

■车规径向引线多层陶瓷电容器

Automotive Grade Radial Lead MLCCs

◆特征 Feature

*汽车等级、具有高可靠性;

Automotive grade、high reliability.

*此类电容器为汽车专用电子元器件，已通过 AEC-Q200 标准设定的所有实验条件，在汽车使用过程中更具稳定性、安全性。

This kind of capacitor special electronic components for cars. Has passed the AEC - Q200 standards set all of the experimental conditions. In the process of automobile application more stability and security.

*材料使用主要有温度稳定性能较高的 C0G 以及高介电常数的 X7R。

Materials used are high temperature stability of C0G and the high dielectric constant X7R.

* 产品应用于汽车电子天窗、摇窗、座椅等。

The product is applied to automobile electronic sunroof, swing window, seat etc.



介质种类 Dielectric Type	I 类介质 Class I	II 类介质 Class II
介质材料 Dielectric Material	温度补偿型 Temperature Compensating	X7R(B)
电气性能 Electrical Properties	电气性能最稳定，几乎不随温度、电压和时间的变化而变化。 It is the most stable one in electrical properties and has little change with temperature, voltage and time.	具有较高的介电常数，容量可做到比 I 类电容器高，具有稳定的温度特性。 X7R material has high dielectric constant, and its capacitance is higher than class I. These capacitors are classified as having a semi-stable T.C..
应用 Application	适用于低损耗，稳定性要求高的高频电路，如滤波器、振荡器和计时电路等。 Used in applications where low-losses and high-stability are required, such as filters, oscillators, and timing circuits so on.	适用于容量范围广，稳定性要求不高的电路中，如隔直、耦合、旁路及鉴频等电路中。 Used over a wide temperature range, such in these kinds of circuits, DC-blocking, coupling, bypassing, frequency discriminating etc.
容量范围 Available capacitance range	0.5pF~0.01uF	100pF~1uF

◆型号表示法 Part Number

ACT4	-	0805	B	104	K	500	P	F3
①		②	③	④	⑤	⑥	⑦	⑧

①

产品类别 Product Type	
代号 Code	类别 Type
ACC4	I 类径向引线电容器 (汽车等级) Class I Dielectric Radial Leaded Mlcc (Automotive Grade)
ACT4	II 类径向引线电容器 (汽车等级) Class II Dielectric Radial Leaded Mlcc (Automotive Grade)

②

单位: 英寸 UNIT: INCHES	
本体外形尺寸规格 (长 x 宽) Nominal Body Size (Length x Width)	
0805	0.17x0.15
1206	0.20x0.18

③

温度特性 Temperature Characteristics			
CG(N)	C0G(NP0)	0±30ppm/°C	(-55~+125°C)
B	X7R	±15%	(-55~+125°C)

④

标称容量 Nominal Capacitance
前两位数字为有效数字, 后一位数字表示零的个数 First two digits are significant, and the third digit is number of zeros. 例如: For example: 104=100000pF 473=47000pF

⑤

容量公差 Tolerance				
C	D	J	K	M
±0.25pF	±0.5pF	±5.0%	±10%	±20%

⑥

额定电压 Rated Voltage
前两位数字为有效数字, 后一位数字表示零的个数 First two digits are significant, and the third digit is number of zeros. 例如: For example: 500=50V, 101=100V

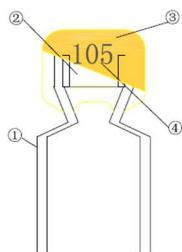
⑦

包装方式 Packaging Style		
编带 Tape	P	盒带包装 Ammo
	T	卷带包装 Reel
散包装 Bulk	空白 Blank	

⑧

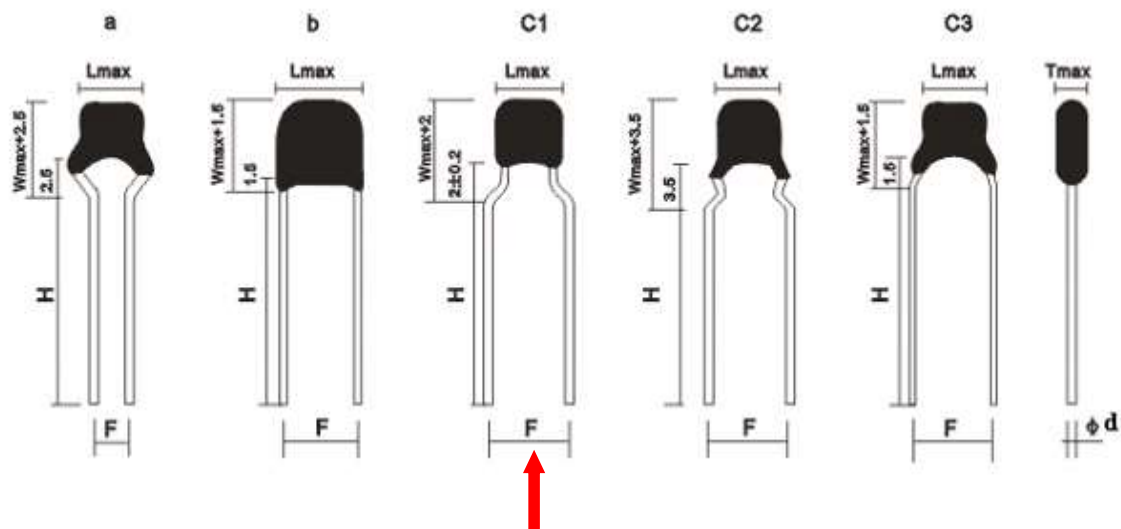
脚距 (单位: mm) Lead Space (Unit: mm)	
F1	2.54
F3	5.08

◆产品结构 Product Structure



序号 No.	部位 Component
1	引线 Lead wire
2	芯片 Chip
3	涂层 Coating
4	标记 mark

◆尺寸、工作电压、容量关系表 Size code, capacitance and voltage



尺寸 规格 Size code	外形 Shape	尺寸（单位：mm） Dimensions (Unit: mm)						工作电 压 Voltage	标称容量范围 Available Capacitance Range	
		F ±0.5	H ±1.0	L max	W max	T max	Φd ±0.1		C0G (NP0)	X7R
0805	a	2.54						50	100~472	102~105
	b	2.54	5							
	C1	5.08	10	4.2	3.8	3.8	0.50	100	100~102	102~104
	C2 C3	5.08 5.08	28							
1206	a	2.54						50	100~472	104~105
	b	2.54	10	5.5	4.5	3.8	0.50			
	C1	5.08						100	100~102	104~105
	C2									

*其它规格可直接和我们联系。Others are available, contact FH.

◆可靠性测试方法 Reliability Test Method

项目 Item	技术要求 Technical Specification			测试方法和备注 Test Method and Remarks		
容量 Capacitance (C)	I 类 Class I	应符合指定的误差级别 within the specified tolerance.		标称容量 Capacitance	测试频率 Measuring Frequency	测试电压 Measuring Voltage
				C≤1000pF	1MHZ±10%	1.0±0.2V
				C> 1000 pF	1KHZ±10%	
	II 类 Class II	应符合指定的误差级别 within the specified tolerance.		标称容量 Capacitance	测试频率 Measuring Frequency	测试电压 Measuring Voltage
				C≤10uF	1KHZ±10%	1.0±0.2V
	损耗角正切 Dissipation Factor (DF)	I 类 Class I	C≥50pF DF≤0.15% C<50pF DF≤1.5[(150/C)+7] X10 ⁻⁴		标称容量 Capacitance	测试频率 Measuring Frequency
≤1000pF					1MHZ±10%	1.0±0.2V
> 1000 pF					1KHZ±10%	
II 类 Class II		B	DF ≤3.5%	标称容量 Capacitance	测试频率 Measuring Frequency	测试电压 Measuring Voltage
				C≤10uF	1KHZ±10%	1.0±0.2V
绝缘电阻 Insulation Resistance		I 类 Class I	C≤10nF IR≥10000MΩ C>10nF R. C≥100 ΩF		测试电压: 额定电压 Measuring Voltage: Rated Voltage 测试时间: 60±5 秒 Duration: 60±5s 测试湿度: ≤75% Test Humidity: ≤75% 测试温度: 25°C±3°C Test Temperature: 25°C±3°C 测试充放电电流: ≤50mA Test Current: ≤50mA	
	II 类 Class II	C≤25nF IR≥4000MΩ C>25nF R.C≥100 ΩF				

项目 Item	技术要求 Technical Specification		测试方法和备注 Test Method and Remarks	
耐电压 Withstandi-ng Voltage	不应有介质被击穿或损伤 No breakdown or damage.		Ur<100V	测试电压 Measuring Voltage : I 类:300%额定电压 Class I :300% Rated voltage II 类:250%额定电压 Class II:250% Rated voltage 持续时间: 5 秒 Duration: 5s 充/放电电流不应超过 50mA The charge/ discharge current is less than 50mA.
			100≤Ur≤630V	施加额定电压的 200%, 5 秒, 最大电流不超过 50mA/ Force 200%Rated voltage for 5 second Max current should not exceed 50 mA.
			500V≤Ur<1000V	施加额定电压的 150%, 5 秒, 最大电流不超过 50mA/ Force 150%Rated voltage for 5 second Max current should not exceed 50 mA.
可焊性 Solder ability	上锡率应大于 95% Lead wire shall be at least 95% covered with a new solder coating.		将电容器引线浸入含有 25%松香的酒精溶液中 5-10 秒, 然后浸入温度为: 245±5℃的金属焊锡 (Sn-3Ag-0.5Cu) 中 2.5(+0.5,-0.5)秒, 注意: 电容器本体底面距离锡面约 1.5~2mm。 The lead wire of capacitor is dipping into a 25% rosin solution of ethanol for 5s-10s and then into molten solder(Sn-3Ag-0.5Cu) of 245±5 °C for 2.5(+0.5,-0.5)s. In both cases the depth of dipping is up to about 1.5~2mm from the terminal body.	
耐焊接热 Resistance to Soldering Heat	项目 Item	$\Delta C/C \leq$	锡温: 260 ±5℃ Solder temperature: 260 ±5℃ 时间: 10 ±1 s Duration: 10 ±1 s	
	Class I	±2.5%or±0.25pF Whichever is lager	浸入条件: 将电容器插入厚度为 1.6mm, 孔径为 1.0mm 的 PC 板。 Immersed conditions: Inserted into the PC board (with t=1.6mm, hole=1.0mm diameter) 对于 I 类介质, 试验后, 应在标准条件下恢复 24±2 小时后才测试。 Recovery: For class I, 24±2 hours of recovery under the standard condition after test.	
	X7R(B)	±10%	对于 II 类介质, 在试验前应首先进行如下预处理: 150(-10,+0) °C, 1 小时, 接着在标准条件下恢复 48 ±4 小时。 Preconditioning (Class II) : 1 hour of preconditioning at 150(-10,+0) °C, followed by 48 ±4 hours of recovery under the standard condition.	
	外观无可见损伤 No significant abnormality in appearance.		恢复: 对于 II 类介质试验后, 应在标准条件下恢复 48 ±4 小时后才测试。 Recovery (Class II) : 48 ±4 hours of recovery under the standard condition after test.	

项目 Item	技术要求 Technical Specification	测试方法和备注 Test Method and Remarks
高温高湿 Biased Humidity	$\Delta C/C$ C0G: $\leq \pm 2.5\%$ 或 $\pm .25pF$ X7R: $\leq \pm 12.5\%$	※预处理（仅针对 2 类电容器）： ※Preconditioning, class 2 only: 在 $140^{\circ}\text{C} \sim 150^{\circ}\text{C}$ 下预热 1 小时后，在室温下放置 24 小时。 At $140^{\circ}\text{C} \sim 150^{\circ}\text{C}$ 1 hour, then keep for 24 ± 1 hour at room temp. 试验条件: $85 \pm 2^{\circ}\text{C}$, 80~85%R.H. 串联一个 $100K \Omega$, 施加额定电压和 1.3~1.5V, 1000 小时 Test condition: 85°C , 85% R.H. Add $100 K \Omega$ resistor, applied U_r and 1.3 to 1.5 volts for 1,000 hours.
	DF COG $Cr \geq 30pF \leq 0.5\%$ $Cr < 30pF \leq 1/(400+20Cr)$ X7R $\geq 25V : 0.035 \text{ max}$ $\geq 16V : 0.050 \text{ max}$ $\geq 10V : 0.075 \text{ max}$	
	IR COG $C \leq 10nF$ $IR \geq 10000M \Omega$ $C > 10nF$ $R.C \geq 100 \Omega F$ X7R $C \leq 25nF$ $IR \geq 4000M \Omega$ $C > 25nF$ $R.C \geq 100 \Omega F$	
	外观 Appearance 无可见损伤 No visible damage	
寿命试验 Life Test	$\Delta C/C$ C0G: $\leq \pm 3\%$ 或 $\pm 0.3pF$ 取两者之中较大者 X7R: $\leq \pm 12.5\%$ C0G: $\leq \pm 3\%$ or $\pm 0.3pF$, whichever is larger. X7R: $\leq \pm 12.5\%$	电压: 2 倍额定电压 时间: 1000 小时 温度: 125°C 充电电流: 不应超过 50mA 放置条件: 室温 放置时间: 24 小时 (C0G), 或 48 小时 (X7R), Applied Voltage: 2Rated Voltage Duration: 1000h Temperature: 125°C Charge/ Discharge Current: 50mA max. Recovery Conditions: Room Temperature Recovery Time: 24h (C0G), or 48h (X7R)
	DF COG $Cr \geq 30pF \leq 0.5\%$ $Cr < 30pF \leq 1/(400+20Cr)$ X7R $\geq 25V : 0.035 \text{ max}$ $\geq 16V : 0.050 \text{ max}$ $\geq 10V : 0.075$	
	IR C0G: $C \leq 10nF$ $IR \geq 10000M \Omega$ $C > 10nF$ $R.C \geq 100 \Omega F$ X7R: $C \leq 25nF$ $IR \geq 4000M \Omega$ $C > 25nF$ $R.C \geq 100 \Omega F$	
	外观: Appearance: 无可见损伤 No visible damage.	

项目 Item	技术要求 Technical Specification	测试方法和备注 Test Method and Remarks																	
温度循环 Temperature Cycle	$\Delta C/C$: C0G: $\leq \pm 2.5\%$ 或 $\pm 2.5\text{pF}$ ，取两者中最大者 X7R: $\leq \pm 10\%$ C0G: $\leq \pm 2.5\%$ or $\pm 2.5\text{pF}$, whichever is larger. X7R: $\leq \pm 10\%$	<div>※预处理※（仅针对 2 类电容器）：上限类别温度，1 小时；恢复：24±1h</div> <div>※ Preconditioning(class 2 only):up-category temperature, 1h; Recovery time: 24±1h</div> <div>初始测量 Initial Measurement</div> <div>循环次数：1000 次, 一个循环分以下 4 步： Cycling Times: 1000 times, 1 cycle, 4 steps:</div>																	
	DF: COG Cr≥30pF $\leq 0.5\%$ Cr<30pF $\leq 1/(400+20Cr)$ X7R: 0.050 max	<table><tr><th>阶段 Step</th><th>温度（℃） Temperature（℃）</th><th>时间（分钟） Time(min.)</th></tr><tr><td>1</td><td>下限温度 Low-categorytemp. (C0G/X7R:-55)</td><td>30±3</td></tr><tr><td>2</td><td>常温 Normaltemp. (25±2)</td><td>1</td></tr><tr><td>3</td><td>上限温度 Up-categorytemp. (C0G/X7R:+125)</td><td>30±3</td></tr><tr><td>4</td><td>常温 Normaltemp. (25±2)</td><td>1</td></tr></table>			阶段 Step	温度（℃） Temperature（℃）	时间（分钟） Time(min.)	1	下限温度 Low-categorytemp. (C0G/X7R:-55)	30±3	2	常温 Normaltemp. (25±2)	1	3	上限温度 Up-categorytemp. (C0G/X7R:+125)	30±3	4	常温 Normaltemp. (25±2)	1
	阶段 Step	温度（℃） Temperature（℃）	时间（分钟） Time(min.)																
	1	下限温度 Low-categorytemp. (C0G/X7R:-55)	30±3																
	2	常温 Normaltemp. (25±2)	1																
3	上限温度 Up-categorytemp. (C0G/X7R:+125)	30±3																	
4	常温 Normaltemp. (25±2)	1																	
IR: COG C≤10nF IR≥10000MΩ C>10nF R. C≥100 Ω F X7R C≤25nF IR≥4000MΩ C>25nF R.C≥100 Ω F																			
外观：无可见损伤 Appearance: No visible damage.	试验后放置（恢复）时间：24±2h Recovery time after test: 24±2h																		

项目 Item	技术要求 Technical Specification	测试方法和备注 Test Method and Remarks
高温存储 High Temperature Exposure	$\Delta C/C$: C0G: $\leq \pm 2.5\%$ 或 $\pm 2.5\text{pF}$, 取两者中最大者 X7R: $\leq \pm 10\%$ C0G: $\leq \pm 2.5\%$ or $\pm 2.5\text{pF}$, whichever is larger. X7R: $\leq \pm 10\%$	温度: 最高工作温度 $125 \pm 2^\circ\text{C}$ Temperature: $125 \pm 2^\circ\text{C}$ 实验电压: 不施加电压 Voltage: without 实验时间: 1000 小时 Duration: 1000h 放置条件: 室温放置 Recovery conditions: Room emperature 时间: 24 小时 (I 类); 48 小时 (II 类) Recovery Time: 24h (Class1) or 48h (Class2)
	DF: COG $\text{Cr} \geq 30\text{pF}$ $\leq 0.15\%$ $\text{Cr} < 30\text{pF}$ $\leq 1/(400+20\text{Cr})$ X7R $\geq 25\text{V}$: 0.035 max $\geq 16\text{V}$: 0.050 max $\geq 10\text{V}$: 0.075 max	
	IR: 同原始标准。 IR: Same to initial value.	
	外观: 无可见损伤 Appearance: No visible damage.	
振动 Vibration	$\Delta C/C$: C0G: $\leq \pm 2.5\%$ X7R: $\leq \pm 10\%$	5g 的力 20 分钟, X,Y,Z 三个方向每个方向 36 个循环。 测试频率从 10-2000 赫兹。 5 g' s for 20 minutes, 36 cycles each of X,Y,X 3 orientations. Test from 10-2000 Hz.
	DF: COG: $\text{Cr} \geq 30\text{pF}$ $\leq 0.15\%$ $\text{Cr} < 30\text{pF}$ $\leq 1/(400+20\text{Cr})$ X7R: $\geq 25\text{V}$: 0.035 max $\geq 16\text{V}$: 0.050 max $\geq 10\text{V}$: 0.075 max	
	IR: 同原始标准。 IR: Same to initial value.	
	外观: 无可见损伤 Appearance: No visible damage.	

项目 Item	技术要求 Technical Specification	测试方法和备注 Test Method and Remarks
机械冲击 Mechanical Shock	$\Delta C/C$: COG: $\leq \pm 2.5\%$, X7R: $\leq \pm 10\%$	应沿试件的 3 个互相垂直轴, 在每个方向上实施 3 次冲击试验 (共计 18 次冲击)。 Three shocks in each direction shall be applied along the three mutually perpendicular axes of the test specimen (18 shocks) 脉冲波形: 正弦半波 Waveform: Half-sin 持续时长: 6 毫秒 Duration: 6 ms 峰值: 100g Peak value: 100 g 速度变化: 12.3 ft/s Velocity change: 12.3 ft/s
	DF: COG $Cr \geq 30pF \leq 0.15\%$ $Cr < 30pF \leq 1/(400+20Cr)$ X7R $\geq 25V : 0.035 \max$ $\geq 16V : 0.050 \max$ $\geq 10V : 0.075 \max$	
	IR:同原始标准。 IR:Same to initial value.	
	外观: 无可见损伤 Appearance:No visible damage.	

项目 Item	技术要求 Technical Specification		测试方法和备注 Test Method and Remarks
端头强度 Terminal Strength	抗拉强度 Tensile Strength	无引线断裂或松动等可见不良。 No abnormality such as cut lead or looseness.	固定电容器本体，沿引线方向逐步施加拉力直至 4.54N，然后保持 10 ±1 秒。 Fix the capacitor body, apply the force gradually to each lead in the radial direction of the capacitor until reaching 4.54N, and then keeping the force for 10 ±1 sec.
	弯折强度 Bending Strength		对电容器引出端施加一 2.27N 的力, 使引线弯曲 90 度, 然后使引线回到原始位置, 接着反方向操作一次为一个循环, 共重复 3 次。 Each lead wire shall be subjected to a force of 2.27N and then be bent a angle of 90 degree then returned to initial position. Then second bend in the opposite direction shall be made, repeat 3 times.

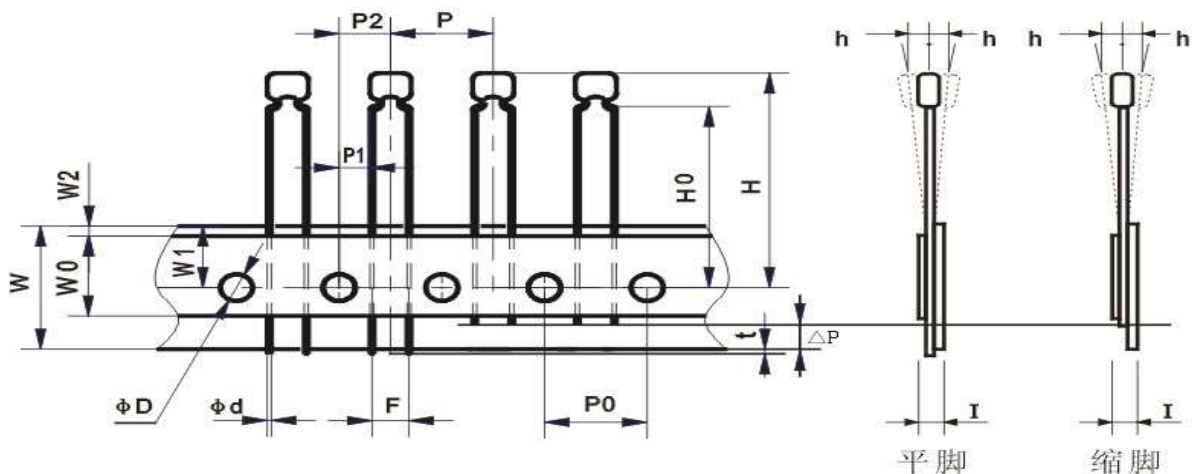
*以上所示“标准条件”解释如下：温度：5~35℃，相对湿度：40%RH~85%RH，

* Note on standard condition: " standard condition " referred to herein should be defined as follows:

5 to 35℃ of temperature, 45 to 75% of relative humidity, and 86 to 106kPa of atmospheric pressure.

* 若测试结果有争议时，仲裁试验用标准大气条件为：温度：25±1℃，相对湿度：48%~52%，

* When there are questions concerning measurement results: In order to provide correlation data, the test should be conducted under a condition of 25 degrees plus/minus 1 centigrade of temperature, 48% through 52% of relative humidity

◆包装 Packaging


代号 Code	P	P0	P1	P2	d	Δ h	W	W0	W1	W2	H	H0	I	D	t	ΔP
尺寸 Dim.	12.7	12.7	3.85	6.35	0.5 0	0	18.5	6~ 10	9	1.5	32.25	16	1.42	4.0	0	0≤P<12
			5.1									19.5				
误差 Tol.	± 1.0	± 0.2	± 0.7	± 1.3	± 0.1	± 1.0	± 1.0	± 1.0	± 0.5	± 1.5	Max.	± 1.0	Ma x	± 0.2	Max	

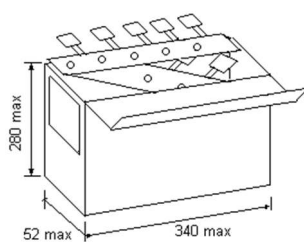
*注意 Note:

P1=3.85mm for F=5.08mm; P1=5.1mm for F=2.54mm.

Ammo Packaging/Tape and Reel Packaging: H0=16±1mm (Pin size 7mm)

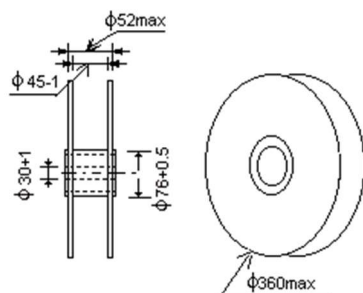
H0=19.5±1mm (Pin size 10mm)

*盒带包装 Ammo Packaging



*卷带包装

Tape and Reel Packaging



* 包装数量

Packaging Quantity

尺寸规格 Size Code	散包装 Bulk		盒带包装 Ammo	卷带包装 Tape and Reel
	pin≤25mm	pin>25mm		
0805	1000pcs	500pcs	2500pcs	4000pcs
1206	1000pcs	500pcs	2000pcs	2000pcs

◆推荐焊接条件 Recommended Soldering Conditions

*本产品建议使用波峰焊接法。

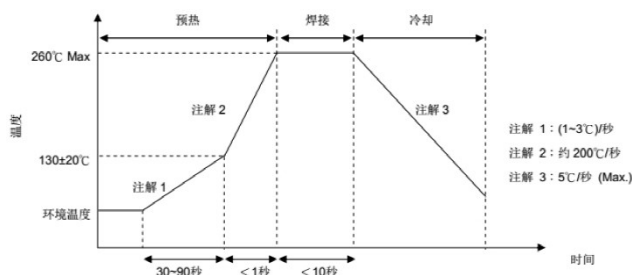
Applicable soldering process to the products is reflow soldering.

* 在焊接安装时，产品本体至焊接点距离，请预留 1.5mm Min。

During welding and installation, please reserve 1.5mm Min from the product body to the welding point

* 焊接曲线

Soldering Profile



* 烙铁焊接 Soldering Iron

使用烙铁进行返修时要求在 150℃下预热至少 1 分钟，不能直接用焊头接触磁体，返修焊接条件如下：

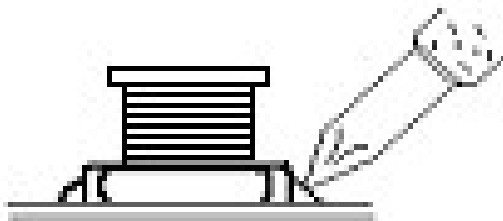
Reworking with Soldering Iron must preheating at 150℃ for 1 minute is required, and do not directly touch the core with the tip of the soldering iron. The reworking soldering conditions are as follows:

烙铁头温度：Temperature of soldering iron tip: 350℃;

烙铁输出功率：Soldering iron power output: 30W max.

烙铁头直径：≤1.0mm Diameter of soldering iron end: 1.0mm max.

焊接时间：Soldering time: within 3 sec.



◆贮存方法 Storage Methods

*存储期限 Storage Period

为保证端子电极的焊接特性和包装材料处于良好状态，请于本公司发货后 6 个月内使用本产品。同时，由于端子电极的焊接特性会随时发生变化，如果贮存时间超过 6 个月，请首先确认其焊接特性后再安装使用。

To maintain the solderability of terminal electrodes and to keep the packing material in good condition, product should be used within 6 months from the time of delivery. And the solderability of products electrodes may decrease as time passes, so in case of storage over

6 months, solderability shall be checked before actual usage.

* 存储条件 Storage conditions

存放货物的仓库应满足以下条件:The warehouse must meet with the following condition:

温度(Temperature): Inductors (product with taping):(+5~+35)°C;

相对湿度(Humidity): (40~85)%RH.

* 禁止将产品保管在腐蚀性物质中，如硫磺、氯气或酸，否则将引起端头氧化，导致降低焊接性。Don't keep products in corrosive gases such as sulfur, chlorine gas or acid, or it may cause oxidization of Electrodes resulting in poor solder ability.

* 为了避免受潮气、灰尘等物质的影响，产品应保管于货架上。

Products should be stored on the palette for the prevention of the influence from humidity, dust and so on.

* 产品保管在库房中，应避免热冲击、振动以及直接光照等等。

Products should be stored in the warehouse without heat shock, vibration, direct sunlight and so on.

*产品应密封包装。

Products should be stored under the airtight packaged condition.

◆使用注意事项 Precautions For Use

* 本承诺书只保证我司产品作为一个单体时的质量情况，当我司产品被安装到贵司产品上时，请贵司对使用在贵司电路上的产品情况进行了有效评价和确认。

Our specification limits the quality of the component as a single unit. Please ensure the component is thoroughly evaluated in your application circue.

*不要对产品施加过大的振动或机械冲击；

Do not apply excessive vibration or mechanical shock to products.

*为防止断线，请不要使用锋利的物体接触线圈，如镊子

Do not touch wire with sharp objects such as tweezers to prevent wire breakage.

在产品贴装时不要使用过大的压力，避免磁芯断裂。

Do not apply excessive stress to products mounted on boards to prevent core breakage

■修改履历 Revision History

版本 Version No.	日期 Date	修订内容 Modify Details	修订人 Reviser
A0	2025-4-25	首次发行	

[illegible]

Note: The above content is the specification of products, Fenghua reserves the right to modify this content without prior notice, and any product changes will be notified to customers via PCN.