

Specifications Approval Sheet

CUSTOMER: _____

CUSTOMER P/N: _____

PART NAME: _____ CT Series - NTC Thermistor

SPECIFICATION: _____ CT103F3950A-08

DATE: _____

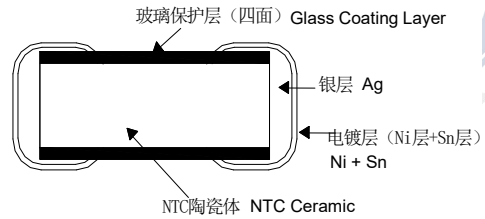
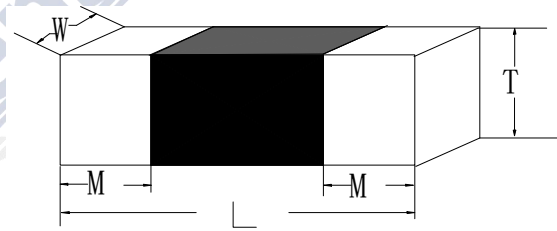
For Customer Approval:

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For Manufacturer Approval:

Drawn by	Checked by	Approved by

1. Product Structure and Size



Module	L	W	T	M
0201 (0603)	0.024±0.002 (0.6±0.05)	0.012±0.002 (0.3±0.05)	0.012±0.00 (0.3±0.05)	0.006±0.002 (0.15±0.05)
0402 (1005)	0.039±0.006 (1.0±0.15)	0.020±0.006 (0.5±0.15)	0.020±0.006 (0.5±0.15)	0.010±0.004 (0.25±0.1)
0603 (1608)	0.063±0.006 (1.6±0.15)	0.031±0.006 (0.8±0.15)	0.031±0.006 (0.8±0.15)	0.012±0.008 (0.3±0.2)
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)
1206 (3216)	0.126±0.008 (3.2±0.20)	0.063±0.008 (1.6±0.2)	0.060Max. (1.50Max.)	0.008Min. (0.20Min.)

2. Part Number

CT 103 F 3950 A - 08

①	②	③	④	⑤	⑥				
Product Series Code	Resistance @25°C		Tolerance @25°C		Beta	Test temp. of B	Dimension		
CT Series NTC Thermistor	222	22×10 ² Ω	F	±1%	3950: B=3950	A	25°C/50°C	02	0201
	103	10×10 ³ Ω	G	±2%				3435: B=3435	B
			H	±3%	06	0603			
			J	±5%	08	0805			
104	10×10 ⁴ Ω	K	±10%	12	1206				

3. Electrical Performance

No.	Item	Symbol	Test Condition	Scope	Unit
1	Resistance @25°C	R ₂₅	T=25±0.01°C	10±1%	KΩ
2	Beta	B _{25/50}	$B = \frac{\ln(R_{T1}) - \ln(R_{T2})}{(1/T1 - 1/T2)}$	3950±1%	K
3	Thermal time constant	τ	50°C → 25°C, in oil	≤5	sec
4	Dissipation Factor	δ	Ta=25±0.5°C	≈2.0	mW/°C
5	Max. Rated Power	Pr	Ta=25±0.5°C	100	mW
6	Operating Temp. Range	/	/	-40~+125	°C

3.1 Resistance Value (R_{25°C})

Requirement: R₂₅ = 10KΩ ± 1%

Test method: Measuring in high-precision thermostatic oil tank of 25°C ± 0.05°C, high precision resistance measuring instrument is used, and the measuring power of the measuring instrument should be zero power. (That is, the self-heat generated by the current flowing through the product can be negligible.)

3.2 Beta

Requirement: B_{25/50} = 3950K ± 1%

Test method: The resistance values of 25±0.05°C and 50±0.05°C are measured in high-precision thermostatic oil tank, then calculate according to the following formula:

$$B_{T1/T2} = \ln(R_{T1}/R_{T2}) / (1/(T1+273.15) - 1/(T2+273.15))$$

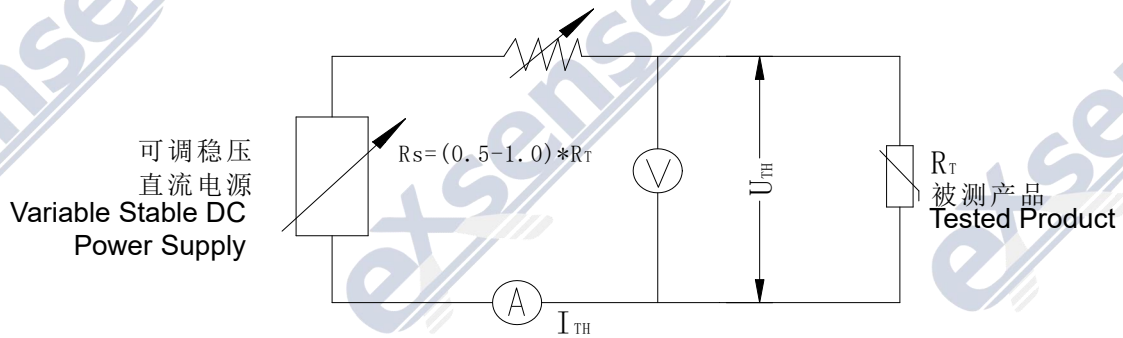
3.3 Thermal Time Constant (τ)

Thermal time constant: T1 = 50 - (50 - 25) * 63.2% = 34.2°C, max 5 seconds (in oil)

Test method: the time required for the product to quickly convert from the 50°C oil tank to the 25°C oil tank to reach the resistance value corresponding to 34.2°C.

3.4 Dissipation Factor (δ)

Test method: the product under test is connected to the following circuit in the still air of 25 ± 0.5°C.



Adjust I_{TH} for $\frac{U_{TH}}{I_{TH}} = R_{85}$, then calculate by the following formula:

$$\delta = \frac{U_{TH} \cdot I_{TH}}{85 - 25^{\circ}\text{C}} \text{ (mw/}^{\circ}\text{C)}$$

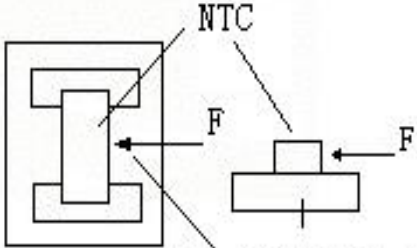
3.5 Max. Rated Power (Pr)

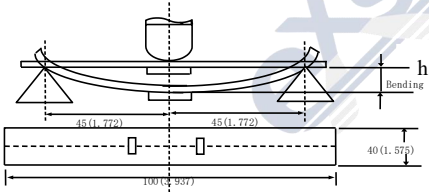
Requirement: $T_a = 25 \pm 0.5^{\circ}\text{C}$, max 100mW.

3.6 Operating temp. Range

$-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$. (All materials used to assemble must meet the highest operating temperature)

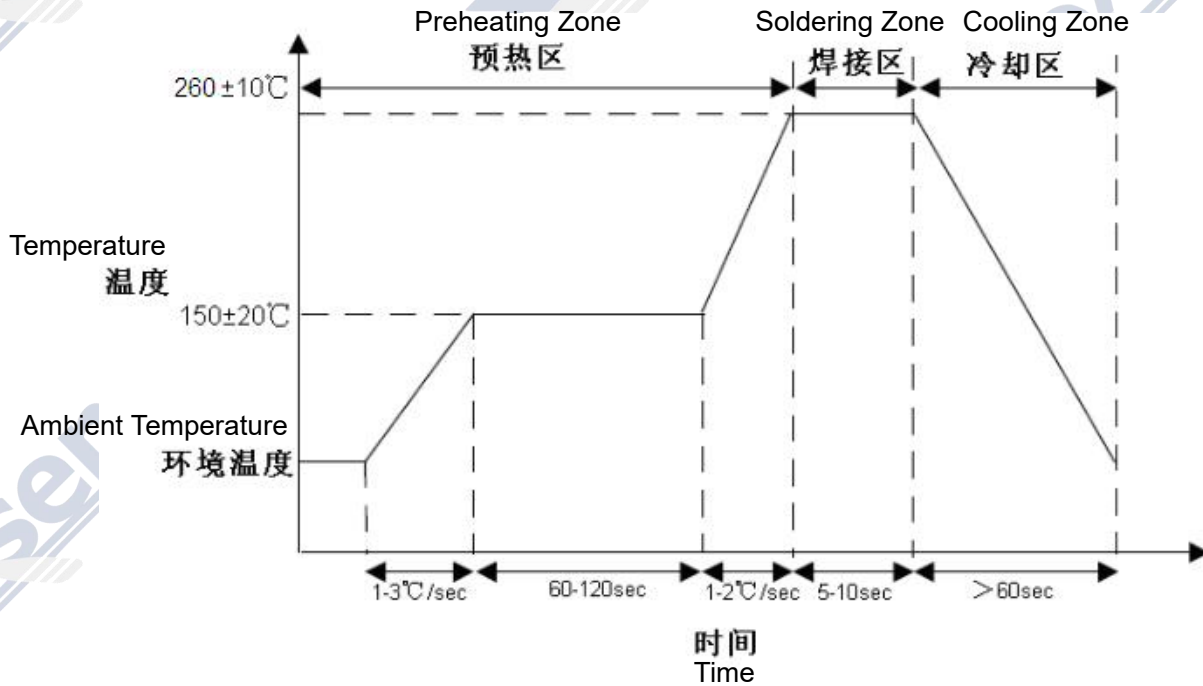
4. Reliability

Item	Standard	Test Method															
Soldering Test	<p>△At least 95% of the termination electrode surface is covered with solder</p>	<p>Preheating temperature: 100°C~150°C Preheating time: 2~3Mins Product soldering temperature: 235±5°C Tin immersion time: 5±0.5s</p>															
Soldering Resistance Test	<p>△There should be no visible damage in appearance △At least 75% of the termination electrode surface is covered with solder △The change rate of R25 is less than ±5% △The change rate of Beta is less than ±2%</p>	<p>Preheating temperature: 100°C~150°C Preheating time: 2~3Mins Product soldering temperature: 260±5°C Tin immersion time: 10±0.5s</p>															
Strength of Termination Electrode	<p>The ceramic body and termination electrode are not damaged</p>	<div style="text-align: center;">  <p>NTC F Epoxy Resin PCB 环氧树脂印刷电路板</p> </div> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Module</th> <th>Force (N)</th> <th>Time (s)</th> </tr> </thead> <tbody> <tr> <td>0402</td> <td>5</td> <td>5±1</td> </tr> <tr> <td>0603</td> <td>5</td> <td>5±1</td> </tr> <tr> <td>0805</td> <td>10</td> <td>5±1</td> </tr> <tr> <td>1206</td> <td>15</td> <td>5±1</td> </tr> </tbody> </table>	Module	Force (N)	Time (s)	0402	5	5±1	0603	5	5±1	0805	10	5±1	1206	15	5±1
Module	Force (N)	Time (s)															
0402	5	5±1															
0603	5	5±1															
0805	10	5±1															
1206	15	5±1															
Vibration	<p>△No visible mechanical damage △The change rate of R25 is less than ±5% △The change rate of Beta is less than ±2%</p>	<p>Vibration frequency range:10~55Hz Total amplitude: 1.52mm Time: X, Y, Z direction each 2hrs.</p>															

Item	Standard	Test Method															
Bending Strength		 <table border="1" data-bbox="853 649 1348 873"> <thead> <tr> <th>Module</th> <th>Curvature h (mm)</th> </tr> </thead> <tbody> <tr> <td>0402, 0603</td> <td>0.7</td> </tr> <tr> <td>0805, 1206</td> <td>1.0</td> </tr> </tbody> </table> <p>Condition: test board (PCB) Rate of pressure: 0.5mm/s</p>	Module	Curvature h (mm)	0402, 0603	0.7	0805, 1206	1.0									
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0402, 0603	0.7																
0805, 1206	1.0																
Drop		Free drop 10 times from a height of 1 meter to the concrete floor.															
High Temperature Resistance	<p>△No visible mechanical damage</p> <p>△The change rate of R25 is less than ±5%</p>	<p>Temperature: 125±2°C (No load)</p> <p>Test time: 1000±24hrs</p>															
Low Temperature Resistance	<p>△The change rate of Beta is less than ±2%</p>	Placed at -40±5°C air for 1000h±24hrs															
Moisture Resistance		Placed at 40±2°C, 90-95%RH air for 1000h±24hrs															
Temperature Cycling		<p>No load, 100 cycles under the following conditions:</p> <table border="1" data-bbox="805 1848 1412 2072"> <thead> <tr> <th>Stage</th> <th>Temperature</th> <th>Time (Min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-40°C</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room Temp.</td> <td>10±2</td> </tr> <tr> <td>3</td> <td>+125°C</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room Temp.</td> <td>10±2</td> </tr> </tbody> </table>	Stage	Temperature	Time (Min.)	1	-40°C	30±3	2	Room Temp.	10±2	3	+125°C	30±3	4	Room Temp.	10±2
Stage	Temperature	Time (Min.)															
1	-40°C	30±3															
2	Room Temp.	10±2															
3	+125°C	30±3															
4	Room Temp.	10±2															

5. Recommended Soldering Process Condition

5.1 Reflow soldering



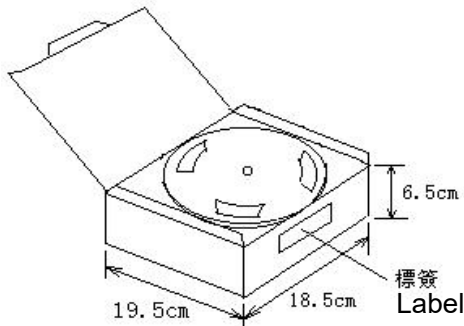
5.2 Recommended working conditions for manual soldered iron soldering

Item	Condition
Preheating temperature of thermistor	130-150°C 60sec (min)
Temperature of soldering iron head	280°C (max)
Diameter of soldering iron head	φ3mm (max)
Power of soldering iron head	30W (max)
Soldering time	5sec (max)

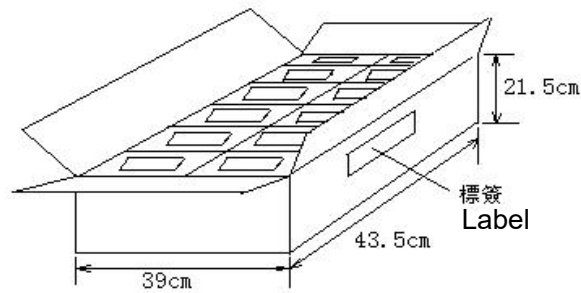
6. Packing

6.1 Outer packing

Packing 1
QTY: 5 reels



Packing 2
QTY: 12 boxes



6.2 Label

6.2.1 Label of paper taping, including the following details:

- ① Model and specification
- ② Nominal resistance value and Beta
- ③ Quantity
- ④ Tolerance
- ⑤ Batch number
- ⑥ Date
- ⑦ QC stamp

6.2.2 Label of packing box or case, including the following details:

- ① Model and specification
- ② Nominal resistance value and Beta
- ③ Quantity
- ④ Tolerance
- ⑤ Batch number
- ⑥ Date
- ⑦ QC stamp

7. Storage

7.1 Storage temperature: $-10\sim 40^{\circ}\text{C}$

7.2 Relative humidity: 45~75%

7.3 Storage life: Use the product within 6 months of delivery, if more than 6 months or longer, please check the solderability before use.

7.4 Storage after unpacking: After unpacking, quickly reseal or place the product in an airtight container with desiccant.

7.5 Storage place: stored without corrosive gases (SO_x , Cl, etc.); Avoid direct sunlight.

8. Attention

8.1 Design of PCB

①When SMD type NTC thermistor is installed on the PCB, the amount of solder used (the size of the pad) will directly affect the performance of SMD type NTC thermistor, so in the design of the substrate, we must consider the size and configuration of the pad carefully, which have a decisive role in the amount of solder composition of the substrate, excessive solder will affect the ability of the thermistor to withstand mechanical stress.

②Substrate configuration: After SMD type NTC thermistor is installed on the PCB, the thermistor will be subjected to the mechanical stress generated during the next machining process. For this reason, stress reduction to the lowest point should be considered when designing the placement of pad and SMD type NTC thermistor.

8.2 Issues to consider during automatic installation

①When installing SMD type NTC thermistor on PCB, do not allow it to withstand excessive impact force.

②Installed machine should be maintained and inspected regularly.

③When PCB is cut along the joint hole, the magnitude of the mechanical stress on SMD type NTC thermistor varies with the method used. The following methods are arranged in order of stress from smallest to largest: push plate, cut, V-shaped groove, joint hole. Therefore, the any ideal layout of SMD type NTC thermistor must take into account the partition method of the PCB.

8.3 Printing of solder paste

①The recommended printing thickness of solder paste is 280~550 μ m.

②After welding, the height of solder wicking is 0.55mm to the thickness of product

③Too much solder will give the product excessive mechanical stress, these stresses will cause fracture or mechanical damage, may also destroy the electrical properties of product.

8.4 Function and treatment of adhesive

①In the process of flow soldering, if the viscosity is not good or the adhesive is not hard enough, it may lead to loose connection between the product and the bottom plate.

②Too low viscosity of the adhesive will cause the product to slide on the plate after soldering.

9. R-T Table

Part No.: CT103F3950A-08				R25=10KΩ±1%				B25/50=3950K±1%			
T(°C)	R _{min} (KΩ)	R _{nor} (KΩ)	R _{max} (KΩ)	T(°C)	R _{min} (KΩ)	R _{nor} (KΩ)	R _{max} (KΩ)	T(°C)	R _{min} (KΩ)	R _{nor} (KΩ)	R _{max} (KΩ)
-40	329.9	345.3	361.3	9	20.58	20.95	21.31	1	30.52	31.18	31.85
-39	308.7	322.8	337.5	10	19.62	19.96	20.30	2	29.02	29.64	30.26
-38	288.9	301.9	315.5	11	18.71	19.02	19.34	3	27.61	28.18	28.76
-37	270.5	282.5	295.1	12	17.85	18.14	18.43	4	26.27	26.80	27.34
-36	253.5	264.5	276.1	13	17.03	17.29	17.56	5	25.01	25.50	25.99
-35	237.6	247.8	258.5	14	16.25	16.50	16.75	6	23.81	24.26	24.72
-34	222.8	232.3	242.1	15	15.51	15.74	15.97	7	22.67	23.10	23.52
-33	209.1	217.8	226.8	16	14.81	15.03	15.24	8	21.60	21.99	22.39
-32	196.2	204.3	212.7	17	14.15	14.35	14.54				
-31	184.3	191.7	199.5	18	13.52	13.70	13.88				
-30	173.2	180.0	187.2	19	12.92	13.09	13.25				
-29	162.8	169.1	175.7	20	12.35	12.50	12.66				
-28	153.1	158.9	165.0	21	11.81	11.95	12.09				
-27	144.0	149.4	155.1	22	11.30	11.43	11.56				
-26	135.5	140.6	145.8	23	10.81	10.93	11.05				
-25	127.6	132.3	137.1	24	10.34	10.45	10.56				
-24	120.2	124.5	129.0	25	9.900	10.00	10.10				
-23	113.3	117.3	121.4	26	9.471	9.570	9.670				
-22	106.8	110.5	114.3	27	9.062	9.162	9.261				
-21	100.7	104.1	107.7	28	8.673	8.773	8.872				
-20	95.01	98.19	101.5	29	8.304	8.402	8.501				
-19	89.67	92.62	95.65	30	7.952	8.049	8.147				
-18	84.67	87.40	90.21	31	7.616	7.713	7.811				
-17	79.98	82.51	85.12	32	7.297	7.393	7.490				
-16	75.58	77.93	80.34	33	6.993	7.088	7.184				
-15	71.45	73.63	75.86	34	6.703	6.797	6.892				
-14	67.57	69.59	71.66	35	6.427	6.520	6.613				
-13	63.92	65.80	67.72	36	6.164	6.255	6.348				
-12	60.50	62.24	64.02	37	5.913	6.003	6.094				
-11	57.28	58.89	60.54	38	5.673	5.762	5.852				
-10	54.25	55.74	57.28	39	5.445	5.532	5.621				
-9	51.40	52.79	54.21	40	5.226	5.313	5.400				
-8	48.71	50.00	51.32	41	5.018	5.103	5.189				
-7	46.18	47.38	48.61	42	4.819	4.903	4.987				
-6	43.80	44.92	46.05	43	4.629	4.711	4.795				
-5	41.56	42.59	43.65	44	4.448	4.529	4.610				
-4	39.44	40.40	41.38	45	4.274	4.354	4.434				
-3	37.44	38.33	39.24	46	4.109	4.187	4.266				
-2	35.56	36.39	37.23	47	3.951	4.027	4.104				
-1	33.78	34.55	35.33	48	3.799	3.874	3.950				
0	32.10	32.81	33.54	49	3.655	3.728	3.803				
1	30.52	31.18	31.85	50	3.516	3.588	3.661				
2	29.02	29.64	30.26	51	3.384	3.454	3.526				
3	27.61	28.18	28.76	52	3.257	3.326	3.396				
4	26.27	26.80	27.34	53	3.135	3.203	3.272				
5	25.01	25.50	25.99	54	3.019	3.086	3.153				
6	23.81	24.26	24.72	55	2.908	2.973	3.039				
7	22.67	23.10	23.52	56	2.801	2.865	2.930				
8	21.60	21.99	22.39	57	2.699	2.761	2.825				

