

# 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) : QN0603X103F3450FB

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

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**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

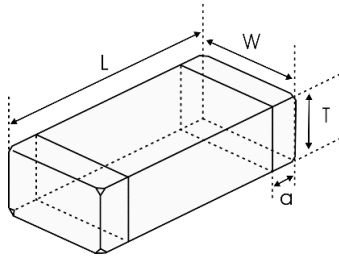


图 1 Fig.1

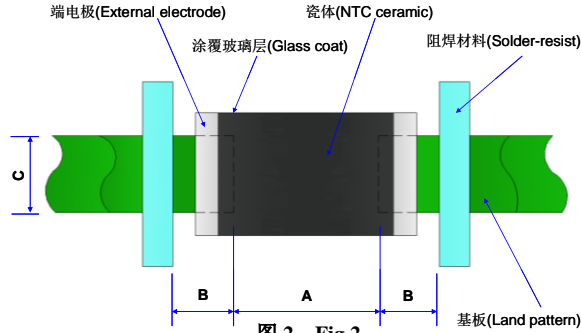


图 2 Fig.2

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   103   F   3450   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
103	10kΩ
154	150kΩ
⑤ 电阻值公差 Tolerance of Resistance	
F	±1%
G	±2%
H	±3%
J	±5%

⑥ B 值常数 B Constant	
3450	3450K
3950	3950K
4500	4500K
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 (℃)
QN0603X103F3450FB	10±1%	3450±1%	3500	0.31	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

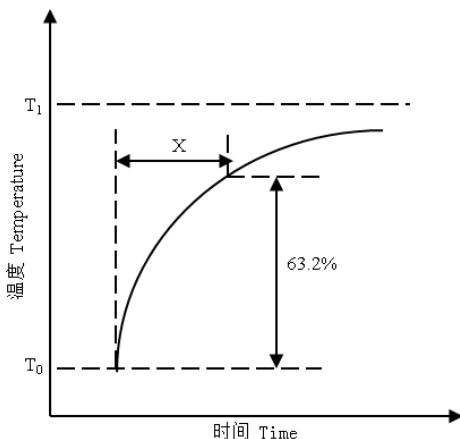
If any doubt on the results, measurements/tests should be made within the following limits:

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

**Inspection Equipment**

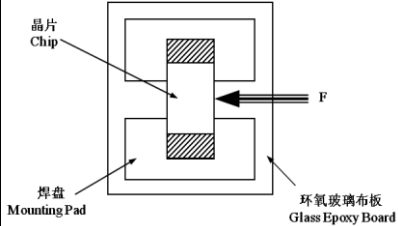
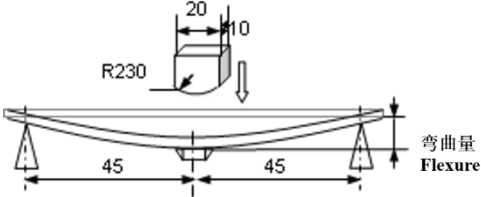
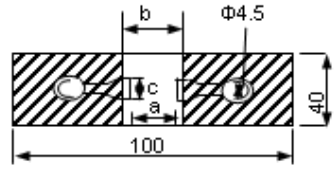
Visual Examination: 20× magnifier  
Resistance value test: Thermistor resistance tester

**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℃. $B(25-50^{\circ}\text{C}) = \frac{\ln R_{25} - \ln R_{50}}{1/T_{25} - 1/T_{50}}$ $B(25-85^{\circ}\text{C}) = \frac{\ln R_{25} - \ln R_{85}}{1/T_{25} - 1/T_{85}}$ 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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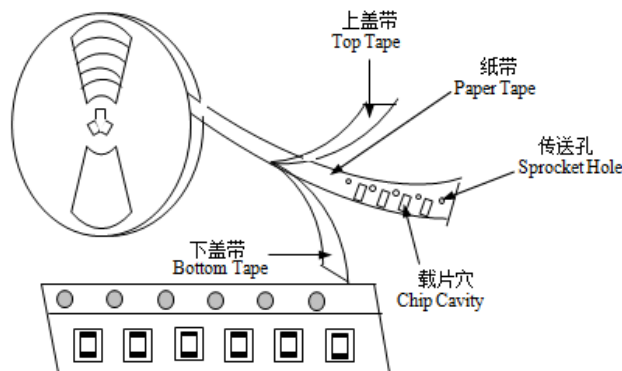
<p>振动 Vibration</p>	<p>IEC 60068-2-80</p>	<p>① 将晶片焊接在测试基板上（如右图所示的环氧玻璃布板）； Solder the chip to the testing jig (glass epoxy board shown in the left) using eutectic solder.</p> <p>② 晶片以全振幅为 1.5mm 进行振动，频率范围为 10Hz ~55 Hz； The chip shall be subjected to a simple harmonic motion having total amplitude of 1.5mm, 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**

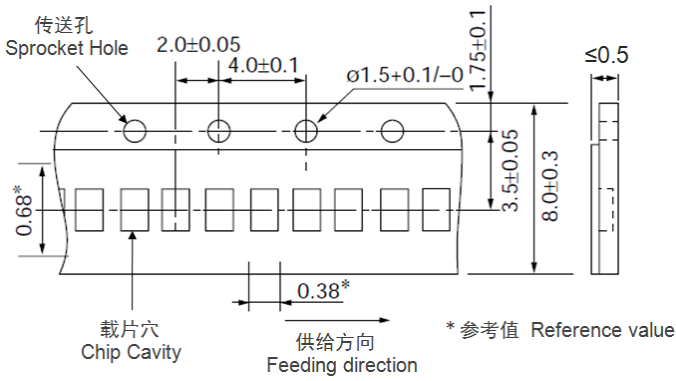
类型 Type	0201	0402	0603	0805
编带厚度 Tape thickness(mm)	0.5±0.15	0.5±0.15	0.8±0.15	0.85±0.2
编带材质 Tape material	纸带 Paper Tape			
每盘数量 Quantity per Reel	15K	10K	4K	4K

(1) 编带图 Taping Drawings

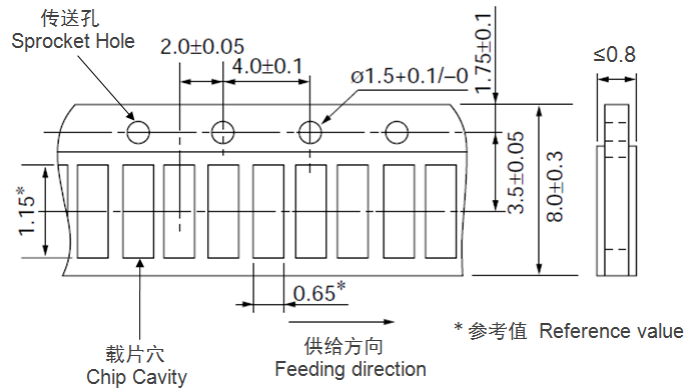


(2) 纸带尺寸 Paper Tape Dimensions (单位 Unit: mm)

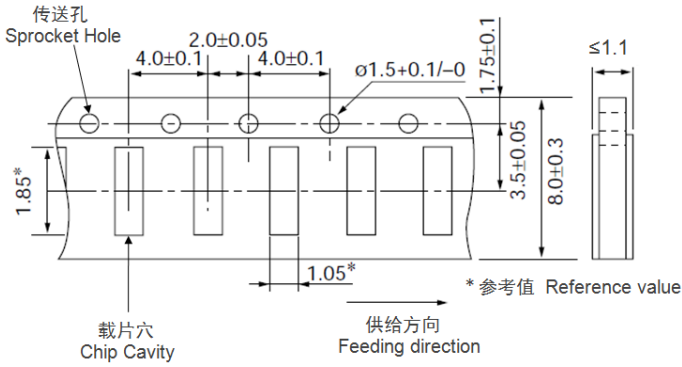
QN0201 系列 QN0201 series



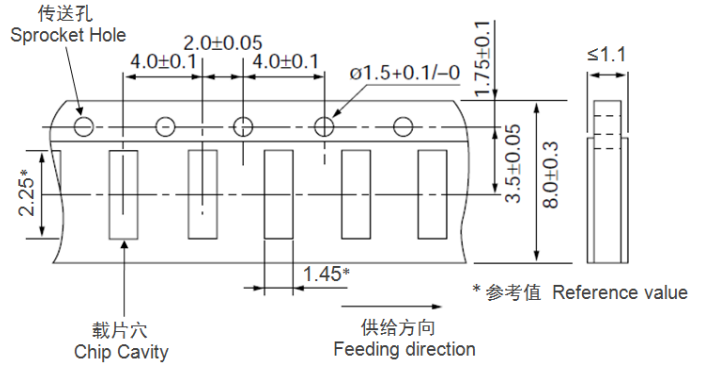
QN0402 系列 QN0402 series



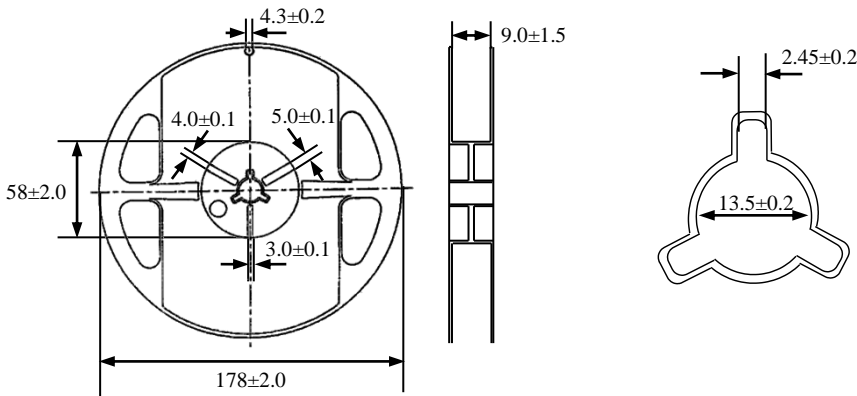
QN0603 系列 QN0603 series



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**

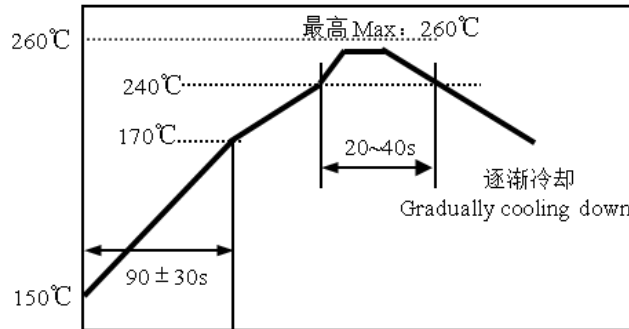
• **回流焊**

- 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**

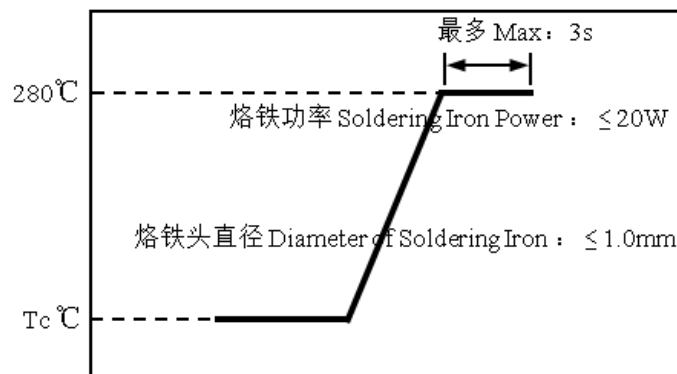
- 烙铁功率：最大 20W
- 预热：150°C/60sec.
- 烙铁头温度：最高 280°C
- 焊接时间：最多 3sec.
- 焊锡：Sn/3.0Ag/0.5Cu
- 手工焊：最多 1 次

• **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

## QN0603X103F3450FB

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	195.784	203.814	212.153	4.09%	0.69
-39	185.358	192.854	200.633	4.03%	0.69
-38	175.541	182.539	189.798	3.98%	0.68
-37	166.293	172.828	179.603	3.92%	0.68
-36	157.580	163.684	170.007	3.86%	0.67
-35	149.368	155.070	160.973	3.81%	0.67
-34	141.626	146.953	152.466	3.75%	0.66
-33	134.325	139.303	144.452	3.70%	0.66
-32	127.439	132.091	136.900	3.64%	0.65
-31	120.941	125.290	129.783	3.59%	0.65
-30	114.808	118.874	123.072	3.53%	0.64
-29	109.018	112.820	116.743	3.48%	0.63
-28	103.550	107.106	110.773	3.42%	0.63
-27	98.385	101.711	105.139	3.37%	0.62
-26	93.505	96.616	99.821	3.32%	0.62
-25	88.892	91.803	94.800	3.26%	0.61
-24	84.531	87.255	90.057	3.21%	0.61
-23	80.407	82.956	85.577	3.16%	0.60
-22	76.506	78.892	81.343	3.11%	0.60
-21	72.815	75.048	77.341	3.06%	0.59
-20	69.321	71.411	73.557	3.01%	0.58
-19	66.013	67.970	69.979	2.95%	0.58
-18	62.881	64.713	66.593	2.90%	0.57
-17	59.914	61.630	63.388	2.85%	0.57
-16	57.103	58.709	60.355	2.80%	0.56
-15	54.438	55.943	57.484	2.75%	0.55
-14	51.912	53.321	54.764	2.70%	0.55
-13	49.517	50.837	52.187	2.66%	0.54
-12	47.244	48.481	49.745	2.61%	0.54
-11	45.088	46.247	47.430	2.56%	0.53
-10	43.042	44.127	45.235	2.51%	0.52
-9	41.100	42.117	43.154	2.46%	0.52
-8	39.256	40.208	41.179	2.42%	0.51
-7	37.504	38.396	39.305	2.37%	0.50
-6	35.840	36.675	37.527	2.32%	0.50
-5	34.258	35.041	35.838	2.27%	0.49
-4	32.755	33.488	34.234	2.23%	0.48
-3	31.326	32.012	32.711	2.18%	0.48
-2	29.966	30.609	31.263	2.14%	0.47
-1	28.673	29.276	29.888	2.09%	0.46
0	27.443	28.007	28.580	2.05%	0.45
1	26.272	26.800	27.336	2.00%	0.45

2	25.157	25.651	26.153	1.96%	0.44
3	24.095	24.558	25.027	1.91%	0.43
4	23.084	23.517	23.956	1.87%	0.43
5	22.120	22.526	22.937	1.82%	0.42
6	21.202	21.582	21.966	1.78%	0.41
7	20.327	20.682	21.041	1.74%	0.40
8	19.493	19.825	20.161	1.69%	0.40
9	18.697	19.008	19.322	1.65%	0.39
10	17.938	18.229	18.522	1.61%	0.38
11	17.214	17.485	17.759	1.57%	0.37
12	16.523	16.777	17.032	1.52%	0.37
13	15.863	16.100	16.339	1.48%	0.36
14	15.234	15.455	15.677	1.44%	0.35
15	14.632	14.838	15.046	1.40%	0.34
16	14.057	14.250	14.443	1.36%	0.33
17	13.508	13.688	13.868	1.32%	0.33
18	12.984	13.151	13.319	1.28%	0.32
19	12.482	12.638	12.794	1.24%	0.31
20	12.003	12.148	12.293	1.20%	0.30
21	11.544	11.679	11.814	1.16%	0.29
22	11.106	11.231	11.356	1.12%	0.29
23	10.686	10.802	10.919	1.08%	0.28
24	10.284	10.392	10.500	1.04%	0.27
25	9.900	10.000	10.100	1.00%	0.26
26	9.525	9.625	9.725	1.04%	0.27
27	9.166	9.265	9.365	1.08%	0.28
28	8.822	8.921	9.021	1.12%	0.30
29	8.493	8.592	8.691	1.15%	0.31
30	8.178	8.276	8.375	1.19%	0.32
31	7.876	7.974	8.072	1.23%	0.33
32	7.587	7.684	7.781	1.27%	0.34
33	7.310	7.406	7.503	1.30%	0.36
34	7.045	7.140	7.236	1.34%	0.37
35	6.790	6.885	6.979	1.38%	0.38
36	6.547	6.640	6.734	1.41%	0.39
37	6.313	6.405	6.498	1.45%	0.41
38	6.088	6.180	6.271	1.49%	0.42
39	5.873	5.963	6.054	1.52%	0.43
40	5.667	5.756	5.846	1.56%	0.44
41	5.469	5.556	5.645	1.60%	0.46
42	5.278	5.365	5.453	1.63%	0.47
43	5.096	5.181	5.268	1.67%	0.48
44	4.921	5.005	5.090	1.70%	0.50
45	4.752	4.835	4.919	1.74%	0.51
46	4.590	4.672	4.755	1.77%	0.52
47	4.435	4.515	4.597	1.81%	0.54

48	4.285	4.365	4.445	1.84%	0.55
49	4.142	4.220	4.299	1.88%	0.56
50	4.004	4.081	4.159	1.91%	0.58
51	3.871	3.947	4.023	1.94%	0.59
52	3.743	3.818	3.893	1.98%	0.60
53	3.621	3.694	3.768	2.01%	0.62
54	3.502	3.574	3.647	2.04%	0.63
55	3.389	3.459	3.531	2.08%	0.65
56	3.279	3.349	3.419	2.11%	0.66
57	3.174	3.242	3.312	2.14%	0.67
58	3.072	3.140	3.208	2.18%	0.69
59	2.975	3.041	3.108	2.21%	0.70
60	2.881	2.945	3.011	2.24%	0.72
61	2.790	2.854	2.918	2.27%	0.73
62	2.702	2.765	2.829	2.31%	0.75
63	2.618	2.680	2.742	2.34%	0.76
64	2.537	2.598	2.659	2.37%	0.78
65	2.459	2.518	2.579	2.40%	0.79
66	2.384	2.442	2.501	2.43%	0.81
67	2.311	2.368	2.426	2.47%	0.82
68	2.241	2.297	2.354	2.50%	0.84
69	2.173	2.228	2.284	2.53%	0.85
70	2.108	2.162	2.217	2.56%	0.87
71	2.045	2.098	2.152	2.59%	0.88
72	1.984	2.036	2.089	2.62%	0.90
73	1.925	1.976	2.029	2.65%	0.91
74	1.868	1.919	1.970	2.68%	0.93
75	1.814	1.863	1.914	2.71%	0.94
76	1.761	1.809	1.859	2.74%	0.96
77	1.710	1.757	1.806	2.77%	0.97
78	1.660	1.707	1.755	2.80%	0.99
79	1.613	1.658	1.705	2.83%	1.00
80	1.567	1.612	1.658	2.86%	1.02
81	1.522	1.566	1.611	2.89%	1.04
82	1.479	1.522	1.567	2.92%	1.05
83	1.437	1.480	1.523	2.95%	1.07
84	1.397	1.439	1.482	2.98%	1.09
85	1.358	1.399	1.441	3.01%	1.10
86	1.320	1.361	1.402	3.03%	1.12
87	1.284	1.324	1.364	3.06%	1.13
88	1.249	1.288	1.327	3.09%	1.15
89	1.215	1.253	1.292	3.12%	1.17
90	1.182	1.219	1.257	3.15%	1.18
91	1.150	1.186	1.224	3.18%	1.20
92	1.119	1.155	1.192	3.20%	1.22
93	1.089	1.124	1.160	3.23%	1.23

94	1.060	1.094	1.130	3.26%	1.25
95	1.032	1.066	1.101	3.29%	1.27
96	1.004	1.038	1.072	3.31%	1.29
97	0.978	1.011	1.045	3.34%	1.30
98	0.952	0.985	1.018	3.37%	1.32
99	0.928	0.959	0.992	3.40%	1.34
100	0.904	0.935	0.967	3.42%	1.36
101	0.880	0.911	0.942	3.45%	1.37
102	0.858	0.888	0.918	3.48%	1.39
103	0.836	0.865	0.895	3.50%	1.41
104	0.815	0.843	0.873	3.53%	1.43
105	0.794	0.822	0.852	3.56%	1.44
106	0.774	0.802	0.831	3.58%	1.46
107	0.755	0.782	0.810	3.61%	1.48
108	0.736	0.763	0.790	3.63%	1.50
109	0.718	0.744	0.771	3.66%	1.52
110	0.700	0.726	0.752	3.68%	1.53
111	0.683	0.708	0.734	3.71%	1.55
112	0.666	0.691	0.717	3.74%	1.57
113	0.650	0.674	0.700	3.76%	1.59
114	0.634	0.658	0.683	3.79%	1.61
115	0.619	0.642	0.667	3.81%	1.63
116	0.604	0.627	0.651	3.84%	1.65
117	0.589	0.612	0.636	3.86%	1.66
118	0.575	0.598	0.621	3.89%	1.68
119	0.562	0.584	0.607	3.91%	1.70
120	0.549	0.570	0.593	3.93%	1.72
121	0.536	0.557	0.579	3.96%	1.74
122	0.523	0.544	0.566	3.98%	1.76
123	0.511	0.532	0.553	4.01%	1.78
124	0.499	0.519	0.540	4.03%	1.80
125	0.488	0.508	0.528	4.06%	1.82