Ceramic PTC Thermistor:
Application

■ Motor Starter

1. Brief of product

In starter circuit for single-phase a.c. motor, CPTC thermistor is in series connection with starting winding of motor. When motor starts, initial resistance of CPTC thermistor is low and provides sufficient current for auxiliary winding to start the motor normally. The devices quickly heats up its body temperature and increases its resistance as the current flows through it. The increase of resistance lowers the current and cuts off the auxiliary winding from the circuit.

2. Main parameter

- Zero-power resistance at 25℃ (R_{25}) and tolerance
- Maximum voltage (V_{max})
- Operating time (t_o)
- Consumption power (P)
- Recovery time (t_r)

3. Circuit for typical application

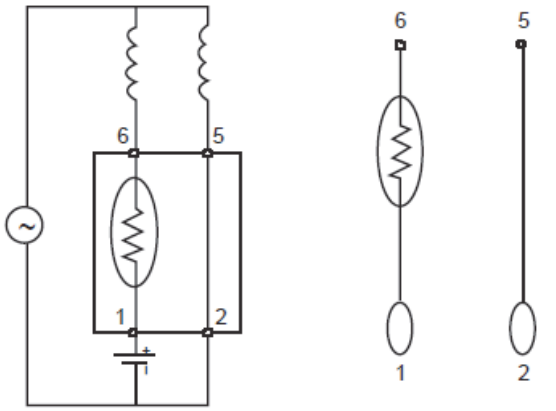

Fig. 6 0:CSIR TYPE
Capacitor motor

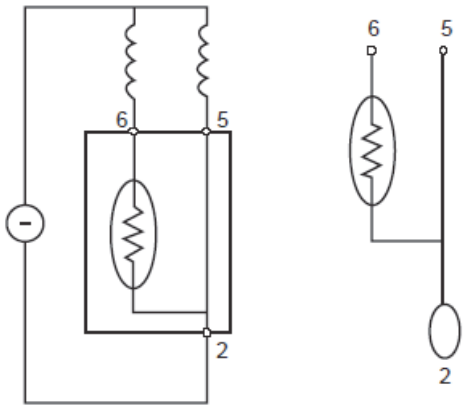

Fig. 7 1:RSIR TYPE
Resistance-spilt start motor

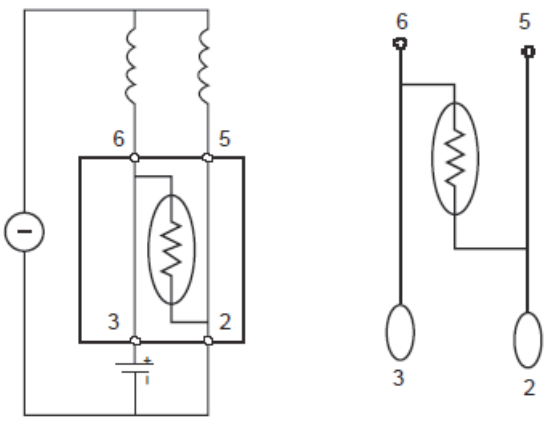

Fig. 8 2:RSCR TYPE
Capacitor-drive

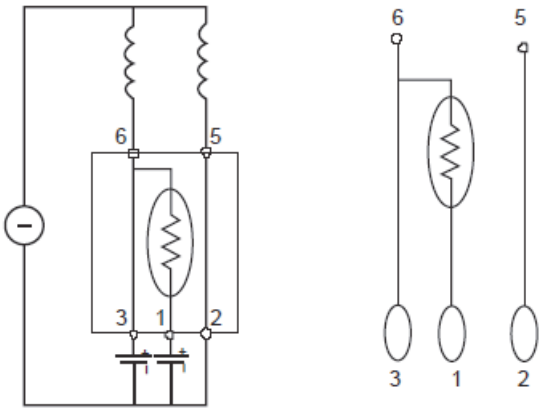

Fig. 9 2:CSR TYPE
Capacitor-start-drive

■ Inrush Current Limiter

1. Brief of product

A switching power supply has large inrush current when it turns on. If CPTC thermistor is used instead of a resistor or NTC thermistor, it works as an inrush current limiter. In addition, if relay fails, thermistor resistance rises and shuts off current when overload occurs.

2. Main parameter

- Maximum voltage (V_{max})
- Maximum link voltage (V_{Lmax})
- Zero-power resistance at 25℃ (R_{25})
- Curie temperature (T_c)
- Heat capacity (C_{th})

3. Circuit for typical application

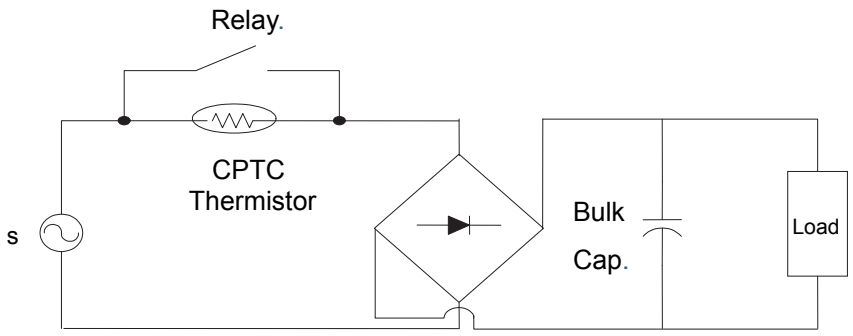

Fig. 10 Inrush current limiter

■ Telecom Protection

1. Brief of product

PTC thermistors are widely used in telecom infrastructure equipment as an over-current protection element . Usually they operate together with overvoltage protection elements to form a resettable overload protection against all kinds of external disturbances like surge, power contact and power induction.

2. Main parameter

- Structure (Dip or twin SMD)
- Zero-power resistance at 25℃ (R_{25})
- Maximum withstanding voltage (V_w)
- Non-tripping current (I_N)

3. Application example

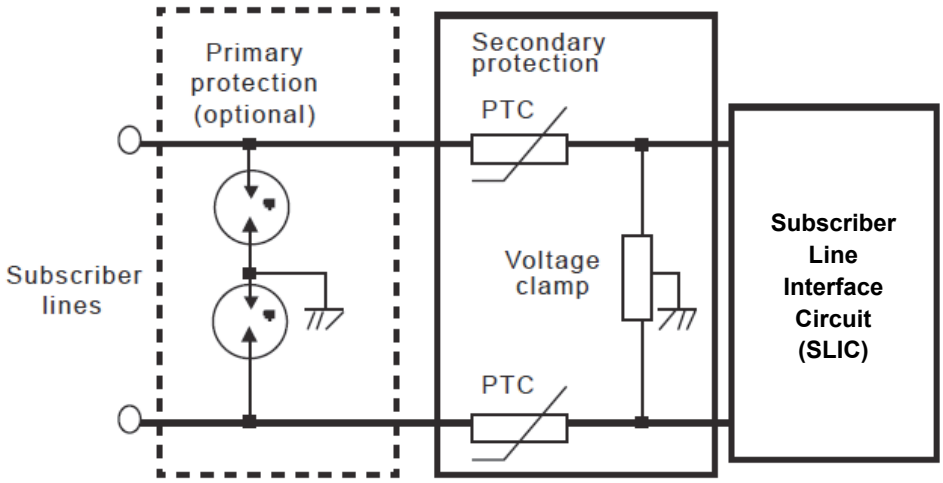

Fig.11 CPTC thermistors offers over-current protection to typical telephone line equipment

■ Overload Protection

1. Brief of product

CPTC thermistor is able to replace conventional fuse installed in applications of electronic devices and transformer, etc. CPTC thermistor resistance increase when overload or abnormal heating occurs and reduces the current to a harmless residual value. Furthermore, CPTC thermistor is suitable for over-current and over-temperature protections.

Conventional fuse is not able to reset after it blows; On the contrary, CPTC thermistor resumes its protection function immediately after a short cooling-down time.

2. Main parameter

- Structure (disc,dip)
- Non-tripping current (I_N)
- Tripping current (I_T)
- Maximum current (I_{max})
- Maximum voltage (V_{max})
- Maximum operating temperature

3. Curve of characteristics

The relationship of current and ambient temperature is described in Fig. 12.

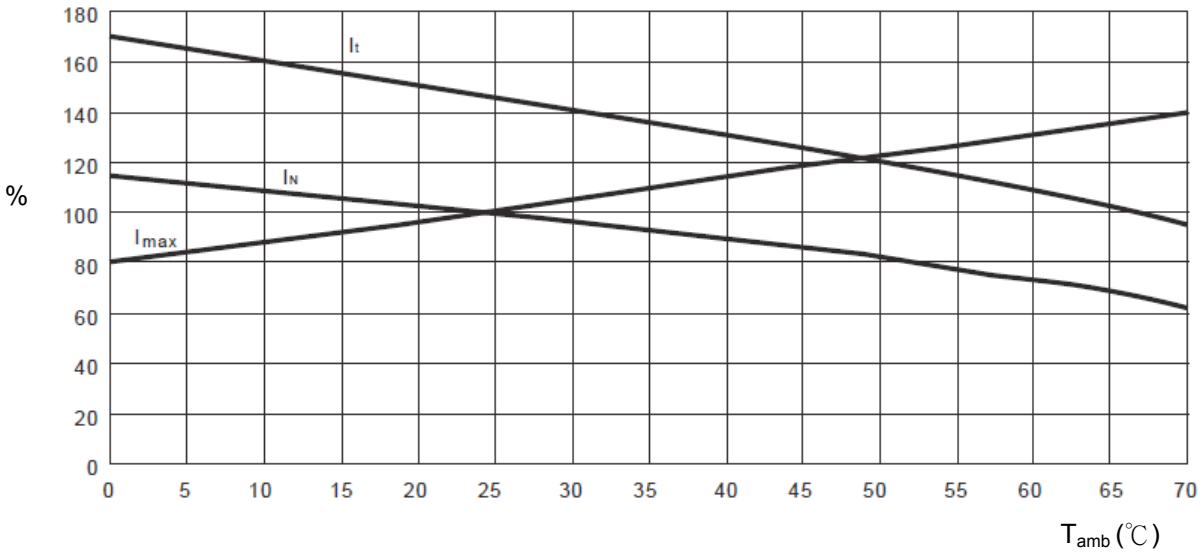

Fig. 12 Temperature V.S Current Curve

4. Application example

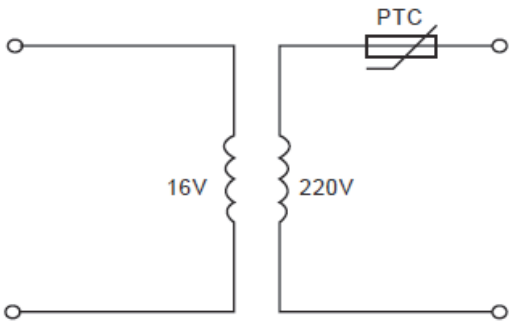

Fig.13 Circuit protection of transformer

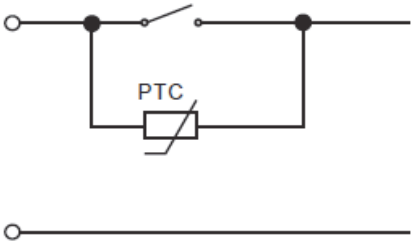

Fig.14 Spark suppression circuit

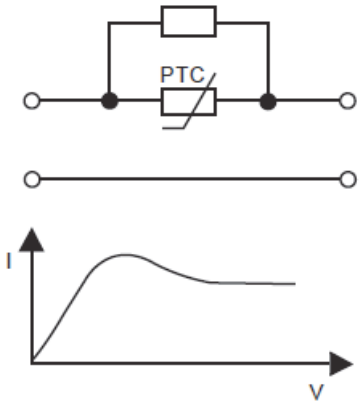

Fig.15 Current stabilization

■ Temperature Sensor

1. Brief of product

Change of ambient temperature affects resistance of CPTC thermistor, its R-T characteristic can use for circuit control and protect the component from damage caused by over-heat.

2. Main parameter

- Temperature of sensor (T_S)
- Temperature of resistor at $T_{S+5℃}$ ($R_{TS+5℃}$)
- Temperature of resistor at $T_{S-5℃}$ ($R_{TS-5℃}$)
- Zero-power resistance at 25℃ (R_{25})
- Maximum operating voltage (V_{max})

3. Principle of temperature sensor

CPTC thermistor is connected to bridge arm of comparator circuit (see Fig. 16). At normal temperature, R_P resistance of CPTC thermistor, is lower than R_s, and comparator's output voltage is low. The component heats up quickly and reaches its switch temperature when abnormal temperature occurs. Therefore, resistance is higher than R_s and causes increase of V_o to activates a trip (see Fig.17).

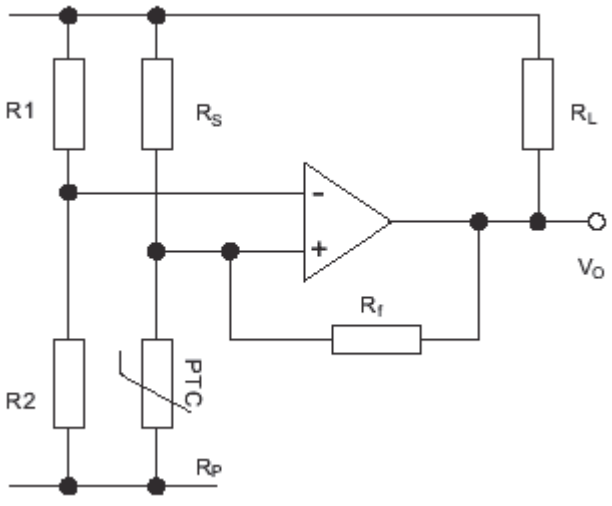

Fig.16 Typical comparator circuit

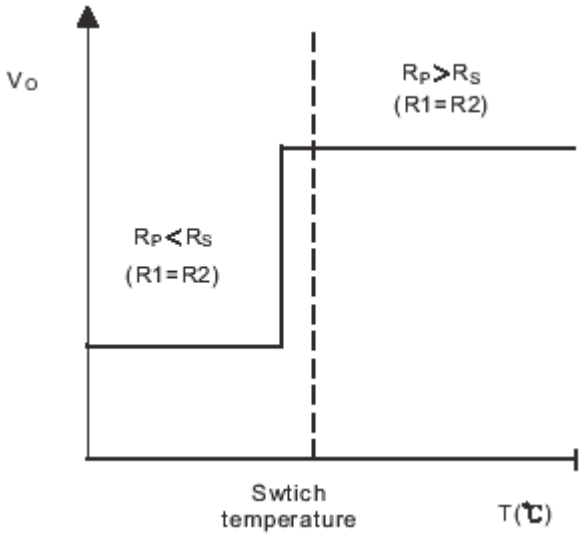

Fig.17 Typical switch characteristic

4. Circuit for typical application

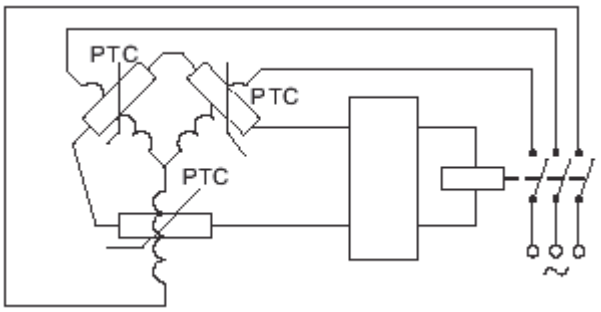

Fig.18 Temperature protection of electric motors

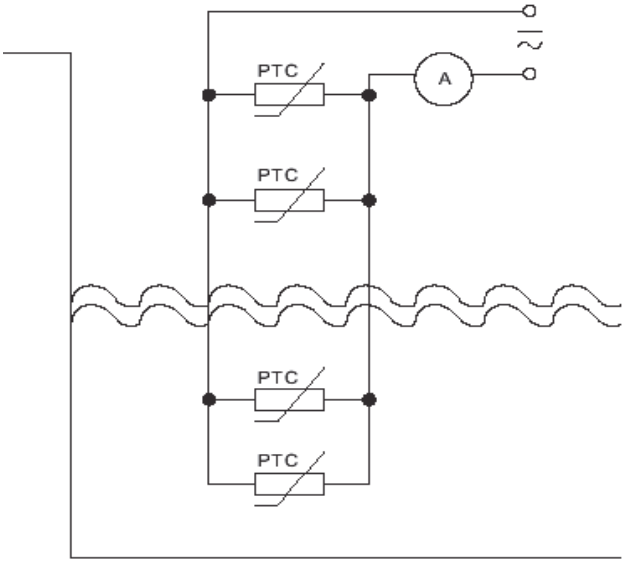

Fig.19 Liquid-level indication

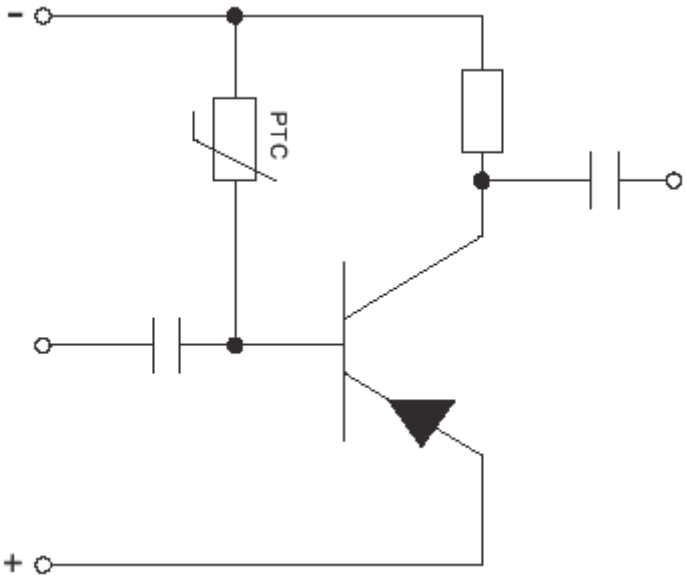

Fig.20 Temperature compensation of transistor

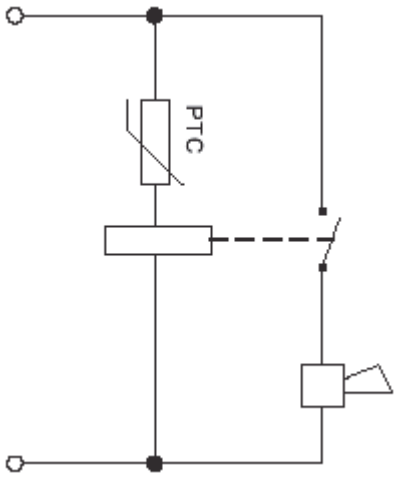

Fig.21 Alarm installation

■ Heating

1. Brief of product

CPTC thermistor is widely used for heating in that it is able to maintain at a constant temperature under the specified condition. The device can be applied to heat supply source of air conditioner, preheat of diesel engine, door lock, thermal protector.and etc.

2. Main parameter

- Zero-power resistance at 25℃ (R_{25})
- Rated voltage (V_R)
- Maximum voltage (V_{max})
- Switch temperature (T_C)
- Surface temperature (T_{sf})
- Maximum inrush current (I_{max})
- Component structure

3. Circuit for typical application

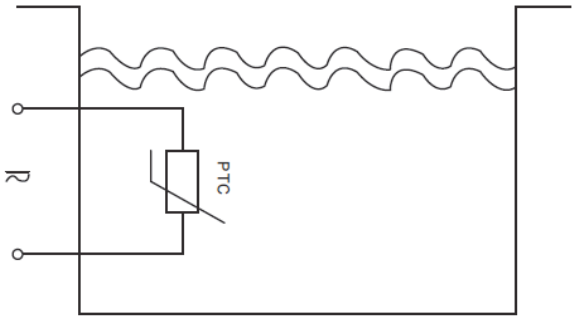

Fig. 22 Thermostatically

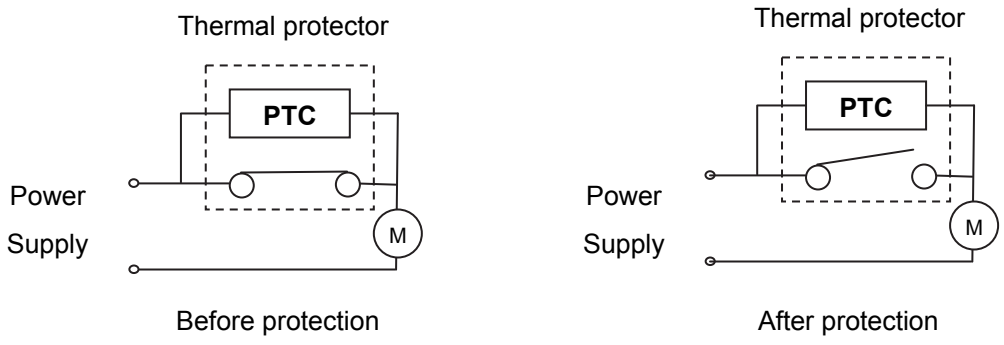

Fig. 23 Thermal protection

■ Electrical Ballast

1. Brief of product

When rectified mains voltage is first applied, CPTC thermistor is in low resistance condition. Therefore, lamp voltage is below necessary ignition value. When current flows through cathode, resistance of CPTC thermistor rises rapidly and allows lamp voltage to reach its ignition value and light the lamp. Once the lamp is lighted, the cathode needs high-frequency power supply (20~40 KHz) and two power FET switches to avoid flickers. After the lamp is lighted, CPTC thermistor only works when the lamp is switched off. Then, delay startup is offered for next ignition.

2. Main parameter

- Resistance at 25℃ (R_{25})
- Switch temperature (T_C)
- Maximum current (I_{max})
- Maximum voltage (V_{max})
- Dimension

3. Circuit for typical application

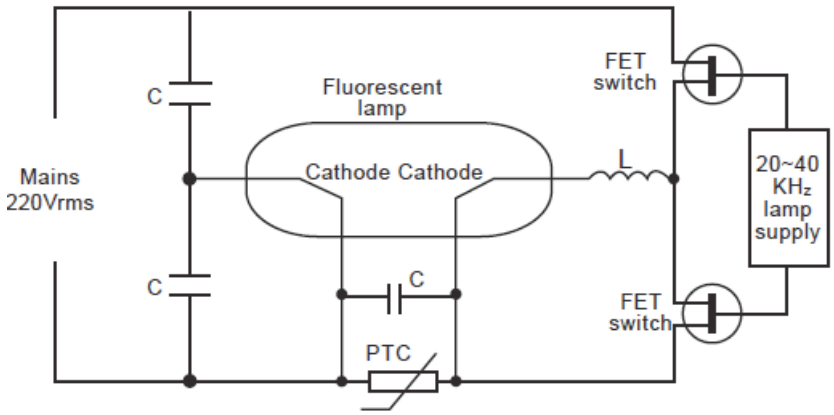

Fig. 24 Typical electronic ballast