



富捷科技

Product Datasheet

产品规格说明书

FNL Series (CuNi) Low TCR Lowohmic Thick Film Chip Resistor

低阻低温漂厚膜片式电阻器(CuNi)

安徽省富捷电子科技有限公司

ANHUI FOJAN ELECTRONICS TECHNOLOGY CO., LTD

安徽省马鞍山市郑蒲港新区金蒲电子产业园

JINPU ELECTRONIC INDUSTRIAL PARK, ZHENGPU PORT NEW
DISTRICT, MAANSHAN CITY, ANHUI PROVINCE

zoey@fosan.net.cn www.fosan.vip

低阻值低 TCR 厚膜片式电阻器

Low TCR Lowohmic Thick Film Chip Resistor FNL Series



特点 (Features)

- 电性能稳定, 可靠度高 - Stable electrical capability and high Reliability
- 符合 RoHS 指令无卤素要求 - Compliant with RoHS directive & Halogen free requirement
- 低温漂低阻值 - Low TCR Lowohmic

应用 (Application)

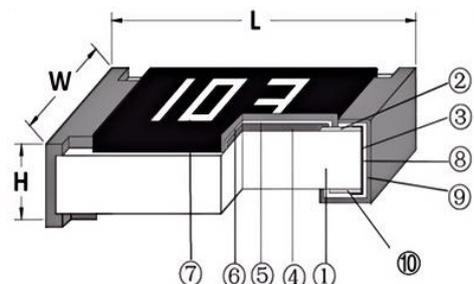
- 广泛应用于转换器、打印机设备、服务器板、电信及消费类电子等领域。
- Widely used in Converters, Printer equipment, Server board, Telecom, consumer electronics etc.

产品料号 (Parts Number Explanation) 示例: FNL1206FR100TS

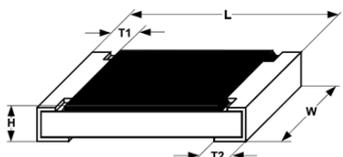
F 公司	NL 产品别	1206 尺寸	F 公差	R100 字码	T 包装别	S 端电极	特殊码
FOJAN	NL: 低阻值低温漂	0402	F:±1%	0402: No-Marking	T: 7 inch reel	S: Sn	Blank:
	Low TCR Lowohmic	0603	G:±2%	0603: 3-digits	Q:10 inch reel	C: Cu	none
	Others series refer to Catalogue	0805	J:±5%	R10=100mR	R:13 inch reel	A: Au	
		1206		R50=500mR	B: Bulk		
		1210		02Z=102mR			
		1812		Others: 4-digits			
		2010		R100=100mR			
		2512		R500=500mR			
Company	Type	Size	Tolerance	Resistance	Packaging	Termination	Special

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	银电极 Conductive layer (Top)	铜 Cu
3	侧电极 Side conductive layer	镍铬合金 NiCr
4	阻体层 Resistive layer	铜镍 CuNi
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	铜电极 Cu plating layer	铜 Cu
10	银电极 Conductive lay (Back)	银 Ag



▪ 尺寸 (Dimension):

尺寸 Dimension						
型别 (Type)		L	W	H	T1	T2
英制	公制					
0402	1005	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
0603	1608	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.25±0.15
0805	2012	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20
1206	3216	3.10±0.10	1.60±0.10	0.55±0.10	0.45±0.20	0.45±0.20
1210	3225	3.10±0.10	2.50±0.15	0.55±0.10	0.45±0.15	0.50±0.20
1218	3245	3.10±0.10	4.60±0.10	0.55±0.10	0.45±0.20	0.40±0.20
1812	4532	4.50±0.20	3.10±0.20	0.55±0.10	0.55±0.20	0.70±0.20
2010	5025	5.00±0.10	2.50±0.15	0.55±0.10	0.45±0.15	0.50±0.20
2512	6432	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.20	0.90±0.20

单位 (unit) : mm

▪ 电气特性 (Electrical characteristics)

型别 Type	70°C 下额定功率 Rated Power at 70°C	最大工作电流 Max Working Current	最大过负荷电流 Max Overload Current	绝缘耐压 Dielectric Withstanding Voltage
0402	1/16W	0.79A	1.97A	300V
0603	1/10W	2.23A	5.59A	300V
0805	1/8W	2.50A	6.25A	500V
1206	1/4W	3.53A	8.83A	500V
1210	1/2W	5.00A	12.50A	500V
1812	3/4W	6.12A	15.30A	500V
2010	3/4W	6.12A	15.30A	500V
2512	1W	7.07A	17.67A	500V

备注 (Remark) : 额定电流计算公式 (The rated current is calculated by the following formula) :

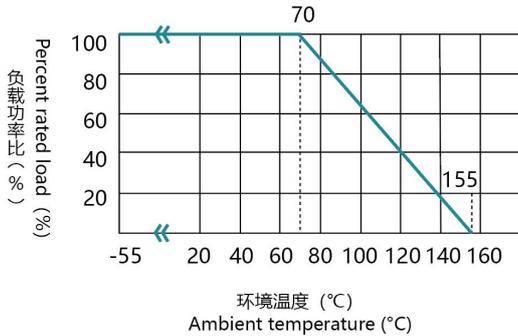
$$I = \sqrt{P/R}$$

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 8, the maximum working voltage shall be regarded as rated voltage.

■ 功率衰减曲线 (Derating Curve)

使用温度范围 Temperature usage range	-55°C~+155°C (其他)
说明 Describe	周围温度若超过 70°C至 155°C之间, 功率可照下图曲线予以修订 If the ambient temperature exceeds 70°C to 155°C,the power can be revised according to the curve in the following figure
功率衰减曲线图 Power Attenuation Curve	 <p>The graph shows the relationship between ambient temperature and the percent of rated power that can be applied. The y-axis is 'Percent rated load (%)' ranging from 0 to 100. The x-axis is 'Ambient temperature (°C)' ranging from -55 to 160. A horizontal line is drawn at 100% load from -55°C to 70°C. From 70°C, the load decreases linearly to 0% at 155°C. Dashed vertical lines indicate the 70°C and 155°C points on the x-axis.</p>

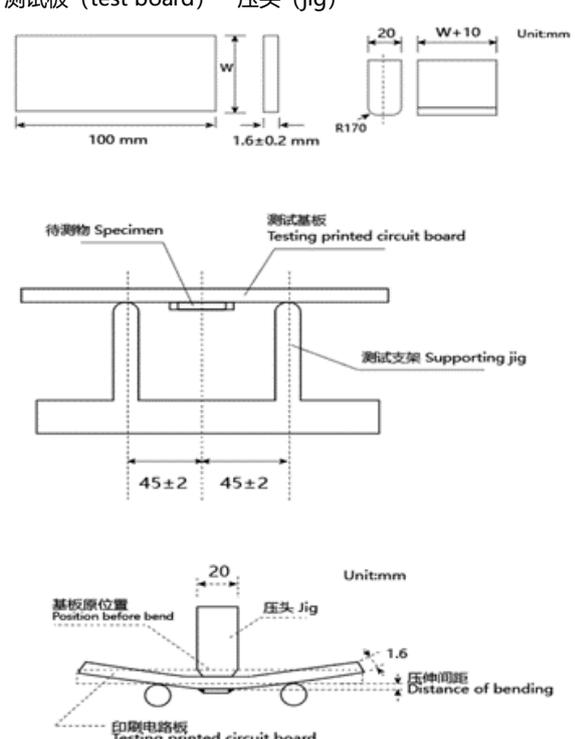
■ 温度系数 (Temperature Coefficient)

型别 Type	阻值范围 Resistance Range	产品精度和温漂系数 (ppm/°C) Resistance Tolerance and TCR (ppm/°C)		
		±1%	±2%	±5%
0402	50mΩ ≤ R < 68mΩ	±600	±600	±600
	68mΩ ≤ R < 100mΩ	±300	±300	±300
	100mΩ ≤ R < 1Ω	±200	±200	±200
0603	50mΩ	±400	±400	±400
	50mΩ ≤ R < 68mΩ	±350	±350	±350
	68mΩ ≤ R < 100mΩ	±300	±300	±300
	100mΩ ≤ R < 1Ω	±200	±200	±200
0805	50mΩ	±350	±350	±350
	50mΩ ≤ R < 68mΩ	±300	±300	±300
	68mΩ ≤ R < 100mΩ	±250	±250	±250
	100mΩ ≤ R < 1Ω	±100	±100	±100
1206	50mΩ ≤ R < 75mΩ	±350	±350	±350
	75mΩ ≤ R < 100mΩ	±100	±100	±100
	100mΩ ≤ R < 1Ω	±75	±75	±75
2010/2512	100mΩ	±100	±100	±100
	100mΩ ≤ R < 1Ω	±75	±75	±75

■ 性能 (Performance)

内容 Item	测试方法 Test Methods	测试条件 Test Conditions	规格 Specification
温度系数 Temperature Coefficient	JIS C 5201 4.8	$TCR = (R - R_0) / (t - t_0) R_0 \times 10^6 \text{ppm}$ R0: 电阻在室温下的阻值 (resistance at room temperature) R: 电阻在 125°C或-55°C下的阻值 (resistance at 125°C or -55°C) t0: 室温 (room temperature) t.测试温度 (test temperature 125°C or -55°C)	As SEPC
短时间过负荷 Short-time overload	JIS C 5201 4.13	加载 2.5 倍的额定电流 5 秒后测量试验前后的阻值变化率。 Applied 2.5 times of rated current for 5 second. Measure the variation of resistance.	1%:±(1.0%+0.05Ω) 5%:±(2.0%+0.05Ω)
焊锡性 Solderability	JIS C 5201 4.17	沾助焊剂后浸入锡炉, 锡炉温度 245±5°C, 时间 3±0.秒。 Dip the terminal in a flux and then dip into a soldering bath at 245±5°C for 3±0.5sec.	> 95%面积上锡 (>95% coverage)
抗焊锡热 Resist to soldering heat	JIS C 5201 4.18	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.	±(1.00% +0.05Ω)
绝缘电阻 Insulation resistance	JIS C 5201 4.6	电阻本体上加载绝缘耐压 60±5 秒后, 测量绝缘阻抗。 Applied the dielectric withstanding voltage on the center of body for 60±5seconds. Then measure insulation resistance.	> 10GΩ
绝缘耐压 Dielectric withstanding voltage	JIS C 5201 4.7	电阻本体上加载绝缘耐压 60±5 秒。 Applied the dielectric withstanding voltage on the center of body for 60±5seconds.	无击穿、飞溅及可见机械性损伤 No evidence of flash over, mechanical damage arcing or insulation breakdown
温湿循环 Moisture resistance	MIL-STD-202 METHOD 106	25°C~65°C,90%~100%RH, 2.5 小时; 65°C 90%~100%RH, 3 小时; 65°C~25°C,80%~100%RH,2.5 小时, 10 个循环, 试验结束 24±4 小时后进行测试。 25°C~65°C,90%~100%RH, 2.5H; 65°C 90%~100%RH, 3H; 65°C~25°C 80%~100%RH, 2.5H, 10 cycles, Measurement at 24±4 hours after test conclusion.	1%:±(1.0%+0.05Ω) 5%:±(2.0%+0.05Ω)
温度快速变化 Rapid temperature changes	JIS C 5201 4.19	电阻放入温度循环机中, T1 温度: -55±3°C; T2 温度: 155±3°C.125±3°C, 放置 30 分钟, 共 300 个循环。量测试验前后阻值变化率。 Put specimen in a chamber which temperature can be T1: -55±3°C; T2: 155±3°C/125±3°C, 30min, repeated 300 cycles. Measure the variation of resistance.	1%:±(1.0%+0.05Ω) 5%:±(2.0%+0.05Ω)

FNL 系列低阻值低温漂厚膜片式电阻器规格书 (CuNi)

内容 Item	测试方法 Test Methods	测试条件 Test Conditions	规格 Specification
耐湿特性 Humidity	JIS C 5201 4.24	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。 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 "ON" and 0.5H "OFF" repeatedly till total test time is $1000^{+48}/_{-0}$ H. Measure the variation of resistance.	1%: $\pm(1.0\%+0.05\Omega)$ 5%: $\pm(2.0\%+0.05\Omega)$
负荷寿命 Load life	JIS C 52014.25.1	电阻放入恒温箱中，温度 $70\pm 2^{\circ}\text{C}$ ，加载 45%额定功率 ON TIME:1.5H, OFF TIME:0.5H, 通电 $1000+24/-0\text{H}$ ，试验结束 24 ± 4 小时后进行测试 Put the specimen in a chamber at $125\pm 2^{\circ}\text{C}$ temperature, Load 45% rated power ON TIME:1.5H, OFF TIME:0.5H, and applied for $1000+24/-0\text{H}$. Measurement at 24 ± 4 hours after test conclusion.	1%: $\pm(1.0\%+0.05\Omega)$ 5%: $\pm(2.0\%+0.05\Omega)$
端子弯曲 Terminal bending	JIS C 5201 4.33	电阻焊接在测试板上进行弯折，弯折保持时间 20 ± 1 秒，1206 (含) 以下的尺寸弯曲 $5+0.2/0$ mm; 1206 以上的尺寸弯曲 $2+0.2/0$ mm; 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 $20\pm 1\text{s}$. the distance of bending is $5+0.2/0$ mm for resistors which size no larger than 1206 or $2+0.2/0$ mm which size larger than 1206. Measure the variation of resistance. 测试板 (test board) 压头 (jig) 	$\pm(1.00\% + 0.05\Omega)$

■ **本体标识** (Marking on the Resistor's Body)

1.0402 因本体太小, 本体上无字码标识

For 0402 size, no marking on the body due to the small size of the resistor

2.0603 规格 (1%&5%) (0603Type) : 3 字码 (3-digits)



R10=100mΩ

3.0805/1206/1210/2010/2512/1812 规格 (1%&5%) : 4 字码

0805/1206/1210/2010/2512/1812type(1%&5%):4-digits



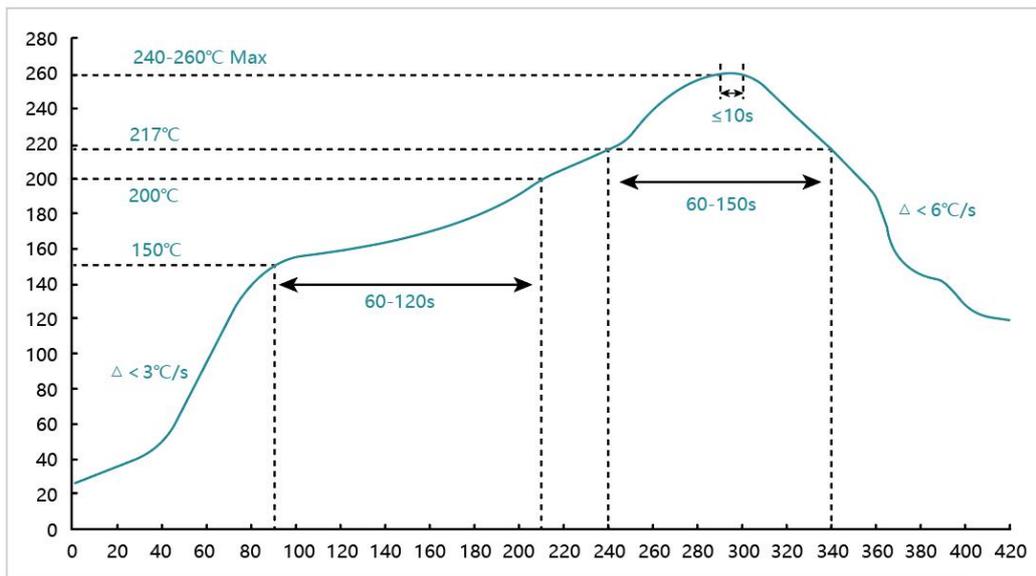
R100=100mΩ



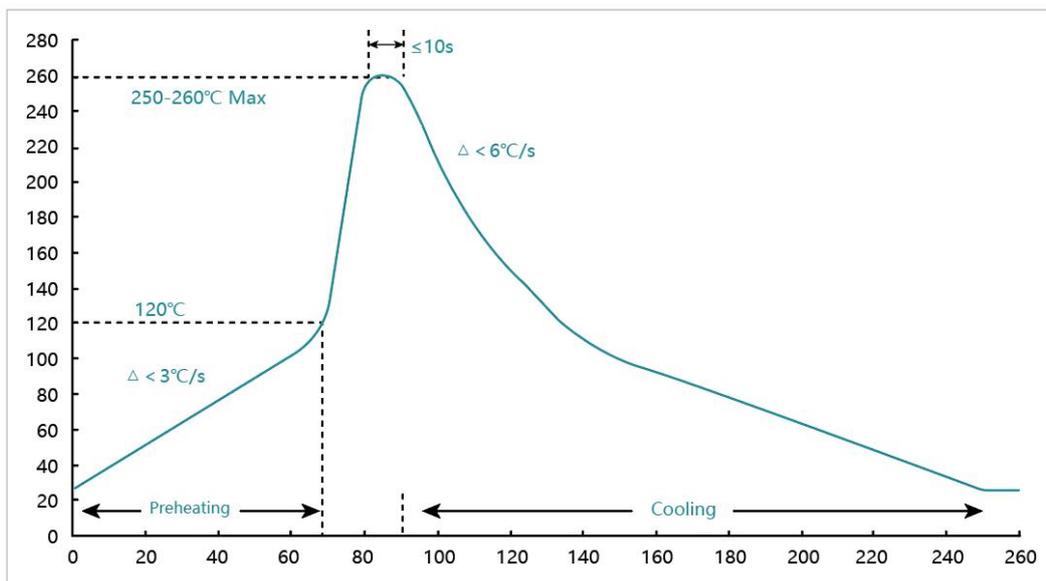
R102=102mΩ

■ 焊接 (soldering)

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



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

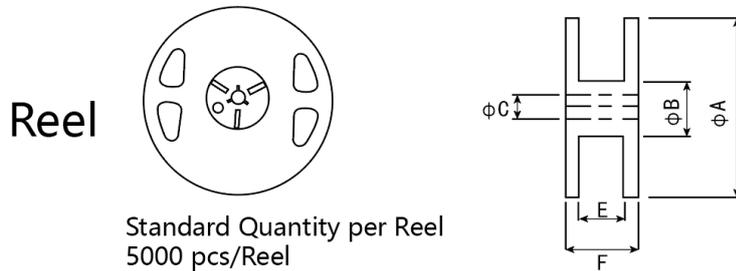


- 手工焊温度 (hand soldering temperature)

烙铁温度 $350 \pm 10^{\circ}\text{C}$ 3 秒之内, 避免烙铁接触电阻本体

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

■ 包装规格 (Tapping Specification)

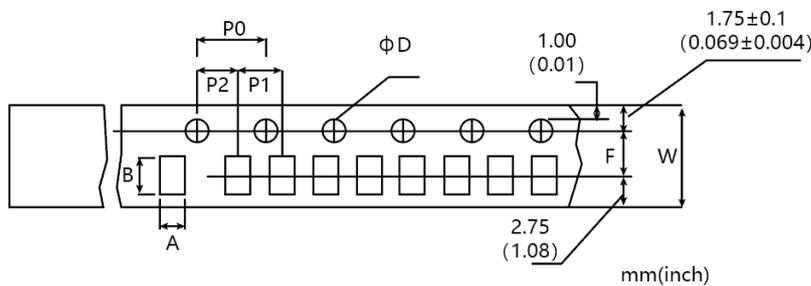


- 卷盘尺寸 (Reel dimension)

Type	Size	Unit	A	B	C	F	W
0402	7"	10K/Reel	178±2.0	60.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
0402	13"	40K/50K Reel	330±2.0	100.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
0603/0805/1206	7"	5K/Reel	178±2.0	60.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
0603/0805/1206	10"	10K/Reel	254±2.0	100.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
0603/0805/1206	13"	20K/Reel	330±2.0	100.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
1218/1812/2010/2512	7"	4K/Reel	178±2.0	60.0±1.0	13.5±0.5	15.4±1.0	13.0±0.3

- 包装尺寸 (packing dimension)

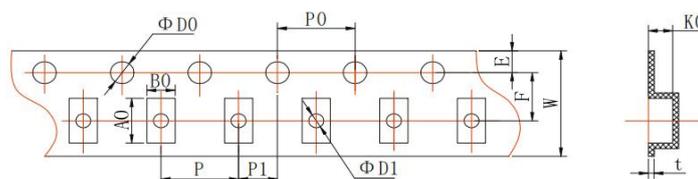
纸带编带 Paper Taping



Unit: mm

Dim	A	B	D	F	P0	P1	P2	W	T
0402	0.65±0.10	1.15±0.10	1.50±0.10	3.50±0.05	4.00±0.10	2.00±0.10	2.00±0.05	8.00±0.20	0.42±0.03
0603	1.10±0.10	1.90±0.10	1.50±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20	0.60±0.03
0805	1.65±0.20	2.40±0.20	1.50±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20	0.75±0.05
1206	1.90±0.20	3.50±0.20	1.50±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20	0.75±0.05
1210	2.80±0.20	3.50±0.20	1.50±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20	0.75±0.05

塑料带编带 Embossed Taping



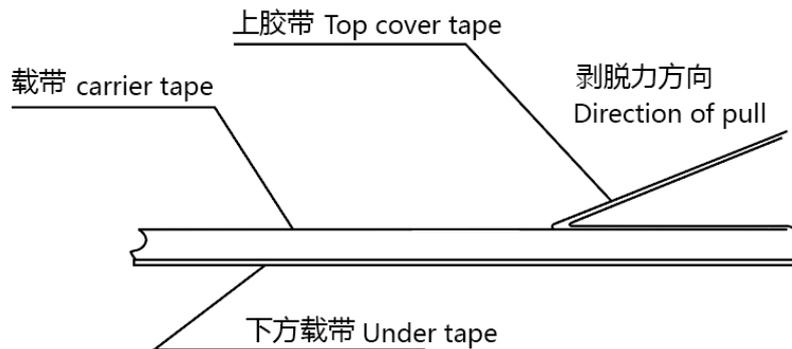
Unit: mm

Dim	B0	A0	D0	F	P0	P	P1	W	K0
1218	2.80±0.20	4.60±0.20	1.50±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10	0.75±0.10
1812	3.52±0.10	5.10±0.10	1.50±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10	0.78±0.10
2010	2.75±0.10	5.40±0.10	1.50±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10	0.75±0.10
2512	3.35±0.10	6.70±0.10	1.50±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10	0.75±0.10

■ 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 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)



■ 厚膜电阻器使用说明 (Chip Resistor Instructions for use)

本产品以下特殊环境下应用，性能可能会受到影响：

(Application of the products in a special environment can deteriorate product performance):

1. 高温；
High temperature
2. 有海风或腐蚀性气体，包括氯气，硫化氢，氨气，二氧化硫，二氧化氮等；
Near the sea ,or corrosive gas, such as Cl₂,H₂S,NH₃,SO₂,and NO₂,etc;
3. 各种类型的液体，包括水，油，化学品，有机溶剂的使用；
Unverified liquids, such as water,oil,chenical or organic solvent;
4. 在用树脂或其他涂层材料密封产品的情况下使用；
Unverified resin or paint to cover products;
5. 焊接后使用不洁焊剂或使用水或水溶性清洁剂清洗产品
Products should be washed with soluble cheaner even if non cleaning flux.

■ 储存 / 搬运条件 (Storage / Carry conditions)

1. 储存温度 25±5°C Temperature: 25±5°C
2. 湿度 30%~70%RH Humidity: 30%~70%RH
3. 储存期限: 先进先出, 2年 Storage life: 2years FIFO
4. 存放和搬运时，请保持盒子的正确方向。严禁跌落在箱体上，否则可能损坏产品电极或本体
Please hold box correct orientation when storing and carrying.It is strictly prohibited to fall on the box.
otherwise the product electrode or body may be damaged.

■ 修订履历 (Revision History)

