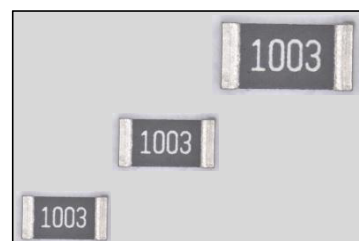


■车规高精厚膜片式固定电阻器

High Precision Thick Film Chip Fixed Resistor Automotive Grade

◆特征 Features

- * 符合 AEC-Q200 汽车标准相关条款 · Compliant with AEC-Q200 standard
- * 体积小, 重量轻 · Miniature and light weight
- * 适应再流焊与波峰焊 · Suit for reflow and wave flow solder
- * 装配成本低, 并与自动贴装设备匹配 · Low assembly cost, suit for automatic SMT equipment
- * 可实现 $\pm 0.1\%$ 阻值精度 · Can achieve $\pm 0.1\%$ resistance accuracy
- * 电阻温度系数可达到 $\pm 25\text{ppm}/^\circ\text{C}$ · The resistance temperature coefficient can reach $\pm 25\text{ppm}/^\circ\text{C}$
- * 具有优越的抗硫化性能 · With excellent sulfuration-resistant performance.
- * 符合 RoHS 指令要求 · Compliant with RoHS directive
- * 符合无卤要求 · Halogen free requirement
- * 潮敏等级 MSL1 · MSL Class:MSL1



◆应用领域 Application

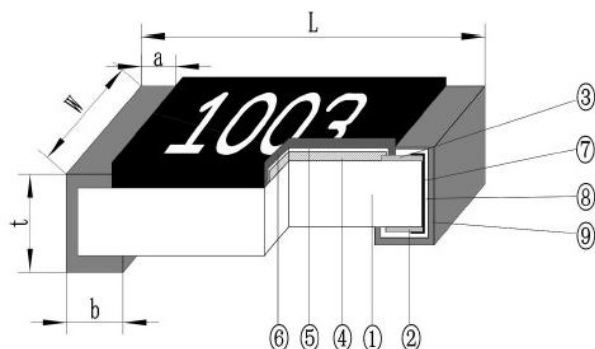
*汽车电子装置, 工业设备, 工业测量。

Automotive electronic devices, industrial equipment, industrial measurement.

◆型号表示法 Part Number

AS	R	06	G	1003	B	T						
产品代号 Product Code	额定功率代号 Rated Power Code		型号代号 Type Code		电阻温度系数 代号 T. C. R Code		电阻值代号 Resistance Value Code		阻值误差精度代号 Resistance Tolerance Code		包装和卷盘方式代号 Packing and Taping Reel Style Code	
车规高精厚膜片式固定电阻器 High Precision Thick Film Chip Fixed Resistor Automotive Grade	代号 Code	额定功率 Rated Power	代号 Code	型号 Type	代号 Code	T.C.R ppm/℃	四位数（E-96 系列）：前三位表示有效数字，第四位表示有效数字后零的个数。 Four digits (E-96 series):The first three digits are significant figures and the four one denotes number of zeros. 小数点用 R 表示。 Decimal point should be expressed by "R" . 例如 Example: 1003=100KΩ（E-96） 10R0=10Ω（E-96）	代号 Code	误差精度 Tolerance	代号 Code	包装方法 Packing Style	
	Q	1/5	03	0603	H	±50		B	±0.1%	T	编带包装 & 7 英寸卷盘 Tape & 7inch Reel	
	F	1/4	05	0805				C	±0.25%			
								D	±0.5%			
	R	1/3	06	1206	G	±25		F	±1.0%	T13	编带包装 & 13 英寸卷盘 Tape & 13inch Reel	

◆结构 Construction

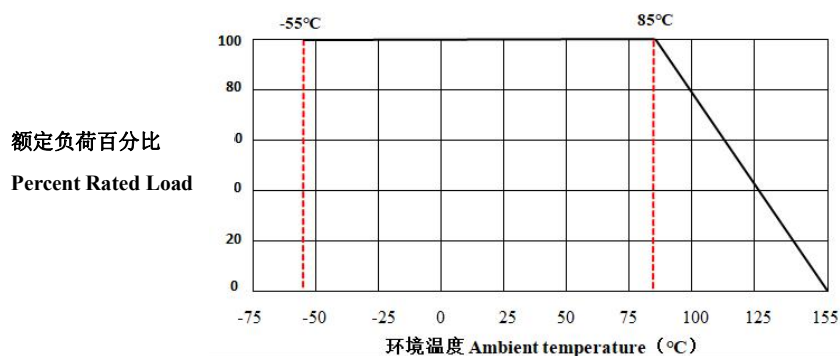


①	陶瓷基板 Ceramic Substrate
②	背电极 Bottom Electrode
③	面电极 Top Electrode
④	电阻体 Resistor Layer
⑤	一次保护 Primary Overcoat
⑥	二次保护 Secondary Overcoat
⑦	端电极 Edge Electrode
⑧	中间电极 Barrier Layer
⑨	外部电极 External Electrode

◆规格尺寸 Dimensions

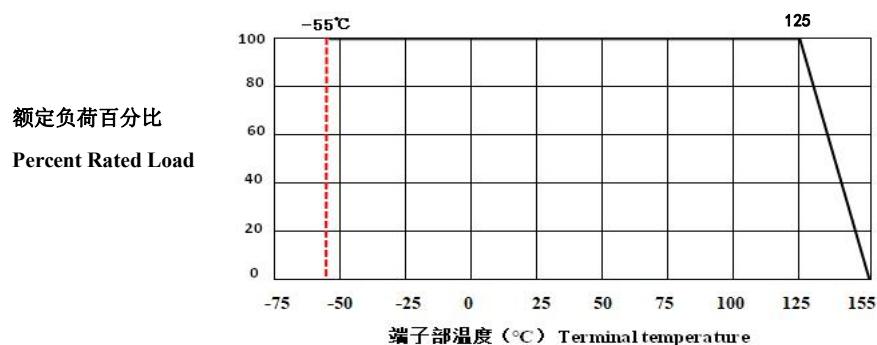
型号 Type	尺寸 Dimensions(mm)				
	L	W	t	a	b
0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.35±0.20
0805	2.00±0.10	1.25±0.15	0.55±0.10	0.35±0.15	0.40±0.20
1206	3.20±0.20	1.60±0.15	0.55±0.10	0.45±0.20	0.50±0.20

◆负荷下降曲线 Derating Curve



注 1: 当电阻使用的环境温度超过 85℃时, 其额定负荷 (额定电流) 按上述曲线下降。

Note1: For resistors operated in ambient over 85℃, rated load (rated current) shall be derated in accordance with the above figure.



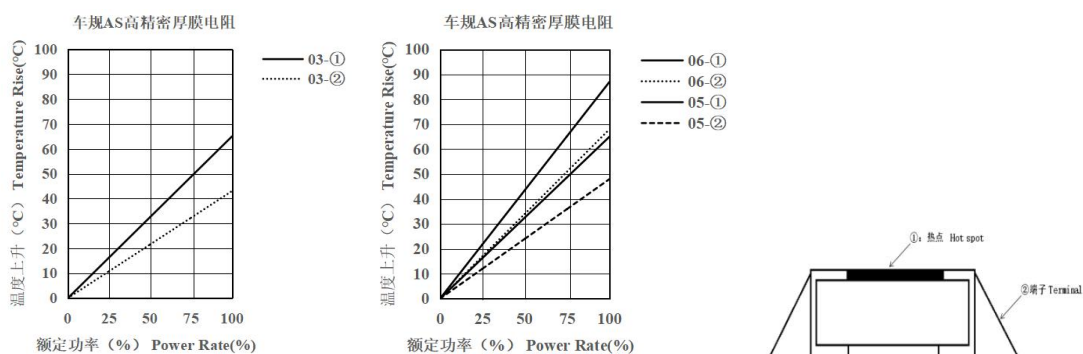
注 2: 超过上述额定端子部温度使用时, 请根据上述功率降额曲线减少额定功率后使用。

Note2: When exceeding the above terminal temperature, please reduce the rated power according to the above power reduction curve.

若根据客户使用状况无法确定应选用额定环境温度还是额定端子部温度, 请以额定端子部温度为准。

If it is unclear whether to use the rated ambient temperature or the rated terminal temperature based on the customer's usage conditions, please prioritize the rated terminal part temperature.

◆温升曲线 Temperature rise curve



注：表面温度上升，由于是用本公司测试条件测定的，根据使用状况、使用基板不同，数值也有不同。

Note: The surface temperature rises, as it is determined with the test conditions of the company, and the value varies according to the use status and the substrate..

◆额定值 Ratings

型号 Type	85℃下额定 功率 Rated Power at 85℃ (W)	电阻温度系 数 T.C.R (ppm/℃)	阻值范围Resistance Range				元件极限电压 Limiting Element Voltage (V)	最大过负荷电压 Max.Overload Voltage (V)
			B: ±0.1%	C: ±0.25%	D: ±0.5%	F: ±1.0%		
0603	1/5	±25*1	10kΩ~1MΩ	10kΩ~1.5MΩ	10kΩ~1.5MΩ	10kΩ~1.5MΩ	100	150
		±50						
0805	1/4	±25*1	100Ω~3MΩ	100Ω~5.1MΩ	100Ω~5.1MΩ	100Ω~5.1MΩ	150	300
		±50						
1206	1/3	±25*1	100Ω~5.1MΩ	100Ω~5.1MΩ	100Ω~5.1MΩ	100Ω~5.1MΩ	200	400
		±50						
注 Note	1、电流为直流或交流有效值。Current of DC or AC RMS value. 2、 $E=\sqrt{P\times R}$ 或元件极限电压两者中的较小值； $E=\sqrt{P\times R}$ or Limiting element voltage whichever is lower. E：额定电压 Rated voltage(V)；P：额定功率 Rated power(W)；R：标称阻值 Normal resistance(Ω). *1：低温 TCR. （-55℃/+25℃）为-50ppm/℃~+25ppm/℃。 LTCR（-55℃/+25℃）for -50ppm/℃~+25ppm/℃							

◆可靠性测试方法 Reliability Test Method

项目 Item	标准 Specifications	测试方法 Test Methods
高温存储 High Temperature Exposure (Storage)	无可见损伤 No mechanical damage $\Delta R \leq \pm (0.5\%R + 0.05\Omega)$	AEC-Q200 Test 3 /MIL-STD-202 Method 108 1000 小时 @ T=155℃, 不通电。 1000 hrs. @ T=155℃. Unpowered.
温度循环 Temperature Cycling	无可见损伤 No mechanical damage 0805、1206: $\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ 0603: $\Delta R \leq \pm (0.5\%R + 0.05\Omega)$	AEC-Q200 Test 4/JESD22 Method JA-104 -55℃(30 分钟)~常温(≤ 1 分钟)~155℃(30 分钟), 1000 个循环。 -55℃(30min)~normal temperature(≤ 1 min)~155℃(30min) , 1000 cycles.

项目 Item	标 准 Specifications	测试方法 Test Methods
高温高湿 Biased Humidity	无可见损伤 No mechanical damage 0805、1206: $\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ 0603: $\Delta R \leq \pm (1.0\%R + 0.05\Omega)$	AEC-Q200 Test 7/MIL-STD-202 Method 103 温度 85°C, 湿度 85%RH, 10%额定功率(电流)下的电压值或元件极限电压(取最小值), 放置 1000 小时。 85°C/85%RH, apply 10% of operating power(current) or limiting element voltage whichever is lower for 1000hours.
85°C耐久 85°C Durability	无可见损伤 No mechanical damage 0805、1206: $\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ 0603: $\Delta R \leq \pm (1.0\%R + 0.05\Omega)$	JIS-C-5201-1 4.25 / IEC-60115-1 4.25.1 85°C $\pm 2^\circ\text{C}$, 1000 小时, 额定功率(电流)下的电压值或元件极限电压(取最小值), 通 1.5 小时/断 0.5 小时。 85°C $\pm 2^\circ\text{C}$, 1000h, operating power (current) or limiting element voltage whichever is lower for 1.5h ON/0.5h OFF.
工作寿命 Operational Life	无可见损伤 No mechanical damage 0805、1206: $\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ 0603: $\Delta R \leq \pm (1.0\%R + 0.05\Omega)$	AEC-Q200 Test 8/ MIL-STD-202 Method 108 125°C $\pm 2^\circ\text{C}$, 1000 小时, 43%额定功率(电流)下的电压值或元件极限电压(取最小值), 通 1.5 小时/断 0.5 小时。 125°C $\pm 2^\circ\text{C}$, 1000h, 43% of operating power (current) or limiting element voltage whichever is lower for 1.5h ON/0.5h OFF.
耐溶剂性 Resistance to Solvents	标志清晰, 无可见损伤 Clearly marked, No mechanical damage	AEC-Q200 Test 12/MIL-STD-202 Method 215 浸在三种溶剂 3min 后擦拭 10 次, 浸、刷共 3 回, 用水清洗清洗剂进行清洗, 并在室温下对整个表面进行通风干燥。 Immersed in three solvents after 3min immersion, brush wipe 10 times, a total of 3 times, washing with washing and cleaning agent, room temperature on the surface of the ventilation drying
机械冲击 Mechanical Shock	无可见损伤 No mechanical damage 0805、1206: $\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ 0603: $\Delta R \leq \pm (1.0\%R + 0.05\Omega)$	AEC-Q200 Test 13/MIL-STD-202 Method 213 正弦半波, 峰值加速度: 100g' s, 脉冲持续时间: 6ms, 三轴六向各 3 次, 共 18 次。 Positive half wave, peak acceleration: 100g' s, pulse duration: 6ms, three axis six to each 3 times, a total of 18 times.
振动 Vibration	无可见损伤 No mechanical damage 0805、1206: $\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ 0603: $\Delta R \leq \pm (1.0\%R + 0.05\Omega)$	AEC-Q200 Test 14/MIL-STD- 202 Method 204 频率: 10Hz~2000Hz, 加速度: 5 g' s, 一个循环 20min, X、Y、Z 三个方向每个方向 12 个循环, 共 36 个循环。 Frequency: 10Hz ~ 2000Hz, acceleration: 5 g' s, a loop 20min, X, Y, Z three directions, each direction 12 cycles, 36 cycles.
耐焊接热 Resistance to Soldering Heat	无可见损伤 No mechanical damage 0805、1206: $\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ 0603: $\Delta R \leq \pm (0.5\%R + 0.05\Omega)$	AEC-Q200 Test 15/MIL-STD-202 Method 210 270°C $\pm 5^\circ\text{C}$ 锡槽, 保持 10s $\pm$ 1s。 Lead-free solder bath at 270°C $\pm 5^\circ\text{C}$ for 10s $\pm$ 1s.
热冲击 Thermal Shock	无可见损伤 No mechanical damage 0805、1206: $\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ 0603: $\Delta R \leq \pm (0.5\%R + 0.05\Omega)$	ACE-Q200 Test 16/MIL-STD-202 Method 107 -55°C (15 分钟) -常温 (≤ 20 秒) -155°C (15 分钟), 300 个循环。 -55°C (15min) ~ normal temperature (≤ 20 s) ~ 155°C (15min), 300 cycles.
ESD 静电放电 Electrostatic Discharge (ESD)	无可见损伤 No mechanical damage 0805、1206: $\Delta R \leq \pm (0.5\%R + 0.05\Omega)$ 0603: $\Delta R \leq \pm (1.0\%R + 0.05\Omega)$	AEC-Q200 Test 17/AEC-Q200-002 人体模式 两次放电, 正、负极性各 1 次。 Human Body Model, 1 pos. + 1 neg. discharges 0603: 0.5kV; 0805: 1kV; 1206: 2kV.
可焊性 Solderability	无可见损伤 No mechanical damage 可焊面积 $\geq 95\%$ 95% Cover Min	AEC-Q200 Test 18/IEC 60115-1 11.1 245°C $\pm 5^\circ\text{C}$ 锡槽, 保持 3s $\pm$ 0.3s。 Lead-free solder bath at 245°C $\pm 5^\circ\text{C}$ for 3s $\pm$ 0.3s.

项目 Item	标准 Specifications	测试方法 Test Methods
电阻温度系数 T.C.R	在规定值内 Within specified T.C.R	AEC-Q200 Test 19/IEC60115-1 6.2 +20°C/-55°C/+20°C/+125°C/+20°C.
可燃性 Flammability	不完全燃尽，薄垫纸应不被引燃，松木板应不被烤焦炭化。 No ignition of the tissue paper or scorching or the pinewood board.	AEC-Q200-Test 20/UL-94 V-0 或 V-1 可接受。不需要电气测试。 V-0 or V-1 are acceptable. Electrical test not required.
基板弯曲试验 Substrate Bending Test	无可见损伤 No mechanical damage $\Delta R \leq \pm (0.5\%R + 0.05\Omega)$	AEC-Q200 Test 21/AEC-Q200-005 弯曲距离(Bending distance): 0603: 3mm; 1206、0805: 2mm; 保持时间(Duration): 60s±5s.
端子强度 Terminal Strength	无可见损伤 No mechanical damage 0805、1206: $\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ 0603: $\Delta R \leq \pm (0.5\%R + 0.05\Omega)$	AEC-Q200 Test 22/AEC-Q200-006 施加力: 17.7N, 保持 60s±1s。 Applying force 17.7N for 60s±1s.
阻燃性 Flame Retardance	不可燃 No Flame	AEC-Q200 Test 24/AEC-Q200-001 9Vdc 到 32Vdc (钳位电流高达 500A)、增量为 1.0Vdc 的电压。每种电压等级最少施加 1 小时。 Subjected to voltage from 9.0 to 32.0 VDC (current clamped up to 500A), and each voltage level shall be increased in 1.0 VDC for one hour minimum.
绝缘电阻 Insulation Resistance	1000MΩ Min	IEC 60115-1 12.1 在电极与基片间施加 100V±15V 直流电压, 保持 1 分钟, 然后测绝缘电阻值。 Apply DC 100V±15V between substrate and terminations for 1min, then check insulation resistance.
耐电压 Voltage Proof	无击穿或飞弧 No breakdown or Flashover	IEC 60115-1 12.2 在电极与基片间以大约 100V/s 的速率施加有效值为最大过负荷电压的交流电压, 保持 60s±5s。 Apply max. overload voltage of AC RMS at a rate of approximately 100V/s between substrate and terminations for 60s±5s.
短时间过负载 Short Time Overload	无可见损伤 No mechanical damage 0805、1206: $\Delta R \leq \pm (0.2\%R + 0.05\Omega)$ 0603: $\Delta R \leq \pm (0.5\%R + 0.05\Omega)$	IEC 60115-1 8.1 2.5 倍额定电压或最大过负荷电压 (取较小值), 持续 5 秒。 2.5 times rated voltage or max. overload voltage(current) whichever is lower for 5s.
抗硫化性能 Sulfuration Resistant	无可见损伤 No mechanical damage $\Delta R \leq \pm (0.5\%R + 0.05\Omega)$	方法一: ASTM-B-809-95 把待测电阻放置在饱和硫蒸气内, 温度: 60°C±3°C, 湿度: 91~93%RH, 放置时间: 1500 小时。 Method1: ASTM-B-809-95 Place the resistor to be measured in saturated sulfur vapor, Temperature: 60°C±3°C, humidity: 91~93%RH, 1500 hours.
	无可见损伤 No mechanical damage $\Delta R \leq \pm (0.5\%R + 0.05\Omega)$	方法二: 油浴, 恒温: 105°C±3°C, 放置时间: 1000 小时。 Method2: Soaked in industrial oil with sulfur substance contained 105°C±3°C 1000h.

◆包装 Packaging

包装方式见附录 Packaging can refer to the Appendix.

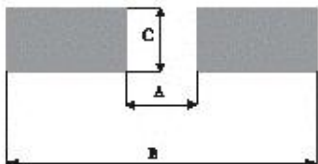
适用范围： 厚膜类电阻及薄膜类电阻 Scope of application: Thick-film resistors and thin-film resistors

附录 Appendix I

◆推荐焊盘尺寸 Recommend Solder Pad Size

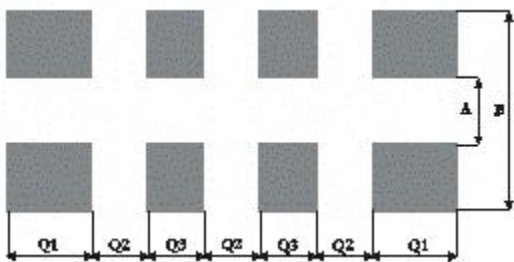
* 片式固定电阻器 Chip fixed resistor

单位unit: mm



厚膜电阻及薄膜电阻 Thick Film Resistor and Thin Film Resistor			
型号Type	A	B	C
01005	0.17±0.03	0.60±0.03	0.22±0.03
0201	0.23±0.05	0.84±0.05	0.38±0.05
0402	0.45±0.05	1.45±0.05	0.60±0.05
0603	0.80±0.05	2.50±0.05	0.95±0.05
0805	1.05±0.1	3.25±0.1	1.40±0.1
1206	1.90±0.1	4.50±0.1	1.75±0.1
1210	2.00±0.1	4.60±0.1	2.70±0.1
2010	3.50±0.1	6.50±0.1	2.70±0.1
2512(1W、1.5W)	4.80±0.1	7.80±0.1	3.40±0.1
2512(2W)	2.70±0.1	7.80±0.1	3.60±0.1
0508	0.60±0.1	2.20±0.1	2.00±0.1
0612	0.60±0.1	2.90±0.1	3.30±0.1
1225	1.40±0.1	4.50±0.1	6.40±0.1

* 厚膜片式网络电阻器 Thick film chip network resistor



单位unit: mm

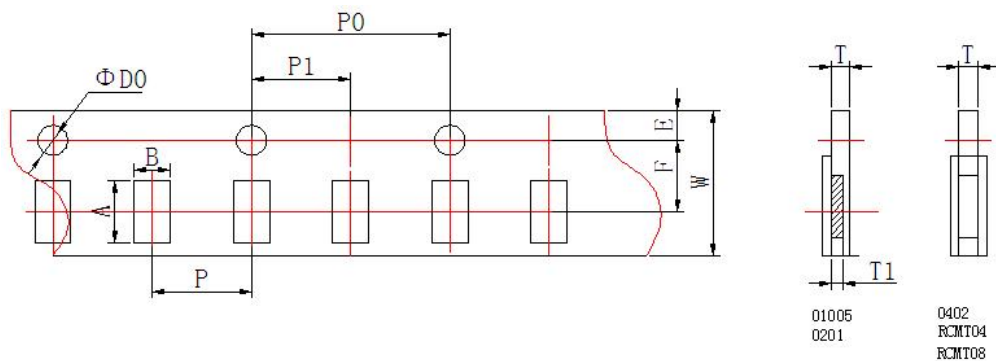
型号Type	A	B	Q1	Q2	Q3
2R01	0.30±0.05	0.90±0.05	0.30±0.05	0.20±0.05	---
4R01	0.30±0.05	0.90±0.05	0.20±0.05	0.20±0.05	0.20±0.05
2R02	0.35±0.05	1.25±0.05	0.65±0.05	0.20±0.05	---
4R02	0.38±0.05	1.60±0.05	0.40±0.05	0.20±0.05	0.30±0.05
4R03	0.80±0.05	2.70±0.05	0.60±0.05	0.40±0.05	0.40±0.05
备注 Remarks	1、2R01型号包含including:RC-MY04、RCMY04、RH-MY04、RHMY04 2、4R01型号包含including:RC-MY08、RCMY08、RH-MY08、RHMY08 3、2R02型号包含including:RC-MT04、RCMT04、RH-MT04、RHMT04 4、4R02型号包含including:RC-MT08、RCMT08、RH-MT08、RHMT08 5、4R03型号包含including:RC-ML08、RCML08、RH-ML08、RHML08 6、上述型号说明适用于附录中所有型号。 The above description applies to all types in the appendix.				

◆包装 Packaging

* 纸带编带 Paper Taping

适用于01005、0201、0402、2R01、4R01、2R02、4R02:

For 01005、0201、0402、2R01、4R01、2R02、4R02:



单位unit: mm

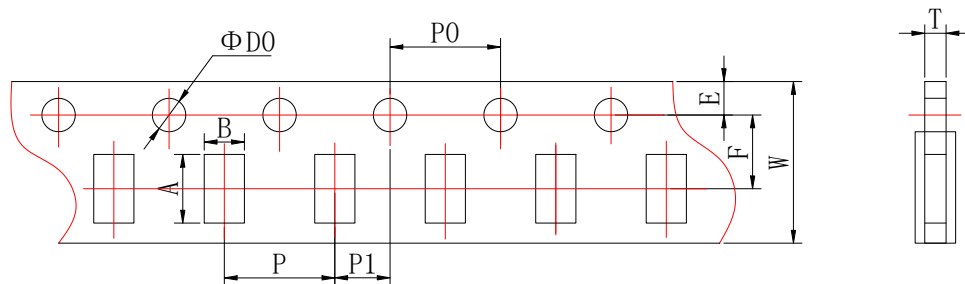
型号Type	A	B	W	F	E
01005	0.45±0.02	0.25±0.02	8.00±0.02	3.50±0.05	1.75±0.05
0201	0.70±0.10	0.40±0.10	8.00±0.20	3.50±0.05	1.75±0.10
0402	1.15±0.10	0.65±0.10	8.00±0.20	3.50±0.05	1.75±0.10
2R01	0.97±0.05	0.77±0.05	8.00±0.20	3.50±0.05	1.75±0.10
4R01	1.57±0.05	0.77±0.05	8.00±0.20	3.50±0.05	1.75±0.10
2R02	1.45±0.10	1.20±0.10	8.00±0.20	3.50±0.05	1.75±0.10
4R02	2.20±0.10	1.20±0.10	8.00±0.20	3.50±0.05	1.75±0.10

单位unit: mm

型号Type	P	P0	P1	$\Phi D0$	T1	T
01005	2.00±0.05	4.00±0.10	2.00±0.05	1.55±0.02	0.17±0.02	0.31±0.02
0201	2.00±0.05	4.00±0.10	2.00±0.05	1.50±0.10	0.28±0.04	0.42±0.05
0402	2.00±0.05	4.00±0.10	2.00±0.05	1.50±0.10	/	0.44±0.05
2R01	2.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	/	0.60±0.10
4R01	2.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	/	0.60±0.10
2R02	2.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	/	0.60±0.10
4R02	2.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	/	0.60±0.10

适用于0603、0805、0508、1206、0612、1210、4R03:

For 0603、0805、0508、1206、0612、1210、4R03:



单位unit: mm

型号Type	A	B	W	F	E
0603	1.80±0.10	1.05±0.10	8.00±0.20	3.50±0.05	1.75±0.10
0805	2.30±0.10	1.50±0.10	8.00±0.20	3.50±0.05	1.75±0.10
0508	2.30±0.10	1.50±0.10	8.00±0.20	3.50±0.05	1.75±0.10
1206	3.50±0.20	1.90±0.20	8.00±0.20	3.50±0.05	1.75±0.10
0612	3.50±0.20	1.90±0.20	8.00±0.20	3.50±0.05	1.75±0.10
1210	3.50±0.20	2.80±0.20	8.00±0.20	3.50±0.05	1.75±0.10
4R03	3.50±0.20	1.90±0.20	8.00±0.20	3.50±0.05	1.75±0.10

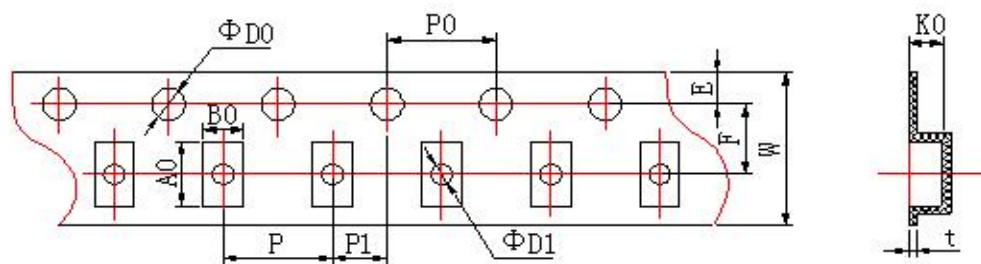
单位unit: mm

型号Type	P	P0	P1	ΦD0	T
0603	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.60±0.10
0805	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.75±0.10
0508	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.75±0.10
1206	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.75±0.10
0612	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.75±0.10
1210	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.75±0.10
4R03	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.75±0.10

***塑料带编带 Embossed Taping**

适用于2010、2512、1225:

For 2010、2512、1225:



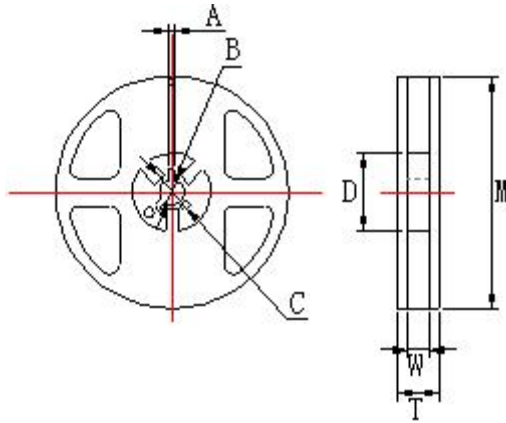
单位unit: mm

型号Type	A0	B0	W	F	E	t
2010	5.50±0.15	2.82±0.15	12.00±0.10	5.50±0.10	1.75±0.10	0.25±0.05
2512	6.78±0.15	3.45±0.15	12.00±0.10	5.50±0.10	1.75±0.10	0.25±0.05
1225	6.78±0.15	3.45±0.15	12.00±0.10	5.50±0.10	1.75±0.10	0.25±0.05

单位unit: mm

型号Type	P	P0	P1	ΦD0	ΦD1	K0
2010	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10/-0	1.50±0.10	0.84±0.10
2512	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10/-0	1.50±0.10	0.81±0.10
1225	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10/-0	1.50±0.10	0.81±0.10

* 卷盘 Reel



单位unit: mm

卷盘尺寸 Reel Type	型号Type	M	W	T	A	B	C	D
7英寸 7inch dia.Reel	01005、0201 0402、0603 0805、1206 1210、2R01 4R01、2R02 4R02、4R03 0508、0612	178±2.0	9.5±1.0	12.5±1.5	2.0±0.5	13.0±0.5	21.0±0.5	58.0±2.0
	2010、2512 1225	178±2.0	13.0±0.5	15.5±1.5	2.0±0.5	13.0±0.5	21.0±0.5	57.0±2.0
13英寸 13 inch dia.Reel	0201、0402 0603、0805 1206	330±2.0	9.5±1.0	13.4±1.0	2.0±0.5	13.0±0.5	21.0±0.5	100.0±1.0

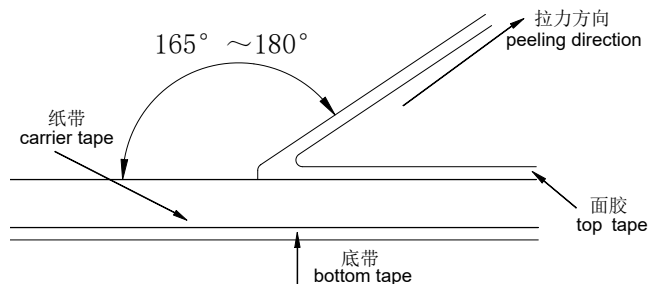
◆ 编带包装能力 Taping Ability

面带拉力 Top tape peel strength

面带拉力强度为11g~70g (0.1N~0.7N)，速度：300mm/min, 经下列试验后不允许有破裂断带现象。

Peel strength is 11g~70g (0.1N~0.7N), with speed of 300mm/min, and should not have flash and tear after peeling.

测试方法Test method:



电阻松动自如，无粘面胶带、底胶带现象。

Resistor is free, no sticking to top tape and bottom tape.

电阻易从纸带中取出，且晶片孔无机械损伤。

Resistor is easy to take out from carrier tape and chip hole have no mechanical damage.

◆包装数量 Packaging Quantity

包装方法 Packaging style	7英寸 7inch dia.Reel					13英寸 13 inch dia.Reel	
型号 Type	01005	0201	0402、2R01 2R02、4R01 4R02	0603、0805 1206、1210 4R03、0508 0612	2010、2512 、1225	0201、 0402	0603、0805、 1206
数量 Quantity (pcs)	20000	15000	10000	5000	4000	50000	20000

◆IEC E-24、E-96系列电阻值代码对照表 IEC E-24、E-96 Series Resistance Cross-reference List

* E-24 系列E-24 series ($\times 10^n \Omega$)

(单位unit: 0.001 Ω 、0.01 Ω 、0.1 Ω 、1 Ω 、10 Ω 、100 Ω 、1k Ω 、10k Ω 、100k Ω 、1M Ω 、10M Ω 、100M Ω 、1000M Ω)

表一 Table One:

1.0	1.5	2.2	3.3	4.7	6.8
1.1	1.6	2.4	3.6	5.1	7.5
1.2	1.8	2.7	3.9	5.6	8.2
1.3	2.0	3.0	4.3	6.2	9.1

* E-96系列E-96 series ($\times 10^n \Omega$)

(单位unit: 0.001 Ω 、0.01 Ω 、0.1 Ω 、1 Ω 、10 Ω 、100 Ω 、1k Ω 、10k Ω 、100k Ω 、1M Ω 、10M Ω 、100M Ω 、1000M Ω)

表二 Table Two:

1.00	1.33	1.78	2.37	3.16	4.22	5.62	7.50
1.02	1.37	1.82	2.43	3.24	4.32	5.76	7.68
1.05	1.40	1.87	2.49	3.32	4.42	5.90	7.87
1.07	1.43	1.91	2.55	3.40	4.53	6.04	8.06
1.10	1.47	1.96	2.61	3.48	4.64	6.19	8.25
1.13	1.50	2.00	2.67	3.57	4.75	6.34	8.45
1.15	1.54	2.05	2.74	3.65	4.87	6.49	8.66
1.18	1.58	2.10	2.80	3.74	4.99	6.65	8.87
1.21	1.62	2.15	2.87	3.83	5.11	6.81	9.09
1.24	1.65	2.21	2.94	3.92	5.23	6.98	9.31
1.27	1.69	2.26	3.01	4.02	5.36	7.15	9.53
1.30	1.74	2.32	3.09	4.12	5.49	7.32	9.76

* E-96系列0603型号《乘数代码对照表》及《电阻值代码对照表》

E-96 series(0603)《multiplied Cross-reference List》And《Resistance Cross-reference List》

表三 Table Three:

乘数multiplied	$\times 10^0$	$\times 10^1$	$\times 10^2$	$\times 10^3$	$\times 10^4$	$\times 10^5$	$\times 10^6$	$\times 10^7$	$\times 10^{-1}$	$\times 10^{-2}$	$\times 10^{-3}$
代码code	A	B	C	D	E	F	G	H	X	Y	Z

表四 Table Four:

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

◆厚膜电阻阻值代码及标记规则

Description for Resistance Value Code and Marking of Thick Film Chip Resistor

* 阻值代码 Resistance Value Code

所有厚膜电阻的阻值代码与其标记是相对的。

All the resistance value code of thick film chip resistor is corresponding with the marking.

* 标记 Marking

* E-24系列 (0603、 $\geq \pm 5\%$)：采用三位数字表示，前二位表示电阻值有效数字，第三位表示乘以10的次方数。

E-24 series: Express resistance value on the glass side with three digits, the first two digits should be significant and the third one denotes number of zeros.

例For example



30K Ω



33 Ω

*E-24系列 (0603、 $\leq \pm 1\%$)：在三位数字标记下方增加下横线识别。

E-24 series(0603、 $\leq \pm 1\%$): One short bar under marking letter.

例For example:

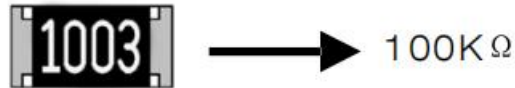


*E-96系列和E-24系列 (0508、0805、0612、1206、1225、1210、2010、2512、 $\pm 1\%$ & $\pm 0.5\%$):

▲采用四位数字表示, 前三位表示电阻值有效数字, 第四位表示乘以10的次方数。

E-96 series & E-24 series (0508、0805、0612、1206、1225、1210、2010、2512、 $\pm 1\%$ & $\pm 0.5\%$): Express the resistance value with four digits, the first three digits are significant figures and the fourth de notes the number of zeros.

例For example:

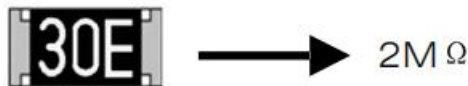


*E-96系列 (0603、 $\leq \pm 1\%$):

▲采用三位代码表示, 前两位表示E-96系列阻值代码, 后一位字母表示乘数代码 (见表三和表四)。

Express the resistance value with three code, the first two digit code denote the resistance of E-96 series, and the third code of letter denote the multiplier (see the table three and four).

例For example:



*小数点以 “R” 表示 The decimal point should be expressed by “R” .

例For example:



*跨接电阻以 “0” 表示 The jumper should be expressed by “0”

例For example:



* ≤ 0402 产品不作标记 : For the chip resistor (≤ 0402) , there is no mark on the glass side.

例For example:



*非IEC标准系列的电阻值标记表示方法: 一般以最接近IEC E24系列标称阻值的标记表示方法。

For the resistance values which don't belong to IEC serial, use the resistance of IEC serial which is most close to the required resistance of non-IEC serial for replacement.

*客户对标记有特殊要求时, 则按照协商的结果印刷标记。

To get agreement by both party if the customers have special requirements for the marking.

◆薄膜电阻阻值代码及标记规则

Description for Resistance Value Code and Marking of Thin of Thin Film Chip Resistor

* 阻值代码 Resistance Value Code

所有薄膜电阻全尺寸统一采用四位数阻值代码表示。

All resistance value code of thin film chip resistor used four digits.

例Example

TD03G4701BT

四位数代号表示，如：4701=4.7K Ω ；1R50=1.5 Ω

To use four digits codes represent resistance value,

例Example 4701=4.7K Ω 1R50=1.5 Ω

* 标记 Marking

*当阻值同时存在于E24和E96系列时，优先采用E96系列。

When resistance value belongs to E24 as well as E96 series, we suggest preferentially use E96 series.

例Example 10K=1002, $\neq$ 103

* $\geq$ 0805产品标记For the chip resistor ($\geq$ 0805) :

▲采用四位数字表示，前三位表示电阻值有效数字，第四位表示10 的次方数。

Express the resistance value with four digits, the first three digits are significant figures and the fourth denotes the number of zeros.

例Example

 100K Ω

*0603标记 Marking for 0603 Size Resistor

▲0603-E96系列：采用三位代码表示，前二位表示E-96系列阻值代码，后一位字母表示乘数代码（见表三和表四）；

Express the resistance value with three code, the first two digit code denote the resistance of E-

96 series, and the third code of letter denote the multiplier (see the table three and four).

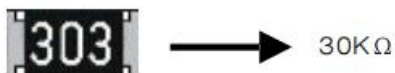
例Example

 2M Ω

▲0603-E24系列：采用三位数字表示，前二位表示电阻值有效数字，第三位表示10 的次方数。

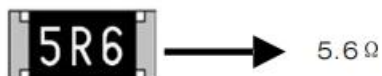
Express the resistance value on the glass side with three digits, the first two digits should be significant and the third denote number of zeros.

例Example

 30K Ω

*▲小数点以“R”表示 The decimal point should be expressed by“R”.

例Example

 5.6 Ω

* $\leq$ 0402 产品：不作标记 For the chip resistor ($\leq$ 0402), there is no mark on the glass side.

例Example



◆电流检测电阻阻值代码及标记规则

Description for resistance Value Code and Marking of Current Sensing Thick Film Chip Resistor

* 阻值代码 Resistance Value Code

所有电流检测电阻全尺寸统一采用四位数阻值代码表示。

All resistance value code of current sensing thick film chip resistor used four digits.

例Example

RBF03MR010FT

四位数字代号表示，如：R010=10mΩ；30M1=30.1mΩ

To use four digits codes represent resistance value,

例Example R010=10mΩ；30M1=30.1mΩ

* 标记 Marking

*E-24和E-96系列（0508、0805、0612、1206、1225、1210、2010、2512， $\leq \pm 5\%$ ）：采用四位标记代码。

For（0508、0805、0612、1206、1225、1210、2010、2512， $\leq \pm 5\%$ ），when resistance value belongs to E24 and E96 series, we suggest preferentially use four digits.

标记代码 Mark Code	阻值范围 Resistance Value	示例 Sample
R00×	$1\text{m}\Omega \leq R \leq 9\text{m}\Omega$	R005=5mΩ
R0×	$10\text{m}\Omega \leq R \leq 99\text{m}\Omega$	R033=33mΩ
R×	$100\text{m}\Omega \leq R \leq 999\text{m}\Omega$	R100=100mΩ
×	$1\text{m}\Omega < R < 10\text{m}\Omega$ （包含小数点后两位有效数字） (Contains two significant digits after the decimal point.)	5M10=5.1mΩ
×	$10\text{m}\Omega < R < 100\text{m}\Omega$ （包含小数点后一位数字） (Contains one significant digit after the decimal point.)	30M1=30.1mΩ

*E-24和E-96系列（0603， $\leq \pm 5\%$ ）：采用三位标记代码。

For the chip resistor（0603， $\leq \pm 5\%$ ），when resistance value belongs to E024 and E96 series, we suggest preferentially use three digits.

标记代码 Mark Code	阻值范围 Resistance Value	示例 Sample
V0×	$1\text{m}\Omega \leq R \leq 9\text{m}\Omega$	V05=5mΩ
V×	$10\text{m}\Omega \leq R \leq 99\text{m}\Omega$	V33=33mΩ
R×	$100\text{m}\Omega \leq R \leq 999\text{m}\Omega$	R100=100mΩ
×	$1\text{m}\Omega < R < 10\text{m}\Omega$ （包含小数点后一位有效数字） (Contains one significant digit after the decimal point.)	5M10=5.1mΩ

* ≤ 0402 产品不印刷标记。

For the chip resistor（ ≤ 0402 ），there is no mark on the glass side.

*非IEC标准系列的电阻标记表示方法：一般以最接近IEC E24系列标称阻值的标记表示方法。

For the resistance values which don't belong to IEC serial, use the resistance of IEC serial which is most close to the required resistance of non-IEC serial for replacement.

*客户对标记有特殊要求时，则按照协商的结果印刷标记。

To get agreement by both party if there special requirement for the marking.

◆片式电阻器使用说明 Chip Resistor Instructions For Use

* 本产品在以下特殊环境下应用，性能可能会受到影响：

- 1、在各种类型的液体，包括水、油、化学品、有机溶剂的使用。
- 2、在户外直接暴露在阳光的地方，或在灰尘多的地方使用。
- 3、在产品暴露的地方，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。
- 4、在产品暴露于静电或电磁波的地方使用。
- 5、在产生热量的部件、塑料线，或其他易燃物品附近使用。
- 6、在用树脂或其他涂层材料密封产品的情况下使用。
- 7、焊接后使用不洁焊料或使用水或水溶性清洗剂清洗产品。
- 8、片状电阻器的基材是氧化铝。由于和安装基板的热膨胀系数不同，在反复施加提供热循环等热应力时，接合部的焊锡（焊锡部）有时会发生裂纹。如果环境温度反复发生很大的变动，并且载荷反复进行ON/OFF，则需要注意龟裂的发生。因热应力而发生的龟裂，取决于所安装的焊盘的大小、焊锡量、安装基板的散热性等，因此在环境温度有很大的变化或者载荷ON/OFF的条件下使用时，请充分注意以进行设计。

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

- 1、Use in various types of liquid, including water, oils, chemicals, and organic solvents.
- 2、Use outdoors where the products are exposed to direct sunlight, or in dusty places.
- 3、Use in places where the products are exposed to sea winds or corrosive gases, including Cl_2 , H_2S , NH_3 , SO_2 , and NO_2 etc.
- 4、Use in places where the products are exposed to static electricity or electromagnetic waves.
- 5、Use in proximity to heat-producing components, plastic cords, or other flammable items.
- 6、Use involving sealing or coating the products with resin or other coating materials.
- 7、Use involving unclean solder or use of water or water-soluble cleaning agents for cleaning after soldering.
- 8、The substrate of chip resistors is alumina. Cracks may occur at the connection of solder (solder fillet portion) due to the difference of the coefficient of thermal expansion from a mounting board when heat stresses like heat cycle, etc. are repeatedly given to them. Care should be taken to the occurrence of the cracks when the change in ambient temperature or ON/OFF of load is repeated. The occurrence of the crack by heat stress may be influenced by the size of a pad, solder volume, heat radiation of mounting board etc., so please pay careful attention to designing when a big change in ambient temperature and conditions for use like ON/OFF of load can be assumed.

◆储存方法 Storage Conditions

温度 $5^{\circ}\text{C}\sim 30^{\circ}\text{C}$ ，相对湿度30%RH~70%RH。建议在符合上述储存条件下十二个月内使用。

T: $5^{\circ}\text{C}\sim 30^{\circ}\text{C}$, RH: 30%RH~70%RH. The products are suggested to be used within twelve months when received, and the storage condition mentioned above should be followed.

◆产品使用注意事项 Precautions on use of products

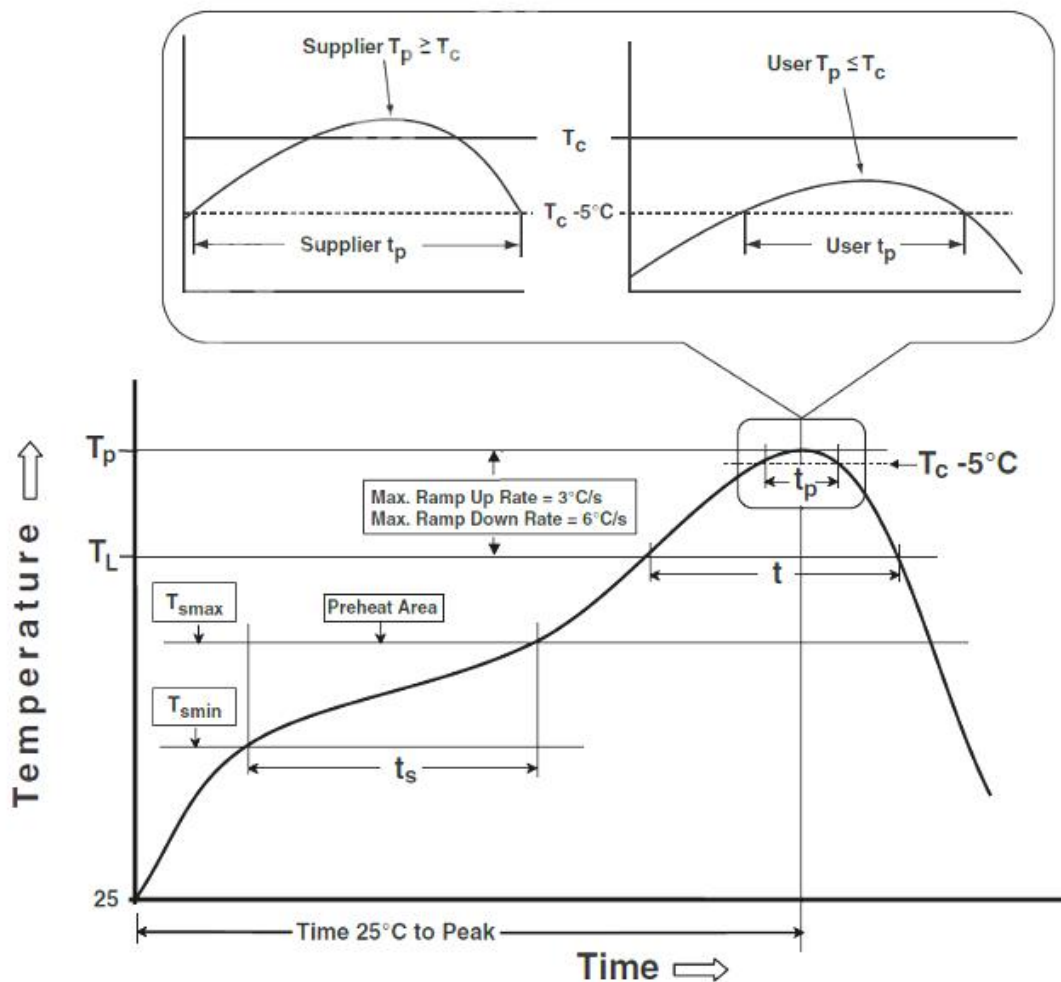
- 1、避免采用超过正常额定功率的功率，超过额定功率的稳态负载条件下可能会对产品性能和可靠性产生负面影响。
- 2、用镊子拿起产品时要小心，有可能会将保护或电阻体夹碎。
- 3、手动安装产品时，烙铁头勿触碰产品。
- 4、用于车载设备、医疗设备、航空设备以及其他涉及人身安全、或可能引起重大损失的设备上时，请务必事先与我公司联系。这些产品在这类用途中出现故障或失灵可能导致人身事故或严重损坏。
- 1、Avoid applying power exceeding normal rated power, exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.
- 2、Be careful when pick up the products with tweezers. There may be a care that the overcoat and / or the body can be chipped.
- 3、Soldering tip shall not touch the product when install product manually.
- 4、Contact our sales representatives before you use our products for applications including automotive, medical equipment and aerospace equipment. Malfunction or failure of the products in such applications may cause loss of human life or serious damage.

◆焊接Soldering

- 回流焊要求：器件回流焊要求满足J-STD-020无铅回流焊，具体要求如下：

Reflow soldering requirements: The device reflow soldering requirements meet the J-STD-020

lead-free reflow soldering. The specific requirements are as follows:



*升温速率 (Ramp-up rate (TL-TP)) : $>3^\circ\text{C/s}$

*降温速率 (Ramp-down rate (TP-TL)) : $\leq 6^\circ\text{C/s}$

*预热温度 (Preheat/soak) : $150^\circ\text{C} - 200^\circ\text{C}$ (T_{smin} to T_{smax}) : 60s-120s

*液相线 217°C 以上时间 Time above 217°C of liquid phase (TL) : 60s-150s.

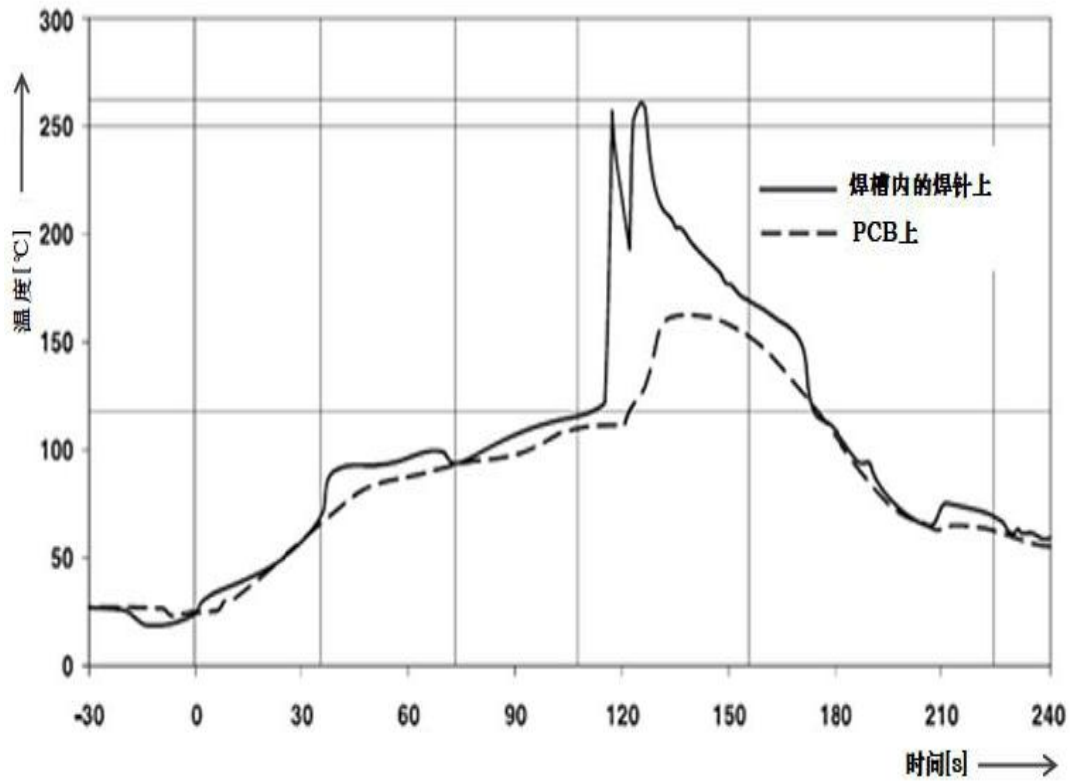
* T_c 最高温度 Maximum temperature of T_c : 260°C

*最长焊接时间 Maximum welding time: 8min max.

*峰值温度 $T_p = T_c - 5^\circ\text{C}$ 以内的时间: 30秒 T_p Time within the range where peak temperature $T_p = T_c - 5^\circ\text{C}$: 30s

*产品至少可承受回流焊次数: 3次 Minimum number of reflow soldering cycles the product can withstand: 3 times

- 波峰焊的要求 Requirements for wave welding



*预热温度要求时间 Preheating temperature requirement: 130 -160 time: 60s-90s

*插装元器件引脚在260°C焊料槽中至少停留10s

The pins of the plug-in components stay in the 260 solder channel for 10s.

- 推荐的焊膏类型 Recommended solder alloy: 96.5Sn-3.0Ag-0.5Cu

◆修订履历 Revision History

版本 Version	日期 Date	修订内容 Revision Content	修订人 Reviser
I 4.0	2026-07-17	-增加 0603 尺寸及相关额定值、指标值。 -Add the parameters to 0603 chip resistor. -增加 0805、1206 尺寸 100Ω~100kΩ阻值段。 - Add resistance range of 100Ω to 100kΩ in 0805 and 1206 sizes. -附录：修改焊接条件。 Appendix: Modification of soldering conditions.	卢振强 Zhenqiang Lu
V3.0	2025-09-04	-附录：修改储存方法。 - Appendix: Modify the storage conditions.	刘瀚阳 Hanyang Liu
V2.0	2025-07-03	-增加 0805 尺寸及相关额定值、指标值。 Add the parameters to 0805 chip resistor.	黄良玉 LiangyuHuang
V1.0	2024-12-11	-原版 The original version.	陈才华 Chencaihoa

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