NTC Thermistors

INDUSTRY

The NTC Thermistors

NTC Thermistors is a negative temperature coefficient resistor that significantly reduces its resistance value as the heat/ ambient temperaturerises. Thermistors is sintered in high-temperature (1200 °C to 1500 °C), and manufactured in various shapes. It's comprised of 2 to 4 kinds of metal oxides: iron, nickel, cobalt, manganese and copper.

Features

- Temperature Coefficient of Resistance is negative, and it's extremely large (-2.8 to -5.1 [%/°C]).
- Various shapes, especially compact size components are available.
- Selection of resistance vale is comparatively free, it's available from several 10 Ω to 100 kΩ.

Recommended applications

- For temperature measurement or temperature detection : Thermometer, temperature controller
- For temperature compensation : Transistor, transistor circuit, quarts oscillation circuit, and measuring instruments

Physical characteristics of NTC Thermistors

Thermistor is a resistor sensitive to temperature that is utilizing the characteristic of metal oxide semiconductor having large temperature coefficient. And its temperature dependency of resistance value is indicated by the following equation :

$$R=R_0 \exp \left[B\left(\frac{1}{T}-\frac{1}{T_0}\right)\right] \dots (1)$$

 $\begin{array}{l} T_0: Standard \mbox{ Temperature } 298.15 \ K \ (25 \ C) \\ R_0: Resistance \ at \ T_0 \ [K] \ , B: Thermistor \ Constant \ [K] \\ Temperature \ coefficient \ (\alpha) \ in \ general \ meaning \ is \ indicated \ as \ follows: \end{array}$

$$\alpha = -\frac{B}{T_2} \quad (2)$$

Since the change by temperature is considerably large, α is not appropriate as a constant. Therefore, B value (constant) is generally used as a coefficient of thermistors.



Major characteristics of NTC Thermistors

The relation between resistance and temperature of a thermistor is linear as shown in Fig. 2. The resistance value is shown in vertical direction in a logarithmic scale and reciprocal of absolute temperature (adding 273.15 to centigrade) is shown in horizontal direction. The B value (constant) determines the gradient of these straight lines. The B value (constant) is calculated by using following equation.

 R_1 : Resistance at $T_1\,K$, R_2 : Resistance at $T_2\,K$ When you calculate this equation, you'll find that B value is not exactly constant. The resistance is expressed by the following equation :

 $R = AT^{-C} \exp D/T$ (4)

In (4), C is a small positive or negative constant and quite negligible except for use in precision temperature-measuring device, therefore, the B value can be considered as constant number.

In Fig. 1, the relation between the resistance ratio R_T/R_{25} (R_{25} : Resistance at 25 °C, RT : Resistance at T °C) and B Value is shown with T °C, in the horizontal direction.



Design and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and/or use Should a safety concern arise regarding this product, please be sure to contact us immediately.