



富捷科技

# Product Datasheet

产品规格说明书

## FRC Series Thick Film Chip Resistor

厚膜片式电阻器

安徽省富捷电子科技有限公司

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## 厚膜片式电阻器

## Thick Film Chip Resistor

## FRC Series



## ■ 特点 (Features)

- 体积小, 重量轻
- 电性能稳定, 可靠度高
- 符合 RoHS 指令要求
- 符合无卤素要求
- Miniature and light weight
- Stable electrical capability and high Reliability
- Compliant with RoHS directive
- Halogen free requirement

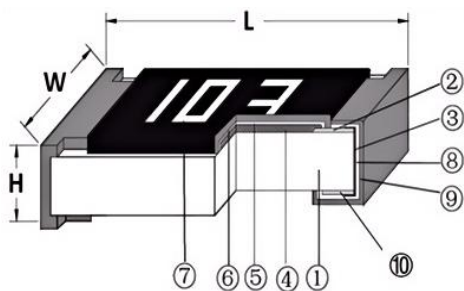
## ■ 应用 (Application)

- 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.

## ■ 产品料号 (Parts Number Explanation) 示例: FRC1206F1001TS

| F<br>公司 | RC<br>产品别                                         | 1206<br>尺寸 | F<br>公差   | 1001<br>字码     | T<br>包装别       | S<br>端电极    | 特殊码             |
|---------|---------------------------------------------------|------------|-----------|----------------|----------------|-------------|-----------------|
| FOJAN   | RC: Normal<br>Others series refer to<br>Catalogue | 01005      | F:±1%     | ±5%:           | T: 7 inch reel | S: Sn       | Blank:          |
|         |                                                   | 0201       | G:±2%     | 3-digits+blank | Q:10 inch reel | C: Cu       | none            |
|         |                                                   | 0402       | J:±5%     | 102=1KΩ        | R:13 inch reel | A: Au       |                 |
|         |                                                   | 0603       |           | 1R0=1Ω         | B: Bulk        |             |                 |
|         |                                                   | 0805       |           | ±1%&Below:     |                |             |                 |
|         |                                                   | 1206       |           | 4-digits       |                |             |                 |
|         |                                                   | 1210       |           | 1001=1KΩ       |                |             |                 |
|         |                                                   | 1218       |           | 1R00=1Ω        |                |             |                 |
|         |                                                   | 1812       |           |                |                |             |                 |
|         |                                                   | 2010       |           |                |                |             |                 |
|         |                                                   | 2512       |           |                |                |             |                 |
| Company | Type                                              | Size       | Tolerance | Resistance     | Packaging      | Termination | Special<br>Case |

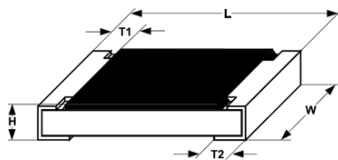
电阻结构 (Construction)



| NO. | 结构<br>Construction          | 主要材料<br>Major material        |
|-----|-----------------------------|-------------------------------|
| 1   | 陶瓷基板 Ceramic substrate      | 三氧化二铝 $\text{Al}_2\text{O}_3$ |
| 2   | 导电层 Conductive layer (Top)  | 银 Ag                          |
| 3   | 侧电极 Side conductive layer   | 镍铬合金 Ni-Cr                    |
| 4   | 阻体层 Resistive layer         | 氧化钌 $\text{RuO}_2$            |
| 5   | 内保护层 Inner protective layer | 玻璃 Glass                      |
| 6   | 外保护层 Outer Protective layer | 环氧树脂 Epoxy                    |
| 7   | 文字 Marking                  | 环氧树脂 Epoxy                    |
| 8   | 镍电极 Ni plating layer        | 镍 Ni                          |
| 9   | 锡电极 Sn plating layer        | 锡 Sn                          |
| 10  | 导电层 Conductive layer (Back) | 银 Ag                          |

尺寸 (Dimension):

尺寸 Dimension



单位 (unit) : mm

| 型别 (Type) |      | L               | W               | H               | T1              | T2              |
|-----------|------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 英制        | 公制   |                 |                 |                 |                 |                 |
| 01005     | 0402 | $0.40 \pm 0.02$ | $0.20 \pm 0.02$ | $0.13 \pm 0.03$ | $0.10 \pm 0.03$ | $0.10 \pm 0.03$ |
| 0201      | 0603 | $0.60 \pm 0.03$ | $0.30 \pm 0.03$ | $0.23 \pm 0.03$ | $0.10 \pm 0.05$ | $0.15 \pm 0.05$ |
| 0402      | 1005 | $1.00 \pm 0.05$ | $0.50 \pm 0.05$ | $0.35 \pm 0.05$ | $0.20 \pm 0.10$ | $0.25 \pm 0.10$ |
| 0603      | 1608 | $1.60 \pm 0.10$ | $0.80 \pm 0.10$ | $0.45 \pm 0.10$ | $0.25 \pm 0.15$ | $0.25 \pm 0.15$ |
| 0805      | 2012 | $2.00 \pm 0.10$ | $1.25 \pm 0.10$ | $0.50 \pm 0.10$ | $0.35 \pm 0.20$ | $0.40 \pm 0.20$ |
| 1206      | 3216 | $3.10 \pm 0.10$ | $1.60 \pm 0.10$ | $0.55 \pm 0.10$ | $0.45 \pm 0.20$ | $0.45 \pm 0.20$ |
| 1210      | 3225 | $3.10 \pm 0.10$ | $2.50 \pm 0.15$ | $0.55 \pm 0.10$ | $0.35 \pm 0.15$ | $0.50 \pm 0.20$ |
| 1812      | 4532 | $4.50 \pm 0.20$ | $3.10 \pm 0.20$ | $0.55 \pm 0.10$ | $0.55 \pm 0.20$ | $0.70 \pm 0.20$ |
| 2010      | 5025 | $5.00 \pm 0.10$ | $2.50 \pm 0.15$ | $0.55 \pm 0.10$ | $0.45 \pm 0.15$ | $0.50 \pm 0.20$ |
| 2512      | 6432 | $6.35 \pm 0.10$ | $3.10 \pm 0.15$ | $0.55 \pm 0.10$ | $0.60 \pm 0.20$ | $0.90 \pm 0.20$ |

## ■ 电气特性 (Electrical characteristics)

| 型别<br>Type | 70°C 下额定功率<br>Rated Power at 70°C | 最大工作电压<br>Max Working Voltage | 最大过负荷电压<br>Max Overload Voltage | 绝缘耐压<br>Dielectric Withstanding Voltage |
|------------|-----------------------------------|-------------------------------|---------------------------------|-----------------------------------------|
| 01005      | 1/32W                             | 15V                           | 30V                             | 50V                                     |
| 0201       | 1/20W                             | 25V                           | 50V                             | 50V                                     |
| 0402       | 1/16W                             | 50V                           | 100V                            | 300V                                    |
| 0603       | 1/10W                             | 75V                           | 150V                            | 300V                                    |
| 0805       | 1/8W                              | 150V                          | 300V                            | 500V                                    |
| 1206       | 1/4W                              | 200V                          | 400V                            | 500V                                    |
| 1210       | 1/2W                              | 200V                          | 400V                            | 500V                                    |
| 1812       | 3/4W                              | 200V                          | 500V                            | 500V                                    |
| 2010       | 3/4W                              | 200V                          | 400V                            | 500V                                    |
| 2512       | 1W                                | 200V                          | 400V                            | 500V                                    |

| 型别<br>Type | 零欧姆阻值<br>Value of Jumper |       | 零欧姆额定电流<br>Rated Current of Jumper | 零欧姆最大电流<br>Max Current of Jumper | 阻值范围<br>Resistance Range |         |         |
|------------|--------------------------|-------|------------------------------------|----------------------------------|--------------------------|---------|---------|
|            | ±1%                      | ±5%   |                                    |                                  | 1%                       | 2%      | 5%      |
| 01005      |                          | <50mΩ | 0.5A                               | 1A                               | 1Ω-10MΩ                  | 1Ω-10MΩ | 1Ω-10MΩ |
| 0201       |                          | <50mΩ | 0.5A                               | 1A                               | 1Ω-10MΩ                  | 1Ω-10MΩ | 1Ω-10MΩ |
| 0402       | <30mΩ                    | <50mΩ | 1A                                 | 2.5A                             | 1Ω-10MΩ                  | 1Ω-10MΩ | 1Ω-10MΩ |
| 0603       | <30mΩ                    | <50mΩ | 1A                                 | 2.5A                             | 1Ω-10MΩ                  | 1Ω-10MΩ | 1Ω-10MΩ |
| 0805       | <30mΩ                    | <50mΩ | 2A                                 | 5A                               | 1Ω-10MΩ                  | 1Ω-10MΩ | 1Ω-10MΩ |
| 1206       | <30mΩ                    | <50mΩ | 2A                                 | 10A                              | 1Ω-10MΩ                  | 1Ω-10MΩ | 1Ω-10MΩ |
| 1210       | <30mΩ                    | <50mΩ | 2A                                 | 10A                              | 1Ω-10MΩ                  | 1Ω-10MΩ | 1Ω-10MΩ |
| 1812       | <30mΩ                    | <50mΩ | 2A                                 | 10A                              | 1Ω-10MΩ                  | 1Ω-10MΩ | 1Ω-10MΩ |
| 2010       | <30mΩ                    | <50mΩ | 2A                                 | 10A                              | 1Ω-10MΩ                  | 1Ω-10MΩ | 1Ω-10MΩ |
| 2512       | <30mΩ                    | <50mΩ | 2A                                 | 10A                              | 1Ω-10MΩ                  | 1Ω-10MΩ | 1Ω-10MΩ |

备注 (Remark) : 额定电压计算公式 (The rated voltage is calculated by the following formula) :

$$E = \sqrt{RP}$$

E: 额定电压 (Rated Voltage) (V)

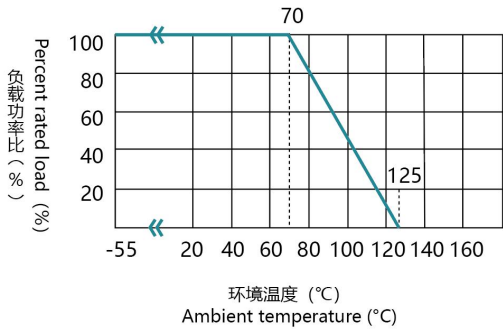
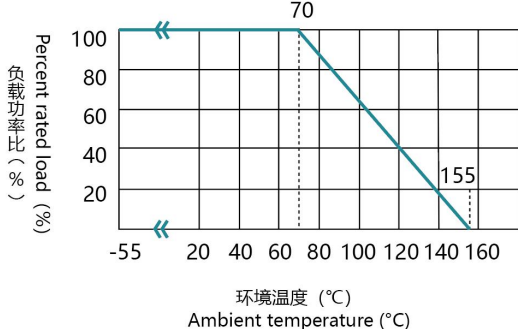
P: 额定功率 (Rated Power) (W)

R: 电阻阻值 (Resistance) (ohm)

如果计算出的电压超过此型别的最大工作电压, 则此型别的最大工作电压为此电阻的额定电压。

In case the value calculated by the formula exceed the maximum working voltage as above table, the maximum working voltage shall be regarded as rated voltage.

功率衰减曲线 (Derating Curve)

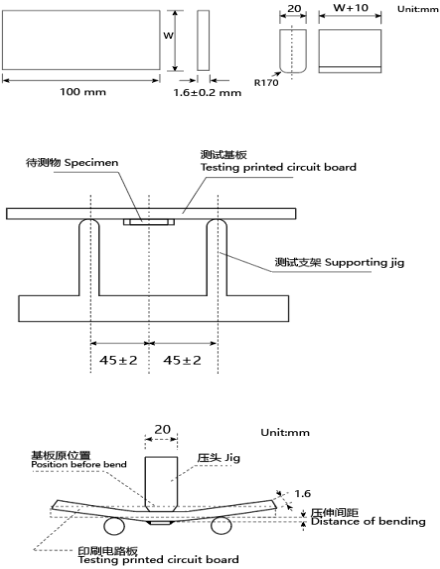
| 使用温度范围<br>Temperature<br>usage range         | -55℃~+125℃(01005/0201)                                                                                                                                       | -55℃~+155℃ (其它)                                                                                                                                              |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 说明<br>Describe                               | 周围温度若超过 70℃至 125℃之间, 功率可照下图曲线予以修订<br>If the ambient temperature exceeds 70℃ to 125℃, the power can be revised according to the curve in the following figure | 周围温度若超过 70℃至 155℃之间, 功率可照下图曲线予以修订<br>If the ambient temperature exceeds 70℃ to 155℃, the power can be revised according to the curve in the following figure |
| 功率衰减<br>曲线图<br>Power<br>Attenuation<br>Curve |                                                                            |                                                                           |

温度系数 (Temperature Coefficient)

| 型别 Type                                  | 阻值范围 Resistance Range | 产品精度和温漂系数 (ppm/℃)<br>Resistance Tolerance and TCR (ppm/℃) |      |      |
|------------------------------------------|-----------------------|-----------------------------------------------------------|------|------|
|                                          |                       | ±1%                                                       | ±2%  | ±5%  |
| 01005                                    | 1Ω≤R<10Ω              | ±400                                                      | ±400 | ±400 |
|                                          | 10Ω≤R<100Ω            | ±300                                                      | ±300 | ±300 |
|                                          | 100Ω≤R<10MΩ           | ±200                                                      | ±200 | ±200 |
| 0201                                     | 1Ω≤R<10Ω              | ±400                                                      | ±400 | ±400 |
|                                          | 10Ω≤R<1MΩ             | ±200                                                      | ±200 | ±200 |
|                                          | 1MΩ≤R<10MΩ            | ±200                                                      | ±200 | ±200 |
| 0402                                     | 1Ω≤R<10Ω              | ±400                                                      | ±400 | ±400 |
|                                          | 10Ω≤R<1MΩ             | ±100                                                      | ±100 | ±100 |
|                                          | 1MΩ≤R<10MΩ            | ±100                                                      | ±100 | ±100 |
| 0603/0805<br>1206/1210<br>1812/2010/2512 | 1Ω≤R<10Ω              | ±400                                                      | ±400 | ±400 |
|                                          | 10Ω≤R<1MΩ             | ±100                                                      | ±100 | ±100 |
|                                          | 1MΩ≤R<10MΩ            | ±100                                                      | ±100 | ±100 |

## ■ 性能 (Performance)

| 内容<br>Item                                    | 测试方法<br>Test Methods      | 测试条件<br>Test Conditions                                                                                                                                                                                                                                                                                                                                                                                                                      | 规格<br>Specification                                                                           |
|-----------------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 温度系数<br>Temperature<br>Coefficient            | JIS C 5201 4.8            | $TCR = (R - R_0) / (t - t_0) R_0 \times 10^6 (\text{ppm})$<br>R0: 电阻在室温下的阻值 (resistance at room temperature)<br>R: 电阻在 125°C或-55°C下的阻值 (resistance at 125°C or -55°C)<br>t0: 室温 (room temperature)<br>t: 测试温度 (test temperature 125°C or -55°C)                                                                                                                                                                                              | As SEPC                                                                                       |
| 短时间过负荷<br>Short-time<br>overload              | JIS C 5201 4.13           | 加载 2.5 倍的额定电压, 时间 5 秒后测量试验前后的阻值变化率。<br>Applied 2.5 times of rated voltage for 5 second. Measure the variation of resistance.                                                                                                                                                                                                                                                                                                                 | 1%: $\pm(1.0\%+0.05\Omega)$<br>2%, 5%: $\pm(2.0\%+0.05\Omega)$                                |
| 焊锡性<br>Solderability                          | JIS C 5201 4.17           | 沾助焊剂后浸入锡炉, 锡炉温度 $245 \pm 5^\circ\text{C}$ , 时间 $3 \pm 0.5$ 秒。<br>Dip the terminal in a flux and then dip into a soldering bath at $245 \pm 5^\circ\text{C}$ for $3 \pm 0.5\text{sec}$ .                                                                                                                                                                                                                                                      | 上锡面积 > 95%<br>Soldered are > 95%                                                              |
| 抗焊锡热<br>Resist to<br>soldering<br>heat        | JIS C 5201 4.18           | 沾助焊剂后浸入锡炉, 锡炉温度 $260 \pm 5^\circ\text{C}$ , 时间 $10 \pm 0.5$ 秒, 测量试验前后的阻值变化率。<br>Dip the terminal in a flux and then dip into a soldering bath at $260 \pm 5^\circ\text{C}$ for $10 \pm 0.5\text{sec}$ . Measure the variation of resistance.                                                                                                                                                                                                 | $\pm(1.00\% + 0.05\Omega)$                                                                    |
| 绝缘电阻<br>Insulation<br>resistance              | JIS C 5201 4.6            | 电阻本体上加载绝缘耐压 $60 \pm 5$ 秒后, 测量绝缘阻抗。<br>Applied the dielectric withstanding voltage on the center of body for $60 \pm 5\text{seconds}$ . Then measure insulation resistance.                                                                                                                                                                                                                                                                   | > 10GΩ                                                                                        |
| 绝缘耐压<br>Dielectric<br>withstanding<br>voltage | JIS C 5201 4.7            | 电阻本体上加载绝缘耐压 $60 \pm 5$ 秒。<br>Applied the dielectric withstanding voltage on the center of body for $60 \pm 5\text{seconds}$ .                                                                                                                                                                                                                                                                                                                | 无击穿、飞溅及可见机械性损伤<br>No evidence of flash over, mechanical damage arcing or insulation breakdown |
| 温度快速变化<br>Rapid<br>temperature<br>changes     | JIS C 5201 4.19           | 电阻放入温度循环机中, T1 温度: $-55 \pm 3^\circ\text{C}$ ; T2 温度: $155 \pm 3^\circ\text{C}$ , $125 \pm 3^\circ\text{C}$ , 放置 30 分钟, 共 300 个循环。量测试前后阻值变化率。<br>Put specimen in a chamber which temperature can be T1: $-55 \pm 3^\circ\text{C}$ ; T2: $155 \pm 3^\circ\text{C}/125 \pm 3^\circ\text{C}$ , 30min, repeated 300 cycles. Measure the variation of resistance.                                                                                 | 1%: $\pm(1.0\%+0.05\Omega)$<br>2%, 5%: $\pm(2.0\%+0.05\Omega)$                                |
| 温湿循环<br>Moisture<br>resistance                | MIL-STD-202<br>METHOD 106 | $25^\circ\text{C} \sim 65^\circ\text{C}$ , 90% ~ 100%RH, 2.5 小时; $65^\circ\text{C}$ , 90% ~ 100%RH, 3 小时; $65^\circ\text{C} \sim 25^\circ\text{C}$ , 80% ~ 100%RH, 2.5 小时, 10 个循环, $24 \pm 4$ 小时后测试。<br>$25^\circ\text{C} \sim 65^\circ\text{C}$ , 90% ~ 100%RH, 2.5H; $65^\circ\text{C}$ 90% ~ 100%RH, 3H; $65^\circ\text{C} \sim 25^\circ\text{C}$ , 80% ~ 100%RH, 2.5H, 10 cycles, Measurement at $24 \pm 4$ hours after test conclusion. | 1%: $\pm(1.0\%+0.05\Omega)$<br>2%, 5%: $\pm(2.0\%+0.05\Omega)$                                |

| 内容<br>Item               | 测试方法<br>Test Methods | 测试条件<br>Test Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 规格<br>Specification                                                                             |
|--------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| 端子弯曲<br>Terminal bending | JIS C 5201 4.33      | <p>电阻焊接在测试板上进行弯折, 弯折保持时间 <math>20 \pm 1</math> 秒, 1206 (含) 以下的尺寸弯曲 <math>5 + 0.2/0</math> mm; 1206 以上的尺寸弯曲 <math>2 + 0.2/0</math> mm; 量测试前后阻值变化率</p> <p>Specimen shall be mounted on test board, then bend the board and maintained for <math>20 \pm 1</math> s. the distance of bending is <math>5 + 0.2/0</math> mm for resistors which size no larger than 1206 or <math>2 + 0.2/0</math> mm which size larger than 1206. Measure the variation of resistance.</p> <p>测试板 (test board) 压头 (jig)</p>  | $\pm(1.00\%+0.05\Omega)$                                                                        |
| 耐湿特性<br>Humidity         | JIS C 5201 4.24      | <p>电阻放入恒温恒湿箱, 温度 <math>40 \pm 2^\circ\text{C}</math>, 湿度 90~95 %RH; 通电额定电压 1.5 小时, 断电 0.5 小时; 重复通断电至试验时间 <math>1000^{+48}/_{-0}</math> 小时。量测试前后阻值变化率。</p> <p>Put the specimen in a chamber at <math>40 \pm 2^\circ\text{C}</math> temperature and 90% ~ 95% relative humidity, then applied rated voltage for 1.5H "ON" and 0.5H "OFF" repeatedly till total test time is <math>1000^{+48}/_{-0}</math> H. Measure the variation of resistance.</p>                                                                                                                                        | <p>1%: <math>\pm(1.0\%+0.05\Omega)</math></p> <p>2%, 5%: <math>\pm(2.0\%+0.05\Omega)</math></p> |
| 负荷寿命<br>Load life        | JIS C 5201 4.25.1    | <p>电阻放入恒温箱中, 温度 <math>70 \pm 2^\circ\text{C}</math>, ON TIME:1.5H, OFF TIME:0.5H, 通电额定电压 <math>1000^{+24}/_{-0}</math> 小时, 量测试前后阻值变化率。</p> <p>Put the specimen in a chamber at <math>70 \pm 2^\circ\text{C}</math> temperature, ON TIME:1.5H, OFF TIME:0.5H, and applied rated voltage for <math>1000^{+24}/_{-0}</math> H. Measure the variation of resistance.</p>                                                                                                                                                                                                                       | <p>1%: <math>\pm(1.0\%+0.05\Omega)</math></p> <p>2%, 5%: <math>\pm(2.0\%+0.05\Omega)</math></p> |

## ■ 本体标识 (Marking on the Resistor's Body)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>1.0201 及 0402 因本体太小, 本体上无字码标识</b><br/>For 0201 and 0402 size, no marking on the body due to the small size of the resistor</p> <p><b>2.公差±5%的产品, 以三字码标示, 前两位表示阻值的有效数字, 最后一位表示 10 的乘幂</b><br/>±5% tolerance product: the marking is 3 digits, the first 2 digits are significant figures of resistance value and the 3rd one denotes the power number of 10, (10X)</p> <p><b>3.±0.5%, ±1%, ±2%的产品, 以四字码标示, 前三 位表示阻值的有效数字, 最后一位表示 10 的乘幂</b><br/>±0.5%, ±1%, ±2% tolerance product: the marking is 4 digits, the first 3 digits are significant figures of resistance value and the 4th one denotes the power number of 10, (10X)</p> <p><b>4.0603 ±1% E96 系列的标准阻值, 因电阻本体太小, 采用三位代码标识。</b><br/>Standard E96 series values of 0603 ±1%: due to the small size of the resistor' s body, use 3digits code to indicate the resistance value.</p> <p><b>5.所有型别, 所有精度零欧姆产品, 采用 1 位代码标识, 即 0</b><br/>All type and tolerance of Jumper products used 1 digit code to indicate the value,i.e.0</p> | <br><br><br><br><br><br><br><br> | <p><b>472=47×10<sup>2</sup>=4.7KΩ</b></p><br><p><b>10Ω以下标示: 5R6=5.6Ω</b><br/><b>Below 10Ω: 5R6=5.6Ω</b></p><br><p><b>4992=499×10<sup>2</sup>=49.9KΩ</b></p><br><p><b>100Ω以下标示</b><br/><b>6R81=6.81Ω</b><br/><b>Below 100Ω: 6R81=6.81Ω</b></p><br><p><b>0Ω=0</b></p> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## ■ 0603±1% E96 系列电阻值代码 Standard E96 Series Resistance Value Code for 0603 ±1% Marking

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



### 0603±1%标记的倍增码 Multiplier Code for 0603 ±1% Marking

| 代码 Code       | Y         | X         | A      | B      | C      | D      | E      | F      |
|---------------|-----------|-----------|--------|--------|--------|--------|--------|--------|
| 指数 Multiplier | $10^{-2}$ | $10^{-1}$ | $10^0$ | $10^1$ | $10^2$ | $10^3$ | $10^4$ | $10^5$ |

阻值标示如下 (So the resistance value are marked as the following examples)



$$10D = 124 \times 10^3 = 124K\Omega$$



$$38Y = 243 \times 10^{-2} = 2.43\Omega$$

0603 ±1%的产品，在标准 E24 系列中，但不属于 E96 系列，标示与 5%的字码相同，但是在中间字码

下加一条线 (Standard E24 and not belong to E96 series values of 0603 ±1%, the marking is the same as 5% tolerance but marking as underline)



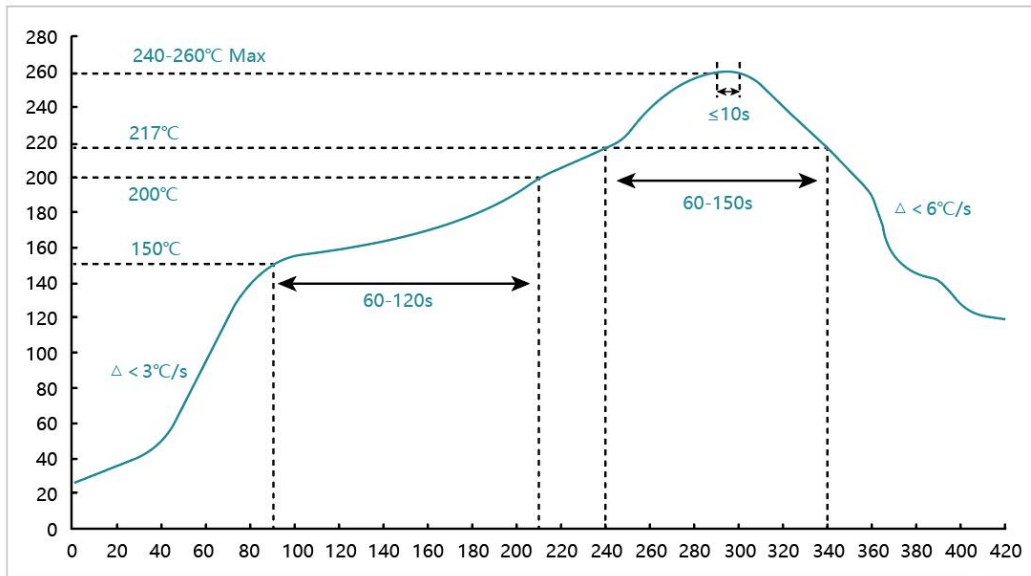
$$3\bar{3}1 = 33 \times 10^1 = 330\Omega$$



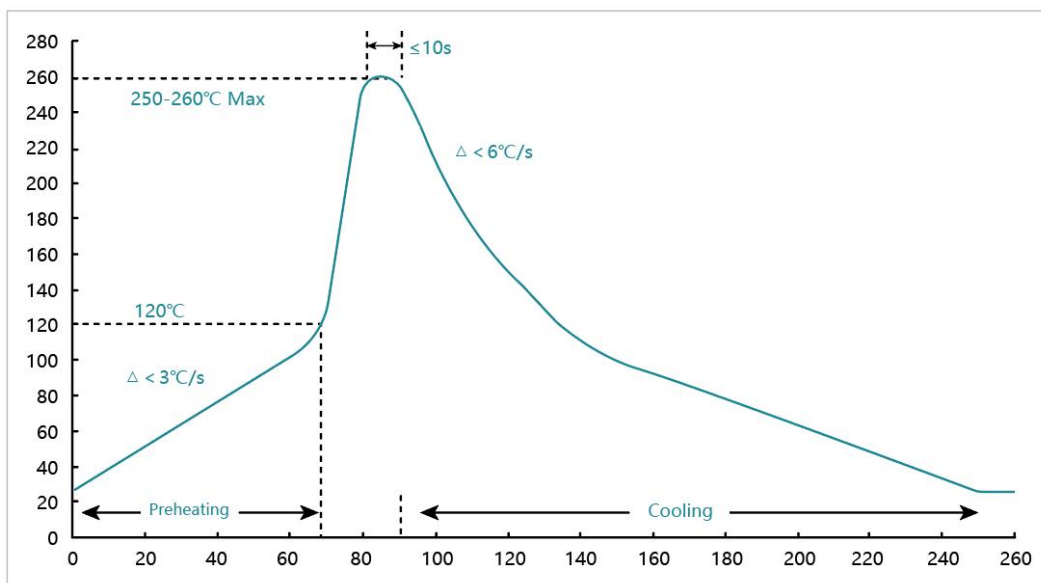
$$5\bar{6}0 = 56 \times 10^0 = 56\Omega$$

## ■ 焊接 (soldering)

### - 建议回流焊曲线 (Recommend reflow soldering profile)



### - 建议波峰焊曲线 (Recommend wave soldering profile)

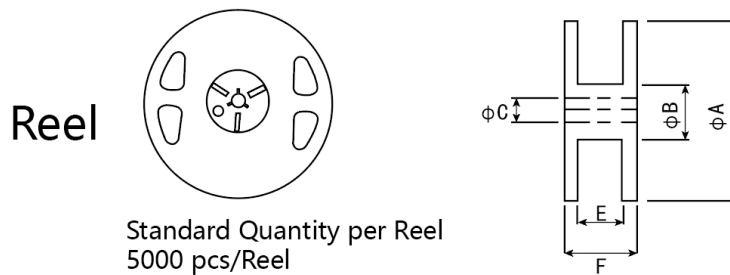


### - 手工焊温度 (hand soldering temperature)

烙铁温度  $350 \pm 10^{\circ}\text{C}$  3 秒之内, 避免烙铁接触电阻本体

The iron temperature is  $350 \pm 10^{\circ}\text{C}$ , hand soldering time less than 3S. Avoid solder iron tip direct touch the components body

### ■ 包装规格 (Tapping Specification)

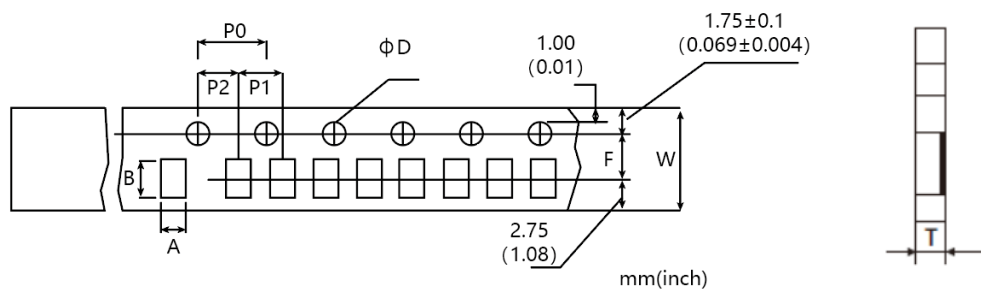


#### - 卷盘尺寸 (Reel dimension)

| Type                | Size |              | Unit | A       | B         | C        | F        | E        |
|---------------------|------|--------------|------|---------|-----------|----------|----------|----------|
| 01005               | 7"   | 10K/15K Reel | mm   | 178±2.0 | 60.0±1.0  | 13.5±0.5 | 11.4±0.1 | 9.00±0.3 |
| 0201                | 7"   | 10K/15K Reel | mm   | 178±2.0 | 60.0±1.0  | 13.5±0.5 | 11.4±0.1 | 9.00±0.3 |
| 0402                | 7"   | 10K/Reel     | mm   | 178±2.0 | 60.0±1.0  | 13.5±0.5 | 11.4±0.1 | 9.00±0.3 |
| 0402                | 13"  | 40K/50K Reel | mm   | 330±2.0 | 100.0±1.0 | 13.5±0.5 | 11.4±0.1 | 9.00±0.3 |
| 0603/0805/1206/1210 | 7"   | 5K/Reel      | mm   | 178±2.0 | 60.0±1.0  | 13.5±0.5 | 11.4±0.1 | 9.00±0.3 |
| 0603/0805/1206      | 10"  | 10K/Reel     | mm   | 254±2.0 | 100.0±1.0 | 13.5±0.5 | 11.4±0.1 | 9.00±0.3 |
| 0603/0805/1206      | 13"  | 20K/Reel     | mm   | 330±2.0 | 100.0±1.0 | 13.5±0.5 | 11.4±0.1 | 9.00±0.3 |
| 1812/2010/2512      | 7"   | 4K/Reel      | mm   | 178±2.0 | 60.0±1.0  | 13.5±0.5 | 15.4±1.0 | 13.0±0.3 |

#### - 包装尺寸 (packing dimension)

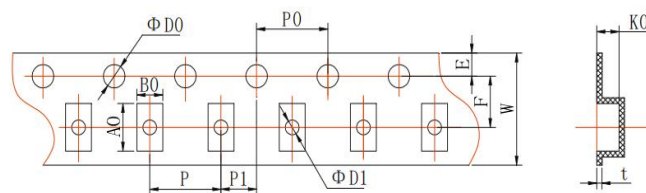
纸带编带 Paper Taping



Unit: mm

| Dim   | A         | B         | D         | F         | P0        | P1        | P2        | W         | T         |
|-------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 01005 | 0.25±0.02 | 0.45±0.02 | 1.50±0.10 | 3.50±0.05 | 4.00±0.10 | 2.00±0.10 | 2.00±0.05 | 8.00±0.20 | 0.31±0.03 |
| 0201  | 0.38±0.05 | 0.68±0.05 | 1.50±0.10 | 3.50±0.05 | 4.00±0.10 | 2.00±0.10 | 2.00±0.05 | 8.00±0.20 | 0.42±0.03 |
| 0402  | 0.65±0.10 | 1.15±0.10 | 1.50±0.10 | 3.50±0.05 | 4.00±0.10 | 2.00±0.10 | 2.00±0.05 | 8.00±0.20 | 0.42±0.03 |
| 0603  | 1.10±0.10 | 1.90±0.10 | 1.50±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 8.00±0.20 | 0.60±0.03 |
| 0805  | 1.65±0.20 | 2.40±0.20 | 1.50±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 8.00±0.20 | 0.75±0.05 |
| 1206  | 1.90±0.20 | 3.50±0.20 | 1.50±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 8.00±0.20 | 0.75±0.05 |
| 1210  | 2.80±0.20 | 3.50±0.20 | 1.50±0.10 | 3.50±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 8.00±0.20 | 0.75±0.05 |

## 塑料带编 Embossed Taping



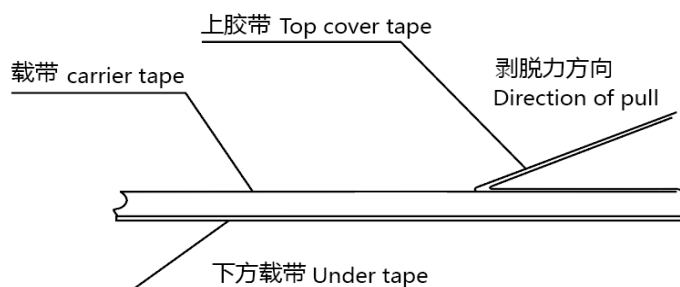
Unit: mm

| Dim  | B0        | A0        | D0        | F         | P0        | P         | P1        | W         | K0        |
|------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1812 | 3.52±0.10 | 5.10±0.10 | 1.50±0.10 | 5.50±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 12.0±0.10 | 0.78±0.10 |
| 2010 | 2.75±0.10 | 5.40±0.10 | 1.50±0.10 | 5.50±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 12.0±0.10 | 0.75±0.10 |
| 2512 | 3.35±0.10 | 6.70±0.10 | 1.50±0.10 | 5.50±0.05 | 4.00±0.10 | 4.00±0.10 | 2.00±0.05 | 12.0±0.10 | 0.75±0.10 |

### 上胶带剥离力测试 (Peel force of top cover tape)

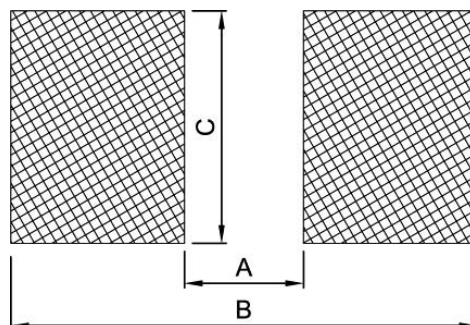
上胶带以 300mm/分钟的速度，沿 165~180 度角的方向进行剥离，如下图所示。纸带的剥离力范围为 10g~70g；载带的剥离力范围 30~100g。

The top cover tape is pulled at a speed of 300 mm/min with the angle between the tape during peel and the direction of unreeling maintained at 165 to 180 degree as following picture. The peel force of paper carrier tape shall be 0.1N to 0.7N(10 to 70 g), the peel force of plastic carrier tape shall be 0.3N to 1N (30 to 100 g).



### 建议焊盘尺寸 (Recommended Pad Dimensions)

| Type  | Land pattern | Dimensions (mm) |           |           |
|-------|--------------|-----------------|-----------|-----------|
|       |              | A               | B         | C         |
| 01005 |              | 0.15~0.20       | 0.50~0.70 | 0.20~0.25 |
| 0201  |              | 0.25~0.30       | 0.80~1.00 | 0.30~0.40 |
| 0402  |              | 0.50~0.60       | 1.30~1.60 | 0.40~0.60 |
| 0603  |              | 0.80~1.10       | 2.00~2.50 | 0.80~1.00 |
| 0805  |              | 1.00~1.40       | 2.90~3.40 | 1.00~1.40 |
| 1206  |              | 2.00~2.40       | 4.10~4.60 | 1.50~1.80 |
| 1210  |              | 2.00~2.40       | 4.10~4.60 | 2.50~3.00 |
| 1812  |              | 2.80~3.30       | 5.00~6.00 | 3.00~3.50 |
| 2010  |              | 3.40~3.90       | 5.70~6.50 | 2.50~3.00 |
| 2512  |              | 3.60~4.20       | 7.60~8.60 | 3.00~3.50 |



## ■ 厚膜电阻器使用说明 (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：

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

1. 高温；  
High temperature
2. 有海风或腐蚀性气体，包括氯气，硫化氢，氨气，二氧化硫，二氧化氮等；  
Near the sea ,or corrosive gas, such as  $\text{Cl}_2$ ,  $\text{H}_2\text{S}$ ,  $\text{NH}_3$ ,  $\text{SO}_2$  and  $\text{NO}_2$  etc;
3. 各种类型的液体，包括水，油，化学品，有机溶剂的使用；  
Unverified liquids, such as water,oil,chenical or organic solvent;
4. 在用树脂或其他涂层材料密封产品的情况下使用；  
Unverified resin or paint to cover products;
5. 焊接后使用不洁焊剂或使用水或水溶性清洁剂清洗产品  
Products should be washed with soluble cheaner even if non cleaning flux.

## - 储存 / 搬运条件 (Storage / Carry conditions)

1. 储存温度  $25\pm 5^\circ\text{C}$                       Temperature:  $25\pm 5^\circ\text{C}$
2. 湿度 30% ~ 70%RH                      Humidity: 30% ~ 70%RH
3. 储存期限：先进先出，2 年              Storage life: 2years FIFO
4. 存放和搬运时，请保持盒子的正确方向。严禁跌落在箱体上，否则可能损坏产品电极或本体  
Please hold box correct orientation when storing and carrying.It is strictly prohibited to fall on the box.  
otherwise the product electrode or body may be damaged.



## ■ 修订履历 (Revision History)

[illegible]