

# RJM SERIES

HIGH PRECISION SMT TYPE RESISTORS

MELF TYPE METAL FILM RESISTORS, COATED TYPE

## Feature

- Advanced thin film technology
- Excellent overall stability: Class 0.05%
- Extremely low TCR: up to  $\pm 5\text{ppm/K}$
- Exceptionally low noise and voltage coefficient
- Compliant to RoHS directive 2011/65/EU
- Compliant to REACH (EC No. 1907/2006)) (last updated: 27/06/2018)



## Description

Production is strictly controlled and follows extensive set of instructions established in production procedure for reproducibility. A homogeneous film of metal alloy is deposited on the surface of high-grade ceramic cores (85%~96%  $\text{AL}_2\text{O}_3$ ) and conditioned to achieve the desired stability and the temperature coefficients.

A professional laser or an extreme thin emery wheel is pressed on the metalized rods to not only achieve the target value but also perfect electronics performance by smoothly cutting a helical groove in the resistance layer on the ceramic rods without damaging the ceramics.

The resistance layers are covered by a protective coating and hard Bakelite designed for electrical, mechanical, and climatic protection.

The resistors are tested in accordance with MIL-R-10509F which refers to MIL- STD-202 or IEC60115.

The established reliability in accordance with CECC 40401-803

Version E is available upon request.

1. PRODUCT: METAL FILM MELF TYPE PRECISION RESISTORS

2. PART NUMBER: Part number of the melf type precision metal film resistor is identified by the series name, power rating, metric size code, resistance tolerance, temperature coefficient, packing type and resistance value.

For example :

RJM	73P	0204	B	6	T	5051
Series Name	Power rating	Size code	Tolerance	TCR	Packing Style	Resistance Value

(1) Series name: RJM series

(2) Power rating listed in the Electric characteristics

M= Tiny size; P= power mode; S= Small size; “ “= normal size

(3) Metric size: DIN: 0102, DIN: 0204, DIN: 0207, DIN: 0411, DIN: 0617

(4) Tolerance: W=±0.05%; B=±0.1%; C=±0.25%; D=±0.5%; F=±1%; G=±2%

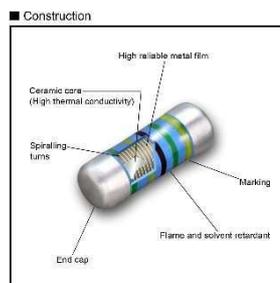
(5) T.C.R.: 7≤ ±5ppm/°C; 6≤ ±10ppm/°C; 5≤ ±15ppm/°C; 3=±25ppm/°C; 2≤ ±50ppm/°C; 1≤±100ppm/°C; 0≤±200ppm/°C

(6) Packaging Type: B=BULK/BOX T=REEL/BOX

(7) Resistance Value: 100K(1003); 22K5(2252); 2K15(2151); 120R(1200); 10R(10R0); 1.8R(1R80); 0.99R(R990).....

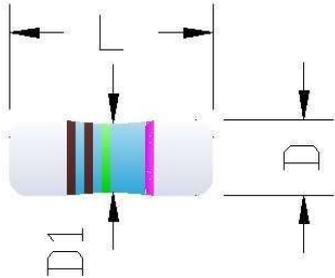
(9) RJM73P020400TR000 and RJM74P020700TR000 are jumpers with resistance lower than 15mΩ

3. Structure of the resistors:



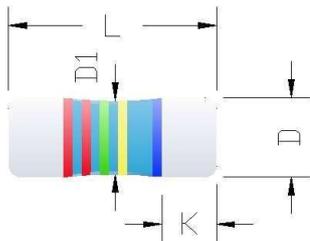
#### 4. COLOR BAND-CODE:

Four color bands codes for size 0102 and 0204.



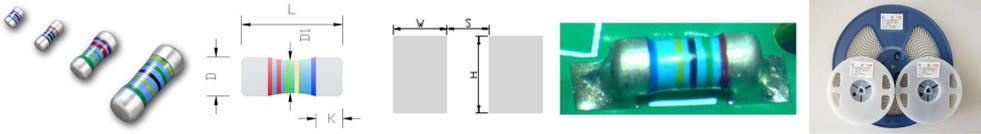
颜色	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	倍率
黑色	0	0	0	1
棕色	1	1	1	10
红色	2	2	2	10 <sup>2</sup>
棕色	3	3	3	10 <sup>3</sup>
黄色	4	4	4	10 <sup>4</sup>
绿色	5	5	5	10 <sup>5</sup>
蓝色	6	6	6	10 <sup>6</sup>
紫色	7	7	7	10 <sup>7</sup>
灰色	8	8	8	
白色	9	9	9	
金色				10 <sup>-1</sup>
银色				10 <sup>-2</sup>

Five color bands for size 0207, 0411, 0516



颜色	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	倍率	精度
黑色	0	0	0	1	
棕色	1	1	1	10	F(±1.0%)
红色	2	2	2	10 <sup>2</sup>	G(±2.0%)
棕色	3	3	3	10 <sup>3</sup>	
黄色	4	4	4	10 <sup>4</sup>	
绿色	5	5	5	10 <sup>5</sup>	D(±0.50%)
蓝色	6	6	6	10 <sup>6</sup>	C(±0.25%)
紫色	7	7	7		B(±0.10%)
灰色	8	8	8		
白色	9	9	9		
金色				10 <sup>-1</sup>	J(±5.0%)
银色				10 <sup>-2</sup>	K(±10%)

## 5. ELECTRICAL CHARACTERISTICS

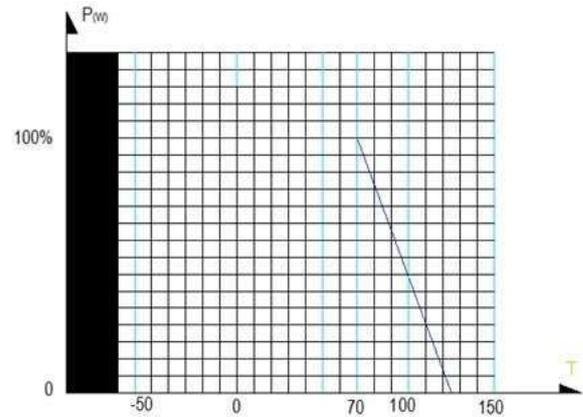
Type	RJM72P	RJM73P	RJM74M	RJM74P	RJM16M	RJM17M	RJM18M	型号
Metric type	DIN: 0102	DIN: 0204	DIN: 0204	DIN: 0207	DIN: 0207	DIN: 0411	DIN: 0617	德国工业标准型号
Standard applied	Q/SLC009-2010; GB/T5729-1994; GB/T9546-1995; GB/T9547-1995							技术标准
Resistance range	1Ω to 10MΩ							阻值范围
Resistance tolerance	W(±0.05%); B(±0.10%); C(±0.25%); D(±0.5%); F(±1%); J(±5%)							精度
Temperature coefficient	C7(±5); C6(±10); C5(±15); C3(±25); C2(±50)							温度系数
Rated dissipation, $P_{70}$	0.20W	0.25W	0.40W	0.60W	1.0W	2.0W	3.0W	$P_{70}$ 70℃以下额定功率
Operating voltage $U_{max}$	150V	200V	200V	300V	350V	400V	450V	$U_{max}$ 最大工作电压
Working temperature range	-55℃ to 125℃							工作温度范围
Dimension	L=2.0±0.1mm	L=3.5±0.2mm	L=3.5±0.2mm	L=5.7±0.2mm	L=6.0±0.2mm	L=8.7±0.2mm	L=10.7±0.2mm	外型尺寸
	D=1.25±0.1mm K>0.4; D <sub>1</sub> >D-0.1	D=1.3±0.1mm K>0.6; D <sub>1</sub> >D-0.2	D=1.3±0.1mm K>0.6; D <sub>1</sub> >D-0.2	D=2.1±0.1mm K>0.6; D <sub>1</sub> >D-0.3	D=2.1±0.1mm K>0.6; D <sub>1</sub> >D-0.3	D=3.1±0.1mm K>1.0; D <sub>1</sub> >D-0.4	D=4.1±0.2mm K>1.0 D <sub>1</sub> >D-0.4	mm
Solder pad (recommended)	S=1.1;W=1.2; H=1.6	S=1.5;W=2; H=2.2	S=1.5;W=2; H=2.2	S=2.8;W=3; H=3	S=3.2;W=3; H=3.5	S=5.6;W=4; H=4.5	S=7.2;W=4.5 H=5	建议焊盘尺寸
Solder paste thickness(recommended)	0.15mm	0.15mm	0.15mm	0.15mm	0.20mm	0.30mm	0.30mm	建议锡膏厚度
Outlines								
Paste mesh thickness(recommended)	0.15mm	0.15mm	0.15mm	0.20mm	0.20mm	0.30mm	0.30mm	建议锡膏网厚度
Minimun packing quantity	3000	3000	3000	2000	2000	2500	2000	最小包装数量

- \* Unless otherwise specified, all values are tested at the following condition  
 Temperature: 21℃ to 25℃; Relative humidity: 45% to 70%;  
 The parts must be well soldering with good soldering pads.
- \* Rated Continuous Working Voltage (RCWV)=  $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$
- \* Resistance value out of range is available on request.
- \* The post high temperature treatment after final tin plating is strictly controlled by our production procedure to minimize the tin whisker phenomenon
- \* The resistances of all jumpers are lower than 15mΩ

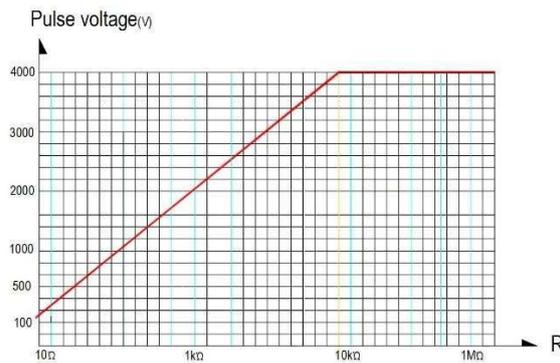
## 6. Derating curves

The power dissipation on the resistor generates a temperature rise against the local ambient, depending on the heat flow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature is not exceeded. These resistors do not feature a limited lifetime when operated within the permissible limits. However, resistance value drift increasing over operating time may result in exceeding a limit acceptable to the specific application, thereby establishing a functional lifetime.

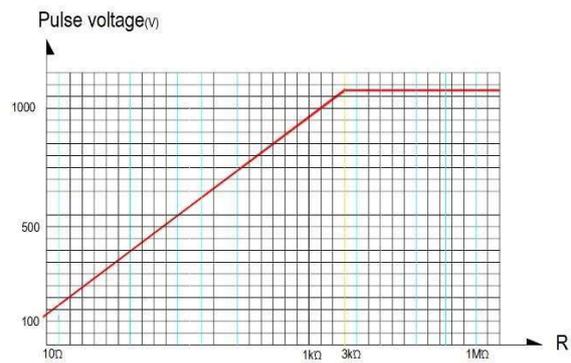
For MELF resistors working at an ambience temperature of 70 °C or above, the power rating shall be derated in accordance with the above curves.



## 7. Pulse load capability



Pulse load rating in accordance with IEC 60115-1,4.27; **1.2µs/50µs**; 5 pulses loaded, for permissible resistance change  $<\pm(0.5\%+0.05\Omega)$



Pulse load rating in accordance with IEC 60115-1,4.27; **10µs/700µs**; 10 pulses loaded, for permissible resistance change  $<\pm(0.5\%+0.05\Omega)$

## 8. ENVIRONMENTAL CHARACTERISTICS

### (1) Temperature Coefficient Test

IEC 60115-1, 4.8: Test of resistors at room temperature and 60°C (or 100°C upon request) above room temperature. Then measure the resistance. The Temperature Coefficient is calculated by the following equation and its value should be within the range requested.

$$\text{Resistor Temperature Coefficient} = \frac{R - R_0}{R_0} \times \frac{1}{t - t_0} \times 10^6$$

R = Resistance value under the testing  
 R<sub>0</sub> = Resistance value at the room temperature  
 t = the 2nd testing temperature  
 t<sub>0</sub> = Room temperature

### (2) Short Time Overload Test

IEC60115-1 4.13: At 2.5 times rated voltage or 2 times the maximum working voltage whichever is lower for 5 seconds, the resistor should be free from defects. The change of the resistance value of normal size resistors should be within ±(0.1%+0.05Ω) and within ±(0.2%+0.05Ω) for tiny size resistors as compared with the value before the test.

### (3) Solderability

IEC 60115-1, 4.17: 255±5°C for 3±0.5 Seconds, there are at least 90% solder coverage on the termination.

### (4) Resistance to soldering heat:

IEC 60115-1, 4.18: 260±3°C for 10±1 Seconds, immersed only the cap into tin bath. The change of the resistance value should be within ±(0.15%+0.1Ω) as compared with the value before the test.

### (5) Rapid change of temperature (Thermal shock)

IEC 60115-1, 4.19: 30 min at LCT; 30 min at UCT; LCT = -55°C; UCT = 125°C. 5 cycle from LCT to room temperature. and to UCT and to room temperature. The change of the resistance value shall be within ±(0.25%+0.05Ω) for the resistors of tight tolerance and normal size; should be within ±(1%+0.05Ω) for resistors of normal tolerance and tiny size as compared with the value before the load.as compared with the value before the load.

(6) Damp Heat Steady State

IEC 60115-1, 4.24:  $40\pm 2^{\circ}\text{C}$ , 90-95% RH for 56 days, loaded with 0.1 times RCWV or the maximum working voltage whichever is lower.

The change of the resistance value should be within  $\pm(0.25\%+0.05\Omega)$  for resistors with tight tolerance and normal size and should be within  $\pm(1\%+0.05\Omega)$  for resistors with normal tolerance and tiny size as compared with the value before the load.

(7) Load Life Test

IEC 60115-1, 4.25:  $70\pm 2^{\circ}\text{C}$  at RCWV or the maximum working voltage whichever is lower for 1,000+48/-0 Hr. (1.5Hr. on, 0.5Hr. off). The resistors shall be arranged not much effected mutually by the temperature of others and the excessive ventilation shall not be performed.

The change of the resistance value should be within  $\pm(0.25\%+0.05\Omega)$  for resistors with tight tolerance and normal size and should be within  $\pm(1\%+0.05\Omega)$  for resistors with normal tolerance and tiny size as compared with the value before the load.

(8) Endurance at upper category temperature

IEC60115-1, 4.25.3: put resistors in over with temperature at  $125^{\circ}\text{C}$  for 1000h. The change of the resistance value should be within  $\pm(0.25\%+0.05\Omega)$  for resistors with tight tolerance and within  $\pm(1\%+0.05\Omega)$  for resistors with normal tolerance and tiny size as compared with the value before the load.

(9) Accidental Overload Test

IEC 60115-1, 4.26: 4 times RCWV or 2 times the maximum working voltage whichever is lower for 1 Minute. No evidence of flaming or arcing.

(10) Component solvent resistance

IEC 60115-1, 4.29: Isopropyl alcohol;  $50^{\circ}\text{C}$ ; method 2. No visible damage.

(11) Solvent resistance of marking

IEC 60115-1, 4.30: Isopropyl alcohol;  $50^{\circ}\text{C}$ ; method 1, toothbrush. Marking legible; no visible damage

(12) Resistance to Solvent

IEC 60115-1, 4.30: IPA for 5±0.5 Min. with ultrasonic. Marking legible; no visible deterioration occurred.

(13) Damp heat, steady state, accelerated

IEC 60115-1, 4.37: (85 ± 2)°C, (85 ± 5)% RH; U = 0.3 x RCWV or U = 0.3 x U<sub>max</sub> or 100V whichever is lower for 120 hours.

The change of the resistance value should be within ±(0.25%+0.05Ω) for resistors with tight tolerance and within ±(1%+0.05Ω) for resistors with normal tolerance and tiny size as compared with the value before the load.

(14) Electrostatic discharge (Human Body Model)

IEC 60115-1, 4.38: IEC 61340-3-1 (1); 3 pos. + 3 neg. discharges.

RJM72P0102: 1.5kV; RJM73P0204: 2kV; RJM74P0207: 3kV;

RJM16M0207: 3 kV; RJM17M0411: 4kV; RJM18M0617: 6kV

The change of the resistance value should be within ±(0.50%+0.05Ω) as compared with the value before the load.

## Disclaimer

All products, product specifications and data are subject to change without notice to improve reliability, function, design or otherwise.

Thunder Precision Resistors makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product to the maximum extent permitted by applicable law.