Summary of NTC Thermistor and Temperature Sensor

Thermistor is a ceramic semiconducting element made from exorbitant oxides material. It has the feature that the resistance changes according to the ambient temperature. Namely, their resistance declines with the rising of ambient temperature at a determinated measuring power. With this feature NTC thermistor and temperature sensor can be applied in the situation of temperature compensation, measurement and control and surge current protection.

Main Techno-Parameter of NTC Thermistor

1. Zero Power Resistance R_T

At rated temperature, it is the resistance measured by the measuring power which causes the resistance change that can be ignored relative to the whole measuring error.

2. Rated Zero Power ResistanceR_{25}

The rated resistance of thermistor which is the zero power resistance measured at 25℃ and signed on the thermistor.

3. B Value

B value is the thermal exponent of negative temperature coefficient thermistor, which is defined as the ratio of the difference between the napierian logarithms of zero power resistance at two temperatures to the difference between the two temperatures' reciproal.

$$B = \ln\frac{R_{T1}}{R_{T2}} / (\frac{1}{T_1} - \frac{1}{T_2}) = \frac{T_1 T_2}{T_2 - T_1} \ln\frac{R_{T1}}{R_{T2}}$$

In the equation:

R_{T1}- the zero power resistance at T_1

R_{T2}- the zero power resistance at T_2

Unless the particular indication, B value is figured out from the zero power resistances at 25℃(298.15K) and 50℃(323.15K) and B value is not a rigorous constant in the range of operating temperature.

4. Temperature Coefficient of Zero Power Resistance α_T

At rated temperature, it is the ratio of the zero power resistance change rate with temperature to the zero power resistance itself. Namely:

$$\alpha_T = \frac{1}{R}\frac{dR_T}{dT} = -\frac{B}{T^2}$$

where:

α_T-the temperature coefficient of zero power resistance at T

R_T-the zero power resistance at T

T-temperature

B- B value

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5. Dissipation Coefficient δ

At rated ambient temperature, it is the ratio of consumption power change rate of thermistor to the change of the corresponding temperature, namely:

$$\delta = \frac{\Delta P}{\Delta T}$$

In the range of operating temperature, δ has a little change with the ambient.

6. Thermal Time Constant τ

At zero power, it is measured as time in seconds which needed for thermistor temperature change of 63.2% difference between initial and final thermistor temperature when the temperature breaks.

τ is in direct ratio to thermal capacity C of thermistor and in inverse ratio to the dissipation coefficient, namely:

$$\tau = \frac{C}{\delta}$$

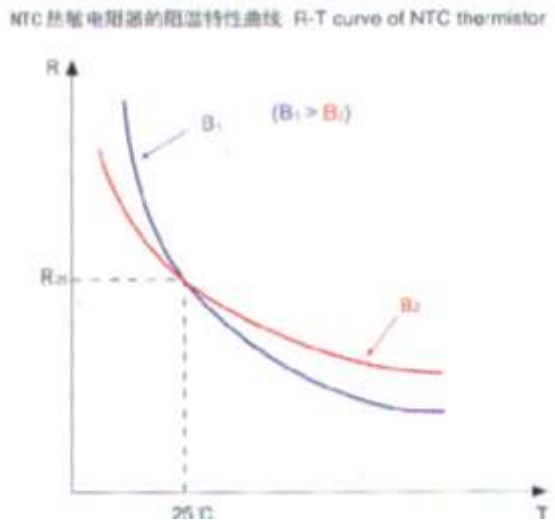
7. Max. Steady State Current

The maximum allowable continuous current passing through thermistor at 25℃.

8. Resistance-temperature Characteristic

The reliant relationship between the zero power resistance of thermistor and its temperature.

R-T curve NTC thermistor



9. Static V-I characteristic refers to the relationship between voltage and current when NTC thermistor establishes the thermal balance state, because the variable range of the relationship between terminal voltage and current of thermistor is very wide, its voltage and current curve is often represent by double logarithms coordinates.

NTC热敏电阻lgU 与 lgI 的关系图

The curve of the relationhip between lgu and lgI of NTC thermistor