

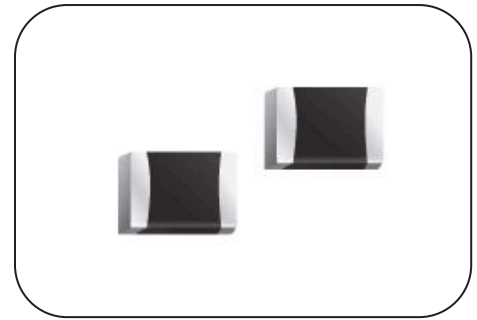
NTC Thermistor : TSM Series

SMD Type NTC Thermistor for Temperature Sensing



■ Features

1. RoHS & Halogen Free (HF) compliant
2. EIA size: 0201, 0402, 0603, 0805
3. Highly reliable structure
4. Operating temperature range: $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
5. Wide resistance range
6. Cost effective
7. Agency recognition: UL / cUL / TUV/ CQC



■ Recommended Applications

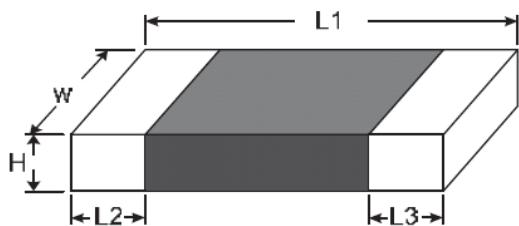
1. Battery pack
2. Motherboard, notebook and personal computer device
3. Liquid crystal display
4. Cellular phone
5. Bluetooth headset
6. Wi-Fi module

■ Part Number Code

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Product Type		Size (EIA)		Definition of B Value		Zero Power Resistance at 25°C (R ₂₅)		Tolerance of R ₂₅		B Value		Tolerance of B Value		Optional Suffix	
TSM	THINKING NTC Thermistor TSM Series	A	0201	A	B _{25/85}	102	$10 \times 10^2 \Omega = 1 \text{ K}\Omega$	F	$\pm 1\%$	338	3380	1	$\pm 1\%$	Z	RoHS & HF Compliant
		0	0402	B	B _{25/50}	103	$10 \times 10^3 \Omega = 10 \text{ K}\Omega$	G	$\pm 2\%$	34D	3435	2	$\pm 2\%$		
		1	0603			473	$47 \times 10^3 \Omega = 47 \text{ K}\Omega$	H	$\pm 3\%$	395	3950	3	$\pm 3\%$		
		2	0805					J	$\pm 5\%$	39H	3975				
								K	$\pm 10\%$	405	4050				
														Packaging	
														R	Reel
														B	Bulk

■ Structure and Dimensions

(Unit: mm)



Part No.	Size (EIA)	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	1.00	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	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	CQC							
TSMAB103□338*	0201	10	1, 2, 3, 5, 10	25/50	3380	1, 2, 3	140	Approx. 1.4	Approx. 1.2	-40 ~ +125	√	√	√							
TSMAB683□425*		68			4250						√	√	√							
TSMAB104□425*		100			4250						√	√	√							
TSM0A103□34D*	0402	10	1, 2, 3, 5, 10	25/85	3435	1, 2, 3	170	Approx. 1.7	Approx. 2.0	-40 ~ +125	√	√	√							
TSM0A103□395*		10			3950						√	√	√							
TSM0A223□395*		22			3950						√	√	√							
TSM0A333□405*		33			4050						√	√	√							
TSM0A683□410*		68			4100						√	√	√							
TSM0A104□405*		100			4050						√	√	√							
TSM0A104□436*		100			4360						√	√	√							
TSM0B103□338*		10		25/50	3380						√	√	√							
TSM0B473□405*		47			4050						√	√	√							
TSM0B104□354*		100			3540						√	√	√							
TSM0B104□425*		100			4250						√	√	√							
TSM0B104□480*		100			4800						√	√	√							
TSM0B224□470*		220			4700						√	√	√							
TSM0B474□470*		470			5, 10						4700	3	100	√	√	√				
TSM1A102□320*		0603		1	1, 2, 3, 5, 10						25/85	3200	1, 2, 3	210	Approx. 2.1	Approx. 3.1	-40~+125	√	√	√
TSM1A202□340*				2								3400						√	√	√
TSM1A472□34D*				4.7								3435						√	√	√
TSM1A472□370*	4.7		3700	√		√	√													
TSM1A502□34D*	5		3435	√		√	√													
TSM1A502□385*	5		3850	√		√	√													
TSM1A682□34D*	6.8		3435	√		√	√													
TSM1A682□395*	6.8		3950	√		√	√													
TSM1A103□34D*	10		3435	√		√	√													
TSM1A103□39H*	10		3975	√		√	√													
TSM1A103□430*	10		5, 10	4300	3	100	√	√	√											
TSM1A223□392*	22		1, 2, 3, 5, 10	25/50	3920	1, 2, 3	210	√	√	√										
TSM1A333□392*	33				3920			√	√	√										
TSM1A473□39H*	47				3975			√	√	√										
TSM1A683□39H*	68				3975			√	√	√										
TSM1A104□405*	100				4050			√	√	√										
TSM1A104□436*	100				4360			√	√	√										
TSM1A154□406*	150				4060			√	√	√										
TSM1A204□410*	200				4100			√	√	√										
TSM1A474□415*	470				4150			√	√	√										
TSM1B221□350*	0.22				5, 10			25/50	3500	3	210	√	√	√						
TSM1B222□395*	2.2		3950			√			√			√								
TSM1B472□425*	4.7		4250			√			√			√								
TSM1B322□395*	3.3		1, 2, 3, 5, 10	25/50	3650	1, 2, 3	210		√	√		√								
TSM1B103□338*	10				3380				√	√		√								
TSM1B103□420*	10				4200				√	√		√								
TSM1B473□425*	47				4250				√	√		√								
TSM1B104□355*	100				3550				√	√		√								
TSM1B104□425*	100				4250				√	√		√								
TSM1B224□460*	220				4600				√	√		√								

Note 1: □ = Tolerance of R₂₅

* = Tolerance of B value

Note 2: UL&cUL File No. E138827 / TUV File No. R 50167657 / CQC File No.12001080962

Note 3: Special specifications are available upon request

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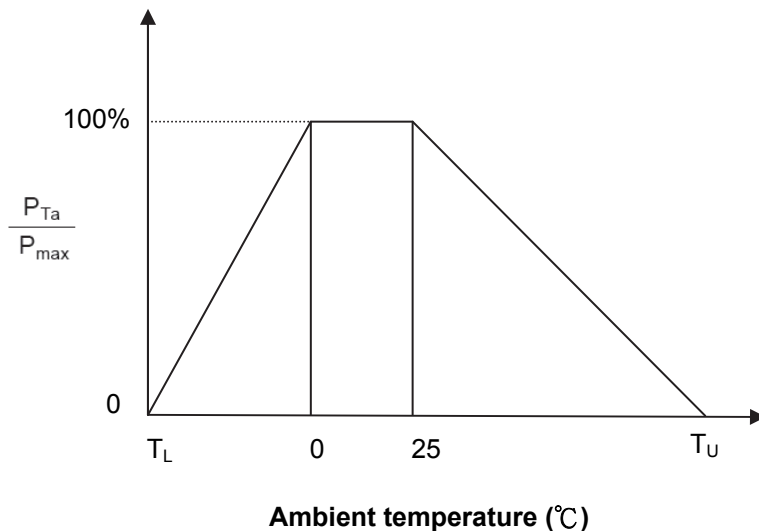
Part No.	Size (EIA)	Zero Power Resistance at 25°C	Tolerance of R25	B Value		Tolerance of B value	Max. Power Dissipation at 25°C	Dissipation Factor	Thermal Time Constant	Operating Temperature Range	Safety Approvals		
		R ₂₅ (KΩ)	(±%)	(K)		(±%)	P _{max} (mW)	δ(mW/°C)	τ (Sec.)	T _L ~T _U (°C)	UL cUL	TUV	CQC
TSM2A102□34D*	0805	1	1, 2, 3, 5, 10	25/85	3435	1, 2, 3	240	Approx. 2.4	Approx. 5.4	-40~+125	√	√	√
TSM2A222□398*		2.2	5,10		3980	3	100				√	√	√
TSM2A 502□34D*		5	1, 2, 3, 5, 10		3435	1, 2, 3	240				√	√	√
TSM2A682□34D*		6.8			3435						√	√	√
TSM2A103□34D*		10			3435						√	√	√
TSM2A103□363*		10			3630						√	√	√
TSM2A103□395*		10			3950						√	√	√
TSM2A223□392*		22			3920						√	√	√
TSM2A473□39H*		47			3975						√	√	√
TSM2A104□405*		100			4050						√	√	√
TSM2A104□455*		100			4550						√	√	√
TSM2A684□450*		680	5, 10		4500	3	100				√	√	√
TSM2B223□395*		22	1, 2, 3, 5, 10	25/50	3950	1, 2, 3	240				√	√	√
TSM2B104□425*		100	4250		√						√	√	

Note 1: □ = Tolerance of R₂₅
 * = Tolerance of B value

Note 2: UL&cUL File No. E138827 / TUV File No. R 50167657 / CQC File No.12001080962

Note 3: 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 (Ta) = 55°C

Maximum operating temperature (T_U) = 125°C

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

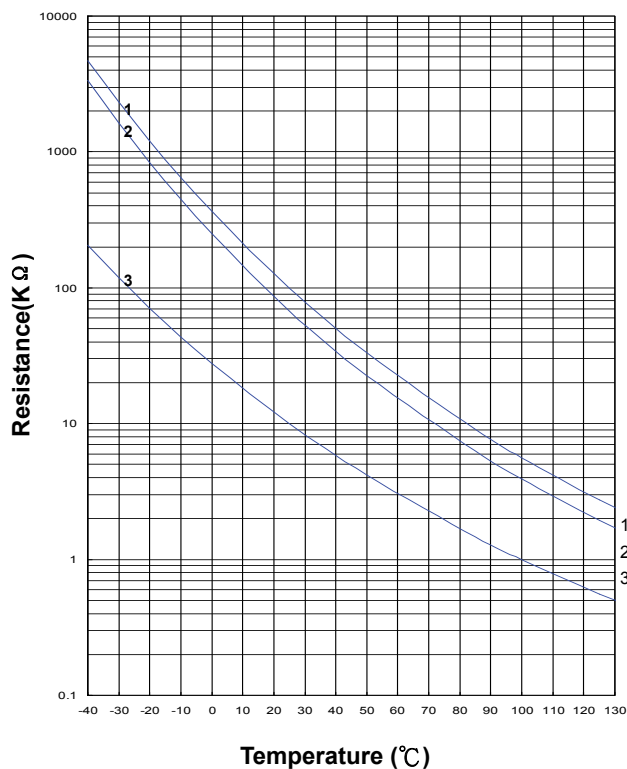
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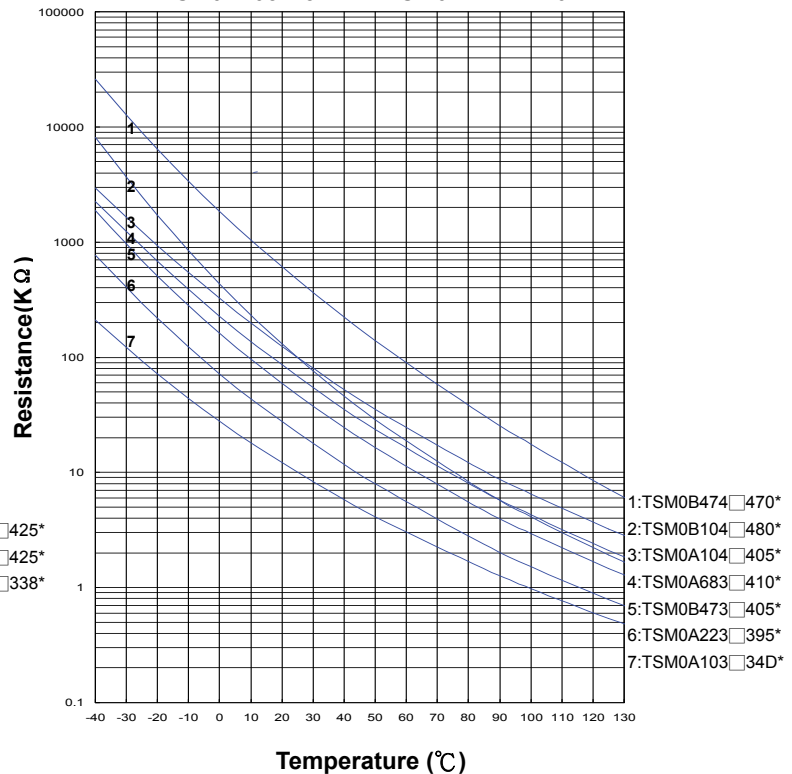


■ R-T Characteristic Curves

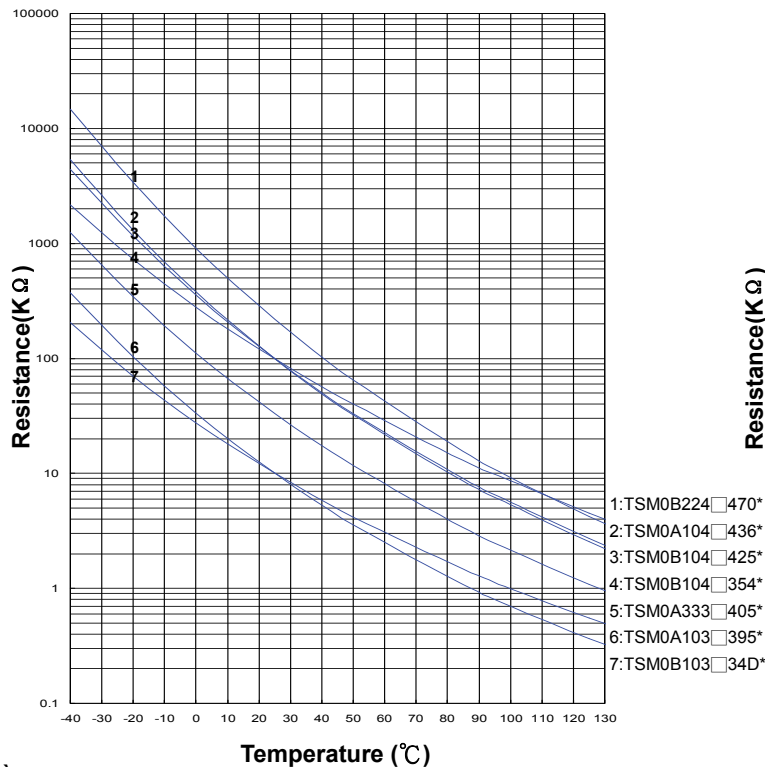
TSMAB103□338* ~ TSMAB104□425*



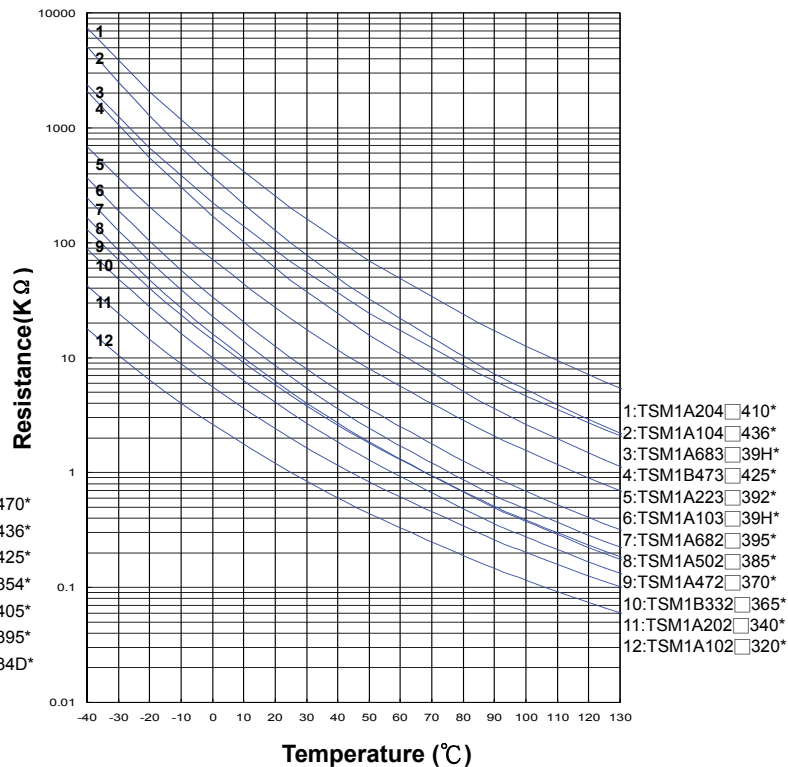
TSM0A103□34D* ~ TSM0B474□470*



TSM0B103□34D* ~ TSM0B224□470*



TSM1A102□320* ~ TSM1A204□410*

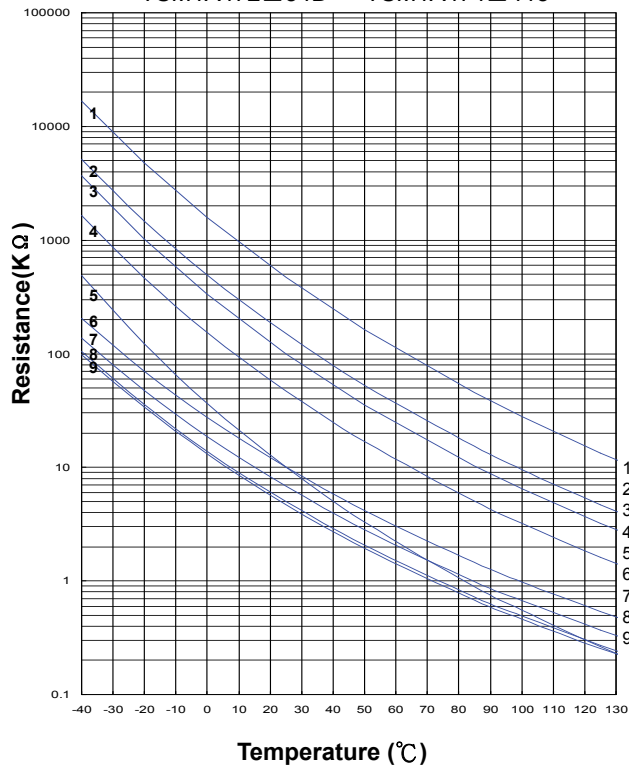


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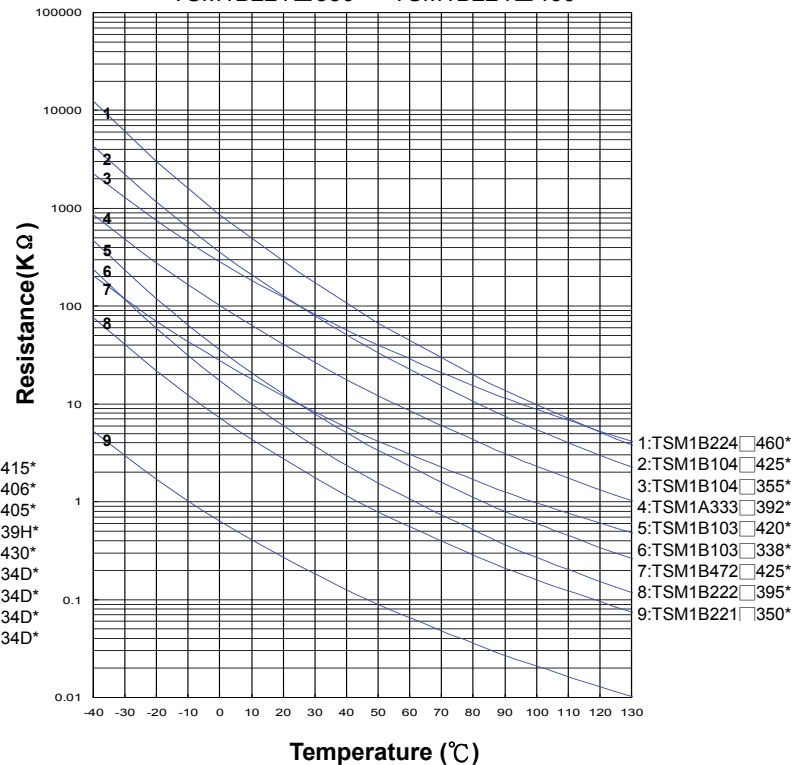
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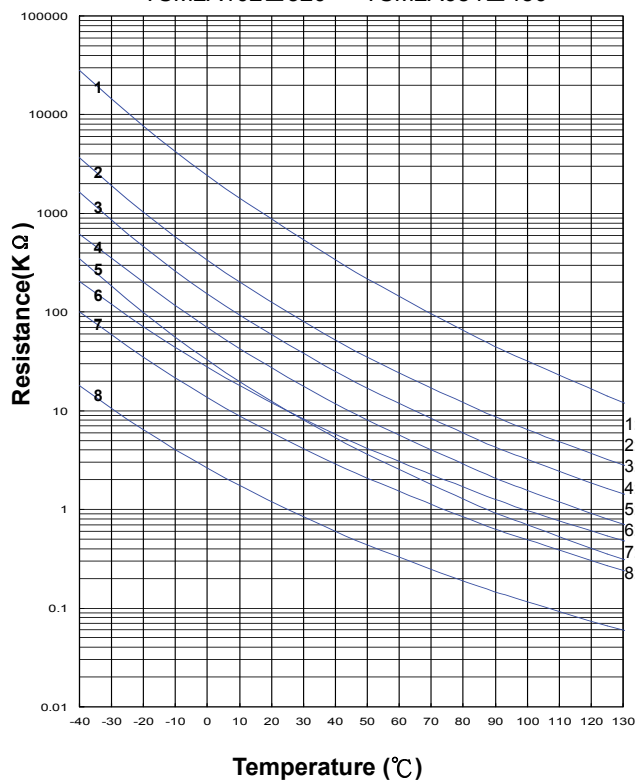
TSM1A472□34D* ~ TSM1A474□415*



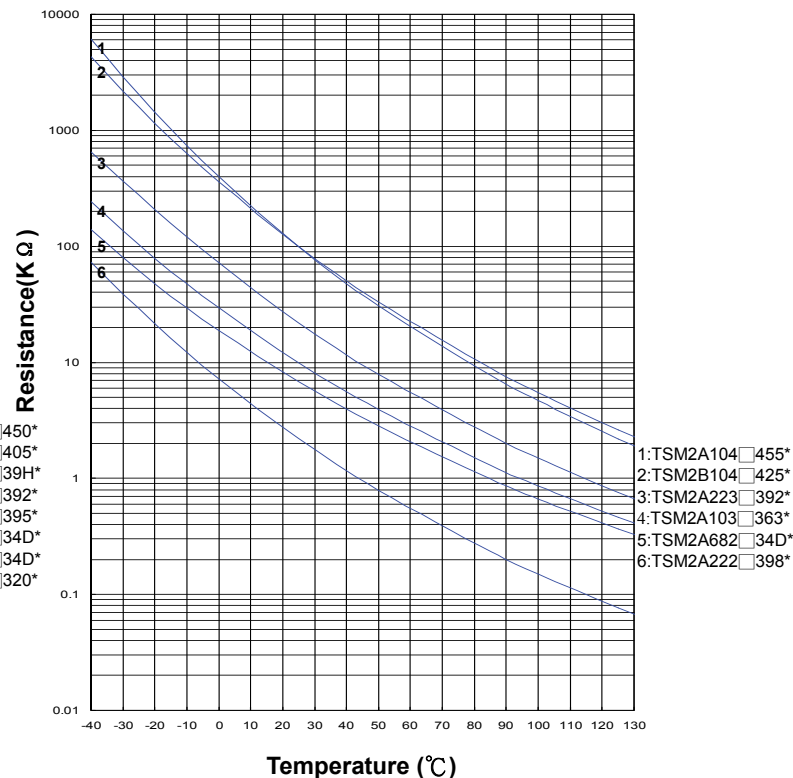
TSM1B221□350* ~ TSM1B224□460*



TSM2A102□320* ~ TSM2A684□450*



TSM2A222□398* ~ TSM2A104□455*



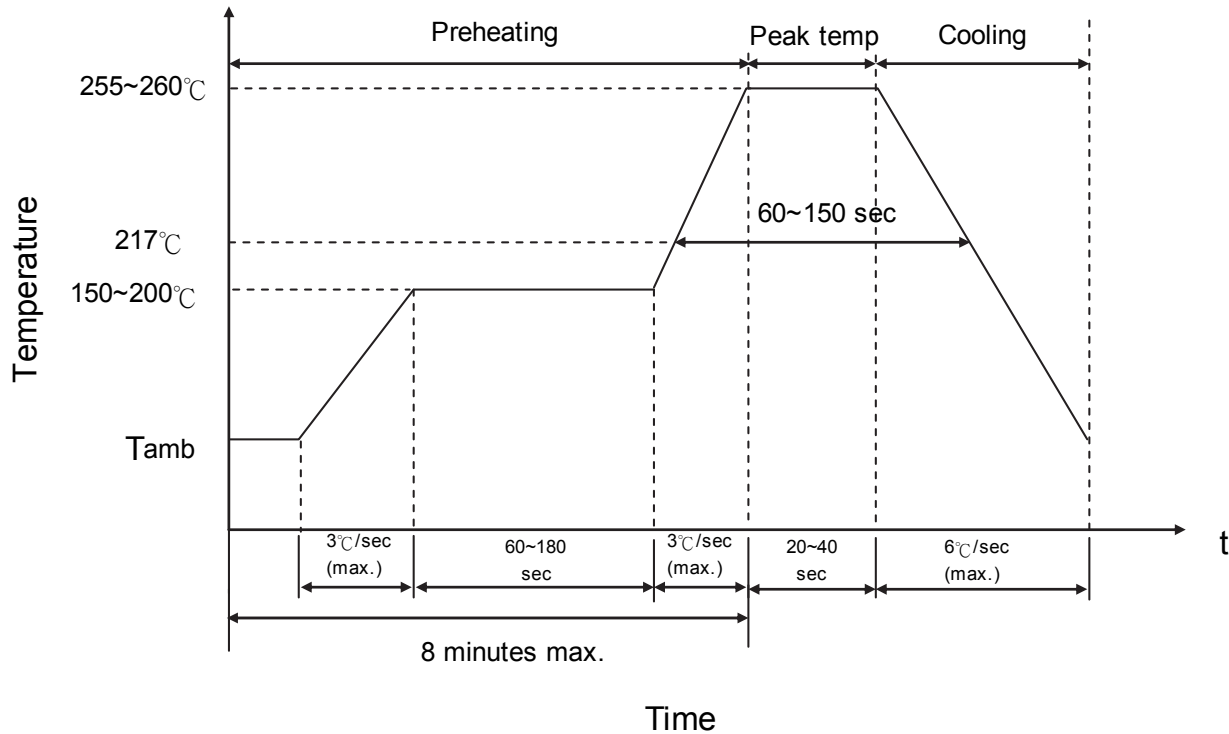
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■ Soldering Recommendation

● IR-Reflow Soldering Profile



● Recommended Reworking Conditions with Soldering Iron

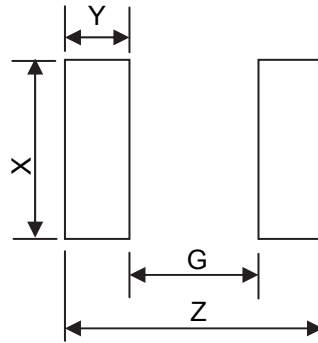
Item	Conditions
Temperature of Soldering Iron-tip	360°C (max.)
Soldering Time	3 sec. (max.)
Diameter of Soldering Iron-tip	Φ3mm (max.)
Caution: Please do not touch the component surface with soldering iron directly to avoid its damage.	

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■ Recommended Soldering Pad Dimensions



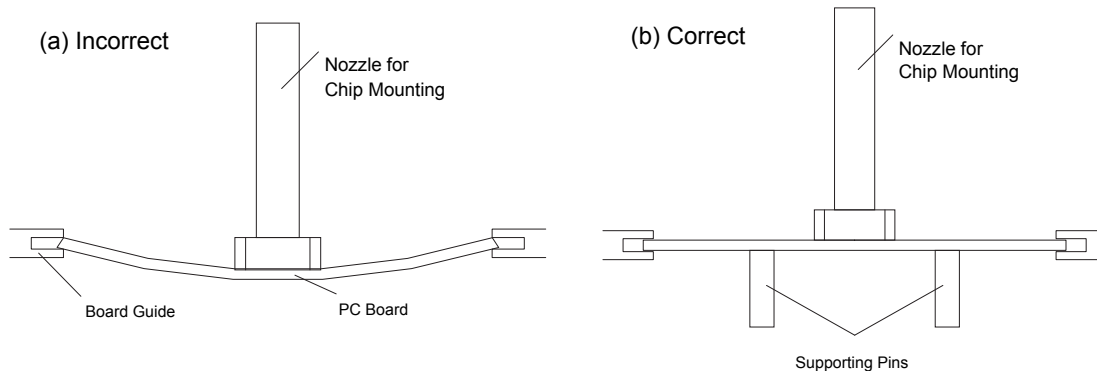
Size (EIA)	Z (mm)	G (mm)	X (mm)	Y (mm)
0201	0.8	0.3	0.3	0.25
0402	1.7	0.5	0.6	0.6
0603	3.0	1.0	1.0	1.0
0805	3.4	1.0	1.4	1.2

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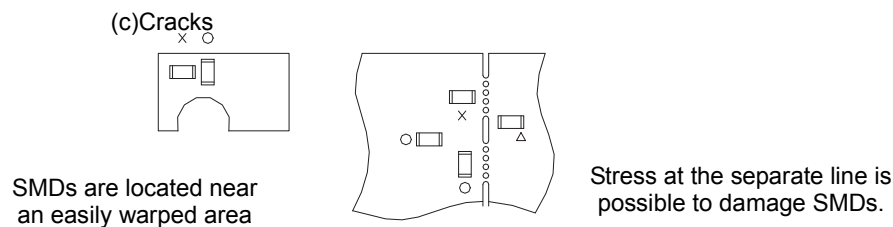
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■ Notice of Soldering and Mounting on PC Board

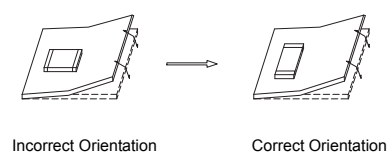


For mounting SMDs on a PC board, supporting pin is suggested for use (refer to figure b) to avoid cracks caused by external stress (refer to figure a).



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



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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■ Reliability

Item	Standard	Test conditions / Methods	Specifications															
Bending Strength	IEC 60068-2-21	Warp : 2mm for 0402,0603 and 0805 1mm for 0201 Speed < 0.5mm/sec. Duration: 10 sec. on PCB 	No visible damage ΔR ₂₅ /R ₂₅ ≤ 5 %															
Solderability	IEC 60068-2-58	245 ± 5℃, 3 ± 0.3 sec.	At least 95% of terminal electrode is covered by new solder															
Resistance to Soldering Heat	IEC 60068-2-58	260 ± 5℃, 10 ± 1 sec.	No visible damage ΔR ₂₅ /R ₂₅ ≤ 3 %															
High Temperature Storage	IEC 60068-2-2	125 ± 5℃, 1000 ± 24 hrs	No visible damage ΔR ₂₅ /R ₂₅ ≤ 5 %															
Damp Heat, Steady State	IEC 60068-2-78	40 ± 2℃, 90~95% RH , 1000 ± 24 hrs	No visible damage ΔR ₂₅ /R ₂₅ ≤ 3 %															
Rapid Change of Temperature	IEC 60068-2-14	The conditions shown below shall be repeated 5 cycles on PCB. <table><tr><th>Step</th><th>Temperature (℃)</th><th>Period (minutes)</th></tr><tr><td>1</td><td>-40 ± 5</td><td>30 ± 3</td></tr><tr><td>2</td><td>Room temperature</td><td>5 ± 3</td></tr><tr><td>3</td><td>125 ± 5</td><td>30 ± 3</td></tr><tr><td>4</td><td>Room temperature</td><td>5 ± 3</td></tr></table>	Step	Temperature (℃)	Period (minutes)	1	-40 ± 5	30 ± 3	2	Room temperature	5 ± 3	3	125 ± 5	30 ± 3	4	Room temperature	5 ± 3	No visible damage ΔR ₂₅ /R ₂₅ ≤ 3 %
Step	Temperature (℃)	Period (minutes)																
1	-40 ± 5	30 ± 3																
2	Room temperature	5 ± 3																
3	125 ± 5	30 ± 3																
4	Room temperature	5 ± 3																
Max. Power Dissipation	IEC 60539-1 4.26.3	25 ± 5℃, Pmax. , 1000 ± 24 hrs	No visible damage ΔR ₂₅ /R ₂₅ ≤ 5 %															

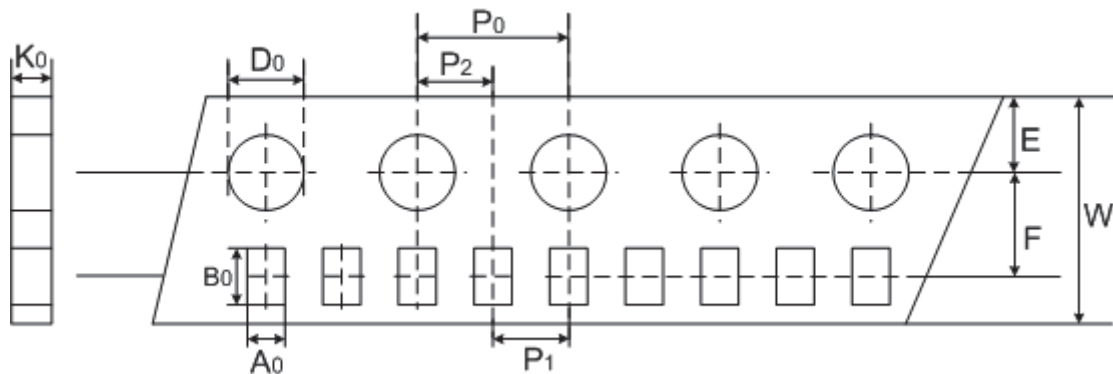
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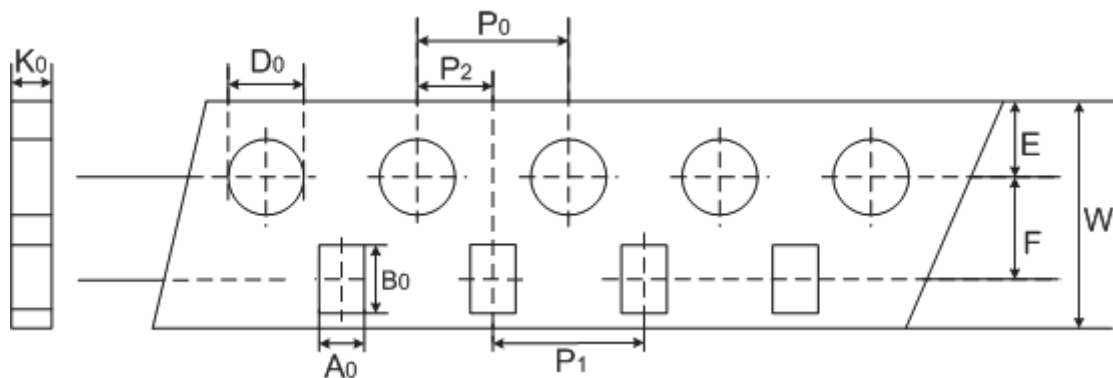
■ Packaging

● Taping Specification



(Unit: mm)

Index Size	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	0.62	1.12	8	1.75	3.5	2	2	4	1.55	0.60



(Unit: mm)

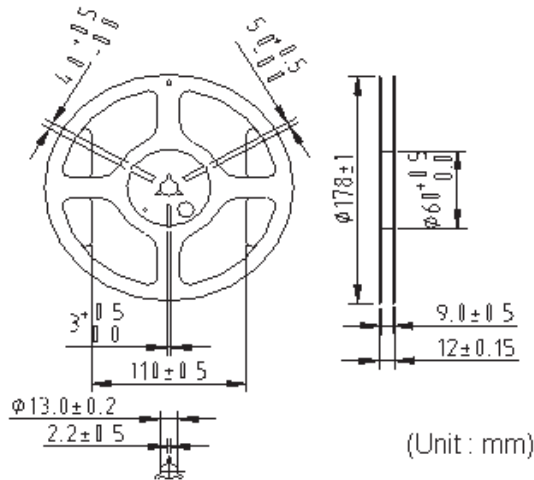
Index Size	A ₀	B ₀	W	E	F	P ₁	P ₂	P ₀	D ₀	K ₀
0603	±0.2	±0.2	±0.2	±0.1	±0.05	±0.1	±0.05	±0.1	±0.1	±0.1
0805	1.5	2.3	8	1.75	3.5	4	2	4	1.55	1.0

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■ Quantity



Size (EIA)	Quantity (pcs/reel)
0201	15,000
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