

# NTC Thermistor : TSM-H Series

## High Temperature SMD Type NTC Thermistor



### ■ Features

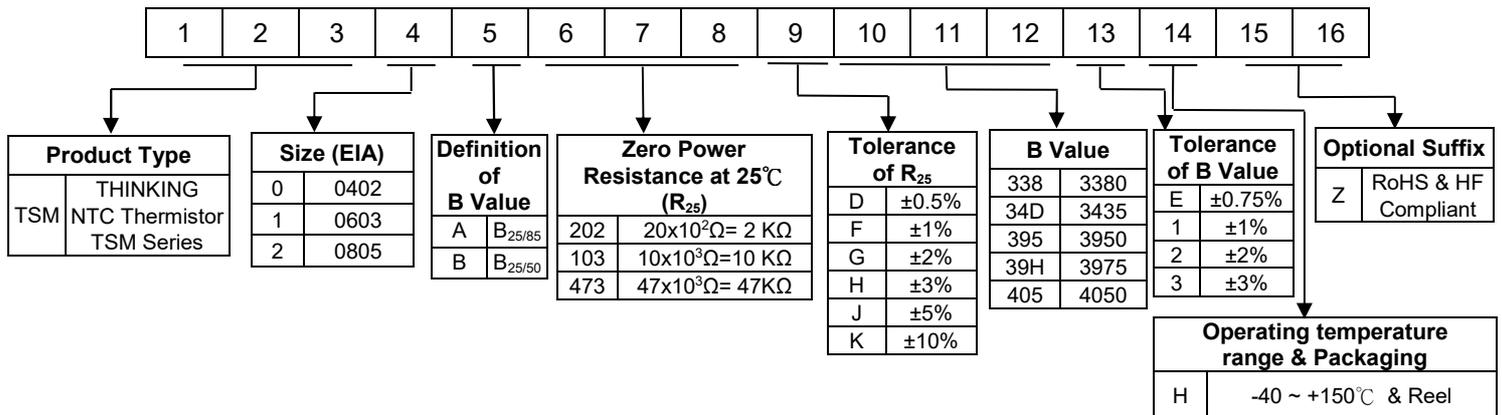
1. RoHS & Halogen Free (HF) compliant
2. EIA size: 0402, 0603, 0805
3. Highly reliable structure
4. Operating temperature range:  $-40^{\circ}\text{C} \sim +150^{\circ}\text{C}$
5. Wide resistance range
6. Cost effective
7. Agency recognition: UL / cUL



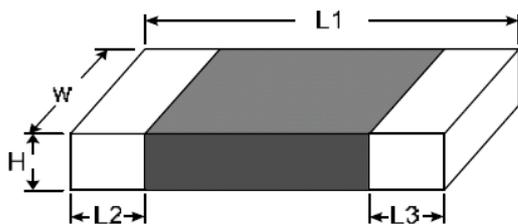
### ■ Recommended Applications

1. Motherboard, notebook and personal computer device
2. Adapter
3. Power Supply
4. Server

### ■ Part Number Code



### ■ Structure and Dimensions



(Unit: mm)

Part No.	Size (EIA)	L1	W	H.	L2 & L3
TSM0	0402	1.00±0.15	0.50±0.10	0.50±0.10	0.20±0.10
TSM1	0603	1.60±0.15	0.80±0.15	0.80±0.15	0.40±0.15
TSM2	0805	2.00±0.20	1.25±0.20	1.00max.	0.40±0.20

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### Electrical Characteristics

Part No.	Size (EIA)	Zero Power Resistance at 25°C	Tolerance of R25	B Value		Tolerance of B value	Max. Power Dissipation at 25°C	Dissipation Factor	Thermal Time Constant	Max. Operating Current at 25°C	Operating Temperature Range	Safety Approvals					
		R <sub>25</sub> (KΩ)	( ±%)	(K)		(±%)	P <sub>max</sub> (mW)	δ(mW/°C)	τ(Sec.)	I <sub>max</sub> (mA)	T <sub>L</sub> ~T <sub>U</sub> (°C)	UL/cUL					
TSM0A103□34D*HZ	0402	10	0.5, 1, 2, 3, 5, 10	25/85	3435	1, 2, 3	170	Approx. 1.7	Approx. 2.0	0.41	-40 ~ +150	√					
TSM0B103□338*HZ		10		25/50	3380							0.75, 1, 2, 3	√				
TSM0A104□40H*HZ		100	1, 2, 3, 5, 10	25/85	4075	1, 2, 3						0.13	√				
TSM0B104□425*HZ		100		25/50	4250							√					
TSM1A202□350*HZ	0603	2	1, 2, 3, 5, 10	25/85	3500	1, 2, 3	210	Approx 2.1	Approx 3.1	1.02	-40 ~ +150	√					
TSM1A103□34D*HZ		10			3435					0.46		√					
TSM1A103□39H*HZ		10			3975					0.21		√					
TSM1A473□39H*HZ		47			3975					0.14		√					
TSM1A104□410*HZ		100			4100					0.12		√					
TSM1A154□465*HZ		150			4650					0.10		√					
TSM1A204□410*HZ		200			4100					0.10		√					
TSM1A224□410*HZ		220			4100					0.07		√					
TSM1A474□415*HZ		470			4150					1.02		√					
TSM1B202□34H*HZ		2			3475					0.46		√					
TSM1B103□338*HZ		10	3380	0.21	√												
TSM1B473□395*HZ		47	3950	0.14	√												
TSM1B104□405*HZ		100	4050	0.12	√												
TSM1B154□460*HZ		150	4600	0.10	√												
TSM1B204□410*HZ		200	4100	0.10	√												
TSM1B224□410*HZ		220	4100	0.07	√												
TSM1B474□410*HZ		470	4100		√												
TSM2A103□34D*HZ		0805	10	1, 2, 3, 5, 10	25/85	3435				1, 2, 3, 5		240	Approx. 2.4	Approx. 5.4	0.49	-40 ~ +150	√
TSM2B103□345*HZ			10		3450	√											
TSM2B103□350*HZ			10	25/50	3500	√											
TSM2B103□395*HZ	10		3950	√													

Note 1: □ = Tolerance of R<sub>25</sub>  
 \* = Tolerance of B value

Note 2: UL&cUL File No. E138827

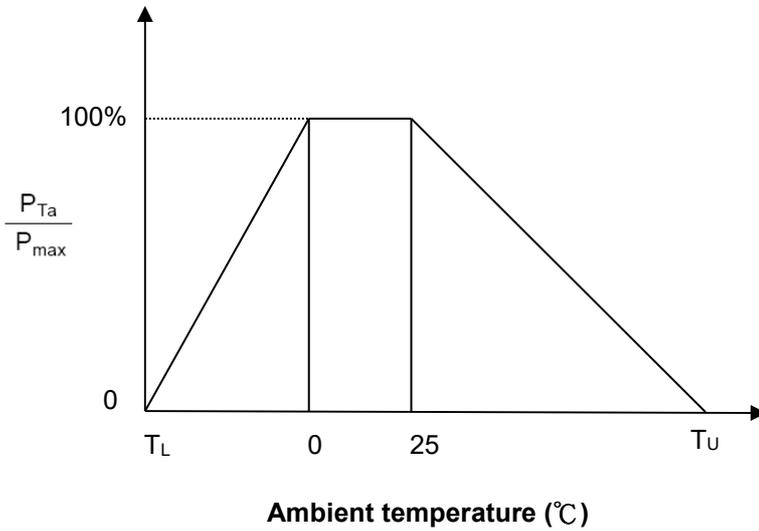
Note 3: Special specifications are available upon request

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### Max. Power Dissipation Derating Curve



$T_U$ : Maximum operating temperature (°C)

$T_L$ : Minimum operating temperature (°C)

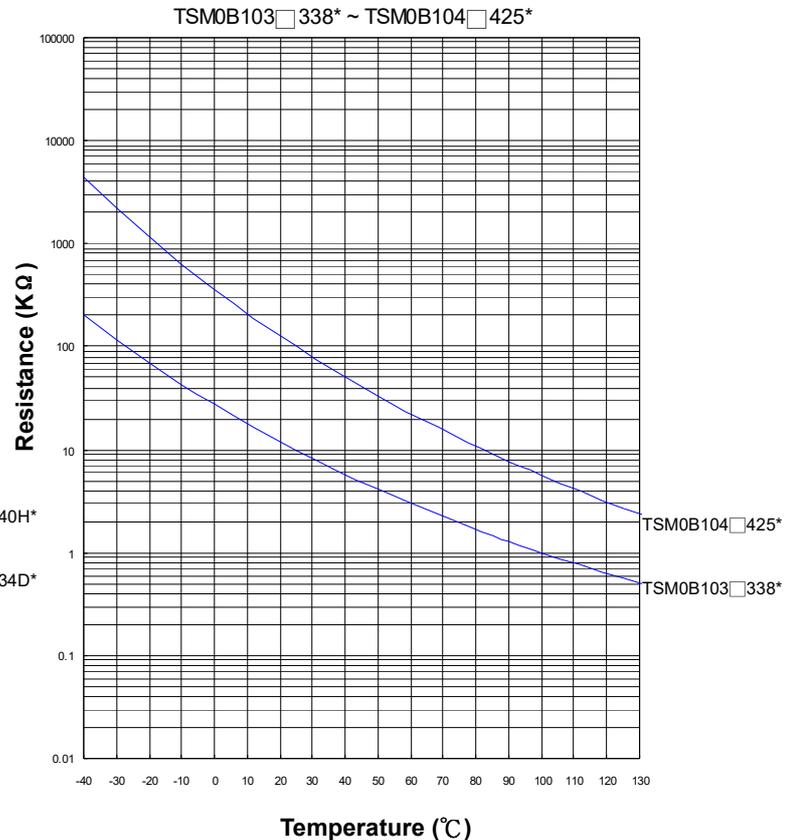
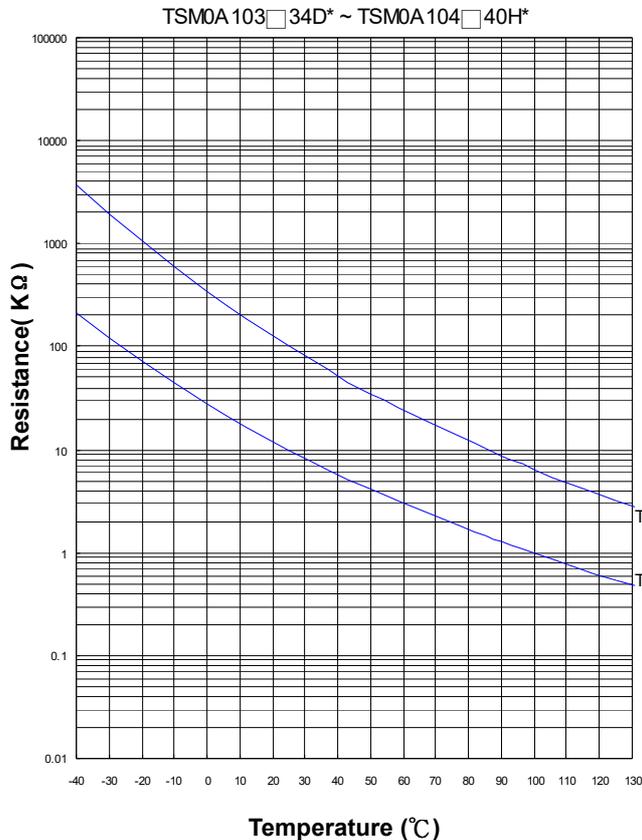
For example:

Ambient temperature ( $T_a$ ) = 55°C

Maximum operating temperature ( $T_U$ ) = 150°C

$$P_{Ta} = \frac{(T_U - T_a)}{(T_U - 25)} \times P_{max} = 76\% P_{max}$$

### R-T Characteristic Curves



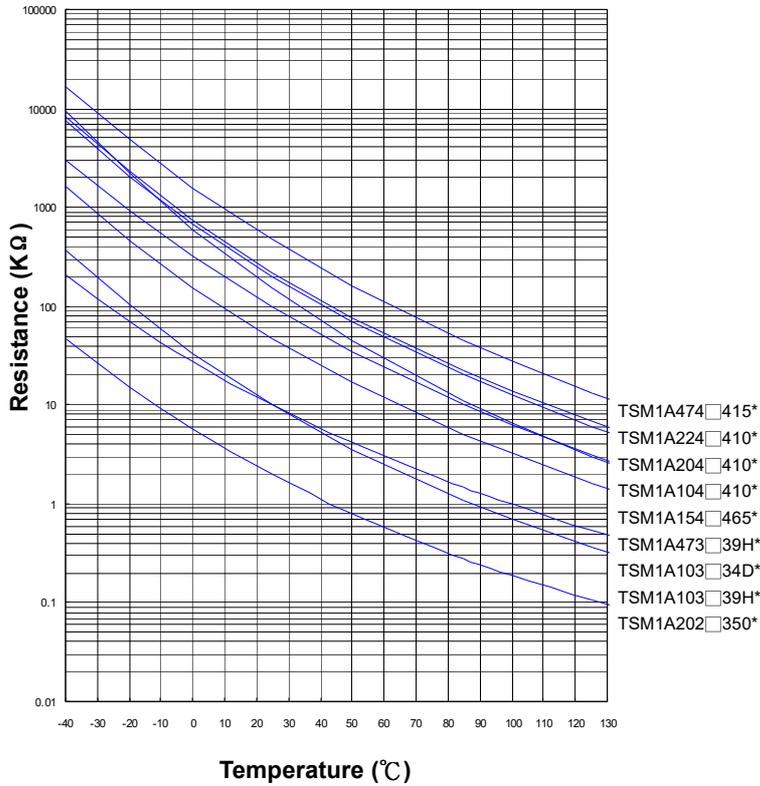
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## High Temperature SMD Type NTC Thermistor

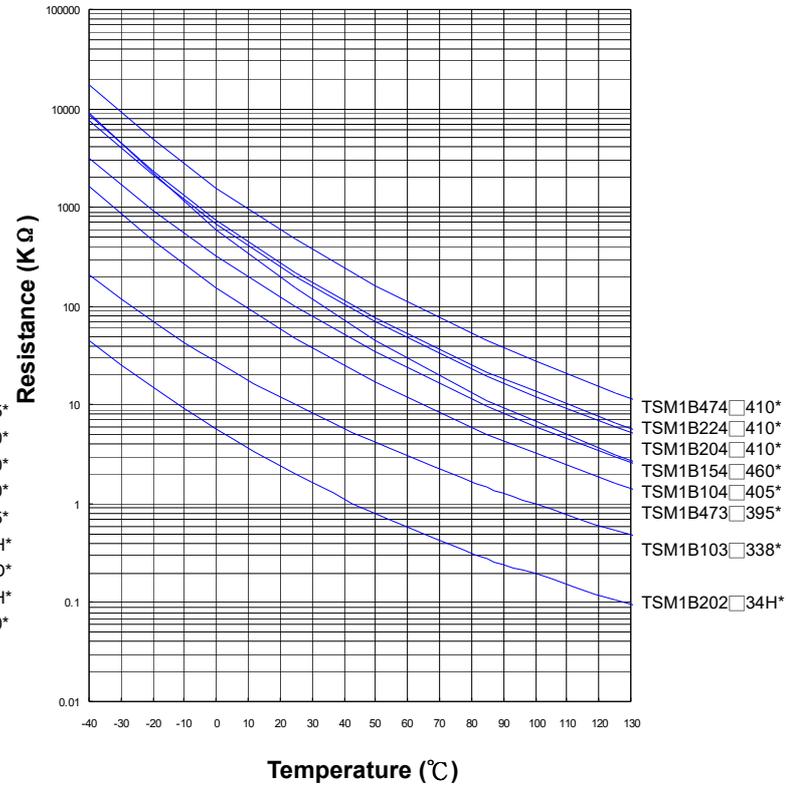


### R-T Characteristic Curves

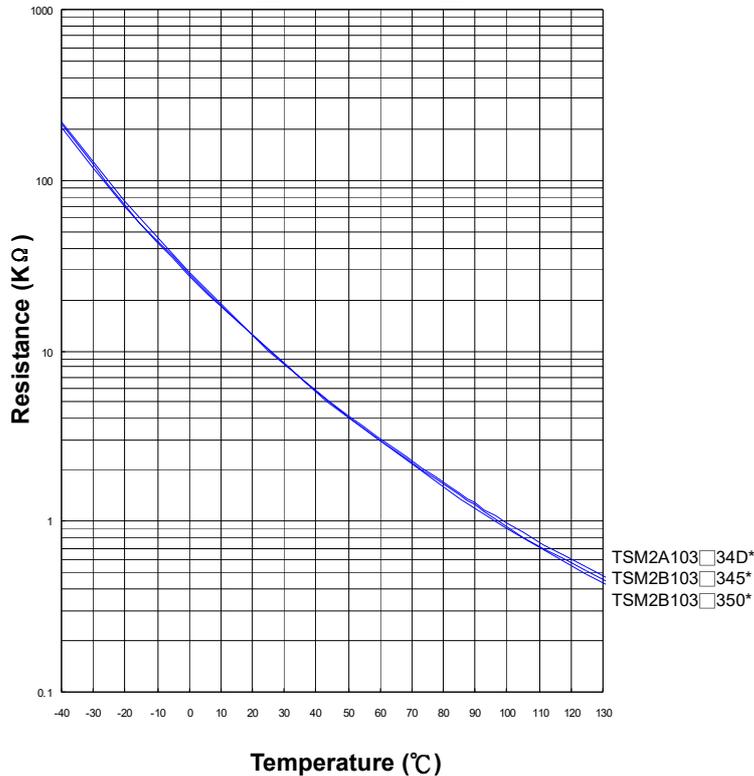
TSM1A202□350\* ~ TSM1A474□415\*



TSM1B202□34H\* ~ TSM1B474□410\*



TSM2A103□34D\* ~ TSM2B103□350\*



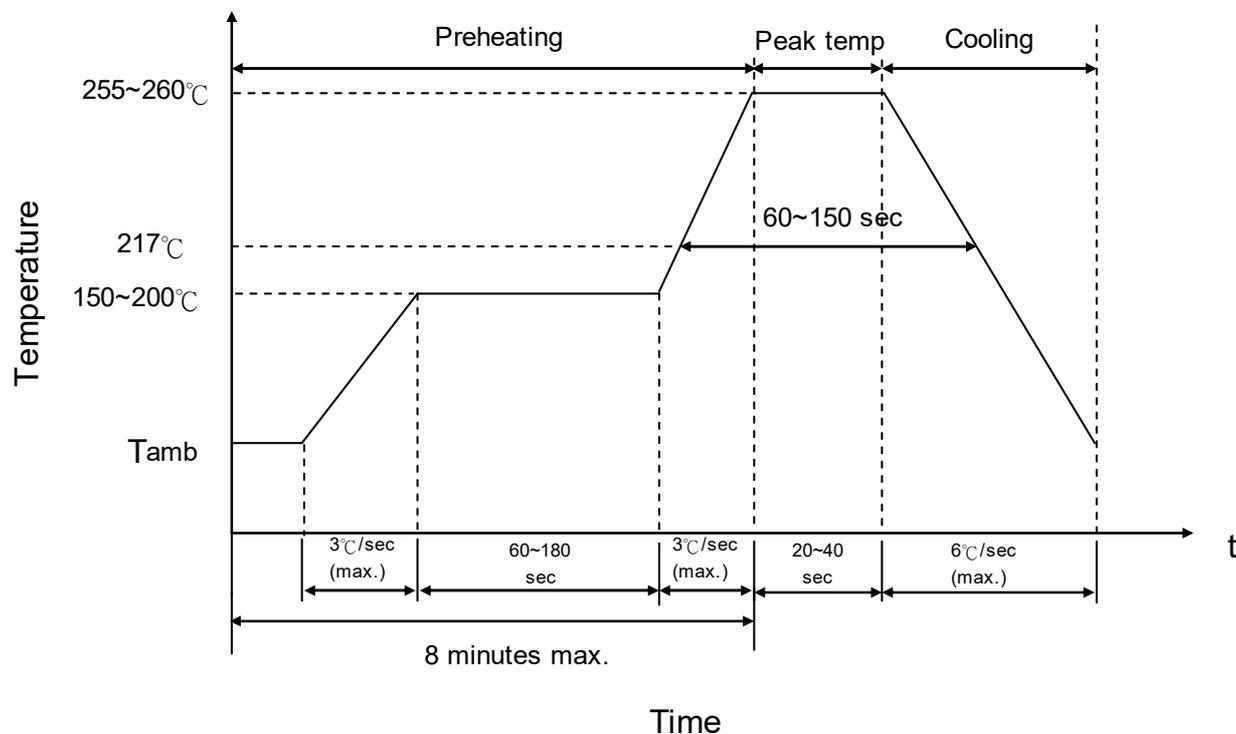
# NTC Thermistor : TSM-H Series

## High Temperature SMD Type NTC Thermistor



### ■ Soldering Recommendation

#### ● IR-Reflow Soldering Profile



#### ● Recommended Reworking Conditions with Soldering Iron

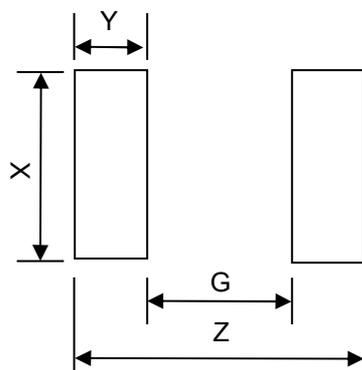
Item	Conditions
Temperature of Soldering Iron-tip	$360^{\circ}\text{C}$ (max.)
Soldering Time	3 sec. (max.)
Diameter of Soldering Iron-tip	$\Phi 3\text{mm}$ (max.)
Caution: Please do not touch the component surface with soldering iron directly to avoid its damage.	

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## High Temperature SMD Type NTC Thermistor



### ■ Recommended Soldering Pad Dimensions



Size (EIA)	Z (mm)	G (mm)	X (mm)	Y (mm)
0402	1.4	0.4	0.5	0.5
0603	2.8	0.8	1.0	1.0
0805	3.4	1.0	1.4	1.2

#### Notice of Mounting on Flexible Printed Circuit (FPC):

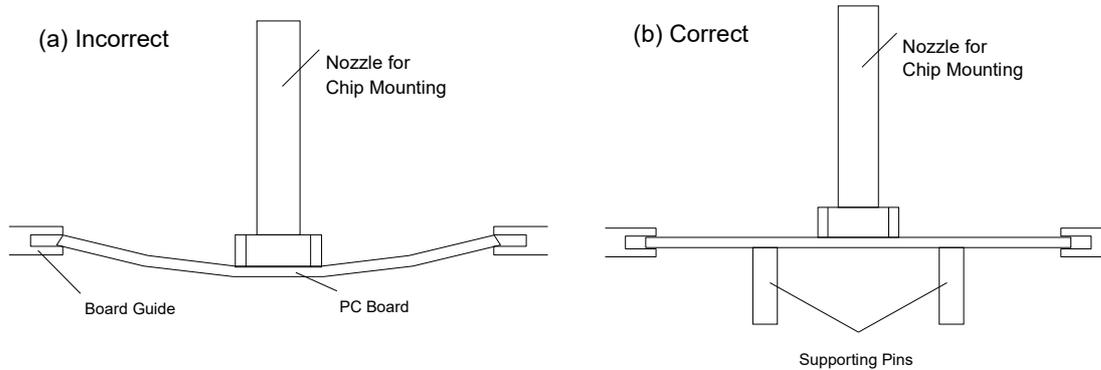
1. Before SMDs mounting, a support plate should be attached to the back of the SMDs mounting position on the FPC to avoid undue stress being imposed on the SMDs body during the placing process.
2. After SMDs mounting is completed, a protective frame should be attached around the outside of the SMDs mounting position to avoid inappropriate stress being directly applied to the SMDs body during the subsequent assembly process.

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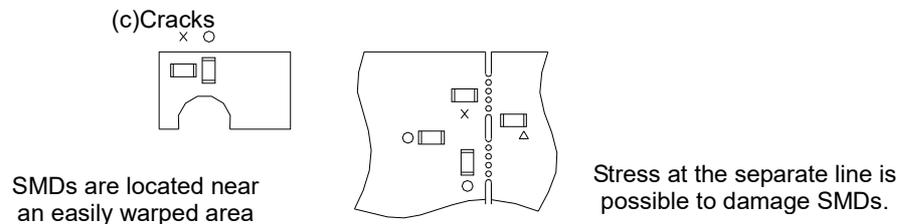
## High Temperature SMD Type NTC Thermistor



### ■ Notice of Soldering and Mounting on PC Board

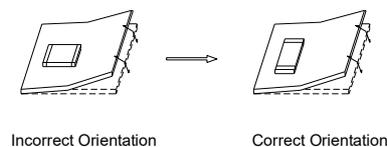


For mounting SMDs on a PC board, supporting pin is suggested for use (refer to figure b) to avoid cracks caused by external stress (refer to figure a).



If circuit bending is needed for PC board design, please refer to figure (c) for mounting positions to avoid cracks caused by stress imposed on the product. O means better, Δ is acceptable, and X is worst.

### (d) Component Orientation



Locate SMDs horizontally to the direction that stress acts

During circuit bending, please locate SMDs horizontally to the direction in which stress act to avoid its cracks (refer to figure d).

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## High Temperature SMD Type NTC Thermistor



### ■ Reliability

Item	Standard	Test conditions / Methods	Specifications															
Bending Strength	IEC 60068-2-21	Warp : 2mm Speed < 0.5mm/sec. Duration: 10 sec. on PCB 	No visible damage   $\Delta R_{25}/R_{25}$   $\leq 5\%$															
Solderability	IEC 60068-2-58	245 $\pm$ 5°C, 3 $\pm$ 0.3 sec.	At least 95% of terminal electrode is covered by new solder															
Resistance to Soldering Heat	IEC 60068-2-58	260 $\pm$ 5°C, 10 $\pm$ 1 sec.	No visible damage   $\Delta R_{25}/R_{25}$   $\leq 3\%$															
High Temperature Storage	IEC 60068-2-2	150 $\pm$ 2°C, 1000 $\pm$ 24 hrs	No visible damage   $\Delta R_{25}/R_{25}$   $\leq 5\%$															
Damp Heat, Steady State	IEC 60068-2-78	40 $\pm$ 2°C, 90~95% RH , 1000 $\pm$ 24 hrs	No visible damage   $\Delta R_{25}/R_{25}$   $\leq 3\%$															
Rapid Change of Temperature	IEC 60068-2-14	The conditions shown below shall be repeated 5 cycles on PCB. <table border="1" data-bbox="517 913 1206 1173"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Period (minutes)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-40 <math>\pm</math> 3</td> <td>30 <math>\pm</math> 3</td> </tr> <tr> <td>2</td> <td>Room temperature</td> <td><math>\leq 3</math></td> </tr> <tr> <td>3</td> <td>150 <math>\pm</math> 2</td> <td>30 <math>\pm</math> 3</td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td><math>\leq 3</math></td> </tr> </tbody> </table>	Step	Temperature (°C)	Period (minutes)	1	-40 $\pm$ 3	30 $\pm$ 3	2	Room temperature	$\leq 3$	3	150 $\pm$ 2	30 $\pm$ 3	4	Room temperature	$\leq 3$	No visible damage   $\Delta R_{25}/R_{25}$   $\leq 3\%$
Step	Temperature (°C)	Period (minutes)																
1	-40 $\pm$ 3	30 $\pm$ 3																
2	Room temperature	$\leq 3$																
3	150 $\pm$ 2	30 $\pm$ 3																
4	Room temperature	$\leq 3$																
Max. Power Dissipation	IEC 60539-1 4.26.3	25 $\pm$ 5°C, Pmax. , 1000 $\pm$ 24 hrs	No visible damage   $\Delta R_{25}/R_{25}$   $\leq 5\%$															

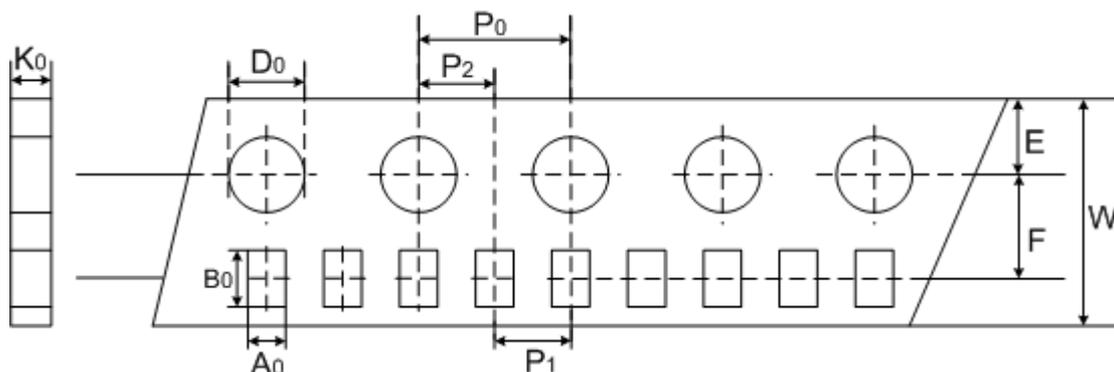
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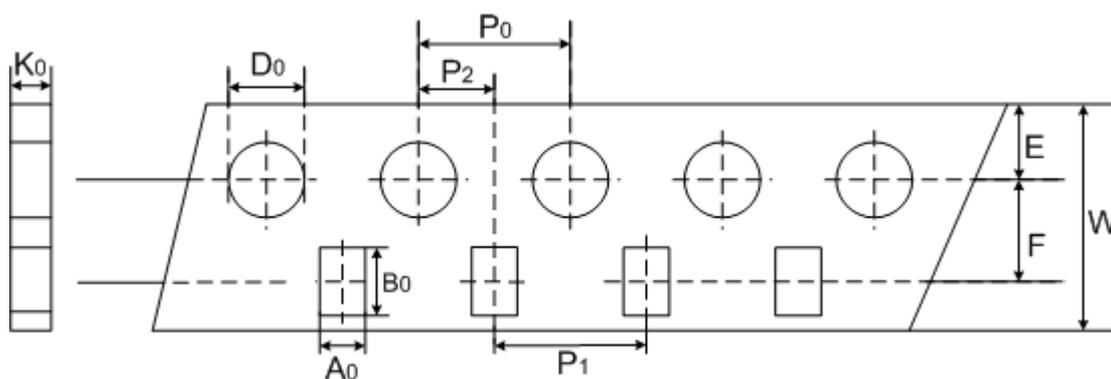
### ■ Packaging

#### ● Taping Specification



(Unit: mm)

Index Size	A <sub>0</sub>	B <sub>0</sub>	W	E	F	P <sub>1</sub>	P <sub>2</sub>	P <sub>0</sub>	D <sub>0</sub>	K <sub>0</sub>
0402	±0.05	±0.12	±0.2	±0.1	±0.05	±0.1	±0.05	±0.1	±0.1	±0.1



(Unit: mm)

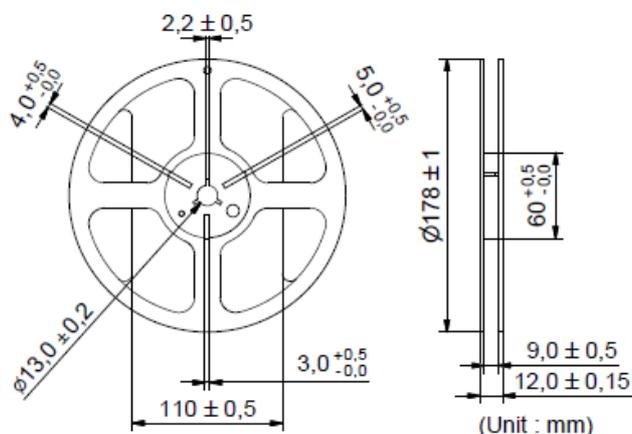
Index Size	A <sub>0</sub>	B <sub>0</sub>	W	E	F	P <sub>1</sub>	P <sub>2</sub>	P <sub>0</sub>	D <sub>0</sub>	K <sub>0</sub>
0603	±0.2	±0.2	±0.2	±0.1	±0.05	±0.1	±0.05	±0.1	±0.1	±0.1
0805	1.5	2.3	8	1.75	3.5	4	2	4	1.55	1.0

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### ■ Quantity



Size (EIA)	Quantity (pcs/reel)
0402	10,000
0603	4,000
0805	3,500

### ■ Warehouse Storage Conditions of Products

#### ■ Storage Conditions :

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

#### ■ Period of Storage : 1 year