

# 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) : QN0402X204F3950FB

客户规格(Customer's Part Number): .....

| 客户承认 CUSTOMER CONFIRM |                                                                                     |                                                                                     |                                                                                       |
|-----------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 承认章<br>STAMP          | 核准<br>APPROVE                                                                       | 审核<br>CHECK                                                                         | 经办人<br>SIGNATURE                                                                      |
|                       |  |  |  |

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变更履历表 Version change history

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

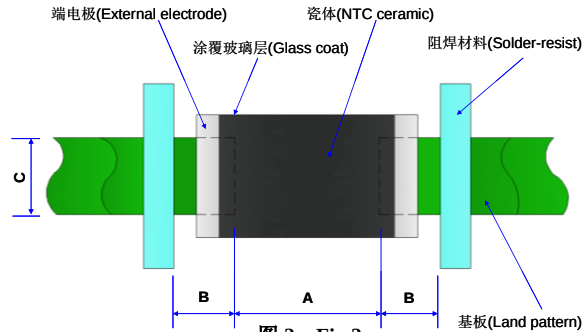


图 2 Fig.2

表 1 (Table 1)

单位 unit: inch[mm]

| 类别 Type        | L                         | W                         | T                         | a                         | A           | B         | C           |
|----------------|---------------------------|---------------------------|---------------------------|---------------------------|-------------|-----------|-------------|
| 0402<br>[1005] | 0.039±0.006<br>[1.0±0.15] | 0.020±0.006<br>[0.5±0.15] | 0.020±0.006<br>[0.5±0.15] | 0.010±0.004<br>[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    204    F    3950    F    B  
①       ②       ③       ④       ⑤       ⑥       ⑦       ⑧

| ① 类别 Type |                                     |
|-----------|-------------------------------------|
| QN        | 片式 NTC 热敏电阻器<br>Chip NTC Thermistor |

| ② 外形尺寸(mm)<br>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<br>Nominal Zero-Power Resistance |       |
|----------------------------------------------|-------|
| 502                                          | 5kΩ   |
| 103                                          | 10kΩ  |
| 204                                          | 200kΩ |

| ⑤ 电阻值公差<br>Tolerance of Resistance |     |
|------------------------------------|-----|
| F                                  | ±1% |
| G                                  | ±2% |
| H                                  | ±3% |
| J                                  | ±5% |

| ⑥ B 值常数 B Constant |       |
|--------------------|-------|
| 3450               | 3450K |
| 3950               | 3950K |
| 4250               | 4250K |

| ⑦ B 值公差<br>Tolerance of B Constant |     |
|------------------------------------|-----|
| F                                  | ±1% |
| H                                  | ±3% |

| ⑧ B 值计算方式<br>B constant calculation method |         |
|--------------------------------------------|---------|
| A                                          | 25℃&85℃ |
| B                                          | 25℃&50℃ |

## 3 电气特性 Electrical Characteristics

| 型号<br>Part No     | 电阻值<br>Resistance<br>(25℃)<br>(kΩ) | B 常数<br>B Constant<br>(25/50℃)<br>(K) | B 常数<br>B Constant<br>(25/85℃)<br>(K) | 允许工作电流<br>Permissible<br>Operating Current<br>(25℃)<br>(mA) | 耗散系数<br>Dissipation<br>Factor<br>(mW/℃) | 热时间常数<br>Thermal<br>Time<br>Constant<br>(s) | 额定功率<br>Rated Electric<br>Power(25℃)<br>(mW) | 工作温度<br>Operating<br>ambient<br>temperature<br>(℃) |
|-------------------|------------------------------------|---------------------------------------|---------------------------------------|-------------------------------------------------------------|-----------------------------------------|---------------------------------------------|----------------------------------------------|----------------------------------------------------|
| QN0402X204F3950FB | 200±1%                             | 3950±1%                               | 4010 ref.                             | 0.07                                                        | 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:

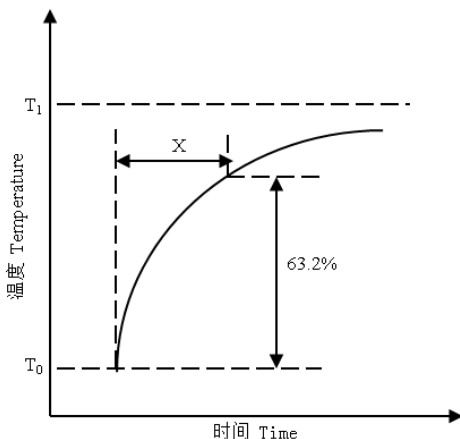
- Ambient Temperature: 25±2℃
- Relative Humidity: 65±5%
- Air Pressure: 86kPa to 106kPa

##### ▪ Inspection Equipment

Visual Examination: 20× magnifier

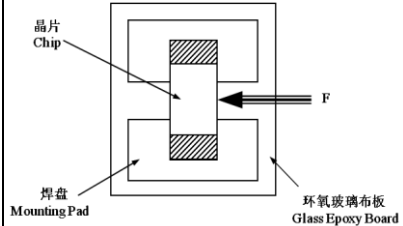
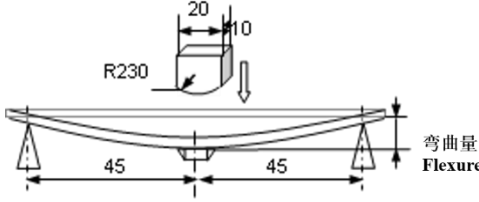
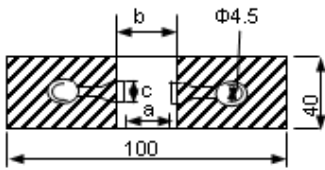
Resistance value test: Thermistor resistance tester

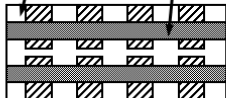
#### 5 电性测试 Electrical Test

| 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<br>Nominal Zero-Power Resistance at<br>25℃(R25) | 环境温度 Ambient temperature: 25±0.05℃<br>测试功率 Measuring electric power: ≤0.1mW                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 2      | B 值常数<br>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。<br>Measure the resistance at the ambient temperature of 25±0.05℃, 50±0.05℃ or 85±0.05℃.<br>$B(25-50^{\circ}\text{C}) = \frac{\ln R_{25} - \ln R_{50}}{1/T_{25} - 1/T_{50}} \quad B(25-85^{\circ}\text{C}) = \frac{\ln R_{25} - \ln R_{85}}{1/T_{25} - 1/T_{85}}$<br>T: 绝对温度 (K) Absolute temperature (K)                                                                                                                                                           |
| 3      | 热时间常数<br>Thermal Time Constant                             | <p>在零功率条件下，当热敏电阻的环境温度发生急剧变化时，热敏电阻组件产生最初温度 T<sub>0</sub> 与最终温度 T<sub>1</sub> 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。</p> <p>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).</p>  |

|   |                                         |                                                                                                                                                                                                                                                                                                                   |
|---|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 | 耗散系数<br>Dissipation Factor              | <p>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：</p> <p>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:</p> $\delta = \frac{W}{T-T_0}$ |
| 5 | 额定功率<br>Rated Power                     | <p>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。</p> <p>The necessary electric power makes thermistor's temperature rise 100℃ by self-heating at ambient temperature 25℃.</p>                                                                                                                                                |
| 6 | 允许工作电流<br>Permissible operating current | <p>在静止空气中通过自身发热使其升温为 1℃的电流。</p> <p>The current that keep body temperature of chip NTC on the PC board in still air rising 1℃ by self-heating.</p>                                                                                                                                                                 |

## 6 信赖性试验 Reliability Test

| 项目<br>Items                   | 测试标准<br>Standard | 测试方法及备注<br>Test Methods and Remarks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 要求<br>Requirements |                  |                            |                  |       |       |            |       |                  |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |   |   |   |      |      |     |     |      |     |     |     |      |     |     |     |      |     |     |      |
|-------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------|----------------------------|------------------|-------|-------|------------|-------|------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---|---|---|------|------|-----|-----|------|-----|-----|-----|------|-----|-----|-----|------|-----|-----|------|
| 端头附着力<br>Terminal Strength    | IEC 60068-2-21   | <p>将芯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；</p> <p>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><tr><th>尺寸 Size</th><th>F</th><th>保持时间 Duration</th></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 | <p>端电极无脱落且瓷体无损伤。</p> <p>No removal or split of the termination or other defects shall occur.</p>                                                                                                                                                                                                                                                                                                                                     |         |   |   |   |      |      |     |     |      |     |     |     |      |     |     |     |      |     |     |      |
| 尺寸 Size                       | F                | 保持时间 Duration                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                    |                  |                            |                  |       |       |            |       |                  |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |   |   |   |      |      |     |     |      |     |     |     |      |     |     |     |      |     |     |      |
| 0201                          | 2N               | 10±1s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                    |                  |                            |                  |       |       |            |       |                  |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |   |   |   |      |      |     |     |      |     |     |     |      |     |     |     |      |     |     |      |
| 0402, 0603                    | 5N               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                  |                            |                  |       |       |            |       |                  |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |   |   |   |      |      |     |     |      |     |     |     |      |     |     |     |      |     |     |      |
| 0805                          | 10N              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                  |                            |                  |       |       |            |       |                  |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |   |   |   |      |      |     |     |      |     |     |     |      |     |     |     |      |     |     |      |
| 抗弯强度<br>Resistance to Flexure | IEC 60068-2-21   | <p>将芯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；</p> <p>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><tr><th>尺寸<br/>Size</th><th>弯曲变形量<br/>Flexure</th><th>施压速度<br/>Pressurizing Speed</th><th>保持时间<br/>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<br>Size         | 弯曲变形量<br>Flexure | 施压速度<br>Pressurizing Speed | 保持时间<br>Duration | 0201, | 1mm   | <0.5mm/s   | 10±1s | 0402, 0603, 0805 | 2mm | <p>① 无外观损伤。</p> <p>No visible damage.</p> <p>② <math> \Delta R_{25}/R_{25}  \leq 2\%</math></p> <p>单位 unit: mm</p> <table><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<br>Size                    | 弯曲变形量<br>Flexure | 施压速度<br>Pressurizing Speed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 保持时间<br>Duration   |                  |                            |                  |       |       |            |       |                  |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |   |   |   |      |      |     |     |      |     |     |     |      |     |     |     |      |     |     |      |
| 0201,                         | 1mm              | <0.5mm/s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 10±1s              |                  |                            |                  |       |       |            |       |                  |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |   |   |   |      |      |     |     |      |     |     |     |      |     |     |     |      |     |     |      |
| 0402, 0603, 0805              | 2mm              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                  |                            |                  |       |       |            |       |                  |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |   |   |   |      |      |     |     |      |     |     |     |      |     |     |     |      |     |     |      |
| 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               |                  |                            |                  |       |       |            |       |                  |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |         |   |   |   |      |      |     |     |      |     |     |     |      |     |     |     |      |     |     |      |

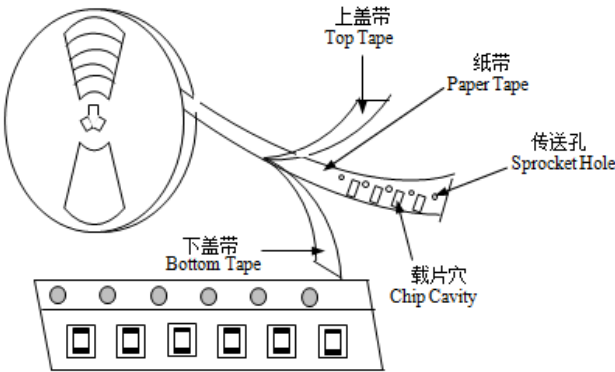
|                                     |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                       |                |         |   |        |         |   |       |        |   |        |         |   |       |        |                                                                                        |
|-------------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------|---|--------|---------|---|-------|--------|---|--------|---------|---|-------|--------|----------------------------------------------------------------------------------------|
| 振动<br>Vibration                     | IEC 60068-2-80 | <p>① 将芯片焊接在测试基板上（如右图所示的环氧玻璃布板）；<br/>Solder the chip to the testing jig (glass epoxy board shown in the left) using eutectic solder.</p> <p>② 芯片以全振幅为 1.5mm 进行振动，频率范围为 10Hz ~55 Hz；<br/>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）。<br/>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).</p> | <p>无外观损伤。<br/>No visible damage.</p> <div><p>铜箔 Cupad      阻焊膜 Solder mask</p><p>环氧玻璃布板Glass Epoxy Board</p></div> |                |         |   |        |         |   |       |        |   |        |         |   |       |        |                                                                                        |
| 坠落<br>Dropping                      | IEC 60068-2-32 | <p>从 1m 的高度让芯片自由坠落至水泥地面 10 次。<br/>Drop a chip 10 times on a concrete floor from a height of 1 meter.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <p>无外观损伤。<br/>No visible damage.</p>                                                                                                                                                                  |                |         |   |        |         |   |       |        |   |        |         |   |       |        |                                                                                        |
| 可焊性<br>Solderability                | IEC 60068-2-58 | <p>① 焊接温度 Solder temperature: 245±5℃.</p> <p>② 浸渍时间 Duration: 3±0.3s.</p> <p>③ 焊锡成分 Solder: 96.5Sn/3.0Ag/0.5Cu.</p> <p>④ 助焊剂 Flux: （重量比）25%松香和 75%酒精<br/>25% Resin and 75% ethanol in weight.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>① 无外观损伤；<br/>No visible damage.</p> <p>② 组件端电极的焊锡覆盖率不小于 95%。<br/>Wetting shall exceed 95% coverage.</p>                                                                                            |                |         |   |        |         |   |       |        |   |        |         |   |       |        |                                                                                        |
| 耐焊性<br>Resistance to Soldering Heat | IEC 60068-2-58 | <p>① 焊接温度 Solder temperature: 260±5℃.</p> <p>② 浸渍时间 Duration: 10±1s.</p> <p>③ 焊锡成分 Solder: 96.5Sn/3.0Ag/0.5Cu.</p> <p>④ 助焊剂 Flux: （重量比）25%松香和 75%酒精<br/>25% Resin and 75% ethanol in weight.</p> <p>⑤ 试验后标准条件下放置 1~2 小时后测量。<br/>The chip shall be stabilized at normal condition for 1~2 hours before measuring.</p>                                                                                                                                                                                                                                                                                                                                                              | <p>① 无外观损伤；<br/>No visible damage.</p> <p>②   ΔR25/R25   ≤2%</p> <p>③   ΔB/B   ≤1%</p>                                                                                                                |                |         |   |        |         |   |       |        |   |        |         |   |       |        |                                                                                        |
| 温度周期<br>Temperature cycling         | IEC 60068-2-14 | <p>① 无负载于下表所示的环境条件下重复 5 次。<br/>5 cycles of following sequence without loading.</p> <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> <p>② 试验后标准条件下放置 1~2 小时后测量。<br/>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；<br/>No visible damage.</p> <p>②   ΔR25/R25   ≤2%</p> <p>③   ΔB/B   ≤1%</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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                       |                |         |   |        |         |   |       |        |   |        |         |   |       |        |                                                                                        |
| 高温存放<br>Resistance to dry heat      | IEC 60068-2-2  | <p>① 在 125±5℃空气中，无负载放置 1000±24 小时。<br/>125±5℃ in air, for 1000±24 hours without loading.</p> <p>② 试验后标准条件下放置 1~2 小时后测量。<br/>The chip shall be stabilized at normal condition for 1~2 hours before measuring.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>① 无外观损伤；<br/>No visible damage.</p> <p>②   ΔR25/R25   ≤2%</p> <p>③   ΔB/B   ≤1%</p>                                                                                                                |                |         |   |        |         |   |       |        |   |        |         |   |       |        |                                                                                        |

|                                                      |                       |                                                                                                                                                                                                                                      |                                                                                        |
|------------------------------------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| 低温存放<br>Resistance<br>to cold                        | IEC 60068-2-1         | <p>① 在-40±3℃空气中，无负载放置 1000±24 小时。<br/>-40±3℃ in air, for 1000±24 hours without loading.</p> <p>② 试验后标准条件下放置 1~2 小时后测量。<br/>The chip shall be stabilized at normal condition for 1~2 hours before measuring.</p>                      | <p>① 无外观损伤;<br/>No visible damage.</p> <p>②   ΔR25/R25   ≤2%</p> <p>③   ΔB/B   ≤1%</p> |
| 湿热存放<br>Resistance<br>to damp heat                   | IEC 60068-2-78        | <p>① 在 60±2℃，相对湿度 90~95%空气中，无负载放置 1000±24 小时。<br/>60±2℃, 90~95%RH in air, for 1000±24 hours without loading.</p> <p>② 试验后标准条件下放置 1~2 小时后测量。<br/>The chip shall be stabilized at normal condition for 1~2 hours before measuring.</p> | <p>① 无外观损伤;<br/>No visible damage.</p> <p>②   ΔR25/R25   ≤2%</p> <p>③   ΔB/B   ≤1%</p> |
| 高温负荷<br>Resistance<br>to high<br>temperature<br>load | IEC 60539-1<br>5.25.4 | <p>① 在 85±2℃空气中，施加允许工作电流 1000±48 小时。<br/>85±2℃ in air with permissive operating current for 1000±48 hours</p> <p>② 试验后标准条件下放置 1~2 小时后测量。<br/>The chip shall be stabilized at normal condition for 1~2 hours before measuring.</p>    | <p>① 无外观损伤;<br/>No visible damage.</p> <p>②   ΔR25/R25   ≤2%</p> <p>③   ΔB/B   ≤1%</p> |

7 编带 Taping

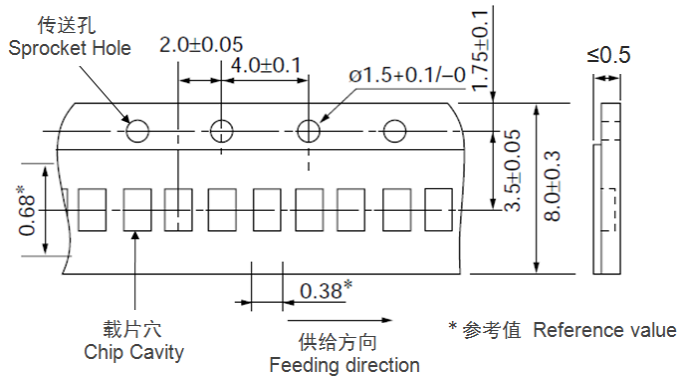
|                            |               |          |          |          |
|----------------------------|---------------|----------|----------|----------|
| 类型 Type                    | 0201          | 0402     | 0603     | 0805     |
| 编带厚度<br>Tape thickness(mm) | 0.5±0.15      | 0.5±0.15 | 0.8±0.15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

(1) 编带图 Taping Drawings

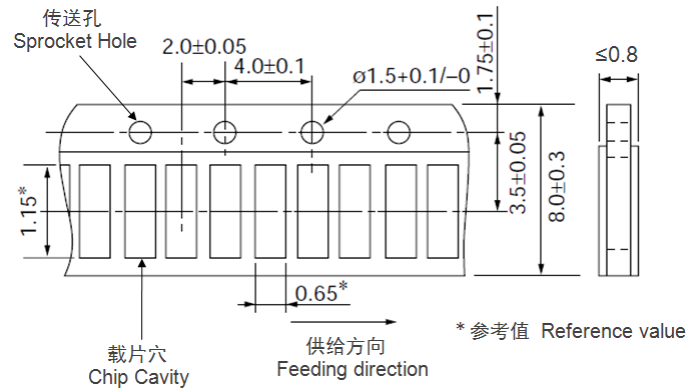


## (2) 纸带尺寸 Paper Tape Dimensions (单位 Unit: mm)

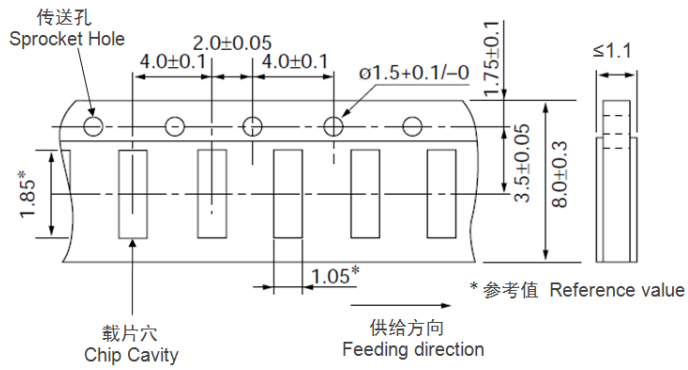
QN0201 系列 QN0201 series



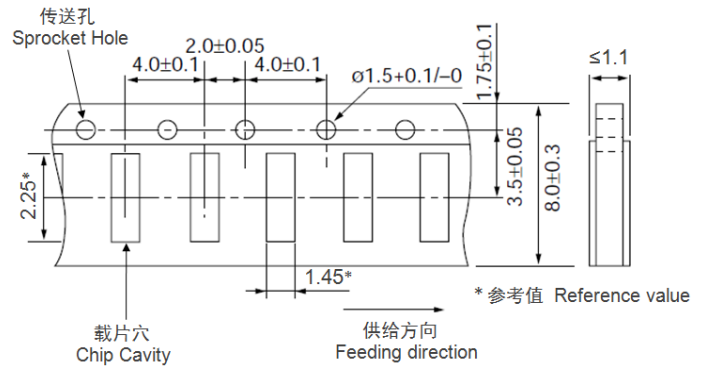
QN0402 系列 QN0402 series



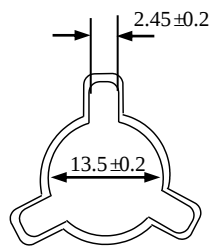
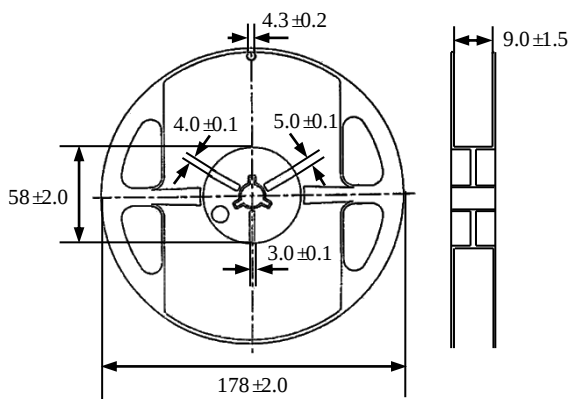
QN0603 系列 QN0603 series



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

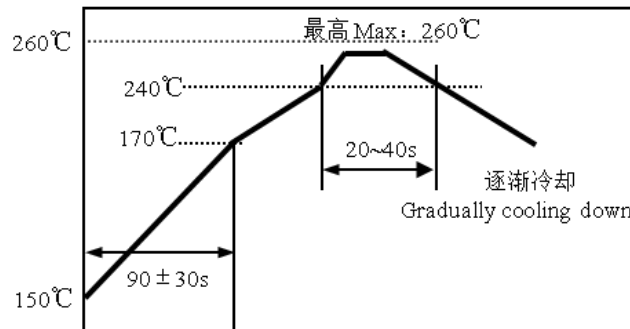
## • 回流焊

- 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

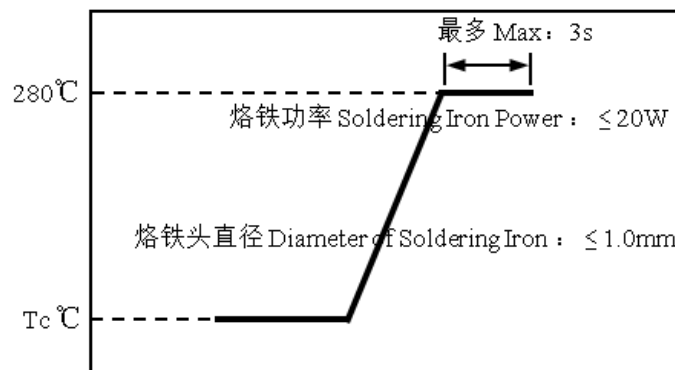
- 烙铁功率: 最大 20W
- 预热: 150°C/60sec.
- 烙铁头温度: 最高 280°C
- 焊接时间: 最多 3sec.
- 焊锡: 96.5Sn/3.0Ag/0.5Cu
- 手工焊: 最多 1 次

## • 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

## QN0402X204F3950FB

| 温度<br>Temp. (°C) | R 最小值<br>R_Min (Kohm) | R 中心值<br>R_Cent (Kohm) | R 最大值<br>R_Max (Kohm) | 阻值公差<br>Res TOL. | 温度公差<br>Temp. TOL.(°C) |
|------------------|-----------------------|------------------------|-----------------------|------------------|------------------------|
| -40              | 6,168.538             | 6,451.090              | 6,745.909             | 4.57%            | 0.67                   |
| -39              | 5,785.570             | 6,046.664              | 6,318.908             | 4.50%            | 0.66                   |
| -38              | 5,428.636             | 5,669.974              | 5,921.448             | 4.44%            | 0.66                   |
| -37              | 5,095.824             | 5,318.965              | 5,551.323             | 4.37%            | 0.65                   |
| -36              | 4,785.370             | 4,991.747              | 5,206.504             | 4.30%            | 0.65                   |
| -35              | 4,495.652             | 4,686.577              | 4,885.122             | 4.24%            | 0.64                   |
| -34              | 4,225.171             | 4,401.849              | 4,585.456             | 4.17%            | 0.64                   |
| -33              | 3,972.544             | 4,136.081              | 4,305.921             | 4.11%            | 0.63                   |
| -32              | 3,736.496             | 3,887.910              | 4,045.055             | 4.04%            | 0.63                   |
| -31              | 3,515.849             | 3,656.073              | 3,801.509             | 3.98%            | 0.62                   |
| -30              | 3,309.515             | 3,439.407              | 3,574.041             | 3.91%            | 0.62                   |
| -29              | 3,116.487             | 3,236.838              | 3,361.502             | 3.85%            | 0.61                   |
| -28              | 2,935.836             | 3,047.373              | 3,162.830             | 3.79%            | 0.61                   |
| -27              | 2,766.702             | 2,870.092              | 2,977.048             | 3.73%            | 0.60                   |
| -26              | 2,608.288             | 2,704.147              | 2,803.249             | 3.66%            | 0.59                   |
| -25              | 2,459.857             | 2,548.752              | 2,640.596             | 3.60%            | 0.59                   |
| -24              | 2,320.726             | 2,403.180              | 2,488.314             | 3.54%            | 0.58                   |
| -23              | 2,190.264             | 2,266.757              | 2,345.687             | 3.48%            | 0.58                   |
| -22              | 2,067.883             | 2,138.860              | 2,212.051             | 3.42%            | 0.57                   |
| -21              | 1,953.040             | 2,018.910              | 2,086.792             | 3.36%            | 0.57                   |
| -20              | 1,845.231             | 1,906.371              | 1,969.339             | 3.30%            | 0.56                   |
| -19              | 1,743.988             | 1,800.746              | 1,859.165             | 3.24%            | 0.55                   |
| -18              | 1,648.875             | 1,701.573              | 1,755.781             | 3.19%            | 0.55                   |
| -17              | 1,559.489             | 1,608.425              | 1,658.731             | 3.13%            | 0.54                   |
| -16              | 1,475.455             | 1,520.903              | 1,567.594             | 3.07%            | 0.54                   |
| -15              | 1,396.425             | 1,438.638              | 1,481.979             | 3.01%            | 0.53                   |
| -14              | 1,322.074             | 1,361.287              | 1,401.523             | 2.96%            | 0.52                   |
| -13              | 1,252.100             | 1,288.530              | 1,325.887             | 2.90%            | 0.52                   |
| -12              | 1,186.223             | 1,220.070              | 1,254.757             | 2.84%            | 0.51                   |
| -11              | 1,124.182             | 1,155.631              | 1,187.842             | 2.79%            | 0.50                   |
| -10              | 1,065.733             | 1,094.957              | 1,124.869             | 2.73%            | 0.50                   |
| -9               | 1,010.650             | 1,037.806              | 1,065.586             | 2.68%            | 0.49                   |
| -8               | 958.721               | 983.958                | 1,009.758             | 2.62%            | 0.48                   |
| -7               | 909.749               | 933.202                | 957.165               | 2.57%            | 0.48                   |
| -6               | 863.551               | 885.347                | 907.603               | 2.51%            | 0.47                   |
| -5               | 819.955               | 840.211                | 860.881               | 2.46%            | 0.46                   |
| -4               | 778.801               | 797.625                | 816.823               | 2.41%            | 0.46                   |
| -3               | 739.940               | 757.433                | 775.263               | 2.35%            | 0.45                   |
| -2               | 703.232               | 719.488                | 736.046               | 2.30%            | 0.44                   |
| -1               | 668.548               | 683.652                | 699.028               | 2.25%            | 0.43                   |
| 0                | 635.764               | 649.798                | 664.075               | 2.20%            | 0.43                   |
| 1                | 604.767               | 617.805                | 631.061               | 2.15%            | 0.42                   |

| 温度<br>Temp. (°C) | R 最小值<br>R_Min (Kohm) | R 中心值<br>R_Cent (Kohm) | R 最大值<br>R_Max (Kohm) | 阻值公差<br>Res TOL. | 温度公差<br>Temp. TOL.(°C) |
|------------------|-----------------------|------------------------|-----------------------|------------------|------------------------|
| 2                | 575.452               | 587.562                | 599.868               | 2.09%            | 0.41                   |
| 3                | 547.717               | 558.965                | 570.387               | 2.04%            | 0.41                   |
| 4                | 521.470               | 531.915                | 542.515               | 1.99%            | 0.40                   |
| 5                | 496.624               | 506.321                | 516.157               | 1.94%            | 0.39                   |
| 6                | 473.096               | 482.098                | 491.221               | 1.89%            | 0.38                   |
| 7                | 450.810               | 459.164                | 467.626               | 1.84%            | 0.38                   |
| 8                | 429.694               | 437.445                | 445.291               | 1.79%            | 0.37                   |
| 9                | 409.681               | 416.870                | 424.142               | 1.74%            | 0.36                   |
| 10               | 390.708               | 397.374                | 404.112               | 1.70%            | 0.35                   |
| 11               | 372.716               | 378.894                | 385.136               | 1.65%            | 0.34                   |
| 12               | 355.648               | 361.372                | 367.151               | 1.60%            | 0.34                   |
| 13               | 339.453               | 344.754                | 350.103               | 1.55%            | 0.33                   |
| 14               | 324.082               | 328.989                | 333.937               | 1.50%            | 0.32                   |
| 15               | 309.489               | 314.029                | 318.604               | 1.46%            | 0.31                   |
| 16               | 295.631               | 299.829                | 304.056               | 1.41%            | 0.30                   |
| 17               | 282.467               | 286.346                | 290.249               | 1.36%            | 0.30                   |
| 18               | 269.958               | 273.540                | 277.142               | 1.32%            | 0.29                   |
| 19               | 258.070               | 261.375                | 264.696               | 1.27%            | 0.28                   |
| 20               | 246.767               | 249.815                | 252.875               | 1.22%            | 0.27                   |
| 21               | 236.020               | 238.827                | 241.644               | 1.18%            | 0.26                   |
| 22               | 225.796               | 228.380                | 230.970               | 1.13%            | 0.25                   |
| 23               | 216.069               | 218.444                | 220.824               | 1.09%            | 0.25                   |
| 24               | 206.812               | 208.993                | 211.176               | 1.04%            | 0.24                   |
| 25               | 198.000               | 200.000                | 202.000               | 1.00%            | 0.23                   |
| 26               | 189.443               | 191.441                | 193.440               | 1.04%            | 0.24                   |
| 27               | 181.301               | 183.292                | 185.287               | 1.09%            | 0.25                   |
| 28               | 173.551               | 175.532                | 177.519               | 1.13%            | 0.26                   |
| 29               | 166.172               | 168.142                | 170.118               | 1.18%            | 0.27                   |
| 30               | 159.144               | 161.100                | 163.063               | 1.22%            | 0.29                   |
| 31               | 152.450               | 154.389                | 156.338               | 1.26%            | 0.30                   |
| 32               | 146.073               | 147.993                | 149.924               | 1.30%            | 0.31                   |
| 33               | 139.994               | 141.894                | 143.806               | 1.35%            | 0.32                   |
| 34               | 134.200               | 136.078                | 137.969               | 1.39%            | 0.33                   |
| 35               | 128.675               | 130.530                | 132.399               | 1.43%            | 0.35                   |
| 36               | 123.405               | 125.237                | 127.083               | 1.47%            | 0.36                   |
| 37               | 118.378               | 120.185                | 122.006               | 1.52%            | 0.37                   |
| 38               | 113.582               | 115.362                | 117.159               | 1.56%            | 0.38                   |
| 39               | 109.004               | 110.758                | 112.528               | 1.60%            | 0.40                   |
| 40               | 104.634               | 106.360                | 108.104               | 1.64%            | 0.41                   |
| 41               | 100.460               | 102.159                | 103.876               | 1.68%            | 0.42                   |
| 42               | 96.475                | 98.145                 | 99.835                | 1.72%            | 0.43                   |
| 43               | 92.667                | 94.310                 | 95.971                | 1.76%            | 0.45                   |
| 44               | 89.029                | 90.643                 | 92.277                | 1.80%            | 0.46                   |
| 45               | 85.552                | 87.137                 | 88.743                | 1.84%            | 0.47                   |
| 46               | 82.228                | 83.784                 | 85.362                | 1.88%            | 0.49                   |

| 温度<br>Temp. (°C) | R 最小值<br>R_Min (Kohm) | R 中心值<br>R_Cent (Kohm) | R 最大值<br>R_Max (Kohm) | 阻值公差<br>Res TOL. | 温度公差<br>Temp. TOL.(°C) |
|------------------|-----------------------|------------------------|-----------------------|------------------|------------------------|
| 47               | 79.050                | 80.577                 | 82.126                | 1.92%            | 0.50                   |
| 48               | 76.010                | 77.509                 | 79.030                | 1.96%            | 0.51                   |
| 49               | 73.102                | 74.573                 | 76.065                | 2.00%            | 0.53                   |
| 50               | 70.320                | 71.762                 | 73.227                | 2.04%            | 0.54                   |
| 51               | 67.658                | 69.072                 | 70.508                | 2.08%            | 0.55                   |
| 52               | 65.109                | 66.495                 | 67.904                | 2.12%            | 0.57                   |
| 53               | 62.669                | 64.027                 | 65.408                | 2.16%            | 0.58                   |
| 54               | 60.333                | 61.663                 | 63.017                | 2.20%            | 0.59                   |
| 55               | 58.094                | 59.398                 | 60.725                | 2.23%            | 0.61                   |
| 56               | 55.950                | 57.227                 | 58.527                | 2.27%            | 0.62                   |
| 57               | 53.896                | 55.146                 | 56.420                | 2.31%            | 0.64                   |
| 58               | 51.927                | 53.151                 | 54.399                | 2.35%            | 0.65                   |
| 59               | 50.039                | 51.238                 | 52.460                | 2.38%            | 0.66                   |
| 60               | 48.229                | 49.403                 | 50.599                | 2.42%            | 0.68                   |
| 61               | 46.494                | 47.642                 | 48.814                | 2.46%            | 0.69                   |
| 62               | 44.829                | 45.953                 | 47.100                | 2.50%            | 0.71                   |
| 63               | 43.232                | 44.332                 | 45.455                | 2.53%            | 0.72                   |
| 64               | 41.699                | 42.775                 | 43.875                | 2.57%            | 0.73                   |
| 65               | 40.229                | 41.281                 | 42.357                | 2.61%            | 0.75                   |
| 66               | 38.817                | 39.846                 | 40.899                | 2.64%            | 0.76                   |
| 67               | 37.461                | 38.468                 | 39.499                | 2.68%            | 0.78                   |
| 68               | 36.159                | 37.145                 | 38.153                | 2.71%            | 0.79                   |
| 69               | 34.909                | 35.873                 | 36.859                | 2.75%            | 0.81                   |
| 70               | 33.708                | 34.650                 | 35.616                | 2.79%            | 0.82                   |
| 71               | 32.553                | 33.475                 | 34.420                | 2.82%            | 0.84                   |
| 72               | 31.444                | 32.346                 | 33.270                | 2.86%            | 0.85                   |
| 73               | 30.378                | 31.260                 | 32.164                | 2.89%            | 0.87                   |
| 74               | 29.353                | 30.215                 | 31.100                | 2.93%            | 0.88                   |
| 75               | 28.367                | 29.210                 | 30.076                | 2.96%            | 0.90                   |
| 76               | 27.419                | 28.244                 | 29.090                | 3.00%            | 0.91                   |
| 77               | 26.508                | 27.314                 | 28.142                | 3.03%            | 0.93                   |
| 78               | 25.631                | 26.419                 | 27.229                | 3.07%            | 0.95                   |
| 79               | 24.786                | 25.557                 | 26.349                | 3.10%            | 0.96                   |
| 80               | 23.974                | 24.728                 | 25.503                | 3.13%            | 0.98                   |
| 81               | 23.192                | 23.929                 | 24.687                | 3.17%            | 0.99                   |
| 82               | 22.439                | 23.160                 | 23.901                | 3.20%            | 1.01                   |
| 83               | 21.714                | 22.419                 | 23.144                | 3.23%            | 1.02                   |
| 84               | 21.016                | 21.705                 | 22.415                | 3.27%            | 1.04                   |
| 85               | 20.344                | 21.018                 | 21.711                | 3.30%            | 1.06                   |
| 86               | 19.696                | 20.355                 | 21.033                | 3.33%            | 1.07                   |
| 87               | 19.072                | 19.716                 | 20.380                | 3.37%            | 1.09                   |
| 88               | 18.470                | 19.100                 | 19.749                | 3.40%            | 1.10                   |
| 89               | 17.890                | 18.506                 | 19.141                | 3.43%            | 1.12                   |
| 90               | 17.331                | 17.933                 | 18.555                | 3.47%            | 1.14                   |
| 91               | 16.792                | 17.381                 | 17.989                | 3.50%            | 1.15                   |

| 温度<br>Temp. (°C) | R 最小值<br>R_Min (Kohm) | R 中心值<br>R_Cent (Kohm) | R 最大值<br>R_Max (Kohm) | 阻值公差<br>Res TOL. | 温度公差<br>Temp. TOL.(°C) |
|------------------|-----------------------|------------------------|-----------------------|------------------|------------------------|
| 92               | 16.272                | 16.848                 | 17.443                | 3.53%            | 1.17                   |
| 93               | 15.771                | 16.334                 | 16.916                | 3.56%            | 1.19                   |
| 94               | 15.287                | 15.838                 | 16.408                | 3.59%            | 1.20                   |
| 95               | 14.821                | 15.360                 | 15.916                | 3.63%            | 1.22                   |
| 96               | 14.370                | 14.897                 | 15.442                | 3.66%            | 1.24                   |
| 97               | 13.936                | 14.451                 | 14.984                | 3.69%            | 1.25                   |
| 98               | 13.516                | 14.021                 | 14.542                | 3.72%            | 1.27                   |
| 99               | 13.111                | 13.605                 | 14.115                | 3.75%            | 1.29                   |
| 100              | 12.720                | 13.203                 | 13.702                | 3.78%            | 1.31                   |
| 101              | 12.343                | 12.815                 | 13.303                | 3.81%            | 1.32                   |
| 102              | 11.978                | 12.440                 | 12.918                | 3.84%            | 1.34                   |
| 103              | 11.626                | 12.077                 | 12.545                | 3.88%            | 1.36                   |
| 104              | 11.285                | 11.727                 | 12.185                | 3.91%            | 1.38                   |
| 105              | 10.956                | 11.389                 | 11.837                | 3.94%            | 1.39                   |
| 106              | 10.638                | 11.061                 | 11.500                | 3.97%            | 1.41                   |
| 107              | 10.331                | 10.745                 | 11.175                | 4.00%            | 1.43                   |
| 108              | 10.034                | 10.439                 | 10.859                | 4.03%            | 1.45                   |
| 109              | 9.747                 | 10.143                 | 10.555                | 4.06%            | 1.46                   |
| 110              | 9.469                 | 9.857                  | 10.260                | 4.09%            | 1.48                   |
| 111              | 9.201                 | 9.580                  | 9.975                 | 4.12%            | 1.50                   |
| 112              | 8.941                 | 9.312                  | 9.698                 | 4.15%            | 1.52                   |
| 113              | 8.689                 | 9.053                  | 9.431                 | 4.18%            | 1.54                   |
| 114              | 8.446                 | 8.802                  | 9.172                 | 4.20%            | 1.56                   |
| 115              | 8.211                 | 8.559                  | 8.922                 | 4.23%            | 1.57                   |
| 116              | 7.983                 | 8.324                  | 8.679                 | 4.26%            | 1.59                   |
| 117              | 7.763                 | 8.097                  | 8.444                 | 4.29%            | 1.61                   |
| 118              | 7.549                 | 7.876                  | 8.217                 | 4.32%            | 1.63                   |
| 119              | 7.343                 | 7.663                  | 7.996                 | 4.35%            | 1.65                   |
| 120              | 7.143                 | 7.456                  | 7.783                 | 4.38%            | 1.67                   |
| 121              | 6.949                 | 7.256                  | 7.576                 | 4.41%            | 1.69                   |
| 122              | 6.761                 | 7.062                  | 7.375                 | 4.43%            | 1.70                   |
| 123              | 6.579                 | 6.874                  | 7.181                 | 4.46%            | 1.72                   |
| 124              | 6.403                 | 6.692                  | 6.992                 | 4.49%            | 1.74                   |
| 125              | 6.233                 | 6.515                  | 6.809                 | 4.52%            | 1.76                   |