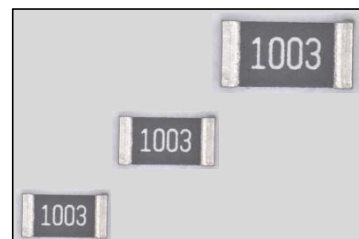


## ■车规高精密厚膜片式固定电阻器

### High Precision Thick Film Chip Fixed Resistor Automotive Grade

#### ◆特征 Features

- \* 符合 AEC-Q200 汽车标准相关条款 · Compliant with AEC-Q200 standard
- \* 体积小, 重量轻 · Miniature and light weight
- \* 适应再流焊与波峰焊 · Suit for reflow and wave flow solder
- \* 装配成本低, 并与自动贴装设备匹配 · Low assembly cost, suit for automatic SMT equipment
- \* 可实现 $\pm 0.1\%$  阻值精度 · Can achieve  $\pm 0.1\%$  resistance accuracy
- \* 电阻温度系数可达到 $\pm 25\text{ppm}/^\circ\text{C}$  · The resistance temperature coefficient can reach  $\pm 25\text{ppm}/^\circ\text{C}$
- \* 具有优越的抗硫化性能 · With excellent sulfuration-resistant performance.
- \* 符合 RoHS 指令要求 · Compliant with RoHS directive
- \* 符合无卤要求 · Halogen free requirement
- \* 潮敏等级 · MSL1 MSL Class:MSL1



#### ◆应用领域 Application

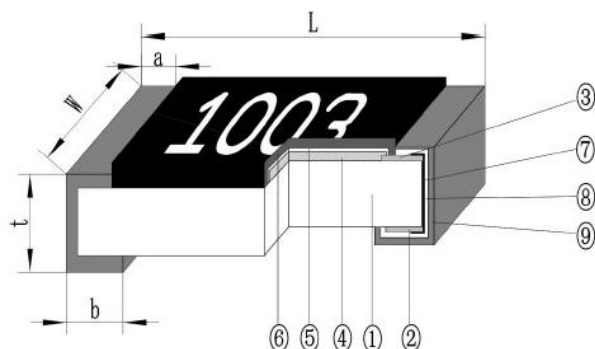
\*汽车电子装置, 工业设备, 工业测量。

Automotive electronic devices, industrial equipment, industrial measurement.

#### ◆型号表示法 Part Number

| AS   |            | R                          |            | 06                |            | G                      |  | 1003                           |   | B                                     |                   | T                            |                       | 13                       |                      |
|--|------------|----------------------------|------------|-------------------|------------|------------------------|--|--------------------------------|---|---------------------------------------|-------------------|------------------------------|-----------------------|--------------------------|----------------------|
| 产品代号<br>Product Code   |            | 额定功率代号<br>Rated Power Code |            | 型号代号<br>Type Code |            | 电阻温度系数代号<br>T.C.R Code |  | 电阻值代号<br>Resistance Value Code |   | 阻值误差精度代号<br>Resistance Tolerance Code |                   | 包装方式代号<br>Packing Style Code |                       | 卷盘方式代号<br>Reel Type Code |                      |
| 车规高精密<br>厚膜片式固定电阻器<br>High Precision Thick Film Chip Fixed Resistor Automotive Grade | 代号<br>Code | 额定功率<br>Rated Power        | 代号<br>Code | 型号<br>Type        | 代号<br>Code | T.C.R<br>PPM/℃         | 三位数（E-24 系列）：前两位表示有效数字，第三位表示有效数字后零的个数。<br>Three digits (E-24 series): The first two digits are significant figures and the third one denotes number of zeros.<br>四位数（E-96 系列）：前三位表示有效数字，第四位表示有效数字后零的个数。<br>Four digits (E-96 series): The first three digits are significant figures and the four one denotes number of zeros.<br>小数点用 R 表示。Decimal point should be expressed by "R" .<br>例如 Example:<br>103=10KΩ （E-24）<br>1003=100KΩ （E-96）<br>1R0=1.0Ω （E-24）<br>000=0Ω |                                |   | 代号<br>Code                            | 误差精度<br>Tolerance | 代号<br>Code                   | 包装方法<br>Packing Style | 代号<br>Code               | 卷盘方式<br>Reel Type    |
|  | F          | 1/4                        | 05         | 0805              | H          | ±50                    |  |                                |   | B                                     | ±0.1%             | T                            | 编带包装<br>Tape & Reel   | 空位<br>Blank              | 7 英寸卷盘<br>7inch Reel |
|  |            |                            |            |                   |            |                        |  |                                |   | C                                     | ±0.25%            |                              |                       |                          |                      |
|  |            |                            |            |                   |            |                        |  |                                |   | D                                     | ±0.5%             |                              |                       |                          |                      |
|  | R          | 1/3                        | 06         | 1206              | G          | ±25                    |  |                                | F | ±1.0%                                 |                   |                              | 13                    | 13 英寸卷盘<br>13inch Reel   |                      |

## ◆结构 Construction

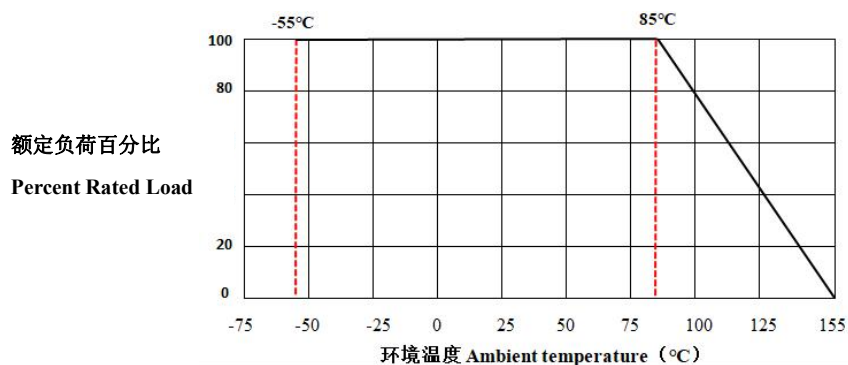


|   |                         |
|---|-------------------------|
| ① | 陶瓷基板 Ceramic Substrate  |
| ② | 背电极 Bottom Electrode    |
| ③ | 面电极 Top Electrode       |
| ④ | 电阻体 Resistor Layer      |
| ⑤ | 一次保护 Primary Overcoat   |
| ⑥ | 二次保护 Secondary Overcoat |
| ⑦ | 端电极 Edge Electrode      |
| ⑧ | 中间电极 Barrier Layer      |
| ⑨ | 外部电极 External Electrode |

## ◆规格尺寸 Dimensions

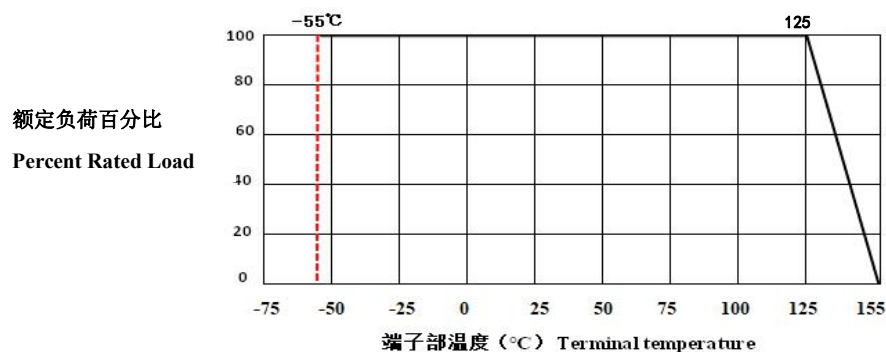
| 型号<br>Type | 尺寸 Dimensions(mm) |           |           |           |           |
|------------|-------------------|-----------|-----------|-----------|-----------|
|            | L                 | W         | t         | a         | b         |
| 0805       | 2.00±0.10         | 1.25±0.15 | 0.55±0.10 | 0.35±0.15 | 0.40±0.20 |
| 1206       | 3.20±0.20         | 1.60±0.15 | 0.55±0.10 | 0.45±0.20 | 0.50±0.20 |

## ◆负荷下降曲线 Derating Curve



注 1：当电阻使用的环境温度超过 85℃时，其额定负荷（额定电流）按上述曲线下降。

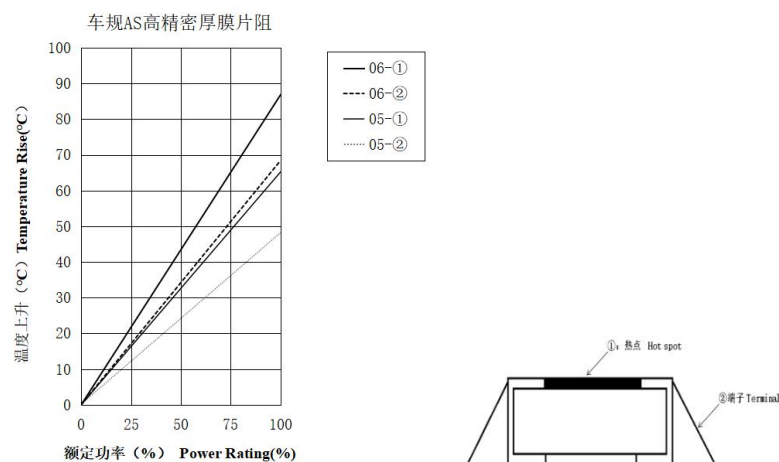
Note1: For resistors operated in ambient over 85℃,rated load (rated current) shall be derated in accordance with the above figure.



注 2：超过上述额定端子部温度使用时，请根据上述功率降额曲线减少额定功率后使用。

Note2: When exceeding the above terminal temperature,please reduce the rated power according to the above power reduction curve.

### ◆温升曲线 Temperature rise curve



注：表面温度上升，由于是用本公司测试条件测定的，根据使用状况、使用基板不同，数值也有不同。

Note: The surface temperature rises, as it is determined with the test conditions of the company, and the value varies according to the use status and the substrate..

### ◆额定值 Ratings

| 型号<br>Type | 85℃下额定功率<br>Rated Power at 85℃ (W)  | 元件极限电压<br>Limiting Element<br>Voltage (V) | 最大过负荷电压<br>Max. Overload<br>Voltage (V) | 阻值范围<br>Resistance Range                          |
|------------|---|---|---|---|
| 0805       | 1/4   | 150                                       | 300                                     | $100\text{K}\Omega \leq R \leq 5.1\text{M}\Omega$ |
| 1206       | 1/3   | 200                                       | 400                                     | $100\text{K}\Omega \leq R \leq 5.1\text{M}\Omega$ |
| 注 Note     | 1、电流为直流或交流有效值。Current of DC or AC RMS value.<br>2、 $E = \sqrt{P \times R}$ 或元件极限电压两者中的较小值；<br>E：额定电压 Rated voltage(V)；P：额定功率 Rated power(W)；<br>3、R：标称阻值 Normal resistance(Ω) |   |   |   |

| 型号<br>Type   | 阻值范围<br>Resistance Range                          | 电阻温度系数 T.C.R (ppm/℃)          |        |       |       |
|--------------|---|-------------------------------|--------|-------|-------|
|              |   | 标称阻值允许偏差 Resistance Tolerance |        |       |       |
|              |   | ±0.1%                         | ±0.25% | ±0.5% | ±1.0% |
| 0805<br>1206 | $100\text{K}\Omega \leq R \leq 5.1\text{M}\Omega$ | ±25 or ±50                    |        |       |       |

### ◆可靠性测试方法 Reliability Test Method

| 项目<br>Item                                     | 标准<br>Specifications   | 测试方法<br>Test Methods  |
|--|--|---|
| 高温存储<br>High Temperature<br>Exposure (Storage) | 无可见损伤<br>No mechanical damage<br>$\Delta R \leq \pm (0.5\%R + 0.05\Omega)$ | AEC-Q200 Test 3 /MIL-STD-202 Method 108<br>1000 小时 @ T=155℃，不通电。<br>1000 hrs. @ T=155℃. Unpowered.  |
| 温度循环<br>Temperature Cycling                    | 无可见损伤<br>No mechanical damage<br>$\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ | AEC-Q200 Test 4/JESD22 Method JA-104<br>-55℃(30 分钟)~常温(≤1 分钟)~155℃(30 分钟)，1000 个循环。<br>-55℃(30min)~normal temperature(≤1min)~155℃(30min)，1000 cycles. |

| 项目<br>Item                                   | 标 准<br>Specifications  | 测试方法<br>Test Methods   |
|--|--|--|
| 高温高湿<br>Biased Humidity                      | 无可见损伤<br>No mechanical damage<br>$\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ | AEC-Q200 Test 7/MIL-STD-202 Method 103<br>温度 85℃, 湿度 85%RH, 10%额定功率(电流)下的电压值或元件极限电压(取最小值), 放置 1000 小时。<br>85℃/85%RH, apply 10% of operating power(current) or limiting element voltage whichever is lower for 1000hours.   |
| 85℃耐久<br>85℃ Durability                      | 无可见损伤<br>No mechanical damage<br>$\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ | JIS-C-5201-1 4.25 / IEC-60115-1 4.25.1<br>85℃±2℃, 1000 小时, 额定功率(电流)下的电压值或元件极限电压(取最小值), 通 1.5 小时/断 0.5 小时。<br>85℃±2℃, 1000h, operating power (current) or limiting element voltage whichever is lower for 1.5h ON/0.5h OFF.   |
| 工作寿命<br>Operational Life                     | 无可见损伤<br>No mechanical damage<br>$\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ | JIS-C-5201-1 4.25 / IEC-60115-1 4.25.1<br>125℃±2℃, 1000 小时, 43%额定功率(电流)下的电压值或元件极限电压(取最小值), 通 1.5 小时/断 0.5 小时。<br>125℃±2℃, 1000h, 43% of operating power (current) or limiting element voltage whichever is lower for 1.5h ON/0.5h OFF.   |
| 耐溶剂性<br>Resistance to Solvents               | 标志清晰, 无可见损伤<br>Clearly marked, No mechanical damage                        | AEC-Q200 Test 12/MIL-STD-202 Method 215<br>浸在三种溶剂 3min 后擦拭 10 次, 浸、刷共 3 回, 用水洗清洗剂进行清洗, 并在室温下对整个表面进行通风干燥。<br>Immersed in three solvents after 3min immersion, brush wipe 10 times, a total of 3 times, washing with washing and cleaning agent, room temperature on the surface of the ventilation drying |
| 机械冲击<br>Mechanical Shock                     | 无可见损伤<br>No mechanical damage<br>$\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ | AEC-Q200 Test 13/MIL-STD-202 Method 213<br>正半弦波, 峰值加速度: 100g' s, 脉冲持续时间: 6ms, 三轴六向各 3 次, 共 18 次。<br>Positive half wave, peak acceleration: 100g' s, pulse duration: 6ms, three axis six to each 3 times, a total of 18 times.  |
| 振动<br>Vibration                              | 无可见损伤<br>No mechanical damage<br>$\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ | AEC-Q200 Test 14/MIL-STD-202 Method 204<br>频率: 10Hz~2000Hz, 加速度: 5g' s, 一个循环 20min, X、Y、Z 三个方向每个方向 12 个循环, 共 36 个循环。<br>Frequency: 10Hz ~ 2000Hz, acceleration: 5 g' s, a loop 20min, X, Y, Z three directions, each direction 12 cycles, 36 cycles.   |
| 耐焊接热<br>Resistance to Soldering<br>Heat      | 无可见损伤<br>No mechanical damage<br>$\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ | AEC-Q200 Test 15/MIL-STD-202 Method 210<br>270℃±5℃锡槽, 保持 10s±1s。<br>Lead-free solder bath at 270℃±5℃ for 10s±1s.   |
| 热冲击<br>Thermal Shock                         | 无可见损伤<br>No mechanical damage<br>$\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ | ACE-Q200 Test 16/MIL-STD-202 Method 107<br>-55℃(15 分钟)-常温(≤20 秒)-155℃(15 分钟), 300 个循环。<br>-55℃(15min)~normal temperature(≤20s)~155℃(15min), 300 cycles.  |
| ESD 静电放电<br>Electrostatic Discharge<br>(ESD) | 无可见损伤<br>No mechanical damage<br>$\Delta R \leq \pm (0.5\%R + 0.05\Omega)$ | AEC-Q200 Test 17/AEC-Q200-002<br>人体模式 两次放电, 正、负极性各 1 次。<br>Human Body Model, 1 pos. + 1 neg. discharges<br>0805: 1kV; 1206: 2kV.   |
| 可焊性<br>Solderability                         | 无可见损伤<br>No mechanical damage<br>可焊面积 ≥95%<br>95% Cover Min                | AEC-Q200 Test 18/IEC 60115-1 4.17<br>245℃±5℃锡槽, 保持 3s±0.3s。<br>Lead-free solder bath at 245℃±5℃ for 3s±0.3s.   |
| 电阻温度系数<br>T.C.R                              | 在规定值内<br>Within specified T.C.R  | JIS-C-5201-1 4.8 / IEC-60115-1 4.8<br>+20℃/-55℃/+20℃/+125℃/+20℃.   |

| 项目<br>Item                       | 标准<br>Specifications  | 测试方法<br>Test Methods  |
|----------------------------------|---|---|
| 可燃性<br>Flammability              | 不完全燃尽，薄垫纸应不被引燃，松木板应不被烤焦炭化。<br>No ignition of the tissue paper or scorching or the pinewood board. | AEC-Q200-Test 20/UL-94<br>V-0 或 V-1 可接受。不需要电气测试。<br>V-0 or V-1 are acceptable. Electrical test not required.  |
| 基板弯曲试验<br>Substrate Bending Test | 无可见损伤<br>No mechanical damage<br>$\Delta R \leq \pm (0.5\%R + 0.05\Omega)$                        | AEC-Q200 Test 21/AEC-Q200-005<br>弯曲距离(Bending distance): 1206、0805: 2mm; 保持时间(Duration): 60s±5s.  |
| 端子强度<br>Terminal Strength        | 无可见损伤<br>No mechanical damage<br>$\Delta R \leq \pm (0.2\%R + 0.05\Omega)$                        | AEC-Q200 Test 22/AEC-Q200-006<br>施加力: 17.7N, 保持 60s±1s。<br>For 0805、1206 : Applying force 17.7N for 60s±1s.   |
| 阻燃性<br>Flame Retardance          | 不可燃<br>No Flame   | AEC-Q200 Test 24/AEC-Q200-001<br>9Vdc 到 32Vdc (钳位电流高达 500A)、增量为 1.0Vdc 的电压。每种电压等级最少施加 1 小时。<br>Subjected to voltage from 9.0 to 32.0 VDC (current clamped up to 500A), and each voltage level shall be increased in 1.0 VDC for one hour minimum. |
| 绝缘电阻<br>Insulation Resistance    | 1000MΩ Min  | IEC 60115-1 4.6<br>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。<br>Apply DC 100V±15V between substrate and terminations for 1min, then check insulation resistance.  |
| 耐电压<br>Voltage Proof             | 无击穿或飞弧<br>No breakdown or Flashover   | IEC 60115-1 4.7<br>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。<br>Apply max. overload voltage of AC RMS at a rate of approximately 100V/s between substrate and terminations for 60s±5s.  |
| 短时间过负载<br>Short Time Overload    | 无可见损伤<br>No mechanical damage<br>$\Delta R \leq \pm (0.2\%R + 0.05\Omega)$                        | IEC 60115-1 4.13<br>2.5 倍额定电压或最大过负荷电压 (取较小值), 持续 5 秒。<br>2.5 times rated voltage or max. overload voltage(current) whichever is lower for 5s.   |
| 抗硫化性能<br>Sulfuration Resistant   | 无可见损伤<br>No mechanical damage<br>$\Delta R \leq \pm (0.5\%R + 0.05\Omega)$                        | 方法一: ASTM-B-809-95<br>把待测电阻放置在饱和硫蒸气内, 温度: 60℃±3℃, 湿度: 91~93%RH, 放置时间: 1500 小时。<br>Method1: ASTM-B-809-95<br>Place the resistor to be measured in saturated sulfur vapor, Temperature: 60℃±3℃, humidity: 91~93%RH, 1500 hours.                     |
|                                  | 无可见损伤<br>No mechanical damage<br>$\Delta R \leq \pm (0.5\%R + 0.05\Omega)$                        | 方法二: 油浴, 恒温: 105℃±3℃, 放置时间: 1000 小时。<br>Method2: Soaked in industrial oil with sulfur substance contained 105℃±3℃ 1000h.  |

## ◆包装 Packaging

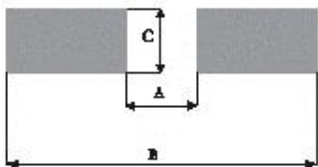
包装方式见附录 Packaging can refer to the Appendix.

## 附录 Appendix I

### ◆推荐焊盘尺寸 Recommend Solder Pad Size

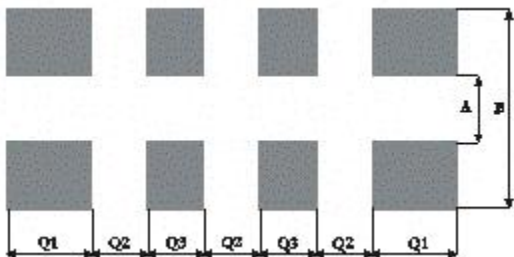
\* 片式固定电阻器 Chip fixed resistor

单位unit: mm



| 厚膜电阻及薄膜电阻<br>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

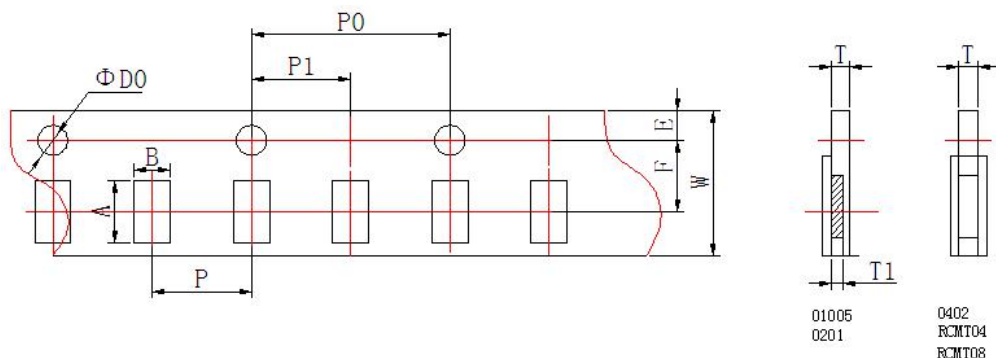
| 型号Type        | A   | B         | Q1        | Q2        | Q3        |
|---------------|---|-----------|-----------|-----------|-----------|
| 2R01          | 0.30±0.05   | 0.90±0.05 | 0.30±0.05 | 0.20±0.05 | ---       |
| 4R01          | 0.30±0.05   | 0.90±0.05 | 0.20±0.05 | 0.20±0.05 | 0.20±0.05 |
| 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<br>Remarks | 1、2R01型号包含including:RC-MYO4、RCMY04、RH-MY04、RHMY04<br>2、4R01型号包含including:RC-MY08、RCMY08、RH-MY08、RHMY08<br>3、2R02型号包含including:RC-MT04、RCMT04、RH-MT04、RHMT04<br>4、4R02型号包含including:RC-MT08、RCMT08、RH-MT08、RHMT08<br>5、4R03型号包含including:RC-ML08、RCML08、RH-ML08、RHML08<br>6、上述型号说明适用于附录中所有型号。<br>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

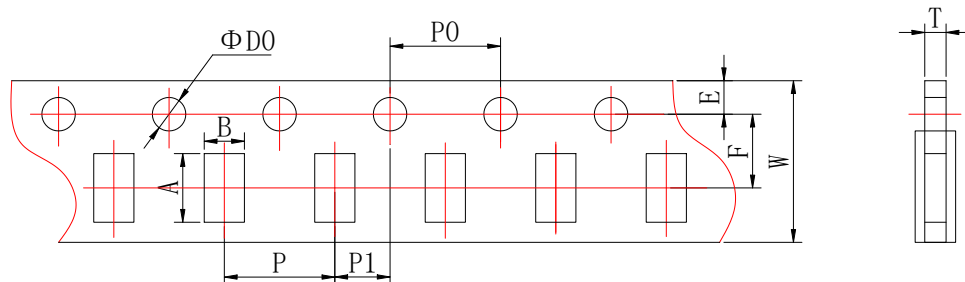
| 型号Type | A         | B         | W         | F         | E         |
|--------|-----------|-----------|-----------|-----------|-----------|
| 01005  | 0.45±0.02 | 0.25±0.02 | 8.00±0.02 | 3.50±0.05 | 1.75±0.05 |
| 0201   | 0.70±0.10 | 0.40±0.10 | 8.00±0.20 | 3.50±0.05 | 1.75±0.10 |
| 0402   | 1.15±0.10 | 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 |

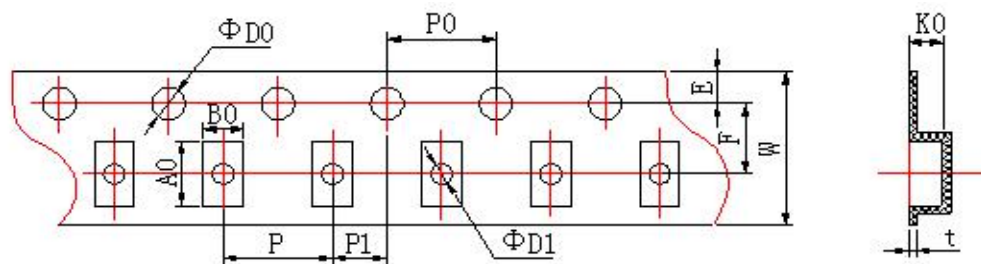
单位unit: mm

| 型号Type | P         | P0        | P1        | ΦD0       | T  |                                    |
|--------|-----------|-----------|-----------|-----------|--|------------------------------------|
|        |           |           |           |           | 厚膜电阻及薄膜电阻<br>Thick Film Resistor and<br>Thin Film Resistor | 合金片式固定电阻<br>Metal<br>Foil resistor |
| 0603   | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 0.60±0.10  | 0.75±0.10                          |
| 0805   | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 0.75±0.10  | 0.95±0.10                          |
| 0508   | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 0.75±0.10  | 0.95±0.10                          |
| 1206   | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 0.75±0.10  | 0.95±0.10                          |
| 0612   | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 1.50±0.10 | 0.75±0.10  | 0.95±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

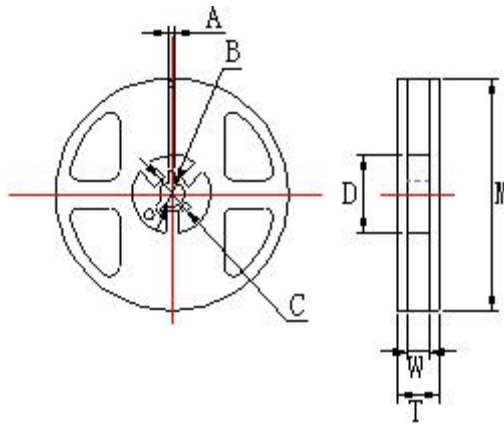
| 型号Type | A0        | B0        | W          | F         | E         | t         |
|--------|-----------|-----------|------------|-----------|-----------|-----------|
| 2010   | 5.50±0.15 | 2.82±0.15 | 12.00±0.10 | 5.50±0.10 | 1.75±0.10 | 0.25±0.05 |
| 2512   | 6.78±0.15 | 3.45±0.15 | 12.00±0.10 | 5.50±0.10 | 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   |                                 |
|--------|-----------|-----------|-----------|--------------|-----------|--|---------------------------------|
|        |           |           |           |              |           | 厚膜电阻及薄膜电阻<br>Thick Film Resistor<br>and Thin Film Resistor | 合金片式固定电阻<br>Metal Foil resistor |
| 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  | 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  | 1.00±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  | 1.00±0.10                       |

\* 卷盘 Reel



单位unit: mm

| 卷盘尺寸<br>Reel Type           | 型号Type   | M       | W        | T        | A       | B        | C        | D         |
|-----------------------------|--|---------|----------|----------|---------|----------|----------|-----------|
| 7英寸<br>7inch<br>dia.Reel    | 01005、0201<br>0402、0603<br>0805、1206<br>1210、2R01<br>4R01、2R02<br>4R02、4R03<br>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  | 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  |
|                             | 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<br>13 inch<br>dia.Reel | 0201、0402<br>0603、0805<br>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

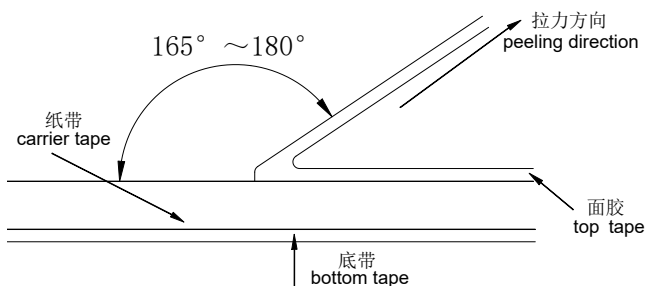
面带拉力 Top tape peel strength

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<br>Packaging style | 7英寸<br>7inch dia.Reel |       |                                |   |                    | 13英寸<br>13 inch dia.Reel |                    |
|-------------------------|-----------------------|-------|--------------------------------|---|--------------------|--------------------------|--------------------|
| 型号<br>Type              | 01005                 | 0201  | 0402、2R01<br>2R02、4R01<br>4R02 | 0603、0805<br>1206、1210<br>4R03、0508<br>0612 | 2010、2512<br>、1225 | 0201、<br>0402            | 0603、0805、<br>1206 |
| 数量<br>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 (×10<sup>n</sup>Ω)

(单位unit: 0.001Ω、0.01Ω、0.1Ω、1Ω、10Ω、100Ω、1kΩ、10kΩ、100kΩ、1MΩ、10MΩ、100MΩ、1000MΩ)

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 (×10<sup>n</sup>Ω)

(单位unit: 0.001Ω、0.01Ω、0.1Ω、1Ω、10Ω、100Ω、1kΩ、10kΩ、100kΩ、1MΩ、10MΩ、100MΩ、1000MΩ)

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

表四 Table Four:

| 代号<br>code | E-96系列电阻<br>E-96 resistance | 代号<br>code | E-96系列电阻<br>E-96 resistance | 代号<br>code | E-96系列电阻<br>E-96 resistance | 代号<br>code | E-96系列电阻<br>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 $\Omega$



33 $\Omega$

\*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:

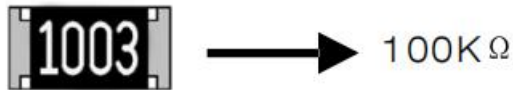


\*E-96系列和E-24系列 (0508、0805、0612、1206、1225、1210、2010、2512、 $\pm 1\%$  &  $\pm 0.5\%$ )：

▲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、 $\pm 1\%$  &  $\pm 0.5\%$ ): 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、 $\leq \pm 1\%$ )：

▲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:



\* $\leq$  0402产品不作标记：For the chip resistor ( $\leq$  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=4.7K $\Omega$ ；1R50=1.5 $\Omega$

To use four digits codes represent resistance value,

例Example 4701=4.7K $\Omega$  1R50=1.5 $\Omega$

\* 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,  $\neq$  103

\*  $\geq$  0805产品标记 For the chip resistor ( $\geq$  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



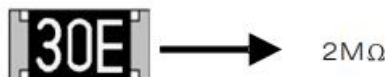
\*0603标记 Marking for 0603 Size Resistor

▲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



▲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



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

例Example



\* $\leq$  0402 产品：不作标记 For the chip resistor ( $\leq$  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<br>Mark Code | 阻值范围<br>Resistance Value  | 示例<br>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）<br>(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）<br>(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<br>Mark Code | 阻值范围<br>Resistance Value   | 示例<br>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）<br>(Contains one significant digit after the decimal point.) | 5M10=5.1mΩ   |

\* $\leq 0402$  产品不印刷标记。

For the chip resistor（ $\leq 0402$ ），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

\* 本产品在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NO/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<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>2</sub> 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℃~30℃，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℃~30℃, 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

- 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。

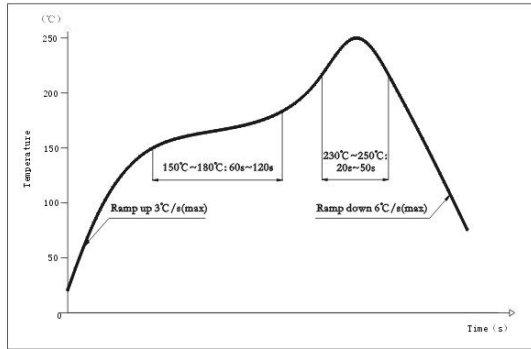
## ◆ Precautions on use of products

- 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.

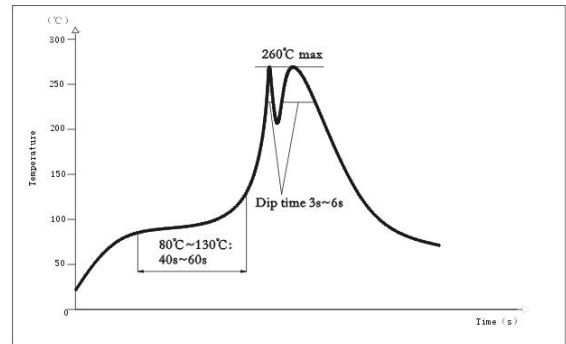
- 3、Soldering tip shall not touch the product when install product manually.
- 4、Contact our sales representatives before you use our products for applications including automotive, medical equipment and aerospace equipment. Malfunction or failure of the products in such applications may cause loss of human life or serious damage.

### ◆焊接Soldering

\* 推荐的回流焊曲线 Recommended reflow profile



\*推荐的波峰焊曲线Recommended wave solder profile



\* 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      |
|------------|------------|---|------------------|
| V3.0       | 2025-09-04 | -附录：修改储存方法。<br>- Appendix: Modify the storage conditions.           | 刘瀚阳 Hanyang Liu  |
| V2.0       | 2025-07-03 | -增加 0805 尺寸及相关额定值、指标值。<br>Add the parameters to 0805 chip resistor. | 黄良玉 LiangyuHuang |
| V1.0       | 2024-12-11 | -原版 The original version.   | 陈才华 Chencaihua   |
|            |            |   |                  |
|            |            |   |                  |

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