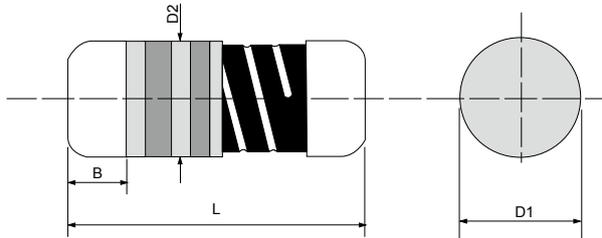


MM102 Metal Film MELF Resistor

Quality • Reliability
Cost-Down via Innovation

MM102



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/-0.2	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%	E-192
				0.22Ω	470KΩ	±1%~±5%	E-24 / E-96

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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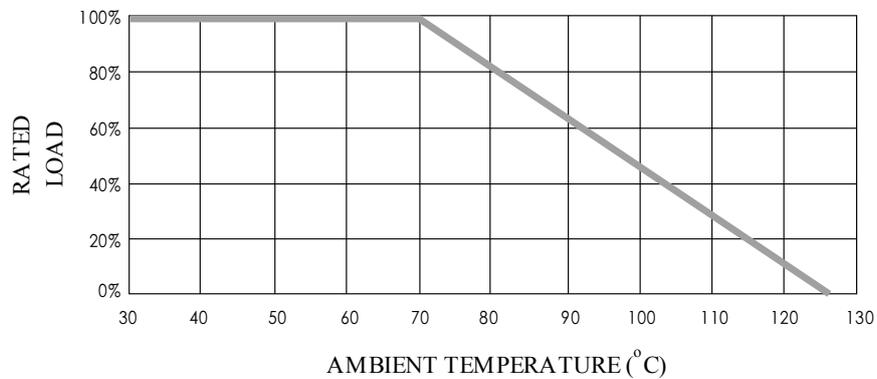
■ PART NUMBER

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

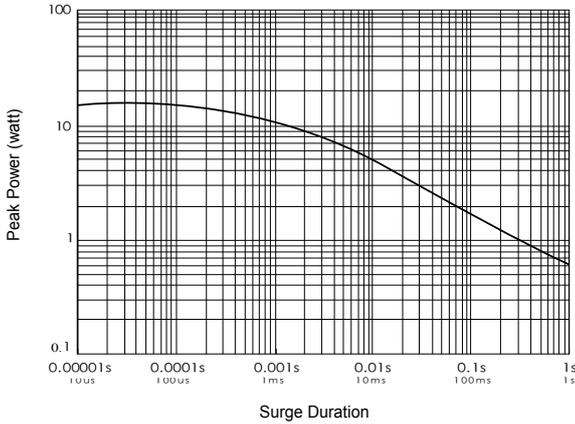
Characteristics	Limits	
Operating Temperature Range, °C	-55 ~ +125	
Temperature Coefficient, PPM / °C*	±0.5%, ±1%, ±2%	±25, ±50, ±100
	±5%	±100
Dielectric Withstanding Voltage, VAC or DC	150	
Insulation Resistance, MΩ	>10 ⁴	
Tin Whisker (JESD201 Temperature Cycling & High Temp./Humidity Storage), μm	<5	
Failure Rate in Time, pcs / 10 ⁹ device hours	<1	

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

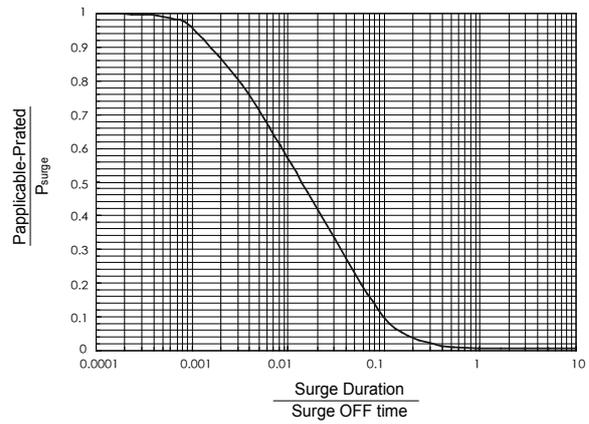
■ PERFORMANCE SPECIFICATIONS

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	125°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)		
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±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.	±(2.0%+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		

■ SINGLE SURGE PERFORMANCE



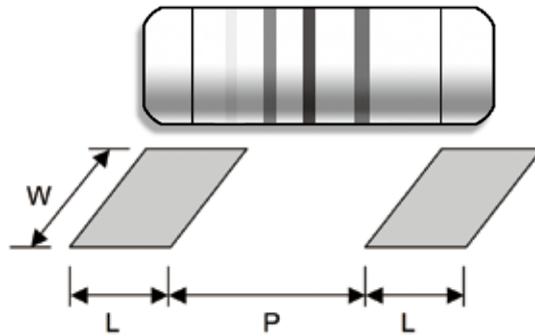
■ SURGE POWER DERATING CURVE



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.)
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

