

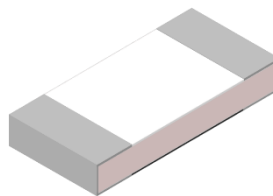
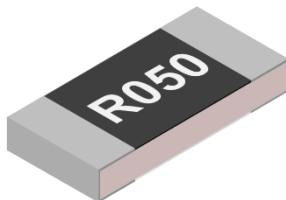


# TSL Series Anti-Sulfur Low-Resistance Metal Film Chip Resistor Product Specifications

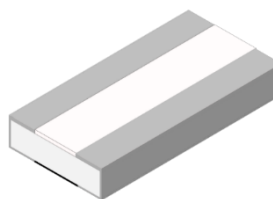
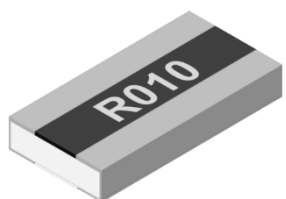
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## ■ Anti-Sulfur Low-Resistance Metal Film Chip Resistor — TSL Series

Standard Type



Wide Terminal Type



Top view

Bottom view

### ■ Applications

- Consumer electronics
- Computer & relative products
- Communication devices
- Measuring instrument
- Industrial / Power supply
- Battery management system

### ■ Features

- Low Resistance / TCR / Inductance
- High precision current sensing
- High power capability
- Sulfur resistant
- Halogen free and lead free
- RoHs compliant

### ■ Parts Number Explanation

#### ■ Example:

| TSL                                                                            | 1206                                                                                 | 05                                                                                                                                                                 | F                                                                  | R560                                                                   | P                                                                                       | 05                                   | Z                   |
|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------------|---------------------|
| Product Type                                                                   | Size (Inch)                                                                          | Rated Power                                                                                                                                                        | Tolerance                                                          | Resistance                                                             | Package                                                                                 | Quantity (PCS)                       | Optional            |
| TSL Series<br>Anti-Sulfur<br>Low-Resistance<br>Metal Film<br>Chip<br>Resistors | 0402<br>0603<br>0805<br>1206<br>1210<br>2010<br>2512<br>0508<br>0612<br>1020<br>1225 | Y6 : 0.063W<br>01 : 0.10W<br>X1 : 0.125W<br>02 : 0.20W<br>X2 : 0.25W<br>04 : 0.40W<br>05 : 0.50W<br>07 : 0.75W<br>10 : 1.0W<br>15 : 1.5W<br>20 : 2.0W<br>30 : 3.0W | D : $\pm 0.5\%$<br>F : $\pm 1\%$<br>G : $\pm 2\%$<br>J : $\pm 5\%$ | EX.<br>R056 = $0.056\Omega$<br>R560 = $0.56\Omega$<br>1R00 = $1\Omega$ | P : Paper Taping<br>(0603~1210)<br>Q : Paper Taping<br>(0402)<br>E : Embossed<br>Taping | 04 : 4000<br>05 : 5000<br>10 : 10000 | Z : Default<br>Code |



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## ■ Standard Electrical Specifications

### ■ Standard Type:

| Type    | Rated Power<br>at 70°C | Max. Rated<br>Current | Max. Overload<br>Current | T.C.R.<br>(ppm/°C) | Resistance Range                   |
|---------|------------------------|-----------------------|--------------------------|--------------------|------------------------------------|
|         |                        |                       |                          |                    | D(0.5%), F(1.0%), G(2.0%), J(5.0%) |
| TSL0402 | 1/16W                  | 1.12A                 | 2.80A                    | ±100               | 50 mΩ ≤ R < 100 mΩ                 |
|         | 1/8W                   | 1.58A                 | 3.54A                    |                    |                                    |
|         | 1/4W                   | 2.24A                 | 5.00A                    |                    |                                    |
| TSL0603 | 1/10W                  | 1.41A                 | 3.54A                    |                    |                                    |
|         | 1/5W                   | 2.00A                 | 4.47A                    |                    |                                    |
|         | 2/5W                   | 2.83A                 | 6.32A                    |                    |                                    |
| TSL0805 | 1/8W                   | 1.58A                 | 3.95A                    | ±50                | 100 mΩ ≤ R ≤ 10 Ω                  |
|         | 1/4W                   | 2.24A                 | 5.00A                    |                    |                                    |
|         | 1/2W                   | 3.16A                 | 7.07A                    |                    |                                    |
| TSL1206 | 1/4W                   | 2.24A                 | 5.59A                    |                    |                                    |
|         | 1/2W                   | 3.16A                 | 7.07A                    |                    |                                    |
|         | 1W                     | 4.47A                 | 10.00A                   |                    |                                    |
| TSL1210 | 1/2W                   | 3.16A                 | 7.91A                    |                    |                                    |
|         | 1W                     | 4.47A                 | 10.00A                   |                    |                                    |
| TSL2010 | 3/4W                   | 2.74A                 | 6.85A                    | ±50                | 100 mΩ ≤ R ≤ 10 Ω                  |
|         | 1.5W                   | 3.87A                 | 8.66A                    |                    |                                    |
| TSL2512 | 1W                     | 3.16A                 | 7.91A                    |                    |                                    |
|         | 2W                     | 4.47A                 | 10.00A                   |                    |                                    |

● If there are other TCR or power requirements, please contact our sales department.

### ■ Wide Terminal Type:

| Type    | Rated Power<br>at 70°C | Max. Rated<br>Current | Max. Overload<br>Current | T.C.R.<br>(ppm/°C) | Resistance Range |               |             |             |
|---------|------------------------|-----------------------|--------------------------|--------------------|------------------|---------------|-------------|-------------|
|         |                        |                       |                          |                    | D<br>(0.5%)      | F<br>(1.0%)   | G<br>(2.0%) | J<br>(5.0%) |
| TSL0508 | 1W                     | 10.00A                | 22.36A                   | ±100               | 100mΩ ≤ R ≤ 2Ω   | 10mΩ ≤ R ≤ 2Ω |             |             |
| TSL0612 | 1W                     | 10.00A                | 22.36A                   | ±100               | 100mΩ ≤ R ≤ 2Ω   | 10mΩ ≤ R ≤ 2Ω |             |             |
| TSL1020 | 2W                     | 14.14A                | 31.62A                   | ±100               | 100mΩ ≤ R ≤ 2Ω   | 10mΩ ≤ R ≤ 2Ω |             |             |
| TSL1225 | 3W                     | 17.32A                | 38.73A                   | ±100               | 100mΩ ≤ R ≤ 2Ω   | 10mΩ ≤ R ≤ 2Ω |             |             |



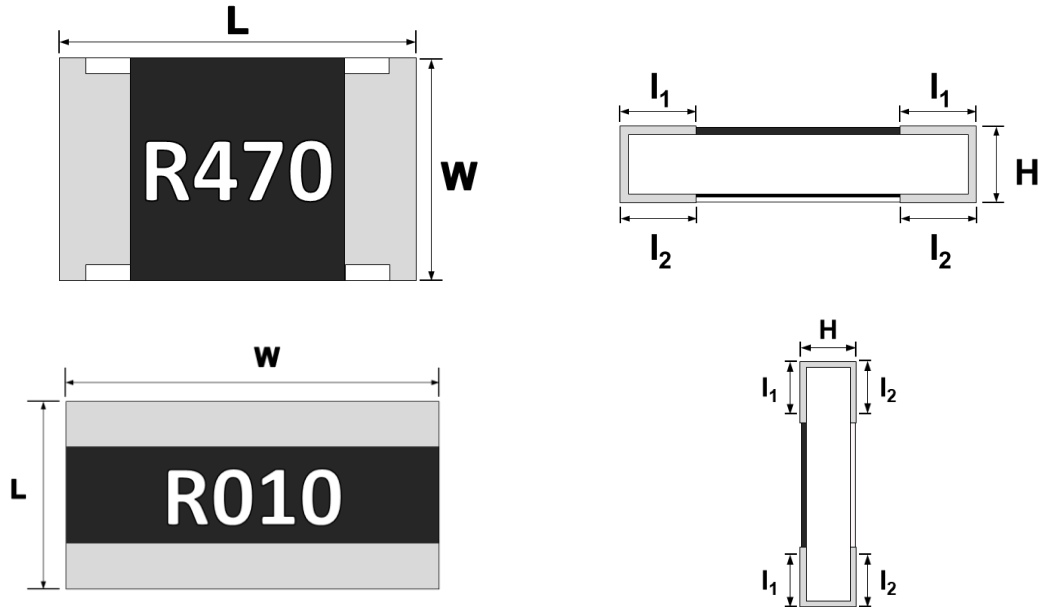
# TSL Series Anti-Sulfur Low-Resistance Metal Film Chip Resistor Product Specifications

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## ■ Type Dimensions



Unit : mm

| Type    | L         | W         | H         | L <sub>1</sub> | L <sub>2</sub> |
|---------|-----------|-----------|-----------|----------------|----------------|
| TSL0402 | 1.00±0.10 | 0.50±0.05 | 0.35±0.05 | 0.20±0.10      | 0.25±0.10      |
| TSL0603 | 1.60±0.10 | 0.80±0.10 | 0.45±0.10 | 0.25±0.15      | 0.30±0.15      |
| TSL0805 | 2.00±0.10 | 1.25±0.10 | 0.55±0.10 | 0.35±0.20      | 0.40±0.20      |
| TSL1206 | 3.10±0.10 | 1.60±0.10 | 0.55±0.10 | 0.40±0.20      | 0.45±0.20      |
| TSL1210 | 3.10±0.10 | 2.50±0.15 | 0.55±0.10 | 0.50±0.20      | 0.50±0.20      |
| TSL2010 | 5.00±0.20 | 2.50±0.15 | 0.55±0.10 | 0.60±0.25      | 0.60±0.25      |
| TSL2512 | 6.30±0.20 | 3.20±0.20 | 0.55±0.10 | 0.65±0.25      | 0.65±0.25      |
| TSL0508 | 1.25±0.10 | 2.00±0.10 | 0.55±0.15 | 0.25±0.15      | 0.35±0.15      |
| TSL0612 | 1.60±0.15 | 3.20±0.20 | 0.55±0.15 | 0.30±0.20      | 0.50±0.20      |
| TSL1020 | 2.50±0.15 | 5.00±0.15 | 0.55±0.15 | 0.40±0.20      | 0.50±0.20      |
| TSL1225 | 3.20±0.20 | 6.30±0.20 | 0.55±0.15 | 0.60±0.25      | 0.80±0.25      |



# TSL Series Anti-Sulfur Low-Resistance Metal Film Chip Resistor Product Specifications

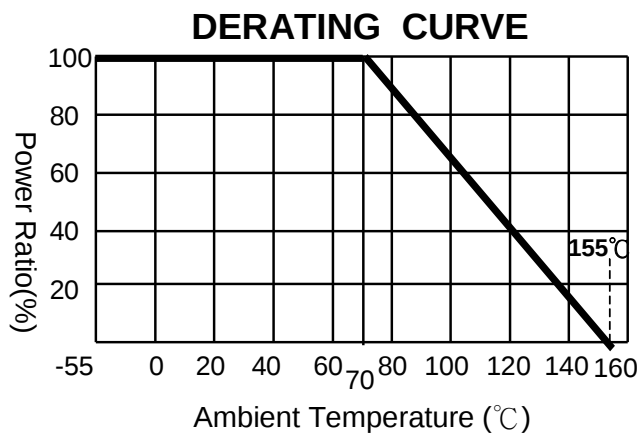
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## Performance Characteristics

### Power Derating Curve

The Operating Temperature Range: -55°C ~+155°C.

Power rating or current rating is in the case based on continuous full-load at ambient temperature of 70°C. For operation at ambient temperature in excess of 70°C, the load should be derated in accordance with figure of derating Curve.



### Rated Current

Resistance Range: <1Ω

Rated Current: The resistor shall have a DC continuous working current or a AC (rms) continuous working current at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

$$I = \sqrt{P/R}$$

I = Rated current (A)

P= Rated Power (W)

R= Resistance(Ω)

### Rated Voltage

Resistance Range: ≥1Ω

Rated Voltage: The resistor shall have a DC continuous working voltage or a RMS AC continuous working voltage at commercial-line frequency and wave form corresponding to the power rating, as determined formula as following:

$$V = \sqrt{P \times R}$$

V = Rated voltage (V)

P = Rated power (W)

R = Nominal resistance (Ω)



# TSL Series Anti-Sulfur Low-Resistance Metal Film Chip Resistor Product Specifications

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## Reliability Tests and Requirements

| Test Item                                     | Test Method                               | Procedure                                                                                                                                                      | Requirements                                |
|-----------------------------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| Temperature Coefficient of Resistance (T.C.R) | JIS-C-5201-1 4.8<br>IEC-60115-1 4.8       | At 25°C /+125°C, 25°C is the reference temperature                                                                                                             | Refer to Standard Electrical Specifications |
| Short Time Overload                           | JIS-C-5201-1 4.13<br>IEC-60115-1 4.13     | Standard power : 6.25 times rated power whichever is less for 5 seconds.<br>High power (2X/4X) : 5 times rated power whichever is less for 5 seconds.          | ±(1.0%+0.001Ω)                              |
| Insulation Resistance                         | JIS-C-5201-1 4.8<br>IEC-60115-1 4.8       | Apply 100VDC for 1 minute.                                                                                                                                     | ≥10GΩ                                       |
| Dielectric Withstanding Voltage               | JIS-C5201-1 4.7                           | 0805、1206、1210、2010、2512 applied 500VAC for 1 minute.<br>0402、0603 applied 300VAC for 1 minute.                                                                | No short or burned on the appearance.       |
| Solderability                                 | JIS-C-5201-1 4.17<br>IEC-60115-1 4.17     | 245±5°C for 3 seconds.                                                                                                                                         | >95% Coverage<br>No Visual damage           |
| Resistance to Soldering Heat                  | JIS-C-5201-1 4.18<br>IEC-60115-1 4.18     | 260±5°C for 10 seconds.                                                                                                                                        | ±(1.0%+0.001Ω)<br>No Visual damage          |
| Leaching                                      | JIS-C-5201-1 4.18<br>IEC-60068-2-58 8.2.1 | 260±5°C for 30 seconds.                                                                                                                                        | >95% Coverage<br>No Visual damage           |
| Rapid Change of Temperature                   | JIS-C-5201-1 4.19<br>IEC-60115-1 4.19     | -55°C to +155°C, 300 cycles                                                                                                                                    | ±(1.0%+0.001Ω)<br>No Visual damage          |
| Damp Heat with Load                           | JIS-C-5201-1 4.24<br>IEC-60115-1 4.24     | 40±2°C, 90~95% R.H. RCWV or Max. working current whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"                                             | ±(1.0%+0.001Ω)                              |
| Biased Humidity                               | MIL-STD-202<br>Method 103                 | 1,000 hours; 85°C / 85% RH, 10% of operating power. Measurement at 24±4 hours after test conclusion.                                                           | ±(0.5%+0.001Ω)                              |
| Load Life (Endurance)                         | JIS-C-5201-1 4.25<br>IEC-60115-1 4.25.1   | 70±2°C, Rated power, or Max. working current whichever is less for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF".                                                | ±(0.5%+0.001Ω)                              |
| High Temperature Exposure                     | JIS-C5201-1 4.25<br>IEC 60068-2-2         | At 155±5°C for 1000 hours.                                                                                                                                     | ±(1.0%+0.001Ω)                              |
| Resistance to Solvent                         | JIS-C-5201-1 4.29                         | The tested resistor be immersed into isopropyl alcohol of 20~25°C for 60 secs.<br>Then the resistor is left in the room for 48 hrs.                            | ±(1.0%+0.001Ω)<br>No Visual damage          |
| Terminal Strength                             | JIS-C5201-1 4.32<br>AEC Q200-006          | Pressurizing force for 10 seconds<br>0402 / 0603 : 8N ; 0805 / 0508 and above : 17.7N                                                                          | No broken                                   |
| Bending Strength                              | JIS-C-5201-1 4.33<br>IEC-60115-1 4.33     | Bending once for 5 seconds<br>Bending once for 5 seconds<br>D : 0402 / 0603 / 0805 = 5mm<br>1206 / 1210 / 0508 / 0612 = 3mm<br>2010 / 2512 / 1020 / 1225 = 2mm | ±(1.0%+0.001Ω)<br>No Visual damage          |
| Sulfur Test (FoS)                             | ASTM B809-95<br>ANSI/EIA-977              | 105±2°C, no power rating for 1000 hrs.                                                                                                                         | ±(2.0%+0.001Ω)                              |

- Temperature Coefficient of Resistance test to - 55 °C is available on request
- We can also provide AEC-Q200 test reports if required by customers.



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## ■ Marking



0201、0402: no marking



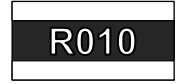
0603: 3 digits



0805~2512: 4 digits



0508 : no marking



0612~1225: 4 digits

### ■ TSL0402、TSL0508 : No marking

### ■ TSL0603 : 3 digit marking

#### 1. For E-24 values:

| Resistance value | Code       | Example     |
|------------------|------------|-------------|
| 50mΩ ~ 99mΩ      | <b>0XX</b> | 068 = 68mΩ  |
| 100mΩ ~ 990mΩ    | <b>RXX</b> | R68 = 680mΩ |
| 1Ω ~ 9.9Ω        | <b>XXR</b> | 6R8 = 6.8Ω  |
| 10Ω              | <b>10R</b> | 10R = 10Ω   |

|      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| E-24 | 10 | 11 | 12 | 13 | 15 | 16 | 18 | 20 | 22 | 24 | 27 | 30 | 33 | 36 | 39 | 43 | 47 | 51 | 56 | 62 | 68 | 75 | 82 | 91 |
|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|

#### 2. For E-96 values: excluding values 10/11/13/15/20/75 of E-24 series.

##### ● Standard E-96 Values and 0603 Resistance Codes

|         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| R-Value | 100 | 102 | 105 | 107 | 110 | 113 | 115 | 118 | 121 | 124 | 127 | 130 | 133 | 137 | 140 | 143 | 147 | 150 | 154 | 158 | 162 | 165 | 169 | 174 |
| Code    | 01  | 02  | 03  | 04  | 05  | 06  | 07  | 08  | 09  | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 21  | 22  | 23  | 24  |
| R-Value | 178 | 182 | 187 | 191 | 196 | 200 | 205 | 210 | 215 | 221 | 226 | 232 | 237 | 243 | 249 | 255 | 261 | 267 | 274 | 280 | 287 | 294 | 301 | 309 |
| Code    | 25  | 26  | 27  | 28  | 29  | 30  | 31  | 32  | 33  | 34  | 35  | 36  | 37  | 38  | 39  | 40  | 41  | 42  | 43  | 44  | 45  | 46  | 47  | 48  |
| R-Value | 316 | 324 | 332 | 340 | 348 | 357 | 365 | 374 | 383 | 392 | 402 | 412 | 422 | 432 | 442 | 453 | 464 | 475 | 487 | 499 | 511 | 523 | 536 | 549 |
| Code    | 49  | 50  | 51  | 52  | 53  | 54  | 55  | 56  | 57  | 58  | 59  | 60  | 61  | 62  | 63  | 64  | 65  | 66  | 67  | 68  | 69  | 70  | 71  | 72  |
| R-Value | 562 | 576 | 590 | 604 | 619 | 634 | 649 | 665 | 681 | 698 | 715 | 732 | 750 | 768 | 787 | 806 | 825 | 845 | 866 | 887 | 909 | 931 | 953 | 976 |
| Code    | 73  | 74  | 75  | 76  | 77  | 78  | 79  | 80  | 81  | 82  | 83  | 84  | 85  | 86  | 87  | 88  | 89  | 90  | 91  | 92  | 93  | 94  | 95  | 96  |

##### ● E-96 Multiplier Code

|            |                 |                 |                 |                 |                 |                 |                 |                 |                  |                  |                  |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Code       | A               | B               | C               | D               | E               | F               | G               | H               | X                | Y                | Z                |
| Multiplier | 10 <sup>0</sup> | 10 <sup>1</sup> | 10 <sup>2</sup> | 10 <sup>3</sup> | 10 <sup>4</sup> | 10 <sup>5</sup> | 10 <sup>6</sup> | 10 <sup>7</sup> | 10 <sup>-1</sup> | 10 <sup>-2</sup> | 10 <sup>-3</sup> |

0603 3 digits coding formula for E-96 values as following:

CODING FORMULA

XX      X  
↑      ↙  
Resistance Code      Multiplier Code

Example: 499 mΩ =  $\frac{499}{100} \times 10^{-3} \Omega = 68Z$



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### ■ TSL0805 ~ TSL2512 : 4 digit marking

First 3 digits are the significant figures, the 4th digit is the multiplier. "R"= decimal point.

Examples:

| Resistance value                         | Code        | Example      |
|------------------------------------------|-------------|--------------|
| 50mΩ ~ 99mΩ<br>(only for 0805,1206,1210) | <b>R0XX</b> | R068 = 68mΩ  |
| 100mΩ ~ 990mΩ                            | <b>RXXX</b> | R680 = 680mΩ |
| 1Ω ~ 9.9Ω                                | <b>XRXX</b> | 6R80 = 6.8Ω  |
| 10Ω                                      | <b>10R0</b> | 10R0 = 10Ω   |

### ■ TSL0612 ~ TSL1225 : 4 digit marking

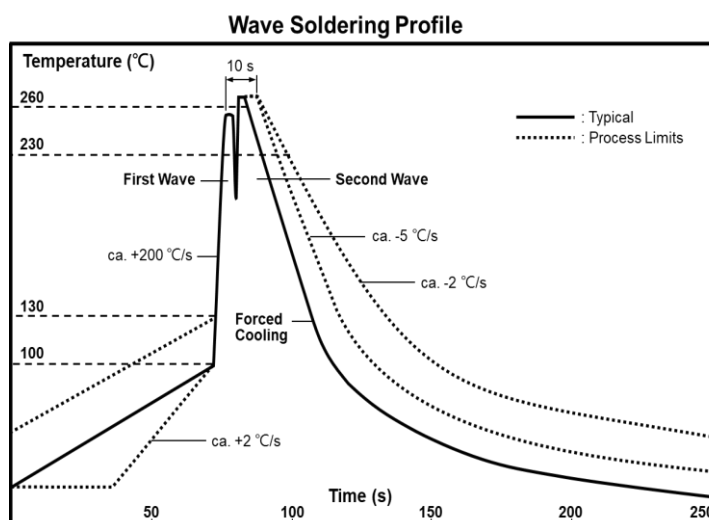
First 3 digits are the significant figures, the 4th digit is the multiplier. "R"= decimal point.

Examples:

| Resistance value | Code        | Example       |
|------------------|-------------|---------------|
| 10 mΩ ~ 99 mΩ    | <b>R0XX</b> | R010 = 10 mΩ  |
| 100 mΩ ~ 999 mΩ  | <b>RXXX</b> | R100 = 100 mΩ |
| 1Ω ~ 2Ω          | <b>XRXX</b> | 1R80 = 1.8Ω   |

## ■ Recommended Customer Soldering Parameters

### ■ Wave solder Temperature condition





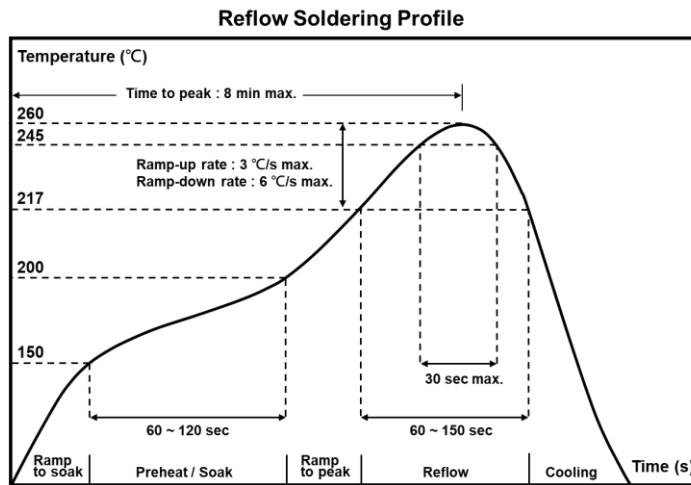
# TSL Series Anti-Sulfur Low-Resistance Metal Film Chip Resistor Product Specifications

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## Solder reflow Temperature condition



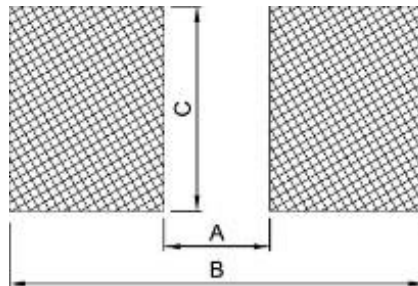
**Rework temperature ( hot air equipment ) : 350°C, 3~5seconds**

## Recommended reflow methods

IR, vapor phase oven, hot air oven

If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.

## Recommend Land Pattern Design



## Dimensions

Unit: mm

| Type    | A    | B    | C    |
|---------|------|------|------|
| TSL0402 | 0.50 | 1.60 | 0.70 |
| TSL0603 | 0.80 | 2.40 | 1.00 |
| TSL0805 | 1.30 | 2.90 | 1.45 |
| TSL1206 | 2.20 | 4.20 | 1.80 |
| TSL1210 | 2.00 | 4.40 | 2.70 |
| TSL2010 | 3.80 | 6.60 | 2.70 |
| TSL2512 | 4.90 | 8.10 | 3.40 |
| TSL0508 | 0.40 | 1.80 | 2.00 |
| TSL0612 | 0.50 | 2.60 | 3.20 |
| TSL1020 | 1.00 | 4.05 | 5.50 |
| TSL1225 | 1.20 | 5.20 | 7.00 |



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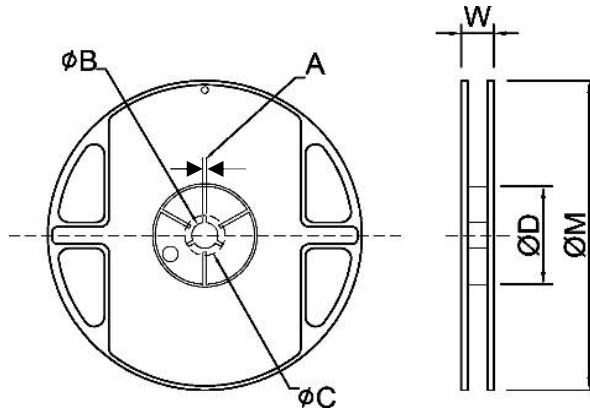
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## Appendix For SMD Chip Resistor

### Packaging Information

#### Reel Dimensions



#### Dimensions

Unit: mm

| Type    | Size |          | A             | $\phi B$       | $\phi C$     | $\phi D$     | W              | $\phi M$      |
|---------|------|----------|---------------|----------------|--------------|--------------|----------------|---------------|
| TSL0402 | 7"   | 10K/Reel | 2.0 $\pm$ 0.5 | 13.5 $\pm$ 1.0 | 21 $\pm$ 1.0 | 60 $\pm$ 1.0 | 11.5 $\pm$ 2.0 | 178 $\pm$ 2.0 |
| TSL0603 | 7"   | 5K/Reel  | 2.0 $\pm$ 0.5 | 13.5 $\pm$ 1.0 | 21 $\pm$ 1.0 | 60 $\pm$ 1.0 | 11.5 $\pm$ 2.0 | 178 $\pm$ 2.0 |
| TSL0805 | 7"   | 5K/Reel  | 2.0 $\pm$ 0.5 | 13.5 $\pm$ 1.0 | 21 $\pm$ 1.0 | 60 $\pm$ 1.0 | 11.5 $\pm$ 2.0 | 178 $\pm$ 2.0 |
| TSL1206 | 7"   | 5K/Reel  | 2.0 $\pm$ 0.5 | 13.5 $\pm$ 1.0 | 21 $\pm$ 1.0 | 60 $\pm$ 1.0 | 11.5 $\pm$ 2.0 | 178 $\pm$ 2.0 |
| TSL1210 | 7"   | 5K/Reel  | 2.0 $\pm$ 0.5 | 13.5 $\pm$ 1.0 | 21 $\pm$ 1.0 | 60 $\pm$ 1.0 | 11.5 $\pm$ 2.0 | 178 $\pm$ 2.0 |
| TSL2010 | 7"   | 4K/Reel  | 2.0 $\pm$ 0.5 | 13.5 $\pm$ 1.0 | 21 $\pm$ 1.0 | 60 $\pm$ 1.0 | 16.0 $\pm$ 2.0 | 178 $\pm$ 2.0 |
| TSL2512 | 7"   | 4K/Reel  | 2.0 $\pm$ 0.5 | 13.5 $\pm$ 1.0 | 21 $\pm$ 1.0 | 60 $\pm$ 1.0 | 16.0 $\pm$ 2.0 | 178 $\pm$ 2.0 |
| TSL0508 | 7"   | 5K/Reel  | 2.0 $\pm$ 0.5 | 13.5 $\pm$ 1.0 | 21 $\pm$ 1.0 | 60 $\pm$ 1.0 | 11.5 $\pm$ 2.0 | 178 $\pm$ 2.0 |
| TSL0612 | 7"   | 5K/Reel  | 2.0 $\pm$ 0.5 | 13.5 $\pm$ 1.0 | 21 $\pm$ 1.0 | 60 $\pm$ 1.0 | 11.5 $\pm$ 2.0 | 178 $\pm$ 2.0 |
| TSL1020 | 7"   | 4K/Reel  | 2.0 $\pm$ 0.5 | 13.5 $\pm$ 1.0 | 21 $\pm$ 1.0 | 60 $\pm$ 1.0 | 16.0 $\pm$ 2.0 | 178 $\pm$ 2.0 |
| TSL1225 | 7"   | 4K/Reel  | 2.0 $\pm$ 0.5 | 13.5 $\pm$ 1.0 | 21 $\pm$ 1.0 | 60 $\pm$ 1.0 | 16.0 $\pm$ 2.0 | 178 $\pm$ 2.0 |



# TSL Series Anti-Sulfur Low-Resistance Metal Film Chip Resistor Product Specifications

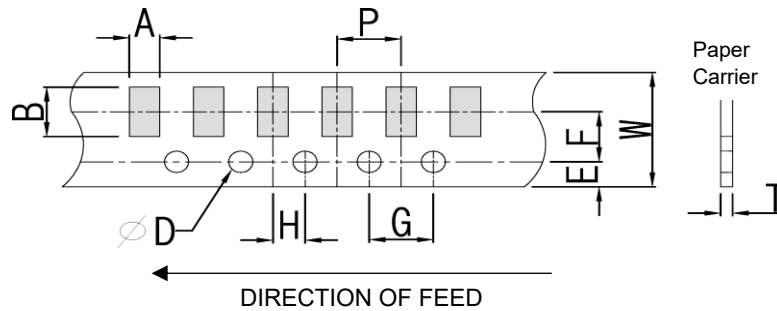
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## ■ Packaging Information

### ■ Tapping Specifications

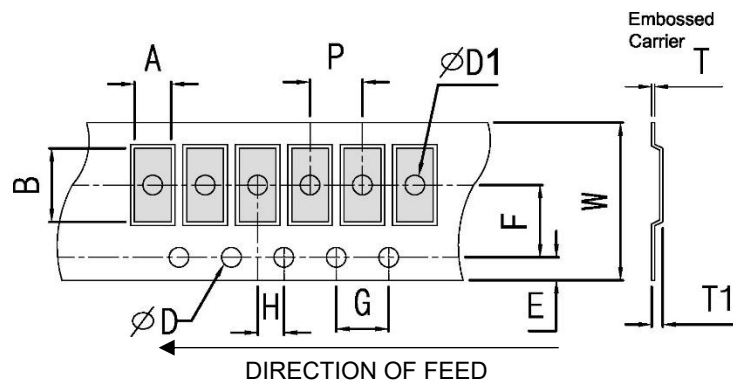


### ■ Dimensions

Unit: mm

| Packaging  | Type | A         | B         | W       | E        | F        | G       | H        | T        | ΦD                                 | P       |
|------------|------|-----------|-----------|---------|----------|----------|---------|----------|----------|------------------------------------|---------|
| Paper Type | 0201 | 0.45±0.1  | 0.75±0.1  | 8.0±0.2 | 1.75±0.1 | 3.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.35±0.1 | 1.50 <sup>+0.1</sup> <sub>-0</sub> | 2.0±0.1 |
|            | 0402 | 0.7±0.1   | 1.20±0.1  | 8.0±0.2 | 1.75±0.1 | 3.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.45±0.1 |                                    | 2.0±0.1 |
|            | 0603 | 1.05±0.2  | 1.80±0.2  | 8.0±0.2 | 1.75±0.1 | 3.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.60±0.1 |                                    | 4.0±0.1 |
|            | 0805 | 1.55±0.2  | 2.30±0.2  | 8.0±0.2 | 1.75±0.1 | 3.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.75±0.1 |                                    | 4.0±0.1 |
|            | 1206 | 1.90±0.2  | 3.05±0.2  | 8.0±0.2 | 1.75±0.1 | 3.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.75±0.1 |                                    | 4.0±0.1 |
|            | 1210 | 2.85±0.2  | 3.05±0.2  | 8.0±0.2 | 1.75±0.1 | 3.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.75±0.1 |                                    | 4.0±0.1 |
|            | 0508 | 1.50±0.15 | 2.25±0.15 | 8.0±0.2 | 1.75±0.1 | 3.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.75±0.1 |                                    | 4.0±0.1 |
|            | 0612 | 2.85±0.2  | 3.05±0.2  | 8.0±0.2 | 1.75±0.1 | 3.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.75±0.1 |                                    | 4.0±0.1 |

### ■ Embossed Dimensions



### ■ Dimensions

Unit: mm

| Packaging     | Type | A        | B        | W      | E        | F        | G       | H        | T        | ΦD                                 | ΦD1      | T1        | P       |
|---------------|------|----------|----------|--------|----------|----------|---------|----------|----------|------------------------------------|----------|-----------|---------|
| Embossed Type | 2010 | 2.80±0.2 | 5.60±0.2 | 12±0.1 | 1.75±0.1 | 5.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.23±0.1 | 1.50 <sup>+0.1</sup> <sub>-0</sub> | 1.50±0.1 | 0.85±0.15 | 4.0±0.1 |
|               | 2512 | 3.40±0.2 | 6.70±0.2 | 12±0.1 | 1.75±0.1 | 5.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.23±0.1 |                                    | 1.50±0.1 | 0.85±0.15 | 4.0±0.1 |
|               | 1020 | 2.80±0.2 | 5.60±0.2 | 12±0.1 | 1.75±0.1 | 5.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.23±0.1 |                                    | 1.50±0.1 | 0.85±0.15 | 4.0±0.1 |
|               | 1225 | 3.40±0.2 | 6.70±0.2 | 12±0.1 | 1.75±0.1 | 5.5±0.05 | 4.0±0.1 | 2.0±0.05 | 0.23±0.1 |                                    | 1.50±0.1 | 0.85±0.15 | 4.0±0.1 |

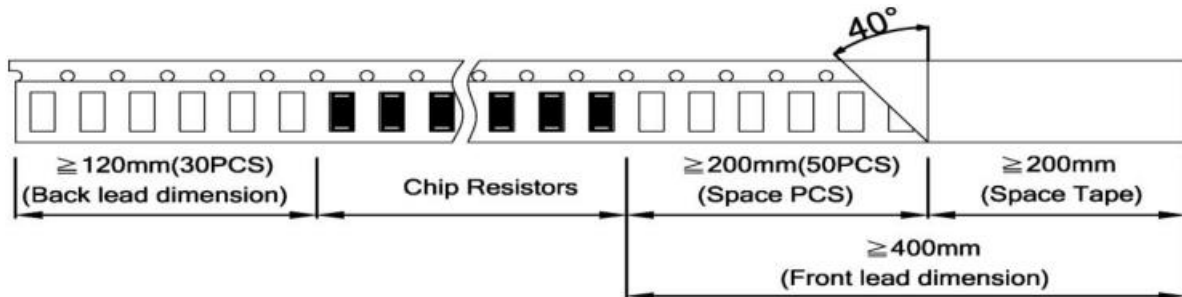


# **TSL Series Anti-Sulfur Low-Resistance Metal Film Chip Resistor Product Specifications**

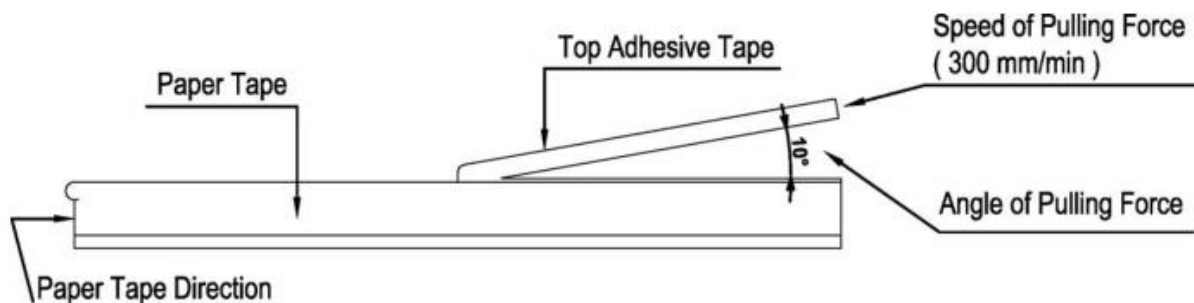
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## ■ Packing Material Data / Storage Data

### ■ Front & Back Lead Dimensions

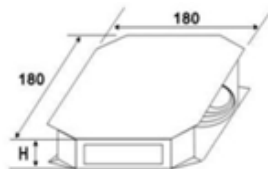


### ■ Top Adhesive Peel Off Strength : 10~70g

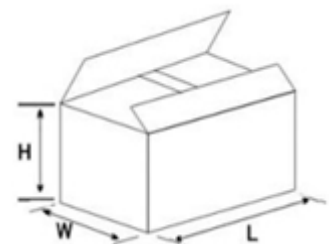


### ■ Package

| Inner Box Size |            |
|----------------|------------|
| Reel           | Size H(mm) |
| 1              | 13         |
| 2              | 24         |
| 3              | 36         |
| 5              | 60         |
| 10             | 113        |



| External Box Size |             |            |             |
|-------------------|-------------|------------|-------------|
| Contain (Kpcs)    | Length (mm) | Width (mm) | Height (mm) |
| 25K               | 180         | 180        | 60          |
| 50K               | 180         | 180        | 110         |
| 150K              | 430         | 200        | 200         |
| 300K              | 400         | 400        | 200         |



### ■ Storage Data :

Storage time at the environment temp:  $25\pm 5^\circ\text{C}$  & humidity:  $60\pm 20\%$  is valid for one year from the date of delivery.