



富捷科技

# Product Datasheet

产品规格说明书

**FWPK Series**

**Four Terminal Alloy Chip Resistors**

**FWPK 四端子合金贴片电阻**

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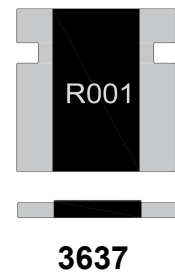
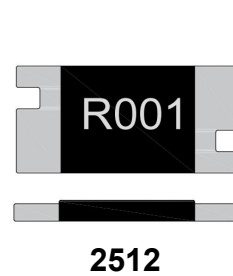
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## FWPK 四端子合金贴片电阻

## Four Terminal Alloy Chip Resistors

## FWPK Series



## ■ 特点 (Features)

- 散热性能好
- 用于高功率耗散
- 用于电流检测的低电流, 高精度电阻
- 低电感
- 全合金材质
- 低温度系数
- 绝缘耐压: 500V DC
- 无铅, 符合 RoHS、Reach 要求
- Good performance for Heat Dissipation
- For High Power Dissipation
- Low Resistance and High Accuracy Resistor for Current Detection
- Low inductance
- All alloy material
- Low temperature coefficient
- Dielectric Withstanding Voltage: 500V DC
- Pb-free to Meet RoHS 、 Reach Requirements

## ■ 应用 (Application)

- DC-DC 转换器, 电池组, 充电, 适配器
- 计算机显卡
- 电压调节模块 (VRM)
- 过流保护
- 电流检测
- 电源管理应用
- DC-DC Converter , Battery Pack, Charge, Adaptor
- Computer graphics card
- Voltage Regulation Module (VRM)
- Over current protection
- Current sensing
- Power Management Applications

## ■ 产品料号 (Parts Number Explanation)

示例: FWPK252WFR005TK4

| FWPK<br>公司名 | 25<br>型别           | 2W<br>功率                | F<br>公差                            | R005<br>字码                           | I<br>包装别                                    | K<br>材质     | 4<br>特殊型                    |
|-------------|--------------------|-------------------------|------------------------------------|--------------------------------------|---------------------------------------------|-------------|-----------------------------|
| FOJAN Type  | 25:2512<br>36:3637 | 2W:2W<br>3W:3W<br>5W:5W | D:±0.5%<br>F:±1%<br>G:±2%<br>J:±5% | R005=5mΩ<br>R100=100mΩ<br>3m50=3.5mΩ | T: 7 inch reel<br>R:13 inch reel<br>B: Bulk | K: Karma    | Blank: none<br>4:4 terminal |
| Company     | Size               | Power                   | Tolerance                          | Resistance                           | Packaging                                   | Termination | Special                     |



尺寸 (Dimension)

产品尺寸  
Product  
Dimension

Technical drawing of a 2512 resistor. The top view shows a rectangular component with a central black square labeled 'R001'. Dimensions are indicated: L (length), W (width), A (distance from left edge to center), B (distance from right edge to center), E (distance from top edge to center), and T (thickness). The side view shows the component's profile with height H.

2512

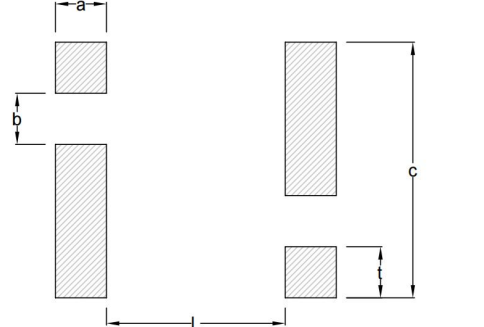
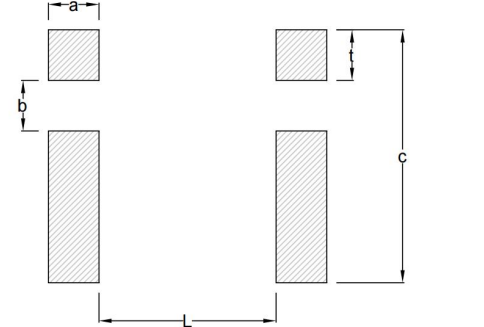
Technical drawing of a 3637 resistor. The top view shows a rectangular component with a central black square labeled 'R001'. Dimensions are indicated: L (length), W (width), A (distance from left edge to center), B (distance from right edge to center), E (distance from top edge to center), and T (thickness). The side view shows the component's profile with height H.

3637

单位 (unit) : mm

| 型别<br>(Size) | Resistance<br>(mΩ) | Product Dimension |         |         |         |         |         |         |
|--------------|--------------------|-------------------|---------|---------|---------|---------|---------|---------|
|              |                    | L                 | W       | A       | B       | E       | T       | H       |
| 2512         | 2~150              | 6.4±0.2           | 3.2±0.2 | 0.9±0.2 | 0.8±0.2 | 0.5±0.2 | 0.8±0.2 | 0.8±0.1 |
| 3637         | 2~200              | 9.2±0.2           | 9.4±0.2 | 2.2±0.2 | 0.8±0.2 | 1.5±0.2 | 1.6±0.2 | 0.8±0.1 |

推荐焊盘尺寸 (Recommended Pad Dimension)

| 焊盘尺寸<br>Pad<br>Dimension |  |               |  |     | 单位 (unit) : mm |     |  |  |
|--------------------------|-------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------|-----|----------------|-----|--|--|
|                          | 2512                                                                                |               | 3637                                                                                 |     |                |     |  |  |
| 型别<br>(Size)             | Resistance<br>(mΩ)                                                                  | Pad Dimension |                                                                                      |     |                |     |  |  |
|                          |                                                                                     | a             | b                                                                                    | c   | t              | L   |  |  |
| 2512                     | 2~150                                                                               | 2.1           | 0.6                                                                                  | 4   | 1.0            | 4.1 |  |  |
| 3637                     | 2~200                                                                               | 3.0           | 0.6                                                                                  | 9.9 | 1.8            | 4.5 |  |  |

## ■ 电阻结构 (Construction)

电子束焊结构

Electron Beam Welding Structures



## ■ 电气特性 (Electrical characteristics)

| 型别<br>Type | 额定功率<br>Power Rating<br>at P70<br>(W) | T.C.R.<br>(PPM/°C) | 阻值范围<br>Resistance Range<br>(mΩ) | 材料<br>Element Material | 精度<br>Tolerance<br>(%) | 使用温度范围<br>Operating<br>Temperature<br>(°C) |
|------------|---------------------------------------|--------------------|----------------------------------|------------------------|------------------------|--------------------------------------------|
| 2512       | 2                                     | ±20、±50            | 101~150                          | Karma                  | ±0.5%, ±1%, ±2%, ±5%   | -55°C~170°C                                |
|            | 3                                     | ±20、±50            | 5~100                            |                        |                        |                                            |
| 3637       | 3                                     | ±20、±50            | 101~200                          |                        |                        |                                            |
|            | 5                                     | ±20、±50            | 5~100                            |                        |                        |                                            |

如有非标准品的需求,请联系我们的业务部门 For non-standard parts, please contact our sales dept.

## ■ 印字标识 (Marking)

产品阻值使用两种方式表示:

- 以“R”字指示  $\Omega$  的小数点的位置
- 以“m”字指示  $m\Omega$  的小数点的位置

例:

R001=1mΩ; R050=50mΩ;

0m50=0.5mΩ; 2m50=2.5mΩ

The resistance value of the product is expressed in two ways:

- The decimal point of  $\Omega$  is indicated by the character "R".
- Using "m" to indicate the decimal point of  $m\Omega$ .

E.g.,

R001=1mΩ; R050=50mΩ;

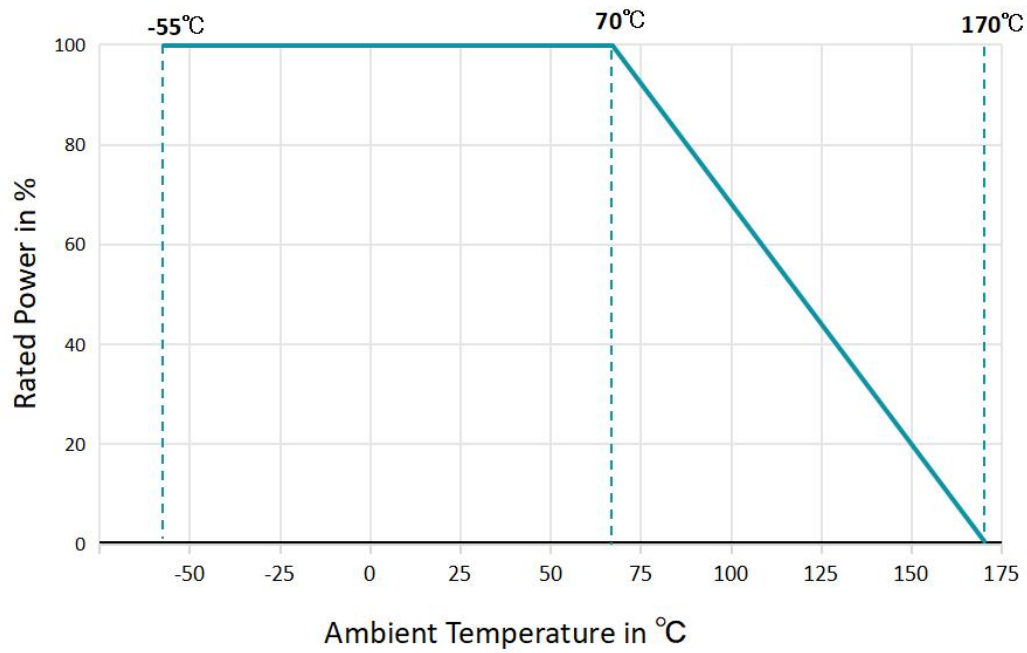
0m50=0.5mΩ; 2m50=2.5mΩ

## ■ 性能 (Performance)

| Test Items<br>测试项目                            | Reference<br>依据标准                              | Conditions of Test<br>测试条件                                                                         | Test Limits<br>测试结果       |
|-----------------------------------------------|------------------------------------------------|----------------------------------------------------------------------------------------------------|---------------------------|
| Temperature Coefficient of Resistance<br>温度系数 | AEC-Q200 TEST 19<br>IEC 60115-1 4.8            | Measuring points -55°C and +125°C, reference point +20°C<br>测量点-55°C和+125°C, 参考点+20°C              | 见图表                       |
| High Temperature Exposure (Storage)<br>高温存储   | AEC-Q200-REV D-Test 3<br>MIL-STD202 Method 108 | T=170°C, 1000hrs, Measurement at 24hrs after test conclusion.<br>170°C, 1000 小时, 测试结束后 24 小时测量。    | $\Delta R \leq \pm 1\%$   |
| Low Temperature Exposure (Storage)<br>低温存储    | IEC60115-1 4.25                                | T=-55°C, 1000 hours, Measurement at 24hrs after test conclusion.<br>-55°C, 1000 小时, 测试结束后 24 小时测量。 | $\Delta R \leq \pm 0.5\%$ |

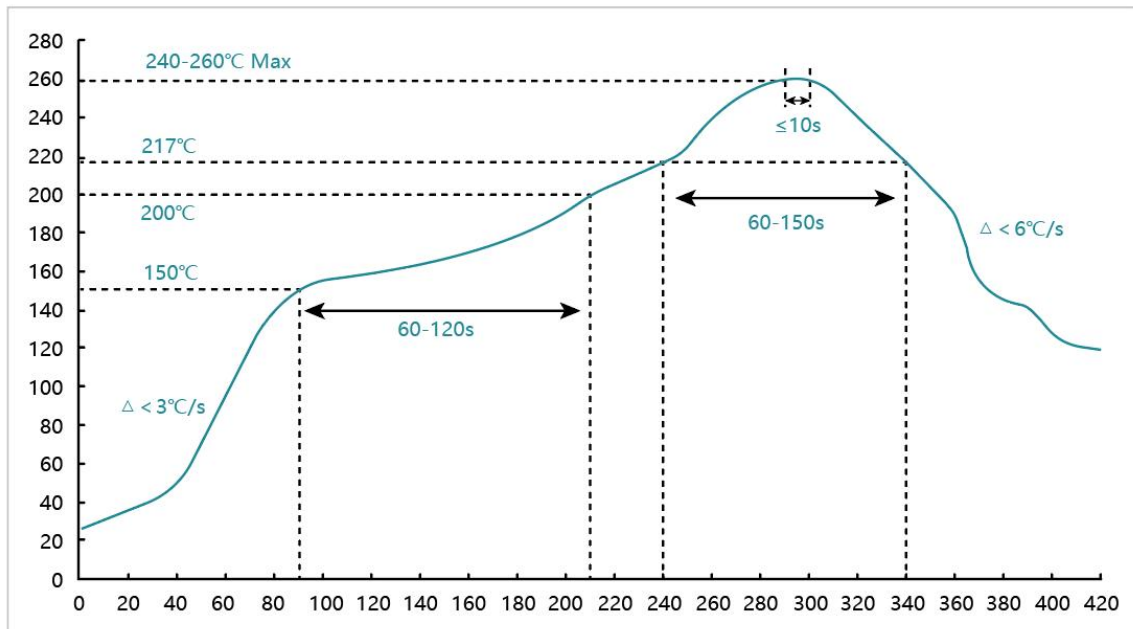
|                                      |                                                         |                                                                                                                                                          |                                                         |
|--------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Temperature Cycling<br>温度循环          | AEC-Q200-REV D-Test 4<br>JESD22 Method JA-104           | 1000 Cycle (-55℃ to 125℃) Measurement at 24hrs after test conclusion.<br>1000 次循环 (-55℃至 125℃) 测试结束后 24 小时进行测量。                                          | $\Delta R \leq \pm 0.5\%$                               |
| Short time overload<br>短时过载          | IEC60115-1 4.13                                         | 5 X rated power for 5s<br>5 倍额定功率, 5 秒                                                                                                                   | $\Delta R \leq \pm 0.5\%$                               |
| Moisture Resistance<br>耐湿性           | AEC-Q200-REV D-Test 6<br>MIL-STD-202 Method 106         | T=24 hours / Cycle ,10 Cycles. Notes: Steps 7a& 7b not required.<br>施加 T=24 小时/周期, 零功率, 方法中 7a 和 7b 不做要求                                                 | $\Delta R \leq \pm 1\%$                                 |
| Biased Humidity<br>高温高湿              | AEC-Q200-REV D-Test 7<br>MIL-STD-202 Method 103         | 10% Rated power at 85℃, RH:85%, 1000Hrs, Measurement at 24hrs after test conclusion.<br>10% 额定功率, 85℃, 相对湿度: 85%, 1000 小时, 测试结束后 24 小时测量。                | $\Delta R \leq \pm 0.5\%$                               |
| Load Life<br>负载寿命                    | AEC-Q200-REV D-Test 8<br>MIL-STD-202 Method 108         | 1000 h at +70 °C, 1.5 h "ON", 0.5 h "OFF", Measurement at 24hrs after test conclusion.<br>1000 小时, +70 °C, 1.5 小时"开启", 0.5 小时"关闭", 测试结束后 24 小时测量。        | $\Delta R \leq \pm 1\%$                                 |
| Resistance to Solvents<br>耐溶剂性       | AEC-Q200-REV D-Test 12<br>MIL-STD-202 Method 215        | Dip in solvent for 3 minutes and wipe 10 times, three cycles of three solvents, rinse and dry at room temperature.<br>浸入溶剂三分钟后擦十次, 三种溶剂三个循环, 清洗后室温干燥     | Markings are clear,<br>no visible damage<br>标志清晰, 无可见损伤 |
| Resistance to Soldering Heat<br>耐焊接热 | AEC-Q200-REV D-Test 15<br>MIL-STD-202 Method 210        | T=260±5℃ solder, 10±1 sec dwell<br>260±5℃ 焊接, 停留 10±1 秒。                                                                                                 | $\Delta R \leq \pm 0.5\%$                               |
| Mechanical Shock<br>机械冲击             | AEC-Q200-REV D-Test 13<br>MIL-STD-202 Method 213        | 100g's, Normal duration is 6ms, half sine shock pulse<br>正半正弦波, 峰值加速度 100g's, 脉冲持续 6ms, 三轴六向各 3 次。                                                       | $\Delta R \leq \pm 0.5\%$                               |
| Resistance to vibration<br>抗震性       | AEC-Q200-REV D-Test 14<br>MIL-STD-202 Method 204        | 5g's for 20min. 12cycles, 10-2000Hz<br>10-2000Hz, 5g's, 20 分钟一个循环, X.Y.Z 三个方向各 12 个循环                                                                    | $\Delta R \leq \pm 0.5\%$                               |
| Board Flex<br>板弯曲试验                  | AEC-Q200-REV D-Test 21<br>AEC-Q200-005                  | Min 2mm deflection ,60sec.<br>2mm, 保持时间 60s                                                                                                              | $\Delta R \leq \pm 0.5\%$                               |
| Thermal Shock<br>冷热冲击                | AEC-Q200-REV D-Test 16<br>MIL-STD-202 Method 107        | -55℃/+155℃. Note: Number of cycles required-1000, Maximum transfer time-20 seconds, Dwell time-15 minutes.<br>-55℃, 15 分钟~常温<20 秒~+155℃, 15 分钟, 1000 个循环 | $\Delta R \leq \pm 1\%$                                 |
| ESD Test<br>静电放电测试                   | AEC-Q200-REV D-Test 17<br>AEC-Q200-002 or ISO/DIS 10605 | a: Direct Contact (Dc): ±6kV;<br>b: Air Discharge (AD): +12kv, +16k, +25kV;<br>a: 直接接触 (DC): ±6kV;<br>b: 空气放电 (AD): +12kV、+16k、+25kV;                    | $\Delta R \leq \pm 1\%$                                 |
| Solderability<br>可焊性                 | AEC-Q200-REV D-Test 18<br>J-STD-002                     | Dip the terminal in a flux and then dip into a soldering bath at 245±5℃ for 3±0.5sec<br>沾助焊剂后浸入锡炉, 锡炉温度 245±5℃, 时间 3±0.5 秒。                              | > 95% area covered<br>> 95% 面积上锡                        |

## ■ 功率衰减曲线 (Derating Curve)

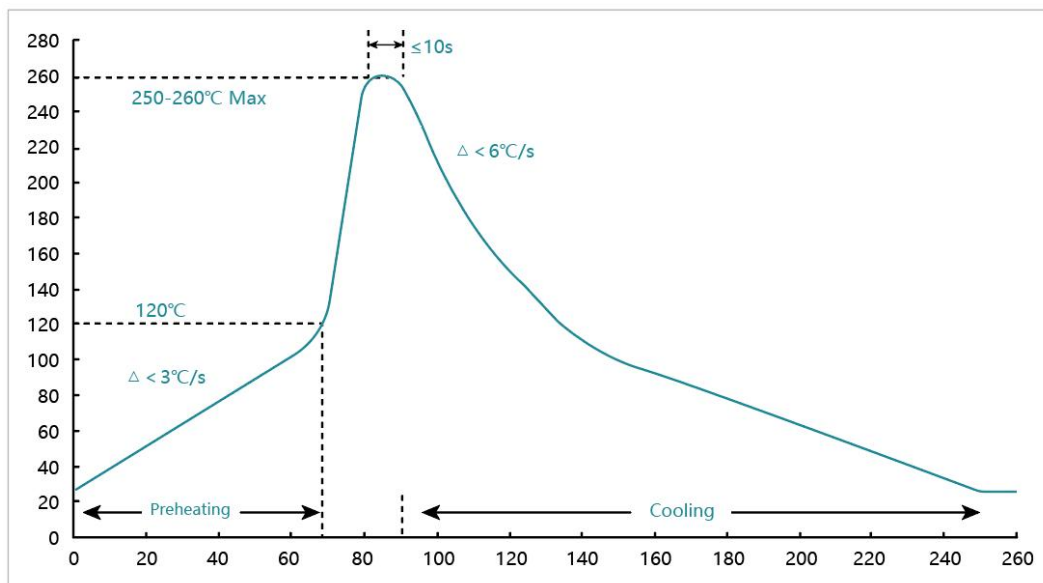


## ■ 焊接 (soldering)

### - 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

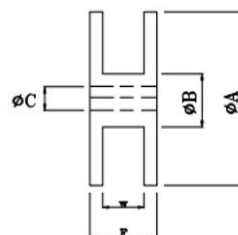
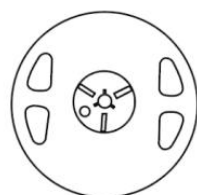
The iron temperature is  $350 \pm 10^\circ\text{C}$ , hand soldering time less than 3S. Avoid solder iron tip direct touch the components body

## ■ 包装规格 (Tapping Specification)

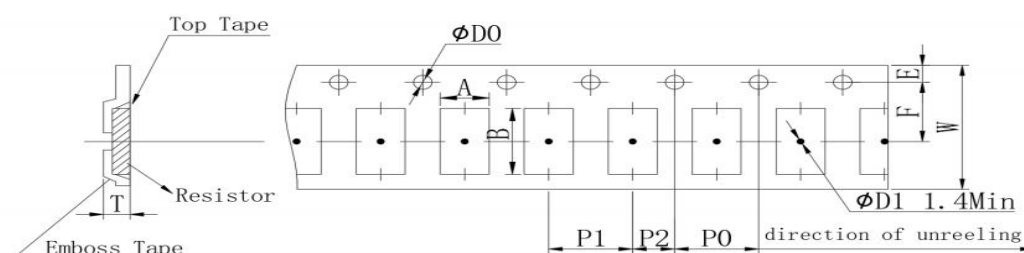
## - 卷盘尺寸 (Reel dimension)

| Type | Size | Unit    | $\phi A$      | $\phi B$       | $\phi C$       | F              | W              |
|------|------|---------|---------------|----------------|----------------|----------------|----------------|
| 2512 | 7"   | 4K/Reel | $178 \pm 2.0$ | $80.0 \pm 1.0$ | $13.5 \pm 1.0$ | $15.4 \pm 2.0$ | $13.0 \pm 1.0$ |
| 3637 | 13"  | 3K/Reel | $330 \pm 2.0$ | $100 \pm 1.0$  | $13.5 \pm 1.0$ | $29 \pm 2.0$   | $24.5 \pm 1.0$ |

Reel



## - 包装尺寸 (packing dimension)

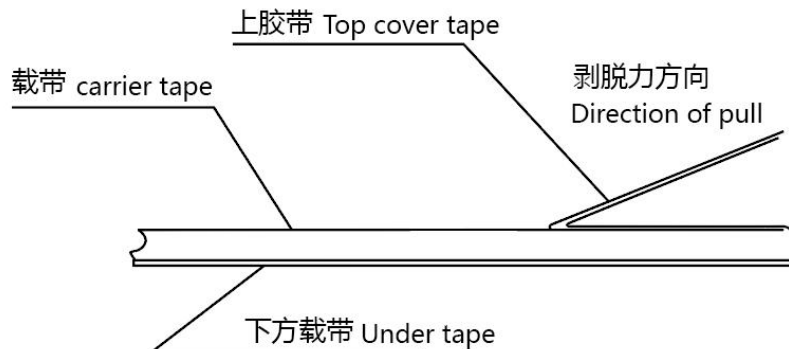


| Size | A±0.2 | B±0.2 | W±0.2 | E±0.1 | F±0.1 | P0±0.1 | P1±0.1 | P2±0.1 | φD0 | T±0.2 |
|------|-------|-------|-------|-------|-------|--------|--------|--------|-----|-------|
| 2512 | 3.5   | 6.8   | 16    | 1.75  | 7.5   | 4.0    | 8.0    | 2.0    | 1.5 | 1.8   |
| 3637 | 9.8   | 9.6   | 24    | 1.75  | 11    | 4.0    | 12.0   | 2.0    | 1.5 | 1.8   |

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

上胶带以 200mm/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 200 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)



#### ■ 合金电阻器使用说明 (Alloy 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, chemical 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 cleaner even if non cleaning flux.

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

1. 储存温度  $25\pm5^\circ\text{C}$       Temperature:  $25\pm5^\circ\text{C}$
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.



[illegible]