

合金箔贴片电阻承认书-RA 系列

Approval Specification Metal Foil Current Sensing Chip Resistors-Type **RA**

承认书

APPROVAL SHEET

厂商：丽智电子（昆山）有限公司

客户：_____

：丽智电子（南通）有限公司

Supplier:

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1. 范围 (scope) :

1.1 适用于本公司所生产的无铅、无卤之合金箔贴片电阻 RA 系列

This specification applies to Metal Foil Current Sensing Chip Resistors which meet requirements of Pb free and halogen free.

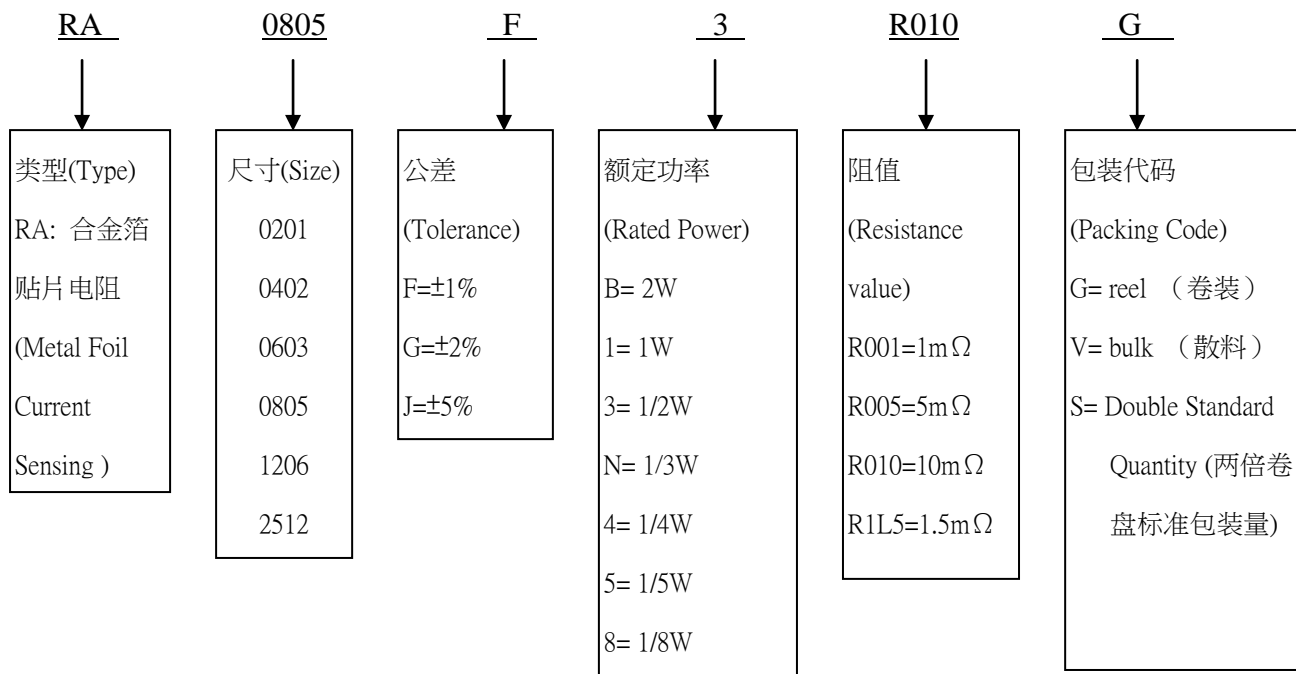
1.2 符合 AEC-Q200 條款

The relevant provisions of the AEC-Q200

2. 产品料号 (part number) :

0805 1% 1/2W 10mΩ

RA0805F3R010G



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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. The Marking is Laser marking, and it is on the black side of the product as the following illustration.



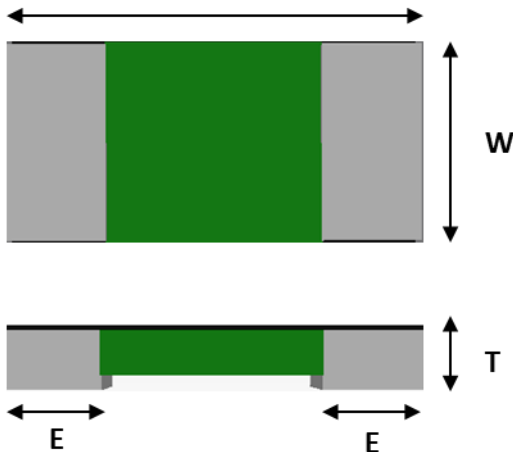
R010=10mΩ

R-value	0201 以上 Code	R-value	0201 以上 Code	R-value	0201 以上 Code
1mΩ	R001	20mΩ	R020	62mΩ	R062
1.5mΩ	R1L5	25mΩ	R025	68mΩ	R068
2mΩ	R002	30mΩ	R030	75mΩ	R075
3mΩ	R003	35mΩ	R035	82mΩ	R082
5mΩ	R005	40mΩ	R040	91mΩ	R091
10mΩ	R010	50mΩ	R050	100mΩ	R100
15mΩ	R015	56mΩ	R056		

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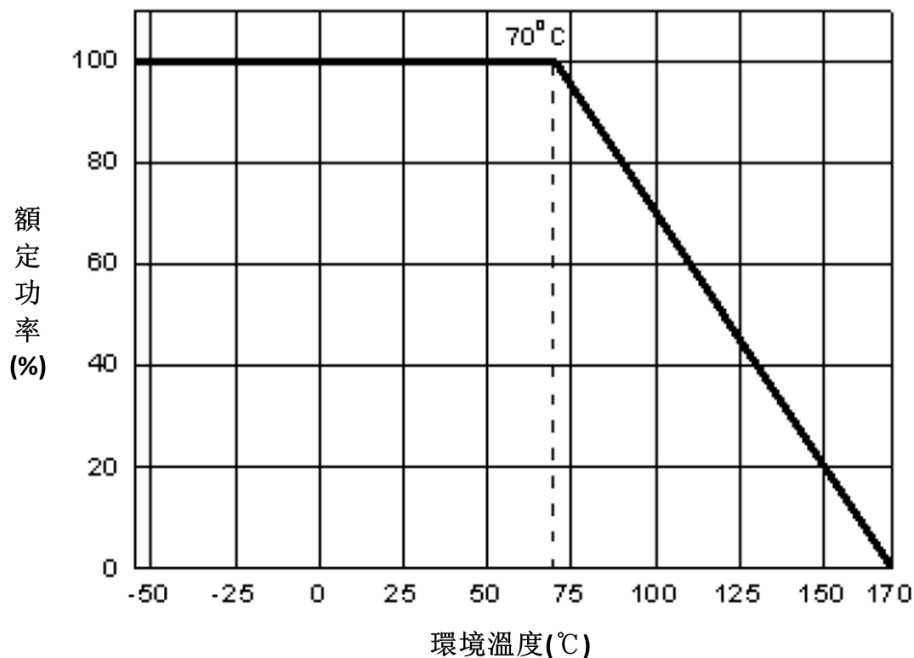
4. 尺寸 (dimension) :

尺寸 dimension						
单位 (unit) : mm						
型别 Type	阻值 R(mΩ)	温度系数 TCR(ppm/°C)	长 L(mm)	宽 W(mm)	高 T(mm)	电极宽 E(mm)
RA0201	3~ 4	±150	0.6±0.05	0.32±0.05	0.25±0.1	0.15±0.07
	5~ 20	±75				
RA0402	3~ 4	±150	1.0±0.10	0.5±0.10	0.35±0.15	0.25±0.10
	5~ 20	±75				
RA0603	2	±150	1.6±0.10	0.8±0.10	0.40±0.20	0.35±0.15
	3~ 4	±75				
	5~ 75	±50				
RA0805	1.5~ 2	±100	2.00±0.15	1.25±0.15	0.40±0.20	0.50±0.15
	3~ 4	±75				
	5~ 100	±50				
RA1206	1	±100	3.2±0.2	1.6±0.2	0.40±0.20	0.95±0.20
	2~ 4	±75				0.75±0.20
	5~ 100	±50				
RA2512	1	±100	6.4±0.2	3.2±0.2	0.40±0.20	1.80±0.20
	2~ 4	±75				1.10±0.20
	5~ 100	±50				

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5. 功率衰减曲线 (Derating Curve) :



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

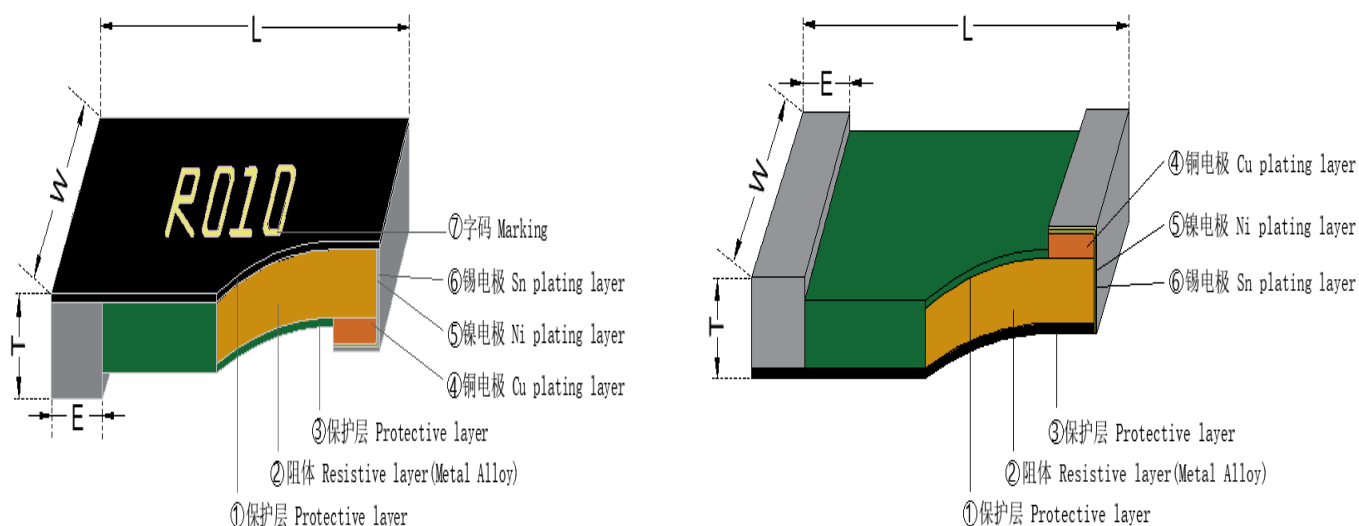
储存条件 (storage condition) : $5 \sim 30^{\circ}\text{C}$, 30~75%RH.

保存期限(Shelf Life) : 2 年制造日期起

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6. 电阻结构 (Construction) :



No.	结构 construction	主要材料 Major material
1	保护层 Protective layer	聚酰亚胺 Polyimide
2	阻体 Resistive layer(Metal Alloy)	合金 Metal Alloy
3	保护层 Protective layer	环氧树脂 Epoxy
4	铜电极 Cu plating layer	铜 Cu
5	镍电极 Ni plating layer	镍 Ni
6	锡电极 Sn plating layer	锡 Sn
7	字码 Marking	聚酰亚胺 Polyimide

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

型别 Type	额定功率 Rated Power	阻值范围 Resistance Range	绝缘阻抗 Insulation Resistance	温度操作范围 Operating Temperature
		F(±1%)、G(±2%)、J(±5%)		
RA0201	1/8W 1/5W	3mΩ~20mΩ	>100MΩ	-55~+170°C
RA0402	1/5W 1/4W	3mΩ~30mΩ	>100MΩ	-55~+170°C
RA0603	1/3W 1/2W	2mΩ~75mΩ	>100MΩ	-55~+170°C
RA0805	1/2W	1.5mΩ~100mΩ	>100MΩ	-55~+170°C
RA1206	1/2W 1W	1mΩ~100mΩ	>100MΩ	-55~+170°C
RA2512	1W 2W	1mΩ~100mΩ	>100MΩ	-55~+170°C

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)

内容 Item	测试方法 Test Methods	测试条件 Test Conditions	规格 Specification
温度系数 Temperature Coefficient	IEC60115-1 4.8	$TCR = (R - R_0) / (t - t_0) R_0 \times 10^6 \text{ (ppm)}$ $R_0 \text{ 电阻在室温下的阻值(resistance at room temperature)}$ $R \text{ 电阻在 } -55^\circ\text{C} \text{ 或 } +155^\circ\text{C} \text{ 下的阻值(resistance at } -55^\circ\text{C or } +155^\circ\text{C)}$ $t_0 \text{ 室温(room temperature)}$ $t \text{ 测试温度 (test temperature } -55^\circ\text{C or } +155^\circ\text{C)}$	请参考特性规格表， Pls refer to the Spec.
高温储存 High Temperature Exposure	MIL-STD-202 Method 108	125°C下放置 1000H，试验结束 24±4 小时后量测试验前后阻值变化率。 1000 hrs. @T=125°C. Measure the variation of resistance at 24±4 hours after test conclusion. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{----- (\%)}$ $R_1 = \text{试验前阻值(resistance before test)}$ $R_2 = \text{试验后阻值(resistance after test)}$	±(1% + 0.0005Ω)
低温储存 Low Temperature operation	IEC60115-1 4.23.4	-55°C下放置 45 分钟，后量测试验前后阻值变化率。 45 min. @T=-55°C. Measure the variation of resistance after test conclusion. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{----- (\%)}$ $R_1 = \text{试验前阻值(resistance before test)}$ $R_2 = \text{试验后阻值(resistance after test)}$	±(0.5% + 0.0005Ω)
温度循环 Temperature cycling	JESD22 Method JA-104	-55°C & +125°C，循环 1000 次，试验结束 24±4 小时后量测试验前后阻值变化率。 1000Cycles (-55°C to +125°C) Measurement at 24±4 hours after test conclusion. Measure the variation of resistance at 24±4 hours after test conclusion. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{----- (\%)}$ $R_1 = \text{试验前阻值(resistance before test)}$ $R_2 = \text{试验后阻值(resistance after test)}$	±(0.5% + 0.0005Ω)

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内容 Item	测试方法 Test Methods	测试条件 Test Conditions	规格 Specification
短时间过负荷 Short-time overload	IEC60115-1 4.13	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。 Applied 5.0 times of rated power for 5 second. Measure the variation of resistance. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 试验前阻值 (resistance before test) R2 = 试验后阻值 (resistance after test)	±(0.5% + 0.0005Ω)
耐湿特性 Biased Humidity	MIL-STD-202 METHOD 103	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 1000 hours 85℃/85%RH. Note: Specified conditions: 10% of operating power. Measurement at 24±4 hours after test conclusion. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 试验前阻值 (resistance before test) R2 = 试验后阻值 (resistance after test)	±(0.5% + 0.0005Ω)
负荷寿命 Operational life	MIL-STD-202 METHOD 108	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 ⁺⁴⁸ / ₋₀ 小时。量测试验前后阻值变化率。 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 ⁺⁴⁸ / ₋₀ .. Measure the variation of resistance. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 试验前阻值 (resistance before test) R2 = 试验后阻值 (resistance after test)	±(1% + 0.0005Ω)

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内容 Item	测试方法 Test Methods	测试条件 Test Conditions	规格 Specification
焊锡性 Solderability	J-STD-002B test B	沾助焊剂后浸入锡炉，锡炉温度 245±5℃，时间 2~3 秒 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 (Min 95% coverage)
抗焊锡热 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。 Dip the terminal in a flux and then dip into a soldering bath at 260±5℃ for 10±1sec. Measure the variation of resistance. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 试验前阻值(resistance before test) R2 = 试验后阻值(resistance after test)	±(0.5% + 0.0005Ω)
机械冲击 Mechanical Shock	MIL-STD-202 METHOD 213	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。 100g's，Normal duration is 6ms，half sine shock pulse .Measure the variation of resistance. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 试验前阻值(resistance before test) R2 = 试验后阻值(resistance after test)	±(0.5% + 0.0005Ω)
振动 Resistance to vibration	MIL-STD-202 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。 5g's for 20min.12cycles, 10-2000Hz . Measure the variation of resistance. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 试验前阻值(resistance before test) R2 = 试验后阻值(resistance after test)	±(0.5% + 0.0005Ω)
端子弯曲 Board Flex	AEC-Q200-005	弯曲2mm，60秒，量测试验前后阻值变化率。 Min 2mm deflection ,60sec. Measure the variation of resistance. Measure the variation of resistance.	±(0.5% + 0.0005Ω)

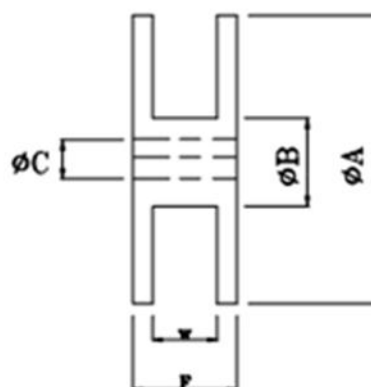
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内容 Item	测试方法 Test Methods	测试条件 Test Conditions	规格 Specification
端子强度 Terminal Strength	AEC-Q200-006	应用17.7N (1.8Kg)，时间60±1秒 Applied a 17.7N (1.8Kg) for 60±1seconds.	±(1% + 0.0005Ω)
冷热冲击 Thermal shock	MIL-STD-202 METHOD 107	温度-55/+125℃，周期数是 300,设备安装。最大传输时间是 20 秒。 use -55/+125℃, Number of cycles is 300. Devices mounted. Maximum transfer time is 20 seconds.Dwell time is 15 minutes. Air –Air $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 试验前阻值(resistance before test) R2 = 试验后阻值(resistance after test)	±(0.5% + 0.0005Ω)
易燃 Flammability	UL-94	V-0 or V-1可接受的，电气特性测试不要求 V-0 or V-1are acceptable，Electrical test not required.	/
ESD 试验 ESD test	AEC-Q200-002	加载规定静电电压2KV.2次/间隔1秒， Other:2KV, 2times/1s	±(1% + 0.0005Ω)

9. 包装规格 (Tapping Specification)

9.1 卷盘尺寸 (reel dimension)

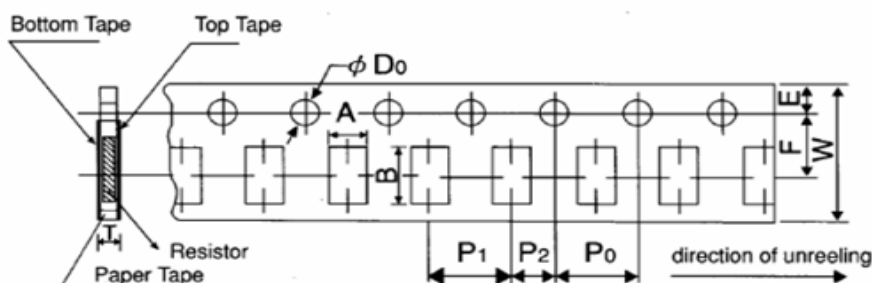


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尺寸 Dimensions		∅ A	∅ B	∅ C	F	W	Packing (pcs/reel)
RA0201	mm	178±2.0	60.0±1.0	13.50±0.50	11.4±0.1	9.0±0.3	10000
	Inch	7.008±0.079	2.362±0.039	0.531±0.020	0.449±0.039	0.354±0.012	
RA0402	mm	178±2.0	60.0±1.0	13.50±0.50	11.4±0.1	9.0±0.3	10000
	Inch	7.008±0.079	2.362±0.039	0.531±0.020	0.449±0.039	0.354±0.012	
RA0603	mm	178±2.0	60.0±1.0	13.50±0.50	11.4±0.1	9.0±0.3	5000
	Inch	7.008±0.079	2.362±0.039	0.531±0.020	0.449±0.039	0.354±0.012	
RA0805	mm	178±2.0	60.0±1.0	13.50±0.50	11.4±0.1	9.0±0.3	5000
	Inch	7.008±0.079	2.362±0.039	0.531±0.020	0.449±0.039	0.354±0.012	
RA1206	mm	178±2.0	60.0±1.0	13.50±0.50	11.4±0.1	9.0±0.3	5000
	Inch	7.008±0.079	2.362±0.039	0.531±0.020	0.449±0.039	0.354±0.012	
RA2512	mm	178±2.0	60.0±1.00	13.50±0.50	11.4±0.1	13.00±0.3	4000
	Inch	7.008±0.079	2.362±0.039	0.531±0.020	0.449±0.039	0.512±0.012	

9.2 包装尺寸 (packing dimension)

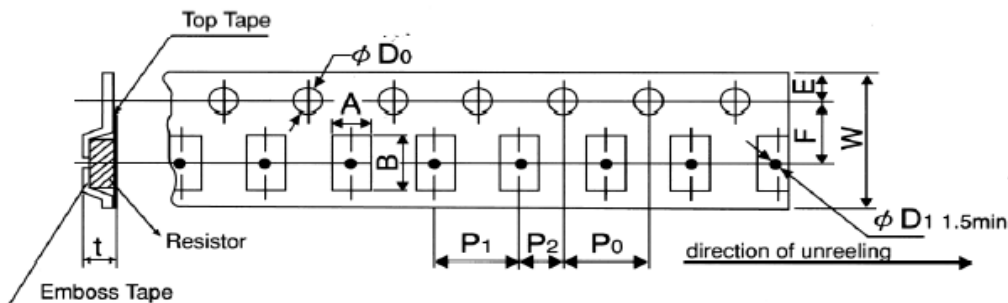


單位:mm

Packing	Type	A	B	W	F	E	P1	P2	P0	D0	T*
Paper Tape	RA0201	0.42±0.05	0.70±0.05	8.0±0.1	3.5±0.05	1.75±0.1	2.0±0.1	2.0±0.05	4.0±0.1	1.50± ^{0.1} _{0.0}	0.42±0.07
Paper Tape	RA0402	0.65±0.1	1.15±0.1	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± ^{0.1} _{0.0}	0.42±0.07
Paper Tape	RA0603	1.0±0.1	1.8±0.1	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± ^{0.1} _{0.0}	0.42±0.07 0.60±0.07
Paper Tape	RA0805	1.65±0.1	2.4±0.1	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± ^{0.1} _{0.0}	0.42±0.07 0.60±0.07
Paper Tape	RA1206	2.0±0.2	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± ^{0.1} _{0.0}	0.42±0.07 0.60±0.07

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單位:mm

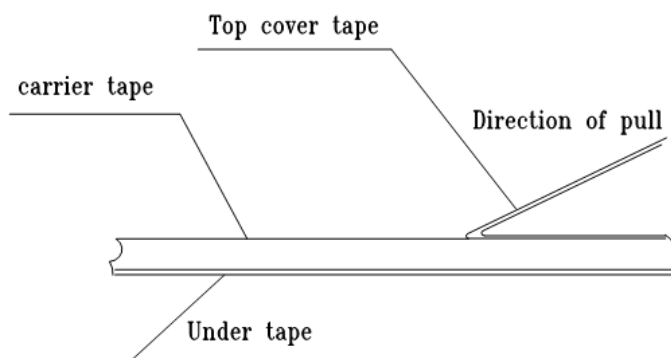
Emboss	RA2512	3.6±0.2	6.8±0.2	12.0±0.2	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	1.50± _{0.0} ^{0.1}	0.42±0.07 0.60±0.07
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T* : T=0.60±0.07 is for which Resistance $\leq 2m\Omega$.

10. 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 15~80g

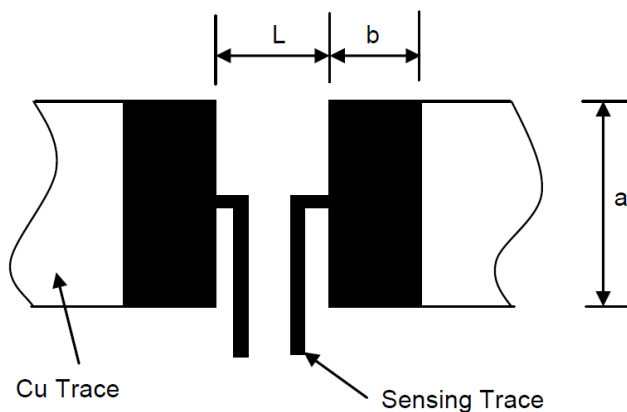
The top cover tape is pulled at a speed of 200 mm/min with the angle between the tape during peel and the direction of unreeling maintained at 165 to 180 degree as following picture. The peel force of paper carrier tape shall be 0.1N to 0.7N(10 to 70 g), the peel force of plastic carrier tape shall be 0.15N to 0.80N (15 to 80 g)



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11. 焊盘尺寸 (Recommended Solder Pad Dimension)



單位:mm

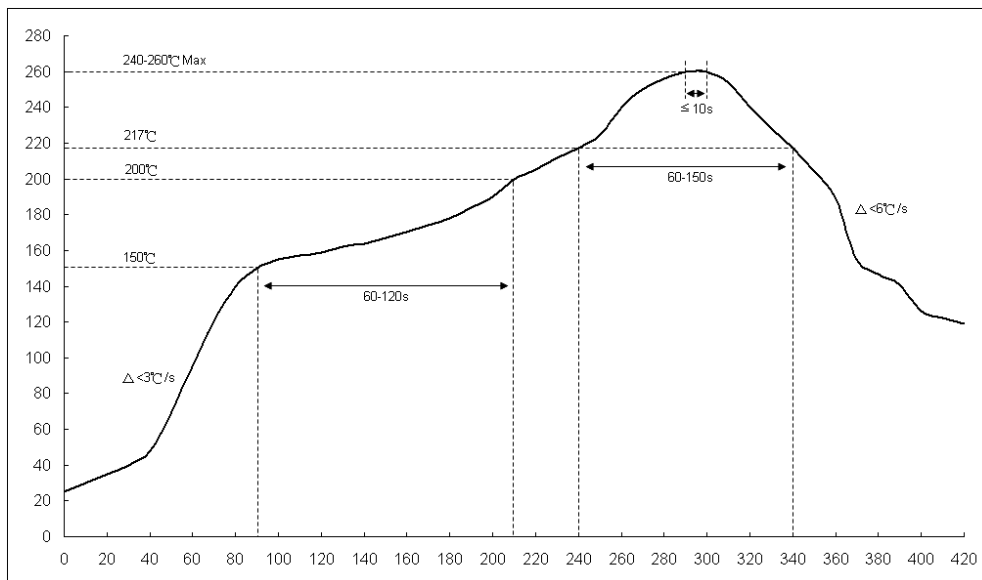
尺寸 Dimensions	阻值范围 Resistance Range	a	b	L
RA0201	3mΩ~20mΩ	0.4	0.45	0.2
RA0402	3mΩ~30mΩ	0.6	0.65	0.5
RA0603	2mΩ~75mΩ	1.2	1.0	0.5
RA0805	1.5mΩ~100mΩ	1.7	1.0	0.6
RA1206	1mΩ~100mΩ	2.2	1.3	0.9
RA2512	1mΩ~100mΩ	3.5	2.6	2.1

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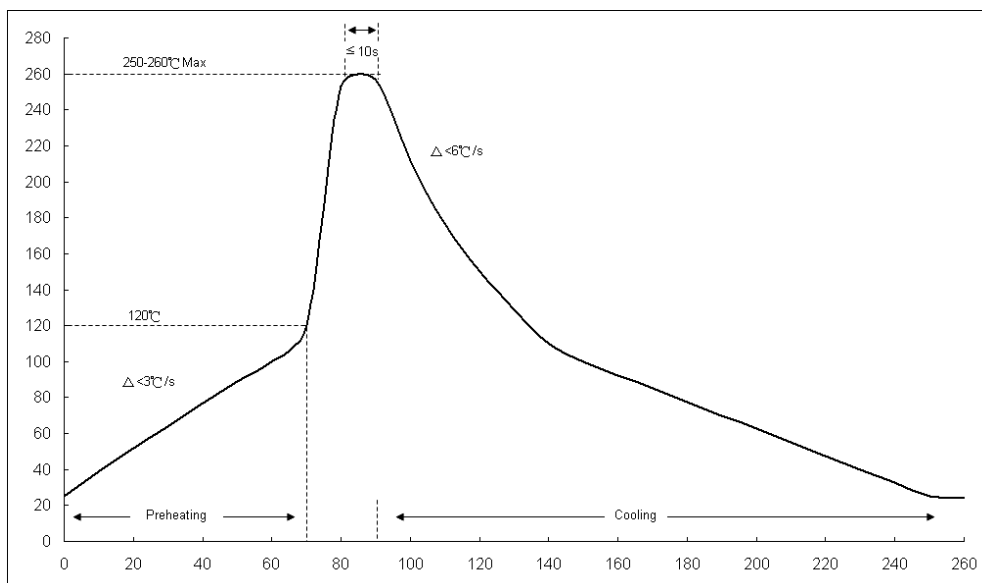
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12. 焊接 (soldering)

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



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



12.3 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.