## Specifications Per

- IEC 60115-1
- EN140401-803



## Features

- SMD enabled structure
- 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 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| RMM102 | $2.1 \pm 0.1$ | $1.1 \pm 0.1$ | D1+0.02/-0.1 | 0.5 Min. | 7 grams |

## GENERAL SPECIFICATIONS

| Type | Power <br> Rating <br> at $70^{\circ} \mathbf{C}$ | Maximum <br> Working <br> Voltage | Maximum <br> Overload <br> Voltage | Minimum <br> Resistance | Maximum <br> Resistance | Resistance <br> Tolerance | Available <br> Resistance <br> Value |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{RMM102}$ | 0.2 W | 150 V | 300 V | $0 \Omega, 10 \Omega$ | $221 \mathrm{~K} \Omega$ | $\pm 0.5 \%$ | $\mathrm{E}-192$ |
|  |  |  |  | $2.2 \mathrm{M} \Omega$ | $\pm 1 \% \sim \pm 5 \%$ | $\mathrm{E}-24 / \mathrm{E}-96$ |  |

Special sizes and specifications available on request.

## - TECHNICAL SUMMARY

| Characteristics | Limits |  |
| :--- | :--- | :--- |
| Operating Temperature Range, ${ }^{\circ} \mathrm{C}$ | $-55 \sim+125$ | $\pm 25, \pm 50, \pm 100$ |
| Temperature Coefficient, PPM $/{ }^{\circ} \mathrm{C}^{\star}$ | $\pm 1 \%, \pm 2 \%$ | $\pm 100$ |
|  | $\pm 5 \%$ |  |
| Dielectric Withstanding Voltage, VAC or DC | 150 | $>10^{4}$ |
| Insulation Resistance, M $\Omega$ | $<5$ |  |
| Tin Whisker (JESD201 Temperature Cycling \& High <br> Temp./Humidity Storage), $\mu \mathrm{m}$ |  |  |

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


## RMM102

## Metal Film MELF Resistor

- SINGLE SURGE PERFORMANCE



## Notes:

- SINGLE SURGE PERFORMANCE graph is good for NON REPETITIVE applications operating in an ambient temperature of $70^{\circ} \mathrm{C}$ or less. For temperatures above $70^{\circ} \mathrm{C}$, the graph power must be derated further linearly down to zero at $125^{\circ} \mathrm{C}$.
- To determine applicable surge power in continuous-surge applications:

1. Identify allowable duration and peak power $\mathrm{P}_{\text {surge }}$ of single surge;
2. Determine ratio of surge duration/surge OFF time in application;
3. Calculate $\mathrm{P}_{\text {applicable }}$ backwardly according to Y -axis of SURGE POWER DERATING CURVE.

- SUGGESTED PAD LAYOUT


| Type | Soldering Mode | Pad Length <br> (L, mm, Min.) | Pad Spacing <br> $\mathbf{( P , ~ m m ) ~}$ | Pad Width <br> (W, mm, Min.) |
| :---: | :---: | :---: | :---: | :---: |
| RMM102 | Reflow | 0.8 | $0.9 \pm 0.05$ |  |
|  | Wave | 1.2 | $0.7 \pm 0.05$ | 1.3 |

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

## - COVER TAPE PEELING SPECIFICATION

Recommended peeling force: 50gft5gf


Carrier

## Metal Film MELF Resistor

## - PERFORMANCE SPECIFICATIONS

| Characteristics | Test Conditions | Limits |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Short Time Overload | IEC 60115-1 4.13 <br> 5 seconds $2.5 x$ rated voltage (not over max. overload voltage) | $0.22 \Omega$ to $221 \mathrm{~K} \Omega$ |  | $\pm 0.5 \%$ |
|  |  | $>221 \mathrm{~K} \Omega$ |  | $\pm 0.75 \%$ |
| Load Life | IEC 60115-1 4.25.1 <br> Rated load (not over max. working voltage) 1,000 hours with 1.5 hours ON, 0.5 hours OFF, at $(70 \pm 2)^{\circ} \mathrm{C}$ | $0.22 \Omega$ to $100 \Omega$ |  | $\pm 5 \%$ |
|  |  | $>100 \Omega$ to $221 \mathrm{~K} \Omega$ |  | $\pm 2.5 \%$ |
|  |  | $>221 \mathrm{~K} \Omega$ |  | $\pm 3.0 \%$ |
| Load Life In Humidity | IEC 60115-1 4.24 <br> 56 days rated load (not over max. working voltage) at $(40 \pm 2)^{\circ} \mathrm{C}$ and $(93 \pm 3) \%$ relative humidity | $0.22 \Omega$ to $100 \Omega$ |  | $\pm 5 \%$ |
|  |  | $>100 \Omega$ |  | $\pm 2.5 \%$ |
| Load Life In Humidity (accelerated mode) | IEC 60115-1 4.37 <br> 1,000 hours at $85^{\circ} \mathrm{C}$ and $85 \%$ relative humidity with 0.1 x rated voltage (not over 100V) | $0.22 \Omega$ to $100 \Omega$ |  | $\pm 5 \%$ |
|  |  | $>100 \Omega$ to $221 \mathrm{~K} \Omega$ |  | $\pm 3.5 \%$ |
|  |  | $>221 \mathrm{~K} \Omega$ |  | $\pm 5 \%$ |
| Periodic Electric Overload | IEC 60115-1 4.39 <br> $3.9 x$ rated voltage (not over max. overload voltage) with 0.1 s ON, 2.5 s OFF for 1,000 cycles | $\pm 1.5 \%$ |  |  |
| Resistance To Soldering Heat | IEC 60115-1 4.18.2 <br> Dip the resistor into a solder bath measured $(260 \pm 5)^{\circ} \mathrm{C}$ and hold it for a $10 \pm 1$ seconds | $0.22 \Omega$ to $100 \Omega$ |  | $\pm 2.5 \%$ |
|  |  | $>100 \Omega$ |  | $\pm 0.5 \%$ |
| Thermal Endurance | IEC 60115-1 4.25.3 <br> 1,000 hours at without load | $125^{\circ} \mathrm{C}$ | $0.22 \Omega$ to $100 \Omega$ | $\pm 5.0 \%$ |
|  |  |  | $>100 \Omega$ to $221 \mathrm{~K} \Omega$ | $\pm 1.5 \%$ |
|  |  |  | $>221 \mathrm{~K} \Omega$ | $\pm 2.0 \%$ |
| Thermal Shock | IEC 60115-1 4.19 <br> $-55^{\circ} \mathrm{C} 30$ minutes, $+125^{\circ} \mathrm{C} 30$ minutes |  | 5 cycles | $\pm 0.5 \%$ |
|  |  |  | 0 cycles | $\pm 2.0 \%$ |
| Single pulse high voltage overload | IEC 60115-1 4.27 <br> - 5 pulses of $1.2 / 50 \mu$ s at $10 x$ rated voltage (not over max. overload voltage) with interval of 12 sec . <br> - 10 pulses of $10 / 700 \mu$ s at 10x rated voltage (not over max. overload voltage) with interval of 60 sec . | $\begin{aligned} & \pm 1.0 \% \\ & \pm 1.0 \% \end{aligned}$ |  |  |
| ```Electrostatic discharge (Human body model)``` | IEC 60115-1 4.38 <br> 3 positive \& 3 negative discharges with 1.5 KV <br> (For continuous surge application please see Surge Performance paragraph) | $\pm 1.0 \%$ |  |  |
| Climatic test | IEC 60115-1 4.23 <br> 4.23.2 - dry heat: 16 hours $125^{\circ} \mathrm{C}$ <br> 4.23.3 - damp heat: 24 hours $55^{\circ} \mathrm{C}$ with $95 \%$ relative humidity <br> 4.23.4 - cold: 2 hours $-55^{\circ} \mathrm{C}$ <br> 4.23.5 - negative air pressure: 2 hour 8.5 KPa at $(25 \pm 10)^{\circ} \mathrm{C}$ <br> 4.23.6 - damp heat cyclic: 5 days $55^{\circ} \mathrm{C}$ with $95 \%$ relative humidity <br> 4.23.7 - DC load: rated voltage at $-55^{\circ} \mathrm{C}$ and $125^{\circ} \mathrm{C}$ each 1 Min . | $\pm 2.0 \%$ |  |  |
| Solderability | IEC 60115-1 4.17.2 <br> Solder area covered after $(235 \pm 3)^{\circ} \mathrm{C} /(2 \pm 0.2)$ seconds with flux applied | 95\% min. coverage |  |  |
| Vibration | IEC 60115-1 4.22 <br> Six hours in each parallel and axial direction with a simple harmonic motion having an amplitude of 1.52 mm and 10 to $2,000 \mathrm{~Hz}$. | $\pm 1.0 \%$ |  |  |
| Bending test | IEC 60115-1 4.33 <br> Pressing depth 2 mm , 3 times | $\pm 0.25 \%$ |  |  |
| Flammability | IEC 60115-1 4.35 <br> Needle flame test 10s | No burning after 30s |  |  |

## RMM102

## Metal Film MELF Resistor

## . PART NUMBER

Example: RMM1021/5W22RF25ppmNIL

RMM102

Type

| Resistance |
| :---: |
| $22 \mathrm{R}=22 \Omega$ |
| $22 \mathrm{~K}=22 \mathrm{~K} \Omega$ |
| $1 \mathrm{M}=1 \mathrm{M} \Omega$ |
| $\mathrm{R}=1$ |
| $\mathrm{~K}=10^{3}$ |
| $\mathrm{M}=10^{6}$ |
| $\mathrm{G}=10^{9}$ |
|  |
|  |
|  |


| Tolerance |
| :---: |
| $\mathrm{F}(1 \%)$ |
| $\mathrm{J}(5 \%)$ |
| $\mathrm{K}(10 \%)$ |
| $\mathrm{M}(20 \%)$ |
|  |
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|  |
|  |
|  |
|  |
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| TCR |
| :---: |
| 3-7-character code |
| TYL=Typical |
| $\pm 25$ ppm=25ppm |
| $\pm 1000 \mathrm{ppm}=1000 \mathrm{ppm}$ |
|  |

NIL

Packaging

Nil = Bulk
T/R = Tape and Reel
$T / B=$ Tape and Box

