

规格书

SPECIFICATION

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超高功率厚膜贴片电阻规格书- HU 系列

Approval Specification for Ultra-High Power Thick Film Chip Resistors-Type HU

1. 范围 (scope) :

1.1 适用于本公司所生产的无铅、超高功率厚膜贴片电阻 HU 系列

This specification applies to **Ultra-High Power** Thick Film Chip Resistors which meet requirements of Pb 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) :

0603 1/3W 5% 100 Ω

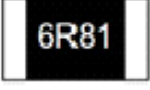
HU0603JN0101G

<u>HU</u>	<u>0603</u>	<u>J</u>	<u>N</u>	<u>0101</u>	<u>G</u>	
↓	↓	↓	↓	↓	↓	↓
类型(Type)	尺寸(Size)	公差	额定功率	阻值	包装代码	区别码
HU: 超高功率厚膜贴片电阻 (Ultra-High Power thick film chip resistors)	0402 0603 0805 1206 1210 2010 2512	Tolerance e D=0.5% F=±1% G=±2% J=±5%	Rated Power 5=1/5W N=1/3W 3=1/2W 2=3/4W 1=1W D=1.5W C=3W	Resistance value ±0.5%、±1% 49R9=49.9 Ω 1002=10K Ω ±2%、±5% 06R8=6.8 Ω 0564=560K Ω	Packing Code G=成品, 7 inch reel 常规包装量 H=成品, 10 inch reel两倍包装量 Z=成品, 15K包装量 S=成品, 20K包装量 U=成品, 50K包装量 V=bulk (散料)	Distinction Code 空码 = 无指定 - “X” = 特别指定, 不同字母代表不同指定

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

※ 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. ※ 公差$\geq \pm 2\%$的产品，以三字码标示，前两位表示阻值的有效数字，最后一位表示 10 的乘幂 $\geq \pm 2\%$ Tolerance product: the marking is 3 digits, the first 2 digits are significant figures of resistance value and the 3rd one denotes the power number of 10, (10X). ※ $\pm 1\%$的产品，以四字码标示，前三位表示阻值的有效数字，最后一位表示 10 的乘幂 $\pm 1\%$ tolerance product: the marking is 4 digits, the first 3 digits are significant figures of resistance value and the 4th one denotes the power number of 10, (10X). ※ 0603 $\pm 1\%$ E96 系列的标准阻值，因电阻本体太小，采用三位代码标示。 Standard E96 series values of 0603 $\pm 1\%$: due to the small size of the resistor's body, use 3digits code to indicate the resistance value.		No Marking
		$472 = 47 \times 10^2 = 4.7K \Omega$
		10 Ω 以下标示：5R6=5.6 Ω Below 10 Ω : 5R6=5.6 Ω
		$4992 = 499 \times 10^2 = 49.9K \Omega$
		100 Ω 以下标示：6R81=6.81 Ω Below 100 Ω : 6R81=6.81 Ω
		0603 $\pm 1\%$ E96 系列 $38Y = 243 \times 10^{-2} = 2.43 \Omega$

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0603 $\pm 1\%$ E96 系列的标准阻值代码(Standard E96 Series Resistance Value Code for 0603 $\pm 1\%$ Marking)

代码 Code	阻值 Value	代码 Code	阻值 Value	代码 Code	阻值 Value	代码 Code	阻值 Value	代码 Code	阻值 Value	代码 Code	阻值 Value
01	100	17	147	33	215	49	316	65	464	81	681
02	102	18	150	34	221	50	324	66	475	82	698
03	105	19	154	35	226	51	332	67	487	83	715
04	107	20	158	36	232	52	340	68	499	84	732
05	110	21	162	37	237	53	348	69	511	85	750
06	113	22	165	38	243	54	357	70	523	86	768
07	115	23	169	39	249	55	365	71	536	87	787
08	118	24	174	40	255	56	374	72	549	88	806
09	121	25	178	41	261	57	383	73	562	89	825
10	124	26	182	42	267	58	392	74	576	90	845
11	127	27	187	43	274	59	402	75	590	91	866
12	130	28	191	44	280	60	412	76	604	92	887
13	133	29	196	45	287	61	422	77	619	93	909
14	137	30	200	46	294	62	432	78	634	94	931
15	140	31	205	47	301	63	442	79	649	95	953
16	143	32	210	48	309	64	453	80	665	96	976

0603 $\pm 1\%$ E96 系列的指数代码(Multiplier Code for 0603 $\pm 1\%$ Marking)

代码 Code	Y	X	A	B	C	D	E	F
指数 Multiplier	10^{-2}	10^{-1}	10^0	10^1	10^2	10^3	10^4	10^5

阻值标示如下(So the resistance value are marked as the following examples)



$$10D = 124 \times 10^3 = 124K \Omega$$



$$38Y = 243 \times 10^{-2} = 2.43 \Omega$$

0603 $\pm 1\%$ 的产品，在标准 E24 系列中，但不属于 E96 系列，标示与 5%的字码相同，但是在字码下加一条线
 Standard E24 and not belong to E96 series values of 0603 $\pm 1\%$, the marking is the same as 5% tolerance but marking as underline



$$\underline{331} = 33 \times 10^1 = 330 \Omega$$

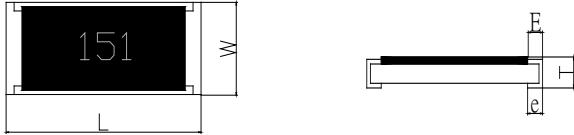


$$\underline{560} = 56 \times 10^0 = 56 \Omega$$

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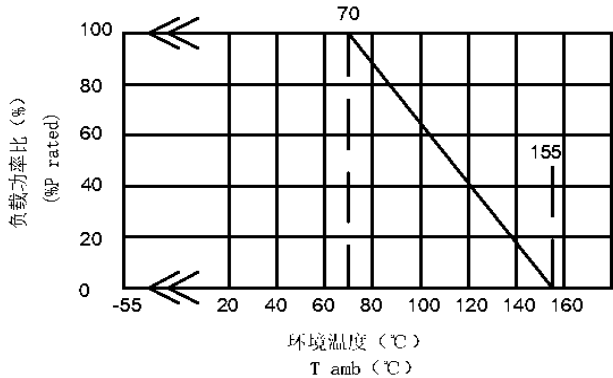
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4. 尺寸 (dimension) :

尺寸 dimension					
	单位 (unit) : mm				
型别 (Type)	L	W	T	E	e
HU0402	1.00±0.05	0.50±0.05	0.30±0.05	0.15±0.10	0.20±0.10
HU0603	1.60±0.10	0.80±0.10	0.40±0.10	0.30±0.20	0.30±0.10
HU0805	2.00±0.10	1.25±0.10	0.50±0.15	0.30±0.15	0.40±0.15
HU1206	3.05±0.10	1.60±0.10	0.55±0.15	0.40±0.20	0.50±0.20
HU1210	3.05±0.10	2.50±0.15	0.55±0.15	0.50±0.20	0.50±0.20
HU2010	5.00±0.20	2.50±0.15	0.55±0.10	0.60±0.20	0.60±0.20
HU2512	6.30±0.20	3.20±0.15	0.68±0.10	0.60±0.20	0.60±0.20

5. 特性参数 (Performance Characteristics)

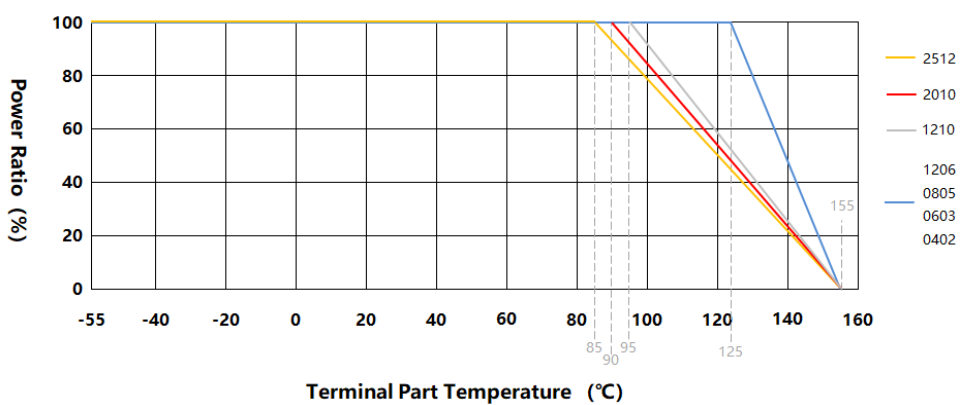
5.1 功率衰减曲线 (Derating Curve) :

使用温度范围	-55℃~+155℃
说明 Directions	电阻的额定功率基于-55℃至 70℃的环境温度下运行。当温度超过 70℃时，负载功率比例依照下图予以修订。 Resistors shall have a power rating based on continuous load operation at an ambient temperature from -55℃ to 70℃.For temperature in excess of 70℃ , the load shall be derated as shown in figure.
功率衰减曲线 Derating Curve	 负载功率比 (%P rated) 环境温度 (℃) T amb (℃)

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5.2 端子温度曲线 (Terminal part Temperature Curve) :

说明 Directions	电阻在使用时，端子温度达到对应尺寸的温度时，功率需按照图上降额曲线修正。 For resistors operated terminal part temperature of described for each size or above, a power rating shall be derated in accordance with derating curve.
端子温度曲线 Terminal part Temperature Curve	 The graph plots Power Ratio (%) on the Y-axis (0 to 100) against Terminal Part Temperature (°C) on the X-axis (-55 to 160). The curves represent different resistor sizes: 2512 (yellow), 2010 (red), 1210 (grey), 1206 (light blue), 0805 (dark blue), 0603 (medium blue), and 0402 (light grey). All curves show a 100% power ratio up to a certain temperature (85°C for 2512, 90°C for 2010, 95°C for 1210, 1206, 0805, and 125°C for 0603 and 0402), after which the power ratio decreases linearly, reaching 0% at 155°C.

备注 (remark) :

※ 额定电压计算公式 (The rated voltage is calculated by the following formula) :

$R \geq 1\Omega$:

$$E = \sqrt{RP}$$

E : 额定电压 (Rated Voltage) (V)

P : 额定功率 (Rated Power) (W)

R : 电阻阻值 (Resistance) (ohm)

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

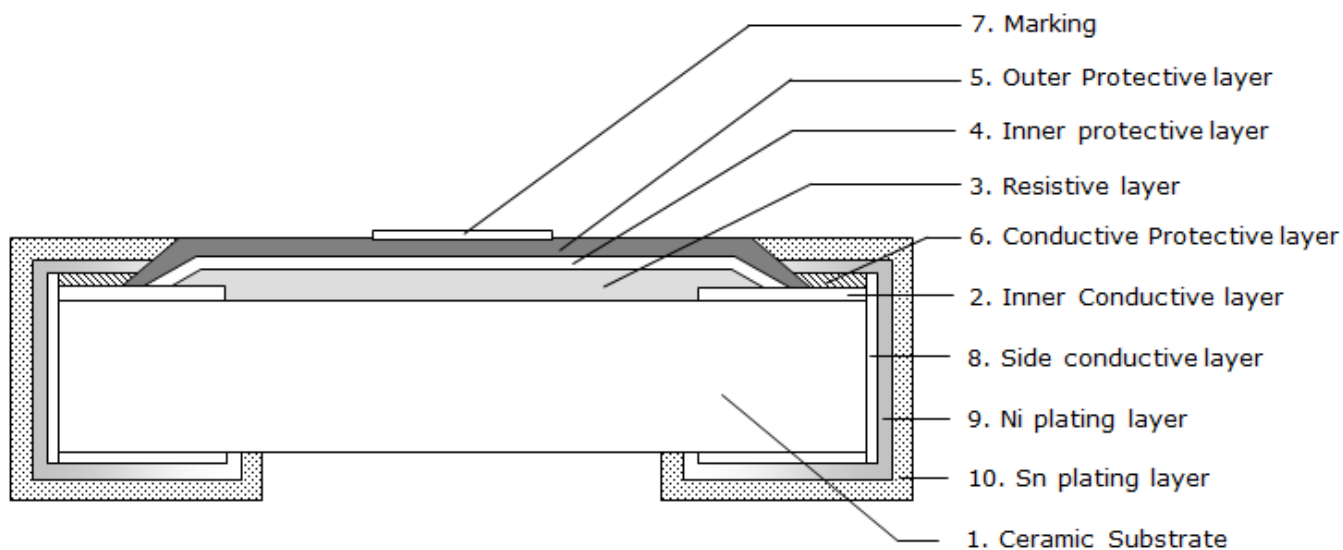
In case the value calculated by the formula exceed the maximum working voltage as above table 9, the maximum working voltage shall be regarded as rated voltage.

储存条件及期限 (storage condition or Data) : $25 \pm 5^\circ\text{C}$, $60 \pm 20\% \text{RH}$; 有效期 2 年。

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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 ₂ O ₃
2	内电极 Inner Conductive layer	银 Ag-Pd
3	阻体层 Resistive layer	氧化钌+玻璃 RuO ₂ + glass
4	内保护层 Inner protective layer	玻璃 Glass
5	外保护层 Outer Protective layer	环氧树脂 Epoxy
6	电极保护层 Conductive Protective layer	银 Ag
7	文字 Marking	环氧树脂 Epoxy
8	侧电极 Side conductive layer	镍铬合金 Ni-Cr
9	镍电极 Ni plating layer	镍 Ni
10	锡电极 Sn plating layer	雾锡 Matte Tin

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7. 电气特性标准 (Standard Electrical Specifications) :

7.1. 规格 (Type)

型别 Type	额定功率 Rated power	最大工作电压 Max Working Voltage	最大过载电压 Max Overload Voltage	T.C.R. (PPM/°C)	阻值范围		
					D: $\pm 0.5\%$	F: $\pm 1.0\%$ G: $\pm 2.0\%$	J: $\pm 5.0\%$
HU0402	1/5W	50V	100V	± 400	-	$1\Omega \leq R < 10\Omega$	
				± 100	$10\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 10M\Omega$	
HU0603	1/3W	150V	200V	± 400	-	$1\Omega \leq R < 10\Omega$	
				± 100	$10\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 10M\Omega$	
HU0805	1/2W	200V	300V	± 400	-	$1\Omega \leq R < 10\Omega$	
				± 100	$10\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 10M\Omega$	
HU1206	3/4W	200V	400V	± 400	-	$1\Omega \leq R < 10\Omega$	
				± 100	$10\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 10M\Omega$	
HU1210	1W	200V	400V	± 400	-	$1\Omega \leq R < 10\Omega$	
				± 100	$10\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 10M\Omega$	
HU2010	1.5W	200V	400V	± 400	-	$1\Omega \leq R < 10\Omega$	
				± 150	$10\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 10M\Omega$	
HU2512	3W	250V	500V	± 400	-	$1\Omega \leq R < 10\Omega$	
				± 150	$10\Omega \leq R \leq 1M\Omega$	$10\Omega \leq R \leq 10M\Omega$	

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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 of Resistance (T.C.R.)□	JIS C 5201 4.8 IEC-60115-1 4.8	$TCR = (R - R_0) / (t - t_0) R_0 \times 10^6 \text{ (ppm)}$ R_0 电阻在室温下的阻值(resistance at room temperature) R 电阻在 155℃或-55℃下的阻值(resistance at 155℃ or -55℃) t_0 室温(room temperature) t 测试温度 (test temperature 155℃ or -55℃)	参照 7 项
绝缘电阻 Insulation resistance	JIS C 5201 4.6 IEC-60115-1 4.6	电阻本体上加载 100V (DC) 绝缘耐压 60±5 秒后, 测量绝缘阻抗 Applying 100V (DC) to the resistor body and withstanding 60±5 seconds of insulation voltage. Measure the insulation resistance	≥ 10GΩ
短时间过负荷 Short-time overload	JIS C 5201 4.13 IEC-60115-1 4.13	加载 5 倍的额定功率或最大过载电压 (两者取其小) 时间 5 秒后测量试验前后的阻值变化率。 Applied 5 times of rated Power or Max Overload Voltage whichever is less for 5 second. Measure the variation of resistance. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R_1 = 试验前阻值(resistance before test) R_2 = 试验后阻值(resistance after test)	≤ ±1%: ±(1.00%+0.05Ω) ≥ ±2%: ±(2.00%+0.1Ω)
溶蚀 Leaching	JIS C 5201 4.18 IEC-60068-2-58 8.2.1	锡炉温度 260±5℃, 时间 30+1/-0 秒, 取出置于显 微镜下观察焊锡面积。 Dip the resistance in a tin furnace at 260±5℃ for 30+1/-0seconds, then take it out and observe the solder area under a microscope;	单边未吃锡面积≤ 5% Individual leaching area ≤ 5% 总未吃锡面积≤ 10% Total leaching area ≤ 10%

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内容 Item	测试方法 Test Methods	测试条件 Test Conditions	规格 Specification
抗焊锡热 Resistance to soldering heat	JIS C 5201 4.18 IEC-60115-1 4.18	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 resistance in a tin furnace at 260±5℃ for 10±0.5sec. 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%: ±(0.50%+0.05Ω) ≥ ±2%: ±(1.00%+0.05Ω)
耐溶剂 Resistance to Solvent	JIS C 5201 4.29	浸于异丙醇中, 温度 20~25℃, 时间 60 秒, 常温静止 48 小时后量测阻值变化率。 The tested resistor be immersed into isopropyl alcohol of 20~25℃ for 60secs. Then the resistor is left in the room for 48 hrs. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 试验前阻值(resistance before test) R2 = 试验后阻值(resistance after test)	±(0.50%+0.05Ω)
端子弯曲 Bending Strength	JIS C 5201 4.33 IEC-60115-1 4.33	电阻焊接在测试板上进行弯折, 弯折保持时间 5 秒, 量测试验前后阻值变化率 Specimen shall be mounted on test board, then bend the board and maintained for 5s. Measure the variation of resistance. 弯折深度 D: 0402/0603/0805=5mm 1206/1210=3mm 2010/2512=2mm $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 试验前阻值(resistance before test) R2 = 试验后阻值(resistance after test)	±(1.00%+0.05Ω)

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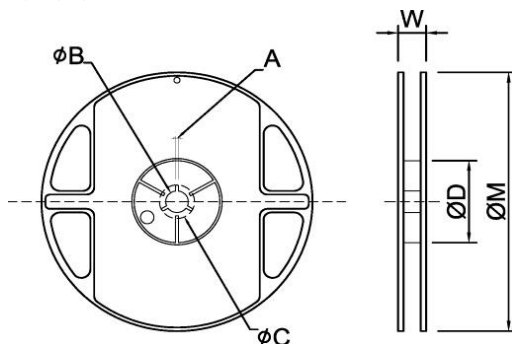
内容 Item	测试方法 Test Methods	测试条件 Test Conditions	规格 Specification
温度循环 Temperature cycling	JIS C 5201 4.19 IEC-60115-1 4.19	电阻放入温度循环机中, 温度 $155\pm 2^{\circ}\text{C}$ 至 $-55\pm 3^{\circ}\text{C}$, 共 5 个循环。量测试验前后阻值变化率. Put specimen in a chamber which temperature can be changed to $155\pm 2^{\circ}\text{C}$ or $-55\pm 3^{\circ}\text{C}$, repeated 5 cycles. Measure the variation of resistance. $\Delta R\% = \frac{R2-R1}{R1} * 100\text{-----} (\%)$ R1 = 试验前阻值(resistance before test) R2 = 试验后阻值(resistance after test)	$\leq \pm 1\%:$ $\pm(0.50\%+0.05\Omega)$ $\geq \pm 2\%:$ $\pm(1.00\%+0.10\Omega)$
负荷寿命 Load Life	JIS C 5201 4.25 IEC-60115-1 4.25.1	恒定温度 70°C 加载额定电压, 通电 1.5H, 断电 0.5H, 共持续 $1000+24/-0$ 小时 Put the specimen in a chamber at 70°C temperature, ON TIME:1.5H, OFF TIME:0.5H, rated voltage $1000+24/-0$ hours $\Delta R\% = \frac{R2-R1}{R1} * 100\text{-----} (\%)$ R1 = 试验前阻值(resistance before test) R2 = 试验后阻值(resistance after test)	$\leq \pm 1\%:$ $\pm(1.00\%+0.05\Omega)$ $\geq \pm 2\%:$ $\pm(3.00\%+0.10\Omega)$
耐湿负荷 Load Life in Moisture	JIS C 5201 4.24 IEC-60115-1 4.24	电阻放入恒温恒湿箱, 温度 $40\pm 2^{\circ}\text{C}$, 湿度 $90\sim 95\% \text{RH}$; 通额定电压 1.5 小时, 断电 0.5 小时; 共持续 $1000+48/-0$ 小时. 量测试验前后阻值变化率. Put the specimen in a chamber at $40\pm 2^{\circ}\text{C}$ temperature and $90\sim 95\%$ relative humidity, then applied rated voltage for 1.5H and rested for 0.5H repeatedly till total test time is $1000+48/-0$ hours. Measure the variation of resistance. $\Delta R\% = \frac{R2-R1}{R1} * 100\text{-----} (\%)$ R1 = 试验前阻值(resistance before test) R2 = 试验后阻值(resistance after test)	$\leq \pm 1\%:$ $\pm(1.00\%+0.05\Omega)$ $\geq \pm 2\%:$ $\pm(2.00\%+0.05\Omega)$

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9. 包装规格 (Tapping Specification)

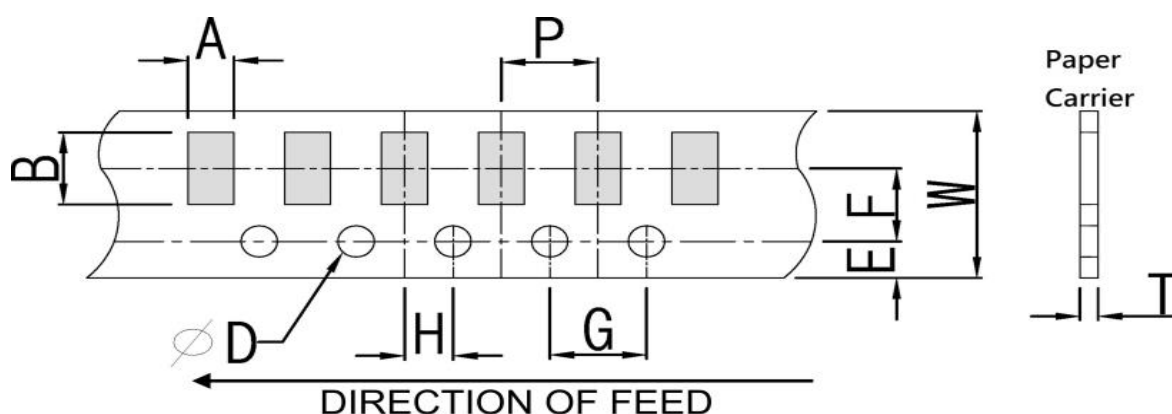
9.1 卷盘尺寸 (reel dimension)



Unit: mm

Type	Size		A	Φ B	Φ C	Φ D	W	Φ M
0402	7"	10K Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
	13"	40K/50K Reel	2.0±0.5	13.5±1.0	21±1.0	100±1.0	11.5±2.0	330±2.0
0603 0805 1206 1210	7"	5K Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	11.5±2.0	178±2.0
0603 0805 1206	10"	10K Reel	2.0±0.5	13.5±1.0	21±1.0	100±1.0	11.5±2.0	254±2.0
	13"	20K Reel	2.0±0.5	13.5±1.0	21±1.0	100±1.0	11.5±2.0	330±2.0
2010 2512	7"	4K Reel	2.0±0.5	13.5±1.0	21±1.0	60±1.0	16.0±2.0	178±2.0

9.2 包装尺寸 (packing dimension)



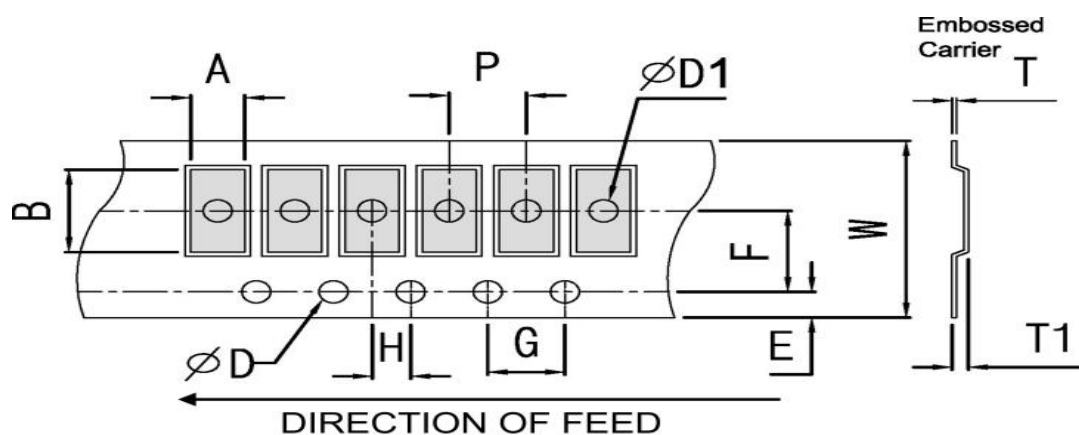
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Unit: mm

Paper Type

Type	A	B	W	E	F	G	H	T	ΦD	P
0402	0.70±0.1	1.20±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.45±0.1	1.50± ^{0.1} _{0.0}	2.0±0.1
0603	1.05±0.2	1.80±0.2	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.60±0.1		4.0±0.1
0805	1.55±0.2	2.30±0.2	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.75±0.1		4.0±0.1
1206	1.90±0.2	3.50±0.2	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.75±0.1		4.0±0.1
1210	2.85±0.2	3.50±0.2	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.75±0.1		4.0±0.1



Unit: mm

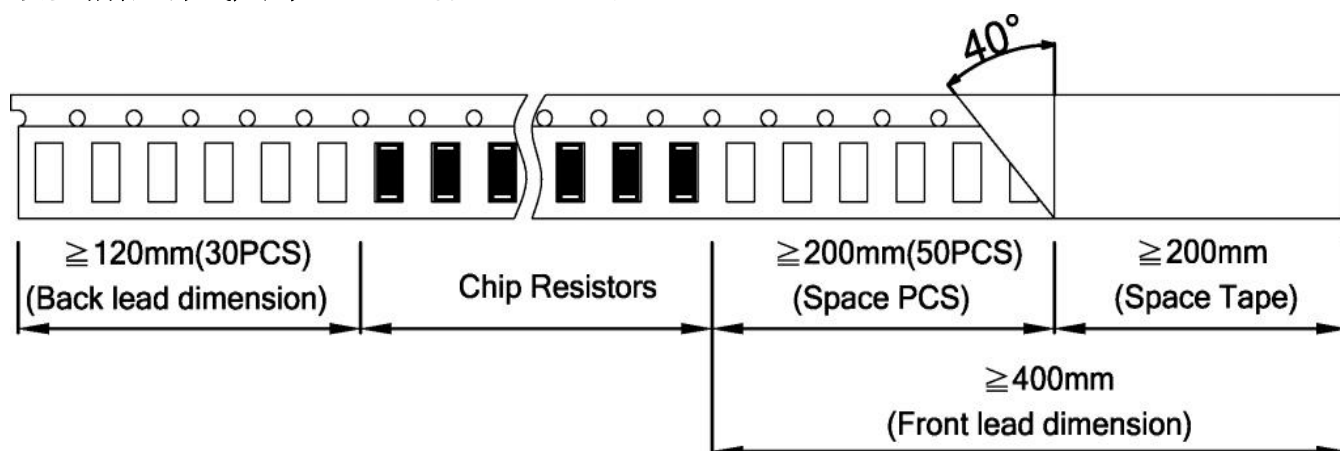
Embossed Type

Type	A	B	W	E	F	G	H	T	ΦD	ΦD1	T1	P
2010	2.80±0.2	5.60±0.2	12±0.1	1.75±0.1	5.5±0.05	4.0±0.1	2.0±0.05	0.23±0.1	1.50± ^{0.1} _{0.0}	1.5±0.1	0.85±0.15	4.0±0.1
2512	3.40±0.2	6.70±0.2	12±0.1	1.75±0.1	5.5±0.05	4.0±0.1	2.0±0.05	0.23±0.1		1.5±0.1	0.95±0.15	4.0±0.1

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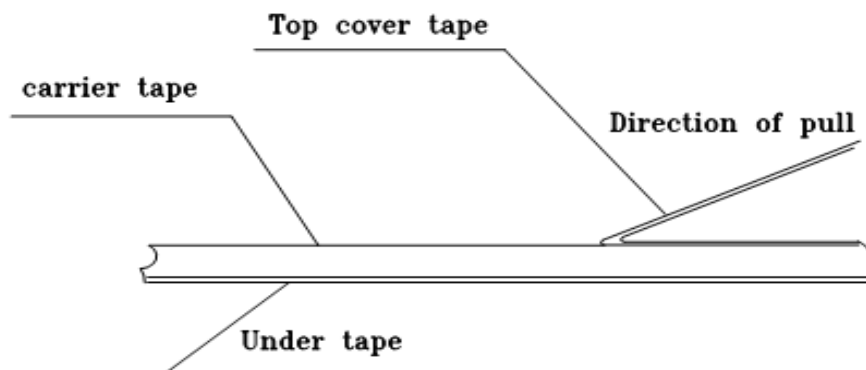
9.3 前后引线尺寸 (Front & Back Lead Dimension)



10. 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 15g~80g

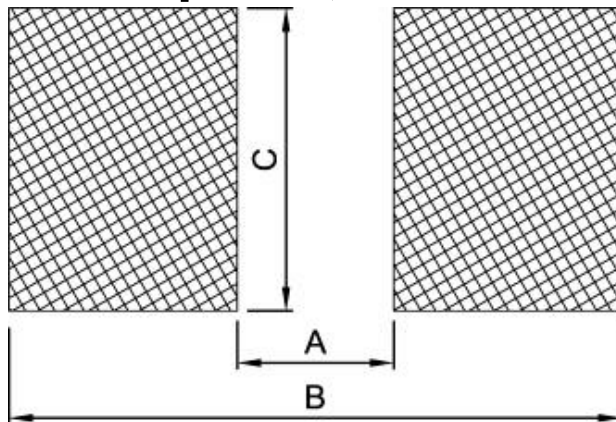
The top cover tape is pulled at a speed of 300 mm/min with the angle between the tape during peel and the direction of unreeling maintained at 165 to 180 degree as following picture. The peel force of paper carrier tape shall be 10 g to 70 g, the peel force of plastic carrier tape shall be 15 g to 80 g



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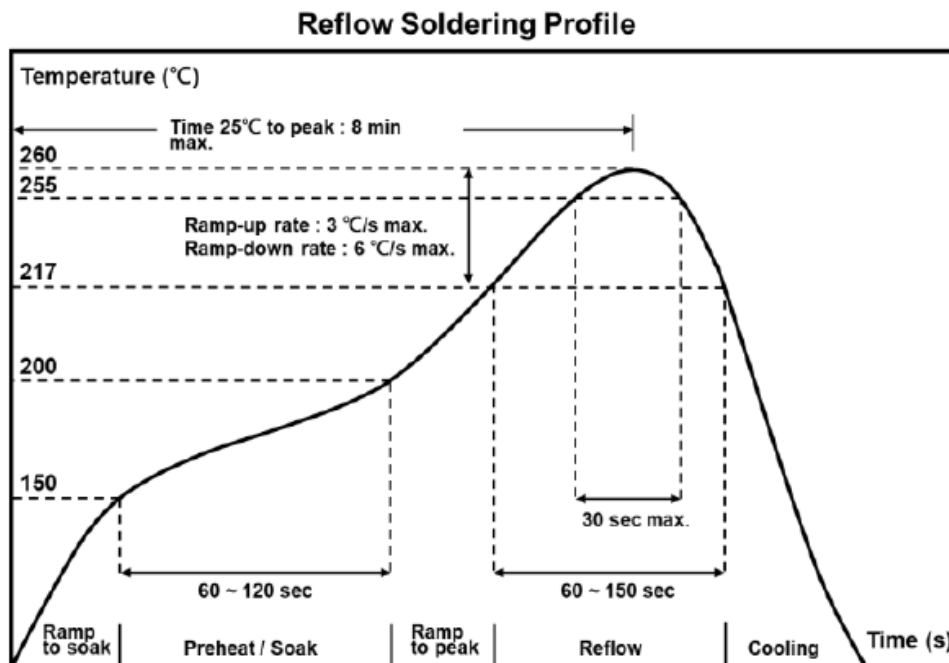
11. 焊盘尺寸 (Recommended land patterns):



Item \ Type	Dimensions (mm)						
	0402	0603	0805	1206	1210	2010	2512
A	0.60	0.80	1.30	2.20	2.00	3.80	4.90
B	1.60	2.40	2.90	4.20	4.40	6.60	8.10
C	0.70	1.00	1.40	1.70	2.70	2.70	3.40

12. 焊接 (soldering)

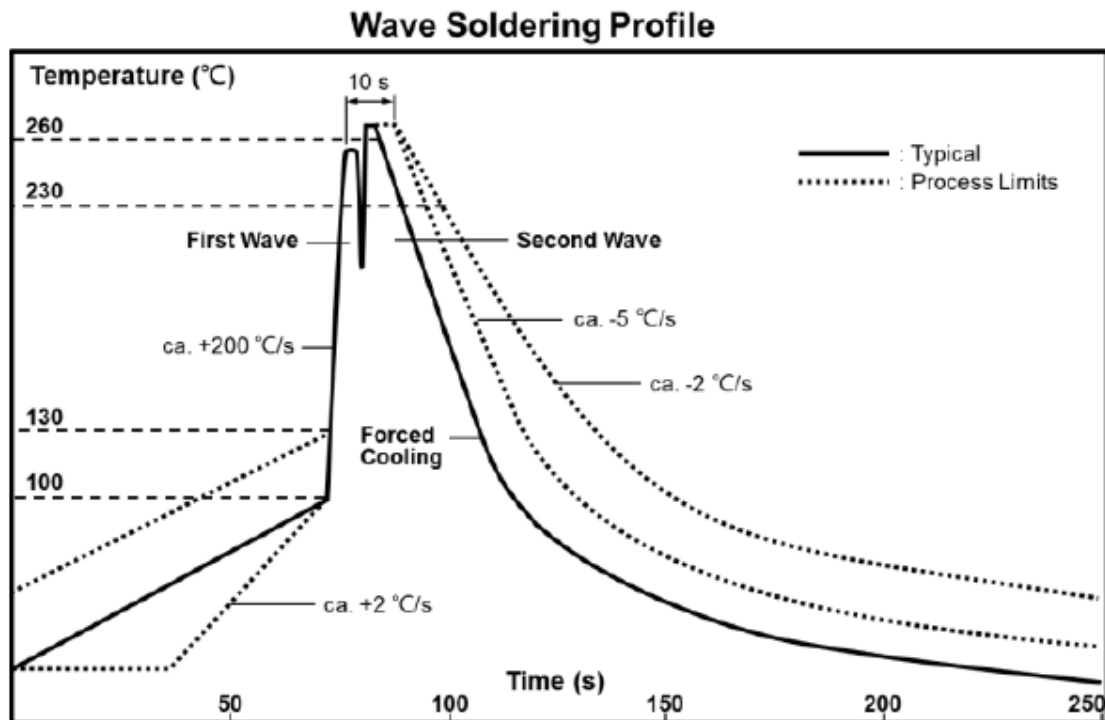
12.1 建议回流焊曲线 (Recommend reflow soldering profile)



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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°C 3~5 秒之內，避免烙鐵接觸電阻本體

The iron temperature is 350°C, hand soldering time less than 3~5S. Avoid solder iron tip direct touch the components body.

产品规格及资料如有更改，恕不另行通知。

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