



低阻值厚膜晶片电阻承认书-CR 系列

Approval Specification for Thick Film Chip Resistors - Low Resistance **CR**

承认书

APPROVAL SHEET

厂商：麗智电子(昆山)有限公司 客户：_____

Supplier:

customer:

核准 Approved by	审核 Checked by	制作 Prepared by

核准 Approved by	审核 Checked by	制作 Prepared by

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1. 范围 (scope) :

1.1 适用于本公司所生产的无铅、无卤之低阻值厚膜晶片电阻 CR 系列

This specification applies to 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晶片电阻端电极无铅，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 1/4W 5% 100m Ω

CR1206J40R10G





<u>CR</u>	<u>1206</u>	<u>J</u>	<u>4</u>	<u>0R10</u>	<u>G</u>
↓	↓	↓	↓	↓	↓
类型(Type) CR: 厚膜晶片 电阻(thick film chip resistor)	尺寸(Size) 0402 0603 0805 1206 1210 2010 2512	公差 Tolerance F=± 1% J=± 5%	额定功率 Rated Power 1= 1W 2= 1/2W 2= 3/4W (for 2010) 3= 1/3W 3= 1/2W (for 1210) 4= 1/4W 8= 1/8W A= 1/10W F= 1/16W H=1/20W	阻值 Resistance value ±1% R010=0.01 Ω R220=0.22 Ω ±5% : 0R33=0.33 Ω 0R10=0.1 Ω	包装代码 Packing Code G= reel (卷装) V= bulk (散料)



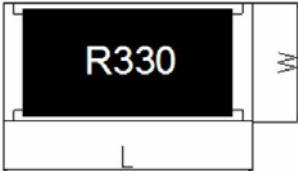
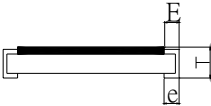
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3. 电阻本体字码标示(Marking on the Resistor's Body):

<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>R10=0.1 Ω R47=0.47 Ω</p>
<p>※ 0603 尺寸的产品, 以三字码标示, 第一位码 R 表示 10^{-3}, 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 10^{-3}, 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 10^{-3}, 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 10^{-3}, The other three digitals declare resistance.</p>	 	<p>R220=0.22 Ω R330=0.33 Ω</p>

4. 尺寸 (dimension) :

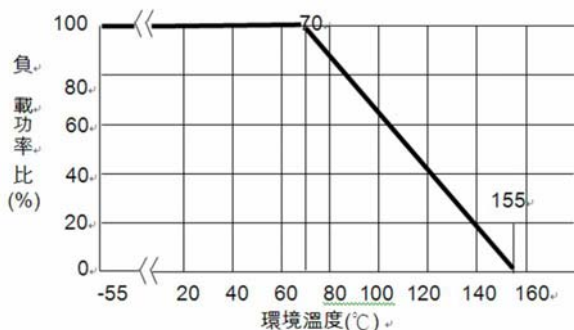
尺寸 dimension			单位 (unit) : mm		
型别 (Type)	L	W	T	E	e
CR0402	1.00±0.10	0.50±0.05	0.30±0.05	0.15±0.10	0.20±0.10
CR0603	1.60±0.15	0.80±0.10	0.45±0.10	0.25±0.20	0.30±0.20
CR0805	2.00±0.15	1.25±0.15	0.50±0.10	0.35±0.20	0.40±0.20
CR1206	3.10±0.15	1.60±0.15	0.55±0.10	0.45±0.25	0.40±0.25
CR1210	3.10±0.15	2.50±0.15	0.55±0.15	0.35±0.25	0.60±0.35
CR2010	5.00±0.20	2.50±0.20	0.55±0.15	0.65±0.25	0.50±0.25
CR2512	6.25±0.20	3.10±0.20	0.55±0.15	0.85±0.25	0.95±0.25



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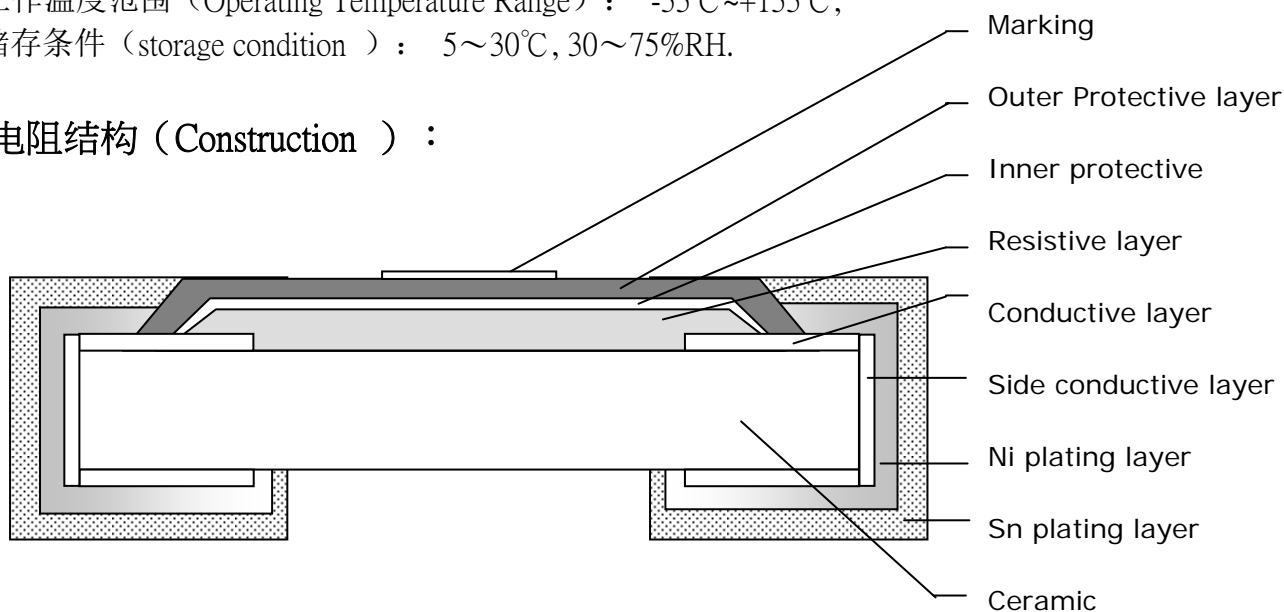
5. 功率衰减曲线 (Derating Curve) :



工作温度范围 (Operating Temperature Range) : $-55^{\circ}\text{C} \sim +155^{\circ}\text{C}$;

储存条件 (storage condition) : $5 \sim 30^{\circ}\text{C}$, 30~75%RH.

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_2O_3)
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 ($\text{RuO}_2 + \text{glass}$)
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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8. 阻值范围及电气特性(Resistance Range and Electrical Characteristics):

型别 Type	额定功率 Rated Power	最大工作电流 Max Working Current	最大过负荷电流 Max Overload Current	温度特性 TCR (ppm/°C)	阻值范围 Resistance Range
					F(1%) J(5%) E24;E96
0402	1/16W	1.2A	3A	±1500	25~36mΩ
				±1200	37~59mΩ
				±800	60~199mΩ
				±600	200~499mΩ
				±400	500~1000mΩ
0603	1/10W	1.5	3.7A	±1500	10~36mΩ
				±1200	37~59mΩ
				±800	60~199mΩ
				±600	200~499mΩ
				±400	500~1000mΩ
0805	1/8W	1.9A	4.8A	±1500	10~18mΩ
				±1200	19~32mΩ
				±800	33~49mΩ
				±600	50~99mΩ
				±400	100~1000mΩ
1206	1/4W	3.6A	9.1A	±1500	10~18mΩ
				±1200	19~24mΩ
				±1000	25~49mΩ
				±600	50~99mΩ
				±400	100~1000mΩ



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型别 Type	额定功率 Rated Power	最大工作电流 Max Working Current	最大过负荷电流 Max Overload Current	温度特性 TCR (ppm/°C)	阻值范围 Resistance Range
					F(1%) J(5%) E24;E96
1210	1/3W	4.4A	11.1A	±1500	10~18mΩ
				±1200	19~24mΩ
				±1000	25~49mΩ
				±600	50~99mΩ
				±400	100~1000mΩ
2010	1/2W	4.4A	11.1A	±1500	10~18mΩ
				±1200	19~24mΩ
				±1000	25~49mΩ
				±600	50~99mΩ
				±400	100~1000mΩ
2512	1W	6.3A	15.8A	±1500	10~18mΩ
				±1200	19~24mΩ
				±1000	25~49mΩ
				±600	50~99mΩ
				±400	100~1000mΩ

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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9. 性能(Performance Specifications):

内容 Item	规格 Specification Limits	测试方法 Test Methods
温度系数 Temperature Coefficient	如上页表格: As above table	JIS C5202 5.2
焊锡性 Solder ability	最少 95%面积上锡(Min 95% coverage)	JIS C5202 6.5
绝缘电阻 Insulation resistance	>10G Ω	JIS C5202 5.6
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 C5202 5.7
短时间过负荷 Short-time overload	$\pm(2.0\% + 0.001\Omega)$ Max (最大)	JIS C5202 6.4
端子弯曲 Terminal bending	$\pm(2.0\% + 0.001\Omega)$ Max (最大)	JIS C5202 6.1.4
抗焊锡热 Resist to soldering heat	$\pm(1.0\% + 0.001\Omega)$ Max (最大)	JIS C5202 6.4
负荷寿命 Load life	$\pm(3.0\% + 0.001\Omega)$ Max (最大)	JIS C5202 7.10
耐湿特性 Humidity	$\pm(2.0\% + 0.001\Omega)$ Max (最大)	JIS C5202 7.5
温度循环 Temperature cycling	$\pm(2.0\% + 0.001\Omega)$ Max (最大)	JIS C5202 7.6
温湿度敏感等级 Moisture sensitive level	Level 1	J-STD-020C
冷热冲击 Thermal shock	$\pm(2.0\% + 0.001\Omega)$ Max (最大)	JIS C5202 7.4



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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
CR0402 CR0603 CR0805 CR1206 CR1210	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
CR2010 CR2512	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

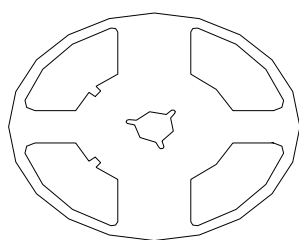
(2) 2010/2512 每卷 4,000 pcs

2010/2512 Quantity per Reel 4,000 pcs/Reel

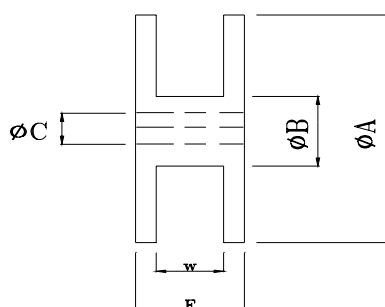
(3) 0603/0805/1206/1210 每卷 5,000pcs

0603/0805/1206/1210 Quantity per Reel 5,000 pcs/Reel

Reel



Standard Quantity per Reel
5,000 pcs/Reel

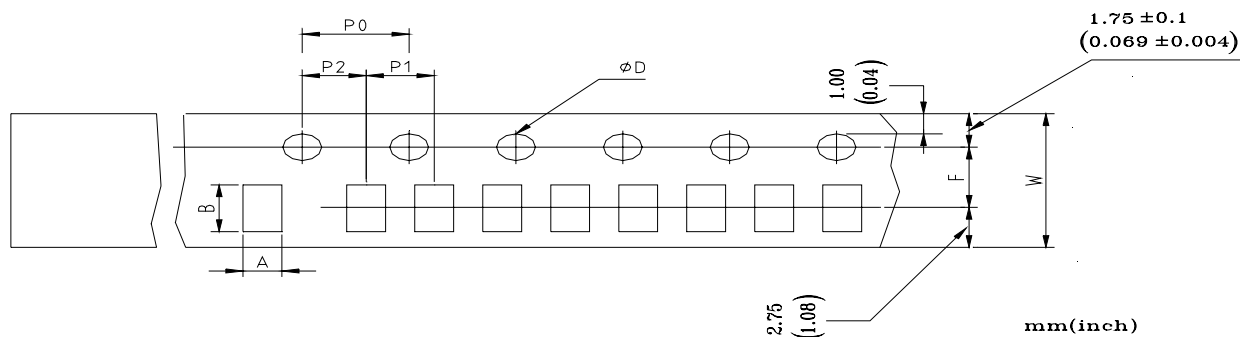




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10.2 包装尺寸 (packing dimension)



Dimensions	A	B	D	F	P0	P1	P2	W
CR0402	0.65±0.10	1.15±0.10	1.50 ± $\begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	3.50±0.05	4.00±0.10	2.00±0.10	2.00±0.05	8.00±0.20
CR0603	1.10±0.10	1.90±0.10	1.50 ± $\begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
CR0805	1.65±0.20	2.40±0.20	1.50 ± $\begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
CR1206	1.90±0.20	3.50±0.20	1.50 ± $\begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
CR1210	2.80±0.20	3.50±0.20	1.50 ± $\begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
CR2010	2.90±0.10	5.30±0.10	1.50 ± $\begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10
CR2512	3.40±0.10	6.60±0.10	1.50 ± $\begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10



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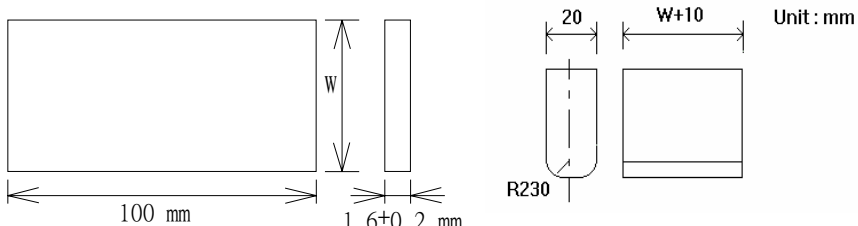
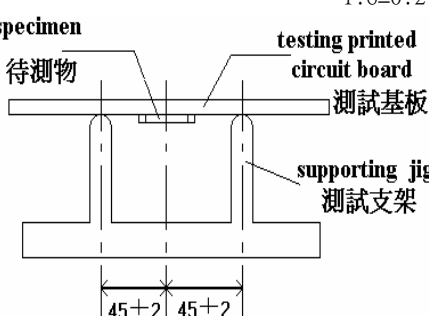
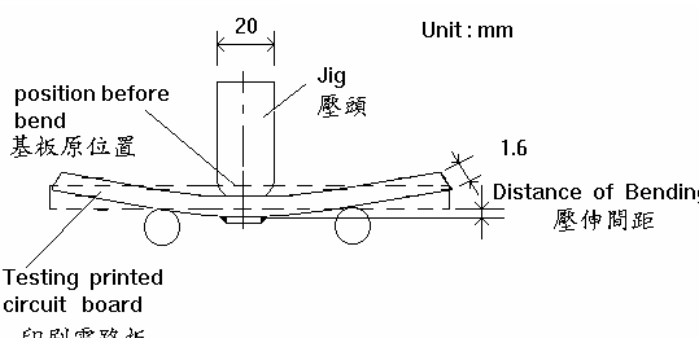
11.信赖性测试 (Reliability Test Methods)

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> R_0 电阻在室温下的阻值(resistance at room temperature) R 电阻在 125℃ 或 -55℃ 下的阻值(resistance at 125℃ or -55℃) t_0 室温(room temperature) t 测试温度 (test temperature 125℃ or -55℃) </p>
焊锡性 Solder ability	沾助焊剂后浸入锡炉，锡炉温度 235±5℃，时间 2±0.5 秒 Dip the terminal in a flux and then dip into a soldering bath at 235±5℃ for 2±0.5sec.
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 倍的额定电压，时间 5 秒后测量试验前后的阻值变化率。 Applied 2.5 times of rated voltage for 5 second. Measure the variation of resistance. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{----- (\%)}$ <p> R_1 = 试验前阻值(resistance before test) R_2 = 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℃，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℃ for 10±0.5sec. Measure the variation of resistance. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{----- (\%)}$ <p> R_1 = 试验前阻值(resistance before test) R_2 = 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 5 ± 1 秒, 1206 以下的尺寸弯曲 $5^{+0.2}/\text{mm}$; 1206 以上的尺寸弯曲 $2^{+0.2}/\text{mm}$; 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 5 ± 1s. the distance of bending is $5^{+0.2}/\text{mm}$ for resistors which size smaller than 1206 or $2^{+0.2}/\text{mm}$ which size larger than 1206. Measure the variation of resistance.</p> <p>测试板 (test board) 压头 (jig)</p>  <p>Unit : mm</p>  <p>specimen testing printed circuit board 待测物 測試基板 supporting jig 測試支架</p>  <p>Unit : mm</p> <p>position before bend 基板原位置 Jig 壓頭 1.6 Distance of Bending 壓伸間距</p> <p>Testing printed circuit board 印刷電路板</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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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 $70\pm 2^{\circ}\text{C}$，通电额定电压 $1000^{+24}/_{-0}$ 小时，量测试验前后阻值变化率。</p> <p>Put the specimen in a chamber at $70\pm 2^{\circ}\text{C}$ temperature, and applied rated voltage for $1000^{+24}/_{-0}\text{H}$. 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 $40\pm 2^{\circ}\text{C}$，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 $1000^{+48}/_{-0}$ 小时。量测试验前后阻值变化率。</p> <p>Put the specimen in a chamber at $40\pm 2^{\circ}\text{C}$ temperature and 90~95% relative humidity, then applied rated voltage for 1.5H and rested for 0.5H repeatedly till total test time is $1000^{+48}/_{-0}$. 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>
温湿度敏感等级 Moisture sensitive level	<p>电阻放入恒温恒湿箱，温度 85°C，湿度 90~95 %RH;时间 168 小时，再进行回流焊测试</p> <p>Put the specimen in a chamber at 85°C temperature and 85% relative humidity for 168H, then apply reflow test</p>
冷热冲击 Thermal shock	<p>电阻放入冷热冲击机中，温度 $125\pm 2^{\circ}\text{C}$ 至 $-55\pm 3^{\circ}\text{C}$，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 $125\pm 2^{\circ}\text{C}$ or $-55\pm 3^{\circ}\text{C}$, 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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内容 Item	测试条件 Test Conditions																																																
温度循环 Temperature cycling	<p>电阻放入恒温恒湿箱，加载额定电压，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。 Put specimen in a chamber and applied rated voltage. Temperature and humidity conditions as following. There are 42 cycles and total test time is 1000H. Measure the variation of resistance.</p> <p>表 1（table1）</p> <table><tr><td>测试条件 test condition</td><td>step1</td><td>step2</td><td>step3</td><td>step4</td><td>step5</td></tr><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℃ increase to 65℃</td><td>65℃</td><td>降温至 25℃ decrease to 25℃</td><td>升温至 65℃ increase to 65℃</td><td>65℃</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></table> <table><tr><td>测试条件 test condition</td><td>step6</td><td>step7</td><td>step8</td><td>step9</td><td>step10</td></tr><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℃ decrease to 25℃</td><td>25℃</td><td>降温至 -10℃ decrease to -10℃</td><td>-10℃</td><td>升温至 25℃ increase to 25℃</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></table> $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----}（\%）$ <p>R1 = 试验前阻值(resistance before test) R2 = 试验后阻值(resistance after test)</p>	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℃ increase to 65℃	65℃	降温至 25℃ decrease to 25℃	升温至 65℃ increase to 65℃	65℃	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℃ decrease to 25℃	25℃	降温至 -10℃ decrease to -10℃	-10℃	升温至 25℃ increase to 25℃	时间 time	2.5H	2H	0.5H	3H	0.5H
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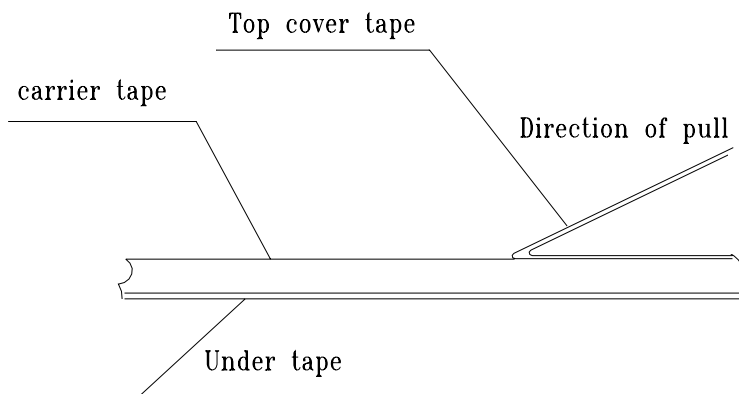
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12. 上胶带剥离力测试 (Peel force of top cover tape)

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 30~100

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)



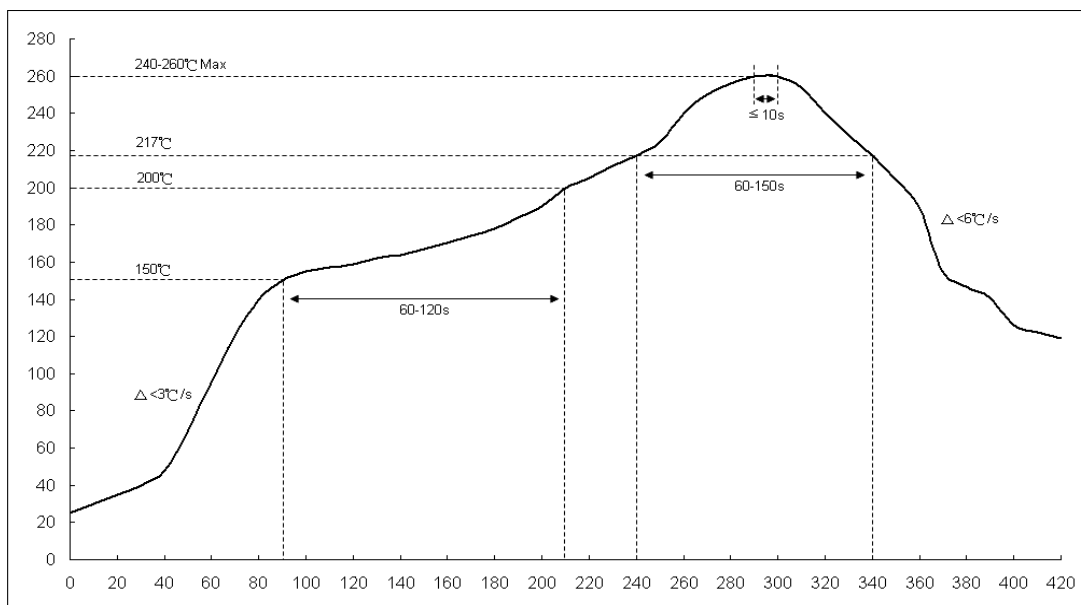


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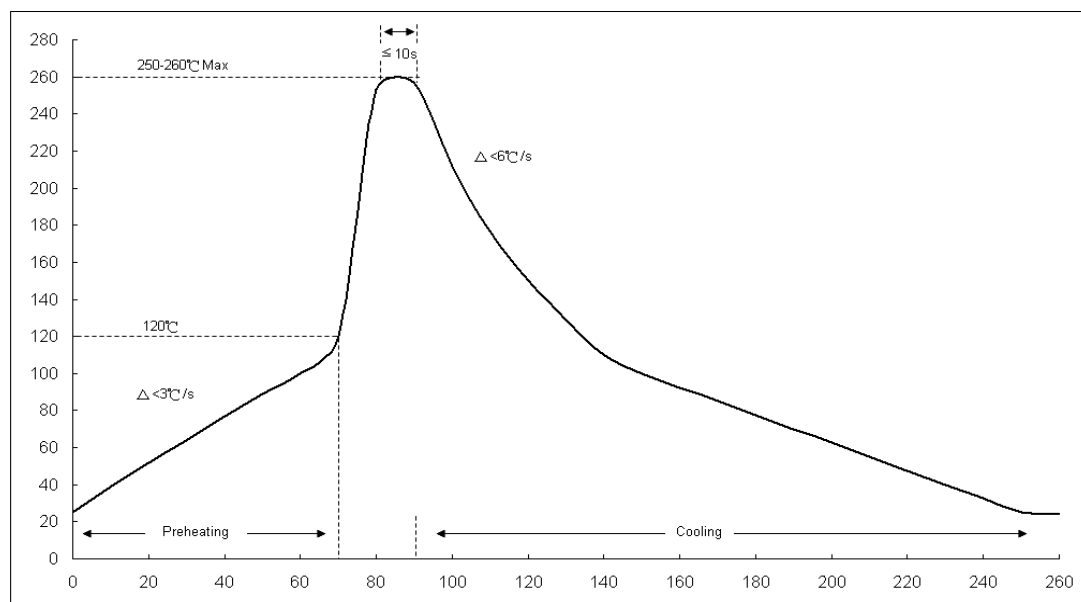
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13. 焊接 (soldering)

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



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



13.3 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