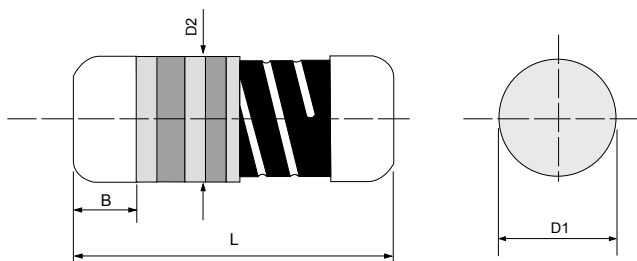


MMP(V) - Metal Film MELF Precision Resistor, Vehicle Grade

Quality • Reliability
Cost-Down via Innovation.



Specifications Per

- IEC 60115-1
- EN140401-803
- AEC-Q200 Rev. D

Features

- AEC-Q200 Compliant
- Excellent solderability termination
- Products meet RoHS requirements and do not contain substances of very high concern identified by European Chemicals Agency

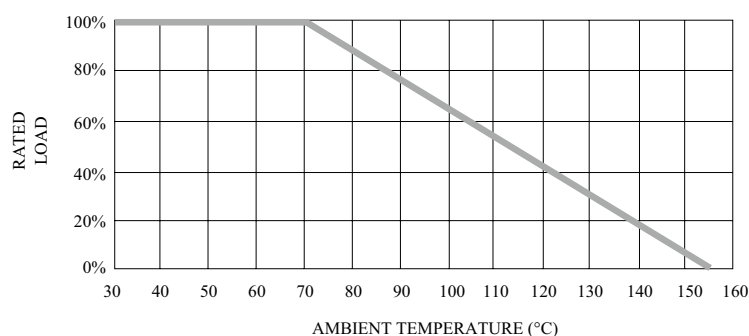
DIMENSIONS

Type	Body Length (L, mm)	Cap Diameter (D1, mm)	Body Diameter (D2, mm)	Soldering Spot (B, mm)	Net Weight Per 1000 pcs
MMP204V	3.52 ± 0.15	1.35 ± 0.1	D1+0.02/ -0.15	0.6 Min.	17 grams
MMP52V	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	Maximum Overload Voltage	Minimum Resistance	Maximum Resistance	Resistance Tolerance	Available Resistance Values
MMP204V	1/4W	200V	400V	10Ω	1MΩ	±0.5%	E-24/ E-192
				22Ω	1MΩ	±0.25%	
				43Ω	1MΩ	±0.1%	
MMP52V	1/2W	300V	500V	10Ω	1MΩ	±0.5%	E-24/ E-192
				15Ω	1MΩ	±0.25%	
				33Ω	1MΩ	±0.1%	

POWER DERATING CURVE



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■ PART NUMBER

Example: MMP52VB2K61TKQTR2K0

MMP52V	B	2K61	TKQ	TR2K0
Type	Tolerance*	Resistance	TC*	Packaging
	B (0.1%) C (0.25%) D (0.5%)	2.61K Ω 4-character code containing - 3 significant digits 1 letter multiplier <u>OHM MULTIPLIER</u> R = 1 K = 10 ³ M = 10 ⁶ G = 10 ⁹	25ppm 3-character code TKM=±5PPM/°C TKN=±10PPM/°C TKP=±15PPM/°C TKQ=±25PPM/°C TKR=±50PPM/°C	5-character code TR = Tape Reel (pieces per reel) <u>MMP204V</u> 3K0 = 3,000 6K0 = 6,000 10K = 10,000 <u>MMP52V</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.
Please check with us before placing order. **upon request

■ TECHNICAL SUMMARY

Characteristics	Limits
Operating Temperature Range, °C	-55 ~ +155
Temperature Coefficient, PPM / °C*	±5, ±10, ±15, ±25, ±50 (See below for availability)
Dielectric Withstanding Voltage, VAC or DC	MMP204V 300
	MMP52V 500
Insulation Resistance, M Ω	>10 ⁴
Film Temperature	155°C
Failure Rate, pcs/109 device hours	<1.5
Tin Whisker (JESD201 Temperature Cycling & High Temp. /Humidity Storage), μ m	<5

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

■ TEMPERATURE COEFFICIENT AVAILABILITY

Specifications			
TC	Tolerance	Resistance Values Available	
		MMP204V	MMP52V
±5 PPM/°C	±0.5%	100 Ω -10K Ω	75 Ω -15K Ω
	±0.25%		
	±0.1%		
±10, ±15 PPM/°C	±0.5%	10 Ω -330K Ω	10 Ω -680K Ω
	±0.25%	22 Ω -330K Ω	15 Ω -510K Ω
	±0.1%	43 Ω -330K Ω	33 Ω -510K Ω
±25, ±50PPM/°C	±0.5%	10 Ω -1M Ω	10 Ω -1M Ω
	±0.25%	22 Ω -1M Ω	15 Ω -1M Ω
	±0.1%	43 Ω -1M Ω	33 Ω -1M Ω

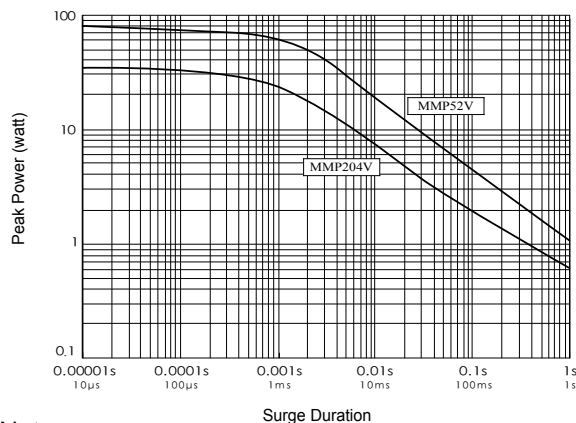
MMP(V) - Metal Film MELF Precision Resistor, Vehicle Grade

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■ PERFORMANCE SPECIFICATIONS

Characteristics	Test Conditions	Limits	
Short Time Overload	IEC 60115-1 4.13 5 seconds 2.5x rated voltage (not over max. overload voltage)	±0.25%	
Load Life In Humidity	IEC 60115-1 4.24 56 days rated load (not over max. working voltage) at (40±2)°C and (93±3)% relative humidity	10Ω to 332KΩ	± 0.5%
		>332KΩ	± 0.75%
Periodic Electric Overload	IEC 60115-1 4.39 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 4.18.2 Dip the resistor into a solder bath measured (260±5)°C and hold it for a 10±1 seconds	± 0.5%	
Solderability	IEC 60115-1 4.17.2 Solder area covered after (235±3)°C/(2±0.2) seconds with flux applied	>95%	
Mechanical Shock	AEC-Q200 REV D. Stress NO.13 (refer to MIL-STD-202 Method 213 Condition C) Three shocks in each direction shall be applied along the three mutually perpendicular axes of the test specimen. Peak value: 100 g's Duration: 6 ms Velocity change: 12.3 ft/s Waveform: Half sine	±0.5%	
Vibration	AEC-Q200 REV D. Stress NO.14 (refer to MIL-STD-202 Method 204) 5 g's for 20 min., 12 cycles each of 3 orientations Test from 10 - 2,000 Hz.	±0.5%	
Load Life	IEC 60115-1 4.25.1 Rated load (not over max. working voltage) 1,000 hours with 1.5 hours ON, 0.5 hours OFF, at (70±2)°C	10Ω to 332KΩ	±0.5%
		>332KΩ	±0.75%
	AEC-Q200 REV D. Stress NO. 3 (refer to MIL-STD-202 Method 108) Condition D Steady State TA=125°C at derated continuous working voltage. Measurement at 24±4 hours after test conclusion.	10Ω to 332KΩ	±1.5%
		>332KΩ	±3.0%
Load Life In Humidity (accelerated mode)	IEC 60115-1 4.37/ AEC-Q200 REV D. Stress NO. 7 (refer to MIL-STD-202 Method 103) 1,000 hours at 85°C and 85% relative humidity with 0.1x rated voltage (not over 100V)	10Ω to 10KΩ	±0.75%
		10KΩ to 332KΩ	±1.5%
		>332KΩ	±2.5%
Thermal Endurance	IEC 60115-1 4.25.3 1,000 hours at 85°C without load	± 0.25%	
		10Ω to < 332KΩ	± 0.5%
	AEC-Q200 REV D. Stress NO. 3 (refer to MIL-STD-202 Method 108) 1,000 hours at 125°C without load	>332KΩ	± 0.75%
Thermal Shock	IEC 60115-1 4.19 -55°C 30minutes, +155°C 30 minutes, 5 cycles	± 0.25%	
		10 Ω to 332KΩ	± 0.5%
	AEC-Q200 REV D. Stress NO. 4 (refer to JESD22 Method JA-104) -55°C 30minutes, +125°C 30 minutes, 1,000 cycles 30min maximum dwell time at each temperature extreme. 1min. Maximum transition time.	>332KΩ	± 0.75%
Single pulse high voltage overload	IEC 60115-1 4.27 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)	IEC 60115-1 4.38 3 positive & 3 negative discharges with 4KV source	± 1.0%	
Climatic test	IEC 60115-1 4.23 4.23.2 - dry heat: 16 hours 155°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±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 155°C each 1 Min.	± 1.0%	
Bending test	IEC 60115-1 4.33 Pressing depth 2mm, 3 times	± 0.25%	
Flammability	IEC 60115-1 4.35 Needle flame test 10s	No burning after 30s	

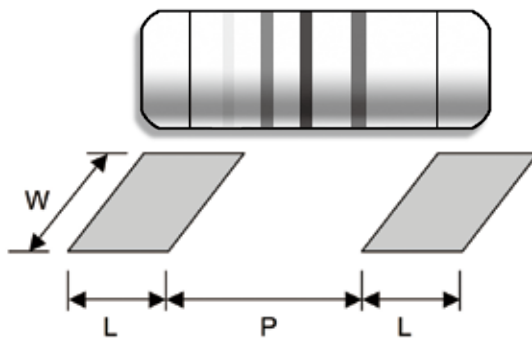
■ SINGLE SURGE PERFORMANCE



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 155°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 $P_{\text{applicable}}$ 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.)
MMP204V	Reflow	1.3	1.6 ± 0.1	1.6
	Wave	1.5	1.5 ± 0.1	1.8
MMP52V	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: 50gf±5gf

