



富捷科技

Product Datasheet

产品规格说明书

FQL Series

Automotive Low Resistance Thick Film Chip Resistor

车规低阻宽电极厚膜片式电阻

安徽省富捷电子科技有限公司

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车规低阻宽电极厚膜片式电阻器

Automotive Low Resistance Thick Film Chip Resistor

FQL Series

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



Standard Type

Wide Standard Type

■ 特点 (Features)

- 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
- 无卤, 无铅
- 符合 RoHS
- 符合 AEC-Q200
- Small size and light weight
- Reliability, high quality
- Low Resistance & Suitable for Large Current Application
- Ultra-low Value
- Halogen free and lead free
- RoHS compliant
- AEC-Q200 compliant

■ 应用 (Application)

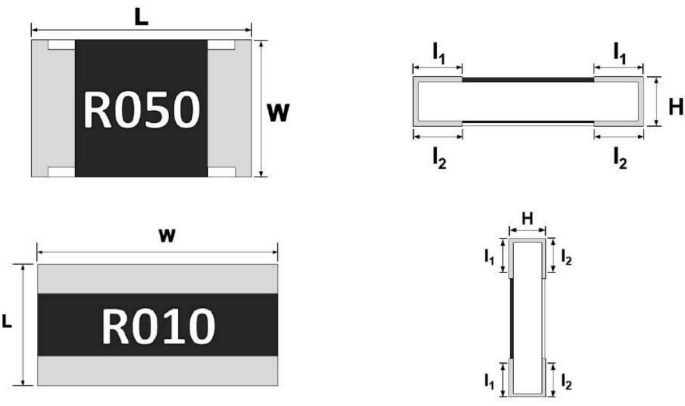
- 娱乐: 立体声, 电视调谐器, 录音机
- 电器: 空调、冰箱
- 电脑及相关产品: 主板、掌上电脑
- 通讯设备: 手机、传真机
- 电源设备: 电源、二级照明设备
- 测量仪器: 电表、导航设备
- Entertainment: Stereo, TV tuners, Tape recorder
- Appliance: Air conditioner, Refrigerator
- Computer & relative products : Main board, PDA
- Communication equipment: Cell phone, Fax machine
- Power equipment: Power supply , II Lumination equipment
- Measuring instrument: Electric meter, Navigation equipment

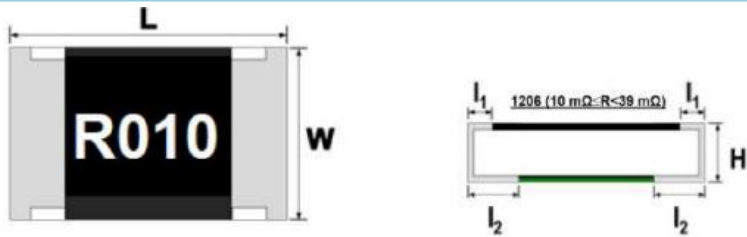
■ 产品料号 (Parts Number Explanation)

示例(Example): FQL1205JR470TSR

F 公司	Q 产品别	L 功能别	12 尺寸	05 功率	F 公差	R470 字码	T 包装别	S 端电极	R 特殊
FOJAN	R:Resistor	C:Normal	06:0603	Y5:0.05W	B:±0.1%	±5%:E24	T: 7 inch reel	S: Sn	R:TRL
	C:Capacitor	P:Hi-Power	08:0805	Y6:0.063W	C:±0.25 %	3-digits+blank	Q:10 inch reel	C: Cu	
	L: Inductor	L: Lowohmic	12:1206	01:0.10W	D:±0.5%	102=1KΩ	R:13 inch reel	A: Au	
	D:Diode	A:Array	10:1210	02:0.20W	F:±1%	1R0=1Ω	B:Bulk		
	A:Audion	S:Surge	20:2010	X2:0.25W	J:±5%	±1%&Below:			
	Q:Automotive	H:Hi-Precision	25:2512	04:0.4W		E24+E96:			
		V:Hi-Voltage	39:3920	05:1/2W		4-digits			
		Q:Auto-motive	07:0508	07:3/4W		1001=1KΩ			
		R:Anti-sulfur	09:0612	1W:1W		1R00=1Ω			
		M:Metal	11:1012	15:1.5W					
		D: LED	13:1020	2W:2W					
			14:1225	3W:3W					
				5W:5W					
Company	Type	Functional	Size	Power	Tolerance	Resistance	Packaging	Termination	Special

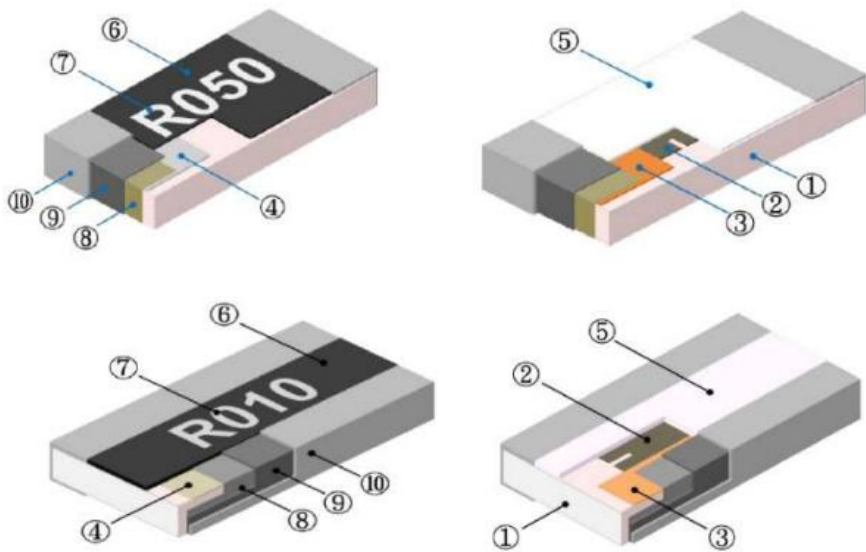
■ 尺寸(Dimension):

尺寸 dimension						单位 (unit) : mm
	型别 (Type)	L	W	H	I1	I2
	0201	0.60±0.03	0.30±0.03	0.26±0.05	0.15±0.05	0.15±0.05
	0402	1.00±0.10	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	0.30±0.15
	0805	2.00±0.10	1.25±0.10	0.55±0.10	0.35±0.20	0.40±0.20
	1206	3.10±0.10	1.60±0.10	0.55±0.10	0.40±0.20	0.45±0.20
	1210	3.10±0.10	2.50±0.15	0.55±0.10	0.50±0.20	0.50±0.20
	2010	5.00±0.20	2.50±0.15	0.55±0.10	0.60±0.25	0.60±0.25
	2512	6.35±0.20	3.20±0.20	0.55±0.10	0.65±0.25	0.65±0.25
	2512(3W)	6.35±0.20	3.20±0.20	0.70±0.15	0.65±0.25	0.65±0.25
	0508	1.25±0.10	2.00±0.10	0.55±0.15	0.25±0.15	0.35±0.15
	0612	1.60±0.15	3.20±0.20	0.55±0.15	0.30±0.20	0.50±0.20
	1020	2.50±0.15	5.00±0.15	0.55±0.15	0.40±0.20	0.50±0.20
	1225	3.20±0.20	6.30±0.20	0.55±0.15	0.60±0.25	0.80±0.25

尺寸 dimension						单位 (unit) : mm
	型别 (Type)	L	W	H	I1	I2
	1206 (10mΩ≤R<39 mΩ)	3.30±0.20	1.70±0.20	0.65±0.20	0.20±0.15	0.68±0.20

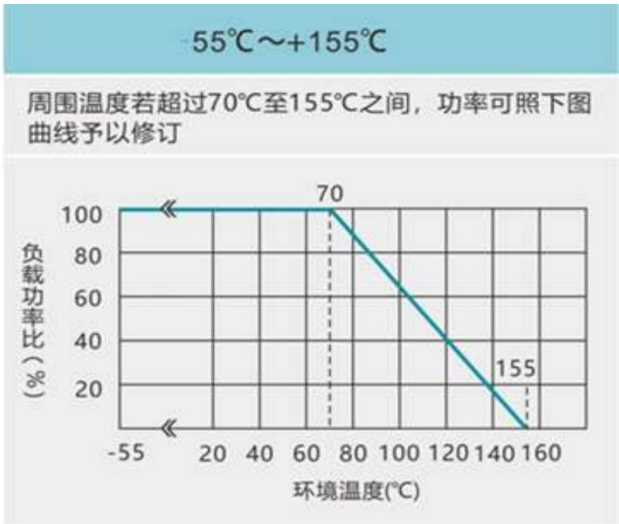


电阻结构 (Construction)



NO.	结构 construction	NO.	结构 construction
1	陶瓷基板 Ceramic substrate	6	保护层 Top Protective layer
2	阻体层 Resistive layer	7	文字 Marking
3	正面 Cu 电极 Bottom Inner Electrode (Cu)	8	侧电极 Side Inner Electrode
4	正面电极 Top Inner Electrode	9	镍电极 Ni plating layer
5	保护层 Bottom Protective Overcoat White ($\geq 39\text{m}\Omega$) Green ($< 39\text{m}\Omega$)	10	锡电极 Sn plating layer

功率衰减曲线 (Derating Curve)



■ 电气特性 (Electrical characteristics)

型号 Type	额定功率 (Power Rating at 70°C)	额定电流 Max Rated Current	最大电流 Max Overload Current	T.C.R. (PPM/ °C)	阻值范围 Resistance Range	
					C(0.25%)	D(0.5%),F(1%),G(2%),J(5%)
0201	1/20W	1.00A	2.50A	±100	-	50mΩ≤R<100mΩ
				±50	-	100mΩ≤R≤10Ω
	1/10W	1.41A	3.16A	±100	-	50mΩ≤R<100mΩ
				±50	-	100mΩ≤R≤10Ω
	1/5W	2.00A	4.47A	±100	-	50mΩ≤R<100mΩ
				±50	-	100mΩ≤R≤10Ω
0402	1/16W	1.12A	2.80A	±100	-	50mΩ≤R<100mΩ
				±50	-	100mΩ≤R≤10Ω
	1/8W	1.58A	3.54A	±100	-	50mΩ≤R<100mΩ
				±50	-	100mΩ≤R≤10Ω
	1/4W	2.24A	5.00A	±100	-	50mΩ≤R<100mΩ
				±50	-	100mΩ≤R≤10Ω
0603	1/10W	1.41A	3.54A	±100	-	50mΩ≤R<100mΩ
				±50	-	100mΩ≤R≤10Ω
	1/5W	2.00A	4.47A	±100	-	50mΩ≤R<100mΩ
				±50	-	100mΩ≤R≤10Ω
	2/5W	2.83A	6.32A	±100	-	50mΩ≤R<100mΩ
				±50	-	100mΩ≤R≤10Ω
0805	1/8W	1.79A	4.48A	±150	-	39mΩ≤R<50mΩ
				±100	-	50mΩ≤R≤100mΩ
				±50	-	100mΩ≤R≤10Ω
	1/4W	2.53A	5.66A	±150	-	39mΩ≤R<50mΩ
				±100	-	50mΩ≤R≤100mΩ
				±50	-	100mΩ≤R≤10Ω
	1/2W	3.58A	8.00A	±150	-	39mΩ≤R<50mΩ
				±100	-	50mΩ≤R≤100mΩ
				±50	-	100mΩ≤R≤10Ω
				±100	-	50mΩ≤R≤100mΩ
1206	1/4W	2.53A	6.33A	±150	-	39mΩ≤R<50mΩ
				±100	-	50mΩ≤R≤100mΩ
				±50	470mΩ≤R≤10Ω	100mΩ≤R≤10Ω
	1/2W	3.58A	8.00A	±150	-	39mΩ≤R<50mΩ
				±100	-	50mΩ≤R≤100mΩ
				±50	470mΩ≤R≤10Ω	100mΩ≤R≤10Ω
	3/4W	4.39A	9.81A	±150	-	39mΩ≤R<50mΩ
				±100	-	50mΩ≤R≤100mΩ

	1W	5.06A	11.32A	±50	470m Ω≤R≤10Ω	100m Ω≤R≤10Ω
				±150	-	39m Ω≤R<50m Ω
				±100	-	50m Ω≤R≤100m Ω
				±50	470m Ω≤R≤10Ω	100m Ω≤R≤10Ω
1210	1/2W	3.58A	8.95A	±150	-	39m Ω≤R<50m Ω
				±100	-	50m Ω≤R≤100m Ω
				±50	470m Ω≤R≤10Ω	100m Ω≤R≤10Ω
	1W	5.06A	11.32A	±150	-	39m Ω≤R<50m Ω
				±100	-	50m Ω≤R≤100m Ω
				±50	470m Ω≤R≤10Ω	100m Ω≤R≤10Ω
2010	3/4W	2.74A	6.85A	±50	470m Ω≤R≤10Ω	100m Ω≤R≤10Ω
	1.5W	3.87A	8.66A	±50	470m Ω≤R≤10Ω	100m Ω≤R≤10Ω
2512	1W	3.16A	7.91A	±50	470m Ω≤R≤10Ω	100m Ω≤R≤10Ω
	2W	4.47A	10.00A	±50	470m Ω≤R≤10Ω	100m Ω≤R≤10Ω
	3W	5.48A	12.25A	±50	470m Ω≤R≤10Ω	100m Ω≤R≤10Ω

型别 Type	额定功率 (Power Rating at 70°C)	额定电流 Max Rated Current	最大电流 Max Overload Current	T.C.R. (PPM/°C)	阻值范围 Resistance Range	
					F(1%),G(2%),J(5%)	
1206	1/4W	5.00A	12.50A	±200	10m Ω≤R<39m Ω	
	1/2W	7.07A	15.81A	±200	10m Ω≤R<39m Ω	

Wide Terminal Type

型别 Type	额定功率 (Power Rating at 70°C)	额定电流 Max Rated Current	最大电流 Max Overload Current	T.C.R. (PPM/°C)	阻值范围 Resistance Range	
					D(0.5%)	F(1%),G(2%),J(5%)
0508	1W	10.00A	22.36A	±100	100m Ω≤R≤2Ω	10m Ω≤R≤2Ω
0612	1W	10.00A	22.36A	±100	100m Ω≤R≤2Ω	10m Ω≤R≤2Ω
1020	2W	14.14A	31.62A	±100	100m Ω≤R≤2Ω	10m Ω≤R≤2Ω
1225	3W	17.32A	38.73A	±100	100m Ω≤R≤2Ω	10m Ω≤R≤2Ω

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	$TCR = (R - R_0) / (t - t_0) R_0 \times 10^6 \text{ (ppm)}$ R_0 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) t_0 室温(room temperature) t 测试温度 (test temperature 125°C or -55°C)	As Spec
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.	$\pm(1.00\% + 0.05\Omega)$
焊锡性 Solderability	JIS C 5201 4.17	沾助焊剂后浸入锡炉, 锡炉温度 $245 \pm 5^\circ\text{C}$, 时间 3 ± 0.5 秒。 Dip the terminal in a flux and then dip into a soldering bath at $245 \pm 5^\circ\text{C}$, for $3 \pm 0.5\text{sec}$.	$> 95\%$ 面积上锡 $(> 95\% \text{ coverage})$
抗焊锡热 Resist to soldering heat	MIL-STD-202 METHOD 210	沾助焊剂后浸入锡炉, 锡炉温度 $260 \pm 5^\circ\text{C}$, 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 $260 \pm 5^\circ\text{C}$ for $10 \pm 0.5\text{sec}$. Measure the variation of resistance.	$\pm(1.00\% + 0.05\Omega)$
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 $60 \pm 5\text{seconds}$. Then measure insulation resistance.	$> 10\text{G}\Omega$

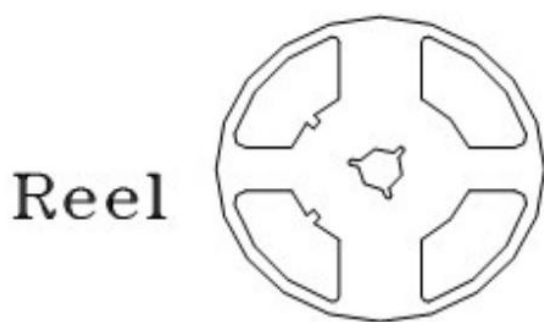
内容 Item	测试方法 Test Methods	测试条件 Test Conditions	规格 Specification
绝缘耐压 Dielectric withstanding voltage	JIS C 5201 4.7	电阻本体上加载绝缘耐压 60±5 秒。 Applied the dielectric withstanding voltage on the center of body for 60±5 seconds.	无击穿、飞弧及可见机械性损伤 No evidence of flashover, mechanical damage arcing or insulation breakdown
耐湿特性 Biased Humidity	MIL-STD-202 METHOD 103	加载 10%额定功率, 85°C/85%RH, 持续通电 1000H, 试验结束 24±4 小时后进行测试 1000 hours 85°C/85%RH. Note: Specified conditions: 10% of operating power. Measurement at 24±4 hours after test conclusion.	±(2.00% +0.05Ω)
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)
湿度寿命 Damp Heat with Load	JIS C 5201 4.24	电阻放入恒温恒湿箱, 温度 40±2°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±2°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 H. Measure the variation of resistance.	±(2.00% +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: $-55 \pm 3^{\circ}\text{C}$; T2 温度: $155 \pm 3^{\circ}\text{C}/125 \pm 3^{\circ}\text{C}$, 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: $-55 \pm 3^{\circ}\text{C}$; T2: $155 \pm 3^{\circ}\text{C}/125 \pm 3^{\circ}\text{C}$, 30min, repeated 300 cycles. Measure the variation of resistance.	$\pm(1.00\% + 0.05\Omega)$
负荷寿命 Load life	JIS C 5201 4.25.1	电阻放入恒温箱中, 温度 $70 \pm 2^{\circ}\text{C}$, 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 $70 \pm 2^{\circ}\text{C}$ temperature, ON TIME:1.5H, OFF TIME:0.5H, and applied rated voltage for $1000^{+24/-0}\text{H}$. Measure the variation of resistance.	$\pm(2.00\% + 0.05\Omega)$
温湿循环 Moisture resistance	MIL-STD-202 METHOD 106	$25^{\circ}\text{C} \sim 65^{\circ}\text{C}, 90 \sim 100\% \text{RH}, 2.5$ 小时; $65^{\circ}\text{C} \sim 90 \sim 100\% \text{RH}, 3$ 小时; $65^{\circ}\text{C} \sim 25^{\circ}\text{C}, 80 \sim 100\% \text{RH}, 2.5$ 小时, 10 个循环, 试验结束 24 ± 4 小时后进行测试。 $25^{\circ}\text{C} \sim 65^{\circ}\text{C}, 90 \sim 100\% \text{RH}, 2.5\text{H}$; $65^{\circ}\text{C} \sim 90 \sim 100\% \text{RH}, 3\text{H}$; $65^{\circ}\text{C} \sim 25^{\circ}\text{C} \sim 80 \sim 100\% \text{RH}, 2.5\text{H}, 10$ cycles, Measurement at 24 ± 4 hours after test conclusion.	$\pm(2.00\% + 0.05\Omega)$

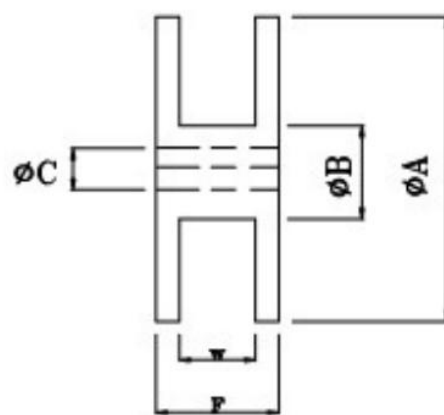
·包装规格 (Tapping Specification)

-卷盘尺寸 (Reel dimension)

Type	Size		Unit	A	B	C	F	W
0201 0402	7"	10K/Reel	mm	178±2.0	60.0±1.0	13.5±0.5	11.5±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	11.5±0.1	9.00±0.3
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
0508 0612	7"	5K/Reel	mm	178±2.0	60.0±1.0	13.5±0.5	11.5±0.1	9.00±0.3
1020 1225	7"	4K/Reel	mm	178±2.0	60.0±1.0	13.5±0.5	15.4±1.0	13.0±0.3

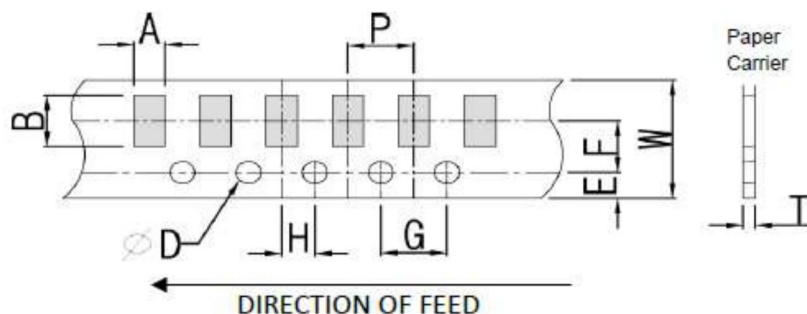


Standard Quantity per Reel
5,000 pcs/Reel



-包装尺寸 (packing dimension)

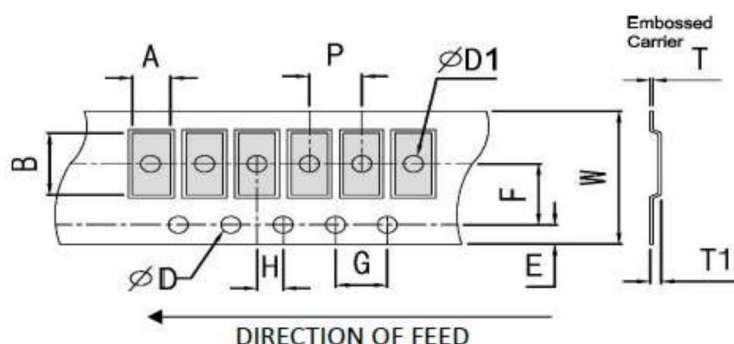
-Tapping Specifications



Unit: mm

Packaging	Type	A	B	W	E	F	G	H	T	ΦD	P
Paper Type	0201	0.45±0.1	0.75±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	0.35±0.1	1.50 ^{+0.1} ₋₀	2.0±0.1
	0402	0.7±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		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	3.05±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	3.05±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
	0508	1.50±0.15	2.25±0.15	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
	0612	2.85±0.2	3.05±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

-Embossed Dimensions:



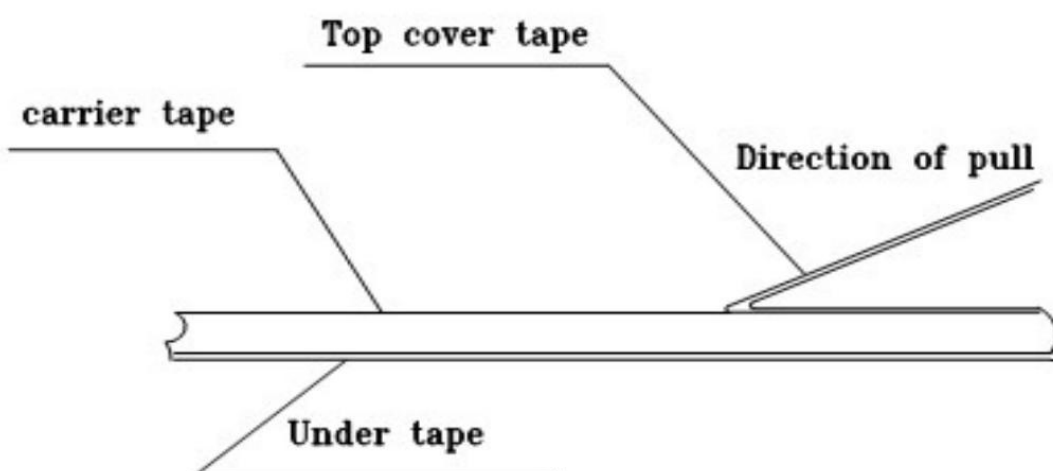
Unit: mm

Packaging	Type	A	B	W	E	F	G	H	T	ΦD	$\Phi D1$	T1	P
Embossed Type	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	1.50±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		1.50±0.1	0.85±0.15	4.0±0.1
	1020	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	0.85±0.15	4.0±0.1
	1225	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		1.50±0.1	0.85±0.15	4.0±0.1

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

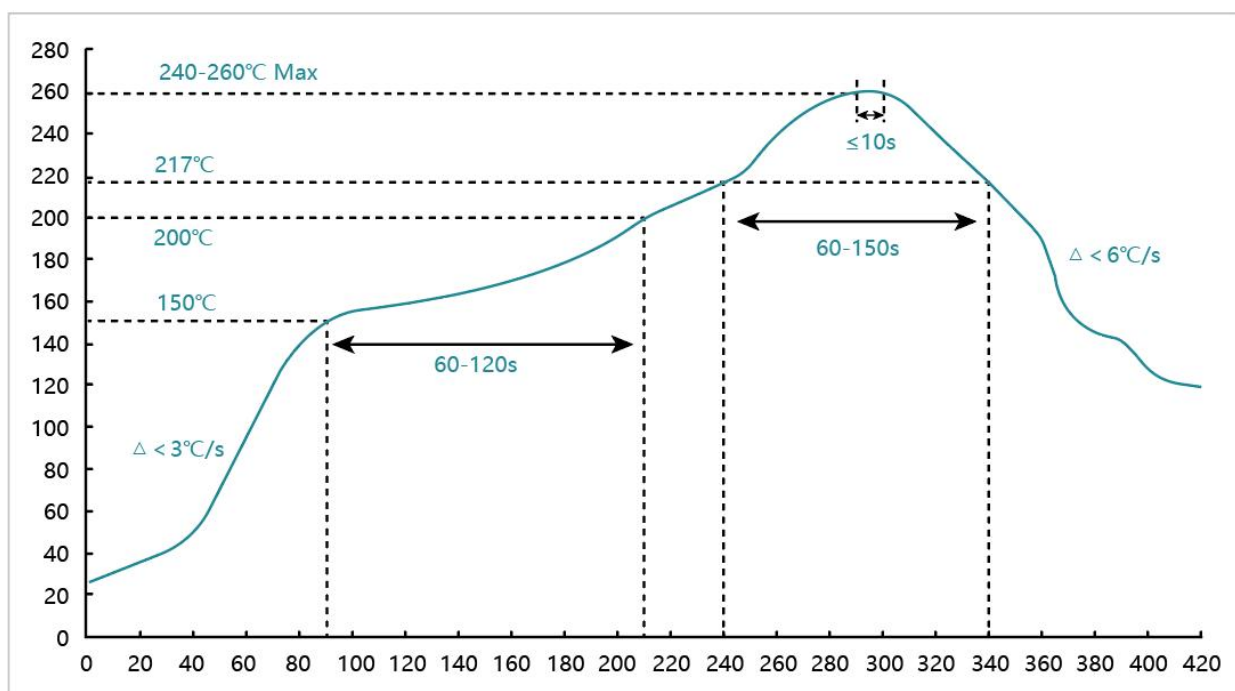
上胶带以 200mm/分钟的速度, 沿 165~180 度角的方向进行剥离, 如下图所示。纸带的剥离力范围为 10g~70g; 载带的剥离力范围为 30~100g。

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)

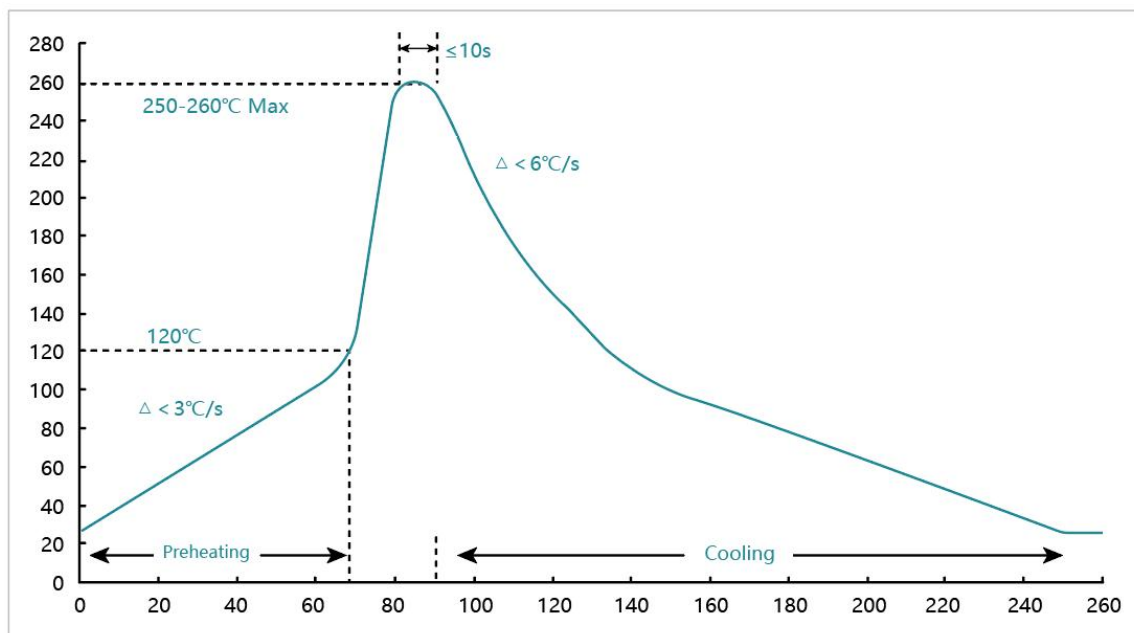


■ 焊接 (soldering)

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



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



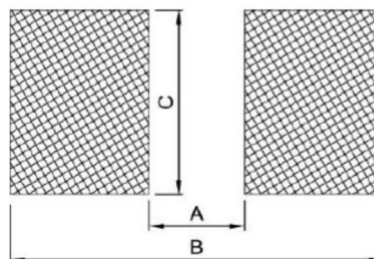
- 手工焊温度 (hand soldering temperature)

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

推荐的焊盘尺寸 (Recommend Land Pattern Design)

单位：mm



Type	A	B	C
0201	0.25	0.85	0.35
0402	0.50	1.60	0.70
0603	0.80	2.40	1.00
0805	1.30	2.90	1.45
1206	2.20	4.20	1.80
1206 ($10\text{m}\Omega \leq R < 39\text{m}\Omega$)	1.20	4.80	1.84
1210	2.00	4.40	2.70
2010	3.80	6.60	2.70
2512	4.90	8.10	3.40
0508	0.40	1.80	2.00
0612	0.50	2.60	3.20
1020	1.00	4.05	5.50
1225	1.20	5.20	7.00

[illegible]