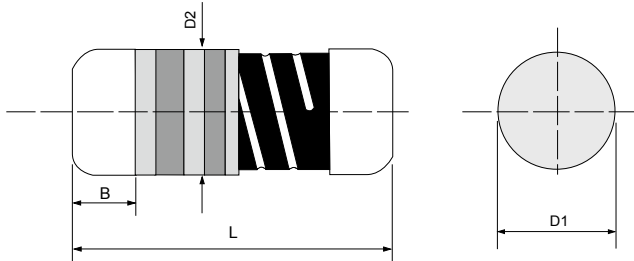


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Specifications Per

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

Features

- AEC-Q200 Compliant
- Excellent solderability termination
- Anti-sulfuration test qualified
- Excellent in heat dissipation than chip resistor
- Stronger mechanical structure to endure vibration and thermal shock
- Products meet RoHS requirements and do not contain substances of very high concern identified by European Chemicals Agency

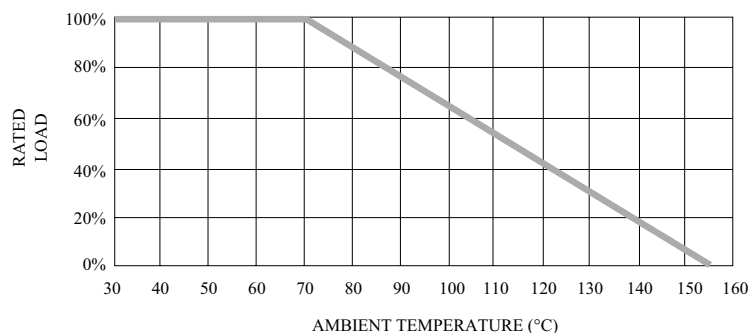
■ DIMENSIONS

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-192
				22Ω	1MΩ	±0.25%	
				43Ω	1MΩ	±0.1%	
MMP52V	1/2W	300V	500V	10Ω	1MΩ	±0.5%	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%)	2.61KΩ 4-character code containing - 3 significant digits 1 letter multiplier OHM MULTIPLIER 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) MMP204V 3K0 = 3,000 6K0 = 6,000 10K = 10,000 MMP52V 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*	±15, ±25, ±50 (See below for availability)
Dielectric Withstanding Voltage, VAC or DC	MMP204V 300
	MMP52V 500
Insulation Resistance, MΩ	>10 ⁴
Failure Rate, pcs/10 ⁹ device hours	<1.5
Tin Whisker (JEESD201 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).

■ TEMPERATURE COEFFICIENT AVAILABILITY

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

■ PERFORMANCE SPECIFICATIONS

Characteristics	Test Conditions	Limits	
High Temperature Exposure (Storage)	AEC-Q200 REV D. Stress NO.3 (refer to MIL-STD-202 Method 108) 1,000 hours at 125°C without load	10Ω to 332KΩ	±0.5%
		>332KΩ	±0.75%
Temperature Cycling	AEC-Q200 REV D. Stress NO.4 (refer to IEC 60115-1 4.19/ JESD22 Method JA-104) -55°C 30minutes, +125°C 30minutes, 1,000 cycles	10Ω to 332KΩ	±0.5%
		>332KΩ	±0.75%
	Proprietary test specification FRC-AECQ-180702 -20°C 30minutes, +120°C 30minutes, 1,000 cycles (Recommended solder paste composition:96.5% Sn, 3% Ag, 0.5% Cu)	Force of 1kg for 10 seconds and without distinct looseness of terminals	
Biased Humidity	AEC-Q200 REV D. Stress NO.7 (refer to IEC 60115-1 4.37/ MIL-STD-202 Method 103) 1,000 hours at 85°C and 85% relative humidity with 10% operating power (not over 100V)	10Ω to < 10KΩ	±0.75%
		10KΩ to 332KΩ	±1.5%
		>332KΩ	±2.5%
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°C	10Ω to 332KΩ	±0.5%
		>332KΩ	±0.75%
	AEC-Q200 REV D. Stress NO.8 (refer to MIL-STD-202 Method 108) 1,000 hours at 125°C with de-rated continuous working voltage (not over max. working voltage)	10Ω to 332KΩ	±1.5%
		>332KΩ	±3%
Resistance to Solvents	AEC-Q200 REV D. Stress NO.12 (refer to MIL-STD-202 Method 215) Add Aqueous wash chemical-OKEM Clean or equivalent. Do not use banned solvents.	No visible damage on appearance and marking	
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	±0.25%	
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.	±0.25%	
Resistance to Soldering Heat	AEC-Q200 REV D. Stress NO.15 (refer to IEC 60115-1 4.18.2/ MIL-STD-202 Method 210) Dip the resistor into a solder bath measured (260±5)°C and hold it for a 10±1 seconds)	±0.5%	
Anti-sulfuration test	EIA-977 (conditions B) 750 hours at (105±2)°C without load	±0.1%	±0.1%
		±0.25%	±0.25%
		±0.5%	±0.5%

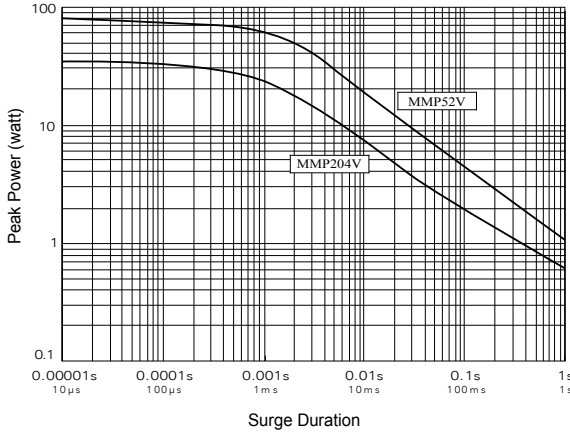
■ PERFORMANCE SPECIFICATIONS

Characteristics	Test Conditions	Limits	
ESD	AEC-Q200 REV D. Stress NO.17 (refer to AEC-Q200-002/ ISO/DIS 10605) (150pF/ 2000Ohm discharge network) Human body model, 1 positive & 1 negative discharges with 2KV source	±0.25%	
Solderability	AEC-Q200 REV D. Stress NO.18 (refer to J-STD-002 or IEC 60115-1 4.17) Solder area covered after (235±3)°C/(2±0.2) seconds with flux applied	95% min. coverage	
Flammability	AEC-Q200 REV D. Stress NO.20 (refer to UL-94) V-0 or V-1 are acceptable. Electrical test not required.	NO flaming	
Board Flex	AEC-Q200 REV D. Stress NO.21 (refer to AEC-Q200-005) 60 sec minimum holding time.	±0.25%	
Terminal Strength	AEC-Q200 REV D. Stress NO.22 (refer to AEC-Q200-006) Force of 1.8kg for 60 seconds	±0.25%	
Short Time Overload	IEC 60115-1 4.13 5 seconds 2.5x rated voltage(not over max. overload voltage)	± 0.25%	
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±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%	
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%
Single pulse high voltage overload	IEC 60115-1 4.27 5 pulses of 1.2/50μs at 10x rated voltage (not over max. overload voltage) with interval of 12 sec. 10 pulses of 10/700μs at 10x rated voltage (not over max. overload voltage) with interval of 60 sec.	±0.5%	
		±0.5%	
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%	

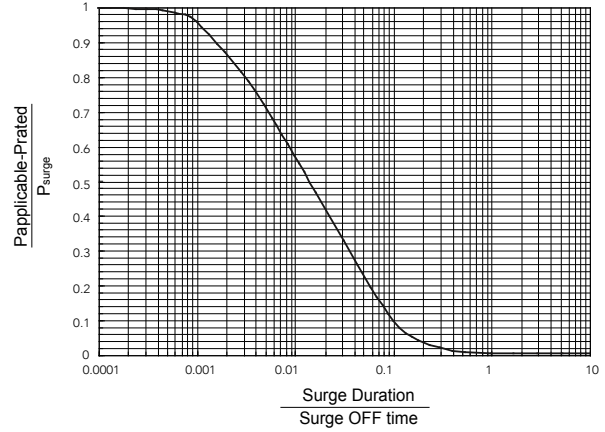
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■ SINGLE SURGE PERFORMANCE



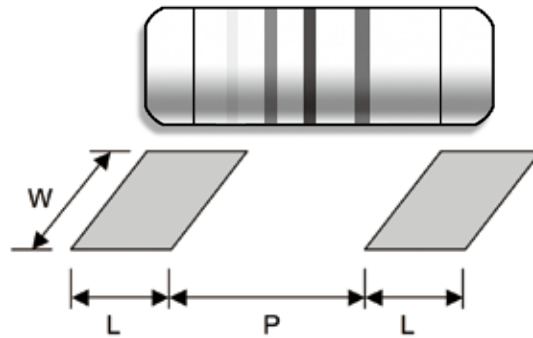
■ SURGE POWER DERATING CURVE



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 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 $P_{applicable}$ 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

