R46 + R Series Metallized Polypropylene Film, Class X2, 275 VAC/300 VAC with Internal Discharge Resistor

Overview

The R46 + R 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 in electromagnetic interference suppression in all X2 and across-the-line applications. Not for use in series with the mains.

Benefits

- Approvals: ENEC, UL, cUL
- Rated voltage: 275/300 VAC 50/60 Hz
- Capacitance range: 0.22 – 10 µF
- Lead spacing: 22.5 – 37.5 mm
- Capacitance tolerance: ±20%, ±10%, ±5% on request
- 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

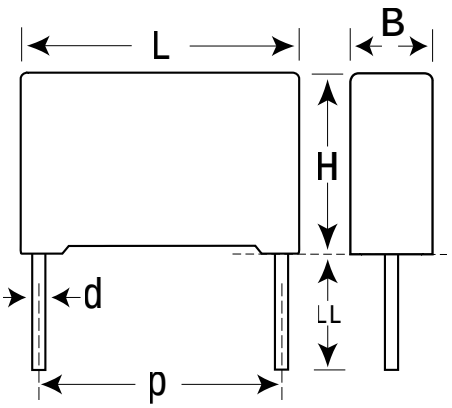
Part Number System

R46	K	N	3220	00	01	M	E
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Lead and Packaging Code	Internal Use	Capacitance Tolerance	Value of Discharge Resistor
X2, Metallized Polypropylene	K = 275	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	01, M1, M2 (Standard)	J = ±5% K = ±10% M = ±20%	470 kΩ = E 680 kΩ = F 1 MΩ = G 1.2 MΩ = L 1.5 MΩ = N 2.2 MΩ = P 3.3 MΩ = Q 4.7 MΩ = S 6.8 MΩ = T 10 MΩ = V

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		
	Bulk (Tray) – Short Leads	4 +2/-0	00
	Tape & Reel (Large Reel)	H_0= 18.5 +/-0.5	CK
	Other Lead and Packaging Options		
	Bulk (Tray) – Long Leads	25 +2/-1	50
	Bulk (Tray) – Max Length Leads	30 +5/-0	40
	Pizza Pack	4 +2/-0	BB
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
	Other Lead and Packaging Options		
	Bulk (Tray) – Long Leads	25 +2/-1	50
	Bulk (Tray) – Max Length Leads	30 +5/-0	40
37.5	Standard Lead and Packaging Options		
	Bulk (Tray) – Short Leads	4 +2/-0	00
	Other Lead and Packaging Options		
	Bulk (Tray) – Long Leads	25 +2/-1	50
	Bulk (Tray) – Max Length Leads	30 +5/-0	40

Dimensions – Millimeters



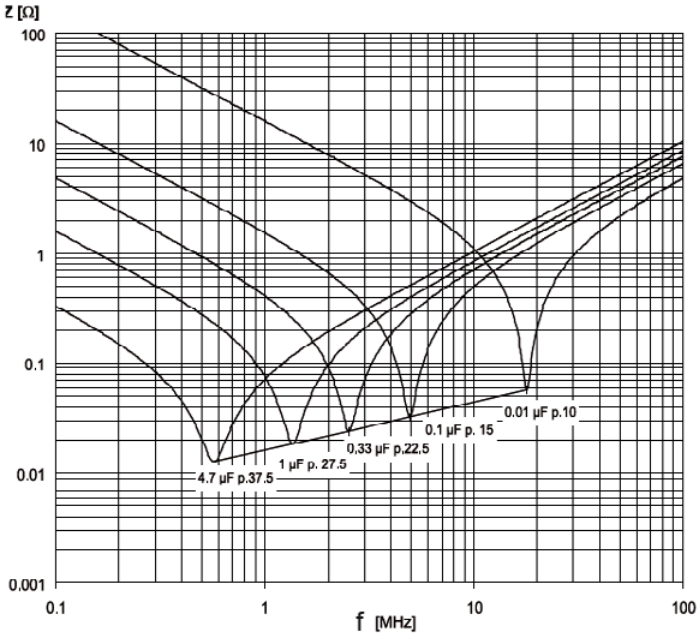
p		B		H		L		d	
Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
22.5	+/-0.4	7.0	+0.2/-0	16.0	+0.1/-0	26.5	+0.3/-0	0.8	+/-0.05
22.5	+/-0.4	8.5	+0.2/-0	17.0	+0.1/-0	26.5	+0.3/-0	0.8	+/-0.05
22.5	+/-0.4	10.0	+0.2/-0	18.5	+0.1/-0	26.5	+0.3/-0	0.8	+/-0.05
22.5	+/-0.4	11.0	+0.2/-0	20.0	+0.1/-0	26.5	+0.3/-0	0.8	+/-0.05
27.5	+/-0.4	11.0	+0.2/-0	20.0	+0.1/-0	32.0	+0.3/-0	0.8	+/-0.05
27.5	+/-0.4	13.0	+0.2/-0	22.0	+0.1/-0	32.0	+0.3/-0	0.8	+/-0.05
27.5	+/-0.4	14.0	+0.2/-0	28.0	+0.1/-0	32.0	+0.3/-0	0.8	+/-0.05
27.5	+/-0.4	18.0	+0.2/-0	33.0	+0.1/-0	32.0	+0.3/-0	0.8	+/-0.05
27.5	+/-0.4	22.0	+0.2/-0	37.0	+0.1/-0	32.0	+0.3/-0	0.8	+/-0.05
37.5	+/-0.4	11.0	+0.3/-0	22.0	+0.1/-0	41.5	+0.3/-0	1	+/-0.05
37.5	+/-0.4	13.0	+0.3/-0	24.0	+0.1/-0	41.5	+0.3/-0	1	+/-0.05
37.5	+/-0.4	16.0	+0.3/-0	28.5	+0.1/-0	41.5	+0.3/-0	1	+/-0.05
37.5	+/-0.4	19.0	+0.3/-0	32.0	+0.1/-0	41.5	+0.3/-0	1	+/-0.05
37.5	+/-0.4	20.0	+0.3/-0	40.0	+0.1/-0	41.5	+0.3/-0	1	+/-0.05
37.5	+/-0.4	24.0	+0.3/-0	44.0	+0.1/-0	41.5	+0.3/-0	1	+/-0.05

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

Performance Characteristics

Rated Voltage	275 VAC 50/60 Hz	
Capacitance Range	0.22 – 10 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	0.1%
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	Minimum Values Between Terminals	
	C ≤ 0.33 µF	≥ 50,000 MΩ
	C > 0.33 µF	≥ 30,000 MΩ • µF
In DC Applications	Recommended voltage ≤ 560/630 VDC	

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	V4413
	UL 1283 (310 VAC)	E85238
	CSA – C22.2 No. 8 (310 VAC)	E85238

Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.

RoHS Compliant

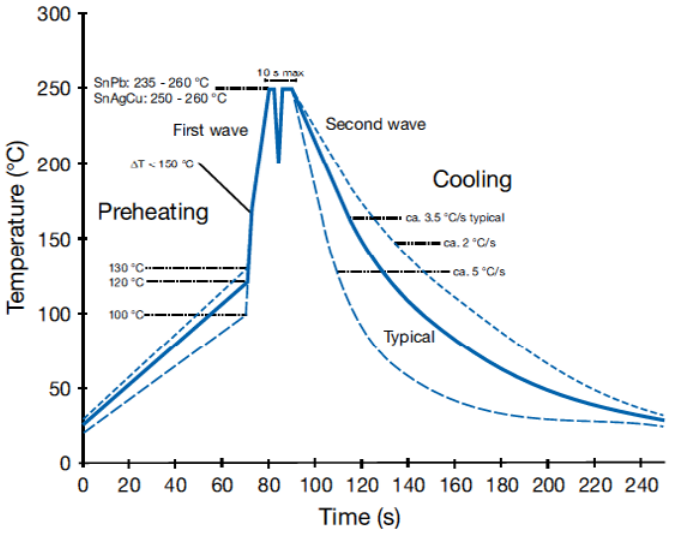
Table 1 – Ratings & Part Number Reference

Capacitance Value (µF)	Dimensions in mm			Lead Spacing (p)	dV/dt (V/µs)	New KEMET Part Number	Legacy Part Number
	B	H	L				
0.22	7.0	16.0	26.5	22.5	200	46KN3220(1)01(2)(3)	R46KN3220(1)01(2)(3)
0.33	8.5	17.0	26.5	22.5	200	46KN3330(1)01(2)(3)	R46KN3330(1)01(2)(3)
0.47	10.0	18.5	26.5	22.5	200	46KN3470(1)01(2)(3)	R46KN3470(1)01(2)(3)
0.68	11.0	20.0	26.5	22.5	200	46KN3680(1)01(2)(3)	R46KN3680(1)01(2)(3)
0.47	11.0	20.0	32.0	27.5	150	46KR3470(1)01(2)(3)	R46KR3470(1)01(2)(3)
0.68	11.0	20.0	32.0	27.5	150	46KR3680(1)M1(2)(3)	R46KR3680(1)M1(2)(3)
1.0	13.0	22.0	32.0	27.5	150	46KR4100(1)M1(2)(3)	R46KR4100(1)M1(2)(3)
1.5	13.0	22.0	32.0	27.5	150	46KR4150(1)M1(2)(3)	R46KR4150(1)M1(2)(3)
2.2	14.0	28.0	32.0	27.5	150	46KR4220(1)M1(2)(3)	R46KR4220(1)M1(2)(3)
3.3	18.0	33.0	32.0	27.5	150	46KR4330(1)M2(2)(3)	R46KR4330(1)M2(2)(3)
4.7	22.0	37.0	32.0	27.5	150	46KR4470(1)M1(2)(3)	R46KR4470(1)M1(2)(3)
1.5	11.0	22.0	41.5	37.5	100	46KW4150(1)M1(2)(3)	R46KW4150(1)M1(2)(3)
2.2	13.0	24.0	41.5	37.5	100	46KW4220(1)M1(2)(3)	R46KW4220(1)M1(2)(3)
3.3	16.0	28.5	41.5	37.5	100	46KW4330(1)M1(2)(3)	R46KW4330(1)M1(2)(3)
4.7	19.0	32.0	41.5	37.5	100	46KW4470(1)M1(2)(3)	R46KW4470(1)M1(2)(3)
6.8	20.0	40.0	41.5	37.5	100	46KW4680(1)M2(2)(3)	R46KW4680(1)M2(2)(3)
10.0	24.0	44.0	41.5	37.5	100	46KW5100(1)M1(2)(3)	R46KW5100(1)M1(2)(3)
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 ordering code for lead type and packaging. See Ordering Options Table for available options.
(2) M = ±20%, K = ±10%, J = ±5% on request.
(3) Insert code for Discharge resistor. See Part Number System.

Soldering Process

The implementation of the RoHS Directive has required the use of SnAuCu (SAC) or SnCu alloys as primary solder. These alloys require a higher liquidus temperature (217ºC – 221ºC) as compared to SnPb eutectic alloy (183ºC). Due to the higher pre-heat and wave temperatures, the heat stress to components has increased considerably. Polypropylene capacitors are especially sensitive to soldering temperature due to the relatively low melting point of polypropylene material (160ºC – 170ºC). As a result, wave soldering can be destructive, especially to mechanically small polypropylene capacitors with lead spacings of 5 – 10 mm. For more information, please refer to KEMET's Recommended Soldering Profiles or contact a KEMET representative. IEC Publication 61760–1 Edition 2 may also be consulted for general guidelines.



Marking

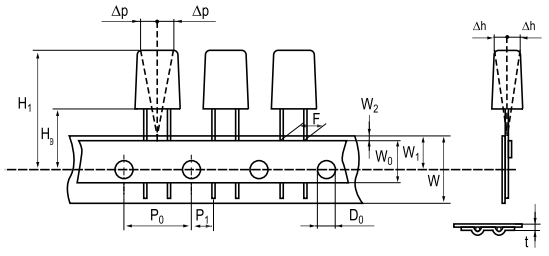
- KEMET's logo
- Series
- Capacitance
- Capacitance tolerance
- Rated voltage
- Capacitor class
- Approval marks
- Manufacturing date code
- IEC climatic category
- Passive flammability class
- Manufacturing plant

Packaging Quantities

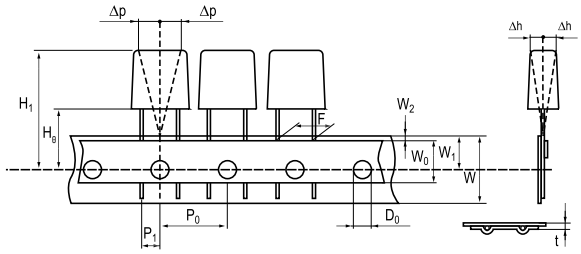
Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel ø 355 mm	Large Reel ø 500 mm	Ammo	Pizza
22.5	6	15	26.5	1404	702	300	700	464	660
	7	16	26.5	1188	594	250	550	380	564
	8.5	17	26.5	972	486	250	450	280	468
	10	18.5	26.5	810	405	160	350	235	396
	11	20	26.5	630	378	190	350	217	360
	13	22	26.5	540	324	150	300	200	300
27.5	9	17	32	816	408		450		
	10	20	32	600	360		350		
	11	20	32	560	336		350		
	13	22	32	480	288		300		
	13	25	32	480	288				
	14	28	32	352	176				
	15	24.5	32	400	240				
	18	33	32	256	128				
	22	37	32	168	112				
37.5	11	22	41.5	420	252				
	13	24	41.5	360	216				
	16	28.5	41.5	216	108				
	19	32	41.5	192	96				
	20	40	41.5	126	84				
	24	44	41.5	108	72				
	30	45	41.5	90	60				

Lead Taping & Packaging (IEC 60286–2)

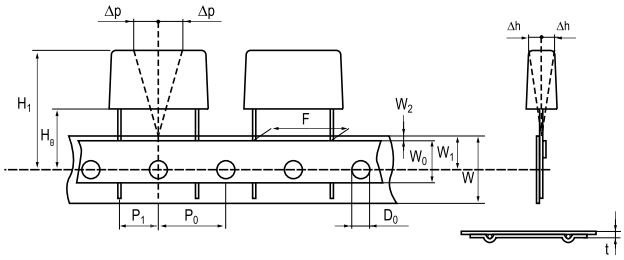
Lead Spacing 5 mm



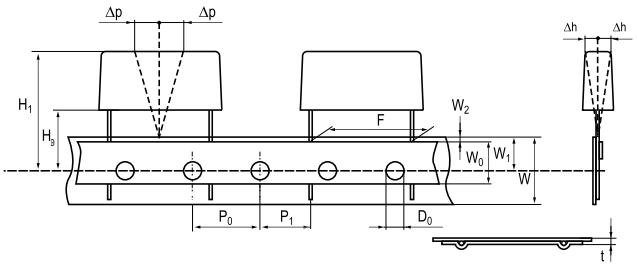
Lead Spacing 7.5 mm



Lead Spacing 10 – 15 mm



Lead Spacing 22.5 – 27.5 mm



Taping Specification

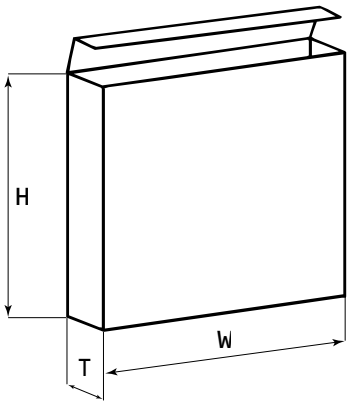
Dimensions in mm									Standard IEC 60286–2
Lead spacing	+6/-0.1	F	5	7.5	10	15	22.5	27.5	F
Carrier tape width	+1/-0.5	W	18	18	18	18	18	18	$18^{+1/-0.5}$
Hold-down tape width	Minimum	W_0	6	6	9	10	10	10	
Position of sprocket hole	+/-0.5	W_1	9	9	9	9	9	9	$9^{+0.75/-0.5}$
Distance between tapes	Maximum	W_2	3	3	3	3	3	3	3
Sprocket hole diameter	+/-0.2	D_0	4	4	4	4	4	4	4
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	2	2	2	2	2	2
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)	$18.5^{+/-0.5}$	$18.5^{+/-0.5}$	$18.5^{+/-0.5}$	$18.5^{+/-0.5}$	$18.5^{+/-0.5}$	$18.5^{+/-0.5}$	$18^{+2/-0}$

(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'd

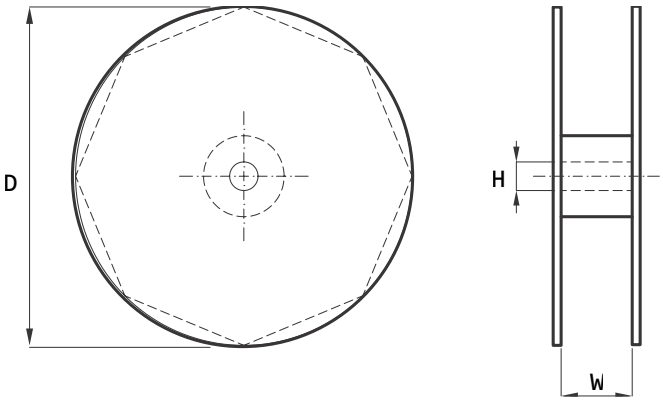
Ammo Specifications

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
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		

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Tel: 49-8191-3350800

Kamen, Germany
Tel: 49-2307-438110

Northern Europe
Bishop's Stortford, United Kingdom
Tel: 44-1279-460122

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

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

Digitally signed by Jeannette Calvo
DN: c=US, st=FL, l=Fort Lauderdale, o=KEMET Corp., ou=Marketing Communications, cn=Jeannette Calvo, email=jeannettecalvo@kemet.com
Date: 2013.04.05 15:19:21 -04'00'