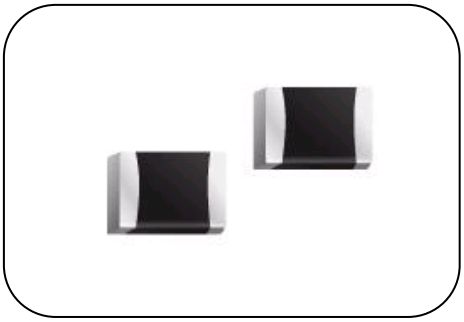
NTC Thermistor: TSM Series

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°C ~+125°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

TSM	THINKING NTC Thermistor TSM Series

Size (EIA)

A	0201
0	0402
1	0603
2	0805

Definition of B Value

A	$B_{25/85}$
B	$B_{25/50}$

Zero Power Resistance at 25°C (R_{25})

102	$10x10^2\Omega$= 1 KΩ
103	$10x10^3\Omega$=10 KΩ
473	$47x10^3\Omega$= 47KΩ

Tolerance of R_{25}

D	±0.5%
F	±1%
G	±2%
H	±3%
J	±5%
K	±10%

B Value

338	3380
34D	3435
395	3950
39H	3975
405	4050

Tolerance of B Value

D	±0.5%
E	±0.75%
1	±1%
2	±2%
3	±3%

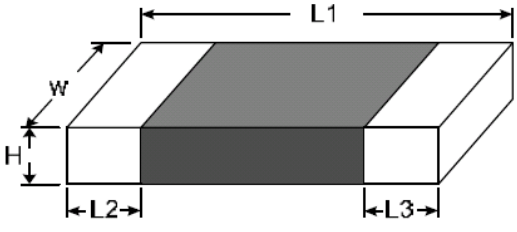
Optional Suffix

Z	RoHS & HF Compliant

Packaging

R	Reel

Structure and Dimensions



(Unit: mm)

Part No.	Size (EIA)	L1	W	H	L2 & L3
TSMA	0201	0.60±0.03	0.30±0.03	0.30±0.03	0.15±0.05
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

NTC Thermistor: TSM Series

SMD Type NTC Thermistor for Temperature Sensing

■ 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		
											UL cUL	TUV	CQC
		R_{25}(KΩ)	(±%)	(K)		(±%)	P_{max}(mW)	δ(mW/°C)	τ (Sec.)	T_L~T_U(°C)			
TSMAB103□338*	0201	10	1, 2, 3, 5, 10	25/50	3380	1, 2, 3	100	Approx. 1.4	Approx. 1.2	-40 ~ +125	√	√	√
TSMAB473□405*		47			4050						√	√	√
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						√	√	√
TSM0A473□395*		47			3950						√	√	√
TSM0A683□410*		68			4100						√	√	√
TSM0A104□405*		100			4050						√	√	√
TSM0A104□436*		100			4360						√	√	√
TSM0A224□475*		220			4750						√	√	√
TSM0B103□338*		10	0.5,1, 2,3, 5, 10	25/50	3380	0.75,1, 2, 3					√	√	√
TSM0B473□405*		47	1, 2, 3, 5, 10		4050	1, 2, 3					√	√	√
TSM0B104□425*		100	0.5,1, 2,3, 5, 10		4250	0.5,1, 2, 3					√	√	√
TSM0B104□436*		100	1, 2, 3, 5, 10		4360	1, 2, 3					√	√	√
TSM0B224□470*		220			4700						√	√	√
TSM0B474□470*		470	3, 5,10	25/50	4700	2,3					√	√	√
TSM1A202□340*	0603	2	1, 2, 3, 5, 10	25/85	3400	1, 2, 3	210	Approx. 2.1	Approx. 3.1	-40~+125	√	√	√
TSM1A472□34D*		4.7			3435						√	√	√
TSM1A472□370*		4.7			3700						√	√	√
TSM1A502□34D*		5			3435						√	√	√
TSM1A682□34D*		6.8			3435						√	√	√
TSM1A103□34D*		10			3435						√	√	√
TSM1A103□39H*		10			3975						√	√	√
TSM1A223□395*		22			3950						√	√	√
TSM1A333□395*		33			3950	2, 3					√	√	√
TSM1A473□39H*		47			3975	1, 2, 3					√	√	√
TSM1A503□400*		50			4000						√	√	√
TSM1A683□400*		68			4000						√	√	√
TSM1A104□39H*		100			3975						√	√	√
TSM1A104□405*		100			4050						√	√	√
TSM1A104□436*		100			4360						√	√	√
TSM1A154□406*		150			4060						√	√	√
TSM1A204□410*		200			4100						√	√	√
TSM1A474□415*		470			4150	2, 3					√	√	√

Note 1: □ = Tolerance of R_{25} * = 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

All specifications are subject to change without notice.

NTC Thermistor: TSM Series

SMD Type NTC Thermistor for Temperature Sensing

■ Electrical Characteristics

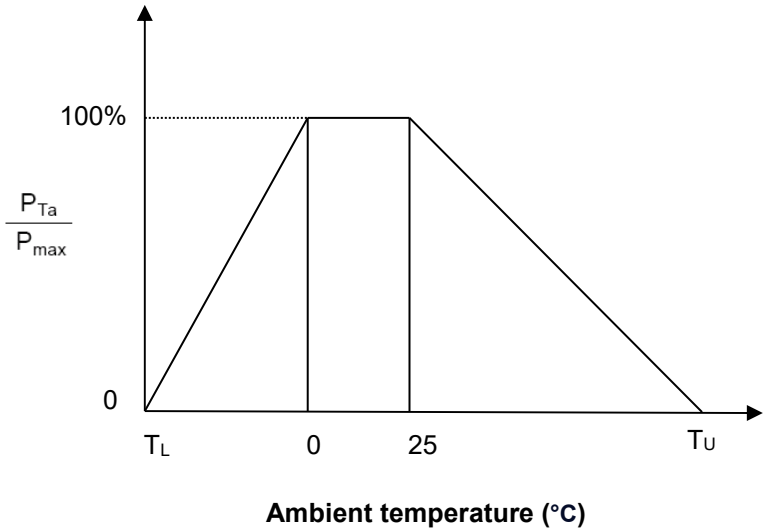
Part No.	Size (EIA)	Zero Power Resistance at 25°C	Tolerance of R25	B Value		Tolerance of B value	Max. Power Dissipation at 25°C	Dissipation Factor	Thermal Time Constant	Operating Temperature Range	Safety Approvals		
											UL cUL	TUV	CQC
		R_{25}(KΩ)	(±%)	(K)		(±%)	P_{max}(mW)	δ(mW/°C)	τ (Sec.)	T_L~T_U(°C)			
TSM1B332□365*	0603	3.3	1, 2, 3, 5, 10	25/50	3650	1, 2, 3	210	Approx. 2.1	Approx. 3.1	-40~+125	√	√	√
TSM1B682□395*		6.8			3950						√	√	√
TSM1B103□338*		10	0.5,1, 2, 3, 5, 10		3380	0.75,1, 2, 3					√	√	√
TSM1B103□420*		10	1, 2, 3, 5, 10		4200	1, 2, 3					√	√	√
TSM1B473□425*		47			4250						√	√	√
TSM1B104□359*		100			3590						√	√	√
TSM1B104□425*		100	0.5, 1, 2, 3, 5, 10		4250	0.5, 1, 2, 3					√	√	√
TSM1B224□450*		220	1, 2, 3, 5, 10		4500	1, 2, 3					√	√	√
TSM2A102□320*	0805	1	1, 2, 3, 5, 10	25/85	3200	1, 2, 3	240	Approx. 2.4	Approx. 5.4	-40~+125	√	√	√
TSM2A222□345*		2.2			3450						√	√	√
TSM2A502□34D*		5			3435						√	√	√
TSM2A682□34D*		6.8			3435						√	√	√
TSM2A103□34D*		10			3435						√	√	√
TSM2A103□373*		10			3730						√	√	√
TSM2A103□395*		10			3950						√	√	√
TSM2A223□396*		22			3960						√	√	√
TSM2A473□400*		47			4000						√	√	√
TSM2A104□400*		100			4000						√	√	√
TSM2A104□455*		100			4550						√	√	√
TSM2A334□41H*		330			4175						√	√	√
TSM2B103□395*		10		25/50	3950						√	√	√
TSM2B104□425*		100			4250						√	√	√

Note 1: □ = Tolerance of R_{25}
* = 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)

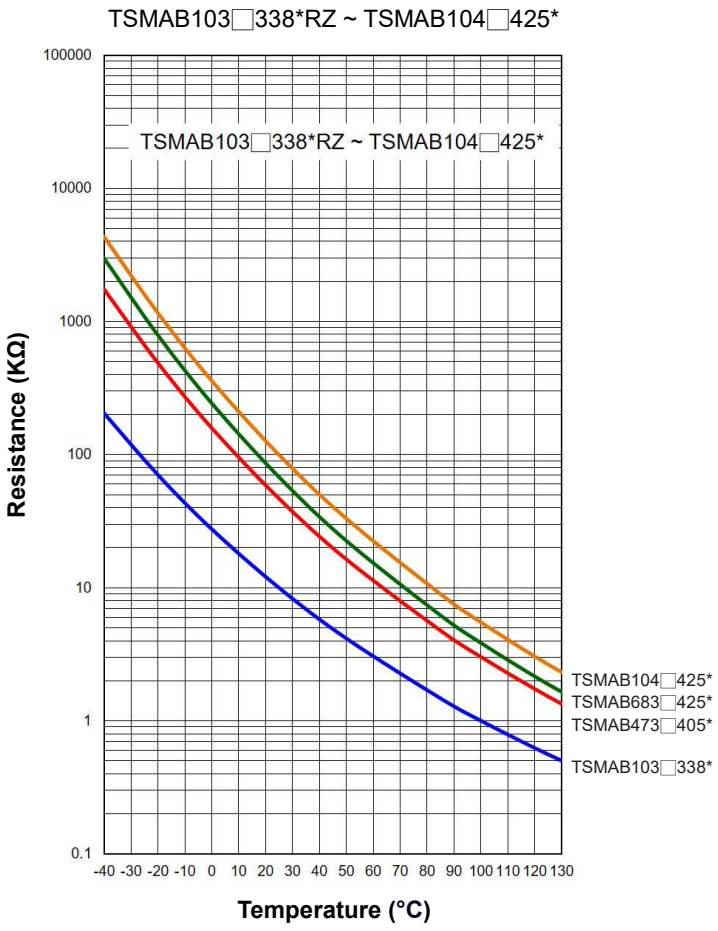
For example:

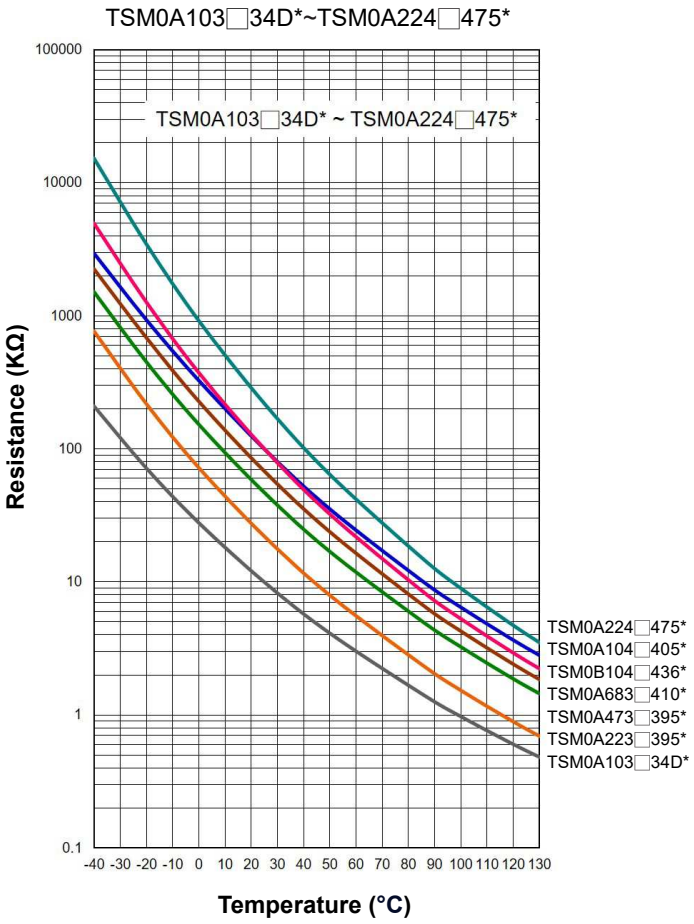
Ambient temperature (Ta) = 55°C

Maximum operating temperature (T_U) = 125°C

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

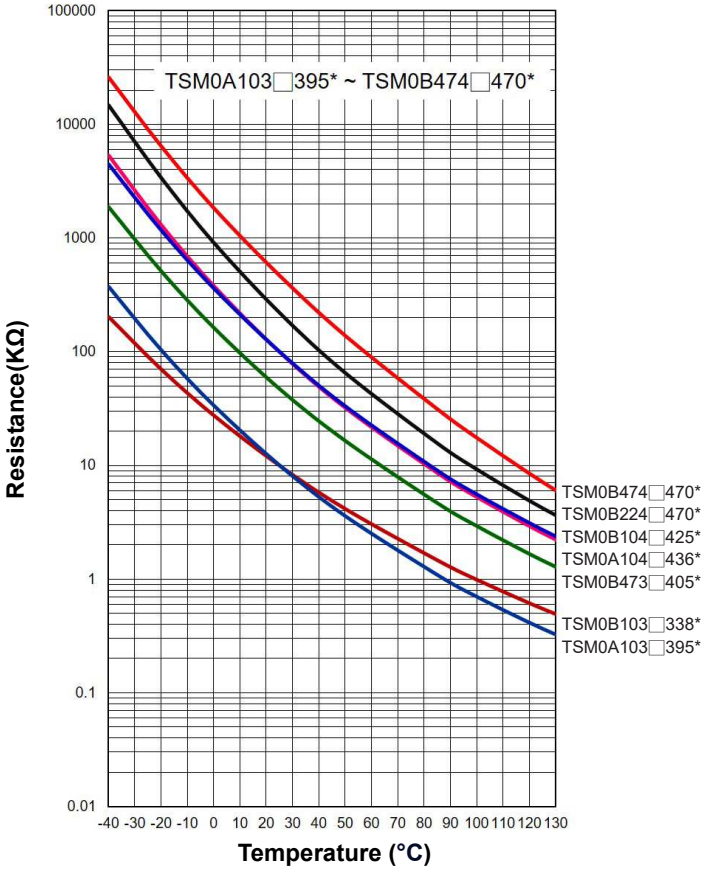
■ R-T Characteristic Curves



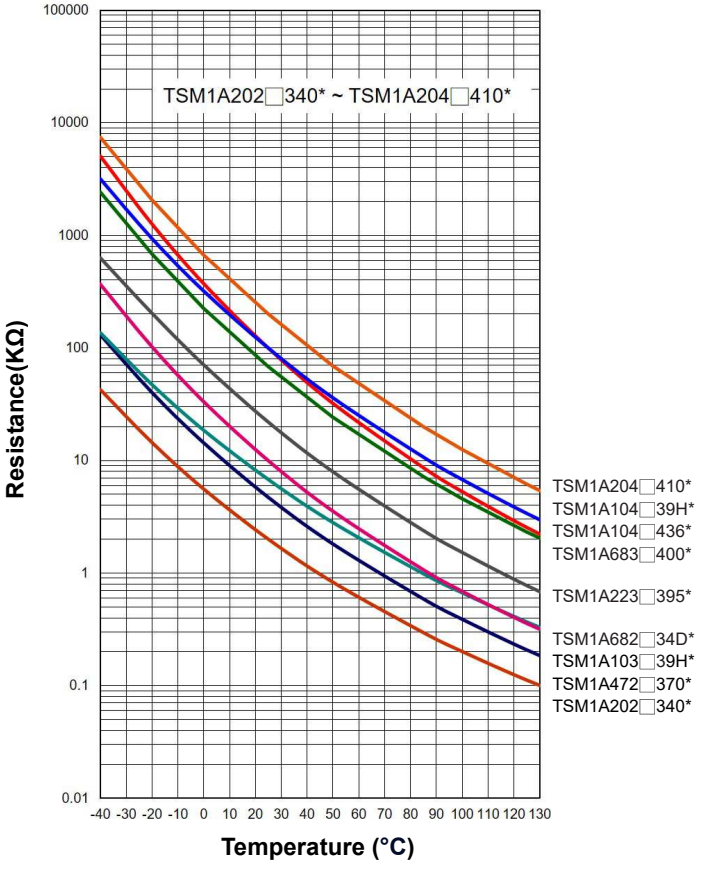


■ R-T Characteristic Curves

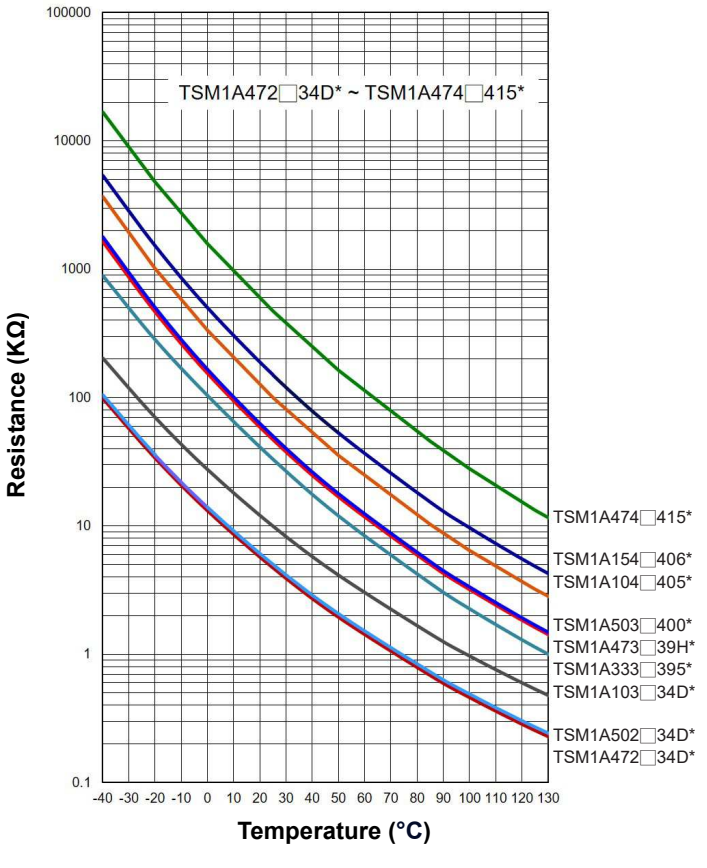
TSM0A103□395* ~ TSM0B474□470*



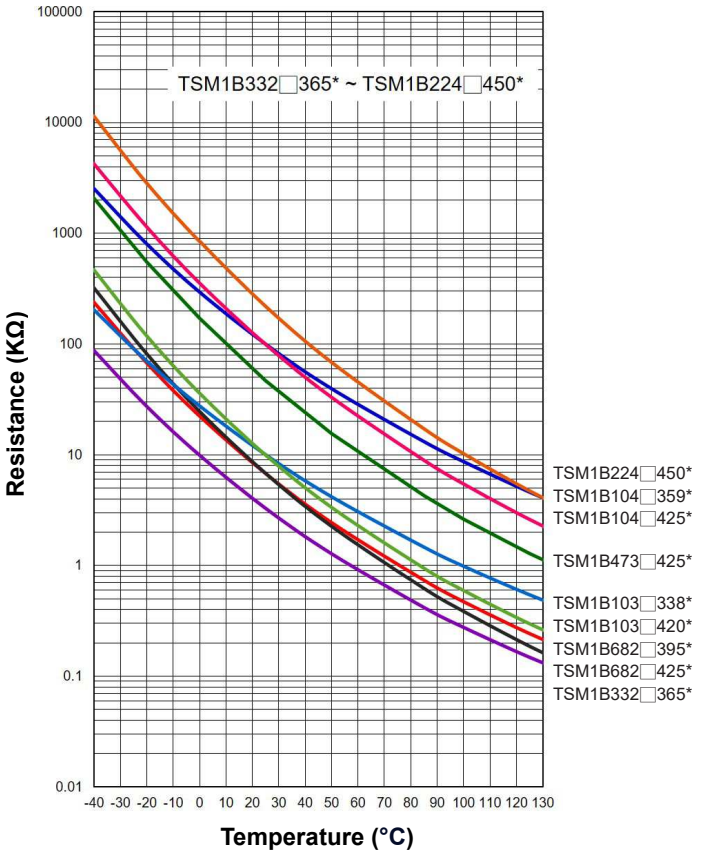
TSM1A202□340*~TSM1A204□410*



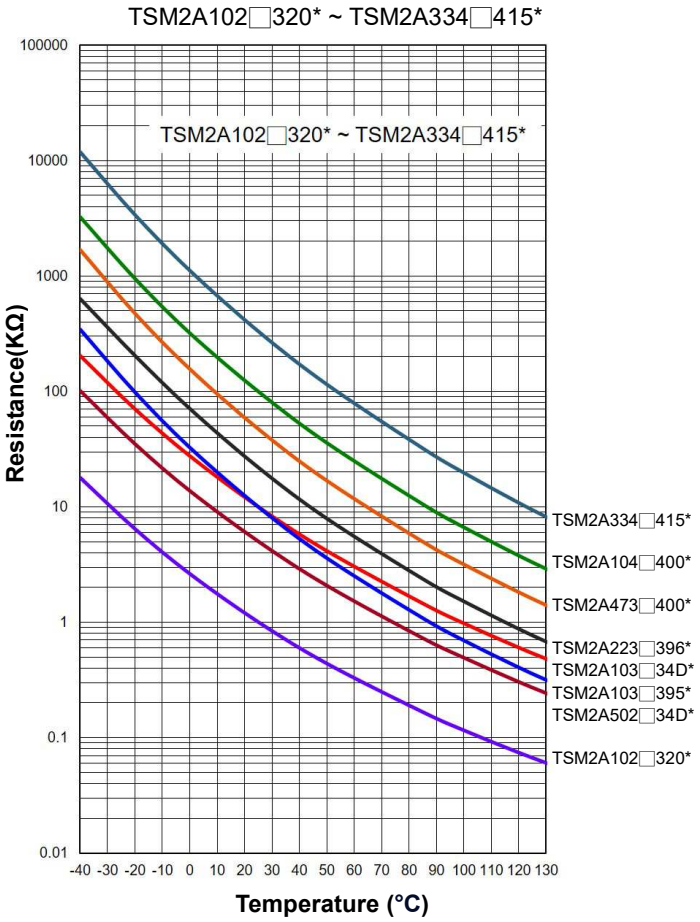
TSM1A472□34D* ~ TSM1A474□415*

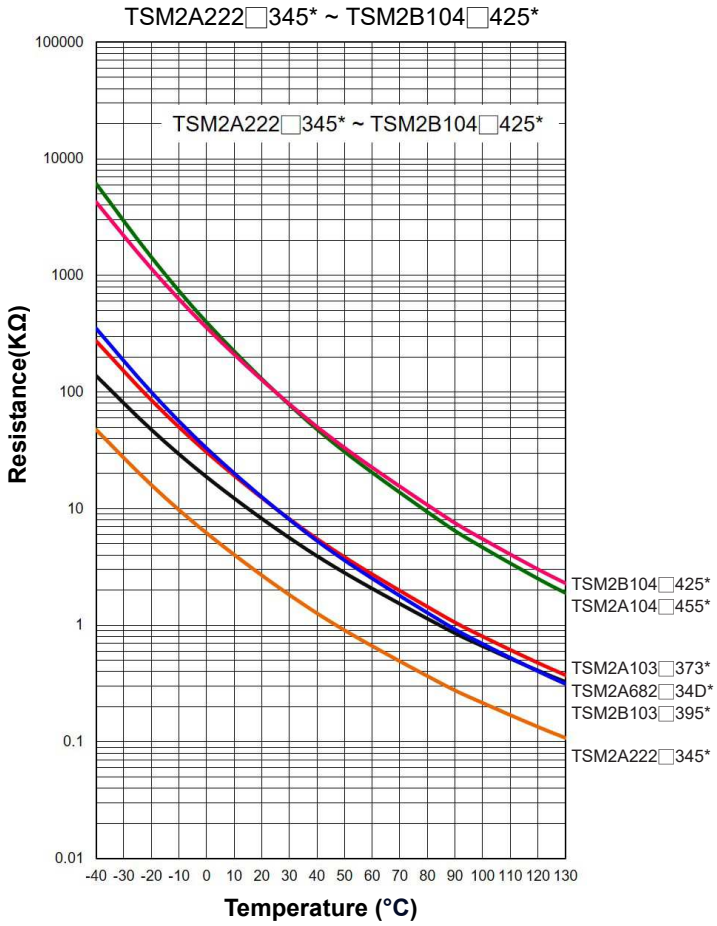


TSM1B332□365* ~ TSM1B224□450*



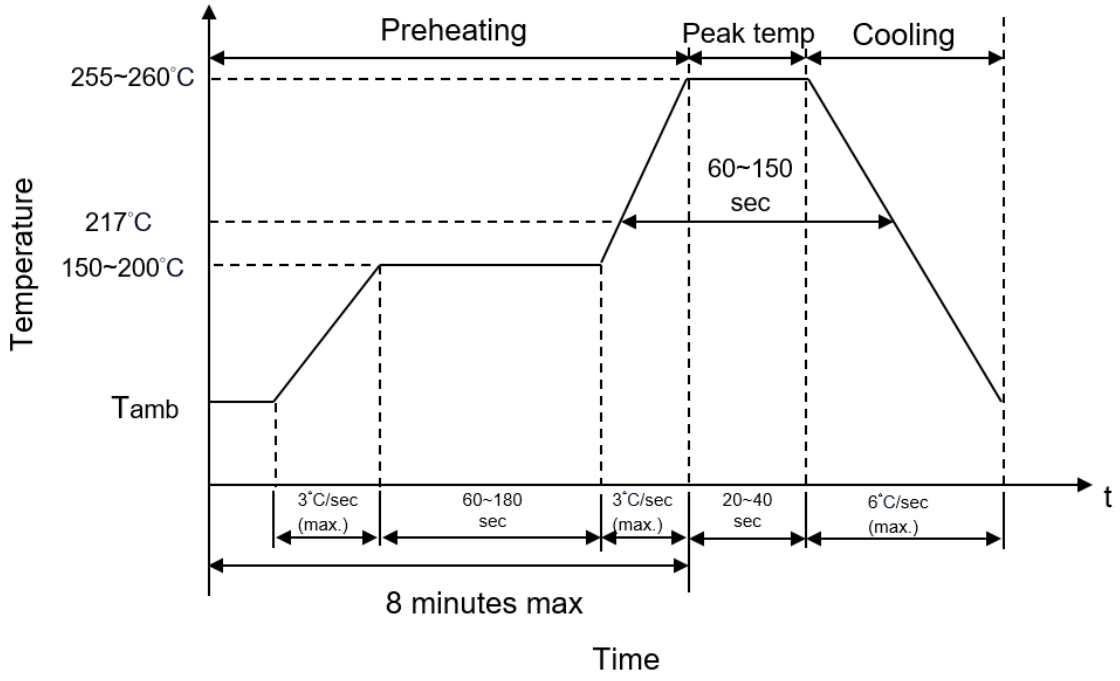
■ R-T Characteristic Curves





■ Soldering Recommendation

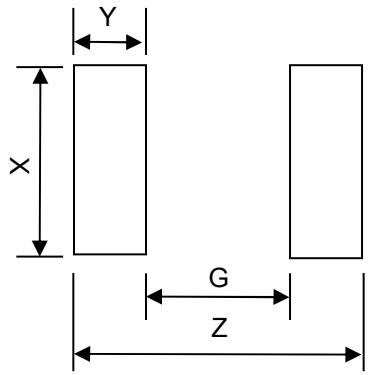
● IR-Reflow Soldering Profile



● Recommended Reworking Conditions with Soldering Iron

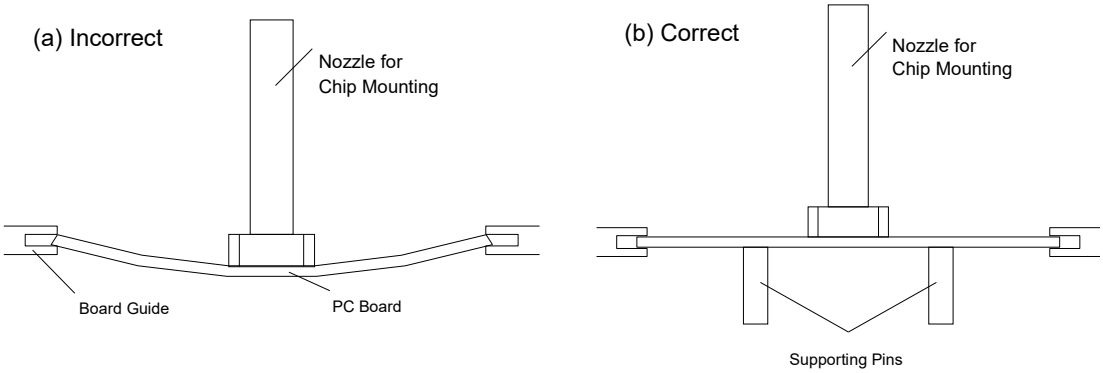
Item	Conditions
Temperature of Soldering Iron-tip	360°C (max.)
Soldering Time	3 sec. (max.)
Diameter of Soldering Iron-tip	Φ3mm (max.)
Caution: Please do not touch the component surface with soldering iron directly to avoid its damage.	

■ Recommended Soldering Pad Dimensions

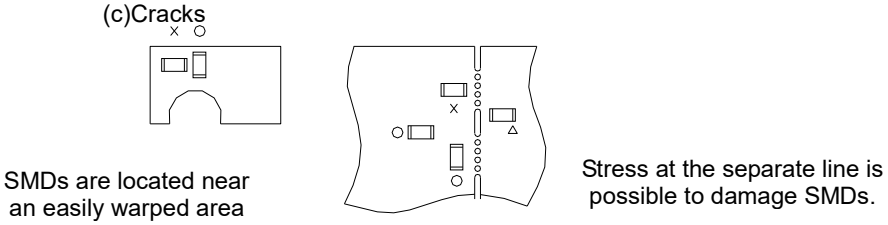


Size (EIA)	Z (mm)	G (mm)	X (mm)	Y (mm)
0201	0.7	0.2	0.3	0.25
0402	1.4	0.4	0.5	0.5
0603	2.8	0.8	1.0	1.0
0805	3.4	1.0	1.4	1.2

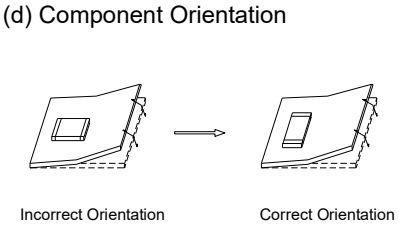
■ Notice of Soldering and Mounting on PC Board



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, △ is acceptable, and X is worst.



Locate SMDs horizontally to the direction that stress acts

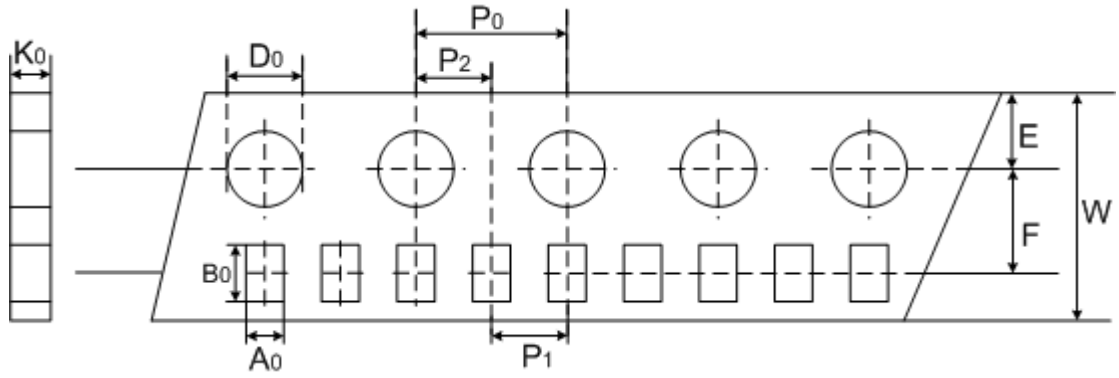
During circuit bending, please locate SMDs horizontally to the direction in which stress act to avoid its cracks (refer to figure d).

■ Reliability

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

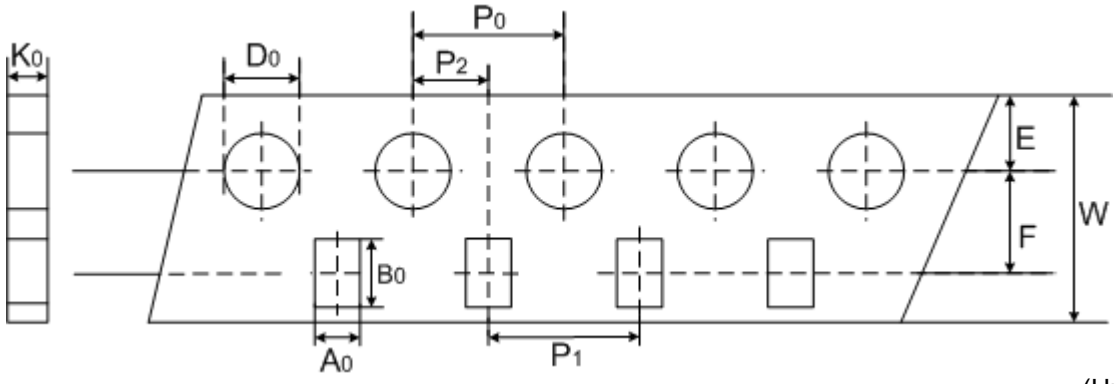
Packaging

- **Taping Specification**



(Unit: mm)

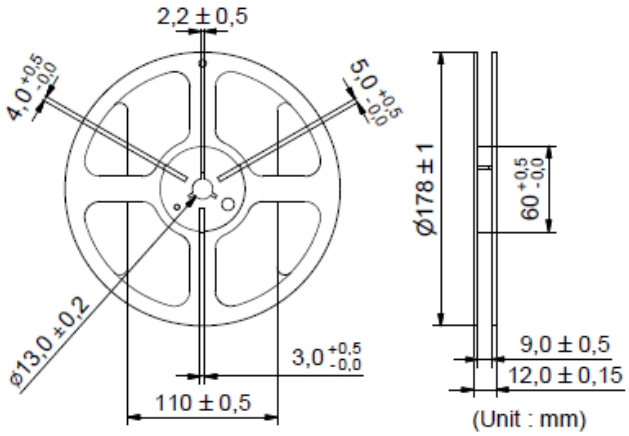
Index / Size	A_0 ±0.05	B_0 ±0.12	W ±0.2	E ±0.1	F ±0.05	P_1 ±0.1	P_2 ±0.05	P_0 ±0.1	D_0 ±0.1	K_0 ±0.1
0201	0.38	0.68	8	1.75	3.5	2	2	4	1.55	0.38
0402	0.62	1.12	8	1.75	3.5	2	2	4	1.55	0.60



(Unit: mm)

Index / Size	A_0 ±0.2	B_0 ±0.2	W ±0.2	E ±0.1	F ±0.05	P_1 ±0.1	P_2 ±0.05	P_0 ±0.1	D_0 ±0.1	K_0 ±0.1
0603	1.1	1.9	8	1.75	3.5	4	2	4	1.55	0.95
0805	1.5	2.3	8	1.75	3.5	4	2	4	1.55	1.0

■ 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°C ~+40°C
2. Relative Humidity: ≦ 75% RH
3. Keep away from corrosive atmosphere and sunlight.

■ Period of Storage: 1 year