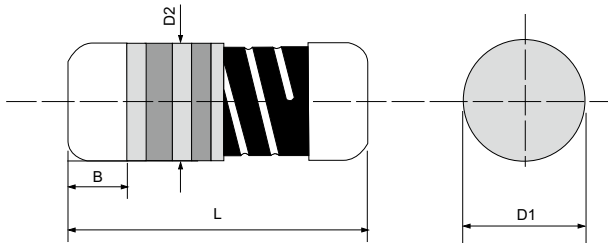


# MMP - Metal Film MELF Precision Resistor

Quality • Reliability  
Cost-Down via Innovation.

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## Specifications Per

- IEC 60115-1
- EN140401-803

## Features

- SMD enabled structure
- Excellent solderability termination
- Products meet RoHS requirements and do not contain substances of very high concern identified by European Chemicals Agency

## DIMENSIONS

Type	Body Length (L, mm)	Cap Diameter (D1, mm)	Body Diameter (D2, mm)	Soldering Spot (B, mm)	Net Weight Per 1000 pcs
MMP16	3.52 ± 0.08	1.35 ± 0.1	D1+0.02/ -0.15	0.6 Min.	17 grams
MMP204	3.52 ± 0.08	1.35 ± 0.1	D1+0.02/ -0.15	0.6 Min.	17 grams
MMP207	5.90 ± 0.20	2.20 ± 0.1	D1+0.02/ -0.2	1.0 Min.	66 grams
MMP52	5.90 ± 0.20	2.20 ± 0.1	D1+0.02/ -0.2	1.0 Min.	66 grams
MMP101	5.90 ± 0.20	2.20 ± 0.1	D1+0.02/ -0.2	1.0 Min.	66 grams

## GENERAL SPECIFICATIONS

Type	Power Rating (at 70°C)	Maximum Working Voltage (AC/DC)	Maximum Overload Voltage (AC/DC)	Minimum Resistance	Maximum Resistance	Resistance Tolerance	Available Resistance Values
MMP16	1/6W	200V	400V	10Ω	1MΩ	± 0.5%	E-24/E192
				22Ω	510KΩ	± 0.25%	
				43Ω	510KΩ	± 0.1%	
MMP204	1/4W	200V	400V	10Ω	1MΩ	± 0.5%	E-24/E192
				22Ω	510KΩ	± 0.25%	
				43Ω	510KΩ	± 0.1%	
MMP207	1/3W	300V	500V	10Ω	1MΩ	± 0.5%	E-24/E192
				15Ω	1MΩ	± 0.25%	
				33Ω	1MΩ	± 0.1%	
MMP52	1/2W	300V	500V	10Ω	1MΩ	± 0.5%	E-24/E192
				15Ω	1MΩ	± 0.25%	
				33Ω	1MΩ	± 0.1%	
MMP101	1W	300V	500V	10Ω	1MΩ	± 0.5%	E-24/E192
				22Ω	1MΩ	± 0.25%	
				43Ω	1MΩ	± 0.1%	

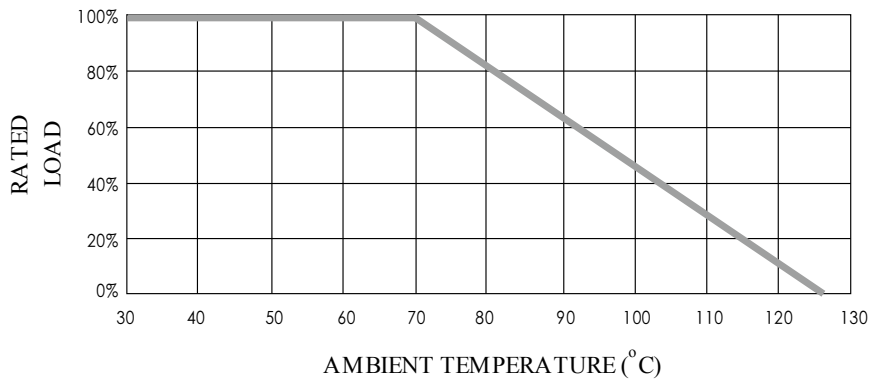
For zero-ohm jumper, please see ZMM series. For values between 10mΩ & 510mΩ, please see CSM series. Special sizes, values, and specifications not listed available on special order.

## TECHNICAL SUMMARY

Characteristics	Ranges & Limits	
Operating Temperature Range, °C	-55 ~ +125	
Temperature Coefficient, PPM / °C*	±5, ±10, ±15, ±25, ±50 (See below for availability)	
Dielectric Withstanding Voltage, VAC or DC	MMP16, MMP204	300
	MMP207, MMP52, MMP101	500
Insulation Resistance, MΩ	>10 <sup>4</sup>	
Film Temperature	MMP16, MMP204	MMP207, MMP52
	125°C	125°C
Failure Rate, pcs/10 <sup>9</sup> device hours	MMP16, MMP207	MMP204, MMP52, MMP101
	<1	<1.5
Tin Whisker (JESD201 Temperature Cycling & High Temp./Humidity Storage), μm	<5	

\* Not applicable to all resistance values. Please check with us regarding the PPM of specific resistance value(s).

## POWER DERATING CURVE



## TEMPERATURE COEFFICIENT AVAILABILITY

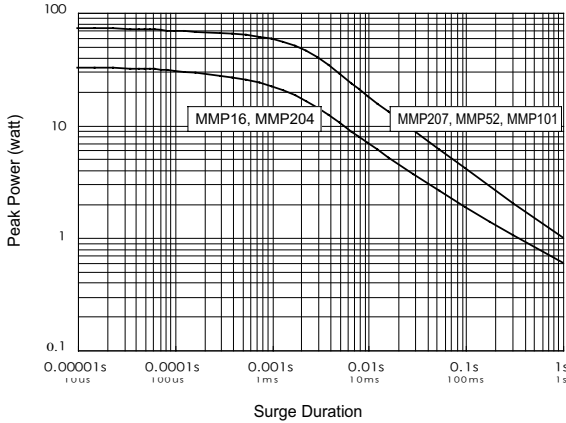
Specifications		Resistance Values Available				
TC	Tolerance	MMP16	MMP204	MMP207	MMP52	MMP101
±5 PPM / °C	±0.5%	100Ω~10KΩ		75Ω~15KΩ		
	±0.25%					
	±0.1%					
±10, ±15 PPM / °C	±0.5%	10Ω~510KΩ	10Ω~330KΩ	10Ω~750KΩ	10Ω~680KΩ	10Ω~680KΩ
	±0.25%	22Ω~510KΩ	22Ω~330KΩ	15Ω~680KΩ	15Ω~510KΩ	15Ω~510KΩ
	±0.1%	43Ω~510KΩ	43Ω~330KΩ	33Ω~680KΩ	33Ω~510KΩ	33Ω~510KΩ
±25 PPM / °C	±0.5%	10Ω~750KΩ		10Ω~1MΩ	10Ω~750KΩ	10Ω~750KΩ
	±0.25%	22Ω~510KΩ		15Ω~1MΩ	15Ω~680KΩ	15Ω~680KΩ
	±0.1%	43Ω~510KΩ		33Ω~1MΩ	33Ω~680KΩ	33Ω~680KΩ
±50 PPM / °C	±0.5%	10Ω~1MΩ		10Ω~1MΩ		
	±0.25%	22Ω~510KΩ		15Ω~1MΩ		
	±0.1%	43Ω~510KΩ		33Ω~1MΩ		

## MMP - Metal Film MELF Precision Resistor

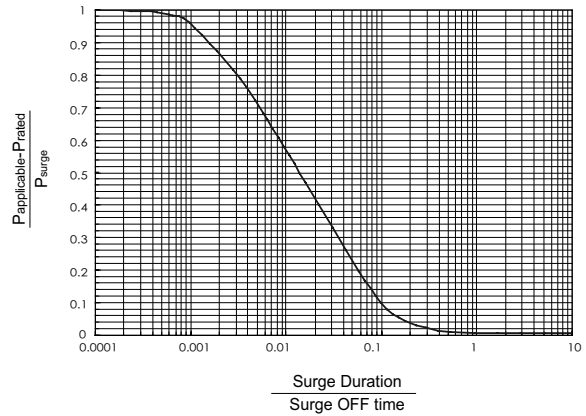
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### ■ SINGLE SURGE PERFORMANCE



### ■ SURGE POWER DERATING CURVE



#### Notes:

• SINGLE SURGE PERFORMANCE graph is good for NON REPETITIVE applications operating in an ambient temperature of 70°C or less. For temperatures above 70°C, the graph power must be derated further linearly down to zero at 125°C.

- To determine applicable surge power in continuous-surge applications:
  1. Identify allowable duration and peak power  $P_{surge}$  of single surge;
  2. Determine ratio of surge duration/surge OFF time in application;
  3. Calculate  $P_{applicable}$  backwardly according to Y-axis of SURGE POWER DERATING CURVE.

### ■ PART NUMBER

Example: MMP52B2K61TKQTR2K0

MMP52	B	2K61	TKQ	TR2K0
Type	Tolerance*	Resistance	TCR*	Packaging
	B (0.1%) C (0.25%) D (0.5%)	2.61KΩ <b>4-character code</b> containing - 3 significant digits 1 letter multiplier  <u>OHM MULTIPLIER</u> R = 1 K = 10 <sup>3</sup> M = 10 <sup>6</sup> G = 10 <sup>9</sup>	25ppm <b>3-character code</b>  TKM = ± 5 ppm TKN = ± 10 ppm TKP = ± 15 ppm TKQ = ± 25 ppm TKR = ± 50 ppm	<b>5-character code</b>  TR = Tape Reel  (pieces per reel) <u>MMP16/MMP204</u> 3K0 = 3,000 6K0 = 6,000** 10K = 10,000**  <u>MMP207/MMP52/</u> <u>MMP101</u> 2K0 = 2,000 6K0 = 6,000** 10K = 10,000**

\* Listed values may not be applicable across product types or to all resistance values. Please check with us before placing order.

\*\* upon request

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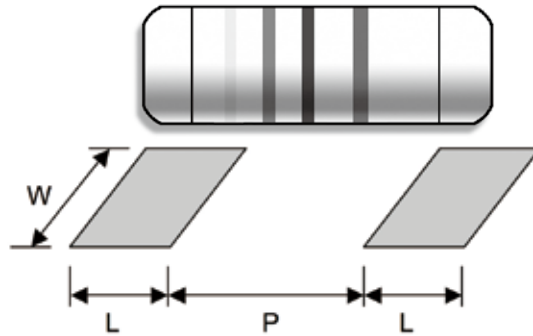
## ■ PERFORMANCE SPECIFICATIONS

Characteristics	Test Conditions	Limits	
Short Time Overload	<b>IEC 60115-1 4.13</b> 5 seconds 2.5x rated voltage (not over max. overload voltage)	± 0.25%	
Load Life	<b>IEC 60115-1 4.25.1</b> Rated load (not over max. working voltage) 1,000 hrs with 1.5 hours ON, 0.5 hours OFF, at (70±2)°C	10Ω to 332KΩ	±0.5%
		>332KΩ	±0.75%
Load Life In Humidity	<b>IEC 60115-1 4.24</b> 56 days rated load (not over max. working voltage) at (40±2)°C and (93±3)% relative humidity	10Ω to 332KΩ	±0.75%
		>332KΩ	±1.0%
Load Life In Humidity (accelerated mode)	<b>IEC 60115-1 4.37</b> 1,000 hours at 85°C and 85% relative humidity with 0.1x rated voltage (not over 100V)	10Ω to <10KΩ	±1.0%
		10KΩ to 332KΩ	±1.5%
		>332KΩ	±3.0%
Periodic Electric Overload	<b>IEC 60115-1 4.39</b> 3.9x rated voltage (not over max. overload voltage) with 0.1s ON, 2.5s OFF for 1,000 cycles	± 0.5%	
Resistance To Soldering Heat	<b>IEC 60115-1 4.18.2</b> Dip the resistor into a solder bath measured (260±5)°C and hold it for a 10±1 seconds	± 0.5%	
Thermal Endurance	<b>IEC 60115-1 4.25.3</b> 1,000 hours without load	MMP16 MMP204 MMP207 MMP52	85°C ± 0.25%
			125°C ± 0.75%
		MMP101	85°C ± 0.5%
			125°C ± 1.0%
Thermal Shock	<b>IEC 60115-1 4.19</b> -55°C 30minutes, +125°C 30minutes	5 Cycles	± 0.25%
		1,000 Cycles	± 1.0%
Single pulse high voltage overload	<b>IEC 60115-1 4.27 Severity no.4</b> 10 pulses of 10/700µs at 10x rated voltage (not over max. overload voltage) with interval of 60 sec.	± 0.5%	
Electrostatic discharge (Human body model)	<b>IEC 60115-1 4.38</b> 3 positive & 3 negative discharges with 2KV for MMP16 & MMP204 or 4KV for MMP207 & MMP52 (For continuous surge application please see Surge Performance paragraph)	± 1.0%	
Climatic test	<b>IEC 60115-1 4.23</b> 4.23.2 - dry heat: 16 hours 125°C 4.23.3 - damp heat: 24 hours 55°C with 95% relative humidity 4.23.4 - cold: 2 hours -55°C 4.23.5 - negative air pressure: 2 hour 8.5KPa at (25±10)°C 4.23.6 - damp heat cyclic: 5 days 55°C with 95% relative humidity 4.23.7 - DC load: rated voltage at -55°C and 125°C each 1 Min.	± 1.0%	
Solderability	<b>IEC 60115-1 4.17.2</b> Solder area covered after (235±3)°C/(2±0.2) seconds with flux applied	> 95%	
Vibration	<b>IEC 60115-1 4.22</b> Six hours in each parallel and axial direction with a simple harmonic motion having an amplitude of 1.52mm and 10 to 2,000 Hz.	± 1.0%	
Bending test	<b>IEC 60115-1 4.33</b> Pressing depth 2mm, 3 times	± 0.25%	
Flammability	<b>IEC 60115-1 4.35</b> Needle flame test 10s	No burning after 30s	

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## ■ SUGGESTED PAD LAYOUT



Type	Soldering Mode	Pad Length (L, mm, Min.)	Pad Spacing (P, mm)	Pad Width (W, mm, Min.)
MMP16 MMP204	Reflow	1.3	1.6 ± 0.1	1.6
	Wave	1.5	1.5 ± 0.1	1.8
MMP207 MMP52 MMP101	Reflow	2.0	3.0 ± 0.1	3.0
	Wave	2.5	3.0 ± 0.1	3.0

For better heat dissipation / lower heat resistance, increase W & L.

## ■ COVER TAPE PEELING SPECIFICATION

Recommended peeling force: 50±5gf

