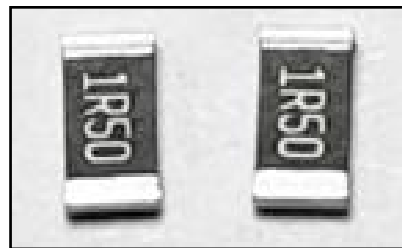


■金属膜厚膜片式固定电阻器(1Ω~10Ω)

Metal Film Thick Film Chip Fixed Resistor(1Ω~10Ω)



◆特征 Features

- * 体积小，重量轻
- * 装配成本低，并与自动贴装设备匹配
- * 阻值范围：1Ω~10Ω
- * 电性能稳定，可靠性高
- * 符合 RoHS 指令要求
- * 符合无卤素要求
- * 整体无铅
- * 潮敏等级：MSL 1
- * Miniature and light weight
- * Low assembly cost, suit for automatic SMT equipment
- * Resistance values from 1Ω to 10Ω
- * Stable electrical capability, high reliability
- * Compliant with RoHS directive
- * Halogen free requirement
- * Total lead free without RoHS exemption
- * MSL Class: MSL 1

◆应用领域 Application

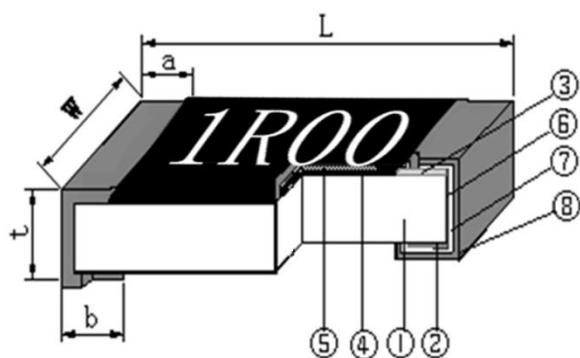
*广泛应用于家电、计算机、通讯、工业自动化及消费类电子产品等领域。

Widely used in home appliances, computers, communications, industrial automation and consumer electronics etc.

◆型号表示法 Part Number

| RT | F | 06 | K | 1R00 | F | T | 13 | G | | | | | | | |
|---|----------------------------|---------------------|--------------------|------------|------------------------|----------------|--|---------------------------------------|------------------------------|------------|---------------------------|-------------|--------------------------------|------------|--------------------------|
| ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | | | | | | | |
| 产品代号 Product Code | 额定功率代号 Rated Power Code | | 封装尺寸 Dimensions | | 电阻温度系数代号 T.C.R Code | | 电阻值代号 Resistance ValueCode | 阻值误差精度代号 Resistance Tolerance Code | 包装方式代号 Packing Style Code | | 卷盘方式代号 Reel Style Code | | 无铅化等级代号 Lead-free Lead code | | |
| 金属膜厚膜片式固定电阻器(1Ω~10Ω) Metal Film Thick Film Chip Fixed Resistor(1Ω~10Ω) | 代号 Code | 额定功率 Rated Power | 代号 Code | 型号 Type | 代号 Code | T.C.R PPM/℃ | 三位数：前二位表示有效数字，第三位表示有效数字后零的个数。 Three digits:The first two digits are significant figures and the third one denotes number of zeros . 四位数：前三位表示有效数字，第四位表示有效数字后零的个数。 Four digits:The first three digits are significant figures and the four one denotes number of zeros . 单位Ω：小数点用 R 表示； UnitsΩ: Decimalpoint should beExpressedby“R”； 例如 Example: 5R6=5.6Ω 5R10=5.10Ω | 代号 Code | 误差精度 Tolerance | 代号 Code | 包装方法 Packing Style | 代号 Code | 卷盘方式 Reel Style | 代号 Code | 无铅化等级 Lead-Free level |
| | E | 1/8 | 05 | 0805 | H | ±50 | | F | ±1% | | | 空位 Blank | 7 英寸 卷盘 7inch Reel | | |
| | F | 1/4 | 06 | 1206 | | | | | | K | ±100 | | | T | 编带包装 Tape & Reel |
| | R | 1/3 | 1210 | 1210 | W | ±200 | | J | ±5% | | | | | | |
| | H | 3/4 | 10 | 2010 | | | | | | | | | | | |
| | J | 1 | 12 | 2512 | | | | | | | | | | | |

◆产品结构 Construction



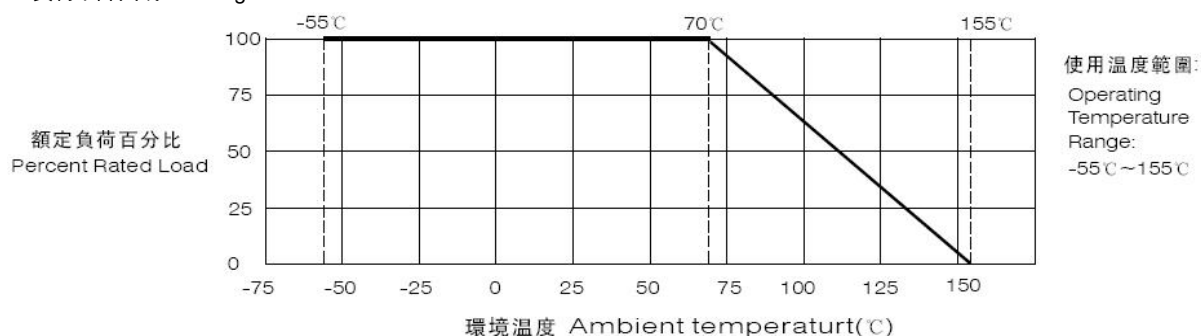
| | |
|---|-------------------------|
| ① | 陶瓷基板 Ceramic Substrate |
| ② | 背电极 Bottom Electrode |
| ③ | 面电极 Top Electrode |
| ④ | 电阻体 Resistor Layer |
| ⑤ | 保护 Top Overcoat |
| ⑥ | 端电极 Edge Electrode |
| ⑦ | 中间电极 Barrier Layer |
| ⑧ | 外部电极 External Electrode |

◆规格尺寸 Dimensions

| 型号 Type | 尺寸 Dimensions(mm) | | | | |
|------------|-------------------|-----------|-----------|-----------|-----------|
| | L | W | t | a | b |
| 0805 | 2.00±0.10 | 1.25±0.15 | 0.50±0.10 | 0.30±0.20 | 0.40±0.20 |
| 1206 | 3.20±0.20 | 1.60±0.15 | 0.55±0.10 | 0.50±0.20 | 0.50±0.20 |
| 1210 | 3.20±0.20 | 2.50±0.20 | 0.55±0.10 | 0.50±0.20 | 0.50±0.20 |
| 2010 | 5.00±0.20 | 2.50±0.20 | 0.55±0.10 | 0.60±0.20 | 0.60±0.20 |
| 2512 | 6.30±0.20 | 3.20±0.20 | 0.55±0.10 | 0.60±0.20 | 0.60±0.20 |

◆产品特性曲线图 Product Characteristic Curve

*负荷下降曲线 Derating Curve



注：当电阻使用的环境温度超过 70℃ 时，其额定负荷（额定电流）按上述曲线下降。

Note: For resistors operated in ambient over 70℃, rated load (rated current) shall be derated in accordance with the above figure.

◆电性能参数 Electrical Performance Parameters

| 型号 Type | 70℃下额定功率 Rated Power at 70℃ (W) | 元件极限电压 Limiting Element Voltage (V) | 最大过负荷电压 Max. Overload Voltage (V) | 阻值范围 Resistance Range (Ω) |
|------------|---|--|--------------------------------------|------------------------------|
| 0805 | E: 1/8 | 1.12 | 2.80 | 1≤R≤10 |
| 1206 | F: 1/4 | 1.58 | 3.95 | 1≤R≤10 |
| 1210 | R: 1/3 | 1.83 | 4.56 | 1≤R≤10 |
| 2010 | H: 3/4 | 2.75 | 6.85 | 1≤R≤10 |
| 2512 | J: 1 | 3.16 | 7.91 | 1≤R≤10 |
| 注 Note | 1、电流为直流或交流有效值。Current of DC or AC RMS value. 2、 $E = \sqrt{P \times R}$ 或元件极限电压两者中的较小值； E: 额定电压 Rated voltage(V); P: 额定功率 Rated power(W); 3、R: 标称阻值 Normal resistance(Ω) | | | |

◆电性能参数 Electrical Performance Parameters

| 型号 Type | 阻值范围 Resistance Range (Ω) | 精度 Tolerance | 电阻温度系数 T.C.R (ppm/°C) | |
|------------|------------------------------|------------------------|-----------------------|--------|
| | | | T.C.R (ppm/°C) | 代号Code |
| 0805 | $1 \leq R \leq 10$ | $\pm 1\%$ $\pm 5\%$ | ± 100 | K |
| 1206 | $1 \leq R \leq 10$ | $\pm 1\%$ $\pm 5\%$ | ± 100 | K |
| 1210 | $1 \leq R \leq 10$ | $\pm 1\%$ $\pm 5\%$ | ± 100 | K |
| 2010 | $1 \leq R \leq 10$ | $\pm 1\%$ $\pm 5\%$ | ± 100 | K |
| 2512 | $1 \leq R \leq 10$ | $\pm 1\%$ $\pm 5\%$ | ± 100 | K |

◆可靠性测试方法 Reliability Test Method

| 项目 Item | 标准 Specifications | 测试方法 (IEC 60115-1) Test Methods (IEC 60115-1) |
|--|---|---|
| 可焊性 Solderability | 可焊面积 $\geq 95\%$ 95% Cover Min | IEC 60115-1 11.1 245°C $\pm 5^\circ$ C 锡槽, 保持3s ± 0.3 s。 Lead-free solder bath at 245°C $\pm 5^\circ$ C for 3s ± 0.3 s. |
| 耐焊接热 Resistance to Soldering Heat | 无可见损伤 No mechanical damage $\Delta R \leq \pm(1.0\%R + 0.05\Omega)$ | IEC 60115-1 11.2 270°C $\pm 5^\circ$ C 锡槽, 保持10s ± 1 s。 Lead-free solder bath at 270°C $\pm 5^\circ$ C for 10s ± 1 s. |
| 基板弯曲试验 Substrate Bending Test | 无可见损伤 No mechanical damage $\Delta R \leq \pm(1.0\%R + 0.05\Omega)$ | IEC 60115-1 9.8 弯曲距离(Bending distance): 0805: 5mm; 1206、1210: 4mm; 2010、2512: 2mm。 保持时间(Duration): 60s ± 5 s. |
| 剪切力试验 Shear Test | 外观无可见损伤 No mechanical damage | IEC 60115-1 9.7 施加力(Applying force): 0805: 9N; 1206、1210: 25N; 2010、2512: 45N。 保持时间(Duration): 10s ± 1 s. |
| 电阻温度系数 T.C.R | 在规定值内 Within specified T.C.R | IEC 60115-1 6.2 +20°C/-55°C/+20°C/+125°C/+20°C |
| 温度快速变化 Rapid Change of Temperature | 无可见损伤 No mechanical damage 1%: $\Delta R \leq \pm(0.5\%R + 0.05\Omega)$ 5%: $\Delta R \leq \pm(1.0\%R + 0.05\Omega)$ | IEC 60115-1 10.1 -55°C(30 分钟)~常温(5 分钟)~155°C(30 分钟) 300 个循环。 -55°C(30min)~normal temperature(5min)~155°C(30min) 300 cycles. |
| 短时间过负载 Short Time Overload | 无可见损伤 No mechanical damage 1%: $\Delta R \leq \pm(1.0\%R + 0.05\Omega)$ 5%: $\Delta R \leq \pm(2.0\%R + 0.05\Omega)$ | IEC 60115-1 8.1 2.5 倍额定电压, 持续 5 秒。 2.5 times rated voltage for 5s. |

| 项目 Item | 标准 Specifications | 测试方法 (IEC 60115-1) Test Methods (IEC 60115-1) |
|---|---|---|
| 稳态湿热 Damp Heat Steady State | 无可见损伤 No mechanical damage 1%: $\Delta R \leq \pm(1.0\%R + 0.05\Omega)$ 5%: $\Delta R \leq \pm(2.0\%R + 0.05\Omega)$ | IEC 60115-1 10.4 40℃±2℃, 93%RH±3%RH, 1000 小时, 额定电压, 通 1.5 小时/断 0.5 小时. 40℃±2℃, 93%RH±3%RH, 1000h, rated voltage or limiting element voltage whichever is lower for 1.5h ON/0.5h OFF. |
| 70℃ 耐久性 Endurance at 70℃ | 无可见损伤 No mechanical damage 1%: $\Delta R \leq \pm(1.0\%R + 0.05\Omega)$ 5%: $\Delta R \leq \pm(2.0\%R + 0.05\Omega)$ | IEC 60115-1 7.1 70℃±2℃, 1000 小时, 额定电压, 通 1.5 小时/断 0.5 小时。 70℃±2℃, 1000h, rated voltage or limiting element voltage whichever is lower for 1.5h ON/0.5h OFF. |
| 上限类别温度耐久性 Endurance at Upper Category Temperature | 无可见损伤 No mechanical damage 1%: $\Delta R \leq \pm(1.0\%R + 0.05\Omega)$ 5%: $\Delta R \leq \pm(2.0\%R + 0.05\Omega)$ | IEC 60115-1 7.3 155℃±2℃, 1000h. |
| 低温负载 Operation at Low Temperature | 无可见损伤 No mechanical damage 1%: $\Delta R \leq \pm(1.0\%R + 0.05\Omega)$ 5%: $\Delta R \leq \pm(2.0\%R + 0.05\Omega)$ | IEC 60115-1 10.2 -55℃±5℃, 无负载 1 小时, 额定电压 45 分钟, 无负载 15 分钟。 -55℃±5℃, 1h without load, rated current or limiting element current whichever is lower for 45min, 15min without load. |
| 绝缘电阻 Insulation Resistance | 1000MΩ Min | IEC 60115-1 12.1 在电极与基片间施加 100V±15V 直流电压, 保持 1 分钟, 然后测绝缘电阻值。 Apply DC 100V±15V between substrate and terminations for 1min, then check insulation resistance. |
| 耐电压 Voltage Proof | 无击穿或飞弧 No breakdown or flashover | IEC 60115-1 12.2 在电极与基片间以大约 100V/s 的速率施加有效值为最大过负荷电压的交流电压, 保持 60s±5s. Apply max. overload voltage of AC RMS at a rate of approximately 100V/s between substrate and terminations for 60s±5s. |
| 耐溶剂 Component Solvent Resistance | 无可见损伤 No mechanical damage $\Delta R \leq \pm(1.0\%R + 0.05\Omega)$ | IEC 60115-1 11.3 异丙醇 (IPA), 23℃±5℃, 浸 10 小时。 Iso-propyl alcohol (IPA), 23℃±5℃, 10h. |

◆包装 Packaging

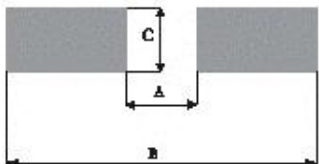
包装方式见附录 Packaging can refer to the Appendix.

适用范围： 厚膜类电阻及薄膜类电阻 Scope of application: Thick-film resistors and thin-film resistors

附录 Appendix I

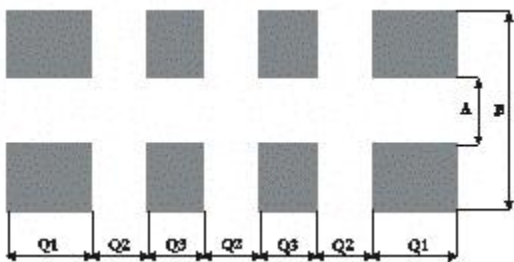
◆推荐焊盘尺寸 Recommend Solder Pad Size

* 片式固定电阻器Chip fixed resistor单位unit: mm



| 厚膜电阻及薄膜电阻 Thick Film Resistor and Thin Film Resistor | | | |
|---|-----------|-----------|-----------|
| 型号Type | A | B | C |
| 01005 | 0.17±0.03 | 0.60±0.03 | 0.22±0.03 |
| 0201 | 0.23±0.05 | 0.84±0.05 | 0.38±0.05 |
| 0402 | 0.45±0.05 | 1.45±0.05 | 0.60±0.05 |
| 0603 | 0.80±0.05 | 2.50±0.05 | 0.95±0.05 |
| 0805 | 1.05±0.1 | 3.25±0.1 | 1.40±0.1 |
| 1206 | 1.90±0.1 | 4.50±0.1 | 1.75±0.1 |
| 1210 | 2.00±0.1 | 4.60±0.1 | 2.70±0.1 |
| 2010 | 3.50±0.1 | 6.50±0.1 | 2.70±0.1 |
| 2512(1W、1.5W) | 4.80±0.1 | 7.80±0.1 | 3.40±0.1 |
| 2512(2W) | 2.70±0.1 | 7.80±0.1 | 3.60±0.1 |
| 0508 | 0.60±0.1 | 2.20±0.1 | 2.00±0.1 |
| 0612 | 0.60±0.1 | 2.90±0.1 | 3.30±0.1 |
| 1225 | 1.40±0.1 | 4.50±0.1 | 6.40±0.1 |

* 厚膜片式网络电阻器Thick film chip network resistor



单位unit: mm

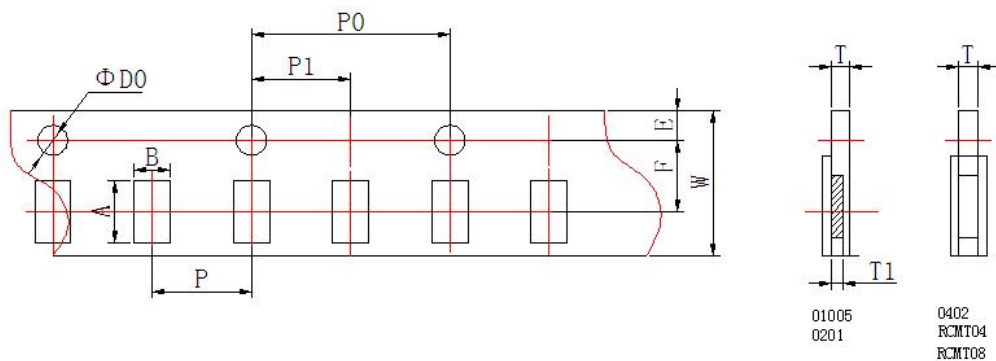
| 型号Type | A | B | Q1 | Q2 | Q3 |
|---------------|---|-----------|-----------|-----------|-----------|
| 2R01 | 0.30±0.05 | 0.90±0.05 | 0.30±0.05 | 0.20±0.05 | --- |
| 4R01 | 0.30±0.05 | 0.90±0.05 | 0.20±0.05 | 0.20±0.05 | 0.20±0.05 |
| 2R02 | 0.35±0.05 | 1.25±0.05 | 0.65±0.05 | 0.20±0.05 | 0.30±0.05 |
| 4R02 | 0.38±0.05 | 1.60±0.05 | 0.40±0.05 | 0.20±0.05 | --- |
| 4R03 | 0.80±0.05 | 2.70±0.05 | 0.60±0.05 | 0.40±0.05 | 0.40±0.05 |
| 备注 Remarks | 1、2R01型号包含including:RC-MY04、RCMY04、RH-MY04、RHMY04 2、4R01型号包含including:RC-MY08、RCMY08、RH-MY08、RHMY08 3、2R02型号包含including:RC-MT04、RCMT04、RH-MT04、RHMT04 4、4R02型号包含including:RC-MT08、RCMT08、RH-MT08、RHMT08 5、4R03型号包含including:RC-ML08、RCML08、RH-ML08、RHML08 6、上述型号说明适用于附录中所有型号。 The above description applies to all types in the appendix. | | | | |

◆包装 Packaging

* 纸带编带 Paper Taping

适用于01005、0201、0402、2R01、4R01、2R02、4R02:

For 01005、0201、0402、2R01、4R01、2R02、4R02:



单位unit: mm

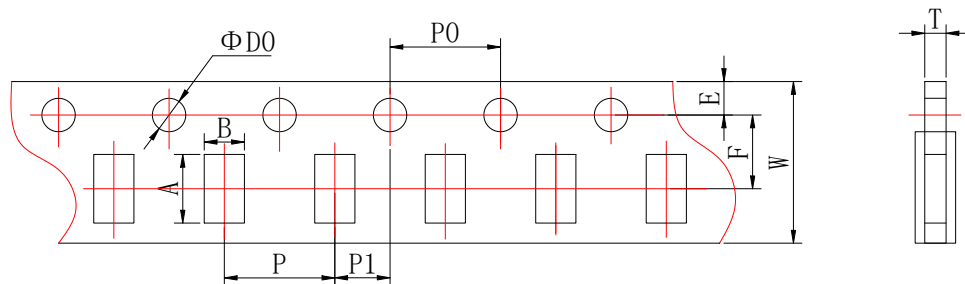
| 型号Type | A | B | W | F | E |
|--------|-----------|-----------|-----------|-----------|-----------|
| 01005 | 0.45±0.02 | 0.25±0.02 | 8.00±0.02 | 3.50±0.05 | 1.75±0.05 |
| 0201 | 0.70±0.10 | 0.40±0.10 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 |
| 0402 | 1.15±0.10 | 0.65±0.10 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 |
| 2R01 | 0.97±0.05 | 0.77±0.05 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 |
| 4R01 | 1.57±0.05 | 0.77±0.05 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 |
| 2R02 | 1.45±0.10 | 1.20±0.10 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 |
| 4R02 | 2.20±0.10 | 1.20±0.10 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 |

单位unit: mm

| 型号Type | P | P0 | P1 | ΦD0 | T1 | T |
|--------|-----------|-----------|-----------|-----------|-----------|-----------|
| 01005 | 2.00±0.05 | 4.00±0.10 | 2.00±0.05 | 1.55±0.02 | 0.17±0.02 | 0.31±0.02 |
| 0201 | 2.00±0.05 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 0.28±0.04 | 0.42±0.05 |
| 0402 | 2.00±0.05 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | / | 0.44±0.05 |
| 2R01 | 2.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | / | 0.60±0.10 |
| 4R01 | 2.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | / | 0.60±0.10 |
| 2R02 | 2.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | / | 0.60±0.10 |
| 4R02 | 2.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | / | 0.60±0.10 |

适用于0603、0805、0508、1206、0612、1210、4R03:

For 0603、0805、0508、1206、0612、1210、4R03:



单位unit: mm

| 型号Type | A | B | W | F | E |
|--------|-----------|-----------|-----------|-----------|-----------|
| 0603 | 1.80±0.10 | 1.05±0.10 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 |
| 0805 | 2.30±0.10 | 1.50±0.10 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 |
| 0508 | 2.30±0.10 | 1.50±0.10 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 |
| 1206 | 3.50±0.20 | 1.90±0.20 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 |
| 0612 | 3.50±0.20 | 1.90±0.20 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 |
| 1210 | 3.50±0.20 | 2.80±0.20 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 |
| 4R03 | 3.50±0.20 | 1.90±0.20 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 |

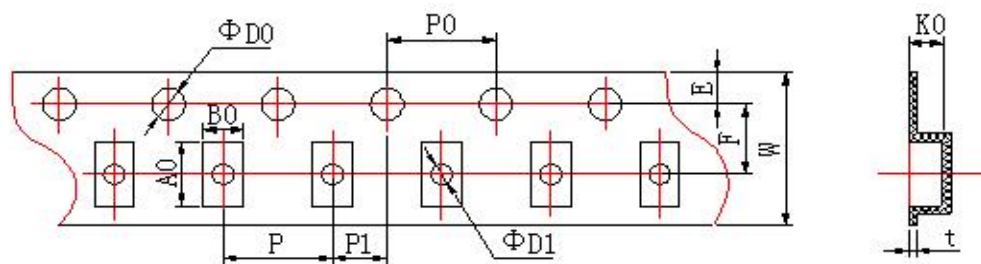
单位unit: mm

| 型号Type | P | P0 | P1 | ΦD0 | T |
|--------|-----------|-----------|-----------|-----------|-----------|
| 0603 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 0.60±0.10 |
| 0805 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 0.75±0.10 |
| 0508 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 0.75±0.10 |
| 1206 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 0.75±0.10 |
| 0612 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 0.75±0.10 |
| 1210 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 0.75±0.10 |
| 4R03 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 0.75±0.10 |

***塑料带编带 Embossed Taping**

适用于2010、2512、1225:

For 2010、2512、1225:



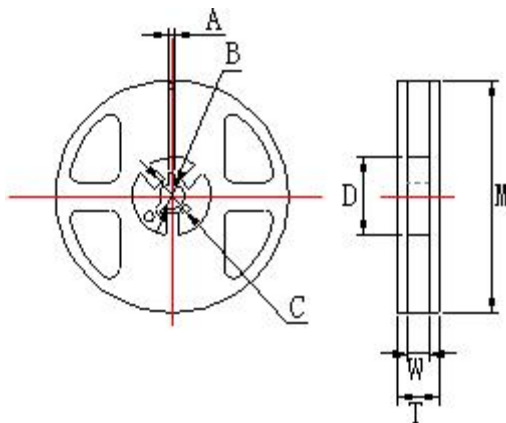
单位unit: mm

| 型号Type | A0 | B0 | W | F | E | t |
|--------|-----------|-----------|------------|-----------|-----------|-----------|
| 2010 | 5.50±0.15 | 2.82±0.15 | 12.00±0.10 | 5.50±0.10 | 1.75±0.10 | 0.25±0.05 |
| 2512 | 6.78±0.15 | 3.45±0.15 | 12.00±0.10 | 5.50±0.10 | 1.75±0.10 | 0.25±0.05 |
| 1225 | 6.78±0.15 | 3.45±0.15 | 12.00±0.10 | 5.50±0.10 | 1.75±0.10 | 0.25±0.05 |

单位unit: mm

| 型号Type | P | P0 | P1 | ΦD0 | ΦD1 | K0 |
|--------|-----------|-----------|-----------|--------------|-----------|-----------|
| 2010 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50+0.10/-0 | 1.50±0.10 | 0.84±0.10 |
| 2512 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50+0.10/-0 | 1.50±0.10 | 0.81±0.10 |
| 1225 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50+0.10/-0 | 1.50±0.10 | 0.81±0.10 |

* 卷盘 Reel



单位unit: mm

| 卷盘尺寸 Reel Type | 型号Type | M | W | T | A | B | C | D |
|-----------------------------|--|---------|----------|----------|---------|----------|----------|-----------|
| 7英寸 7inch dia.Reel | 01005、0201 0402、0603 0805、1206 1210、2R01 4R01、2R02 4R02、4R03 0508、0612 | 178±2.0 | 9.5±1.0 | 12.5±1.5 | 2.0±0.5 | 13.0±0.5 | 21.0±0.5 | 58.0±2.0 |
| | 2010、2512 1225 | 178±2.0 | 13.0±0.5 | 15.5±1.5 | 2.0±0.5 | 13.0±0.5 | 21.0±0.5 | 57.0±2.0 |
| 13英寸 13 inch dia.Reel | 0201、0402 0603、0805 1206 | 330±2.0 | 9.5±1.0 | 13.4±1.0 | 2.0±0.5 | 13.0±0.5 | 21.0±0.5 | 100.0±1.0 |

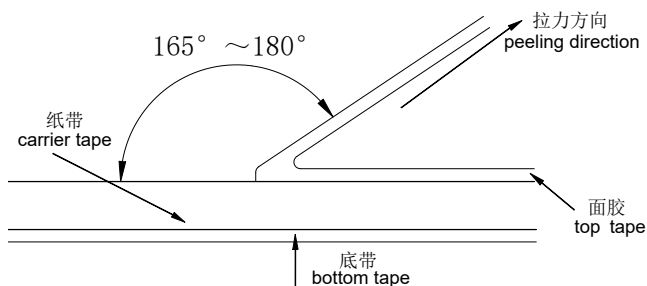
◆ 编带包装能力 Taping Ability

面带拉力 Top tape peel strength

面带拉力强度未11g~70g (0.1N~0.7N)，速度：300mm/min, 经下列试验后不允许有破裂断带现象。

Peel strength is 11g~70g (0.1N~0.7N), with speed of 300mm/min, and should not have flash and tear after peeling.

测试方法Test method:



电阻松动自如，无粘面胶带、底胶带现象。

Resistor is free, no sticking to top tape and bottom tape.

电阻易从纸带中取出，且晶片孔无机械损伤。

Resistor is easy to take out from carrier tape and chip hole have no mechanical damage.

◆包装数量 Packaging Quantity

| 包装方法 Packaging style | 7英寸 7inch dia.Reel | | | | | 13英寸 13 inch dia.Reel | |
|-------------------------|-----------------------|-------|--------------------------------|---|--------------------|--------------------------|--------------------|
| 型号 Type | 01005 | 0201 | 0402、2R01 2R02、4R01 4R02 | 0603、0805 1206、1210 4R03、0508 0612 | 2010、2512 、1225 | 0201、 0402 | 0603、0805、 1206 |
| 数量 Quantity (pcs) | 20000 | 15000 | 10000 | 5000 | 4000 | 50000 | 20000 |

◆IEC E-24、E-96系列电阻值代码对照表 IEC E-24、E-96 Series Resistance Cross-reference List

* E-24 系列E-24 series ($\times 10^n \Omega$)

(单位unit: 0.001 Ω 、0.01 Ω 、0.1 Ω 、1 Ω 、10 Ω 、100 Ω 、1k Ω 、10k Ω 、100k Ω 、1M Ω 、10M Ω 、100M Ω 、1000M Ω)

表一 Table One:

| | | | | | |
|-----|-----|-----|-----|-----|-----|
| 1.0 | 1.5 | 2.2 | 3.3 | 4.7 | 6.8 |
| 1.1 | 1.6 | 2.4 | 3.6 | 5.1 | 7.5 |
| 1.2 | 1.8 | 2.7 | 3.9 | 5.6 | 8.2 |
| 1.3 | 2.0 | 3.0 | 4.3 | 6.2 | 9.1 |

* E-96系列E-96 series ($\times 10^n \Omega$)

(单位unit: 0.001 Ω 、0.01 Ω 、0.1 Ω 、1 Ω 、10 Ω 、100 Ω 、1k Ω 、10k Ω 、100k Ω 、1M Ω 、10M Ω 、100M Ω 、1000M Ω)

表二 Table Two:

| | | | | | | | |
|------|------|------|------|------|------|------|------|
| 1.00 | 1.33 | 1.78 | 2.37 | 3.16 | 4.22 | 5.62 | 7.50 |
| 1.02 | 1.37 | 1.82 | 2.43 | 3.24 | 4.32 | 5.76 | 7.68 |
| 1.05 | 1.40 | 1.87 | 2.49 | 3.32 | 4.42 | 5.90 | 7.87 |
| 1.07 | 1.43 | 1.91 | 2.55 | 3.40 | 4.53 | 6.04 | 8.06 |
| 1.10 | 1.47 | 1.96 | 2.61 | 3.48 | 4.64 | 6.19 | 8.25 |
| 1.13 | 1.50 | 2.00 | 2.67 | 3.57 | 4.75 | 6.34 | 8.45 |
| 1.15 | 1.54 | 2.05 | 2.74 | 3.65 | 4.87 | 6.49 | 8.66 |
| 1.18 | 1.58 | 2.10 | 2.80 | 3.74 | 4.99 | 6.65 | 8.87 |
| 1.21 | 1.62 | 2.15 | 2.87 | 3.83 | 5.11 | 6.81 | 9.09 |
| 1.24 | 1.65 | 2.21 | 2.94 | 3.92 | 5.23 | 6.98 | 9.31 |
| 1.27 | 1.69 | 2.26 | 3.01 | 4.02 | 5.36 | 7.15 | 9.53 |
| 1.30 | 1.74 | 2.32 | 3.09 | 4.12 | 5.49 | 7.32 | 9.76 |

* E-96系列0603型号《乘数代码对照表》及《电阻值代码对照表》

E-96 series(0603)《multiplied Cross-reference List》And《Resistance Cross-reference List》

表三 Table Three:

| 乘数multiplied | $\times 10^0$ | $\times 10^1$ | $\times 10^2$ | $\times 10^3$ | $\times 10^4$ | $\times 10^5$ | $\times 10^6$ | $\times 10^7$ | $\times 10^{-1}$ | $\times 10^{-2}$ | $\times 10^{-3}$ |
|--------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|------------------|------------------|------------------|
| 代码code | A | B | C | D | E | F | G | H | X | Y | Z |

表四 Table Four:

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

◆厚膜电阻阻值代码及标记规则

Description for Resistance Value Code and Marking of Thick Film Chip Resistor

* 阻值代码 Resistance Value Code

所有厚膜电阻的阻值代码与其标记是相对的。

All the resistance value code of thick film chip resistor is corresponding with the marking.

* 标记 Marking

* E-24系列 (0603、 $\geq \pm 5\%$)：采用三位数字表示，前二位表示电阻值有效数字，第三位表示乘以10的次方数。

E-24 series: Express resistance value on the glass side with three digits, the first two digits should be significant and the third one denotes number of zeros.

例For example



30K Ω



33 Ω

*E-24系列 (0603、 $\leq \pm 1\%$)：在三位数字标记下方增加下横线识别。

E-24 series(0603、 $\leq \pm 1\%$): One short bar under marking letter.

例For example:

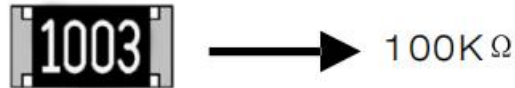


*E-96系列和E-24系列（0508、0805、0612、1206、1225、1210、2010、2512、±1% ±0.5%）：

▲采用四位数字表示，前三位表示电阻值有效数字，第四位表示乘以10的次方数。

E-96 series & E-24 series（0508、0805、0612、1206、1225、1210、2010、2512、±1% ±0.5%）：Express the resistance value with four digits, the first three digits are significant figures and the fourth de notes the number of zeros.

例For example:

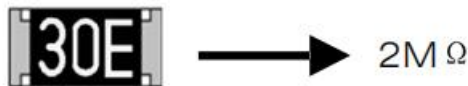


*E-96系列（0603、≤±1%）：

▲采用三位代码表示，前两位表示E-96系列阻值代码，后一位字母表示乘数代码（见表三和表四）。

Express the resistance value with three code, the first two digit code denote the resistance of E-96 series, and the third code of letter denote the multiplier (see the table three and four).

例For example:



*小数点以“R”表示 The decimal point should be expressed by “R” .

例For example:



*跨接电阻以“0”表示 The jumper should be expressed by “0”

例For example:



*≤0402产品不作标记：For the chip resistor（≤0402），there is no mark on the glass side.

例For example:



*非IEC标准系列的电阻值标记表示方法：一般以最接近IEC E24系列标称阻值的标记表示方法。

For the resistance values which don't belong to IEC serial, use the resistance of IEC serial which is most close to the required resistance of non-IEC serial for replacement.

*客户对标记有特殊要求时，则按照协商的结果印刷标记。

To get agreement by both party if the customers have special requirements for the marking.

◆薄膜电阻阻值代码及标记规则

Description for Resistance Value Code and Marking of Thin of Thin Film Chip Resistor

* 阻值代码 Resistance Value Code

所有薄膜电阻全尺寸统一采用四位数阻值代码表示。

All resistance value code of thin film chip resistor used four digits.

例Example

TD03G4701BT

四位数代号表示，如：4701=4.7KΩ；1R50=1.5Ω

To use four digits codes represent resistance value,

例Example 4701=4.7KΩ 1R50=1.5Ω

* 标记 Marking

*当阻值同时存在于E24和E96系列时，优先采用E96系列。

When resistance value belongs to E24 as well as E96 series, we suggest preferentially use E96 series.

例Example 10K=1002, ≠103

*≥0805产品标记For the chip resistor (≥0805) :

▲采用四位数字表示，前三位表示电阻值有效数字，第四位表示10 的次方数。

Express the resistance value with four digits, the first three digits are significant figures and the fourth denotes the number of zeros.

例Example

 100KΩ

*0603标记 Marking for 0603 Size Resistor

▲0603-E96系列：采用三位代码表示，前二位表示E-96系列阻值代码，后一位字母表示乘数代码（见表三和表四）；

Express the resistance value with three code, the first two digit code denote the resistance of E-

96 series, and the third code of letter denote the multiplier (see the table three and four).

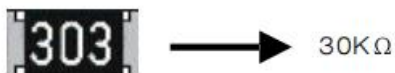
例Example

 2MΩ

▲0603-E24系列：采用三位数字表示，前二位表示电阻值有效数字，第三位表示10 的次方数。

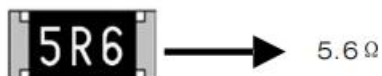
Express the resistance value on the glass side with three digits, the first two digits should be significant and the third denote number of zeros.

例Example

 30KΩ

*▲小数点以“R”表示 The decimal point should be expressed by“R”.

例Example

 5.6Ω

*≤0402 产品：不作标记 For the chip resistor (≤0402) , there is no mark on the glass side.

例Example



◆电流检测电阻阻值代码及标记规则

Description for resistance Value Code and Marking of Current Sensing Thick Film Chip Resistor

* 阻值代码 Resistance Value Code

所有电流检测电阻全尺寸统一采用四位数阻值代码表示。

All resistance value code of current sensing thick film chip resistor used four digits.

例Example

RBF03MR010FT

四位数代号表示，如：R010=10mΩ；30M1=30.1mΩ

To use four digits codes represent resistance value,

例Example R010=10mΩ；30M1=30.1mΩ

* 标记 Marking

*E-24和E-96系列（0508、0805、0612、1206、1225、1210、2010、2512， $\leq \pm 5\%$ ）：采用四位标记代码。

For (0508、0805、0612、1206、1225、1210、2010、2512， $\leq \pm 5\%$)，when resistance value belongs to E24 and E96 series, we suggest preferentially use four digits.

| 标记代码 Mark Code | 阻值范围 Resistance Value | 示例 Sample |
|-------------------|---|--------------|
| R00× | $1\text{m}\Omega \leq R \leq 9\text{m}\Omega$ | R005=5mΩ |
| R0× | $10\text{m}\Omega \leq R \leq 99\text{m}\Omega$ | R033=33mΩ |
| R× | $100\text{m}\Omega \leq R \leq 999\text{m}\Omega$ | R100=100mΩ |
| × | $1\text{m}\Omega < R < 10\text{m}\Omega$ （包含小数点后两位有效数字） (Contains two significant digits after the decimal point.) | 5M10=5.1mΩ |
| × | $10\text{m}\Omega < R < 100\text{m}\Omega$ （包含小数点后一位数字） (Contains one significant digit after the decimal point.) | 30M1=30.1mΩ |

*E-24和E-96系列（0603， $\leq \pm 5\%$ ）：采用三位标记代码。

For the chip resistor (0603， $\leq \pm 5\%$)，when resistance value belongs to E024 and E96 series, we suggest preferentially use three digits.

| 标记代码 Mark Code | 阻值范围 Resistance Value | 示例 Sample |
|-------------------|--|--------------|
| V0× | $1\text{m}\Omega \leq R \leq 9\text{m}\Omega$ | V05=5mΩ |
| V× | $10\text{m}\Omega \leq R \leq 99\text{m}\Omega$ | V33=33mΩ |
| R× | $100\text{m}\Omega \leq R \leq 999\text{m}\Omega$ | R100=100mΩ |
| × | $1\text{m}\Omega < R < 10\text{m}\Omega$ （包含小数点后一位有效数字） (Contains one significant digit after the decimal point.) | 5M10=5.1mΩ |

* ≤ 0402 产品不印刷标记。

For the chip resistor (≤ 0402)，there is no mark on the glass side.

*非IEC标准系列的电阻标记表示方法：一般以最接近IEC E24系列标称阻值的标记表示方法。

For the resistance values which don't belong to IEC serial, use the resistance of IEC serial which is most close to the required resistance of non-IEC serial for replacement.

*客户对标记有特殊要求时，则按照协商的结果印刷标记。

To get agreement by both party if there special requirement for the marking.

◆片式电阻器使用说明 Chip Resistor Instructions For Use

* 本产品以下特殊环境下应用，性能可能会受到影响：

- 1、在各种类型的液体，包括水、油、化学品、有机溶剂的使用。
- 2、在户外直接暴露在阳光的地方，或在灰尘多的地方使用。
- 3、在产品暴露的地方，有海风或腐蚀性气体，包括氯气、硫化氢、氨气、二氧化硫、二氧化氮。
- 4、在产品暴露于静电或电磁波的地方使用。
- 5、在产生热量的部件、塑料线，或其他易燃物品附近使用。
- 6、在用树脂或其他涂层材料密封产品的情况下使用。
- 7、焊接后使用不洁焊料或使用水或水溶性清洗剂清洗产品。
- 8、片状电阻器的基材是氧化铝。由于和安装基板的热膨胀系数不同，在反复施加提供热循环等热应力时，接合部的焊锡（焊锡部）有时会发生裂纹。如果环境温度反复发生很大的变动，并且载荷反复进行ON/OFF，则需要注意龟裂的发生。因热应力而发生的龟裂，取决于所安装的焊盘的大小、焊锡量、安装基板的散热性等，因此在环境温度有很大的变化或者载荷ON/OFF的条件下使用时，请充分注意以进行设计。

* Application of the products in a special environment can deteriorate product performance:

- 1、Use in various types of liquid, including water, oils, chemicals, and organic solvents.
- 2、Use outdoors where the products are exposed to direct sunlight, or in dusty places.
- 3、Use in places where the products are exposed to sea winds or corrosive gases, including Cl_2 , H_2S , NH_3 , SO_2 , and NO_2 etc.
- 4、Use in places where the products are exposed to static electricity or electromagnetic waves.
- 5、Use in proximity to heat-producing components, plastic cords, or other flammable items.
- 6、Use involving sealing or coating the products with resin or other coating materials.
- 7、Use involving unclean solder or use of water or water-soluble cleaning agents for cleaning after soldering.
- 8、The substrate of chip resistors is alumina. Cracks may occur at the connection of solder (solder fillet portion) due to the difference of the coefficient of thermal expansion from a mounting board when heat stresses like heat cycle, etc. are repeatedly given to them. Care should be taken to the occurrence of the cracks when the change in ambient temperature or ON/OFF of load is repeated. The occurrence of the crack by heat stress may be influenced by the size of a pad, solder volume, heat radiation of mounting board etc., so please pay careful attention to designing when a big change in ambient temperature and conditions for use like ON/OFF of load can be assumed.

◆储存方法 Storage Conditions

温度 $5^{\circ}\text{C}\sim 30^{\circ}\text{C}$ ，相对湿度30%RH~70%RH。建议在符合上述储存条件下十二个月内使用。

T: $5^{\circ}\text{C}\sim 30^{\circ}\text{C}$, RH: 30%RH~70%RH. The products are suggested to be used within twelve months when received, and the storage condition mentioned above should be followed.

◆产品使用注意事项 Precautions on use of products

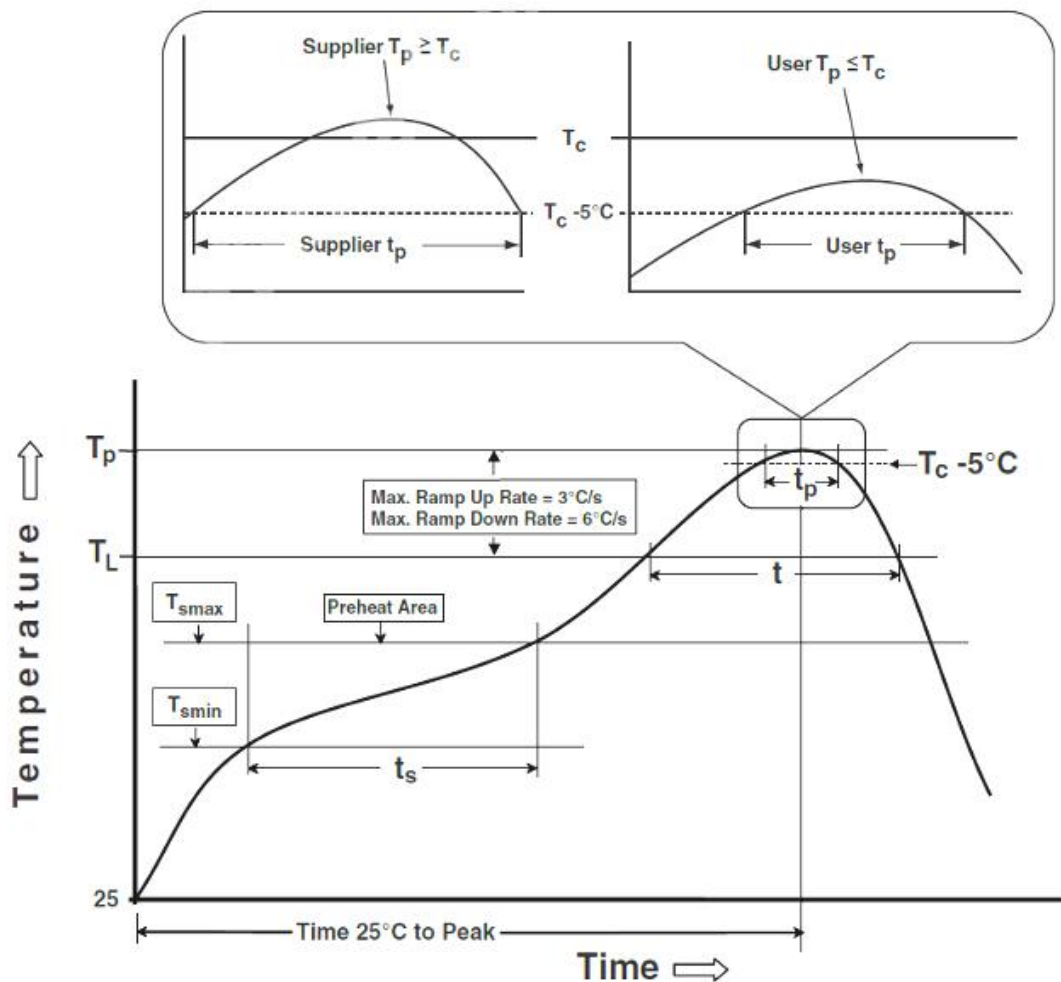
- 1、避免采用超过正常额定功率的功率，超过额定功率的稳态负载条件下可能会对产品性能和可靠性产生负面影响。
- 2、用镊子拿起产品时要小心，有可能会将保护或电阻体夹碎。
- 3、手动安装产品时，烙铁头勿触碰产品。
- 4、用于车载设备、医疗设备、航空设备以及其他涉及人身安全、或可能引起重大损失的设备上时，请务必事先与我公司联系。这些产品在这类用途中出现故障或失灵可能导致人身事故或严重损坏。
- 1、Avoid applying power exceeding normal rated power, exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.
- 2、Be careful when pick up the products with tweezers. There may be a care that the overcoat and / or the body can be chipped.
- 3、Soldering tip shall not touch the product when install product manually.
- 4、Contact our sales representatives before you use our products for applications including automotive, medical equipment and aerospace equipment. Malfunction or failure of the products in such applications may cause loss of human life or serious damage.

◆焊接Soldering

- 回流焊要求：器件回流焊要求满足J-STD-020无铅回流焊，具体要求如下：

Reflow soldering requirements: The device reflow soldering requirements meet the J-STD-020

lead-free reflow soldering. The specific requirements are as follows:



*升温速率 (Ramp-up rate (TL-TP)) : $>3^\circ\text{C/s}$

*降温速率 (Ramp-down rate (TP-TL)) : $\leq 6^\circ\text{C/s}$

*预热温度 (Preheat/soak) : $150^\circ\text{C} - 200^\circ\text{C}$ (TS min to TS max) : 60s-120s

*液相线 217°C 以上时间 Time above 217°C of liquid phase (TL) : 60s-150s.

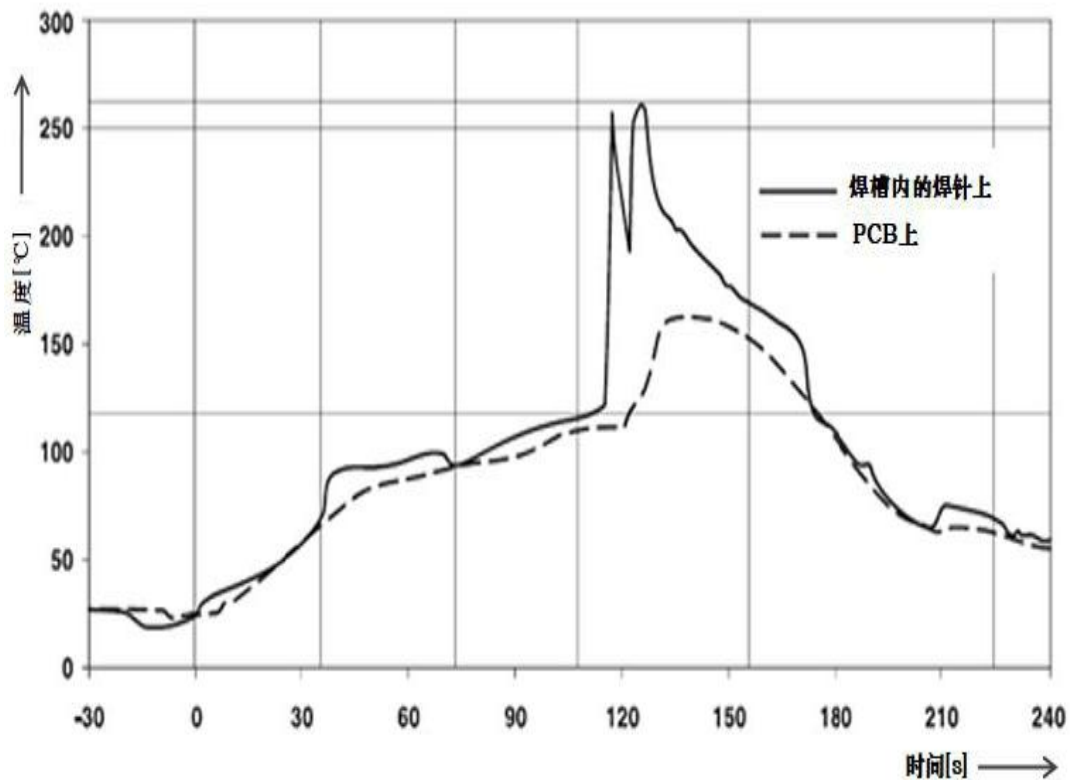
* T_c 最高温度 Maximum temperature of T_c : 260°C

*最长焊接时间 Maximum welding time: 8min max.

*峰值温度 $T_p = T_c - 5^\circ\text{C}$ 以内的时间: 30秒 T_p Time within the range where peak temperature $T_p = T_c - 5^\circ\text{C}$: 30s

*产品至少可承受回流焊次数: 3次 Minimum number of reflow soldering cycles the product can withstand: 3 times

- 波峰焊的要求 Requirements for wave welding



*预热温度要求时间 Preheating temperature requirement: 130 -160 time: 60s-90s

*插装元器件引脚在260°C焊料槽中至少停留10s

The pins of the plug-in components stay in the 260 solder channel for 10s.

- 推荐的焊膏类型 Recommended solder alloy: 96.5Sn-3.0Ag-0.5Cu

◆修订履历 Revision History

| 版本 Version | 日期 Date | 修订内容 Revision Content | 修订人 Reviser |
|---------------|------------|--|-----------------|
| I 5.0 | 2026-05-09 | -产品结构：修改“二次保护”为“保护”。 -Construction: Modify the “Secondary Overcoat” to “Top Overcoat” . -附录：修改焊接条件。 - Appendix: Modification of Soldering Conditions. | 刘明伟 Mingwei Liu |
| I 4.0 | 2026-04-20 | -产品结构：修改产品结构示意图。 -Construction: Modify the construction diagram. -附录：修改焊接要求。 - Appendix: Modify the soldering requirements. | 刘明伟 Mingwei Liu |
| I 3.0 | 2025-10-29 | -特性：新增产品特性 - Features:add product features. -修改可靠性测试方法部分试验方法的引用条款。 Modify the reference clauses of test methods in the section on reliability test methods. | 邱朝辉 Chaohui Qiu |
| V 2.0 | 2025-09-04 | -附录：修改储存方法。 - Appendix: Modify the storage conditions. | 刘瀚阳 Hanyang Liu |
| V 1.0 | 2025-06-25 | -原版 The original version. | 邱朝辉 Chaohui Qiu |

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