



南京时恒电子科技有限公司

规格承认书

APPROVAL SHEET

客户名称:

CUSTOMER _____

产品名称:

PART NAME 片式NTC热敏电阻规格书

产品规格:

PART NUMBER CMFX 1034F3950

日期:

DATE 2021年3月26日

确 认

CONFIRM

| 客户 | 供货商/制造商 |
|------------|-------------------|
| 品保部: _____ | 规格书制作: <u>鞠晓丽</u> |
| 制造部: _____ | 业务员审核: _____ |
| 工程部: _____ | 技术部审核: <u>程鹏</u> |
| | 品质部审核: <u>李少媛</u> |

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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

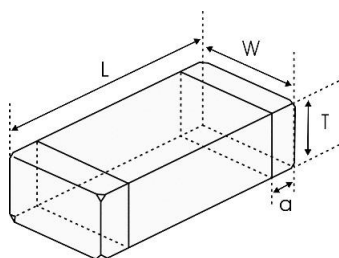


图 1 Fig.1

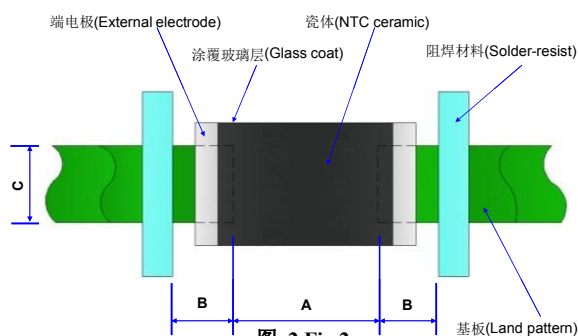


图 2 Fig.2

表 1 (Table 1)

单位 unit: inch[mm]

| 类别Type | L | W | T | a | A | B | C |
|-------------|---------------------------|---------------------------|---------------------------|---------------------------|-------------|-----------|-------------|
| X [0402] | 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)

CMF X 104 F 3950
① ② ③ ④ ⑤

| ① 类别 Type | |
|-----------|------------------------------------|
| CMF | 片式NTC 热敏电阻器 Chip NTC Thermistor |

| ② 外形尺寸(mm) External Dimensions (L×W×T) | |
|---|------------------|
| 0201[A] | 0.60×0.3 0×0.3 0 |
| X[0402] | 1.00×0.5 0×0.5 0 |
| A[0603] | 1.60×0.8 0×0.8 0 |
| B[0805] | 2.00×1.2 5×0.8 5 |

| ③ 25℃的零功率电阻 Nominal Zero-Power Resistance | |
|--|------|
| 502 | 5kΩ |
| 683 | 68kΩ |
| ④ 电阻值公差 Tolerance of Resistance | |
| F | ±1% |
| G | ±2% |
| H | ±3% |
| J | ±5% |

| ⑤ B 值常数 B Constant | |
|--------------------|-------|
| 3450 | 3450K |
| 3950 | 3950K |
| 4250 | 4250K |

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 (℃) |
|---------------|------------------------------------|--------------------------------------|--------------------------------------|---|---|---|--|--|
| CMFX 104F3950 | 100±1% | 3950±1% | 4010 | 0.10 | 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:

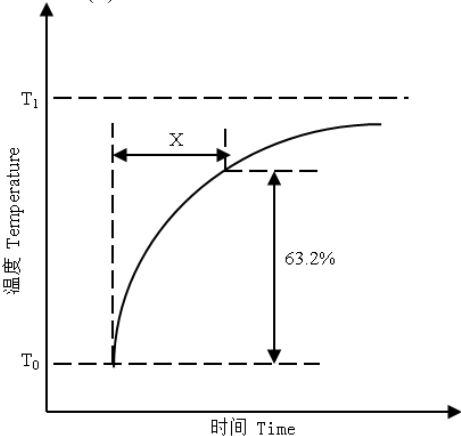
- Ambient Temperature: 25±2℃
- Relative Humidity: 65±5%
- Air Pressure: 86kPa to 106kPa

Inspection Equipment

Visual Examination: 20× magnifier

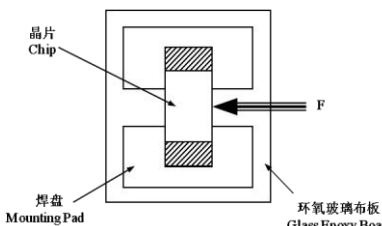
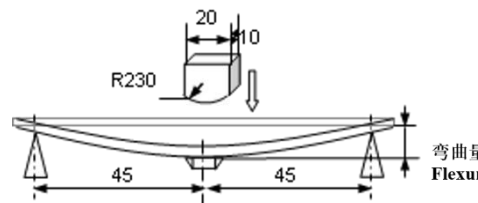
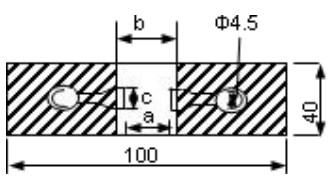
Resistance value test: Thermistor resistance tester

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 | <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。</p> <p>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).</p>  |

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

6 信赖性试验 Reliability Test

| 项目 Items | 测试标准 Standard | 测试方法及备注 Test Methods and Remarks | 要求 Requirements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------|------------------|--|--------------------|---------------|-------------------------|---------------|-------|-------|----------|-------|---------|-----|--|---------|---|---|---|------|------|-----|-----|---|-----|-----|-----|---|-----|-----|-----|---|-----|-----|------|
| 端头附着力 Terminal Strength | IEC 60068-2-21 | <p>将晶片焊接在测试基板上（如右图所示的环氧玻璃布板），按箭头所示方向施加作用力； Solder the chip to the testing jig (glass epoxy board shown in the right) using eutectic solder. Then apply a force in the direction of the arrow.</p> <table border="1"> <thead> <tr> <th>尺寸 Size</th> <th>F</th> <th>保持时间 Duration</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>2N</td> <td rowspan="3">10±1s</td> </tr> <tr> <td>X, A</td> <td>5N</td> </tr> <tr> <td>B</td> <td>10N</td> </tr> </tbody> </table> | 尺寸 Size | F | 保持时间 Duration | 0201 | 2N | 10±1s | X, A | 5N | B | 10N | <p>端电极无脱落且瓷体无损伤。 No removal or split of the termination or other defects shall occur.</p>  | | | | | | | | | | | | | | | | | | | | |
| 尺寸 Size | F | 保持时间 Duration | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0201 | 2N | 10±1s | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X, A | 5N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B | 10N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 抗弯强度 Resistance to Flexure | IEC 60068-2-21 | <p>将晶片焊接在测试基板上（如右图所示的环氧玻璃布板），按下图箭头所示方向施加作用力； Solder the chip to the test jig (glass epoxy board shown in the right) using a eutectic solder. Then apply a force in the direction shown as follow;</p>  <table border="1"> <thead> <tr> <th>尺寸 Size</th> <th>弯曲变形量 Flexure</th> <th>施压速度 Pressurizing Speed</th> <th>保持时间 Duration</th> </tr> </thead> <tbody> <tr> <td>0201,</td> <td>1mm</td> <td rowspan="2"><0.5mm/s</td> <td rowspan="2">10±1s</td> </tr> <tr> <td>X, A, B</td> <td>2mm</td> </tr> </tbody> </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 | X, A, B | 2mm | <p>① 无外观损伤。 No visible damage. ② $\Delta R_{25}/R_{25} \leq 2\%$</p> <p>单位 unit: mm</p> <table border="1"> <thead> <tr> <th>类型 Type</th> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>0.25</td> <td>0.3</td> <td>0.3</td> </tr> <tr> <td>X</td> <td>0.4</td> <td>1.5</td> <td>0.5</td> </tr> <tr> <td>A</td> <td>1.0</td> <td>3.0</td> <td>1.2</td> </tr> <tr> <td>B</td> <td>1.2</td> <td>4.0</td> <td>1.65</td> </tr> </tbody> </table>  | 类型 Type | a | b | c | 0201 | 0.25 | 0.3 | 0.3 | X | 0.4 | 1.5 | 0.5 | A | 1.0 | 3.0 | 1.2 | B | 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X, A, B | 2mm | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 类型 Type | a | b | c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0201 | 0.25 | 0.3 | 0.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X | 0.4 | 1.5 | 0.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A | 1.0 | 3.0 | 1.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B | 1.2 | 4.0 | 1.65 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

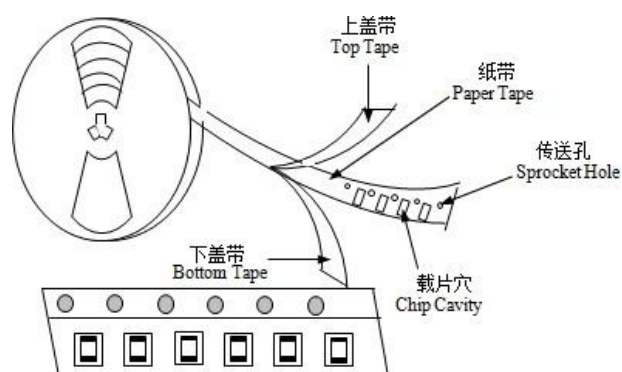
| <p>振动 Vibration</p> | <p>IEC 60068-2-80</p> | <p>① 将晶片焊接在测试基板上（如右图所示的环氧玻璃布板）； Solder the chip to the testing jig (glass epoxy board shown in the left) using eutectic solder.</p> <p>② 晶片以全振幅为 1.5mm 进行振动，频率范围为 10Hz ~55 Hz； The chip shall be subjected to a simple harmonic motion having total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55 Hz.</p> <p>③ 振动频率按 10Hz→55Hz→10Hz 循环，周期为 1 分钟，在空间三个互相垂直的方向上各振动 2 小时（共 6 小时）。 The frequency ranges from 10 to 55 Hz and return to 10 Hz shall be traversed in approximately 1 minute. This motion shall be applied for a period of 2 hours in each 3 mutually perpendicular directions (total of 6 hours).</p> | <p>无外观损伤。 No visible damage.</p>  | | | | | | | | | | | | | | | |
|---|-----------------------|--|--|----------------|---------|---|----------|---------|---|---------|--------|---|----------|---------|---|---------|--------|--|
| <p>坠落 Dropping</p> | <p>IEC 60068-2-32</p> | <p>从 1m 的高度让晶片自由坠落至水泥地面 10 次。 Drop a chip 10 times on a concrete floor from a height of 1 meter.</p> | <p>无外观损伤。 No visible damage.</p> | | | | | | | | | | | | | | | |
| <p>可焊性 Solderability</p> | <p>IEC 60068-2-58</p> | <p>① 焊接温度 Solder temperature: 245±5 °C. 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.</p> | <p>① 无外观损伤； No visible damage. ② 元件端电极的焊锡覆盖率不小于 95%。 Wetting shall exceed 95% coverage.</p> | | | | | | | | | | | | | | | |
| <p>耐焊性 Resistance to Soldering Heat</p> | <p>IEC 60068-2-58</p> | <p>① 焊接温度 Solder temperature: 260±5 °C. 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.</p> | <p>① 无外观损伤； No visible damage. ② $\Delta R_{25}/R_{25} \leq 2\%$ ③ $\Delta B/B \leq 1\%$</p> | | | | | | | | | | | | | | | |
| <p>温度周期 Temperature cycling</p> | <p>IEC 60068-2-14</p> | <p>① 无负载于下表所示的环境条件下重复 5 次。 5 cycles of following sequence without loading.</p> <table border="1" data-bbox="491 1429 1040 1619"> <thead> <tr> <th>步骤 Step</th> <th>温度 Temperature</th> <th>时间 Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-40±5 °C</td> <td>30±3min</td> </tr> <tr> <td>2</td> <td>25±2 °C</td> <td>5±3min</td> </tr> <tr> <td>3</td> <td>125±2 °C</td> <td>30±3min</td> </tr> <tr> <td>4</td> <td>25±2 °C</td> <td>5±3min</td> </tr> </tbody> </table> <p>② 试验后标准条件下放置 1~2 小时后测量。 The chip shall be stabilized at normal condition for 1~2 hours before measuring.</p> | 步骤 Step | 温度 Temperature | 时间 Time | 1 | -40±5 °C | 30±3min | 2 | 25±2 °C | 5±3min | 3 | 125±2 °C | 30±3min | 4 | 25±2 °C | 5±3min | <p>① 无外观损伤； No visible damage. ② $\Delta R_{25}/R_{25} \leq 2\%$ ③ $\Delta B/B \leq 1\%$</p> |
| 步骤 Step | 温度 Temperature | 时间 Time | | | | | | | | | | | | | | | | |
| 1 | -40±5 °C | 30±3min | | | | | | | | | | | | | | | | |
| 2 | 25±2 °C | 5±3min | | | | | | | | | | | | | | | | |
| 3 | 125±2 °C | 30±3min | | | | | | | | | | | | | | | | |
| 4 | 25±2 °C | 5±3min | | | | | | | | | | | | | | | | |
| <p>高温存放 Resistance to dry heat</p> | <p>IEC 60068-2-2</p> | <p>① 在 125±5 °C 空气中，无负载放置 1000±24 小时。 125±5 °C in air, for 1000±24 hours without loading. ② 试验后标准条件下放置 1~2 小时后测量。 The chip shall be stabilized at normal condition for 1~2 hours before measuring.</p> | <p>① 无外观损伤； No visible damage. ② $\Delta R_{25}/R_{25} \leq 2\%$ ③ $\Delta B/B \leq 1\%$</p> | | | | | | | | | | | | | | | |

| | | | |
|--|-----------------------|--|--|
| 低温存放 Resistance to cold | IEC 60068-2-1 | ① 在-40±3℃空气中, 无负载放置 1000±24 小时。 -40±3℃ in air, for 1000±24 hours without loading. ② 试验后标准条件下放置 1~2 小时后测量。 The chip shall be stabilized at normal condition for 1~2 hours before measuring. | ① 无外观损伤; No visible damage. ② $ \Delta R25/R25 \leq 2\%$ ③ $ \Delta B/B \leq 1\%$ |
| 湿热存放 Resistance to damp heat | IEC 60068-2-78 | ① 在 40±2℃, 相对湿度 90~95%空气中, 无负载放置 1000±24 小时。 40±2℃, 90~95%RH in air, for 1000±24 hours without loading. ② 试验后标准条件下放置 1~2 小时后测量。 The chip shall be stabilized at normal condition for 1~2 hours before measuring. | ① 无外观损伤; No visible damage. ② $ \Delta R25/R25 \leq 2\%$ ③ $ \Delta B/B \leq 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 $ \Delta R25/R25 \leq 2\%$ ③ $ \Delta B/B \leq 1\%$ |

7 编带 Taping

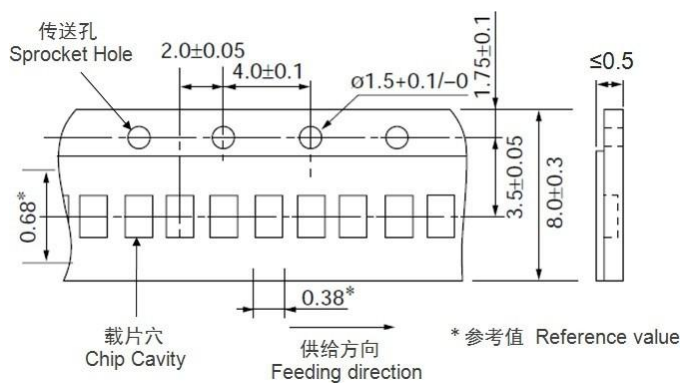
| 类型 Type | 0201 | X | A | B |
|----------------------------|---------------|----------|----------|----------|
| 编带厚度 Tape thickness(mm) | 0.5±0.15 | 0.5±0.15 | 0.8±0.15 | 0.85±0.2 |
| 编带材质 Tape material | 纸带 Paper Tape | | | |
| 每盘数量 Quantity per Reel | 15K | 10K | 4K | 4K |

(1) 编带图 Taping Drawings

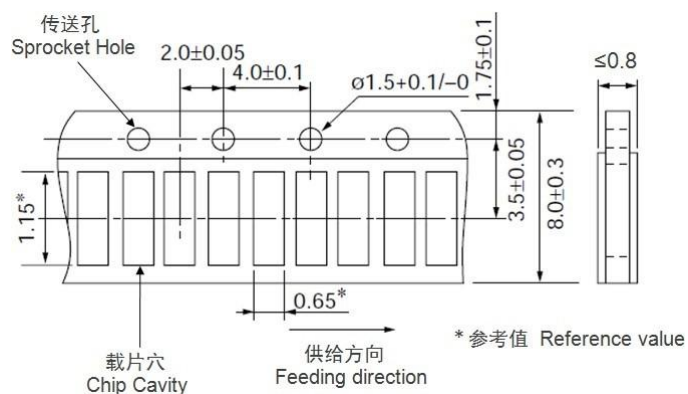


(2) 纸带尺寸 Paper Tape Dimensions (单位 Unit: mm)

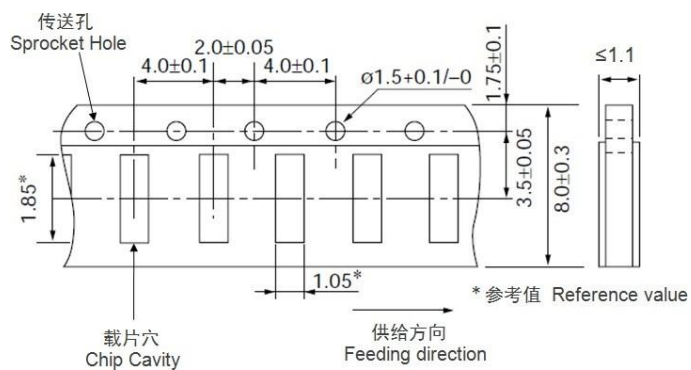
CMF0201 系列 CMF0201 series



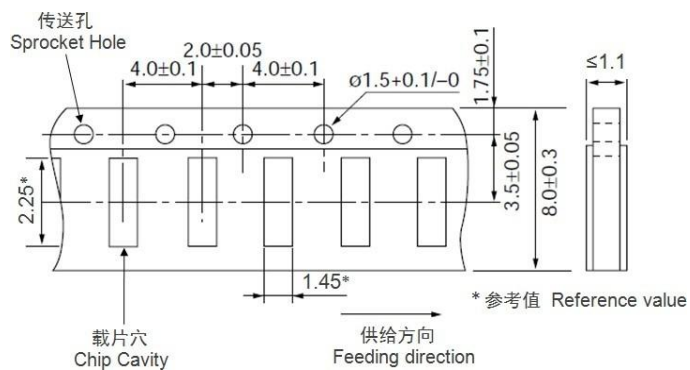
CMFX 系列 CMFX series



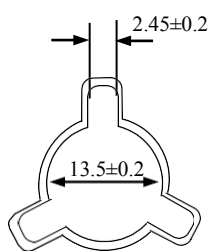
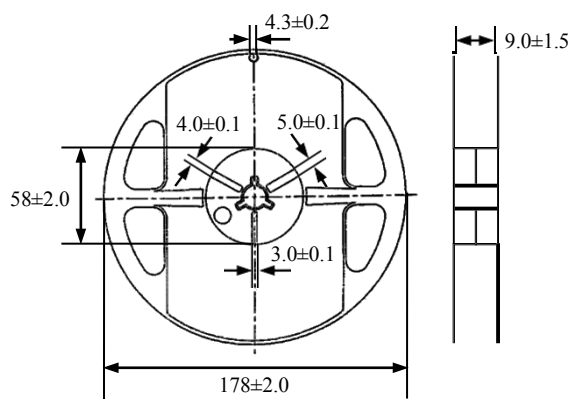
CMFA 系列 CMFA series



CMFB 系列 CMFB 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

• CMF 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

• CMF 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。

• CMF 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 CMF 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 CMF series thermistors is fragile, no excessive pressure or impact shall be exerted on it.

• The CMF 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

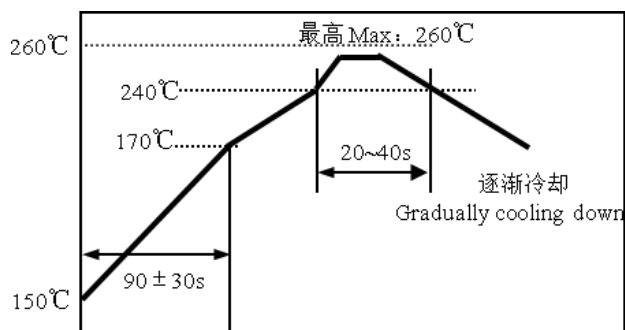
Pre-heating: 150~170°C/90±30 sec.

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.

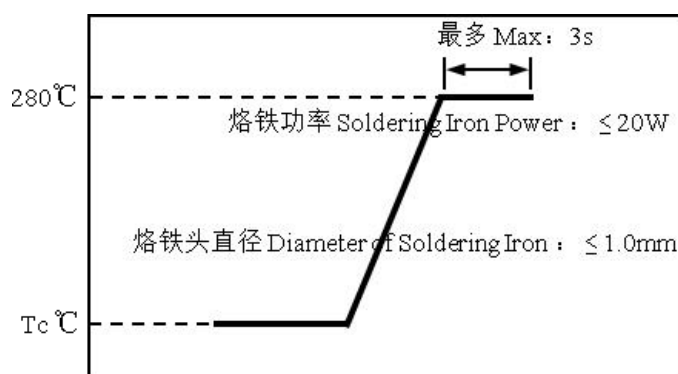
Soldering time: 3 sec Max.

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

CMFX 104F3950FB

| 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 | 3,084.269 | 3,225.545 | 3,372.955 | 4.57% | 0.67 |
| -39 | 2,892.785 | 3,023.332 | 3,159.454 | 4.50% | 0.66 |
| -38 | 2,714.318 | 2,834.987 | 2,960.724 | 4.44% | 0.66 |
| -37 | 2,547.912 | 2,659.483 | 2,775.662 | 4.37% | 0.65 |
| -36 | 2,392.685 | 2,495.874 | 2,603.252 | 4.30% | 0.65 |
| -35 | 2,247.826 | 2,343.289 | 2,442.561 | 4.24% | 0.64 |
| -34 | 2,112.585 | 2,200.924 | 2,292.728 | 4.17% | 0.64 |
| -33 | 1,986.272 | 2,068.041 | 2,152.960 | 4.11% | 0.63 |
| -32 | 1,868.248 | 1,943.955 | 2,022.527 | 4.04% | 0.63 |
| -31 | 1,757.924 | 1,828.036 | 1,900.755 | 3.98% | 0.62 |
| -30 | 1,654.757 | 1,719.704 | 1,787.021 | 3.91% | 0.62 |
| -29 | 1,558.243 | 1,618.419 | 1,680.751 | 3.85% | 0.61 |
| -28 | 1,467.918 | 1,523.686 | 1,581.415 | 3.79% | 0.61 |
| -27 | 1,383.351 | 1,435.046 | 1,488.524 | 3.73% | 0.60 |
| -26 | 1,304.144 | 1,352.073 | 1,401.624 | 3.66% | 0.59 |
| -25 | 1,229.928 | 1,274.376 | 1,320.298 | 3.60% | 0.59 |
| -24 | 1,160.363 | 1,201.590 | 1,244.157 | 3.54% | 0.58 |
| -23 | 1,095.132 | 1,133.379 | 1,172.844 | 3.48% | 0.58 |
| -22 | 1,033.942 | 1,069.430 | 1,106.026 | 3.42% | 0.57 |
| -21 | 976.520 | 1,009.455 | 1,043.396 | 3.36% | 0.57 |
| -20 | 922.616 | 953.185 | 984.670 | 3.30% | 0.56 |
| -19 | 871.994 | 900.373 | 929.583 | 3.24% | 0.55 |
| -18 | 824.437 | 850.787 | 877.890 | 3.19% | 0.55 |
| -17 | 779.744 | 804.212 | 829.365 | 3.13% | 0.54 |
| -16 | 737.728 | 760.451 | 783.797 | 3.07% | 0.54 |
| -15 | 698.212 | 719.319 | 740.990 | 3.01% | 0.53 |
| -14 | 661.037 | 680.643 | 700.761 | 2.96% | 0.52 |
| -13 | 626.050 | 644.265 | 662.943 | 2.90% | 0.52 |
| -12 | 593.112 | 610.035 | 627.379 | 2.84% | 0.51 |
| -11 | 562.091 | 577.816 | 593.921 | 2.79% | 0.50 |
| -10 | 532.867 | 547.478 | 562.435 | 2.73% | 0.50 |
| -9 | 505.325 | 518.903 | 532.793 | 2.68% | 0.49 |
| -8 | 479.360 | 491.979 | 504.879 | 2.62% | 0.48 |
| -7 | 454.874 | 466.601 | 478.582 | 2.57% | 0.48 |
| -6 | 431.775 | 442.674 | 453.801 | 2.51% | 0.47 |
| -5 | 409.977 | 420.105 | 430.441 | 2.46% | 0.46 |
| -4 | 389.400 | 398.813 | 408.412 | 2.41% | 0.46 |
| -3 | 369.970 | 378.717 | 387.631 | 2.35% | 0.45 |
| -2 | 351.616 | 359.744 | 368.023 | 2.30% | 0.44 |
| -1 | 334.274 | 341.826 | 349.514 | 2.25% | 0.43 |
| 0 | 317.882 | 324.899 | 332.037 | 2.20% | 0.43 |
| 1 | 302.384 | 308.903 | 315.530 | 2.15% | 0.42 |

| 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 | 287.726 | 293.781 | 299.934 | 2.09% | 0.41 |
| 3 | 273.859 | 279.483 | 285.193 | 2.04% | 0.41 |
| 4 | 260.735 | 265.958 | 271.258 | 1.99% | 0.40 |
| 5 | 248.312 | 253.161 | 258.078 | 1.94% | 0.39 |
| 6 | 236.548 | 241.049 | 245.611 | 1.89% | 0.38 |
| 7 | 225.405 | 229.582 | 233.813 | 1.84% | 0.38 |
| 8 | 214.847 | 218.722 | 222.645 | 1.79% | 0.37 |
| 9 | 204.841 | 208.435 | 212.071 | 1.74% | 0.36 |
| 10 | 195.354 | 198.687 | 202.056 | 1.70% | 0.35 |
| 11 | 186.358 | 189.447 | 192.568 | 1.65% | 0.34 |
| 12 | 177.824 | 180.686 | 183.576 | 1.60% | 0.34 |
| 13 | 169.727 | 172.377 | 175.052 | 1.55% | 0.33 |
| 14 | 162.041 | 164.495 | 166.969 | 1.50% | 0.32 |
| 15 | 154.745 | 157.015 | 159.302 | 1.46% | 0.31 |
| 16 | 147.816 | 149.914 | 152.028 | 1.41% | 0.30 |
| 17 | 141.233 | 143.173 | 145.124 | 1.36% | 0.30 |
| 18 | 134.979 | 136.770 | 138.571 | 1.32% | 0.29 |
| 19 | 129.035 | 130.688 | 132.348 | 1.27% | 0.28 |
| 20 | 123.384 | 124.908 | 126.437 | 1.22% | 0.27 |
| 21 | 118.010 | 119.413 | 120.822 | 1.18% | 0.26 |
| 22 | 112.898 | 114.190 | 115.485 | 1.13% | 0.25 |
| 23 | 108.035 | 109.222 | 110.412 | 1.09% | 0.25 |
| 24 | 103.406 | 104.497 | 105.588 | 1.04% | 0.24 |
| 25 | 99.000 | 100.000 | 101.000 | 1.00% | 0.23 |
| 26 | 94.722 | 95.720 | 96.720 | 1.04% | 0.24 |
| 27 | 90.650 | 91.646 | 92.643 | 1.09% | 0.25 |
| 28 | 86.775 | 87.766 | 88.760 | 1.13% | 0.26 |
| 29 | 83.086 | 84.071 | 85.059 | 1.18% | 0.27 |
| 30 | 79.572 | 80.550 | 81.532 | 1.22% | 0.29 |
| 31 | 76.225 | 77.195 | 78.169 | 1.26% | 0.30 |
| 32 | 73.036 | 73.997 | 74.962 | 1.30% | 0.31 |
| 33 | 69.997 | 70.947 | 71.903 | 1.35% | 0.32 |
| 34 | 67.100 | 68.039 | 68.985 | 1.39% | 0.33 |
| 35 | 64.337 | 65.265 | 66.200 | 1.43% | 0.35 |
| 36 | 61.703 | 62.618 | 63.541 | 1.47% | 0.36 |
| 37 | 59.189 | 60.092 | 61.003 | 1.52% | 0.37 |
| 38 | 56.791 | 57.681 | 58.579 | 1.56% | 0.38 |
| 39 | 54.502 | 55.379 | 56.264 | 1.60% | 0.40 |
| 40 | 52.317 | 53.180 | 54.052 | 1.64% | 0.41 |
| 41 | 50.230 | 51.080 | 51.938 | 1.68% | 0.42 |
| 42 | 48.237 | 49.073 | 49.918 | 1.72% | 0.43 |
| 43 | 46.334 | 47.155 | 47.986 | 1.76% | 0.45 |
| 44 | 44.515 | 45.321 | 46.138 | 1.80% | 0.46 |
| 45 | 42.776 | 43.569 | 44.371 | 1.84% | 0.47 |
| 46 | 41.114 | 41.892 | 42.681 | 1.88% | 0.49 |

| 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 | 39.525 | 40.289 | 41.063 | 1.92% | 0.50 |
| 48 | 38.005 | 38.755 | 39.515 | 1.96% | 0.51 |
| 49 | 36.551 | 37.286 | 38.033 | 2.00% | 0.53 |
| 50 | 35.160 | 35.881 | 36.613 | 2.04% | 0.54 |
| 51 | 33.829 | 34.536 | 35.254 | 2.08% | 0.55 |
| 52 | 32.555 | 33.248 | 33.952 | 2.12% | 0.57 |
| 53 | 31.335 | 32.014 | 32.704 | 2.16% | 0.58 |
| 54 | 30.166 | 30.832 | 31.508 | 2.20% | 0.59 |
| 55 | 29.047 | 29.699 | 30.362 | 2.23% | 0.61 |
| 56 | 27.975 | 28.614 | 29.264 | 2.27% | 0.62 |
| 57 | 26.948 | 27.573 | 28.210 | 2.31% | 0.64 |
| 58 | 25.963 | 26.576 | 27.199 | 2.35% | 0.65 |
| 59 | 25.020 | 25.619 | 26.230 | 2.38% | 0.66 |
| 60 | 24.115 | 24.701 | 25.300 | 2.42% | 0.68 |
| 61 | 23.247 | 23.821 | 24.407 | 2.46% | 0.69 |
| 62 | 22.415 | 22.976 | 23.550 | 2.50% | 0.71 |
| 63 | 21.616 | 22.166 | 22.727 | 2.53% | 0.72 |
| 64 | 20.850 | 21.388 | 21.937 | 2.57% | 0.73 |
| 65 | 20.114 | 20.641 | 21.179 | 2.61% | 0.75 |
| 66 | 19.408 | 19.923 | 20.450 | 2.64% | 0.76 |
| 67 | 18.731 | 19.234 | 19.749 | 2.68% | 0.78 |
| 68 | 18.080 | 18.572 | 19.076 | 2.71% | 0.79 |
| 69 | 17.454 | 17.936 | 18.430 | 2.75% | 0.81 |
| 70 | 16.854 | 17.325 | 17.808 | 2.79% | 0.82 |
| 71 | 16.277 | 16.738 | 17.210 | 2.82% | 0.84 |
| 72 | 15.722 | 16.173 | 16.635 | 2.86% | 0.85 |
| 73 | 15.189 | 15.630 | 16.082 | 2.89% | 0.87 |
| 74 | 14.676 | 15.108 | 15.550 | 2.93% | 0.88 |
| 75 | 14.184 | 14.605 | 15.038 | 2.96% | 0.90 |
| 76 | 13.710 | 14.122 | 14.545 | 3.00% | 0.91 |
| 77 | 13.254 | 13.657 | 14.071 | 3.03% | 0.93 |
| 78 | 12.815 | 13.209 | 13.614 | 3.07% | 0.95 |
| 79 | 12.393 | 12.779 | 13.175 | 3.10% | 0.96 |
| 80 | 11.987 | 12.364 | 12.751 | 3.13% | 0.98 |
| 81 | 11.596 | 11.965 | 12.344 | 3.17% | 0.99 |
| 82 | 11.220 | 11.580 | 11.951 | 3.20% | 1.01 |
| 83 | 10.857 | 11.210 | 11.572 | 3.23% | 1.02 |
| 84 | 10.508 | 10.853 | 11.207 | 3.27% | 1.04 |
| 85 | 10.172 | 10.509 | 10.856 | 3.30% | 1.06 |
| 86 | 9.848 | 10.177 | 10.517 | 3.33% | 1.07 |
| 87 | 9.536 | 9.858 | 10.190 | 3.37% | 1.09 |
| 88 | 9.235 | 9.550 | 9.875 | 3.40% | 1.10 |
| 89 | 8.945 | 9.253 | 9.571 | 3.43% | 1.12 |
| 90 | 8.666 | 8.967 | 9.277 | 3.47% | 1.14 |
| 91 | 8.396 | 8.691 | 8.995 | 3.50% | 1.15 |

| 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 | 8.136 | 8.424 | 8.722 | 3.53% | 1.17 |
| 93 | 7.885 | 8.167 | 8.458 | 3.56% | 1.19 |
| 94 | 7.644 | 7.919 | 8.204 | 3.59% | 1.20 |
| 95 | 7.410 | 7.680 | 7.958 | 3.63% | 1.22 |
| 96 | 7.185 | 7.449 | 7.721 | 3.66% | 1.24 |
| 97 | 6.968 | 7.226 | 7.492 | 3.69% | 1.25 |
| 98 | 6.758 | 7.010 | 7.271 | 3.72% | 1.27 |
| 99 | 6.556 | 6.802 | 7.057 | 3.75% | 1.29 |
| 100 | 6.360 | 6.601 | 6.851 | 3.78% | 1.31 |
| 101 | 6.171 | 6.407 | 6.652 | 3.81% | 1.32 |
| 102 | 5.989 | 6.220 | 6.459 | 3.84% | 1.34 |
| 103 | 5.813 | 6.039 | 6.273 | 3.88% | 1.36 |
| 104 | 5.643 | 5.864 | 6.093 | 3.91% | 1.38 |
| 105 | 5.478 | 5.694 | 5.918 | 3.94% | 1.39 |
| 106 | 5.319 | 5.531 | 5.750 | 3.97% | 1.41 |
| 107 | 5.166 | 5.373 | 5.587 | 4.00% | 1.43 |
| 108 | 5.017 | 5.220 | 5.430 | 4.03% | 1.45 |
| 109 | 4.873 | 5.072 | 5.277 | 4.06% | 1.46 |
| 110 | 4.735 | 4.929 | 5.130 | 4.09% | 1.48 |
| 111 | 4.600 | 4.790 | 4.987 | 4.12% | 1.50 |
| 112 | 4.470 | 4.656 | 4.849 | 4.15% | 1.52 |
| 113 | 4.345 | 4.527 | 4.716 | 4.18% | 1.54 |
| 114 | 4.223 | 4.401 | 4.586 | 4.20% | 1.56 |
| 115 | 4.105 | 4.280 | 4.461 | 4.23% | 1.57 |
| 116 | 3.992 | 4.162 | 4.340 | 4.26% | 1.59 |
| 117 | 3.881 | 4.048 | 4.222 | 4.29% | 1.61 |
| 118 | 3.775 | 3.938 | 4.108 | 4.32% | 1.63 |
| 119 | 3.671 | 3.831 | 3.998 | 4.35% | 1.65 |
| 120 | 3.571 | 3.728 | 3.891 | 4.38% | 1.67 |
| 121 | 3.474 | 3.628 | 3.788 | 4.41% | 1.69 |
| 122 | 3.381 | 3.531 | 3.687 | 4.43% | 1.70 |
| 123 | 3.290 | 3.437 | 3.590 | 4.46% | 1.72 |
| 124 | 3.202 | 3.346 | 3.496 | 4.49% | 1.74 |
| 125 | 3.116 | 3.257 | 3.405 | 4.52% | 1.76 |

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