

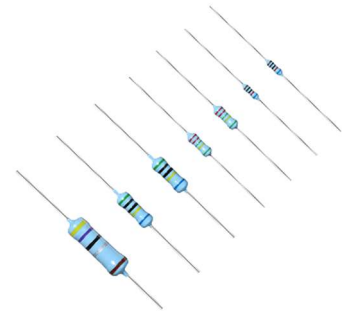


## RJ SERIES

## PRECISION METAL FILM RESISTORS

### Feature

- Advanced thin film technology
- Excellent overall stability: Class 0.1%
- Very low TCR: up to  $\pm 5$ ppm/K
- Very low noise and voltage coefficient
- Match tolerance and TCR is available upon request
- 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%  $Al_2O_3$ ) and conditioned to achieve the desired stability and the temperature coefficients.

A professional fine grain diamond grinding 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. The resistance layers are covered by a protective coating 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: PRECISION METAL FILM RESISTORS

## 2. PART NUMBER:

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

Example:

<b>RJ</b>	<b>73</b>	<b>S</b>	<b>B</b>	<b>3</b>	<b>T</b>	<b>1004</b>
Series Name	Power Rating	Size Code	Resistance Tolerance	Temperature Coefficient	Packing Type	Resistance Value

Style: RJ SERIES

(1) Power Rating: 73=1/4W; 74=1/2W; 75=16=1.0W; 76=17=2.0W; 18=3.0W;

(2) Size code: - normal size; S: small size; M: mini size;

MP: mini size power mode

(4) Tolerance: B=±0.1%; C=±0.25%; D=±0.50%; F=±1.0%; G=±2.0%; J=±5.0%;

(5) T.C.R.: 7=±5ppm/°C; 6=±10ppm/°C; 5=±15ppm/°C;

3=±25ppm/°C; 2 = ±50ppm/°C; 1=±100ppm/°C;

0= over ±100ppm/°C

(6) Packaging Type: B=BULK/BOX

T=Tape on Box Packing;

F type and M type forming are available upon request

(7) Resistance Value: 1R00、20R0、1000、1001、1002、3303、1004.....

## 3. Standard applied:

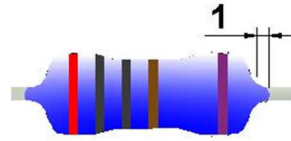
RJ7 series: SJ/T 10571~10574;

RJ16, RJ17 series: Q/RU221-94;

Thunder Enterprise standard: Q/SLC005-1995



## 4. COLOR BAND-CODE:



COLO R	1st	2nd	3rd	multipl e	tolerance	TCR
black	0	0	0	1		
brown	1	1	1	10	F(±1.0%)	100ppm/ °C
red	2	2	2	10 <sup>2</sup>	G(±2.0%)	50ppm/°C
orange	3	3	3	10 <sup>3</sup>		15ppm/°C
yellow	4	4	4	10 <sup>4</sup>		25ppm/°C
green	5	5	5	10 <sup>5</sup>	D(±0.50% )	15ppm/°C
blue	6	6	6	10 <sup>6</sup>	C(±0.25% )	10ppm/°C
purple	7	7	7		B(±0.10% )	5ppm/°C
gray	8	8	8			
white	9	9	9			
golden				10 <sup>-1</sup>	J(±5.0%)	
silver				10 <sup>-2</sup>	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

Type	Cross to Vishay's P/N	Cross to KOA's P/N	Rated dissipation at 70°C	Max. working voltage $U_{max}$	Max. short time overload voltage	Dielectric withstanding voltage	Resistance range				Dimension		
							Resistance tolerance (%)				L (mm)	D (mm)	d (mm)
							Temperature coefficient (ppm/°C)						
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 1MΩ	10Ω to 2MΩ	1Ω to 10MΩ	3.2±0.3	1.7±0.3	0.45±0.05
RJ73S	SMA0204	SPRX1/4	0.25W	250V	500V	300V	49Ω to 300kΩ	10Ω to 1MΩ	10Ω to 2MΩ	1Ω to 10MΩ	3.2±0.3	1.7±0.3	0.45±0.05
RJ74M	MSR16		0.50W	200V	400V	300V			10Ω to 2MΩ	1Ω to 10MΩ	3.2±0.3	1.7±0.3	0.45±0.05
RJ73		SPR1/4	0.25W	250V	500V	500V	19Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ	5.9±0.5	2.3±0.3	0.60±0.05
RJ74S	MSR25; SMA0207	SPRX1/2	0.60W	350V	700V	500V	19Ω to 1MΩ	10Ω to 5M5Ω	10Ω to 5MΩ	1Ω to 10MΩ	5.9±0.5	2.3±0.3	0.60±0.05
RJ16M	PR01; SMA0309		1.00W	350V	700V	500V			10Ω to 5MΩ	1Ω to 10MΩ	6.0±0.5	2.3±0.3	0.60±0.05
RJ74		SPR1/2	0.50W	350V	700V	700V	10Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ	9.0±1.0	3.3±0.5	0.60±0.05
RJ16S	SMA0414	SPRX1	1.00W	400V	800V	700V	10Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ	9.0±1.0	3.3±0.5	0.60±0.05
RJ17M	PR02		2.00W	500V	1000V	700V			10Ω to 5MΩ	1Ω to 10MΩ	9.0±1.0	3.3±0.5	0.60±0.05
RJ16		SPR1	1.00W	500V	1000V	800V	10Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ	11±1.0	4.2±0.8	0.80±0.1
RJ17S		SPRX2	2.00W	500V	1000V	800V	10Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ	11±1.0	4.2±0.8	0.80±0.1
RJ18M	PR03		3.00W	600V	1200V	800V			10Ω to 5MΩ	1Ω to 10MΩ	11±1.0	4.2±0.8	0.80±0.1
RJ17		SPR2	2.00W	500V	1000V	800V	10Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ	15±1.0	5.5±1.0	0.80±0.1
RJ18S		SPRX3	3.00W	500V	1000V	1000V	10Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ	15±1.0	5.5±1.0	0.80±0.1
RJ19M			5.00W	500V	1000V	1000V			10Ω to 5MΩ	1Ω to 10MΩ	17±1.0	6±1.0	0.80±0.1
RJ18		SPR3	3.00W	600V	1200V	1000V	10Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ	25±1.0	8.0±1.0	0.80±0.1
RJ19S			5.00W	600V	1200V	1000V	10Ω to 1MΩ	10Ω to 2M5Ω	10Ω to 5MΩ	1Ω to 10MΩ	25±1.0	8.0±1.0	0.80±0.1

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

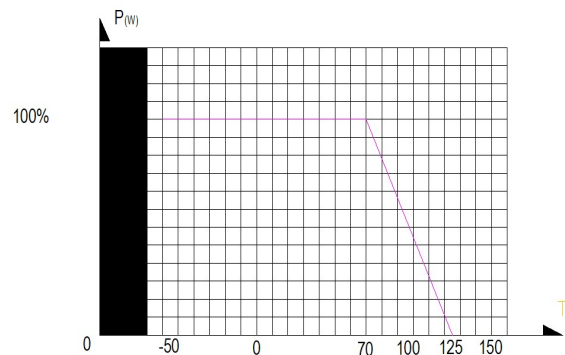
Temperature: 21°C to 25°C;

Relative humidity: 45% to 70%

Resistance out of range is available upon request.

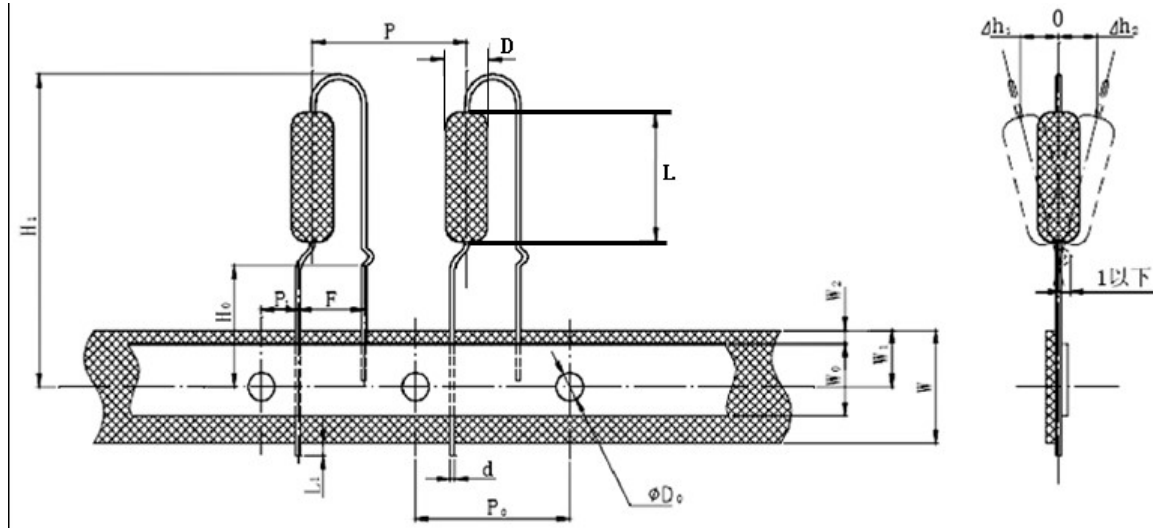
## 6. DERATING CURVE

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



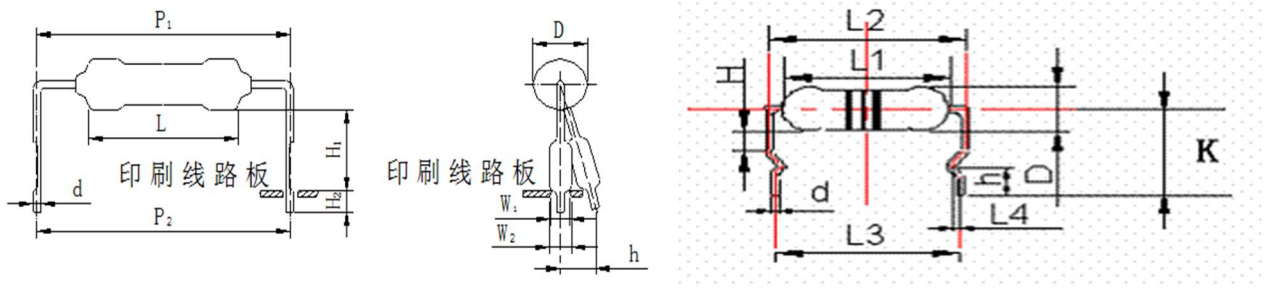


## 7. Deforming FK type



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

## 8. Deforming M type



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



## 9. ENVIRONMENTAL CHARACTERISTICS

### (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.

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

R = Resistance value under the testing temperature

R<sub>0</sub> = Resistance value at the room temperature

t = the 2<sup>nd</sup> testing temperature

t<sub>0</sub> = 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  $\pm(0.10\%+0.05 \Omega)$  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:  $260\pm 3^{\circ}\text{C}$  for  $10\pm 1$  Seconds, immersed to a point  $3\pm 0.5\text{mm}$  from the body. The change of the resistance value should be within  $\pm(0.15\%+0.05 \Omega)$  as compared with the value before the test.

(7) Climatic sequence

IEC 60115-1, 4.19:  $-55^{\circ}\text{C}$  to Room Temp. to  $+155^{\circ}\text{C}$  to Room Temp. (5 cycles). The change of the resistance value shall be within  $\pm(0.50\%+0.05 \Omega)$  for tight tolerance and  $\pm(1.0\%+0.05 \Omega)$  for normal tolerance as compared with the value before the test.

(8) 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  $\pm(0.50\%+0.05 \Omega)$  for tight tolerance and  $\pm(2.0\%+0.05 \Omega)$  for normal tolerance as compared with the value before the test.

(9) 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  $\pm(0.50\%+0.05 \Omega)$  for tight tolerance and  $\pm(2.0\%+0.05 \Omega)$  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  $\pm(2.0\%+0.05\Omega)$ .



(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 10 $\mu$ s/700 $\mu$ s. The change of the resistance shall be within  $\pm (2.0\%+0.05\Omega)$ .

(13) Resistance to Solvent

IEC 60115-1, 4.30: IPA for 5 $\pm$ 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  $\pm(2.00\%+0.05\Omega)$ .





## Disclaimer

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