

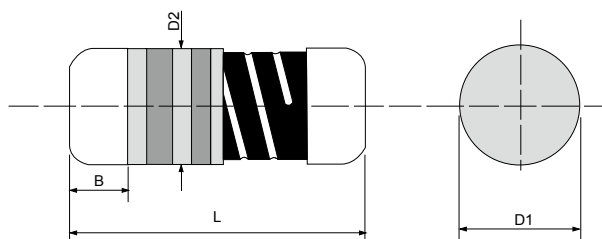
MM102

Metal Film MELF Resistor

Quality • Reliability
Cost-Down via Innovation

Specifications Per

- IEC 60115-1
- EN140401-803



Features

- AEC-Q200 Compliant
- Anti-sulfuration test qualified
- SMD enabled structure
- Excellent solderability termination
- 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
MM102	2.1 ± 0.1	1.1 ± 0.1	D1+0.02/-0.1	0.5 Min.	7 grams

GENERAL SPECIFICATIONS

Type	Power Rating at 70°C	Maximum Working Voltage*	Maximum Overload Voltage**	Minimum Resistance	Maximum Resistance	Resistance Tolerance	Available Resistance Value
MM102	0.2W	150V	300V	0Ω, 10Ω	221KΩ	±0.5%	E192
				0.22Ω	470K	±1%~±5%	E24 / E96

For a better life cycle under normal usage, 50% of the rated power is recommended.

Special sizes and specifications available on request.

* Rated Continuous Maximum Working Voltage (RCWV) should be determined from $RCWV = \sqrt{\text{Power Rating} \times \text{Resistance Values Max.}}$ RCWV listed above.

** Short-time Overload (STOL) test should be determined from $STOL = 2.5 \times \sqrt{\text{Power Rating} \times \text{Resistance Values}}$ or maximum overload voltage listed above, whichever is lower.

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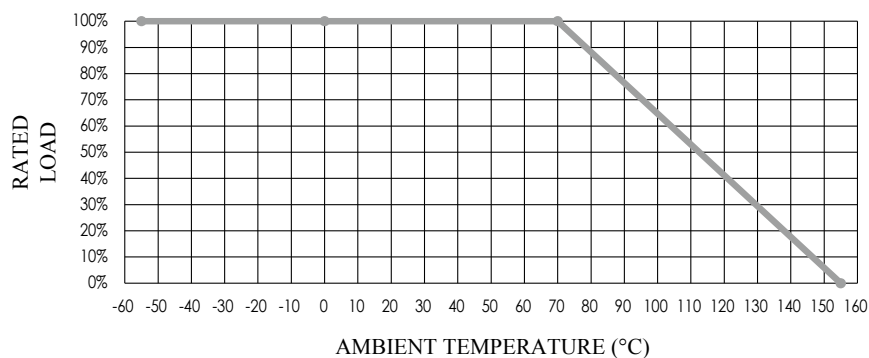
■ PART NUMBER

Example: MM102F162RTKRTR3K0

MM102	F	162R	TKR	TR3K0
Type	Tolerance*	Resistance	TCR	Packaging
	D (0.5%) F (1%) G (2%) J (5%)	162Ω 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	50ppm 3-character code Insert the corresponding Code for the temperature coefficient available for the specific product. TKQ = ±25PPM TKR = ±50PPM TKS = ±100PPM	5-character code TR=Tape Reel MM102 3K0 = 3,000 pcs 6K0 = 6,000 pcs 10K = 10,000 pcs

* May not be applicable to all product types or to all resistance values. Please check with us before placing order.

■ POWER DERATING CURVE



■ TECHNICAL SUMMARY

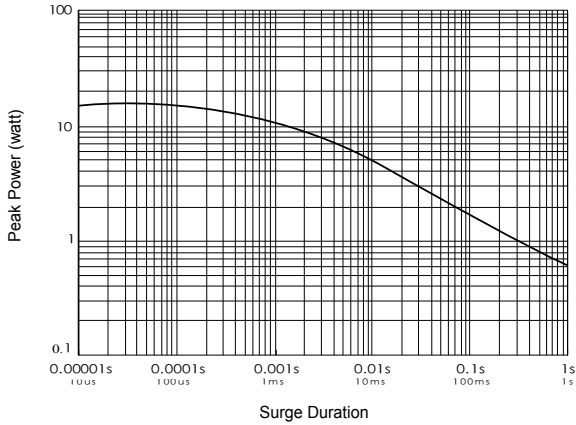
Characteristics	Limits
Operating Temperature Range, °C	-55 ~ +155
Dielectric Withstanding Voltage, VAC or DC	150
Insulation Resistance, MΩ	>10 ⁴
Tin Whisker (JESD201 Temperature Cycling & High Temp./Humidity Storage), μm	<5
Failure Rate in Time, pcs / 10 ⁹ device hours	<1

■ PERFORMANCE SPECIFICATIONS

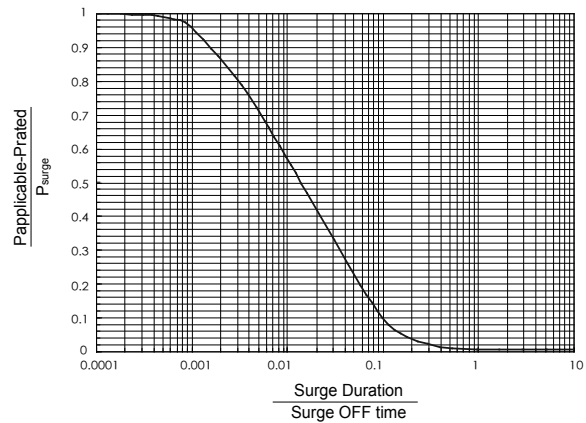
Characteristics	Test Conditions	Limits	
Short Time Overload	IEC 60115-1 4.13 5 seconds 2.5x rated voltage (not over max. overload voltage)	0.22Ω to 221KΩ	±(0.5%+0.01Ω)
		>221KΩ	±(0.75%+0.01Ω)
Load Life	IEC 60115-1 4.25.1 Rated load (not over max. working voltage) 1,000 hours with 1.5 hours ON, 0.5 hours OFF, at (70±2)°C	0.22Ω to 100Ω	±(1%+0.01Ω)
		>100Ω to 221KΩ	±(0.75%+0.01Ω)
		>221KΩ	±(1.5%+0.01Ω)
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	±(1.5%+0.01Ω)	
Load Life In Humidity (accelerated mode)	IEC 60115-1 4.37 1,000 hours at 85°C and 85% relative humidity with 0.1x rated voltage (not over 100V)	0.22Ω to 100Ω	±(2.5%+0.01Ω)
		>100Ω to 221KΩ	±(2%+0.01Ω)
		>221KΩ	±(3.5%+0.01Ω)
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	±(0.75%+0.01Ω)	
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	0.22Ω to 100Ω	±(1.5%+0.01Ω)
		>100Ω	±(0.5%+0.01Ω)
Thermal Endurance	IEC 60115-1 4.25.3 1,000 hours at without load	155°C 0.22Ω to 100Ω	±(1.5%+0.01Ω)
		>100Ω to 221KΩ	±(1%+0.01Ω)
		>221KΩ	±(1.5%+0.01Ω)
Thermal Shock	IEC 60115-1 4.19 -55°C 30minutes, +125°C 30minutes	5 cycles	±(0.25%+0.01Ω)
		1,000 cycles	±(1.5%+0.01Ω)
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.	±(1.0%+0.01Ω)	
		±(1.0%+0.01Ω)	
Electrostatic discharge (Human body model)	IEC 60115-1 4.38 3 positive & 3 negative discharges with 1.5KV (For continuous surge application please see Surge Performance paragraph)	±(0.25%+0.01Ω)	
Solderability	IEC 60115-1 4.17.2 Solder area covered after (235±3)°C/(2±0.2) seconds with flux applied	95% min. coverage	
Vibration	IEC 60115-1 4.22 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.	±(0.25%+0.01Ω)	
Bending test	IEC 60115-1 4.33 Pressing depth 2mm, 3 times	±(0.25%+0.01Ω)	
Flammability	IEC 60115-1 4.35 Needle flame test 10s	No burning after 30s	
Temperature Coefficient*	IEC 60115-14.8 At -55°C to +25°C and +25°C to +155°C as the reference temperature.	±0.5%, ±1%, ±2%	±25, ±50, ±100 PPM/°C
		±5%	±100 PPM/°C

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

■ SINGLE SURGE PERFORMANCE



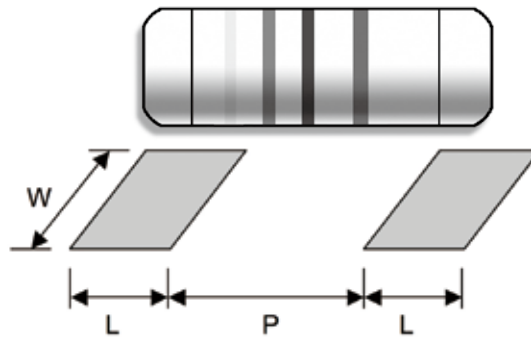
■ SURGE POWER DERATING CURVE



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 $P_{\text{applicable}}$ 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.)
MM102	Reflow	0.8	0.9 ± 0.05	1.3
	Wave	1.2	0.7 ± 0.05	1.5

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

■ COVER TAPE PEELING SPECIFICATION

Recommended peeling force: 50gf±5gf

