

合金贴片电阻承认书-RM 系列

Approval Specification Metal Current Sensing Chip Resistors-Type **RM**

承认书  
**APPROVAL SHEET**

厂商：丽智电子有限公司

客户：\_\_\_\_\_

Supplier:

Customer:

| 核准<br>Approved by | 审核<br>Checked by | 制作<br>Prepared by |
|-------------------|------------------|-------------------|
|                   |                  |                   |

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## 合金贴片电阻承认书-RM 系列

### Approval Specification Metal Current Sensing Chip Resistors-Type **RM**

#### 范围 (scope) :

##### 1.1 适用于本公司所生产的无铅、无卤之合金贴片电阻 RM 系列

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

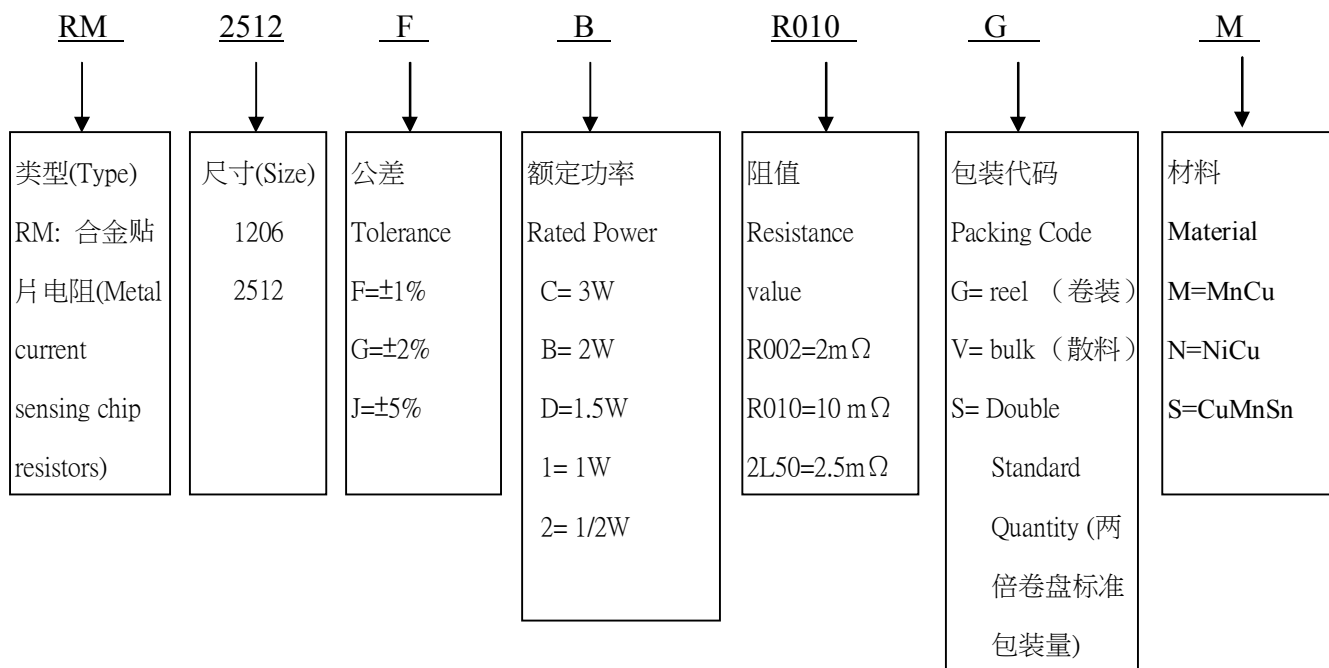
##### 1.2 符合 AEC-Q200 條款

The relevant provisions of the AEC-Q200

#### 2 产品料号 (part number) :

2512 2W 1% 10mΩ

RM2512FBR010GM



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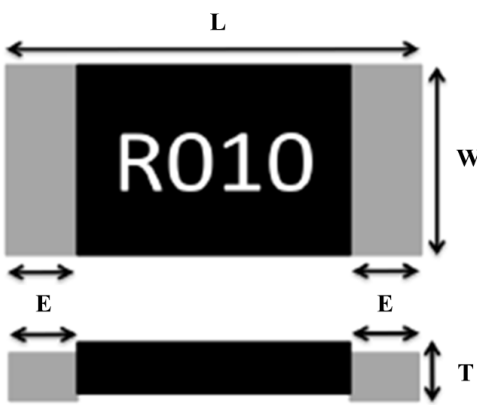
#### 3 电阻本体字码标示(Marking on the Resistor's Body):

※  $\pm 1\%$ ,  $\pm 2\%$ ,  $\pm 5\%$  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。

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

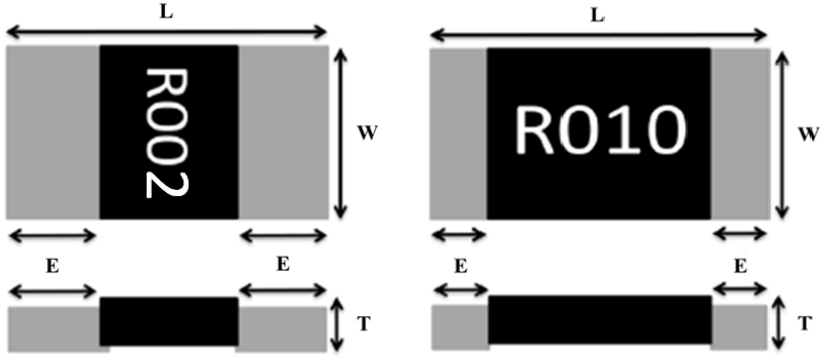


#### 4 尺寸 (dimension) :

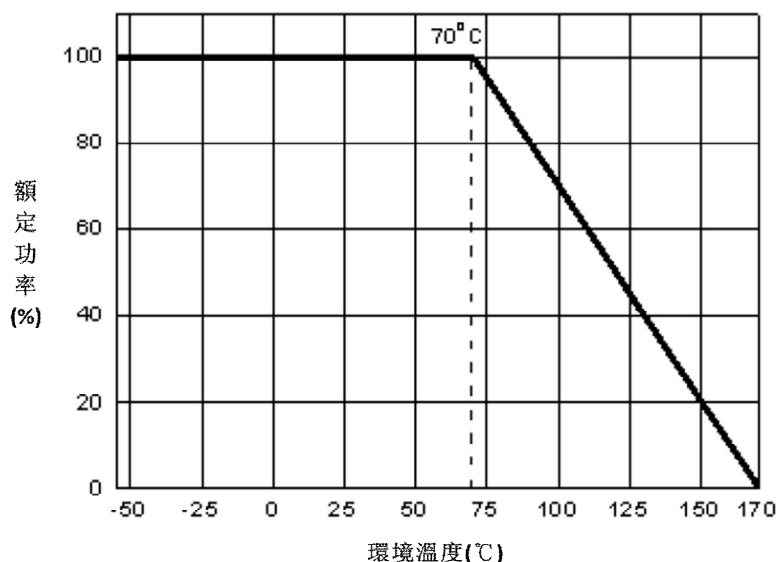
|                 |  |          |                               |                               |
|-----------------|--|----------|-------------------------------|-------------------------------|
| 尺寸<br>dimension |  <p style="text-align: right;">单位 (unit) : mm</p> |          |                               |                               |
| 型别<br>Type      | L  | W        | T                             | E                             |
| RM1206          | 3.2±0.20   | 1.6±0.20 | 0.60±0.20<br>(3mΩ ≤ R ≤ 30mΩ) | 0.50±0.30<br>(3mΩ ≤ R ≤ 30mΩ) |

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| 尺寸<br>dimension |  |         |           |                      |
|-----------------|--|---------|-----------|----------------------|
|                 | 单位 (unit) : mm   |         |           |                      |
| 型别<br>Type      | L  | W       | T         | E                    |
| RM2512          | 6.4±0.2  | 3.2±0.2 | 0.60±0.20 | 2.0±0.2<br>(R ≤ 2mΩ) |
|                 |  |         |           | 0.9±0.2<br>(R > 2mΩ) |

### 5 功率衰减曲线 ( Derating Curve ) :



工作温度范围 ( Operating Temperature Range ) : -55°C ~ +170°C ;

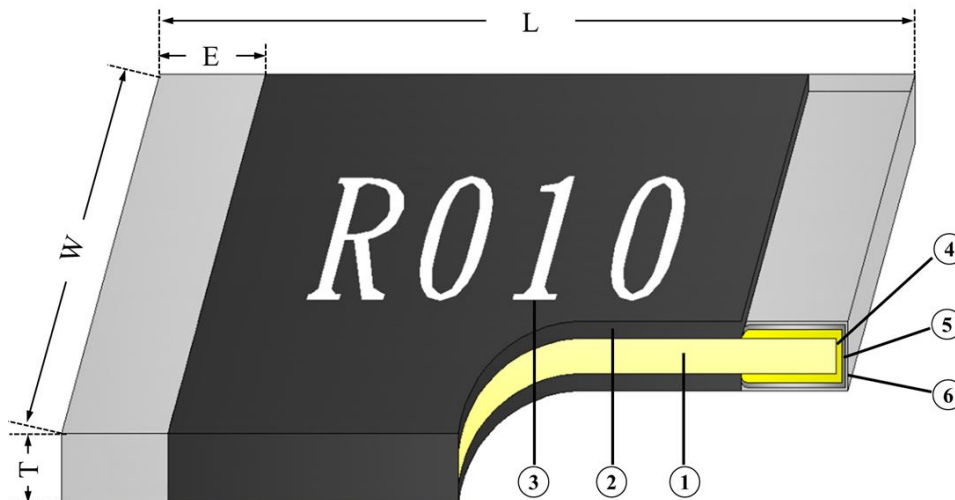
储存条件 ( storage condition ) : 5 ~ 35°C, 40 ~ 75%RH.

保存期限 ( Shelf Life ) : 2 年

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#### 6 电阻结构 (Construction) :



| No. | 结构<br>construction                 | 主要材料<br>Major material |
|-----|------------------------------------|------------------------|
| 1   | 阻体<br>Resistive layer(Metal Alloy) | 合金<br>Metal Alloy      |
| 2   | 保护层<br>Protective layer            | 环氧树脂<br>Epoxy          |
| 3   | 文字<br>Marking                      | 环氧树脂<br>Epoxy          |
| 4   | 铜电极<br>Cu plating layer            | 铜<br>Cu                |
| 5   | 镍电极<br>Ni plating layer            | 镍<br>Ni                |
| 6   | 锡电极<br>Sn plating layer            | 锡<br>Sn                |

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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) | 绝缘耐压<br>Insulation<br>Resistance |
|-----------------|---------------------|--------------------------|---------------------|----------------------------------|
|                 |                     | F(±1%)、G(±2%)、J(±5%)     |                     |                                  |
| RM1206          | 1/2W、1W             | 3mΩ~30mΩ                 | +25~+125°C: ±50     | >100MΩ                           |
|                 |                     |                          | +25~+155°C: ±65     |                                  |
| RM2512          | 1W、1.5W、2W          | 1mΩ~50mΩ                 | +25~+125°C: ±50     | >100MΩ                           |
|                 | 3W                  | 1mΩ~3 mΩ                 | +25~+155°C: ±65     |                                  |
| +25~+125°C: ±50 |                     |                          | +25~+155°C: ±65     |                                  |

#### 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) (V)

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(Performance Specifications)

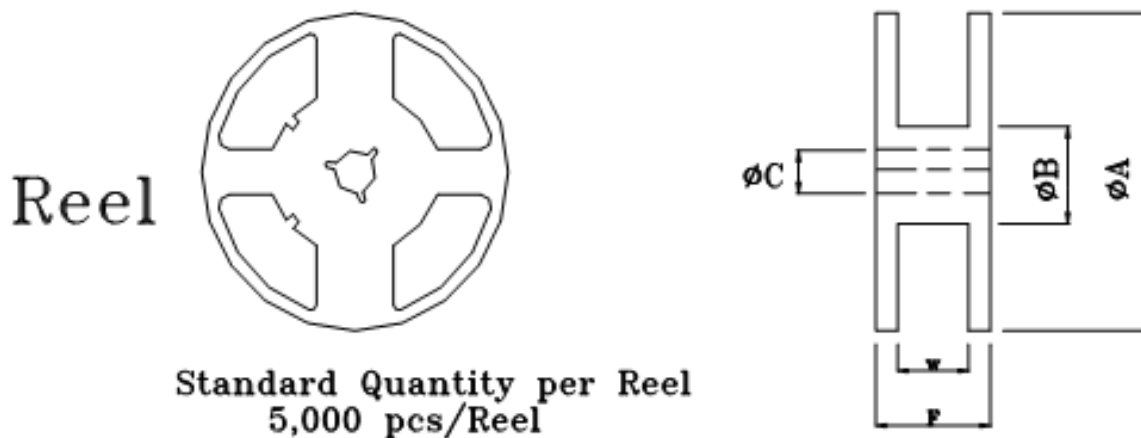
| 内容<br>Item                           | 规格<br>Specification Limits   | 测试方法<br>Test Methods      |
|--------------------------------------|--|---------------------------|
| 温度系数<br>Temperature Coefficient      | 如规格表, As Spec.<br>+25~+125°C: $\pm 50\text{ppm}/^\circ\text{C}$<br>+25~+155°C: $\pm 65\text{ppm}/^\circ\text{C}$ | IEC60115-1 4.8            |
| 高温储存<br>High Temperature Exposure    | $<\pm 1\%$   | MIL-STD-202<br>Method 108 |
| 低温储存<br>Low Temperature operation    | $<\pm 0.5\%$   | IEC60115-1 4.23.4         |
| 温度循环<br>Temperature cycling          | $<\pm 0.5\%$   | JESD22<br>Method JA-104   |
| 短时间过负荷<br>Short-time overload        | $<\pm 0.5\%$   | IEC60115-1 4.13           |
| 耐湿特性<br>Biased Humidity              | $<\pm 0.5\%$   | MIL-STD-202<br>METHOD 103 |
| 负荷寿命<br>Operational life             | $<\pm 1\%$   | MIL-STD-202<br>METHOD 108 |
| 焊锡性<br>Solderability                 | 最少 95%面积上锡(Min 95% coverage)   | J-STD-002B test B         |
| 抗焊锡热<br>Resistance to soldering heat | $<\pm 0.5\%$   | IEC60115-1 4.18           |
| 机械冲击<br>Mechanical Shock             | $<\pm 0.5\%$   | MIL-STD-202<br>METHOD 213 |
| 振动<br>Resistance to vibration        | $<\pm 0.5\%$   | MIL-STD-202<br>METHOD 204 |
| 端子弯曲<br>Board Flex                   | $<\pm 0.5\%$   | AEC-Q200-005              |
| 端子强度<br>Terminal Strength            | $<\pm 1\%$   | AEC-Q200-006              |
| 冷热冲击<br>Thermal shock                | $<\pm 0.5\%$   | MIL-STD-202<br>METHOD 107 |
| 易燃<br>Flammability                   | /  | UL-94                     |
| ESD 试验<br>ESD test                   | $<\pm 1\%$   | AEC-Q200-002              |

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#### 9 包装规格 (Tapping Specification)

##### 9.1 卷盘尺寸 (reel dimension)



| 尺寸<br>Dimensions |      | A           | B           | C           | F           | W           |
|------------------|------|-------------|-------------|-------------|-------------|-------------|
| RM1206           | mm   | 178±2.00    | 60.00±1.00  | 13.50±0.50  | 11.40±0.10  | 9.00±0.30   |
|                  | Inch | 7.008±0.079 | 2.362±0.039 | 0.531±0.020 | 0.449±0.039 | 0.354±0.012 |
| RM2512           | mm   | 178±2.00    | 60.00±1.00  | 13.50±0.50  | 15.40±1.00  | 13.00±0.3   |
|                  | Inch | 7.008±0.079 | 2.362±0.039 | 0.531±0.020 | 0.606±0.039 | 0.512±0.012 |

※ 备注 (Remark) : (1) 2512 每卷 4,000 pcs

2512 Quantity per Reel 4,000 pcs/Reel

(2) 1206 每卷 5,000pcs

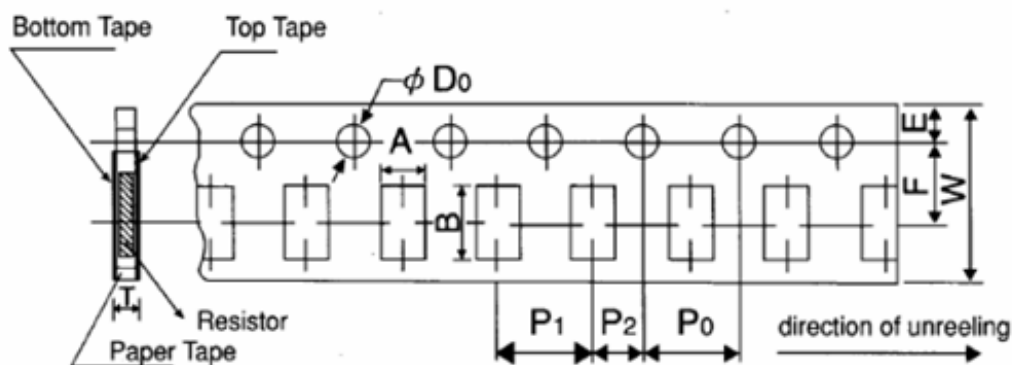
1206 Quantity per Reel 5,000 pcs/Reel



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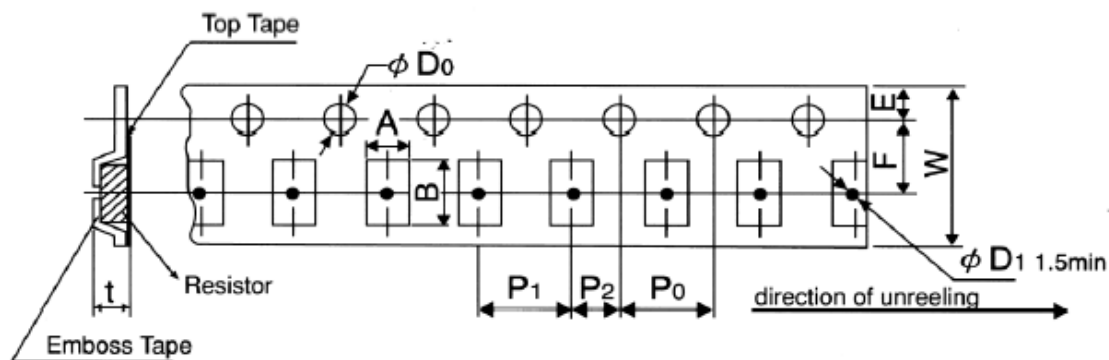
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#### 9.2 包装尺寸 (packing dimension)



單位:mm

| Packing    | Type   | A        | B       | W       | F        | E        | P1      | P2       | P <sub>0</sub> | D <sub>0</sub>   | T        |
|------------|--------|----------|---------|---------|----------|----------|---------|----------|----------------|--|----------|
| Paper Tape | RM1206 | 2.0±0.15 | 3.6±0.2 | 8.0±0.2 | 3.5±0.05 | 1.75±0.1 | 4.0±0.1 | 2.0±0.05 | 4.0±0.1        | 1.50± $\begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$ | 0.84±0.1 |



單位:mm

| Packing | Type   | A  | B       | W        | F        | E        | P1      | P2       | P <sub>0</sub> | D <sub>0</sub>   | T         |
|---------|--------|--|---------|----------|----------|----------|---------|----------|----------------|--|-----------|
| Emboss  | RM2512 | 3.6± $\begin{smallmatrix} 0.2 \\ 0.18 \end{smallmatrix}$ | 6.9±0.2 | 12.0±0.2 | 5.5±0.05 | 1.75±0.1 | 4.0±0.1 | 2.0±0.05 | 4.0±0.05       | 1.50± $\begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$ | 1.00±0.15 |

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### Approval Specification Metal Current Sensing Chip Resistors-Type **RM**

#### 10 信赖性测试 (Reliability Test Methods)

| 内容<br>Item                        | 测试条件<br>Test Conditions   |
|-----------------------------------|---|
| 温度系数<br>Temperature Coefficient   | $TCR = (R - R_0) / (t - t_0) R_0 \times 10^6 \text{ (ppm)}$ R <sub>0</sub> 电阻在室温下的阻值(resistance at room temperature)<br>R 电阻在+155℃或+25℃下的阻值(resistance at +155℃ or +25℃)<br>t <sub>0</sub> 室温(room temperature)<br>t 测试温度 (test temperature +155℃ or +25℃)  |
| 高温储存<br>High Temperature Exposure | 125℃下放置 1000H，试验结束 24±4 小时后量测试验前后阻值变化率。<br>1000 hrs. @T=125℃. Measure the variation of resistance at 24±4 hours after test conclusion.<br>$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{----- ( \% )}$ R1 = 试验前阻值(resistance before test)<br>R2 = 试验后阻值(resistance after test)  |
| 低温储存<br>Low Temperature operation | -55℃下放置 45 分钟，后量测试验前后阻值变化率。<br>45 min. @T=-55℃. Measure the variation of resistance after test conclusion.<br>$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{----- ( \% )}$ R1 = 试验前阻值(resistance before test)<br>R2 = 试验后阻值(resistance after test)  |
| 温度循环<br>Temperature cycling       | -55℃&+125℃, 循环 1000 次，试验结束 24±4 小时后量测试验前后阻值变化率。<br>1000Cycles (-55℃ to +125℃) Measurement at 24±4 hours after test conclusion. Measure the variation of resistance at 24±4 hours after test conclusion.<br>$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{----- ( \% )}$ R1 = 试验前阻值(resistance before test)<br>R2 = 试验后阻值(resistance after test) |

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| 内容<br>Item                       | 测试条件<br>Test Conditions  |
|----------------------------------|--|
| 短时间过负荷<br>Short-time overload    | 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.<br><br>$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 试验前阻值(resistance before test)<br>R2 = 试验后阻值(resistance after test)  |
| 耐湿特性<br>Biased Humidity          | 加载 10%额定功率，85℃/85%RH,<br>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.<br><br>$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 试验前阻值(resistance before test)<br>R2 = 试验后阻值(resistance after test)   |
| 负荷寿命<br>Operational life         | 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</sup> / <sub>-0</sub> 小时。量测试验前后阻值变化率。<br>Put the specimen in a chamber at 70±2℃ temperature, and applied rated Current for 1.5H and rested for 0.5H repeatedly till total test time is 1000 <sup>+48</sup> / <sub>-0</sub> . Measure the variation of resistance.<br><br>$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 试验前阻值(resistance before test)<br>R2 = 试验后阻值(resistance after test) |
| 焊锡性<br>Solder ability            | 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.  |
| 抗焊锡热<br>Resist to soldering heat | 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><br>$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 试验前阻值(resistance before test)<br>R2 = 试验后阻值(resistance after test)  |

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| 内容<br>Item                    | 测试条件<br>Test Conditions  |
|-------------------------------|--|
| 机械冲击<br>Mechanical Shock      | 半正弦，100g's，震動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>$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 试验前阻值(resistance before test)<br>R2 = 试验后阻值(resistance after test)                                      |
| 振动<br>Resistance to vibration | 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>$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 试验前阻值(resistance before test)<br>R2 = 试验后阻值(resistance after test)   |
| 端子弯曲<br>Board Flex            | 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.<br>Measure the variation of resistance.  |
| 端子强度<br>Terminal Strength     | 应用17.7N (1.8Kg)，时间60±1秒<br>Applied a 17.7N (1.8Kg) for 60±1seconds.  |
| 冷热冲击<br>Thermal shock         | 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。<br>use -55/+125℃, Number of cycles is 300. Devices mounted. Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air -Air<br>$\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 试验前阻值(resistance before test)<br>R2 = 试验后阻值(resistance after test) |
| 易燃<br>Flammability            | V-0 or V-1可接受的，電氣特性測試不要求<br>V-0 or V-1are acceptable, Electrical test not required.  |
| ESD 试验<br>ESD test            | 加载规定静电电压2KV.2次/间隔1秒，<br>Other:2KV, 2times/1s   |

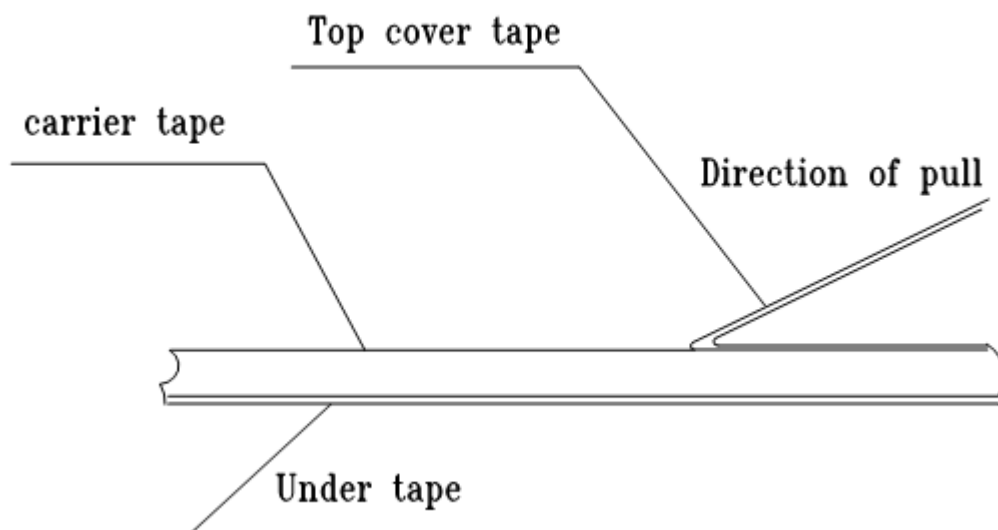
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#### 11 上胶带剥离力测试 (Peel force of top cover tape)

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; 载带的剥离力范围为 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)

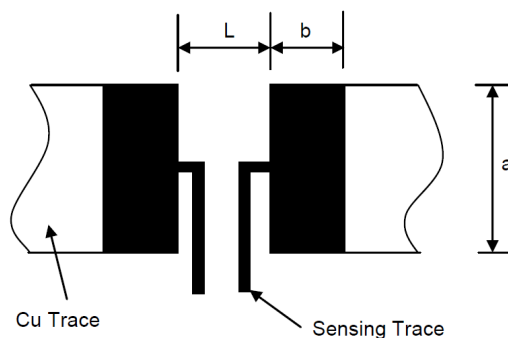


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## 12 焊接 (soldering)

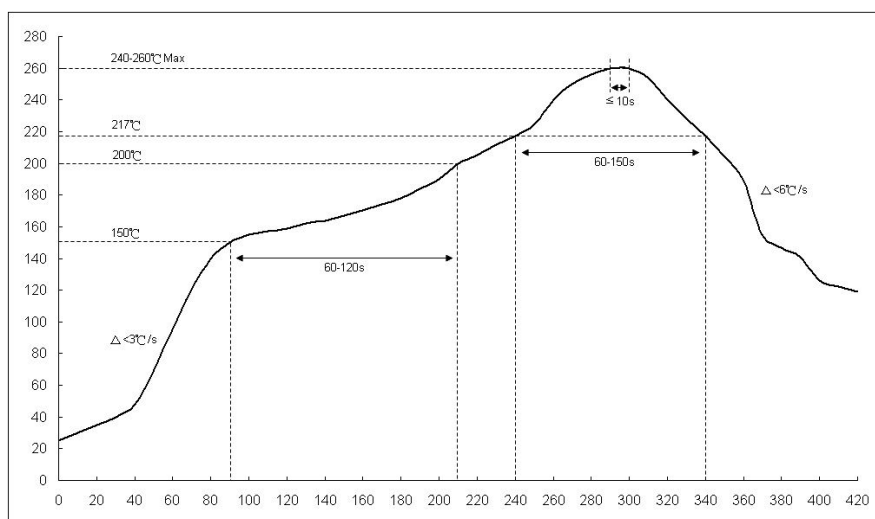
### 12.1 建议焊盘尺寸 (Recommended Solder Pad Dimension)



單位:mm

| 尺寸<br>Dimensions | 阻值範圍<br>Resistance Range | a    | b    | L    |
|------------------|--------------------------|------|------|------|
| RM1206           | 3mΩ~30mΩ                 | 1.80 | 1.70 | 1.60 |
| RM2512           | 1mΩ~2mΩ                  | 4.00 | 3.10 | 1.80 |
|                  | 3mΩ~50mΩ                 | 4.00 | 2.10 | 4.10 |

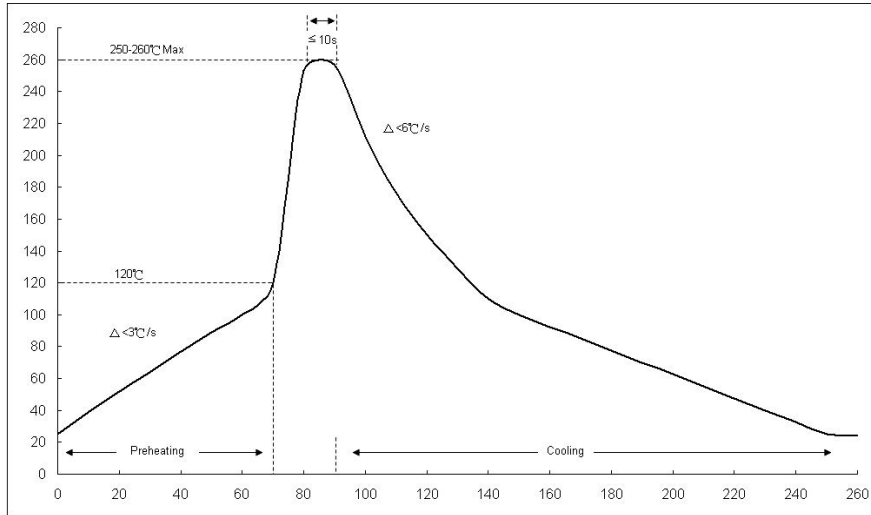
### 12.2 建议回流焊曲线 (Recommend reflow soldering profile)



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



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

烙鐵溫度  $350\pm 10^{\circ}\text{C}$ ，3 秒之內，避免烙鐵接觸電阻本體

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

★所有產品規格改變不再另行通知

★All product specification and data are subject to change without notice.

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