

低阻值大功率厚膜贴片电阻承认书-CH 系列

Approval Specification for Low Resistance High Power Thick Film Chip Resistors - Type **CH**

承认书  
**APPROVAL SHEET**

厂商：丽智电子（昆山）有限公司  
：丽智电子（南通）有限公司

客户：\_\_\_\_\_

Supplier:

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### Approval Specification for Low Resistance High Power Thick Film Chip Resistors - Type **CH**

#### 1. 范围 (scope) :

##### 1.1 适用于本公司所生产的无铅、无卤之低阻值高功率厚膜贴片电阻 CH 系列

This specification applies to low resistance high power thick film chip resistors which meet requirements of Pb free and halogen free.

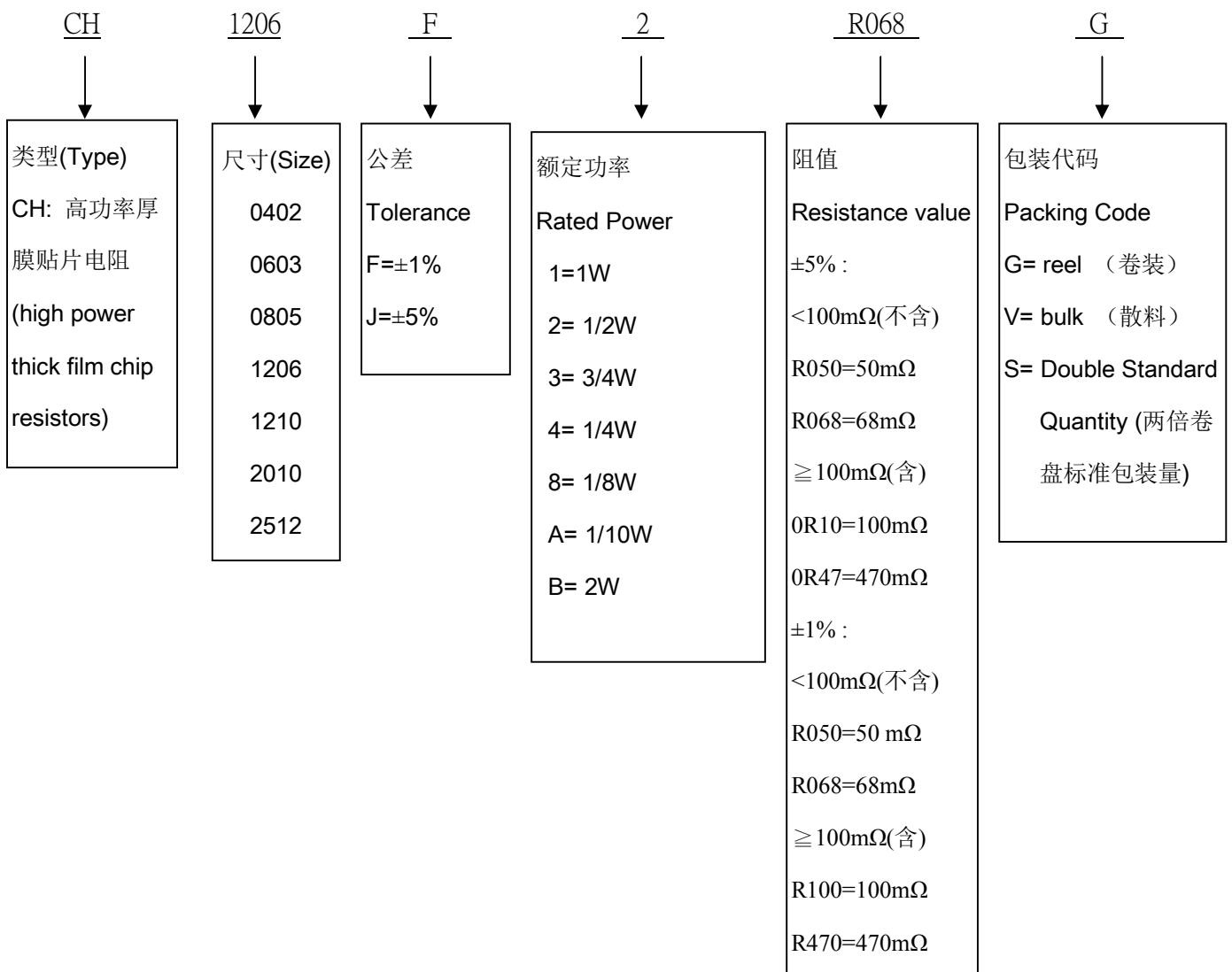
##### 1.2 本公司的无铅产品指的贴片电阻端电极无铅，而存在于电阻层的玻璃中的符合 RoHS 豁免条款。

There no lead exists in terminal of resistor, and lead which exist in glass of resistor layer meets RoHS exemption.

#### 2. 产品料号 (part number) :

1206 1/2W 1% 68mΩ





CH1206F2R068G



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

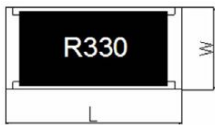
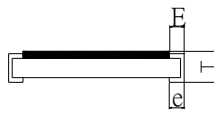
<p>※ 0402 因本体太小，本体上无字码标示。 For 0402 size, no marking on the body due to the small size of the resistor</p> <p>※ 0603 尺寸的产品，以三字码标示，第一位码R 表示<math>10^{-3}</math>，后两位表示阻值的有效数字。 For 0603 size, use three digitals to declare resistance. The first letter 'R' denotes <math>10^{-3}</math>, The other two digitals declare resistance.</p> <p>※ 0603 以上尺寸的产品，以四字码标示，第一位码R 表示<math>10^{-3}</math>，后三位表示阻值的有效数字。 The size larger than 0603, use four digitals to declare resistance. The first letter 'R' denotes <math>10^{-3}</math>, The other three digitals declare resistance.</p>	       	<p>R10=0R100=0.100Ω 068=0R068=0.068Ω</p> <hr/> <p>R068=0R068=0.068Ω R330=0R330=0.330Ω</p>
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R-value	0805 以上 Code	0603Code	R-value	0805 以上 Code	0603Code	R-value	0805 以上 Code	0603Code
50mΩ	R050	050	100mΩ	R100	R10	360mΩ	R360	R36
51mΩ	R050	051	110mΩ	R110	R11	390mΩ	R390	R39
56mΩ	R056	056	120mΩ	R120	R12	400mΩ	R400	R40
62mΩ	R062	062	130mΩ	R130	R13	430mΩ	R430	R43
68mΩ	R068	068	150mΩ	R150	R15	470mΩ	R470	R47
75mΩ	R075	075	160mΩ	R160	R16	500mΩ	R500	R50
82mΩ	R082	082	180mΩ	R180	R18	510mΩ	R510	R51
91mΩ	R091	091	200mΩ	R200	R20	560mΩ	R560	R56
			220mΩ	R220	R22	620mΩ	R620	R62
			240mΩ	R240	R24	680mΩ	R680	R68
			270mΩ	R270	R27	750mΩ	R750	R75
			300mΩ	R300	R30	820mΩ	R820	R82
			330mΩ	R330	R33	910mΩ	R910	R91

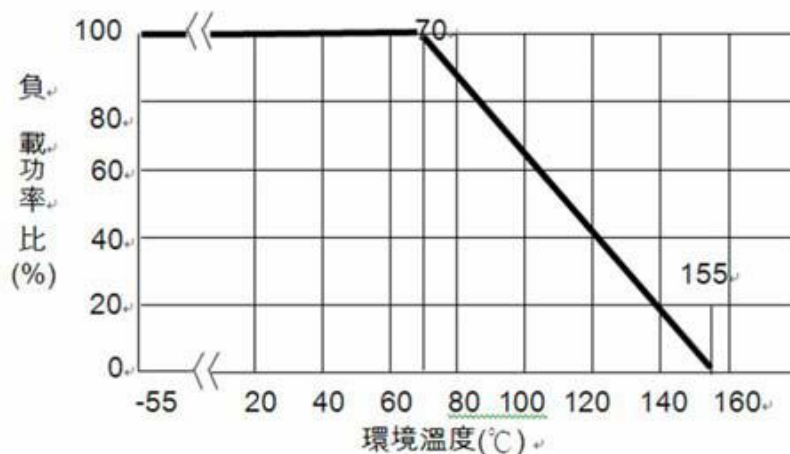
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#### 4. 尺寸 (dimension) :

尺寸 dimension	 				
	单位 (unit) : mm				
型别 (Type)	L	W	T	E	e
CH0402	1.00±0.05	0.50±0.05	0.30±0.05	0.15±0.10	0.20±0.10
CH0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.20	0.30±0.20
CH0805	2.00±0.15	1.25±0.15	0.50±0.10	0.35±0.20	0.40±0.20
CH1206	3.10±0.15	1.60±0.15	0.55±0.10	0.45±0.25	0.40±0.25
CH1210	3.10±0.15	2.50±0.15	0.55±0.15	0.35±0.25	0.60±0.25
CH2010	5.00±0.20	2.50±0.20	0.55±0.15	0.65±0.25	0.50±0.25
CH2512	6.25±0.20	3.10±0.20	0.55±0.15	0.85±0.25	0.95±0.25

#### 5. 功率衰减曲线 ( Derating Curve ) :



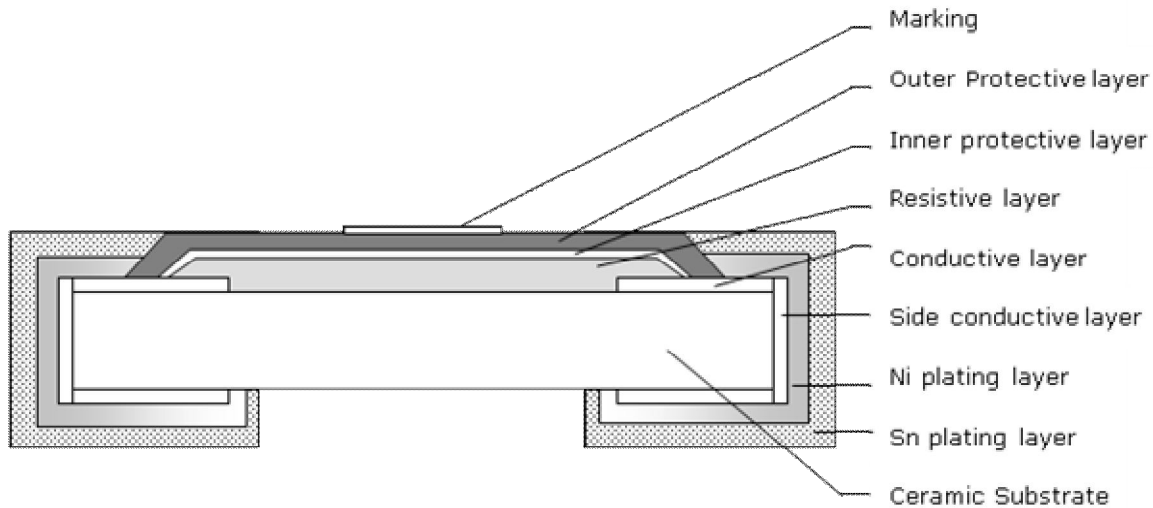
工作温度范围 (Operating Temperature Range) : -55°C ~ +155°C;

储存条件 (storage condition) : 5~30°C, 30~75%RH.

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#### 6.电阻结构（Construction）：



No.	结构 construction	主要材料 Major material
1	陶瓷基板 Ceramic substrate	三氧化二铝 Al <sub>2</sub> O <sub>3</sub>
2	银电极 Conductive layer	银 Ag
3	侧电极 Side conductive layer	镍铬合金 NiCr
4	阻体层 Resistive layer	氧化钌+玻璃 RuO <sub>2</sub> + glass
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	雾锡 Matte Tin

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#### 7. 阻值范围 (resistance range) :

型别 Type	阻值范围 Resistance Range	
	1%	5%
CH0402	0.05Ω~1Ω(不含)	0.05Ω~1Ω(不含)
CH0603	0.05Ω~1Ω(不含)	0.05Ω~1Ω(不含)
CH0805	0.05Ω~1Ω(不含)	0.05Ω~1Ω(不含)
CH1206	0.05Ω~1Ω(不含)	0.05Ω~1Ω(不含)
CH1210	0.10Ω~1Ω(不含)	0.10Ω~1Ω(不含)
CH2010	0.10Ω~1Ω(不含)	0.10Ω~1Ω(不含)
CH2512	0.10Ω~1Ω(不含)	0.10Ω~1Ω(不含)

#### 8. 电气特性(Electrical Characteristics):

型别 Type	CH0402	CH0603	CH0805	CH1206	CH1210	CH2010	CH2512
额定功率 Rated power	1/10W	1/8W	1/4W	1/2W	3/4W	1W	2W
最大工作電流 Max Working Current	1.41A	1.58A	2.24A	3.16A	2.74A	3.16A	4.47A
最大過負荷電流 Max Overload Current	3.54A	3.95A	5.59A	7.91A	6.85A	7.91A	11.18A
绝缘耐压 Dielectric Withstanding Voltage	150V	220V	430V	570V	710V	710V	710V

#### 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 8, the maximum working current shall be regarded as rated current.

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#### 9. 性能(Performance Specifications)

内容 Item	规格 Specification Limits	测试方法 Test Methods
温度系数 Temperature Coefficient	0.05 Ω ~0.06 Ω (含):±1500PPM/°C 0.06 Ω ~0.2 Ω (含):±800PPM/°C 0.2 Ω ~0.5 Ω (含):±600PPM/°C >0.5 Ω :±400PPM/°C	JIS C 5201 4.8
焊锡性 Solderability	最少 95%面积上锡(Min 95% coverage)	JIS C 5201 4.17
绝缘电阻 Insulation resistance	>10G Ω	JIS C 5201 4.6
绝缘耐压 Dielectric withstanding voltage	无击穿、飞弧及可见机械性损伤 No evidence of flashover, mechanical damage arcing or insulation breakdown	JIS C 5201 4.7
短时间过负荷 Short-time overload	±(2.0% +0.001 Ω) Max (最大)	JIS C 5201 4.13
端子弯曲 Terminal bending	±(2.0% +0.001 Ω) Max (最大)	JIS C 5201 4.33
抗焊锡热 Resist to soldering heat	±(1.0% +0.001 Ω) Max (最大)	JIS C 5201 4.18
负荷寿命 Load life	±(3.0% +0.001 Ω) Max (最大)	JIS C 5201 4.25.1
耐湿特性 Humidity	±(2.0% +0.001 Ω) Max (最大)	JIS C 5201 4.24
温度循环 Temperature cycling	±(2.0% +0.001 Ω) Max (最大)	JIS C 5201 4.19
温湿循环 Moisture Resistance	±(2.0% +0.001 Ω) Max (最大)	MIL-STD-202 METHOD 106

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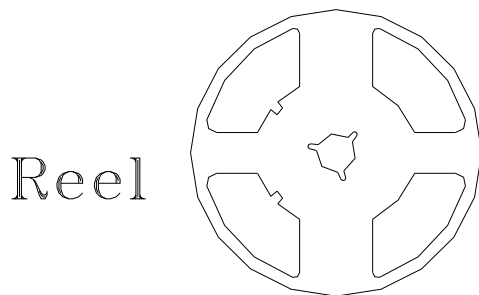
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#### 10. 包装规格 (Tapping Specification)

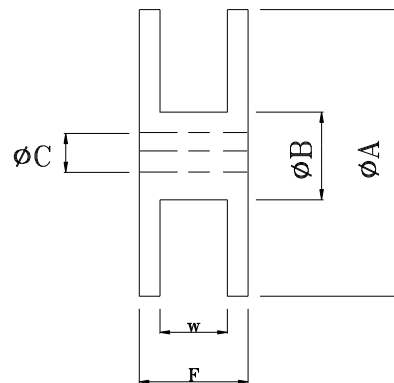
##### 10.1 卷盘尺寸 (reel dimension)

尺寸 Dimensions		A	B	C	F	W
CH0402 CH0603 CH0805 CH1206 CH1210	mm	178±2.0	60.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
	Inch	7.008±0.079	2.362±0.039	0.531±0.020	0.449±0.039	0.354±0.012
CH2010 CH2512	mm	178±2.0	60.0±1.0	13.5±0.5	15.4±1.0	13.0±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) 0402 每卷 10,000 pcs  
0402 Quantity per Reel 10,000 pcs/Reel
  - (2) 2010/2512 每卷 4,000 pcs  
2010/2512 Quantity per Reel 4,000 pcs/Reel
  - (3) 0603/0805/1206/1210 每卷 5,000pcs  
0603/0805/1206/1210 Quantity per Reel 5,000 pcs/Reel



Standard Quantity per Reel  
5,000 pcs/Reel

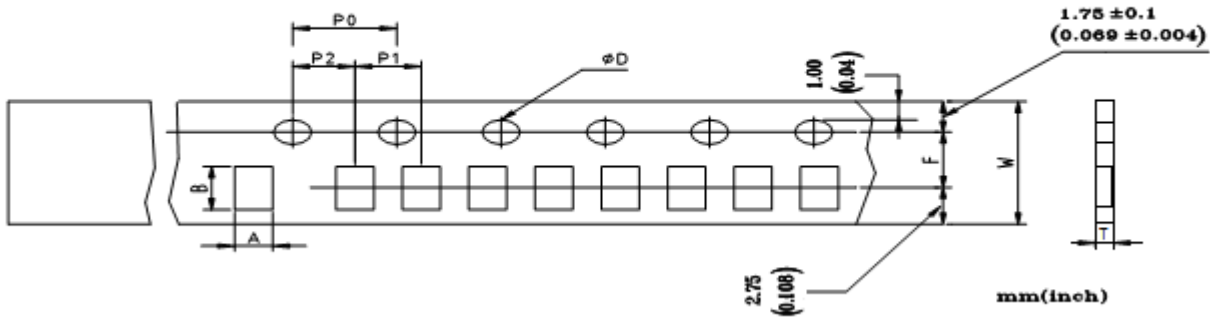




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#### 10.2 包装尺寸 (packing dimension)



Unit: mm

Dimensions	A	B	D	F	P0	P1	P2	W	T
CH0402	0.65±0.10	1.15±0.10	1.50± $\frac{0.1}{0.0}$	3.50±0.05	4.00±0.10	2.00±0.10	2.00±0.05	8.00±0.20	0.42±0.07
CH0603	1.10±0.10	1.90±0.10	1.50± $\frac{0.1}{0.0}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20	0.60±0.07
CH0805	1.65±0.20	2.40±0.20	1.50± $\frac{0.1}{0.0}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20	0.75±0.07
CH1206	2.00±0.20	3.60±0.20	1.50± $\frac{0.1}{0.0}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20	0.75±0.07
CH1210	2.80±0.20	3.50±0.20	1.50± $\frac{0.1}{0.0}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20	0.75±0.07
CH2010	2.90±0.10	5.30±0.10	1.50± $\frac{0.1}{0.0}$	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10	1.0±0.07
CH2512	3.40±0.10	6.60±0.10	1.50± $\frac{0.1}{0.0}$	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10	1.0±0.07

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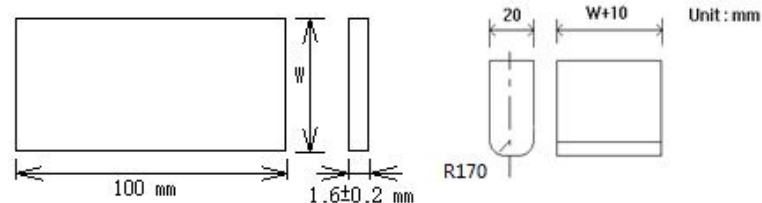
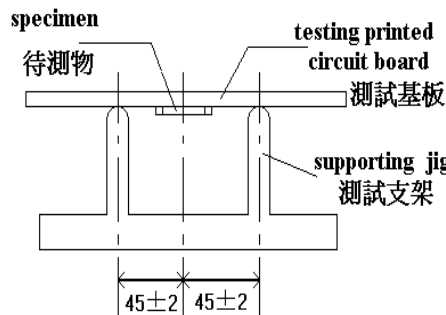
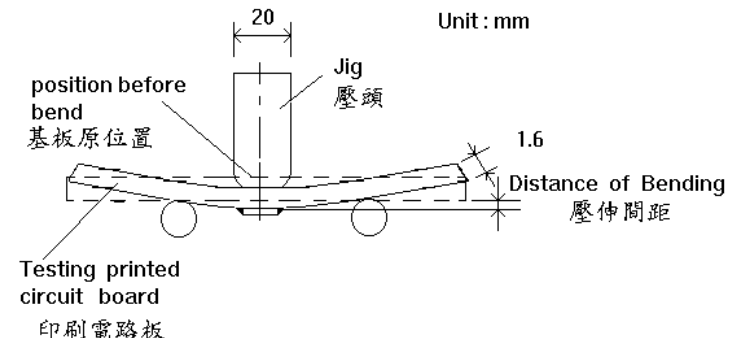
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#### 11. 信赖性测试 (Reliability Test Methods)

内容 Item	测试条件 Test Conditions
温度系数 Temperature Coefficient	$TCR = (R - R_0) / (t - t_0) R_0 \times 10^6 \text{ (ppm)}$ <p> <math>R_0</math> 电阻在室温下的阻值(resistance at room temperature)  <math>R</math> 电阻在 125°C 或 -55°C 下的阻值(resistance at 125°C or -55°C)  <math>t_0</math> 室温(room temperature)  <math>t</math> 测试温度 (test temperature 125°C or -55°C)                 </p>
焊锡性 Solderability	沾助焊剂后浸入锡炉，锡炉温度 245±5°C，时间 2~3 秒 Dip the terminal in a flux and then dip into a soldering bath at 245±5°C for 2~3sec.
绝缘电阻 Insulation resistance	电阻本体上加载最大的工作电压 60 秒后，测量绝缘阻抗 Applied the maximum DC working voltage on the center of body for 60 ±5seconds. Then measure insulation resistance
绝缘耐压 Dielectric withstanding voltage	电阻本体上加载最大的工作电压 60 秒。 Applied the maximum DC working voltage on the center of body for 60 ±5seconds.
短时间过负荷 Short-time overload	加载 2.5 倍的额定功率，时间 5 秒后测量试验前后的阻值变化率。 Applied 2.5 times of rated power for 5 second. Measure the variation of resistance. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{----- ( \% )}$ <p> <math>R_1</math> = 试验前阻值(resistance before test)  <math>R_2</math> = 试验后阻值(resistance after test)                 </p>
抗焊锡热 Resist to soldering heat	沾助焊剂后浸入锡炉，锡炉温度 260±5°C，时间 10±0.5 秒，测量试验前后的阻值变化率。 Dip the terminal in a flux and then dip into a soldering bath at 260±5°C for 10±0.5sec. Measure the variation of resistance. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{----- ( \% )}$ <p> <math>R_1</math> = 试验前阻值(resistance before test)  <math>R_2</math> = 试验后阻值(resistance after test)                 </p>

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内容 Item	测试条件 Test Conditions
端子弯曲 Terminal bending	<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}/\%</math>mm; 1206 以上的尺寸弯曲 <math>2^{+0.2}/\%</math>mm; 量测试验前后阻值变化率</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}/\%</math> mm for resistors which size no larger than 1206 or <math>2^{+0.2}/\%</math> mm which size larger than 1206. Measure the variation of resistance.</p> <p style="text-align: center;">测试板 (test board) <span style="float: right;">压头 (jig)</span></p> <div style="text-align: center;">  <p style="text-align: right;">Unit : mm</p> </div> <div style="text-align: center;">  <p style="text-align: right;">Unit : mm</p> </div> <div style="text-align: center;">  <p style="text-align: right;">Unit : mm</p> </div> <div style="text-align: center; margin-top: 20px;"> <math display="block">\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)</math> <p>R1 = 试验前阻值(resistance before test) R2 = 试验后阻值(resistance after test)</p> </div>

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内容 Item	测试条件 Test Conditions
负荷寿命 Load life	<p>电阻放入恒温箱中，温度 <math>70\pm 2^{\circ}\text{C}</math>，通电额定功率 <math>1000^{+24}/_{-0}</math> 小时，量测试验前后阻值变化率。</p> <p>Put the specimen in a chamber at <math>70\pm 2^{\circ}\text{C}</math> temperature, and applied rated Power for <math>1000^{+24}/_{-0}\text{H}</math>. Measure the variation of resistance.</p> $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ <p>R1 = 试验前阻值(resistance before test)            R2 = 试验后阻值(resistance after test)</p>
耐湿特性 Humidity	<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;通电额定功率 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。量测试验前后阻值变化率。</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 Power for 1.5H and rested for 0.5H repeatedly till total test time is <math>1000^{+48}/_{-0}</math>. Measure the variation of resistance.</p> $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ <p>R1 = 试验前阻值(resistance before test)            R2 = 试验后阻值(resistance after test)</p>
温度循环 Temperature Cycling	<p>电阻放入温度循环机中，温度 <math>155\pm 2^{\circ}\text{C}</math> 至 <math>-55\pm 3^{\circ}\text{C}</math>，共 5 个循环。量测试验前后阻值变化率。</p> <p>Put specimen in a chamber which temperature can be changed to <math>125\pm 2^{\circ}\text{C}</math> or <math>-55\pm 3^{\circ}\text{C}</math>, repeated 5 times. Measure the variation of resistance.</p> $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ <p>R1 = 试验前阻值(resistance before test)            R2 = 试验后阻值(resistance after test)</p>

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### Approval Specification for Low Resistance High Power Thick Film Chip Resistors - Type **CH**

内容 Item	测试条件 Test Conditions																																																
温湿循环 Moisture Resistance	<p>电阻放入恒温恒湿箱，加载额定功率，温湿度条件如下表；循环测试 42 次，测试时间 1000 小时。量测试前后阻值变化率。</p> <p>Put specimen in a chamber and applied rated Power. Temperature and humidity conditions as following. There are 42 cycles and total test time is 1000H. Measure the variation of resistance.</p> <p style="text-align: center;">表 1 (table1)</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th style="width: 15%;">测试条件 test condition</th> <th style="width: 15%;">step1</th> <th style="width: 15%;">step2</th> <th style="width: 15%;">step3</th> <th style="width: 15%;">step4</th> <th style="width: 15%;">step5</th> </tr> </thead> <tbody> <tr> <td>湿度% humidity</td> <td>90~96%</td> <td>90~96%</td> <td>80~96%</td> <td>90~96%</td> <td>90~96%</td> </tr> <tr> <td>温度 temperature</td> <td>升温至 65°C increase to 65°C</td> <td>65°C</td> <td>降温至 25°C decrease to 25°C</td> <td>升温至 65°C increase to 65°C</td> <td>65°C</td> </tr> <tr> <td>时间 time</td> <td>2.5H</td> <td>3H</td> <td>2.5H</td> <td>2.5H</td> <td>3H</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th style="width: 15%;">测试条件 test condition</th> <th style="width: 15%;">step6</th> <th style="width: 15%;">step7</th> <th style="width: 15%;">step8</th> <th style="width: 15%;">step9</th> <th style="width: 15%;">step10</th> </tr> </thead> <tbody> <tr> <td>湿度% humidity</td> <td>80~96%</td> <td>90~96%</td> <td>90~96%</td> <td>90~96%</td> <td>90~96%</td> </tr> <tr> <td>温度 temperature</td> <td>降温至 25°C decrease to 25°C</td> <td>25°C</td> <td>降温至 -10°C decrease to -10°C</td> <td>-10°C</td> <td>升温至 25°C increase to 25°C</td> </tr> <tr> <td>时间 time</td> <td>2.5H</td> <td>2H</td> <td>0.5H</td> <td>3H</td> <td>0.5H</td> </tr> </tbody> </table> <p style="text-align: center;"> <math display="block">\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)</math> </p> <p style="text-align: center;">           R1 = 试验前阻值(resistance before test)            R2 = 试验后阻值(resistance after test)         </p>	测试条件 test condition	step1	step2	step3	step4	step5	湿度% humidity	90~96%	90~96%	80~96%	90~96%	90~96%	温度 temperature	升温至 65°C increase to 65°C	65°C	降温至 25°C decrease to 25°C	升温至 65°C increase to 65°C	65°C	时间 time	2.5H	3H	2.5H	2.5H	3H	测试条件 test condition	step6	step7	step8	step9	step10	湿度% humidity	80~96%	90~96%	90~96%	90~96%	90~96%	温度 temperature	降温至 25°C decrease to 25°C	25°C	降温至 -10°C decrease to -10°C	-10°C	升温至 25°C increase to 25°C	时间 time	2.5H	2H	0.5H	3H	0.5H
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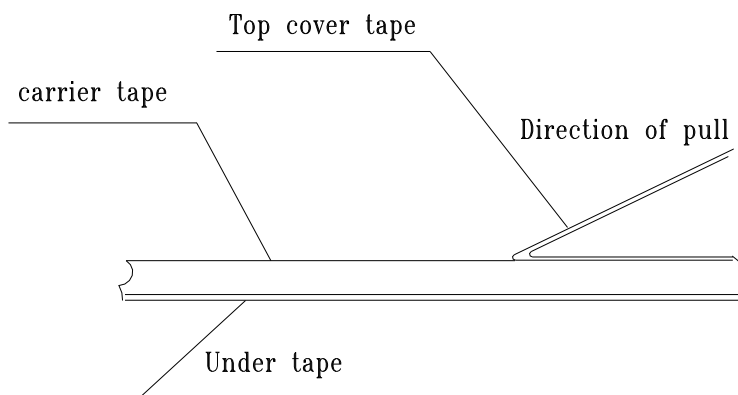
## 低阻值大功率厚膜贴片电阻承认书-CH 系列

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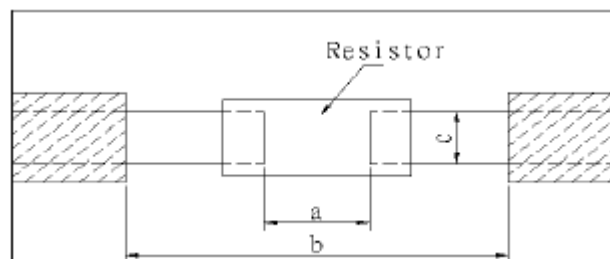
#### 12. 上胶带剥离力测试 (Peel force of top cover tape)

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；载带的剥离力范围为 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)



#### 13. 焊盘尺寸 (Recommended land patterns):



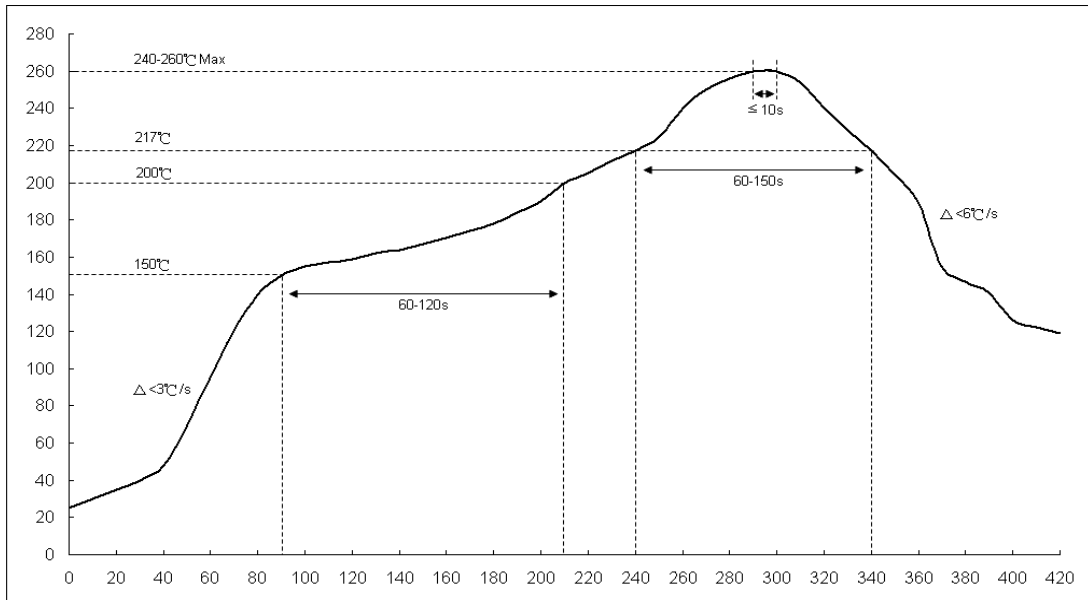
Type	Land pattern	Dimensions (mm)		
		a	b	c
	CH0402	0.5~0.6	1.4~1.6	0.4~0.6
	CH0603	0.7~0.9	2.0~2.2	0.8~1.0
	CH0805	1.0~1.4	3.2~3.8	0.9~1.4
	CH1206	2.0~2.4	4.4~5.0	1.2~1.8
	CH1210	2.0~2.4	4.4~5.0	2.3~3.5
	CH2010	3.3~3.7	5.7~6.5	2.3~3.5
	CH2512	3.6~4.0	7.6~8.6	2.3~3.5

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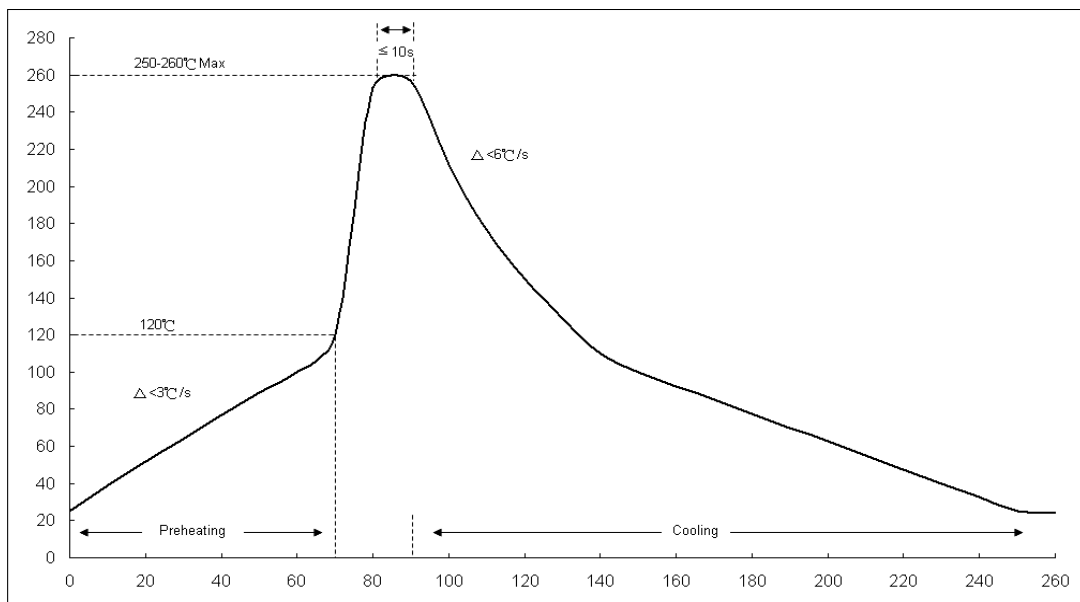
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#### 14. 焊接 (soldering)

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



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



##### 14.3 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.