

PMR209 Series Metallized Impregnated Paper, Class X2, 250 VAC/630 VDC

Overview

The PMR209 Series 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
- Rated voltage: 630 VDC, 250 VAC 50/60 Hz
- Capacitance range: 0.047 – 0.47 μ F
- Capacitance tolerance: \pm 20%
- Resistance range: 22 – 470 Ω
- Resistance tolerance: \pm 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



Legacy Part Number System

PMR209	M	B	5470	M	047	R30
Series	Rated Voltage (VAC)	Lead Spacing (mm)	Capacitance Code (pF)	Capacitance Tolerance	Resistance (Ω)	Lead and Packaging Code
RC Snubber, Metallized Paper	M = 250	B = 15.2 C = 20.3 E = 25.4	Digits 2 – 4 (3) indicates the first three digits of the capacitance value. First digit indicates the total number of digits in the capacitance value.	M = \pm 20%	Resistance Value in Ω	See Ordering Options Table

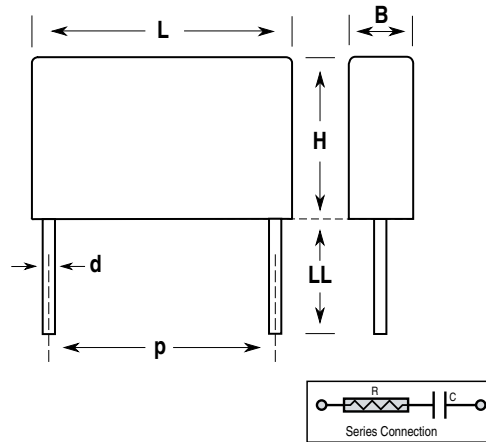
New KEMET Part Number System

P	409	Q	M	473	M	250	A	H470
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	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 = \pm 20%	250 = 250	See Ordering Options Table	H + 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
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 (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) – 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 (Bag) – Short Leads	6 +0/-1	C	R06
	Bulk (Tray) – Max 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
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
CP	20.3	+/-0.4	11.3	Maximum	16.5	Maximum	24	Maximum	0.8	+/-0.05
EJ	25.4	+/-0.4	12.1	Maximum	19	Maximum	30.5	Maximum	1.0	+/-0.05
EL	25.4	+/-0.4	15.3	Maximum	22	Maximum	30.5	Maximum	1.0	+/-0.05

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



Performance Characteristics

Rated Voltage	250 VAC 50/60 Hz	
Capacitance Range	0.047 – 0.47 μ F	
Capacitance Tolerance	\pm 20%	
Resistance Range	22 – 470 Ω	
Resistance Tolerance	\pm 30%	
Temperature Range	-40°C to +85°C	
Climatic Category	40/085/56/B	
Approvals	ENEC, UL	
Peak Pulse Voltage	1,000 V	
Series Resistance	The series resistance is defined at 1 kHz for RC \geq 50 μ s and at 100 kHz for RC < 50 μ s	
Insulation Resistance	Minimum Values Between Terminals	
	C \leq 0.33 μ F	\geq 3,000 M Ω
	C > 0.33 μ F	\geq 1,000 M Ω • μ F
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 \leq 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
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	Wetting time for d > 0.8 < 1.5 seconds
Damp Heat Steady State	IEC 60068–2–78 Test Cab	+40°C and 93% RH, 56 days
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	Specification	File Number
	EN/IEC 60384–14	SE/0140–28A
	UL 1283	E100117

Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.



RoHS Compliant

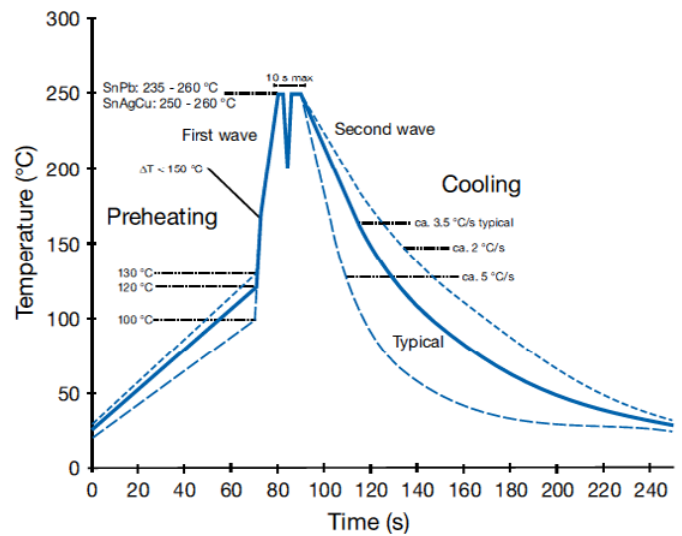
Table 1 – Ratings & Part Number Reference

Lead Spacing (p)	Cap Value (µF)	Resistance (Ω)	Maximum Dimensions in mm			New KEMET Part Number	Legacy Part Number
			B	H	L		
15.2	0.047	47	7.3	13	18.5	P409QM473M250(1)H470	PMR209MB5470M047(1)
15.2	0.047	100	7.3	13	18.5	P409QM473M250(1)H101	PMR209MB5470M100(1)
20.3	0.1	22	7.6	14	24	P409CE104M250(1)H220	PMR209MC6100M022(1)
20.3	0.1	33	7.6	14	24	P409CE104M250(1)H330	PMR209MC6100M033(1)
20.3	0.1	47	7.6	14	24	P409CE104M250(1)H470	PMR209MC6100M047(1)
20.3	0.1	68	7.6	14	24	P409CE104M250(1)H680	PMR209MC6100M068(1)
20.3	0.1	100	7.6	14	24	P409CE104M250(1)H101	PMR209MC6100M100(1)
20.3	0.1	150	11.3	16.5	24	P409CP104M250(1)H151	PMR209MC6100M150(1)
20.3	0.1	220	11.3	16.5	24	P409CP104M250(1)H221	PMR209MC6100M220(1)
20.3	0.1	330	11.3	16.5	24	P409CP104M250(1)H331	PMR209MC6100M330(1)
20.3	0.1	470	11.3	16.5	24	P409CP104M250(1)H471	PMR209MC6100M470(1)
20.3	0.22	22	11.3	16.5	24	P409CP224M250(1)H220	PMR209MC6220M022(1)
20.3	0.22	33	11.3	16.5	24	P409CP224M250(1)H330	PMR209MC6220M033(1)
20.3	0.22	47	11.3	16.5	24	P409CP224M250(1)H470	PMR209MC6220M047(1)
20.3	0.22	68	11.3	16.5	24	P409CP224M250(1)H680	PMR209MC6220M068(1)
20.3	0.22	100	11.3	16.5	24	P409CP224M250(1)H101	PMR209MC6220M100(1)
20.3	0.22	150	11.3	16.5	24	P409CP224M250(1)H151	PMR209MC6220M150(1)
20.3	0.22	220	11.3	16.5	24	P409CP224M250(1)H221	PMR209MC6220M220(1)
25.4	0.22	330	12.1	19	30.5	P409EJ224M250(1)H331	PMR209ME6220M330(1)
25.4	0.22	470	15.3	22	30.5	P409EL224M250(1)H471	PMR209ME6220M470(1)
25.4	0.47	33	15.3	22	30.5	P409EL474M250(1)H330	PMR209ME6470M033(1)
25.4	0.47	47	15.3	22	30.5	P409EL474M250(1)H470	PMR209ME6470M047(1)
25.4	0.47	68	15.3	22	30.5	P409EL474M250(1)H680	PMR209ME6470M068(1)
25.4	0.47	100	15.3	22	30.5	P409EL474M250(1)H101	PMR209ME6470M100(1)
25.4	0.47	150	15.3	22	30.5	P409EL474M250(1)H151	PMR209ME6470M150(1)
25.4	0.47	220	15.3	22	30.5	P409EL474M250(1)H221	PMR209ME6470M220(1)
Lead Spacing (p)	Cap Value (µF)	Resistance Ω	B (mm)	H (mm)	L (mm)	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 required the use of SnAuCu (SAC) or SnCu alloys as primary solder. These alloys require a higher liquidus temperature (217°C – 221°C) as compared to SnPb eutectic alloy (183°C). 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 (160°C – 170°C). 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

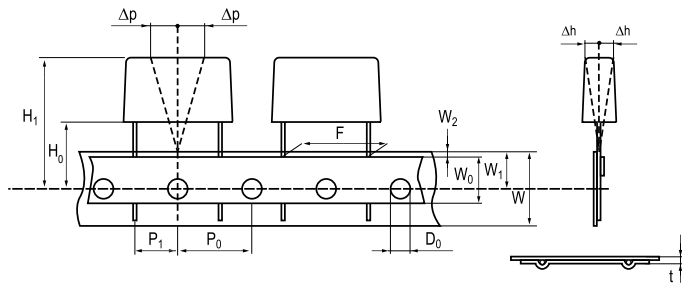
- KEMET's logo
- Series
- RC unit
- Capacitance
- Rated resistance
- Rated voltage
- IEC climatic category
- Circuit diagram
- Passive flammability class
- Manufacturing date code

Packaging Quantities

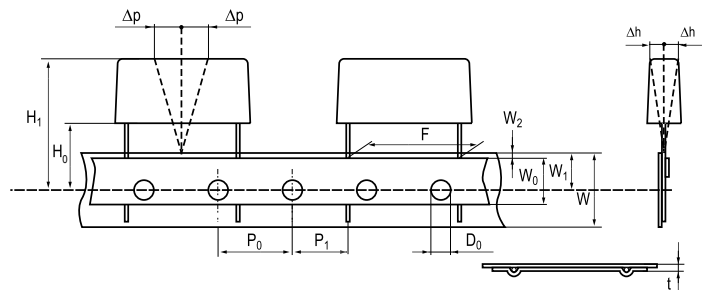
Size Code	Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel ø 360 mm
QM	15.2	7.3	13	18.5	500	100	600
CE	20.3	7.6	14	24	250	1500	250
CP	20.3	11.3	16.5	24	150	1000	180
EJ	25.4	12.1	19	30.5	100	800	
EL	25.4	15.3	22	30.5	75	600	

Lead Taping & Packaging (IEC 60286-2)

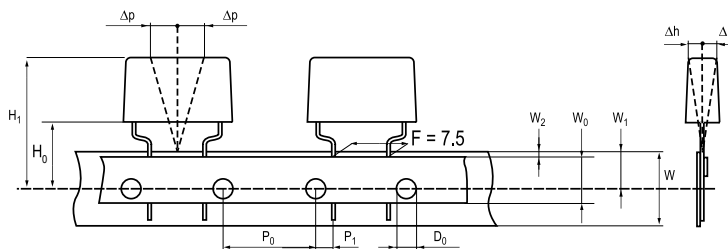
Lead Spacing 10.2 – 15.2 mm



Lead Spacing 20.3 – 22.5 mm



Formed Leads from 10.2 to 7.5 mm



Taping Specification

	Dimensions in mm							Standard IEC 60286-2
	+6/-0.1	F	Formed 7.5	10.2	15.2	20.3	22.5	F
Lead spacing	+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	+/-0.3	W ₀	9	12	12	12	12	
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 ^{MAX}	0.9 ^{MAX}
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⁾	35	35	35	35	58	58 ^{MAX}

(1) Maximum cumulative feed hole error, 1 mm per 20 parts.

(2) 16.5 mm available on request.

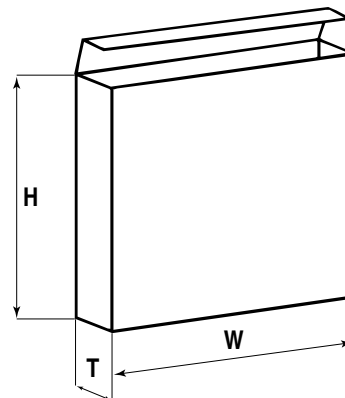
(3) Depending on case size.

(4) 15 mm available on request.

Lead Taping & Packaging (IEC 60286–2) cont'd

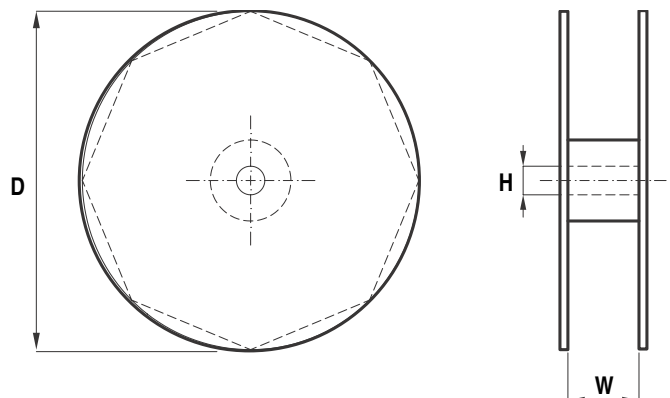
Ammo Specifications

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	55 (Max)
F5A, F5B, F5D		25	
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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West Chester, PA
Tel: 610-692-4642

Central

Novi, MI
Tel: 248-994-1030

Carmel, IN
Tel: 317-706-6742

West

Milpitas, CA
Tel: 408-433-9950

Mexico

Zapopan, Jalisco
Tel: 52-33-3123-2141

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
Tel: 34-91-804-4303

Central Europe

Landsberg, Germany
Tel: 49-8191-3350800

Dortmund, Germany
Tel: 49-2307-3619672

Kwidzyn, Poland
Tel: 48-55-279-7025

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

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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

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

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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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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.



Digitally signed by: Marcy Brand
DN: o=KEMET Corporation
Location: Fort Lauderdale, FL
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