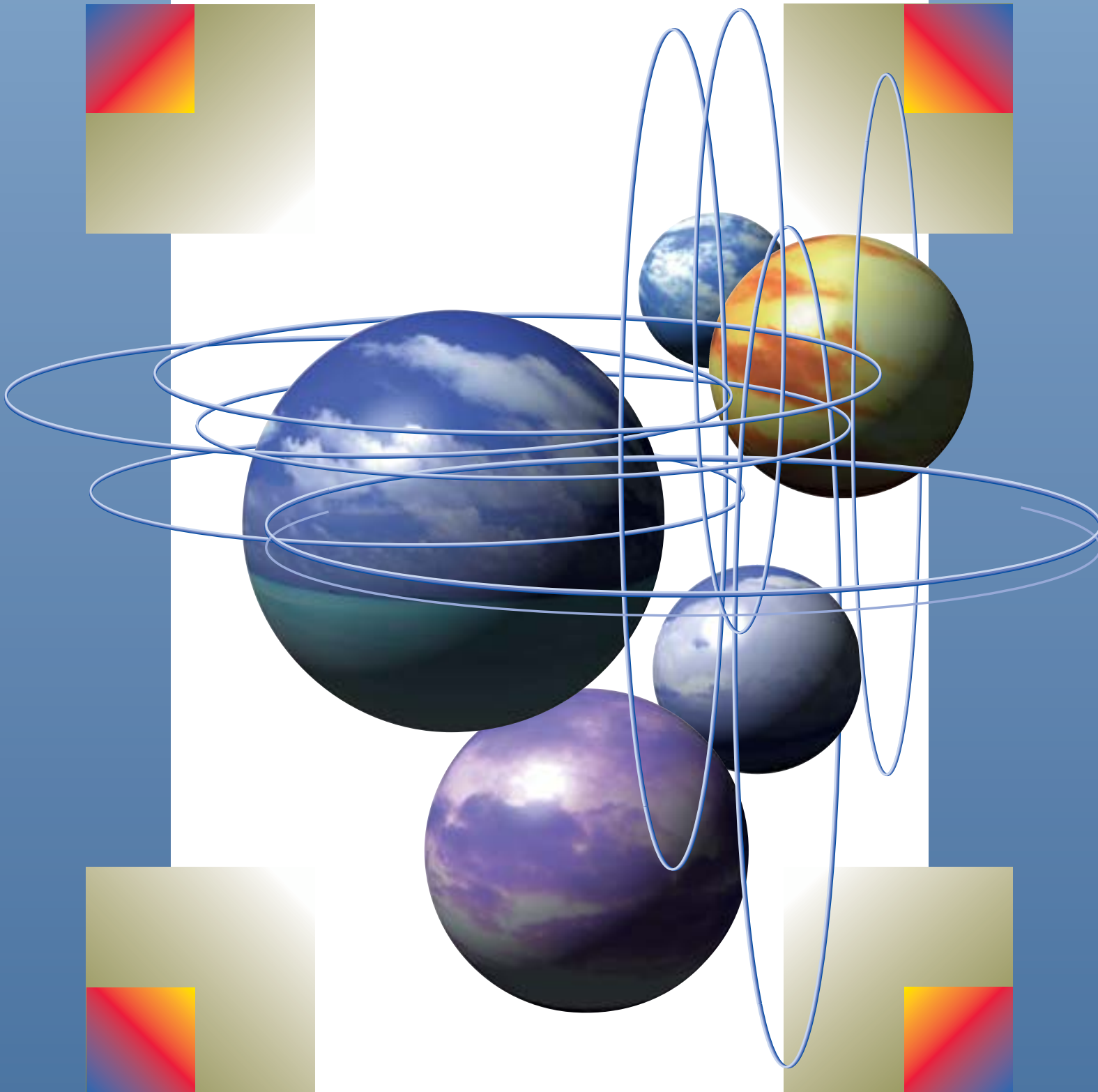


**SEMITEC<sup>®</sup>**

**Ishizuka Electronics Corporation**

**PRODUCT CATALOG**



# AP THERMISTOR

The AP Thermistor features higher accuracy and higher resistance to heat than our existing high-precision thermistor. AP Thermistor suits various types of application.

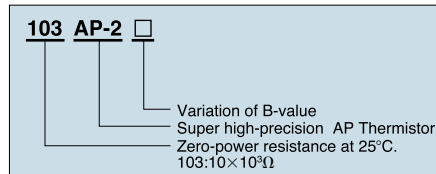
## Features

- Super high-precision : Tolerance on  $R_{25}$  and  $B_{25/85}$  is  $\pm 0.5\%$ .
- Narrow deviation in wide temperature range: Accurate temperature detecting with tolerance of  $\pm 0.5^\circ\text{C}$  in  $-60^\circ\text{C}$  to  $70^\circ\text{C}$ .
- High resistance to heat : Category temperature range is  $-60^\circ\text{C}\sim 150^\circ\text{C}$ .

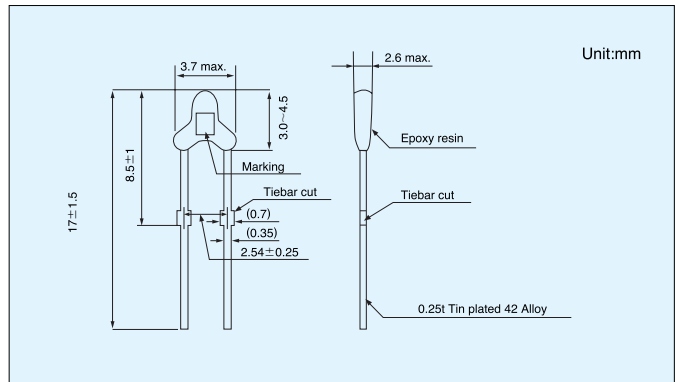
## Applications

Portable devices, Battery packs, Fan motor, Automobile, Office automation equipment, Electrical household appliances, Security devices, Thermometer, Measurement equipment, Temperature detecting, etc.

## Part number

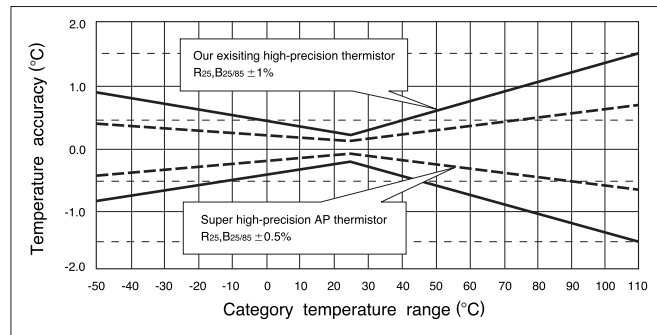


## Dimensions



This products complies with RoHS

## Temperature accuracy



## Specifications

Part No.	$R_{25}^{*1}$	B value <sup>*2</sup>	Dissipation factor (mW/ $^\circ\text{C}$ ) Approx.	Thermal time constant(s) <sup>*3</sup> Approx.	Rated maximum power dissipation(at $25^\circ\text{C}$ )(mW)	Category temperature range( $^\circ\text{C}$ )
202AP-2	2.00k $\Omega$	3976K	1.2	15	6	$-60\sim +150$
232AP-2	2.252k $\Omega$	3976K				
502AP-2	5.00k $\Omega$	3976K				
103AP-2	10.0k $\Omega$	3435K				
103AP-2-A		3976K				
203AP-2	20.0k $\Omega$	3976K				
503AP-2	50.0k $\Omega$	4220K				
104AP-2	100k $\Omega$	4261K				
204AP-2	200k $\Omega$	4470K				

\*1  $R_{25}$  : Zero-power resistance value at  $25^\circ\text{C}$ .

\*2 B-value : Calculated from the zero-power resistance values measured at  $25^\circ\text{C}$  and  $85^\circ\text{C}$ .

\*3 Time when Thermistor temperature reaches 63.2% of the temperature difference. The value is measured in still air.

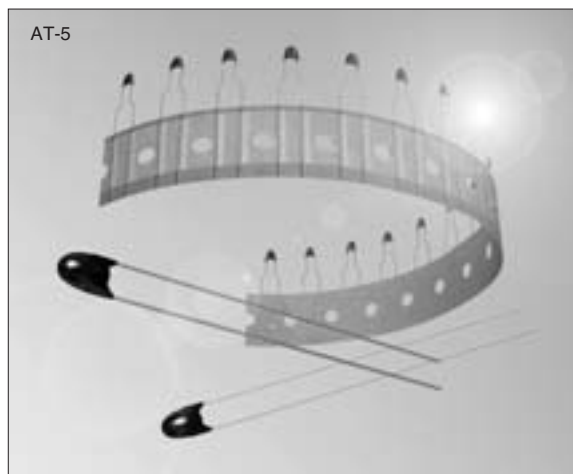
# HIGH PRECISION THERMISTOR

## AT THERMISTOR

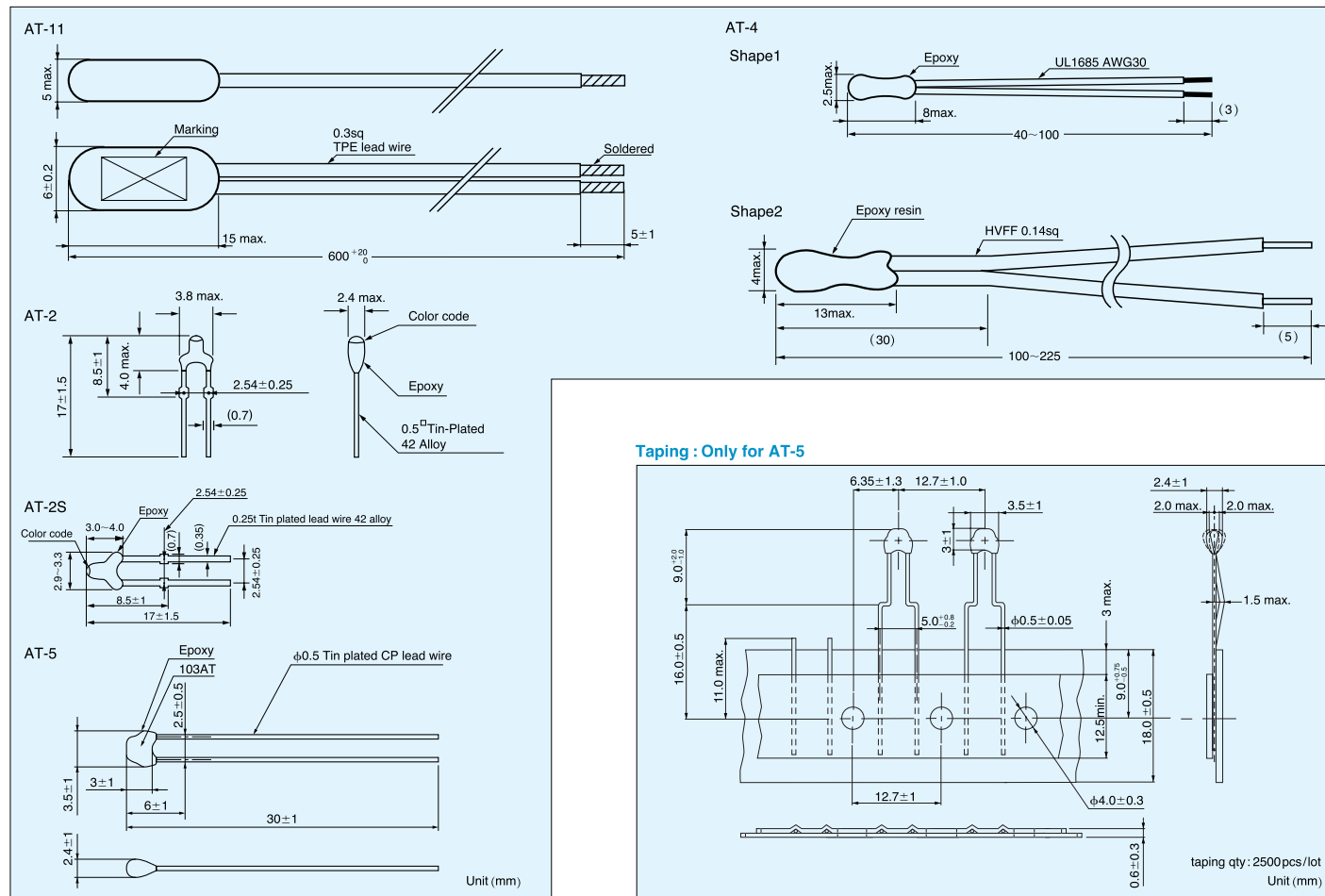
The AT thermistor is a high-precision thermal sensing device featuring extremely small B-value tolerance and resistance.

When used as a temperature gauge, the AT thermistor requires no adjustment between the control circuit and the sensor.

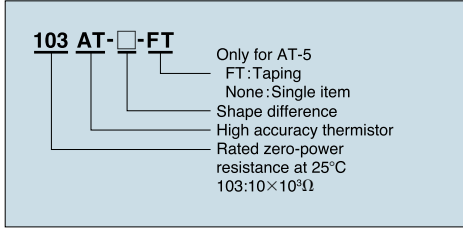
This insures temperature precision of  $\pm 0.3^{\circ}\text{C}$ .  
Temperature indicators and control instruments are now available for use with the thermistor.



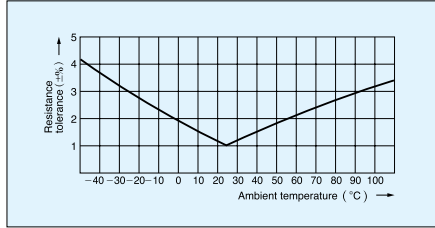
### Dimensions



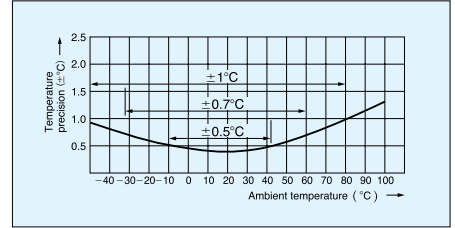
**Part number**



**Resistance tolerance**



**Interchange precision**



**Acquisition Standard**

For AT-2 type :UL1434, CSA-C22.2, No.0 Authorized.

**Specifications**

Part No	R <sub>25</sub> <sup>1</sup>	B value <sup>2</sup>	Dissipation factor (mW/°C) Approx.	Thermal time constant (s) <sup>3</sup> Approx.	Rated maximum power dissipation (at 25°C)(mW)	Category temp. range(°C)	Color code
102AT-2	1.0kΩ±1%	3100K±1%	2	15	10	-50~+90	Black
202AT-2	2.0kΩ±1%	3182K±1%					Red
502AT-2	5.0kΩ±1%	3324K±1%				-50~+110	Yellow
103AT-2	10.0kΩ±1%	3435K±1%					White
203AT-2	20.0kΩ±1%	4013K±1%					
104AT-2	100.0kΩ±1%	4665K±1%	3	75	-50~+90	None	
102AT-11	1.0kΩ±1%	3100K±1%					
202AT-11	2.0kΩ±1%	3182K±1%					
502AT-11	5.0kΩ±1%	3324K±1%					
103AT-11	10.0kΩ±1%	3435K±1%	2	10	10	-30~+90	None
103AT-4 Shape1	10.0kΩ±1%	3435K±1%					
103AT-4 Shape2	10.0kΩ±1%	3435K±1%	4	35	20	-50~+110	White
103AT-2S	10.0kΩ±1%	3435K±1%	1	15	5		
103AT-5	10.0kΩ±1%	3435K±1%	2.5		10	10	None

\*Other resistance is also available, please ask.

<sup>1</sup> R<sub>25</sub> : Rated zero-power resistance value at 25°C.

<sup>2</sup> B value : determined by rated zero-power resistance at 25°C and 85°C.

<sup>3</sup> Time when thermistor temperature reaches 63.2% of the temperature difference. The value is measured in the air.

**Resistance-Temperature**

Temperature (°C)	Type							Temperature (°C)	Type						
	102AT	202AT	502AT	103AT	203AT	503AT	104AT		102AT	202AT	502AT	103AT	203AT	503AT	104AT
-50	24.46	55.66	154.6	329.5	1253	3168	11473	35	0.7229	1.424	3.508	6.940	13.06	32.48	60.94
-45	18.68	42.17	116.5	247.7	890.5	2257	7781	40	0.6189	1.211	2.961	5.827	10.65	26.43	48.10
-40	14.43	32.34	88.91	188.5	642.0	1632	5366	45	0.5316	1.033	2.509	4.911	8.716	21.59	38.13
-35	11.23	24.96	68.19	144.1	465.8	1186	3728	50	0.4587	0.8854	2.137	4.160	7.181	17.75	30.44
-30	8.834	19.48	52.87	111.3	342.5	872.8	2629	55	0.3967	0.7620	1.826	3.536	5.941	14.64	24.42
-25	6.998	15.29	41.21	86.43	253.6	646.3	1864	60	0.3446	0.6587	1.567	3.020	4.943	12.15	19.72
-20	5.594	12.11	32.44	67.77	190.0	484.3	1340	65	0.3000	0.5713	1.350	2.588	4.127	10.13	15.99
-15	4.501	9.655	25.66	53.41	143.2	364.6	969.0	70	0.2622	0.4975	1.168	2.228	3.464	8.482	13.05
-10	3.651	7.763	20.48	42.47	109.1	277.5	709.5	75	0.2285	0.4343	1.014	1.924	2.916	7.129	10.68
-5	2.979	6.277	16.43	33.90	83.75	212.3	523.3	80	0.1999	0.3807	0.8835	1.668	2.468	6.022	8.796
0	2.449	5.114	13.29	27.28	64.88	164.0	390.3	85	0.1751	0.3346	0.7722	1.451	2.096	5.105	7.271
5	2.024	4.188	10.80	22.05	50.53	127.5	292.5	90	0.1536	0.2949	0.6771	1.266	1.788	4.345	6.041
10	1.684	3.454	8.840	17.96	39.71	99.99	221.5	95			0.5961	1.108	1.530	3.712	5.037
15	1.408	2.862	7.267	14.69	31.36	78.77	168.6	100			0.5265	0.9731	1.315	3.185	4.220
20	1.184	2.387	6.013	12.09	24.96	62.56	129.5	105			0.4654	0.8572	1.134	2.741	3.546
25	1.000	2.000	5.000	10.00	20.00	50.00	100.0	110			0.4128	0.7576	0.9807	2.369	2.994
30	0.8486	1.684	4.179	8.313	16.12	40.20	77.81								

Unit(kΩ)

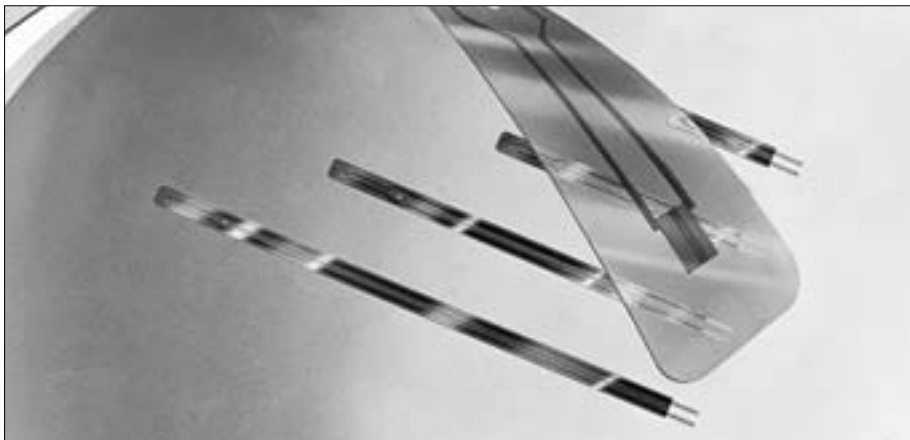
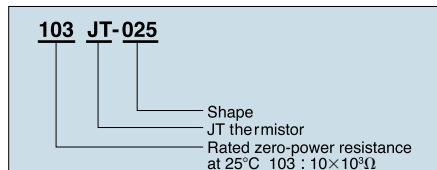
# ULTIMATE THINNESS, JT THERMISTOR

## 500 $\mu$ m only

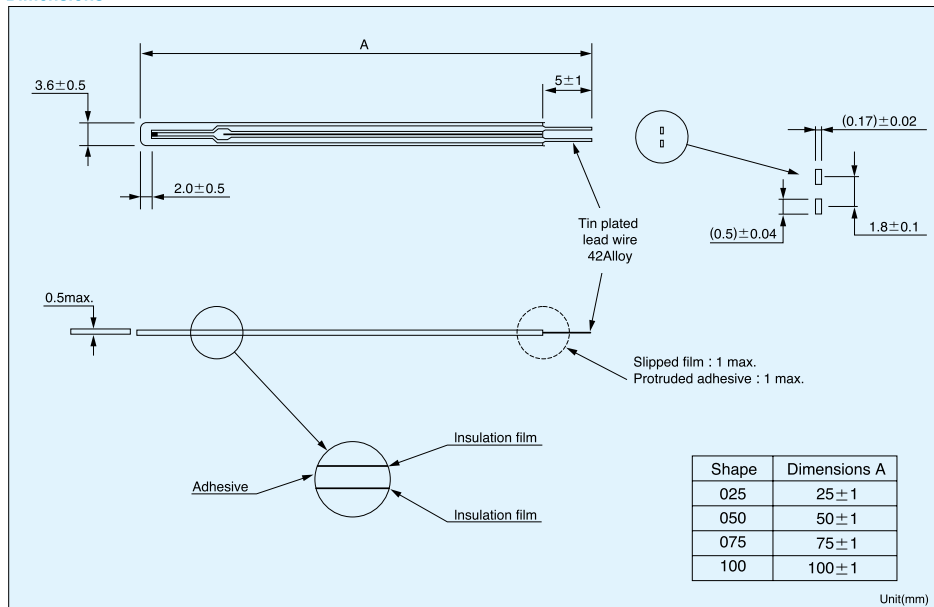
### JT THERMISTOR

JT thermistors feature ultra thinness of 500 $\mu$ m and superior electrical insulation. It is possible to use with safety in ambience that might contact with electrodes.

#### Part number



#### Dimensions



#### Resistance-Temperature

Temperature (°C)	Type	
	103JT	104JT
-50	367.7	9584
-40	204.7	4572
-30	118.5	2282
-20	71.02	1191
-10	43.67	647.2
0	27.70	365.0
10	18.07	212.5
20	12.11	127.7
30	8.301	78.88
40	5.811	50.03
50	4.147	32.51
60	3.011	21.61
70	2.224	14.66
80	1.668	10.13
90	1.267	7.135
100		5.111
110		3.720
120		2.746
125		2.371

Unit(k $\Omega$ )

#### Specifications

Part No.	R <sub>25</sub> *1	B value*2	Dissipation factor (mW/°C) Approx.	Thermal time constant(s)*3 Approx.	Rated maximum power dissipation(at 25°C)(mW)	Category temp. range(°C)
103JT-□□□	10k $\Omega$ ±1%	3435K±1%	0.7	5	3.5	-50~ +90
104JT-□□□	100k $\Omega$ ±1%	4390K±1%				-50~+125

\*1 R<sub>25</sub> : Rated zero-power resistance value at 25°C, ±2% and 3% are also available.

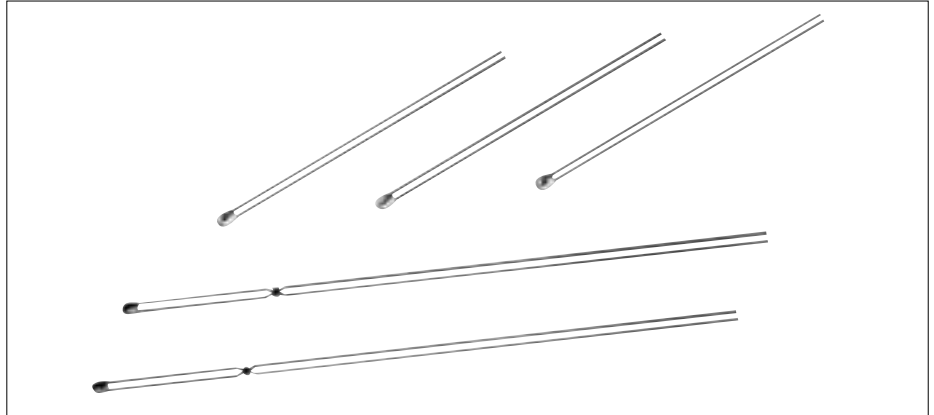
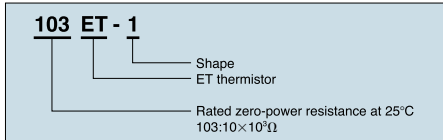
\*2 B value : determined by rated zero-power resistance at 25°C and 85°C.

\*3 Time when thermistor temperature reaches 63.2% of the temperature difference. The value is measured in the air.

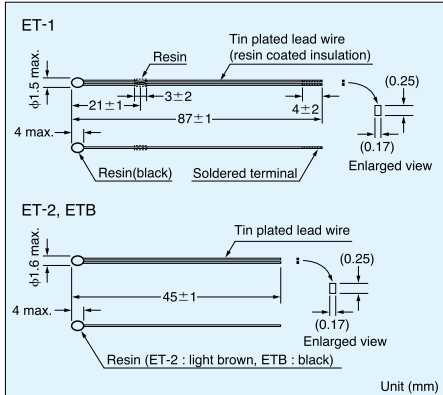
# ET THERMISTOR

The ET thermistor is smaller version of the AT thermistor. Its fast response time and high reliability makes it particularly suitable for use in medical equipment and thermometers. Manufactured by full-automated production line, all ET thermistors have identical size and that makes it possible to assemble sensors automatically.

## Part number



## Dimensions



## Specifications

Part No.	R <sub>25</sub> *1	B value*2	Dissipation factor (mW/°C) Approx.	Thermal time constant (s)*3	Rated maximum power dissipation (at 25°C)(mW)	Category temp. range (°C)
402ET-1(2)	4.0kΩ±3%	3100K±1%	0.7	6	3.5	-40~ +90
103ET-1(2)	10.0kΩ±3%	3250K±1%				-40~ +100
303ET-1(2)	30.0kΩ±3%	3760K±1%				-40~ +100
403ET-1(2)	40.0kΩ±3%	3525K±1%				-40~ +100
413ET-1(2)	41.0kΩ±3%	3435K±1%				-40~ +100
503ET-1(2)	50.0kΩ±3%	4055K±1%				-40~ +100
593ET-1(2)	59.0kΩ±3%	3617K±1%				-40~ +100
833ET-1(2)	83.0kΩ±3%	4013K±1%				-40~ +100
104ET-1(2)	100.0kΩ±3%	4132K±1%				-40~ +100
224ET-1(2)	226.0kΩ±3%	4021K±1%				-40~ +100
234ET-1(2)	232.0kΩ±3%	4274K±1%				-40~ +100
103ETB	10.0kΩ±2%	3435K±1%				-40~ +90

\*1 R<sub>25</sub>: Rated zero-power resistance value at 25°C.

\*2 B value: determined by rated zero-power resistance at 25°C and 85°C.

\*3 Time when thermistor temperature reaches 63.2% of the temperature difference. The value is measured in the air.

## Resistance-Temperature

Temperature (°C)	Type											
	402ET	103ET	303ET	403ET	413ET	503ET	593ET	833ET	104ET	224ET	234ET	103ETB
-40	57.71	170.9	810.7	833.3	772.8	1602	1318	2664	3325	7005	9046	204.7
-30	35.34	102.2	445.1	481.1	456.5	855.0	754.3	1421	1769	3784	4680	118.5
-20	22.38	63.07	253.7	287.5	277.9	474.4	445.8	788.5	977.5	2116	2515	71.02
-10	14.60	40.08	149.8	177.2	174.1	272.7	271.7	453.0	559.0	1225	1401	43.67
0	9.797	26.16	91.30	112.4	111.7	161.9	170.1	269.3	329.8	730.1	808.2	27.70
10	6.737	17.51	57.31	73.00	73.63	99.13	109.4	164.8	200.5	447.8	480.2	18.07
20	4.736	11.99	37.00	48.61	49.57	62.38	72.10	103.6	125.3	282.1	293.7	12.11
30	3.394	8.387	24.47	33.08	34.08	40.24	48.55	66.91	80.27	182.1	184.4	8.301
40	2.476	5.988	16.56	22.96	23.89	26.58	33.41	44.18	52.62	120.3	118.6	5.811
50	1.835	4.353	11.45	16.26	17.06	17.93	23.44	29.80	35.23	81.07	78.00	4.147
60	1.378	3.217	8.070	11.70	12.38	12.33	16.73	20.51	24.00	55.75	52.39	3.011
70	1.049	2.414	5.791	8.569	9.135	8.588	12.15	14.37	16.59	39.01	35.87	2.224
80	0.7997	1.836	4.222	6.367	6.838	6.064	8.951	10.24	11.64	27.78	24.99	1.668
90	0.6145	1.416	3.125	4.797	5.190	4.338	6.697	7.419	8.287	20.10	17.72	1.267
100			2.346	3.662	3.990	3.142	5.077	5.459		14.75	12.75	

Unit (kΩ)

## Specifications

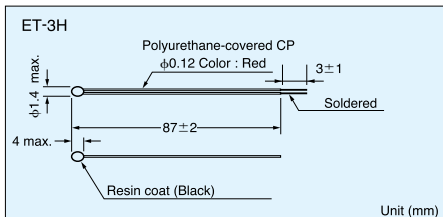
Part No.	R <sub>37</sub> *1	B value*2	Dissipation factor (mW/°C) Approx.	Thermal time constant (s)*3	Rated maximum power dissipation (at 25°C)(mW)	Category temp. range (°C)
503ET-3H87L-20073	29.615kΩ~30.263kΩ	3944K±0.5%	0.7	0.8	3.5	-40~ +100

\*1 R<sub>37</sub>: Rated zero-power resistance value at 37°C.

\*2 B value: determined by rated zero-power resistance at 30°C and 45°C.

\*3 Time when thermistor temperature reaches 63.2% of the temperature difference. The value is measured in oil.

## Dimensions



## Tolerance of the group : ± 0.09% /group

Group	Resistance(kΩ)	Group	Resistance(kΩ)
C	29.615/29.641/29.667	I	29.937/29.964/29.991
D	29.668/29.695/29.721	J	29.992/30.018/30.045
E	29.722/29.749/29.775	K	30.046/30.073/30.100
F	29.776/29.802/29.828	L	30.101/30.127/30.154
G	29.829/29.856/29.883	M	30.155/30.182/30.209
H	29.884/29.910/29.936	N	30.210/30.237/30.263

Notes ; Min./Center/Max.

# THIN FILM THERMISTOR

## UNDER DEVELOPMENT

## FI-R THERMISTOR

### FEATURE

#### VERY FAST RESPONSE

Downsized thin film thermistor assures very fast response.

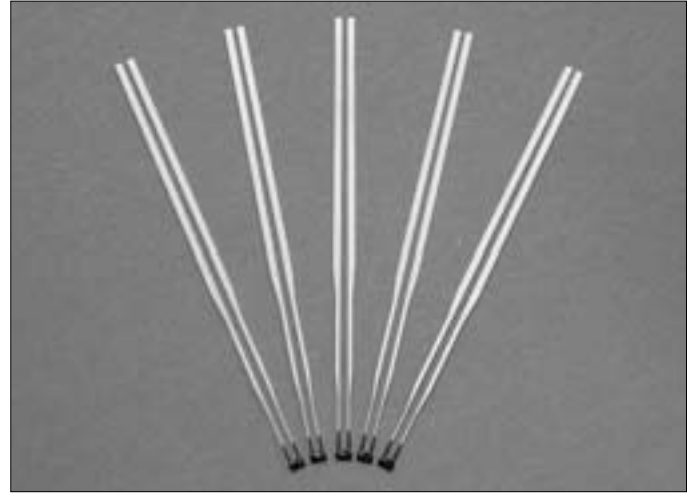
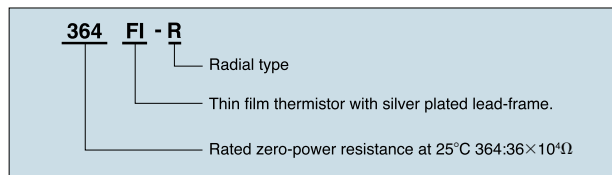
#### HEAT PROOF

Glass passivation enables high heat proof and less drift in resistance for long time.

#### EASY TO ASSEMBLE

Form of lead-frame is suitable for welding method.

### Part number



### Applications

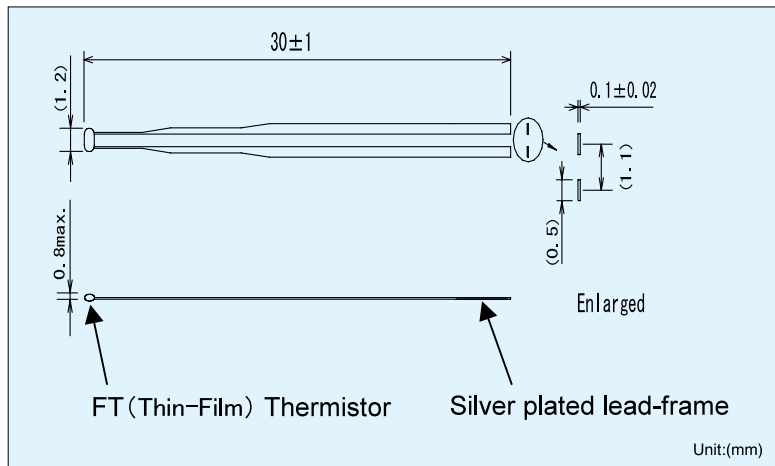
- High temperature range thermometer
- LCD
- Fire alarm

### Specifications

Part No.	Zero-power resistance	B-value	Dissipation factor (mW/°C)	Thermal time constant(s)*	Rated maximum power dissipation(at 25°C)(mW)	Category temp. range (°C)
	R25	B25/85				
364FI (Preliminary)	360kΩ±3%	3370K±1%	approx.0.5mW/°C	approx.2s	2.5mW	-50~+400

\*Resistance welding is recommended for connection method

### Dimensions



### Method of custody

- Keep away from corrosive gas environment such as H<sub>2</sub>S,SO<sub>2</sub>,NH<sub>3</sub>,Cl<sub>2</sub>,Nox,H<sub>2</sub> etc.when storing. An end terminal will corrode.
- Please keep in an environment of 10°C to 40°C,under 76% relative humidity so that it won't cause any dew condensation nor freezing.
- Thermistor can be damaged by ESD.And it will cause resistance trouble. Please take countermeasure against static electricity when handling.
- A lead wire is asked to be connected by welding.
- Terminal surface has silver plated and it will turn black by sulfuration. When a silver sulfurates,its resistance may sometimes get increase.
- The causation of the problem is a sulfuration gas (H<sub>2</sub>S,SO<sub>2</sub> etc.) or sulfur mixes in an oil mist and stick on the parts.
- Full preparation for sulfurate is needed if it will be used in this kind of environment.

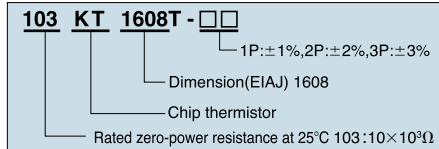
# CHIP TYPE THERMISTOR

## KT THERMISTOR

Chip thermistors are specially processed, highly reliable thermistors.

They can be face-bonded to act as thermal compensators for ICs and they are manufactured in sizes down to 1 square mm, they can also be used to detect temperature with relatively small time constants.

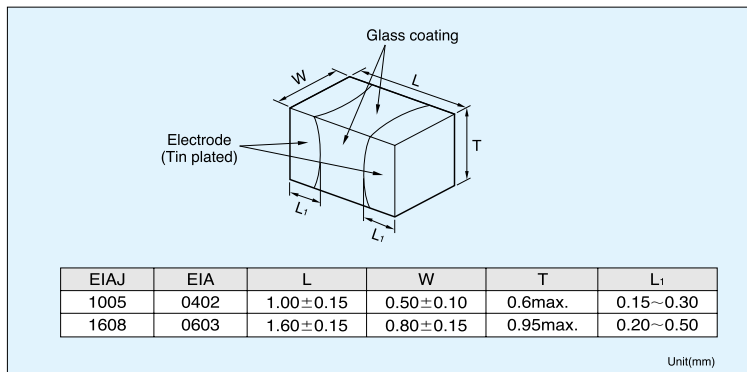
### KT-type Part number



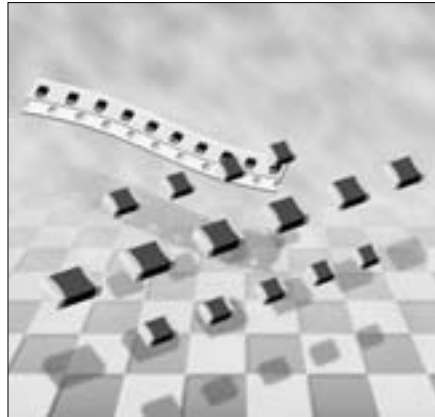
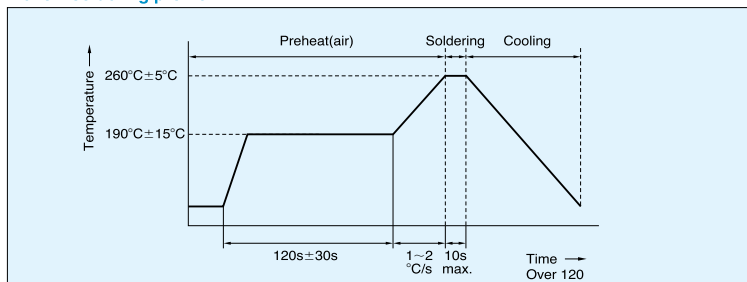
### Precautions

- Do not expose the thermistors to high soldering heat for more than specified time. (260°C for not longer than 10s is recommended)

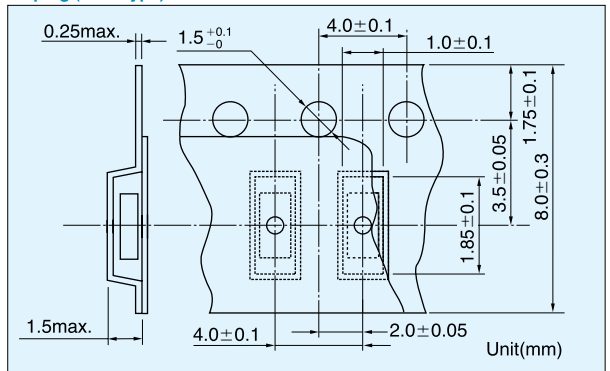
### Dimensions



### Reflow soldering profile

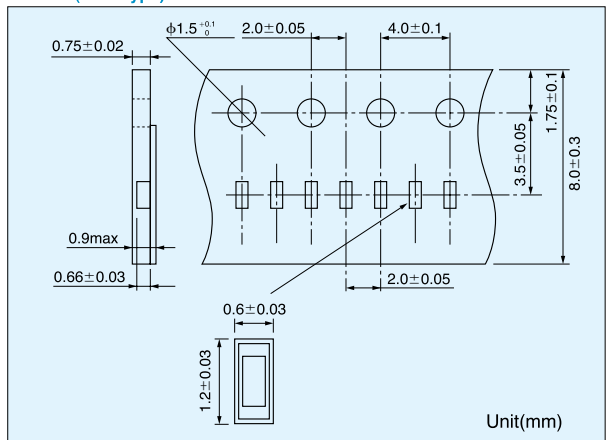


### Taping (1608 type)



Minimum quantity:4000pcs/reel

### (1005 type)



Minimum quantity:10000pcs/reel

### Specifications

Part No.	R <sub>25</sub> <sup>*1</sup>	B value <sup>*2</sup>	Dissipation factor (mW/°C) Approx.	Thermal time constant(s) <sup>*3</sup> Approx.	Rated maximum power dissipation (at 25°C)(mW)	Category temp. range(°C)
103KT1608T	10kΩ	3435K±1%	0.9	5.0	4.5	-40~+125
503KT1608T	50kΩ	4055K±1%				
104KT1608T	100kΩ	4390K±1%				
103KT1005T	10kΩ	3435K±1%	0.7	2.2	3.5	

\*1 R<sub>25</sub>: Rated zero-power resistance value at 25°C.

\*2 B value: determined by rated zero-power resistance at 25°C and 85°C.

\*3 Time when thermistor temperature reaches 63.2% of the temperature difference. The value is measured in the air. Other resistance is available, please ask.



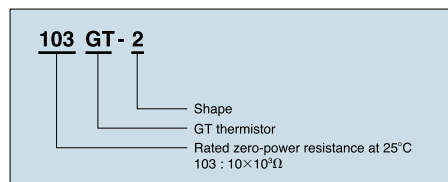
# HIGH HEAT-RESISTANCE AND HIGH SENSITIVE THERMISTOR

## GT THERMISTOR

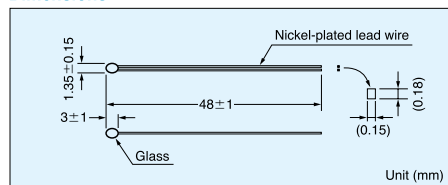
GT thermistor is combined both superior feature of BT thermistor and ET thermistor as fast response time, high reliability, wide category temperature range, high moisture proof, high accuracy and reasonable price.

GT thermistor is made up of a high quality thermistor element and the lead wire is connected to the thermistor element by alloyed technology, and glass coating for the thermistor element.

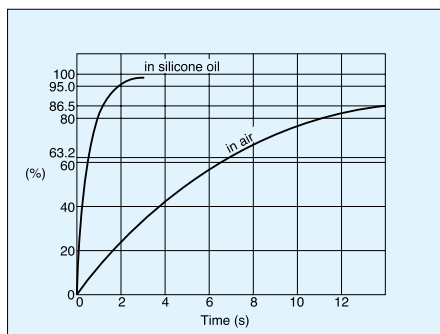
### Part number



### Dimensions



### Time constant



### Specifications

Part No.	R <sub>25</sub> *1	B value*2	Dissipation factor (mW/°C) Approx.	Thermal time constant(s)*3	Rated maximum power dissipation (at 25°C)(mW)	Category temp. range(°C)
102GT-2	1.0kΩ±3%	3305K±2%	0.6	7(0.6)	3	-50~+200
202GT-2	2.0kΩ±3%	3838K±2%				
502GT-2	5.0kΩ±3%	3964K±2%				
103GT-2	10.0kΩ±3%	4126K±2%				-50~+300
203GT-2	20.0kΩ±3%	4282K±2%				
503GT-2	50.0kΩ±3%	4288K±2%				
104GT-2	100.0kΩ±3%	4267K±2%				
104GTA-2	100.0kΩ±3%	4390K±2%				
204GT-2	200.0kΩ±3%	4338K±2%				
504GT-2	500.0kΩ±3%	4526K±2%				
105GT-2	1000.0kΩ±3%	4608K±2%				

### Specifications

Part No.	Rated zero-power resistance			temperature (°C)	B value*2	Dissipation factor (mW/°C) Approx.	Thermal time constant(s)*3	Rated Electricity mW at 25°C	Category temp. range(°C)
	temperature*1 (°C)	resistance	tolerance						
252GT-2-20185	0	6kΩ	±5%	0/100	3390K±2%	0.6	7	3.0	-50~+300
252GT-2-20197	25	2.5kΩ	±2.5%						
262GT-2-20198	0	8kΩ	±1%	25/50	3745K±2%				
542GT-2-20184	75	0.7331kΩ	±3%	0/100	3450K±2%				
542GT-2-20186	0	15kΩ	±3%						
852GT-2-20156	50	3.485kΩ	±3%						
103GT-2-20196	25	10kΩ	±1%	25/85	3435K±1%				
103GTA-2-20199	25	10kΩ	±5%	25/125	3980K±2%				
303GT-2-20205	25	30kΩ	±3%	0/100	3970K±2%				
333GT-2-20204	125	1.509kΩ	±3%	0/100	3570K±2%				
493GT-2-20157	5	127kΩ	±2%	0/100	3970K±2%				
493GT-2-20159	75	7.214kΩ	±3%						
493GT-2-20188	40	26.06kΩ	±2%						
104GT-2-20201	25	100kΩ	±3%	100/200	4300K±3%				
234GT-2-20194	25	231.44kΩ	±3%	100/200	4537K±1%				
234GT-2-20195	150	3.161kΩ	±3%		4537K±2%				
145GT-2-20203	200	4kΩ	±5%	200/300	5133K±3%				

\*1 Rated zero-power resistance at each temperature.

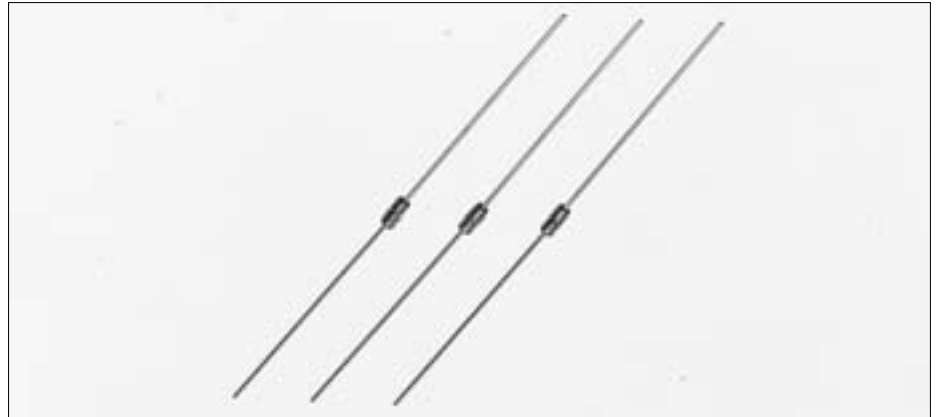
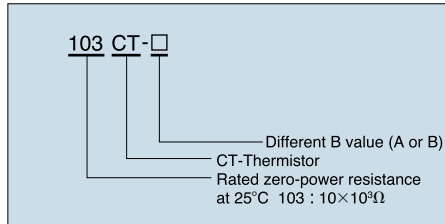
\*2 B value : determined by rated zero-power resistance at each temperature.

\*3 Time when thermistor reaches 63.2% of the temperature difference. The value is measured in the air.

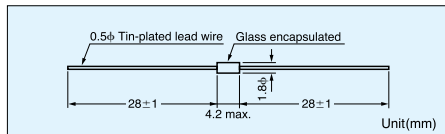
# CT THERMISTOR

The CT thermistor is a thermal sensor in a DO35 package. Similar to the BT thermistor, it is highly reliable and offers a wide operating range of  $-50^{\circ}\text{C}$  to  $(150^{\circ}\text{C})$   $250^{\circ}\text{C}$ . It is primarily used in home electric appliances and features a competitive price for full-automated manufacturing system.

## Part number

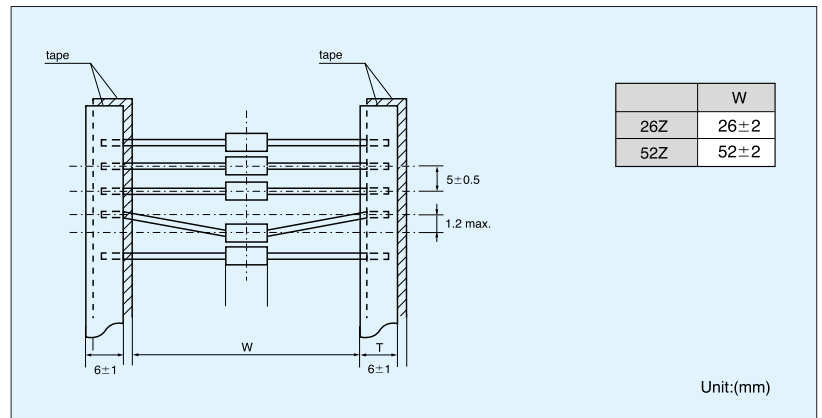


## Dimensions



To allow automatic insertion, this product can be taped.

## Taping Specification



## Specifications

Part No.	Rated zero-power resistance			temperature ( $^{\circ}\text{C}$ )	B value* <sup>2</sup>	Dissipation factor (mW/ $^{\circ}\text{C}$ ) Approx.	Thermal time constant(s)* <sup>3</sup> Approx.	Rated Electricity mW at 25 $^{\circ}\text{C}$	Category temp. range( $^{\circ}\text{C}$ )	Lead wire	Packing Method		
	temperature* <sup>1</sup> ( $^{\circ}\text{C}$ )	resistance	tolerance										
252CT-4	25	2.50k $\Omega$	$\pm 5\%$	25/85	3670K $\pm 2\%$	2.1	10~20	10.5	-50~-+250	Nickel plate	Individually packed		
512CT-4		5.10k $\Omega$											
562CT-4		5.60k $\Omega$											
912CT-4		9.10k $\Omega$											
103CT-4		10.0k $\Omega$											
113CT-4		11.0k $\Omega$											
203CT-4		20.0k $\Omega$											
473CT-4		47.0k $\Omega$											
513CT-4		51.0k $\Omega$											
563CT-4		56.0k $\Omega$											
104CT-4		100k $\Omega$											
204CT-4		200k $\Omega$											
252CT-20218		0			7.881k $\Omega$							$\pm 3\%$	25/50
103CT-11005	25	10.0k $\Omega$	$\pm 2\%$	25/50	3680K $\pm 2\%$	-30~-+150	26mm taping						
103CT-21048	25	10.0k $\Omega$	$\pm 3\%$	25/85	4100K $\pm 2\%$	-40~-+150	Individual						
103CT-01006	25	10.0k $\Omega$	$\pm 5\%$	25/85	3900K $\pm 2\%$	-30~-+150	26mm taping						
103CT-20217	0	30.0k $\Omega$	$\pm 3\%$	25/50	3434K $\pm 2\%$	-40~-+150	52mm taping						
503CT-91027	50	19.727k $\Omega$	$\pm 2.5\%$	25/85	3992K $\pm 2\%$		26mm taping						
104CT-90113	25	100.0k $\Omega$	$\pm 5\%$	25/85	4070K $\pm 2\%$		52mm taping						
503CT-90083	85	5.911k $\Omega$	$\pm 3\%$	25/85	3800K $\pm 2\%$	-40~-+250	Nickel plate	Individual					

\*1 Rated zero power resistance at each temperature.

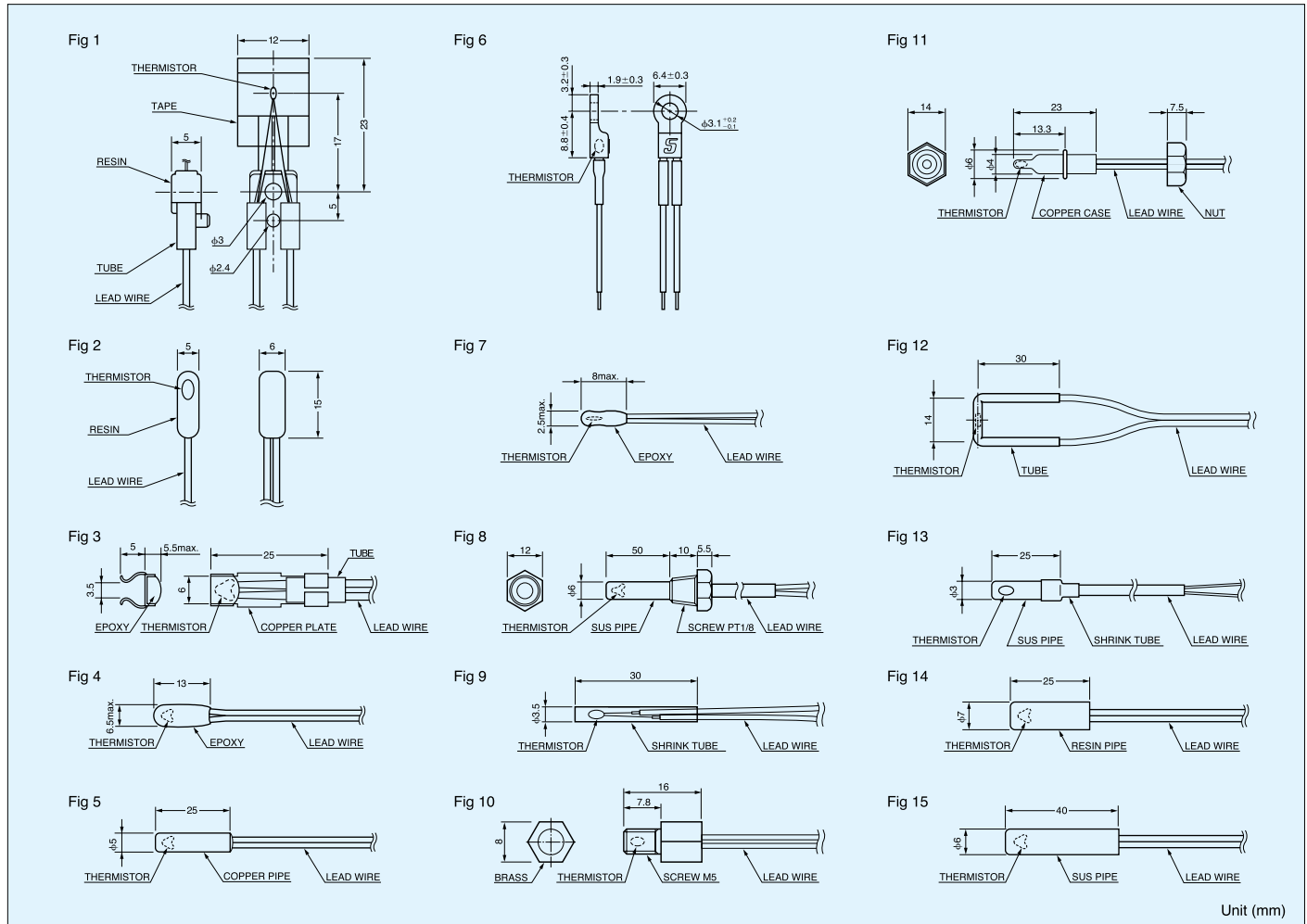
\*2 B value : determined by rated zero-power resistance at each temperature.

\*3 Time when thermistor reaches 63.2% of the temperature difference. The value is measured in the air.

# TEMPERATURE SENSOR

The TEMPERATURE SENSOR is assembled one with various parts and thermistor devices according to the required applications. Its electric characteristics are the same as those of thermistor devices. Variable type of sensor can be utilized for detecting or controlling temperature because its operating temperature range is wide from  $-50$  to  $+300^{\circ}\text{C}$ . Standard TEMPERATURE SENSOR is available in accordance with the applications such as measurements of liquid, atmosphere and surface temperature.

## External dimensions



## Specifications

Fig	Thermal Time constant(s)			Dissipation factor (mW/°C) Approx.	Category temperature range (°C)	Application	Thermistor
	Air	Water	Heater				
1	-	-	1.5	0.4	-30~+230	Surface temp. sensor for OA equipment.	BT
2	75	-	-	2.6	-30~+105	Air temp. sensor for general use.	AT
3	40	-	-	4	-30~+105	Surface temp. sensor for general use.	AT
4	70	-	-	5	-30~+110	Air temp. sensor for air conditioner.	AT(ET)
5	166	-	-	3.7	-30~+110	Air temp. sensor for air conditioner.	AT(ET)
6	65	-	-	3	-40~+110	Surface temp. sensor for general use.	AT
7	10	-	-	2	-30~+ 90	Surface temp. sensor for rechargeable battery.	AT
8	-	5	-	4.5	-30~+105	Water (Oil)temp. sensor for general use.	AT(ET, GT)
9	-	3	-	1.1	-50~+200	For general use.	BT
10	70	-	-	5	-50~+250	Inner temp. sensor for general use.	GT(BT)
11	-	1.7	-	1.0	-30~+100	Fast response water temp. sensor	ET
12	35	-	-	2.1	-50~+200	Surface temp. sensor for cooker.	CT
13	85	-	-	1.1	-30~+100	Air temp. sensor for general use.	ET
14	-	20	-	1.3	-30~+105	For general use.	AT(ET)
15	260	-	-	2.6	-30~+105	For general use.	AT(ET)

# THERMOPILE TYPE INFRARED SENSOR

## THERMOPILE

Thermopile type Infrared sensor  
utilizing own silicon micromachining  
technology.

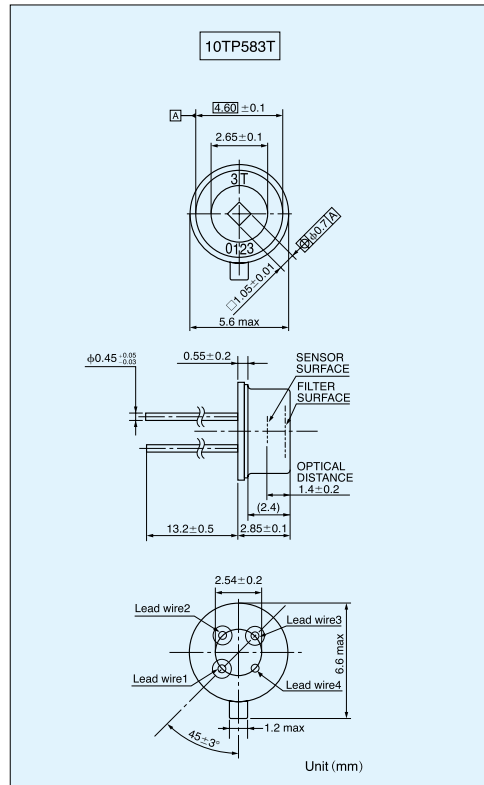
Applications: Tympanic thermometer  
Microwave oven  
Non contact temperature measurement



### Part number

Part No.	type	Thermistor
10TP583T	TO18	Built-in

### Dimensions



### Ratings

Parameters	Value	Unit	Conditions
	10TP583T		
Sensitive area	1.05×1.05	mm <sup>2</sup>	Size of Absorbing Film
*1 Responsivity	15±30%	V/ W	
*1 Output Voltage	200±30%	μV	
*2 Output Voltage	1.00±30%	mV	
*1 Temperature Coefficient of Responsivity	0.02±0.02	% / °C	Reference
Thermopile Resistance	65±30%	kΩ	
Temperature Coefficient of Thermopile Resistance	±0.1	% / °C	
Johnson Noise Voltage	33	nV/ √Hz	Johnson Noise r.m.s.,298K 1Hz Typical
*1 S/N Ratio	75.7	dB	Output Voltage/Johnson Noise, Typical
*1 Noise Equivalent Power	2.2	nW/ Hz <sup>1/2</sup>	Typical
*1 Specific Detectivity	4.7×10 <sup>7</sup>	cm·Hz <sup>1/2</sup> / w	Typical
Time Constant	15	ms	Typical
Operating Temperature range	-20~+100	°C	
Storage Temperature range	-40~+100	°C	
Filter Range	Cut on 5	μm	Standard
Field of View	±50	deg.	Incident Angle to Achieve 50% Responsivity
Insulation Resistance	≥500	MΩ	Application of DC25V
Sealing	≤1×10 <sup>-9</sup>	Pa·m <sup>3</sup> / s	
*3 Thermistor Resistance Value	100±3%	kΩ	Rated Zero-power Resistance Value at 25°C
*3 Thermistor B-Value	3435±0.7%	K	
*3 Thermistor Rated Power	0.5	mW	at 25°C

\*1 Test Condition  
Blackbody Temperature : 500K  
Sensor-Blackbody Distance : 100mm  
Sensor Temperature : 298K  
Aperture size : φ12.7mm

\*2 Test Condition  
Blackbody Temperature : 310K  
Sensor Temperature : 298K

\*3 Built-in Type

深圳同创利电子有限公司 13510714926 胡凯

# POWER THERMISTOR

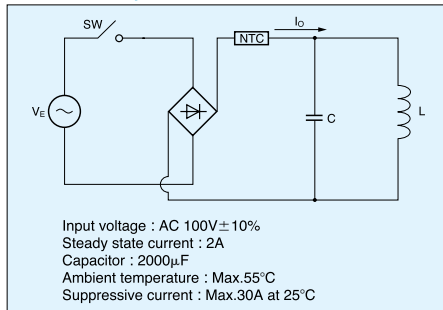
The POWER THERMISTOR is a device for suppressing inrush current to an electric circuit. Circuits including electric bulbs or capacitors induce an inrush current more than 100 times the normal current when the circuit switch is turned on. The POWER THERMISTOR in the circuits protects electric equipments from being damaged by limiting the inrush current.

## Application

The power thermistor will suppress inrush current which is caused by a capacitor, filament for a bulb, inverter for fluorescent lamp, a heater and etc., also will control fan motor speed of cooler for electric circuit.

It is developed to use for power supply of TV, VCR instead of cement resistor.

## How to use the power thermistor



The most suitable power thermistor for the above circuit is required to fulfill the following terms and conditions.

1. The permissible current at ambient temperature of 55°C should be over 2A.
2. The thermistor resistance for suppressive current which becomes below 30A should be over 4.2 ohm from the under-mentioned formula.

$$\frac{\sqrt{2} V_E \times 1.1}{R_c + R_{25}} \leq 30$$

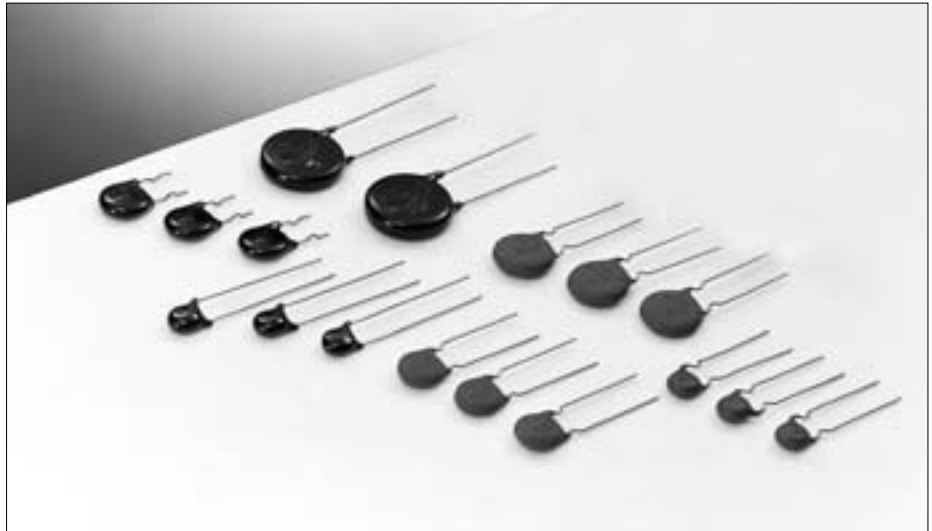
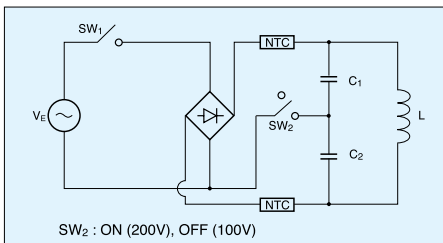
$R_c$  : Internal resistance value in the circuit is 1 ohm (100V/100A)

$R_{25}$  : Rated zero-power resistance at 25°C

3. Max. capacitance shall be over 2000μF at AC 100V.

Accordingly, suitable thermistors are 6D2-22, 5D2-18 and 8D2-18, and if we consider in the points of small time constant which means a small size and large effect for suppressive current which means large rated zero-power resistance, 8D2-18 is the most suitable one.

Use the following circuit in the power supply for 100V and 200V.



## Thermal time constant

If ambient temperature of a thermistor is changed from  $T_1$  to  $T_2$  suddenly, temperature of the thermistor changes slowly.

The time constant means the time when temperature of the thermistor reaches 63% of the temperature difference.

## Residual resistance

If current is flowed through a thermistor, any heat will be generated in the thermistor by which its resistance will be decreased, however, a decrease of a resistance will be stabilized at a saturation resistance value which is determined by impressed electric power and a dissipation constant. The residual resistance value means maximum saturation resistance value when the maximum permissible current is flowed through the thermistor.

## Temperature coefficient α

The temperature coefficient of a thermistor is expressed by the following equation ;

$$\alpha = -\frac{B}{T_2} \times 100 (\%/^{\circ}\text{C})$$

## Dissipation factor

If small voltage is applied to a thermistor, small current will flow which produce enough heat in the thermistor. Dissipation factor is electric power which make 1°C raise by heat in a thermistor.

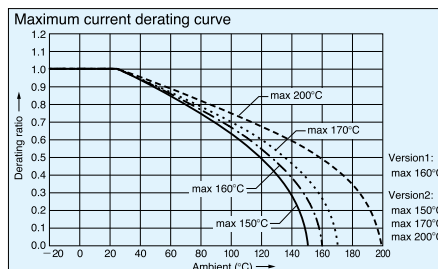
$$\delta = \frac{P}{\Delta t} (\text{mW}/^{\circ}\text{C})$$

P is applied electric power.

$\Delta t$  is risen temperature of the thermistor.

## Maximum permissible current

If the maximum permissible current flows to a thermistor at 25°C, temperature of the thermistor rises to 200°C, (160°C). When ambient temperature is above 25°C, the maximum permissible current shall be over reduced as the maximum permissible current reduction curve.



## Reliability tests

### Version 1

#### Dry heat test

Test sample is exposed in air at 160°C for 1,000 hours.  $\Delta R_{25}/R_{25} \pm 15\%$

#### Damp heat test

Test sample is exposed in atmosphere of 95%RH at 40°C for 1,000 hours.  $\Delta R_{25}/R_{25} \pm 15\%$

#### Load test

Test sample is applied the maximum rating current in air at 25°C for 1,000 hours.  $\Delta R_{25}/R_{25} \pm 15\%$

#### Change of temperature

Test sample is given 10 times of the following temperature cycle,  
 → -40°C for 30 minutes → room temperature for 5 minutes →  
 → 160°C for 30 minutes → room temperature for 5 minutes.  
 $\Delta R_{25}/R_{25} \pm 15\%$

### Version 2

#### Dry heat test

Test sample is exposed in air at 150°C~200°C for 1,000 hours.  $\Delta R_{25}/R_{25} \pm 20\%$

#### Damp heat test

Test sample is exposed in atmosphere of 95%RH at 40°C for 1,000 hours.  $\Delta R_{25}/R_{25} \pm 15\%$

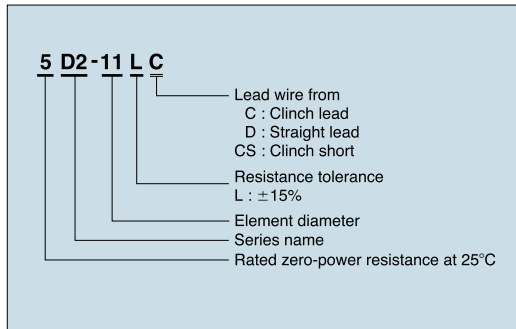
#### Load test

Test sample is applied the maximum rating current in air at 25°C for 1,000 hours.  $\Delta R_{25}/R_{25} \pm 20\%$

#### Change of temperature

Test sample is given 10 times of the following temperature cycle,  
 → -40°C for 30 minutes → room temperature for 5 minutes →  
 → 160°C for 30 minutes → room temperature for 5 minutes.  
 $\Delta R_{25}/R_{25} \pm 15\%$

**Part number**

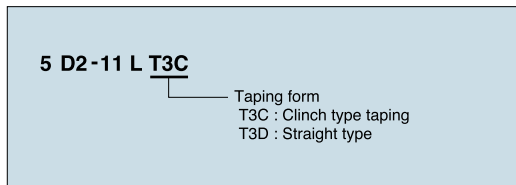


**Applications**

- Switching power supply
- Adapter
- LC, Plasma TV, DVD player
- AV, home electricity, Air-con
- OA, printer, PC
- etc.

**Acquisition Standard**

UL1434 File No. E92669



**Specifications : D2 Series Version 1**

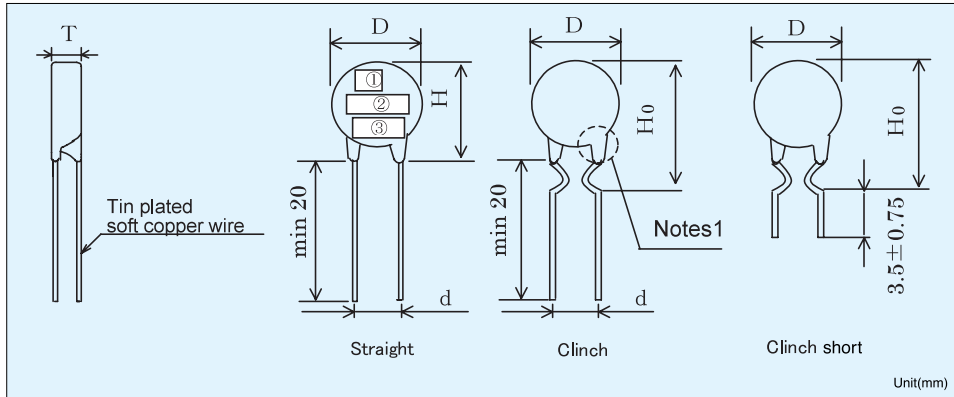
Part No.	Rated zero-power resistance (±15%)	Dissipation factor	Thermal time constant	Maximum current at 25°C	Residual resistance	Maximum permissible capacitance		Category temperature range
	[Ω]					[mW/°C]	[S]	
5D2-07 □ □	5.0	(30)	(35)	3.0	0.36	400	80	-40~+160
8D2-07 □ □	8.0		(41)					
10D2-07 □ □	10.0		(45)	2.0	0.72	680	140	
12D2-07 □ □	12.0		(41)	1.7	0.78	380	80	
16D2-07 □ □	16.0		(45)	2.0	1.04	800	160	
22D2-07 □ □	22.0		(50)	1.0	1.43	960	190	
2D2-10 □ □	2.0	(32)	(50)	5.0	0.15	1640	330	
3D2-10 □ □	3.0		(53)					
5D2-10 □ □	5.0		(53)	3.0	0.33	1440	290	
8D2-10 □ □	8.0		(70)					
10D2-10 □ □	10.0		(75)	0.65	1640	330		
12D2-10 □ □	12.0		(53)				1.8	
16D2-10 □ □	16.0	(70)	1.6	0.94				
2D2-14 □ □	2.0	(36)	(90)	5.0	0.15	4200	860	
3D2-14 □ □	3.0		(80)					
4D2-14 □ □	4.0		(95)	0.26	3400	700		
5D2-14 □ □	5.0		(110)				4.0	
8D2-14 □ □	8.0		(80)	2.5	0.47	1390	280	
10D2-14 □ □	10.0		(95)	2.2	0.59	1790	370	
12D2-14 □ □	12.0		(105)	2.0	0.71	2190	450	
16D2-14 □ □	16.0		(115)	1.8	0.94	2790	570	

\*The rated values in "Dissipation factor" and "Thermal time constant" are for reference.

Specifications : D2 Series Version 2

Part No.	Rated zero-power resistance (±15%)	Dissipation factor	Thermal time constant	Maximum current at 25°C	Residual resistance	Maximum permissible capacitance		Category temperature range	Rated B-value (±5%)		
	[Ω]	[mW/°C]	[S]	[A]	[Ω]	AC.100V	AC.220V	(°C)	[K]		
5D2-05 □ □	5.0	(15)	(20)	2.0	0.48	860	170	-50~+150	2650		
10D2-05 □ □	10.0	(7)		1.0	0.91				2700		
20D2-05 □ □	20.0	(1)		0.3	1.66				2800		
5D2-08 □ □	5.0	(22)	(35)	3.0	0.35	1260	260	-50~+170	2700		
10D2-08 □ □	10.0	(17)		2.0	0.63				2800		
15D2-08 □ □	15.0	(26)		1.0	0.94				2800		
20D2-08 □ □	20.0	(8)	(40)	1.0	1.13	2880	590	-50~+170	2900		
2D2-11 □ □	2.0	(26)		5.0	0.15				2700	550	2650
3D2-11 □ □	3.0	(24)		4.0	0.22	4830	990		2650		
4D2-11 □ □	4.0	(31)				2880	590		2700		
5D2-11 □ □	5.0	(39)				0.35	2700		550	2700	
8D2-11 □ □	8.0	(31)		3.0	0.50	2880	590		-50~+170	2800	
10D2-11 □ □	10.0	(42)		3.1	0.63					2800	
12D2-11 □ □	12.0	(21)		2.0	0.75	4030	830		2800		
15D2-11 □ □	15.0	(34)		2.5	0.80	2880	590		-50~+170	2950	
16D2-11 □ □	16.0	(37)								2.5	0.86
20D2-11 □ □	20.0	(28)	2.0					1.02		3000	
1D2-13 □ □	1.0	(12)	(55)	6.0	0.06	860	170	-50~+200	2650		
2D2-13 □ □	2.0	(21)		5.0	0.10				2700	550	2700
4D2-13 □ □	4.0	(24)									0.18
4.7D2-13 □ □	4.7	(26)				0.18	2900				
5D2-13 □ □	5.0	(27)		4.0	0.19	2880	590		2900		
8D2-13 □ □	8.0	(25)							0.27	3000	
10D2-13 □ □	10.0	(29)		4.0	0.32	4830	990		3050		
12D2-13 □ □	12.0	(37)		3.0	0.41				3000		
15D2-13 □ □	15.0	(25)							0.48	3050	
16D2-13 □ □	16.0	(26)		3.0	0.51	3050					
1D2-15 □ □	1.0	(22)	(70)	8.0	0.06	6910	1420	-50~+200	2650		
1.5D2-15 □ □	1.5	(29)		8.0	0.08				6910	1420	2650
2D2-15 □ □	2.0	(37)									0.10
3D2-15 □ □	3.0	(36)				7.0	0.13				4030
4D2-15 □ □	4.0	(48)		0.18	2800						
4.7D2-15 □ □	4.7	(37)		6.0	0.18	5760	1190		2900		
5D2-15 □ □	5.0	(39)		6.0	0.19				2900		
8D2-15 □ □	8.0	(39)							0.27	3000	
10D2-15 □ □	10.0	(49)		5.0	0.34	5760	1190		3000		
12D2-15 □ □	12.0	(54)		4.0	0.39				3050		
15D2-15 □ □	15.0	(41)	0.45					3100			
16D2-15 □ □	16.0	(44)	4.0	0.48	3100						
4D2-18 □ □	4.0	(59)	(90)	8.0	0.16	6910	1420	-50~+200	2900		
5D2-18 □ □	5.0	(66)		8.0	0.18				6910	1420	2950
8D2-18 □ □	8.0	(53)									0.26
10D2-18 □ □	10.0	(62)		6.0	0.30				3100		
47D2-18 □ □	47.0	(21)		2.0	0.94				3450		
3D2-22 □ □	3.0	(48)	(130)	8.0	0.13	12600	2610	-50~+200	2800		
4D2-22 □ □	4.0	(59)		8.0	0.16				2900		
6D2-22 □ □	6.0	(43)							6.0	0.21	3000

Dimensions



①: Trade mark **S**      ②: Part.No. (Notes 2)      ③: Lot.No.

Notes1 : In case of adding strength to lead wire from the side, it may occur crack and fragment at a part of pants legs.

Notes2 : In case of D2-05, Marking is Resistance and D2. (example) 5D2-05... [5D2]

Dimensions Version 1

Part No.	Dimensions [mm]					
	D	H	T	d	H0	lead wire
<input type="checkbox"/> D2-07 <input type="checkbox"/> <input type="checkbox"/>	max. 11.0	max. 13.0	max. 9.0	5.0±1.0	max. 16.0	(φ0.8)
<input type="checkbox"/> D2-10 <input type="checkbox"/> <input type="checkbox"/>	max. 13.0	max. 17.0			max. 19.5	
<input type="checkbox"/> D2-14 <input type="checkbox"/> <input type="checkbox"/>	max. 17.0	max. 21.0		7.5±1.0	max. 22.5	

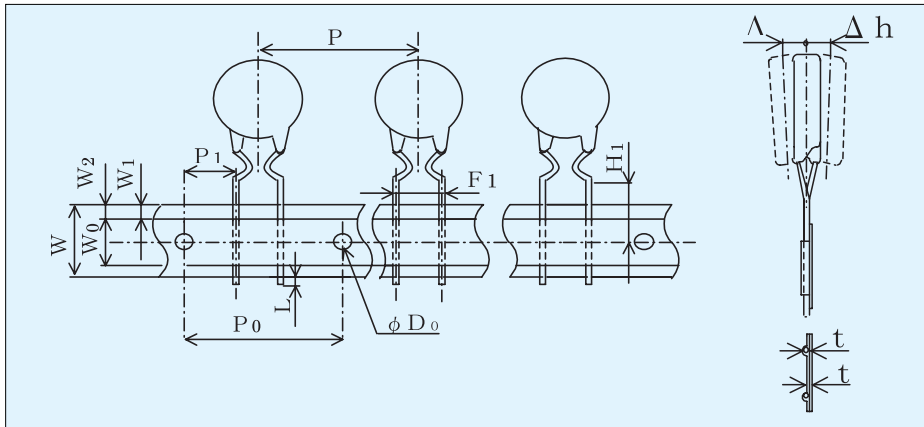
Dimensions Version 2

Part No.	Dimensions [mm]					
	D	H	T	d	H0	lead wire
<input type="checkbox"/> D2-05 <input type="checkbox"/> <input type="checkbox"/>	max 8.5	max 11.5	max. 7.0	5.0±1.0	max 15.5	(φ0.8)
<input type="checkbox"/> D2-08 <input type="checkbox"/> <input type="checkbox"/>	max 10.0	max 13.0			max 17.0	
<input type="checkbox"/> D2-11 <input type="checkbox"/> <input type="checkbox"/>	max 11.5	max 15.0		max. 8.0	7.5±1.0	
<input type="checkbox"/> D2-13 <input type="checkbox"/> <input type="checkbox"/>	max 14.5	max 18.0	max 21.5			
<input type="checkbox"/> D2-15 <input type="checkbox"/> <input type="checkbox"/>	max 16.5	max 20.0	10.0±1.0		max 23.0	(φ1.0)
<input type="checkbox"/> D2-18 <input type="checkbox"/> <input type="checkbox"/>	max 19.5	max 23.0			max 26.0	
<input type="checkbox"/> D2-22 <input type="checkbox"/> <input type="checkbox"/>	max 23.0	max 26.5	max. 8.5	max 29.5		



Taping

Clinch type taping : T3C



Taping qty

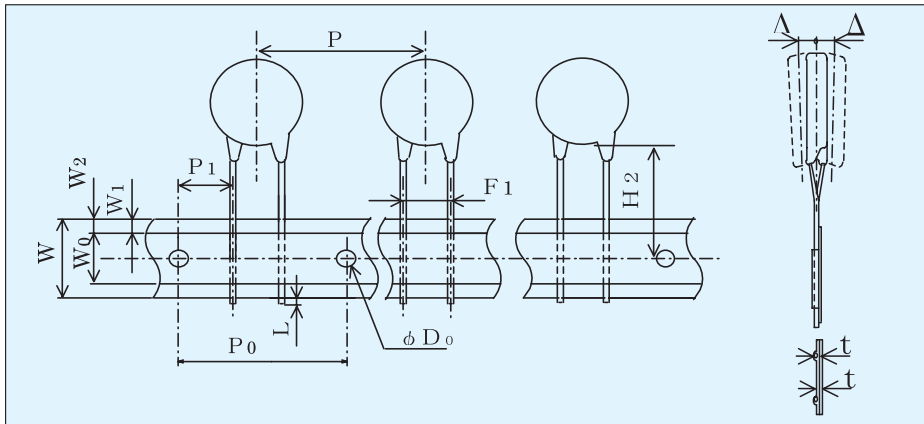
version 1

D2-07	1,000pcs/box
D2-10	
D2-14	(Part 500pcs/box)

version 2

D2-05	1,000pcs/box
D2-08	
D2-11	
D2-13	(Part 500pcs/box)

Straight type taping : T3D



Dimensions (Version 1)

Unit(mm)

	P	P0	P1	W	W0	W1	W2	H1
D2-07	15.0±1.0	15.0±3.0	5.0±0.7	17.5~19.0	min5.0	9.0±0.5	max3.0	16.0±0.5
D2-10	15.0±1.0							
D2-14	30.0±1.0		3.75±0.7					
	H2	L	F1	φD0	t	t1	Δh	
D2-07	19.0~21.5	max1.0	5.0±0.5	4.0±0.2	0.6±0.3	max1.5	0±2.0	
D2-10								
D2-14			7.5±0.5					

Dimensions (Version 2)

	P	P0	P1	W	W0	W1	W2	H1
D2-05	15.0±1.0	15.0±3.0	5.0±0.7	17.5~19.0	min5.0	9.0±0.5	max3.0	16.0±0.5
D2-08	15.0±1.0							
D2-11	15.0±1.0		3.75±0.7					
D2-13	30.0±1.0							
	H2	L	F1	φD0	t	t1	Δh	
D2-05	19.0~21.5	max1.0	5.0±0.5	4.0±0.2	0.6±0.3	max1.5	0±2.0	
D2-08								
D2-11			7.5±0.5					
D2-13								

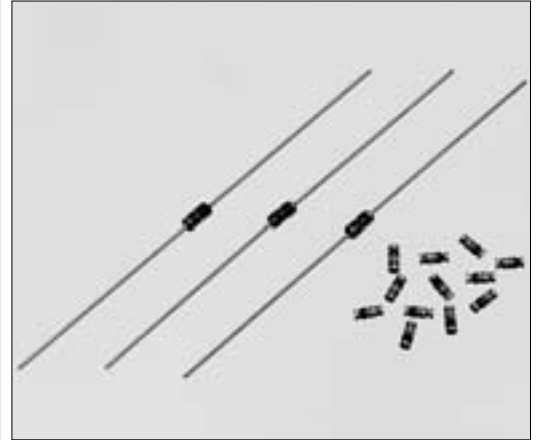
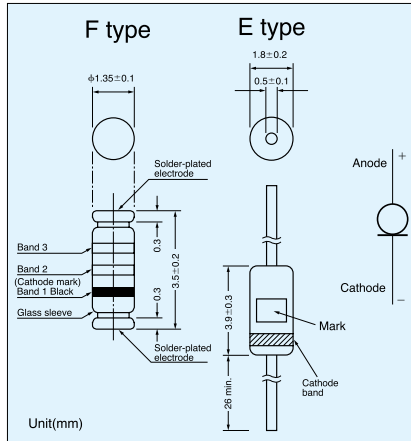
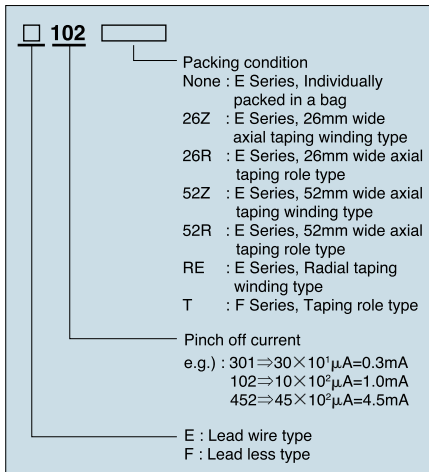
## CURRENT REGULATIVE DIODE

# CRD

CRD is a diode which supplies constant current to an electric circuit, even when power supply voltage fluctuations or load impedance fluctuations occur.

CRD is used for current stabilization and current limiting.

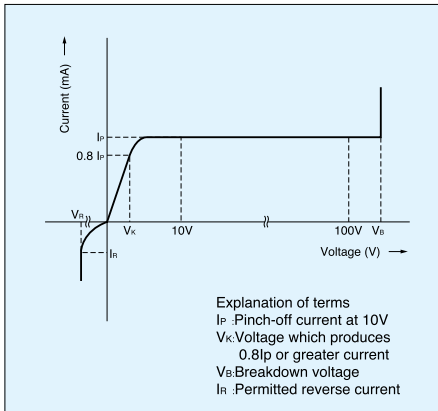
### Part number



### Specifications

Part No.	Pinch-off current*1	Limiting current*2	Dynamic impedance Zr(MΩ)	Limiting current ratio I100V/Ip*100V/Ip	Temperature coefficient (%/°C)	Indication				
						lead less	with lead	Test Voltage	Ip(mA)	Vk(V)
								Band 2	Band 3	Type
F-101L	E-101L	0.01~0.06	0.4	8.00	+2.10~+0.10	Light blue	White	1L		
F-101	E-101	0.05~0.21	0.5	6.00	+2.10~+0.10		Pink	01		
F-301	E-301	0.20~0.42	0.8	4.00	+0.40~-0.20	Yellow green	Orange	03		
F-501	E-501	0.40~0.63	1.1	2.00	+0.15~-0.25		Yellow green	05		
F-701	E-701	0.60~0.92	1.4	1.00	0.00~-0.32	Blue	Blue	07		
F-102	E-102	0.88~1.32	1.7	0.65	-0.10~-0.37		Pink	10		
F-152	E-152	1.28~1.72	2.0	0.40	-0.13~-0.40	Orange	Orange	15		
F-202	E-202	1.68~2.32	2.3	0.25	-0.15~-0.42		Yellow green	20		
F-272	E-272	2.28~3.10	2.7	0.15	-0.18~-0.45	Yellow green	Light blue	27		
F-352	E-352	3.00~4.10	3.2	0.10	-0.20~-0.47		Blue	35		
F-452	E-452	3.90~5.10	3.7	0.07	-0.22~-0.50	Purple	Purple	45		
F-562	E-562	5.00~6.50	4.5	0.04	-0.25~-0.53		White	56		
F-822	E-822	6.56~9.84	3.1	0.32	-0.25~-0.45	Yellow	Yellow	82		
F-103	E-103	8.00~12.0	3.5	0.17	-0.25~-0.45		Pink	10		
F-123	E-123	9.60~14.4	3.8	0.08	-0.25~-0.45	Orange	White	12		
F-153	E-153	12.0~18.0	4.3	0.03	-0.25~-0.45		Light blue	15		

### Basic characteristics



### Maximum ratings

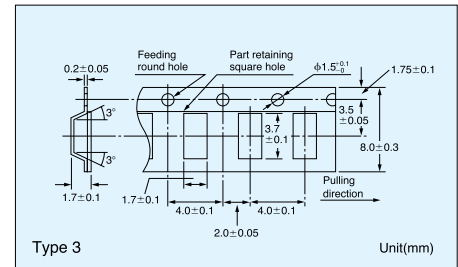
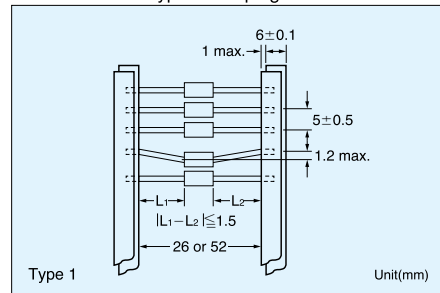
	E type	F type
Rating power	300mW	400mW
Thermal resistance	300°C/W	150°C/W
Reverse current	50mA	
Operating temp	-30°C~150°C	

### Maximum rating voltage

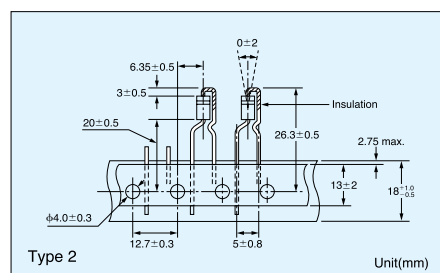
Part No.	Voltage	Part No.	Voltage
E101L~E-562	100V	F101L~F-562	100V
E-822	30	F-822	50
E-103		F-103	42
E-123		F-123	34
E-153	25	F-153	28

### Taping

There are three Types for taping.



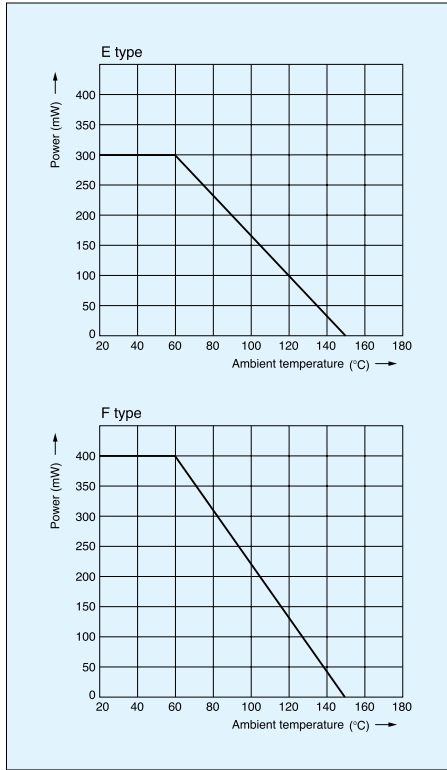
\*In principal elements are set with cathode side on the round hole side.



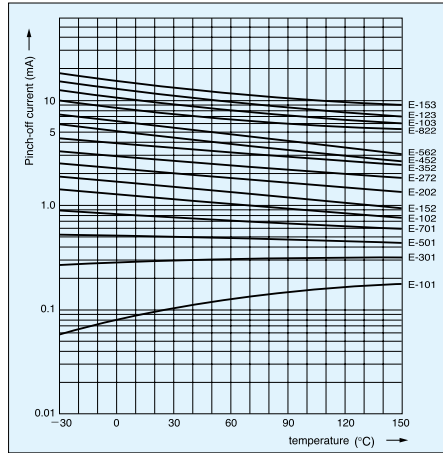
### Minimum taping quantity for

Type 1 Roll.....5000pcs  
 Box.....2500pcs  
 Type 2 4000pcs  
 Type 3 2500pcs

**Power derating**



**Pinch-off current Temperature**

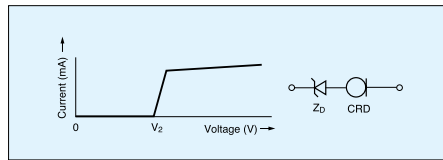


**CRD in parallel**

The use of CRD in parallel increases their current handling capabilities.

**Increasing the voltage range using a zener diode**

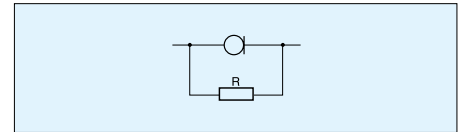
Connecting zener diodes in series with the line ensures that the current is constant in high-voltage area.



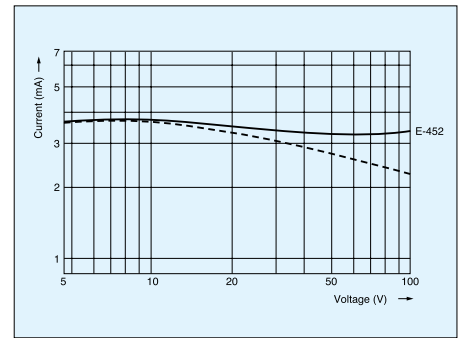
**The compensation of current reduction due to self heating**

Placing resistors in parallel with CRD can correct any current decrease when the applied voltage increases. The following values are typical for correction resistors.

E-102	1MΩ	E-352	82kΩ
E-152	390kΩ	E-452	56kΩ
E-202	240kΩ	E-562	39kΩ
E-272	120kΩ		



Compensative resistor is not necessary if the current value is less than 1 mA.



**Dynamic characteristics (saturation characteristics)**

