



Cheemi Technology Co., Ltd

Specification

Product Name: Chip NTC thermistor

Part Number: CM-0805X104J4250FB

Date: 2023/08/02

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.

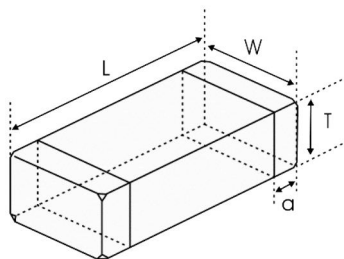


图 1 Fig.1

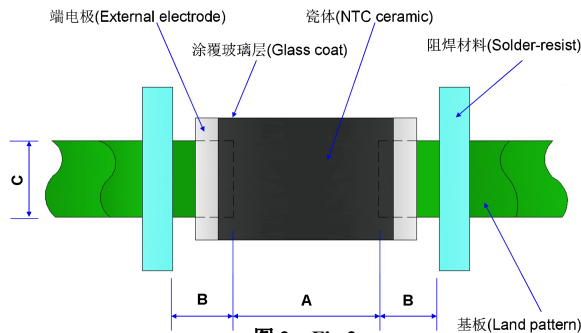


图 2 Fig.2

表 1 (Table 1) 单位 unit: inch[mm]

类别 Type	L	W	T	a	A	B	C
0805 [2012]	0.079±0.008 [2.0±0.2]	0.049±0.008 [1.25±0.2]	0.033±0.008 [0.85±0.2]	0.020±0.012 [0.5±0.3]	[1.0-1.1]	[0.6-0.7]	[10.-1.2]

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

<u>CM</u>		<u>0805</u>	<u>X</u>	<u>104</u>	<u>J</u>	<u>4250</u>	<u>F</u>	<u>B</u>				
①		②	③	④	⑤	⑥	⑦	⑧				
①类别 Type		④25℃的零功率电阻 Nominal Zero-Power Resistance					⑥B 值常数 B Constant					
CM	晨铭片式 NTC 热敏电阻器 Chip NTC Thermistor						222	2.2kΩ	3380	3380K		
							103	10kΩ	3950	3950K		
			104	100kΩ		4250	4250K					
② 外形尺寸(mm) External Dimensions (L×W)		⑤电阻值公差 Tolerance of Resistance										
0201[0603]	0.6×0.3											
0402[1005]	1.0×0.5											
0603[1608]	1.6×0.8											
0805[2012]	2.0×1.2											
③ 分隔符 Delimiter		⑦B 值公差 Tolerance of B Constant										
X									F	±1%	F	±1%
									G	±2%		
		H	±3%	⑧B 值计算方式 B constant calculation method								
		J	±5%									
									A	25℃&85℃		
						B	25℃&50℃					

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：20±2℃；
- 相对湿度：65±5%RH；
- 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:

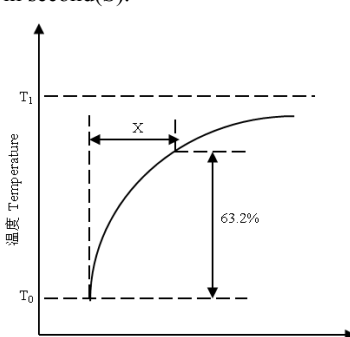
- Ambient Temperature: 20±2℃
- Relative Humidity: 65±5%
- Air Pressure: 86kPa to 106kPa

Inspection Equipment

Visual Examination: 20×magnifier

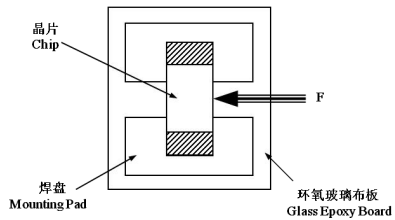
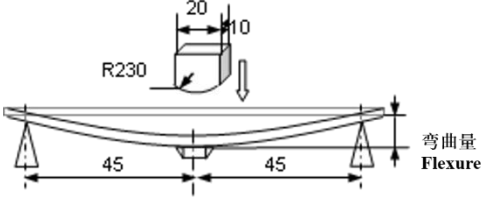
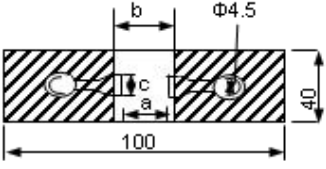
Resistance value test: Thermistor resistance tester

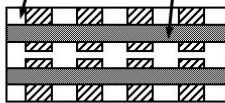
5 电性测试 Electrical Test

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±0.2℃ 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±0.2℃, 50±0.2℃或 85±0.2℃下测量电阻值。 Measure the resistance at the ambient temperature of 25±0.2℃, 50±0.2℃ or 85±0.2℃. $B(25-50^{\circ}\text{C}) = \frac{\ln R_{25} - \ln R_{50}}{1/T_{25} - 1/T_{50}} \quad B(25-85^{\circ}\text{C}) = \frac{\ln R_{25} - \ln R_{85}}{1/T_{25} - 1/T_{85}}$ T: 绝对温度 (K) Absolute temperature (K)
3	热时间常数 Thermal Time Constant	在零功率条件下，当热敏电阻的环境温度发生急剧变化时，热敏电阻元件产生最初温度 T0 与最终温度 T1 两者温度差的 63.2%的温度变化所需要的时间，通常以秒(S)表示。 The total time for the temperature of the thermistor to change by 63.2% of the difference from ambient temperature T ₀ (°C) to T ₁ (°C) by the drastic change of the power applied to thermistor from Non-zero Power to Zero-Power state, normally expressed in second(S). 

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

5 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	① 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. ② 0201、0402 和 0603 系列施加 5N 的作用力，0805 系列产品施加 10N 的作用力； 5N force for 0201, 0402 and 0603 series, 10N force for 0805 series. ③ 保持时间 Duration: 10±1s	端电极无脱落且瓷体无损伤。 No removal or split of the termination or other defects shall occur. 																				
抗弯强度 Resistance to Flexure	IEC 60068-2-21	① 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; ② 弯曲变形量 Flexure 0201: 1mm 0402, 0603, 0805: 2mm ③ 施压速度 Pressurizing Speed: <0.5mm/s; ④ 保持时间 Duration: 10s 	① 无外观损伤。 No visible damage. ② 试验前后 R25 的变化率: ±5%以内; R25 variation: within ±5% 单位 unit: mm <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>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> </tbody> </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
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 Vibration	IEC 60068-2-80	① 将晶片焊接在测试基板上（如右图所示的环氧玻璃布板）； Solder the chip to the testing jig (glass epoxy board shown in the left) using eutectic solder. ② 晶片以全振幅为 1.5mm 进行振动，频率范围为 10Hz ~55 Hz； The chip shall be subjected to a simple harmonic motion having total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55 Hz. ③ 振动频率按 10Hz→55Hz→10Hz 循环，周期为 1 分钟，在空间三个互相垂直的方向上各振动 2 小时（共 6 小时）。 The frequency ranges from 10 to 55 Hz and return to 10 Hz shall be traversed in approximately 1 minute. This motion shall be applied for a period of 2 hours in each 3mutually perpendicular directions (total of 6 hours).	无外观损伤。 No visible damage. 铜箔 Cu pad 阻焊膜 Solder mask  环氧玻璃布板Glass Epoxy Board															
坠落 Dropping	IEC 60068-2-32	从 1m 的高度让晶片自由坠落至水泥地面 10 次。 Drop a chip 10 times on a concrete floor from a height of 1 meter.	无外观损伤。 No visible damage.															
可焊性 Solderability	IEC 60068-2-58	① 焊接温度 Solder temperature: 245±5℃. ② 浸渍时间 Duration: 3±0.3s. ③ 焊锡成分 Solder: Sn/3.0Ag/0.5Cu. ④ 助焊剂 Flux: （重量比）25%松香和 75%酒精 25% Resin and 75% ethanol in weight.	① 无外观损伤； No visible damage. ② 元件端电极的焊锡覆盖率不小于 95%。 Wetting shall exceed 95% coverage.															
耐焊性 Resistance to Soldering Heat	IEC 60068-2-58	① 焊接温度 Solder temperature: 260±5℃. ② 浸渍时间 Duration: 10±1s. ③ 焊锡成分 Solder: Sn/3.0Ag/0.5Cu. ④ 助焊剂 Flux: （重量比）25%松香和 75%酒精 25% Resin and 75% ethanol in weight. ⑤ 试验后标准条件下放置 1~2 小时后测量。 The chip shall be stabilized at normal condition for 1~2 hours before measuring.	① 无外观损伤； No visible damage. ② 试验前后 R25 的变化率：±3%以内； R25 variation: within ±3% ③ 试验前后 B 值的变化率：±2%以内。 B constant variation: within ±2%															
温度周期 Temperature cycling	IEC 60068-2-14	① 无负载于下表所示的环境条件下重复 5 次。 5 cycles of following sequence without loading. <table><tr><td>步骤 Step</td><td>温度 Temperature</td><td>时间 Time</td></tr><tr><td>1</td><td>-40±5℃</td><td>30±3min</td></tr><tr><td>2</td><td>25±2℃</td><td>5±3min</td></tr><tr><td>3</td><td>125±2℃</td><td>30±3min</td></tr><tr><td>4</td><td>25±2℃</td><td>5±3min</td></tr></table> ② 试验后标准条件下放置 1~2 小时后测量。 The chip shall be stabilized at normal condition for 1~2 hours before measuring.	步骤 Step	温度 Temperature	时间 Time	1	-40±5℃	30±3min	2	25±2℃	5±3min	3	125±2℃	30±3min	4	25±2℃	5±3min	① 无外观损伤； No visible damage. ② 试验前后 R25 的变化率：±3%以内； R25 variation: within ±3% ③ 试验前后 B 值的变化率：±2%以内。 B constant variation: within ±2%
步骤 Step	温度 Temperature	时间 Time																
1	-40±5℃	30±3min																
2	25±2℃	5±3min																
3	125±2℃	30±3min																
4	25±2℃	5±3min																
高温存放 Resistance to dry heat	IEC 60068-2-2	① 在 125±5℃空气中，无负载放置 1000±24 小时。 125±5℃ in air, for 1000±24 hours without loading. ② 试验后标准条件下放置 1~2 小时后测量。 The chip shall be stabilized at normal condition for 1~2 hours before measuring.	① 无外观损伤； No visible damage. ② 试验前后 R25 的变化率：±5%以内； R25 variation: within ±5% ③ 试验前后 B 值的变化率：±2%以内。 B constant variation: within ±2%															
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 试验前后 R25 的变化率：±5%以内； R25 variation: within ±5% ③ 试验前后 B 值的变化率：±2%以内。 B constant variation: within ±2%															

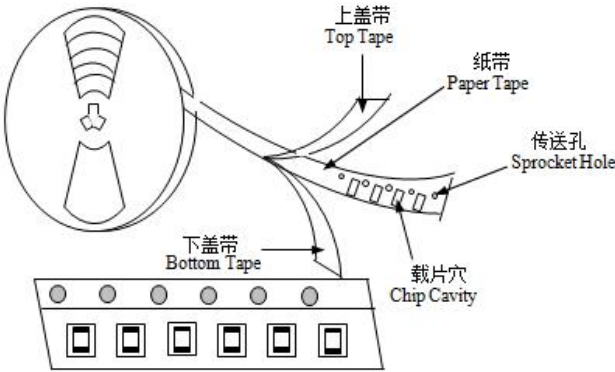
湿热存放 Resistance to damp heat	IEC 60068-2-78	① 在 40±2℃，相对湿度 90~95%空气中，无负载放置 1000±24 小时。 40±2℃, 90~95%RH in air, for 1000±24 hours without loading. ② 试验后标准条件下放置 1~2 小时后测量。 The chip shall be stabilized at normal condition for 1~2 hours before measuring.	① 无外观损伤； No visible damage. ② 试验前后 R25 的变化率：±3%以内；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

6 编带和储存 Taping & Storage

编带 Taping

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

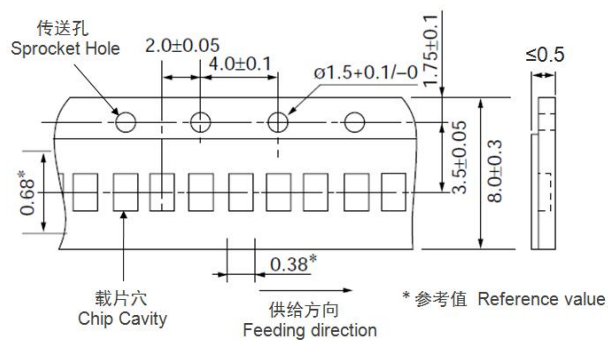
(1) 编带图 Taping Drawings



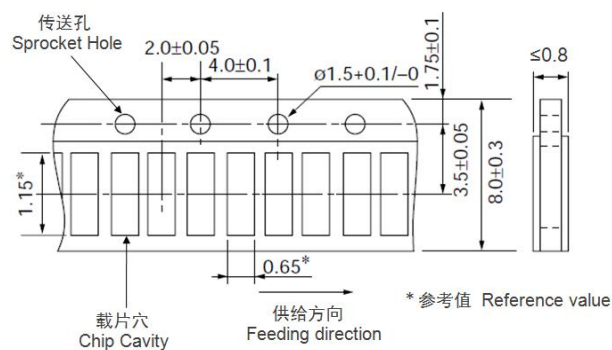
(2) 纸带尺寸 Paper Tape Dimensions

(单位 Unit: mm)

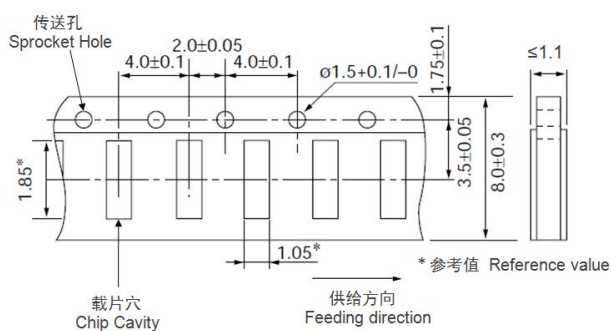
CM0201 系列 CM0201 series



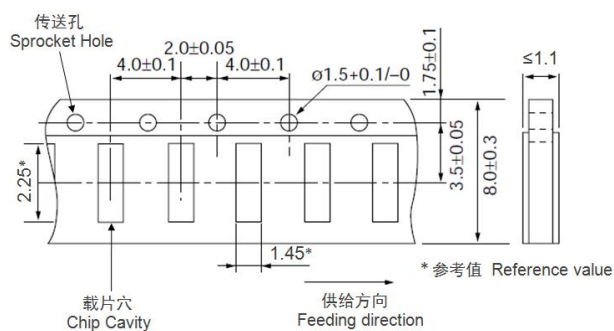
CM0402 系列 CM0402 series



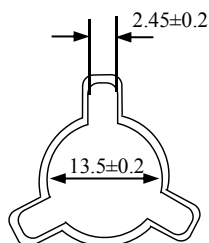
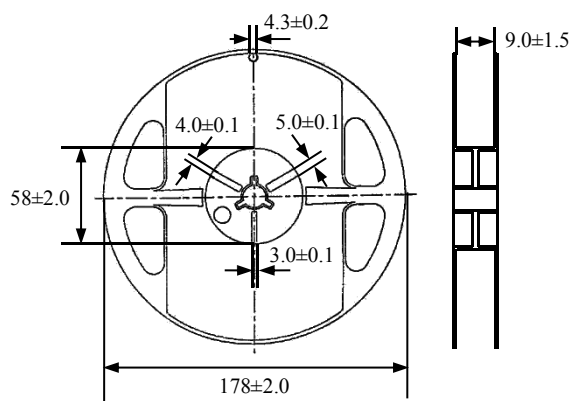
CM0603 系列 CM0603 series



CM0805 系列 CM0805 series



(3) 卷盘尺寸 Reel Dimensions(单位 Unit: mm)



7 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: 6 个月

8 注意事项

CM 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

- CM 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。

- CM 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。

7 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

8 Notes & Warnings

The CM 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) Excessive 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 CM series thermistors is fragile, no excessive pressure or impact shall be exerted on it.

- The CM series thermistors shall not be operated beyond the specified "Operating Temperature Range" in the catalog.

9 建议焊接条件

• 回流焊

温升 1~2°C/sec.

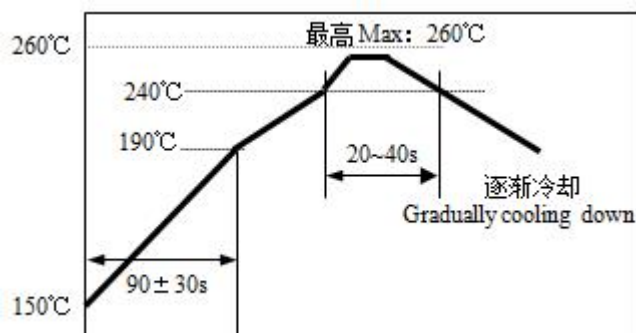
预热: 150~190°C/90±30 sec.

大于 240°C时间: 20~40sec

峰值温度: 最高 260°C/10 sec.

焊锡: Sn/3.0Ag/0.5Cu

回流焊: 最多 2 次



• 手工焊

烙铁功率: 最大 30W

预热: 150°C/60sec.

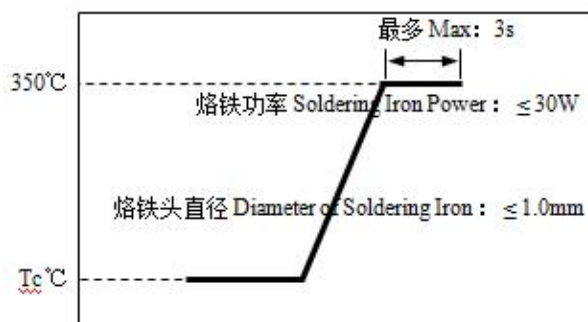
烙铁头温度: 最高 350°C

焊接时间: 最多 3sec.

焊锡: Sn/3.0Ag/0.5Cu

手工焊: 最多 1 次

[注: 不要使烙铁头接触到端头]



9 Recommended Soldering Technologies

• Re-flowing Profile

1~2°C/sec. Ramp

Pre-heating: 150~190°C/90±30 sec.

Time above 240°C: 20~40 sec.

Peak temperature: 260°C Max./10 sec.

Solder paste: Sn/3.0Ag/0.5Cu

Max.2 times for re-flowing.

• Iron Soldering Profile

Iron soldering power: Max.30W

Pre-heating: 150°C/60sec.

Soldering Tip temperature: 350°C Max.

Soldering time: 3 sec Max.

Solder paste: Sn/3.0Ag/0.5Cu

Max.1 times for iron soldering

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

10 R-T 表 R-T table

CM-0805X104J4250FB

温度 Temp. (°C)	R 最小值 R_Min (Kohm)	R 中心值 R_Cent (Kohm)	R 最大值 R_Max (Kohm)	阻值公差 Res TOL.	温度公差 Temp. TOL.(°C)
-40	4,022.168	4,397.119	4,795.007	9.05%	1.22
-39	3,746.551	4,092.874	4,460.031	8.97%	1.21
-38	3,491.669	3,811.717	4,150.698	8.89%	1.21
-37	3,255.828	3,551.749	3,864.879	8.82%	1.21
-36	3,037.483	3,311.236	3,600.637	8.74%	1.21
-35	2,835.225	3,088.599	3,356.205	8.66%	1.21
-34	2,647.767	2,882.396	3,129.972	8.59%	1.21
-33	2,473.931	2,691.310	2,920.469	8.51%	1.21
-32	2,312.643	2,514.137	2,726.353	8.44%	1.21
-31	2,162.918	2,349.778	2,546.398	8.37%	1.21
-30	2,023.855	2,197.225	2,379.483	8.29%	1.20
-29	1,894.628	2,055.558	2,224.581	8.22%	1.20
-28	1,774.481	1,923.932	2,080.754	8.15%	1.20
-27	1,662.720	1,801.573	1,947.142	8.08%	1.20
-26	1,558.707	1,687.773	1,822.957	8.01%	1.20
-25	1,461.859	1,581.881	1,707.476	7.94%	1.20
-24	1,371.457	1,483.100	1,599.821	7.87%	1.19
-23	1,287.219	1,391.113	1,499.634	7.80%	1.19
-22	1,208.687	1,305.413	1,406.354	7.73%	1.19
-21	1,135.441	1,225.531	1,319.462	7.66%	1.19
-20	1,067.092	1,151.037	1,238.481	7.60%	1.19
-19	1,003.284	1,081.535	1,162.975	7.53%	1.19
-18	943.687	1,016.661	1,092.540	7.46%	1.18
-17	887.999	956.080	1,026.806	7.40%	1.18
-16	835.941	899.481	965.431	7.33%	1.18
-15	787.253	846.579	908.099	7.27%	1.18
-14	741.698	797.111	854.522	7.20%	1.18
-13	699.056	750.834	804.431	7.14%	1.17
-12	659.124	707.524	757.579	7.07%	1.17
-11	621.714	666.972	713.737	7.01%	1.17
-10	586.651	628.988	672.695	6.95%	1.17
-9	553.727	593.342	634.202	6.89%	1.16
-8	522.849	559.931	598.143	6.82%	1.16
-7	493.879	528.602	564.351	6.76%	1.16
-6	466.687	499.212	532.669	6.70%	1.16
-5	441.155	471.632	502.954	6.64%	1.16
-4	417.201	445.772	475.109	6.58%	1.15
-3	394.687	421.480	448.966	6.52%	1.15
-2	373.518	398.652	424.414	6.46%	1.15
-1	353.607	377.193	401.345	6.40%	1.14

0	334.872	357.012	379.663	6.34%	1.14
1	317.219	338.006	359.255	6.29%	1.14
2	300.598	320.122	340.061	6.23%	1.14
3	284.943	303.287	322.004	6.17%	1.13
4	270.194	287.434	305.009	6.11%	1.13
5	256.292	272.500	289.007	6.06%	1.13
6	243.185	258.426	273.936	6.00%	1.12
7	230.823	245.160	259.737	5.95%	1.12
8	219.158	232.649	246.353	5.89%	1.12
9	208.149	220.847	233.734	5.84%	1.12
10	197.754	209.710	221.832	5.78%	1.11
11	187.937	199.196	210.602	5.73%	1.11
12	178.661	189.268	200.003	5.67%	1.11
13	169.895	179.890	189.996	5.62%	1.10
14	161.607	171.028	180.545	5.57%	1.10
15	153.768	162.651	171.616	5.51%	1.10
16	146.350	154.726	163.173	5.46%	1.09
17	139.330	147.232	155.193	5.41%	1.09
18	132.686	140.142	147.647	5.35%	1.08
19	126.396	133.432	140.508	5.30%	1.08
20	120.437	127.080	133.754	5.25%	1.08
21	114.793	121.066	127.362	5.20%	1.07
22	109.443	115.368	121.310	5.15%	1.07
23	104.372	109.970	115.578	5.10%	1.07
24	99.562	104.852	110.147	5.05%	1.06
25	95.000	100.000	105.000	5.00%	1.06
26	90.586	95.398	100.215	5.05%	1.08
27	86.399	91.032	95.674	5.10%	1.09
28	82.429	86.889	91.362	5.15%	1.11
29	78.661	82.956	87.267	5.20%	1.13
30	75.085	79.222	83.377	5.24%	1.14
31	71.691	75.675	79.681	5.29%	1.16
32	68.468	72.306	76.168	5.34%	1.18
33	65.407	69.104	72.828	5.39%	1.20
34	62.498	66.061	69.652	5.44%	1.22
35	59.734	63.167	66.631	5.48%	1.23
36	57.106	60.415	63.756	5.53%	1.25
37	54.607	57.797	61.020	5.58%	1.27
38	52.230	55.306	58.416	5.62%	1.29
39	49.969	52.934	55.936	5.67%	1.31
40	47.817	50.677	53.573	5.72%	1.32
41	45.770	48.528	51.324	5.76%	1.34
42	43.821	46.482	49.181	5.81%	1.36
43	41.965	44.533	47.139	5.85%	1.38

44	40.197	42.675	45.191	5.90%	1.40
45	38.512	40.904	43.334	5.94%	1.42
46	36.905	39.213	41.561	5.99%	1.44
47	35.373	37.601	39.869	6.03%	1.46
48	33.912	36.063	38.254	6.08%	1.48
49	32.519	34.595	36.713	6.12%	1.50
50	31.189	33.195	35.241	6.16%	1.51
51	29.922	31.859	33.837	6.21%	1.53
52	28.713	30.584	32.496	6.25%	1.55
53	27.558	29.366	31.214	6.29%	1.57
54	26.455	28.203	29.990	6.34%	1.59
55	25.402	27.091	28.819	6.38%	1.61
56	24.396	26.028	27.700	6.42%	1.63
57	23.435	25.013	26.630	6.47%	1.65
58	22.516	24.042	25.606	6.51%	1.67
59	21.638	23.113	24.627	6.55%	1.69
60	20.798	22.224	23.689	6.59%	1.71
61	19.995	21.374	22.792	6.63%	1.73
62	19.226	20.561	21.933	6.67%	1.75
63	18.491	19.782	21.110	6.72%	1.78
64	17.787	19.036	20.323	6.76%	1.80
65	17.113	18.323	19.568	6.80%	1.82
66	16.470	17.640	18.846	6.84%	1.84
67	15.854	16.986	18.155	6.88%	1.86
68	15.263	16.360	17.492	6.92%	1.88
69	14.698	15.760	16.856	6.96%	1.90
70	14.156	15.184	16.247	7.00%	1.92
71	13.635	14.631	15.661	7.04%	1.94
72	13.136	14.101	15.099	7.08%	1.97
73	12.657	13.592	14.559	7.12%	1.99
74	12.198	13.104	14.041	7.16%	2.01
75	11.758	12.635	13.544	7.19%	2.03
76	11.337	12.187	13.069	7.23%	2.05
77	10.932	11.757	12.612	7.27%	2.07
78	10.544	11.344	12.173	7.31%	2.10
79	10.172	10.947	11.751	7.35%	2.12
80	9.814	10.566	11.346	7.39%	2.14
81	9.471	10.200	10.957	7.42%	2.16
82	9.141	9.848	10.583	7.46%	2.19
83	8.824	9.510	10.223	7.50%	2.21
84	8.520	9.185	9.877	7.54%	2.23
85	8.227	8.873	9.545	7.57%	2.25
86	7.946	8.572	9.225	7.61%	2.28
87	7.676	8.283	8.917	7.65%	2.30

88	7.416	8.006	8.621	7.69%	2.32
89	7.166	7.738	8.336	7.72%	2.35
90	6.925	7.481	8.061	7.76%	2.37
91	6.695	7.234	7.798	7.79%	2.39
92	6.473	6.997	7.545	7.83%	2.42
93	6.259	6.769	7.301	7.87%	2.44
94	6.054	6.548	7.066	7.90%	2.46
95	5.856	6.337	6.839	7.94%	2.49
96	5.665	6.132	6.620	7.97%	2.51
97	5.480	5.934	6.409	8.01%	2.53
98	5.303	5.744	6.206	8.04%	2.56
99	5.132	5.561	6.010	8.08%	2.58
100	4.967	5.384	5.821	8.11%	2.61
101	4.809	5.214	5.639	8.15%	2.63
102	4.657	5.051	5.464	8.18%	2.66
103	4.510	4.893	5.295	8.22%	2.68
104	4.369	4.741	5.132	8.25%	2.70
105	4.232	4.594	4.975	8.28%	2.73
106	4.100	4.453	4.823	8.32%	2.75
107	3.973	4.316	4.677	8.35%	2.78
108	3.851	4.184	4.535	8.39%	2.80
109	3.733	4.057	4.399	8.42%	2.83
110	3.619	3.934	4.267	8.45%	2.85
111	3.508	3.816	4.139	8.49%	2.88
112	3.402	3.701	4.016	8.52%	2.90
113	3.299	3.591	3.898	8.55%	2.93
114	3.200	3.484	3.783	8.58%	2.96
115	3.104	3.380	3.672	8.62%	2.98
116	3.012	3.281	3.565	8.65%	3.01
117	2.924	3.185	3.462	8.68%	3.03
118	2.838	3.093	3.362	8.71%	3.06
119	2.755	3.003	3.266	8.75%	3.08
120	2.674	2.916	3.172	8.78%	3.11
121	2.596	2.832	3.082	8.81%	3.14
122	2.521	2.751	2.994	8.84%	3.16
123	2.448	2.672	2.909	8.87%	3.19
124	2.378	2.596	2.827	8.90%	3.22
125	2.309	2.522	2.747	8.94%	3.24