

MNTC0402 Series

Chip Temp. Sensing NTC Thermistor

FEATURES

- SMD type suitable for high density mounting
- Series of B constant for various applications
- Excellent solder ability
- Operate temperature range $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$.
- RoHS compliant

APPLICATIONS

- Telecommunication equipments such as cellular phone, automobile phone, etc.
- Office automation such as printer, facsimile, word processor, etc.
- Battery, CPU temperature protection.

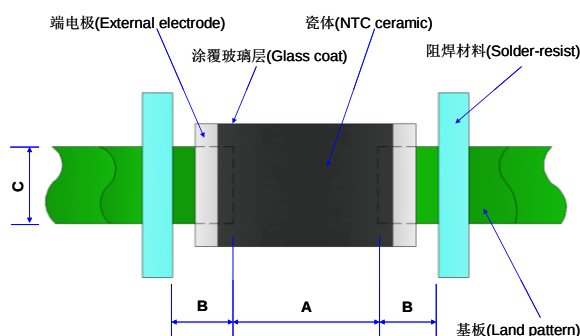
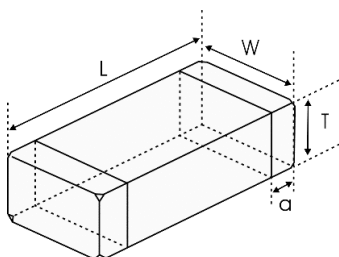
PRODUCT IDENTIFICATION

MNTC 0402 X 104 F 4250 F T B

1 2 3 4 5 6 7 8 9

- 1:Product Series: Chip Temp. Sensing NTC Thermistor
- 2:Dimensions:0402[1005]:1.0×0.5×0.5
- 3:Delimiter:X
- 4:Nominal Zero-Power Resistance at 25°C : 104: 100k Ω
- 5:Tolerance of Resistance:F $\pm 1\%$,G $\pm 2\%$,H $\pm 3\%$,J $\pm 5\%$
- 6:B Constant:3435:3435K,3950:3950K,4250:4250K
- 7:Tolerance of B Constant:F $\pm 1\%$, H $\pm 3\%$
- 8: Packing:Tape Carrier Package
- 9:B constant calculation method:A 25°C & 85°C ;B: 25°C & 50°C

Dimensions: [mm]



Recommended PCB pattern for reflow soldering

unit: inch[mm]

Type	L	W	T	a	A	B	C
0402 [1005]	0.039 $\pm$ 0.006 [1.0 $\pm$ 0.15]	0.020 $\pm$ 0.006 [0.5 $\pm$ 0.15]	0.020 $\pm$ 0.006 [0.5 $\pm$ 0.15]	0.010 $\pm$ 0.004 [0.25 $\pm$ 0.1]	[0.45-0.55]	[0.4-0.5]	[0.45-0.55]

Electrical Characteristics List

1) F Series

Part No	Resistance (25℃) (kΩ)	B Constant (25/50℃) (K)	B Constant (25/85℃) (K)	Permissible Operating Current (25℃) (mA)	Dissipation Factor (mW/℃)	Thermal Time Constant (s)	Rated Electric Power(25℃) (mW)	Operating ambient temperature (℃)
MNTC0402X103F3435FTA	10±1%	3380±1%	3435±1%	0.31	1.0	<3	100	-40~+125
MNTC0402X103F3450FTB	10±1%	3450±1%	3500	0.31				
MNTC0402X103F3950FTB	10±1%	3950±1%	3987	0.31				
MNTC0402X223F3950FTB	22±1%	3950±1%	3987	0.21				
MNTC0402X333F4050FTB	33±1%	4050±1%	4100	0.17				
MNTC0402X473F4050FTB	47±1%	4050±1%	4100	0.14				
MNTC0402X683F4150FTB	68±1%	4150±1%	4210	0.12				
MNTC0402X104F3950FTB	100±1%	3950±1%	3987	0.10				
MNTC0402X104F4250FTB	100±1%	4250±1%	4310	0.10				
NTC0402X474F4050FTA	470±1%	4000±1%	4050±1%	0.04				

2) H Series

Part No	Resistance (25℃) (kΩ)	B Constant (25/50℃) (K)	B Constant (25/85℃) (K)	Permissible Operating Current (25℃) (mA)	Dissipation Factor (mW/℃)	Thermal Time Constant (s)	Rated Electric Power(25℃) (mW)	Operating ambient temperature (℃)
MNTC0402X103H3435FTA	10±3%	3380±1%	3435±1%	0.31	1.0	<3	100	-40~+125
MNTC0402X103H3450FTB	10±3%	3450±1%	3500	0.31				
MNTC0402X103H3950FTB	10±3%	3950±1%	3987	0.31				
MNTC0402X223H3950FTB	22±3%	3950±1%	3987	0.21				
MNTC0402X333H4050FTB	33±3%	4050±1%	4100	0.17				
MNTC0402X473H4050FTB	47±3%	4050±1%	4100	0.14				
MNTC0402X683H4150FTB	68±3%	4150±1%	4210	0.12				
MNTC0402X104H3950FTB	100±3%	3950±1%	3987	0.10				
MNTC0402X104H4250FTB	100±3%	4250±1%	4310	0.10				

3) J Series

Part No	Resistance (25℃) (kΩ)	B Constant (25/50℃) (K)	B Constant (25/85℃) (K)	Permissible Operating Current (25℃) (mA)	Dissipation Factor (mW/℃)	Thermal Time Constant (s)	Rated Electric Power(25℃) (mW)	Operating ambient temperature (℃)
MNTC0402X103J3435FTA	10±5%	3380±1%	3435±1%	0.31	1.0	<3	100	-40~+125
MNTC0402X103J3450FTB	10±5%	3450±1%	3500	0.31				
MNTC0402X103J3950FTB	10±5%	3950±1%	3987	0.31				
MNTC0402X223J3950FTB	22±5%	3950±1%	3987	0.21				
MNTC0402X333J4050FTB	33±5%	4050±1%	4100	0.17				
MNTC0402X473J4050FTB	47±5%	4050±1%	4100	0.14				
MNTC0402X683J4150FTB	68±5%	4150±1%	4210	0.12				
MNTC0402X104J3950FTB	100±5%	3950±1%	3987	0.10				
MNTC0402X104J4250FTB	100±5%	4250±1%	4310	0.10				
MNTC0402X474J4050FTA	470±5%	4000±1%	4050±1%	0.04				

Test and Measurement Procedures

• Test Conditions

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

- a. Ambient Temperature: $20 \pm 15^{\circ}\text{C}$
- b. Relative Humidity: $65 \pm 20\%$
- c. Air Pressure: 86kPa to 106kPa

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

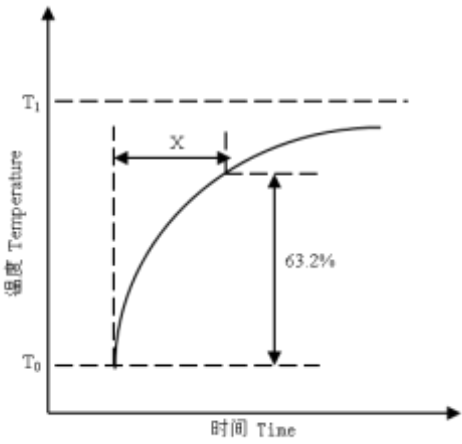
- a. Ambient Temperature: $25 \pm 2^{\circ}\text{C}$
- b. Relative Humidity: $65 \pm 5\%$
- c. Air Pressure: 86kPa to 106kPa

• Inspection Equipment

Visual Examination: 20×magnifier

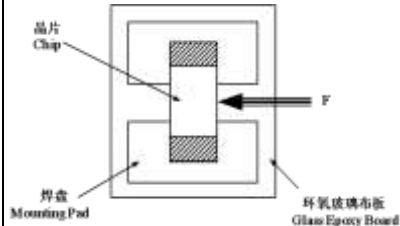
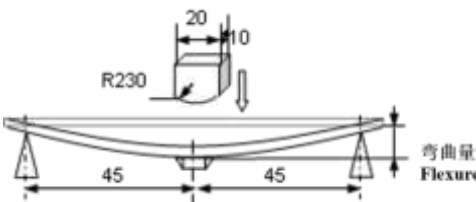
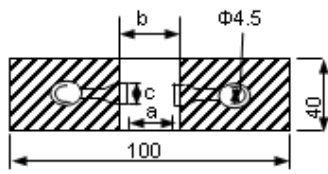
Resistance value test: Thermistor resistance tester

Electrical Test

No.	Items	Test Methods and Remarks
1	Nominal Zero-Power Resistance at 25°C (R25)	Ambient temperature: $25 \pm 0.05^{\circ}\text{C}$ Measuring electric power: $\leq 0.1\text{mW}$
2	Nominal B Constant	Measure the resistance at the ambient temperature of $25 \pm 0.05^{\circ}\text{C}$, $50 \pm 0.05^{\circ}\text{C}$ or $85 \pm 0.05^{\circ}\text{C}$. $B(25-50^{\circ}\text{C}) = \frac{\ln R_{25} - \ln R_{50}}{1/T_{25} - 1/T_{50}} \quad B(25-85^{\circ}\text{C}) = \frac{\ln R_{25} - \ln R_{85}}{1/T_{25} - 1/T_{85}}$ T: (K) Absolute temperature (K)
3	Thermal Time Constant	The total time for the temperature of the thermistor to change by 63.2% of the difference from ambient temperature $T_0 (^{\circ}\text{C})$ to $T_1 (^{\circ}\text{C})$ by the drastic change of the power applied to thermistor from Non-zero Power to Zero-Power state, normally expressed in second(S). 

4	Dissipation Factor	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	Rated Power	The necessary electric power makes thermistor's temperature rise 100℃ by self-heating at ambient temperature 25℃.
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.

Reliability Test

Items	Standard	Test Methods and Remarks	Requirements																														
Terminal Strength	IEC 60068-2-21	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. <table><tr><td>Size</td><td>F</td><td>Duration</td></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>	Size	F	Duration	0201	2N	10±1s	0402, 0603	5N	0805	10N	No removal or split of the termination or other defects shall occur.  晶片 Chip 焊盘 Mounting Pad 环氧玻璃布板 Glass Epoxy Board																				
Size	F	Duration																															
0201	2N	10±1s																															
0402, 0603	5N																																
0805	10N																																
Resistance to Flexure	IEC 60068-2-21	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;  弯曲量 Flexure <table><tr><td>Size</td><td>Flexure</td><td>Pressurizing Speed</td><td>Duration</td></tr><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></table>	Size	Flexure	Pressurizing Speed	Duration	0201,	1mm	<0.5mm/s	10±1s	0402, 0603, 0805	2mm	① No visible damage. ② $\Delta R_{25}/R_{25} \leq 2\%$ unit: mm <table><tr><td>Type</td><td>a</td><td>b</td><td>c</td></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> 	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
Size	Flexure	Pressurizing Speed	Duration																														
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0603	1.0	3.0	1.2																														
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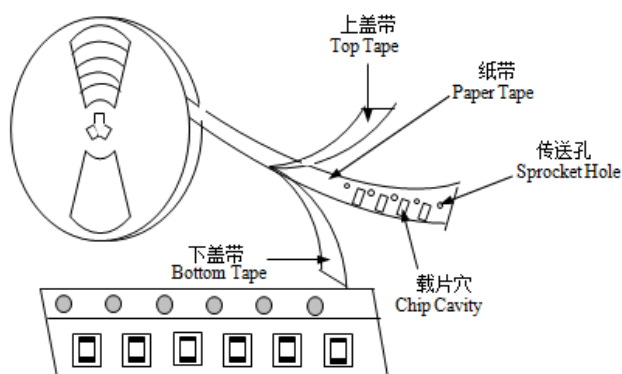
Vibration	IEC 60068-2-80	① Solder the chip to the testing jig (glass epoxy board shown in the left) using eutectic solder. ② The chip shall be subjected to a simple harmonic motion having total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55 Hz. ③ 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).	No visible damage. 铜箔 Chip pad 阻焊膜 Solder mask  环氧玻璃布板 Glass Epoxy Board															
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	① Solder temperature: 245±5℃. ② Duration: 3±0.3s. ③ Solder: 96.5Sn/3.0Ag/0.5Cu. ④ Flux: （重量比）25%松香和 75%酒精25% Resin and 75% ethanol in weight.	① No visible damage. ② Wetting shall exceed 95% coverage															
Resistance to Soldering Heat	IEC 60068-2-58	① Solder temperature: 260±5 ℃ . ② Duration: 10±1s. ③ Solder: 96.5Sn/3.0Ag/0.5Cu. ④ Flux: （重量比）25%松香和 75%酒精25% Resin and 75% ethanol in weight. ⑤ The chip shall be stabilized at normal condition for 1~2 hours before measuring.	① No visible damage. ② ΔR25/R25 ≤2% ③ ΔB/B ≤1%															
Temperature cycling	IEC 60068-2-14	① 5 cycles of following sequence without loading. <table><tr><td>Step</td><td>Temperature</td><td>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 The chip shall be stabilized at normal condition for 1~2 hours before measuring.	Step	Temperature	Time	1	-40±5℃	30±3min	2	25±2℃	5±3min	3	125±2℃	30±3min	4	25±2℃	5±3min	① No visible damage. ② ΔR25/R25 ≤2% ③ ΔB/B ≤1%
Step	Temperature	Time																
1	-40±5℃	30±3min																
2	25±2℃	5±3min																
3	125±2℃	30±3min																
4	25±2℃	5±3min																
Resistance to dry heat	IEC 60068-2-2	① 125±5℃ in air, for 1000±24 hours without loading. ② The chip shall be stabilized at normal condition for 1~2 hours before measuring.	① No visible damage. ② ΔR25/R25 ≤2% ③ ΔB/B ≤1%															

Resistance to cold	IEC 60068-2-1	① $-40 \pm 3^{\circ}\text{C}$ in air, for 1000 ± 24 hours without loading. ② The chip shall be stabilized at normal condition for 1~2 hours before measuring.	① No visible damage. ② $ \Delta R_{25}/R_{25} \leq 2\%$ ③ $ \Delta B/B \leq 1\%$
Resistance to damp heat	IEC 60068-2-78	① $40 \pm 2^{\circ}\text{C}$, 90~95%RH in air, for 1000 ± 24 hours without loading. ② The chip shall be stabilized at normal condition for 1~2 hours before measuring.	① No visible damage. ② $ \Delta R_{25}/R_{25} \leq 2\%$ ③ $ \Delta B/B \leq 1\%$
Resistance to high temperature load	IEC 60539-1 5.25.4	① $85 \pm 2^{\circ}\text{C}$ in air with permissive operating current for 1000 ± 48 hours ② The chip shall be stabilized at normal condition for 1~2 hours before measuring.	① No visible damage. ② $ \Delta R_{25}/R_{25} \leq 2\%$ ③ $ \Delta B/B \leq 1\%$

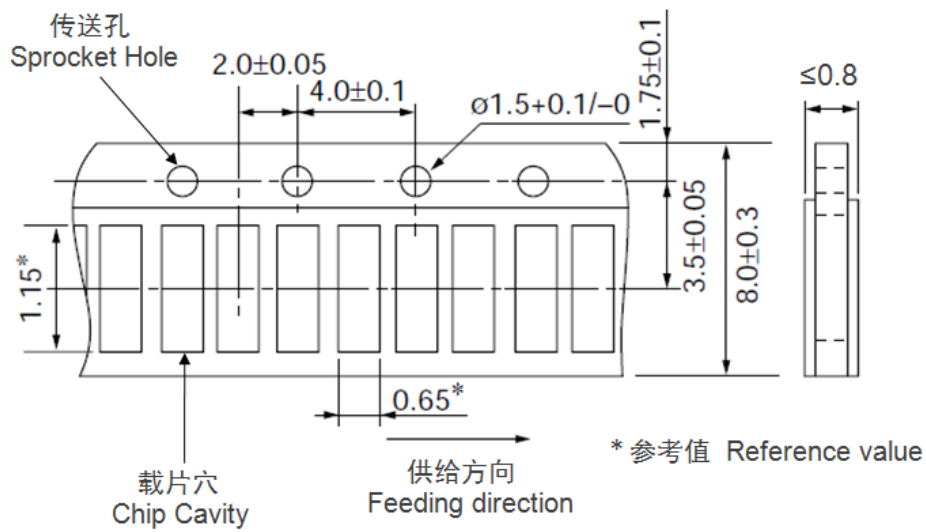
Taping

Type	0402
Tape thickness(mm)	0.5 ± 0.15
Tape material	Paper Tape
Quantity per Reel	10K

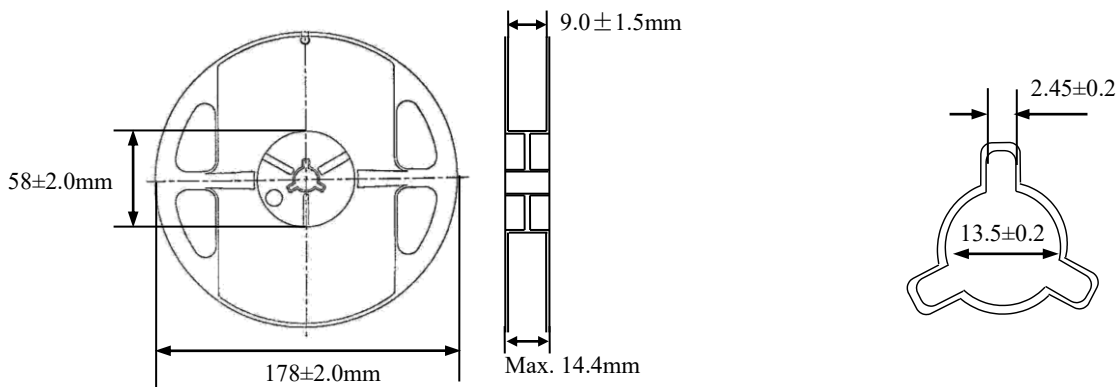
Taping Drawings



Paper Tape Dimensions



Reel Dimensions Unit: mm)



Storage

- **Storage Conditions**
 - Storage Temperature: -10℃～40℃
 - Relative Humidity: ≤75%RH
 - Keep away from corrosive atmosphere and sunlight.
- **Period of Storage: 6 Months**

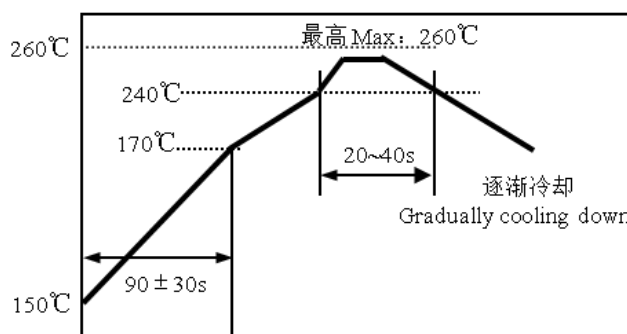
Notes & Warnings

- The MNTC series thermistors shall not be operated and stored under the following environmental condition:
 - (1) Corrosive or deoxidized atmospheres
(such as chlorine, sulfured 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 MNTC series thermistors is fragile, no excessive pressure or impact shall be exerted on it.
- The MNTC series thermistors shall not be operated beyond the specified “Operating Temperature Range” in the catalog.

Recommended Soldering Technologies

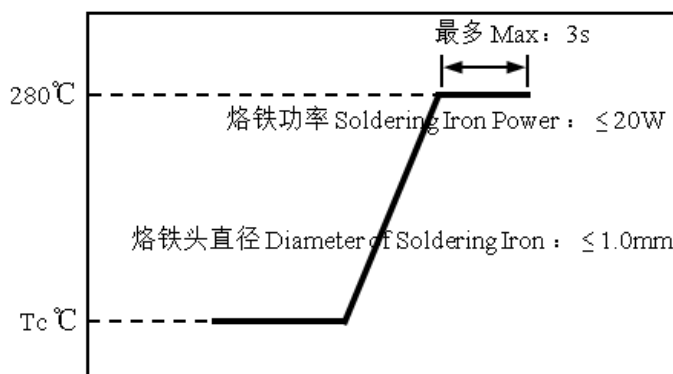
Re-flowing Profile

- 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.]