

# PMR209 Series Metallized Impregnated Paper, Class X2, 250 VAC

## Overview

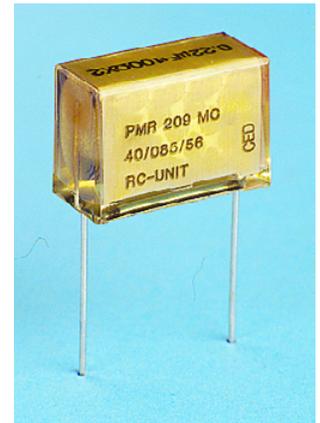
The PMR209 Series is constructed of multilayer metallized paper encapsulated and impregnated in self-extinguishing material meeting the requirements of UL 94 V-0.

## Applications

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

## Benefits

- Approvals: ENEC, UL, cUL
- Rated voltage: 250 VAC 50/60 Hz
- Capacitance range: 0.047 – 0.47  $\mu$ F
- Capacitance tolerance:  $\pm$ 20%
- Resistance range: 22 – 470  $\Omega$
- 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 ( $\Omega$ )	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 $\Omega$	See Ordering Options Table

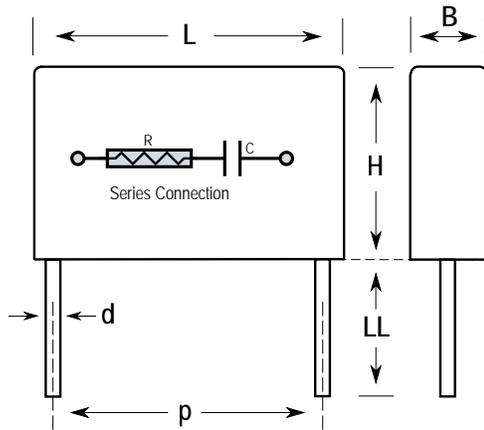
## New KEMET Part Number System

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 ( $\Omega$ )
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	<b>Standard Lead and Packaging Options</b>			
	Bulk (Bag) – Short Leads	6 +0/-1	C	R06
	Bulk (Bag) – Max Length Leads	30 +5/-0	A	R30
	Tape & Reel (Standard Reel)	$H_0 = 18.5 \pm 0.5$	L	R19T0
	<b>Other Lead and Packaging Options</b>			
	Tape & Reel (Large Reel)	$H_0 = 18.5 \pm 0.5$	P	R19T1
20.3	<b>Standard Lead and Packaging Options</b>			
	Bulk (Tray) – Short Leads	6 +0/-1	C	R06
	Bulk (Bag) – Max Length Leads	30 +5/-0	A	R30
	Tape & Reel (Standard Reel)	$H_0 = 18.5 \pm 0.5$	L	R19T0
	<b>Other Lead and Packaging Options</b>			
	Tape & Reel (Large Reel)	$H_0 = 18.5 \pm 0.5$	P	R19T1
25.4	<b>Standard Lead and Packaging Options</b>			
	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								
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 $\mu$ F	
Capacitance Tolerance	$\pm$ 20%	
Resistance Range	22 – 470 $\Omega$	
Resistance Tolerance	$\pm$ 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 $\geq$ 50 $\mu$ s and at 100 kHz for RC < 50 $\mu$ s	
Insulation Resistance	Minimum Values Between Terminals	
	C $\leq$ 0.33 $\mu$ F	$\geq$ 3,000 M $\Omega$
	C > 0.33 $\mu$ F	$\geq$ 1,000 M $\Omega$ • $\mu$ 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 <sup>2</sup>
Bump	IEC 60068–2–29 Test Eb	4,000 bumps at 390 m/s <sup>2</sup>
Solderability	IEC 60068–2–20 Test Ta	Wetting time d or d > 0.8 < 1.5 seconds
Active Flammability	IEC 60384–14	V <sub>R</sub> + 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/0140–28C
UL		UL 60384-14 CAN/ CSA-E60384-14-09	E73869

## Environmental Compliance

All KEMET EMI capacitors are RoHS Compliant.



RoHS Compliant

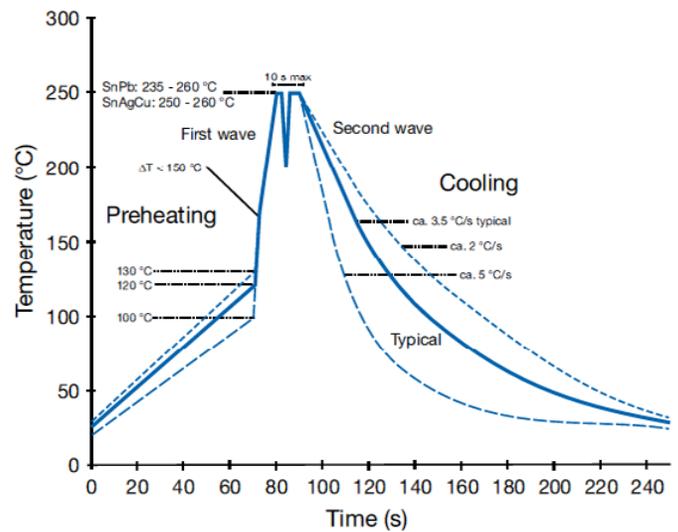
**Table 1 – Ratings & Part Number Reference**

Lead Spacing (p)	Capacitance 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)
<b>Lead Spacing (p)</b>	<b>Capacitance Value (µF)</b>	<b>Resistance Ω</b>	<b>B (mm)</b>	<b>H (mm)</b>	<b>L (mm)</b>	<b>New KEMET Part Number</b>	<b>Legacy Part Number</b>

(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

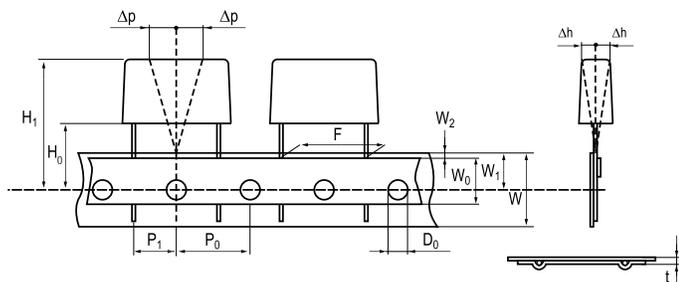
- KEMET's logo
- Series
- RC unit
- Capacitance
- Rated resistance
- Rated voltage
- IEC climatic category
- Circuit diagram
- Passive flammability class
- Manufacturing date code

## Packaging Quantities

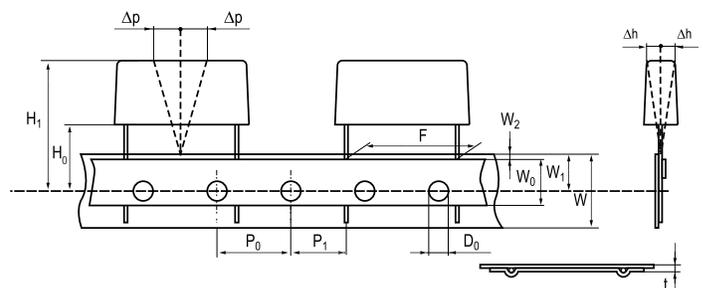
Size Code	Lead Spacing (mm)	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel ø 360 mm
QM	15.2	7.3	13	18.5	500	100	600
CE	20.3	7.6	14	24	250	1500	250
CP	20.3	11.3	16.5	24	150	1000	180
EJ	25.4	12.1	19	30.5	100	800	
EL	25.4	15.3	22	30.5	75	600	

## Lead Taping & Packaging (IEC 60286-2)

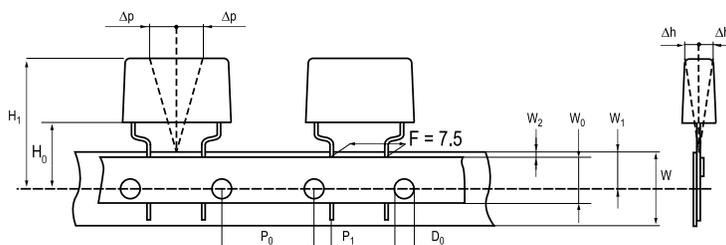
Lead Spacing 10.2 – 15.2 mm



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
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 <sup>+1/-0.5</sup>
Hold-down tape width	+/-0.3	W <sub>0</sub>	9	12	12	12	12	
Position of sprocket hole	+/-0.5	W <sub>1</sub>	9	9	9	9	9	9 <sup>+0.75/-0.5</sup>
Distance between tapes	Maximum	W <sub>2</sub>	3	3	3	3	3	3
Sprocket hole diameter	+/-0.2	D <sub>0</sub>	4	4	4	4	4	4
Feed hole lead spacing	+/-0.3	P <sub>0</sub> <sup>(1)</sup>	12.7 <sup>(4)</sup>	12.7	12.7	12.7	12.7	12.7
Distance lead – feed hole	+/-0.7	P <sub>1</sub>	3.75	7.6	5.1	8.9	5.3	P <sup>1</sup>
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 <sup>MAX</sup>	0.9 <sup>MAX</sup>
Sprocket hole/cap body	Nominal	H <sub>0</sub> <sup>(2)</sup>	18 <sup>+2/-0</sup>	18 <sup>+2/-0</sup>	18 <sup>+2/-0</sup>	18 <sup>+2/-0</sup>	18.5 <sup>+/-0.5</sup>	18 <sup>+2/-0</sup>
Sprocket hole/top of cap body	Maximum	H <sub>1</sub> <sup>(3)</sup>	35	35	35	35	58	58 <sup>MAX</sup>

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

(2) 16.5 mm available on request.

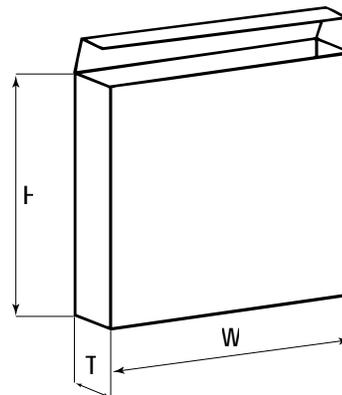
(3) Depending on case size.

(4) 15 mm available on request.

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

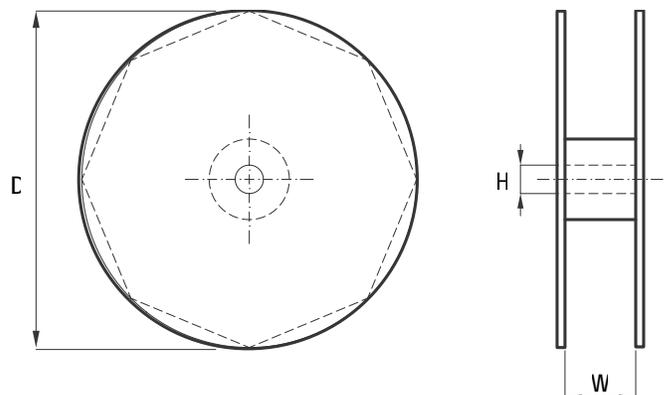
### Ammo Specifications

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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Tel: 86-10-5829-1711

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

Taipei, Taiwan  
Tel: 886-2-27528585

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

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## Other KEMET Resources

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

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

Product Request	
Resource	Location
Sample Request	<a href="http://www.kemet.com/sample">http://www.kemet.com/sample</a>
Engineering Kit Request	<a href="http://www.kemet.com/kits">http://www.kemet.com/kits</a>

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

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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 indicated or that other measures may not be required.

