

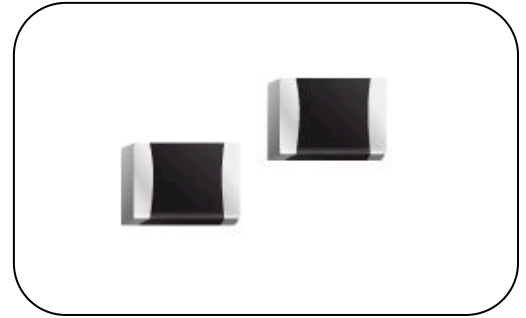
NTC Thermistor: TSM Series

SMD NTC Thermistor for Temperature Sensing



■ Features

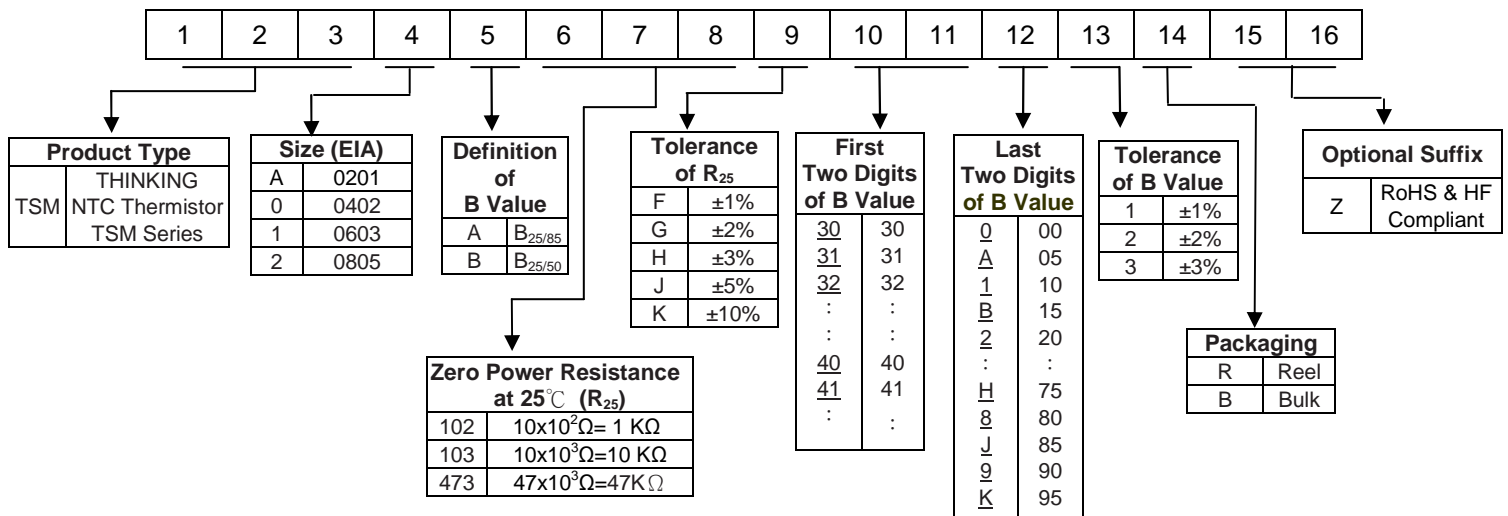
1. RoHS & HF compliant
2. EIA size: 0201, 0402, 0603, 0805
3. Highly reliable structure
4. Operating temperature range: -40 ~ +125 °C
5. Wide resistance range
6. Cost effective
7. Agency recognition: UL/cUL/TUV



■ Recommended Applications

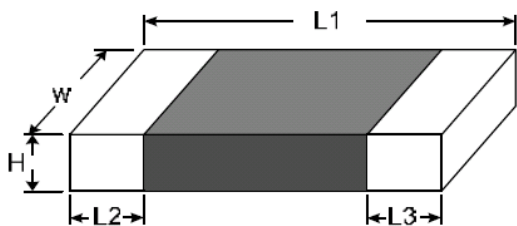
1. Battery pack
2. Motherboard/ Notebook computer/ Personal computer
3. Liquid crystal display
4. Cellular phones
5. Bluetooth headset

■ Part Number Code



■ Structure and Dimensions

(Unit: mm)



Part No.	Size	L1.	W	H max.	L2 & L3
TSM A	0201	0.60±0.05	0.30±0.05	0.35	0.15±0.05
TSM 0	0402	1.00±0.15	0.50±0.10	0.60	0.20±0.10
TSM 1	0603	1.60±0.15	0.80±0.15	0.95	0.40±0.15
TSM 2	0805	2.00±0.20	1.25±0.20	1.20	0.40±0.20

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Electrical Characteristics

Part No.	Zero Power Resistance at 25°C	Tolerance of R ₂₅	B Value		Tolerance of B value	Max. Power Dissipation at 25°C	Dissipation Factor	Thermal Time Constant	Operating Temperature Range	Safety Approvals								
	R ₂₅ (KΩ)		(±%)	(K)						(±%)	P _{max} (mW)	δ(mW/°C)	τ(Sec.)	T _L ~T _U (°C)	UL/cUL	TUV		
TSM0A682□34D*	6.8	1、2、3 5、10	25/85	3435	1、2、3	140	Approx. 1.4	Approx. 1.2	-40 ~ +125	√	√							
TSM0A103□34D*	10			3435						√	√							
TSM0A104□425*	100		25/50	4250						√	√							
TSM0A224□450*	220			4500						√	√							
TSM0A103□34D*	10	1、2、3 5、10	25/85	3435	1、2、3	170	Approx. 1.7	Approx. 2.0	-40 ~ +125	√	√							
TSM0A103□391*	10			3910						√	√							
TSM0A223□393*	22			3930						√	√							
TSM0A333□393*	33			3930						√	√							
TSM0A473□393*	47			3930						√	√							
TSM0A503□395*	50			3950						√	√							
TSM0A683□405*	68			4050						√	√							
TSM0A104□39H*	100			3975						√	√							
TSM0A224□405*	220			4050						√	√							
TSM0A474□409*	470			4090						√	√							
TSM0B474□470*	470			5、10						25/50	4700	2、3					√	√
TSM1A202□340*	2			1、2、3、 5、10						25/85	3400	1、2、3					√	√
TSM1A222□34D*	2.2										3435						√	√
TSM1B222□395*	2.2			5、10						25/50	3950	2、3					√	√
TSM1A472□34D*	4.7	1、2、3、 5、10	25/85	3435	1、2、3					√	√							
TSM1A472□367*	4.7			3670						√	√							
TSM1A502□34D*	5			3435						√	√							
TSM1A682□34D*	6.8			3435						√	√							
TSM1A682□430*	6.8	5、10		4300	2、3					√	√							
TSM1A103□34D*	10	1、2、3、 5、10	25/85	3435	1、2、3	210	Approx 2.1	Approx 3.1	-40~+125	√	√							
TSM1A103□39H*	10			3975						√	√							
TSM1B103□425*	10			25/50						4250	2、3					√	√	
TSM1A123□380*	12									3800	1、2、3					√	√	
TSM1A153□395*	15									3950		√	√					
TSM1A223□39H*	22									3975		√	√					
TSM1A333□39H*	33			25/85						3975		√	√					
TSM1A473□39H*	47									3975	√	√						
TSM1A503□39H*	50									3975	√	√						
TSM1A683□39H*	68									3975	√	√						
TSM1A104□405*	100									4050	√	√						
TSM1B104□425*	100			25/50						4250	2、3					√	√	
TSM1A104□436*	100									4360	1、2、3					√	√	
TSM1A154□406*	150									4060		√	√					
TSM1A204□410*	200	25/85	4100	√	√													
TSM1A224□410*	220		4100	√	√													
TSM1A334□415*	330		4150	√	√													
TSM1A474□410*	470		4100	√	√													
TSM1B474□446*	470	25/50	4460	2、3					√	√								
TSM2A102□320*	1	1、2、3、 5、10	25/85	3200	1、2、3	240	Approx 2.4	Approx 5.4	-40~+125	√	√							
TSM2A472□34D*	4.7			3435						√	√							
TSM2A502□34D*	5			3435						√	√							
TSM2A682□34D*	6.8			3435						√	√							
TSM2A103□34D*	10			3435						√	√							
TSM2A103□380*	10									3800	√	√						
TSM2A103□39H*	10									3975	√	√						
TSM2A153□395*	15									3950	√	√						
TSM2A203□395*	20									3950	√	√						
TSM2A223□380*	22									3800	√	√						
TSM2A223□39H*	22									3975	√	√						
TSM2A303□39H*	30									3975	√	√						
TSM2A473□39H*	47									3975	√	√						

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Electrical Characteristics

Part No.	Zero Power Resistance at 25°C	Tolerance of R ₂₅	B Value		Tolerance of B value	Max. Power Dissipation at 25°C	Dissipation Factor	Thermal Time Constant	Operating Temperature Range	Safety Approvals	
	R ₂₅ (KΩ)	(±%)	(K)		(±%)	P _{max} (mW)	δ(mW/°C)	τ(Sec.)	T _L ~T _U (°C)	UL/cUL	TUV
TSM2A503□39H*	50	1、2、3、5、10	25/85	3975	1、2、3	240	Approx 2.4	Approx 5.4	-40~+125	✓	✓
TSM2A683□39H*	68			3975						✓	✓
TSM2A104□405*	100			4050						✓	✓
TSM2A204□410*	200			4100						✓	✓
TSM2A224□410*	220			4100						✓	✓

Note 1: □ = Tolerance of R₂₅

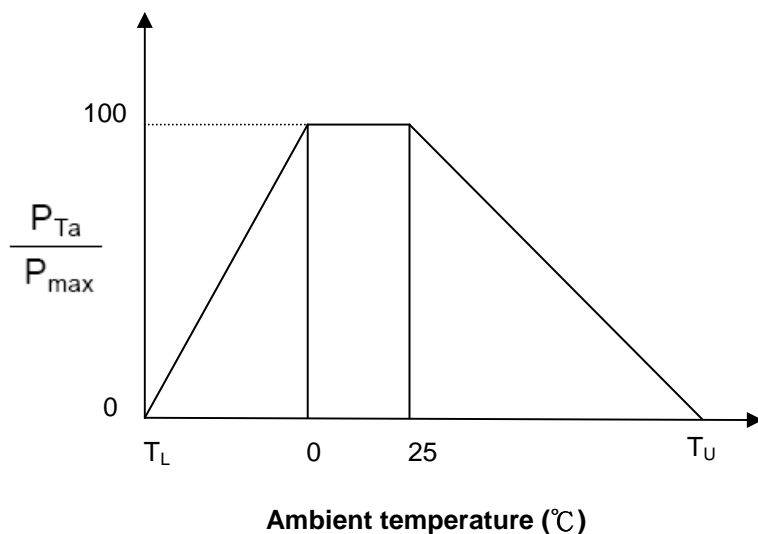
Note 2: * = Tolerance of B value

Note 3: UL&cUL File No. E138827

TUV File No. R 50167657

*Special specifications are available upon request

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)=125°C

$P_{Ta} = (T_U - T_a) / (T_U - 25) \times P_{max} = 70\% P_{max}$

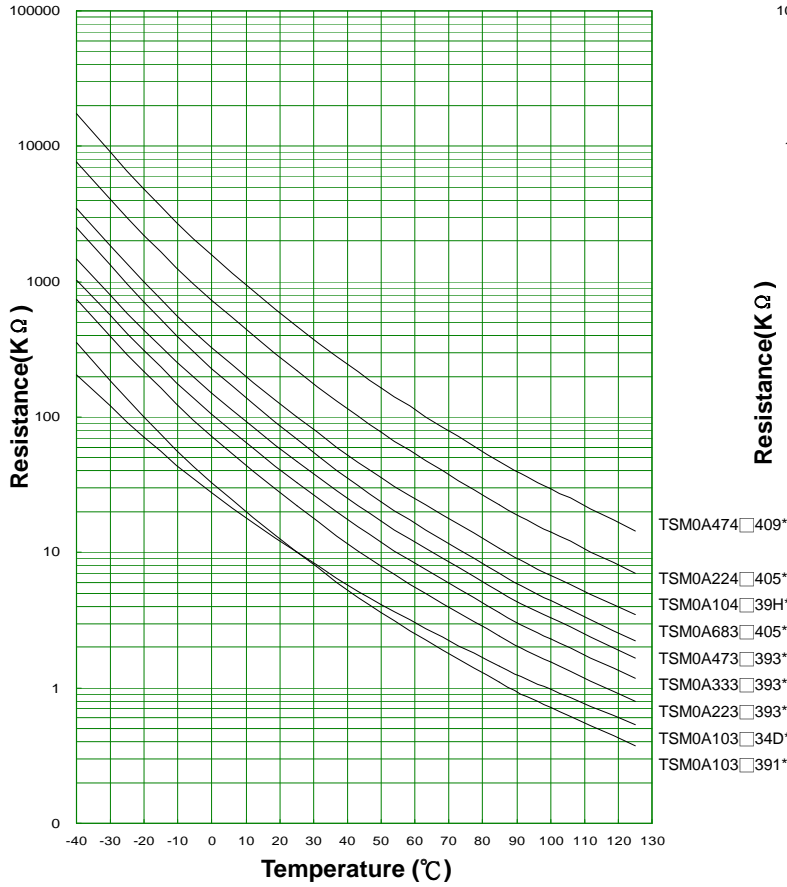
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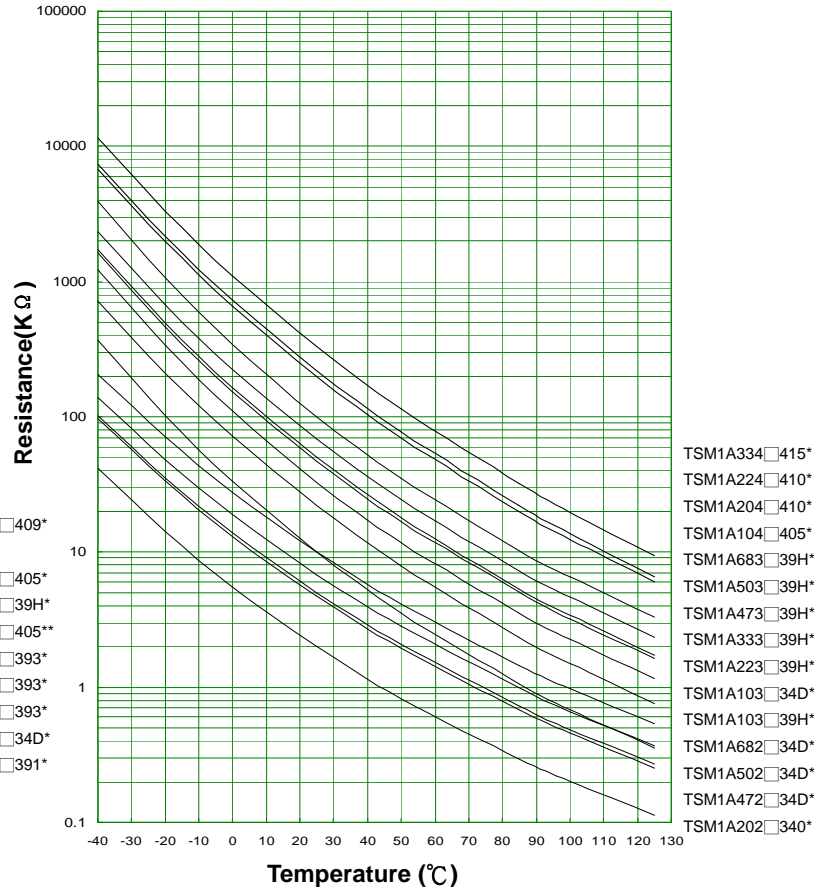


■ R-T Characteristic Curves (representative)

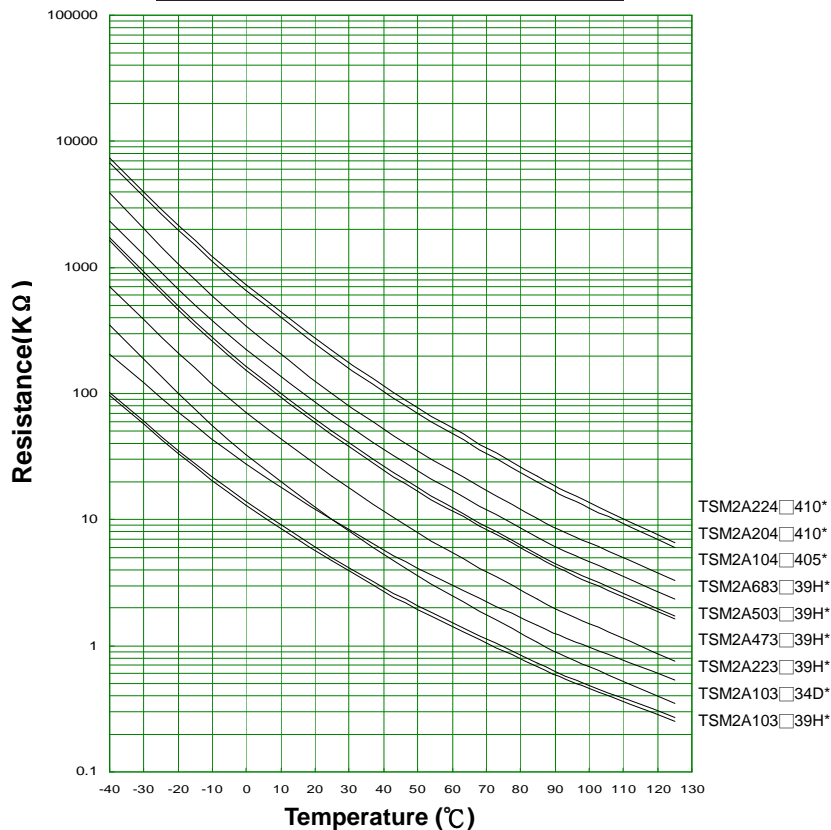
TSM0A103□391* ~ TSM0A474□409*



TSM1A202□340* ~ TSM1A334□415*



TSM2A472□34D* ~ TSM2A224□410*



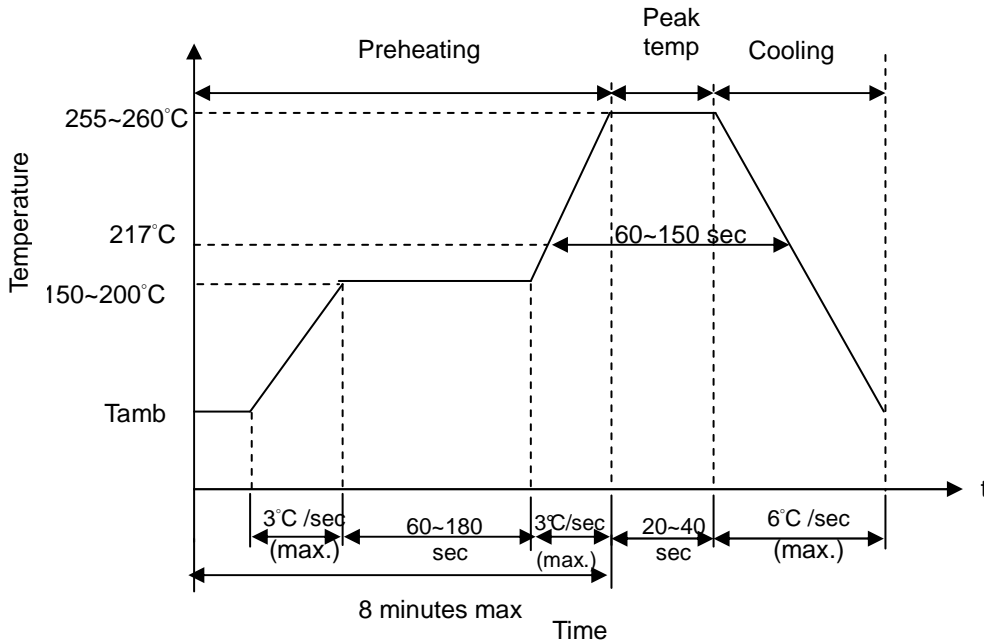
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■ Soldering Recommendation

● IR-reflow Soldering Profile

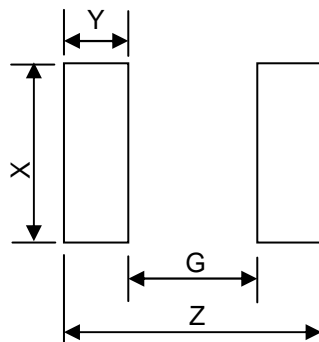


● Reworking Conditions with Soldering Iron

Item	Conditions
Temperature of Soldering Iron-tip	360°C (max.)
Soldering Time	3 sec (max.)
Diameter of Soldering Iron-tip	Φ3mm (max.)

Caution: Do not touch the component surface with soldering iron directly to prevent it from damage.

■ Recommended Soldering Pad Dimensions



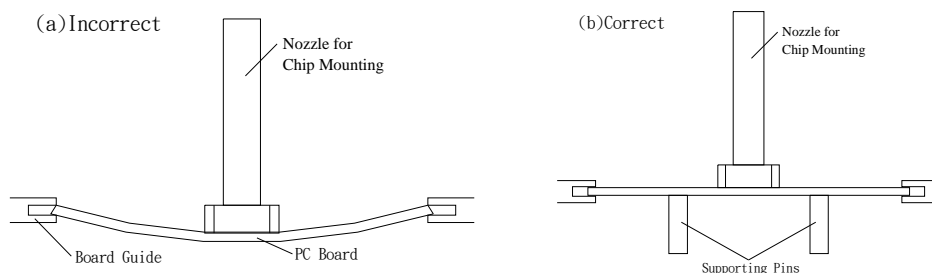
Size	Z (mm)	G (mm)	X (mm)	Y (mm)
0201	0.8	0.3	0.3	0.25
0402	1.7	0.5	0.6	0.6
0603	3.0	1.0	1.0	1.0
0805	3.4	1.0	1.4	1.2

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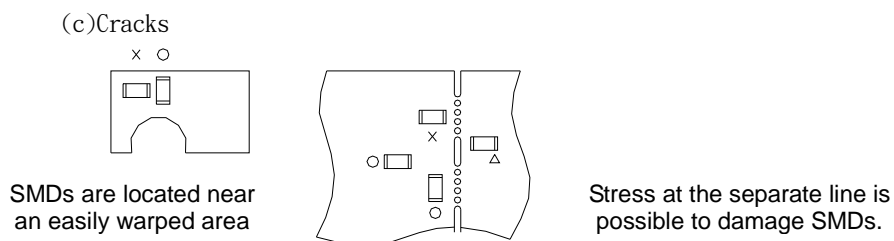
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■ Notice of Soldering and Mounting on PC Board

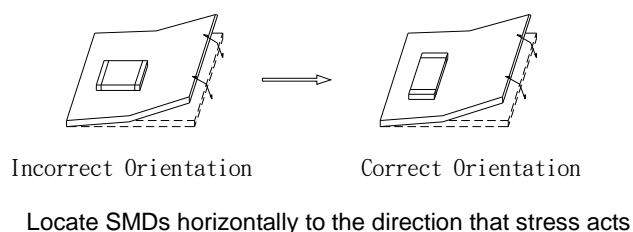


For mounting SMDs on a PC board, supporting pin is suggested for use (refer to figure b) to avoid cracks caused by external stress (refer to figure a).



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




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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■ 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	IEC60068-2-58	245 \pm 5°C, 3 \pm 0.3 sec	At least 95% of terminal electrode is covered by new solder															
Resistance to Soldering Heat	IEC60068-2-58	260 \pm 5°C, 10 \pm 1 sec.	No visible damage $\Delta R_{25}/R_{25}$ $\leq 3\%$															
High Temperature Storage	IEC60068-2-2	125 \pm 5°C, 1000 \pm 24 hrs	No visible damage $\Delta R_{25}/R_{25}$ $\leq 5\%$															
Damp Heat, Steady State	IEC60068-2-3	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	IEC60068-2-14	The conditions shown below shall be repeated 5 cycles on PCB <table border="1" data-bbox="497 891 1187 1151"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Period (minutes)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-40 \pm 5</td> <td>30 \pm 3</td> </tr> <tr> <td>2</td> <td>Room temperature</td> <td>5 \pm 3</td> </tr> <tr> <td>3</td> <td>125 \pm 5</td> <td>30 \pm 3</td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td>5 \pm 3</td> </tr> </tbody> </table>	Step	Temperature (°C)	Period (minutes)	1	-40 \pm 5	30 \pm 3	2	Room temperature	5 \pm 3	3	125 \pm 5	30 \pm 3	4	Room temperature	5 \pm 3	No visible damage $\Delta R_{25}/R_{25}$ $\leq 3\%$
Step	Temperature (°C)	Period (minutes)																
1	-40 \pm 5	30 \pm 3																
2	Room temperature	5 \pm 3																
3	125 \pm 5	30 \pm 3																
4	Room temperature	5 \pm 3																
Max. Power Dissipation	IEC 60539-1	25 \pm 5°C, Pmax. , 1000 \pm 24 hrs	No visible damage $\Delta R_{25}/R_{25}$ $\leq 5\%$															

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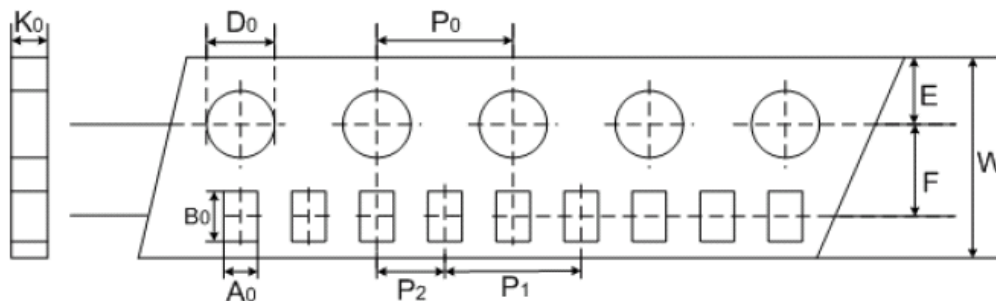
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Package

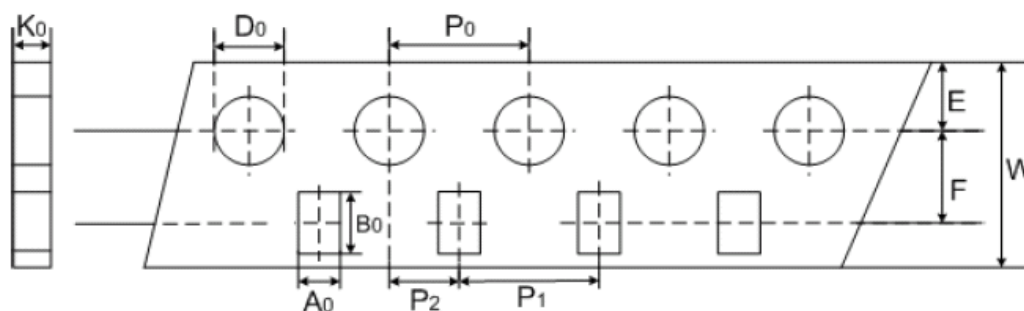
● Taping Specification

- ◆ 0201 & 0402 & 0603 & 0805 type



(Unit: mm)

Index Type	A ₀	B ₀	W	E	F	P ₁	P ₂	P ₀	D ₀	K ₀
0201	±0.05	±0.12	±0.2	±0.1	±0.05	±0.1	±0.05	±0.1	±0.1	±0.1
0402	0.38	0.68	8	1.75	3.5	4	2	4	1.55	0.38



(Unit: mm)

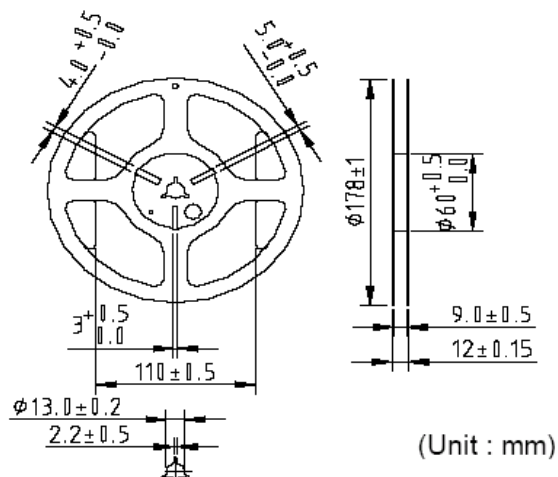
Index Type	A ₀	B ₀	W	E	F	P ₁	P ₂	P ₀	D ₀	K ₀
0603	±0.2	±0.2	±0.2	±0.1	±0.05	±0.1	±0.05	±0.1	±0.1	±0.1
0805	1.1	1.9	8	1.75	3.5	4	2	4	1.55	0.95

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■ Quantity



Type	Quantity (pcs/reel)
0201	15,000
0402	10,000
0603	4,000
0805	3,500

■ 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.
- Shelf Life : 1 year