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NTC Thermistor Glossary

Zero Power Resistance(R_T)

The Zero Power Resistance is the DC Resistance value of a thermistor measured at a specified temperature with Zero electrical power dissipation. For purposes of measurement, the power dissipation in the thermistor so that any further decrease in power will result not more than ± 0.01% change in resistance.

Standard Reference Temperature

The standard reference temperature is the temperature of the thermistor body at specified (25°C ± 0.03°C , Unless otherwise specified).

Resistance-Temperature Characteristic

The zero-power resistance-temperature characteristics is the relationship between the zero-power resistance of a thermistor and its body temperature. This characteristic may be approximated by the classical thermistor formula:

$$R_T = R_{To} \times e^{B(1/T - 1/To)} \quad \text{..... (1)}$$

$$T_1 \leqq T \leqq T_2 \text{ or } T_1 \leqq T_0 \leqq T_2$$

B Constant

The B is the material constant of a thermistor although B increases slightly with increasing temperature in may be considered constant over limited temperature spans of approximately 30°C to 0°C, depending upon the thermistor material and the absolute temperature which the center of the span is located. The B of a thermistor may be determined from equations (1).

Unless otherwise specified, B is derived from measurements at 0°C and 50°C ∞ 25°C and 85°C ∞ 25°C and 125°C as follows:

$$B\ (0°C\text{-}50°C) = 4064.94 \log (R_{0°C} / R_{50°C})$$

$$B\ (25°C\text{-}85°C) = 4097.88 \log (R_{25°C} / R_{85°C}) \quad \text{.....(2)}$$

$$B\ (25°C\text{-}125°C) = 2733.37 \log (R_{25°C} / R_{125°C})$$

Temperature Coefficient of Resistance (α)

The zero-power temperature coefficient of resistance is the ratio at specified zero-power resistance with temperature to temperature (T), of the rate of change of the zero-power resistance of the thermistor:

$$\alpha(T) = (1 / R_T) \times (dR_T / d_T) \quad \text{.....(3)}$$

Dissipation Constant (δ)

The dissipation constant is the ratio, at a specified ambient temperature, of the power dissipated in a thermistor to the resultant change in its body temperature. Since the temperature rise in the thermistor due to dissipated power depends on the rate at which heat is transferred away from it, the dissipation constant depen ds on the method of mounting the unit as well as the medium or environment in which the unit is located. Unless otherwise specified, the dissipation constant is given for the thermistor in still air at an ambient temperature of 25°C, within a test chamber having a volume greater than 1,000 times the volume of the thermistor under test. Usually, the power dissipated is taken as the power required to raise the body temperature of the thermistor by 50°C (from 25°C ± 0.2°C to 75°C ± 0.2°C). The dissipation constant is generally specified as minimum value.

$$P = V_T \cdot I_T = \delta (T - T_A) \quad \text{Unit as: (mW /°C)} \quad \text{.....(4)}$$

Thermal Time Constant (τ)

The thermal time constant is the time required for a thermistor to change 63.2% of the difference between its initial and final body temperatures , when subjected to a step function change in constant depends upon the rate of heat transfer between the thermistor and its surroundings, the method of mounting the unit as well as the surrounding medium must be specified. The test conditions are usually the same as those used for obtaining the dissipation constant, and the tests can be performed sequentially. In practice, with the thermistor stabilized at 75°C (after the dissipation constant has been determined), the power is switched to its "zero-power" level and the time required for the thermistor to cool to 43.4°Cis its time constant.
Therefore, the thermistor's temperature from a given value (T_{a1}) to another value (T_{a2})is associated with the following relationship between thermal capacitance (C_{th}) and dissipation constant (δ) of the thermistor

Resolving this equation gives $C_{th}\, d\, T = \delta\ (T_{a1} - T_{a2})\ d\ t$ .....(5)

Where is the time; C_{th} / δ and T the temperature of the thermistor at that time.
The expression (τ) in equation (6) is termed the "thermal time constant". If t = τ , above equation (6) becomes:

$$T - T_{a2} = (T_{a1} - T_{a2}) \times e^{(t/\tau)} \quad \text{.....(6)}$$

therefore, τ can be determined by measuring the time required for the thermistor's intrinsic temperature to change by 63.2% . The table below shows the relationship between the time and the rate at which the thermistor's intrinsic temperature changes from T_{a1} to approximate to the temperature value T_{a2}. Table of thermal time

$$T = T_{a2} + (T_{a1} - T_{a2})\ e^{-1} = (T_{a2} - T_{a1})\ (1 - e^{-1}) + T_{a1} \quad \text{.....(7)}$$

constant:

t (sec.)	$\frac{T-T_{a1}}{T_{a2}-T_{a1}}$
τ	63.2%
2τ	86.5%
3τ	95.0%
4τ	98.2%
5τ	99.4%

Static Voltage-Current Characteristic

The static voltage - current characteristic is the relationship , at a specified ambient temperature, between the voltage across a thermistor and the current through it under conditions of thermal equilibrium. For very small currents, for which the power dissipation is low, this characteristic approximates the linear relationship given by Ohm's Law (V = IR). As self-heating of the thermistor is progressively increased the slope of the characteristic, dV / dI, continues to decrease until it becomes negative. In this region, the thermistor is said to exhibit a negative resistance characteristic.

Current-Time Characteristic

The current-time characteristic is the relationship, at a specified ambient temperature, between the current through a thermistor and the time elapsed from the application of a step function of voltage. Unless otherwise specified, the test temperature shall be 25℃±0.2℃ and the mounting and test conditions shall be as specified under dissipation constant.

Maximum Operating Temperature

The maximum operating temperature is the maximum body temperature at which the thermistor will operate an extended period of time with acceptable stability of its characteristics.
The temperature is the result of internal or external heating,, or both , and should exceed the maximum value specified.

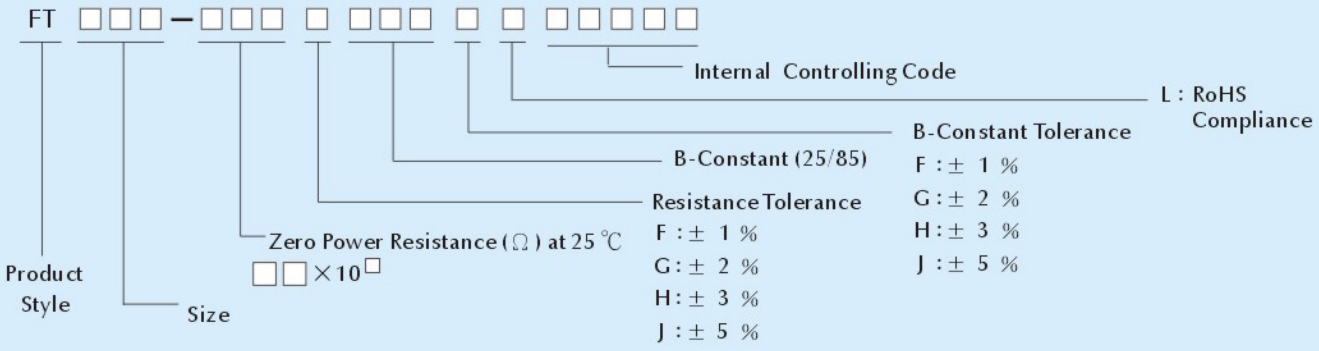
Maximum Power Rating

The maximum power rating of a thermistor is the maximum power which a thermistor will dissipate for an extended period of time with acceptable stability of its characteristics.

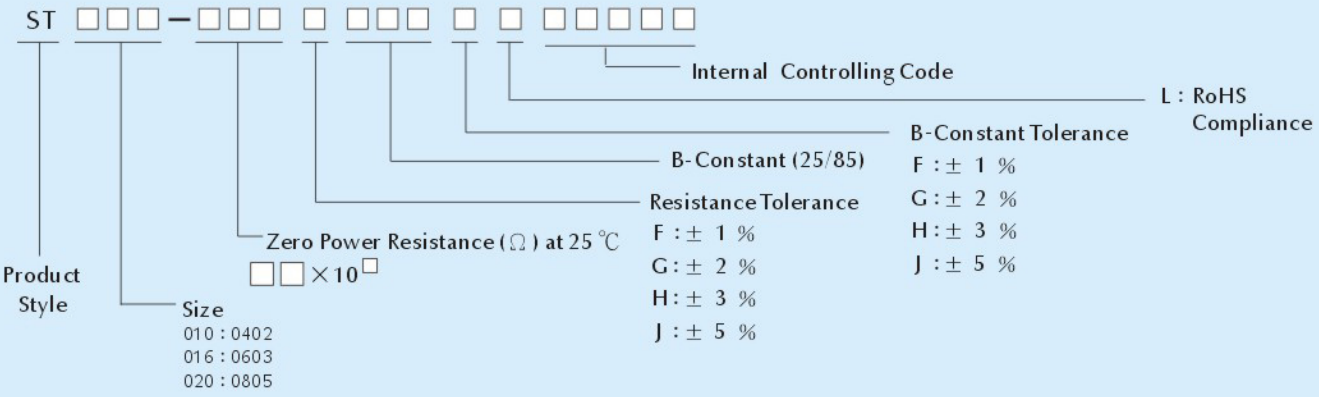
Ordering Code

NTC Thermistor

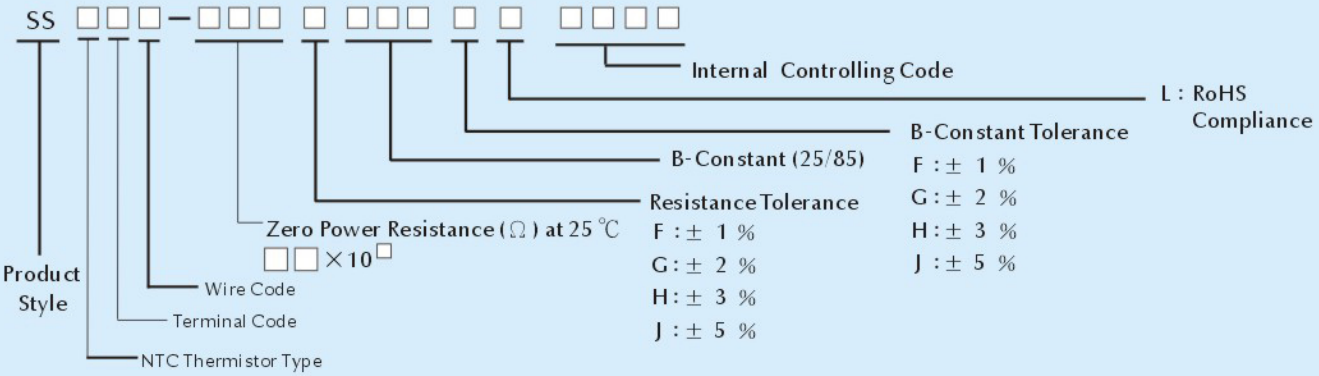
FT/TS/GD/GR Series



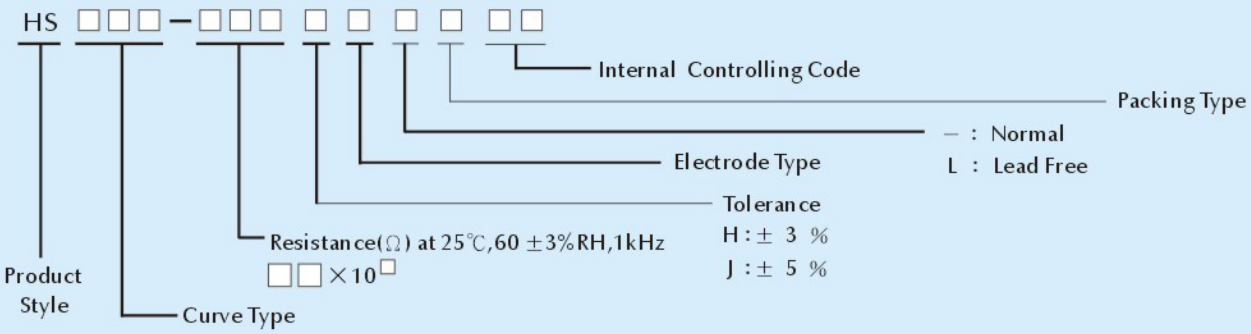
ST Series



Sensor Series

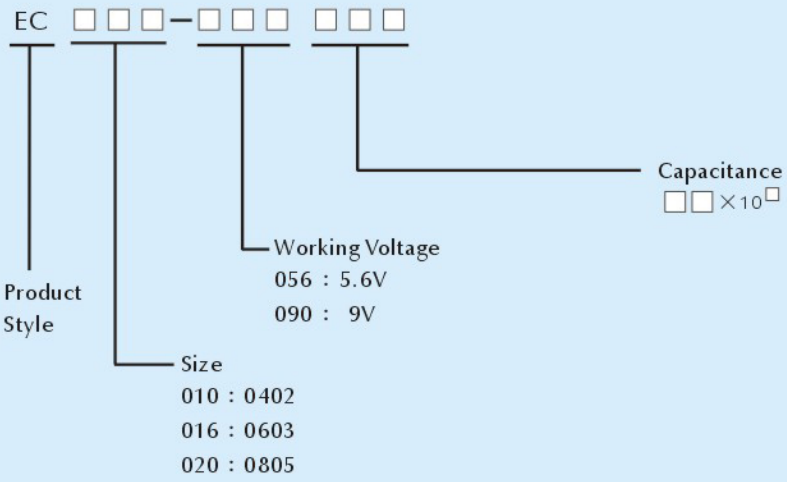


Humidity Sensor

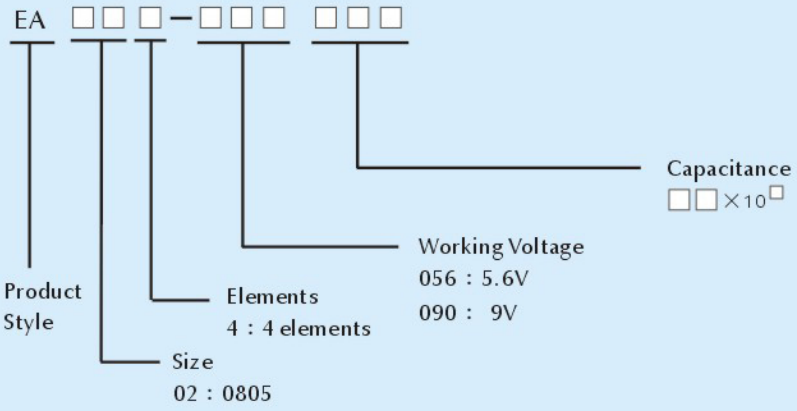


ESD Suppressor

EC Series

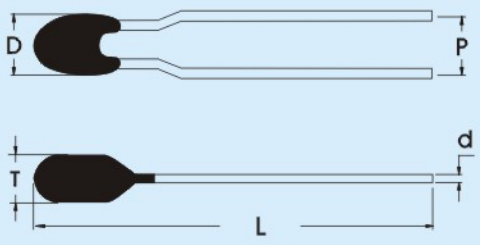


EA Series



NTC Thermistor Leaded Type

FT 3 ϕ Series



DIMENSIONS

Unit: mm

Chip ϕ	D max.	L	d nor.	P nor.	T max.
3.0	3.0	12 , 32	0.45 ± 0.05	2.54 ± 0.50	3.0

SPECIFICATIONS

Part No.	Zero Power Resistance at 25℃ (KΩ)	Tolerance of Resistance (±%)	B-Value (25/85) (K)	Tolerance of B-Value (±%)	Thermal Dissipation Constant (mW/℃)	Thermal Time Constant (sec)	Operating Temperature Range (℃)
FT003-202□397*	2	1,2,3,5,10	3970	1,2,3	≧3	≦12	-40～+120
FT003-302□372*	3	1,2,3,5,10	3720	1,2,3	≧3	≦12	-40～+120
FT003-302□397*	3	1,2,3,5,10	3970	1,2,3	≧3	≦12	-40～+120
FT003-472□372*	4.7	1,2,3,5,10	3720	1,2,3	≧3	≦12	-40～+120
FT003-502□352*	5	1,2,3,5,10	3520	1,2,3	≧3	≦12	-40～+120
FT003-502□397*	5	1,2,3,5,10	3970	1,2,3	≧3	≦12	-40～+120
FT003-682□397*	6.8	1,2,3,5,10	3970	1,2,3	≧3	≦12	-40～+120
FT003-103□343*	10	1,2,3,5,10	3435	1,2,3	≧3	≦12	-40～+120
FT003-103□397*	10	1,2,3,5,10	3977	1,2,3	≧3	≦12	-40～+120
FT003-103□414*	10	1,2,3,5,10	4145	1,2,3	≧3	≦12	-40～+120
FT003-153□414*	15	1,2,3,5,10	4145	1,2,3	≧3	≦12	-40～+120
FT003-203□397*	30	1,2,3,5,10	3970	1,2,3	≧3	≦12	-40～+120
FT003-203□420*	20	1,2,3,5,10	4200	1,2,3	≧3	≦12	-40～+120
FT003-303□420*	30	1,2,3,5,10	4200	1,2,3	≧3	≦12	-40～+120
FT003-473□399*	47	1,2,3,5,10	3990	1,2,3	≧3	≦12	-40～+120
FT003-503□399*	50	1,2,3,5,10	3990	1,2,3	≧3	≦12	-40～+120
FT003-683□440*	68	1,2,3,5,10	4400	1,2,3	≧3	≦12	-40～+120
FT003-104□439*	100	1,2,3,5,10	4390	1,2,3	≧3	≦12	-40～+120
FT003-154□440*	150	1,2,3,5,10	4400	1,2,3	≧3	≦12	-40～+120
FT003-204□440*	200	1,2,3,5,10	4400	1,2,3	≧3	≦12	-40～+120

Note1: □Tolerance of Resistance: F=± 1%, G=± 2%, H=± 3%, J=± 5% ,K=±10%

Note2: *Tolerance of B-Value F=± 1%, G=± 2%, H=± 3%

Note3: Please contact us for special spec.

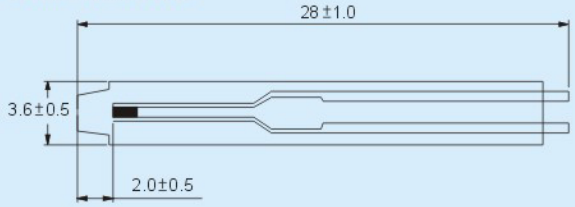
Reliability Test

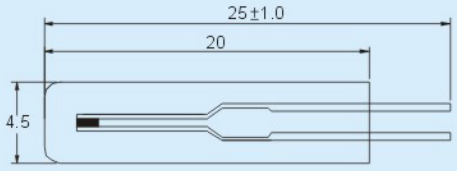
Item	Conditions	Specification
Solderability	After dipping the terminal of the lead wire to a depth of approximately 3mm (.118") from the body in a soldering bath of 230℃ for three seconds, the terminal shall be visually examined.	Almost all the surface should be covered with solder uniformly.
Resistance to soldering heat	The terminal shall be dipped into a soldering bath having a temperature of 260℃ to a point 3mm (.118") from the body of the unit and then be held there for three seconds. The change of R_{25} and mechanical damage shall be examined.	$\triangle R_{25} / R_{25} \leqq 3\%$ $\triangle B/B \leqq 3\%$ No outstanding damage
High temperature storage	The specimen shall be subjected to 125℃ for 1000 hours in a thermostatic bath without load and then stored at room temperature and humidity for one to two hours. Thereafter, the change of R_{25} shall be measured.	$\triangle R_{25} / R_{25} \leqq 3\%$ $\triangle B/B \leqq 3\%$
Humidity	The specimen shall be subjected to 45℃ 90 to 95% R.H. for 1000 hours without load and then stored at room temperature and humidity for one to two hours. Thereafter, the change of R_{25} shall be measured.	$\triangle R_{25} / R_{25} \leqq 3\%$ $\triangle B/B \leqq 3\%$
Thermal shock	The temperature cycle shown below shall be repeated five times and then stored at room temperature and humidity for one to two hours. The change of R_{25} as well as mechanical damage shall be examined. Step / Temperature / Period 1 / -40 / 30 min. 2 / +125 / 30 min.	$\triangle R_{25} / R_{25} \leqq 3\%$ $\triangle B/B \leqq 3\%$
Solder Iron Test	The inspected unit is tested by solder iron under 380±10℃ with 5±1 sec.	$\triangle R_{25} / R_{25} \leqq 3\%$ $\triangle B/B \leqq 3\%$

NTC Thermistor Insulation Film Type

TS Series

DIMENSIONS

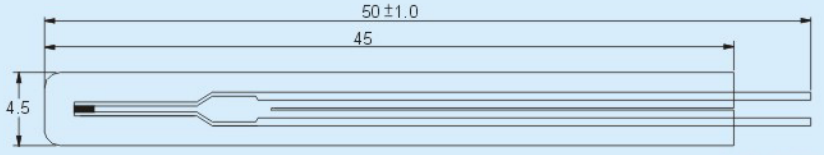




Unit: mm

SPECIFICATIONS

Part No.	Zero Power Resistance at 25℃ (KΩ)	Tolerance of Resistance (±%)	B-Value (25/85) (K)	Tolerance of B-Value (±%)	Thermal Dissipation Constant (mW/℃)	Thermal Time Constant (sec)	Operating Temperature Range (℃)
TS001-103□343*	10	1,2,3,5	3435	1,2,3	≧0.7	≦5.0	-40～+90
TS001-103□397*	10	1,2,3,5	3977	1,2,3	≧0.7	≦5.0	-40～+90
TS001-104□397*	100	1,2,3,5	3977	1,2,3	≧0.7	≦5.0	-40～+90



Unit: mm

SPECIFICATIONS

Part No.	Zero Power Resistance at 25℃ (KΩ)	Tolerance of Resistance (±%)	B-Value (25/85) (K)	Tolerance of B-Value (±%)	Thermal Dissipation Constant (mW/℃)	Thermal Time Constant (sec)	Operating Temperature Range (℃)
TS002-103□343*	10	1,2,3,5	3435	1,2,3	≧0.7	≦5.0	-40～+90

Note1: □Tolerance of Resistance: F=±1%, G=±2%, H=±3%, J=±5% ,K=±10%

Note2: *Tolerance of B-Value F=±1%, G=±2%, H=±3%

Note3: Please contact us for special spec.

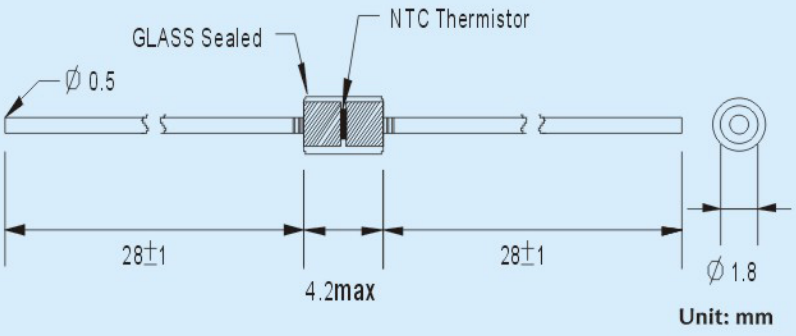
Reliability Test

Item	Conditions	Specification
High Temperature Test	Temp.=90 ±5℃ Period=1000±12hrs	$\triangle R_{25} / R_{25} \leqq \pm 3\%$ $\triangle B / B \leqq \pm 3\%$
Low Temperature Test	Temp.=-30 ±5℃ Period=1000±12hrs	$\triangle R_{25} / R_{25} \leqq \pm 3\%$ $\triangle B / B \leqq \pm 3\%$
Thermal Shock	The thermal shock condition shown below shall be repeated 10 times. Step / Temperature(℃) / Period(min) 1 / -30 ± 2 ℃ / 30 2 / Room Temp. / 5 3 / 90 ± 2 ℃ / 30 4 / Room Temp. / 5	$\triangle R_{25} / R_{25} \leqq \pm 3\%$ $\triangle B / B \leqq \pm 3\%$
Humidity	Temp.=40±2℃ Humidity = 95%RH Period=1000 hrs	$\triangle R_{25} / R_{25} \leqq \pm 3\%$ $\triangle B / B \leqq \pm 3\%$

Mechanical Test

Item	Conditions	Specification
Lead Pull Test	From lead wire axis direction,hang a load of 2.0Kgf and stay for 10 sec. between lead wire and the coating.	$\triangle R_{25} / R_{25} \leqq \pm 1\%$ $\triangle B / B \leqq \pm 1\%$
Drop Test	Drop from height 50 cm 3 times	$\triangle R_{25} / R_{25} \leqq \pm 1\%$ $\triangle B / B \leqq \pm 1\%$
Solderability heat Resistance	Terminals of lead wire are immersed in solder bath Solder:SN:97.5% AG:2.5% Solder Temperature:260±5℃ Dip time:10±1 sec.	$\triangle R_{25} / R_{25} \leqq \pm 3\%$ $\triangle B / B \leqq \pm 3\%$
Solderability	Terminals of lead wire are immersed in solder bath Solder:SN:97.5% AG:2.5% Solder Temperature:235±5℃ Dip time:4±1 sec.	More then 95% of terminal

DIMENSIONS



SPECIFICATIONS

Part No.	Zero Power Resistance at 25℃ (KΩ)	Tolerance of Resistance (±%)	B-Value (25/85) (K)	Tolerance of B-Value (±%)	Thermal Dissipation Constant (mW/℃)	Thermal Time Constant (sec)	Operating Temperature Range (℃)
GD002-202□342*	2	1,2,3,5,10	3420	1,2,3	≧3	≦12	-40～+250
GD002-502□348*	5	1,2,3,5,10	3480	1,2,3	≧3	≦12	-40～+250
GD002-103□327*	10	1,2,3,5,10	3270	1,2,3	≧3	≦12	-40～+250
GD002-103□397*	10	1,2,3,5,10	3976	1,2,3	≧3	≦12	-40～+250
GD002-103□405*	10	1,2,3,5,10	4050	1,2,3	≧3	≦12	-40～+250
GD002-203□399*	20	1,2,3,5,10	3992	1,2,3	≧3	≦12	-40～+250
GD002-503□399*	50	1,2,3,5,10	3992	1,2,3	≧3	≦12	-40～+250
GD002-104□399*	100	1,2,3,5,10	3992	1,2,3	≧3	≦12	-40～+250
GD002-204□350*	200	1,2,3,5,10	3500	1,2,3	≧3	≦12	-40～+250
GD002-234□424*	230	1,2,3,5,10	4240	1,2,3	≧3	≦12	-40～+250

Note1: □Tolerance of Resistance: F=±1%, G=±2%, H=±3%, J=±5% ,K=±10%

Note2: *Tolerance of B-Value F=±1%, G=±2%, H=±3%

Note3: Please contact us for special spec.

Reliability Test

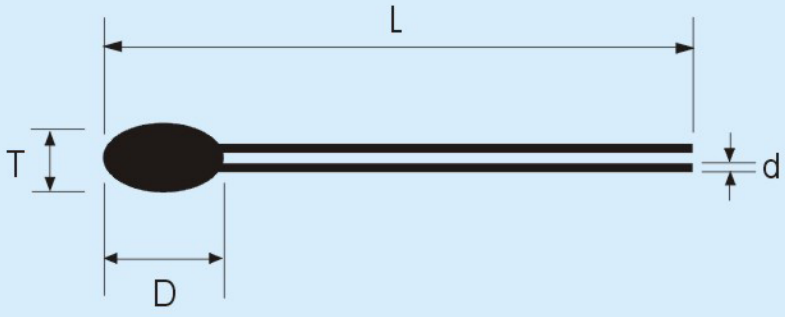
Item	Conditions	Specification
High temperature storage	The specimen shall be subjected to 200°C for 1000 hours in a thermostatic bath without load and then stored at room temperature and humidity for one to two hours. Thereafter, the change of R_{25} shall be measured.	△R25 / R25 ≦ 3 % △B / B ≦ 3 %
Humidity	The specimen shall be subjected to 45°C 90 to 95% R.H. for 1000 hours without load and then stored at room temperature and humidity for one to two hours. Thereafter, the change of R_{25} shall be measured.	△R25 / R25 ≦ 3 % △B / B ≦ 3 %
Thermal Shock	The temperature cycle shown below shall be repeated five times and then stored at room temperature and humidity for one to two hours. The change of R_{25} as well as mechanical damage shall be examined	△R25 / R25 ≦ 3 % △B / B ≦ 3 %

Step	Temperature	Period
1	- 30	30 min.
2	+90	30 min.

Mechanical Test

Item	Conditions	Specification
Lead Pull Test	The one lead shall fixed and then the static weight of 0.51kgf shall be applied to the other lead for 10±1 sec.	△ R_{25} / R_{25} ≦ ± 2 % △B / B ≦ ± 2 %

DIMENSIONS



Unit: mm

Mode No.	D	T	L	d
GR002	2.30±0.70	1.25±0.25	65±5.0	0.2
GR003	4.10±0.50	2.10±0.20	65±2.0	0.3

SPECIFICATIONS

Part No.	Zero Power Resistance at 25℃ (KΩ)	Tolerance of Resistance (±%)	B-Value (25/85) (K)	Tolerance of B-Value (±%)	Thermal Dissipation Constant (mW/℃)	Thermal Time Constant (sec)	Operating Temperature Range (℃)
GR002-202 □334*	2	1,2,3,5	3348	1,2,3	0.7~0.8	0.3~0.4	-30～+250
GR002-103 □397*	10	1,2,3,5	3977	1,2,3	0.7~0.8	0.3~0.4	-30～+250
GR003-502 □352*	5	1,2,3,5	3520	1,2,3	1.0~1.5	10~15	-30～+250
GR003-103 □327*	10	1,2,3,5	3270	1,2,3	1.0~1.5	10~15	-30～+250
GR003-103 □348*	10	1,2,3,5	3480	1,2,3	1.0~1.5	10~15	-30～+250
GR003-103 □372*	10	1,2,3,5	3720	1,2,3	1.0~1.5	10~15	-30～+250
GR003-103 □397*	10	1,2,3,5	3970	1,2,3	1.0~1.5	10~15	-30～+250
GR003-203 □397*	20	1,2,3,5	3970	1,2,3	1.0~1.5	10~15	-30～+250
GR003-303 □397*	30	1,2,3,5	3970	1,2,3	1.0~1.5	10~15	-30～+250
GR003-4B3 □399*	49.12	1,2,3,5	3990	1,2,3	1.0~1.5	10~15	-30～+250
GR003-104 □406*	100	1,2,3,5	4066	1,2,3	1.0~1.5	10~15	-30～+250
GR003-234 □425*	230	1,2,3,5	4250	1,2,3	1.0~1.5	10~15	-30～+250

Note1: □Tolerance of Resistance: F=±1%, G=±2%, H=±3%, J=±5% ,K=±10%

Note2: *Tolerance of B-Value F=±1%, G=±2%, H=±3%

Note3: Please contact us for special spec.

Reliability Test

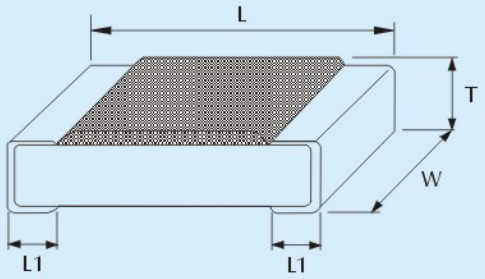
Item	Conditions	Specification
High Temperature Test	Temp.= 200±5℃ Period=1000±12hrs	$\triangle R_{25}$ / $R_{25} \leqq \pm 3\%$ $\triangle B / B \leqq \pm 3\%$
Low Temperature Test	Temp.=-30 ±5℃ Period=1000±12hrs	$\triangle R_{25}$ / $R_{25} \leqq \pm 3\%$ $\triangle B / B \leqq \pm 3\%$
Thermal Shock	The thermal shock condition shown below shall be repead 10 times.	$\triangle R_{25}$ / $R_{25} \leqq \pm 3\%$ $\triangle B / B \leqq \pm 3\%$
Humidity	Temp.=60 ±2℃ Humidity =95 % RH Period=1000±12hrs	$\triangle R_{25}$ / $R_{25} \leqq \pm 3\%$ $\triangle B / B \leqq \pm 3\%$

Step	Temperature(℃)	Period(mins)
1	-30 ± 2 ℃	30
2	Room Temp.	5
3	200 ± 2 ℃	30
4	Room Temp.	5

Mechanical Test

Item	Conditions	Specification
Lead Pull Test	From lead wire axis direction,hang a load of 0.51Kgf and stay for 30 sec. between lead wire and the coating.	$\triangle R_{25} / R_{25} \leqq \pm 1\%$ $\triangle B / B \leqq \pm 1\%$

DIMENSIONS



Unit: mm

Mode No.	Size	L	W	T	L1
ST010	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.25±0.10
ST016	0603	1.60±0.15	0.80±0.15	0.50±0.10	0.30±0.20
ST020	0805	2.00±0.20	1.25±0.20	0.55±0.10	0.40±0.20

SPECIFICATIONS

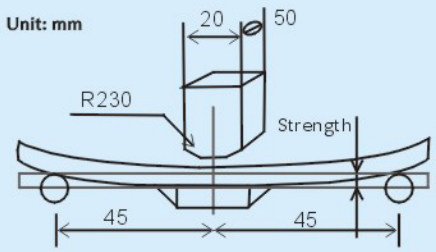
Part No.	Zero Power Resistance at 25℃ (KΩ)	Tolerance of Resistance (±%)	B-Value (25/85) (K)	Tolerance of B-Value (±%)	Thermal Dissipation Constant (mW/℃)	Thermal Time Constant (sec)	Operating Temperature Range (℃)
ST010-502 □350*	5	1,2,3,5,10	3500	1,2,3,5	≦1.5	≦5	-40～+125
ST010-103 □343*	10	1,2,3,5,10	3435	1,2,3,5	≦1.5	≦5	-40～+125
ST010-103 □410*	10	1,2,3,5,10	4100	1,2,3,5	≦1.5	≦5	-40～+125
ST010-473 □410*	47	1,2,3,5,10	4100	1,2,3,5	≦1.5	≦5	-40～+125
ST010-683 □410*	68	1,2,3,5,10	4100	1,2,3,5	≦1.5	≦5	-40～+125
ST010-104 □410*	100	1,2,3,5,10	4100	1,2,3,5	≦1.5	≦5	-40～+125
ST016-502 □350*	5	1,2,3,5,10	3500	1,2,3,5	≦1.5	≦5	-40～+125
ST016-103 □343*	10	1,2,3,5,10	3435	1,2,3,5	≦1.5	≦5	-40～+125
ST016-103 □410*	10	1,2,3,5,10	4100	1,2,3,5	≦1.5	≦5	-40～+125
ST016-473 □410*	47	1,2,3,5,10	4100	1,2,3,5	≦1.5	≦5	-40～+125
ST016-503 □395*	50	1,2,3,5,10	3950	1,2,3,5	≦1.5	≦5	-40～+125
ST016-683 □410*	68	1,2,3,5,10	4100	1,2,3,5	≦1.5	≦5	-40～+125
ST016-104 □410*	100	1,2,3,5,10	4100	1,2,3,5	≦1.5	≦5	-40～+125
ST016-154 □410*	150	1,2,3,5,10	4100	1,2,3,5	≦1.5	≦5	-40～+125
ST016-204 □410*	200	1,2,3,5,10	4100	1,2,3,5	≦1.5	≦5	-40～+125
ST020-202 □350*	2	1,2,3,5,10	3500	1,2,3,5	≦1.5	≦5	-40～+125
ST020-502 □350*	5	1,2,3,5,10	3500	1,2,3,5	≦1.5	≦5	-40～+125
ST020-103 □343*	10	1,2,3,5,10	3435	1,2,3,5	≦1.5	≦5	-40～+125
ST020-103 □410*	10	1,2,3,5,10	4100	1,2,3,5	≦1.5	≦5	-40～+125
ST020-473 □410*	47	1,2,3,5,10	4100	1,2,3,5	≦1.5	≦5	-40～+125
ST020-503 □395*	50	1,2,3,5,10	3950	1,2,3,5	≦1.5	≦5	-40～+125
ST020-683 □410*	68	1,2,3,5,10	4100	1,2,3,5	≦1.5	≦5	-40～+125
ST020-104 □410*	100	1,2,3,5,10	4100	1,2,3,5	≦1.5	≦5	-40～+125
ST020-154 □410*	150	1,2,3,5,10	4100	1,2,3,5	≦1.5	≦5	-40～+125
ST020-204 □410*	200	1,2,3,5,10	4100	1,2,3,5	≦1.5	≦5	-40～+125

Note1: □**Tolerance of Resistance: F=±1%, G=±2%, H=±3%, J=±5%** ,K=±10%

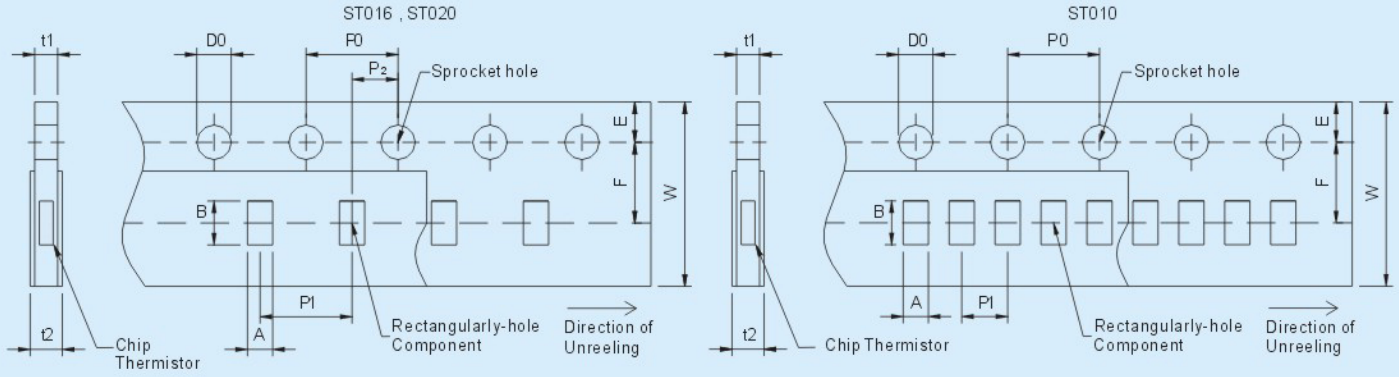
Note2: *Tolerance of B-Value **F=±1%, G=±2%, H=±3%, J=±5%**

Note3: Please contact us for special spec.

Reliability Test

Item	Conditions	Specification
Stability	(125±3℃) × (1000+48)hrs	$\triangle R_{25} / R_{25} \leqq \pm 3\%$ $\triangle B/B \leqq \pm 2\%$
Low temperature	(-40±3℃) × (1000+48)hrs	$\triangle R_{25} / R_{25} \leqq \pm 3\%$ $\triangle B/B \leqq \pm 2\%$
Humidity	85±2℃, 85±5%RH × (1000+48) hrs	$\triangle R_{25} / R_{25} \leqq \pm 3\%$ $\triangle B/B \leqq \pm 2\%$
Thermal Shock Test	-40±3℃ ×30(min)→25±3℃ × 3(min) 125±3℃ × 30(min)→25±3℃ × 3(min) 100cycles	$\triangle R_{25} / R_{25} \leqq \pm 3\%$ $\triangle B/B \leqq \pm 2\%$
Load humidity	85±2℃, 85±5%RH, rated power 90 mins on, 30 mins off for (1000+48) hrs	$\triangle R_{25} / R_{25} \leqq \pm 3\%$ $\triangle B/B \leqq \pm 2\%$
Resistance to Soldering Heat Test	Soldering temperature : 260±5℃ Duration of immersion : 10 ±1 sec.	$\triangle R_{25} / R_{25} \leqq \pm 3\%$ No mechanical damage
Solderability Test	Soldering temperature : 245±5℃ Duration of immersion : 3±0.5 sec. Preparation : Immersion in flux for 1~2 secs. Flux : rosin : methanol = 25wt% : 75wt% Solder : Sn-3.0Ag-0.5Cu	At least 95% of the electrode on each end of the ceramic chip must be covered with new solder
Solder Iron Test	The inspected unit is tested by solder iron under 380±10℃ with 5±1 sec.	$\triangle R_{25} / R_{25} \leqq \pm 3\%$ $\triangle B/B \leqq \pm 3\%$
Substrate bending	Applied bending : 5mm Holding time : 10±1 secs Substrate : glass fiber base epoxy resin t=1.6mm 	$\triangle R_{25} / R_{25} \leqq \pm 3\%$ No mechanical damage
Vibration	Applied frequency : 10~55~10Hz / 1min Amplitude : 1.5mm in each X,Y,Z directions Applied time : 2 hrs in each X,Y,Z directions	$\triangle R_{25} / R_{25} \leqq \pm 3\%$ No mechanical damage

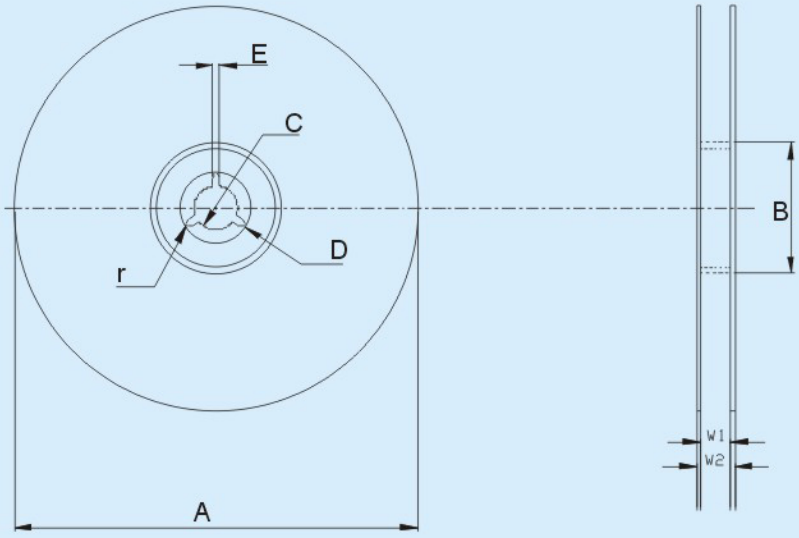
Dimensions of Taping



Unit: mm

Size	A	B	W	F	E	P_1	P_2	P_0	D_0	t_1	t_2
0402	0.65±0.1	1.15±0.1	8.0±0.2	3.5±0.05	1.75±0.1	2.0±0.05	2.0±0.05	4.0±0.10	1.55±0.05	0.5max.	1.0max.
0603	1.10±0.2	1.9±0.2				4.0±0.1				1.0 max.	1.4 max.
0805	1.65±0.2	2.4±0.2									

Dimensions of Reel

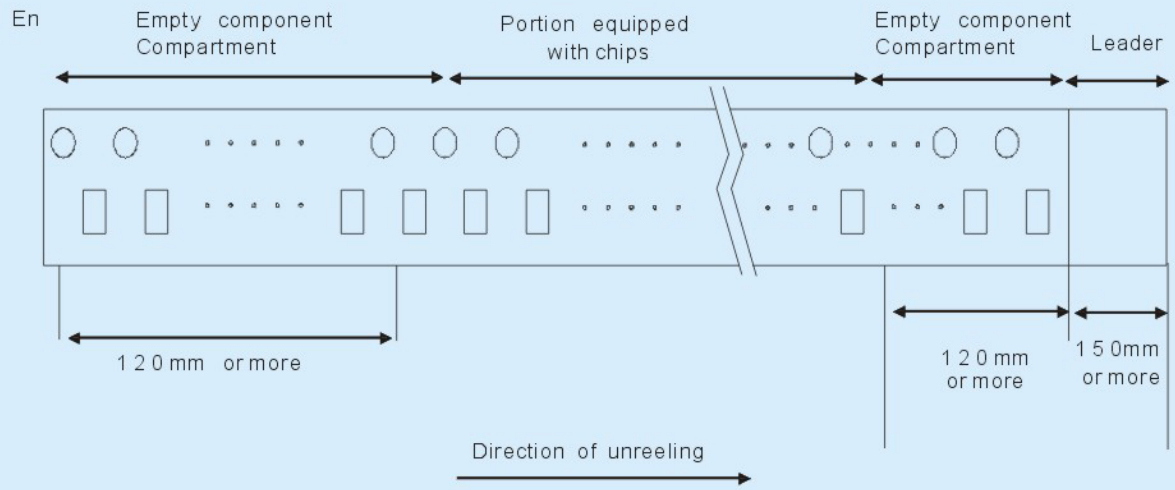


Material:Plastic

Unit: mm

Symbol	A	B	C	D	E	W_1	W_2	r
Dimension	ϕ180 +0 -3	ϕ60 +1.0 -0.0	ϕ 13±0.2	ϕ 21±0.8	2.0±0.5	9.0±0.3	11.4±1.0	0.5

Structure of Taping



Package quantity

Size	pcs / reel
0402	10000
0603	5000
0805	5000

NTC Thermistor Sensor Type

SSA Series

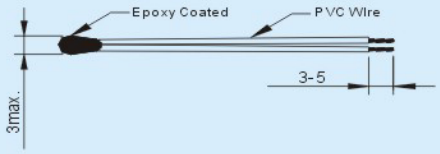
FEATURES

- High Stability, High Accuracy, and High Reliability
- Resistance Values from 1KΩto 200KΩ ±1～5%
- B-Constant 25/85 from 3000 to 4500K ±1～3%

SSA SERIES

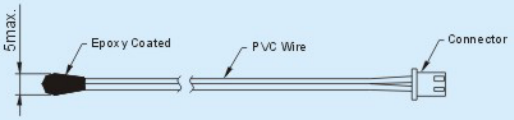
Unit:mm

Type I (Epoxy Coating) — Battery Charger Sensor



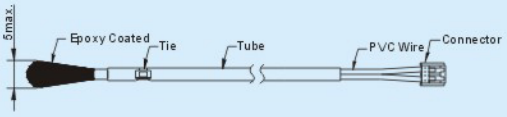
Operating Temp. Range	-40 to +100℃
Dissipation Constant	Approx. 2 m W/℃ (still air)
Response Time	Approx. 10 sec. (thermal bath)

Type II (Epoxy Coating) — Air Conditioning Sensor / Quick Temperature Response



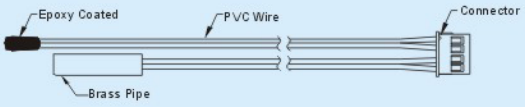
Operating Temp. Range	-40 to +100℃
Dissipation Constant	Approx. 2 m W/℃ (still air)
Response Time	Approx. 10 sec. (thermal bath)

Type III (Epoxy Coating) — Air Conditioning Sensor



Operating Temp. Range	-40 to +100℃
Dissipation Constant	Approx. 2 m W/℃ (still air)
Response Time	Approx. 10 sec. (thermal bath)

Type IV (Epoxy Coating & Copper pipe) — Air Conditioning Sensor



Operating Temp. Range	-40 to +100℃
Dissipation Constant	Approx. 2.5 m W/℃ (still air)
Response Time	Approx. 34 sec. (thermal bath)

Note1: The connector is optional.

Note2: The lead wire length can be customized.

Note3: Please contact us for special spec.

SSI Series

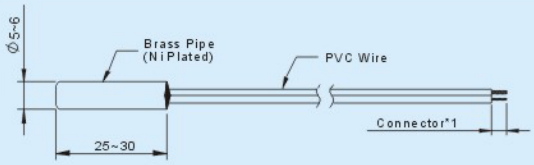
FEATURES

- High Stability, High Accuracy, and High Reliability
- Resistance Values from 1KΩ to 200KΩ ±1~5%
- B-Constant 25/85 from 3000 to 4500K ±1~3%

SSI SERIES

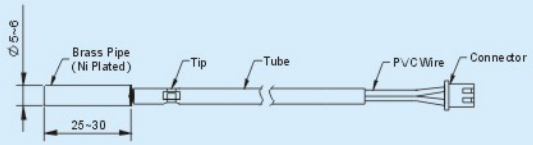
Unit:mm

Type I (Copper Pipe) — Heat Exchanger / Air Conditioning Sensor



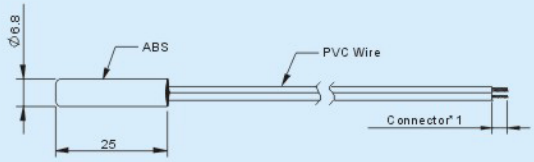
Operating Temp. Range	-40 to +105℃
Dissipation Constant	Approx. 2.5 mW/℃ (still air)
Response Time	Approx. 34 sec.(thermal bath)

Type II (Copper Pipe) — Heat Exchanger / Air Conditioning Sensor



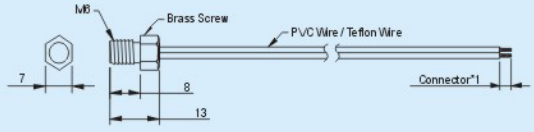
Operating Temp. Range	-40 to +105℃
Dissipation Constant	Approx. 2.5 mW/℃ (still air)
Response Time	Approx. 34 sec.(thermal bath)

Type III (ABS Pipe) — Refrigerator Sensor



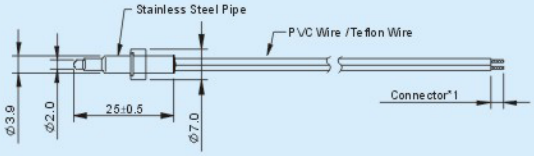
Operating Temp. Range	-40 to +100℃
Dissipation Constant	Approx. 2.5 mW/℃ (still air)
Response Time	Approx. 40 sec.(thermal bath)

Type IV (Brass Screw) — Heater Temperature Sensor



Operating Temp. Range	-40 to +200℃
Dissipation Constant	Approx. 3 mW/℃ (still air)
Response Time	Approx. 16 sec.(thermal bath)

Type V (Stainless Steel Pipe) — Hot Water Heater Temperature Sensor / Quick Temperature Response



Operating Temp. Range	-40 to +125℃
Dissipation Constant	Approx. 4 mW/℃ (still air)
Response Time	Approx. 10 sec.(thermal bath)

Note1: The connector is optional.

Note2: The lead wire length can be customized.

Note3: Please contact us for special spec.

NTC Thermistor Sensor Type

SSS Series

FEATURES

High Stability, High Accuracy, and High Reliability

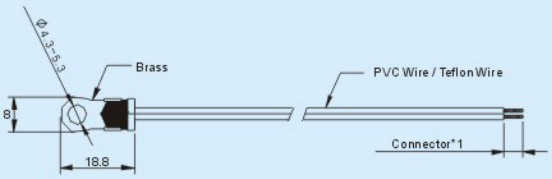
Resistance Values from 1KΩ to 200KΩ ±1~5%

B-Constant 25/85 from 3000 to 4500K±1~3%

SSS SERIES

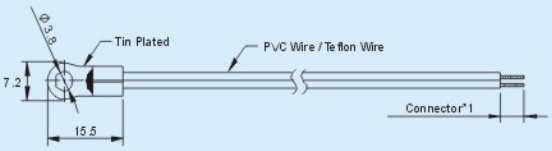
Unit:mm

Type I (Electrical terminal) — Surface Temperature Sensor



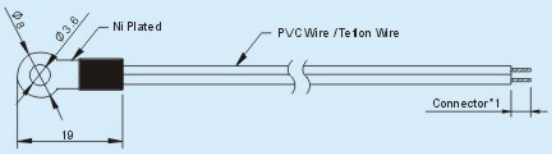
Operating Temp. Range	-40 to +125℃
Dissipation Constant	Approx. 4 mW/℃ (still air)
Response Time	Approx. 17 sec. (thermal bath)

Type II (Electrical terminal) — Surface Temperature Sensor



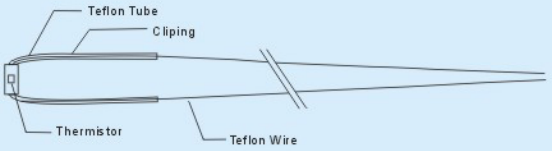
Operating Temp. Range	-40 to +125℃
Dissipation Constant	Approx. 2.5 mW/℃ (still air)
Response Time	Approx. 17 sec. (thermal bath)

Type III (Electrical terminal) — Surface Temperature Sensor



Operating Temp. Range	-40 to +125℃
Dissipation Constant	Approx. 2.5 mW/℃ (still air)
Response Time	Approx. 17 sec. (thermal bath)

Type IV — Home Baker / Microwave Oven Sensor



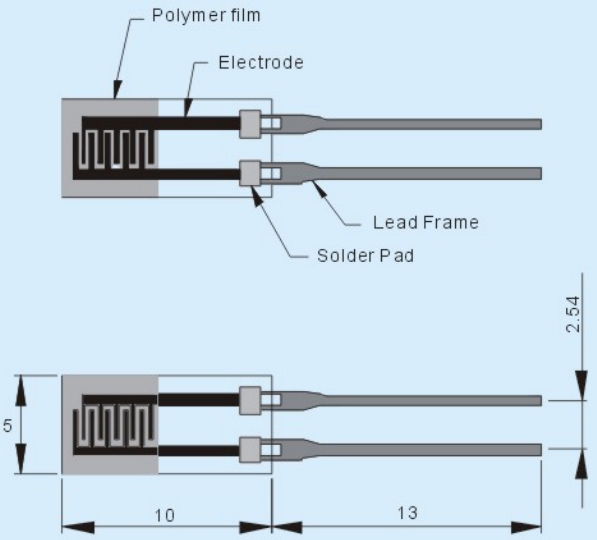
Operating Temp. Range	-20 to +180℃
Dissipation Constant	Approx. 3 mW/℃ (still air)
Response Time	Approx. 12 sec. (thermal bath)

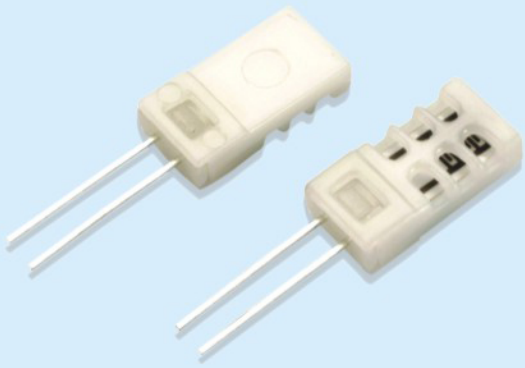
Note1: The connector is optional.

Note2: The lead wire length can be customized.

Note3: Please contact us for special spec.

DIMENSIONS





Unit: mm

Part No.	HS001-233H	HS001-313H
Rated Voltage	5VAC Max. (Sine wave)	5VAC Max. (Sine wave)
Rated Power	5mW. AC (MAX)	5mW. AC (MAX)
Operating Temperature Range	-20 to 70℃	-20 to 70℃
Operating Humidity Range	95%RH or Less	95%RH or Less
Operating Frequency	100Hz ~ 10kHz	100Hz ~ 10kHz
Resistance Value	23 Kohm (at 25℃,60 ±3%RH,1kHz)	31 Kohm (at 25℃,60 ±3%RH,1kHz)
Storage Temperature Range	-40 ~ 85℃	-40 ~ 85℃
Storage Humidity Range	95%RH or less	**95%RH or less**
Hysteresis	≤±2%RH	≤±2%RH
Response Time	60 sec (30%RH⇔90%RH)	≤60 sec (30%RH⇔90%RH)

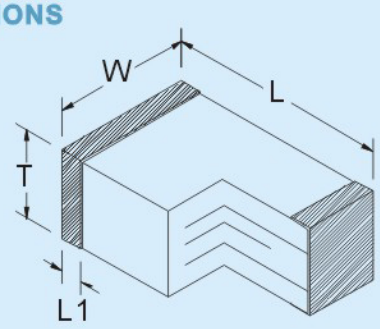
Reliability Test

Item	Conditions	Specification
High Temperature Test	85℃ for 1000 hours	No significant damage. ≦ ± 5% RH
Low Temperature Test	-30℃ for 1000 hours	No significant damage. ≦ ± 5% RH
High Temperature & High Humidity Test	60℃,90%RH for 1000 hours	No significant damage. ≦ ± 5% RH
Thermal Shock Test	-30℃,30min ⇔85℃,30min for 100cycles	No significant damage. ≦ ± 5% RH
Humidity Cycle	25℃,30%RH ⇔25℃,90%RH for 500cycles	No significant damage. ≦ ± 5% RH

Machanical Test

Item	Conditions	Specification
Lead Bend Strength	The humidity sensor is kept in the vertical direction and the leads should be bent 1 cycle in the direction of 90 degree of load applied 250g.	No significant damage. ≦ ± 5% RH
Lead Strength Test	A load of 1kg is applied to each lead in the vertical plane against the surface of the sensor for 60 ±1 seconds.	No significant damage. ≦ ± 5% RH
Drop Test	Humidity sensor is dropped on to a wooden surface from a height of 1 m three times.	No significant damage. ≦ ± 5% RH

DIMENSIONS



Unit: mm

Mode No.	Size	L	W	T	L1
EC010	0402	1.00±0.10	0.50±0.10	0.50±0.10	0.25±0.10
EC016	0603	1.60±0.10	0.80±0.10	0.80±0.10	0.30±0.10
EC020	0805	2.00±0.15	1.25±0.15	0.80±0.15	0.20±0.10

SPECIFICATIONS

Part No.	Max Warking Voltage (<25μA)	Breakdown Voltage (@1mA)	Max Clamping Voltage (8/20μs)		Max Peak Current (8/20μs)	Max Transient Energy (10/1000μs)	Capacitance (@1KHz)
Symbol	Vw(V)	VB(V)	Vc(V)	Ip(A)	Ip(A)	ET(J)	C(pF)
EC010-056100	5.6	10.1~15.0	30	1	2	0.02	10
EC010-056300	5.6	10.1~15.0	30	1	2	0.02	30
EC010-056500	5.6	10.1~15.0	25	1	5	0.02	50
EC010-056101	5.6	10.1~15.0	25	1	10	0.05	100
EC010-056201	5.6	10.1~15.0	25	1	20	0.05	200
EC010-056371	5.6	6.7~10.1	18	1	20	0.05	370
EC010-056481	5.6	6.7~10.1	18	1	20	0.05	480
EC010-090300	9.0	16.8~22.2	38	1	5	0.02	30
EC010-090201	9.0	10.1~15.0	25	1	20	0.05	200
EC010-140300	14.0	16.8~22.2	38	1	5	0.02	30
EC010-140500	14.0	21.5~28.5	42	1	5	0.02	50
EC010-140101	14.0	16.8~22.2	38	1	10	0.02	100
EC010-180020	18.0	100~140	300	7	1	0.005	≤2
EC010-180070	18.0	30.9~40.9	62	1	2	0.005	7
EC010-180100	18.0	30.9~40.9	62	1	2	0.005	10
EC010-180150	18.0	30.9~40.9	62	1	2	0.005	15
EC010-180500	18.0	21.5~28.5	42	1	5	0.02	50
EC010-180900	18.0	21.5~28.5	42	1	10	0.05	90
EC010-180101	18.0	21.5~28.5	42	1	10	0.05	100
EC010-260100	26.0	30.9~40.9	62	1	2	0.005	10

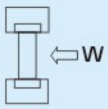
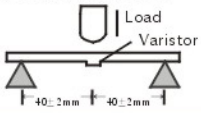
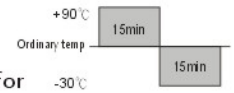
Note: Please contact us for special spec.

SPECIFICATIONS

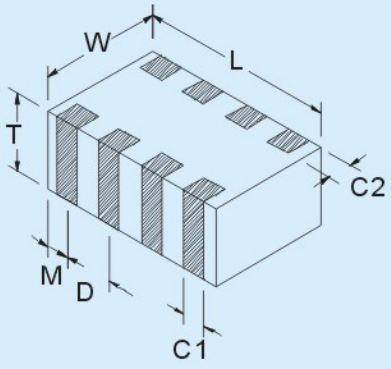
Part No.	Max Warking Voltage (<25μA)	Breakdown Voltage (@1mA)	Max Clamping Voltage (8/20μs)		Max Peak Current (8/20μs)	Max Transient Energy (10/1000μs)	Capacitance (@1KHz)
Symbol	Vw(V)	V_B(V)	Vc(V)	Ip(A)	Ip(A)	E_T(J)	C(pF)
EC016-056300	5.6	10.1~15.0	30	1	2	0.005	30
EC016-056101	5.6	10.1~15.0	25	1	20	0.05	100
EC016-056401	5.6	6.7~10.1	18	2	30	0.10	400
EC016-056481	5.6	6.7~10.1	18	2	30	0.10	480
EC016-120100	12.0	21.0~28.0	60	1	2	0.10	10
EC016-140351	14.0	16.8~22.2	38	2	30	0.10	350
EC016-140451	14.0	16.8~22.2	38	2	30	0.10	450
EC016-180050	18.0	30.9~40.9	62	1	2	0.005	5
EC016-180100	18.0	30.9~40.9	62	1	2	0.005	10
EC016-180750	18.0	21.5~28.5	46	1	15	0.05	75
EC016-180101	18.0	21.5~28.5	46	1	15	0.05	100
EC016-180181	18.0	30.9~40.9	62	2	30	0.10	180
EC016-180231	18.0	21.5~28.5	46	2	30	0.10	230
EC016-300101	30.0	35.7~47.3	67	2	25	0.10	100
EC020-120521	12.0	14.0~18.3	30	2	40	0.10	520
EC020-260161	26.0	30.9~40.9	62	2	30	0.10	160
EC020-300201	30.0	35.7~47.3	67	2	40	0.10	200

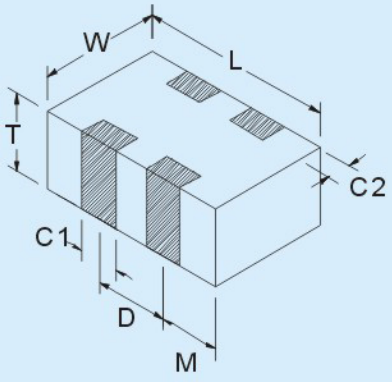
Note: Please contact us for special spec.

Reliability Test

Item	Test Method	Criteria for judging
Resistance to Soldering heat	Soldering temperature : 260±5℃ Duration of immersion : 10±1sec Preheating : 150℃,1min	Visual : No mechanical damage. △VB/VB ≦10 %
Solderability Test	Soldering temperature : 235±5℃ Duration of immersion : 20~40sec Preheating : 150~180℃,90~150℃	At least 75% of the electrode must be covered with new solder.
Adhesion	The Force W is applied to DUT 	Visual : No mechanical damage. 0805 : over 2.0 kgf 0603 : over 1.0 kgf 0402 : over 0.7 kgf
Resistance to Flexure of Substrate	The middle part of substrate shall. Successively,be pressurized by means of the pressurizing rod at a rate of about 1mm/sec. Maintenance time : 5sec. Bending distane : 1mm 	Visual : No mechanical damage.
Dry Heat Test	Test temperature : 125±2℃ Test duration : 1000+48hrs. After completion of the test,leave the sample under the standard conditions for 24±2hrs.	Visual : No mechanical damage. △VB/VB ≦10 %
Cold Test	Test temperature : -30±2℃ Test duration : 1000+48hrs. After completion of the test,leave the sample under the standard conditions for 24±2hrs.	Visual : No mechanical damage. △VB/VB ≦10 %
Damp Heat Test (Steady State)	Test temperature : 40±2℃ Test relative humidity : 90~95RH% Test duration : 56days+24hrs. After completion of the test,leave the sample under the standard conditions for 24±2hrs. (IEC60068-2-3)	Visual : No mechanical damage. △VB/VB ≦10 %
Thermal Shock Test	This cycle is repeated 50 times.After completion of the test,leave the sampie under standard condition for 24±2hrs. 	Visual : No mechanical damage. △VB/VB ≦10 %
ESD Test (Contact discharge)	Test Voltage : 8kV Type of discharge : direct contact discharge Number of test pulses : 20 times Polarity : +/- (IEC 61000-4-2)	Visual : No mechanical damage. △VB/VB ≦15 %
ESD Test (Air Discharge)	Test Voltage : 15kV Type of discharge : air discharge Number of test pulses : 20 times Polarity : +/- (IEC 61000-4-2)	Visual : No mechanical damage. △VB/VB ≦15 %
High Temperature Life Test	Temp : 85±2℃ duration : 1000+48hrs. Applied voltage : V dc max. After completion of the test,leave the sample under standard condition for 24±2hrs.	Visual : No mechanical damage. △VB/VB ≦10 %

DIMENSIONS





Unit: mm

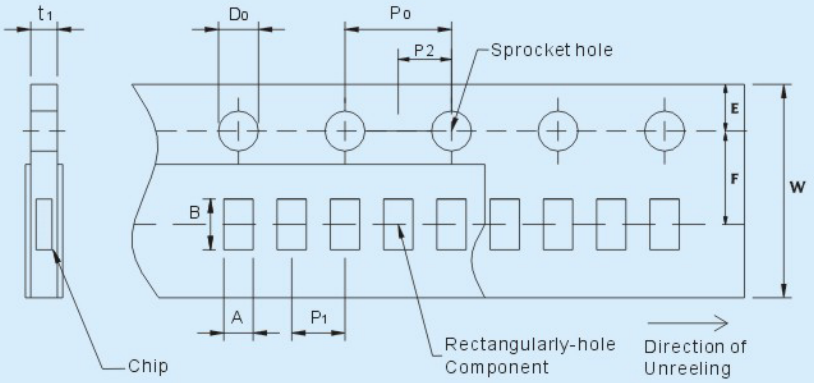
Mode No.	L	W	T	C1	C2	D	M
EA024	2.00±0.20	1.25±0.20	0.80±0.10	0.25±0.10	0.25±0.15	0.50±0.10	0.20 max
EA022	2.00±0.20	1.25±0.20	0.80±0.10	0.40±0.10	0.25±0.15	0.76±0.10	0.65 max

SPECIFICATIONS

Part No.	Max Warking Voltage (<25μA)	Breakdown Voltage (@1mA) VB(V)		Max Clamping Voltage (8/20μs)	Peak Current (8/20μs)	Max Transient Energy (10/1000μs)	Capacitance (@1KHz)
Symbol	Vw(V)	Min.	Max.	Vc(V)	Ip(A)	ET(J)	C(pF)
EA0241 40101	14	18	24	35	15	0.05	100
EA0241 80150	18	24	36	45	2	0.005	15
EA0241 80300	18	24	36	45	5	0.02	30
EA0241 80500	18	24	36	45	10	0.05	50
EA0221 40101	14	18	24	35	15	0.05	100
EA0221 80150	18	24	36	45	2	0.005	15
EA0221 80300	18	24	36	45	5	0.02	30
EA0221 80500	18	24	36	45	10	0.05	50

Note: Please contact us for special spec.

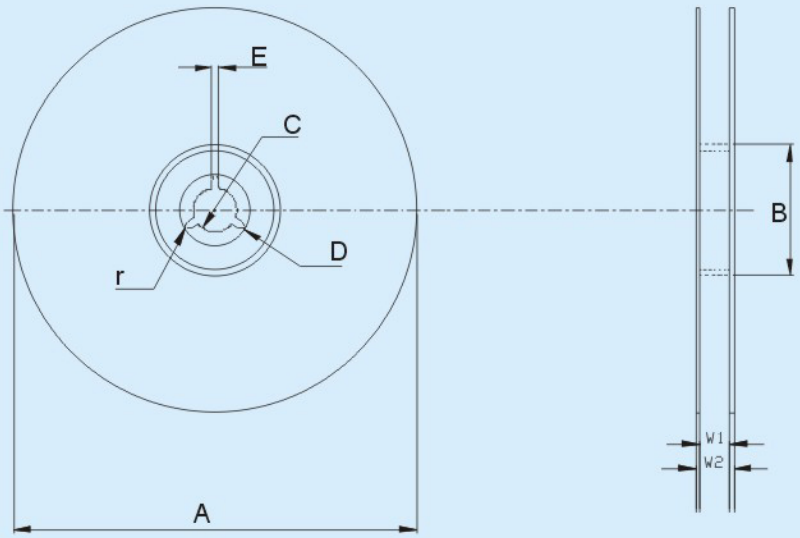
Dimensions of Taping



Unit: mm

Size	A	B	W	F	E	P_1	P_2	P_0	D_0	t_1
0402	0.66±0.03	1.17±0.03	8.0±0.10	3.5±0.05	1.75±0.05	2.0±0.05	2.0±0.05	4.0±0.10	1.55±0.05	0.60±0.05
0603	1.00±0.05	1.90±0.05								0.95±0.05
0805	1.55± 0.05	2.30±0.05								

Dimensions of Reel

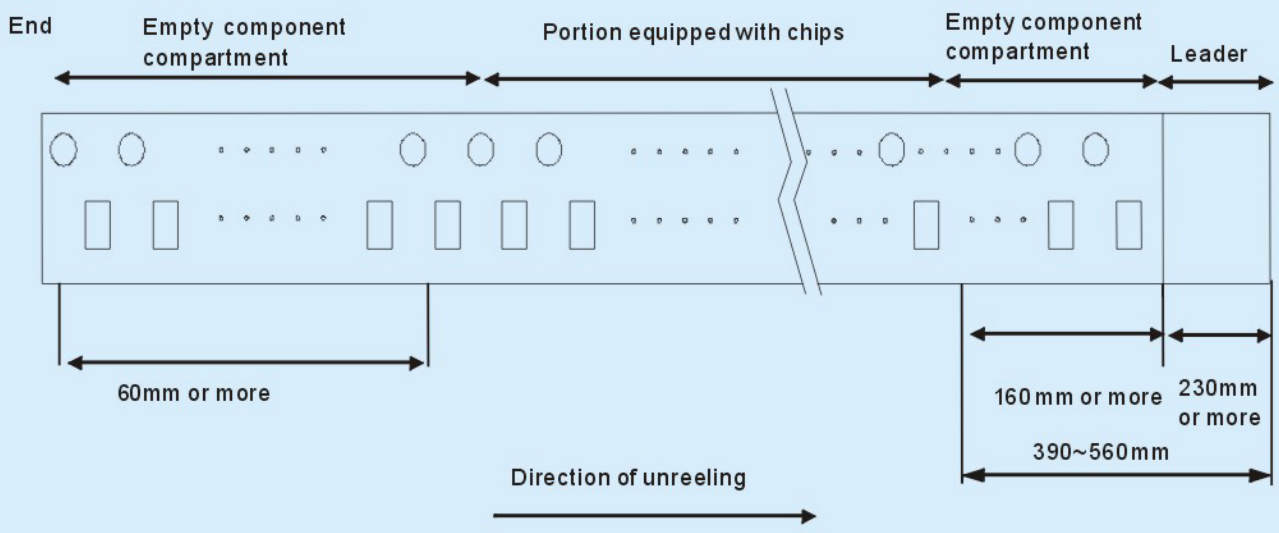


Material:Plastic

Unit: mm

Symbol	A	B	C	D	E	W_1	W_2	r
Dimension	ϕ180 +0 -3	ϕ60 +1.0 -0.0	ϕ 13±0.2	ϕ 21±0.8	ϕ 2.0±0.5	9.0±0.3	11.4±1.0	0.5

Structure of Taping



Package quantity

Size	pcs / reel
0402	10000
0603	4000
0805	4000