

Overview

The A70 Series is a metallized polypropylene film encapsulated with an aluminum layer deposited by evaporation under vacuum. Protection consists of polyester tape wrapping and thermosetting resin end fill.

Applications

Typical applications include temperature compensation circuits, timing, oscillator circuits, power factor correction and coupling capacitors in switched mode power supply (SMPS) applications.

Benefits

- Rated voltage: 160 – 630 VDC
- Rated voltage: 90 – 250 VAC
- Capacitance range: 0.001 – 4.7 μ F
- Diameter: 5 – 21.5 mm
- Length: 11 – 33 mm
- Capacitance tolerance: $\pm 5\%$, $\pm 10\%$, $\pm 20\%$
- Climatic category: 55/105/56, IEC 60068–1
- Tape and reel packaging in accordance with IEC 60286–1
- RoHS Compliant and lead-free terminations
- Category temperature range of -55°C to $+105^{\circ}\text{C}$



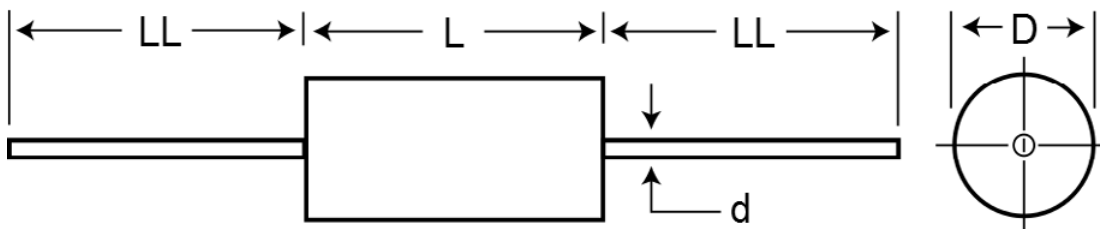
Part Number System

A70	G	F	2220	AA	00	J
Series	Rated Voltage (VDC)	Length (mm)	Capacitance Code (pF)	Lead and Packaging Code	Internal Use	Capacitance Tolerance
Metallized Polypropylene	G = 160 I = 250 M = 400 P = 630	F = 11 H = 14 K = 20.5 Q = 28 T = 33	Digits 2 – 4 indicate the first three digits of the capacitance value. First digit indicates the number of zeros to be added.	See Ordering Options Table	00 (Standard)	J = $\pm 5\%$ K = $\pm 10\%$ M = $\pm 20\%$

Ordering Options Table

Type of Leads and Packaging	Lead Length (mm)	Lead and Packaging Code
Bulk (Bag) – Straight Leads	40 +/-5	AA
Tape & Reel (Standard Reel)		26

Dimensions – Millimeters



D		L		d	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
5	Maximum	11	Maximum	0.5	+/-0.05
5.5	Maximum	14	Maximum	0.6	+/-0.05
6	Maximum	14	Maximum	0.6	+/-0.05
6.5	Maximum	14	Maximum	0.6	+/-0.05
7	Maximum	14	Maximum	0.6	+/-0.05
7	Maximum	20.5	Maximum	0.6	+/-0.05
7.5	Maximum	14	Maximum	0.8	+/-0.05
7.5	Maximum	20.5	Maximum	0.8	+/-0.05
8	Maximum	20.5	Maximum	0.8	+/-0.05
8	Maximum	28	Maximum	0.8	+/-0.05
8.5	Maximum	14	Maximum	0.8	+/-0.05
8.5	Maximum	20.5	Maximum	0.8	+/-0.05
8.5	Maximum	28	Maximum	0.8	+/-0.05
9	Maximum	20.5	Maximum	0.8	+/-0.05
9.5	Maximum	28	Maximum	0.8	+/-0.05
10	Maximum	28	Maximum	0.8	+/-0.05

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

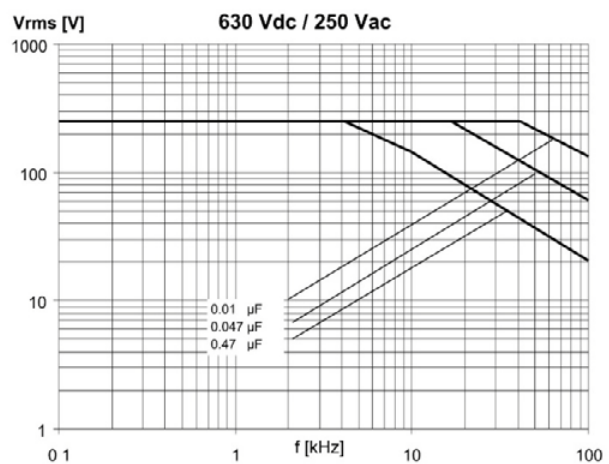
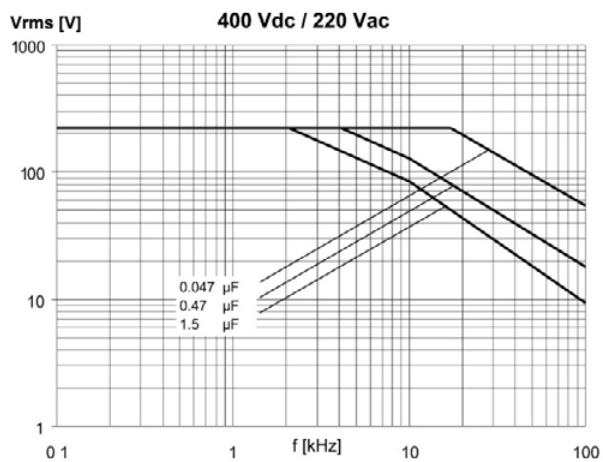
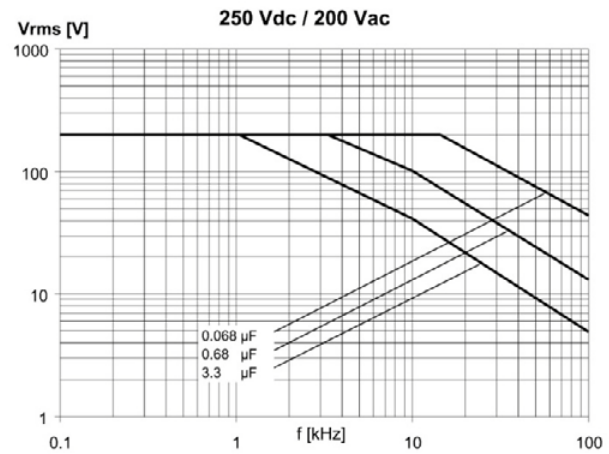
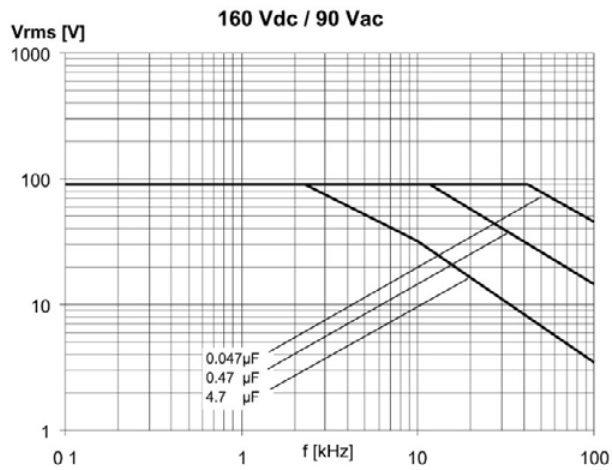
D		L		d	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
11	Maximum	28	Maximum	0.8	+/-0.05
11.5	Maximum	28	Maximum	0.8	+/-0.05
12	Maximum	33	Maximum	0.8	+/-0.05
12.5	Maximum	33	Maximum	0.8	+/-0.05
13	Maximum	28	Maximum	0.8	+/-0.05
13.5	Maximum	33	Maximum	0.8	+/-0.05
14.5	Maximum	33	Maximum	0.8	+/-0.05
15	Maximum	33	Maximum	0.8	+/-0.05
16.5	Maximum	33	Maximum	1	+/-0.05
17	Maximum	33	Maximum	1	+/-0.05
17.5	Maximum	33	Maximum	1	+/-0.05
18	Maximum	33	Maximum	1	+/-0.05
20	Maximum	33	Maximum	1	+/-0.05
21	Maximum	33	Maximum	1	+/-0.05
21.5	Maximum	33	Maximum	1	+/-0.05

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

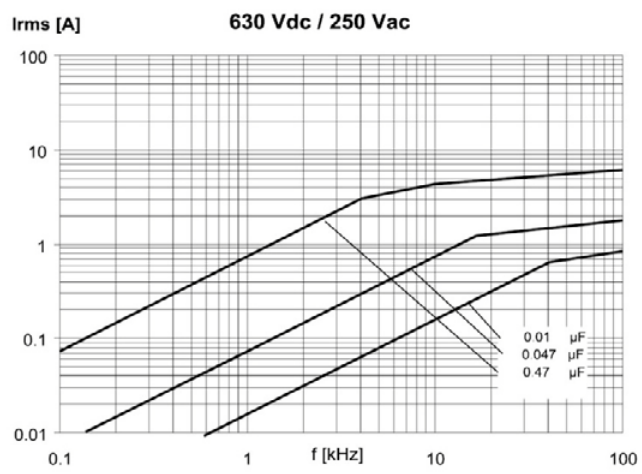
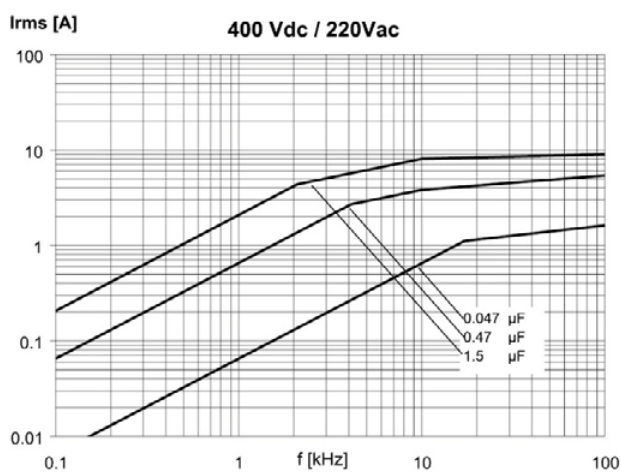
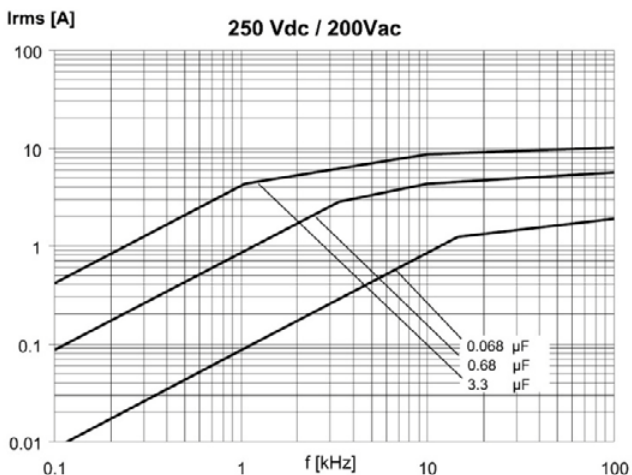
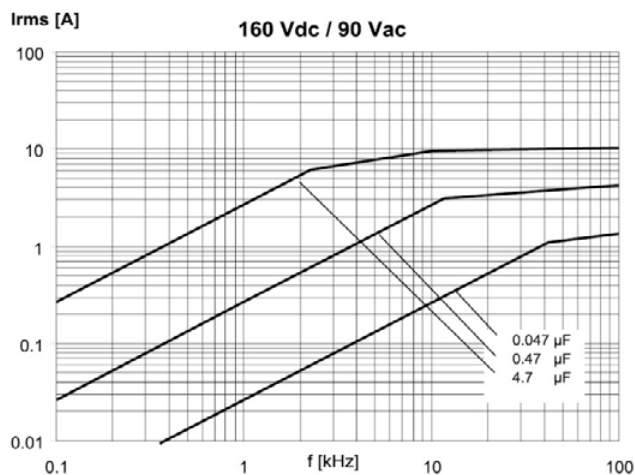
Performance Characteristics

Voltage Range (VDC)	160	250	400	630
Voltage Range (VAC)	90	200	220	250
Capacitance Range (μF)	0.022 – 4.7	0.01 – 3.3	0.0068 – 1.5	0.001 – 0.68
Capacitance Values	IEC E6 Values			
Capacitance Tolerance	±5%, ±10%, ±20%			
Category Temperature Range	-55°C to +105°C			
Rated Temperature	+85°C			
Voltage Derating	The rated voltage is decreased with 1.25%/°C between +85°C and +105°C			
Climatic Category	IEC 60068–1, 55/105/56			
Self-Inductance	Approximately 1 nH/mm for the total length of capacitor winding and the leads			
Dissipation Factor tanδ	Measured at 25°C ± 5°C			
		C ≤ 0.1 μF	0.1 μF < C ≤ 1 μF	C ≥ 1 μF
	1 kHz	0.0006	0.0006	0.0006
	10 kHz	0.001	0.002	
	100 kHz	0.003		
Insulation Resistance	Typical Value at +25°C, 100 VDC 60 seconds			
	Minimum Values Between Terminals:			
	C ≤ 0.33 μF		≥ 100,000 MΩ	
	C > 0.33 μF		≥ 30,000 MΩ • μF	
Test Voltage Between Terminals	1.6 x V _R applied for 2 seconds at 25°C ± 5°C			

Maximum Voltage (V_{rms}) vs. Frequency (Sinusoidal Waveform/ $T \leq 40^\circ\text{C}$)



Maximum Current (I_{rms}) vs. Frequency (Sinusoidal Waveform/ $T \leq 40^\circ\text{C}$)



Environmental Test Data

Test	IEC Publication	Procedure	Requirements
Voltage Proof	60384-1 Clause 4.6	$1.6 \times V_R$ after 60 seconds	The capacitors must withstand the voltage without breakdowns or flashovers and without decreased insulation resistance below the value in each detail specification. No visible damage
	Clause 4.6 2.3	$2 \times V_R$ (minimum 400 VDC to case) after 60 seconds	As above
Resistance to Soldering Heat	60068-2-20 Method 1A	Solder bath at $+260^\circ\text{C} \pm 5^\circ\text{C}$ with screening	Immersion of the terminations into the solder bath shall be completed in a time not exceeding 1 second and the terminations shall remain immersed to the specified depth for $10 + 1$ second and then be withdrawn. $\Delta C/C \leq \pm 1.0\%$ $\tan\delta$ increase < 0.001 No visible damage
Climatic Sequence	60384-1 Paragraph 4:21	60068-2.2 dry heat 16 hours 60068-2-34 damp heat, one cycle 60068-2-1 Test Aa 2 hours	Insulation resistance: $\geq 100,000 \text{ M}\Omega$ for $C_R \leq 0.33 \mu\text{F}$ $\geq 30,000 \text{ M}\Omega \cdot \mu\text{F}$ for $C_R > 0.33 \mu\text{F}$ $\Delta C/C \leq \pm 0.5\%$ $\tan\delta \leq 1.2 \times \text{stated value at } 100 \text{ kHz}$ 56 days no visible damage
Damp Heat Steady State	60068-2-3 Test Ca	$+40^\circ\text{C}$ and 90 – 95% RH	Insulation resistance: $\geq 50,000 \text{ M}\Omega$ for $C_R \leq 0.33 \mu\text{F}$ $\geq 15,000 \text{ M}\Omega \cdot \mu\text{F}$ for $C_R > 0.33 \mu\text{F}$ $\Delta C/C \leq \pm 1\%$ $\tan\delta \leq 1.2 \times \text{stated value at } 100 \text{ kHz}$
Endurance, AC		1,000 hours at $+85^\circ\text{C}$ and $1.25 \times V_R$ AC	No visible damage $\Delta C/C \leq \pm 3\%$ $\tan\delta \leq 1.5 \times \text{stated value at } 100 \text{ kHz}$ Insulation resistance: $\geq 100,000 \text{ M}\Omega$ for $C_R \leq 0.33 \mu\text{F}$ $\geq 30,000 \text{ M}\Omega \cdot \mu\text{F}$ for $C_R > 0.33 \mu\text{F}$

Environmental Compliance

All KEMET pulse capacitors are RoHS Compliant.



RoHS Compliant

Table 1 – Ratings & Part Number Reference

VDC	VAC	Capacitance Value (μF)	Dimensions in mm		dV/dt (V/μs)	Max K ₀ (V ² /μs)	New KEMET Part Number	Legacy Part Number
			D	L				
160	90	0.022	5.0	11.0	5	160 E3	70GF2220(1)00(2)	A70GF2220(1)00(2)
160	90	0.033	5.0	11.0	5	160 E3	70GF2330(1)00(2)	A70GF2330(1)00(2)
160	90	0.047	5.0	11.0	5	160 E3	70GF2470(1)00(2)	A70GF2470(1)00(2)
160	90	0.068	5.5	14.0	5	160 E3	70GH2680(1)00(2)	A70GH2680(1)00(2)
160	90	0.10	5.5	14.0	5	160 E3	70GH3100(1)00(2)	A70GH3100(1)00(2)
160	90	0.15	6.5	14.0	5	160 E3	70GH3150(1)00(2)	A70GH3150(1)00(2)
160	90	0.22	7.5	14.0	5	160 E3	70GH3220(1)00(2)	A70GH3220(1)00(2)
160	90	0.33	7.0	20.5	3	160 E3	70GK3330(1)00(2)	A70GK3330(1)00(2)
160	90	0.47	8.0	20.5	3	160 E3	70GK3470(1)00(2)	A70GK3470(1)00(2)
160	90	0.68	8.0	28.0	2	160 E3	70GQ3680(1)00(2)	A70GQ3680(1)00(2)
160	90	1.0	9.5	28.0	2	160 E3	70GQ4100(1)00(2)	A70GQ4100(1)00(2)
160	90	1.5	11.0	28.0	2	160 E3	70GQ4150(1)00(2)	A70GQ4150(1)00(2)
160	90	2.2	12.0	33.0	1	160 E3	70GT4220(1)00(2)	A70GT4220(1)00(2)
160	90	3.3	14.5	33.0	1	160 E3	70GT4330(1)00(2)	A70GT4330(1)00(2)
160	90	4.7	17.0	33.0	1	160 E3	70GT4470(1)00(2)	A70GT4470(1)00(2)
250	200	0.010	5.0	11.0	11.0	250 E3	70IF2100(1)00(2)	A70IF2100(1)00(2)
250	200	0.015	5.0	11.0	11.0	250 E3	70IF2150(1)00(2)	A70IF2150(1)00(2)
250	200	0.022	5.5	14.0	10.0	250 E3	70IH2220(1)00(2)	A70IH2220(1)00(2)
250	200	0.033	5.5	14.0	10.0	250 E3	70IH2330(1)00(2)	A70IH2330(1)00(2)
250	200	0.047	6.0	14.0	10.0	250 E3	70IH2470(1)00(2)	A70IH2470(1)00(2)
250	200	0.068	7.0	14.0	10.0	250 E3	70IH2680(1)00(2)	A70IH2680(1)00(2)
250	200	0.10	8.5	14.0	10.0	250 E3	70IH3100(1)00(2)	A70IH3100(1)00(2)
250	200	0.15	7.5	20.5	7.0	250 E3	70IK3150(1)00(2)	A70IK3150(1)00(2)
250	200	0.22	9.0	20.5	7.0	250 E3	70IK3220(1)00(2)	A70IK3220(1)00(2)
250	200	0.33	8.5	28.0	4.0	250 E3	70IQ3330(1)00(2)	A70IQ3330(1)00(2)
250	200	0.47	10.0	28.0	4.0	250 E3	70IQ3470(1)00(2)	A70IQ3470(1)00(2)
250	200	0.68	11.5	28.0	4.0	250 E3	70IQ3680(1)00(2)	A70IQ3680(1)00(2)
250	200	1.0	12.5	33.0	2.5	250 E3	70IT4100(1)00(2)	A70IT4100(1)00(2)
250	200	1.5	15.0	33.0	2.5	250 E3	70IT4150(1)00(2)	A70IT4150(1)00(2)
250	200	2.2	18.0	33.0	2.5	250 E3	70IT4220(1)00(2)	A70IT4220(1)00(2)
250	200	3.3	21.5	33.0	2.5	250 E3	70IT4330(1)00(2)	A70IT4330(1)00(2)
400	220	0.0068	5.0	11.0	25.0	400 E3	70MF1680(1)00(2)	A70MF1680(1)00(2)
400	220	0.010	5.5	14.0	13.5	400 E3	70MH2100(1)00(2)	A70MH2100(1)00(2)
400	220	0.015	6.0	14.0	13.5	400 E3	70MH2150(1)00(2)	A70MH2150(1)00(2)
400	220	0.022	6.0	14.0	13.5	400 E3	70MH2220(1)00(2)	A70MH2220(1)00(2)
400	220	0.033	6.5	14.0	13.5	400 E3	70MH2330(1)00(2)	A70MH2330(1)00(2)
400	220	0.047	8.0	14.0	13.5	400 E3	70MH2470(1)00(2)	A70MH2470(1)00(2)
400	220	0.068	7.0	20.5	10.0	400 E3	70MK2680(1)00(2)	A70MK2680(1)00(2)
400	220	0.10	8.0	20.5	10.0	400 E3	70MK3100(1)00(2)	A70MK3100(1)00(2)
400	220	0.15	8.0	28.0	6.5	400 E3	70MQ3150(1)00(2)	A70MQ3150(1)00(2)
400	220	0.22	9.5	28.0	6.5	400 E3	70MQ3220(1)00(2)	A70MQ3220(1)00(2)
400	220	0.33	11.0	28.0	6.5	400 E3	70MQ3330(1)00(2)	A70MQ3330(1)00(2)
400	220	0.47	13.0	28.0	6.5	400 E3	70MQ3470(1)00(2)	A70MQ3470(1)00(2)
400	220	0.68	13.5	33.0	4.0	400 E3	70MT3680(1)00(2)	A70MT3680(1)00(2)
400	220	1.0	16.5	33.0	4.0	400 E3	70MT4100(1)00(2)	A70MT4100(1)00(2)
400	220	1.5	20.0	33.0	4.0	400 E3	70MT4150(1)00(2)	A70MT4150(1)00(2)
630	250	0.0010	5.0	11.0	30	630 E3	70PF1100(1)00(2)	A70PF1100(1)00(2)
630	250	0.0015	5.0	11.0	30	630 E3	70PF1150(1)00(2)	A70PF1150(1)00(2)
630	250	0.0022	5.0	11.0	30	630 E3	70PF1220(1)00(2)	A70PF1220(1)00(2)
630	250	0.0033	5.0	11.0	30	630 E3	70PF1330(1)00(2)	A70PF1330(1)00(2)
630	250	0.0047	5.0	11.0	30	630 E3	70PF1470(1)00(2)	A70PF1470(1)00(2)
630	250	0.0068	5.5	14.0	20	630 E3	70PH1680(1)00(2)	A70PH1680(1)00(2)
630	250	0.010	6.0	14.0	20	630 E3	70PH2100(1)00(2)	A70PH2100(1)00(2)
630	250	0.015	7.0	14.0	20	630 E3	70PH2150(1)00(2)	A70PH2150(1)00(2)
630	250	0.022	8.5	14.0	20	630 E3	70PH2220(1)00(2)	A70PH2220(1)00(2)
630	250	0.033	7.5	20.5	15	630 E3	70PK2330(1)00(2)	A70PK2330(1)00(2)
630	250	0.047	8.5	20.5	15	630 E3	70PK2470(1)00(2)	A70PK2470(1)00(2)
630	250	0.068	8.5	28.0	10	630 E3	70PQ2680(1)00(2)	A70PQ2680(1)00(2)
630	250	0.10	10.0	28.0	10	630 E3	70PQ3100(1)00(2)	A70PQ3100(1)00(2)
630	250	0.15	11.5	28.0	10	630 E3	70PQ3150(1)00(2)	A70PQ3150(1)00(2)
VDC	VAC	Capacitance Value (μF)	B (mm)	H (mm)	dV/dt (V/μs)	Max K ₀ (V ² /μs)	New 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'd

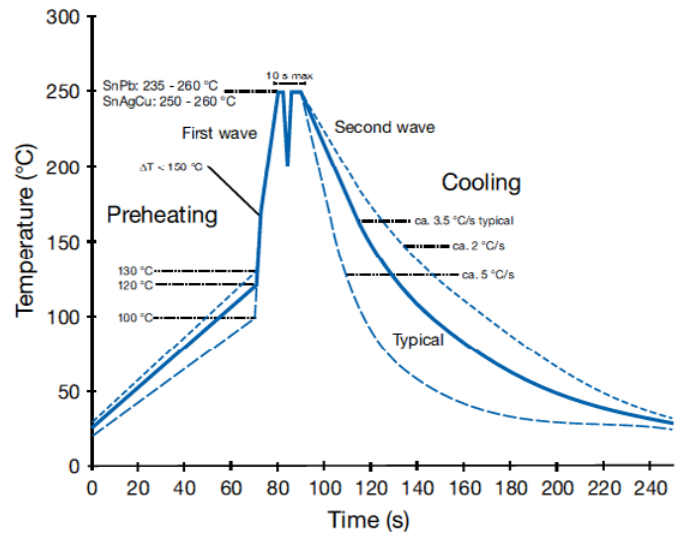
VDC	VAC	Capacitance Value (μF)	Dimensions in mm		dV/dt (V/μs)	Max K ₀ (V ² /μs)	New KEMET Part Number	Legacy Part Number
			D	L				
630	250	0.22	12.5	33.0	6	630 E3	70PT3220(1)00(2)	A70PT3220(1)00(2)
630	250	0.33	15.0	33.0	6	630 E3	70PT3330(1)00(2)	A70PT3330(1)00(2)
630	250	0.47	17.5	33.0	6	630 E3	70PT3470(1)00(2)	A70PT3470(1)00(2)
630	250	0.68	21.0	33.0	6	630 E3	70PT3680(1)00(2)	A70PT3680(1)00(2)
VDC	VAC	Capacitance Value (μF)	B (mm)	H (mm)	dV/dt (V/μs)	Max K ₀ (V ² /μs)	New 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 required the selection SnAuCu (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°C – 221°C for the new alloys. As a result, the heat stress to components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (melting point of polypropylene is 160°C – 170°C). Wave soldering can be destructive especially for mechanically small polypropylene capacitors and great care must be taken during soldering. The solder profiles from KEMET are highly recommended. You may also refer to the wave soldering curve from IEC Publication 61760–1 Edition 2. Please consult KEMET with any questions.



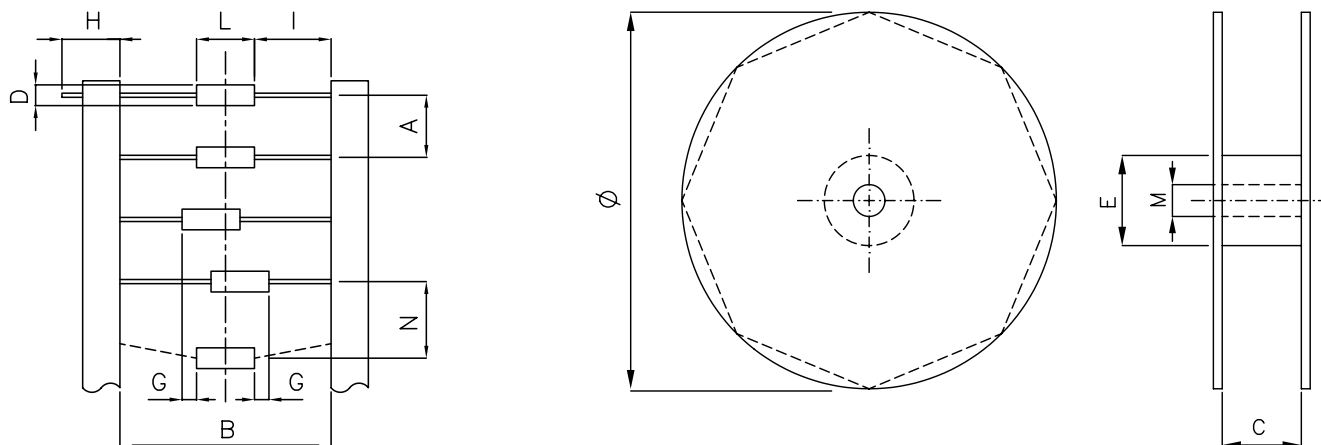
Marking

- KEMET's logo
- Series
- Dielectric code MKP
- Capacitance
- Capacitance tolerance
- Rated DC voltage

Packaging Quantities

Diameter	Length	Bulk Long Leads	Standard Reel ø 355 mm
5	11	1500	3000
5.5	14	1500	1500
6	14	1200	1300
6.5	14	1200	1300
7	14	1500	1000
7	20.5	1250	1100
7.5	14	1500	1000
7.5	20.5	1000	1000
8	20.5	1000	900
8	28	500	900
8.5	14	1000	800
8.5	20.5	750	800
8.5	28	500	800
9	20.5	750	800
9.5	28	500	600
10	28	500	600
11	28	500	400
11.5	28	300	400
12	33	300	400
12.5	33	300	400
13	28	300	400
13.5	33	300	300
14.5	33	300	300
15	33	300	300
16.5	33	200	250
17	33	200	200
17.5	33	200	200
18	33	200	200
20	33	150	150
21	33	100	
21.5	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 1
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 2
Lead length from the component body to the adhesive tape	I	≥ 20
Distance between reel flanges	C	See Table 2

(1) Maximum cumulative feed hole error 1.5 mm per 6 parts.

(2) 9 ± 1 for capacitor with L ≥ 31.5.

Table 1

Dimensions in mm	
Diameter	A ^{±0.5}
≤ 5	5
5.1 – 9.5	10
9.6 – 14.7	15
14.8 – 19.5	15

Table 2

Dimensions in mm			
Length	Class	B ^{±1.5}	C
≤ 11	I	52.4	75
14 – 20.5	II	63.6	86
≥ 26	III	73	98

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Landsberg, Germany
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Kamen, Germany
Tel: 49-2307-438110

Northern Europe

Bishop's Stortford, United Kingdom
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Espoo, Finland
Tel: 358-9-5406-5000

Asia

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Singapore
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Other KEMET Resources

Tools	
Resource	Location
Configure A Part: CapEdge	http://capacitoredge.kemet.com
SPICE & FIT Software	http://www.kemet.com/spice
Search Our FAQs: KnowledgeEdge	http://www.kemet.com/keask
Electrolytic LifeCalculator	http://www.kemet.com:8080/elc

Product Information	
Resource	Location
Products	http://www.kemet.com/products
Technical Resources (Including Soldering Techniques)	http://www.kemet.com/technicalpapers
RoHS Statement	http://www.kemet.com/rohs
Quality Documents	http://www.kemet.com/qualitydocuments

Product Request	
Resource	Location
Sample Request	http://www.kemet.com/sample
Engineering Kit Request	http://www.kemet.com/kits

Contact	
Resource	Location
Website	www.kemet.com
Contact Us	http://www.kemet.com/contact
Investor Relations	http://www.kemet.com/ir
Call Us	1-877-MyKEMET
Twitter	http://twitter.com/kemetcapacitors

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