Precautions for the Thermal Sensors

Refer to the precautions of common matters for all products in the beginning of this catalog.

Particulars Common to Thermal Sensors

- Excessive voltage such as ESD, could damage thermal sensors.
- Water drops from condensation or impure substances that adheres between the electrode wires may cause insulation deficiency and lower the resistance value of the thermal sensors. Be aware when using this product.
- Avoid sudden changes in temperature to maintain the accuracy of the thermal sensors.
- Some of the thermal sensors use special temperature sensing films. Contact us if the sensors are constantly operated under high temperature environment.
- It is necessary to suppress self heating in the design to maintain accuracy of the thermal sensor if rated temperature is set.

Platinum Thin-Film Thermal Sensors

- Welding is recommended to connect the lead wires of SDT101B, SDT310P, SDT310MTM, SDT310AP, SDT310HCTP and SDT310VASP2 since they are heat resistant lead wires. Select the flux for stainless-steel when soldering. Wash the flux with hot water after the soldering to remove the residue completely.
- The 3-wire or 4-wire method is recommended for implementing high precision temperature measuring for both SDT101 and SDT310 series.
- When molded or placed in a metal tube filled with resin, the resistance value may change depending on the kind of resins used.

Terms and Definitions

Platinum Thin Film Thermal Chip Sensors

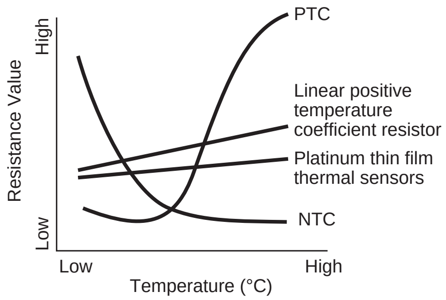
- Also known as a platinum resistance temperature detector, an electronic component whose resistance value changes with temperature as determined by standards.
- It uses a platinum thin film as a resistor and has excellent environmental resistance, and its resistance value rises almost linearly as the temperature rises.

Linear Positive Temperature Coefficient Resistor

- Unlike the platinum thin film thermal chip sensors, there are many types of resistance value changes with temperature, and there are many types of resistance values, and the resistance value changes with temperature.
- The resistance value change range is narrow compared to the thermistors but the linearity is high.

Thermistor

- Thermally sensitive resistors, constructed from temperature sensitive semi-conductive materials, with predictable, large variation in resistance due to change in temperature. There are two kinds of thermistors characterized by resistance change.
- PTC (Positive Temperature Coefficient): Resistance increases with a rise in temperature.
- NTC (Negative Temperature Coefficient): Resistance decreases with a rise in temperature.



Thermal Time Constant

- Time needed for a sensor's temperature to change 63.2% when the ambient temperature of a sensor is rapidly changed by a condition in which self heat generation can be ignored.

Thermal Dissipation Constant

- The necessary power which is needed to increase the temperature of the element 1℃ by self heating and is expressed with the following formula:

$\delta(W/°C) = W/(T1-T)$

W : Electrical input power (W)
T : Standard Temperature (℃)
T1 : Self heating temperature generated by applied power (°C)

Self-Heating Coefficient

- Self-heating coefficient expressed in °C/mW is values measured at temperature: 0°C in flowing oil with a velocity >0.2m/s, which is value of elements and vary with connecting or fixing methods.

Temperature Coefficient of Resistance (T.C.R.)

- Relative variation of resistance between two given temperatures when temperature is changed by 1K, which is calculated by the following formula.

$$\text{T.C.R. (ppm/°C)} \; \frac{R-R_0}{R_0} \times \frac{1}{T-T_0} \times 10^6$$

R : Resistance value (Ω) at T (°C)
R0 : Resistance value (Ω) at T_0 (°C)
T : Measured test temperature (°C)
T0 : Measured base temperature (°C)

Specified Current

- The electricity which it is charged with in the element is moved to the range that rise in temperature due to a self-heat generation can be ignored. Ordinarily recommended measuring currents are 1mA for 100Ω and 0.1mA for 500Ω.

Rated Power

- The maximum wattage which can be continuously applied to a resistor at the rated ambient temperature.

Critical Resistance Value

- The maximum nominal resistance value at which the rated power can be applied without exceeding the maximum working voltage.
- The rated voltage is equal to the maximum working voltage at the critical resistance value.

Maximum Working Voltage

- Maximum D.C. or A.C. voltage (rms) that can be continuously applied to a resistor or a thermosensor. However, the maximum value of the applicable voltage is the rated voltage at the critical resistance value or lower.

Overload Voltage

- Allowable voltage which is applied for 5 sec. according to the short time overload test. Overload voltage shall be 2.5 times of rated voltage or max. overload voltage, whichever is lower.

Rated Ambient Temperature

- Maximum ambient temperature at which the power rating may be applied continuously. The rated ambient temperature refers to the temperature around the resistor mounted inside the equipment, not to the air temperature outside the equipment.

Derating Curve

- Curve that expresses the relation between ambient temperature and the maximum allowable power, which is generally expressed in percentage.

External Conductor

- A conductor connected to a temperature sensor that is located outside of the protective body.

Internal Conductor

- A conductor connected to a temperature sensor that is located inside of the protective body.