

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) : QN0402X473J4050FB

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
			

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变更履历表 Version change history

版本号 Rev.	生效日期 Effective Date	变更内容 Changed Contents	变更原因 Change Reasons	批准 Approved By
01	/	新版发行 New release	/	潘士宾 Shibin Pan

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

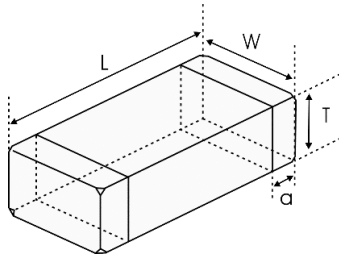


图 1 Fig.1

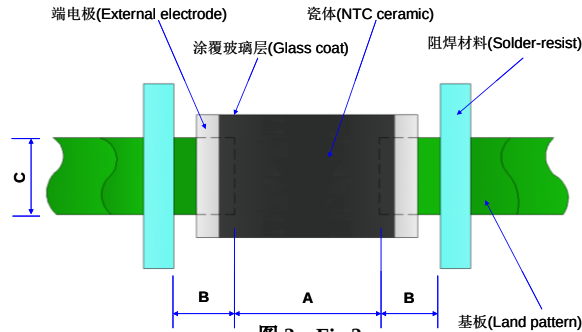


图 2 Fig.2

表 1 (Table 1)

单位 unit: inch[mm]

类别 Type	L	W	T	a	A	B	C
0402 [1005]	0.039±0.006 [1.0±0.15]	0.020±0.006 [0.5±0.15]	0.020±0.006 [0.5±0.15]	0.010±0.004 [0.25±0.1]	[0.45-0.55]	[0.4-0.5]	[0.45-0.55]

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

QN 0402 X 473 J 4050 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

③ 分隔符 Delimiter
X

④ 25℃的零功率电阻 Nominal Zero-Power Resistance	
222	2.2kΩ
473	47kΩ
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	
3450	3450K
4050	4050K
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 (℃)
QN0402X473J4050FB	47±5%	4050±1%	4108 ref.	0.14	1.0	<3	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：

- 环境温度：20±15℃；
- 相对湿度：65±20%；
- 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：

- 环境温度：25±2℃；
- 相对湿度：65±5%
- 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:

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

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

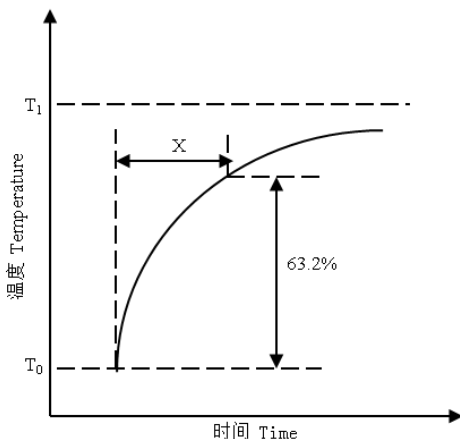
- Ambient Temperature: 25±2℃
- Relative Humidity: 65±5%
- Air Pressure: 86kPa to 106kPa

▪ Inspection Equipment

Visual Examination: 20× magnifier

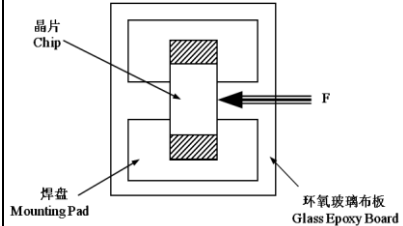
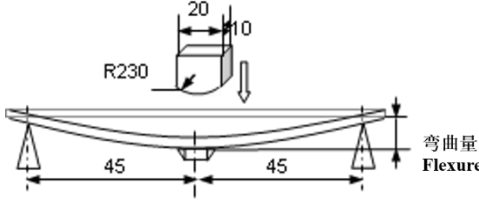
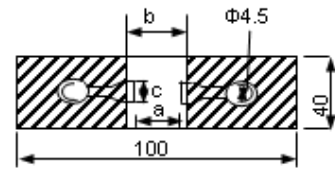
Resistance value test: Thermistor resistance tester

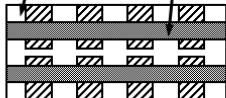
5 电性测试 Electrical Test

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 T₀ (°C) to T₁ (°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	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. <table><tr><td>尺寸 Size</td><td>F</td><td>保持时间 Duration</td></tr><tr><td>0201</td><td>2N</td><td rowspan="3">10±1s</td></tr><tr><td>0402, 0603</td><td>5N</td></tr><tr><td>0805</td><td>10N</td></tr></table>	尺寸 Size	F	保持时间 Duration	0201	2N	10±1s	0402, 0603	5N	0805	10N	端电极无脱落且瓷体无损伤。 No removal or split of the termination or other defects shall occur. 																				
尺寸 Size	F	保持时间 Duration																															
0201	2N	10±1s																															
0402, 0603	5N																																
0805	10N																																
抗弯强度 Resistance to Flexure	IEC 60068-2-21	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;  <table><tr><td>尺寸 Size</td><td>弯曲变形量 Flexure</td><td>施压速度 Pressurizing Speed</td><td>保持时间 Duration</td></tr><tr><td>0201,</td><td>1mm</td><td rowspan="2"><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	① 无外观损伤。 No visible damage. ② $\Delta R_{25}/R_{25} \leq 2\%$ 单位 unit: mm <table><tr><td>类型 Type</td><td>a</td><td>b</td><td>c</td></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																														
0201,	1mm	<0.5mm/s	10±1s																														
0402, 0603, 0805	2mm																																
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0805	1.2	4.0	1.65																														

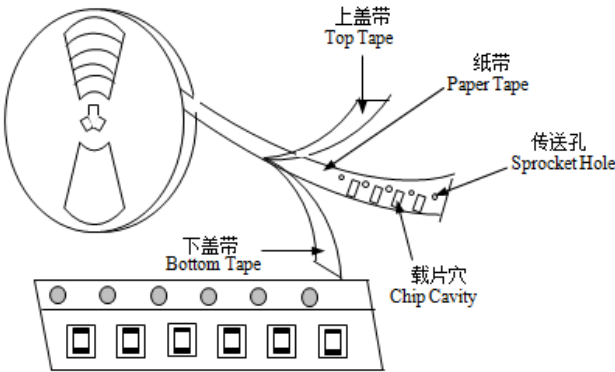
振动 Vibration	IEC 60068-2-80	① 将晶片焊接在测试基板上（如右图所示的环氧玻璃布板）； Solder the chip to the testing jig (glass epoxy board shown in the left) using eutectic solder. ② 晶片以全振幅为 1.5mm 进行振动，频率范围为 10Hz ~55 Hz； The chip shall be subjected to a simple harmonic motion having total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55 Hz. 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 3mutually perpendicular directions (total of 6 hours).	无外观损伤。 No visible damage. 铜箔 Cupad 阻焊膜 Solder mask  环氧玻璃布板Glass Epoxy Board															
坠落 Dropping	IEC 60068-2-32	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.	无外观损伤。 No visible damage.															
可焊性 Solderability	IEC 60068-2-58	① 焊接温度 Solder temperature: 245±5℃. ② 浸渍时间 Duration: 3±0.3s. ③ 焊锡成分 Solder: 96.5Sn/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.	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.															
耐焊性 Resistance to Soldering Heat	IEC 60068-2-58	① 焊接温度 Solder temperature: 260±5℃. ② 浸渍时间 Duration: 10±1s. ③ 焊锡成分 Solder: 96.5Sn/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.	① 无外观损伤； No visible damage. ② ΔR25/R25 ≤2% ③ ΔB/B ≤1%															
温度周期 Temperature cycling	IEC 60068-2-14	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. <table><tr><td>步骤 Step</td><td>温度 Temperature</td><td>时间 Time</td></tr><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></table> 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.	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	① 无外观损伤； No visible damage. ② ΔR25/R25 ≤2% ③ ΔB/B ≤1%
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																
高温存放 Resistance to dry heat	IEC 60068-2-2	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.	① 无外观损伤； No visible damage. ② ΔR25/R25 ≤2% ③ ΔB/B ≤1%															

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 ΔR25/R25 ≤2% ③ ΔB/B ≤1%
湿热存放 Resistance to damp heat	IEC 60068-2-78	① 在 60±2℃，相对湿度 90~95%空气中，无负载放置 1000±24 小时。 60±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 ΔR25/R25 ≤2% ③ ΔB/B ≤1%
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 ΔR25/R25 ≤2% ③ ΔB/B ≤1%

7 编带 Taping

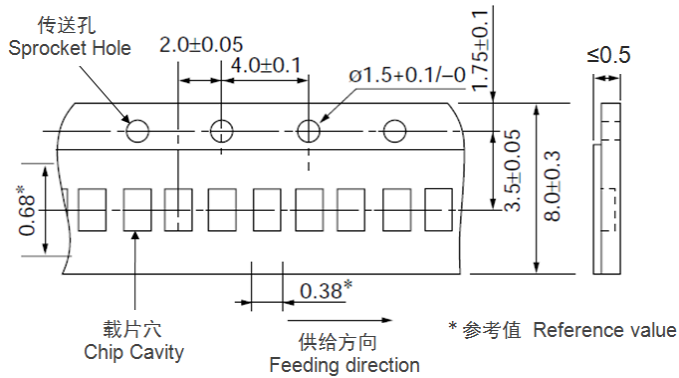
类型 Type	0201	0402	0603	0805
编带厚度 Tape thickness(mm)	0.5±0.15	0.5±0.15	0.8±0.15	0.85±0.2
编带材质 Tape material	纸带 Paper Tape			
每盘数量 Quantity per Reel	15K	10K	4K	4K

(1) 编带图 Taping Drawings

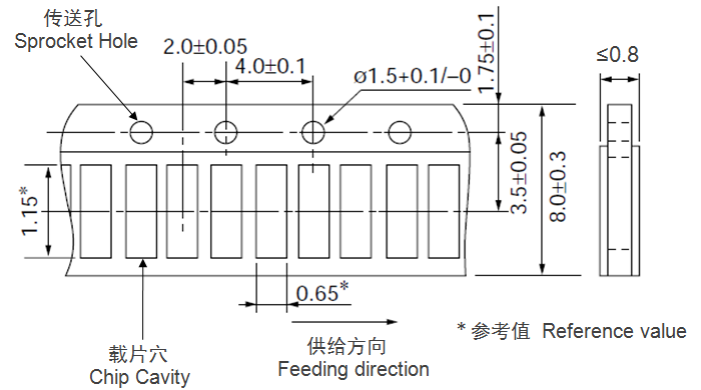


(2) 纸带尺寸 Paper Tape Dimensions (单位 Unit: mm)

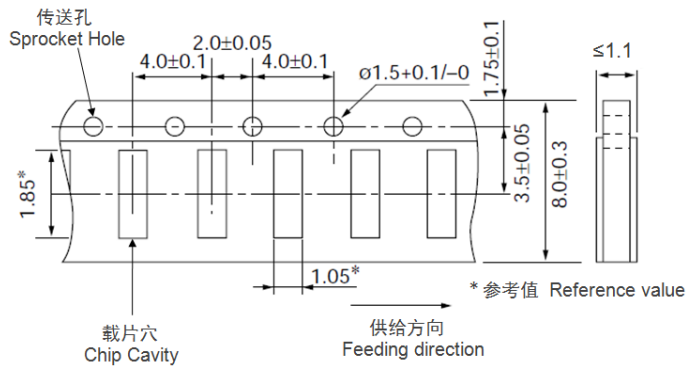
QN0201 系列 QN0201 series



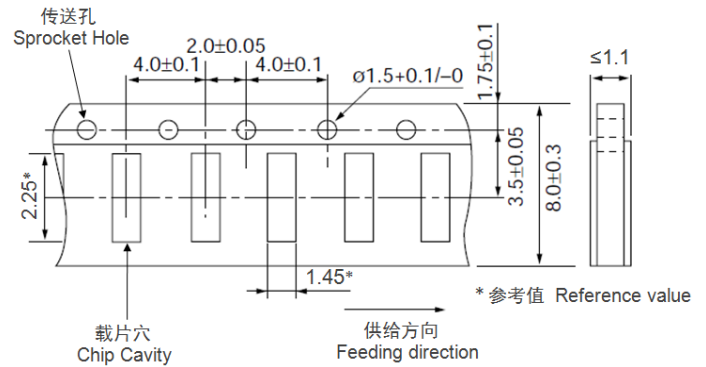
QN0402 系列 QN0402 series



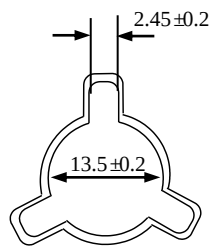
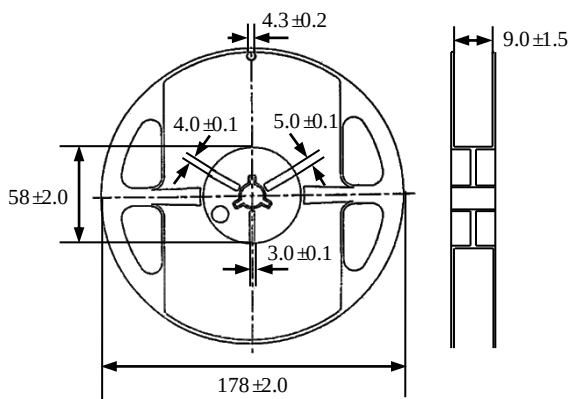
QN0603 系列 QN0603 series



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: $\leq 75\% \text{RH}$
 - 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

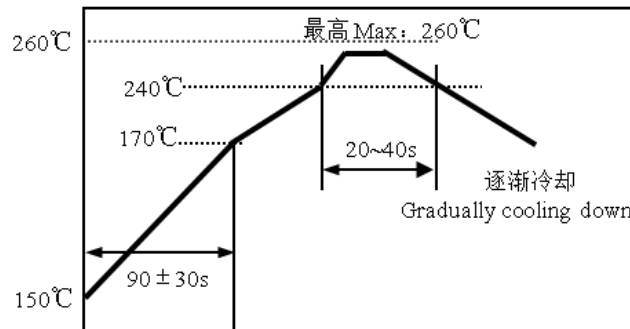
• 回流焊

- 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: 96.5Sn/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: 96.5Sn/3.0Ag/0.5Cu
- Max.2 times for re-flowing



• 手工焊

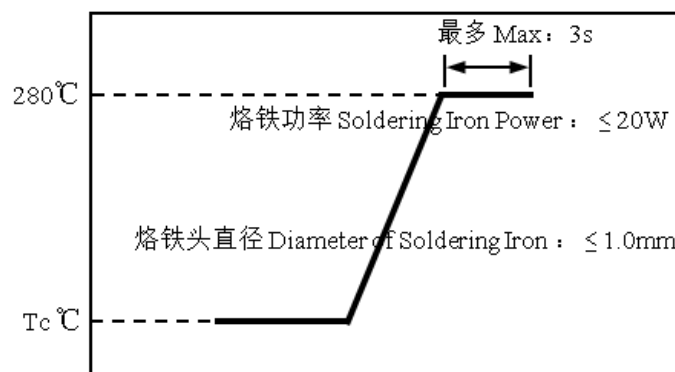
- 烙铁功率: 最大 20W
- 预热: 150°C/60sec.
- 烙铁头温度: 最高 280°C
- 焊接时间: 最多 3sec.
- 焊锡: 96.5Sn/3.0Ag/0.5Cu
- 手工焊: 最多 1 次

• 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: 96.5Sn/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

QN0402X473J4050FB

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	1,601.551	1,747.920	1,902.896	8.87%	1.25
-39	1,496.067	1,631.671	1,775.118	8.79%	1.25
-38	1,398.253	1,523.950	1,656.795	8.72%	1.25
-37	1,307.502	1,424.076	1,547.165	8.64%	1.24
-36	1,223.258	1,331.424	1,445.533	8.57%	1.24
-35	1,145.012	1,245.428	1,351.263	8.50%	1.24
-34	1,072.298	1,165.564	1,263.775	8.43%	1.24
-33	1,004.689	1,091.357	1,182.537	8.35%	1.24
-32	941.795	1,022.370	1,107.063	8.28%	1.24
-31	883.257	958.202	1,036.907	8.21%	1.24
-30	828.744	898.485	971.660	8.14%	1.24
-29	777.955	842.884	910.948	8.08%	1.24
-28	730.612	791.088	854.428	8.01%	1.24
-27	686.460	742.813	801.783	7.94%	1.23
-26	645.263	697.798	752.723	7.87%	1.23
-25	606.806	655.802	706.983	7.80%	1.23
-24	570.888	616.605	664.317	7.74%	1.23
-23	537.328	580.001	624.499	7.67%	1.23
-22	505.955	545.805	587.322	7.61%	1.23
-21	476.613	513.842	552.594	7.54%	1.23
-20	449.159	483.954	520.140	7.48%	1.23
-19	423.460	455.992	489.796	7.41%	1.22
-18	399.393	429.822	461.413	7.35%	1.22
-17	376.844	405.317	434.852	7.29%	1.22
-16	355.709	382.362	409.985	7.22%	1.22
-15	335.891	360.850	386.695	7.16%	1.22
-14	317.299	340.680	364.871	7.10%	1.22
-13	299.850	321.762	344.413	7.04%	1.21
-12	283.468	304.011	325.227	6.98%	1.21
-11	268.081	287.347	307.226	6.92%	1.21
-10	253.623	271.697	290.332	6.86%	1.21
-9	240.032	256.995	274.468	6.80%	1.21
-8	227.251	243.176	259.566	6.74%	1.20
-7	215.228	230.184	245.563	6.68%	1.20
-6	203.912	217.963	232.399	6.62%	1.20
-5	193.258	206.463	220.018	6.57%	1.20
-4	183.212	195.624	208.356	6.51%	1.19
-3	173.747	185.419	197.381	6.45%	1.19
-2	164.828	175.808	187.049	6.39%	1.19
-1	156.420	166.751	177.320	6.34%	1.19
0	148.490	158.214	168.154	6.28%	1.19
1	141.009	150.165	159.516	6.23%	1.18

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)
2	133.949	142.573	151.372	6.17%	1.18
3	127.284	135.408	143.691	6.12%	1.18
4	120.989	128.645	136.445	6.06%	1.18
5	115.041	122.259	129.605	6.01%	1.17
6	109.421	116.227	123.149	5.95%	1.17
7	104.107	110.528	117.051	5.90%	1.17
8	99.082	105.140	111.289	5.85%	1.16
9	94.328	100.045	105.844	5.80%	1.16
10	89.829	95.227	100.697	5.74%	1.16
11	85.570	90.667	95.828	5.69%	1.16
12	81.537	86.352	91.223	5.64%	1.15
13	77.717	82.266	86.864	5.59%	1.15
14	74.096	78.396	82.738	5.54%	1.15
15	70.665	74.730	78.831	5.49%	1.14
16	67.412	71.256	75.131	5.44%	1.14
17	64.326	67.962	71.624	5.39%	1.14
18	61.399	64.839	68.300	5.34%	1.13
19	58.621	61.876	65.149	5.29%	1.13
20	55.983	59.065	62.160	5.24%	1.13
21	53.479	56.396	59.324	5.19%	1.12
22	51.100	53.863	56.633	5.14%	1.12
23	48.840	51.457	54.079	5.10%	1.12
24	46.692	49.172	51.653	5.05%	1.11
25	44.650	47.000	49.350	5.00%	1.11
26	42.670	44.936	47.204	5.05%	1.13
27	40.788	42.974	45.163	5.09%	1.15
28	39.000	41.108	43.221	5.14%	1.16
29	37.299	39.332	41.373	5.19%	1.18
30	35.682	37.643	39.613	5.23%	1.20
31	34.143	36.035	37.938	5.28%	1.22
32	32.678	34.504	36.341	5.33%	1.23
33	31.284	33.046	34.821	5.37%	1.25
34	29.956	31.657	33.372	5.42%	1.27
35	28.691	30.334	31.990	5.46%	1.29
36	27.487	29.073	30.674	5.51%	1.31
37	26.340	27.872	29.419	5.55%	1.33
38	25.247	26.726	28.221	5.59%	1.34
39	24.204	25.633	27.079	5.64%	1.36
40	23.210	24.591	25.988	5.68%	1.38
41	22.262	23.596	24.947	5.73%	1.40
42	21.358	22.647	23.953	5.77%	1.42
43	20.494	21.740	23.004	5.81%	1.44
44	19.671	20.875	22.097	5.86%	1.46
45	18.884	20.048	21.230	5.90%	1.48
46	18.133	19.258	20.402	5.94%	1.50

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)
47	17.415	18.503	19.610	5.98%	1.52
48	16.729	17.782	18.853	6.03%	1.54
49	16.074	17.092	18.129	6.07%	1.56
50	15.448	16.433	17.436	6.11%	1.58
51	14.849	15.802	16.774	6.15%	1.60
52	14.276	15.198	16.139	6.19%	1.61
53	13.728	14.621	15.532	6.23%	1.64
54	13.204	14.068	14.950	6.27%	1.66
55	12.702	13.539	14.393	6.32%	1.68
56	12.222	13.032	13.860	6.36%	1.70
57	11.763	12.547	13.349	6.40%	1.72
58	11.323	12.082	12.859	6.44%	1.74
59	10.901	11.636	12.390	6.48%	1.76
60	10.497	11.209	11.939	6.52%	1.78
61	10.111	10.801	11.509	6.56%	1.80
62	9.741	10.409	11.096	6.59%	1.82
63	9.386	10.034	10.699	6.63%	1.84
64	9.046	9.673	10.319	6.67%	1.86
65	8.719	9.328	9.954	6.71%	1.88
66	8.406	8.996	9.604	6.75%	1.90
67	8.106	8.678	9.267	6.79%	1.93
68	7.818	8.373	8.944	6.83%	1.95
69	7.542	8.080	8.634	6.87%	1.97
70	7.276	7.798	8.336	6.90%	1.99
71	7.021	7.527	8.049	6.94%	2.01
72	6.775	7.266	7.773	6.98%	2.03
73	6.540	7.016	7.508	7.02%	2.06
74	6.313	6.776	7.253	7.05%	2.08
75	6.096	6.544	7.008	7.09%	2.10
76	5.887	6.323	6.773	7.13%	2.12
77	5.687	6.110	6.547	7.16%	2.14
78	5.494	5.905	6.330	7.20%	2.17
79	5.309	5.708	6.121	7.24%	2.19
80	5.131	5.518	5.919	7.27%	2.21
81	4.960	5.336	5.726	7.31%	2.23
82	4.796	5.161	5.540	7.35%	2.26
83	4.637	4.992	5.361	7.38%	2.28
84	4.485	4.830	5.188	7.42%	2.30
85	4.339	4.674	5.022	7.45%	2.33
86	4.197	4.523	4.861	7.49%	2.35
87	4.061	4.377	4.706	7.52%	2.37
88	3.929	4.237	4.557	7.56%	2.40
89	3.803	4.102	4.413	7.59%	2.42
90	3.681	3.972	4.275	7.63%	2.44
91	3.564	3.846	4.141	7.66%	2.47

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)
92	3.450	3.725	4.012	7.70%	2.49
93	3.341	3.609	3.888	7.73%	2.51
94	3.236	3.496	3.768	7.76%	2.54
95	3.135	3.388	3.652	7.80%	2.56
96	3.038	3.284	3.541	7.83%	2.59
97	2.944	3.183	3.433	7.87%	2.61
98	2.853	3.086	3.330	7.90%	2.64
99	2.765	2.992	3.230	7.93%	2.66
100	2.681	2.902	3.133	7.97%	2.68
101	2.600	2.815	3.040	8.00%	2.71
102	2.521	2.730	2.950	8.03%	2.73
103	2.445	2.649	2.862	8.06%	2.76
104	2.372	2.570	2.778	8.10%	2.78
105	2.301	2.494	2.697	8.13%	2.81
106	2.232	2.421	2.618	8.16%	2.83
107	2.166	2.349	2.542	8.19%	2.86
108	2.102	2.281	2.468	8.23%	2.88
109	2.040	2.214	2.397	8.26%	2.91
110	1.980	2.150	2.328	8.29%	2.94
111	1.923	2.088	2.261	8.32%	2.96
112	1.867	2.028	2.197	8.35%	2.99
113	1.813	1.970	2.135	8.38%	3.01
114	1.761	1.914	2.075	8.42%	3.04
115	1.711	1.860	2.017	8.45%	3.06
116	1.662	1.808	1.961	8.48%	3.09
117	1.615	1.757	1.907	8.51%	3.12
118	1.570	1.708	1.854	8.54%	3.14
119	1.526	1.661	1.803	8.57%	3.17
120	1.484	1.615	1.754	8.60%	3.20
121	1.442	1.571	1.706	8.63%	3.22
122	1.402	1.528	1.660	8.66%	3.25
123	1.364	1.486	1.615	8.69%	3.28
124	1.326	1.445	1.571	8.72%	3.30
125	1.290	1.406	1.529	8.75%	3.33