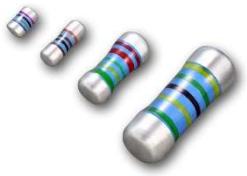
RJM SERIES

HIGH PRECISION SMT TYPE RESISTORS

MELF TYPE METAL FILM RESISTORS, COATED TYPE

Feature



· Advanced thin film technology
· Excellent overall stability: Class 0.05%
· Very low TCR: up to ±5ppm/K
· Very 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% AL_2O_3) and conditioned to achieve the desired stability and the temperature coefficients.
A professional laser is pressed on the metalized rods to not only achieve the target value but also prefect electronics performance by smoothly cutting a helical groove in the resistance layer on the ceramic rods without damaging the ceramics*1. 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 some resistors with low Ohm value could be cut by fine grain diamond grinding wheel.

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 type name, power rating, size code, tolerance, temperature coefficient, packing type and resistance value.
Example：

RJM	16M	0207	F	2	T	1004
Series Name	Size Code	Metric Size	Resistance Tolerance	Temperature Coefficient of Resistance	Packing Style	Resistance Value

(1) Type name: RJM series

(2) Power Rating: 72P=0.20W; 73P=0.25W; 74M=0.4W;
74P=0.60W; 16M=1.0W; 17M=2W; 18M=3W

(3) Metric size: DIN: 0102, DIN: 0204, DIN:0207, DIN0411, DIN0617

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

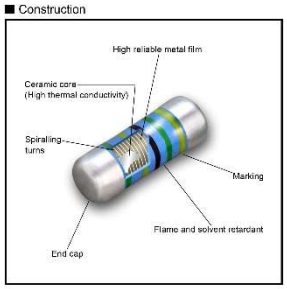
(5) T.C.R.: 7= ±5ppm/℃; 6= ±10ppm/℃; 5=±15ppm/℃; 3=±25ppm/℃;
2= ±50ppm/℃; 1=±100ppm/℃; 0=No TCR test and request

(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)……

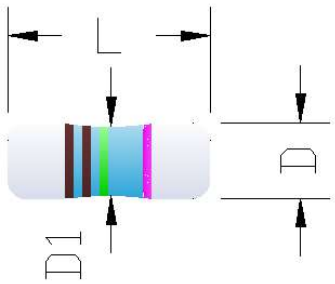
(8) RJM73P020400TR000 and RJM74P020700TR000 are jumpers with resistance lower than 15mΩ

3. Structure of the resistors:



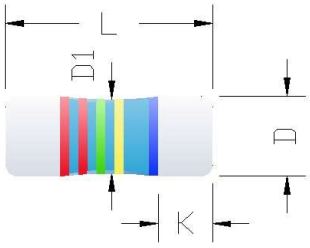
4. COLOR BAND-CODE:

Four color bands codes for size 0102 and 0204.



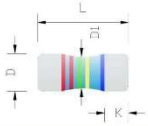
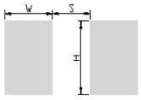
颜色	1st	2nd	3rd	倍率
黑色	0	0	0	1
棕色	1	1	1	10
红色	2	2	2	10^2
橙色	3	3	3	10^3
黄色	4	4	4	10^4
绿色	5	5	5	10^5
蓝色	6	6	6	10^6
紫色	7	7	7	10^7
灰色	8	8	8	
白色	9	9	9	
金色				10^{-1}
银色				10^{-2}

Five color bands for size 0207, 0411, 0516



颜色	1st	2nd	3rd	倍率	精度
黑色	0	0	0	1	
棕色	1	1	1	10	F(±1.0%)
红色	2	2	2	10^2	G(±2.0%)
橙色	3	3	3	10^3	
黄色	4	4	4	10^4	
绿色	5	5	5	10^5	D(±0.50%)
蓝色	6	6	6	10^6	C(±0.25%)
紫色	7	7	7		B(±0.10%)
灰色	8	8	8		
白色	9	9	9		
金色				10^{-1}	J(±5.0%)
银色				10^{-2}	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
Cross to Vishay's P/N	MMU0102	MMA0204	MMA0204 power	MMB0207	MMB0207 power			最大短时间过载电压
Cross to Vishay's P/N	SMM0102	SMM0204			SMM0207			最大短时间过载电压
Resistance range	10Ω 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 ppm/℃	C7(±5); C6(±10); C5(±15); C3(±25); C2(±50)							ppm/℃ 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
Max short time overload voltage	300V	400V	400V	600V	700V	800V	900V	最大短时间过载电压
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=11.8±0.2mm	外型尺寸
	D=1.25±0.1mm	D=1.3±0.1mm	D=1.3±0.1mm	D=2.1±0.1mm	D=2.1±0.1mm	D=3.1±0.1mm	D=3.6±0.1mm	
mm	K≥0.4;D_1≥D-0.1	K≥0.6;D_1≥D-0.2	K≥0.6;D_1≥D-0.2	K≥0.6;D_1≥D-0.3	K≥0.6;D_1≥D-0.3	K≥1.0;D_1≥D-0.4	K≥1.0;D_1≥D-0.4	mm
Solder pad (recommended) mm	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	S=8.1; W=5 H=5	mm 建议焊盘尺寸
Outlines								外观
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.

* Terminal caps of the resistors are all with three electroplating: the inner is copper plating + nickel plating to minimize the tin whisker phenomenon and final plating is tin to improve the solderability. The thickness of the 3 layers are Cu:0.8~1.5μm + Ni:<1μm + Tin:>3μm.

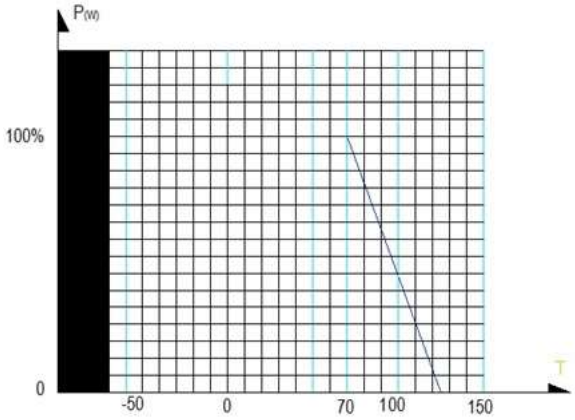
* The post high temperature treatment after final tin plating is strictly controlled by our production procedure to minimize the tin whisker phenomenon

* The resistances of all **jumpers** are lower than **15mΩ**

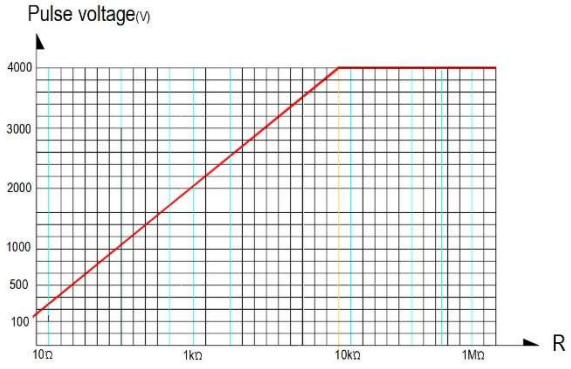
6. Derating curves

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.

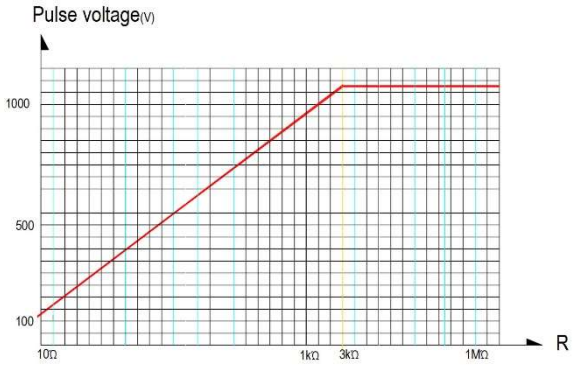
For MELF resistors working at an ambiance temperature of 70℃ or above, the power rating shall be derated in accordance with the above curves.



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 <±(0.5%+0.05Ω)



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

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 temperature
R_0 = Resistance value at the room temperature
t = the 2nd testing temperature
t_0 = Room temperature

(2) Short Time Over Load 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 should be within ±(0.1%+0.1Ω) as compared with the value before the test.

(3) Solderability

IEC 60115-1, 4.17: 235±5°C for 3±0.5 Seconds, there are at least 95% solder coverage on the termination.

(4) Resistance to soldering heat:

IEC 60115-1, 4.18: 260±3°C for 10±1 Seconds, immersed to a point 3±0.5mm from the body. 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 Temp. and to UCT and to room Temp.. The change of the resistance value shall be within ± (0.25%+0.1Ω) as compared with the value before the load. After the test the resistors shall be free from the electrical or mechanical damage.

(6) Damp Heat Steady State

IEC 60115-1, 4.24: 40±2°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 ± (0.25%+0.1Ω) for resistors with tight tolerance and within ± (0.5%+0.1Ω) 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±2°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 ± (0.25%+0.1Ω) for resistors with tight tolerance and within ± (0.5%+0.1Ω) 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 °C for 1000h. The change of the resistance value should be within ± (0.25%+0.1Ω) for resistors with tight tolerance and within ± (0.5%+0.1Ω) 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 °C; method 2. No visible damage.

(11) Solvent resistance of marking

IEC 60115-1, 4.30: Isopropyl alcohol; 50 °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) Flammability

IEC 60115-1, 4.35: IEC 60695-11-5 (1), needle flame test; 10 s. No burning after 30 seconds.

(14) 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_{max} or 100V whichever is lower for 1000 hours. The change of the resistance value should be within ±(0.25%+0.1Ω) for resistors with tight tolerance and within ±(1%+0.1Ω) for resistors with normal tolerance and tiny size as compared with the value before the load.

(15) 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: 6kV; RJM18M0617: 6kV
The change of the resistance value should be within ±(0.50%+0.1Ω) as compared with the value before the load.

Disclaimer

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