Metallized Polypropylene Film EMI Suppression Capacitors – F861, Class X2, 310 VAC

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Overview

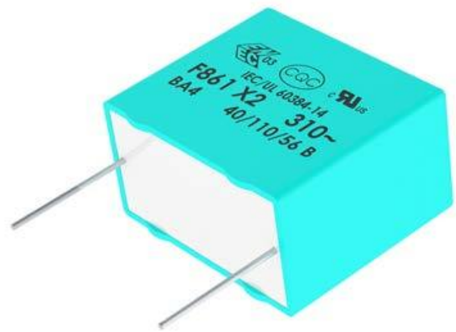
The F861 Series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material meeting the requirements of UL 94 V–0.

Applications

For use as electromagnetic interference (EMI) noise suppression in across-the-line applications requiring X2 safety classification according to IEC 60384–14. Not for use in "series with mains" and as AC Power filtering type applications.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- Rated voltage: 310 VAC 50/60 Hz
- Capacitance range: 0.01 – 4.7 µF
- Lead spacing: 7.5 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category: 40/110/56, IEC 60068–1
- Tape & Reel in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of −40°C to +110°C
- 100% screening factory test at 1,900 VDC



Part Number System

F	861	B	C	104	M	310	C
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Voltage (VAC)	Packaging
F = Film	X2, Metallized Polypropylene	K = 7.5 A = 10 B = 15 D = 22.5 F = 27.5 R = 37.5	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	310	See Ordering Options Table

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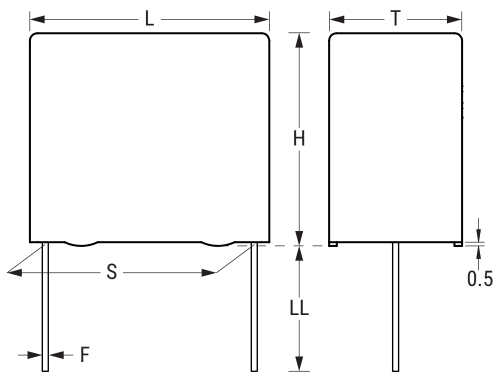
Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
7.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4+2/-0	C
	Bulk (Bag) – Long Leads	17+0/-1	A
	Tape & Reel (Standard Reel)	H_0= 18.5±0.5	L
	Other Lead and Packaging Options		
	Bulk (Bag) – Maximum Length Leads	20+5/-0	ALL0L
	Ammo Pack	H_0= 18.5±0.5	R
10	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4+2/-0	C
	Bulk (Bag) – Long Leads	17+0/-1	A
	Tape & Reel (Standard Reel)	H_0= 18.5±0.5	L
	Other Lead and Packaging Options		
	Bulk (Bag) – Maximum Length Leads	20+5/-0	ALL0L
	Ammo Pack	H_0= 18.5±0.5	R
	Tape & Reel (Large Reel)	H_0= 18.5±0.5	P
15	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4+2/-0	C
	Bulk (Bag) – Long Leads	17+0/-1	A
	Tape & Reel (Standard Reel)	H_0= 18.5±0.5	L
	Pizza Pack	4+2/-0	Z
	Other Lead and Packaging Options		
	Bulk (Bag) – Maximum Length Leads	25+5/-0	ALR0L
	Ammo Pack	H_0= 18.5±0.5	R
	Tape & Reel (Large Reel)	H_0= 18.5±0.5	P
22.5	**Standard Lead and Packaging Options**		
	Pizza – Long Leads	17+0/-1	ZLH0J
	Pizza Pack	4+2/-0	Z
	Other Lead and Packaging Options		
	Tape & Reel (Standard Reel)	H_0= 18.5±0.5	L
	Tape & Reel (Large Reel)	H_0= 18.5±0.5	P
	Ammo Pack	H_0= 18.5±0.5	R
27.5	**Standard Lead and Packaging Options**		
	Pizza – Long Leads	17+0/-1	ZLH0J
	Pizza Pack	4+2/-0	Z
37.5	**Standard Lead and Packaging Options**		
	Pizza – Long Leads	17+0/-1	ZLH0J
	Pizza Pack	4+2/-0	Z

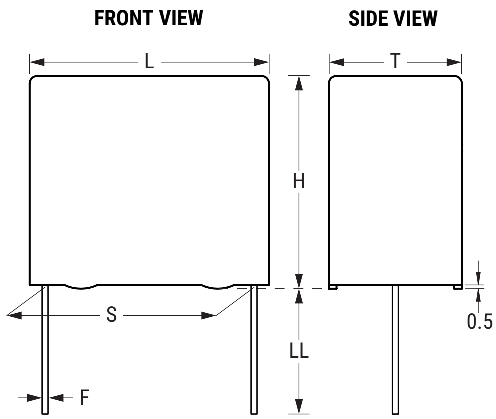
Dimensions – Millimeters



Size Code	Version	S		T		H		L		F	
		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
KG		7.5	±0.4	4	+0/-0.5	8.0	+0/-0.5	10.0	+0/-0.5	0.6	±0.05
KH		7.5	±0.4	4	+0/-0.5	9.0	+0/-0.5	10.0	+0/-0.5	0.6	±0.05
KJ		7.5	±0.4	5	+0/-0.5	10.5	+0/-0.5	10.0	+0/-0.5	0.6	±0.05
KM		7.5	±0.4	6	+0/-0.5	12.0	+0/-0.5	10.5	+0/-0.5	0.6	±0.05
AG		10.0	±0.4	4.0	+0/-0.5	9.0	+0/-0.5	13.0	+0/-0.5	0.6	±0.05
AK		10.0	±0.4	5.0	+0/-0.5	11.0	+0/-0.5	13.0	+0/-0.5	0.6	±0.05
AP		10.0	±0.4	6.0	+0/-0.5	12.0	+0/-0.5	13.0	+0/-0.5	0.6	±0.05
AO		10.0	±0.4	7.0	+0/-0.5	17.0	+0/-0.5	13.0	+0/-0.5	0.6	±0.05
AL	Low Profile	10.0	±0.4	9.5	+0/-0.5	7.5	+0/-0.5	13.0	+0/-0.5	0.6	±0.05
AE	Special Version	10.0	±0.4	4.0	+0/-0.5	8.0	+0/-0.5	13.0	+0/-0.5	0.6	±0.05
BB		15.0	±0.4	4.0	+0/-0.5	10.0	+0/-0.5	18.0	+0/-0.5	0.8	±0.05
BC		15.0	±0.4	5.0	+0/-0.5	11.0	+0/-0.5	18.0	+0/-0.5	0.8	±0.05
BE		15.0	±0.4	5.5	+0/-0.5	12.5	+0/-0.5	18.0	+0/-0.5	0.8	±0.05
BG		15.0	±0.4	6.0	+0/-0.5	12.0	+0/-0.5	18.0	+0/-0.5	0.8	±0.05
BI	High Profile	15.0	±0.4	6.0	+0/-0.5	17.5	+0/-0.5	18.0	+0/-0.5	0.8	±0.05
BK		15.0	±0.4	7.5	+0/-0.5	13.5	+0/-0.5	18.0	+0/-0.5	0.8	±0.05
BO	High Profile	15.0	±0.4	7.5	+0/-0.5	18.5	+0/-0.5	18.0	+0/-0.5	0.8	±0.05
BP		15.0	±0.4	8.5	+0/-0.5	14.5	+0/-0.5	18.0	+0/-0.5	0.8	±0.05
BT		15.0	±0.4	9.0	+0/-0.5	12.5	+0/-0.5	18.0	+0/-0.5	0.8	±0.05
BS		15.0	±0.4	10.0	+0/-0.5	16.0	+0/-0.5	18.0	+0/-0.5	0.8	±0.05
BY		15.0	±0.4	11.0	+0/-0.5	19.0	+0/-0.5	18.0	+0/-0.5	0.8	±0.05
BZ	Special Version	15.0	±0.4	12.0	+0/-0.5	20.0	+0/-0.5	18.0	+0/-0.5	0.8	±0.05
BR	Low Profile	15.0	±0.4	13.0	+0/-0.5	12.0	+0/-0.5	18.0	+0/-0.5	0.8	±0.05
DB		22.5	±0.4	6.0	+0/-0.5	14.5	+0/-0.5	26.0	+0/-0.5	0.8	±0.05
DI		22.5	±0.4	7.0	+0/-0.5	16.0	+0/-0.5	26.0	+0/-0.5	0.8	±0.05
DH		22.5	±0.4	8.0	+0/-0.5	16.0	+0/-0.5	26.0	+0/-0.5	0.8	±0.05
DJ		22.5	±0.4	8.5	+0/-0.5	17.0	+0/-0.5	26.0	+0/-0.5	0.8	±0.05
DM		22.5	±0.4	9.0	+0/-0.5	18.5	+0/-0.5	26.0	+0/-0.5	0.8	±0.05

Note: See Ordering Options Table for lead length (LL) options.

Dimensions – Millimeters cont.



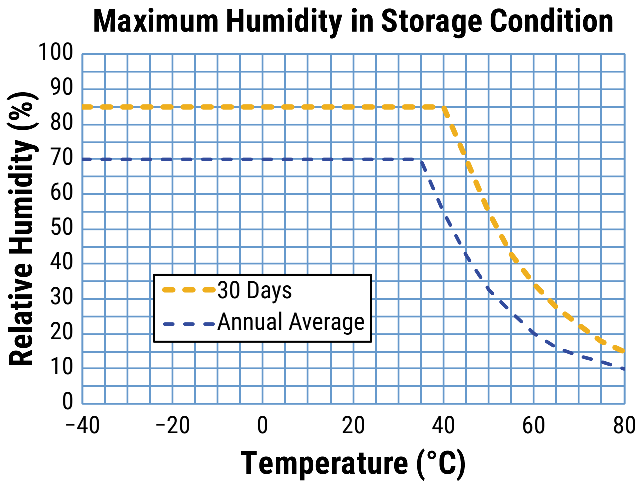
Size Code	Version	S		T		H		L		F	
		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
DO		22.5	±0.4	10.0	+0/-0.5	18.5	+0/-0.5	26.0	+0/-0.5	0.8	±0.05
DP		22.5	±0.4	11.0	+0/-0.5	20.0	+0/-0.5	26.0	+0/-0.5	0.8	±0.05
DU		22.5	±0.4	13.0	+0/-0.5	22.0	+0/-0.5	26.0	+0/-0.5	0.8	±0.05
DY		22.5	±0.4	15.5	+0/-0.5	24.5	+0/-0.5	26.0	+0/-0.5	0.8	±0.05
FB		27.5	±0.4	9.0	+0/-0.7	17.0	+0/-0.7	31.5	+0/-0.7	0.8	±0.05
FC		27.5	±0.4	11.0	+0/-0.7	20.0	+0/-0.7	31.5	+0/-0.7	0.8	±0.05
FI		27.5	±0.4	13.0	+0/-0.7	25.0	+0/-0.7	31.5	+0/-0.7	0.8	±0.05
FN		27.5	±0.4	14.0	+0/-0.7	28.0	+0/-0.7	31.5	+0/-0.7	0.8	±0.05
FO	High Profile	27.5	±0.4	17.0	+0/-0.7	40.0	+0/-0.7	31.5	+0/-0.7	0.8	±0.05
FR		27.5	±0.4	17.5	+0/-0.7	28.0	+0/-0.7	31.5	+0/-0.7	0.8	±0.05
FS		27.5	±0.4	19.0	+0/-0.7	29.0	+0/-0.7	31.5	+0/-0.7	0.8	±0.05
FY		27.5	±0.4	22.0	+0/-0.7	37.0	+0/-0.7	31.5	+0/-0.7	0.8	±0.05
FH	Low Profile	27.5	±0.4	21.0	+0/-0.7	12.5	+0/-0.7	31.5	+0/-0.7	0.8	±0.05
FQ	Low Profile	27.5	±0.4	27.5	+0/-0.7	16.0	+0/-0.7	31.5	+0/-0.7	0.8	±0.05
FT	Low Profile	27.5	±0.4	31.0	+0/-0.7	19.0	+0/-0.7	31.5	+0/-0.7	0.8	±0.05
RB		37.5	±0.4	11.0	+0/-0.7	22.0	+0/-0.7	41.0	+0/-0.7	1	±0.05
RF		37.5	±0.4	13.0	+0/-0.7	24.0	+0/-0.7	41.0	+0/-0.7	1	±0.05
RH		37.5	±0.4	15.0	+0/-0.7	26.0	+0/-0.7	41.0	+0/-0.7	1	±0.05
RC		37.5	±0.4	16.0	+0/-0.7	28.5	+0/-0.7	41.0	+0/-0.7	1	±0.05
RD		37.5	±0.4	19.0	+0/-0.7	32.0	+0/-0.7	41.0	+0/-0.7	1	±0.05
RP		37.5	±0.4	21.0	+0/-0.7	38.0	+0/-0.7	41.0	+0/-0.7	1	±0.05
RO		37.5	±0.4	24.0	+0/-0.7	44.0	+0/-0.7	41.0	+0/-0.7	1	±0.05
RU		37.5	±0.4	30.0	+0/-0.7	45.0	+0/-0.7	41.0	+0/-0.7	1	±0.05
RV	Low Profile	37.5	±0.4	24.0	+0/-0.7	15.0	+0/-0.7	41.0	+0/-0.7	1	±0.05
RW	Low Profile	37.5	±0.4	24.0	+0/-0.7	19.0	+0/-0.7	41.0	+0/-0.7	1	±0.05

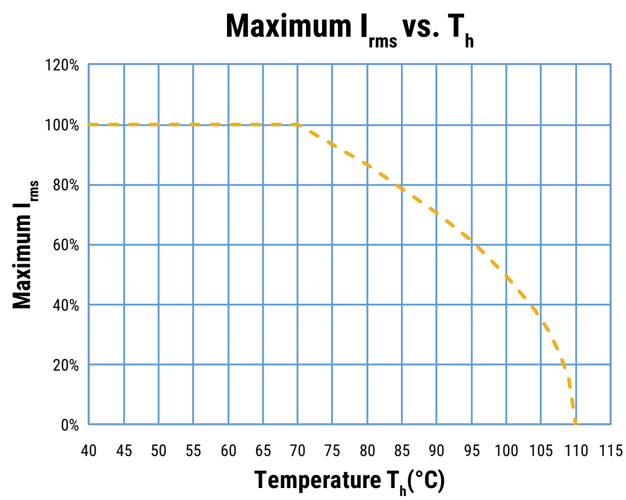
Note: See Ordering Options Table for lead length (LL) options.

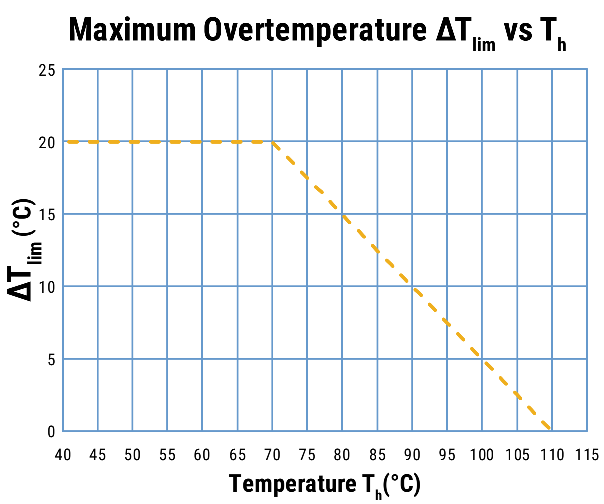
Performance Characteristics

<table>
<tr><td>Rated Voltage</td><td colspan="4">310 VAC 50/60 Hz</td></tr>
<tr><td>Capacitance Range</td><td colspan="4">0.01 – 4.7 µF</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="4">±20%, ±10%</td></tr>
<tr><td>Temperature Range</td><td colspan="4">−40°C to +110°C</td></tr>
<tr><td>Climatic Category</td><td colspan="4">40/110/56</td></tr>
<tr><td>Storage Conditions</td><td colspan="4">Storage time: ≤ 24 months from the date marked on the label package
Average relative humidity per year ≤ 70%
RH ≤ 85% for 30 days randomly distributed throughout the year
Dew is absent
Temperature: -40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)</td></tr>
<tr><td>Approvals</td><td colspan="4">ENEC, UL, cUL, CQC</td></tr>
<tr><td rowspan="3">Dissipation Factor</td><td colspan="4">Maximum Values at +23°C</td></tr>
<tr><td></td><td>C ≤ 0.1 µF</td><td colspan="2">C > 0.1 µF</td></tr>
<tr><td>1 kHz</td><td>0.3%</td><td colspan="2">0.2%</td></tr>
<tr><td>Test Voltage Between Terminals</td><td colspan="4">The 100% screening factory test is carried out at 1,900 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. It's not permitted to repeat this Test as there is a risk to damage the Capacitor. KEMET is not liable in such case for any failures</td></tr>
<tr><td rowspan="4">Insulation Resistance</td><td colspan="4">Measured at +25°C ±5°C, according to IEC 60384-2</td></tr>
<tr><td colspan="4">Minimum Values Between Terminals</td></tr>
<tr><td>Voltage Charge</td><td>Voltage Charge time</td><td>C ≤ 0.33 µF</td><td>C > 0.33 µF</td></tr>
<tr><td>100 VDC</td><td>1 minute</td><td>≥ 3 • 10^4 MΩ</td><td>≥ 10,000 MΩ • µF</td></tr>
<tr><td>In DC Applications</td><td colspan="4">Recommended voltage ≤ 630 VDC</td></tr>
</table>

Performance Characteristics cont.

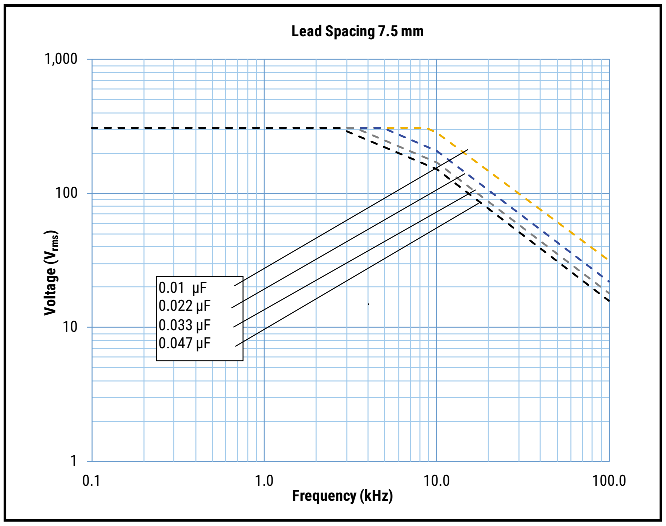


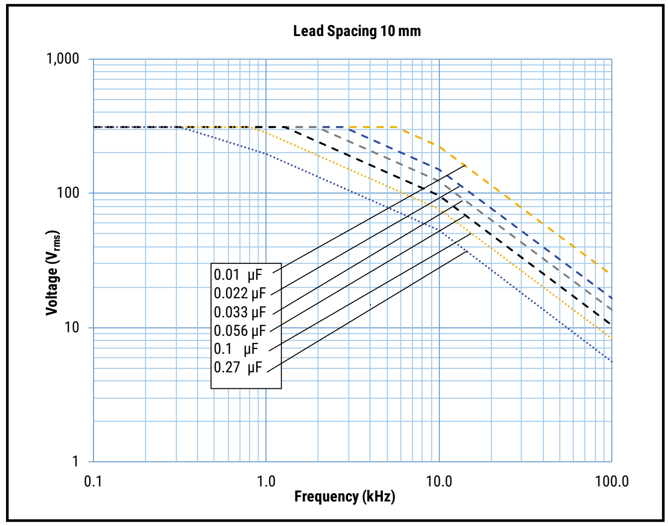


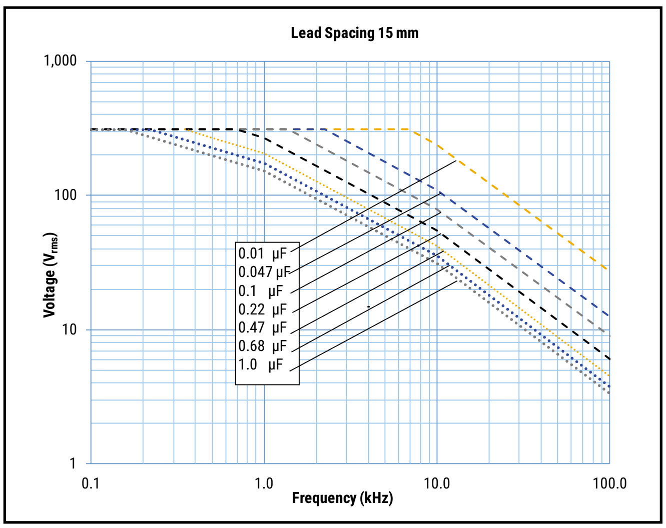


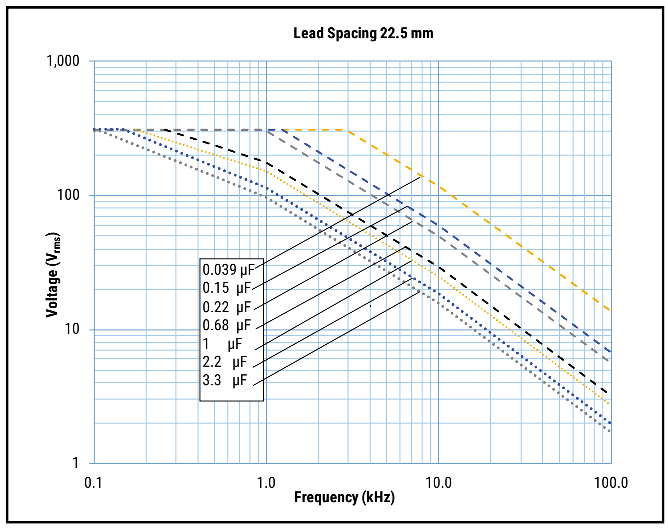
T_h is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

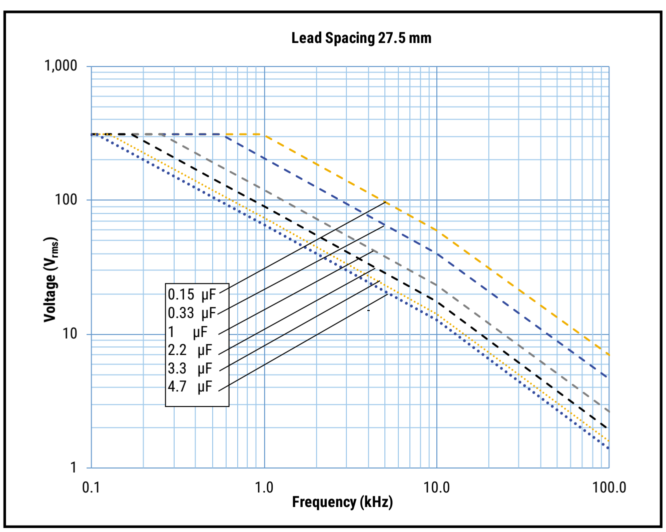
Maximum Voltage (V_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 70°C)

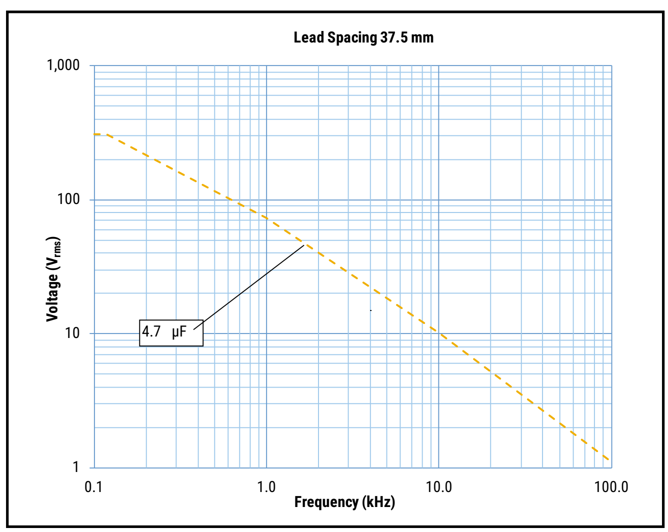




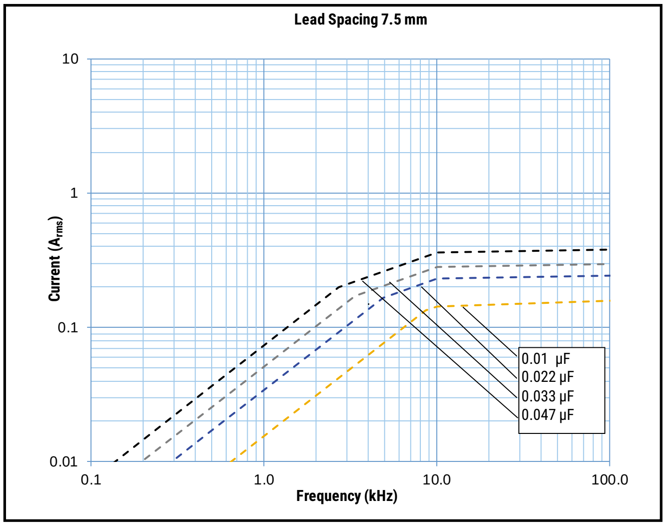


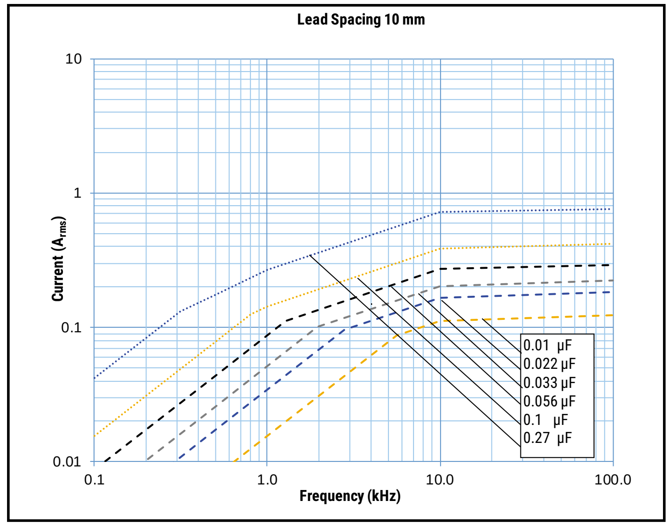


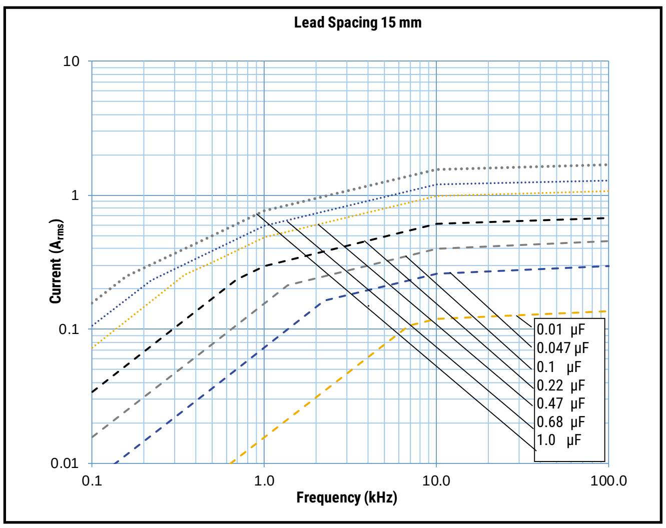


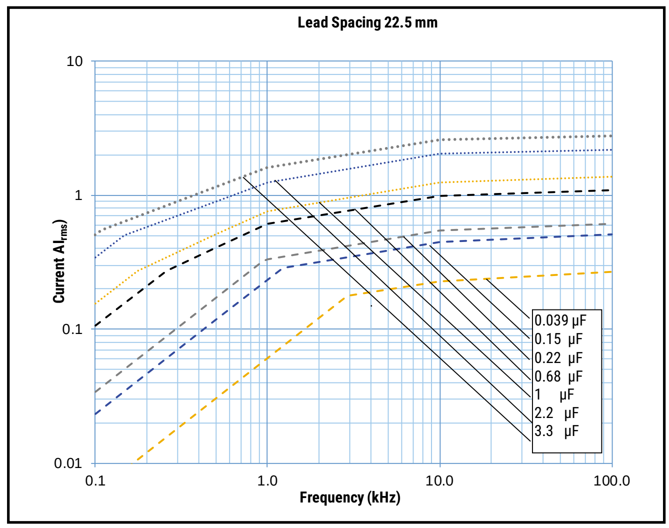


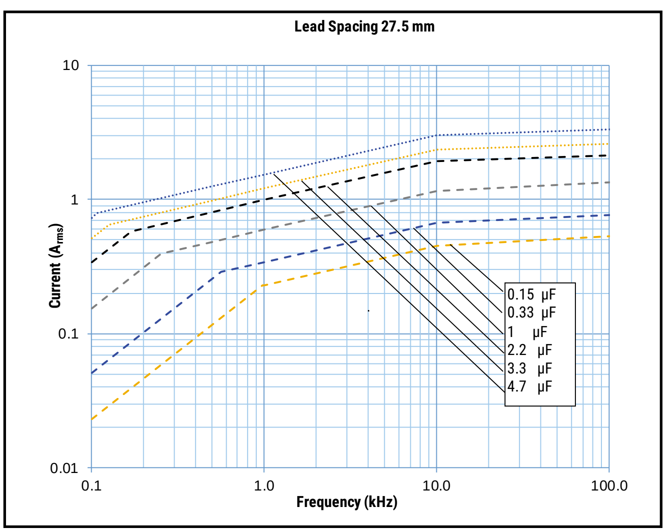
Maximum Current (A_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 70°C)

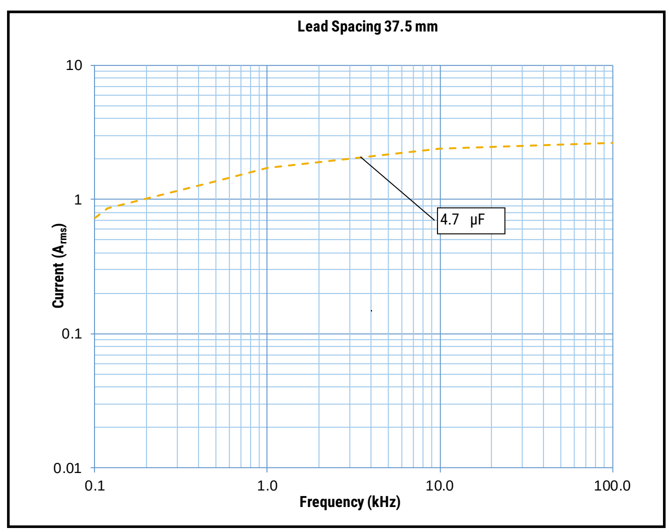




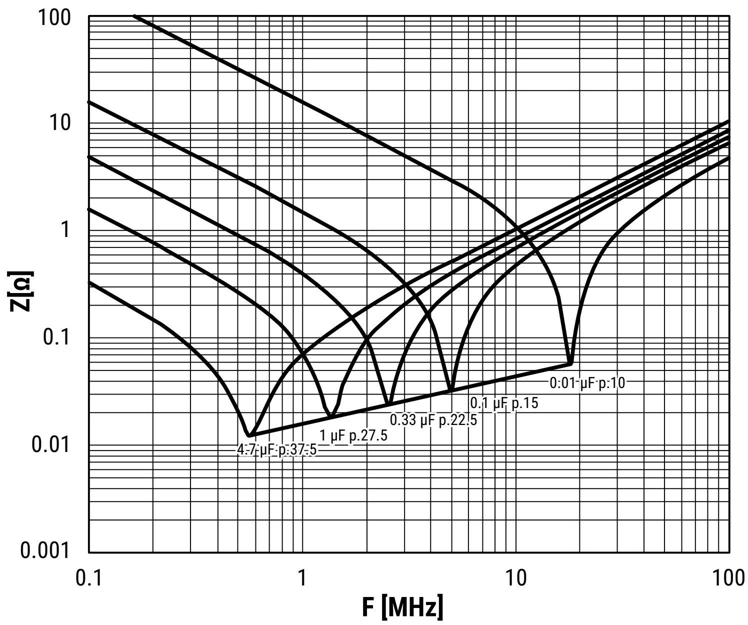








Impedance Graph



Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R +20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle–flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
IMQ S.p.A.		EN/IEC 60384–14	CA08.00189
UL		UL 60384–14 and CAN/CSA–E60384–14	E97797
CQC		IEC 60384–14	CQC12001084206 CQC12001084386 CQC12001084205 CQC12001084204 CQC12001084207

Environmental Compliance

All new KEMET EMI capacitors are RoHS compliant and Halogen–Free.

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Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Size Code	Maximum Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Part Number
		T	H	L			
0.01	KG	4.0	8.0	10.0	7.5	500	F861KG103(1)310(2)
0.012	KG	4.0	8.0	10.0	7.5	500	F861KG123(1)310(2)
0.015	KH	4.0	9.0	10.0	7.5	500	F861KH153(3)310(2)
0.018	KJ	5.0	10.5	10.0	7.5	500	F861KJ183(1)310(2)
0.022	KJ	5.0	10.5	10.0	7.5	500	F861KJ223(1)310(2)
0.025	KJ	5.0	10.5	10.0	7.5	500	F861KJ253(1)310(2)
0.027	KJ	5.0	10.5	10.0	7.5	500	F861KJ273(1)310(2)
0.033	KJ	5.0	10.5	10.0	7.5	500	F861KJ333(3)310(2)
0.033	KM	6.0	12.0	10.5	7.5	500	F861KM333(1)310(2)
0.039	KM	6.0	12.0	10.5	7.5	500	F861KM393(1)310(2)
0.047	KM	6.0	12.0	10.5	7.5	500	F861KM473(3)310(2)
0.01	AE	4.0	8.0	13.0	10.0	500	F861AE103(1)310(2)
0.01	AL	9.5	7.5	13.0	10.0	500	F861AL103(1)310(2)
0.012	AE	4.0	8.0	13.0	10.0	500	F861AE123(1)310(2)
0.015	AE	4.0	8.0	13.0	10.0	500	F861AE153(1)310(2)
0.015	AL	9.5	7.5	13.0	10.0	500	F861AL153(1)310(2)
0.018	AE	4.0	8.0	13.0	10.0	500	F861AE183(1)310(2)
0.018	AL	9.5	7.5	13.0	10.0	500	F861AL183(1)310(2)
0.022	AE	4.0	8.0	13.0	10.0	500	F861AE223(1)310(2)
0.022	AL	9.5	7.5	13.0	10.0	500	F861AL223(1)310(2)
0.025	AE	4.0	8.0	13.0	10.0	500	F861AE253(1)310(2)
0.025	AL	9.5	7.5	13.0	10.0	500	F861AL253(1)310(2)
0.027	AE	4.0	8.0	13.0	10.0	500	F861AE273(1)310(2)
0.027	AL	9.5	7.5	13.0	10.0	500	F861AL273(1)310(2)
0.033	AE	4.0	8.0	13.0	10.0	500	F861AE333(1)310(2)
0.033	AL	9.5	7.5	13.0	10.0	500	F861AL333(1)310(2)
0.039	AE	4.0	8.0	13.0	10.0	500	F861AE393(1)310(2)
0.039	AL	9.5	7.5	13.0	10.0	500	F861AL393(1)310(2)
0.047	AE	4.0	8.0	13.0	10.0	500	F861AE473(3)310(2)
0.047	AL	9.5	7.5	13.0	10.0	500	F861AL473(1)310(2)
0.056	AG	4.0	9.0	13.0	10.0	500	F861AG563(1)310(2)
0.056	AL	9.5	7.5	13.0	10.0	500	F861AL563(1)310(2)
0.068	AK	5.0	11.0	13.0	10.0	500	F861AK683(1)310(2)
0.068	AL	9.5	7.5	13.0	10.0	500	F861AL683(1)310(2)
0.082	AK	5.0	11.0	13.0	10.0	500	F861AK823(1)310(2)
0.082	AL	9.5	7.5	13.0	10.0	500	F861AL823(1)310(2)
0.1	AK	5.0	11.0	13.0	10.0	500	F861AK104(3)310(2)
0.1	AL	9.5	7.5	13.0	10.0	500	F861AL104(1)310(2)
0.1	AP	6.0	12.0	13.0	10.0	500	F861AP104(1)310(2)
0.12	AL	9.5	7.5	13.0	10.0	500	F861AL124(1)310(2)
0.12	AP	6.0	12.0	13.0	10.0	500	F861AP124(1)310(2)
0.15	AO	7.0	17.0	13.0	10.0	500	F861AO154(1)310(2)
0.15	AP	6.0	12.0	13.0	10.0	500	F861AP154(3)310(2)
0.18	AO	7.0	17.0	13.0	10.0	500	F861AO184(1)310(2)
0.22	AO	7.0	17.0	13.0	10.0	500	F861AO224(1)310(2)
0.25	AO	7.0	17.0	13.0	10.0	500	F861AO254(1)310(2)
0.27	AO	7.0	17.0	13.0	10.0	500	F861AO274(1)310(2)
0.01	BB	4.0	10.0	18.0	15.0	400	F861BB103(1)310(2)
0.012	BB	4.0	10.0	18.0	15.0	400	F861BB123(1)310(2)
0.015	BB	4.0	10.0	18.0	15.0	400	F861BB153(1)310(2)
0.018	BB	4.0	10.0	18.0	15.0	400	F861BB183(1)310(2)
0.022	BB	4.0	10.0	18.0	15.0	400	F861BB223(1)310(2)
0.025	BB	4.0	10.0	18.0	15.0	400	F861BB253(1)310(2)
0.027	BB	4.0	10.0	18.0	15.0	400	F861BB273(1)310(2)
0.033	BB	4.0	10.0	18.0	15.0	400	F861BB333(1)310(2)
0.039	BB	4.0	10.0	18.0	15.0	400	F861BB393(1)310(2)
0.047	BB	4.0	10.0	18.0	15.0	400	F861BB473(1)310(2)
0.056	BB	4.0	10.0	18.0	15.0	400	F861BB563(1)310(2)
0.068	BB	4.0	10.0	18.0	15.0	400	F861BB683(1)310(2)
Capacitance Value (µF)	**Size Code**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See Ordering Options Table for available options.
(3) M = ±20% (only available tolerance).

Table 1 – Ratings & Part Number Reference cont.

Capacitance Value (µF)	Size Code	Maximum Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Part Number
		T	H	L			
0.082	BB	4.0	10.0	18.0	15.0	400	F861BB823(1)310(2)
0.1	BB	4.0	10.0	18.0	15.0	400	F861BB104(1)310(2)
0.12	BB	4.0	10.0	18.0	15.0	400	F861BB124(3)310(2)
0.12	BC	5.0	11.0	18.0	15.0	400	F861BC124(1)310(2)
0.15	BC	5.0	11.0	18.0	15.0	400	F861BC154(1)310(2)
0.15	BT	9.0	12.5	18.0	15.0	400	F861BT154(1)310(2)
0.18	BC	5.0	11.0	18.0	15.0	400	F861BC184(3)310(2)
0.18	BE	5.5	12.5	18.0	15.0	400	F861BE184(1)310(2)
0.18	BT	9.0	12.5	18.0	15.0	400	F861BT184(1)310(2)
0.22	BE	5.5	12.5	18.0	15.0	400	F861BE224(1)310(2)
0.22	BG	6.0	12.0	18.0	15.0	400	F861BG224(1)310(2)
0.22	BT	9.0	12.5	18.0	15.0	400	F861BT224(1)310(2)
0.25	BG	6.0	12.0	18.0	15.0	400	F861BG254(1)310(2)
0.25	BT	9.0	12.5	18.0	15.0	400	F861BT254(1)310(2)
0.27	BG	6.0	12.0	18.0	15.0	400	F861BG274(3)310(2)
0.27	BI	6.0	17.5	18.0	15.0	400	F861BI274(1)310(2)
0.27	BK	7.5	13.5	18.0	15.0	400	F861BK274(1)310(2)
0.27	BR	13.0	12.0	18.0	15.0	400	F861BR274(1)310(2)
0.27	BT	9.0	12.5	18.0	15.0	400	F861BT274(1)310(2)
0.33	BI	6.0	17.5	18.0	15.0	400	F861BI334(1)310(2)
0.33	BK	7.5	13.5	18.0	15.0	400	F861BK334(1)310(2)
0.33	BR	13.0	12.0	18.0	15.0	400	F861BR334(1)310(2)
0.33	BT	9.0	12.5	18.0	15.0	400	F861BT334(1)310(2)
0.39	BI	6.0	17.5	18.0	15.0	400	F861BI394(1)310(2)
0.39	BK	7.5	13.5	18.0	15.0	400	F861BK394(3)310(2)
0.39	BP	8.5	14.5	18.0	15.0	400	F861BP394(1)310(2)
0.39	BR	13.0	12.0	18.0	15.0	400	F861BR394(1)310(2)
0.39	BT	9.0	12.5	18.0	15.0	400	F861BT394(1)310(2)
0.47	BO	7.5	18.5	18.0	15.0	400	F861BO474(1)310(2)
0.47	BP	8.5	14.5	18.0	15.0	400	F861BP474(1)310(2)
0.47	BR	13.0	12.0	18.0	15.0	400	F861BR474(1)310(2)
0.56	BO	7.5	18.5	18.0	15.0	400	F861BO564(1)310(2)
0.56	BR	13.0	12.0	18.0	15.0	400	F861BR564(1)310(2)
0.56	BS	10.0	16.0	18.0	15.0	400	F861BS564(1)310(2)
0.68	BR	13.0	12.0	18.0	15.0	400	F861BR684(3)310(2)
0.68	BS	10.0	16.0	18.0	15.0	400	F861BS684(1)310(2)
0.82	BY	11.0	19.0	18.0	15.0	400	F861BY824(1)310(2)
1	BZ	12.0	20.0	18.0	15.0	400	F861BZ105(3)310(2)
0.039	DB	6.0	14.5	26.0	22.5	200	F861DB393(1)310(2)
0.047	DB	6.0	14.5	26.0	22.5	200	F861DB473(1)310(2)
0.056	DB	6.0	14.5	26.0	22.5	200	F861DB563(1)310(2)
0.068	DB	6.0	14.5	26.0	22.5	200	F861DB683(1)310(2)
0.082	DB	6.0	14.5	26.0	22.5	200	F861DB823(1)310(2)
0.1	DB	6.0	14.5	26.0	22.5	200	F861DB104(1)310(2)
0.12	DB	6.0	14.5	26.0	22.5	200	F861DB124(1)310(2)
0.15	DB	6.0	14.5	26.0	22.5	200	F861DB154(1)310(2)
0.18	DB	6.0	14.5	26.0	22.5	200	F861DB184(1)310(2)
0.22	DB	6.0	14.5	26.0	22.5	200	F861DB224(1)310(2)
0.25	DB	6.0	14.5	26.0	22.5	200	F861DB254(1)310(2)
0.27	DB	6.0	14.5	26.0	22.5	200	F861DB274(1)310(2)
0.33	DB	6.0	14.5	26.0	22.5	200	F861DB334(1)310(2)
0.39	DB	6.0	14.5	26.0	22.5	200	F861DB394(1)310(2)
0.47	DB	6.0	14.5	26.0	22.5	200	F861DB474(3)310(2)
0.47	DI	7.0	16.0	26.0	22.5	200	F861DI474(1)310(2)
0.56	DI	7.0	16.0	26.0	22.5	200	F861DI564(1)310(2)
0.68	DI	7.0	16.0	26.0	22.5	200	F861DI684(1)310(2)
0.82	DH	8.0	16.0	26.0	22.5	200	F861DH824(1)310(2)
1	DJ	8.5	17.0	26.0	22.5	200	F861DJ105(3)310(2)
1.2	DM	9.0	18.5	26.0	22.5	200	F861DM125(3)310(2)
Capacitance Value (µF)	**Size Code**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See Ordering Options Table for available options.
(3) M = ±20% (only available tolerance).

Table 1 – Ratings & Part Number Reference cont.

Capacitance Value (µF)	Size Code	Maximum Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Part Number
		T	H	L			
1.2	DO	10.0	18.5	26.0	22.5	200	F861DO125(1)310(2)
1.5	DP	11.0	20.0	26.0	22.5	200	F861DP155(1)310(2)
1.8	DP	11.0	20.0	26.0	22.5	200	F861DP185(3)310(2)
1.8	DU	13.0	22.0	26.0	22.5	200	F861DU185(1)310(2)
2.2	DU	13.0	22.0	26.0	22.5	200	F861DU225(1)310(2)
2.5	DU	13.0	22.0	26.0	22.5	200	F861DU255(3)310(2)
2.5	DY	15.5	24.5	26.0	22.5	200	F861DY255(1)310(2)
2.7	DY	15.5	24.5	26.0	22.5	200	F861DY275(1)310(2)
3.3	DY	15.5	24.5	26.0	22.5	200	F861DY335(3)310(2)
0.15	FB	9.0	17.0	31.5	27.5	150	F861FB154(1)310(2)
0.18	FB	9.0	17.0	31.5	27.5	150	F861FB184(1)310(2)
0.22	FB	9.0	17.0	31.5	27.5	150	F861FB224(1)310(2)
0.25	FB	9.0	17.0	31.5	27.5	150	F861FB254(1)310(2)
0.25	FH	21.0	12.5	31.5	27.5	150	F861FH254(1)310(2)
0.27	FB	9.0	17.0	31.5	27.5	150	F861FB274(1)310(2)
0.27	FH	21.0	12.5	31.5	27.5	150	F861FH274(1)310(2)
0.33	FB	9.0	17.0	31.5	27.5	150	F861FB334(1)310(2)
0.33	FH	21.0	12.5	31.5	27.5	150	F861FH334(1)310(2)
0.39	FB	9.0	17.0	31.5	27.5	150	F861FB394(1)310(2)
0.39	FH	21.0	12.5	31.5	27.5	150	F861FH394(1)310(2)
0.47	FB	9.0	17.0	31.5	27.5	150	F861FB474(1)310(2)
0.47	FH	21.0	12.5	31.5	27.5	150	F861FH474(1)310(2)
0.56	FB	9.0	17.0	31.5	27.5	150	F861FB564(1)310(2)
0.56	FH	21.0	12.5	31.5	27.5	150	F861FH564(1)310(2)
0.68	FB	9.0	17.0	31.5	27.5	150	F861FB684(1)310(2)
0.68	FH	21.0	12.5	31.5	27.5	150	F861FH684(1)310(2)
0.82	FB	9.0	17.0	31.5	27.5	150	F861FB824(1)310(2)
0.82	FH	21.0	12.5	31.5	27.5	150	F861FH824(1)310(2)
1	FB	9.0	17.0	31.5	27.5	150	F861FB105(1)310(2)
1	FH	21.0	12.5	31.5	27.5	150	F861FH105(1)310(2)
1.2	FB	9.0	17.0	31.5	27.5	150	F861FB125(3)310(2)
1.2	FC	11.0	20.0	31.5	27.5	150	F861FC125(1)310(2)
1.2	FH	21.0	12.5	31.5	27.5	150	F861FH125(1)310(2)
1.5	FC	11.0	20.0	31.5	27.5	150	F861FC155(1)310(2)
1.5	FH	21.0	12.5	31.5	27.5	150	F861FH155(1)310(2)
1.8	FC	11.0	20.0	31.5	27.5	150	F861FC185(3)310(2)
1.8	FH	21.0	12.5	31.5	27.5	150	F861FH185(1)310(2)
2.2	FH	21.0	12.5	31.5	27.5	150	F861FH225(3)310(2)
2.2	FI	13.0	25.0	31.5	27.5	150	F861FI225(1)310(2)
2.5	FI	13.0	25.0	31.5	27.5	150	F861FI255(1)310(2)
2.5	FQ	27.5	16.0	31.5	27.5	150	F861FQ255(1)310(2)
2.7	FI	13.0	25.0	31.5	27.5	150	F861FI275(1)310(2)
2.7	FQ	27.5	16.0	31.5	27.5	150	F861FQ275(1)310(2)
3.3	FI	13.0	25.0	31.5	27.5	150	F861FI335(3)310(2)
3.3	FN	14.0	28.0	31.5	27.5	150	F861FN335(1)310(2)
3.3	FO	17.0	40.0	31.5	27.5	150	F861FO335(1)310(2)
3.3	FQ	27.5	16.0	31.5	27.5	150	F861FQ335(1)310(2)
3.9	FO	17.0	40.0	31.5	27.5	150	F861FO395(1)310(2)
3.9	FQ	27.5	16.0	31.5	27.5	150	F861FQ395(3)310(2)
3.9	FR	17.5	28.0	31.5	27.5	150	F861FR395(1)310(2)
3.9	FT	31.0	19.0	31.5	27.5	150	F861FT395(1)310(2)
4.7	FO	17.0	40.0	31.5	27.5	150	F861FO475(1)310(2)
4.7	FR	17.5	28.0	31.5	27.5	150	F861FR475(1)310(2)
4.7	FT	31.0	19.0	31.5	27.5	150	F861FT475(1)310(2)
4.7	RF	13.0	24.0	41.0	37.5	100	F861RF475(3)310(2)
4.7	RH	15.0	26.0	41.0	37.5	100	F861RH475(1)310(2)
4.7	RV	24.0	15.0	41.0	37.5	100	F861RV475(3)310(2)
4.7	RW	24.0	19.0	41.0	37.5	100	F861RW475(1)310(2)
Capacitance Value (µF)	**Size Code**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See Ordering Options Table for available options.
(3) M = ±20% (only available tolerance).

Soldering Process

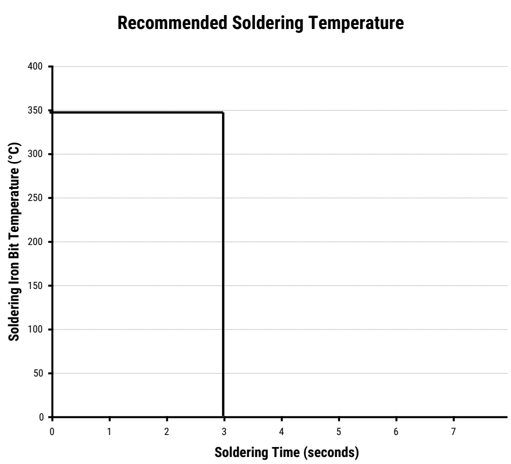
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

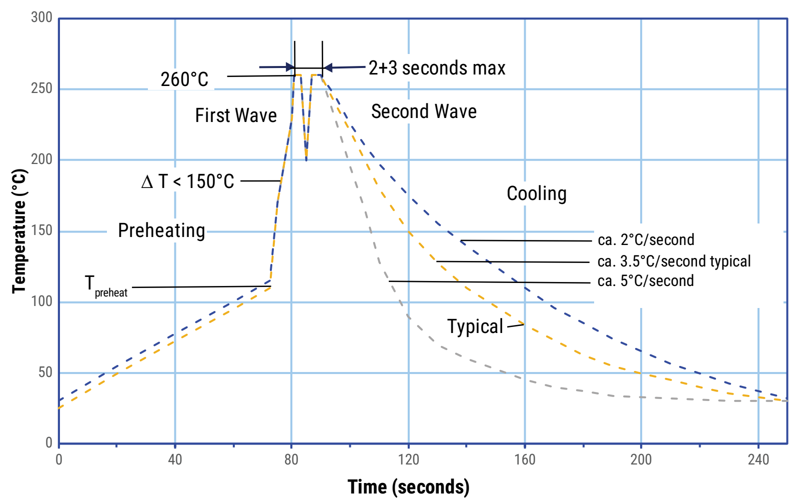
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

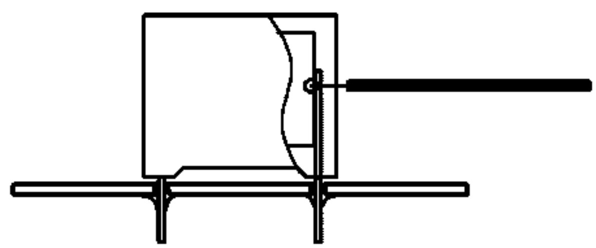
1. The table indicates the maximum set-up temperature of the soldering process

Figure 1

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



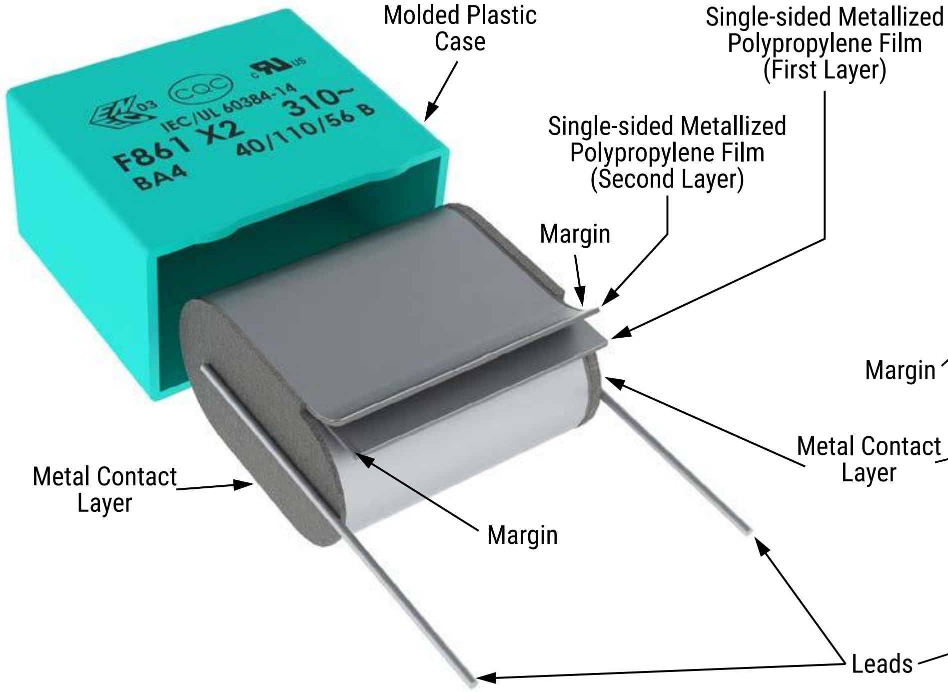
Temperature monitored inside the capacitor.

Selective Soldering Recommendations

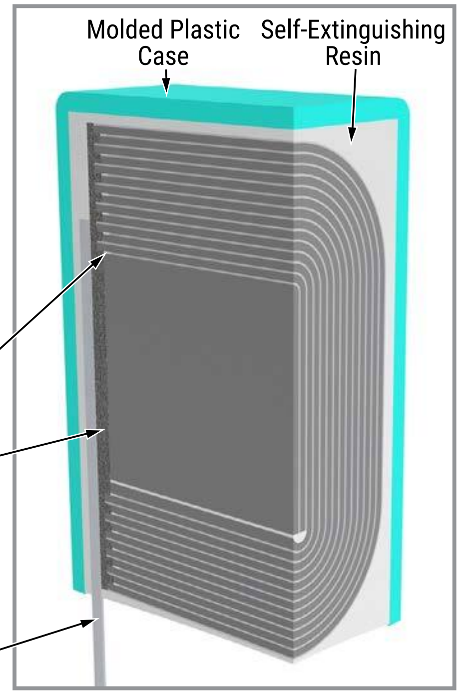
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

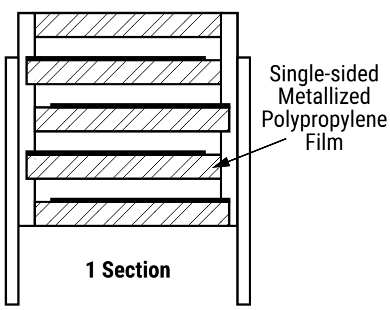
Construction



Detailed Cross Section



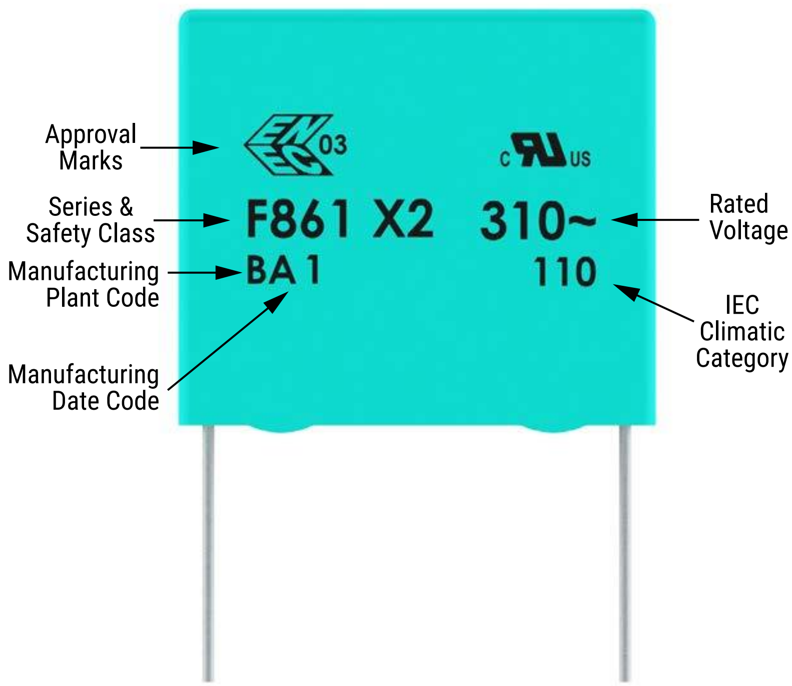
Winding Scheme



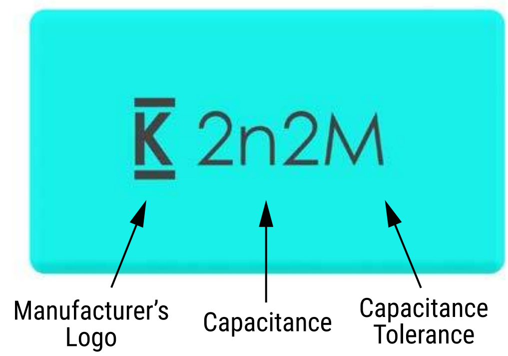
Marking

Pitch = 7.5 mm

FRONT

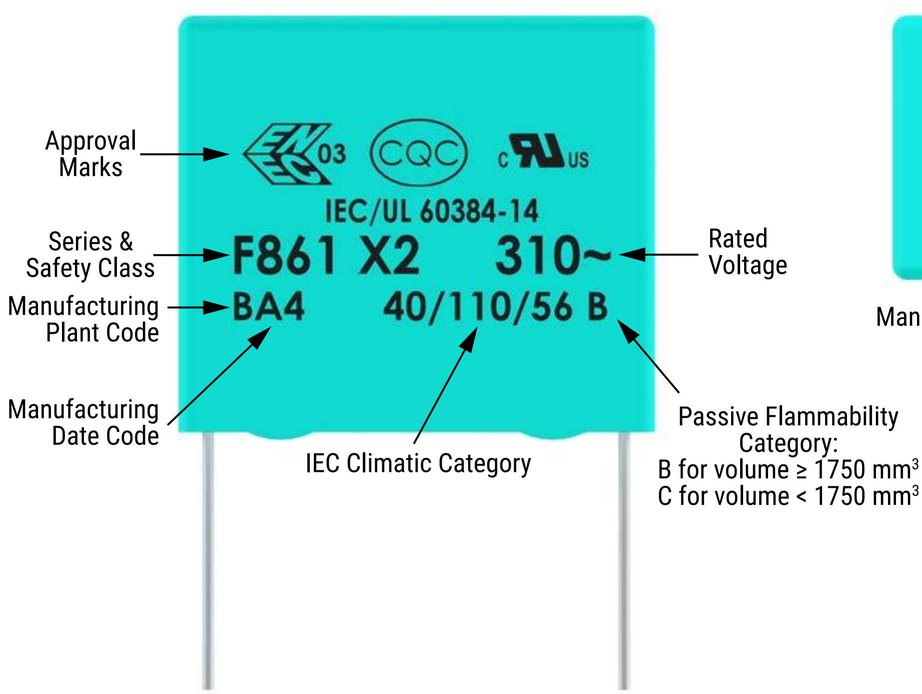


TOP

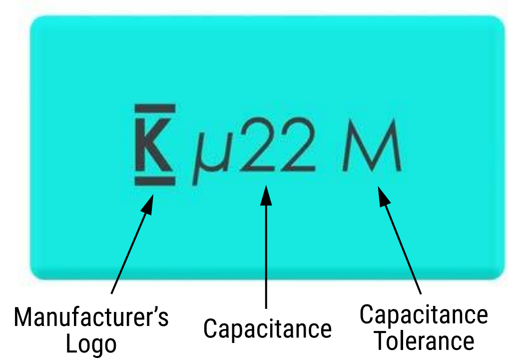


Pitch ≥ 10 mm

FRONT



TOP



Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

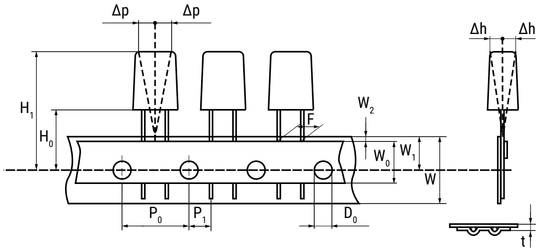
Size Code	Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 355 mm	Large Reel 500 mm	Ammo	Pizza
KE	7.5	2.5	6	10	2,000	2,500	2,500		3,500	
KF		3	8	10	1,500	1,750	2,100		2,800	
KG		4	8	10	2,000	1,500	1,500		2,100	
KJ		5	10.5	10	1,500	1,000	1,200		1,600	
KM		6	12	10.5	1,000	800	1,000		1,350	
KH		4	9	10	2,000	1,500	1,500		2,100	
AN	10	3.5	9	13	2,000	2,200	850	1,700	1,150	
AG		4	9	13	2,000	2,200	750	1,500	1,000	
AK		5	11	13	1,300	2,000	600	1,250	800	
AP		6	12	13	1,000	1,800	500	1,000	680	
AO		7	17	13	600	700	450	900	580	
AL		9.5	7.5	13	1,000	1,500	300	600	430	
AE		4	8	13	2,000	2,200	750	1,500	1,000	
BB	15	4	10	18	2,500	1,500	750	1,500	1,000	1,411
BC		5	11	18	1,000	1,250	600	1,250	800	1,139
BE		5.5	12.5	18	800	1,000	550	1,100	750	1,020
BG		6	12	18	1,750	1,000	500	1,000	680	935
BK		7.5	13.5	18	1,000	800	350	800	500	748
BI		6	17.5	18	1,000	800	500	1,000	680	935
BP		8.5	14.5	18	1,000	650	300	700	440	663
BT		9	12.5	18	1,000	700	270	650	410	629
BO		7.5	18.5	18	900	500	350	800	500	748
BS		10	16	18	750	550	300	600	380	561
BR		13	12	18	750	520	200	480	280	425
BY		11	19	18	450	400	250	500	340	510
BA		8.5	12.5	18	1,000	650	300	700	440	663
BZ		12	20	18	350	300	220	450	330	459
DB	22.5	6	14.5	26	805	450	300	700	464	660
DI		7	16	26	700	450	250	550	380	564
DH		8.0	16.0	26	520	300	240	500	330	492
DJ		8.5	17	26	450	350	250	450	280	468
DM		9	18.5	26	400	225	200	400	300	444
DO		10	18.5	26	360	350	160	350	235	396
DP		11	20	26	300	200	190	350	217	360
DU		13	22	26	230	150	150	300	200	300
DY		15.5	24.5	26	150	100	120	250	170	252

Packaging Quantities cont.

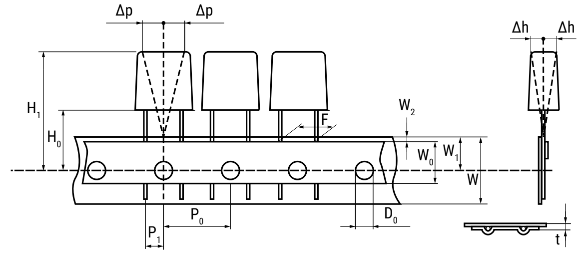
Size Code	Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 355 mm	Large Reel 500 mm	Ammo	Pizza
FB	27.5	9.0	17.0	31.5						370
FC		11.0	20.0	31.5						300
FI		13.0	25.0	31.5						250
FN		14.0	28.0	31.5						230
FO		17.0	40.0	31.5						190
FR		17.5	28.0	31.5						190
FS		19.0	29.0	31.5						170
FY		22.0	37.0	31.5						150
FH		21.0	12.5	31.5						150
FQ		27.5	16.0	31.5						120
FT		31.0	19.0	31.5						100
RB	37.5	11.0	22.0	41.0						210
RF		13.0	24.0	41.0						175
RH		15.0	26.0	41.0						154
RC		16.0	28.5	41.0						140
RD		19.0	32.0	41.0						119
RP		21.0	38.0	41.0						105
RO		24.0	44.0	41.0						91
RU		30.0	45.0	41.0						77
RV		24.0	15.0	41.0						91
RW		24.0	19.0	41.0						91

Lead Taping & Packaging (IEC 60286–2)

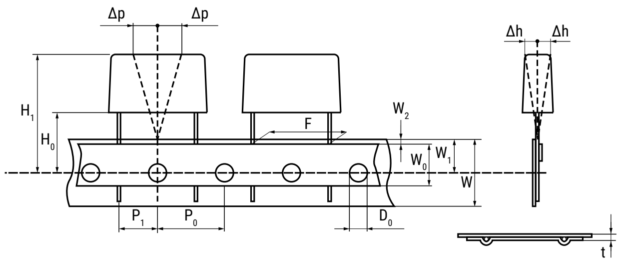
Lead Spacing 5 mm



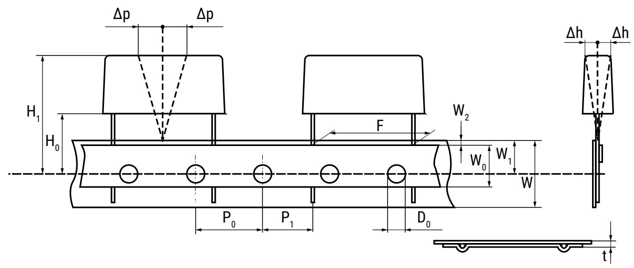
Lead Spacing 7.5 mm



Lead Spacing 10 – 15 mm



Lead Spacing 22.5 – 27.5 mm



Taping Specification

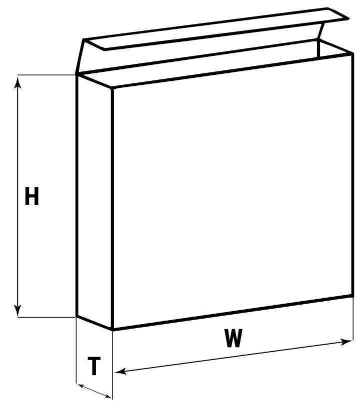
Dimensions in mm									Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	5.0	7.5	10.0	15.0	22.5	27.5	F
Carrier Tape Width	+1/−0.5	W	18.0	18.0	18.0	18.0	18.0	18.0	$18^{+1/-0.5}$
Hold-Down Tape Width	Minimum	W_0	6.0	6.0	9.0	10.0	10.0	10.0	
Position of Sprocket Hole	±0.5	W_1	9.0	9.0	9.0	9.0	9.0	9.0	$9^{+0.75/-0.5}$
Distance Between Tapes	Maximum	W_2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Sprocket Hole Diameter	±0.2	D_0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Feed Hole Lead Spacing	±0.2(1)	P_0(3)	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.85	3.75	7.7	5.2	7.8	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	±2	Δh	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.9^{MAX}	0.9^{MAX}	0.9^{MAX}
Sprocket Hole/Cap Body	±0.5	H_0(2)	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18^{+2/-0}$

(1) Maximum cumulative feed hole error, 1 mm per 20 parts.
(2) 16.5 mm available on request.
(3) 15 mm available on request (F ≥ 10 mm).

Lead Taping & Packaging (IEC 60286–2) cont.

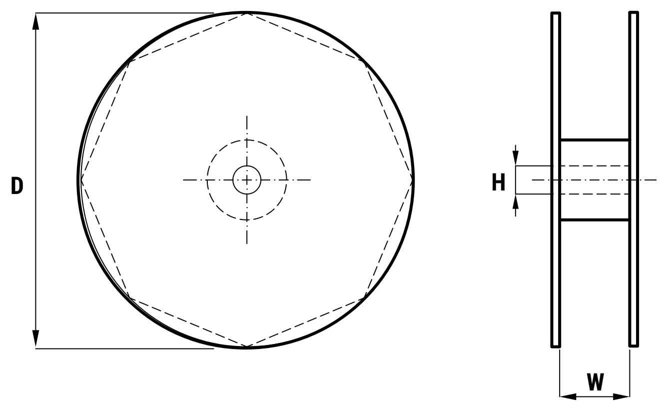
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
F5A, F5B, F5D F6xx, F8xx	360	340	59
PHExxx, PMExxx, PMRxxx	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
F5A, F5B, F5D F6xx, F8xx	355 500	30 25	55 (Max)
PHExxx, PMExxx, PMRxxx	360 500	30	46 (Max)



Metallized Polypropylene Film EMI Suppression Capacitors – F871, Class X1, 330 VAC

Overview

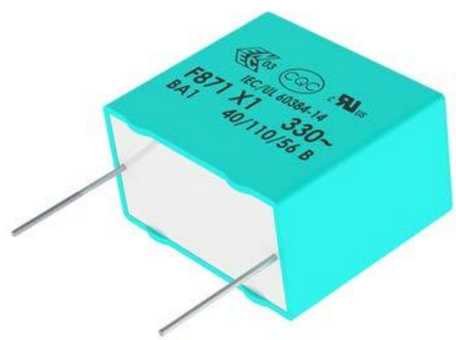
The F871 Series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material recognized to UL 94 V–0.

Applications

For worldwide use as electromagnetic interference (EMI) suppression filter in across-the-line applications requiring X1 safety classification. Not for use in "series with mains" type applications.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- Rated voltage: 330 VAC 50/60 Hz
- Capacitance range: 0.001 – 8.2 µF
- Lead spacing: 10 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category 40/110/56, IEC 60068–1
- Tape & Reel in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of −40°C to +110°C
- 100% screening factory test at 2,500 VDC



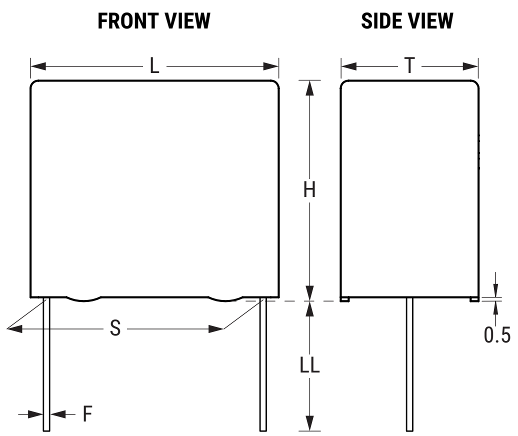
Part Number System

F	871	B	K	104	M	330	C
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Voltage (VAC)	Packaging
F = Film	X1, Metallized Polypropylene	A = 10 B = 15 D = 22.5 F = 27.5 R = 37.5	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	330	See Ordering Options Table

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
10	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4+2/−0	C
	Bulk (Bag) – Long Leads	17+0/−1	A
	Tape & Reel (Standard Reel)	H_0= 18.5±0.5	L
	Other Lead and Packaging Options		
	Bulk (Bag) – Maximum Length Leads	20+5/−0	ALL0L
	Ammo Pack	H_0= 18.5±0.5	R
	Tape & Reel (Large Reel)	H_0= 18.5±0.5	P
15	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4+2/−0	C
	Bulk (Bag) – Long Leads	17+0/−1	A
	Tape & Reel (Standard Reel)	H_0= 18.5±0.5	L
	Pizza Pack	4+2/−0	Z
	Other Lead and Packaging Options		
	Bulk (Bag) – Maximum Length Leads	25+5/−0	ALR0L
	Ammo Pack	H_0= 18.5±0.5	R
	Tape & Reel (Large Reel)	H_0= 18.5±0.5	P
22.5	**Standard Lead and Packaging Options**		
	Pizza – Long Leads	17+0/−1	ZLH0J
	Pizza Pack	4+2/−0	Z
	Other Lead and Packaging Options		
	Tape & Reel (Standard Reel)	H_0= 18.5±0.5	L
	Tape & Reel (Large Reel)	H_0= 18.5±0.5	P
	Ammo Pack	H_0= 18.5±0.5	R
27.5	**Standard Lead and Packaging Options**		
	Pizza – Long Leads	17+0/−1	ZLH0J
	Pizza Pack	4+2/−0	Z
37.5	**Standard Lead and Packaging Options**		
	Pizza – Long Leads	17+0/−1	ZLH0J
	Pizza Pack	4+2/−0	Z

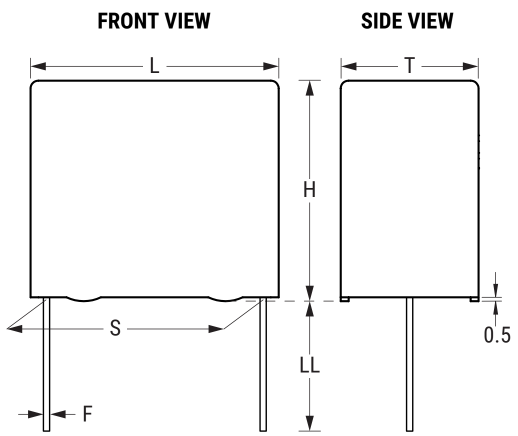
Dimensions – Millimeters



Size Code	Version	S		T		H		L		F	
		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
AG		10.0	±0.4	4.0	+0/−0.5	9.0	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
AK		10.0	±0.4	5.0	+0/−0.5	11.0	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
AP		10.0	±0.4	6.0	+0/−0.5	12.0	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
AO		10.0	±0.4	7.0	+0/−0.5	17.0	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
AL	Low Profile	10.0	±0.4	9.5	+0/−0.5	7.5	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
AE	Special Version	10.0	±0.4	4.0	+0/−0.5	8.0	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
BB		15.0	±0.4	4.0	+0/−0.5	10.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BC		15.0	±0.4	5.0	+0/−0.5	11.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BE		15.0	±0.4	5.5	+0/−0.5	12.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BG		15.0	±0.4	6.0	+0/−0.5	12.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BI	High Profile	15.0	±0.4	6.0	+0/−0.5	17.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BK		15.0	±0.4	7.5	+0/−0.5	13.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BO	High Profile	15.0	±0.4	7.5	+0/−0.5	18.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BP		15.0	±0.4	8.5	+0/−0.5	14.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BT		15.0	±0.4	9.0	+0/−0.5	12.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BS		15.0	±0.4	10.0	+0/−0.5	16.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BY		15.0	±0.4	11.0	+0/−0.5	19.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BZ	Special Version	15.0	±0.4	12.0	+0/−0.5	20.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BR	Low Profile	15.0	±0.4	13.0	+0/−0.5	12.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
DB		22.5	±0.4	6.0	+0/−0.5	14.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DI		22.5	±0.4	7.0	+0/−0.5	16.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DH		22.5	±0.4	8.0	+0/−0.5	16.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DJ		22.5	±0.4	8.5	+0/−0.5	17.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DM		22.5	±0.4	9.0	+0/−0.5	18.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DO		22.5	±0.4	10.0	+0/−0.5	18.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DP		22.5	±0.4	11.0	+0/−0.5	20.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DU		22.5	±0.4	13.0	+0/−0.5	22.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DY		22.5	±0.4	15.5	+0/−0.5	24.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05

Note: See Ordering Options Table for lead length (LL) options.

Dimensions – Millimeters cont.



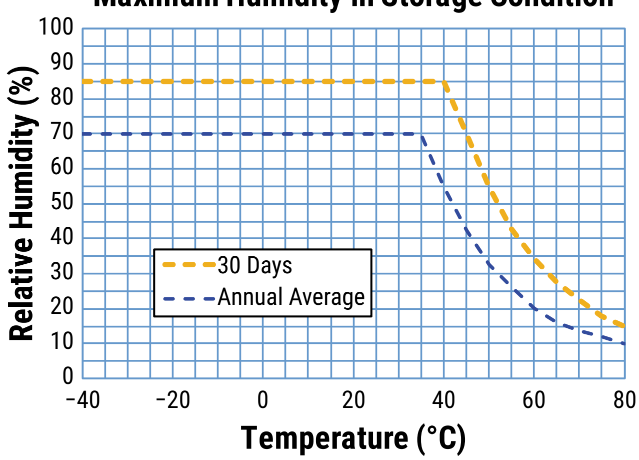
Size Code	Version	S		T		H		L		F	
		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
FB		27.5	±0.4	9.0	+0/−0.7	17.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FC		27.5	±0.4	11.0	+0/−0.7	20.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FI		27.5	±0.4	13.0	+0/−0.7	25.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FN		27.5	±0.4	14.0	+0/−0.7	28.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FO	High Profile	27.5	±0.4	17.0	+0/−0.7	40.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FR		27.5	±0.4	17.5	+0/−0.7	28.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FS		27.5	±0.4	19.0	+0/−0.7	29.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FY		27.5	±0.4	22.0	+0/−0.7	37.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FH	Low Profile	27.5	±0.4	21.0	+0/−0.7	12.5	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FQ	Low Profile	27.5	±0.4	27.5	+0/−0.7	16.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FT	Low Profile	27.5	±0.4	31.0	+0/−0.7	19.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
RB		37.5	±0.4	11.0	+0/−0.7	22.0	+0/−0.7	41.0	+0/−0.7	1	±0.05
RF		37.5	±0.4	13.0	+0/−0.7	24.0	+0/−0.7	41.0	+0/−0.7	1	±0.05
RH		37.5	±0.4	15.0	+0/−0.7	26.0	+0/−0.7	41.0	+0/−0.7	1	±0.05
RC		37.5	±0.4	16.0	+0/−0.7	28.5	+0/−0.7	41.0	+0/−0.7	1	±0.05
RD		37.5	±0.4	19.0	+0/−0.7	32.0	+0/−0.7	41.0	+0/−0.7	1	±0.05
RP		37.5	±0.4	21.0	+0/−0.7	38.0	+0/−0.7	41.0	+0/−0.7	1	±0.05
RO		37.5	±0.4	24.0	+0/−0.7	44.0	+0/−0.7	41.0	+0/−0.7	1	±0.05
RU		37.5	±0.4	30.0	+0/−0.7	45.0	+0/−0.7	41.0	+0/−0.7	1	±0.05
RV	Low Profile	37.5	±0.4	24.0	+0/−0.7	15.0	+0/−0.7	41.0	+0/−0.7	1	±0.05
RW	Low Profile	37.5	±0.4	24.0	+0/−0.7	19.0	+0/−0.7	41.0	+0/−0.7	1	±0.05

Note: See Ordering Options Table for lead length (LL) options.

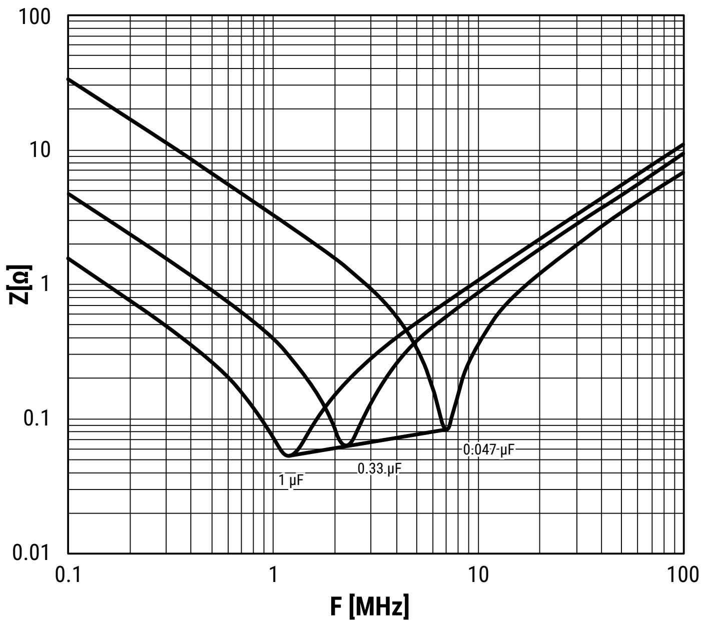
Performance Characteristics

<table>
<tr><td>Rated Voltage</td><td colspan="4">330 VAC 50/60 Hz</td></tr>
<tr><td>Capacitance Range</td><td colspan="4">0.001 – 8.2 µF</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="4">±20%, ±10%</td></tr>
<tr><td>Temperature Range</td><td colspan="4">−40°C to +110°C</td></tr>
<tr><td>Climatic Category</td><td colspan="4">40/110/56</td></tr>
<tr><td>Storage Conditions</td><td colspan="4">Storage time: ≤ 24 months from the date marked on the label package
Average relative humidity per year ≤ 70%
RH ≤ 85% for 30 days randomly distributed throughout the year
Dew is absent
Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)</td></tr>
<tr><td>Approvals</td><td colspan="4">ENEC, UL, cUL, CQC</td></tr>
<tr><td rowspan="3">Dissipation Factor</td><td colspan="4">Maximum Values at +23°C</td></tr>
<tr><td></td><td colspan="2">C ≤ 0.1 µF</td><td>C > 0.1 µF</td></tr>
<tr><td>1 kHz</td><td colspan="2">0.3%</td><td>0.2%</td></tr>
<tr><td>Test Voltage Between Terminals</td><td colspan="4">The 100% screening factory test is carried out at 2,500 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. It's not permitted to repeat this Test as there is a risk to damage the Capacitor. KEMET is not liable in such case for any failures.</td></tr>
<tr><td rowspan="4">Insulation Resistance</td><td colspan="4">Measured at +25°C ±5°C, according to IEC 60384-2</td></tr>
<tr><td colspan="4">Minimum Values Between Terminals</td></tr>
<tr><td>Voltage Charge</td><td>Voltage Charge time</td><td>C ≤ 0.33 µF</td><td>C > 0.33 µF</td></tr>
<tr><td>100 VDC</td><td>1 minute</td><td>≥ 3 • 10⁴ MΩ</td><td>≥ 10,000 MΩ • µF</td></tr>
<tr><td>In DC Applications</td><td colspan="4">Recommended voltage ≤ 800 VDC</td></tr>
</table>

Maximum Humidity in Storage Condition



Impedance Graph



Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R +20 surge pulses at 4 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle–flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
IMQ S.p.A.		EN/IEC 60384–14	CA08.00186
UL		UL 60384–14 and CAN/CSA–E60384–14	E97797
CQC		IEC 60384–14	CQC12001084008 CQC12001084009 CQC12001084010 CQC12001084012 CQC12001086290

Environmental Compliance

All new KEMET EMI capacitors are RoHS compliant and Halogen-Free.

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Size Code	Maximum Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Part Number
		T	H	L			
0.001	AE	4	8	13	10	500	F871AE102(1)330(2)
0.0012	AE	4	8	13	10	500	F871AE122(1)330(2)
0.0015	AE	4	8	13	10	500	F871AE152(1)330(2)
0.0018	AE	4	8	13	10	500	F871AE182(1)330(2)
0.0018	AL	9.5	7.5	13	10	500	F871AL182(1)330(2)
0.0022	AE	4	8	13	10	500	F871AE222(1)330(2)
0.0022	AL	9.5	7.5	13	10	500	F871AL222(1)330(2)
0.0025	AE	4	8	13	10	500	F871AE252(1)330(2)
0.0025	AL	9.5	7.5	13	10	500	F871AL252(1)330(2)
0.0027	AE	4	8	13	10	500	F871AE272(1)330(2)
0.0027	AL	9.5	7.5	13	10	500	F871AL272(1)330(2)
0.0033	AE	4	8	13	10	500	F871AE332(1)330(2)
0.0033	AL	9.5	7.5	13	10	500	F871AL332(1)330(2)
0.0039	AE	4	8	13	10	500	F871AE392(1)330(2)
0.0039	AL	9.5	7.5	13	10	500	F871AL392(1)330(2)
0.0047	AE	4	8	13	10	500	F871AE472(1)330(2)
0.0047	AL	9.5	7.5	13	10	500	F871AL472(1)330(2)
0.0056	AE	4	8	13	10	500	F871AE562(1)330(2)
0.0056	AL	9.5	7.5	13	10	500	F871AL562(1)330(2)
0.0068	AE	4	8	13	10	500	F871AE682(1)330(2)
0.0068	AL	9.5	7.5	13	10	500	F871AL682(1)330(2)
0.0082	AE	4	8	13	10	500	F871AE822(1)330(2)
0.0082	AL	9.5	7.5	13	10	500	F871AL822(1)330(2)
0.01	AE	4	8	13	10	500	F871AE103(3)330(2)
0.01	AG	4	9	13	10	500	F871AG103(1)330(2)
0.01	AL	9.5	7.5	13	10	500	F871AL103(1)330(2)
0.012	AG	4	9	13	10	500	F871AG123(1)330(2)
0.012	AL	9.5	7.5	13	10	500	F871AL123(1)330(2)
0.015	AK	5	11	13	10	500	F871AK153(1)330(2)
0.015	AL	9.5	7.5	13	10	500	F871AL153(1)330(2)
0.018	AK	5	11	13	10	500	F871AK183(1)330(2)
0.018	AL	9.5	7.5	13	10	500	F871AL183(1)330(2)
0.022	AK	5	11	13	10	500	F871AK223(3)330(2)
0.022	AL	9.5	7.5	13	10	500	F871AL223(1)330(2)
0.022	AP	6	12	13	10	500	F871AP223(1)330(2)
0.025	AL	9.5	7.5	13	10	500	F871AL253(1)330(2)
0.025	AP	6	12	13	10	500	F871AP253(1)330(2)
0.027	AL	9.5	7.5	13	10	500	F871AL273(1)330(2)
0.027	AP	6	12	13	10	500	F871AP273(1)330(2)
0.033	AO	7	17	13	10	500	F871AO333(1)330(2)
0.033	AP	6	12	13	10	500	F871AP333(3)330(2)
0.035	AO	7	17	13	10	500	F871AO353(1)330(2)
0.039	AO	7	17	13	10	500	F871AO393(1)330(2)
0.047	AO	7	17	13	10	500	F871AO473(3)330(2)
0.0027	BB	4	10	18	15	400	F871BB272(1)330(2)
Capacitance Value (µF)	Size Code	T (mm)	H (mm)	L (mm)	Lead Spacing (S)	dV/dt (V/µs)	Part Number

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See table for available options.
(3) M = ±20% (only available tolerance).

Table 1 – Ratings & Part Number Reference cont.

Capacitance Value (µF)	Size Code	Maximum Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Part Number
		T	H	L			
0.0033	BB	4	10	18	15	400	F871BB332(1)330(2)
0.0039	BB	4	10	18	15	400	F871BB392(1)330(2)
0.0047	BB	4	10	18	15	400	F871BB472(1)330(2)
0.0056	BB	4	10	18	15	400	F871BB562(1)330(2)
0.0068	BB	4	10	18	15	400	F871BB682(1)330(2)
0.0082	BB	4	10	18	15	400	F871BB822(1)330(2)
0.01	BB	4	10	18	15	400	F871BB103(1)330(2)
0.012	BB	4	10	18	15	400	F871BB123(1)330(2)
0.015	BB	4	10	18	15	400	F871BB153(1)330(2)
0.018	BB	4	10	18	15	400	F871BB183(1)330(2)
0.022	BB	4	10	18	15	400	F871BB223(1)330(2)
0.025	BB	4	10	18	15	400	F871BB253(1)330(2)
0.027	BB	4	10	18	15	400	F871BB273(1)330(2)
0.033	BB	4	10	18	15	400	F871BB333(3)330(2)
0.033	BC	5	11	18	15	400	F871BC333(1)330(2)
0.039	BC	5	11	18	15	400	F871BC393(1)330(2)
0.047	BC	5	11	18	15	400	F871BC473(3)330(2)
0.047	BE	5.5	12.5	18	15	400	F871BE473(1)330(2)
0.056	BE	5.5	12.5	18	15	400	F871BE563(1)330(2)
0.068	BE	5.5	12.5	18	15	400	F871BE683(3)330(2)
0.068	BG	6	12	18	15	400	F871BG683(1)330(2)
0.082	BI	6	17.5	18	15	400	F871BI823(1)330(2)
0.082	BK	7.5	13.5	18	15	400	F871BK823(1)330(2)
0.082	BR	13	12	18	15	400	F871BR823(1)330(2)
0.082	BT	9	12.5	18	15	400	F871BT823(1)330(2)
0.1	BI	6	17.5	18	15	400	F871BI104(1)330(2)
0.1	BK	7.5	13.5	18	15	400	F871BK104(1)330(2)
0.1	BR	13	12	18	15	400	F871BR104(1)330(2)
0.1	BT	9	12.5	18	15	400	F871BT104(1)330(2)
0.12	BI	6	17.5	18	15	400	F871BI124(1)330(2)
0.12	BK	7.5	13.5	18	15	400	F871BK124(3)330(2)
0.12	BP	8.5	14.5	18	15	400	F871BP124(1)330(2)
0.12	BR	13	12	18	15	400	F871BR124(1)330(2)
0.12	BT	9	12.5	18	15	400	F871BT124(3)330(2)
0.15	BO	7.5	18.5	18	15	400	F871BO154(1)330(2)
0.15	BP	8.5	14.5	18	15	400	F871BP154(3)330(2)
0.15	BR	13	12	18	15	400	F871BR154(1)330(2)
0.18	BO	7.5	18.5	18	15	400	F871BO184(3)330(2)
0.18	BR	13	12	18	15	400	F871BR184(1)330(2)
0.18	BS	10	16	18	15	400	F871BS184(1)330(2)
0.22	BY	11	19	18	15	400	F871BY224(1)330(2)
0.25	BY	11	19	18	15	400	F871BY254(3)330(2)
0.25	BZ	12	20	18	15	400	F871BZ254(1)330(2)
0.27	BY	11	19	18	15	400	F871BY274(3)330(2)
0.27	BZ	12	20	18	15	400	F871BZ274(1)330(2)
Capacitance Value (µF)	**Size Code**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See table for available options.
(3) M = ±20% (only available tolerance).

Table 1 – Ratings & Part Number Reference cont.

Capacitance Value (µF)	Size Code	Maximum Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Part Number
		T	H	L			
0.039	DB	6	14.5	26	22.5	200	F871DB393(1)330(2)
0.047	DB	6	14.5	26	22.5	200	F871DB473(1)330(2)
0.056	DB	6	14.5	26	22.5	200	F871DB563(1)330(2)
0.068	DB	6	14.5	26	22.5	200	F871DB683(1)330(2)
0.082	DB	6	14.5	26	22.5	200	F871DB823(1)330(2)
0.1	DB	6	14.5	26	22.5	200	F871DB104(1)330(2)
0.12	DB	6	14.5	26	22.5	200	F871DB124(1)330(2)
0.15	DB	6	14.5	26	22.5	200	F871DB154(3)330(2)
0.15	DI	7	16	26	22.5	200	F871DI154(1)330(2)
0.18	DI	7	16	26	22.5	200	F871DI184(1)330(2)
0.22	DI	7	16	26	22.5	200	F871DI224(1)330(2)
0.25	DH	8	16	26	22.5	200	F871DH254(1)330(2)
0.27	DH	8	16	26	22.5	200	F871DH274(3)330(2)
0.33	DJ	8.5	17	26	22.5	200	F871DJ334(3)330(2)
0.33	DM	9	18.5	26	22.5	200	F871DM334(1)330(2)
0.39	DM	9	18.5	26	22.5	200	F871DM394(3)330(2)
0.39	DO	10	18.5	26	22.5	200	F871DO394(1)330(2)
0.47	DO	10	18.5	26	22.5	200	F871DO474(3)330(2)
0.47	DP	11	20	26	22.5	200	F871DP474(1)330(2)
0.56	DP	11	20	26	22.5	200	F871DP564(3)330(2)
0.68	DU	13	22	26	22.5	200	F871DU684(1)330(2)
0.82	DU	13	22	26	22.5	200	F871DU824(3)330(2)
0.82	DY	15.5	24.5	26	22.5	200	F871DY824(1)330(2)
1	DY	15.5	24.5	26	22.5	200	F871DY105(1)330(2)
0.15	FC	11	20	31.5	27.5	150	F871FC154(1)330(2)
0.18	FC	11	20	31.5	27.5	150	F871FC184(1)330(2)
0.22	FB	9	17	31.5	27.5	150	F871FB224(1)330(2)
0.25	FB	9	17	31.5	27.5	150	F871FB254(1)330(2)
0.25	FH	21	12.5	31.5	27.5	150	F871FH254(1)330(2)
0.27	FB	9	17	31.5	27.5	150	F871FB274(1)330(2)
0.27	FH	21	12.5	31.5	27.5	150	F871FH274(1)330(2)
0.33	FB	9	17	31.5	27.5	150	F871FB334(1)330(2)
0.33	FH	21	12.5	31.5	27.5	150	F871FH334(1)330(2)
0.39	FB	9	17	31.5	27.5	150	F871FB394(1)330(2)
0.39	FH	21	12.5	31.5	27.5	150	F871FH394(1)330(2)
0.47	FC	11	20	31.5	27.5	150	F871FC474(1)330(2)
0.47	FH	21	12.5	31.5	27.5	150	F871FH474(1)330(2)
0.56	FC	11	20	31.5	27.5	150	F871FC564(1)330(2)
0.56	FH	21	12.5	31.5	27.5	150	F871FH564(1)330(2)
0.68	FC	11	20	31.5	27.5	150	F871FC684(1)330(2)
0.68	FH	21	12.5	31.5	27.5	150	F871FH684(1)330(2)
0.82	FI	13	25	31.5	27.5	150	F871FI824(1)330(2)
1	FI	13	25	31.5	27.5	150	F871FI105(1)330(2)
1.2	FN	14	28	31.5	27.5	150	F871FN125(3)330(2)
1.2	FQ	27.5	16	31.5	27.5	150	F871FQ125(1)330(2)
Capacitance Value (µF)	**Size Code**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See table for available options.
(3) M = ±20% (only available tolerance).

Table 1 – Ratings & Part Number Reference cont.

Capacitance Value (µF)	Size Code	Maximum Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Part Number
		T	H	L			
1.5	FR	17.5	28	31.5	27.5	150	F871FR155(1)330(2)
1.5	FT	31	19	31.5	27.5	150	F871FT155(1)330(2)
1.8	FO	17	40	31.5	27.5	150	F871FO185(1)330(2)
1.8	FR	17.5	28	31.5	27.5	150	F871FR185(3)330(2)
1.8	FS	19	29	31.5	27.5	150	F871FS185(1)330(2)
1.8	FT	31	19	31.5	27.5	150	F871FT185(1)330(2)
2.2	FO	17	40	31.5	27.5	150	F871FO225(3)330(2)
2.2	FY	22	37	31.5	27.5	150	F871FY225(1)330(2)
2.5	FY	22	37	31.5	27.5	150	F871FY255(1)330(2)
2.7	FY	22	37	31.5	27.5	150	F871FY275(1)330(2)
3.3	FY	22	37	31.5	27.5	150	F871FY335(3)330(2)
0.33	RB	11	22	41	37.5	100	F871RB334(1)330(2)
0.39	RB	11	22	41	37.5	100	F871RB394(1)330(2)
0.47	RB	11	22	41	37.5	100	F871RB474(1)330(2)
0.56	RB	11	22	41	37.5	100	F871RB564(1)330(2)
0.56	RV	24	15	41	37.5	100	F871RV564(1)330(2)
0.68	RB	11	22	41	37.5	100	F871RB684(1)330(2)
0.68	RV	24	15	41	37.5	100	F871RV684(1)330(2)
0.82	RB	11	22	41	37.5	100	F871RB824(1)330(2)
0.82	RV	24	15	41	37.5	100	F871RV824(1)330(2)
1	RB	11	22	41	37.5	100	F871RB105(1)330(2)
1	RV	24	15	41	37.5	100	F871RV105(1)330(2)
1.2	RF	13	24	41	37.5	100	F871RF125(1)330(2)
1.2	RV	24	15	41	37.5	100	F871RV125(3)330(2)
1.5	RF	13	24	41	37.5	100	F871RF155(1)330(2)
1.5	RH	15	26	41	37.5	100	F871RH155(1)330(2)
1.5	RV	24	15	41	37.5	100	F871RV155(1)330(2)
1.8	RH	15	26	41	37.5	100	F871RH185(1)330(2)
1.8	RW	24	19	41	37.5	100	F871RW185(1)330(2)
2.2	RC	16	28.5	41	37.5	100	F871RC225(1)330(2)
2.2	RW	24	19	41	37.5	100	F871RW225(3)330(2)
2.5	RD	19	32	41	37.5	100	F871RD255(1)330(2)
2.5	RW	24	19	41	37.5	100	F871RW255(3)330(2)
2.7	RD	19	32	41	37.5	100	F871RD275(1)330(2)
2.7	RW	24	19	41	37.5	100	F871RW275(3)330(2)
3.3	RD	19	32	41	37.5	100	F871RD335(1)330(2)
3.3	RP	21	38	41	37.5	100	F871RP335(1)330(2)
3.9	RP	21	38	41	37.5	100	F871RP395(1)330(2)
4.7	RP	21	38	41	37.5	100	F871RP475(1)330(2)
4.7	RO	24	44	41	37.5	100	F871RO475(1)330(2)
5.6	RO	24	44	41	37.5	100	F871RO565(1)330(2)
6.8	RO	24	44	41	37.5	100	F871RO685(3)330(2)
6.8	RU	30	45	41	37.5	100	F871RU685(1)330(2)
8.2	RU	30	45	41	37.5	100	F871RU825(3)330(2)
Capacitance Value (µF)	**Size Code**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See table for available options.
(3) M = ±20% (only available tolerance).

Soldering Process

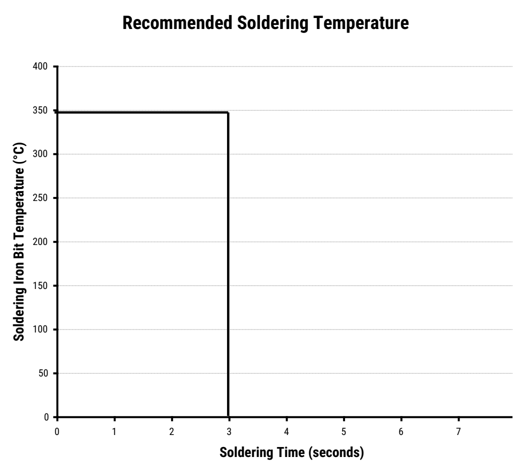
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5– 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

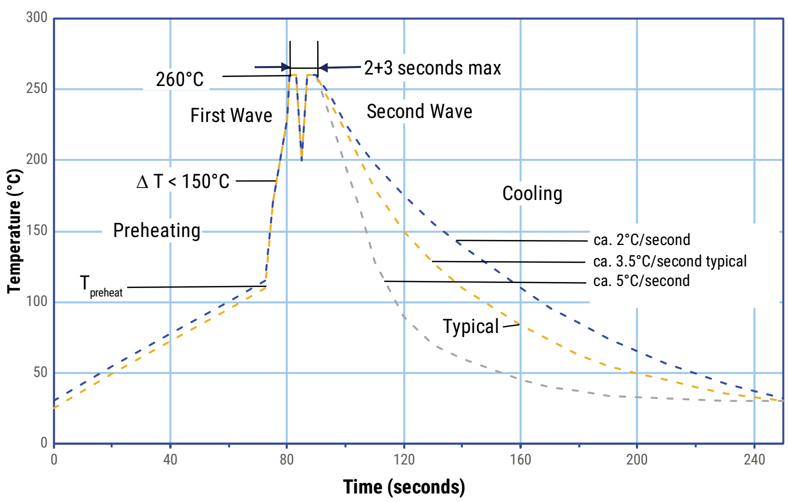
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

1. The table indicates the maximum set-up temperature of the soldering process

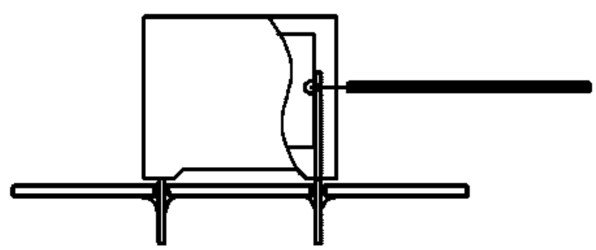
Figure 1

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C

Temperature monitored inside the capacitor.

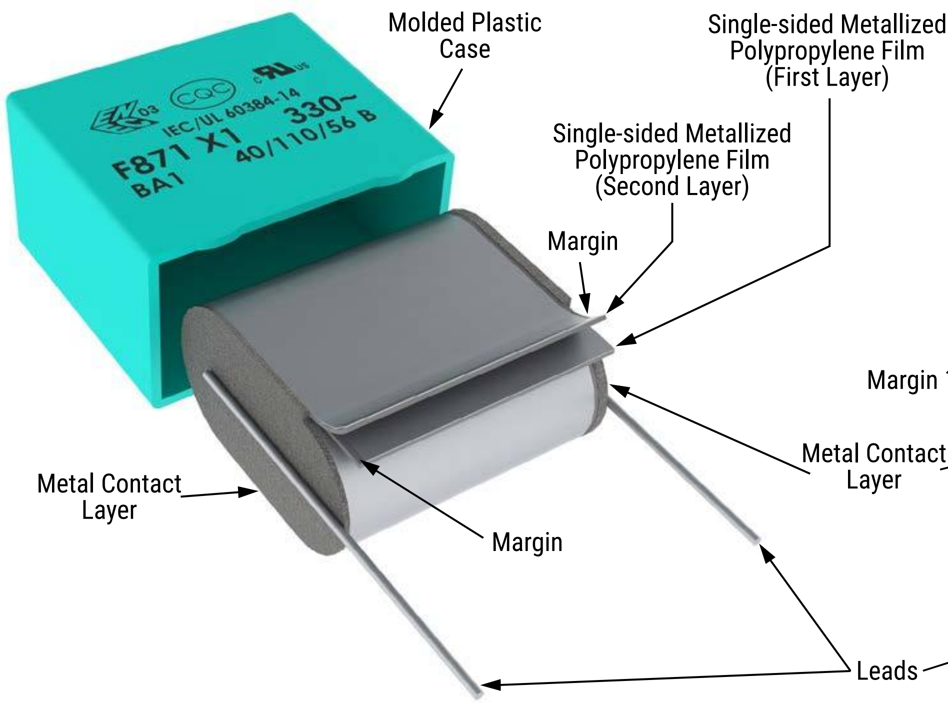


Selective Soldering Recommendations

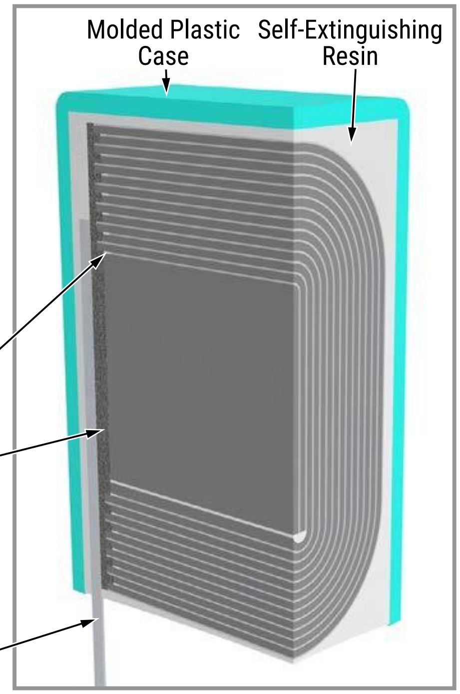
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

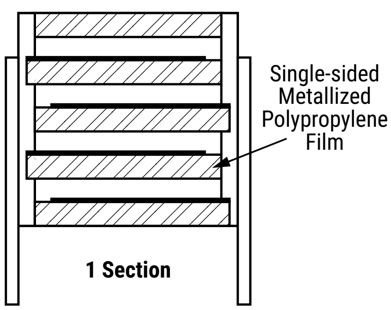
Construction



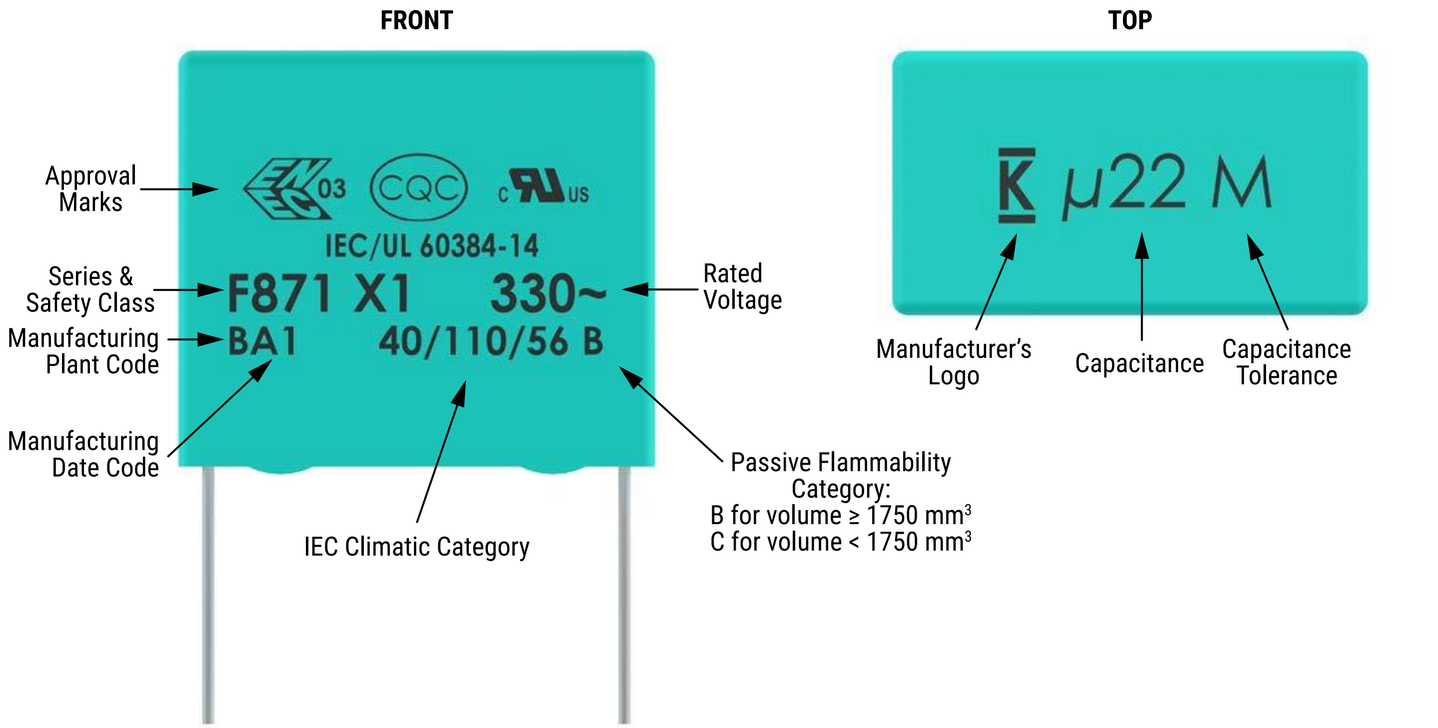
Detailed Cross Section



Winding Scheme



Marking



Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics

Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

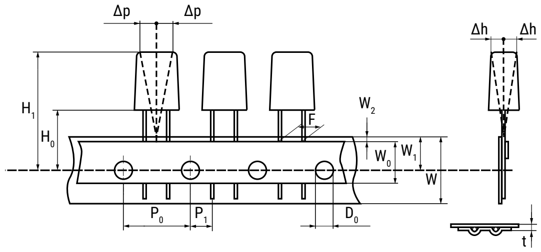
Size Code	Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo	Pizza
AN	10	3.5	9	13	2,200	3,200	850	1,700	1,150	
AG		4	9	13	2,000	2,200	750	1,500	1,000	
AK		5	11	13	1,300	2,000	600	1,250	800	
AP		6	12	13	1,000	1,800	500	1,000	680	
AO		7	17	13	600	900	450	900	580	
AL		9.5	7.5	13	1,100	2,000	300	600	430	
AE		4	8	13	2,000	2,200	750	1,500	1,000	
BB	15	4	10	18	1,300	1,500	750	1,500	1,000	1,411
BC		5	11	18	1,000	1,250	600	1,250	800	1,139
BE		5.5	12.5	18	800	1,100	550	1,100	750	1,020
BG		6	12	18	1,750	1,000	500	1,000	680	935
BK		7.5	13.5	18	1,000	800	350	800	500	748
BI		6	17.5	18	1,000	800	500	1,000	680	935
BP		8.5	14.5	18	1,000	650	300	700	440	663
BT		9	12.5	18	1,000	700	270	650	410	629
BO		7.5	18.5	18	900	600	350	800	500	748
BS		10	16	18	750	550	300	600	380	561
BR		13	12	18	750	520	200	480	280	425
BY		11	19	18	450	400	250	500	340	510
BA		8.5	12.5	18	1,000	650	300	700	440	663
BZ		12	20	18	350	300	220	450	330	459
DB	22.5	6	14.5	26	1,638	702	300	700	464	660
DI		7	16	26	1,188	594	250	550	380	564
DH		8.0	16.0	26	1,026	513	240	500	330	492
DJ		8.5	17	26	972	486	250	450	280	468
DM		9	18.5	26	918	459	200	400	300	444
DO		10	18.5	26	810	405	160	350	235	396
DP		11	20	26	756	378	190	350	217	360
DU		13	22	26	540	324	150	300	200	300
DY		15.5	24.5	26	450	270	120	250	170	252

Packaging Quantities cont.

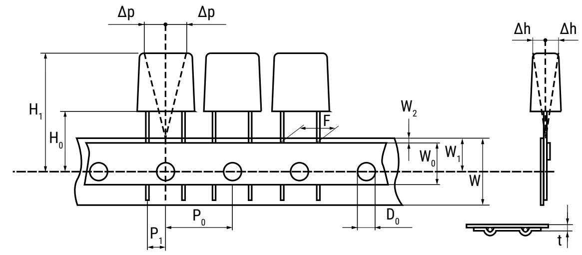
Size Code	Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo	Pizza
FB	27.5	9.0	17.0	31.5	816	408				370
FC		11.0	20.0	31.5	672	336				300
FI		13.0	25.0	31.5	480	288				250
FN		14.0	28.0	31.5	352	176				230
FO		17.0	40.0	31.5	216	144				190
FR		17.5	28.0	31.5	256	128				190
FS		19.0	29.0	31.5	256	128				170
FY		22.0	37.0	31.5	168	112				150
FH		21.0	12.5	31.5	392	168				150
FQ		27.5	16.0	31.5	280	120				120
FT		31.0	19.0	31.5	240	120				100
RB	37.5	11.0	22.0	41.0	420	252				210
RF		13.0	24.0	41.0	360	216				175
RH		15.0	26.0	41.0	300	180				154
RC		16.0	28.5	41.0	216	108				140
RD		19.0	32.0	41.0	192	96				119
RP		21.0	38.0	41.0	126	84				105
RO		24.0	44.0	41.0	108	72				91
RU		30.0	45.0	41.0	90	60				77
RV		24.0	15.0	41.0	252	108				91
RW		24.0	19.0	41.0	216	108				91

Lead Taping & Packaging (IEC 60286–2)

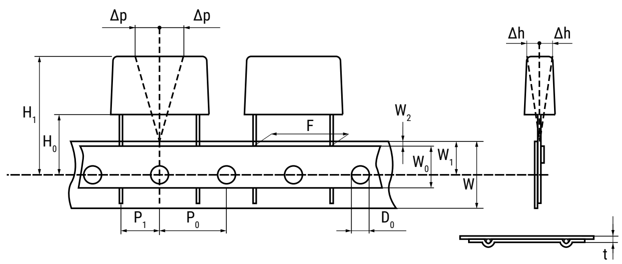
Lead Spacing 5 mm



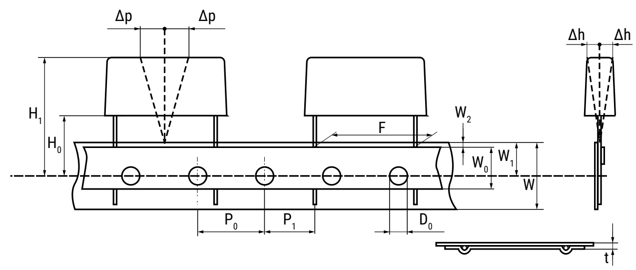
Lead Spacing 7.5 mm



Lead Spacing 10 – 15 mm



Lead Spacing 22.5 – 27.5 mm



Taping Specification

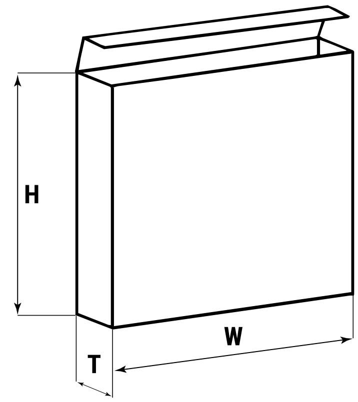
Dimensions in mm									Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	5.0	7.5	10.0	15.0	22.5	27.5	F
Carrier Tape Width	+1/−0.5	W	18.0	18.0	18.0	18.0	18.0	18.0	$18^{+1/-0.5}$
Hold-Down Tape Width	Minimum	W_0	6.0	6.0	9.0	10.0	10.0	10.0	
Position of Sprocket Hole	±0.5	W_1	9.0	9.0	9.0	9.0	9.0	9.0	$9^{+0.75/-0.5}$
Distance Between Tapes	Maximum	W_2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Sprocket Hole Diameter	±0.2	D_0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Feed Hole Lead Spacing	±0.2(1)	P_0(3)	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.85	3.75	7.7	5.2	7.8	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	±2	Δh	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.9^{MAX}	0.9^{MAX}	0.9^{MAX}
Sprocket Hole/Cap Body	±0.5	H_0(2)	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18^{+2/-0}$

(1) Maximum cumulative feed hole error, 1 mm per 20 parts.
(2) 16.5 mm available on request.
(3) 15 mm available on request (F ≥ 10 mm).

Lead Taping & Packaging (IEC 60286–2) cont.

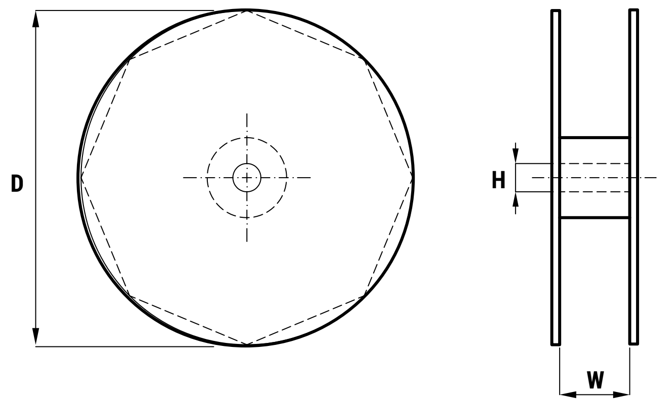
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
F5A, F5B, F5D	360	340	59
F6xx, F8xx			
PHExxx, PMExxx, PMRxxx	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
F5A, F5B, F5D	355 500	30 25	55 (Max)
F6xx, F8xx			
PHExxx, PMExxx, PMRxxx	360 500	30	46 (Max)



AC Line EMI Suppression and RC Networks

Metallized Polypropylene Film EMI Suppression Capacitors – F872, Class X1, 480 VAC

Overview

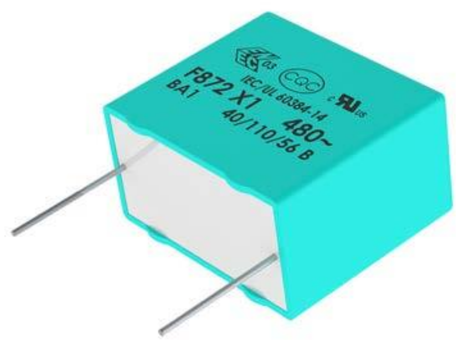
The F872 Series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material meeting the requirements of UL 94 V–0.

Applications

For worldwide use as electromagnetic interference (EMI) suppression filter in across-the-line applications requiring X1 safety classification.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- Rated voltage: 480 VAC 50/60 Hz
- Capacitance range: 0.001 – 3.5 μF
- Lead spacing: 10 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category: 40/110/56, IEC 60068–1
- Tape & Reel in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of –40°C to +110°C
- 100% screening factory test at 3,000 VDC



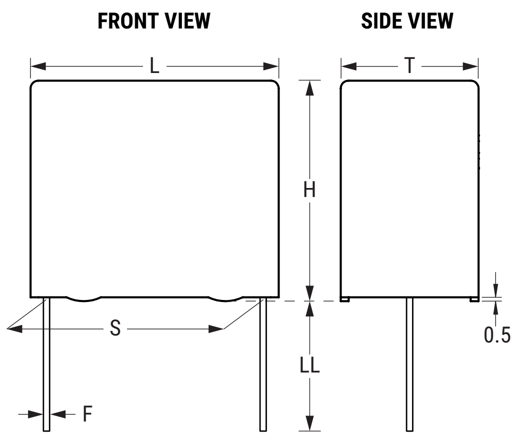
Part Number System

F	872	B	S	104	M	480	C
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Voltage (VAC)	Packaging
F = Film	X1, Metallized Polypropylene	A = 10 B = 15 D = 22.5 F = 27.5 R = 37.5	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	480	See Ordering Options Table

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
10	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4+2/−0	C
	Bulk (Bag) – Long Leads	17+0/−1	A
	Tape & Reel (Standard Reel)	H_0= 18.5±0.5	L
	Other Lead and Packaging Options		
	Bulk (Bag) – Maximum Length Leads	20+5/−0	ALL0L
	Ammo Pack	H_0= 18.5±0.5	R
	Tape & Reel (Large Reel)	H_0= 18.5±0.5	P
15	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4+2/−0	C
	Bulk (Bag) – Long Leads	17+0/−1	A
	Tape & Reel (Standard Reel)	H_0= 18.5±0.5	L
	Pizza Pack	4+2/−0	Z
	Other Lead and Packaging Options		
	Bulk (Bag) – Maximum Length Leads	25+5/−0	ALR0L
	Ammo Pack	H_0= 18.5±0.5	R
	Tape & Reel (Large Reel)	H_0= 18.5±0.5	P
22.5	**Standard Lead and Packaging Options**		
	Pizza – Long Leads	17+0/−1	ZLH0J
	Pizza Pack	4+2/−0	Z
	Other Lead and Packaging Options		
	Tape & Reel (Standard Reel)	H_0= 18.5±0.5	L
	Tape & Reel (Large Reel)	H_0= 18.5±0.5	P
	Ammo Pack	H_0= 18.5±0.5	R
27.5	**Standard Lead and Packaging Options**		
	Pizza – Long Leads	17+0/−1	ZLH0J
	Pizza Pack	4+2/−0	Z
37.5	**Standard Lead and Packaging Options**		
	Pizza – Long Leads	17+0/−1	ZLH0J
	Pizza Pack	4+2/−0	Z

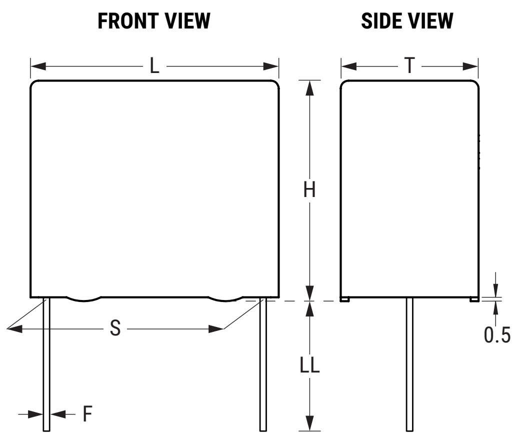
Dimensions – Millimeters



Size Code	Version	S		T		H		L		F	
		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
AG		10.0	±0.4	4.0	+0/−0.5	9.0	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
AK		10.0	±0.4	5.0	+0/−0.5	11.0	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
AP		10.0	±0.4	6.0	+0/−0.5	12.0	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
AO		10.0	±0.4	7.0	+0/−0.5	17.0	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
AL	Low Profile	10.0	±0.4	9.5	+0/−0.5	7.5	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
AE	Special Version	10.0	±0.4	4.0	+0/−0.5	8.0	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
BB		15.0	±0.4	4.0	+0/−0.5	10.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BC		15.0	±0.4	5.0	+0/−0.5	11.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BE		15.0	±0.4	5.5	+0/−0.5	12.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BG		15.0	±0.4	6.0	+0/−0.5	12.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BI	High Profile	15.0	±0.4	6.0	+0/−0.5	17.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BK		15.0	±0.4	7.5	+0/−0.5	13.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BO	High Profile	15.0	±0.4	7.5	+0/−0.5	18.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BP		15.0	±0.4	8.5	+0/−0.5	14.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BT		15.0	±0.4	9.0	+0/−0.5	12.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BS		15.0	±0.4	10.0	+0/−0.5	16.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BY		15.0	±0.4	11.0	+0/−0.5	19.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BZ	Special Version	15.0	±0.4	12.0	+0/−0.5	20.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BR	Low Profile	15.0	±0.4	13.0	+0/−0.5	12.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
DB		22.5	±0.4	6.0	+0/−0.5	14.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DI		22.5	±0.4	7.0	+0/−0.5	16.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DH		22.5	±0.4	8.0	+0/−0.5	16.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DJ		22.5	±0.4	8.5	+0/−0.5	17.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DM		22.5	±0.4	9.0	+0/−0.5	18.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DO		22.5	±0.4	10.0	+0/−0.5	18.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DP		22.5	±0.4	11.0	+0/−0.5	20.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DU		22.5	±0.4	13.0	+0/−0.5	22.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DY		22.5	±0.4	15.5	+0/−0.5	24.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05

Note: See Ordering Options Table for lead length (LL) options.

Dimensions – Millimeters cont.

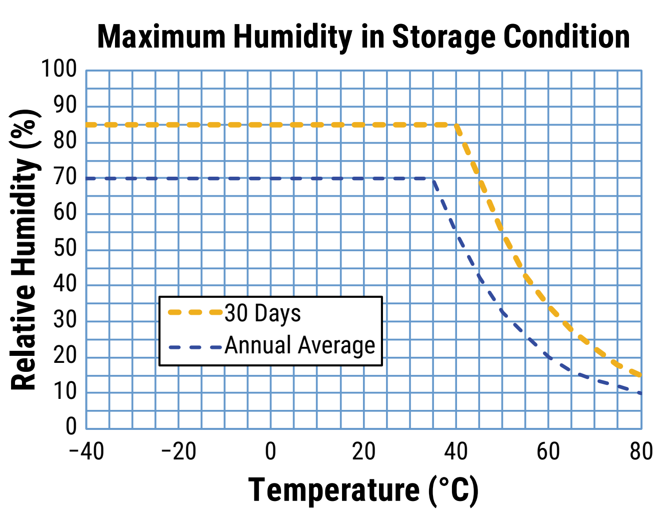


Size Code	Version	S		T		H		L		F	
		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
FB		27.5	±0.4	9.0	+0/−0.7	17.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FC		27.5	±0.4	11.0	+0/−0.7	20.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FI		27.5	±0.4	13.0	+0/−0.7	25.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FN		27.5	±0.4	14.0	+0/−0.7	28.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FO	High Profile	27.5	±0.4	17.0	+0/−0.7	40.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FR		27.5	±0.4	17.5	+0/−0.7	28.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FS		27.5	±0.4	19.0	+0/−0.7	29.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FY		27.5	±0.4	22.0	+0/−0.7	37.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FH	Low Profile	27.5	±0.4	21.0	+0/−0.7	12.5	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FQ	Low Profile	27.5	±0.4	27.5	+0/−0.7	16.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FT	Low Profile	27.5	±0.4	31.0	+0/−0.7	19.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
RB		37.5	±0.4	11.0	+0/−0.7	22.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RF		37.5	±0.4	13.0	+0/−0.7	24.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RH		37.5	±0.4	15.0	+0/−0.7	26.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RC		37.5	±0.4	16.0	+0/−0.7	28.5	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RD		37.5	±0.4	19.0	+0/−0.7	32.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RP		37.5	±0.4	21.0	+0/−0.7	38.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RO		37.5	±0.4	24.0	+0/−0.7	44.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RU		37.5	±0.4	30.0	+0/−0.7	45.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RV	Low Profile	37.5	±0.4	24.0	+0/−0.7	15.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RW	Low Profile	37.5	±0.4	24.0	+0/−0.7	19.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05

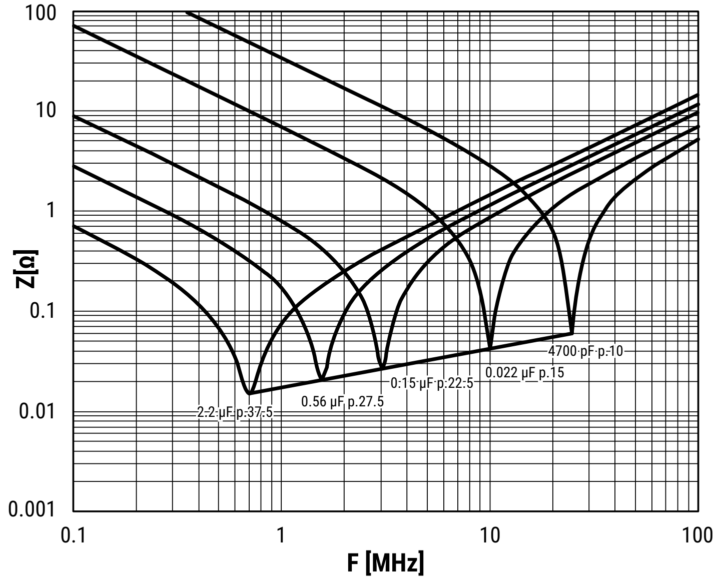
Note: See Ordering Options Table for lead length (LL) options.

Performance Characteristics

Rated Voltage	480 VAC 50/60 Hz			
Capacitance Range	0.001 – 3.5 µF			
Capacitance Tolerance	±20%, ±10%			
Temperature Range	−40 to +110°C			
Climatic Category	40/110/56			
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package Average relative humidity per year ≤ 70% RH ≤ 85% for 30 days randomly distributed throughout the year Dew is absent Temperature: -40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)			
Approvals	ENEC, UL, cUL, CQC			
Dissipation Factor	Maximum Values at +23°C			
		C ≤ 0.1 µF	C > 0.1 µF	
	1 kHz	0.3%	0.2%	
Test Voltage Between Terminals	The 100% screening factory test is carried out at 3,000 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. It's not permitted to repeat this Test as there is a risk to damage the Capacitor. KEMET is not liable in such case for any failures			
Insulation Resistance	Measured at +25°C ±5°C, according to IEC 60384-2			
	Minimum Values Between Terminals			
	Voltage Charge	Voltage Charge time	C ≤ 0.33 µF	C > 0.33 µF
	100 VDC	1 minute	≥ 3 • 10^4 MΩ	≥ 10,000 MΩ • µF
In DC Applications	Recommended voltage ≤ 1000 VDC			



Impedance Graph



Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 4 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle–flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
IMQ S.p.A.		EN/IEC 60384–14	CA08.00187
UL		UL 60384–14 and CAN/CSA–E60384–14	E97797
CQC		IEC 60384–14	CQC12001084716 CQC12001084708 CQC12001084714 CQC12001084713 CQC12001088081

Environmental Compliance

All new KEMET EMI capacitors are RoHS compliant and Halogen–Free.

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Size Code	Maximum Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Part Number
		T	H	L			
0.001	AE	4	8	13	10	750	F872AE102(1)480(2)
0.0012	AE	4	8	13	10	750	F872AE122(1)480(2)
0.0015	AE	4	8	13	10	750	F872AE152(1)480(2)
0.0018	AE	4	8	13	10	750	F872AE182(1)480(2)
0.0018	AL	9.5	7.5	13	10	750	F872AL182(1)480(2)
0.0022	AE	4	8	13	10	750	F872AE222(1)480(2)
0.0022	AL	9.5	7.5	13	10	750	F872AL222(1)480(2)
0.0025	AE	4	8	13	10	750	F872AE252(1)480(2)
0.0025	AL	9.5	7.5	13	10	750	F872AL252(1)480(2)
0.0027	AE	4	8	13	10	750	F872AE272(1)480(2)
0.0027	AL	9.5	7.5	13	10	750	F872AL272(1)480(2)
0.0033	AE	4	8	13	10	750	F872AE332(1)480(2)
0.0033	AL	9.5	7.5	13	10	750	F872AL332(1)480(2)
0.0039	AE	4	8	13	10	750	F872AE392(3)480(2)
0.0039	AG	4	9	13	10	750	F872AG392(1)480(2)
0.0039	AL	9.5	7.5	13	10	750	F872AL392(1)480(2)
0.0047	AG	4	9	13	10	750	F872AG472(1)480(2)
0.0047	AL	9.5	7.5	13	10	750	F872AL472(1)480(2)
0.0056	AK	5	11	13	10	750	F872AK562(1)480(2)
0.0056	AL	9.5	7.5	13	10	750	F872AL562(1)480(2)
0.0068	AK	5	11	13	10	750	F872AK682(1)480(2)
0.0068	AL	9.5	7.5	13	10	750	F872AL682(1)480(2)
0.0082	AK	5	11	13	10	750	F872AK822(3)480(2)
0.0082	AL	9.5	7.5	13	10	750	F872AL822(1)480(2)
0.01	AL	9.5	7.5	13	10	750	F872AL103(1)480(2)
0.01	AP	6	12	13	10	750	F872AP103(1)480(2)
0.012	AP	6	12	13	10	750	F872AP123(3)480(2)
0.015	AO	7	17	13	10	750	F872AO153(1)480(2)
0.018	AO	7	17	13	10	750	F872AO183(3)480(2)
0.0027	BB	4	10	18	15	600	F872BB272(1)480(2)
0.0033	BB	4	10	18	15	600	F872BB332(1)480(2)
0.0039	BB	4	10	18	15	600	F872BB392(1)480(2)
0.0047	BB	4	10	18	15	600	F872BB472(1)480(2)
0.0056	BB	4	10	18	15	600	F872BB562(1)480(2)
0.0068	BB	4	10	18	15	600	F872BB682(1)480(2)
0.0082	BB	4	10	18	15	600	F872BB822(1)480(2)
0.01	BB	4	10	18	15	600	F872BB103(1)480(2)
0.012	BB	4	10	18	15	600	F872BB123(1)480(2)
0.015	BB	4	10	18	15	600	F872BB153(1)480(2)
0.015	BT	9	12.5	18	15	600	F872BT153(1)480(2)
0.018	BC	5	11	18	15	600	F872BC183(1)480(2)
0.018	BT	9	12.5	18	15	600	F872BT183(1)480(2)
0.022	BC	5	11	18	15	600	F872BC223(1)480(2)
0.022	BT	9	12.5	18	15	600	F872BT223(1)480(2)
0.025	BE	5.5	12.5	18	15	600	F872BE253(1)480(2)
0.025	BT	9	12.5	18	15	600	F872BT253(1)480(2)
0.027	BE	5.5	12.5	18	15	600	F872BE273(1)480(2)
0.027	BT	9	12.5	18	15	600	F872BT273(1)480(2)
0.033	BE	5.5	12.5	18	15	600	F872BE333(3)480(2)
0.033	BG	6	12	18	15	600	F872BG333(1)480(2)
0.033	BT	9	12.5	18	15	600	F872BT333(1)480(2)
0.039	BI	6	17.5	18	15	600	F872BI393(3)480(2)
0.039	BK	7.5	13.5	18	15	600	F872BK393(1)480(2)
0.039	BR	13	12	18	15	600	F872BR393(1)480(2)
0.039	BT	9	12.5	18	15	600	F872BT393(1)480(2)
0.047	BI	6	17.5	18	15	600	F872BI473(1)480(2)
0.047	BK	7.5	13.5	18	15	600	F872BK473(1)480(2)
0.047	BR	13	12	18	15	600	F872BR473(1)480(2)
Capacitance Value (µF)	**Size Code**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See Ordering Options Table for available options.
(3) M = ±20% (only available tolerance).

Table 1 – Ratings & Part Number Reference cont.

Capacitance Value (µF)	Size Code	Maximum Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Part Number
		T	H	L			
0.047	BT	9	12.5	18	15	600	F872BT473(1)480(2)
0.056	BI	6	17.5	18	15	600	F872BI563(3)480(2)
0.056	BK	7.5	13.5	18	15	600	F872BK563(3)480(2)
0.056	BO	7.5	18.5	18	15	600	F872BO563(1)480(2)
0.056	BP	8.5	14.5	18	15	600	F872BP563(1)480(2)
0.056	BR	13	12	18	15	600	F872BR563(1)480(2)
0.068	BO	7.5	18.5	18	15	600	F872BO683(1)480(2)
0.068	BP	8.5	14.5	18	15	600	F872BP683(3)480(2)
0.068	BR	13	12	18	15	600	F872BR683(1)480(2)
0.082	BO	7.5	18.5	18	15	600	F872BO823(3)480(2)
0.082	BR	13	12	18	15	600	F872BR823(1)480(2)
0.082	BS	10	16	18	15	600	F872BS823(1)480(2)
0.1	BS	10	16	18	15	600	F872BS104(3)480(2)
0.1	BY	11	19	18	15	600	F872BY104(1)480(2)
0.12	BY	11	19	18	15	600	F872BY124(3)480(2)
0.12	BZ	12	20	18	15	600	F872BZ124(1)480(2)
0.15	BZ	12	20	18	15	600	F872BZ154(3)480(2)
0.039	DB	6	14.5	26	22.5	300	F872DB393(1)480(2)
0.047	DB	6	14.5	26	22.5	300	F872DB473(1)480(2)
0.056	DB	6	14.5	26	22.5	300	F872DB563(1)480(2)
0.068	DB	6	14.5	26	22.5	300	F872DB683(1)480(2)
0.082	DI	7	16	26	22.5	300	F872DI823(1)480(2)
0.1	DI	7	16	26	22.5	300	F872DI104(1)480(2)
0.12	DH	8	16	26	22.5	300	F872DH124(1)480(2)
0.12	DI	7	16	26	22.5	300	F872DI124(3)480(2)
0.15	DJ	8.5	17	26	22.5	300	F872DJ154(3)480(2)
0.15	DM	9	18.5	26	22.5	300	F872DM154(1)480(2)
0.18	DM	9	18.5	26	22.5	300	F872DM184(3)480(2)
0.18	DO	10	18.5	26	22.5	300	F872DO184(1)480(2)
0.22	DO	10	18.5	26	22.5	300	F872DO224(3)480(2)
0.22	DP	11	20	26	22.5	300	F872DP224(1)480(2)
0.25	DU	13	22	26	22.5	300	F872DU254(1)480(2)
0.27	DU	13	22	26	22.5	300	F872DU274(1)480(2)
0.33	DU	13	22	26	22.5	300	F872DU334(1)480(2)
0.39	DU	13	22	26	22.5	300	F872DU394(3)480(2)
0.39	DY	15.5	24.5	26	22.5	300	F872DY394(1)480(2)
0.47	DY	15.5	24.5	26	22.5	300	F872DY474(1)480(2)
0.15	FB	9	17	31.5	27.5	225	F872FB154(1)480(2)
0.18	FB	9	17	31.5	27.5	225	F872FB184(1)480(2)
0.22	FC	11	20	31.5	27.5	225	F872FC224(1)480(2)
0.25	FC	11	20	31.5	27.5	225	F872FC254(1)480(2)
0.25	FH	21	12.5	31.5	27.5	225	F872FH254(1)480(2)
0.27	FC	11	20	31.5	27.5	225	F872FC274(1)480(2)
0.27	FH	21	12.5	31.5	27.5	225	F872FH274(1)480(2)
0.33	FC	11	20	31.5	27.5	225	F872FC334(1)480(2)
0.33	FH	21	12.5	31.5	27.5	225	F872FH334(1)480(2)
0.39	FI	13	25	31.5	27.5	225	F872FI394(1)480(2)
0.39	FH	21	12.5	31.5	27.5	225	F872FH394(3)480(2)
0.47	FI	13	25	31.5	27.5	225	F872FI474(1)480(2)
0.56	FQ	27.5	16	31.5	27.5	225	F872FQ564(1)480(2)
0.56	FN	14	28	31.5	27.5	225	F872FN564(1)480(2)
0.68	FQ	27.5	16	31.5	27.5	225	F872FQ684(3)480(2)
0.68	FR	17.5	28	31.5	27.5	225	F872FR684(1)480(2)
0.68	FT	31	19	31.5	27.5	225	F872FT684(1)480(2)
0.82	FR	17.5	28	31.5	27.5	225	F872FR824(1)480(2)
0.82	FS	19	29	31.5	27.5	225	F872FS824(1)480(2)
0.82	FT	31	19	31.5	27.5	225	F872FT824(1)480(2)
0.82	FO	17	40	31.5	27.5	225	F872FO824(1)480(2)
Capacitance Value (µF)	**Size Code**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See Ordering Options Table for available options.
(3) M = ±20% (only available tolerance).

Table 1 – Ratings & Part Number Reference cont.

Capacitance Value (µF)	Size Code	Maximum Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Part Number
		T	H	L			
1	FO	17	40	31.5	27.5	225	F872FO105(1)480(2)
1	FS	19	29	31.5	27.5	225	F872FS105(3)480(2)
1	FY	22	37	31.5	27.5	225	F872FY105(1)480(2)
1	FT	31	19	31.5	27.5	225	F872FT105(1)480(2)
1.2	FO	17	40	31.5	27.5	225	F872FO125(3)480(2)
1.2	FY	22	37	31.5	27.5	225	F872FY125(1)480(2)
1.5	FY	22	37	31.5	27.5	225	F872FY155(3)480(2)
1.8	FY	22	37	31.5	27.5	225	F872FY185(3)480(2)
0.33	RB	11	22	41	37.5	150	F872RB334(1)480(2)
0.39	RB	11	22	41	37.5	150	F872RB394(1)480(2)
0.47	RB	11	22	41	37.5	150	F872RB474(1)480(2)
0.56	RB	11	22	41	37.5	150	F872RB564(1)480(2)
0.56	RV	24	15	41	37.5	150	F872RV564(1)480(2)
0.68	RF	13	24	41	37.5	150	F872RF684(1)480(2)
0.68	RV	24	15	41	37.5	150	F872RV684(1)480(2)
0.82	RH	15	26	41	37.5	150	F872RH824(1)480(2)
0.82	RW	24	19	41	37.5	150	F872RW824(1)480(2)
1	RC	16	28.5	41	37.5	150	F872RC105(1)480(2)
1	RH	15	26	41	37.5	150	F872RH105(3)480(2)
1	RW	24	19	41	37.5	150	F872RW105(1)480(2)
1.2	RD	19	32	41	37.5	150	F872RD125(1)480(2)
1.2	RC	16	28.5	41	37.5	150	F872RC125(3)480(2)
1.2	RW	24	19	41	37.5	150	F872RW125(3)480(2)
1.5	RD	19	32	41	37.5	150	F872RD155(1)480(2)
1.8	RD	19	32	41	37.5	150	F872RD185(3)480(2)
1.8	RP	21	38	41	37.5	150	F872RP185(1)480(2)
2.2	RO	24	44	41	37.5	150	F872RO225(1)480(2)
2.5	RO	24	44	41	37.5	150	F872RO255(1)480(2)
2.7	RO	24	44	41	37.5	150	F872RO275(1)480(2)
3.3	RU	30	45	41	37.5	150	F872RU335(1)480(2)
3.5	RU	30	45	41	37.5	150	F872RU355(3)480(2)
Capacitance Value (µF)	**Size Code**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See Ordering Options Table for available options.
(3) M = ±20% (only available tolerance).

Soldering Process

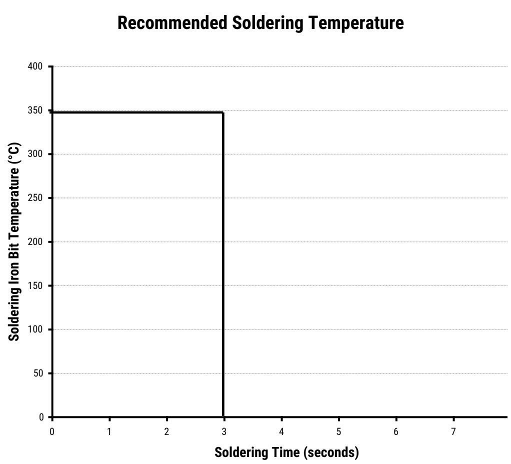
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through–hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through–hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through–hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

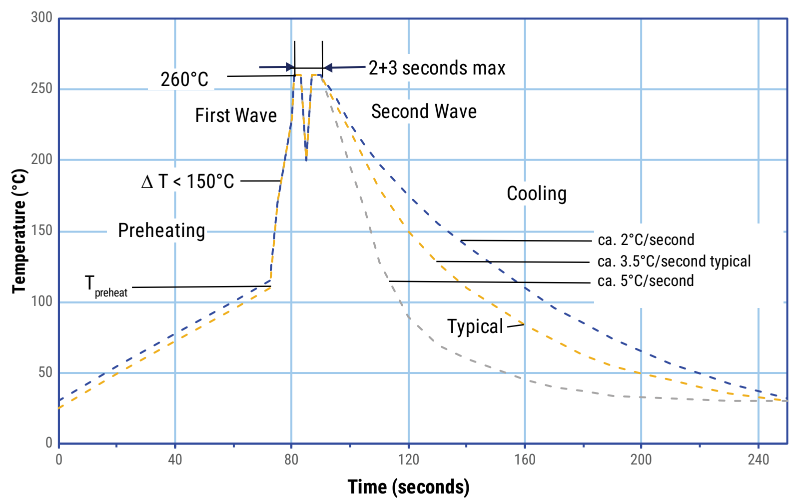
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

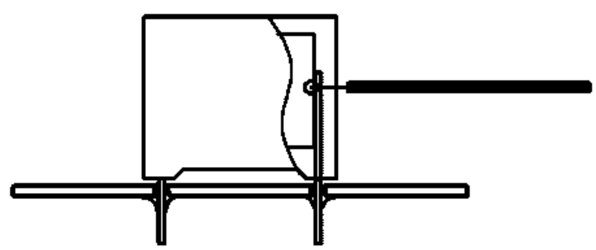
1. The table indicates the maximum set-up temperature of the soldering process

Figure 1

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



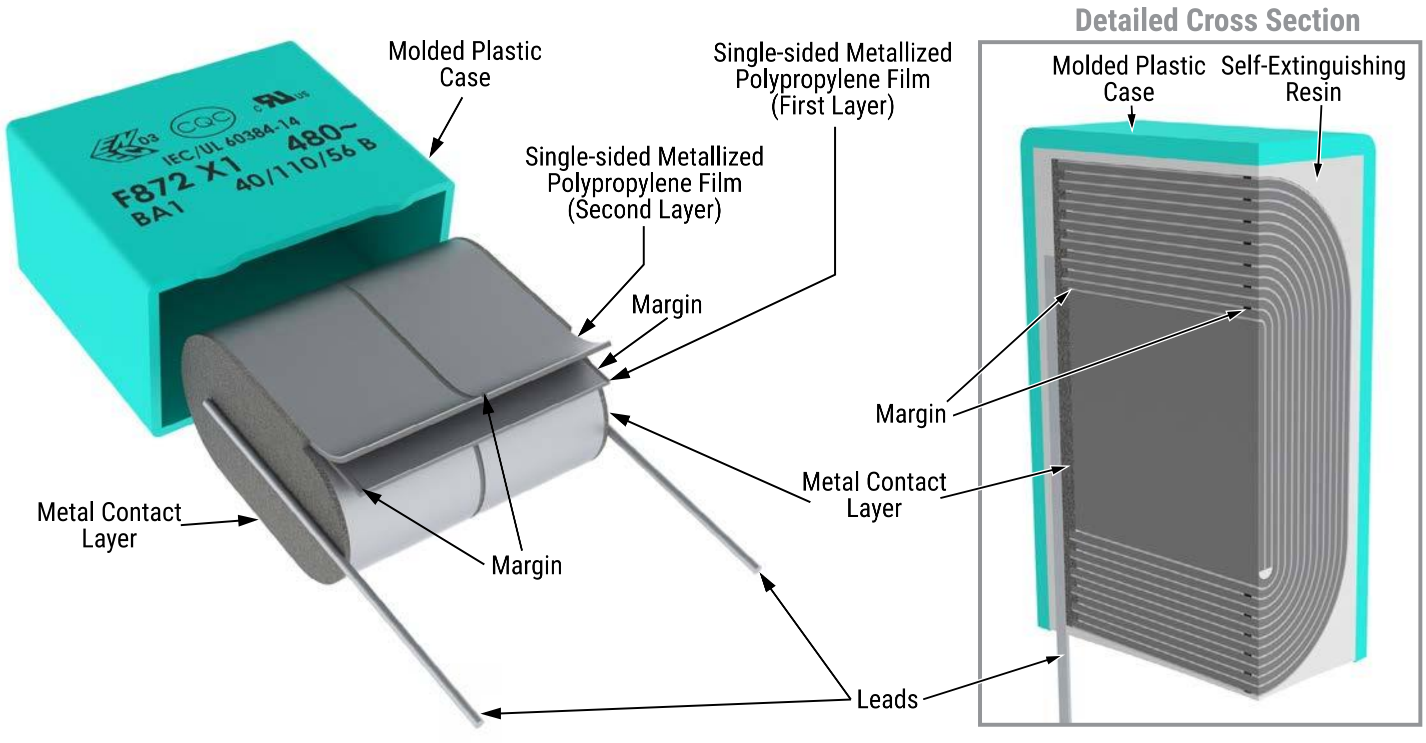
Temperature monitored inside the capacitor.

Selective Soldering Recommendations

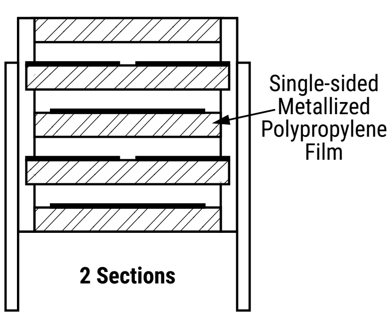
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

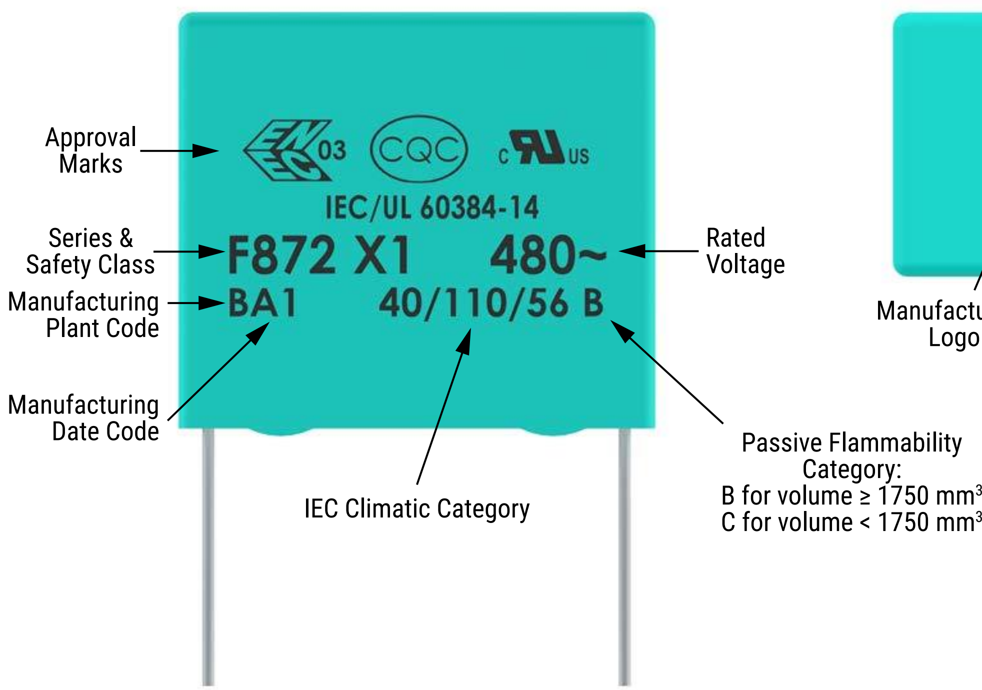
Construction

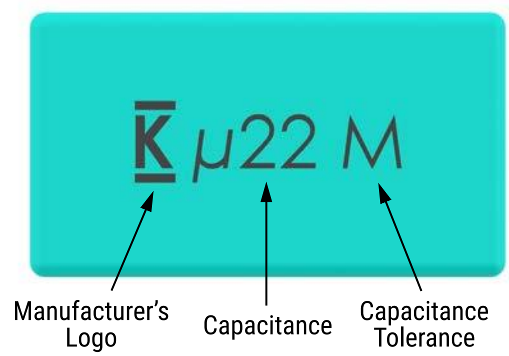


Winding Scheme



Marking





Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics

Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

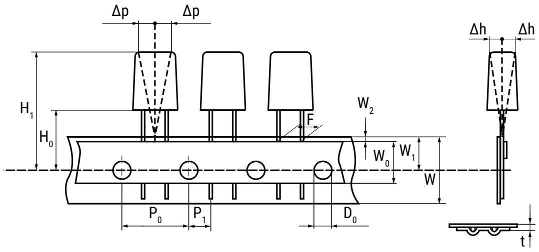
Size Code	Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo	Pizza
AN	10	3.5	9	13	2,000	2,200	850	1,700	1,150	
AG		4	9	13	2,000	2,200	750	1,500	1,000	
AK		5	11	13	1,300	2,000	600	1,250	800	
AP		6	12	13	1,000	1,800	500	1,000	680	
AO		7	17	13	600	700	450	900	580	
AL		9.5	7.5	13	1,000	1,500	300	600	430	
AE		4	8	13	2,000	2,200	750	1,500	1,000	
BB	15	4	10	18	2,500	1,500	750	1,500	1,000	1,411
BC		5	11	18	1,000	1,250	600	1,250	800	1,139
BE		5.5	12.5	18	800	1,000	550	1,100	750	1,020
BG		6	12	18	1,750	1,000	500	1,000	680	935
BK		7.5	13.5	18	1,000	800	350	800	500	748
BI		6	17.5	18	1,000	800	500	1,000	680	935
BP		8.5	14.5	18	1,000	650	300	700	440	663
BT		9	12.5	18	1,000	700	270	650	410	629
BO		7.5	18.5	18	900	500	350	800	500	748
BS		10	16	18	750	550	300	600	380	561
BR		13	12	18	750	520	200	480	280	425
BY		11	19	18	450	400	250	500	340	510
BA		8.5	12.5	18	1,000	650	300	700	440	663
BZ		12	20	18	350	300	220	450	330	459
DB	22.5	6	14.5	26	805	450	300	700	464	660
DI		7	16	26	700	450	250	550	380	564
DH		8.0	16.0	26	520	300	240	500	330	492
DJ		8.5	17	26	450	350	250	450	280	468
DM		9	18.5	26	400	225	200	400	300	444
DO		10	18.5	26	360	350	160	350	235	396
DP		11	20	26	300	200	190	350	217	360
DU		13	22	26	230	150	150	300	200	300
DY		15.5	24.5	26	150	100	120	250	170	252

Packaging Quantities cont.

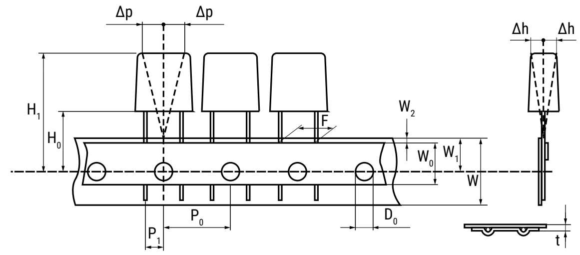
Size Code	Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo	Pizza
FB	27.5	9.0	17.0	31.5						370
FC		11.0	20.0	31.5						300
FI		13.0	25.0	31.5						250
FN		14.0	28.0	31.5						230
FO		17.0	40.0	31.5						190
FR		17.5	28.0	31.5						190
FS		19.0	29.0	31.5						170
FY		22.0	37.0	31.5						150
FH		21.0	12.5	31.5						150
FQ		27.5	16.0	31.5						120
FT		31.0	19.0	31.5						100
RB	37.5	11.0	22.0	41.0						210
RF		13.0	24.0	41.0						175
RH		15.0	26.0	41.0						154
RC		16.0	28.5	41.0						140
RD		19.0	32.0	41.0						119
RP		21.0	38.0	41.0						105
RO		24.0	44.0	41.0						91
RU		30.0	45.0	41.0						77
RV		24.0	15.0	41.0						91
RW		24.0	19.0	41.0						91

Lead Taping & Packaging (IEC 60286–2)

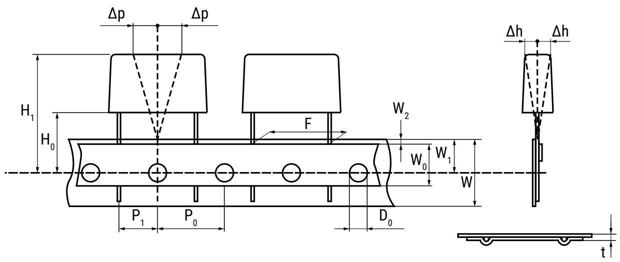
Lead Spacing 5 mm



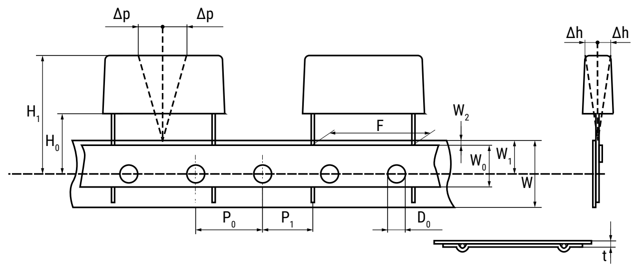
Lead Spacing 7.5 mm



Lead Spacing 10 – 15 mm



Lead Spacing 22.5 – 27.5 mm



Taping Specification

Dimensions in mm									Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	5.0	7.5	10.0	15.0	22.5	27.5	F
Carrier Tape Width	+1/−0.5	W	18.0	18.0	18.0	18.0	18.0	18.0	$18^{+1/-0.5}$
Hold-Down Tape Width	Minimum	W_0	6.0	6.0	9.0	10.0	10.0	10.0	
Position of Sprocket Hole	±0.5	W_1	9.0	9.0	9.0	9.0	9.0	9.0	$9^{+0.75/-0.5}$
Distance Between Tapes	Maximum	W_2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Sprocket Hole Diameter	±0.2	D_0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Feed Hole Lead Spacing	±0.2(1)	P_0 (3)	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.85	3.75	7.7	5.2	7.8	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	±2	Δh	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.9^{MAX}	0.9^{MAX}	0.9^{MAX}
Sprocket Hole/Cap Body	±0.5	H_0 (2)	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18^{+2/-0}$

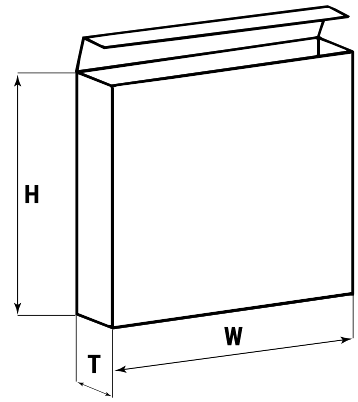
(1) Maximum cumulative feed hole error, 1 mm per 20 parts.
(2) 16.5 mm available on request.
(3) 15 mm available on request (F ≥ 10 mm).

KEMET a YAGEO company

Lead Taping & Packaging (IEC 60286–2) cont.

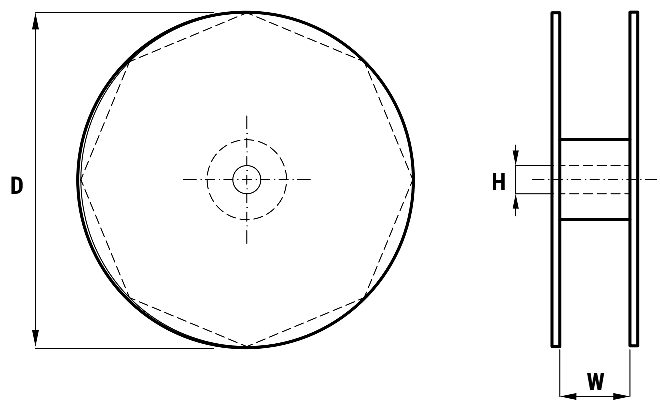
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
F5A, F5B, F5D F6xx, F8xx	360	340	59
PHExxx, PMExxx, PMRxxx	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
F5A, F5B, F5D F6xx, F8xx	355 500	30 25	55 (Max)
PHExxx, PMExxx, PMRxxx	360 500	30	46 (Max)



Metallized Polypropylene Film EMI Suppression Capacitors – F873, Class X1, 760 VAC

KEMET a YAGEO company

Overview

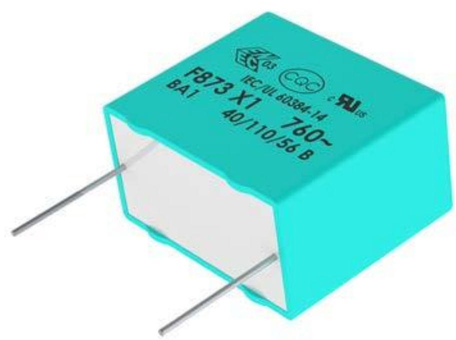
Metallized polypropylene film encapsulated with self-extinguishing resin in a box of material recognized to UL 94 V–0.

Applications

For worldwide use as electromagnetic interference (EMI) suppression filter in across-the-line applications requiring X1 safety classification.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- Rated voltage: 760 VAC 50/60 Hz
- Capacitance range: 0.01 – 1.8 µF
- Lead spacing: 22.5 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category 40/110/56, IEC 60068–1
- Tape & Reel in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of −40°C to +110°C
- 100% screening factory test at 4,250 VDC



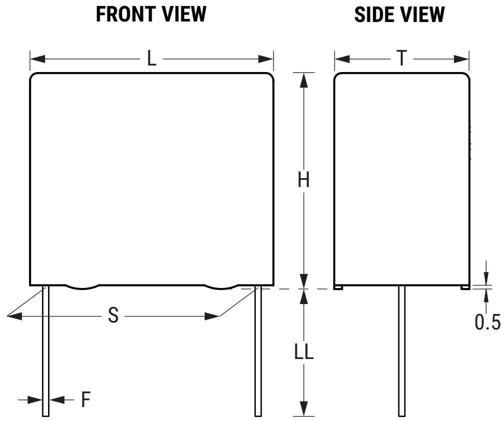
Part Number System

F	873	D	U	104	M	760	C
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Voltage (VAC)	Packaging
F = Film	X1, Metallized Polypropylene	D = 22.5 F = 27.5 R = 37.5	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	760	See Ordering Options Table

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
22.5	**Standard Lead and Packaging Options**		
	Pizza – Long Leads	17+0/−1	ZLH0J
	Pizza Pack	4+2/−0	Z
	Other Lead and Packaging Options		
	Tape & Reel (Standard Reel)	H_0= 18.5±0.5	L
	Tape & Reel (Large Reel)	H_0= 18.5±0.5	P
	Ammo Pack	H_0= 18.5±0.5	R
27.5	**Standard Lead and Packaging Options**		
	Pizza – Long Leads	17+0/−1	ZLH0J
	Pizza Pack	4+2/−0	Z
37.5	**Standard Lead and Packaging Options**		
	Pizza – Long Leads	17+0/−1	ZLH0J
	Pizza Pack	4+2/−0	Z

Dimensions – Millimeters



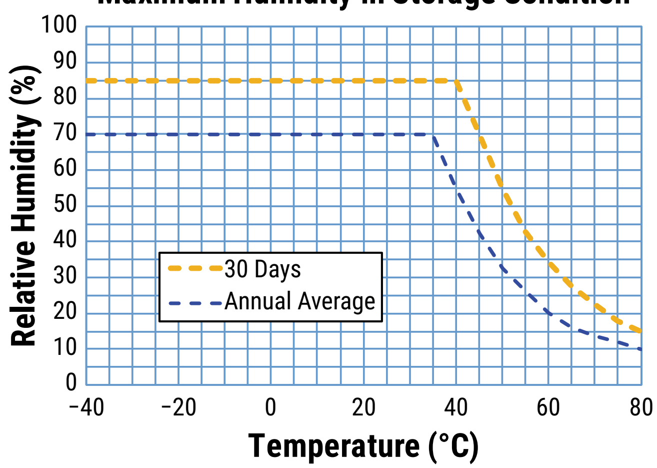
Size Code	Version	S		T		H		L		F	
		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
DB		22.5	±0.4	6.0	+0/−0.5	14.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DI		22.5	±0.4	7.0	+0/−0.5	16.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DH		22.5	±0.4	8.0	+0/−0.5	16.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DJ		22.5	±0.4	8.5	+0/−0.5	17.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DM		22.5	±0.4	9.0	+0/−0.5	18.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DO		22.5	±0.4	10.0	+0/−0.5	18.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DP		22.5	±0.4	11.0	+0/−0.5	20.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DU		22.5	±0.4	13.0	+0/−0.5	22.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DY		22.5	±0.4	15.5	+0/−0.5	24.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
FB		27.5	±0.4	9.0	+0/−0.7	17.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FC		27.5	±0.4	11.0	+0/−0.7	20.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FI		27.5	±0.4	13.0	+0/−0.7	25.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FN		27.5	±0.4	14.0	+0/−0.7	28.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FO	High Profile	27.5	±0.4	17.0	+0/−0.7	40.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FR		27.5	±0.4	17.5	+0/−0.7	28.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FS		27.5	±0.4	19.0	+0/−0.7	29.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FY		27.5	±0.4	22.0	+0/−0.7	37.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FH	Low Profile	27.5	±0.4	21.0	+0/−0.7	12.5	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FQ	Low Profile	27.5	±0.4	27.5	+0/−0.7	16.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FT	Low Profile	27.5	±0.4	31.0	+0/−0.7	19.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
RB		37.5	±0.4	11.0	+0/−0.7	22.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RF		37.5	±0.4	13.0	+0/−0.7	24.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RH		37.5	±0.4	15.0	+0/−0.7	26.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RC		37.5	±0.4	16.0	+0/−0.7	28.5	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RD		37.5	±0.4	19.0	+0/−0.7	32.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RP		37.5	±0.4	21.0	+0/−0.7	38.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RO		37.5	±0.4	24.0	+0/−0.7	44.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RU		37.5	±0.4	30.0	+0/−0.7	45.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RV	Low Profile	37.5	±0.4	24.0	+0/−0.7	15.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RW	Low Profile	37.5	±0.4	24.0	+0/−0.7	19.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05

Note: See Ordering Options Table for lead length (LL) options.

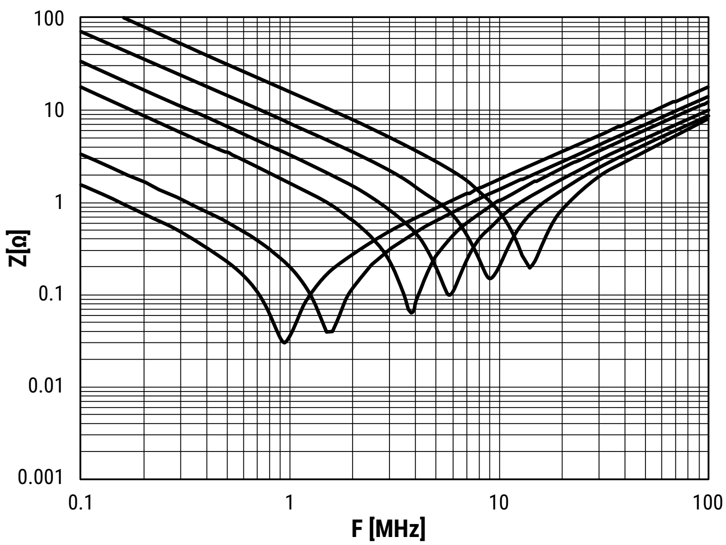
Performance Characteristics

<table>
<tr><td>Rated Voltage</td><td colspan="4">760 VAC 50/60 Hz</td></tr>
<tr><td>Capacitance Range</td><td colspan="4">0.01 – 1.8 µF</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="4">±20%, ±10%</td></tr>
<tr><td>Temperature Range</td><td colspan="4">−40 to +110°C</td></tr>
<tr><td>Climatic Category</td><td colspan="4">40/110/56</td></tr>
<tr><td>Storage Conditions</td><td colspan="4">Storage time: ≤ 24 months from the date marked on the label package
Average relative humidity per year ≤ 70%
RH ≤ 85% for 30 days randomly distributed throughout the year
Dew is absent
Temperature: -40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)</td></tr>
<tr><td>Approvals</td><td colspan="4">ENEC, UL, cUL, CQC</td></tr>
<tr><td rowspan="3">Dissipation Factor</td><td colspan="4">Maximum Values at +23°C</td></tr>
<tr><td></td><td colspan="2">C ≤ 0.1 µF</td><td>C > 0.1 µF</td></tr>
<tr><td>1 kHz</td><td colspan="2">0.1%</td><td>0.1%</td></tr>
<tr><td>Test Voltage Between Terminals</td><td colspan="4">The 100% screening factory test is carried out at 4,250 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. It's not permitted to repeat this Test as there is a risk to damage the Capacitor. KEMET is not liable in such case for any failures</td></tr>
<tr><td rowspan="4">Insulation Resistance</td><td colspan="4">Measured at +25°C ±5°C, according to IEC 60384-2</td></tr>
<tr><td colspan="4">Minimum Values Between Terminals</td></tr>
<tr><td>Voltage Charge</td><td>Voltage Charge time</td><td>C ≤ 0.33 µF</td><td>C > 0.33 µF</td></tr>
<tr><td>100 VDC</td><td>1 minute</td><td>≥ 3 • 10⁴ MΩ</td><td>≥ 10,000 MΩ • µF</td></tr>
<tr><td>In DC Applications</td><td colspan="4">Recommended Voltage ≤ 1,500 VDC</td></tr>
</table>

Maximum Humidity in Storage Condition



Impedance Graph



Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 4 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle–flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
IMQ S.p.A.		EN/IEC 60384–14	CA08.00188
UL		UL 60384–14 and CAN/CSA–E60384–14	E97797
CQC		IEC 60384–14	CQC12001084815 CQC12001084817 CQC12001084814 CQC12001084820 CQC12001088068

Environmental Compliance

All new KEMET EMI capacitors are RoHS compliant and Halogen–Free.

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Size Code	Maximum Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Part Number
		T	H	L			
0.01	DB	6	14.5	26	22.5	300	F873DB103(1)760(2)
0.012	DB	6	14.5	26	22.5	300	F873DB123(1)760(2)
0.015	DB	6	14.5	26	22.5	300	F873DB153(1)760(2)
0.018	DB	6	14.5	26	22.5	300	F873DB183(1)760(2)
0.022	DB	6	14.5	26	22.5	300	F873DB223(1)760(2)
0.025	DB	6	14.5	26	22.5	300	F873DB253(3)760(2)
0.025	DI	7	16	26	22.5	300	F873DI253(1)760(2)
0.027	DI	7	16	26	22.5	300	F873DI273(1)760(2)
0.033	DI	7	16	26	22.5	300	F873DI333(1)760(2)
0.039	DI	7	16	26	22.5	300	F873DI393(1)760(2)
0.047	DH	8	16	26	22.5	300	F873DH473(3)760(2)
0.047	DJ	8.5	17	26	22.5	300	F873DJ473(1)760(2)
0.056	DJ	8.5	17	26	22.5	300	F873DJ563(3)760(2)
0.056	DM	9	18.5	26	22.5	300	F873DM563(1)760(2)
0.068	DO	10	18.5	26	22.5	300	F873DO683(1)760(2)
0.082	DO	10	18.5	26	22.5	300	F873DO823(3)760(2)
0.082	DP	11	20	26	22.5	300	F873DP823(1)760(2)
0.1	DP	11	20	26	22.5	300	F873DP104(3)760(2)
0.1	DU	13	22	26	22.5	300	F873DU104(1)760(2)
0.12	DU	13	22	26	22.5	300	F873DU124(1)760(2)
0.15	DY	15.5	24.5	26	22.5	300	F873DY154(1)760(2)
0.18	DY	15.5	24.5	26	22.5	300	F873DY184(1)760(2)
0.056	FB	9	17	31.5	27.5	225	F873FB563(1)760(2)
0.068	FB	9	17	31.5	27.5	225	F873FB683(1)760(2)
0.082	FB	9	17	31.5	27.5	225	F873FB823(3)760(2)
0.082	FC	11	20	31.5	27.5	225	F873FC823(1)760(2)
0.1	FC	11	20	31.5	27.5	225	F873FC104(1)760(2)
0.1	FH	21	12.5	31.5	27.5	225	F873FH104(1)760(2)
0.12	FC	11	20	31.5	27.5	225	F873FC124(3)760(2)
0.12	FH	21	12.5	31.5	27.5	225	F873FH124(1)760(2)
0.15	FH	21	12.5	31.5	27.5	225	F873FH154(3)760(2)
0.15	FI	13	25	31.5	27.5	225	F873FI154(1)760(2)
0.18	FI	13	25	31.5	27.5	225	F873FI184(1)760(2)
0.22	FI	13	25	31.5	27.5	225	F873FI224(3)760(2)
0.22	FN	14	28	31.5	27.5	225	F873FN224(1)760(2)
0.22	FQ	27.5	16	31.5	27.5	225	F873FQ224(1)760(2)
0.25	FN	14	28	31.5	27.5	225	F873FN254(3)760(2)
0.25	FO	17	40	31.5	27.5	225	F873FO254(1)760(2)
0.25	FQ	27.5	16	31.5	27.5	225	F873FQ254(3)760(2)
0.25	FR	17.5	28	31.5	27.5	225	F873FR254(1)760(2)
Capacitance Value (µF)	**Size Code**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See table for available options.
(3) M = ±20% (only available tolerance).

Table 1 – Ratings & Part Number Reference cont.

Capacitance Value (µF)	Size Code	Maximum Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Part Number
		T	H	L			
0.27	FO	17	40	31.5	27.5	225	F873FO274(1)760(2)
0.27	FR	17.5	28	31.5	27.5	225	F873FR274(1)760(2)
0.27	FT	31	19	31.5	27.5	225	F873FT274(1)760(2)
0.33	FO	17	40	31.5	27.5	225	F873FO334(1)760(2)
0.33	FR	17.5	28	31.5	27.5	225	F873FR334(3)760(2)
0.33	FS	19	29	31.5	27.5	225	F873FS334(1)760(2)
0.33	FT	31	19	31.5	27.5	225	F873FT334(1)760(2)
0.39	FO	17	40	31.5	27.5	225	F873FO394(1)760(2)
0.39	FS	19	29	31.5	27.5	225	F873FS394(3)760(2)
0.39	FY	22	37	31.5	27.5	225	F873FY394(1)760(2)
0.47	FY	22	37	31.5	27.5	225	F873FY474(1)760(2)
0.56	FY	22	37	31.5	27.5	225	F873FY564(1)760(2)
0.15	RB	11	22	41	37.5	150	F873RB154(1)760(2)
0.18	RB	11	22	41	37.5	150	F873RB184(1)760(2)
0.22	RB	11	22	41	37.5	150	F873RB224(3)760(2)
0.22	RV	24	15	41	37.5	150	F873RV224(1)760(2)
0.25	RF	13	24	41	37.5	150	F873RF254(1)760(2)
0.25	RV	24	15	41	37.5	150	F873RV254(1)760(2)
0.27	RF	13	24	41	37.5	150	F873RF274(1)760(2)
0.27	RV	24	15	41	37.5	150	F873RV274(1)760(2)
0.33	RF	13	24	41	37.5	150	F873RF334(3)760(2)
0.33	RH	15	26	41	37.5	150	F873RH334(1)760(2)
0.33	RV	24	15	41	37.5	150	F873RV334(3)760(2)
0.33	RW	24	19	41	37.5	150	F873RW334(1)760(2)
0.39	RC	16	28.5	41	37.5	150	F873RC394(1)760(2)
0.39	RW	24	19	41	37.5	150	F873RW394(1)760(2)
0.47	RC	16	28.5	41	37.5	150	F873RC474(3)760(2)
0.47	RD	19	32	41	37.5	150	F873RD474(1)760(2)
0.47	RW	24	19	41	37.5	150	F873RW474(3)760(2)
0.56	RD	19	32	41	37.5	150	F873RD564(1)760(2)
0.68	RD	19	32	41	37.5	150	F873RD684(3)760(2)
0.68	RP	21	38	41	37.5	150	F873RP684(1)760(2)
0.82	RO	24	44	41	37.5	150	F873RO824(1)760(2)
0.82	RP	21	38	41	37.5	150	F873RP824(3)760(2)
1	RO	24	44	41	37.5	150	F873RO105(1)760(2)
1.2	RO	24	44	41	37.5	150	F873RO125(1)760(2)
1.5	RU	30	45	41	37.5	150	F873RU155(1)760(2)
1.8	RU	30	45	41	37.5	150	F873RU185(3)760(2)
Capacitance Value (µF)	**Size Code**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See table for available options.
(3) M = ±20% (only available tolerance).

Soldering Process

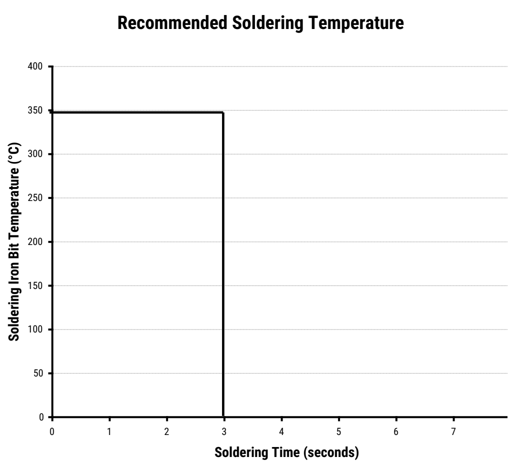
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

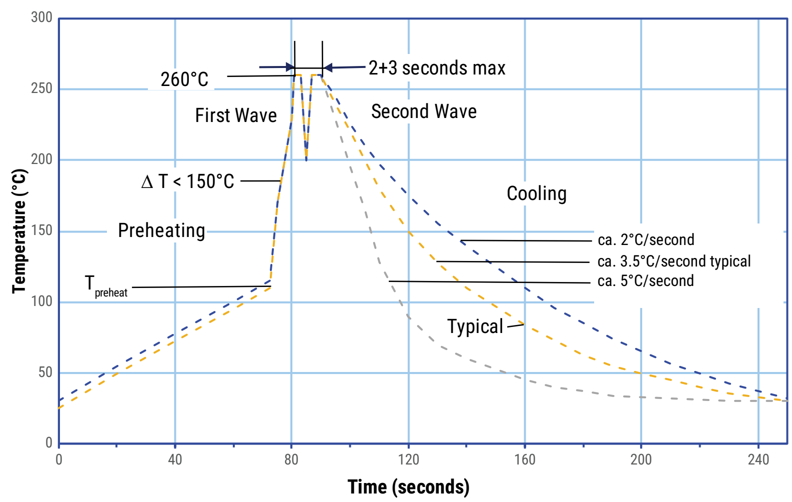
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

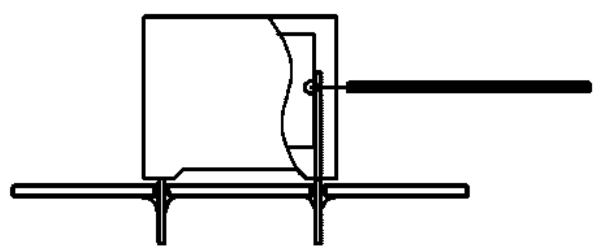
1. The table indicates the maximum set-up temperature of the soldering process

Figure 1

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



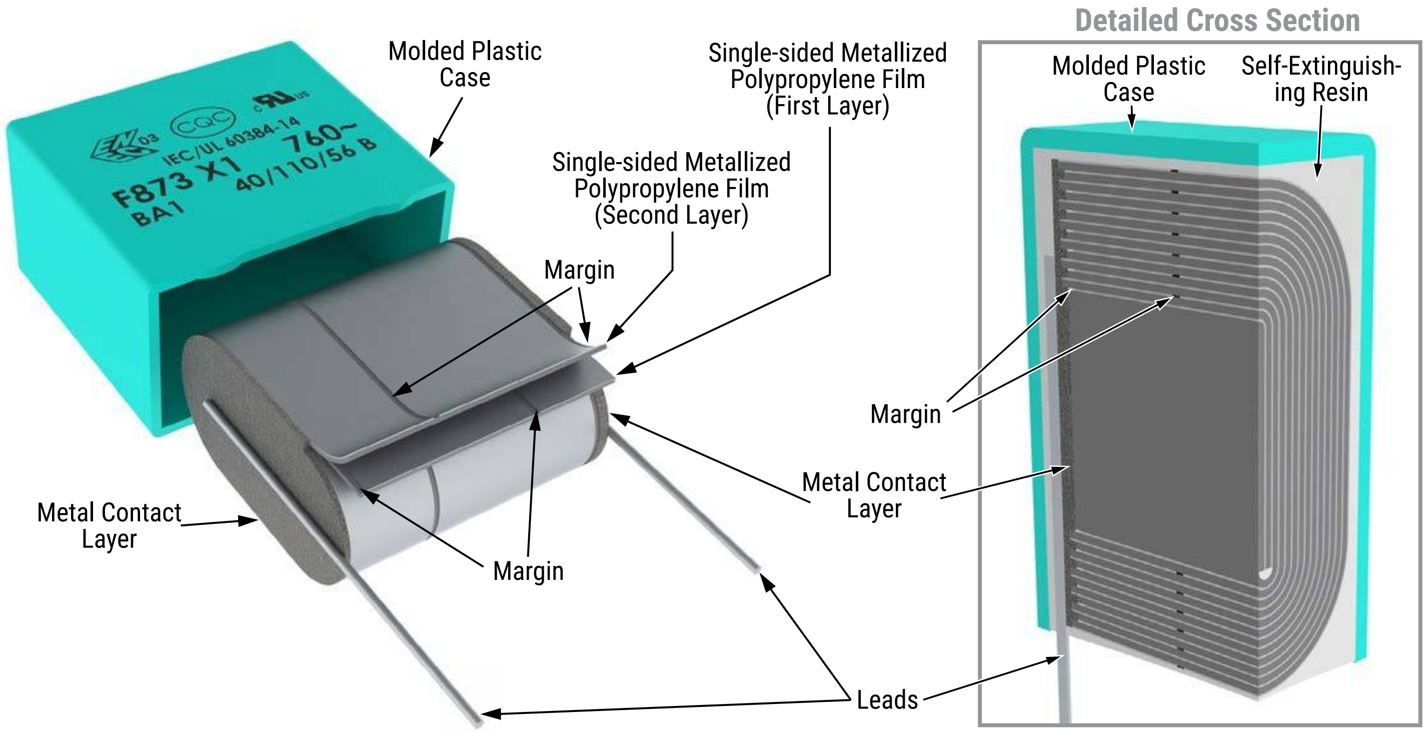
Temperature monitored inside the capacitor.

Selective Soldering Recommendations

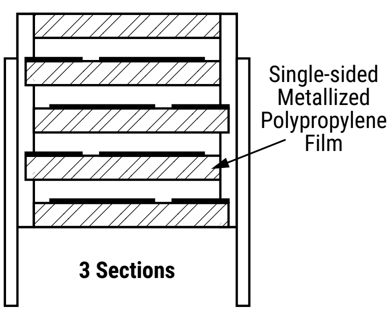
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

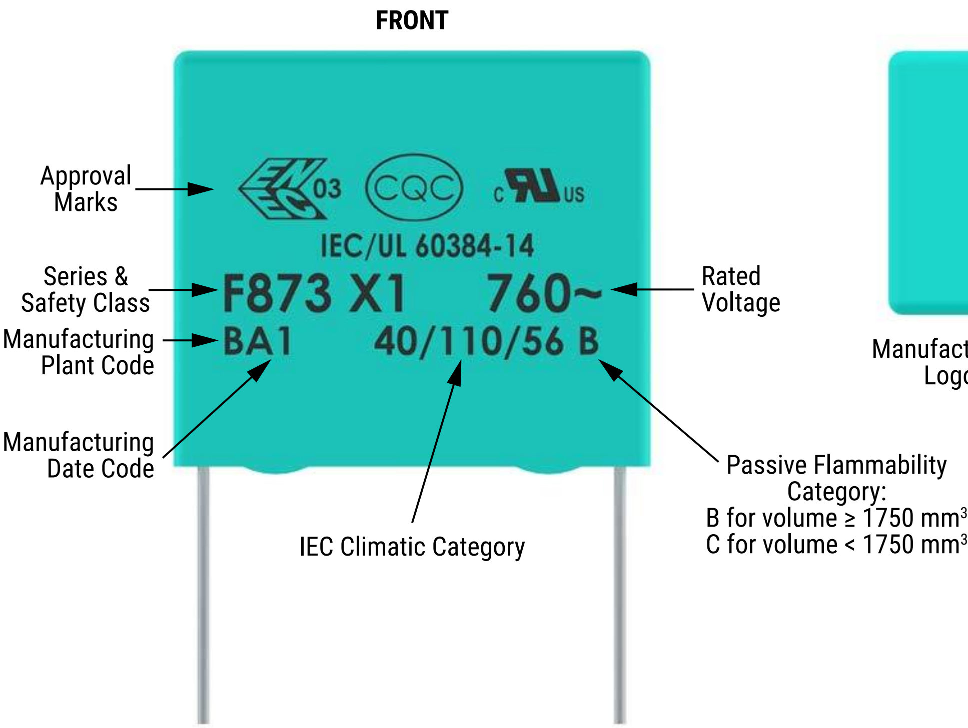
Construction

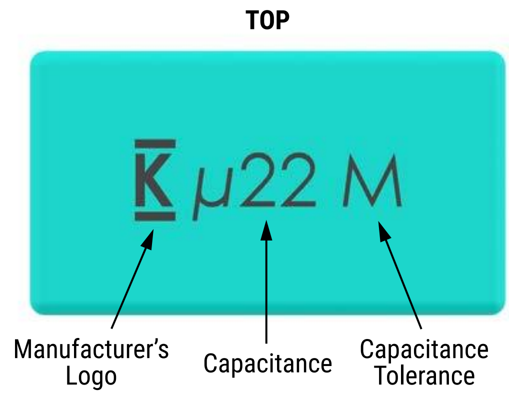


Winding Scheme



Marking





Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics

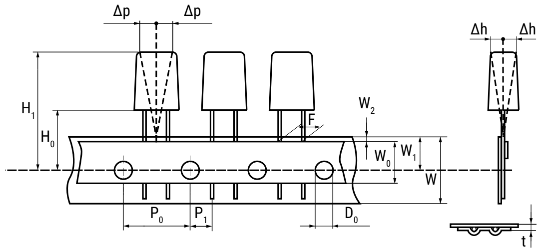
Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

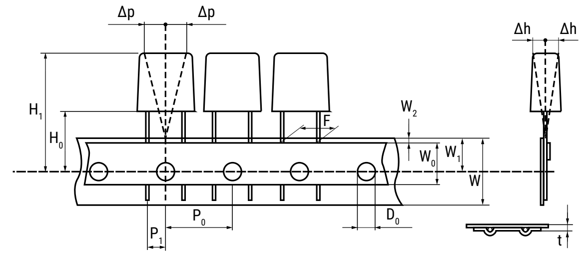
Size Code	Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo	Pizza
DB	22.5	6	14.5	26	805	450	300	700	464	660
DI		7	16	26	700	450	250	550	380	564
DH		8.0	16.0	26	520	300	240	500	330	492
DJ		8.5	17	26	450	350	250	450	280	468
DM		9	18.5	26	400	225	200	400	300	444
DO		10	18.5	26	360	350	160	350	235	396
DP		11	20	26	300	200	190	350	217	360
DU		13	22	26	230	150	150	300	200	300
DY		15.5	24.5	26	150	100	120	250	170	252
FB	27.5	9.0	17.0	31.5						370
FC		11.0	20.0	31.5						300
FI		13.0	25.0	31.5						250
FN		14.0	28.0	31.5						230
FO		17.0	40.0	31.5						190
FR		17.5	28.0	31.5						190
FS		19.0	29.0	31.5						170
FY		22.0	37.0	31.5						150
FH		21.0	12.5	31.5						150
FQ		27.5	16.0	31.5						120
FT		31.0	19.0	31.5						100
RB	37.5	11.0	22.0	41.0						210
RF		13.0	24.0	41.0						175
RH		15.0	26.0	41.0						154
RC		16.0	28.5	41.0						140
RD		19.0	32.0	41.0						119
RP		21.0	38.0	41.0						105
RO		24.0	44.0	41.0						91
RU		30.0	45.0	41.0						77
RV		24.0	15.0	41.0						91
RW		24.0	19.0	41.0						91

Lead Taping & Packaging (IEC 60286–2)

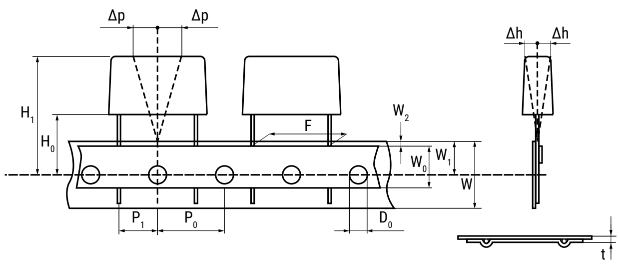
Lead Spacing 5 mm



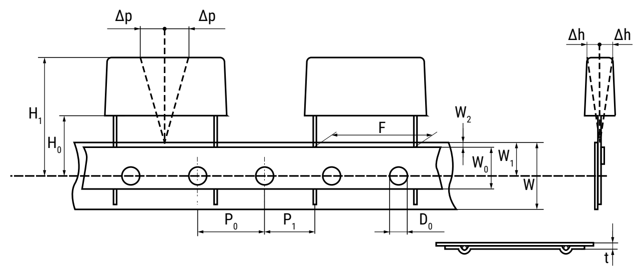
Lead Spacing 7.5 mm



Lead Spacing 10 – 15 mm



Lead Spacing 22.5 – 27.5 mm



Taping Specification

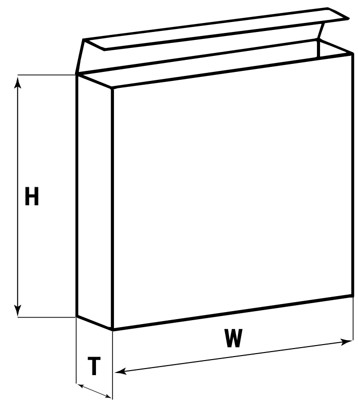
Dimensions in mm									Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	5.0	7.5	10.0	15.0	22.5	27.5	F
Carrier Tape Width	+1/−0.5	W	18.0	18.0	18.0	18.0	18.0	18.0	$18^{+1/-0.5}$
Hold-Down Tape Width	Minimum	W_0	6.0	6.0	9.0	10.0	10.0	10.0	
Position of Sprocket Hole	±0.5	W_1	9.0	9.0	9.0	9.0	9.0	9.0	$9^{+0.75/-0.5}$
Distance Between Tapes	Maximum	W_2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Sprocket Hole Diameter	±0.2	D_0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Feed Hole Lead Spacing	±0.2(1)	P_0(3)	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.85	3.75	7.7	5.2	7.8	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	±2	Δh	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.9^{MAX}	0.9^{MAX}	0.9^{MAX}
Sprocket Hole/Cap Body	±0.5	H_0(2)	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18^{+2/-0}$

(1) Maximum cumulative feed hole error, 1 mm per 20 parts.
(2) 16.5 mm available on request.
(3) 15 mm available on request (F ≥ 10 mm).

Lead Taping & Packaging (IEC 60286–2) cont.

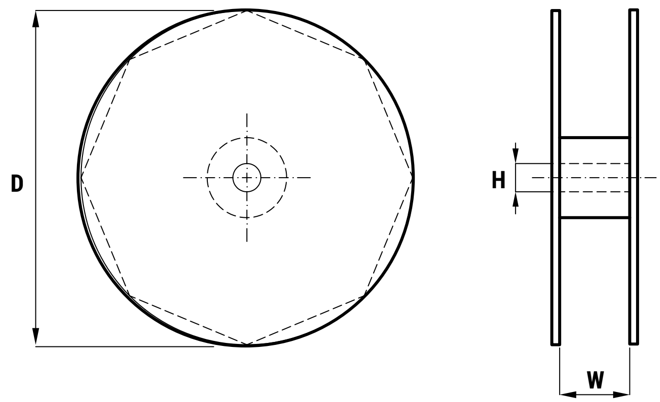
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
F5A, F5B, F5D F6xx, F8xx	360	340	59
PHExxx, PMExxx, PMRxxx	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
F5A, F5B, F5D F6xx, F8xx	355 500	30 25	55 (Max)
PHExxx, PMExxx, PMRxxx	360 500	30	46 (Max)



Metallized Polypropylene Film EMI Suppression Capacitors – F881, Class Y2, 300 VAC

Overview

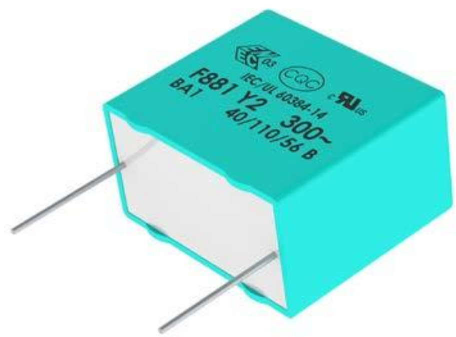
The F881 Series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material meeting the requirements of UL 94 V–0.

Applications

For worldwide use as electromagnetic interference (EMI) suppression in all "line to earth" applications requiring Y2 safety classification.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- Rated voltage: 300 VAC 50/60 Hz
- Capacitance range: 0.001 – 1.0 µF
- Lead spacing: 7.5 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category: 40/110/56, IEC 60068–1
- Tape & Reel in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of −40°C to +110°C
- 100% screening factory test at 4,000 VDC and 2,500 VAC



Part Number System

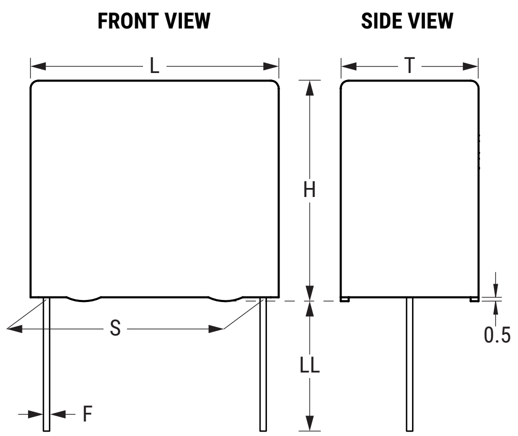
F	881	B	C	103	M	300	C
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Voltage (VAC)	Packaging
F = Film	Y2, Metallized Polypropylene	K = 7.5 A = 10 B = 15 D = 22.5 F = 27.5 R = 37.5	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	300	See Ordering Options Table

KEMET a YAGEO company

Ordering Options Table

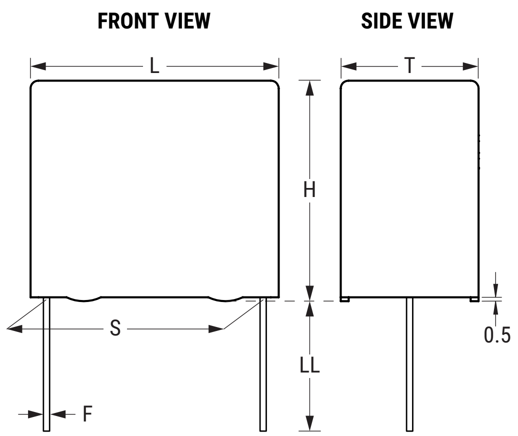
Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
7.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4+2/−0	C
	Bulk (Bag) – Long Leads	17+0/−1	A
	Tape & Reel (Standard Reel)	H_0= 18.5±0.5	L
	Other Lead and Packaging Options		
	Bulk (Bag) – Maximum Length Leads	20+5/−0	ALL0L
	Ammo Pack	H_0= 18.5±0.5	R
10	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4+2/−0	C
	Bulk (Bag) – Long Leads	17+0/−1	A
	Tape & Reel (Standard Reel)	H_0= 18.5±0.5	L
	Other Lead and Packaging Options		
	Bulk (Bag) – Maximum Length Leads	20+5/−0	ALL0L
	Ammo Pack	H_0= 18.5±0.5	R
	Tape & Reel (Large Reel)	H_0= 18.5±0.5	P
15	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4+2/−0	C
	Bulk (Bag) – Long Leads	17+0/−1	A
	Tape & Reel (Standard Reel)	H_0= 18.5±0.5	L
	Pizza Pack	4+2/−0	Z
	Other Lead and Packaging Options		
	Bulk (Bag) – Maximum Length Leads	25+5/−0	ALR0L
	Ammo Pack	H_0= 18.5±0.5	R
	Tape & Reel (Large Reel)	H_0= 18.5±0.5	P
22.5	**Standard Lead and Packaging Options**		
	Pizza – Long Leads	17+0/−1	ZLH0J
	Pizza Pack	4+2/−0	Z
	Other Lead and Packaging Options		
	Tape & Reel (Standard Reel)	H_0= 18.5±0.5	L
	Tape & Reel (Large Reel)	H_0= 18.5±0.5	P
	Ammo Pack	H_0= 18.5±0.5	R
27.5	**Standard Lead and Packaging Options**		
	Pizza – Long Leads	17+0/−1	ZLH0J
	Pizza Pack	4+2/−0	Z
37.5	**Standard Lead and Packaging Options**		
	Pizza – Long Leads	17+0/−1	ZLH0J
	Pizza Pack	4+2/−0	Z

Dimensions – Millimeters



Size Code	Version	S		T		H		L		F	
		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
KF		7.5	±0.4	3	+0/−0.5	8	+0/−0.5	10	+0/−0.5	0.6	±0.05
KG		7.5	±0.4	4	+0/−0.5	8	+0/−0.5	10	+0/−0.5	0.6	±0.05
KH		7.5	±0.4	4	+0/−0.5	9	+0/−0.5	10	+0/−0.5	0.6	±0.05
KJ		7.5	±0.4	5	+0/−0.5	10.5	+0/−0.5	10	+0/−0.5	0.6	±0.05
KM		7.5	±0.4	6	+0/−0.5	12	+0/−0.5	10.5	+0/−0.5	0.6	±0.05
AG		10.0	±0.4	4.0	+0/−0.5	9.0	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
AK		10.0	±0.4	5.0	+0/−0.5	11.0	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
AP		10.0	±0.4	6.0	+0/−0.5	12.0	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
AO		10.0	±0.4	7.0	+0/−0.5	17.0	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
AL	Low Profile	10.0	±0.4	9.5	+0/−0.5	7.5	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
AE	Special Version	10.0	±0.4	4.0	+0/−0.5	8.0	+0/−0.5	13.0	+0/−0.5	0.6	±0.05
BB		15.0	±0.4	4.0	+0/−0.5	10.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BC		15.0	±0.4	5.0	+0/−0.5	11.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BE		15.0	±0.4	5.5	+0/−0.5	12.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BG		15.0	±0.4	6.0	+0/−0.5	12.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BI	High Profile	15.0	±0.4	6.0	+0/−0.5	17.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BK		15.0	±0.4	7.5	+0/−0.5	13.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BO	High Profile	15.0	±0.4	7.5	+0/−0.5	18.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BP		15.0	±0.4	8.5	+0/−0.5	14.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BT		15.0	±0.4	9.0	+0/−0.5	12.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BS		15.0	±0.4	10.0	+0/−0.5	16.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BY		15.0	±0.4	11.0	+0/−0.5	19.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BZ	Special Version	15.0	±0.4	12.0	+0/−0.5	20.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BR	Low Profile	15.0	±0.4	13.0	+0/−0.5	12.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
DB		22.5	±0.4	6.0	+0/−0.5	14.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DI		22.5	±0.4	7.0	+0/−0.5	16.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DH		22.5	±0.4	8.0	+0/−0.5	16.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DJ		22.5	±0.4	8.5	+0/−0.5	17.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
Note: See Ordering Options Table for lead length (LL) options.											

Dimensions – Millimeters cont.

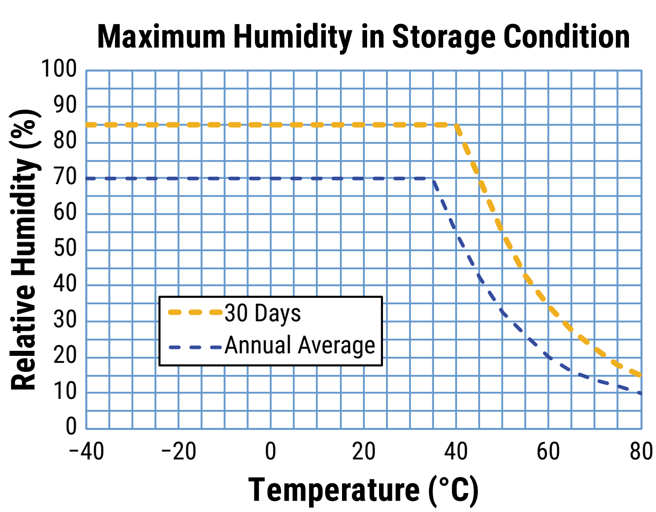


Size Code	Version	S		T		H		L		F	
		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
DM		22.5	±0.4	9.0	+0/−0.5	18.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DO		22.5	±0.4	10.0	+0/−0.5	18.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DP		22.5	±0.4	11.0	+0/−0.5	20.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DU		22.5	±0.4	13.0	+0/−0.5	22.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DY		22.5	±0.4	15.5	+0/−0.5	24.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
FB		27.5	±0.4	9.0	+0/−0.7	17.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FC		27.5	±0.4	11.0	+0/−0.7	20.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FI		27.5	±0.4	13.0	+0/−0.7	25.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FN		27.5	±0.4	14.0	+0/−0.7	28.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FO	High Profile	27.5	±0.4	17.0	+0/−0.7	40.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FR		27.5	±0.4	17.5	+0/−0.7	28.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FS		27.5	±0.4	19.0	+0/−0.7	29.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FY		27.5	±0.4	22.0	+0/−0.7	37.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FH	Low Profile	27.5	±0.4	21.0	+0/−0.7	12.5	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FQ	Low Profile	27.5	±0.4	27.5	+0/−0.7	16.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FT	Low Profile	27.5	±0.4	31.0	+0/−0.7	19.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
RB		37.5	±0.4	11.0	+0/−0.7	22.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RF		37.5	±0.4	13.0	+0/−0.7	24.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RH		37.5	±0.4	15.0	+0/−0.7	26.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RC		37.5	±0.4	16.0	+0/−0.7	28.5	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RD		37.5	±0.4	19.0	+0/−0.7	32.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RP		37.5	±0.4	21.0	+0/−0.7	38.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RO		37.5	±0.4	24.0	+0/−0.7	44.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RU		37.5	±0.4	30.0	+0/−0.7	45.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RV	Low Profile	37.5	±0.4	24.0	+0/−0.7	15.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05
RW	Low Profile	37.5	±0.4	24.0	+0/−0.7	19.0	+0/−0.7	41.0	+0/−0.7	1.0	±0.05

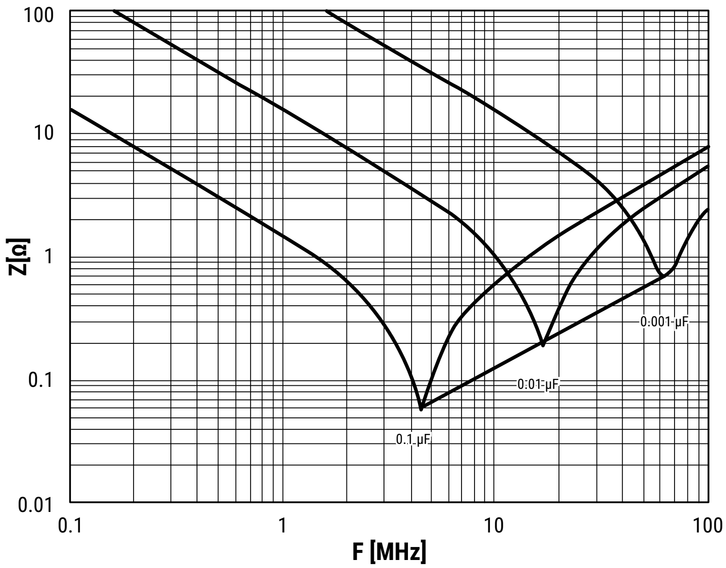
Note: See Ordering Options Table for lead length (LL) options.

Performance Characteristics

<table>
<tr><td>Rated Voltage</td><td colspan="4">300 VAC 50/60 Hz</td></tr>
<tr><td>Capacitance Range</td><td colspan="4">0.001 – 1.0 μF</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="4">±20%, ±10%</td></tr>
<tr><td>Temperature Range</td><td colspan="4">−40°C to +110°C</td></tr>
<tr><td>Climatic Category</td><td colspan="4">40/110/56</td></tr>
<tr><td>Storage Conditions</td><td colspan="4">Storage time: ≤ 24 months from the date marked on the label package
Average relative humidity per year ≤ 70%
RH ≤ 85% for 30 days randomly distributed throughout the year
Dew is absent
Temperature: -40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)</td></tr>
<tr><td>Approvals</td><td colspan="4">ENEC, UL, cUL, CQC</td></tr>
<tr><td rowspan="3">Dissipation Factor</td><td colspan="4">Maximum Values at +23°C</td></tr>
<tr><td></td><td>C ≤ 0.1 μF</td><td colspan="2">C > 0.1 μF</td></tr>
<tr><td>1 kHz</td><td>0.3%</td><td colspan="2">0.2%</td></tr>
<tr><td>Test Voltage Between Terminals</td><td colspan="4">The 100% screening factory test is carried out at 4,000 VDC and 2,500 VAC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. It's not permitted to repeat this Test as there is a risk to damage the Capacitor. KEMET is not liable in such case for any failures</td></tr>
<tr><td rowspan="4">Insulation Resistance</td><td colspan="4">Measured at +25°C ±5°C, according to IEC 60384-2</td></tr>
<tr><td colspan="4">Minimum Values Between Terminals</td></tr>
<tr><td>Voltage Charge</td><td>Voltage Charge time</td><td>C ≤ 0.33 μF</td><td>C > 0.33 μF</td></tr>
<tr><td>100 VDC</td><td>1 minute</td><td>≥ 3 • 10^4 MΩ</td><td>≥ 10,000 MΩ • μF</td></tr>
<tr><td>In DC Applications</td><td colspan="4">Recommended voltage ≤ 1000 VDC</td></tr>
</table>



Impedance Graph



Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384–14	1.7 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle–flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
IMQ S.p.A.		EN/IEC 60384–14	CA08.00185
UL		UL 60384–14 and CAN/CSA–E60384–14	E97797
CQC		IEC 60384–14	CQC12001081968 CQC12001081972 CQC12001081971 CQC12001081970 CQC12001088067

Environmental Compliance

All new KEMET EMI capacitors are RoHS compliant and Halogen–Free.

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Size Code	Maximum Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Part Number
		T	H	L			
0.001	KF	3	8	10	7.5	800	F881KF102(1)300(2)
0.0012	KG	4	8	10	7.5	800	F881KG122(1)300(2)
0.0015	KG	4	8	10	7.5	800	F881KG152(1)300(2)
0.0018	KH	4	9	10	7.5	800	F881KH182(1)300(2)
0.0022	KH	4	9	10	7.5	800	F881KH222(1)300(2)
0.0025	KJ	5	10.5	10	7.5	800	F881KJ252(1)300(2)
0.0027	KJ	5	10.5	10	7.5	800	F881KJ272(1)300(2)
0.0033	KJ	5	10.5	10	7.5	800	F881KJ332(1)300(2)
0.0039	KJ	5	10.5	10	7.5	800	F881KJ392(3)300(2)
0.0039	KM	6	12	10.5	7.5	800	F881KM392(1)300(2)
0.0047	KM	6	12	10.5	7.5	800	F881KM472(1)300(2)
0.0056	KM	6	12	10.5	7.5	800	F881KM562(3)300(2)
0.001	AE	4	8	13	10	800	F881AE102(1)300(2)
0.0012	AE	4	8	13	10	800	F881AE122(1)300(2)
0.0015	AE	4	8	13	10	800	F881AE152(1)300(2)
0.0018	AE	4	8	13	10	800	F881AE182(1)300(2)
0.0018	AL	9.5	7.5	13	10	800	F881AL182(1)300(2)
0.0022	AE	4	8	13	10	800	F881AE222(1)300(2)
0.0022	AL	9.5	7.5	13	10	800	F881AL222(1)300(2)
0.0025	AG	4	9	13	10	800	F881AG252(1)300(2)
0.0025	AL	9.5	7.5	13	10	800	F881AL252(1)300(2)
0.0027	AG	4	9	13	10	800	F881AG272(1)300(2)
0.0027	AL	9.5	7.5	13	10	800	F881AL272(1)300(2)
0.0033	AK	5	11	13	10	800	F881AK332(1)300(2)
0.0033	AL	9.5	7.5	13	10	800	F881AL332(1)300(2)
0.0039	AK	5	11	13	10	800	F881AK392(1)300(2)
0.0039	AL	9.5	7.5	13	10	800	F881AL392(1)300(2)
0.0047	AK	5	11	13	10	800	F881AK472(3)300(2)
0.0047	AL	9.5	7.5	13	10	800	F881AL472(1)300(2)
0.0056	AL	9.5	7.5	13	10	800	F881AL562(1)300(2)
0.0056	AP	6	12	13	10	800	F881AP562(1)300(2)
0.0068	AL	9.5	7.5	13	10	800	F881AL682(3)300(2)
0.0068	AP	6	12	13	10	800	F881AP682(1)300(2)
0.0082	AO	7	17	13	10	800	F881AO822(1)300(2)
0.01	AO	7	17	13	10	800	F881AO103(1)300(2)
0.0027	BB	4	10	18	15	600	F881BB272(1)300(2)
0.0033	BB	4	10	18	15	600	F881BB332(1)300(2)
0.0039	BB	4	10	18	15	600	F881BB392(1)300(2)
0.0047	BB	4	10	18	15	600	F881BB472(1)300(2)
0.0056	BB	4	10	18	15	600	F881BB562(1)300(2)
0.0068	BB	4	10	18	15	600	F881BB682(1)300(2)
0.0082	BB	4	10	18	15	600	F881BB822(1)300(2)
0.01	BB	4	10	18	15	600	F881BB103(3)300(2)
0.01	BC	5	11	18	15	600	F881BC103(1)300(2)
0.012	BC	5	11	18	15	600	F881BC123(1)300(2)
0.015	BC	5	11	18	15	600	F881BC153(3)300(2)
0.015	BE	5.5	12.5	18	15	600	F881BE153(1)300(2)
0.015	BT	9	12.5	18	15	600	F881BT153(1)300(2)
0.018	BE	5.5	12.5	18	15	600	F881BE183(1)300(2)
0.018	BT	9	12.5	18	15	600	F881BT183(1)300(2)
Capacitance Value (µF)	**Size Code**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See Ordering Options Table for available options.
(3) M = ±20% (only available tolerance).

KEMET a YAGEO company

Table 1 – Ratings & Part Number Reference cont.

Capacitance Value (µF)	Size Code	Maximum Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Part Number
		T	H	L			
0.022	BG	6	12	18	15	600	F881BG223(3)300(2)
0.022	BT	9	12.5	18	15	600	F881BT223(1)300(2)
0.025	BI	6	17.5	18	15	600	F881BI253(3)300(2)
0.025	BK	7.5	13.5	18	15	600	F881BK253(1)300(2)
0.025	BR	13	12	18	15	600	F881BR253(1)300(2)
0.025	BT	9	12.5	18	15	600	F881BT253(1)300(2)
0.027	BI	6	17.5	18	15	600	F881BI273(1)300(2)
0.027	BK	7.5	13.5	18	15	600	F881BK273(1)300(2)
0.027	BR	13	12	18	15	600	F881BR273(1)300(2)
0.027	BT	9	12.5	18	15	600	F881BT273(1)300(2)
0.033	BI	6	17.5	18	15	600	F881BI333(1)300(2)
0.033	BO	7.5	18.5	18	15	600	F881BO333(1)300(2)
0.033	BR	13	12	18	15	600	F881BR333(1)300(2)
0.033	BT	9	12.5	18	15	600	F881BT333(1)300(2)
0.039	BI	6	17.5	18	15	600	F881BI393(3)300(2)
0.039	BO	7.5	18.5	18	15	600	F881BO393(1)300(2)
0.039	BP	8.5	14.5	18	15	600	F881BP393(1)300(2)
0.039	BR	13	12	18	15	600	F881BR393(1)300(2)
0.039	BT	9	12.5	18	15	600	F881BT393(3)300(2)
0.047	BO	7.5	18.5	18	15	600	F881BO473(1)300(2)
0.047	BP	8.5	14.5	18	15	600	F881BP473(3)300(2)
0.047	BR	13	12	18	15	600	F881BR473(1)300(2)
0.047	BS	10	16	18	15	600	F881BS473(1)300(2)
0.056	BO	7.5	18.5	18	15	600	F881BO563(3)300(2)
0.056	BR	13	12	18	15	600	F881BR563(3)300(2)
0.056	BS	10	16	18	15	600	F881BS563(1)300(2)
0.068	BY	11	19	18	15	600	F881BY683(1)300(2)
0.082	BY	11	19	18	15	600	F881BY823(3)300(2)
0.082	BZ	12	20	18	15	600	F881BZ823(1)300(2)
0.039	DB	6	14.5	26	22.5	500	F881DB393(1)300(2)
0.047	DB	6	14.5	26	22.5	500	F881DB473(1)300(2)
0.056	DB	6	14.5	26	22.5	500	F881DB563(3)300(2)
0.056	DI	7	16	26	22.5	500	F881DI563(1)300(2)
0.068	DI	7	16	26	22.5	500	F881DI683(1)300(2)
0.082	DH	8	16	26	22.5	500	F881DH823(1)300(2)
0.082	DI	7	16	26	22.5	500	F881DI823(3)300(2)
0.1	DH	8	16	26	22.5	500	F881DH104(3)300(2)
0.1	DJ	8.5	17	26	22.5	500	F881DJ104(1)300(2)
0.12	DJ	8.5	17	26	22.5	500	F881DJ124(3)300(2)
0.12	DM	9	18.5	26	22.5	500	F881DM124(1)300(2)
0.15	DO	10	18.5	26	22.5	500	F881DO154(1)300(2)
0.18	DP	11	20	26	22.5	500	F881DP184(1)300(2)
0.22	DP	11	20	26	22.5	500	F881DP224(3)300(2)
0.22	DU	13	22	26	22.5	500	F881DU224(1)300(2)
0.25	DU	13	22	26	22.5	500	F881DU254(1)300(2)
0.27	DU	13	22	26	22.5	500	F881DU274(1)300(2)
0.33	DY	15.5	24.5	26	22.5	500	F881DY334(1)300(2)
0.39	DY	15.5	24.5	26	22.5	500	F881DY394(1)300(2)
0.1	FB	9	17	31.5	27.5	400	F881FB104(1)300(2)
0.12	FB	9	17	31.5	27.5	400	F881FB124(1)300(2)
Capacitance Value (µF)	**Size Code**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See Ordering Options Table for available options.
(3) M = ±20% (only available tolerance).

Table 1 – Ratings & Part Number Reference cont.

Capacitance Value (µF)	Size Code	Maximum Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Part Number
		T	H	L			
0.15	FB	9	17	31.5	27.5	400	F881FB154(1)300(2)
0.18	FC	11	20	31.5	27.5	400	F881FC184(1)300(2)
0.22	FC	11	20	31.5	27.5	400	F881FC224(1)300(2)
0.22	FH	21	12.5	31.5	27.5	400	F881FH224(1)300(2)
0.25	FC	11	20	31.5	27.5	400	F881FC254(3)300(2)
0.25	FH	21	12.5	31.5	27.5	400	F881FH254(1)300(2)
0.27	FC	11	20	31.5	27.5	400	F881FC274(3)300(2)
0.27	FH	21	12.5	31.5	27.5	400	F881FH274(1)300(2)
0.27	FI	13	25	31.5	27.5	400	F881FI274(1)300(2)
0.33	FH	21	12.5	31.5	27.5	400	F881FH334(3)300(2)
0.33	FI	13	25	31.5	27.5	400	F881FI334(1)300(2)
0.39	FI	13	25	31.5	27.5	400	F881FI394(1)300(2)
0.39	FQ	27.5	16	31.5	27.5	400	F881FQ394(1)300(2)
0.47	FR	17.5	28	31.5	27.5	400	F881FR474(1)300(2)
0.47	FQ	27.5	16	31.5	27.5	400	F881FQ474(1)300(2)
0.56	FN	14	28	31.5	27.5	400	F881FN564(1)300(2)
0.56	FR	17.5	28	31.5	27.5	400	F881FR564(1)300(2)
0.56	FT	31	19	31.5	27.5	400	F881FT564(1)300(2)
0.68	FO	17	40	31.5	27.5	400	F881FO684(1)300(2)
0.68	FR	17.5	28	31.5	27.5	400	F881FR684(1)300(2)
0.68	FT	31	19	31.5	27.5	400	F881FT684(1)300(2)
0.82	FO	17	40	31.5	27.5	400	F881FO824(1)300(2)
0.82	FT	31	19	31.5	27.5	400	F881FT824(3)300(2)
0.82	FY	22	37	31.5	27.5	400	F881FY824(1)300(2)
1	FY	22	37	31.5	27.5	400	F881FY105(1)300(2)
0.33	RB	11	22	41	37.5	300	F881RB334(1)300(2)
0.39	RB	11	22	41	37.5	300	F881RB394(1)300(2)
0.47	RF	13	24	41	37.5	300	F881RF474(1)300(2)
0.47	RV	24	15	41	37.5	300	F881RV474(1)300(2)
0.56	RH	15	26	41	37.5	300	F881RH564(1)300(2)
0.56	RV	24	15	41	37.5	300	F881RV564(1)300(2)
0.68	RH	15	26	41	37.5	300	F881RH684(1)300(2)
0.68	RW	24	19	41	37.5	300	F881RW684(1)300(2)
0.82	RH	15	26	41	37.5	300	F881RH824(1)300(2)
0.82	RW	24	19	41	37.5	300	F881RW824(1)300(2)
1	RD	19	32	41	37.5	300	F881RD105(1)300(2)
1	RW	24	19	41	37.5	300	F881RW105(1)300(2)
Capacitance Value (µF)	**Size Code**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See Ordering Options Table for available options.
(3) M = ±20% (only available tolerance).

Soldering Process

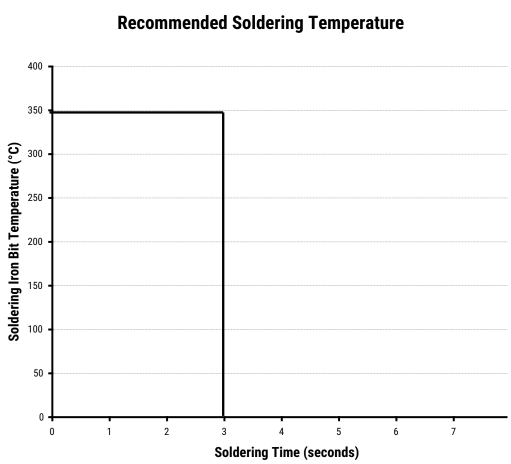
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 mm to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

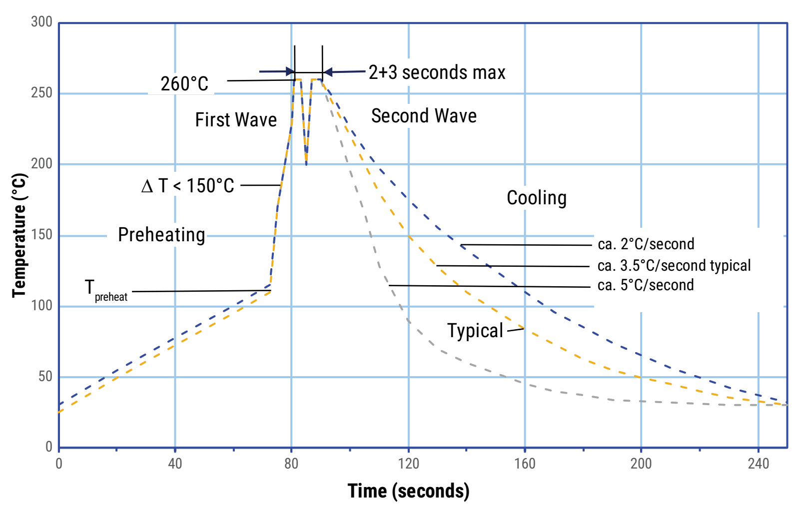
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

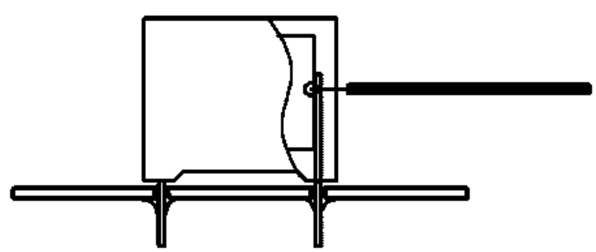
1. The table indicates the maximum set-up temperature of the soldering process

Figure 1

Dielectric film material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



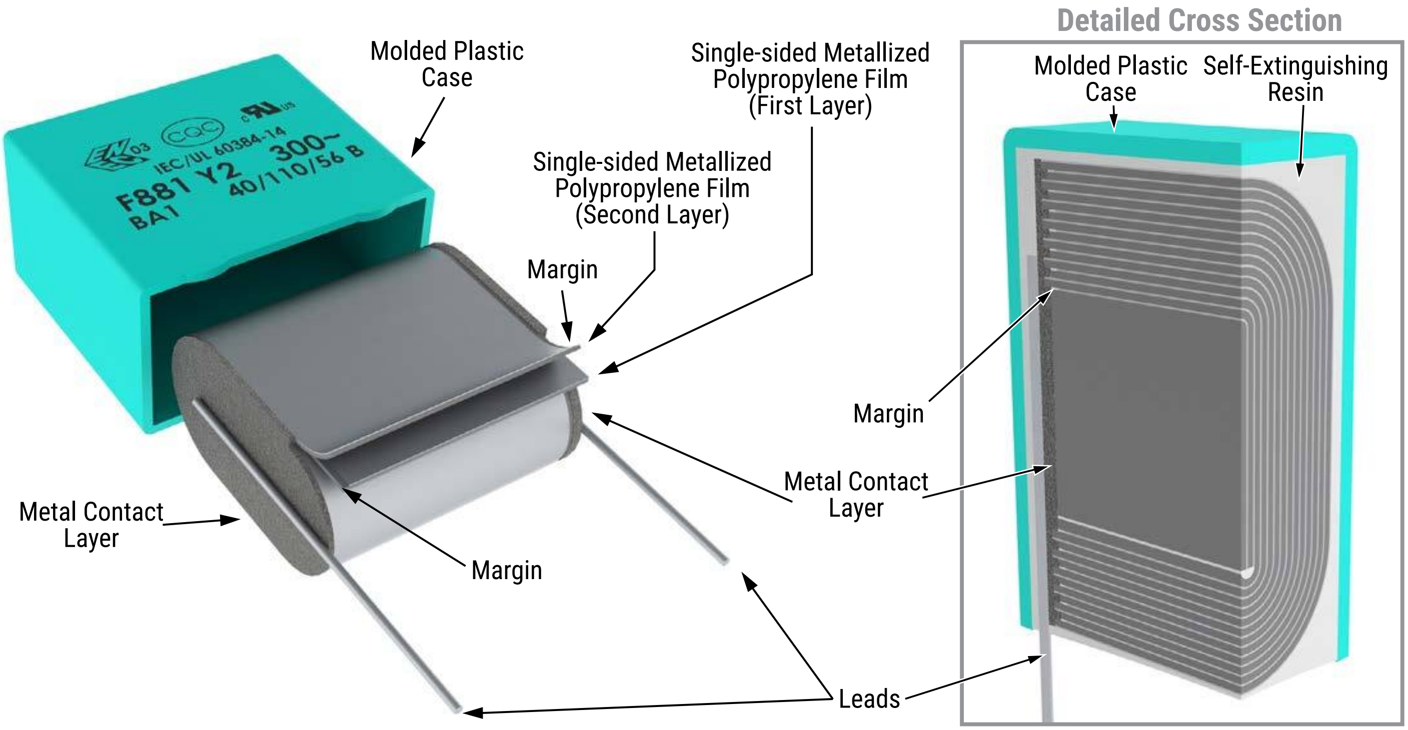
Temperature monitored inside the capacitor.

Selective Soldering Recommendations

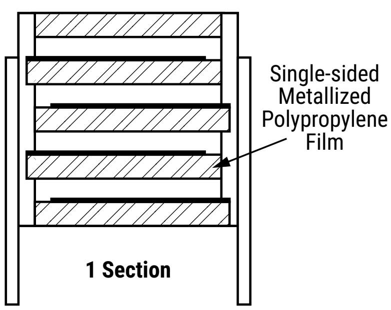
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Construction

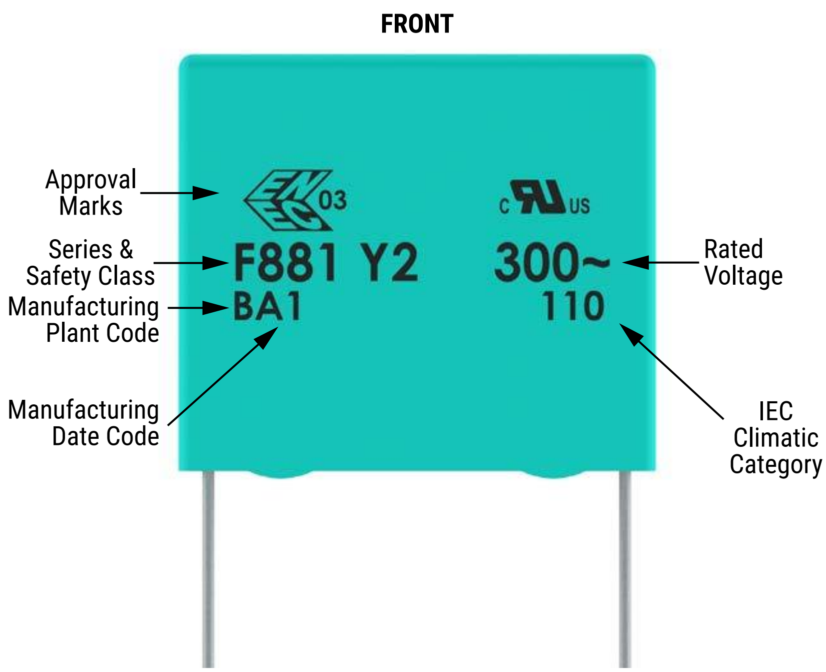


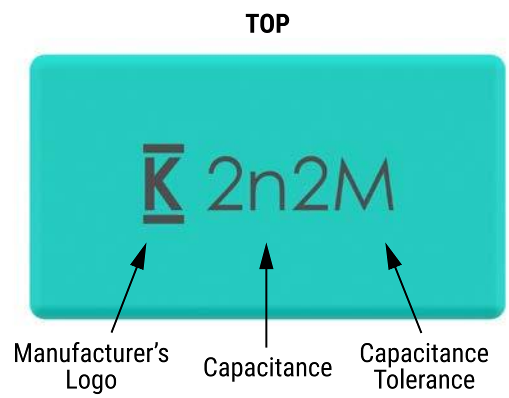
Winding Scheme



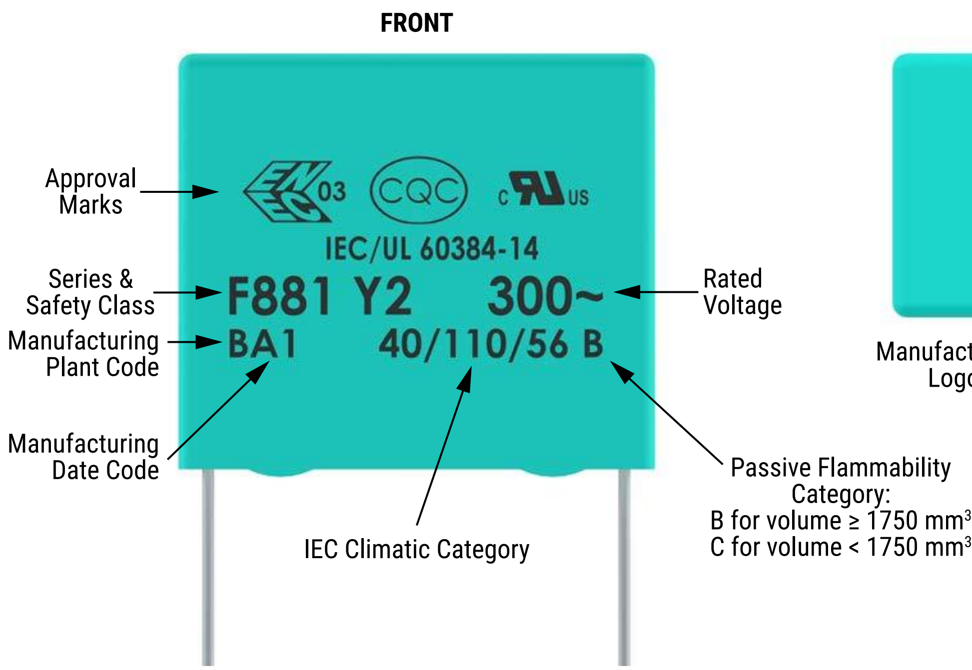
Marking

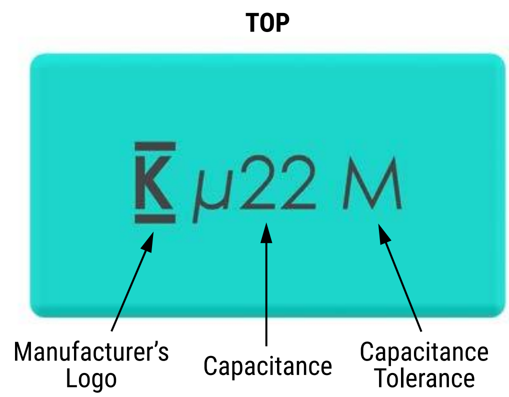
Pitch = 7.5 mm





Pitch ≥ 10 mm





Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

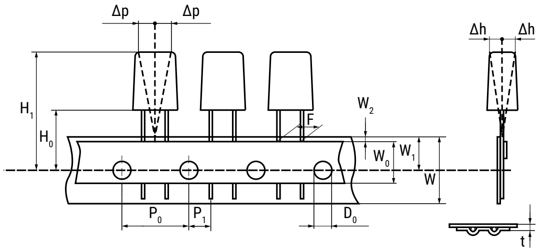
Size Code	Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo	Pizza
KE	7.5	2.5	6	10	2,000	2,500	2,500		3,500	
KF		3	8	10	1,500	1,750	2,100		2,800	
KG		4	8	10	2,000	1,500	1,500		2,100	
KJ		5	10.5	10	1,500	1,000	1,200		1,600	
KM		6	12	10.5	1,000	800	1,000		1,350	
KH		4	9	10	2,000	1,500	1,500		2,100	
AN	10	3.5	9	13	2,000	2,200	850	1,700	1,150	
AG		4	9	13	2,000	2,200	750	1,500	1,000	
AK		5	11	13	1,300	2,000	600	1,250	800	
AP		6	12	13	1,000	1,800	500	1,000	680	
AO		7	17	13	600	700	450	900	580	
AL		9.5	7.5	13	1,000	1,500	300	600	430	
AE		4	8	13	2,000	2,200	750	1,500	1,000	
BB	15	4	10	18	2,500	1,500	750	1,500	1,000	1,411
BC		5	11	18	1,000	1,250	600	1,250	800	1,139
BE		5.5	12.5	18	800	1,000	550	1,100	750	1,020
BG		6	12	18	1,750	1,000	500	1,000	680	935
BK		7.5	13.5	18	1,000	800	350	800	500	748
BI		6	17.5	18	1,000	800	500	1,000	680	935
BP		8.5	14.5	18	1,000	650	300	700	440	663
BT		9	12.5	18	1,000	700	270	650	410	629
BO		7.5	18.5	18	900	500	350	800	500	748
BS		10	16	18	750	550	300	600	380	561
BR		13	12	18	750	520	200	480	280	425
BY		11	19	18	450	400	250	500	340	510
BA		8.5	12.5	18	1,000	650	300	700	440	663
BZ		12	20	18	350	300	220	450	330	459
DB	22.5	6	14.5	26	805	450	300	700	464	660
DI		7	16	26	700	450	250	550	380	564
DH		8.0	16.0	26	520	300	240	500	330	492
DJ		8.5	17	26	450	350	250	450	280	468
DM		9	18.5	26	400	225	200	400	300	444
DO		10	18.5	26	360	350	160	350	235	396
DP		11	20	26	300	200	190	350	217	360
DU		13	22	26	230	150	150	300	200	300
DY		15.5	24.5	26	150	100	120	250	170	252

Packaging Quantities cont.

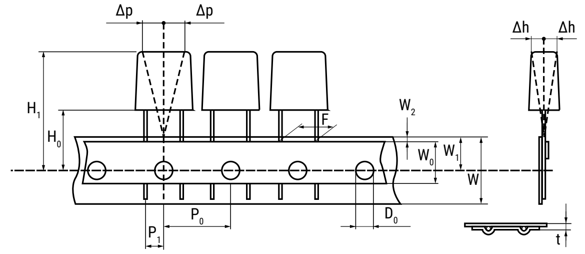
Size Code	Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo	Pizza
FB	27.5	9.0	17.0	31.5						370
FC		11.0	20.0	31.5						300
FI		13.0	25.0	31.5						250
FN		14.0	28.0	31.5						230
FO		17.0	40.0	31.5						190
FR		17.5	28.0	31.5						190
FS		19.0	29.0	31.5						170
FY		22.0	37.0	31.5						150
FH		21.0	12.5	31.5						150
FQ		27.5	16.0	31.5						120
FT		31.0	19.0	31.5						100
RB	37.5	11.0	22.0	41.0						210
RF		13.0	24.0	41.0						175
RH		15.0	26.0	41.0						154
RC		16.0	28.5	41.0						140
RD		19.0	32.0	41.0						119
RP		21.0	38.0	41.0						105
RO		24.0	44.0	41.0						91
RU		30.0	45.0	41.0						77
RV		24.0	15.0	41.0						91
RW		24.0	19.0	41.0						91

Lead Taping & Packaging (IEC 60286–2)

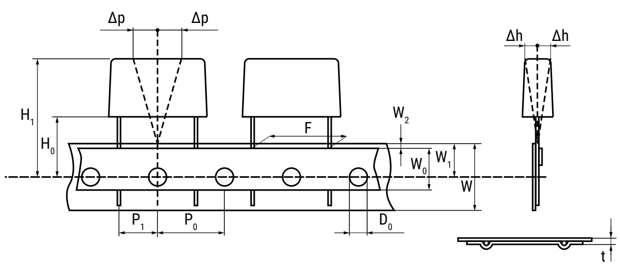
Lead Spacing 5 mm



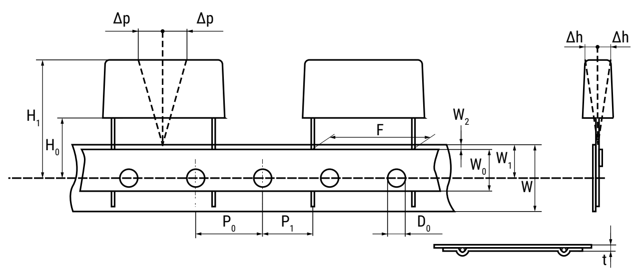
Lead Spacing 7.5 mm



Lead Spacing 10 – 15 mm



Lead Spacing 22.5 – 27.5 mm



Taping Specification

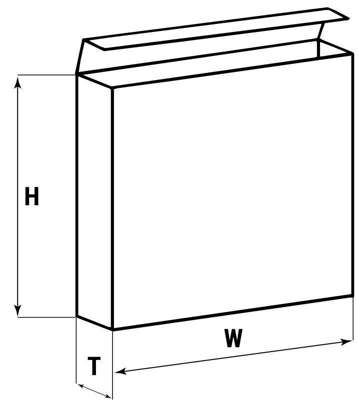
Dimensions in mm									Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	5.0	7.5	10.0	15.0	22.5	27.5	F
Carrier Tape Width	+1/−0.5	W	18.0	18.0	18.0	18.0	18.0	18.0	$18^{+1/-0.5}$
Hold-Down Tape Width	Minimum	W_0	6.0	6.0	9.0	10.0	10.0	10.0	
Position of Sprocket Hole	±0.5	W_1	9.0	9.0	9.0	9.0	9.0	9.0	$9^{+0.75/-0.5}$
Distance Between Tapes	Maximum	W_2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Sprocket Hole Diameter	±0.2	D_0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Feed Hole Lead Spacing	±0.2(1)	P_0 (3)	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.85	3.75	7.7	5.2	7.8	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	±2	Δh	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.9^{MAX}	0.9^{MAX}	0.9^{MAX}
Sprocket Hole/Cap Body	±0.5	H_0 (2)	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18^{+2/-0}$

(1) Maximum cumulative feed hole error, 1 mm per 20 parts.
(2) 16.5 mm available on request.
(3) 15 mm available on request (F ≥ 10 mm).

Lead Taping & Packaging (IEC 60286–2) cont.

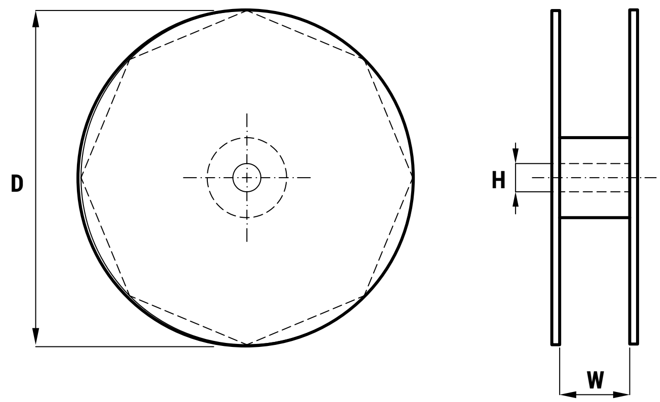
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
F5A, F5B, F5D	360	340	59
F6xx, F8xx			
PHExxx, PMExxx, PMRxxx	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
F5A, F5B, F5D	355	30	55 (Max)
F6xx, F8xx	500	25	
PHExxx, PMExxx, PMRxxx	360 500	30	46 (Max)



Metallized Polypropylene Film EMI Suppression Capacitors

R47, Class X2, 520 VAC, 85°C (Automotive Grade)

KEMET a YAGEO company

Overview

The R47 series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material that meets the requirements of UL 94 V–0.

Automotive Grade devices (up to 22.5 mm lead spacing) meet the demanding Automotive Electronics Council's AEC-Q200 qualification requirements.

Applications

For worldwide use in electromagnetic interference (EMI) suppression in across-the-line applications that require X2 safety classification. Intended for use in situations in which capacitor failure would not result in exposure to electric shock.

Benefits

- Approvals: ENEC, UL, cUL
- X2 CLASS (IEC 60384–14)
- Rated voltage: 520VAC 50/60Hz
- Capacitance range: 0.0047 – 2.2 µF
- Lead spacing: 10.0 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category 40/85/56, IEC 60068–1
- Tape & Reel in accordance with IEC 60286–2
- RoHS compliant and lead-free terminations
- Operating temperature range of −40°C to +85°C
- 100% screening factory test at 2,700 VDC/1,700 VAC
- Self healing properties
- Automotive (AEC–Q200) grades available up to 22.5 mm lead spacing

Part Number System

R47	5	I	2100	00	01	M
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Lead and Packaging Code	Internal Use	Capacitance Tolerance
X2, Metallized Polypropylene	5 = 520	F = 10.0 I = 15.0 N = 22.5 R = 27.5 W = 37.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	See Ordering Options Table	01 02 03	K = ±10% M = ±20%

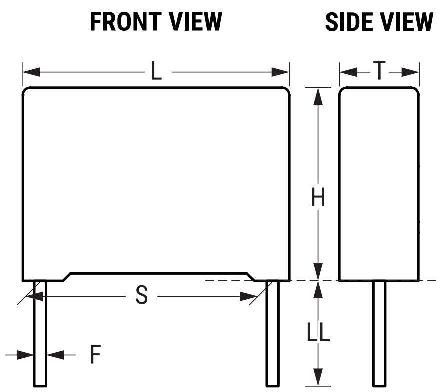
Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
10 15 22.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/−0	00
	Ammo Pack	H_0= 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK
	Bulk (Bag)[2] – Short Leads	3.5 +0.5/−0	JB
	Bulk (Bag)[2] – Short Leads	4.0 +0.5/−0	JE
	Bulk (Bag) – Long Leads	30 +5/−0	40
	Bulk (Bag) – Long Leads	25+2/−1	50
27.5 37.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/−0	00
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK[1]
	Other Lead and Packaging Options		
	Bulk (Tray) – Short Leads	3.5 +0.5/−0	JB
	Bulk (Tray) – Long Leads	30 +5/−0	40
	Bulk (Tray) – Long Leads	25 +2/−1	50

[1] *Not for all sizes, see "Packaging Quantities" table.*

[2] *For lead spacing 22.5 case sizes ≥ 8.5*17*26.5 the parts are packed in a Pizza box 335*320*34 mm*

Dimensions – Millimeters



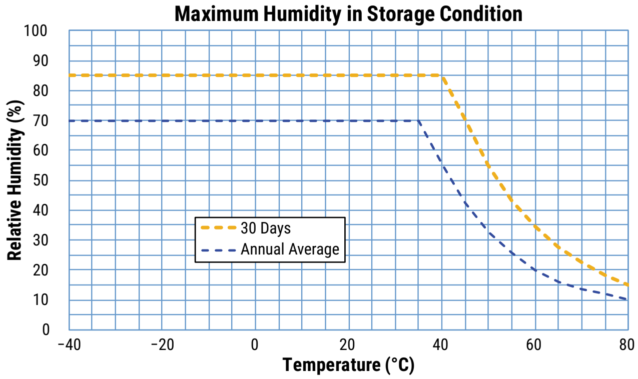
S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
10.0	±0.4	4.0	+0.2/−0.5	9.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
10.0	±0.4	5.0	+0.2/−0.5	11.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
10.0	±0.4	6.0	+0.2/−0.5	12.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
15.0	±0.4	5.0	+0.2/−0.5	11.0	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	6.0	+0.2/−0.5	12.0	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	6.0	+0.2/−0.5	17.5	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	7.5	+0.2/−0.5	13.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	7.5	+0.2/−0.5	18.5	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	±0.4	8.5	+0.2/−0.5	14.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	9.0	+0.2/−0.5	12.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	10.0	+0.2/−0.5	16.0	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	±0.4	11.0	+0.2/−0.5	19.0	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	±0.4	13.0	+0.2/−0.5	12.0	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
22.5	±0.4	6.0	+0.2/−0.5	15.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	6.5	+0.2/−0.5	13.5	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	7.0	+0.2/−0.5	16.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	8.5	+0.2/−0.5	17.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	10.0	+0.2/−0.5	18.5	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	11.0	+0.2/−0.5	20.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	13.0	+0.2/−0.5	22.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
27.5	±0.4	9.0	+0.2/−0.7	17.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	11.0	+0.2/−0.7	20.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	13.0	+0.2/−0.7	22.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	14.0	+0.2/−0.7	28.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	18.0	+0.2/−0.7	33.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	22.0	+0.2/−0.7	37.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
37.5	±0.4	11.0	+0.3/−0.7	22.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	13.0	+0.3/−0.7	24.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	16.0	+0.3/−0.7	28.5	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	19.0	+0.3/−0.7	32.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	20.0	+0.3/−0.7	40.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05

Note: See Ordering Options Table for lead length (LL/H_0) options.

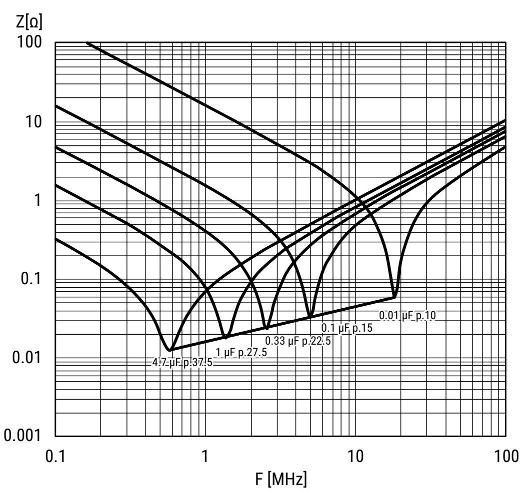
Performance Characteristics

Dielectric	Polypropylene film			
Plates	Metal layer deposited by evaporation under vacuum			
Winding	Non-inductive type			
Leads	Tinned wire			
Protection	Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94.			
Related Documents	IEC 60384–14, EN 60384–14			
Rated Voltage V_R	520 VAC (50/60 Hz)			
Recommended DC Voltage	≤ 1,000 VDC			
Capacitance Range	4,700 pF to 1 µF			
Capacitance Values	E6 series (IEC 60063) measured at 1 kHz and +20 ±1°C			
Capacitance Tolerance	±10%, ±20%			
Temperature Range	−40°C to +85°C			
Climatic Category	40/85/56 IEC 60068-1			
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package			
	Average relative humidity per year ≤ 70%			
	RH ≤ 85% for 30 days randomly distributed throughout the year			
	Dew is absent			
	Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)			
Approvals	ENEC, UL, cUL			
Dissipation Factor (tanδ)	≤ 0.1% (0.06%*) at 1 kHz , +25°C ±5°C (* typical value)			
Test Voltage Between Terminals	The 100% screening factory test is carried out at 2,700 VDC/1,700 VAC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. This test cannot be repeated, as there is a risk of damaging the capacitor. KEMET is not liable in such cases for any failures.			
Insulation Resistance	Measured at +25°C ±5°C, according to IEC 60384–2			
	Minimum Values Between Terminals			
	Voltage Charge	Voltage Charge Time	C ≤ 0.33 µF	C > 0.33 µF
	100 VDC	1 minute	≥ 1 • 10^5 MΩ	≥ 30,000 MΩ • µF
In DC Applications	Recommended voltage ≤ 1,000 VDC			

Performance Characteristics cont.



Impedance Graph



Environmental Test Data

Test	IEC Publication	Procedure
Endurance	EN/IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Mark	Specification	File Number
	EN/IEC 60384–14	CA08.00101
	UL 60384–14 and CAN/CSA E60384–14 (440VAC)	E97797

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Legacy Part Number
	T	H	L				
0.0047	4.0	9.0	13.0	10.0	750	475F1470(1)01(2)	R475F1470(1)01(2)
0.0068	5.0	11.0	13.0	10.0	750	475F1680(1)01(2)	R475F1680(1)01(2)
0.0082	6.0	12.0	13.0	10.0	750	475F1820(1)01(2)	R475F1820(1)01(2)
0.010	6.0	12.0	13.0	10.0	750	475F2100(1)01(2)	R475F2100(1)01(2)
0.010	5.0	11.0	18.0	15.0	600	475I2100(1)01(2)	R475I2100(1)01(2)
0.012	5.0	11.0	18.0	15.0	600	475I2120(1)01(2)	R475I2120(1)01(2)
0.015	5.0	11.0	18.0	15.0	600	475I2150(1)01(2)	R475I2150(1)01(2)
0.018	5.0	11.0	18.0	15.0	600	475I2180(1)01(2)	R475I2180(1)01(2)
0.022	6.0	12.0	18.0	15.0	600	475I2220(1)01(2)	R475I2220(1)01(2)
0.027	6.0	12.0	18.0	15.0	600	475I2270(1)01(2)	R475I2270(1)01(2)
0.033	6.0	12.0	18.0	15.0	600	475I2330(1)01(2)	R475I2330(1)01(2)
0.039	7.5	13.5	18.0	15.0	600	475I2390(1)01(2)	R475I2390(1)01(2)
0.047	7.5	13.5	18.0	15.0	600	475I2470(1)01(2)	R475I2470(1)01(2)
0.047	6.0	17.5	18.0	15.0	600	475I2470(1)02(2)	R475I2470(1)02(2)
0.047	9.0	12.5	18.0	15.0	600	475I2470(1)03(2)	R475I2470(1)03(2)
0.056	8.5	14.5	18.0	15.0	600	475I2560(1)01(2)	R475I2560(1)01(2)
0.068	10.0	16.0	18.0	15.0	600	475I2680(1)01(2)	R475I2680(1)01(2)
0.068	7.5	18.5	18.0	15.0	600	475I2680(1)02(2)	R475I2680(1)02(2)
0.068	13.0	12.0	18.0	15.0	600	475I2680(1)03(2)	R475I2680(1)03(2)
0.082	10.0	16.0	18.0	15.0	600	475I2820(1)01(2)	R475I2820(1)01(2)
0.10	11.0	19.0	18.0	15.0	600	475I3100(1)01(2)	R475I3100(1)01(2)
0.047	6.0	15.0	26.5	22.5	300	475N2470(1)01(2)	R475N2470(1)01(2)
0.047	6.5	13.5	26.5	22.5	300	475N2470(1)02(2)	R475N2470(1)02(2)
0.068	6.0	15.0	26.5	22.5	300	475N2680(1)01(2)	R475N2680(1)01(2)
0.10	7.0	16.0	26.5	22.5	300	475N3100(1)01(2)	R475N3100(1)01(2)
0.12	8.5	17.0	26.5	22.5	300	475N3120(1)01(2)	R475N3120(1)01(2)
0.15	10.0	18.5	26.5	22.5	300	475N3150(1)01(2)	R475N3150(1)01(2)
0.18	10.0	18.5	26.5	22.5	300	475N3180(1)01(2)	R475N3180(1)01(2)
0.22	11.0	20.0	26.5	22.5	300	475N3220(1)01(2)	R475N3220(1)01(2)
0.27	13.0	22.0	26.5	22.5	300	475N3270(1)01(2)	R475N3270(1)01(2)
0.33	13.0	22.0	26.5	22.5	300	475N3330(1)01(2)	R475N3330(1)01(2)
0.15	9.0	17.0	32.0	27.5	225	475R3150(1)01(2)	R475R3150(1)01(2)
0.18	9.0	17.0	32.0	27.5	225	475R3180(1)01(2)	R475R3180(1)01(2)
0.22	9.0	17.0	32.0	27.5	225	475R3220(1)01(2)	R475R3220(1)01(2)
0.27	9.0	17.0	32.0	27.5	225	475R3270(1)02(2)	R475R3270(1)02(2)
0.33	11.0	20.0	32.0	27.5	225	475R3330(1)02(2)	R475R3330(1)02(2)
0.39	11.0	20.0	32.0	27.5	225	475R3390(1)01(2)	R475R3390(1)01(2)
0.47	13.0	22.0	32.0	27.5	225	475R3470(1)01(2)	R475R3470(1)01(2)
0.56	13.0	22.0	32.0	27.5	225	475R3560(1)01(2)	R475R3560(1)01(2)
0.68	14.0	28.0	32.0	27.5	225	475R3680(1)01(2)	R475R3680(1)01(2)
0.82	18.0	33.0	32.0	27.5	225	475R3820(1)01(2)	R475R3820(1)01(2)
1.0	18.0	33.0	32.0	27.5	225	475R4100(1)01(2)	R475R4100(1)01(2)
1.2	18.0	33.0	32.0	27.5	225	475R4120(1)01(2)	R475R4120(1)01(2)
1.5	22.0	37.0	32.0	27.5	225	475R4150(1)01(2)	R475R4150(1)01(2)
0.47	11.0	22.0	41.5	37.5	150	475W3470(1)01(2)	R475W3470(1)01(2)
0.56	11.0	22.0	41.5	37.5	150	475W3560(1)01(2)	R475W3560(1)01(2)
0.68	13.0	24.0	41.5	37.5	150	475W3680(1)01(2)	R475W3680(1)01(2)
0.82	16.0	28.5	41.5	37.5	150	475W3820(1)01(2)	R475W3820(1)01(2)
1.0	16.0	28.5	41.5	37.5	150	475W4100(1)01(2)	R475W4100(1)01(2)
1.2	19.0	32.0	41.5	37.5	150	475W4120(1)01(2)	R475W4120(1)01(2)
1.5	19.0	32.0	41.5	37.5	150	475W4150(1)01(2)	R475W4150(1)01(2)
1.8	20.0	40.0	41.5	37.5	150	475W4180(1)01(2)	R475W4180(1)01(2)
2.2	20.0	40.0	41.5	37.5	150	475W4220(1)01(2)	R475W4220(1)01(2)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See table for available options.
(2) M = ±20%, K = ±10%

Soldering Process

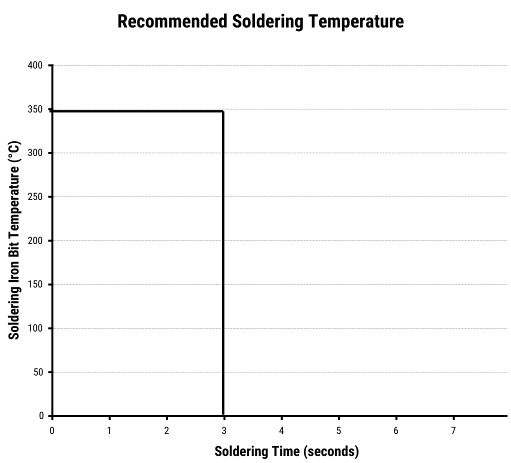
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder material. This has increased the liquidus temperature from 183°C for SnPb eutectic alloys to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm). Great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above-recommended limits may result to degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after curing surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to normal temperature before performing the second soldering cycle.

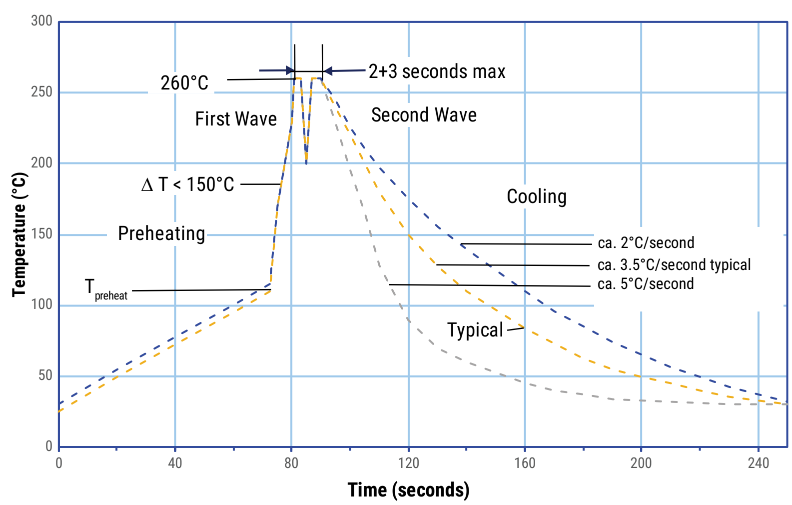
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

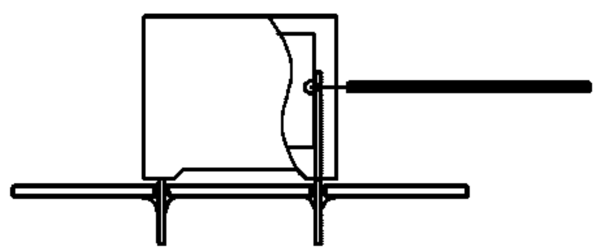
Wave Soldering Recommendations cont.

1. The table indicates the maximum set-up temperature of the soldering process.

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that the maximum temperature inside the element is below the limit.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



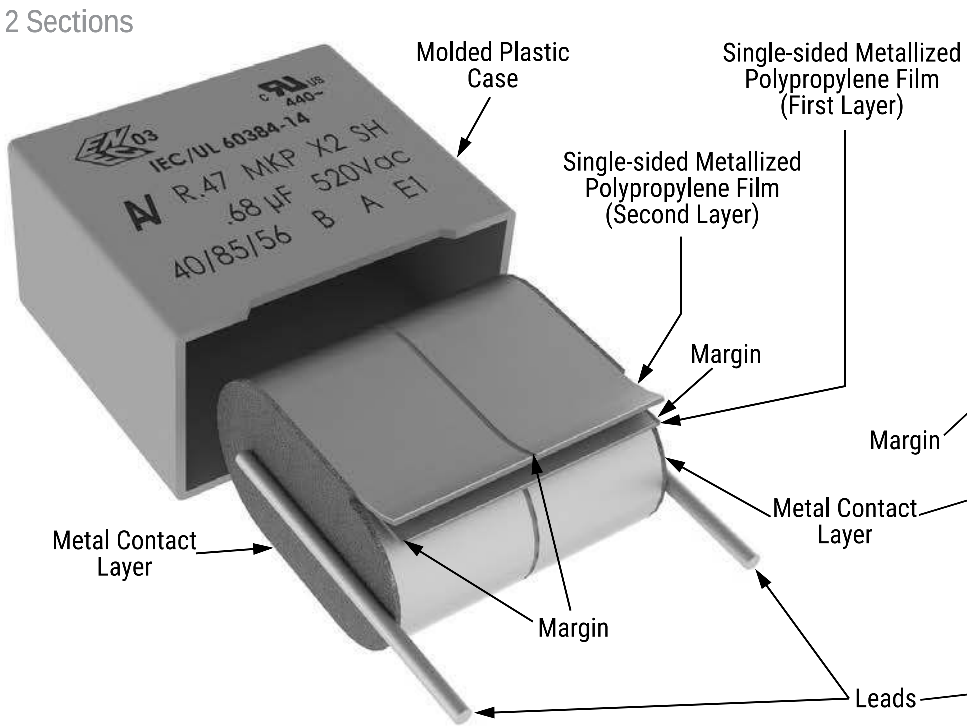
Temperature monitored inside the capacitor.

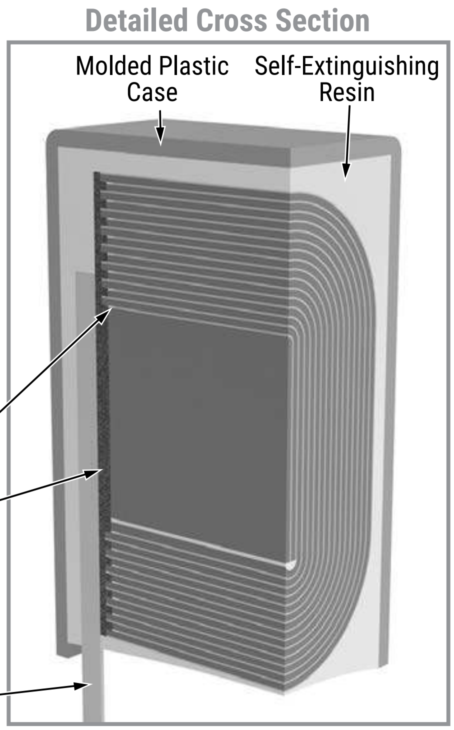
Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as it is in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder, only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

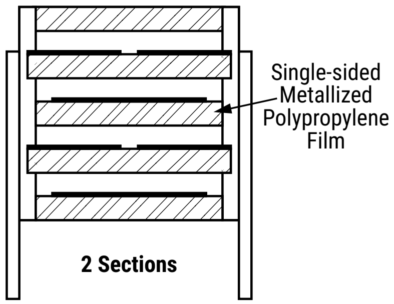
The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 – 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts do not overheat.

Construction





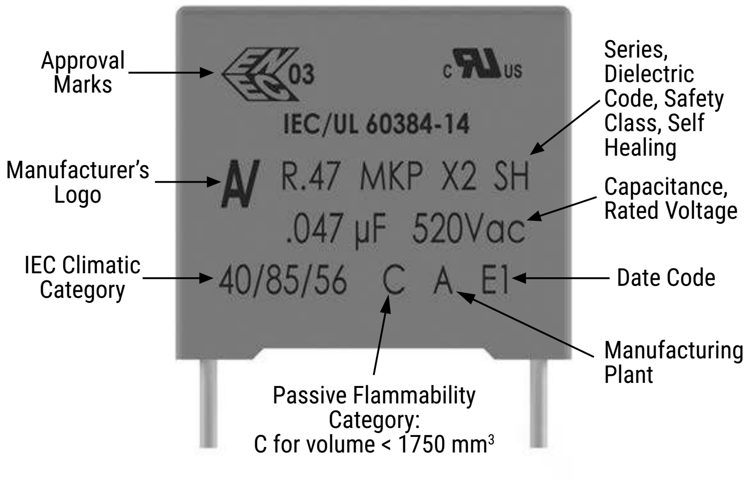
Winding Scheme



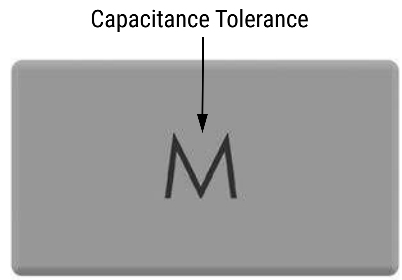
Marking

Lead Spacing 10 mm

FRONT



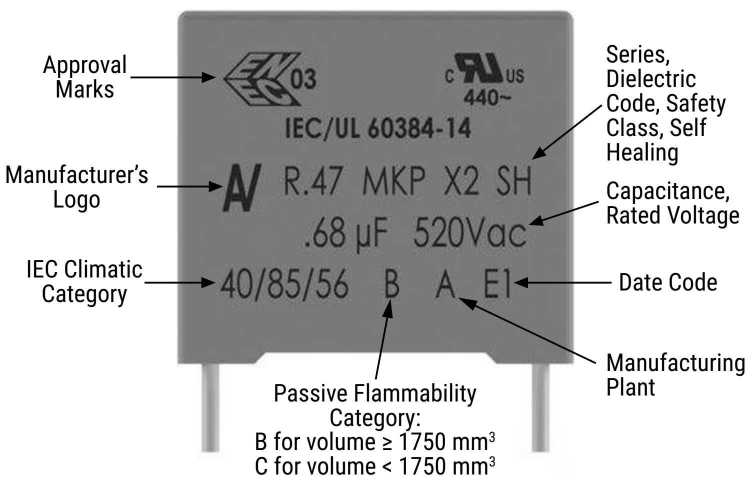
TOP



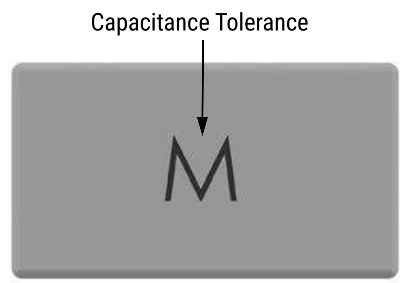
NOTE: Hot imprinting with or without color or ink jet or laser marking

Lead Spacing 15 mm, 22.5 mm, and 27.5 mm

FRONT



TOP



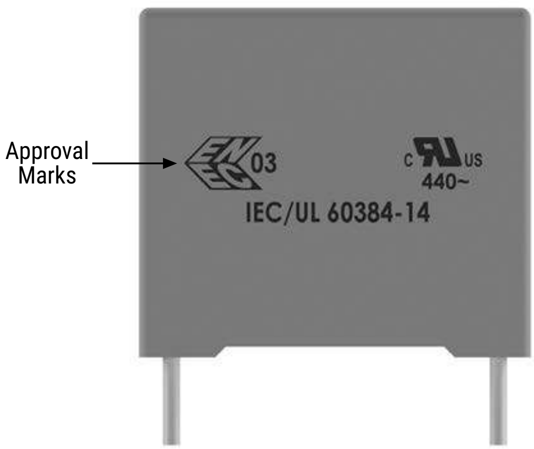
NOTE: Hot imprinting with or without color or ink jet or laser marking

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Marking cont.

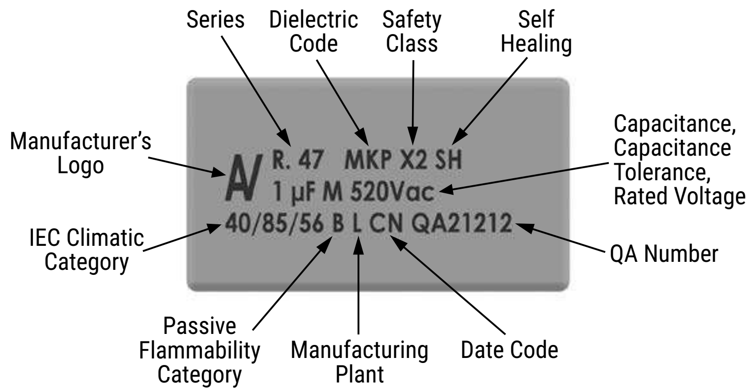
Lead Spacing 22.5 and 27.5 mm (alternatives*) and 37.5 mm

FRONT



**Differences are caused by technology (clichee, laser, or ink) and production line.*

TOP



Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads		Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped
Lead and Packaging Code:				00 - JA - JB JE - JH	JM	40 – 50	GY	CK	DQ
10	4	9	13	2,000	2,200	1,800	750	1,500	1,000
	5	11	13	1,300	2,000	1,500	600	1,250	800
	6	12	13	1,000	1,800	1,200	500	1,000	680
15	5	11	18	2,000	1,250	1,000	600	1,250	800
	6	12	18	1,750	1,000	900	500	1,000	680
	6	17.5	18	1,000	800	700	500	1,000	680
	7.5	13.5	18	1,000	650	700	350	800	500
	7.5	18.5	18	900	650	500	-	800	500
	8.5	14.5	18	1,000	700	500	300	700	440
	9	12.5	18	1,000	550	520	270	650	410
	10	16	18	750	400	500	270	600	380
	11	19	18	450	350	350	-	500	340
	13	12	18	750	520	490	200	480	280
22.5	6	15	26.5	805	450	500	-	700	464
	6.5	13,5	26.5	800	-	-	-	-	-
	7	16	26.5	700	450	500	-	550	380
	8.5	17	26.5	468	350	300	-	450	280
	10	18.5	26.5	396	350	300	-	350	235
	11	20	26.5	360	200	250	-	350	217
	13	22	26.5	300	150	200	-	300	-
27.5	9	17	32	816	408	408	-	450	-
	11	20	32	560	336	336	-	350	-
	13	22	32	480	288	288	-	300	-
	14	28	32	352	176	176	-	-	-
	18	33	32	256	128	128	-	-	-
	22	37	32	168	112	112	-	-	-
37.5	11	22	41.5	420	252	252	-	-	-
	13	24	41.5	360	216	216	-	-	-
	16	28.5	41.5	216	108	108	-	-	-
	19	32	41.5	192	96	96	-	-	-
	20	40	41.5	126	84	84	-	-	-

Lead Taping & Packaging (IEC 60286–2)

Figure 1
Lead Spacing 10 mm

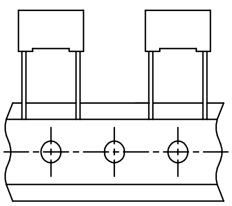


Figure 2
Lead Spacing 15 mm

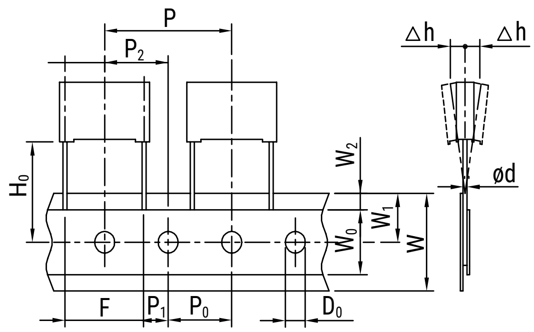
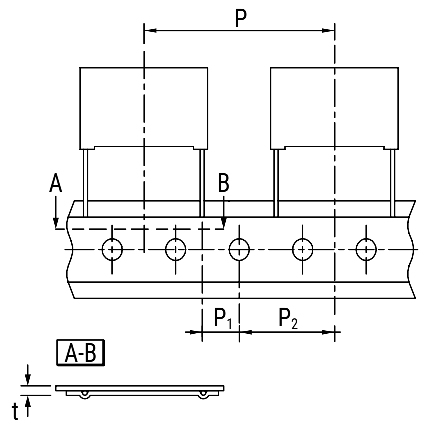


Figure 3
Lead Spacing 22.5 – 27.5 mm



Taping Specification

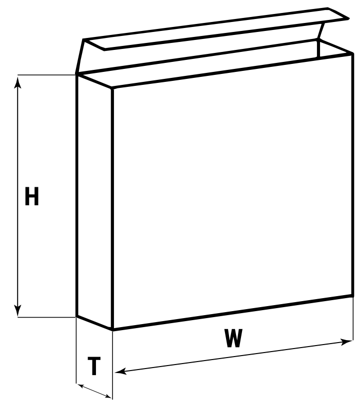
Description	Symbol	Dimensions (mm)				
		Lead Space				Tol.
		10	15	22.5	27.5	
		Fig. 1	Fig. 2	Fig. 3	Fig. 3	
Lead wire diameter	d	0.6	0.6–0.8	0.8	0.8	±0.05
Taping lead space	P	25.4	25.4	38.1	38.1	±1
Feed hole lead space *	P_0	12.7	12.7	12.7	12.7	±0.2 **
Centering of the lead wire	P_1	7.7	5.2	7.8	5.3	±0.7
Centering of the body	P_2	12.7	12.7	19.05	19.05	±1.3
Lead spacing (pitch) ***	F	10	15	22.5	27.5	+0.6/−0.1
Component alignment	Δh	0	0	0	0	±2
Height of component from tape center	H_0 ****	18.5	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	18	+1/−0.5
Hold down tape width	W_0	9	10	10	10	Minimum
Hole position	W_1	9	9	9	9	±0.5
Hold down tape position	W_2	3	3	3	3	Maximum
Feed hole diameter	D_0	4	4	4	4	±0.2
Total tape thickness	t	0.7	0.7	0.7	0.7	±0.2

** 15 mm also available*
*** Maximum of 1 mm on 20 lead spaces*
**** Pitches 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request*
***** H_0 = 16.5 mm is available upon request*

Lead Taping & Packaging (IEC 60286–2) cont.

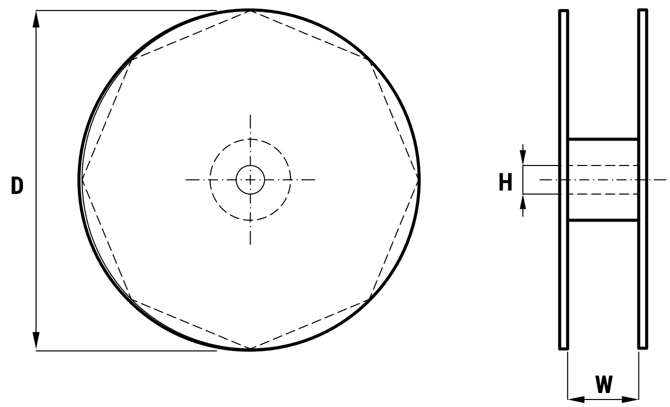
Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



Reel Specifications

Reel Size	Dimensions (mm)		
	D	H	W
Standard	355	30	55 Maximum
Large	500	25	



Metallized Impregnated Paper EMI Suppression Capacitors PME271M, Class X2, 275 VAC

Overview

The PME271M is constructed of multilayer metallized paper encapsulated and impregnated in self-extinguishing material meeting the requirements of UL 94 V–0.

Applications

Typical applications include worldwide use in electromagnetic interference suppression in all X2 and across-the-line applications.

Benefits

- Approvals: ENEC, UL, cUL
- Rated voltage: 275 VAC 50/60 Hz
- Capacitance range: 0.001 – 0.6 µF
- Lead spacing: 10.2 – 25.4 mm
- Capacitance tolerance: M = ±20% (for C ≤ 0.1 µF), K = ±10% (for C > 0.1 µF)
- Climatic category: 40/110/56, IEC 60068–1
- Tape and reel in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of −40°C to +110°C
- 100% screening factory test at 2,150 VDC

Customer Part Number

PME271	M	(B)	610(0)	M	R30
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Capacitance Tolerance	Packaging
X2, Metallized Paper	M = 275	Blank = Standard A = 10.2 B = 15.2 D = 22.5	The last three digits represent significant figures. The first digit specifies the total number of digits.	M = ±20% (for C ≤ 0.1 µF) K = ±10% (for C > 0.1 µF)	See Ordering Options Table

KEMET Internal Part Number

P	276	Q	E	104	M	275	A
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Packaging
P = Paper	X2, Metallized Paper	H = 10.2 Q = 15.2 C = 20.3 S = 22.5 E = 25.4	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	M = ±20% (for C ≤ 0.1 µF) K = ±10% (for C > 0.1 µF)	275 = 275	See Ordering Options Table

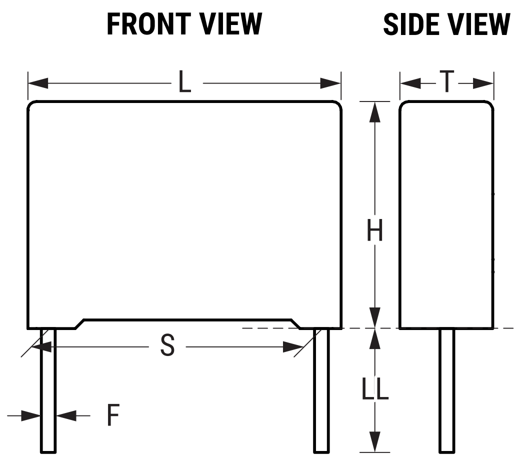
Benefits cont.

- The highest possible safety regarding active and passive flammability
- Excellent self-healing properties ensure long life even when subjected to frequent over voltages
- Good resistance to ionization due to impregnated dielectric
- High dV/dt capability
- The impregnated paper ensures excellent stability and outstanding reliability properties, especially in applications with continuous operation

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	KEMET Lead and Packaging Code	Legacy Lead and Packaging Code
10.2	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	L	R19T0
	Other Lead and Packaging Options			
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	P	R19T1
Native 10.2 formed to 7.5	Ammo Pack	H_0= 16.5 ±0.5	LAF3	R30XA
15.2	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	L	R19T0
	Other Lead and Packaging Options			
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	P	R19T1
20.3	**Standard Lead and Packaging Options**			
	Bulk (Tray) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	L	R19T0
	Other Lead and Packaging Options			
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	P	R19T1
22.5	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	L	R19T0
	Other Lead and Packaging Options			
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	P	R19T1
25.4	**Standard Lead and Packaging Options**			
	Bulk (Tray) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30

Dimensions – Millimeters



Size Code	S		T		H		L		F	
	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
HE	10.2	±0.4	3.9	Maximum	7.5	Maximum	13.5	Maximum	0.6	±0.05
HH	10.2	±0.4	4.1	Maximum	8.2	Maximum	13.5	Maximum	0.6	±0.05
HL	10.2	±0.4	5.1	Maximum	10.5	Maximum	13.5	Maximum	0.6	±0.05
QE	15.2	±0.4	5.2	Maximum	10.5	Maximum	18.5	Maximum	0.8	±0.05
QL	15.2	±0.4	6.0	Maximum	12.5	Maximum	18.5	Maximum	0.8	±0.05
QP	15.2	±0.4	7.8	Maximum	13.5	Maximum	18.5	Maximum	0.8	±0.05
QS	15.2	±0.4	8.5	Maximum	14.3	Maximum	18.5	Maximum	0.8	±0.05
CE	20.3	±0.4	7.6	Maximum	14.0	Maximum	24.0	Maximum	0.8	±0.05
CJ	20.3	±0.4	9.0	Maximum	15.0	Maximum	24.0	Maximum	0.8	±0.05
CP	20.3	±0.4	11.3	Maximum	16.5	Maximum	24.0	Maximum	0.8	±0.05
SJ	22.5	±0.4	8.0	Maximum	17.0	Maximum	27.0	Maximum	0.8	±0.05
SP	22.5	±0.4	10.0	Maximum	19.0	Maximum	27.0	Maximum	0.8	±0.05
SU	22.5	±0.4	12.0	Maximum	22.0	Maximum	27.0	Maximum	0.8	±0.05
EG	25.4	±0.4	10.5	Maximum	17.3	Maximum	30.5	Maximum	1.0	±0.05
EJ	25.4	±0.4	12.1	Maximum	19.0	Maximum	30.5	Maximum	1.0	±0.05
EL	25.4	±0.4	15.3	Maximum	22.0	Maximum	30.5	Maximum	1.0	±0.05

Note: See Ordering Options Table for lead length (LL) options.

Performance Characteristics

Rated Voltage	275 VAC 50/60 Hz	
Capacitance Range	0.001 – 0.6 µF	
Capacitance Tolerance	±20%, ±10%, ±5% on request	
Temperature Range	−40°C to +110°C	
Climatic Category	40/110/56	
Approvals	ENEC, UL, cUL	
Dissipation Factor	Maximum Values at +23°C	
	1 kHz	1.3%
Test Voltage Between Terminals	The 100% screening factory test is carried out at 2,150 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. It is not permitted to repeat this test as there is a risk to damage the capacitor. KEMET is not liable in such case for any failures.	
Insulation Resistance	Minimum Values Between Terminals	
	C ≤ 0.33 µF	≥ 12,000 MΩ
	C > 0.33 µF	≥ 4,000 MΩ • µF
In DC Applications	Recommended voltage ≤ 630 VDC	

Environmental Test Data

Test	IEC Publication	Procedure
Endurance	EN/IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle-flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
Intertek Semko AB		EN/IEC 60384–14	SE/0140–16D
UL		UL 60384–14 CAN/CSA–E60384–14–09	E73869

Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Maximum Dimensions in mm			Lead Spacing (S)	f_o (MHz)	dV/dt (V/µs)	KEMET Part Number	Legacy Part Number
	T	H	L					
0.001	3.9	7.5	13.5	10.2	53	1,200	P276HE102M275(1)	PME271M410M(1)
0.0015	3.9	7.5	13.5	10.2	44	1,200	P276HE152M275(1)	PME271M415M(1)
0.0022	3.9	7.5	13.5	10.2	37	1,200	P276HE222M275(1)	PME271M422M(1)
0.0033	4.1	8.2	13.5	10.2	30	1,200	P276HH332M275(1)	PME271M433M(1)
0.0047	5.1	10.5	13.5	10.2	24	1,200	P276HL472M275(1)	PME271M447M(1)
0.0068	5.1	10.5	13.5	10.2	21	1,200	P276HL682M275(1)	PME271MA4680M(1)
0.0068	5.2	10.5	18.5	15.2	19	1,200	P276QE682M275(1)	PME271M468M(1)
0.010	5.2	10.5	18.5	15.2	16	1,200	P276QE103M275(1)	PME271M510M(1)
0.015	5.2	10.5	18.5	15.2	13	1,200	P276QE153M275(1)	PME271M515M(1)
0.022	6	12.5	18.5	15.2	10	1,200	P276QL223M275(1)	PME271M522M(1)
0.033	6	12.5	18.5	15.2	8.4	1,200	P276QL333M275(1)	PME271M533M(1)
0.047	6	12.5	18.5	15.2	7	1,200	P276QL473M275(1)	PME271M547M(1)
0.068	7.8	13.5	18.5	15.2	5.6	1,200	P276QP683M275(1)	PME271M568M(1)
0.1	8.5	14.3	18.5	15.2	4.3	1,200	P276QS104M275(1)	PME271MB6100M(1)
0.1	7.6	14	24	20.3	4.1	600	P276CE104M275(1)	PME271M610M(1)
0.15	9	15	24	20.3	3.4	600	P276CJ154K275(1)	PME271M615K(1)
0.22	11.3	16.5	24	20.3	2.7	600	P276CP224K275(1)	PME271M622K(1)
0.1	8	17	27	22.5	3.9	600	P276SJ104M275(1)	PME271MD6100M(1)
0.15	8	17	27	22.5	3.3	600	P276SJ154K275(1)	PME271MD6150K(1)
0.22	10	19	27	22.5	2.6	600	P276SP224K275(1)	PME271MD6220K(1)
0.27	12	22	27	22.5	2.3	400	P276SU274K275(1)	PME271MD6270K(1)
0.33	12	22	27	22.5	2.1	400	P276SU334K275(1)	PME271MD6330K(1)
0.27	10.5	17.3	30.5	25.4	2.4	400	P276EG274K275(1)	PME271M627K(1)
0.33	12.1	19	30.5	25.4	2.1	400	P276EJ334K275(1)	PME271M633K(1)
0.47	15.3	22	30.5	25.4	1.8	400	P276EL474K275(1)	PME271M647K(1)
0.6	15.3	22	30.5	25.4	1.6	400	P276EL604K275(1)	PME271M660K(1)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**f_o (MHz)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert ordering code for lead type and packaging. See Ordering Options Table for available options.

Soldering Process

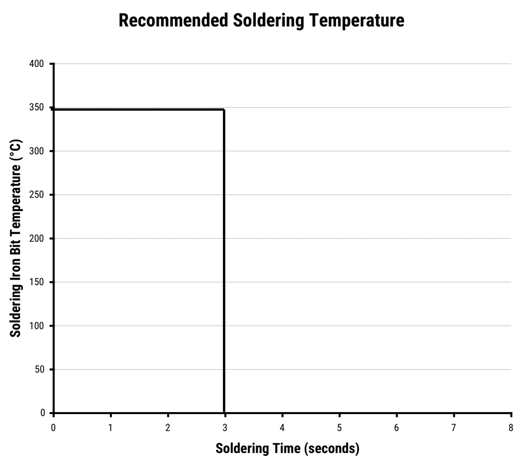
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

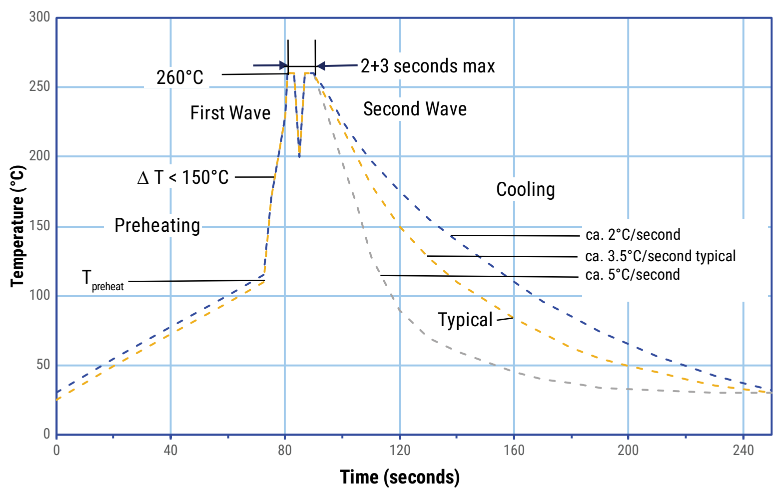
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

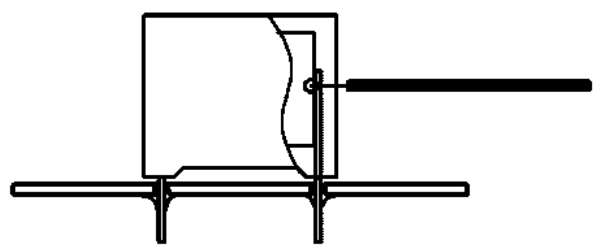
1. The table indicates the maximum set-up temperature of the soldering process

Figure 1

Dielectric Film Material	Maximum Preheat Temperature			Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 10 mm	Capacitor Pitch = 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	130°C	270°C	270°C
Polypropylene	100°C	110°C	130°C	260°C	270°C
Paper	130°C	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



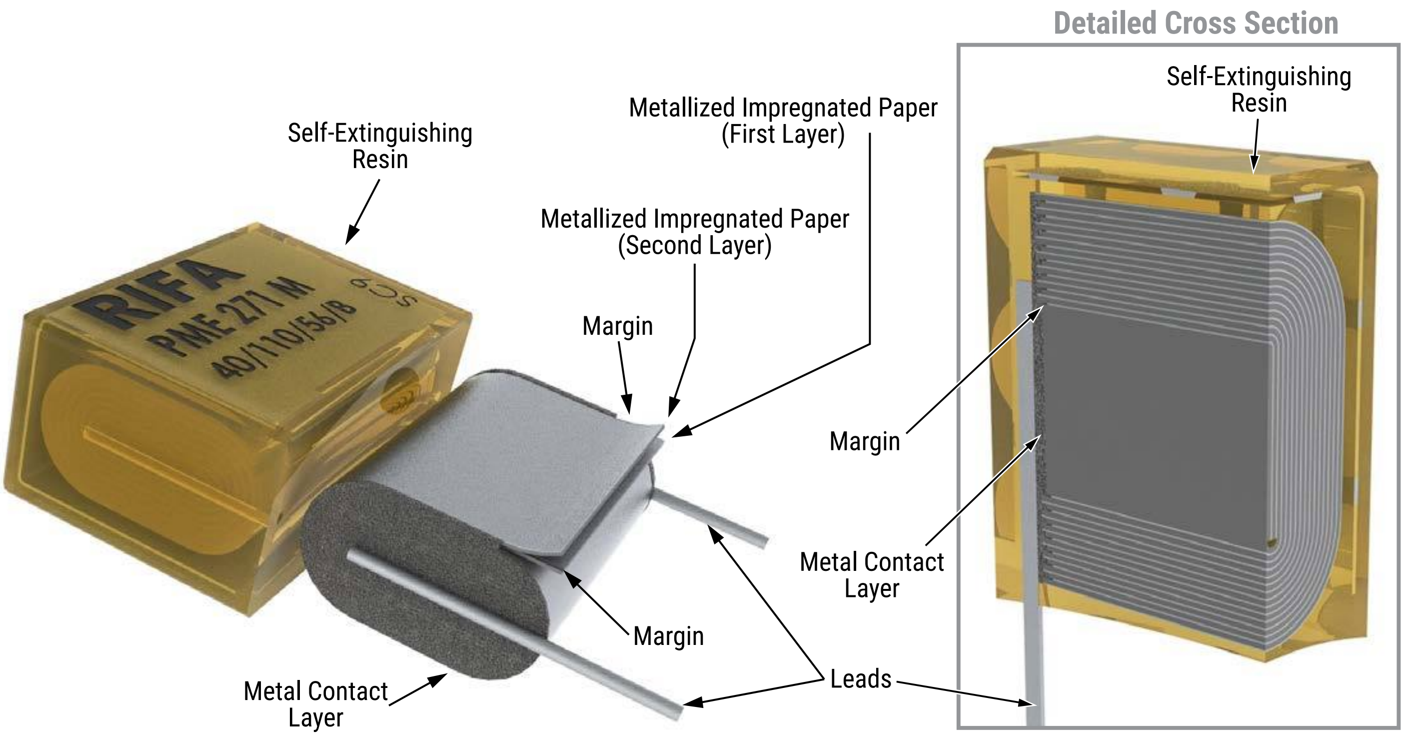
Temperature monitored inside the capacitor.

Selective Soldering Recommendations

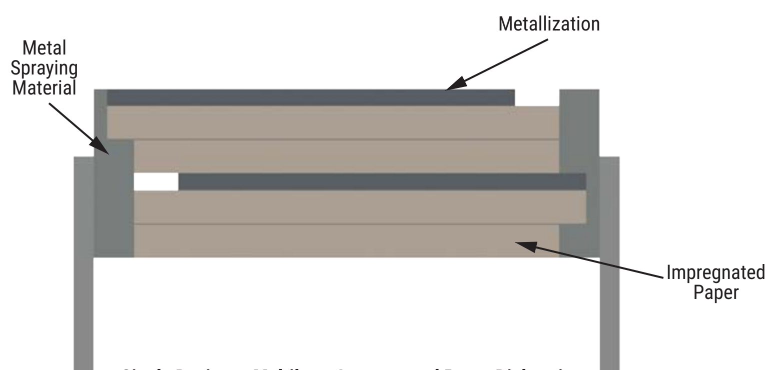
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Construction

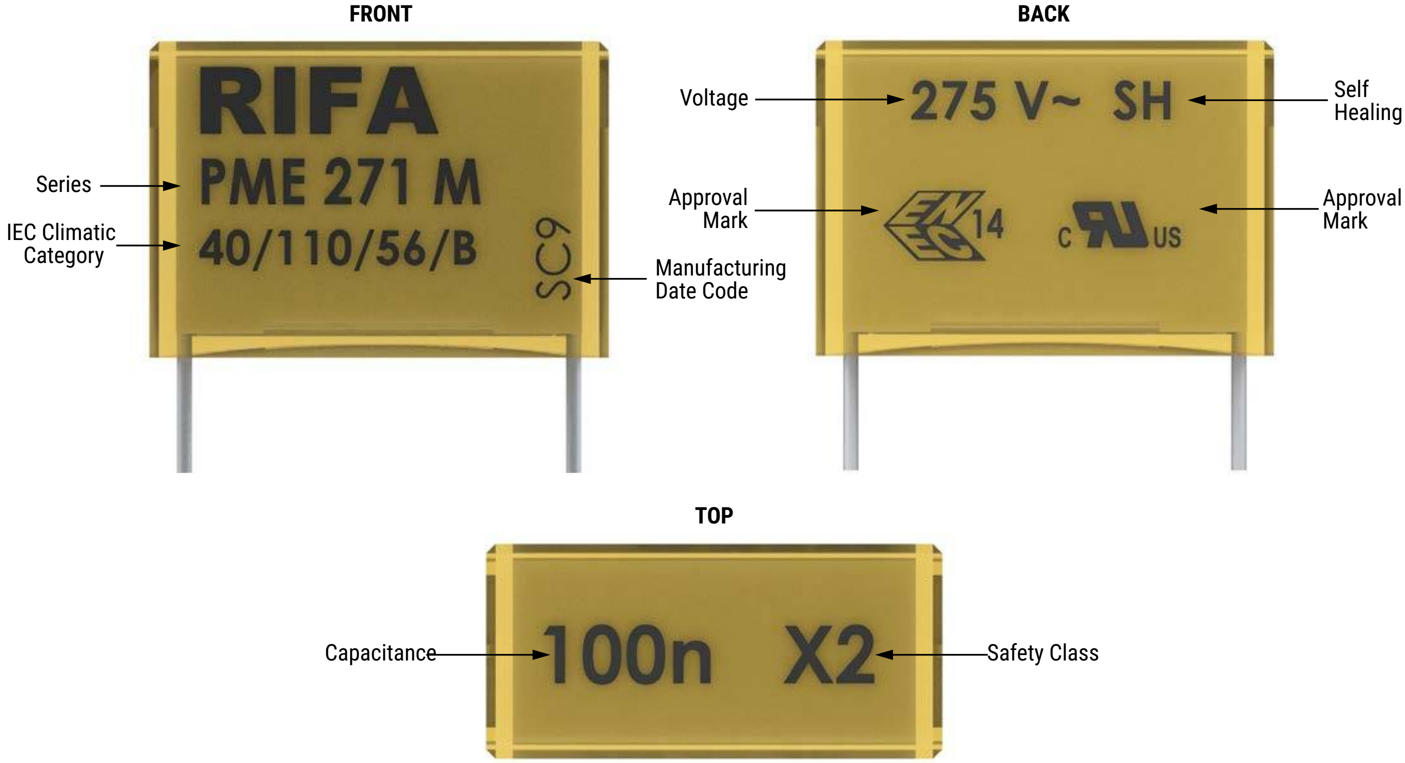


Winding Scheme



Single Design — Multilayer Impregnated Paper Dielectric
1 Section

Marking



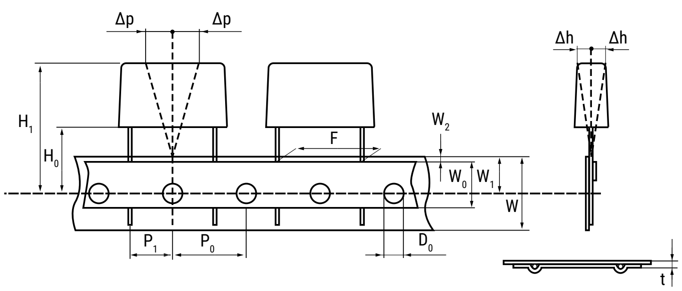
Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

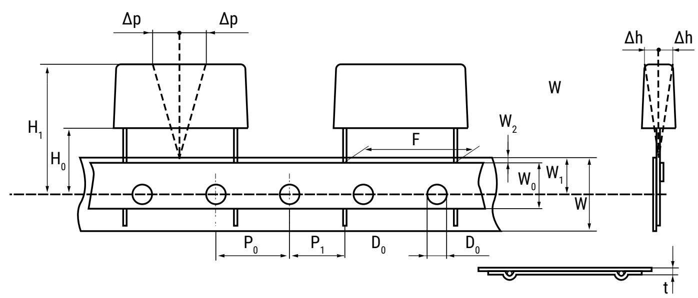
Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 360 mm	Large Reel 500 mm	Ammo Formed
10.2	3.9	7.5	13.5	2,000	1,000	700	1,400	800
	4.1	8.2	13.5	2,000	1,000	600		780
	5.1	10.5	13.5	1,600	800	600	1,200	630
15.2	5.5	12.5	18	1,000	500	600		
	6.5	12.5	18	600	400	400		
	7.5	14.5	18	600	400	400		
	8.5	16	18	400	250	400		
	5.2	10.5	18.5	1,000	500	600		
	5.5	11	18.5	1,000	500	500		
	6	12.5	18.5	600	400	400		
	7.3	13	18.5	600	400	400	800	
	7.8	13.5	18.5	600	400	400		
	8.5	14.3	18.5	500	300	350		
20.3	7.6	14	24	1,500	250	250	500	
	8.4	14	24	1,200	200	250	500	
	9	15	24	1,500	200	250		
	11.3	16.5	24	1,000	150	180	400	
22.5	8	17	27	1,200	200			
	10	19	27	1,000	150	200		
	12	22	27	800	100	180	350	
25.4	10.6	16.1	30.5	1,000	150			
	10.5	17.3	30.5	1,000	100			
	12.1	19	30.5	800	100			
	15.3	22	30.5	600	75			

Lead Taping & Packaging (IEC 60286–2)

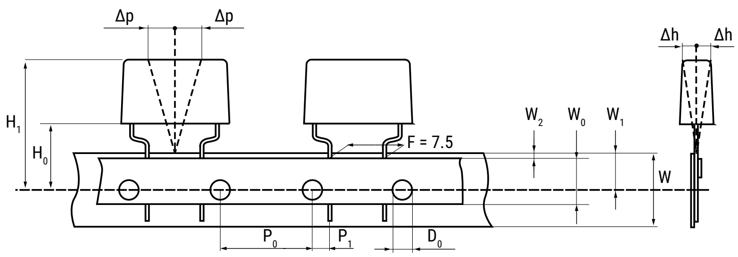
Lead Spacing 10.2 – 15.2 mm



Lead Spacing 20.3 – 22.5 mm



Formed Leads from 10.2 – 7.5 mm



Taping Specification

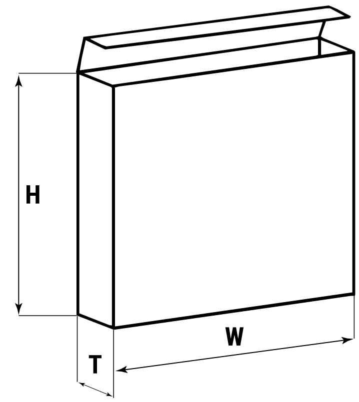
Dimensions in mm								Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	Formed 7.5	10.2	15.2	20.3	22.5	F
Carrier Tape Width	±0.5	W	18.0	18.0	18.0	18.0	18.0	18 +1/−0.5
Hold-Down Tape Width	Minimum	W_0	5.0	5.0	5.0	5.0	5.0	
Position of Sprocket Hole	±0.5	W_1	9.0	9.0	9.0	9.0	9.0	9 +0.75/−0.5
Distance Between Tapes	Maximum	W_2	3.0	3.0	3.0	3.0	3.0	3.0
Sprocket Hole Diameter	±0.2	D_0	4.0	4.0	4.0	4.0	4.0	4.0
Feed Hole Lead Spacing	±0.3	P_0 (1)	12.7 (4)	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.75	7.6	5.1	8.9	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	Maximum	Δh	2.0	2.0	2.0	2.0	2.0	2.0
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.9 Maximum	0.9 Maximum
Sprocket Hole/Cap Body	Nominal	H_0 (2)	18 +2/−0	18 +2/−0	18 +2/−0	18 +2/−0	18.5 ±0.5	18 +2/−0
Sprocket Hole/Top of Cap Body	Maximum	H_1 (3)	43	43	43	58	58	58 Maximum

(1) Maximum cumulative feed hole error, 1 mm per 20 parts
(2) 16.5 mm available on request
(3) Depending on case size
(4) 15 mm available on request

Lead Taping & Packaging (IEC 60286–2) cont.

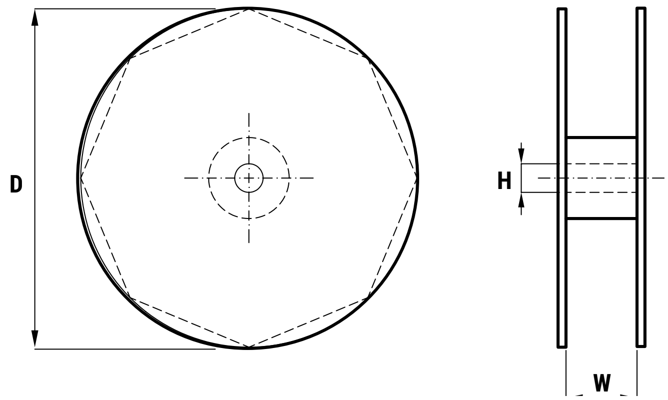
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
R4x, R4x+R, R7x, RSB F5A, F5B, F5D F6xx, F8xx	360	340	59
PHExxx, PMExxx, PMRxxx	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
R4x, R4x+R, R7x, RSB F5A, F5B, F5D F6xx, F8xx	355 500	30 25	55 (Max)
PHExxx, PMExxx, PMRxxx	360 500	30	46 (Max)



Class X2

Metallized Impregnated Paper EMI Suppression Capacitors PME264, Class X2, 660 VAC

KEMET a YAGEO company

Overview

Multilayer metallized paper, encapsulated and impregnated in self-extinguishing material meeting the requirements of UL 94 V–0.

Applications

For worldwide use in electromagnetic interference suppression in all X2 and across-the-line applications. Also for use in high AC and DC voltage applications such as commutator capacitor in converters and ignition circuits.

Benefits

- Approvals: ENEC, UL, cUL
- Rated voltage: 660 VAC 50/60 Hz
- Capacitance range: 0.001 – 0.1 µF
- Lead spacing: 15.2 – 25.4 mm
- Capacitance tolerance: ±20%
- Climatic category: 40/85/56, IEC 60068–1
- Tape and reel in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations

Customer Part Number

PME264	N	B	5100	M	R30
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Capacitance Tolerance	Packaging
X2, Metallized Paper	N = 660	B = 15.2 C = 20.3 E = 25.4	The last three digits represent significant figures. The first digit specifies the total number of digits.	M = ±20%	See Ordering Options Table

KEMET Internal Part Number

P	264	Q	E	103	M	660	A
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Packaging
P = Paper	X2, Metallized Paper	Q = 15.2 C = 20.3 E = 25.4	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	M = ±20%	660 = 660	See Ordering Options Table

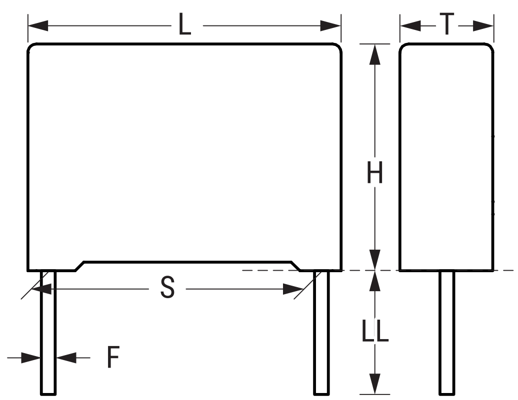
Benefits cont.

- Operating temperature range of −40°C to +85°C
- 100% screening factory test at 3,000 VDC
- The highest possible safety regarding active and passive flammability
- Excellent self-healing properties ensure long life even when subjected to frequent over-voltages
- Good resistance to ionization due to impregnated dielectric
- High dV/dt capability
- The impregnated paper ensures excellent stability and outstanding reliability properties, especially in applications with continuous operation

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	KEMET Lead and Packaging Code	Legacy Lead and Packaging Code
15.2	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Max Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	L	R19T0
	Other Lead and Packaging Options			
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	P	R19T1
20.3	**Standard Lead and Packaging Options**			
	Bulk (Tray) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Max Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	L	R19T0
	Other Lead and Packaging Options			
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	P	R19T1
25.4	**Standard Lead and Packaging Options**			
	Bulk (Tray) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Max Length Leads	30 +5/−0	A	R30

Dimensions – Millimeters



Size Code	S		T		H		L		F	
	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
QE	15.2	±0.4	5.2	Maximum	10.5	Maximum	18.5	Maximum	0.8	±0.05
QM	15.2	±0.4	7.3	Maximum	13	Maximum	18.5	Maximum	0.8	±0.05
CE	20.3	±0.4	7.6	Maximum	14	Maximum	24	Maximum	0.8	±0.05
CJ	20.3	±0.4	9	Maximum	15	Maximum	24	Maximum	0.8	±0.05
CP	20.3	±0.4	11.3	Maximum	16.5	Maximum	24	Maximum	0.8	±0.05
EF	25.4	±0.4	10.5	Maximum	17	Maximum	30.5	Maximum	1	±0.05
EJ	25.4	±0.4	12.1	Maximum	19	Maximum	30.5	Maximum	1	±0.05
EL	25.4	±0.4	15.3	Maximum	22	Maximum	30.5	Maximum	1	±0.05
Note: See Ordering Options Table for lead length (LL) options.										

Performance Characteristics

Rated Voltage	660 VAC 50/60 Hz	
Capacitance Range	0.001 – 0.1 µF	
Capacitance Tolerance	±20%	
Temperature Range	−40°C to +85°C	
Climatic Category	40/85/56	
Approvals	ENEC, UL, CUL	
Dissipation Factor	Maximum Values at +23°C	
	1 kHz	1.3%
Test Voltage Between Terminals	The 100% screening factory test is carried out at 3,000 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. It is not permitted to repeat this test as there is a risk to damage the capacitor. KEMET is not liable in such case for any failures.	
Insulation Resistance	Minimum Value Between Terminals	
	≥ 12,000 MΩ	
In DC Applications	Recommended voltage ≤ 1,500 VDC	

Environmental Test Data

Test	IEC Publication	Procedure
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	4,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle-flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
Intertek Semko AB		EN/IEC 60384-14	SE/0140-25D
UL	c UL us	UL 60384-14 CAN/CSA-E60384-14-09	E73869

Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Maximum Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Legacy Part Number
	T	H	L				
0.001	5.2	10.5	18.5	15.2	2,000	P264QE102M660(1)	PME264NB4100M(1)
0.0015	5.2	10.5	18.5	15.2	2,000	P264QE152M660(1)	PME264NB4150M(1)
0.0022	5.2	10.5	18.5	15.2	2,000	P264QE222M660(1)	PME264NB4220M(1)
0.0033	5.2	10.5	18.5	15.2	2,000	P264QE332M660(1)	PME264NB4330M(1)
0.0047	5.2	10.5	18.5	15.2	2,000	P264QE472M660(1)	PME264NB4470M(1)
0.0068	7.3	13.0	18.5	15.2	1,400	P264QM682M660(1)	PME264NB4680M(1)
0.010	7.3	13.0	18.5	15.2	1,400	P264QM103M660(1)	PME264NB5100M(1)
0.015	7.6	14.0	24.0	20.3	1,400	P264CE153M660(1)	PME264NC5150M(1)
0.022	9.0	15.0	24.0	20.3	1,400	P264CJ223M660(1)	PME264NC5220M(1)
0.033	11.3	16.5	24.0	20.3	1,000	P264CP333M660(1)	PME264NC5330M(1)
0.047	10.5	17.0	30.5	25.4	1,000	P264EF473M660(1)	PME264NE5470M(1)
0.068	12.1	19.0	30.5	25.4	1,000	P264EJ683M660(1)	PME264NE5680M(1)
0.1	15.3	22.0	30.5	25.4	600	P264EL104M660(1)	PME264NE6100M(1)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert ordering code for lead type and packaging. See Ordering Options Table for available options.

Soldering Process

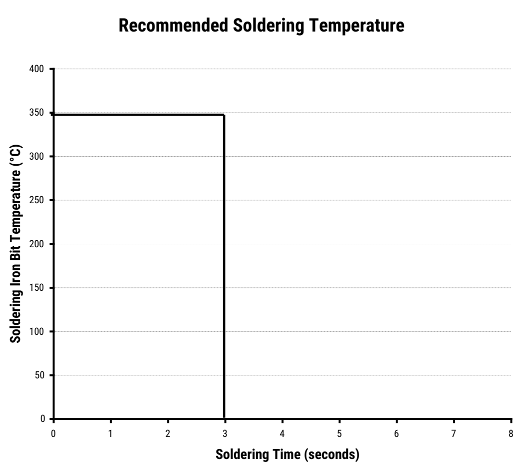
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

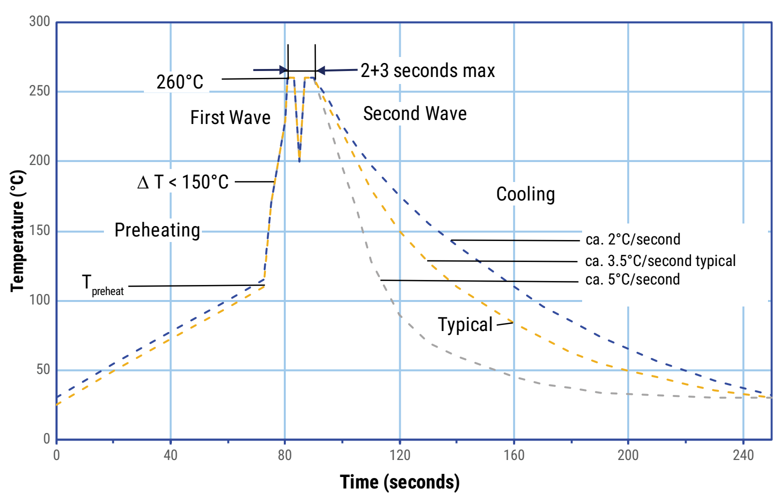
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



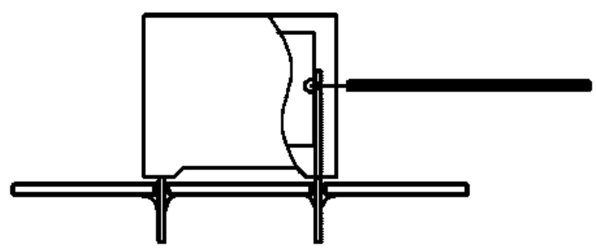
Soldering Process cont.

Wave Soldering Recommendations cont.
1. The table indicates the maximum set-up temperature of the soldering process
Figure 1

Dielectric Film Material	Maximum Preheat Temperature			Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 10 mm	Capacitor Pitch = 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	130°C	270°C	270°C
Polypropylene	100°C	110°C	130°C	260°C	270°C
Paper	130°C	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



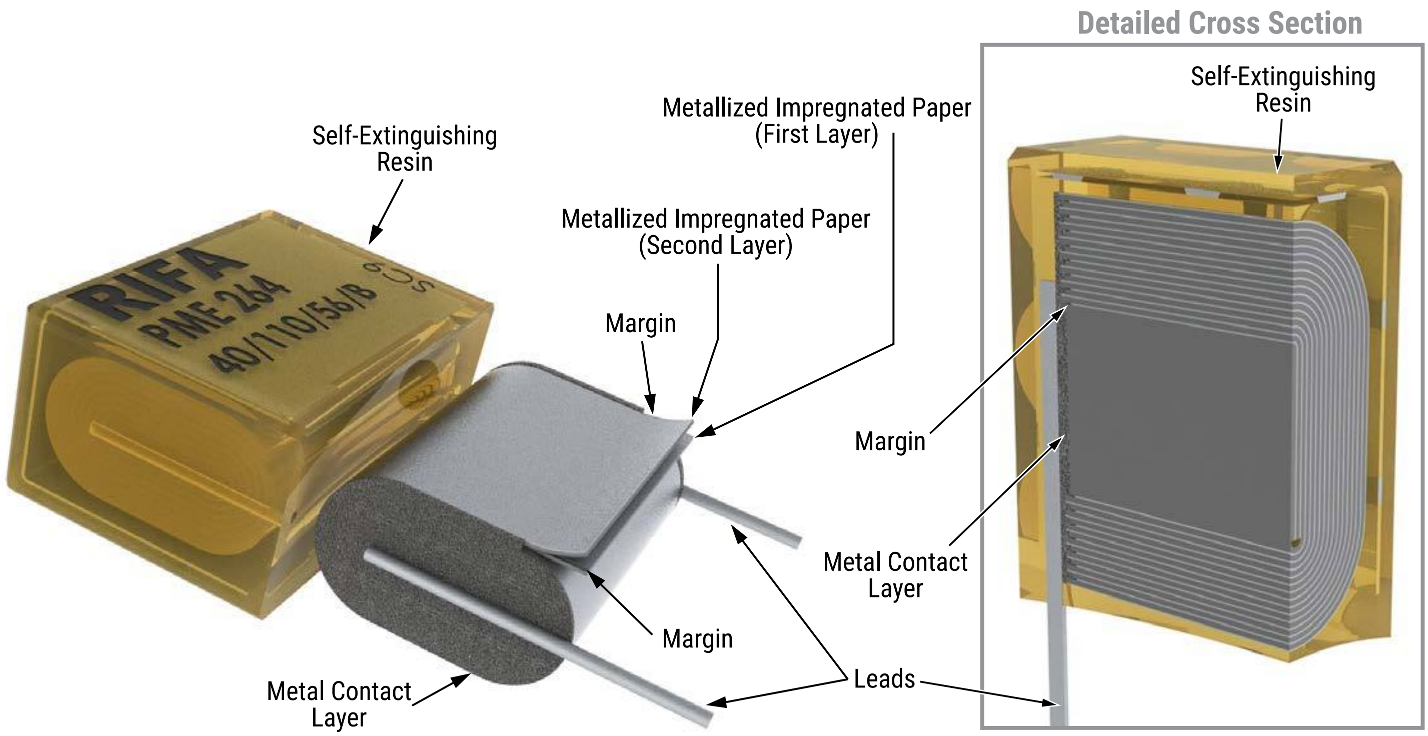
Temperature monitored inside the capacitor.

Selective Soldering Recommendations

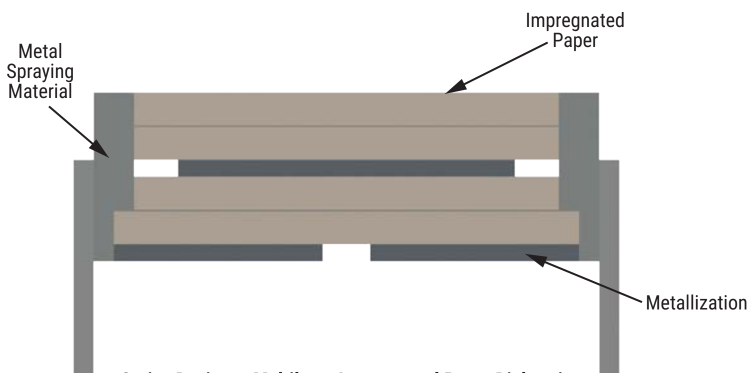
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Construction

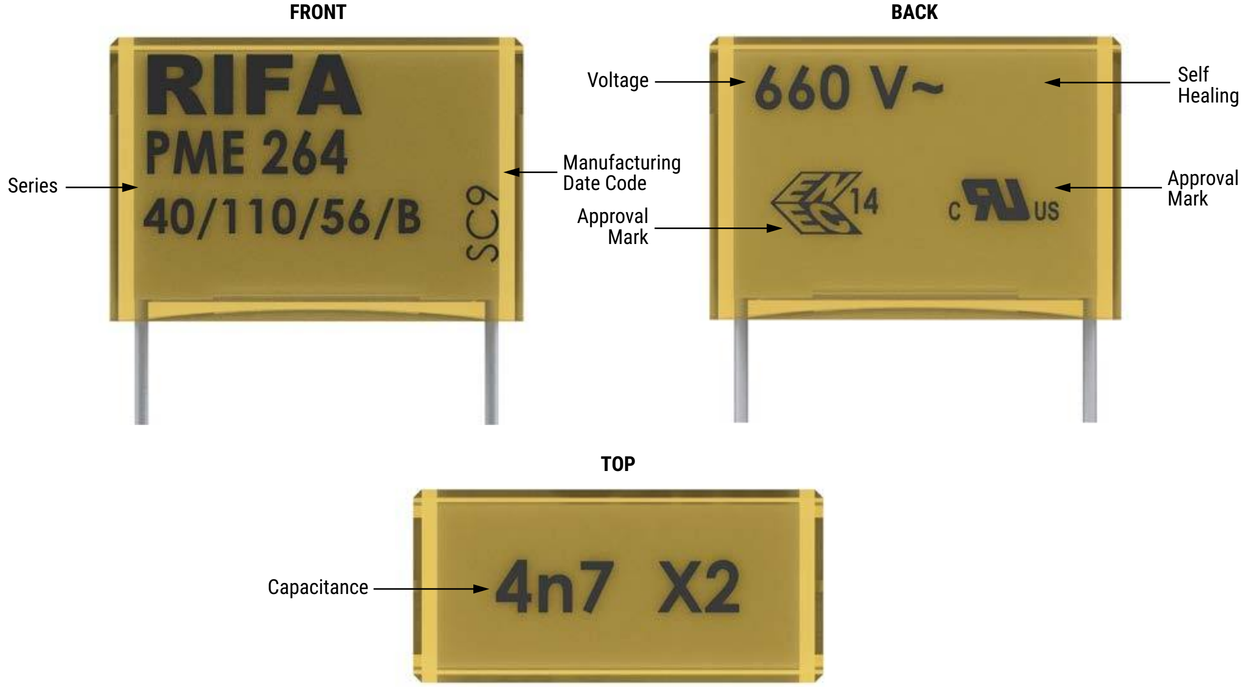


Winding Scheme



Series Design — Multilayer Impregnated Paper Dielectric
2 Section

Marking



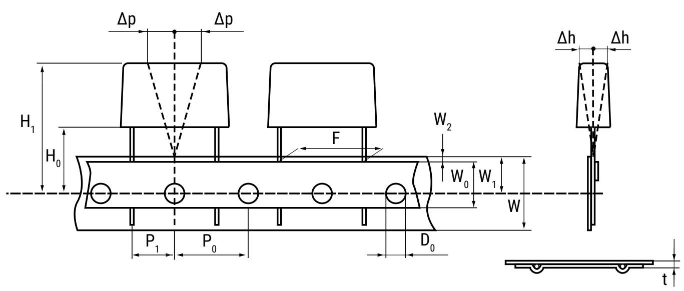
Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

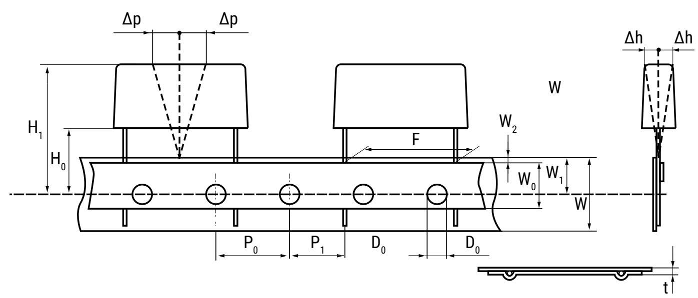
Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 360 mm	Large Reel 500 mm
15.2	5.5	12.5	18.0	1,000	500	600	
	6.5	12.5	18.0	600	400	400	
	7.5	14.5	18.0	600	400	400	
	8.5	16	18.0	400	250	400	
	5.2	10.5	18.5	1,000	500	600	
	5.5	11	18.5	1,000	500	500	
	6.0	12.5	18.5	600	400	400	
	7.3	13	18.5	600	400	400	800
	7.8	13.5	18.5	600	400	400	
	8.5	14.3	18.5	500	300	350	
20.3	7.6	14.0	24.0	1,500	250	250	500
	8.4	14.0	24.0	1,200	200	250	500
	9.0	15.0	24.0	1,500	200	250	
	11.3	16.5	24.0	1,000	150	180	400
25.4	10.6	16.1	30.5	1,000	150		
	10.5	17.0	30.5	1,000	100		
	12.1	19.0	30.5	800	100		
	15.3	22.0	30.5	600	75		

Lead Taping & Packaging (IEC 60286–2)

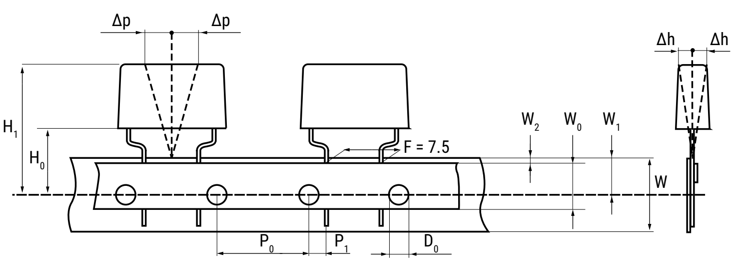
Lead Spacing 10.2 – 15.2 mm



Lead Spacing 20.3 – 22.5 mm



Formed Leads from 10.2 – 7.5 mm



Taping Specification

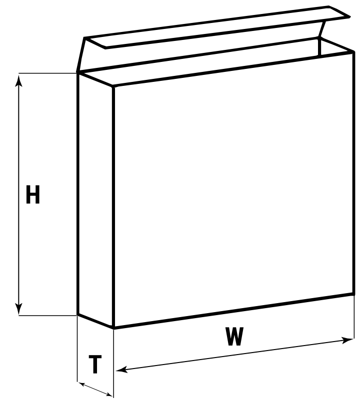
Dimensions in mm								Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	Formed 7.5	10.2	15.2	20.3	22.5	F
Carrier Tape Width	±0.5	W	18.0	18.0	18.0	18.0	18.0	18 +1/−0.5
Hold-Down Tape Width	Minimum	W_0	5.0	5.0	5.0	5.0	5.0	
Position of Sprocket Hole	±0.5	W_1	9.0	9.0	9.0	9.0	9.0	9 +0.75/−0.5
Distance Between Tapes	Maximum	W_2	3.0	3.0	3.0	3.0	3.0	3.0
Sprocket Hole Diameter	±0.2	D_0	4.0	4.0	4.0	4.0	4.0	4.0
Feed Hole Lead Spacing	±0.3	P_0 (1)	12.7 (4)	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.75	7.6	5.1	8.9	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	Maximum	Δh	2.0	2.0	2.0	2.0	2.0	2.0
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.9 Maximum	0.9 Maximum
Sprocket Hole/Cap Body	Nominal	H_0 (2)	18 +2/−0	18 +2/−0	18 +2/−0	18 +2/−0	18.5 ±0.5	18 +2/−0
Sprocket Hole/Top of Cap Body	Maximum	H_1 (3)	43	43	43	58	58	58 Maximum

(1) Maximum cumulative feed hole error, 1 mm per 20 parts
(2) 16.5 mm available on request
(3) Depending on case size
(4) 15 mm available on request

Lead Taping & Packaging (IEC 60286–2) cont.

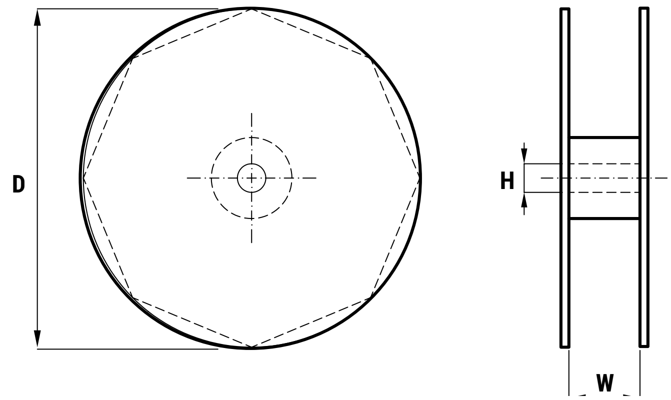
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
R4x, R4x+R, R7x, RSB F5A, F5B, F5D F6xx, F8xx	360	340	59
PHExxx, PMExxx, PMRxxx	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
R4x, R4x+R, R7x, RSB F5A, F5B, F5D F6xx, F8xx	355 500	30 25	55 (Max)
PHExxx, PMExxx, PMRxxx	360 500	30	46 (Max)



PME271E, Metallized Impregnated Paper, Class X1, 300 VAC

Overview

Multilayer metallized paper encapsulated and impregnated in self-extinguishing material, meeting the requirements of UL 94 V–0.

Applications

For worldwide use as an electromagnetic interference suppressor in all X1 and across-the-line applications.

Benefits

- Approvals: ENEC, UL
- Rated voltage: 300 VAC 50/60 Hz
- Capacitance range: 0.01µF – 0.22 µF
- Lead Spacing: 15.2 – 25.4 mm
- Capacitance tolerance: ±20% for C ≤ 0.1µF, ±10% for C > 0.1 µF
- Climatic category: 40/110/56/B, IEC 60068–1
- Tape & Reel packaging in accordance with IEC 60286–2
- RoHS compliance and lead-free terminations
- Operating temperature range of −40°C to +110°C
- 100% screening factory test at 2,150 VDC
- Highest possible safety regarding active and passive flammability

Customer Part Number

PME271	E	(D)	510(0)	M	R30
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Capacitance Tolerance	Packaging
X1, Metallized Paper	E = 300	Blank = Standard D = 22.5	The last three digits represent significant figures. The first digit specifies the total number of digits.	M = ±20% (for C ≤ 0.1 µF) K = ±10% (for C > 0.1 µF)	See Ordering Options Table

KEMET Internal Part Number

P	277	Q	E	103	M	300	A
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Packaging
P = Paper	X1, Metallized Paper	Q = 15.2 C = 20.3 S = 22.5 E = 25.4	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	M = ±20% (for C ≤ 0.1 µF) K = ±10% (for C > 0.1 µF)	300 = 300	See Ordering Options Table

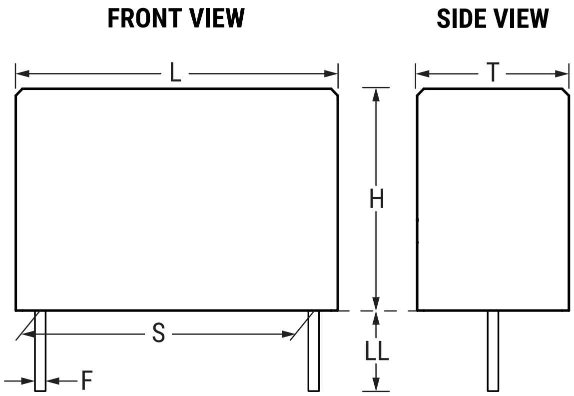
Benefits cont.

- Excellent self-healing properties which ensure long life even when subjected to frequent overvoltages
- Good resistance to ionization due to impregnated paper dielectric
- High dv/dt capability
- Impregnated paper ensures excellent stability and reliability properties, particularly in applications with continuous operation

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	KEMET Lead and Packaging Code	Legacy Lead and Packaging Code
15.2	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	L	R19T0
	Other Lead and Packaging Options			
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	P	R19T1
20.3	**Standard Lead and Packaging Options**			
	Bulk (Tray) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	L	R19T0
	Other Lead and Packaging Options			
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	P	R19T1
22.5	**Standard Lead and Packaging Options**			
	Bulk (Tray) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	L	R19T0
	Other Lead and Packaging Options			
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	P	R19T1
25.4	**Standard Lead and Packaging Options**			
	Bulk (Tray) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30

Dimensions – Millimeters



Size Code	S		T		H		L		F	
	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
QE	15.2	±0.4	5.2	Maximum	10.5	Maximum	18.5	Maximum	0.8	±0.05
QN	15.2	±0.4	7.3	Maximum	13.0	Maximum	19.0	Maximum	0.8	±0.05
QS	15.2	±0.4	8.5	Maximum	14.3	Maximum	18.5	Maximum	0.8	±0.05
CE	20.3	±0.4	7.6	Maximum	14.0	Maximum	24.0	Maximum	0.8	±0.05
CP	20.3	±0.4	11.3	Maximum	16.5	Maximum	24.0	Maximum	0.8	±0.05
SJ	22.5	±0.4	8.0	Maximum	17.0	Maximum	27.0	Maximum	0.8	±0.05
SP	22.5	±0.4	10.0	Maximum	19.0	Maximum	27.0	Maximum	0.8	±0.05
SU	22.5	±0.4	12.0	Maximum	22.0	Maximum	27.0	Maximum	0.8	±0.05
EE	25.4	±0.4	10.6	Maximum	16.1	Maximum	30.5	Maximum	1.0	±0.05
EJ	25.4	±0.4	12.1	Maximum	19.0	Maximum	30.5	Maximum	1.0	±0.05

Note: See the Ordering Options Table for lead length (LL) options.

Performance Characteristics

Rated Voltage	300 VAC 50/60 Hz	
Capacitance Range	0.01 – 0.22 µF	
Capacitance Tolerance	±20% for C ≤ 0.1 µF, ±10% for C > 0.1 µF	
Temperature Range	−40°C to +110°C	
Climatic Category	40/110/56/B	
Approvals	ENEC, UL	
Dissipation Factor	Maximum Values at +23°C	
	1 kHz	1.3%
Test Voltage Between Terminals	The 100% screening factory test is carried out at 2,150 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. It is not permitted to repeat this test as there is a risk to damage the capacitor. KEMET is not liable in such case for any failures.	
Insulation Resistance	Minimum Values Between Terminals	
	C ≤ 0.33 µF	≥ 12,000 MΩ
	C > 0.33 µF	≥ 4,000 MΩ • µF
In DC Applications	Recommended voltage ≤ 630 VDC	

Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R +20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle-flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
Intertek Semko AB		EN/IEC 60384–14	SE/0140–15D
UL		UL 60384-14 CAN/CSA-E60384-14	E73869

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Maximum Dimensions in mm			Lead Spacing (S)	f_o (MHz)	dV/dt (V/µs)	KEMET Part Number	Customer Part Number
	T	H	L					
0.010	5.2	10.5	18.5	15.2	16	1,200	P277QE103M300(1)	PME271E510M(1)
0.015	5.2	10.5	18.5	15.2	13	1,200	P277QE153M300(1)	PME271E515M(1)
0.022	7.3	13	18.5	15.2	9.8	1,200	P277QN223M300(1)	PME271E522M(1)
0.033	7.3	13	18.5	15.2	7	1,200	P277QN333M300(1)	PME271E533M(1)
0.047	8.5	14.3	18.5	15.2	6.4	1,200	P277QS473M300(1)	PME271E547M(1)
0.068	7.6	14	24	20.3	5.2	600	P277CE683M300(1)	PME271E568M(1)
0.1	11.3	16.5	24	20.3	4.1	600	P277CP104M300(1)	PME271E610M(1)
0.068	8	17	27	22.5	4.7	600	P277SJ683M300(1)	PME271ED5680M(1)
0.1	8	17	27	22.5	4.1	600	P277SJ104M300(1)	PME271ED6100M(1)
0.15	10	19	27	22.5	3.2	600	P277SP154K300(1)	PME271ED6150K(1)
0.22	12	22	27	22.5	2.5	600	P277SU224K300(1)	PME271ED6220K(1)
0.15	10.6	16.1	30.5	25.4	3.3	400	P277EE154K300(1)	PME271E615K(1)
0.22	12.1	19	30.5	25.4	2.6	400	P277EJ224K300(1)	PME271E622K(1)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**f_o (MHz)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Customer Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.

Soldering Process

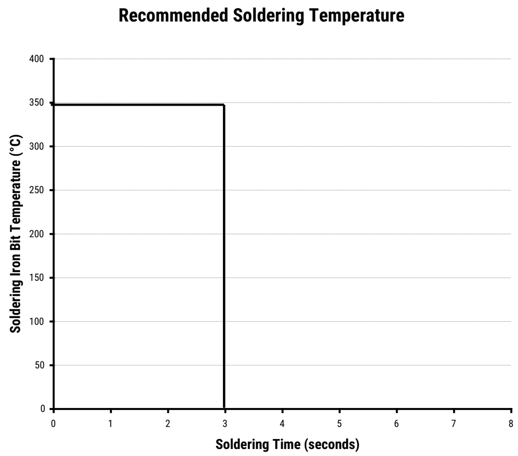
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for SnPb eutectic alloy to 217 – 221ºC for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170ºC). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm), and great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the recommended limits may result in degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface-mount components. Insert through-hole parts after curing the surface-mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum of two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

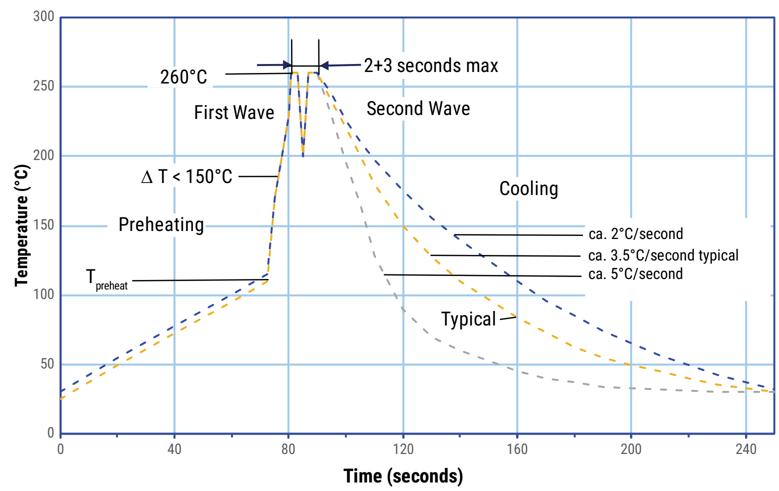
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



Soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

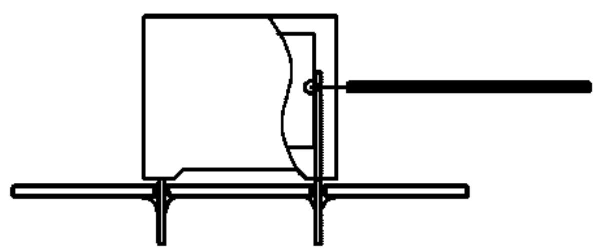
1. The table indicates the maximum setup temperature for the soldering process.

Dielectric film material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≥ 10 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that inside the element the maximum temperature is below the limit.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C

Temperature monitored inside the capacitor.

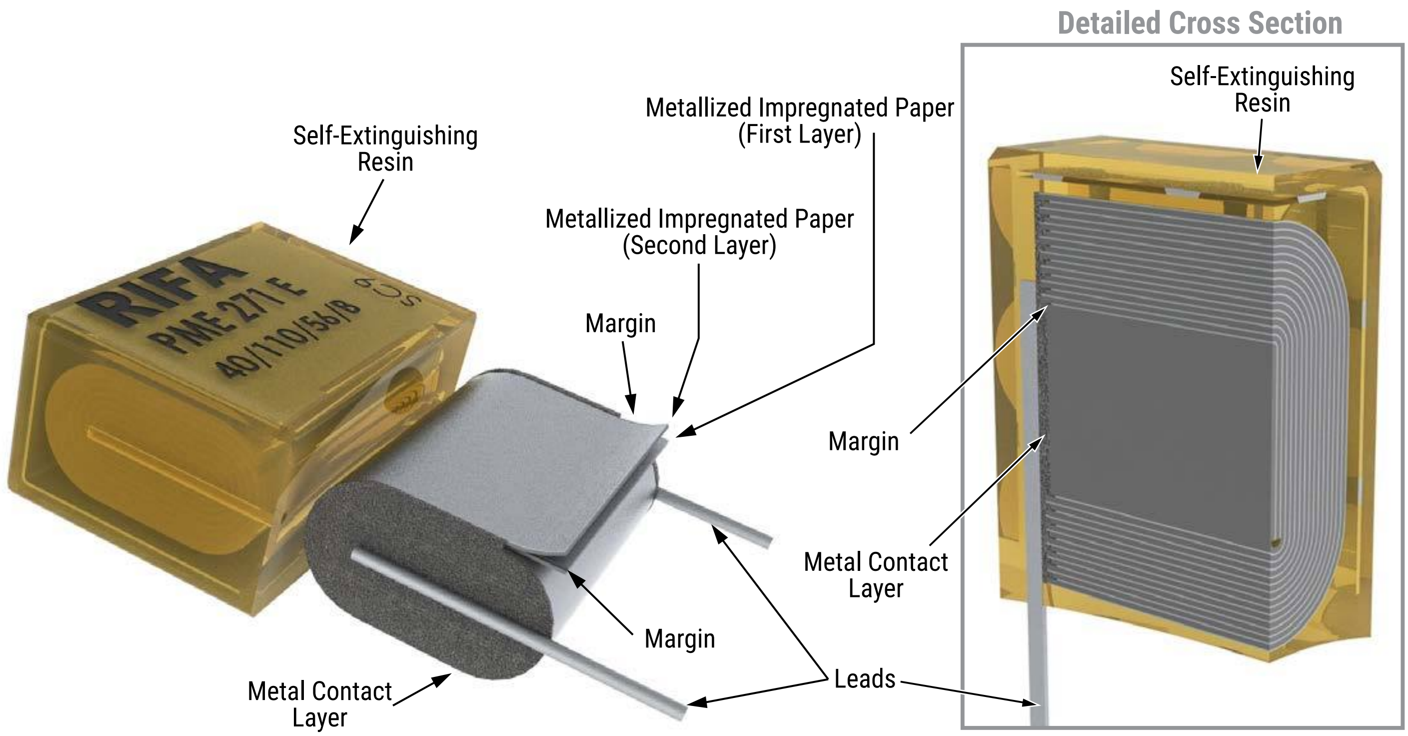


Selective Soldering Recommendations

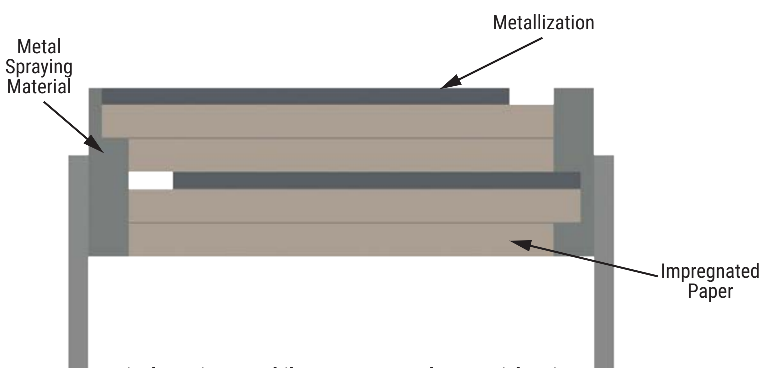
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath, as in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder, only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering. Great care must be taken so that the parts do not overheat.

Construction

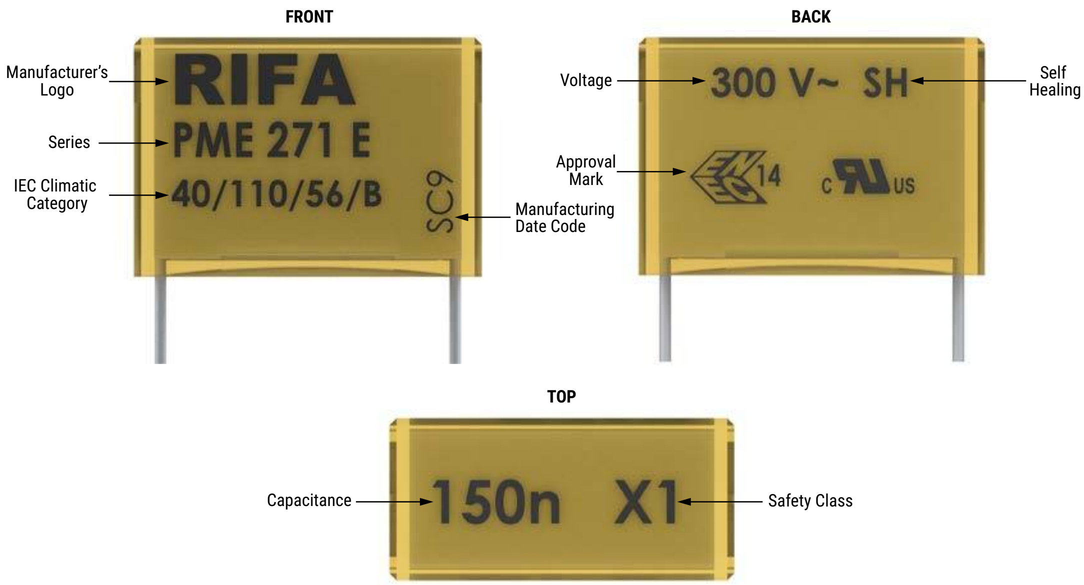


Winding Scheme



**Single Design – Multilayer Impregnated Paper Dielectric
1 Section**

Marking

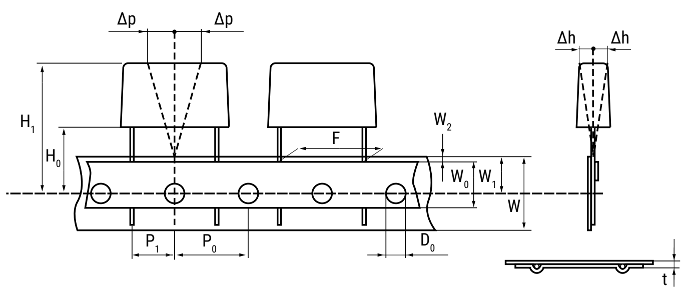


Packaging Quantities

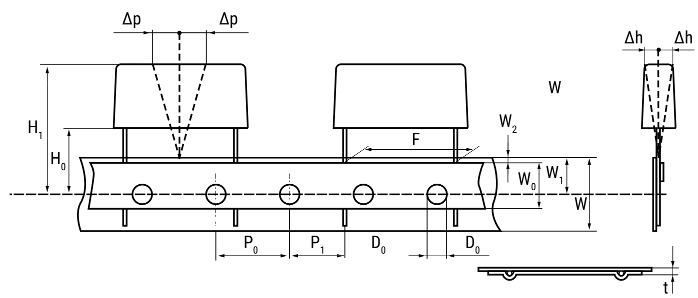
Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 360 mm	Large Reel 500 mm
15.2	5.5	12.5	18.0	1,000	500	600	
	6.5	12.5	18.0	600	400	400	
	7.5	14.5	18.0	600	400	400	
	8.5	16.0	18.0	400	250	400	
	5.2	10.5	18.5	1,000	500	600	
	5.5	11.1	18.5	1,000	500	500	
	6.0	12.5	18.5	600	400	400	
	7.3	13.0	18.5	600	400	400	800
	7.8	13.5	18.5	600	400	400	
	8.5	14.3	18.5	500	300	350	
20.3	7.6	14.0	24.0	1,500	250	250	500
	8.4	14.0	24.0	1,200	200	250	500
	9.0	15.0	24.0	1,500	200	250	
	11.3	16.5	24.0	1,000	150	180	400
22.5	8.0	17.0	27.0	1,200	200		
	10.0	19.0	27.0	1,000	150	200	
	12.0	22.0	27.0	800	100	180	350
25.4	10.6	16.1	30.5	1,000	150		
	10.5	17.3	30.5	1,000	100		
	12.1	19.0	30.5	800	100		
	15.3	22.0	30.5	600	75		

Lead Taping & Packaging (IEC 60286–2)

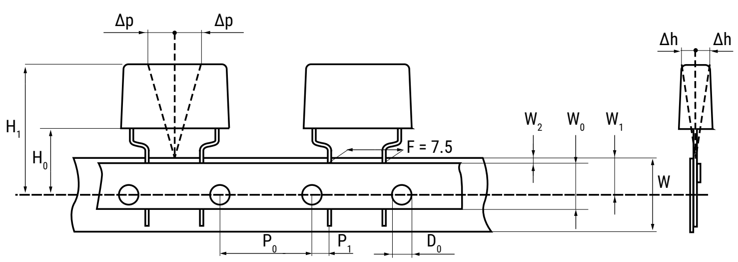
Lead Spacing 10.2 – 15.2 mm



Lead Spacing 20.3 – 22.5 mm



Formed Leads from 10.2 – 7.5 mm



Taping Specification

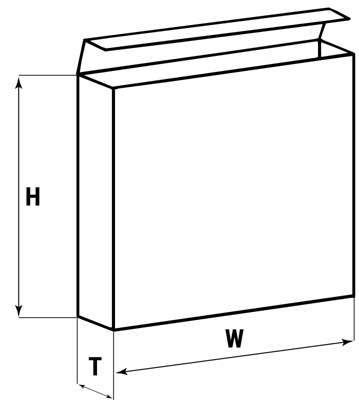
Dimensions in mm								Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	Formed 7.5	10.2	15.2	20.3	22.5	F
Carrier Tape Width	±0.5	W	18.0	18.0	18.0	18.0	18.0	18 +1/−0.5
Hold-Down Tape Width	Minimum	W_0	5.0	5.0	5.0	5.0	5.0	
Position of Sprocket Hole	±0.5	W_1	9.0	9.0	9.0	9.0	9.0	9 +0.75/−0.5
Distance Between Tapes	Maximum	W_2	3.0	3.0	3.0	3.0	3.0	3.0
Sprocket Hole Diameter	±0.2	D_0	4.0	4.0	4.0	4.0	4.0	4.0
Feed Hole Lead Spacing	±0.3	P_0[(1)]	12.7[(4)]	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.75	7.6	5.1	8.9	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	Maximum	Δh	2.0	2.0	2.0	2.0	2.0	2.0
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.9 Maximum	0.9 Maximum
Sprocket Hole/Cap Body	Nominal	H_0[(2)]	18 +2/−0	18 +2/−0	18 +2/−0	18 +2/−0	18.5 ±0.5	18 +2/−0
Sprocket Hole/Top of Cap Body	Maximum	H_1[(3)]	43	43	43	58	58	58 Maximum

(1) Maximum cumulative feed hole error, 1 mm per 20 parts
(2) 16.5 mm available on request
(3) Depending on case size
(4) 15 mm available on request

Lead Taping & Packaging (IEC 60286–2) cont.

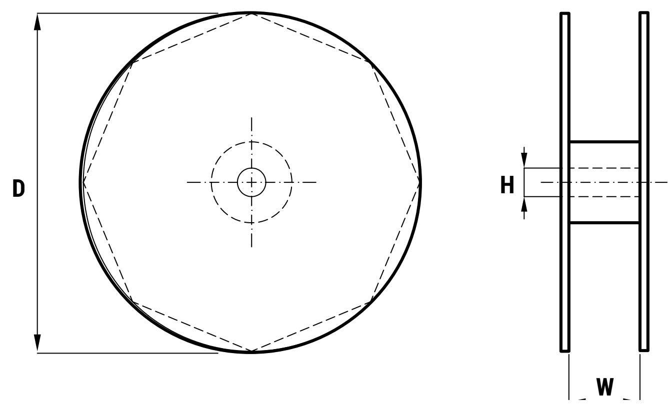
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
R4x, R4x+R, R7x, RSB	360	340	59
F5A, F5B, F5D			
F6xx, F8xx			
PHExxx, PMExxx, PMRxxx	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
R4x, R4x+R, R7x, RSB	355 500	30 25	55 (Max)
F5A, F5B, F5D			
F6xx, F8xx			
PHExxx, PMExxx, PMRxxx	360 500	30	46 (Max)



Manufacturing Date Code (IEC–60062)

Y = Year, Z = Month			
Year	Code	Month	Code
2010	A	January	1
2011	B	February	2
2012	C	March	3
2013	D	April	4
2014	E	May	5
2015	F	June	6
2016	H	July	7
2017	J	August	8
2018	K	September	9
2019	L	October	O
2020	M	November	N
2021	N	December	D
2022	P		
2023	R		
2024	S		
2025	T		
2026	U		
2027	V		
2028	W		
2029	X		
2030	A		

PME271Y, Metallized Impregnated Paper, Class Y2, 250 VAC

Overview

Multilayer, metallized paper, encapsulated and impregnated in self-extinguishing material that meets the requirements of UL 94 V–0.

Applications

For worldwide use as an electromagnetic interference suppressor in all Y2 applications, line-to-earth.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- Rated voltage: 250 VAC 50/60 Hz
- Capacitance range: 0.001 – 0.1 µF
- Lead spacing: 10.2 – 25.4 mm
- Capacitance tolerance: ±20%
- Climatic category: 40/100/56/B, IEC 60068–1
- Tape & Reel packaging in accordance with IEC 60286–2
- RoHS compliance and lead-free terminations
- Operating temperature range of −40°C to +100°C
- 100% screening factory test at 3,000 VDC
- Highest possible safety regarding active and passive flammability

Customer Part Number System

PME271	Y	410	M	R30
Series	Rated Voltage (VAC)	Capacitance Code (pF)	Capacitance Tolerance	Packaging
Y2, Metallized Paper	Y = 250	The last two digits represent significant figures. The first digit specifies the total number of digits.	M = ±20%	See Ordering Options Table

KEMET Internal Part Number System

P	271	H	E	102	M	250	A
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Lead and Packaging Code
P = Paper	Y2, Metallized Paper	H = 10.2 Q = 15.2 C = 20.3 E = 25.4	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	M = ±20%	250 = 250	See Ordering Options Table

KEMET a YAGEO company

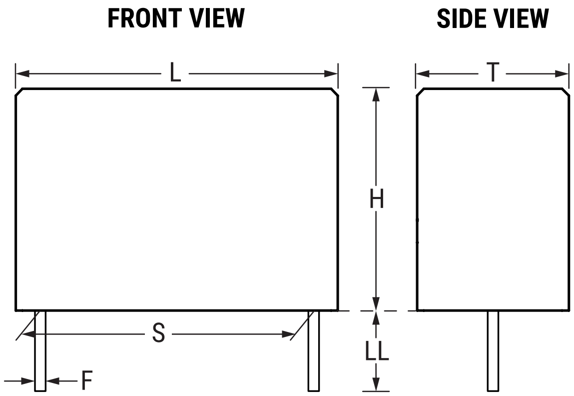
Benefits cont.

- Excellent self-healing properties ensure long life, even when subjected to frequent overvoltages
- Good resistance to ionization due to impregnated dielectric
- High dv/dt capability
- Impregnated paper that ensures excellent stability and reliability, particularly in applications with continuous operation

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	KEMET Lead and Packaging Code	Legacy Lead and Packaging Code
10.2	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	L	R19T0
	Other Lead and Packaging Options			
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	P	R19T1
Native 10.2 formed to 7.5	Ammo Pack	H_0= 18.5 ±0.5	LAF3	R30XA
15.2	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	L	R19T0
	Other Lead and Packaging Options			
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	P	R19T1
20.3	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	L	R19T0
	Other Lead and Packaging Options			
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	P	R19T1
25.4	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30

Dimensions – Millimeters



S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
10.2	±0.4	3.9	Maximum	7.5	Maximum	13.5	Maximum	0.6	±0.05
10.2	±0.4	4.1	Maximum	8.2	Maximum	13.5	Maximum	0.6	±0.05
10.2	±0.4	5.1	Maximum	10.5	Maximum	13.5	Maximum	0.6	±0.05
15.2	±0.4	5.2	Maximum	10.5	Maximum	18.5	Maximum	0.8	±0.05
15.2	±0.4	5.5	Maximum	11.0	Maximum	18.5	Maximum	0.8	±0.05
15.2	±0.4	7.3	Maximum	13.0	Maximum	18.5	Maximum	0.8	±0.05
20.3	±0.4	7.6	Maximum	14.0	Maximum	24.0	Maximum	0.8	±0.05
20.3	±0.4	9.0	Maximum	15.0	Maximum	24.0	Maximum	0.8	±0.05
20.3	±0.4	11.3	Maximum	16.5	Maximum	24.0	Maximum	0.8	±0.05
25.4	±0.4	12.1	Maximum	19.0	Maximum	30.5	Maximum	1.0	±0.05

Note: See the Ordering Options Table for lead length (LL) options.

Performance Characteristics

Rated Voltage	250 VAC 50/60 Hz	
Capacitance Range	0.001 – 0.1 µF	
Capacitance Tolerance	±20%	
Temperature Range	-40°C to +100°C	
Climatic Category	40/100/56/B	
Approvals	ENEC, UL, CSA, CQC	
Dissipation Factor	Maximum Values at +23°C	
	1 kHz	1.3%
Test Voltage Between Terminals	The 100% screening factory test is carried out at 3,000 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. This test may not be repeated due to potential capacitor damage. KEMET is not liable for any failures that result from repeating the test.	
Insulation Resistance	Minimum Value Between Terminals	
	12,000 MΩ	
In DC Applications	Recommended voltage ≤ 1,000 VDC	

Environmental Test Data

Test	IEC Publication	Procedure
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 500 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	4,000 bumps at 390 m/s^2
Solderability	IEC 60068–2–20 Test Ta	Solder globule method
Active flammability	IEC 60384–14	
Passive flammability	IEC 60384–14	Needle-flame test
Humidity	IEC 60068–2–3 Test Ca	+40°C and 90 – 95% R.H.

Approvals

Certification Body	Mark	Specification	File Number
Intertek Semko AB		EN/IEC 60384–14	SE/0140–27D
UL		UL 60384–14 CAN/CSA–E60384–14	E73869
CQC		CQC	14001107140

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Maximum Dimensions in mm			Lead Spacing (S)	f_o (MHz)	dV/dt (V/µs)	KEMET Part Number	Customer Part Number
	T	H	L					
0.0010	3.9	7.5	13.5	10.2	53	2,000	P271HE102M250(1)	PME271Y410M(1)
0.0015	3.9	7.5	13.5	10.2	44	2,000	P271HE152M250(1)	PME271Y415M(1)
0.0022	3.9	7.5	13.5	10.2	37	2,000	P271HE222M250(1)	PME271Y422M(1)
0.0033	4.1	8.2	13.5	10.2	30	2,000	P271HH332M250(1)	PME271Y433M(1)
0.0047	5.1	10.5	13.5	10.2	24	2,000	P271HL472M250(1)	PME271Y447M(1)
0.0068	5.2	10.5	18.5	15.2	19	1,400	P271QE682M250(1)	PME271Y468M(1)
0.0100	5.2	10.5	18.5	15.2	16	1,400	P271QE103M250(1)	PME271Y510M(1)
0.0150	5.5	11.0	18.5	15.2	13	1,400	P271QH153M250(1)	PME271Y515M(1)
0.0220	7.3	13.0	18.5	15.2	9.8	1,400	P271QM223M250(1)	PME271Y522M(1)
0.0330	7.6	14.0	24.0	20.3	7.0	1,000	P271CE333M250(1)	PME271Y533M(1)
0.0470	9.0	15.0	24.0	20.3	6.0	1,000	P271CJ473M250(1)	PME271Y547M(1)
0.0680	11.3	16.5	24.0	20.3	4.6	600	P271CP683M250(1)	PME271Y568M(1)
0.1000	12.1	19.0	30.5	25.4	3.9	400	P271EJ104M250(1)	PME271Y610M(1)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**f_o (MHz)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Customer Part Number**

(1) Insert ordering code for lead type and packaging. See Ordering Options Table for available options.

Soldering Process

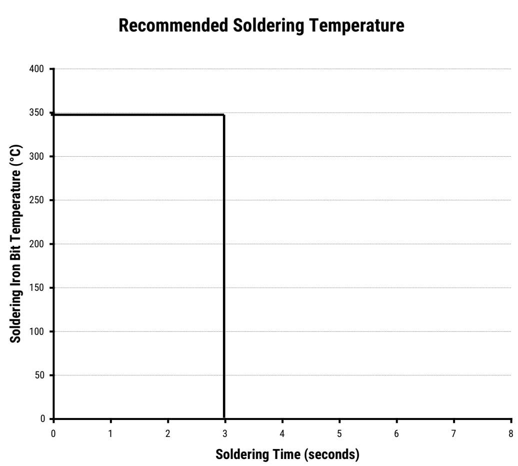
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as a primary solder. This has increased the liquidus temperature from 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm). Great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the recommended limits may result in degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface-mount components. Insert through-hole parts after curing the surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum of two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

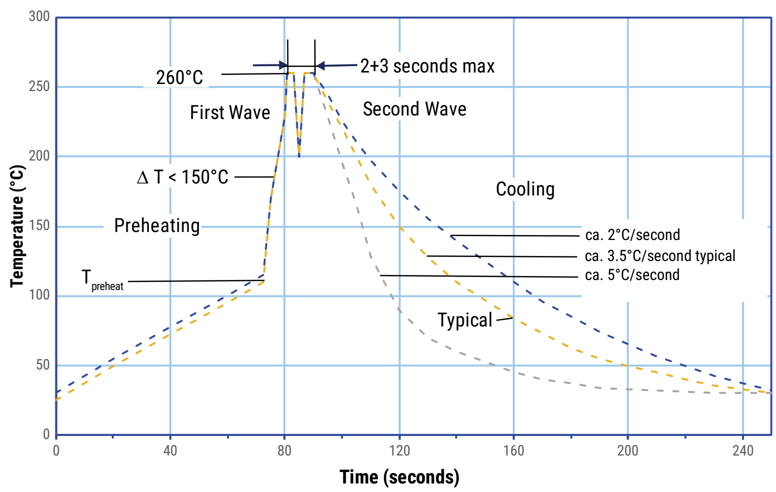
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



Soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

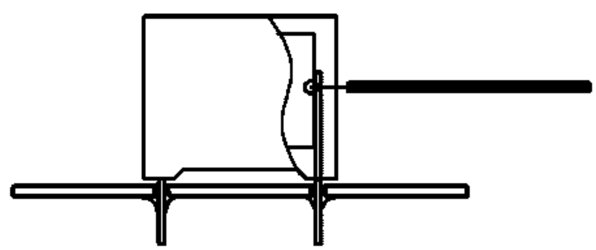
Wave Soldering Recommendations cont.

1. The table indicates the maximum setup temperature for the soldering process.

Dielectric film material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that inside the element the maximum temperature is below the limit.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



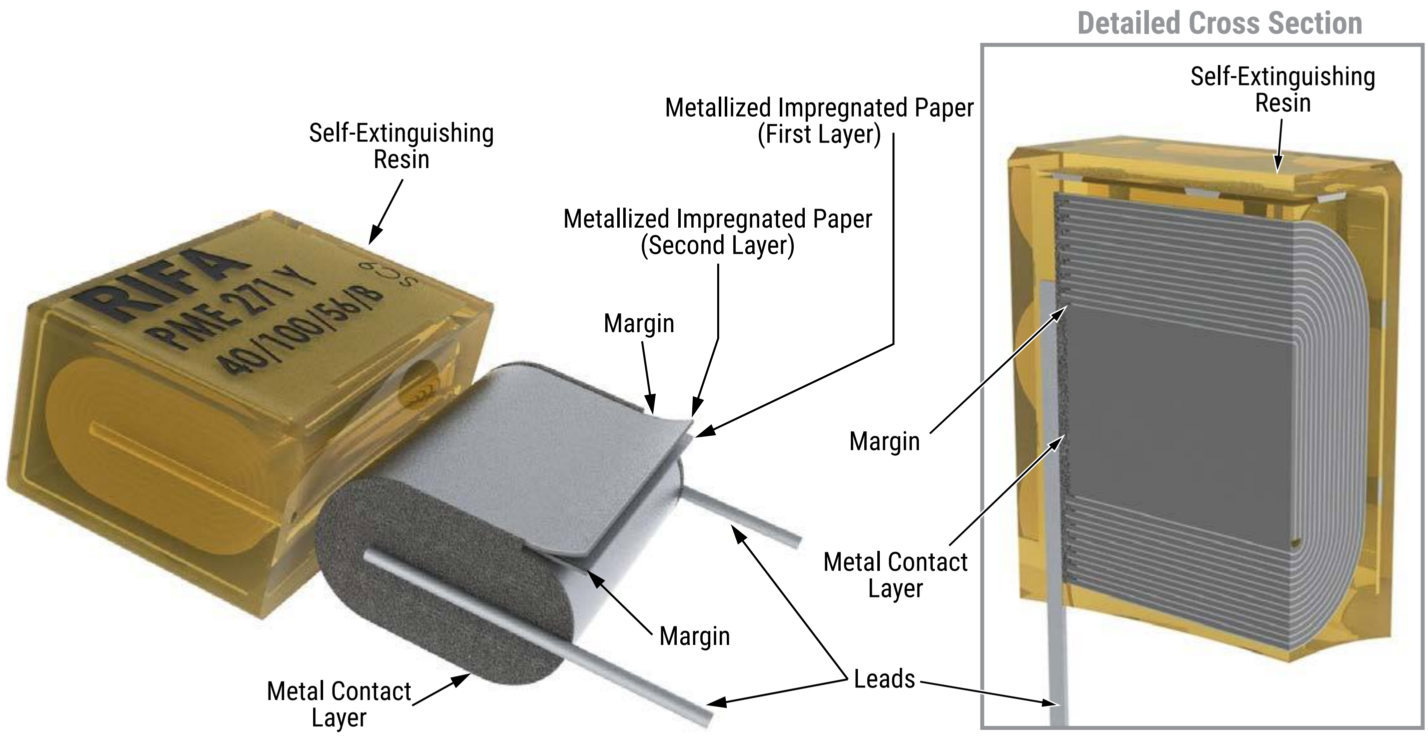
Temperature monitored inside the capacitor.

Selective Soldering Recommendations

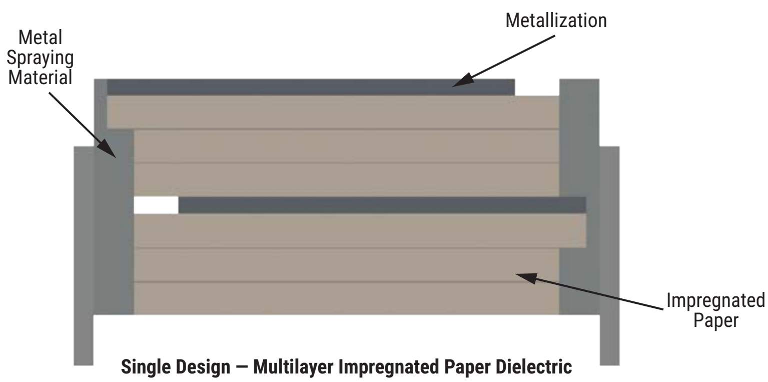
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath, as in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder, only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering. Great care must be taken so that the parts do not overheat.

Construction

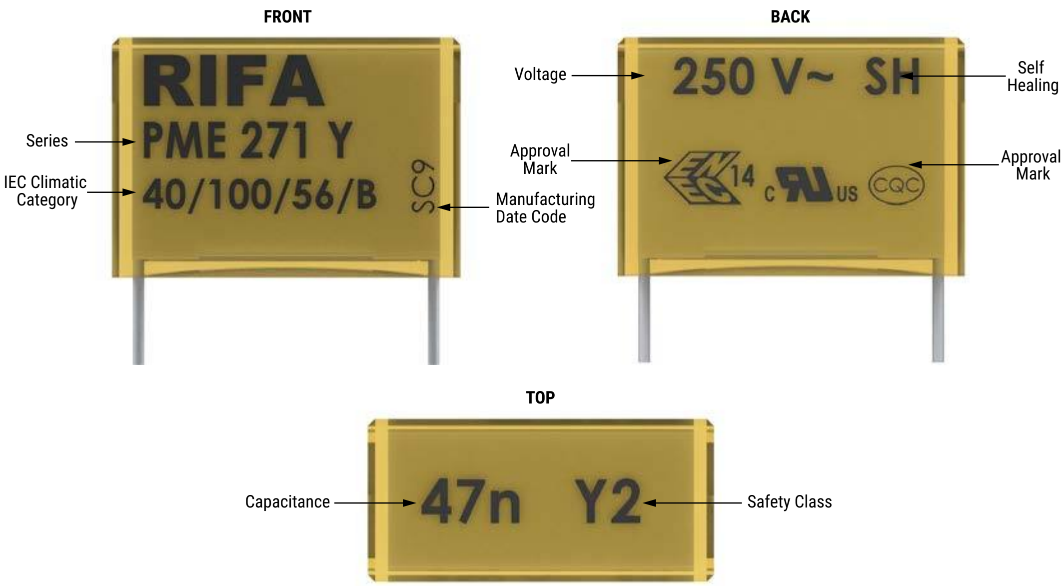


Winding Scheme



Single Design — Multilayer Impregnated Paper Dielectric
1 Section

Marking

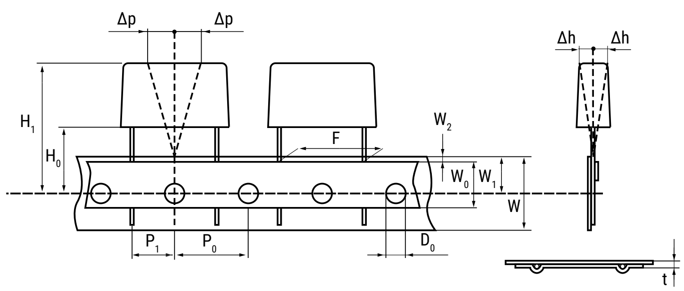


Packaging Quantities

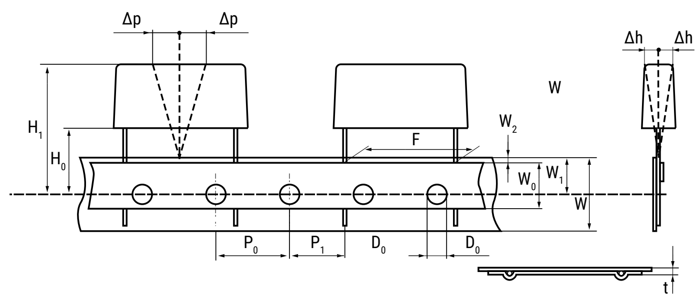
Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 360 mm	Large Reel 500 mm	Ammo Formed
10.2	3.9	7.5	13.5	2,000	1,000	700	1,400	800
	4.1	8.2	13.5	2,000	1,000	600		780
	5.1	10.5	13.5	1,600	800	600	1,200	630
15.2	5.5	12.5	18.0	1,000	500	600		
	6.5	12.5	18.0	600	400	400		
	7.5	14.5	18.0	600	400	400		
	8.5	16.0	18.0	400	250	400		
	5.2	10.5	18.5	1,000	500	600		
	5.5	11.0	18.5	1,000	500	500		
	6.0	12.5	18.5	600	400	400		
	7.3	13.0	18.5	600	400	400	800	
	7.8	13.5	18.5	600	400	400		
	8.5	14.3	18.5	500	300	350		
20.3	7.6	14.0	24.0	1,500	250	250	500	
	8.4	14.0	24.0	1,200	200	250	500	
	9.0	15.0	24.0	1,500	200	250		
	11.3	16.5	24.0	1,000	150	180	400	
25.4	10.6	16.1	30.5	1,000	150			
	10.5	17.3	30.5	1,000	100			
	12.1	19.0	30.5	800	100			
	15.3	22.0	30.5	600	75			

Lead Taping & Packaging (IEC 60286–2)

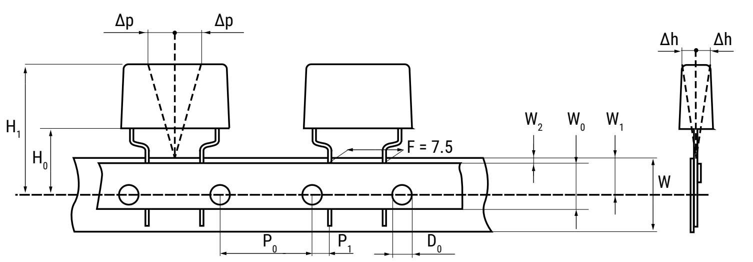
Lead Spacing 10.2 – 15.2 mm



Lead Spacing 20.3 – 22.5 mm



Formed Leads from 10.2 – 7.5 mm



Taping Specification

Dimensions in mm								Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	Formed 7.5	10.2	15.2	20.3	22.5	F
Carrier Tape Width	±0.5	W	18	18	18	18	18	18 +1/−0.5
Hold-Down Tape Width	Minimum	W_0	5	5	5	5	5	
Position of Sprocket Hole	±0.5	W_1	9	9	9	9	9	9 +0.75/−0.5
Distance Between Tapes	Maximum	W_2	3	3	3	3	3	3
Sprocket Hole Diameter	±0.2	D_0	4	4	4	4	4	4
Feed Hole Lead Spacing	±0.3	P_0(1)	12.7(4)	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.75	7.6	5.1	8.9	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	Maximum	Δh	2	2	2	2	2	2
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.9 Maximum	0.9 Maximum
Sprocket Hole/Cap Body	Nominal	H_0(2)	18 +2/−0	18 +2/−0	18 +2/−0	18 +2/−0	18.5 ±0.5	18 +2/−0
Sprocket Hole/Top of Cap Body	Maximum	H_1(3)	43	43	43	58	58	58 Maximum

(1) Maximum cumulative feed hole error, 1 mm per 20 parts
(2) 16.5 mm available on request
(3) Depending on case size
(4) 15 mm available on request

PME271YA–E, Metallized Impregnated Paper, Class Y2, 300 VAC

KEMET
a YAGEO company

Overview

Multilayer, metallized paper, encapsulated and impregnated in self-extinguishing material that meets the requirements of UL 94 V–0.

Applications

For worldwide use as an electromagnetic interference suppressor in all Y2 applications, line-to-earth.

Benefits

- • Approvals: ENEC, UL, cUL, CQC
- Rated voltage: 300 VAC 50/60 Hz
- Capacitance range: 0.001 – 0.15 µF
- Lead spacing: 10.2 – 25.4 mm
- Capacitance tolerance: ±20% for C ≤ 0.1 µF, ±10% for C > 0.1 µF
- Climatic category: 40/115/56/B, IEC 60068–1
- Tape & Reel packaging in accordance with IEC 60286–2
- RoHS compliance and lead-free terminations
- Operating temperature range of −40°C to +115°C
- 100% screening factory test at 3,000 VDC

Customer Part Number System

PME271	Y	A	4100	M	R30
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Capacitance Tolerance	Packaging
Y2, Metallized Paper	Y = 300	A = 10.2 B = 15.2 C = 20.3 D = 22.5 E = 25.4	The last three digits represent significant figures. The first digit specifies the total number of digits.	M = ±20% (for C ≤ 0.1 µF) K = ±10% (for C > 0.1 µF)	See Ordering Options Table

KEMET Internal Part Number System

P	272	H	E	102	M	300	A
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Packaging
P = Paper	Y2, Metallized Paper	H = 10.2 Q = 15.2 C = 20.3 D = 22.5 E = 25.4	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	M = ±20% (for C ≤ 0.1 µF) K = ±10% (for C > 0.1 µF)	300 = 300	See Ordering Options Table

Benefits cont.

- The highest possible safety regarding active and passive flammability
- Excellent self-healing properties ensure long life, even when subjected to frequent overvoltages
- Good resistance to ionization due to impregnated dielectric
- High dv/dt capability
- Impregnated paper that ensures excellent stability and reliability properties, particularly in applications with continuous operation

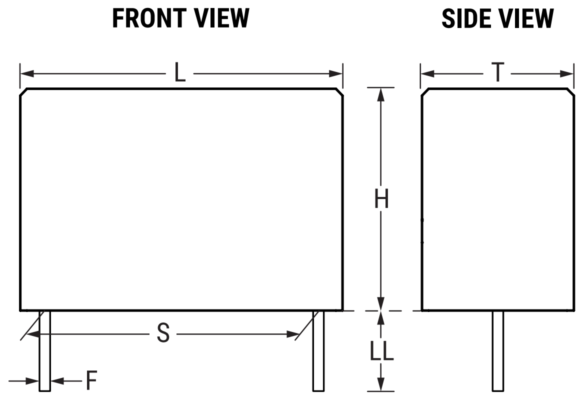
Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	KEMET Lead and Packaging Code	Legacy Lead and Packaging Code
10.2	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	L	R19T0
	Other Lead and Packaging Options			
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	P	R19T1
Native 10.2 formed to 7.5	Ammo Pack	H_0 = 18.5 ±0.5	LAF3	R30XA
15.2	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	L	R19T0
	Other Lead and Packaging Options			
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	P	R19T1
20.3	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6+0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30+5/−0	A	R30
	Tape & Reel (Standard Reel)	H_0 = 18.5+/−0.5	L	R19T0
	Other Lead and Packaging Options			
	Tape & Reel (Large Reel)	H_0 = 18.5+/−0.5	P	R19T1

Ordering Options Table cont.

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	KEMET Lead and Packaging Code	Legacy Lead and Packaging Code
22.5	**Standard Lead and Packaging Options**			
	Bulk (Tray) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	L	R19T0
	Other Lead and Packaging Options			
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	P	R19T1
25.4	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30

Dimensions – Millimeters



S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
10.2	±0.4	3.9	Maximum	7.5	Maximum	13.5	Maximum	0.6	±0.05
10.2	±0.4	4.1	Maximum	8.2	Maximum	13.5	Maximum	0.6	±0.05
10.2	±0.4	5.1	Maximum	10.5	Maximum	13.5	Maximum	0.6	±0.05
15.2	±0.4	5.2	Maximum	10.5	Maximum	18.5	Maximum	0.8	±0.05
15.2	±0.4	5.5	Maximum	11.0	Maximum	18.5	Maximum	0.8	±0.05
15.2	±0.4	7.3	Maximum	13.0	Maximum	18.5	Maximum	0.8	±0.05
20.3	±0.4	7.6	Maximum	14.0	Maximum	24.0	Maximum	0.8	±0.05
20.3	±0.4	9.0	Maximum	15.0	Maximum	24.0	Maximum	0.8	±0.05
20.3	±0.4	11.3	Maximum	16.5	Maximum	24.0	Maximum	0.8	±0.05
22.5	±0.4	8.0	Maximum	17.0	Maximum	27.0	Maximum	0.8	±0.05
22.5	±0.4	10.0	Maximum	19.0	Maximum	27.0	Maximum	0.8	±0.05
22.5	±0.4	12.0	Maximum	22.0	Maximum	27.0	Maximum	0.8	±0.05
25.4	±0.4	12.1	Maximum	19.0	Maximum	30.5	Maximum	1.0	±0.05
25.4	±0.4	15.3	Maximum	22.0	Maximum	30.5	Maximum	1.0	±0.05
Note: See the Ordering Options Table for lead length (LL) options.									

Performance Characteristics

Rated Voltage	300 VAC 50/60 Hz	
Capacitance Range	0.001 – 0.15 µF	
Capacitance Tolerance	±20% for C ≤ 0.1µF, ±10% for C > 0.1µF	
Temperature Range	−40°C to +115°C	
Climatic Category	40/115/56/B	
Approvals	ENEC, UL, CSA, CQC	
Dissipation Factor	Maximum values at +23°C	
	1 kHz	1.3%
Test Voltage Between Terminals	The 100% screening factory test is carried out at 3,000 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. This test may not be repeated due to potential capacitor damage. KEMET is not liable for any failures that result from repeating the test.	
Insulation Resistance	Between Terminals	
	12,000 MΩ	
In DC Applications	Recommended voltage ≤ 1,000 VDC	

Environmental Test Data

Test	IEC Publication	Procedure
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 500 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	4,000 bumps at 390 m/s^2
Solderability	IEC 60068–2–20 Test Ta	Solder globule method
Active flammability	IEC 60384–14	
Passive flammability	IEC 60384–14	Needle-flame test
Humidity	IEC 60068–2–3 Test Ca	+40°C and 90 – 95% R.H.

Approvals

Certification Body	Mark	Specification	File Number
Intertek Semko AB		EN/IEC 60384–14	SE/0140–27D
UL		UL 60384-14 CAN/CSA-E60384-14	E73869
CQC		CQC	14001107139

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Maximum Dimensions in mm			Lead Spacing (S)	f_o (MHz)	dV/dt (V/µs)	KEMET Part Number	Customer Part Number
	T	H	L					
0.0010	3.9	7.5	13.5	10.2	53	2,000	P272HE102M300(1)	PME271YA4100M(1)
0.0015	3.9	7.5	13.5	10.2	44	2,000	P272HE152M300(1)	PME271YA4150M(1)
0.0022	3.9	7.5	13.5	10.2	37	2,000	P272HE222M300(1)	PME271YA4220M(1)
0.0025	4.1	8.2	13.5	10.2	35	2,000	P272HH252M300(1)	PME271YA4250M(1)
0.0033	4.1	8.2	13.5	10.2	30	2,000	P272HH332M300(1)	PME271YA4330M(1)
0.0047	5.1	10.5	13.5	10.2	24	2,000	P272HL472M300(1)	PME271YA4470M(1)
0.0068	5.2	10.5	18.5	15.2	19	1,400	P272QE682M300(1)	PME271YB4680M(1)
0.0100	5.2	10.5	18.5	15.2	16	1,400	P272QE103M300(1)	PME271YB5100M(1)
0.0150	5.5	11.0	18.5	15.2	13	1,400	P272QH153M300(1)	PME271YB5150M(1)
0.0220	7.3	13.0	18.5	15.2	9.8	1,400	P272QM223M300(1)	PME271YB5220M(1)
0.0330	7.6	14.0	24.0	20.3	7.0	1,000	P272CE333M300(1)	PME271YC5330M(1)
0.0470	9.0	15.0	24.0	20.3	6.0	1,000	P272CJ473M300(1)	PME271YC5470M(1)
0.0680	11.3	16.5	24.0	20.3	4.6	1,000	P272CP683M300(1)	PME271YC5680M(1)
0.0330	8.0	17.0	27.0	22.5	6.8	600	P272SJ333M300(1)	PME271YD5330M(1)
0.0470	8.0	17.0	27.0	22.5	5.8	600	P272SJ473M300(1)	PME271YD5470M(1)
0.0680	10.0	19.0	27.0	22.5	4.8	600	P272SP683M300(1)	PME271YD5680M(1)
0.1000	12.0	22.0	27.0	22.5	3.8	600	P272SU104M300(1)	PME271YD6100M(1)
0.1000	12.1	19.0	30.5	25.4	3.9	400	P272EJ104M300(1)	PME271YE6100M(1)
0.1500	15.3	22.0	30.5	25.4	3.1	400	P272EL154K300(1)	PME271YE6150K(1)
Capacitance Value (µF)	T (mm)	H (mm)	L (mm)	Lead Spacing (S)	f_o (MHz)	dV/dt (V/µs)	KEMET Part Number	Customer Part Number

(1) Insert ordering code for lead type and packaging. See Ordering Options Table for available options.

Soldering Process

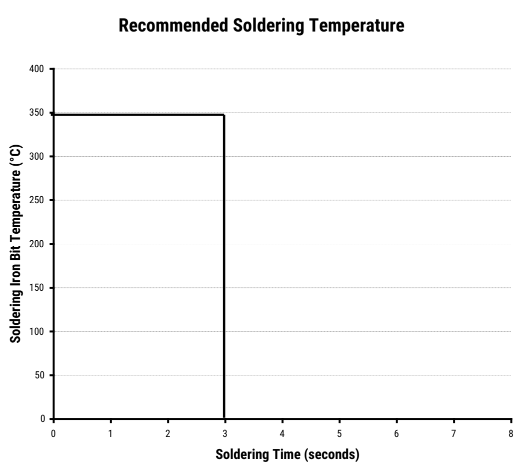
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as a primary solder. This has increased the liquidus temperature from 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm). Great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the recommended limits may result in degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface-mount components. Insert through-hole parts after curing the surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum of two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

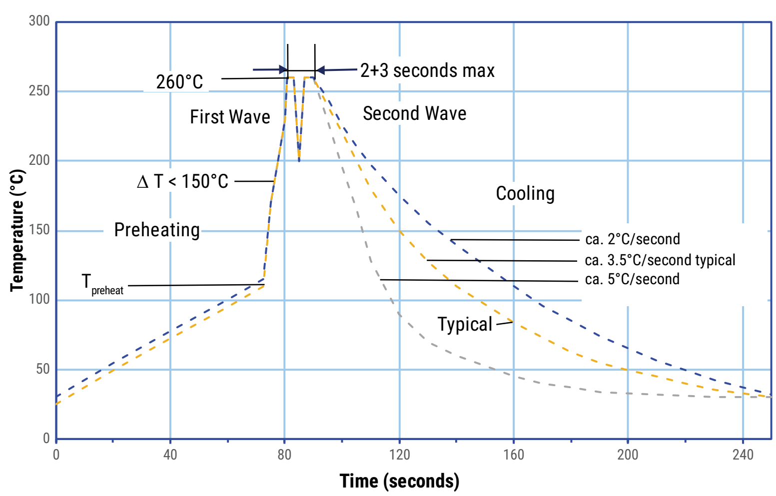
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



Soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

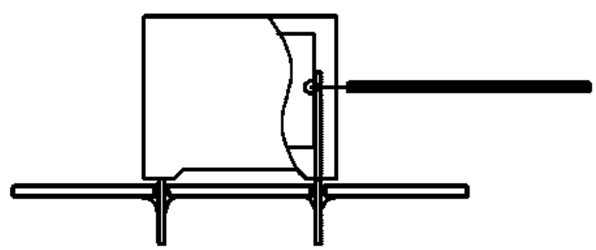
Wave Soldering Recommendations cont'd

1. The table indicates the maximum setup temperature for the soldering process.

Dielectric film material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that inside the element the maximum temperature is below the limit.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



Temperature monitored inside the capacitor.

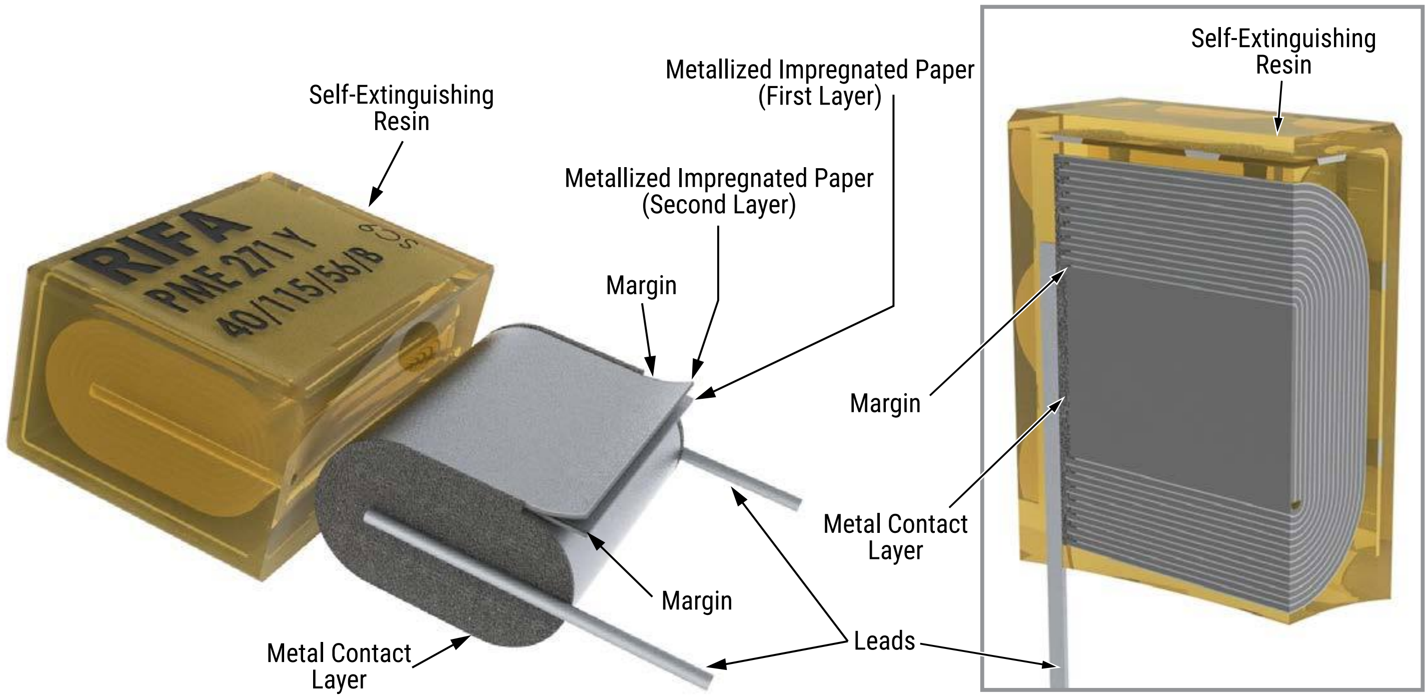
Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath, as in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder, only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

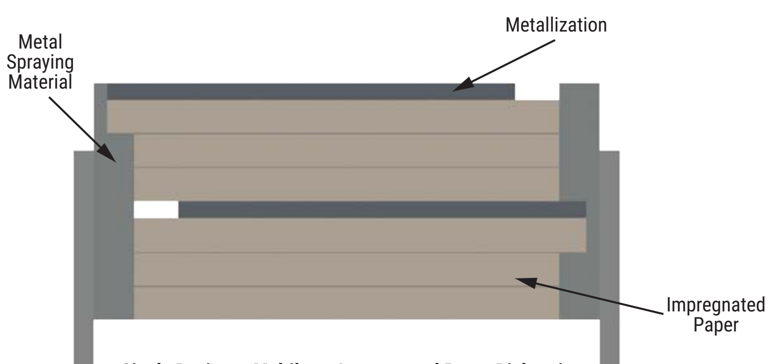
The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering. Great care must be taken so that the parts do not overheat.

Construction

Detailed Cross Section

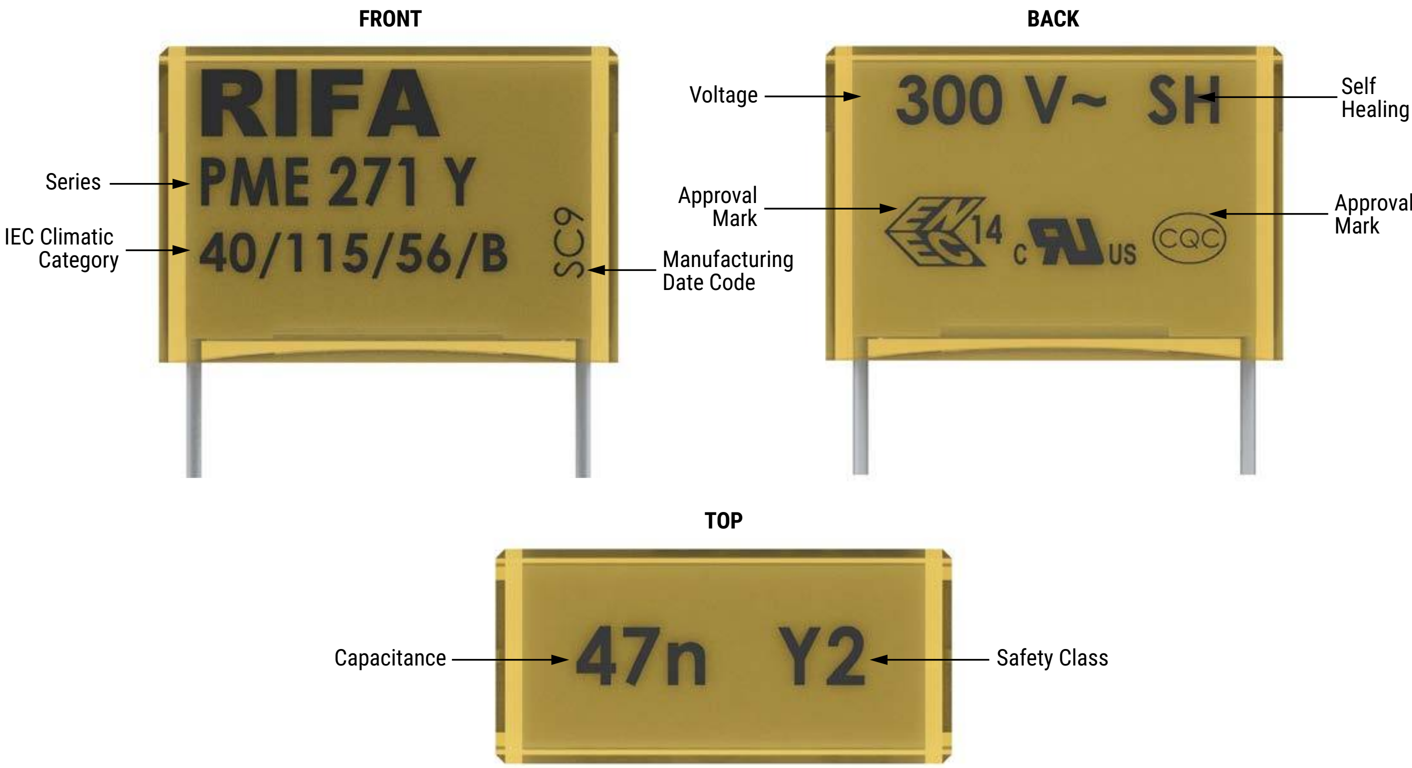


Winding Scheme



Single Design — Multilayer Impregnated Paper Dielectric 1 Section

Marking

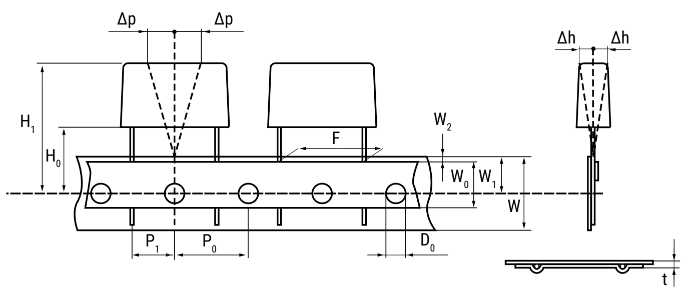

FRONT
RIFA
PME 271 Y
40/115/56/B
SC9
Series
IEC Climatic
Category
Manufacturing
Date Code
BACK
300 V~ SH
14
c US
CQC
Voltage
Self
Healing
Approval
Mark
Approval
Mark
TOP
47n Y2
Capacitance
Safety Class

Packaging Quantities

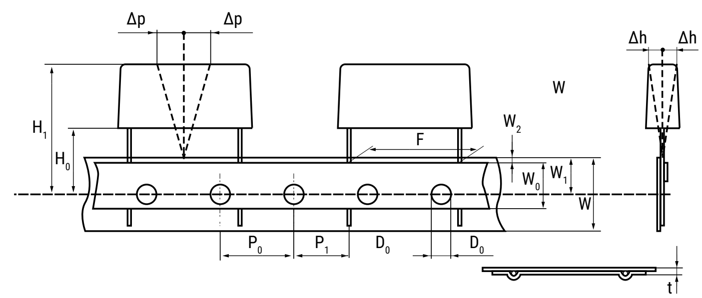
Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 360 mm	Large Reel 500 mm	Ammo Formed
10.2	3.9	7.5	13.5	2,000	1,000	700	1,400	800
	4.1	8.2	13.5	2,000	1,000	600		780
	5.1	10.5	13.5	1,600	800	600	1,200	630
15.2	5.5	12.5	18.0	1,000	500	600		
	6.5	12.5	18.0	600	400	400		
	7.5	14.5	18.0	600	400	400		
	8.5	16.0	18.0	400	250	400		
	5.2	10.5	18.5	1,000	500	600		
	5.5	11.0	18.5	1,000	500	500		
	6.0	12.5	18.5	600	400	400		
	7.3	13.0	18.5	600	400	400	800	
	7.8	13.5	18.5	600	400	400		
	8.5	14.3	18.5	500	300	350		
20.3	7.6	14.0	24.0	1,500	250	250	500	
	8.4	14.0	24.0	1,200	200	250	500	
	9.0	15.0	24.0	1,500	200	250		
	11.3	16.5	24.0	1,000	150	180	400	
22.5	8.0	17.0	27.0	1,200	200			
	10.0	19.0	27.0	1,000	150	200		
	12.0	22.0	27.0	800	100	180	350	
25.4	10.6	16.1	30.5	1,000	150			
	10.5	17.3	30.5	1,000	100			
	12.1	19.0	30.5	800	100			
	15.3	22.0	30.5	600	75			

Lead Taping & Packaging (IEC 60286–2)

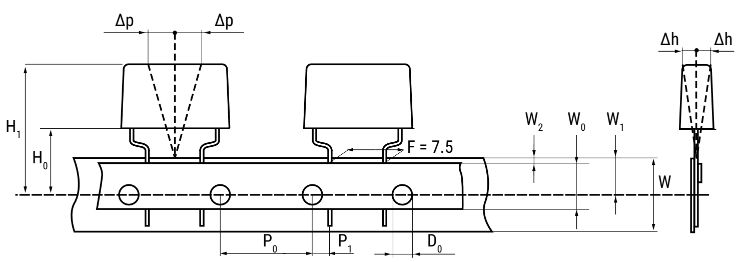
Lead Spacing 10.2 – 15.2 mm



Lead Spacing 20.3 – 22.5 mm



Formed Leads from 10.2 – 7.5 mm



Taping Specification

Dimensions in mm								Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	Formed 7.5	10.2	15.2	20.3	22.5	F
Carrier Tape Width	±0.5	W	18	18	18	18	18	18 +1/−0.5
Hold-Down Tape Width	Minimum	W_0	5	5	5	5	5	
Position of Sprocket Hole	±0.5	W_1	9	9	9	9	9	9 +0.75/−0.5
Distance Between Tapes	Maximum	W_2	3	3	3	3	3	3
Sprocket Hole Diameter	±0.2	D_0	4	4	4	4	4	4
Feed Hole Lead Spacing	±0.3	P_0 (1)	12.7 (4)	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.75	7.6	5.1	8.9	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	Maximum	Δh	2	2	2	2	2	2
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.9 Maximum	0.9 Maximum
Sprocket Hole/Cap Body	Nominal	H_0 (2)	18 +2/−0	18 +2/−0	18 +2/−0	18 +2/−0	18.5 ±0.5	18 +2/−0
Sprocket Hole/Top of Cap Body	Maximum	H_1 (3)	43	43	43	58	58	58 Maximum

(1) Maximum cumulative feed hole error, 1 mm per 20 parts
(2) 16.5 mm available on request
(3) Depending on case size
(4) 15 mm available on request

Class Y2

Impregnated Metallized Paper EMI Suppression Capacitors SMP253, Class Y2, 250 VAC SMD (Automotive Grade)

Overview

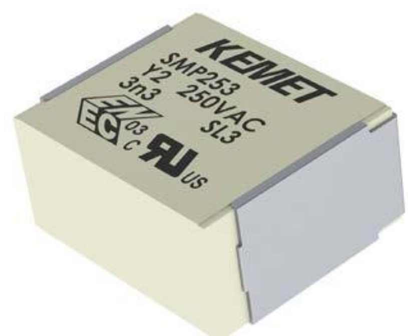
Multilayer, metallized paper, encapsulated and impregnated in self-extinguishing material that meets the requirements of UL 94 V–0.

Applications

For worldwide use as an electromagnetic interference suppressor in all Y2 applications, line-to-earth.

Benefits

- High dv/dt capability
- Impregnated paper that ensures excellent stability and reliability properties, particularly in applications with continuous operation
- Approvals: ENEC, cULus
- Rated voltage: 250 VAC 50/60 Hz, maximum recommended DC voltage 1,500 VDC
- Capacitance range: 0.001 – 0.0047 µF
- Size code: 5045, 12.7 mm
- Capacitance tolerance: ±20%
- Automotive (AEC-Q200) grade



Customer Part Number System

SMP253	M	A	4100	M	TR24
Series	Rated Voltage (VAC)	Chip Length (mm)	Capacitance Code (pF)	Capacitance Tolerance	Packaging
Y2, Metallized Paper	M = 250	A = 12.7	The last three digits represent significant figures. The first digit specifies the total number of digits.	M = ±20%	See Table 1

KEMET Internal Part Number System

P	101	AA	102	M	250	V
Capacitor Class	Series	Chip Size	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Packaging
P = Paper	Y2, Metallized Paper	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	M = ±20%	250 = 250	See Ordering Options Table

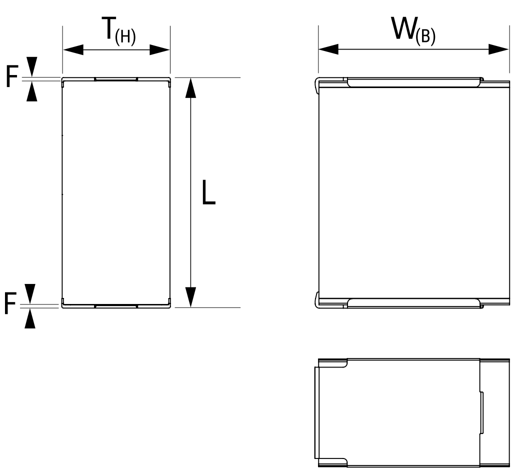
Benefits cont.

- Climatic category: 40/100/56/B, IEC 60068–1
- Tape & Reel packaging in accordance with IEC 60286–3
- RoHS compliance and lead-free terminations
- Operating temperature range of −40°C to +100°C
- 100% screening factory test at 3,000 VDC
- Highest possible safety regarding active and passive flammability
- Excellent self-healing properties ensure long life, even when subjected to frequent overvoltages
- Good resistance to ionization due to impregnated dielectric
- High dv/dt capability
- Impregnated paper that ensures excellent stability and reliability, particularly in applications with continuous operation

Ordering Options Table

Packaging Type	KEMET Packaging Code	Legacy Packaging Code
Standard Lead and Packaging Options		
Tape & Reel (Standard Reel)	V	TR24
Bulk (Bag)	A	BULK
Other Lead and Packaging Options		
Tape & Reel (Vertical Orientation Standard Reel)	Y	TV24

Dimensions – Millimeters



Chip Size	W		T		L		F	
EIA	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
5045	11.5	-0 /+0.6	6.5	-0/+0.4	12.7	-0/+0.4	0.5	Nominal

Performance Characteristics

Rated Voltage	250 VAC 50/60 Hz	
Capacitance Range	0.001 – 0.0047 µF	
Capacitance Tolerance	±20%	
Temperature Range	−40°C to +100°C	
Climatic Category	40/100/56/B	
Approvals	ENEC, cULus	
Dissipation Factor	Maximum Values at +23°C	
	1 kHz	1.3%
Test Voltage Between Terminals	The 100% screening factory test is carried out at 3,000 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. This test may not be repeated due to potential capacitor damage. KEMET is not liable for any failures that result from repeating the test.	
Insulation Resistance	Between Terminals	
	12,000 MΩ	

Cleaning/Storage and Moisture Recommendations

Cleaning Suggestions

To clean the PCB assembly KEMET recommends to use a suitable solvent like Isopropyl alcohol, deionized water or neutral pH detergents. Aggressive solvents shall not be used. For any different cleaning solvent used please contact KEMET Technical Services to analyze the potential impact on KEMET products.

Storage and Moisture Recommendations

KEMET SMD film capacitors are supplied in a moisture barrier bag (MBB) Class 1. We can guarantee a 24 month shelf life (temperature ≤ 40°C/relative humidity ≤ 90%). After the MBB has been opened, components may stay in areas with controlled temperature and humidity (temperature ≤ 30°C/relative humidity ≤ 60%) for 168 hours (MSL 3). For longer periods of time and/or higher temperature and/or higher relative humidity values, it is absolutely necessary to protect the components against humidity. If the reel inside the MBB is partially used, KEMET recommends to re-use the same MBB or to avoid areas without controlled temperature and humidity (see above). If the above conditions are not respected, components require baking (minimum time: 48 hours at 55 ±5°C, ≤ 5% RH) before the reflow.

Environmental Test Data

Test	IEC Publication	Procedure
Impulse Voltage and Endurance	IEC 60384–14	1.7 x V_R VAC 50 Hz, once every hour increse to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature.
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 500 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–27 Test Eb	4,000 bumps at 390 m/s^2
Rapid Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14 IEC 60695–11–5	Needle-flame test
Humidity	IEC 60068–2–3 Test Ca	+40°C and 90 – 95% R.H.
Damp Heat Steady State	IEC 60068-2-78 Test Cab	+40 ±2°C and 93 ±3% R.H., 56 days

Approvals

Certification Body	Mark	Specification	File Number
IMQ S.p.A.		EN/IEC 60384–14	CA08.00226
UL		UL 60384 and CAN/CSA E60384–14	E97797

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

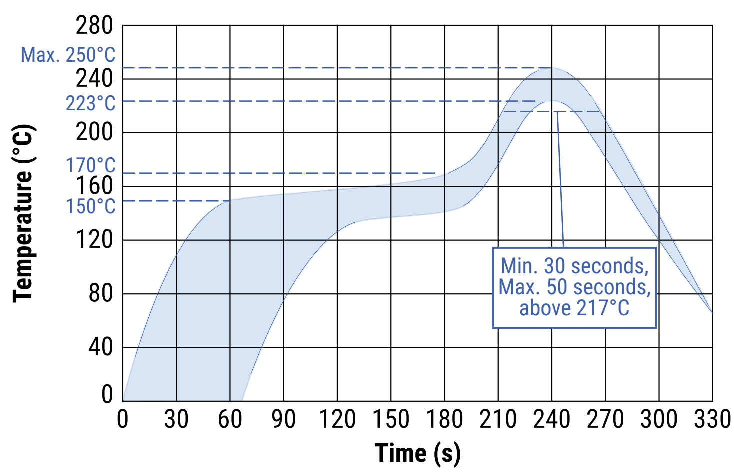
Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Maximum Dimensions in mm			dV/dt (V/µs)	KEMET Part Number	Customer Part Number
	W -0/+0.6	T -0/+0.4	L -0/+0.4			
0.0010	11.5	6.5	12.7	2,000	P101AA102M250(1)	SMP253MA4100M(1)
0.0015	11.5	6.5	12.7	2,000	P101AA152M250(1)	SMP253MA4150M(1)
0.0022	11.5	6.5	12.7	2,000	P101AA222M250(1)	SMP253MA4220M(1)
0.0025	11.5	6.5	12.7	2,000	P101AA252M250(1)	SMP253MA4250M(1)
0.0033	11.5	6.5	12.7	2,000	P101AA332M250(1)	SMP253MA4330M(1)
0.0039	11.5	6.5	12.7	2,000	P101AA392M250(1)	SMP253MA4390M(1)
0.0047	11.5	6.5	12.7	2,000	P101AA472M250(1)	SMP253MA4470M(1)
Capacitance Value (µF)	**W (mm)**	**T (mm)**	**L (mm)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Customer Part Number**

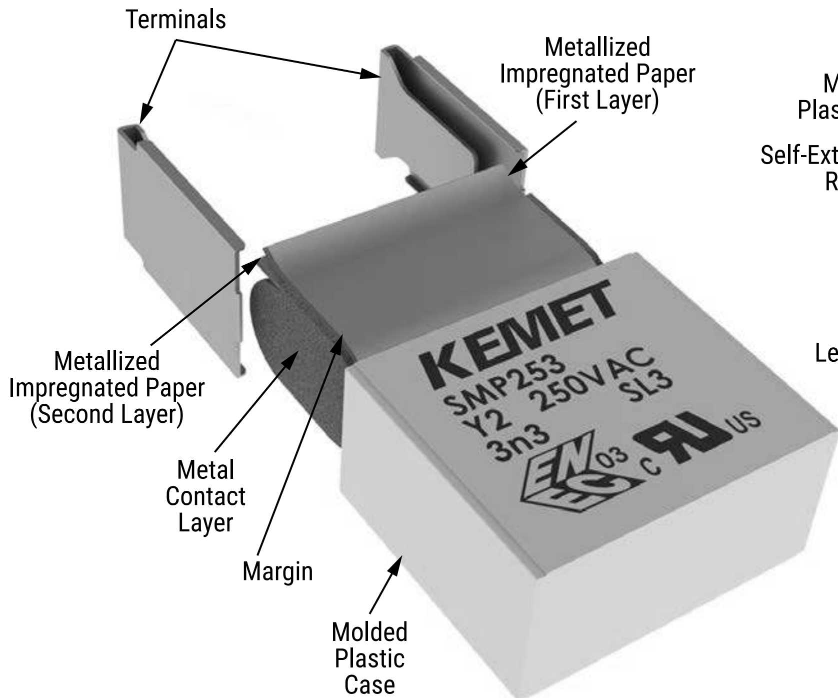
(1) Insert packaging code. See Ordering Options Table for available options.

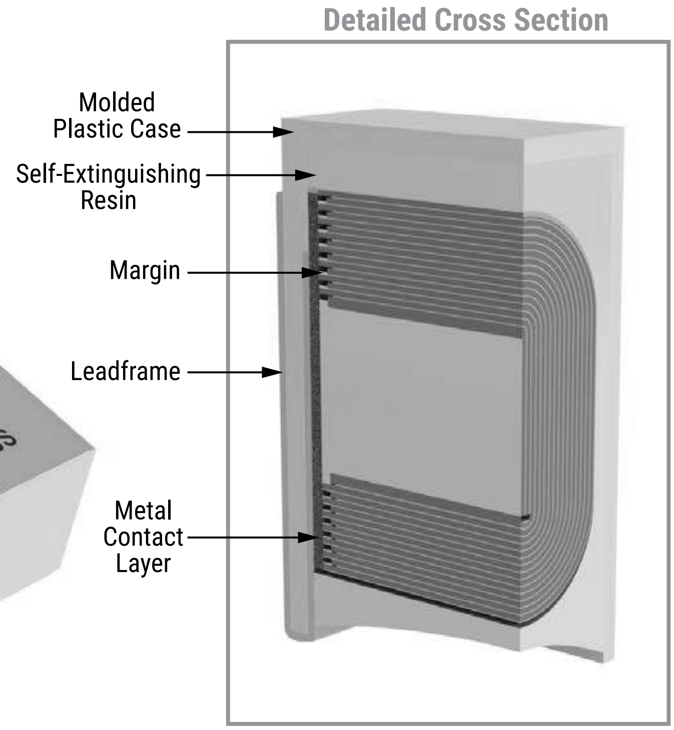
Soldering Process

Reflow soldering temperature is measured on the top body surface of the component. Use the recommended soldering profiles for convection reflow ovens and IR reflow ovens. If a vapor phase reflow oven is used, consult KEMET. Exceeding the manufacturer's process recommendations may harm the component. KEMET is not liable for any defect caused by exceeding recommendations. According to international standards, the maximum temperature capability must be measured on the top surface of a component. The international standards do not define how the thermocouple should be fastened on the component. Our recommendation for attaching the thermocouple to the top surface of the component is to glue it with high-temperature resistant glue.

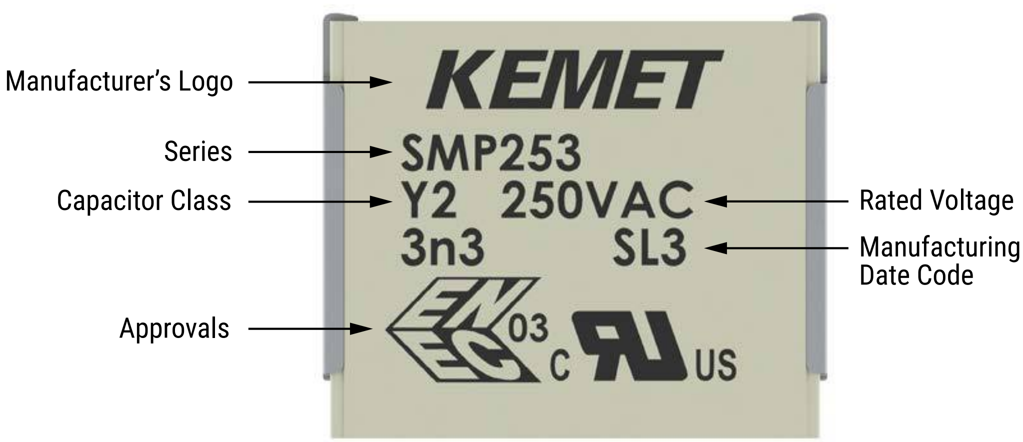


Construction





Marking

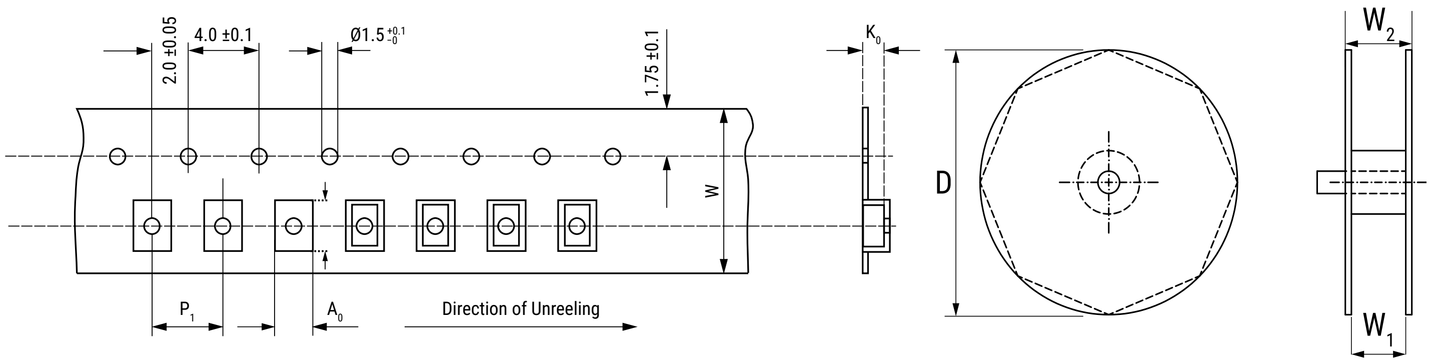


Packaging Quantities

Chip Size EIA	Thickness (mm)	Height (mm)	Length (mm)	Standard Reel (330 mm)	
				Horizontal Orientation	Vertical Orientation
5045	11.5	6.5	12.7	600	400

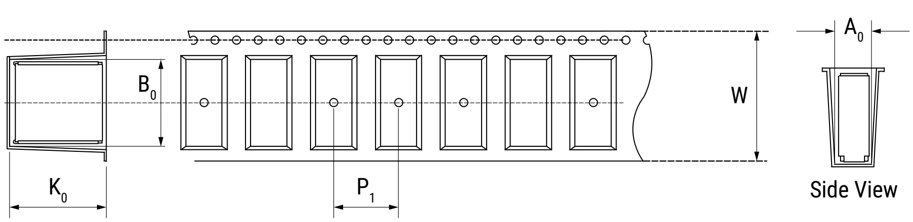
Carrier Taping & Packaging (IEC 60286–3)

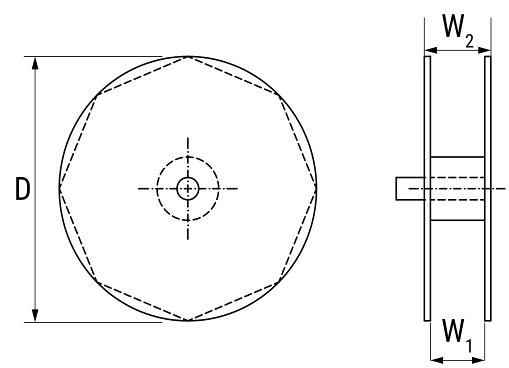
Horizontal Taping Orientation



EIA Size Code Horizontal Mounting	Dimensions in mm			Taping Specification							
	B	H	L	W	P_1	A_0	B_0	K_0	D	W_1	W_2
	Nominal	Nominal	Nominal	-0/+0.3	+/-0.1	Nominal	Nominal	Nominal	±2.0	-0/+2	Maximum
5045	11.5	6.5	12.7	24.0	16.0	11.9	13.1	6.8	330	24.4	30.0

Vertical Taping Orientation





EIA Size Code Vertical Mounting	Dimensions in mm			Taping Specification							
	B	H	L	W	P_1	A_0	B_0	K_0	D	W_1	W_2
	Nominal	Nominal	Nominal	-0/+0.3	+/-0.1	Nominal	Nominal	Nominal	±2.0	-0/+2	Maximum
5026 (5045)	12.7	6.5	11.5	24.0	16.0	6.9	13.1	11.8	330	24.4	30.0

PZB300, Delta Configuration X2 + 2x Y2, 275 VAC

KEMET a YAGEO company

Overview

Multilayer, metallized paper encapsulated and impregnated in self-extinguishing material that meets the requirements of UL 94 V–0.

Applications

Typical applications include interference suppressors with X2 + 2x Y2 capacitors in a delta configuration.

Benefits

- Approvals: ENEC, UL, cUL
- Rated Voltage: 275 VAC 50/60 Hz
- Capacitance X Value: 0.1 µF, and 0.15 µF
- Capacitance Y Value: 0.0022 µF, 0.0033 µF, and 0.0044 µF
- Lead Spacing: 20 mm
- Capacitance Tolerance: ±20%

Customer Part Number System

PZB300	M	C	11	R30
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging
Delta EMI, X2 + 2xY2, Metallized Paper	M = 275	C = 20.0	The first digit indicates the value of the X capacitor: 1 = 0.10 µF 2 = 0.15 µF The second digit indicates the value of the Y capacitor: 1 = 0.0022 µF 2 = 0.0033 µF 3 = 0.0047 µF	See Ordering Options Table

KEMET Internal Part Number System

P	300	P	L	104	M	275	A	C222
Capacitor Class	Series	Lead Spacing (mm)	Size Code	X Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Packaging	Y Capacitance Code
P = Paper	Delta EMI, X2 + 2x Y2, Metallized Paper	P = 20	See Dimension Table	The first two digits indicate the two most significant digits of the capacitance value in picofarads. The third digit is the number of following zeros.	M = ±20%	275 = 275	See Ordering Options Table	C plus the first two digits represent significant figures. The third digit specifies number of zeros.

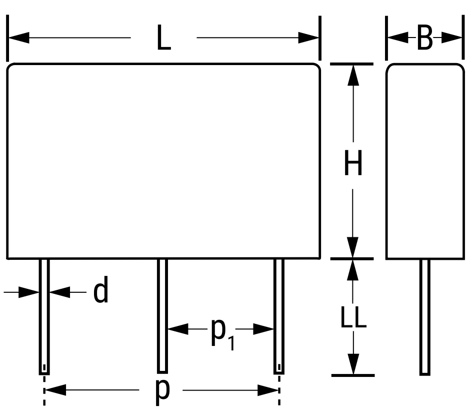
Benefits cont.

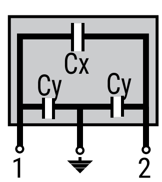
- Climatic Category: 40/100/56/B, IEC 60068–1
- Tape & Reel packaging in accordance with IEC 60286–2
- RoHS compliance and lead-free terminations
- Operating temperature range of −40°C to +100°C
- 100% screening factory test at 2,150 VDC/1,500 VAC
- Excellent self-healing properties ensure long life, even when subjected to frequent overvoltages
- Good resistance to ionization due to impregnated paper dielectric
- High dv/dt capability
- Impregnated paper that ensures excellent stability and reliability properties, particularly in applications with continuous operation

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	KEMET Lead and Packaging Code	Legacy Lead and Packaging Code
20	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag)– Maximum Length Leads	30 +5/−0	A	R30

Dimensions – Millimeters





p		p_1		B		H		L		d	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
20.0	±0.5	10.0	Nominal	12.5	Maximum	16.0	Maximum	24.0	Maximum	0.8	±0.05
Note: See the Ordering Options Table for lead length (LL) options.											

Performance Characteristics

Rated Voltage	275 VAC 50/60 Hz	
Capacitance Range	0.1 µF – 0.15 µF	
Capacitance Tolerance	±20%	
Temperature Range	−40°C to +100°C	
Climatic Category	40/100/56/B	
Approvals	ENEC, UL, CSA	
Dissipation Factor	Maximum Values at +23°C	
	1 kHz	1.3%
Test Voltage Between Terminals	The 100% screening factory test is carried out at 2,150 VDC for X2 capacitors and 3,000 VDC for Y2 capacitors. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. This test may not be repeated due to potential capacitor damage. KEMET is not liable for any failures that result from repeating the test.	
Insulation Resistance	Between Terminals	
	≥ 12,000 MΩ	

Environmental Test Data

Test	IEC Publication	Procedure
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each, 10 – 500 Hz at 0.75 mm or 98 m/s^2 (PZB300 MCx mounted on PC board)
Bump	IEC 60068–2–29 Test Eb	4,000 bumps at 390 m/s^2
Solderability	IEC 60068–2–20 Test Ta	Solder globule method Wetting time < 1 second
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle-flame test
Humidity	IEC 60068–2–3 Test Ca	+40°C and 90 – 95% R.H., 56 days

Approvals

Certification Body	Mark	Specification	File Number
Intertek Semko AB	ENEC	EN/IEC 60384–14	SE/0140–24E
UL	c UL us	UL 60384–14 CAN/CSA–E60384–14–09	E73869

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Cx (µF)	Cy (µF)	Maximum Dimensions in mm			Lead Spacing (p)	Package Quantity				New KEMET Part Number	Legacy Part Number
		B	H	L		A (R30)	C (R06)	dV/dt Cx	dV/dt Cy		
0.10	0.0022	12.5	16.0	24.0	20.0	150	1,000	600	1,000	P300PL104M275(1)C222	PZB300MC11(1)
0.10	0.0033	12.5	16.0	24.0	20.0	150	1,000	600	1,000	P300PL104M275(1)C332	PZB300MC12(1)
0.10	0.0047	12.5	16.0	24.0	20.0	150	1,000	600	1,000	P300PL104M275(1)C472	PZB300MC13(1)
0.15	0.0022	12.5	16.0	24.0	20.0	150	1,000	600	1,000	P300PL154M275(1)C222	PZB300MC21(1)
0.15	0.0033	12.5	16.0	24.0	20.0	150	1,000	600	1,000	P300PL154M275(1)C332	PZB300MC22(1)
0.15	0.0047	12.5	16.0	24.0	20.0	150	1,000	600	1,000	P300PL154M275(1)C472	PZB300MC23(1)
Cx (µF)	Cy (µF)	B (mm)	H (mm)	L (mm)	Lead Spacing (p)	A (R30)	C (R06)	dV/dt Cx	dV/dt Cy	New KEMET Part Number	Legacy Part Number

(1) Insert lead and packaging code. See Ordering Options Table for available options.

Soldering Process

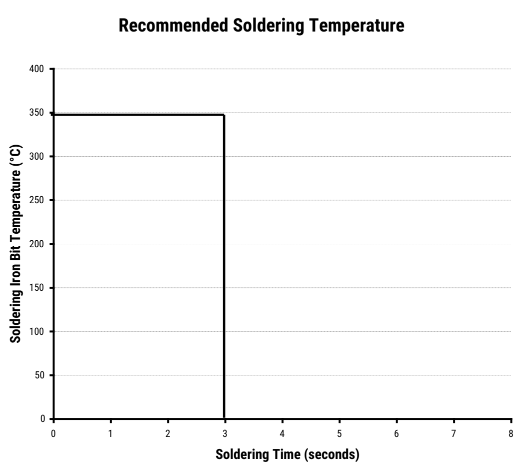
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from 183°C for SnPb eutectic alloys to 217 – 221°C for the new alloys. As a result the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm), and great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the recommended limits may result in degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after curing the surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum of two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

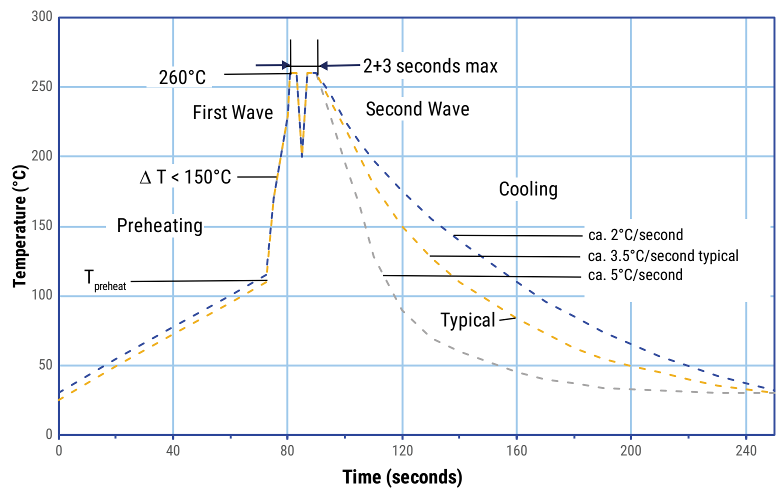
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

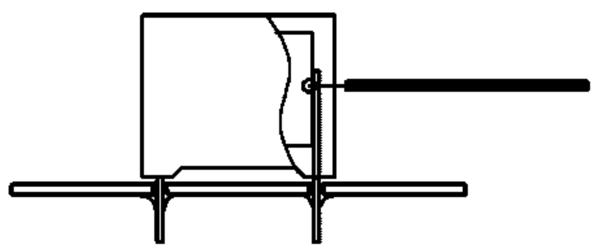
1. The table indicates the maximum setup temperature of the soldering process.

Figure 1

Dielectric Film Material	Maximum Preheat Temperature			Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 10 mm	Capacitor Pitch = 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	130°C	270°C	270°C
Polypropylene	100°C	110°C	130°C	260°C	270°C
Paper	130°C	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that the maximum temperature is below the limit inside the element.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



The temperature is monitored inside the capacitor.

Selective Soldering Recommendations

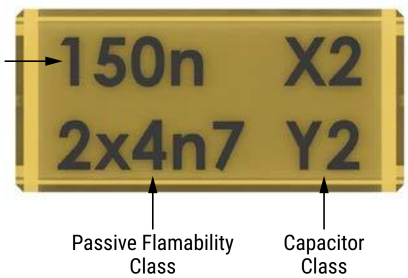
Selective dip soldering is a variation of reflow soldering. In this method the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath, as in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and then pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the profile for double wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts do not overheat.

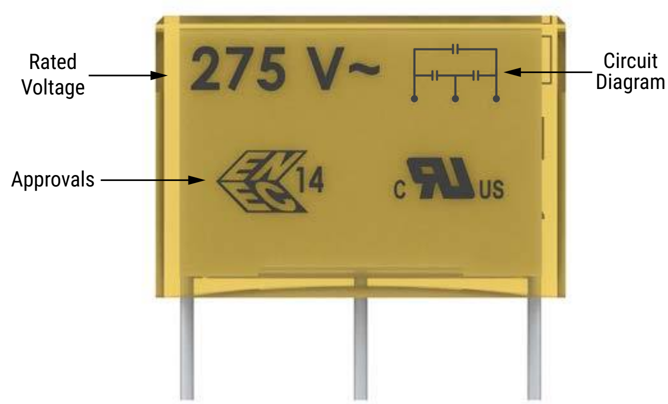
Marking

FRONT

TOP



BACK



Manufacturing Date Code (IEC–60062)

Y = Year, Z = Month					
Year	Code	Year	Code	Month	Code
2010	A	2022	P	January	1
2011	B	2023	R	February	2
2012	C	2024	S	March	3
2013	D	2025	T	April	4
2014	E	2026	U	May	5
2015	F	2027	V	June	6
2016	H	2028	W	July	7
2017	J	2029	X	August	8
2018	K	2030	A	September	9
2019	L			October	O
2020	M			November	N
2021	N			December	D

OBSOLETE

PHZ9004 Series Metallized Polypropylene Film, 300 VAC 3x X2 with Separate Terminals for Three-Phase Filtering

KEMET
a YAGEO company

Overview

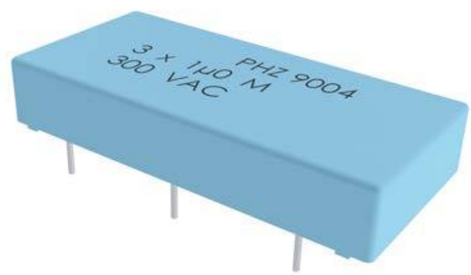
The PHZ9004 Series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material meeting the requirements of UL 94 V–0.

Applications

Typical applications include worldwide use as an electromagnetic interference suppressor in X2 and across-the-line applications for three phases.

Benefits

- Rated voltage: 300 VAC 50/60 Hz
- Capacitance range: 3 x 1.0 µF
- Lead spacing: 27.5 mm
- Capacitance tolerance: ±20%, other tolerances on request
- Climatic category: 55/105/56, IEC 60068–1
- Tape and reel in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of −55°C to +105°C
- 100% screening factory test at 2,200 VDC



Legacy Part Number System

PHZ9004	E	F	7100	M	R06L2
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Capacitance Tolerance	Packaging
Triple Capacitor X2, Metallized Polypropylene	E = 300	F = 27.5	The last three digits represent significant figures. The first digit specifies the total number of digits.	M = ±20%	See Ordering Options Table

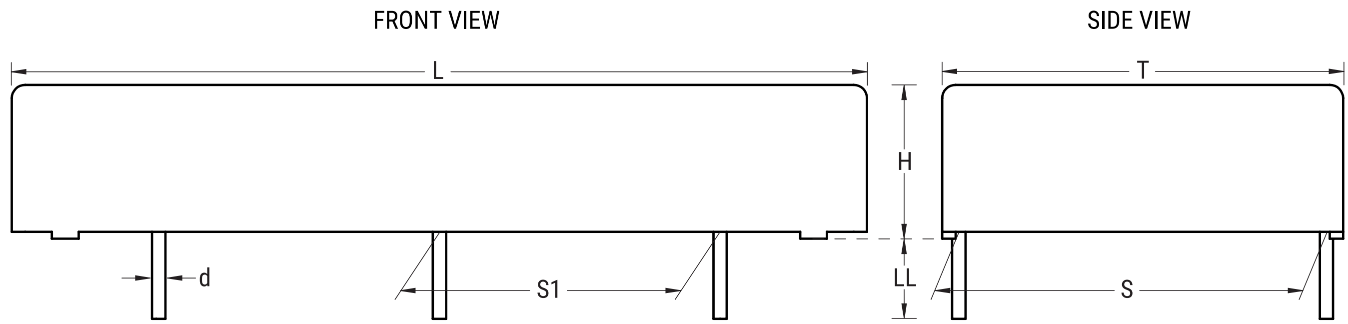
New KEMET Part Number System

9004	AA	105	M	300	C	DECT	V680
Capacitor Class	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Packaging	C-Spec	V-Spec
Triple Capacitor X2, Metallized Polypropylene	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	M = ±20%	300 = 300	See Ordering Options Table	Optional additional characters at KEMET's option.	Part Number specific version code

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	KEMET Lead and Packaging Code	Legacy Lead and Packaging Code
27.5	**Standard Lead and Packaging Options**			
	Bulk (Tray) – Short Leads	6+0/-1	C	R06L2

Dimensions – Millimeters



p		p_1		B		H		L		d	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
27.5	+/-0.5	21	+/-0.5	30	Maximum	11.5	Maximum	64	Maximum	1	+/-0.05
Note: See Ordering Options Table for lead length (LL) options.											

Performance Characteristics

Rated Voltage	300 VAC 50/60 Hz	
Capacitance Range	3 x 1.0 µF	
Capacitance Tolerance	±20%, other tolerances on request	
Temperature Range	−55°C to +105°C	
Climatic Category	55/105/56	
Dissipation Factor	Maximum Values at +23°C	
	1 kHz	0.10%
	10 kHz	0.50%
Test Voltage Between Terminals	The 100% screening factory test is carried out at 2,200 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. This test may not be repeated due to potential capacitor damage. KEMET is not liable in such case for any failures.	
Insulation Resistance	Minimum Value Between Terminals	
	≥ 10,000 MΩ • µF	
	Minimum Value Between Terminals and Case	
	≥ 100,000 MΩ	

Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle-flame test
Humidity	IEC 60068–2–3 Test Ca	+40°C and 90 – 95% RH, 56 days

Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.

Table 1 – Ratings & Part Number Reference

VAC	Cap Value (µF)	Max Dimensions in mm			Lead Spacing (p)	Package Quantity C (R06I2)	dV/dt (V/µs)	New KEMET Part Number	Legacy Part Number
		B	H	L					
300	3 x 1.0	30.0	11.5	64.0	27.5	72	100	9004AA105M300CDECTV680	PHZ9004EF7100MR06L2

Soldering Process

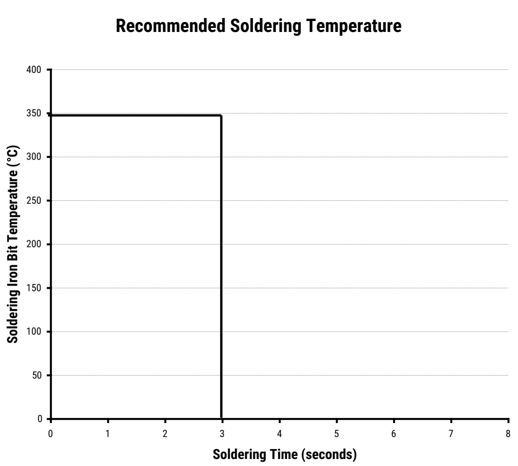
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 mm to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

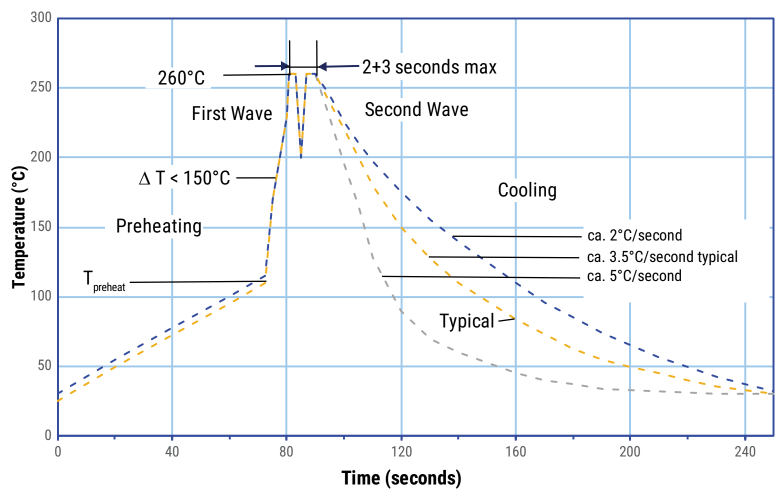
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont'd

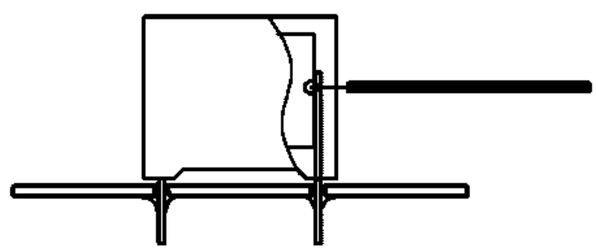
1. The table indicates the maximum set-up temperature of the soldering process

Figure 1

Dielectric Film Material	Maximum Preheat Temperature			Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 10 mm	Capacitor Pitch = 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	130°C	270°C	270°C
Polypropylene	100°C	110°C	130°C	260°C	270°C
Paper	130°C	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



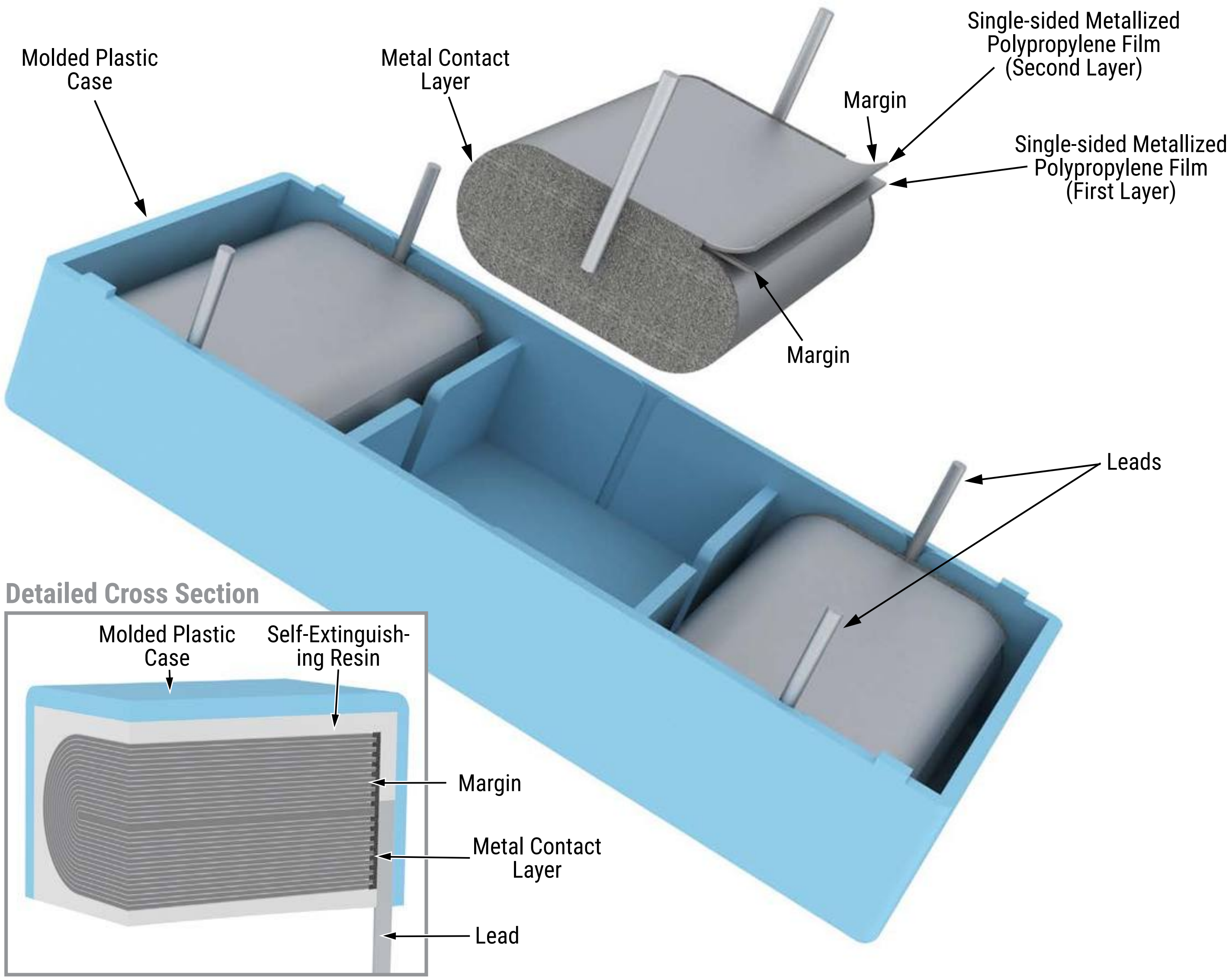
Temperature monitored inside the capacitor.

Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

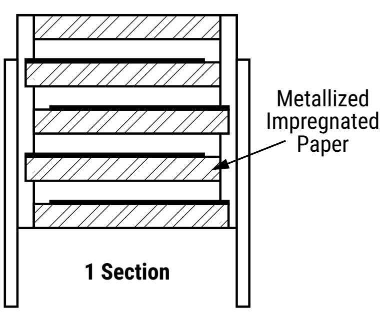
The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Construction

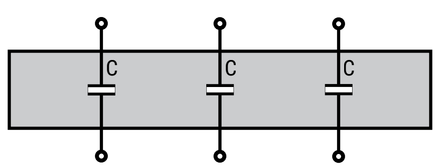


Detailed Cross Section

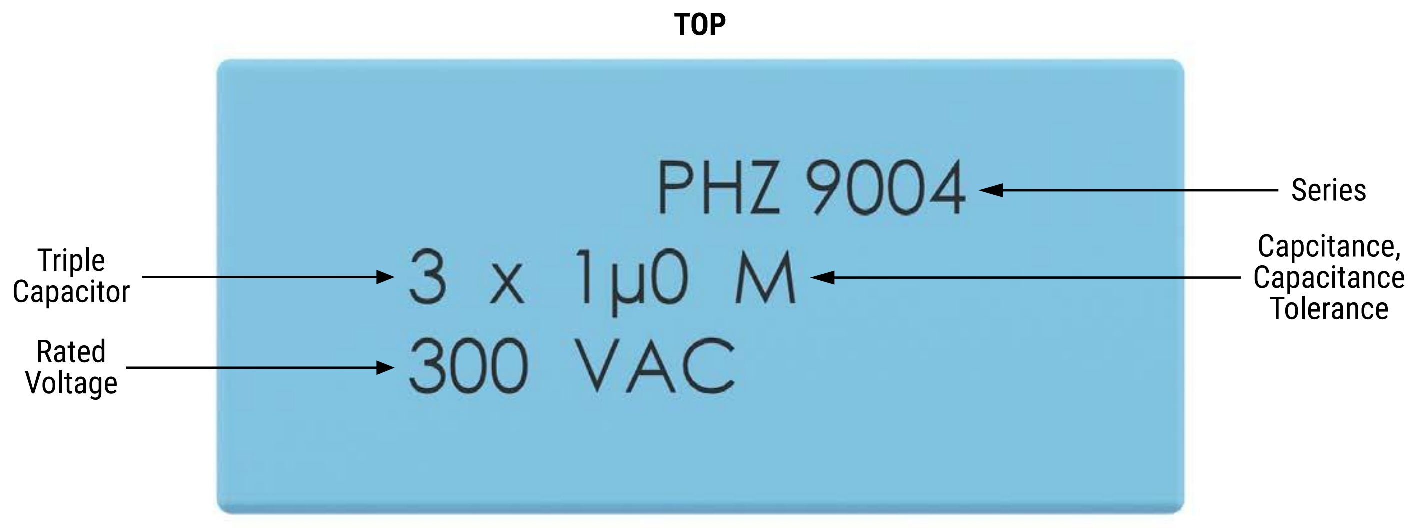
Winding Scheme



Electrical Scheme



Marking



Manufacturing Date Code (IEC–60062)

Y = Year, Z = Month			
Year	Code	Month	Code
2010	A	January	1
2011	B	February	2
2012	C	March	3
2013	D	April	4
2014	E	May	5
2015	F	June	6
2016	H	July	7
2017	J	August	8
2018	K	September	9
2019	L	October	O
2020	M	November	N
2021	N	December	D
2022	P		
2023	R		
2024	S		
2025	T		
2026	U		
2027	V		
2028	W		
2029	X		
2030	A		

F5D, 63 VDC

KEMET
a YAGEO company

Overview

The F5D series is a metallized polyester (MKT) film capacitor with an integrated ceramic capacitor, encapsulated in a thermosetting, resin-filled, plastic box with tinned wire leads. Box material is solvent-resistant and flame-retardant, meeting the requirements of UL 94 V–0.

Applications

For worldwide use as EMI/RFI suppressors for automotive motors and other suppression applications such as engine blower fans, central locking systems, heating/air-conditioning blowers, electric sun roofs, electric window regulators, fuel/oil pumps, electric windshield wipers, and electrically operated seats. This through-hole EMI/RFI suppression element is mainly used for automotive applications without a printed circuit board (e.g. motor suppression) or mixed through-hole and surface mount printed circuit boards.

Benefits

- Low inductive MKT capacitors in parallel construction with a ceramic capacitor in a single case that provides superior suppression results
- Approvals: AEC–Q200, ISO7637
- Rated Voltage: 63 VDC
- Capacitance Range: 0.1 – 2.2 µF
- Capacitance Tolerance: ±10%, ±20%
- Climatic Category: 55/125/56 IEC 60068–1
- Tape & Reel packaging in accordance with IEC 60286–2
- RoHS compliance and lead-free terminations
- Operating temperature range: −55˚C to +125˚C

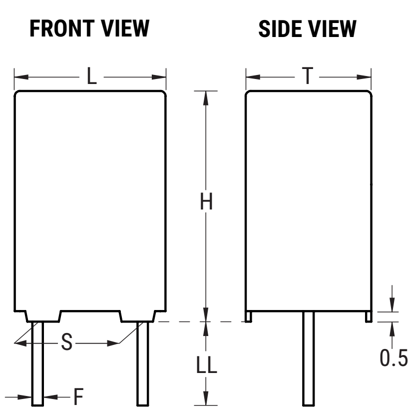
Part Number System

F5D	D	C	3100	DQ	W	5	M
Series	Rated Voltage (VDC)	Lead Spacing (mm)	Capacitance Code (pF)	Lead and Packaging Code	Ceramic Capacitor Value	Size Code	Capacitance Tolerance
Film Capacitor/ Ceramic Capacitor Unit	D = 63	C = 5 mm F= 10 mm	Digits 2 – 4 indicate the first three digits of the capacitance value. The first digit indicates the number of zeros to be added.	See Ordering Options Table	See Ceramic Capacitor Table	See Dimension Table	K = ±10% M = ±20%

Ordering Options Table

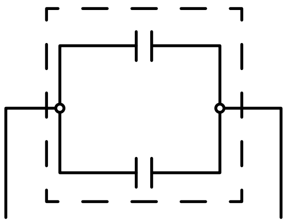
Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/-0	AA
	Ammo Pack	H_0 = 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Bulk (Bag) – Long Leads	17 +1/-2	Z3
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	CK
10	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/-0	AA
	Ammo Pack	H_0 = 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Bulk (Bag) – Long Leads	17 +1/-2	Z3
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	CK

Dimensions – Millimeters



Rated Capacitance	Size Code	S		T		H		L		F	
µF		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
0.1 – 0.47	5	5.0	±0.4	4.6	Maximum	9.6	Max	7.4	Maximum	0.6	±0.05
0.56 – 1.5	6	5.0	±0.4	5.1	Maximum	10.1	Max	7.5	Maximum	0.6	±0.05
1.8 – 2.2	7	5.0	±0.4	6.1	Maximum	11.1	Max	7.5	Maximum	0.6	±0.05
0.1 – 1.0	2	10.0	±0.4	5.2	Maximum	11.1	Max	13.4	Maximum	0.75	±0.05
1.2 – 1.5	3	10.0	±0.4	6.2	Maximum	12.1	Max	13.4	Maximum	0.75	±0.05
Note: See the Ordering Options Table for lead length (LL) options.											

Circuit Diagram



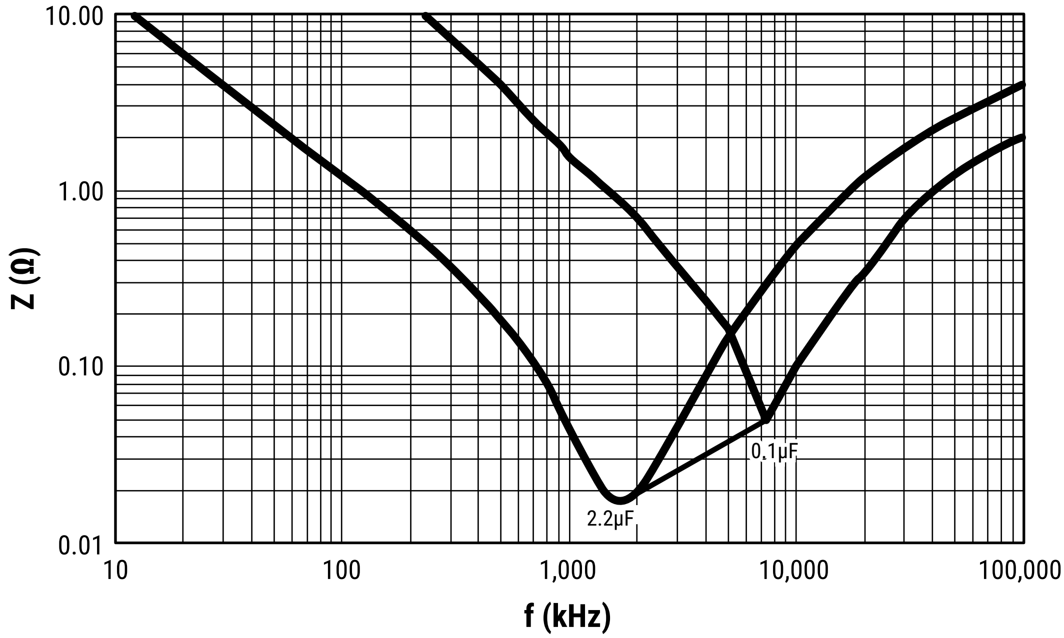
Ceramic Capacitor Value

Ceramic Capacitor Value	Digit 12
10 pF	U
22 pF	V
47 pF	W
68 pF	X
100 pF	E
220 pF	G
470 pF	A
680 pF	H
1 nF	C
2.2 nF	F
4.7 nF	B
6.8 nF	N
10 nF	D
47 nF	R
68 nF	T
100 nF	S

Performance Characteristics

Rated Voltage	63 VDC (For temperature over 100°C a decreasing factor of 2% per degree has to be applied on the rated voltage V_R)
Capacitance Range	0.1 – 2.2 µF (See Ceramic Capacitor Value Table)
Capacitance Tolerance	±10%, ±20%
Temperature Range	−55°C to +125°C
Climatic Category	55/125/56, IEC 60068−1
Leakage Current	≤ 10 µA at V_R
Approvals	AEC−Q200, ISO 7637
Dissipation Factor	0.025 (1 kHz at 25°C ±5°C)
Test Voltage Between Terminals	1.6 x V_R
Insulation Resistance	100 MΩ at 50 V

Impedance Graphs



Environmental Test Data

Test	Conditions	Performance	
Damp Heat Steady State	+40°C ±2°C and 93% ±2% R.H., 56 days	Δ C/C	≤ 5%
		DF Change	≤ 50 x 10^{-4} at 1 kHz
		Leakage Current at V_R	≤ 100 µA
Endurance	+125°C ±2°C/100°C ±2°C, 0.5 x V_R/1.0 x V_R, 1,000 hours	Δ C/C	≤ 10%
		DF Change	≤ 50 x 10^{-4} at 1 kHz
		Leakage Current at V_R	≤ 100 µA
Resistance to Soldering Heat	+260°C ±5°C, 10±1 second	Δ C/C	≤ 3%
		DF Change	≤ 30 x 10^{-4} at 1 kHz
		Leakage Current at V_R	≤ 50 µA
Long-Term Stability (After 2 Years)	−40°C to +80°C, ≤ 70% humidity	Δ C/C	≤ 3%
		DF Change	≤ 20 x 10^{-4} at 1 kHz
		Leakage Current at V_R	≤ 50 µA
Reliability Failure Criteria	Reference MIL HDB 217 +40°C ±2°C, 0.5 x V_R, ≤ 5 FIT	Δ C/C	> 10%
		DF Change	≤ 20 x 10^{-4} at 1 kHz
		Leakage Current at V_R	≤ 200 µA

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	VDC	Max Dimensions in mm			Lead Spacing (S)	Ceramic Cap (µF)	KEMET Part Number	Legacy Part Number
		T	H	L				
0.10	63	4.6	9.6	7.4	5.0	0.00001	5DDC3100(1)U5(2)	F5DDC3100(1)U5(2)
0.10	63	4.6	9.6	7.4	5.0	0.000022	5DDC3100(1)V5(2)	F5DDC3100(1)V5(2)
0.10	63	4.6	9.6	7.4	5.0	0.000047	5DDC3100(1)W5(2)	F5DDC3100(1)W5(2)
0.10	63	4.6	9.6	7.4	5.0	0.000068	5DDC3100(1)X5(2)	F5DDC3100(1)X5(2)
0.10	63	4.6	9.6	7.4	5.0	0.0001	5DDC3100(1)E5(2)	F5DDC3100(1)E5(2)
0.10	63	4.6	9.6	7.4	5.0	0.00022	5DDC3100(1)G5(2)	F5DDC3100(1)G5(2)
0.10	63	4.6	9.6	7.4	5.0	0.00047	5DDC3100(1)A5(2)	F5DDC3100(1)A5(2)
0.10	63	4.6	9.6	7.4	5.0	0.00068	5DDC3100(1)H5(2)	F5DDC3100(1)H5(2)
0.10	63	4.6	9.6	7.4	5.0	0.001	5DDC3100(1)C5(2)	F5DDC3100(1)C5(2)
0.10	63	4.6	9.6	7.4	5.0	0.0022	5DDC3100(1)F5(2)	F5DDC3100(1)F5(2)
0.10	63	4.6	9.6	7.4	5.0	0.0047	5DDC3100(1)B5(2)	F5DDC3100(1)B5(2)
0.10	63	4.6	9.6	7.4	5.0	0.0068	5DDC3100(1)N5(2)	F5DDC3100(1)N5(2)
0.10	63	4.6	9.6	7.4	5.0	0.01	5DDC3100(1)D5(2)	F5DDC3100(1)D5(2)
0.10	63	4.6	9.6	7.4	5.0	0.047	5DDC3100(1)R5(2)	F5DDC3100(1)R5(2)
0.10	63	4.6	9.6	7.4	5.0	0.068	5DDC3100(1)T5(2)	F5DDC3100(1)T5(2)
0.10	63	4.6	9.6	7.4	5.0	0.1	5DDC3100(1)S5(2)	F5DDC3100(1)S5(2)
0.22	63	4.6	9.6	7.4	5.0	0.00001	5DDC3220(1)U5(2)	F5DDC3220(1)U5(2)
0.22	63	4.6	9.6	7.4	5.0	0.000022	5DDC3220(1)V5(2)	F5DDC3220(1)V5(2)
0.22	63	4.6	9.6	7.4	5.0	0.000047	5DDC3220(1)W5(2)	F5DDC3220(1)W5(2)
0.22	63	4.6	9.6	7.4	5.0	0.000068	5DDC3220(1)X5(2)	F5DDC3220(1)X5(2)
0.22	63	4.6	9.6	7.4	5.0	0.0001	5DDC3220(1)E5(2)	F5DDC3220(1)E5(2)
0.22	63	4.6	9.6	7.4	5.0	0.00022	5DDC3220(1)G5(2)	F5DDC3220(1)G5(2)
0.22	63	4.6	9.6	7.4	5.0	0.00047	5DDC3220(1)A5(2)	F5DDC3220(1)A5(2)
0.22	63	4.6	9.6	7.4	5.0	0.00068	5DDC3220(1)H5(2)	F5DDC3220(1)H5(2)
0.22	63	4.6	9.6	7.4	5.0	0.001	5DDC3220(1)C5(2)	F5DDC3220(1)C5(2)
0.22	63	4.6	9.6	7.4	5.0	0.0022	5DDC3220(1)F5(2)	F5DDC3220(1)F5(2)
0.22	63	4.6	9.6	7.4	5.0	0.0047	5DDC3220(1)B5(2)	F5DDC3220(1)B5(2)
0.22	63	4.6	9.6	7.4	5.0	0.0068	5DDC3220(1)N5(2)	F5DDC3220(1)N5(2)
0.22	63	4.6	9.6	7.4	5.0	0.01	5DDC3220(1)D5(2)	F5DDC3220(1)D5(2)
0.22	63	4.6	9.6	7.4	5.0	0.047	5DDC3220(1)R5(2)	F5DDC3220(1)R5(2)
0.22	63	4.6	9.6	7.4	5.0	0.068	5DDC3220(1)T5(2)	F5DDC3220(1)T5(2)
0.22	63	4.6	9.6	7.4	5.0	0.1	5DDC3220(1)S5(2)	F5DDC3220(1)S5(2)
0.33	63	4.6	9.6	7.4	5.0	0.00001	5DDC3330(1)U5(2)	F5DDC3330(1)U5(2)
0.33	63	4.6	9.6	7.4	5.0	0.000022	5DDC3330(1)V5(2)	F5DDC3330(1)V5(2)
0.33	63	4.6	9.6	7.4	5.0	0.000047	5DDC3330(1)W5(2)	F5DDC3330(1)W5(2)
0.33	63	4.6	9.6	7.4	5.0	0.000068	5DDC3330(1)X5(2)	F5DDC3330(1)X5(2)
Capacitance Value (µF)	**VDC**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**Ceramic Cap (µF)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) K = 10%, M = 20%.

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Table 1 – Ratings & Part Number Reference cont.

Capacitance Value (µF)	VDC	Max Dimensions in mm			Lead Spacing (S)	Ceramic Cap (µF)	KEMET Part Number	Legacy Part Number
		T	H	L				
0.33	63	4.6	9.6	7.4	5.0	0.0001	5DDC3330(1)E5(2)	F5DDC3330(1)E5(2)
0.33	63	4.6	9.6	7.4	5.0	0.00022	5DDC3330(1)G5(2)	F5DDC3330(1)G5(2)
0.33	63	4.6	9.6	7.4	5.0	0.00047	5DDC3330(1)A5(2)	F5DDC3330(1)A5(2)
0.33	63	4.6	9.6	7.4	5.0	0.00068	5DDC3330(1)H5(2)	F5DDC3330(1)H5(2)
0.33	63	4.6	9.6	7.4	5.0	0.001	5DDC3330(1)C5(2)	F5DDC3330(1)C5(2)
0.33	63	4.6	9.6	7.4	5.0	0.0022	5DDC3330(1)F5(2)	F5DDC3330(1)F5(2)
0.33	63	4.6	9.6	7.4	5.0	0.0047	5DDC3330(1)B5(2)	F5DDC3330(1)B5(2)
0.33	63	4.6	9.6	7.4	5.0	0.0068	5DDC3330(1)N5(2)	F5DDC3330(1)N5(2)
0.33	63	4.6	9.6	7.4	5.0	0.01	5DDC3330(1)D5(2)	F5DDC3330(1)D5(2)
0.33	63	4.6	9.6	7.4	5.0	0.047	5DDC3330(1)R5(2)	F5DDC3330(1)R5(2)
0.33	63	4.6	9.6	7.4	5.0	0.068	5DDC3330(1)T5(2)	F5DDC3330(1)T5(2)
0.33	63	4.6	9.6	7.4	5.0	0.1	5DDC3330(1)S5(2)	F5DDC3330(1)S5(2)
0.47	63	4.6	9.6	7.4	5.0	0.00001	5DDC3470(1)U5(2)	F5DDC3470(1)U5(2)
0.47	63	4.6	9.6	7.4	5.0	0.000022	5DDC3470(1)V5(2)	F5DDC3470(1)V5(2)
0.47	63	4.6	9.6	7.4	5.0	0.000047	5DDC3470(1)W5(2)	F5DDC3470(1)W5(2)
0.47	63	4.6	9.6	7.4	5.0	0.000068	5DDC3470(1)X5(2)	F5DDC3470(1)X5(2)
0.47	63	4.6	9.6	7.4	5.0	0.0001	5DDC3470(1)E5(2)	F5DDC3470(1)E5(2)
0.47	63	4.6	9.6	7.4	5.0	0.00022	5DDC3470(1)G5(2)	F5DDC3470(1)G5(2)
0.47	63	4.6	9.6	7.4	5.0	0.00047	5DDC3470(1)A5(2)	F5DDC3470(1)A5(2)
0.47	63	4.6	9.6	7.4	5.0	0.00068	5DDC3470(1)H5(2)	F5DDC3470(1)H5(2)
0.47	63	4.6	9.6	7.4	5.0	0.001	5DDC3470(1)C5(2)	F5DDC3470(1)C5(2)
0.47	63	4.6	9.6	7.4	5.0	0.0022	5DDC3470(1)F5(2)	F5DDC3470(1)F5(2)
0.47	63	4.6	9.6	7.4	5.0	0.0047	5DDC3470(1)B5(2)	F5DDC3470(1)B5(2)
0.47	63	4.6	9.6	7.4	5.0	0.0068	5DDC3470(1)N5(2)	F5DDC3470(1)N5(2)
0.47	63	4.6	9.6	7.4	5.0	0.01	5DDC3470(1)D5(2)	F5DDC3470(1)D5(2)
0.47	63	4.6	9.6	7.4	5.0	0.047	5DDC3470(1)R5(2)	F5DDC3470(1)R5(2)
0.47	63	4.6	9.6	7.4	5.0	0.068	5DDC3470(1)T5(2)	F5DDC3470(1)T5(2)
0.47	63	4.6	9.6	7.4	5.0	0.1	5DDC3470(1)S5(2)	F5DDC3470(1)S5(2)
0.56	63	5.1	10.1	7.5	5.0	0.00001	5DDC3560(1)U6(2)	F5DDC3560(1)U6(2)
0.56	63	5.1	10.1	7.5	5.0	0.000022	5DDC3560(1)V6(2)	F5DDC3560(1)V6(2)
0.56	63	5.1	10.1	7.5	5.0	0.000047	5DDC3560(1)W6(2)	F5DDC3560(1)W6(2)
0.56	63	5.1	10.1	7.5	5.0	0.000068	5DDC3560(1)X6(2)	F5DDC3560(1)X6(2)
0.56	63	5.1	10.1	7.5	5.0	0.0001	5DDC3560(1)E6(2)	F5DDC3560(1)E6(2)
0.56	63	5.1	10.1	7.5	5.0	0.00022	5DDC3560(1)G6(2)	F5DDC3560(1)G6(2)
0.56	63	5.1	10.1	7.5	5.0	0.00047	5DDC3560(1)A6(2)	F5DDC3560(1)A6(2)
0.56	63	5.1	10.1	7.5	5.0	0.00068	5DDC3560(1)H6(2)	F5DDC3560(1)H6(2)
0.56	63	5.1	10.1	7.5	5.0	0.001	5DDC3560(1)C6(2)	F5DDC3560(1)C6(2)
0.56	63	5.1	10.1	7.5	5.0	0.0022	5DDC3560(1)F6(2)	F5DDC3560(1)F6(2)
0.56	63	5.1	10.1	7.5	5.0	0.0047	5DDC3560(1)B6(2)	F5DDC3560(1)B6(2)
0.56	63	5.1	10.1	7.5	5.0	0.0068	5DDC3560(1)N6(2)	F5DDC3560(1)N6(2)
0.56	63	5.1	10.1	7.5	5.0	0.01	5DDC3560(1)D6(2)	F5DDC3560(1)D6(2)
0.56	63	5.1	10.1	7.5	5.0	0.047	5DDC3560(1)R6(2)	F5DDC3560(1)R6(2)
Capacitance Value (µF)	**VDC**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**Ceramic Cap (µF)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) K = 10%, M = 20%.

Table 1 – Ratings & Part Number Reference cont.

Capacitance Value (µF)	VDC	Max Dimensions in mm			Lead Spacing (S)	Ceramic Cap (µF)	KEMET Part Number	Legacy Part Number
		T	H	L				
0.56	63	5.1	10.1	7.5	5.0	0.068	5DDC3560(1)T6(2)	F5DDC3560(1)T6(2)
0.56	63	5.1	10.1	7.5	5.0	0.1	5DDC3560(1)S6(2)	F5DDC3560(1)S6(2)
0.68	63	5.1	10.1	7.5	5.0	0.00001	5DDC3680(1)U6(2)	F5DDC3680(1)U6(2)
0.68	63	5.1	10.1	7.5	5.0	0.000022	5DDC3680(1)V6(2)	F5DDC3680(1)V6(2)
0.68	63	5.1	10.1	7.5	5.0	0.000047	5DDC3680(1)W6(2)	F5DDC3680(1)W6(2)
0.68	63	5.1	10.1	7.5	5.0	0.000068	5DDC3680(1)X6(2)	F5DDC3680(1)X6(2)
0.68	63	5.1	10.1	7.5	5.0	0.0001	5DDC3680(1)E6(2)	F5DDC3680(1)E6(2)
0.68	63	5.1	10.1	7.5	5.0	0.00022	5DDC3680(1)G6(2)	F5DDC3680(1)G6(2)
0.68	63	5.1	10.1	7.5	5.0	0.00047	5DDC3680(1)A6(2)	F5DDC3680(1)A6(2)
0.68	63	5.1	10.1	7.5	5.0	0.00068	5DDC3680(1)H6(2)	F5DDC3680(1)H6(2)
0.68	63	5.1	10.1	7.5	5.0	0.001	5DDC3680(1)C6(2)	F5DDC3680(1)C6(2)
0.68	63	5.1	10.1	7.5	5.0	0.0022	5DDC3680(1)F6(2)	F5DDC3680(1)F6(2)
0.68	63	5.1	10.1	7.5	5.0	0.0047	5DDC3680(1)B6(2)	F5DDC3680(1)B6(2)
0.68	63	5.1	10.1	7.5	5.0	0.0068	5DDC3680(1)N6(2)	F5DDC3680(1)N6(2)
0.68	63	5.1	10.1	7.5	5.0	0.01	5DDC3680(1)D6(2)	F5DDC3680(1)D6(2)
0.68	63	5.1	10.1	7.5	5.0	0.047	5DDC3680(1)R6(2)	F5DDC3680(1)R6(2)
0.68	63	5.1	10.1	7.5	5.0	0.068	5DDC3680(1)T6(2)	F5DDC3680(1)T6(2)
0.68	63	5.1	10.1	7.5	5.0	0.1	5DDC3680(1)S6(2)	F5DDC3680(1)S6(2)
1.00	63	5.1	10.1	7.5	5.0	0.00001	5DDC4100(1)U6(2)	F5DDC4100(1)U6(2)
1.00	63	5.1	10.1	7.5	5.0	0.000022	5DDC4100(1)V6(2)	F5DDC4100(1)V6(2)
1.00	63	5.1	10.1	7.5	5.0	0.000047	5DDC4100(1)W6(2)	F5DDC4100(1)W6(2)
1.00	63	5.1	10.1	7.5	5.0	0.000068	5DDC4100(1)X6(2)	F5DDC4100(1)X6(2)
1.00	63	5.1	10.1	7.5	5.0	0.0001	5DDC4100(1)E6(2)	F5DDC4100(1)E6(2)
1.00	63	5.1	10.1	7.5	5.0	0.00022	5DDC4100(1)G6(2)	F5DDC4100(1)G6(2)
1.00	63	5.1	10.1	7.5	5.0	0.00047	5DDC4100(1)A6(2)	F5DDC4100(1)A6(2)
1.00	63	5.1	10.1	7.5	5.0	0.00068	5DDC4100(1)H6(2)	F5DDC4100(1)H6(2)
1.00	63	5.1	10.1	7.5	5.0	0.001	5DDC4100(1)C6(2)	F5DDC4100(1)C6(2)
1.00	63	5.1	10.1	7.5	5.0	0.0022	5DDC4100(1)F6(2)	F5DDC4100(1)F6(2)
1.00	63	5.1	10.1	7.5	5.0	0.0047	5DDC4100(1)B6(2)	F5DDC4100(1)B6(2)
1.00	63	5.1	10.1	7.5	5.0	0.0068	5DDC4100(1)N6(2)	F5DDC4100(1)N6(2)
1.00	63	5.1	10.1	7.5	5.0	0.01	5DDC4100(1)D6(2)	F5DDC4100(1)D6(2)
1.00	63	5.1	10.1	7.5	5.0	0.047	5DDC4100(1)R6(2)	F5DDC4100(1)R6(2)
1.00	63	5.1	10.1	7.5	5.0	0.068	5DDC4100(1)T6(2)	F5DDC4100(1)T6(2)
1.00	63	5.1	10.1	7.5	5.0	0.1	5DDC4100(1)S6(2)	F5DDC4100(1)S6(2)
1.50	63	6.1	11.1	7.5	5.0	0.00001	5DDC4150(1)U7(2)	F5DDC4150(1)U7(2)
1.50	63	6.1	11.1	7.5	5.0	0.000022	5DDC4150(1)V7(2)	F5DDC4150(1)V7(2)
1.50	63	6.1	11.1	7.5	5.0	0.000047	5DDC4150(1)W7(2)	F5DDC4150(1)W7(2)
1.50	63	6.1	11.1	7.5	5.0	0.000068	5DDC4150(1)X7(2)	F5DDC4150(1)X7(2)
1.50	63	6.1	11.1	7.5	5.0	0.0001	5DDC4150(1)E7(2)	F5DDC4150(1)E7(2)
1.50	63	6.1	11.1	7.5	5.0	0.00022	5DDC4150(1)G7(2)	F5DDC4150(1)G7(2)
1.50	63	6.1	11.1	7.5	5.0	0.00047	5DDC4150(1)A7(2)	F5DDC4150(1)A7(2)
1.50	63	6.1	11.1	7.5	5.0	0.00068	5DDC4150(1)H7(2)	F5DDC4150(1)H7(2)
Capacitance Value (µF)	VDC	T (mm)	H (mm)	L (mm)	Lead Spacing (S)	Ceramic Cap (µF)	KEMET Part Number	Legacy Part Number

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) K = 10%, M = 20%.

Table 1 – Ratings & Part Number Reference cont.

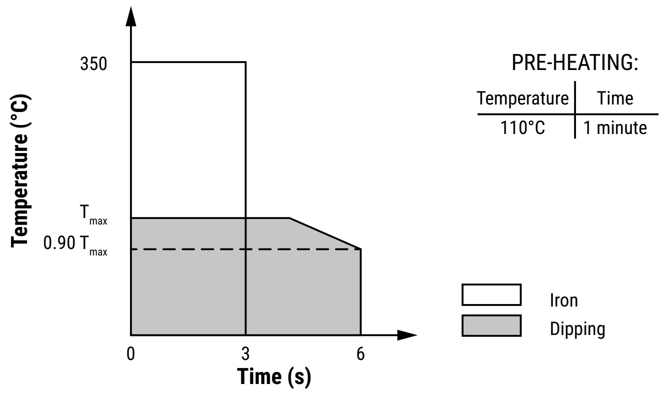
Capacitance Value (µF)	VDC	Max Dimensions in mm T	H	L	Lead Spacing (S)	Ceramic Cap (µF)	KEMET Part Number	Legacy Part Number
1.50	63	6.1	11.1	7.5	5.0	0.001	5DDC4150(1)C7(2)	F5DDC4150(1)C7(2)
1.50	63	6.1	11.1	7.5	5.0	0.0022	5DDC4150(1)F7(2)	F5DDC4150(1)F7(2)
1.50	63	6.1	11.1	7.5	5.0	0.0047	5DDC4150(1)B7(2)	F5DDC4150(1)B7(2)
1.50	63	6.1	11.1	7.5	5.0	0.0068	5DDC4150(1)N7(2)	F5DDC4150(1)N7(2)
1.50	63	6.1	11.1	7.5	5.0	0.01	5DDC4150(1)D7(2)	F5DDC4150(1)D7(2)
1.50	63	6.1	11.1	7.5	5.0	0.047	5DDC4150(1)R7(2)	F5DDC4150(1)R7(2)
1.50	63	6.1	11.1	7.5	5.0	0.068	5DDC4150(1)T7(2)	F5DDC4150(1)T7(2)
1.50	63	6.1	11.1	7.5	5.0	0.1	5DDC4150(1)S7(2)	F5DDC4150(1)S7(2)
1.80	63	6.1	11.1	7.5	5.0	0.1	5DDC4180(1)S7(2)	F5DDC4180(1)S7(2)
1.80	63	6.1	11.1	7.5	5.0	0.000022	5DDC4180(1)V7(2)	F5DDC4180(1)V7(2)
1.80	63	6.1	11.1	7.5	5.0	0.000047	5DDC4180(1)W7(2)	F5DDC4180(1)W7(2)
1.80	63	6.1	11.1	7.5	5.0	0.000068	5DDC4180(1)X7(2)	F5DDC4180(1)X7(2)
1.80	63	6.1	11.1	7.5	5.0	0.0001	5DDC4180(1)E7(2)	F5DDC4180(1)E7(2)
1.80	63	6.1	11.1	7.5	5.0	0.00022	5DDC4180(1)G7(2)	F5DDC4180(1)G7(2)
1.80	63	6.1	11.1	7.5	5.0	0.00047	5DDC4180(1)A7(2)	F5DDC4180(1)A7(2)
1.80	63	6.1	11.1	7.5	5.0	0.00068	5DDC4180(1)H7(2)	F5DDC4180(1)H7(2)
1.80	63	6.1	11.1	7.5	5.0	0.001	5DDC4180(1)C7(2)	F5DDC4180(1)C7(2)
1.80	63	6.1	11.1	7.5	5.0	0.0022	5DDC4180(1)F7(2)	F5DDC4180(1)F7(2)
1.80	63	6.1	11.1	7.5	5.0	0.0047	5DDC4180(1)B7(2)	F5DDC4180(1)B7(2)
1.80	63	6.1	11.1	7.5	5.0	0.0068	5DDC4180(1)N7(2)	F5DDC4180(1)N7(2)
1.80	63	6.1	11.1	7.5	5.0	0.01	5DDC4180(1)D7(2)	F5DDC4180(1)D7(2)
1.80	63	6.1	11.1	7.5	5.0	0.047	5DDC4180(1)R7(2)	F5DDC4180(1)R7(2)
1.80	63	6.1	11.1	7.5	5.0	0.068	5DDC4180(1)T7(2)	F5DDC4180(1)T7(2)
1.80	63	6.1	11.1	7.5	5.0	0.00001	5DDC4180(1)U7(2)	F5DDC4180(1)U7(2)
2.20	63	6.1	11.1	7.5	5.0	0.1	5DDC4220(1)S7(2)	F5DDC4220(1)S7(2)
2.20	63	6.1	11.1	7.5	5.0	0.000022	5DDC4220(1)V7(2)	F5DDC4220(1)V7(2)
2.20	63	6.1	11.1	7.5	5.0	0.000047	5DDC4220(1)W7(2)	F5DDC4220(1)W7(2)
2.20	63	6.1	11.1	7.5	5.0	0.000068	5DDC4220(1)X7(2)	F5DDC4220(1)X7(2)
2.20	63	6.1	11.1	7.5	5.0	0.0001	5DDC4220(1)E7(2)	F5DDC4220(1)E7(2)
2.20	63	6.1	11.1	7.5	5.0	0.00022	5DDC4220(1)G7(2)	F5DDC4220(1)G7(2)
2.20	63	6.1	11.1	7.5	5.0	0.00047	5DDC4220(1)A7(2)	F5DDC4220(1)A7(2)
2.20	63	6.1	11.1	7.5	5.0	0.00068	5DDC4220(1)H7(2)	F5DDC4220(1)H7(2)
2.20	63	6.1	11.1	7.5	5.0	0.001	5DDC4220(1)C7(2)	F5DDC4220(1)C7(2)
2.20	63	6.1	11.1	7.5	5.0	0.0022	5DDC4220(1)F7(2)	F5DDC4220(1)F7(2)
2.20	63	6.1	11.1	7.5	5.0	0.0047	5DDC4220(1)B7(2)	F5DDC4220(1)B7(2)
2.20	63	6.1	11.1	7.5	5.0	0.0068	5DDC4220(1)N7(2)	F5DDC4220(1)N7(2)
2.20	63	6.1	11.1	7.5	5.0	0.01	5DDC4220(1)D7(2)	F5DDC4220(1)D7(2)
2.20	63	6.1	11.1	7.5	5.0	0.047	5DDC4220(1)R7(2)	F5DDC4220(1)R7(2)
2.20	63	6.1	11.1	7.5	5.0	0.068	5DDC4220(1)T7(2)	F5DDC4220(1)T7(2)
2.20	63	6.1	11.1	7.5	5.0	0.00001	5DDC4220(1)U7(2)	F5DDC4220(1)U7(2)
Capacitance Value (µF)	**VDC**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**Ceramic Cap (µF)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) K = 10%, M = 20%.

Maximum Soldering Temperature

In order to achieve optimal solderability, we suggest the following:

- Set the temperature so that the maximum temperature inside the element is below 160°C.
- Solder within the following temperature profiles, especially for iron soldering:



PRE-HEATING:

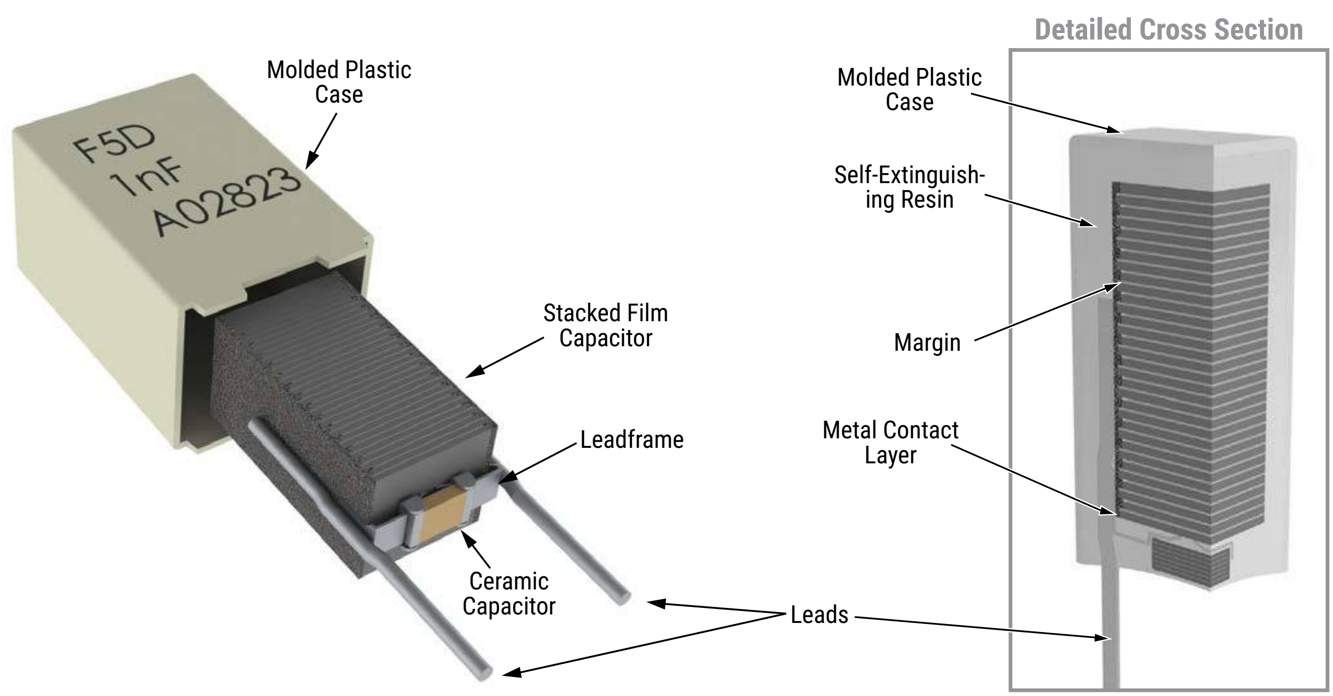
Temperature	Time
110°C	1 minute

Box series: T_{max} = 275°C for 4 seconds

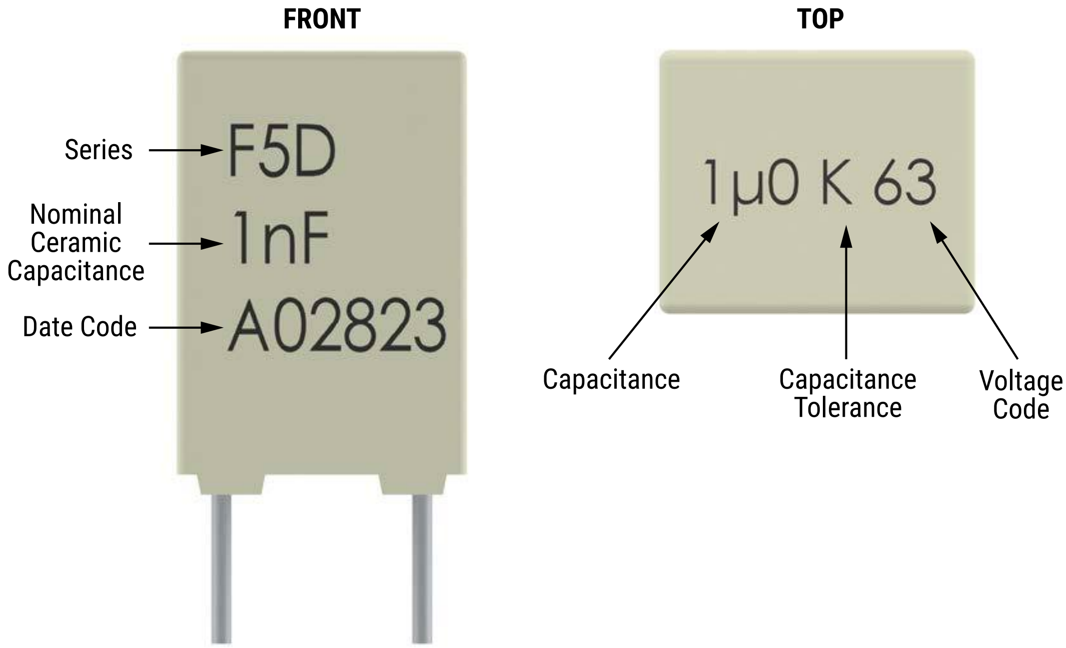
General Conditions

- If two solderings are required, allow for recovery time until the temperature on the capacitor surface is below 50°C.
- Avoid passing through the adhesive curing oven when fixing surface-mount parts in combination with through-hole parts. Insert through-hole parts only after curing the surface-mount parts.
- Avoid reflow soldering by combining the lead type with surface-mount parts.

Construction



Marking

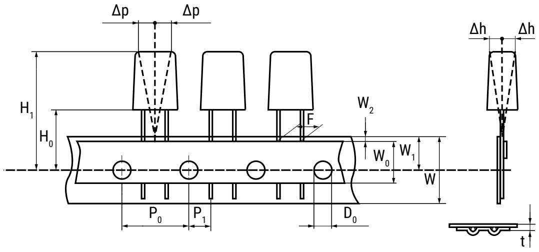


Packaging Quantities

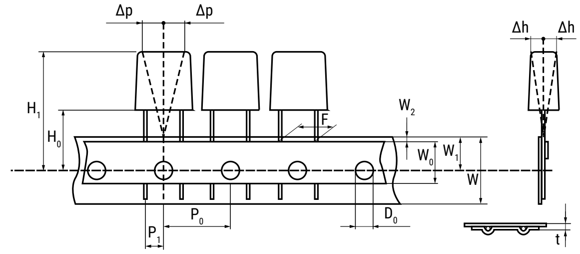
Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 355 mm	Large Reel 500 mm	Ammo
5	4.6	9.6	7.4	1,500	2,000	1,400		1,900
	5.1	10.1	7.5	1,000	1,500	1,200		1,700
	6.1	11.1	7.5	2,000	1,000	1,000		1,400
	7.3	13.1	7.5	1,500	750	800		1,150
10	5.2	11.1	13.4	1,300	2,000	600	1,250	800
	6.2	12.1	13.4	1,000	1,800	500	1,000	680

Lead Taping & Packaging (IEC 60286–2)

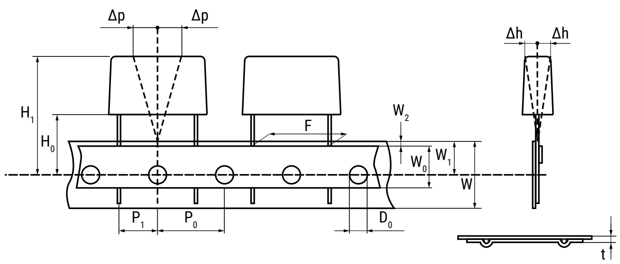
Lead Spacing 5 mm



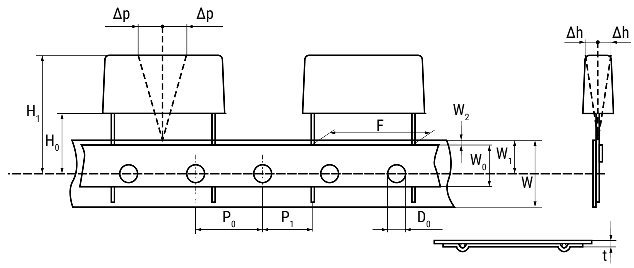
Lead Spacing 7.5 mm



Lead Spacing 10 – 15 mm



Lead Spacing 22.5 – 27.5 mm



Taping Specification

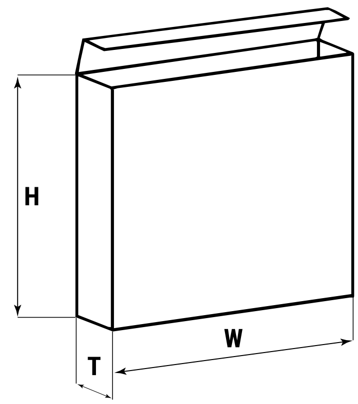
Dimensions in mm									Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	5.0	7.5	10.0	15.0	22.5	27.5	F
Carrier Tape Width	+1/−0.5	W	18.0	18.0	18.0	18.0	18.0	18.0	$18^{+1/-0.5}$
Hold-Down Tape Width	Minimum	W_0	6.0	6.0	9.0	10.0	10.0	10.0	
Position of Sprocket Hole	±0.5	W_1	9.0	9.0	9.0	9.0	9.0	9.0	$9^{+0.75/-0.5}$
Distance Between Tapes	Maximum	W_2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Sprocket Hole Diameter	±0.2	D_0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Feed Hole Lead Spacing	±0.2(1)	P_0(3)	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.85	3.75	7.7	5.2	7.8	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	±2	Δh	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.9^{MAX}	0.9^{MAX}	0.9^{MAX}
Sprocket Hole/Cap Body	±0.5	H_0(2)	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18^{+2/-0}$

(1) Maximum cumulative feed hole error, 1 mm per 20 parts.
(2) 16.5 mm available on request.
(3) 15 mm available on request (F ≥ 10 mm).

Lead Taping & Packaging (IEC 60286–2) cont.

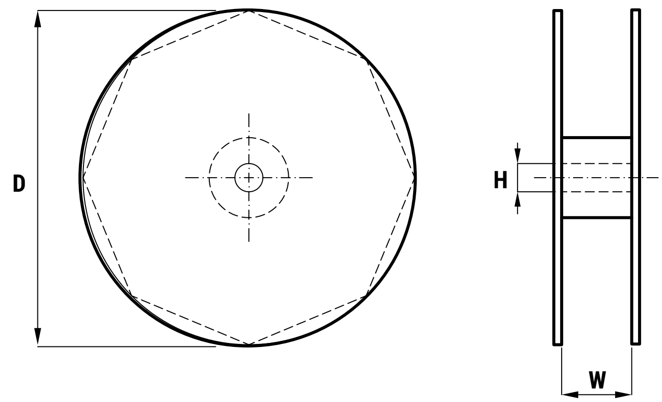
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
F5A, F5B, F5D F6xx, F8xx	360	340	59
PHExxx, PMExxx, PMRxxx	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
F5A, F5B, F5D F6xx, F8xx	355 500	30 25	55 (Max)
PHExxx, PMExxx, PMRxxx	360 500	30	46 (Max)



F43 Metallized Polypropylene RC Snubber Film, 160 – 220 VAC/250 – 630 VDC; 275 VAC Class X2

Overview

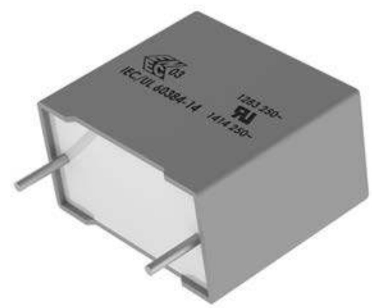
The F43 is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material that meets the requirements of UL 94 V–0.

Applications

Typical applications include worldwide use in contact protection, contact interference suppression, and transient suppression.

Benefits

- Approvals (for 275 VAC only): ENEC, UL
- Rated voltage: 160 VAC/250 VDC, 200 VAC/400 VDC, 220 VAC/630 VDC, 275 VAC Class X2
- Capacitance range: 0.01 – 1.0 µF
- Lead spacing: 15.0 – 27.5 mm
- Capacitance tolerance: ±20%, ±10%
- Resistance range: 22 – 470 Ω
- Resistance tolerance: ±10%
- Resistance power: 0.5 W
- Climatic category: 55/100/56, IEC 60068–1 and 40/100/56 (275 VAC), IEC 60068–1
- Tape & Reel packaging in accordance with IEC 60286-2
- RoHS compliance and lead (Pb)-free terminations
- Operating temperature range: –55°C to +100°C and –40°C to +100°C (275 VAC)



Part Number System

F	43	K	N	3100	XX	01	K	R101
Capacitor Class	Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance	Resistance (Ω)
Legacy PN: F New KEMET PN: Omit this character	RC Snubber, Metallized Polypropylene	I = 160 M = 200 P = 220 K = 275 (X2)	I = 15.0 N = 22.5 R = 27.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	See Ordering Option Table. Contact KEMET for other packaging availability and details.	00, 01, 04 (Standard)	K = ±10% M = ±20%	R plus first two digits represent significant figures. Third digit specifies number of zeros.

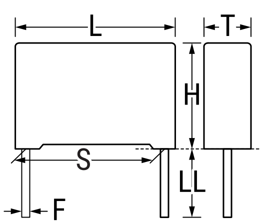
Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
15 22.5 27.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short leads	4 +2/−0	00
	Ammo Pack	H_0 = 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel Ø = 500 mm)	H_0 = 18.5 ±0.5	CK
	Bulk (Bag) – Long leads	30 +5/−0	40
	Bulk (Bag) – Long leads	25 +2/−1	50
	Bulk (Bag) – Insulated Rigid Leads	30 +5/-0 (sp 8 ±2)	51
	Bulk (Bag) – Insulated Flexible Leads	150 ±5 (sp 8 ±2)	52

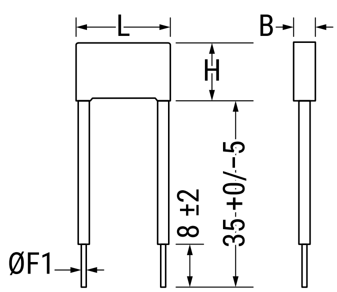
Contact KEMET for availability and details for special leads or packing.

Dimensions – Millimeters

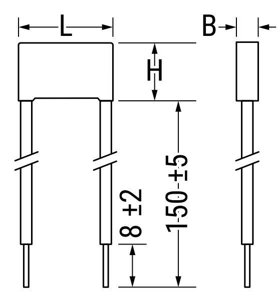
Loose



Insulated Rigid Leads



Insulated Flexible Leads 0.5 mm²



S		T		H		L		F		F1	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
15.0	±0.4	6.0	+0.2	17.5	+0.1	18.0	+0.3	0.6	±0.05	0.8	±0.05
15.0	±0.4	7.5	+0.2	14.5	+0.1	18.0	+0.5	0.6	±0.05	0.8	±0.05
15.0	±0.4	8.5	+0.2	14.5	+0.1	18.0	+0.5	0.6	±0.05	0.8	±0.05
15.0	±0.4	10.0	+0.2	16.0	+0.1	18.0	+0.5	0.6	±0.05	0.8	±0.05
22.5	±0.4	6.0	+0.2	15.0	+0.1	26.5	+0.3	0.6	±0.05	0.8	±0.05
22.5	±0.4	7.0	+0.2	16.0	+0.1	26.5	+0.3	0.6	±0.05	0.8	±0.05
22.5	±0.4	8.5	+0.2	17.0	+0.1	26.5	+0.3	0.6	±0.05	0.8	±0.05
22.5	±0.4	10.0	+0.2	18.5	+0.1	26.5	+0.3	0.8	±0.05	0.8	±0.05
22.5	±0.4	11.0	+0.2	20.0	+0.1	26.5	+0.3	0.8	±0.05	0.8	±0.05
27.5	±0.4	11.0	+0.2	20.0	+0.1	32.0	+0.3	0.8	±0.05	0.8	±0.05
27.5	±0.4	13.0	+0.2	22.0	+0.1	32.0	+0.3	0.8	±0.05	0.8	±0.05
27.5	±0.4	18.0	+0.2	33.0	+0.1	32.0	+0.3	0.8	±0.05	0.8	±0.05
Note: See the Ordering Options Table for lead length (LL) options.											

Performance Characteristics

Rated Voltage	160 VAC/250 VDC, 200 VAC/400 VDC, 220 VAC/630 VDC, 275 VAC, Class X2	
Capacitance Range	0.01 – 1.0 µF	
Capacitance Tolerance	±10%, ±20%	
Temperature Range	−55°C to +100°C, −40°C to +100°C (275 VAC)	
Climatic Category	55/100/56, 40/100/56 (275 VAC)	
Approvals	ENEC, UL	
Dissipation Factor	Maximum Values at +23°C	
	Frequency	tanδ
	1 kHz	0.1%
Test Voltage Between Terminals	The 100% screening factory test is carried out at 1.6 UR, 4.3 UR for 275 VAC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. This test may not be repeated due to potential capacitor damage. KEMET is not liable for any failures that result from re-testing.	
Insulation Resistance	Between Terminals	
	C ≤ 0.33 µF	≥ 10,000 MΩ
	C > 0.33 µF	≥ 3,000 MΩ • µF
In DC Applications	Recommended voltage ≤ 800 VDC	

Environmental Test Data

Test	IEC Publication	Procedure
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 500 Hz at 0.75 mm or 98 m/seconds^2
Bump	IEC 60068–2–29 Test Eb	4,000 bumps at 390 m/seconds^2
Solderability	IEC 60068–2–20 Test Ta	Wetting time d or d > 0.8 < 1.5 seconds
Active Flammability	IEC 60384–14	V_R +20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 needle flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% R.H., 56 days

Approvals

Certification Body	Specification	File Number
ENEC	EN/IEC 60384–14	CA08.00032
cULus	UL 60384–14 and CAN/CSA–E60384–14	E97797

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

Circuit Drawings

Mounting: RC units are mounted parallel to the contacts to be protected or parallel to the inductive load (Figures 1 and 2). RC units are generally mounted parallel to the contacts to suppress radio interference (Figure 1).

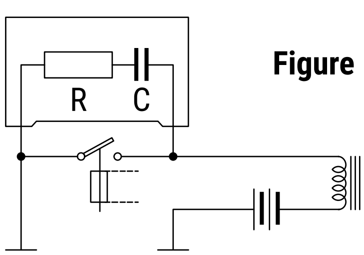


Figure 1

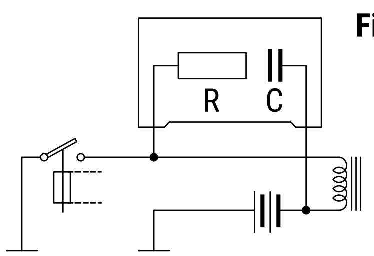


Figure 2

Table 1 – Ratings & Part Number Reference

VAC	VDC	Capacitance Value (µF)	Max Dimensions in mm			Lead Spacing (S)	KEMET Part Number	Legacy Part Number
			T	H	L			
160	250	0.25	8.5	14.5	18.0	15.0	43II3250(1)01(2)(3)	F43II3250(1)01(2)(3)
160	250	0.33	6.0	15.0	26.5	22.5	43IN3330(1)01(2)(3)	F43IN3330(1)01(2)(3)
160	250	0.47	8.5	17.0	26.5	22.5	43IN3470(1)01(2)(3)	F43IN3470(1)01(2)(3)
160	250	0.5	8.5	17.0	26.5	22.5	43IN3500(1)01(2)(3)	F43IN3500(1)01(2)(3)
160	250	1	10.0	18.5	26.5	22.5	43IN4100(1)01(2)(3)	F43IN4100(1)01(2)(3)
200	400	0.25	7.0	16.0	26.5	22.5	43MN3250(1)01(2)(3)	F43MN3250(1)01(2)(3)
200	400	0.5	10.0	18.5	26.5	22.5	43MN3500(1)01(2)(3)	F43MN3500(1)01(2)(3)
200	400	1	13.0	22.0	32.0	27.5	43MR4100(1)01(2)(3)	F43MR4100(1)01(2)(3)
220	630	0.022	7.5	14.5	18.0	15.0	43PI2220(1)01(2)(3)	F43PI2220(1)01(2)(3)
220	630	0.1	7.0	16.0	26.5	22.5	43PN3100(1)01(2)(3)	F43PN3100(1)01(2)(3)
220	630	0.25	11.0	20.0	26.5	22.5	43PN3250(1)01(2)(3)	F43PN3250(1)01(2)(3)
220	630	0.5	13.0	22.0	32.0	27.5	43PR3500(1)01(2)(3)	F43PR3500(1)01(2)(3)
275 (X2)		0.01	7.5	14.5	18.0	15.0	43KI2100(1)01(2)(3)	F43KI2100(1)01(2)(3)
275 (X2)		0.015	7.5	14.5	18.0	15.0	43KI2150(1)01(2)(3)	F43KI2150(1)01(2)(3)
275 (X2)		0.022	7.5	14.5	18.0	15.0	43KI2220(1)01(2)(3)	F43KI2220(1)01(2)(3)
275 (X2)		0.033	7.5	14.5	18.0	15.0	43KI2330(1)01(2)(3)	F43KI2330(1)01(2)(3)
275 (X2)		0.047	7.5	14.5	18.0	15.0	43KI2470(1)01(2)(3)	F43KI2470(1)01(2)(3)
275 (X2)		0.068	10.0	16.0	18.0	15.0	43KI2680(1)01(2)(3)	F43KI2680(1)01(2)(3)
275 (X2)		0.1	8.5	17.0	26.5	22.5	43KN3100(1)01(2)(3)	F43KN3100(1)01(2)(3)
275 (X2)		0.15	10.0	18.5	26.5	22.5	43KN3150(1)01(2)(3)	F43KN3150(1)01(2)(3)
275 (X2)		0.22	11.0	20.0	26.5	22.5	43KN3220(1)01(2)(3)	F43KN3220(1)01(2)(3)
275 (X2)		0.25	11.0	20.0	32.0	27.5	43KR3250(1)01(2)(3)	F43KR3250(1)01(2)(3)
275 (X2)		0.33	11.0	20.0	32.0	27.5	43KR3330(1)01(2)(3)	F43KR3330(1)01(2)(3)
275 (X2)		0.47	13.0	22.0	32.0	27.5	43KR3470(1)01(2)(3)	F43KR3470(1)01(2)(3)
275 (X2)		0.5	13.0	22.0	32.0	27.5	43KR3500(1)01(2)(3)	F43KR3500(1)01(2)(3)
275 (X2)		0.68	18.0	33.0	32.0	27.5	43KR3680(1)01(2)(3)	F43KR3680(1)01(2)(3)
275 (X2)		1	18.0	33.0	32.0	27.5	43KR4100(1)01(2)(3)	F43KR4100(1)01(2)(3)
VAC	VDC	Capacitance Value (µF)	T (mm)	H (mm)	L (mm)	Lead Spacing (S)	KEMET Part Number	Legacy Part Number

(1) Lead and packaging code. Contact KEMET for availability and details.

(2) M = ±20%, K = ±10%.

(3) Resistance value [Ω] - R plus first two digits represent significant figures. Third digit specifies number of zeros:

R220 = 22 Ω
R470 = 47 Ω
R101 = 100 Ω
R221 = 220 Ω
R471 = 470 Ω

Soldering Process

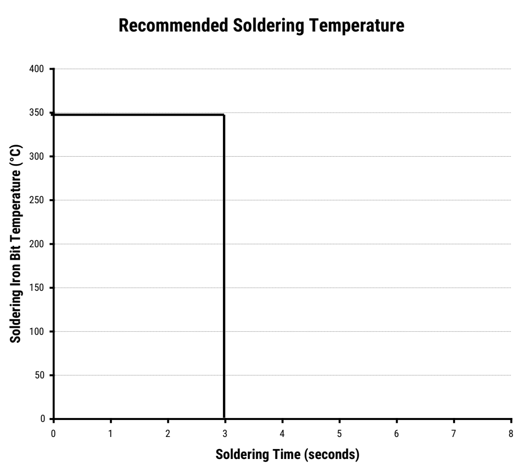
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for SnPb eutectic alloy to 217 – 221ºC for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170ºC). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm), and great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the recommended limits may result in degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface-mount components. Insert through-hole parts after curing the surface-mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum of two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

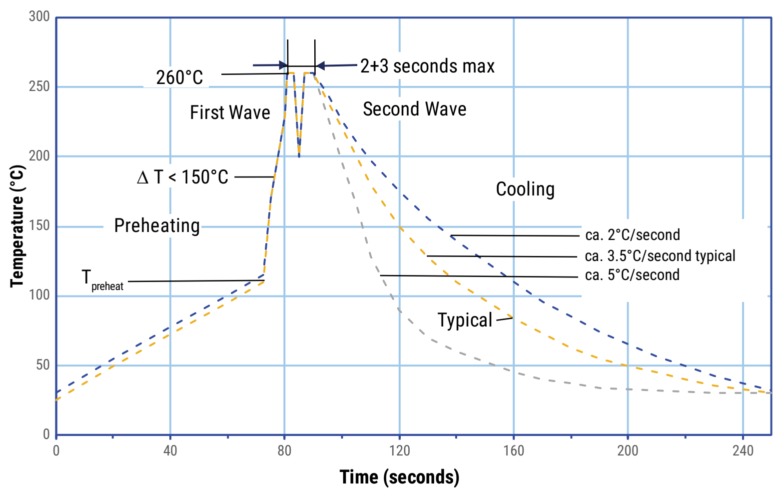
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



Soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

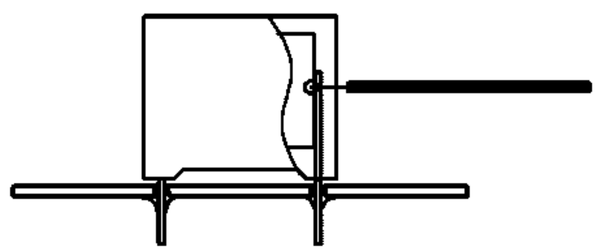
Wave Soldering Recommendations cont.

1. The table indicates the maximum setup temperature for the soldering process.

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≥ 10 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that inside the element the maximum temperature is below the limit.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



Temperature monitored inside the capacitor.

Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath, as in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder, only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering. Great care must be taken so that the parts do not overheat.

Marking

- KEMET's logo
- Series
- Capacitance
- Rated resistance
- Rated voltage
- Capacitor class
- Approval marks
- IEC climatic category
- Passive flammability class
- Manufacturing date code

Packaging Quantities

Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads		
Packaging Codes				00	40 – 50	51	52
15	6.0	17.5	18.0	1,000	700	700	250
	7.5	14.5	18.0	1,000	700	500	250
	8.5	14.5	18.0	1,000	500	500	250
	10.0	16.0	18.0	750	500	500	250
22.5	6.0	15.0	26.5	805	500	500	250
	7.5	16.0	26.5	700	500	400	250
	8.5	17.0	26.5	468	300	300	200
	10.0	18.5	26.5	396	300	250	200
	11.0	20.0	26.5	360	250	200	200
27.5	11.0	20.0	32.0	600	336	336	150
	13.0	22.0	32.0	480	288	288	150
	18.0	33.0	32.0	256	128	128	150

Lead Taping & Packaging (IEC 60286–2)

Figure 1
Lead Spacing 15 mm

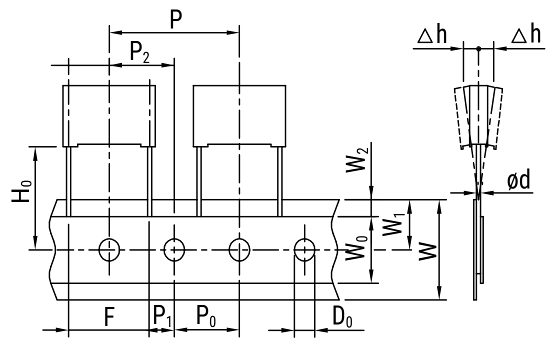
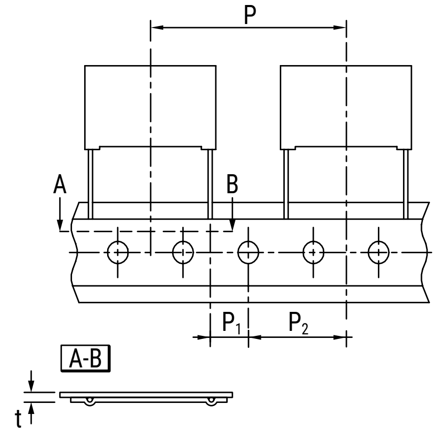


Figure 2
Lead Spacing 22.5 and 27.5 mm



Taping Specification

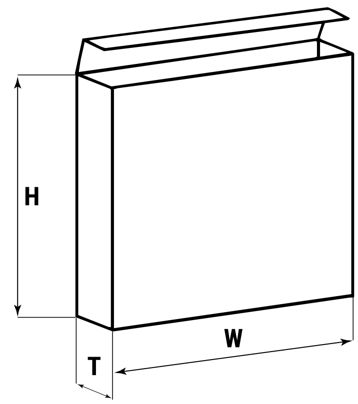
Description	Symbol	Dimensions (mm)			
		Lead Space			Tolerance
		15	22.5	27.5	
		Figure 1	Figure 2	Figure 2	
Lead Wire Diameter	d	0.6 – 0.8	0.8	0.8	±0.05
Taping Lead Space	P	25.4	38.1	38.1	±1
Feed-hole Lead Space*	P_0	12.7	12.7	12.7	±0.2**
Centering of the Lead Wire	P_1	5.2	7.8	5.3	±0.7
Centering of the Body	P_2	12.7	19.05	19.05	±1.3
Lead Spacing (Pitch)***	F	15	22.5	27.5	+0.6/−0.1
Component Alignment	Δh	0	0	0	±2
Height of Component from Tape Center	H0 ****	18.5	18.5	18.5	±0.5
Carrier Tape Width	W	18.0	18.0	18.0	+1/−0.5
Hold Down Tape Width	W_0	10.0	10.0	10.0	Minimum
Hole Position	W_1	10.0	10.0	10.0	±0.5
Hold Down Tape Position	W_2	3.0	3.0	3.0	Maximum
Feed-hole Diameter	D_0	4.0	4.0	4.0	±0.2
Total Tape Thickness	t	0.7	0.7	0.7	±0.2

** Available also in 15 mm*
*** Maximum 1 mm on 20 lead spaces*
**** Pitches 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request*
***** H_0 = 16.5 mm available upon request*

Lead Taping & Packaging (IEC 60286–2) cont.

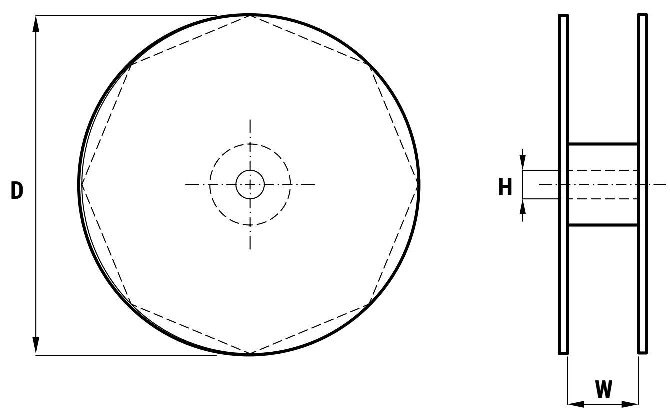
Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



Reel Specifications

Dimensions (mm)		
D	H	W
355	30	55 Maximum
500	25	



Manufacturing Date Code (IEC–60062)

Y = Year, Z = Month			
Year	Code	Month	Code
2010	A	January	1
2011	B	February	2
2012	C	March	3
2013	D	April	4
2014	E	May	5
2015	F	June	6
2016	H	July	7
2017	J	August	8
2018	K	September	9
2019	L	October	O
2020	M	November	N
2021	N	December	D
2022	P		
2023	R		
2024	S		
2025	T		
2026	U		
2027	V		
2028	W		
2029	X		
2030	A		

PMR205, Metallized Impregnated Paper, 125 VAC/250 VDC

KEMET a YAGEO company

Overview

Multilayer metallized paper encapsulated and impregnated in self-extinguishing material that meets the requirements of UL 94 V–0.

Applications

For worldwide use in contact protection, contact interference suppression, and transient suppression.

Benefits

- Rated voltage: 250 VDC, 125 VAC 50/60 Hz
- Capacitance range: 0.1 – 1.0 µF
- Capacitance tolerance: ±20%
- Resistance range: 22 – 680 Ω
- Resistance tolerance: ±30%
- Lead Spacing: 15.2 – 25.4 mm
- Climatic category: 40/085/56/B, IEC 60068–1
- Tape & Reel packaging in accordance with IEC 60286–2
- RoHS compliance and lead-free terminations
- Operating temperature range of −40°C to +85°C

Legacy Part Number System

PMR205	A	B	6100	M	033	R30
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Capacitance Tolerance	Resistance (Ω)	Packaging
RC Snubber, Metallized Paper	A = 125	B = 15.2 C = 20.3 E = 25.4	The last three digits represent significant figures. The first digit specifies the total number of digits.	M = ±20%	Resistance Value in Ω	See Ordering Options Table

KEMET Part Number System

P	405	Q	E	104	M	125	A	H330
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Packaging	Resistance (Ω)
P = Metallized Paper	RC Snubber	Q = 15.2 C = 20.3 E = 25.4	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	M = ±20%	125 = 125	See Ordering Options Table	H plus first two digits represent significant figures. Third digit specifies number of zeros.

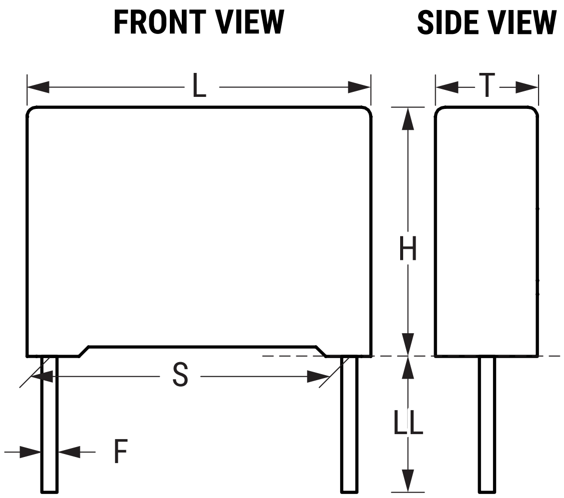
Benefits cont.

- Excellent self-healing properties that ensure long life, even when subjected to frequent over-voltages
- Good resistance to ionization due to impregnated paper dielectric
- High dv/dt capability
- Impregnated paper that ensures excellent stability and reliability properties, particularly in applications with continuous operation

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	KEMET Lead and Packaging Code	Legacy Lead and Packaging Code
15.2	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel Φ = 360 mm)	H_0 = 18.5 ±0.5	L	R19T0
20.3	**Standard Lead and Packaging Options**			
	Bulk (Tray) – Short Leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum Length Leads	30 +5/−0	A	R30
	Tape & Reel (Standard Reel Φ = 360 mm)	H_0 = 18.5 ±0.5	L	R19T0
25.4	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6 +0/−1	C	R06
	Bulk (Tray) – Maximumn Length Leads	30 +5/−0	A	R30

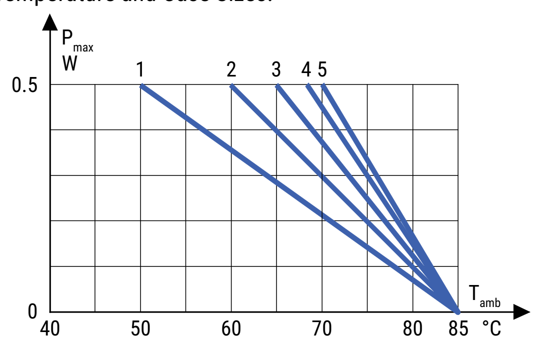
Dimensions – Millimeters



Size Code	S		T		H		L		F	
	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
QE	15.2	±0.4	5.2	Maximum	10.5	Maximum	18.5	Maximum	0.8	±0.05
QM	15.2	±0.4	7.3	Maximum	13.0	Maximum	18.5	Maximum	0.8	±0.05
QP	15.2	±0.4	7.8	Maximum	13.5	Maximum	18.5	Maximum	0.8	±0.05
CE	20.3	±0.4	7.6	Maximum	14.0	Maximum	24.0	Maximum	0.8	±0.05
CJ	20.3	±0.4	9.0	Maximum	15.0	Maximum	24.0	Maximum	0.8	±0.05
CP	20.3	±0.4	11.3	Maximum	16.5	Maximum	24.0	Maximum	0.8	±0.05
EE	25.4	±0.4	10.6	Maximum	16.1	Maximum	30.5	Maximum	1.0	±0.05

Note: See the Ordering Options Table for lead length (LL) options.

Performance Characteristics

<table>
<tr><td>Rated Voltage</td><td colspan="2">125 VAC 50/60 Hz</td></tr>
<tr><td>Capacitance Range</td><td colspan="2">0.1 – 1.0 µF</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="2">±20%</td></tr>
<tr><td>Resistance Range</td><td colspan="2">22 – 680 Ω</td></tr>
<tr><td>Resistance Tolerance</td><td colspan="2">±30%</td></tr>
<tr><td>Temperature Range</td><td colspan="2">-40°C to +85°C</td></tr>
<tr><td>Climatic Category</td><td colspan="2">40/085/56/B</td></tr>
<tr><td>Peak Pulse Voltage</td><td colspan="2">375 V</td></tr>
<tr><td>Series Resistance</td><td colspan="2">The series resistance is defined at 1 kHz for RC ≥ 50 µs and at 100 kHz for RC < 50 µs</td></tr>
<tr><td rowspan="3">Insulation Resistance</td><td colspan="2">Minimum Values Between Terminals</td></tr>
<tr><td>C ≤ 0.33 µF</td><td>≥ 3,000 MΩ</td></tr>
<tr><td>C > 0.33 µF</td><td>≥ 1,000 MΩ • µF</td></tr>
<tr><td>Power Ratings</td><td colspan="2">The average losses may reach 0.5 W provided the surface temperature does not exceed +85°C. For maximum permitted power dissipation vs. temperature, see Derating Curves.</td></tr>
<tr><td rowspan="8">Derating Curves</td><td colspan="2">Maximum Allowable Power Dissipation vs. Ambient Temperature and Case Sizes.

</td></tr>
<tr><td>Curve</td><td>Dimension B (mm)</td></tr>
<tr><td>1</td><td>5.2</td></tr>
<tr><td>2</td><td>7.3</td></tr>
<tr><td>2</td><td>7.8</td></tr>
<tr><td>3</td><td>7.6</td></tr>
<tr><td>4</td><td>9.0</td></tr>
<tr><td>5</td><td>11.3</td></tr>
</table>

Environmental Test Data

Test	IEC Publication	Procedure
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 500 Hz at 0.75 mm or 98 m/s²
Bump	IEC 60068–2–29 Test Eb	4,000 bumps at 390 m/s²
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% R.H., 56 days

KEMET
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Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Lead Spacing (S)	Capacitance Value (µF)	Resistance (Ω)	Maximum Dimensions in mm			KEMET Part Number	Legacy Part Number
			T	H	L		
15.2	0.10	33	5.2	10.5	18.5	P405QE104M125(1)H330	PMR205AB6100M033(1)
15.2	0.10	47	5.2	10.5	18.5	P405QE104M125(1)H470	PMR205AB6100M047(1)
15.2	0.10	100	5.2	10.5	18.5	P405QE104M125(1)H101	PMR205AB6100M100(1)
15.2	0.10	220	5.2	10.5	18.5	P405QE104M125(1)H221	PMR205AB6100M220(1)
15.2	0.15	68	5.2	10.5	18.5	P405QE154M125(1)H680	PMR205AB6150M068(1)
15.2	0.15	100	5.2	10.5	18.5	P405QE154M125(1)H101	PMR205AB6150M100(1)
15.2	0.22	47	7.3	13.0	18.5	P405QM224M125(1)H470	PMR205AB6220M047(1)
15.2	0.22	100	7.3	13.0	18.5	P405QM224M125(1)H101	PMR205AB6220M100(1)
15.2	0.22	220	7.3	13.0	18.5	P405QM224M125(1)H221	PMR205AB6220M220(1)
15.2	0.22	330	7.3	13.0	18.5	P405QM224M125(1)H331	PMR205AB6220M330(1)
15.2	0.22	470	7.3	13.0	18.5	P405QM224M125(1)H471	PMR205AB6220M470(1)
15.2	0.25	200	7.3	13.0	18.5	P405QM254M125(1)H201	PMR205AB6250M200(1)
15.2	0.25	350	7.3	13.0	18.5	P405QM254M125(1)H351	PMR205AB6250M350(1)
15.2	0.25	600	7.3	13.0	18.5	P405QM254M125(1)H601	PMR205AB6250M600(1)
15.2	0.33	47	7.8	13.5	18.5	P405QP334M125(1)H470	PMR205AB6330M047(1)
20.3	0.47	22	7.6	14.0	24.0	P405CE474M125(1)H220	PMR205AC6470M022(1)
20.3	0.47	33	7.6	14.0	24.0	P405CE474M125(1)H330	PMR205AC6470M033(1)
20.3	0.47	47	7.6	14.0	24.0	P405CE474M125(1)H470	PMR205AC6470M047(1)
20.3	0.47	68	7.6	14.0	24.0	P405CE474M125(1)H680	PMR205AC6470M068(1)
20.3	0.47	100	7.6	14.0	24.0	P405CE474M125(1)H101	PMR205AC6470M100(1)
20.3	0.47	150	7.6	14.0	24.0	P405CE474M125(1)H151	PMR205AC6470M150(1)
20.3	0.47	220	7.6	14.0	24.0	P405CE474M125(1)H221	PMR205AC6470M220(1)
20.3	0.47	330	7.6	14.0	24.0	P405CE474M125(1)H331	PMR205AC6470M330(1)
20.3	0.47	470	9.0	15.0	24.0	P405CJ474M125(1)H471	PMR205AC6470M470(1)
20.3	0.47	680	11.3	16.5	24.0	P405CP474M125(1)H681	PMR205AC6470M680(1)
25.4	1.0	33	10.6	16.1	30.5	P405EE105M125(1)H330	PMR205AE7100M033(1)
20.3	1.0	47	11.3	16.5	24.0	P405CP105M125(1)H470	PMR205AC7100M047(1)
20.3	1.0	68	11.3	16.5	24.0	P405CP105M125(1)H680	PMR205AC7100M068(1)
20.3	1.0	100	11.3	16.5	24.0	P405CP105M125(1)H101	PMR205AC7100M100(1)
20.3	1.0	150	11.3	16.5	24.0	P405CP105M125(1)H151	PMR205AC7100M150(1)
20.3	1.0	220	11.3	16.5	24.0	P405CP105M125(1)H221	PMR205AC7100M220(1)
Lead Spacing (S)	**Capacitance Value (µF)**	**Resistance Ω**	**T (mm)**	**H (mm)**	**L (mm)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.

Soldering Process

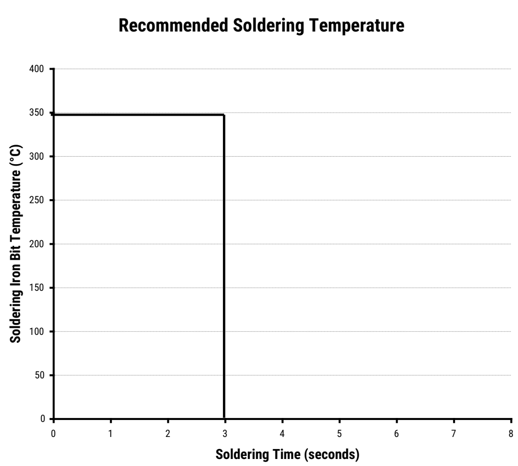
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for SnPb eutectic alloy to 217 – 221ºC for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170ºC). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm), and great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the recommended limits may result in degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface-mount components. Insert through-hole parts after curing the surface-mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum of two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

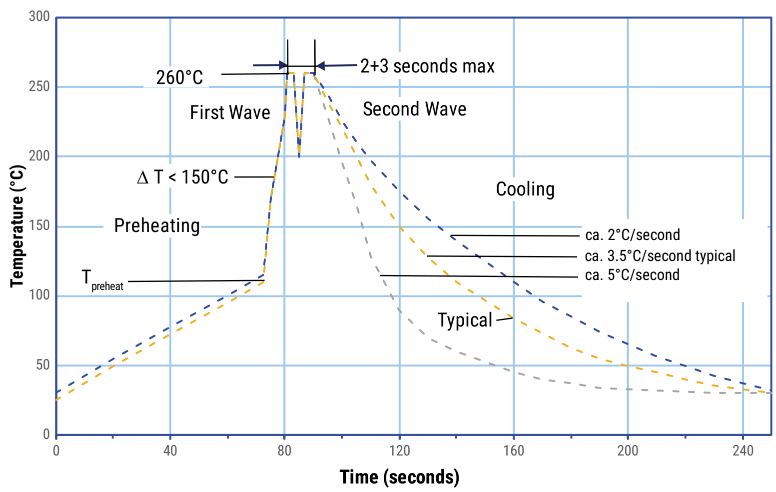
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



Soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

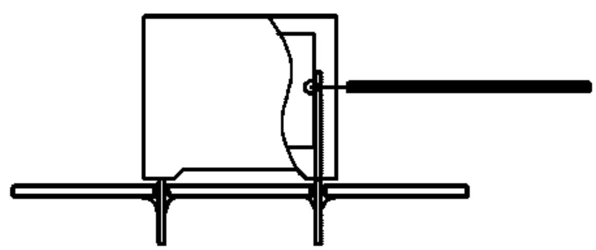
1. The table indicates the maximum setup temperature for the soldering process.

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≥ 10 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that inside the element the maximum temperature is below the limit.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C

Temperature monitored inside the capacitor.

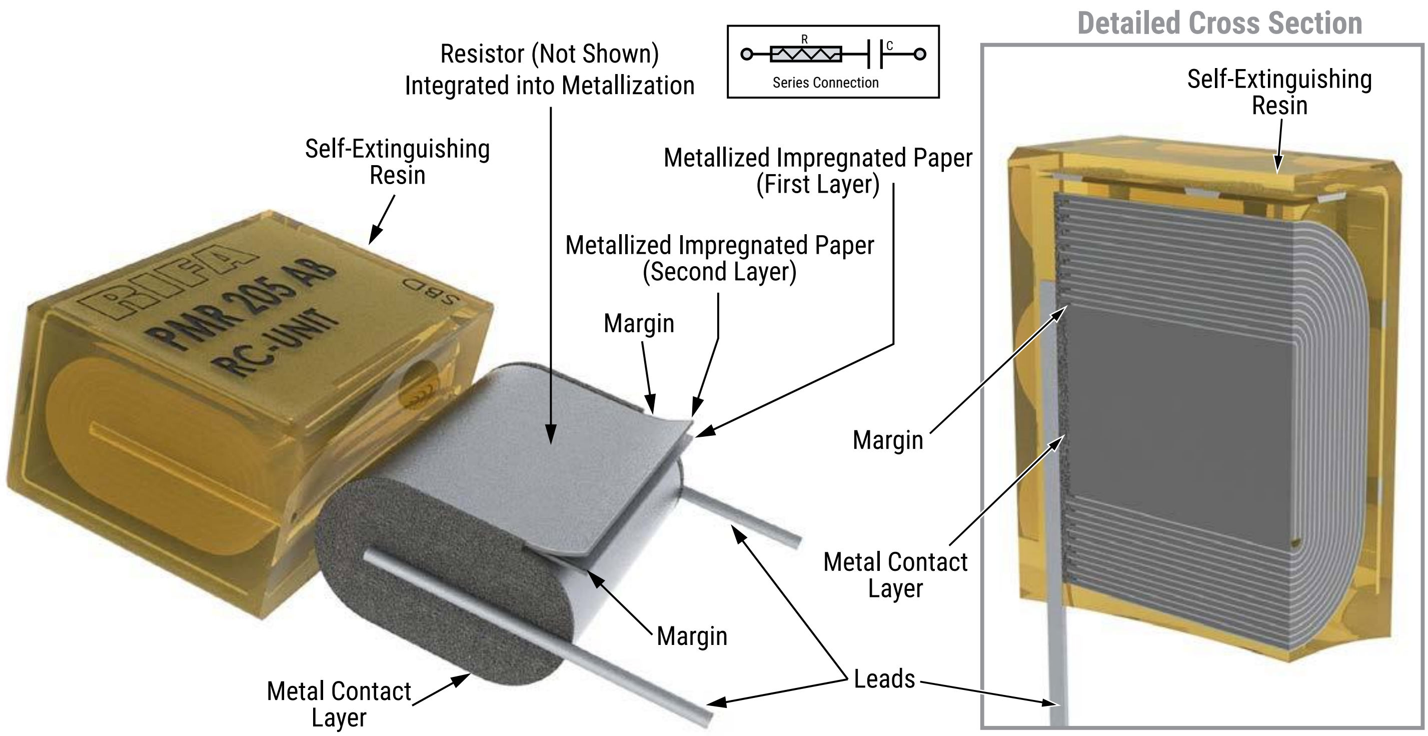


Selective Soldering Recommendations

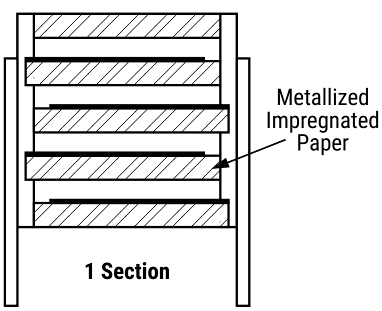
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath, as in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder, only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering. Great care must be taken so that the parts do not overheat.

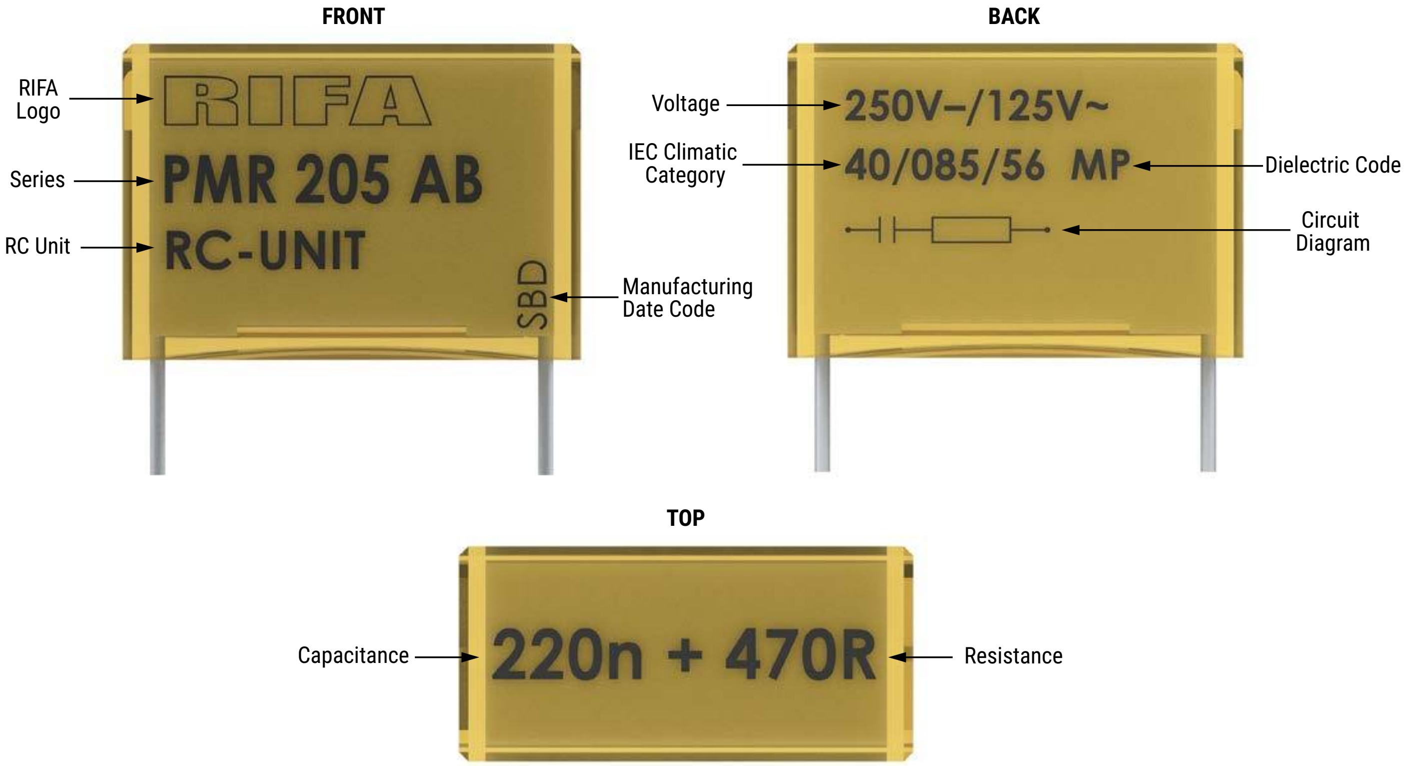
Construction



Winding Scheme



Marking

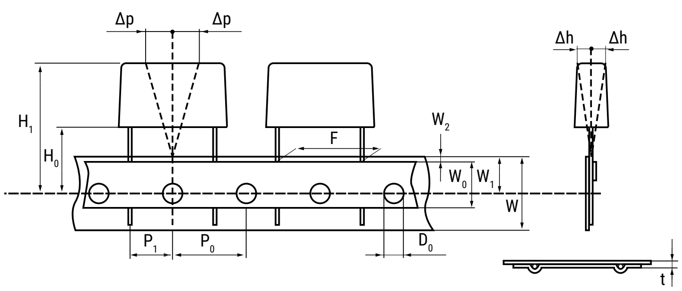


Packaging Quantities

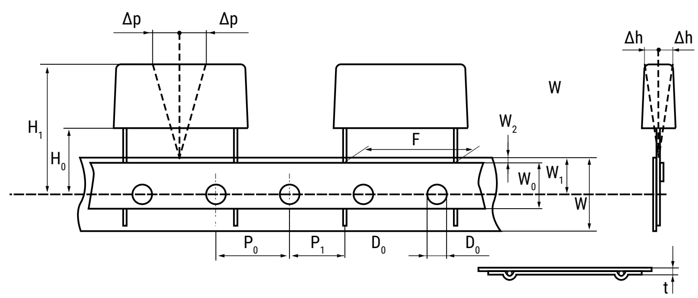
Size Code	Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 360 mm
Lead and Packaging Code					C/R06	A/R30	L/R19T0
QE	15.2	5.2	10.5	18.5	1,000	500	600
QM	15.2	7.3	13.0	18.5	600	400	400
QP	15.2	7.8	13.5	18.5	600	400	400
CE	20.3	7.6	14.0	24.0	1,530	250	250
CJ	20.3	9.0	15.0	24.0	1,530	200	250
CP	20.3	11.3	16.5	24.0	1,080	150	180
EE	25.4	10.6	16.1	30.5	1,008	150	

Lead Taping & Packaging (IEC 60286–2)

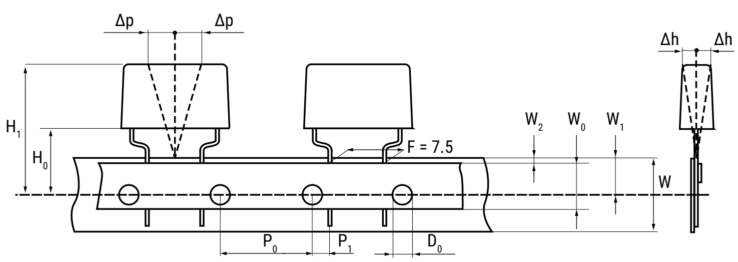
Lead Spacing 10.2 – 15.2 mm



Lead Spacing 20.3 – 22.5 mm



Formed Leads from 10.2 – 7.5 mm



Taping Specification

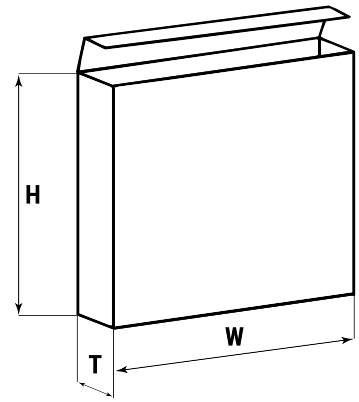
Dimensions in mm								Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	Formed 7.5	10.2	15.2	20.3	22.5	F
Carrier Tape Width	±0.5	W	18.0	18.0	18.0	18.0	18.0	18 +1/−0.5
Hold-Down Tape Width	Minimum	W_0	5.0	5.0	5.0	5.0	5.0	
Position of Sprocket Hole	±0.5	W_1	9.0	9.0	9.0	9.0	9.0	9 +0.75/−0.5
Distance Between Tapes	Maximum	W_2	3.0	3.0	3.0	3.0	3.0	3.0
Sprocket Hole Diameter	±0.2	D_0	4.0	4.0	4.0	4.0	4.0	4.0
Feed Hole Lead Spacing	±0.3	$P_0^{(1)}$	12.7(4)	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.75	7.6	5.1	8.9	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	Maximum	Δh	2.0	2.0	2.0	2.0	2.0	2.0
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.9 Maximum	0.9 Maximum
Sprocket Hole/Cap Body	Nominal	$H_0^{(2)}$	18 +2/−0	18 +2/−0	18 +2/−0	18 +2/−0	18.5 ±0.5	18 +2/−0
Sprocket Hole/Top of Cap Body	Maximum	$H_1^{(3)}$	43	43	43	58	58	58 Maximum

(1) Maximum cumulative feed hole error, 1 mm per 20 parts
(2) 16.5 mm available on request
(3) Depending on case size
(4) 15 mm available on request

Lead Taping & Packaging (IEC 60286–2) cont.

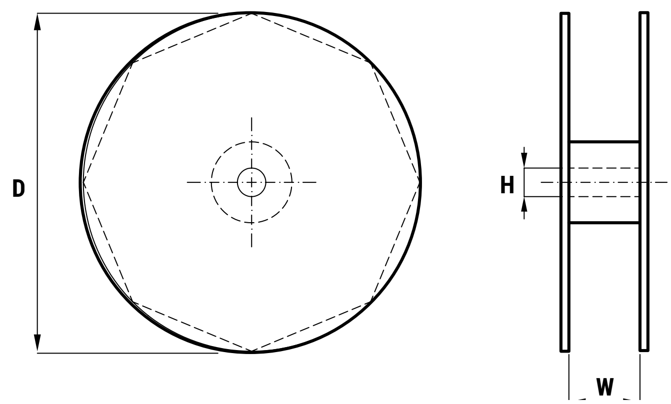
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
R4x, R4x+R, R7x, RSB	360	340	59
F5A, F5B, F5D			
F6xx, F8xx			
PHExxx, PMExxx, PMRxxx	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
R4x, R4x+R, R7x, RSB	355 500	30 25	55 (Max)
F5A, F5B, F5D			
F6xx, F8xx			
PHExxx, PMExxx, PMRxxx	360 500	30	46 (Max)



Manufacturing Date Code (IEC–60062)

Y = Year, Z = Month			
Year	Code	Month	Code
2010	A	January	1
2011	B	February	2
2012	C	March	3
2013	D	April	4
2014	E	May	5
2015	F	June	6
2016	H	July	7
2017	J	August	8
2018	K	September	9
2019	L	October	O
2020	M	November	N
2021	N	December	D
2022	P		
2023	R		
2024	S		
2025	T		
2026	U		
2027	V		
2028	W		
2029	X		
2030	A		

PMZ2035, Class X1, 440 VAC/1,000 VDC

Overview

Multilayer, metallized paper encapsulated and impregnated in self-extinguishing material that meets the requirements of UL 94 V–0.

Applications

For worldwide use in contact protection, contact interference suppression, and transient suppression.

Benefits

- Approvals: ENEC
- Rated voltage: 440 VDC 50/60 Hz
- Capacitance: 0.1 µF
- Capacitance tolerance: ±10%; other tolerances on request
- Resistance: 150 Ω
- Resistance tolerance: ±30%
- Lead spacing: 25.4 mm
- Climatic category: 40/085/56/B, IEC 60068–1
- Tape & Reel packaging in accordance with IEC 60286–2
- RoHS compliance and lead-free terminations
- Operating temperature range of −40°C to +85°C
- Excellent self-healing properties that ensure long life, even when subjected to frequent over-voltages
- Good resistance to ionization due to impregnated paper dielectric
- High dv/dt capability
- Impregnated paper that ensures excellent stability and reliability properties, particularly in applications with continuous operation

Legacy Part Number System

PMZ2035	R	E	6100	K	150	R30
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Capacitance Tolerance	Resistance (Ω)	Lead and Packaging Code
RC Snubber, Metallized Paper	R = 440	E = 25.4	Digits two – four (3) indicates the first three digits of the capacitance value. First digit indicates the total number of digits in the capacitance value.	K = ±10% M = ±20%	Resistance Value in Ω	See Ordering Options Table

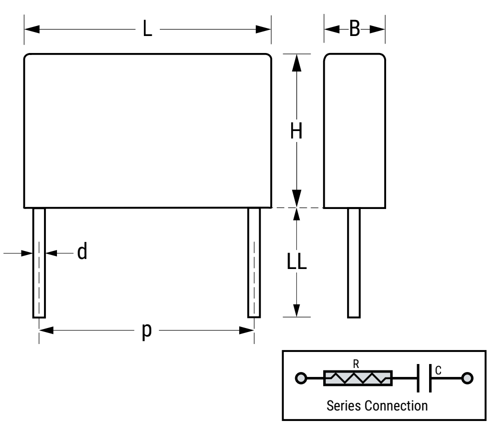
New KEMET Part Number System

P	435	E	J	104	K	440	A	H151
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Lead and Packaging Code	Resistance (Ω)
P = Metallized Paper	RC Snubber	E = 25.4	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	440 = 440	See Ordering Options Table	H and first two digits representing significant figures. Third digit specifies number of zeros.

Ordering Options Table

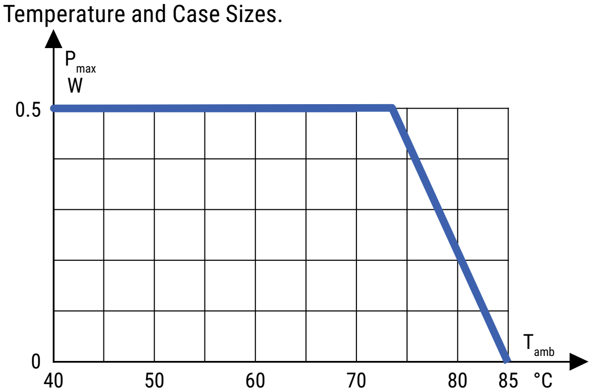
Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	KEMET Lead and Packaging Code	Legacy Lead and Packaging Code
25.4	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short Leads	6 +0/−1	C	R06
	Bulk (Tray) – Maximum Length Leads	30 +5/−0	A	R30

Dimensions – Millimeters



Size Code	p		B		H		L		d	
	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
EJ	25.4	±0.4	12.1	Maximum	19	Maximum	30.5	Maximum	1	±0.05
Note: See the Ordering Options Table for lead length (LL) options.										

Performance Characteristics

Rated Voltage	440 VAC 50/60 Hz
Capacitance Range	0.1 µF
Capacitance Tolerance	±10%, other tolerances on request
Resistance Range	150 Ω
Resistance Tolerance	±30%
Temperature Range	−40°C to +85°C
Climatic Category	40/085/56/B
Approvals	ENEC
Peak Pulse Voltage	1,000 V
Series Resistance	The series resistance is defined at 100 kHz
Insulation Resistance	Minimum Value Between Terminals ≥ 6,000 MΩ
Pulse Current	Maximum 12 A repetitive. Maximum 20 A peak for occasional transients.
Test Voltage Between Terminals	The 100% screening factory test is carried out at 1,800 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test.
In DC Applications	Recommended voltage ≤ 1,000 VDC
Power Ratings	The average losses may reach 0.5 W, provided the surface temperature does not exceed +85°C. For maximum permitted power dissipation versus temperature, see Derating Curve.
Derating Curves	Maximum Allowable Power Dissipation vs. Ambient Temperature and Case Sizes. 

Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increased to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature.
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each, 10 – 500 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	4,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068-2-14 Test Na	Upper and lower rated temperature, 5 cycles
Active Flammability	IEC 60384–14	V_R +20 surge pulses at 4.0 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle-flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
Intertek Semko AB	ENEC	EN/IEC 60384–14	SE/0140–29C

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Lead Space	Capacitance Value (µF)	Resistance Ω	Maximum Dimensions (mm)			Quantity per Package		F Article Code	Part Number
			B	H	L	R06	R30		
25.4	0.1	150	12.1	19.0	30.5	100	800	P435EJ104K440(1)H151	PMZ2035RE6100K150(1)

(1) Insert lead and packaging code. See Ordering Options Table for available options.

Soldering Process

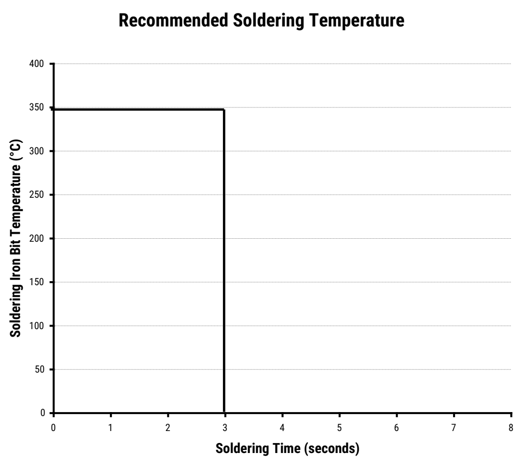
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for SnPb eutectic alloy to 217 – 221ºC for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170ºC). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm), and great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the recommended limits may result in degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface-mount components. Insert through-hole parts after curing the surface-mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum of two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

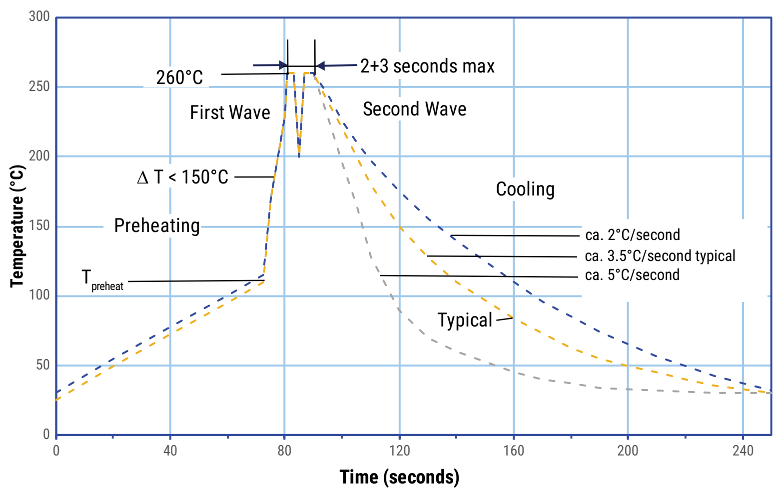
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



Soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont'd

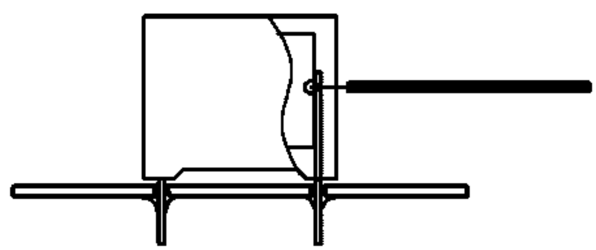
1. The table indicates the maximum setup temperature for the soldering process.

Dielectric film material	Maximum Preheat Temperature			Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 10 mm	Capacitor Pitch = 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	130°C	270°C	270°C
Polypropylene	100°C	110°C	130°C	260°C	270°C
Paper	130°C	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that inside the element the maximum temperature is below the limit.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C

Temperature monitored inside the capacitor.

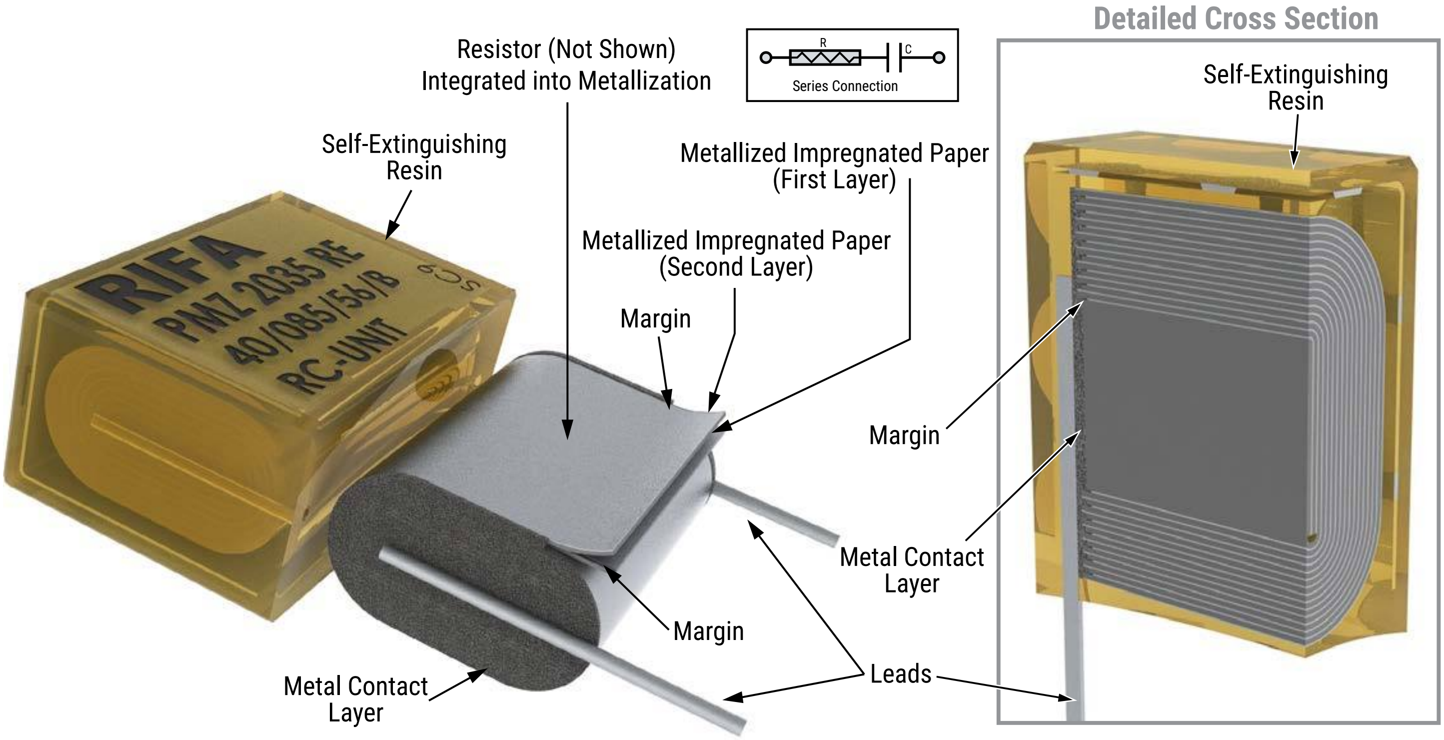


Selective Soldering Recommendations

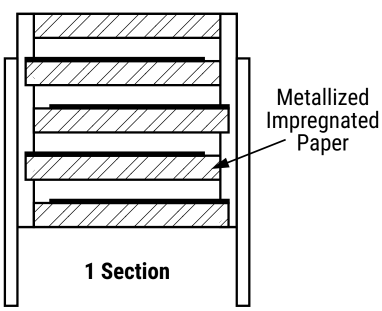
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath, as in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder, only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering. Great care must be taken so that the parts do not overheat.

Construction



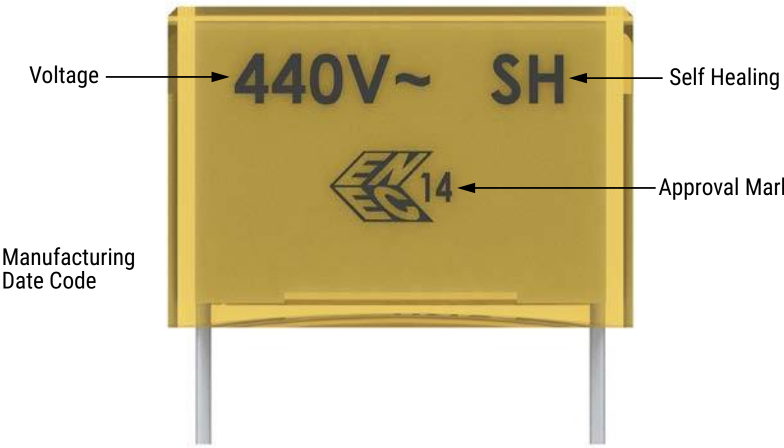
Winding Scheme



Marking

FRONT

BACK



TOP

AC Line EMI Suppression and RC Networks

PME295, Metallized Impregnated Paper, Class Y1, 440 VAC/480 VAC

KEMET a YAGEO company

Overview

The PME295 is constructed of multilayer metallized paper encapsulated and impregnated in self-extinguishing material, meeting the requirements of UL 94 V–0.

Applications

Safety capacitors for bridging of double or reinforced insulation applications, requiring voltage testing up to 4,000 VAC at 60 seconds. PME295 capacitors can be left in place during this test.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- Rated voltage: 440 VAC/480 VAC 50/60 Hz
- Capacitance range: 470 – 4,700 pF
- Lead spacing: 15.0 mm
- Capacitance tolerance: ±20%
- Climatic category: 40/115/56/B, IEC 60068–1
- Tape & Reel packaging in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of −40˚C to +115˚C
- 100% screening factory test at 4,000 VAC, 50 Hz, 2 seconds

Legacy Part Number System

PME295	R	B	3470	M	R30
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Capacitance Tolerance	Packaging
Y1, Metallized Paper	R = 440	B = 15.0	The last three digits represent significant figures. The first digit specifies the total number of digits.	J = ±5% K = ±10% M = ±20%	See Ordering Options Table

New KEMET Part Number System

P	295	B	E	471	M	440	A
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Packaging
P = Paper	Y1, Metallized Paper	B = 15.0	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	J = ±5% K = ±10% M = ±20%	440 = 440	See Ordering Options Table

Benefits cont.

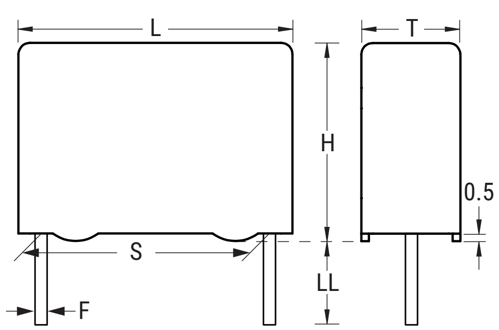
- Highest possible safety regarding active and passive flammability
- Excellent self-healing properties ensure long life even when subjected to frequent over voltages
- Good resistance to ionization due to impregnated dielectric
- High dV/dt capability
- Impregnated paper provides excellent stability and reliability properties, particularly in applications with continuous operation

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	KEMET Lead and Packaging Code	Legacy Lead and Packaging Code
15	**Standard Lead and Packaging Options**			
	Bulk (Bag) – Short leads	6 +0/−1	C	R06
	Bulk (Bag) – Maximum length leads	30 +5/−0	A	R30
	Tape & Reel (Standard reel Φ = 360 mm)	H_0 = 18.5 ±0.5	L	R19T0
Native 15 formed to 7.5	Tape & Reel (Standard reel Φ = 360 mm)	H_0 = 18.5 ±0.5	XLTF1	R25X2

Dimensions – Millimeters

FRONT VIEW **SIDE VIEW**



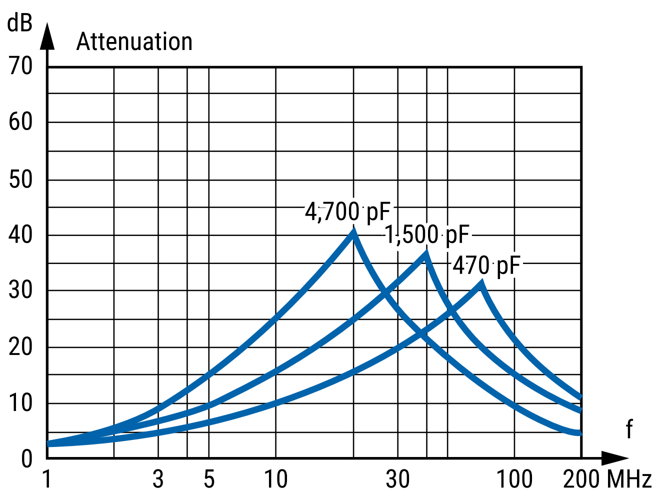
S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
15	±0.4	5.5	Maximum	12.5	Maximum	18	Maximum	0.8	±0.05
15	±0.4	6.5	Maximum	12.5	Maximum	18	Maximum	0.8	±0.05
15	±0.4	7.5	Maximum	14.5	Maximum	18	Maximum	0.8	±0.05
15	±0.4	8.5	Maximum	16	Maximum	18	Maximum	0.8	±0.05

Note: See Ordering Options Table for lead length (LL) options.

Performance Characteristics

Rated Voltage	440 VAC 50/60 Hz (ENEC)	
	480 VAC 50/60 Hz (UL, cUL)	
Capacitance Range	0.00047 – 0.0047 µF	
Capacitance Tolerance	±20%	
Temperature Range	−40°C to +115°C	
Climatic Category	40/115/56/B	
Approvals	ENEC, UL, cUL, CQC	
Dissipation Factor	Maximum Values at +23°C	
	1 kHz	1.3%
Test Voltage Between Terminals	The 100% screening factory test is carried out at 4,000 VAC, 50 Hz, 2 seconds. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test.	
Insulation Resistance	Measured at 500 VDC after 60 seconds, +23°C	
	Between Terminals:	
	12,000 MΩ	
In DC Applications	Recommended voltage ≤ 1,500 VDC	
Resonance Frequency	Tabulated self-resonance frequencies f_0 refer to 5 mm lead length	

Suppression vs. Frequency, Typical Values



Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384-14	1.7 x V_R Vac 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature.
Vibration	IEC 60068-2-6 Test Fc	3 directions at 2 hours each 10 – 500 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068-2-29 Test Eb	4,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068-2-14 Test Na	Upper and lower rated temperature 5 cycles
Passive Flammability	IEC 60384-14	IEC 60384-1, IEC 60695-11-5 Needle flame test
Humidity	IEC 60068-2-3 Test Ca	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
Intertek Semko AB		EN/IEC 60384–14 (440 VAC)	SE/0140–13D
UL		UL 60384–14 CAN/CSA–E60384–14:09	E73869
CQC		IEC 60384–14	CQC16001145221

Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Maximum Dimensions in mm			Lead Spacing (S)	f_o (MHz)	dV/dt (V/µs)	KEMET Part Number	Legacy Part Number
	T	H	L					
0.00047	5.5	12.5	18.0	15.0	64	2,000	P295BE471(3)440(1)	PME295RB3470(3)(1)
0.00056	5.5	12.5	18.0	15.0	59	2,000	P295BE561(3)440(1)	PME295RB3560(3)(1)
0.00068	5.5	12.5	18.0	15.0	54	2,000	P295BE681(3)440(1)	PME295RB3680(3)(1)
0.00082	5.5	12.5	18.0	15.0	49	2,000	P295BE821(3)440(1)	PME295RB3820(3)(1)
0.001	5.5	12.5	18.0	15.0	46	2,000	P295BE102(2)440(1)	PME295RB4100(2)(1)
0.0012	6.5	12.5	18.0	15.0	43	2,000	P295BJ122(2)440(1)	PME295RB4120(2)(1)
0.0015	6.5	12.5	18.0	15.0	40	2,000	P295BJ152(2)440(1)	PME295RB4150(2)(1)
0.0018	6.5	12.5	18.0	15.0	37	2,000	P295BJ182(2)440(1)	PME295RB4180(2)(1)
0.0022	6.5	12.5	18.0	15.0	33	2,000	P295BJ222(2)440(1)	PME295RB4220(2)(1)
0.0025	7.5	14.5	18.0	15.0	31	2,000	P295BL252(2)440(1)	PME295RB4250(2)(1)
0.0027	7.5	14.5	18.0	15.0	30	2,000	P295BL272(2)440(1)	PME295RB4270(2)(1)
0.0033	7.5	14.5	18.0	15.0	27	2,000	P295BL332(2)440(1)	PME295RB4330(2)(1)
0.0039	8.5	16.0	18.0	15.0	24	2,000	P295BQ392(2)440(1)	PME295RB4390(2)(1)
0.0047	8.5	16.0	18.0	15.0	22	2,000	P295BQ472(2)440(1)	PME295RB4470(2)(1)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**f_o (MHz)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert ordering code for lead type and packaging. See Ordering Options Table for available options.
(2) Insert tolerance letter (J = ±5%, K = ±10%, M = ±20%)
(3) Insert tolerance letter (K = ±10%, M = ±20%)

Soldering Process

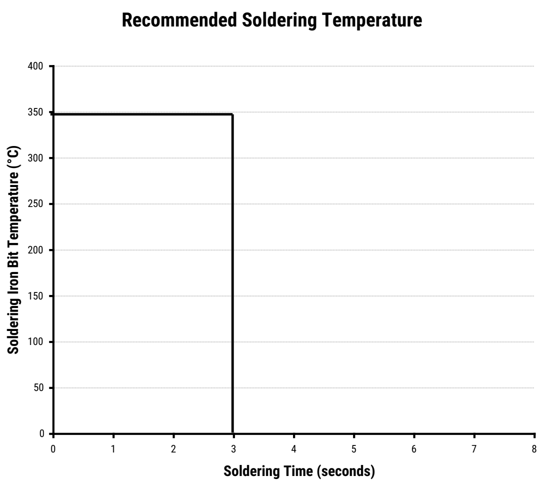
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from 183°C for SnPb eutectic alloys to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher preheat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 to 15 mm), and great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1, Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result in degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum of two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to normal before the second soldering cycle.

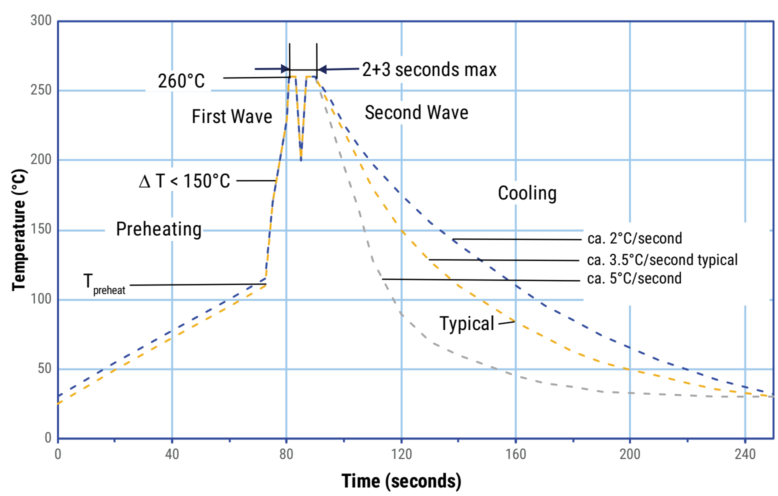
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

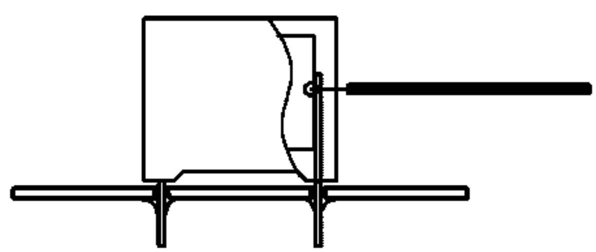
Wave Soldering Recommendations cont.

1. The table indicates the maximum set-up temperature of the soldering process
   Figure 1

Dielectric film material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that inside the element the maximum temperature is below the limit.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene sulphide	160°C



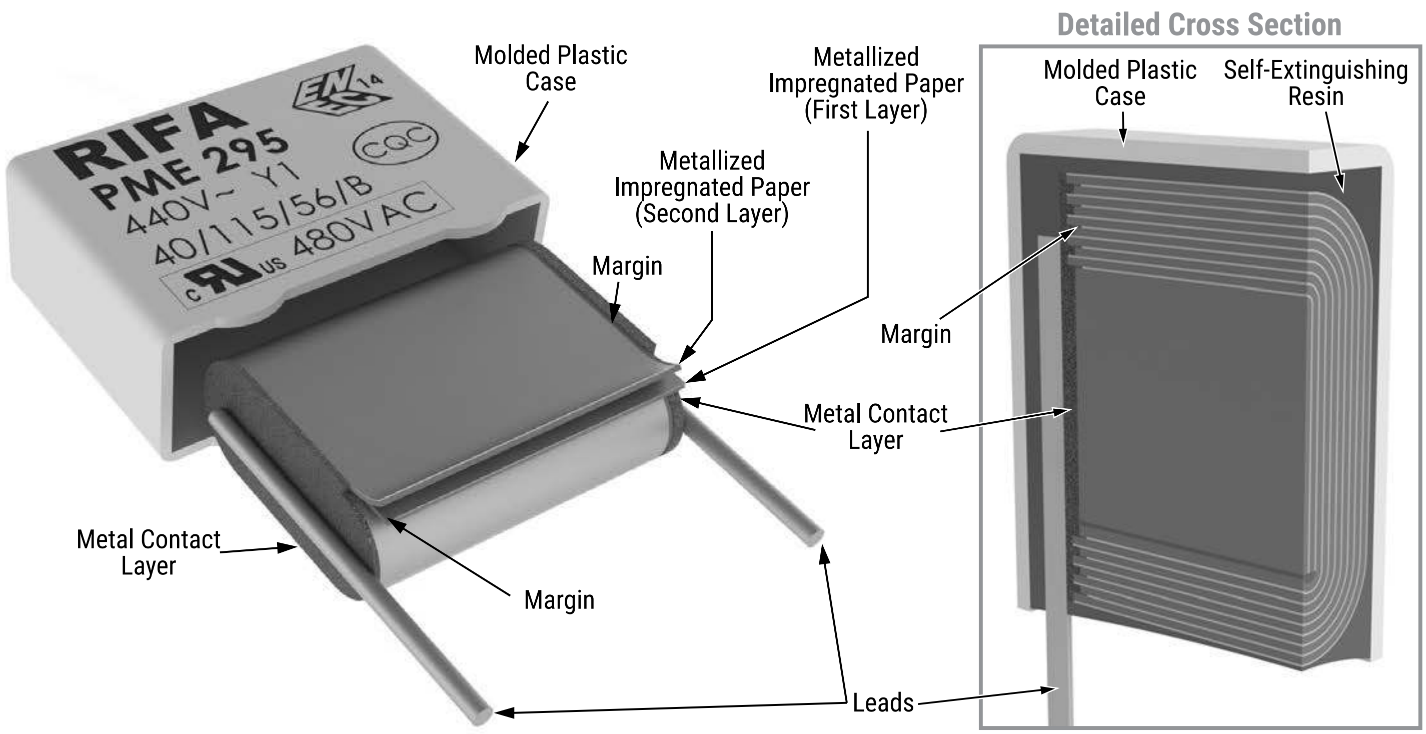
Temperature monitored inside the capacitor.

Selective Soldering Recommendations

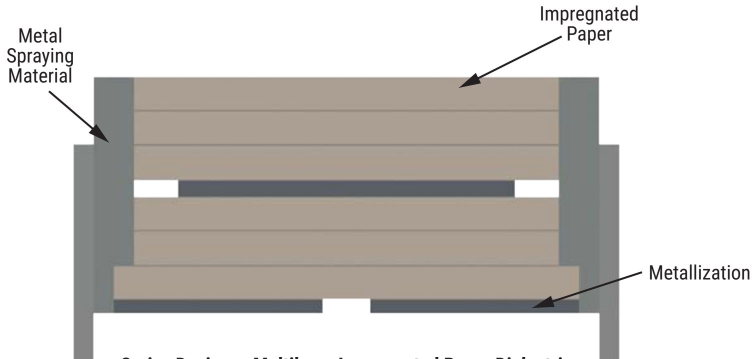
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath, as in normal-flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and then pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the temperature profile for double-wave flow soldering outlined in this document. However, instead of two baths, there is only one with a time from 3 to 10 seconds. In selective soldering, the risk of overheating is greater than in double-wave flow soldering, and great care must be taken so that the parts do not overheat.

Construction

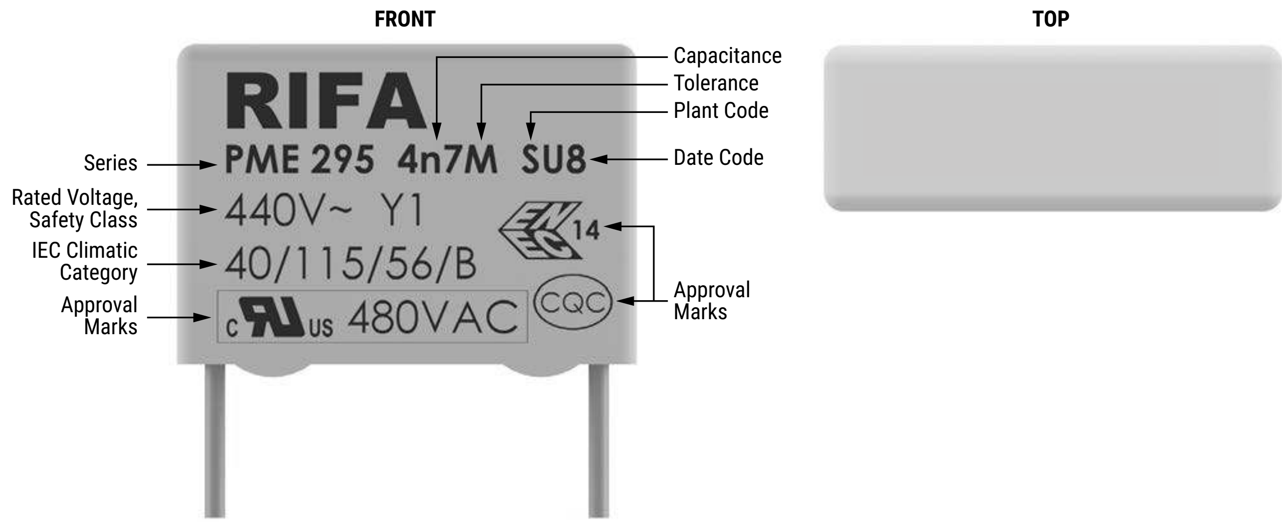


Winding Scheme



Series Design — Multilayer Impregnated Paper Dielectric 2 Section

Marking

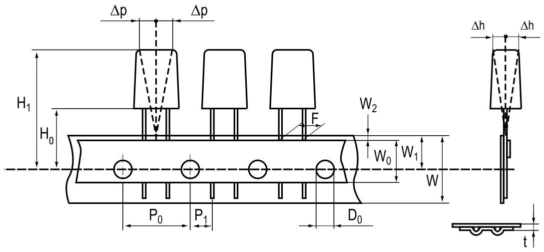


Packaging Quantities

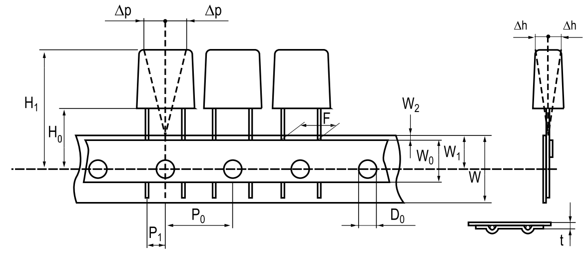
Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 360 mm	Standard Reel Formed
Lead and Packaging Code				C/R06	A/R30	L/R19T0	XLTF1/R25X2
15	5.5	12.5	18.0	1,000	500	600	-
	7.5	14.5	18.0	600	400	400	350
	6.5	12.5	18.0	600	400	400	400
	8.5	16	18.0	400	250	400	-

Lead Taping & Packaging (IEC 60286-2)

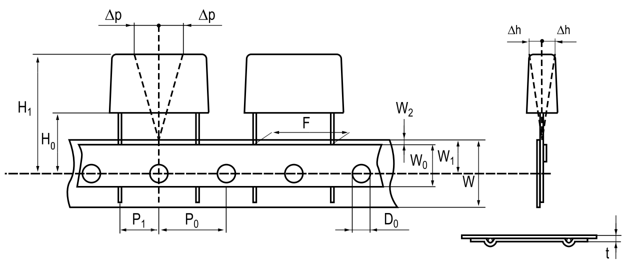
Lead Spacing 5 mm



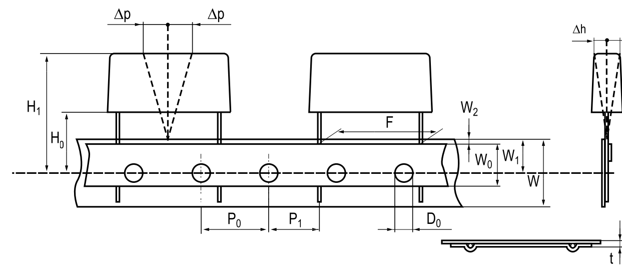
Lead Spacing 7.5 mm



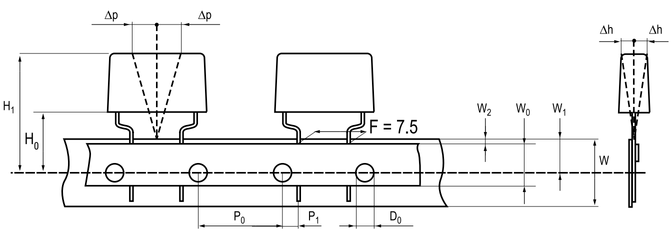
Lead Spacing 10 – 15mm



Lead Spacing 22.5 – 27.5 mm



Formed Leads from 10 and 15 mm to 7.5 mm



Taping Specification

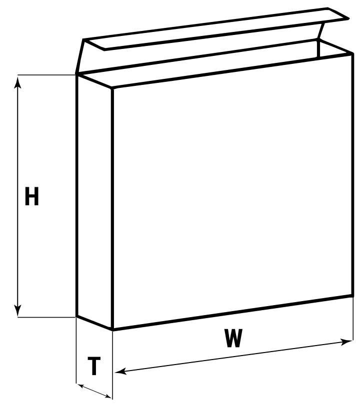
Dimensions in mm										Standard IEC 60286-2
Lead spacing	+0.6/−0.1	F	5	7.5	Formed 7.5	10	15	22.5	27.5	F
Carrier tape width	±0.5	W	18	18	18	18	18	18	18	18 +1/−0.5
Hold-down tape width	Minimum	W_0	5	5	5	5	5	5	5	
Position of sprocket hole	±0.5	W_1	9	9	9	9	9	9	9	9 +0.75/−0.5
Distance between tapes	Maximum	W_2	3	3	3	3	3	3	3	3
Sprocket hole diameter	±0.2	D_0	4	4	4	4	4	4	4	4
Feed hole lead spacing	±0.3	P_0 (1)	12.7	12.7	12.7 (4)	12.7	12.7	12.7	12.7	12.7
Distance lead – feed hole	±0.7	P_1	3.85	3.75	3.75	7.7	5.2	5.3	5.3	P1
Deviation tape – plane	Maximum	Δ p	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral deviation	Maximum	Δ h	2	2	2	2	2	2	2	2
Total thickness	±0.2	t	0.7	0.7	0.7	0.7	0.7	0.9 Maximum	0.9 Maximum	0.9 Maximum
Sprocket hole/cap body	Nominal	H_0 (2)	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.0 +2/−0
Sprocket hole/ top of cap body	Maximum	H_1 (3)	32	31	43	43	43	58	58	58 Maximum

(1) Maximum cumulative feed hole error, 1 mm per 20 parts
(2) 16.5 mm available on request
(3) Depending on case size
(4) 15 mm available on request

Lead Taping & Packaging (IEC 60286-2) cont.

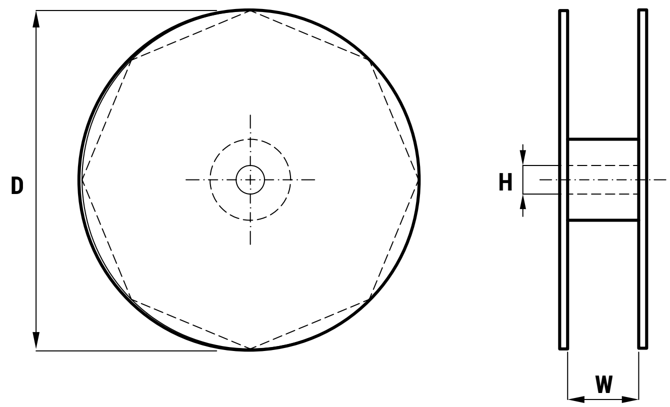
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
R4x, R4x+R, R7x, RSB F5A, F5B, F5D F6xx, F8xx	360	340	59
PHExxx, PMExxx, PMRxxx, SMR & PFR	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
R4x, R4x+R, R7x, RSB F5A, F5B, F5D F6xx, F8xx	355 500	30 25	55 (Max)
PHExxx, PMExxx, PMRxxx, SMR & PFR	360 500	30	46 (Max)



Manufacturing Date Code (IEC–60062)

Y = Year, Z = Month			
Year	Code	Month	Code
2010	A	January	1
2011	B	February	2
2012	C	March	3
2013	D	April	4
2014	E	May	5
2015	F	June	6
2016	H	July	7
2017	J	August	8
2018	K	September	9
2019	L	October	O
2020	M	November	N
2021	N	December	D
2022	P		
2023	R		
2024	S		
2025	T		
2026	U		
2027	V		
2028	W		
2029	X		
2030	A		

RSB, 5 mm Lead Spacing, 50 – 630 VDC (Automotive Grade)

Overview

The RSB is constructed of metallized polyester film (stacked technology) with radial leads of tinned wire. Radial leads are electrically welded to the contact metal layer on the ends of the capacitor winding. The capacitor is encapsulated with thermosetting resin in a box of material meeting the UL 94 V–0 requirements.

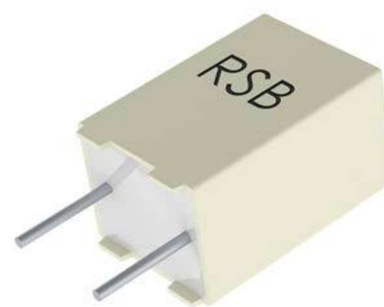
Automotive grade devices meet the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

Applications

Typical applications include high performance, high temperature, blocking, coupling, decoupling for a signal from DC to high frequency, pulse, logic and timing circuit, lamp capacitor for electronic compact lamps, inverter for LCD monitors, and automotive DC motor suppression. Not suitable for across-the-line application (see Suppressor Capacitors).

Benefits

- Voltage range: 50 – 630 VDC
- Capacitance range: 0.001 – 4.7 µF
- Lead spacing: 5 mm
- Capacitance tolerance: ±20%, ±10% standard, ±5% on request
- Climatic category: 55/125/56
- Operating temperature range of −55˚C to +125˚C
- RoHS Compliant and lead-free terminations
- Tape and reel packaging in accordance with IEC 60286–2
- Self-healing
- Automotive grade (AEC–Q200)



Part Number System

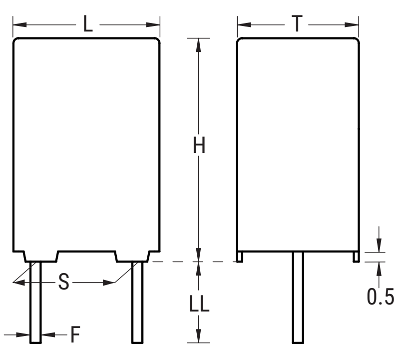
RSB	D	C	3100	AA	00	J
Series	Rated Voltage (VDC)	Length (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance
Metallized Polyester	C = 50 D = 63 E = 100 I = 250 M = 400 W = 500 P = 630	C = 5.0	The last three digits represent significant figures. First digit specifies the number of zeros to be added.	See Ordering Options Table	30 50 60 70	J = ±5% K = ±10% M = ±20%

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	LL Lead Length (mm)	Lead and Packaging Code
5	**Standard Lead and Packaging Options**		
	Bulk – Short Leads	4 +1.5/-0	AA
	Ammo Pack	H_0=18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Tape & Reel (Standard Reel Ø 355 mm)	H_0 = 18.5 ±0.5	CK
	Bulk – Short Leads	2.7 +0.5/-0	JA
	Bulk – Short Leads	3.5 +0.5/-0	JB
	Bulk – Short Leads	10 ±1	JC
	Bulk – Short Leads	3.2 +0.3/-0.2	JH
	Bulk – Long Leads	17 +1/-2	Z3

Dimensions – Millimeters

FRONT VIEW SIDE VIEW



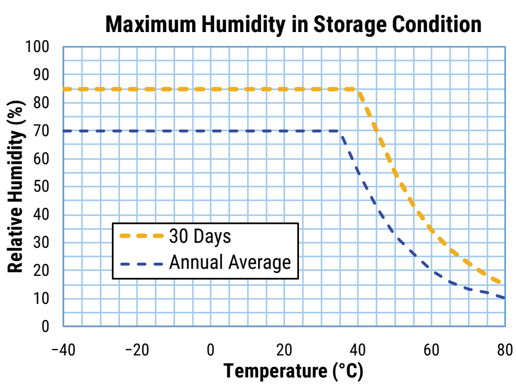
S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
5.0	±0.4	2.5	+0.1/-0.5	6.5	+0.1/-0.5	7.2	+0.2/-0.5	0.5	±0.05
5.0	±0.4	3.5	+0.1/-0.5	7.5	+0.1/-0.5	7.2	+0.2/-0.5	0.5	±0.05
5.0	±0.4	4.5	+0.1/-0.5	9.5	+0.1/-0.5	7.2	+0.3/-0.5	0.5	±0.05
5.0	±0.4	5.0	+0.1/-0.5	10.0	+0.1/-0.5	7.2	+0.3/-0.5	0.5	±0.05
5.0	±0.4	6.0	+0.1/-0.5	11.0	+0.1/-0.5	7.2	+0.3/-0.5	0.5	±0.05
5.0	±0.4	7.2	+0.1/-0.5	13.0	+0.1/-0.5	7.2	+0.3/-0.5	0.5	±0.05
Note: See Ordering Options Table for lead length (LL/H_0) options.									

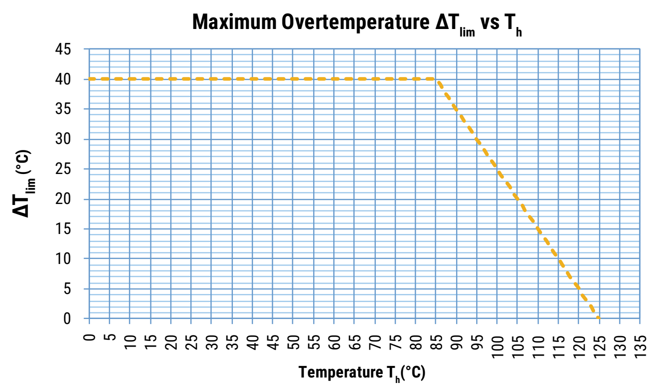
Performance Characteristics

Dielectric	Polyester film (polyethylene terephthalate)						
Plates	Metal layer deposited by evaporation under vacum						
Winding	Non-inductive type						
Leads	Tinned wire						
Protection	Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94.						
Related Documents	IEC 60384–2						
Rated Voltage V_R (VDC)	50	63	100	250	400	500	630
Rated Voltage V_R (VAC)	30	40	63	160	200	220	220
Capacitance Range (µF)	2.2	0.1 – 4.7	0.0047 – 0.47	0.001 – 0.15	0.001 – 0.047	0.001 – 0.015	0.001 – 0.01
Capacitance Values	E6 series (IEC 60063) measured at 1 kHz and +20±1°C						
Capacitance Tolerance	±5% on request, ±10%, ±20%						
Operating Temperature Range	−55°C to 125°C						
Rated Temperature T_R	+85°C						
Voltage Derating	Above +85°C DC and AC voltage derating is 1.25%/°C						
Climatic Category	55/125/56 IEC 60068–1						
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package						
	Average relative humidity per year ≤ 70%						
	RH ≤ 85% for 30 days randomly distributed throughout the year						
	Dew is absent						
	Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)						
Test Voltage	1.6 x V_R VDC for 2 seconds (between terminations) at +25°C ±5°C						
Capacitance Drift	Maximum 3% after a 2 year storage period at a temperature of +10°C to +40°C and a relative humidity of 40% to 60%						
Reliability (Reference IEC 61709)	Operational life >200,000 hours						
	Failure rate ≤ 1 FIT, T = +40°C, V = 0.5 x V_R						
	Failure criteria: open or short circuit, cap. change > 10%, DF 2 times the catalog limits, IR < 0.005 x initial limit						
Maximum Pulse Steepness	dV/dt according to Table 1. For peak to peak voltages lower than rated voltage (Vpp <V_R), the specified dv/dt can be multiplied by the factor V_R/Vpp						
Temperature Coefficient	+400 (±200) ppm/°C at 1 kHz						
Self Inductance (Lead Length ~ 2 mm)	Approximately 7 nH. Maximum 1nH per 1 mm lead and capacitor length.						

Performance Characteristics cont.

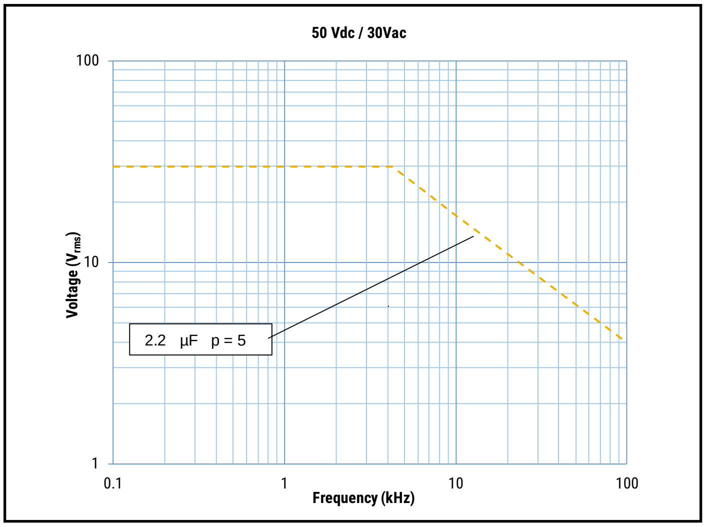
Dissipation Factor tanδ	Maximum Values at 25°C ±5°C			
	Frequency	C ≤ 0.1 µF	0.1 µF < 2.2 µF	C > 2.2 µF
	1 kHz	0.80%	0.80%	0.80%
	10 kHz	1.20%	1.20%	1.50%
	100 kHz	2.50%	–	–
Insulation Resistance	Measured at +25°C ±5°C, according to IEC 60384–2			
	Minimum Values Between Terminals			
	Voltage Charge/Time	C ≤ 0.33 µF	0.33 µF < C ≤ 1.0 µF	C > 1.0 µF
	50 VDC for V_R ≤ 100 VDC 1 minute	≥ 15,000 MΩ	≥ 5,000 MΩ • µF	≥ 1,000 MΩ • µF
	100 VDC for V_R > 100 VDC 1 minute	≥ 30,000 MΩ		

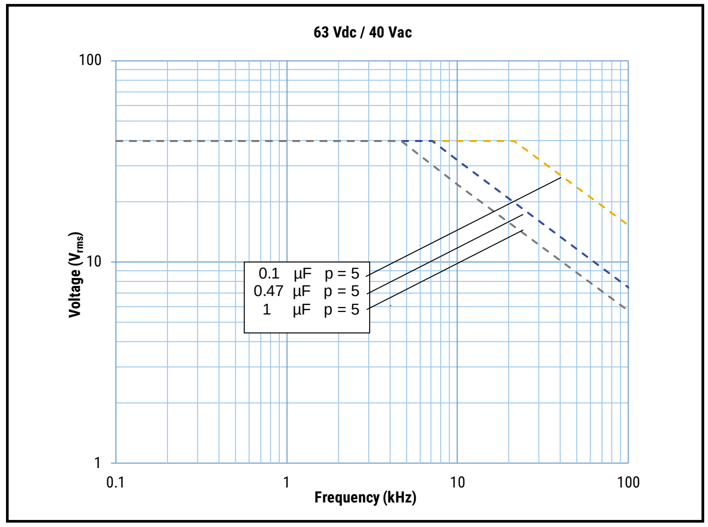


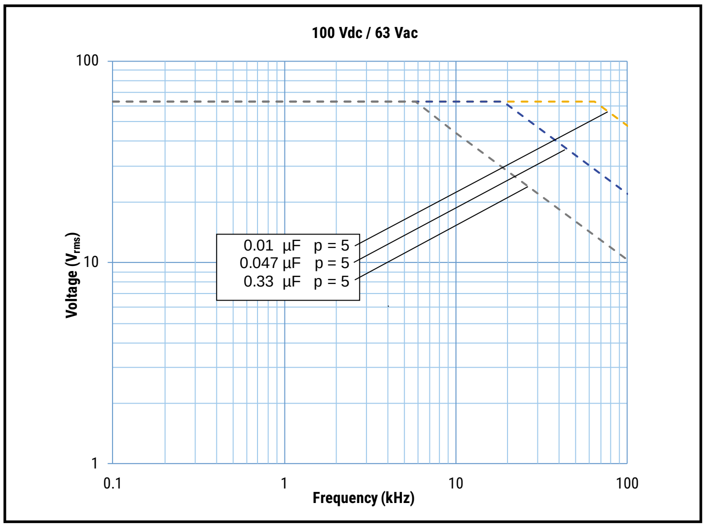


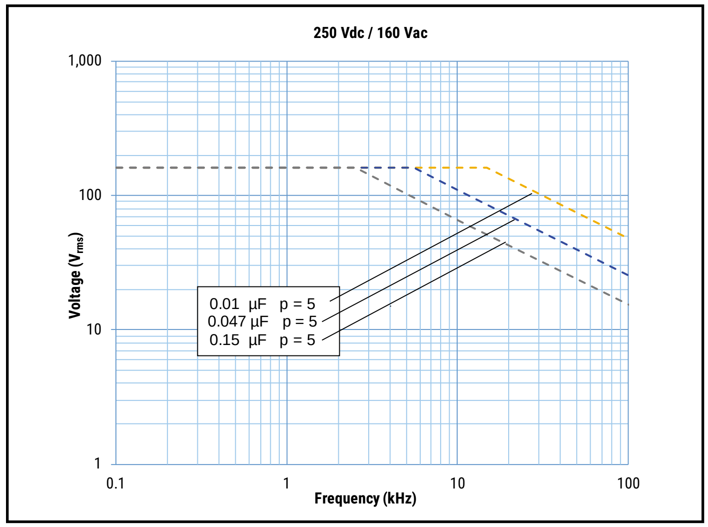
T_h is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

Maximum Voltage (V_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C)

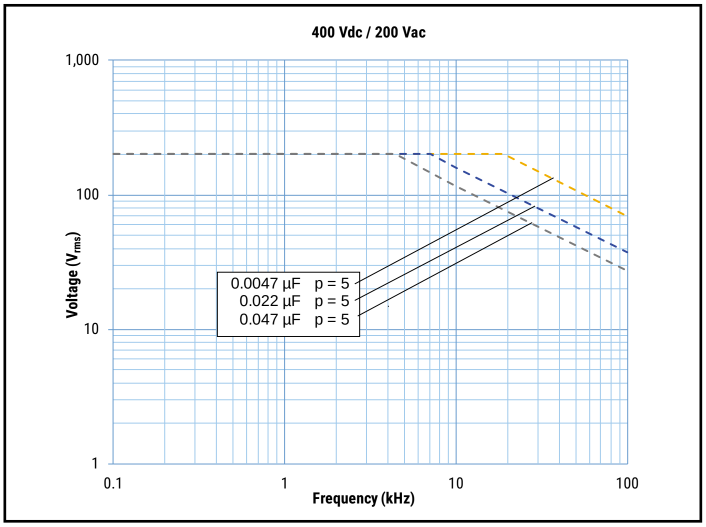


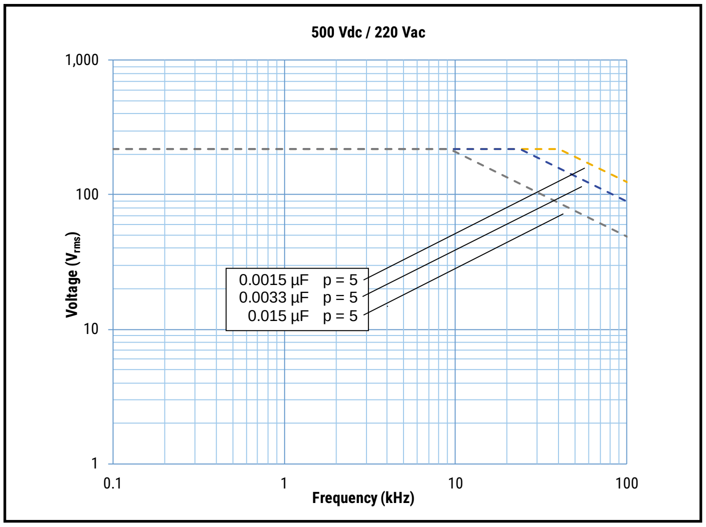


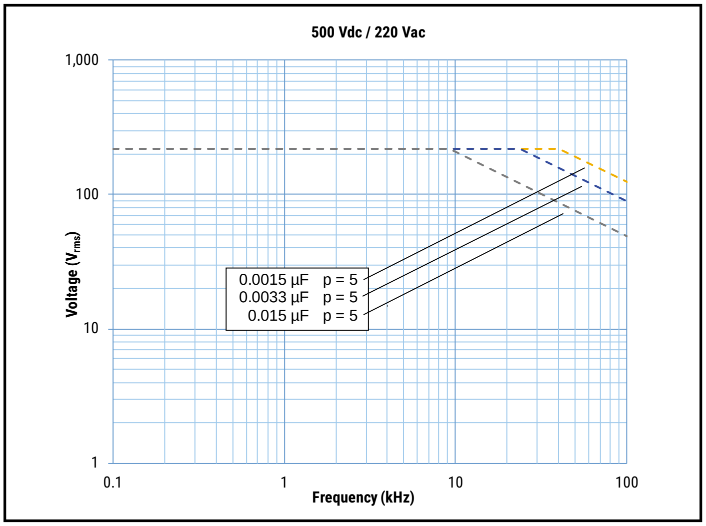




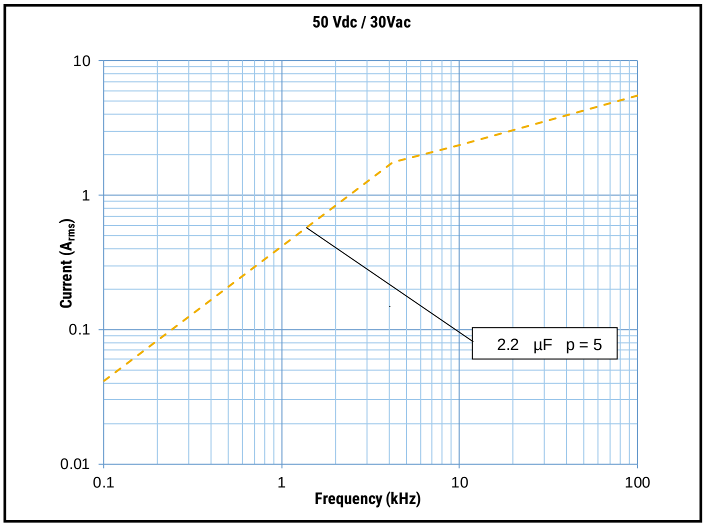
Maximum Voltage (V_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C) cont.

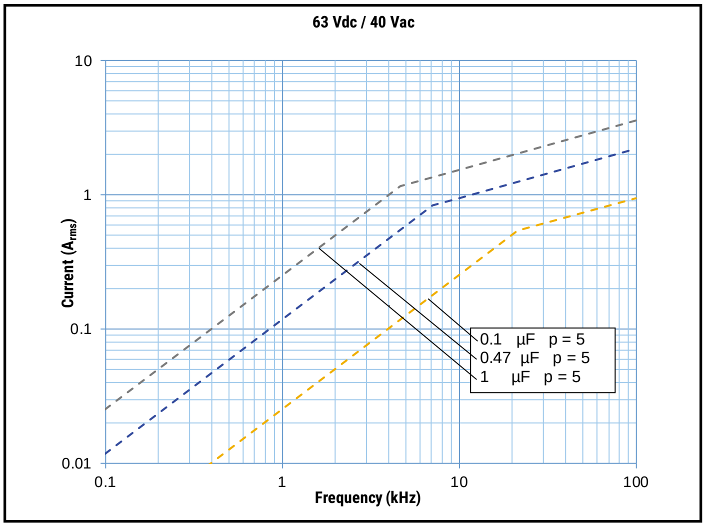


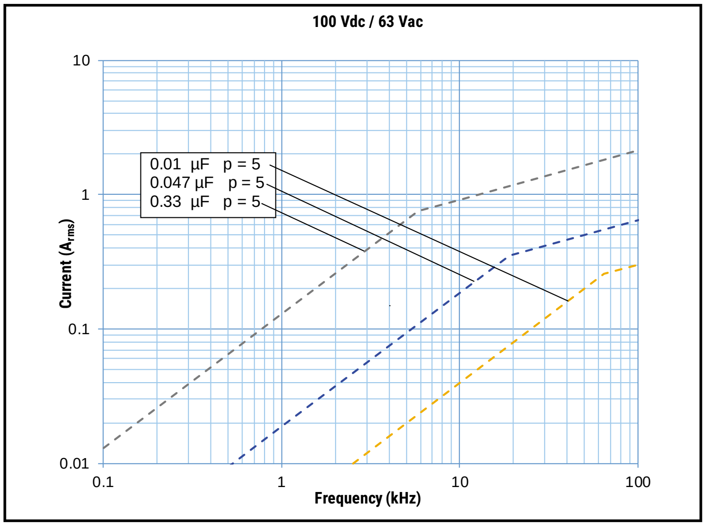


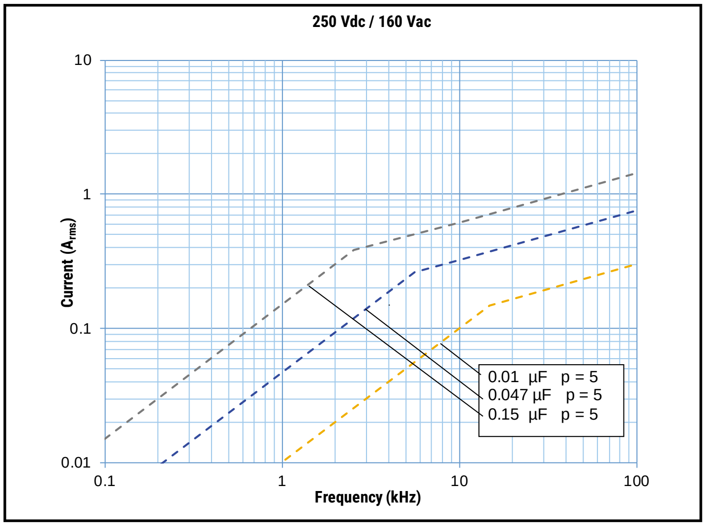


Maximum Current (I_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C)

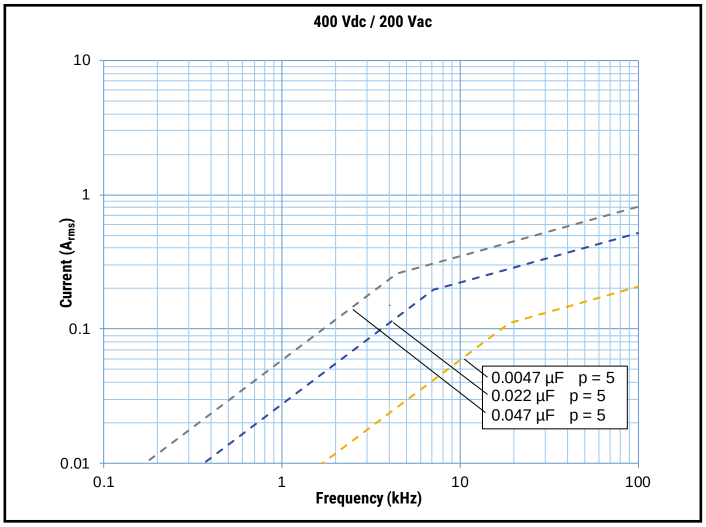


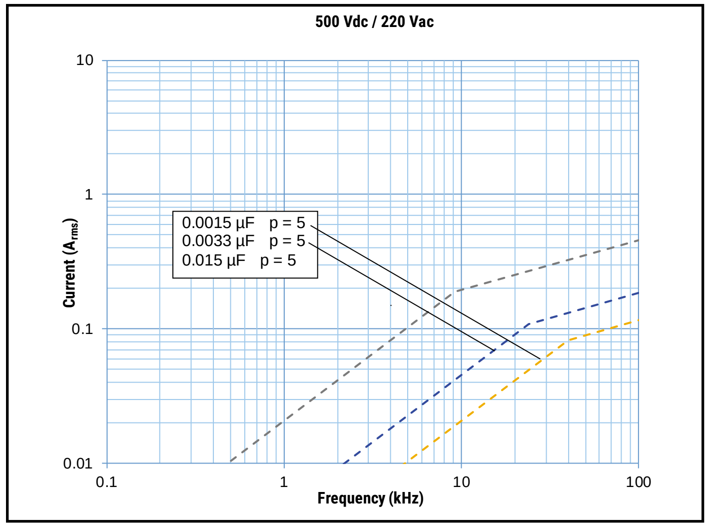


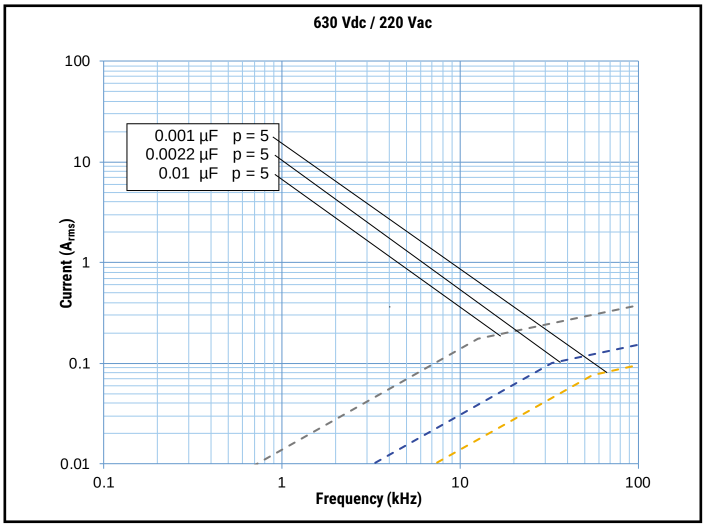




Maximum Current (I_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C) cont.







Environmental Test Data

Damp Heat, Steady State Test	Test Conditions:		Performances
	Temperature: Relative humidity (RH): Test duration:	+40°C ±2°C 93% ±2% 56 days	$\lvert\Delta C/C\rvert \leq 5\%$, $\Delta \tan\delta \leq 0.005$ at 1 kHz IR after test ≥ 50% of initial limit
Endurance Test	**Test Conditions**		**Performances**
	Temperature: Voltage applied: Test duration:	+125°C ±2°C $1.25 \times V_C$ 2,000 hours	$\lvert\Delta C/C\rvert \leq 5\%$, $\Delta \tan\delta \leq 0.003$ at 10 kHz for C ≤ 1µF $\Delta \tan\delta \leq 0.002$ at 1 kHz for C > 1µF IR after test ≥ 50% of initial limit
Resistance to Soldering Heat Test	**Test Conditions**		**Performances**
	Solder bath temperature: Dipping time (with heat screen):	260°C ±5°C 10 seconds ±1 second	$\lvert\Delta C/C\rvert \leq 2\%$, $\Delta \tan\delta \leq 0.003$ at 10 kHz for C ≤ 1µF $\Delta \tan\delta \leq 0.002$ at 1 kHz for C > 1µF IR after test ≥ initial limit

Environmental Compliance

All KEMET MKT capacitors are RoHS Compliant.

Table 1 – Ratings & Part Number Reference

VDC	VAC	Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Maximum K_0 (V^2/µs)	KEMET Part Number	Legacy Part Number
			T	H	L					
50	30	2.2	6.0	11.0	7.2	5.0	200	20,000	SBCC4220(1)10(2)	RSBCC4220(1)10(2)
63	40	0.10	2.5	6.5	7.2	5.0	250	31,500	SBDC3100(1)00(2)	RSBDC3100(1)00(2)
63	40	0.15	2.5	6.5	7.2	5.0	250	31,500	SBDC3150(1)00(2)	RSBDC3150(1)00(2)
63	40	0.22	2.5	6.5	7.2	5.0	250	31,500	SBDC3220(1)10(2)	RSBDC3220(1)10(2)
63	40	0.33	3.5	7.5	7.2	5.0	250	31,500	SBDC3330(1)00(2)	RSBDC3330(1)00(2)
63	40	0.47	3.5	7.5	7.2	5.0	250	31,500	SBDC3470(1)10(2)	RSBDC3470(1)10(2)
63	40	0.68	4.5	9.5	7.2	5.0	250	31,500	SBDC3680(1)10(2)	RSBDC3680(1)10(2)
63	40	1.0	5.0	10.0	7.2	5.0	250	31,500	SBDC4100(1)10(2)	RSBDC4100(1)10(2)
63	40	1.5	6.0	11.0	7.2	5.0	250	31,500	SBDC4150(1)10(2)	RSBDC4150(1)10(2)
63	40	2.2	6.0	11.0	7.2	5.0	100	12,600	SBDC4220(1)20(2)	RSBDC4220(1)20(2)
63	40	3.3	7.2	13.0	7.2	5.0	100	12,600	SBDC4330(1)20(2)	RSBDC4330(1)20(2)
63	**40**	**4.7**	**7.2**	**13.0**	**7.2**	**5.0**	**100**	**12,600**	**SBDC4470(1)20(3)**	**RSBDC4470(1)20(3)**
100	63	0.0047	2.5	6.5	7.2	5.0	300	60,000	SBEC1470(1)00(2)	RSBEC1470(1)00(2)
100	63	0.0068	2.5	6.5	7.2	5.0	300	60,000	SBEC1680(1)00(2)	RSBEC1680(1)00(2)
100	63	0.010	2.5	6.5	7.2	5.0	300	60,000	SBEC2100(1)00(2)	RSBEC2100(1)00(2)
100	63	0.015	2.5	6.5	7.2	5.0	300	60,000	SBEC2150(1)00(2)	RSBEC2150(1)00(2)
100	63	0.022	2.5	6.5	7.2	5.0	300	60,000	SBEC2220(1)00(2)	RSBEC2220(1)00(2)
100	63	0.033	2.5	6.5	7.2	5.0	300	60,000	SBEC2330(1)00(2)	RSBEC2330(1)00(2)
100	63	0.047	2.5	6.5	7.2	5.0	300	60,000	SBEC2470(1)00(2)	RSBEC2470(1)00(2)
100	63	0.07	2.5	6.5	7.2	5.0	300	60,000	SBEC2680(1)10(2)	RSBEC2680(1)10(2)
100	63	0.10	3.5	7.5	7.2	5.0	300	60,000	SBEC3100(1)00(2)	RSBEC3100(1)00(2)
100	63	0.15	4.5	9.5	7.2	5.0	300	60,000	SBEC3150(1)00(2)	RSBEC3150(1)00(2)
100	63	0.22	5.0	10.0	7.2	5.0	300	60,000	SBEC3220(1)00(2)	RSBEC3220(1)00(2)
100	63	0.33	6.0	11.0	7.2	5.0	300	60,000	SBEC3330(1)00(2)	RSBEC3330(1)00(2)
100	63	0.47	6.0	11.0	7.2	5.0	300	60,000	SBEC3470(1)10(2)	RSBEC3470(1)10(2)
250	160	0.0010	2.5	6.5	7.2	5.0	400	200,000	SBIC1100(1)00(2)	RSBIC1100(1)00(2)
250	160	0.0015	2.5	6.5	7.2	5.0	400	200,000	SBIC1150(1)00(2)	RSBIC1150(1)00(2)
250	160	0.0022	2.5	6.5	7.2	5.0	400	200,000	SBIC1220(1)00(2)	RSBIC1220(1)00(2)
250	160	0.0033	2.5	6.5	7.2	5.0	400	200,000	SBIC1330(1)00(2)	RSBIC1330(1)00(2)
250	160	0.0047	2.5	6.5	7.2	5.0	400	200,000	SBIC1470(1)00(2)	RSBIC1470(1)00(2)
250	160	0.0068	2.5	6.5	7.2	5.0	400	200,000	SBIC1680(1)00(2)	RSBIC1680(1)00(2)
250	160	0.010	2.5	6.5	7.2	5.0	400	200,000	SBIC2100(1)00(2)	RSBIC2100(1)00(2)
250	160	0.015	2.5	6.5	7.2	5.0	400	200,000	SBIC2150(1)00(2)	RSBIC2150(1)00(2)
250	160	0.022	3.5	7.5	7.2	5.0	400	200,000	SBIC2220(1)00(2)	RSBIC2220(1)00(2)
250	160	0.033	3.5	7.5	7.2	5.0	400	200,000	SBIC2330(1)00(2)	RSBIC2330(1)00(2)
VDC	**VAC**	**Capacitance Value (µF)**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Max K_0 (V^2/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) K = ±10%, M = ±20%, J = ±5% on request.
(3) M = ±20% (only available tolerance).

Table 1 – Ratings & Part Number Reference cont.

VDC	VAC	Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Maximum K_0 ($V^2/\mu s$)	KEMET Part Number	Legacy Part Number
			T	H	L					
250	160	0.047	4.5	9.5	7.2	5.0	400	200,000	SBIC2470(1)00(2)	RSBIC2470(1)00(2)
250	160	0.068	4.5	9.5	7.2	5.0	400	200,000	SBIC2680(1)00(2)	RSBIC2680(1)00(2)
250	160	0.10	5.0	10.0	7.2	5.0	400	200,000	SBIC3100(1)00(2)	RSBIC3100(1)00(2)
250	160	0.15	6.0	11.0	7.2	5.0	400	200,000	SBIC3150(1)00(2)	RSBIC3150(1)00(2)
400	200	0.0010	2.5	6.5	7.2	5.0	600	480,000	SBMC1100(1)00(2)	RSBMC1100(1)00(2)
400	200	0.0015	2.5	6.5	7.2	5.0	600	480,000	SBMC1150(1)00(2)	RSBMC1150(1)00(2)
400	200	0.0022	2.5	6.5	7.2	5.0	600	480,000	SBMC1220(1)00(2)	RSBMC1220(1)00(2)
400	200	0.0033	2.5	6.5	7.2	5.0	600	480,000	SBMC1330(1)00(2)	RSBMC1330(1)00(2)
400	200	0.0047	2.5	6.5	7.2	5.0	600	480,000	SBMC1470(1)00(2)	RSBMC1470(1)00(2)
400	200	0.0068	3.5	7.5	7.2	5.0	600	480,000	SBMC1680(1)00(2)	RSBMC1680(1)00(2)
400	200	0.010	3.5	7.5	7.2	5.0	600	480,000	SBMC2100(1)00(2)	RSBMC2100(1)00(2)
400	200	0.015	3.5	7.5	7.2	5.0	600	480,000	SBMC2150(1)00(2)	RSBMC2150(1)00(2)
400	200	0.022	4.5	9.5	7.2	5.0	600	480,000	SBMC2220(1)00(2)	RSBMC2220(1)00(2)
400	200	0.033	5.0	10.0	7.2	5.0	600	480,000	SBMC2330(1)00(2)	RSBMC2330(1)00(2)
400	200	0.047	6.0	11.0	7.2	5.0	600	480,000	SBMC2470(1)00(2)	RSBMC2470(1)00(2)
500	220	0.0010	2.5	6.5	7.2	5.0	700	700,000	SBWC1100(1)00(2)	RSBWC1100(1)00(2)
500	220	0.0015	2.5	6.5	7.2	5.0	700	700,000	SBWC1150(1)00(2)	RSBWC1150(1)00(2)
500	220	0.0022	3.5	7.5	7.2	5.0	700	700,000	SBWC1220(1)00(2)	RSBWC1220(1)00(2)
500	220	0.0033	3.5	7.5	7.2	5.0	700	700,000	SBWC1330(1)00(2)	RSBWC1330(1)00(2)
500	220	0.0047	3.5	7.5	7.2	5.0	700	700,000	SBWC1470(1)00(2)	RSBWC1470(1)00(2)
500	220	0.0068	4.5	9.5	7.2	5.0	700	700,000	SBWC1680(1)00(2)	RSBWC1680(1)00(2)
500	220	0.010	5.0	10.0	7.2	5.0	700	700,000	SBWC2100(1)00(2)	RSBWC2100(1)00(2)
500	220	0.015	6.0	11.0	7.2	5.0	700	700,000	SBWC2150(1)00(2)	RSBWC2150(1)00(2)
630	220	0.0010	2.5	6.5	7.2	5.0	800	1,008,000	SBPC1100(1)00(2)	RSBPC1100(1)00(2)
630	220	0.0015	3.5	7.5	7.2	5.0	800	1,008,000	SBPC1150(1)00(2)	RSBPC1150(1)00(2)
630	220	0.0022	3.5	7.5	7.2	5.0	800	1,008,000	SBPC1220(1)00(2)	RSBPC1220(1)00(2)
630	220	0.0033	4.5	9.5	7.2	5.0	800	1,008,000	SBPC1330(1)00(2)	RSBPC1330(1)00(2)
630	220	0.0047	4.5	9.5	7.2	5.0	800	1,008,000	SBPC1470(1)00(2)	RSBPC1470(1)00(2)
630	220	0.0068	5.0	10.0	7.2	5.0	800	1,008,000	SBPC1680(1)00(2)	RSBPC1680(1)00(2)
630	220	0.010	6.0	11.0	7.2	5.0	800	1,008,000	SBPC2100(1)00(2)	RSBPC2100(1)00(2)
VDC	VAC	Capacitance Value (µF)	T (mm)	H (mm)	L (mm)	Lead Spacing (S)	dV/dt (V/µs)	Max K_0 ($V^2/\mu s$)	KEMET Part Number	Legacy Part Number

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) K = ±10%, M = ±20%, J = ±5% on request.
(3) M = ±20% (only available tolerance).

Soldering Process

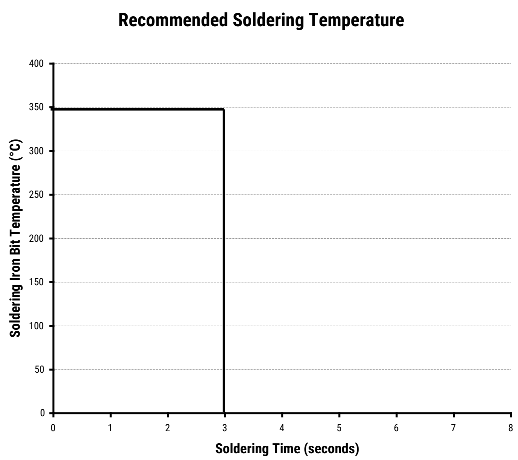
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2, serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

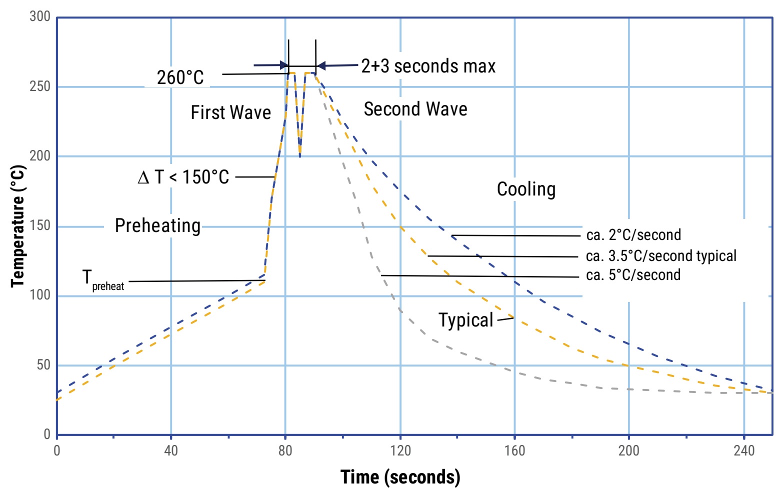
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

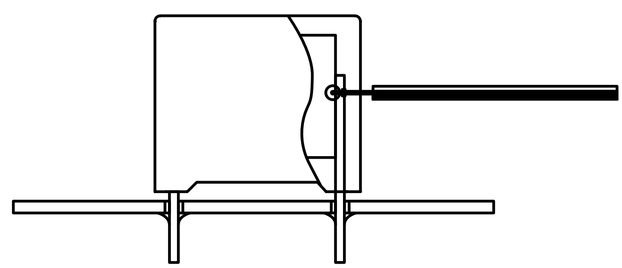
Wave Soldering Recommendations cont.

1. The table indicates the maximum set-up temperature of the soldering process
Figure 1.

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



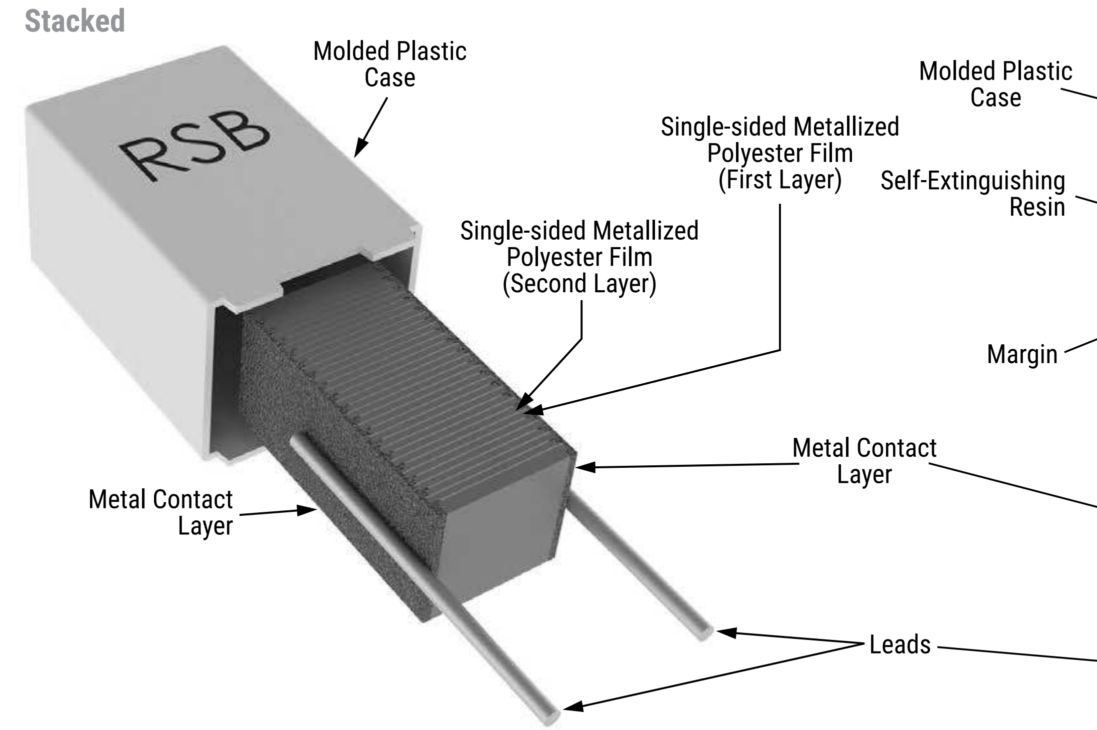
Temperature monitored inside the capacitor.

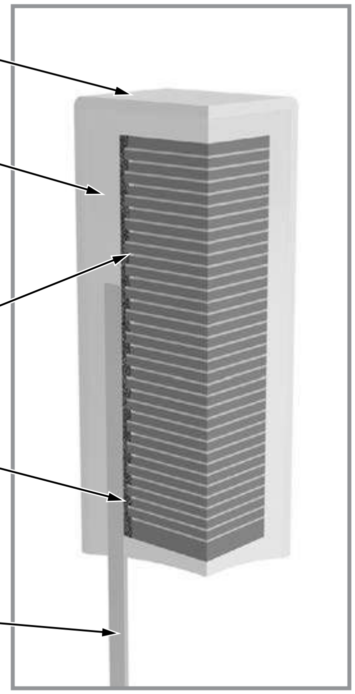
Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

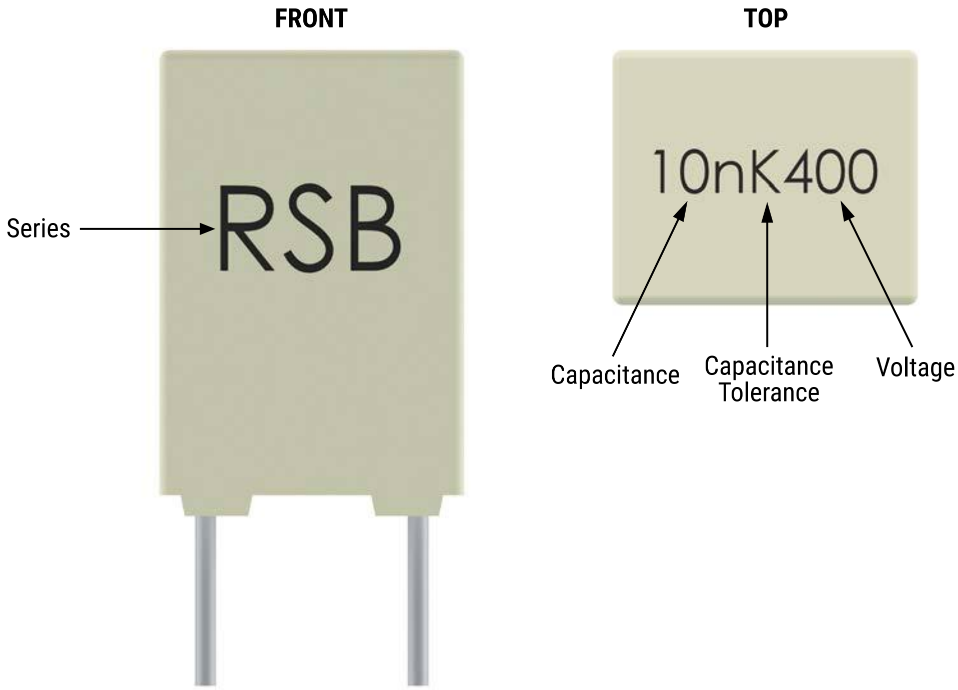
The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Construction





Marking

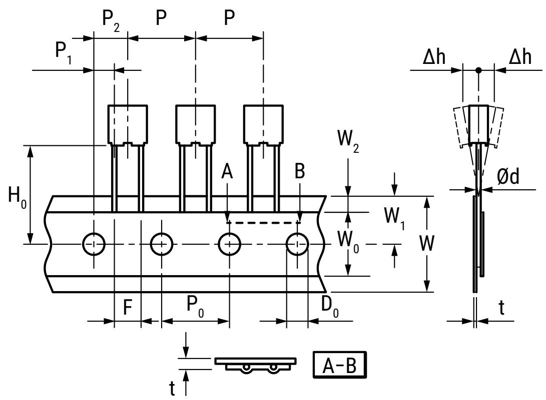


Packaging Quantities

Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 355 mm	Ammo Taped
5	2.5	6.5	7.2	3,000	4,000	2,500	3,500
	3.5	7.5	7.2	2,000	3,000	1,800	2,500
	4.5	9.5	7.2	1,500	2,000	1,400	1,900
	5.0	10.0	7.2	1,000	1,500	1,200	1,700
	6.0	11.0	7.2	2,000	1,000	1,000	1,400
	7.2	13.0	7.2	1,500	750	800	1,150

Lead Taping & Packaging (IEC 60286–2)

Figure 1 — Lead Spacing 5 & 7.5 mm



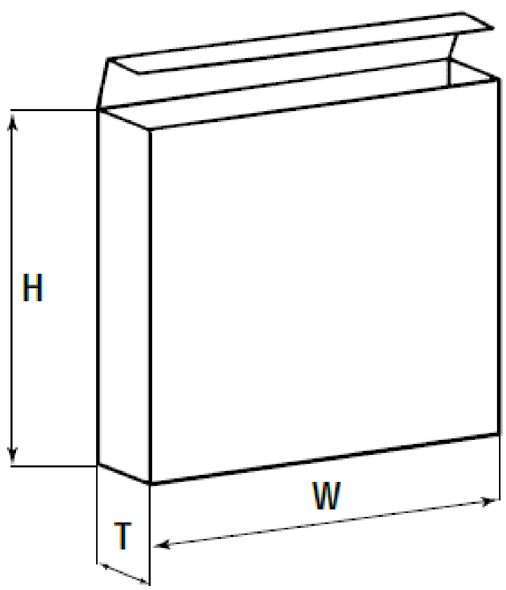
Description	Symbol	Dimensions (mm)	
		Lead Spacing 5 Figure 1	Tolerance
Lead wire diameter	d	0.5 – 0.6	±0.05
Taping lead space	P	12.7	±1
Feed hole lead space	P_0	12.7	±0.2*
Centering of the lead wire	P_1	3.85	±0.7
Centering of the body	P_2	6.35	±1.3
Lead spacing	F	5	+0.6/−0.1
Component alignment	Δh	0	±2
Height of component from tape center	H_0**	18.5	±0.5
Carrier tape width	W	18	+1/−0.5
Hold down tape width	W_0	6	Minimum
Hole position	W_1	9	±0.5
Hold down tape position	W_2	3	Maximum
Feed hole diameter	D_0	4	±0.2
Tape thickness	t	0.7	±0.2

*Maximum 1 mm on 20 lead spaces.
**H_0 = 16.5 mm is available upon request.
For orders of capacitors with lead space = 7.5 mm, please specify the requested version (Figure 1 or Figure 2).

Ammo Specifications

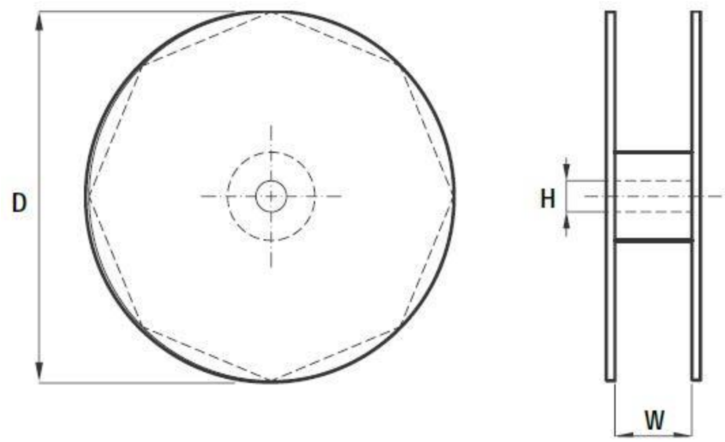
Dimensions in mm		
H	W	T
360 *	340	59

** Lower dimension available upon request (maximum 295 mm)*



Reel Specifications

Dimensions in mm		
D	H	W
355	30	55 maximum



F5A, Metallized Polyester Film with Integrated Ceramic Varistor, 18 – 45 VDC

KEMET a YAGEO company

Overview

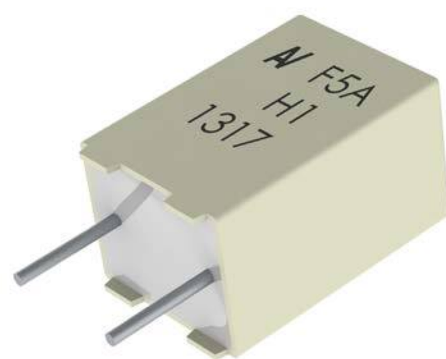
The F5A series is a metallized polyester (MKT) film capacitor with an integrated ceramic varistor, encapsulated in a thermosetting, resin-filled, plastic box with tinned wire leads. Box material is solvent-resistant and flame-retardant, meeting the requirements of UL 94 V–0.

Applications

For worldwide use as EMI/RFI and transient voltage suppressors for automotive motors and other suppression applications. These inlcude engine blower fans, central locking systems, heating/air-conditioning blowers, electric sun roofs, electric window regulators, fuel/oil pumps, electric windshield wipers, and electrically operated seats. This through-hole EMI/RFI suppression element is mainly used for automotive applications without a printed circuit board (e.g., motor suppression) or mixed through-hole and surface-mount printed circuit boards.

Benefits

- Low-inductive MKT capacitors in parallel construction with a ceramic varistor in a single case for superior suppression results
- Approvals: AEC–Q200, ISO 7637
- Rated Voltage: 18 – 45 VDC
- Capacitance Range: 0.1 – 2.2 µF
- Lead Spacing: 5 – 10 mm
- Capacitance Tolerance: ±10%, ±20%
- Climatic Category: 55/125/56 IEC 60068–1
- Tape & Reel packaging in accordance with IEC 60286–2
- RoHS compliance and lead-free terminations
- Operating temperature range: −55°C to +125°C



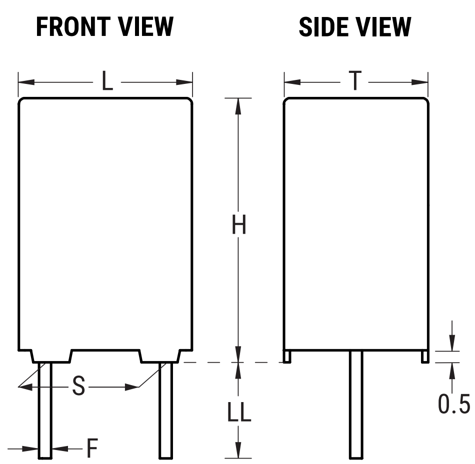
Part Number System

F5A	H	C	4100	DQ	A	6	K
Series	Rated Voltage (VDC)	Lead Spacing (mm)	Capacitance Code (pF)	Lead and Packaging Code	Varistor Voltage V_V at 1 mA	Size Code	Capacitance Tolerance
Film Capacitor/ Ceramic Varistor Unit	B = 18 H = 25 J = 30 N = 45	C = 5 F = 10	Digits 2 - 4 indicate the first three digits of the capacitance value. The first digit indicates the number of zeros to be added.	See Ordering Options Table	See Varistor Voltage table	See Dimension Table	K = ±10% M = ±20%

Ordering Options Table

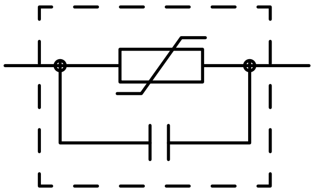
Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/-0	AA
	Ammo Pack	H_0 = 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Bulk (Bag) – Long Leads	17 +1/-2	Z3
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	CK
10	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/-0	AA
	Ammo Pack	H_0 = 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Bulk (Bag) – Long Leads	17 +1/-2	Z3
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	CK

Dimensions – Millimeters



Rated Capacitance µF	Size Code	S		T		H		L		F	
		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
0.1 – 0.47	5	5.0	±0.4	4.6	Maximum	9.6	Maximum	7.4	Maximum	0.6	±0.05
0.56 – 1.5	6	5.0	±0.4	5.1	Maximum	10.1	Maximum	7.5	Maximum	0.6	±0.05
1.8 – 2.2	7	5.0	±0.4	6.1	Maximum	11.1	Maximum	7.5	Maximum	0.6	±0.05
0.1 – 1.0	2	10.0	±0.4	5.2	Maximum	11.1	Maximum	13.4	Maximum	0.75	±0.05
1.2 – 1.5	3	10.0	±0.4	6.2	Maximum	12.1	Maximum	13.4	Maximum	0.75	±0.05
Note: See the Ordering Options Table for lead length (LL) options.											

Circuit Diagram



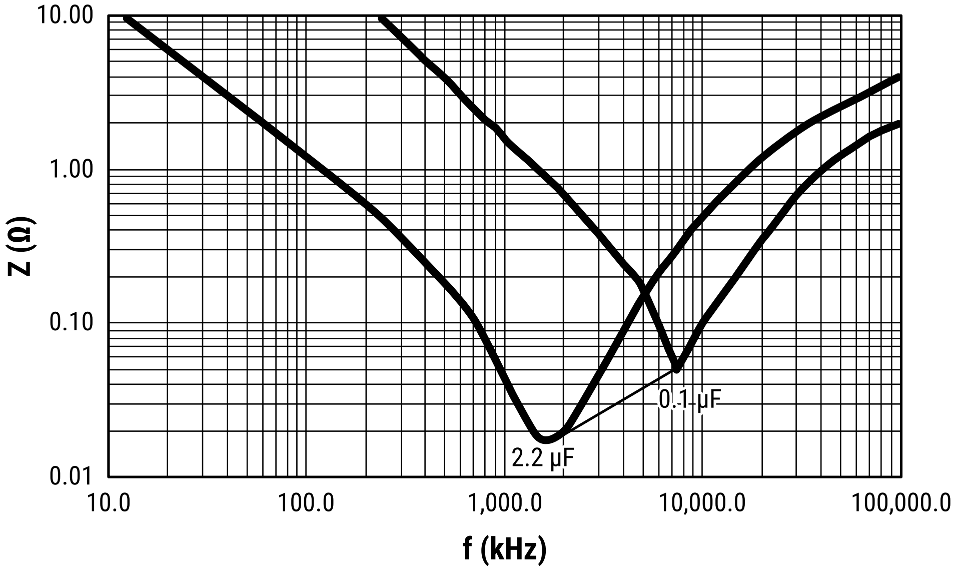
Varistor Voltage Table

Part Number Digit 4		Part Number Digit 12		Clamping Voltage (1 A, Pulse 8/20 µs)
Letter	V_{Rhow} (VDC)	Letter	V_v (VDC)	V_C (V)
B	18	B	22	38
B	18	E	27	44
H	25	A	33	54
J	30	D	39	65
J	30	I	47	77
N	45	B	56	90

Performance Characteristics

Rated Voltage	18 – 45 VDC (For temperature over 100°C a decreasing factor of 2% per degree has to be applied on the rated voltage V_R)
Capacitance Range	0.1 – 2.2 µF
Capacitance Tolerance	±10%, ±20%
Temperature Range	−55°C to +125°C
Climatic Category	55/125/56, IEC 60068−1
Leakage Current	≤ 50 µA at V_R
Approvals	AEC−Q200, ISO 7637
Dissipation Factor	0.01 (1 kHz at 25°C ±5°C)
Insulation Resistance	V_R < 24 V 1 MΩ at 12 V V_R ≥ 24 V 1 MΩ at 24 V
Varistor	Multilayer ceramic, EIA case size 1206
Peak Current Pulse	8/20 µs
Peak Current for V_v < 50 V	200 A
Peak Current for V_v > 50 V	100 A

Impedance Graph



Environmental Test Data

Test	Conditions	Performance	
Damp Heat Steady State	+40°C ±2°C and 93% ±2% R.H., 56 days	Δ C/C	≤ 5%
		V_v change	≤ 10%
		DF change	≤ 50 x 10^{-4} at 1 kHz
		Leakage current at V_R	≤ 100 µA
Endurance	+125°C ±2°C/100°C ±2°C, 0.5 x V_R/1.0 x V_R, 1,000 hours	Δ C/C	≤ 10%
		V_v change	≤ 10%
		DF change	≤ 50 x 10^{-4} at 1 kHz
		Leakage current at V_R	≤ 100 µA
Resistance to Soldering Heat	+260°C ±5°C, 10 ±1 second	Δ C/C	≤ 3%
		V_v change	≤ 5%
		DF change	≤ 30 x 10^{-4} at 1 kHz
		Leakage current at V_R	≤ 50 µA
Peak Current Derating	Reference CECC 42,000/Test C 2.1, 100 times (2 ms), 120 seconds between each current peak	Δ C/C	≤ 10%
		V_v change	≤ 10%
		DF change	≤ 30 x 10^{-4} at 1 kHz
		Leakage current at V_R	≤ 100 µA
Long-Term Stability (After 2 Years)	-40°C to +80°C, ≤ 70% Humidity	Δ C/C	≤ 3%
		V_v change	≤ 5%
		DF change	≤ 20 x 10^{-4} at 1 kHz
		Leakage current at V_R	≤ 50 µA
Reliability Failure Criteria	Reference MIL HDB 217 +40°C ±2°C, 0.5 x V_R, ≤ 5 FIT	Δ C/C	> 10%
		V_v change	≤ 10%
		DF change	≤ 20 x 10^{-4} at 1 kHz
		Leakage current at V_R	≤ 200 µA

Environmental Compliance

All KEMET pulse capacitors are RoHS compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	VDC	Max Dimensions in mm			Lead Spacing (S)	Varistor Voltage (VDC)	KEMET Part Number	Legacy Part Number
		T	H	L				
0.10	18	4.6	9.6	7.4	5.0	22	5ABC3100(1)B5(2)	F5ABC3100(1)B5(2)
0.10	18	4.6	9.6	7.4	5.0	27	5ABC3100(1)E5(2)	F5ABC3100(1)E5(2)
0.22	18	4.6	9.6	7.4	5.0	22	5ABC3220(1)B5(2)	F5ABC3220(1)B5(2)
0.22	18	4.6	9.6	7.4	5.0	27	5ABC3220(1)E5(2)	F5ABC3220(1)E5(2)
0.33	18	4.6	9.6	7.4	5.0	22	5ABC3330(1)B5(2)	F5ABC3330(1)B5(2)
0.33	18	4.6	9.6	7.4	5.0	27	5ABC3330(1)E5(2)	F5ABC3330(1)E5(2)
0.47	18	4.6	9.6	7.4	5.0	22	5ABC3470(1)B5(2)	F5ABC3470(1)B5(2)
0.47	18	4.6	9.6	7.4	5.0	27	5ABC3470(1)E5(2)	F5ABC3470(1)E5(2)
0.56	18	5.1	10.1	7.5	5.0	22	5ABC3560(1)B6(2)	F5ABC3560(1)B6(2)
0.56	18	5.1	10.1	7.5	5.0	27	5ABC3560(1)E6(2)	F5ABC3560(1)E6(2)
0.68	18	5.1	10.1	7.5	5.0	22	5ABC3680(1)B6(2)	F5ABC3680(1)B6(2)
0.68	18	5.1	10.1	7.5	5.0	27	5ABC3680(1)E6(2)	F5ABC3680(1)E6(2)
0.82	18	5.1	10.1	7.5	5.0	22	5ABC3820(1)B6(2)	F5ABC3820(1)B6(2)
0.82	18	5.1	10.1	7.5	5.0	27	5ABC3820(1)E6(2)	F5ABC3820(1)E6(2)
1.00	18	5.1	10.1	7.5	5.0	22	5ABC4100(1)B6(2)	F5ABC4100(1)B6(2)
1.00	18	5.1	10.1	7.5	5.0	27	5ABC4100(1)E6(2)	F5ABC4100(1)E6(2)
1.20	18	5.1	10.1	7.5	5.0	22	5ABC4120(1)B6(2)	F5ABC4120(1)B6(2)
1.20	18	5.1	10.1	7.5	5.0	27	5ABC4120(1)E6(2)	F5ABC4120(1)E6(2)
1.50	18	5.1	10.1	7.5	5.0	22	5ABC4150(1)B6(2)	F5ABC4150(1)B6(2)
1.50	18	5.1	10.1	7.5	5.0	27	5ABC4150(1)E6(2)	F5ABC4150(1)E6(2)
1.80	18	6.1	11.1	7.5	5.0	22	5ABC4180(1)B7(2)	F5ABC4180(1)B7(2)
1.80	18	6.1	11.1	7.5	5.0	27	5ABC4180(1)E7(2)	F5ABC4180(1)E7(2)
2.20	18	6.1	11.1	7.5	5.0	22	5ABC4220(1)B7(2)	F5ABC4220(1)B7(2)
2.20	18	6.1	11.1	7.5	5.0	27	5ABC4220(1)E7(2)	F5ABC4220(1)E7(2)
0.10	25	4.6	9.6	7.4	5.0	33	5AHC3100(1)A5(2)	F5AHC3100(1)A5(2)
0.22	25	4.6	9.6	7.4	5.0	33	5AHC3220(1)A5(2)	F5AHC3220(1)A5(2)
0.33	25	4.6	9.6	7.4	5.0	33	5AHC3330(1)A5(2)	F5AHC3330(1)A5(2)
0.47	25	4.6	9.6	7.4	5.0	33	5AHC3470(1)A5(2)	F5AHC3470(1)A5(2)
0.56	25	5.1	10.1	7.5	5.0	33	5AHC3560(1)A6(2)	F5AHC3560(1)A6(2)
0.68	25	5.1	10.1	7.5	5.0	33	5AHC3680(1)A6(2)	F5AHC3680(1)A6(2)
0.82	25	5.1	10.1	7.5	5.0	33	5AHC3820(1)A6(2)	F5AHC3820(1)A6(2)
1.00	25	5.1	10.1	7.5	5.0	33	5AHC4100(1)A6(2)	F5AHC4100(1)A6(2)
1.20	25	5.1	10.1	7.5	5.0	33	5AHC4120(1)A6(2)	F5AHC4120(1)A6(2)
1.50	25	5.1	10.1	7.5	5.0	33	5AHC4150(1)A6(2)	F5AHC4150(1)A6(2)
1.80	25	6.1	11.1	7.5	5.0	33	5AHC4180(1)A7(2)	F5AHC4180(1)A7(2)
2.20	25	6.1	11.1	7.5	5.0	33	5AHC4220(1)A7(2)	F5AHC4220(1)A7(2)
0.10	30	4.6	9.6	7.4	5.0	39	5AJC3100(1)D5(2)	F5AJC3100(1)D5(2)
0.10	30	4.6	9.6	7.4	5.0	47	5AJC3100(1)I5(2)	F5AJC3100(1)I5(2)
0.22	30	4.6	9.6	7.4	5.0	39	5AJC3220(1)D5(2)	F5AJC3220(1)D5(2)
0.22	30	4.6	9.6	7.4	5.0	47	5AJC3220(1)I5(2)	F5AJC3220(1)I5(2)
Capacitance Value (µF)	VDC	T (mm)	H (mm)	L (mm)	Lead Spacing (S)	Varistor Voltage (VDC)	KEMET Part Number	Legacy Part Number

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) K = 10%, M = 20%.

Table 1 – Ratings & Part Number Reference cont.

Capacitance Value (µF)	VDC	Max Dimensions in mm			Lead Spacing (S)	Varistor Voltage (VDC)	KEMET Part Number	Legacy Part Number
		T	H	L				
0.33	30	4.6	9.6	7.4	5.0	39	5AJC3330(1)D5(2)	F5AJC3330(1)D5(2)
0.33	30	4.6	9.6	7.4	5.0	47	5AJC3330(1)I5(2)	F5AJC3330(1)I5(2)
0.47	30	4.6	9.6	7.4	5.0	39	5AJC3470(1)D5(2)	F5AJC3470(1)D5(2)
0.47	30	4.6	9.6	7.4	5.0	47	5AJC3470(1)I5(2)	F5AJC3470(1)I5(2)
0.56	30	5.1	10.1	7.5	5.0	39	5AJC3560(1)D6(2)	F5AJC3560(1)D6(2)
0.56	30	5.1	10.1	7.5	5.0	47	5AJC3560(1)I6(2)	F5AJC3560(1)I6(2)
0.68	30	5.1	10.1	7.5	5.0	39	5AJC3680(1)D6(2)	F5AJC3680(1)D6(2)
0.68	30	5.1	10.1	7.5	5.0	47	5AJC3680(1)I6(2)	F5AJC3680(1)I6(2)
0.82	30	5.1	10.1	7.5	5.0	39	5AJC3820(1)D6(2)	F5AJC3820(1)D6(2)
0.82	30	5.1	10.1	7.5	5.0	47	5AJC3820(1)I6(2)	F5AJC3820(1)I6(2)
1.00	30	5.1	10.1	7.5	5.0	39	5AJC4100(1)D6(2)	F5AJC4100(1)D6(2)
1.00	30	5.1	10.1	7.5	5.0	47	5AJC4100(1)I6(2)	F5AJC4100(1)I6(2)
1.20	30	5.1	10.1	7.5	5.0	39	5AJC4120(1)D6(2)	F5AJC4120(1)D6(2)
1.20	30	5.1	10.1	7.5	5.0	47	5AJC4120(1)I6(2)	F5AJC4120(1)I6(2)
1.50	30	5.1	10.1	7.5	5.0	39	5AJC4150(1)D6(2)	F5AJC4150(1)D6(2)
1.50	30	5.1	10.1	7.5	5.0	47	5AJC4150(1)I6(2)	F5AJC4150(1)I6(2)
1.80	30	6.1	11.1	7.5	5.0	39	5AJC4180(1)D7(2)	F5AJC4180(1)D7(2)
1.80	30	6.1	11.1	7.5	5.0	47	5AJC4180(1)I7(2)	F5AJC4180(1)I7(2)
2.20	30	6.1	11.1	7.5	5.0	39	5AJC4220(1)D7(2)	F5AJC4220(1)D7(2)
2.20	30	6.1	11.1	7.5	5.0	47	5AJC4220(1)I7(2)	F5AJC4220(1)I7(2)
0.10	45	4.6	9.6	7.4	5.0	56	5ANC3100(1)B5(2)	F5ANC3100(1)B5(2)
0.22	45	4.6	9.6	7.4	5.0	56	5ANC3220(1)B5(2)	F5ANC3220(1)B5(2)
0.33	45	4.6	9.6	7.4	5.0	56	5ANC3330(1)B5(2)	F5ANC3330(1)B5(2)
0.47	45	4.6	9.6	7.4	5.0	56	5ANC3470(1)B5(2)	F5ANC3470(1)B5(2)
0.56	45	5.1	10.1	7.5	5.0	56	5ANC3560(1)B6(2)	F5ANC3560(1)B6(2)
0.68	45	5.1	10.1	7.5	5.0	56	5ANC3680(1)B6(2)	F5ANC3680(1)B6(2)
0.82	45	5.1	10.1	7.5	5.0	56	5ANC3820(1)B6(2)	F5ANC3820(1)B6(2)
1.00	45	5.1	10.1	7.5	5.0	56	5ANC4100(1)B6(2)	F5ANC4100(1)B6(2)
1.20	45	5.1	10.1	7.5	5.0	56	5ANC4120(1)B6(2)	F5ANC4120(1)B6(2)
1.50	45	5.1	10.1	7.5	5.0	56	5ANC4150(1)B6(2)	F5ANC4150(1)B6(2)
1.80	45	6.1	11.1	7.5	5.0	56	5ANC4180(1)B7(2)	F5ANC4180(1)B7(2)
2.20	45	6.1	11.1	7.5	5.0	56	5ANC4220(1)B7(2)	F5ANC4220(1)B7(2)
0.10	18	5.2	11.1	13.4	10.0	22	5ABF3100(1)B2(2)	F5ABF3100(1)B2(2)
0.10	18	5.2	11.1	13.4	10.0	27	5ABF3100(1)E2(2)	F5ABF3100(1)E2(2)
0.22	18	5.2	11.1	13.4	10.0	22	5ABF3220(1)B2(2)	F5ABF3220(1)B2(2)
0.22	18	5.2	11.1	13.4	10.0	27	5ABF3220(1)E2(2)	F5ABF3220(1)E2(2)
0.33	18	5.2	11.1	13.4	10.0	22	5ABF3330(1)B2(2)	F5ABF3330(1)B2(2)
0.33	18	5.2	11.1	13.4	10.0	27	5ABF3330(1)E2(2)	F5ABF3330(1)E2(2)
0.47	18	5.2	11.1	13.4	10.0	22	5ABF3470(1)B2(2)	F5ABF3470(1)B2(2)
0.47	18	5.2	11.1	13.4	10.0	27	5ABF3470(1)E2(2)	F5ABF3470(1)E2(2)
0.56	18	5.2	11.1	13.4	10.0	22	5ABF3560(1)B2(2)	F5ABF3560(1)B2(2)
0.56	18	5.2	11.1	13.4	10.0	27	5ABF3560(1)E2(2)	F5ABF3560(1)E2(2)
0.68	18	5.2	11.1	13.4	10.0	22	5ABF3680(1)B2(2)	F5ABF3680(1)B2(2)
0.68	18	5.2	11.1	13.4	10.0	27	5ABF3680(1)E2(2)	F5ABF3680(1)E2(2)
0.82	18	5.2	11.1	13.4	10.0	22	5ABF3820(1)B2(2)	F5ABF3820(1)B2(2)
0.82	18	5.2	11.1	13.4	10.0	27	5ABF3820(1)E2(2)	F5ABF3820(1)E2(2)
1.00	18	5.2	11.1	13.4	10.0	22	5ABF4100(1)B2(2)	F5ABF4100(1)B2(2)
1.00	18	5.2	11.1	13.4	10.0	27	5ABF4100(1)E2(2)	F5ABF4100(1)E2(2)
1.20	18	6.2	12.1	13.4	10.0	22	5ABF4120(1)B3(2)	F5ABF4120(1)B3(2)
1.20	18	6.2	12.1	13.4	10.0	27	5ABF4120(1)E3(2)	F5ABF4120(1)E3(2)
1.50	18	6.2	12.1	13.4	10.0	22	5ABF4150(1)B3(2)	F5ABF4150(1)B3(2)
1.50	18	6.2	12.1	13.4	10.0	27	5ABF4150(1)E3(2)	F5ABF4150(1)E3(2)
0.10	25	5.2	11.1	13.4	10.0	33	5AHF3100(1)A2(2)	F5AHF3100(1)A2(2)
0.22	25	5.2	11.1	13.4	10.0	33	5AHF3220(1)A2(2)	F5AHF3220(1)A2(2)
0.33	25	5.2	11.1	13.4	10.0	33	5AHF3330(1)A2(2)	F5AHF3330(1)A2(2)
Capacitance Value (µF)	VDC	T (mm)	H (mm)	L (mm)	Lead Spacing (S)	Varistor Voltage (VDC)	KEMET Part Number	Legacy Part Number

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) K = 10%, M = 20%.

Table 1 – Ratings & Part Number Reference cont.

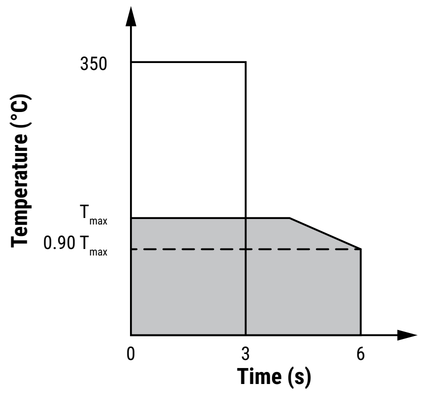
Capacitance Value (µF)	VDC	Max Dimensions in mm			Lead Spacing (S)	Varistor Voltage (VDC)	KEMET Part Number	Legacy Part Number
		T	H	L				
0.47	25	5.2	11.1	13.4	10.0	33	5AHF3470(1)A2(2)	F5AHF3470(1)A2(2)
0.56	25	5.2	11.1	13.4	10.0	33	5AHF3560(1)A2(2)	F5AHF3560(1)A2(2)
0.68	25	5.2	11.1	13.4	10.0	33	5AHF3680(1)A2(2)	F5AHF3680(1)A2(2)
0.82	25	5.2	11.1	13.4	10.0	33	5AHF3820(1)A2(2)	F5AHF3820(1)A2(2)
1.00	25	5.2	11.1	13.4	10.0	33	5AHF4100(1)A2(2)	F5AHF4100(1)A2(2)
1.20	25	6.2	12.1	13.4	10.0	33	5AHF4120(1)A3(2)	F5AHF4120(1)A3(2)
1.50	25	6.2	12.1	13.4	10.0	33	5AHF4150(1)A3(2)	F5AHF4150(1)A3(2)
0.10	30	5.2	11.1	13.4	10.0	39	5AJF3100(1)D2(2)	F5AJF3100(1)D2(2)
0.10	30	5.2	11.1	13.4	10.0	47	5AJF3100(1)I2(2)	F5AJF3100(1)I2(2)
0.22	30	5.2	11.1	13.4	10.0	39	5AJF3220(1)D2(2)	F5AJF3220(1)D2(2)
0.22	30	5.2	11.1	13.4	10.0	47	5AJF3220(1)I2(2)	F5AJF3220(1)I2(2)
0.33	30	5.2	11.1	13.4	10.0	39	5AJF3330(1)D2(2)	F5AJF3330(1)D2(2)
0.33	30	5.2	11.1	13.4	10.0	47	5AJF3330(1)I2(2)	F5AJF3330(1)I2(2)
0.47	30	5.2	11.1	13.4	10.0	39	5AJF3470(1)D2(2)	F5AJF3470(1)D2(2)
0.47	30	5.2	11.1	13.4	10.0	47	5AJF3470(1)I2(2)	F5AJF3470(1)I2(2)
0.56	30	5.2	11.1	13.4	10.0	39	5AJF3560(1)D2(2)	F5AJF3560(1)D2(2)
0.56	30	5.2	11.1	13.4	10.0	47	5AJF3560(1)I2(2)	F5AJF3560(1)I2(2)
0.68	30	5.2	11.1	13.4	10.0	39	5AJF3680(1)D2(2)	F5AJF3680(1)D2(2)
0.68	30	5.2	11.1	13.4	10.0	47	5AJF3680(1)I2(2)	F5AJF3680(1)I2(2)
0.82	30	5.2	11.1	13.4	10.0	39	5AJF3820(1)D2(2)	F5AJF3820(1)D2(2)
0.82	30	5.2	11.1	13.4	10.0	47	5AJF3820(1)I2(2)	F5AJF3820(1)I2(2)
1.00	30	5.2	11.1	13.4	10.0	39	5AJF4100(1)D2(2)	F5AJF4100(1)D2(2)
1.00	30	5.2	11.1	13.4	10.0	47	5AJF4100(1)I2(2)	F5AJF4100(1)I2(2)
1.20	30	6.2	12.1	13.4	10.0	39	5AJF4120(1)D3(2)	F5AJF4120(1)D3(2)
1.20	30	6.2	12.1	13.4	10.0	47	5AJF4120(1)I3(2)	F5AJF4120(1)I3(2)
1.50	30	6.2	12.1	13.4	10.0	39	5AJF4150(1)D3(2)	F5AJF4150(1)D3(2)
1.50	30	6.2	12.1	13.4	10.0	47	5AJF4150(1)I3(2)	F5AJF4150(1)I3(2)
0.10	45	5.2	11.1	13.4	10.0	56	5ANF3100(1)B2(2)	F5ANF3100(1)B2(2)
0.22	45	5.2	11.1	13.4	10.0	56	5ANF3220(1)B2(2)	F5ANF3220(1)B2(2)
0.33	45	5.2	11.1	13.4	10.0	56	5ANF3330(1)B2(2)	F5ANF3330(1)B2(2)
0.47	45	5.2	11.1	13.4	10.0	56	5ANF3470(1)B2(2)	F5ANF3470(1)B2(2)
0.56	45	5.2	11.1	13.4	10.0	56	5ANF3560(1)B2(2)	F5ANF3560(1)B2(2)
0.68	45	5.2	11.1	13.4	10.0	56	5ANF3680(1)B2(2)	F5ANF3680(1)B2(2)
0.82	45	5.2	11.1	13.4	10.0	56	5ANF3820(1)B2(2)	F5ANF3820(1)B2(2)
1.00	45	5.2	11.1	13.4	10.0	56	5ANF4100(1)B2(2)	F5ANF4100(1)B2(2)
1.20	45	6.2	12.1	13.4	10.0	56	5ANF4120(1)B3(2)	F5ANF4120(1)B3(2)
1.50	45	6.2	12.1	13.4	10.0	56	5ANF4150(1)B3(2)	F5ANF4150(1)B3(2)
Capacitance Value (µF)	**VDC**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**Varistor Voltage (VDC)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) K = 10%, M = 20%.

Maximum Soldering Temperature

In order to achieve optimal solderability, we suggest the following:

- Set the temperature so that the maximum temperature inside the element is below 160°C.
- Solder within the following temperature profiles, especially for iron soldering:



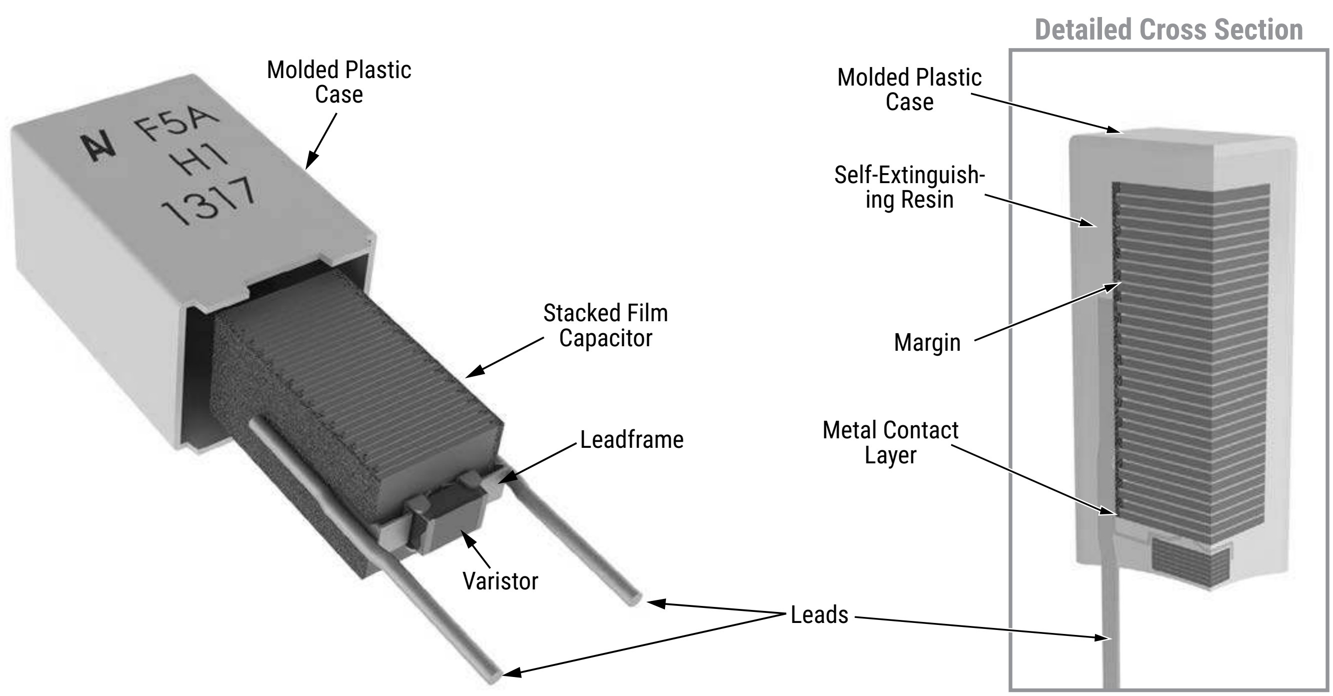
Temperature	Time
110°C	1 minute

Box series: T_{max} = 275°C for 4 seconds

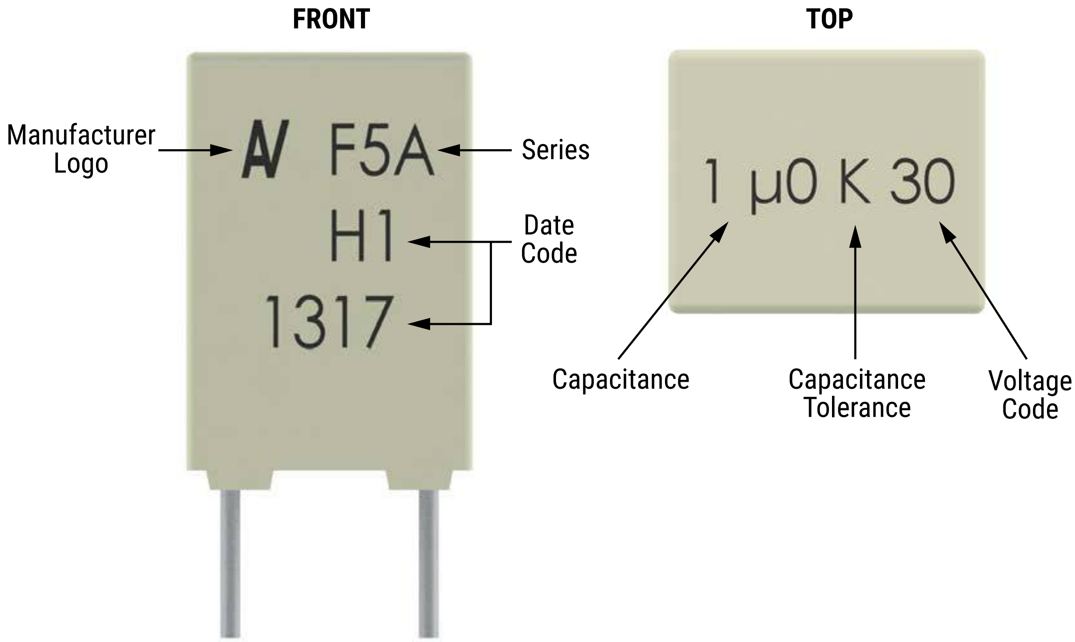
General Conditions

- If two solderings are required, allow for recovery time until the temperature on the capacitor surface is below 50°C.
- Avoid passing through the adhesive curing oven when fixing surface-mount parts in combination with through-hole parts. Insert through-hole parts only after curing the surface-mount parts.
- Avoid reflow soldering by combining the lead type with surface-mount parts.

Construction



Marking

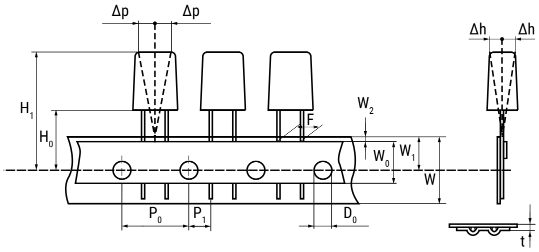


Packaging Quantities

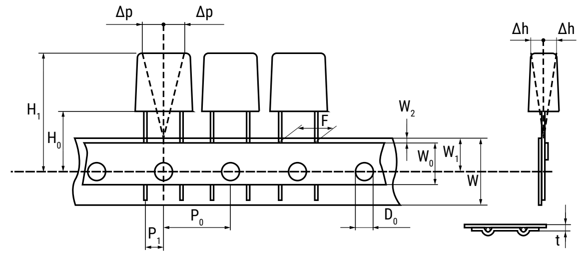
Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 355 mm	Large Reel 500 mm	Ammo
5	4.6	9.6	7.4	1,500	2,000	1,400		1,900
	5.1	10.1	7.5	1,000	1,500	1,200		1,700
	6.1	11.1	7.5	2,000	1,000	1,000		1,400
	7.3	13.1	7.5	1,500	750	800		1,150
10	5.2	11.1	13.4	1,300	2,000	600	1,250	800
	6.2	12.1	13.4	1,000	1,800	500	1,000	680

Lead Taping & Packaging (IEC 60286–2)

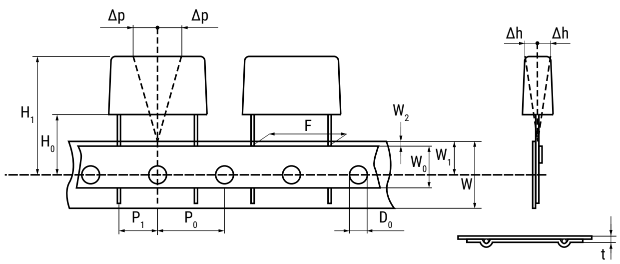
Lead Spacing 5 mm



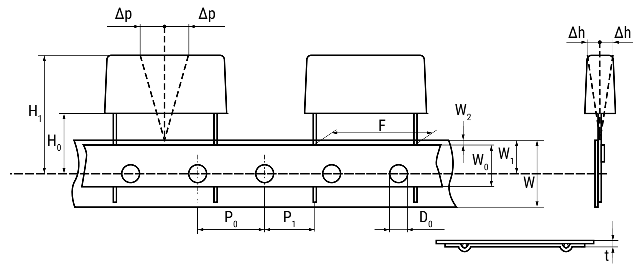
Lead Spacing 7.5 mm



Lead Spacing 10 – 15 mm



Lead Spacing 22.5 – 27.5 mm



Taping Specification

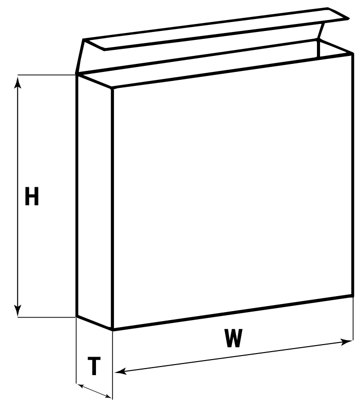
Dimensions in mm									Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	5.0	7.5	10.0	15.0	22.5	27.5	F
Carrier Tape Width	+1/−0.5	W	18.0	18.0	18.0	18.0	18.0	18.0	$18^{+1/-0.5}$
Hold-Down Tape Width	Minimum	W_0	6.0	6.0	9.0	10.0	10.0	10.0	
Position of Sprocket Hole	±0.5	W_1	9.0	9.0	9.0	9.0	9.0	9.0	$9^{+0.75/-0.5}$
Distance Between Tapes	Maximum	W_2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Sprocket Hole Diameter	±0.2	D_0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Feed Hole Lead Spacing	±0.2(1)	P_0(3)	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.85	3.75	7.7	5.2	7.8	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	±2	Δh	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.9^{MAX}	0.9^{MAX}	0.9^{MAX}
Sprocket Hole/Cap Body	±0.5	H_0(2)	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18^{+2/-0}$

(1) Maximum cumulative feed hole error, 1 mm per 20 parts.
(2) 16.5 mm available on request.
(3) 15 mm available on request (F ≥ 10 mm).

Lead Taping & Packaging (IEC 60286–2) cont.

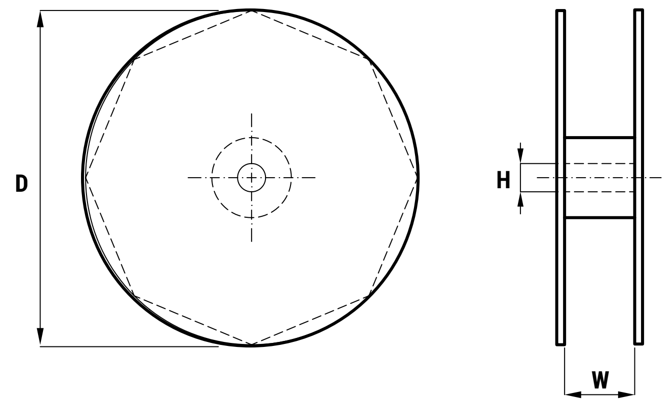
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
F5A, F5B, F5D	360	340	59
F6xx, F8xx			
PHExxx, PMExxx, PMRxxx	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
F5A, F5B, F5D	355 500	30 25	55 (Max)
F6xx, F8xx			
PHExxx, PMExxx, PMRxxx	360 500	30	46 (Max)



F5B, Metallized Polyester Film with Integrated Suppression Diode 18 – 63 VDC

KEMET a YAGEO company

Overview

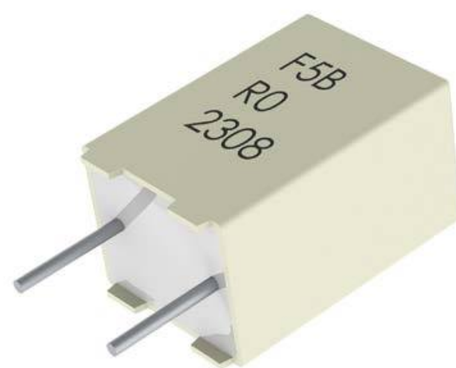
The F5B series is a metallized polyester (MKT) film capacitor with an integrated suppression diode, encapsulated in a thermosetting, resin-filled, plastic box with tinned wire leads. Box material is solvent-resistant and flame-retardant, meeting the requirements of UL 94 V–0.

Applications

For worldwide use as EMI/RFI and advanced transient voltage suppressors for automotive motors and other suppression applications. These include engine blower fans, central locking systems, heating/air-conditioning blowers, electric sun roofs, electric window regulators, fuel/oil pumps, electric windshield wipers, and electrically operated seats. This through-hole EMI/RFI suppression element is mainly used for automotive applications without a printed circuit board (e.g. motor suppression) or mixed through-hole and surface-mount printed circuit boards.

Benefits

- Low-inductive MKT capacitors in parallel construction with a high-power bidirectional transient voltage suppressor diode in a single case that provides superior suppression results
- Approvals: AEC–Q200 (in progress), ISO7637
- Rated Voltage: 18 – 63 VDC
- Capacitance Range: 0.1 – 2.2 µF
- Lead Spacing: 5 mm
- Capacitance Tolerance: ±10%, ±20%
- Climatic Category: 55/125/56 IEC 60068–1
- Tape & Reel packaging in accordance with IEC 60286–2
- RoHS compliance and lead-free terminations
- Operating temperature range: –55˚C to +125˚C



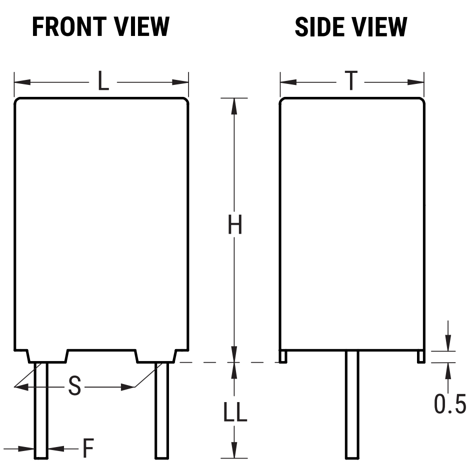
Part Number System

F5B	H	C	4100	DQ	A	7	K
Series	Rated Voltage (VDC)	Lead Spacing (mm)	Capacitance Code (pF)	Lead and Packaging Code	Diode Breakdown Voltage V_{BR} at 1 mA	Size Code	Capacitance Tolerance
Film Capacitor/ Diode Unit	B= 18 H = 25 J = 30 N = 45 C = 50 D = 63	C = 5 mm	Digits 2 – 4 indicate the first three digits of the capacitance value. The first digit indicates the number of zeros to be added.	See Ordering Options Table	See Diode Breakdown Voltage table	See Dimension Table	K = ±10% M = ±20%

Ordering Options Table

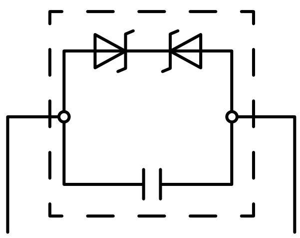
Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/−0	AA
	Ammo Pack	H_0= 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Bulk (Bag) – Long Leads	17 +1/−2	Z3
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	CK

Dimensions – Millimeters



Rated Capacitance µF	Size Code	S		T		H		L		F	
		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
0.1 – 1.2	7	5	±0.4	6.1	Maximum	11.1	Maximum	7.5	Maximum	0.6	±0.05
1.5 – 2.2	8	5	±0.4	7.3	Maximum	13.1	Maximum	7.5	Maximum	0.6	±0.05
Note: See the Ordering Options Table for lead length (LL) options.											

Circuit Diagram



Diode Breakdown Voltage & Clamping Voltage Table

Part Number Digit 4		Part Number Digit 12		Clamping Voltage (Pulse 10/700 µs)	
Letter	V_R (VDC)	Letter	V_{BR} (VDC)	V_C (V)	I_p (A)
B	18	B	22	28	24
B	18	E	27	33	31
H	25	A	30	36	20
H	25	C	33	40	19
J	30	D	36	43	18
J	30	I	39	46	17
J	30	N	44	52	16
N	45	B	53	62	14
C	50	C	68	78	12
D	63	C	78	89	11

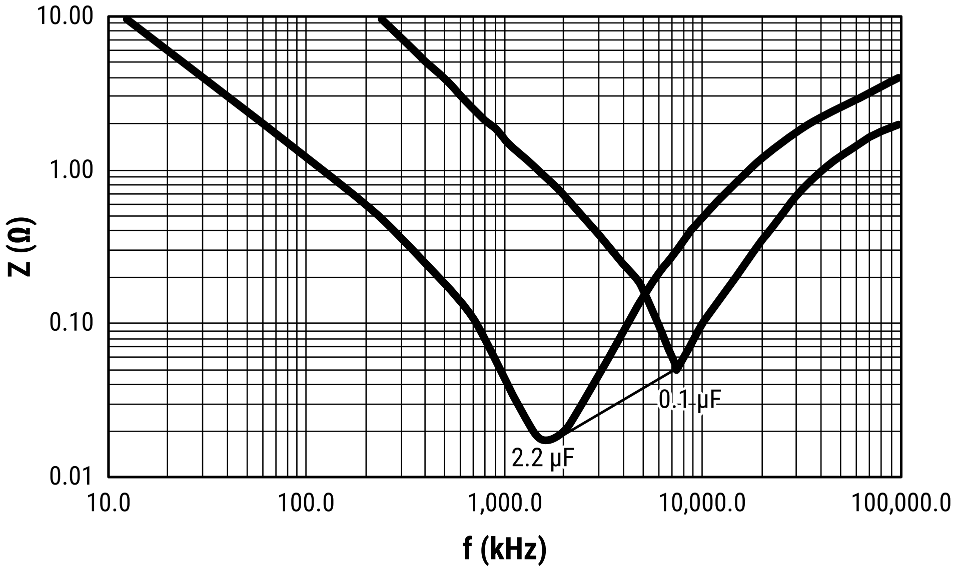
Performance Characteristics

Rated Voltage	18 – 63 VDC (For temperature over 100°C a decreasing factor of 2% per degree has to be applied on the rated voltage V_R)
Capacitance Range	0.1 – 2.2 µF
Capacitance Tolerance	±10%, ±20%
Temperature Range	−55°C to +125°C
Climatic Category	55/125/56, IEC 60068–1
Leakage Current	≤ 50 µA at V_R
Approvals	AEC–Q200 (in progress), ISO 7637–2
Dissipation Factor	0.01 (1 kHz at 25°C ±5°C)
Test Voltage Between Terminals	100 VDC
Insulation Resistance	1 MΩ at 12 V (24 V for V_R > 24 V)
Diode	600 W TVS diode, bidirectional
Peak Current Pulse	10/700 µs
Peak Current	See Diode Breakdown Voltage & Clamping Voltage Table

Environmental Compliance

All KEMET pulse capacitors are RoHS compliant.

Impedance Graph



Environmental Test Data

Test	Conditions	Performance	
Damp Heat Steady State	+40°C ±2°C and 93% ±2% RH, 56 days	Δ C/C	≤ 5%
		V_{BR} Change	≤ 10%
		DF Change	≤ 50 x 10^{-4} at 1 kHz
		Leakage Current at V_R	≤ 100 µA
Endurance	+125°C ±2°C/100°C ±2°C, 0.5 x V_R/1.0 x V_R, 1,000 hours	Δ C/C	≤ 10%
		V_{BR} Change	≤ 10%
		DF Change	≤ 50 x 10^{-4} ar 1 kHz
		Leakage Current at V_R	≤ 100 µA
Resistance to Soldering Heat	+260°C ±5°C, 10 ±1 second	Δ C/C	≤ 3%
		V_{BR} Change	≤ 5%
		DF Change	≤ 30 x 10^{-4} at 1 kHz
		Leakage Current at V_R	≤ 50 µA
Peak Current Derating	Pulse 10/700 µs, 300 V_p; 100 cycles with alternating polarity, 120 seconds between each current peak	Δ C/C	≤ 10%
		V_{BR} Change	≤ 10%
		DF Change	≤ 30 x 10^{-4} at 1 kHz
		Leakage Current at V_R	≤ 100 µA
Long-Term Stability (After 2 Years)	−40°C to +80°C, ≤ 70% humidity	Δ C/C	≤ 3%
		V_{BR} Change	≤ 5%
		DF Change	≤ 20 x 10^{-4} at 1 kHz
		Leakage Current at V_R	≤ 50 µA
Reliability Failure Criteria	Reference MIL HDB 217 +40°C ±2°C, 0.5 x V_R, ≤ 5 FIT	Δ C/C	> 10%
		V_{BR} Change	> 10%
		DF Change	≥ 20 x 10^{-4} at 1 kHz
		Leakage Current at V_R	> 200 µA

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	VDC	Max Dimensions in mm			Lead Spacing (S)	Diode Breakdown Voltage (VDC)	KEMET Part Number	Legacy Part Number
		T	H	L				
0.10	18	6.1	11.1	7.5	5.0	22	5BBC3100(1)B7(2)	F5BBC3100(1)B7(2)
0.10	18	6.1	11.1	7.5	5.0	27	5BBC3100(1)E7(2)	F5BBC3100(1)E7(2)
0.22	18	6.1	11.1	7.5	5.0	22	5BBC3220(1)B7(2)	F5BBC3220(1)B7(2)
0.22	18	6.1	11.1	7.5	5.0	27	5BBC3220(1)E7(2)	F5BBC3220(1)E7(2)
0.33	18	6.1	11.1	7.5	5.0	22	5BBC3330(1)B7(2)	F5BBC3330(1)B7(2)
0.33	18	6.1	11.1	7.5	5.0	27	5BBC3330(1)E7(2)	F5BBC3330(1)E7(2)
0.47	18	6.1	11.1	7.5	5.0	22	5BBC3470(1)B7(2)	F5BBC3470(1)B7(2)
0.47	18	6.1	11.1	7.5	5.0	27	5BBC3470(1)E7(2)	F5BBC3470(1)E7(2)
0.56	18	6.1	11.1	7.5	5.0	22	5BBC3560(1)B7(2)	F5BBC3560(1)B7(2)
0.56	18	6.1	11.1	7.5	5.0	27	5BBC3560(1)E7(2)	F5BBC3560(1)E7(2)
0.68	18	6.1	11.1	7.5	5.0	22	5BBC3680(1)B7(2)	F5BBC3680(1)B7(2)
0.68	18	6.1	11.1	7.5	5.0	27	5BBC3680(1)E7(2)	F5BBC3680(1)E7(2)
0.82	18	6.1	11.1	7.5	5.0	22	5BBC3820(1)B7(2)	F5BBC3820(1)B7(2)
0.82	18	6.1	11.1	7.5	5.0	27	5BBC3820(1)E7(2)	F5BBC3820(1)E7(2)
1.00	18	6.1	11.1	7.5	5.0	22	5BBC4100(1)B7(2)	F5BBC4100(1)B7(2)
1.00	18	6.1	11.1	7.5	5.0	27	5BBC4100(1)E7(2)	F5BBC4100(1)E7(2)
1.20	18	6.1	11.1	7.5	5.0	22	5BBC4120(1)B7(2)	F5BBC4120(1)B7(2)
1.20	18	6.1	11.1	7.5	5.0	27	5BBC4120(1)E7(2)	F5BBC4120(1)E7(2)
1.50	18	7.3	13.1	7.5	5.0	22	5BBC4150(1)B8(2)	F5BBC4150(1)B8(2)
1.50	18	7.3	13.1	7.5	5.0	27	5BBC4150(1)E8(2)	F5BBC4150(1)E8(2)
1.80	18	7.3	13.1	7.5	5.0	22	5BBC4180(1)B8(2)	F5BBC4180(1)B8(2)
1.80	18	7.3	13.1	7.5	5.0	27	5BBC4180(1)E8(2)	F5BBC4180(1)E8(2)
2.20	18	7.3	13.1	7.5	5.0	22	5BBC4220(1)B8(2)	F5BBC4220(1)B8(2)
2.20	18	7.3	13.1	7.5	5.0	27	5BBC4220(1)E8(2)	F5BBC4220(1)E8(2)
0.10	25	6.1	11.1	7.5	5.0	30	5BHC3100(1)A7(2)	F5BHC3100(1)A7(2)
0.10	25	6.1	11.1	7.5	5.0	33	5BHC3100(1)C7(2)	F5BHC3100(1)C7(2)
0.22	25	6.1	11.1	7.5	5.0	30	5BHC3220(1)A7(2)	F5BHC3220(1)A7(2)
0.22	25	6.1	11.1	7.5	5.0	33	5BHC3220(1)C7(2)	F5BHC3220(1)C7(2)
0.33	25	6.1	11.1	7.5	5.0	30	5BHC3330(1)A7(2)	F5BHC3330(1)A7(2)
0.33	25	6.1	11.1	7.5	5.0	33	5BHC3330(1)C7(2)	F5BHC3330(1)C7(2)
0.47	25	6.1	11.1	7.5	5.0	30	5BHC3470(1)A7(2)	F5BHC3470(1)A7(2)
0.47	25	6.1	11.1	7.5	5.0	33	5BHC3470(1)C7(2)	F5BHC3470(1)C7(2)
0.56	25	6.1	11.1	7.5	5.0	30	5BHC3560(1)A7(2)	F5BHC3560(1)A7(2)
0.56	25	6.1	11.1	7.5	5.0	33	5BHC3560(1)C7(2)	F5BHC3560(1)C7(2)
0.68	25	6.1	11.1	7.5	5.0	30	5BHC3680(1)A7(2)	F5BHC3680(1)A7(2)
0.68	25	6.1	11.1	7.5	5.0	33	5BHC3680(1)C7(2)	F5BHC3680(1)C7(2)
0.82	25	6.1	11.1	7.5	5.0	30	5BHC3820(1)A7(2)	F5BHC3820(1)A7(2)
0.82	25	6.1	11.1	7.5	5.0	33	5BHC3820(1)C7(2)	F5BHC3820(1)C7(2)
1.00	25	6.1	11.1	7.5	5.0	30	5BHC4100(1)A7(2)	F5BHC4100(1)A7(2)
1.00	25	6.1	11.1	7.5	5.0	33	5BHC4100(1)C7(2)	F5BHC4100(1)C7(2)
1.20	25	6.1	11.1	7.5	5.0	30	5BHC4120(1)A7(2)	F5BHC4120(1)A7(2)
1.20	25	6.1	11.1	7.5	5.0	33	5BHC4120(1)C7(2)	F5BHC4120(1)C7(2)
1.50	25	7.3	13.1	7.5	5.0	30	5BHC4150(1)A8(2)	F5BHC4150(1)A8(2)
1.50	25	7.3	13.1	7.5	5.0	33	5BHC4150(1)C8(2)	F5BHC4150(1)C8(2)
1.80	25	7.3	13.1	7.5	5.0	30	5BHC4180(1)A8(2)	F5BHC4180(1)A8(2)
1.80	25	7.3	13.1	7.5	5.0	33	5BHC4180(1)C8(2)	F5BHC4180(1)C8(2)
2.20	25	7.3	13.1	7.5	5.0	30	5BHC4220(1)A8(2)	F5BHC4220(1)A8(2)
2.20	25	7.3	13.1	7.5	5.0	33	5BHC4220(1)C8(2)	F5BHC4220(1)C8(2)
0.10	30	6.1	11.1	7.5	5.0	36	5BJC3100(1)D7(2)	F5BJC3100(1)D7(2)
0.10	30	6.1	11.1	7.5	5.0	39	5BJC3100(1)I7(2)	F5BJC3100(1)I7(2)
0.10	30	6.1	11.1	7.5	5.0	44	5BJC3100(1)N7(2)	F5BJC3100(1)N7(2)
0.22	30	6.1	11.1	7.5	5.0	36	5BJC3220(1)D7(2)	F5BJC3220(1)D7(2)
0.22	30	6.1	11.1	7.5	5.0	39	5BJC3220(1)I7(2)	F5BJC3220(1)I7(2)
0.22	30	6.1	11.1	7.5	5.0	44	5BJC3220(1)N7(2)	F5BJC3220(1)N7(2)
0.33	30	6.1	11.1	7.5	5.0	36	5BJC3330(1)D7(2)	F5BJC3330(1)D7(2)
0.33	30	6.1	11.1	7.5	5.0	39	5BJC3330(1)I7(2)	F5BJC3330(1)I7(2)
0.33	30	6.1	11.1	7.5	5.0	44	5BJC3330(1)N7(2)	F5BJC3330(1)N7(2)
0.47	30	6.1	11.1	7.5	5.0	36	5BJC3470(1)D7(2)	F5BJC3470(1)D7(2)
0.47	30	6.1	11.1	7.5	5.0	39	5BJC3470(1)I7(2)	F5BJC3470(1)I7(2)
0.47	30	6.1	11.1	7.5	5.0	44	5BJC3470(1)N7(2)	F5BJC3470(1)N7(2)
Capacitance Value (µF)	VDC	T (mm)	H (mm)	L (mm)	Lead Spacing (S)	Diode Breakdown Voltage (VDC)	KEMET Part Number	Legacy Part Number

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) Capacitance tolerance: K= ±10%, M = ±20%.

Table 1 – Ratings & Part Number Reference cont.

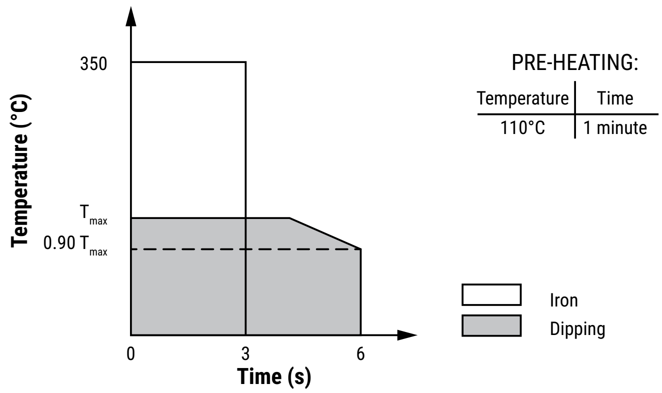
Capacitance Value (µF)	VDC	Max Dimensions in mm			Lead Spacing (S)	Diode Breakdown Voltage (VDC)	KEMET Part Number	Legacy Part Number
		T	H	L				
0.56	30	6.1	11.1	7.5	5.0	36	5BJC3560(1)D7(2)	F5BJC3560(1)D7(2)
0.56	30	6.1	11.1	7.5	5.0	39	5BJC3560(1)I7(2)	F5BJC3560(1)I7(2)
0.56	30	6.1	11.1	7.5	5.0	44	5BJC3560(1)N7(2)	F5BJC3560(1)N7(2)
0.68	30	6.1	11.1	7.5	5.0	36	5BJC3680(1)D7(2)	F5BJC3680(1)D7(2)
0.68	30	6.1	11.1	7.5	5.0	39	5BJC3680(1)I7(2)	F5BJC3680(1)I7(2)
0.68	30	6.1	11.1	7.5	5.0	44	5BJC3680(1)N7(2)	F5BJC3680(1)N7(2)
0.82	30	6.1	11.1	7.5	5.0	36	5BJC3820(1)D7(2)	F5BJC3820(1)D7(2)
0.82	30	6.1	11.1	7.5	5.0	39	5BJC3820(1)I7(2)	F5BJC3820(1)I7(2)
0.82	30	6.1	11.1	7.5	5.0	44	5BJC3820(1)N7(2)	F5BJC3820(1)N7(2)
1.00	30	6.1	11.1	7.5	5.0	36	5BJC4100(1)D7(2)	F5BJC4100(1)D7(2)
1.00	30	6.1	11.1	7.5	5.0	39	5BJC4100(1)I7(2)	F5BJC4100(1)I7(2)
1.00	30	6.1	11.1	7.5	5.0	44	5BJC4100(1)N7(2)	F5BJC4100(1)N7(2)
1.20	30	6.1	11.1	7.5	5.0	36	5BJC4120(1)D7(2)	F5BJC4120(1)D7(2)
1.20	30	6.1	11.1	7.5	5.0	39	5BJC4120(1)I7(2)	F5BJC4120(1)I7(2)
1.20	30	6.1	11.1	7.5	5.0	44	5BJC4120(1)N7(2)	F5BJC4120(1)N7(2)
1.50	30	7.3	13.1	7.5	5.0	36	5BJC4150(1)D8(2)	F5BJC4150(1)D8(2)
1.50	30	7.3	13.1	7.5	5.0	39	5BJC4150(1)I8(2)	F5BJC4150(1)I8(2)
1.50	30	7.3	13.1	7.5	5.0	44	5BJC4150(1)N8(2)	F5BJC4150(1)N8(2)
1.80	30	7.3	13.1	7.5	5.0	36	5BJC4180(1)D8(2)	F5BJC4180(1)D8(2)
1.80	30	7.3	13.1	7.5	5.0	39	5BJC4180(1)I8(2)	F5BJC4180(1)I8(2)
1.80	30	7.3	13.1	7.5	5.0	44	5BJC4180(1)N8(2)	F5BJC4180(1)N8(2)
2.20	30	7.3	13.1	7.5	5.0	36	5BJC4220(1)D8(2)	F5BJC4220(1)D8(2)
2.20	30	7.3	13.1	7.5	5.0	39	5BJC4220(1)I8(2)	F5BJC4220(1)I8(2)
2.20	30	7.3	13.1	7.5	5.0	44	5BJC4220(1)N8(2)	F5BJC4220(1)N8(2)
0.10	45	6.1	11.1	7.5	5.0	53	5BNC3100(1)B7(2)	F5BNC3100(1)B7(2)
0.22	45	6.1	11.1	7.5	5.0	53	5BNC3220(1)B7(2)	F5BNC3220(1)B7(2)
0.33	45	6.1	11.1	7.5	5.0	53	5BNC3330(1)B7(2)	F5BNC3330(1)B7(2)
0.47	45	6.1	11.1	7.5	5.0	53	5BNC3470(1)B7(2)	F5BNC3470(1)B7(2)
0.56	45	6.1	11.1	7.5	5.0	53	5BNC3560(1)B7(2)	F5BNC3560(1)B7(2)
0.68	45	6.1	11.1	7.5	5.0	53	5BNC3680(1)B7(2)	F5BNC3680(1)B7(2)
0.82	45	6.1	11.1	7.5	5.0	53	5BNC3820(1)B7(2)	F5BNC3820(1)B7(2)
1.00	45	6.1	11.1	7.5	5.0	53	5BNC4100(1)B7(2)	F5BNC4100(1)B7(2)
1.20	45	6.1	11.1	7.5	5.0	53	5BNC4120(1)B7(2)	F5BNC4120(1)B7(2)
1.50	45	7.3	13.1	7.5	5.0	53	5BNC4150(1)B8(2)	F5BNC4150(1)B8(2)
1.80	45	7.3	13.1	7.5	5.0	53	5BNC4180(1)B8(2)	F5BNC4180(1)B8(2)
2.20	45	7.3	13.1	7.5	5.0	53	5BNC4220(1)B8(2)	F5BNC4220(1)B8(2)
0.10	50	6.1	11.1	7.5	5.0	68	5BCC3100(1)C7(2)	F5BCC3100(1)C7(2)
0.22	50	6.1	11.1	7.5	5.0	68	5BCC3220(1)C7(2)	F5BCC3220(1)C7(2)
0.33	50	6.1	11.1	7.5	5.0	68	5BCC3330(1)C7(2)	F5BCC3330(1)C7(2)
0.47	50	6.1	11.1	7.5	5.0	68	5BCC3470(1)C7(2)	F5BCC3470(1)C7(2)
0.56	50	6.1	11.1	7.5	5.0	68	5BCC3560(1)C7(2)	F5BCC3560(1)C7(2)
0.68	50	6.1	11.1	7.5	5.0	68	5BCC3680(1)C7(2)	F5BCC3680(1)C7(2)
0.82	50	6.1	11.1	7.5	5.0	68	5BCC3820(1)C7(2)	F5BCC3820(1)C7(2)
1.00	50	6.1	11.1	7.5	5.0	68	5BCC4100(1)C7(2)	F5BCC4100(1)C7(2)
1.20	50	6.1	11.1	7.5	5.0	68	5BCC4120(1)C7(2)	F5BCC4120(1)C7(2)
1.50	50	7.3	13.1	7.5	5.0	68	5BCC4150(1)C8(2)	F5BCC4150(1)C8(2)
1.80	50	7.3	13.1	7.5	5.0	68	5BCC4180(1)C8(2)	F5BCC4180(1)C8(2)
2.20	50	7.3	13.1	7.5	5.0	68	5BCC4220(1)C8(2)	F5BCC4220(1)C8(2)
0.10	63	6.1	11.1	7.5	5.0	82	5BDC3100(1)C7(2)	F5BDC3100(1)C7(2)
0.22	63	6.1	11.1	7.5	5.0	82	5BDC3220(1)C7(2)	F5BDC3220(1)C7(2)
0.33	63	6.1	11.1	7.5	5.0	82	5BDC3330(1)C7(2)	F5BDC3330(1)C7(2)
0.47	63	6.1	11.1	7.5	5.0	82	5BDC3470(1)C7(2)	F5BDC3470(1)C7(2)
0.56	63	6.1	11.1	7.5	5.0	82	5BDC3560(1)C7(2)	F5BDC3560(1)C7(2)
0.68	63	6.1	11.1	7.5	5.0	82	5BDC3680(1)C7(2)	F5BDC3680(1)C7(2)
0.82	63	6.1	11.1	7.5	5.0	82	5BDC3820(1)C7(2)	F5BDC3820(1)C7(2)
1.00	63	6.1	11.1	7.5	5.0	82	5BDC4100(1)C7(2)	F5BDC4100(1)C7(2)
1.20	63	6.1	11.1	7.5	5.0	82	5BDC4120(1)C7(2)	F5BDC4120(1)C7(2)
1.50	63	7.3	13.1	7.5	5.0	82	5BDC4150(1)C8(2)	F5BDC4150(1)C8(2)
1.80	63	7.3	13.1	7.5	5.0	82	5BDC4180(1)C8(2)	F5BDC4180(1)C8(2)
2.20	63	7.3	13.1	7.5	5.0	82	5BDC4220(1)C8(2)	F5BDC4220(1)C8(2)
Capacitance Value (µF)	**VDC**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**Diode Breakdown Voltage (VDC)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) Capacitance tolerance: K= ±10%, M = ±20%.

Maximum Soldering Temperature

In order to achieve optimal solderability, we suggest the following:

- Set the temperature so that the maximum temperature inside the element is below 160°C.
- Solder within the following temperature profiles, especially for iron soldering:

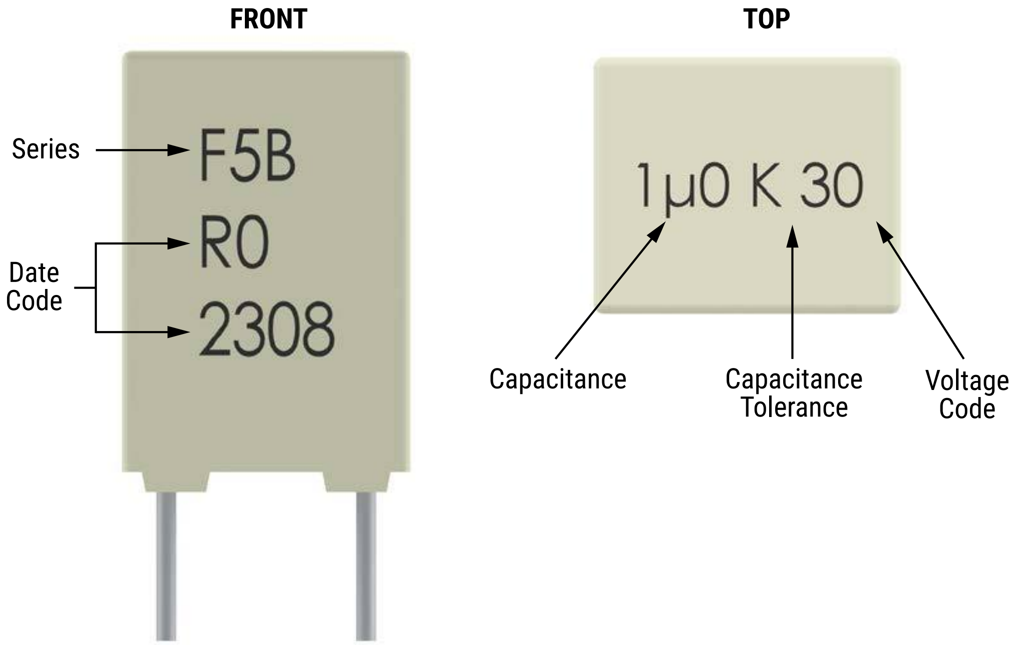


Box series: T_{max} = 275°C for 4 seconds

General Conditions

- If two solderings are required, allow for recovery time until the temperature on the capacitor surface is below 50°C.
- Avoid passing through the adhesive curing oven when fixing surface-mount parts in combination with through-hole parts. Insert through-hole parts only after curing the surface-mount parts.
- Avoid reflow soldering by combining the lead type with surface-mount parts.

Marking

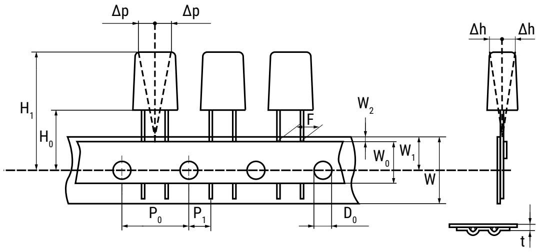


Packaging Quantities

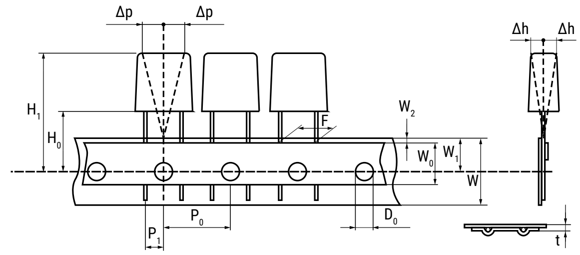
Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 355 mm	Ammo
5	4.6	9.6	7.4	1,500	2,000	1,400	1,900
	5.1	10.1	7.5	1,000	1,500	1,200	1,700
	6.1	11.1	7.5	2,000	1,000	1,000	1,400
	7.3	13.1	7.5	1,500	750	800	1,150

Lead Taping & Packaging (IEC 60286–2)

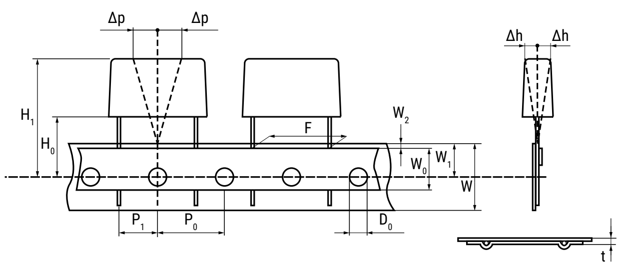
Lead Spacing 5 mm



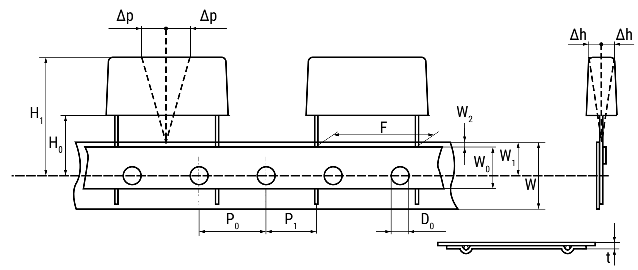
Lead Spacing 7.5 mm



Lead Spacing 10 – 15 mm



Lead Spacing 22.5 – 27.5 mm



Taping Specification

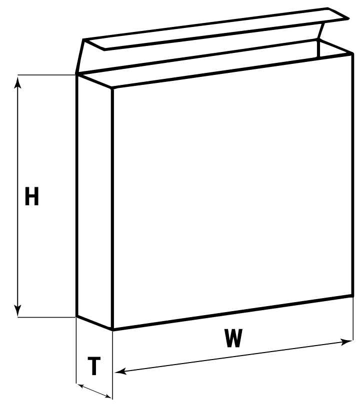
Dimensions in mm									Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	5.0	7.5	10.0	15.0	22.5	27.5	F
Carrier Tape Width	+1/−0.5	W	18.0	18.0	18.0	18.0	18.0	18.0	$18^{+1/-0.5}$
Hold-Down Tape Width	Minimum	W_0	6.0	6.0	9.0	10.0	10.0	10.0	
Position of Sprocket Hole	±0.5	W_1	9.0	9.0	9.0	9.0	9.0	9.0	$9^{+0.75/-0.5}$
Distance Between Tapes	Maximum	W_2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Sprocket Hole Diameter	±0.2	D_0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Feed Hole Lead Spacing	±0.2[(1)]	P_0[(3)]	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.85	3.75	7.7	5.2	7.8	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	±2	Δh	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.9^{MAX}	0.9^{MAX}	0.9^{MAX}
Sprocket Hole/Cap Body	±0.5	H_0[(2)]	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18^{+2/-0}$

(1) Maximum cumulative feed hole error, 1 mm per 20 parts.
(2) 16.5 mm available on request.
(3) 15 mm available on request (F ≥ 10 mm).

Lead Taping & Packaging (IEC 60286–2) cont.

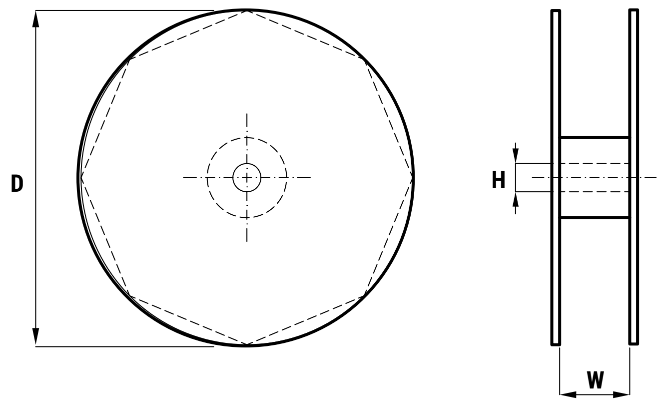
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
F5A, F5B, F5D	360	340	59
F6xx, F8xx			
PHExxx, PMExxx, PMRxxx	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
F5A, F5B, F5D	355 500	30 25	55 (Max)
F6xx, F8xx			
PHExxx, PMExxx, PMRxxx	360 500	30	46 (Max)



A50, Axial, 50 – 1,000 VDC (Automotive Grade)

Overview

The A50 Series is constructed of metallized polyester film (wound technology) with axial leads of tinned wire. Axial leads are electrically welded to the contact metal layer on the ends of the capacitor winding. The capacitor is encapsulated in polyester tape wrapping with the thermosetting resin ends filled.

Automotive grade devices meet the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

Applications

Typical applications include blocking, coupling, decoupling, bypassing, and interference suppression in low voltage applications such as automotive. Not suitable for across-the-line application (see Suppressor Capacitors).

Benefits

- Voltage range: 50 – 1,000 VDC
- Capacitance range: 0.001 – 10 µF
- Diameter: 5 – 22 mm
- Length 11 – 33 mm
- Capacitance tolerance: ±5%, ±10%, ±20%
- Climatic category: 55/105/56
- Operating temperature range of −55°C to +105°C
- RoHS Compliant and lead-free terminations
- Tape & Reel packaging in accordance with IEC 60286–1
- Self-Healing
- Automotive grade (AEC–Q200)

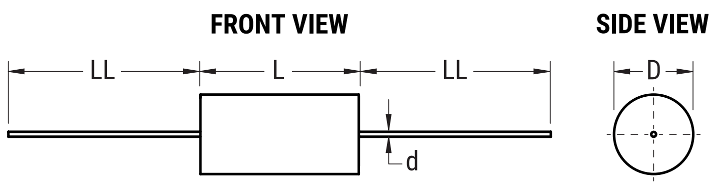
Part Number System

A50	C	F	3470	AA	00	J
Series	Rated Voltage (VDC)	Length (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance
Metallized Polyester	C = 50 D = 63 E = 100 I = 250 M = 400 P = 630 Q = 1,000	F = 11.0 H = 14.0 K = 20.5 Q = 28.0 T = 33.0	The last three digits represent significant figures. First digit specifies the number of zeros to be added.	See Ordering Options Table	00, 60 (Standard)	J = ±5% K = ±10% M = ±20%

Ordering Options Table

Type of Leads and Packaging	LL/l Lead Length (mm)	Lead and Packaging Code
Standard Lead and Packaging Options		
Bulk (Bag) – Short Leads	40.0 ±5	AA
Tape & Reel (Standard Reel Ø 355 mm)	≥ 20	26

Dimensions – Millimeters



D		L		d	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
5.0	Maximum	11.0	Maximum	0.6	Maximum
5.0	Maximum	14.0	Maximum	0.6	Maximum
5.5	Maximum	14.0	Maximum	0.6	Maximum
6.0	Maximum	14.0	Maximum	0.6	Maximum
6.0	Maximum	20.5	Maximum	0.6	Maximum
6.5	Maximum	11.0	Maximum	0.6	Maximum
6.5	Maximum	20.5	Maximum	0.6	Maximum
6.5	Maximum	14.0	Maximum	0.6	Maximum
7.0	Maximum	14.0	Maximum	0.8	Maximum
7.0	Maximum	20.5	Maximum	0.8	Maximum
7.0	Maximum	28.0	Maximum	0.8	Maximum
7.5	Maximum	20.5	Maximum	0.8	Maximum
7.5	Maximum	14.0	Maximum	0.8	Maximum
8.0	Maximum	14.0	Maximum	0.8	Maximum
8.0	Maximum	20.5	Maximum	0.8	Maximum
8.0	Maximum	28.0	Maximum	0.8	Maximum
8.5	Maximum	20.5	Maximum	0.8	Maximum
8.5	Maximum	28.0	Maximum	0.8	Maximum
9.0	Maximum	20.5	Maximum	0.8	Maximum
9.0	Maximum	28.0	Maximum	0.8	Maximum
9.5	Maximum	20.5	Maximum	0.8	Maximum
9.5	Maximum	28.0	Maximum	0.8	Maximum
Note: See Ordering Options Table for lead length (LL/l) options.					

D		L		d	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
10.0	Maximum	20.5	Maximum	0.8	Maximum
10.0	Maximum	33.0	Maximum	0.8	Maximum
10.0	Maximum	28.0	Maximum	0.8	Maximum
10.5	Maximum	33.0	Maximum	0.8	Maximum
10.5	Maximum	28.0	Maximum	0.8	Maximum
11.0	Maximum	28.0	Maximum	0.8	Maximum
11.0	Maximum	33.0	Maximum	0.8	Maximum
11.5	Maximum	33.0	Maximum	0.8	Maximum
12.0	Maximum	20.5	Maximum	0.8	Maximum
12.0	Maximum	33.0	Maximum	0.8	Maximum
12.5	Maximum	33.0	Maximum	0.8	Maximum
12.5	Maximum	28.0	Maximum	0.8	Maximum
13.0	Maximum	33.0	Maximum	0.8	Maximum
13.5	Maximum	33.0	Maximum	0.8	Maximum
14.5	Maximum	33.0	Maximum	0.8	Maximum
15.0	Maximum	33.0	Maximum	0.8	Maximum
15.5	Maximum	33.0	Maximum	0.8	Maximum
16.0	Maximum	33.0	Maximum	0.8	Maximum
17.5	Maximum	33.0	Maximum	1	Maximum
18.5	Maximum	33.0	Maximum	1	Maximum
19.0	Maximum	33.0	Maximum	1	Maximum
22.0	Maximum	33.0	Maximum	1	Maximum
Note: See Ordering Options Table for lead length (LL/l) options.					

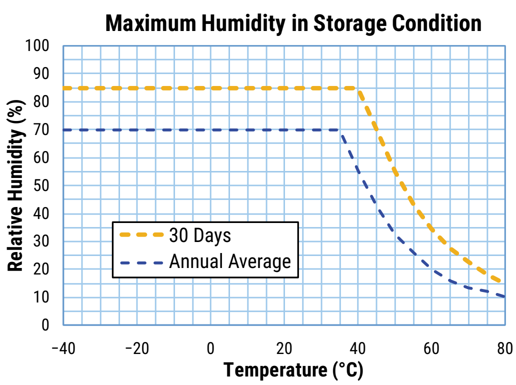
Performance Characteristics

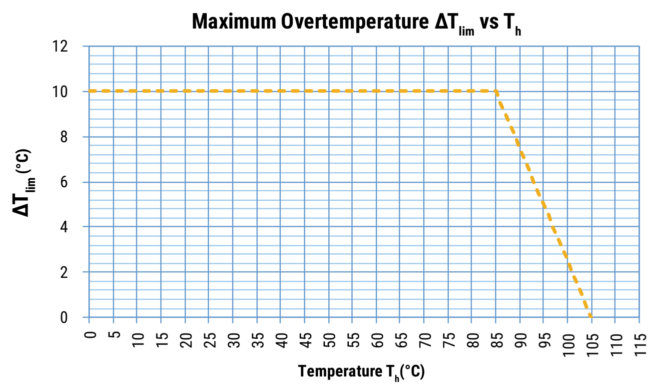
Dielectric	Polyester film (polyethylene terephthalate)						
Plates	Metal layer deposited by evaporation under vacuum						
Winding	Non-inductive type						
Leads	Tinned wire						
Protection	Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94.						
Related Documents	IEC 60384–2						
Rated Voltage V_R (VDC)	50	63	100	250	400	630	1,000
Rated Voltage V_R (VAC)	30	40	63	160	200	220	250
Capacitance Range (µF)	0.47 – 10.0	0.33 – 10.0	0.1 – 10.0	0.047 – 10.0	0.01 – 3.3	0.001 – 1	0.001 – 0.47
Capacitance Values	E6 series (IEC 60063) measured at 1 kHz and +20 ±1°C						
Capacitance Tolerance	±5%, ±10%, ±20%						
Operating Temperature Range	−55°C to 105°C						
Rated Temperature T_R	+85°C						
Voltage Derating	Above +85°C DC and AC voltage derating is 1.25%/°C						
Climatic Category	55/105/56 IEC 60068–1						
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package						
	Average relative humidity per year ≤ 70%						
	RH ≤ 85% for 30 days randomly distributed throughout the year						
	Dew is absent						
	Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)						
Test Voltage	1.6 x V_R VDC for 2 seconds (between terminations) at +25°C ±5°C						
Capacitance Drift	Maximum 3% after a 2 year storage period at a temperature of +10°C to +40°C and a relative humidity of 40% to 60%						
Reliability (Reference IEC-61709)	Operational life >200,000 hours						
	Failure rate ≤ 5 FIT, T = +40°C, V = 0.5 x V_R						
	Failure criteria: open or short circuit, cap. change > 10%, DF 2 times the catalog limits, IR < 0.005 x initial limit						
Maximum Pulse Steepness	dV/dt according to Table 1. For peak to peak voltages lower than rated voltage (Vpp <V_R), the specified dv/dt can be multiplied by the factor V_R/Vpp						
Temperature Coefficient	+400 (±200) ppm/°C at 1 kHz						

Performance Characteristics cont.

Self Inductance (Lead Length ~ 2 mm)	Approximately 7 nH. Maximum 1nH per 1 mm lead and capacitor length.			
Dissipation Factor tanδ	Maximum Values at 25°C ±5°C			
	Frequency	C ≤ 0.1 µF	0.1 µF < C ≤ 1 µF	C > 1 µF
	1 kHz	0.80%	0.80%	1.00%
	10 kHz	1.50%	1.50%	–
	100 kHz	2.50%	–	–
Insulation Resistance	Measured at +25°C ±5°C, according to IEC 60384–2			
	Minimum Values Between Terminals			
	Voltage Charge/Time	C ≤0.33 µF	C >0.33 µF	
	50 VDC for V_R ≤100 VDC 1 minute	≥ 3,750 MΩ (≥ 50,000 MΩ)*	≥ 1,000 MΩ • µF (≥ 5,000 MΩ • µF)*	
	100 VDC for V_R >100 VDC 1 minute	≥ 30,000 MΩ (≥ 50,000 MΩ)*	≥ 10,000 MΩ • µF (≥ 17,000 MΩ • µF)*	

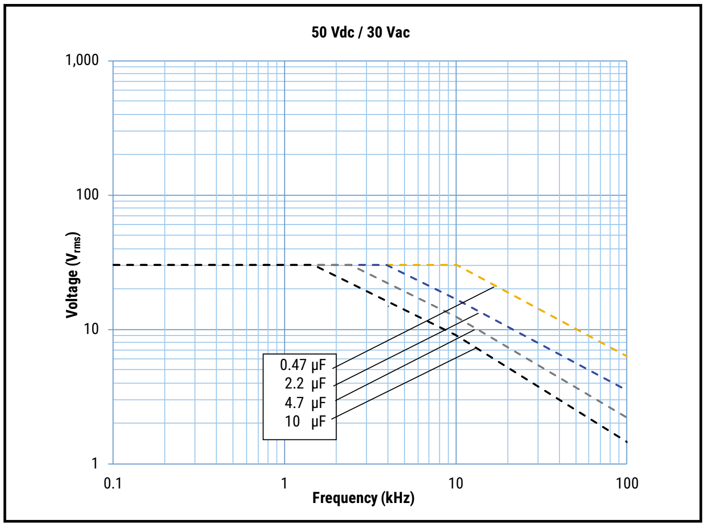
** typical value*

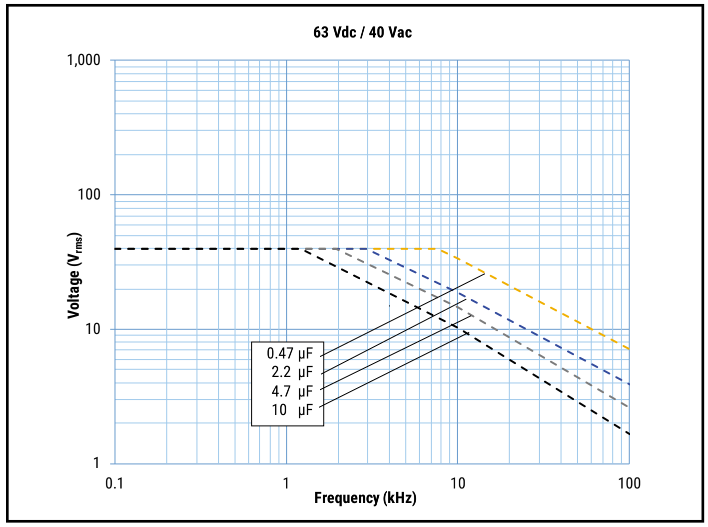


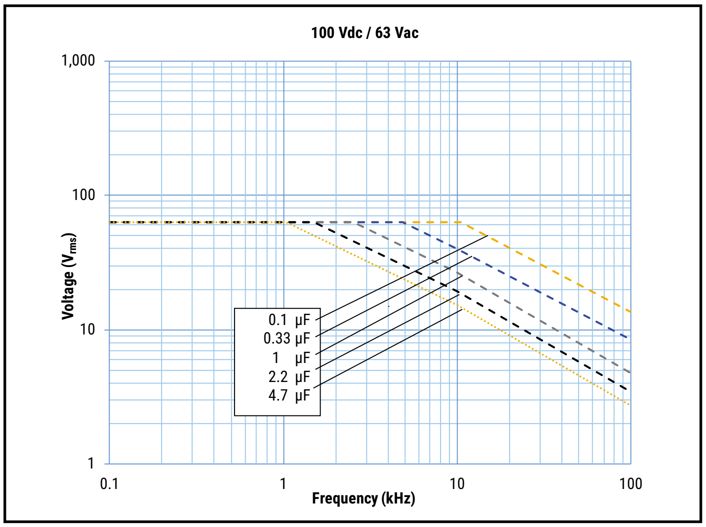


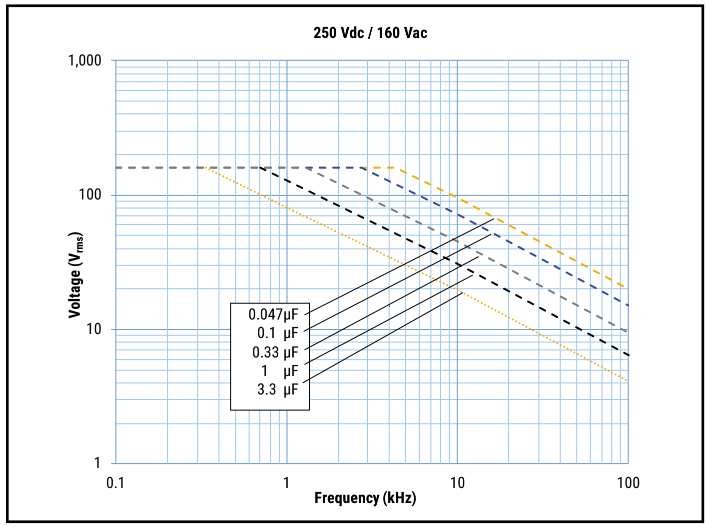
T_h is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

Maximum Voltage (V_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C)

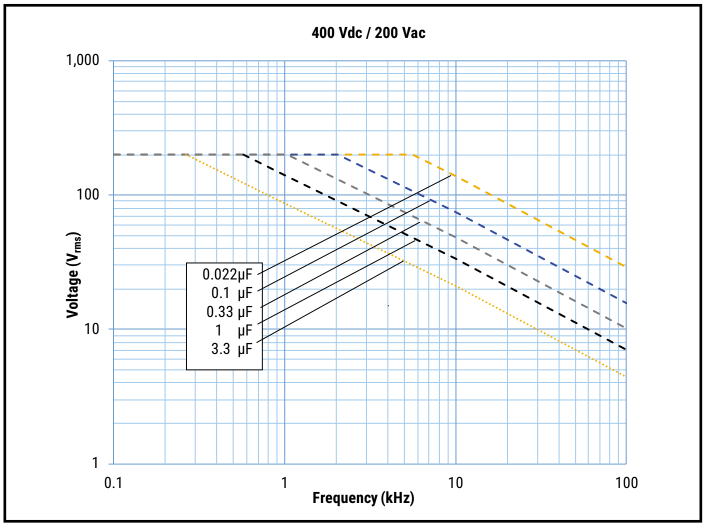


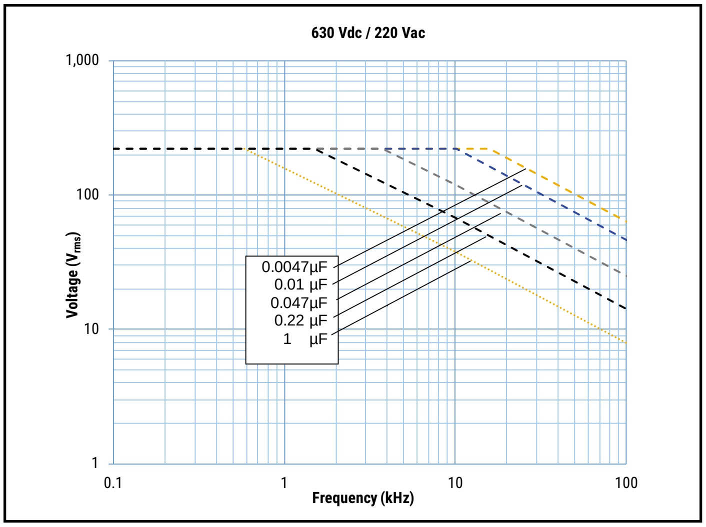


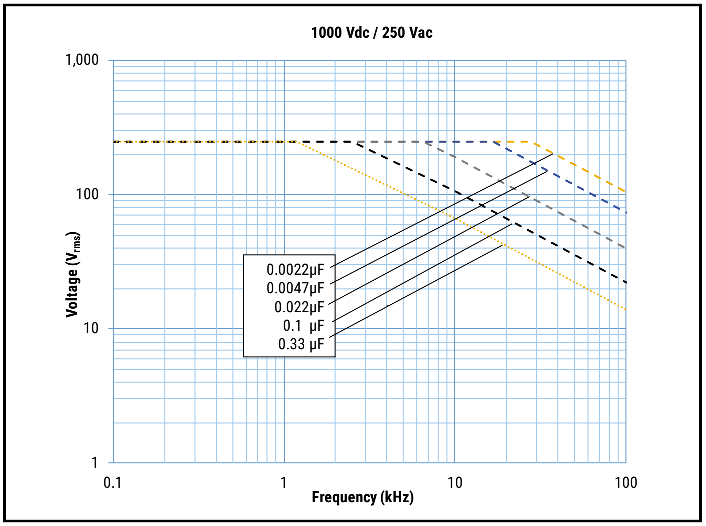




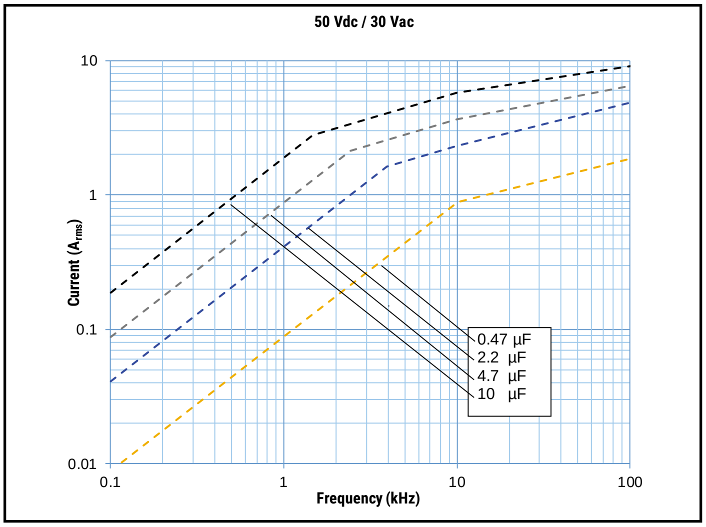
Maximum Voltage (V_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C) cont.

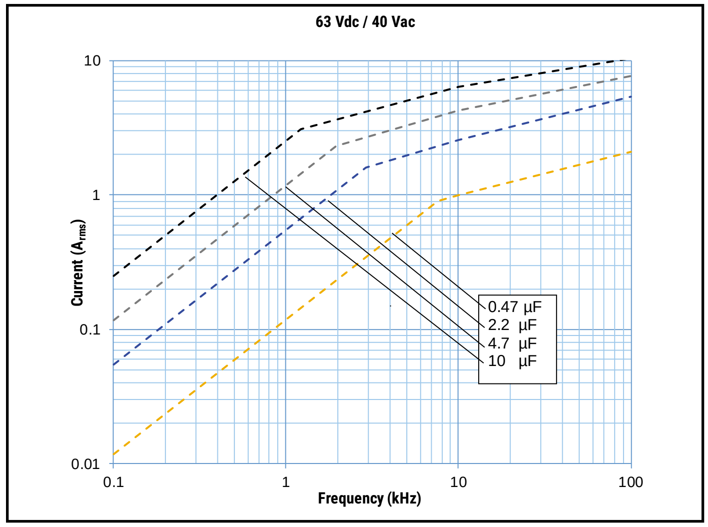


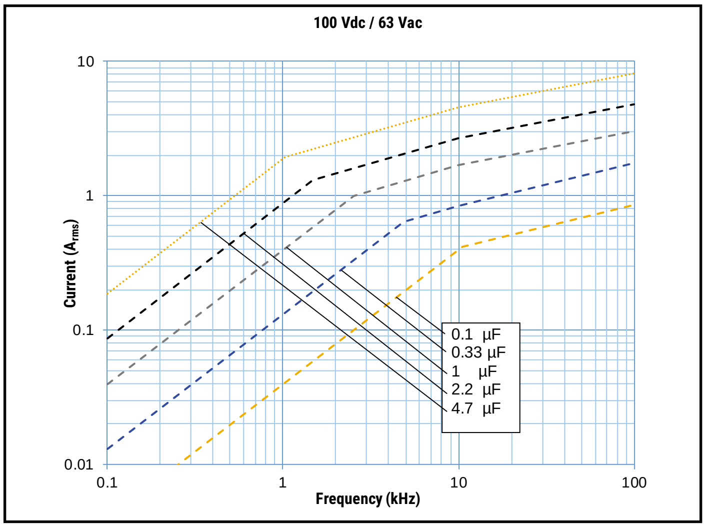


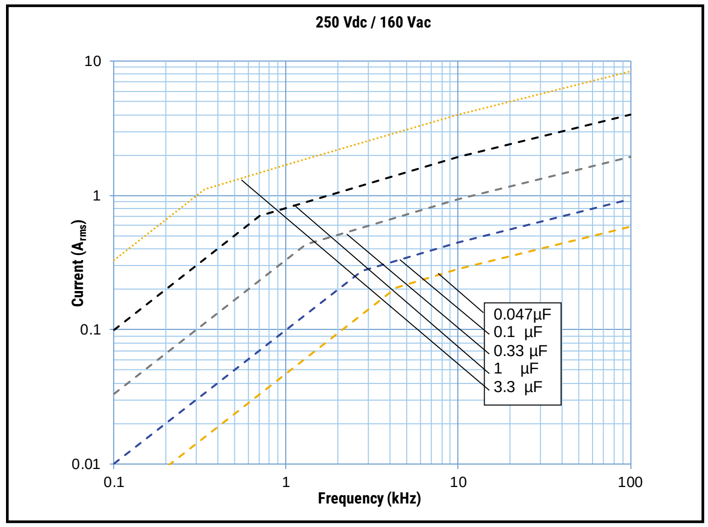


Maximum Current (I_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C)

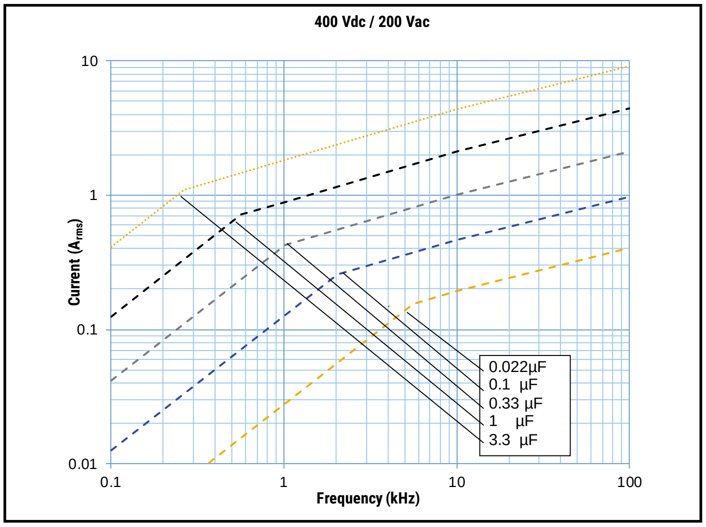


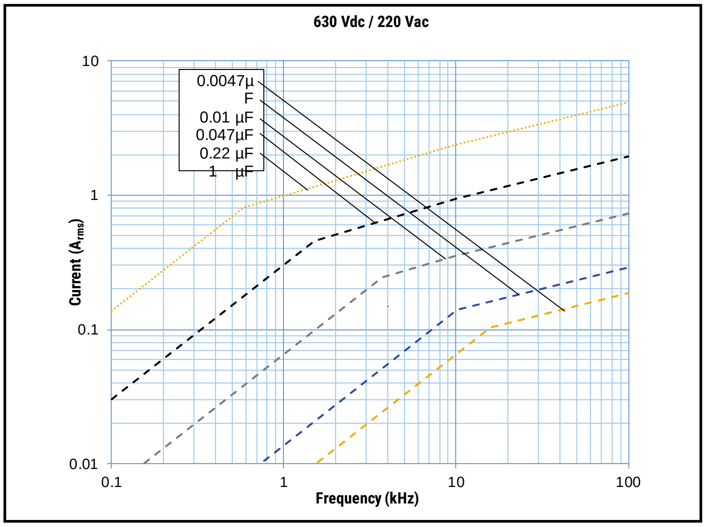


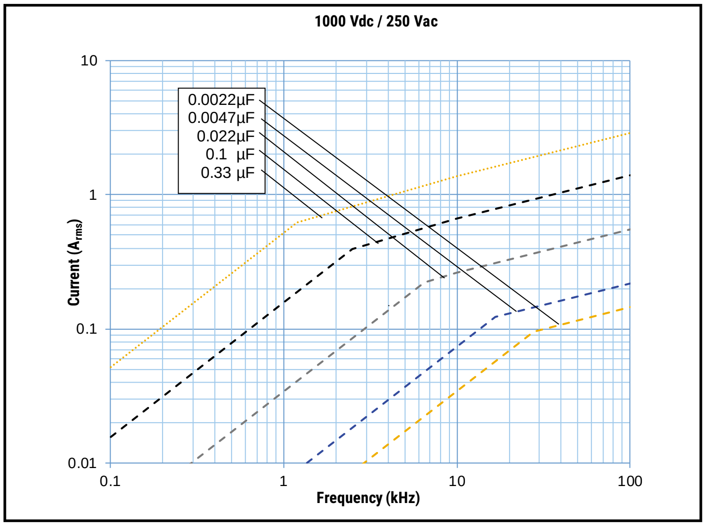




Maximum Current (I_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C) cont.







Environmental Test Data

Damp Heat, Steady State Test	Test Conditions:		Performances
	Temperature: Relative humidity (RH): Test duration:	+40°C ±2°C 93% ±2% 56 days	|Δ C/C| ≤ 5%, Δ tanδ ≤ 0.005 at 1 kHz IR after test ≥ 50% of initial limit
Endurance Test	**Test Conditions**		**Performances**
	Temperature: Voltage applied: Test duration:	+85°C ±2°C 1.25 x V_R 2,000 hours	|Δ C/C| ≤ 5%, Δ tanδ ≤ 0.003 at 10 kHz for C ≤ 1 µF Δ tanδ ≤ 0.002 at 1 kHz for C > 1 µF IR after test ≥ 50% of initial limit
Resistance to Soldering Heat Test	**Test Conditions**		**Performances**
	Solder bath temperature: Dipping time (with heat screen):	260°C ±5°C 10 seconds ±1 second	|Δ C/C| ≤ 2%, Δ tanδ ≤ 0.003 at 10 kHz for C ≤ 1 µF Δ tanδ ≤ 0.002 at 1 kHz for C > 1 µF IR after test ≥ initial limit

Environmental Compliance

All KEMET MKT capacitors are RoHS Compliant.

RoHS

Table 1 – Ratings & Part Number Reference

VDC	VAC	Capacitance Value (µF)	Dimensions in mm D	Dimensions in mm L	dV/dt (V/µs)	Max K_0 (V^2/µs)	KEMET Part Number	Legacy Part Number
50	30	0.47	5.0	11.0	4.0	400	50CF3470(1)00(2)	A50CF3470(1)00(2)
50	30	0.68	5.0	11.0	4.0	400	50CF3680(1)00(2)	A50CF3680(1)00(2)
50	30	1.0	6.5	11.0	4.0	400	50CF4100(1)00(2)	A50CF4100(1)00(2)
50	30	1.5	7.0	14.0	4.0	400	50CH4150(1)00(2)	A50CH4150(1)00(2)
50	30	2.2	8.0	14.0	4.0	400	50CH4220(1)00(2)	A50CH4220(1)00(2)
50	30	3.3	7.5	20.5	2.0	200	50CK4330(1)00(2)	A50CK4330(1)00(2)
50	30	4.7	8.5	20.5	2.0	200	50CK4470(1)00(2)	A50CK4470(1)00(2)
50	30	6.8	10.0	20.5	2.0	200	50CK4680(1)00(2)	A50CK4680(1)00(2)
50	30	10.0	12.0	20.5	2.0	200	50CK5100(1)00(2)	A50CK5100(1)00(2)
63	40	0.33	5.0	11.0	4.0	500	50DF3330(1)60(2)	A50DF3330(1)60(2)
63	40	0.47	6.0	14.0	4.0	500	50DH3470(1)60(2)	A50DH3470(1)60(2)
63	40	0.68	6.0	14.0	4.0	500	50DH3680(1)60(2)	A50DH3680(1)60(2)
63	40	1.0	7.0	14.0	4.0	500	50DH4100(1)60(2)	A50DH4100(1)60(2)
63	40	1.5	6.5	20.5	2.0	250	50DK4150(1)60(2)	A50DK4150(1)60(2)
63	40	2.2	8.0	20.5	2.0	250	50DK4220(1)60(2)	A50DK4220(1)60(2)
63	40	3.3	9.5	20.5	2.0	250	50DK4330(1)60(2)	A50DK4330(1)60(2)
63	40	4.7	9.5	28.0	1.5	190	50DQ4470(1)60(2)	A50DQ4470(1)60(2)
63	40	6.8	11.0	28.0	1.5	190	50DQ4680(1)60(2)	A50DQ4680(1)60(2)
63	40	10.0	11.5	33.0	1.0	130	50DT5100(1)60(2)	A50DT5100(1)60(2)
100	63	0.10	5.0	11.0	5.0	1000	50EF3100(1)60(2)	A50EF3100(1)60(2)
100	63	0.15	5.0	11.0	5.0	1000	50EF3150(1)60(2)	A50EF3150(1)60(2)
100	63	0.22	5.0	11.0	5.0	1000	50EF3220(1)60(2)	A50EF3220(1)60(2)
100	63	0.33	6.0	14.0	5.0	1000	50EH3330(1)60(2)	A50EH3330(1)60(2)
100	63	0.47	6.0	14.0	5.0	1000	50EH3470(1)60(2)	A50EH3470(1)60(2)
100	63	0.68	7.0	14.0	5.0	1000	50EH3680(1)60(2)	A50EH3680(1)60(2)
100	63	1.0	7.0	20.5	3.0	600	50EK4100(1)60(2)	A50EK4100(1)60(2)
100	63	1.5	8.0	20.5	3.0	600	50EK4150(1)60(2)	A50EK4150(1)60(2)
100	63	2.2	9.5	20.5	3.0	600	50EK4220(1)60(2)	A50EK4220(1)60(2)
100	63	3.3	9.5	28.0	2.0	400	50EQ4330(1)60(2)	A50EQ4330(1)60(2)
100	63	4.7	10.0	33.0	1.0	300	50ET4470(1)60(2)	A50ET4470(1)60(2)
100	63	6.8	12.0	33.0	1.0	300	50ET4680(1)60(2)	A50ET4680(1)60(2)
100	63	10.0	14.5	33.0	1.0	300	50ET5100(1)60(2)	A50ET5100(1)60(2)
250	160	0.047	5.0	11.0	10.0	5000	50IF2470(1)60(2)	A50IF2470(1)60(2)
250	160	0.068	5.0	11.0	10.0	5000	50IF2680(1)60(2)	A50IF2680(1)60(2)
250	160	0.10	5.5	14.0	10.0	5000	50IH3100(1)60(2)	A50IH3100(1)60(2)
250	160	0.15	5.5	14.0	10.0	5000	50IH3150(1)60(2)	A50IH3150(1)60(2)
250	160	0.22	6.5	14.0	10.0	5000	50IH3220(1)60(2)	A50IH3220(1)60(2)
250	160	0.33	6.0	20.5	7.0	3500	50IK3330(1)60(2)	A50IK3330(1)60(2)
250	160	0.47	7.0	20.5	7.0	3500	50IK3470(1)60(2)	A50IK3470(1)60(2)
250	160	0.68	8.5	20.5	7.0	3500	50IK3680(1)60(2)	A50IK3680(1)60(2)
250	160	1.0	8.5	28.0	4.0	2000	50IQ4100(1)60(2)	A50IQ4100(1)60(2)
250	160	1.5	10.0	28.0	4.0	2000	50IQ4150(1)60(2)	A50IQ4150(1)60(2)
250	160	2.2	11.0	33.0	2.5	1300	50IT4220(1)60(2)	A50IT4220(1)60(2)
250	160	3.3	13.0	33.0	2.5	1300	50IT4330(1)60(2)	A50IT4330(1)60(2)
250	160	4.7	15.5	33.0	2.5	1300	50IT4470(1)60(2)	A50IT4470(1)60(2)
250	160	6.8	18.5	33.0	2.5	1300	50IT4680(1)60(2)	A50IT4680(1)60(2)
250	160	10.0	22.0	33.0	2.5	1300	50IT5100(1)60(2)	A50IT5100(1)60(2)
400	200	0.010	5.0	11.0	13.5	11000	50MF2100(1)60(2)	A50MF2100(1)60(2)
400	200	0.015	5.0	11.0	13.5	11000	50MF2150(1)60(2)	A50MF2150(1)60(2)
400	200	0.022	5.0	11.0	13.5	11000	50MF2220(1)60(2)	A50MF2220(1)60(2)
400	200	0.033	5.0	11.0	13.5	11000	50MF2330(1)60(2)	A50MF2330(1)60(2)
400	200	0.047	6.0	14.0	13.5	11000	50MH2470(1)60(2)	A50MH2470(1)60(2)
400	200	0.068	6.0	14.0	13.5	11000	50MH2680(1)60(2)	A50MH2680(1)60(2)
400	200	0.10	6.5	14.0	13.5	11000	50MH3100(1)60(2)	A50MH3100(1)60(2)
400	200	0.15	6.0	20.5	10.0	8000	50MK3150(1)60(2)	A50MK3150(1)60(2)
400	200	0.22	7.5	20.5	10.0	8000	50MK3220(1)60(2)	A50MK3220(1)60(2)
400	200	0.33	8.5	20.5	10.0	8000	50MK3330(1)60(2)	A50MK3330(1)60(2)
400	200	0.47	8.5	28.0	6.5	5200	50MQ3470(1)60(2)	A50MQ3470(1)60(2)
400	200	0.68	10.0	28.0	6.5	5200	50MQ3680(1)60(2)	A50MQ3680(1)60(2)
VDC	**VAC**	**Capacitance Value (µF)**	**D (mm)**	**L (mm)**	**dV/dt (V/µs)**	**Max K_0 (V^2/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) J = 5%, K = 10%, M = 20%.

Table 1 – Ratings & Part Number Reference cont.

VDC	VAC	Capacitance Value (µF)	Dimensions in mm D	Dimensions in mm L	dV/dt (V/µs)	Max K_0 (V^2/µs)	KEMET Part Number	Legacy Part Number
400	200	1.0	10.5	33.0	4.0	3200	50MT4100(1)60(2)	A50MT4100(1)60(2)
400	200	1.5	12.5	33.0	4.0	3200	50MT4150(1)60(2)	A50MT4150(1)60(2)
400	200	2.2	15.0	33.0	4.0	3200	50MT4220(1)60(2)	A50MT4220(1)60(2)
400	200	3.3	18.5	33.0	4.0	3200	50MT4330(1)60(2)	A50MT4330(1)60(2)
630	220	0.0010	5.0	11.0	20.0	250000	50PF1100(1)60(2)	A50PF1100(1)60(2)
630	220	0.0015	5.0	11.0	20.0	250000	50PF1150(1)60(2)	A50PF1150(1)60(2)
630	220	0.0022	5.0	11.0	20.0	250000	50PF1220(1)60(2)	A50PF1220(1)60(2)
630	220	0.0033	5.0	11.0	20.0	250000	50PF1330(1)60(2)	A50PF1330(1)60(2)
630	220	0.0047	5.0	11.0	20.0	250000	50PF1470(1)60(2)	A50PF1470(1)60(2)
630	220	0.0068	5.0	11.0	20.0	250000	50PF1680(1)60(2)	A50PF1680(1)60(2)
630	220	0.010	5.0	14.0	20.0	250000	50PH2100(1)60(2)	A50PH2100(1)60(2)
630	220	0.015	5.0	14.0	20.0	250000	50PH2150(1)60(2)	A50PH2150(1)60(2)
630	220	0.022	6.0	14.0	20.0	250000	50PH2220(1)60(2)	A50PH2220(1)60(2)
630	220	0.033	6.0	20.5	15.0	190000	50PK2330(1)60(2)	A50PK2330(1)60(2)
630	220	0.047	6.0	20.5	15.0	190000	50PK2470(1)60(2)	A50PK2470(1)60(2)
630	220	0.068	7.0	20.5	15.0	190000	50PK2680(1)60(2)	A50PK2680(1)60(2)
630	220	0.10	7.0	28.0	10.0	130000	50PQ3100(1)60(2)	A50PQ3100(1)60(2)
630	220	0.15	8.5	28.0	10.0	130000	50PQ3150(1)60(2)	A50PQ3150(1)60(2)
630	220	0.22	10.0	28.0	10.0	130000	50PQ3220(1)60(2)	A50PQ3220(1)60(2)
630	220	0.33	10.5	33.0	6.0	7500	50PT3330(1)60(2)	A50PT3330(1)60(2)
630	220	0.47	12.0	33.0	6.0	7500	50PT3470(1)60(2)	A50PT3470(1)60(2)
630	220	0.68	14.5	33.0	6.0	7500	50PT3680(1)60(2)	A50PT3680(1)60(2)
630	220	1.0	17.5	33.0	6.0	7500	50PT4100(1)60(2)	A50PT4100(1)60(2)
1000	250	0.0010	6.5	14.0	50.0	100000	50QH1100(1)00(2)	A50QH1100(1)00(2)
1000	250	0.0015	6.5	14.0	50.0	100000	50QH1150(1)00(2)	A50QH1150(1)00(2)
1000	250	0.0022	6.5	14.0	50.0	100000	50QH1220(1)00(2)	A50QH1220(1)00(2)
1000	250	0.0033	6.5	14.0	50.0	100000	50QH1330(1)00(2)	A50QH1330(1)00(2)
1000	250	0.0047	7.5	14.0	50.0	100000	50QH1470(1)00(2)	A50QH1470(1)00(2)
1000	250	0.0068	8.0	14.0	50.0	100000	50QH1680(1)00(2)	A50QH1680(1)00(2)
1000	250	0.010	7.0	20.5	30.0	60000	50QK2100(1)00(2)	A50QK2100(1)00(2)
1000	250	0.015	7.5	20.5	30.0	60000	50QK2150(1)00(2)	A50QK2150(1)00(2)
1000	250	0.022	9.0	20.5	30.0	60000	50QK2220(1)00(2)	A50QK2220(1)00(2)
1000	250	0.033	8.0	28.0	15.0	30000	50QQ2330(1)00(2)	A50QQ2330(1)00(2)
1000	250	0.047	9.0	28.0	15.0	30000	50QQ2470(1)00(2)	A50QQ2470(1)00(2)
1000	250	0.068	10.5	28.0	15.0	30000	50QQ2680(1)00(2)	A50QQ2680(1)00(2)
1000	250	0.10	12.5	28.0	15.0	30000	50QQ3100(1)00(2)	A50QQ3100(1)00(2)
1000	250	0.15	13.5	33.0	10.0	20000	50QT3150(1)00(2)	A50QT3150(1)00(2)
1000	250	0.22	16.0	33.0	10.0	20000	50QT3220(1)00(2)	A50QT3220(1)00(2)
1000	250	0.33	19.0	33.0	10.0	20000	50QT3330(1)00(2)	A50QT3330(1)00(2)
1000	250	0.47	22.0	33.0	10.0	20000	50QT3470(1)00(2)	A50QT3470(1)00(2)
VDC	**VAC**	**Capacitance Value (µF)**	**D (mm)**	**L (mm)**	**dV/dt (V/µs)**	**Max K_0 (V^2/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) J = 5%, K = 10%, M = 20%.

Soldering Process

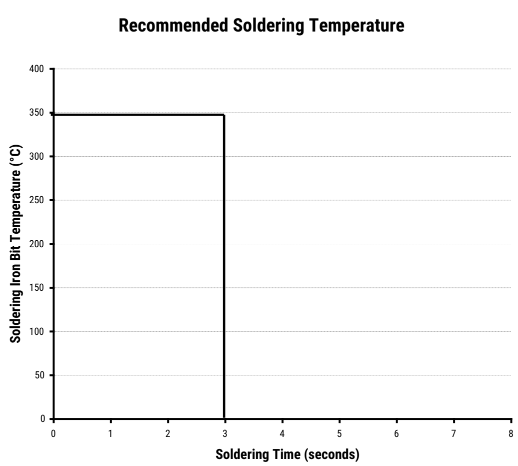
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2, serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

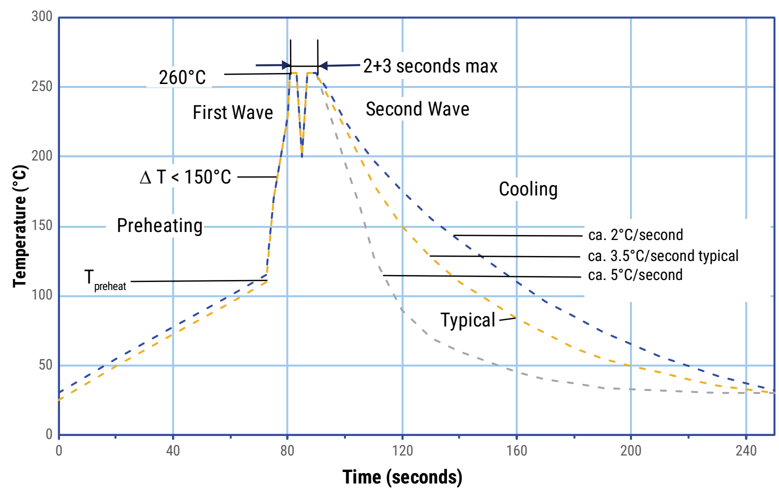
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

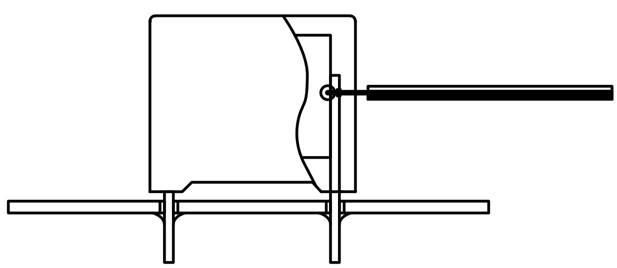
Wave Soldering Recommendations cont.

1. The table indicates the maximum set-up temperature of the soldering process
Figure 1.

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



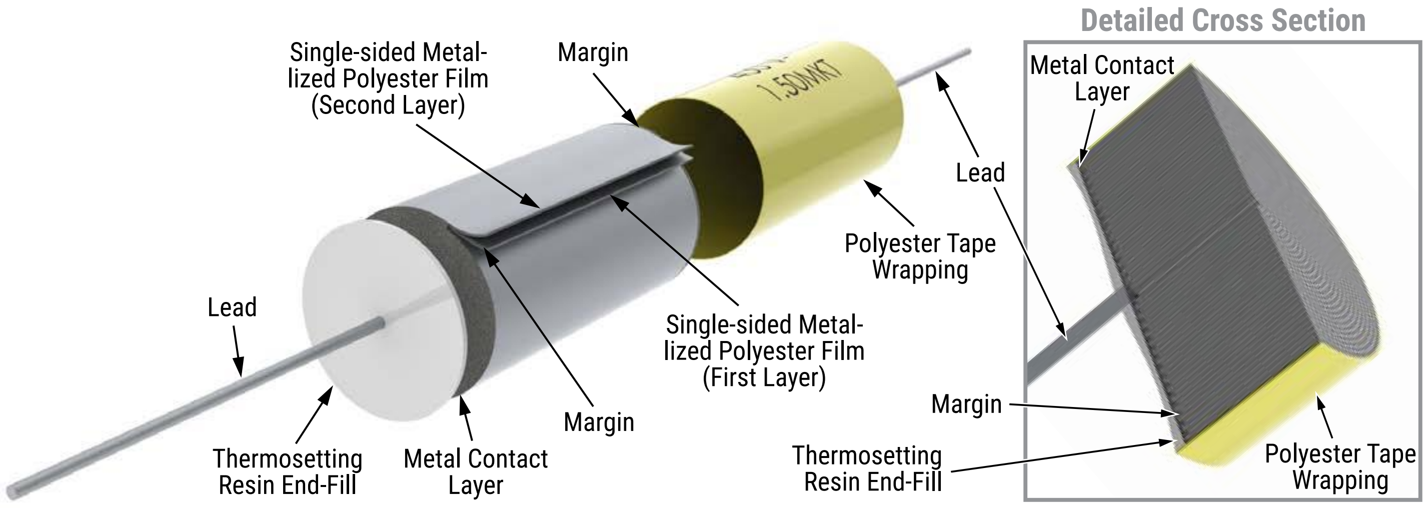
Temperature monitored inside the capacitor.

Selective Soldering Recommendations

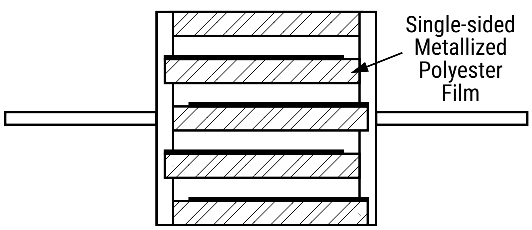
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Construction

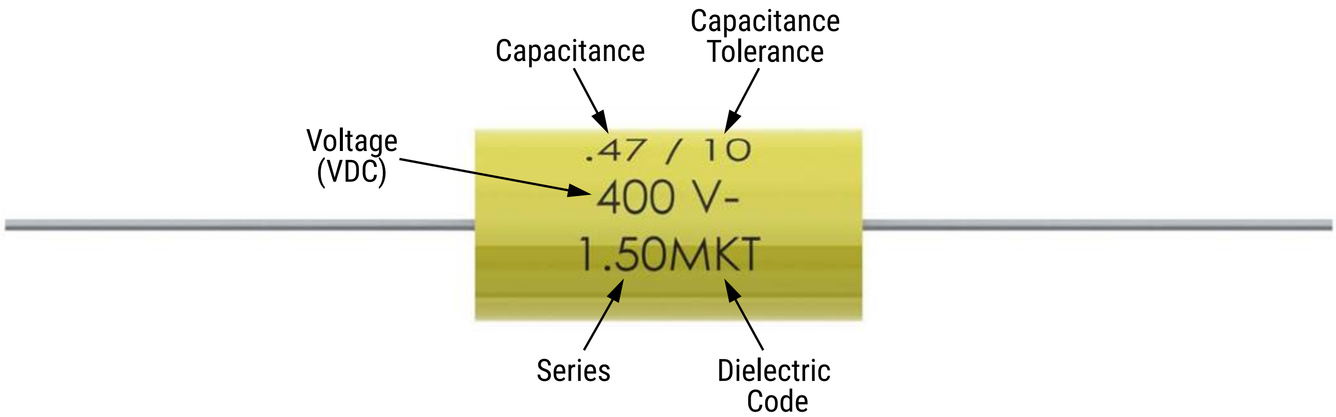


Winding Scheme



1 Section

Marking

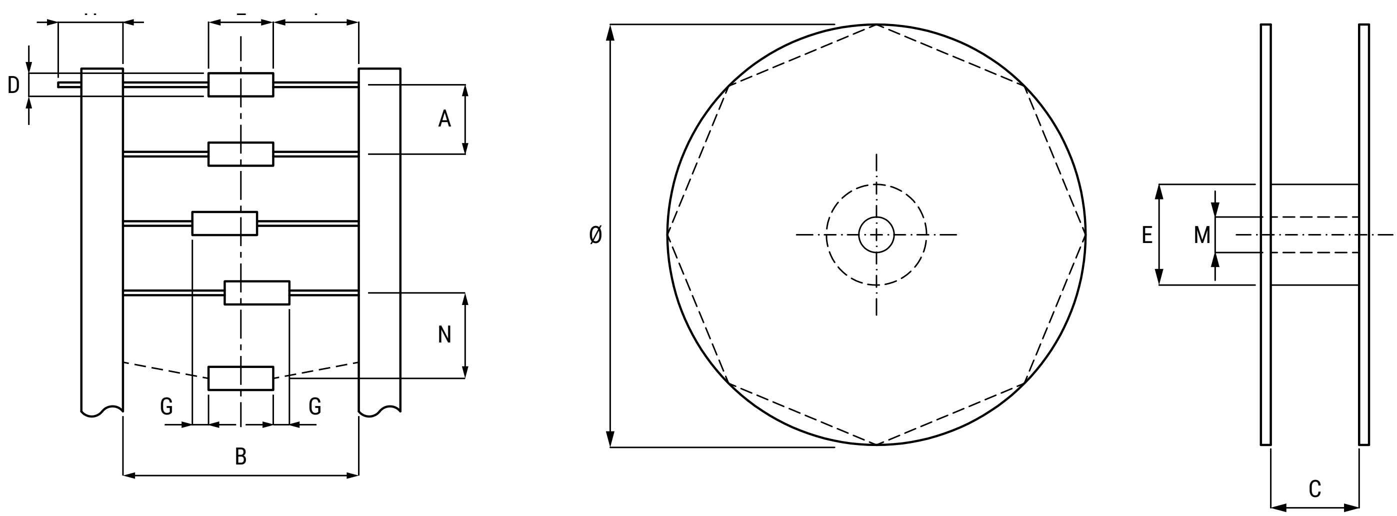


Packaging Quantities

Diameter (mm)	Length (mm)	Bulk Long Leads	Standard Reel 355 mm
5	11	1,500	3,000
6.5	11	1,200	1,300
5	14	2,000	1,300
5.5	14	2,000	1,300
6	14	2,000	1,300
6.5	14	2,000	1,200
7	14	1,750	1,100
7.5	14	1,500	1,000
8	14	1,250	900
6	20.5	1,500	1,300
6.5	20.5	1,250	1,200
7	20.5	1,250	1,100
7.5	20.5	1,000	1,000
8	20.5	1,000	900
8.5	20.5	750	800
9	20.5	750	800
9.5	20.5	750	600
10	20.5	750	600
12	20.5	500	400
7	28	750	1,000
8	28	500	900
8.5	28	500	800

Diameter (mm)	Length (mm)	Bulk Long Leads	Standard Reel 355 mm
9	28	500	800
9.5	28	500	600
10	28	500	600
10.5	28	500	400
11	28	500	400
12.5	28	300	400
10	33	400	400
10.5	33	400	400
11	33	400	400
11.5	33	400	400
12	33	300	400
12.5	33	300	400
13	33	300	400
13.5	33	300	300
14.5	33	300	300
15	33	300	300
15.5	33	200	250
16	33	200	250
17.5	33	200	200
18.5	33	150	150
19	33	150	150
22	33	100	–

Lead Taping & Packaging (IEC 60286–1)



Taping Specification

Description	Symbol	Dimensions (mm)
Component diameter	D	4.5 – 19.5
Body length	L	11 – 33
Component lead spacing	A(1)	See Table 2
Reel core diameter	E	85
Arbor hole diameter	M	30
Reel diameter	ø	355 maximum
Tape width	H	6 ±0.5/9 ±1(2)
Body location (lateral deviation)	G	≤ 0.7
Body location (longitudinal deviation)	N	≤ 1.2
Tape spacing	B	See Table 3
Lead length from the component body to the adhesive tape	I	≥ 20
Distance between reel flanges	C	See Table 3

(1) Maximum cumulative feed hole error; 1.5 mm per 6 parts.
(2) 9±1 for capacitor with L ≥ 31.5.

Table 2

Dimensions in mm	
Diameter	A
≤ 5	5±0.5
5.1 – 9.5	10±0.5
9.6 – 14.7	15±0.5
14.8 – 19.5	20±1.0

Table 3

Dimensions in mm			
Length	Class	$B^{\pm 1.5}$	C
≤ 11	I	52.4	75
14 – 20.5	II	63.6	86
≥ 26	III	73.0	98

P278, Metallized Impregnated Paper, Class X1, 480 VAC

Overview

Multilayer metallized paper encapsulated and impregnated in self-extinguishing material that meets the requirements of UL 94 V–0.

Applications

Typical applications include worldwide use as an electromagnetic interference suppressor in all X1 and across-the-line applications.

Benefits

- Approvals: ENEC, UL, cUL
- Rated voltage: 480 VAC 50/60 Hz
- Capacitance range: 0.001 – 0.15 µF
- Lead Spacing: 10.2 – 25.4 mm
- Capacitance tolerance: ±20%
- Climatic category: 40/110/56, IEC 60068–1
- Tape & Reel in accordance with IEC 60286–2
- RoHS compliance and lead-free terminations
- Operating temperature range of −40°C to +110°C
- 100% screening factory test at 2,700 VDC
- Highest possible safety regarding active and passive flammability
- Excellent self-healing properties that ensure long life, even when subjected to frequent over-voltages
- Good resistance to ionization due to impregnated paper dielectric
- Impregnated paper that ensures excellent stability and reliability properties, particularly in applications that operate continuously

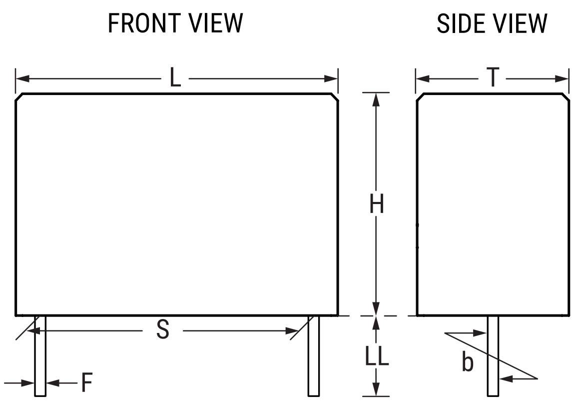
Part Number System

P	278	H	E	102	M	480	A
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Packaging
P = Paper	X1, Metallized Paper	H = 10.2 Q = 15.2 C = 20.3 S = 22.5 E = 25.4	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	M = ±20%	480 = 480	See Ordering Options Table

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Part Number (Insert at 14th character)
10.2	**Standard Lead and Packaging Options**		
	Bulk – Short Leads	6 +0/−1	C
	Bulk – Maximum Length Leads	30 +5/−0	A
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	L
	Other Lead and Packaging Options		
	Ammo Pack formed to Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	XLAF1
		H_0 = 18.5 ±0.5	P
15.2	**Standard Lead and Packaging Options**		
	Bulk – Short Leads	6 +0/−1	C
	Bulk – Maximum Length Leads	30 +5/−0	A
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	L
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	P
20.3	**Standard Lead and Packaging Options**		
	Tray – Short Leads	6 +0/−1	C
	Bulk – Maximum Length Leads	30 +5/−0	A
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	L
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	P
22.5	**Standard Lead and Packaging Options**		
	Tray – Short Leads	6 +0/−1	C
	Bulk – Maximum Length Leads	30 +5/−0	A
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	L
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	P
25.4	**Standard Lead and Packaging Options**		
	Tray – Short Leads	6 +0/−1	C
	Bulk – Maximum Length Leads	30 +5/−0	A

Dimensions – Millimeters



Size Code	S		T		H		L		F		b
	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Tolerance
HE	10.2	±0.4	3.9	Maximum	7.5	Maximum	13.5	Maximum	0.6	±0.05	±0.4
HH	10.2	±0.4	4.1	Maximum	8.2	Maximum	13.5	Maximum	0.6	±0.05	±0.4
HL	10.2	±0.4	5.1	Maximum	10.5	Maximum	13.5	Maximum	0.6	±0.05	±0.4
QE	15.2	±0.4	5.2	Maximum	10.5	Maximum	18.5	Maximum	0.8	±0.05	±0.4
QJ	15.2	±0.4	5.5	Maximum	11.1	Maximum	18.5	Maximum	0.8	±0.05	±0.4
QS	15.2	±0.4	8.5	Maximum	14.3	Maximum	18.5	Maximum	0.8	±0.05	±0.4
CE	20.3	±0.4	7.6	Maximum	14.0	Maximum	24.0	Maximum	0.8	±0.05	±0.4
CJ	20.3	±0.4	9.0	Maximum	15.0	Maximum	24.0	Maximum	0.8	±0.05	±0.4
CP	20.3	±0.4	11.3	Maximum	16.5	Maximum	24.0	Maximum	0.8	±0.05	±0.4
SJ	22.5	±0.4	8.0	Maximum	17.0	Maximum	27.0	Maximum	0.8	±0.05	±0.4
SP	22.5	±0.4	10.0	Maximum	19.0	Maximum	27.0	Maximum	0.8	±0.05	±0.4
SU	22.5	±0.4	12.0	Maximum	22.0	Maximum	27.0	Maximum	0.8	±0.05	±0.4
EJ	25.4	±0.4	12.1	Maximum	19.0	Maximum	30.5	Maximum	1.0	±0.05	±0.4
EL	25.4	±0.4	15.3	Maximum	22.0	Maximum	30.5	Maximum	1.0	±0.05	±0.4

Note: See Ordering Options Table for lead length (LL) options.

Performance Characteristics

Rated Voltage	480 VAC 50/60Hz	
Capacitance Range	0.001 – 0.15 µF	
Capacitance Tolerance	±20%	
Temperature Range	-40°C to +110°C	
Climatic Category	40/110/56/B	
Approvals	ENEC, UL, cUL	
Dissipation Factor	Maximum Values at +23°C	
	1 kHz	1.3%
Test Voltage Between Terminals	The 100% screening factory test is carried out at 2,700 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. This test may not be repeated due to potential capacitor damage. KEMET is not liable for any failures that result from performing the test again.	
Insulation Resistance	Minimum Value Between Terminals:	
	≥ 12,000 MΩ	
In DC Applications	Recommended voltage ≤ 1,000 VDC	
Resonance Frequency	Tabulated self-resonance frequencies (f_0) refer to 5 mm lead length	

Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384-14	1.25 x V_R VAC 50 Hz , once every hour increase to 1,000 VAC for 0.1 seconds, 1,000 hours at upper rated temperature
Vibration	IEC 60068-2-6 Test Fc	3 directions at 2 hours each 10 – 500 Hz at 0.75 mm or 98m/seconds^2
Bump	IEC 60068-2-29 Test Eb	4,000 bumps at 390 m/seconds^2
Change of Temperature	IEC 60068-2-14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384-14	V_R + 20 surge pulses at 4.0 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384-14	IEC 60384-1, IEC 60695-11-5 Needle-flame test
Damp Heat Steady State	IEC 60068-2-78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
Intertek Semko AB		EN/IEC 60384-14	SE/0140-35A
UL	c UL us	UL 60384-14 CAN/CSA-E60384-14-09	E73869

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Maximum Dimensions in mm			Lead Spacing (S)	f_o (MHz)	dV/dt (V/µs)	KEMET Part Number
	T	H	L				
0.001	3.9	7.5	13.5	10.2	53	2,000	P278HE102M480(1)
0.0015	3.9	7.5	13.5	10.2	44	2,000	P278HE152M480(1)
0.0022	3.9	7.5	13.5	10.2	37	2,000	P278HE222M480(1)
0.0033	4.1	8.2	13.5	10.2	30	2,000	P278HH332M480(1)
0.0047	5.1	10.5	13.5	10.2	24	2,000	P278HL472M480(1)
0.0068	5.2	10.5	18.5	15.2	18.5	1,400	P278QE682M480(1)
0.010	5.2	10.5	18.5	15.2	15.5	1,400	P278QE103M480(1)
0.015	5.5	11.1	18.5	15.2	13	1,400	P278QJ153M480(1)
0.022	8.5	14.3	18.5	15.2	9.6	1,400	P278QS223M480(1)
0.033	7.6	14.0	24.0	20.3	9.6	1,000	P278CE333M480(1)
0.047	9.0	15.0	24.0	20.3	7.5	1,000	P278CJ473M480(1)
0.068	11.3	16.5	24.0	20.3	6.2	1,000	P278CP683M480(1)
0.033	8.0	17.0	27.0	22.5	7.2	1,000	P278SJ333M480(1)
0.047	8.0	17.0	27.0	22.5	6	1,000	P278SJ473M480(1)
0.068	10.0	19.0	27.0	22.5	4.8	1,000	P278SP683M480(1)
0.1	12.0	22.0	27.0	22.5	3.6	600	P278SU104M480(1)
0.1	12.1	19.0	30.5	25.4	3.9	600	P278EJ104M480(1)
0.15	15.3	22.0	30.5	25.4	3.2	600	P278EL154M480(1)
Capacitance Value (µF)	**B (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (p)**	**f^o (MHz)**	**dV/dt (V/µs)**	**KEMET Part Number**

(1) Insert ordering code for lead type and packaging. See Ordering Options Table for available options.

Soldering Process

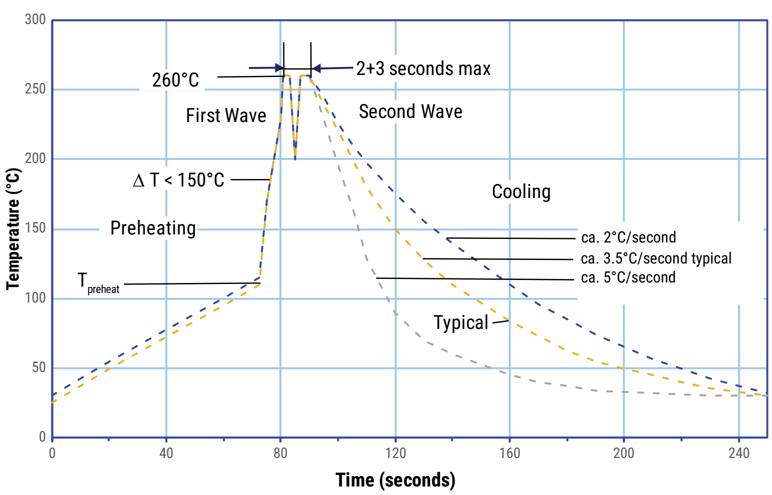
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for the SnPb eutectic alloy to 217 – 221ºC for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170ºC). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 mm to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result in degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum of two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

Figure 1

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

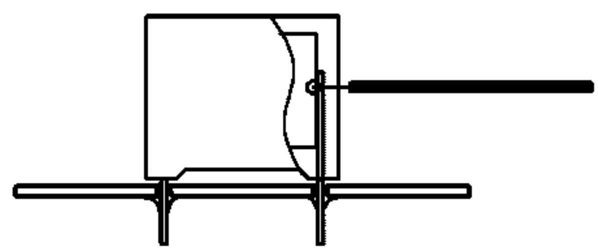
1. The table indicates the maximum set-up temperature of the soldering process.

Dielectric film material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≥ 10 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C

Temperature monitored inside the capacitor.

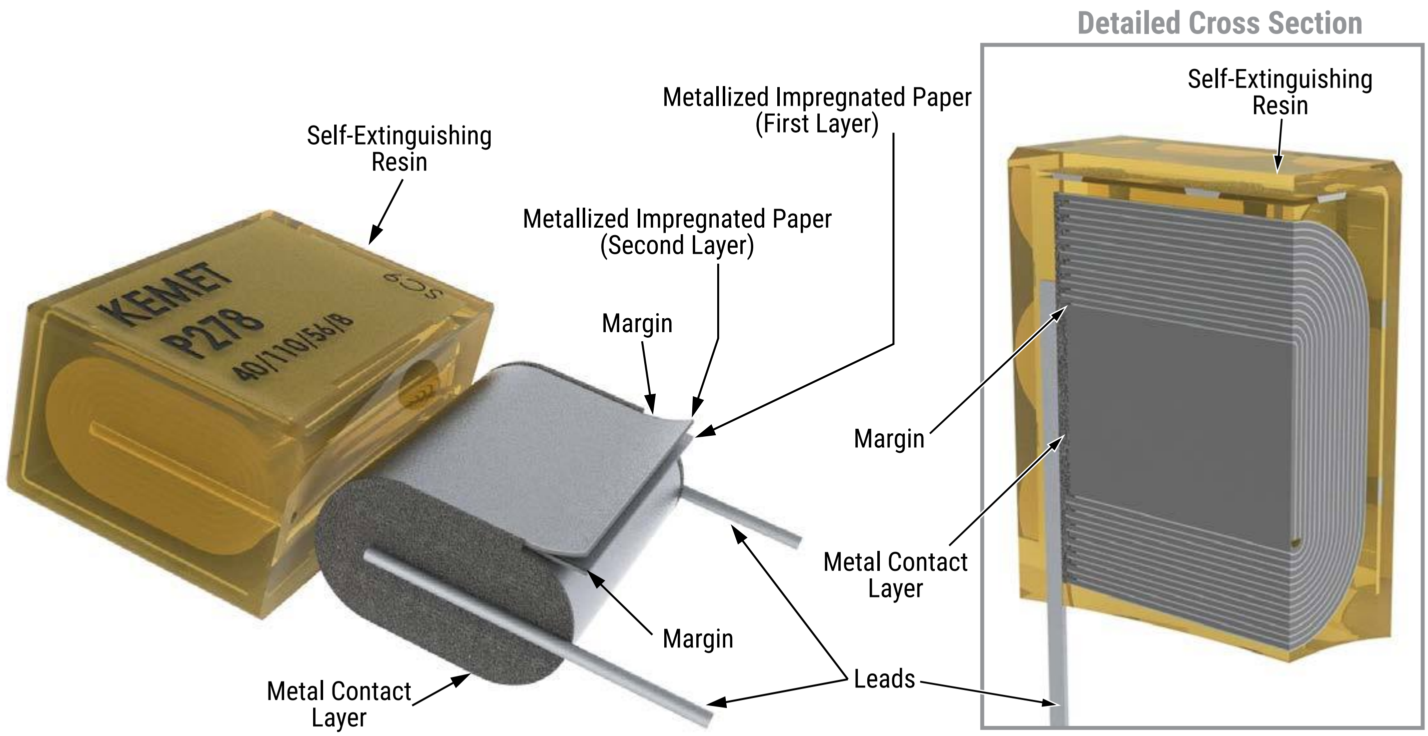


Selective Soldering Recommendations

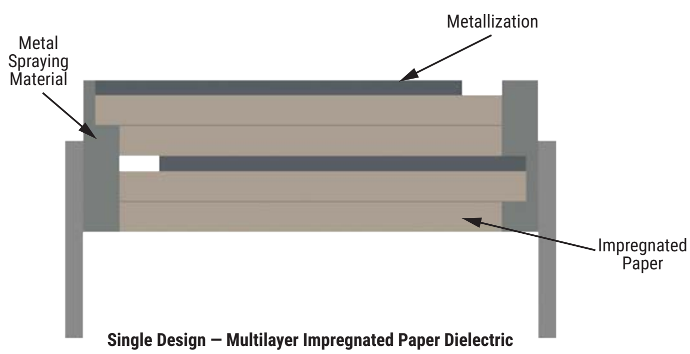
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath, as in normal-flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and then pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the temperature profile for double-wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double-wave flow soldering, and great care must be taken so that the parts do not overheat.

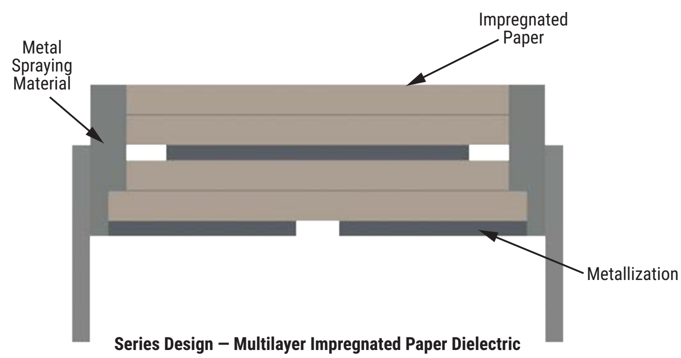
Construction



Winding Scheme



Single Design — Multilayer Impregnated Paper Dielectric
1 Section

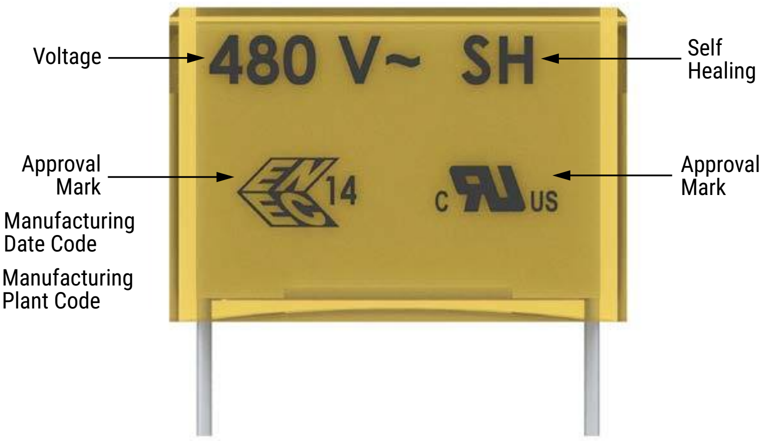


Series Design — Multilayer Impregnated Paper Dielectric
2 Section

Marking

FRONT

BACK



TOP

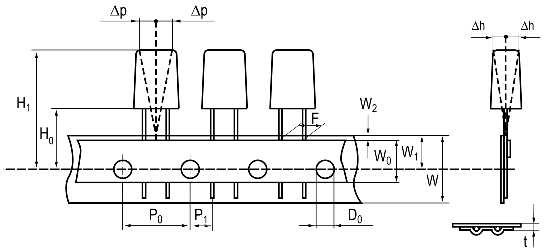
Manufacturing Date Code (IEC 60062)									
Year	Code	Year	Code	Year	Code	Month	Code	Month	Code
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

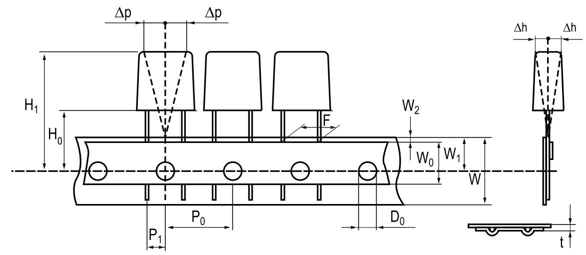
Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 360 mm	Large Reel 500 mm	Ammo Formed
10.2	3.9	7.5	13.5	2,000	1,000	700	1,400	800
	4.1	8.2	13.5	2,000	1,000	600		780
	5.1	10.5	13.5	1,600	800	600	1,200	630
15.2	5.5	12.5	18.0	1,000	500	600		
	6.5	12.5	18.0	600	400	400		
	7.5	14.5	18.0	600	400	400		
	8.5	16.0	18.0	400	250	400		
	5.2	10.5	18.5	1000	500	600		
	5.5	11.1	18.5	1,000	500	500		
	6.0	12.5	18.5	600	400	400		
	7.3	13.0	18.5	600	400	400	800	
	7.8	13.5	18.5	600	400	400		
	8.5	14.3	18.5	500	300	350		
20.3	7.6	14.0	24.0	1,500	250	250	500	
	8.4	14.0	24.0	1,200	200	250	500	
	9.0	15.0	24.0	1,500	200	250		
	11.3	16.5	24.0	1,000	150	180	400	
22.5	8.0	17.0	27.0	1,200	200			
	10.0	19.0	27.0	1,000	150	200		
	12.0	22.0	27.0	800	100	180	350	
25.4	10.6	16.1	30.5	1,000	150			
	10.5	17.3	30.5	1,000	100			
	12.1	19.0	30.5	800	100			
	15.3	22.0	30.5	600	75			

Lead Taping & Packaging (IEC 60286–2)

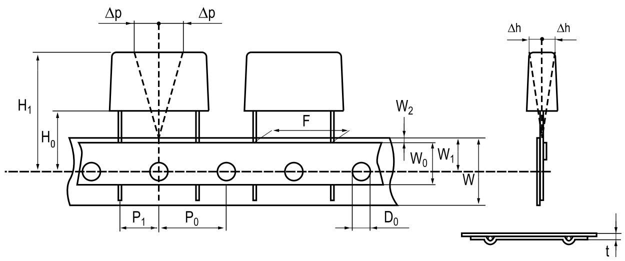
Lead Spacing 5 mm



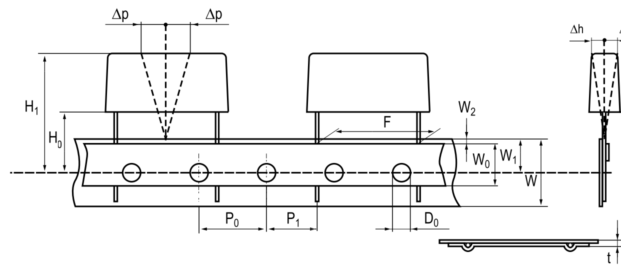
Lead Spacing 7.5 mm



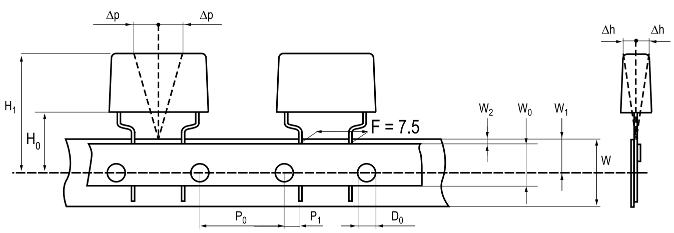
Lead Spacing 10 – 15mm



Lead Spacing 22.5 – 27.5 mm



Formed Leads from 10 and 15 mm to 7.5 mm



Taping Specification

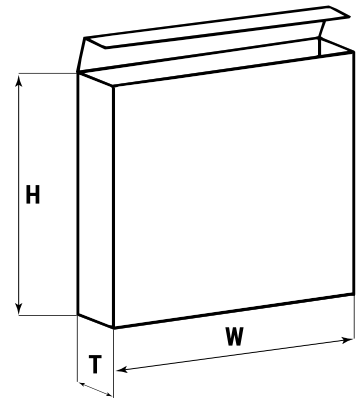
Dimensions in mm										Standard IEC 60286-2
Lead Spacing	+0.6/−0.1	F	5	7.5	Formed 7.5	10	15	22.5	27.5	F
Carrier Tape Width	±0.5	W	18	18	18	18	18	18	18	18+1/−0.5
Hold-down Tape Width	Minimum	W_0	5	5	5	5	5	5	5	
Position of Sprocket Hole	±0.5	W_1	9	9	9	9	9	9	9	9+0.75/−0.5
Distance Between Tapes	Maximum	W_2	3	3	3	3	3	3	3	3
Sprocket Hole Diameter	±0.2	D_0	4	4	4	4	4	4	4	4
Feed Hole Lead Spacing	±0.3	P_0 (1)	12.7	12.7	12.7 (4)	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.85	3.75	3.75	7.7	5.2	5.3	5.3	P1
Deviation Tape – Plane	Maximum	Δ p	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	Maximum	Δ h	2	2	2	2	2	2	2	2
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.7	0.9 Maximum	0.9 Maximum	0.9 Maximum
Sprocket Hole/Cap Body	Nominal	H_0 (2)	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.0+2/−0
Sprocket Hole/ Top of Cap Body	Maximum	H_1 (3)	32	31	43	43	43	58	58	58 Maximum

(1) Maximum cumulative feed hole error, 1 mm per 20 parts
(2) 16.5 mm available on request
(3) Depending on case size
(4) 15 mm available on request

Lead Taping & Packaging (IEC 60286–2) cont.

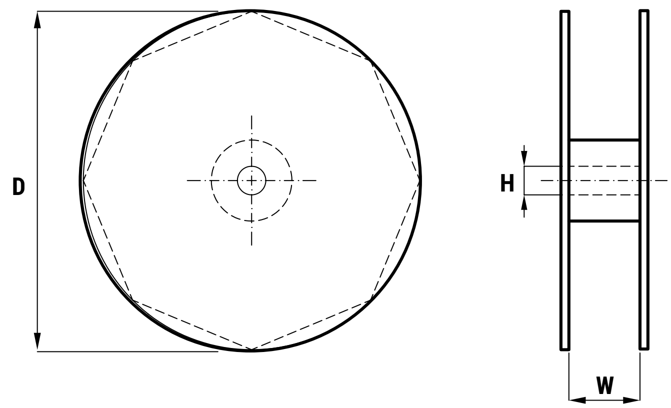
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
P278	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
P278	360 500	30	46 (Max)



P295, Metallized Impregnated Paper, Class Y1, 500 VAC

Overview

Multilayer metallized paper, encapsulated and impregnated in self-extinguishing material that meets the requirements of UL 94 V–0.

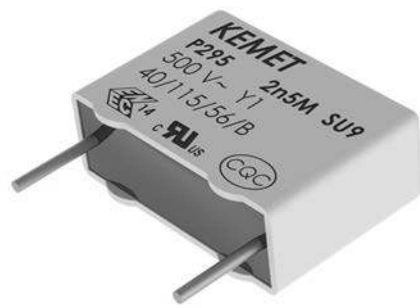
Automotive grade devices meet the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

Applications

Safety capacitors for bridging of double or reinforced insulation applications that require a voltage test up to 4,000 VAC at 60 seconds. P295 series capacitors can be left in place during this test.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- Rated voltage: 500 VAC 50/60 Hz
- Capacitance range: 470 – 4,700 pF
- Lead spacing: 15.0 mm
- Capacitance tolerance: ±20%
- Climatic category: 40/115/56/B, IEC 60068–1
- Tape and reel packaging in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of −40°C to +115°C
- 100% screening factory test at 4,000 VAC, 50 Hz, 2 seconds
- Highest possible safety regarding active and passive flammability
- Excellent self-healing properties ensure long life even when subjected to frequent over voltages
- Good resistance to ionization due to impregnated dielectric
- High dV/dt capability
- Impregnated paper provides excellent stability and reliability properties, particularly in applications with continuous operation
- Automotive Grade (AEC-Q200)



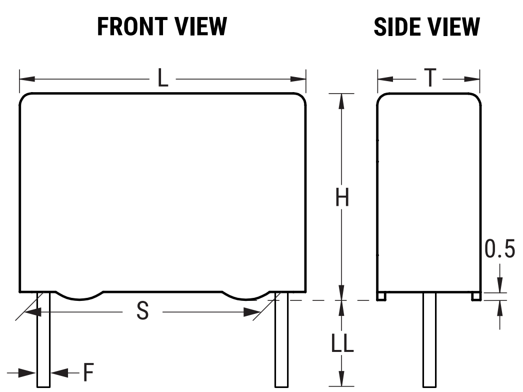
Part Number System

P	295	B	E	471	M	500	A
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Packaging
P = Paper	Y1, Metallized Paper	B = 15.0	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	J = ±5% K = ±10% M = ±20%	500 = 500	See Ordering Options Table

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	KEMET Part Number (Insert at 14th character)
15	**Standard Lead and Packaging Options**		
	Bulk – Short Leads	6 +0/−1	C
	Bulk – Maximum Length Leads	30 +5/−0	A
	Tape and Reel (Standard Reel Φ = 360 mm)	H_0= 18.5 +/-0.5	L

Dimensions – Millimeters



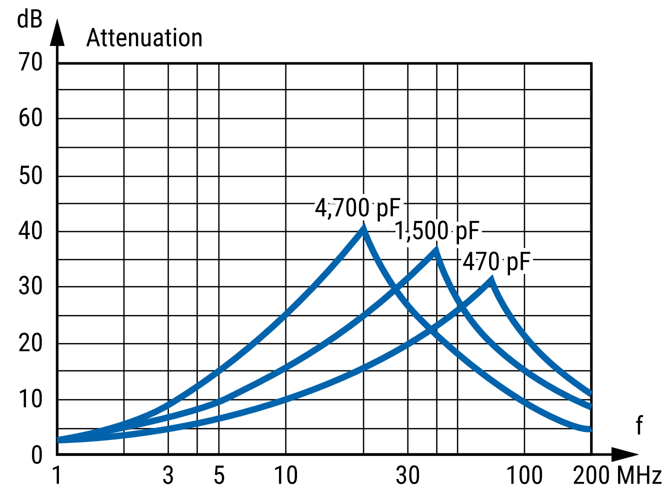
Size Code	S		T		H		L		F	
	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
BE	15.0	±0.4	5.5	Maximum	12.5	Maximum	18.0	Maximum	0.8	±0.05
BJ	15.0	±0.4	6.5	Maximum	12.5	Maximum	18.0	Maximum	0.8	±0.05
BL	15.0	±0.4	7.5	Maximum	14.5	Maximum	18.0	Maximum	0.8	±0.05
BQ	15.0	±0.4	8.5	Maximum	16.0	Maximum	18.0	Maximum	0.8	±0.05

Note: See Ordering Options Table for lead length (LL) options.

Performance Characteristics

Rated Voltage	500 VAC 50/60 Hz	
Capacitance Range	0.00047 – 0.0047 μF	
Capacitance Tolerance	±20%	
Temperature Range	−40°C to +115°C	
Climatic Category	40/115/56/B	
Approvals	ENEC, UL, cUL, CQC	
Dissipation Factor	Maximum Values at +23°C	
	1 kHz	1.3%
Test Voltage Between Terminals	The 100% screening factory test is carried out at 4,000 VAC, 50 Hz, 2 seconds. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test.	
Insulation Resistance	Measured at 500 VDC after 60 seconds, +23°C	
	Minimum Value Between Terminals	
	≥ 12,000 MΩ	
In DC Applications	Recommended voltage ≤ 1,500 VDC	
Resonance Frequency	Tabulated self-resonance frequencies f_0 refer to 5 mm lead length	

Suppression vs. Frequency, Typical Values



Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384–14	1.7 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10–500 Hz at 0.75 mm or $98 m/second^2$
Bump	IEC 60068–2–29 Test Eb	4,000 bumps at $390 m/second^2$
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
Intertek Semko AB		EN/IEC 60384–14	SE/0140–34A
UL		UL 60384–14 CAN/CSA-E60384–14–09	E73869
CQC		IEC 60384–14	CQC16001145222

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Maximum Dimensions in mm			Lead Spacing (S)	f_o (MHz)	dV/dt (V/µs)	KEMET Part Number
	T	H	L				
0.00047	5.5	12.5	18.0	15.0	64	2,000	P295BE471(3)500(1)
0.00056	5.5	12.5	18.0	15.0	59	2,000	P295BE561(3)500(1)
0.00068	5.5	12.5	18.0	15.0	54	2,000	P295BE681(3)500(1)
0.00082	5.5	12.5	18.0	15.0	49	2,000	P295BE821(3)500(1)
0.001	5.5	12.5	18.0	15.0	46	2,000	P295BE102(2)500(1)
0.0012	6.5	12.5	18.0	15.0	43	2,000	P295BJ122(2)500(1)
0.0015	6.5	12.5	18.0	15.0	40	2,000	P295BJ152(2)500(1)
0.0018	6.5	12.5	18.0	15.0	37	2,000	P295BJ182(2)500(1)
0.0022	6.5	12.5	18.0	15.0	33	2,000	P295BJ222(2)500(1)
0.0025	7.5	14.5	18.0	15.0	31	2,000	P295BL252(2)500(1)
0.0027	7.5	14.5	18.0	15.0	30	2,000	P295BL272(2)500(1)
0.0033	7.5	14.5	18.0	15.0	27	2,000	P295BL332(2)500(1)
0.0039	8.5	16.0	18.0	15.0	24	2,000	P295BQ392(2)500(1)
0.0047	8.5	16.0	18.0	15.0	22	2,000	P295BQ472(2)500(1)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**f_o (MHz)**	**dV/dt (V/µs)**	**KEMET Part Number**

(1) Insert ordering code for lead type and packaging. See Ordering Options Table for available options.
(2) Insert tolerance letter (J = ±5%, K = ±10%, M ±20%)
(3) Insert tolerance letter (K = ±10%, M ±20%)

Soldering Process

The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from 183ºC for SnPb eutectic alloys to 217 – 221ºC for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170ºC). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 mm to 15 mm), and great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

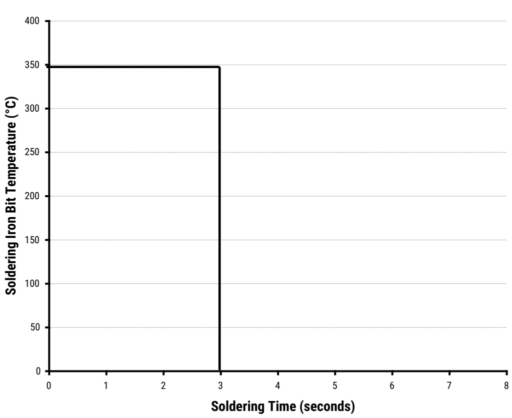
Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the recommended limits may result in degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum of two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to normal before the second soldering cycle.

Manual Soldering Recommendations

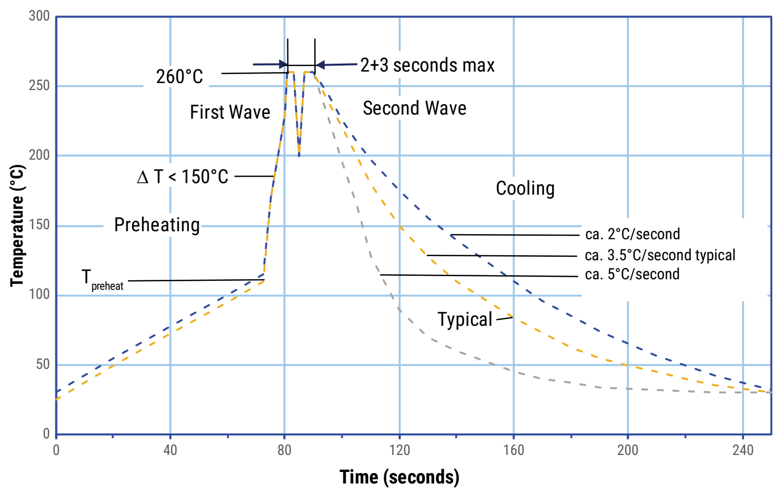
Following is the recommendation for manual soldering with a soldering iron.

Recommended Soldering Temperature



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

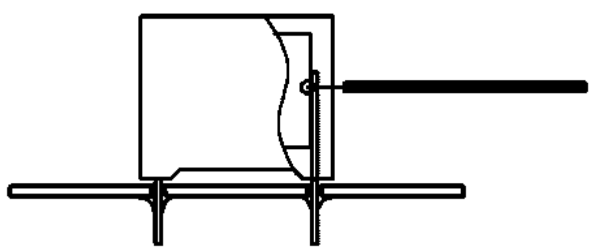
1. The table indicates the maximum set-up temperature of the soldering process.

Dielectric film material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor. Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C

Temperature monitored inside the capacitor.

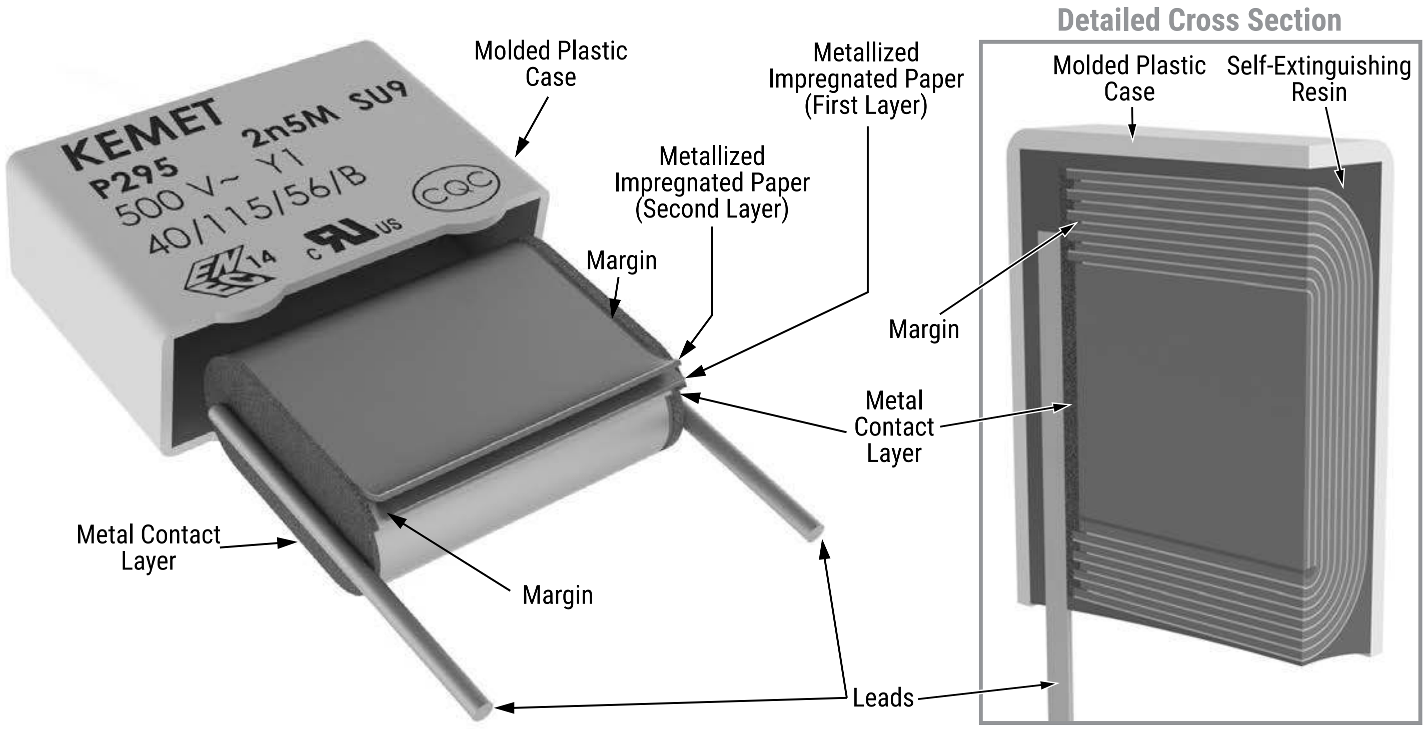


Selective Soldering Recommendations

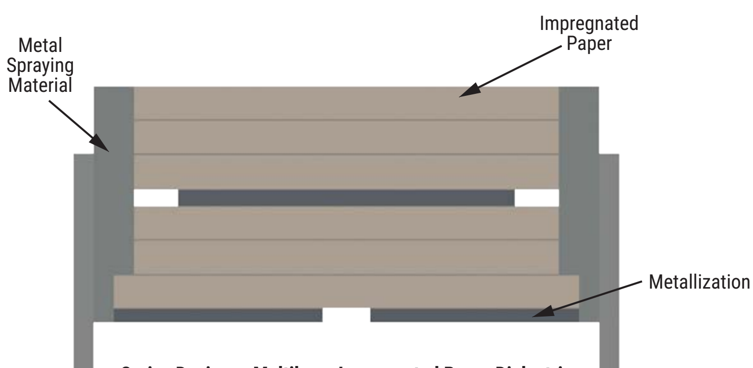
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath, as in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and then pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double-wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double-wave flow soldering, and great care must be taken so that the parts do not overheat.

Construction

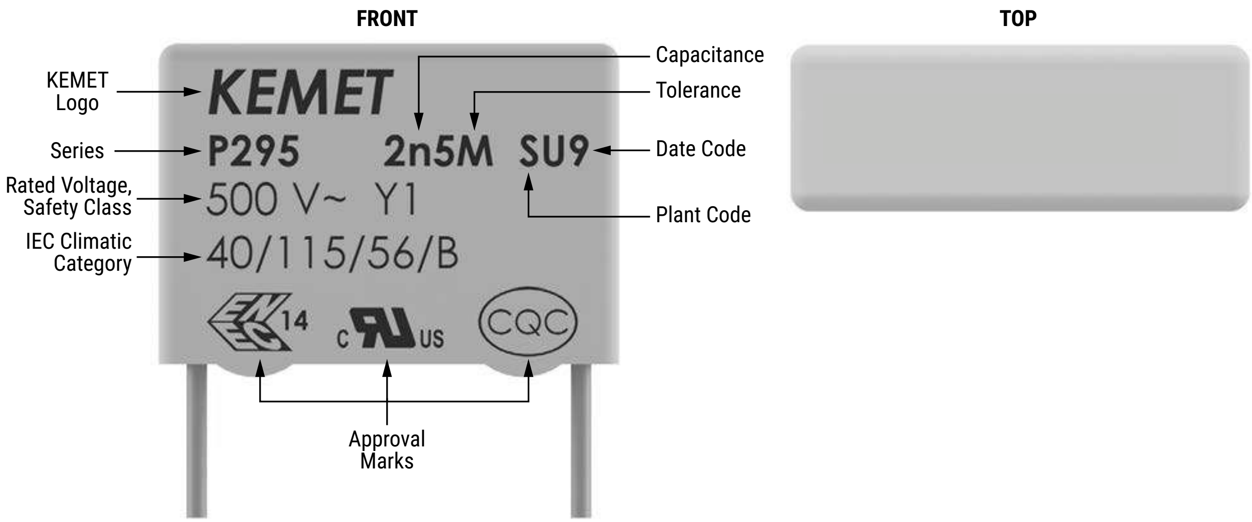


Winding Scheme



Series Design — Multilayer Impregnated Paper Dielectric 2 Section

Marking

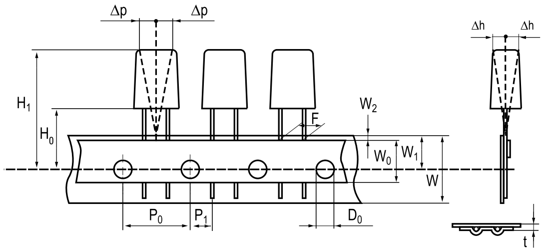


Packaging Quantities

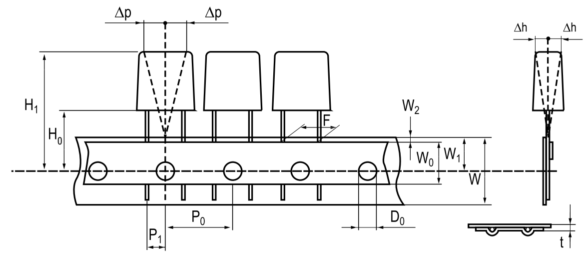
Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 360 mm
Lead and Packaging Code				C	A	L
15	5.5	12.5	18	1,000	500	600
	7.5	14.5	18	600	400	400
	6.5	12.5	18	600	400	400
	8.5	16	18	400	250	400

Lead Taping & Packaging (IEC 60286–2)

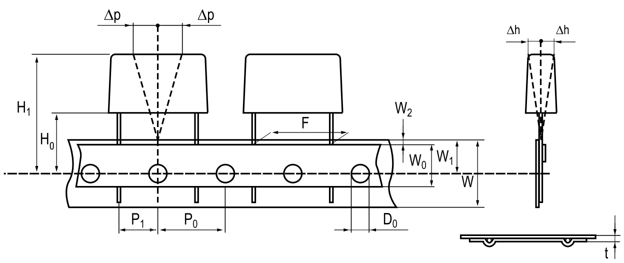
Lead Spacing 5 mm



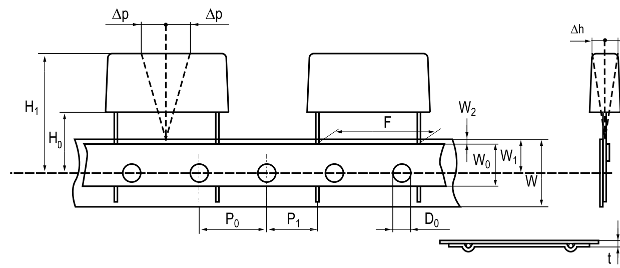
Lead Spacing 7.5 mm



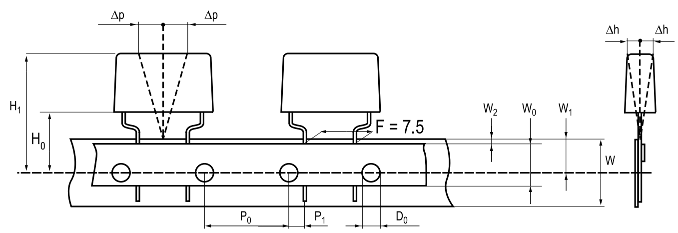
Lead Spacing 10 – 15mm



Lead Spacing 22.5 – 27.5 mm



Formed Leads from 10 and 15 mm to 7.5 mm



Taping Specification

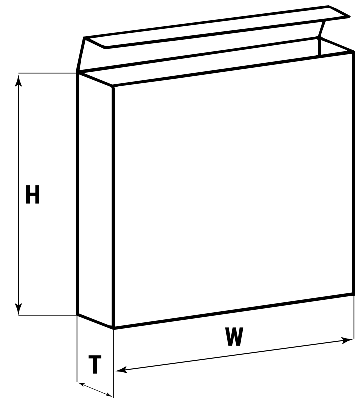
Dimensions in mm										Standard IEC 60286-2
Lead Spacing	+0.6/−0.1	F	5	7.5	Formed 7.5	10	15	22.5	27.5	F
Carrier Tape Width	±0.5	W	18	18	18	18	18	18	18	18+1/−0.5
Hold-down Tape Width	Minimum	W_0	5	5	5	5	5	5	5	
Position of Sprocket Hole	±0.5	W_1	9	9	9	9	9	9	9	9+0.75/−0.5
Distance Between Tapes	Maximum	W_2	3	3	3	3	3	3	3	3
Sprocket Hole Diameter	±0.2	D_0	4	4	4	4	4	4	4	4
Feed Hole Lead Spacing	±0.3	P_0 (1)	12.7	12.7	12.7 (4)	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.85	3.75	3.75	7.7	5.2	5.3	5.3	P1
Deviation Tape – Plane	Maximum	Δ p	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	Maximum	Δ h	2	2	2	2	2	2	2	2
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.7	0.9 Maximum	0.9 Maximum	0.9 Maximum
Sprocket Hole/Cap Body	Nominal	H_0 (2)	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.0+2/−0
Sprocket Hole/ Top of Cap Body	Maximum	H_1 (3)	32	31	43	43	43	58	58	58 Maximum

(1) Maximum cumulative feed hole error, 1 mm per 20 parts
(2) 16.5 mm available on request
(3) Depending on case size
(4) 15 mm available on request

Lead Taping & Packaging (IEC 60286–2) cont.

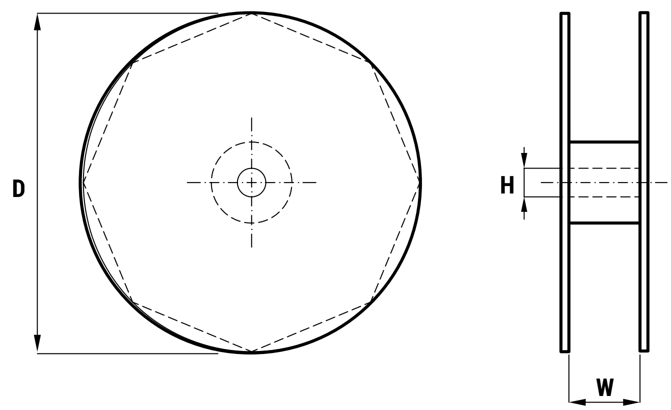
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
P295	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
P295	360 500	30	46 (Max)



Manufacturing Date Code (IEC–60062)

Y = Year, Z = Month			
Year	Code	Month	Code
2000	M	January	1
2001	N	February	2
2002	P	March	3
2003	R	April	4
2004	S	May	5
2005	T	June	6
2006	U	July	7
2007	V	August	8
2008	W	September	9
2009	X	October	O
2010	A	November	N
2011	B	December	D
2012	C		
2013	D		
2014	E		
2015	F		
2016	H		
2017	J		
2018	K		
2019	L		
2020	M		

P409, Integrated Resistor, Metallized Impregnated Paper, Class X2, 275 VAC

Overview

The P409 is constructed of multilayer metallized paper encapsulated and impregnated in self-extinguishing material meeting the requirements of UL 94 V–0.

Applications

Typical applications include worldwide use in contact protection, contact interference suppression and transient suppression.

Benefits

- Approvals: ENEC, UL, cUL
- Rated voltage: 275 VAC 50/60 Hz
- Capacitance range: 0.047 – 0.47 µF
- Capacitance tolerance: ±20%
- Resistance range: 22 – 470 Ω
- Resistance tolerance: ±30%
- Lead spacing: 15.2 – 25.4 mm
- Climatic category: 40/085/56/B, IEC 60068–1
- Tape and reel packaging in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of −40°C to +85°C
- Excellent self-healing properties which ensure long life even when subjected to frequent over voltages
- Good resistance to ionization due to impregnated paper dielectric
- High dV/dt capability
- Impregnated paper ensures excellent stability and reliability properties, particularly in applications with continuous operation

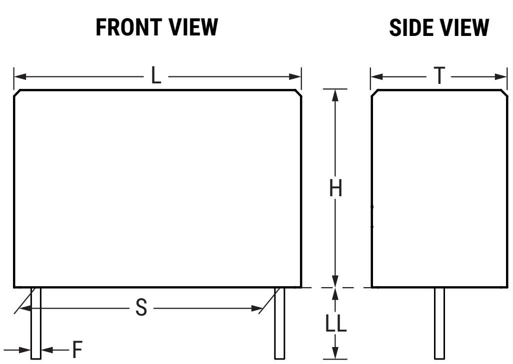
Part Number System

P	409	Q	M	473	M	275	A	H470
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Packaging	Resistance (Ω)
P= Metallized Paper	RC Snubber	Q = 15.2 C = 20.3 E = 25.4	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	M = ±20%	275 = 275	See Ordering Options Table	H plus first two digits represent significant figures. Third digit specifies number of zeros.

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Part Number (Insert at 14th character)
15.2	**Standard Lead and Packaging Options**		
	Bulk – Short Leads	6 +0/−1	C
	Bulk – Maximum Length Leads	30 +5/−0	A
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	L
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	P
20.3	**Standard Lead and Packaging Options**		
	Tray – Short Leads	6 +0/−1	C
	Bulk – Maximum Length Leads	30 +5/−0	A
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	L
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	P
25.4	**Standard Lead and Packaging Options**		
	Bulk – Short Leads	6 +0/−1	C
	Bulk – Maximum Length Leads	30 +5/−0	A

Dimensions – Millimeters



Size Code	S		T		H		L		F	
	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
QM	15.2	±0.4	7.3	Maximum	13.0	Maximum	18.5	Maximum	0.8	±0.05
CE	20.3	±0.4	7.6	Maximum	14.0	Maximum	24.0	Maximum	0.8	±0.05
CP	20.3	±0.4	11.3	Maximum	16.5	Maximum	24.0	Maximum	0.8	±0.05
EJ	25.4	±0.4	12.1	Maximum	19.0	Maximum	30.5	Maximum	1.0	±0.05
EL	25.4	±0.4	15.3	Maximum	22.0	Maximum	30.5	Maximum	1.0	±0.05

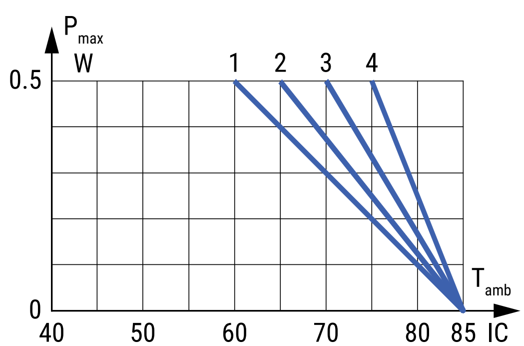
Note: See Ordering Options Table for lead length (LL) options.

Performance Characteristics

Rated Voltage	275 VAC 50/60 Hz	
Capacitance Range	0.047 – 0.47 µF	
Capacitance Tolerance	±20%	
Resistance Range	22 – 470 Ω	
Resistance Tolerance	±30%	
Temperature Range	−40°C to +85°C	
Climatic Category	40/085/56/B	
Approvals	ENEC, UL, cUL	
Peak Pulse Voltage	1,000 V	
Series Resistance	The series resistance is defined at 1 kHz for RC ≥ 50 µs and at 100 kHz for RC < 50 µs	
Insulation Resistance	Minimum Values Between Terminals	
	C ≤ 0.33 µF	≥ 3,000 MΩ
	C > 0.33 µF	≥ 1,000 MΩ • µF
Pulse Current	Maximum 12 A repetitive. Maximum 20 A peak for occasional transients.	
Test Voltage Between Terminals	The 100% screening factory test is carried out at 1,800 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test.	
In DC Applications	Recommended voltage ≤ 630 VDC	
Power Ratings	The average losses may reach 0.5 W provided the surface temperature does not exceed + 85°C. For maximum permitted power dissipation vs. temperature, see Derating Curves.	

Derating Curves

Maximum Allowable Power Dissipation vs. Ambient Temperature and Case Sizes.



Curve	Dimension B (mm)
1	7.3
2	7.6
3	11.3
4	15.3

Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384–14	1.25 x V_R Vac 50Hz, once every hour increase to 1,000 Vac for 0.1 second, 1,000 hours at upper rated temperature.
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each, 10 – 500 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	4,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower temperature 5 cycles
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle-flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
Intertek Semko AB	ENEC	EN/IEC 60384–14	SE/0140–33A
UL	c UL us	UL 60384–14 CAN/CSA-E60384–14–09	E73869

Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Lead Spacing (S)	Capacitance Value (µF)	Resistance (Ω)	Maximum Dimensions in mm			KEMET Part Number
			T	H	L	
15.2	0.047	47	7.3	13.0	18.5	P409QM473M275(1)H470
15.2	0.047	100	7.3	13.0	18.5	P409QM473M275(1)H101
20.3	0.1	22	7.6	14.0	24.0	P409CE104M275(1)H220
20.3	0.1	33	7.6	14.0	24.0	P409CE104M275(1)H330
20.3	0.1	47	7.6	14.0	24.0	P409CE104M275(1)H470
20.3	0.1	68	7.6	14.0	24.0	P409CE104M275(1)H680
20.3	0.1	100	7.6	14.0	24.0	P409CE104M275(1)H101
20.3	0.1	150	11.3	16.5	24.0	P409CP104M275(1)H151
20.3	0.1	220	11.3	16.5	24.0	P409CP104M275(1)H221
20.3	0.1	330	11.3	16.5	24.0	P409CP104M275(1)H331
20.3	0.1	470	11.3	16.5	24.0	P409CP104M275(1)H471
20.3	0.22	22	11.3	16.5	24.0	P409CP224M275(1)H220
20.3	0.22	33	11.3	16.5	24.0	P409CP224M275(1)H330
20.3	0.22	47	11.3	16.5	24.0	P409CP224M275(1)H470
20.3	0.22	68	11.3	16.5	24.0	P409CP224M275(1)H680
20.3	0.22	100	11.3	16.5	24.0	P409CP224M275(1)H101
20.3	0.22	150	11.3	16.5	24.0	P409CP224M275(1)H151
20.3	0.22	220	11.3	16.5	24.0	P409CP224M275(1)H221
25.4	0.22	330	12.1	19.0	30.5	P409EJ224M275(1)H331
25.4	0.22	470	15.3	22.0	30.5	P409EL224M275(1)H471
25.4	0.47	33	15.3	22.0	30.5	P409EL474M275(1)H330
25.4	0.47	47	15.3	22.0	30.5	P409EL474M275(1)H470
25.4	0.47	68	15.3	22.0	30.5	P409EL474M275(1)H680
25.4	0.47	100	15.3	22.0	30.5	P409EL474M275(1)H101
25.4	0.47	150	15.3	22.0	30.5	P409EL474M275(1)H151
25.4	0.47	220	15.3	22.0	30.5	P409EL474M275(1)H221
Lead Spacing (S)	**Capacitance Value (µF)**	**Resistance Ω**	**T (mm)**	**H (mm)**	**L (mm)**	**KEMET Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.

Soldering Process

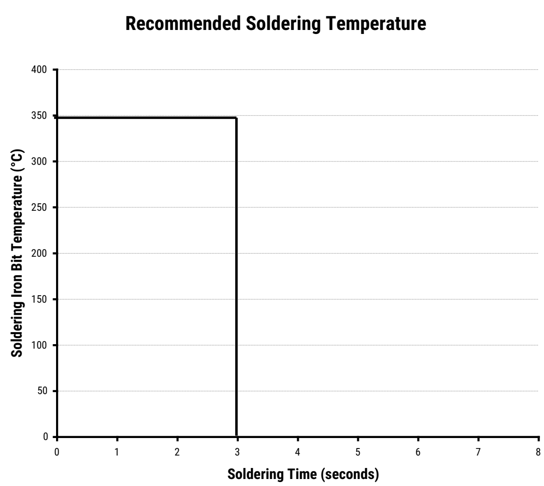
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 mm to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

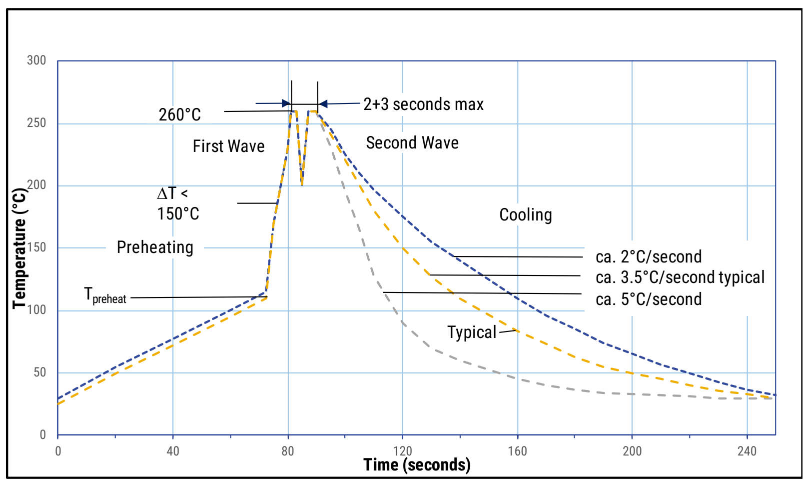
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

1. The table indicates the maximum set-up temperature of the soldering process

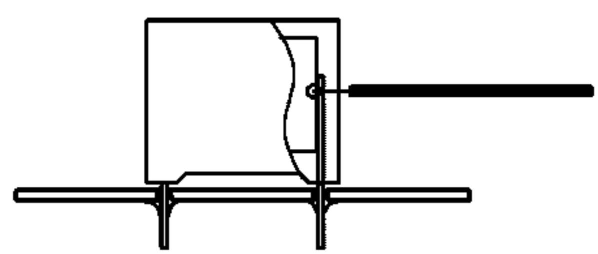
Figure 1

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≥ 10 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C

Temperature monitored inside the capacitor.

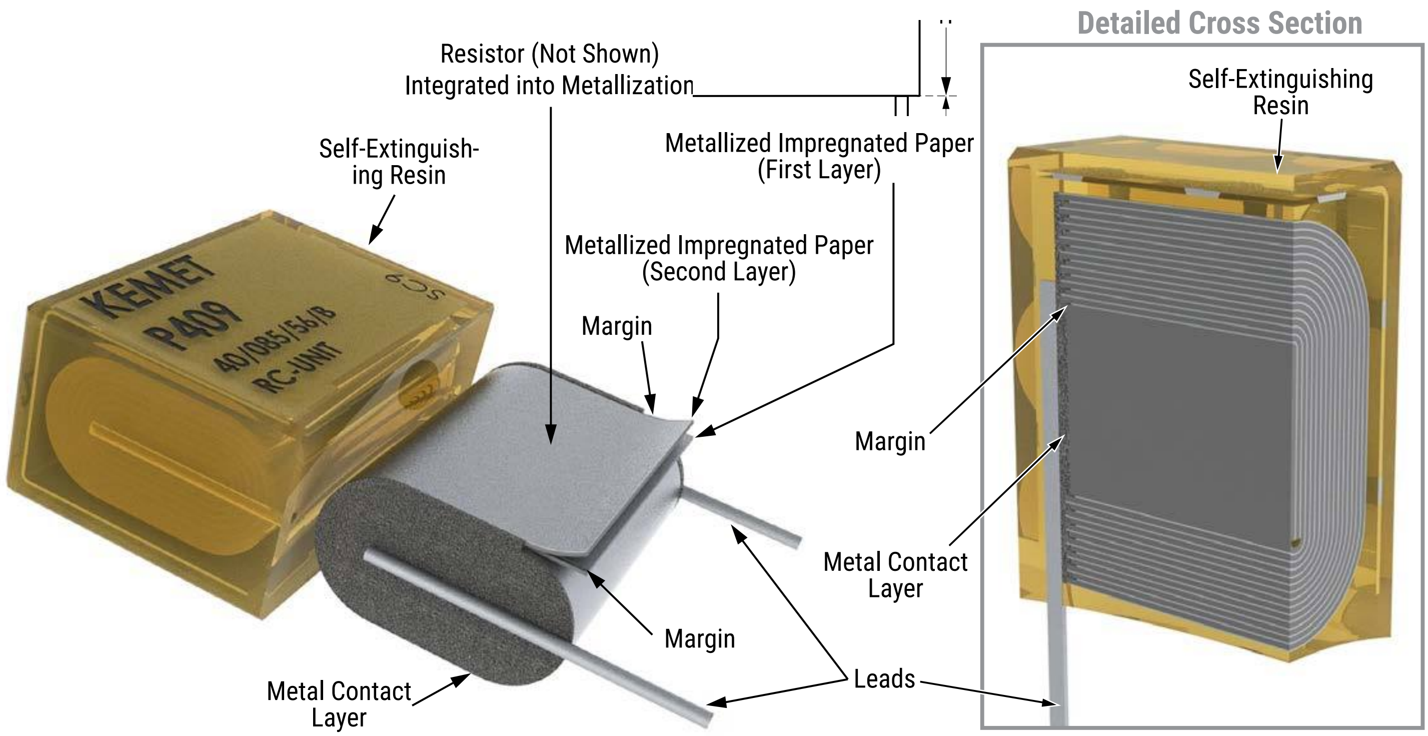


Selective Soldering Recommendations

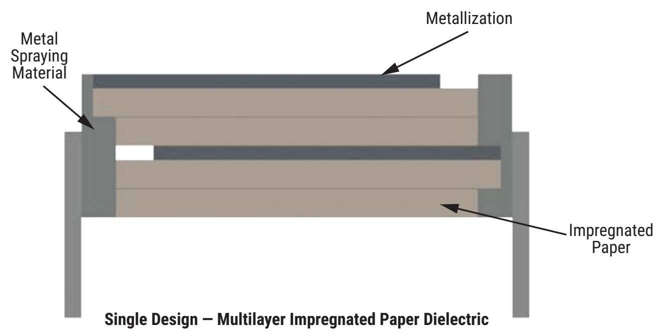
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Construction



Winding Scheme



Single Design — Multilayer Impregnated Paper Dielectric
1 Section

Mounting

RC units are mounted in parallel with the contacts to be protected or in parallel with the inductive load (Fig. 1 and Fig. 2). RC units are generally mounted in parallel with the contacts to suppress radio interferences (Fig. 1).

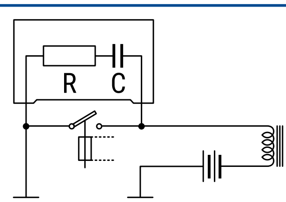


Fig. 1

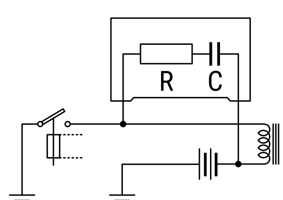
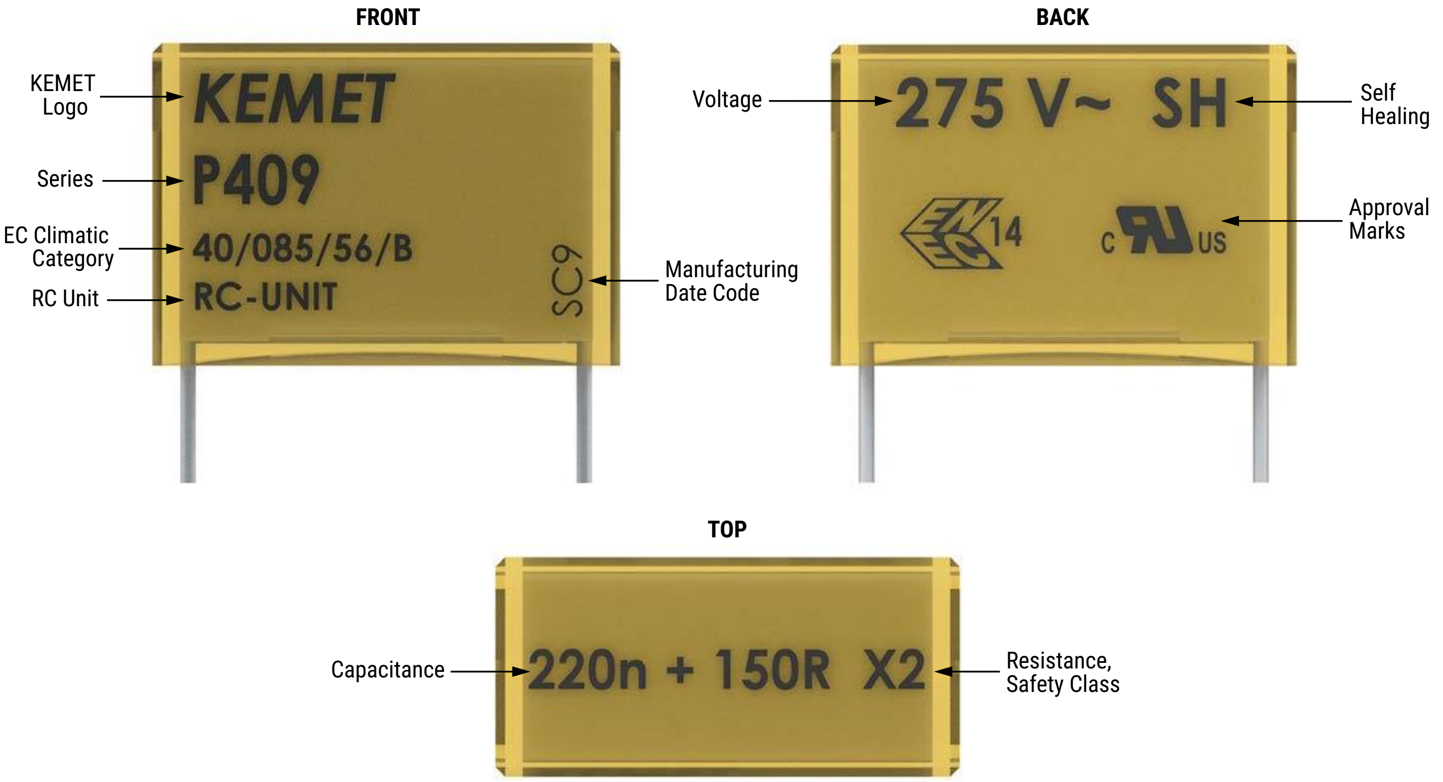


Fig. 2

Marking

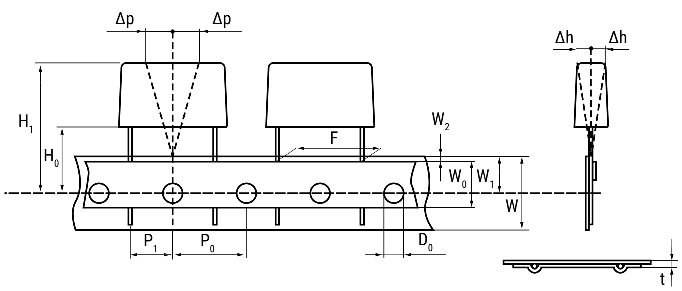


Packaging Quantities

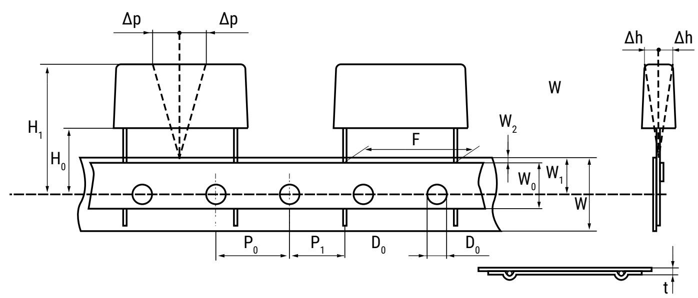
Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel ø 360 mm
Lead and Packaging Code				C	A	L
15.2	7.3	13.0	18.5	600	400	400
20.3	7.6	14.0	24.0	1530	250	250
	11.3	16.5	24.0	1080	150	180
25.4	12.1	19.0	30.5	864	100	
	15.3	22.0	30.5	648	75	

Lead Taping & Packaging (IEC 60286–2)

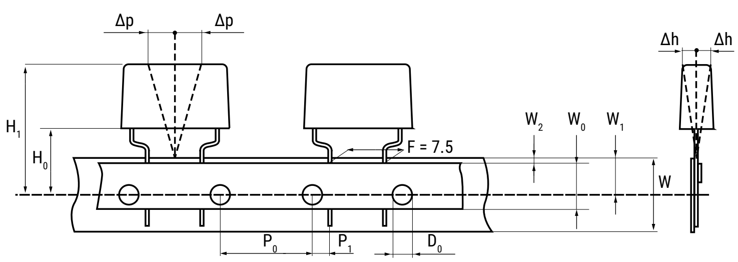
Lead Spacing 10.2 – 15.2 mm



Lead Spacing 20.3 – 22.5 mm



Formed Leads from 10.2 – 7.5 mm



Taping Specification

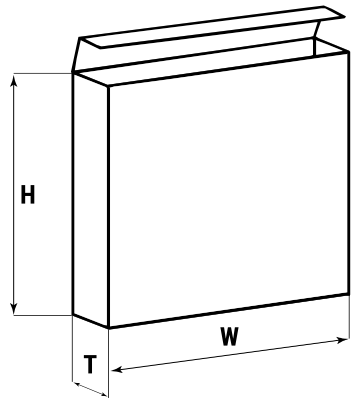
Dimensions in mm										Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	5	7.5	Formed 7.5	10	15	22.5	27.5	F
Carrier Tape Width	±0.5	W	18	18	18	18	18	18	18	18 +1/−0.5
Hold-Down Tape Width	Minimum	W_0	5	5	5	5	5	5	5	
Position of Sprocket Hole	±0.5	W_1	9	9	9	9	9	9	9	9 +0.75/−0.5
Distance Between Tapes	Maximum	W_2	3	3	3	3	3	3	3	3.0
Sprocket Hole Diameter	±0.2	D_0	4	4	4	4	4	4	4	4.0
Feed Hole Lead Spacing	±0.3	P_0 (1)	12.7	12.7	12.7(4)	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.85	3.75	3.75	7.7	5.2	5.3	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	Maximum	Δh	2	2	2	2	2	2	2	2.0
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.7	0.9 Maximum	0.9 Maximum	0.9 Maximum
Sprocket Hole/Cap Body	Nominal	H_0 (2)	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18 +2/−0
Sprocket Hole/Top of Cap Body	Maximum	H_1 (3)	32	31	43	43	43	58	58	58 Maximum

(1) Maximum cumulative feed hole error, 1 mm per 20 parts
(2) 16.5 mm available on request
(3) Depending on case size
(4) 15 mm available on request

Lead Taping & Packaging (IEC 60286–2) cont.

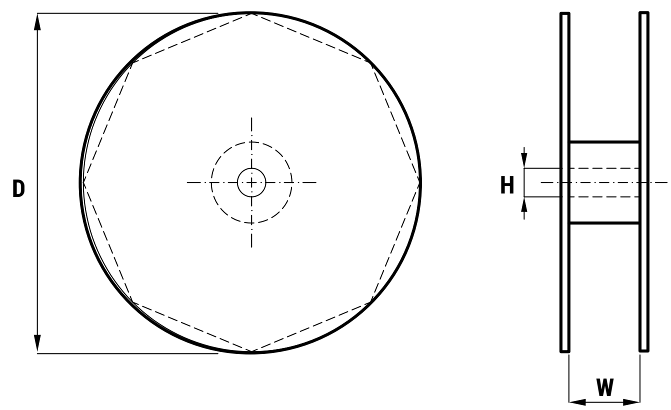
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
P409	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
P409	360 500	30	46 (Max)



Manufacturing Date Code (IEC–60062)

Y = Year, Z = Month			
Year	Code	Month	Code
2000	M	January	1
2001	N	February	2
2002	P	March	3
2003	R	April	4
2004	S	May	5
2005	T	June	6
2006	U	July	7
2007	V	August	8
2008	W	September	9
2009	X	October	O
2010	A	November	N
2011	B	December	D
2012	C		
2013	D		
2014	E		
2015	F		
2016	H		
2017	J		
2018	K		
2019	L		
2020	M		

P410, Integrated Resistor, Metallized Impregnated Paper, Class X1, 300 VAC

Overview

The P410 is constructed of multilayer metallized paper encapsulated and impregnated in self-extinguishing material meeting the requirements of UL 94 V–0.

Applications

Typical applications include worldwide use in contact protection, contact interference suppression and transient suppression.

Benefits

- Approvals: ENEC, UL, cUL
- Rated voltage: 300 VAC 50/60 Hz
- Capacitance range: 0.022 – 0.1 µF
- Capacitance tolerance: ± 20%
- Resistance range: 100 Ω
- Resistance tolerance: ± 30%
- Lead spacing: 15.2 – 25.4 mm
- Climatic category: 40/085/56/B, IEC 60068-1
- Tape and reel packaging in accordance with IEC 60286-2
- RoHS Compliant and lead-free terminations
- Operating temperature range of −40˚C to +85˚C
- Excellent self-healing properties which ensure long life even when subjected to frequent over-voltages
- Good resistance to ionization due to impregnated paper dielectric
- High dV/dt capability
- Impregnated paper ensures excellent stability and reliability properties, particularly in applications with continuous operation

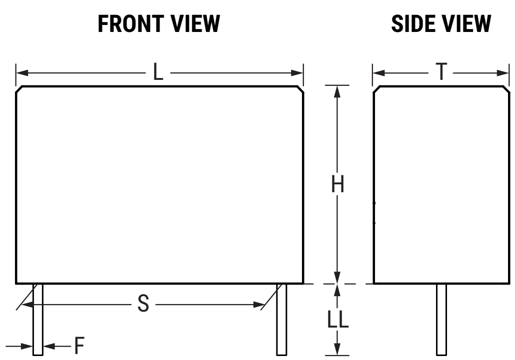
Part Number System

P	410	Q	M	223	M	300	A	H101
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Packaging	Resistance (Ω)
P= Metallized Paper	RC Snubber	Q = 15.2 C = 20.3 E = 25.4	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	M = ±20%	300 = 300	See Ordering Options Table	H plus first two digits represent significant figures. Third digit specifies number of zeros.

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Part Number (Insert at 14th character)
15.2	**Standard Lead and Packaging Options**		
	Bulk – Short Leads	6 +0/−1	C
	Bulk – Maximum Length Leads	30 +5/−0	A
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	L
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	P
20.3	**Standard Lead and Packaging Options**		
	Tray – Short Leads	6 +0/−1	C
	Bulk – Maximum Length Leads	30 +5/−0	A
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	L
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	P
25.4	**Standard Lead and Packaging Options**		
	Bulk – Short Leads	6 +0/−1	C
	Bulk – Maximum Length Leads	30 +5/−0	A

Dimensions – Millimeters

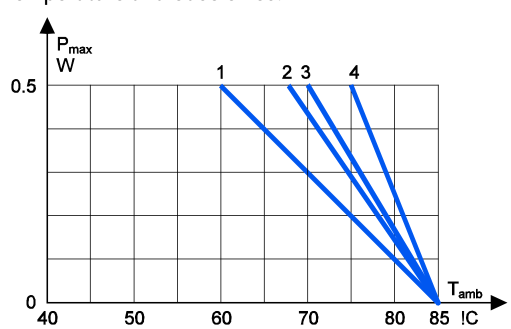


Size Code	S		T		H		L		F	
	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
QM	15.2	±0.4	7.3	Maximum	13.0	Maximum	18.5	Maximum	0.8	±0.05
QS	15.2	±0.4	8.5	Maximum	14.3	Maximum	18.5	Maximum	0.8	±0.05
CJ	20.3	±0.4	9.0	Maximum	15.0	Maximum	24.0	Maximum	0.8	±0.05
CP	20.3	±0.4	11.3	Maximum	16.5	Maximum	24.0	Maximum	0.8	±0.05
EE	25.4	±0.4	10.6	Maximum	16.1	Maximum	30.5	Maximum	1.0	±0.05

Note: See Ordering Options Table for lead length (LL) options.

Performance Characteristics

Rated Voltage	300 VAC 50/60 Hz
Capacitance Range	0.022 – 0.1 µF
Capacitance Tolerance	±20%
Resistance Range	100 Ω
Resistance Tolerance	±30%
Temperature Range	−40°C to +85°C
Climatic Category	40/085/56/B
Approvals	ENEC, UL, cUL
Peak Pulse Voltage	1,000 V
Series Resistance	The series resistance is defined at 1 kHz for RC ≥ 50 µs and at 100 kHz for RC < 50 µs
Insulation Resistance	Minimum Values Between Terminals ≥ 1,000 MΩ
Pulse Current	Maximum 12 A repetitive. Maximum 20 A peak for occasional transients.
Test Voltage Between Terminals	The 100% screening factory test is carried out at 3,000 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test.
In DC Applications	Recommended voltage ≤ 1,000 VDC
Power Ratings	The average losses may reach 0.5 W provided the surface temperature does not exceed + 85°C. For maximum permitted power dissipation vs. temperature, see Derating Curves.
Derating Curves	Maximum Allowable Power Dissipation vs. Ambient Temperature and Case Sizes.



Curve	Dimension B (mm)
1	7.3
1	8.5
2	9
3	11.3
4	10.6

Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384-14	1.25 x V_R Vac 50Hz, once every hour increase to 1,000 Vac for 0.1 second, 1,000 hours at upper rated temperature.
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each, 10 – 500 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	4,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068-2-14 Test Na	Upper and lower temperature 5 cycles
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 4.0 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle-flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
Intertek Semko AB		EN/IEC 60384-14	SE/0140–36A
UL		UL 60384-14 CAN/CSA-E60384-14-09	E73869

Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.

Table 1 – Ratings & Part Number Reference

Lead Spacing (S)	Capacitance Value (µF)	Resistance (Ω)	Maximum Dimensions in mm			KEMET Part Number
			T	H	L	
15.2	0.022	100	7.3	13.0	18.5	P410QM223M300(1)H101
15.2	0.033	100	8.5	14.3	18.5	P410QS333M300(1)H101
20.3	0.047	100	9.0	15.0	24.0	P410CJ473M300(1)H101
20.3	0.068	100	11.3	16.5	24.0	P410CP683M300(1)H101
25.4	0.1	100	10.6	16.1	30.5	P410EE104M300(1)H101

(1) Insert lead and packaging code. See Ordering Options Table for available options.

Soldering Process

The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 mm to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

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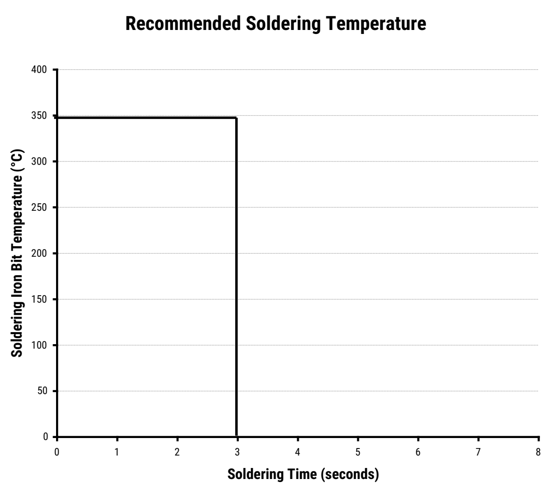
Following is the recommendation for manual soldering with a soldering iron.



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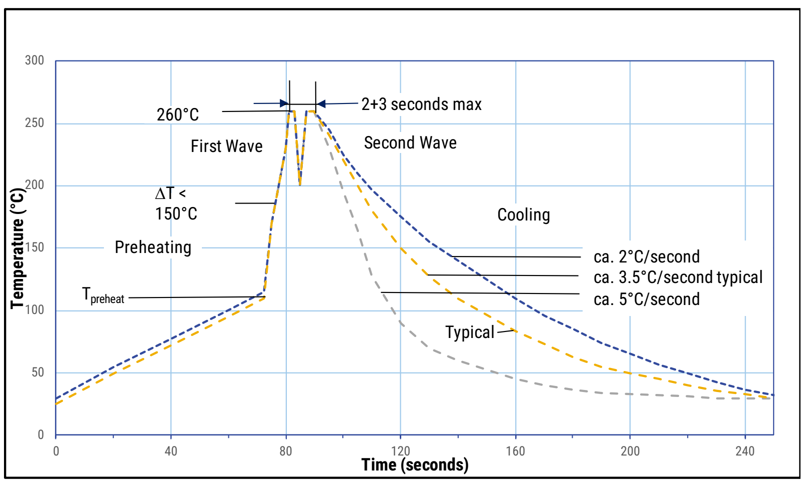
Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

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2. The maximum temperature measured inside the capacitor:
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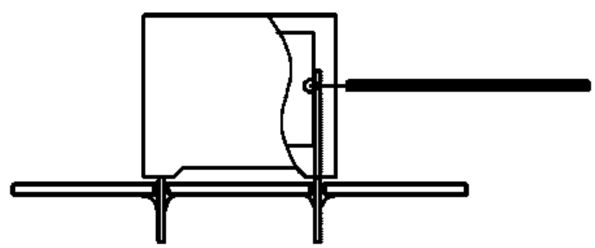

Temperature monitored inside the capacitor.

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Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

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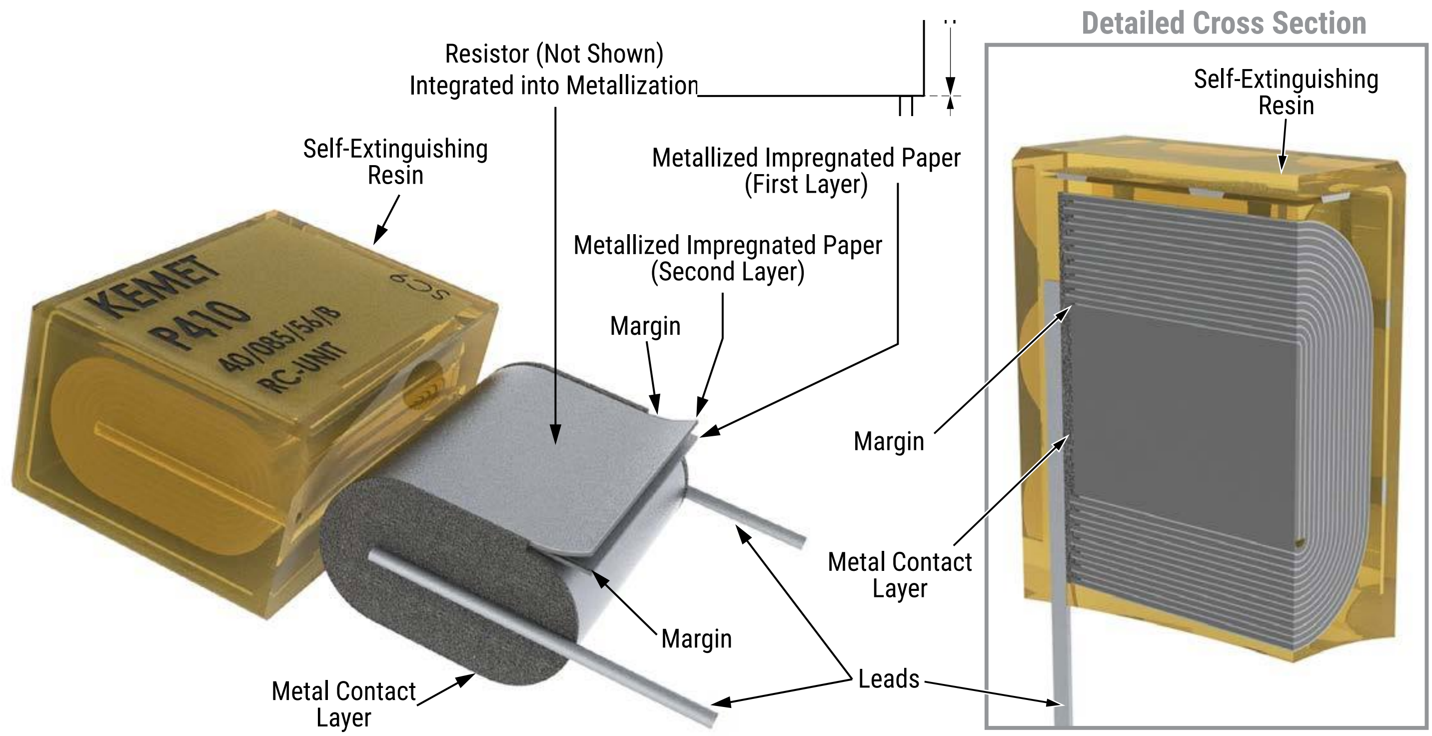
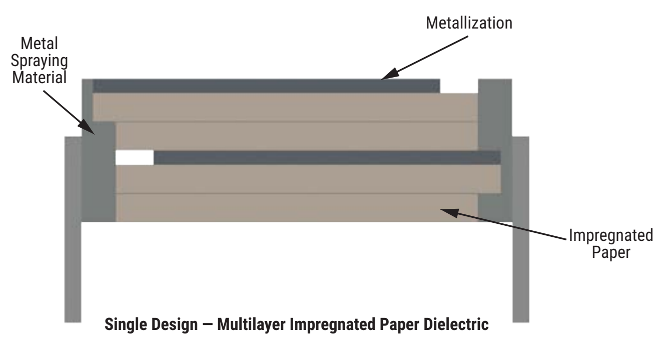


Winding Scheme



Single Design — Multilayer Impregnated Paper Dielectric
1 Section

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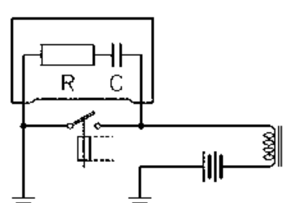


Fig. 1

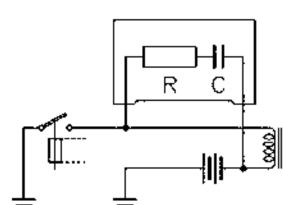
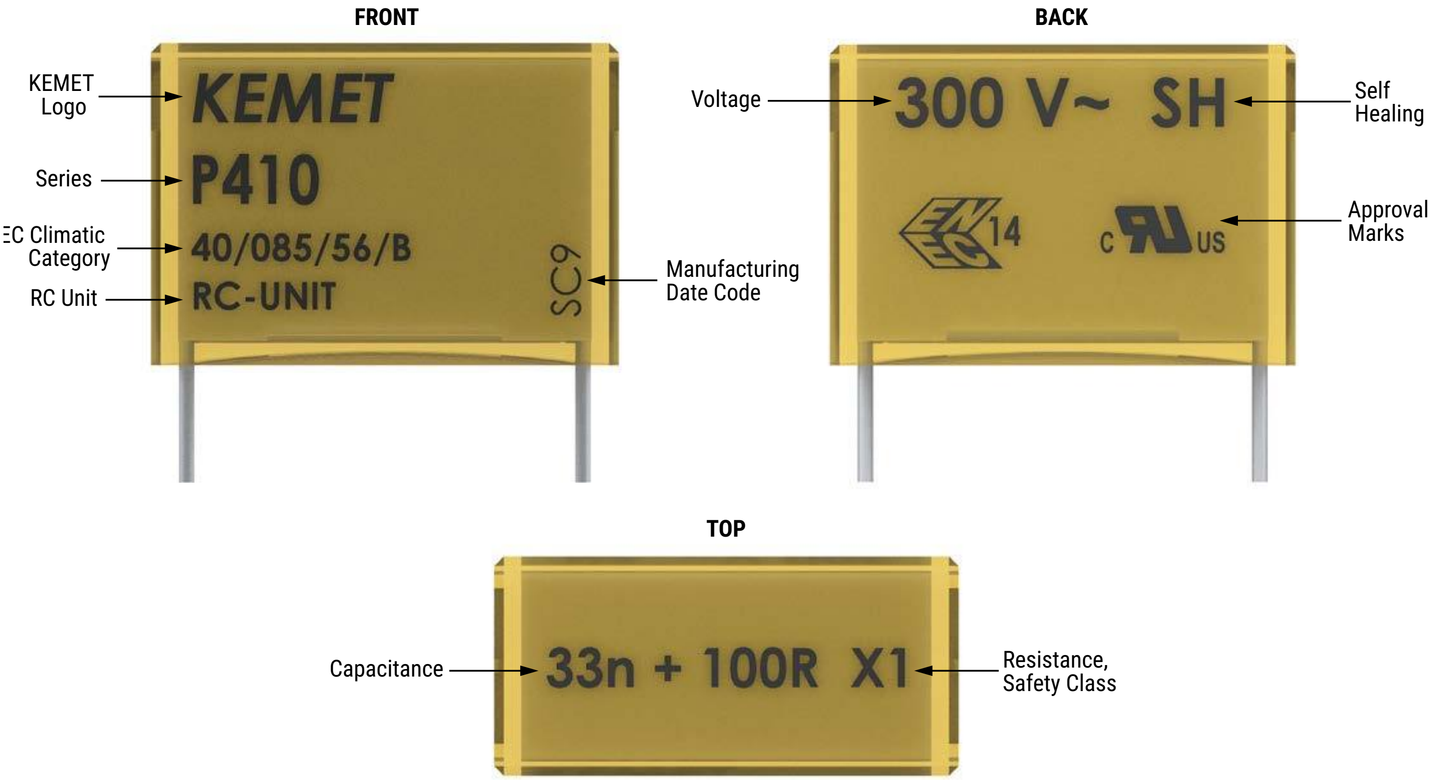


Fig. 2

Marking

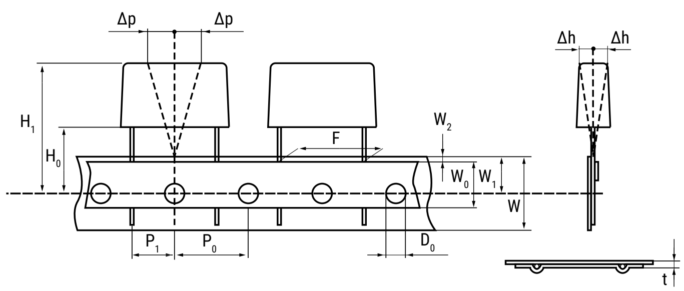


Packaging Quantities

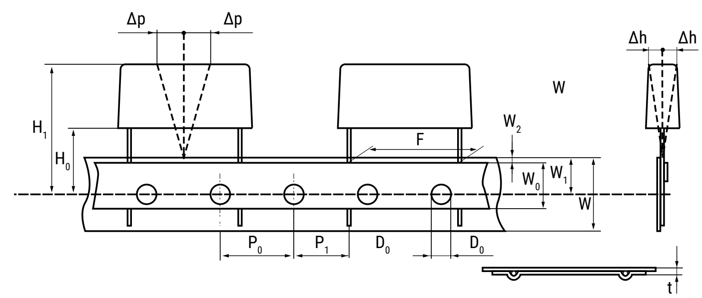
Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel ø 360 mm
Lead and Packaging Code				C	A	L
15.2	7.3	13.0	18.5	600	400	400
	8.5	14.3	18.5	500	300	350
20.3	9.0	15.0	24.0	1530	200	250
	11.3	16.5	24.0	1080	150	180
25.4	10.6	16.1	30.5	1008	150	

Lead Taping & Packaging (IEC 60286–2)

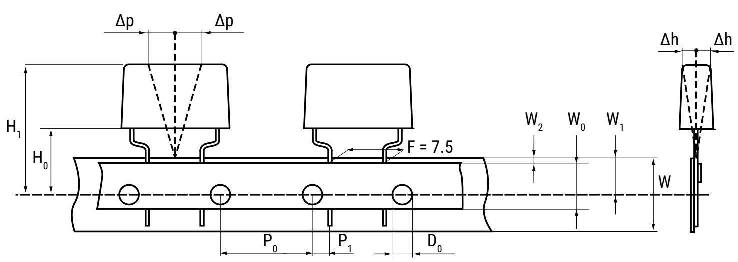
Lead Spacing 10.2 – 15.2 mm



Lead Spacing 20.3 – 22.5 mm



Formed Leads from 10.2 – 7.5 mm



Taping Specification

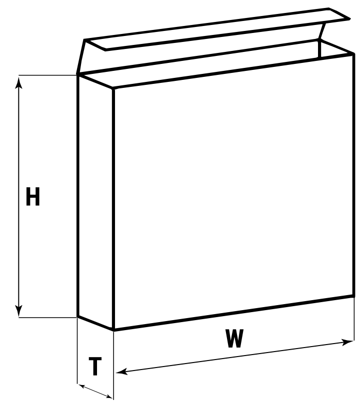
Dimensions in mm										Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	5	7.5	Formed 7.5	10	15	22.5	27.5	F
Carrier Tape Width	±0.5	W	18	18	18	18	18	18	18	18 +1/−0.5
Hold-Down Tape Width	Minimum	W_0	5	5	5	5	5	5	5	
Position of Sprocket Hole	±0.5	W_1	9	9	9	9	9	9	9	9 +0.75/−0.5
Distance Between Tapes	Maximum	W_2	3	3	3	3	3	3	3	3.0
Sprocket Hole Diameter	±0.2	D_0	4	4	4	4	4	4	4	4.0
Feed Hole Lead Spacing	±0.3	P_0 (1)	12.7	12.7	12.7(4)	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.85	3.75	3.75	7.7	5.2	5.3	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	Maximum	Δh	2	2	2	2	2	2	2	2.0
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.7	0.9 Maximum	0.9 Maximum	0.9 Maximum
Sprocket Hole/Cap Body	Nominal	H_0 (2)	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18.5±0.5	18 +2/−0
Sprocket Hole/Top of Cap Body	Maximum	H_1 (3)	32	31	43	43	43	58	58	58 Maximum

(1) Maximum cumulative feed hole error, 1 mm per 20 parts
(2) 16.5 mm available on request
(3) Depending on case size
(4) 15 mm available on request

Lead Taping & Packaging (IEC 60286–2) cont.

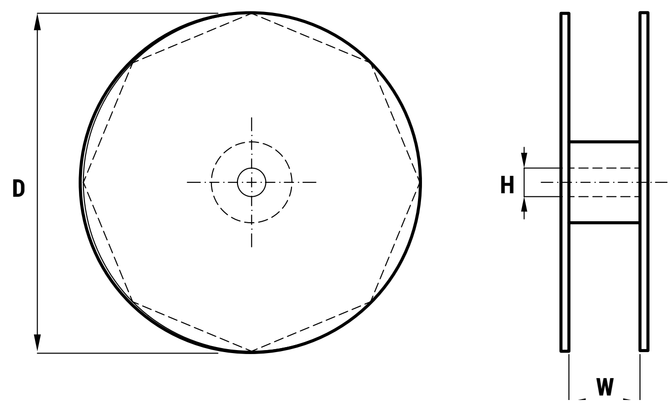
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
P410	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
P410	360 500	30	46 (Max)



Manufacturing Date Code (IEC–60062)

Y = Year, Z = Month			
Year	Code	Month	Code
2000	M	January	1
2001	N	February	2
2002	P	March	3
2003	R	April	4
2004	S	May	5
2005	T	June	6
2006	U	July	7
2007	V	August	8
2008	W	September	9
2009	X	October	O
2010	A	November	N
2011	B	December	D
2012	C		
2013	D		
2014	E		
2015	F		
2016	H		
2017	J		
2018	K		
2019	L		
2020	M		

Metallized Polypropylene Film EMI Suppression Capacitors for Harsh Environmental Conditions - F862, Class X2, 310 VAC (Automotive Grade)

Overview

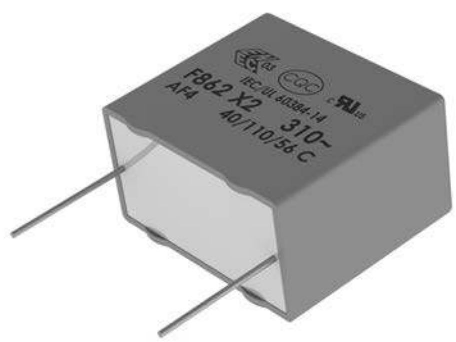
The F862 is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box material recognized by UL 94 V–0. The F862 Series is ideal for harsh environmental conditions and meets the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

Applications

Typical applications include connection in series with the mains, capacitive power supplies and energy meters, with special emphasis in automotive applications for severe ambient conditions.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- THB Grade IIB: 85°C, 85% RH, 500 hours at URAC acc. to IEC 60384-14 (not for Halogen-Free variant)
- Rated voltage: 310 VAC 50/60 Hz
- Capacitance range: 0.1 – 4.7 µF
- Lead spacing: 15.0 – 27.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category: 40/110/56, IEC 60068–1
- Tape & Reel in accordance with IEC 60286–2
- RoHS compliant and lead-free terminations
- Operating temperature range of −40˚C to +110˚C
- 100% screening factory test at 1,900 VDC
- Qualification based on AEC–Q200 guidelines



Simulator Tool and Lifetime Expectancy model available online:

K-SIM **K-LEM**

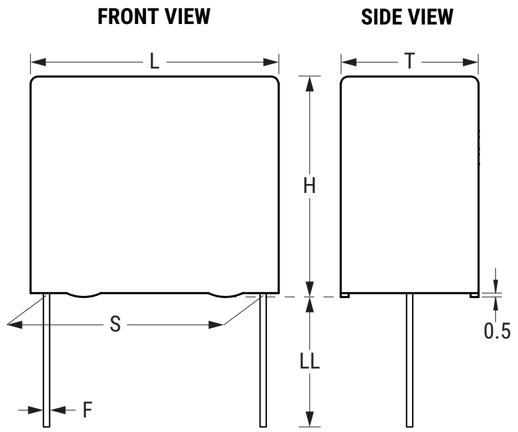
Part Number System

F	862	B	C	104	M	310	C	V054
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Voltage (VAC)	Packaging	C-Spec
F = Film	X2, Metallized Polypropylene	B = 15 D = 22.5 F = 27.5	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	310	See Ordering Options Table	V054 = Standard Blank = Halogen-free, green box

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
15	**Standard Lead and Packaging Options**		
	Pizza Pack	4+2/−0	Z
	Other Lead and Packaging Options		
	Pizza – Short Leads	3.2 +0.3/−0.2	ZL32K
	Bulk (Bag) – Maximum Length Leads	25 +5/−0	ALR0L
	Ammo Pack	H_0 = 18.5 ±0.5	R
22.5	**Standard Lead and Packaging Options**		
	Pizza Pack	4 +2/−0	Z
	Pizza Pack – Long Leads	17 +0/−1	ZLH0J
	Other Lead and Packaging Options		
	Pizza – Short Leads	3.2 +0.3/−0.2	ZL32K
	Pizza Pack – Max Length Leads	25 +5/−0	ZLR0L
	Ammo Pack	H_0= 18.5±0.5	R
27.5	**Standard Lead and Packaging Options**		
	Pizza Pack	4 +2/−0	Z
	Pizza – Long Leads	17 +0/−1	ZLH0J
	Pizza – Short Leads	3.2 +0.3/−0.2	ZL32K

Dimensions – Millimeters



Size Code	S		T		H		L		F	
	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
BG	15.0	±0.4	6.0	+0/−0.5	12.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BK	15.0	±0.4	7.5	+0/−0.5	13.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BP	15.0	±0.4	8.5	+0/−0.5	14.5	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BS	15.0	±0.4	10.0	+0/−0.5	16.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BY	15.0	±0.4	11.0	+0/−0.5	19.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
BZ	15.0	±0.4	12.0	+0/−0.5	20.0	+0/−0.5	18.0	+0/−0.5	0.8	±0.05
DB	22.5	±0.4	6.0	+0/−0.5	14.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DI	22.5	±0.4	7.0	+0/−0.5	16.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DJ	22.5	±0.4	8.5	+0/−0.5	17.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DO	22.5	±0.4	10.0	+0/−0.5	18.5	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DP	22.5	±0.4	11.0	+0/−0.5	20.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
DU	22.5	±0.4	13.0	+0/−0.5	22.0	+0/−0.5	26.0	+0/−0.5	0.8	±0.05
FC	27.5	±0.4	11.0	+0/−0.7	20.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FI	27.5	±0.4	13.0	+0/−0.7	25.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FN	27.5	±0.4	14.0	+0/−0.7	28.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FS	27.5	±0.4	19.0	+0/−0.7	29.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05
FY	27.5	±0.4	22.0	+0/−0.7	37.0	+0/−0.7	31.5	+0/−0.7	0.8	±0.05

Note: See Ordering Options Table for lead length (LL/H_0) options.

Performance Characteristics

Rated Voltage	310 VAC 50/60 Hz
Capacitance Range	0.1 – 4.7 µF
Capacitance Tolerance	±20%, ±10%
Temperature Range	−40°C to +110°C
Climatic Category	40/110/56
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package Average relative humidity per year ≤ 70% RH ≤ 85% for 30 days randomly distributed throughout the year Dew is absent Temperature: -40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)
Approvals	ENEC, UL, cUL, CQC

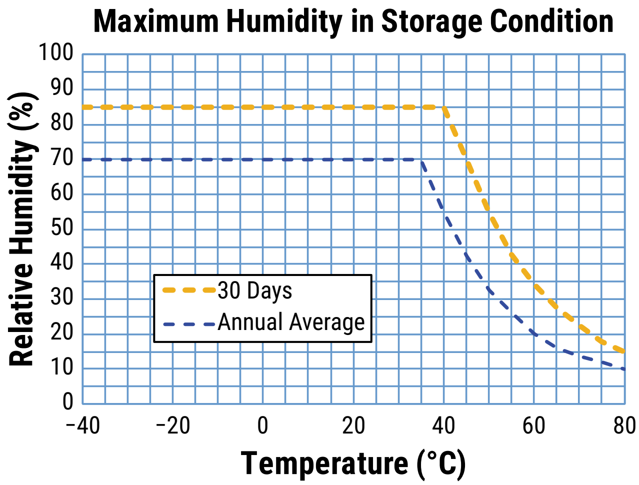
Dissipation Factor	Maximum Values at +23°C		
		C ≤ 0.1 µF	C > 0.1 µF
	1 kHz	0.3%	0.2%

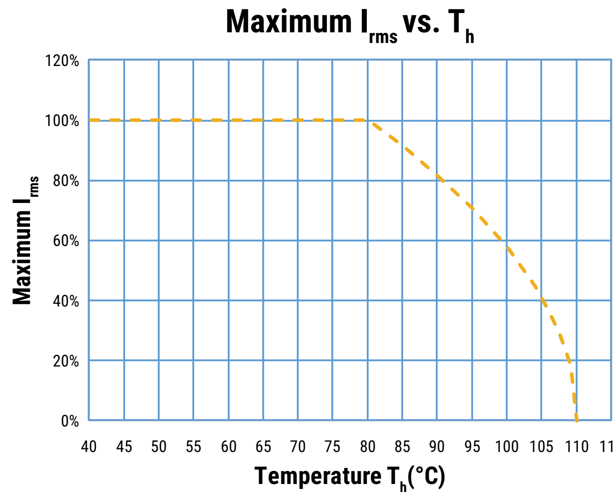
Test Voltage Between Terminals	The 100% screening factory test is carried out at 1,900 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. It's not permitted to repeat this Test as there is a risk to damage the Capacitor. KEMET is not liable in such case for any failures

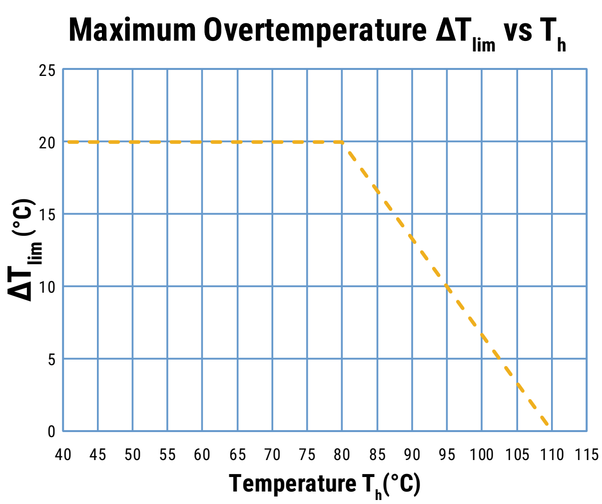
Insulation Resistance	Measured at +25°C ±5°C, according to IEC 60384-2			
	Minimum Values Between Terminals			
	Voltage Charge	Voltage Charge time	C ≤ 0.33 µF	C > 0.33 µF
	100 VDC	1 minute	≥ 3 • 10^4 MΩ	≥ 10,000 MΩ • µF

In DC Applications	Recommended voltage ≤ 630 VDC

Performance Characteristics cont.

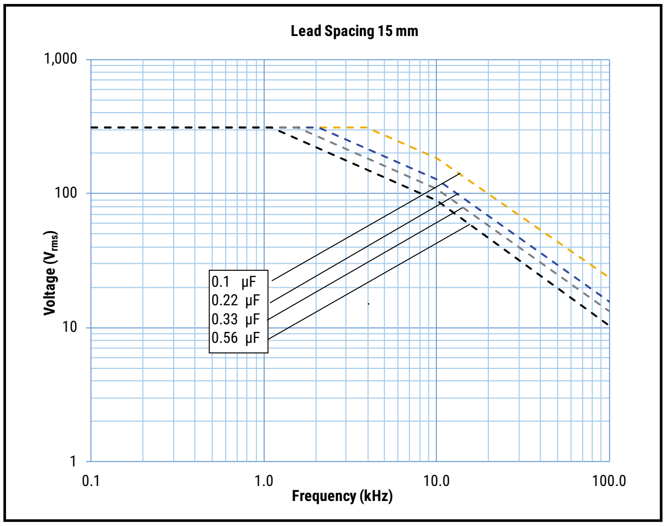


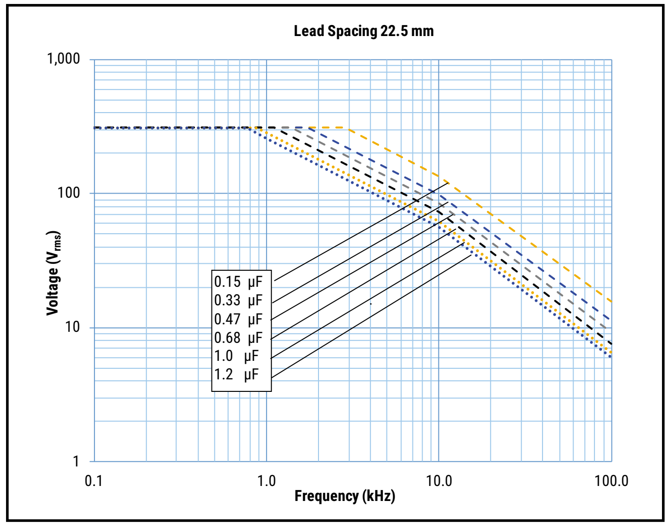


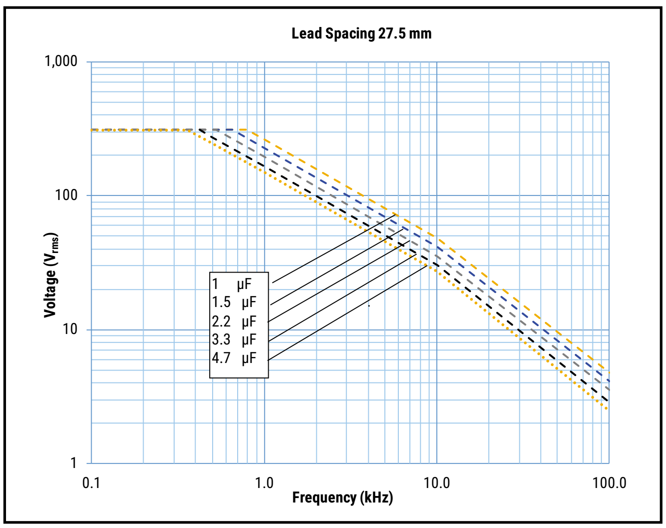


T_h is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

Maximum Voltage (V_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 80°C)

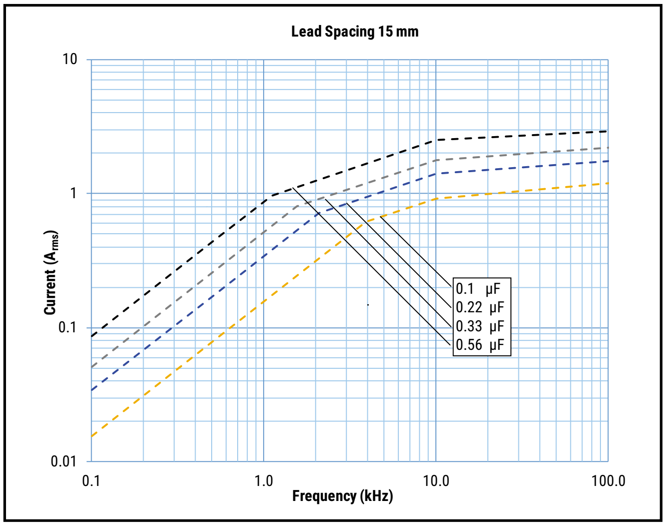


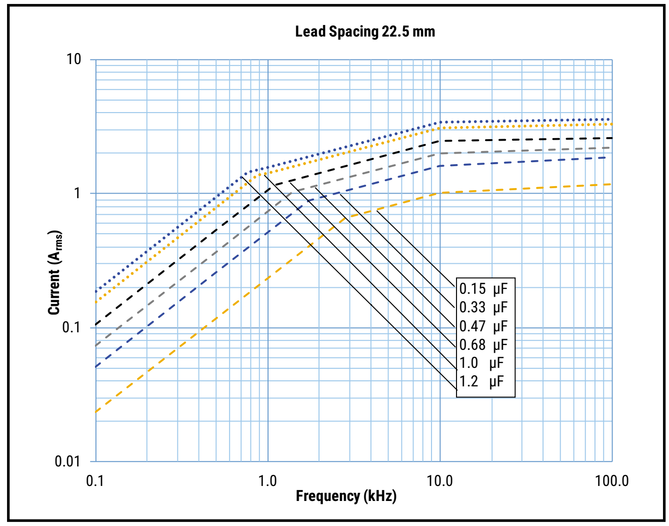


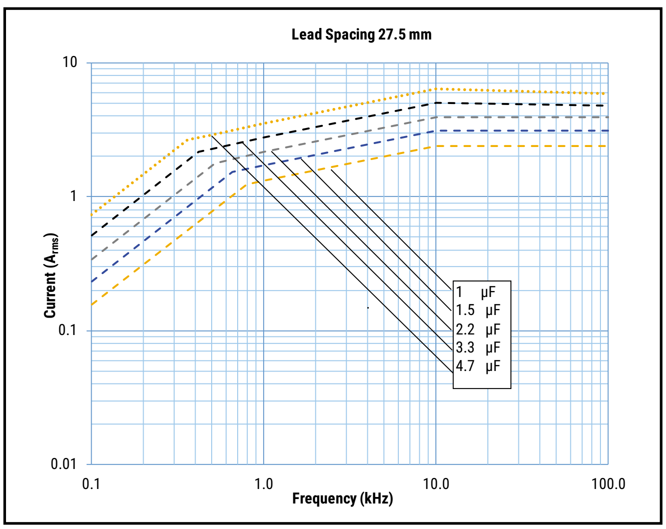


All the curves are evaluated in accordance to the datasheet declarations and considering an environmental condition as Dry Condition.
If your environment is too harsh in terms of temperature and relative humidity, please contact KEMET for any kind of information.

Maximum Current (A_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 80°C)

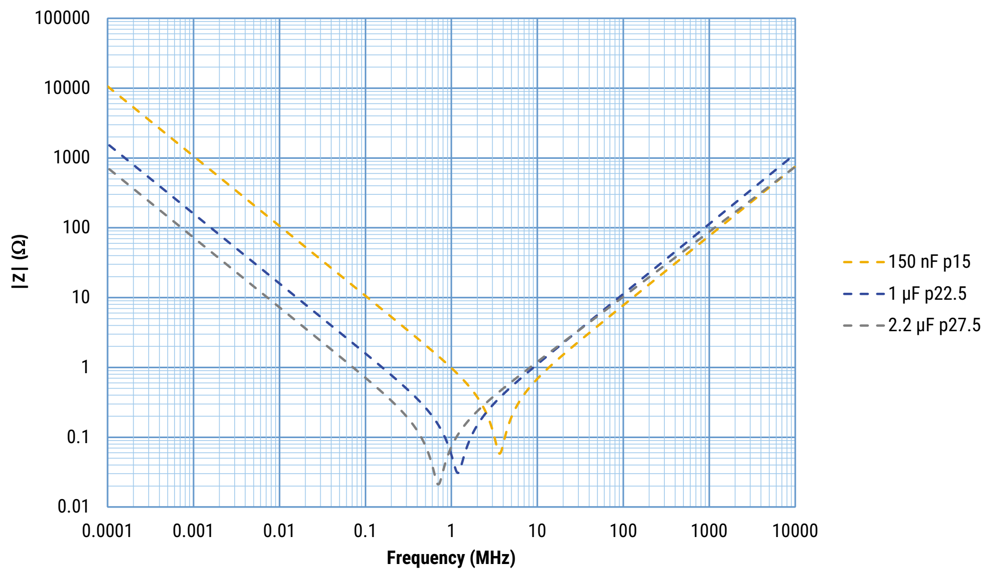






All the curves are evaluated in accordance to the datasheet declarations and considering an environmental condition as Dry Condition.
If your environment is too harsh in terms of temperature and relative humidity, please contact KEMET for any kind of information.

Impedance Graph



Environmental Test Data

Test	Publication	Procedure
Endurance	IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Temperature Cycling	JESD22–MethodJA–104	1,000 cycles (−55°C to 85°C) Note: If 100°C or 125°C part the 1,000 cycles will be at that temperature rating. Measurement at 24 ±4 hours after test conclusion. 30 minute maximum dwell time at each temperature extreme. 1 minute maximum transition time.
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle-flame test
Biased Humidity	MIL–STD–202 Method 103	1,000 hours 40°C/93%RH. Rated voltage. Measurement at 24 ±2 hours after test conclusion.
THB Test 1		85°C, 85% RH and 240 VAC, 1,000 hours Capacitance change (ΔC/C): ≤ 10% Dissipation factor change (Δtan δ): ≤ 5 * 10^{-3} (at 1 kHz) Insulation resistance Rins or time constant τ = CR Rins: ≥ 50% of initial limit
THB Test 2 Not for halogen-free variant.		85°C, 85% RH and 310 VAC, 500 hours Capacitance change (ΔC/C): ≤ 10% Dissipation factor change (Δtan δ): ≤ 5 * 10^{-3} (at 1 kHz) Insulation resistance Rins or time constant τ = CR Rins: ≥ 50% of initial limit

Approvals

Certification Body	Mark	Specification	File Number
IMQ S.p.A.		EN/IEC 60384–14	CA08.00203
UL		UL 60384–14 and CAN/CSA–E60384–14	E97797
CQC		IEC 60384–14	CQC17001166651 CQC17001166767 CQC17001167225 CQC17001167220 CQC17001166886

Environmental Compliance

All KEMET EMI capacitors in green boxes are RoHS compliant and Halogen-Free.

With C-Spec V054
All KEMET EMI capacitors are RoHS compliant.

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Size Code	Dimensions in mm			Lead Spacing (p)	dV/dt (V/µs)	Part Number
		T	H	L			
0.1	BK	7.5	13.5	18.0	15.0	400	F862BK104(1)310(2) V054
0.15	BK	7.5	13.5	18.0	15.0	400	F862BK154(1)310(2) V054
0.22	BP	8.5	14.5	18.0	15.0	400	F862BP224(1)310(2) V054
0.33	BS	10.0	16.0	18.0	15.0	400	F862BS334(1)310(2) V054
0.39	BS	10.0	16.0	18.0	15.0	400	F862BS394(1)310(2) V054
0.47	BY	11.0	19.0	18.0	15.0	400	F862BY474(1)310(2) V054
0.56	BZ	12.0	20.0	18.0	15.0	400	F862BZ564(1)310(2) V054
0.15	DB	6.0	14.5	26.0	22.5	200	F862DB154(1)310(2) V054
0.22	DI	7.0	16.0	26.0	22.5	200	F862DI224(1)310(2) V054
0.33	DJ	8.5	17.0	26.0	22.5	200	F862DJ334(1)310(2) V054
0.39	DJ	8.5	17.0	26.0	22.5	200	F862DJ394(1)310(2) V054
0.47	DO	10.0	18.5	26.0	22.5	200	F862DO474(1)310(2) V054
0.56	DO	10.0	18.5	26.0	22.5	200	F862DO564(1)310(2) V054
0.68	DP	11.0	20.0	26.0	22.5	200	F862DP684(1)310(2) V054
0.82	DP	11.0	20.0	26.0	22.5	200	F862DP824(1)310(2) V054
1.0	DU	13.0	22.0	26.0	22.5	200	F862DU105(1)310(2) V054
1.2	DU	13.0	22.0	26.0	22.5	200	F862DU125(1)310(2) V054
1.0	FC	11.0	20.0	31.5	27.5	150	F862FC105(1)310(2) V054
1.5	FI	13.0	25.0	31.5	27.5	150	F862FI155(1)310(2) V054
2.2	FN	14.0	28.0	31.5	27.5	150	F862FN225(1)310(2) V054
3.3	FS	19.0	29.0	31.5	27.5	150	F862FS335(1)310(2) V054
4.7	FY	22.0	37.0	31.5	27.5	150	F862FY475(1)310(2) V054
Capacitance Value (µF)	**Size Code**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (p)**	**dV/dt (V/µs)**	**Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See Ordering Options Table for available options.

Soldering Process

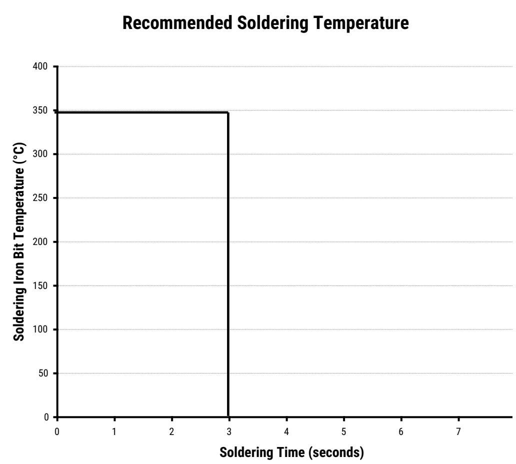
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

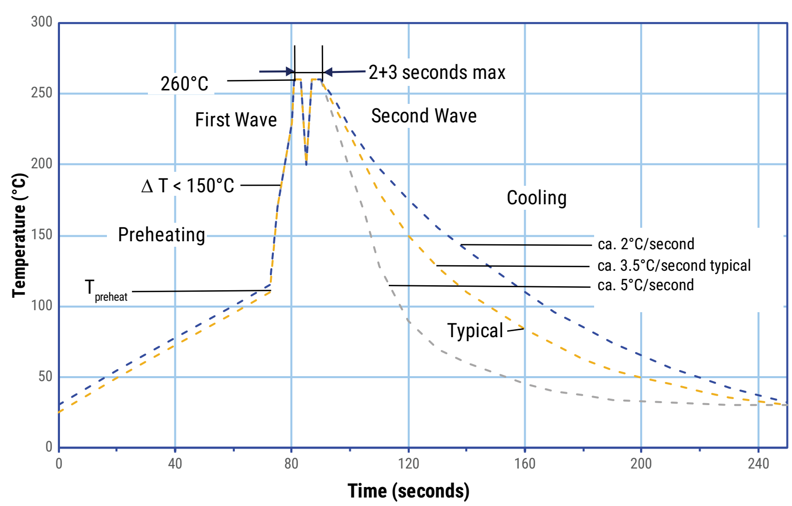
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

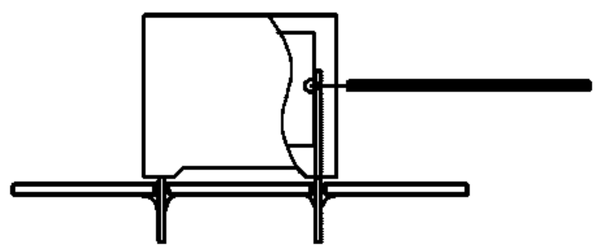
1. The table indicates the maximum set-up temperature of the soldering process
Figure 1.

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C

Temperature monitored inside the capacitor.



Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Mounting

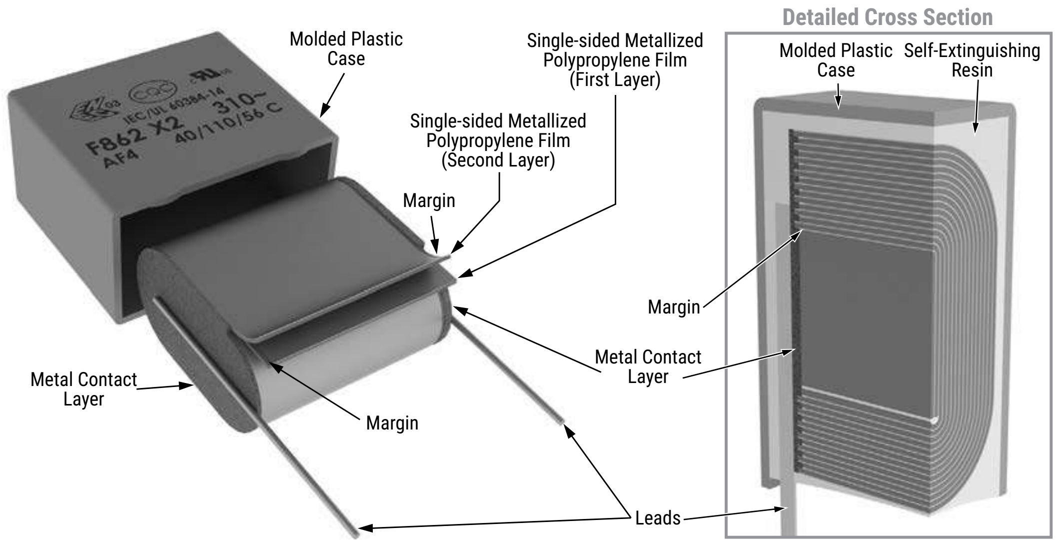
Resistance to Vibration and Mechanical Shock

AEC-Q200 Rev. E Mechanical Stress Tests:

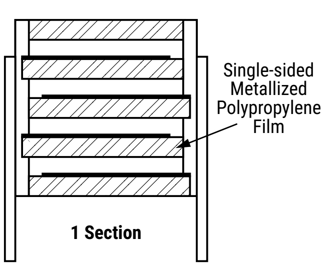
Mechanical Shock	**MIL-SDT-202 Method 213**	Figure 1 of Method 213 • THT: Condition C • SMD: Condition C • Tested per the Supplier's recommended mounting method
Vibration	**MIL-SDT-202 Method 204**	• 5 g for 20 minutes, 12 cycles each of 3 orientations • Tested per the Supplier's recommended mounting method • Verification of transfer load: during setup, verify that with the selected PCB design (size, thickness and secure points), or an alternative mount, that the transferred load onto the component corresponds to the requested load. This verification can be achieved using a laser vibrometer or other adequate measuring device • Test from 10 Hz – 2,000 Hz.

The capacitors are designed for PCB mounting. The stand-off pipes must be in good contact with the printed circuit board. The capacitors with pitch ≤ 22.5 mm can be mechanically fixed by the leads, for pitch > 22.5 mm, the capacitor body has to be properly fixed (e.g. clamped or glued).

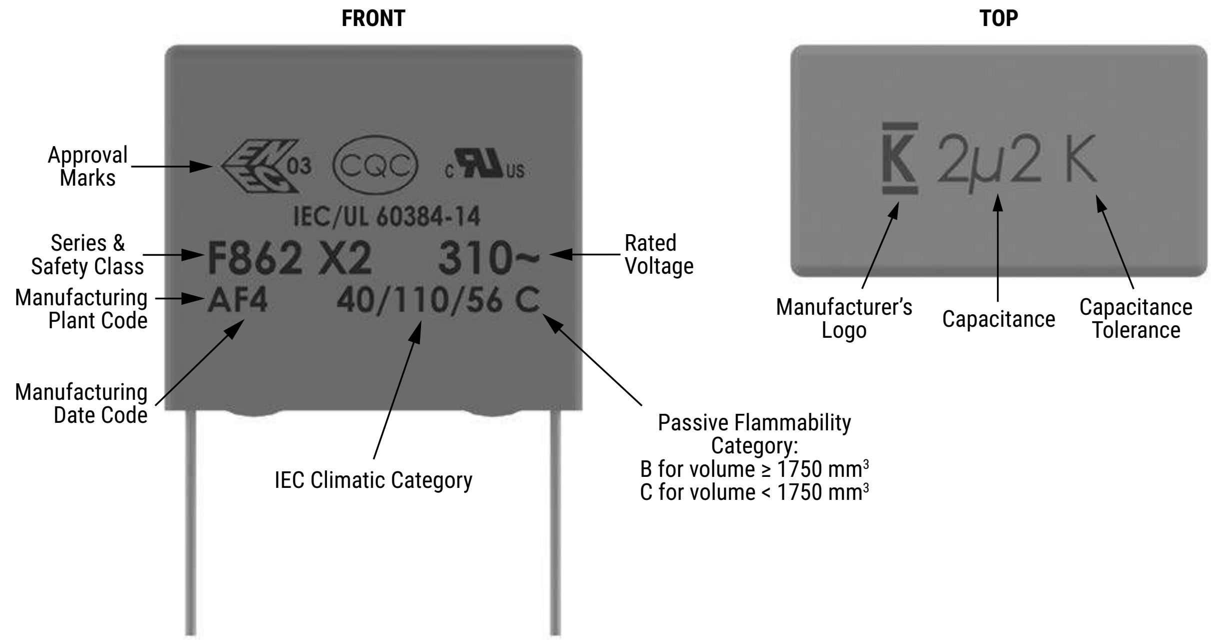
Construction



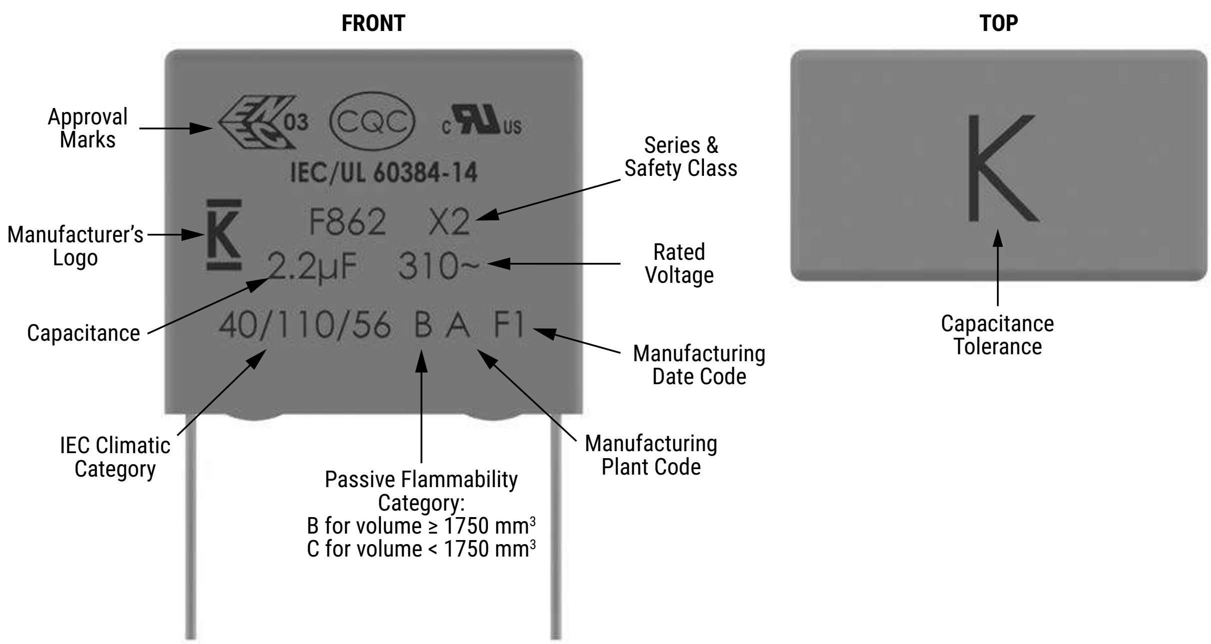
Winding Scheme



Marking



OR



Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

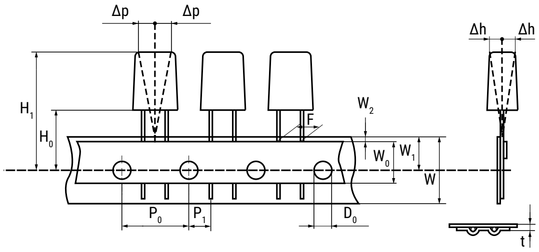
Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

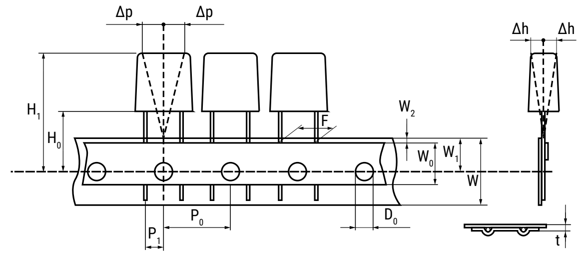
Size Code	Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Ammo	Pizza
BG	15	6	12	18	1,750	1,000	680	935
BK		7.5	13.5	18	1,000	800	500	748
BP		8.5	14.5	18	1,000	650	440	663
BS		10	16	18	750	550	380	561
BY		11	19	18	450	400	340	510
BZ		12	20	18	350	300	330	459
DB	22.5	6	14.5	26	805	450	464	660
DI		7	16	26	700	450	380	564
DJ		8.5	17	26	450	350	280	468
DO		10	18.5	26	360	350	235	396
DP		11	20	26	300	200	217	360
DU		13	22	26	230	150	200	300
FC	27.5	11.0	20.0	31.5				300
FI		13.0	25.0	31.5				250
FN		14.0	28.0	31.5				230
FS		19.0	29.0	31.5				170
FY		22.0	37.0	31.5				150

Lead Taping & Packaging (IEC 60286–2)

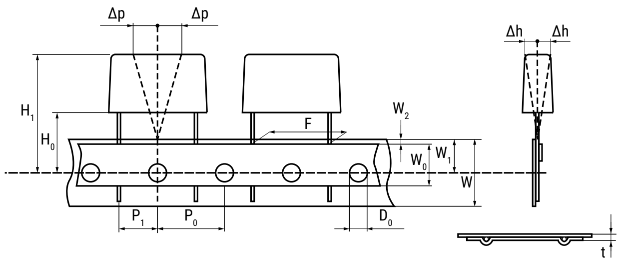
Lead Spacing 5 mm



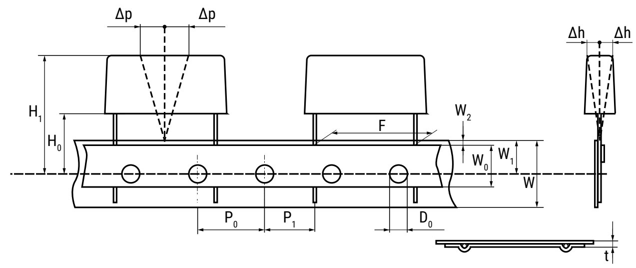
Lead Spacing 7.5 mm



Lead Spacing 10 – 15 mm



Lead Spacing 22.5 – 27.5 mm



Taping Specification

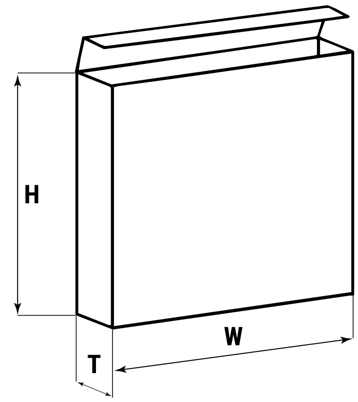
Dimensions in mm									Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	5.0	7.5	10.0	15.0	22.5	27.5	F
Carrier Tape Width	+1/−0.5	W	18.0	18.0	18.0	18.0	18.0	18.0	$18^{+1/-0.5}$
Hold-Down Tape Width	Minimum	W_0	6.0	6.0	9.0	10.0	10.0	10.0	
Position of Sprocket Hole	±0.5	W_1	9.0	9.0	9.0	9.0	9.0	9.0	$9^{+0.75/-0.5}$
Distance Between Tapes	Maximum	W_2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Sprocket Hole Diameter	±0.2	D_0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Feed Hole Lead Spacing	±0.2(1)	P_0(3)	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.85	3.75	7.7	5.2	7.8	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	±2	Δh	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.9^{MAX}	0.9^{MAX}	0.9^{MAX}
Sprocket Hole/Cap Body	±0.5	H_0(2)	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18^{+2/-0}$

(1) Maximum cumulative feed hole error, 1 mm per 20 parts.
(2) 16.5 mm available on request.
(3) 15 mm available on request (F ≥ 10 mm).

Lead Taping & Packaging (IEC 60286–2) cont.

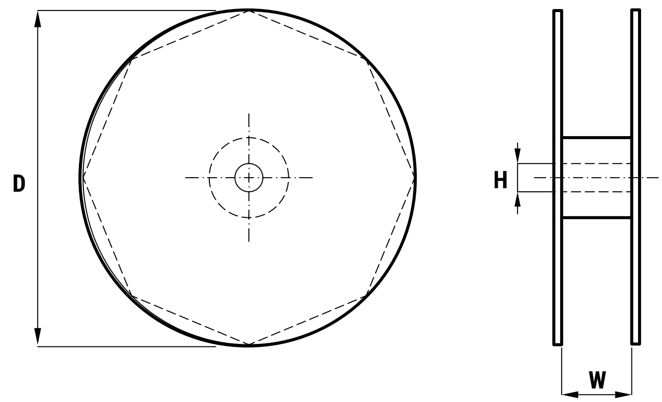
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
F5A, F5B, F5D F6xx, F8xx	360	340	59
PHExxx, PMExxx, PMRxxx	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
F5A, F5B, F5D F6xx, F8xx	355 500	30 25	55 (Max)
PHExxx, PMExxx, PMRxxx	360 500	30	46 (Max)



Metallized Polypropylene Film EMI Suppression Capacitors

R46 (Miniature), Class X2, 275 VAC, 110°C

KEMET
a YAGEO company

Overview

The R46 series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material that meets the requirements of UL 94 V–0.

Applications

For worldwide use in electromagnetic interference (EMI) suppression in across-the-line applications that require X2 safety classification. Intended for use in situations in which capacitor failure would not result in exposure to electric shock. Not for use in "series with mains" type applications.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- X2 CLASS (IEC 60384-14)
- Rated voltage: 275 VAC 50/60 Hz
- Capacitance range: 0.033 – 10 µF
- Lead spacing: 10.0 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category 40/110/56, IEC 60068–1
- Tape & Reel in accordance with IEC 60286–2
- RoHS compliant and lead-free terminations
- Operating temperature range of −40°C to +110°C
- 100% screening factory test at 2,200 VDC/1,500 VAC
- Self healing properties

Part Number System

R46	K	I	3470	00	P0	M
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance
X2, Metallized Polypropylene	K = 275	F = 10.0 I = 15.0 N = 22.5 R = 27.5 W = 37.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	See Ordering Options Table	P0 P1 P2 P3	K = ±10% M = ±20%

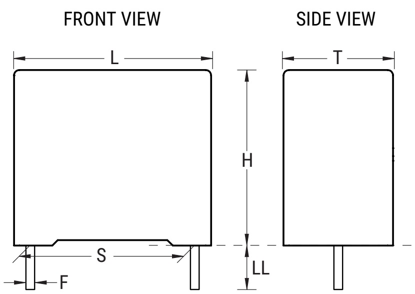
Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
10 15 22.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/-0	00
	Ammo Pack	H_0 = 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	CK
	Bulk (Bag) – Short Leads	2.7 +0.5/-0	JA
	Bulk (Bag) – Short Leads	3.5 +0.5/-0	JB
	Bulk (Bag) – Short Leads	4.0 +0.5/-0	JE
	Bulk (Bag) – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Bag) – Long Leads	18 ±1	JM
	Bulk (Bag) – Long Leads	30 +5/-0	40
	Bulk (Bag) – Long Leads	25 +2/-1	50
	Bulk (Bag) – Insulated Rigid Leads	30 +5/-0 (sp 8 ±2)	51
	Bulk (Bag) – Insulated Flexible Leads	150 ±5 (sp 8 ±2)	52
27.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/-0	00
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK[1]
	Other Lead and Packaging Options		
	Bulk (Tray) – Short Leads	2.7 +0.5/-0	JA
	Bulk (Tray) – Short Leads	3.5 +0.5/-0	JB
	Bulk (Tray) – Short Leads	4.0 +0.5/-0	JE
	Bulk (Tray) – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Tray) – Long Leads	18 ±1	JM
	Bulk (Tray) – Long Leads	30 +5/-0	40
	Bulk (Tray) – Long Leads	25 +2/-1	50
	Bulk (Bag) – Insulated Rigid Leads	30 +5/-0 (sp 8 ±2)	51
	Bulk (Bag) – Insulated Flexible Leads	150 ±5 (sp 8 ±2)	52
37.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/-0	00
	Other Lead and Packaging Options		
	Bulk (Tray) – Short Leads	2.7 +0.5/-0	JA
	Bulk (Tray) – Short Leads	3.5 +0.5/-0	JB
	Bulk (Tray) – Short Leads	4.0 +0.5/-0	JE
	Bulk (Tray) – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Tray) – Long Leads	18 ±1	JM
	Bulk (Tray) – Long Leads	30 +5/-0	40
	Bulk (Tray) – Long Leads	25 +2/-1	50
	Bulk (Bag) – Insulated Rigid Leads	30 +5/-0 (sp 8 ±2)	51
	Bulk (Bag) – Insulated Flexible Leads	150 ±5 (sp 8 ±2)	52

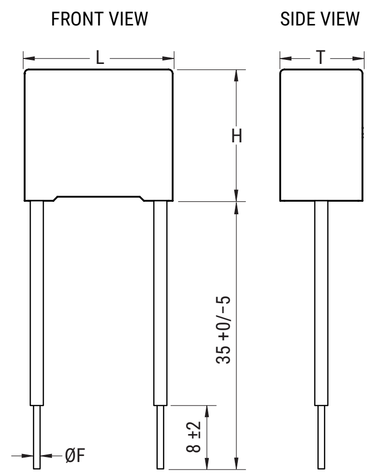
[1] *Not for all sizes, see "Packaging Quantities" table.*

Dimensions – Millimeters

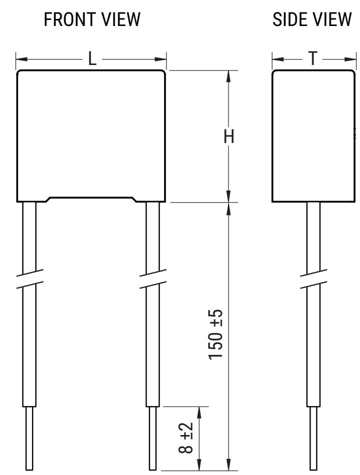
Loose



Insulated Rigid Leads



Insulated Flexible Leads 0.5 mm²



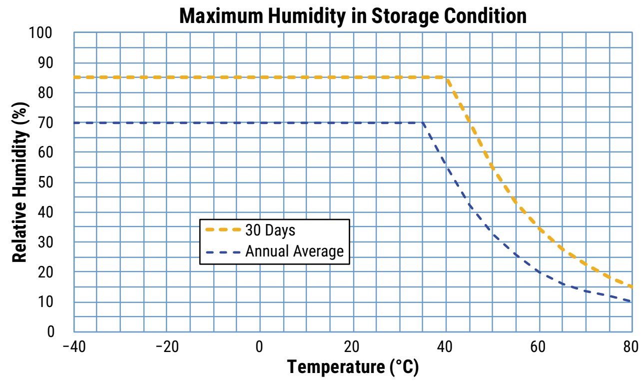
S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
10.0	±0.4	4.0	+0.2/−0.5	9.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
10.0	±0.4	5.0	+0.2/−0.5	11.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
10.0	±0.4	6.0	+0.2/−0.5	12.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
15.0	±0.4	5.0	+0.2/−0.5	11.0	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	6.0	+0.2/−0.5	12.0	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	6.0	+0.2/−0.5	17.5	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	7.5	+0.2/−0.5	13.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	7.5	+0.2/−0.5	18.5	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	±0.4	8.5	+0.2/−0.5	14.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	9.0	+0.2/−0.5	12.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	10.0	+0.2/−0.5	16.0	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	±0.4	11.0	+0.2/−0.5	19.0	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
22.5	±0.4	6.0	+0.2/−0.5	15.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	7.0	+0.2/−0.5	16.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	8.5	+0.2/−0.5	17.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	10.0	+0.2/−0.5	18.5	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	11.0	+0.2/−0.5	20.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	13.0	+0.2/−0.5	22.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
27.5	±0.4	9.0	+0.2/−0.7	17.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	11.0	+0.2/−0.7	20.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	13.0	+0.2/−0.7	22.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	14.0	+0.2/−0.7	28.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	18.0	+0.2/−0.7	33.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	22.0	+0.2/−0.7	37.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
37.5	±0.4	11.0	+0.3/−0.7	22.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	13.0	+0.3/−0.7	24.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	16.0	+0.3/−0.7	28.5	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	19.0	+0.3/−0.7	32.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	20.0	+0.3/−0.7	40.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05

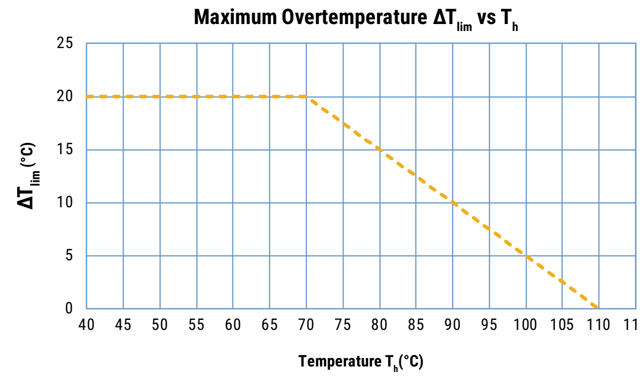
Note: See Ordering Options Table for lead length (LL/H_0) options.

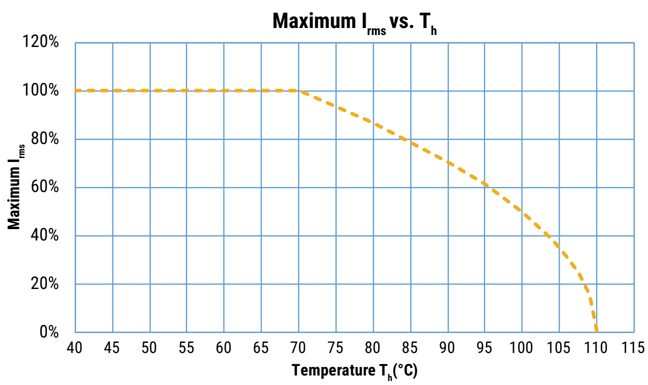
Performance Characteristics

<table>
<tr><td>Dielectric</td><td colspan="4">Polypropylene film</td></tr>
<tr><td>Plates</td><td colspan="4">Metal layer deposited by evaporation under vacuum</td></tr>
<tr><td>Winding</td><td colspan="4">Non-inductive type</td></tr>
<tr><td>Leads</td><td colspan="4">Tinned wire</td></tr>
<tr><td>Protection</td><td colspan="4">Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94.</td></tr>
<tr><td>Related Documents</td><td colspan="4">IEC 60384-14, EN 60384-14</td></tr>
<tr><td>Rated Voltage V_R</td><td colspan="4">275 VAC (50/60 Hz)</td></tr>
<tr><td>Recommended DC Voltage</td><td colspan="4">≤ 560 VDC</td></tr>
<tr><td>Capacitance Range</td><td colspan="4">0.033 – 10 µF</td></tr>
<tr><td>Capacitance Values</td><td colspan="4">E6 series (IEC 60063) measured at 1 kHz and +20 ±1°C</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="4">±10%, ±20%</td></tr>
<tr><td>Temperature Range</td><td colspan="4">−40°C to +110°C</td></tr>
<tr><td>Climatic Category</td><td colspan="4">40/110/56 IEC 60068-1</td></tr>
<tr><td rowspan="5">Storage Conditions</td><td colspan="4">Storage time: ≤ 24 months from the date marked on the label package</td></tr>
<tr><td colspan="4">Average relative humidity per year ≤ 70%</td></tr>
<tr><td colspan="4">RH ≤ 85% for 30 days randomly distributed throughout the year</td></tr>
<tr><td colspan="4">Dew is absent</td></tr>
<tr><td colspan="4">Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)</td></tr>
<tr><td>Approvals</td><td colspan="4">ENEC, UL, cUL, CQC</td></tr>
<tr><td>Dissipation Factor (tanδ)</td><td colspan="4">≤ 0.1% (0.06%*) at 1 kHz , +25°C ±5°C (* typical value)</td></tr>
<tr><td>Test Voltage Between Terminals</td><td colspan="4">The 100% screening factory test is carried out at 2,200 VDC/1,500 VAC.
The voltage level is selected to meet the requirements in applicable equipment standards.
All electrical characteristics are checked after the test. This test cannot be repeated, as there is a risk of damaging the capacitor. KEMET is not liable in such cases for any failures.</td></tr>
<tr><td rowspan="4">Insulation Resistance</td><td colspan="4">Measured at +25°C ±5°C, according to IEC 60384−2</td></tr>
<tr><td colspan="4">Minimum Values Between Terminals</td></tr>
<tr><td>Voltage Charge</td><td>Voltage Charge Time</td><td>C ≤ 0.33 µF</td><td>C > 0.33 µF</td></tr>
<tr><td>100 VDC</td><td>1 minute</td><td>≥ $1 \cdot 10^5$ MΩ
(≥ $5 \cdot 10^5$ MΩ)*</td><td>≥ 30,000 MΩ • µF
(≥ 150,000 MΩ • µF)*</td></tr>
</table>

Performance Characteristics cont.

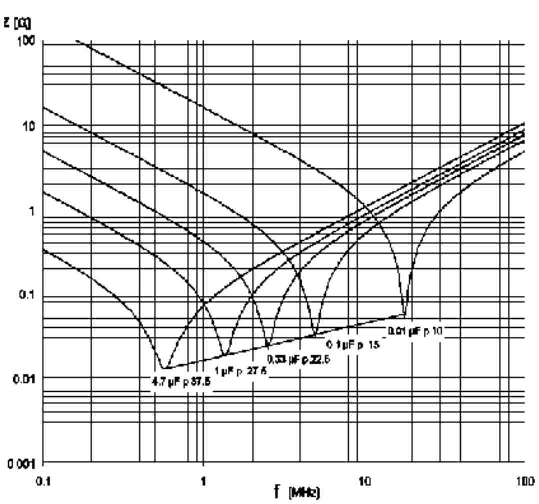




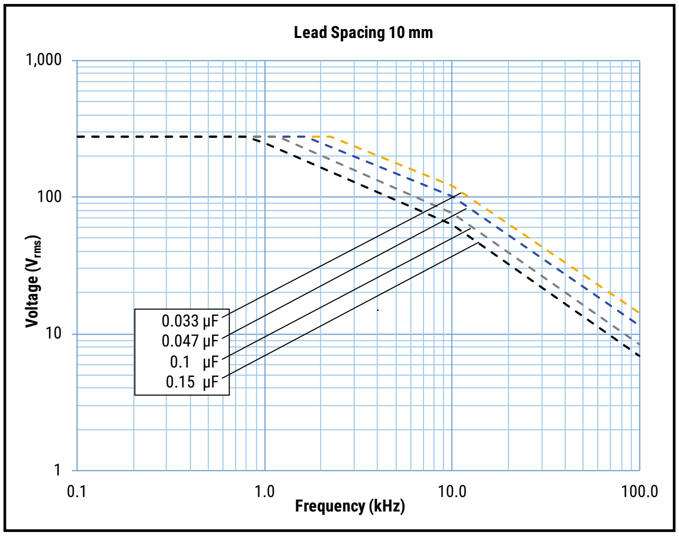


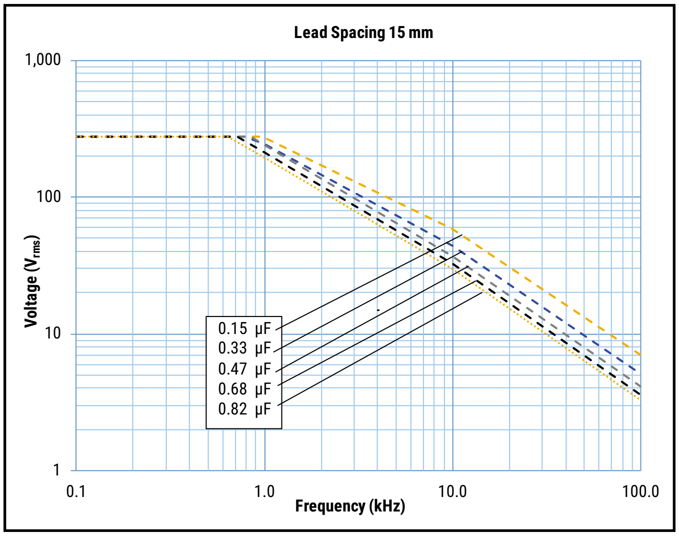
T_h is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

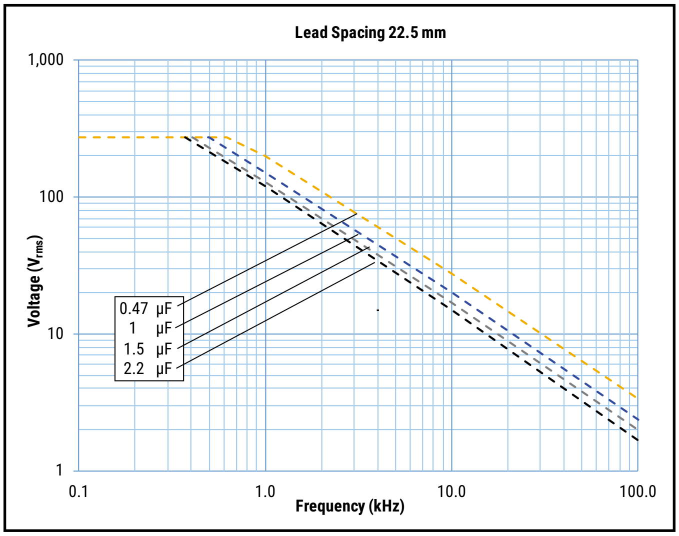
Impedance Graph

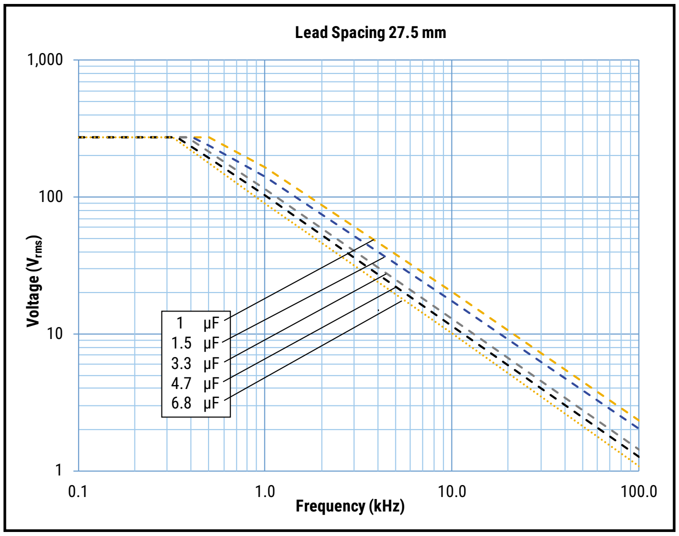


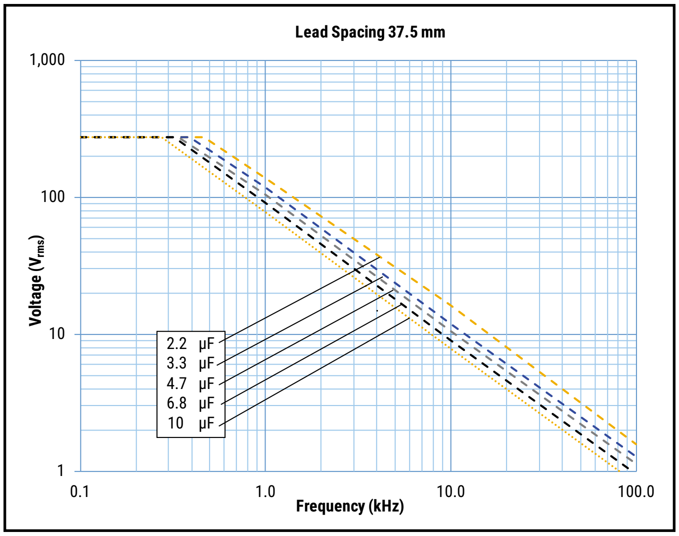
Maximum Voltage (V_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 70°C)



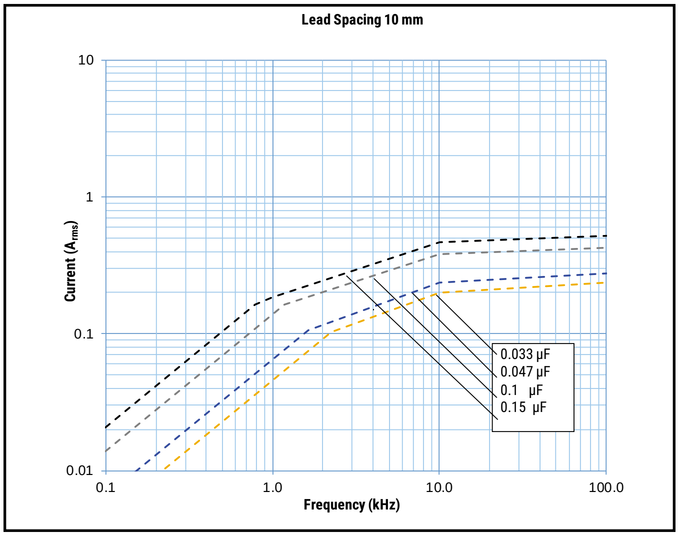


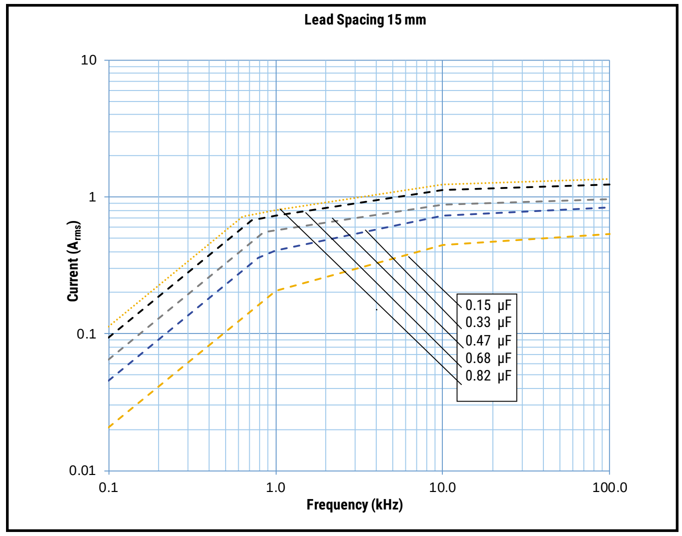


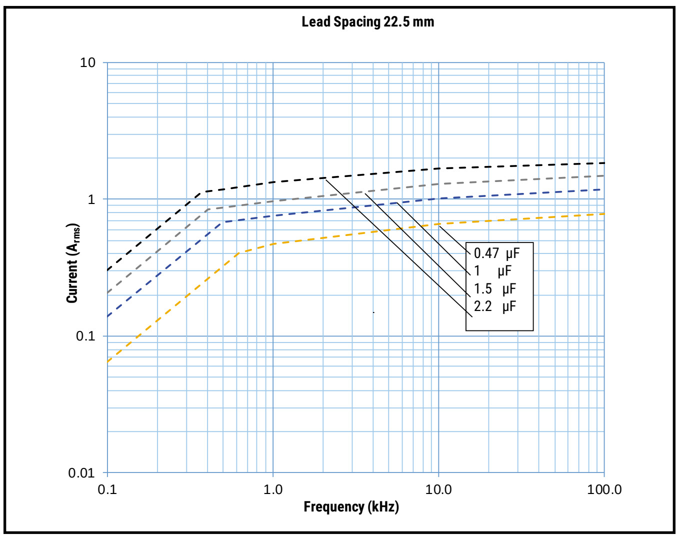


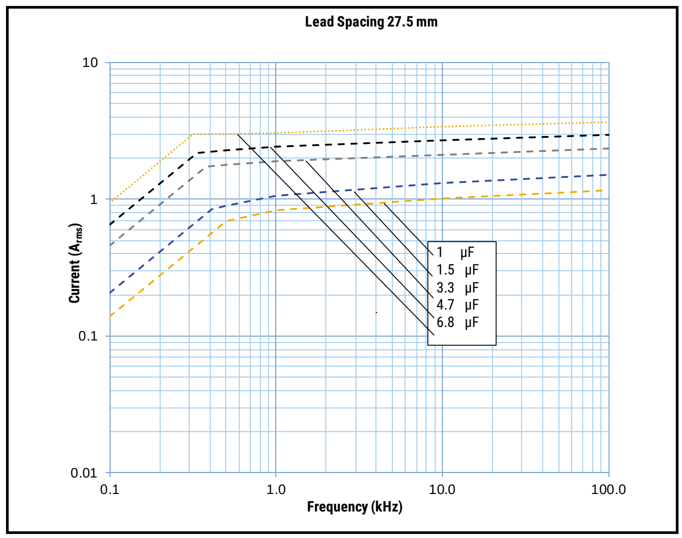


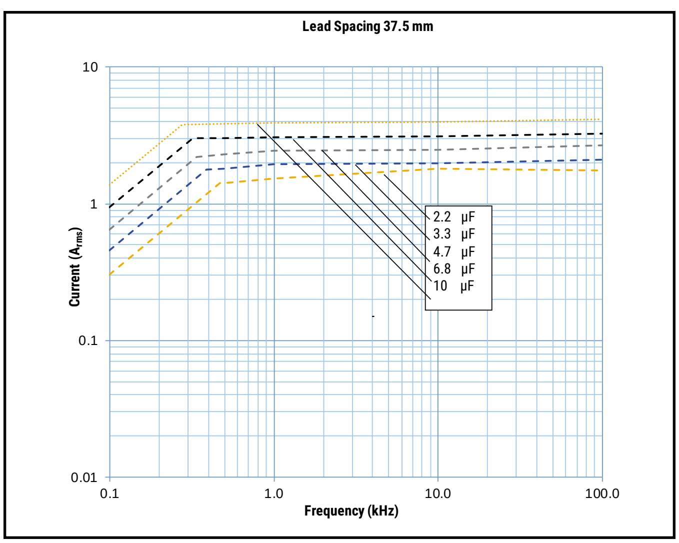
Maximum Current (I_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 70°C)











Environmental Test Data

Test	IEC Publication	Procedure
Endurance	EN/IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
IMQ S-p.A.	ENEC	EN/IEC 60384–14	V4413
UL	c UL US	UL 60384–14 and CAN/CSA E60384–14 (310 VAC)	E97797
CQC	CQC	GB/T 14472 IEC 60384–14	CQC08001026549 CQC11001060118 CQC13001087757 CQC14001116028 CQC13001101266

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Legacy Part Number
	T	H	L				
0.033	4.0	9.0	13.0	10.0	500	46KF2330(1)P0(2)	R46KF2330(1)P0(2)
0.047	4.0	9.0	13.0	10.0	500	46KF2470(1)P0(2)	R46KF2470(1)P0(2)
0.068	5.0	11.0	13.0	10.0	500	46KF2680(1)P0(2)	R46KF2680(1)P0(2)
0.10	5.0	11.0	13.0	10.0	500	46KF3100(1)P1(3)	R46KF3100(1)P1(3)
0.10	6.0	12.0	13.0	10.0	500	46KF3100(1)P0(2)	R46KF3100(1)P0(2)
0.15	6.0	12.0	13.0	10.0	500	46KF3150(1)P0(3)	R46KF3150(1)P0(3)
0.15	5.0	11.0	18.0	15.0	400	46KI3150(1)P0(2)	R46KI3150(1)P0(2)
0.22	6.0	12.0	18.0	15.0	400	46KI3220(1)P0(2)	R46KI3220(1)P0(2)
0.33	7.5	13.5	18.0	15.0	400	46KI3330(1)P0(2)	R46KI3330(1)P0(2)
0.33	9.0	12.5	18.0	15.0	400	46KI3330(1)P1(2)	R46KI3330(1)P1(2)
0.33	6.0	17.5	18.0	15.0	400	46KI3330(1)P2(2)	R46KI3330(1)P2(2)
0.47	8.5	14.5	18.0	15.0	400	46KI3470(1)P0(2)	R46KI3470(1)P0(2)
0.47	9.0	12.5	18.0	15.0	400	46KI3470(1)P1(3)	R46KI3470(1)P1(3)
0.47	6.0	17.5	18.0	15.0	400	46KI3470(1)P2(3)	R46KI3470(1)P2(3)
0.47	7.5	18.5	18.0	15.0	400	46KI3470(1)P3(2)	R46KI3470(1)P3(2)
0.68	10.0	16.0	18.0	15.0	400	46KI3680(1)P1(2)	R46KI3680(1)P1(2)
0.68	11.0	19.0	18.0	15.0	400	46KI3680(1)P0(2)	R46KI3680(1)P0(2)
0.82	11.0	19.0	18.0	15.0	400	46KI3820(1)P0(3)	R46KI3820(1)P0(3)
0.47	6.0	15.0	26.5	22.5	200	46KN3470(1)P1(2)	R46KN3470(1)P1(2)
0.56	6.0	15.0	26.5	22.5	200	46KN3560(1)P1(3)	R46KN3560(1)P1(3)
0.56	7.0	16.0	26.5	22.5	200	46KN3560(1)P0(2)	R46KN3560(1)P0(2)
0.68	7.0	16.0	26.5	22.5	200	46KN3680(1)P0(2)	R46KN3680(1)P0(2)
1.0	8.5	17.0	26.5	22.5	200	46KN4100(1)P1(3)	R46KN4100(1)P1(3)
1.0	10.0	18.5	26.5	22.5	200	46KN4100(1)P0(2)	R46KN4100(1)P0(2)
1.5	10.0	18.5	26.5	22.5	200	46KN4150(1)P1(3)	R46KN4150(1)P1(3)
1.5	11.0	20.0	26.5	22.5	200	46KN4150(1)P0(2)	R46KN4150(1)P0(2)
2.2	13.0	22.0	26.5	22.5	200	46KN4220(1)P0(3)	R46KN4220(1)P0(3)
1.0	9.0	17.0	32.0	27.5	150	46KR4100(1)P0(2)	R46KR4100(1)P0(2)
1.5	11.0	20.0	32.0	27.5	150	46KR4150(1)P0(2)	R46KR4150(1)P0(2)
2.2	13.0	22.0	32.0	27.5	150	46KR4220(1)P0(2)	R46KR4220(1)P0(2)
3.3	14.0	28.0	32.0	27.5	150	46KR4330(1)P0(2)	R46KR4330(1)P0(2)
4.7	14.0	28.0	32.0	27.5	150	46KR4470(1)P1(3)	R46KR4470(1)P1(3)
4.7	18.0	33.0	32.0	27.5	150	46KR4470(1)P0(2)	R46KR4470(1)P0(2)
6.8	22.0	37.0	32.0	27.5	150	46KR4680(1)P0(2)	R46KR4680(1)P0(2)
2.2	11.0	22.0	41.5	37.5	100	46KW4220(1)P0(2)	R46KW4220(1)P0(2)
3.3	13.0	24.0	41.5	37.5	100	46KW4330(1)P0(2)	R46KW4330(1)P0(2)
4.7	16.0	28.5	41.5	37.5	100	46KW4470(1)P0(2)	R46KW4470(1)P0(2)
6.8	19.0	32.0	41.5	37.5	100	46KW4680(1)P0(2)	R46KW4680(1)P0(2)
10.0	20.0	40.0	41.5	37.5	100	46KW5100(1)P0(2)	R46KW5100(1)P0(2)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) M = ±20%, K = ±10%
(3) M = ±20% (only available tolerance).

Soldering Process

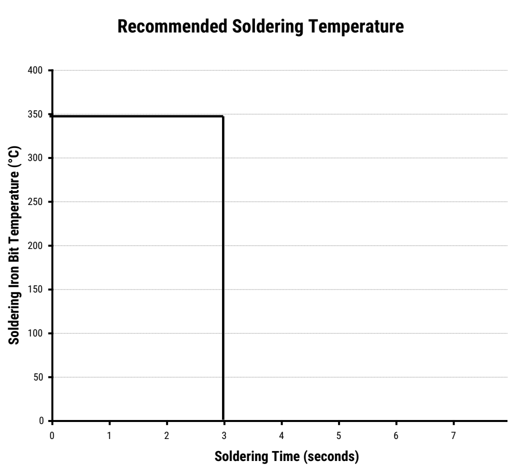
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder material. This has increased the liquidus temperature from 183°C for SnPb eutectic alloys to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm). Great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above-recommended limits may result to degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after curing surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to normal temperature before performing the second soldering cycle.

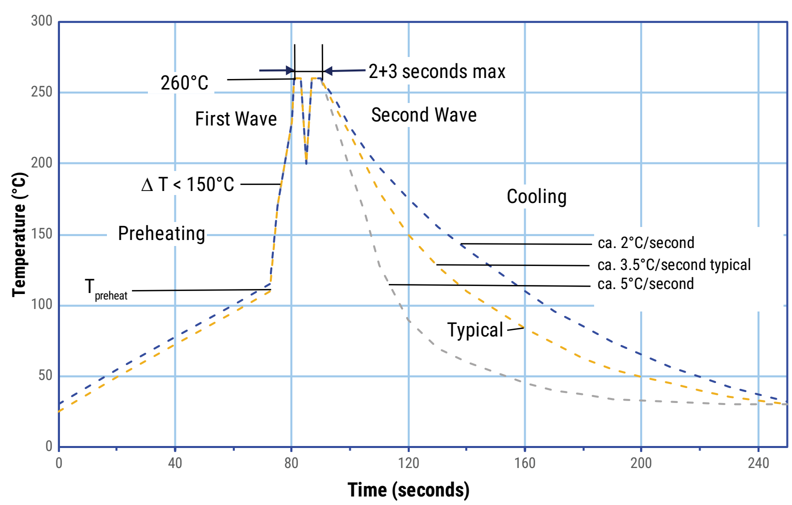
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

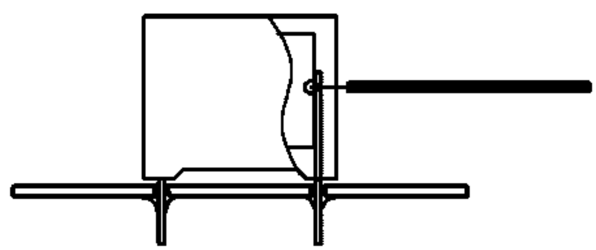
Wave Soldering Recommendations cont.

1. The table indicates the maximum set-up temperature of the soldering process.

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that the maximum temperature inside the element is below the limit.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



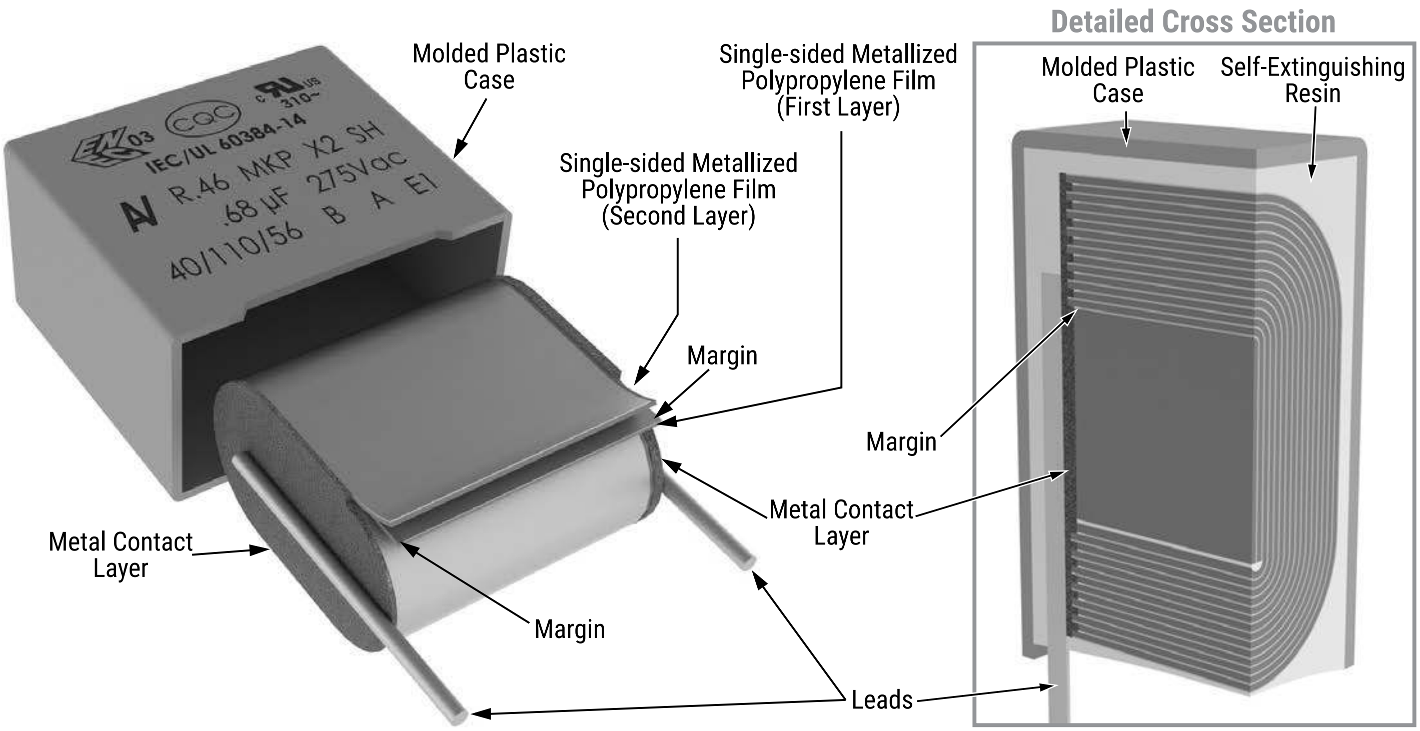
Temperature monitored inside the capacitor.

Selective Soldering Recommendations

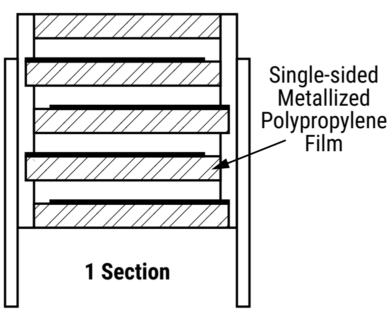
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as it is in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder, only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 – 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts do not overheat.

Construction



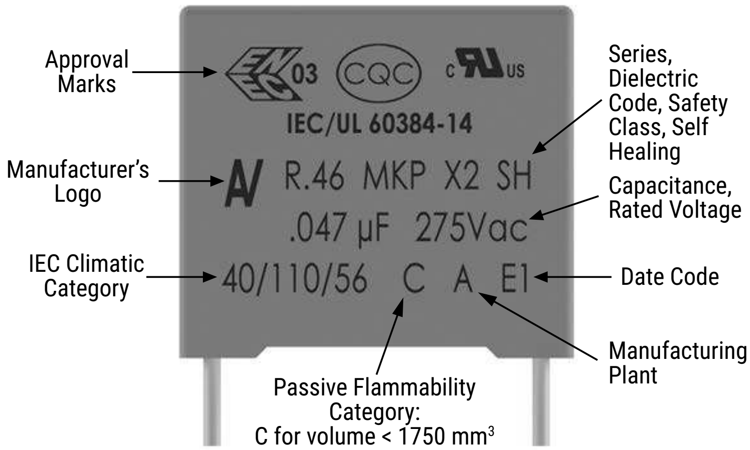
Winding Scheme



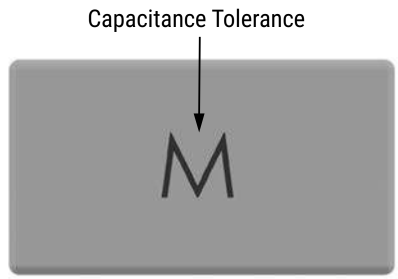
Marking

Lead Spacing 10 mm

FRONT



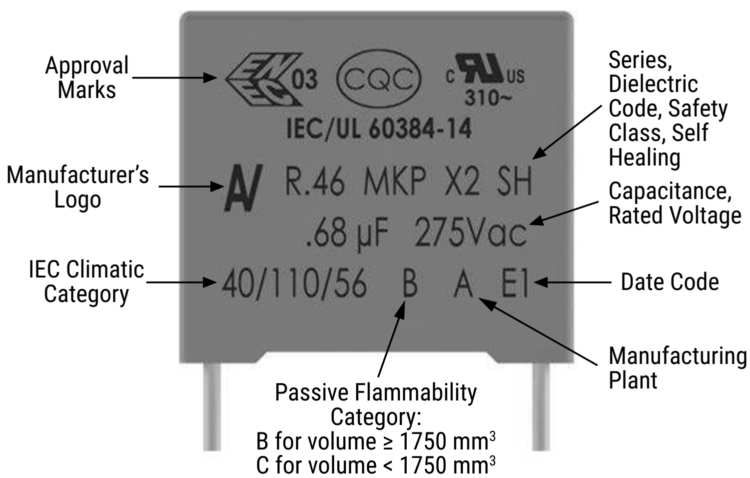
TOP



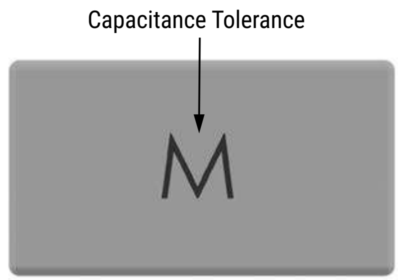
NOTE: Hot imprinting with or without color or ink jet or laser marking

Lead Spacing 15 mm, 22.5 mm, and 27.5 mm

FRONT



TOP



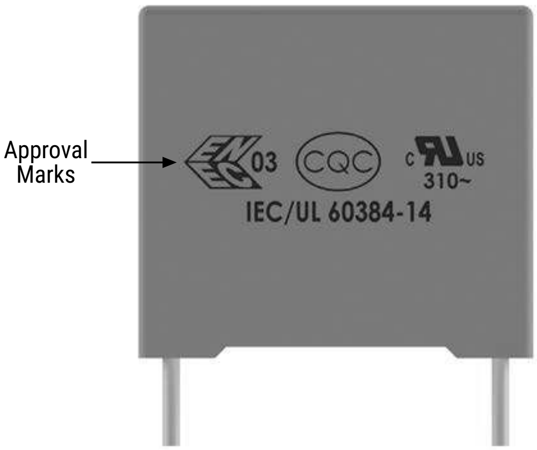
NOTE: Hot imprinting with or without color or ink jet or laser marking

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Marking cont.

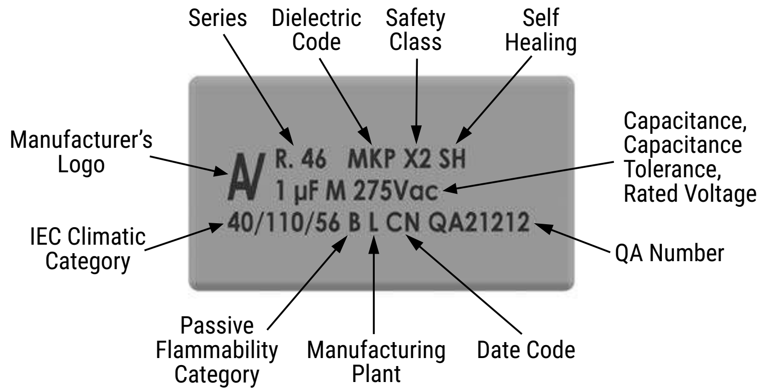
Lead Spacing 22.5 and 27.5 mm (alternatives*) and 37.5 mm

FRONT



**Differences are caused by technology (clichee, laser, or ink) and production line.*

TOP



NOTE: Hot imprinting with or without color or ink jet or laser marking

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads		Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped
Lead and Packaging Code:				00 - JA - JB JE - JH	JM	40 – 50	GY	CK	DQ
10	4	9	13	2,000	2,200	1,800	750	1,500	1,000
	5	11	13	1,300	2,000	1,500	600	1,250	800
	6	12	13	1,000	1,800	1,200	500	1,000	680
15	5	11	18	2,000	1,250	1,000	600	1,250	800
	6	12	18	1,750	1,000	900	500	1,000	680
	6	17.5	18	1,000	800	700	500	1,000	680
	7.5	13.5	18	1,000	650	700	350	800	500
	7.5	18.5	18	900	650	500	-	800	500
	8.5	14.5	18	1,000	700	500	300	700	440
	9	12.5	18	1,000	550	520	270	650	410
	10	16	18	750	400	500	270	600	380
	11	19	18	450	350	350	-	500	340
22.5	6	15	26.5	805	450	500	-	700	464
	7	16	26.5	700	450	500	-	550	380
	8.5	17	26.5	468	350	300	-	450	280
	10	18.5	26.5	396	350	300	-	350	235
	11	20	26.5	360	200	250	-	350	217
	13	22	26.5	300	150	200	-	300	-
27.5	9	17	32	816	408	408	-	450	-
	11	20	32	560	336	336	-	350	-
	13	22	32	480	288	288	-	300	-
	14	28	32	352	176	176	-	-	-
	18	33	32	256	128	128	-	-	-
	22	37	32	168	112	112	-	-	-
37.5	11	22	41.5	420	252	252	-	-	-
	13	24	41.5	360	216	216	-	-	-
	16	28.5	41.5	216	108	108	-	-	-
	19	32	41.5	192	96	96	-	-	-
	20	40	41.5	126	84	84	-	-	-

Lead Taping & Packaging (IEC 60286–2)

Figure 1
Lead Spacing 10 mm

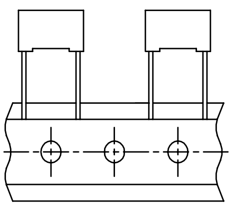


Figure 2
Lead Spacing 15 mm

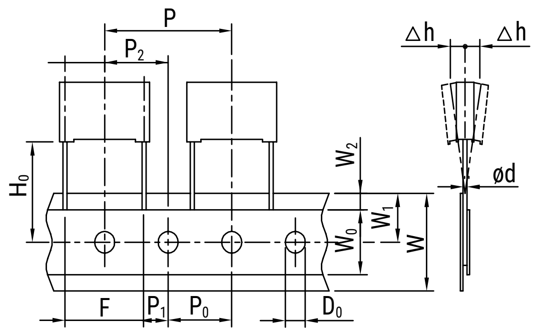
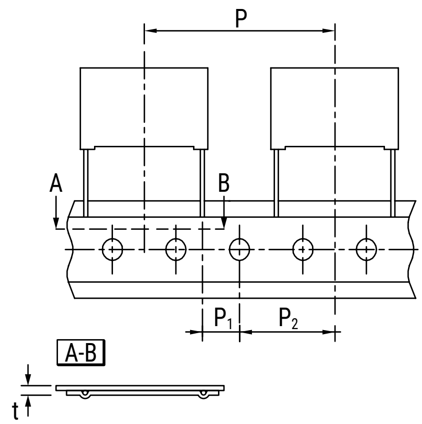


Figure 3
Lead Spacing 22.5 – 27.5 mm



Taping Specification

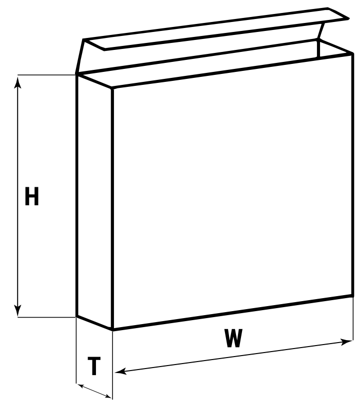
Description	Symbol	Dimensions (mm)				
		Lead Space				Tol.
		10	15	22.5	27.5	
		Fig. 1	Fig. 2	Fig. 3	Fig. 3	
Lead wire diameter	d	0.6	0.6−0.8	0.8	0.8	±0.05
Taping lead space	P	25.4	25.4	38.1	38.1	±1
Feed hole lead space *	P_0	12.7	12.7	12.7	12.7	±0.2 **
Centering of the lead wire	P_1	7.7	5.2	7.8	5.3	±0.7
Centering of the body	P_2	12.7	12.7	19.05	19.05	±1.3
Lead spacing (pitch) ***	F	10	15	22.5	27.5	+0.6/−0.1
Component alignment	Δh	0	0	0	0	±2
Height of component from tape center	H_0 ****	18.5	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	18	+1/−0.5
Hold down tape width	W_0	9	10	10	10	Minimum
Hole position	W_1	9	9	9	9	±0.5
Hold down tape position	W_2	3	3	3	3	Maximum
Feed hole diameter	D_0	4	4	4	4	±0.2
Total tape thickness	t	0.7	0.7	0.7	0.7	±0.2

** 15 mm also available*
*** Maximum of 1 mm on 20 lead spaces*
**** Pitches 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request*
***** H_0 = 16.5 mm is available upon request*

Lead Taping & Packaging (IEC 60286–2) cont.

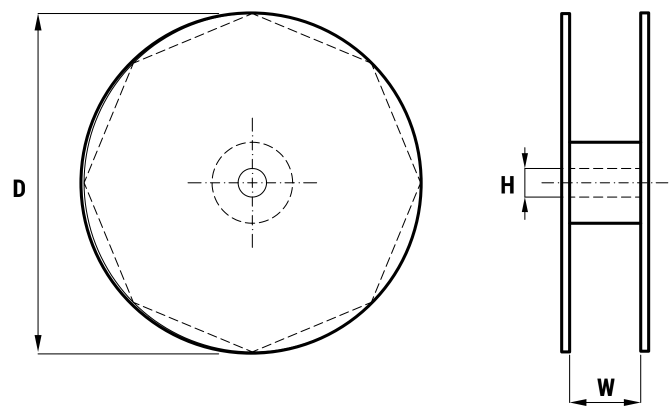
Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



Reel Specifications

Reel Size	Dimensions (mm)		
	D	H	W
Standard	355	30	55 Maximum
Large	500	25	



R46, Class X2, 310 VAC, 110°C

Overview

The R46 series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material that meets the requirements of UL 94 V–0.

Applications

For worldwide use in electromagnetic interference (EMI) suppression in across-the-line applications that require X2 safety classification. Intended for use in situations in which capacitor failure would not result in exposure to electric shock. Not for use in "series with mains" type applications.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- X2 CLASS (IEC 60384-14)
- Rated voltage: 310 VAC 50/60 Hz
- Capacitance range: 0.01 – 10 µF
- Lead spacing: 10.0 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category 40/110/56, IEC 60068–1
- Tape & Reel in accordance with IEC 60286–2
- RoHS compliant and lead-free terminations
- Operating temperature range of −40°C to +110°C
- 100% screening factory test at 2,200 VDC/1,500 VAC
- Self healing properties

Part Number System

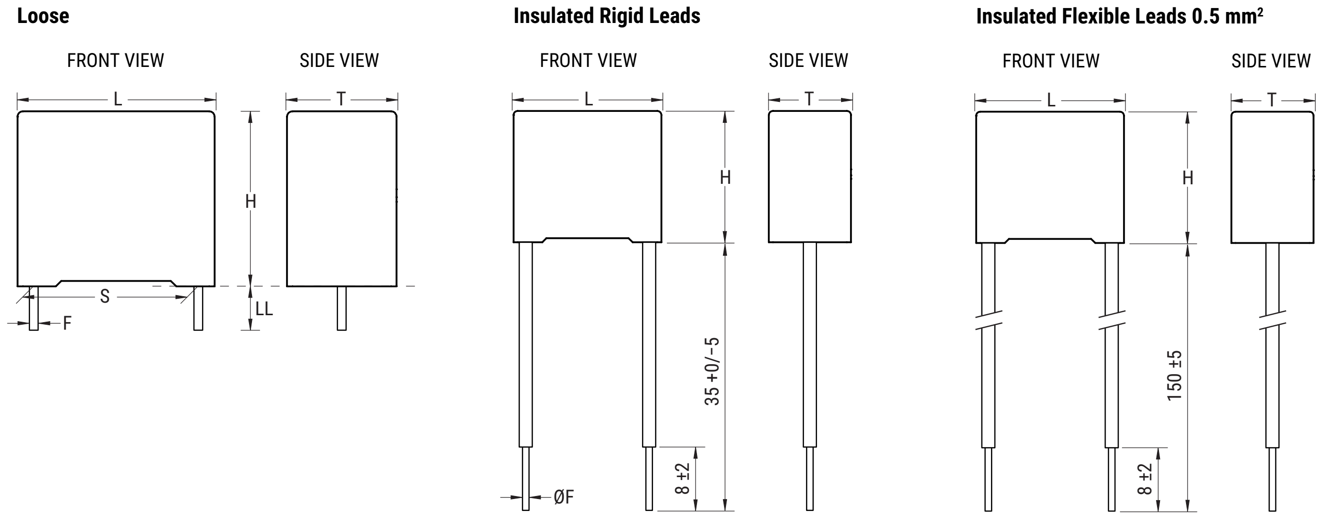
R46	3	N	3150	00	01	M
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance
X2, Metallized Polypropylene	3 = 310	F = 10.0 I = 15.0 N = 22.5 R = 27.5 W = 37.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	See Ordering Options Table	01 02 L2 M1 M2 N0 N1 N2	K = ±10% M = ±20%

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
10 15 22.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/-0	00
	Ammo Pack	H_0 = 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	CK
	Bulk (Bag)[2] – Short Leads	2.7 +0.5/-0	JA
	Bulk (Bag)[2] – Short Leads	3.5 +0.5/-0	JB
	Bulk (Bag)[2] – Short Leads	4.0 +0.5/-0	JE
	Bulk (Bag)[2] – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Bag) – Long Leads	18 ±1	JM
	Bulk (Bag) – Long Leads	30 +5/-0	40
	Bulk (Bag) – Long Leads	25 +2/-1	50
	Bulk (Bag) – Insulated Rigid Leads	30 +5/-0 (sp 8 ±2)	51
	Bulk (Bag) – Insulated Flexible Leads	150 ±5 (sp 8 ±2)	52
27.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/-0	00
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK[1]
	Other Lead and Packaging Options		
	Bulk (Tray) – Short Leads	2.7 +0.5/-0	JA
	Bulk (Tray) – Short Leads	3.5 +0.5/-0	JB
	Bulk (Tray) – Short Leads	4.0 +0.5/-0	JE
	Bulk (Tray) – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Tray) – Long Leads	18 ±1	JM
	Bulk (Tray) – Long Leads	30 +5/-0	40
	Bulk (Tray) – Long Leads	25 +2/-1	50
	Bulk (Bag) – Insulated Rigid Leads	30 +5/-0 (sp 8 ±2)	51
	Bulk (Bag) – Insulated Flexible Leads	150 ±5 (sp 8 ±2)	52
37.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/-0	00
	Other Lead and Packaging Options		
	Bulk (Tray) – Short Leads	2.7 +0.5/-0	JA
	Bulk (Tray) – Short Leads	3.5 +0.5/-0	JB
	Bulk (Tray) – Short Leads	4.0 +0.5/-0	JE
	Bulk (Tray) – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Tray) – Long Leads	18 ±1	JM
	Bulk (Tray) – Long Leads	30 +5/-0	40
	Bulk (Tray) – Long Leads	25 +2/-1	50
	Bulk (Bag) – Insulated Rigid Leads	30 +5/-0 (sp 8 ±2)	51
	Bulk (Bag) – Insulated Flexible Leads	150 ±5 (sp 8 ±2)	52

[1] *Not for all sizes, see "Packaging Quantities" table.*
[2] *For lead spacing 22.5 case sizes ≥8.5*17*26.5 the parts are packed in a Pizza box 335*320*34 mm*

Dimensions – Millimeters

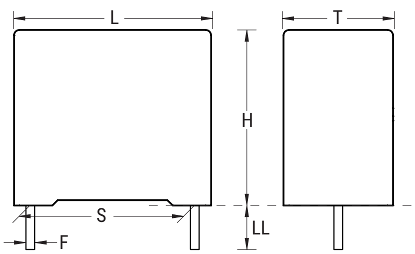


S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
10.0	± 0.4	4.0	+0.2/−0.5	9.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
10.0	± 0.4	5.0	+0.2/−0.5	11.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
10.0	± 0.4	6.0	+0.2/−0.5	12.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
15.0	± 0.4	5.0	+0.2/−0.5	11.0	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	± 0.4	6.0	+0.2/−0.5	12.0	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	± 0.4	6.0	+0.2/−0.5	17.5	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	± 0.4	7.5	+0.2/−0.5	13.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	± 0.4	7.5	+0.2/−0.5	18.5	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	± 0.4	8.5	+0.2/−0.5	14.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	± 0.4	9.0	+0.2/−0.5	12.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	± 0.4	10.0	+0.2/−0.5	16.0	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	± 0.4	11.0	+0.2/−0.5	19.0	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	± 0.4	13.0	+0.2/−0.5	12.0	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
22.5	± 0.4	6.0	+0.2/−0.5	15.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	± 0.4	7.0	+0.2/−0.5	16.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	± 0.4	10.0	+0.2/−0.5	18.5	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	± 0.4	11.0	+0.2/−0.5	20.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	± 0.4	13.0	+0.2/−0.5	22.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
27.5	± 0.4	9.0	+0.2/−0.7	17.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	± 0.4	11.0	+0.2/−0.7	20.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	± 0.4	13.0	+0.2/−0.7	22.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	± 0.4	13.0	+0.2/−0.7	25.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	± 0.4	14.0	+0.2/−0.7	28.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	± 0.4	18.0	+0.2/−0.7	33.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	± 0.4	22.0	+0.2/−0.7	37.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
Note: See Ordering Options Table for lead length (LL/H_0) options.									

Dimensions – Millimeters cont.

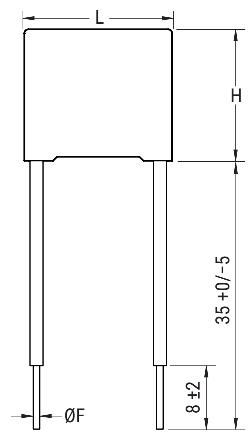
Loose

FRONT VIEW SIDE VIEW



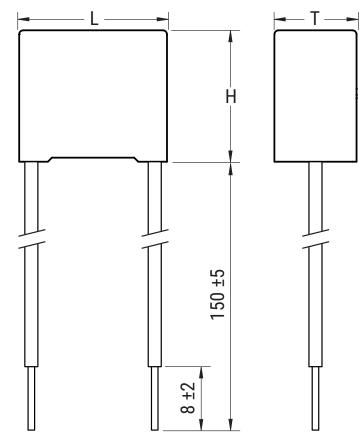
Insulated Rigid Leads

FRONT VIEW SIDE VIEW



Insulated Flexible Leads 0.5 mm²

FRONT VIEW SIDE VIEW



S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
37.5	± 0.4	11.0	+0.3/−0.7	22.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	± 0.4	13.0	+0.3/−0.7	24.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	± 0.4	16.0	+0.3/−0.7	28.5	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	± 0.4	19.0	+0.3/−0.7	32.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	± 0.4	20.0	+0.3/−0.7	40.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	± 0.4	24.0	+0.3/−0.7	44.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	± 0.4	30.0	+0.3/−0.7	45.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
Note: See Ordering Options Table for lead length (LL/H_0) options.									

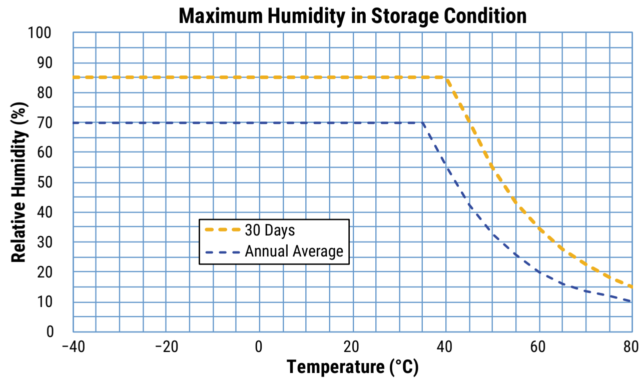
Performance Characteristics

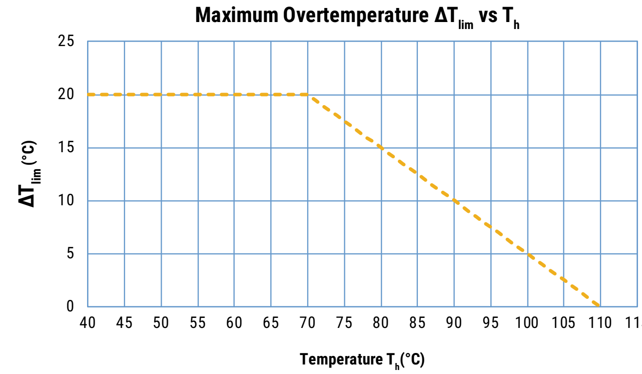
Dielectric	Polypropylene film
Plates	Metal layer deposited by evaporation under vacuum
Winding	Non-inductive type
Leads	Tinned wire
Protection	Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94.
Related Documents	IEC 60384–14, EN 60384–14
Rated Voltage V_R	310 VAC (50/60 Hz)
Recommended DC Voltage	≤ 630 VDC
Capacitance Range	0.010 – 10 µF
Capacitance Values	E6 series (IEC 60063) measured at 1 kHz and +20 ±1°C
Capacitance Tolerance	±10%, ±20%
Temperature Range	−40°C to +110°C
Climatic Category	40/110/56 IEC 60068-1
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package
	Average relative humidity per year ≤ 70%
	RH ≤ 85% for 30 days randomly distributed throughout the year
	Dew is absent
	Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)
Approvals	ENEC, UL, cUL, CQC
Dissipation Factor (tanδ)	≤ 0.1% (0.06%*) at 1 kHz , +25°C ±5°C (* typical value)
Test Voltage Between Terminals	The 100% screening factory test is carried out at 2,200 VDC/1,500 VAC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. This test cannot be repeated, as there is a risk of damaging the capacitor. KEMET is not liable in such cases for any failures.

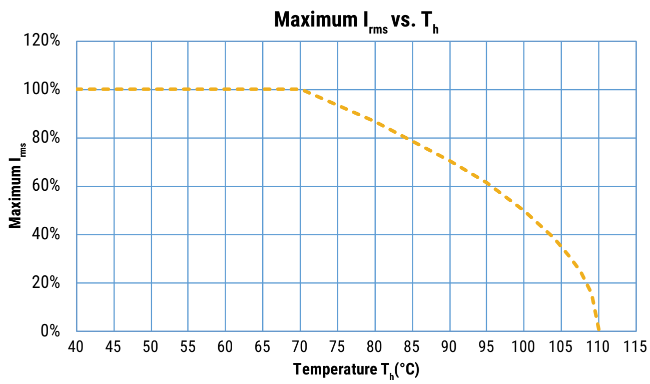
Insulation Resistance	Measured at +25°C ±5°C, according to IEC 60384–2			
	Minimum Values Between Terminals			
	Voltage Charge	Voltage Charge Time	C ≤ 0.33 µF	C > 0.33 µF
	100 VDC	1 minute	≥ 1 • 10^5 MΩ (≥ 5 • 10^5 MΩ)*	≥ 30,000 MΩ • µF (≥ 150,000 MΩ • µF)*

** Typical value*

Performance Characteristics cont.

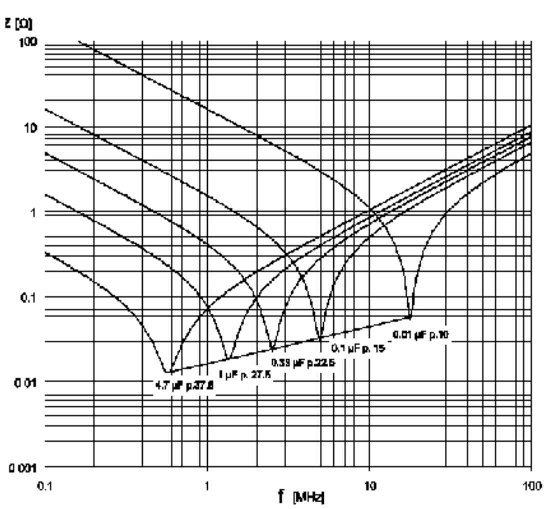




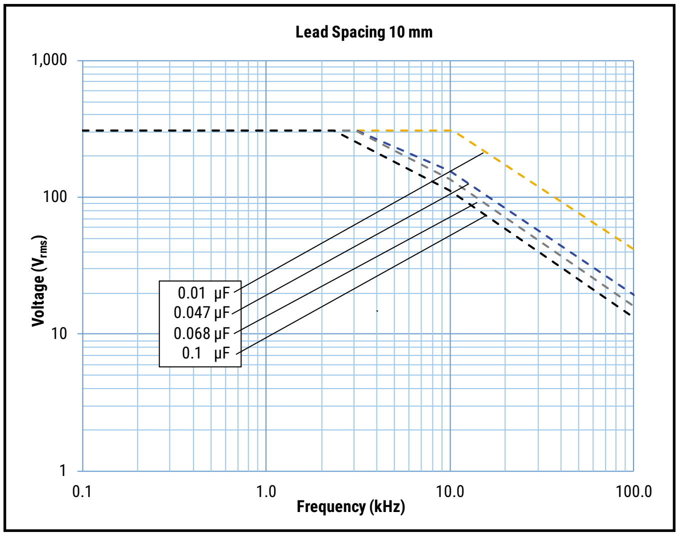


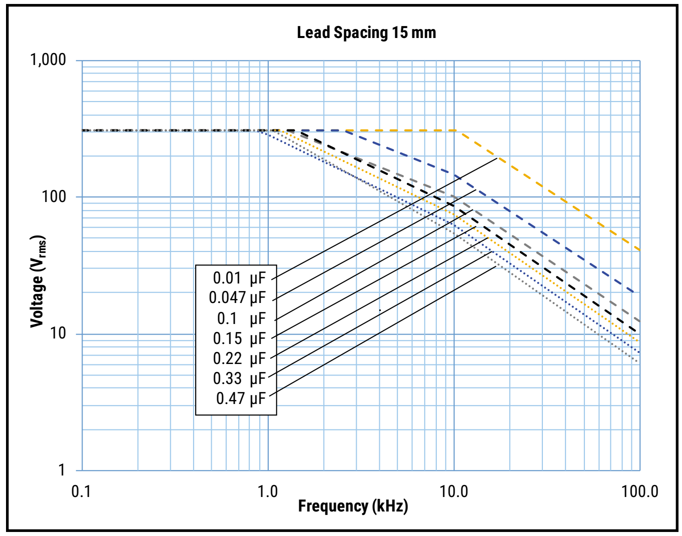
T_h is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

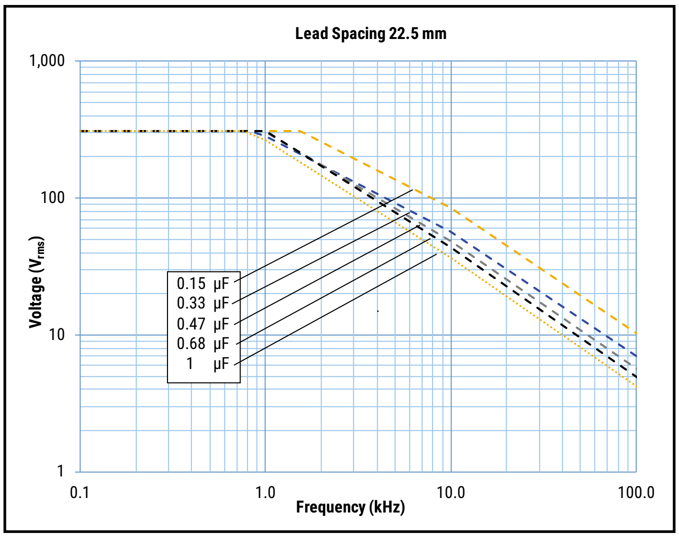
Impedance Graph

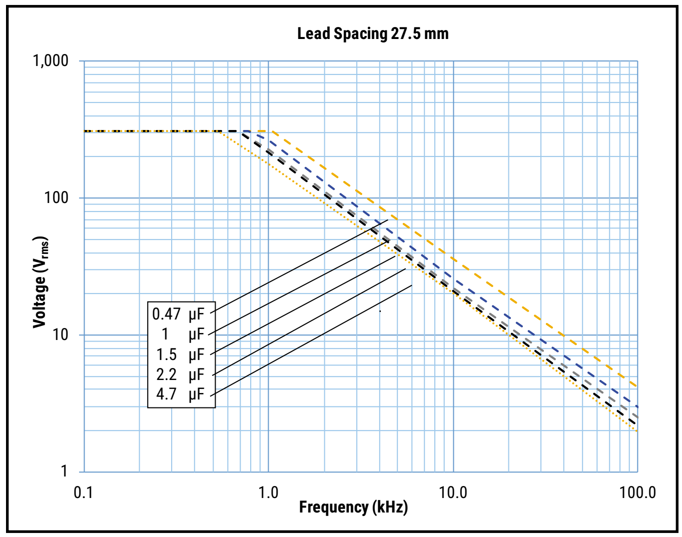


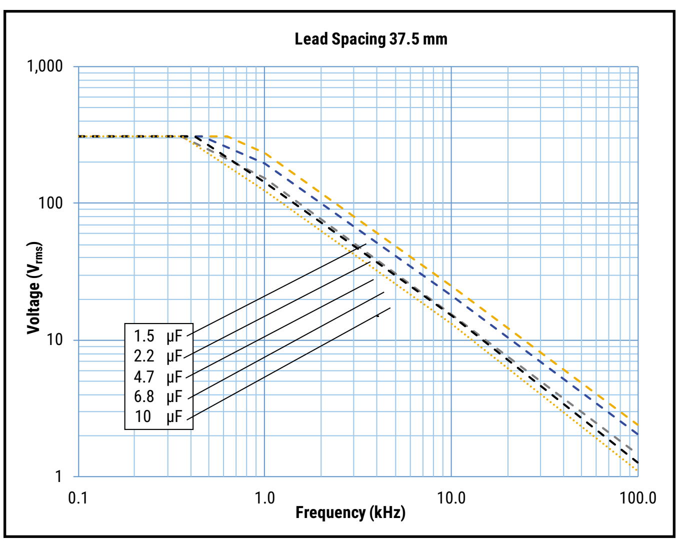
Maximum Voltage (V_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 70°C)



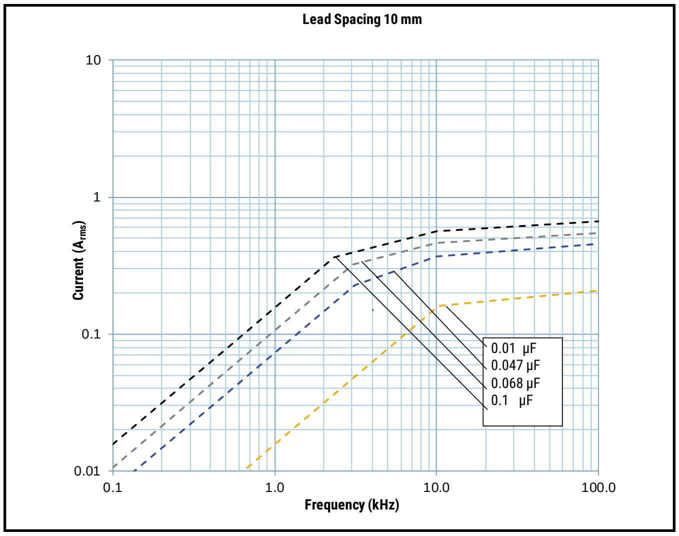


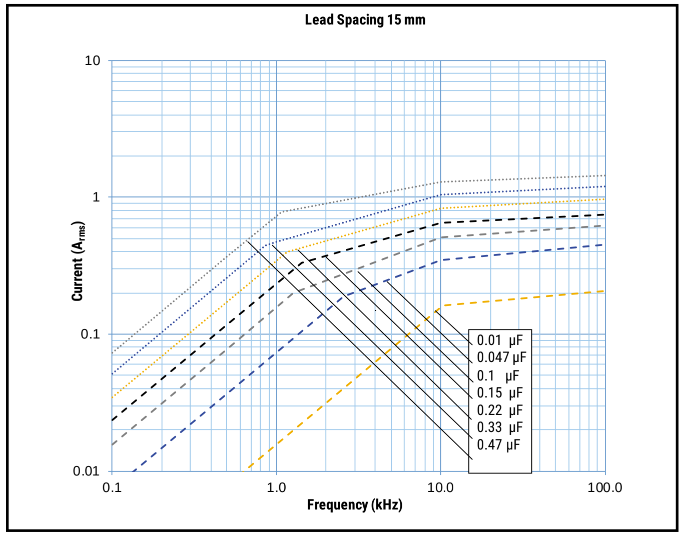


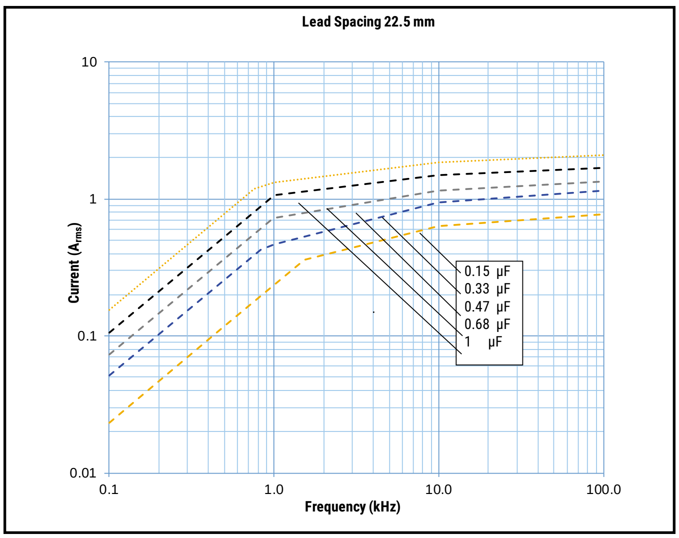


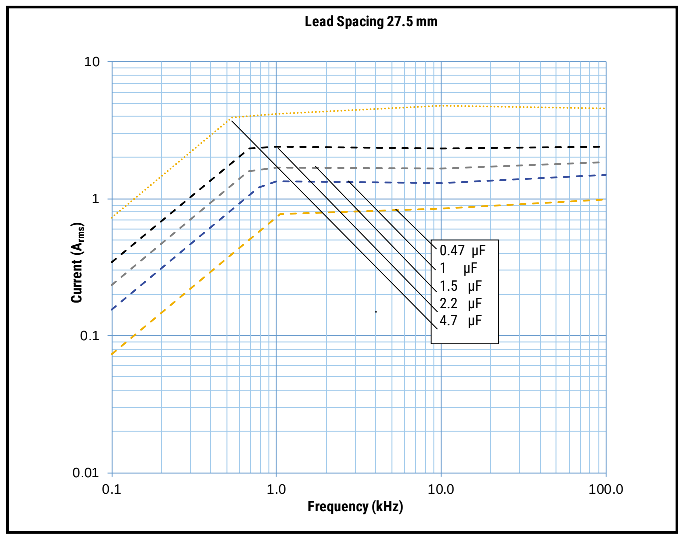


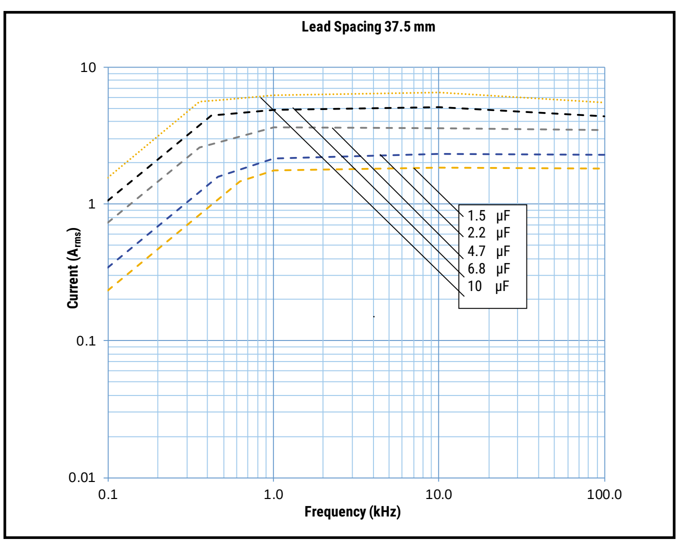
Maximum Current (I_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 70°C)











Environmental Test Data

Test	IEC Publication	Procedure
Endurance	EN/IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
IMQ S-p.A.		EN/IEC 60384–14	V4413
UL		UL 60384–14 and CAN/CSA E60384–14 (310 VAC)	E97797
CQC		GB/T 14472 IEC 60384–14	CQC08001026549 CQC11001060118 CQC13001087757 CQC14001116028 CQC13001101266

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Dimensions in mm T	H	L	Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Legacy Part Number
0.010	4.0	9.0	13.0	10.0	500	463F2100(1)N0(2)	R463F2100(1)N0(2)
0.015	4.0	9.0	13.0	10.0	500	463F2150(1)N0(2)	R463F2150(1)N0(2)
0.022	4.0	9.0	13.0	10.0	500	463F2220(1)N0(2)	R463F2220(1)N0(2)
0.033	5.0	11.0	13.0	10.0	500	463F2330(1)M1(2)	R463F2330(1)M1(2)
0.047	5.0	11.0	13.0	10.0	500	463F2470(1)N0(2)	R463F2470(1)N0(2)
0.068	6.0	12.0	13.0	10.0	500	463F2680(1)M1(2)	R463F2680(1)M1(2)
0.10	6.0	12.0	13.0	10.0	500	463F3100(1)M1(3)	R463F3100(1)M1(3)
0.010	5.0	11.0	18.0	15.0	400	463I2100(1)01(2)	R463I2100(1)01(2)
0.015	5.0	11.0	18.0	15.0	400	463I2150(1)01(2)	R463I2150(1)01(2)
0.022	5.0	11.0	18.0	15.0	400	463I2220(1)01(2)	R463I2220(1)01(2)
0.033	5.0	11.0	18.0	15.0	400	463I2330(1)01(2)	R463I2330(1)01(2)
0.047	5.0	11.0	18.0	15.0	400	463I2470(1)01(2)	R463I2470(1)01(2)
0.068	5.0	11.0	18.0	15.0	400	463I2680(1)01(2)	R463I2680(1)01(2)
0.10	5.0	11.0	18.0	15.0	400	463I3100(1)M1(2)	R463I3100(1)M1(2)
0.15	6.0	12.0	18.0	15.0	400	463I3150(1)M2(2)	R463I3150(1)M2(2)
0.15	9.0	12.5	18.0	15.0	400	463I3150(1)L2(2)	R463I3150(1)L2(2)
0.22	7.5	13.5	18.0	15.0	400	463I3220(1)M2(2)	R463I3220(1)M2(2)
0.22	9.0	12.5	18.0	15.0	400	463I3220(1)L2(2)	R463I3220(1)L2(2)
0.22	6.0	17.5	18.0	15.0	400	463I3220(1)02(2)	R463I3220(1)02(2)
0.33	8.5	14.5	18.0	15.0	400	463I3330(1)N0(2)	R463I3330(1)N0(2)
0.33	10.0	16.0	18.0	15.0	400	463I3330(1)M1(2)	R463I3330(1)M1(2)
0.33	7.5	18.5	18.0	15.0	400	463I3330(1)02(2)	R463I3330(1)02(2)
0.33	13.0	12.0	18.0	15.0	400	463I3330(1)01(2)	R463I3330(1)01(2)
0.47	10.0	16.0	18.0	15.0	400	463I3470(1)N0(3)	R463I3470(1)N0(3)
0.47	11.0	19.0	18.0	15.0	400	463I3470(1)M1(2)	R463I3470(1)M1(2)
0.56	11.0	19.0	18.0	15.0	400	463I3560(1)N0(2)	R463I3560(1)N0(2)
0.60	11.0	19.0	18.0	15.0	400	463I3600(1)N0(2)	R463I3600(1)N0(2)
0.15	6.0	15.0	26.5	22.5	200	463N3150(1)01(2)	R463N3150(1)01(2)
0.22	6.0	15.0	26.5	22.5	200	463N3220(1)M1(2)	R463N3220(1)M1(2)
0.33	6.0	15.0	26.5	22.5	200	463N3330(1)N0(2)	R463N3330(1)N0(2)
0.47	7.0	16.0	26.5	22.5	200	463N3470(1)N0(2)	R463N3470(1)N0(2)
0.68	10.0	18.5	26.5	22.5	200	463N3680(1)M2(2)	R463N3680(1)M2(2)
1.0	10.0	18.5	26.5	22.5	200	463N4100(1)N2(3)	R463N4100(1)N2(3)
1.0	11.0	20.0	26.5	22.5	200	463N4100(1)N1(2)	R463N4100(1)N1(2)
1.5	13.0	22.0	26.5	22.5	200	463N4150(1)N1(2)	R463N4150(1)N1(2)
0.47	9.0	17.0	32.0	27.5	150	463R3470(1)01(2)	R463R3470(1)01(2)
0.68	9.0	17.0	32.0	27.5	150	463R3680(1)M1(2)	R463R3680(1)M1(2)
1.0	11.0	20.0	32.0	27.5	150	463R4100(1)M1(2)	R463R4100(1)M1(2)
1.5	13.0	22.0	32.0	27.5	150	463R4150(1)M1(2)	R463R4150(1)M1(2)
2.2	13.0	25.0	32.0	27.5	150	463R4220(1)M2(2)	R463R4220(1)M2(2)
2.2	14.0	28.0	32.0	27.5	150	463R4220(1)M1(2)	R463R4220(1)M1(2)
3.3	18.0	33.0	32.0	27.5	150	463R4330(1)M2(2)	R463R4330(1)M2(2)
4.7	18.0	33.0	32.0	27.5	150	463R4470(1)M2(2)	R463R4470(1)M2(2)
4.7	22.0	37.0	32.0	27.5	150	463R4470(1)M1(2)	R463R4470(1)M1(2)
1.5	11.0	22.0	41.5	37.5	100	463W4150(1)M1(2)	R463W4150(1)M1(2)
2.2	11.0	22.0	41.5	37.5	100	463W4220(1)M2(3)	R463W4220(1)M2(3)
2.2	13.0	24.0	41.5	37.5	100	463W4220(1)M1(2)	R463W4220(1)M1(2)
3.3	16.0	28.5	41.5	37.5	100	463W4330(1)M1(2)	R463W4330(1)M1(2)
4.7	16.0	28.5	41.5	37.5	100	463W4470(1)M2(3)	R463W4470(1)M2(3)
4.7	19.0	32.0	41.5	37.5	100	463W4470(1)M1(2)	R463W4470(1)M1(2)
6.8	20.0	40.0	41.5	37.5	100	463W4680(1)M2(2)	R463W4680(1)M2(2)
6.8	24.0	44.0	41.5	37.5	100	463W4680(1)M1(2)	R463W4680(1)M1(2)
10.0	30.0	45.0	41.5	37.5	100	463W5100(1)M1(2)	R463W5100(1)M1(2)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) M = ±20%, K = ±10%
(3) M = ±20% (only available tolerance).

Soldering Process

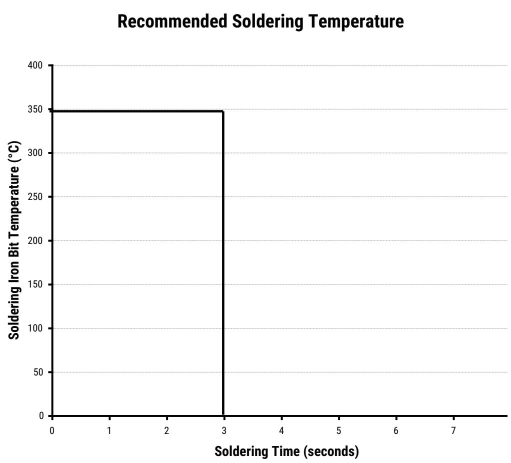
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder material. This has increased the liquidus temperature from 183°C for SnPb eutectic alloys to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm). Great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above-recommended limits may result to degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after curing surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to normal temperature before performing the second soldering cycle.

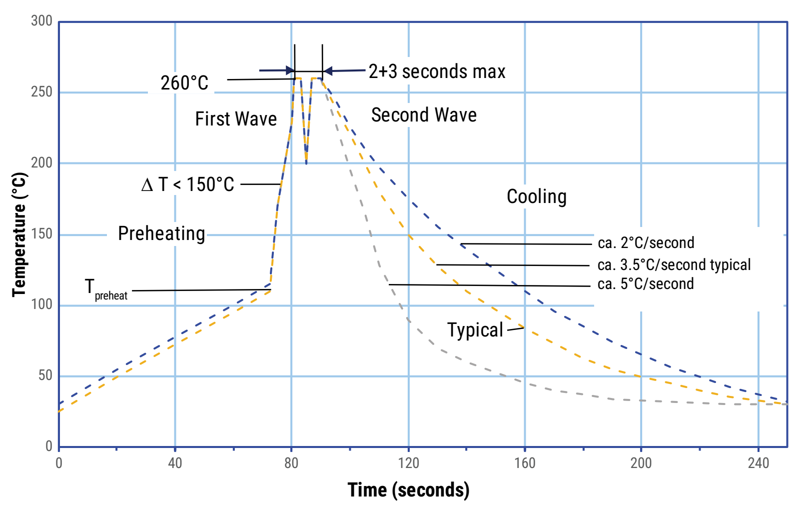
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

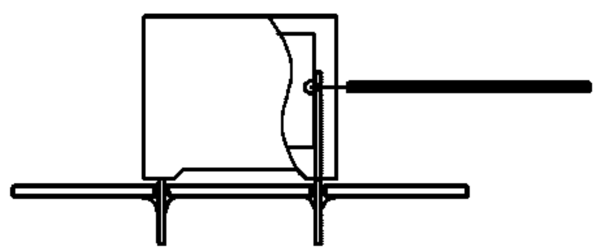
1. The table indicates the maximum set-up temperature of the soldering process.

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that the maximum temperature inside the element is below the limit.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C

Temperature monitored inside the capacitor.

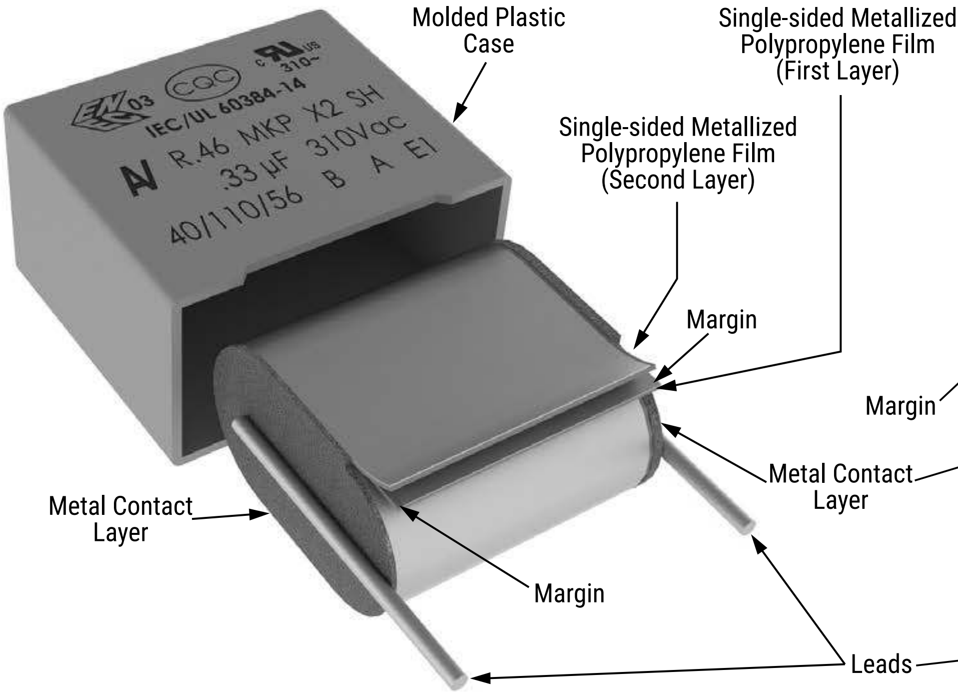


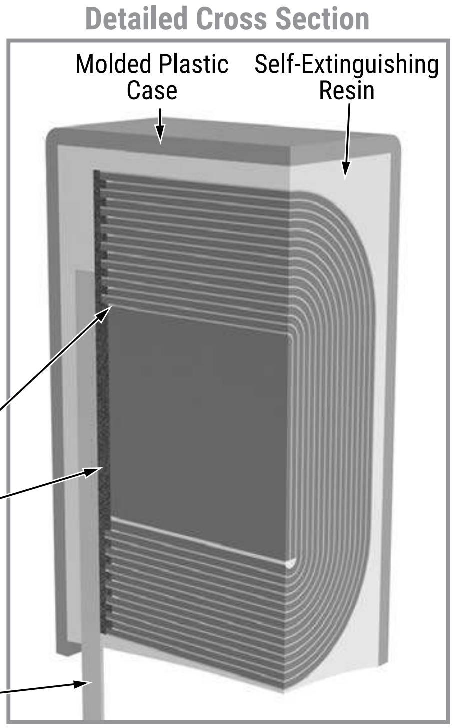
Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as it is in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder, only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

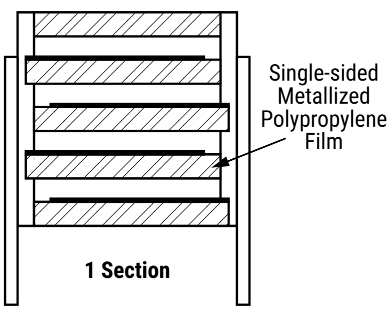
The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 – 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts do not overheat.

Construction





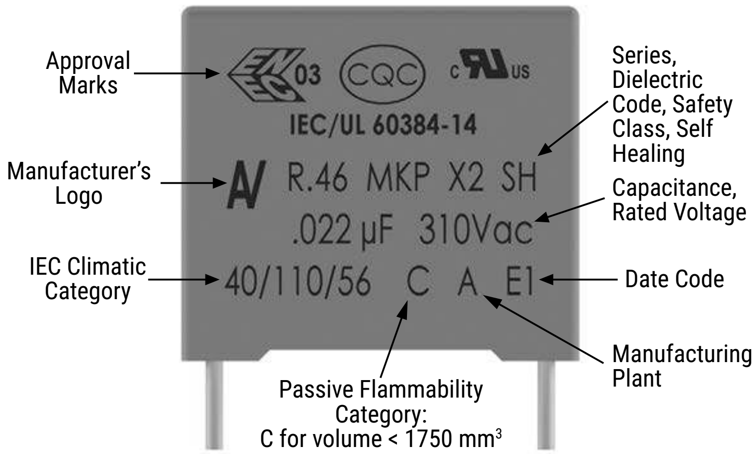
Winding Scheme



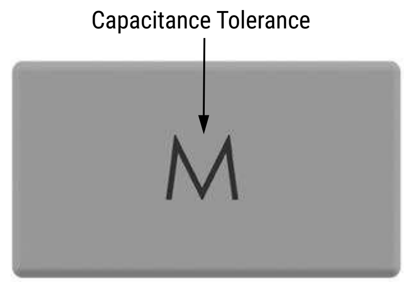
Marking

Lead Spacing 10 mm

FRONT



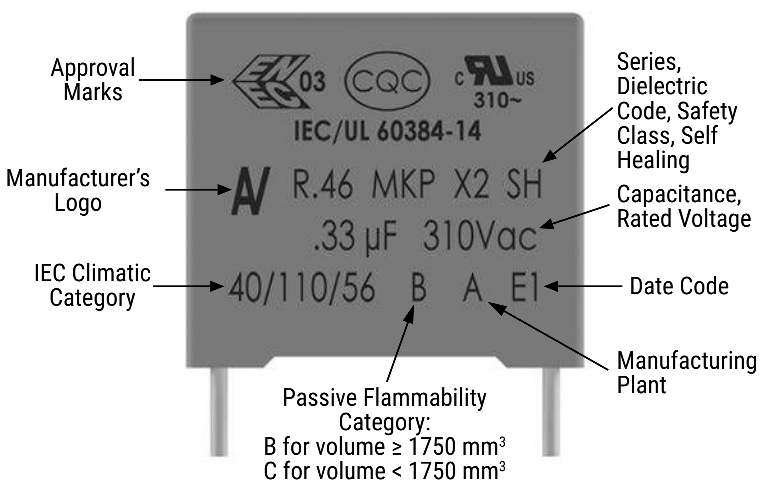
TOP



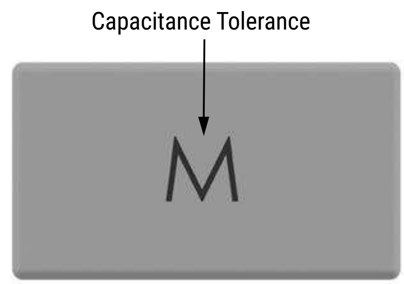
NOTE: Hot imprinting with or without color or ink jet or laser marking

Lead Spacing 15 mm, 22.5 mm, and 27.5 mm

FRONT



TOP



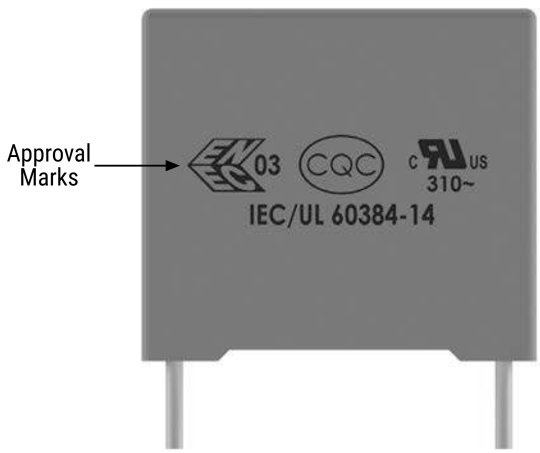
NOTE: Hot imprinting with or without color or ink jet or laser marking

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Marking cont.

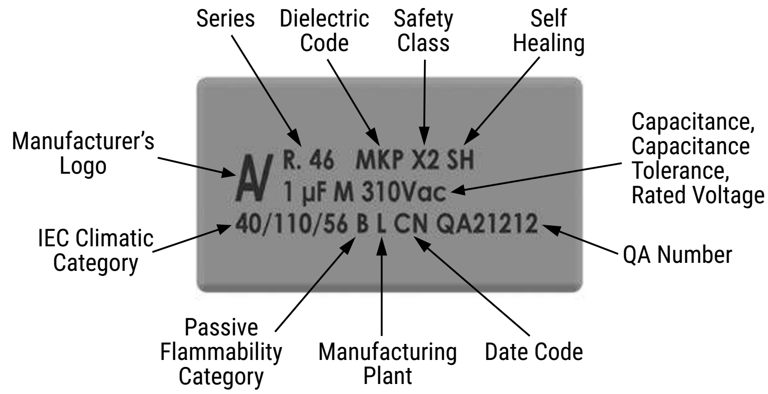
Lead Spacing 22.5 and 27.5 mm (alternatives*) and 37.5 mm

FRONT



**Differences are caused by technology (clichee, laser, or ink) and production line.*

TOP



Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads		Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped
Lead and Packaging Code:				00 - JA - JB JE - JH	JM	40 – 50	GY	CK	DQ
10	4	9	13	2,000	2,200	1,800	750	1,500	1,000
	5	11	13	1,300	2,000	1,500	600	1,250	800
	6	12	13	1,000	1,800	1,200	500	1,000	680
15	5	11	18	2,000	1,250	1,000	600	1,250	800
	6	12	18	1,750	1,000	900	500	1,000	680
	6	17.5	18	1,000	800	700	500	1,000	680
	7.5	13.5	18	1,000	800	700	350	800	500
	7.5	18.5	18	900	650	500	-	800	500
	8.5	14.5	18	1,000	650	500	300	700	440
	9	12.5	18	1,000	700	520	270	650	410
	10	16	18	750	550	500	270	600	380
	11	19	18	450	400	350	-	500	340
	13	12	18	750	520	490	200	480	280
22.5	6	15	26.5	805	450	500	-	700	464
	7	16	26.5	700	450	500	-	550	380
	10	18.5	26.5	396	350	300	-	350	235
	11	20	26.5	360	200	250	-	350	217
	13	22	26.5	300	150	200	-	300	
27.5	9	17	32	816	408	408	-	450	-
	11	20	32	560	336	336	-	350	-
	13	22	32	480	288	288	-	300	-
	13	25	32	480	288	288	-	-	-
	14	28	32	352	176	176	-	-	-
	18	33	32	256	128	128	-	-	-
	22	37	32	168	112	112	-	-	-
37.5	11	22	41.5	420	252	252	-	-	-
	13	24	41.5	360	216	216	-	-	-
	16	28.5	41.5	216	108	108	-	-	-
	19	32	41.5	192	96	96	-	-	-
	20	40	41.5	126	84	84	-	-	-
	24	44	41.5	108	72	72	-	-	-
	30	45	41.5	90	60	60	-	-	-

Lead Taping & Packaging (IEC 60286–2)

Figure 1
Lead Spacing 10 mm

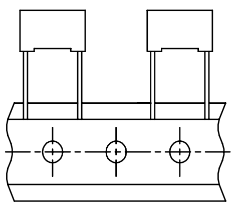


Figure 2
Lead Spacing 15 mm

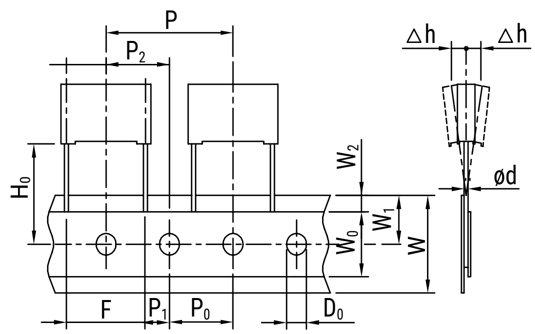
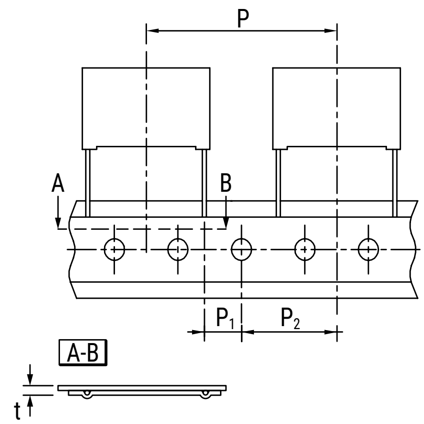


Figure 3
Lead Spacing 22.5 – 27.5 mm



Taping Specification

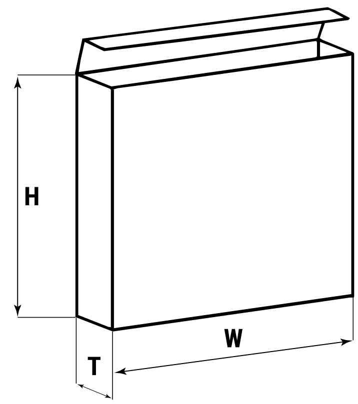
Description	Symbol	Dimensions (mm)				
		Lead Space				Tol.
		10	15	22.5	27.5	
		Fig. 1	Fig. 2	Fig. 3	Fig. 3	
Lead wire diameter	d	0.6	0.6–0.8	0.8	0.8	±0.05
Taping lead space	P	25.4	25.4	38.1	38.1	±1
Feed hole lead space *	P_0	12.7	12.7	12.7	12.7	±0.2 **
Centering of the lead wire	P_1	7.7	5.2	7.8	5.3	±0.7
Centering of the body	P_2	12.7	12.7	19.05	19.05	±1.3
Lead spacing (pitch) ***	F	10	15	22.5	27.5	+0.6/−0.1
Component alignment	Δh	0	0	0	0	±2
Height of component from tape center	H_0 ****	18.5	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	18	+1/−0.5
Hold down tape width	W_0	9	10	10	10	Minimum
Hole position	W_1	9	9	9	9	±0.5
Hold down tape position	W_2	3	3	3	3	Maximum
Feed hole diameter	D_0	4	4	4	4	±0.2
Total tape thickness	t	0.7	0.7	0.7	0.7	±0.2

** 15 mm also available*
*** Maximum of 1 mm on 20 lead spaces*
**** Pitches 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request*
***** H_0 = 16.5 mm is available upon request*

Lead Taping & Packaging (IEC 60286–2) cont.

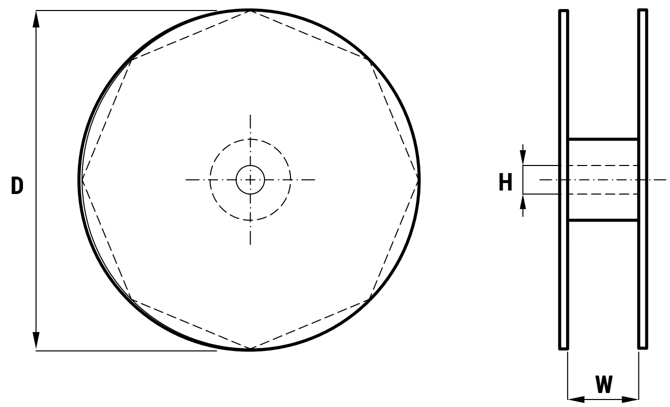
Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



Reel Specifications

Reel Size	Dimensions (mm)		
	D	H	W
Standard	355	30	55 Maximum
Large	500	25	



Metallized Polypropylene Film EMI Suppression Capacitors

R47, Class X2, 440 VAC, 110°C (Automotive Grade)

Overview

The R47 series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material that meets the requirements of UL 94 V–0.

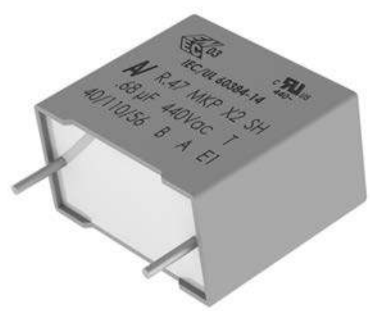
Automotive Grade devices meet the demanding Automotive Electronics Council's AEC-Q200 qualification requirements.

Applications

For worldwide use in electromagnetic interference (EMI) suppression in across-the-line applications that require X2 safety classification. Intended for use in situations in which capacitor failure would not result in exposure to electric shock.

Benefits

- Approvals: ENEC, UL, cUL
- X2 CLASS (IEC 60384-14)
- THB Grade IB
- Rated voltage: 440 VAC 50/60Hz
- Capacitance range: 0.0047 – 2.2 µF
- Lead spacing: 10.0 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category 40/110/56, IEC 60068–1
- Tape & Reel in accordance with IEC 60286–2
- RoHS compliant and lead-free terminations
- Operating temperature range of −40°C to +110°C
- 100% screening factory test at 2,700 VDC/1,700 VAC
- Self healing properties
- Automotive (AEC-Q200) grade



Part Number System

R47	4	F	1470	00	01	M	V057
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance	C-Spec
X2, Metallized Polypropylene	4 = 440	F = 10.0 I = 15.0 N = 22.5 R = 27.5 W = 37.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	See Ordering Options Table	01 02 03	K = ±10% M = ±20%	V057 = Standard (Grade IB and AEC-Q200)

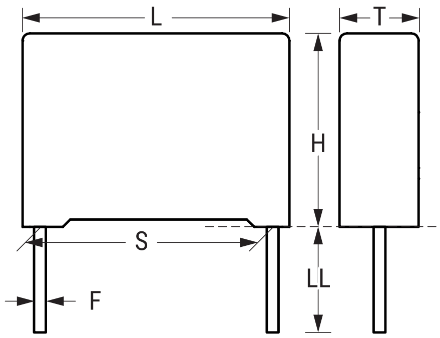
Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
10 15 22.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/−0	00
	Ammo Pack	H_0= 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK
	Bulk (Bag)[2] – Short Leads	3.5 +0.5/−0	JB
	Bulk (Bag)[2] – Short Leads	4.0 +0.5/−0	JE
	Bulk (Bag) – Long Leads	30 +5/−0	40
	Bulk (Bag) – Long Leads	25+2/−1	50
27.5 37.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/−0	00
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK[1]
	Other Lead and Packaging Options		
	Bulk (Tray) – Short Leads	3.5 +0.5/−0	JB
	Bulk (Tray) – Long Leads	30 +5/−0	40
	Bulk (Tray) – Long Leads	25 +2/−1	50

[1] Not for all sizes, see "Packaging Quantities" table.

*[2] For lead spacing 22.5 case sizes ≥ 8.5*17*26.5 the parts are packed in a Pizza box 335*320*34 mm*

Dimensions – Millimeters



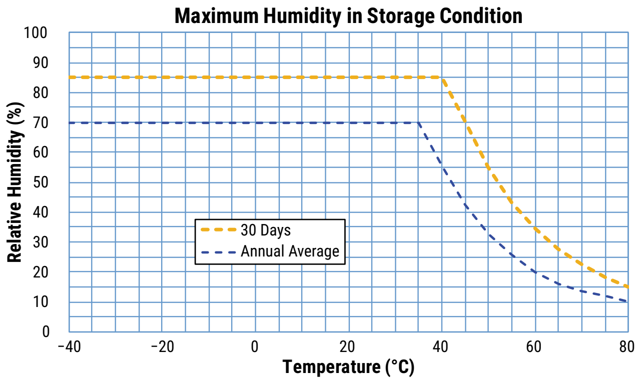
S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
10.0	±0.4	4.0	+0.2/−0.5	9.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
10.0	±0.4	5.0	+0.2/−0.5	11.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
10.0	±0.4	6.0	+0.2/−0.5	12.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
15.0	±0.4	5.0	+0.2/−0.5	11.0	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	6.0	+0.2/−0.5	12.0	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	6.0	+0.2/−0.5	17.5	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	7.5	+0.2/−0.5	13.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	7.5	+0.2/−0.5	18.5	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	±0.4	8.5	+0.2/−0.5	14.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	9.0	+0.2/−0.5	12.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	10.0	+0.2/−0.5	16.0	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	±0.4	11.0	+0.2/−0.5	19.0	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	±0.4	13.0	+0.2/−0.5	12.0	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
22.5	±0.4	6.0	+0.2/−0.5	15.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	6.5	+0.2/−0.5	13.5	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	7.0	+0.2/−0.5	16.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	8.5	+0.2/−0.5	17.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	10.0	+0.2/−0.5	18.5	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	11.0	+0.2/−0.5	20.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	13.0	+0.2/−0.5	22.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
27.5	±0.4	9.0	+0.2/−0.7	17.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	11.0	+0.2/−0.7	20.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	13.0	+0.2/−0.7	22.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	14.0	+0.2/−0.7	28.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	18.0	+0.2/−0.7	33.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	22.0	+0.2/−0.7	37.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
37.5	±0.4	11.0	+0.3/−0.7	22.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	13.0	+0.3/−0.7	24.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	16.0	+0.3/−0.7	28.5	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	19.0	+0.3/−0.7	32.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	20.0	+0.3/−0.7	40.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05

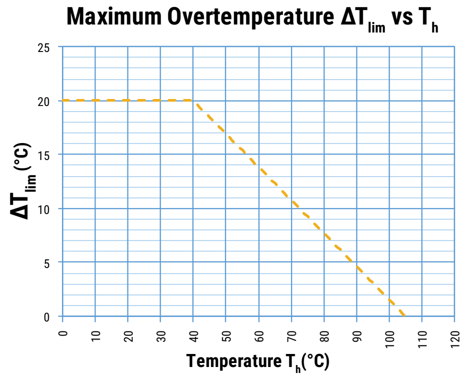
Note: See Ordering Options Table for lead length (LL/H_0) options.

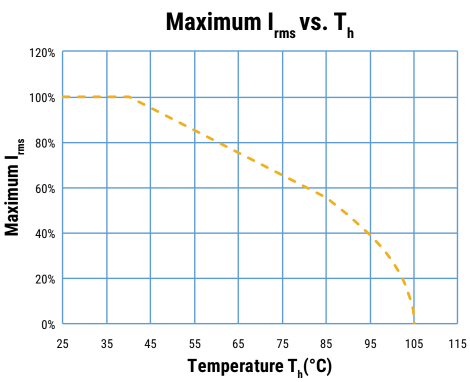
Performance Characteristics

<table>
<tr><td>Dielectric</td><td colspan="4">Polypropylene film</td></tr>
<tr><td>Plates</td><td colspan="4">Metal layer deposited by evaporation under vacuum</td></tr>
<tr><td>Winding</td><td colspan="4">Non-inductive type</td></tr>
<tr><td>Leads</td><td colspan="4">Tinned wire</td></tr>
<tr><td>Protection</td><td colspan="4">Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94.</td></tr>
<tr><td>Related Documents</td><td colspan="4">IEC 60384–14, EN 60384–14</td></tr>
<tr><td>Rated Voltage V_R</td><td colspan="4">440 VAC (50/60 Hz)</td></tr>
<tr><td>Recommended DC Voltage</td><td colspan="4">≤ 1,000 VDC</td></tr>
<tr><td>Capacitance Range</td><td colspan="4">4,700 pF to 1 µF</td></tr>
<tr><td>Capacitance Values</td><td colspan="4">E6 series (IEC 60063) measured at 1 kHz and +20 ±1°C</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="4">±10%, ±20%</td></tr>
<tr><td>Temperature Range</td><td colspan="4">−40°C to +110°C</td></tr>
<tr><td>Climatic Category</td><td colspan="4">40/110/56 IEC 60068-1</td></tr>
<tr><td rowspan="5">Storage Conditions</td><td colspan="4">Storage time: ≤ 24 months from the date marked on the label package</td></tr>
<tr><td colspan="4">Average relative humidity per year ≤ 70%</td></tr>
<tr><td colspan="4">RH ≤ 85% for 30 days randomly distributed throughout the year</td></tr>
<tr><td colspan="4">Dew is absent</td></tr>
<tr><td colspan="4">Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)</td></tr>
<tr><td>Approvals</td><td colspan="4">ENEC, UL, cUL</td></tr>
<tr><td rowspan="3">Dissipation Factor (tanδ) at 1 kHz</td><td colspan="4">Maximum Values at +25°C ±5°C</td></tr>
<tr><td colspan="2">Pitch = 10 mm</td><td colspan="2">Pitch ≥ 15 mm</td></tr>
<tr><td colspan="2">0.8%</td><td colspan="2">0.3% (typical: 0.2%)</td></tr>
<tr><td>Test Voltage Between Terminals</td><td colspan="4">The 100% screening factory test is carried out at 2,700 VDC/1,700 VAC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. This test cannot be repeated, as there is a risk of damaging the capacitor. KEMET is not liable in such cases for any failures.</td></tr>
<tr><td rowspan="4">Insulation Resistance</td><td colspan="4">Measured at +25°C ±5°C, according to IEC 60384–2</td></tr>
<tr><td colspan="4">Minimum Values Between Terminals</td></tr>
<tr><td>Voltage Charge</td><td>Voltage Charge Time</td><td>C ≤ 0.33 µF</td><td>C > 0.33 µF</td></tr>
<tr><td>100 VDC</td><td>1 minute</td><td>≥ 1 • 10^5 MΩ</td><td>≥ 30,000 MΩ • µF</td></tr>
</table>

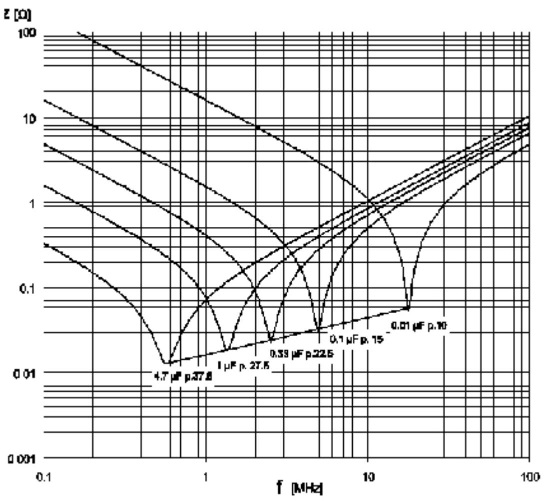
Performance Characteristics cont.







Impedance Graph



Environmental Test Data

Test	IEC Publication	Procedure
Endurance	EN/IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	MIL-STD-202 Method 204	5 G for 20 minutes, 12 cycles each of 3 orientations. Use 8" x 5" PCB, 0.031" thick. 7 secure points on one 8" side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10 – 2,000 Hz.
Mechanical Shock	MIL-STD-202 Method 213	Figure 1 of Method 213. Condition C
Temperature Cycling	JESD22-Method JA-104	1,000 cycles (−40°C to 110°C) Note: Measurement at 24 ±4 hours after test conclusion. 30 minute maximum dwell time at each temperature extreme. 1 minute maximum transition time.
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days
Biased Humidity	MIL-STD-202 Method 103	1,000 hours 40°C/93% RH. Rated Voltage. Measurement at 24 ±2 hours after test conclusion.
THB Test		85°C, 85% RH and 440 VAC, 168 hours Capacitance change (ΔC/C): ≤ 10% Dissipation factor change (Δtanδ): ≤ 150 * 10^{-4} (at 1 kHz for Cap > 1 µF) Dissipation factor change (Δtanδ): ≤ 240 * 10^{-4} (at 10 kHz for Cap ≤ 1 µF) IR ≥ 50% of initial limit or minimum 200 MΩ

Approvals

Certification Body	Mark	Specification	File Number
IMQ S-p.A.		EN/IEC 60384-14	CA08.00101
UL		UL 60384-14 and CAN/CSA E60384-14 (440VAC)	E97797

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Legacy Part Number
	T	H	L				
0.0047	4.0	9.0	13.0	10.0	750	474F1470(1)01(2) V057	R474F1470(1)01(2) V057
0.0068	5.0	11.0	13.0	10.0	750	474F1680(1)01(2) V057	R474F1680(1)01(2) V057
0.0082	6.0	12.0	13.0	10.0	750	474F1820(1)01(2) V057	R474F1820(1)01(2) V057
0.010	6.0	12.0	13.0	10.0	750	474F2100(1)01(2) V057	R474F2100(1)01(2) V057
0.010	5.0	11.0	18.0	15.0	600	474I2100(1)01(2) V057	R474I2100(1)01(2) V057
0.012	5.0	11.0	18.0	15.0	600	474I2120(1)01(2) V057	R474I2120(1)01(2) V057
0.015	5.0	11.0	18.0	15.0	600	474I2150(1)01(2) V057	R474I2150(1)01(2) V057
0.018	5.0	11.0	18.0	15.0	600	474I2180(1)01(2) V057	R474I2180(1)01(2) V057
0.022	6.0	12.0	18.0	15.0	600	474I2220(1)01(2) V057	R474I2220(1)01(2) V057
0.027	6.0	12.0	18.0	15.0	600	474I2270(1)01(2) V057	R474I2270(1)01(2) V057
0.033	6.0	12.0	18.0	15.0	600	474I2330(1)01(2) V057	R474I2330(1)01(2) V057
0.039	7.5	13.5	18.0	15.0	600	474I2390(1)01(2) V057	R474I2390(1)01(2) V057
0.047	7.5	13.5	18.0	15.0	600	474I2470(1)01(2) V057	R474I2470(1)01(2) V057
0.047	6.0	17.5	18.0	15.0	600	474I2470(1)02(2) V057	R474I2470(1)02(2) V057
0.047	9.0	12.5	18.0	15.0	600	474I2470(1)03(2) V057	R474I2470(1)03(2) V057
0.056	8.5	14.5	18.0	15.0	600	474I2560(1)01(2) V057	R474I2560(1)01(2) V057
0.068	10.0	16.0	18.0	15.0	600	474I2680(1)01(2) V057	R474I2680(1)01(2) V057
0.068	7.5	18.5	18.0	15.0	600	474I2680(1)02(2) V057	R474I2680(1)02(2) V057
0.068	13.0	12.0	18.0	15.0	600	474I2680(1)03(2) V057	R474I2680(1)03(2) V057
0.082	10.0	16.0	18.0	15.0	600	474I2820(1)01(2) V057	R474I2820(1)01(2) V057
0.10	11.0	19.0	18.0	15.0	600	474I3100(1)01(2) V057	R474I3100(1)01(2) V057
0.047	6.0	15.0	26.5	22.5	300	474N2470(1)01(2) V057	R474N2470(1)01(2) V057
0.047	6.5	13.5	26.5	22.5	300	474N2470(1)02(2) V057	R474N2470(1)02(2) V057
0.068	6.0	15.0	26.5	22.5	300	474N2680(1)01(2) V057	R474N2680(1)01(2) V057
0.10	7.0	16.0	26.5	22.5	300	474N3100(1)01(2) V057	R474N3100(1)01(2) V057
0.12	8.5	17.0	26.5	22.5	300	474N3120(1)01(2) V057	R474N3120(1)01(2) V057
0.15	10.0	18.5	26.5	22.5	300	474N3150(1)01(2) V057	R474N3150(1)01(2) V057
0.18	10.0	18.5	26.5	22.5	300	474N3180(1)01(2) V057	R474N3180(1)01(2) V057
0.22	11.0	20.0	26.5	22.5	300	474N3220(1)01(2) V057	R474N3220(1)01(2) V057
0.27	13.0	22.0	26.5	22.5	300	474N3270(1)01(2) V057	R474N3270(1)01(2) V057
0.33	13.0	22.0	26.5	22.5	300	474N3330(1)01(2) V057	R474N3330(1)01(2) V057
0.15	9.0	17.0	32.0	27.5	225	474R3150(1)01(2) V057	R474R3150(1)01(2) V057
0.18	9.0	17.0	32.0	27.5	225	474R3180(1)01(2) V057	R474R3180(1)01(2) V057
0.22	9.0	17.0	32.0	27.5	225	474R3220(1)01(2) V057	R474R3220(1)01(2) V057
0.27	9.0	17.0	32.0	27.5	225	474R3270(1)02(2) V057	R474R3270(1)02(2) V057
0.33	11.0	20.0	32.0	27.5	225	474R3330(1)02(2) V057	R474R3330(1)02(2) V057
0.39	11.0	20.0	32.0	27.5	225	474R3390(1)01(2) V057	R474R3390(1)01(2) V057
0.47	13.0	22.0	32.0	27.5	225	474R3470(1)01(2) V057	R474R3470(1)01(2) V057
0.56	13.0	22.0	32.0	27.5	225	474R3560(1)01(2) V057	R474R3560(1)01(2) V057
0.68	14.0	28.0	32.0	27.5	225	474R3680(1)01(2) V057	R474R3680(1)01(2) V057
0.82	18.0	33.0	32.0	27.5	225	474R3820(1)01(2) V057	R474R3820(1)01(2) V057
1.0	18.0	33.0	32.0	27.5	225	474R4100(1)01(2) V057	R474R4100(1)01(2) V057
1.2	18.0	33.0	32.0	27.5	225	474R4120(1)01(2) V057	R474R4120(1)01(2) V057
1.5	22.0	37.0	32.0	27.5	225	474R4150(1)01(2) V057	R474R4150(1)01(2) V057
0.47	11.0	22.0	41.5	37.5	150	474W3470(1)01(2) V057	R474W3470(1)01(2) V057
0.56	11.0	22.0	41.5	37.5	150	474W3560(1)01(2) V057	R474W3560(1)01(2) V057
0.68	13.0	24.0	41.5	37.5	150	474W3680(1)01(2) V057	R474W3680(1)01(2) V057
0.82	16.0	28.5	41.5	37.5	150	474W3820(1)01(2) V057	R474W3820(1)01(2) V057
1.0	16.0	28.5	41.5	37.5	150	474W4100(1)01(2) V057	R474W4100(1)01(2) V057
1.2	19.0	32.0	41.5	37.5	150	474W4120(1)01(2) V057	R474W4120(1)01(2) V057
1.5	19.0	32.0	41.5	37.5	150	474W4150(1)01(2) V057	R474W4150(1)01(2) V057
1.8	20.0	40.0	41.5	37.5	150	474W4180(1)01(2) V057	R474W4180(1)01(2) V057
2.2	20.0	40.0	41.5	37.5	150	474W4220(1)01(2) V057	R474W4220(1)01(2) V057
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See table for available options.
(2) M = ±20%, K = ±10%

Soldering Process

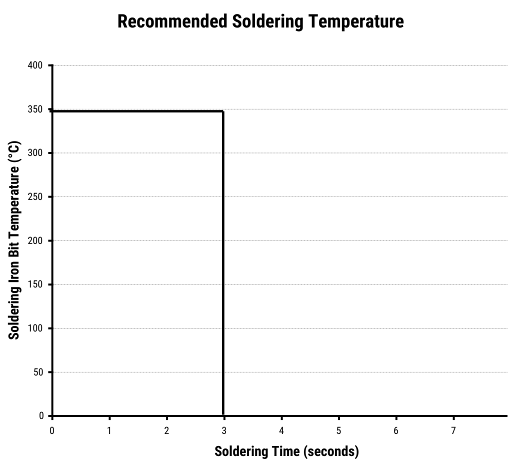
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder material. This has increased the liquidus temperature from 183°C for SnPb eutectic alloys to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm). Great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above-recommended limits may result to degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after curing surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to normal temperature before performing the second soldering cycle.

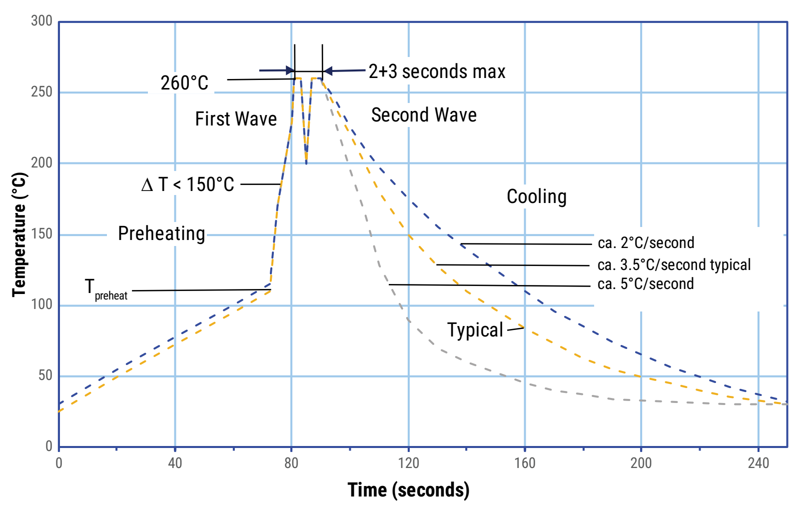
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

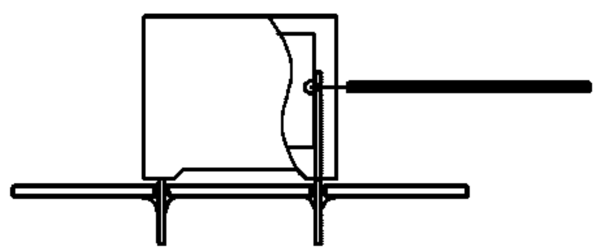
Wave Soldering Recommendations cont.

1. The table indicates the maximum set-up temperature of the soldering process.

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that the maximum temperature inside the element is below the limit.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



Temperature monitored inside the capacitor.

Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as it is in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder, only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 – 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts do not overheat.

Mounting

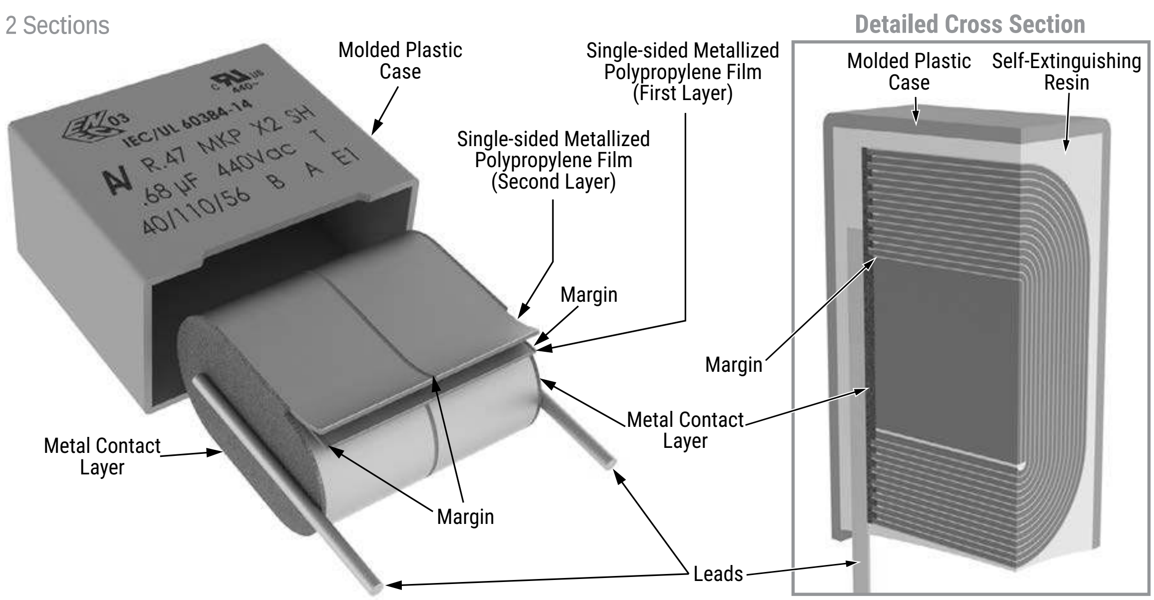
Resistance to Vibration and Mechanical Shock

AEC-Q200 Rev. E, Mechanical Stress Tests:

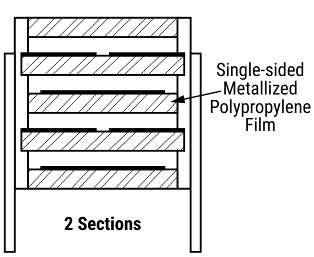
Mechanical Shock	**MIL-SDT-202 Method 213**	Figure 1 of Method 213 • THT: Condition C • SMD: Condition C • Tested per the Supplier's recommended mounting method
Vibration	**MIL-SDT-202 Method 204**	• 5 g for 20 minutes, 12 cycles each of 3 orientations • Tested per the Supplier's recommended mounting method • Verification of transfer load: during setup, verify that with the selected PCB design (size, thickness and secure points), or an alternative mount, that the transferred load onto the component corresponds to the requested load. This verification can be achieved using a laser vibrometer or other adequate measuring device • Test from 10 Hz – 2,000 Hz.

The capacitors are designed for PCB mounting. The stand-off pipes must be in good contact with the printed circuit board. The capacitor body has to be properly fixed (e.g. clamped or glued).

Construction



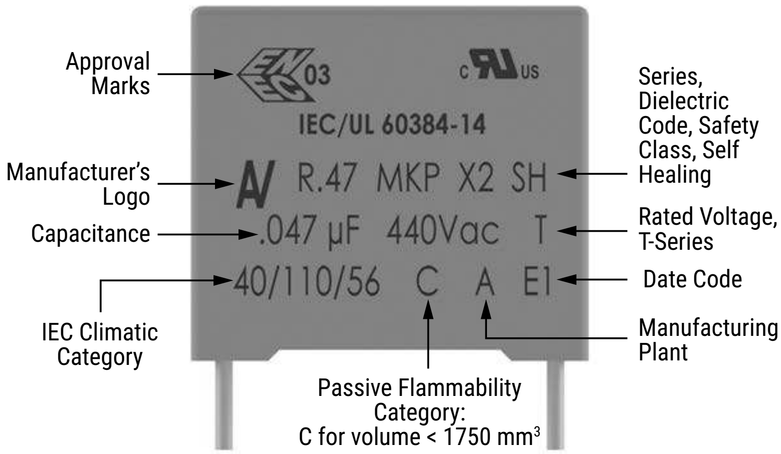
Winding Scheme



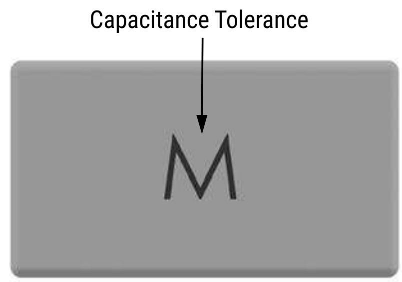
Marking

Lead Spacing 10 mm

FRONT



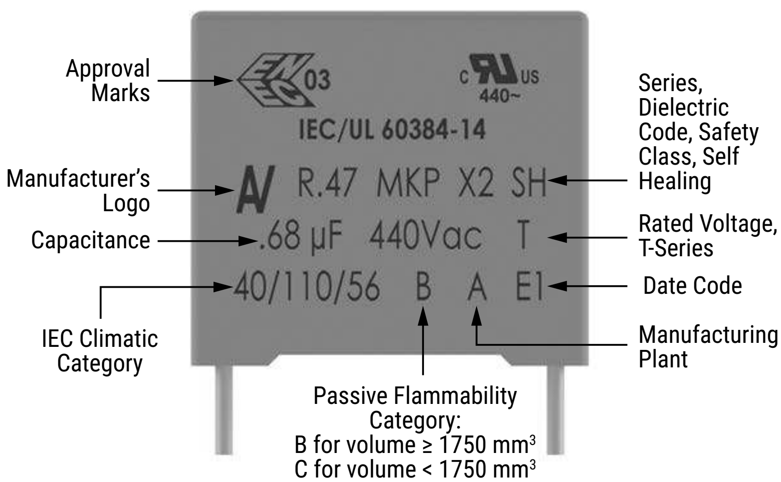
TOP



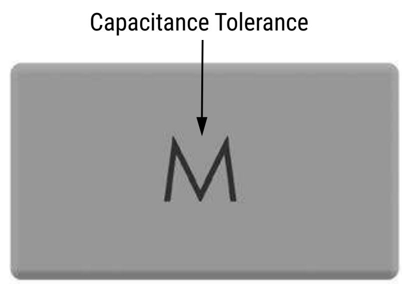
NOTE: Hot imprinting with or without color or ink jet or laser marking

Lead Spacing 15 mm, 22.5 mm, and 27.5 mm

FRONT



TOP



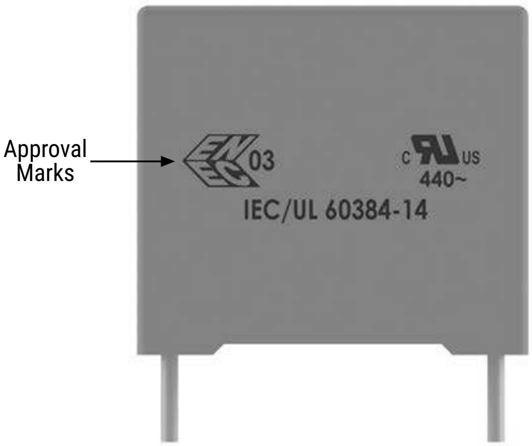
NOTE: Hot imprinting with or without color or ink jet or laser marking

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Marking cont.

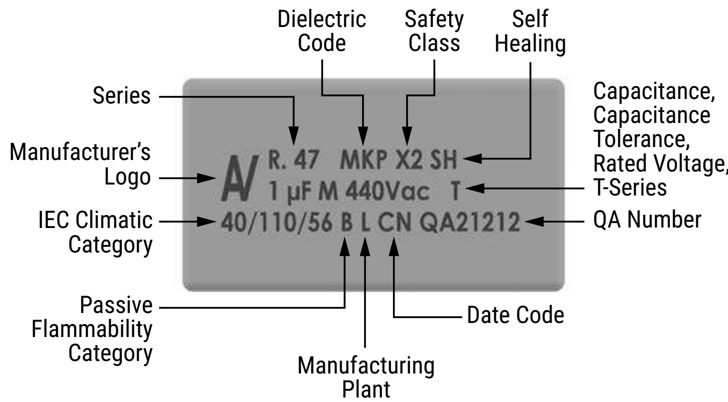
Lead Spacing 22.5 and 27.5 mm (alternatives*) and 37.5 mm

FRONT



**Differences are caused by technology (clichee, laser, or ink) and production line.*

TOP



Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads		Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped
Lead and Packaging Code:				00 - JA - JB JE - JH	JM	40 – 50	GY	CK	DQ
10	4	9	13	2,000	2,200	1,800	750	1,500	1,000
	5	11	13	1,300	2,000	1,500	600	1,250	800
	6	12	13	1,000	1,800	1,200	500	1,000	680
15	5	11	18	2,000	1,250	1,000	600	1,250	800
	6	12	18	1,750	1,000	900	500	1,000	680
	6	17.5	18	1,000	800	700	500	1,000	680
	7.5	13.5	18	1,000	650	700	350	800	500
	7.5	18.5	18	900	650	500	-	800	500
	8.5	14.5	18	1,000	700	500	300	700	440
	9	12.5	18	1,000	550	520	270	650	410
	10	16	18	750	400	500	270	600	380
	11	19	18	450	350	350	-	500	340
	13	12	18	750	520	490	200	480	280
22.5	6	15	26.5	805	450	500	-	700	464
	6.5	13,5	26.5	800	-	-	-	-	-
	7	16	26.5	700	450	500	-	550	380
	8.5	17	26.5	468	350	300	-	450	280
	10	18.5	26.5	396	350	300	-	350	235
	11	20	26.5	360	200	250	-	350	217
	13	22	26.5	300	150	200	-	300	-
27.5	9	17	32	816	408	408	-	450	-
	11	20	32	560	336	336	-	350	-
	13	22	32	480	288	288	-	300	-
	14	28	32	352	176	176	-	-	-
	18	33	32	256	128	128	-	-	-
	22	37	32	168	112	112	-	-	-
37.5	11	22	41.5	420	252	252	-	-	-
	13	24	41.5	360	216	216	-	-	-
	16	28.5	41.5	216	108	108	-	-	-
	19	32	41.5	192	96	96	-	-	-
	20	40	41.5	126	84	84	-	-	-

Lead Taping & Packaging (IEC 60286–2)

Figure 1
Lead Spacing 10 mm

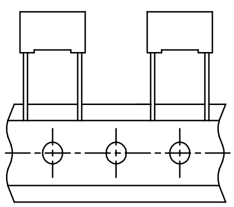


Figure 2
Lead Spacing 15 mm

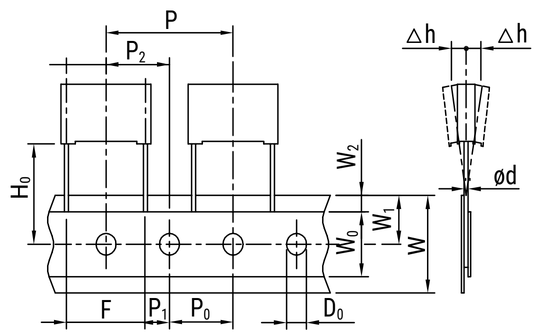
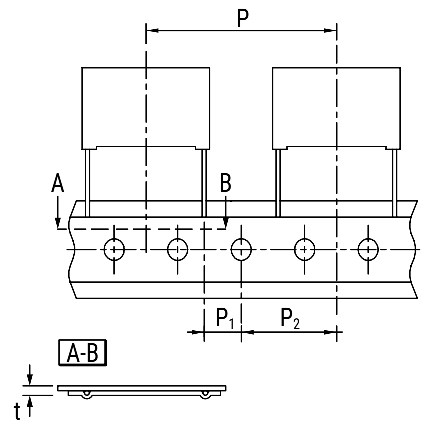


Figure 3
Lead Spacing 22.5 – 27.5 mm



Taping Specification

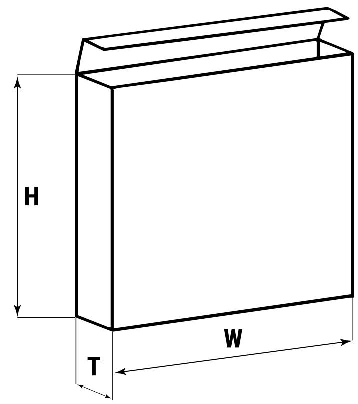
Description	Symbol	Dimensions (mm)				
		Lead Space				Tol.
		10	15	22.5	27.5	
		Fig. 1	Fig. 2	Fig. 3	Fig. 3	
Lead wire diameter	d	0.6	0.6–0.8	0.8	0.8	±0.05
Taping lead space	P	25.4	25.4	38.1	38.1	±1
Feed hole lead space *	P_0	12.7	12.7	12.7	12.7	±0.2 **
Centering of the lead wire	P_1	7.7	5.2	7.8	5.3	±0.7
Centering of the body	P_2	12.7	12.7	19.05	19.05	±1.3
Lead spacing (pitch) ***	F	10	15	22.5	27.5	+0.6/−0.1
Component alignment	Δh	0	0	0	0	±2
Height of component from tape center	H_0 ****	18.5	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	18	+1/−0.5
Hold down tape width	W_0	9	10	10	10	Minimum
Hole position	W_1	9	9	9	9	±0.5
Hold down tape position	W_2	3	3	3	3	Maximum
Feed hole diameter	D_0	4	4	4	4	±0.2
Total tape thickness	t	0.7	0.7	0.7	0.7	±0.2

** 15 mm also available*
*** Maximum of 1 mm on 20 lead spaces*
**** Pitches 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request*
***** H_0 = 16.5 mm is available upon request*

Lead Taping & Packaging (IEC 60286–2) cont.

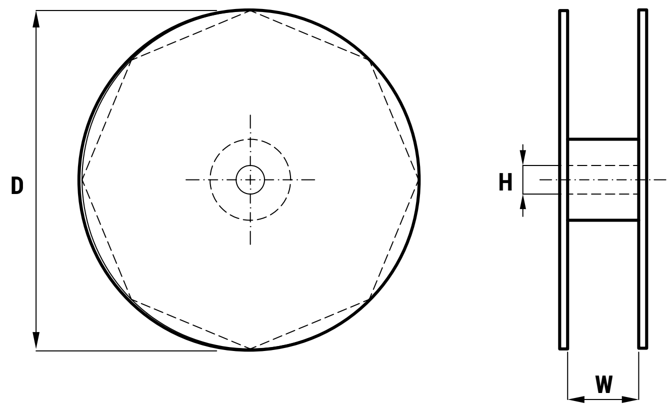
Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



Reel Specifications

Reel Size	Dimensions (mm)		
	D	H	W
Standard	355	30	55 Maximum
Large	500	25	



R47, Class X1, 440 VAC, 110°C (Automotive Grade)

Overview

The R47 is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material meeting the requirements of UL 94 V–0.

Automotive Grade devices meet the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

Applications

For use as a electromagnetic interference (EMI) suppression filter in across-the-line applications requiring X1 safety classification. Intended for use in situations where exposure to a shock in the event of capacitor failure is not possible. X1 classified capacitors are for use only in a permanently connected apparatus with a connection to mains which cannot be loosened without the use of a tool.

Benefits

- Approvals: ENEC, UL, cUL
- Class X1 (IEC 60384-14)
- THB Grade IB
- Rated voltage: 440 VAC 50/60 Hz
- Capacitance range: 0.0047 – 2.2 µF
- Lead spacing: 10.0 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category: 40/110/56, IEC 60068–1
- Tape and reel in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of -40˚C to +110˚C
- 100% screening factory test at 2,700 VDC/1,700 VAC
- Self-healing properties
- Automotive (AEC–Q200) grade

Simulator Tool available online:

K-SIM

Part Number System

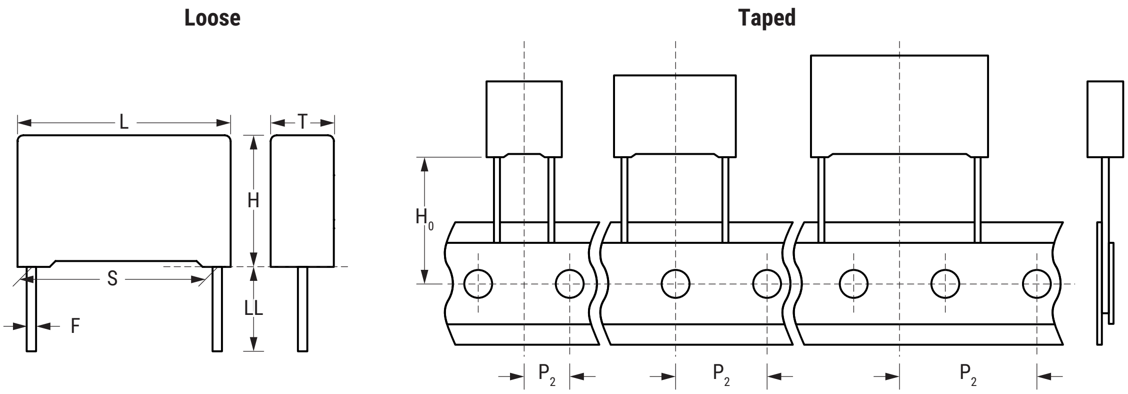
R47	4	I	2100	00	A1	M	V057
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance	C-Spec
X1, Metallized Polypropylene	4 = 440	F = 10.0 I = 15.0 N = 22.5 R = 27.5 W = 37.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	See Ordering Options Table	A1 A2 A3	K = ±10% M = ±20%	V057 = Standard (Grade IB and AEC-Q200)

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
10, 15, 22.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/-0	00
	Ammo Pack	H_0= 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK
	Bulk (Bag) – Short Leads	3.5 +0.5/-0	JB
	Bulk (Bag) – Short Leads	4.0 +0.5/-0	JE
	Bulk (Bag) – Short Leads	3.2 +0.3/-0	JH
	Bulk (Bag) – Long Leads	18 ±1	JM
	Bulk (Bag) – Long Leads	30 +5/-0	40
	Bulk (Bag) – Long Leads	25 +2/-1	50
27.5	**Standard Lead and Packaging Options**		
	Bulk (Tray)–Short Leads	4 +2/-0	00
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK[1]
	Other Lead and Packaging Options		
	Bulk (Tray)–Short Leads	3.5 +0.5/-0	JB
	Bulk (Tray)–Short Leads	4.0 +0.5/-0	JE
	Bulk (Tray)–Short Leads	3.2 +0.3/-0	JH
	Bulk (Tray)–Long Leads	18 ±1	JM
	Bulk (Tray)–Long Leads	30 +5/-0	40
	Bulk (Tray)–Long Leads	25 +2/-1	50
37.5	**Standard Lead and Packaging Options**		
	Bulk (Tray)–Short Leads	4 +2/-0	00
	Other Lead and Packaging Options		
	Bulk (Tray)–Short Leads	2.7 +0.5/-0	JA
	Bulk (Tray)–Short Leads	3.5 +0.5/-0	JB
	Bulk (Tray)–Short Leads	4.0 +0.5/-0	JE
	Bulk (Tray)–Short Leads	3.2 +0.3/-0	JH
	Bulk (Tray)–Long Leads	18 ±1	JM
	Bulk (Tray)–Long Leads	30 +5/-0	40
	Bulk (Tray)–Long Leads	25 +2/-1	50

[1] Not for all sizes, see "Packaging Quantities" table

Dimensions – Millimeters

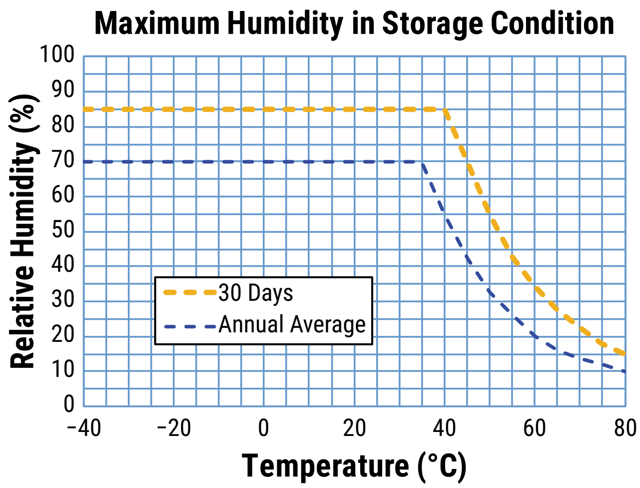


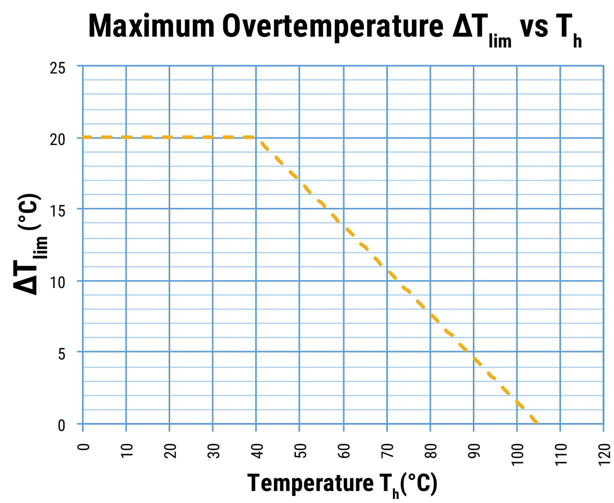
S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
10.0	± 0.4	4.0	+0.2/−0.5	9.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
10.0	± 0.4	5.0	+0.2/−0.5	11.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
10.0	±0.4	6.0	+0.2/−0.5	12.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
15.0	±0.4	5.0	+0.2/−0.5	11.0	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	6.0	+0.2/−0.5	12.0	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	6.0	+0.2/−0.5	17.5	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	7.5	+0.2/−0.5	13.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	7.5	+0.2/−0.5	18.5	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	±0.4	8.5	+0.2/−0.5	14.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	9.0	+0.2/−0.5	12.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	10.0	+0.2/−0.5	16.0	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	±0.4	11.0	+0.2/−0.5	19.0	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	±0.4	13.0	+0.2/−0.5	12.0	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
22.5	±0.4	6.0	+0.2/−0.5	15.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	6.5	+0.2/−0.5	13,5	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	7.0	+0.2/−0.5	16.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	8.5	+0.2/−0.5	17.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	10.0	+0.2/−0.5	18.5	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	11.0	+0.2/−0.5	20.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	13.0	+0.2/−0.5	22.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
27.5	±0.4	9.0	+0.2/−0.7	17.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	11.0	+0.2/−0.7	20.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	13.0	+0.2/−0.7	22.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	14.0	+0.2/−0.7	28.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	18.0	+0.2/−0.7	33.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	22.0	+0.2/−0.7	37.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
37.5	±0.4	11.0	+0.3/−0.7	22.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	13.0	+0.3/−0.7	24.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	16.0	+0.3/−0.7	28.5	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	19.0	+0.3/−0.7	32.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	20.0	+0.3/−0.7	40.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
Note: See Ordering Options Table for lead length (LL/H_0) options.									

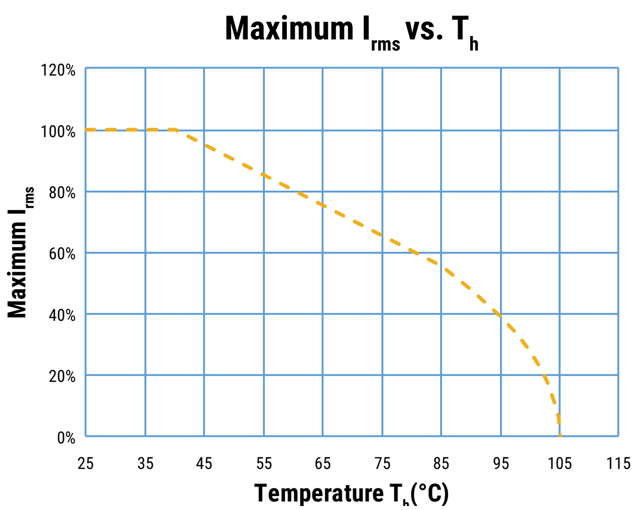
Performance Characteristics

Dielectric	Polypropylene film			
Plates	Metal layer deposited by evaporation under vacuum			
Winding	Non-inductive type			
Leads	Tinned wire			
Protection	Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94.			
Related documents	IEC 60384-14, EN 60384-14			
Rated Voltage (V_R)	440 VAC (50/60 Hz)			
Recommended DC Voltage	1,000 VDC			
Capacitance Range	0.0047 – 2.2 µF			
Capacitance Values	E6/E12 series (IEC 60063)			
Capacitance Tolerance	±10%, ±20%			
Temperature Range	−40° to +110°C			
Climatic Category	40/110/56 IEC 60068-1			
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package			
	Average relative humidity per year ≤ 70%			
	RH ≤ 85% for 30 days randomly distributed throughout the year			
	Dew is absent			
	Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)			
Approvals	ENEC, UL, cUL			
Dissipation Factor (tanδ) at 1 kHz	Maximum Values at +25°C ±5°C			
	Pitch = 10 mm		Pitch ≥ 15 mm	
	0.8%		0.3% (Typical: 0.2%)	
Test Voltage Between Terminals	The 100% screening factory test is carried out at 2,700 VDC/1,700 VAC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. It is not permitted to repeat this test as there is a risk to damage the capacitor. KEMET is not liable in such case for any failures.			
Insulation Resistance	Measured at +25°C ±5°C, according to IEC 60384−2			
	Minimum Values Between Terminals			
	Voltage Charge	Voltage Charge Time	C ≤ 0.33 µF	C > 0.33 µF
	100 VDC	1 minute	≥ 1 • 10^5 MΩ	≥ 30,000 MΩ • µF

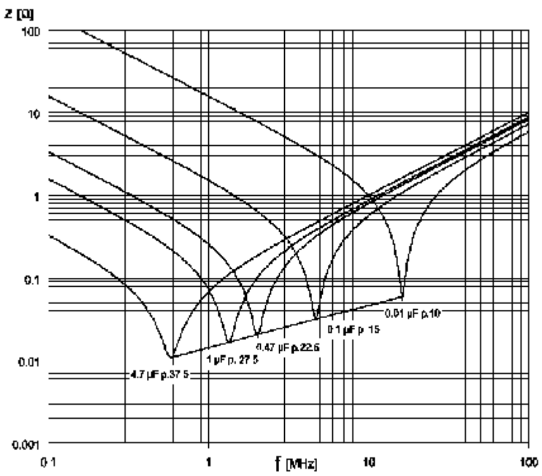
Performance Characteristics cont.







Impedance Graph



Environmental Test Data

Test	IEC Publication	Procedure
Endurance	EN/IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R +20 surge pulses at 4 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days
Biased Humidity	MIL–STD–202 Method 103	1,000 hours 40°C/93%RH. Rated Voltage. Measurement at 24 ±2 hours after test conclusion.
THB Test		85°C, 85% RH and 440 VAC, 168 hours Capacitance change (ΔC/C): ≤ 10% Dissipation factor change (Δtanδ): ≤ 150 * 10^{-4} (at 1 kHz for Cap > 1 µF) Dissipation factor change (Δtanδ): ≤ 240 * 10^{-4} (at 10 kHz for Cap ≤ 1 µF) IR ≥ 50% of initial limit or minimum 200 MΩ

Approvals

Certification Body	Mark	Specification	File Number
IMQ S.p.A.		EN/IEC 60384-14	CA08.00101
UL		UL 60384-14 and CAN/CSA E60384-14 (440 VAC)	E97797

Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Customer Part Number
	T	H	L				
0.0047	4.0	9.0	13.0	10.0	750	474F1470(1)A1(2) V057	R474F1470(1)A1(2) V057
0.0068	5.0	11.0	13.0	10.0	750	474F1680(1)A1(2) V057	R474F1680(1)A1(2) V057
0.0082	6.0	12.0	13.0	10.0	750	474F1820(1)A1(2) V057	R474F1820(1)A1(2) V057
0.010	6.0	12.0	13.0	10.0	750	474F2100(1)A1(2) V057	R474F2100(1)A1(2) V057
0.010	5.0	11.0	18.0	15.0	600	474I2100(1)A1(2) V057	R474I2100(1)A1(2) V057
0.012	5.0	11.0	18.0	15.0	600	474I2120(1)A1(2) V057	R474I2120(1)A1(2) V057
0.015	5.0	11.0	18.0	15.0	600	474I2150(1)A1(2) V057	R474I2150(1)A1(2) V057
0.018	5.0	11.0	18.0	15.0	600	474I2180(1)A1(2) V057	R474I2180(1)A1(2) V057
0.022	6.0	12.0	18.0	15.0	600	474I2220(1)A1(2) V057	R474I2220(1)A1(2) V057
0.027	6.0	12.0	18.0	15.0	600	474I2270(1)A1(2) V057	R474I2270(1)A1(2) V057
0.033	6.0	12.0	18.0	15.0	600	474I2330(1)A1(2) V057	R474I2330(1)A1(2) V057
0.039	7.5	13.5	18.0	15.0	600	474I2390(1)A1(2) V057	R474I2390(1)A1(2) V057
0.047	7.5	13.5	18.0	15.0	600	474I2470(1)A1(2) V057	R474I2470(1)A1(2) V057
0.047	6.0	17.5	18.0	15.0	600	474I2470(1)A2(2) V057	R474I2470(1)A2(2) V057
0.047	9.0	12.5	18.0	15.0	600	474I2470(1)A3(2) V057	R474I2470(1)A3(2) V057
0.056	8.5	14.5	18.0	15.0	600	474I2560(1)A1(2) V057	R474I2560(1)A1(2) V057
0.068	10.0	16.0	18.0	15.0	600	474I2680(1)A1(2) V057	R474I2680(1)A1(2) V057
0.068	7.5	18.5	18.0	15.0	600	474I2680(1)A2(2) V057	R474I2680(1)A2(2) V057
0.068	13.0	12.0	18.0	15.0	600	474I2680(1)A3(2) V057	R474I2680(1)A3(2) V057
0.082	10.0	16.0	18.0	15.0	600	474I2820(1)A1(2) V057	R474I2820(1)A1(2) V057
0.10	11.0	19.0	18.0	15.0	600	474I3100(1)A1(2) V057	R474I3100(1)A1(2) V057
0.047	6.0	15.0	26.5	22.5	300	474N2470(1)A1(2) V057	R474N2470(1)A1(2) V057
0.068	6.0	15.0	26.5	22.5	300	474N2680(1)A1(2) V057	R474N2680(1)A1(2) V057
0.10	7.0	16.0	26.5	22.5	300	474N3100(1)A1(2) V057	R474N3100(1)A1(2) V057
0.12	8.5	17.0	26.5	22.5	300	474N3120(1)A1(2) V057	R474N3120(1)A1(2) V057
0.15	10.0	18.5	26.5	22.5	300	474N3150(1)A1(2) V057	R474N3150(1)A1(2) V057
0.18	10.0	18.5	26.5	22.5	300	474N3180(1)A1(2) V057	R474N3180(1)A1(2) V057
0.22	11.0	20.0	26.5	22.5	300	474N3220(1)A1(2) V057	R474N3220(1)A1(2) V057
0.27	13.0	22.0	26.5	22.5	300	474N3270(1)A1(2) V057	R474N3270(1)A1(2) V057
0.33	13.0	22.0	26.5	22.5	300	474N3330(1)A1(2) V057	R474N3330(1)A1(2) V057
0.15	9.0	17.0	32.0	27.5	225	474R3150(1)A1(2) V057	R474R3150(1)A1(2) V057
0.18	9.0	17.0	32.0	27.5	225	474R3180(1)A1(2) V057	R474R3180(1)A1(2) V057
0.22	9.0	17.0	32.0	27.5	225	474R3220(1)A1(2) V057	R474R3220(1)A1(2) V057
0.27	9.0	17.0	32.0	27.5	225	474R3270(1)A2(2) V057	R474R3270(1)A2(2) V057
0.33	11.0	20.0	32.0	27.5	225	474R3330(1)A2(2) V057	R474R3330(1)A2(2) V057
0.39	11.0	20.0	32.0	27.5	225	474R3390(1)A1(2) V057	R474R3390(1)A1(2) V057
0.47	13.0	22.0	32.0	27.5	225	474R3470(1)A1(2) V057	R474R3470(1)A1(2) V057
0.56	13.0	22.0	32.0	27.5	225	474R3560(1)A1(2) V057	R474R3560(1)A1(2) V057
0.68	14.0	28.0	32.0	27.5	225	474R3680(1)A1(2) V057	R474R3680(1)A1(2) V057
0.82	18.0	33.0	32.0	27.5	225	474R3820(1)A1(2) V057	R474R3820(1)A1(2) V057
1.0	18.0	33.0	32.0	27.5	225	474R4100(1)A1(2) V057	R474R4100(1)A1(2) V057
1.2	18.0	33.0	32.0	27.5	225	474R4120(1)A1(2) V057	R474R4120(1)A1(2) V057
1.5	22.0	37.0	32.0	27.5	225	474R4150(1)A1(2) V057	R474R4150(1)A1(2) V057
0.47	11.0	22.0	41.5	37.5	150	474W3470(1)A1(2) V057	R474W3470(1)A1(2) V057
0.56	11.0	22.0	41.5	37.5	150	474W3560(1)A1(2) V057	R474W3560(1)A1(2) V057
0.68	13.0	24.0	41.5	37.5	150	474W3680(1)A1(2) V057	R474W3680(1)A1(2) V057
0.82	16.0	28.5	41.5	37.5	150	474W3820(1)A1(2) V057	R474W3820(1)A1(2) V057
1.0	16.0	28.5	41.5	37.5	150	474W4100(1)A1(2) V057	R474W4100(1)A1(2) V057
1.2	19.0	32.0	41.5	37.5	150	474W4120(1)A1(2) V057	R474W4120(1)A1(2) V057
1.5	19.0	32.0	41.5	37.5	150	474W4150(1)A1(2) V057	R474W4150(1)A1(2) V057
1.8	20.0	40.0	41.5	37.5	150	474W4180(1)A1(2) V057	R474W4180(1)A1(2) V057
2.2	20.0	40.0	41.5	37.5	150	474W4220(1)A1(2) V057	R474W4220(1)A1(2) V057
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Customer Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) M = ±20%, K = ±10%

Soldering Process

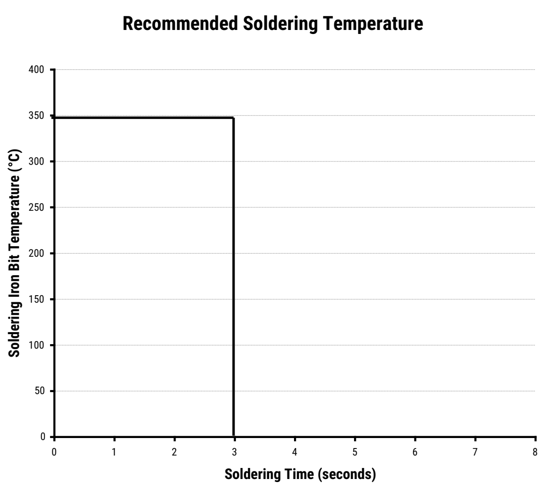
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 mm to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

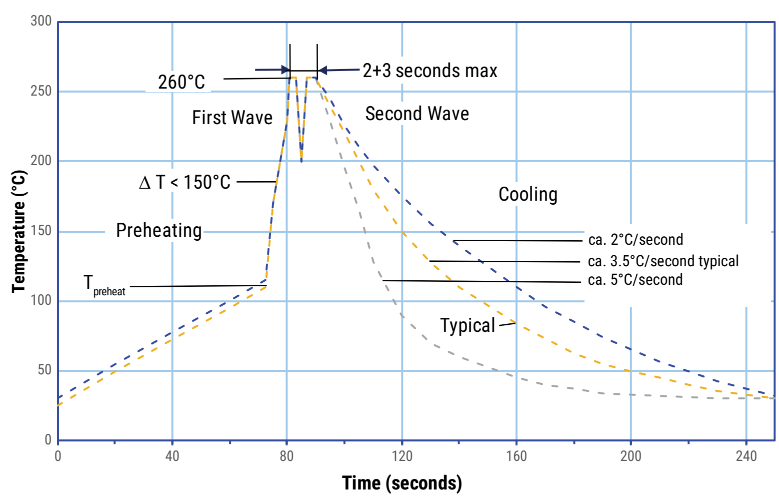
Manual Soldering Recommendations

The following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

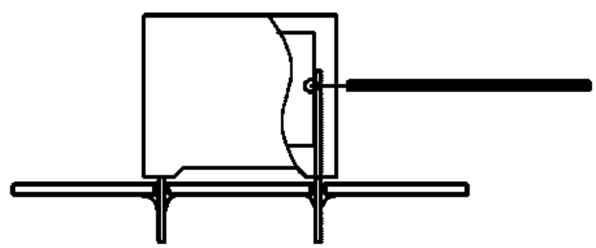
1. The table indicates the maximum set-up temperature of the soldering process

Figure 1

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene sulphide	160°C



Temperature monitored inside the capacitor.

Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Mounting

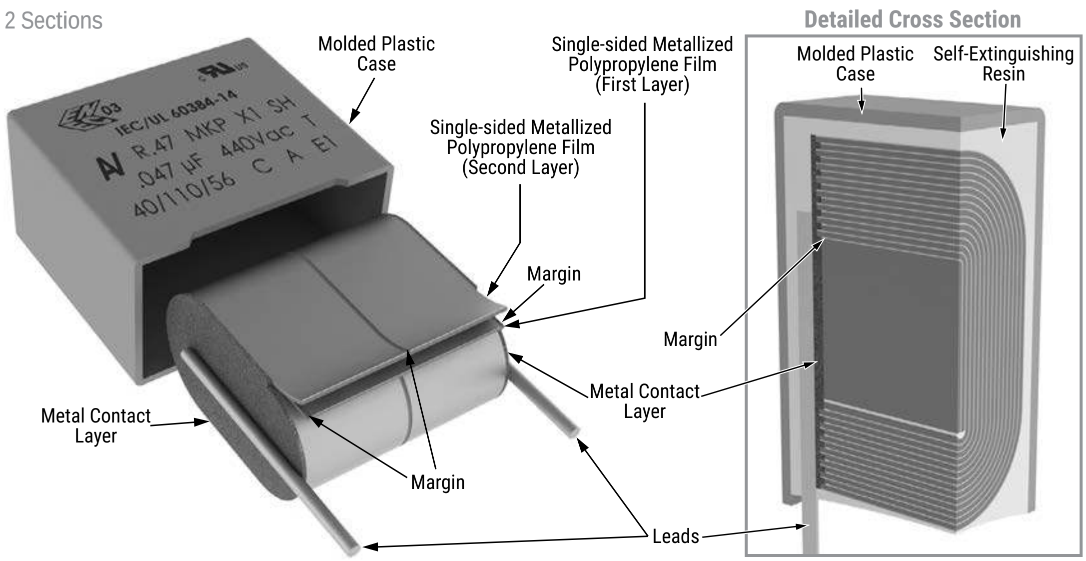
Resistance to Vibration and Mechanical Shock

AEC-Q200 Rev. E Mechanical Stress Tests:

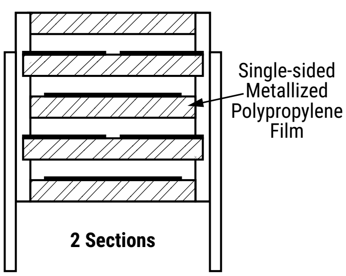
Mechanical Shock	**MIL-SDT-202 Method 213**	Figure 1 of Method 213 • THT: Condition C • SMD: Condition C • Tested per the Supplier's recommended mounting method
Vibration	**MIL-SDT-202 Method 204**	• 5 g for 20 minutes, 12 cycles each of 3 orientations • Tested per the Supplier's recommended mounting method • Verification of transfer load: during setup, verify that with the selected PCB design (size, thickness and secure points), or an alternative mount, that the transferred load onto the component corresponds to the requested load. This verification can be achieved using a laser vibrometer or other adequate measuring device • Test from 10 Hz – 2,000 Hz.

The capacitors are designed for PCB mounting. The stand-off pipes must be in good contact with the printed circuit board. The capacitor body has to be properly fixed (e.g. clamped or glued).

Construction



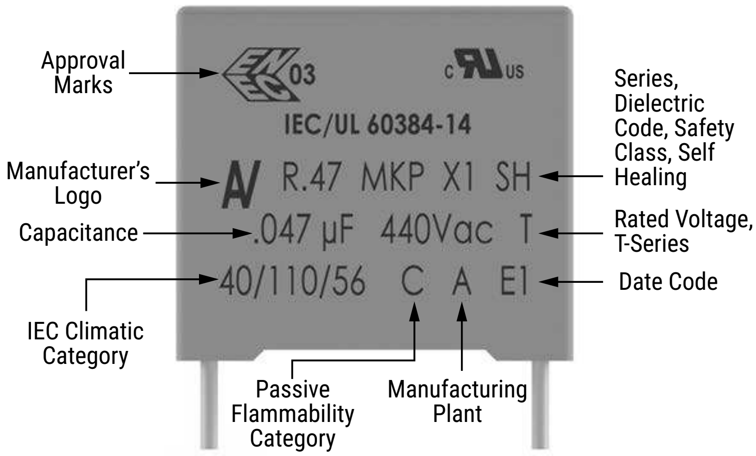
Winding Scheme



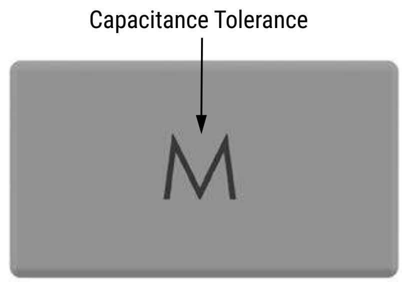
Marking

Lead Spacing 10 mm

FRONT



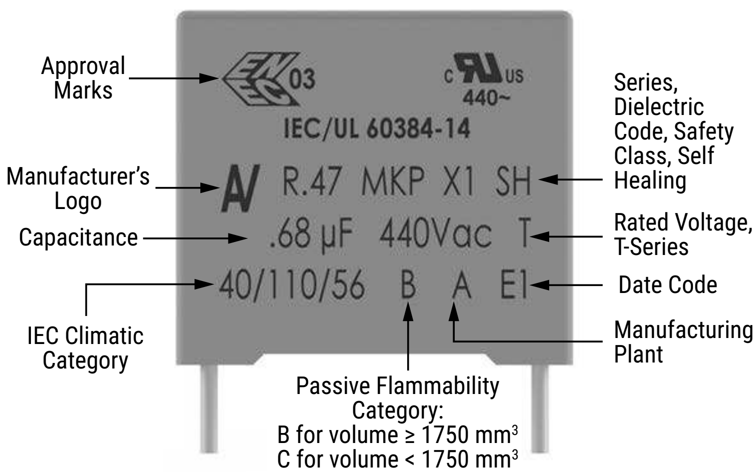
TOP



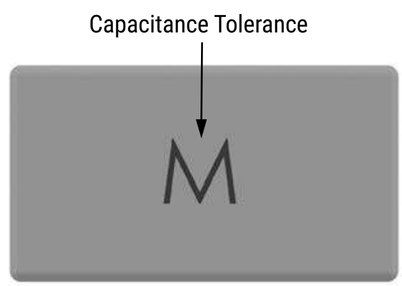
NOTE: Hot imprinting with or without color or ink jet or laser marking

Lead Spacing 15 mm, 22.5 mm (small case sizes)

FRONT



TOP



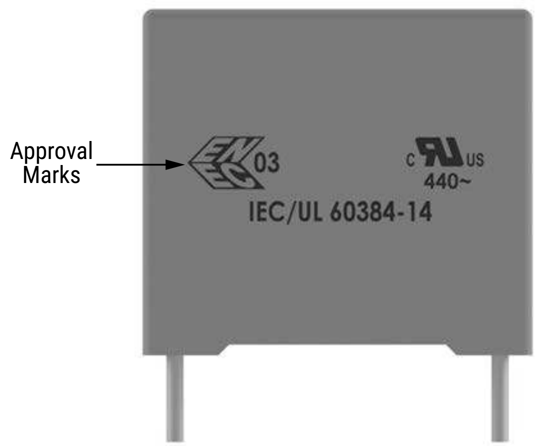
NOTE: Hot imprinting with or without color or ink jet or laser marking

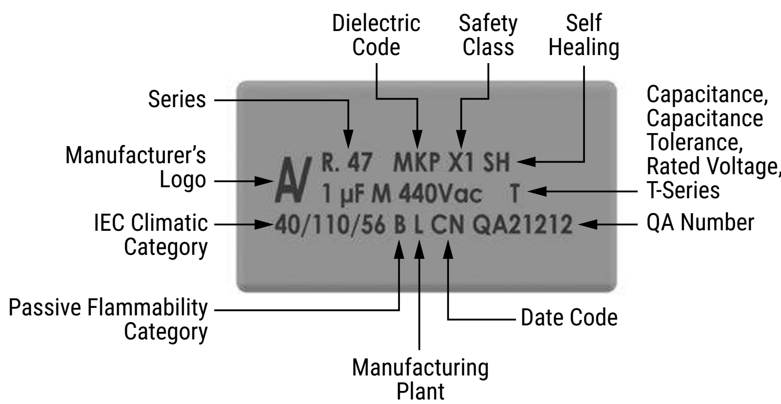
** Differences caused by technology (clichee, laser or ink jet) and production line*

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics

Marking cont.

Lead Spacing 22.5 and 27.5 mm (alternatives*) and 37.5 mm





** Differences caused by technology (clichee, laser or ink jet) and production line*

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics

Manufacturing Date Code (IEC 60062)			
Year	Code	Month	Code
2020	M	January	1
2021	N	February	2
2022	P	March	3
2023	R	April	4
2024	S	May	5
2025	T	June	6
2026	U	July	7
2027	V	August	8
2028	W	September	9
2029	X	October	O
2030	A	November	N
2031	B	December	D
2032	C		
2033	D		
2034	E		
2035	F		
2036	H		
2037	J		
2038	K		
2039	L		
2040	M		

Packaging Quantities

Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped
10	4.0	9.0	13.0	2,000	1,800	750	1,500	1,000
	5.0	11.0	13.0	1,300	1,500	600	1,250	800
	6.0	12.0	13.0	1,000	1,200	500	1,000	680
15	5.0	11.0	18.0	2,000	1,000	600	1,250	800
	6.0	12.0	18.0	1,750	900	500	1,000	680
	6.0	17.5	18.0	1,000	700	500	1,000	680
	7.5	13.5	18.0	1,000	700	350	800	500
	7.5	18.5	18.0	900	500	-	800	500
	8.5	14.5	18.0	1,000	500	300	700	440
	9.0	12.5	18.0	1,000	520	270	650	410
	10.0	16.0	18.0	750	500	300	600	380
	11.0	19.0	18.0	450	350	-	500	340
	13.0	12.0	18.0	750	490	200	480	280
22.5	6.0	15.0	26.5	805	500	–	700	464
	6.5	13.5	26.5	800	–	–	–	–
	7.0	16.0	26.5	700	500	–	550	380
	8.5	17.0	26.5	468	300	–	450	280
	10.0	18.5	26.5	396	300	–	350	235
	11.0	20.0	26.5	360	250	–	350	217
	13.0	22.0	26.5	300	200	–	300	–
27.5	9.0	17.0	32.0	816	408	–	450	–
	11.0	20.0	32.0	560	336	–	350	–
	13.0	22.0	32.0	480	288	–	300	–
	14.0	28.0	32.0	352	176	–	–	–
	18.0	33.0	32.0	256	128	–	–	–
	22.0	37.0	32.0	168	112	–	–	–
	22.0	37.0	32.0	168	112	–	–	–
37.5	11.0	22.0	41.5	420	252	–	–	–
	13.0	24.0	41.5	360	216	–	–	–
	16.0	28.5	41.5	216	108	–	–	–
	19.0	32.0	41.5	192	96	–	–	–
	20.0	40.0	41.5	126	84	–	–	–

Lead Taping & Packaging (IEC 60286–2)

Figure 1
Lead Spacing 10 mm

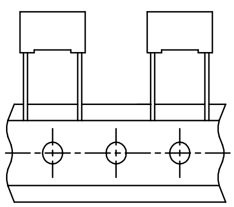


Figure 2
Lead Spacing 15 mm

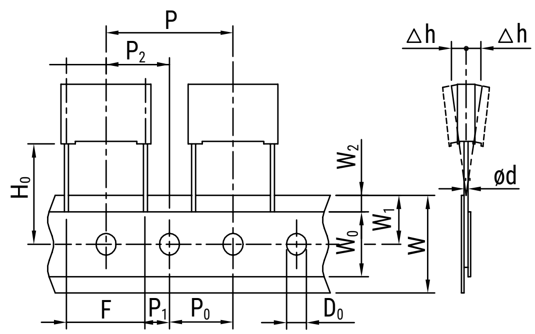
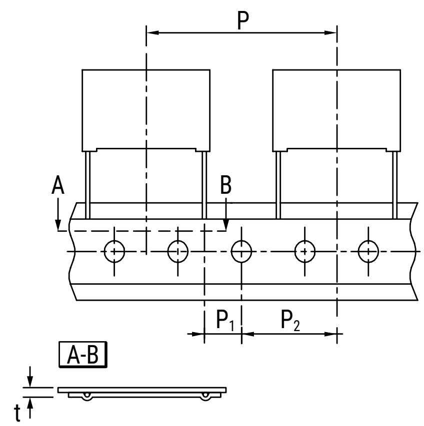


Figure 3
Lead Spacing 22.5 – 27.5 mm



Taping Specification

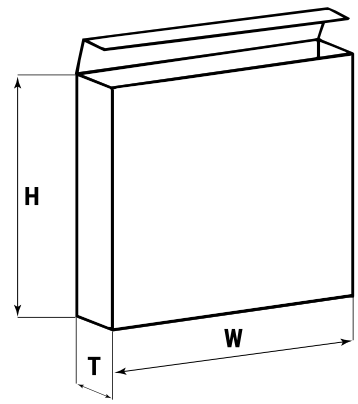
Description	Symbol	Dimensions (mm)				
		Lead Space				Tol.
		10	15	22.5	27.5	
		Fig. 1	Fig. 2	Fig. 3	Fig. 3	
Lead wire diameter	d	0.6	0.6–0.8	0.8	0.8	±0.05
Taping lead space	P	25.4	25.4	38.1	38.1	±1
Feed hole lead space *	P_0	12.7	12.7	12.7	12.7	±0.2 **
Centering of the lead wire	P_1	7.7	5.2	7.8	5.3	±0.7
Centering of the body	P_2	12.7	12.7	19.05	19.05	±1.3
Lead spacing (pitch) ***	F	10	15	22.5	27.5	+0.6/−0.1
Component alignment	Δh	0	0	0	0	±2
Height of component from tape center	H_0 ****	18.5	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	18	+1/−0.5
Hold down tape width	W_0	9	10	10	10	Minimum
Hole position	W_1	9	9	9	9	±0.5
Hold down tape position	W_2	3	3	3	3	Maximum
Feed hole diameter	D_0	4	4	4	4	±0.2
Total tape thickness	t	0.7	0.7	0.7	0.7	±0.2

** 15 mm also available*
*** Maximum of 1 mm on 20 lead spaces*
**** Pitches 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request*
***** H_0 = 16.5 mm is available upon request*

Lead Taping & Packaging (IEC 60286–2) cont.

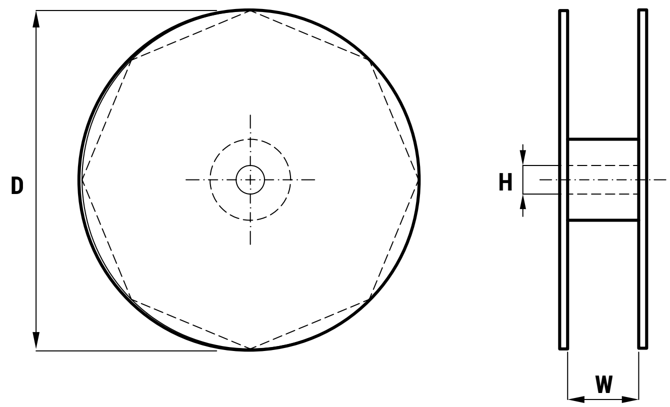
Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



Reel Specifications

Reel Size	Dimensions (mm)		
	D	H	W
Standard	355	30	55 Maximum
Large	500	25	



R49, Class X1, 310 VAC, 110°C

KEMET a YAGEO company

Overview

The R49 is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material meeting the requirements of UL 94 V–0.

Applications

For use as electromagnetic interference, (EMI) suppression filter in across-the-line applications requires X1 safety classification. Intended for the use in situations where exposure to shock in the event of capacitor failure is not possible. Not for use in "series with mains" type applications. X1 classified capacitors are only for the use in a permanently connected apparatus with a connection to mains, which cannot be loosened without the use of a tool.

Benefits

- Approvals: ENEC, UL, cUL
- Class X1 (IEC 60384-14)
- Rated voltage: 310 VAC 50/60 Hz
- Capacitance range: 0.01 – 2.2 µF
- Lead spacing: 10.0 – 27.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category: 40/110/56, IEC 60068–1
- Tape and reel in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of −40˚C to +110˚C
- 100% screening factory test at 2,200 VDC/1,500 VAC
- Self-healing properties

Part Number System

R49	A	I	3100	00	01	M
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance
X1, Metallized Polypropylene	A = 310	F = 10.0 I = 15.0 N = 22.5 R = 27.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	See Ordering Options Table	01 M1	K = ±10% M = ±20%

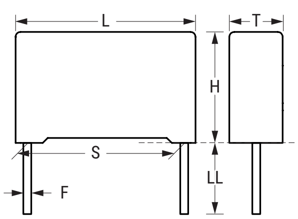
Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
10, 15, 22.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/−0	00
	Ammo Pack	H_0 = 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	CK
	Bulk (Bag) – Short Leads	3.5 +0.5/−0	JB
	Bulk (Bag) – Short Leads	4.0 +0.5/−0	JE
	Bulk (Bag) – Short Leads	3.2 +0.3/−0.2	JH
	Bulk (Bag) – Long Leads	18 ±1	JM
	Bulk (Bag) – Long Leads	30 +5/−0	40
	Bulk (Bag) – Long Leads	25 +2/−1	50
	Bulk (Bag) – Insulated Rigid Leads	30 +5/−0 (sp 8 ±2)	51
	Bulk (Bag) – Insulated Flexible Leads	150 ±5 (sp 8 ±2)	52
27.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/−0	00
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	CK[1]
	Other Lead and Packaging Options		
	Bulk (Tray) – Long Leads	30 +5/−0	40
	Bulk (Tray) – Long Leads	25 +2/−1	50
	Bulk (Bag) – Insulated Rigid Leads	30 +5/−0 (sp 8 ±2)	51
	Bulk (Bag) – Insulated Flexible Leads	150 ±5 (sp 8 ±2)	52
37.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/−0	00
	Other Lead and Packaging Options		
	Bulk (Tray) – Long Leads	30 +5/−0	40
	Bulk (Tray) – Long Leads	25 +2/−1	50
	Bulk (Bag) – Insulated Rigid Leads	30 +5/−0 (sp 8 ±2)	51
	Bulk (Bag) – Insulated Flexible Leads	150 ±5 (sp 8 ±2)	52

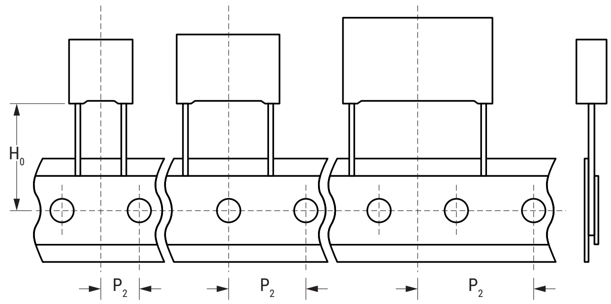
[1] *Not for all sizes, see "Packaging Quantities" table*

Dimensions – Millimeters

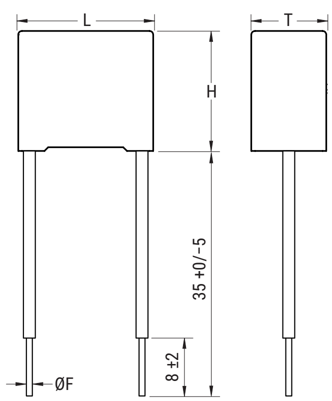
Loose



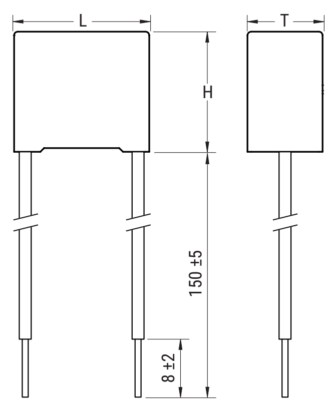
Taped



Insulated Rigid Leads



Insulated Flexible Leads 0.5 mm²



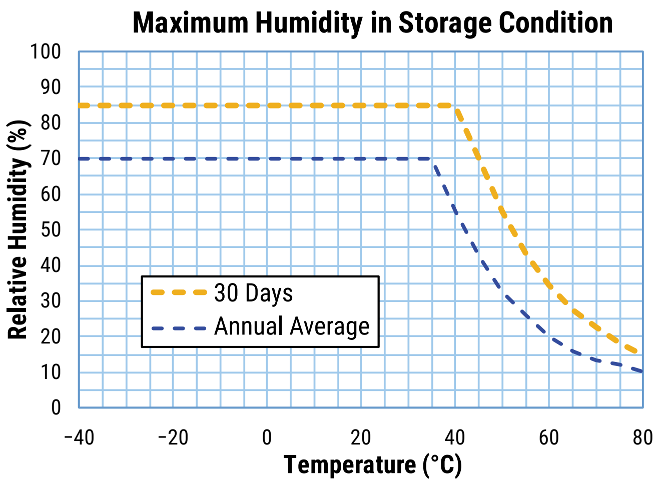
S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
10.0	±0.4	5.0	+0.2/–0.5	11.0	+0.1/–0.5	13.0	+0.2/–0.5	0.6	±0.05
10.0	±0.4	6.0	+0.2/–0.5	12.0	+0.1/–0.5	13.0	+0.2/–0.5	0.6	±0.05
15.0	±0.4	5.0	+0.2/–0.5	11.0	+0.1/–0.5	18.0	+0.3/–0.5	0.6	±0.05
15.0	±0.4	6.0	+0.2/–0.5	12.0	+0.1/–0.5	18.0	+0.3/–0.5	0.6	±0.05
15.0	±0.4	7.5	+0.2/–0.5	13.5	+0.1/–0.5	18.0	+0.5/–0.5	0.6	±0.05
15.0	±0.4	8.5	+0.2/–0.5	14.5	+0.1/–0.5	18.0	+0.5/–0.5	0.6	±0.05
15.0	±0.4	10.0	+0.2/–0.5	16.0	+0.1/–0.5	18.0	+0.5/–0.5	0.8	±0.05
22.5	±0.4	6.0	+0.2/–0.5	15.0	+0.1/–0.5	26.5	+0.3/–0.5	0.8	±0.05
22.5	±0.4	7.0	+0.2/–0.5	16.0	+0.1/–0.5	26.5	+0.3/–0.5	0.8	±0.05
22.5	±0.4	8.5	+0.2/–0.5	17.0	+0.1/–0.5	26.5	+0.3/–0.5	0.8	±0.05
22.5	±0.4	10.0	+0.2/–0.5	18.5	+0.1/–0.5	26.5	+0.3/–0.5	0.8	±0.05
22.5	±0.4	11.0	+0.2/–0.5	20.0	+0.1/–0.5	26.5	+0.3/–0.5	0.8	±0.05
27.5	±0.4	9.0	+0.2/–0.7	17.0	+0.1/–0.7	32.0	+0.3/–0.7	0.8	±0.05
27.5	±0.4	11.0	+0.2/–0.7	20.0	+0.1/–0.7	32.0	+0.3/–0.7	0.8	±0.05
27.5	±0.4	13.0	+0.2/–0.7	22.0	+0.1/–0.7	32.0	+0.3/–0.7	0.8	±0.05
27.5	±0.4	14.0	+0.2/–0.7	28.0	+0.1/–0.7	32.0	+0.3/–0.7	0.8	±0.05
27.5	±0.4	18.0	+0.2/–0.7	33.0	+0.1/–0.7	32.0	+0.3/–0.7	0.8	±0.05
27.5	±0.4	22.0	+0.2/–0.7	37.0	+0.1/–0.7	32.0	+0.3/–0.7	0.8	±0.05
Note: See Ordering Options Table for lead length (LL/H_0) options.									

Performance Characteristics

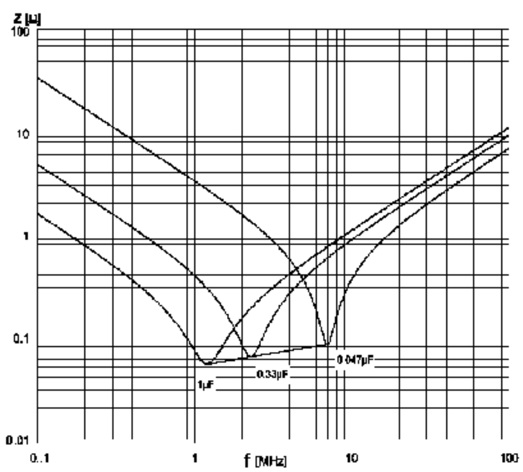
Dielectric	Polypropylene film			
Plates	Metal layer deposited by evaporation under vacuum			
Winding	Non-inductive type			
Leads	Tinned wire			
Protection	Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94.			
Related documents	IEC 60384-14, EN 60384-14			
Rated Voltage (V_R)	310 VAC (50/60 Hz)			
Recommended DC Voltage	800 VDC			
Capacitance Range	0.010 – 2.2 µF			
Capacitance Values	E6 series (IEC 60063)			
Capacitance Tolerance	±10%, ±20%			
Temperature Range	−40° to +110°C			
Climatic Category	40/110/56 IEC 60068-1			
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package			
	Average relative humidity per year ≤ 70%			
	RH ≤ 85% for 30 days randomly distributed throughout the year			
	Dew is absent			
	Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)			
Approvals	ENEC, UL, cUL			
Dissipation Factor (tanδ)	≤ 0.1% (0.06%*) at 1 kHz, +25°C ±5°C (* typical value)			
Test Voltage Between Terminals	The 100% screening factory test is carried out at 2,200 VDC/1,500 VAC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. It is not permitted to repeat this test as there is a risk to damage the capacitor. KEMET is not liable in such case for any failures.			
Insulation Resistance	Measured at +25°C ±5°C, according to IEC 60384−2			
	Minimum Values Between Terminals			
	Voltage Charge	Voltage Charge Time	C ≤ 0.33 µF	C > 0.33 µF
	100 VDC	1 minute	≥ 1 • 10^5 MΩ (≥ 5 • 10^5 MΩ)*	≥ 30,000 MΩ • µF (≥ 150,000 MΩ • µF)*

** Typical value*

Performance Characteristics cont.



Impedance Graph



Environmental Test Data

Test	IEC Publication	Procedure
Endurance	EN/IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R +20 surge pulses at 4 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
IMQ S.p.A.	ENEC	EN/IEC 60384-14	CA08.00030
UL	c UL us	UL 60384-14 and CAN/CSA E60384-14 (310 VAC)	E97797

Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Customer Part Number
	T	H	L				
0.010	5.0	11.0	13.0	10.0	600	49AF2100(1)01(2)	R49AF2100(1)01(2)
0.015	5.0	11.0	13.0	10.0	600	49AF2150(1)01(2)	R49AF2150(1)01(2)
0.022	6.0	12.0	13.0	10.0	600	49AF2220(1)01(2)	R49AF2220(1)01(2)
0.033	6.0	12.0	13.0	10.0	600	49AF2330(1)01(2)	R49AF2330(1)01(2)
0.010	5.0	11.0	18.0	15.0	500	49AI2100(1)01(2)	R49AI2100(1)01(2)
0.015	5.0	11.0	18.0	15.0	500	49AI2150(1)01(2)	R49AI2150(1)01(2)
0.022	5.0	11.0	18.0	15.0	500	49AI2220(1)01(2)	R49AI2220(1)01(2)
0.033	5.0	11.0	18.0	15.0	500	49AI2330(1)01(2)	R49AI2330(1)01(2)
0.047	6.0	12.0	18.0	15.0	500	49AI2470(1)01(2)	R49AI2470(1)01(2)
0.068	6.0	12.0	18.0	15.0	500	49AI2680(1)M1(3)	R49AI2680(1)M1(3)
0.068	7.5	13.5	18.0	15.0	500	49AI2680(1)01(2)	R49AI2680(1)01(2)
0.10	7.5	13.5	18.0	15.0	500	49AI3100(1)M1(3)	R49AI3100(1)M1(3)
0.10	8.5	14.5	18.0	15.0	500	49AI3100(1)01(2)	R49AI3100(1)01(2)
0.15	10.0	16.0	18.0	15.0	500	49AI3150(1)01(2)	R49AI3150(1)01(2)
0.10	6.0	15.0	26.5	22.5	400	49AN3100(1)01(2)	R49AN3100(1)01(2)
0.15	7.0	16.0	26.5	22.5	400	49AN3150(1)01(2)	R49AN3150(1)01(2)
0.22	8.5	17.0	26.5	22.5	400	49AN3220(1)01(2)	R49AN3220(1)01(2)
0.33	10.0	18.5	26.5	22.5	400	49AN3330(1)01(2)	R49AN3330(1)01(2)
0.47	11.0	20.0	26.5	22.5	400	49AN3470(1)01(2)	R49AN3470(1)01(2)
0.33	9.0	17.0	32.0	27.5	200	49AR3330(1)01(2)	R49AR3330(1)01(2)
0.47	11.0	20.0	32.0	27.5	200	49AR3470(1)01(2)	R49AR3470(1)01(2)
0.68	13.0	22.0	32.0	27.5	200	49AR3680(1)01(2)	R49AR3680(1)01(2)
1.0	14.0	28.0	32.0	27.5	200	49AR4100(1)01(2)	R49AR4100(1)01(2)
1.5	18.0	33.0	32.0	27.5	200	49AR4150(1)01(2)	R49AR4150(1)01(2)
2.2	22.0	37.0	32.0	27.5	200	49AR4220(1)01(2)	R49AR4220(1)01(2)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Customer Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) M = ±20%, K = ±10%
(3) M = ±20% (only available tolerance).

Soldering Process

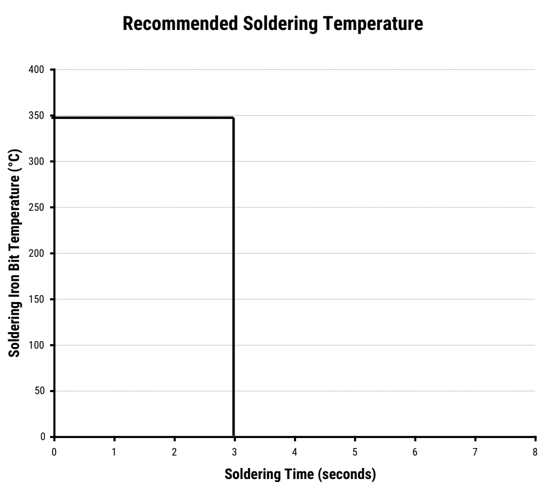
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 mm to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

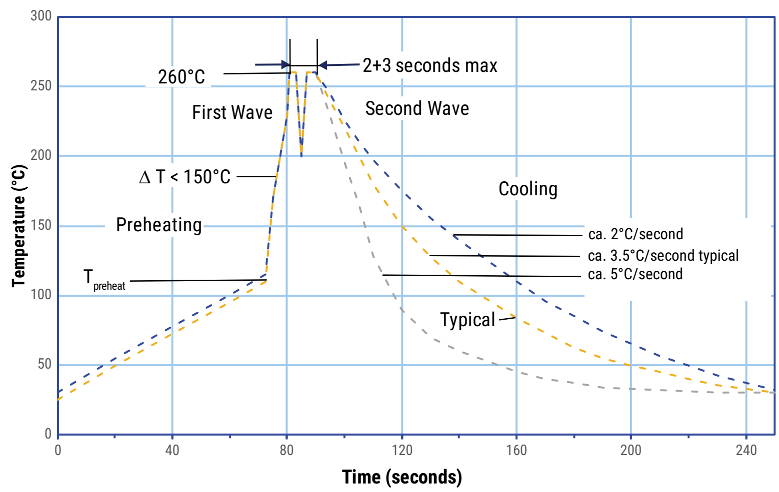
Manual Soldering Recommendations

The following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

1. The table indicates the maximum set-up temperature of the soldering process

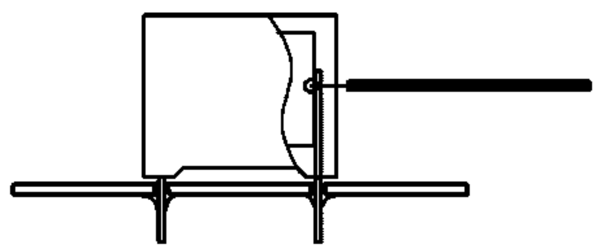
Figure 1

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene sulphide	160°C

Temperature monitored inside the capacitor.

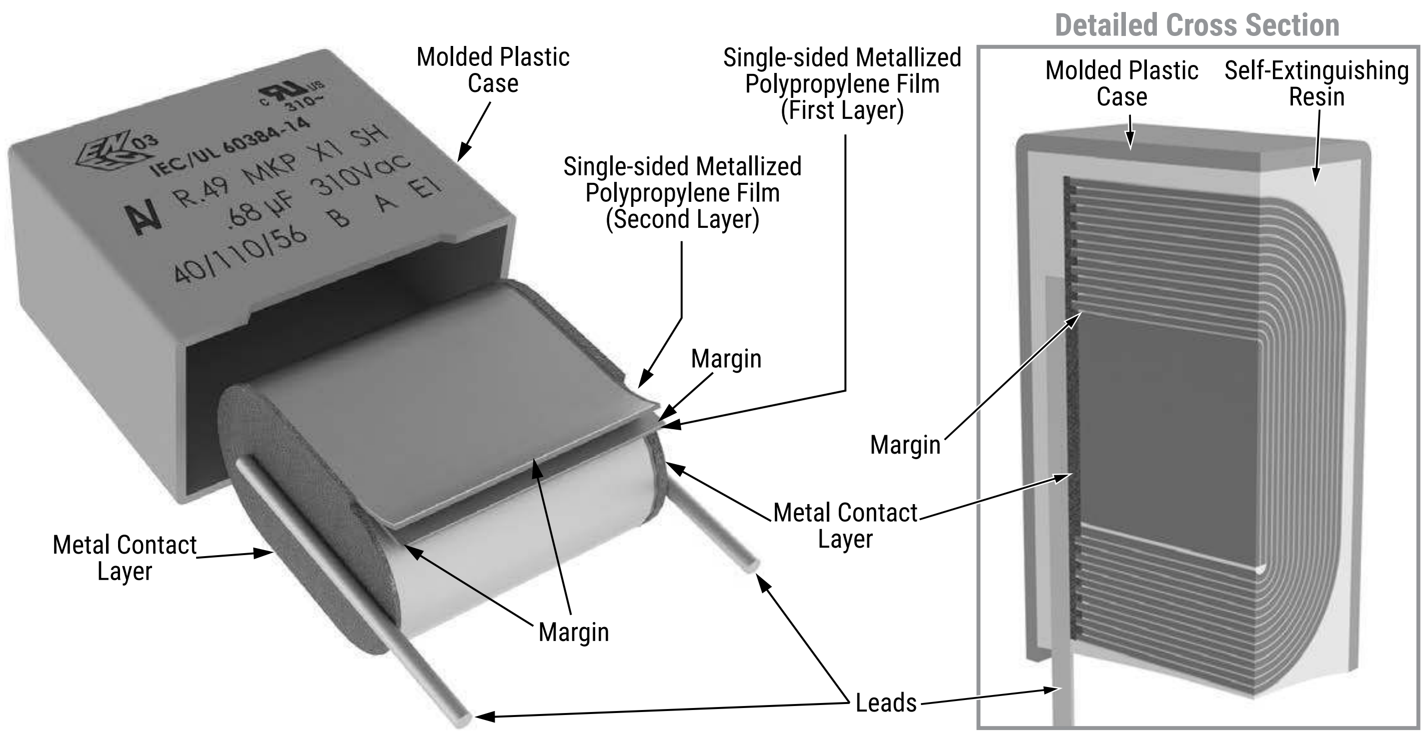


Selective Soldering Recommendations

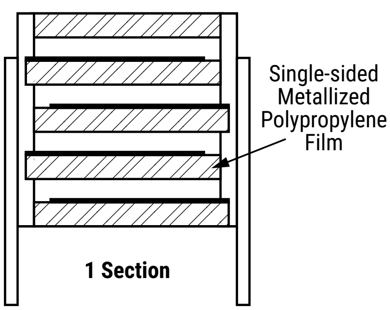
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Construction

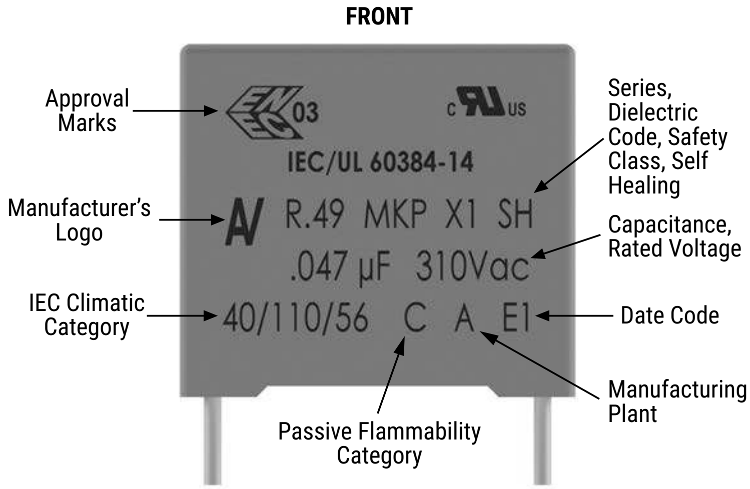


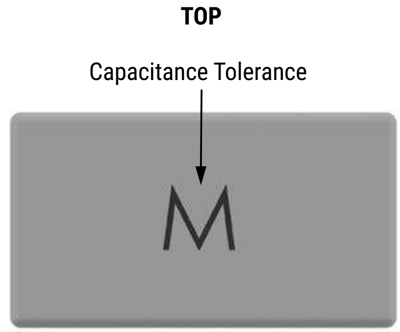
Winding Scheme



Marking

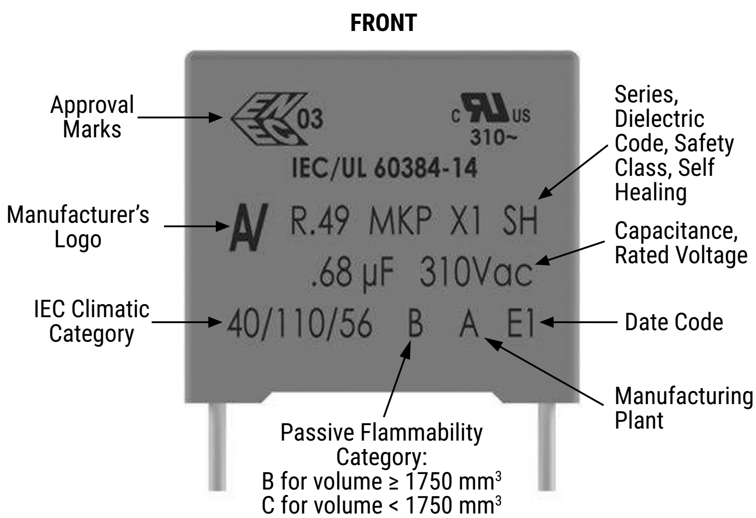
Lead Spacing 10 mm

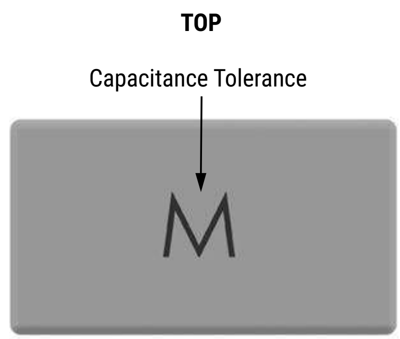




NOTE: Hot imprinting with or without color or ink jet or laser marking

Lead Spacing 15 mm, 22.5 mm (small case sizes)





NOTE: Hot imprinting with or without color or ink jet or laser marking

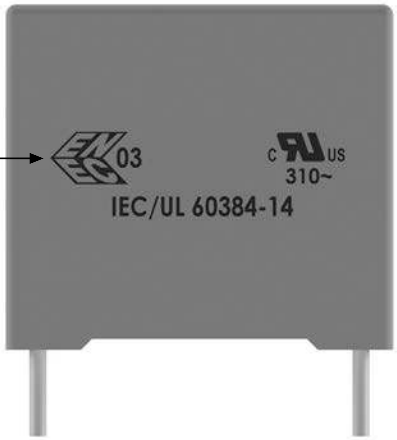
** Differences caused by technology (clichee, laser or ink jet) and production line*

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics

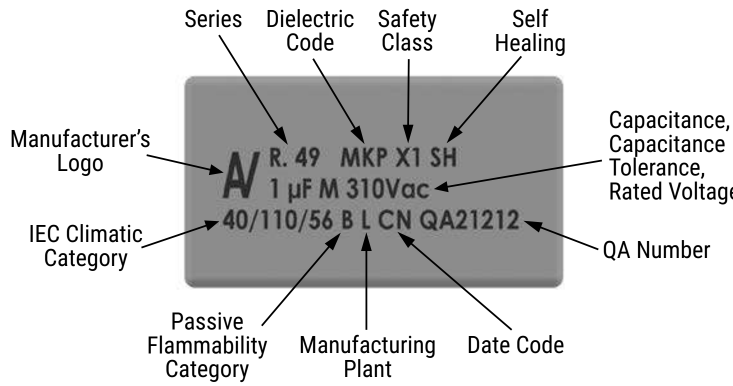
Marking cont.

Lead Spacing 22.5 and 27.5 mm (alternatives*) and 37.5 mm

FRONT



TOP



** Differences caused by technology (clichee, laser or ink jet) and production line*

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics

Manufacturing Date Code (IEC 60062)			
Y = Year, Z = Month			
Year	**Code**	**Month**	**Code**
2020	M	January	1
2021	N	February	2
2022	P	March	3
2023	R	April	4
2024	S	May	5
2025	T	June	6
2026	U	July	7
2027	V	August	8
2028	W	September	9
2029	X	October	0
2030	A	November	N
2031	B	December	D
2032	C		
2033	D		
2034	E		
2035	F		
2036	H		
2037	J		
2038	K		
2039	L		
2040	M		

Packaging Quantities

Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped
10	5.0	11.0	13.0	1,300	1,500	600	1,250	800
	6.0	12.0	13.0	1,000	1,200	500	1,000	680
15	5.0	11.0	18.0	2,000	1,000	600	1,250	800
	6.0	12.0	18.0	1,750	900	500	1,000	680
	7.5	13.5	18.0	1,000	700	350	800	500
	8.5	14.5	18.0	1,000	500	300	700	440
	10.0	16.0	18.0	750	500	300	600	380
22.5	6.0	15.0	26.5	805	500	–	700	464
	7.0	16.0	26.5	700	500	–	550	380
	8.5	17.0	26.5	468	300	–	450	280
	10.0	18.5	26.5	396	300	–	350	235
	11.0	20.0	26.5	360	250	–	350	217
27.5	9.0	17.0	32.0	816	408	–	450	–
	11.0	20.0	32.0	560	336	–	350	–
	13.0	22.0	32.0	480	288	–	300	–
	14.0	28.0	32.0	352	176	–	–	–
	18.0	33.0	32.0	256	128	–	–	–
	22.0	37.0	32.0	168	112	–	–	–

Lead Taping & Packaging (IEC 60286–2)

Figure 1
Lead Spacing 10 mm

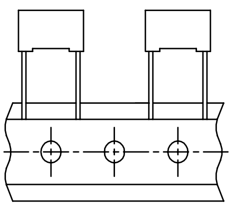


Figure 2
Lead Spacing 15 mm

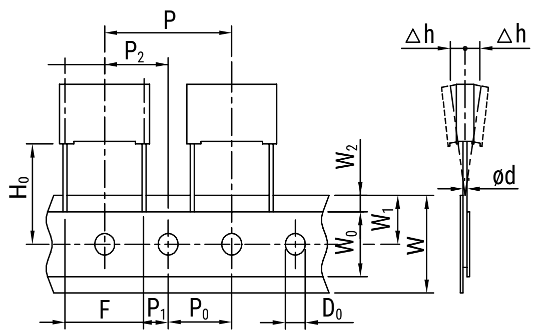
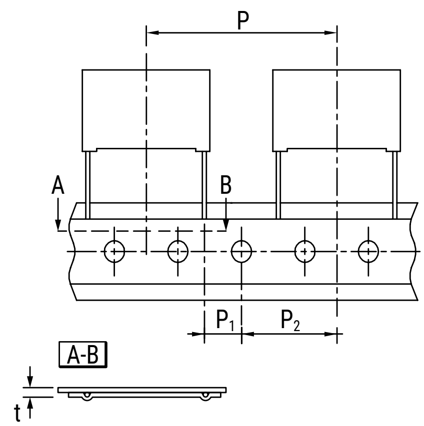


Figure 3
Lead Spacing 22.5 – 27.5 mm



Taping Specification

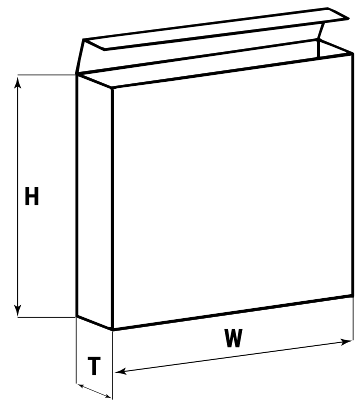
Description	Symbol	Dimensions (mm)				
		Lead Space				Tol.
		10	15	22.5	27.5	
		Fig. 1	Fig. 2	Fig. 3	Fig. 3	
Lead wire diameter	d	0.6	0.6–0.8	0.8	0.8	±0.05
Taping lead space	P	25.4	25.4	38.1	38.1	±1
Feed hole lead space *	P_0	12.7	12.7	12.7	12.7	±0.2 **
Centering of the lead wire	P_1	7.7	5.2	7.8	5.3	±0.7
Centering of the body	P_2	12.7	12.7	19.05	19.05	±1.3
Lead spacing (pitch) ***	F	10	15	22.5	27.5	+0.6/−0.1
Component alignment	Δh	0	0	0	0	±2
Height of component from tape center	H_0 ****	18.5	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	18	+1/−0.5
Hold down tape width	W_0	9	10	10	10	Minimum
Hole position	W_1	9	9	9	9	±0.5
Hold down tape position	W_2	3	3	3	3	Maximum
Feed hole diameter	D_0	4	4	4	4	±0.2
Total tape thickness	t	0.7	0.7	0.7	0.7	±0.2

** 15 mm also available*
*** Maximum of 1 mm on 20 lead spaces*
**** Pitches 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request*
***** H_0 = 16.5 mm is available upon request*

Lead Taping & Packaging (IEC 60286–2) cont.

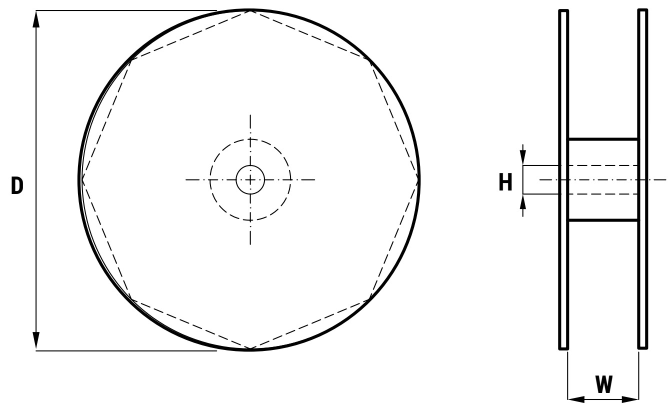
Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



Reel Specifications

Reel Size	Dimensions (mm)		
	D	H	W
Standard	355	30	55 Maximum
Large	500	25	



R49, Class X1, 330 VAC, 110°C

Overview

The R49 is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material meeting the requirements of UL 94 V–0.

Applications

For use as electromagnetic interference, (EMI) suppression filter in across-the-line applications requires X1 safety classification. Intended for the use in situations where exposure to shock in the event of capacitor failure is not possible. Not for use in "series with mains" type applications. X1 classified capacitors are only for the use in a permanently connected apparatus with a connection to mains, which cannot be loosened without the use of a tool.

Benefits

- Approvals: ENEC, UL, cUL
- Class X1 (IEC 60384-14)
- Rated voltage: 330 VAC 50/60 Hz
- Capacitance range: 0.047 – 6.8 µF
- Lead spacing: 15.0 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category: 40/110/56, IEC 60068–1
- Tape and reel in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of −40˚C to +110˚C
- 100% screening factory test at 2,200 VDC/1,500 VAC
- Self-healing properties

Part Number System

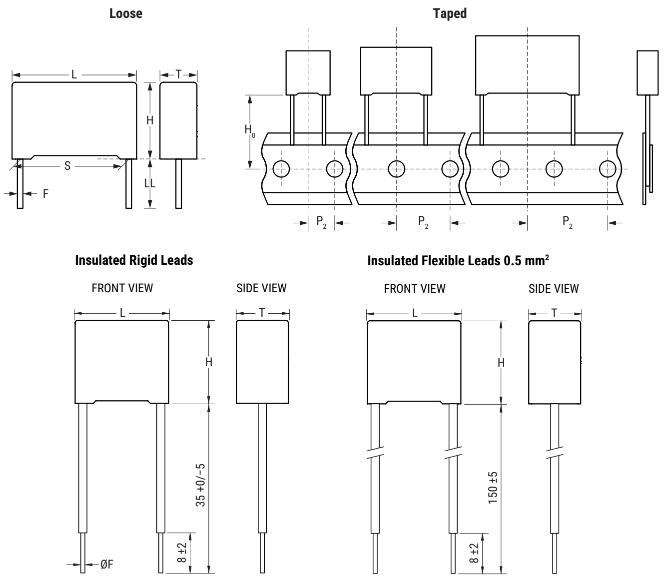
R49	A	N	3150	00	B1	M
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Lead and Packaging Code	Internal Use	Capacitance Tolerance
X1, Metallized Polypropylene	A = 330	I = 15.0 N = 22.5 R = 27.5 W = 37.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	See Ordering Options Table	A1 A2 A3 B1 B2	K = ±10% M = ±20%

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
10, 15, 22.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/−0	00
	Ammo Pack	H_0= 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK
	Bulk (Bag) – Short Leads	3.5 +0.5/−0	JB
	Bulk (Bag) – Short Leads	4.0 +0.5/−0	JE
	Bulk (Bag) – Short Leads	3.2 +0.3/−0.2	JH
	Bulk (Bag) – Long Leads	18 ±1	JM
	Bulk (Bag) – Long Leads	30 +5/−0	40
	Bulk (Bag) – Long Leads	25 +2/−1	50
	Bulk (Bag) – Insulated Rigid Leads	30 +5/−0 (sp 8 ±2)	51
	Bulk (Bag) – Insulated Flexible Leads	150 ±5 (sp 8 ±2)	52
27.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/−0	00
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK[1]
	Other Lead and Packaging Options		
	Bulk (Tray) – Long Leads	30 +5/−0	40
	Bulk (Tray) – Long Leads	25 +2/−1	50
	Bulk (Bag) – Insulated Rigid Leads	30 +5/−0 (sp 8 ±2)	51
	Bulk (Bag) – Insulated Flexible Leads	150 ±5 (sp 8 ±2)	52
37.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/−0	00
	Other Lead and Packaging Options		
	Bulk (Tray) – Long Leads	30 +5/−0	40
	Bulk (Tray) – Long Leads	25 +2/−1	50
	Bulk (Bag) – Insulated Rigid Leads	30 +5/−0 (sp 8 ±2)	51
	Bulk (Bag) – Insulated Flexible Leads	150 ±5 (sp 8 ±2)	52

[1] *Not for all sizes, see "Packaging Quantities" table*

Dimensions – Millimeters



S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
15.0	±0.4	5.0	+0.2/-0.5	11.0	+0.1/-0.5	18.0	+0.3/-0.5	0.6	±0.05
15.0	±0.4	6.0	+0.2/-0.5	12.0	+0.1/-0.5	18.0	+0.3/-0.5	0.6	±0.05
15.0	±0.4	6.0	+0.2/-0.5	17.5	+0.1/-0.5	18.0	+0.3/-0.5	0.6	±0.05
15.0	±0.4	8.5	+0.2/-0.5	14.5	+0.1/-0.5	18.0	+0.5/-0.5	0.6	±0.05
15.0	±0.4	10.0	+0.2/-0.5	16.0	+0.1/-0.5	18.0	+0.6/-0.5	0.8	±0.05
15.0	±0.4	11.0	+0.2/-0.5	19.0	+0.1/-0.5	18.0	+0.7/-0.5	0.8	±0.05
15.0	±0.4	13.0	+0.2/-0.5	12.0	+0.1/-0.5	18.0	+0.8/-0.5	0.8	±0.05
22.5	±0.4	6.0	+0.2/-0.5	15.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
22.5	±0.4	7.0	+0.2/-0.5	16.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
22.5	±0.4	8.5	+0.2/-0.5	17.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
22.5	±0.4	10.0	+0.2/-0.5	18.5	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
22.5	±0.4	13.0	+0.2/-0.5	22.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
27.5	±0.4	9.0	+0.2/-0.7	17.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	11.0	+0.2/-0.7	20.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	13.0	+0.2/-0.7	22.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	13.0	+0.2/-0.7	25.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	14.0	+0.2/-0.7	28.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	18.0	+0.2/-0.7	33.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	22.0	+0.2/-0.7	37.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
37.5	±0.4	11.0	+0.3/-0.7	22.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	13.0	+0.3/-0.7	24.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	16.0	+0.3/-0.7	28.5	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	19.0	+0.3/-0.7	32.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	30.0	+0.3/-0.7	45.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05

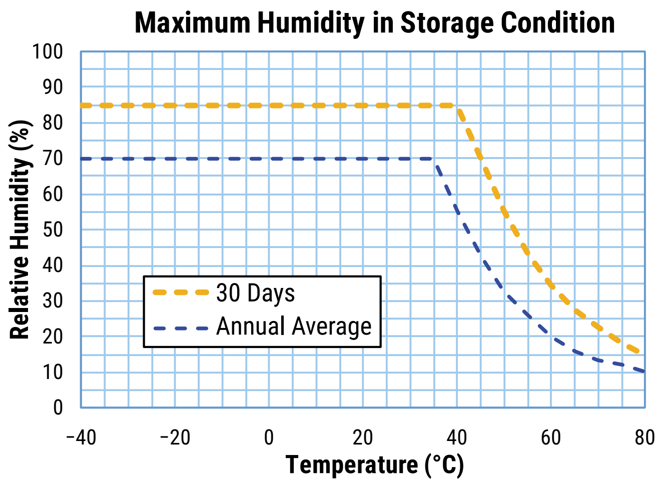
Note: See Ordering Options Table for lead length (LL/H_0) options.

Performance Characteristics

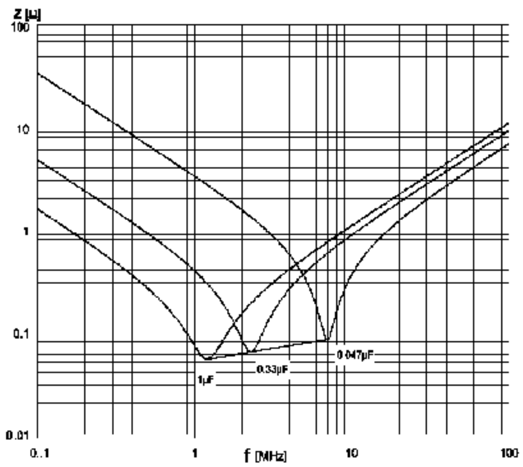
<table>
<tr><td>Dielectric</td><td colspan="4">Polypropylene film</td></tr>
<tr><td>Plates</td><td colspan="4">Metal layer deposited by evaporation under vacuum</td></tr>
<tr><td>Winding</td><td colspan="4">Non-inductive type</td></tr>
<tr><td>Leads</td><td colspan="4">Tinned wire</td></tr>
<tr><td>Protection</td><td colspan="4">Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94.</td></tr>
<tr><td>Related documents</td><td colspan="4">IEC 60384-14, EN 60384-14</td></tr>
<tr><td>Rated Voltage (V_R)</td><td colspan="4">330 VAC (50/60 Hz)</td></tr>
<tr><td>Recommended DC Voltage</td><td colspan="4">800 VDC</td></tr>
<tr><td>Capacitance Range</td><td colspan="4">0.047 – 6.8 µF</td></tr>
<tr><td>Capacitance Values</td><td colspan="4">E6 series (IEC 60063)</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="4">±10%, ±20%</td></tr>
<tr><td>Temperature Range</td><td colspan="4">−40° to +110°C</td></tr>
<tr><td>Climatic Category</td><td colspan="4">40/110/56 IEC 60068-1</td></tr>
<tr><td rowspan="5">Storage Conditions</td><td colspan="4">Storage time: ≤ 24 months from the date marked on the label package</td></tr>
<tr><td colspan="4">Average relative humidity per year ≤ 70%</td></tr>
<tr><td colspan="4">RH ≤ 85% for 30 days randomly distributed throughout the year</td></tr>
<tr><td colspan="4">Dew is absent</td></tr>
<tr><td colspan="4">Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)</td></tr>
<tr><td>Approvals</td><td colspan="4">ENEC, UL, cUL</td></tr>
<tr><td>Dissipation Factor (tanδ)</td><td colspan="4">≤ 0.1% (0.06%*) at 1 kHz, +25°C ±5°C (* typical value)</td></tr>
<tr><td>Test Voltage Between Terminals</td><td colspan="4">The 100% screening factory test is carried out at 2,200 VDC/1,500 VAC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. It is not permitted to repeat this test as there is a risk to damage the capacitor. KEMET is not liable in such case for any failures.</td></tr>
<tr><td rowspan="4">Insulation Resistance</td><td colspan="4">Measured at +25°C ±5°C, according to IEC 60384−2</td></tr>
<tr><td colspan="4">Minimum Values Between Terminals</td></tr>
<tr><td>Voltage Charge</td><td>Voltage Charge Time</td><td>C ≤ 0.33 µF</td><td>C > 0.33 µF</td></tr>
<tr><td>100 VDC</td><td>1 minute</td><td>≥ 1 • 10^5 MΩ
(≥ 5 • 10^5 MΩ)*</td><td>≥ 30,000 MΩ • µF
(≥ 150,000 MΩ • µF)*</td></tr>
</table>

** Typical value*

Performance Characteristics cont.



Impedance Graph



Environmental Test Data

Test	IEC Publication	Procedure
Endurance	EN/IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R +20 surge pulses at 4 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
IMQ S.p.A.	ENEC	EN/IEC 60384-14	CA08.00030
UL	c UL us ®	UL 60384-14 and CAN/CSA E60384-14 (330 VAC)	E97797

Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Dimensions in mm T	H	L	Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Customer Part Number
0.047	5.0	11.0	18.0	15.0	500	49AI2470(1)B1(2)	R49AI2470(1)B1(2)
0.068	6.0	12.0	18.0	15.0	500	49AI2680(1)B1(2)	R49AI2680(1)B1(2)
0.068	6.0	17.5	18.0	15.0	500	49AI2680(1)A2(2)	R49AI2680(1)A2(2)
0.10	6.0	17.5	18.0	15.0	500	49AI3100(1)A2(2)	R49AI3100(1)A2(2)
0.15	8.5	14.5	18.0	15.0	500	49AI3150(1)B1(3)	R49AI3150(1)B1(3)
0.22	10.0	16.0	18.0	15.0	500	49AI3220(1)B2(3)	R49AI3220(1)B2(3)
0.22	11.0	19.0	18.0	15.0	500	49AI3220(1)B1(2)	R49AI3220(1)B1(2)
0.15	6.0	15.0	26.5	22.5	400	49AN3150(1)B1(2)	R49AN3150(1)B1(2)
0.22	7.0	16.0	26.5	22.5	400	49AN3220(1)B1(2)	R49AN3220(1)B1(2)
0.33	8.5	17.0	26.5	22.5	400	49AN3330(1)B1(3)	R49AN3330(1)B1(3)
0.47	10.0	18.5	26.5	22.5	400	49AN3470(1)B1(3)	R49AN3470(1)B1(3)
0.68	13.0	22.0	26.5	22.5	400	49AN3680(1)B1(3)	R49AN3680(1)B1(3)
0.33	9.0	17.0	32.0	27.5	200	49AR3330(1)A1(2)	R49AR3330(1)A1(2)
0.47	11.0	20.0	32.0	27.5	200	49AR3470(1)A1(2)	R49AR3470(1)A1(2)
0.68	11.0	20.0	32.0	27.5	200	49AR3680(1)B1(2)	R49AR3680(1)B1(2)
0.68	13.0	22.0	32.0	27.5	200	49AR3680(1)A1(2)	R49AR3680(1)A1(2)
1.0	13.0	25.0	32.0	27.5	200	49AR4100(1)B1(2)	R49AR4100(1)B1(2)
1.0	14.0	28.0	32.0	27.5	200	49AR4100(1)A1(2)	R49AR4100(1)A1(2)
1.5	14.0	28.0	32.0	27.5	200	49AR4150(1)B1(2)	R49AR4150(1)B1(2)
1.5	18.0	33.0	32.0	27.5	200	49AR4150(1)A1(2)	R49AR4150(1)A1(2)
2.2	18.0	33.0	32.0	27.5	200	49AR4220(1)B1(2)	R49AR4220(1)B1(2)
2.2	22.0	37.0	32.0	27.5	200	49AR4220(1)A1(2)	R49AR4220(1)A1(2)
3.3	22.0	37.0	32.0	27.5	200	49AR4330(1)B1(2)	R49AR4330(1)B1(2)
0.68	11.0	22.0	41.5	37.5	100	49AW3680(1)B1(2)	R49AW3680(1)B1(2)
1.0	11.0	22.0	41.5	37.5	100	49AW4100(1)B1(2)	R49AW4100(1)B1(2)
1.5	13.0	24.0	41.5	37.5	100	49AW4150(1)B1(2)	R49AW4150(1)B1(2)
2.2	16.0	28.5	41.5	37.5	100	49AW4220(1)B1(2)	R49AW4220(1)B1(2)
3.3	19.0	32.0	41.5	37.5	100	49AW4330(1)B1(2)	R49AW4330(1)B1(2)
4.7	20.0	40.0	41.5	37.5	100	49AW4470(1)B1(2)	R49AW4470(1)B1(2)
6.8	30.0	45.0	41.5	37.5	100	49AW4680(1)B1(2)	R49AW4680(1)B1(2)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Customer Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) M = ±20%, K = ±10%
(3) M = ±20% (only available tolerance).

Soldering Process

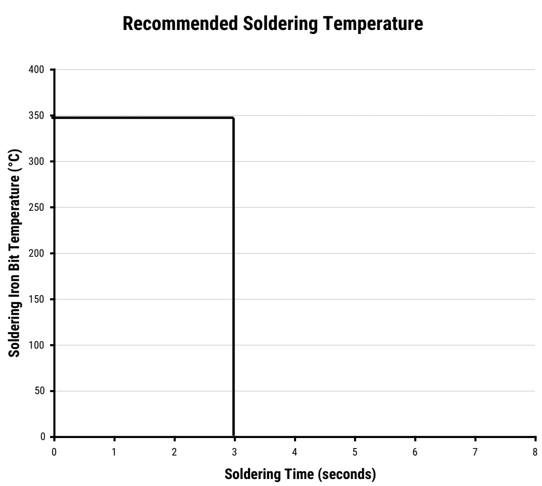
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 mm to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

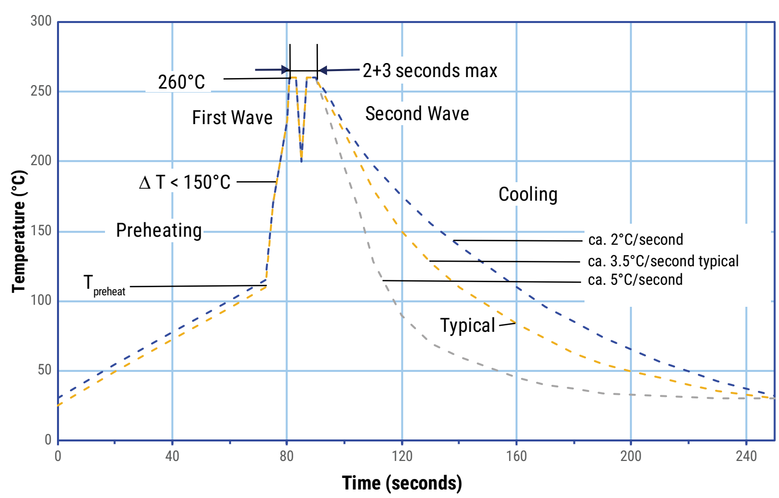
Manual Soldering Recommendations

The following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

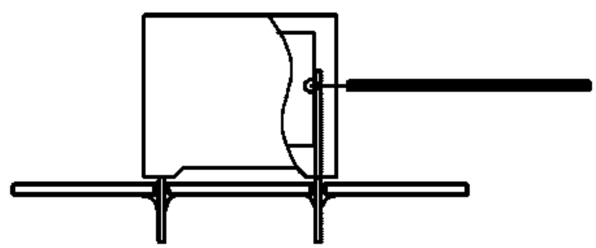
1. The table indicates the maximum set-up temperature of the soldering process

Figure 1

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene sulphide	160°C



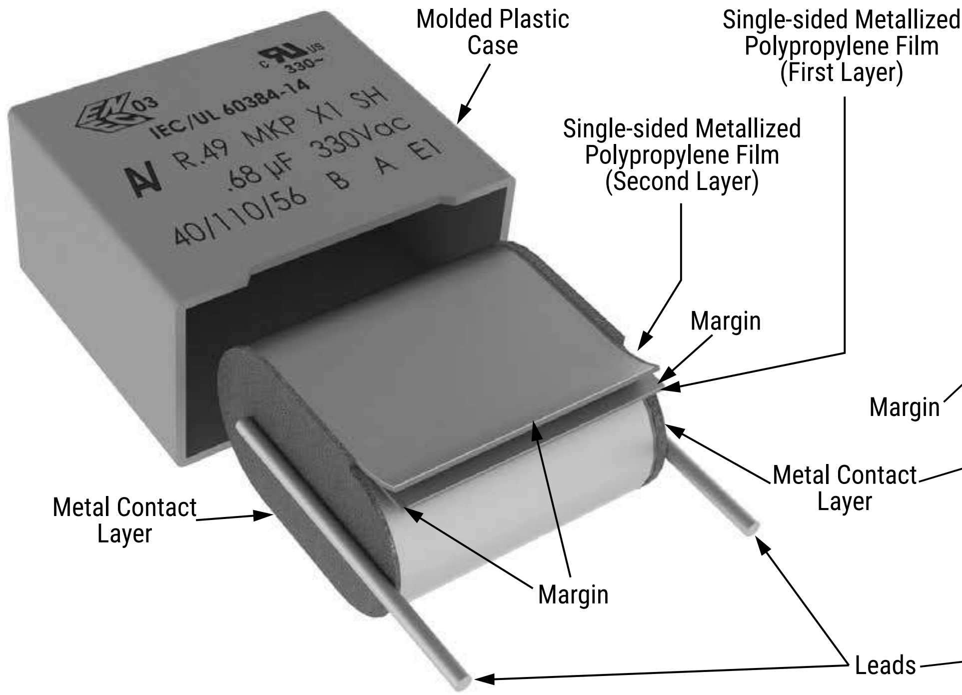
Temperature monitored inside the capacitor.

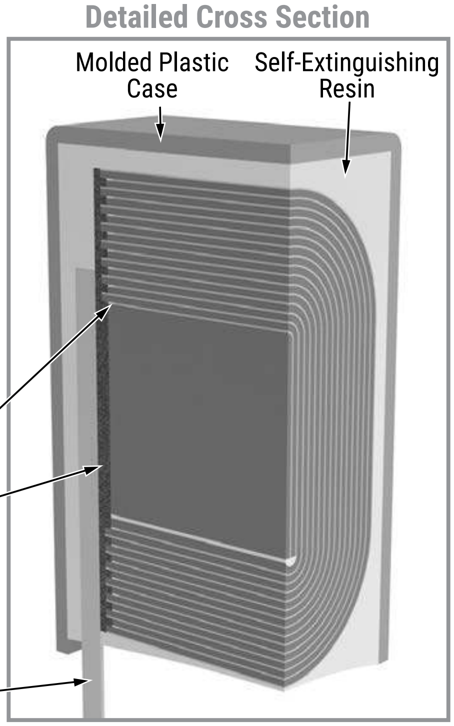
Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

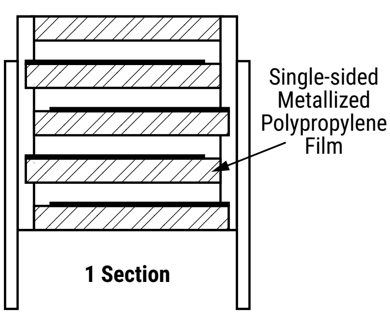
The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Construction





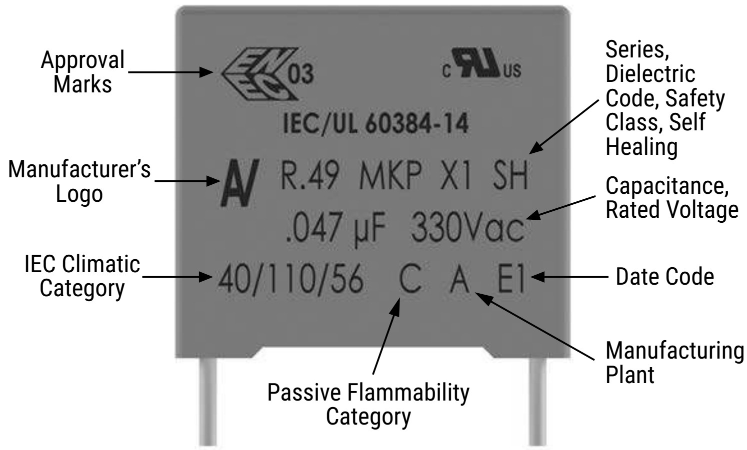
Winding Scheme



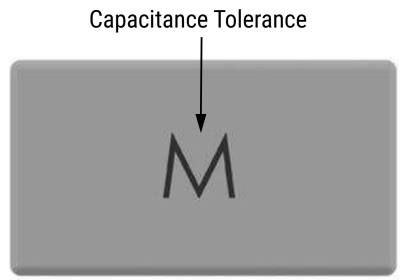
Marking

Lead Spacing 10 mm

FRONT



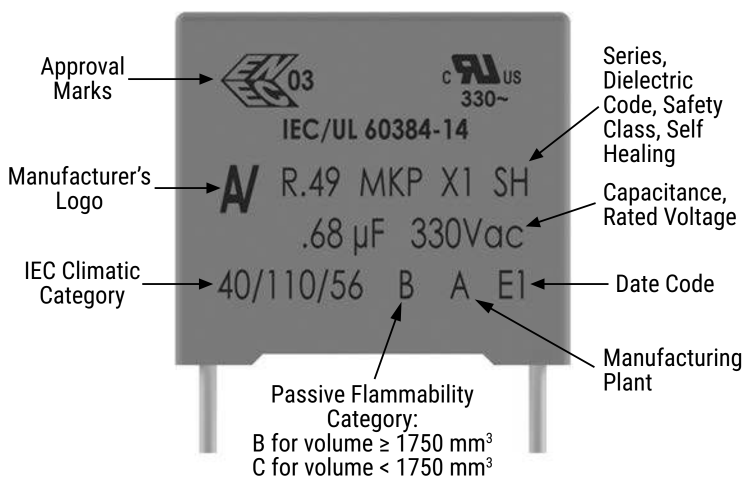
TOP



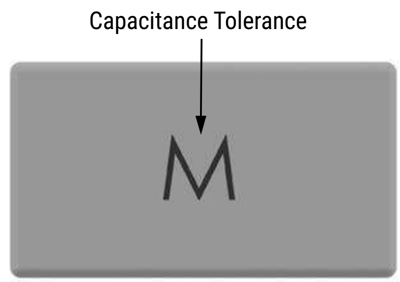
NOTE: Hot imprinting with or without color or ink jet or laser marking

Lead Spacing 15 mm, 22.5 mm (small case sizes)

FRONT



TOP



NOTE: Hot imprinting with or without color or ink jet or laser marking

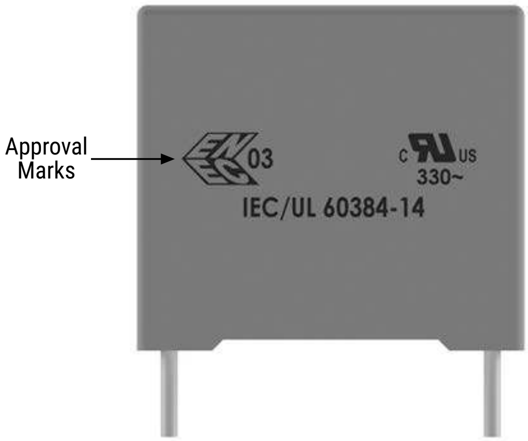
** Differences caused by technology (clichee, laser or ink jet) and production line*

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics

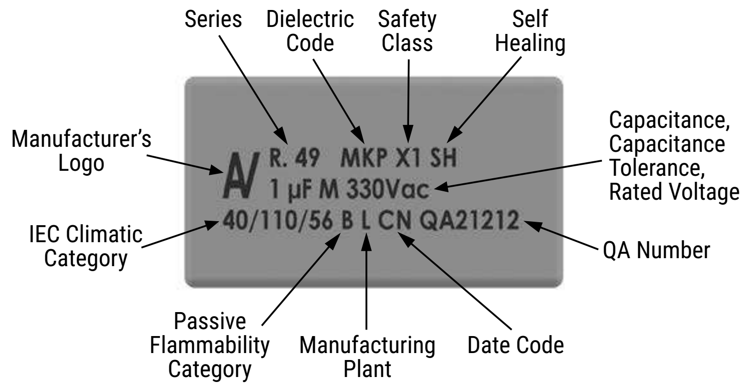
Marking cont.

Lead Spacing 22.5 and 27.5 mm (alternatives*) and 37.5 mm

FRONT



TOP



** Differences caused by technology (clichee, laser or ink jet) and production line*

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics

Manufacturing Date Code (IEC 60062)			
Y = Year, Z = Month			
Year	**Code**	**Month**	**Code**
2020	M	January	1
2021	N	February	2
2022	P	March	3
2023	R	April	4
2024	S	May	5
2025	T	June	6
2026	U	July	7
2027	V	August	8
2028	W	September	9
2029	X	October	O
2030	A	November	N
2031	B	December	D
2032	C		
2033	D		
2034	E		
2035	F		
2036	H		
2037	J		
2038	K		
2039	L		
2040	M		

Packaging Quantities

Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped
15	5.0	11.0	18.0	2,000	1,000	600	1,250	800
	6.0	12.0	18.0	1,750	900	500	1,000	680
	6.0	17.5	18.0	1,000	700	500	1,000	680
	8.5	14.5	18.0	1,000	500	300	700	440
	10.0	16.0	18.0	750	500	300	600	380
	11.0	19.0	18.0	450	350	-	500	340
	13.0	12.0	18.0	750	490	200	480	280
22.5	6.0	15.0	26.5	805	500	–	700	464
	7.0	16.0	26.5	700	500	–	550	380
	8.5	17.0	26.5	468	300	–	450	280
	10.0	18.5	26.5	396	300	–	350	235
	13.0	22.0	26.5	300	200	–	300	–
27.5	9.0	17.0	32.0	816	408	–	450	–
	11.0	20.0	32.0	560	336	–	350	–
	13.0	22.0	32.0	480	288	–	300	–
	13.0	25.0	32.0	480	288	–	–	–
	14.0	28.0	32.0	352	176	–	–	–
	18.0	33.0	32.0	256	128	–	–	–
	22.0	37.0	32.0	168	112	–	–	–
37.5	11.0	22.0	41.5	420	252	–	–	–
	13.0	24.0	41.5	360	216	–	–	–
	16.0	28.5	41.5	216	108	–	–	–
	19.0	32.0	41.5	192	96	–	–	–
	30.0	45.0	41.5	90	60	–	–	–

Lead Taping & Packaging (IEC 60286–2)

Figure 1
Lead Spacing 10 mm

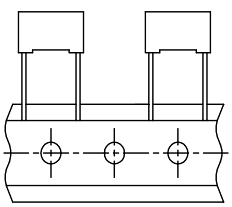


Figure 2
Lead Spacing 15 mm

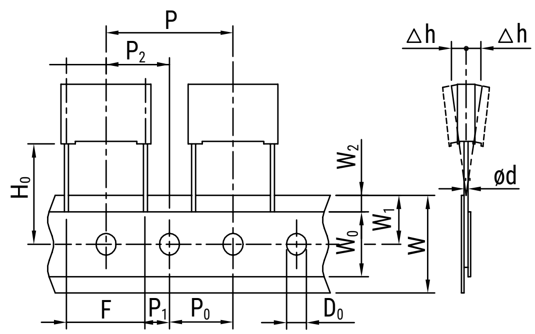
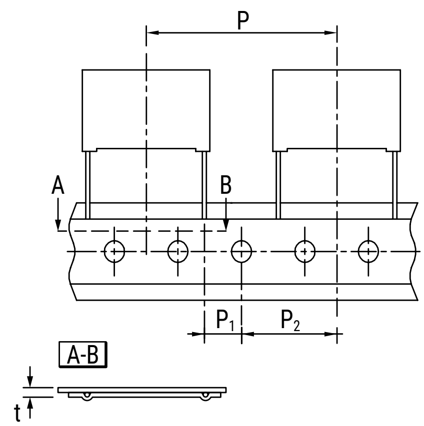


Figure 3
Lead Spacing 22.5 – 27.5 mm



Taping Specification

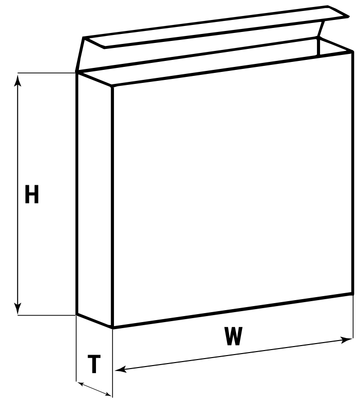
Description	Symbol	Dimensions (mm)				
		Lead Space				Tol.
		10	15	22.5	27.5	
		Fig. 1	Fig. 2	Fig. 3	Fig. 3	
Lead wire diameter	d	0.6	0.6–0.8	0.8	0.8	±0.05
Taping lead space	P	25.4	25.4	38.1	38.1	±1
Feed hole lead space *	P_0	12.7	12.7	12.7	12.7	±0.2 **
Centering of the lead wire	P_1	7.7	5.2	7.8	5.3	±0.7
Centering of the body	P_2	12.7	12.7	19.05	19.05	±1.3
Lead spacing (pitch) ***	F	10	15	22.5	27.5	+0.6/−0.1
Component alignment	Δh	0	0	0	0	±2
Height of component from tape center	H_0 ****	18.5	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	18	+1/−0.5
Hold down tape width	W_0	9	10	10	10	Minimum
Hole position	W_1	9	9	9	9	±0.5
Hold down tape position	W_2	3	3	3	3	Maximum
Feed hole diameter	D_0	4	4	4	4	±0.2
Total tape thickness	t	0.7	0.7	0.7	0.7	±0.2

** 15 mm also available*
*** Maximum of 1 mm on 20 lead spaces*
**** Pitches 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request*
***** H_0 = 16.5 mm is available upon request*

Lead Taping & Packaging (IEC 60286–2) cont.

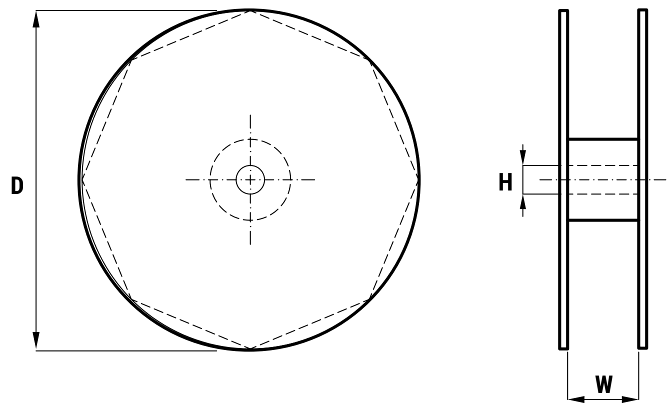
Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



Reel Specifications

Reel Size	Dimensions (mm)		
	D	H	W
Standard	355	30	55 Maximum
Large	500	25	



Metallized Polypropylene Film EMI Suppression Capacitors

R41, Class X1/Y2, 300 VAC, 110°C (Automotive Grade)

Overview

The R41 is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material meeting the requirements of UL 94 V–0.

Automotive Grade devices (up to 22.5 mm Lead Spacing) meet the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

Applications

For use in electromagnetic interference (EMI) suppression filter in "line-to-ground" and "across-the-line" applications requiring Y2/X1 safety classification. Suitable for use in situations where failure of the capacitor could lead to danger of electric shock. Not for use in "series with mains" type applications.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- Class X1 / Y2 (IEC 60384-14)
- Rated voltage: 300 VAC 50/60 Hz
- Capacitance range: 0.001 – 1 µF
- Lead spacing: 10 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category: 40/110/56, IEC 60068–1
- Tape and reel in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of −40˚C to +110˚C
- 100% screening factory test at 5,000 VDC/2,500 VAC
- Self-healing properties
- Automotive (AEC–Q200) grades available up to 22.5 mm Lead Spacing

Part Number System

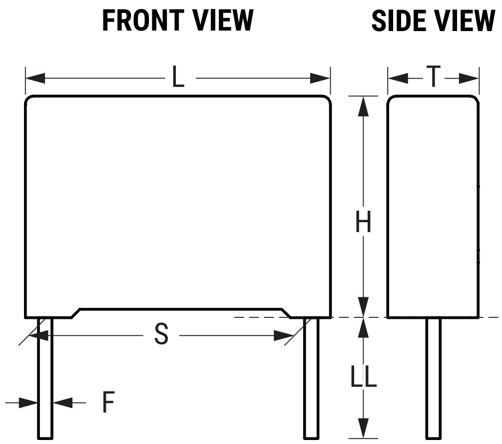
R41	3	I	2330	00	M1	M
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance
Y2, Metallized Polypropylene	3 = 300	F = 10.0 I = 15.0 N = 22.5 R = 27.5 W = 37.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	See Ordering Options Table	00 M1	K = ±10% M = ±20%

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
10, 15, 22.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/−0	00
	Ammo Pack	H_0= 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK
	Bulk (Bag) – Short Leads	3.5 +0.5/−0	JB
	Bulk (Bag) – Short Leads	4.0 +0.5/−0	JE
	Bulk (Bag) – Short Leads	3.2 +0.3/−0.2	JH
	Bulk (Bag) – Long Leads	18 ±1	JM
	Bulk (Bag) – Long Leads	30 +5/−0	40
	Bulk (Bag) – Long Leads	25 +2/−1	50
27.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/−0	00
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK[1]
	Other Lead and Packaging Options		
	Bulk (Tray) – Long Leads	30 +5/−0	40
	Bulk (Tray) – Long Leads	25 +2/−1	50
37.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/−0	00
	Other Lead and Packaging Options		
	Bulk (Tray) – Long Leads	30 +5/−0	40
	Bulk (Tray) – Long Leads	25 +2/−1	50

[1] *Not for all sizes, see "Packaging Quantities" table*

Dimensions – Millimeters



S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
10.0	±0.4	4.0	+0.2/-0.5	9.0	+0.1/-0.5	13.0	+0.3/-0.5	0.6	±0.05
10.0	±0.4	5.0	+0.2/-0.5	11.0	+0.1/-0.5	13.0	+0.3/-0.5	0.6	±0.05
10.0	±0.4	6.0	+0.2/-0.5	12.0	+0.1/-0.5	13.0	+0.3/-0.5	0.6	±0.05
15.0	±0.4	5.0	+0.2/-0.5	11.0	+0.1/-0.5	18.0	+0.3/-0.5	0.6	±0.05
15.0	±0.4	6.0	+0.2/-0.5	12.0	+0.1/-0.5	18.0	+0.3/-0.5	0.6	±0.05
15.0	±0.4	7.5	+0.2/-0.5	13.5	+0.1/-0.5	18.0	+0.3/-0.5	0.6	±0.05
15.0	±0.4	8.5	+0.2/-0.5	14.5	+0.1/-0.5	18.0	+0.3/-0.5	0.6	±0.05
15.0	±0.4	11.0	+0.2/-0.5	19.0	+0.1/-0.5	18.0	+0.3/-0.5	0.8	±0.05
22.5	±0.4	6.0	+0.2/-0.5	15.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
22.5	±0.4	7.0	+0.2/-0.5	16.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
22.5	±0.4	8.5	+0.2/-0.5	17.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
22.5	±0.4	10.0	+0.2/-0.5	18.5	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
22.5	±0.4	13.0	+0.2/-0.5	22.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
27.5	±0.4	13.0	+0.2/-0.7	22.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	14.0	+0.2/-0.7	28.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	18.0	+0.2/-0.7	33.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
37.5	±0.4	13.0	+0.2/-0.7	24.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	16.0	+0.2/-0.7	28.5	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	20.0	+0.2/-0.7	40.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05

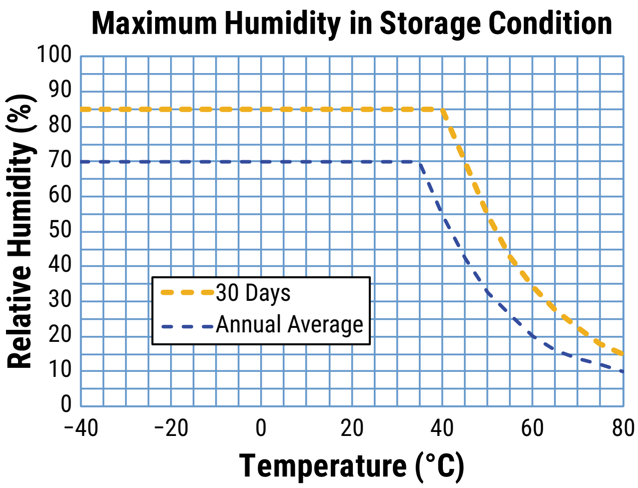
Note: See Ordering Options Table for lead length (LL/H_0) options.

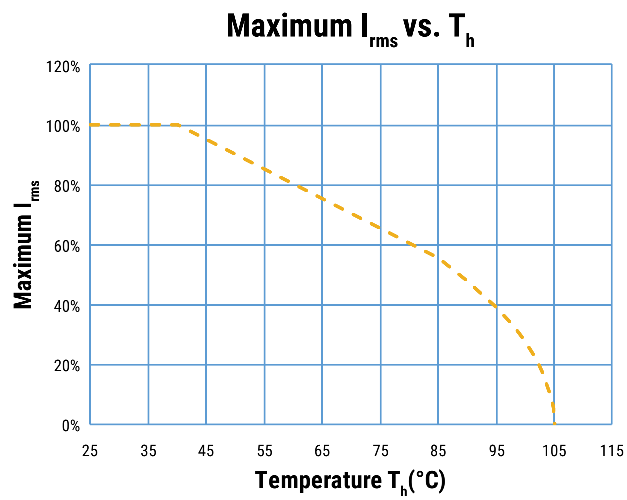
Performance Characteristics

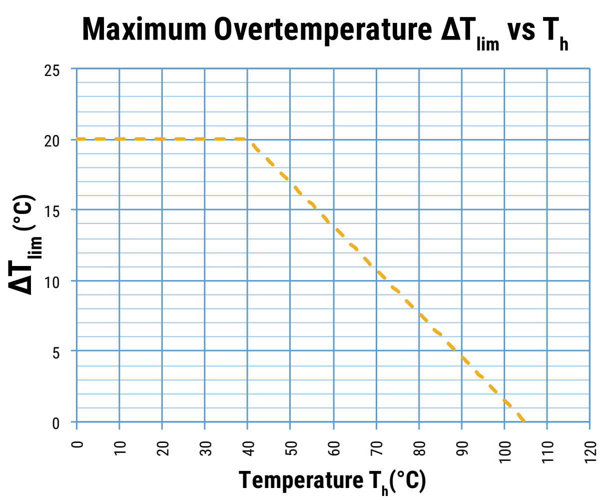
Dielectric	Polypropylene film			
Plates	Metal layer deposited by evaporation under vacuum			
Winding	Non-inductive type			
Leads	Tinned wire			
Protection	Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94.			
Related documents	IEC 60384-14, EN 60384-14			
Rated Voltage (V_R)	300 VAC (50/60 Hz)			
Recommended DC Voltage	1,000 VDC			
Capacitance Range	0.0010 to 1 µF			
Capacitance Values	E6 series (IEC 60063)			
Capacitance Tolerance	±10%, ±20%			
Temperature Range	−40°C to +110°C			
Climatic Category	40/110/56 IEC 60068-1			
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package			
	Average relative humidity per year ≤ 70%			
	RH ≤ 85% for 30 days randomly distributed throughout the year			
	Dew is absent			
	Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)			
Approvals	ENEC, UL, cUL, CQC			
Dissipation Factor (tanδ) at 1 kHz	Maximum Values at +25°C ±5°C			
	≤ 0.3% (0.2%*) at 1 kHz , +25°C ±5°C			
Test Voltage Between Terminals	The 100% screening factory test is carried out at 5,000 VDC/2,500 VAC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. It is not permitted to repeat this test as there is a risk to damage the capacitor. KEMET is not liable in such case for any failures.			
Insulation Resistance	Measured at +25°C ±5°C			
	Minimum Values Between Terminals			
	Voltage Charge	Voltage Charge Time	C ≤ 0.33 µF	C > 0.33 µF
	100 VDC	1 minute	≥ 1 • 10^5 MΩ (≥ 5 • 10^5 MΩ)*	≥ 30,000 MΩ • µF (≥ 150,000 MΩ • µF)*
In DC Applications	Recommended voltage ≤ 1,000 VDC			

** Typical value*

Performance Characteristics cont.

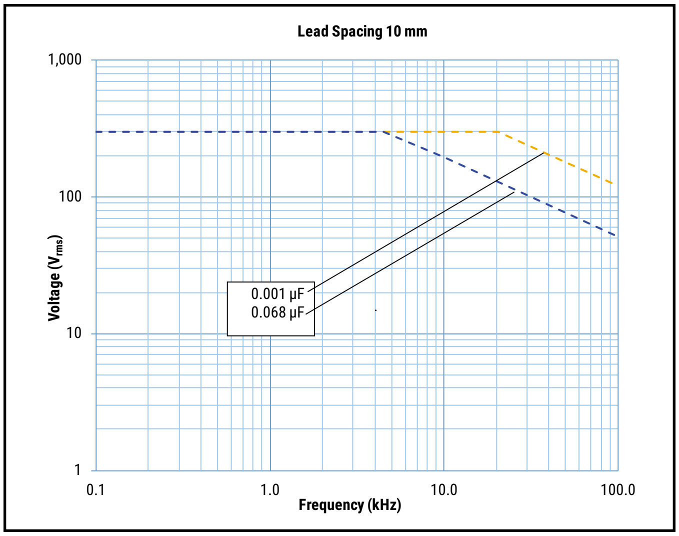


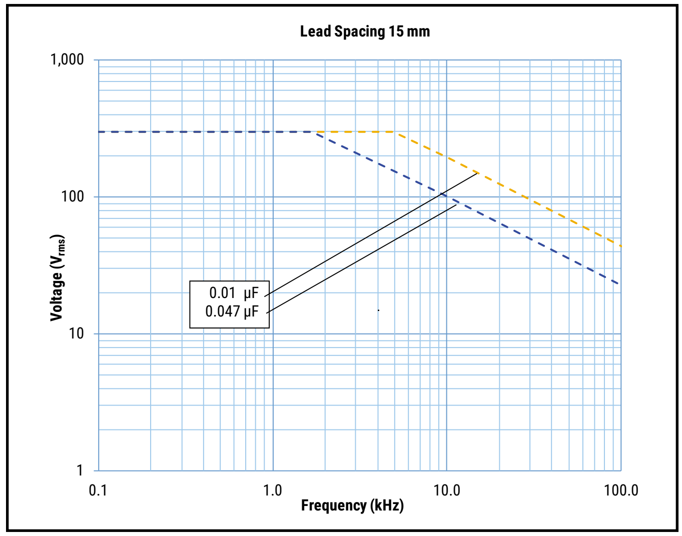


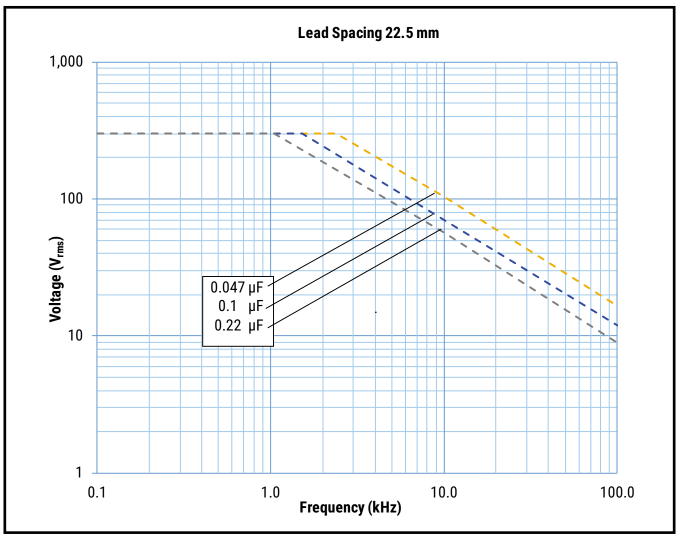


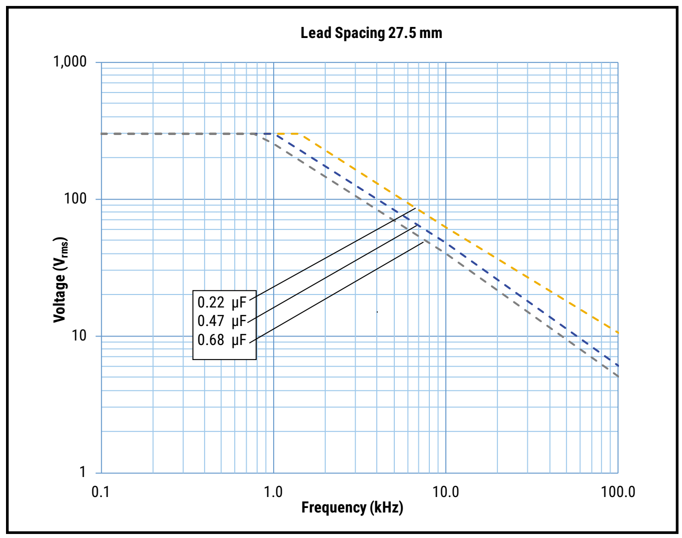
T_h is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

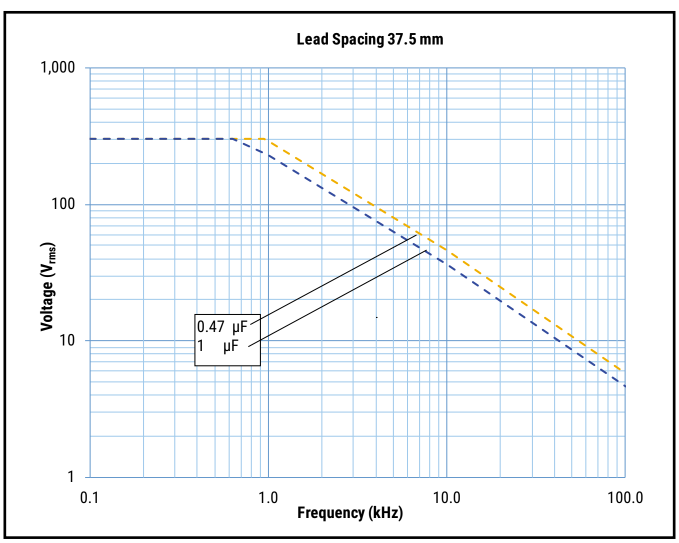
Maximum Voltage (V_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 40°C)



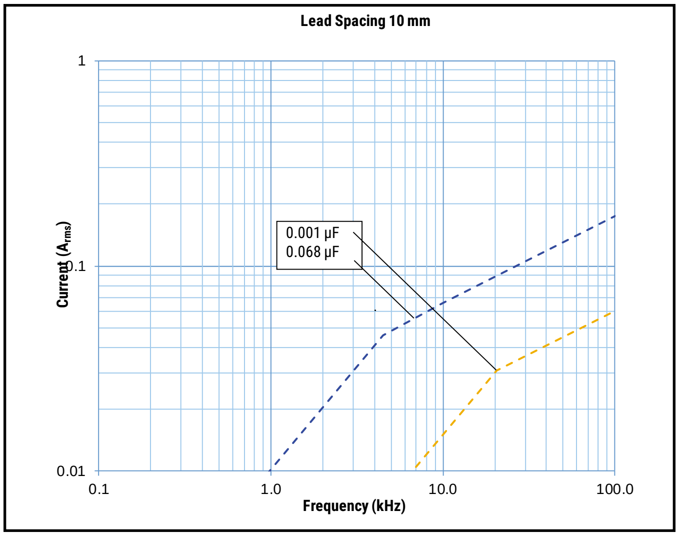


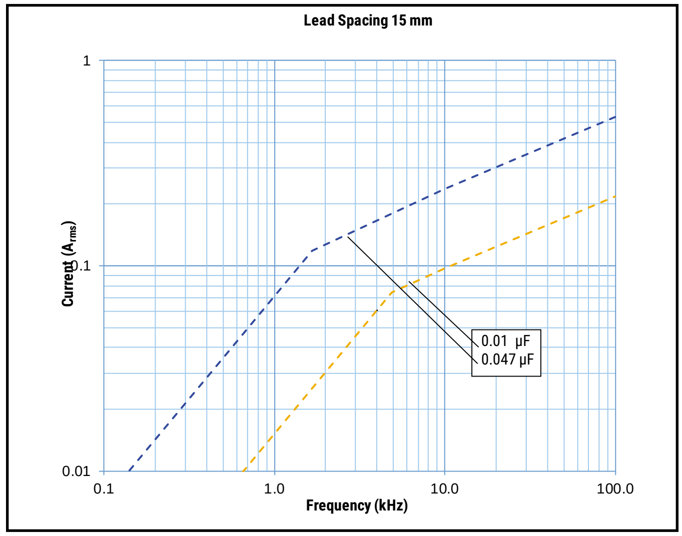


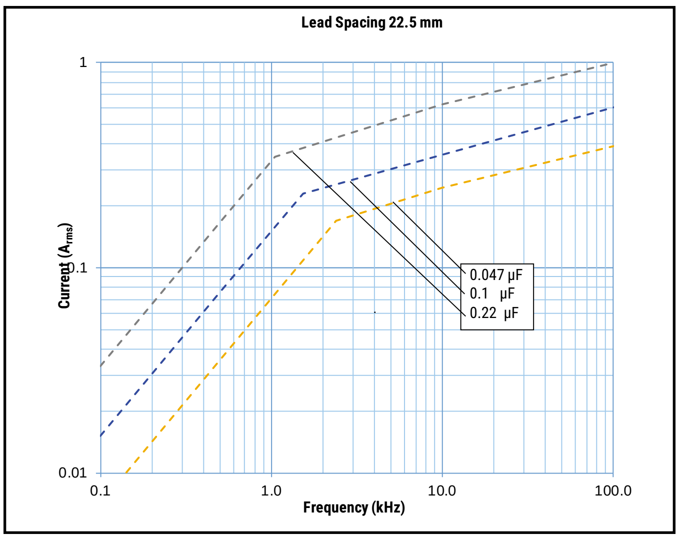


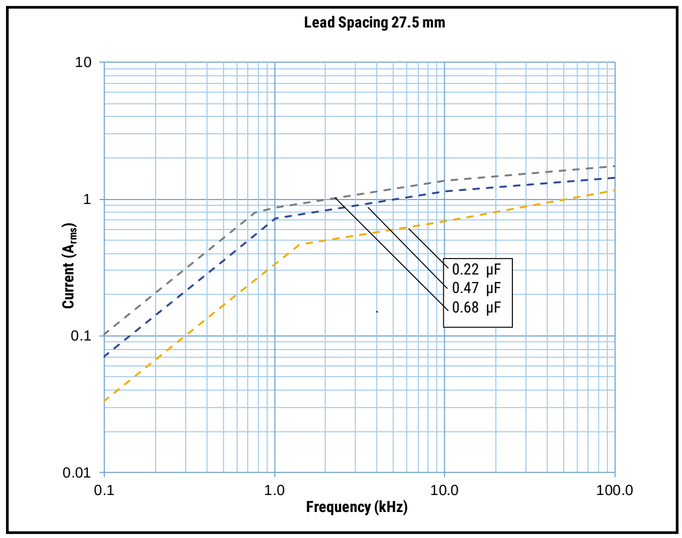


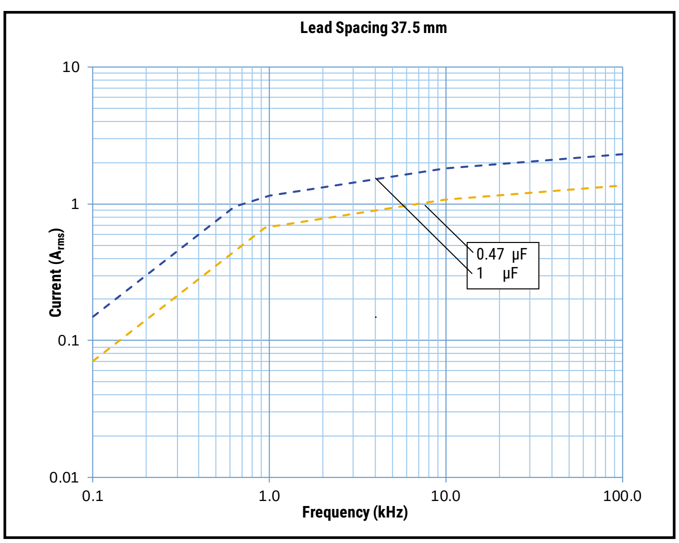
Maximum Current (I_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 40°C)



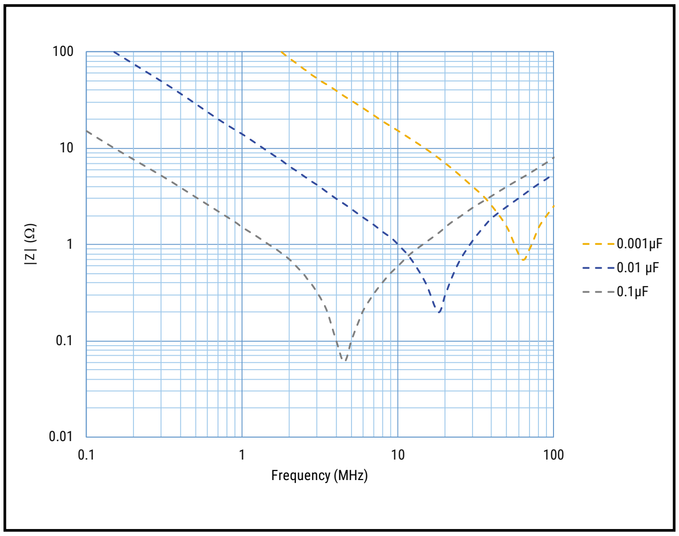








Impedance Graph



Environmental Test Data

Test	IEC Publication	Procedure
Endurance	EN/IEC 60384–14	1.7 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R +20 surge pulses at 5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
IMQ S.p.A.		EN/IEC 60384-14	V4160
UL		UL 60384-14 and CAN/CSA E60384-14 (300 VAC)	E97797
CQC		IEC 60384-14	CQC13001101264 CQC15001128704 CQC19001218777 CQC13001087758

Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Customer Part Number
	T	H	L				
0.0010	4.0	9.0	13.0	10.0	800	413F1100(1)00(2)	R413F1100(1)00(2)
0.0015	4.0	9.0	13.0	10.0	800	413F1150(1)00(2)	R413F1150(1)00(2)
0.0022	4.0	9.0	13.0	10.0	800	413F1220(1)00(2)	R413F1220(1)00(2)
0.0033	4.0	9.0	13.0	10.0	800	413F1330(1)M1(2)	R413F1330(1)M1(2)
0.0047	5.0	11.0	13.0	10.0	800	413F1470(1)M1(2)	R413F1470(1)M1(2)
0.0068	**6.0**	**12.0**	**13.0**	**10.0**	**800**	**413F1680(1)00(3)**	**R413F1680(1)00(3)**
0.010	**6.0**	**12.0**	**13.0**	**10.0**	**800**	**413F2100(1)M1(3)**	**R413F2100(1)M1(3)**
0.0033	5.0	11.0	18.0	15.0	600	413I1330(1)00(2)	R413I1330(1)00(2)
0.0047	5.0	11.0	18.0	15.0	600	413I1470(1)00(2)	R413I1470(1)00(2)
0.0068	5.0	11.0	18.0	15.0	600	413I1680(1)00(2)	R413I1680(1)00(2)
0.010	5.0	11.0	18.0	15.0	600	413I2100(1)00(2)	R413I2100(1)00(2)
0.015	5.0	11.0	18.0	15.0	600	413I2150(1)M1(2)	R413I2150(1)M1(2)
0.022	6.0	12.0	18.0	15.0	600	413I2220(1)M1(2)	R413I2220(1)M1(2)
0.033	7.5	13.5	18.0	15.0	600	413I2330(1)M1(2)	R413I2330(1)M1(2)
0.047	8.5	14.5	18.0	15.0	600	413I2470(1)M1(2)	R413I2470(1)M1(2)
0.068	11.0	19.0	18.0	15.0	600	413I2680(1)00(2)	R413I2680(1)00(2)
0.047	**6.0**	**15.0**	**26.5**	**22.5**	**500**	**413N2470(1)00(2)**	**R413N2470(1)00(2)**
0.068	6.0	15.0	26.5	22.5	500	413N2680(1)M1(3)	R413N2680(1)M1(3)
0.068	7.0	16.0	26.5	22.5	500	413N2680(1)00(2)	R413N2680(1)00(2)
0.10	8.5	17.0	26.5	22.5	500	413N3100(1)M1(2)	R413N3100(1)M1(2)
0.15	10.0	18.5	26.5	22.5	500	413N3150(1)M1(2)	R413N3150(1)M1(2)
0.22	13.0	22.0	26.5	22.5	500	413N3220(1)00(2)	R413N3220(1)00(2)
0.22	13.0	22.0	32.0	27.5	400	413R3220(1)00(2)	R413R3220(1)00(2)
0.33	14.0	28.0	32.0	27.5	400	413R3330(1)00(2)	R413R3330(1)00(2)
0.33	13.0	22.0	32.0	27.5	400	413R3330(1)M1(2)	R413R3330(1)M1(2)
0.47	18.0	33.0	32.0	27.5	400	413R3470(1)00(2)	R413R3470(1)00(2)
0.68	18.0	33.0	32.0	27.5	400	413R3680(1)00(2)	R413R3680(1)00(2)
0.47	13.0	24.0	41.5	37.5	300	413W3470(1)00(2)	R413W3470(1)00(2)
0.68	16.0	28.5	41.5	37.5	300	413W3680(1)00(2)	R413W3680(1)00(2)
1.0	20.0	40.0	41.5	37.5	300	413W4100(1)00(2)	R413W4100(1)00(2)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Customer Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) M = ±20%, K = ±10%
(3) M = ±20% (only available tolerance).

Soldering Process

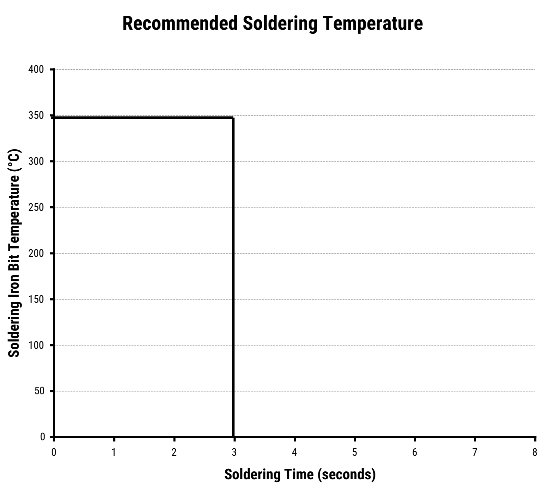
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 mm to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

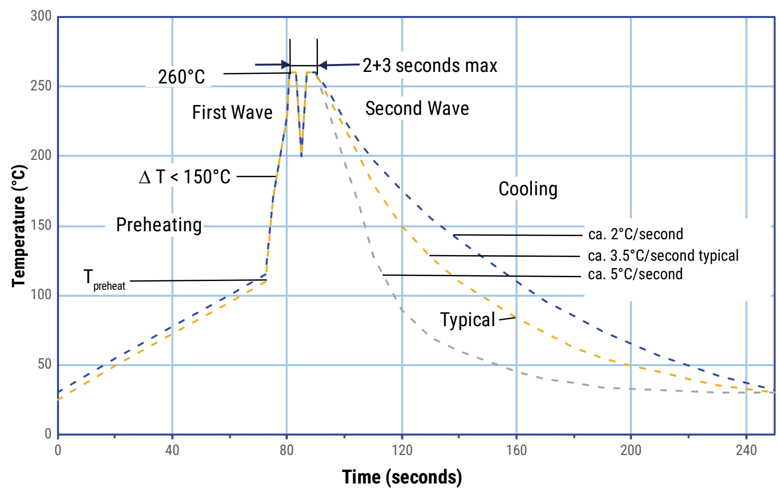
Manual Soldering Recommendations

The following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

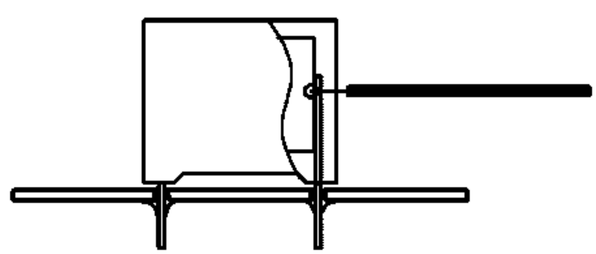
1. The table indicates the maximum set-up temperature of the soldering process

Figure 1

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene sulphide	160°C



Temperature monitored inside the capacitor.

Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Mounting

Resistance to Vibration and Mechanical Shock

AEC-Q200 Rev. E Mechanical Stress Tests:

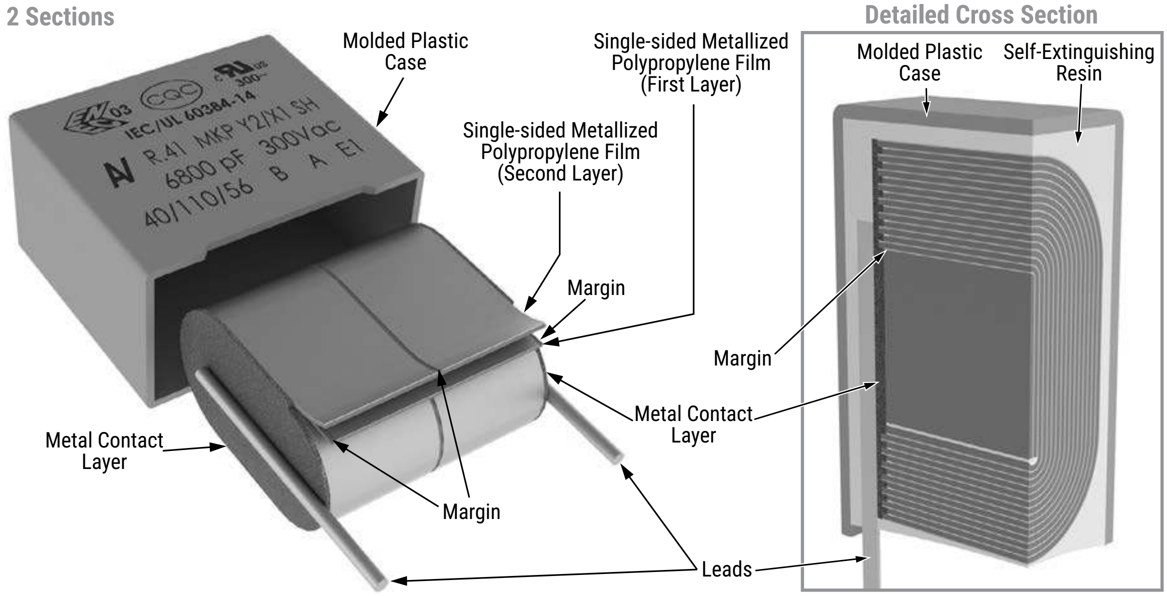
Mechanical Shock	**MIL-STD-202 Method 213**	Figure 1 of Method 213 • THT: Condition C • SMD: Condition C • Tested per the Supplier's recommended mounting method
Vibration	**MIL-STD-202 Method 204**	• 5 g for 20 minutes, 12 cycles each of 3 orientations • Tested per the Supplier's recommended mounting method • Verification of transfer load: during setup, verify that with the selected PCB design (size, thickness and secure points), or an alternative mount, that the transferred load onto the component corresponds to the requested load. This verification can be achieved using a laser vibrometer or other adequate measuring device • Test from 10 Hz – 2,000 Hz.

The capacitors are designed for PCB mounting. The stand-off pipes must be in good contact with the printed circuit board. The capacitor body has to be properly fixed (e.g. clamped or glued).

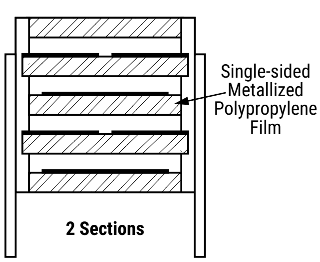
Construction

2 Sections

Detailed Cross Section



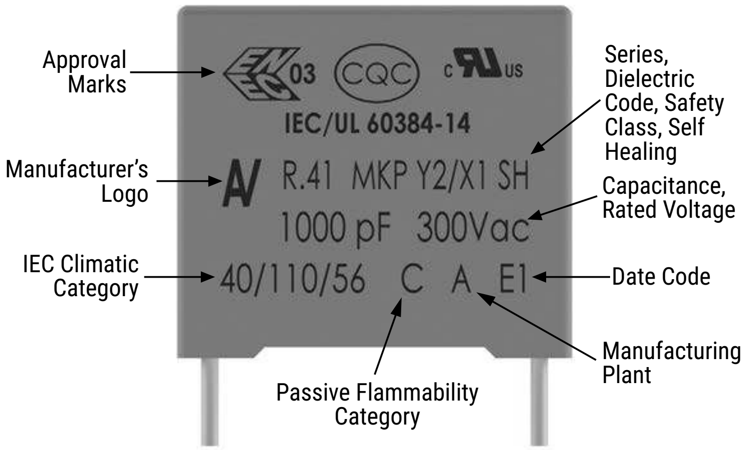
Winding Scheme



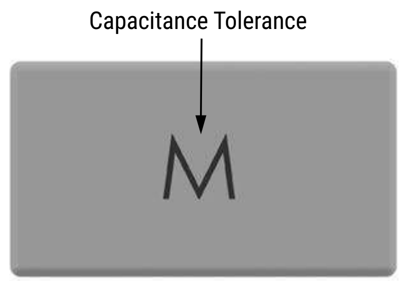
Marking

Lead Spacing 10 mm

FRONT



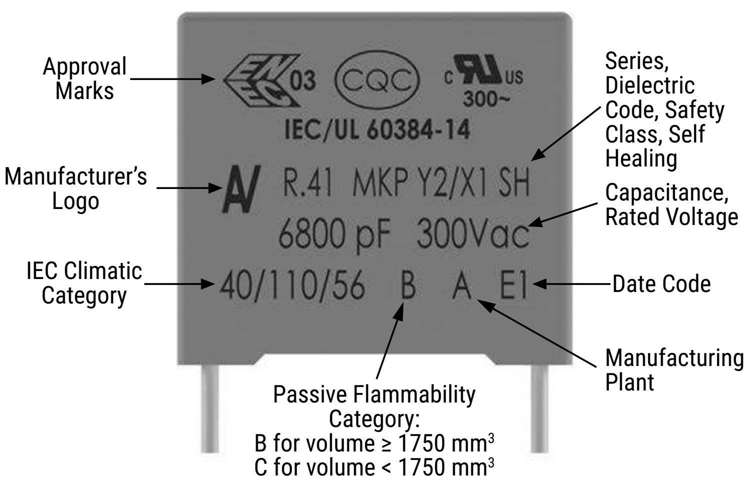
TOP



NOTE: Hot imprinting with or without color or ink jet or laser marking

Lead Spacing 15 mm, 22.5 mm (small case sizes)

FRONT



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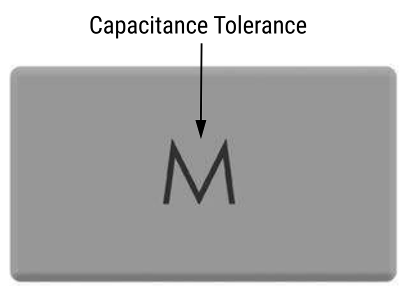


NOTE: Hot imprinting with or without color or ink jet or laser marking

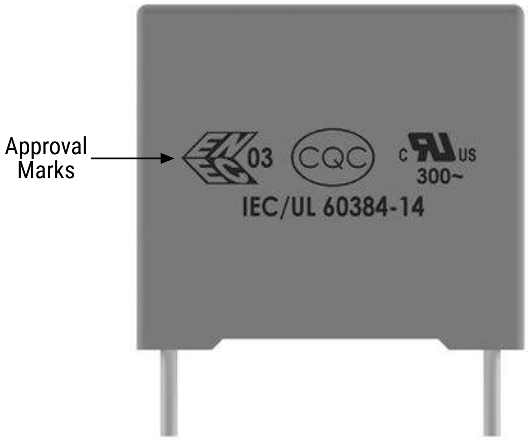
** Differences caused by technology (clichee, laser or ink jet) and production line*

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Marking cont.

Lead Spacing 22.5 and 27.5 mm (alternatives*) and 37.5 mm

FRONT



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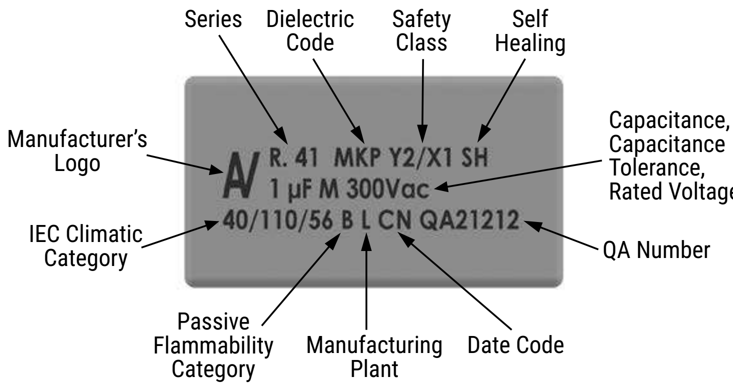


** Differences caused by technology (clichee, laser or ink jet) and production line*

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads		Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped
Lead And Packaging Code:				00 - JB JE - JH	40 - 50	JM	GY	CK	DQ
10	4.0	9.0	13.0	2,000	1,800	2,200	750	1,500	1000
	5.0	11.0	13.0	1,300	1,500	2,000	600	1,250	800
	6.0	12.0	13.0	1,000	1,200	1,800	500	1,000	680
15	5.0	11.0	18.0	2,000	1,000	1,250	600	1,250	800
	6.0	12.0	18.0	1,750	900	1,000	500	1,000	680
	7.5	13.5	18.0	1,000	700	800	350	800	500
	8.5	14.5	18.0	1,000	500	650	270	700	440
	11.0	19.0	18.0	450	350	400	270	500	340
22.5	6.0	15.0	26.5	805	500	450	300	700	464
	7.0	16.0	26.5	700	500	450	250	550	380
	8.5	17.0	26.5	468	300	350	250	450	280
	10.0	18.5	26.5	396	300	350	160	350	235
	13.0	22.0	26.5	300	200	150	130	300	–
27.5	13.0	22.0	32.0	480	288	288	–	300	–
	14.0	28.0	32.0	352	176	176	–	–	–
	18.0	33.0	32.0	256	128	128	–	–	–
37.5	13.0	24.0	41.5	360	216	216	–	–	–
	16.0	28.5	41.5	216	108	108	–	–	–
	20.0	40.0	41.5	126	84	84	–	–	–

Lead Taping & Packaging (IEC 60286–2)

Figure 1
Lead Spacing 10 mm

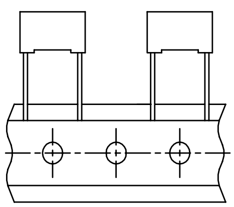


Figure 2
Lead Spacing 15 mm

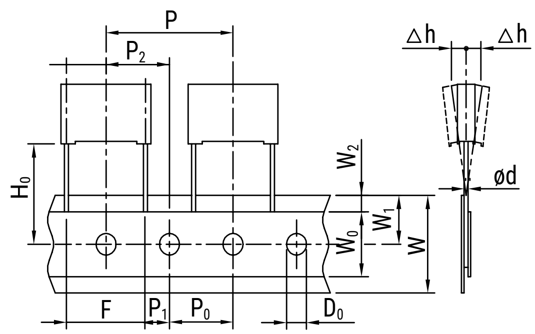
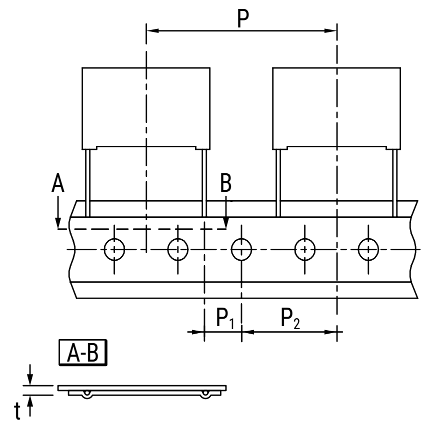


Figure 3
Lead Spacing 22.5 – 27.5 mm



Taping Specification

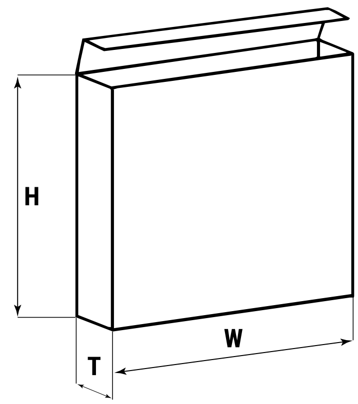
Description	Symbol	Dimensions (mm)				
		Lead Space				Tol.
		10	15	22.5	27.5	
		Fig. 1	Fig. 2	Fig. 3	Fig. 3	
Lead wire diameter	d	0.6	0.6–0.8	0.8	0.8	±0.05
Taping lead space	P	25.4	25.4	38.1	38.1	±1
Feed hole lead space *	P_0	12.7	12.7	12.7	12.7	±0.2 **
Centering of the lead wire	P_1	7.7	5.2	7.8	5.3	±0.7
Centering of the body	P_2	12.7	12.7	19.05	19.05	±1.3
Lead spacing (pitch) ***	F	10	15	22.5	27.5	+0.6/−0.1
Component alignment	Δh	0	0	0	0	±2
Height of component from tape center	H_0 ****	18.5	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	18	+1/−0.5
Hold down tape width	W_0	9	10	10	10	Minimum
Hole position	W_1	9	9	9	9	±0.5
Hold down tape position	W_2	3	3	3	3	Maximum
Feed hole diameter	D_0	4	4	4	4	±0.2
Total tape thickness	t	0.7	0.7	0.7	0.7	±0.2

** 15 mm also available*
*** Maximum of 1 mm on 20 lead spaces*
**** Pitches 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request*
***** H_0 = 16.5 mm is available upon request*

Lead Taping & Packaging (IEC 60286–2) cont.

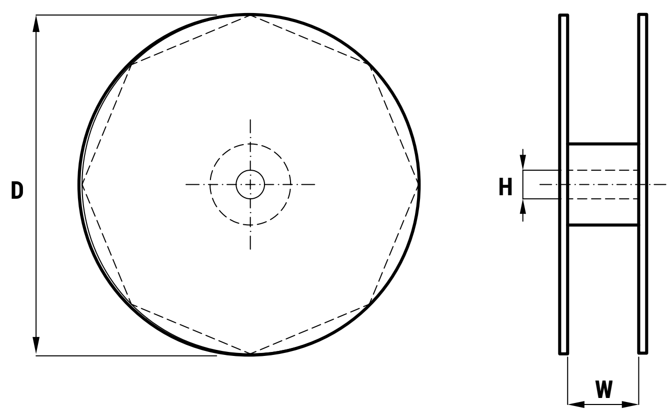
Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



Reel Specifications

Reel Size	Dimensions (mm)		
	D	H	W
Standard	355	30	55 Maximum
Large	500	25	



R82, Radial, 5 mm Lead Spacing, 50 – 400 VDC (Automotive Grade)

Overview

The R82 is constructed of metallized polyester film (wound or stacked technology) with radial leads of tinned wire. Radial leads are electrically welded to the contact metal layer on the ends of the capacitor winding. The capacitor is encapsulated with thermosetting resin in a box of material meeting the UL 94 V–0 requirements.

Automotive grade devices meet the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

Applications

Typical applications include blocking, coupling, decoupling, timing, and oscillator circuits. Not suitable for across-the-line application (see Suppressor Capacitors).

Benefits

- Voltage range: 50 – 400 VDC
- Capacitance range: 0.001 – 4.7 µF
- Lead Spacing: 5 mm
- Capacitance tolerance: ±5%, ±10%, ±20%
- Climatic category: 55/105/56
- Operating temperature range of −55°C to +105°C
- RoHS compliance and lead-free terminations
- Tape & Reel packaging in accordance with IEC 60286–2
- Self-healing
- Automotive grade (AEC–Q200)

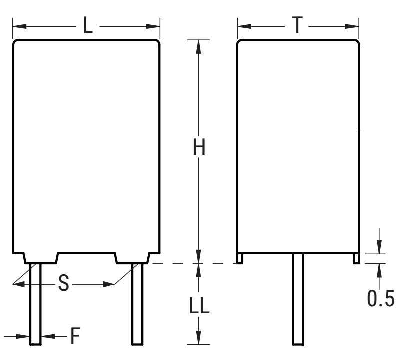
Part Number System

R82	D	C	3470	AA	60	J
Series	Rated Voltage (VDC)	Length (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance
Metallized Polyester	C = 50 D = 63 E = 100 I = 250 M = 400	C = 5.0	The last three digits represent significant figures. First digit specifies the number of zeros to be added.	See Ordering Options Table	30 50 60 70	J = ±5% K = ±10% M = ±20%

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	LL Lead Length (mm)	Lead and Packaging Code
5	**Standard Lead and Packaging Options**		
	Bulk – Short leads	4 +1.5/−0	AA
	Ammo Pack	H_0 = 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Tape & Reel (Standard Reel Ø 355 mm)	H_0 = 18.5 ±0.5	CK
	Bulk – Short leads	2.7 +0.5/−0	JA
	Bulk – Short leads	3.5 +0.5/−0	JB
	Bulk – Short leads	10 ±1	JC
	Bulk – Short leads	4.0 +0.5/−0	JE
	Bulk – Short leads	3.2 +0.3/−0.2	JH
	Bulk – Long leads	17 +1/−2	Z3

Dimensions – Millimeters



S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
5.0	±0.4	2.5	+0.1/−0.5	6.5	+0.1/−0.5	7.2	+0.2/−0.5	0.5	±0.05
5.0	±0.4	3.5	+0.1/−0.5	7.5	+0.1/−0.5	7.2	+0.2/−0.5	0.5	±0.05
5.0	±0.4	4.5	+0.1/−0.5	9.5	+0.1/−0.5	7.2	+0.3/−0.5	0.5	±0.05
5.0	±0.4	5.0	+0.1/−0.5	10.0	+0.1/−0.5	7.2	+0.3/−0.5	0.5	±0.05
5.0	±0.4	6.0	+0.1/−0.5	11.0	+0.1/−0.5	7.2	+0.3/−0.5	0.5	±0.05
5.0	±0.4	7.2	+0.1/−0.5	13.0	+0.1/−0.5	7.2	+0.3/−0.5	0.6	±0.05

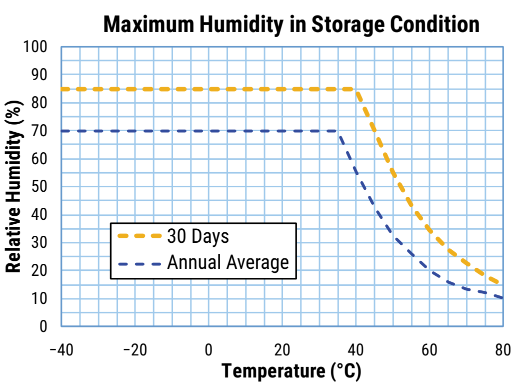
Note: See Ordering Options Table for lead length (LL/H_0) options.

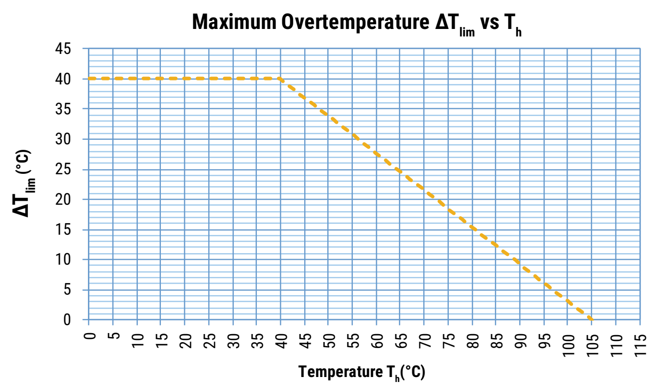
Performance Characteristics

Dielectric	Polyester film (polyethylene terephthalate).						
Plates	Metal layer deposited by evaporation under vacum.						
Winding	Non-inductive type.						
Leads	Tinned wire.						
Protection	Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94.						
Related Documents	IEC 60384–2						
Rated Voltage V_R (VDC)	50	63	100	250	250	400	400
Rated Voltage V_R (VAC)	30	40	63	140	160	160	200
Capacitance Range (µF)	2.2 – 4.7	0.1 – 1.5	0.001 – 1	0.022 – 0.22	0.0068 – 0.15	0.0068 – 0.068	0.001 – 0.047
Capacitance Values	E6 series (IEC 60063) measured at 1 kHz and +20 ±1°C						
Capacitance Tolerance	±5%, ±10%, ±20%						
Operating Temperature Range	-55°C to 105°C						
Rated Temperature T_R	+85°C						
Voltage Derating	Above +85°C DC and AC voltage derating is 1.25%/°C						
Climatic Category	55/105/56 IEC 60068–1						
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package						
	Average relative humidity per year ≤ 70%						
	RH ≤ 85% for 30 days randomly distributed throughout the year						
	Dew is absent						
	Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)						
Test Voltage	1.4 x V_R VDC for 2 seconds (between terminations) at +25°C ±5°C						
Capacitance Drift	Maximum 3% after a 2 year storage period at a temperature of +10°C to +40°C and a relative humidity of 40% to 60%						
Reliability (Reference IEC 61709)	Operational life > 200,000 hours						
	Failure rate ≤ 1 FIT, T = +40°C, V = 0.5 x V_R						
	Failure criteria: open or short circuit, cap. change > 10%, DF 2 times the catalog limits, IR < 0.005 x initial limit						
Maximum Pulse Steepness	dV/dt according to Table 1. For peak to peak voltages lower than rated voltage (Vpp <V_R), the specified dv/dt can be multiplied by the factor V_R/Vpp						
Temperature Coefficient	+400 (±200) ppm/°C at 1 kHz						
Self Inductance (Lead Length ~ 2 mm)	Approximately 7 nH. Maximum 1nH per 1 mm lead and capacitor length.						

Performance Characteristics cont.

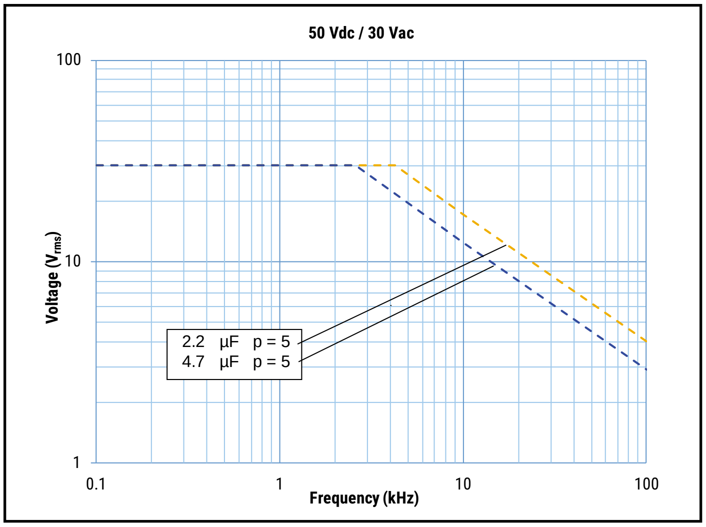
Dissipation Factor tanδ	Maximum Values at 25°C ±5°C			
	Frequency		C ≤ 0.1 µF	C > 0.1 µF
	1 kHz		0.80%	0.80%
	10 kHz		1.20%	1.20%
	100 kHz		2.50%	–
Insulation Resistance	Measured at +25°C ±5°C, according to IEC 60384–2			
	Minimum Values Between Terminals			
	Voltage charge/time	C ≤ 0.33 µF	0.33 µF < C ≤ 1.0 µF	C > 1.0 µF
	50 VDC for V_R < 100 VDC 1 minute	≥ 15,000 MΩ	≥ 5,000 MΩ • µF	≥ 1,000 MΩ • µF
	100 VDC for V_R ≥ 100 VDC 1 minute	≥ 30,000 MΩ		

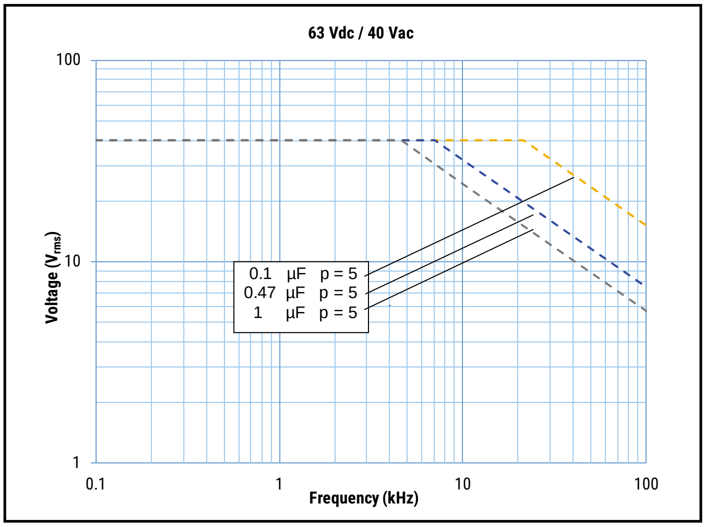


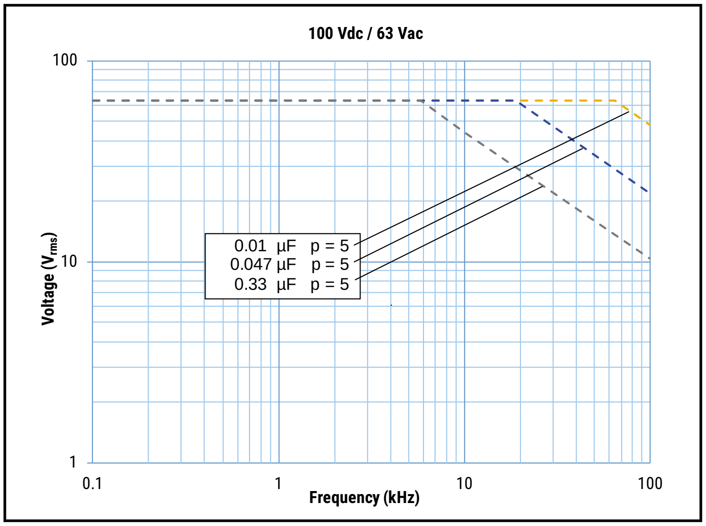


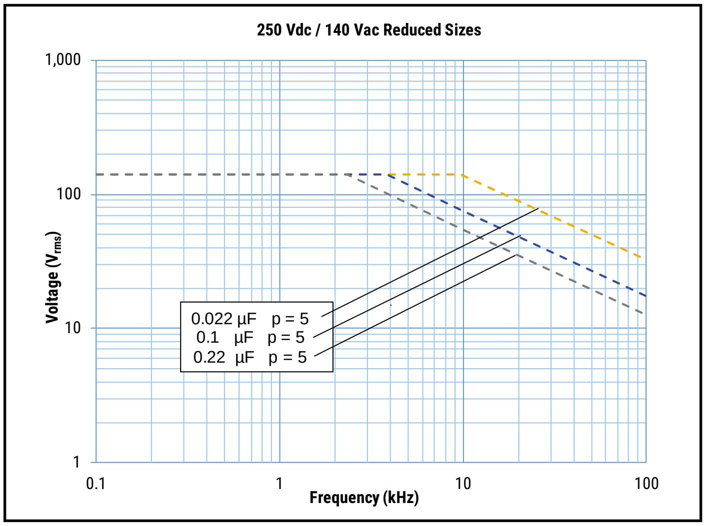
T_h is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

Maximum Voltage (V_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C)

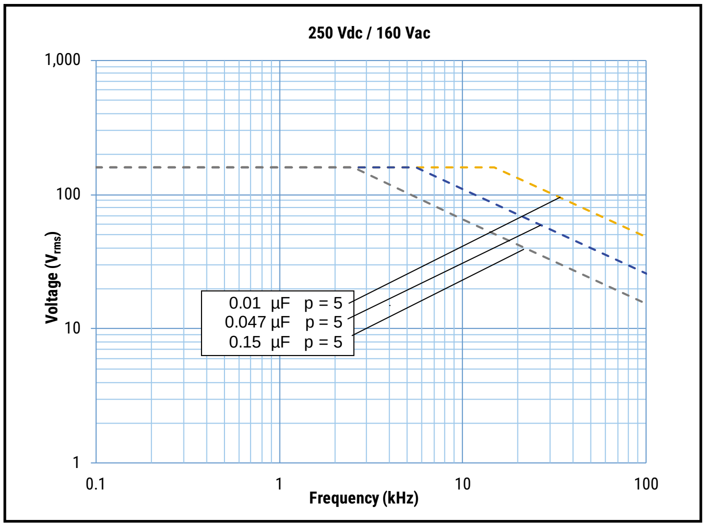


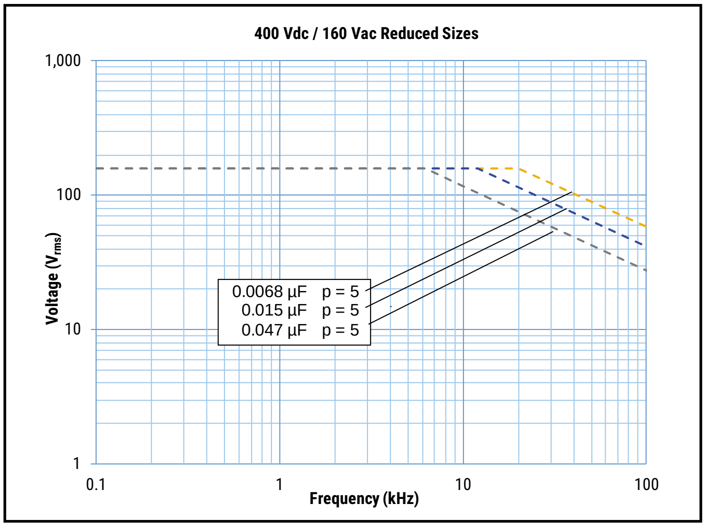


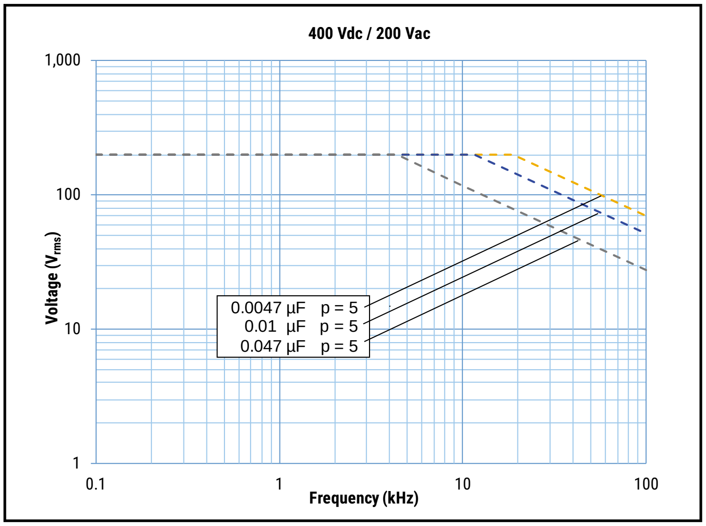




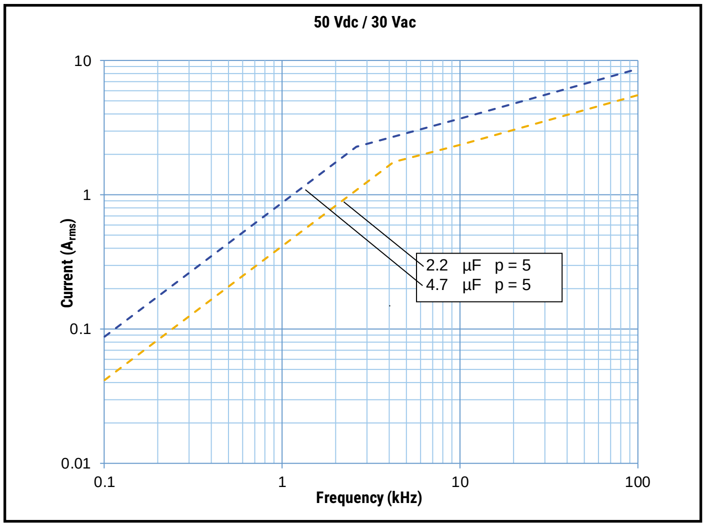
Maximum Voltage (V_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C) cont.

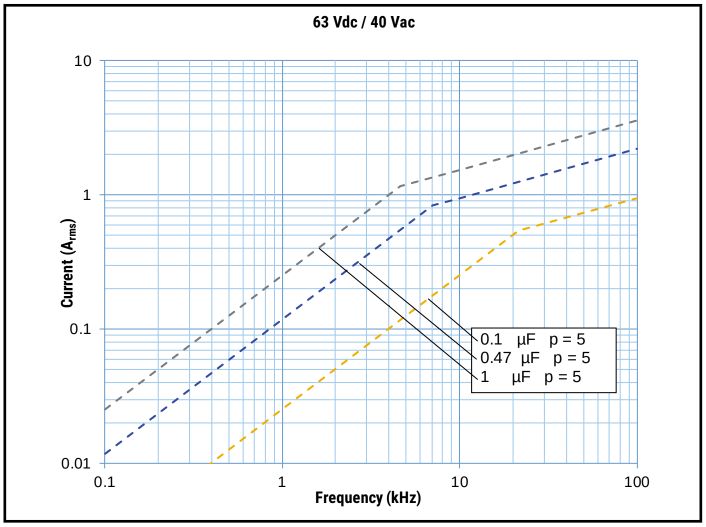


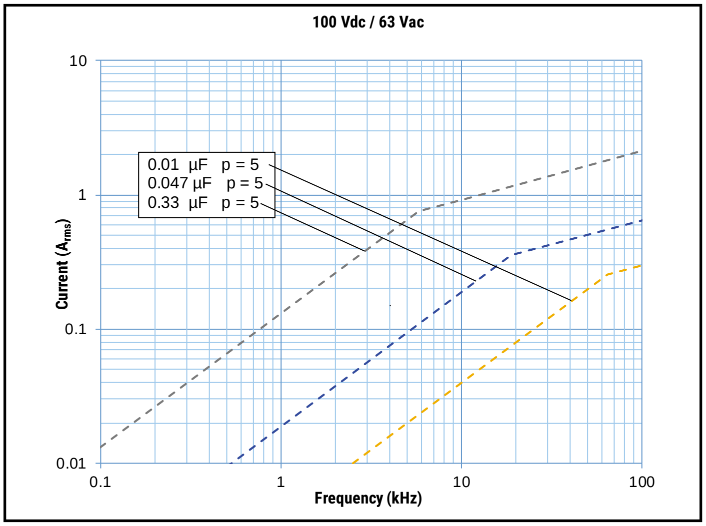


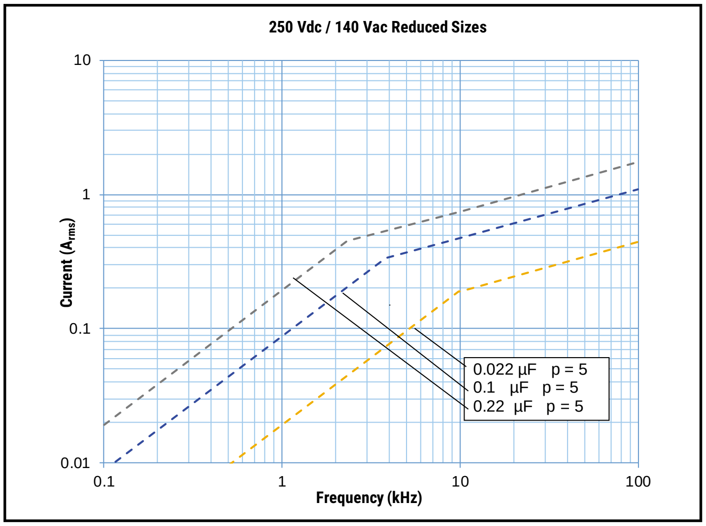


Maximum Current (I_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C)

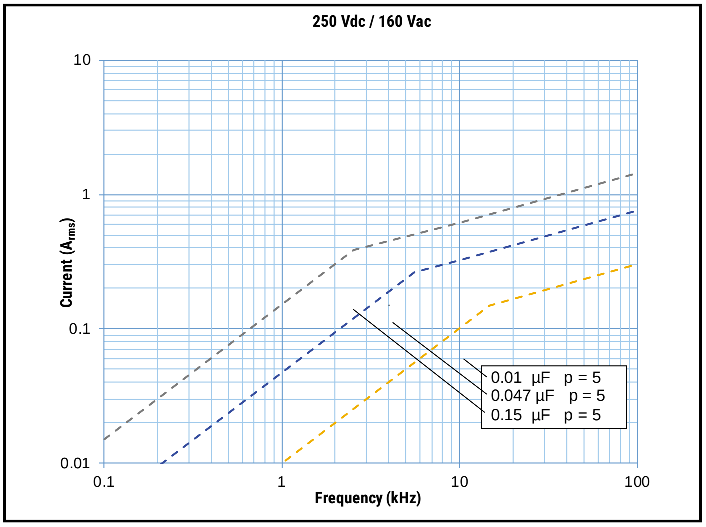


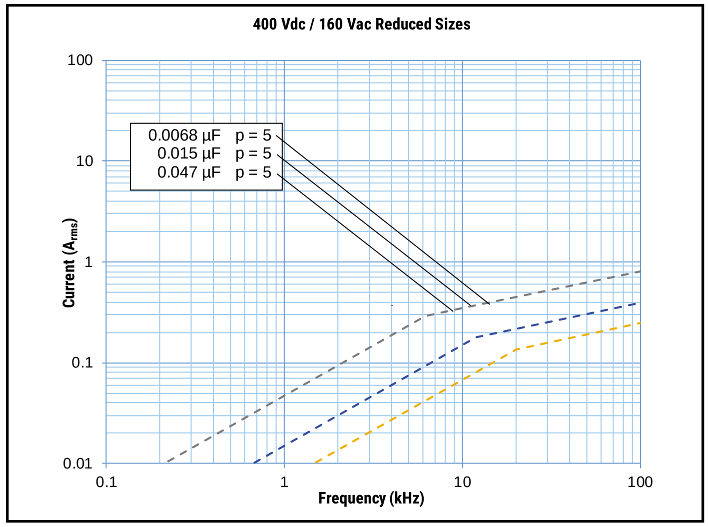


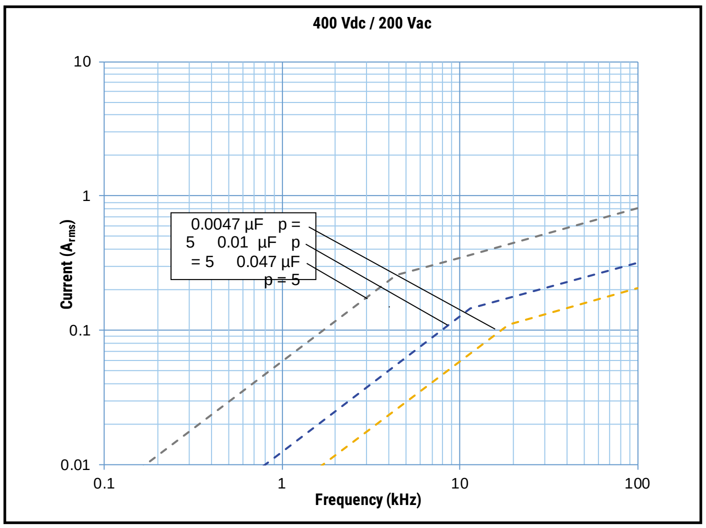




Maximum Current (I_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C) cont.







Environmental Test Data

Damp Heat, Steady State Test	Test Conditions:		Performances
	Temperature: Relative humidity (RH): Test duration:	+40°C ±2°C 93% ±2% 56 days	Δ C/C ≤ 5%, Δ tanδ ≤ 0.5% at 1 kHz IR after test ≥ 50% of initial limit
Endurance Test	**Test Conditions**		**Performances**
	Temperature: Voltage applied: Test duration:	+105°C ±2°C 1.25 x V_C 2,000 hours	Δ C/C ≤ 5%, Δ tanδ ≤ 0.003 at 10 kHz for C ≤ 1 μF Δ tanδ ≤ 0.002 at 1 kHz for C > 1 μF IR after test ≥ 50% of initial limit
Resistance to Soldering Heat Test	**Test Conditions**		**Performances**
	Solder bath temperature: Dipping time (with heat screen):	260°C ±5°C 10 seconds ±1 second	|Δ C/C| ≤ 2%, Δ tanδ ≤ 0.003 at 10 kHz for C ≤ 1μF Δ tanδ ≤ 0.002 at 1 kHz for C > 1μF IR after test ≥ initial limit

Environmental Compliance

All KEMET MKT capacitors are RoHS Compliant.

Table 1 – Ratings & Part Number Reference

VDC	VAC	Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Maximum K_0 (V^2/µs)	KEMET Part Number	Legacy Part Number
			T	H	L					
50	30	2.2	6.0	11.0	7.2	5.0	100	10000	82CC4220(1)70(2)	R82CC4220(1)70(2)
50	**30**	**3.3**	**7.2**	**13.0**	**7.2**	**5.0**	**25**	**2500**	**82CC4330(1)30(2)**	**R82CC4330(1)30(2)**
50	**30**	**4.7**	**7.2**	**13.0**	**7.2**	**5.0**	**25**	**2500**	**82CC4470(1)30(2)**	**R82CC4470(1)30(2)**
63	40	0.10	2.5	6.5	7.2	5.0	160	20160	82DC3100(1)50(2)	R82DC3100(1)50(2)
63	40	0.15	2.5	6.5	7.2	5.0	160	20160	82DC3150(1)60(2)	R82DC3150(1)60(2)
63	40	0.22	2.5	6.5	7.2	5.0	160	20160	82DC3220(1)60(2)	R82DC3220(1)60(2)
63	40	0.33	3.5	7.5	7.2	5.0	160	20160	82DC3330(1)60(2)	R82DC3330(1)60(2)
63	40	0.47	3.5	7.5	7.2	5.0	160	20160	82DC3470(1)60(2)	R82DC3470(1)60(2)
63	40	0.68	4.5	9.5	7.2	5.0	160	20160	82DC3680(1)60(2)	R82DC3680(1)60(2)
63	40	1.0	5.0	10.0	7.2	5.0	160	20160	82DC4100(1)60(2)	R82DC4100(1)60(2)
63	40	1.5	6.0	11.0	7.2	5.0	160	20160	82DC4150(1)60(2)	R82DC4150(1)60(2)
100	63	0.0010	2.5	6.5	7.2	5.0	200	40000	82EC1100(1)50(2)	R82EC1100(1)50(2)
100	63	0.0015	2.5	6.5	7.2	5.0	200	40000	82EC1150(1)50(2)	R82EC1150(1)50(2)
100	63	0.0022	2.5	6.5	7.2	5.0	200	40000	82EC1220(1)50(2)	R82EC1220(1)50(2)
VDC	**VAC**	**Capacitance Value (µF)**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Max K_0 (V^2/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) J = 5%, K = 10%, M = 20%
Bold denotes wound capacitor technology

Table 1 – Ratings & Part Number Reference cont.

VDC	VAC	Capacitance Value (µF)	Dimensions in mm T	Dimensions in mm H	Dimensions in mm L	Lead Spacing (S)	dV/dt (V/µs)	Maximum K_0 (V^2/µs)	KEMET Part Number	Legacy Part Number
100	63	0.0033	2.5	6.5	7.2	5.0	200	40000	82EC1330(1)50(2)	R82EC1330(1)50(2)
100	63	0.0047	2.5	6.5	7.2	5.0	200	40000	82EC1470(1)50(2)	R82EC1470(1)50(2)
100	63	0.0068	2.5	6.5	7.2	5.0	200	40000	82EC1680(1)50(2)	R82EC1680(1)50(2)
100	63	0.010	2.5	6.5	7.2	5.0	200	40000	82EC2100(1)50(2)	R82EC2100(1)50(2)
100	63	0.015	2.5	6.5	7.2	5.0	200	40000	82EC2150(1)50(2)	R82EC2150(1)50(2)
100	63	0.022	2.5	6.5	7.2	5.0	200	40000	82EC2220(1)50(2)	R82EC2220(1)50(2)
100	63	0.033	2.5	6.5	7.2	5.0	200	40000	82EC2330(1)50(2)	R82EC2330(1)50(2)
100	63	0.047	2.5	6.5	7.2	5.0	200	40000	82EC2470(1)60(2)	R82EC2470(1)60(2)
100	63	0.056	2.5	6.5	7.2	5.0	200	40000	82EC2560(1)60(2)	R82EC2560(1)60(2)
100	63	0.068	2.5	6.5	7.2	5.0	200	40000	82EC2680(1)60(2)	R82EC2680(1)60(2)
100	63	0.10	2.5	6.5	7.2	5.0	200	40000	82EC3100(1)70(2)	R82EC3100(1)70(2)
100	63	0.15	3.5	7.5	7.2	5.0	200	40000	82EC3150(1)70(2)	R82EC3150(1)70(2)
100	63	0.22	3.5	7.5	7.2	5.0	200	40000	82EC3220(1)70(2)	R82EC3220(1)70(2)
100	63	0.33	4.5	9.5	7.2	5.0	200	40000	82EC3330(1)70(2)	R82EC3330(1)70(2)
100	63	0.47	4.5	9.5	7.2	5.0	200	40000	82EC3470(1)70(2)	R82EC3470(1)70(2)
100	63	0.68	5.0	10.0	7.2	5.0	200	40000	82EC3680(1)70(2)	R82EC3680(1)70(2)
100	63	1.00	6.0	11.0	7.2	5.0	200	40000	82EC4100(1)70(2)	R82EC4100(1)70(2)
250	140	0.022	2.5	6.5	7.2	5.0	130	65000	82IC2220(1)60(2)	R82IC2220(1)60(2)
250	140	0.047	3.5	7.5	7.2	5.0	130	65000	82IC2470(1)60(2)	R82IC2470(1)60(2)
250	140	0.068	3.5	7.5	7.2	5.0	130	65000	82IC2680(1)60(2)	R82IC2680(1)60(2)
250	140	0.10	4.5	9.5	7.2	5.0	130	65000	82IC3100(1)60(2)	R82IC3100(1)60(2)
250	140	0.15	5.0	10.0	7.2	5.0	130	65000	82IC3150(1)60(2)	R82IC3150(1)60(2)
250	140	0.22	6.0	11.0	7.2	5.0	130	65000	82IC3220(1)60(2)	R82IC3220(1)60(2)
250	160	0.0068	2.5	6.5	7.2	5.0	250	125000	82IC1680(1)50(2)	R82IC1680(1)50(2)
250	160	0.010	2.5	6.5	7.2	5.0	250	125000	82IC2100(1)50(2)	R82IC2100(1)50(2)
250	160	0.015	2.5	6.5	7.2	5.0	250	125000	82IC2150(1)50(2)	R82IC2150(1)50(2)
250	160	0.022	3.5	7.5	7.2	5.0	250	125000	82IC2220(1)50(2)	R82IC2220(1)50(2)
250	160	0.033	3.5	7.5	7.2	5.0	250	125000	82IC2330(1)50(2)	R82IC2330(1)50(2)
250	160	0.047	4.5	9.5	7.2	5.0	250	125000	82IC2470(1)50(2)	R82IC2470(1)50(2)
250	160	0.068	4.5	9.5	7.2	5.0	250	125000	82IC2680(1)50(2)	R82IC2680(1)50(2)
250	160	0.10	5.0	10.0	7.2	5.0	250	125000	82IC3100(1)55(2)	R82IC3100(1)55(2)
250	160	0.15	6.0	11.0	7.2	5.0	250	125000	82IC3150(1)50(2)	R82IC3150(1)50(2)
400	160	0.0068	2.5	6.5	7.2	5.0	200	160000	82MC1680(1)60(2)	R82MC1680(1)60(2)
400	160	0.015	3.5	7.5	7.2	5.0	200	160000	82MC2150(1)60(2)	R82MC2150(1)60(2)
400	160	0.033	4.5	9.5	7.2	5.0	200	160000	82MC2330(1)60(2)	R82MC2330(1)60(2)
400	160	0.047	5.0	10.0	7.2	5.0	200	160000	82MC2470(1)60(2)	R82MC2470(1)60(2)
400	160	0.068	6.0	11.0	7.2	5.0	200	160000	82MC2680(1)60(2)	R82MC2680(1)60(2)
400	200	0.0010	2.5	6.5	7.2	5.0	400	320000	82MC1100(1)50(2)	R82MC1100(1)50(2)
400	200	0.0015	2.5	6.5	7.2	5.0	400	320000	82MC1150(1)50(2)	R82MC1150(1)50(2)
400	200	0.0022	2.5	6.5	7.2	5.0	400	320000	82MC1220(1)50(2)	R82MC1220(1)50(2)
400	200	0.0033	2.5	6.5	7.2	5.0	400	320000	82MC1330(1)50(2)	R82MC1330(1)50(2)
400	200	0.0047	2.5	6.5	7.2	5.0	400	320000	82MC1470(1)50(2)	R82MC1470(1)50(2)
400	200	0.0068	3.5	7.5	7.2	5.0	400	320000	82MC1680(1)50(2)	R82MC1680(1)50(2)
400	200	0.010	3.5	7.5	7.2	5.0	400	320000	82MC2100(1)50(2)	R82MC2100(1)50(2)
400	200	0.015	4.5	9.5	7.2	5.0	400	320000	82MC2150(1)50(2)	R82MC2150(1)50(2)
400	200	0.022	4.5	9.5	7.2	5.0	400	320000	82MC2220(1)50(2)	R82MC2220(1)50(2)
400	200	0.033	5.0	10.0	7.2	5.0	400	320000	82MC2330(1)50(2)	R82MC2330(1)50(2)
400	200	0.047	6.0	11.0	7.2	5.0	400	320000	82MC2470(1)50(2)	R82MC2470(1)50(2)
VDC	VAC	Capacitance Value (µF)	T (mm)	H (mm)	L (mm)	Lead Spacing (S)	dV/dt (V/µs)	Max K_0 (V^2/µs)	KEMET Part Number	Legacy Part Number

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) J = 5%, K = 10%, M = 20%

Soldering Process

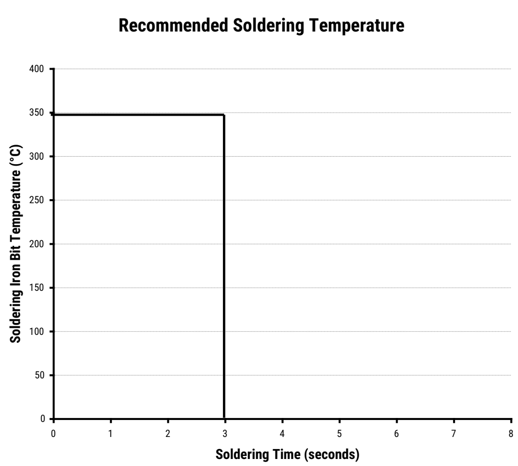
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2, serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

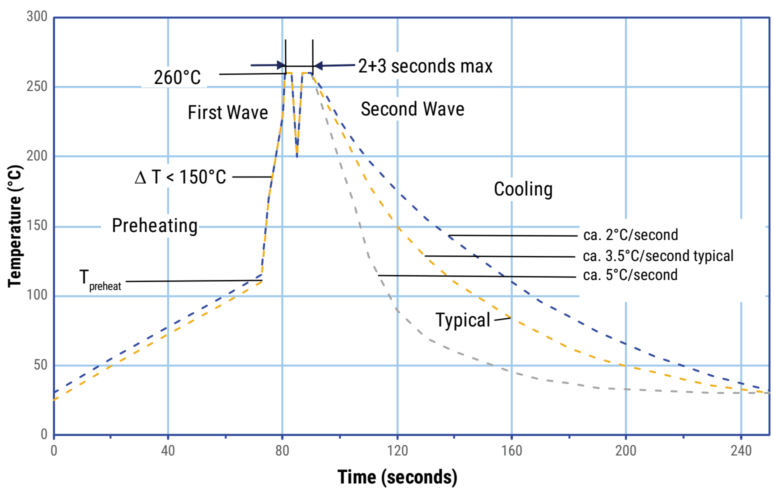
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

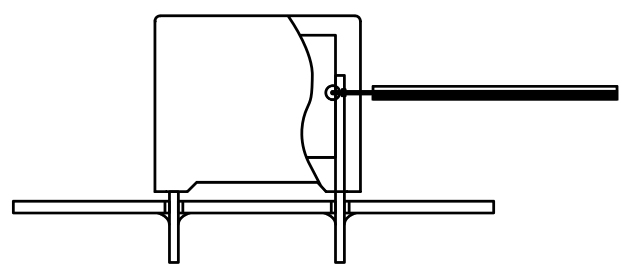
Wave Soldering Recommendations cont.

1. The table indicates the maximum set-up temperature of the soldering process Figure 1.

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



Temperature monitored inside the capacitor.

Selective Soldering Recommendations

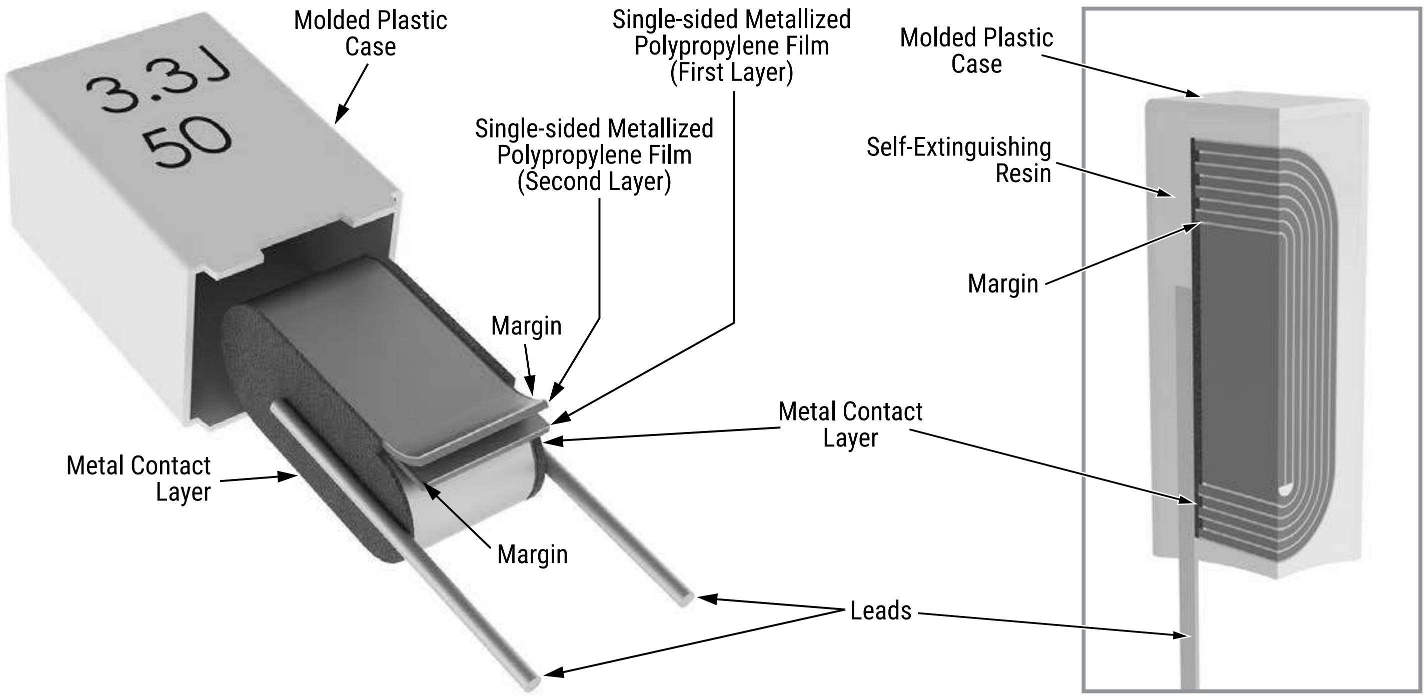
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

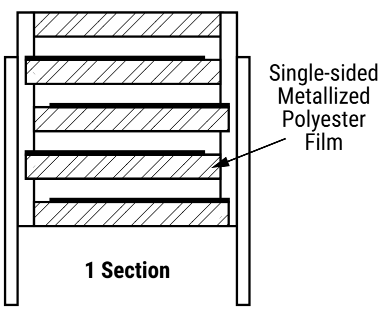
Construction

Wound

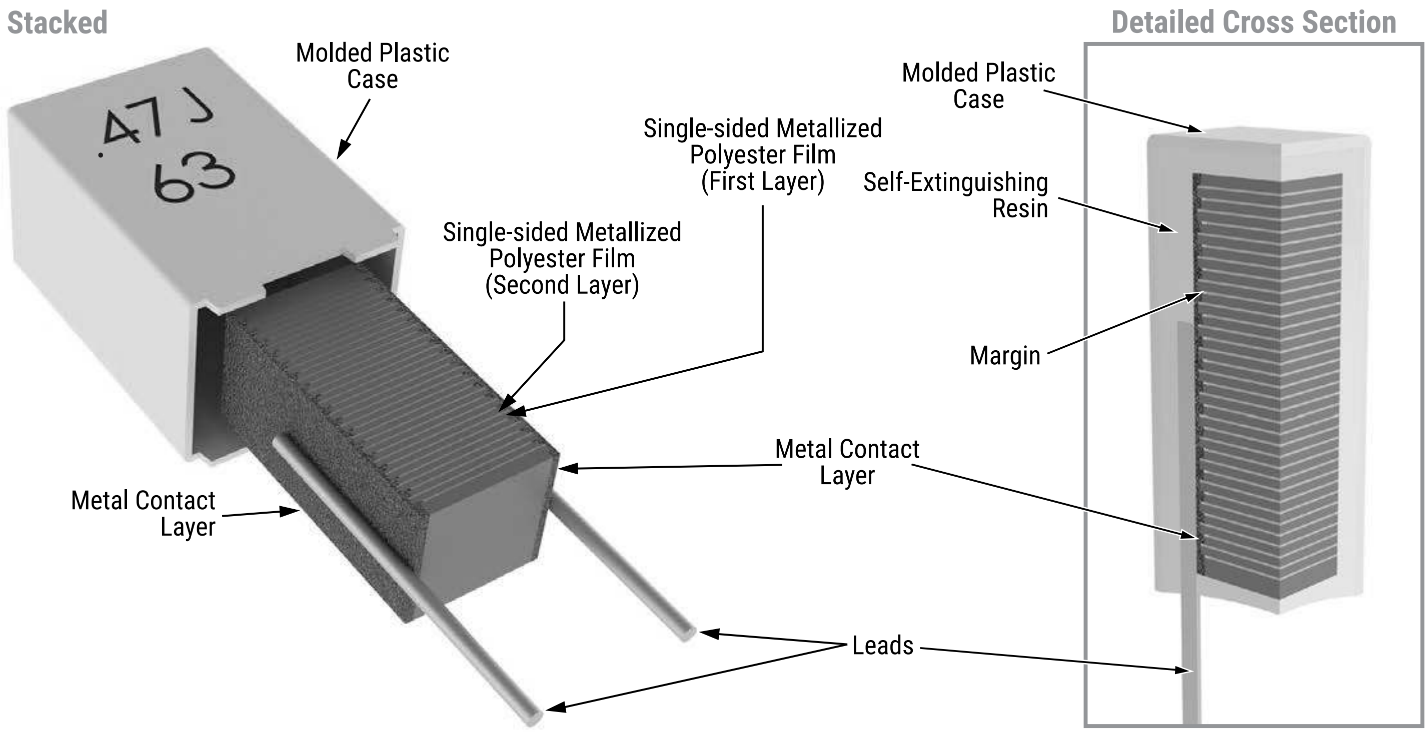
Detailed Cross Section



Winding Scheme

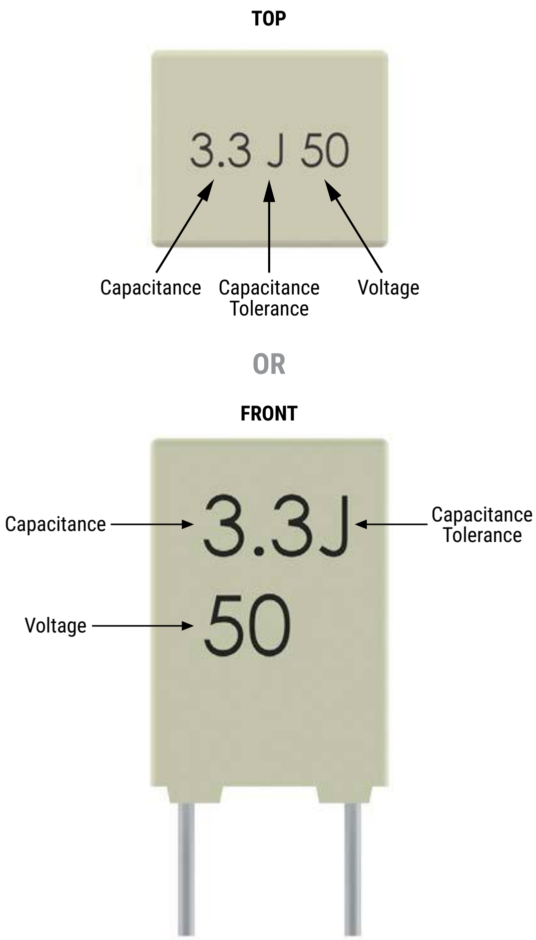


Construction cont.

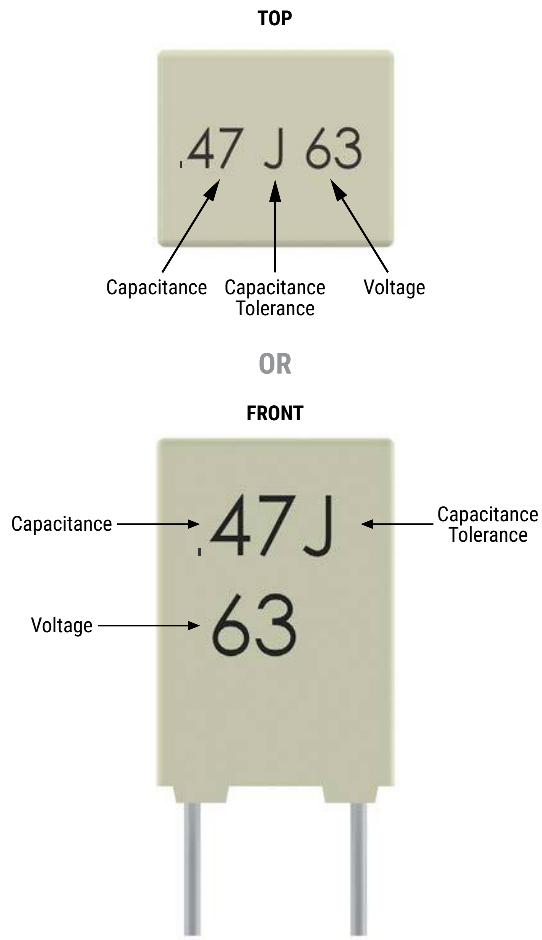


Marking

Wound



Stacked

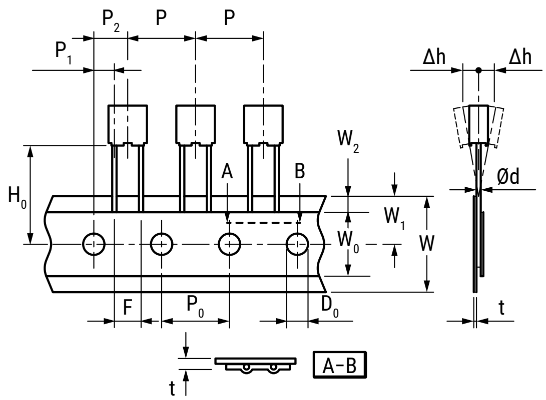


Packaging Quantities

Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 355 mm	Ammo Taped
5	2.5	6.5	7.2	3,000	4,000	2,500	3,500
	3.5	7.5	7.2	2,000	3,000	1,800	2,500
	4.5	9.5	7.2	1,500	2,000	1,400	1,900
	5.0	10.0	7.2	1,000	1,500	1,200	1,700
	6.0	11.0	7.2	2,000	1,000	1,000	1,400
	7.2	13.0	7.2	1,500	750	800	1,150

Lead Taping & Packaging (IEC 60286–2)

Figure 1 — Lead Spacing 5 & 7.5 mm



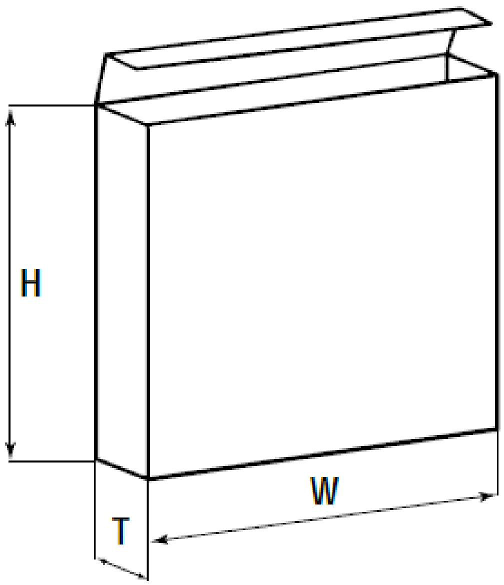
Description	Symbol	Dimensions (mm)	
		Lead Spacing 5 Figure 1	Tolerance
Lead wire diameter	d	0.5 – 0.6	±0.05
Taping lead space	P	12.7	±1
Feed hole lead space	P_0	12.7	±0.2*
Centering of the lead wire	P_1	3.85	±0.7
Centering of the body	P_2	6.35	±1.3
Lead spacing	F	5	+0.6/−0.1
Component alignment	Δh	0	±2
Height of component from tape center	H_0**	18.5	±0.5
Carrier tape width	W	18	+1/−0.5
Hold down tape width	W_0	6	Minimum
Hole position	W_1	9	±0.5
Hold down tape position	W_2	3	Maximum
Feed hole diameter	D_0	4	±0.2
Tape thickness	t	0.7	±0.2

*Maximum 1 mm on 20 lead spaces.
**H_0 = 16.5 mm is available upon request.
For orders of capacitors with lead space = 7.5 mm, please specify the requested version (Figure 1 or Figure 2).

Ammo Specifications

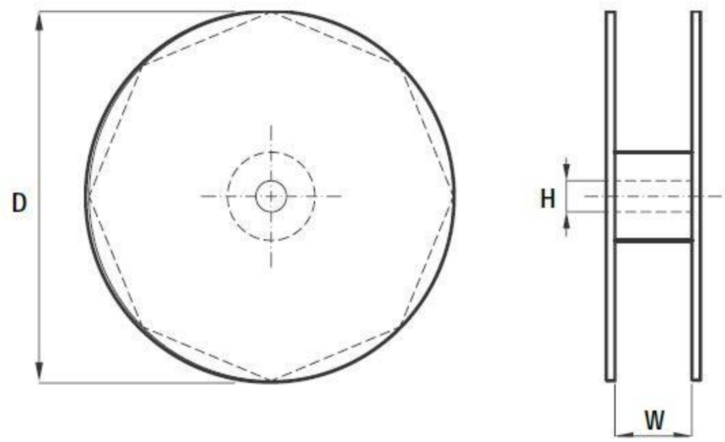
Dimensions in mm		
H	W	T
360 *	340	59

** Lower dimension available upon request (maximum 295 mm)*



Reel Specifications

Dimensions in mm		
D	H	W
355	30	55 maximum



R66, Radial, 7.5 mm Lead Spacing, 50 – 630 VDC (Automotive Grade)

KEMET a YAGEO company

Overview

The R66 is constructed of metallized polyester film (wound or stacked technology) with radial leads of tinned wire. Radial leads are electrically welded to the contact metal layer on the ends of the capacitor winding. The capacitor is encapsulated with thermosetting resin in a box of material meeting the UL 94 V–0 requirements.

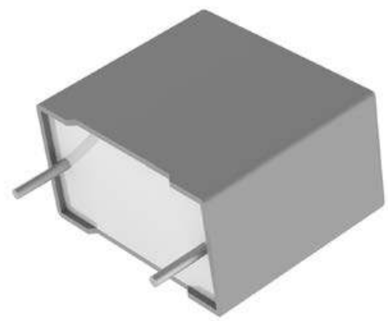
Automotive grade devices meet the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

Applications

Typical applications include blocking, coupling, decoupling, bypassing, and interference suppression in low voltage applications such as automotive. Not suitable for across-the-line application (see Suppressor Capacitors).

Benefits

- Voltage range: 50 – 630 VDC
- Capacitance range: 0.001 – 4.7 µF
- Lead Spacing: 7.5 mm
- Capacitance tolerance: ±5%, ±10%, ±20%
- Climatic category: 55/105/56
- Operating temperature range of −55°C to +105°C
- RoHS compliance and lead (Pb)-free terminations
- Tape & Reel packaging in accordance with IEC 60286–2
- Self-healing
- Automotive grade (AEC–Q200)



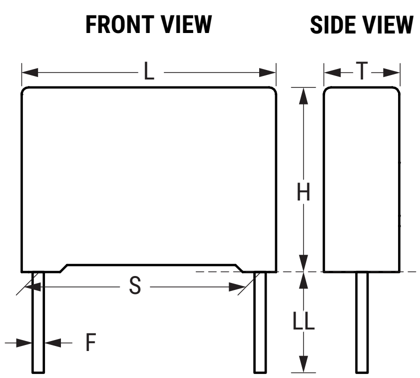
Part Number System

R66	E	D	3100	AA	7A	J
Series	Rated Voltage (VDC)	Length (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance
Metallized Polyester	C = 50 D = 63 E = 100 I = 250 M = 400 P = 630	D = 7.5	The last three digits represent significant figures. First digit specifies the number of zeros to be added.	See Ordering Options Table	10 6A 7A	J = ±5% K = ±10% M = ±20%

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	LL Lead Length (mm)	Lead and Packaging Code
7.5	**Standard Lead and Packaging Options**		
	Bulk – Short Leads	4 +2/−0	AA
	Ammo Pack in Taping Style Figure 1	H_0=18.5 ±0.5	DQ
	Ammo Pack in Taping Style Figure 2	H_0=18.5 ±0.5	28
	Other Lead and Packaging Options		
	Tape & Reel (Standard Reel Ø 355 mm)	H_0 = 18.5 ±0.5	CK
	Bulk – Short Leads	2.7 +0.5/−0	JA
	Bulk – Short Leads	3.5 +0.5/−0	JB
	Bulk – Short Leads	10 ±1	JC
	Bulk – Short Leads	3.2 +0.3/−0.2	JH
	Bulk – Long Leads	17 +1/−2	Z3

Dimensions – Millimeters



S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
7.5	±0.4	3.0	+0.1/−0.5	8.0	+0.1/−0.5	10.0	+0.2/−0.5	0.5	±0.05
7.5	±0.4	4.0	+0.1/−0.5	9.0	+0.1/−0.5	10.0	+0.2/−0.5	0.6	±0.05
7.5	±0.4	5.0	+0.1/−0.5	10.5	+0.1/−0.5	10.0	+0.2/−0.5	0.6	±0.05
7.5	±0.4	6.0	+0.1/−0.5	12.0	+0.1/−0.5	10.5	+0.2/−0.5	0.6	±0.05
Note: See Ordering Options Table for lead length (LL/H_0) options.									

Performance Characteristics

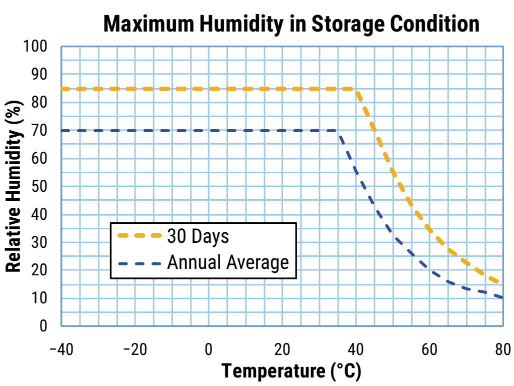
Dielectric	Polyester film (polyethylene terephthalate)					
Plates	Metal layer deposited by evaporation under vacuum					
Winding	Non-inductive type					
Leads	Tinned wire					
Protection	Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94					
Related Documents	IEC 60384–2					
Rated Voltage V_R (VDC)	50	63	100	250	400	630
Rated Voltage V_R (VAC)	30	40	63	160	200	220
Capacitance Range (µF)	0.68 – 4.7	0.33 – 3.3	0.068 – 1.5	0.022 – 0.33	0.0068 – 0.15	0.001 – 0.047
Capacitance Values	E6 series (IEC 60063) measured at 1 kHz and +20 ±1°C					
Capacitance Tolerance	±5%, ±10%, ±20%					
Operating Temperature Range	−55°C to +105°C Upper operating temperature of +125°C is allowed for a maximum operating time of 1,000 hours. (Stacked technology only)					
Rated Temperature T_R	+85°C					
Voltage Derating	Above +85°C DC and AC voltage derating is 1.25%/°C					
Climatic Category	55/105/56 IEC 60068–1					
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package					
	Average relative humidity per year ≤ 70%					
	RH ≤ 85% for 30 days randomly distributed throughout the year					
	Dew is absent					
	Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)					
Test Voltage	1.6 x V_R VDC for 2 seconds (between terminations) at +25°C ±5°C					
Capacitance Drift	Maximum 3% after a 2 year storage period at a temperature of +10°C to +40°C and a relative humidity of 40% to 60%					
Reliability (Reference IEC-61709)	Operational life > 200,000 hours					
	Failure rate ≤ 1 FIT, T = +40°C, V = 0.5 x V_R					
	Failure criteria: open or short circuit, capacitance change > 10%, DF 2 times the catalog limits, IR < 0.005 x initial limit					
Maximum Pulse Steepness	dV/dt according to Table 1. For peak to peak voltages lower than rated voltage (Vpp <V_R), the specified dv/dt can be multiplied by the factor V_R/Vpp					
Temperature Coefficient	+400 (±200) ppm/°C at 1 kHz					
Self Inductance (Lead Length ~ 2 mm)	Approximately 8 nH. Maximum 1nH per 1 mm lead and capacitor length.					

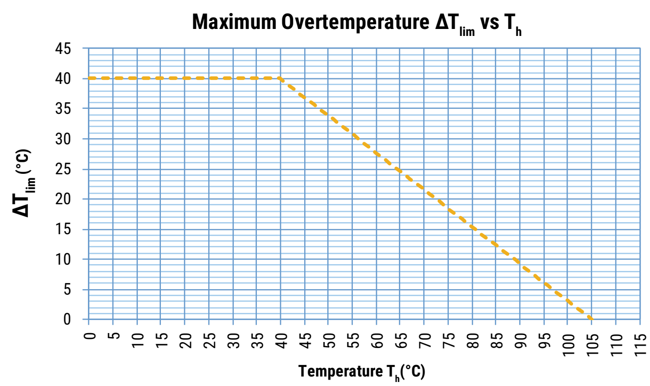
Performance Characteristics cont.

	Maximum Values at 25°C ±5°C	
Dissipation Factor tanδ	Frequency	For all Capacitance Values
	1 kHz	1.00%
	10 kHz	1.50%

	Measured at +25°C ±5°C, according to IEC 60384–2		
Insulation Resistance	Minimum Values Between Terminals		
	Voltage Charge/Time	C ≤ 0.33 µF	C > 0.33 µF
	50 VDC for V_R ≤ 100 VDC 1 minute	≥ 3,750 MΩ (≥ 50,000 MΩ)*	≥ 1,250 MΩ • µF (≥ 5,000 MΩ • µF)*
	100 VDC for V_R > 100 VDC 1 minute	≥ 30,000 MΩ (≥ 50,000 MΩ)*	

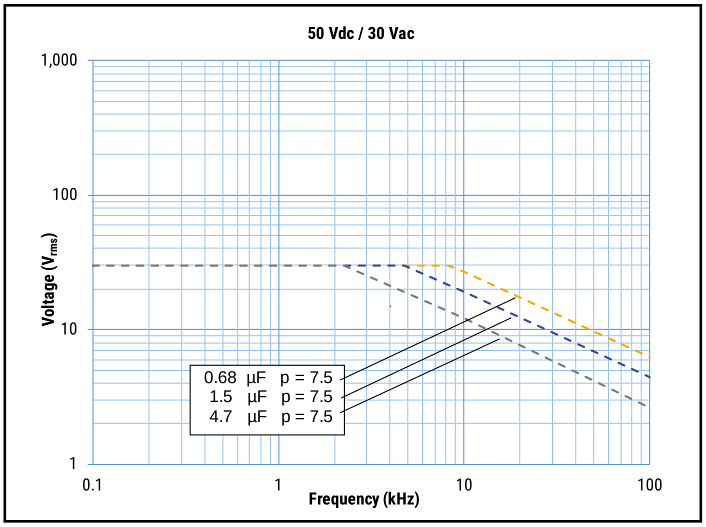
** typical value*

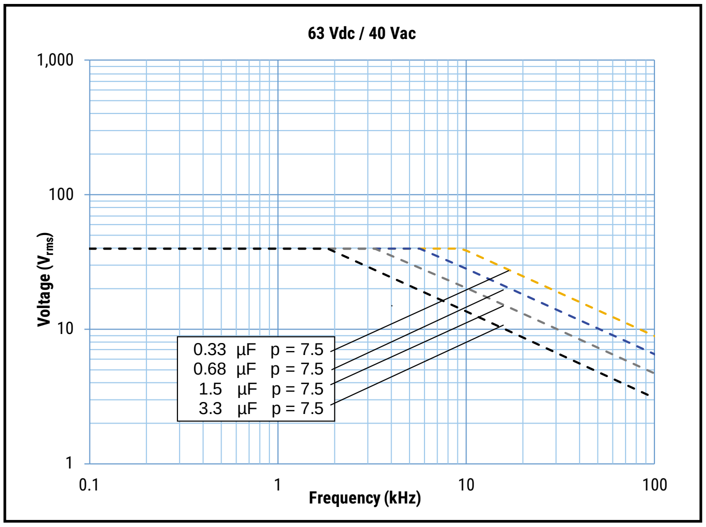


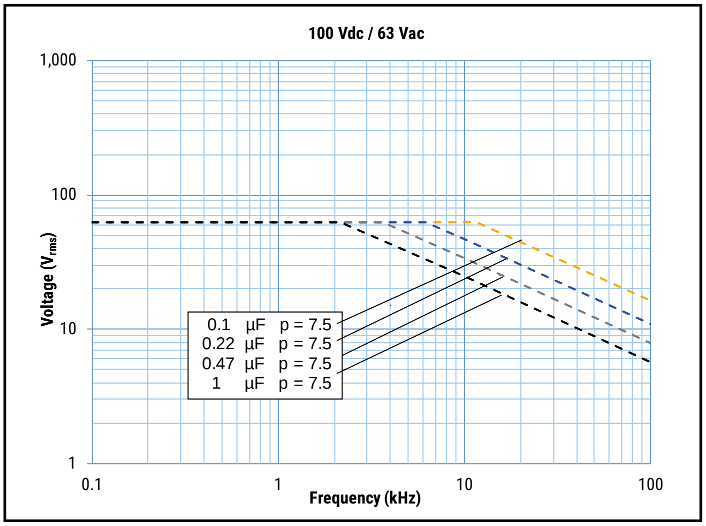


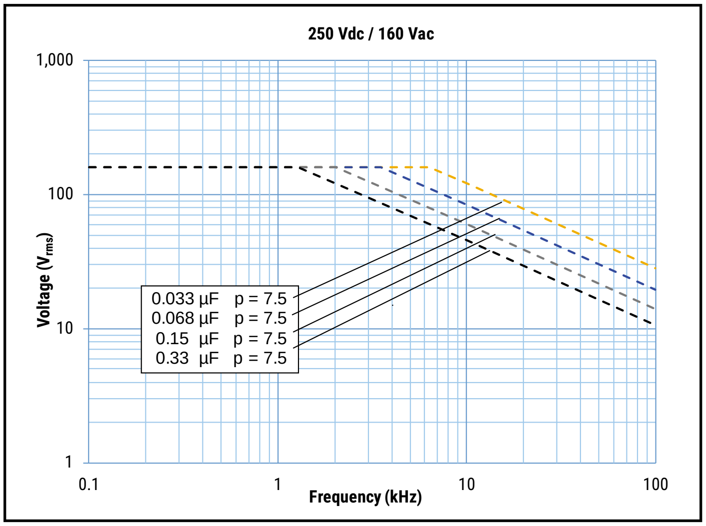
T_h is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

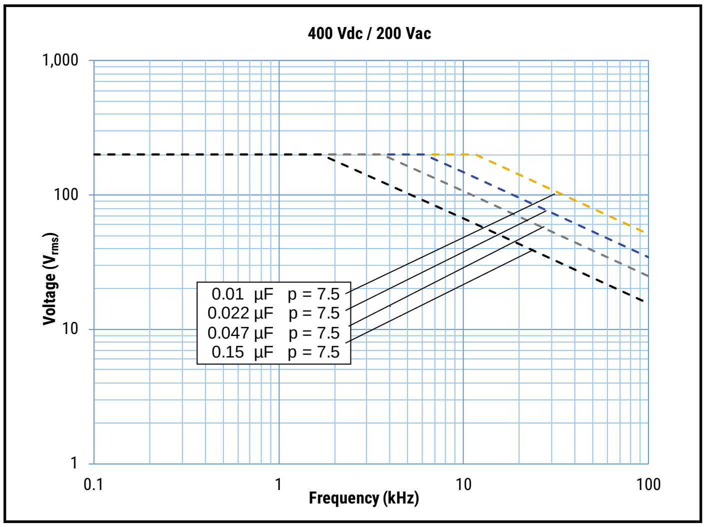
Maximum Voltage (V_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C)

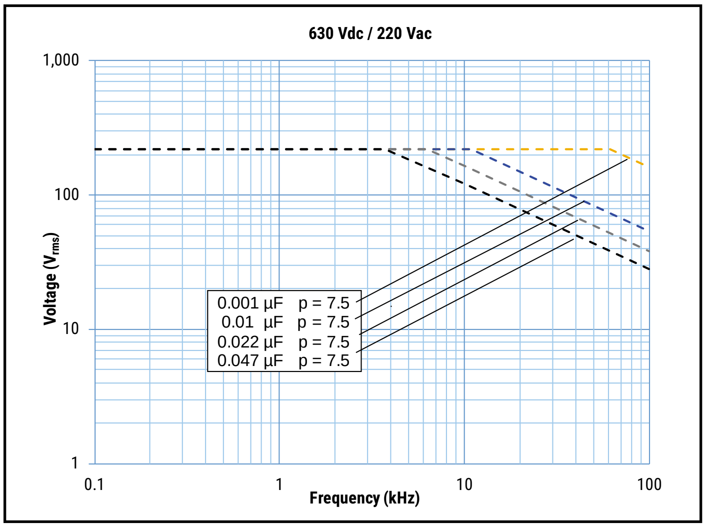




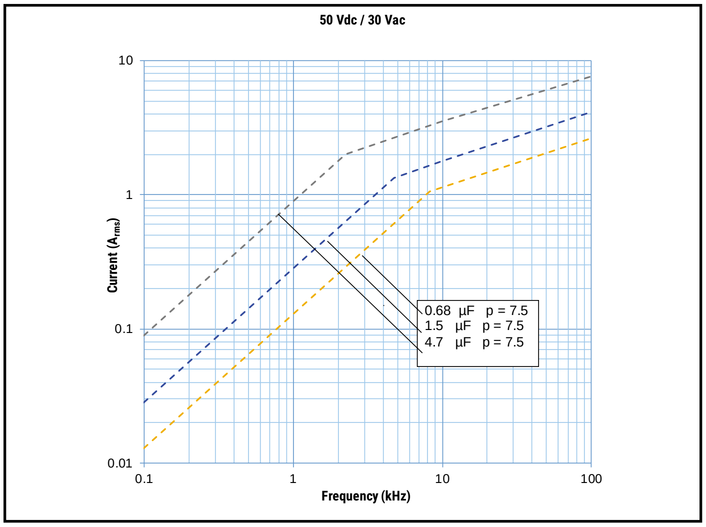


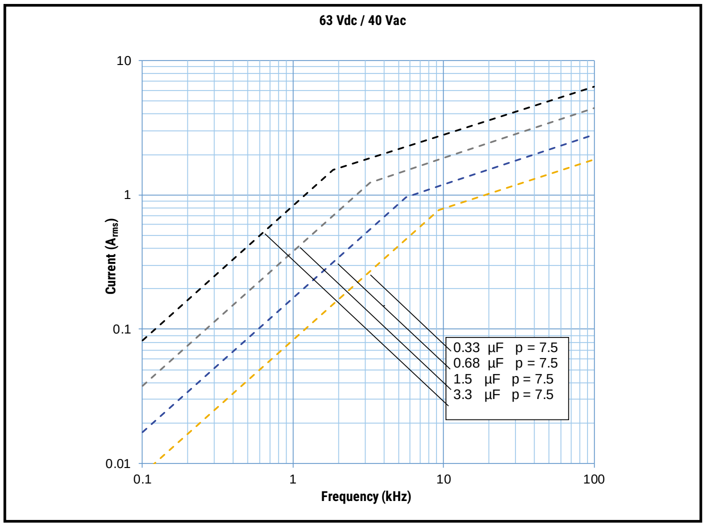


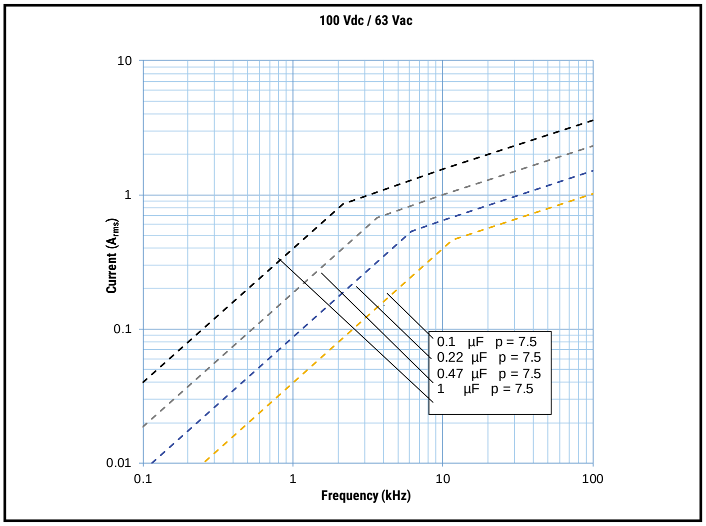


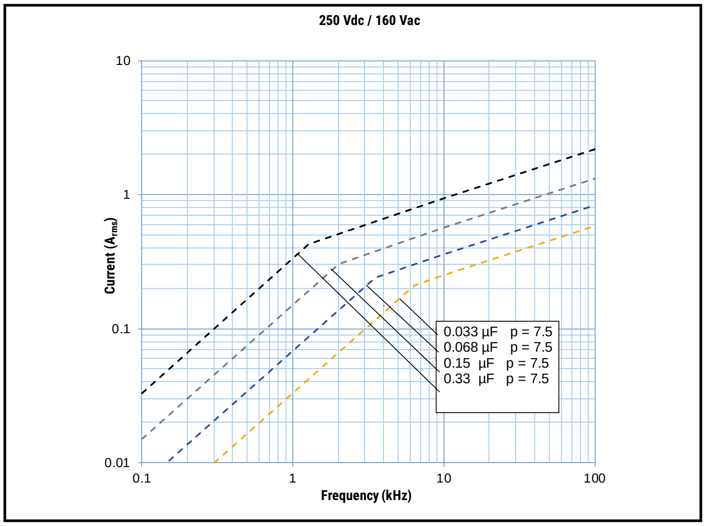


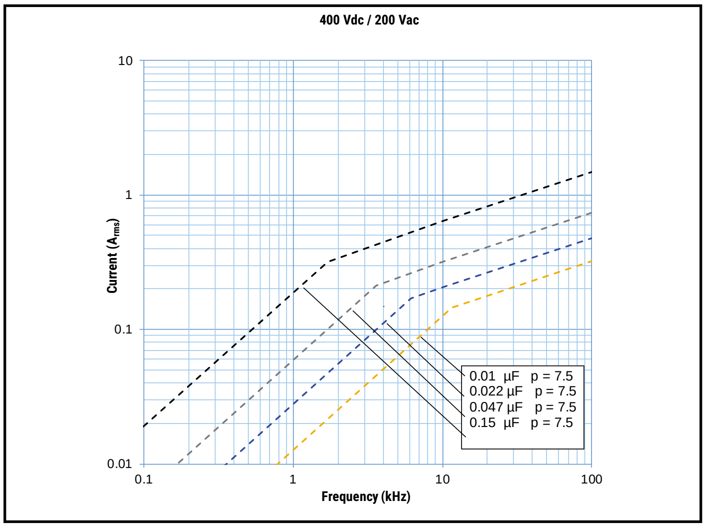
Maximum Current (I_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C)

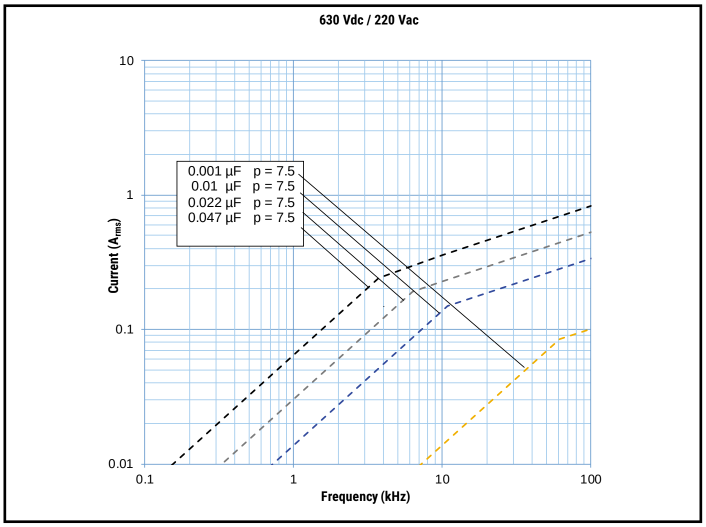












Environmental Test Data

Damp Heat, Steady State Test	Test Conditions:		Performances
	Temperature: Relative humidity (RH): Test duration:	+40°C ±2°C 93% ±2% 56 days	|Δ C/C| ≤ 5%, Δ tanδ ≤ 0.005 at 1 kHz IR after test ≥ 50% of initial limit
Endurance Test	**Test Conditions**		**Performances**
	Temperature: Voltage applied: Test duration:	+105°C ±2°C 1.25 x V_C 2,000 hours	|Δ C/C| ≤ 5%, Δ tanδ ≤ 0.005 at 10 kHz for C ≤ 1μF Δ tanδ ≤ 0.003 at 1 kHz for C > 1μF IR after test ≥ 50% of initial limit
Resistance to Soldering Heat Test	**Test Conditions**		**Performances**
	Solder bath temperature: Dipping time (with heat screen):	260°C ±5°C 10 seconds ±1 second	|Δ C/C| ≤ 2%, Δ tanδ ≤ 0.005 at 10 kHz for C ≤ 1μF Δ tanδ ≤ 0.003 at 1 kHz for C > 1μF IR after test ≥ initial limit

Environmental Compliance

All KEMET MKT capacitors are RoHS compliant.

Table 1 – Ratings & Part Number Reference

VDC	VAC	Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Maximum K_0 (V^2/µs)	KEMET Internal Part Number	Customer Part Number
			T	H	L					
50	30	0.68	3.0	8.0	10.0	7.5	100	10000	66CD3680(1)6A(2)	R66CD3680(1)6A(2)
50	30	1.0	3.0	8.0	10.0	7.5	100	10000	66CD4100(1)6A(2)	R66CD4100(1)6A(2)
50	30	1.5	4.0	9.0	10.0	7.5	100	10000	66CD4150(1)6A(2)	R66CD4150(1)6A(2)
50	30	2.2	5.0	10.5	10.0	7.5	100	10000	66CD4220(1)6A(2)	R66CD4220(1)6A(2)
50	30	4.7	6.0	12.0	10.5	7.5	100	10000	66CD4470(1)6A(2)	R66CD4470(1)6A(2)
63	40	0.33	3.0	8.0	10.0	7.5	120	15120	66DD3330(1)7A(2)	R66DD3330(1)7A(2)
63	40	0.47	3.0	8.0	10.0	7.5	120	15120	66DD3470(1)6A(2)	R66DD3470(1)6A(2)
63	40	0.68	4.0	9.0	10.0	7.5	120	15120	66DD3680(1)7A(2)	R66DD3680(1)7A(2)
63	40	1.0	4.0	9.0	10.0	7.5	120	15120	66DD4100(1)7A(2)	R66DD4100(1)7A(2)
63	40	1.5	5.0	10.5	10.0	7.5	120	15120	66DD4150(1)7A(2)	R66DD4150(1)7A(2)
63	40	2.2	6.0	12.0	10.5	7.5	120	15120	66DD4220(1)6A(2)	R66DD4220(1)6A(2)
63	40	3.3	6.0	12.0	10.5	7.5	120	15120	66DD4330(1)6A(2)	R66DD4330(1)6A(2)
100	63	0.068	3.0	8.0	10.0	7.5	150	30000	66ED2680(1)7A(2)	R66ED2680(1)7A(2)
100	63	0.10	3.0	8.0	10.0	7.5	150	30000	66ED3100(1)7A(2)	R66ED3100(1)7A(2)
100	63	0.15	3.0	8.0	10.0	7.5	150	30000	66ED3150(1)7A(2)	R66ED3150(1)7A(2)
100	63	0.22	3.0	8.0	10.0	7.5	150	30000	66ED3220(1)7A(2)	R66ED3220(1)7A(2)
100	63	0.33	4.0	9.0	10.0	7.5	150	30000	66ED3330(1)7A(2)	R66ED3330(1)7A(2)
100	63	0.47	4.0	9.0	10.0	7.5	150	30000	66ED3470(1)7A(2)	R66ED3470(1)7A(2)
100	63	0.68	4.0	9.0	10.0	7.5	150	30000	66ED3680(1)7A(2)	R66ED3680(1)7A(2)
100	63	1.0	5.0	10.5	10.0	7.5	150	30000	66ED4100(1)7A(2)	R66ED4100(1)7A(2)
100	63	1.5	6.0	12.0	10.5	7.5	150	30000	66ED4150(1)6A(2)	R66ED4150(1)6A(2)
250	160	0.022	3.0	8.0	10.0	7.5	200	100000	66ID2220(1)7A(2)	R66ID2220(1)7A(2)
250	160	0.033	3.0	8.0	10.0	7.5	200	100000	66ID2330(1)7A(2)	R66ID2330(1)7A(2)
250	160	0.047	3.0	8.0	10.0	7.5	200	100000	66ID2470(1)7A(2)	R66ID2470(1)7A(2)
250	160	0.068	3.0	8.0	10.0	7.5	200	100000	66ID2680(1)6A(2)	R66ID2680(1)6A(2)
250	160	0.10	4.0	9.0	10.0	7.5	200	100000	66ID3100(1)7A(2)	R66ID3100(1)7A(2)
250	160	0.15	4.0	9.0	10.0	7.5	200	100000	66ID3150(1)7A(2)	R66ID3150(1)7A(2)
250	160	0.22	5.0	10.5	10.0	7.5	200	100000	66ID3220(1)7A(2)	R66ID3220(1)7A(2)
250	160	0.33	6.0	12.0	10.5	7.5	200	100000	66ID3330(1)6A(2)	R66ID3330(1)6A(2)
400	200	0.0068	3.0	8.0	10.0	7.5	275	220000	66MD1680(1)7A(2)	R66MD1680(1)7A(2)
400	200	0.010	3.0	8.0	10.0	7.5	275	220000	66MD2100(1)7A(2)	R66MD2100(1)7A(2)
400	200	0.015	3.0	8.0	10.0	7.5	275	220000	66MD2150(1)7A(2)	R66MD2150(1)7A(2)
400	200	0.022	3.0	8.0	10.0	7.5	275	220000	66MD2220(1)6A(2)	R66MD2220(1)6A(2)
400	200	0.033	4.0	9.0	10.0	7.5	275	220000	66MD2330(1)7A(2)	R66MD2330(1)7A(2)
400	200	0.047	4.0	9.0	10.0	7.5	275	220000	66MD2470(1)7A(2)	R66MD2470(1)7A(2)
400	200	0.068	5.0	10.5	10.0	7.5	275	220000	66MD2680(1)7A(2)	R66MD2680(1)7A(2)
400	200	0.10	6.0	12.0	10.5	7.5	275	220000	66MD3100(1)6A(2)	R66MD3100(1)6A(2)
400	200	0.15	6.0	12.0	10.5	7.5	275	220000	66MD3150(1)6A(2)	R66MD3150(1)6A(2)
630	**220**	**0.0010**	**3.0**	**8.0**	**10.0**	**7.5**	**40**	**50400**	**66PD1100(1)10(2)**	**R66PD1100(1)10(2)**
630	**220**	**0.0015**	**3.0**	**8.0**	**10.0**	**7.5**	**40**	**50400**	**66PD1150(1)10(2)**	**R66PD1150(1)10(2)**
630	**220**	**0.0022**	**3.0**	**8.0**	**10.0**	**7.5**	**40**	**50400**	**66PD1220(1)10(2)**	**R66PD1220(1)10(2)**
630	**220**	**0.0033**	**3.0**	**8.0**	**10.0**	**7.5**	**40**	**50400**	**66PD1330(1)10(2)**	**R66PD1330(1)10(2)**
630	**220**	**0.0047**	**3.0**	**8.0**	**10.0**	**7.5**	**40**	**50400**	**66PD1470(1)10(2)**	**R66PD1470(1)10(2)**
630	**220**	**0.0068**	**4.0**	**9.0**	**10.0**	**7.5**	**40**	**50400**	**66PD1680(1)10(2)**	**R66PD1680(1)10(2)**
630	220	0.010	4.0	9.0	10.0	7.5	300	378000	66PD2100(1)7A(2)	R66PD2100(1)7A(2)
630	220	0.015	4.0	9.0	10.0	7.5	300	378000	66PD2150(1)7A(2)	R66PD2150(1)7A(2)
630	220	0.022	5.0	10.5	10.0	7.5	300	378000	66PD2220(1)7A(2)	R66PD2220(1)7A(2)
630	220	0.033	6.0	12.0	10.5	7.5	300	378000	66PD2330(1)6A(2)	R66PD2330(1)6A(2)
630	220	0.047	6.0	12.0	10.5	7.5	300	378000	66PD2470(1)6A(2)	R66PD2470(1)6A(2)
VDC	VAC	Capacitance Value (µF)	T (mm)	H (mm)	L (mm)	Lead Spacing	dV/dt (V/µs)	Max K_0 (V^2/µs)	KEMET Internal Part Number	Customer Part Number

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) J = 5%, K = 10%, M = 20%
Bold denotes wound capacitor technology

Soldering Process

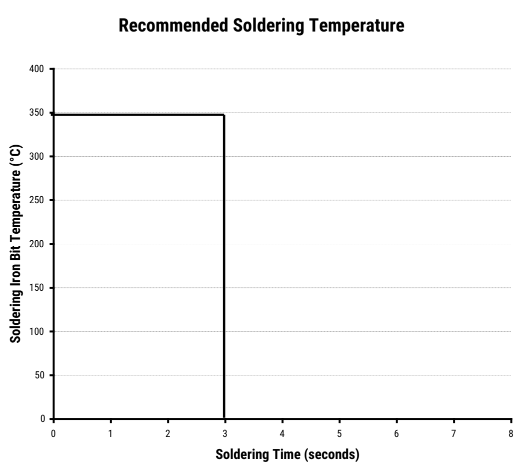
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2, serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

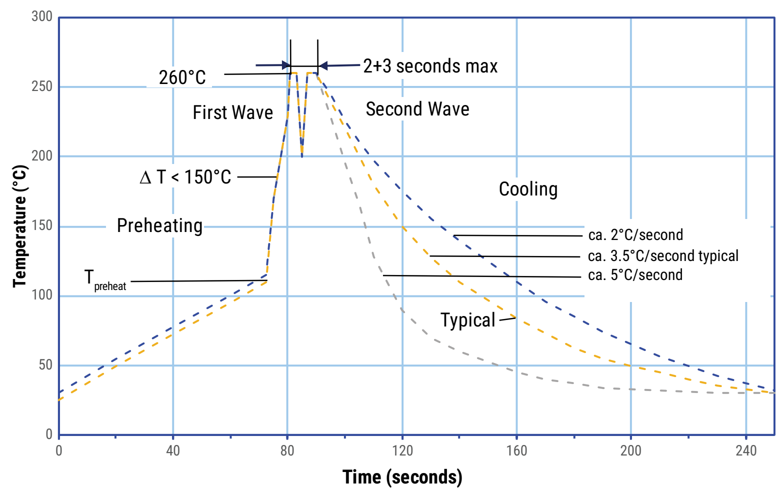
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

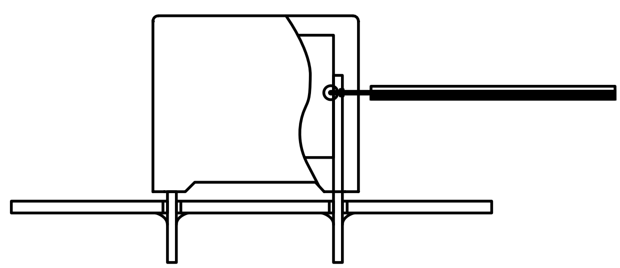
Wave Soldering Recommendations cont.

1. The table indicates the maximum set-up temperature of the soldering process
 Figure 1.

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
 Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



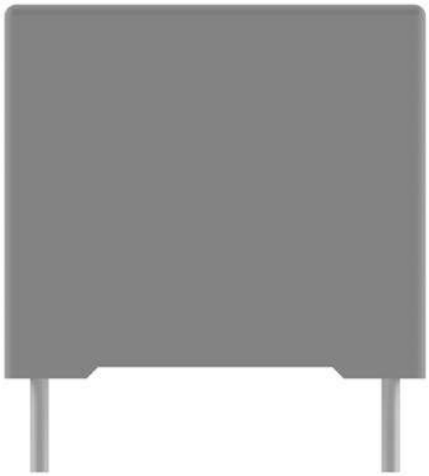
Temperature monitored inside the capacitor.

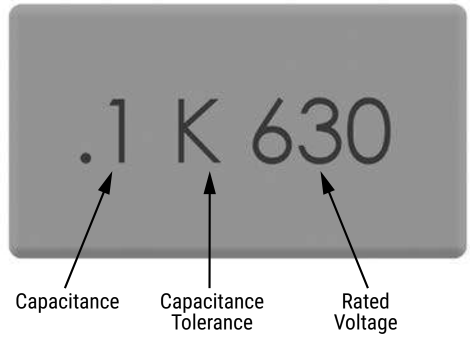
Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Marking





Packaging Quantities

Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel 355 mm	Ammo Taped
7.5	3.0	8.0	10.0	1,500	1,750	2,100	2,800
	4.0	9.0	10.0	2,000	1,500	1,500	2,100
	5.0	10.5	10.0	1,500	1,000	1,200	1,600
	6.0	12.0	10.5	1,000	800	1,000	1,350

Lead Taping & Packaging (IEC 60286–2)

Figure 1 — Lead Spacing 5 & 7.5 mm

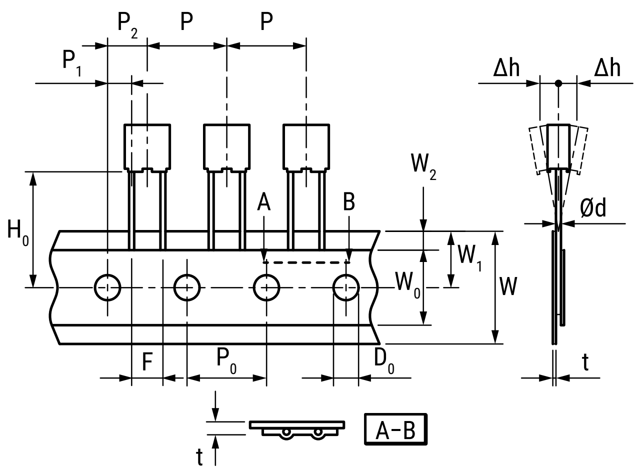
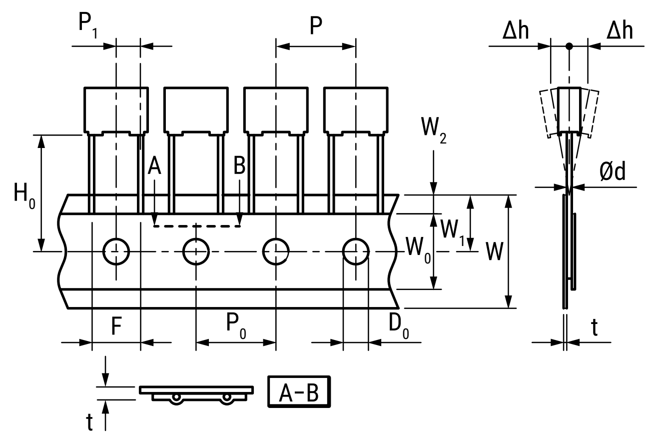


Figure 2 — Lead Spacing 7.5 mm



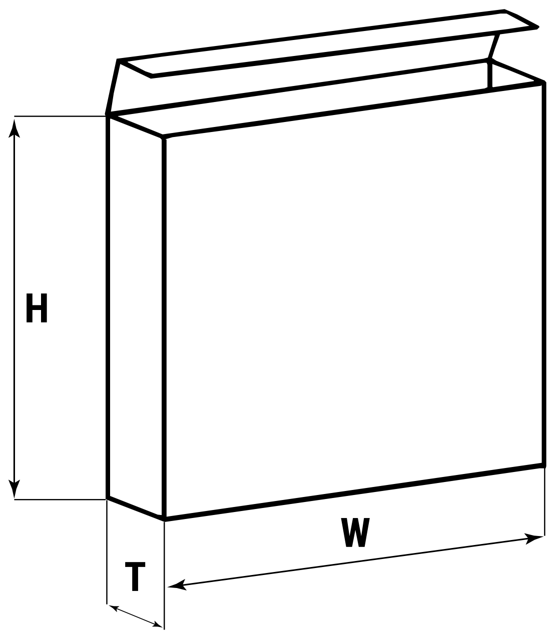
Description	Symbol	Dimensions (mm)			
		Lead Spacing			Tolerance
		5	7.5	7.5	
		Figure 1	Figure 1	Figure 2	
Lead wire diameter	d	0.5 – 0.6	0.5 – 0.6	0.5 – 0.6	±0.05
Taping lead space	P	12.7	12.7	12.7	±1
Feed hole lead space	P_0	12.7	12.7	12.7	±0.2*
Centering of the lead wire	P_1	3.85	2.6	3.75	±0.7
Centering of the body	P_2	6.35	6.35		±1.3
Lead spacing	F	5	7.5	7.5	+0.6/−0.1
Component alignment	Δh	0	0	0	±2
Height of component from tape center	H_0**	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	+1/−0.5
Hold down tape width	W_0	6	6	6	Minimum
Hole position	W_1	9	9	9	±0.5
Hold down tape position	W_2	3	3	3	Maximum
Feed hole diameter	D_0	4	4	4	±0.2
Tape thickness	t	0.7	0.7	0.7	±0.2

**Maximum 1 mm on 20 lead spaces.*
***H_0 = 16.5 mm is available upon request.*
For orders of capacitors with lead space = 7.5 mm, please specify the requested version: Figure 1 = Packaging code "CK" / Figure 2 – Packaging code "28"

Ammo Specifications

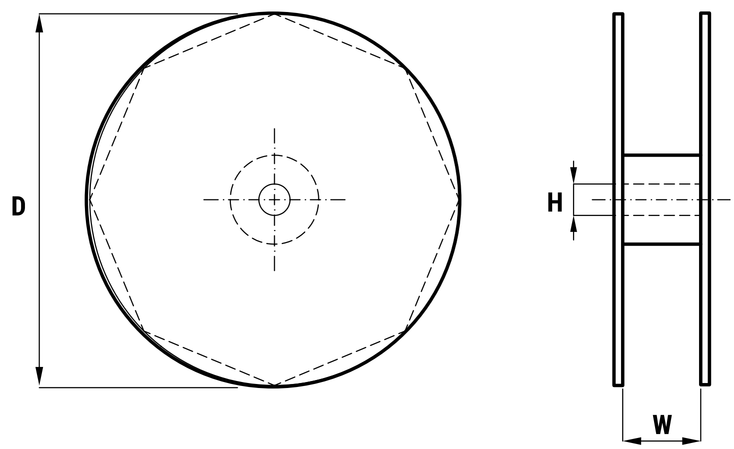
Dimensions in mm		
H	W	T
360 *	340	59

** Lower dimension available upon request (maximum 295 mm)*



Reel Specifications

Dimensions in mm		
D	H	W
355	30	55 maximum



R60, Radial, 10.0 – 37.5 mm Lead Spacing, 50 – 1,000 VDC (Automotive Grade)

KEMET a YAGEO company

Overview

The R60 is constructed of metallized polyester film (wound or stacked technology) with radial leads of tinned wire. Radial leads are electrically welded to the contact metal layer on the ends of the capacitor winding. The capacitor is encapsulated with thermosetting resin in a box material meeting the UL 94V–0 requirements.

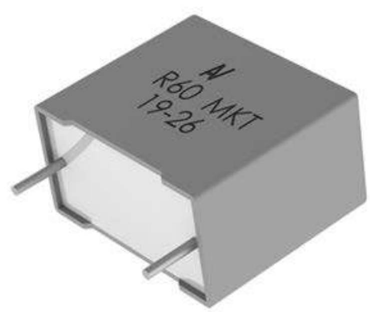
R60 components (up to lead spacing 22.5 mm) meet the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

Applications

Typical applications include blocking, coupling, decoupling, bypassing and interference suppression in low voltage applications such as automotive. Not suitable for across-the-line application (see suppressor capacitors).

Benefits

- Voltage range: 50 – 1,000 VDC
- Capacitance range: 0.001 – 150.0 µF
- Lead spacing: 10.0 – 37.5 mm
- Capacitance tolerance: ±5%, ±10%, ±20%
- Climatic category: 55/105/56
- Operating temperature range of −55°C to +105°C
- RoHS compliance and lead (Pb)-free terminations
- Tape and reel packaging in accordance with IEC 60286–2
- Self-healing
- Automotive (AEC–Q200) grades up to pitch 22.5 mm



Part Number System

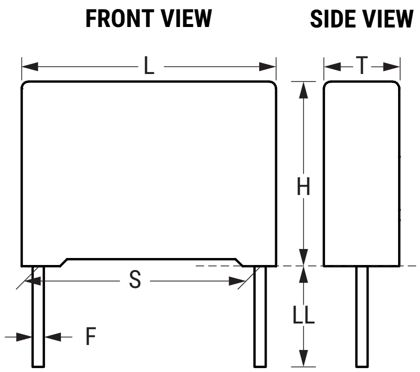
R60	M	F	2470	AA	60	K
Series	Rated Voltage (VDC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance
Metallized Polyester	C = 50 D = 63 E = 100 G = 160 I = 250 M = 400 P = 630 Q = 1,000	F = 10.0 I = 15.0 N = 22.5 R = 27.5 W = 37.5	The last three digits represent significant figures. First digit specifies the number of zeros to be added.	See Ordering Options Table	00 01 30 40 50 6A L0 L1	J = ±5% K = ±10% M = ±20%

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	LL Lead Length (mm)	Lead and Packaging Code
10 15 22.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/−0	AA
	Ammo Pack	H0=18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Tape & Reel (Standard Reel Ø 355mm)	H0=18.5 ±0.5	GY
	Tape & Reel (Large Reel Ø 500mm)	H0=18.5 ±0.5	CK
	Bulk (Bag) – Short Leads	2.7 +0.5/−0	JA
	Bulk (Bag) – Short Leads	3.5 +0.5/−0	JB
	Bulk (Bag) – Short Leads	10 ±1	JC
	Bulk (Bag) – Short Leads	4.0 +0.5/−0	JE
	Bulk (Bag) – Short Leads	3.2 +0.3/−0.2	JH
	Bulk (Bag) – Long Leads	18 ±1	JM*
	Bulk (Bag) – Long Leads	17 +1/−2	Z3**
	Bulk (Bag) – Long Leads	30 +5/−0	40***
	Bulk (Bag) – Long Leads	25 +2/−1	50
27.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/−0	AA
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel Ø 500mm)	H0=18.5 ±0.5	CK[1]
	Bulk (Tray) – Short Leads	2.7 +0.5/−0	JA
	Bulk (Tray) – Short Leads	3.5 +0.5/−0	JB
	Bulk (Tray) – Short Leads	4.0 +0.5/−0	JE
	Bulk (Tray) – Short Leads	3.2 +0.3/−0.2	JH
	Bulk (Tray) – Long Leads	18 ±1	JM
	Bulk (Tray) – Long Leads	30 +5/−0	40
	Bulk (Tray) – Long Leads	25 +2/−1	50
37.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/−0	AA
	Other Lead and Packaging Options		
	Bulk (Tray) – Short Leads	2.7 +0.5/−0	JA
	Bulk (Tray) – Short Leads	3.5 +0.5/−0	JB
	Bulk (Tray) – Short Leads	4.0 +0.5/−0	JE
	Bulk (Tray) – Short Leads	3.2 +0.3/−0.2	JH
	Bulk (Tray) – Long Leads	18 ±1	JM
	Bulk (Tray) – Long Leads	30 +5/−0	40
	Bulk (Tray) – Long Leads	25 +2/−1	50

** Only available for lead spacing ≥15 mm.*
*** Only available for 10 mm lead spacing.*
**** Not available for Stacked Capacitor Technology with 10 mm Lead Spacing.*
[1] Not for all dimensions (see table "Packging Quantity")

Dimensions – Millimeters



S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
10.0	±0.4	4.0	+0.2/−0.5	9.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
10.0	±0.4	5.0	+0.2/−0.5	11.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
10.0	±0.4	6.0	+0.2/−0.5	12.0	+0.1/−0.5	13.0	+0.2/−0.5	0.6	±0.05
15.0	±0.4	5.0	+0.2/−0.5	11.0	+0.1/−0.5	18.0	+0.3/−0.5	0.8	±0.05
15.0	±0.4	6.0	+0.2/−0.5	12.0	+0.1/−0.5	18.0	+0.3/−0.5	0.8	±0.05
15.0	±0.4	7.5	+0.2/−0.5	13.5	+0.1/−0.5	18.0	±0.5	0.8	±0.05
15.0	±0.4	8.5	+0.2/−0.5	14.5	+0.1/−0.5	18.0	±0.5	0.8	±0.05
15.0	±0.4	9.0	+0.2/−0.5	12.5	+0.1/−0.5	18.0	±0.5	0.8	±0.05
15.0	±0.4	10.0	+0.2/−0.5	16.0	+0.1/−0.5	18.0	±0.5	0.8	±0.05
15.0	±0.4	11.0	+0.2/−0.5	19.0	+0.1/−0.5	18.0	±0.5	0.8	±0.05
15.0	±0.4	13.0	+0.2/−0.5	12.0	+0.1/−0.5	18.0	±0.5	0.8	±0.05
22.5	±0.4	6.0	+0.2/−0.5	15.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	7.0	+0.2/−0.5	16.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	8.5	+0.2/−0.5	17.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	10.0	+0.2/−0.5	18.5	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	11.0	+0.2/−0.5	20.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	13.0	+0.2/−0.5	22.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
27.5	±0.4	9.0	+0.2/−0.7	17.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	11.0	+0.2/−0.7	20.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	13.0	+0.2/−0.7	12.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	13.0	+0.2/−0.7	22.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	14.0	+0.2/−0.7	28.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	18.0	+0.2/−0.7	33.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	22.0	+0.2/−0.7	37.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	24.0	+0.2/−0.7	15.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
37.5	±0.4	11.0	+0.3/−0.7	22.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	13.0	+0.3/−0.7	24.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	16.0	+0.3/−0.7	28.5	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	19.0	+0.3/−0.7	32.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	20.0	+0.3/−0.7	40.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	24.0	+0.3/−0.7	15.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	24.0	+0.3/−0.7	19.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	24.0	+0.3/−0.7	44.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	30.0	+0.3/−0.7	45.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05

Note: See Ordering Options Table for lead length (LL/H_0) options.

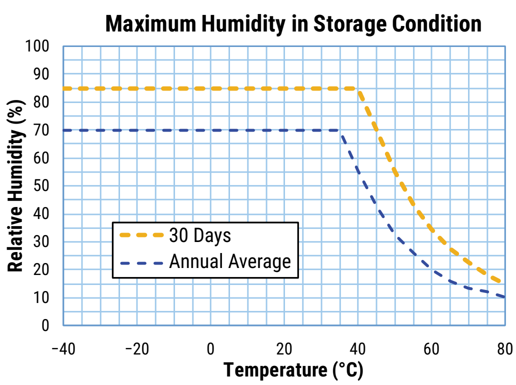
Performance Characteristics

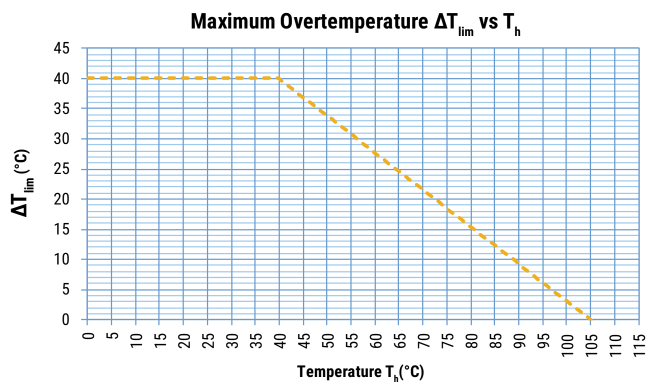
Dielectric	Polyester film (polyethylene terephthalate)							
Plates	Metal layer deposited by evaporation under vacum							
Winding	Non-inductive type							
Leads	Tinned wire							
Protection	Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL 94.							
Related Documents	IEC 60384–2							
Rated Voltage V_R (VDC)	50	63	100	160	250	400	630	1,000
Rated Voltage V_R (VAC)	30	40	63	90	160	200	220	250
Capacitance Range (µF)	1.5 – 5.6	0.68 – 100	0.33 – 150	0.22 – 150	0.1 – 68	0.022 – 33	0.0047 – 10	0.001 – 4.7
Capacitance Values	E6 series (IEC 60063) measured at 1 kHz and +20 ±1°C							
Capacitance Tolerance	±5%, ±10%, ±20%							
Operating Temperature Range	−55°C to +105°C Upper operating temperature of +125°C is allowed for a maximum operating time of 1,000 hours.							
Rated Temperature T_R	+85°C							
Voltage Derating	Above +85°C DC and AC voltage derating is 1.25%/°C							
Climatic Category	55/105/56 IEC 60068–1							
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package							
	Average relative humidity per year ≤ 70%							
	RH ≤ 85% for 30 days randomly distributed throughout the year							
	Dew is absent							
	Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)							
Test Voltage	1.6 x V_R VDC for 2 seconds (between terminations) at +25°C ±5°C							
Capacitance Drift	Maximum 3% after a 2 year storage period at a temperature of +10°C to +40°C and a relative humidity of 40% to 60%							
Reliability (Reference IEC-61709)	Operational life > 200,000 hours							
	Failure rate ≤ 1 FIT, T = +40°C, V = 0.5 x V_R							
	Failure criteria: open or short circuit, capacitance change > 10%, DF 2 times the catalog limits, IR < 0.005 x initial limit							
Maximum Pulse Steepness	dV/dt according to Table 1. For peak to peak voltages lower than rated voltage (Vpp <V_R), the specified dv/dt can be multiplied by the factor V_R/Vpp							
Temperature Coefficient	+400 (±200) ppm/°C at 1 kHz							
Self Inductance (Lead Length ~ 2 mm)	Lead Spacing (mm)	10	15	22.5	27.5	37.5		
	L (nH)	9	10	18	18	22		
	Maximum 1 nH per 1 mm lead and capacitor length.							

Performance Characteristics cont.

Dissipation Factor tanδ	Maximum Values at 25°C ±5°C		
	Frequency	C ≤ 1 µF	C > 1 µF
	1 kHz	1.00%	1.00%
	10 kHz	1.50%	–
Insulation Resistance	Measured at +25°C ±5°C, according to IEC 60384–2		
	Minimum Values Between Terminals		
	Voltage Charge/Time	C ≤ 0.33 µF	C > 0.33 µF
	50 VDC for V_R ≤ 100 VDC 1 minute	≥ 3,750 MΩ (≥ 50,000 MΩ) *	≥ 1,250 MΩ • µF (≥ 5,000 MΩ • µF) *
	100 VDC for V_R > 100 VDC 1 minute	≥ 30,000 MΩ (≥ 50,000 MΩ) *	≥ 10,000 MΩ • µF (≥ 17,000 MΩ • µF) *

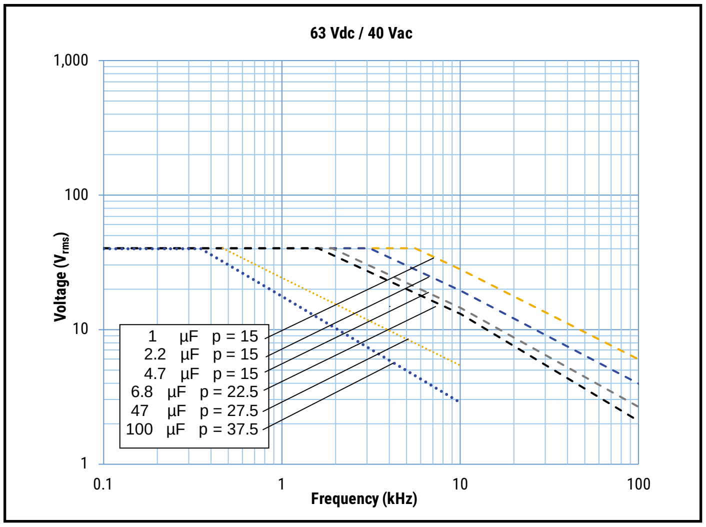
** typical value*

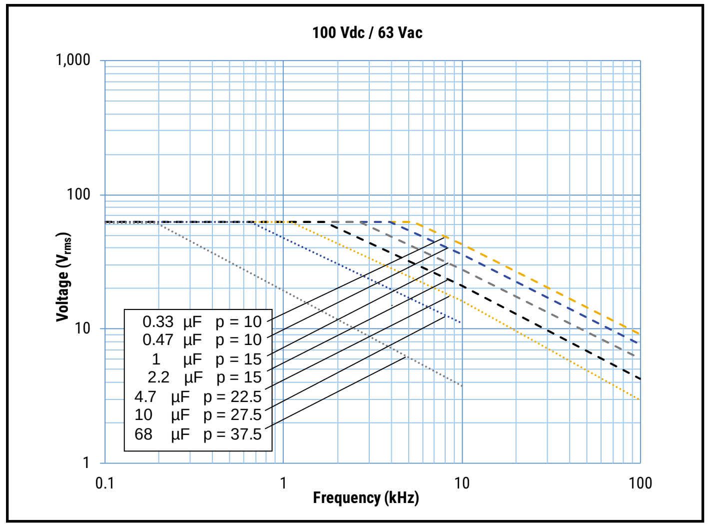


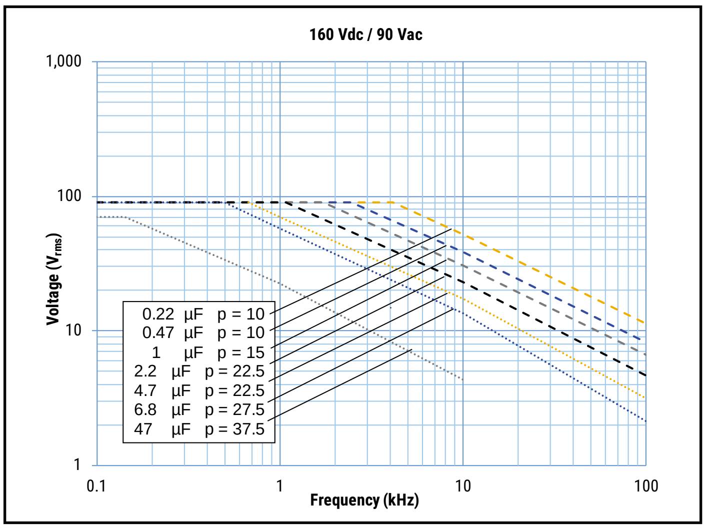


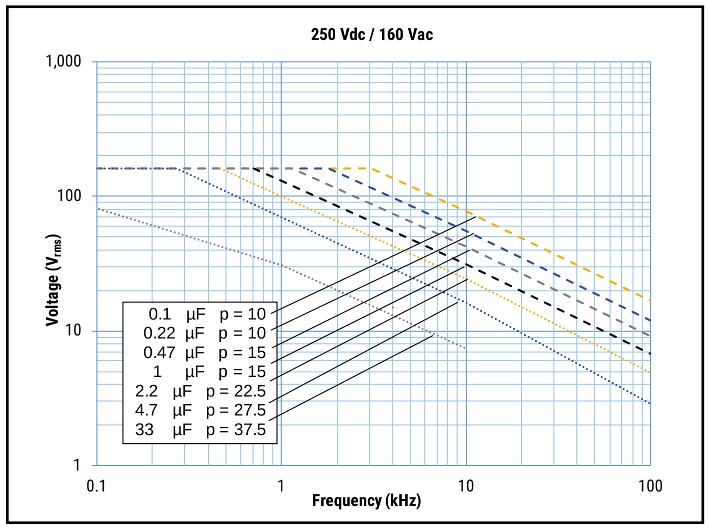
T_h is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

Maximum Voltage (V_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C)

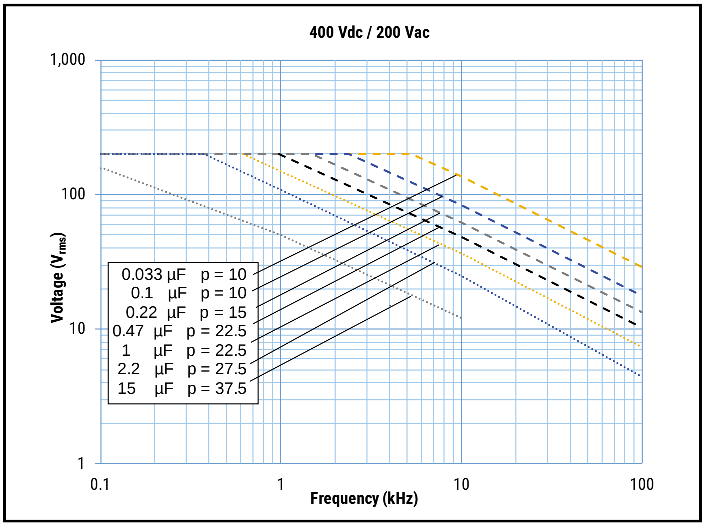


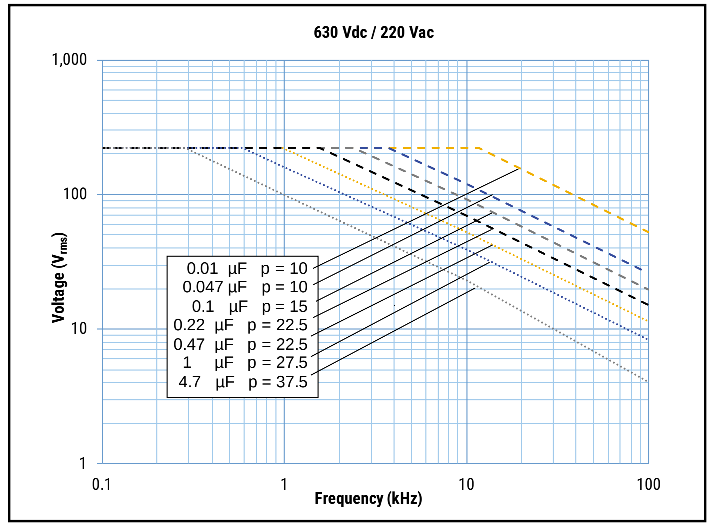


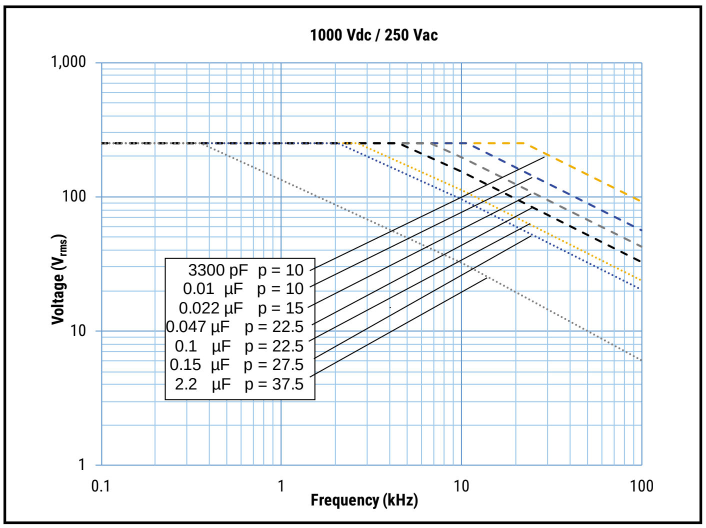




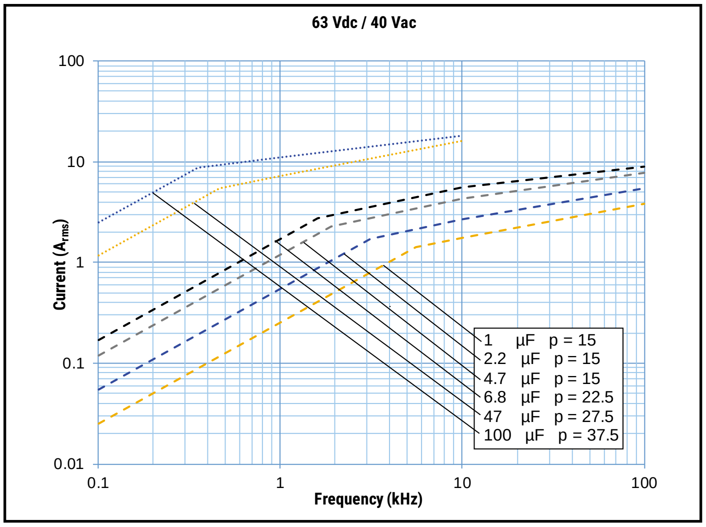
Maximum Voltage (V_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C) cont.

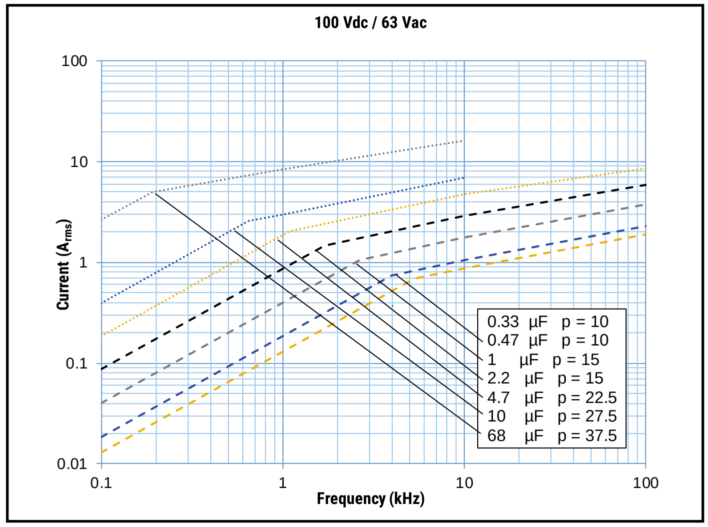


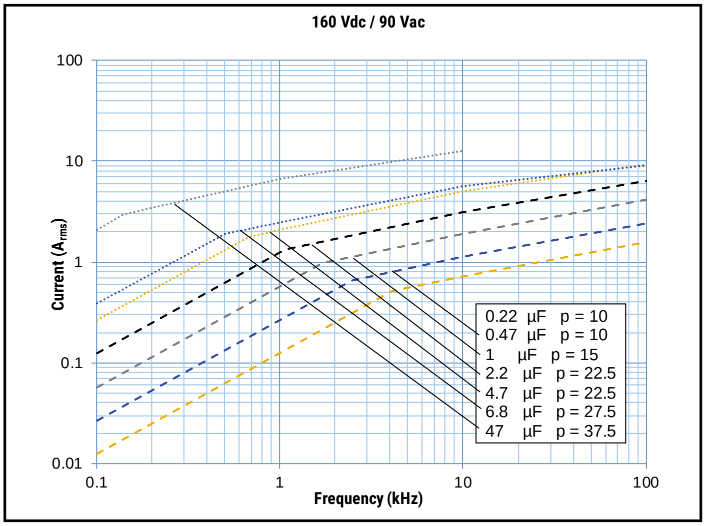


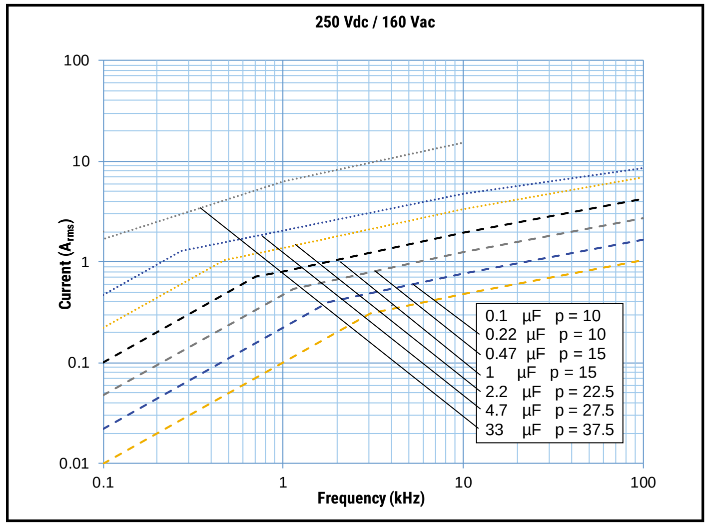


Maximum Current (I_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C)

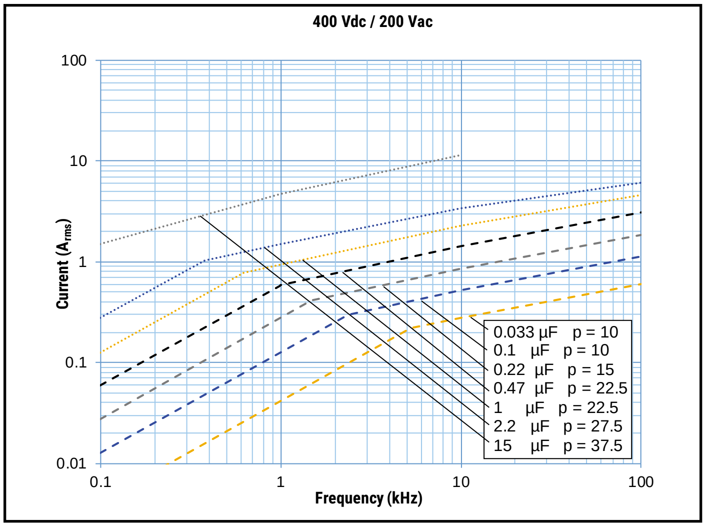


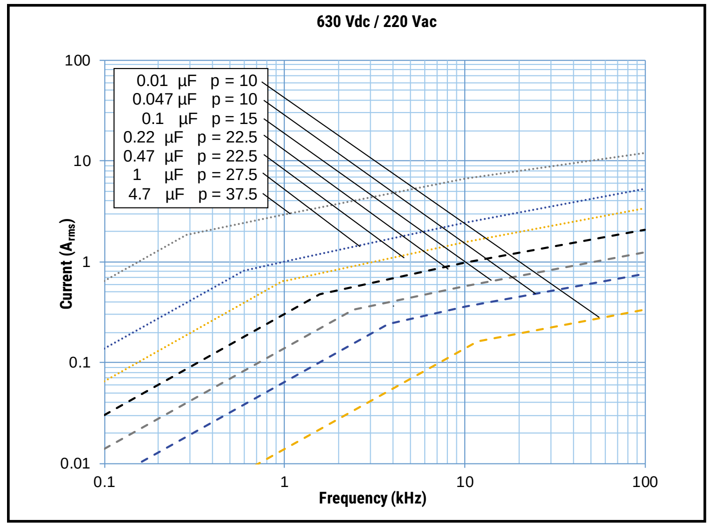


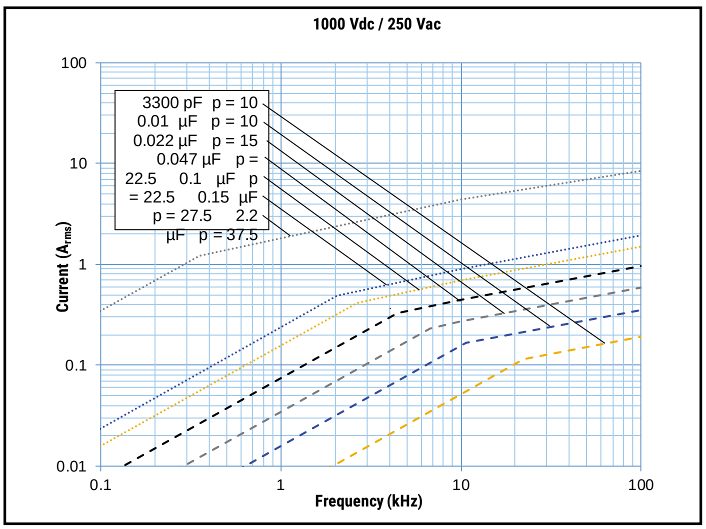




Maximum Current (I_{rms}) vs. Frequency (Sinusoidal Waveform/Th ≤ 40°C) cont.







Environmental Test Data

Damp Heat, Steady State Test	Test Conditions		Performances
	Temperature Relative humidity (RH) Test duration	+40°C ±2°C 93% ±2% 56 days	|Δ C/C| ≤ 5%, Δ tanδ ≤ 0.005 at 1 kHz IR after test ≥ 50% of initial limit
Endurance Test	**Test Conditions**		**Performances**
	Temperature Voltage applied Test duration	+105°C ±2°C 1.25 x V_C 2,000 hours	|Δ C/C| ≤ 5%, Δ tanδ ≤ 0.005 at 10 kHz for C ≤ 1 µF Δ tanδ ≤ 0.003 at 1 kHz for C > 1 µF IR after test ≥ 50% of initial limit
Resistance to Soldering Heat Test	**Test Conditions**		**Performances**
	Solder bath temperature Dipping time (with heat screen)	260°C ±5°C 10 seconds ±1 second	|Δ C/C| ≤ 2%, Δ tanδ ≤ 0.005 at 10 kHz for C ≤ 1 µF Δ tanδ ≤ 0.003 at 1 kHz for C > 1 µF IR after test ≥ initial limit

Environmental Compliance

All KEMET MKT capacitors are RoHS compliant.

Table 1A – Ratings & Part Number Reference (Stacked Capacitor Technology)

VDC	VAC	Capacitance Value (µF)	Dimensions in mm T	Dimensions in mm H	Dimensions in mm L	Lead Spacing (S)	dV/dt (V/µs)	Maximum K_0 (V^2/µs)	KEMET Internal Part Number	Customer Part Number
50	30	1.5	4.0	9.0	13.0	10.0	30	3000	60CF4150(1)6A(2)	R60CF4150(1)6A(2)
50	30	2.2	4.0	9.0	13.0	10.0	30	3000	60CF4220(1)6A(2)	R60CF4220(1)6A(2)
50	30	3.3	5.0	11.0	13.0	10.0	30	3000	60CF4330(1)6A(2)	R60CF4330(1)6A(2)
50	30	4.7	6.0	12.0	13.0	10.0	30	3000	60CF4470(1)6A(2)	R60CF4470(1)6A(2)
50	30	5.6	6.0	12.0	13.0	10.0	30	3000	60CF4560(1)6A(2)	R60CF4560(1)6A(2)
63	40	1.0	4.0	9.0	13.0	10.0	50	6300	60DF4100(1)6A(2)	R60DF4100(1)6A(2)
63	40	1.5	5.0	11.0	13.0	10.0	50	6300	60DF4150(1)6A(2)	R60DF4150(1)6A(2)
63	40	2.2	5.0	11.0	13.0	10.0	50	6300	60DF4220(1)6A(2)	R60DF4220(1)6A(2)
63	40	3.3	6.0	12.0	13.0	10.0	50	6300	60DF4330(1)6A(2)	R60DF4330(1)6A(2)
100	63	0.33	4.0	9.0	13.0	10.0	75	15000	60EF3330(1)6A(2)	R60EF3330(1)6A(2)
100	63	0.47	4.0	9.0	13.0	10.0	75	15000	60EF3470(1)6A(2)	R60EF3470(1)6A(2)
100	63	0.68	4.0	9.0	13.0	10.0	75	15000	60EF3680(1)6A(2)	R60EF3680(1)6A(2)
100	63	1.0	5.0	11.0	13.0	10.0	75	15000	60EF4100(1)6A(2)	R60EF4100(1)6A(2)
100	63	1.5	5.0	11.0	13.0	10.0	75	15000	60EF4150(1)6A(2)	R60EF4150(1)6A(2)
160	90	0.22	4.0	9.0	13.0	10.0	100	32000	60GF3220(1)6A(2)	R60GF3220(1)6A(2)
160	90	0.33	4.0	9.0	13.0	10.0	100	32000	60GF3330(1)6A(2)	R60GF3330(1)6A(2)
160	90	0.47	5.0	11.0	13.0	10.0	100	32000	60GF3470(1)6A(2)	R60GF3470(1)6A(2)
160	90	0.68	6.0	12.0	13.0	10.0	100	32000	60GF3680(1)6A(2)	R60GF3680(1)6A(2)
250	160	0.10	4.0	9.0	13.0	10.0	150	75000	60IF3100(1)6A(2)	R60IF3100(1)6A(2)
250	160	0.15	4.0	9.0	13.0	10.0	150	75000	60IF3150(1)6A(2)	R60IF3150(1)6A(2)
250	160	0.22	5.0	11.0	13.0	10.0	150	75000	60IF3220(1)6A(2)	R60IF3220(1)6A(2)
250	160	0.33	5.0	11.0	13.0	10.0	150	75000	60IF3330(1)6A(2)	R60IF3330(1)6A(2)
250	160	0.47	6.0	12.0	13.0	10.0	150	75000	60IF3470(1)6A(2)	R60IF3470(1)6A(2)
VDC	**VAC**	**Capacitance Value (µF)**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing**	**dV/dt (V/µs)**	**Max K_0 (V^2/µs)**	**KEMET Internal Part Number**	**Customer Part Number**

Table 1A – Ratings & Part Number Reference (Stacked Capacitor Technology) cont.

VDC	VAC	Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Maximum K_0 (V^2/µs)	KEMET Internal Part Number	Customer Part Number
			T	H	L					
400	200	0.033	4.0	9.0	13.0	10.0	175	140000	60MF2330(1)6A(2)	R60MF2330(1)6A(2)
400	200	0.047	4.0	9.0	13.0	10.0	175	140000	60MF2470(1)6A(2)	R60MF2470(1)6A(2)
400	200	0.068	4.0	9.0	13.0	10.0	175	140000	60MF2680(1)6A(2)	R60MF2680(1)6A(2)
400	200	0.10	5.0	11.0	13.0	10.0	175	140000	60MF3100(1)6A(2)	R60MF3100(1)6A(2)
400	200	0.15	6.0	12.0	13.0	10.0	175	140000	60MF3150(1)6A(2)	R60MF3150(1)6A(2)
630	220	0.010	4.0	9.0	13.0	10.0	200	252000	60PF2100(1)6A(2)	R60PF2100(1)6A(2)
630	220	0.015	4.0	9.0	13.0	10.0	200	252000	60PF2150(1)6A(2)	R60PF2150(1)6A(2)
630	220	0.022	4.0	9.0	13.0	10.0	200	252000	60PF2220(1)6A(2)	R60PF2220(1)6A(2)
630	220	0.033	5.0	11.0	13.0	10.0	200	252000	60PF2330(1)6A(2)	R60PF2330(1)6A(2)
630	220	0.047	5.0	11.0	13.0	10.0	200	252000	60PF2470(1)6A(2)	R60PF2470(1)6A(2)
VDC	VAC	Capacitance Value (µF)	T (mm)	H (mm)	L (mm)	Lead Spacing	dV/dt (V/µs)	Max K_0 (V^2/µs)	KEMET Internal Part Number	Customer Part Number

Table 1B – Ratings & Part Number Reference (Wound Capacitor Technology)

VDC	VAC	Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Maximum K_0 (V^2/µs)	KEMET Internal Part Number	Customer Part Number
			T	H	L					
63	40	0.68	5.0	11.0	18.0	15.0	2.5	315	60DI3680(1)30(2)	R60DI3680(1)30(2)
63	40	1.0	5.0	11.0	18.0	15.0	2.5	315	60DI4100(1)30(2)	R60DI4100(1)30(2)
63	40	1.5	5.0	11.0	18.0	15.0	2.5	315	60DI4150(1)30(2)	R60DI4150(1)30(2)
63	40	2.2	6.0	12.0	18.0	15.0	2.5	315	60DI4220(1)30(2)	R60DI4220(1)30(2)
63	40	3.3	7.5	13.5	18.0	15.0	2.5	315	60DI4330(1)30(2)	R60DI4330(1)30(2)
63	40	3.3	9.0	12.5	18.0	15.0	2.5	315	60DI4330(1)L0(2)	R60DI4330(1)L0(2)
63	40	4.7	8.5	14.5	18.0	15.0	2.5	315	60DI4470(1)30(2)	R60DI4470(1)30(2)
63	40	4.7	13.0	12.0	18.0	15.0	2.5	315	60DI4470(1)L0(2)	R60DI4470(1)L0(2)
63	40	6.8	10.0	16.0	18.0	15.0	2.5	315	60DI4680(1)30(2)	R60DI4680(1)30(2)
63	40	3.3	6.0	15.0	26.5	22.5	1.5	189	60DN4330(1)30(2)	R60DN4330(1)30(2)
63	40	4.7	7.0	16.0	26.5	22.5	1.5	189	60DN4470(1)30(2)	R60DN4470(1)30(2)
63	40	6.8	7.0	16.0	26.5	22.5	1.5	189	60DN4680(1)30(2)	R60DN4680(1)30(2)
63	40	10.0	8.5	17.0	26.5	22.5	1.5	189	60DN5100(1)30(2)	R60DN5100(1)30(2)
63	40	15.0	11.0	20.0	26.5	22.5	1.5	189	60DN5150(1)30(2)	R60DN5150(1)30(2)
63	40	4.7	13.0	12.0	32.0	27.5	1.0	126	60DR4470(1)L0(2)	R60DR4470(1)L0(2)
63	40	6.8	13.0	12.0	32.0	27.5	1.0	126	60DR4680(1)L0(2)	R60DR4680(1)L0(2)
63	40	10.0	9.0	17.0	32.0	27.5	1.0	126	60DR5100(1)30(2)	R60DR5100(1)30(2)
63	40	15.0	11.0	20.0	32.0	27.5	1.0	126	60DR5150(1)30(2)	R60DR5150(1)30(2)
63	40	15.0	24.0	15.0	32.0	27.5	1.0	126	60DR5150(1)L0(2)	R60DR5150(1)L0(2)
63	40	22.0	13.0	22.0	32.0	27.5	1.0	126	60DR5220(1)30(2)	R60DR5220(1)30(2)
63	40	22.0	24.0	15.0	32.0	27.5	1.0	126	60DR5220(1)L0(2)	R60DR5220(1)L0(2)
63	40	22.0	11.0	20.0	32.0	27.5	1.0	126	60DR5220(1)40(2)	R60DR5220(1)40(2)
63	40	33.0	18.0	33.0	32.0	27.5	1.0	126	60DR5330(1)50(2)	R60DR5330(1)50(2)
63	40	47.0	18.0	33.0	32.0	27.5	1.0	126	60DR5470(1)40(2)	R60DR5470(1)40(2)
63	40	47.0	22.0	37.0	32.0	27.5	1.0	126	60DR5470(1)50(2)	R60DR5470(1)50(2)
63	40	68.0	22.0	37.0	32.0	27.5	1.0	126	60DR5680(1)30(2)	R60DR5680(1)30(2)
63	40	22.0	11.0	22.0	41.5	37.5	0.8	101	60DW5220(1)30(2)	R60DW5220(1)30(2)
63	40	22.0	24.0	15.0	41.5	37.5	0.8	101	60DW5220(1)L0(2)	R60DW5220(1)L0(2)
63	40	33.0	16.0	28.5	41.5	37.5	0.8	101	60DW5330(1)30(2)	R60DW5330(1)30(2)
63	40	33.0	24.0	15.0	41.5	37.5	0.8	101	60DW5330(1)L0(2)	R60DW5330(1)L0(2)
63	40	47.0	16.0	28.5	41.5	37.5	0.8	101	60DW5470(1)50(2)	R60DW5470(1)50(2)
63	40	47.0	24.0	19.0	41.5	37.5	0.8	101	60DW5470(1)L0(2)	R60DW5470(1)L0(2)
63	40	68.0	19.0	32.0	41.5	37.5	0.8	101	60DW5680(1)30(2)	R60DW5680(1)30(2)
63	**40**	**100.0**	**20.0**	**40.0**	**41.5**	**37.5**	**0.8**	**101**	**60DW6100(1)50(3)**	**R60DW6100(1)50(3)**
63	40	100.0	24.0	44.0	41.5	37.5	0.8	101	60DW6100(1)60(2)	R60DW6100(1)60(2)
100	63	0.33	5.0	11.0	18.0	15.0	3.0	600	60EI3330(1)30(2)	R60EI3330(1)30(2)
100	63	0.47	5.0	11.0	18.0	15.0	3.0	600	60EI3470(1)30(2)	R60EI3470(1)30(2)
VDC	VAC	Capacitance Value (µF)	T (mm)	H (mm)	L (mm)	Lead Spacing	dV/dt (V/µs)	Max K_0 (V^2/µs)	KEMET Internal Part Number	Customer Part Number

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) J = 5%, K = 10%, M = 20%
(3) K = 10%, M = 20%

Table 1B – Ratings & Part Number Reference (Wound Capacitor Technology) cont.

VDC	VAC	Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Maximum K_0 (V^2/µs)	KEMET Internal Part Number	Customer Part Number
			T	H	L					
100	63	0.68	5.0	11.0	18.0	15.0	3.0	600	60EI3680(1)30(2)	R60EI3680(1)30(2)
100	63	1.0	5.0	11.0	18.0	15.0	3.0	600	60EI4100(1)30(2)	R60EI4100(1)30(2)
100	63	1.5	7.5	13.5	18.0	15.0	3.0	600	60EI4150(1)30(2)	R60EI4150(1)30(2)
100	63	2.2	8.5	14.5	18.0	15.0	3.0	600	60EI4220(1)30(2)	R60EI4220(1)30(2)
100	63	2.2	9.0	12.5	18.0	15.0	3.0	600	60EI4220(1)L0(2)	R60EI4220(1)L0(2)
100	63	3.3	10.0	16.0	18.0	15.0	3.0	600	60EI4330(1)30(2)	R60EI4330(1)30(2)
100	63	3.3	13.0	12.0	18.0	15.0	3.0	600	60EI4330(1)L0(2)	R60EI4330(1)L0(2)
100	63	4.7	11.0	19.0	18.0	15.0	3.0	600	60EI4470(1)30(2)	R60EI4470(1)30(2)
100	63	1.5	6.0	15.0	26.5	22.5	2.0	400	60EN4150(1)30(2)	R60EN4150(1)30(2)
100	63	2.2	6.0	15.0	26.5	22.5	2.0	400	60EN4220(1)30(2)	R60EN4220(1)30(2)
100	63	3.3	7.0	16.0	26.5	22.5	2.0	400	60EN4330(1)30(2)	R60EN4330(1)30(2)
100	63	4.7	8.5	17.0	26.5	22.5	2.0	400	60EN4470(1)30(2)	R60EN4470(1)30(2)
100	63	6.8	10.0	18.5	26.5	22.5	2.0	400	60EN4680(1)30(2)	R60EN4680(1)30(2)
100	63	10.0	13.0	22.0	26.5	22.5	2.0	400	60EN5100(1)30(2)	R60EN5100(1)30(2)
100	63	4.7	9.0	17.0	32.0	27.5	1.5	300	60ER4470(1)30(2)	R60ER4470(1)30(2)
100	63	4.7	13.0	12.0	32.0	27.5	1.5	300	60ER4470(1)L0(2)	R60ER4470(1)L0(2)
100	63	6.8	9.0	17.0	32.0	27.5	1.5	300	60ER4680(1)30(2)	R60ER4680(1)30(2)
100	63	6.8	13.0	12.0	32.0	27.5	1.5	300	60ER4680(1)L0(2)	R60ER4680(1)L0(2)
100	63	10.0	9.0	17.0	32.0	27.5	1.5	300	60ER5100(1)40(2)	R60ER5100(1)40(2)
100	63	15.0	11.0	20.0	32.0	27.5	1.5	300	60ER5150(1)40(2)	R60ER5150(1)40(2)
100	63	15.0	24.0	15.0	32.0	27.5	1.5	300	60ER5150(1)L0(2)	R60ER5150(1)L0(2)
100	63	22.0	13.0	22.0	32.0	27.5	1.5	300	60ER5220(1)40(2)	R60ER5220(1)40(2)
100	63	22.0	24.0	15.0	32.0	27.5	1.5	300	60ER5220(1)L0(2)	R60ER5220(1)L0(2)
100	63	33.0	14.0	28.0	32.0	27.5	1.5	300	60ER5330(1)40(2)	R60ER5330(1)40(2)
100	63	33.0	18.0	33.0	32.0	27.5	1.5	300	60ER5330(1)50(2)	R60ER5330(1)50(2)
100	63	47.0	18.0	33.0	32.0	27.5	1.5	300	60ER5470(1)40(2)	R60ER5470(1)40(2)
100	63	47.0	22.0	37.0	32.0	27.5	1.5	300	60ER5470(1)50(2)	R60ER5470(1)50(2)
100	63	68.0	22.0	37.0	32.0	27.5	1.5	300	60ER5680(1)00(2)	R60ER5680(1)00(2)
100	63	15.0	11.0	22.0	41.5	37.5	1.0	200	60EW5150(1)40(2)	R60EW5150(1)40(2)
100	63	22.0	11.0	22.0	41.5	37.5	1.0	200	60EW5220(1)40(2)	R60EW5220(1)40(2)
100	63	22.0	24.0	15.0	41.5	37.5	0.8	101	60EW5220(1)L0(2)	R60EW5220(1)L0(2)
100	63	33.0	16.0	28.5	41.5	37.5	1.0	200	60EW5330(1)30(2)	R60EW5330(1)30(2)
100	63	33.0	24.0	15.0	41.5	37.5	0.8	101	60EW5330(1)L0(2)	R60EW5330(1)L0(2)
100	63	47.0	16.0	28.5	41.5	37.5	1.0	200	60EW5470(1)40(2)	R60EW5470(1)40(2)
100	63	47.0	24.0	19.0	41.5	37.5	0.8	101	60EW5470(1)L0(2)	R60EW5470(1)L0(2)
100	63	68.0	19.0	32.0	41.5	37.5	1.0	200	60EW5680(1)50(2)	R60EW5680(1)50(2)
100	**63**	**100.0**	**20.0**	**40.0**	**41.5**	**37.5**	**1.0**	**200**	**60EW6100(1)00(3)**	**R60EW6100(1)00(3)**
100	63	100.0	24.0	44.0	41.5	37.5	1.0	200	60EW6100(1)10(2)	R60EW6100(1)10(2)
100	63	150.0	30.0	45.0	41.5	37.5	1.0	200	60EW6150(1)10(2)	R60EW6150(1)10(2)
160	90	0.33	5.0	11.0	18.0	15.0	9.0	2880	60GI3330(1)30(2)	R60GI3330(1)30(2)
160	90	0.47	5.0	11.0	18.0	15.0	9.0	2880	60GI3470(1)30(2)	R60GI3470(1)30(2)
160	90	0.68	5.0	11.0	18.0	15.0	9.0	2880	60GI3680(1)30(2)	R60GI3680(1)30(2)
160	90	1.0	7.5	13.5	18.0	15.0	9.0	2880	60GI4100(1)30(2)	R60GI4100(1)30(2)
160	90	1.5	8.5	14.5	18.0	15.0	9.0	2880	60GI4150(1)30(2)	R60GI4150(1)30(2)
160	90	1.5	9.0	12.5	18.0	15.0	9.0	2880	60GI4150(1)L0(2)	R60GI4150(1)L0(2)
160	90	2.2	10.0	16.0	18.0	15.0	9.0	2880	60GI4220(1)30(2)	R60GI4220(1)30(2)
160	90	2.2	13.0	12.0	18.0	15.0	9.0	2880	60GI4220(1)L0(2)	R60GI4220(1)L0(2)
160	90	3.3	11.0	19.0	18.0	15.0	9.0	2880	60GI4330(1)30(2)	R60GI4330(1)30(2)
160	90	1.5	6.0	15.0	26.5	22.5	5.5	1760	60GN4150(1)30(2)	R60GN4150(1)30(2)
160	90	2.2	7.0	16.0	26.5	22.5	5.5	1760	60GN4220(1)30(2)	R60GN4220(1)30(2)
160	90	3.3	8.5	17.0	26.5	22.5	5.5	1760	60GN4330(1)30(2)	R60GN4330(1)30(2)
160	90	4.7	11.0	20.0	26.5	22.5	5.5	1760	60GN4470(1)30(2)	R60GN4470(1)30(2)
160	90	6.8	13.0	22.0	26.5	22.5	5.5	1760	60GN4680(1)30(2)	R60GN4680(1)30(2)
160	90	3.3	9.0	17.0	32.0	27.5	3.0	960	60GR4330(1)30(2)	R60GR4330(1)30(2)
160	90	3.3	13.0	12.0	32.0	27.5	3.0	960	60GR4330(1)L0(2)	R60GR4330(1)L0(2)
160	90	4.7	9.0	17.0	32.0	27.5	3.0	960	60GR4470(1)30(2)	R60GR4470(1)30(2)
160	90	4.7	13.0	12.0	32.0	27.5	3.0	960	60GR4470(1)L0(2)	R60GR4470(1)L0(2)
160	90	6.8	9.0	17.0	32.0	27.5	3.0	960	60GR4680(1)40(2)	R60GR4680(1)40(2)
VDC	VAC	Capacitance Value (µF)	T (mm)	H (mm)	L (mm)	Lead Spacing	dV/dt (V/µs)	Max K_0 (V^2/µs)	KEMET Internal Part Number	Customer Part Number

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) J = 5%, K = 10%, M = 20%
(3) K = 10%, M = 20%

Table 1B – Ratings & Part Number Reference (Wound Capacitor Technology) cont.

VDC	VAC	Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Maximum K_0 (V^2/µs)	KEMET Internal Part Number	Customer Part Number
			T	H	L					
160	90	6.8	13.0	12.0	32.0	27.5	3.0	960	60GR4680(1)L0(2)	R60GR4680(1)L0(2)
160	90	10.0	9.0	17.0	32.0	27.5	3.0	960	60GR5100(1)40(2)	R60GR5100(1)40(2)
160	**90**	**10.0**	**24.0**	**15.0**	**32.0**	**27.5**	**3.0**	**960**	**60GR5100(1)L0(3)**	**R60GR5100(1)L0(3)**
160	90	15.0	11.0	20.0	32.0	27.5	3.0	960	60GR5150(1)40(2)	R60GR5150(1)40(2)
160	90	15.0	24.0	15.0	32.0	27.5	3.0	960	60GR5150(1)L0(2)	R60GR5150(1)L0(2)
160	90	22.0	13.0	22.0	32.0	27.5	3.0	960	60GR5220(1)40(2)	R60GR5220(1)40(2)
160	90	22.0	24.0	15.0	32.0	27.5	3.0	960	60GR5220(1)L0(2)	R60GR5220(1)L0(2)
160	90	33.0	14.0	28.0	32.0	27.5	3.0	960	60GR5330(1)00(2)	R60GR5330(1)00(2)
160	90	47.0	18.0	33.0	32.0	27.5	3.0	960	60GR5470(1)00(2)	R60GR5470(1)00(2)
160	90	68.0	22.0	37.0	32.0	27.5	3.0	960	60GR5680(1)00(2)	R60GR5680(1)00(2)
160	90	10.0	11.0	22.0	41.5	37.5	2.0	640	60GW5100(1)30(2)	R60GW5100(1)30(2)
160	90	15.0	11.0	22.0	41.5	37.5	2.0	640	60GW5150(1)40(2)	R60GW5150(1)40(2)
160	90	15.0	24.0	15.0	41.5	37.5	2.0	640	60GW5150(1)L0(2)	R60GW5150(1)L0(2)
160	90	22.0	11.0	22.0	41.5	37.5	2.0	640	60GW5220(1)40(2)	R60GW5220(1)40(2)
160	90	22.0	24.0	15.0	41.5	37.5	2.0	640	60GW5220(1)L0(2)	R60GW5220(1)L0(2)
160	90	33.0	13.0	24.0	41.5	37.5	2.0	640	60GW5330(1)40(2)	R60GW5330(1)40(2)
160	90	33.0	24.0	15.0	41.5	37.5	2.0	640	60GW5330(1)L0(2)	R60GW5330(1)L0(2)
160	90	47.0	16.0	28.5	41.5	37.5	2.0	640	60GW5470(1)40(2)	R60GW5470(1)40(2)
160	90	47.0	24.0	19.0	41.5	37.5	2.0	640	60GW5470(1)L0(2)	R60GW5470(1)L0(2)
160	90	68.0	19.0	32.0	41.5	37.5	2.0	640	60GW5680(1)00(2)	R60GW5680(1)00(2)
160	90	100.0	20.0	40.0	41.5	37.5	2.0	640	60GW6100(1)00(2)	R60GW6100(1)00(2)
160	90	150.0	30.0	45.0	41.5	37.5	2.0	640	60GW6150(1)00(2)	R60GW6150(1)00(2)
250	160	0.10	5.0	11.0	18.0	15.0	12.0	6000	60II3100(1)30(2)	R60II3100(1)30(2)
250	160	0.15	5.0	11.0	18.0	15.0	12.0	6000	60II3150(1)30(2)	R60II3150(1)30(2)
250	160	0.22	5.0	11.0	18.0	15.0	12.0	6000	60II3220(1)30(2)	R60II3220(1)30(2)
250	160	0.33	5.0	11.0	18.0	15.0	12.0	6000	60II3330(1)30(2)	R60II3330(1)30(2)
250	160	0.47	6.0	12.0	18.0	15.0	12.0	6000	60II3470(1)30(2)	R60II3470(1)30(2)
250	160	0.68	7.5	13.5	18.0	15.0	12.0	6000	60II3680(1)30(2)	R60II3680(1)30(2)
250	160	0.68	9.0	12.5	18.0	15.0	12.0	6000	60II3680(1)L0(2)	R60II3680(1)L0(2)
250	160	1.0	8.5	14.5	18.0	15.0	12.0	6000	60II4100(1)30(2)	R60II4100(1)30(2)
250	160	1.0	13.0	12.0	18.0	15.0	12.0	6000	60II4100(1)L0(2)	R60II4100(1)L0(2)
250	160	1.5	10.0	16.0	18.0	15.0	12.0	6000	60II4150(1)30(2)	R60II4150(1)30(2)
250	160	0.47	6.0	15.0	26.5	22.5	8.0	4000	60IN3470(1)30(2)	R60IN3470(1)30(2)
250	160	0.68	6.0	15.0	26.5	22.5	8.0	4000	60IN3680(1)30(2)	R60IN3680(1)30(2)
250	160	1.0	6.0	15.0	26.5	22.5	8.0	4000	60IN4100(1)30(2)	R60IN4100(1)30(2)
250	160	1.5	7.0	16.0	26.5	22.5	8.0	4000	60IN4150(1)30(2)	R60IN4150(1)30(2)
250	160	2.2	10.0	18.5	26.5	22.5	8.0	4000	60IN4220(1)30(2)	R60IN4220(1)30(2)
250	160	3.3	11.0	20.0	26.5	22.5	8.0	4000	60IN4330(1)30(2)	R60IN4330(1)30(2)
250	160	1.5	9.0	17.0	32.0	27.5	5.0	2500	60IR4150(1)30(2)	R60IR4150(1)30(2)
250	160	1.5	13.0	12.0	32.0	27.5	5.0	2500	60IR4150(1)L0(2)	R60IR4150(1)L0(2)
250	160	2.2	9.0	17.0	32.0	27.5	5.0	2500	60IR4220(1)30(2)	R60IR4220(1)30(2)
250	160	2.2	13.0	12.0	32.0	27.5	5.0	2500	60IR4220(1)L0(2)	R60IR4220(1)L0(2)
250	160	3.3	9.0	17.0	32.0	27.5	5.0	2500	60IR4330(1)40(2)	R60IR4330(1)40(2)
250	160	3.3	13.0	12.0	32.0	27.5	5.0	2500	60IR4330(1)L0(2)	R60IR4330(1)L0(2)
250	160	4.7	9.0	17.0	32.0	27.5	5.0	2500	60IR4470(1)40(2)	R60IR4470(1)40(2)
250	160	4.7	24.0	15.0	32.0	27.5	5.0	2500	60IR4470(1)L0(2)	R60IR4470(1)L0(2)
250	160	6.8	11.0	20.0	32.0	27.5	5.0	2500	60IR4680(1)40(2)	R60IR4680(1)40(2)
250	160	10.0	13.0	22.0	32.0	27.5	5.0	2500	60IR5100(1)40(2)	R60IR5100(1)40(2)
250	160	10.0	24.0	15.0	32.0	27.5	5.0	2500	60IR5100(1)L0(2)	R60IR5100(1)L0(2)
250	160	15.0	14.0	28.0	32.0	27.5	5.0	2500	60IR5150(1)40(2)	R60IR5150(1)40(2)
250	160	22.0	18.0	33.0	32.0	27.5	5.0	2500	60IR5220(1)00(2)	R60IR5220(1)00(2)
250	160	33.0	22.0	37.0	32.0	27.5	5.0	2500	60IR5330(1)00(2)	R60IR5330(1)00(2)
250	160	4.7	11.0	22.0	41.5	37.5	4.0	2000	60IW4470(1)30(2)	R60IW4470(1)30(2)
250	160	6.8	11.0	22.0	41.5	37.5	4.0	2000	60IW4680(1)40(2)	R60IW4680(1)40(2)
250	160	10.0	11.0	22.0	41.5	37.5	4.0	2000	60IW5100(1)40(2)	R60IW5100(1)40(2)
250	160	10.0	24.0	15.0	41.5	37.5	4.0	2000	60IW5100(1)L0(2)	R60IW5100(1)L0(2)
250	160	15.0	13.0	24.0	41.5	37.5	4.0	2000	60IW5150(1)40(2)	R60IW5150(1)40(2)
250	160	15.0	24.0	15.0	41.5	37.5	4.0	2000	60IW5150(1)L0(2)	R60IW5150(1)L0(2)
VDC	VAC	Capacitance Value (µF)	T (mm)	H (mm)	L (mm)	Lead Spacing	dV/dt (V/µs)	Max K_0 (V^2/µs)	KEMET Internal Part Number	Customer Part Number

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) J = 5%, K = 10%, M = 20%
(3) K = 10%, M = 20%

Table 1B – Ratings & Part Number Reference (Wound Capacitor Technology) cont.

VDC	VAC	Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Maximum K_0 ($V^2/µs$)	KEMET Internal Part Number	Customer Part Number
			T	H	L					
250	160	22.0	20.0	40.0	41.5	37.5	4.0	2000	60IW5220(1)30(2)	R60IW5220(1)30(2)
250	160	22.0	16.0	28.5	41.5	37.5	4.0	2000	60IW5220(1)40(2)	R60IW5220(1)40(2)
250	160	33.0	19.0	32.0	41.5	37.5	4.0	2000	60IW5330(1)40(2)	R60IW5330(1)40(2)
250	160	47.0	20.0	40.0	41.5	37.5	4.0	2000	60IW5470(1)00(2)	R60IW5470(1)00(2)
250	160	68.0	24.0	44.0	41.5	37.5	4.0	2000	60IW5680(1)00(2)	R60IW5680(1)00(2)
400	200	0.022	5.0	11.0	18.0	15.0	20.0	16000	60MI2220(1)30(2)	R60MI2220(1)30(2)
400	200	0.047	5.0	11.0	18.0	15.0	20.0	16000	60MI2470(1)30(2)	R60MI2470(1)30(2)
400	200	0.068	5.0	11.0	18.0	15.0	20.0	16000	60MI2680(1)30(2)	R60MI2680(1)30(2)
400	200	0.10	5.0	11.0	18.0	15.0	20.0	16000	60MI3100(1)30(2)	R60MI3100(1)30(2)
400	200	0.15	5.0	11.0	18.0	15.0	20.0	16000	60MI3150(1)30(2)	R60MI3150(1)30(2)
400	200	0.22	5.0	11.0	18.0	15.0	20.0	16000	60MI3220(1)40(2)	R60MI3220(1)40(2)
400	200	0.22	6.0	12.0	18.0	15.0	20.0	16000	60MI3220(1)30(2)	R60MI3220(1)30(2)
400	200	0.33	7.5	13.5	18.0	15.0	20.0	16000	60MI3330(1)30(2)	R60MI3330(1)30(2)
400	200	0.33	9.0	12.5	18.0	15.0	20.0	16000	60MI3330(1)L0(2)	R60MI3330(1)L0(2)
400	200	0.47	7.5	13.5	18.0	15.0	20.0	16000	60MI3470(1)40(2)	R60MI3470(1)40(2)
400	200	0.47	8.5	14.5	18.0	15.0	20.0	16000	60MI3470(1)30(2)	R60MI3470(1)30(2)
400	200	0.47	9.0	12.5	18.0	15.0	20.0	16000	60MI3470(1)L1(2)	R60MI3470(1)L1(2)
400	200	0.47	13.0	12.0	18.0	15.0	20.0	16000	60MI3470(1)L0(2)	R60MI3470(1)L0(2)
400	200	0.68	10.0	16.0	18.0	15.0	20.0	16000	60MI3680(1)40(2)	R60MI3680(1)40(2)
400	200	0.68	11.0	19.0	18.0	15.0	20.0	16000	60MI3680(1)30(2)	R60MI3680(1)30(2)
400	200	0.68	13.0	12.0	18.0	15.0	20.0	16000	60MI3680(1)L0(2)	R60MI3680(1)L0(2)
400	200	1.0	11.0	19.0	18.0	15.0	20.0	16000	60MI4100(1)30(2)	R60MI4100(1)30(2)
400	200	0.22	6.0	15.0	26.5	22.5	10.0	8000	60MN3220(1)30(2)	R60MN3220(1)30(2)
400	200	0.33	6.0	15.0	26.5	22.5	10.0	8000	60MN3330(1)30(2)	R60MN3330(1)30(2)
400	200	0.47	6.0	15.0	26.5	22.5	10.0	8000	60MN3470(1)30(2)	R60MN3470(1)30(2)
400	200	0.68	6.0	15.0	26.5	22.5	10.0	8000	60MN3680(1)40(2)	R60MN3680(1)40(2)
400	200	0.68	7.0	16.0	26.5	22.5	10.0	8000	60MN3680(1)30(2)	R60MN3680(1)30(2)
400	200	1.0	8.5	17.0	26.5	22.5	10.0	8000	60MN4100(1)40(2)	R60MN4100(1)40(2)
400	200	1.0	10.0	18.5	26.5	22.5	10.0	8000	60MN4100(1)30(2)	R60MN4100(1)30(2)
400	200	1.5	10.0	18.5	26.5	22.5	10.0	8000	60MN4150(1)40(2)	R60MN4150(1)40(2)
400	200	1.5	11.0	20.0	26.5	22.5	10.0	8000	60MN4150(1)30(2)	R60MN4150(1)30(2)
400	200	2.2	13.0	22.0	26.5	22.5	10.0	8000	60MN4220(1)30(2)	R60MN4220(1)30(2)
400	200	0.68	9.0	17.0	32.0	27.5	8.5	6800	60MR3680(1)30(2)	R60MR3680(1)30(2)
400	200	1.0	9.0	17.0	32.0	27.5	8.5	6800	60MR4100(1)30(2)	R60MR4100(1)30(2)
400	200	1.0	13.0	12.0	32.0	27.5	8.5	6800	60MR4100(1)L0(2)	R60MR4100(1)L0(2)
400	200	1.5	9.0	17.0	32.0	27.5	8.5	6800	60MR4150(1)40(2)	R60MR4150(1)40(2)
400	200	2.2	11.0	20.0	32.0	27.5	8.5	6800	60MR4220(1)40(2)	R60MR4220(1)40(2)
400	200	2.2	24.0	15.0	32.0	27.5	8.5	6800	60MR4220(1)L0(2)	R60MR4220(1)L0(2)
400	200	3.3	13.0	22.0	32.0	27.5	8.5	6800	60MR4330(1)40(2)	R60MR4330(1)40(2)
400	**200**	**3.3**	**24.0**	**15.0**	**32.0**	**27.5**	**8.5**	**6800**	**60MR4330(1)L0(3)**	**R60MR4330(1)L0(3)**
400	200	4.7	14.0	28.0	32.0	27.5	8.5	6800	60MR4470(1)40(2)	R60MR4470(1)40(2)
400	200	6.8	18.0	33.0	32.0	27.5	8.5	6800	60MR4680(1)40(2)	R60MR4680(1)40(2)
400	200	10.0	22.0	37.0	32.0	27.5	8.5	6800	60MR5100(1)40(2)	R60MR5100(1)40(2)
400	200	3.3	11.0	22.0	41.5	37.5	6.0	4800	60MW4330(1)30(2)	R60MW4330(1)30(2)
400	200	3.3	24.0	15.0	41.5	37.5	6.0	4800	60MW4330(1)L0(2)	R60MW4330(1)L0(2)
400	200	4.7	11.0	22.0	41.5	37.5	6.0	4800	60MW4470(1)40(2)	R60MW4470(1)40(2)
400	200	4.7	24.0	15.0	41.5	37.5	6.0	4800	60MW4470(1)L0(2)	R60MW4470(1)L0(2)
400	200	6.8	13.0	24.0	41.5	37.5	6.0	4800	60MW4680(1)40(2)	R60MW4680(1)40(2)
400	200	6.8	24.0	15.0	41.5	37.5	6.0	4800	60MW4680(1)L0(2)	R60MW4680(1)L0(2)
400	200	10.0	16.0	28.5	41.5	37.5	6.0	4800	60MW5100(1)40(2)	R60MW5100(1)40(2)
400	200	15.0	24.0	44.0	41.5	37.5	6.0	4800	60MW5150(1)30(2)	R60MW5150(1)30(2)
400	200	22.0	24.0	44.0	41.5	37.5	6.0	4800	60MW5220(1)40(2)	R60MW5220(1)40(2)
400	200	33.0	30.0	45.0	41.5	37.5	6.0	4800	60MW5330(1)40(2)	R60MW5330(1)40(2)
630	220	0.0047	4.0	9.0	13.0	10.0	40.0	50400	60PF1470(1)30(2)	R60PF1470(1)30(2)
630	220	0.0068	4.0	9.0	13.0	10.0	40.0	50400	60PF1680(1)30(2)	R60PF1680(1)30(2)
630	220	0.010	4.0	9.0	13.0	10.0	40.0	50400	60PF2100(1)30(2)	R60PF2100(1)30(2)
630	220	0.015	4.0	9.0	13.0	10.0	40.0	50400	60PF2150(1)30(2)	R60PF2150(1)30(2)
630	220	0.022	4.0	9.0	13.0	10.0	40.0	50400	60PF2220(1)40(2)	R60PF2220(1)40(2)
VDC	**VAC**	**Capacitance Value (µF)**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing**	**dV/dt (V/µs)**	**Max K_0 ($V^2/µs$)**	**KEMET Internal Part Number**	**Customer Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) J = 5%, K = 10%, M = 20%
(3) K = 10%, M = 20%

Table 1B – Ratings & Part Number Reference (Wound Capacitor Technology) cont.

VDC	VAC	Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Maximum K_0 (V^2/µs)	KEMET Internal Part Number	Customer Part Number
			T	H	L					
630	220	0.022	5.0	11.0	13.0	10.0	40.0	50400	60PF2220(1)30(2)	R60PF2220(1)30(2)
630	220	0.033	5.0	11.0	13.0	10.0	40.0	50400	60PF2330(1)40(2)	R60PF2330(1)40(2)
630	220	0.033	6.0	12.0	13.0	10.0	40.0	50400	60PF2330(1)30(2)	R60PF2330(1)30(2)
630	220	0.047	6.0	12.0	13.0	10.0	40.0	50400	60PF2470(1)30(2)	R60PF2470(1)30(2)
630	220	0.033	5.0	11.0	18.0	15.0	25.0	31500	60PI2330(1)30(2)	R60PI2330(1)30(2)
630	220	0.047	5.0	11.0	18.0	15.0	25.0	31500	60PI2470(1)30(2)	R60PI2470(1)30(2)
630	220	0.068	5.0	11.0	18.0	15.0	25.0	31500	60PI2680(1)40(2)	R60PI2680(1)40(2)
630	220	0.068	6.0	12.0	18.0	15.0	25.0	31500	60PI2680(1)30(2)	R60PI2680(1)30(2)
630	220	0.10	6.0	12.0	18.0	15.0	25.0	31500	60PI3100(1)40(2)	R60PI3100(1)40(2)
630	220	0.10	7.5	13.5	18.0	15.0	25.0	31500	60PI3100(1)30(2)	R60PI3100(1)30(2)
630	220	0.10	9.0	12.5	18.0	15.0	25.0	31500	60PI3100(1)L0(2)	R60PI3100(1)L0(2)
630	220	0.15	7.5	13.5	18.0	15.0	25.0	31500	60PI3150(1)40(2)	R60PI3150(1)40(2)
630	220	0.15	8.5	14.5	18.0	15.0	25.0	31500	60PI3150(1)30(2)	R60PI3150(1)30(2)
630	220	0.22	8.5	14.5	18.0	15.0	25.0	31500	60PI3220(1)40(2)	R60PI3220(1)40(2)
630	220	0.22	10.0	16.0	18.0	15.0	25.0	31500	60PI3220(1)30(2)	R60PI3220(1)30(2)
630	220	0.33	10.0	16.0	18.0	15.0	25.0	31500	60PI3330(1)30(2)	R60PI3330(1)30(2)
630	220	0.10	6.0	15.0	26.5	22.5	12.0	15120	60PN3100(1)30(2)	R60PN3100(1)30(2)
630	220	0.15	6.0	15.0	26.5	22.5	12.0	15120	60PN3150(1)30(2)	R60PN3150(1)30(2)
630	220	0.22	6.0	15.0	26.5	22.5	12.0	15120	60PN3220(1)40(2)	R60PN3220(1)40(2)
630	220	0.22	7.0	16.0	26.5	22.5	12.0	15120	60PN3220(1)30(2)	R60PN3220(1)30(2)
630	220	0.33	7.0	16.0	26.5	22.5	12.0	15120	60PN3330(1)50(2)	R60PN3330(1)50(2)
630	220	0.33	8.5	17.0	26.5	22.5	12.0	15120	60PN3330(1)40(2)	R60PN3330(1)40(2)
630	220	0.33	10.0	18.5	26.5	22.5	12.0	15120	60PN3330(1)30(2)	R60PN3330(1)30(2)
630	220	0.47	10.0	18.5	26.5	22.5	12.0	15120	60PN3470(1)40(2)	R60PN3470(1)40(2)
630	220	0.47	11.0	20.0	26.5	22.5	12.0	15120	60PN3470(1)30(2)	R60PN3470(1)30(2)
630	220	0.68	11.0	20.0	26.5	22.5	12.0	15120	60PN3680(1)40(2)	R60PN3680(1)40(2)
630	220	0.68	13.0	22.0	26.5	22.5	12.0	15120	60PN3680(1)30(2)	R60PN3680(1)30(2)
630	220	0.33	9.0	17.0	32.0	27.5	10.0	12600	60PR3330(1)30(2)	R60PR3330(1)30(2)
630	220	0.33	13.0	12.0	32.0	27.5	10.0	12600	60PR3330(1)L0(2)	R60PR3330(1)L0(2)
630	220	0.47	9.0	17.0	32.0	27.5	10.0	12600	60PR3470(1)40(2)	R60PR3470(1)40(2)
630	220	0.47	13.0	12.0	32.0	27.5	10.0	12600	60PR3470(1)L0(2)	R60PR3470(1)L0(2)
630	220	0.68	11.0	20.0	32.0	27.5	10.0	12600	60PR3680(1)40(2)	R60PR3680(1)40(2)
630	220	0.68	24.0	15.0	32.0	27.5	10.0	12600	60PR3680(1)L0(2)	R60PR3680(1)L0(2)
630	220	1.0	11.0	20.0	32.0	27.5	10.0	12600	60PR4100(1)50(2)	R60PR4100(1)50(2)
630	220	1.0	24.0	15.0	32.0	27.5	10.0	12600	60PR4100(1)L0(2)	R60PR4100(1)L0(2)
630	220	1.5	18.0	33.0	32.0	27.5	10.0	12600	60PR4150(1)30(2)	R60PR4150(1)30(2)
630	220	1.5	24.0	15.0	32.0	27.5	10.0	12600	60PR4150(1)L0(2)	R60PR4150(1)L0(2)
630	220	2.2	18.0	33.0	32.0	27.5	10.0	12600	60PR4220(1)40(2)	R60PR4220(1)40(2)
630	220	3.3	22.0	37.0	32.0	27.5	10.0	12600	60PR4330(1)40(2)	R60PR4330(1)40(2)
630	220	4.7	22.0	37.0	32.0	27.5	10.0	12600	60PR4470(1)40(2)	R60PR4470(1)40(2)
630	220	1.0	11.0	22.0	41.5	37.5	8.0	10080	60PW4100(1)30(2)	R60PW4100(1)30(2)
630	220	1.5	11.0	22.0	41.5	37.5	8.0	10080	60PW4150(1)40(2)	R60PW4150(1)40(2)
630	220	1.5	24.0	15.0	41.5	37.5	8.0	10080	60PW4150(1)L0(2)	R60PW4150(1)L0(2)
630	220	2.2	13.0	24.0	41.5	37.5	8.0	10080	60PW4220(1)40(2)	R60PW4220(1)40(2)
630	220	2.2	24.0	15.0	41.5	37.5	8.0	10080	60PW4220(1)L0(2)	R60PW4220(1)L0(2)
630	220	3.3	16.0	28.5	41.5	37.5	8.0	10080	60PW4330(1)40(2)	R60PW4330(1)40(2)
630	220	3.3	24.0	19.0	41.5	37.5	8.0	10080	60PW4330(1)L0(2)	R60PW4330(1)L0(2)
630	220	4.7	19.0	32.0	41.5	37.5	8.0	10080	60PW4470(1)40(2)	R60PW4470(1)40(2)
630	220	6.8	20.0	40.0	41.5	37.5	8.0	10080	60PW4680(1)00(2)	R60PW4680(1)00(2)
630	220	10.0	24.0	44.0	41.5	37.5	8.0	10080	60PW5100(1)40(2)	R60PW5100(1)40(2)
1000	250	0.0010	4.0	9.0	13.0	10.0	60.0	120000	60QF1100(1)01(2)	R60QF1100(1)01(2)
1000	250	0.0015	4.0	9.0	13.0	10.0	60.0	120000	60QF1150(1)01(2)	R60QF1150(1)01(2)
1000	250	0.0022	4.0	9.0	13.0	10.0	60.0	120000	60QF1220(1)01(2)	R60QF1220(1)01(2)
1000	250	0.0033	4.0	9.0	13.0	10.0	60.0	120000	60QF1330(1)01(2)	R60QF1330(1)01(2)
1000	250	0.0047	5.0	11.0	13.0	10.0	60.0	120000	60QF1470(1)01(2)	R60QF1470(1)01(2)
1000	250	0.0068	6.0	12.0	13.0	10.0	60.0	120000	60QF1680(1)01(2)	R60QF1680(1)01(2)
1000	250	0.010	5.0	11.0	18.0	15.0	30.0	60000	60QI2100(1)00(2)	R60QI2100(1)00(2)
1000	250	0.015	5.0	11.0	18.0	15.0	30.0	60000	60QI2150(1)30(2)	R60QI2150(1)30(2)
VDC	VAC	Capacitance Value (µF)	T (mm)	H (mm)	L (mm)	Lead Spacing	dV/dt (V/µs)	Max K_0 (V^2/µs)	KEMET Internal Part Number	Customer Part Number

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) J = 5%, K = 10%, M = 20%
(3) K = 10%, M = 20%

Table 1B – Ratings & Part Number Reference (Wound Capacitor Technology) cont.

VDC	VAC	Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	Maximum K_0 (V^2/µs)	KEMET Internal Part Number	Customer Part Number
			T	H	L					
1000	250	0.022	6.0	12.0	18.0	15.0	30.0	60000	60QI2220(1)30(2)	R60QI2220(1)30(2)
1000	250	0.033	7.5	13.5	18.0	15.0	30.0	60000	60QI2330(1)30(2)	R60QI2330(1)30(2)
1000	250	0.033	9.0	12.5	18.0	15.0	30.0	60000	60QI2330(1)L0(2)	R60QI2330(1)L0(2)
1000	250	0.047	10.0	16.0	18.0	15.0	30.0	60000	60QI2470(1)00(2)	R60QI2470(1)00(2)
1000	250	0.047	13.0	12.0	18.0	15.0	30.0	60000	60QI2470(1)L0(2)	R60QI2470(1)L0(2)
1000	250	0.068	11.0	19.0	18.0	15.0	30.0	60000	60QI2680(1)00(2)	R60QI2680(1)00(2)
1000	250	0.033	6.0	15.0	26.5	22.5	15.0	30000	60QN2330(1)00(2)	R60QN2330(1)00(2)
1000	250	0.047	6.0	15.0	26.5	22.5	15.0	30000	60QN2470(1)00(2)	R60QN2470(1)00(2)
1000	250	0.068	7.0	16.0	26.5	22.5	15.0	30000	60QN2680(1)30(2)	R60QN2680(1)30(2)
1000	250	0.10	8.5	17.0	26.5	22.5	15.0	30000	60QN3100(1)30(2)	R60QN3100(1)30(2)
1000	250	0.15	13.0	22.0	26.5	22.5	15.0	30000	60QN3150(1)00(2)	R60QN3150(1)00(2)
1000	250	0.15	9.0	17.0	32.0	27.5	12.0	24000	60QR3150(1)30(2)	R60QR3150(1)30(2)
1000	250	0.22	9.0	17.0	32.0	27.5	12.0	24000	60QR3220(1)40(2)	R60QR3220(1)40(2)
1000	250	0.33	11.0	20.0	32.0	27.5	12.0	24000	60QR3330(1)40(2)	R60QR3330(1)40(2)
1000	250	0.33	24.0	15.0	32.0	27.5	12.0	24000	60QR3330(1)L0(2)	R60QR3330(1)L0(2)
1000	250	0.47	13.0	22.0	32.0	27.5	12.0	24000	60QR3470(1)40(2)	R60QR3470(1)40(2)
1000	250	0.47	24.0	15.0	32.0	27.5	12.0	24000	60QR3470(1)L0(2)	R60QR3470(1)L0(2)
1000	250	0.68	14.0	28.0	32.0	27.5	12.0	24000	60QR3680(1)40(2)	R60QR3680(1)40(2)
1000	250	1.0	18.0	33.0	32.0	27.5	12.0	24000	60QR4100(1)40(2)	R60QR4100(1)40(2)
1000	250	1.5	22.0	37.0	32.0	27.5	12.0	24000	60QR4150(1)40(2)	R60QR4150(1)40(2)
1000	250	0.47	11.0	22.0	41.5	37.5	10.0	20000	60QW3470(1)30(2)	R60QW3470(1)30(2)
1000	250	0.68	11.0	22.0	41.5	37.5	10.0	20000	60QW3680(1)40(2)	R60QW3680(1)40(2)
1000	250	0.68	24.0	15.0	41.5	37.5	10.0	20000	60QW3680(1)L0(2)	R60QW3680(1)L0(2)
1000	250	1.0	16.0	28.5	41.5	37.5	10.0	20000	60QW4100(1)50(2)	R60QW4100(1)50(2)
1000	**250**	**1.0**	**24.0**	**15.0**	**41.5**	**37.5**	**10.0**	**20000**	**60QW4100(1)L0(3)**	**R60QW4100(1)L0(3)**
1000	250	1.0	24.0	19.0	41.5	37.5	10.0	20000	60QW4100(1)L1(2)	R60QW4100(1)L1(2)
1000	250	1.5	19.0	32.0	41.5	37.5	10.0	20000	60QW4150(1)50(2)	R60QW4150(1)50(2)
1000	250	2.2	20.0	40.0	41.5	37.5	10.0	20000	60QW4220(1)30(2)	R60QW4220(1)30(2)
1000	250	3.3	24.0	44.0	41.5	37.5	10.0	20000	60QW4330(1)00(2)	R60QW4330(1)00(2)
1000	**250**	**4.7**	**30.0**	**45.0**	**41.5**	**37.5**	**10.0**	**20000**	**60QW4470(1)40(3)**	**R60QW4470(1)40(3)**
VDC	**VAC**	**Capacitance Value (µF)**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing**	**dV/dt (V/µs)**	**Max K_0 (V^2/µs)**	**KEMET Internal Part Number**	**Customer Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) J = 5%, K = 10%, M = 20%
(3) K = 10%, M = 20%

Soldering Process

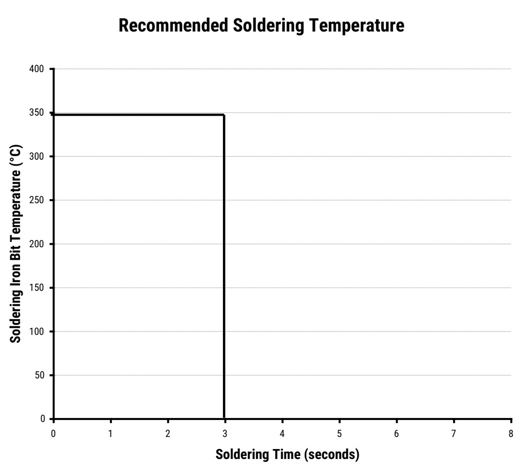
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2, serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

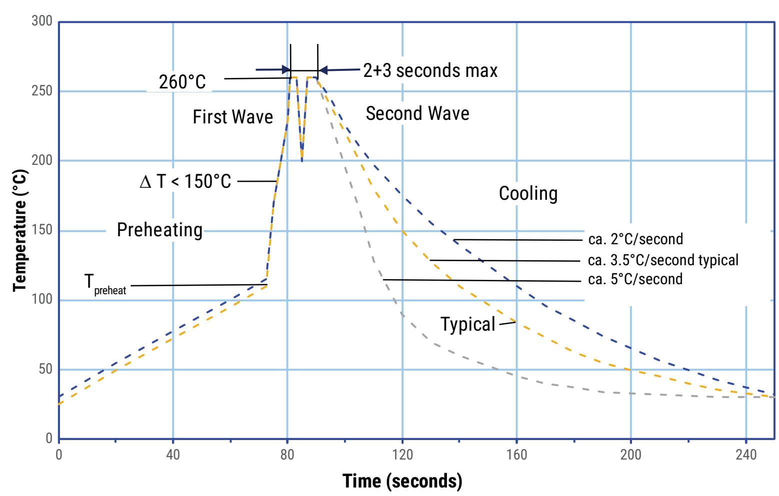
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

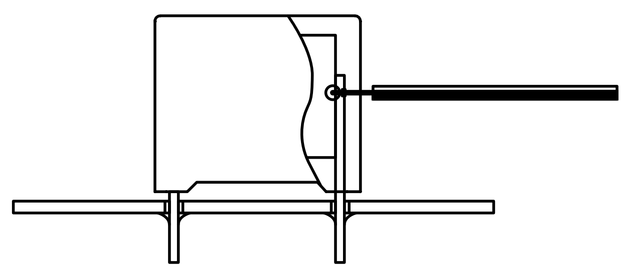
Wave Soldering Recommendations cont.

1. The table indicates the maximum set-up temperature of the soldering process
Figure 1.

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



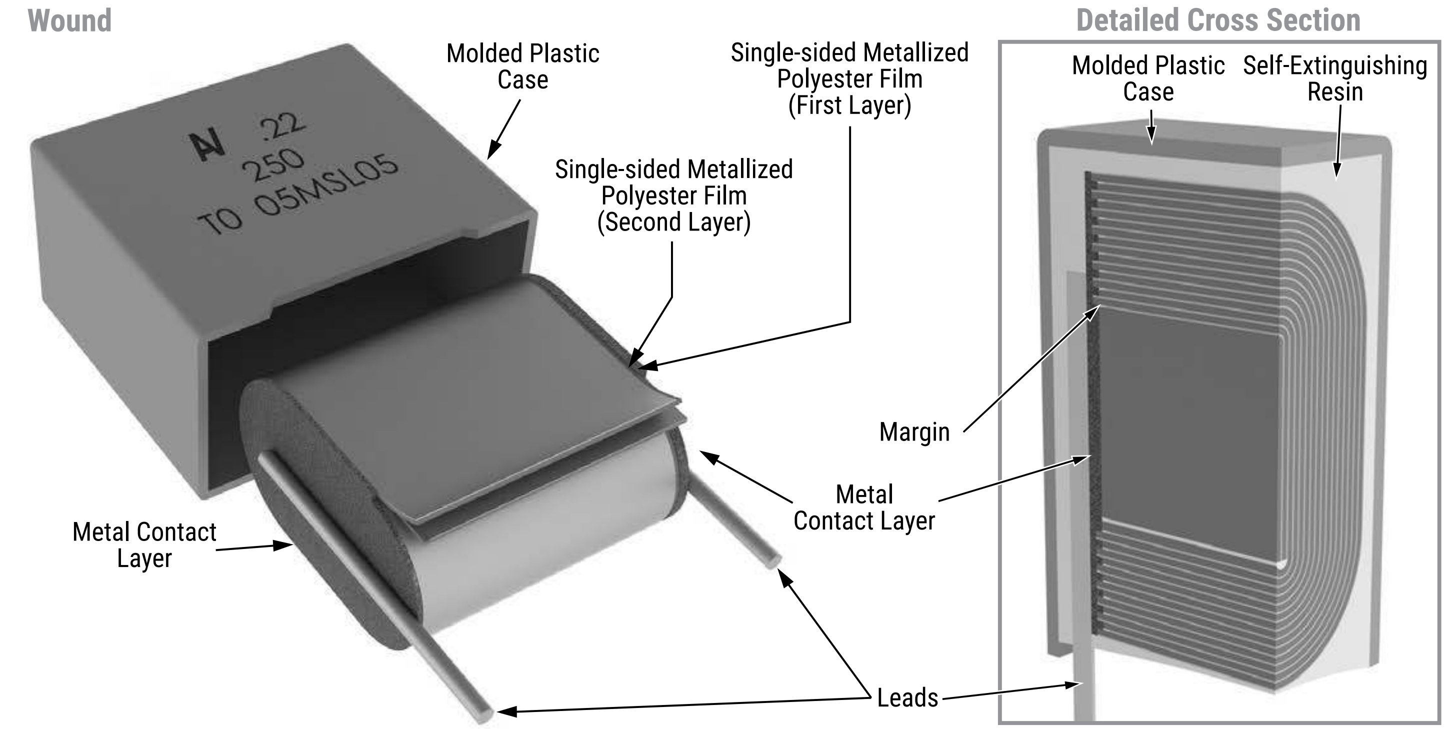
Temperature monitored inside the capacitor.

Selective Soldering Recommendations

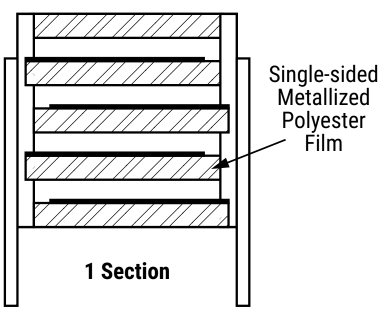
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Construction

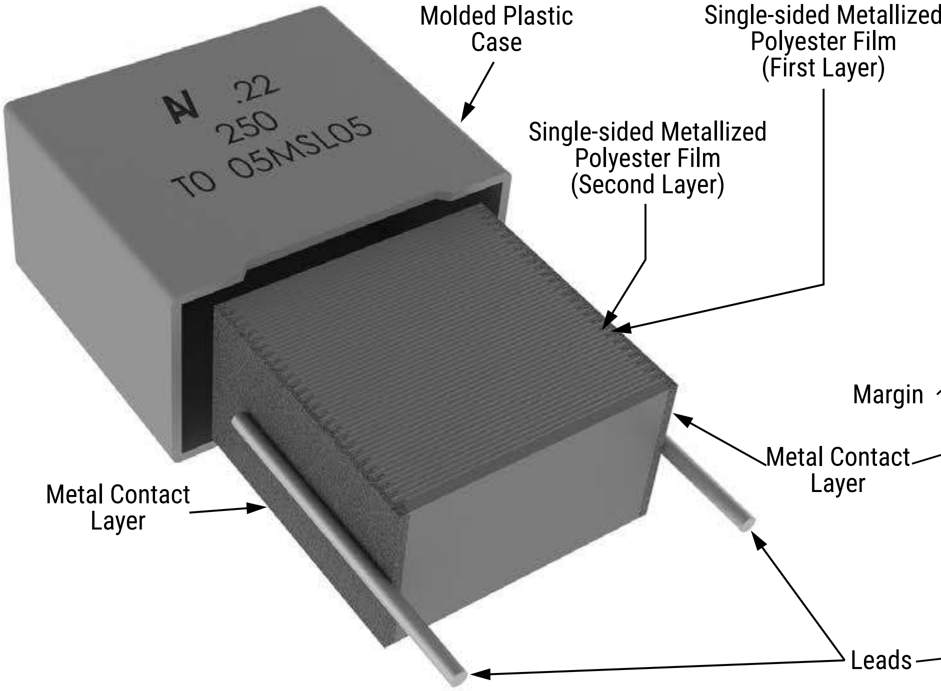


Winding Scheme

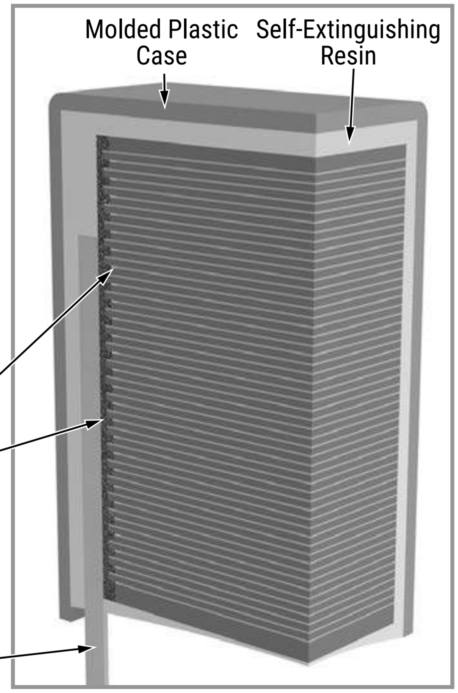


Construction cont.

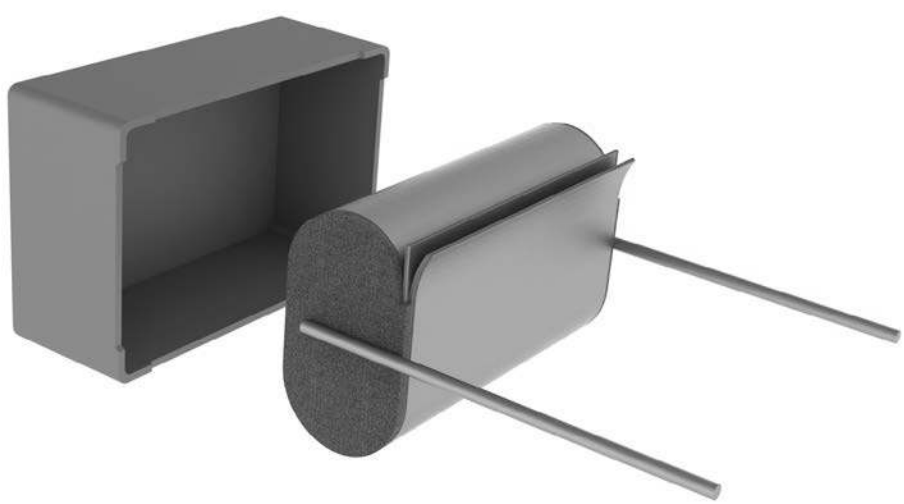
Stacked



Detailed Cross Section

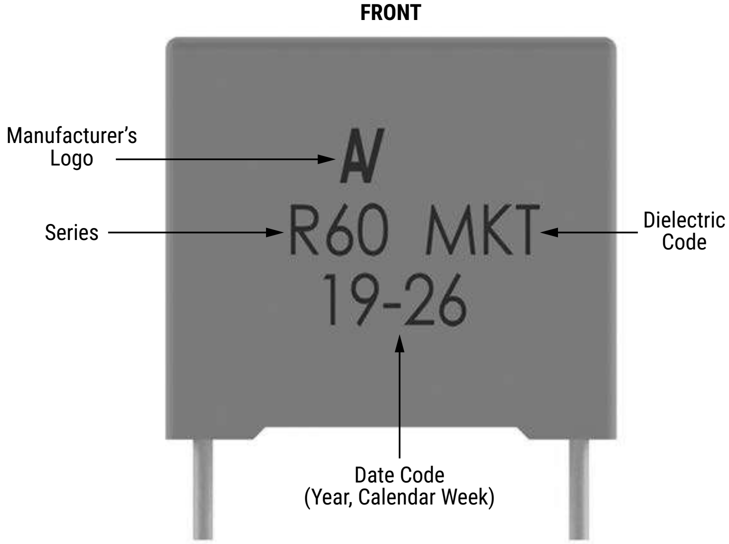


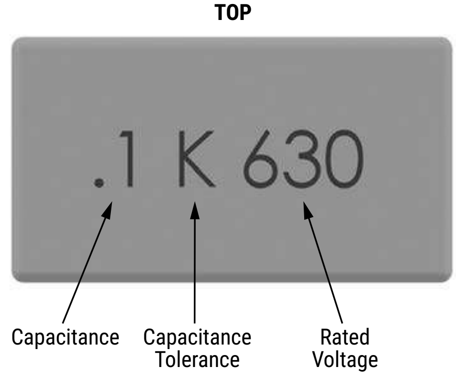
Low Profile Version



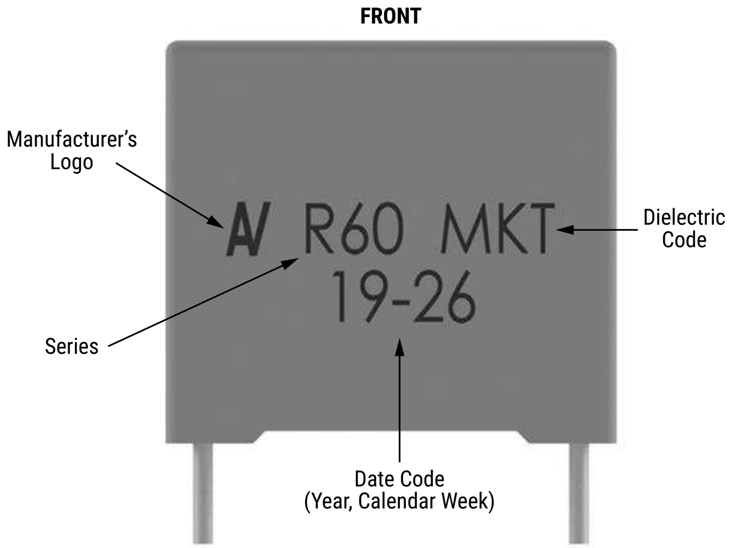
Marking

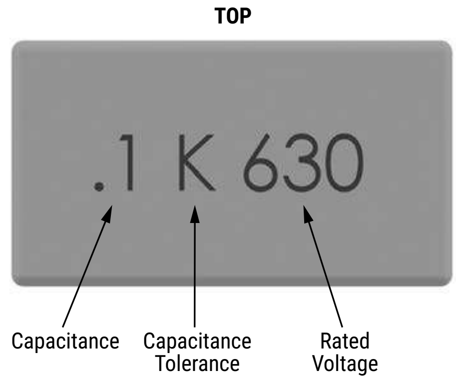
Pitch Variants - 10, 15, and 22.5





OR



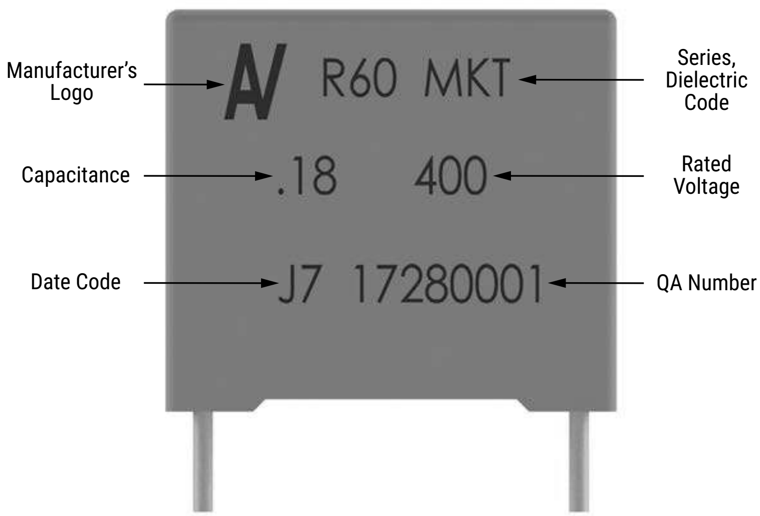


Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

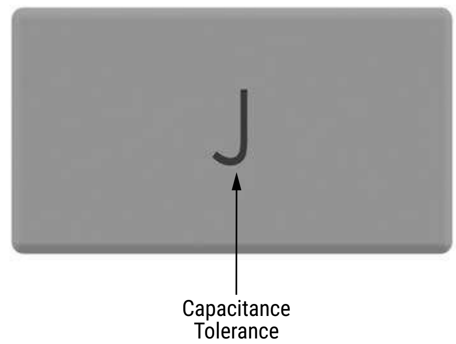
Marking cont.

Pitch Variants - 10 and 15

FRONT



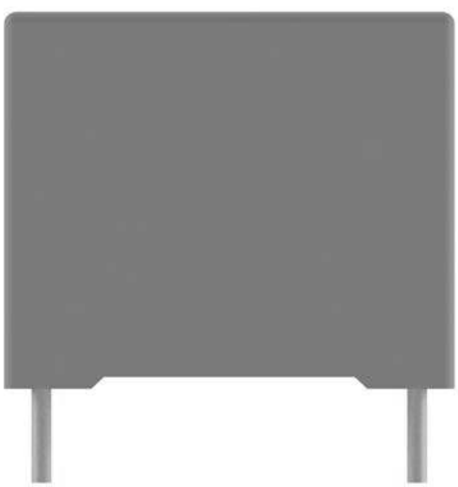
TOP



Top marking in hot imprinting with or without color

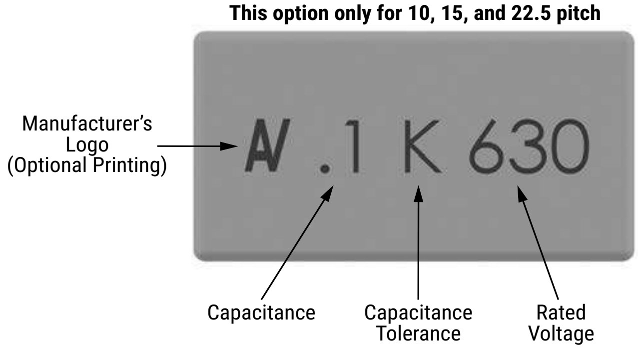
Pitch Variants - 10, 15, 22.5, 27.5, and 37.5

FRONT

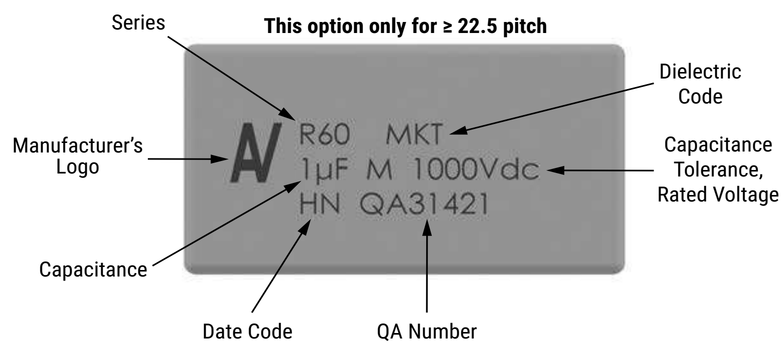


TOP

This option only for 10, 15, and 22.5 pitch



This option only for ≥ 22.5 pitch



Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Packaging Quantities

Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads			Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped
	Lead and Packaging Code			AA - JA - JB JE - JH	JC	Z3[1] JM[2]	40[3] – 50	GY	CK	DQ
10	4.0	9.0	13.0	2,000	2,200	2,200	1,800	750	1,500	1,000
	5.0	11.0	13.0	1,300	2,000	2,000	1,500	600	1,250	800
	6.0	12.0	13.0	1,000	1,800	1,800	1,200	500	1,000	680
15	5.0	11.0	18.0	2,000	1,750	1,250	1,000	600	1,250	800
	6.0	12.0	18.0	1,750	1,500	1,000	900	500	1,000	680
	7.5	13.5	18.0	1,000	1,000	800	700	350	800	500
	8.5	14.5	18.0	1,000	750	650	500	300	700	440
	9.0	12.5	18.0	1,000	800	700	520	270	650	410
	10.0	16.0	18.0	750	500	550	500	270	600	380
	11.0	19.0	18.0	450	350	400	350	270	500	340
	13.0	12.0	18.0	750	520	520	490	200	480	280
22.5	6.0	15.0	26.5	805	800	450	500	300	700	464
	7.0	16.0	26.5	700	600	450	500	250	550	380
	8.5	17.0	26.5	468	450	350	300	250	450	280
	10.0	18.5	26.5	396	380	350	300	160	350	235
	11.0	20.0	26.5	360	380	200	250	160	350	217
	13.0	22.0	26.5	300	280	150	200	130	300	-
27.5	9.0	17.0	32.0	816	408	408	408	230	450	-
	11.0	20.0	32.0	560	336	336	336	190	350	-
	13.0	12.0	32.0	672	288	288	288	-	-	-
	13.0	22.0	32.0	480	288	288	288	150	300	-
	14.0	28.0	32.0	352	176	176	176	-	-	-
	18.0	33.0	32.0	256	128	128	128	-	-	-
	22.0	37.0	32.0	168	112	112	112	-	-	-
	24.0	15.0	32.0	336	144	144	144	-	-	-
37.5	11.0	22.0	41.5	420	252	252	252	-	-	-
	13.0	24.0	41.5	360	216	216	216	-	-	-
	16.0	28.5	41.5	216	108	108	108	-	-	-
	19.0	32.0	41.5	192	96	96	96	-	-	-
	20.0	40.0	41.5	126	84	84	84	-	-	-
	24.0	15.0	41.5	252	108	108	108	-	-	-
	24.0	19.0	41.5	216	108	108	108	-	-	-
	24.0	44.0	41.5	108	72	72	72	-	-	-
	30.0	45.0	41.5	90	60	60	60	-	-	-

[1] *Only available for 10 mm lead spacing.*
[2] *Only available for lead spacing ≥ 15 mm.*
[3] *Not available for Stacked Capacitor Technology with 10 mm Lead Spacing.*

Lead Taping & Packaging (IEC 60286–2)

Figure 1 — Lead Spacing 10 mm

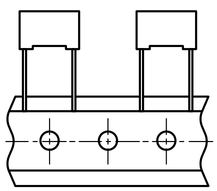


Figure 2 — Lead Spacing 15 mm

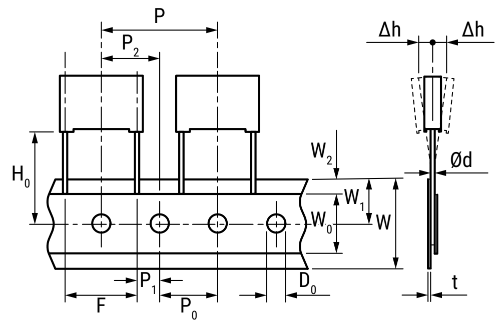
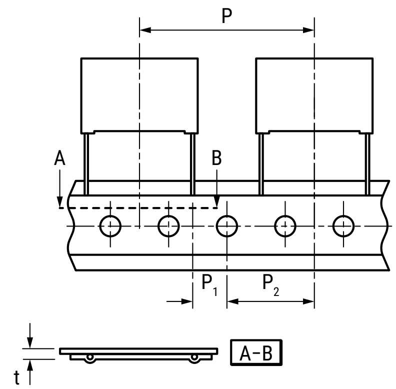


Figure 3 — Lead Spacing 22.5 & 27.5 mm

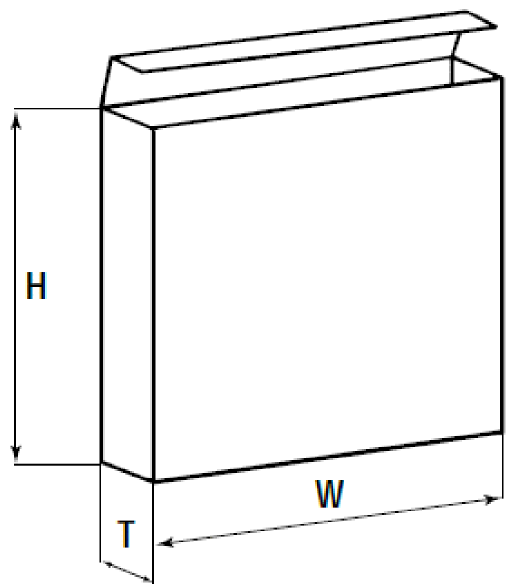


Description	Symbol	Dimensions (mm)				
		Lead Space				Tolerance
		10.0	15.0	22.5	27.5	
		Figure 1	Figure 2	Figure 3	Figure 3	
Lead wire diameter	d	0.6	0.6 – 0.8	0.8	0.8	±0.05
Taping lead space	P	25.4	25.4	38.1	38.1	±1
Feed hole lead space*	P_0	12.7	12.7	12.7	12.7	±0.2 **
Centering of the lead wire	P_1	7.7	5.2	7.8	5.3	±0.7
Centering of the body	P_2	12.7	12.7	19.05	19.05	±1.3
Lead spacing***	F	10.0	15.0	22.5	27.5	+0.6/−0.1
Component alignment	Δh	0	0	0	0	±2
Height of component from tape center	H_0****	18.5	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	18	+1/−0.5
Hold down tape width	W_0	9	10	10	10	Minimum
Hole position	W_1	9	9	9	9	±0.5
Hold down tape position	W_2	3	3	3	3	Maximum
Feed hole diameter	D_0	4	4	4	4	±0.2
Total tape thickness	t	0.7	0.7	0.7	0.7	±0.2

** Available also 15 mm.*
*** Maximum 1 mm on 20 lead spaces.*
**** Lead Spacing 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request.*
***** H = 16.5 mm is available upon request.*

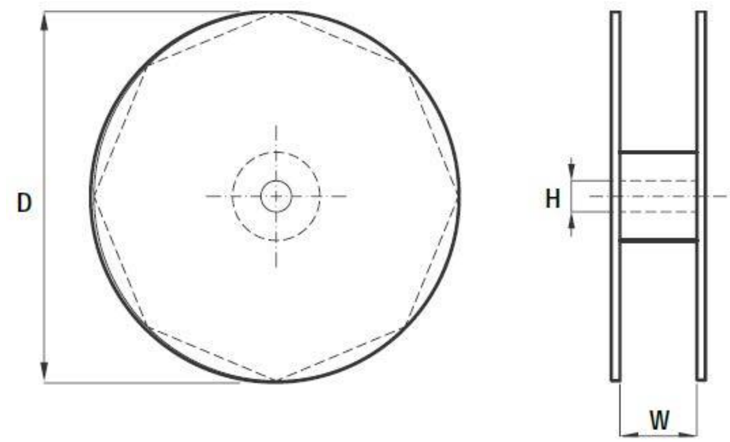
Ammo Specifications

Dimensions in mm		
H	W	T
360	340	59



Reel Specifications

Dimensions in mm		
D	H	W
355	30	55 maximum
500	25	



Manufacturing Date Code (IEC-60062)

Manufacturing Date Code (IEC-60062)					
Year	Code	Year	Code	Month	Code
2010	A	2022	P	January	1
2011	B	2023	R	February	2
2012	C	2024	S	March	3
2013	D	2025	T	April	4
2014	E	2026	U	May	5
2015	F	2027	V	June	6
2016	H	2028	W	July	7
2017	J	2029	X	August	8
2018	K	2030	A	September	9
2019	L			October	O
2020	M			November	N
2021	N			December	D

PHE844, Class X1, 440/480 VAC, 105°C

Overview

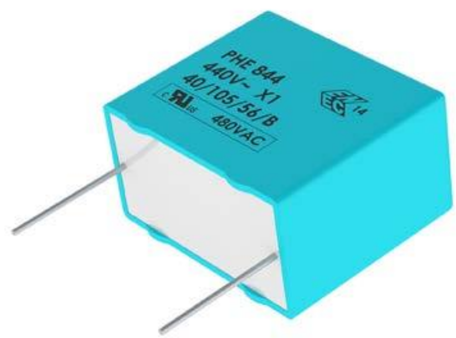
The PHE844 series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material that meets the requirements of UL 94 V–0.

Applications

For use as an electromagnetic interference (EMI) suppression filter in across-the-line applications that require X1 safety classification. Suitable for use in situations in which capacitor failure does not pose a danger of electric shock.

Benefits

- Approvals: ENEC, UL, cUL
- Class X1 (IEC 60384-14)
- THB Grade IA: 40°C, 93% RH, 500 hours at 480 V URAC acc. to IEC 60384-14
- Rated voltage: 440 VAC 50/60 Hz (ENEC), 480 VAC 50/60 Hz (UL, cUL)
- Capacitance range: 0.1 – 2.2 µF
- Lead spacing: 22.5 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category 40/105/56/B, IEC 60068–1
- Tape & Reel in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of −40°C to +105°C
- 100% screening factory test at 3,000 VDC
- Self-healing properties



Customer Part Number

PHE844	R	D	6100	M	R06L2
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Capacitance Tolerance	Packaging
X1, Metallized Polypropylene	R = 440	D = 22.5 F = 27.5 R = 37.5	The last three digits represent significant figures. The first digit specifies the total number of digits.	K = ±10% M = ±20%	See Ordering Options Table

KEMET Internal Part Number

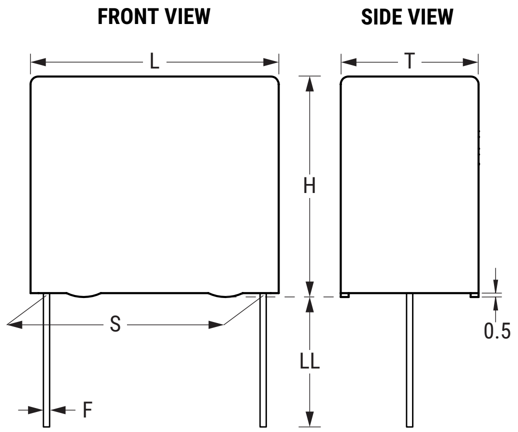
F	844	D	H	104	M	440	C
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Packaging
F = Film	X1, Metallized Polypropylene	D = 22.5 F = 27.5 R = 37.5	See Dimension Table	The first two digits represent significant figures. The third digit specifies number of zeros.	K = ±10% M = ±20%	440 = 440	See Ordering Options Table

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	KEMET Lead and Packaging Code	Legacy Lead and Packaging Code
22.5	**Standard Lead and Packaging Options**			
	Bulk (Tray)–Short Leads	6 +0/-1	C	R06L2(1)
	Other Lead and Packaging Options			
	Pizza Pack	6 +0/−1	Z	R06L2(1)
	Bulk (Tray)–Long Leads	30 +5/−0	ALW0L	R30L2
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	L	R17T0
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	P	R17T1
27.5	**Standard Lead and Packaging Options**			
	Bulk (Tray)–Short Leads	6 +0/−1	C	R06L2(1)
	Other Lead and Packaging Options			
	Pizza Pack	6 +0/−1	Z	R06L2(1)
	Bulk (Tray)–Long Leads	30 +5/−0	ALW0L	R30L2
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	P	R17T1
37.5	**Standard Lead and Packaging Options**			
	Bulk (Tray)–Short Leads	6 +0/−1	C	R06L2(1)
	Other Lead and Packaging Options			
	Pizza Pack	6 +0/−1	Z	R06L2(1)

(1) Please specify Bulk (Tray) or Pizza Packaging

Dimensions – Millimeters



KEMET Size Code	Legacy Size Code	S		T		H		L		F	
		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
DH	D14	22.5	±0.4	8.0	Maximum	16.0	Maximum	26.0	Maximum	0.8	±0.05
DM	D15	22.5	±0.4	9.0	Maximum	18.5	Maximum	26.0	Maximum	0.8	±0.05
DT	D16	22.5	±0.4	11.0	Maximum	21.5	Maximum	26.0	Maximum	0.8	±0.05
DW	D20	22.5	±0.4	13.5	Maximum	23.0	Maximum	26.0	Maximum	0.8	±0.05
DY	D19	22.5	±0.4	15.5	Maximum	24.5	Maximum	26.0	Maximum	0.8	±0.05
FE	F11	27.5	±0.4	10.5	Maximum	20.5	Maximum	31.5	Maximum	0.8	±0.05
FK	F03	27.5	±0.4	13.5	Maximum	23.0	Maximum	31.5	Maximum	0.8	±0.05
FM	F13	27.5	±0.4	14.5	Maximum	24.5	Maximum	31.5	Maximum	0.8	±0.05
FR	F14	27.5	±0.4	17.5	Maximum	28.0	Maximum	31.5	Maximum	0.8	±0.05
FV	F16	27.5	±0.4	21.0	Maximum	30.0	Maximum	31.5	Maximum	0.8	±0.05
RF	R05	37.5	±0.5	13.0	Maximum	24.0	Maximum	41.0	Maximum	1.0	±0.05
RH	R04	37.5	±0.5	15.0	Maximum	26.0	Maximum	41.0	Maximum	1.0	±0.05
RM	R03	37.5	±0.5	19.0	Maximum	36.0	Maximum	41.0	Maximum	1.0	±0.05
RP	R06	37.5	±0.5	21.0	Maximum	38.0	Maximum	41.0	Maximum	1.0	±0.05

Note: See the Ordering Options Table for lead length (LL) options.

Performance Characteristics

Dielectric	Polypropylene film			
Plates	Metal layer deposited by evaporation under vacuum			
Winding	Non-inductive type. Series design.			
Leads	Tinned wire			
Protection	Plastic case, thermosetting resin-filled. Box material is solvent-resistant and flame-retardant according to UL94 V–0.			
Rated Voltage V_R	440 VAC 50/60 Hz (ENEC) – 480 VAC 50/60 Hz (UL,cUL)			
Capacitance Range	0.10 – 2.2 µF			
Capacitance Values	E6 series (IEC 60063)			
Capacitance Tolerance	±20% standard, ±10% option			
Temperature Range	-40°C to 105°C			
Climatic Category	40/105/56/B IEC 60068-1			
Approvals	ENEC, UL, cUL			
Related Documents	EN/IEC 60384-14:2005, UL 60384-14, CAN/CSA E60384-14:09			
Dissipation Factor (tanδ)	Maximum Values at +23°C			
	Frequency	C ≤ 0.1 µF	0.1 µF < C ≤ 1 µF	C > 1 µF
	1 kHz	0.1%	0.1%	0.1%
	10 kHz	0.2%	0.4%	0.8%
	100 kHz	0.6%	-	-
Test Voltage Between Terminals	The 100% screening factory test is carried out at 3,000 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. Do not repeat this test, as there is a risk of damaging the capacitor. KEMET is not liable for any failures if the test has been repeated.			
Resonance Frequency	Tabulated Self-resonance Frequencies f_o (see Table 1 – Ratings & Part Number Reference)			
Insulation Resistance	Measured at +25°C ±5°C, according to IEC 60384-2			
	Minimum Values Between Terminals			
	C ≤ 0.33 µF	C > 0.33 µF		
	≥ 30,000 MΩ	≥ 10,000 MΩ • µF		
In DC Applications	Recommended voltage ≤ 1,000 VDC			

Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384-14:2005	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068-2-6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2 No visible damage. No open or short circuit.
Bump	IEC 60068-2-29 Test Eb	1,000 bumps at 390 m/s^2 No visible damage. No open or short circuit.
Change of Temperature	IEC 60068-2-14 Test Na	Upper and lower rated temperature 5 cycles No visible damage.
Active Flammability	IEC 60384-14:2005	V_R + 20 surge pulses at 4 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384-14:2005	IEC 60384–1, IEC 60695–11–5 Needle Flame Test
Damp Heat Steady State	IEC 60068-2-78 Test Cab	+40°C and 90 – 95% RH, 56 days
THB Test	According to Grade IA	+40°C and 90 - 95% RH, 21 days at rated AC-voltage Capacitance change (ΔC/C): ≤ 10% Dissipation factor change (Δtan δ): ≤ 24 * 10^{-3} (at 10 kHz) for C ≤ 1 µF Dissipation factor change (Δtan δ): ≤ 15 * 10^{-3} (at 1 kHz) for C > 1 µF Insulation resistance IR in seconds or time constant τ = CR Rins: ≥ 50% of initial limit

Approvals

Certification Body	Mark	Specification	File Number
Intertek Semko AB		EN/IEC 60384-14	SE/0140–1D
UL	c US	UL 60384 and CAN/CSA E60384-14:09 (480 VAC)	E73869

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Size Code (KEMET/ Legacy)	Maximum Dimensions in mm			Lead Spacing (S)	f_o (MHz)	dV/dt (V/ µs)	KEMET Part Number	Legacy Part Number
		T	H	L					
0.10	DH/D14	8.0	16.0	26.0	22.5	3.2	100	F844DH104(1)440(2)	PHE844RD6100(1)(2)
0.15	DM/D15	9.0	18.5	26.0	22.5	2.6	100	F844DM154(1)440(2)	PHE844RD6150(1)(2)
0.22	DT/D16	11.0	21.5	26.0	22.5	2.1	100	F844DT224(1)440(2)	PHE844RD6220(1)(2)
0.33	DW/D20	13.5	23.0	26.0	22.5	1.8	100	F844DW334(1)440(2)	PHE844RD6330(1)(2)
0.47	DY/D19	15.5	24.5	26.0	22.5	1.5	100	F844DY474(1)440(2)	PHE844RD6470(1)(2)
0.22	FE/F11	10.5	20.5	31.5	27.5	2.2	100	F844FE224(1)440(2)	PHE844RF6220(1)(2)
0.33	FK/F03	13.5	23.0	31.5	27.5	1.7	100	F844FK334(1)440(2)	PHE844RF6330(1)(2)
0.47	FM/F13	14.5	24.5	31.5	27.5	1.4	100	F844FM474(1)440(2)	PHE844RF6470(1)(2)
0.68	FR/F14	17.5	28.0	31.5	27.5	1.1	100	F844FR684(1)440(2)	PHE844RF6680(1)(2)
1.0	FV/F16	21.0	30.0	31.5	27.5	1.0	100	F844FV105(1)440(2)	PHE844RF7100(1)(2)
0.47	RF/R05	13.0	24.0	41.0	37.5	1.3	100	F844RF474(1)440(2)	PHE844RR6470(1)(2)
0.68	RF/R05	13.0	24.0	41.0	37.5	1.1	100	F844RF684(1)440(2)	PHE844RR6680(1)(2)
1.0	RH/R04	15.0	26.0	41.0	37.5	0.92	100	F844RH105(1)440(2)	PHE844RR7100(1)(2)
1.5	RM/R03	19.0	36.0	41.0	37.5	0.74	100	F844RM155(1)440(2)	PHE844RR7150(1)(2)
2.2	RP/R06	21.0	38.0	41.0	37.5	0.60	100	F844RP225(1)440(2)	PHE844RR7220(1)(2)
Capacitance Value (µF)	**Size Code (KEMET/Legacy)**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**f_o (MHz)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert ordering code for lead type and packaging. See the Ordering Options Table for available options.

Soldering Process

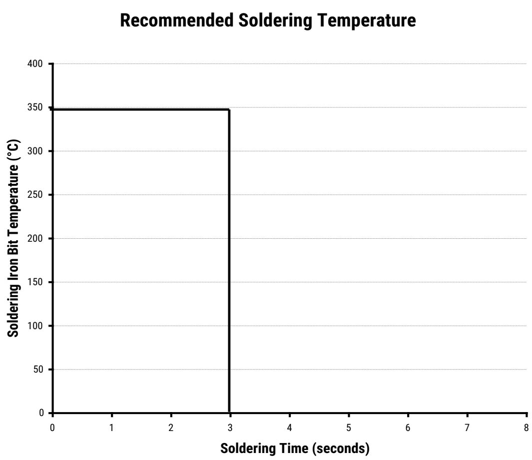
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder. This implementation has increased the liquidus temperature from 183ºC for SnPb eutectic alloys to 217 – 221ºC for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170ºC). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm), and great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the recommended limits may result in degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface-mount components. Insert through-hole parts after curing the surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum of two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to normal before the second soldering cycle.

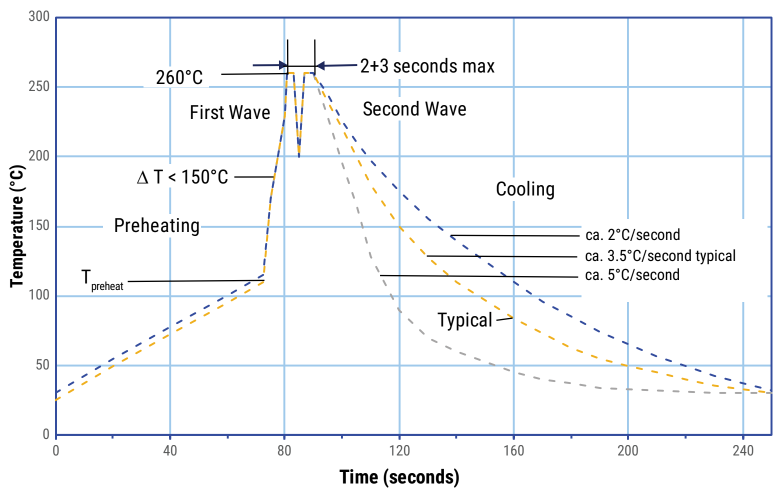
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



Soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

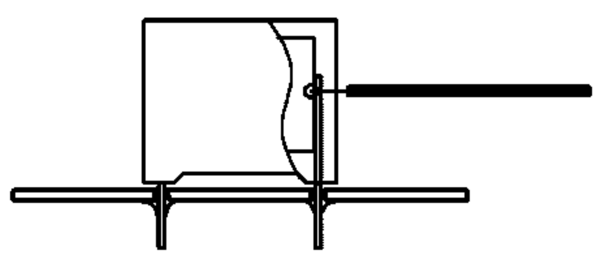
1. The table indicates the maximum set-up temperature of the soldering process.

Figure 1

Dielectric film material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≥ 10 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that the maximum temperature is below the limit inside the element.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



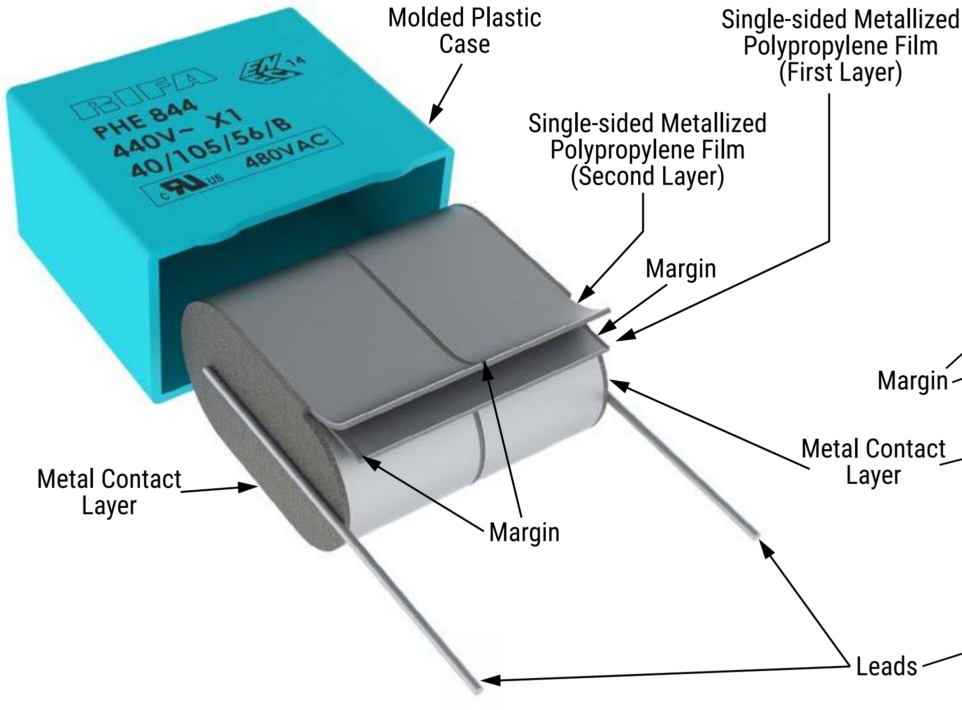
Temperature monitored inside the capacitor.

Selective Soldering Recommendations

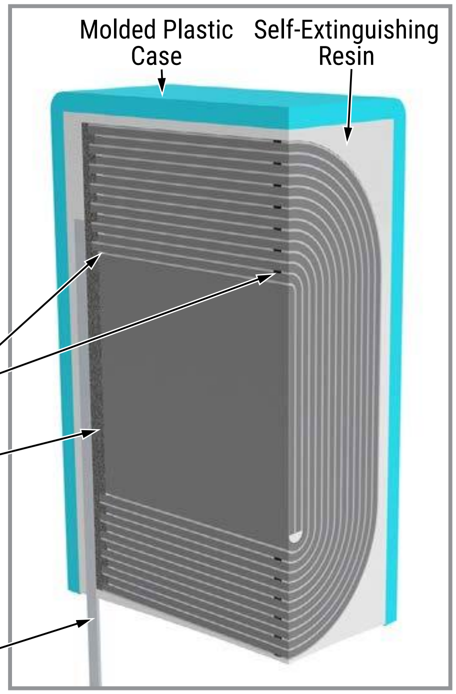
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath, as in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and then pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double-wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double-wave flow soldering. Great care must be taken so that the parts do not overheat.

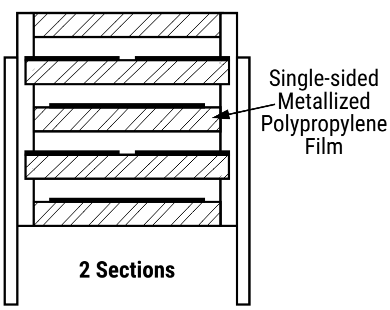
Construction



Detailed Cross Section

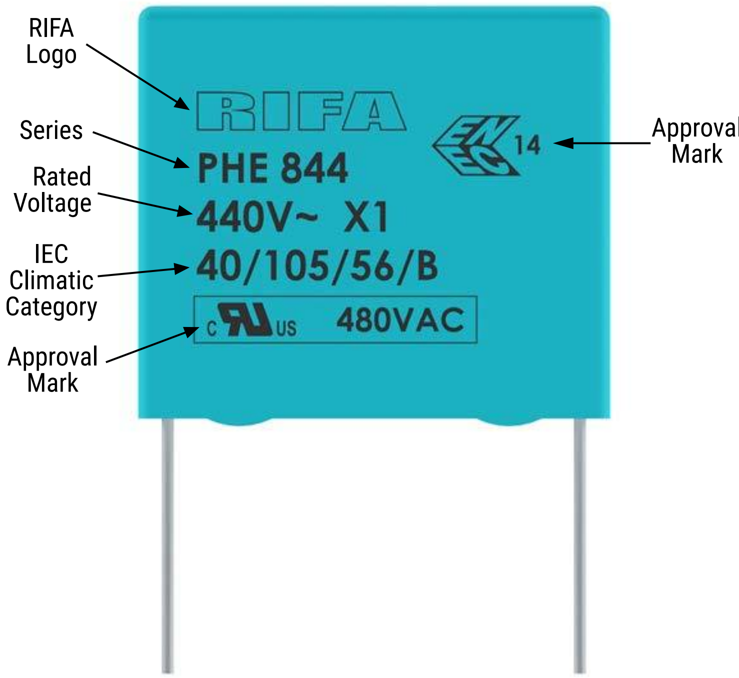


Winding Scheme

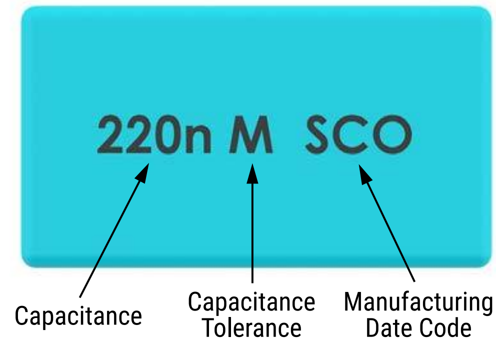


Marking

FRONT



TOP



Manufacturing Date Code (IEC-60062)			
Year	Code	Month	Code
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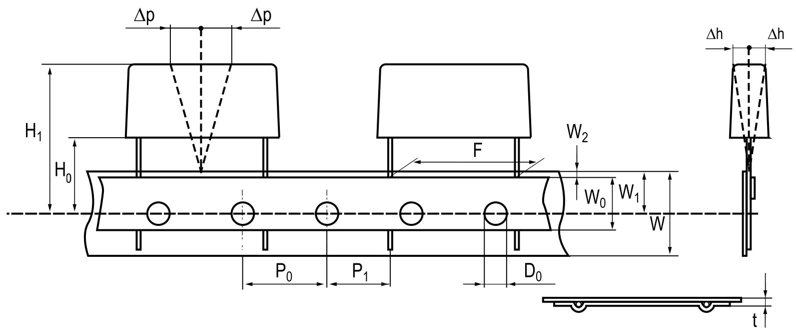
2011	B	February	2
2012	C	March	3
2013	D	April	4
2014	E	May	5
2015	F	June	6
2016	H	July	7
2017	J	August	8
2018	K	September	9
2019	L	October	O
2020	M	November	N
2021	N	December	D
2022	P		
2023	R		
2024	S		
2025	T		
2026	U		
2027	V		
2028	W		
2029	X		
2030	A		

Packaging Quantities

Lead Spacing	KEMET Size Code	Legacy Size Code	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Bulk (Pizza)
22.5	DD	D13	6.5	14.5	26.0	234	300	600	440
	DH	D14	8.0	16.0	26.0	186	250	500	352
	DM	D15	9.0	18.5	26.0	308	250	500	308
	DT	D16	11.0	21.5	26.0	253	200	400	253
	DF	D17	7.0	16.5	26.0	216	300	600	396
	DR	D18	10.5	19.0	26.0	264	200	400	264
	DY	D19	15.5	24.5	26.0	176	110	250	176
	DW	D20	13.5	23.0	26.0	209	160	300	209
27.5	FK	F03	13.5	23.0	31.5	171		250	171
	FE	F11	10.5	20.5	31.5	216		350	216
	FG	F12	11.5	22.5	31.5	198		300	198
	FM	F13	14.5	24.5	31.5	153		250	153
	FR	F14	17.5	28.0	31.5	126			126
	FS	F15	19.0	29.0	31.5	117			117
	FV	F16	21.0	30.0	31.5	108			108
	FH	F17	21.0	12.5	31.5	108			108
	FT	F18	31.0	18.5	31.5	72			72
	FQ	F19	27.5	16.0	31.5	81			81
37.5	RK	R02	16.5	32.0	41.0	105			105
	RM	R03	19.0	36.0	41.0	91			91
	RH	R04	15.0	26.0	41.0	119			119
	RF	R05	13.0	24.0	41.0	140			140
	RP	R06	21.0	38.0	41.0	84			84
	RS	R08	28.0	43.0	41.0	54			54

Lead Taping & Packaging (IEC 60286-2)

Lead Spacing 22.5 – 27.5 mm



Taping Specification

Description	Symbol	Dimensions (mm)		
		Lead Space		Tolerance
		22.5	27.5	
Lead Spacing	F	22.5	27.5	+0.6/−0.1
Carrier Tape Width	W	18	18	+1/−0.5
Hold Down Tape Width	W_0	5	5	Minimum
Hole Position	W_1	9	9	+0.75/−0.5
Hold Down Tape Position	W_2	3	3	Maximum
Feed Hole Diameter	D_0	4	4	±0.2
Feed-hole Lead Space *	P_0	12.7	12.7	±0.2 **
Centering of the Lead Wire	P_1	7.8	5.3	±0.7
Component Alignment	Δh	2	2	±2
Deviation Tape – Plane	Δp	1.3	1.3	Maximum
Tape Thickness	t	0.9	0.9	Maximum
Height of Component from Tape Center	H_0***	18.5	18.5	±0.5

**Available also 15mm*
***Maximum 1 mm on 20 lead spaces*
**** H_0 = 16.5 mm is available upon request*

PHE845, Class X1, 760 VAC, 105°C

KEMET a YAGEO company

Overview

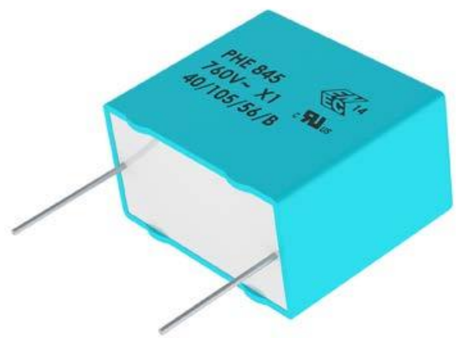
The PHE845 series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material that meets the requirements of UL 94 V–0.

Applications

For use as an electromagnetic interference (EMI) suppression filter in across-the-line applications that require X1 safety classification. Suitable for use in situations in which capacitor failure does not pose a danger of electric shock.

Benefits

- Approvals: ENEC, UL, cUL
- Class X1 (IEC 60384-14)
- THB Grade IA: 40°C, 93% RH, 500 hours at 760 V URAC acc. to IEC 60384-14
- Rated voltage: 760 VAC 50/60 Hz
- Capacitance range: 0.01 – 1.0 µF
- Lead spacing: 22.5 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category 40/105/56/B, IEC 60068-1
- Tape & Reel in accordance with IEC 60286-2
- RoHS compliant and lead-free terminations
- Operating temperature range of −40°C to +105°C
- 100% screening factory test at 4,250 VDC
- Self-healing properties



Customer Part Number

PHE845	V	D	5100	M	R06L2
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Capacitance Tolerance	Packaging
X1, Metallized Polypropylene	V = 760	D = 22.5 F = 27.5 R = 37.5	The last three digits represent significant figures. The first digit specifies the total number of digits.	K = ±10% M = ±20%	See Ordering Options Table

KEMET Internal Part Number

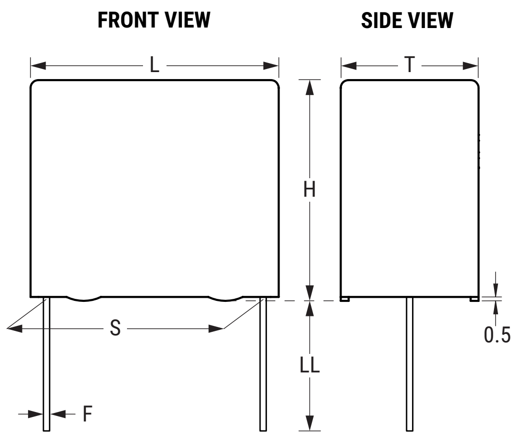
F	845	D	D	103	M	760	C
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VAC)	Packaging
F = Film	X1, Metallized Polypropylene	D = 22.5 F = 27.5 R = 37.5	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	760 = 760	See Ordering Options Table

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	KEMET Lead and Packaging Code	Legacy Lead and Packaging Code
22.5	**Standard Lead and Packaging Options**			
	Bulk (Tray)–Short Leads	6 +0/-1	C	R06L2[1]
	Other Lead and Packaging Options			
	Pizza Pack	6 +0/−1	Z	R06L2[1]
	Bulk (Tray)–Long Leads	30 +5/−0	ALW0L	R30L2
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	L	R17T0
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	P	R17T1
27.5	**Standard Lead and Packaging Options**			
	Bulk (Tray)–Short Leads	6 +0/−1	C	R06L2[1]
	Other Lead and Packaging Options			
	Pizza Pack	6 +0/−1	Z	R06L2[1]
	Bulk (Tray)–Long Leads	30 +5/−0	ALW0L	R30L2
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	P	R17T1
37.5	**Standard Lead and Packaging Options**			
	Bulk (Tray)–Short Leads	6 +0/−1	C	R06L2[1]
	Other Lead and Packaging Options			
	Pizza Pack	6 +0/−1	Z	R06L2[1]

(1) Please specify Bulk (Tray) or Pizza Packaging

Dimensions – Millimeters



KEMET Size Code	Legacy Size Code	S		T		H		L		F	
		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
DD	D13	22.5	±0.4	6.5	Maximum	14.5	Maximum	26.0	Maximum	0.8	±0.05
DG	D17	22.5	±0.4	7.0	Maximum	16.5	Maximum	26.0	Maximum	0.8	±0.05
DM	D15	22.5	±0.4	9.0	Maximum	18.5	Maximum	26.0	Maximum	0.8	±0.05
DR	D18	22.5	±0.4	10.5	Maximum	19.0	Maximum	26.0	Maximum	0.8	±0.05
DT	D16	22.5	±0.4	11.0	Maximum	21.5	Maximum	26.0	Maximum	0.8	±0.05
DW	D20	22.5	±0.4	13.5	Maximum	23.0	Maximum	26.0	Maximum	0.8	±0.05
DY	D19	22.5	±0.4	15.5	Maximum	24.5	Maximum	26.0	Maximum	0.8	±0.05
FE	F11	27.5	±0.4	10.5	Maximum	20.5	Maximum	31.5	Maximum	0.8	±0.05
FG	F12	27.5	±0.4	11.5	Maximum	22.5	Maximum	31.5	Maximum	0.8	±0.05
FK	F03	27.5	±0.4	13.5	Maximum	23.0	Maximum	31.5	Maximum	0.8	±0.05
FS	F15	27.5	±0.4	19.0	Maximum	29.0	Maximum	31.5	Maximum	0.8	±0.05
FV	F16	27.5	±0.4	21.0	Maximum	30.0	Maximum	31.5	Maximum	0.8	±0.05
RH	R04	37.5	±0.5	15.0	Maximum	26.0	Maximum	41.0	Maximum	1.0	±0.05
RK	R02	37.5	± 0.5	16.5	Maximum	32.0	Maximum	41.0	Maximum	1.0	±0.05
RM	R03	37.5	±0.5	19.0	Maximum	36.0	Maximum	41.0	Maximum	1.0	±0.05
RP	R06	37.5	±0.5	21.0	Maximum	38.0	Maximum	41.0	Maximum	1.0	±0.05

Note: See the Ordering Options Table for lead length (LL) options.

Performance Characteristics

Dielectric	Polypropylene film		
Plates	Metal layer deposited by evaporation under vacuum		
Winding	Non-inductive type. Triple design.		
Leads	Tinned wire		
Protection	Plastic case, thermosetting resin-filled. Box material is solvent-resistant and flame-retardant according to UL94 V–0.		
Rated Voltage (V_R)	760 VAC 50/60 Hz		
Capacitance Range	0.010 – 1.0 µF		
Capacitance Values	E6 series (IEC 60063)		
Capacitance Tolerance	±20% standard, ±10% option		
Temperature Range	-40°C to 105°C		
Climatic Category	40/105/56/B IEC 60068-1		
Approvals	ENEC, UL, cUL		
Related Documents	EN/IEC 60384-14:2005, UL 60384-14, CAN/CSA E60384-14:09		
Dissipation Factor (tanδ)	Maximum Values at +23°C		
	Frequency	C ≤ 0.1 µF	0.1 µF < C ≤ 1 µF
	1 kHz	0.1%	0.1%
	10 kHz	0.2%	0.4%
	100 kHz	0.6%	-
Test Voltage Between Terminals	The 100% screening factory test is carried out at 4,250 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. It is not permitted to repeat this test as there is a risk to damage the capacitor. KEMET is not liable in such case for any failures.		
Resonance Frequency	Tabulated self-resonance frequencies f_o (see Table 1 – Ratings & Part Number Reference)		
Insulation Resistance	Measured at +25°C ±5°C, according to IEC 60384-2		
	Minimum Values Between Terminals		
	C ≤ 0.33 µF	C > 0.33 µF	
	≥ 30,000 MΩ	≥ 10,000 MΩ • µF	
In DC Applications	Recommended voltage ≤ 1,500 VDC		

Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384-14:2005	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068-2-6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2 No visible damage. No open or short circuit.
Bump	IEC 60068-2-29 Test Eb	1,000 bumps at 390 m/s^2 No visible damage. No open or short circuit.
Change of Temperature	IEC 60068-2-14 Test Na	Upper and lower rated temperature 5 cycles No visible damage.
Active Flammability	IEC 60384-14:2005	V_R + 20 surge pulses at 4 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384-14:2005	IEC 60384–1, IEC 60695–11–5 Needle Flame Test
Damp Heat Steady State	IEC 60068-2-78 Test Cab	+40°C and 90 – 95% RH, 56 days
THB Test	According to Grade IA	+40°C and 90 - 95% RH, 21 days at rated AC-voltage Capacitance change (ΔC/C): ≤ 10% Dissipation factor change (Δtan δ): ≤ 24 * 10^{-3} (at 10 kHz) for C ≤ 1 µF Dissipation factor change (Δtan δ): ≤ 15 * 10^{-3} (at 1 kHz) for C > 1 µF Insulation resistance IR in seconds or time constant τ = CR Rins: ≥ 50% of initial limit

Approvals

Certification Body	Mark	Specification	File Number
Intertek Semko AB	ENEC	EN/IEC 60384-14	SE/0140–17E
UL	c UL us	UL 60384 and CAN/CSA E60384-14:09 (760 VAC)	E73869

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Size Code (KEMET/ Legacy)	Maximum Dimensions in mm			Lead Spacing (S)	f_o (MHz)	dV/dt (V/ µs)	KEMET Part Number	Legacy Part Number
		T	H	L					
0.010	DD/D13	6.5	14.5	26.0	22.5	11	100	F845DD103(1)760(2)	PHE845VD5100(1)(2)
0.015	DD/D13	6.5	14.5	26.0	22.5	9.2	100	F845DD153(1)760(2)	PHE845VD5150(1)(2)
0.022	DD/D13	6.5	14.5	26.0	22.5	7.6	100	F845DD223(1)760(2)	PHE845VD5220(1)(2)
0.033	DF/D17	7.0	16.5	26.0	22.5	6.4	100	F845DF333(1)760(2)	PHE845VD5330(1)(2)
0.047	DM/D15	9.0	18.5	26.0	22.5	5.3	100	F845DM473(1)760(2)	PHE845VD5470(1)(2)
0.068	DR/D18	10.5	19.0	26.0	22.5	4.4	100	F845DR683(1)760(2)	PHE845VD5680(1)(2)
0.10	DT/D16	11.0	21.5	26.0	22.5	3.5	100	F845DT104(1)760(2)	PHE845VD6100(1)(2)
0.15	DW/D20	13.5	23.0	26.0	22.5	3.1	100	F845DW154(1)760(2)	PHE845VD6150(1)(2)
0.22	DY/D19	15.5	24.5	26.0	22.5	2.7	100	F845DY224M760(2)	PHE845VY6220M(2)
0.10	FE/F11	10.5	20.5	31.5	27.5	3.4	100	F845FE104(1)760(2)	PHE845VF6100(1)(2)
0.15	FG/F12	11.5	22.5	31.5	27.5	3.0	100	F845FG154(1)760(2)	PHE845VF6150(1)(2)
0.22	FK/F03	13.5	23.0	31.5	27.5	2.4	100	F845FK224(1)760(2)	PHE845VF6220(1)(2)
0.33	FS/F15	19.0	29.0	31.5	27.5	2.0	100	F845FS334(1)760(2)	PHE845VF6330(1)(2)
0.47	FV/F16	21.0	30.0	31.5	27.5	1.6	100	F845FV474M760(2)	PHE845VZ6470M(2)
0.47	RH/R04	15.0	26.0	41.0	37.5	1.6	100	F845RH474M760(2)	PHE845VW6470M(2)
0.47	RK/R02	16.5	32.0	41.0	37.5	1.6	100	F845RK474(1)760(2)	PHE845VR6470(1)(2)
0.68	RM/R03	19.0	36.0	41.0	37.5	1.2	100	F845RM684(1)760(2)	PHE845VR6680(1)(2)
1.0	RP/R06	21.0	38.0	41.0	37.5	1.0	100	F845RP105M760(2)	PHE845VW7100M(2)
Capacitance Value (µF)	**Size Code (KEMET/Legacy)**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**f_o (MHz)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert ordering code for lead type and packaging. See the Ordering Options Table for available options.

Soldering Process

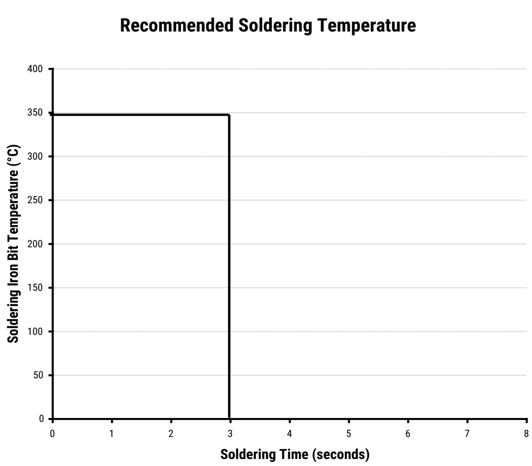
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder. This implementation has increased the liquidus temperature from 183ºC for SnPb eutectic alloys to 217 – 221ºC for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170ºC). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm), and great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the recommended limits may result in degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface-mount components. Insert through-hole parts after curing the surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum of two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to normal before the second soldering cycle.

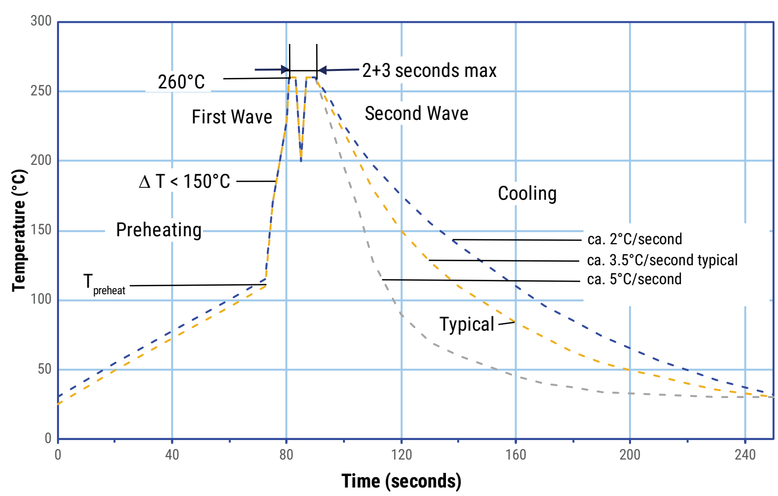
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



Soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed 3 seconds.

Wave Soldering Recommendations



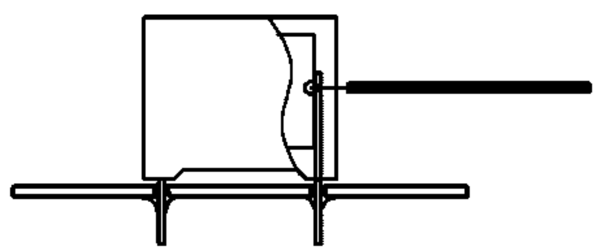
Soldering Process cont.

Wave Soldering Recommendations cont.
1. The table indicates the maximum set-up temperature of the soldering process.
Figure 1

Dielectric film material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≥ 10 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that the maximum temperature is below the limit inside the element.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



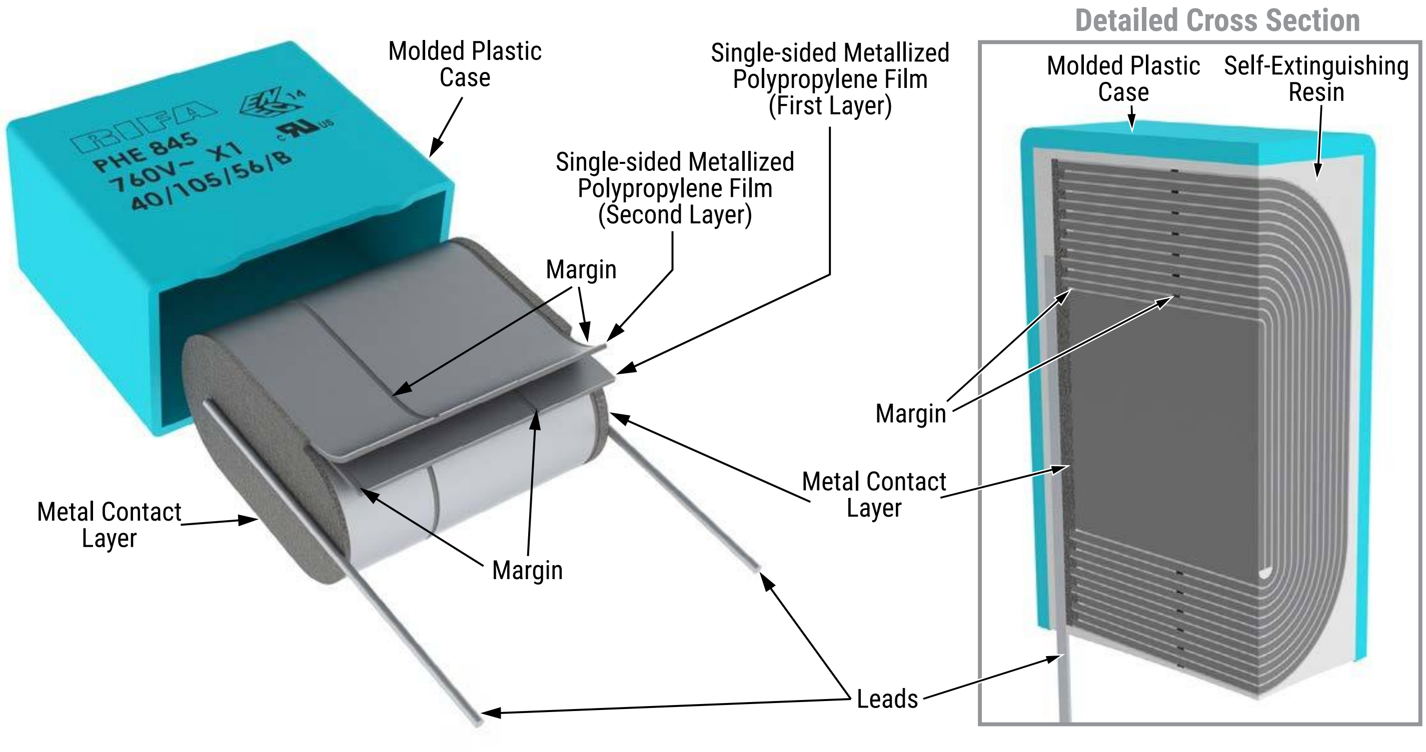
Temperature monitored inside the capacitor.

Selective Soldering Recommendations

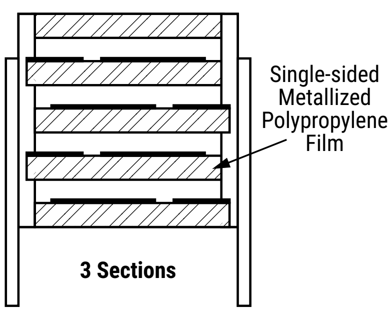
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath, as in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and then pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double-wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double-wave flow soldering. Great care must be taken so that the parts do not overheat.

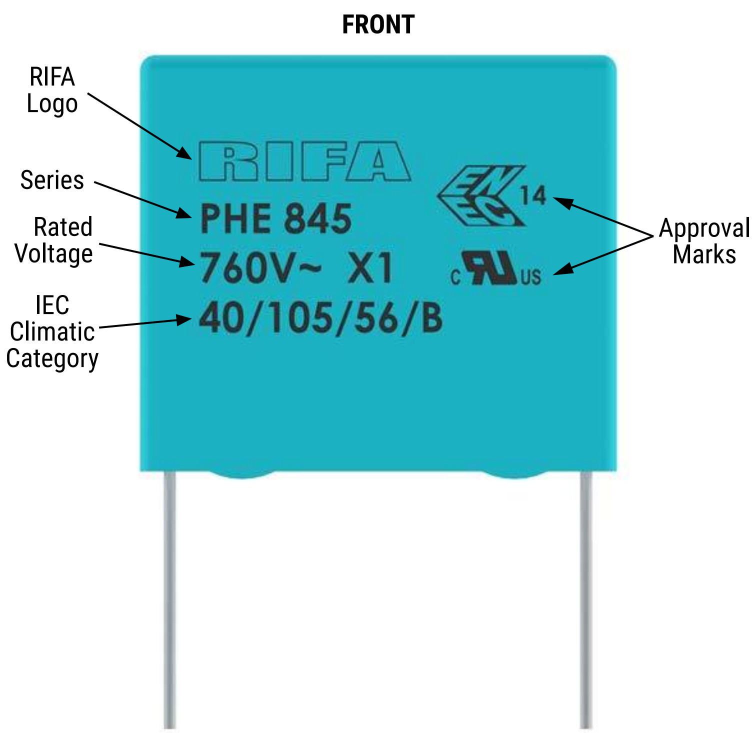
Construction

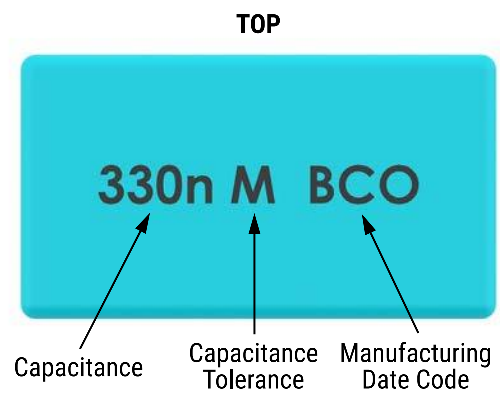


Winding Scheme



Marking





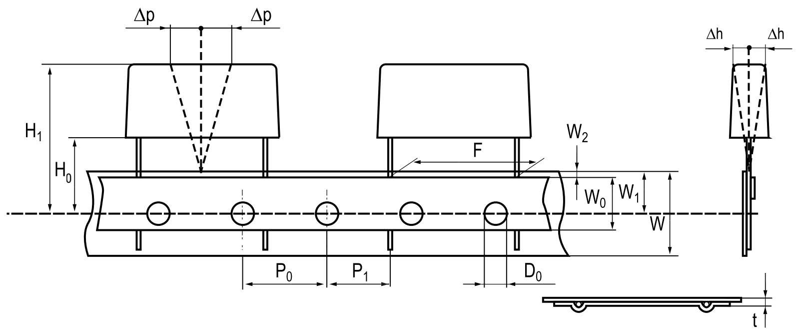
Manufacturing Date Code (IEC-60062)			
Year	Code	Month	Code
2010	A	January	1
2011	B	February	2
2012	C	March	3
2013	D	April	4
2014	E	May	5
2015	F	June	6
2016	H	July	7
2017	J	August	8
2018	K	September	9
2019	L	October	O
2020	M	November	N
2021	N	December	D
2022	P		
2023	R		
2024	S		
2025	T		
2026	U		
2027	V		
2028	W		
2029	X		
2030	A		

Packaging Quantities

Lead Spacing	KEMET Size Code	Legacy Size Code	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Bulk (Pizza)
22.5	DD	D13	6.5	14.5	26.0	234	300	600	440
	DH	D14	8.0	16.0	26.0	186	250	500	352
	DM	D15	9.0	18.5	26.0	308	250	500	308
	DT	D16	11.0	21.5	26.0	253	200	400	253
	DF	D17	7.0	16.5	26.0	216	300	600	396
	DR	D18	10.5	19.0	26.0	264	200	400	264
	DY	D19	15.5	24.5	26.0	176	110	250	176
	DW	D20	13.5	23.0	26.0	209	160	300	209
27.5	FK	F03	13.5	23.0	31.5	171		250	171
	FE	F11	10.5	20.5	31.5	216		350	216
	FG	F12	11.5	22.5	31.5	198		300	198
	FM	F13	14.5	24.5	31.5	153		250	153
	FR	F14	17.5	28.0	31.5	126			126
	FS	F15	19.0	29.0	31.5	117			117
	FV	F16	21.0	30.0	31.5	108			108
	FH	F17	21.0	12.5	31.5	108			108
	FT	F18	31.0	18.5	31.5	72			72
	FQ	F19	27.5	16.0	31.5	81			81
37.5	RK	R02	16.5	32.0	41.0	105			105
	RM	R03	19.0	36.0	41.0	91			91
	RH	R04	15.0	26.0	41.0	119			119
	RF	R05	13.0	24.0	41.0	140			140
	RP	R06	21.0	38.0	41.0	84			84
	RS	R08	28.0	43.0	41.0	54			54

Lead Taping & Packaging (IEC 60286–2)

Lead Spacing 22.5 – 27.5 mm



Taping Specification

Description	Symbol	Dimensions (mm)		
		Lead Space		Tolerance
		22.5	27.5	
Lead Spacing	F	22.5	27.5	+0.6/−0.1
Carrier Tape Width	W	18	18	+1/−0.5
Hold Down Tape Width	W_0	5	5	Minimum
Hole Position	W_1	9	9	+0.75/−0.5
Hold Down Tape Position	W_2	3	3	Maximum
Feed Hole Diameter	D_0	4	4	±0.2
Feed-hole Lead Space *	P_0	12.7	12.7	±0.2 **
Centering of the Lead Wire	P_1	7.8	5.3	±0.7
Component Alignment	Δh	2	2	±2
Deviation Tape – Plane	Δp	1.3	1.3	Maximum
Tape Thickness	t	0.9	0.9	Maximum
Height of Component from Tape Center	H_0***	18.5	18.5	±0.5

**Available also 15mm*
***Maximum 1 mm on 20 lead spaces*
**** H_0 = 16.5 mm is available upon request*

Metallized Polypropylene Film EMI Suppression Capacitors for Harsh Environmental Conditions – F863, Class X2, 310 VAC (Automotive Grade)

Overview

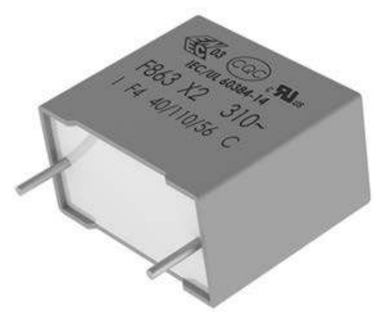
The F863 is constructed of metallized polypropylene film, encapsulated with self-extinguishing resin in a box material recognized by UL 94 V–0. The F863 is ideal for harsh environmental conditions and meets the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

Applications

Typical applications include parallel connection and in series with the mains for indoor application, capacitive power supplies with special emphasis in automotive applications for severe ambient conditions.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- Rated voltage: 310 VAC 50/60 Hz
- Capacitance range: 0.1 – 10.0 µF
- Lead spacing: 15.0 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category: 40/110/56, IEC 60068–1
- Tape & Reel in accordance with IEC 60286–2
- RoHS Compliant and lead-free terminations
- Operating temperature range of −40°C to +110°C
- 100% screening factory test at 1,900 VDC
- Qualification based on AEC–Q200 guidelines



Simulator Tool and Lifetime Expectancy model available online:

K-SIM **K-LEM**

Part Number System

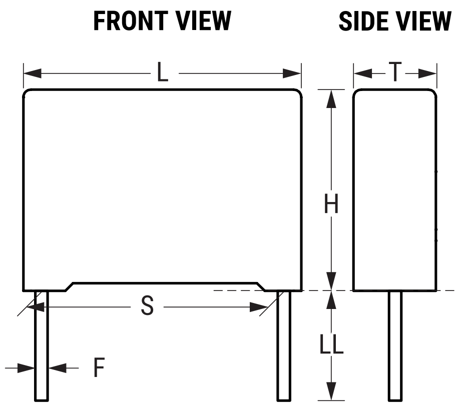
F	863	B	C	104	M	310	C
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Voltage (VAC)	Packaging
F = Film	X2, Metallized Polypropylene	B = 15 D = 22.5 F = 27.5 R = 37.5	See Dimension Table	First two digits represent significant figures. Third digit specifies number of zeros.	K = ±10% M = ±20%	310	See Ordering Options Table

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
15	**Standard Lead and Packaging Options**		
	Pizza Pack	4 +2/−0	Z
	Ammo Pack	H_0 = 18.5 ±0.5	R
	Other Lead and Packaging Options		
	Bulk – Short Leads	4 +2/−0	C
	Bulk – Long Leads	30 +5/−0	ALW0L
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	L
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	P
22.5	**Standard Lead and Packaging Options**		
	Pizza Pack [1]	4 +2/−0	Z
	Ammo Pack [2]	H_0 = 18.5 ±0.5	R
	Other Lead and Packaging Options		
	Bulk – Short Leads [3]	4 +2/−0	C
	Bulk – Long Leads	30 +5/−0	ALW0L
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	L
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	P
27.5 37.5	**Standard Lead and Packaging Options**		
	Tray – Long Leads	30 +5/−0	ALW0L
	Other Lead and Packaging Options		
	Tray – Short Leads	4 +2/−0	Z

1 Only for dimensions > 7 x16 x 26.5 mm
2 Only for dimensions ≤ 11 x 20 x 26.5 mm
3 Only for dimensions ≤ 7 x 16 x 26.5 mm

Dimensions – Millimeters



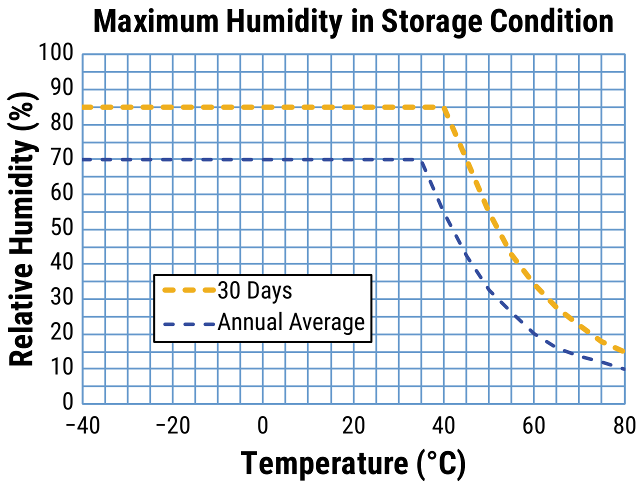
Size Code	S		T		H		L		F	
	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
BC	15.0	±0.4	5.0	+0.2/-0.5	11.0	+0.1/-0.5	18.0	+0.3/-0.5	0.6	±0.05
BF	15.0	±0.4	6.0	+0.2/-0.5	12.0	+0.1/-0.5	18.0	+0.3/-0.5	0.6	±0.05
BK	15.0	±0.4	7.5	+0.2/-0.5	13.5	+0.1/-0.5	18.0	+0.5/-0.5	0.6	±0.05
BN	15.0	±0.4	8.5	+0.2/-0.5	14.5	+0.1/-0.5	18.0	+0.5/-0.5	0.6	±0.05
BS	15.0	±0.4	10.0	+0.2/-0.5	16.0	+0.1/-0.5	18.0	+0.5/-0.5	0.8	±0.05
BT	15.0	±0.4	9.0	+0.2/-0.5	12.5	+0.1/-0.5	18.0	+0.5/-0.5	0.6	±0.05
BW	15.0	±0.4	11.0	+0.2/-0.5	19.0	+0.1/-0.5	18.0	+0.5/-0.5	0.8	±0.05
DC	22.5	±0.4	6.0	+0.2/-0.5	15.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
DE	22.5	±0.4	7.0	+0.2/-0.5	16.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
DL	22.5	±0.4	8.5	+0.2/-0.5	17.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
DN	22.5	±0.4	10.0	+0.2/-0.5	18.5	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
DS	22.5	±0.4	11.0	+0.2/-0.5	20.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
DV	22.5	±0.4	13.0	+0.2/-0.5	22.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
FD	27.5	±0.4	9.0	+0.2/-0.7	17.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
FF	27.5	±0.4	11.0	+0.2/-0.7	20.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
FJ	27.5	±0.4	13.0	+0.2/-0.7	22.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
FL	27.5	±0.4	13.0	+0.2/-0.7	25.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
FP	27.5	±0.4	14.0	+0.2/-0.7	28.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
FU	27.5	±0.4	18.0	+0.2/-0.7	33.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
FW	27.5	±0.4	22.0	+0.2/-0.7	37.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
RE	37.5	±0.4	11.0	+0.3/-0.7	22.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
RG	37.5	±0.4	13.0	+0.3/-0.7	24.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
RJ	37.5	±0.4	16.0	+0.3/-0.7	28.5	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
RL	37.5	±0.4	19.0	+0.3/-0.7	32.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
RQ	37.5	±0.4	20.0	+0.3/-0.7	40.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
RR	37.5	±0.4	24.0	+0.3/-0.7	44.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
RT	37.5	±0.4	30.0	+0.3/-0.7	45.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05

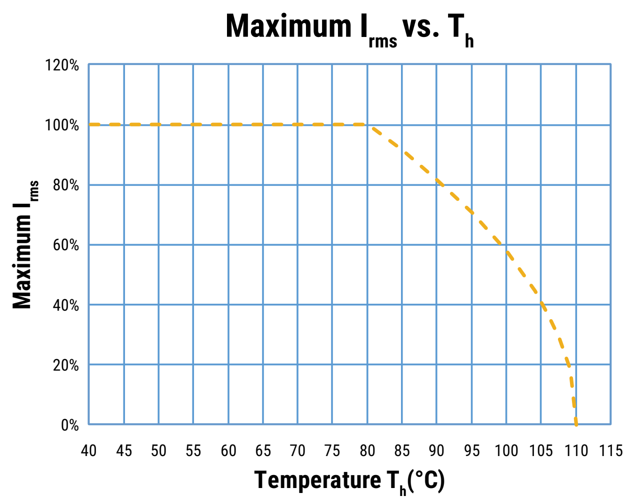
Note: See the Ordering Options Table for lead length (LL/H_0) options.

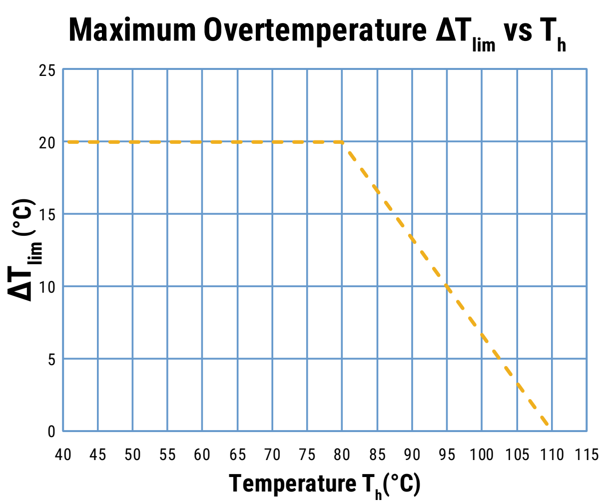
Performance Characteristics

<table>
<tr><td>Rated Voltage</td><td colspan="4">310 VAC 50/60 Hz</td></tr>
<tr><td>Capacitance Range</td><td colspan="4">0.1 – 10 µF</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="4">±20%, ±10%</td></tr>
<tr><td>Temperature Range</td><td colspan="4">−40°C to +110°C</td></tr>
<tr><td>Climatic Category</td><td colspan="4">40/110/56</td></tr>
<tr><td>Storage Conditions</td><td colspan="4">Storage time: ≤ 24 months from the date marked on the label package
Average relative humidity per year ≤ 70%
RH ≤ 85% for 30 days randomly distributed throughout the year
Dew is absent
Temperature: -40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)</td></tr>
<tr><td>Approvals</td><td colspan="4">ENEC, UL, cUL, CQC</td></tr>
<tr><td rowspan="3">Dissipation Factor</td><td colspan="4">Maximum Values at +23°C</td></tr>
<tr><td></td><td colspan="2">C ≤ 0.1 µF</td><td>C > 0.1 µF</td></tr>
<tr><td>1 kHz</td><td colspan="2">0.3%</td><td>0.2%</td></tr>
<tr><td>Test Voltage Between Terminals</td><td colspan="4">The 100% screening factory test is carried out at 1,900 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. It's not permitted to repeat this Test as there is a risk to damage the Capacitor. KEMET is not liable in such case for any failures</td></tr>
<tr><td rowspan="4">Insulation Resistance</td><td colspan="4">Measured at +25°C ±5°C, according to IEC 60384-2</td></tr>
<tr><td colspan="4">Minimum Values Between Terminals</td></tr>
<tr><td>Voltage Charge</td><td>Voltage Charge time</td><td>C ≤ 0.33 µF</td><td>C > 0.33 µF</td></tr>
<tr><td>100 VDC</td><td>1 minute</td><td>≥ 3 • 10^4 MΩ</td><td>≥ 10,000 MΩ • µF</td></tr>
<tr><td>In DC Applications</td><td colspan="4">Recommended voltage ≤ 630 VDC</td></tr>
</table>

Performance Characteristics cont.

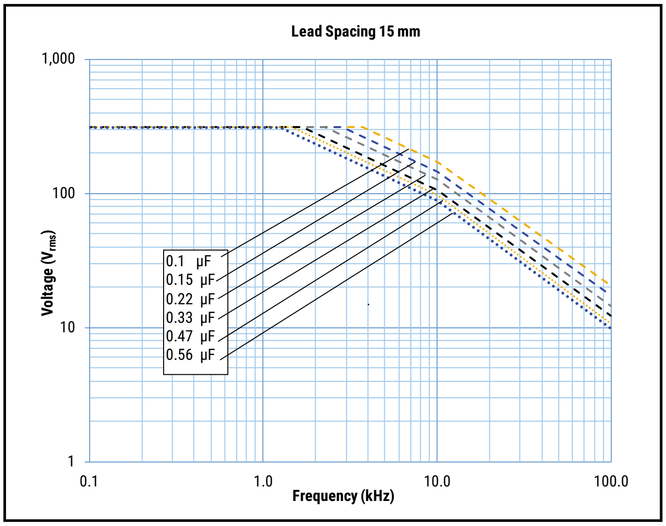


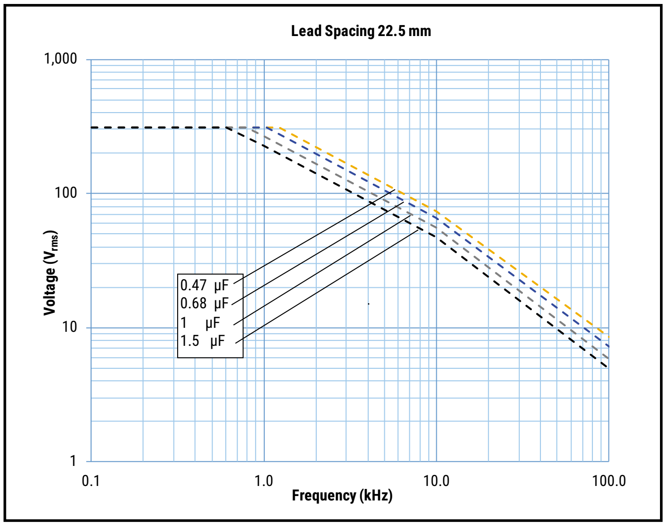


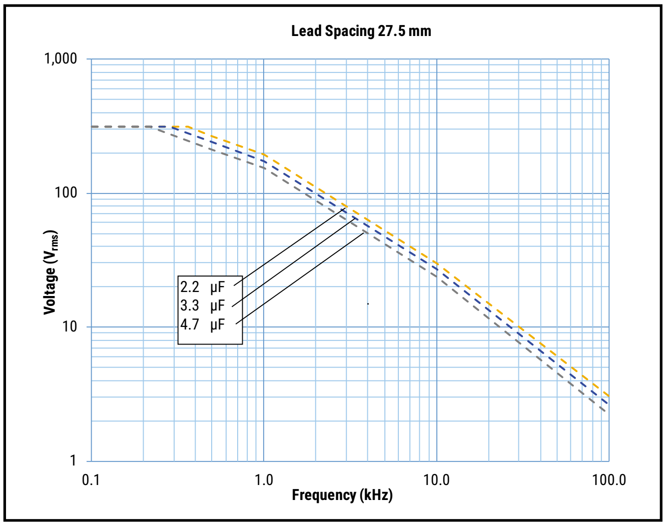


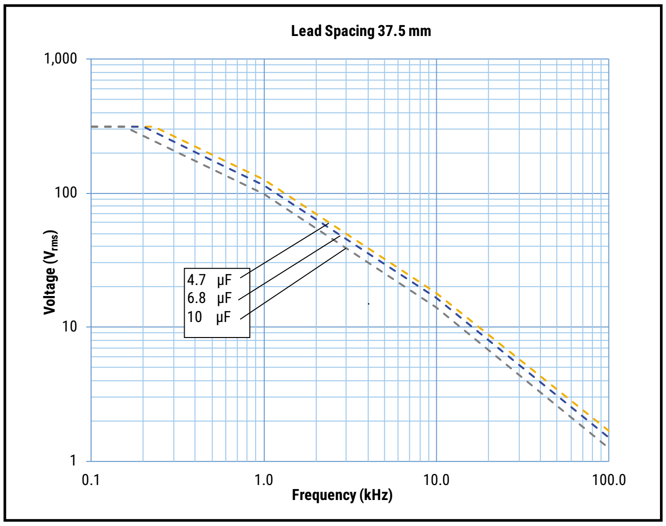
T_h is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

Maximum Voltage (V_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 80°C)



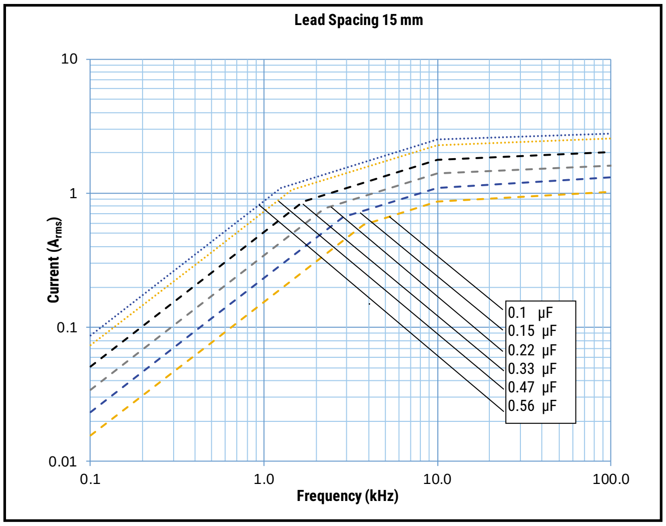


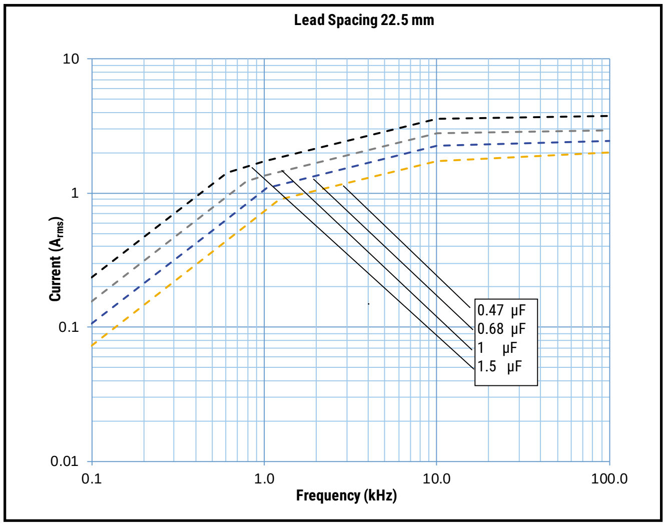


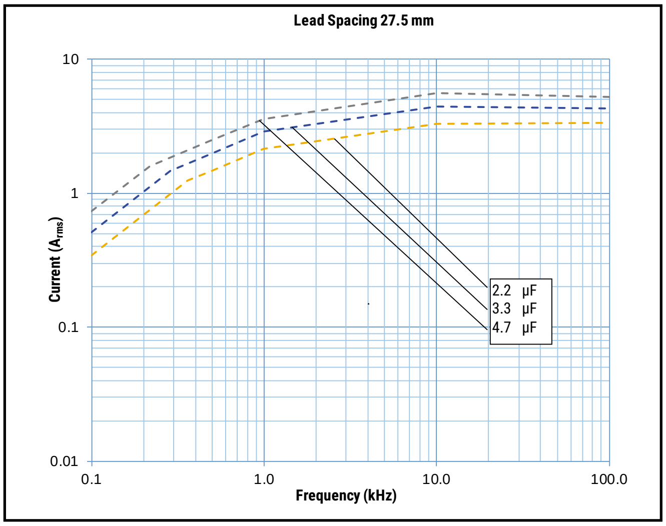


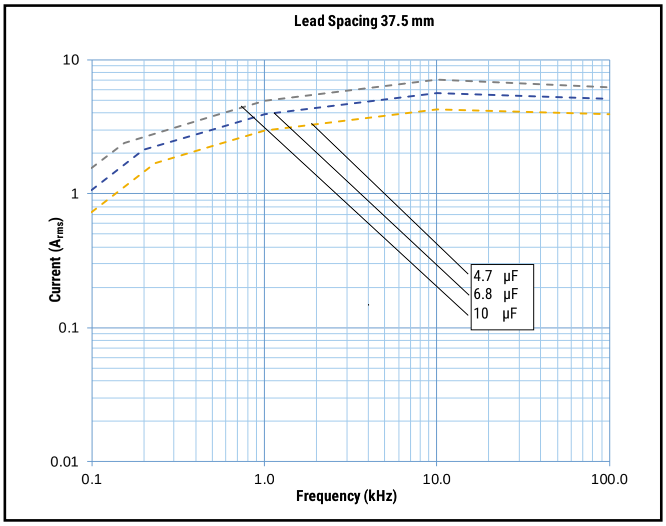
All the curves are evaluated in accordance to the datasheet declarations and considering an environmental condition as Dry Condition.
If your environment is too harsh in terms of temperature and relative humidity, please contact KEMET for any kind of information.

Maximum Current (A_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 80°C)



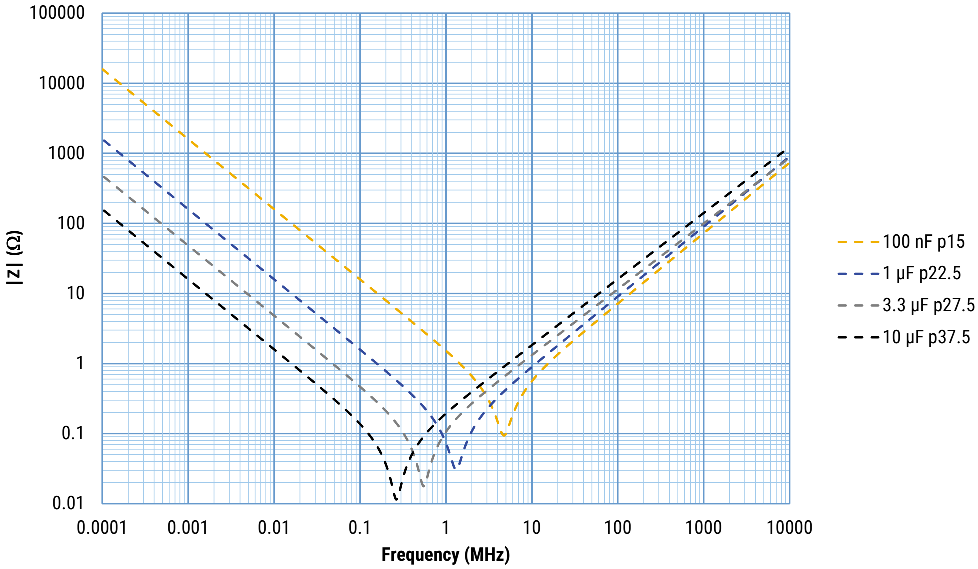






All the curves are evaluated in accordance to the datasheet declarations and considering an environmental condition as Dry Condition.
If your environment is too harsh in terms of temperature and relative humidity, please contact KEMET for any kind of information.

Impedance Graph



Typical Values

Environmental Test Data

Test	Publication	Procedure
Endurance	IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Temperature Cycling	JESD22–MethodJA–104	1,000 cycles (–55°C to 85°C) Note: If 100°C or 125°C part the 1,000 cycles will be at that temperature rating. Measurement at 24 ±4 hours after test conclusion. 30 minute maximum dwell time at each temperature extreme. 1 minute maximum transition time.
Active Flammability	IEC 60384–14	V_R +20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle–flame test
Biased Humidity	MIL–STD–202 Method 103	1,000 hours 40°C/93%RH. Rated Voltage. Measurement at 24 ±2 hours after test conclusion.
THB Test		85°C, 85% RH and 240 VAC, 500 hours Capacitance change (ΔC/C): ≤ 10% Dissipation factor change (Δtan δ): ≤ 5 * 10^{-3} (at 1 kHz) Insulation resistance Rins or time constant τ = CR Rins: ≥ 50% of initial limit

Approvals

Certification Body	Mark	Specification	File Number
IMQ S.p.A.		EN/IEC 60384-14	CA08.00209
UL	c US	UL 60384-14 and CAN/CSA-E60384-14	E97797
CQC	CQC	IEC 60384-14	CQC15001128240 CQC15001128444 CQC15001128445 CQC15001128446

Environmental Compliance

All new KEMET EMI capacitors are RoHS compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Size Code	Dimensions in mm T	Dimensions in mm H	Dimensions in mm L	Lead Spacing (S)	dV/dt (V/µs)	Part Number
0.1	BC	5.0	11.0	18.0	15.0	400	F863BC104(1)310(2)
0.15	BF	6.0	12.0	18.0	15.0	400	F863BF154(1)310(2)
0.22	BK	7.5	13.5	18.0	15.0	400	F863BK224(1)310(2)
0.33	BN	8.5	14.5	18.0	15.0	400	F863BN334(1)310(2)
0.47	BW	11.0	19.0	18.0	15.0	400	F863BW474(1)310(2)
0.56	BW	11.0	19.0	18.0	15.0	400	F863BW564(1)310(2)
0.47	DE	7.0	16.0	26.5	22.5	200	F863DE474(1)310(2)
0.68	DN	10.0	18.5	26.5	22.5	200	F863DN684(1)310(2)
1.0	DS	11.0	20.0	26.5	22.5	200	F863DS105(1)310(2)
1.5	DV	13.0	22.0	26.5	22.5	200	F863DV155(1)310(2)
2.2	FL	13.0	25.0	32.0	27.5	150	F863FL225(1)310(2)
3.3	FU	18.0	33.0	32.0	27.5	150	F863FU335(1)310(2)
4.7	FW	22.0	37.0	32.0	27.5	150	F863FW475(1)310(2)
4.7	RL	19.0	32.0	41.5	37.5	100	F863RL475(1)310(2)
6.8	RR	24.0	44.0	41.5	37.5	100	F863RR685(1)310(2)
10.0	RT	30.0	45.0	41.5	37.5	100	F863RT106(1)310(2)
Capacitance Value (µF)	**Size Code**	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**Part Number**

(1) M = ±20%, K = ±10%.
(2) Insert lead and packaging code. See Ordering Options Table for available options.

Soldering Process

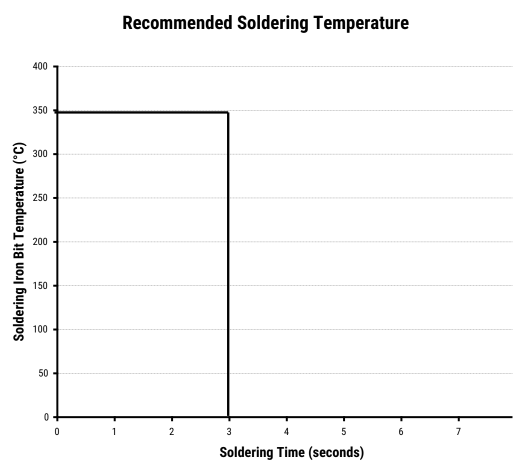
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183ºC for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760–1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

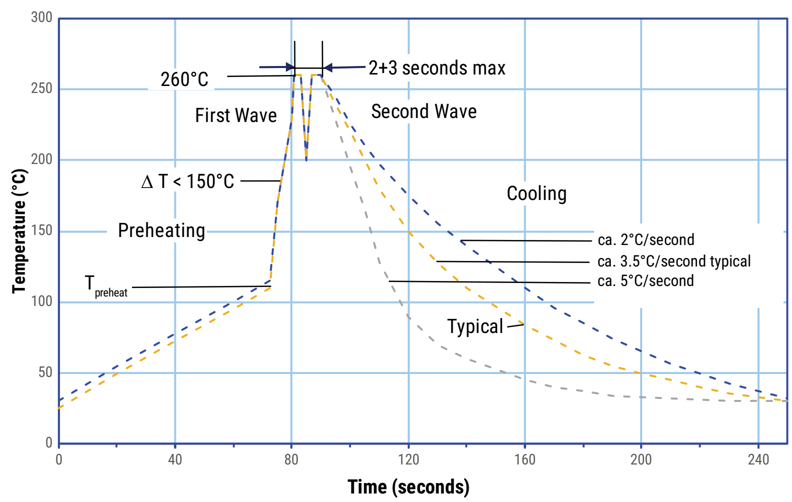
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

1. The table indicates the maximum set-up temperature of the soldering process

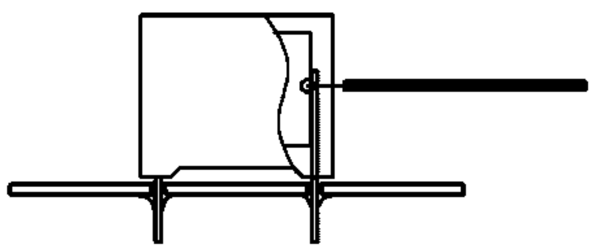
Figure 1

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C

Temperature monitored inside the capacitor.



Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Mounting

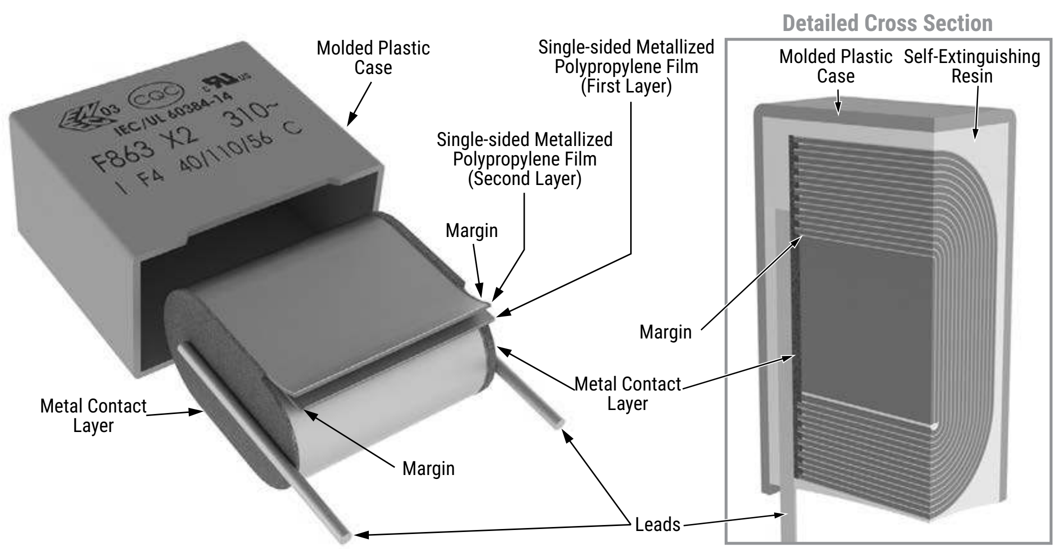
Resistance to Vibration and Mechanical Shock

AEC-Q200 Rev. E Mechanical Stress Tests:

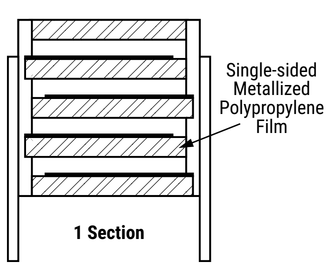
Mechanical Shock	**MIL-SDT-202 Method 213**	Figure 1 of Method 213 • THT: Condition C • SMD: Condition C • Tested per the Supplier's recommended mounting method
Vibration	**MIL-SDT-202 Method 204**	• 5 g for 20 minutes, 12 cycles each of 3 orientations • Tested per the Supplier's recommended mounting method • Verification of transfer load: during setup, verify that with the selected PCB design (size, thickness and secure points), or an alternative mount, that the transferred load onto the component corresponds to the requested load. This verification can be achieved using a laser vibrometer or other adequate measuring device • Test from 10 Hz – 2,000 Hz.

The capacitors are designed for PCB mounting. The stand-off pipes must be in good contact with the printed circuit board. The capacitors with pitch ≤ 22.5 mm can be mechanically fixed by the leads, for pitch > 22.5 mm, the capacitor body has to be properly fixed (e.g. clamped or glued).

Construction

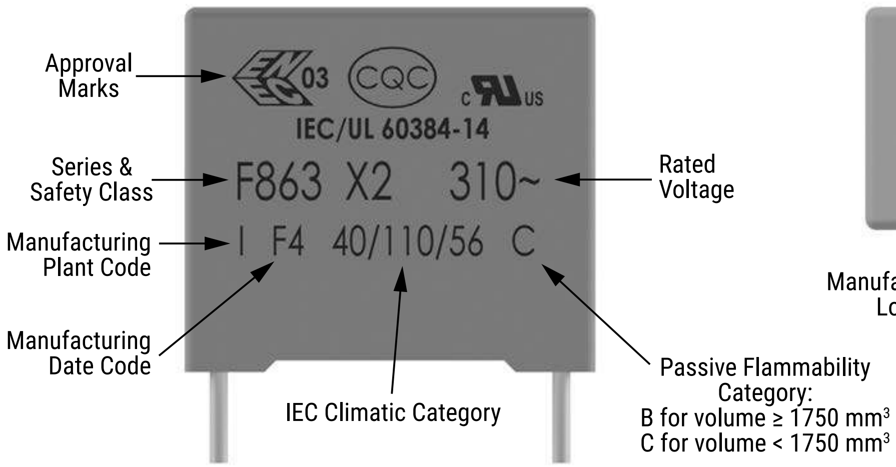


Winding Scheme

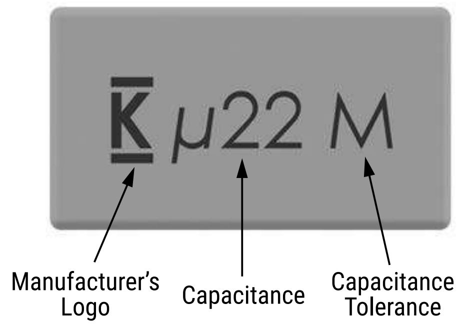


Marking

FRONT

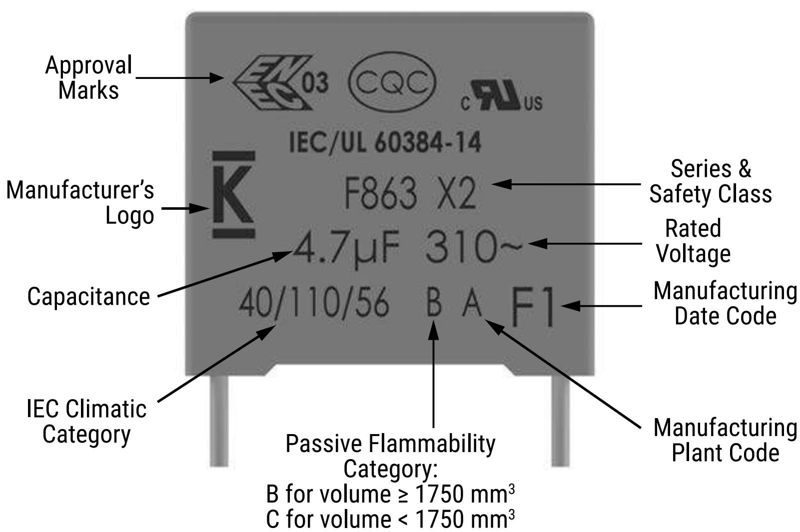


TOP

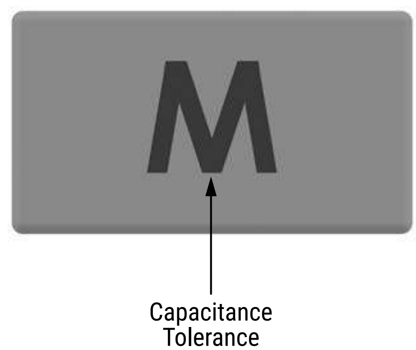


OR

FRONT



TOP



Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

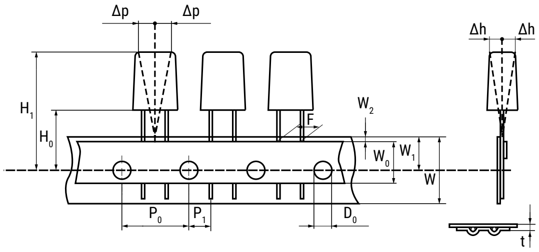
Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

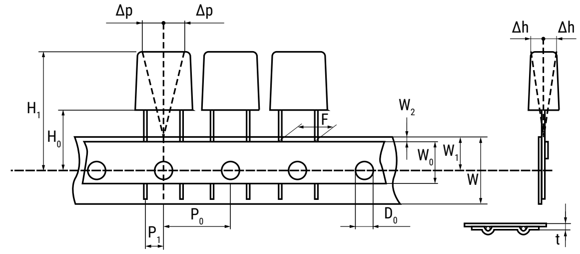
Size Code	Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Tray – Pizza Short Leads	Tray – Pizza Long Leads	Standard Reel (355 mm)	Large Reel (500 mm)	Ammo	Pizza
BC	15	5	11	18	2,000	1,000			600	1,250	800	1,122
BF		6	12	18	1,750	900			500	1,000	680	935
BK		7.5	13.5	18	1,000	700			350	800	500	748
BN		8.5	14.5	18	1,000	500			300	700	440	663
BT		9	12.5	18	1,000	520			270	650	410	612
BS		10	16	18	750	500				600	380	561
BW		11	19	18	450	350				500	340	510
DC	22.5	6	15	26.5	805	500			300	700	464	660
DE		7	16	26.5	700	500			250	550	380	564
DL		8.5	17	26.5		300			250	450	280	468
DN		10	18.5	26.5		300			160	350	235	396
DS		11	20	26.5		250			190	350	217	360
DV		13	22	26.5		200			130	300		300
FD	27.5	9.0	17.0	32.0			816	408				
FF		11.0	20.0	32.0			560	336				
FJ		13.0	22.0	32.0			480	288				
FL		13.0	25.0	32.0			480	288				
FP		14.0	28.0	32.0			352	176				
FU		18.0	33.0	32.0			256	128				
FW		22.0	37.0	32.0			168	112				
RE	37.5	11.0	22.0	41.5			420	252				
RG		13.0	24.0	41.5			360	216				
RJ		16.0	28.5	41.5			216	108				
RL		19.0	32.0	41.5			192	96				
RQ		20.0	40.0	41.5			126	84				
RR		24.0	44.0	41.5			108	72				
RT		30.0	45.0	41.5			90	60				

Lead Taping & Packaging (IEC 60286–2)

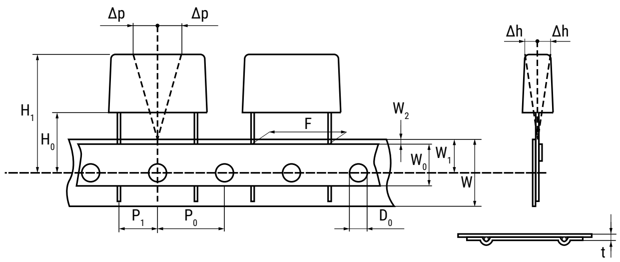
Lead Spacing 5 mm



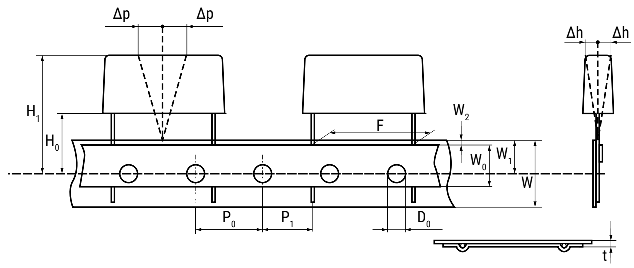
Lead Spacing 7.5 mm



Lead Spacing 10 – 15 mm



Lead Spacing 22.5 – 27.5 mm



Taping Specification

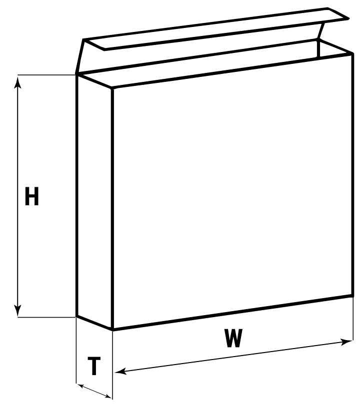
Dimensions in mm									Standard IEC 60286–2
Lead Spacing	+0.6/−0.1	F	5.0	7.5	10.0	15.0	22.5	27.5	F
Carrier Tape Width	+1/−0.5	W	18.0	18.0	18.0	18.0	18.0	18.0	$18^{+1/-0.5}$
Hold-Down Tape Width	Minimum	W_0	6.0	6.0	9.0	10.0	10.0	10.0	
Position of Sprocket Hole	±0.5	W_1	9.0	9.0	9.0	9.0	9.0	9.0	$9^{+0.75/-0.5}$
Distance Between Tapes	Maximum	W_2	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Sprocket Hole Diameter	±0.2	D_0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Feed Hole Lead Spacing	±0.2(1)	P_0(3)	12.7	12.7	12.7	12.7	12.7	12.7	12.7
Distance Lead – Feed Hole	±0.7	P_1	3.85	3.75	7.7	5.2	7.8	5.3	P^1
Deviation Tape – Plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral Deviation	±2	Δh	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Total Thickness	±0.2	t	0.7	0.7	0.7	0.7	0.9^{MAX}	0.9^{MAX}	0.9^{MAX}
Sprocket Hole/Cap Body	±0.5	H_0(2)	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18.5^{\pm0.5}$	$18^{+2/-0}$

(1) Maximum cumulative feed hole error, 1 mm per 20 parts.
(2) 16.5 mm available on request.
(3) 15 mm available on request (F ≥ 10 mm).

Lead Taping & Packaging (IEC 60286–2) cont.

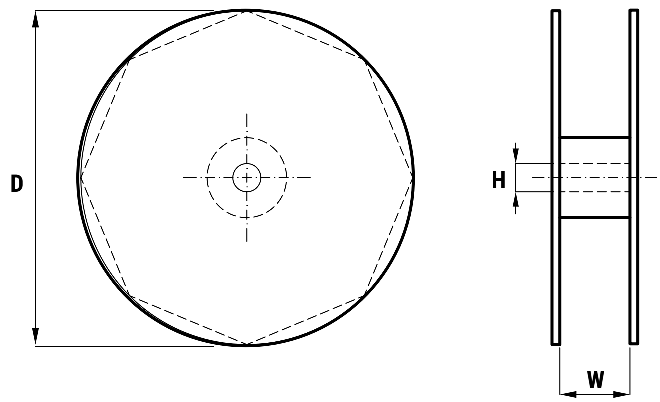
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
F5A, F5B, F5D	360	340	59
F6xx, F8xx			
PHExxx, PMExxx, PMRxxx	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
F5A, F5B, F5D	355	30	55 (Max)
F6xx, F8xx	500	25	
PHExxx, PMExxx, PMRxxx	360 500	30	46 (Max)



Metallized Polypropylene Film EMI Suppression Capacitors

R41T, THB, Class X1/Y2, 300 VAC, 125°C (Automotive Grade)

Overview

The R41T is constructed of metallized polypropylene film encapsulated with self-extinguishing resin, in a box of material meeting the requirements of UL 94 V–0.

Automotive Grade devices meet the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

Applications

For use in electromagnetic interference (EMI) suppression filter in "line-to-ground" and "across-the-line" applications, requiring Y2/X1 safety classification. Suitable for use in situations where failure of the capacitor could lead to danger of electric shock.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- Class X1/Y2 (IEC 60384-14)
- THB Grade IIIB: 85°C, 85% RH, 1,000 hours at 300 V URAC acc. to IEC 60384-14, for details see Environmental Test Data
- Rated voltage: 300 VAC 50/60 Hz
- Capacitance range: 0.001 µF – 1 µF
- Lead spacing: 7.5 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category 40/110/56, IEC 60068-1
- Tape and reel in accordance with IEC 60286-2
- RoHS compliant and lead-free terminations
- Operating temperature range of −40°C to +125°C
- Self-healing properties
- Automotive (AEC–Q200) grade

Part Number System

R41	3	I	2330	00	T0	M
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance
Y2, Metallized Polypropylene	3 = 300	D = 7.5 F = 10.0 I = 15.0 N = 22.5 R = 27.5 W = 37.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	See Ordering Options Table	T0 T1	K = ±10% M = ±20%

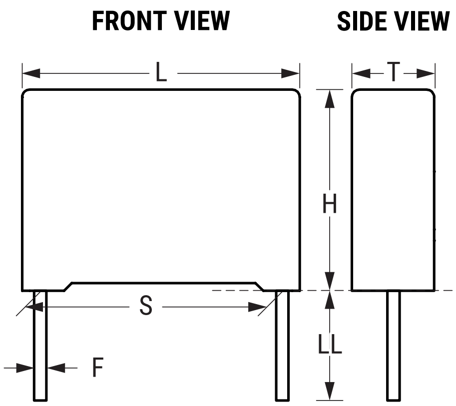
Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
7.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/-0	AA
	Ammo Pack	H_0= 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Tape & Reel (Standard Reel Ø 355 mm)	H_0 = 18.5±0.5	CK
	Bulk (Bag) – Short Leads	2.7 +0.5/-0	JA
	Bulk (Bag) – Short Leads	3.5 +0.5/-0	JB
	Bulk (Bag) – Short Leads	4.0 +0.5/-0	JE
	Bulk (Bag) – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Bag) – Long Leads	18 ±1	JM
10 15 22.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/-0	00
	Ammo Pack	H_0= 18.5 ±0.5	DQ
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	GY
	Bulk (Bag)[2] – Short Leads	3.5 +0.5/-0	JB
	Bulk (Bag)[2] – Short Leads	4.0 +0.5/-0	JE
	Bulk (Bag) [2] – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Bag) – Long Leads	18 ±1	JM
	Bulk (Bag) – Long Leads	30 +5/-0	40
	Bulk (Bag) – Long Leads	25 +2/-1	50
27.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/-0	00
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK[1]
	Other Lead and Packaging Options		
	Bulk (Tray) – Long Leads	30 +5/-0	40
	Bulk (Tray) – Long Leads	25 +2/-1	50
37.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/-0	00
	Other Lead and Packaging Options		
	Bulk (Tray) – Long Leads	30 +5/-0	40
	Bulk (Tray) – Long Leads	25 +2/-1	50

[1] *Not for all sizes, see "Packaging Quantities" table*

[2] *For lead spacing 22.5 case sizes ≥ 8.5*17*26.5 the parts are packed in a Pizza box 335*320*34 mm*

Dimensions – Millimeters



S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
7.5	±0.4	4	+0.1/−0.5	9	+0.1/−0.5	10	+0.2/−0.5	0.6	±0.05
7.5	±0.4	5	+0.1/−0.5	10.5	+0.1/−0.5	10	+0.2/−0.5	0.6	±0.05
7.5	±0.4	6	+0.1/−0.5	12	+0.1/−0.5	10.5	+0.2/−0.5	0.6	±0.05
10.0	±0.4	4.0	+0.2/−0.5	9.0	+0.1/−0.5	13.0	+0.3/−0.5	0.6	±0.05
10.0	±0.4	5.0	+0.2/−0.5	11.0	+0.1/−0.5	13.0	+0.3/−0.5	0.6	±0.05
10.0	±0.4	6.0	+0.2/−0.5	12.0	+0.1/−0.5	13.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	5.0	+0.2/−0.5	11.0	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	6.0	+0.2/−0.5	12.0	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	7.5	+0.2/−0.5	13.5	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	8.5	+0.2/−0.5	14.5	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	10.0	+0.2/−0.5	16.0	+0.1/−0.5	18.0	+0.3/−0.5	0.8	±0.05
15.0	±0.4	11.0	+0.2/−0.5	19.0	+0.1/−0.5	18.0	+0.3/−0.5	0.8	±0.05
22.5	±0.4	6.0	+0.2/−0.5	15.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	7.0	+0.2/−0.5	16.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	8.5	+0.2/−0.5	17.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	10.0	+0.2/−0.5	18.5	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	11.0	+0.2/−0.5	20.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	13.0	+0.2/−0.5	22.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
27.5	±0.4	13.0	+0.2/−0.7	22.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	14.0	+0.2/−0.7	28.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	18.0	+0.2/−0.7	33.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
37.5	±0.4	13.0	+0.2/−0.7	24.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	16.0	+0.2/−0.7	28.5	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	20.0	+0.2/−0.7	40.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05

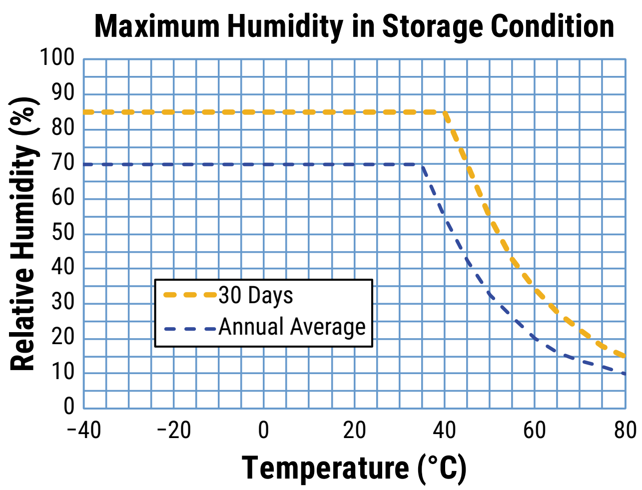
Note: See Ordering Options Table for lead length (LL/H_0) options.

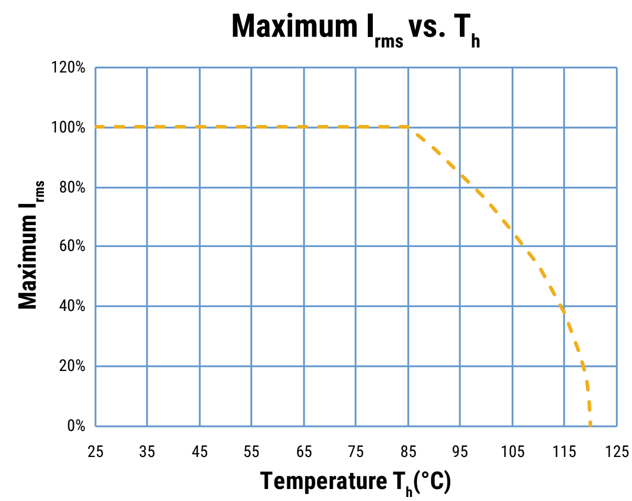
Performance Characteristics

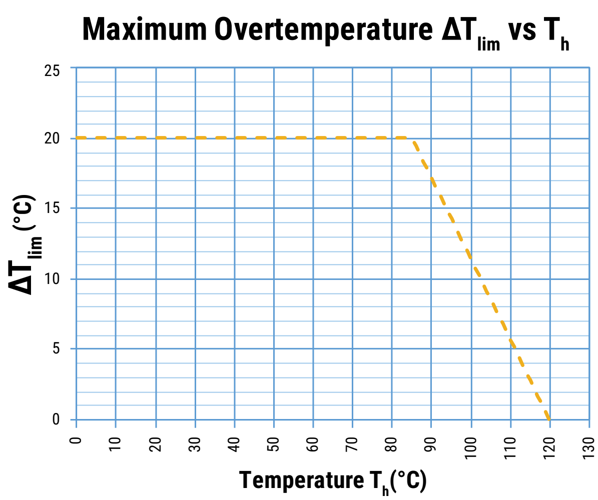
<table>
<tr><td>Dielectric</td><td colspan="4">Polypropylene film</td></tr>
<tr><td>Plates</td><td colspan="4">Metal layer deposited by evaporation under vacum</td></tr>
<tr><td>Winding</td><td colspan="4">Non-inductive type</td></tr>
<tr><td>Leads</td><td colspan="4">Tinned wire</td></tr>
<tr><td>Protection</td><td colspan="4">Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL 94</td></tr>
<tr><td>Related Documents</td><td colspan="4">IEC 60384-14, EN 60384-14</td></tr>
<tr><td>Rated Voltage (V_R)</td><td colspan="4">300 VAC (50/60 Hz)</td></tr>
<tr><td>Recommended DC Voltage</td><td colspan="4">1,500 VDC</td></tr>
<tr><td>Capacitance Range</td><td colspan="4">0.001 – 1.0 µF</td></tr>
<tr><td>Capacitance Values</td><td colspan="4">E6 series (IEC 60063)</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="4">±10%, ±20%</td></tr>
<tr><td>Temperature Range</td><td colspan="4">−40°C to +125°C</td></tr>
<tr><td>Climatic Category</td><td colspan="4">40/110/56 IEC 60068-1</td></tr>
<tr><td>Reliability</td><td colspan="4">Operational life at rated voltage:
100,000 hours at 85°C (60,000 hours for lead spacing 7.5 mm parts); 2,000 hours at 125°C</td></tr>
<tr><td rowspan="5">Storage Conditions</td><td colspan="4">Storage time: ≤ 24 months from the date marked on the label package</td></tr>
<tr><td colspan="4">Average relative humidity per year ≤ 70%</td></tr>
<tr><td colspan="4">RH ≤ 85% for 30 days randomly distributed throughout the year</td></tr>
<tr><td colspan="4">Dew is absent</td></tr>
<tr><td colspan="4">Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)</td></tr>
<tr><td>Approvals</td><td colspan="4">ENEC, UL, cUL, CQC</td></tr>
<tr><td rowspan="3">Dissipation Factor (tanδ)
at 1 kHz</td><td colspan="4">Maximum Values at +25°C ±5°C</td></tr>
<tr><td>Pitch = 7.5 mm</td><td>Pitch = 10 mm</td><td>Pitch = 15 – 27.5 mm</td><td>Pitch = 37.5 mm</td></tr>
<tr><td>1.5%</td><td>0.8%</td><td>0.3% (typical: 0.2%)</td><td>0.2%</td></tr>
<tr><td rowspan="2">Hi-Pot Test</td><td>Terminal To Terminal</td><td colspan="3">4.0k VDC (Type test 60 seconds, each ramp 5 seconds)</td></tr>
<tr><td>Terminal To Case</td><td colspan="3">4.0k VDC (Type test 60 seconds, each ramp 5 seconds)</td></tr>
<tr><td rowspan="4">Insulation Resistance</td><td colspan="4">Measured at +25°C ±5°C</td></tr>
<tr><td colspan="4">Minimum Values Between Terminals</td></tr>
<tr><td>Voltage Charge</td><td>Voltage Charge Time</td><td>C ≤ 0.33 µF</td><td>C > 0.33 µF</td></tr>
<tr><td>100 VDC</td><td>1 minute</td><td>≥ 1 • 10^5 MΩ
(≥ 5 • 10^5 MΩ)*</td><td>≥ 30,000 MΩ • µF
(≥ 150,000 MΩ • µF)*</td></tr>
</table>

** Typical value*

Performance Characteristics cont.

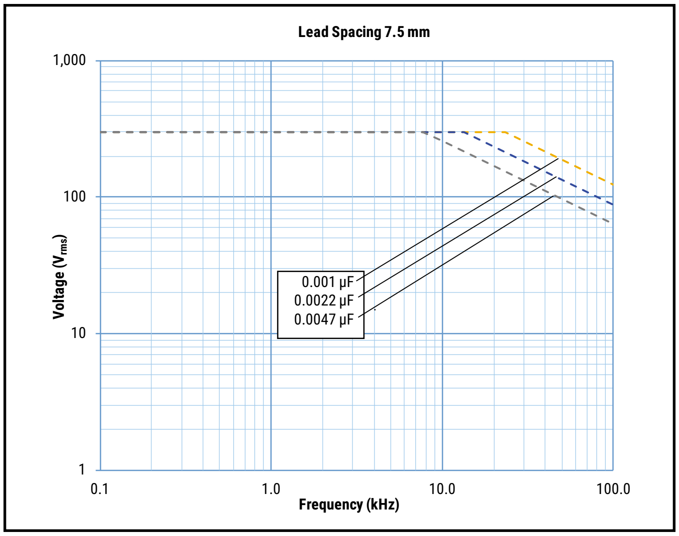


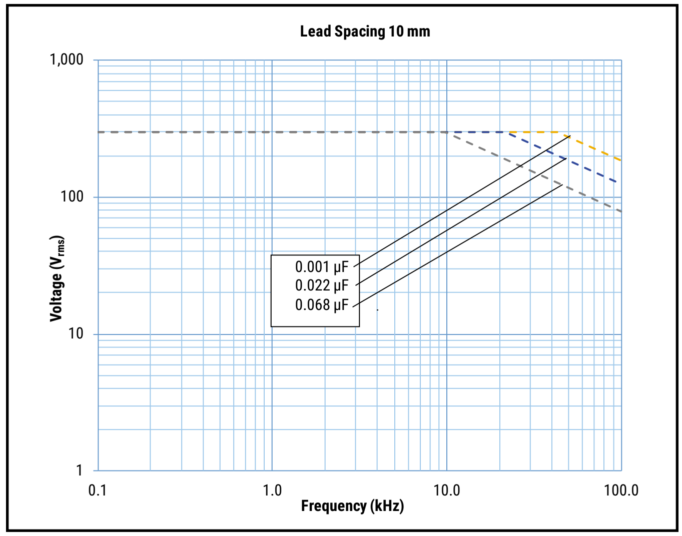


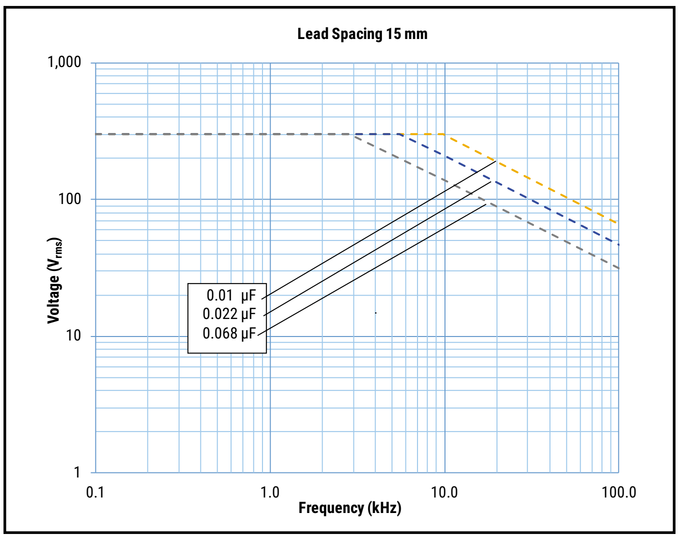


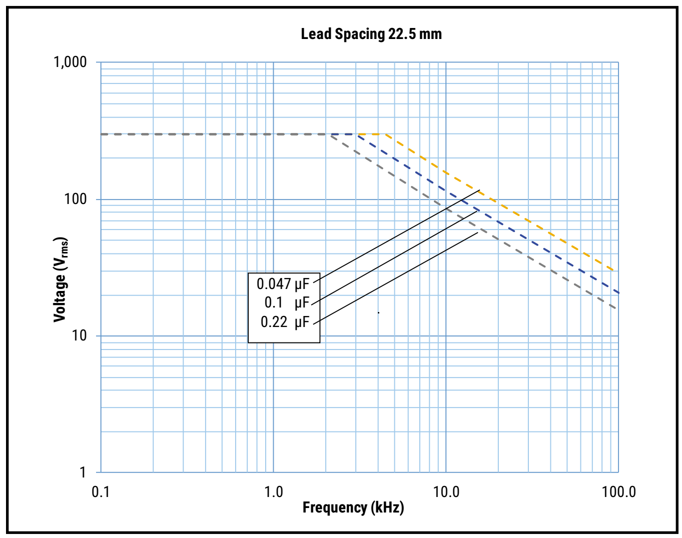
T_h is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

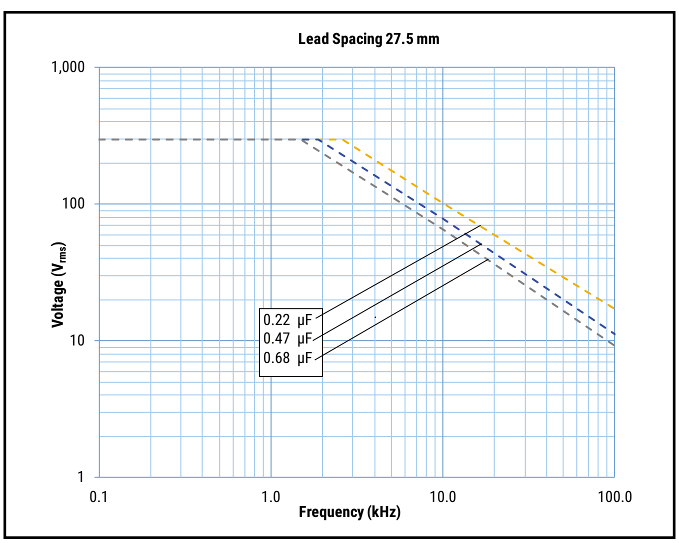
Maximum Voltage (V_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 85°C)

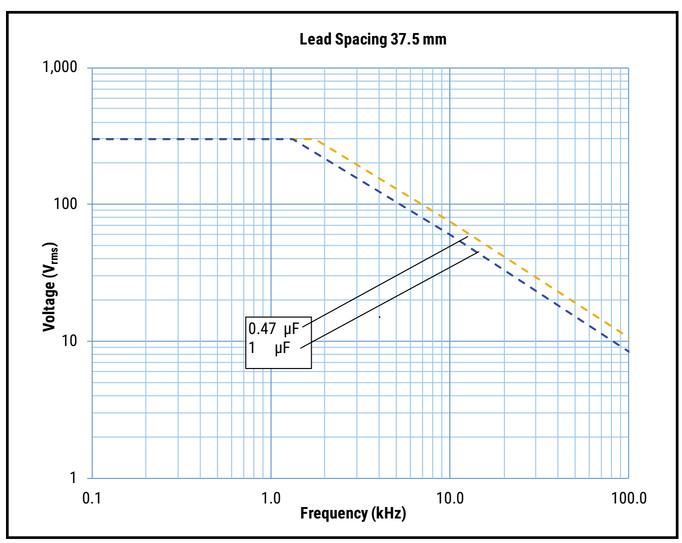




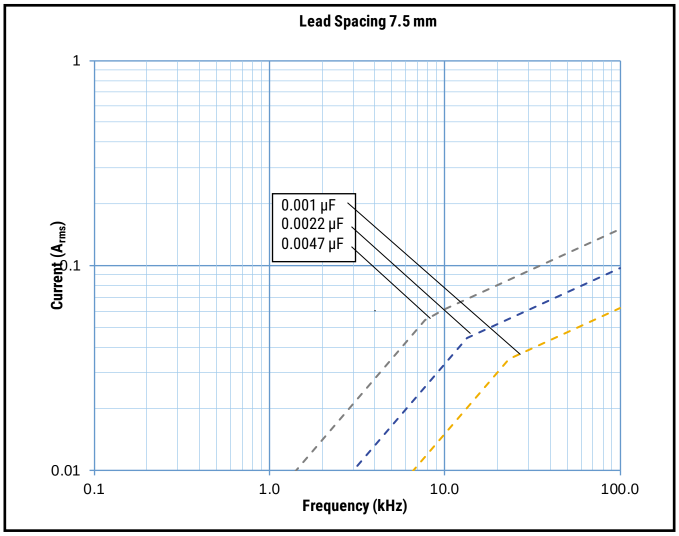


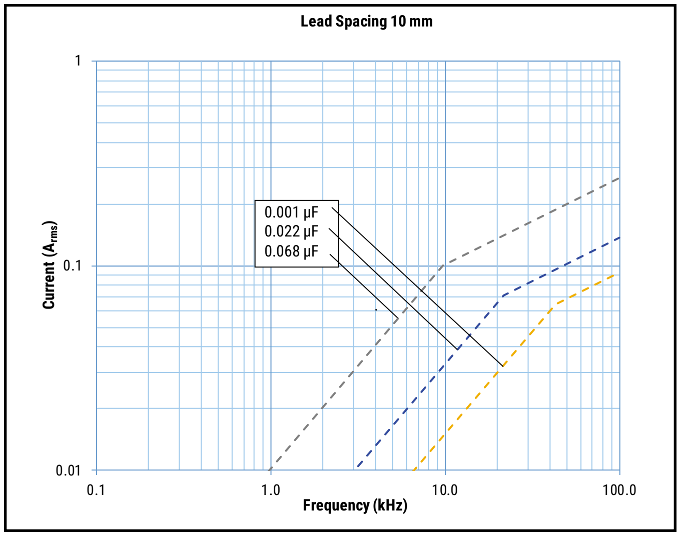


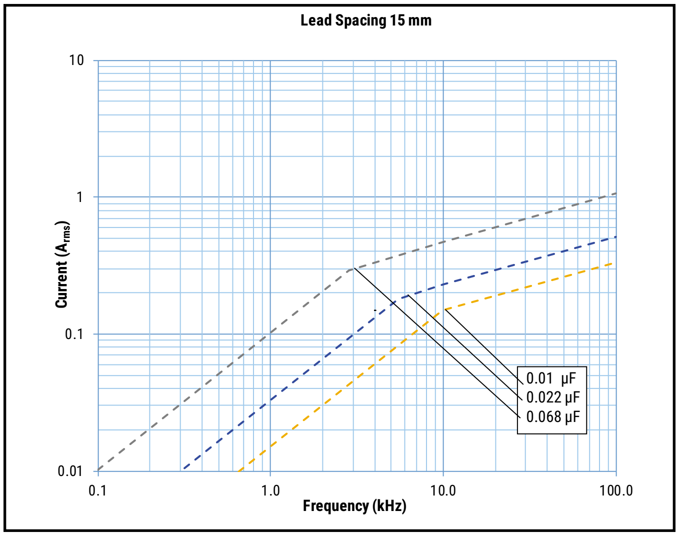


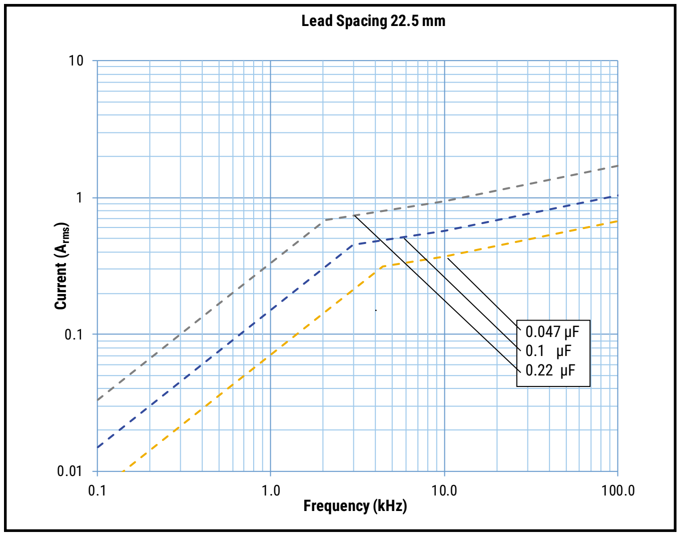


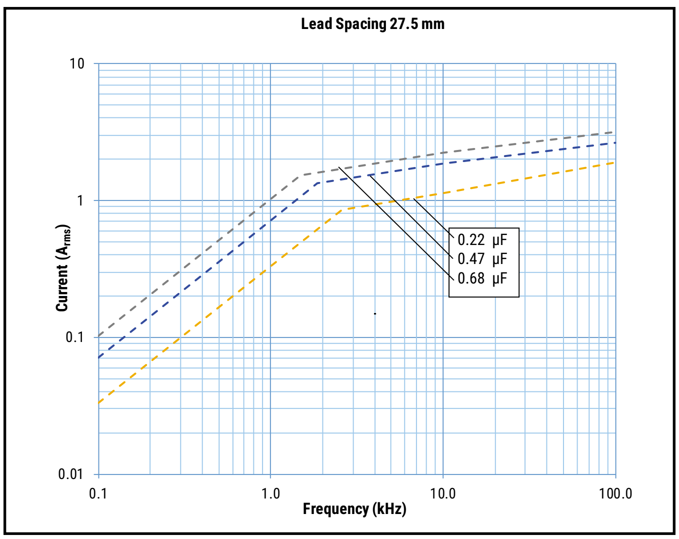
Maximum Current (I_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 85°C)

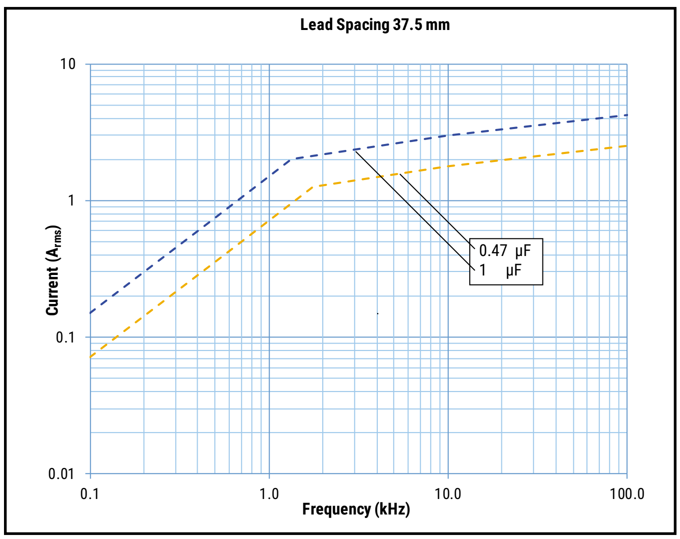




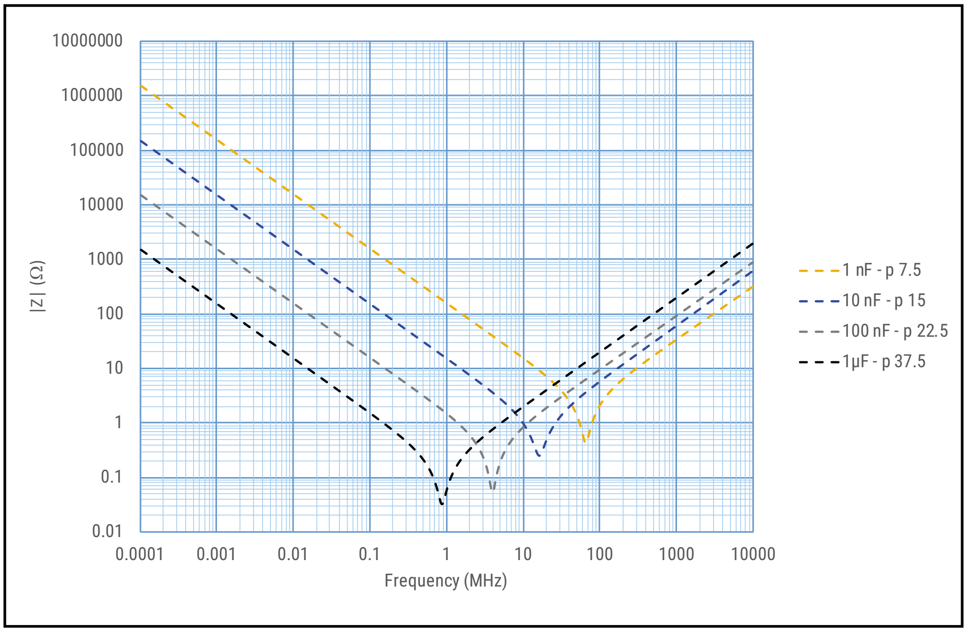








Impedance Graph



Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384-14	1.7 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature"
Vibration	IEC 60068-2-6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98m/s^2
Bump	IEC 60068-2-29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068-2-14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384-14	V_R +20 surge pulses at 5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384-14	IEC 60384-1, IEC 60695-11-5 Needle Flame Test
Damp Heat Steady State	IEC 60068-2-78 Test Cab	+40°C and 93% RH, 56 days
THB test1		65°C, 93% RH and 1000 VDC, 1,600 hours Capacitance change (Δ C/C): ≤ 10% for ≥P10 (≤20% for P7.5 parts) Dissipation factor change (Δtanδ): ≤ 150 * 10^{-4} (at 1 kHz for Cap > 1 µF) Dissipation factor change (Δtanδ): ≤ 240 * 10^{-4} (at 10 kHz for Cap ≤ 1 µF) IR ≥ 50% of initial limit or minimum 200 MΩ
THB test2		85°C, 85% RH and 1,500 VDC, 1,000 hours Capacitance change (Δ C/C): ≤ 10% for ≥P10 (≤20% for P7.5 parts) Dissipation factor change (Δtanδ): ≤ 150 * 10^{-4} (at 1 kHz for Cap > 1 µF) Dissipation factor change (Δtanδ): ≤ 240 * 10^{-4} (at 10 kHz for Cap ≤ 1 µF) IR ≥ 50% of initial limit or minimum 200 MΩ
THB test3 For P10 (≥ 2.2 nF) and ≥ P15 Parts		85°C, 85% RH and 300 VAC, 1,000 hours Capacitance change (Δ C/C): ≤ 10% Dissipation factor change (Δtanδ): ≤ 150 * 10^{-4} (at 1 kHz for Cap > 1 µF) Dissipation factor change (Δtanδ): ≤ 240 * 10^{-4} (at 10 kHz for Cap ≤ 1 µF) IR ≥ 50% of initial limit or minimum 200 MΩ
THB test4 For P10 (< 2.2 nF) and all P7.5 Parts		85°C, 85% RH and 240 VAC, 1,000 hours Capacitance change (Δ C/C): ≤ 10% for P10 (≤20% for P7.5 parts) Dissipation factor change (Δtanδ): ≤ 150 * 10^{-4} (at 1 kHz for Cap > 1 µF) Dissipation factor change (Δtanδ): ≤ 240 * 10^{-4} (at 10 kHz for Cap ≤ 1 µF) IR ≥ 50% of initial limit or minimum 200 MΩ
THB test5 For P10 (< 2.2 nF) Parts		85°C, 85% RH and 300 VAC, 500 hours Capacitance change (Δ C/C): ≤ 10% Dissipation factor change (Δtanδ): ≤ 150 * 10^{-4} (at 1 kHz for Cap > 1 µF) Dissipation factor change (Δtanδ): ≤ 240 * 10^{-4} (at 10 kHz for Cap ≤ 1 µF) IR ≥ 50% of initial limit or minimum 200 MΩ

Approvals

Certification Body	Mark	Specification	File Number
IMQ S.p.A.		EN/IEC 60384-14	V4160
UL		UL 60384-14 and CAN/CSA E60384-14 (300 VAC)	E97797
CQC		IEC 60384-14	CQC13001101264 CQC15001128704 CQC19001218777 CQC13001087758

Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Customer Part Number
	T	H	L				
0.001	4.0	9.0	10.0	7.5	800	413D1100(1)T0(2)	R413D1100(1)T0(2)
0.0015	4.0	9.0	10.0	7.5	800	413D1150(1)T0(2)	R413D1150(1)T0(2)
0.0022	5.0	10.5	10.0	7.5	800	413D1220(1)T0(2)	R413D1220(1)T0(2)
0.0033	6.0	12.0	10.5	7.5	800	413D1330(1)T0(2)	R413D1330(1)T0(2)
0.0047	6.0	12.0	10.5	7.5	800	413D1470(1)T0(2)	R413D1470(1)T0(2)
0.001	4.0	9.0	13.0	10.0	800	413F1100(1)T0(2)	R413F1100(1)T0(2)
0.0015	4.0	9.0	13.0	10.0	800	413F1150(1)T0(2)	R413F1150(1)T0(2)
0.0022	4.0	9.0	13.0	10.0	800	413F1220(1)T0(2)	R413F1220(1)T0(2)
0.0033	5.0	11.0	13.0	10.0	800	413F1330(1)T0(2)	R413F1330(1)T0(2)
0.0047	5.0	11.0	13.0	10.0	800	413F1470(1)T1(2)	R413F1470(1)T1(2)
0.0047	6.0	12.0	13.0	10.0	800	413F1470(1)T0(2)	R413F1470(1)T0(2)
0.0068	6.0	12.0	13.0	10.0	800	413F1680(1)T0(2)	R413F1680(1)T0(2)
0.0047	5.0	11.0	18.0	15.0	600	413I1470(1)T0(2)	R413I1470(1)T0(2)
0.0068	5.0	11.0	18.0	15.0	600	413I1680(1)T0(2)	R413I1680(1)T0(2)
0.010	5.0	11.0	18.0	15.0	600	413I2100(1)T0(2)	R413I2100(1)T0(2)
0.015	5.0	11.0	18.0	15.0	600	413I2150(1)T1(2)	R413I2150(1)T1(2)
0.015	6.0	12.0	18.0	15.0	600	413I2150(1)T0(2)	R413I2150(1)T0(2)
0.022	6.0	12.0	18.0	15.0	600	413I2220(1)T1(2)	R413I2220(1)T1(2)
0.022	7.5	13.5	18.0	15.0	600	413I2220(1)T0(2)	R413I2220(1)T0(2)
0.033	7.5	13.5	18.0	15.0	600	413I2330(1)T1(2)	R413I2330(1)T1(2)
0.033	8.5	14.5	18.0	15.0	600	413I2330(1)T0(2)	R413I2330(1)T0(2)
0.047	10.0	16.0	18.0	15.0	600	413I2470(1)T0(2)	R413I2470(1)T0(2)
0.068	11.0	19.0	18.0	15.0	600	413I2680(1)T0(2)	R413I2680(1)T0(2)
0.047	6.0	15.0	26.5	22.5	500	413N2470(1)T0(2)	R413N2470(1)T0(2)
0.068	7.0	16.0	26.5	22.5	500	413N2680(1)T0(2)	R413N2680(1)T0(2)
0.10	8.5	17.0	26.5	22.5	500	413N3100(1)T1(2)	R413N3100(1)T1(2)
0.10	10.0	18.5	26.5	22.5	500	413N3100(1)T0(2)	R413N3100(1)T0(2)
0.15	10.0	18.5	26.5	22.5	500	413N3150(1)T1(2)	R413N3150(1)T1(2)
0.15	11.0	20.0	26.5	22.5	500	413N3150(1)T0(2)	R413N3150(1)T0(2)
0.22	13.0	22.0	26.5	22.5	500	413N3220(1)T0(2)	R413N3220(1)T0(2)
0.22	13.0	22.0	32.0	27.5	400	413R3220(1)T0(2)	R413R3220(1)T0(2)
0.33	14.0	28.0	32.0	27.5	400	413R3330(1)T0(2)	R413R3330(1)T0(2)
0.47	18.0	33.0	32.0	27.5	400	413R3470(1)T0(2)	R413R3470(1)T0(2)
0.68	18.0	33.0	32.0	27.5	400	413R3680(1)T0(2)	R413R3680(1)T0(2)
0.47	13.0	24.0	41.5	37.5	300	413W3470(1)T0(2)	R413W3470(1)T0(2)
0.68	16.0	28.5	41.5	37.5	300	413W3680(1)T0(2)	R413W3680(1)T0(2)
1.0	20.0	40.0	41.5	37.5	300	413W4100(1)T0(2)	R413W4100(1)T0(2)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Customer Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) M = ±20%, K = ±10%
(3) M = ±20% (only available tolerance).

Soldering Process

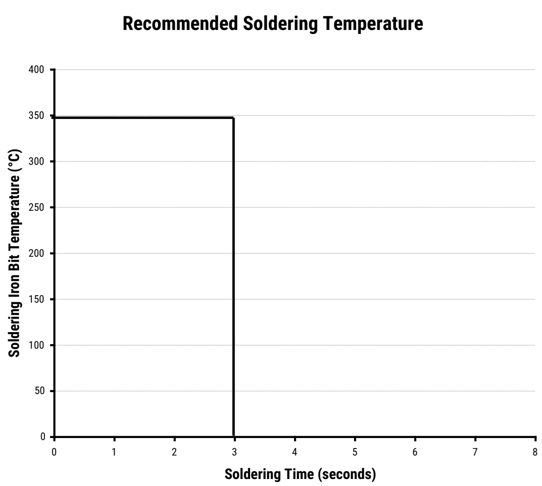
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 mm to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

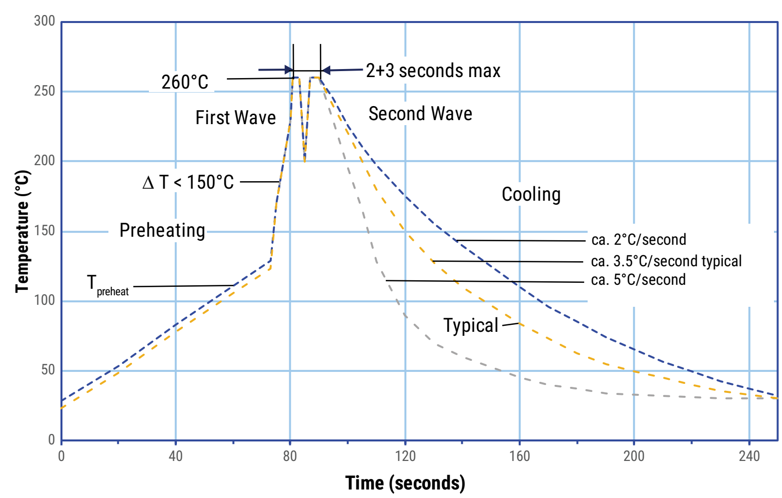
Manual Soldering Recommendations

The following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

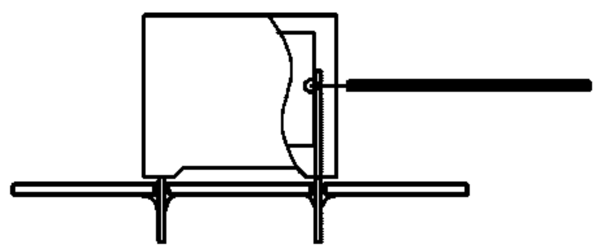
1. The table indicates the maximum set-up temperature of the soldering process

Figure 1

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	125°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	125°C
Paper	160°C
Polyphenylene sulphide	160°C



Temperature monitored inside the capacitor.

Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Mounting

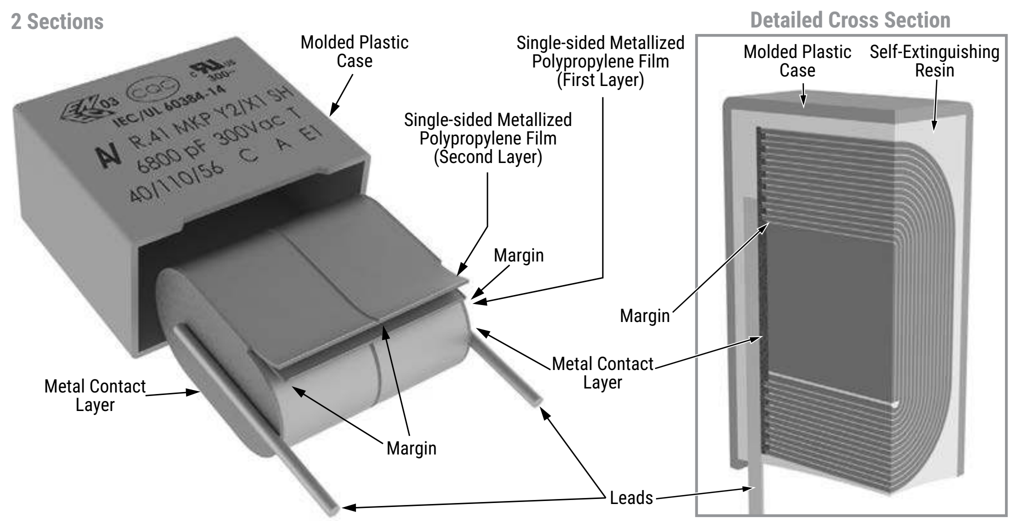
Resistance to Vibration and Mechanical Shock

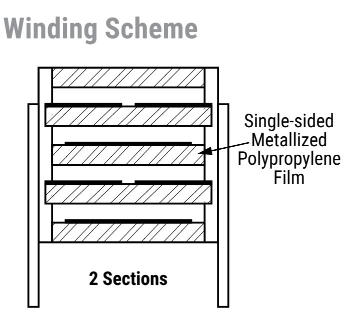
AEC-Q200 Rev. E Mechanical Stress Tests:

Mechanical Shock	**MIL-SDT-202 Method 213**	Figure 1 of Method 213 • THT: Condition C • SMD: Condition C • Tested per the Supplier's recommended mounting method
Vibration	**MIL-SDT-202 Method 204**	• 5 g for 20 minutes, 12 cycles each of 3 orientations • Tested per the Supplier's recommended mounting method • Verification of transfer load: during setup, verify that with the selected PCB design (size, thickness and secure points), or an alternative mount, that the transferred load onto the component corresponds to the requested load. This verification can be achieved using a laser vibrometer or other adequate measuring device • Test from 10 Hz – 2,000 Hz.

The capacitors are designed for PCB mounting. The stand-off pipes must be in good contact with the printed circuit board. The capacitors with pitch ≤ 22.5 mm can be mechanically fixed by the leads, for pitch > 22.5 mm, the capacitor body has to be properly fixed (e.g. clamped or glued).

Construction

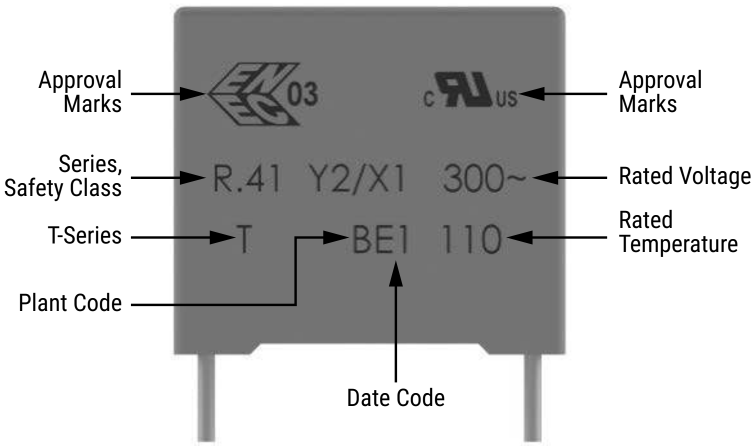




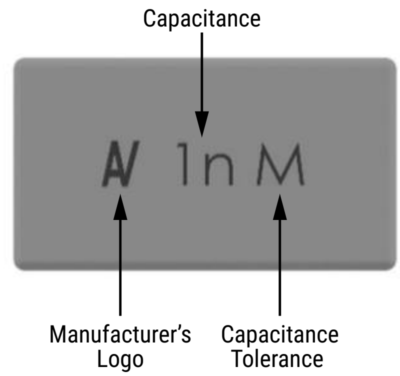
Marking

Lead Spacing 7.5 mm

FRONT



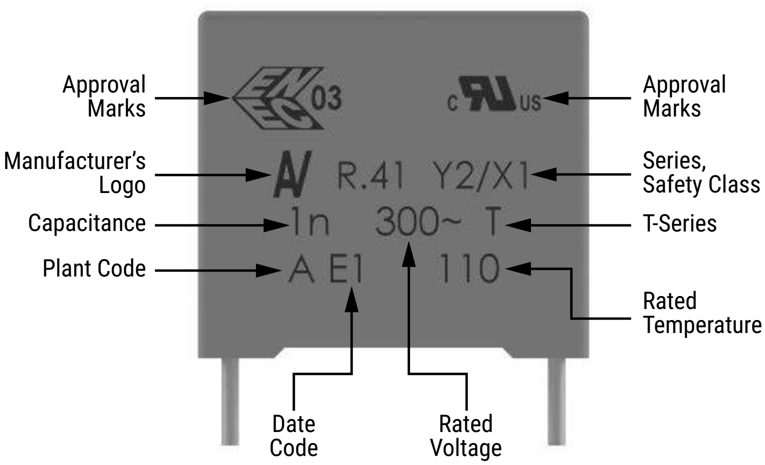
TOP



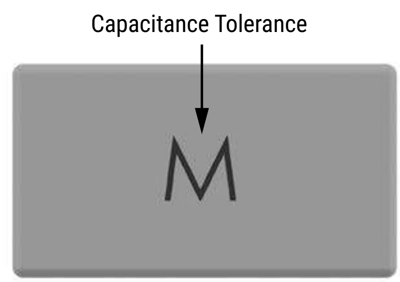
NOTE: Hot imprinting with or without color or ink jet or laser marking

Lead Spacing 7.5 mm (alternatives*)

FRONT



TOP



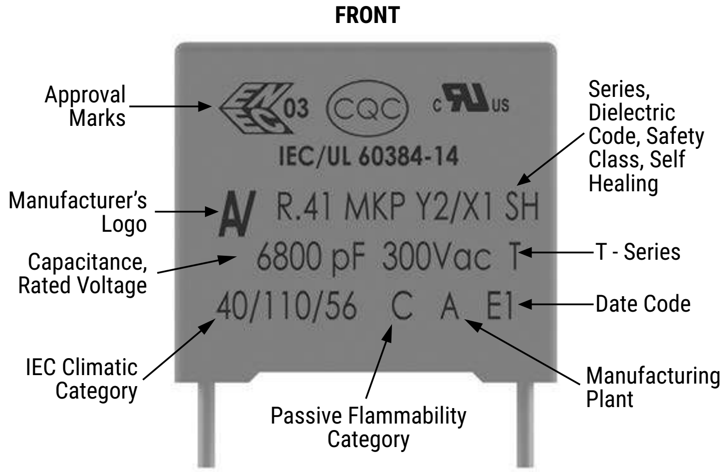
NOTE: Hot imprinting with or without color or ink jet or laser marking

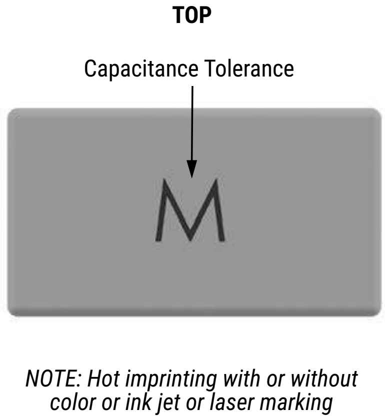
* *Differences caused by technology (clichee, laser or ink jet) and production line*

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

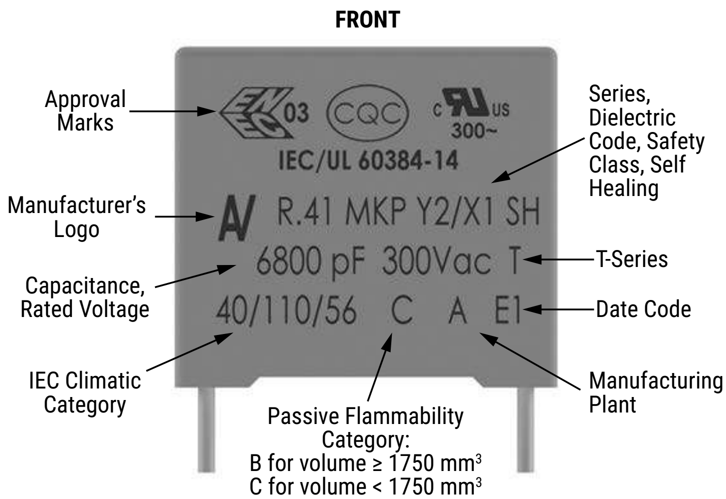
Marking cont.

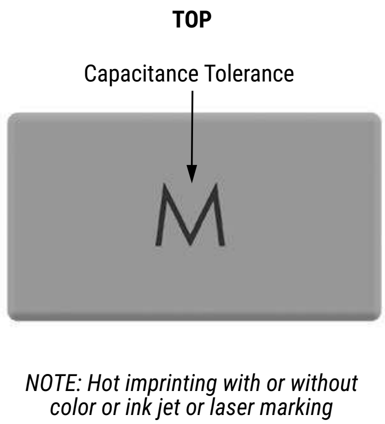
Lead Spacing 10 mm





Lead Spacing ≥ 15 mm, 22.5 mm (small case sizes)





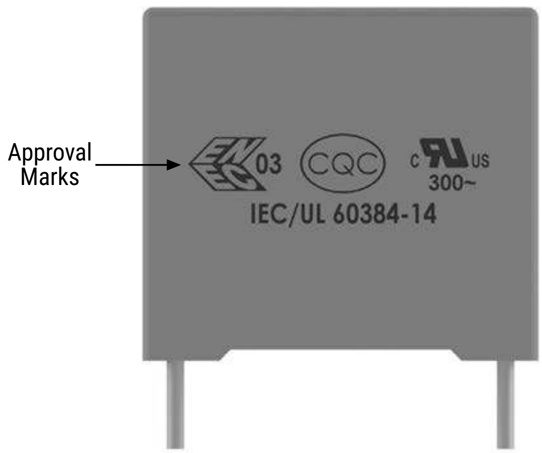
** Differences caused by technology (clichee, laser or ink jet) and production line*

Slight change in the layout can be possible but this does not affect the content of the information of the current marking. This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

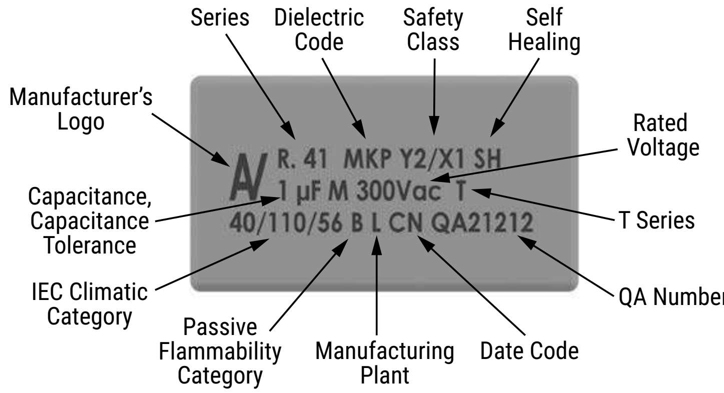
Marking cont.

Lead Spacing 22.5 and 27.5 mm (alternatives*) and 37.5 mm

FRONT



TOP



** Differences caused by technology (clichee, laser or ink jet) and production line*

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

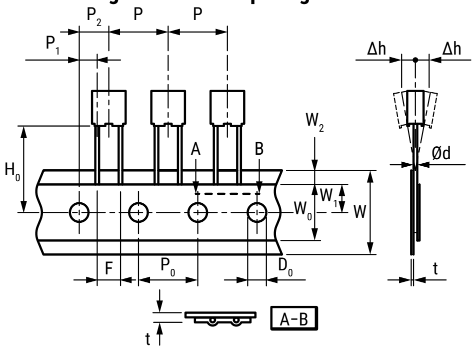
Packaging Quantities

Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads		Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped
Lead and Packaging Code:				00 - JA - JB JE - JH	40 - 50	JM	GY - CK[1]	CK	DQ
7.5	4.0	9.0	10.0	2,000	1,500	-	1,500	-	2,100
	5.0	10.5	10.0	1,500	1,000	-	1,200	-	1,600
	6.0	12.0	10.5	1,000	800	-	1,000	-	1,350
10	4.0	9.0	13.0	2,000	1,800	2,200	750	1,500	1,000
	5.0	11.0	13.0	1,300	1,500	2,000	600	1,250	800
	6.0	12.0	13.0	1,000	1,200	1,800	500	1,000	680
15	5.0	11.0	18.0	2,000	1,000	1,250	600	1,250	800
	6.0	12.0	18.0	1,750	900	1,000	500	1,000	680
	7.5	13.5	18.0	1,000	700	800	350	800	500
	8.5	14.5	18.0	1,000	500	650	300	700	440
	10.0	16.0	18.0	750	500	550	270	600	380
	11.0	19.0	18.0	450	350	400	270	500	340
22.5	6.0	15.0	26.5	805	500	450	300	700	464
	7.0	16.0	26.5	700	500	450	250	550	380
	8.5	17.0	26.5	468	300	350	250	450	280
	10.0	18.5	26.5	396	300	350	160	350	235
	11.0	20.0	26.5	360	250	200	160	350	217
	13.0	22.0	26.5	300	200	150	130	300	-
27.5	13.0	22.0	32.0	480	288	288	-	300	-
	14.0	28.0	32.0	352	176	176	-	-	-
	18.0	33.0	32.0	256	128	128	-	-	-
37.5	13.0	24.0	41.5	360	216	216	-	-	-
	16.0	28.5	41.5	216	108	108	-	-	-
	20.0	40.0	41.5	126	84	84	-	-	-

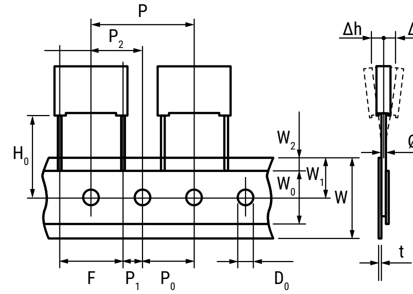
1 Only for 7.5 mm lead spacing

Lead Taping & Packaging (IEC 60286–2)

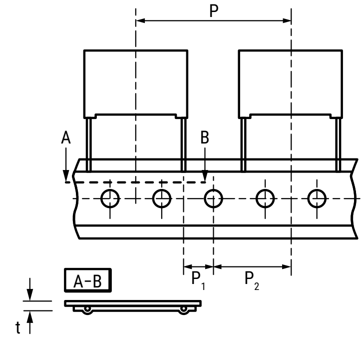
Figure 1 — Lead Spacing 7.5 mm



Lead Spacing 10 & 15 mm



Lead Spacing 22.5 & 27.5 mm



Taping Specification

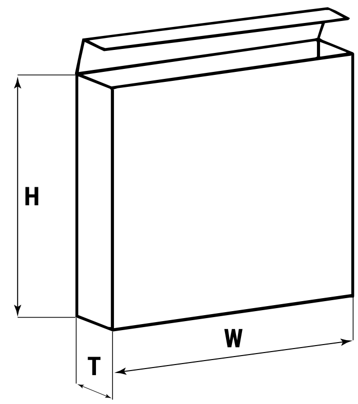
Description	Symbol	Dimensions (mm)					
		Lead Spacing					Tolerance
		7.5	10.0	15.0	22.5	27.5	
Lead wire diameter	d	0.5 – 0.6	0.6	0.6 – 0.8	0.8	0.8	±0.05
Taping lead space	P	12.7	25.4	25.4	38.1	38.1	±1
Feed hole lead space *	P_0	12.7	12.7	12.7	12.7	12.7	±0.2 **
Centering of the lead wire	P_1	2.6	7.7	5.2	7.8	5.3	±0.7
Centering of the body	P_2	6.35	12.7	12.7	19.05	19.05	±1.3
Lead spacing ***	F	7.5	10.0	15.0	22.5	27.5	+0.6/−0.1
Component alignment	Δh	0	0	0	0	0	±2
Component deviation	Δp	0	0	0	0	0	±1
Height of component from tape center	H_0****	18.5	18.5	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	18	18	+1/−0.5
Hold down tape width	W_0	6	9	10	10	10	Minimum
Hole position	W_1	9	9	9	9	9	±0.5
Hold down tape position	W_2	3	3	3	3	3	Maximum
Feed hole diameter	D_0	4	4	4	4	4	±0.2
Total Tape thickness	t	0.7	0.7	0.7	0.7	0.7	±0.2

** Available also 15 mm.*
*** Maximum 1 mm on 20 lead spacing.*
**** 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request.*
***** H_0 = 16.5 mm is available upon request.*

Lead Taping & Packaging (IEC 60286–2) cont.

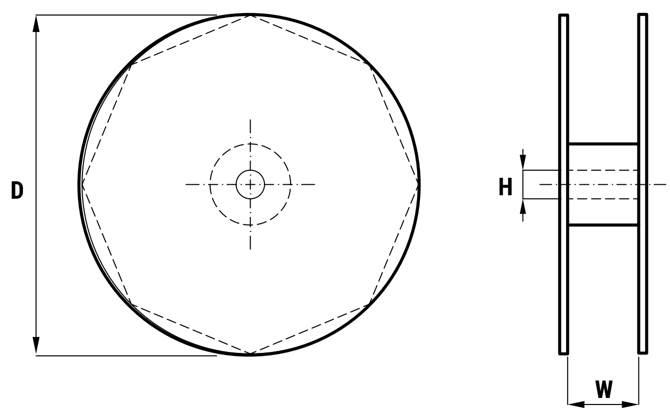
Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



Reel Specifications

Reel Size	Dimensions (mm)		
	D	H	W
Standard	355	30	55 Maximum
Large	500	25	



R46, Class X2, 310 VAC, 125°C

Overview

The R46 series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material that meets the requirements of UL 94 V–0.

Applications

For worldwide use in electromagnetic interference (EMI) suppression in across-the-line applications that require X2 safety classification. Intended for use in situations in which capacitor failure would not result in exposure to electric shock. Not for use in "series with mains" type applications.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- X2 CLASS (IEC 60384-14)
- Rated voltage: 310 VAC 50/60 Hz
- Capacitance range: 0.01 – 15 µF
- Lead spacing: 10.0 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category 40/125/56, IEC 60068-1
- Tape & Reel in accordance with IEC 60286-2
- RoHS compliant and lead-free terminations
- Operating temperature range of −40°C to +125°C
- 100% screening factory test at 2,200 VDC/1,500 VAC
- Self healing properties

Part Number System

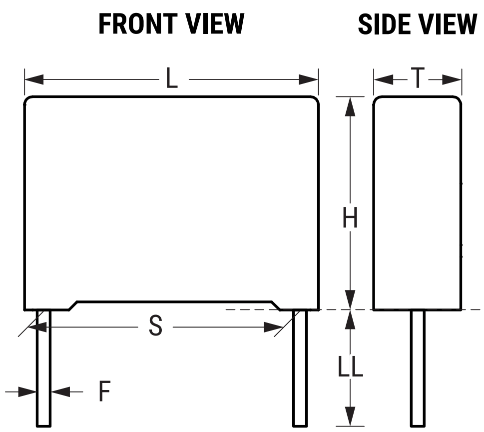
R46	3	N	3220	00	H1	M
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance
X2, Metallized Polypropylene	3 = 310	F = 10.0 I = 15.0 N = 22.5 R = 27.5 W = 37.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	See Ordering Options Table	H = High Temperature H1 H2 H3 H4 H7	K = ±10% M = ±20%

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
10 15 22.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4+2/−0	00
	Ammo Pack	H_0= 18.5 ±0.5	DQ[1]
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	GY[1]
	Bulk (Bag)[2] – Short Leads	2.7 +0.5/−0	JA
	Bulk (Bag)[2] – Short Leads	3.5 +0.5/−0	JB
	Bulk (Bag)[2] – Short Leads	4.0 +0.5/−0	JE
	Bulk (Bag)[2] – Short Leads	3.2 +0.3/−0.2	JH
	Bulk (Bag) – Long Leads	18 ±1	JM
	Bulk (Bag) – Long Leads	30 +5/−0	40
	Bulk (Bag) – Long Leads	25 +2/−1	50
27.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4+2/−0	00
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK[1]
	Other Lead and Packaging Options		
	Bulk (Tray) – Short Leads	2.7 +0.5/−0	JA
	Bulk (Tray) – Short Leads	3.5 +0.5/−0	JB
	Bulk (Tray) – Short Leads	4.0 +0.5/−0	JE
	Bulk (Tray)– Short Leads	3.2 +0.3/−0.2	JH
	Bulk (Tray) – Long Leads	18 ±1	JM
	Bulk (Tray) – Long Leads	30 +5/−0	40
	Bulk (Tray) – Long Leads	25 +2/−1	50
37.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4+2/−0	00
	Other Lead and Packaging Options		
	Bulk (Tray) – Short Leads	2.7 +0.5/−0	JA
	Bulk (Tray) – Short Leads	3.5 +0.5/−0	JB
	Bulk (Tray) – Short Leads	4.0 +0.5/−0	JE
	Bulk (Tray)– Short Leads	3.2 +0.3/−0.2	JH
	Bulk (Tray) – Long Leads	18 ±1	JM
	Bulk (Tray) – Long Leads	30 +5/−0	40
	Bulk (Tray) – Long Leads	25 +2/−1	50

[1] *Not for all sizes, see "Packaging Quantities" table.*
[2] *For lead spacing 22.5 case sizes ≥ 8.5*17*26.5 the parts are packed in a Pizza box 335*320*34 mm*

Dimensions – Millimeters



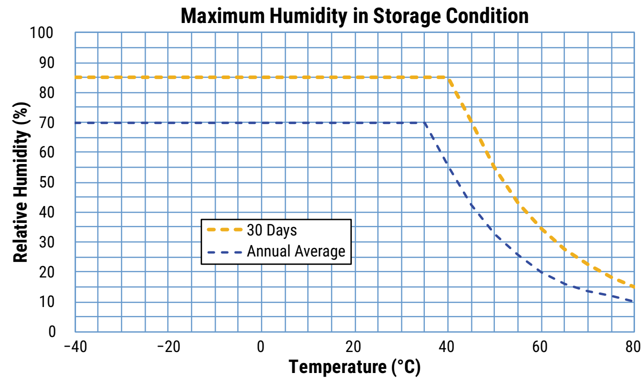
S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
10.0	±0.4	4.0	+0.2/-0.5	9.0	+0.1/-0.5	13.0	+0.2/-0.5	0.6	±0.05
10.0	±0.4	5.0	+0.2/-0.5	11.0	+0.1/-0.5	13.0	+0.2/-0.5	0.6	±0.05
10.0	±0.4	6.0	+0.2/-0.5	12.0	+0.1/-0.5	13.0	+0.2/-0.5	0.6	±0.05
15.0	±0.4	5.0	+0.2/-0.5	11.0	+0.1/-0.5	18.0	+0.3/-0.5	0.6	±0.05
15.0	±0.4	6.0	+0.2/-0.5	12.0	+0.1/-0.5	18.0	+0.3/-0.5	0.6	±0.05
15.0	±0.4	6.0	+0.2/-0.5	17.5	+0.1/-0.5	18.0	+0.3/-0.5	0.6	±0.05
15.0	±0.4	7.5	+0.2/-0.5	13.5	+0.1/-0.5	18.0	+0.5/-0.5	0.6	±0.05
15.0	±0.4	7.5	+0.2/-0.5	18.5	+0.1/-0.5	18.0	+0.5/-0.5	0.8	±0.05
15.0	±0.4	8.5	+0.2/-0.5	14.5	+0.1/-0.5	18.0	+0.5/-0.5	0.6	±0.05
15.0	±0.4	9.0	+0.2/-0.5	12.5	+0.1/-0.5	18.0	+0.5/-0.5	0.6	±0.05
15.0	±0.4	10.0	+0.2/-0.5	16.0	+0.1/-0.5	18.0	+0.5/-0.5	0.8	±0.05
15.0	±0.4	11.0	+0.2/-0.5	19.0	+0.1/-0.5	18.0	+0.5/-0.5	0.8	±0.05
15.0	±0.4	13.0	+0.2/-0.5	12.0	+0.1/-0.5	18.0	+0.5/-0.5	0.8	±0.05
22.5	±0.4	6.0	+0.2/-0.5	15.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
22.5	±0.4	7.0	+0.2/-0.5	16.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
22.5	±0.4	10.0	+0.2/-0.5	18.5	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
22.5	±0.4	11.0	+0.2/-0.5	20.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
22.5	±0.4	13.0	+0.2/-0.5	22.0	+0.1/-0.5	26.5	+0.3/-0.5	0.8	±0.05
27.5	±0.4	9.0	+0.2/-0.7	17.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	11.0	+0.2/-0.7	20.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	13.0	+0.2/-0.7	22.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	13.0	+0.2/-0.7	25.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	14.0	+0.2/-0.7	28.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	18.0	+0.2/-0.7	33.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
27.5	±0.4	22.0	+0.2/-0.7	37.0	+0.1/-0.7	32.0	+0.3/-0.7	0.8	±0.05
37.5	±0.4	11.0	+0.3/-0.7	22.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	13.0	+0.3/-0.7	24.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	16.0	+0.3/-0.7	28.5	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	19.0	+0.3/-0.7	32.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	20.0	+0.3/-0.7	40.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	24.0	+0.3/-0.7	44.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
37.5	±0.4	30.0	+0.3/-0.7	45.0	+0.1/-0.7	41.5	+0.3/-0.7	1.0	±0.05
Note: See Ordering Options Table for lead length (LL/H_0) options.									

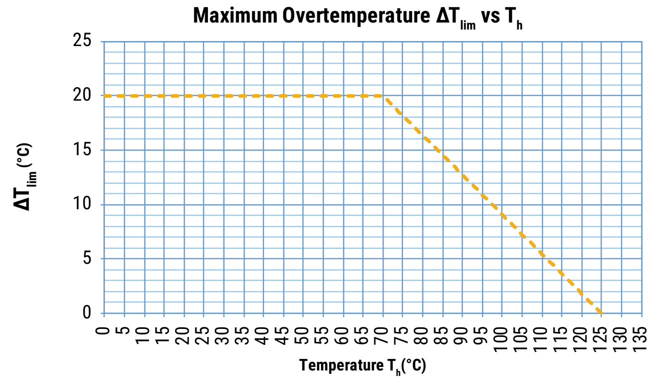
Performance Characteristics

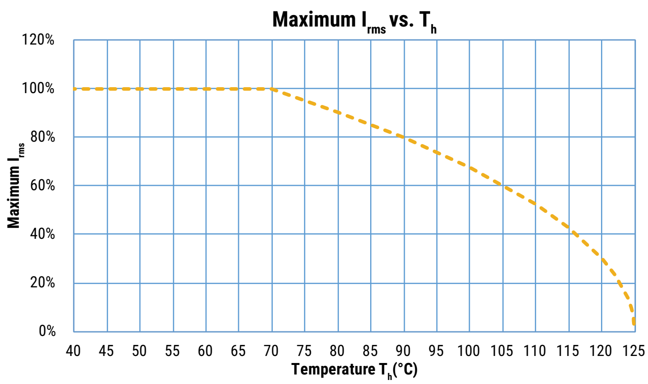
Dielectric	Polypropylene film			
Plates	Metal layer deposited by evaporation under vacuum			
Winding	Non-inductive type			
Leads	Tinned wire			
Protection	Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94.			
Related Documents	IEC 60384–14, EN 60384–14			
Rated Voltage V_R	310 VAC (50/60 Hz)			
Recommended DC Voltage	≤ 630 VDC			
Capacitance Range	0.010 – 15 µF			
Capacitance Values	E6 series (IEC 60063) measured at 1 kHz and +20 ±1°C			
Capacitance Tolerance	±10%, ±20%			
Temperature Range	−40°C to +125°C			
Climatic Category	40/125/56 IEC 60068-1			
Reliability	Operational life 100,000 hours at 85°C; 2,000 hours at 125°C			
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package			
	Average relative humidity per year ≤ 70%			
	RH ≤ 85% for 30 days randomly distributed throughout the year			
	Dew is absent			
	Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)			
Approvals	ENEC, UL, cUL, CQC			
Dissipation Factor (tanδ)	Maximum Values at +23°C			
			C ≤ 0.1 µF	C > 0.1 µF
	Frequency = 1 kHz		0.3%	0.2%
Test Voltage Between Terminals	The 100% screening factory test is carried out at 2,200 VDC/1,500 VAC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. This test cannot be repeated, as there is a risk of damaging the capacitor. KEMET is not liable in such cases for any failures.			
Insulation Resistance	Measured at +25°C ±5°C, according to IEC 60384–2			
	Minimum Values Between Terminals			
	Voltage Charge	Voltage Charge Time	C ≤ 0.33 µF	C > 0.33 µF
	100 VDC	1 minute	≥ 1 • 10^5 MΩ (≥ 5 • 10^5 MΩ)*	≥ 30,000 MΩ • µF (≥ 150,000 MΩ • µF)*

** Typical value*

Performance Characteristics cont.

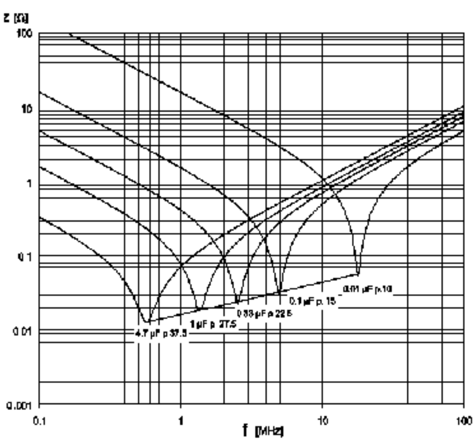




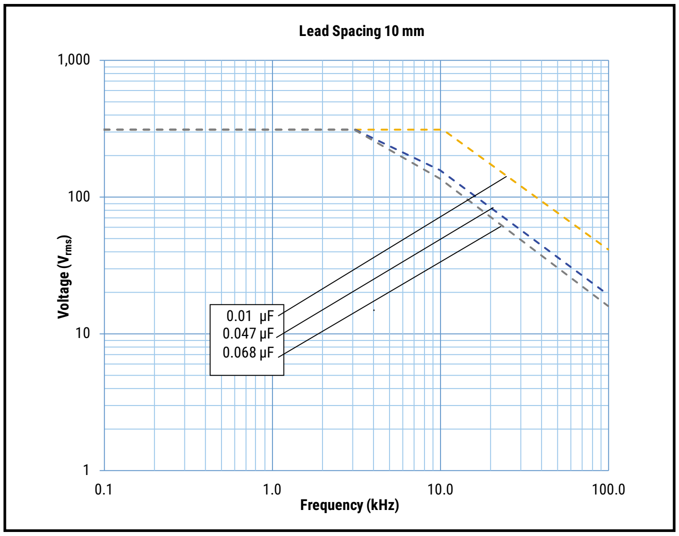


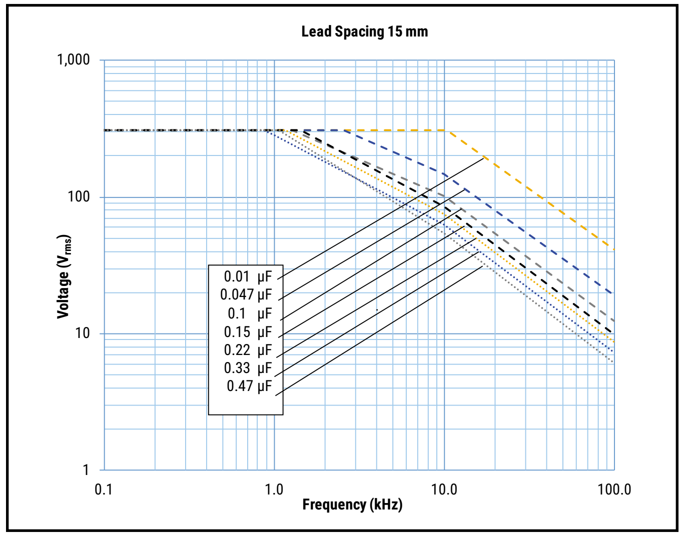
T_h is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

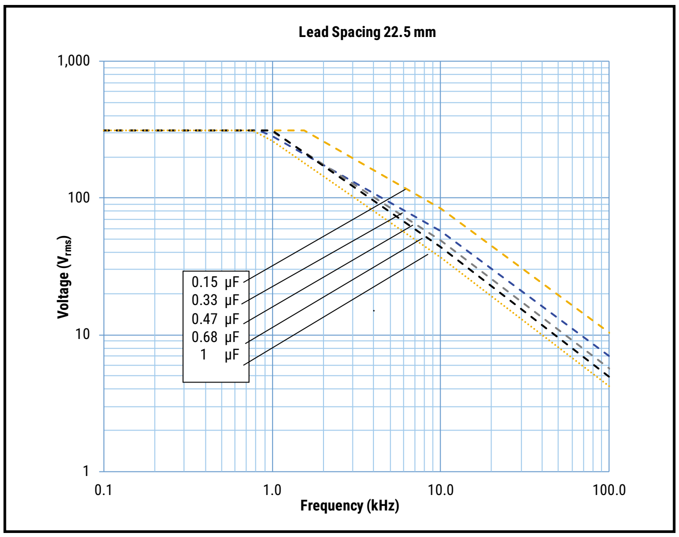
Impedance Graph

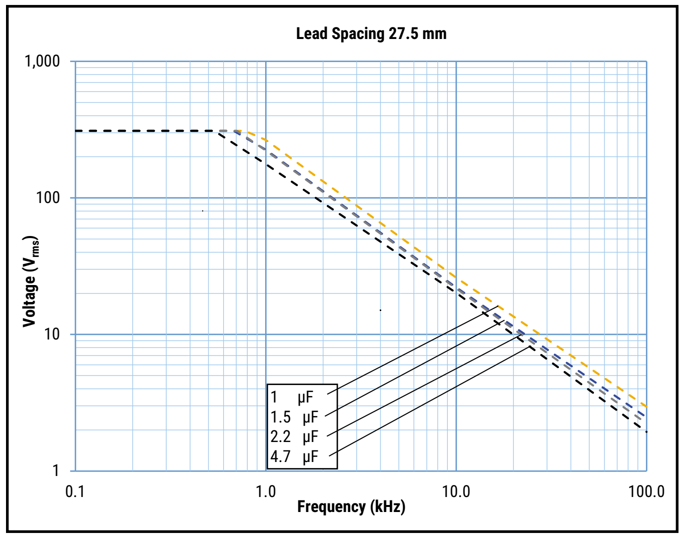


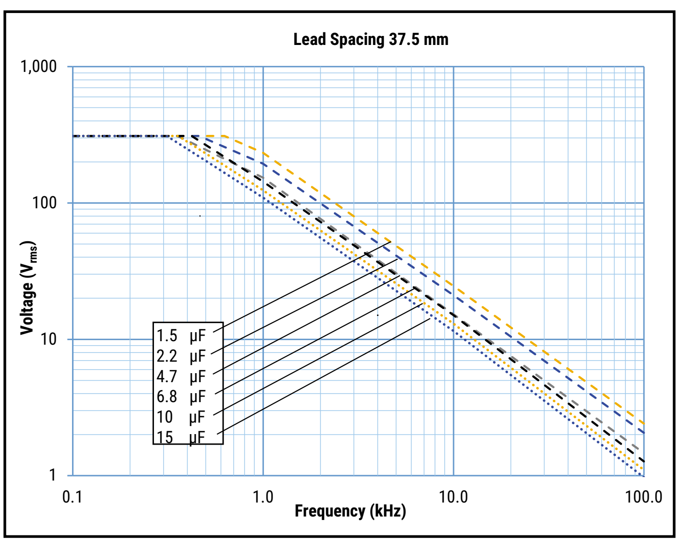
Maximum Voltage (V_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 70°C)



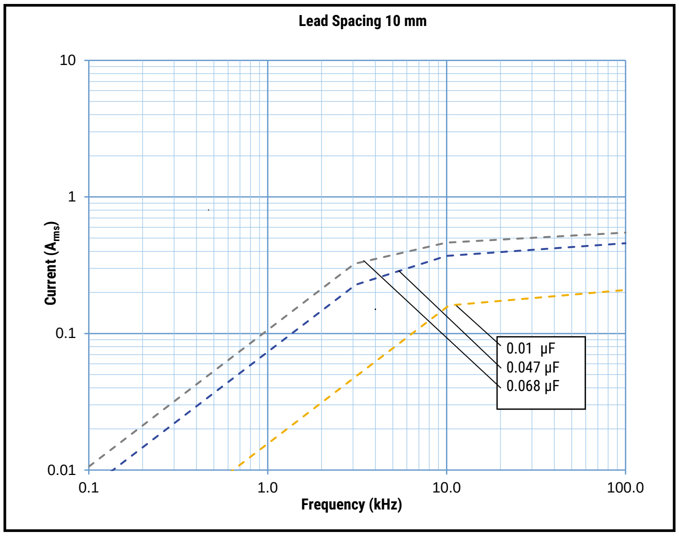


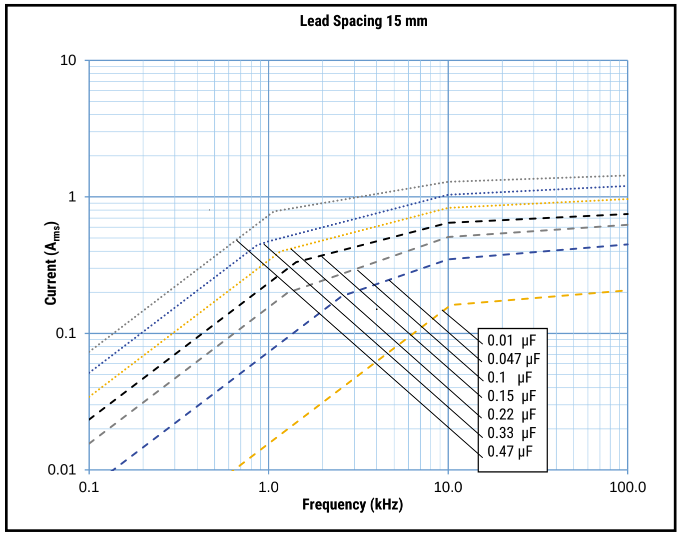


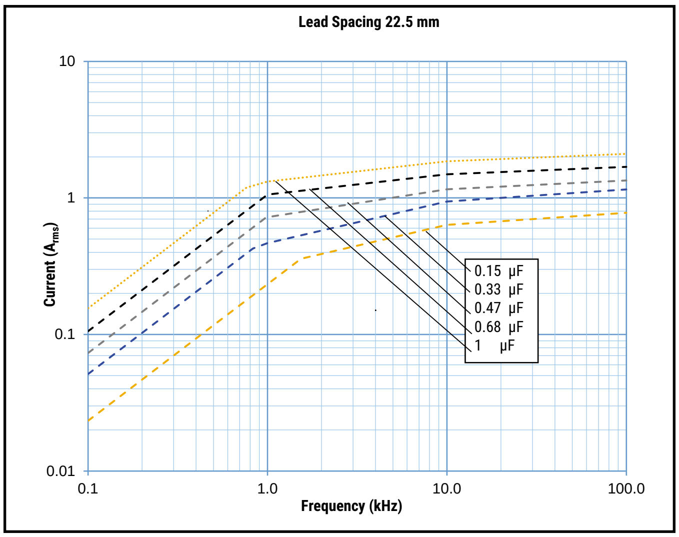


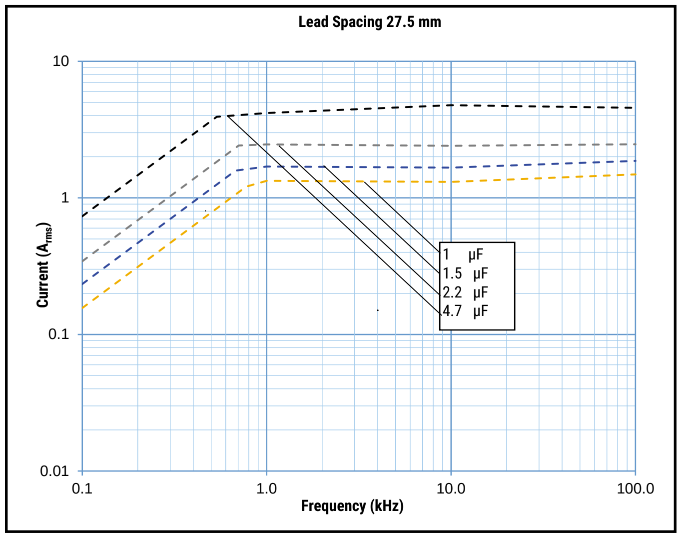


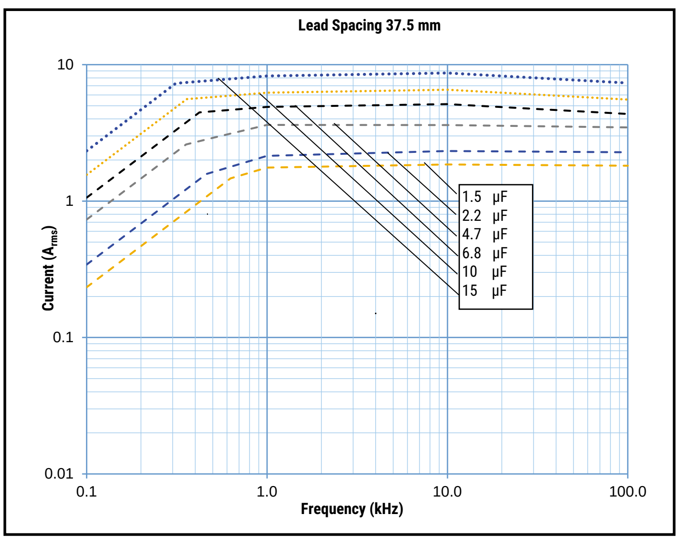
Maximum Current (I_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 70°C)











Environmental Test Data

Test	IEC Publication	Procedure
Endurance	EN/IEC 60384–14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	IEC 60068–2–6 Test Fc	3 directions at 2 hours each 10 – 55 Hz at 0.75 mm or 98 m/s^2
Bump	IEC 60068–2–29 Test Eb	1,000 bumps at 390 m/s^2
Change of Temperature	IEC 60068–2–14 Test Na	Upper and lower rated temperature 5 cycles
Active Flammability	IEC 60384–14	V_R + 20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384–14	IEC 60384–1, IEC 60695–11–5 Needle flame test
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days

Approvals

Certification Body	Mark	Specification	File Number
IMQ S-p.A.		EN/IEC 60384–14	CA08.00063
UL		UL 60384–14 and CAN/CSA E60384–14 (310 VAC)	E97797
CQC		IEC 60384–14	CQC15001128630 CQC15001128703 CQC15001128705

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Legacy Part Number
	T	H	L				
0.01	4.0	9.0	13.0	10.0	500	463F2100(1)H7(2)	R463F2100(1)H7(2)
0.01	5.0	11.0	13.0	10.0	500	463F2100(1)H1(2)	R463F2100(1)H1(2)
0.015	4.0	9.0	13.0	10.0	500	463F2150(1)H7(2)	R463F2150(1)H7(2)
0.015	5.0	11.0	13.0	10.0	500	463F2150(1)H1(2)	R463F2150(1)H1(2)
0.022	4.0	9.0	13.0	10.0	500	463F2220(1)H7(2)	R463F2220(1)H7(2)
0.022	5.0	11.0	13.0	10.0	500	463F2220(1)H1(2)	R463F2220(1)H1(2)
0.033	5.0	11.0	13.0	10.0	500	463F2330(1)H1(2)	R463F2330(1)H1(2)
0.047	5.0	11.0	13.0	10.0	500	463F2470(1)H7(2)	R463F2470(1)H7(2)
0.047	6.0	12.0	13.0	10.0	500	463F2470(1)H1(2)	R463F2470(1)H1(2)
0.068	6.0	12.0	13.0	10.0	500	463F2680(1)H1(3)	R463F2680(1)H1(3)
0.010	5.0	11.0	18.0	15.0	400	463I2100(1)H1(2)	R463I2100(1)H1(2)
0.015	5.0	11.0	18.0	15.0	400	463I2150(1)H1(2)	R463I2150(1)H1(2)
0.022	5.0	11.0	18.0	15.0	400	463I2220(1)H1(2)	R463I2220(1)H1(2)
0.033	5.0	11.0	18.0	15.0	400	463I2330(1)H1(2)	R463I2330(1)H1(2)
0.047	5.0	11.0	18.0	15.0	400	463I2470(1)H1(2)	R463I2470(1)H1(2)
0.068	5.0	11.0	18.0	15.0	400	463I2680(1)H1(2)	R463I2680(1)H1(2)
0.10	5.0	11.0	18.0	15.0	400	463I3100(1)H7(2)	R463I3100(1)H7(2)
0.10	6.0	12.0	18.0	15.0	400	463I3100(1)H1(2)	R463I3100(1)H1(2)
0.15	6.0	12.0	18.0	15.0	400	463I3150(1)H7(2)	R463I3150(1)H7(2)
0.15	6.0	17.5	18.0	15.0	400	463I3150(1)H2(2)	R463I3150(1)H2(2)
0.15	9.0	12.5	18.0	15.0	400	463I3150(1)H3(2)	R463I3150(1)H3(2)
0.15	7.5	13.5	18.0	15.0	400	463I3150(1)H1(2)	R463I3150(1)H1(2)
0.22	7.5	13.5	18.0	15.0	400	463I3220(1)H7(2)	R463I3220(1)H7(2)
0.22	8.5	14.5	18.0	15.0	400	463I3220(1)H1(2)	R463I3220(1)H1(2)
0.22	6.0	17.5	18.0	15.0	400	463I3220(1)H2(3)	R463I3220(1)H2(3)
0.22	9.0	12.5	18.0	15.0	400	463I3220(1)H3(3)	R463I3220(1)H3(3)
0.22	7.5	18.5	18.0	15.0	400	463I3220(1)H4(2)	R463I3220(1)H4(2)
0.33	8.5	14.5	18.0	15.0	400	463I3330(1)H7(2)	R463I3330(1)H7(2)
0.33	10.0	16.0	18.0	15.0	400	463I3330(1)H1(3)	R463I3330(1)H1(3)
0.33	7.5	18.5	18.0	15.0	400	463I3330(1)H2(3)	R463I3330(1)H2(3)
0.33	13.0	12.0	18.0	15.0	400	463I3330(1)H3(3)	R463I3330(1)H3(3)
0.47	10.0	16.0	18.0	15.0	400	463I3470(1)H7(3)	R463I3470(1)H7(3)
0.47	11.0	19.0	18.0	15.0	400	463I3470(1)H1(3)	R463I3470(1)H1(3)
0.68	11.0	19.0	18.0	15.0	400	463I3680(1)H7(3)	R463I3680(1)H7(3)
0.15	6.0	15.0	26.5	22.5	200	463N3150(1)H1(2)	R463N3150(1)H1(2)
0.22	6.0	15.0	26.5	22.5	200	463N3220(1)H1(2)	R463N3220(1)H1(2)
0.33	6.0	15.0	26.5	22.5	200	463N3330(1)H7(2)	R463N3330(1)H7(2)
0.33	7.0	16.0	26.5	22.5	200	463N3330(1)H1(2)	R463N3330(1)H1(2)
0.47	7.0	16.0	26.5	22.5	200	463N3470(1)H7(2)	R463N3470(1)H7(2)
0.47	10.0	18.5	26.5	22.5	200	463N3470(1)H1(2)	R463N3470(1)H1(2)
0.68	10.0	18.5	26.5	22.5	200	463N3680(1)H7(2)	R463N3680(1)H7(2)
0.68	11.0	20.0	26.5	22.5	200	463N3680(1)H1(2)	R463N3680(1)H1(2)
1.0	11.0	20.0	26.5	22.5	200	463N4100(1)H7(2)	R463N4100(1)H7(2)
1.0	13.0	22.0	26.5	22.5	200	463N4100(1)H1(2)	R463N4100(1)H1(2)
1.5	13.0	22.0	26.5	22.5	200	463N4150(1)H7(2)	R463N4150(1)H7(2)
1	11.0	20.0	32.0	27.5	150	463R4100(1)H7(2)	R463R4100(1)H7(2)
1.5	13.0	22.0	32.0	27.5	150	463R4150(1)H7(2)	R463R4150(1)H7(2)
2.2	14.0	28.0	32.0	27.5	150	463R4220(1)H7(2)	R463R4220(1)H7(2)
3.3	18.0	33.0	32.0	27.5	150	463R4330(1)H7(2)	R463R4330(1)H7(2)
4.7	22.0	37.0	32.0	27.5	150	463R4470(1)H7(2)	R463R4470(1)H7(2)
1.5	11.0	22.0	41.5	37.5	100	463W4150(1)H7(2)	R463W4150(1)H7(2)
2.2	13.0	24.0	41.5	37.5	100	463W4220(1)H7(2)	R463W4220(1)H7(2)
3.3	16.0	28.5	41.5	37.5	100	463W4330(1)H7(2)	R463W4330(1)H7(2)
4.7	19.0	32.0	41.5	37.5	100	463W4470(1)H7(2)	R463W4470(1)H7(2)
6.8	20.0	40.0	41.5	37.5	100	463W4680(1)H7(2)	R463W4680(1)H7(2)
10	24.0	44.0	41.5	37.5	100	463W5100(1)H7(2)	R463W5100(1)H7(2)
15	30.0	45.0	41.5	37.5	100	463W5150(1)H7(3)	R463W5150(1)H7(3)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) M = ±20%, K = ±10%
(3) M = ±20% (only available tolerance).

Soldering Process

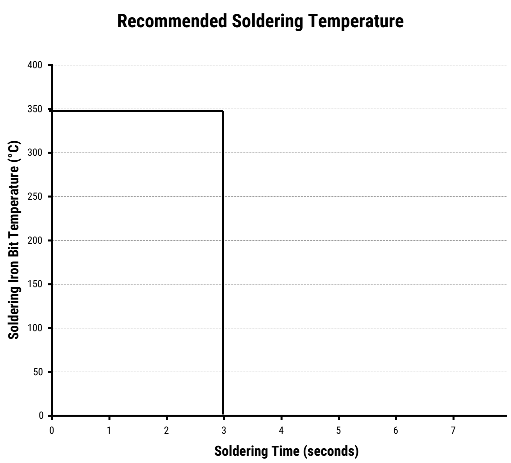
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder material. This has increased the liquidus temperature from 183°C for SnPb eutectic alloys to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm). Great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above-recommended limits may result to degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after curing surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to normal temperature before performing the second soldering cycle.

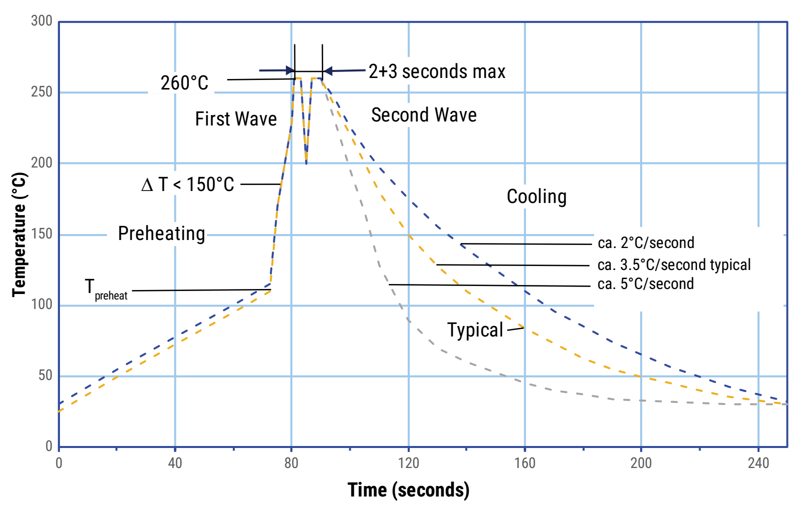
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

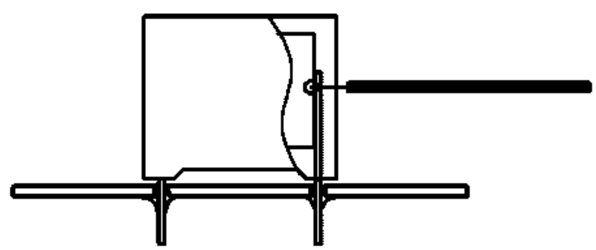
Wave Soldering Recommendations cont.
1. The table indicates the maximum set-up temperature of the soldering process.

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	125°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that the maximum temperature inside the element is below the limit.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	125°C
Paper	160°C
Polyphenylene Sulphide	160°C

Temperature monitored inside the capacitor.

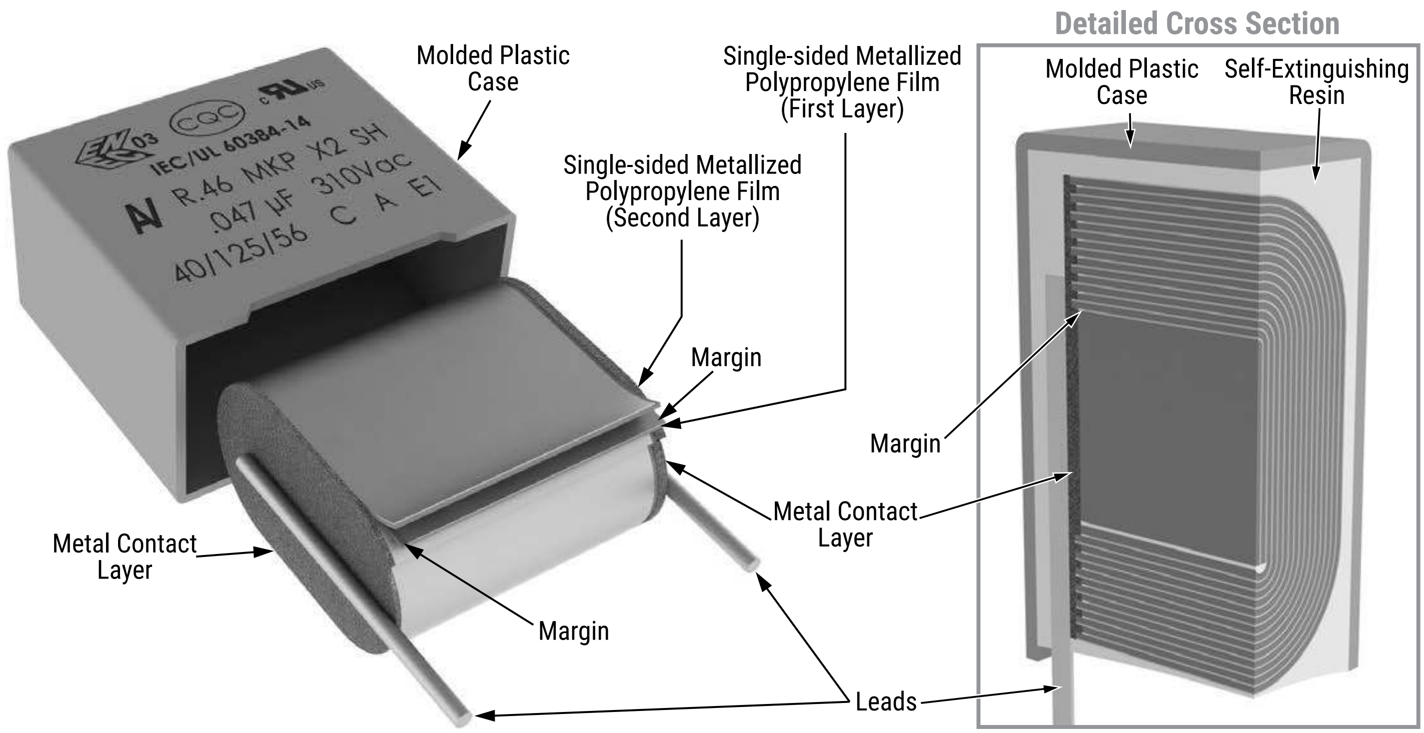


Selective Soldering Recommendations

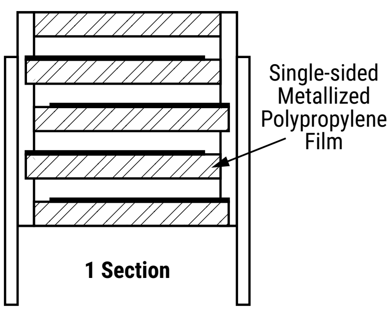
Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as it is in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder, only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 – 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts do not overheat.

Construction

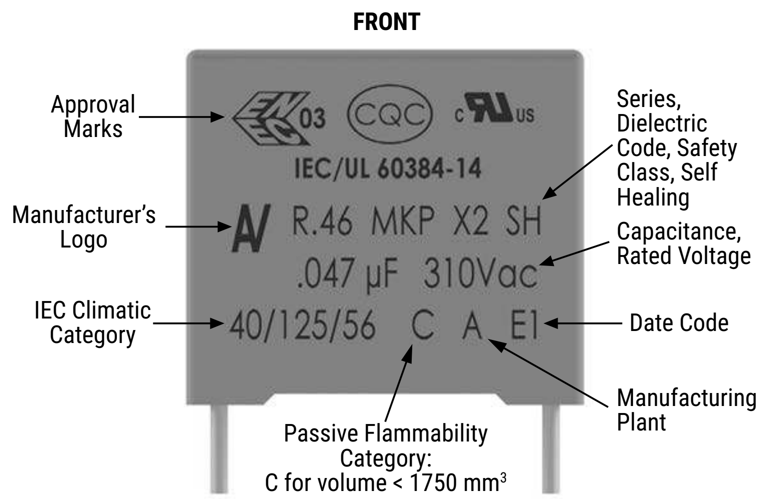


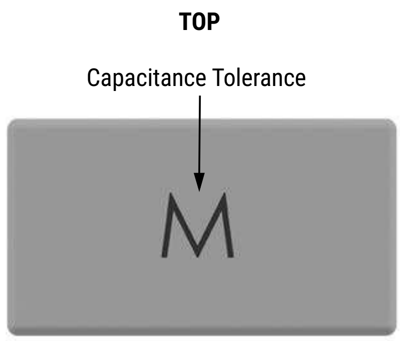
Winding Scheme



Marking

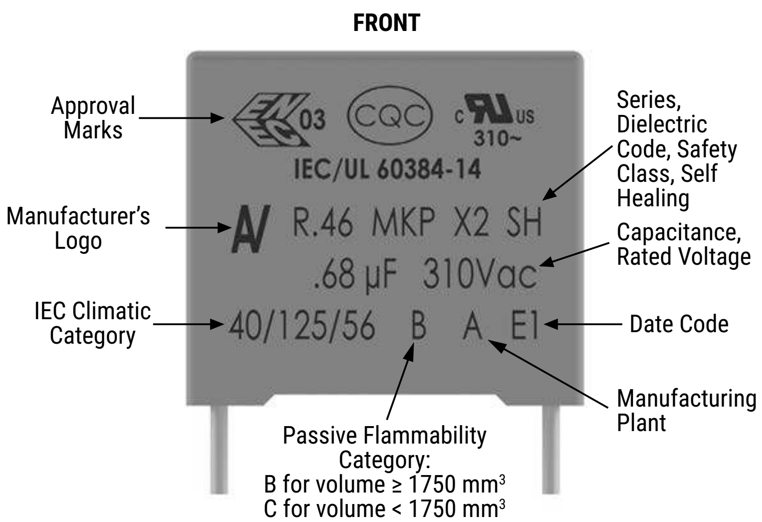
Lead Spacing 10 mm

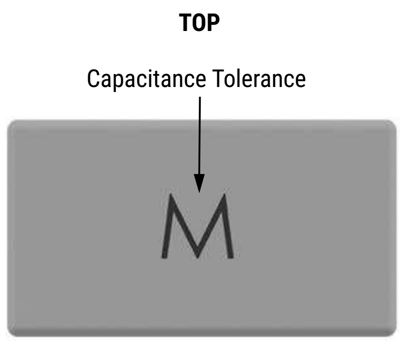




NOTE: Hot imprinting with or without color or ink jet or laser marking

Lead Spacing 15 mm, 22.5 mm, and 27.5 mm





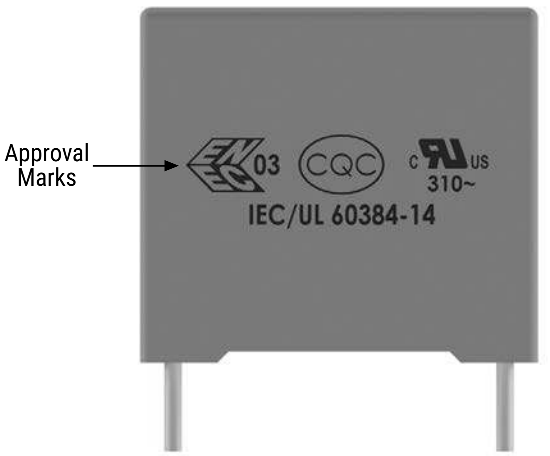
NOTE: Hot imprinting with or without color or ink jet or laser marking

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

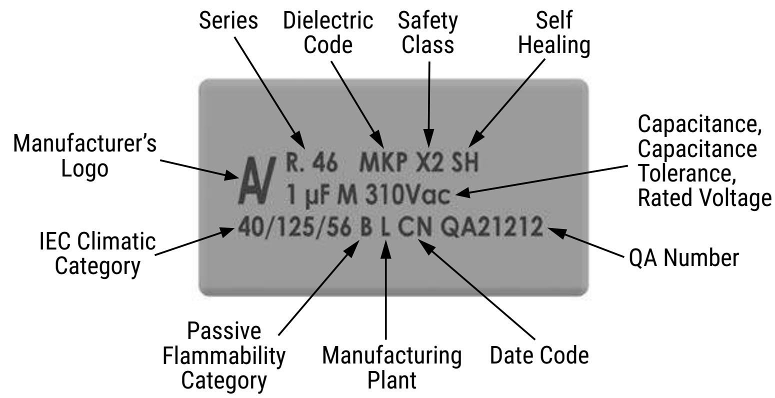
Marking cont.

Lead Spacing 22.5 and 27.5 mm (alternatives*) and 37.5 mm

FRONT



TOP



**Differences are caused by technology (clichee, laser, or ink) and production line.*

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Manufacturing Date Code (IEC 60062)											
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	0
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads		Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped
Lead and Packaging Code:				00 - JA - JB JE - JH	JM	40 – 50	GY	CK	DQ
10	4	9	13	2,000	2,200	1,800	750	1,500	1,000
	5	11	13	1,300	2,000	1,500	600	1,250	800
	6	12	13	1,000	1,800	1,200	500	1,000	680
15	5	11	18	2,000	1,250	1,000	600	1,250	800
	6	12	18	1,750	1,000	900	500	1,000	680
	6	17.5	18	1,000	800	700	500	1,000	680
	7.5	13.5	18	1,000	800	700	350	800	500
	7.5	18.5	18	900	650	500	-	800	500
	8.5	14.5	18	1,000	650	500	300	700	440
	9	12.5	18	1,000	700	520	270	650	410
	10	16	18	750	550	500	270	600	380
	11	19	18	450	400	350	-	500	340
	13	12	18	750	520	490	200	480	280
22.5	6	15	26.5	805	450	500	-	700	464
	7	16	26.5	700	450	500	-	550	380
	10	18.5	26.5	396	350	300	-	350	235
	11	20	26.5	360	200	250	-	350	217
	13	22	26.5	300	150	200	-	300	
27.5	9	17	32	816	408	408	-	450	-
	11	20	32	560	336	336	-	350	-
	13	22	32	480	288	288	-	300	-
	14	28	32	352	176	176	-	-	-
	18	33	32	256	128	128	-	-	-
	22	37	32	168	112	112	-	-	-
37.5	11	22	41.5	420	252	252	-	-	-
	13	24	41.5	360	216	216	-	-	-
	16	28.5	41.5	216	108	108	-	-	-
	19	32	41.5	192	96	96	-	-	-
	20	40	41.5	126	84	84	-	-	-
	24	44	41.5	108	72	72	-	-	-
	30	45	41.5	90	60	60	-	-	-

Lead Taping & Packaging (IEC 60286–2)

Figure 1
Lead Spacing 10 mm

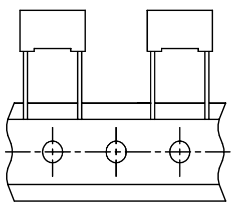


Figure 2
Lead Spacing 15 mm

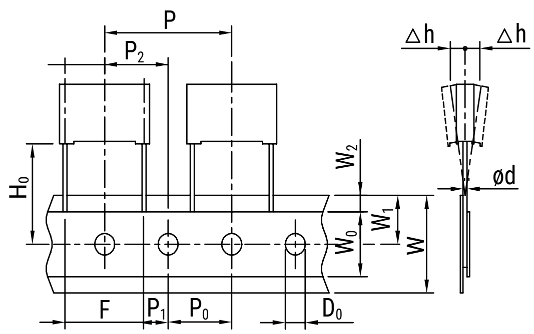
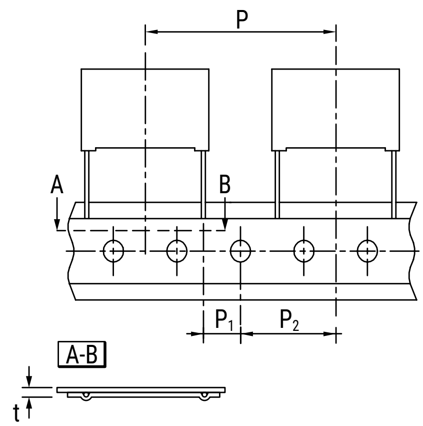


Figure 3
Lead Spacing 22.5 – 27.5 mm



Taping Specification

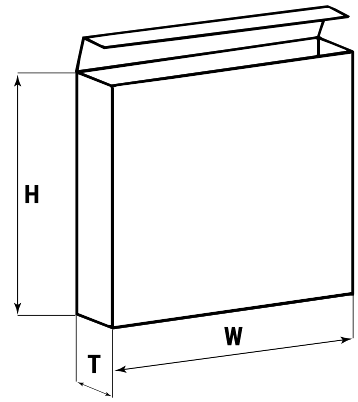
Description	Symbol	Dimensions (mm)				
		Lead Space				Tol.
		10	15	22.5	27.5	
		Fig. 1	Fig. 2	Fig. 3	Fig. 3	
Lead wire diameter	d	0.6	0.6–0.8	0.8	0.8	±0.05
Taping lead space	P	25.4	25.4	38.1	38.1	±1
Feed hole lead space *	P_0	12.7	12.7	12.7	12.7	±0.2 **
Centering of the lead wire	P_1	7.7	5.2	7.8	5.3	±0.7
Centering of the body	P_2	12.7	12.7	19.05	19.05	±1.3
Lead spacing (pitch) ***	F	10	15	22.5	27.5	+0.6/−0.1
Component alignment	Δh	0	0	0	0	±2
Height of component from tape center	H_0 ****	18.5	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	18	+1/−0.5
Hold down tape width	W_0	9	10	10	10	Minimum
Hole position	W_1	9	9	9	9	±0.5
Hold down tape position	W_2	3	3	3	3	Maximum
Feed hole diameter	D_0	4	4	4	4	±0.2
Total tape thickness	t	0.7	0.7	0.7	0.7	±0.2

** 15 mm also available*
*** Maximum of 1 mm on 20 lead spaces*
**** Pitches 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request*
***** H_0 = 16.5 mm is available upon request*

Lead Taping & Packaging (IEC 60286–2) cont.

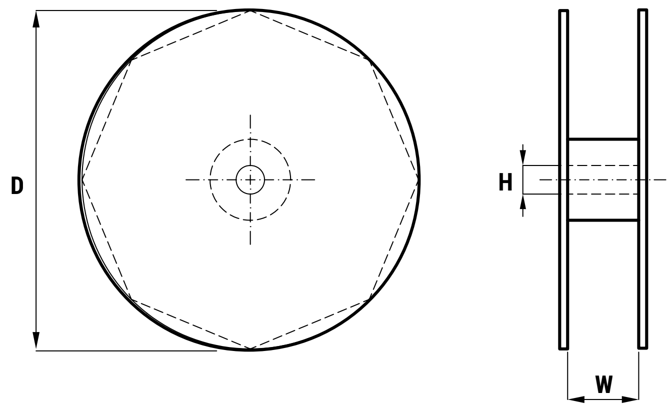
Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



Reel Specifications

Reel Size	Dimensions (mm)		
	D	H	W
Standard	355	30	55 Maximum
Large	500	25	



R52 (Miniature), Class X2, 310 VAC, 110°C (Automotive Grade)

Overview

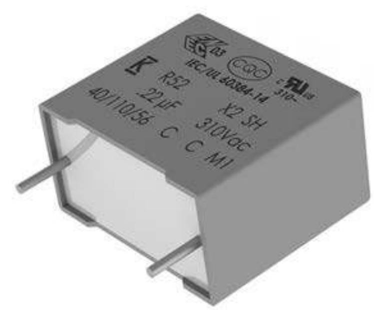
The R52 series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material that meets the requirements of UL 94 V–0. The R52 Series is ideal for harsh environmental conditions and meets the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

Applications

For worldwide use in electromagnetic interference (EMI) suppression in across-the-line applications that require X2 safety classification. Intended for use in situations in which capacitor failure would not result in exposure to electric shock. Typical applications include connection in series with the mains, capacitive power supplies and energy meters, with special emphasis in automotive applications for severe ambient conditions.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- X2 CLASS (IEC 60384-14)
- THB Grade IIB: 85°C, 85% RH, 500 hours at URAC acc. to IEC 60384-14
- Rated voltage: 310 VAC 50/60 Hz
- Capacitance range: 0.047 – 22 µF
- Lead spacing: 10.0 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category 40/110/56, IEC 60068-1
- Tape & Reel in accordance with IEC 60286-2
- RoHS compliant and lead-free terminations
- Operating temperature range of −40°C to +110°C
- 100% screening factory test at 1,900 VDC
- Self healing properties
- Automotive (AEC-Q200) grade



Simulator Tool and Lifetime Expectancy model available online:

K-SIM **K-LEM**

Part Number System

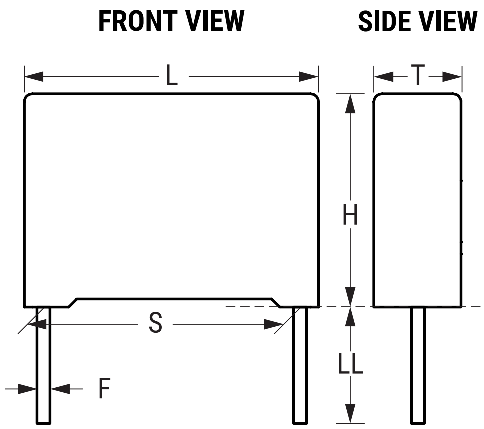
R52	3	I	3470	00	P0	M
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance
X2, Metallized Polypropylene	3 = 310	F = 10.0 I = 15.0 N = 22.5 R = 27.5 W = 37.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	See Ordering Options Table	P0 P1 P2 P3	K = ±10% M = ±20%

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
10 15 22.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/-0	00
	Pizza Pack – Short Leads	4 +2/-0	BB
	Ammo Pack	H_0 = 18.5 ±0.5	DQ[1]
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	CK
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	GY[1]
	Bulk (Bag)[2] – Short Leads	2.7 +0.5/-0	JA
	Bulk (Bag)[2] – Short Leads	3.5 +0.5/-0	JB
	Bulk (Bag)[2] – Short Leads	4.0 +0.5/-0	JE
	Bulk (Bag)[2] – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Bag) – Long Leads	18 ±1	JM
	Bulk (Bag) – Long Leads	30 +5/-0	40
	Bulk (Bag) – Long Leads	25 +2/-1	50
27.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/-0	00
	Pizza Pack – Short Leads	4 +2/-0	BB
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK[1]
	Other Lead and Packaging Options		
	Bulk (Tray) – Short Leads	2.7 +0.5/-0	JA
	Bulk (Tray) – Short Leads	3.5 +0.5/-0	JB
	Bulk (Tray) – Short Leads	4.0 +0.5/-0	JE
	Bulk (Tray) – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Tray) – Long Leads	18 ±1	JM
	Bulk (Tray) – Long Leads	30 +5/-0	40
	Bulk (Tray) – Long Leads	25 +2/-1	50
37.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/-0	00
	Pizza Pack – Short Leads	4 +2/-0	BB
	Other Lead and Packaging Options		
	Bulk (Tray) – Short Leads	2.7 +0.5/-0	JA
	Bulk (Tray) – Short Leads	3.5 +0.5/-0	JB
	Bulk (Tray) – Short Leads	4.0 +0.5/-0	JE
	Bulk (Tray) – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Tray) – Long Leads	18 ±1	JM
	Bulk (Tray) – Long Leads	30 +5/-0	40
	Bulk (Tray) – Long Leads	25 +2/-1	50

[1] *Not for all sizes, see "Packaging Quantities" table.*
[2] *For lead spacing 22.5 case sizes ≥ 8.5*17*26.5 the parts are packed in a Pizza box 335*320*34 mm*

Dimensions – Millimeters



S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
10.0	±0.4	4.0	+0.3/−0.5	9.0	+0.3/−0.5	13.0	+0.3/−0.5	0.6	±0.05
10.0	±0.4	5.0	+0.3/−0.5	11.0	+0.3/−0.5	13.0	+0.3/−0.5	0.6	±0.05
10.0	±0.4	6.0	+0.3/−0.5	12.0	+0.3/−0.5	13.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	5.0	+0.2/−0.5	11.0	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	6.0	+0.2/−0.5	12.0	+0.1/−0.5	18.0	+0.3/−0.5	0.6	±0.05
15.0	±0.4	7.5	+0.2/−0.5	13.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	7.5	+0.2/−0.5	18.5	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	±0.4	8.5	+0.2/−0.5	14.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	9.0	+0.2/−0.5	12.5	+0.1/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	10.0	+0.2/−0.5	16.0	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	±0.4	11.0	+0.2/−0.5	19.0	+0.1/−0.5	18.0	+0.5/−0.5	0.8	±0.05
22.5	±0.4	7.0	+0.2/−0.5	16.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	8.5	+0.2/−0.5	17.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	10.0	+0.2/−0.5	18.5	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	11.0	+0.2/−0.5	20.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	13.0	+0.2/−0.5	22.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
27.5	±0.4	9.0	+0.2/−0.7	17.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	11.0	+0.2/−0.7	20.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	13.0	+0.2/−0.7	22.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	14.0	+0.2/−0.7	28.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	16.0	+0.2/−0.7	30.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	18.0	+0.2/−0.7	33.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
27.5	±0.4	22.0	+0.2/−0.7	37.0	+0.1/−0.7	32.0	+0.3/−0.7	0.8	±0.05
37.5	±0.4	11.0	+0.3/−0.7	22.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	13.0	+0.3/−0.7	24.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	16.0	+0.3/−0.7	28.5	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	19.0	+0.3/−0.7	32.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	20.0	+0.3/−0.7	40.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	24.0	+0.3/−0.7	44.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05
37.5	±0.4	30.0	+0.3/−0.7	45.0	+0.1/−0.7	41.5	+0.3/−0.7	1.0	±0.05

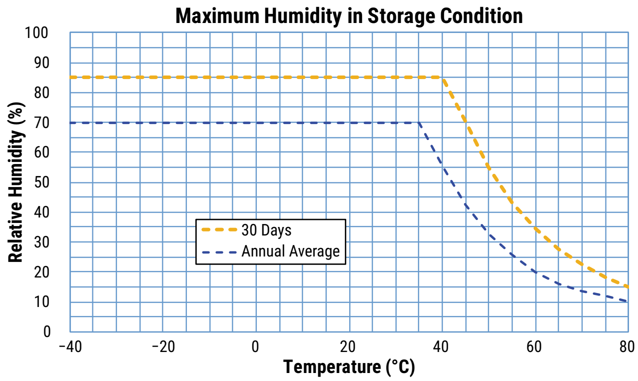
Note: See Ordering Options Table for lead length (LL/H_0) options.

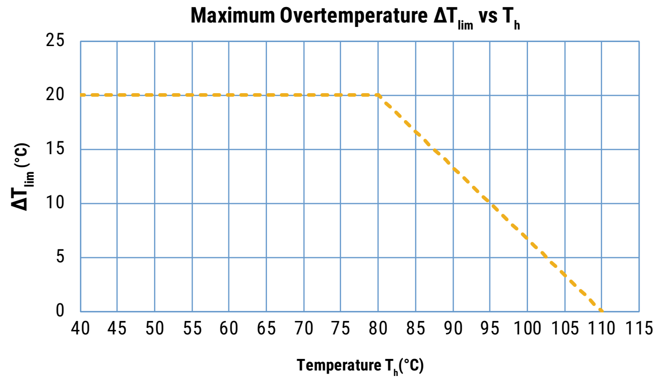
Performance Characteristics

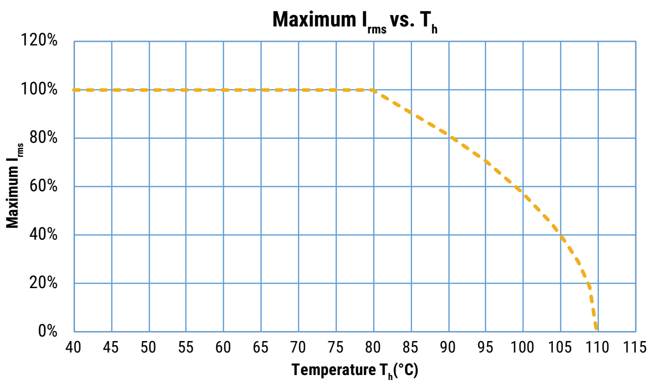
<table>
<tr><td>Dielectric</td><td colspan="4">Polypropylene film</td></tr>
<tr><td>Plates</td><td colspan="4">Metal layer deposited by evaporation under vacuum</td></tr>
<tr><td>Winding</td><td colspan="4">Non-inductive type</td></tr>
<tr><td>Leads</td><td colspan="4">Tinned wire</td></tr>
<tr><td>Protection</td><td colspan="4">Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94.</td></tr>
<tr><td>Related Documents</td><td colspan="4">IEC 60384-14, EN 60384-14</td></tr>
<tr><td>Rated Voltage V_R</td><td colspan="4">310 VAC (50/60 Hz)</td></tr>
<tr><td>Recommended DC Voltage</td><td colspan="4">≤ 630 VDC</td></tr>
<tr><td>Capacitance Range</td><td colspan="4">0.047 – 22 µF</td></tr>
<tr><td>Capacitance Values</td><td colspan="4">E6 series (IEC 60063) measured at 1 kHz and +20 ±1°C</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="4">±10%, ±20%</td></tr>
<tr><td>Temperature Range</td><td colspan="4">−40°C to +110°C</td></tr>
<tr><td>Climatic Category</td><td colspan="4">40/110/56 IEC 60068-1</td></tr>
<tr><td rowspan="5">Storage Conditions</td><td colspan="4">Storage time: ≤ 24 months from the date marked on the label package</td></tr>
<tr><td colspan="4">Average relative humidity per year ≤ 70%</td></tr>
<tr><td colspan="4">RH ≤ 85% for 30 days randomly distributed throughout the year</td></tr>
<tr><td colspan="4">Dew is absent</td></tr>
<tr><td colspan="4">Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)</td></tr>
<tr><td>Approvals</td><td colspan="4">ENEC, UL, cUL, CQC</td></tr>
<tr><td rowspan="2">Dissipation Factor (tanδ)
at 1 kHz at 25 °C ±5°C</td><td colspan="2">C ≤ 0.1 µF</td><td colspan="2">C > 0.1 µF</td></tr>
<tr><td colspan="2">0.3%</td><td colspan="2">0.2%</td></tr>
<tr><td>Test Voltage Between Terminals</td><td colspan="4">The 100% screening factory test is carried out at 1,900 VDC.
The voltage level is selected to meet the requirements in applicable equipment standards.
All electrical characteristics are checked after the test. This test cannot be repeated, as there is a risk of damaging the capacitor. KEMET is not liable in such cases for any failures.</td></tr>
<tr><td rowspan="4">Insulation Resistance</td><td colspan="4">Measured at +25°C ±5°C, according to IEC 60384−2</td></tr>
<tr><td colspan="4">Minimum Values Between Terminals</td></tr>
<tr><td>Voltage Charge</td><td>Voltage Charge Time</td><td>C ≤ 0.33 µF</td><td>C > 0.33 µF</td></tr>
<tr><td>100 VDC</td><td>1 minute</td><td>≥ 1 • 10^5 MΩ
(≥ 5 • 10^5 MΩ)*</td><td>≥ 30,000 MΩ • µF
(≥ 150,000 MΩ • µF)*</td></tr>
</table>

** Typical value*

Performance Characteristics cont.

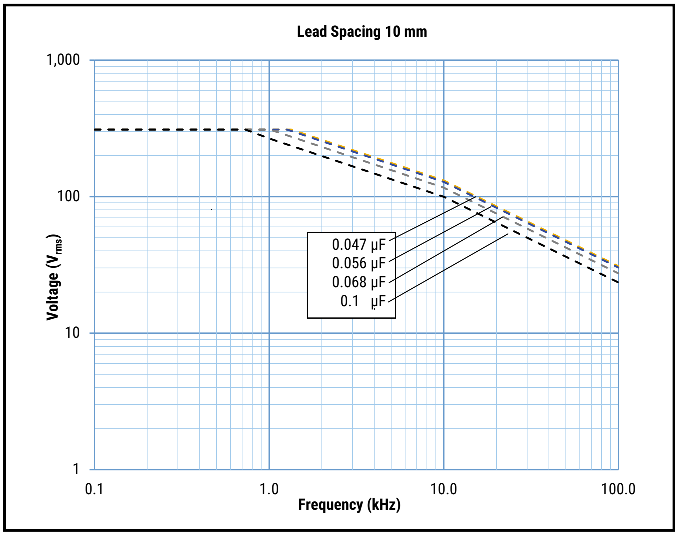


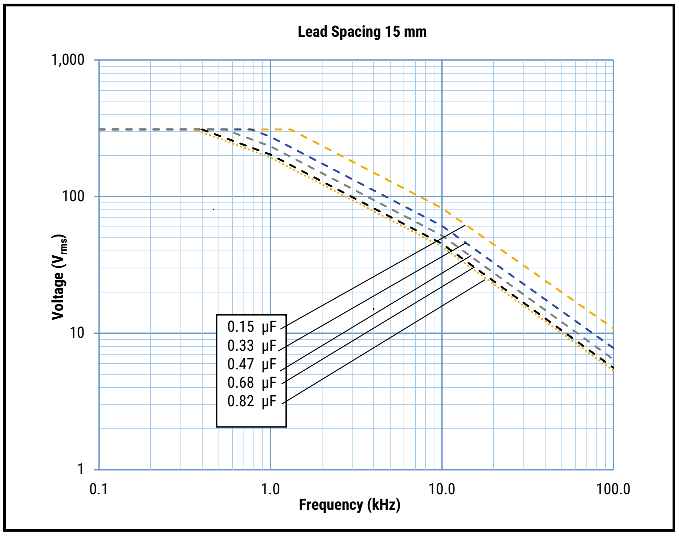


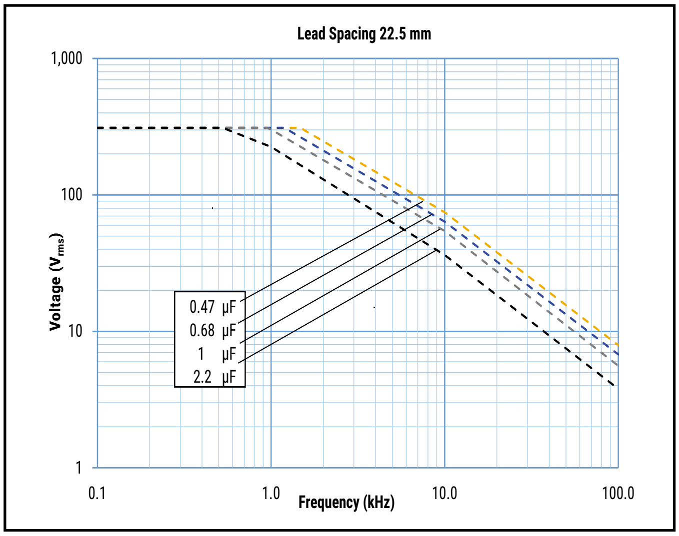


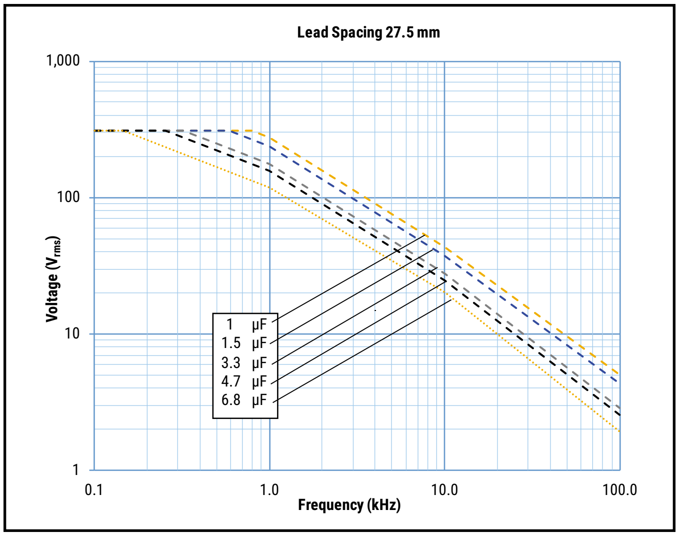
T_h is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

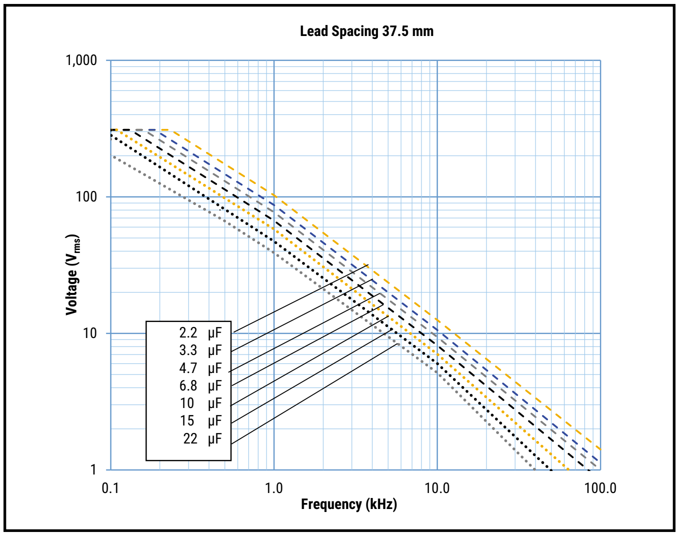
Maximum Voltage (V_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 80°C)



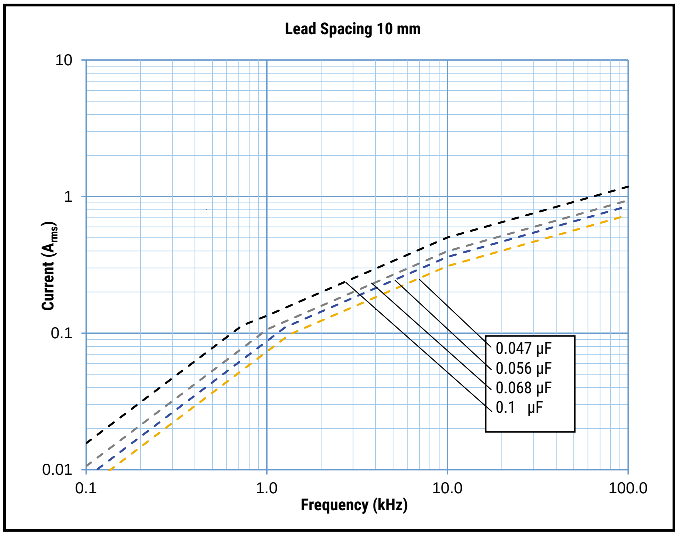


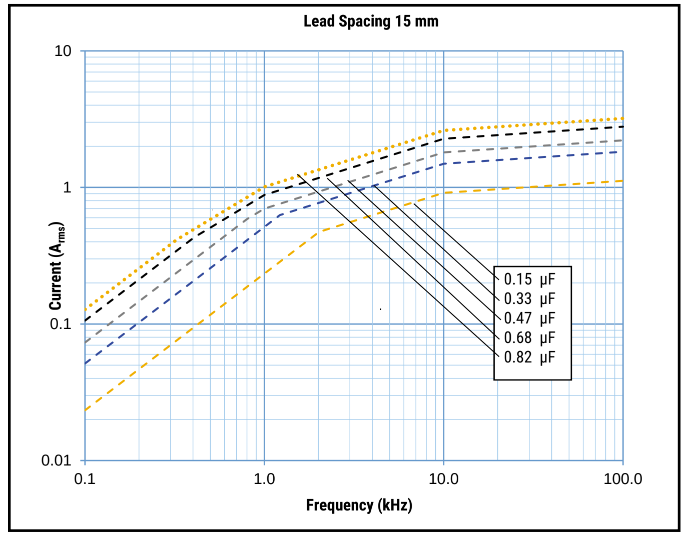


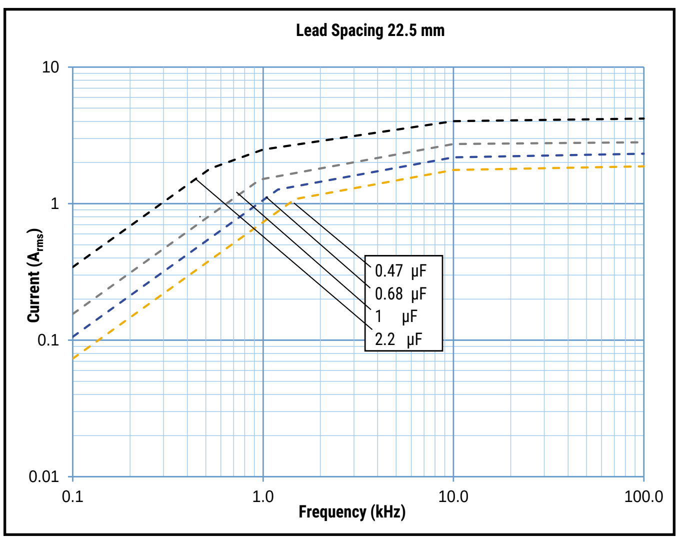


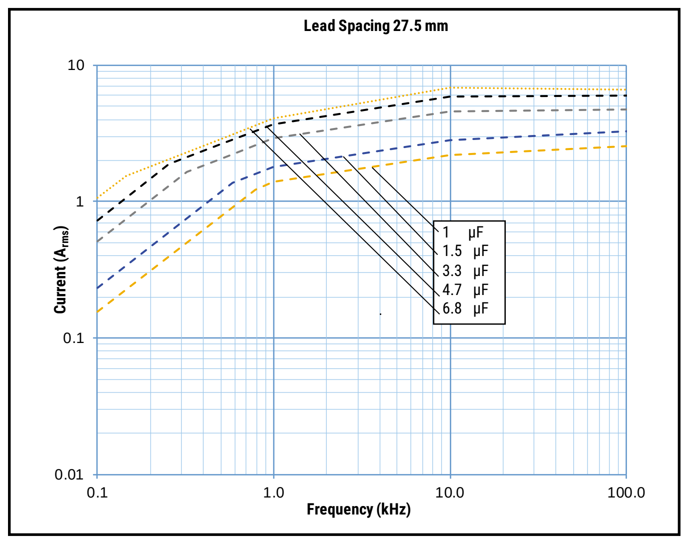


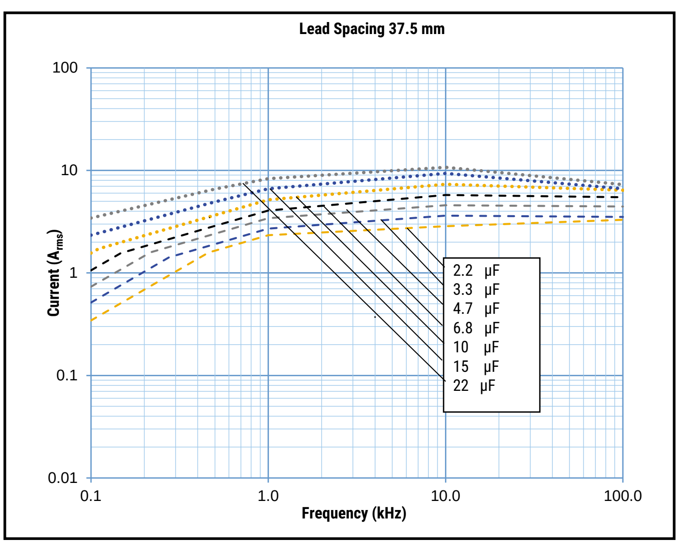
Maximum Current (I_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 80°C)











Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384-14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Vibration	MIL-STD-202 Method 204	5 G for 20 minutes, 12 cycles each of 3 orientations. Use 8" X 5" PCB, 0.031" thick. 7 secure points on one 8" side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10 – 2,000 Hz.
Mechanical Shock	MIL-STD-202 Method 213	Figure 1 of Method 213. Condition C
Temperature Cycling	JESD22-Method JA-104	1,000 cycles (−40°C to 110°C) Note: Measurement at 24 ±4 hours after test conclusion. 30 minute maximum dwell time at each temperature extreme. 1 minute maximum transition time.
Active Flammability	IEC 60384-14	V_R + 20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384-14	IEC 60384–1, IEC 60695–11–5 Needle flame test
Biased Humidity		85°C/85% RH and 240 VAC, 1,000 hours Capacitance change (ΔC/C): ≤ 10% Dissipation factor change (Δtan δ): ≤ 15 * 10^{-3} (at 1 kHz) Insulation resistance Rins or time constant τ = CR Rins: ≥ 50% of initial limit
	According to Grade IIB	85°C/85% RH and 310 VAC, 500 hours Capacitance change (ΔC/C): ≤ 10% Dissipation factor change (Δtan δ): ≤ 24 * 10^{-3} (at 10 kHz) for C ≤ 1 µF Dissipation factor change (Δtan δ): ≤ 15 * 10^{-3} (at 1 kHz) for C > 1 µF Insulation resistance Rins or time constant τ = CR Rins: ≥ 50% of initial limit

Approvals

Certification Body	Mark	Specification	File Number
IMQ S-p.A.		EN/IEC 60384–14	CA08.00231
UL		UL 60384–14 and CAN/CSA E60384–14 (310 VAC)	E97797
CQC		IEC 60384–14	CQC20001263098 CQC20001263100 CQC20001263101 CQC20001263102 CQC20001263103

Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.

RoHS

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Dimensions in mm T	Dimensions in mm H	Dimensions in mm L	Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Legacy Part Number
0.047	4.0	9.0	13.0	10.0	500	523F2470(1)P0(2)	R523F2470(1)P0(2)
0.056	5.0	11.0	13.0	10.0	500	523F2560(1)P0(2)	R523F2560(1)P0(2)
0.068	5.0	11.0	13.0	10.0	500	523F2680(1)P0(2)	R523F2680(1)P0(2)
0.10	6.0	12.0	13.0	10.0	500	523F3100(1)P0(2)	R523F3100(1)P0(2)
0.10	5.0	11.0	18.0	15.0	400	523I3100(1)P0(2)	R523I3100(1)P0(2)
0.15	5.0	11.0	18.0	15.0	400	523I3150(1)P0(2)	R523I3150(1)P0(2)
0.22	6.0	12.0	18.0	15.0	400	523I3220(1)P0(2)	R523I3220(1)P0(2)
0.33	7.5	13.5	18.0	15.0	400	523I3330(1)P0(2)	R523I3330(1)P0(2)
0.33	9.0	12.5	18.0	15.0	400	523I3330(1)P1(2)	R523I3330(1)P1(2)
0.47	8.5	14.5	18.0	15.0	400	523I3470(1)P0(2)	R523I3470(1)P0(2)
0.47	9.0	12.5	18.0	15.0	400	523I3470(1)P1(3)	R523I3470(1)P1(3)
0.47	7.5	18.5	18.0	15.0	400	523I3470(1)P3(2)	R523I3470(1)P3(2)
0.56	10.0	16.0	18.0	15.0	400	523I3560(1)P0(2)	R523I3560(1)P0(2)
0.68	10.0	16.0	18.0	15.0	400	523I3680(1)P1(3)	R523I3680(1)P1(3)
0.68	11.0	19.0	18.0	15.0	400	523I3680(1)P0(2)	R523I3680(1)P0(2)
0.82	11.0	19.0	18.0	15.0	400	523I3820(1)P0(3)	R523I3820(1)P0(3)
1.0	12.0	20.0	18.0	15.0	400	523I4100(1)P0(3)	R523I4100(1)P0(3)
0.47	7.0	16.0	26.5	22.5	200	523N3470(1)P0(2)	R523N3470(1)P0(2)
0.56	7.0	16.0	26.5	22.5	200	523N3560(1)P0(2)	R523N3560(1)P0(2)
0.68	7.0	16.0	26.5	22.5	200	523N3680(1)P0(2)	R523N3680(1)P0(2)
0.82	8.5	17.0	26.5	22.5	200	523N3820(1)P0(2)	R523N3820(1)P0(2)
1.0	8.5	17.0	26.5	22.5	200	523N4100(1)P1(3)	R523N4100(1)P1(3)
1.0	10.0	18.5	26.5	22.5	200	523N4100(1)P0(2)	R523N4100(1)P0(2)
1.5	10.0	18.5	26.5	22.5	200	523N4150(1)P1(3)	R523N4150(1)P1(3)
1.5	11.0	20.0	26.5	22.5	200	523N4150(1)P0(2)	R523N4150(1)P0(2)
2.2	13.0	22.0	26.5	22.5	200	523N4220(1)P0(3)	R523N4220(1)P0(3)
1.0	9.0	17.0	32.0	27.5	150	523R4100(1)P0(2)	R523R4100(1)P0(2)
1.5	11.0	20.0	32.0	27.5	150	523R4150(1)P0(2)	R523R4150(1)P0(2)
2.2	13.0	22.0	32.0	27.5	150	523R4220(1)P0(2)	R523R4220(1)P0(2)
3.3	14.0	28.0	32.0	27.5	150	523R4330(1)P0(2)	R523R4330(1)P0(2)
4.7	14.0	28.0	32.0	27.5	150	523R4470(1)P1(3)	R523R4470(1)P1(3)
4.7	16.0	30.0	32.0	27.5	150	523R4470(1)P2(2)	R523R4470(1)P2(2)
4.7	18.0	33.0	32.0	27.5	150	523R4470(1)P0(2)	R523R4470(1)P0(2)
6.8	22.0	37.0	32.0	27.5	150	523R4680(1)P0(2)	R523R4680(1)P0(2)
2.2	11.0	22.0	41.5	37.5	100	523W4220(1)P0(2)	R523W4220(1)P0(2)
3.3	13.0	24.0	41.5	37.5	100	523W4330(1)P0(2)	R523W4330(1)P0(2)
4.7	16.0	28.5	41.5	37.5	100	523W4470(1)P0(2)	R523W4470(1)P0(2)
6.8	19.0	32.0	41.5	37.5	100	523W4680(1)P0(2)	R523W4680(1)P0(2)
10.0	20.0	40.0	41.5	37.5	100	523W5100(1)P0(2)	R523W5100(1)P0(2)
15.0	24.0	44.0	41.5	37.5	100	523W5150(1)P0(2)	R523W5150(1)P0(2)
22.0	30.0	45.0	41.5	37.5	100	523W5220(1)P0(2)	R523W5220(1)P0(2)
Capacitance Value (µF)	**B (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (p)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) M = ±20%, K = ±10%
(3) M = ±20% (only available tolerance).

Soldering Process

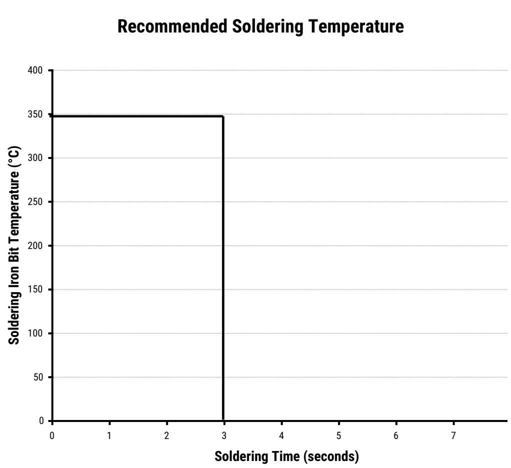
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder material. This has increased the liquidus temperature from 183°C for SnPb eutectic alloys to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm). Great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above-recommended limits may result to degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after curing surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to normal temperature before performing the second soldering cycle.

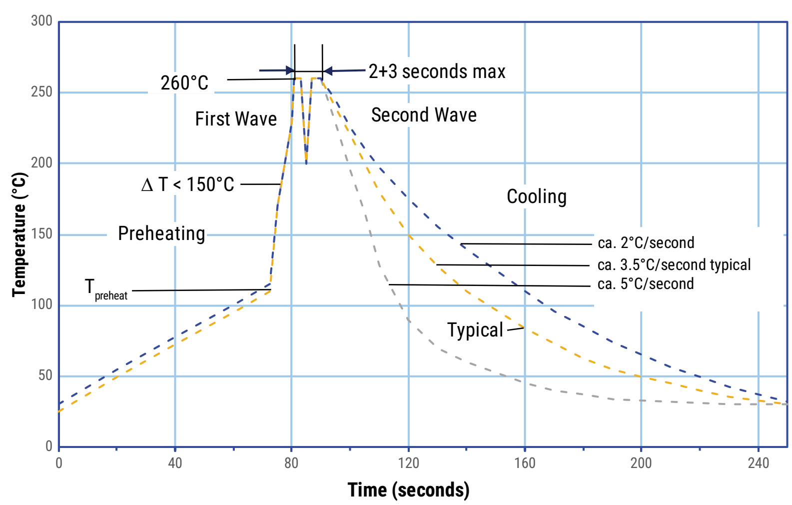
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

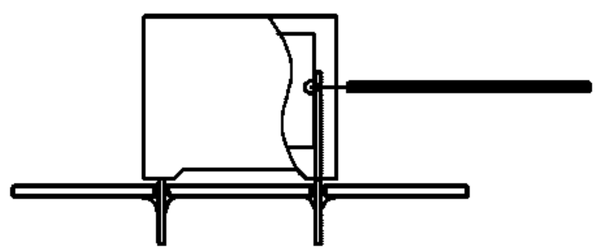
1. The table indicates the maximum set-up temperature of the soldering process.

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that the maximum temperature inside the element is below the limit.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C

Temperature monitored inside the capacitor.



Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as it is in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder, only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 – 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts do not overheat.

Mounting

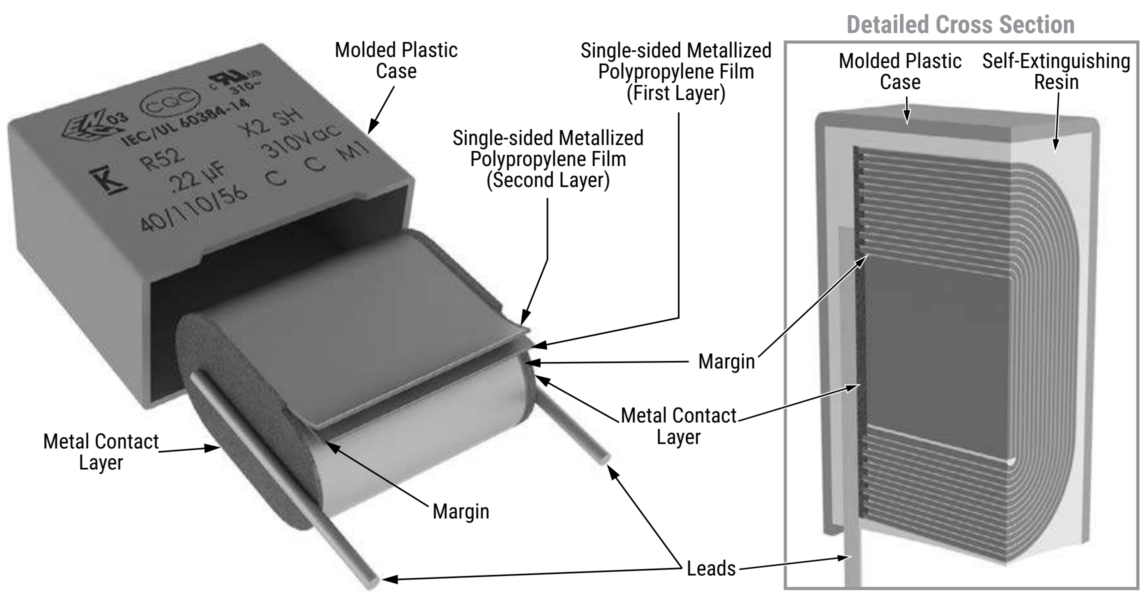
Resistance to Vibration and Mechanical Shock

AEC-Q200 Rev. E, Mechanical Stress Tests:

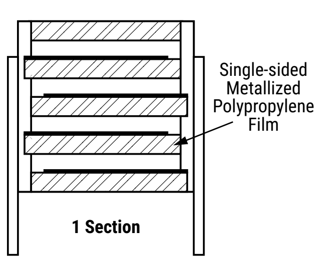
Mechanical Shock	**MIL-SDT-202 Method 213**	Figure 1 of Method 213 • THT: Condition C • SMD: Condition C • Tested per the Supplier's recommended mounting method
Vibration	**MIL-SDT-202 Method 204**	• 5 g for 20 minutes, 12 cycles each of 3 orientations • Tested per the Supplier's recommended mounting method • Verification of transfer load: during setup, verify that with the selected PCB design (size, thickness and secure points), or an alternative mount, that the transferred load onto the component corresponds to the requested load. This verification can be achieved using a laser vibrometer or other adequate measuring device • Test from 10 Hz – 2,000 Hz.

The capacitors are designed for PCB mounting. The stand-off pipes must be in good contact with the printed circuit board. The capacitor body has to be properly fixed (e.g. clamped or glued).

Construction



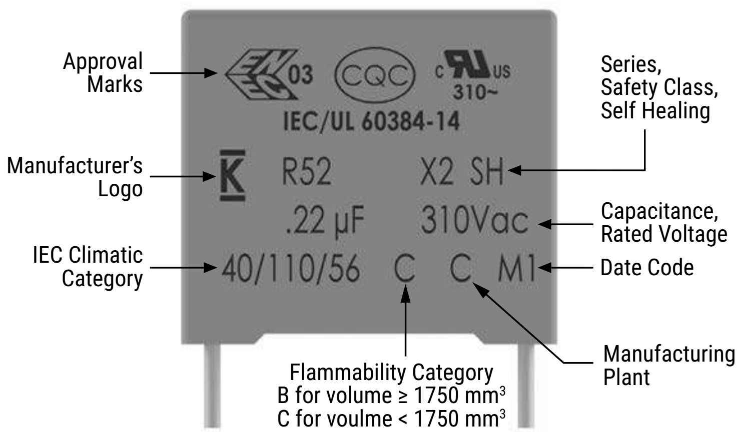
Winding Scheme



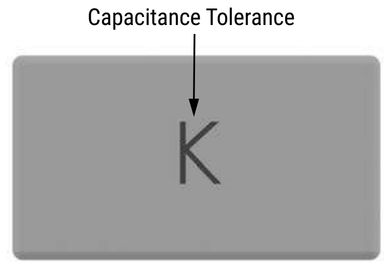
Marking

Lead Spacing 15 mm, 22.5 mm, and 27.5 mm

FRONT



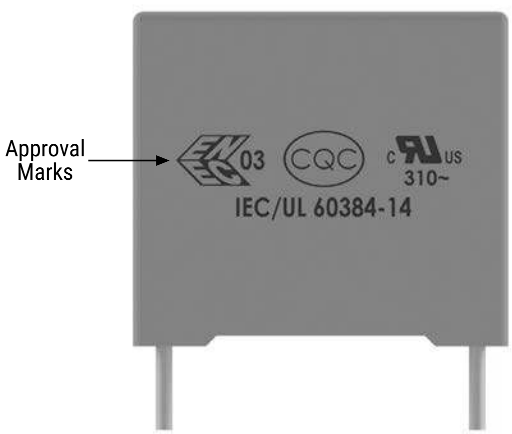
TOP



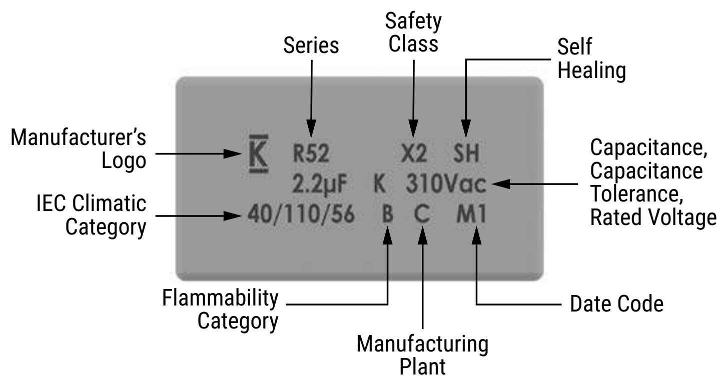
NOTE: Hot imprinting with or without color or ink jet or laser marking

Lead Spacing 22.5, 27.5 mm (alternatives*) and 37.5 mm

FRONT



TOP

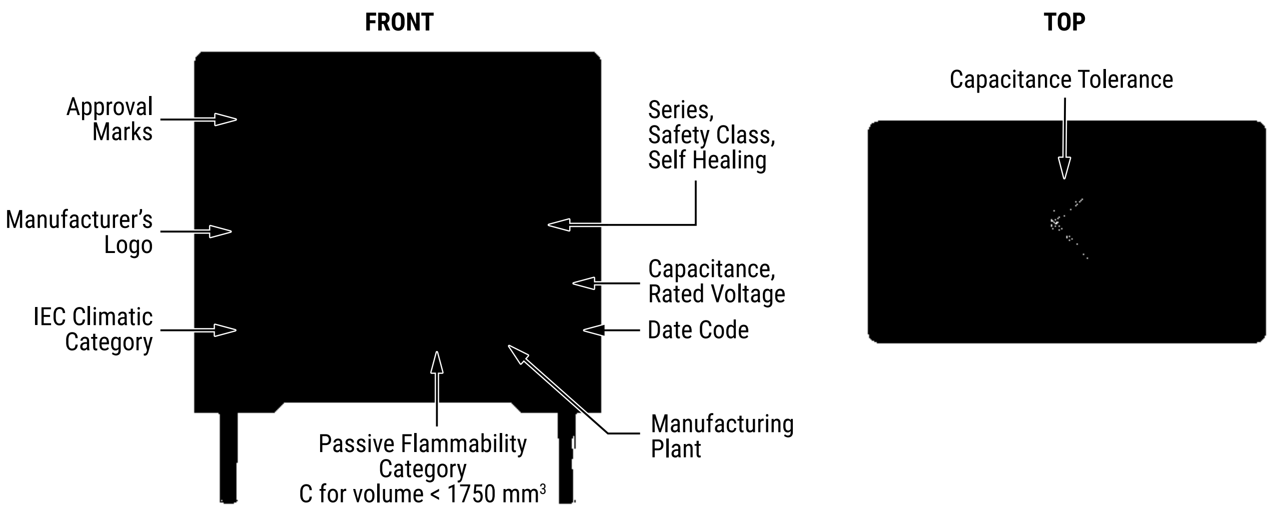


**Differences are caused by technology (clichee, laser, or ink) and production line.*

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Marking cont.

Lead Spacing 10 mm



Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads		Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped	Pizza
Lead and Packaging Code:				00 - JA - JB JE - JH	JM	40 – 50	GY	CK	DQ	BB
10	4	9	13	2,000	2,200	1,800	750	1,500	1000	-
	5	11	13	1,300	2,000	1,500	600	1,250	800	-
	6	12	13	1,000	1,800	1,200	500	1000	680	-
15	5	11	18	2,000	1,250	1,000	600	1,250	800	1,122
	6	12	18	1,750	1,000	900	500	1,000	680	935
	7.5	13.5	18	1,000	800	700	350	800	500	748
	7.5	18.5	18	900	650	500	-	800	500	748
	8.5	14.5	18	1,000	650	500	300	700	440	663
	9	12.5	18	1,000	700	520	270	650	410	612
	10	16	18	750	550	500	270	600	380	561
	11	19	18	450	400	350	-	500	340	510
	12	20	18	400	350	350	220	450	300	459
22.5	7	16	26.5	700	450	500	-	550	380	564
	8.5	17	26.5	468	350	300	-	450	280	468
	10	18.5	26.5	396	350	300	-	350	235	396
	11	20	26.5	360	200	250	-	350	217	360
	13	22	26.5	300	150	200	-	300	-	300
27.5	9	17	32	816	408	408	-	450	-	370
	11	20	32	560	336	336	-	350	-	300
	13	22	32	480	288	288	-	300	-	250
	14	28	32	352	176	176	-	-	-	230
	16	30	32	288	144	144	-	-	-	200
	18	33	32	256	128	128	-	-	-	170
	22	37	32	168	112	112	-	-	-	150
37.5	11	22	41.5	420	252	252	-	-	-	210
	13	24	41.5	360	216	216	-	-	-	175
	16	28.5	41.5	216	108	108	-	-	-	140
	19	32	41.5	192	96	96	-	-	-	119
	20	40	41.5	126	84	84	-	-	-	112
	24	44	41.5	108	72	72	-	-	-	91
	30	45	41.5	90	60	60	-	-	-	77

Lead Taping & Packaging (IEC 60286–2)

Figure 1
Lead Spacing 10 mm

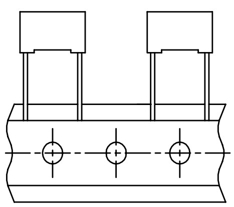


Figure 2
Lead Spacing 15 mm

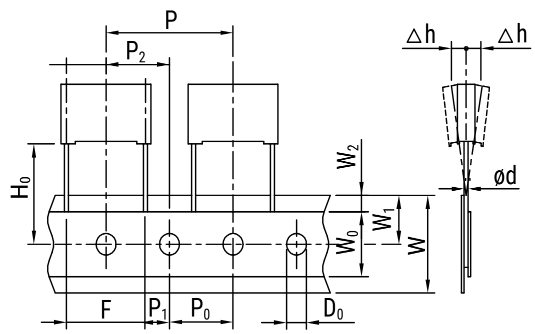
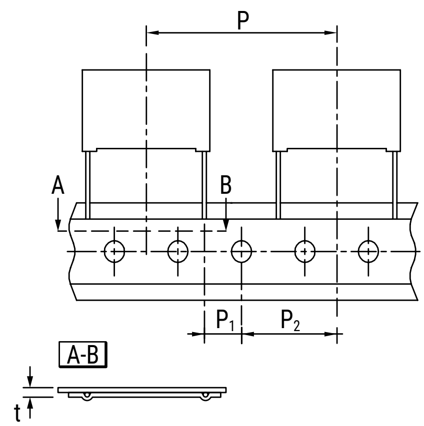


Figure 3
Lead Spacing 22.5 – 27.5 mm



Taping Specification

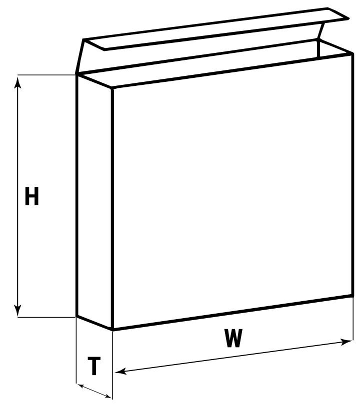
Description	Symbol	Dimensions (mm)				
		Lead Space				Tol.
		10	15	22.5	27.5	
		Fig. 1	Fig. 2	Fig. 3	Fig. 3	
Lead wire diameter	d	0.6	0.6−0.8	0.8	0.8	±0.05
Taping lead space	P	25.4	25.4	38.1	38.1	±1
Feed hole lead space *	P_0	12.7	12.7	12.7	12.7	±0.2 **
Centering of the lead wire	P_1	7.7	5.2	7.8	5.3	±0.7
Centering of the body	P_2	12.7	12.7	19.05	19.05	±1.3
Lead spacing (pitch) ***	F	10	15	22.5	27.5	+0.6/−0.1
Component alignment	Δh	0	0	0	0	±2
Height of component from tape center	H_0 ****	18.5	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	18	+1/−0.5
Hold down tape width	W_0	9	10	10	10	Minimum
Hole position	W_1	9	9	9	9	±0.5
Hold down tape position	W_2	3	3	3	3	Maximum
Feed hole diameter	D_0	4	4	4	4	±0.2
Total tape thickness	t	0.7	0.7	0.7	0.7	±0.2

** 15 mm also available*
*** Maximum of 1 mm on 20 lead spaces*
**** Pitches 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request*
***** H_0 = 16.5 mm is available upon request*

Lead Taping & Packaging (IEC 60286–2) cont.

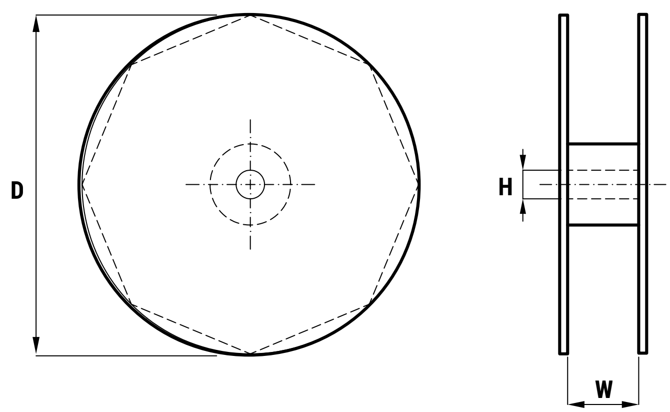
Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



Reel Specifications

Reel Size	Dimensions (mm)		
	D	H	W
Standard	355	30	55 Maximum
Large	500	25	



R53 (Miniature), THB Grade IIIB, Class X2, 310 VAC, 110°C (Automotive Grade)

Overview

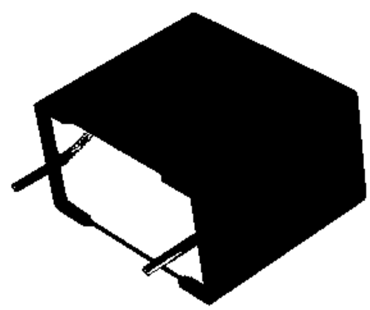
The R53 series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material that meets the requirements of UL 94 V–0. The R53 series is ideal for harsh environmental conditions and meets the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

Applications

For worldwide use in electromagnetic interference (EMI) suppression in across-the-line applications that require X2 safety classification. Intended for use in situations in which capacitor failure would not result in exposure to electric shock. Typical applications include connection in series with the mains, capacitive power supplies and energy meters, with special emphasis in automotive applications for severe ambient conditions such as On Board Chargers.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- X2 CLASS (IEC 60384-14)
- THB Grade IIIB: 85°C, 85% RH, 1,000 hours at 310 VAC acc. to IEC 60384-14
- THB Grade IIIB: 85°C, 85% RH, 1,000 hours at 560 VDC acc. to IEC 60384-14
- Low Halogen Content according to JS709C
- Rated voltage: 310 VAC 50/60 Hz
- Recommended DC Voltage ≤ 630 VDC
- Capacitance range: 0.1 – 22 µF
- Lead spacing: 15.0 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category 40/110/56, IEC 60068-1
- Tape & Reel in accordance with IEC 60286-2
- RoHS compliant and lead-free terminations
- Operating temperature range of −40°C to +110°C
- 100% screening factory test at 1,900 VDC
- Self healing properties
- Automotive (AEC-Q200) grade



Part Number System

R53	3	I	3470	00	P0	M
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance
X2, Metallized Polypropylene	3 = 310	I = 15.0 N = 22.5 R = 27.5 W = 37.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	See Ordering Options Table	P0 P1 P2 P3	K = ±10% M = ±20%

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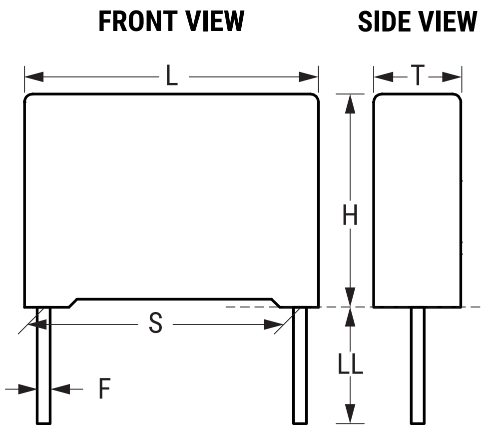
Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
15 22.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/-0	00
	Pizza Pack – Short Leads	4 +2/-0	BB
	Ammo Pack	H_0 = 18.5 ±0.5	DQ[1]
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	CK
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	GY[1]
	Bulk (Bag)[2] – Short Leads	2.7 +0.5/-0	JA
	Bulk (Bag)[2] – Short Leads	3.5 +0.5/-0	JB
	Bulk (Bag)[2] – Short Leads	4.0 +0.5/-0	JE
	Bulk (Bag)[2] – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Bag) – Long Leads	18 ±1	JM
	Bulk (Bag) – Long Leads	30 +5/-0	40
	Bulk (Bag) – Long Leads	25 +2/-1	50
27.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/-0	00
	Pizza Pack – Short Leads	4 +2/-0	BB
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK[1]
	Other Lead and Packaging Options		
	Bulk (Tray) – Short Leads	2.7 +0.5/-0	JA
	Bulk (Tray) – Short Leads	3.5 +0.5/-0	JB
	Bulk (Tray) – Short Leads	4.0 +0.5/-0	JE
	Bulk (Tray) – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Tray) – Long Leads	18 ±1	JM
	Bulk (Tray) – Long Leads	30 +5/-0	40
	Bulk (Tray) – Long Leads	25 +2/-1	50
37.5	**Standard Lead and Packaging Options**		
	Pizza Pack – Short Leads	4 +2/-0	00
	Other Lead and Packaging Options		
	Pizza Pack – Short Leads	2.7 +0.5/-0	JA
	Pizza Pack – Short Leads	3.5 +0.5/-0	JB
	Pizza Pack – Short Leads	4.0 +0.5/-0	JE
	Pizza Pack – Short Leads	3.2 +0.3/-0.2	JH
	Pizza Pack – Long Leads	18 ±1	JM
	Pizza Pack – Long Leads	30 +5/-0	40
	Pizza Pack – Long Leads	25 +2/-1	50

[1] *Not for all sizes, see "Packaging Quantities" table.*

[2] *For lead spacing 22.5 case sizes ≥ 8.5*17*26.5 the parts are packed in a Pizza box 335*320*34 mm*

Dimensions – Millimeters



S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
15.0	±0.4	5.0	+0.3/−0.5	11.0	+0.3/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	6.0	+0.3/−0.5	12.0	+0.3/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	7.5	+0.3/−0.5	13.5	+0.3/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	7.5	+0.3/−0.5	18.5	+0.3/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	±0.4	8.5	+0.3/−0.5	14.5	+0.3/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	9.0	+0.3/−0.5	12.5	+0.3/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	10.0	+0.3/−0.5	16.0	+0.3/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	±0.4	11.0	+0.3/−0.5	19.0	+0.3/−0.5	18.0	+0.5/−0.5	0.8	±0.05
22.5	±0.4	7.0	+0.3/−0.5	16.0	+0.3/−0.5	26.5	+0.5/−0.5	0.8	±0.05
22.5	±0.4	8.5	+0.3/−0.5	17.0	+0.3/−0.5	26.5	+0.5/−0.5	0.8	±0.05
22.5	±0.4	10.0	+0.3/−0.5	18.5	+0.3/−0.5	26.5	+0.5/−0.5	0.8	±0.05
22.5	±0.4	11.0	+0.3/−0.5	20.0	+0.3/−0.5	26.5	+0.5/−0.5	0.8	±0.05
22.5	±0.4	13.0	+0.3/−0.5	22.0	+0.3/−0.5	26.5	+0.5/−0.5	0.8	±0.05
27.5	±0.4	11.0	+0.3/−0.7	20.0	+0.3/−0.7	32.0	+0.5/−0.7	0.8	±0.05
27.5	±0.4	13.0	+0.3/−0.7	22.0	+0.3/−0.7	32.0	+0.5/−0.7	0.8	±0.05
27.5	±0.4	14.0	+0.3/−0.7	28.0	+0.3/−0.7	32.0	+0.5/−0.7	0.8	±0.05
27.5	±0.4	16.0	+0.3/−0.7	30.0	+0.3/−0.7	32.0	+0.5/−0.7	0.8	±0.05
27.5	±0.4	22.0	+0.3/−0.7	37.0	+0.3/−0.7	32.0	+0.5/−0.7	0.8	±0.05
37.5	±0.4	20.0	+0.3/−0.7	40.0	+0.3/−0.7	42.0	+0.5/−0.7	1.0	±0.05
37.5	±0.4	24.0	+0.3/−0.7	44.0	+0.3/−0.7	42.0	+0.5/−0.7	1.0	±0.05
37.5	±0.4	30.0	+0.3/−0.7	45.0	+0.3/−0.7	42.0	+0.5/−0.7	1.0	±0.05

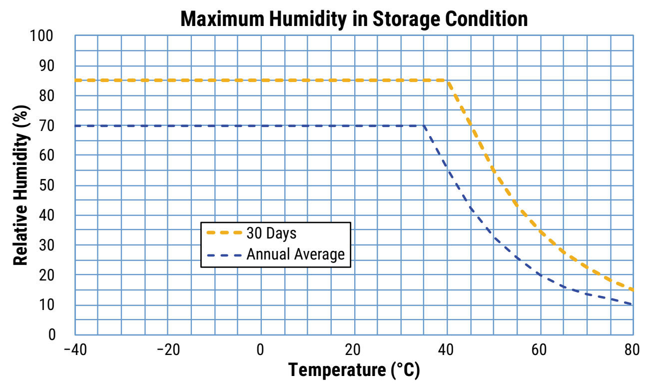
Note: See Ordering Options Table for lead length (LL/H_0) options.

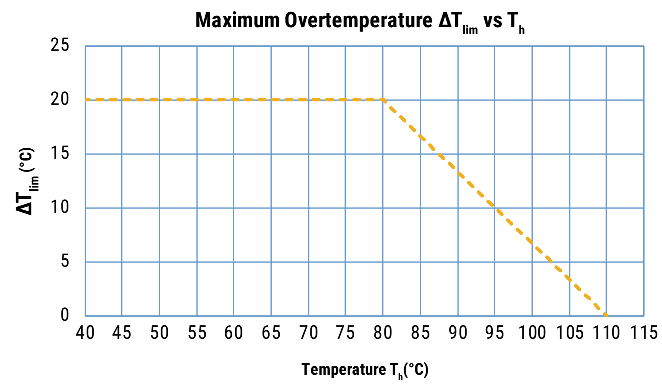
Performance Characteristics

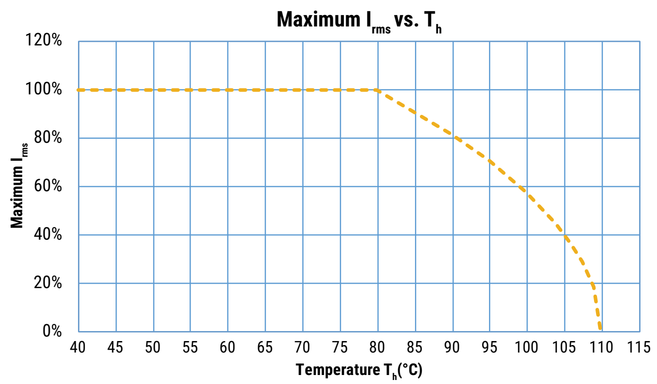
Dielectric	Polypropylene film			
Plates	Metal layer deposited by evaporation under vacuum			
Winding	Non-inductive type			
Leads	Tinned wire			
Protection	Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94.			
Related Documents	IEC 60384-14, EN 60384-14			
Rated Voltage V_R	310 VAC (50/60 Hz)			
Recommended DC Voltage	≤ 630 VDC			
Capacitance Range	0.1 –22 µF			
Capacitance Values	E6 series (IEC 60063) measured at 1 kHz and +20 ±1°C			
Capacitance Tolerance	±10%, ±20%			
Temperature Range	−40°C to +110°C			
Climatic Category	40/110/56 IEC 60068-1			
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package			
	Average relative humidity per year ≤ 70%			
	RH ≤ 85% for 30 days randomly distributed throughout the year			
	Dew is absent			
	Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)			
Approvals	ENEC, UL, cUL, CQC			
Dissipation Factor (tanδ) at 1 kHz	C ≤ 0.1 µF		C > 0.1µF	
	0.3%		0.2%	
Test Voltage Between Terminals	The 100% screening factory test is carried out at 1,900 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. This test cannot be repeated, as there is a risk of damaging the capacitor. KEMET is not liable in such cases for any failures.			
Insulation Resistance	Measured at +25°C ±5°C, according to IEC 60384−2			
	Minimum Values Between Terminals			
	Voltage Charge	Voltage Charge Time	C ≤ 0.33 µF	C > 0.33 µF
	100 VDC	1 minute	≥ 1 • 10^5 MΩ (≥ 5 • 10^5 MΩ)*	≥ 30,000 MΩ • µF (≥ 150,000 MΩ • µF)*

** Typical value*

Performance Characteristics cont.

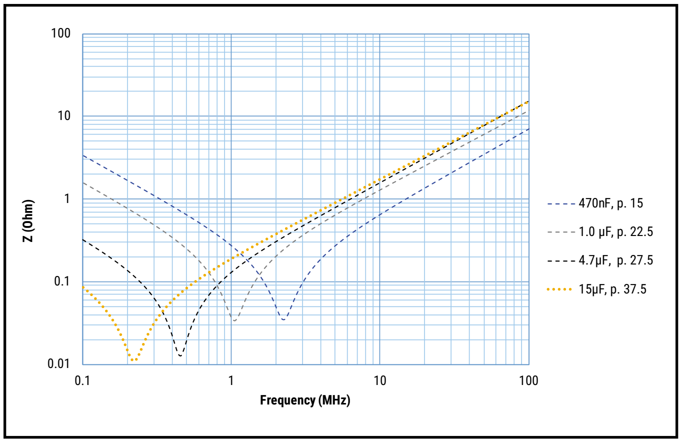




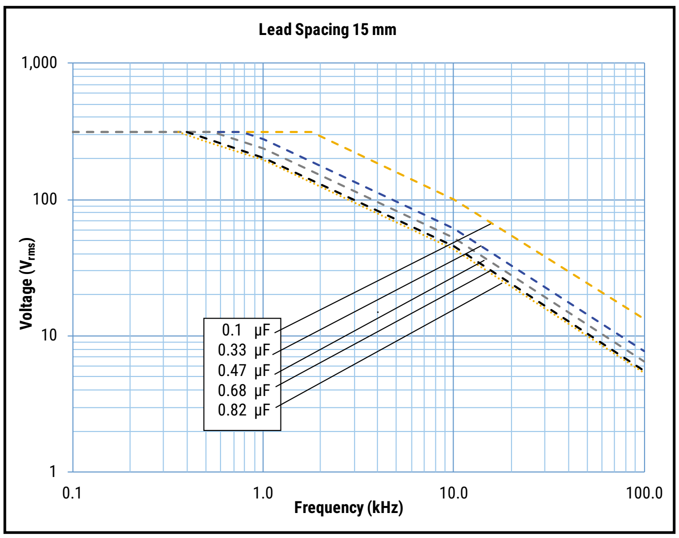


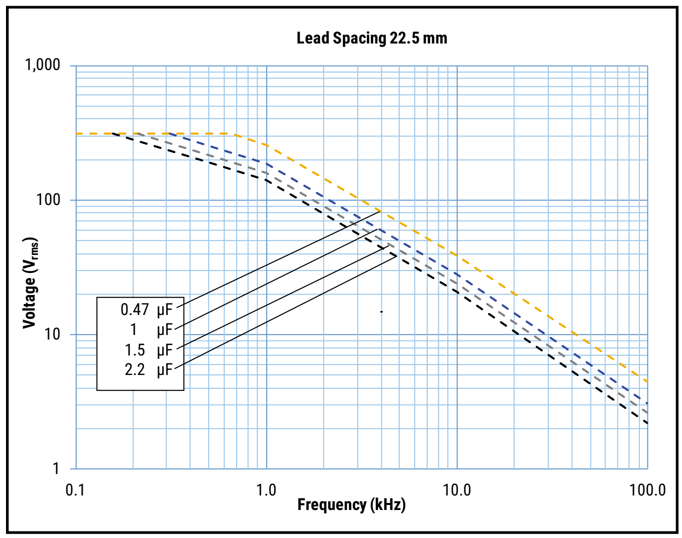
T_h is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

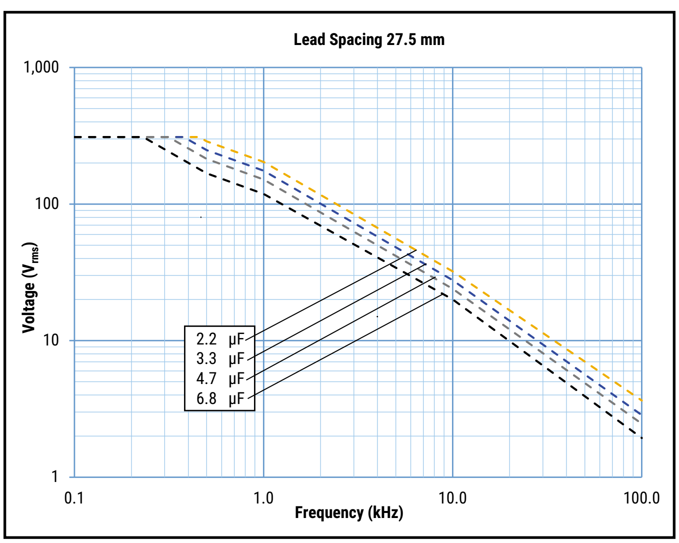
Impedance Graph

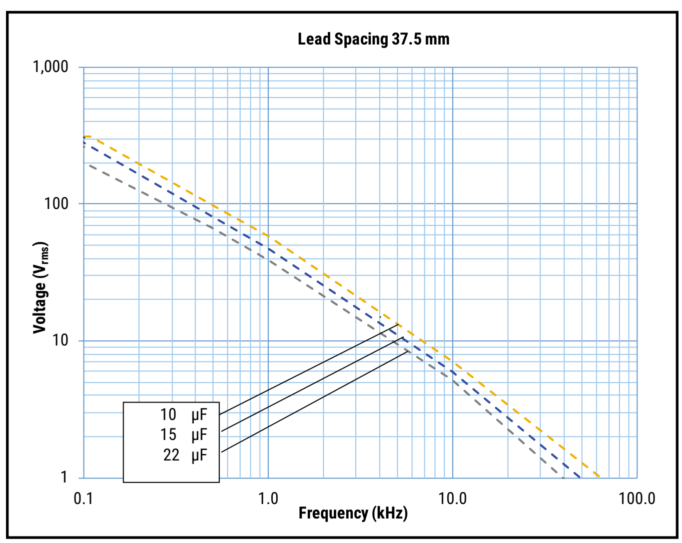


Maximum Voltage (V_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 80°C)

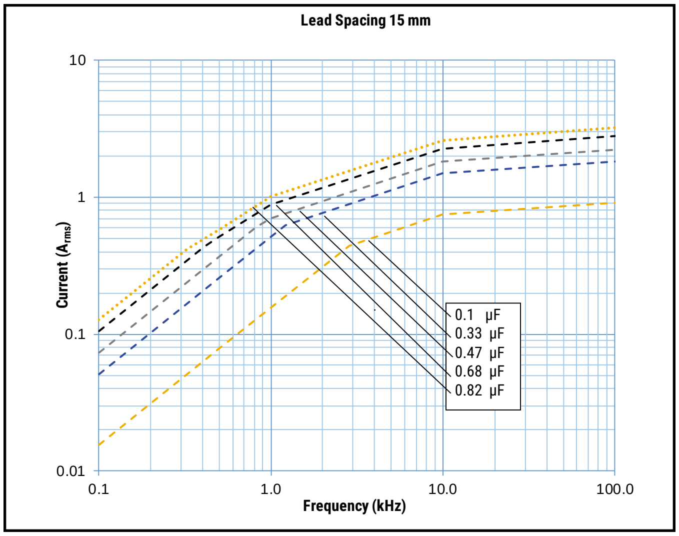


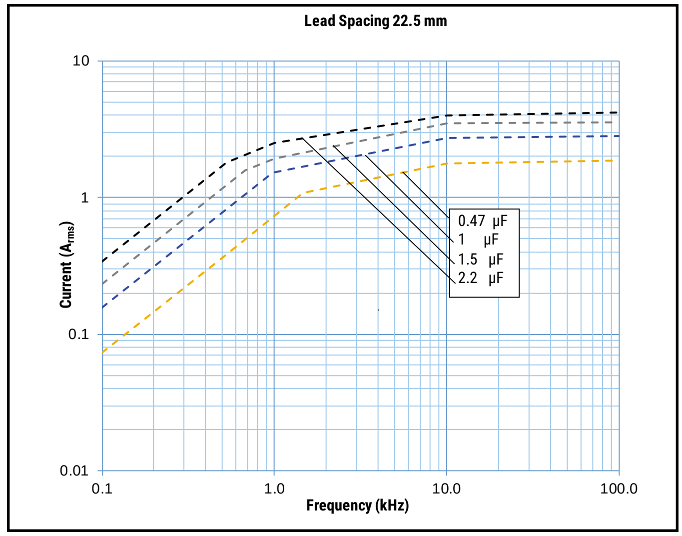


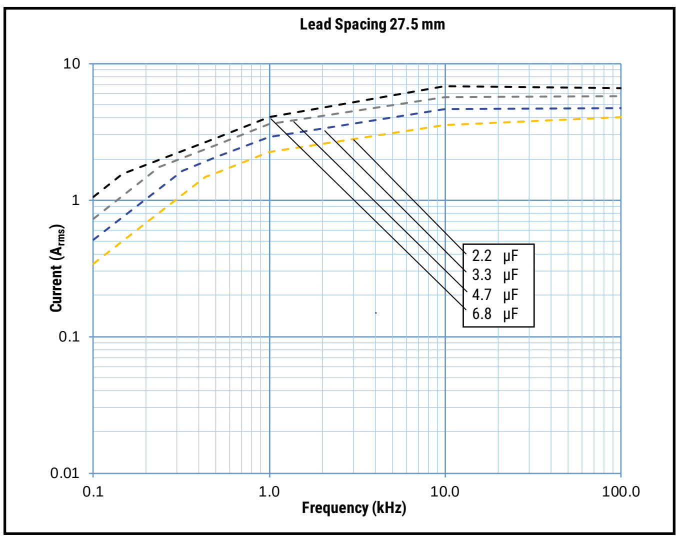


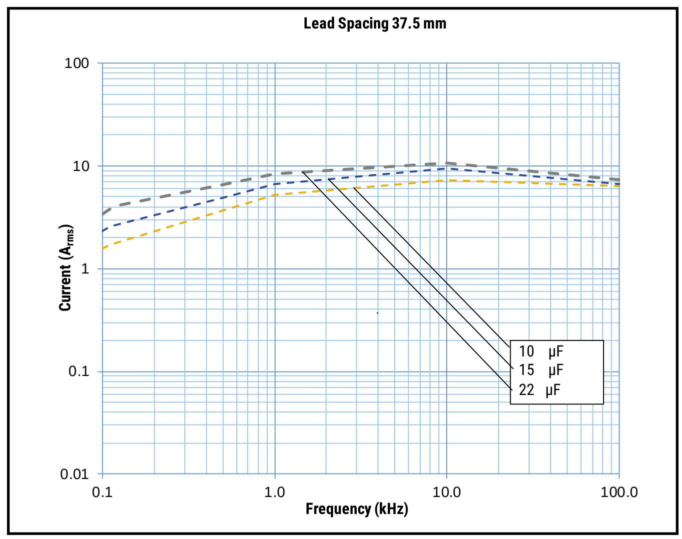


Maximum Current (I_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 80°C)









Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384-14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Endurance	IEC 60384-14	1.25 x 630 VDC, 1,000 hours at upper rated temperature
Vibration	MIL-STD-202 Method 204	5 G for 20 minutes, 12 cycles each of 3 orientations. Use 8" X 5" PCB, 0.031" thick. 7 secure points on one 8" side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10 – 2,000 Hz.
Mechanical Shock	MIL-STD-202 Method 213	Figure 1 of Method 213. Condition C
Temperature Cycling	JESD22-Method JA-104	1,000 cycles (−40°C to 110°C) Note: Measurement at 24 ±4 hours after test conclusion. 30 minute maximum dwell time at each temperature extreme. 1 minute maximum transition time.
Active Flammability	IEC 60384-14	V_R + 20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384-14	IEC 60384–1, IEC 60695–11–5 Needle flame test
Biased Humidity	According to Grade IIIB	85°C/85% RH and 310 VAC, 1,000 hours Capacitance change (ΔC/C): ≤ 10% Dissipation factor change (Δtan δ): ≤ 24 * 10^{-3} (at 10 kHz) for C ≤ 1 µF Dissipation factor change (Δtan δ): ≤ 15 * 10^{-3} (at 1 kHz) for C > 1 µF Insulation resistance Rins or time constant τ = CR Rins: ≥ 50% of initial limit
	According to Grade IIIB	85°C/85% RH and 560 VDC, 1,000 hours Capacitance change (ΔC/C): ≤ 10% Dissipation factor change (Δtan δ): ≤ 24 * 10^{-3} (at 10 kHz) for C ≤ 1 µF Dissipation factor change (Δtan δ): ≤ 15 * 10^{-3} (at 1 kHz) for C > 1 µF Insulation resistance Rins or time constant τ = CR Rins: ≥ 50% of initial limit

Approvals

Certification Body	Mark	Specification	File Number
IMQ S-p.A.		EN/IEC 60384–14	CA08.00232
UL		UL 60384–14 and CAN/CSA E60384–14 (310 VAC)	E97797
CQC		IEC 60384–14	CQC20001267604 CQC20001267618 CQC20001267599 CQC20001267617 CQC20001267616

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

RoHS

LH Low Halogen

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Legacy Part Number
	T	H	L				
0.10	5.0	11.0	18.0	15.0	400	533I3100(1)P0(2)	R533I3100(1)P0(2)
0.15	6.0	12.0	18.0	15.0	400	533I3150(1)P0(2)	R533I3150(1)P0(2)
0.22	6.0	12.0	18.0	15.0	400	533I3220(1)P0(2)	R533I3220(1)P0(2)
0.33	7.5	13.5	18.0	15.0	400	533I3330(1)P0(2)	R533I3330(1)P0(2)
0.33	9.0	12.5	18.0	15.0	400	533I3330(1)P1(2)	R533I3330(1)P1(2)
0.47	8.5	14.5	18.0	15.0	400	533I3470(1)P0(2)	R533I3470(1)P0(2)
0.47	9.0	12.5	18.0	15.0	400	533I3470(1)P1M	R533I3470(1)P1M
0.47	7.5	18.5	18.0	15.0	400	533I3470(1)P3(2)	R533I3470(1)P3(2)
0.56	10.0	16.0	18.0	15.0	400	533I3560(1)P0(2)	R533I3560(1)P0(2)
0.68	10.0	16.0	18.0	15.0	400	533I3680(1)P1M	R533I3680(1)P1M
0.68	11.0	19.0	18.0	15.0	400	533I3680(1)P0(2)	R533I3680(1)P0(2)
0.82	11.0	19.0	18.0	15.0	400	533I3820(1)P0M	R533I3820(1)P0M
0.47	7.0	16.0	26.5	22.5	200	533N3470(1)P0(2)	R533N3470(1)P0(2)
0.56	7.0	16.0	26.5	22.5	200	533N3560(1)P0(2)	R533N3560(1)P0(2)
0.68	7.0	16.0	26.5	22.5	200	533N3680(1)P0(2)	R533N3680(1)P0(2)
0.82	8.5	17.0	26.5	22.5	200	533N3820(1)P0(2)	R533N3820(1)P0(2)
1.0	8.5	17.0	26.5	22.5	200	533N4100(1)P1M	R533N4100(1)P1M
1.0	10.0	18.5	26.5	22.5	200	533N4100(1)P0(2)	R533N4100(1)P0(2)
1.2	10.0	18.5	26.5	22.5	200	533N4120(1)P0(2)	R533N4120(1)P0(2)
1.5	10.0	18.5	26.5	22.5	200	533N4150(1)P1M	R533N4150(1)P1M
1.5	11.0	20.0	26.5	22.5	200	533N4150(1)P0(2)	R533N4150(1)P0(2)
1.8	11.0	20.0	26.5	22.5	200	533N4180(1)P1M	R533N4180(1)P1M
1.8	13.0	22.0	26.5	22.5	200	533N4180(1)P0(2)	R533N4180(1)P0(2)
2.2	13.0	22.0	26.5	22.5	200	533N4220(1)P0M	R533N4220(1)P0M
1.5	11.0	20.0	32.0	27.5	150	533R4150(1)P0(2)	R533R4150(1)P0(2)
1.8	11.0	20.0	32.0	27.5	150	533R4180(1)P0(2)	R533R4180(1)P0(2)
2.2	13.0	22.0	32.0	27.5	150	533R4220(1)P0(2)	R533R4220(1)P0(2)
2.7	14.0	28.0	32.0	27.5	150	533R4270(1)P0(2)	R533R4270(1)P0(2)
3.3	14.0	28.0	32.0	27.5	150	533R4330(1)P0(2)	R533R4330(1)P0(2)
3.9	14.0	28.0	32.0	27.5	150	533R4390(1)P0(2)	R533R4390(1)P0(2)
4.7	14.0	28.0	32.0	27.5	150	533R4470(1)P1M	R533R4470(1)P1M
4.7	16.0	30.0	32.0	27.5	150	533R4470(1)P2(2)	R533R4470(1)P2(2)
5.6	16.0	30.0	32.0	27.5	150	533R4560(1)P0M	R533R4560(1)P0M
6.8	22.0	37.0	32.0	27.5	150	533R4680(1)P0(2)	R533R4680(1)P0(2)
8.2	22.0	37.0	32.0	27.5	150	533R4820(1)P0(2)	R533R4820(1)P0(2)
10.0	20.0	40.0	42.0	37.5	100	533W5100(1)P0(2)	R533W5100(1)P0(2)
12.0	24.0	44.0	42.0	37.5	100	533W5120(1)P0(2)	R533W5120(1)P0(2)
15.0	24.0	44.0	42.0	37.5	100	533W5150(1)P0(2)	R533W5150(1)P0(2)
18.0	30.0	45.0	42.0	37.5	100	533W5180(1)P0(2)	R533W5180(1)P0(2)
20.0	30.0	45.0	42.0	37.5	100	533W5200(1)P0(2)	R533W5200(1)P0(2)
22.0	30.0	45.0	42.0	37.5	100	533W5220(1)P0(2)	R533W5220(1)P0(2)
Capacitance Value (µF)	**B (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (p)**	**dV/dt (V/µs)**	**New KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) M = ±20%, K = ±10%

Soldering Process

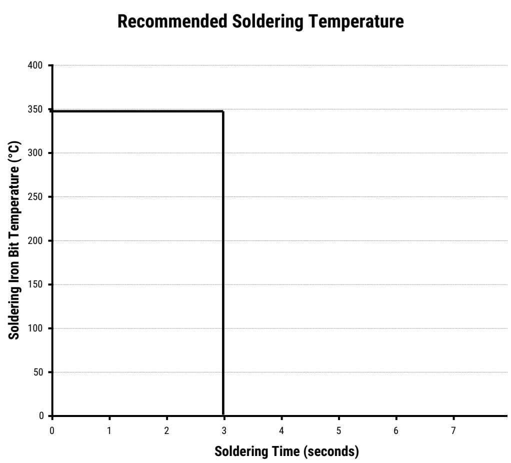
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder material. This has increased the liquidus temperature from 183°C for SnPb eutectic alloys to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm). Great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above-recommended limits may result to degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after curing surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to normal temperature before performing the second soldering cycle.

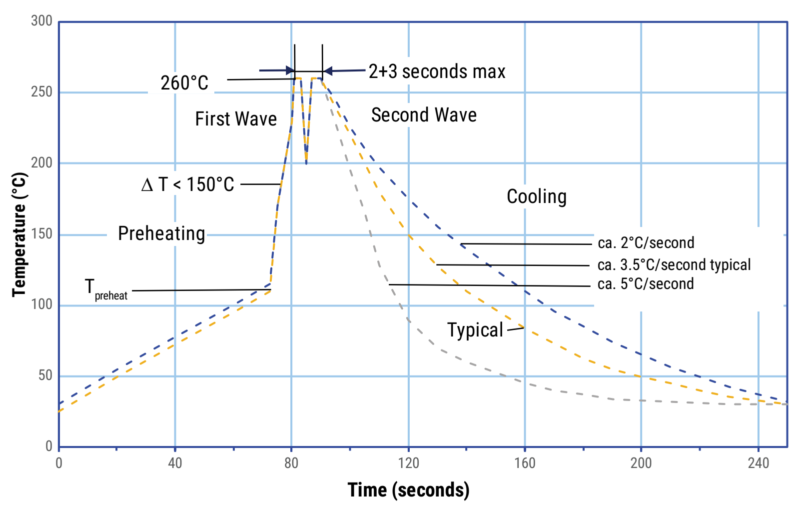
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

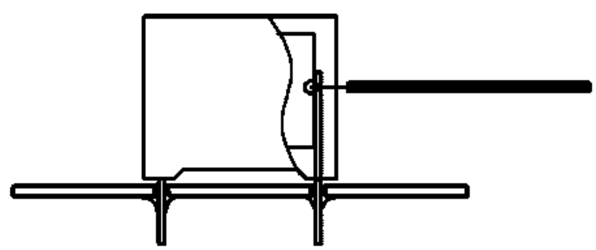
1. The table indicates the maximum set-up temperature of the soldering process.

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≥ 10 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that the maximum temperature inside the element is below the limit.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C

Temperature monitored inside the capacitor.



Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as it is in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder, only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 – 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts do not overheat.

Mounting

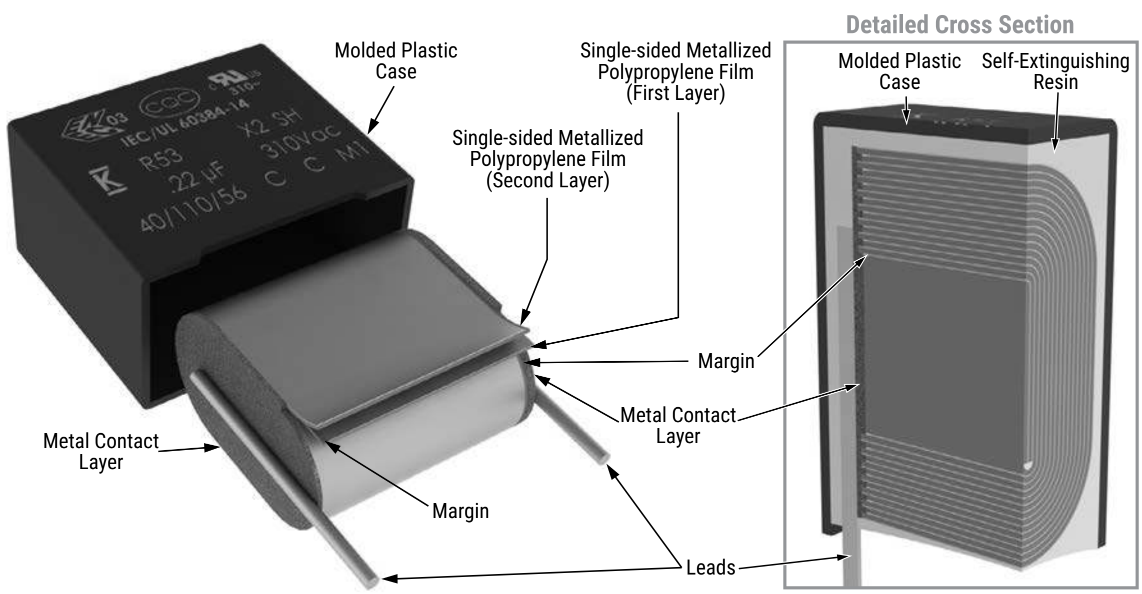
Resistance to Vibration and Mechanical Shock

AEC-Q200 Rev. E, Mechanical Stress Tests:

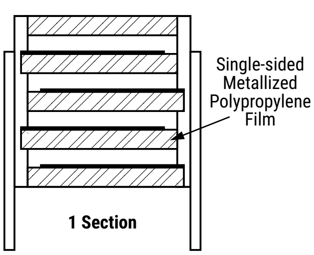
Mechanical Shock	**MIL-SDT-202 Method 213**	Figure 1 of Method 213 • THT: Condition C • SMD: Condition C • Tested per the Supplier's recommended mounting method
Vibration	**MIL-SDT-202 Method 204**	• 5 g for 20 minutes, 12 cycles each of 3 orientations • Tested per the Supplier's recommended mounting method • Verification of transfer load: during setup, verify that with the selected PCB design (size, thickness and secure points), or an alternative mount, that the transferred load onto the component corresponds to the requested load. This verification can be achieved using a laser vibrometer or other adequate measuring device • Test from 10 Hz – 2,000 Hz.

The capacitors are designed for PCB mounting. The stand-off pipes must be in good contact with the printed circuit board. The capacitor body has to be properly fixed (e.g. clamped or glued).

Construction

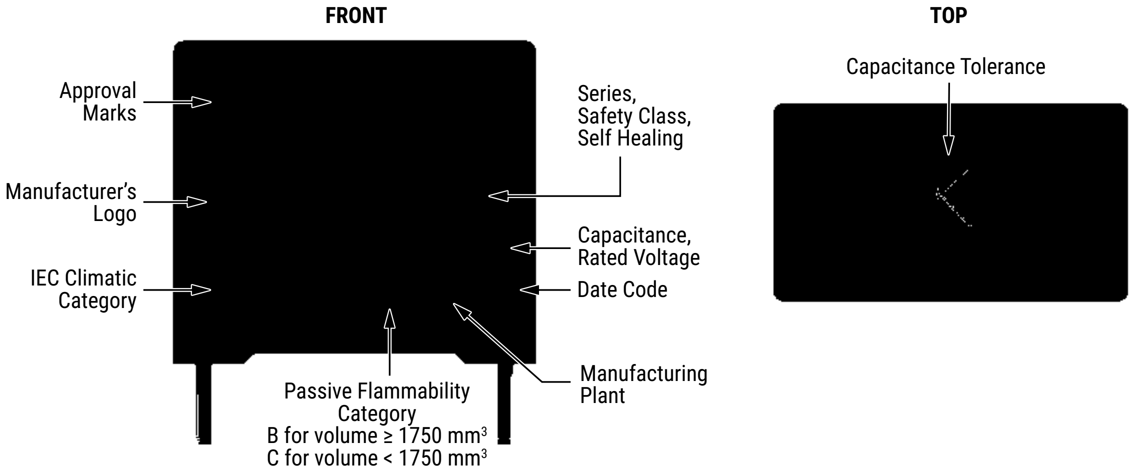


Winding Scheme

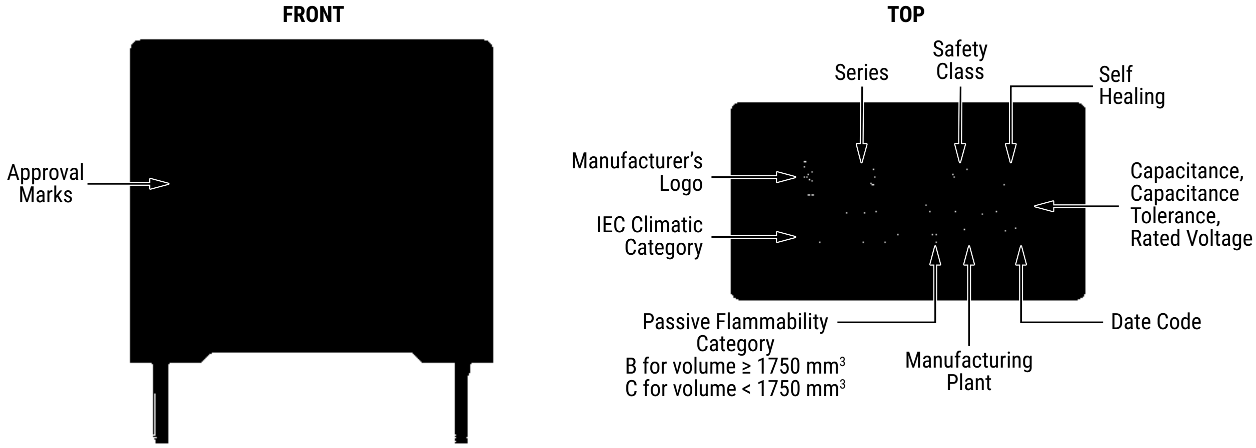


Marking

Lead Spacing 15 mm, 22.5 mm, and 27.5 mm



Lead Spacing 27.5 mm (alternatives*) and 37.5 mm



**Differences are caused by technology (clichee, laser, or ink) and production line.*

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads		Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped	Pizza
Lead and Packaging Code:				00 - JA - JB JE - JH	JM	40 – 50	GY	CK	DQ	BB
15	5	11	18	2,000	1,250	1,000	600	1,250	800	1,122
	6	12	18	1,750	1,000	900	500	1,000	680	935
	7.5	13.5	18	1,000	800	700	350	800	500	748
	7.5	18.5	18	900	650	500	-	800	500	748
	8.5	14.5	18	1,000	650	500	300	700	440	663
	9	12.5	18	1,000	700	520	270	650	410	612
	10	16	18	750	550	500	270	600	380	561
	11	19	18	450	400	350	-	500	340	510
22.5	7	16	26.5	700	450	500	-	550	380	564
	8.5	17	26.5	468	350	300	-	450	280	468
	10	18.5	26.5	396	350	300	-	350	235	396
	11	20	26.5	360	200	250	-	350	217	360
	13	22	26.5	300	150	200	-	300	-	300
27.5	11	20	32	560	336	336	-	350	-	300
	13	22	32	480	288	288	-	300	-	250
	14	28	32	352	176	176	-	-	-	230
	16	30	32	288	144	144	-	-	-	200
	22	37	32	168	112	112	-	-	-	150
37.5	20	40	42	58	58	58	-	-	-	-
	24	44	42	44	44	44	-	-	-	-
	30	45	42	36	36	36	-	-	-	-

Lead Taping & Packaging (IEC 60286–2)

Figure 1 – Lead Spacing 15 mm

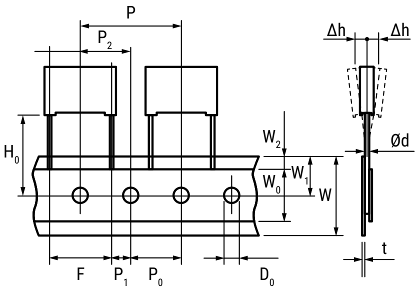
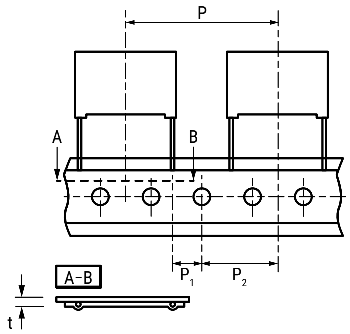


Figure 2 – Lead Spacing 22.5 & 27.5 mm



Taping Specification

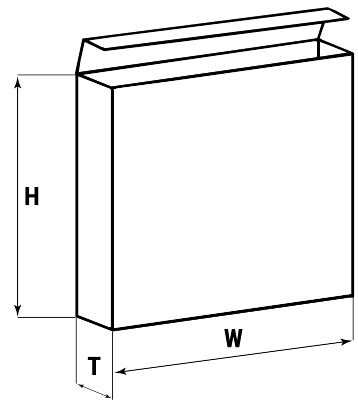
Description	Symbol	Dimensions (mm)			
		Lead Space			Tolerance
		15.0	22.5	27.5	
Lead wire diameter	d	0.6 – 0.8	0.8	0.8	±0.05
Taping lead space	P	25.4	38.1	38.1	±1
Feed hole lead space *	P_0	12.7	12.7	12.7	±0.2 **
Centering of the lead wire	P_1	5.2	7.8	5.3	±0.7
Centering of the body	P_2	12.7	19.05	19.05	±1.3
Lead spacing ***	F	15.0	22.5	27.5	+0.6/−0.1
Component alignment	Δh	0	0	0	±2
Component deviation	Δp	0	0	0	±1
Height of component from tape center	H_0****	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	+1/−0.5
Hold down tape width	W_0	10	10	10	Minimum
Hole position	W_1	9	9	9	±0.5
Hold down tape position	W_2	3	3	3	Maximum
Feed hole diameter	D_0	4	4	4	±0.2
Total Tape thickness	t	0.7	0.7	0.7	±0.2

** Available also 15 mm.*
*** Maximum 1 mm on 20 lead spacing.*
**** 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request.*
***** H_0 = 16.5 mm is available upon request.*

Lead Taping & Packaging (IEC 60286–2) cont.

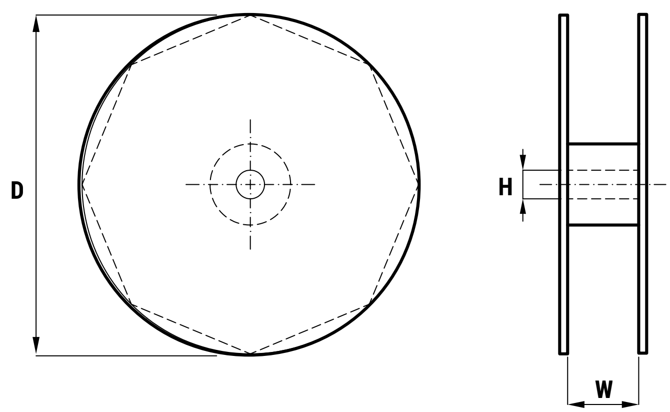
Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



Reel Specifications

Reel Size	Dimensions (mm)		
	D	H	W
Standard	355	30	55 Maximum
Large	500	25	



R53B, THB Grade IIIB, Class X2, 350 VAC, 125°C (Automotive Grade)

Overview

The R53B series is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material that meets the requirements of UL 94 V–0. The R53B series is ideal for harsh environmental conditions and meets the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

Applications

For worldwide use in electromagnetic interference (EMI) suppression in across-the-line applications that require X2 safety classification. Intended for use in situations in which capacitor failure would not result in exposure to electric shock. Typical applications include connection in series with the mains, capacitive power supplies and energy meters, with special emphasis in automotive applications for severe ambient conditions such as On Board Chargers.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- X2 CLASS (IEC 60384-14)
- THB Grade IIIB: 85°C, 85% RH, 1,000 hours at 350 VAC/800 VDC acc. to IEC 60384-14
- Low Halogen Content according to JS709C
- Rated AC voltage: 350 VAC 50/60 Hz
- Rated DC Voltage: 800 VDC
- Recommended DC Voltage ≤ 1000 VDC
- Capacitance range: 0.068 – 20 µF
- Lead spacing: 15.0 – 52.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category 40/110/56, IEC 60068-1
- Tape & Reel in accordance with IEC 60286-2
- RoHS compliant and lead-free terminations
- Operating temperature range of −40°C to +125°C
- 100% screening factory test at 1,900 VDC
- Self healing properties"
- Automotive (AEC-Q200) grade
- Parallel and Series construction available

Part Number System

R53	B	I	3100	00	0	0	M	C-Spec
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use	Internal Use	Capacitance Tolerance	(Optional)
X2, Metallized Polypropylene	B = 350	I = 15.0 N = 22.5 R = 27.5 W = 37.5 Y = 52.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	See Ordering Options Table	0 = Internal Parallel Construction S = Internal Series Construction	0 = Internal Use	K = ±10% M = ±20%	Blank = Standard V103 = 4 pins, S = 37.5 mm, S1 =10.2 mm V104 = 4 pins, S = 37.5 mm, S1 =20.3 mm

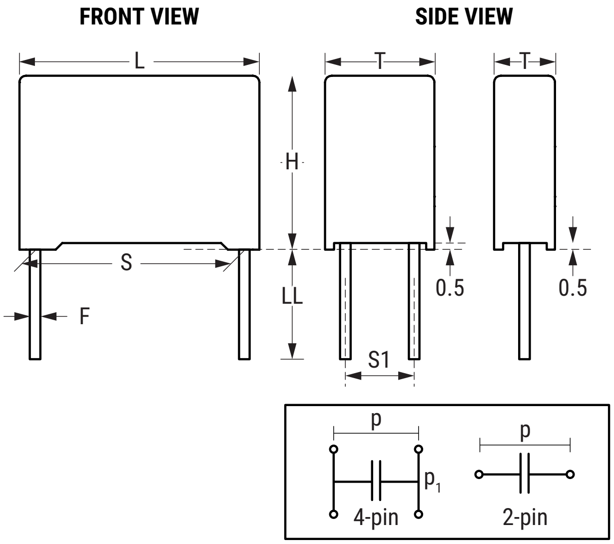
Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
15 22.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/−0	00
	Pizza Pack – Short Leads	4 +2/−0	BB
	Ammo Pack	H_0 = 18.5 ±0.5	DQ[1]
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	CK
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	GY[1]
	Bulk (Bag)[2]– Short Leads	2.7 +0.5/−0	JA
	Bulk (Bag)[2]– Short Leads	3.5 +0.5/−0	JB
	Bulk (Bag)[2]– Short Leads	4.0 +0.5/−0	JE
	Bulk (Bag)[2]– Short Leads	3.2 +0.3/−0.2	JH
	Bulk (Bag) – Long Leads	18 ±1	JM
	Bulk (Bag) – Long Leads	30 +5/−0	40
	Bulk (Bag) – Long Leads	25 +2/−1	50
27.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4 +2/−0	00
	Pizza Pack – Short Leads	4 +2/−0	BB
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK[1]
	Other Lead and Packaging Options		
	Bulk (Tray) – Short Leads	2.7 +0.5/−0	JA
	Bulk (Tray) – Short Leads	3.5 +0.5/−0	JB
	Bulk (Tray) – Short Leads	4.0 +0.5/−0	JE
	Bulk (Tray) – Short Leads	3.2 +0.3/−0.2	JH
	Bulk (Tray) – Long Leads	18 ±1	JM
	Bulk (Tray) – Long Leads	30 +5/−0	40
	Bulk (Tray) – Long Leads	25 +2/−1	50
37.5	**Standard Lead and Packaging Options**		
	Pizza Pack – Short Leads	4 +2/−0	00
	Other Lead and Packaging Options		
	Pizza Pack – Short Leads	2.7 +0.5/−0	JA
	Pizza Pack – Short Leads	3.5 +0.5/−0	JB
	Pizza Pack – Short Leads	4.0 +0.5/−0	JE
	Pizza Pack – Short Leads	3.2 +0.3/−0.2	JH
	Pizza Pack – Long Leads	18 ±1	JM
	Pizza Pack – Long Leads	30 +5/−0	40
	Pizza Pack – Long Leads	25 +2/−1	50
52.5	**Standard Lead and Packaging Options**		
	Pizza Pack – Short Leads	4 +2/−0	00

[1] *Not for all sizes, see "Packaging Quantities" table.*

[2] *For lead spacing 22.5 case sizes ≥8.5*17*26.5 the parts are packed in a Pizza box 335*320*34 mm*

Dimensions – Millimeters



S		S1		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
15.0	±0.4	-	-	5.0	+0.3/-0.5	11.0	+0.3/-0.5	18.0	+0.5/-0.5	0.6	±0.05
15.0	±0.4	-	-	6.0	+0.3/-0.5	12.0	+0.3/-0.5	18.0	+0.5/-0.5	0.6	±0.05
15.0	±0.4	-	-	7.5	+0.3/-0.5	13.5	+0.3/-0.5	18.0	+0.5/-0.5	0.6	±0.05
15.0	±0.4	-	-	8.5	+0.3/-0.5	14.5	+0.3/-0.5	18.0	+0.5/-0.5	0.6	±0.05
15.0	±0.4	-	-	10.0	+0.3/-0.5	16.0	+0.3/-0.5	18.0	+0.5/-0.5	0.8	±0.05
15.0	±0.4	-	-	11.0	+0.3/-0.5	19.0	+0.3/-0.5	18.0	+0.5/-0.5	0.8	±0.05
22.5	±0.4	-	-	6.0	+0.3/-0.5	15.0	+0.3/-0.5	26.5	+0.5/-0.5	0.8	±0.05
22.5	±0.4	-	-	7.0	+0.3/-0.5	16.0	+0.3/-0.5	26.5	+0.5/-0.5	0.8	±0.05
22.5	±0.4	-	-	8.5	+0.3/-0.5	17.0	+0.3/-0.5	26.5	+0.5/-0.5	0.8	±0.05
22.5	±0.4	-	-	10.0	+0.3/-0.5	18.5	+0.3/-0.5	26.5	+0.5/-0.5	0.8	±0.05
22.5	±0.4	-	-	11.0	+0.3/-0.5	20.0	+0.3/-0.5	26.5	+0.5/-0.5	0.8	±0.05
22.5	±0.4	-	-	13.0	+0.3/-0.5	22.0	+0.3/-0.5	26.5	+0.5/-0.5	0.8	±0.05
27.5	±0.4	-	-	11.0	+0.3/-0.7	20.0	+0.3/-0.7	32.0	+0.5/-0.7	0.8	±0.05
27.5	±0.4	-	-	13.0	+0.3/-0.7	22.0	+0.3/-0.7	32.0	+0.5/-0.7	0.8	±0.05
27.5	±0.4	-	-	13.0	+0.3/-0.7	25.0	+0.3/-0.7	32.0	+0.5/-0.7	0.8	±0.05
27.5	±0.4	-	-	14.0	+0.3/-0.7	28.0	+0.3/-0.7	32.0	+0.5/-0.7	0.8	±0.05
27.5	±0.4	-	-	16.0	+0.3/-0.7	30.0	+0.3/-0.7	32.0	+0.5/-0.7	0.8	±0.05
27.5	±0.4	-	-	22.0	+0.3/-0.7	37.0	+0.3/-0.7	32.0	+0.5/-0.7	0.8	±0.05
37.5	±0.4	10.2(1)	±0.4	20.0	+0.3/-0.7	40.0	+0.3/-0.7	42.0	+0.5/-0.7	1.0	±0.05
37.5	±0.4	10.2(1)	±0.4	24.0	+0.3/-0.7	44.0	+0.3/-0.7	42.0	+0.5/-0.7	1.0	±0.05
37.5	±0.4	20.3(2)	±0.4	30.0	+0.3/-0.7	45.0	+0.3/-0.7	42.0	+0.5/-0.7	1.0	±0.05
52.5	±0.4	20.3(3)	±0.4	30.0	+1.2/-1.2	45.0	+1.2/-1.2	57.5	+1.2/-1.2	1.2	±0.05
52.5	±0.4	20.3(3)	±0.4	35.0	+1.2/-1.2	50.0	+1.2/-1.2	57.5	+1.2/-1.2	1.2	±0.05
Note: See Ordering Options Table for lead length (LL/H_0) options.											

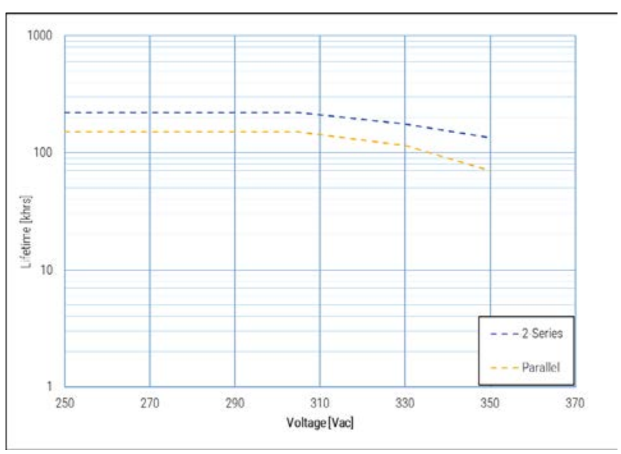
(1) Standard = 2 pins, C-Spec V103 = 4 pins
(2) Standard = 2 pins, C-Spec V104 = 4 pins
(3) Standard = 4 pins, S1 = 20.3mm

Performance Characteristics

Dielectric	Polypropylene film
Plates	Metal layer deposited by evaporation under vacuum
Winding	Non-inductive type
Leads	Tinned wire
Protection	Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL94.
Related Documents	IEC 60384-14, EN 60384-14
Rated Voltage V_R	350 VAC (50/60 Hz) / 800 VDC
Maximum Operational DC Voltage	≤ 1,000 VDC in parallel construction (1,000 h)
Capacitance Range	0.068 –20 µF
Capacitance Values	E6 series (IEC 60063) measured at 1 kHz and +20 ±1°C
Capacitance Tolerance	±10%, ±20%
Temperature Range	−40°C to 125°C in parallel construction, −40°C to 110°C in series construction
Climatic Category	40/110/56 IEC 60068-1

Reliablity at AC Voltage

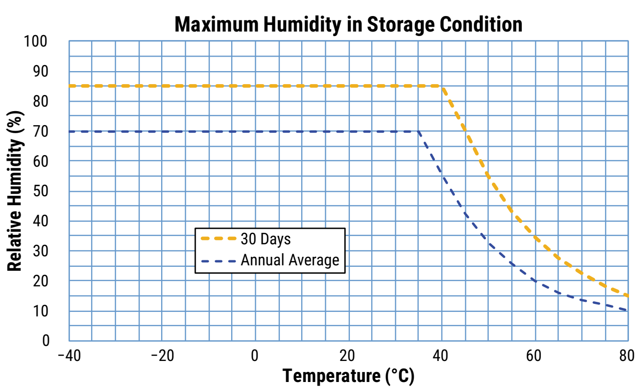
Construction	Temperature(°C)	Voltage (Vac)	Lifetime (khrs) [DeltaC = −20%)
2-Series	85	250	220
2-Series	85	305	220
2-Series	85	330	175
2-Series	85	350	135
Parallel	85	250	150
Parallel	85	305	150
Parallel	85	330	115
Parallel	85	350	70

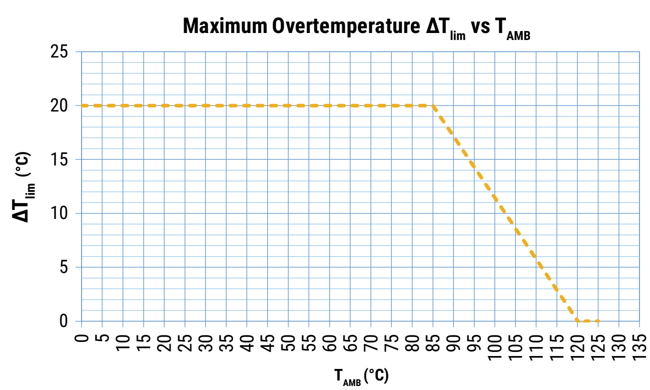


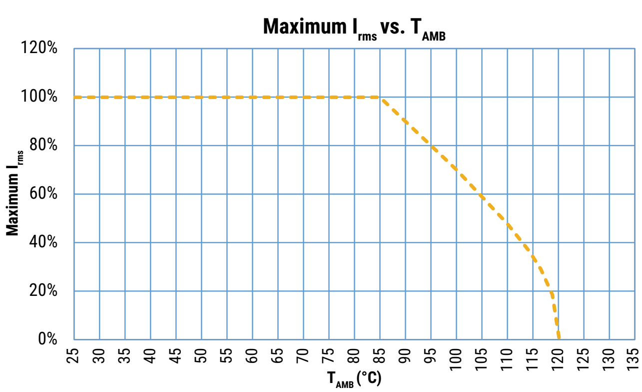
Reliablity at AC Voltage V_R	2,000 hours at 125°C in parallel construction for Pitch 15 to 52.5 mm.
Reliablity at DC Voltage V_R	Operation life 100,000 hours at 85°C for all part numbers. 2,000 hours at 125°C in parallel construction for Pitch 15 to 52.5 mm.

Performance Characteristics cont.

Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package			
	Average relative humidity per year ≤ 70%			
	RH ≤ 85% for 30 days randomly distributed throughout the year			
	Dew is absent			
	Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)			
Approvals	ENEC, UL, cUL, CQC			
Dissipation Factor (tanδ) at 1 kHz at 25°C ±5°C	C ≤ 0.47 µF		C > 0.47 µF	
	0.5%		0.3%	
Test Voltage Between Terminals	The 100% screening factory test is carried out at 1,900 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. This test cannot be repeated, as there is a risk of damaging the capacitor. KEMET is not liable in such cases for any failures.			
Insulation Resistance	Measured at +25°C ±5°C, according to IEC 60384−2			
	Minimum Values Between Terminals			
	Voltage Charge	Voltage Charge Time	C ≤ 0.33 µF	C > 0.33 µF
	100 VDC	1 minute	≥ 30,000 MΩ	≥ 10,000 MΩ • µF

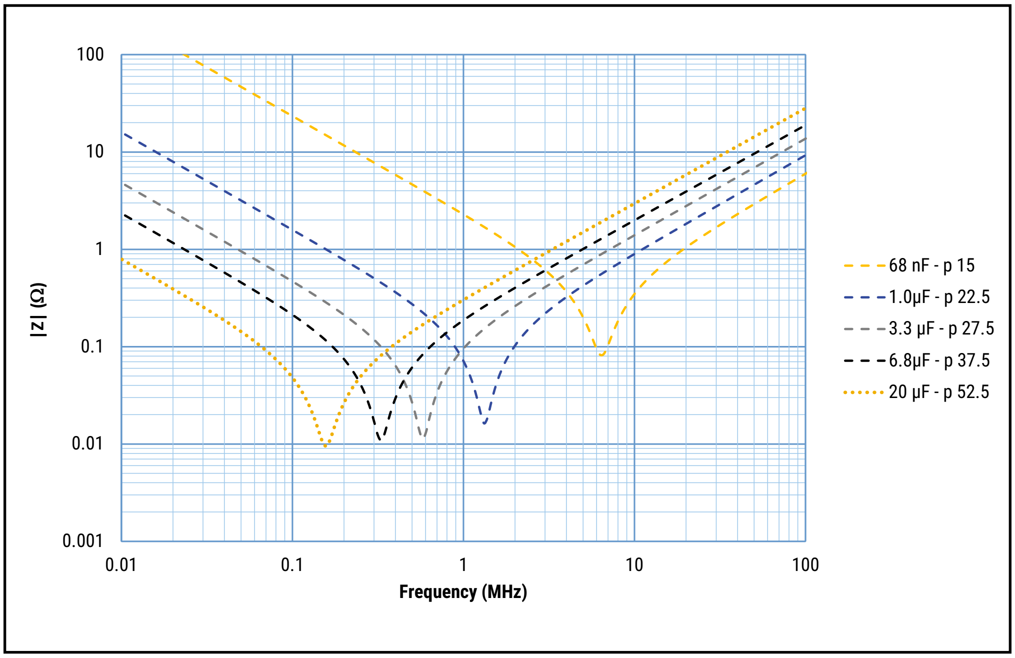




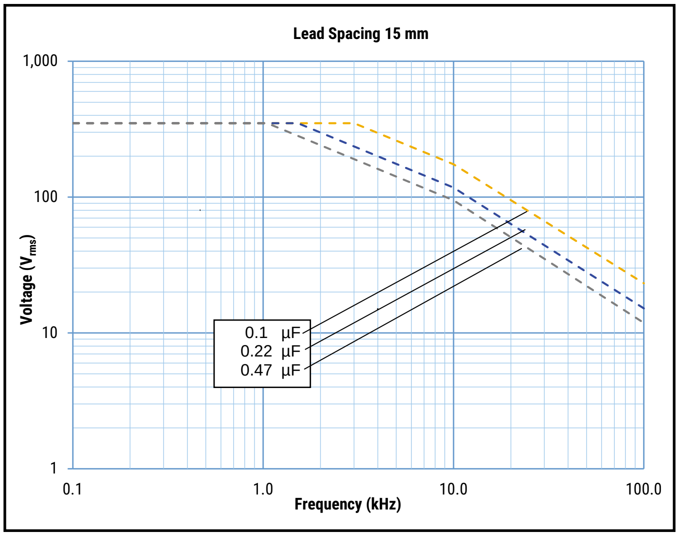


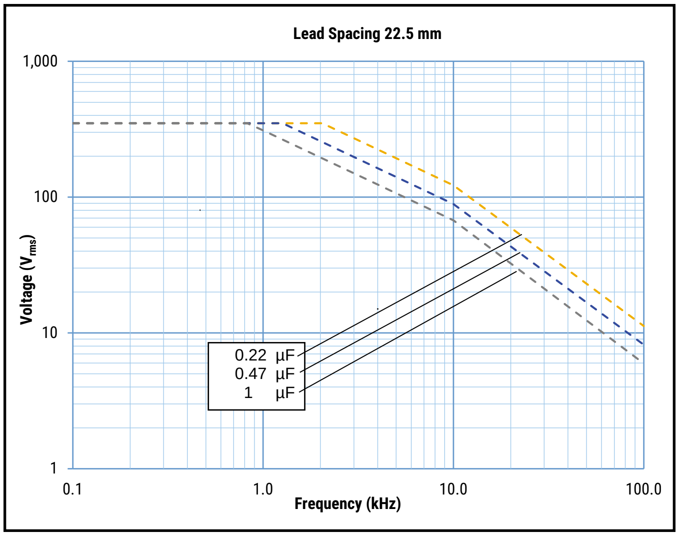
T_{AMB} is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

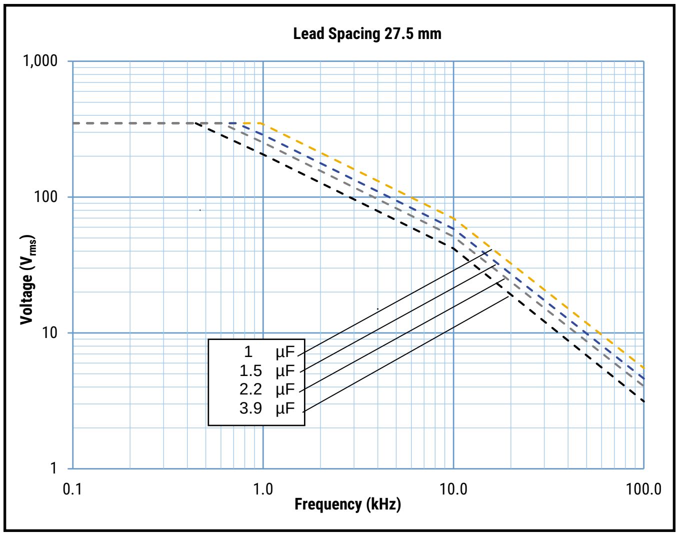
Impedance Graph

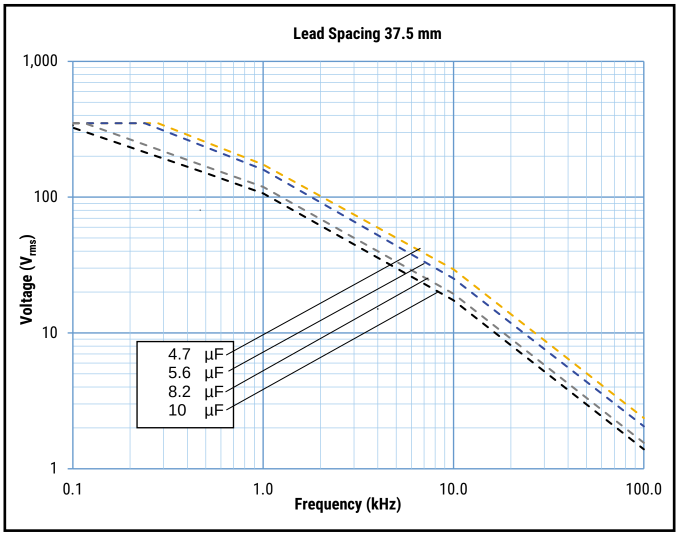


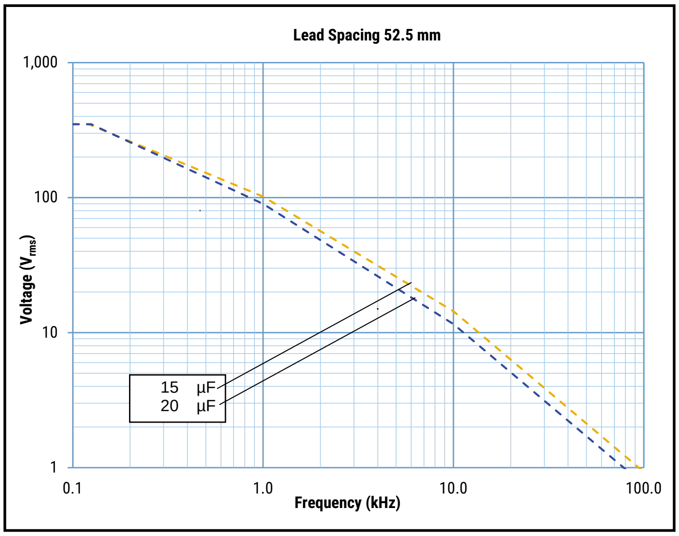
Maximum Voltage (V_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 85°C)



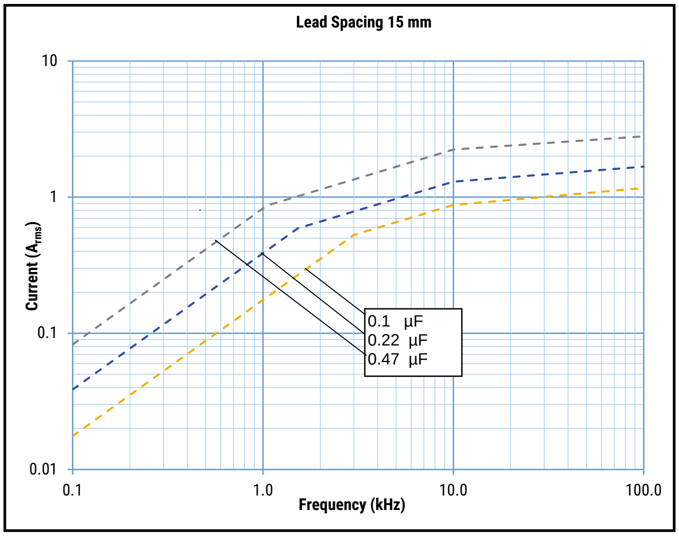


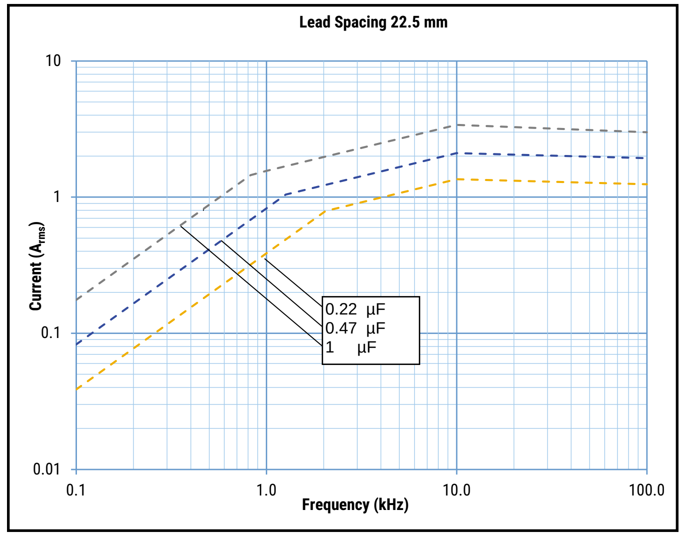


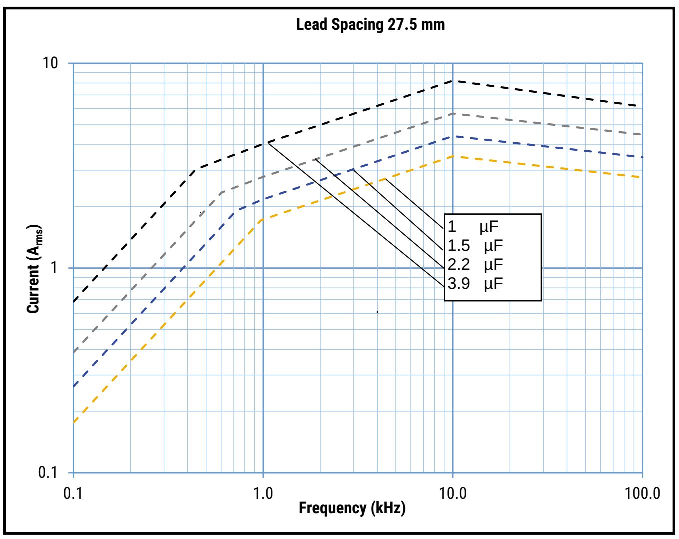


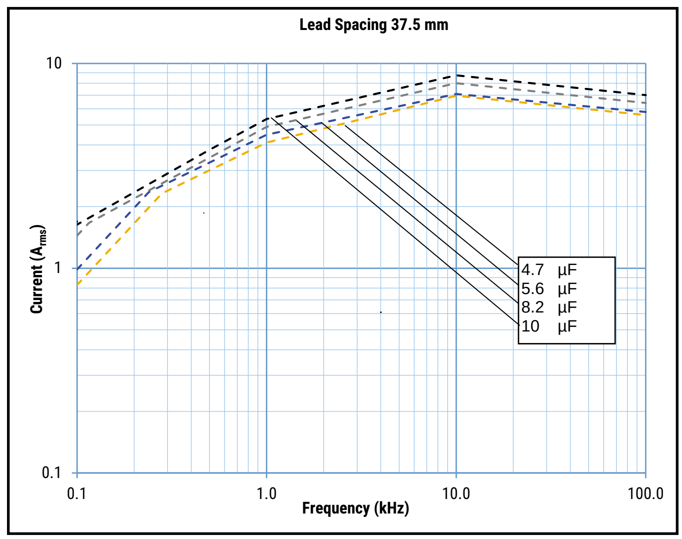


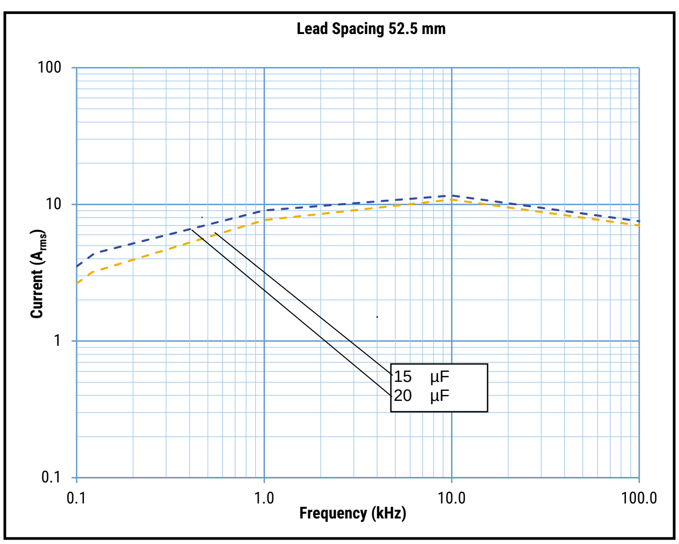
Maximum Current (I_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 85°C)











Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384-14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at rated temperature (110°C)
Endurance	IEC 60384-14	1.25 x V_{RDC}, 1,000 hours at rated temperature (110°C)
Vibration	MIL-STD-202 Method 204	5 G for 20 minutes, 12 cycles each of 3 orientations. Use 8" X 5" PCB, 0.031" thick. 7 secure points on one 8" side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10 – 2,000 Hz.
Mechanical Shock	MIL-STD-202 Method 213	Figure 1 of Method 213. Condition C
Temperature Cycling	JESD22-Method JA-104	1,000 cycles (−40°C to 110°C) Note: Measurement at 24 ±4 hours after test conclusion. 30 minute maximum dwell time at each temperature extreme. 1 minute maximum transition time.
Active Flammability	IEC 60384-14	V_R + 20 surge pulses at 2.5 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384-14	IEC 60384–1, IEC 60695–11–5 Needle flame test
Biased Humidity	According to Grade IIIB For Parallel and Series construction	85°C/85% RH and 350 VAC, 1,000 hours Capacitance change (ΔC/C): ≤ 10% Dissipation factor change (Δtan δ): ≤ 150 * 10^{-4} (at 1 kHz for Cap > 1 µF) Dissipation factor change (Δtan δ): ≤ 240 * 10^{-4} (at 10 kHz) for Cap ≤ 1 µF IR ≥ 50% of initial limit or minimum 200 MΩ
	According to Grade IIIB For Parallel construction only	85°C/85% RH and 800 VDC, 1,000 hours Capacitance change (ΔC/C): ≤ 10% Dissipation factor change (Δtan δ): ≤ 150 * 10^{-4} (at 1 kHz for Cap > 1 µF) Dissipation factor change (Δtan δ): ≤ 240 * 10^{-4} (at 10 kHz) for Cap ≤ 1 µF IR ≥ 50% of initial limit or minimum 200 MΩ

Approvals

Certification Body	Mark	Specification	File Number
IMQ S-p.A.	ENEC	EN/IEC 60384–14	CA08.00236
UL	c UL US	UL 60384–14 and CAN/CSA E60384–14 (350 VAC)	E97797
CQC	CQC	IEC 60384–14	CQC21001325465 CQC21001325444 CQC21001325441 CQC21001325445 CQC21001325440 CQC21001325438

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

Table 1 – Ratings & Part Number Reference for Parts with Internal Parallel Construction

Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Legacy Part Number
	T	H	L				
0.068	5.0	11.0	18.0	15	400	53BI2680(1)00(2)	R53BI2680(1)00(2)
0.1	6.0	12.0	18.0	15	400	53BI3100(1)00(2)	R53BI3100(1)00(2)
0.15	7.5	13.5	18.0	15	400	53BI3150(1)00(2)	R53BI3150(1)00(2)
0.22	8.5	14.5	18.0	15	400	53BI3220(1)00(2)	R53BI3220(1)00(2)
0.33	10.0	16.0	18.0	15	400	53BI3330(1)00(2)	R53BI3330(1)00(2)
0.39	11.0	19.0	18.0	15	400	53BI3390(1)00(2)	R53BI3390(1)00(2)
0.47	11.0	19.0	18.0	15	400	53BI3470(1)00(2)	R53BI3470(1)00(2)
0.22	6.0	15.0	26.5	22.5	200	53BN3220(1)00(2)	R53BN3220(1)00(2)
0.33	7.0	16.0	26.5	22.5	200	53BN3330(1)00(2)	R53BN3330(1)00(2)
0.47	8.5	17.0	26.5	22.5	200	53BN3470(1)00(2)	R53BN3470(1)00(2)
0.56	10.0	18.5	26.5	22.5	200	53BN3560(1)00(2)	R53BN3560(1)00(2)
0.68	11.0	20.0	26.5	22.5	200	53BN3680(1)00(2)	R53BN3680(1)00(2)
1	13.0	22.0	26.5	22.5	200	53BN4100(1)00(2)	R53BN4100(1)00(2)
0.82	11.0	20.0	32.0	27.5	150	53BR3820(1)00(2)	R53BR3820(1)00(2)
1	13.0	22.0	32.0	27.5	150	53BR4100(1)00(2)	R53BR4100(1)00(2)
1.2	13.0	22.0	32.0	27.5	150	53BR4120(1)00(2)	R53BR4120(1)00(2)
1.5	13.0	25.0	32.0	27.5	150	53BR4150(1)00(2)	R53BR4150(1)00(2)
1.8	14.0	28.0	32.0	27.5	150	53BR4180(1)00(2)	R53BR4180(1)00(2)
2.2	16.0	30.0	32.0	27.5	150	53BR4220(1)00(2)	R53BR4220(1)00(2)
3.3	22.0	37.0	32.0	27.5	150	53BR4330(1)00(2)	R53BR4330(1)00(2)
3.9	22.0	37.0	32.0	27.5	150	53BR4390(1)00(2)	R53BR4390(1)00(2)
4.7	20.0	40.0	42.0	37.5	100	53BW4470(1)00(2)	R53BW4470(1)00(2)
5.6	20.0	40.0	42.0	37.5	100	53BW4560(1)00(2)	R53BW4560(1)00(2)
6.8	24.0	44.0	42.0	37.5	100	53BW4680(1)00(2)	R53BW4680(1)00(2)
8.2	24.0	44.0	42.0	37.5	100	53BW4820(1)00(2)	R53BW4820(1)00(2)
10	30.0	45.0	42.0	37.5	100	53BW5100(1)00(2)	R53BW5100(1)00(2)
15	30.0	45.0	57.5	52.5	50	53BY5150(1)00(2)	R53BY5150(1)00(2)
18	35.0	50.0	57.5	52.5	50	53BY5180(1)00(2)	R53BY5180(1)00(2)
20	35.0	50.0	57.5	52.5	50	53BY5200(1)00(2)	R53BY5200(1)00(2)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) M = ±20%, K = ±10%

Table 2 – Ratings & Part Number Reference for Parts with Internal Series Construction

Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Legacy Part Number
	T	H	L				
0.068	5.0	11.0	18.0	15	400	53BI2680(1)S0M	R53BI2680(1)S0M
0.1	6.0	12.0	18.0	15	400	53BI3100(1)S0M	R53BI3100(1)S0M
0.15	7.5	13.5	18.0	15	400	53BI3150(1)S0M	R53BI3150(1)S0M
0.22	8.5	14.5	18.0	15	400	53BI3220(1)S0M	R53BI3220(1)S0M
0.33	10.0	16.0	18.0	15	400	53BI3330(1)S0M	R53BI3330(1)S0M
0.39	11.0	19.0	18.0	15	400	53BI3390(1)S0M	R53BI3390(1)S0M
0.47	11.0	19.0	18.0	15	400	53BI3470(1)S0M	R53BI3470(1)S0M
0.22	6.0	15.0	26.5	22.5	200	53BN3220(1)S0M	R53BN3220(1)S0M
0.33	7.0	16.0	26.5	22.5	200	53BN3330(1)S0M	R53BN3330(1)S0M
0.47	8.5	17.0	26.5	22.5	200	53BN3470(1)S0M	R53BN3470(1)S0M
0.56	10.0	18.5	26.5	22.5	200	53BN3560(1)S0M	R53BN3560(1)S0M
0.68	11.0	20.0	26.5	22.5	200	53BN3680(1)S0M	R53BN3680(1)S0M
1	13.0	22.0	26.5	22.5	200	53BN4100(1)S0M	R53BN4100(1)S0M
0.82	11.0	20.0	32.0	27.5	150	53BR3820(1)S0M	R53BR3820(1)S0M
1	13.0	22.0	32.0	27.5	150	53BR4100(1)S0M	R53BR4100(1)S0M
1.2	13.0	22.0	32.0	27.5	150	53BR4120(1)S0M	R53BR4120(1)S0M
1.5	13.0	25.0	32.0	27.5	150	53BR4150(1)S0M	R53BR4150(1)S0M
1.8	14.0	28.0	32.0	27.5	150	53BR4180(1)S0M	R53BR4180(1)S0M
2.2	16.0	30.0	32.0	27.5	150	53BR4220(1)S0M	R53BR4220(1)S0M
3.3	22.0	37.0	32.0	27.5	150	53BR4330(1)S0M	R53BR4330(1)S0M
3.9	22.0	37.0	32.0	27.5	150	53BR4390(1)S0M	R53BR4390(1)S0M
4.7	20.0	40.0	42.0	37.5	100	53BW4470(1)S0M	R53BW4470(1)S0M
5.6	20.0	40.0	42.0	37.5	100	53BW4560(1)S0M	R53BW4560(1)S0M
6.8	24.0	44.0	42.0	37.5	100	53BW4680(1)S0M	R53BW4680(1)S0M
8.2	24.0	44.0	42.0	37.5	100	53BW4820(1)S0M	R53BW4820(1)S0M
10	30.0	45.0	42.0	37.5	100	53BW5100(1)S0M	R53BW5100(1)S0M
15	30.0	45.0	57.5	52.5	50	53BY5150(1)S0M	R53BY5150(1)S0M
18	35.0	50.0	57.5	52.5	50	53BY5180(1)S0M	R53BY5180(1)S0M
20	35.0	50.0	57.5	52.5	50	53BY5200(1)S0M	R53BY5200(1)S0M
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Legacy Part Number**

(1) Insert lead and packaging code. See table for available options.

Soldering Process

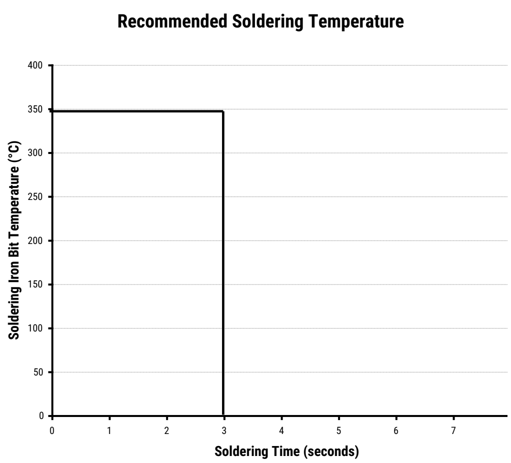
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder material. This has increased the liquidus temperature from 183°C for SnPb eutectic alloys to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher preheat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm). Great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above-recommended limits may result to degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after curing surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to normal temperature before performing the second soldering cycle.

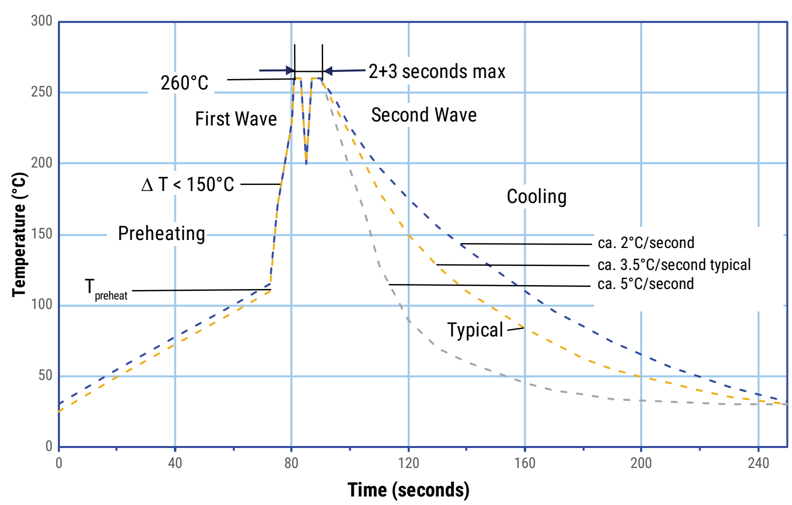
Manual Soldering Recommendations

Following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

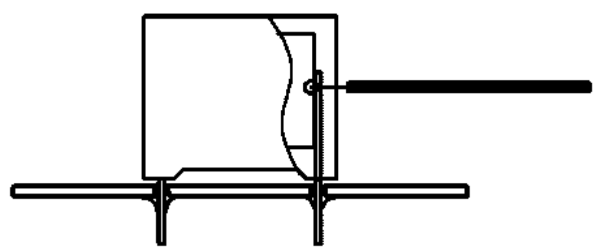
Wave Soldering Recommendations cont.

1. The table indicates the maximum set-up temperature of the soldering process.

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	125°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that the maximum temperature inside the element is below the limit.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	125°C
Paper	160°C
Polyphenylene Sulphide	160°C



Temperature monitored inside the capacitor.

Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as it is in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder, only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 – 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts do not overheat.

Mounting

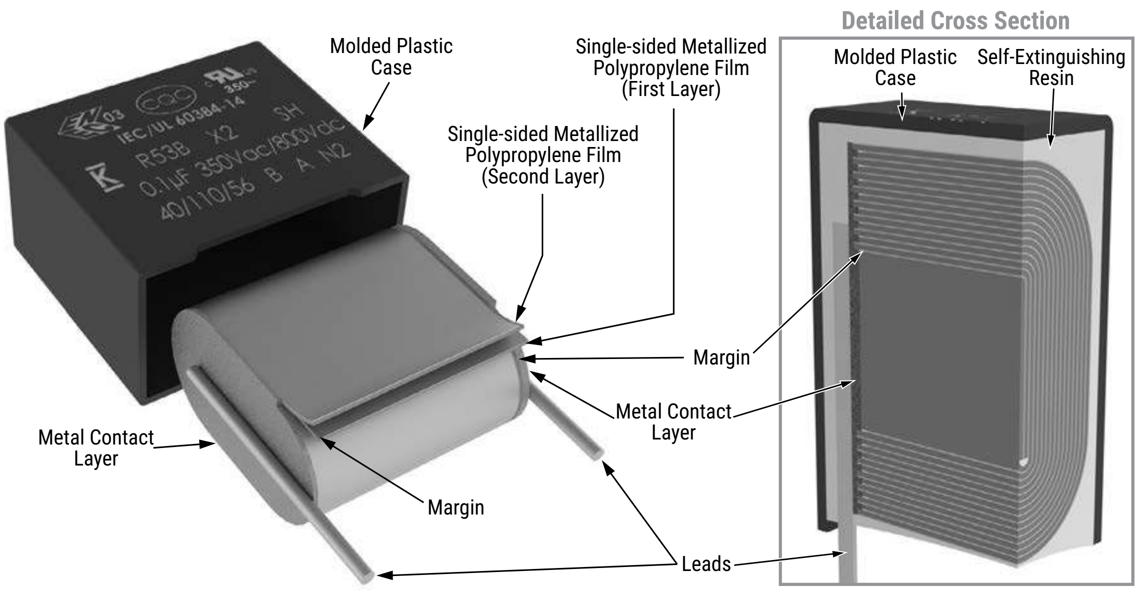
Resistance to Vibration and Mechanical Shock

AEC-Q200 Rev. E, Mechanical Stress Tests:

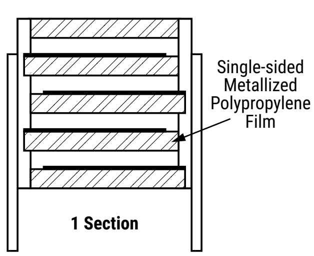
Mechanical Shock	**MIL-SDT-202 Method 213**	Figure 1 of Method 213 • THT: Condition C • SMD: Condition C • Tested per the Supplier's recommended mounting method
Vibration	**MIL-SDT-202 Method 204**	• 5 g for 20 minutes, 12 cycles each of 3 orientations • Tested per the Supplier's recommended mounting method • Verification of transfer load: during setup, verify that with the selected PCB design (size, thickness and secure points), or an alternative mount, that the transferred load onto the component corresponds to the requested load. This verification can be achieved using a laser vibrometer or other adequate measuring device • Test from 10 Hz – 2,000 Hz.

The capacitors are designed for PCB mounting. The stand-off pipes must be in good contact with the printed circuit board. The capacitor body has to be properly fixed (e.g. clamped or glued).

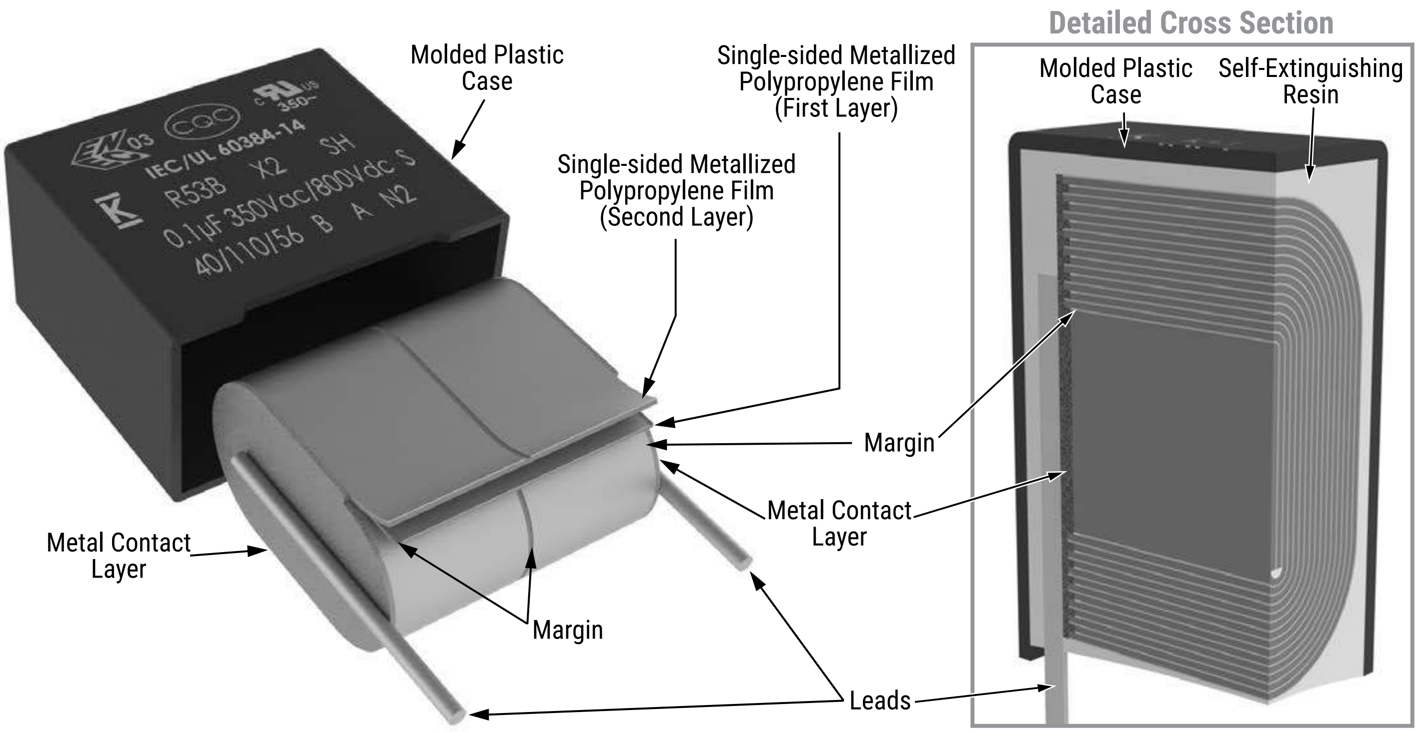
Construction



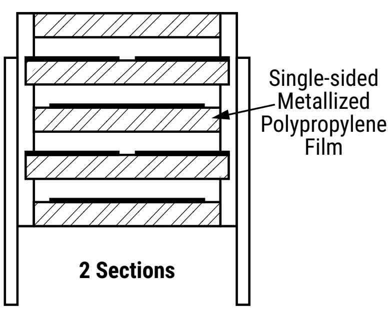
Winding Scheme



Construction cont.

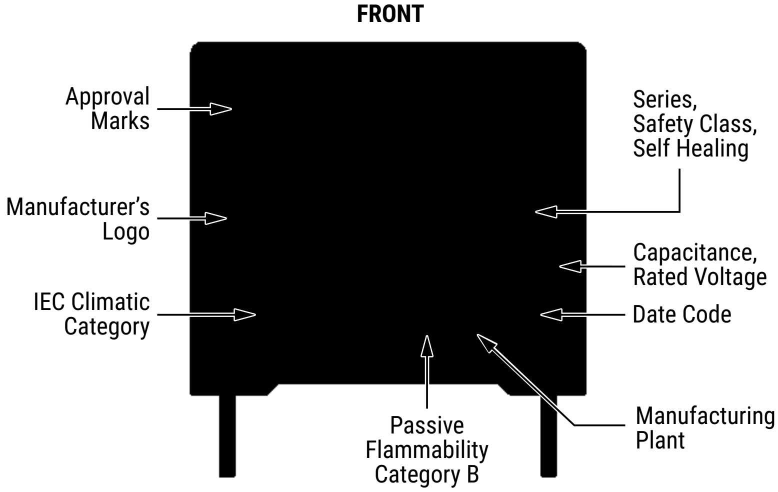


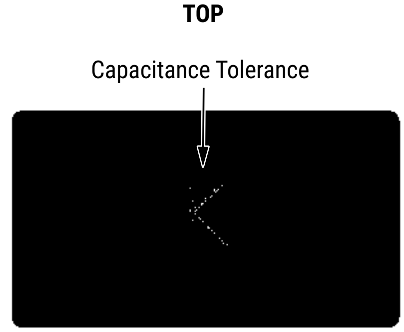
Winding Scheme



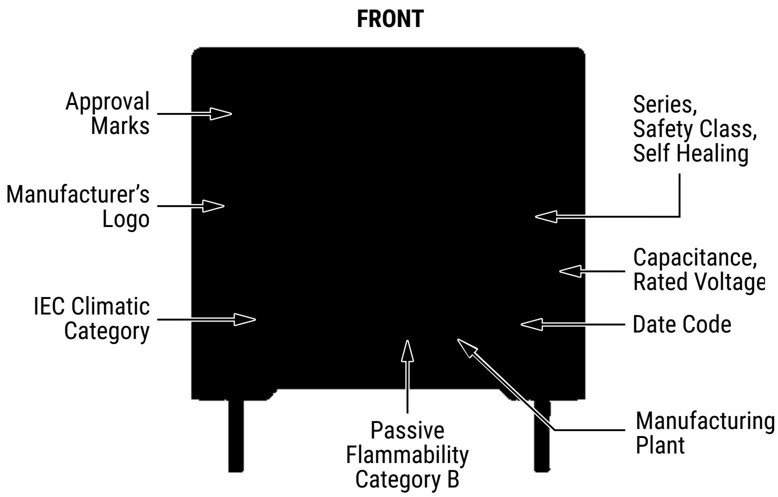
Marking

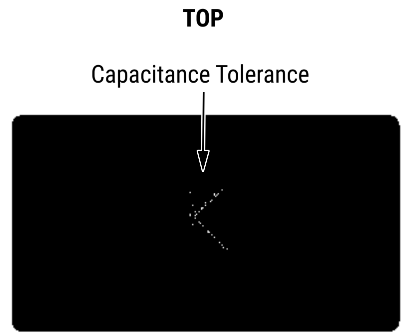
Parallel Construction Part Numbers: Lead Spacing 15 mm, 22.5 mm, and 27.5 mm





Series Construction Part Numbers: Lead Spacing 15 mm, 22.5 mm, and 27.5 mm

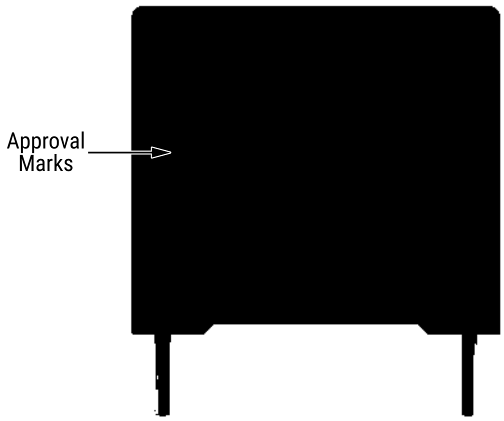


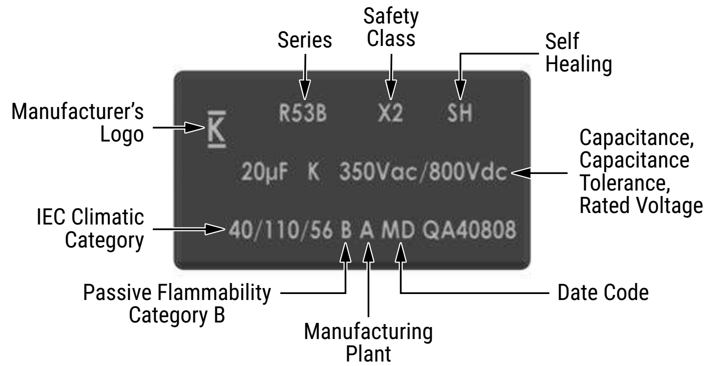


Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Marking cont.

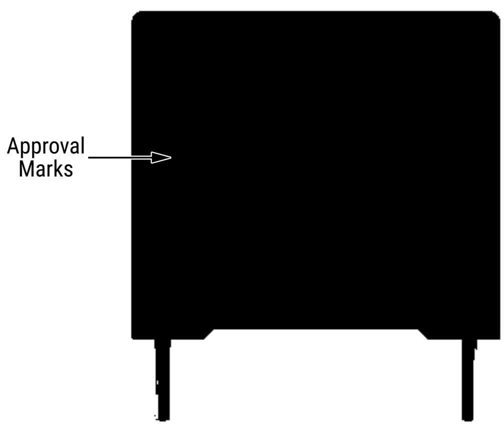
Parallel Construction Part Numbers: Lead Spacing 27.5 mm (alternatives*), 37.5 mm and 52.5 mm

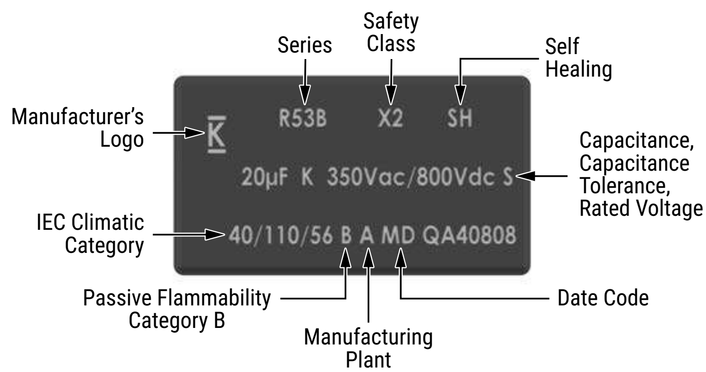




*Differences are caused by technology (clichee, laser, or ink) and production line.

Series Construction Part Numbers: Lead Spacing 27.5 mm (alternatives*), 37.5 mm and 52.5 mm





*Differences are caused by technology (clichee, laser, or ink) and production line.

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

Packaging Quantities

Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads		Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped	Pizza
Lead and Packaging Code:				00 - JA - JB JE - JH	JM	40 – 50	GY	CK	DQ	BB
15	5	11	18	2,000	1,250	1,000	600	1,250	800	1,122
	6	12	18	1,750	1,000	900	500	1,000	680	935
	7.5	13.5	18	1,000	800	700	350	800	500	748
	8.5	14.5	18	1,000	650	500	300	700	440	663
	10	16	18	750	550	500	270	600	380	561
	11	19	18	450	400	350	-	500	340	510
22.5	6	15	26.5	805	450	500	-	700	464	660
	7	16	26.5	700	450	500	-	550	380	564
	8.5	17	26.5	468	350	300	-	450	280	468
	10	18.5	26.5	396	350	300	-	350	235	396
	11	20	26.5	360	200	250	-	350	217	360
	13	22	26.5	300	150	200	-	300	-	300
27.5	11	20	32	560	336	336	-	350	-	300
	13	22	32	480	288	288	-	300	-	250
	13	25	32	480	288	288	-	-	-	250
	14	28	32	352	176	176	-	-	-	230
	16	30	32	288	144	144	-	-	-	200
	22	37	32	168	112	112	-	-	-	150
37.5	20	40	42	58	58	58	-	-	-	-
	24	44	42	44	44	44	-	-	-	-
	30	45	42	36	36	36	-	-	-	-
52.5	30	45	57.5	27	-	-	-	-	-	-
	35	50	57.5	23	-	-	-	-	-	-

Lead Taping & Packaging (IEC 60286–2)

Figure 1 – Lead Spacing 15 mm

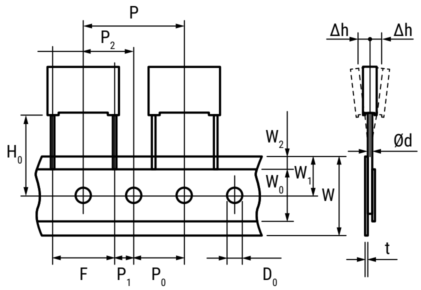
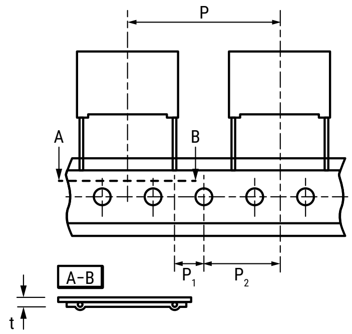


Figure 2 – Lead Spacing 22.5 & 27.5 mm



Taping Specification

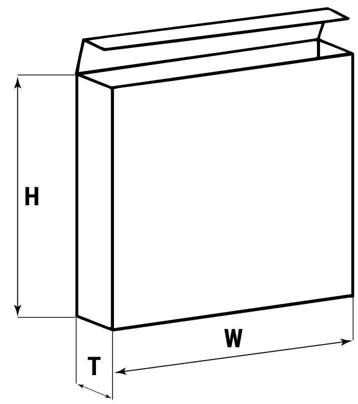
Description	Symbol	Dimensions (mm)			
		Lead Space			Tolerance
		15.0	22.5	27.5	
Lead wire diameter	d	0.6 – 0.8	0.8	0.8	±0.05
Taping lead space	P	25.4	38.1	38.1	±1
Feed hole lead space *	P_0	12.7	12.7	12.7	±0.2 **
Centering of the lead wire	P_1	5.2	7.8	5.3	±0.7
Centering of the body	P_2	12.7	19.05	19.05	±1.3
Lead spacing ***	F	15.0	22.5	27.5	+0.6/−0.1
Component alignment	Δh	0	0	0	±2
Component deviation	Δp	0	0	0	±1
Height of component from tape center	H_0****	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	+1/−0.5
Hold down tape width	W_0	10	10	10	Minimum
Hole position	W_1	9	9	9	±0.5
Hold down tape position	W_2	3	3	3	Maximum
Feed hole diameter	D_0	4	4	4	±0.2
Total Tape thickness	t	0.7	0.7	0.7	±0.2

** Available also 15 mm.*
*** Maximum 1 mm on 20 lead spacing.*
**** 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request.*
***** H_0 = 16.5 mm is available upon request.*

Lead Taping & Packaging (IEC 60286–2) cont.

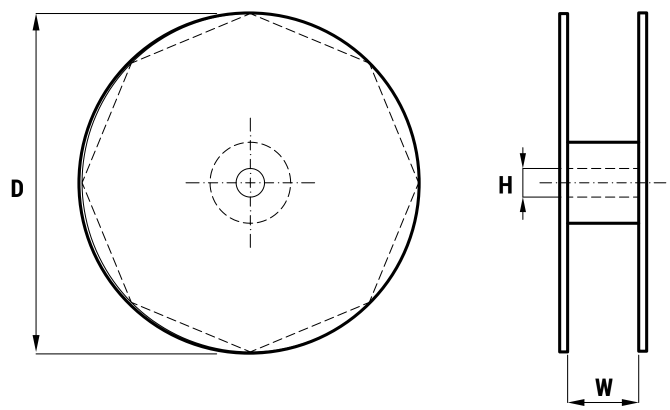
Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



Reel Specifications

Reel Size	Dimensions (mm)		
	D	H	W
Standard	355	30	55 Maximum
Large	500	25	



R58, Class X1, THB Grade IIIB, 600 VAC, 110°C (Automotive Grade)

KEMET a YAGEO company

Overview

The R58 is constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material meeting the requirements of UL 94 V–0.

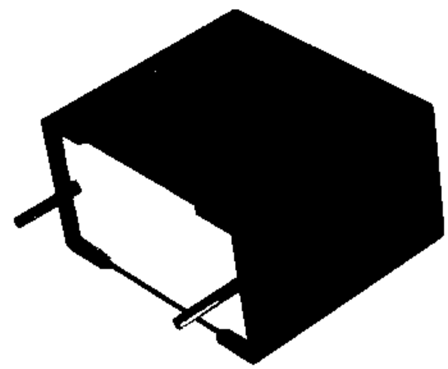
Automotive Grade devices meet the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

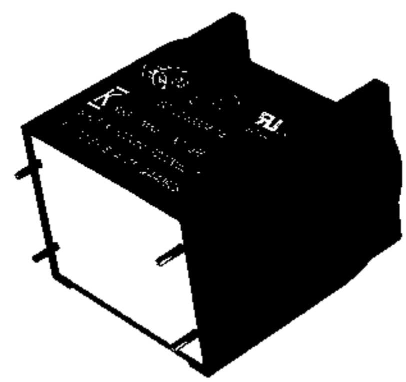
Applications

For worldwide use in electromagnetic interference (EMI) suppression in across-the-line applications that require X1 safety classification. Typical applications include Industrial, Solar inverter output EMI filtering and Automotive HV DC bus filtering.

Benefits

- Approvals: ENEC, UL, cUL, CQC (in progress)
- Class X1 (IEC 60384-14)
- THB Grade IIIB: 85°C, 85% RH, 1,000 hours at 600 VAC acc. to IEC 60384-14
- THB Grade IIIB: 85°C, 85% RH, 1,000 hours at 1,200 VDC acc. to IEC 60384-14
- Low Halogen Content according to JS709C
- Rated AC voltage: 600 VAC 50/60 Hz
- Rated DC voltage: 1,200 VDC
- Capacitance range: 0.01 – 8.2 µF
- Lead spacing: 15.0 – 52.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category 40/110/56, IEC 60068-1
- Tape and reel in accordance with IEC 60286-2
- RoHS compliant and lead-free terminations
- Operating temperature range of −40°C to +110°C
- 100% screening factory test at 3,000 VDC
- Self-healing properties
- Automotive (AEC–Q200) grade





Customer Part Number

R58	6	I	2470	00	T0	M
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance
X1, Metallized Polypropylene	6 = 600	I = 15.0 N = 22.5 R = 27.5 W = 37.5 Y = 52.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	See Ordering Options Table	T0 T1	K = ±10% M = ±20%

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	LL Lead Length (mm)	Lead and Packaging Code
15 22.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4.0 +2/−0	00
	Pizza Pack – Short Leads	4.0 +2/−0	BB
	Ammo Pack	H_0 = 18.5 ±0.5	DQ[1]
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	CK
	Tape & Reel (Standard Reel)	H_0 = 18.5 ±0.5	GY[1]
	Bulk (Bag)[2] – Short Leads	2.7 +0.5/−0	JA
	Bulk (Bag)[2] – Short Leads	3.5 +0.5/−0	JB
	Bulk (Bag)[2] – Short Leads	4.0 +0.5/−0	JE
	Bulk (Bag)[2] – Short Leads	3.2 +0.3/−0.2	JH
	Bulk (Bag) – Long Leads	18 ±1	JM
	Bulk (Bag) – Long Leads	30 +5/−0	40
	Bulk (Bag) – Long Leads	25 +2/−1	50
27.5	**Standard Lead and Packaging Options**		
	Bulk (Tray) – Short Leads	4.0 +2/−0	00
	Pizza Pack – Short Leads	4.0 +2/−0	BB
	Tape & Reel (Large Reel)	H_0 = 18.5 ±0.5	CK[1]
	Other Lead and Packaging Options		
	Bulk (Tray) – Short Leads	2.7 +0.5/−0	JA
	Bulk (Tray) – Short Leads	3.5 +0.5/−0	JB
	Bulk (Tray) – Short Leads	4.0 +0.5/−0	JE
	Bulk (Tray) – Short Leads	3.2 +0.3/−0.2	JH
	Bulk (Tray) – Long Leads	18 ±1	JM
	Bulk (Tray) – Long Leads	30 +5/−0	40
	Bulk (Tray) – Long Leads	25 +2/−1	50

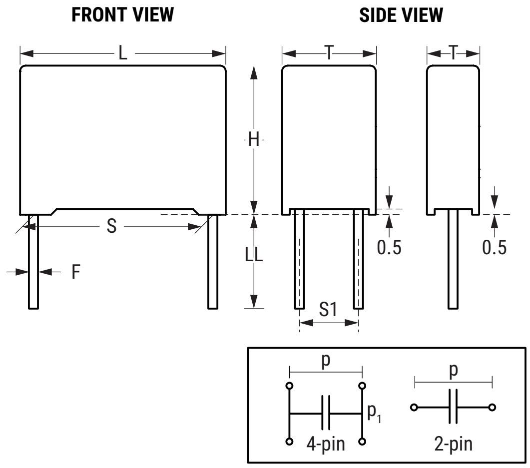
1 Not for all sizes, see "Packaging Quantities" table.
*2 For lead spacing 22.5 case sizes ≥ 8.5*17*26.5 the parts are packed in Pizza box 335*320*34 mm.*

Ordering Options Table cont.

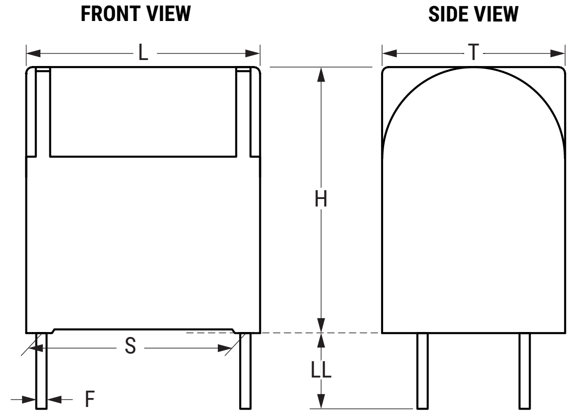
Lead Spacing Nominal (mm)	Type of Leads and Packaging	LL Lead Length (mm)	Lead and Packaging Code
37.5	**Standard Lead and Packaging Options**		
	Pizza Pack – Short Leads	4.0 +2/−0	00
	Other Lead and Packaging Options		
	Pizza Pack – Short Leads	2.7 +0.5/−0	JA
	Pizza Pack – Short Leads	3.5 +0.5/−0	JB
	Pizza Pack – Short Leads	4.0 +0.5/−0	JE
	Pizza Pack – Short Leads	3.2 +0.3/−0.2	JH
	Pizza Pack – Long Leads	18 ±1	JM
	Pizza Pack – Long Leads	30 +5/−0	40
	Pizza Pack – Long Leads	25 +2/-1	50
52.5	**Standard Lead and Packaging Options**		
	Pizza Pack – Short Leads	4.0 +2/−0	00

1 Not for all sizes, see "Packaging Quantities" table.
*2 For lead spacing 22.5 case sizes ≥ 8.5*17*26.5 the parts are packed in Pizza box 335*320*34 mm.*

Dimensions – Millimeters



Box with Arc Shape Design



S		S1		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
15.0	±0.4	-	-	5.0	+0.3/−0.5	11.0	+0.3/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	-	-	6.0	+0.3/−0.5	12.0	+0.3/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	-	-	7.5	+0.3/−0.5	13.5	+0.3/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	-	-	8.5	+0.3/−0.5	14.5	+0.3/−0.5	18.0	+0.5/−0.5	0.6	±0.05
15.0	±0.4	-	-	10.0	+0.3/−0.5	16.0	+0.3/−0.5	18.0	+0.5/−0.5	0.8	±0.05
15.0	±0.4	-	-	11.0	+0.3/−0.5	19.0	+0.3/−0.5	18.0	+0.5/−0.5	0.8	±0.05
22.5	±0.4	-	-	6.0	+0.3/−0.5	15.0	+0.3/−0.5	26.5	+0.5/−0.5	0.8	±0.05
22.5	±0.4	-	-	7.0	+0.3/−0.5	16.0	+0.3/−0.5	26.5	+0.5/−0.5	0.8	±0.05
22.5	±0.4	-	-	8.5	+0.3/−0.5	17.0	+0.3/−0.5	26.5	+0.5/−0.5	0.8	±0.05
22.5	±0.4	-	-	10.0	+0.3/−0.5	18.5	+0.3/−0.5	26.5	+0.5/−0.5	0.8	±0.05
22.5	±0.4	-	-	11.0	+0.3/−0.5	20.0	+0.3/−0.5	26.5	+0.5/−0.5	0.8	±0.05
22.5	±0.4	-	-	13.0	+0.3/−0.5	22.0	+0.3/−0.5	26.5	+0.5/−0.5	0.8	±0.05
27.5	±0.4	-	-	11.0	+0.3/−0.7	20.0	+0.3/−0.7	32.0	+0.5/−0.7	0.8	±0.05
27.5	±0.4	-	-	13.0	+0.3/−0.7	22.0	+0.3/−0.7	32.0	+0.5/−0.7	0.8	±0.05
27.5	±0.4	-	-	14.0	+0.3/−0.7	28.0	+0.3/−0.7	32.0	+0.5/−0.7	0.8	±0.05
27.5	±0.4	-	-	18.0	+0.3/−0.7	33.0	+0.3/−0.7	32.0	+0.5/−0.7	0.8	±0.05
27.5	±0.4	-	-	22.0	+0.3/−0.7	37.0	+0.3/−0.7	32.0	+0.5/−0.7	0.8	±0.05
37.5	±0.4	-	-	11.0	+0.3/−0.7	22.0	+0.3/−0.7	42.0	+0.5/−0.7	1.0	±0.05
37.5	±0.4	-	-	13.0	+0.3/−0.7	24.0	+0.3/−0.7	42.0	+0.5/−0.7	1.0	±0.05
37.5	±0.4	-	-	16.0	+0.3/−0.7	28.5	+0.3/−0.7	42.0	+0.5/−0.7	1.0	±0.05
37.5	±0.4	-	-	19.0	+0.3/−0.7	32.0	+0.3/−0.7	42.0	+0.5/−0.7	1.0	±0.05
37.5	±0.4	-	-	20.0	+0.3/−0.7	40.0	+0.3/−0.7	42.0	+0.5/−0.7	1.0	±0.05
37.5	±0.4	-	-	24.0	+0.3/−0.7	44.0	+0.3/−0.7	42.0	+0.5/−0.7	1.0	±0.05
37.5	±0.4	-	-	30.0	+0.3/−0.7	45.0	+0.3/−0.7	42.0	+0.5/−0.7	1.0	±0.05
52.5	±0.4	20.3	±0.4	30.0	+1.2/−1.2	45.0	+1.2/−1.2	57.5	+1.2/−1.2	1.2	±0.05
52.5	±0.4	20.3	±0.4	35.0	+1.2/−1.2	50.0	+1.2/−1.2	57.5	+1.2/−1.2	1.2	±0.05
52.5*	±0.4	20.3	±0.4	45.0	+1.2/−1.2	56.0	+1.2/−1.2	57.5	+1.2/−1.2	1.2	±0.05
Note: See the Ordering Options Table for lead length (LL) options.											

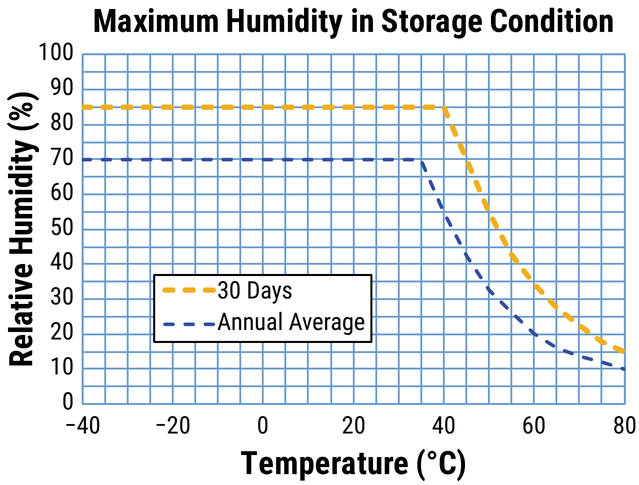
** Box with Arc Shape Design*

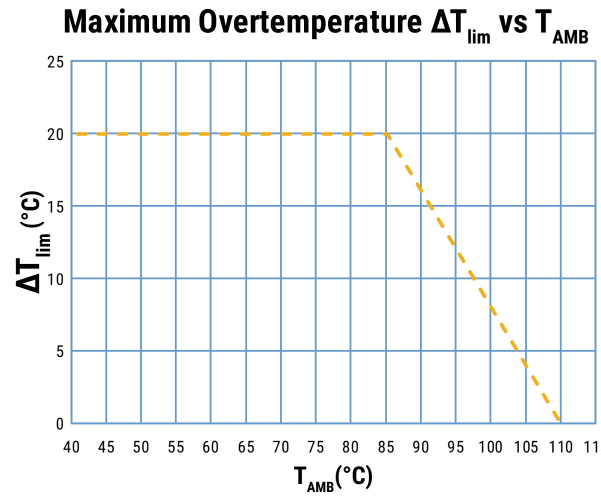
Performance Characteristics

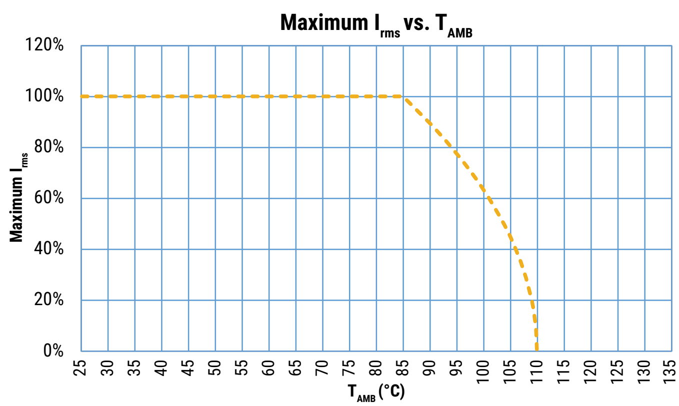
Dielectric	Polypropylene film			
Plates	Metal layer deposited by evaporation under vacuum			
Winding	Non-inductive type			
Leads	Tinned wire			
Protection	Plastic case, thermosetting resin-filled. Box material is solvent resistant and flame retardant according to UL94.			
Related Documents	IEC 60384-14, EN 60384-14			
Rated Voltage V_R	600 VAC (50/60 Hz) / 1,200 VDC			
Capacitance Range	0.01 – 8.2 µF			
Capacitance Values	E6 series (IEC 60063) measured at 1 kHz and +20 ±1°C			
Capacitance Tolerance	±10%, ±20%			
Temperature Range	−40°C to 110°C			
Climatic Category	40/110/56 IEC 60068-1			
Storage Conditions	Storage time: ≤ 24 months from the date marked on the label package			
	Average relative humidity per year ≤ 70%			
	RH ≤ 85% for 30 days randomly distributed throughout the year			
	Dew is absent			
	Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)			
Approvals	ENEC, UL, cUL, CQC (in progress)			
Dissipation Factor (tanδ) at 1 kHz	Maximum Values at +25°C ±5°C			
	Pitch = 15 mm	Pitch = 22.5 or 27.5 mm	Pitch = 37.5 or 52.5 mm	
	0.4%	0.3%	0.2%	
Test Voltage Between Terminations	The 100% screening factory test is carried out at 3,000 VDC. The voltage level is selected to meet the requirements in applicable equipment standards. All electrical characteristics are checked after the test. It is not permitted to repeat this test as there is a risk to damage the capacitor. KEMET is not liable in such case for any failures.			
Insulation Resistance	Measured at +25°C ±5°C			
	Minimum Values Between Terminals			
	Voltage Charge	Voltage Charge Time	C ≤ 0.33 µF	C > 0.33 µF
	500 VDC	1 minute	≥ $1 \cdot 10^5$ MΩ (≥ $5 \cdot 10^5$ MΩ)*	≥ 30,000 MΩ • µF (≥ 150,000 MΩ • µF)*

**Typical Value*

Performance Characteristics cont.

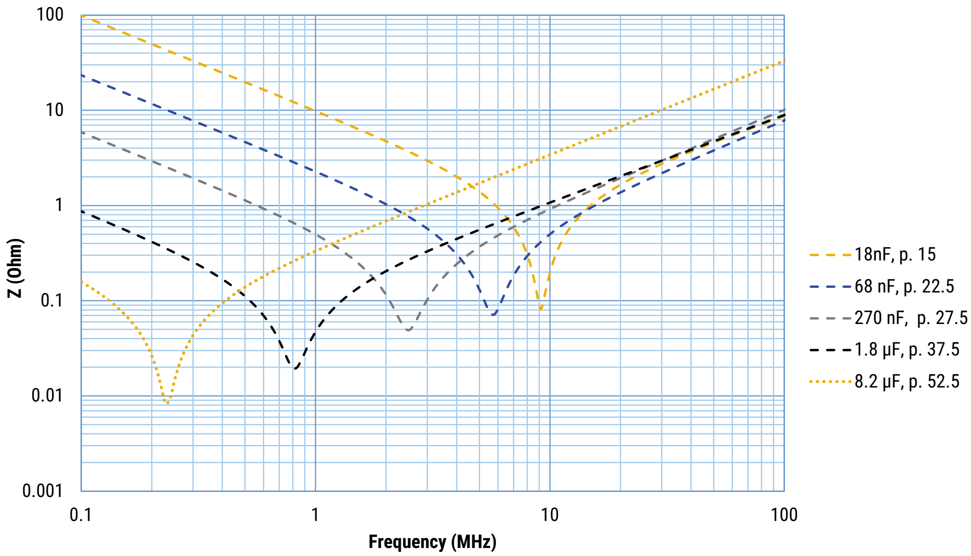






T_{AMB} is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

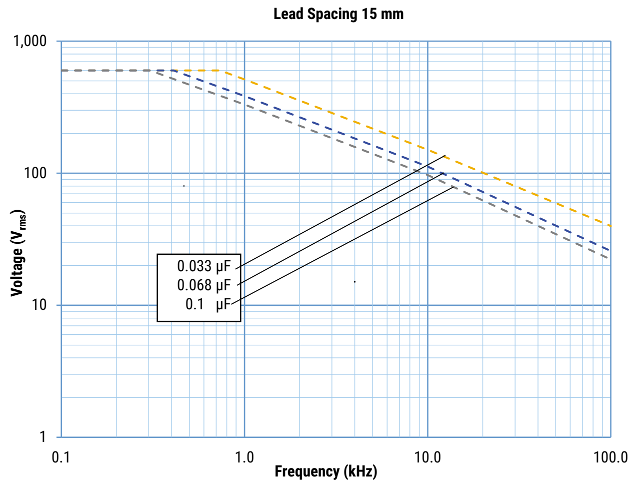
Impedance Graph

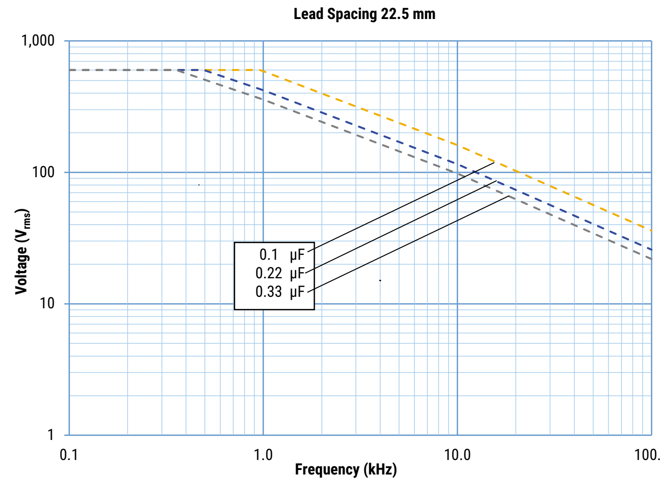


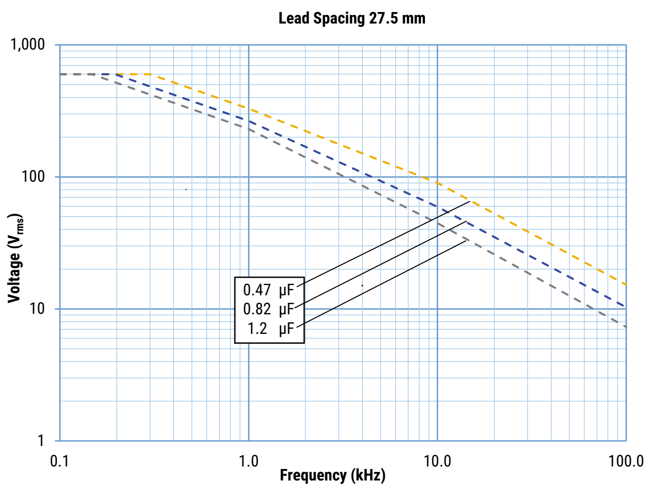
Environmental Test Data

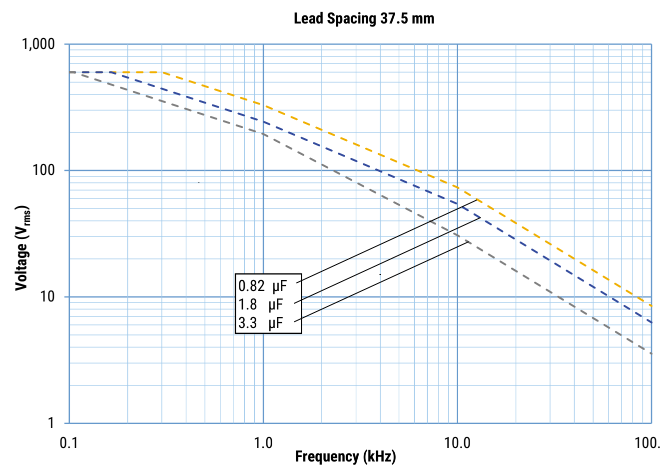
Test	IEC Publication	Procedure
Endurance	IEC 60384-14	1.25 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature
Endurance	IEC 60384-14	1.25 x 1200 VDC, 1,000 hours at upper rated temperature
Vibration	MIL–STD–202 Method 204	5 G for 20 minutes, 12 cycles each of 3 orientations. Use 8" X 5" PCB, 0.031" thick. 7 secure points on one 8" side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10 – 2,000 Hz.
Mechanical Shock	MIL–STD–202 Method 213	Figure 1 of Method 213. Condition C
Temperature Cycling	JESD22–Method JA–104	1,000 cycles (−40°C to 110°C) Note: Measurement at 24 ±4 hours after test conclusion. 30 minute maximum dwell time at each temperature extreme. 1 minute maximum transition time.
Active Flammability	IEC 60384-14	V_R + 20 surge pulses at 4 kV (pulse every 5 seconds)
Passive Flammability	IEC 60384-14	IEC 60384-1, IEC 60695-11-5 Needle Flame Test
Biased Humidity	According to Grade IIIB	85°C/85% RH and 600 VAC, 1,000 hours Capacitance change (ΔC/C): ≤ 10% Dissipation factor change (Δtan δ): ≤ 24 * 10−3 (at 10 kHz) for C ≤ 1 µF Dissipation factor change (Δtan δ): ≤ 15 * 10−3 (at 1 kHz) for C > 1 µF Insulation resistance Rins or time constant τ = CR Rins: ≥ 50% of initial limit
Biased Humidity	According to Grade IIIB	85°C/85% RH and 1200 VDC, 1,000 hours Capacitance change (ΔC/C): ≤ 10% Dissipation factor change (Δtan δ): ≤ 24 * 10−3 (at 10 kHz) for C ≤ 1 µF Dissipation factor change (Δtan δ): ≤ 15 * 10−3 (at 1 kHz) for C > 1 µF Insulation resistance Rins or time constant τ = CR Rins: ≥ 50% of initial limit

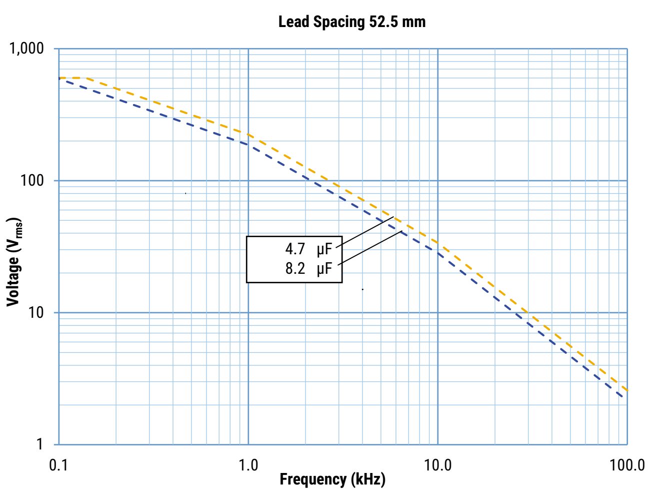
Maximum Voltage (V_{RMS}) Versus Frequency (Sinusoidal Waveform/Th ≤ 85°C)





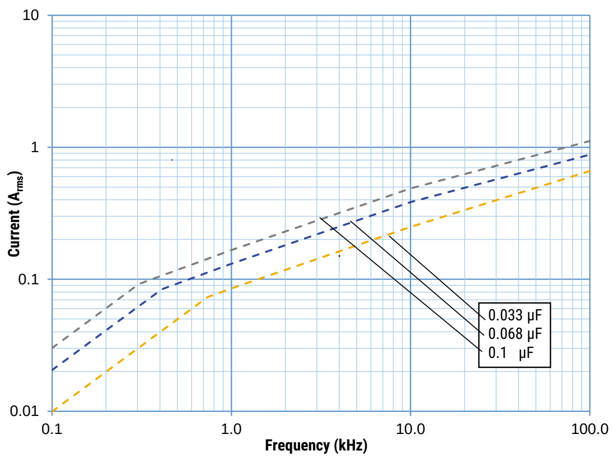




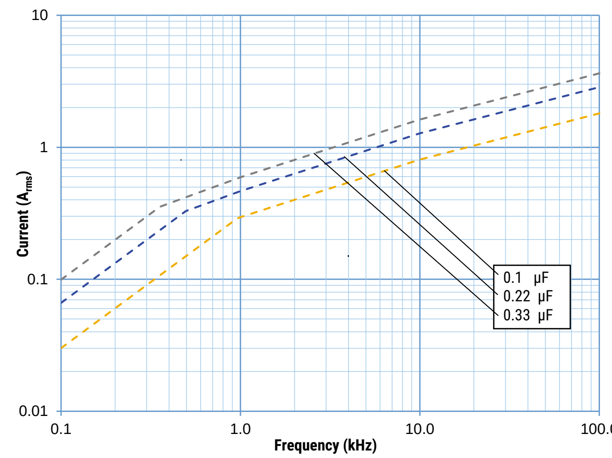


Maximum Current (I_{RMS}) Versus Frequency (Sinusoidal Waveform/Th ≤ 85°C)

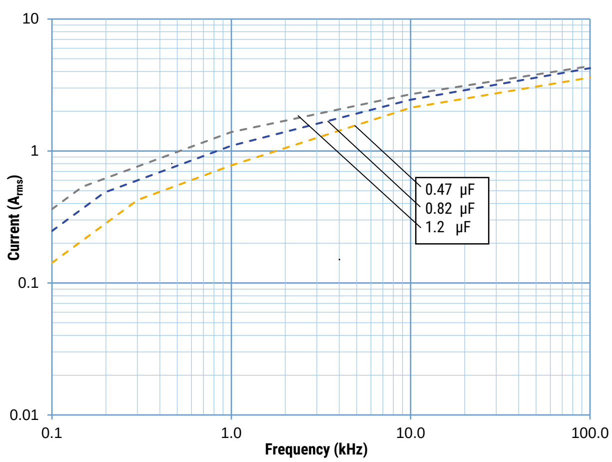
Lead Spacing 15 mm



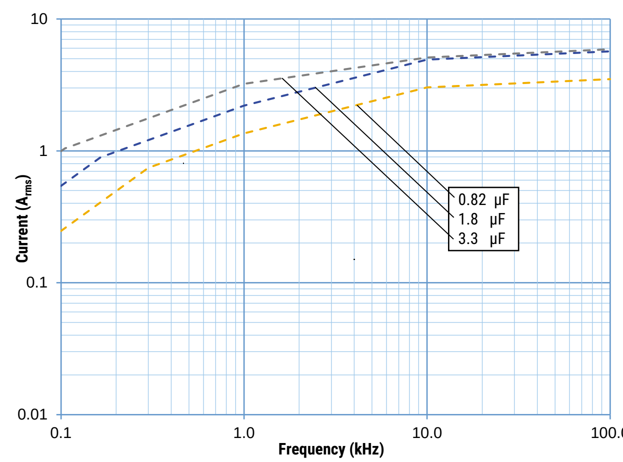
Lead Spacing 22.5 mm



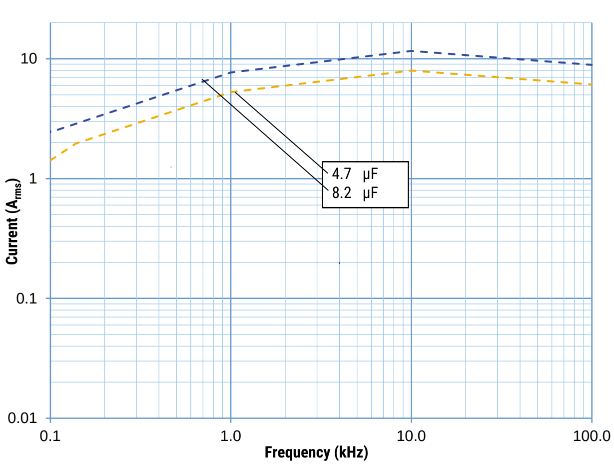
Lead Spacing 27.5 mm



Lead Spacing 37.5 mm



Lead Spacing 52.5 mm



Environmental Compliance

All KEMET EMI capacitors are RoHS compliant.

Approvals

Certification Body	Mark	Specification	File Number
IMQ S.p.A.		EN/IEC 60384-14	CA08.00241
UL		UL 60384-14 and CAN/CSA-E60384-14	E97797
CQC		IEC 60384-14	CQC23001378656 CQC23001378657 CQC23001378658 CQC23001378659 CQC23001378660

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Customer Part Number
	T	H	L				
0.01	5.0	11.0	18.0	15.0	600	586I2100(1)T0(2)	R586I2100(1)T0(2)
0.012	5.0	11.0	18.0	15.0	600	586I2120(1)T0(2)	R586I2120(1)T0(2)
0.015	5.0	11.0	18.0	15.0	600	586I2150(1)T0(2)	R586I2150(1)T0(2)
0.018	6.0	12.0	18.0	15.0	600	586I2180(1)T0(2)	R586I2180(1)T0(2)
0.022	6.0	12.0	18.0	15.0	600	586I2220(1)T0(2)	R586I2220(1)T0(2)
0.027	7.5	13.5	18.0	15.0	600	586I2270(1)T0(2)	R586I2270(1)T0(2)
0.033	7.5	13.5	18.0	15.0	600	586I2330(1)T0(2)	R586I2330(1)T0(2)
0.039	7.5	13.5	18.0	15.0	600	586I2390(1)T0(2)	R586I2390(1)T0(2)
0.047	8.5	14.5	18.0	15.0	600	586I2470(1)T0(2)	R586I2470(1)T0(2)
0.056	10.0	16.0	18.0	15.0	600	586I2560(1)T0(2)	R586I2560(1)T0(2)
0.068	10.0	16.0	18.0	15.0	600	586I2680(1)T0(2)	R586I2680(1)T0(2)
0.082	11.0	19.0	18.0	15.0	600	586I2820(1)T0(2)	R586I2820(1)T0(2)
0.10	11.0	19.0	18.0	15.0	600	586I3100(1)T0(2)	R586I3100(1)T0(2)
0.047	6.0	15.0	26.5	22.5	300	586N2470(1)T0(2)	R586N2470(1)T0(2)
0.056	6.0	15.0	26.5	22.5	300	586N2560(1)T0(2)	R586N2560(1)T0(2)
0.068	6.0	15.0	26.5	22.5	300	586N2680(1)T0M	R586N2680(1)T0M
0.082	7.0	16.0	26.5	22.5	300	586N2820(1)T0(2)	R586N2820(1)T0(2)
0.10	8.5	17.0	26.5	22.5	300	586N3100(1)T0(2)	R586N3100(1)T0(2)
0.12	8.5	17.0	26.5	22.5	300	586N3120(1)T0(2)	R586N3120(1)T0(2)
0.15	10.0	18.5	26.5	22.5	300	586N3150(1)T0(2)	R586N3150(1)T0(2)
0.18	10.0	18.5	26.5	22.5	300	586N3180(1)T0(2)	R586N3180(1)T0(2)
0.22	11.0	20.0	26.5	22.5	300	586N3220(1)T0(2)	R586N3220(1)T0(2)
0.27	13.0	22.0	26.5	22.5	300	586N3270(1)T0(2)	R586N3270(1)T0(2)
0.33	13.0	22.0	26.5	22.5	300	586N3330(1)T0M	R586N3330(1)T0M
0.22	11.0	20.0	32.0	27.5	225	586R3220(1)T0(2)	R586R3220(1)T0(2)
0.27	13.0	22.0	32.0	27.5	225	586R3270(1)T0(2)	R586R3270(1)T0(2)
0.33	13.0	22.0	32.0	27.5	225	586R3330(1)T0(2)	R586R3330(1)T0(2)
0.39	14.0	28.0	32.0	27.5	225	586R3390(1)T0(2)	R586R3390(1)T0(2)
0.47	14.0	28.0	32.0	27.5	225	586R3470(1)T0(2)	R586R3470(1)T0(2)
0.56	14.0	28.0	32.0	27.5	225	586R3560(1)T0M	R586R3560(1)T0M
0.68	18.0	33.0	32.0	27.5	225	586R3680(1)T0(2)	R586R3680(1)T0(2)
0.82	18.0	33.0	32.0	27.5	225	586R3820(1)T0(2)	R586R3820(1)T0(2)
1.0	18.0	33.0	32.0	27.5	225	586R4100(1)T0M	R586R4100(1)T0M
1.2	22.0	37.0	32.0	27.5	225	586R4120(1)T0(2)	R586R4120(1)T0(2)
0.47	11.0	22.0	42.0	37.5	150	586W3470(1)T0M	R586W3470(1)T0M
0.56	13.0	24.0	42.0	37.5	150	586W3560(1)T0(2)	R586W3560(1)T0(2)
0.68	13.0	24.0	42.0	37.5	150	586W3680(1)T0M	R586W3680(1)T0M
0.82	16.0	28.5	42.0	37.5	150	586W3820(1)T0(2)	R586W3820(1)T0(2)
1.0	16.0	28.5	42.0	37.5	150	586W4100(1)T0M	R586W4100(1)T0M
1.2	19.0	32.0	42.0	37.5	150	586W4120(1)T0(2)	R586W4120(1)T0(2)
1.5	20.0	40.0	42.0	37.5	150	586W4150(1)T0(2)	R586W4150(1)T0(2)
1.8	20.0	40.0	42.0	37.5	150	586W4180(1)T0(2)	R586W4180(1)T0(2)
2.2	24.0	44.0	42.0	37.5	150	586W4220(1)T0(2)	R586W4220(1)T0(2)
2.7	24.0	44.0	42.0	37.5	150	586W4270(1)T0(2)	R586W4270(1)T0(2)
3.3	30.0	45.0	42.0	37.5	150	586W4330(1)T0(2)	R586W4330(1)T0(2)
4.7	30.0	45.0	57.5	52.5	76	586Y4470(1)T0(2)	R586Y4470(1)T0(2)
5.6	30.0	45.0	57.5	52.5	76	586Y4560(1)T0(2)	R586Y4560(1)T0(2)
6.8	35.0	50.0	57.5	52.5	76	586Y4680(1)T0(2)	R586Y4680(1)T0(2)
8.2	45.0	56.0	57.5	52.5	76	586Y4820(1)T0(2)	R586Y4820(1)T0(2)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Customer Part Number**

(1) Insert lead and packaging code. See table for available options.
(2) M = ±20%, K = ±10%

Soldering Process

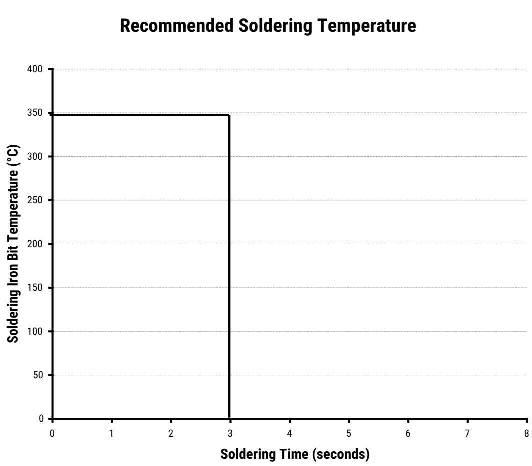
The implementation of the RoHS directive has resulted in the selection of SnAuCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from 183ºC for SnPb eutectic alloys to 217 – 221ºC for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170ºC). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 – 15 mm), and great care must be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. See Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the recommended limits may result in degradation of or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface-mount components. Insert through-hole parts after curing the surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum of two soldering cycles is recommended. Allow time for the capacitor surface temperature to return to normal before the second soldering cycle.

Manual Soldering Recommendations

The following is the recommendation for manual soldering with a soldering iron.



Soldering iron tip temperature should be set at 350°C (+10°C maximum), with the soldering duration not to exceed 3 seconds.

Wave Soldering Recommendations

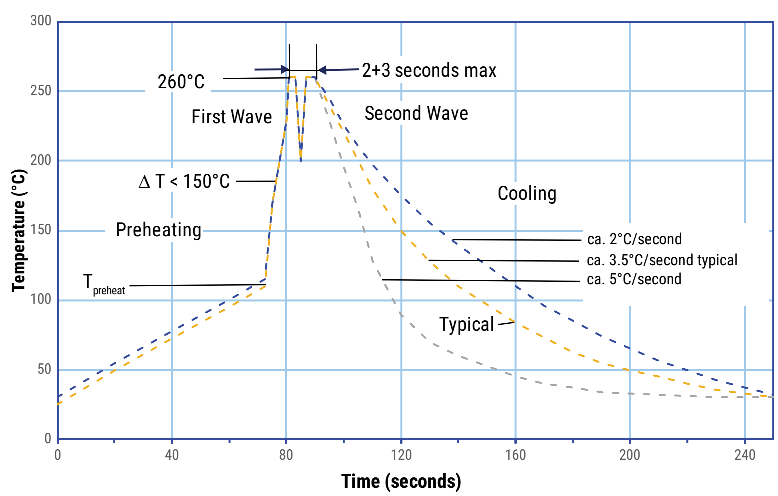


Figure 1

Soldering Process cont.

Wave Soldering Recommendations cont.

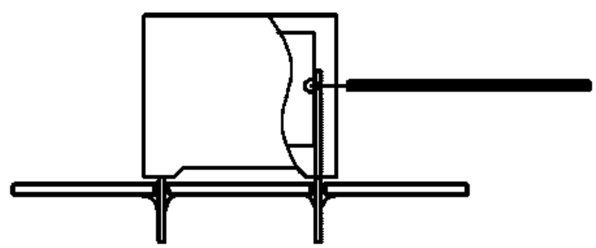
1. The table indicates the maximum set-up temperature of the soldering process.

Figure 1

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	110°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor: set the temperature so that the maximum temperature is below the.

Dielectric Film Material	Maximum Temperature Measured Inside the Element
Polyester	160°C
Polypropylene	110°C
Paper	160°C
Polyphenylene Sulphide	160°C



Temperature monitored inside the capacitor.

Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath, as in normal flow soldering, without touching the solder. When the board is over the bath, it is stopped. Pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and then pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double-wave flow soldering outlined in this document. **However, instead of two baths, there is only one with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double-wave flow soldering. Great care must be taken so that the parts do not overheat.

Mounting

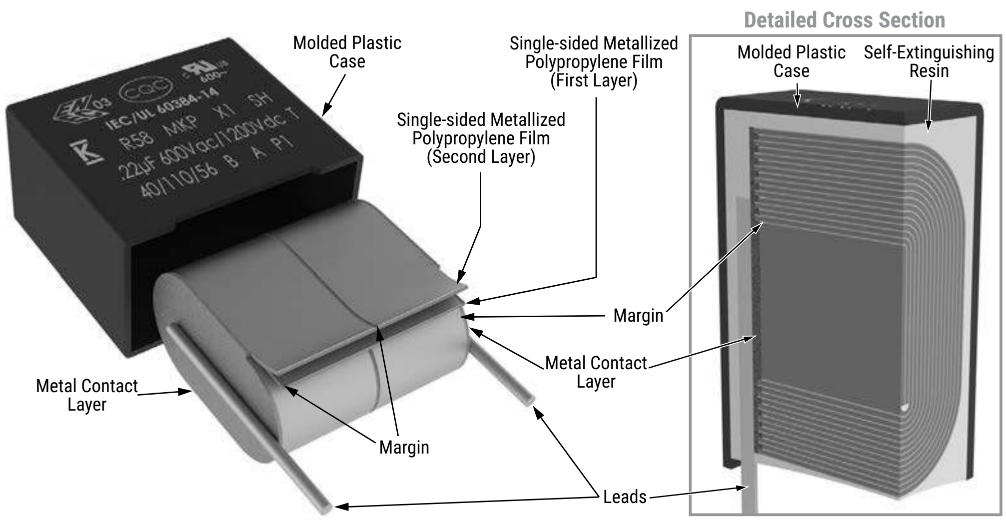
Resistance to Vibration and Mechanical Shock

AEC-Q200 Rev. E Mechanical Stress Tests:

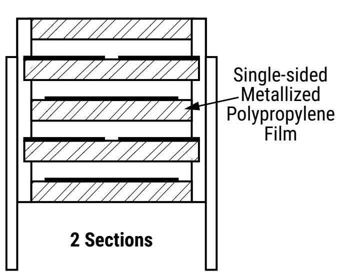
Mechanical Shock	**MIL-SDT-202 Method 213**	Figure 1 of Method 213 • THT: Condition C • SMD: Condition C • Tested per the Supplier's recommended mounting method
Vibration	**MIL-SDT-202 Method 204**	• 5 g for 20 minutes, 12 cycles each of 3 orientations • Tested per the Supplier's recommended mounting method • Verification of transfer load: during setup, verify that with the selected PCB design (size, thickness and secure points), or an alternative mount, that the transferred load onto the component corresponds to the requested load. This verification can be achieved using a laser vibrometer or other adequate measuring device • Test from 10 Hz – 2,000 Hz.

The capacitors are designed for PCB mounting. The stand-off pipes must be in good contact with the printed circuit board. The capacitor body has to be properly fixed (e.g. clamped or glued).

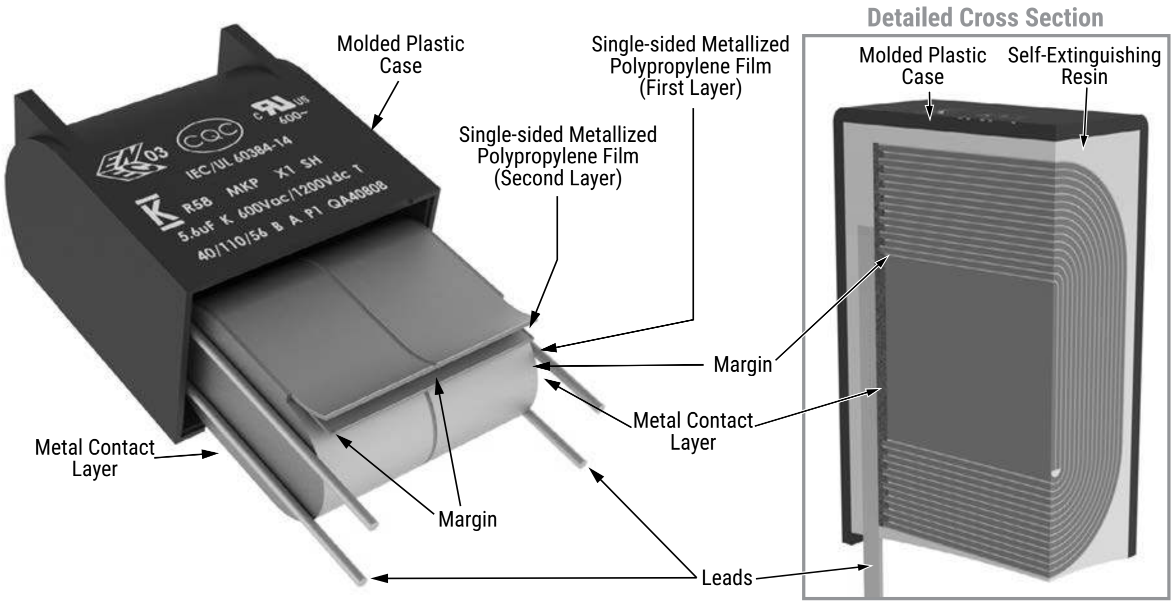
Construction



Winding Scheme

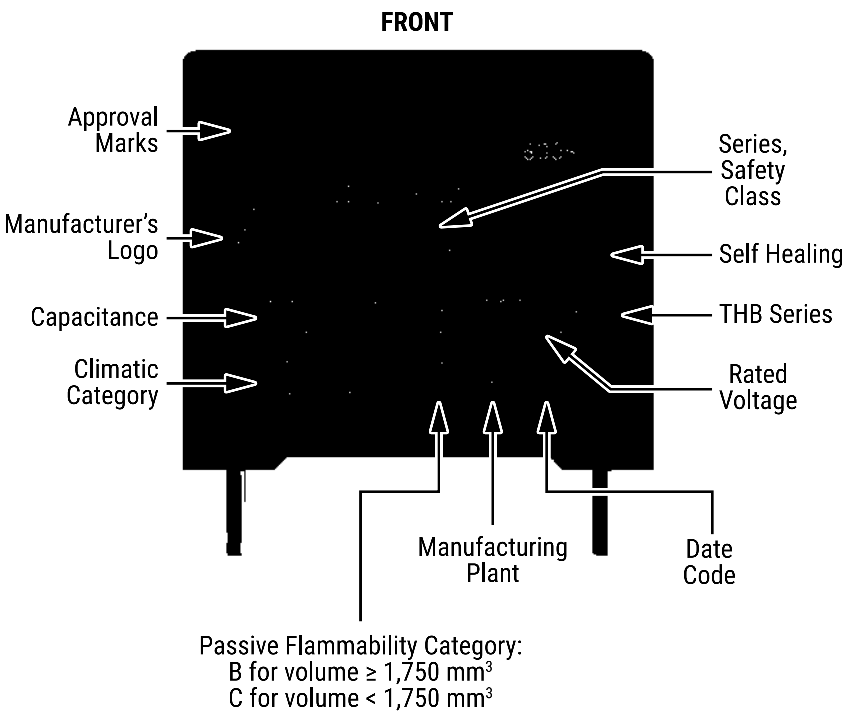


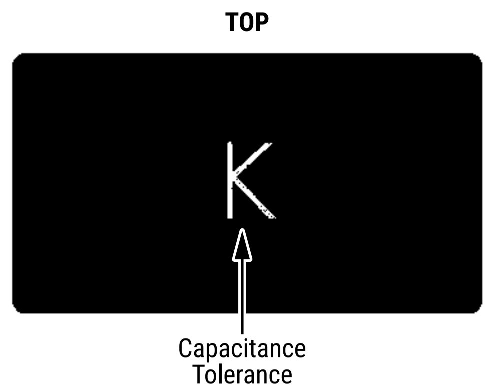
Construction cont.



Marking

Lead Spacing 15 mm, 22.5 mm, and 27.5 mm

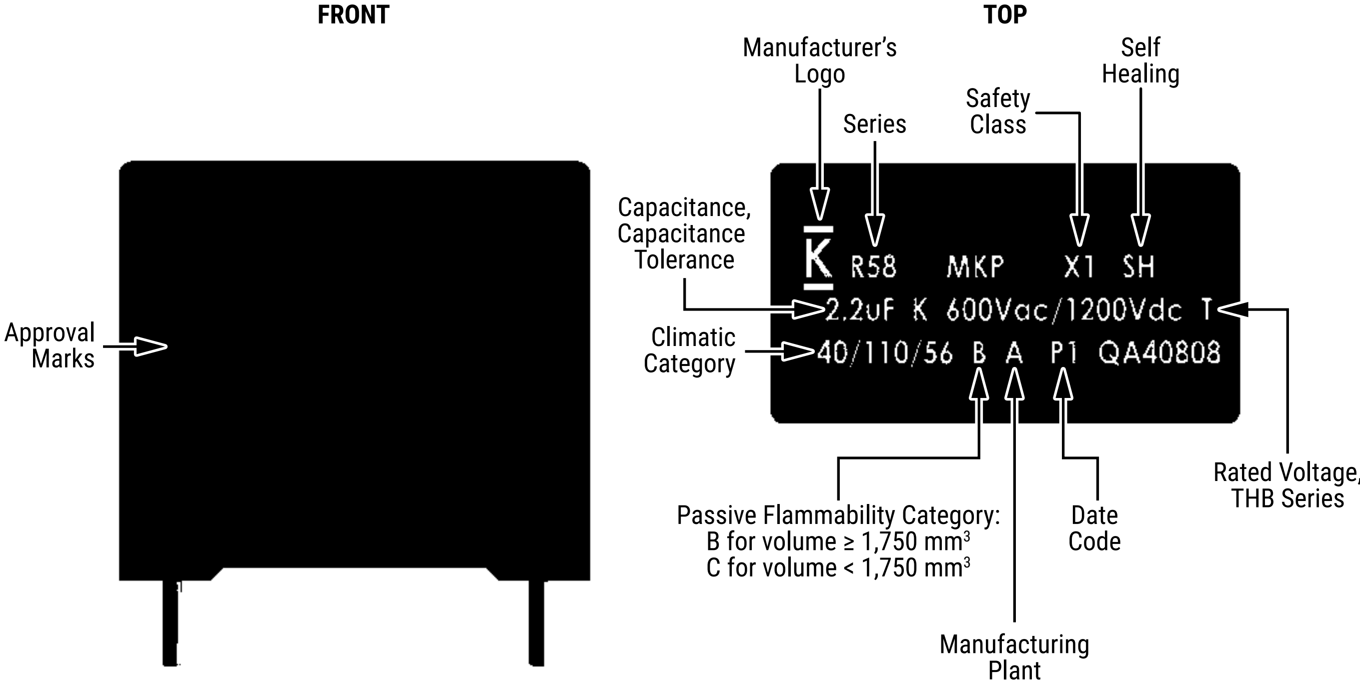




Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics

Marking cont.

Lead Spacing 27.5 mm alternative*, 37.5 mm and 52.5 mm in rectangular box

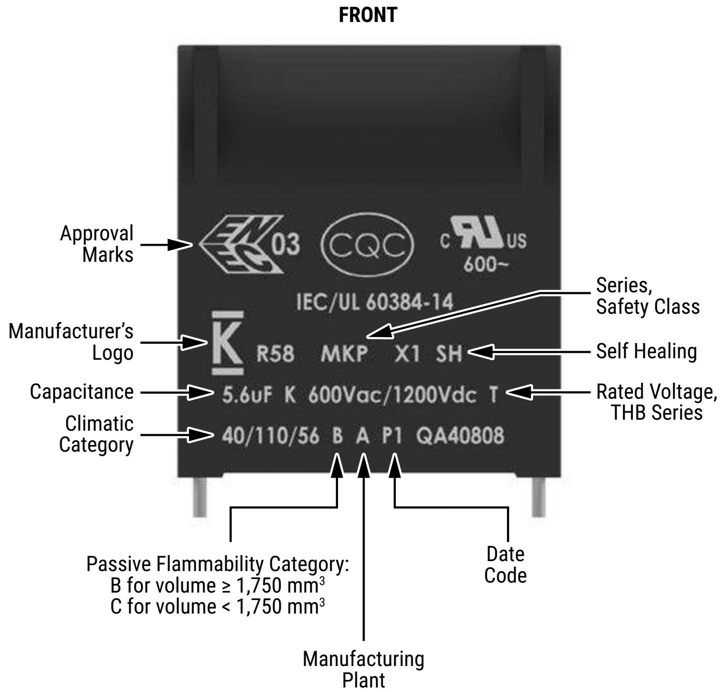


** Differences caused by technology (clichee, laser or ink jet) and production line*

*Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics*

Marking cont.

Lead Spacing 52.5 mm in Arc Shaped Design Case



** Differences caused by technology (clichee, laser or ink jet) and production line*

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics

Manufacturing Date Code (IEC–60062)					
Year	Code	Year	Code	Month	Code
2020	M	2032	C	January	1
2021	N	2033	D	February	2
2022	P	2034	E	March	3
2023	R	2035	F	April	4
2024	S	2036	H	May	5
2025	T	2037	J	June	6
2026	U	2038	K	July	7
2027	V	2039	L	August	8
2028	W	2040	M	September	9
2029	X			October	O
2030	A			November	N
2031	B			December	D

Packaging Quantities

Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads		Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped	Pizza
Lead And Packaging Code:				00 - JA - JB JE - JH	JM	40 - 50	GY	CK	DQ	BB
15	5	11	18	2,000	1,250	1,000	600	1,250	800	1,122
	6	12	18	1,750	1,000	900	500	1,000	680	935
	7.5	13.5	18	1,000	800	700	350	800	500	748
	8.5	14.5	18	1,000	650	500	300	700	440	663
	10	16	18	750	550	500	270	600	380	561
	11	19	18	450	400	350	–	500	340	510
22.5	6	15	26.5	805	450	500	–	700	464	660
	7	16	26.5	700	450	500	–	550	380	564
	8.5	17	26.5	468	350	300	–	450	280	468
	10	18.5	26.5	396	350	300	–	350	235	396
	11	20	26.5	360	200	250	–	350	217	360
	13	22	26.5	300	150	200	–	300	–	300
27.5	11	20	32	560	336	336	–	350	–	300
	13	22	32	480	288	288	–	300	–	250
	14	28	32	352	176	176	–	–	–	230
	18	33	32	256	128	128	–	–	–	170
	22	37	32	168	112	112	–	–	–	150
37.5	11	22	42	204	102	102	–	–	–	–
	13	24	42	168	84	84	–	–	–	–
	16	28.5	42	66	66	66	–	–	–	–
	19	32	42	58	58	58	–	–	–	–
	20	40	42	58	58	58	–	–	–	–
	24	44	42	44	44	44	–	–	–	–
	30	45	42	36	36	36	–	–	–	–
52.5	30	45	57.5	27	–	–	–	–	–	–
	35	50	57.5	23	–	–	–	–	–	–
	45	56	57.5	18	–	–	–	–	–	–

Lead Taping & Packaging (IEC 60286–2)

Figure 1 – Lead Spacing 15 mm

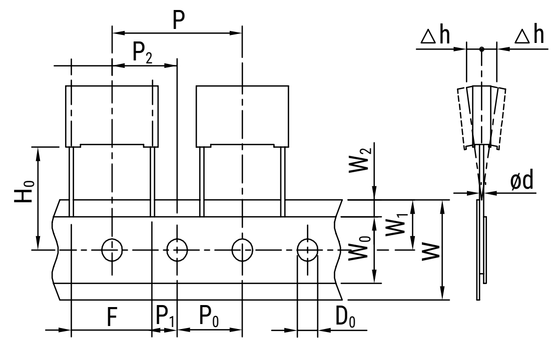
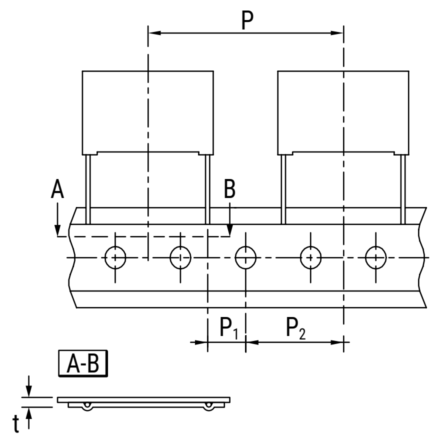


Figure 2 – Lead Spacing 22.5 & 27.5 mm



Taping Specification

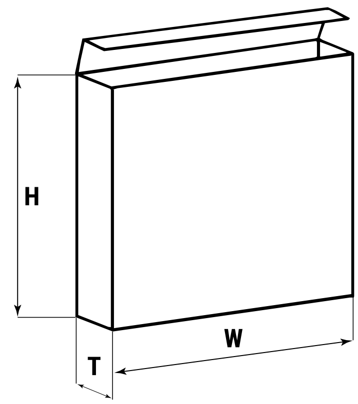
Description	Symbol	Dimensions (mm)			
		Lead Space			Tol.
		15 Fig. 2	22.5 Fig. 3	27.5 Fig. 3	
Lead Wire Diameter	d	0.6–0.8	0.8	0.8	±0.05
Taping Lead Space	P	25.4	38.1	38.1	±1
Feed Hole Lead Space *	P_0	12.7	12.7	12.7	±0.2 **
Centering of the Lead Wire	P_1	5.2	7.8	5.3	±0.7
Centering of the Body	P_2	12.7	19.05	19.05	±1.3
Lead Spacing (Pitch) ***	F	15	22.5	27.5	+0.6/−0.1
Component Alignment	Δh	0	0	0	±2
Height of Component from Tape Center	H_0 ****	18.5	18.5	18.5	±0.5
Carrier Tape Width	W	18	18	18	+1/−0.5
Hold Down Tape Width	W_0	10	10	10	Minimum
Hole Position	W_1	10	10	10	±0.5
Hold Down Tape Position	W_2	3	3	3	Maximum
Feed Hole Diameter	D_0	4	4	4	±0.2
Total Tape Thickness	t	0.7	0.7	0.7	±0.2

** 15 mm also available*
*** Maximum of 1 mm on 20 lead spaces*
**** Pitches 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request*
***** H_0 = 16.5 mm is available upon request*

Lead Taping & Packaging (IEC 60286–2) cont.

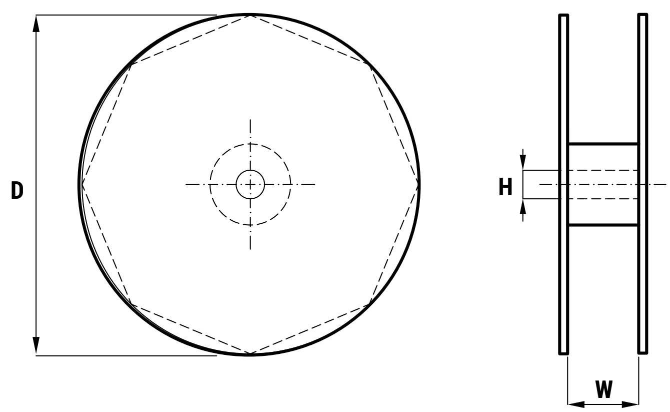
Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



Reel Specifications

Reel Size	Dimensions (mm)		
	D	H	W
Standard	355	30	55 Maximum
Large	500	25	



Metallized Polypropylene Film EMI Suppression Capacitors

R4Y, THB Grade IIB, Class Y1, 500 VAC, 125°C (Automotive Grade)

Overview

The R4Y is constructed of metallized polypropylene film, encapsulated with self-extinguishing resin, in a box of material meeting the requirements of UL 94 V–0.

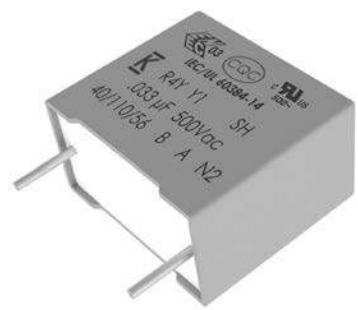
Automotive Grade devices meet the demanding Automotive Electronics Council's AEC–Q200 qualification requirements.

Applications

For use in electromagnetic interference (EMI) suppression filter in "line-to-ground" applications, requiring Y1 safety classification. Suitable for use in situations where failure of the capacitor could lead to danger of electric shock.

Benefits

- Approvals: ENEC, UL, cUL, CQC
- Class Y1 (IEC 60384-14)
- THB Grade IIB: 85°C, 85% RH, 500 hours at 500 V URAC , acc. to IEC 60384-14
- Rated voltage: 500 VAC 50/60 Hz
- Capacitance range: 0.00047 – 0.033 µF
- Lead spacing: 15 – 22.5 mm
- Capacitance tolerance: ±20%, ±10%
- Climatic category 40/110/56, IEC 60068-1
- Tape and reel in accordance with IEC 60286-2
- RoHS compliant and lead-free terminations
- Operating temperature range of −40˚C to +125˚C
- Self-healing properties
- Automotive (AEC–Q200) grade



Part Number System

R4Y	5	I	2100	00	00	M
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Packaging	Internal Use	Capacitance Tolerance
Y1, Metallized Polypropylene	5 = 500	I = 15.0 N = 22.5	The last three digits represent significant figures. The first digit specifies number of zeros to be added.	See Ordering Options Table	00	K = ±10% M = ±20%

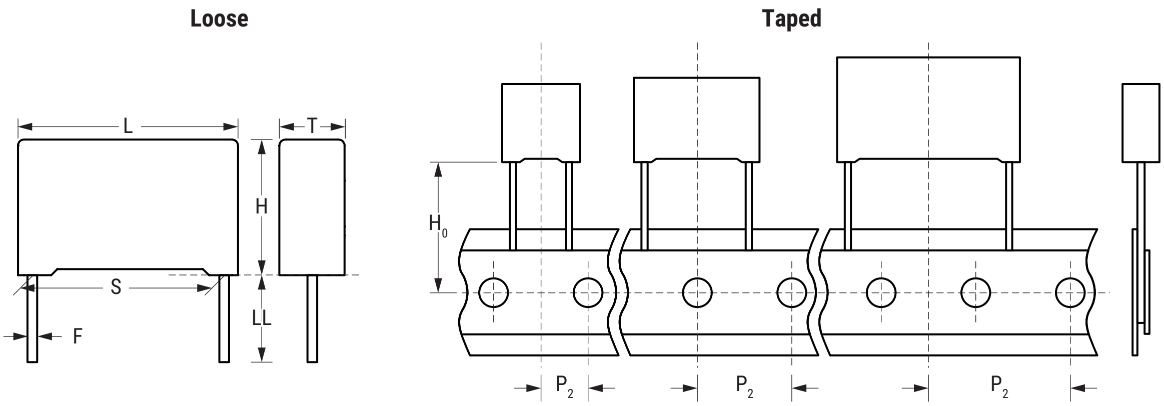
Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
15 22.5	**Standard Lead and Packaging Options**		
	Bulk (Bag) – Short Leads	4 +2/-0	00
	Ammo Pack	H_0= 18.5 ±0.5	DQ[1]
	Other Lead and Packaging Options		
	Tape & Reel (Large Reel)	H_0= 18.5 ±0.5	CK
	Tape & Reel (Standard Reel)	H_0= 18.5 ±0.5	GY
	Pizza-Short Leads	3.2 +0.3/-0.2	HA
	Bulk (Bag)[2] – Short Leads	3.5 +0.5/-0	JB
	Bulk (Bag)[2] – Short Leads	4.0 +0.5/-0	JE
	Bulk (Bag)[2] – Short Leads	3.2 +0.3/-0.2	JH
	Bulk (Bag) – Long Leads	18 ±1	JM
	Bulk (Bag) – Long Leads	30 +5/-0	40
	Bulk (Bag) – Long Leads	25 +2/-1	50

[1] *Not for all sizes, see "Packaging Quantities" table*

[2] *For lead spacing 22.5 case sizes ≥ 8.5*17*26.5 the parts are packed in a Pizza box 335*320*34 mm*

Dimensions – Millimeters



S		T		H		L		F	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
15.0	±0.4	5.0	+0.2/−0.5	11.0	+0.1/−0.5	18.0	+0.3/−0.5	0.8	±0.05
15.0	±0.4	6.0	+0.2/−0.5	12.0	+0.1/−0.5	18.0	+0.3/−0.5	0.8	±0.05
15.0	±0.4	7.5	+0.2/−0.5	13.5	+0.1/−0.5	18.0	+0.3/−0.5	0.8	±0.05
15.0	±0.4	8.5	+0.2/−0.5	14.5	+0.1/−0.5	18.0	+0.3/−0.5	0.8	±0.05
15.0	±0.4	10.0	+0.2/−0.5	16.0	+0.1/−0.5	18.0	+0.3/−0.5	0.8	±0.05
15.0	±0.4	11.0	+0.2/−0.5	19.0	+0.1/−0.5	18.0	+0.3/−0.5	0.8	±0.05
22.5	±0.4	6.0	+0.2/−0.5	15.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	7.0	+0.2/−0.5	16.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	8.5	+0.2/−0.5	17.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	10.0	+0.2/−0.5	18.5	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	11.0	+0.2/−0.5	20.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
22.5	±0.4	13.0	+0.2/−0.5	22.0	+0.1/−0.5	26.5	+0.3/−0.5	0.8	±0.05
Note: See Ordering Options Table for lead length (LL/H_0) options.									

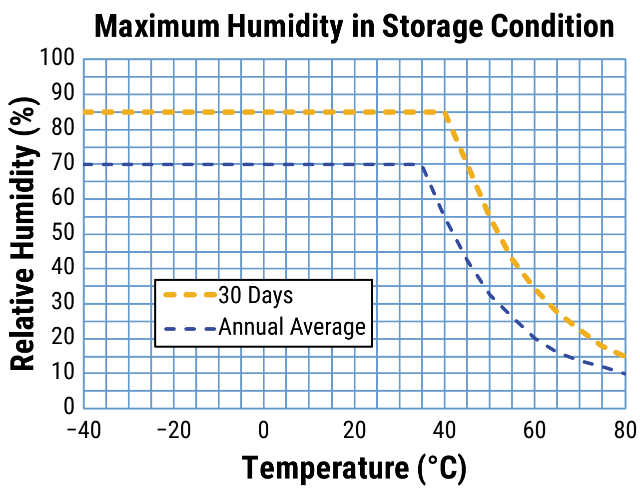
KEMET a YAGEO company

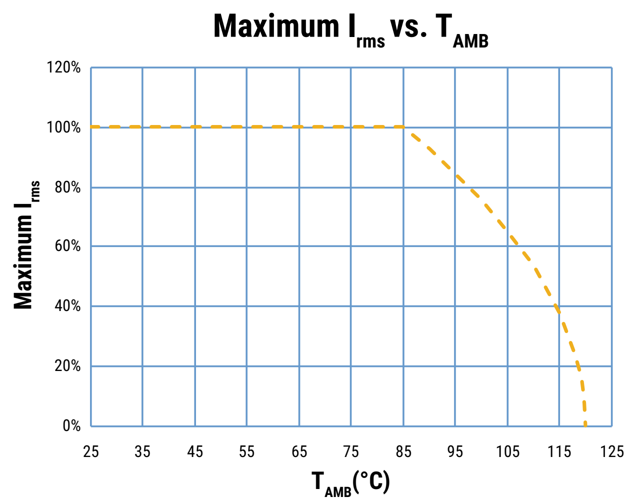
Performance Characteristics

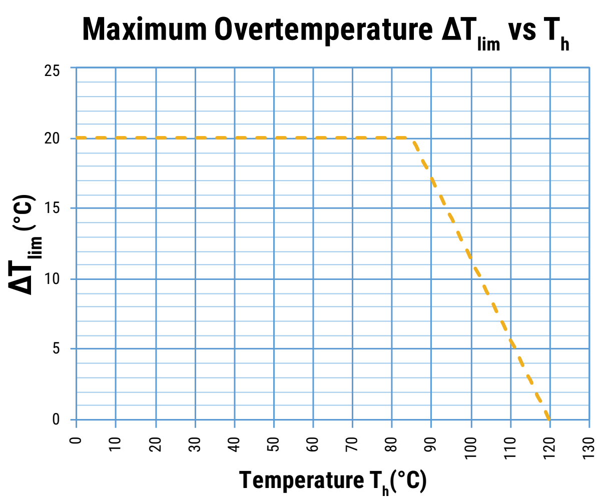
<table>
<tr><td>Dielectric</td><td colspan="4">Polypropylene film</td></tr>
<tr><td>Plates</td><td colspan="4">Metal layer deposited by evaporation under vacum</td></tr>
<tr><td>Winding</td><td colspan="4">Non-inductive type</td></tr>
<tr><td>Leads</td><td colspan="4">Tinned wire</td></tr>
<tr><td>Protection</td><td colspan="4">Plastic case, thermosetting resin filled. Box material is solvent resistant and flame retardant according to UL 94</td></tr>
<tr><td>Related Documents</td><td colspan="4">IEC 60384-14, EN 60384-14</td></tr>
<tr><td>Rated Voltage V_R</td><td colspan="4">500 VAC (50/60 Hz)</td></tr>
<tr><td>Recommended DC Voltage</td><td colspan="4">1,500 VDC</td></tr>
<tr><td>Maximum Continuous AC Voltage</td><td colspan="4">750 VAC (50/60 Hz) (1,000 h at 125°C)</td></tr>
<tr><td>Maximum Continuous DC Voltage</td><td colspan="4">3,000 VDC at 85°C (1,000 h), +85°C to +125°C, 1.5% /°C derating</td></tr>
<tr><td>Capacitance Range</td><td colspan="4">0.00047 – 0.033 µF</td></tr>
<tr><td>Capacitance Values</td><td colspan="4">E6 series (IEC 60063)</td></tr>
<tr><td>Capacitance Tolerance</td><td colspan="4">±10%, ±20%</td></tr>
<tr><td>Temperature Range</td><td colspan="4">−40°C to +125°C</td></tr>
<tr><td>Climatic Category</td><td colspan="4">40/110/56 IEC 60068-1</td></tr>
<tr><td>Reliability</td><td colspan="4">Operational life at rated voltage: 100,000 hours at 85°C; 2,000 hours at 125°C</td></tr>
<tr><td rowspan="5">Storage Conditions</td><td colspan="4">Storage time: ≤ 24 months from the date marked on the label package</td></tr>
<tr><td colspan="4">Average relative humidity per year ≤ 70%</td></tr>
<tr><td colspan="4">RH ≤ 85% for 30 days randomly distributed throughout the year</td></tr>
<tr><td colspan="4">Dew is absent</td></tr>
<tr><td colspan="4">Temperature: −40 to 80°C (see "Maximum Humidity in Storage Conditions" graph below)</td></tr>
<tr><td>Approvals</td><td colspan="4">ENEC, UL, cUL, CQC</td></tr>
<tr><td rowspan="3">Dissipation Factor (tanδ)
at 1 kHz</td><td colspan="4">Maximum Values at +25°C ±5°C</td></tr>
<tr><td colspan="2">Pitch = 15 mm</td><td colspan="2">Pitch = 22.5 mm</td></tr>
<tr><td colspan="2">1.0%</td><td colspan="2">0.6%</td></tr>
<tr><td rowspan="4">Insulation Resistance</td><td colspan="4">Measured at +25°C ±5°C</td></tr>
<tr><td colspan="4">Minimum Values Between Terminals</td></tr>
<tr><td>Voltage Charge</td><td>Voltage Charge Time</td><td>C ≤ 0.33 µF</td><td></td></tr>
<tr><td>500 VDC</td><td>1 minute</td><td>≥ 1 • 10^5 MΩ
(≥ 5 • 10^5 MΩ)*</td><td></td></tr>
</table>

** Typical value*

Performance Characteristics cont.

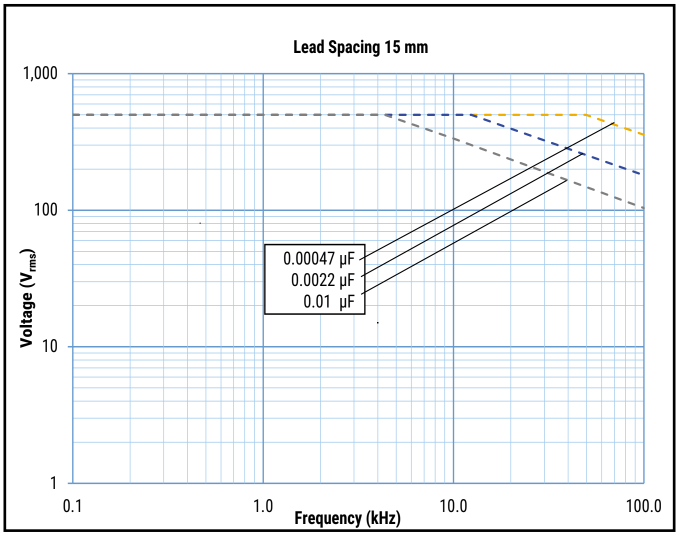


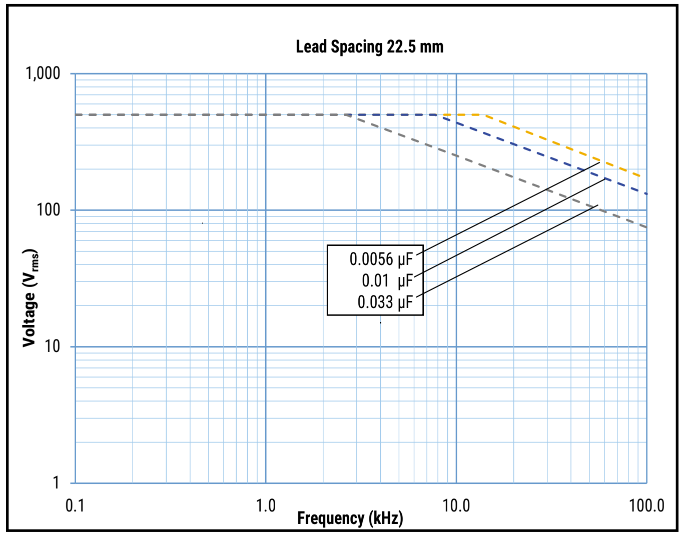




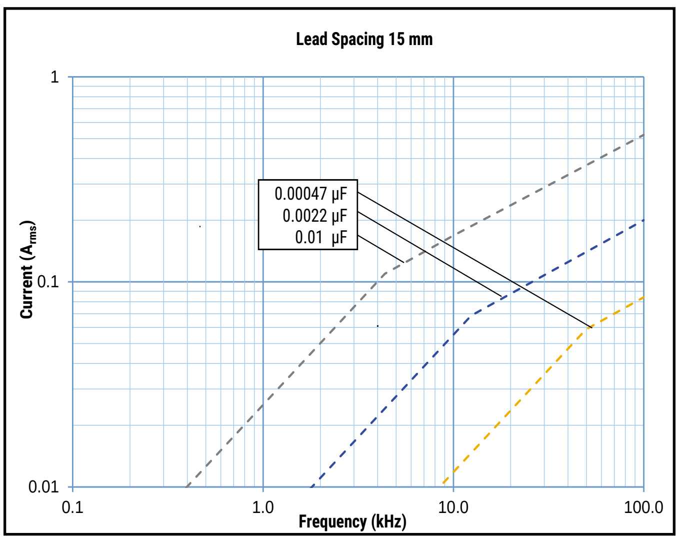
T_h is the maximum ambient temperature surrounding the capacitor or hottest contact point (e.g. tracks), whichever is higher, in the worst operation conditions in °C.

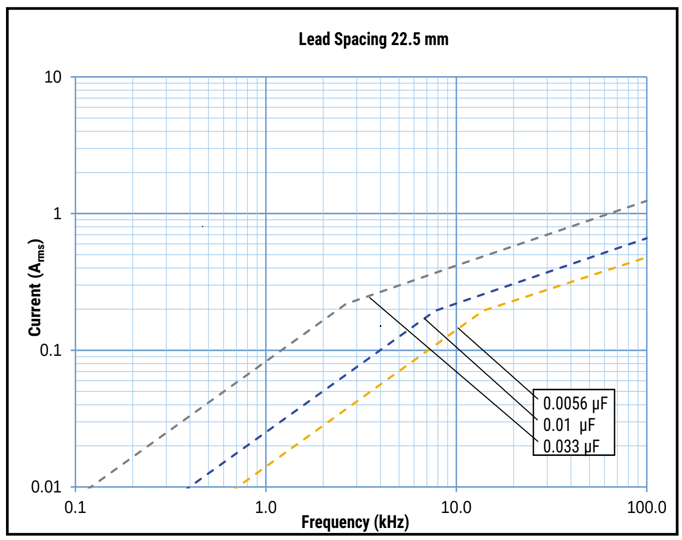
Maximum Voltage (V_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 85°C)



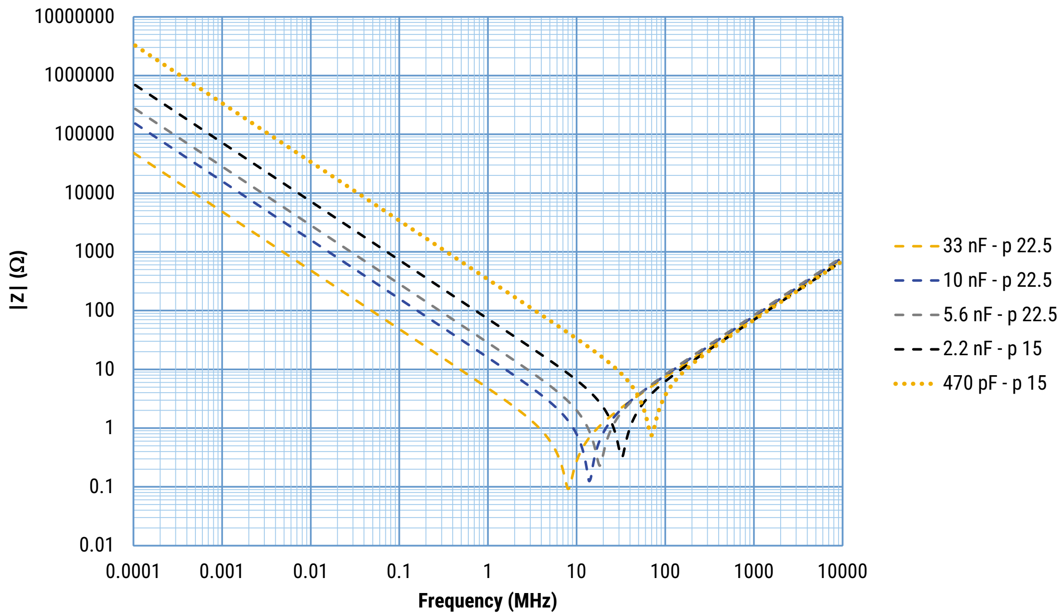


Maximum Current (I_{rms}) Versus Frequency (Sinusoidal Waveform/Th ≤ 85°C)





Impedance Graph



Environmental Test Data

Test	IEC Publication	Procedure
Endurance	IEC 60384-14	1.7 x V_R VAC 50 Hz, once every hour increase to 1,000 VAC for 0.1 second, 1,000 hours at upper rated temperature (110°C)
Vibration	MIL-STD-202 Method 204	5 G for 20 minutes, 12 cycles each of 3 orientations. Use 8"X5" PCB, 0.031" thick. 7 secure points on one 8" side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10 – 2,000 Hz.
Mechanical Shock	MIL-STD-202 Method 213	Figure 1 of Method 213. Condition C
Temperature Cycling	JESD22-Method JA-104	1,000 cycles (−40°C to 110°C) Note: Measurement at 24 ±4 hours after test conclusion. 30 minute maximum dwell time at each temperature extreme. 1 minute maximum transition time.
Passive Flammability	IEC 60384-14	IEC 60384-1, IEC 60695-11-5 Needle Flame Test
Biased Humidity	According to IEC 60384-14 Grade IIB	85°C, 85% RH and 500 VAC, 500 hours Capacitance change (Δ C/C): ≤ 10% Dissipation factor change (Δtanδ): ≤ 150 * 10^{-4} (at 1 kHz for Cap > 1 µF) Dissipation factor change (Δtanδ): ≤ 240 * 10^{-4} (at 10 kHz for Cap ≤ 1 µF) IR ≥ 50% of initial limit or minimum 200 MΩ

Approvals

Certification Body	Mark	Specification	File Number
IMQ S.p.A.		EN/IEC 60384-14	CA08.00238
UL		UL 60384-14 and CAN/CSA E60384-14	E97797
CQC		IEC 60384-14	CQC23001376112 CQC23001376113 CQC23001376114 CQC23001376115 CQC23001376116

Environmental Compliance

RoHS

Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Dimensions in mm			Lead Spacing (S)	dV/dt (V/µs)	KEMET Part Number	Customer Part Number
	T	H	L				
0.00047	5.0	11.0	18.0	15.0	3000	4Y5I0470(1)00(2)	R4Y5I0470(1)00(2)
0.00068	5.0	11.0	18.0	15.0	3000	4Y5I0680(1)00(2)	R4Y5I0680(1)00(2)
0.001	5.0	11.0	18.0	15.0	3000	4Y5I1100(1)00(2)	R4Y5I1100(1)00(2)
0.0015	5.0	11.0	18.0	15.0	3000	4Y5I1150(1)00(2)	R4Y5I1150(1)00(2)
0.0022	6.0	12.0	18.0	15.0	3000	4Y5I1220(1)00(2)	R4Y5I1220(1)00(2)
0.0033	7.5	13.5	18.0	15.0	3000	4Y5I1330(1)00(2)	R4Y5I1330(1)00(2)
0.0047	8.5	14.5	18.0	15.0	3000	4Y5I1470(1)00(2)	R4Y5I1470(1)00(2)
0.0068	10.0	16.0	18.0	15.0	3000	4Y5I1680(1)00(2)	R4Y5I1680(1)00(2)
0.01	11.0	19.0	18.0	15.0	3000	4Y5I2100(1)00(2)	R4Y5I2100(1)00(2)
0.0056	6.0	15.0	26.5	22.5	1000	4Y5N1560(1)00(2)	R4Y5N1560(1)00(2)
0.0068	7.0	16.0	26.5	22.5	1000	4Y5N1680(1)00(2)	R4Y5N1680(1)00(2)
0.01	8.5	17.0	26.5	22.5	1000	4Y5N2100(1)00(2)	R4Y5N2100(1)00(2)
0.015	10.0	18.5	26.5	22.5	1000	4Y5N2150(1)00(2)	R4Y5N2150(1)00(2)
0.022	11.0	20.0	26.5	22.5	1000	4Y5N2220(1)00(2)	R4Y5N2220(1)00(2)
0.033	13.0	22.0	26.5	22.5	1000	4Y5N2330(1)00(2)	R4Y5N2330(1)00(2)
Capacitance Value (µF)	**T (mm)**	**H (mm)**	**L (mm)**	**Lead Spacing (S)**	**dV/dt (V/µs)**	**KEMET Part Number**	**Customer Part Number**

(1) Insert lead and packaging code. See Ordering Options Table for available options.
(2) M = ±20%, K = ±10%

Soldering Process

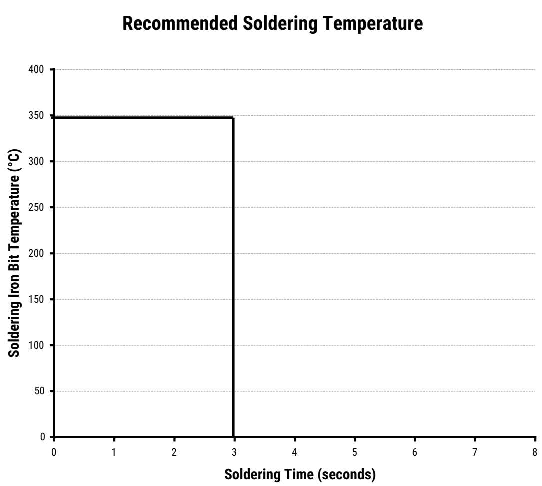
The implementation of the RoHS directive has resulted in the selection of SnAgCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217 – 221°C for the new alloys. As a result, the heat stress to the components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (the melting point of polypropylene is 160 – 170°C). Wave soldering can be destructive, especially for mechanically small polypropylene capacitors (with lead spacing of 5 mm to 15 mm), and great care has to be taken during soldering. The recommended solder profiles from KEMET should be used. Please consult KEMET with any questions. In general, the wave soldering curve from IEC Publication 61760-1 Edition 2 serves as a solid guideline for successful soldering. Please see Figure 1.

Reflow soldering is not recommended for through-hole film capacitors. Exposing capacitors to a soldering profile in excess of the above the recommended limits may result to degradation or permanent damage to the capacitors.

Do not place the polypropylene capacitor through an adhesive curing oven to cure resin for surface mount components. Insert through-hole parts after the curing of surface mount parts. Consult KEMET to discuss the actual temperature profile in the oven, if through-hole components must pass through the adhesive curing process. A maximum two soldering cycles is recommended. Please allow time for the capacitor surface temperature to return to a normal temperature before the second soldering cycle.

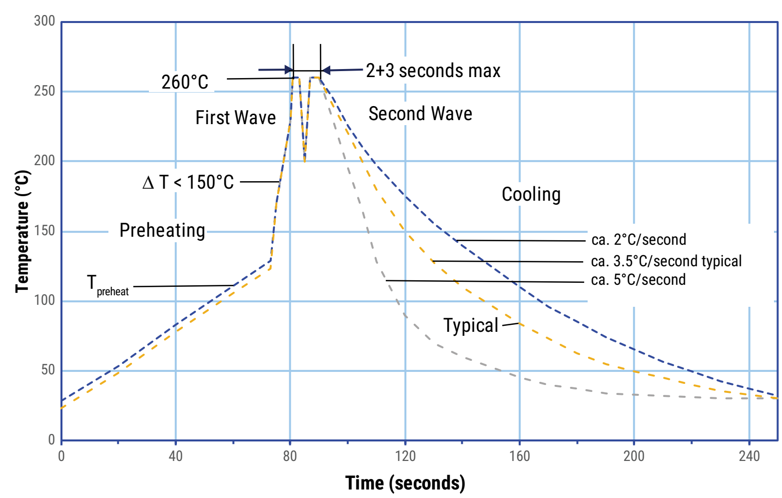
Manual Soldering Recommendations

The following is the recommendation for manual soldering with a soldering iron.



The soldering iron tip temperature should be set at 350°C (+10°C maximum) with the soldering duration not to exceed more than 3 seconds.

Wave Soldering Recommendations



Soldering Process cont.

Wave Soldering Recommendations cont.

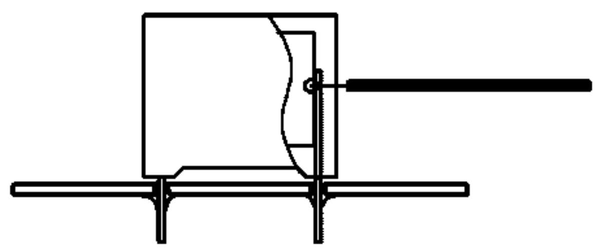
1. The table indicates the maximum set-up temperature of the soldering process

Figure 1

Dielectric Film Material	Maximum Preheat Temperature		Maximum Peak Soldering Temperature	
	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm	Capacitor Pitch ≤ 15 mm	Capacitor Pitch > 15 mm
Polyester	130°C	130°C	270°C	270°C
Polypropylene	125°C	130°C	260°C	270°C
Paper	130°C	140°C	270°C	270°C
Polyphenylene Sulphide	150°C	160°C	270°C	270°C

2. The maximum temperature measured inside the capacitor:
   Set the temperature so that inside the element the maximum temperature is below the limit:

Dielectric Film Material	Maximum temperature measured inside the element
Polyester	160°C
Polypropylene	125°C
Paper	160°C
Polyphenylene sulphide	160°C



Temperature monitored inside the capacitor.

Selective Soldering Recommendations

Selective dip soldering is a variation of reflow soldering. In this method, the printed circuit board with through-hole components to be soldered is preheated and transported over the solder bath as in normal flow soldering without touching the solder. When the board is over the bath, it is stopped and pre-designed solder pots are lifted from the bath with molten solder only at the places of the selected components, and pressed against the lower surface of the board to solder the components.

The temperature profile for selective soldering is similar to the double wave flow soldering outlined in this document, **however, instead of two baths, there is only one bath with a time from 3 to 10 seconds.** In selective soldering, the risk of overheating is greater than in double wave flow soldering, and great care must be taken so that the parts are not overheated.

Mounting

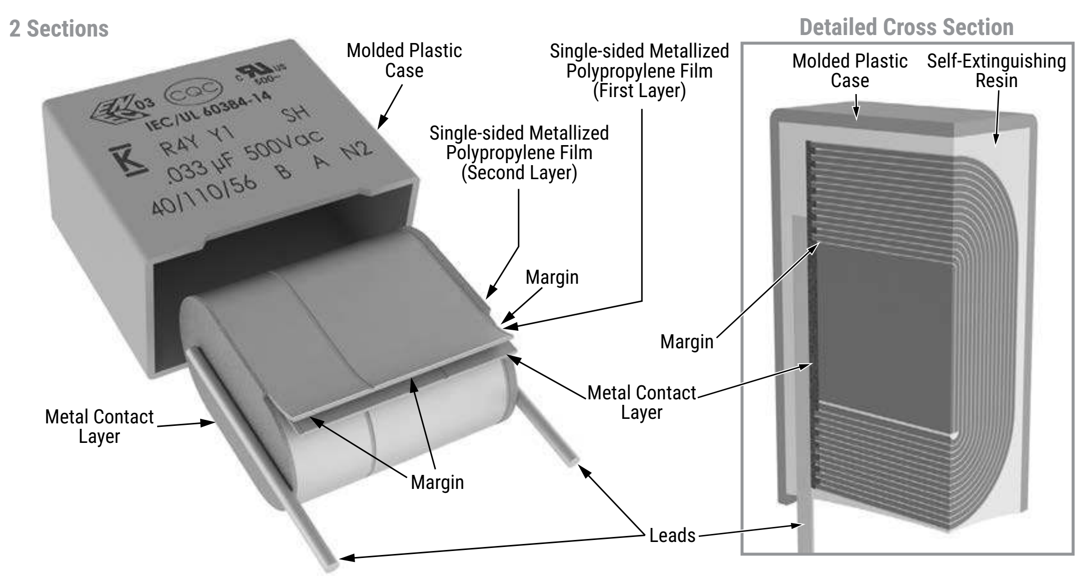
Resistance to Vibration and Mechanical Shock

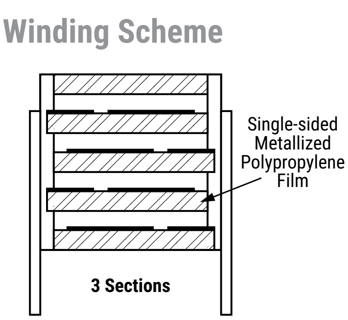
AEC-Q200 Rev. E Mechanical Stress Tests:

Mechanical Shock	**MIL-STD-202 Method 213**	Figure 1 of Method 213 • THT: Condition C • SMD: Condition C • Tested per the Supplier's recommended mounting method
Vibration	**MIL-STD-202 Method 204**	• 5 g for 20 minutes, 12 cycles each of 3 orientations • Tested per the Supplier's recommended mounting method • Verification of transfer load: during setup, verify that with the selected PCB design (size, thickness and secure points), or an alternative mount, that the transferred load onto the component corresponds to the requested load. This verification can be achieved using a laser vibrometer or other adequate measuring device • Test from 10 Hz – 2,000 Hz.

The capacitors are designed for PCB mounting. The stand-off pipes must be in good contact with the printed circuit board. The capacitor body has to be properly fixed (e.g. clamped or glued).

Construction

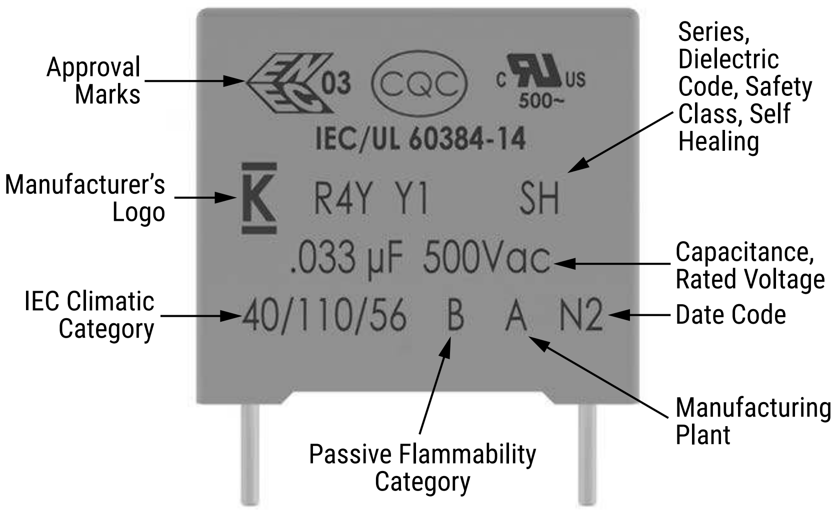




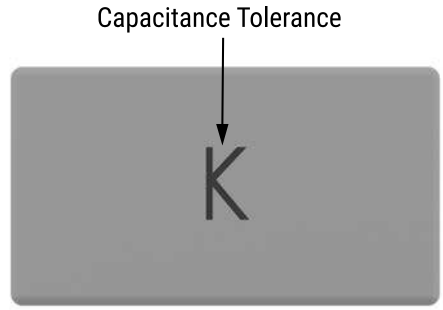
Marking

Lead Spacing 15 - 22.5 mm

FRONT



TOP



NOTE: Hot imprinting with or without color or ink jet or laser marking

Slight change in the layout can be possible but this does not affect the content of the information of the current marking.
This change will be achieved without impact to product form, fit or function, as the products are equivalent with respect to physical, mechanical, quality and reliability characteristics.

Manufacturing Date Code (IEC 60062)									
Year	**Code**	**Year**	**Code**	**Year**	**Code**	**Month**	**Code**	**Month**	**Code**
2020	M	2027	V	2034	E	January	1	July	7
2021	N	2028	W	2035	F	February	2	August	8
2022	P	2029	X	2036	G	March	3	September	9
2023	R	2030	A	2037	H	April	4	October	O
2024	S	2031	B	2038	K	May	5	November	N
2025	T	2032	C	2039	L	June	6	December	D
2026	U	2033	D	2040	M				

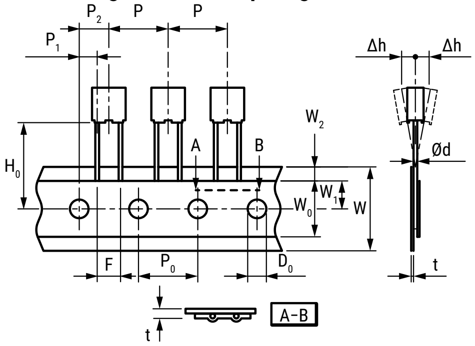
Packaging Quantities

Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads[1]	Bulk Long Leads		Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo Taped	Pizza
Lead And Packaging Code:				00 - JB JE - JH	40 - 50	JM	GY	CK	DQ	HA
15	5.0	11.0	18.0	2,000	1,000	1,250	600	1,250	800	1122
	6.0	12.0	18.0	1,750	900	1,000	500	1,000	680	935
	7.5	13.5	18.0	1,000	700	800	350	800	500	748
	8.5	14.5	18.0	1,000	500	650	300	700	440	663
	10.0	16.0	18.0	750	500	550	270	600	380	561
	11.0	19.0	18.0	450	350	400	270	500	340	510
22.5	6.0	15.0	26.5	805	500	450	300	700	464	660
	7.0	16.0	26.5	700	500	450	250	550	380	564
	8.5	17.0	26.5		300	350	250	450	280	468
	10.0	18.5	26.5		300	350	160	350	235	396
	11.0	20.0	26.5		250	200	160	350	217	360
	13.0	22.0	26.5		200	150	130	300	-	300

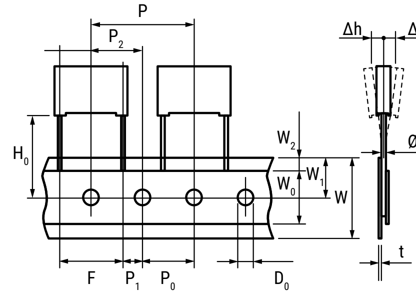
*1 For lead spacing 22.5 case sizes ≥8.5*17*26.5 the parts are packed in a Pizza box 335*320*34 mm*

Lead Taping & Packaging (IEC 60286–2)

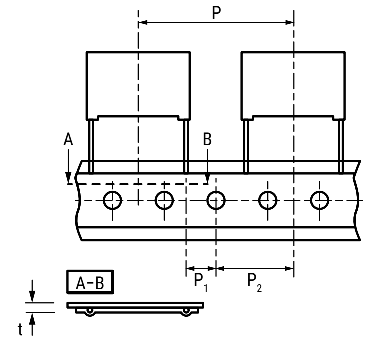
Figure 1 — Lead Spacing 7.5 mm



Lead Spacing 10 & 15 mm



Lead Spacing 22.5 & 27.5 mm



Taping Specification

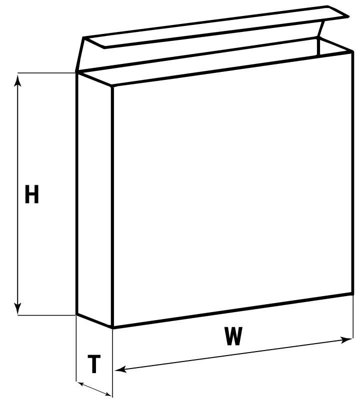
Description	Symbol	Dimensions (mm)					
		Lead Spacing					Tolerance
		7.5	10.0	15.0	22.5	27.5	
Lead wire diameter	d	0.5 – 0.6	0.6	0.6 – 0.8	0.8	0.8	±0.05
Taping lead space	P	12.7	25.4	25.4	38.1	38.1	±1
Feed hole lead space *	P_0	12.7	12.7	12.7	12.7	12.7	±0.2 **
Centering of the lead wire	P_1	2.6	7.7	5.2	7.8	5.3	±0.7
Centering of the body	P_2	6.35	12.7	12.7	19.05	19.05	±1.3
Lead spacing ***	F	7.5	10.0	15.0	22.5	27.5	+0.6/−0.1
Component alignment	Δh	0	0	0	0	0	±2
Component deviation	Δp	0	0	0	0	0	±1
Height of component from tape center	H_0****	18.5	18.5	18.5	18.5	18.5	±0.5
Carrier tape width	W	18	18	18	18	18	+1/−0.5
Hold down tape width	W_0	6	9	10	10	10	Minimum
Hole position	W_1	9	9	9	9	9	±0.5
Hold down tape position	W_2	3	3	3	3	3	Maximum
Feed hole diameter	D_0	4	4	4	4	4	±0.2
Total Tape thickness	t	0.7	0.7	0.7	0.7	0.7	±0.2

** Available also 15 mm.*
*** Maximum 1 mm on 20 lead spacing.*
**** 15 mm and 10 mm taped to 7.5 mm (crimped leads) available upon request.*
***** H_0 = 16.5 mm is available upon request.*

Lead Taping & Packaging (IEC 60286–2) cont.

Ammo Specifications

Dimensions (mm)		
H	W	T
360	340	59



Reel Specifications

Reel Size	Dimensions (mm)		
	D	H	W
Standard	355	30	55 Maximum
Large	500	25