Ceramic PTC Thermistor: Introduction

Ceramic Positive Temperature Coefficient thermistor (hereafter abbreviated to CPTC thermistor) are thermally sensitive semiconductor that are mainly made of doped polycrystalline ceramic, and resistance of the thermistor increases at a specified temperature point because of its material. Furthermore, dielectric constant of this ferroelectric material varies with temperature. When the component's temperature is below curie temperature (Tc), high dielectric constant prevents formation of potential barriers at crystal grains and leads to low resistance. When the component's temperature is above curie temperature (Tc), dielectric constant drops dramatically to allow formation of potential barriers at the grain boundaries, and the resistance increases sharply. If the temperature is higher, the component exhibits NTC behavior.

CPTC thermistor works as motor starter, electrical ballast, heater, over-current protection device, inrush-current limiter, and temperature sensor because of its characteristics.

Advantages

(1) High temperature coefficient of thermistor resistance
(2) A variety of thermistors with switch temperature
(3) Resistance ranged from 0.1Ω to 10KΩ
(4) Operating voltage ranged from 6V to 1000V.
(5) Diversified component structures
(6) Simple application circuit and low cost.

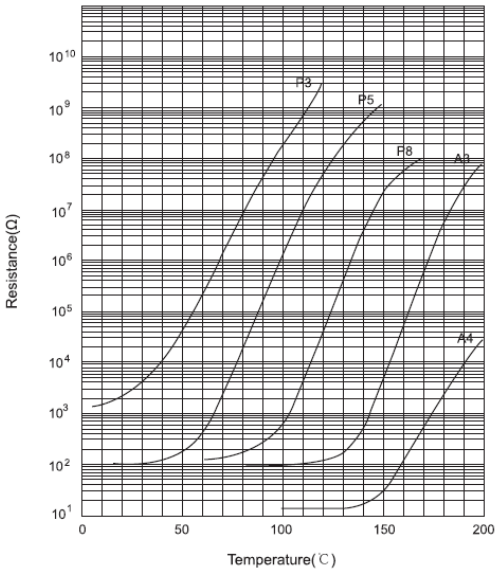
Characteristics

Major electrical characteristics of CPTC thermistor are resistance-temperature (R-T), current-time (I-T), and voltage-current (V-I) characteristics.

Resistance-temperature characteristic (R-T curve, see Fig. 1)

R-T curve illustrates relationship of zero-power resistance and temperature at specific voltage. When temperature of CPTC thermistor reaches curie temperature (Tc), its resistance increases sharply. In contrast, the thermistor returns to low-resistance condition following decrease of its temperature. The device self-heats in that current flows through it and ambient temperature rises.

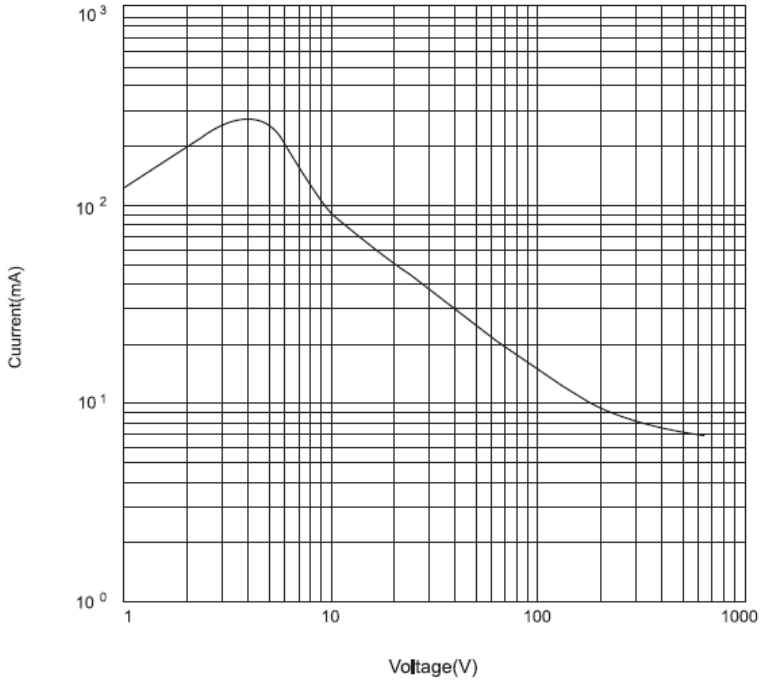
Fig 1 R-T Curve



◆ Voltage-current characteristic (V-I curve, see Fig. 2)

V-I curve is relationship of voltage and current in thermally steady state and in still air at 25℃.

Fig 2　V-I Curve



◆ Current-time characteristic (I-T curve, see Fig. 3)

I-T curve is relationship of current and time in specified voltage and current in still air at 25℃.

Fig 3　I - T Curve