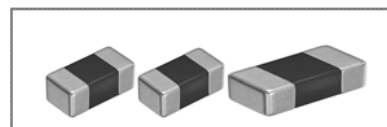


## ■车规叠层片式负温度系数热敏电阻器

## Automotive Grade Multilayer Chip NTC Thermistors



### ◆特征

#### Feature

- \*具有较高的抗弯曲特性。

High mechanical performance able to withstand.

- \* 高的使用温度，最高达 150℃。

Use at temperatures up to 150 ℃.

- \* 采用柔性端电极。

Flexible Termination electrode.

- \* 通过 AEC-Q200 认证

AEC-Q200 verified

### ◆应用

#### Application

- \* 可充电电池、CPU的温度探测。

Temperature sensing in rechargeable batteries and CPU.

- \* IC、LCD、石英振荡器的温度补偿。

Temperature compensation in IC、LCD、Crystal oscillator and so on.

- \* 需温度补偿和探测的各种电路。

Temperature compensation or temperature sensing for various types of circuits.

- \* 应用于高弯曲的电路板。

High Flexure Stress Circuit Boards.

### ◆产品规格型号的表示方法

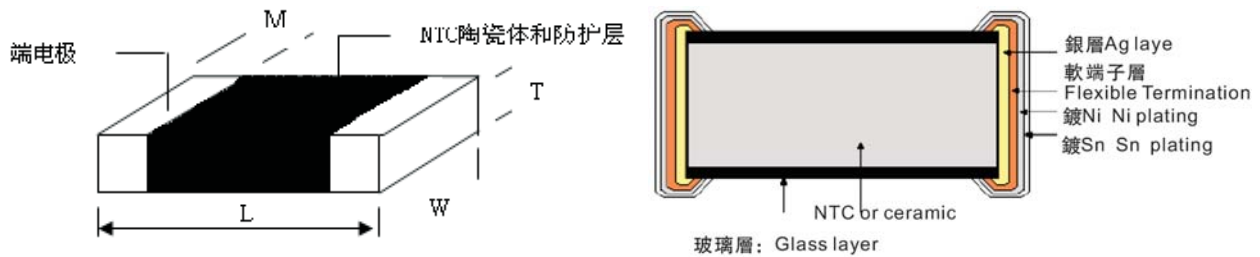
#### Part number identification

AMK	A	103	J	3380	H	A	N	T
①	②	③	④	⑤	⑥	⑦	⑧	⑨

①		②		③		④		⑤		⑥		⑦		⑧	⑨
产品代号 Product code		规格尺寸 (L×W×T) (mm) Dimensions		标称阻值 Rated resistance R25 (Ω)		阻值公差 Tolerance (%)		材料常数 B 值 (K) Material constant		B 值精度 Tolerance (%)		B 值温度代码 B value Temperature Code (℃/℃)		端电极 Termina Electrodel	包装方式 Packaging Style
AMK	车规片式负温度系数热敏电阻器 Automotive Grade Chip NTC Thermistors	D	1.0×0.5	103	10000	F	±1	直接读数 Direct read 3380		F	±1	A	25/50	端电极材料代号: N为三层电镀 Termination Code: NNickelBarrier	T 卷带盘装 Tape&Reel
		A	1.6×0.8	前二位为有效数字, 第三位表示有效数字后“0”的个数 The first two are significant figure of resistance and the thir done expresses number of following zeros.			G	±2		G	±2	B	25/ 85		
		B	2.0×1.2				H	±3		H	±3	C	0/25		B 散装 Bulk
							J	±5				D	0/50		
						K	±10					E	0/100		

### ◆内部结构与外形尺寸

Inner-configuration and dimension



单位(Unit):mm/inch

型号 Size	L	W	T	M
100505 (0402)	1.0±0.15 (0.040±0.006)	0.5±0.15 (0.020±0.006)	0.5±0.15 (0.020±0.006)	0.25±0.10 (0.010±0.004)
160808 (0603)	1.6±0.15 (0.063±0.008)	0.75±0.15 (0.031±0.008)	0.75±0.15 (0.031±0.008)	0.30±0.2 (0.012±0.008)
201209 (0805)	2.0±0.2 (0.079±0.008)	1.25±0.2 (0.047±0.008)	0.9±0.2 (0.035±0.008)	0.5±0.3 (0.020±0.012)

### ◆性能参数

Specification

1005 (0402) Type

型号规格 PartNumber	零功率标称电阻 Zero Power Resistance @ 25°C	B 值 B Value	最大允许工作电 流Maximum Operating Current @ 25°C	热时间常数 Thermal Time Constant	标准耗散常数 Typical Dissipation Constant@ 25°C	额定功率 Rated Electric Power@ 25°C
	R <sub>25</sub> (KΩ)	B <sub>25/50</sub> (k)	(mA)	sec	(mW/°C)	(mW)
AMKD103□3380△ANT	10	3380	0.31	<5	1.0	100
AMKD103□3950△ANT	10	3950	0.31			
AMKD473□3950△ANT	47	3950	0.12			
AMKD104□4050△ANT	100	4050	0.1			
AMKD154□3950△ANT	150	3950	0.08			
AMKD474□4050△ANT	470	4050	0.04			

注：□阻值精度 resistance tolerance, △ B 值精度 B Value tolerance, F: ±1%, G ±2%, H ±3%, J ±5%.

1608 (0603) Type

型号规格 PartNumber	零功率标称电阻 Zero Power Resistance @ 25°C	B 值 B Value	最大允许工作电 流Maximum Operating Current @ 25°C	热时间常数 Thermal Time Constant	标准耗散常数 Typical Dissipation Constant@ 25°C	额定功率 Rated Electric Power@ 25°C
	R <sub>25</sub> (KΩ)	B <sub>25/50</sub> (k)	(mA)	sec	(mW/°C)	(mW)
AMKA103□3380△ANT	10	3380	0.31	<7	1.0	100
AMKA103□3600△ANT	10	3600	0.31			
AMKA103□3950△ANT	10	3950	0.31			

**1608 (0603) Type**

型号规格 PartNumber	零功率标称电阻 Zero Power Resistance @ 25°C	B 值 B Value	最大允许工作电 流Maximum Operating Current @ 25°C	热时间常数 Thermal Time Constant	标准耗散常数 Typical Dissipation Constant@ 25°C	额定功率 Rated Electric Power@ 25°C
	R <sub>25</sub> (KΩ)	B <sub>25/50</sub> (k)	(mA)	sec	(mW/°C)	(mW)
AMKA473□3950△ANT	47	3950	0.14	<7	1.0	100
AMKA473□4150△ANT	47	4150	0.14			
AMKA104□4050△ANT	100	4050	0.1			
AMKA474□4200△ANT	470	4200	0.04			

注：□阻值精度 resistance tolerance, △ B 值精度 B Value tolerance, F: ±1%、G ±2%、H ±3%、J ±5%。

**2012 (0805) Type**

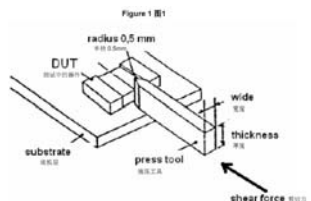
型号规格 PartNumber	零功率标称电阻 Zero Power Resistance @ 25°C	B 值 B Value	最大允许工作电 流Maximum Operating Current @ 25°C	热时间常数 Thermal Time Constant	标准耗散常数 Typical Dissipation Constant@ 25°C	额定功率 Rated Electric Power@ 25°C
	R <sub>25</sub> (KΩ)	B <sub>25/50</sub> (k)	(mA)	sec	(mW/°C)	(mW)
AMKB502□3500△ANT	5	3500	0.6	<9	2.0	200
AMKB103□3600△ANT	10	3600	0.4		2.0	
AMKB103□3950△ANT	10	3950	0.4		2.0	
AMKB223□3950△ANT	22	3950	0.31		2.0	
AMKB473□4050△ANT	47	4050	0.2		2.0	
AMKB104□3950△ANT	100	3950	0.14		2.0	
AMKB154□4050△ANT	150	4050	0.11		2.0	
AMKB224□4050△ANT	220	4050	0.08		2.0	
AMKB474□4150△ANT	470	4150	0.05		2.0	

注：□阻值精度 resistance tolerance, △ B 值精度 B Value tolerance, F: ±1%、G ±2%、H ±3%、J ±5%。

**◆可靠性测试方法**
**Reliability Test Method**

序号 No.	项目 Items	要求 Requirements	试验方法及备注 Test Methods and Remarks
1	工作温度范围 Operating Temperature Range	-40°C~+150°C	
2	高温存储 High Temperature Exposure (Storage)	无可见机械损伤; R25 变化率小于±5%; No mechanical damage. R25 change shall be less than ±5%;	温度 150°C; 不通电; 持续时间 1000h; 试验结束后 (24±4)h 内进行电性能测量。 Temperature 150°C Unpowered. Duration 1000h. Measurement at (24±4) hours after test conclusion.

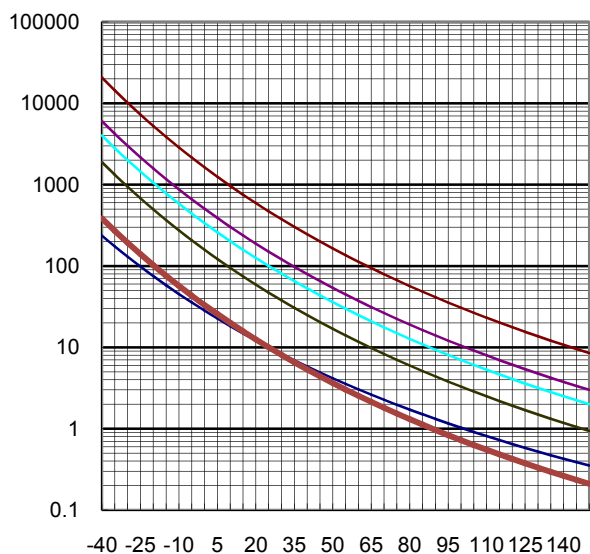
序号 No.	项目 Items	要求 Requirements	试验方法及备注 Test Methods and Remarks
3	温度冲击 Temperature Shock	无可见机械损伤; R25 变化率小于 $\pm 5\%$ ; No mechanical damage. R25change shall be less than $\pm 5\%$ ;	高温 125℃; 低温 -55℃; 每个温度的停留时间不超过30分钟; 转换时间 $\leq 1\text{min}$ ; 循环次数 1000 次。 试验结束后 24 $\pm 4$ 小时内进行测试。 High Temperature +125℃; low temperature -55℃; Duration at each temperature 30 min: Transition time $\leq 1$ min: Severity 1000 cycles: Measurement at 24 $\pm 4$ hours after test Conclusion.
4	耐潮负荷 (高温高湿) Biased Humidity	无可见机械损伤; R25 变化率小于 $\pm 5\%$ ; No mechanical damage. R25change shall be less than $\pm 5\%$ ;	温度: 85℃ 湿度: 85% 施加工作电流-稳定状态; 持续时间: 1000 h 试验结束后 24 $\pm 4$ 小时内进行测试。 Temperature: 85℃; Relative humidity: 85%: With Permissive Operating Current. - steady state; Duration: 1000 h; Measurement at 24 $\pm 4$ hours after test conclusion.
5	工作寿命 Operational Life	无可见机械损伤; R25 变化率小于 $\pm 5\%$ ; No mechanical damage. R25change shall be less than $\pm 5\%$ ;	温度: 150℃; 施加工作电流-稳定状态; 持续时间: 1000 小时; 试验结束后 24 $\pm 4$ 小时内进行测试。 Temperature: 150℃; With Permissive Operating Current. - steady state; Duration: 1000 h; Measurement at 24 $\pm 4$ hours after test conclusion;
6	机械冲击 Mechanical Shock	无可见机械损伤; R25 变化率小于 $\pm 5\%$ ; No mechanical damage. R25change shall be less than $\pm 5\%$ ;	正半弦波; 峰值加速度 1500g; 脉冲持续时间 0.5ms; 三轴六向各 3 次, 共 18 次。 Half sine wave; Peak value 1500g; Normal duration 0.5ms; Three shocks in each direction shall be applied along the three mutually perpendicular axes of the test specimen (18 shocks).
7	振动 Vibration	无可见机械损伤; R25 变化率小于 $\pm 5\%$ ; No mechanical damage. R25change shall be less than $\pm 5\%$ ;	频率 10Hz~2000Hz; 加速度 5g; 一个循环 20 分钟; X、Y、Z 三个方向每个方向 12 个循环, 共 36 个循环; The entire frequency range of 10 to 2000 Hz and return to 10 Hz shall be traversed in 20 minutes. This cycle shall be performed 12 time in each of three mutually perpendicular directions (total of 36 times) so that the motion shall be applied for a total period of approximately 12 hours. Peak value 5g.

序号 No.	项目 Items	要求 Requirements	试验方法及备注 Test Methods and Remarks
8	耐焊接热 Resistance to Soldering Heat	无可见机械损伤; R25 变化率小于 $\pm 5\%$ ; No mechanical damage. R25change shall be less than $\pm 5\%$ ;	焊槽法; 温度 $(260\pm 5)^\circ\text{C}$ ; 浸渍时间 $(10\pm 1)\text{s}$ . Solder bath; Temperature $(260\pm 5)^\circ\text{C}$ ; Immersion timer $(10\pm 1)$ seconds.
9	静电放电 ESD	无可见机械损伤; R25 变化率小于 $\pm 5\%$ ; No mechanical damage. R25change shall be less than $\pm 5\%$ ;	接触放电; 放电电压: 8000V; 每个样品每个电极承受两次放电, 正、负极性各 1 次 Direct contact discharge; Indicated voltage: 8000V; Two discharges shall be applied to each PUT within a sample group and at each stress voltage level, one with a positive polarity and one with a negative polarity.
10	可焊性 Solderability	无可见损伤; 电极面 95%以上覆盖新的焊料。 95% or more of electrode area shall be coated by new solder.	预处理: $155^\circ\text{C}$ 干热 @4h 焊槽法; 无铅焊锡; 焊料温度: $235^\circ\text{C} \pm 5^\circ\text{C}$ 浸渍深度: 10 mm 浸渍时间: $5 \pm 0.5\text{s}$ Pretreatment $155^\circ\text{C}$ dry heat @4h; Solder bath; Lead-free solder; Temperature $235^\circ\text{C} \pm 5^\circ\text{C}$ ; Immersion depth: 10mm; Immersion timer $(5 \pm 0.5)$ seconds.
11	弯曲 Board flex	无可见机械损伤; R25 变化率小于 $\pm 5\%$ ; No mechanical damage. R25change shall be less than $\pm 5\%$ ;	试样安装在厚 1.6mm 环氧玻璃布板上, 以 1mm/s 的速度向下弯曲 1mm; 维持时间 60s(+5s). The testing samples shall be mounted on a $100\text{mm} \times 40\text{mm}$ FR4 PCB board, which is $1.6\text{mm} \pm 0.2\text{mm}$ thick; Bending shall be applied to the 1.0mm with 1.0mm/sec; Duration: 60s(+5s).
12	端子强度 Terminal Strength	无可见机械损伤; R25 变化率小于 $\pm 5\%$ ; No mechanical damage. R25change shall be less than $\pm 5\%$ ;	试样安装在环氧玻璃布板上, 施加 0402 规格: 5N, 0603 规格: 6N, 0805 规格: 10N, 的力到试样的侧面, 保持: 60s(+1s)。 The testing samples shall be mounted on the testing epoxy boards, exerting force on side of the samples, Size 0402: 5N ; Size 0603: 6N ; Size 0805: 10N, Duration : 60s(+1s)。 

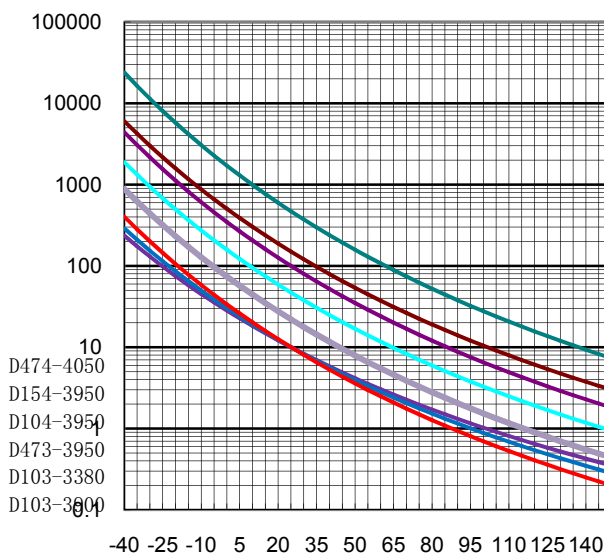
◆阻值温度特性曲线图

Resistance temperature Characteristic Curve

AMKD 系列

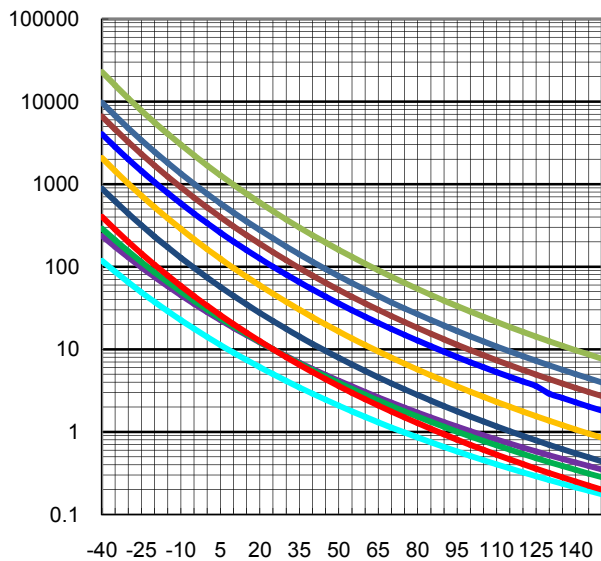


AMKA 系列



A474-4200  
A154-3950  
A104-4050  
A473-3950  
A223-3950  
A103-3380  
A103-3600  
A103-3950

AMKB 系列



A474-4150  
B154-4050  
B104-3950  
B473-4050  
B223-3950  
B103-3380  
B103-3600  
B103-3950  
B502-3380

# ◆包装

## Packaging

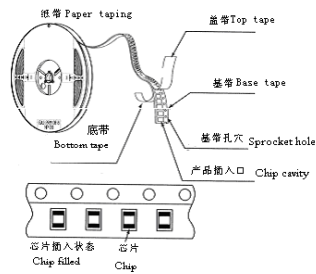
### \*包装数量

Packaging number

类型 SIZE	201209	160808	100505
每卷数量 REEL	4000	4000	10000
每盒数量 BOX	40000	40000	100000
每箱数量 CASE	240000	240000	600000

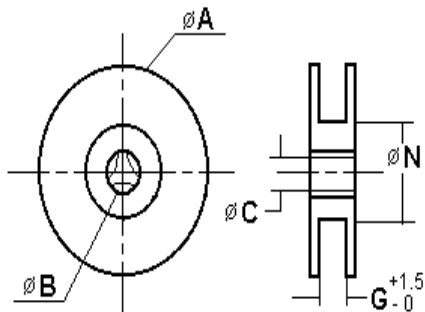
### \* 编带图

Taping drawings



### \* 卷盘尺寸

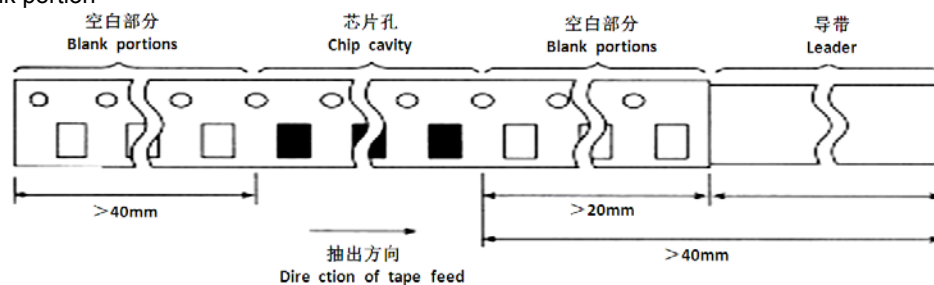
Reel dimensions (Unit: mm)



卷盘 Reel	A	B	C	N	G
CF-8	178±2.0	22.0±2.0	12.5±1.5	57±2.0	8

### \* 导带及空格部分

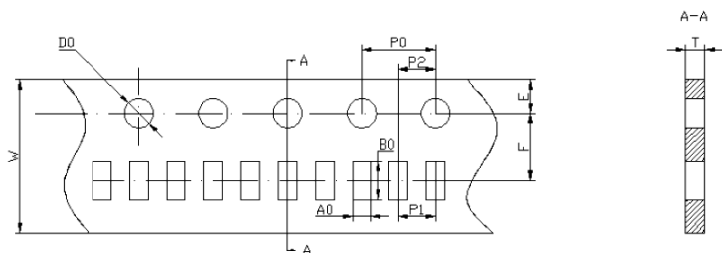
Leader and blank portion



### \* 编带尺寸

Taping dimensions (Unit: mm)

纸带 Paper tape



Part NO.	A0	B0	W	F	E	P1	P2	P0	D0	T
1005	0.59±0.03	1.12±0.03	8.0±0.1	3.5±0.05	1.75±0.1	2.0±0.05	2.0±0.05	4.0±0.1	1.55±0.05	0.60±0.03
1608	1.10±0.2	1.90±0.2	8.0±0.2	3.5±0.1	1.75±0.2	4.0±0.2	2.0±0.1	4.0±0.2	1.55±0.1	0.95±0.1
2012	1.50±0.2	2.30±0.2	8.0±0.2	3.5±0.1	1.75±0.2	4.0±0.2	2.0±0.1	4.0±0.2	1.55±0.1	0.95±0.1

### ◆环保情况说明

#### Environmental Protection Statement

\*RoHS 指令：本公司产品符合 RoHS 指令。

Response to RoHS directive: Our products are RoHS compliance.

### ◆推荐焊接工艺

#### Recommended Soldering Technologies

##### \*回流焊 Re-flowing Profile

● 预热不足有可能引发产品表面裂纹，从而导致产品品质下降。预热温度与最高温度之间的差值应 $\leq 100^{\circ}\text{C}$ 。  
 Un-enough pre-heating may cause cracks on the ferrite, resulting in the deterioration of product quality. The difference between the preheating temperature and the maximum temperature should be less than  $100^{\circ}\text{C}$

● 不建议将元件浸泡溶剂或使用其他方法来快速冷却元件。

Rapid cooling by dipping in solvent or by other means is not recommended.

##### ● 回流焊接条件 REFLOW SOLDERING CONDITIONS

预热条件：150 ~ 200 $^{\circ}\text{C}$  / 60 ~ 120 秒

Preheat condition: 150 ~ 200 $^{\circ}\text{C}$  / 60~120sec

允许大于 217 $^{\circ}\text{C}$  时间：60—90 秒

Allowed time above 217 $^{\circ}\text{C}$ : 60~90sec

最大温度：260  $^{\circ}\text{C}$

max temp: 260  $^{\circ}\text{C}$

最高温的最大时间：10 秒

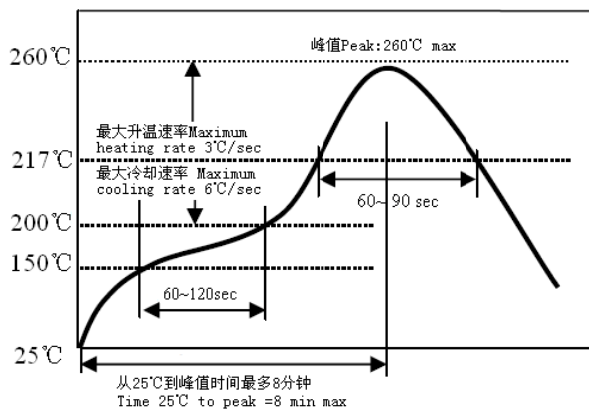
max time at max temp: 10 sec

焊膏：Sn/3.0Ag/0.5Cu

Solder paste: Sn/3.0Ag/0.5Cu

回流焊次数：最多 2 次

Allowed Reflow time: 2x max



注意：上表中回流焊曲线仅谨作参考，并非为指定的回流焊工艺。实际的电路板组装配置必须根据客户具体的电路板设计、焊膏和工艺，并且不应超过以上回流焊曲线参数。

Note: The reflow profile in the above table is for reference only and is not the specified reflow process. Actual board assembly configuration must be based on the customer's specific board design, solder paste and process, and should not exceed the parameters as the reflow profile shows.



### \*手工焊接

#### Iron soldering

- 烙铁温度：350℃（Max）

Soldering Tip temperature: 350℃Max.

- 烙铁功率：最大为 30W

Iron soldering power: Max.30W

- 烙铁头直径：Φ3mm (max.)

- Diameter of Soldering Iron-tip: Φ3mm (max.)

- 烙铁停留时间：<3S（注意不要将烙铁碰到产品端电极）。

Soldering Time: < 3S（Take care not to apply the tip of the soldering iron to the terminal electrodes）.

- 手工焊接：最多 1 次

Max.1 times for iron soldering

#### 注意：

常规情况下不建议用烙铁焊接，如用烙铁焊接需注意烙铁头的温度管理和焊接工艺控制。烙铁温度急剧变化所产生的压力将直接作用在热敏电阻上，骤热或骤冷、两端焊锡不均匀、产品高低不平等等都会使热敏电阻内部产生较大的热应力，将引发热裂纹。因此用烙铁焊接时需慎重评估相关条件及方法。

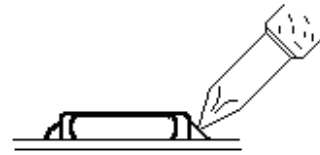
Note: In normal circumstances, soldering with soldering iron is not recommended. If welding with soldering iron, please pay attention to the temperature of the soldering iron head and welding process control. The pressure caused by sharp temperature change of soldering iron will act directly on the thermistor. Sudden heat or cold, uneven solder at both ends, uneven product will cause big thermal stress in the thermistor, which will cause hot cracks. Therefore, it is necessary to evaluate the relevant conditions and methods carefully when welding with soldering iron.

建议采用热风方法进行维修。

hot air methods are recommended for repair purposes.

用烙铁焊接过一次并拆卸后的产品不可使用。

Once the product is welded with soldering iron and disassembled, it can't be used.



### \*清洗 Cleaning

- 清洗条件Cleaning Conditions

清洗温度：60℃（最高）Cleaning temperature : 60℃ max

清洗时间：1 分钟（最少）Cleaning time: 1 minute min.

超声波功率：最大为 200W Ultrasonic output power: 200W max

进行超声波清洗时，请防止安装部分与基板发生共振。

Please keep mounted parts and a substrate from an occurrence of resonance in ultrasonic cleaning.

### \*存储要求 Storage Requirements

- 存储期限 Storage period

距电感公司出厂检验时间 1 年内，产品可以使用检验时间可以通过包装外侧标记的检验号确认。若时间超过 1 年，应检查焊接性能后方可使用。

Products which inspected inductor company over 1 year ago should be examined and used, which can be Confirmed with inspection No. marked on the container. Solder ability should be checked if this period is exceeded.

- 存储条件 Storage conditions

存放货物的库房应满足以下条件：温度：-10~+40℃，相对湿度：30~70%。

Products should be storage in the warehouse on the following conditions:

Temperature : -10~+40℃ Humidity: 30~70% relative humidity

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 case 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

### \*操作注意事项 OPERATING CONSIDERATIONS

本产品的陶瓷元件为易碎材料制成，使用时务必小心不要施加过大压力或引起冲击。此类强力可能会造成产品破裂或破碎。

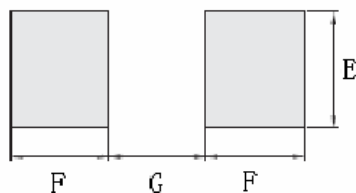
The ceramic of this product is fragile, and care mustbe taken not to load an excessive press - force orto give a shock at handling. Such forces may cause cracking or chipping.

### \* PC 板的设计 PCB design

当片式NTCR被安装在PC板上后，所使用的焊料的量（焊盘的大小）会直接影响到片式NTCR的性能，因此在设计基板时，必须慎重考虑焊盘的大小和配置，这些对组成基板的焊料的量有着决定的作用，过量的焊料会影响到芯片耐机械应力的能力。

When chip thermistors are mounted on a PCB, the amount of solder used(size of fillet) can directly affect thermistor performance Therefore, when design land- patterns it is necessary to consider the appropriate size and configuration of the solder pads, which determines the amount of solder necessary to form the fillets. Excess solder can affect the ability of chips to withstand mechanical stress.

推荐最大焊盘尺寸 Recommended maximum dimensions (mm)



型号 SIZE	E	F	G
0402	0.60	0.60	0.50
0603	1.00	1.00	1.00
0805	1.40	1.20	1.00
1206	1.80	1.20	2.00

基板配置：将片式 NTCR 安装在板上之后，芯片将承受在下一加工过程中产生的机械应力，出于这个原因，在设计焊盘和片式 NTCR 的位置时，应注意考虑将应力减少到最低点。

Pattern configurations: After chip thermistor have been mounted on the board, chips can be subject to mechanical stresses in subsequent manufacturing process , for this reason, planning pattern configurations and the position of SMD thermistors should be carefully performed to minimize stress.

### \*自动安装应考虑到问题 Considerations for automatic placement.

在将片式 NTCR 安装在 PC 板上时，不能让其承受过量的冲击力。

Excessive impact load should not be imposed on the thermistor when mounting on the PCB .

应定期对安装机器进行维护和检查。

The maintenance and inspection of the mounting devices should be conducted periodically .

当 PC 板沿着接缝孔切割开时, 片式 NTCR 所受机械应力的大小因使用的方法不同而不同。以下方法按应力从小到大进行排列: 推板、割裂、V 形凹槽、接缝孔。因此。任何理想的片式 NTCR 的布局必须考虑到 PC 板的分割方法。

When beating PCB along their perforations, the amount of mechanical stress on the thermistor can vary according to the method used. The following methods are listed in order from least stressful to most stressful: push-back, slit, v-grooving, and perforation. Thus, any ideal SMD thermistor layout must also consider the PCB splitting procedure.

**\*焊膏的印刷 printing solder paste**

焊膏的印刷厚度建议在 150  $\mu$ m~200  $\mu$ m。

Recommendable thickness of solder paste printing should from 150 $\mu$ m to 200 $\mu$ m.

焊接后, 爬锡高度为 0.2MM 至本产品的厚度。

After soldering, the solder fillet shall be a height from 0.2mm to the thickness of chip thermistor.

过多的焊料将给本产品过大的机械应力, 这些应力将导致断裂或机械损伤, 也可能破坏产品的电性能。

Too much solder gives too strong mechanical stress to chip thermistor, such stress may cause cracking or any mechanical damage. And also, it can destroy the electrical performance of this product.

[illegible]

12