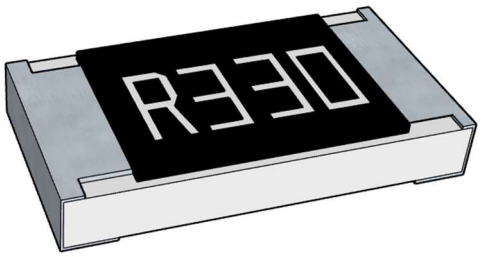
▪ 低阻厚膜晶片电阻（Low Resistance Thick Film Chip Resistor）



▪ 应用（Application）

- Entertainment：Stereo， TV tuners，Tape recorder
- Appliance: Air conditioner, Refrigerator
- Computer & relative products : Main board, PDA
- Communication equipment: Cell phone, Fax machine
- Power equipment: Power supply , II Lumination equipment
- Measuring instrument: Electric meter, Navigation equipment

- 娱乐：立体声，电视调谐器，录音机
- 电器：空调、冰箱
- 电脑及相关产品：主板、掌上电脑
- 通讯设备：手机、传真机
- 电源设备：电源、二级照明设备
- 测量仪器：电表、导航设备

▪ 特点（Features）

- Small size and light weight
- Reliability, high quality
- Low Resistance & Suitable for Large Current Application
- Ultra-low Value

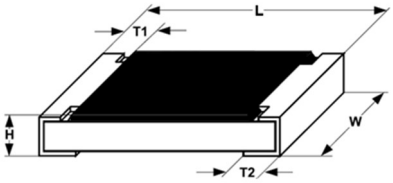
- 体积小，重量轻
- 可靠性，高质量
- 低阻值，适合大电流通过
- 超低阻值

▪料号说明（Parts Number Explanation）：

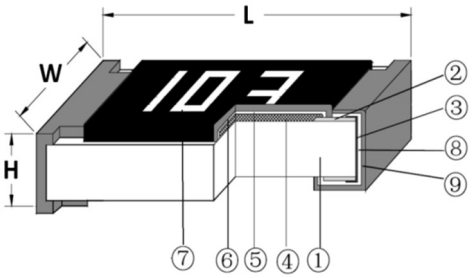
示例 Example: FRL1206JR470TSW

F 公司名	R 产品别	L 功能别	1206 型别	F 公差	R470 字码	T 包装别	S 端电极	W 特殊型
FOJAN	R:Resistor C:Capacitor L:Inductor D:Diode A:Audion	C:Normal P:Hi-Power L:Lowohmic A:Array S:Surge H:Hi-Precision V:Hi-Voltage Q:Auto-motive R:Anti-sulfur M:Metal D: LED	0402 0603 0805 1206 1210 2010 1812 2512	B:±0.1% C:±0.25% D:±0.5% F:±1% J:±5% P：Jumper	±5%:E24 3-digits+blank 102=1KΩ 1R0=1Ω ±1%&Below: E24+E96: 4-digits 1001=1KΩ 1R00=1Ω	T: 7 inch reel Q:10 inch reel R:13 inch reel B:Bulk	S：Sn C：Cu A：Au	A：10ppm E：15ppm X：25ppm V：50ppm W:100PPm
Company code	Type code	Functional code	Size code	Tolerance code	Resistance code	Packaging code	Termination code	Special code

▪尺寸（Dimension）

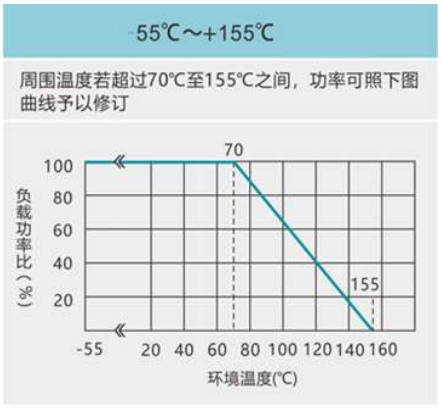
尺寸 dimension	 单位（unit）：mm				
型别（Type）	**L**	**W**	**H**	**T1**	**T2**
0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.25±0.15
0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.35±0.20
1206	3.10±0.10	1.60±0.10	0.55±0.10	0.45±0.20	0.40±0.20
1210	3.10±0.10	2.50±0.15	0.55±0.10	0.45±0.15	0.50±0.20
2010	5.00±0.10	2.50±0.15	0.55±0.10	0.45±0.15	0.50±0.20
1812	4.50±0.20	3.10±0.20	0.55±0.10	0.55±0.20	0.70±0.20
2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.20	0.90±0.20

▪ 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 RuO_2 + 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	锡 Matte Tin

▪ 功率衰减曲线（ Derating Curve）



▪ 阻值范围（Resistance range）

型别 Type	**阻值范围** Resistance Range	
	1%	5%
0402	0R1~1Ω	0R1~1Ω
0603	0R01~1Ω	0R01~1Ω
0805	0R01~1Ω	0R01~1Ω
1206	0R01~1Ω	0R01~1Ω
1210	0R01~1Ω	0R01~1Ω
2010	0R01~1Ω	0R01~1Ω
1812	0R01~1Ω	0R01~1Ω
2512	0R01~1Ω	0R01~1Ω

如有非标准品的需求,请联系我们的业务部门 For non-standard parts, please contact our sales dept.

▪电气特性（Electrical characteristics）

型别 Type	**额定功率** (Power Rating at 70℃)	**绝缘耐压** Dielectric Withstanding Voltage	**额定电流** Rated Current of Jumper	**最大电流** Max Current of Jumper	**T.C.R.** (PPM/℃)	**阻值范围** Resistance Range
0402	1/16W	100V	0.79A	1.97A	0.02Ω~0.06(含): ±1200PPM/℃ 0.06Ω~0.2(含): ±600PPM/℃ 0.2Ω~0.5(含): ±300PPM/℃ >0.5Ω:±200PPM/℃	0R1~1Ω
0603	1/10W	100V	2.23A	5.59A		0R01~1Ω
0805	1/8W	300V	2.5A	6.25A		
1206	1/4W	500V	3.53A	8.83A		
1210	1/2W	500V	5A	12.50A		
1812	3/4W	500V	6.12A	15.30A		
2010	3/4W	500V	6.12A	15.30A		
2512	1W	500V	7.07A	17.67A		

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） (V)

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.

▪ 性能（Performance Specifications）

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 ×10^6 （ppm） R0 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℃) t0 室温(room temperature) t 测试温度（test temperature 125℃ or -55℃）	0.02Ω~0.06(含): ±1200PPM/℃ 0.06Ω~0.2(含): ±600PPM/℃ 0.2Ω~0.5(含): ±300PPM/℃ >0.5Ω: ±200PPM/℃
短时间过负荷 Short-time overload	JIS C 5201 4.13	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.	±(1.00% +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℃，时间 3±0.5 秒。 Dip the terminal in a flux and then dip into a soldering bath at 245±5℃ ，for 3±0.5sec.	＞95%面积上锡 (＞95% coverage)

内容 Item	**测试方法** Test Methods	**测试条件** Test Conditions	**规格** **Specification**
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℃，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.	±(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 for60±5seconds.	无击穿、飞弧及可见机械性损伤 No evidence of flashover, mechanical damage arcing or insulation breakdown
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±1s. 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.	±(1.00% +0.05Ω)

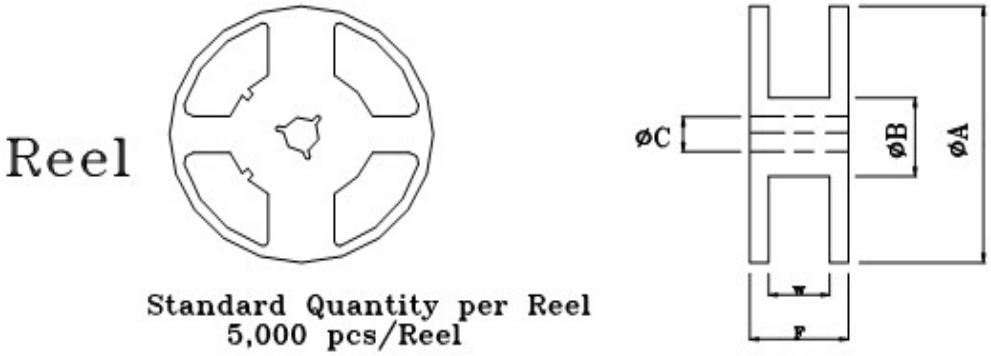
内容 Item	**测试方法** Test Methods	**测试条件** Test Conditions	**规格** **Specification**
温度快速变化 Rapid temperature changes	JIS C 5201 4.19	电阻放入温度循环机中，T1 温度：-55±3℃；T2 温度：155±3℃./125±3℃，放置 30 分钟，共 300 个循环。量测试验前后阻值变化率. Put specimen in a chamber which temperature can be T1： -55±3℃; T2： 155±3℃/125±3℃, 30min, repeated 300 cycles. Measure the variation of resistance.	±(1.00% +0.05Ω)
耐湿特性 Humidity	JIS C 5201 4.24	电阻放入恒温恒湿箱，温度 40±2℃，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±2℃ temperature and 90~95% relative humidity, then applied rated voltage for1.5H and rested for 0.5H repeatedly till total test time is 1000$^{+48}/_{-0}$ H. Measure the variation of resistance.	±(2.00% +0.05Ω)
负荷寿命 Load life	JIS C 5201 4.25.1	电阻放入恒温箱中，温度 70±2℃，ON TIME:1.5H，OFF TIME:0.5H，通电额定电压 1000 $^{+24}/_{-0}$ 小时，量测试验前后阻值变化率. Put the specimen in a chamber at 70±2℃ temperature, ON TIME:1.5H，OFF TIME:0.5H， and applied rated voltage for 1000 $^{+24}/_{-0}$H. Measure the variation of resistance.	±(2.00% +0.05Ω)

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.	±(2.00% +0.05Ω)

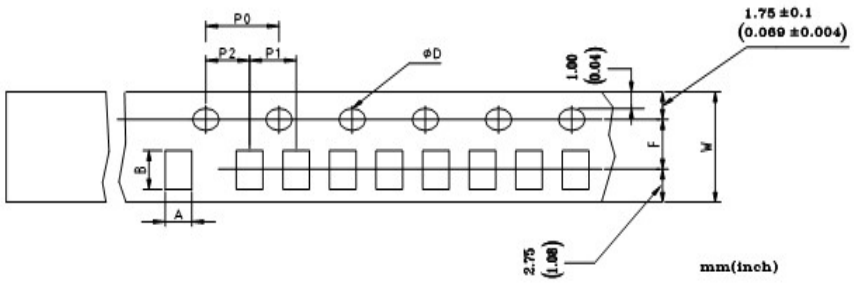
▪ 包装规格（Tapping Specification）

-卷盘尺寸（Reel dimension）

Type	Size		Unit	A	B	C	F	W
0402	7”	10K/Reel	mm	178±2.0	60.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
0402	13”	40K/50K Reel	mm	330±2.0	100.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
0603 0805 1206 1210	7”	5K/Reel	mm	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	mm	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	mm	330±2.0	100.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
1812 2010 2512	7”	4K/Reel	mm	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）



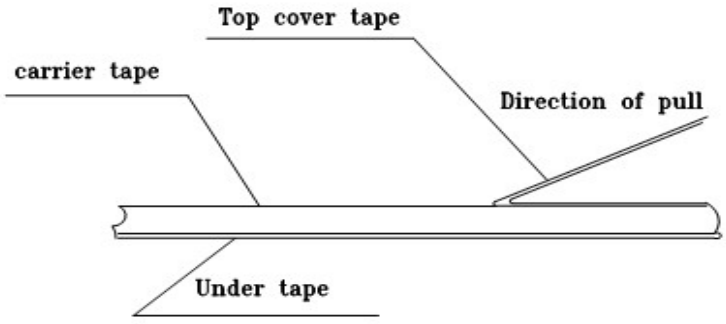
Unit: mm

Dimensions	A	B	D	F	P0	P1	P2	W
0402	0.65±0.10	1.15±0.10	$1.50\pm^{0.1}_{0.0}$	3.50±0.05	4.00±0.10	2.00±0.10	2.00±0.05	8.00±0.20
0603	1.10±0.10	1.90±0.10	$1.50\pm^{0.1}_{0.0}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
0805	1.65±0.20	2.40±0.20	$1.50\pm^{0.1}_{0.0}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
1206	1.90±0.20	3.50±0.20	$1.50\pm^{0.1}_{0.0}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
1210	2.80±0.20	3.50±0.20	$1.50\pm^{0.1}_{0.0}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
1812	3.30±0.20	4.60±0.20	$1.50\pm^{0.1}_{0.0}$	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10
2010	2.90±0.10	5.30±0.10	$1.50\pm^{0.1}_{0.0}$	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10
2512	3.40±0.10	6.60±0.10	$1.50\pm^{0.1}_{0.0}$	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10

▪ 上胶带剥离力测试（Peel force of top cover tape）

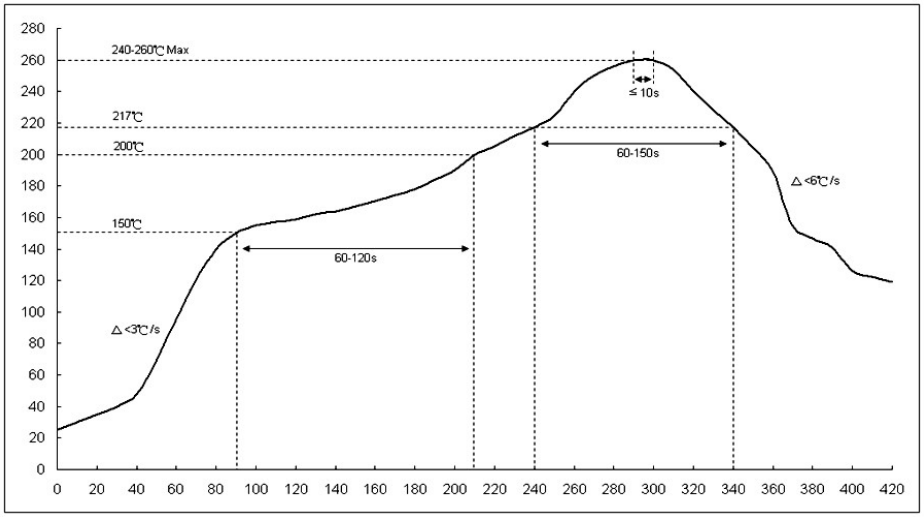
上胶带以 200mm/分钟的速度，沿 165～180 度角的方向进行剥离，如下图所示。纸带的剥离力范围为 10g～70g; 载带的剥离力范围为 30～100g。

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)

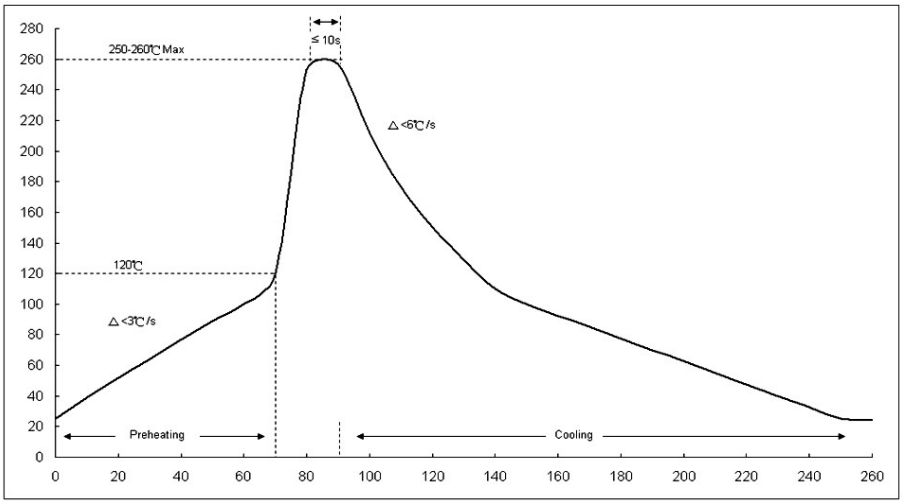


▪ 焊接 （soldering）

- 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）

烙鐵温度 350±10℃ 3 秒之內，避免烙铁接触电阻本体

The iron temperature is 350±10℃, hand soldering time less than 3S. Avoid solder iron tip direct touch the components body

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

- 本产品在以下特殊环境下应用，性能可能会收到影响（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 Cl_2,H_2S,NH_3,SO_2,and NO_2,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）

6. 储存温度 25±5℃ Temperature：25±5℃
7. 湿度 30~70%RH Humidity：30~70%RH
8. 储存期限：先进先出，2 年 Storage life：2years FIFO
9. 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.