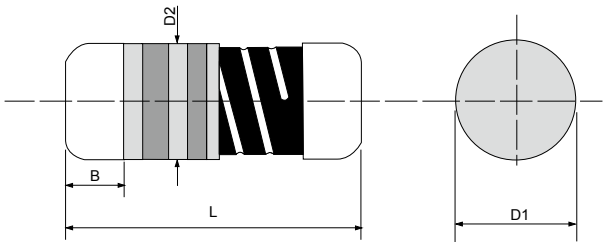
MM102
Metal Film MELF Resistor

Quality • Reliability
Cost-Down via Innovation



Specifications Per

- IEC 60115-1
- EN140401-803

Features

- AEC-Q200 Compliant
- 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%	E-192
				0.22Ω	2.2MΩ	±1%~±5%	E-24 / E-96

Special sizes and specifications available on request.

PART NUMBER

Example: MM102F162RTKRTR3K0

MM102	F	162R	TKR	TR3K0
Type	Tolerance*	Resistance	TCR	Packaging
	Z (Jumper) D (0.5%) F (1%) G (2%) J (5%)	162Ω **4-character code** containing - 3 significant digits 1 letter multiplier OHM MULTIPLIER 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 6K0 = 6,000 10K = 10,000

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

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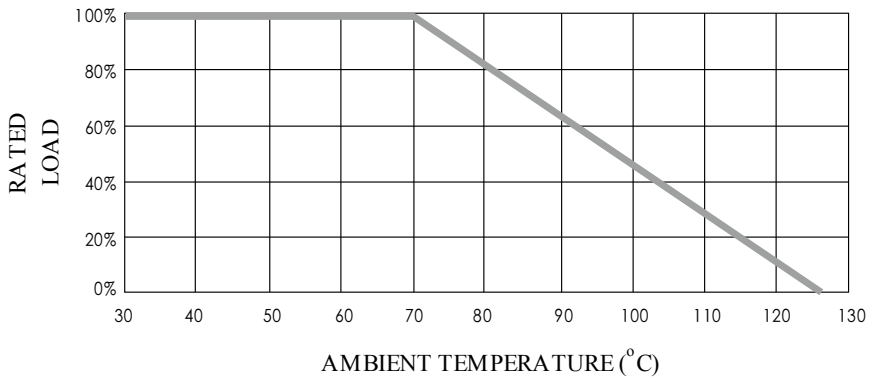
POWER DERATING CURVE

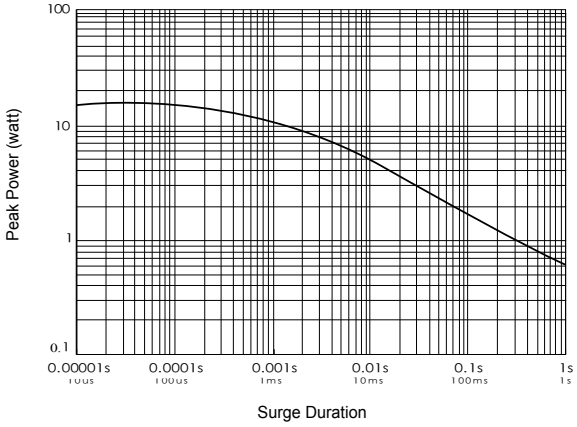


TECHNICAL SUMMARY

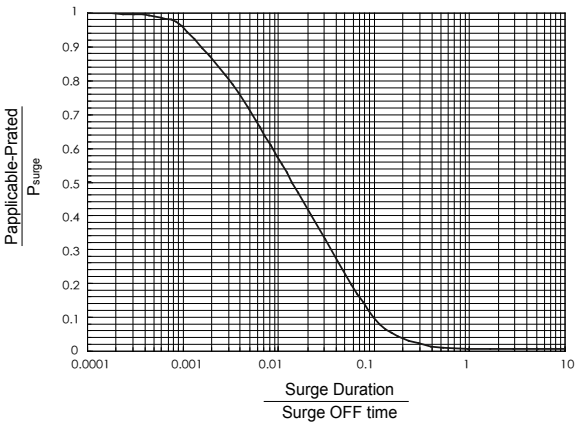
Characteristics	Limits	
Operating Temperature Range, °C	-55 ~ +125	
Temperature Coefficient, PPM / °C*	±0.5%, ±1%, ±2%	±25, ±50, ±100
	±5%	±100
Dielectric Withstanding Voltage, VAC or DC	150	
Insulation Resistance, MΩ	$>10^4$	
Tin Whisker (JESD201 Temperature Cycling & High Temp./Humidity Storage), μm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

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.

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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)	0.22Ω to 221KΩ		±0.5%
		>221KΩ		±0.75%
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%
		>100Ω to 221KΩ		±0.75%
		>221KΩ		±1.5%
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%		
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%
		>100Ω to 221KΩ		±2%
		>221KΩ		±3.5%
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	±0.75%		
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%
		>100Ω		±0.5%
Thermal Endurance	**IEC 60115-1 4.25.3** 1,000 hours at without load	125°C	0.22Ω to 100Ω	±1.5%
			>100Ω to 221KΩ	±1%
			>221KΩ	±1.5%
Thermal Shock	**IEC 60115-1 4.19** -55°C 30minutes, +125°C 30minutes	5 cycles		±0.25%
		1,000 cycles		±1.5%
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% ±1.0%		
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%		
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%		
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%		
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		

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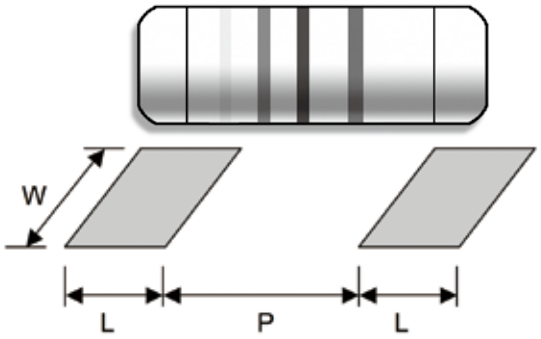
SUGGESTED PAD LAYOUT



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