# APPROVAL SHEET

# RJ SERIES

# METAL FILM RESISTORS

| PRODUCE | CHECK AND APPROVE | ACCEPTED BY |
|---|---|---|
| EM | CE | HONORABLE CUSTOMER |
| Edison Chen | Charles Chen | |
| Mar.28, 2019 | Mar.28, 2019 | |

1. PRODUCT: METAL FILM PRECISION RESISTORS TYPE

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：

| **RJ** | **73** | **S** | **B** | **3** | **T** | **1004** |
|---|---|---|---|---|---|---|
| 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/ºC; 6=±10ppm/ ºC; 5=±15ppm/ ºC;

3=±25ppm/ ºC; 2 = ±50ppm/ ºC; 1=±100ppm/ ºC;

0= over ±100ppm/ ºC

(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……

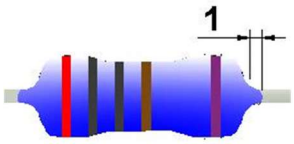
3. Standard applied:

RJ7 series: SJ/T 10571~10574;

RJ16, RJ17 series: Q/RU221-94;

Thunder Enterprise standard: Q/SLC005-1995

## 4. COLOR BAND-CODE:



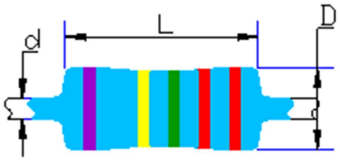

| COLOR | 1st | 2nd | 3rd | multiple | tolerance | TCR |
|---|---|---|---|---|---|---|
| black | 0 | 0 | 0 | 1 | | |
| brown | 1 | 1 | 1 | 10 | F(±1.0%) | 100ppm/℃ |
| red | 2 | 2 | 2 | $10^2$ | G(±2.0%) | 50ppm/℃ |
| orange | 3 | 3 | 3 | $10^3$ | | 15ppm/℃ |
| yellow | 4 | 4 | 4 | $10^4$ | | 25ppm/℃ |
| 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.

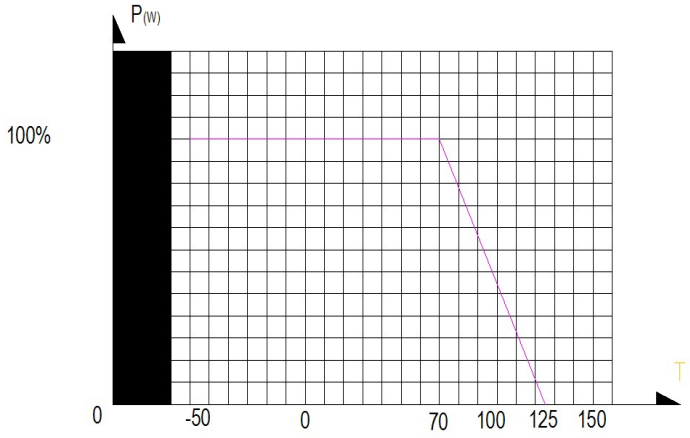
## 5. ELECTRICAL CHARACTERISTICS

| Type | Cross to Vishay's P/N | Cross to KOA's P/N | Rated dissipation at 70℃ | Max. working voltage $U_{max}$ | Max. short time overload voltage | Dielectric withstanding voltage | Resistance range Resistance tolerance (%) Temperature coefficient (ppm/℃) | | | | Dimenision | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | B; C; D; F C7; C6; C5 | B; C; D; F C3 | C; D; F C3;C2 | F; J C2;C1 | L (mm) | D (mm) | d (mm) |
| RJ72 | | | 0.16W | 200V | 400V | 300V | 49Ω to 300kΩ | 10Ω to 1M Ω | 10Ω to 2M2Ω | 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 1M Ω | 10Ω to 2M2Ω | 1Ω to 10MΩ | 3.2±0.3 | 1.7±0.3 | 0.45±0.05 |
| RJ74M | MSR16 | | 0.50W | 200V | 400V | 300V | | | 10Ω to 2M2Ω | 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 |

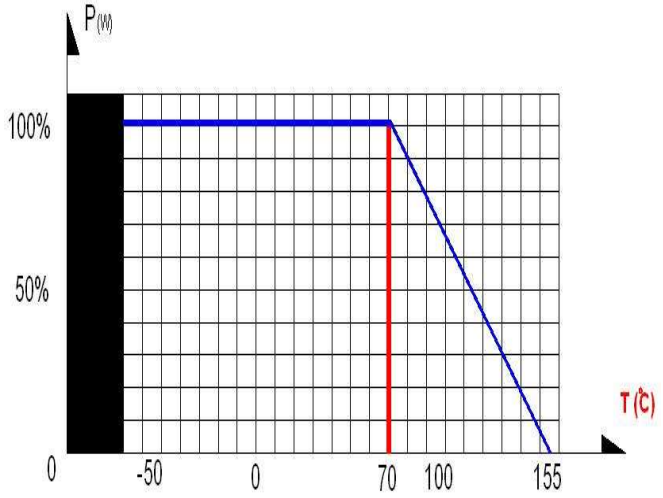
Unless otherwise specified, all values are tested at the following condition:
Temperature: 21℃ to 25℃;
Relative humidity: 45% to 70%
Resistance out of range is available upon request.



## 6. DERATING CURVE



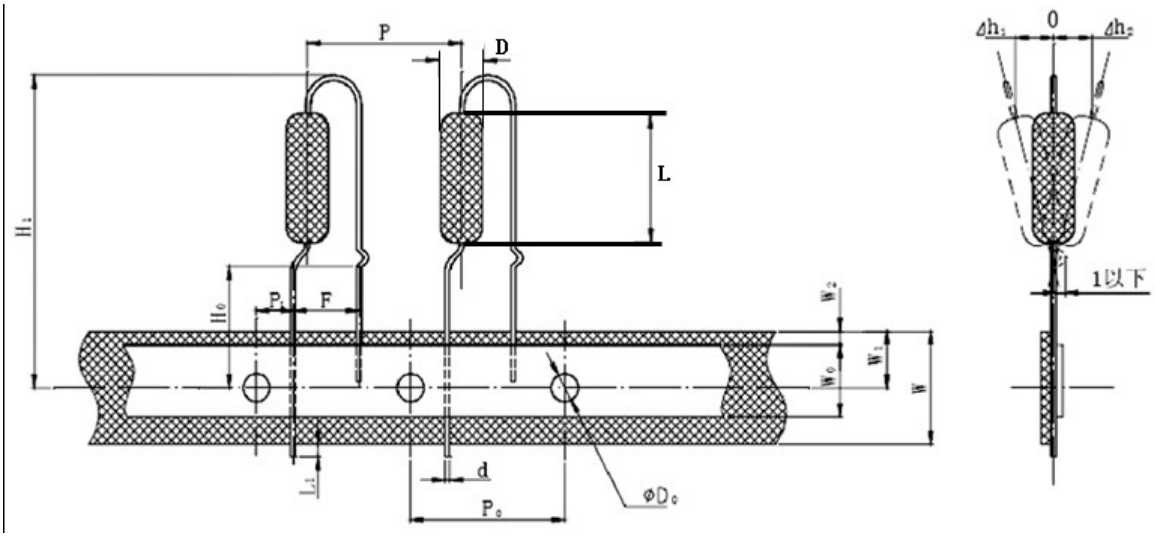

normal size resistors;




small size and mini size resistors

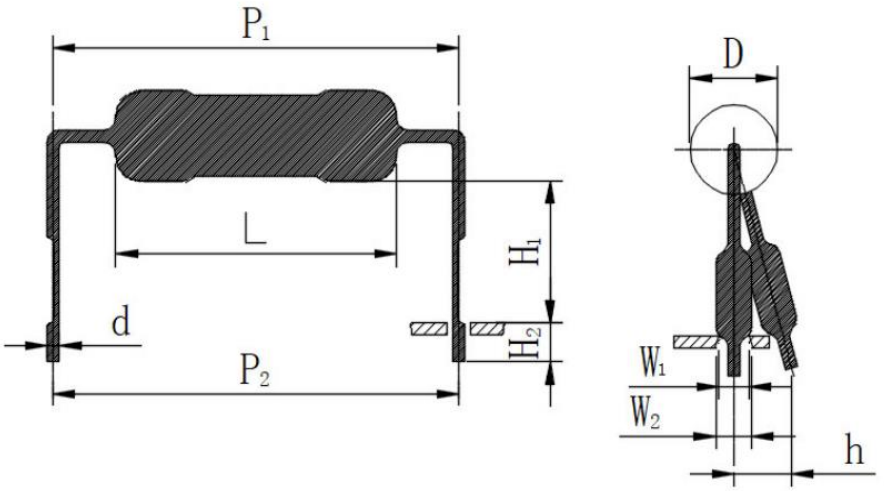
For resistors working at an ambiance temperature of 70℃ or above, the power rating shall be derated in accordance with the above curves.

## 7. Deforming FK type




| 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 |

## 8. Deforming M type




| 功率 | L | P1 | P2(成型跨距) | W1 | D | d | H1 | H2 |
|---|---|---|---|---|---|---|---|---|
| 2W | 11.5±1.0 | 16.0±0.6 | 16.0±0.6 | ≥1.2 | 4.5±0.5 | 0.75±0.05 | 5±1mm | 3.5±0.5 |

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.

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

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 ±(2.0%+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 ±(2.0%+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).

# 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.*