



KUNSHAN GOLDEN-WAVE ELECTRONIC CO.,LTD.

昆山金浪电子有限公司

# 规格承认书

## Specification for Approval

|                      |                                                                          |
|----------------------|--------------------------------------------------------------------------|
| 客户<br>Customer       |                                                                          |
| 产品名称<br>Product Name | 合金板式电流检测贴片电阻-RA 系列<br>Metal Alloy Current Sensing Chip Resistors-Type RA |
| 规格<br>Part Name      | RA2512 0.3m $\Omega$ 3W<br>(公差Tolerance: $\pm 1\%$ )                     |

地址: 江苏省昆山市玉山镇迎宾中路 1277 号

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## 1. 特性/应用 (Features/Applications) :

1.1 适用于本公司所生产的无铅、无卤之合金板式电流检测贴片电阻。

This specification applies to metal alloy current sensing chip resistors which meet requirements of Pb free and halogen free.

1.2 高功率，功率可达 3W。

High power rating up to 2watts.

1.3 超低阻值，优异的电阻温度系数。

Ultra-low resistance values. Excellent temperature coefficient characteristics.

1.4 可应用于汽车电子、电流传感器、手机、电脑、电源供应器、电池充电器等领域。

Applied to Automotive electronics、Current sensor、Mobile phones、Computers、Power supplies、Battery chargers and other fields.

1.5 符合 AEC-Q200 条款。

The relevant provisions of the AEC-Q200.

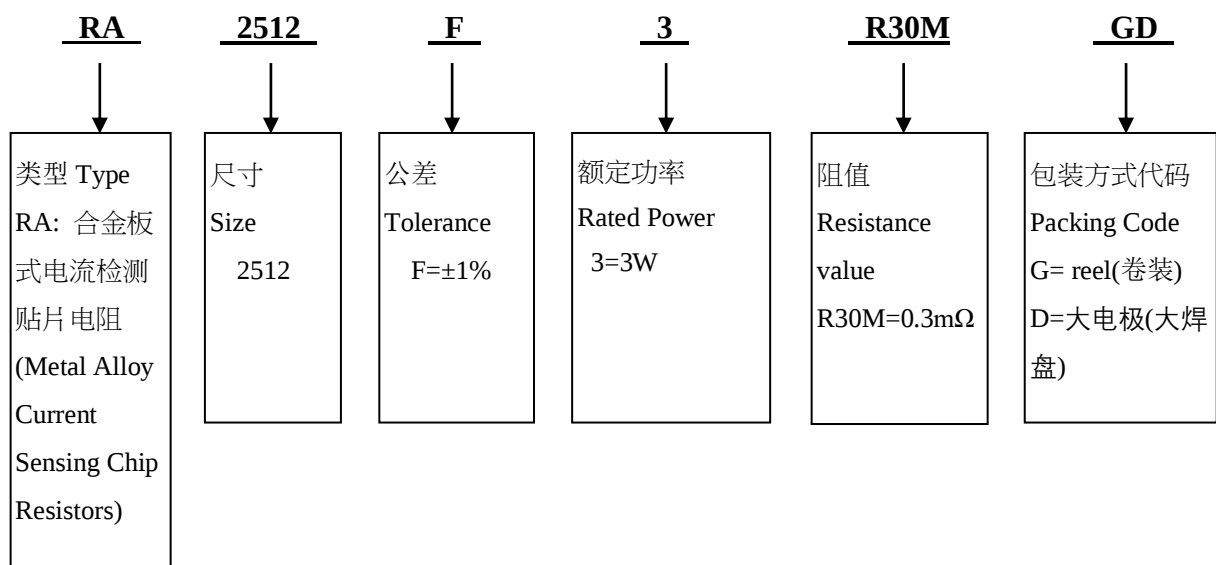
1.6 通过：RoHS REACH 认证，ISO9001 认证，IATF16949 认证。

Passed: RoHS REACH certification, ISO9001 certification, IATF16949 certification.

## 2. 产品型号含义 (Product model meaning) :

2512 3W 1% 0.3mΩ

RA2512F3R30MGD



### 3. 字码标示(Marking on the Resistor's Body):

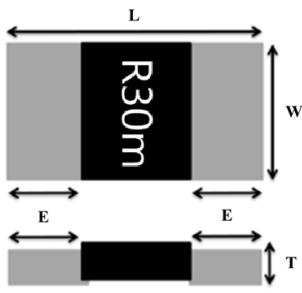
$\pm 0.5\%$ ,  $\pm 1\%$ ,  $\pm 2\%$ ,  $\pm 3\%$ ,  $\pm 5\%$ 的产品，以四字码标示，第一位字码 R 标示  $10^{-3}$ ，后三位表示阻值的有效数字。

$\pm 0.5\%$ ,  $\pm 1\%$ ,  $\pm 2\%$ ,  $\pm 3\%$ ,  $\pm 5\%$  tolerance product: the marking is 4 digits, The first letter 'R' denotes  $10^{-3}$ , The other three digitals declare resistance.

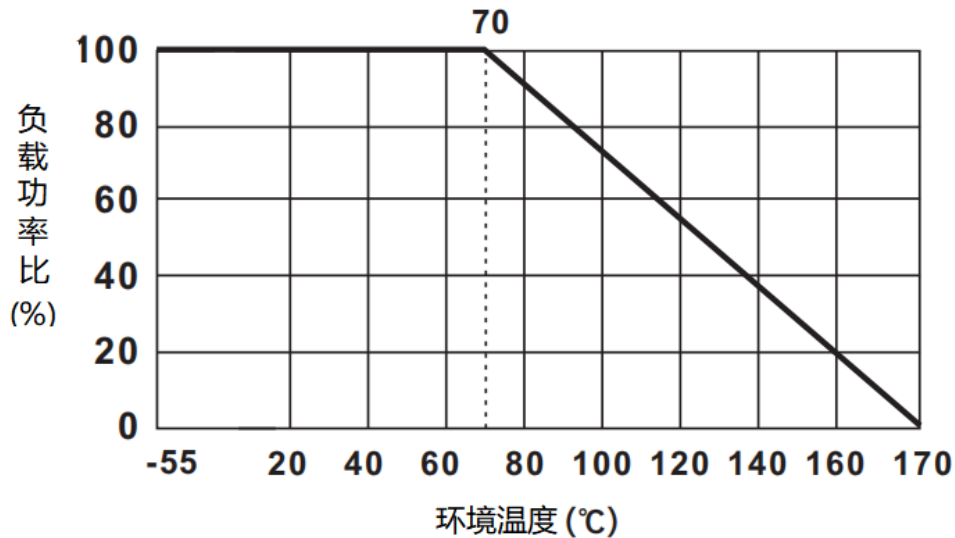


$R30m = 0.3m\Omega$

### 4. 尺寸 (dimension) :

| 尺寸<br>dimension |  <p>单位 Unit :mm</p> |                |                 |                 |
|-----------------|--------------------------------------------------------------------------------------------------------|----------------|-----------------|-----------------|
| 型别<br>Type      | 长<br>L(mm)                                                                                             | 宽<br>W(mm)     | 厚<br>T(mm)      | 电极宽<br>E(mm)    |
| RA2512          | $6.4 \pm 0.20$                                                                                         | $3.2 \pm 0.20$ | $0.80 \pm 0.20$ | $2.20 \pm 0.20$ |

## 5. 负载降额曲线 ( Derating Curve ) :

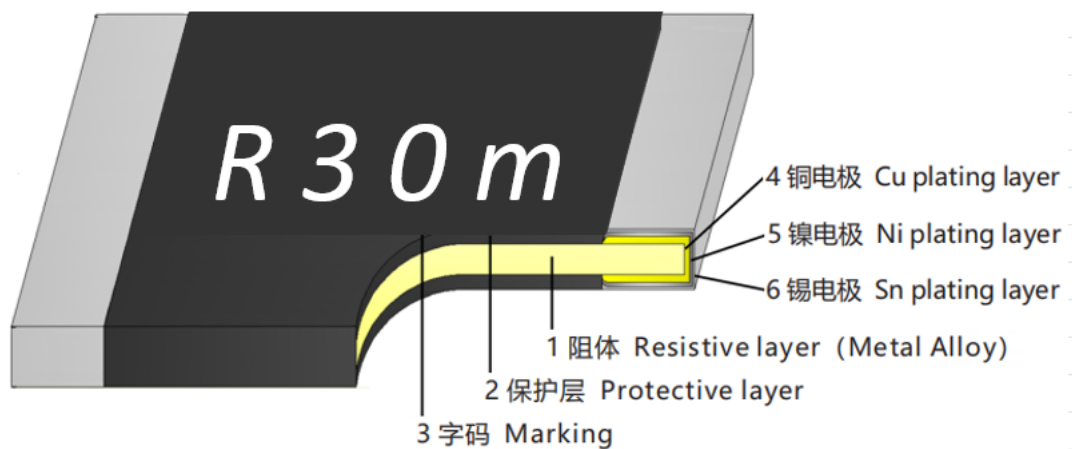


工作温度范围 ( Operating Temperature Range ) :  $-55^{\circ}\text{C} \sim +170^{\circ}\text{C}$ .

当电阻在高于  $70^{\circ}\text{C}$  的周围环境中工作时, 最大负载功率应该按照以上曲线减少。

When the resistor is operating in an ambient environment above  $70^{\circ}\text{C}$ , the maximum load power should be reduced according to the above curve.

## 6. 电阻结构 ( Construction ) :





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7. 阻值范围及电气特性 (Resistance Range and Electrical Characteristics) :

| 型别<br>Type | 额定功率<br>Rated Power | 阻值范围<br>Resistance Range | 温度特性TCR<br>(ppm/°C) | 绝缘阻抗<br>Insulation Resistance |
|------------|---------------------|--------------------------|---------------------|-------------------------------|
|            |                     | F(±1%)                   |                     |                               |
| RA2512     | 3W                  | 0.3mΩ                    | +150~+550           | >100MΩ                        |

备注 (remark) :

※ 额定电流计算公式 (The rated current is calculated by the following formula) :

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

I : 额定电流 (Rated current) (A)

P : 额定功率 (Rated Power) (W)

R : 电阻阻值 (Resistance) (ohm)

※ 如果计算出的电流超过此型别的最大工作电流, 则此型别的最大工作电流为此电阻的额定电流。

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



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## 8. 性能信赖性测试 (Performance Reliability Test Methods)

| 测试项目<br>Test 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 Coefficient   | IEC60115-1 4.8         | $TCR = (R - R_0) / (t - t_0) R_0 \times 10^6 \text{ (ppm)}$ $R_0 \text{ 电阻在室温下的阻值(resistance at room temperature)}$ $R \text{ 电阻在 } +125^\circ\text{C} \text{ 或 } +155^\circ\text{C} \text{ 下的阻值 (resistance at } +125^\circ\text{C or } +155^\circ\text{C)}$ $t_0 \text{ 室温(room temperature)}$ $t \text{ 测试温度 (test temperature } +125^\circ\text{C or } +155^\circ\text{C)}$                                                                                             | 请参考特性规格表, Please refer to the Spec. |
| 高温储存<br>High Temperature Exposure | MIL-STD-202 Method 108 | $125^\circ\text{C} \text{ 下放置 } 1000\text{H}, \text{ 试验结束 } 24 \pm 4 \text{ 小时后量测试前后阻值变化率.}$ $1000 \text{ hrs. @ } T=125^\circ\text{C. Measure the variation of resistance at } 24 \pm 4 \text{ hours after test conclusion.}$ $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100\%$ $R_1 = \text{试验前阻值(resistance before test)}$ $R_2 = \text{试验后阻值(resistance after test)}$                                                                                                        | < ±1%                               |
| 低温储存<br>Low Temperature operation | IEC60115-1 4.23.4      | $-55^\circ\text{C} \text{ 下放置 } 45 \text{ 分钟, 后量测试前后阻值变化率.}$ $45 \text{ min. @ } T=-55^\circ\text{C. Measure the variation of resistance after test conclusion.}$ $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100\%$ $R_1 = \text{试验前阻值(resistance before test)}$ $R_2 = \text{试验后阻值(resistance after test)}$                                                                                                                                                                     | < ±1%                               |
| 温度循环<br>Temperature cycling       | JESD22 Method JA-104   | $-55^\circ\text{C}/+125^\circ\text{C}, \text{ 循环 } 1000 \text{ 次, 试验结束 } 24 \pm 4 \text{ 小时后量测试前后阻值变化率.}$ $1000\text{Cycles } (-55^\circ\text{C to } +125^\circ\text{C}) \text{ Measurement at } 24 \pm 4 \text{ hours after test conclusion. Measure the variation of resistance at } 24 \pm 4 \text{ hours after test conclusion.}$ $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100\%$ $R_1 = \text{试验前阻值(resistance before test)}$ $R_2 = \text{试验后阻值(resistance after test)}$ | < ±1%                               |



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| 测试项目<br>Test Item             | 测试方法<br>Test Methods   | 测试条件<br>Test Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                 | 规格<br>Specification |
|-------------------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 短时间过负荷<br>Short-time overload | IEC60115-1 4.13        | <p>加载 5 倍的额定功率 ,时间 5 秒后测量试验前后的阻值变化率。<br/>Applied 5.0 times of rated power for 5 second. Measure the variation of resistance.</p> $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100\%$ <p>R1 = 试验前阻值(resistance before test)<br/>R2 = 试验后阻值(resistance after test)</p> <p>备注 : RA4527(51mΩ~200mΩ)规格,加载 2.5 倍的额定功率,时间 10 秒</p>                                                                                                                                    | < ±1%               |
| 耐湿特性<br>Biased Humidity       | MIL-STD-202 METHOD 103 | <p>加载 10%额定功率 , 85℃/85%RH, 持续通电 1000H,试验结束 24±4 小时后进行测试<br/>1000 hours 85℃/85%RH.<br/>Note: Specified conditions: 10% of operating power. Measurement at 24±4 hours after test conclusion.</p> $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100\%$ <p>R1 = 试验前阻值(resistance before test)<br/>R2 = 试验后阻值(resistance after test)</p>                                                                                                                             | < ±1%               |
| 负荷寿命<br>Operational life      | MIL-STD-202 METHOD 108 | <p>电阻放入恒温箱中 , 温度 70±2℃ , 通电额定电流 1.5 小时 , 断电 0.5 小时 ; 重复通断电至试验时间 1000<sup>+48/-0</sup> 小时. 量测试验前后阻值变化率.<br/>Put the specimen in a chamber at 70±2 °C temperature , and applied rated currmt for1.5H and rested for 0.5H repeatedly till total test time is 1000<sup>+48/-0</sup>.. Measure the variation of resistance.</p> $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100\%$ <p>R1 = 试验前阻值(resistance before test)<br/>R2 = 试验后阻值(resistance after test)</p> | < ±1%               |



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| 测试项目<br>Test Item                    | 测试方法<br>Test Methods      | 测试条件<br>Test Conditions                                                                                                                                                                                                                                                                               | 规格<br>Specification              |
|--------------------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| 焊锡性<br>Solderability                 | J-STD-002B<br>test B      | 沾助焊剂后浸入锡炉，锡炉温度 245±5℃，时间 2~3 秒<br>Dip the terminal in a flux and then dip into a soldering bath at 245±5℃ for 2~3sec.                                                                                                                                                                                 | 最少 95%面积上锡<br>(Min 95% coverage) |
| 抗焊锡热<br>Resistance to soldering heat | IEC60115-1 4.18           | 沾助焊剂后浸入锡炉，锡炉温度 260±5℃，时间 10±1 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±5℃ for 10±1sec. Measure the variation of resistance.<br>$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100\%$<br>R1 = 试验前阻值(resistance before test)<br>R2 = 试验后阻值(resistance after test) | < ±1%                            |
| 机械冲击<br>Mechanical Shock             | MIL-STD-202<br>METHOD 213 | 半正弦，100g's，震动6ms，速度12.3 ft/s100Hz，量测试验前后阻值变化率。<br>100g's, Normal duration is 6ms, half sine shock pulse .Measure the variation of resistance.<br>$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100\%$<br>R1 = 试验前阻值(resistance before test)<br>R2 = 试验后阻值(resistance after test)                              | < ±1%                            |
| 振动<br>Resistance to vibration        | MIL-STD-202<br>METHOD 204 | 5g's的力20分钟，12个循环，测试频率从10-2000赫兹，量测试验前后阻值变化率。<br>5g's for 20min.12cycles, 10-2000Hz . Measure the variation of resistance.<br>$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100\%$<br>R1 = 试验前阻值(resistance before test)<br>R2 = 试验后阻值(resistance after test)                                                  | < ±1%                            |
| 端子弯曲<br>Terminal Bending             | AEC-Q200-005              | 弯曲2mm，60秒，量测试验前后阻值变化率。<br>Min 2mm deflection ,60sec. Measure the variation of resistance. Measure the variation of resistance.                                                                                                                                                                        | < ±1%                            |



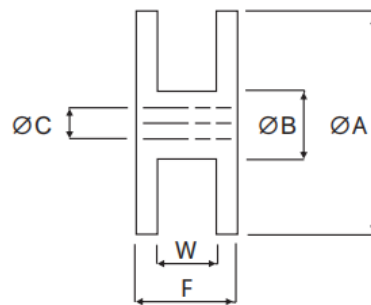
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| 测试项目<br>Test Item         | 测试方法<br>Test Methods      | 测试条件<br>Test Conditions                                                                                                                                                                                                                                                                                                                                            | 规格<br>Specification |
|---------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 端子强度<br>Terminal Strength | AEC-Q200-006              | 应用17.7N (1.8Kg) , 时间60±1秒<br>Applied a 17.7N (1.8Kg) for 60±1seconds.                                                                                                                                                                                                                                                                                              | < ±1%               |
| 冷热冲击<br>Thermal shock     | MIL-STD-202<br>METHOD 107 | 温度-55/+125℃ , 周期数是 300,设备安装。最大传输时间是 20 秒。停留 15 分钟,量测试前后阻值变化率。<br>use -55/+125°C, Number of cycles is 300. Devices mounted. Maximum transfer time is 20 seconds.Dwell time is 15 minutes. Air –Air. Measure the variation of resistance.<br>$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100\%$<br>R1 = 试验前阻值(resistance before test)<br>R2 = 试验后阻值(resistance after test) | < ±1%               |
| 阻燃性<br>Flammability       | UL-94                     | V-0 or V-1可接受的, 电器特性测试不要求<br>V-0 or V-1are acceptable.Electrical test not required.                                                                                                                                                                                                                                                                                | /                   |
| ESD 试验<br>ESD test        | AEC-Q200-002              | 加载规定静电电压2KV , 2次/间隔1秒<br>2KV, 2times/1s                                                                                                                                                                                                                                                                                                                            | < ±1%               |

## 9. 包装规格 (Tapping Specification)

### 9.1 卷盘尺寸 (reel dimension)

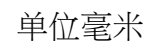


单位毫米 Unit :mm



※ 备注(Remark): (1) 2512 每卷 4,000 pcs  
2512 Quantity per Reel 4,000 pcs/Reel

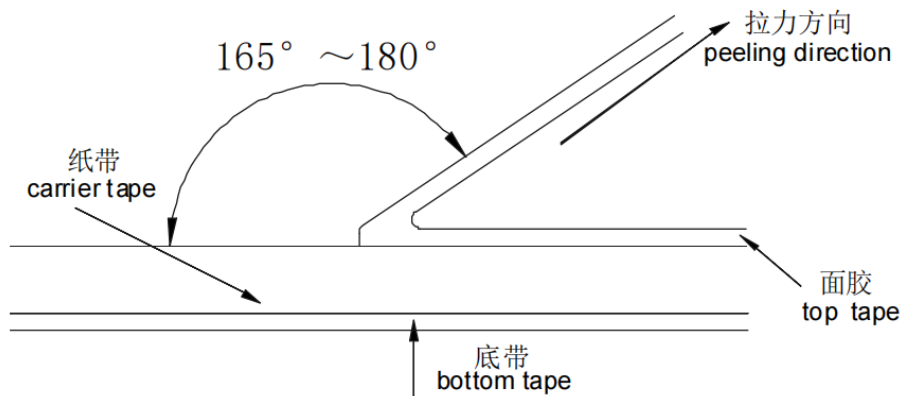
单位毫米 Unit:mm



| Packing | Type   | A         | B         | W         | F         | E        | P <sub>0</sub> | P1        | P2       | ØD <sub>0</sub>                     | T         |
|---------|--------|-----------|-----------|-----------|-----------|----------|----------------|-----------|----------|-------------------------------------|-----------|
| Emboss  | RA2512 | 3.60±0.20 | 6.90±0.20 | 12.0±0.20 | 5.50±0.05 | 1.75±0.1 | 4.00±0.1       | 4.00±0.10 | 2.0±0.05 | 1.50± <sup>0.1</sup> <sub>0.0</sub> | 1.00±0.15 |

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。纸带的剥离范围为 0.1N~0.7N(10g~70g)，载带的剥离力范围为 0.3N~1N(30g~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).



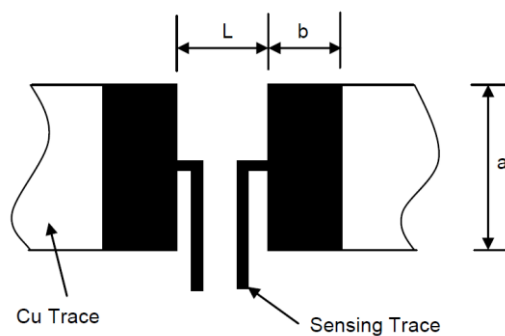
#### 9.4 标签 (Label)

标签涵盖以下信息 The label covers the following information:

- 9.4.1 阻值 Resistance
- 9.4.2 功率 power
- 9.4.3 数量 quantity
- 9.4.4 公差 tolerance
- 9.4.5 系列 series
- 9.4.6 流水号 Serial number

### 10. 焊接 (soldering)

#### 10.1 建议焊盘尺寸 (Recommended Solder Pad Dimension)



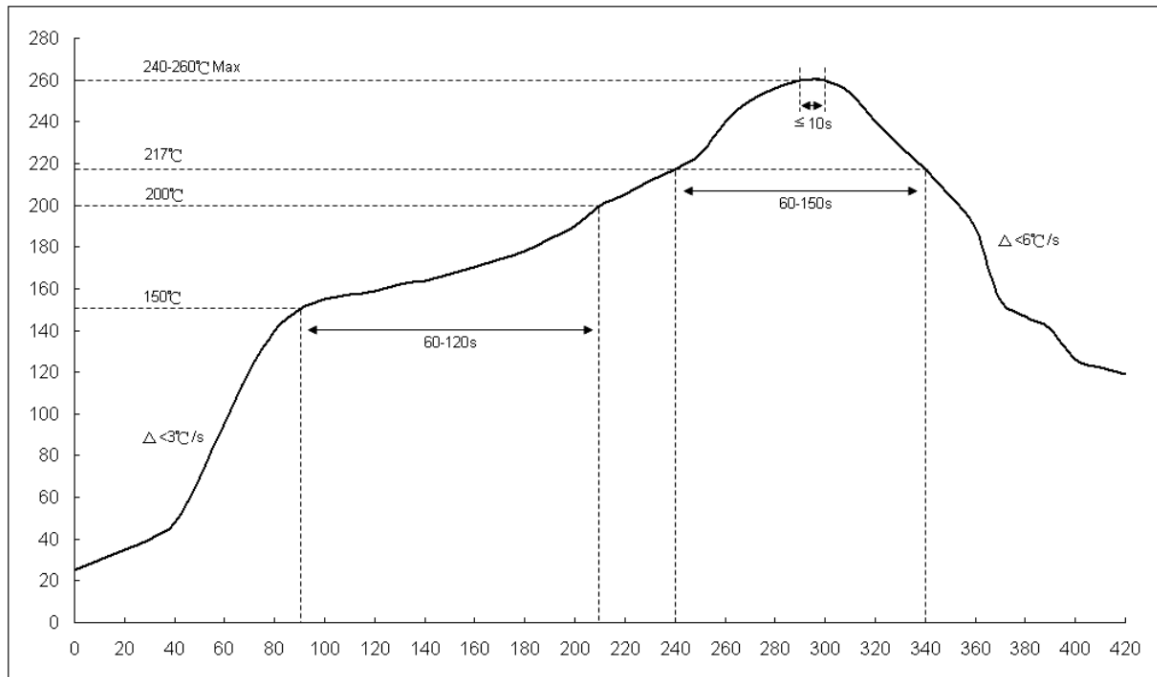
單位:mm

| 尺寸<br>Dimensions | 阻值范围<br>Resistance Range | a    | b    | L    |
|------------------|--------------------------|------|------|------|
| RA2512           | 0.3mΩ                    | 4.00 | 3.10 | 1.80 |

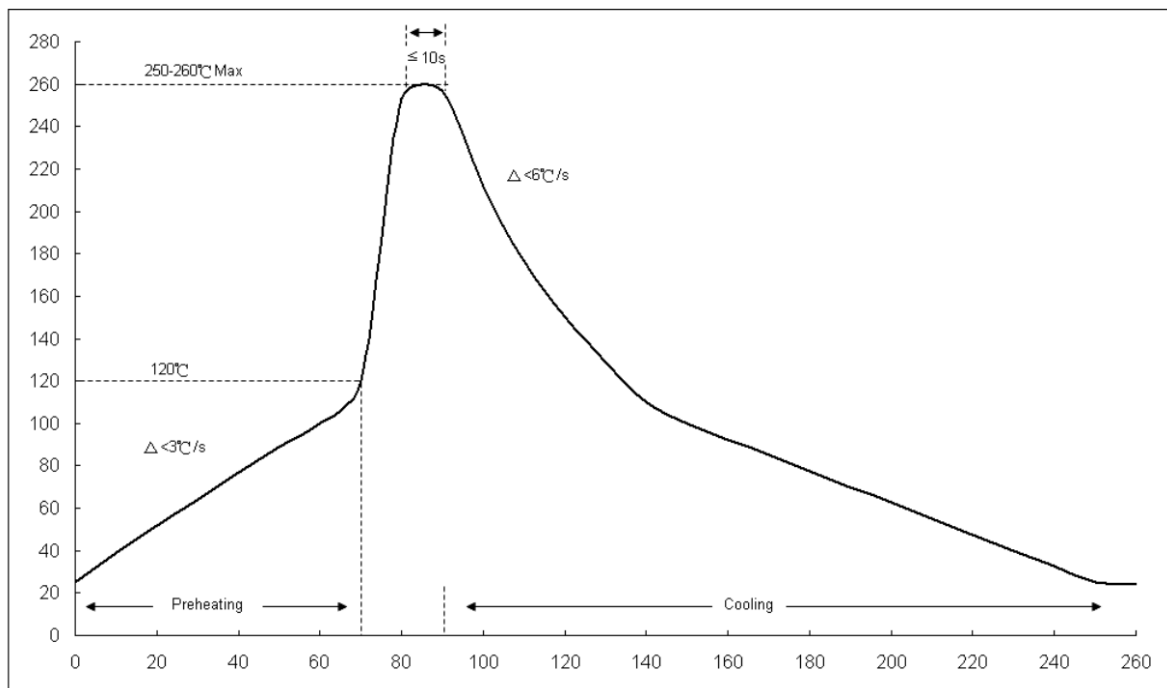
## 10.2 建议焊膏类型 (Recommended type of solder paste ) :

合金 alloy 96.5Sn/3.0Ag/0.5Cu

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



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





## 10.5 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.

## 11. 存储放置 (Storage placement)

### 11.1 储存及搬运注意事项 (Storage and handling precautions) :

11.1.1 储存时应注意温度和湿度(温度  $5\sim 35^{\circ}\text{C}$  , 相对湿度  $45\sim 75\%\text{RH}$ ) , 湿度尽可能保持在低范围内, 有效期:2 年。

When storing, you should pay attention to the temperature and humidity (temperature  $5\sim 35^{\circ}\text{C}$  , relative humidity  $45\sim 75\%\text{RH}$ ) , humidity as much as possible Can be kept in the low range, valid for 2 years.

11.1.2 不能阳光直射。

Do not have direct sunlight.

11.1.3 不能存储在潮湿, 灰尘及导致焊接性能变差的有害气体环境中, 包括氯气、硫化氢、氨气、二氧化硫、二氧化氮等。

Can not be stored in humid, dusty and harmful gas environments that cause poor welding performance, including  $\text{Cl}_2$ 、 $\text{H}_2\text{S}$ 、 $\text{NH}_3$ 、 $\text{SO}_2$ 、and  $\text{NO}_2$  etc.

11.1.4 产品搬运、存储时请保证箱体的正确朝向, 严禁摔落、挤压箱体, 否则可能造成产品电极或本体受损。

When handling and storing products, please ensure the correct orientation of the box, and it is strictly forbidden to drop and squeeze the box, otherwise it may cause production the electrode or body is damaged.

### 11.2 操作使用注意事项 (Precautions for operation use) :

11.2.1 必须保护产品的边缘和保护层免受机械应力的影响。

The edges and protective layers of the product must be protected from mechanical Stress.

11.2.2 当印刷电路板 (PCB) 被分割或固定在支撑体上时, 要小心处理, 因为印刷电路板 (PCB) 安装的弯曲会给电阻造成机械应力。



Be careful when a printed circuit board (PCB) is split or fixed to a support body, as bending of the printed circuit board (PCB) mount can cause mechanical stress on the resistor.

- 11.2.3 电阻的使用范围应在具体规定的额定范围内，特别是当电压超过规定值时，会对机器造成损坏。温度上升取决于产生的热量，并增加电阻值或断裂。

The range of use of the resistor should be within the specified rated range, especially when the voltage exceeds the specified value, which will cause damage to the machine.

The temperature rise depends on the heat generated and increases the resistance value or breakage

- 11.2.4 当电阻被负载到额定电压时，必须确定电阻器的温度，并根据负载降额曲线来降低负载功率。

When the resistor is loaded to the rated voltage, the temperature of the resistor must be determined and the load power must be reduced according to the load derating curve.

- 11.2.5 观察每个规范中规定的极限元件电压和最大过载电压。

Observe the limit element voltages and maximum overload voltages specified in each specification.

- 11.2.6 如果有可能将大电压（脉冲电压、冲击电压）充电到电阻，则必须在使用前设置操作条件。

If it is possible to charge a large voltage (pulse voltage, impulse voltage) to the resistor, the operating conditions must be set before use.