

■ 车用厚膜晶片电阻 Automotive Thick Chip Resistor



■ 应用 (Application)

- Automotive electronics
- Navigation equipment TPMS
- Heating, Ventilating and Air conditioning
- Indoor lighting, Central door locking, Wiper module
- 汽车电子
- 导航设备、胎压监测
- 暖气系统、通风系统、空调
- 室内照明、中央门锁、雨刮器模块

■ 特性 (Features)

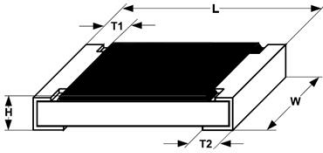
- Small size and lightweight
- Reliability, high quality
- CCD visual quality inspection
- Comply with AEC-Q200 standard
- 体积小、重量轻
- 可靠性、高质量
- 通过 CCD 外观品质检测
- 符合 AEC-Q200 标准

■ 料号说明 (Parts Number Explanation)

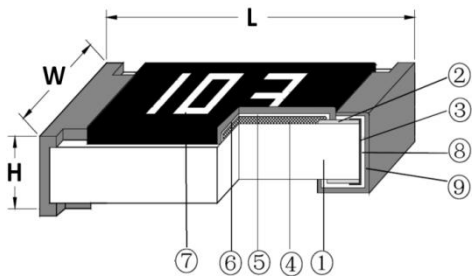
示例: Example: FRQ0805J102TS

<u>F</u> 公司名	<u>R</u> 产品别	<u>Q</u> 功能别	<u>0805</u> 型别	<u>J</u> 公差	<u>102</u> 字码	<u>I</u> 包装别	<u>S</u> 端电极	特殊型
FOJAN	R:Resistor	Q:Auto-motive	0201	B:±0.1%	±5%:E24	T: 7 inch reel	S: Sn	N: Normal
			0402	C:±0.25%	3-digits+blank	Q:10 inch reel	C: Cu	
			0603	D:±0.5%	102=1KΩ	R:13 inch reel	A: Au	
			0805	F:±1%	1R0=1Ω	B:Bulk		
			1206	J:±5%				
			1210	P: Jumper	±1%&Below:			
			2010		E24+E96:			
			1812		4-digits			
			2512		1001=1KΩ 1R00=1Ω			
Company code	Type code	Functional code	Size code	Tolerance code	Resistance code	Packaging code	Termination code	Special code

尺寸 (Dimension)

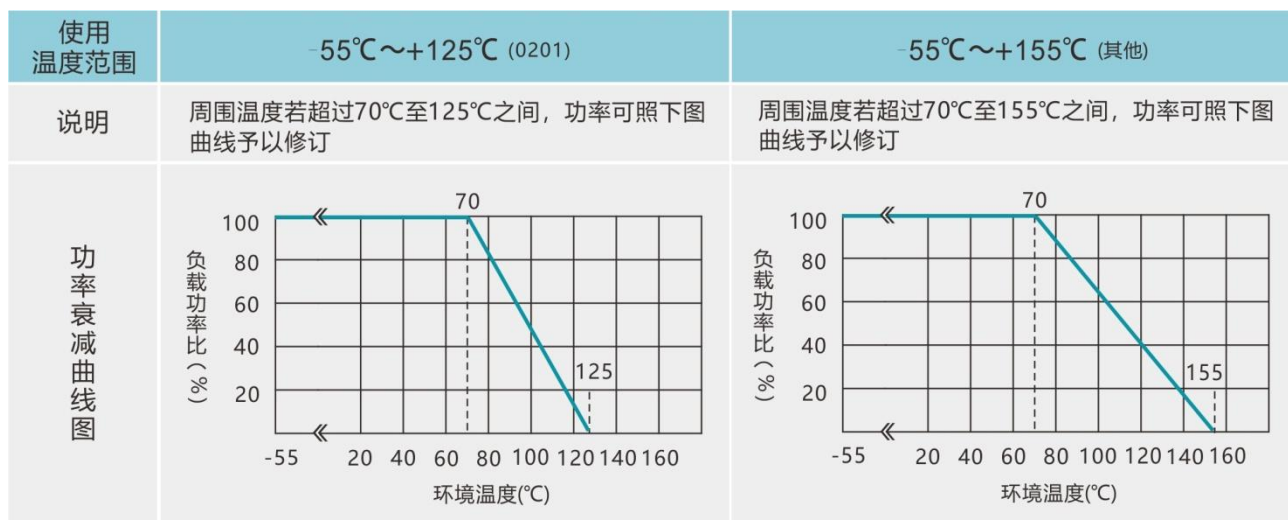
尺寸 dimension	 单位 (unit) : mm				
型别 (Type)	L	W	H	T1	T2
0201	0.60±0.03	0.30±0.03	0.23±0.03	0.10±0.05	0.15±0.05
0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.25±0.15
0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.35±0.20
1206	3.10±0.10	1.60±0.10	0.55±0.10	0.45±0.20	0.40±0.20
1210	3.10±0.10	2.60±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	0.50±0.20

电阻结构 (Construction)



NO.	结构 construction	主要材料 Major material
1	陶瓷基板 Ceramic substrate	氧化铝 Al ₂ O 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			
	0.5%, 0.1%	1%	2%	5%
0201	-	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ
0402	100Ω~1MΩ	1Ω~10MΩ	1Ω~22MΩ	1Ω~22MΩ
0603	100Ω~1MΩ	1Ω~10MΩ	1Ω~22MΩ	1Ω~22MΩ
0805	100Ω~1MΩ	1Ω~10MΩ	1Ω~22MΩ	1Ω~22MΩ
1206	100Ω~1MΩ	1Ω~10MΩ	1Ω~22MΩ	1Ω~22MΩ
1210	100Ω~1MΩ	1Ω~10MΩ	1Ω~22MΩ	1Ω~22MΩ
2010	100Ω~1MΩ	1Ω~10MΩ	1Ω~22MΩ	1Ω~22MΩ
1812	100Ω~1MΩ	1Ω~10MΩ	1Ω~22MΩ	1Ω~22MΩ
2512	100Ω~1MΩ	1Ω~10MΩ	1Ω~22MΩ	1Ω~22MΩ

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	0201	0402	0603	0805	1206	1210	2010	2512
绝缘耐压 Dielectric Withstanding Voltage	75V	100V	100V	300V	500V	500V	500V	500V
零欧姆阻值 ±5% Resistance Value of Jumper ±5%	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ
零欧姆额定电流 Rated Current of Jumper	0.5A	1A	1A	2A	2A	2A	2A	2A
零欧姆电阻最大电流 Max Current of Jumper	1A	2A	2A	5A	10A	10A	10A	10A

■ 电性规格 (Standard Electrical Specifications)

型别 Type	额定功率 (Power Rating at 70℃)	最高工作电压 Max. RCWV	最大过负荷电压 Max. Overload Voltage	T.C.R. (PPM/℃)	阻值范围 Resistance Range
0201	1/20W	25V	50V	-100~+300	1Ω~10Ω
					10 MΩ~22 MΩ
				± 200	10Ω~10MΩ
0402	1/16W	50V	100V	±200	1Ω~10Ω
					10 MΩ~22 MΩ
				± 100	10Ω~10MΩ
0603	1/10W	75V	150V	± 200	1Ω~10Ω
					10 MΩ~22 MΩ
				± 100	10Ω~10MΩ
0805	1/8W	150V	300V	± 200	1Ω~10Ω
					10 MΩ~22 MΩ
				± 100	10Ω~10MΩ
1206	1/4W	200V	400V	± 200	1Ω~10Ω
					10 MΩ~22 MΩ
				± 100	10Ω~10MΩ
1210	1/2W	200V	500V	± 200	1Ω~10Ω
					10 MΩ~22 MΩ
				± 100	10Ω~10MΩ
2010	3/4W	200V	500V	± 200	1Ω~10Ω
					10 MΩ~22 MΩ
				± 100	10Ω~10MΩ
2512	1W	200V	500V	± 200	1Ω~10Ω
					10 MΩ~22 MΩ
				± 100	10Ω~10MΩ

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.

■ 性能 (Performance Specifications)

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	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)

FRQ-Series
Automotive Thick Film Chip Resistor
FRQ 系列车用厚膜晶片电阻器规格说明书



FOJAN
富捷电阻

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℃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℃)	0201 规格: $1\Omega \leq R \leq 10\Omega$: -100~+300PPM/℃ $10\Omega < R \leq 10M\Omega$: ±200 PPM/℃ 0402~2512 规格: $1\Omega \leq R \leq 10\Omega$: ±200 PPM/℃ $10\Omega < R \leq 10M\Omega$: ±100 PPM/℃ $10M\Omega < R \leq 22M\Omega$: ±200PPM/℃
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)
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±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% +0.05%)
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、飞弧及可见机械性损伤 No evidence of flashover, mechanical damage arcing or insulation breakdown

内容 Item	测试方法 Test Methods	测试条件 Test Conditions	规格 Specification
端子弯曲 Terminal bending	AEC-Q200-005	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; 1210 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)
温度循环 Temperature Cycling	JESD22 METHOD JA-104	-55℃~+ 155℃, 循环 1000 次, 在每一个极限温度持续时间不超过 30 分钟, 且温度转换时间不超过 1 分钟, 试验结束 24±4 小时后进行测试. 1000 Cycles (-55℃ to +155℃) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1min. maximum transition time.	±(2.00% +0.05Ω)
耐湿特性 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.	±(2.00% +0.05Ω)
负荷寿命 Load life	MIL-STD-202 METHOD 108	电阻放入恒温箱中, 温度 125±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 125±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)

内容 Item	测试方法 Test Methods	测试条件 Test Conditions	规格 Specification
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)
高温储存 High Temperature Exposure(Storag)	MIL-STD-202 METHOD 108	155°C下放置 1000h,不加载功率, 试验结束 24±4 小时 后进行测试. 1000 hrs. @ T=155°C. Unpowered. Measurement at 24±4 hours after test conclusion	±(1.00%+0.05Ω)
ESD 试验 ESD test	AEC-Q200-002	加载规定静电电压2次/间隔1秒, 0201/0402规格:0.5KV, 0603规格:1KV, 其它规格2KV. 0201/0402: 0.5KV, 0603: 1.0KV, Other:2KV, 2times/1s	±(3.0%+0.05Ω)
抗硫化试验 Sulfuration test	ASTM-B-809-95	方法一: 温度60°C, 湿热蒸硫粉试验 (加饱和和硝酸钾) 750hrs 方法二: 切削油:硫粉=96.5:3.5, 温度60°C, 100 hrs; 预处理: 前后先经历3次回流焊+100次温冲 Method 1: steam sulfur powder test (with saturated potassium nitrate) at 60°C with humidity and heat (750hrs) Method 2: cutting oil: sulfur powder =96.5:3.5, temperature 60°C, 100 hrs; Pretreatment: before and after three reflow soldering +100 thermal shock	±(1.0% +0.05Ω)

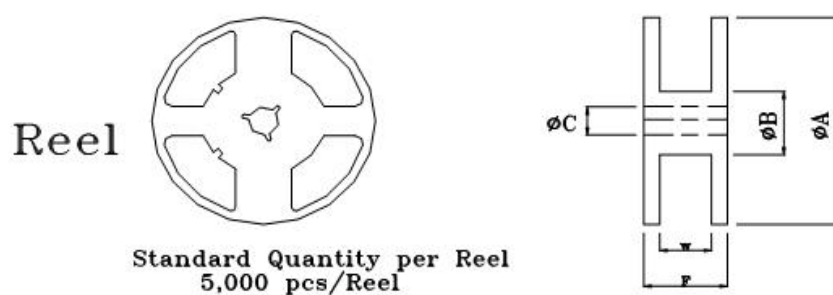
■
包
装

规格 (Tapping Specification)

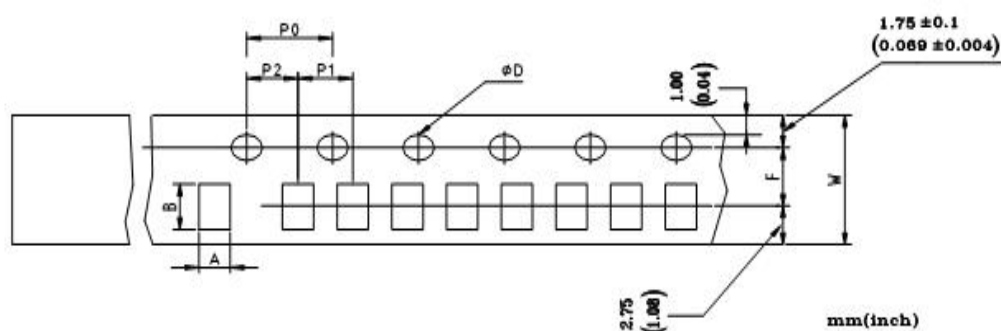
-卷盘尺寸 (Reel dimension)

Type	Size	Unit	A	B	C	F	W
------	------	------	---	---	---	---	---

0201/0402	7"	10K/Reel 15K/Reel 0201 only	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	178±2.0	60.0±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	178±2.0	60.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
0603/0805/1206	13"	20K/Reel	mm	178±2.0	60.0±1.0	13.5±0.5	11.4±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



-包装尺寸 (packing dimension)



Unit: mm

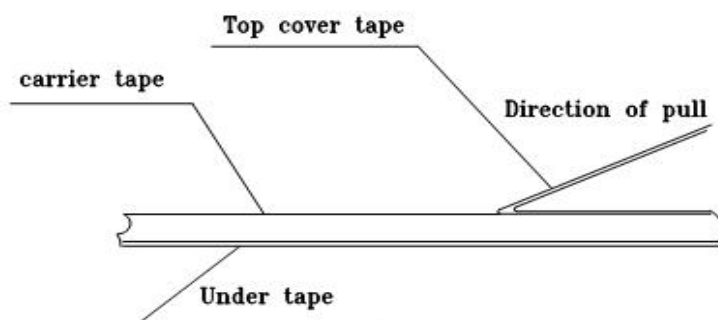
Dimensions	A	B	D	F	P0	P1	P2	W
0201	0.38±0.05	0.68±0.05	1.50± ^{0.1} _{0.0}	3.50±0.05	4.00±0.10	2.00±0.10	2.00±0.05	8.00±0.20

0402	0.65±0.10	1.15±0.10	1.50± $\frac{0.1}{0.0}$	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± $\frac{0.1}{0.0}$	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± $\frac{0.1}{0.0}$	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± $\frac{0.1}{0.0}$	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± $\frac{0.1}{0.0}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
2010	2.90±0.10	5.30±0.10	1.50± $\frac{0.1}{0.0}$	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± $\frac{0.1}{0.0}$	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)

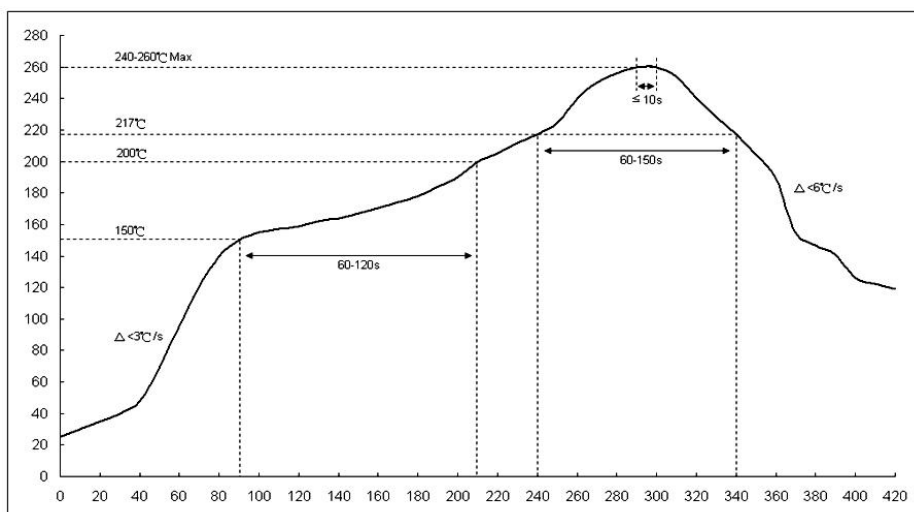
上胶带以 200mm/分钟的速度，沿 165~180 度角的方向进行剥离，如下图所示。纸带的剥离力范围为 10g~70g；载带的剥离力范围为 30~100g。

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)

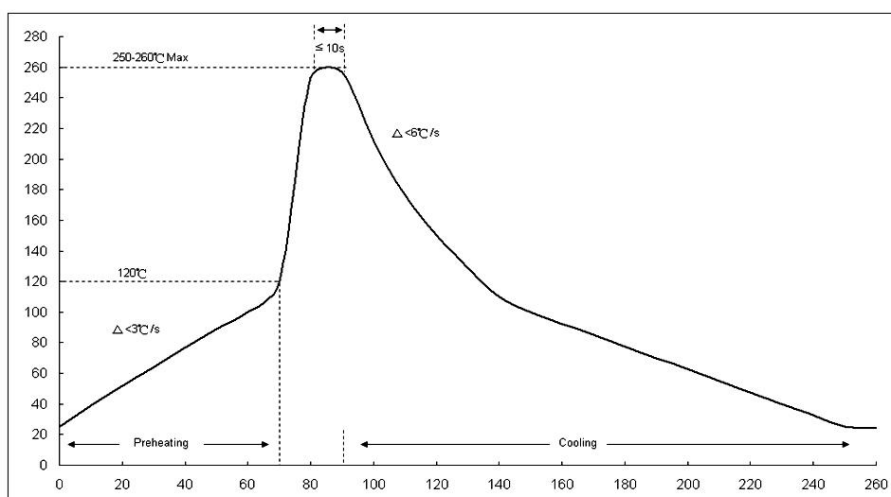


■ 焊接 (soldering)

- 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