

# THERMISTOR

"Thermistor" is the generic name given to thermally sensitive resistors. Negative temperature coefficient thermistor is generally called as thermistor. Thermistor is a semiconducting ceramic resistor produced by sintering the materials at high temperature and made mainly from metal oxide. Depending on the manufacturing method and the structure, there are many shapes and characteristics for various purposes such as temperature measurement, temperature compensation and etc. The thermistor resistance values, unless otherwise specified, are classified at a standard temperature of 25°C. B value is calculated from the resistance values at 25°C and 85°C.

## Resistance-Temperature Characteristics

The resistance of a temperature is solely a function of its absolute temperature. Since electrical power being dissipated within a temperature might heat above its ambient temperature and thereby reduce its resistance, it is necessary to test for resistance with temperature. The resistance so measured is called RT, which means the resistance at essentially zero-power. The mathematical expression which relates the resistance and the absolute temperature of a thermistor is as follows:

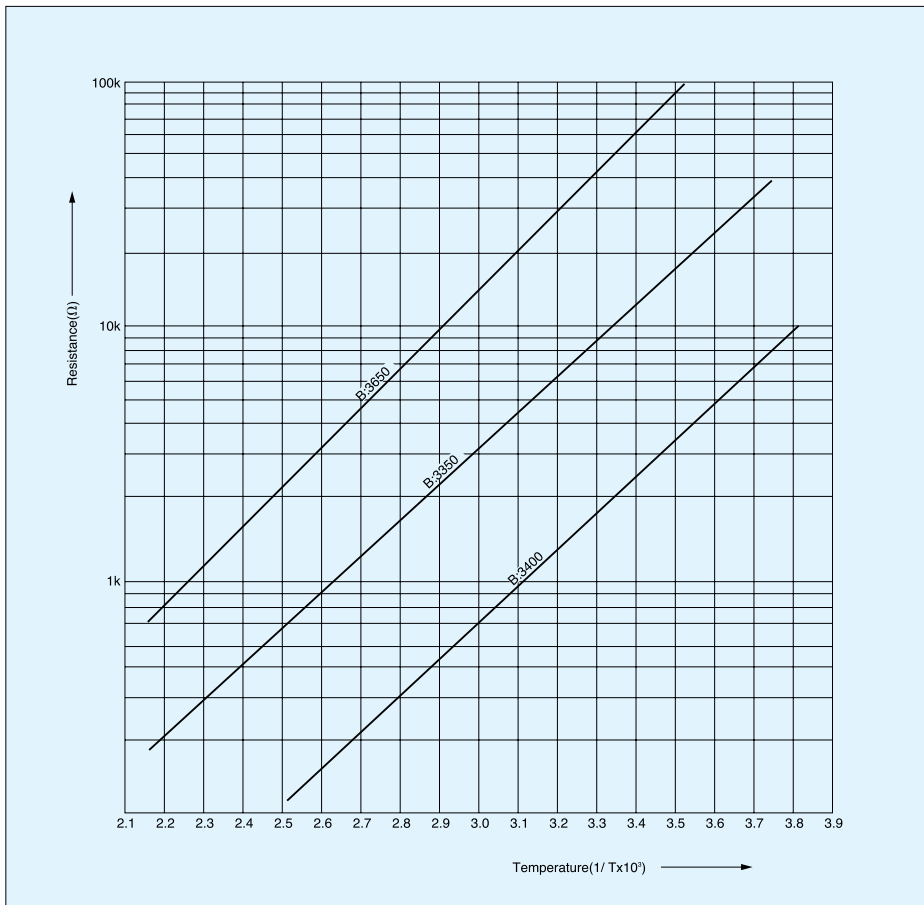
$$R_a = R_b \exp \left[ B \left( \frac{1}{T_1} - \frac{1}{T_2} \right) \right]$$

Where:  $R_a$  is the resistance at absolute temperature  $T_1$   
 $R_b$  is the resistance at absolute temperature  $T_2$   
 $B$  is a constant which depends on the material of the thermistor

Unless otherwise specified, all values of  $B$  are determined from measurements made at 25°C and 85°C.

The temperature coefficient of resistance  $\alpha$  is expressed in the following equation:

$$\alpha = - \frac{B}{T^2} \times 100 (\%/^{\circ}\text{C})$$



## Dissipation factor

Dissipation factor ( $\delta$ ) is power in milliwatts required to raise thermistor temperature 1°C. Measured with thermistor suspended by its leads in a specified environment.

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

$P$  : Power (mW)

$\Delta t$  : Raise temperature (°C)

## Thermal time constant

Thermal time constant ( $\tau_a$ ) is the time required by a thermistor to change 63% of the difference between its initial and final temperature. Measured with thermistor suspended by its leads in specified environment.

