

# 规格承认书

## SPECIFICATION

编号(No): .....

日期(Date): .....

客户 (Customer): .....

品名(Product Name): 片式NTC热敏电阻 Chip NTC thermistor

恭成料号 (QAMCN Part Number) : QN0603X104F4250FB

客户规格(Customer's Part Number): .....

客户承认 CUSTOMER CONFIRM			
承认章 STAMP	核准 APPROVE	审核 CHECK	经办人 SIGNATURE

### 恭成科技有限公司

## Quest for Advanced Materials Electronics Co., Ltd.

营销中心: 广东省深圳市龙华新区观澜银星科技大厦 518109

Marketing Center: Yinxing Technology Building, Guanlan, Longhua new district, Shenzhen 518109

电话 Tel: 0086-755-23732935 传真 Fax: 0086-755-23762516

制造中心: 河北省唐山市曹妃甸工业区中日生态园 063200

Manufactory: Sino-Japan Eco-industrial park, Caofeidian industrial district, Tangshan, Hebei, China 063200

电话 Tel: 0086-315-7332530

网址 Website: <https://www.qamcn.com>

邮箱 E-Mail: [qam@qamcn.com](mailto:qam@qamcn.com)

**1 外形尺寸 Shape and Dimensions**

- 尺寸：见图 1 和表 1
- PCB 焊盘：见图 2 和表 1
- Dimensions: See Fig.1 and Table 1.
- Recommended PCB pattern for reflow soldering: See Fig.2 and Table 1

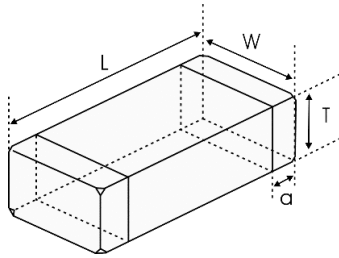


图 1 Fig.1

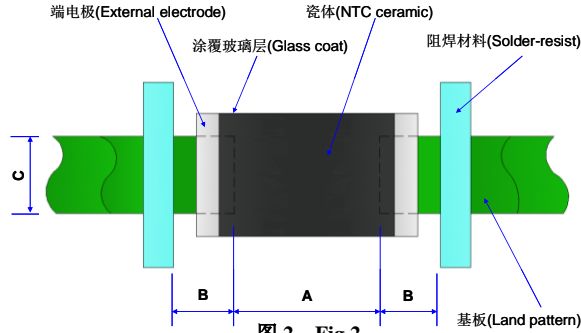


图 2 Fig.2

表 1 (Table 1)

单位 unit: inch[mm]

类别 Type	L	W	T	a	A	B	C
0603 [1608]	0.063±0.006 [1.6±0.15]	0.031±0.006 [0.8±0.15]	0.031±0.006 [0.8±0.15]	0.012±0.008 [0.3±0.2]	[0.6-0.8]	[0.6-0.7]	[0.6-0.8]

**2 产品标识 (料号) Product Identification(Part Number)**

**QN 0603 X 104 F 4250 F B**  
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① 类别 Type	
QN	片式 NTC 热敏电阻器 Chip NTC Thermistor
② 外形尺寸(mm) External Dimensions (L×W×T)	
0201[0603]	0.60×0.30×0.30
0402[1005]	1.00×0.50×0.50
0603[1608]	1.60×0.80×0.80
0805[2012]	2.00×1.25×0.85
1206[3216]	3.20×1.60×0.85
③ 分隔符 Delimiter	
X	

④ 25℃的零功率电阻 Nominal Zero-Power Resistance	
472	4.7kΩ
683	68kΩ
104	100kΩ

⑤ 电阻值公差 Tolerance of Resistance	
F	±1%
G	±2%
H	±3%
J	±5%

⑥ B 值常数 B Constant	
3600	3600K
3950	3950K
4250	4250K

⑦ B 值公差 Tolerance of B Constant	
F	±1%
H	±3%

⑧ B 值计算方式 B constant calculation method	
A	25℃&85℃
B	25℃&50℃

**3 电气特性 Electrical Characteristics**

型号 Part No	电阻值 Resistance (25℃) (kΩ)	B 常数 B Constant (25/50℃) (K)	B 常数 B Constant (25/85℃) (K)	允许工作电流 Permissible Operating Current (25℃) (mA)	耗散系数 Dissipation Factor (mW/℃)	热时间常数 Thermal Time Constant (s)	额定功率 Rated Electric Power(25℃) (mW)	工作温度 Operating ambient temperature (℃)
QN0603X104F4250FB	100±1%	4250±1%	4310	0.10	1.0	<5	100	-40~+125

**4 检验和测试程序**

**测试条件**

如无特别规定，检验和测试的标准大气环境条件如下：

- a. 环境温度：20±15℃；
- b. 相对湿度：65±20%；
- c. 气压：86 kPa~106 kPa

如果对测试结果有异议，则在下述条件下测试：

- a. 环境温度：25±2℃；
- b. 相对湿度：65±5%
- c. 气压：86kPa ~ 106kPa

**检查设备**

外观检查：20 倍放大镜；  
阻值检查：热敏电阻测试仪

**4 Test and Measurement Procedures**

**Test Conditions**

Unless otherwise specified, the standard atmospheric conditions for measurement/test as:

- a. Ambient Temperature: 20±15℃
- b. Relative Humidity: 65±20%
- c. Air Pressure: 86kPa to 106kPa

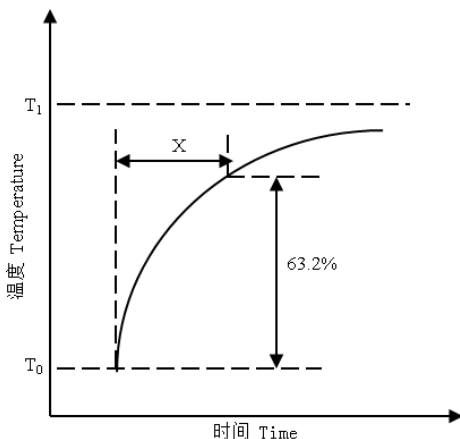
If any doubt on the results, measurements/tests should be made within the following limits:

- a. Ambient Temperature: 25±2℃
- b. Relative Humidity: 65±5%
- c. Air Pressure: 86kPa to 106kPa

**Inspection Equipment**

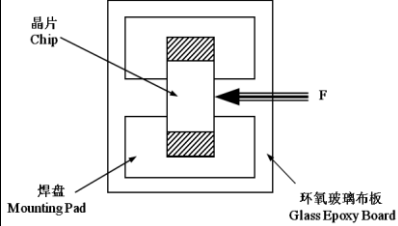
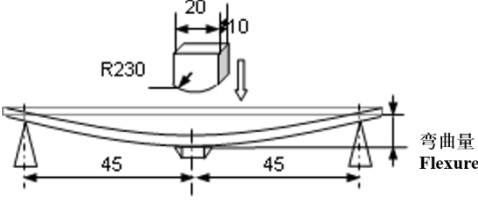
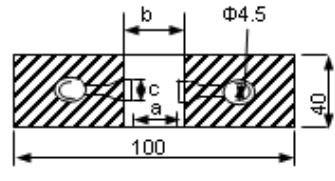
Visual Examination: 20× magnifier  
Resistance value test: Thermistor resistance tester

**5 电性测试 Electrical Test**

序号 No.	项目 Items	测试方法及备注 Test Methods and Remarks
1	25℃零功率电阻值 Nominal Zero-Power Resistance at 25℃(R25)	环境温度 Ambient temperature: 25±0.05℃ 测试功率 Measuring electric power: ≤0.1mW
2	B 值常数 Nominal B Constant	分别在环境温度 25±0.05℃, 50±0.05℃或 85±0.05℃下测量电阻值。 Measure the resistance at the ambient temperature of 25±0.05℃, 50±0.05℃ or 85±0.05℃. $B(25-50^{\circ}\text{C}) = \frac{\ln R_{25} - \ln R_{50}}{1/T_{25} - 1/T_{50}} \quad B(25-85^{\circ}\text{C}) = \frac{\ln R_{25} - \ln R_{85}}{1/T_{25} - 1/T_{85}}$ T: 绝对温度 (K) Absolute temperature (K)
3	热时间常数 Thermal Time Constant	在零功率条件下，当热敏电阻的环境温度发生急剧变化时，热敏电阻元件产生最初温度 T0 与最终温度 T1 两者温度差的 63.2%的温度变化所需要的时间，通常以秒(S)表示。 The total time for the temperature of the thermistor to change by 63.2% of the difference from ambient temperature T <sub>0</sub> (°C) to T <sub>1</sub> (°C) by the drastic change of the power applied to thermistor from Non-zero Power to Zero-Power state, normally expressed in second(S). 

4	耗散系数 Dissipation Factor	在一定环境温度下，NTC 热敏电阻通过自身发热使其温度升高 1℃ 时所需要的功率，通常以 mW/℃ 表示。可由下面公式计算： The required power which makes the NTC thermistor body temperature raise 1℃ through self-heated, normally expressed in milliwatts per degree Celsius (mW/℃). It can be calculated by the following formula: $\delta = \frac{W}{T-T_0}$
5	额定功率 Rated Power	在环境温度 25℃ 下因自身发热使表面温度升高 100℃ 所需要的功率。 The necessary electric power makes thermistor's temperature rise 100℃ by self-heating at ambient temperature 25℃.
6	允许工作电流 Permissible operating current	在静止空气中通过自身发热使其升温为 1℃ 的电流。 The current that keep body temperature of chip NTC on the PC board in still air rising 1℃ by self-heating.

**6 信赖性试验 Reliability Test**

项目 Items	测试标准 Standard	测试方法及备注 Test Methods and Remarks	要求 Requirements																														
端头附着力 Terminal Strength	IEC 60068-2-21	<p>将晶片焊接在测试基板上（如右图所示的环氧玻璃布板），按箭头所示方向施加作用力； Solder the chip to the testing jig (glass epoxy board shown in the right) using eutectic solder. Then apply a force in the direction of the arrow.</p> <table border="1"> <tr> <th>尺寸 Size</th> <th>F</th> <th>保持时间 Duration</th> </tr> <tr> <td>0201, 0402, 0603</td> <td>5N</td> <td rowspan="2">10±1s</td> </tr> <tr> <td>0805</td> <td>10N</td> </tr> </table>	尺寸 Size	F	保持时间 Duration	0201, 0402, 0603	5N	10±1s	0805	10N	<p>端电极无脱落且瓷体无损伤。 No removal or split of the termination or other defects shall occur.</p> 																						
尺寸 Size	F	保持时间 Duration																															
0201, 0402, 0603	5N	10±1s																															
0805	10N																																
抗弯强度 Resistance to Flexure	IEC 60068-2-21	<p>将晶片焊接在测试基板上（如右图所示的环氧玻璃布板），按下图箭头所示方向施加作用力； Solder the chip to the test jig (glass epoxy board shown in the right) using a eutectic solder. Then apply a force in the direction shown as follow;</p>  <table border="1"> <tr> <th>尺寸 Size</th> <th>弯曲变形量 Flexure</th> <th>施压速度 Pressurizing Speed</th> <th>保持时间 Duration</th> </tr> <tr> <td>0201,</td> <td>1mm</td> <td rowspan="2">&lt;0.5mm/s</td> <td rowspan="2">10±1s</td> </tr> <tr> <td>0402, 0603, 0805</td> <td>2mm</td> </tr> </table>	尺寸 Size	弯曲变形量 Flexure	施压速度 Pressurizing Speed	保持时间 Duration	0201,	1mm	<0.5mm/s	10±1s	0402, 0603, 0805	2mm	<p>① 无外观损伤。 No visible damage. ②  ΔR25/R25  ≤ 5%</p> <p>单位 unit: mm</p> <table border="1"> <tr> <th>类型 Type</th> <th>a</th> <th>b</th> <th>c</th> </tr> <tr> <td>0201</td> <td>0.25</td> <td>0.3</td> <td>0.3</td> </tr> <tr> <td>0402</td> <td>0.4</td> <td>1.5</td> <td>0.5</td> </tr> <tr> <td>0603</td> <td>1.0</td> <td>3.0</td> <td>1.2</td> </tr> <tr> <td>0805</td> <td>1.2</td> <td>4.0</td> <td>1.65</td> </tr> </table> 	类型 Type	a	b	c	0201	0.25	0.3	0.3	0402	0.4	1.5	0.5	0603	1.0	3.0	1.2	0805	1.2	4.0	1.65
尺寸 Size	弯曲变形量 Flexure	施压速度 Pressurizing Speed	保持时间 Duration																														
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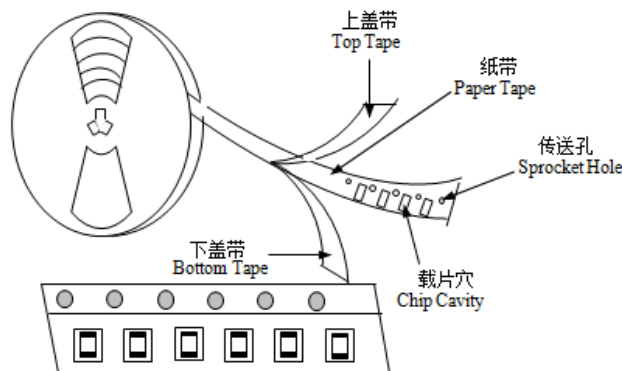
<p>振动 Vibration</p>	<p>IEC 60068-2-80</p>	<p>① 将晶片焊接在测试基板上（如右图所示的环氧玻璃布板）； Solder the chip to the testing jig (glass epoxy board shown in the left) using eutectic solder.</p> <p>② 晶片以全振幅为 1.5mm 进行振动，频率范围为 10Hz ~55 Hz； The chip shall be subjected to a simple harmonic motion having total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55 Hz.</p> <p>③ 振动频率按 10Hz→55Hz→10Hz 循环，周期为 1 分钟，在空间三个互相垂直的方向上各振动 2 小时（共 6 小时）。 The frequency ranges from 10 to 55 Hz and return to 10 Hz shall be traversed in approximately 1 minute. This motion shall be applied for a period of 2 hours in each 3 mutually perpendicular directions (total of 6 hours).</p>	<p>无外观损伤。 No visible damage.</p> 															
<p>坠落 Dropping</p>	<p>IEC 60068-2-32</p>	<p>从 1m 的高度让晶片自由坠落至水泥地面 10 次。 Drop a chip 10 times on a concrete floor from a height of 1 meter.</p>	<p>无外观损伤。 No visible damage.</p>															
<p>可焊性 Solderability</p>	<p>IEC 60068-2-58</p>	<p>① 焊接温度 Solder temperature: 245±5℃. ② 浸渍时间 Duration: 3±0.3s. ③ 焊锡成分 Solder: Sn/3.0Ag/0.5Cu. ④ 助焊剂 Flux:（重量比）25%松香和 75%酒精 25% Resin and 75% ethanol in weight.</p>	<p>① 无外观损伤； No visible damage. ② 元件端电极的焊锡覆盖率不小于 95%。 Wetting shall exceed 95% coverage.</p>															
<p>耐焊性 Resistance to Soldering Heat</p>	<p>IEC 60068-2-58</p>	<p>① 焊接温度 Solder temperature: 260±5℃. ② 浸渍时间 Duration: 10±1s. ③ 焊锡成分 Solder: Sn/3.0Ag/0.5Cu. ④ 助焊剂 Flux:（重量比）25%松香和 75%酒精 25% Resin and 75% ethanol in weight. ⑤ 试验后标准条件下放置 1~2 小时后测量。 The chip shall be stabilized at normal condition for 1~2 hours before measuring.</p>	<p>① 无外观损伤； No visible damage. ② <math> \Delta R_{25}/R_{25}  \leq 5\%</math> ③ <math> \Delta B/B  \leq 2\%</math></p>															
<p>温度周期 Temperature cycling</p>	<p>IEC 60068-2-14</p>	<p>① 无负载于下表所示的环境条件下重复 5 次。 5 cycles of following sequence without loading.</p> <table border="1" data-bbox="491 1429 1040 1624"> <thead> <tr> <th>步骤 Step</th> <th>温度 Temperature</th> <th>时间 Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-40±5℃</td> <td>30±3min</td> </tr> <tr> <td>2</td> <td>25±2℃</td> <td>5±3min</td> </tr> <tr> <td>3</td> <td>125±2℃</td> <td>30±3min</td> </tr> <tr> <td>4</td> <td>25±2℃</td> <td>5±3min</td> </tr> </tbody> </table> <p>② 试验后标准条件下放置 1~2 小时后测量。 The chip shall be stabilized at normal condition for 1~2 hours before measuring.</p>	步骤 Step	温度 Temperature	时间 Time	1	-40±5℃	30±3min	2	25±2℃	5±3min	3	125±2℃	30±3min	4	25±2℃	5±3min	<p>① 无外观损伤； No visible damage. ② <math> \Delta R_{25}/R_{25}  \leq 3\%</math> ③ <math> \Delta B/B  \leq 2\%</math></p>
步骤 Step	温度 Temperature	时间 Time																
1	-40±5℃	30±3min																
2	25±2℃	5±3min																
3	125±2℃	30±3min																
4	25±2℃	5±3min																
<p>高温存放 Resistance to dry heat</p>	<p>IEC 60068-2-2</p>	<p>① 在 125±5℃ 空气中，无负载放置 1000±24 小时。 125±5℃ in air, for 1000±24 hours without loading. ② 试验后标准条件下放置 1~2 小时后测量。 The chip shall be stabilized at normal condition for 1~2 hours before measuring.</p>	<p>① 无外观损伤； No visible damage. ② <math> \Delta R_{25}/R_{25}  \leq 5\%</math> ③ <math> \Delta B/B  \leq 2\%</math></p>															

低温存放 Resistance to cold	IEC 60068-2-1	① 在-40±3℃空气中，无负载放置 1000±24 小时。 -40±3℃ in air, for 1000±24 hours without loading. ② 试验后标准条件下放置 1~2 小时后测量。 The chip shall be stabilized at normal condition for 1~2 hours before measuring.	① 无外观损伤； No visible damage. ② $ \Delta R25/R25  \leq 5\%$ ③ $ \Delta B/B  \leq 2\%$
湿热存放 Resistance to damp heat	IEC 60068-2-78	① 在 40±2℃，相对湿度 90~95%空气中，无负载放置 1000±24 小时。 40±2℃, 90~95%RH in air, for 1000±24 hours without loading. ② 试验后标准条件下放置 1~2 小时后测量。 The chip shall be stabilized at normal condition for 1~2 hours before measuring.	① 无外观损伤； No visible damage. ② $ \Delta R25/R25  \leq 3\%$ ③ $ \Delta B/B  \leq 2\%$
高温负荷 Resistance to high temperature load	IEC 60539-1 5.25.4	① 在 85±2℃空气中，施加允许工作电流 1000±48 小时。 85±2℃ in air with permissive operating current for 1000±48 hours ② 试验后标准条件下放置 1~2 小时后测量。 The chip shall be stabilized at normal condition for 1~2 hours before measuring.	① 无外观损伤； No visible damage. ② $ \Delta R25/R25  \leq 5\%$ ③ $ \Delta B/B  \leq 2\%$

**7 编带 Taping**

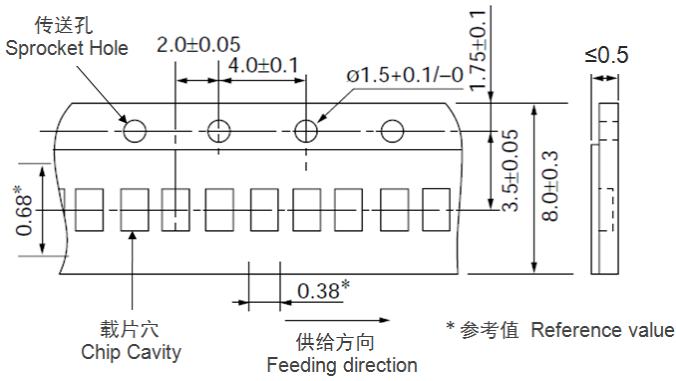
类型 Type	0201	0402	0603	0805
编带厚度 Tape thickness(mm)	0.5±0.15	0.5±0.15	0.8±0.15	0.85±0.2
编带材质 Tape material	纸带 Paper Tape			
每盘数量 Quantity per Reel	15K	10K	4K	4K

(1) 编带图 Taping Drawings

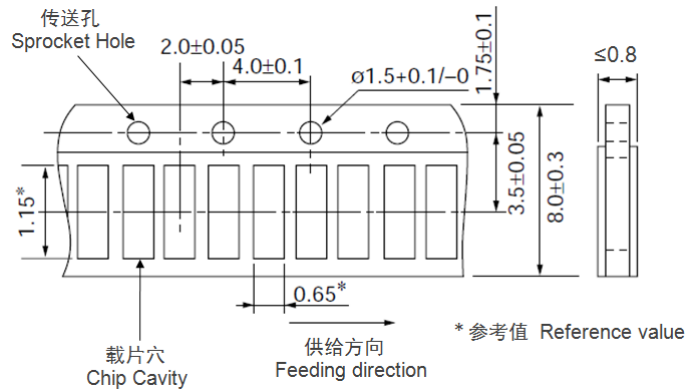


(2) 纸带尺寸 Paper Tape Dimensions (单位 Unit: mm)

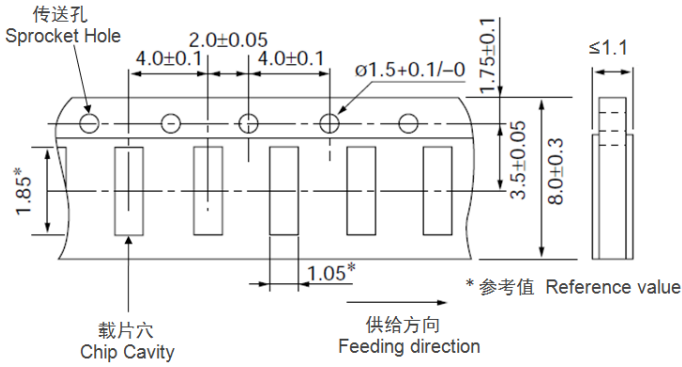
QN0201 系列 QN0201 series



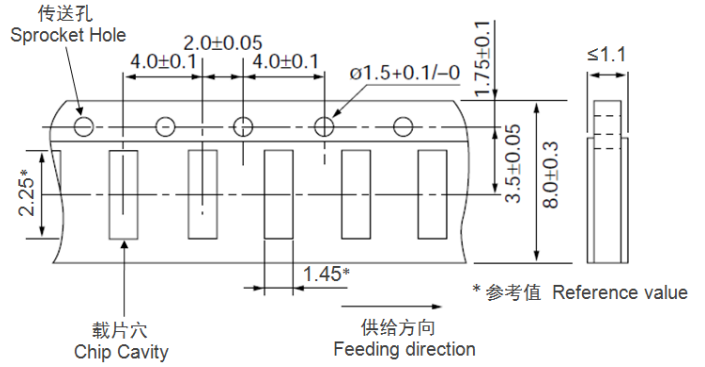
QN0402 系列 QN0402 series



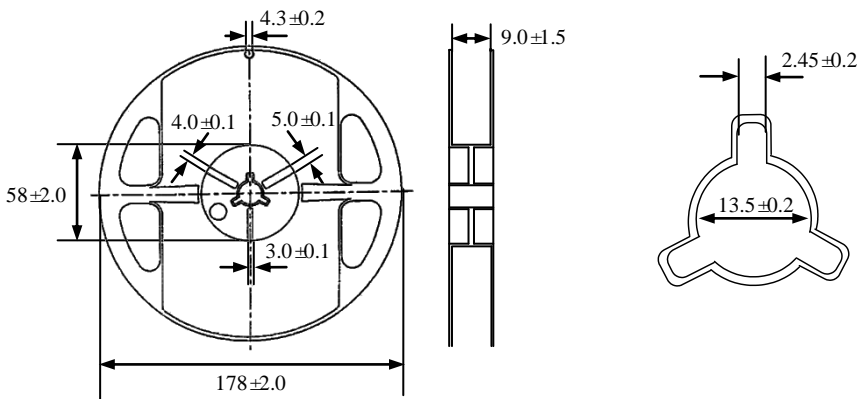
QN0603 系列 QN0603 series



QN0805 系列 QN0805 series



(3) 卷盘尺寸 Reel Dimensions (单位 Unit: mm)



## 8 储存

- **储存条件**
  - a. 储存温度:  $-10^{\circ}\text{C} \sim 40^{\circ}\text{C}$
  - b. 相对湿度:  $\leq 75\% \text{RH}$
  - c. 避免接触粉尘、腐蚀性气氛和阳光
- **储存期限: 产品交付后 6 个月**

## 9 注意事项

- QN 系列热敏电阻不可在以下条件下工作或储存:
  - (1) 腐蚀性气体或还原性气体  
(氯气、硫化氢气体、氨气、硫酸气体、一氧化氮等)。
  - (2) 挥发性或易燃性气体
  - (3) 多尘条件
  - (4) 高压或低压条件
  - (5) 潮湿场所
  - (6) 存在盐水、油、化学液体或有机溶剂的场所
  - (7) 强烈振动
  - (8) 存在类似有害条件的其他场所
- QN 系列热敏电阻的陶瓷属于易碎材料, 使用时不可施加过大压力或冲击。
- QN 系列热敏电阻不可在超过目录规定的温度范围情况下工作。

## 8 Storage

- **Storage Conditions**
  - a. Storage Temperature:  $-10^{\circ}\text{C} \sim 40^{\circ}\text{C}$
  - b. Relative Humidity:  $\cong 75\% \text{RH}$
  - c. Keep away from corrosive atmosphere and sunlight.
- **Period of Storage: 6 Months after delivery**

## 9 Notes & Warnings

- The QN series thermistors shall not be operated and stored under the following environmental condition:
  - (1) Corrosive or deoxidized atmospheres  
(such as chlorine, sulfurated hydrogen, ammonia, sulfuric acid, nitric oxide and so on)
  - (2) Volatile or inflammable atmospheres
  - (3) Dusty condition
  - (4) Excessively high or low pressure condition
  - (5) Humid site
  - (6) Places with brine, oil, chemical liquid or organic solvent
  - (7) Intense vibration
  - (8) Places with analogously deleterious conditions
- The ceramic body of the QN series thermistors is fragile, no excessive pressure or impact shall be exerted on it.
- The QN series thermistors shall not be operated beyond the specified "Operating Temperature Range" in the catalog.

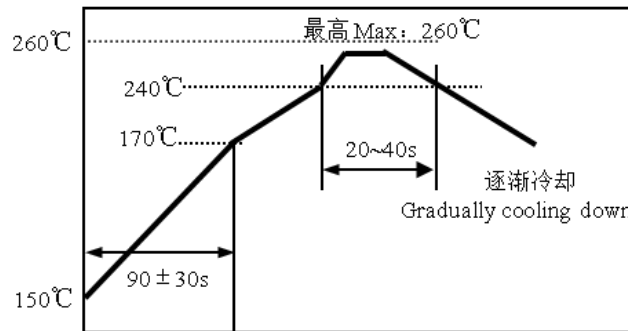


**10 建议焊接条件**

- 回流焊
  - 温升 1~2°C/sec.
  - 预热: 150~170°C/90±30 sec.
  - 大于 240°C 时间: 20~40sec
  - 峰值温度: 最高 260°C/10 sec.
  - 焊锡: Sn/3.0Ag/0.5Cu
  - 回流焊: 最多 2 次

**10 Recommended Soldering Technologies**

- **Re-flowing Profile**
  - 1~2°C/sec. Ramp
  - Pre-heating: 150~170°C/90±30 sec.
  - Time above 240°C: 20~40 sec.
  - Peak temperature: 260°C Max./10 sec.
  - Solder paste: Sn/3.0Ag/0.5Cu
  - Max.2 times for re-flowing



• 手工焊

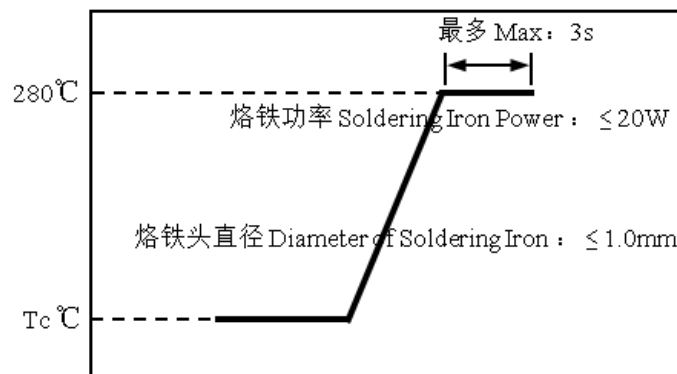
- 烙铁功率: 最大 20W
- 预热: 150°C/60sec.
- 烙铁头温度: 最高 280°C
- 焊接时间: 最多 3sec.
- 焊锡: Sn/3.0Ag/0.5Cu
- 手工焊: 最多 1 次

• **Iron Soldering Profile**

- Iron soldering power: Max.20W
- Pre-heating: 150°C/60sec.
- Soldering Tip temperature: 280°C Max.
- Soldering time: 3 sec Max.
- Solder paste: Sn/3.0Ag/0.5Cu
- Max.1 times for iron soldering

[注: 不要使烙铁头接触到端头]

[Note: Take care not to apply the tip of the soldering iron to the terminal electrodes.]



## 11 R-T 表 R-T table

## QN0603X104F4250FB

温度 Temp. (°C)	R 最小值 R_Min (Kohm)	R 中心值 R_Cent (Kohm)	R 最大值 R_Max (Kohm)	阻值公差 Res TOL.	温度公差 Temp. TOL.(°C)
-40	4,191.522	4,397.119	4,612.340	4.89%	0.66
-39	3,904.301	4,092.874	4,290.126	4.82%	0.65
-38	3,638.686	3,811.717	3,992.576	4.74%	0.65
-37	3,392.915	3,551.749	3,717.646	4.67%	0.64
-36	3,165.377	3,311.236	3,463.470	4.60%	0.64
-35	2,954.603	3,088.599	3,228.349	4.52%	0.63
-34	2,759.251	2,882.396	3,010.735	4.45%	0.63
-33	2,578.097	2,691.310	2,809.213	4.38%	0.62
-32	2,410.018	2,514.137	2,622.492	4.31%	0.62
-31	2,253.988	2,349.778	2,449.393	4.24%	0.61
-30	2,109.070	2,197.225	2,288.836	4.17%	0.61
-29	1,974.402	2,055.558	2,139.835	4.10%	0.60
-28	1,849.196	1,923.932	2,001.488	4.03%	0.59
-27	1,732.729	1,801.573	1,872.966	3.96%	0.59
-26	1,624.337	1,687.773	1,753.511	3.89%	0.58
-25	1,523.411	1,581.881	1,642.430	3.83%	0.58
-24	1,429.203	1,483.100	1,538.875	3.76%	0.57
-23	1,341.418	1,391.113	1,442.505	3.69%	0.57
-22	1,259.579	1,305.413	1,352.779	3.63%	0.56
-21	1,183.249	1,225.531	1,269.196	3.56%	0.55
-20	1,112.022	1,151.037	1,191.301	3.50%	0.55
-19	1,045.527	1,081.535	1,118.671	3.43%	0.54
-18	983.422	1,016.661	1,050.919	3.37%	0.53
-17	925.389	956.080	987.689	3.31%	0.53
-16	871.138	899.481	928.652	3.24%	0.52
-15	820.400	846.579	873.505	3.18%	0.52
-14	772.928	797.111	821.969	3.12%	0.51
-13	728.490	750.834	773.786	3.06%	0.50
-12	686.877	707.524	728.718	3.00%	0.50
-11	647.891	666.972	686.547	2.93%	0.49
-10	611.352	628.988	647.069	2.87%	0.48
-9	577.042	593.342	610.042	2.81%	0.48
-8	544.864	559.931	575.357	2.75%	0.47
-7	514.674	528.602	542.852	2.70%	0.46
-6	486.337	499.212	512.377	2.64%	0.46
-5	459.730	471.632	483.794	2.58%	0.45
-4	434.767	445.772	457.009	2.52%	0.44
-3	411.305	421.480	431.863	2.46%	0.43
-2	389.245	398.652	408.245	2.41%	0.43
-1	368.496	377.193	386.056	2.35%	0.42
0	348.972	357.012	365.200	2.29%	0.41
1	330.575	338.006	345.569	2.24%	0.41

2	313.254	320.122	327.107	2.18%	0.40
3	296.941	303.287	309.737	2.13%	0.39
4	281.571	287.434	293.389	2.07%	0.38
5	267.084	272.500	277.997	2.02%	0.38
6	253.425	258.426	263.501	1.96%	0.37
7	240.541	245.160	249.842	1.91%	0.36
8	228.386	232.649	236.968	1.86%	0.35
9	216.913	220.847	224.830	1.80%	0.34
10	206.081	209.710	213.381	1.75%	0.34
11	195.850	199.196	202.579	1.70%	0.33
12	186.184	189.268	192.384	1.65%	0.32
13	177.048	179.890	182.758	1.59%	0.31
14	168.411	171.028	173.667	1.54%	0.30
15	160.243	162.651	165.078	1.49%	0.30
16	152.512	154.726	156.957	1.44%	0.29
17	145.197	147.232	149.281	1.39%	0.28
18	138.273	140.142	142.022	1.34%	0.27
19	131.717	133.432	135.156	1.29%	0.26
20	125.508	127.080	128.659	1.24%	0.25
21	119.626	121.066	122.510	1.19%	0.25
22	114.052	115.368	116.689	1.14%	0.24
23	108.766	109.970	111.175	1.10%	0.23
24	103.754	104.852	105.951	1.05%	0.22
25	99.000	100.000	101.000	1.00%	0.21
26	94.400	95.398	96.397	1.05%	0.22
27	90.037	91.032	92.029	1.09%	0.23
28	85.899	86.889	87.881	1.14%	0.25
29	81.973	82.956	83.942	1.19%	0.26
30	78.247	79.222	80.200	1.24%	0.27
31	74.710	75.675	76.645	1.28%	0.28
32	71.351	72.306	73.266	1.33%	0.29
33	68.161	69.104	70.054	1.37%	0.31
34	65.130	66.061	66.999	1.42%	0.32
35	62.249	63.167	64.093	1.47%	0.33
36	59.510	60.415	61.327	1.51%	0.34
37	56.906	57.797	58.696	1.56%	0.35
38	54.429	55.306	56.190	1.60%	0.37
39	52.073	52.934	53.805	1.64%	0.38
40	49.830	50.677	51.532	1.69%	0.39
41	47.697	48.528	49.369	1.73%	0.40
42	45.666	46.482	47.308	1.78%	0.42
43	43.732	44.533	45.343	1.82%	0.43
44	41.890	42.675	43.470	1.86%	0.44
45	40.134	40.904	41.684	1.91%	0.46
46	38.459	39.213	39.978	1.95%	0.47
47	36.863	37.601	38.350	1.99%	0.48

48	35.340	36.063	36.797	2.04%	0.49
49	33.888	34.595	35.314	2.08%	0.51
50	32.502	33.195	33.898	2.12%	0.52
51	31.182	31.859	32.548	2.16%	0.53
52	29.921	30.584	31.258	2.20%	0.55
53	28.718	29.366	30.025	2.25%	0.56
54	27.569	28.203	28.847	2.29%	0.57
55	26.472	27.091	27.721	2.33%	0.59
56	25.424	26.028	26.645	2.37%	0.60
57	24.422	25.013	25.615	2.41%	0.62
58	23.464	24.042	24.631	2.45%	0.63
59	22.549	23.113	23.688	2.49%	0.64
60	21.674	22.224	22.787	2.53%	0.66
61	20.837	21.374	21.924	2.57%	0.67
62	20.036	20.561	21.097	2.61%	0.69
63	19.269	19.782	20.306	2.65%	0.70
64	18.536	19.036	19.548	2.69%	0.72
65	17.834	18.323	18.822	2.73%	0.73
66	17.163	17.640	18.128	2.77%	0.74
67	16.521	16.986	17.463	2.81%	0.76
68	15.906	16.360	16.825	2.85%	0.77
69	15.316	15.760	16.214	2.88%	0.79
70	14.752	15.184	15.628	2.92%	0.80
71	14.209	14.631	15.064	2.96%	0.82
72	13.689	14.101	14.523	3.00%	0.83
73	13.190	13.592	14.004	3.04%	0.85
74	12.712	13.104	13.506	3.07%	0.86
75	12.253	12.635	13.029	3.11%	0.88
76	11.814	12.187	12.571	3.15%	0.89
77	11.393	11.757	12.131	3.19%	0.91
78	10.988	11.344	11.709	3.22%	0.92
79	10.600	10.947	11.304	3.26%	0.94
80	10.228	10.566	10.914	3.30%	0.96
81	9.870	10.200	10.539	3.33%	0.97
82	9.526	9.848	10.180	3.37%	0.99
83	9.196	9.510	9.834	3.40%	1.00
84	8.879	9.185	9.501	3.44%	1.02
85	8.574	8.873	9.181	3.48%	1.03
86	8.281	8.572	8.873	3.51%	1.05
87	7.999	8.283	8.577	3.55%	1.07
88	7.728	8.006	8.292	3.58%	1.08
89	7.467	7.738	8.018	3.62%	1.10
90	7.217	7.481	7.754	3.65%	1.12
91	6.976	7.234	7.501	3.69%	1.13
92	6.745	6.997	7.258	3.72%	1.15
93	6.523	6.769	7.023	3.76%	1.17

94	6.309	6.548	6.797	3.79%	1.18
95	6.102	6.337	6.579	3.83%	1.20
96	5.903	6.132	6.368	3.86%	1.22
97	5.711	5.934	6.165	3.89%	1.23
98	5.526	5.744	5.969	3.93%	1.25
99	5.348	5.561	5.781	3.96%	1.27
100	5.177	5.384	5.599	3.99%	1.28
101	5.012	5.214	5.424	4.03%	1.30
102	4.853	5.051	5.256	4.06%	1.32
103	4.700	4.893	5.093	4.09%	1.34
104	4.553	4.741	4.937	4.13%	1.35
105	4.410	4.594	4.785	4.16%	1.37
106	4.273	4.453	4.639	4.19%	1.39
107	4.141	4.316	4.498	4.22%	1.41
108	4.013	4.184	4.362	4.26%	1.42
109	3.890	4.057	4.231	4.29%	1.44
110	3.771	3.934	4.104	4.32%	1.46
111	3.656	3.816	3.982	4.35%	1.48
112	3.545	3.701	3.863	4.38%	1.49
113	3.438	3.591	3.749	4.42%	1.51
114	3.335	3.484	3.639	4.45%	1.53
115	3.235	3.380	3.532	4.48%	1.55
116	3.139	3.281	3.429	4.51%	1.57
117	3.047	3.185	3.330	4.54%	1.59
118	2.957	3.093	3.234	4.57%	1.60
119	2.871	3.003	3.141	4.60%	1.62
120	2.787	2.916	3.052	4.63%	1.64
121	2.706	2.832	2.964	4.66%	1.66
122	2.627	2.751	2.880	4.70%	1.68
123	2.551	2.672	2.798	4.73%	1.70
124	2.478	2.596	2.719	4.76%	1.72
125	2.407	2.522	2.643	4.79%	1.74