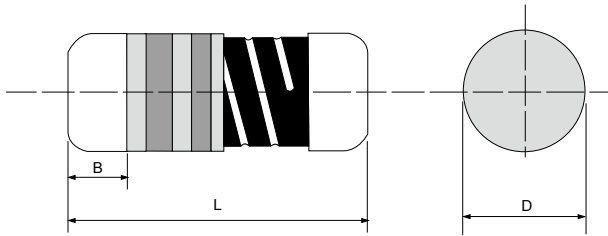


MMP - Metal Film MELF Precision Resistor

Quality • Reliability
Cost-Down via Technology



Specifications Per

- IEC 115-1 115-2
- CECC 40101
- DIN 44061

Features

- SMD enabled structure
- Conformal coating against humidity
- 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)	Body Diameter (D, mm)	Soldering Spot (B, mm)	Net Weight Per 1000 pcs
MMP16	3.52 ± 0.08	1.35 ± 0.1	0.6 Min.	17 grams
MMP204	3.52 ± 0.08	1.35 ± 0.1	0.6 Min.	17 grams
MMP207	5.90 ± 0.20	2.20 ± 0.1	1.0 Min.	66 grams
MMP52	5.90 ± 0.20	2.20 ± 0.1	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	Standard Resistance Values
MMP16	1/6W	200V	400V	10Ω	1MΩ	± 0.5%	E24 / E192
				22Ω	510KΩ	± 0.25%	
				43Ω	510KΩ	± 0.1%	
MMP204	1/4W	200V	400V	10Ω	1MΩ	± 0.5%	E24 / E192
				22Ω	510KΩ	± 0.25%	
				43Ω	510KΩ	± 0.1%	
MMP207	1/3W	300V	500V	10Ω	1MΩ	± 0.5%	E24 / E192
				15Ω	1MΩ	± 0.25%	
				33Ω	1MΩ	± 0.1%	
MMP52	1/2W	300V	500V	10Ω	1MΩ	± 0.5%	E24 / E192
				15Ω	1MΩ	± 0.25%	
				33Ω	1MΩ	± 0.1%	

For zero-ohm jumper, please see ZMM series. For 500mohm & under, please see CSM series. Special sizes, values, and specifications not listed available on special order.

ORDERING INFORMATION

Type	Tolerance	Temperature Coefficient	Resistance Value	Packaging	Special Request (Optional)
MMP16 MMP204	D (0.5%) C (0.25%)	TK15 TK50	49R9 2K61	TR3 (3K/reel) TR6 (6K/reel) TR10 (10K/reel)	LV (Low value)
MMP207 MMP52	B (0.1%)	TK100	10K	TR2 (2K/reel) TR6 (6K/reel) TR10 (10K/reel)	

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		MMP207, MMP52	
	300		500	
Insulation Resistance, MΩ	>10 ⁴			
Film Temperature	MMP16, MMP204		MMP207, MMP52	
	125°C		125°C	
Voltage Coefficient, PPM / V	<0.5			
Current Noise, μV / V	MMP16, MMP204		MMP207, MMP52	
	<15KΩ	<0.1	<10KΩ	<0.05
	15KΩ~120KΩ	<0.4	10KΩ~100KΩ	<0.2
	120KΩ~1MΩ	<1.5	100KΩ~1MΩ	<1
Power Derating, Linear	100% for < 70°C, down to zero at 125°C			
Failure Rate, pcs/10 ⁹ device hours	MMP16, MMP207		MMP204, MMP52	
	<1		<1.5	
Tin Whisker (JESD201 Temperature Cycling & High Temp./Humidity Storage), μm	<5			

TEMPERATURE COEFFICIENT AVAILABILITY

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

PERFORMANCE SPECIFICATIONS

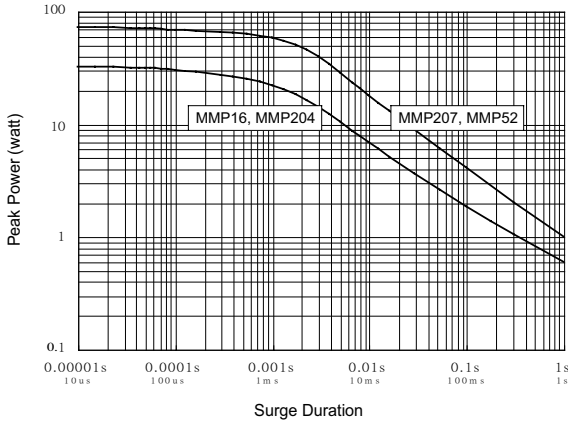
Characteristics	Test Conditions	Limits	
Short Time Overload	IEC 60115-1 4.13 2 seconds 2.5x rated voltage (not over max. overload voltage)	± 0.02%	
Load Life	IEC 60115-1 4.25.1 Rated load 1.5 hours ON, 0.5 hours OFF, at 70°C	1,000 hours	± 0.1%
		8,000 hours	± 0.2%
		225,000 hours	± 0.6%
Load Life In Humidity	IEC 60115-1 4.24 56 days rated load at 40°C and 93% relative humidity	± 0.2%	
Load Life In Humidity (accelerated mode)	IEC 60115-1 4.39 1,000 hours at 85°C and 85% relative humidity with 0.1x rated voltage (not over 100V)	± 0.25%	
Periodic Electric Overload	IEC 60115-1 4.37 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	IEC 60115-1 4.18 10 seconds at 260°C solder bath temperature	± 0.05%	
Thermal Endurance	IEC 60115-1 4.25.3 1,000 hours without load	85°C	± 0.05%
		125°C	± 0.1%
Thermal Shock	IEC 60115-1 4.19 -55°C 30minutes, +125°C 30minutes	5 cycles	± 0.02%
		1,000 cycles	± 0.2%
Single pulse high voltage overload	IEC 60115-1 4.27 Severity no.4 10 pulses of 10/700µs at 10x rated voltage (not over max. overload voltage) with interval of 60 sec.	± 0.2%	
Electrostatic discharge (Human body mode)	IEC 60115-1 4.40 3 positive & 3 negative discharges with 2KV for MMP16 & MMP204 or 4KV for MMP207 & MMP52 (For continuous surge application please see Surge Performance paragraph)	± 0.5%	
Climatic test	IEC 60115-1 4.23 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°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.	± 0.1%	
Solderability	MIL-STD-202 Method 208 Solder area covered after 230±5°C/5±0.5 seconds with flux applied	> 95%	
Vibration	MIL-STD-202 Method 204 Six hours in each parallel and axial direction with a simple harmonic motion having an amplitude of 1.52mm and 10 to 20,000 Hz.	± 0.1%	
Bending test	IEC 60115-1 4.33 Pressing depth 2mm, 3 times	± 0.05%	
Flammability	IEC 60115-1 4.35 Needle flame test 10s	No burning after 30s	

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■ SINGLE SURGE PERFORMANCE



■ SURGE POWER DERATING CURVE

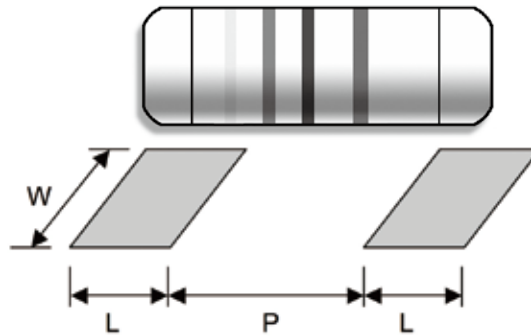


Notes:

• 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.

■ SUGGESTED PAD LAYOUT



Type	Soldering Mode	Pad Length (L, mm, Min.)	Pad Spacing (P, mm)	Pad Width (W, mm, Min.)
MMP16 MMP204	Reflow	1.0	2.0 ± 0.2	1.6
	Wave	1.2	2.0 ± 0.2	1.6
MMP207 MMP52	Reflow	2.0	3.0 ± 0.3	3.0
	Wave	2.5	3.0 ± 0.3	3.0

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

■ COVER TAPE PEELING SPECIFICATION

Recommended peeling force: 50±5gf

