

## PTC Thermistors, Mini Chips for Over-Temperature Protection



### FEATURES

- Well-defined protection temperature levels
- Fast reaction time (< 6 s in still air)
- Accurate resistance for ease of circuit design
- Excellent long term behavior (< 1 °C or 5 % after 1000 h at  $T_n + 15$  °C)
- Wide range of protection temperatures (70 °C to 170 °C)
- No need to reset supply after overtemperature switch
- Small size and rugged
- Coated leaded and naked devices available
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC



**RoHS**  
COMPLIANT

### QUICK REFERENCE DATA

| PARAMETER                               | VALUE                  | UNIT |
|-----------------------------------------|------------------------|------|
| Maximum resistance at 25 °C             | 100                    | Ω    |
| Minimum resistance at ( $T_n + 15$ ) °C | 4000                   | Ω    |
| Maximum (DC) voltage                    | 30                     | V    |
| Temperature range                       | - 20 to ( $T_n + 15$ ) | °C   |
| Weight                                  | ≈ 0.006                | g    |
| Climatic category                       | 25/125/56              |      |

### APPLICATIONS

Over-temperature protection and control in:

- Industrial electronics
- Power supplies
- Electronic data processing
- Motor protection

### DESCRIPTION

These directly heated thermistors have a positive temperature coefficient and are primarily intended for sensing.

### NOMINAL WORKING TEMPERATURES AND ORDERING INFORMATION

| NOMINAL WORKING TEMPERATURE |                                                    |                                      |                                       | CATALOG NUMBER 2381 671 .....                  |
|-----------------------------|----------------------------------------------------|--------------------------------------|---------------------------------------|------------------------------------------------|
| $T_n$<br>(°C)               | RESISTANCE from<br>- 20 °C to $T_n - 20$ °C<br>(Ω) | RESISTANCE<br>at $T_n - 5$ °C<br>(Ω) | RESISTANCE<br>at $T_n + 5$ °C<br>(kΩ) | NAKED CHIP <sup>(1)</sup><br>1.7 x 1.7<br>(mm) |
| 70                          | 30 to 250                                          | 50 to 570                            | 0.57 to 50                            | 91002                                          |
| 80                          | 30 to 250                                          | 50 to 550                            | 1.33 to 50                            | 91003                                          |
| 90                          | 30 to 250                                          | 50 to 550                            | 1.33 to 50                            | 91004                                          |
| 100                         | 30 to 250                                          | 50 to 550                            | 1.33 to 50                            | 91005                                          |
| 110                         | 30 to 250                                          | 50 to 550                            | 1.33 to 50                            | 91006                                          |
| 120                         | 30 to 250                                          | 50 to 550                            | 1.33 to 50                            | 91007                                          |
| 130                         | 30 to 250                                          | 50 to 550                            | 1.33 to 50                            | 91009                                          |
| 140                         | 30 to 250                                          | 50 to 550                            | 1.33 to 50                            | 91012                                          |
| 150                         | 30 to 250                                          | 50 to 550                            | 1.33 to 50                            | 91014                                          |
| 155                         | 30 to 250                                          | 50 to 550                            | 1.33 to 50                            | 91015                                          |
| 160                         | 30 to 250                                          | 50 to 550                            | 1.33 to 50                            | 91016                                          |
| 170                         | 30 to 250                                          | 50 to 550                            | 1.33 to 50                            | 91017                                          |

#### Note

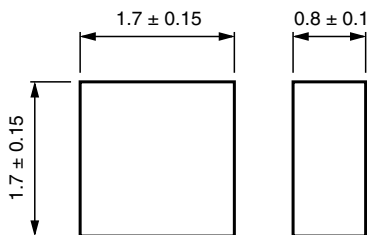
<sup>(1)</sup> Naked chips are packed in a hermetically-sealed alu-plastic bag

**ELECTRICAL CHARACTERISTICS**

| PARAMETER                               | VALUES                                                          |
|-----------------------------------------|-----------------------------------------------------------------|
| Maximum resistance at 25 °C             | 100 $\Omega$                                                    |
| Maximum resistance at ( $T_n - 5$ ) °C  | See Nominal Working Temperatures and Ordering Information table |
| Minimum resistance at ( $T_n + 15$ ) °C | 4000 $\Omega$                                                   |
| Minimum resistance at ( $T_n + 5$ ) °C  | See Nominal Working Temperatures and Ordering Information table |
| Maximum voltage                         | 30 V (AC or DC)                                                 |

**CATALOG NUMBERS AND PACKAGING**

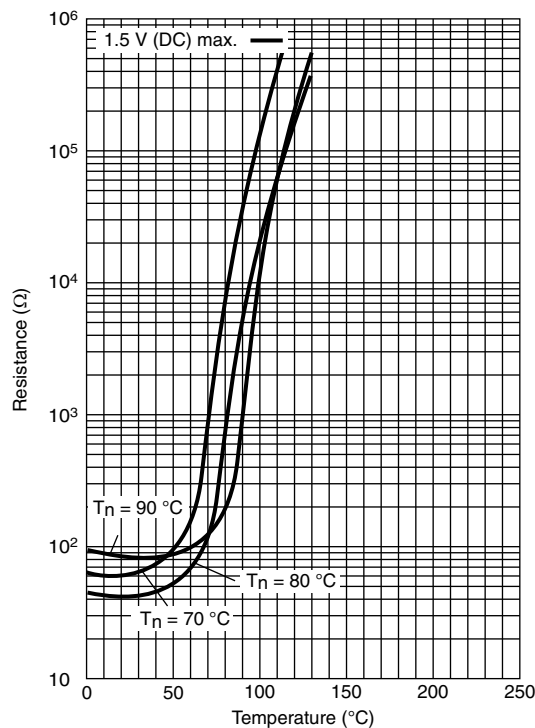
| 12NC           | SAP            | SPQ  |
|----------------|----------------|------|
| 2381 671 91002 | PTCSC17T071DBE | 5000 |
| 2381 671 91003 | PTCSC17T081DBE | 5000 |
| 2381 671 91004 | PTCSC17T091DBE | 5000 |
| 2381 671 91005 | PTCSC17T101DBE | 5000 |
| 2381 671 91006 | PTCSC17T111DBE | 5000 |
| 2381 671 91007 | PTCSC17T121DBE | 5000 |
| 2381 671 91009 | PTCSC17T131DBE | 5000 |
| 2381 671 91012 | PTCSC17T141DBE | 5000 |
| 2381 671 91014 | PTCSC17T151DBE | 5000 |
| 2381 671 91015 | PTCSC17T155DBE | 5000 |
| 2381 671 91016 | PTCSC17T161DBE | 5000 |
| 2381 671 91017 | PTCSC17T171DBE | 5000 |

**COMPONENT OUTLINES DIMENSIONS** in millimeters


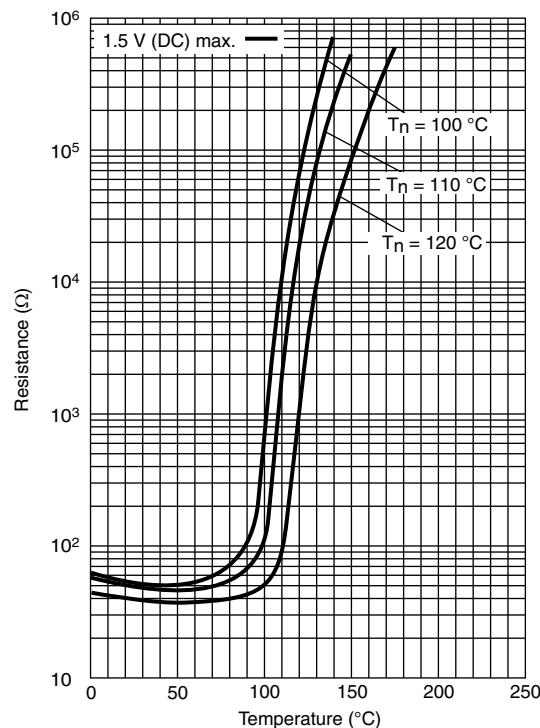
Component outline for 91002 to 91017

For clamping, reflow or hand soldering. Not intended for either wave or ultrasonic soldering and not for spot welding.  
All standard solder alloys with low activated halogene-free fluxes are acceptable, for example: 62Sn/36Pb/2Ag.

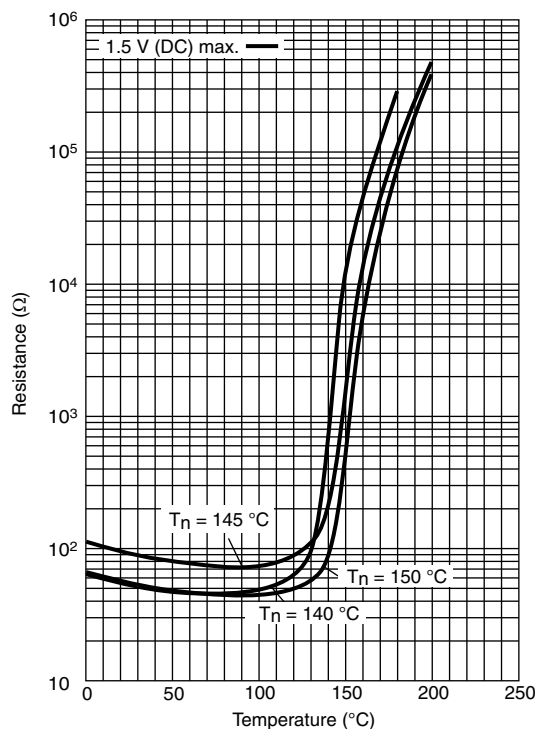
**TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTIC FOR 2381 671 91002, 2381 671 91003 and 2381 671 91004**



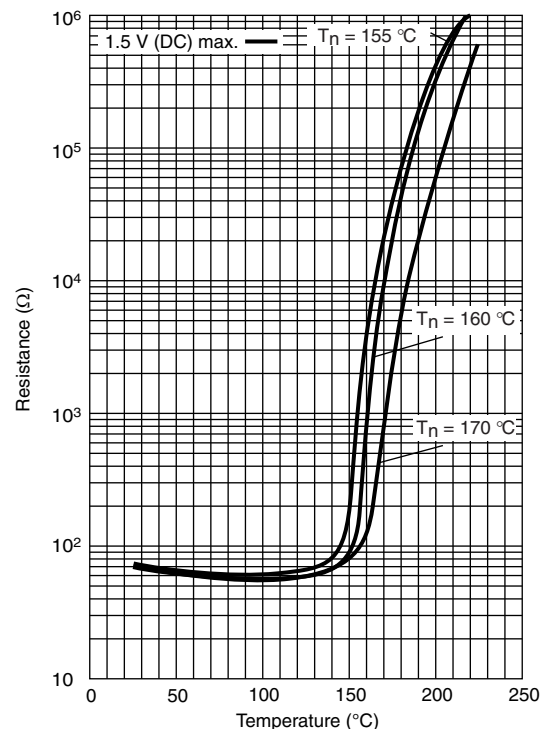
**TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTIC FOR 2381 671 91005, 2381 671 91006 and 2381 671 91007**



**TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTIC FOR 2381 671 91009, 2381 671 91012 and 2381 671 91014**



**TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTIC FOR 2381 671 91015, 2381 671 91016 and 2381 671 91017**



## APPLICATION SPECIFIC DATA

Negative Temperature Coefficient (NTC) thermistors are well known for temperature sensing. What is not well known, however, is that Positive Temperature Coefficient (PTC) thermistors can be used for thermal protection. Although their operating principles are similar, the applications are very different; whereas NTC thermistors sense and measure temperature over a defined range, PTC thermistors switch at one particular temperature.

Just like thermostats they protect such equipment and components as motors, transformers, power transistors and thyristors against overtemperature. A PTC thermistor is less expensive than a thermostat, and its switch temperature can be more accurately specified. It is also smaller and easier to design-in to electronic circuitry.

The PTC thermistor is mounted in thermal contact with the equipment to be protected, and connected into the bridge arm of a comparator circuit, such as shown in Fig. 1. At normal temperature, the PTC thermistor resistance ( $R_p$ ) is lower than  $R_s$  (see Fig. 2), so the comparator's output voltage  $V_o$  will be low. If an equipment overtemperature occurs, the PTC thermistor will quickly heat up to its trigger or nominal reference temperature  $T_n$ , whereupon its resistance will increase to a value much higher than  $R_s$ , causing  $V_o$  to switch to a high level sufficient to activate an alarm, relay or power shutdown circuit.

## APPLICATION EXAMPLES

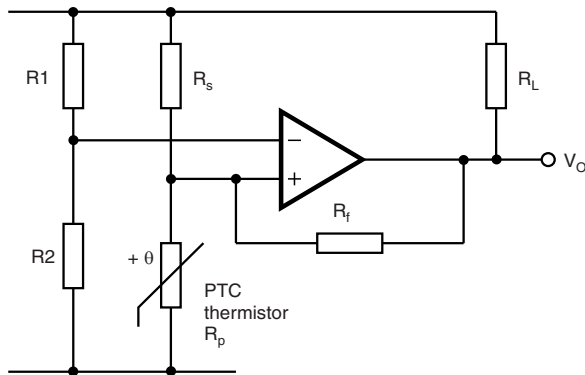


Fig. 1 Typical comparator circuit

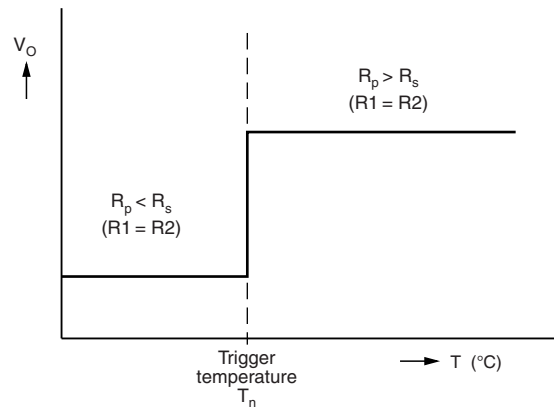


Fig. 2 Typical switch characteristic

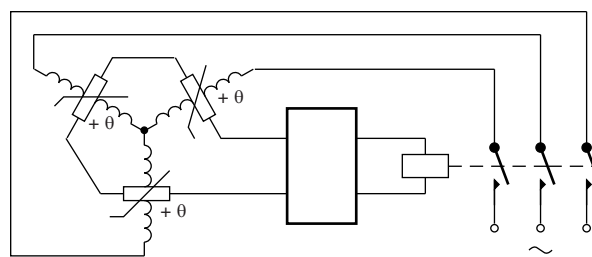


Fig. 3 Temperature protection of electric motors



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