APPROVAL SHEET

产品承认书

RJ SERIES
PRECISION METAL FILM RESISTORS

RJ 系列精密金属膜电阻器

DATE: 20151028

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Approval by:

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(1) 产品名称：精密金属膜电阻器

(2) 产品代码：产品代码包括电阻型号、额定功率、电阻精度、电阻温度系数、包装方式和阻值。如 1/4W 金属膜电阻，其对应的产品型号为 RJ73，精度为±1%，温度系数为±25ppm/℃,阻值为 1M 欧姆,则其产品代码为: RJ73F3B7R15

Example：

RJ	73	F	3	B	7R15
Series Name	Size Code	Resistance Tolerance	Temperature Coefficient	Packing Style	Resistance Value

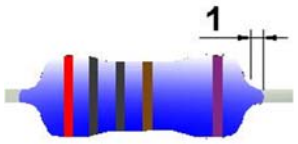
1. Style: RJ SERIES 型号为 RJ
2. 额定功率为1/4W size code 73
3. 精度为: F=±1%;
4. 温度系数为C3=±25ppm/℃
5. 包装方式为: B 散装; T 编带; F 或M 成型
6. 阻值为: 7R15

(3) 采用和执行标准：Standard applied:

RJ72, RJ73, RJ74 series: SJ/T 10571~10574; Thunder Enterprise standard: Q/SLC005-1995

RJ16, RJ17, series: SJ-231-2674~2675-86; Thunder Enterprise Standard: Q/SLC005-1995

(4) BAND-CODE: 色环标识



COLOR	1st	2nd	3rd	multiple	tolerance	TCR
black	0	0	0	1		
brown	1	1	1	10	F(±1.0%)	100ppm/℃
red	2	2	2	10^2	G(±2.0%)	50ppm/℃
orange	3	3	3	10^3		15ppm/℃
yellow	4	4	4	10^4		25ppm/℃
green	5	5	5	10^5	D(±0.50%)	15ppm/℃
blue	6	6	6	10^6	C(±0.25%)	10ppm/℃
purple	7	7	7		B(±0.10%)	5ppm/℃
gray	8	8	8			
white	9	9	9			
golden				10^{-1}	J(±5.0%)	
silver				10^{-2}	K(±10%)	

Five or six color code rings designate the resistance value and tolerance and temperature coefficient in accordance with IEC 60062. Temperature coefficient marked for small TCR on request as the sixth ring in accordance with IEC 60062. Digital marking is available on request.

(5) ELECTRICAL CHARACTERISTICS 电气性能参数

Type	Rated dissipation at 70℃	Max. working voltage U_{max}	Max. short time overload voltage	Dielectric withstanding voltage	Resistance range Resistance tolerance (%) Temperature coefficient (ppm/℃)			
					B; C; D; F C7; C6; C5	B; C; D; F C3	C; D; F C3;C2	F; J C2;C1
RJ72	0.16W	200V	400V	300V	49Ω to 300kΩ	10Ω to 1M Ω	10Ω to 2M2Ω	1Ω to 10MΩ
RJ73S	0.25W	200V	400V	300V	49Ω to 300kΩ	10Ω to 1M Ω	10Ω to 2M2Ω	1Ω to 10MΩ
RJ73	0.25W	250V	500V	350V	19Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ
RJ74M	0.40W	200V	400V	300V			10Ω to 2M2Ω	1Ω to 10MΩ
RJ74MP	0.50W	200V	400V	300V			10Ω to 2M2Ω	1Ω to 10MΩ
RJ74S	0.60W	250V	500V	350V	19Ω to 1MΩ	10Ω to 5M5Ω	10Ω to 5MΩ	1Ω to 10MΩ
RJ74	0.50W	350V	700V	500V	10Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ
RJ16M	1.00W	250V	500V	350V			10Ω to 5MΩ	1Ω to 10MΩ
RJ16S	1.00W	350V	700V	500V	10Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ
RJ16	1.00W	500V	1000V	700V	10Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ
RJ17M	2.00W	350V	700V	500V			10Ω to 5MΩ	1Ω to 10MΩ
RJ17S	2.00W	500V	1000V	700V	10Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ
RJ17	2.00W	750V	1500V	750V	10Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ
RJ18M	3.00W	500V	1500V	750V			10Ω to 5MΩ	1Ω to 10MΩ
RJ18S	3.00W	750V	1500V	750V	10Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ
RJ18	3.00W	750V	1500V	750V	10Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ
RJ19M	5.00W	750V	1500V	750V			10Ω to 5MΩ	1Ω to 10MΩ
RJ19S	5.00W	750V	1500V	750V	10Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ

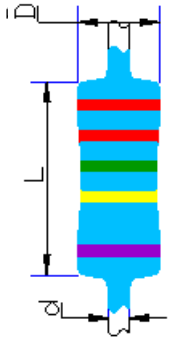
Unless otherwise specified, all values are tested at the following condition:

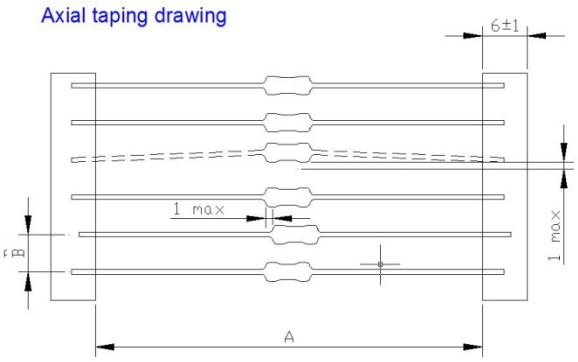
Temperature: 21℃ to 25℃;

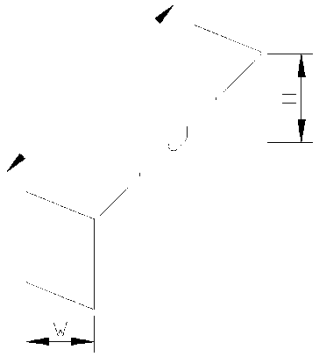
Relative humidity: 45% to 70%

Resistance out of range is available on request.

(6) Dimension and packing information 外观尺寸和包装尺寸

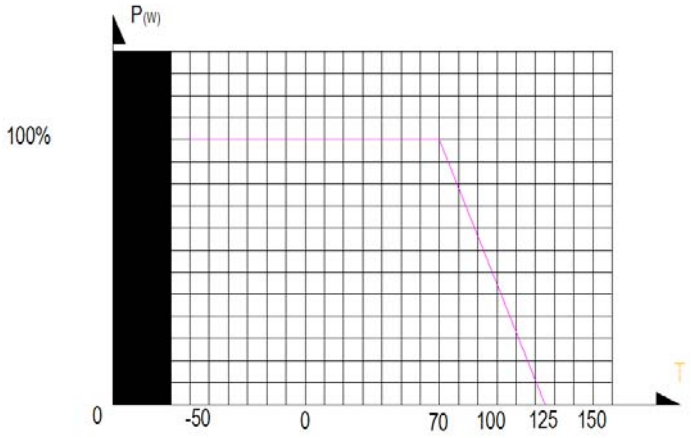




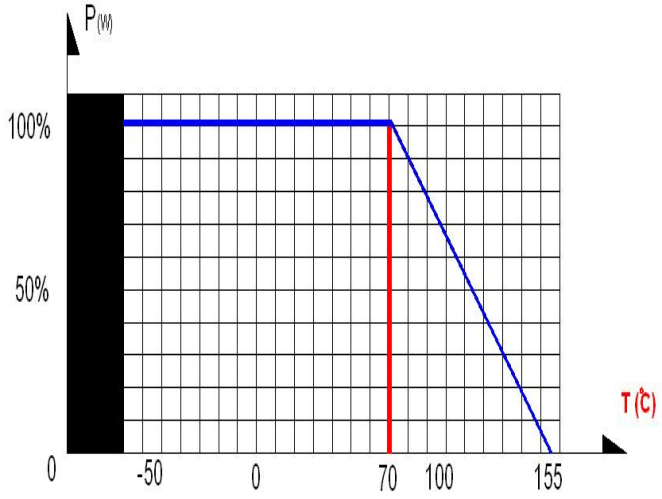


TJpe	L (mm)	D (mm)	d (mm)	Weight (±15mg)	TAPING		BOX (±10mm)			MPQ
					B (mm)	A (mm)	W (mm)	H (mm)	L (mm)	
RJ72	3.2±0.3	1.7±0.3	0.45±0.05	120	5.0±0.3	52±1.0	75	75	255	5000
RJ73S	3.2±0.3	1.7±0.3	0.45±0.05	130	5.0±0.3	52±1.0	75	75	255	5000
RJ74M	3.2±0.3	1.7±0.3	0.45±0.05	140	5.0±0.3	52±1.0	75	75	255	5000
RJ73	5.9±0.5	2.3±0.3	0.60±0.05	240	5.0±0.3	52±1.0	75	100	255	5000
RJ74S	5.9±0.5	2.3±0.3	0.60±0.05	260	5.0±0.3	52±1.0	75	100	255	5000
RJ16M	6.0±0.5	2.3±0.3	0.60±0.05	280	5.0±0.3	52±1.0	75	100	255	5000
RJ74	9.0±1.0	3.3±0.5	0.60±0.05	490	5.0±0.3	52±1.0	75	100	255	2500
RJ16S	9.0±1.0	3.3±0.5	0.60±0.05	500	5.0±0.3	52±1.0	75	100	255	2500
RJ17M	9.0±1.0	3.3±0.5	0.60±0.05	550	5.0±0.3	52±1.0	75	100	255	2500
RJ16	11±1.0	4.2±0.8	0.75±0.05	760	5.0±0.5	52±1.0	75	75	255	1000
RJ17S	11±1.0	4.2±0.8	0.75±0.05	800	5.0±0.5	52±1.0	75	75	255	1000
RJ18M	11±1.0	4.2±0.8	0.75±0.05	860	5.0±0.5	52±1.0	75	75	255	1000
RJ17	15±1.0	5.5±1.0	0.75±0.05	1320	10±0.5	62±1.0	85	100	255	1000
RJ18S	15±1.0	5.5±1.0	0.75±0.05	1400	10±0.5	62±1.0	85	100	255	1000
RJ19M	15±1.0	5.5±1.0	0.75±0.05	1550	10±0.5	62±1.0	85	100	255	1000
RJ18	25±1.0	9.0±1.0	0.75±0.05	4450	10±0.5	62±1.0	85	100	255	500
RJ19S	25±1.0	9.0±1.0	0.75±0.05	4700	10±0.5	62±1.0	85	100	255	500

(7) DERATING CURVE 降功率曲线



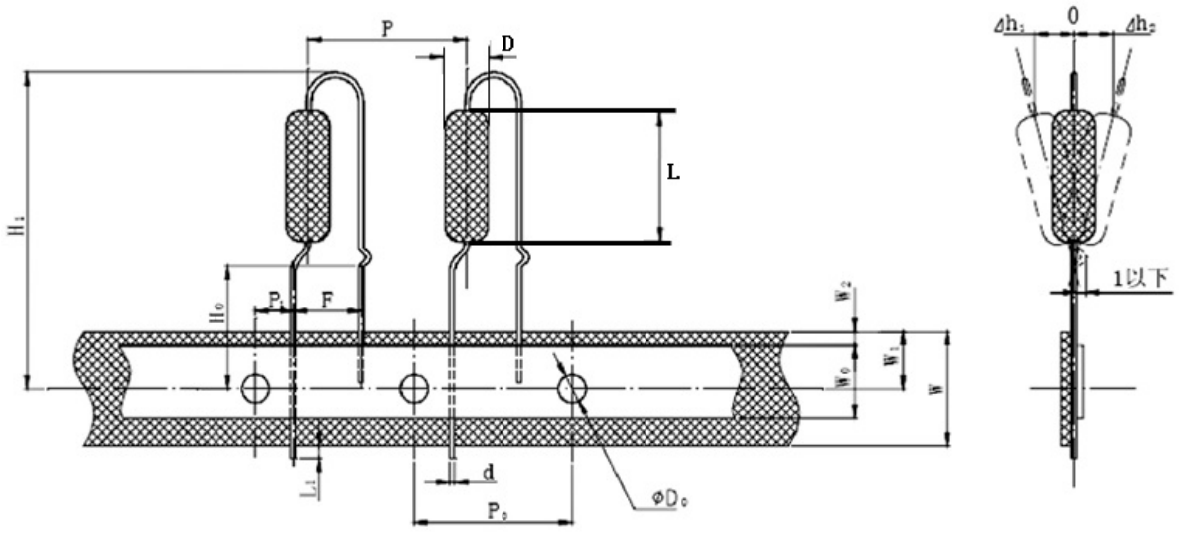
normal size resistors;



small size and mini size resistors

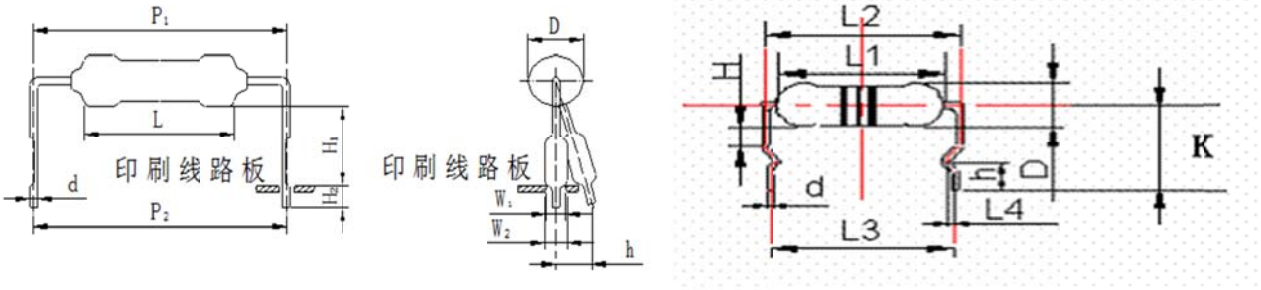
For resistors working at an ambiance temperature of 70℃ or above, the power rating shall be derated in accordance with the above curves.

(8) Deforming FK type 立式成型图样



1,2W	12.7	12.7	3.85	5	18	9	17.5	φ4.0	11.5	4.5
功率	P±1.0	P_0±0.3	P_1±0.7	F±0.5	W±0.5	W_1±0.5	H_0±1.0	D_0±0.2	L±1.0	D±0.5

(9) Deforming M type 卧式成型图样



Dimension varies according to the size of the resistors and could be adjusted on request.

(10) ENVIRONMENTAL CHARACTERISTICS 例行环境试验

1. Insulation Resistance

   IEC 60115-1, 4.6: in V-block for 60 seconds, the test resistance should be high than 10,000 M Ohm.

2. Dielectric Withstanding Voltage

   IEC 60115-1 4.7: Place resistors in V-block for 60 Seconds, no breakdown or flashover.

3. Temperature Coefficient Test

   IEC 60115-1, 4.8: Test of resistors at room temperature and 60°C or 100°C on 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.

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

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

4. Short Time Over Load Test

   IEC60115-1 4.13: At 10 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 ±(0.10%+0.05 Ω) as compared with the value before the test.

5. Solderability

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

6. 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%+0.05 Ω) as compared with the value before the test.

7. Climatic sequence

   IEC 60115-1, 4.19: -55°C to Room Temp. to +155°C to Room Temp. (5 cycles). The change of the resistance value shall be within ±(0.50%+0.05 Ω) for tight tolerance and ±(1.0%+0.05 Ω) for normal tolerance as compared with the value before the test.

8. 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 ±(0.50%+0.05 Ω) for tight tolerance and ±(1.0%+0.05 Ω) for normal tolerance as compared with the value before the test.

9. 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 ±(0.50%+0.05 Ω) for tight tolerance and ±(1.0%+0.05 Ω) for normal tolerance as compared with the value before the test.

10. Accidental Overload Test

    IEC 60115-1, 4.26: 4 times RCWV for 1 Minute. No evidence of flaming or arcing

11. Single-pulse high-voltage overload test .

    IEC 60115-1, 4.27: Apply 4 times rated voltage or 2 times the maximum working voltage whichever is lower to the resistor at the 0.1 second on and 2.5 seconds off cycle for 1000 cycles. The change of the resistance shall be within ± (2.0%+0.05Ω).

12. High voltage high pulse overload

    IEC 60115-1, 4.28: Apply 10 pulses with 10 times rated voltage or 2 times the maximum working voltage whichever is lower to the resistor, the pulses parameter is 10μs/700μs. The change of the resistance shall be within ± (2.0%+0.05Ω).

13. Resistance to Solvent

    IEC 60115-1, 4.30: IPA for 5±0.5 Min. with ultrasonic. No deterioration of coating and color code occurred.

14. Boiling test

    Sample 80 pcs from each lot boiling in boiling water for 1hour, dry them in room temperature for 30 minutes and load them with rated DC voltage or maximum working voltage whichever is lower for 1hour, repeat to boil and load for another 1cycle, dry them at least 30m before test. The change of the tolerance of the resistors shall be within ±(2.00%+0.05Ω).

Appendix: cross checking for Vishay's and KOA's parts.

Thunder's type	Vishay's type	KOA's type
RJ72		
RJ73S	SMA 0204	MFS1/4; SPRX1/4
RJ73		MF1/4; SPR1/4
RJ74M	MSR16	
RJ74MP	SMA0204	
RJ74S	MSR25; SMA 0207	MFS1/2; SPRX1/2
RJ74		MF1/2; SPR1/2
RJ16M	PR01; SMA0309	
RJ16S	SMA 0414	SPRX1
RJ16		MF1; SPR1
RJ17M	PR02	
RJ17S		SPRX2
RJ17		MF2; SPR2
RJ18M	PR03	
RJ18S		SPRX3
RJ18		SPR3
RJ19M		
RJ19S		SPRX5

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