

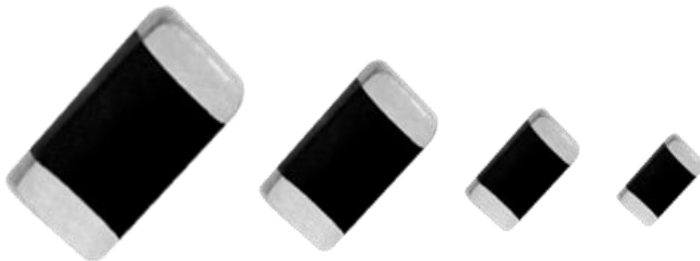
Chip NTC thermistor

Features

- The surface of the porcelain body is sealed with glass, which has good moisture resistance, high reliability and stability
- Small size, no lead, excellent welding performance, suitable for high-density surface mounting
- Wide working temperature range: $-55\text{ }^{\circ}\text{C} \sim +125\text{ }^{\circ}\text{C}$
- A variety of B values can meet various applications

Application

- Communication equipment, such as mobile phone, car phone
- Office equipment such as printer, fax machine, projector, desktop computer
- Consumer electronic devices such as video recorders, laptops, smart wearable devices
- Others, such as power supply, secondary battery and charger, LED lighting equipment



1. Shape and Dimensions

- Dimensions: See Fig.1 and Table 1.
- Recommended PCB pattern for reflow soldering: See Fig.2 and Table 1

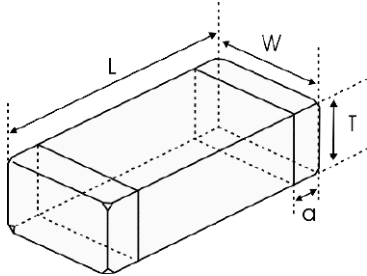


Fig.1

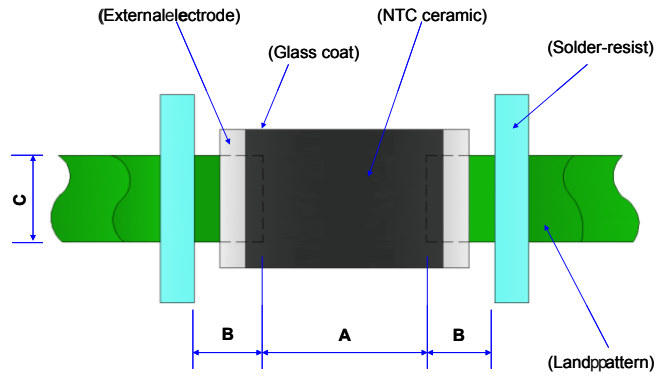


Fig.2

Table 1

unit: inch mm

Type	L	W	T	a	A	B	C
0201 [0603]	0.024±0.002 [0.6±0.05]	0.012±0.002 [0.3±0.05]	0.012±0.002 [0.3±0.05]	0.006±0.002 [0.15±0.05]	[0.2-0.3]	[0.25-0.35]	[0.25-0.35]
0402 [1005]	0.039±0.006 [1.0±0.15]	0.020±0.006 [0.5±0.15]	0.020±0.006 [0.5±0.15]	0.010±0.004 [0.25±0.1]	[0.45-0.55]	[0.4-0.5]	[0.45-0.55]
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]	[0.6-0.8]	[0.6-0.7]	[0.6-0.8]
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]	[1.0-1.2]

2. Product Identification(Part Number)

TP 0402 104 F 4250 F B
 ① ② ③ ④ ⑤ ⑥ ⑦

① Type	
TP	Chip NTC Thermistor

② External Dimensions L×W×T(mm)	
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 Nominal Zero - Power Resistance at 25°C	
222	2.2kΩ
103	10kΩ
104	100kΩ

④ Tolerance of Resistance	
F	±1%
G	±2%
H	±3%
J	±5%

⑤ B Constant	
3380	3380K
3950	3950K
4250	4250K

⑥ Tolerance of B Constant	
F	±1%

⑦ B constant calculation method	
A	25°C&85°C
B	25°C&50°C

3. Electrical Characteristics

Part No	Resistance (25°C) (kΩ)	B Constant (25/50°C) (K)	B Constant (25/85°C) (K)	Permissible Operating Current (25°C) (mA)	Dissipation Factor (mW/°C)	Thermal Time Constant(s)	operating ambient temperature (25°C) (mW)
TP0402 103 □3380FB	10	3380±1%	3435	0.31	1.0	<3	100
TP0402 683 □4250FB	68	4250±1%	4311	0.12			
TP0402 104 □4250FB	100	4250±1%	4310	0.1			
TP0402 474 □4250FB	470	4250±1%	4311	0.04			

- Tolerance of Resistance (F ±1%, G±2%, H±3%, J±5%)

4. Test and Measurement Procedures

Test Conditions

Unless otherwise specified, the standard atmospheric conditions for measurement/test as:

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

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

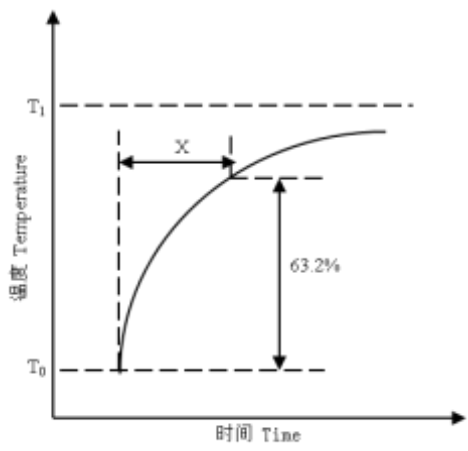
- Ambient Temperature: 25±2°C
- Relative Humidity: 65±5%
- Air Pressure: 86kPa to 106kPa

Inspection Equipment

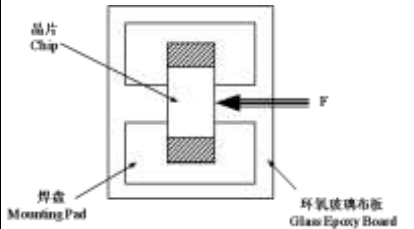
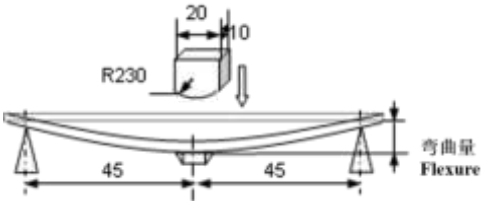
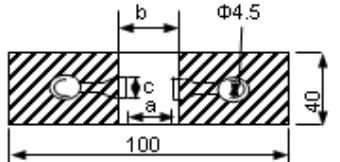
Visual Examination: 20×magnifier

Resistance value test: Thermistor resistance tester

5. Electrical Test

No.	Items	Test Methods and Remarks
1	Nominal Zero-Power Resistance at 25°C (R25)	Ambient temperature: 25±0.05°C Measuring electric power: ≤ 0.1mW
2	Nominal B Constant	Measure the resistance at the ambient temperature of 25±0.05°C, 50±0.05°C or 85±0.05°C. $B(25-50^{\circ}\text{C}) = \frac{\ln R_{25} - \ln R_{50}}{1/T_{25} - 1/T_{50}} \quad B(25-85^{\circ}\text{C}) = \frac{\ln R_{25} - \ln R_{85}}{1/T_{25} - 1/T_{85}}$ Absolute temperature (K)
3	Thermal Time Constant	<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>  <p style="text-align: center;">温度 Temperature 时间 Time</p>
4	Dissipation Factor	<p>The required power which makes the NTC thermistor body temperature raise 1°C through self-heated, normally expressed in milliwatts per degree Celsius (mW/°C). It can be calculated by the following formula:</p> $\delta = \frac{W}{T - T_0}$
5	Rated Power	The necessary electric power makes thermistor's temperature rise 100°C by self-heating at ambient temperature 25°C.
6	Permissible operating current	The current that keep body temperature of chip NTC on the PC board in still air rising 1°C by self-heating.

6. Reliability Test

Items	Standard	Test Methods and Remarks	Requirements																														
Terminal Strength	IEC 60068-2-21	<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 border="1"> <thead> <tr> <th>Size</th> <th>F</th> <th>Duration</th> </tr> </thead> <tbody> <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> </tbody> </table>	Size	F	Duration	0201	2N	10±1s	0402, 0603	5N	0805	10N	<p>No removal or split of the termination or other defects shall occur.</p> 																				
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Resistance to Flexure	IEC 60068-2-21	<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 border="1"> <thead> <tr> <th>Size</th> <th>Flexure</th> <th>Pressurizing Speed</th> <th>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>0402, 0603, 0805</td> <td>2mm</td> </tr> </tbody> </table>	Size	Flexure	Pressurizing Speed	Duration	0201,	1mm	<0.5mm/s	10±1s	0402, 0603, 0805	2mm	<ul style="list-style-type: none"> No visible damage. $\Delta R25/R25 \leq 2\%$ <p style="text-align: right;">unit: mm</p> <table border="1"> <thead> <tr> <th>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> 	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
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Vibration	IEC 60068-2-80	<ul style="list-style-type: none"> Solder the chip to the testing jig (glass epoxy board shown in the left) using eutectic solder. 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. 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). 	No visible damage.																														
Dropping	IEC 60068-2-32	Drop a chip 10 times on a concrete floor from a height of 1 meter.	No visible damage.																														

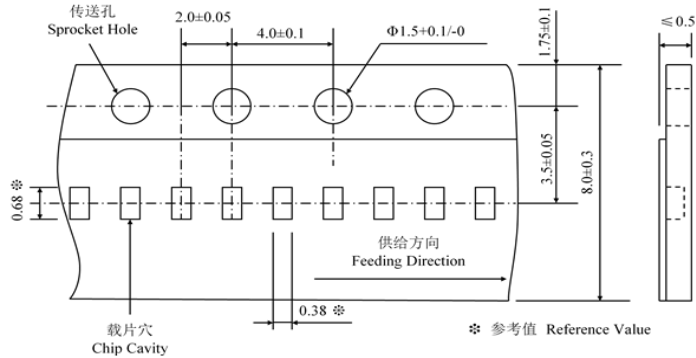
Solderability	IEC 60068-2-58	<ul style="list-style-type: none"> Solder temperature: 245±5°C. Duration: 3±0.3s. Solder: 96.5Sn/3.0Ag/0.5Cu. 25% Resin and 75% ethanol in weight. 	<ul style="list-style-type: none"> ① No visible damage. ② Wetting shall exceed 95% coverage. 															
Resistance to Soldering Heat	IEC 60068-2-58	<ul style="list-style-type: none"> Solder temperature: 260±5°C. Duration: 10±1s. Solder: 96.5Sn/3.0Ag/0.5Cu. 25% Resin and 75% ethanol in weight. The chip shall be stabilized at normal condition for 1~2 hours before measuring. 	<ul style="list-style-type: none"> No visible damage. ΔR25/R25 ≤2% ΔB/B ≤1% 															
Temperature cycling	IEC 60068-2-14	<p>① 5 cycles of following sequence without loading.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>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 The chip shall be stabilized at normal condition for 1~2 hours before measuring.</p>	Step	Temperature	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	<ul style="list-style-type: none"> No visible damage. ΔR25/R25 ≤2% ΔB/B ≤1%
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1	-40±5°C	30±3min																
2	25±2°C	5±3min																
3	125±2°C	30±3min																
4	25±2°C	5±3min																
Resistance to dry heat	IEC 60068-2-2	<ul style="list-style-type: none"> 125±5°C in air, for 1000±24 hours without loading. The chip shall be stabilized at normal condition for 1~2 hours before measuring. 	<ul style="list-style-type: none"> No visible damage. ΔR25/R25 ≤2% ΔB/B ≤1% 															
Resistance to cold	IEC 60068-2-1	<ul style="list-style-type: none"> ① -40±3°C in air, for 1000±24 hours without loading. ② The chip shall be stabilized at normal condition for 1~2 hours before measuring. 	<ul style="list-style-type: none"> No visible damage. ΔR25/R25 ≤2% ΔB/B ≤1% 															
Resistance to damp heat	IEC 60068-2-78	<ul style="list-style-type: none"> 40±2°C, 90~95%RH in air, for 1000±24 hours without loading. The chip shall be stabilized at normal condition for 1~2 hours before measuring. 	<ul style="list-style-type: none"> No visible damage. ΔR25/R25 ≤2% ΔB/B ≤1% 															
Resistance to high temperature load	IEC 60539-1 5.25.4	<ul style="list-style-type: none"> 85±2°C in air with permissive operating current for 1000±48 hours The chip shall be stabilized at normal condition for 1~2 hours before measuring. 	<ul style="list-style-type: none"> ① No visible damage. ② ΔR25/R25 ≤2% ③ ΔB/B ≤1% 															

7. Taping

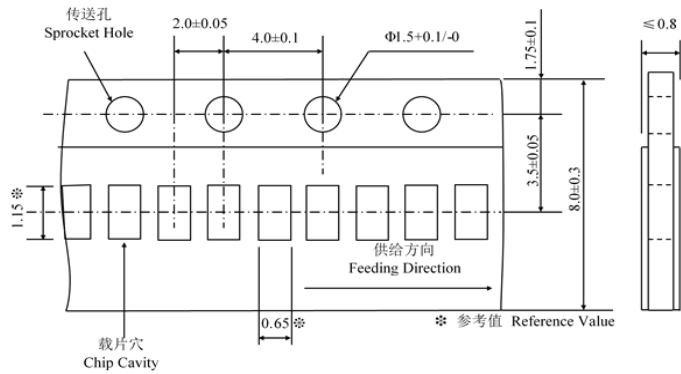
Type	0201	0402	0603	0805	1206
Tape thickness(mm)	0.5±0.15	0.5±0.15	0.8±0.15	0.85±0.2	1.8±0.2
Tape material	Paper Tape				Embossed Tape
Quantity per Reel	15K	10K	4K	4K	2K

Paper Tape Dimensions (Unit: mm)

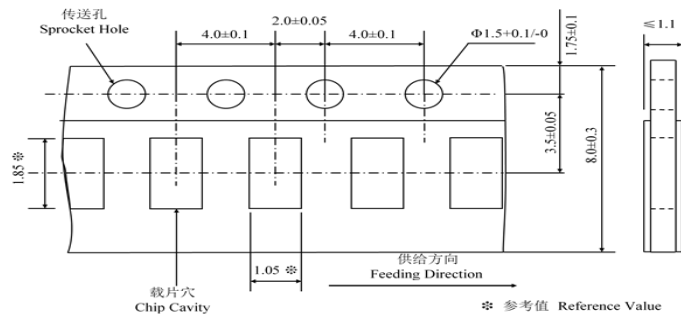
(1) TP0201



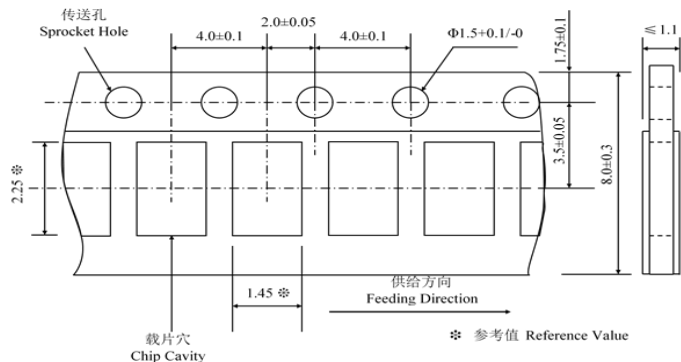
(2) TP 0402



(3) TP 0603

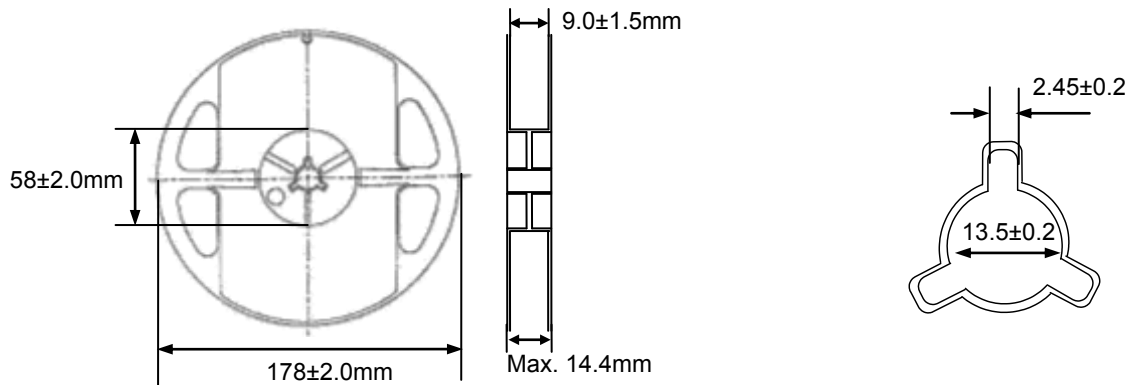


(4) TP 0805



A0 (±0.2)	B0 (±0.2)	K0 Max.	T Max.	W (±0.3)	P0 (±0.2)	P (±0.2)	P2 (±0.2)
2.1	3.6	2.5	0.30	8.0	4.0	4.0	2.0

Reel Dimensions(Unit: mm)



8. Storage

Storage Conditions

- Storage Temperature: $-10^{\circ}\text{C} \sim 40^{\circ}\text{C}$
- Relative Humidity: $\leq 75\% \text{RH}$
- Keep away from corrosive atmosphere and sunlight.

Period of Storage: 6 Months

9. Notes & Warnings

The TP series thermistors shall not be operated and stored under the following environmental condition:

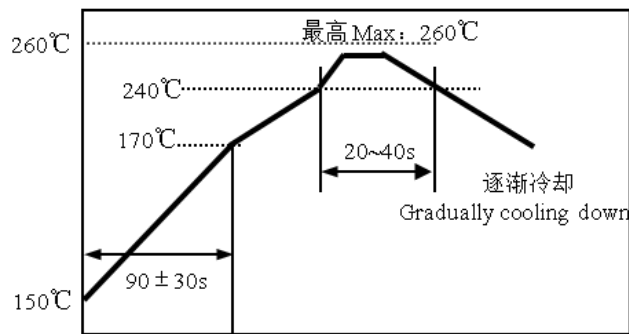
- Corrosive or deoxidized atmospheres (such as chlorine, sulfurated hydrogen, ammonia, sulfuric acid, nitric oxide and so on)
- Volatile or inflammable atmospheres
- Dusty condition
- Excessively high or low pressure condition
- Humid site
- Places with brine, oil, chemical liquid or organic solvent
- Intense vibration
- Places with analogously deleterious conditions

The ceramic body of the TP series thermistors is fragile, no excessive pressure or impact shall be exerted on it. The TP series thermistors shall not be operated beyond the specified "Operating Temperature Range" in the catalog.

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



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

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

