PTC Thermistors

PHYSICAL DESIGN CONSIDERATIONS
Diameter (D) - Common diameters range from 4 to 22 mm.
Thicknness (T) - Typical thickness ranges from 1 to 5 mm.
Curie (Switching) Temperature (Tsw) - Typical switching temperatures range from 60 °C to 140 °C.
Resistivity (ρ) - Determined during sintering process; combined with pellet geometry results in final resistance based on:
\[ R_{25} = \text{zero power resistance at } 25^\circ \text{C} = \frac{\rho T}{\text{Area}} \]

Table 2
<table>
<thead>
<tr>
<th>How Various Physical Parameters Influence a PTCs:</th>
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<tbody>
<tr>
<td>PARAMETER</td>
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<tr>
<td>Disc Diameter (D)</td>
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<tr>
<td>Disc Thickness (T)</td>
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<tr>
<td>Curie (Switch) (Tsw)</td>
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<tr>
<td>Resistance (Rho)</td>
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<tr>
<td>Thermal Loading (Heat Sink) Wire Leads</td>
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<tr>
<td>Coating Material</td>
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</table>

HOW TO SELECT THE CORRECT PTC OVERLOAD DEVICE
1. Check the operational parameters of the application:
   a) What is the maximum voltage (Vmax) that the PTC has to handle after an overload has occurred?
   b) What is the maximum normal operating current (Ihold or Ih non-trip) at maximum ambient temperature (Tamb max) that the PTC has to handle without switching to the high ohmic state?
   c) What is the maximum overload current (Imax) that the PTC has to handle?
2. On the basis of these parameters a first selection can be made; choose a standard or application specific PTC which has the values (or higher values) of the selected parameter.
3. Check if the device parameters correspond to the application requirements, with regard to trip-time or response time.
4. Check if the outline dimensions of the selected PTC are within the available space considerations.
5. Verify the performance of the PTC in the application to make sure that all aspects of the design (electrical and thermal) have been taken into account. Also check the failure modes on ceramic PTCs to ensure that no unwanted operation can occur.

PTCs designed for mains voltage operation, can also operate at lower voltages with maximum overload currents which are significantly higher than those indicated in the data Tables.

If a specific PTC cannot be found in the range of available products, a custom made PTC can be the solution for the protection of your application. In such cases, please contact your local BCcomponents sales organization.

HOW TO MEASURE PTC THERMISTORS
Since PTC thermistors often exhibit a very high temperature coefficient, especially at high temperatures, measurement at high temperatures must be carried out with particular care. Even an error of 0.1 K can give errors of a few percent in resistance value. Specially calibrated thermometers must be used.

To prevent self-heating of the PTC thermistor the measuring current should be adapted to a low value (for example ≤ 1 mA).

When measuring high resistance values (for example above 1MΩ), voltage should be limited to a maximum of 5 V.
Pulsed voltages should be used for measuring the voltage dependence of PTC thermistors, with a maximum pulse time of 20 ms to prevent self-heating.

Tolerances
The resistances of standard PTC thermistors are generally specified at:
1. 25 °C
2. A temperature having a greater value than the switch temperature

The switch temperature is quoted in the relevant data sheets. For each standard type, tolerances are specified for R25 and the high temperature resistance. The tolerance on switch temperature is not specified; normally it is only a few K.

Special types are often specified in accordance with the requirements for the particular application. For example, PTC thermistors for motor control may be specified at a high temperature with a close tolerance, whilst the tolerance below the switch temperature, being of less importance, is much greater. PTC thermistors for current limiting applications are, in most instances, specified in terms of current and voltage.

Important notice
The specification and tolerances of PTC thermistors depend to a great extent upon the application in which the device is to be used. They are not limited to the standard range detailed in this handbook. The manufacturer should be consulted if special PTC thermistor characteristics are required which cannot be found in this data handbook, as the requirements may be fulfilled by a non-listed device.

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<th>CAUTIONS</th>
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<tr>
<td>DO NOT APPLY A VOLTAGE ABOVE Vmax TO THE PTC THERMISTOR FOR A PROLONGED PERIOD OF TIME SINCE THIS MAY DESTROY THE DEVICE</td>
</tr>
<tr>
<td>DO NOT CONNECT PTC THERMISTORS IN SERIES TO OBTAIN HIGHER VOLTAGES OR WATTAGES, SINCE THIS MAY CAUSE AN INDIVIDUAL PTC THERMISTOR TO HEAT UP FASTER THAN THE OTHER(S), RESULTING IN TOO HIGH A VOLTAGE ACROSS THE PTC THERMISTOR IN QUESTION.</td>
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