

Construction

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

Benefits

- Approvals: ENEC, UL, cUL
- Rated Voltage: 275VAC 50/60Hz
- Capacitance Range: 0.01–1 μ F
- Pitch: 10.0–22.5 mm
- Capacitance Tolerance: \pm 20% standard, \pm 10% option, \pm 5% on request
- Climatic category 40/125/56, 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
- 100% screening factory test at 2200VDC/1500VAC

Applications

For worldwide use in electromagnetic interference suppression in all X2 and across-the-line applications. Not for use in series with the mains.



Ordering Information

R46	K	I	2100	00	H1	M
Series	Rated Voltage	Pitch	Capacitance Code (pF)	Packing Option and Leadform	Internal Use	Capacitance Tolerance
X2, Metallized Polypropylene	K = 275VAC	F = 10.0 I = 15.0 N = 22.5 R = 27.5 W = 37.5	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	"H" for High Temperature	J = \pm 5% K = \pm 10% M = \pm 20%

Ordering Options Table

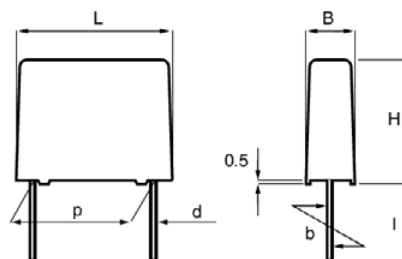
Standard Packaging Style	Lead Length (mm)	Taping Style			Ordering Code
		P2	Fif.	Pitch	
		(mm)	(No)	(mm)	
Ammo Pack		12.70	1	10.0/15.0	DQ
Ammo Pack		19.05	2	22.5	DQ
Tape & Reel 500 mm		12.70	1	10.0/15.0	CK
Tape & Reel 500 mm		19.05	2	22.5/27.5	CK
Loose, Short Leads	4 ⁺²				00
Loose, Long Leads	25 ^{-1/+2}				50
Loose, Long Leads	30 ⁺⁵				40
Loose, insulated rigid Leads	30 ⁺⁵				51
Loose, insulated flexible Leads	150 ⁺⁵				51
Other options available on request					

Dimension Table

Lead Space	Outer Dimension		
	B	H	L
10.0	4.0	9.0	13.0
10.0	5.0	11.0	13.0
10.0	6.0	12.0	13.0
15.0	10.0	16.0	18.0
15.0	11.0	19.0	18.0
15.0	13.0	12.0	18.0
15.0	5.0	11.0	18.0
15.0	6.0	12.0	18.0
15.0	6.0	17.5	18.0
15.0	7.5	13.5	18.0
15.0	7.5	18.5	18.0
15.0	8.5	14.5	18.0
15.0	9.0	12.5	18.0
22.5	10.0	18.5	26.5
22.5	11.0	20.0	26.5
22.5	13.0	22.0	26.5
22.5	6.0	15.0	26.5
22.5	6.5	13.5	26.5
22.5	7.0	16.0	26.5
22.5	8.5	17.0	26.5
27.5	11.0	20.0	32.0
27.5	13.0	22.0	32.0
27.5	14.0	28.0	32.0
27.5	18.0	33.0	32.0
27.5	22.0	37.0	32.0
27.5	9.0	17.0	32.0
37.5	11.0	22.0	41.5
37.5	13.0	24.0	41.5
37.5	16.0	28.5	41.5
37.5	19.0	32.0	41.5
37.5	20.0	40.0	41.5
37.5	24.0	44.0	41.5

Leadspacing Table

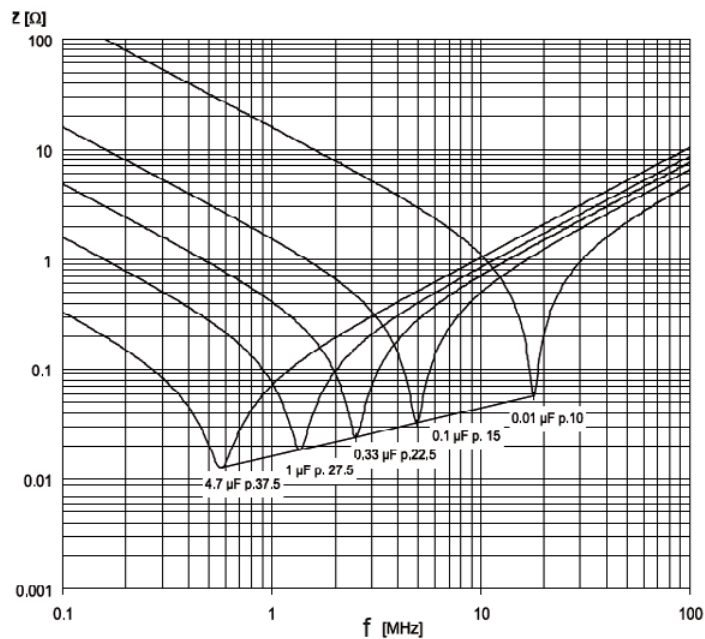
p	d	std l	max l	b
10.0 ± 0.4	0.6	4	20	± 0.4
15.0 ± 0.4	0.6	4	30	± 0.4
22.5 ± 0.4	0.8	4	30	± 0.4
Tolerance in Lead Length		< 30mm +2 / -0		
		30mm +5 / -0		



Technical Data

Rated Voltage	275 VAC 50/60Hz	
Capacitance Range	0.01–1 μF	
Capacitance Tolerance	$\pm 20\%$ standard, $\pm 10\%$ option, $\pm 5\%$ on request	
Temperature Range	-40 to +125°C	
Climatic Category	40/125/56	
Approvals	ENEC, UL, cUL	
Dissipation Factor	Maximum Values at +23°C	
	1 kHz	0.1%
Test Voltage Between Terminals	The 100% screening factory test is carried out at 2200VDC/1500VAC. 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	$C \leq 0.33 \mu\text{F} : \geq 50\,000 \text{ M}\Omega$	
	$C > 0.33 \mu\text{F} : \geq 30\,000 \text{ s}$	
In DC applications	Recommended Voltage $\leq 560 \text{ VDC}$	

Impedance Graph



Environmental Test Data

Test	IEC Publication	Procedure
Endurance	EN/IEC 60384-14	1.25 x UR VAC 50Hz, once every hour increase to 1000 VAC for 0.1 s, 1000 h 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	1000 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	UR + 20 surge pulses at 2.5 kV (pulse every 5 s)
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 90 - 95% R.H., 56 days

Environmental Compliance

All KEMET EMI capacitors are RoHS compliant and Halogen Free.



RoHS Compliant



Approvals



Mark	Specification	File Number
	EN/IEC 60384-14	CA08.00063
	UL 1414 (up to 1µF, 85°C, 250VAC)	E97797
	CSA - C22.2 No.1 (up to 1µF, 85°C, 250VAC)	E97797
	UL 1283 (310VAC)	E85238
	CSA - C22.2 No. 8 (310VAC)	E85238

Table 1 – Ratings & Part Number Reference

Lead Space	Cap Value (µF)	B (mm)	H (mm)	L (mm)	Ø d	dV/dt (V/µsec)	F Article Code	Part Number
10.0	0.010	5.0	11.0	13.0	0.6	500	46KF210000H1M	R46KF210000H1M*
10.0	0.015	5.0	11.0	13.0	0.6	500	46KF215000H1M	R46KF215000H1M
10.0	0.022	5.0	11.0	13.0	0.6	500	46KF222000H1M	R46KF222000H1M
10.0	0.033	5.0	11.0	13.0	0.6	500	46KF233000H1M	R46KF233000H1M
10.0	0.047	6.0	12.0	13.0	0.6	500	46KF247000H1M	R46KF247000H1M
10.0	0.068	6.0	12.0	13.0	0.6	500	46KF268000H1M	R46KF268000H1M*
15.0	0.010	5.0	11.0	18.0	0.6	400	46KI210000H1M	R46KI210000H1M
15.0	0.015	5.0	11.0	18.0	0.6	400	46KI215000H1M	R46KI215000H1M
15.0	0.022	5.0	11.0	18.0	0.6	400	46KI222000H1M	R46KI222000H1M
15.0	0.033	5.0	11.0	18.0	0.6	400	46KI233000H1M	R46KI233000H1M
15.0	0.047	5.0	11.0	18.0	0.6	400	46KI247000H1M	R46KI247000H1M
15.0	0.068	5.0	11.0	18.0	0.6	400	46KI268000H1M	R46KI268000H1M
15.0	0.10	6.0	12.0	18.0	0.6	400	46KI310000H1M	R46KI310000H1M
15.0	0.15	6.0	17.5	18.0	0.6	400	46KI315000H2M	R46KI315000H2M
15.0	0.15	9.0	12.5	18.0	0.6	400	46KI315000H3M	R46KI315000H3M
15.0	0.15	7.5	13.5	18.0	0.6	400	46KI315000H1M	R46KI315000H1M
15.0	0.22	8.5	14.5	18.0	0.6	400	46KI322000H1M	R46KI322000H1M
15.0	0.22	6.0	17.5	18.0	0.6	400	46KI322000H2M	R46KI322000H2M*
15.0	0.22	9.0	12.5	18.0	0.6	400	46KI322000H3M	R46KI322000H3M*
15.0	0.22	7.5	18.5	18.0	0.8	400	46KI322000H4M	R46KI322000H4M
15.0	0.33	10.0	16.0	18.0	0.8	400	46KI333000H1M	R46KI333000H1M*
15.0	0.33	7.5	18.5	18.0	0.8	400	46KI333000H2M	R46KI333000H2M*
15.0	0.33	13.0	12.0	18.0	0.8	400	46KI333000H3M	R46KI333000H3M*
15.0	0.47	11.0	19.0	18.0	0.8	400	46KI347000H1M	R46KI347000H1M*
22.5	0.15	6.0	15.0	26.5	0.8	200	46KN315000H1M	R46KN315000H1M
22.5	0.22	6.0	15.0	26.5	0.8	200	46KN322000H1M	R46KN322000H1M
22.5	0.33	7.0	16.0	26.5	0.8	200	46KN333000H1M	R46KN333000H1M
22.5	0.47	10.0	18.5	26.5	0.8	200	46KN347000H1M	R46KN347000H1M
22.5	0.68	11.0	20.0	26.5	0.8	200	46KN368000H1M	R46KN368000H1M
22.5	1.0	13.0	22.0	26.5	0.8	200	46KN410000H1M	R46KN410000H1M
Lead Space	Cap Value (µF)	B (mm)	H (mm)	L (mm)	Ø d	dV/dt (V/µsec)	F Article Code	Part Number

Other part number options:

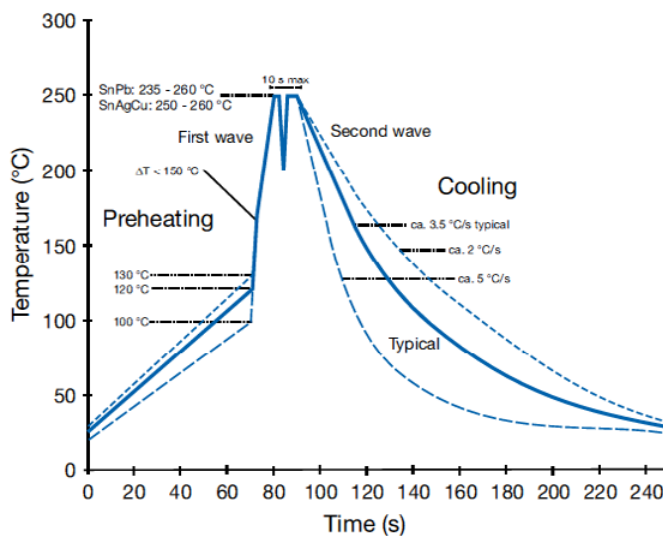
(1) Where the 14th character equal to, J ($\pm 5\%$ tolerance), K ($\pm 10\%$ tolerance) and M ($\pm 20\%$ tolerance).

(2) Refer to Ordering Options Table for Ordering Code.

*Where the 10th character equal to M ($\pm 20\%$ tolerance) is only available in M ($\pm 20\%$ tolerance).

Soldering Process

The implementation of RoHS Directive has forced to select 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 217–221°C for the new alloys. This means that the heat stress to components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. The Polypropylene Capacitors are especially sensitive to heat (melting point of Polypropylene is 160–170°C). The wave soldering can be destructive especially for mechanically small Polypropylene Capacitors (lead spacings 5-10 mm), and great care has to be taken when soldering them. The recommended solder profiles from KEMET should be used. In case of doubt, KEMET should be consulted. In general the wave soldering curve from IEC Publication 61760-1 edition 2 gives a good guideline for successful soldering.



Marking

- Manufacturer's logo
- Article series
- Rated capacitance
- Capacitance tolerance
- Rated voltage
- Capacitor class
- Approval marks
- Manufacturing date code
- IEC climatic category
- Passive flammability class
- Manufacturing date code
- Manufacturing plant

Lead Taping and Packaging of Radial Components for Automatic Insertion Machines

Technical terms: IEC 60286-2

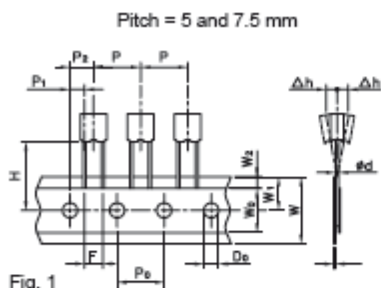


Fig. 1

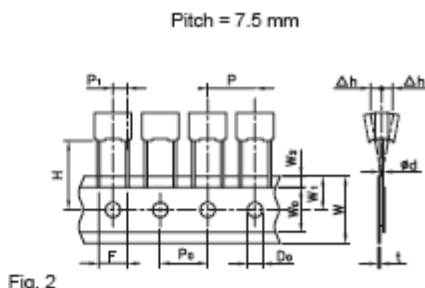
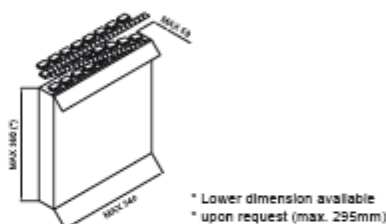


Fig. 2

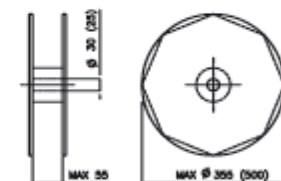
Packaging detail

Two different containers are available:
 Fan-fold box (Ammo-pack)
 Reel \varnothing 355 mm only.

Ammo-pack (dimensions in mm)



Reel (dimensions in mm)



Description	Symbol	Dimensions (mm)			Tol.
		Pitch			
		5 mm Fig.1	7.5 mm Fig.1	7.5 mm Fig. 2	
Lead wire diameter	d	0.5 ... 0.6	0.5 ... 0.6	0.5 ... 0.6	± 0.05
Taping pitch	P	12.7	12.7	12.7	± 1
Feed hole pitch	P ₀	12.7	12.7	12.7	$\pm 0.2^*$
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 (pitch)	F	5	7.5	7.5	+0.6 -0.1
Component alignment	Δh	0	0	0	± 2
Height of component from tape center	H**	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	min.
Hole position	W ₁	9	9	9	± 0.5
Hold down tape position	W ₂	3	3	3	max.
Feed hole diameter	D ₀	4	4	4	± 0.2
Tape thickness	t	0.7	0.7	0.7	± 0.2

Remarks

- * Max 1mm on 20 pitches
- ** H = 18.5 mm is available upon request.

For orders of capacitors with pitch = 7.5 mm, please specify the requested version (fig.1 or fig.2).

NUMBER OF PIECES FOR PACKING UNIT

Box dimensions			Pitch	Loose *short leads	Loose **long leads	Ammo	Reel \varnothing 355mm
B	H	L					
(mm)	(mm)	(mm)	(mm)	(pcs)	(pcs)	(pcs)	(pcs)
2.5	6.5	7.2	5.0	3000	4000	3500	2500
3.5	7.5	7.2	5.0	2000	3000	2500	1800
4.5	9.5	7.2	5.0	1500	2000	1900	1400
5.0	10.0	7.2	5.0	1000	1500	1700	1200
6.0	11.0	7.2	5.0	2000	1000	1400	1000
7.2	13.0	7.2	5.0	1500	750	1150	800

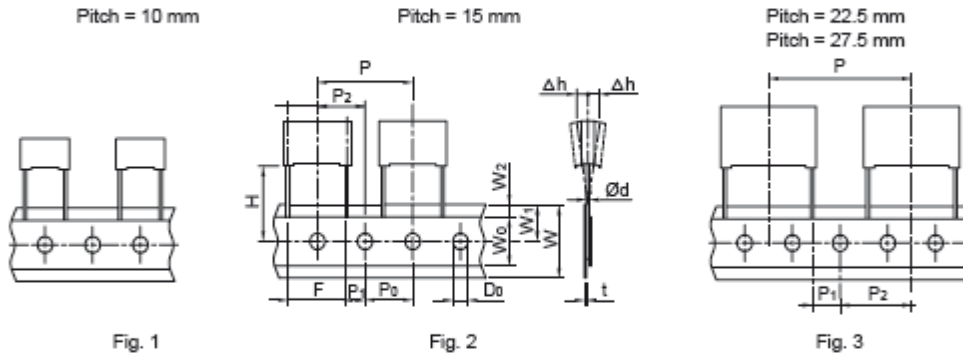
Box dimensions			Pitch	Loose *short leads	Loose **long leads	Ammo	Reel \varnothing 355mm
B	H	L					
(mm)	(mm)	(mm)	(mm)	(pcs)	(pcs)	(pcs)	(pcs)
3.0	8.0	10.0	7.5	1500	1750	2600	2100
4.0	9.0	10.0	7.5	2000	1500	2100	1500
5.0	10.5	10.0	7.5	1500	1000	1600	1200
6.0	12.0	10.5	7.5	1000	800	1350	1000

* Short leads: lead length = $4^{+0.5}$ mm (pitch = 5mm); $4^{+0.2}$ mm (pitch = 7.5mm)

** Long leads: lead length = $17^{+0.2}$ mm

Lead Taping and Packaging of Radial Components for Robot Insertion Machines

Technical terms: IEC 60288-2



Description	Symbol	Dimensions (mm)				Tol.
		Pitch				
		10 mm Fig.1	15 mm Fig.2	22.5mm Fig.3	27.5mm Fig.3	
Lead wire diameter	d	0.6	0.6/0.8	0.8	0.8	±0.05
Taping pitch	P	25.4	25.4	38.1	38.1	±1
Feed hole pitch*	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****	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	min.
Hole position	W ₁	9	9	9	9	±0.5
Hold down tape position	W ₂	3	3	3	3	max.
Feed hole diameter	D ₀	4	4	4	4	±0.2
Tape thickness	t	0.7	0.7	0.7	0.7	±0.2

Remarks

- * Available also 15mm.
- ** Max 1mm on 20 pitches.
- *** Pitches 15mm and 10mm taped to 7.5mm (crimped leads) available upon request.
- **** H = 18.5 mm is available upon request.

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Carmel, IN
Tel: 317-706-6742

West

Milpitas, CA
Tel: 408-433-9950

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Zapopan, Jalisco
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Europe

Southern Europe

Geneva, Switzerland
Tel: 41-22-715-0100

Paris, France
Tel: 33-1-4646-1009

Sasso Marconi, Italy
Tel: 39-051-939111

Milan, Italy
Tel: 39-02-57518176

Rome, Italy
Tel: 39-06-23231718

Madrid, Spain
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Central Europe

Landsberg, Germany
Tel: 49-8191-3350800

Dortmund, Germany
Tel: 49-2307-3619672

Kwidzyn, Poland
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Northern Europe

Bishop's Stortford, United Kingdom
Tel: 44-1279-757201

Weymouth, United Kingdom
Tel: 44-1305-830747

Coatbridge, Scotland
Tel: 44-1236-434455

Färjestaden, Sweden
Tel: 46-485-563934

Espoo, Finland
Tel: 358-9-5406-5000

Asia

Northeast Asia

Hong Kong
Tel: 852-2305-1168

Shenzhen, China
Tel: 86-755-2518-1306

Beijing, China
Tel: 86-10-5829-1711

Shanghai, China
Tel: 86-21-6447-0707

Taipei, Taiwan
Tel: 886-2-27528585

Southeast Asia

Singapore
Tel: 65-6586-1900

Penang, Malaysia
Tel: 60-4-6430200

Bangalore, India
Tel: 91-806-53-76817

Note: KEMET reserves the right to modify minor details of internal and external construction at any time in the interest of product improvement. KEMET does not assume any responsibility for infringement that might result from the use of KEMET Capacitors in potential circuit designs. KEMET is a registered trademark of KEMET Electronics Corporation.

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

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
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Although we design and manufacture our products to the most stringent quality and safety standards, given the current state of the art, isolated component failures may still occur. Accordingly, customer applications which require a high degree of reliability or safety should employ suitable designs or other safeguards (such as installation of protective circuitry or redundancies) in order to ensure that the failure of an electrical component does not result in a risk of personal injury or property damage.

Although all product-related warnings, cautions and notes must be observed, the customer should not assume that all safety measures are indicated or that other measures may not be required.

