

145 V PTC Thermistors for Overload Protection



FEATURES

- Wide range of trip and non-trip currents:
From 47 mA up to 1 A for the non-trip current
- Small ratio between trip and non-trip currents
($I_t/I_{nt} = 1.5$ at 25 °C)
- High maximum inrush current (up to 13 A)
- Leaded parts withstand mechanical stresses and vibration
- UL file E148885 according to XGPU standard UL1434
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

APPLICATIONS

Overload (current, voltage, temperature) protection in:

- Telecommunications
- Industrial electronics
- Consumer electronics
- Electronic data processing

DESCRIPTION

These directly heated ceramic-based thermistors have a positive temperature coefficient and are primarily intended for overload protection. They consist of a ceramic pellet soldered between two tinned CCS wires and coated with a UL 94 V-0 high temperature hard silicone lacquer.

MOUNTING

PTC thermistors can be mounted by wave, reflow, or hand-soldering. Current levels have been determined according IEC 60738 conditions. Different ways of mounting or connecting the thermistors can influence their thermal and electrical behavior. Standard operation is in still air, any potting or encapsulation of PTC thermistors is not recommended and will change its operating characteristics.

Typical Soldering

235 °C; duration: 5 s (Lead (Pb)-bearing)

245 °C; duration: 5 s (Lead (Pb)-free)

Resistance to Soldering Heat

260 °C; duration: 10 s max.

MARKING

Only the grey lacquered thermistors with a diameter of 8.5 mm to 20.5 mm are marked with BC, R_{25} value (example 1R9) on one side and I_{nt} , V_{max} on the other side.

QUICK REFERENCE DATA

| PARAMETER | VALUE | UNIT |
|---|-------------|----------|
| Maximum voltage (RMS or DC) | 145 | V |
| Maximum holding current (I_{nt}) | 0.047 to 1 | A |
| Resistance at 25 °C (R_{25}) | 1.3 to 240 | Ω |
| Tolerance on R_{25} value | 20 | % |
| Maximum overload current I_{ol} | 0.2 to 13 | A |
| Switching temperature | 135 to 140 | °C |
| Operating temperature range at max. voltage | 0 to 70 | °C |
| Storage temperature | -40 to +175 | °C |

QUALITY

UL approved PTCs are guaranteed to withstand severe test programs and have factory audited follow-up programs. Major UL qualification tests are long-life (6000 cycles) electrical cycle tests at trip-current, long-life stability storage tests (3000 h at 250 °C), damp heat and water immersion tests and over-voltage tests up to 200 % of rated voltage.

UL approved PTCs are guaranteed to withstand severe test programs

- Long-life cycle tests (over 5000 trip cycles)
- Long-life storage tests (3000 h at 250 °C)
- Electrical cycle tests at low ambient temperatures (-40 °C or 0 °C)
- Damp-heat and water immersion tests
- Overvoltage tests at up to 200 % of rated voltage

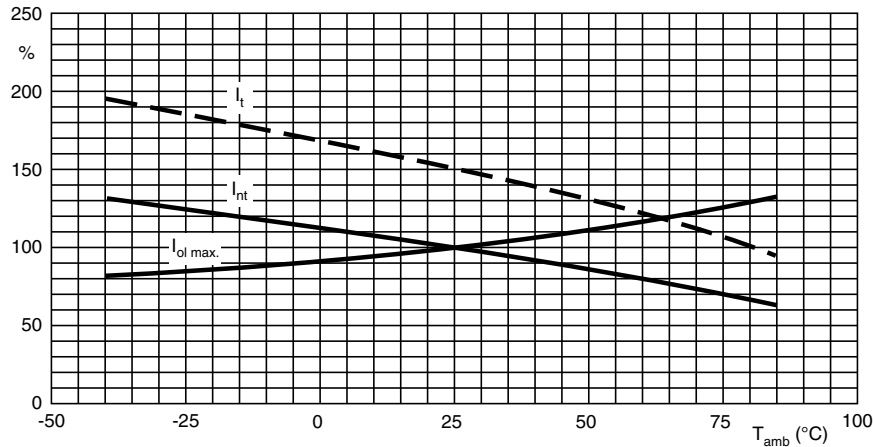


| ELECTRICAL DATA AND ORDERING INFORMATION | | | | | | | | |
|---|--|----------------------------|---|--|--------------------------------------|---------------|-----------------------|----------------|
| I _{nt} MAX. at 25 °C (mA) ⁽¹⁾ | I _t MIN. at 25 °C (mA) ⁽¹⁾ | R ₂₅ ± 20 % (Ω) | I _{ol} MAX. at 25 °C (mA) ⁽²⁾ | I _{res} MAX. at V _{max.} and 25 °C (mA) ⁽¹⁾ | DISSIP. FACTOR (mW/K) ⁽¹⁾ | Ø D MAX. (mm) | ORDERING PART NUMBERS | |
| | | | | | | | BULK | TAPE ON REEL |
| 47 | 70 | 240 | 200 | 9 | 7.3 | 5 | PTCCL05H470FBE | PTCCL05H470FTE |
| 65 | 100 | 115 | 300 | 11 | 7.3 | 5 | PTCCL05H650FBE | PTCCL05H650FTE |
| 93 | 140 | 55 | 450 | 13 | 7.3 | 5 | PTCCL05H930FBE | PTCCL05H930FTE |
| 110 | 165 | 40 | 500 | 13 | 7.3 | 5 | PTCCL05H111FBE | PTCCL05H111FTE |
| 130 | 195 | 28 | 600 | 13 | 7.3 | 5 | PTCCL05H131FBE | PTCCL05H131FTE |
| 170 | 255 | 19 | 1000 | 15 | 8.3 | 7 | PTCCL07H171FBE | PTCCL07H171FTE |
| 210 | 315 | 12 | 1400 | 15 | 8.3 | 7 | PTCCL07H211FBE | PTCCL07H211FTE |
| 250 | 375 | 9.4 | 2000 | 16.5 | 9 | 8.5 | PTCCL09H251FBE | PTCCL09H251FTE |
| 270 | 405 | 8 | 2200 | 16.5 | 9 | 8.5 | PTCCL09H271FBE | PTCCL09H271FTE |
| 320 | 480 | 6.7 | 3000 | 19 | 10.5 | 10.5 | PTCCL11H321FBE | PTCCL11H321FTE |
| 360 | 540 | 5.3 | 3500 | 19 | 10.5 | 10.5 | PTCCL11H361FBE | PTCCL11H361FTE |
| 410 | 615 | 4.6 | 4500 | 22.5 | 11.7 | 12.5 | PTCCL13H411FBE | PTCCL13H411FTE |
| 450 | 675 | 3.8 | 5000 | 22.5 | 11.7 | 12.5 | PTCCL13H451FBE | PTCCL13H451FTE |
| 600 | 900 | 2.9 | 7200 | 28.5 | 15.5 | 16.5 | PTCCL17H601FBE | - |
| 710 | 1065 | 2.1 | 8500 | 28.5 | 15.5 | 16.5 | PTCCL17H711FBE | - |
| 880 | 1320 | 1.7 | 11 000 | 37.5 | 19.8 | 20.5 | PTCCL21H881FBE | - |
| 1000 | 1500 | 1.3 | 13 000 | 37.5 | 19.8 | 20.5 | PTCCL21H102FBE | - |

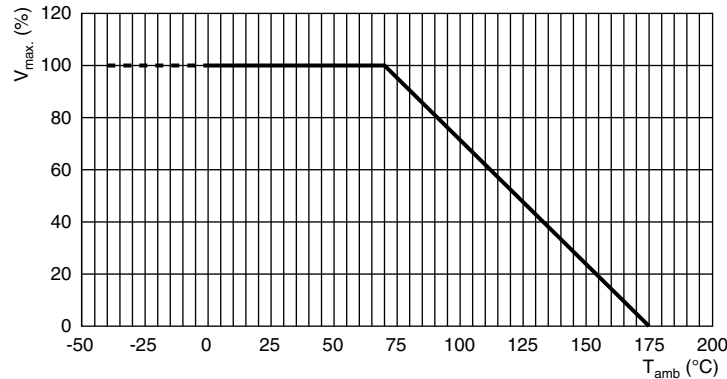
Notes

- ⁽¹⁾ The indicated current levels are guaranteed according IEC 60738 mounting conditions. For different mounting conditions the indicated current levels can change and should be evaluated in the application.
- ⁽²⁾ I_{ol max.} is the maximum overload current that may flow through the PTC when it passes from the low ohmic to the high ohmic state. UL approval: I_{ol max.} x 0.85

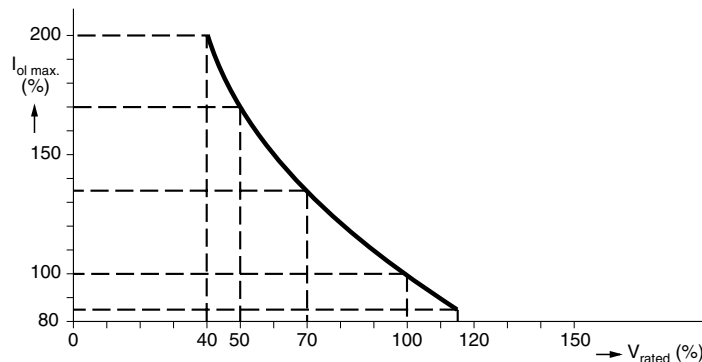
CURRENT DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE



VOLTAGE DERATING AS A FUNCTION OF AMBIENT TEMPERATURE



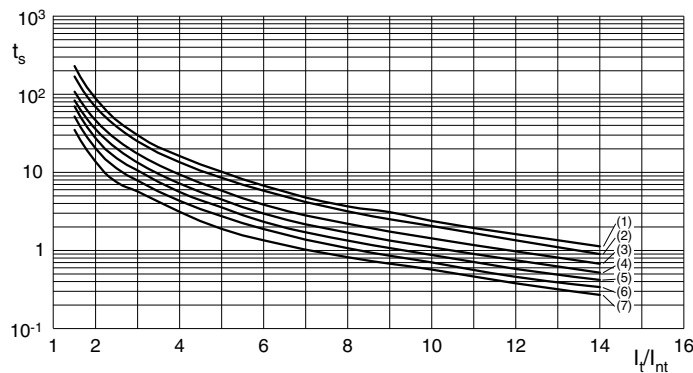
MAXIMUM OVERLOAD CURRENT I_{ol max.} DERATING AS A FUNCTION OF VOLTAGE



I_{ol max.} as stated in the electrical data and ordering information tables, is the maximum overload current that may flow through the PTC when passing from the low ohmic to high ohmic state at rated voltage.

When other voltages are present after tripping, the I_{ol max.} value can be derived from the above I_{ol max.} as a function of voltage graph. Voltages below V_{rated} will allow higher overload currents to pass the PTC.

TYPICAL TRIP-TIME AS A FUNCTION OF TRIP CURRENT RATIO



- Curve 1: Ø D_{max.} = 20.5 mm
 - Curve 2: Ø D_{max.} = 16.5 mm
 - Curve 3: Ø D_{max.} = 12.5 mm
 - Curve 4: Ø D_{max.} = 10.5 mm
 - Curve 5: Ø D_{max.} = 8.5 mm
 - Curve 6: Ø D_{max.} = 7.0 mm
 - Curve 7: Ø D_{max.} = 5.0 mm
- Measured in accordance with "IEC 60738".

Trip-Time or Switching Time (t_s)

To check the trip-time for a specific PTC, refer to the Electrical Data and Ordering Information tables for the value I_{nt}. Divide the overload or trip current by this I_{nt} and you realize the factor I_t/I_{nt}. This rule is valid for any ambient temperature between 0 °C and 70 °C. Adapt the correct non-trip current with the appropriate curve in the Current Deviation as a Function of the Ambient Temperature graph. The relationship between the I_t/I_{nt} factor and the switching time is a function of the PTC diameter; see the above graphs.

Example

What will be the trip-time at I_{ol} = 0.8 A and T_{amb} = 0 °C of a thermistor type PTCCL07H211FBE; 12 Ω; Ø D_{max.} = 7.0 mm:

I_{nt} from the table: 210 mA at 25 °C

I_{nt}: 210 x 1.12 = 235 mA (at 0 °C).

Overload current = 0.8 A; factor I_t/I_{nt}: 0.8/0.235 = 3.40. In the typical trip-time as a function of trip current ratio graph, at the 7.0 mm line and I_t/I_{nt} = 3.40, the typical trip-time is 6.0 s.

| COMPONENTS PACKING INFORMATION | | | |
|--------------------------------|----------------|------|-----------------|
| SAP ORDERING PART NUMBER | | SPQ | PACKING OUTLINE |
| PTCCL05H....BE | | 500 | Bulk |
| PTCCL05H....TE | | 1500 | Tape and reel |
| PTCCL07H....BE | PTCCL09H....BE | 250 | Bulk |
| PTCCL07H....TE | PTCCL09H....TE | 1500 | Tape and reel |
| PTCCL11H....BE | PTCCL13H....BE | 200 | Bulk |
| PTCCL11H....TE | | 1500 | Tape and reel |
| PTCCL13H....TE | | 750 | Tape and reel |
| PTCCL17H....BE | | 100 | Bulk |
| PTCCL21H....BE | | 100 | Bulk |

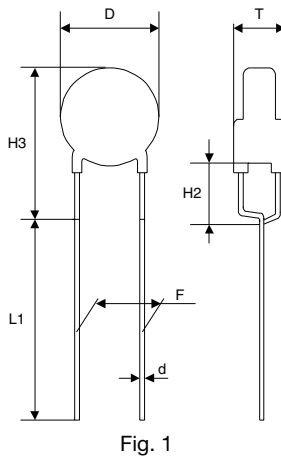
PTC THERMISTORS IN BULK


Fig. 1

DIMENSIONS OF BULK TYPE PTCs (in mm)

| | |
|----|------------|
| D | See table |
| d | 0.6 ± 0.05 |
| T | 5.0 max. |
| H2 | 4.0 ± 1.0 |
| H3 | D + 5 max. |
| L1 | 20 min. |
| F | 5.0 |

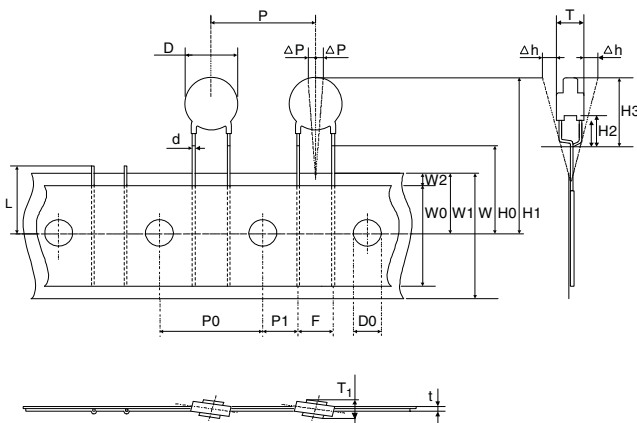
PTC THERMISTORS ON TAPE AND REEL


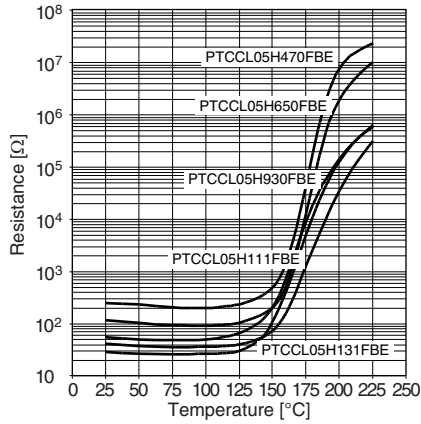
Fig. 2

TAPE AND REEL ACCORDING TO IEC 60286-2 (in mm)

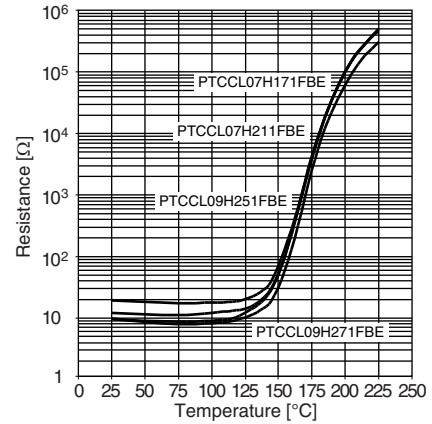
| SYMBOL | PARAMETER | DIMENSIONS | TOLERANCE |
|----------------|---|--------------|------------------|
| D | Body diameter | See table | max. |
| d | Lead diameter | 0.6 | ± 0.05 |
| P | Pitch of components Diameter < 12 mm Diameter ≥ 12 mm | 12.7 25.4 | ± 1.0 ± 2.0 |
| P ₀ | Feedhole pitch | 12.7 | ± 0.3 |
| F | Leadcenter to leadcenter distance (between component and tape) | 5.0 | + 0.5 / - 0.2 |
| H0 | Lead wire clinch height | 16.0 | ± 0.5 |
| H2 | Component bottom to seating plane | 4.0 | ± 1.0 |
| H3 | Component top to seating plane | D + 5 | max. |
| H4 | Seating plane difference (left-right lead) | 2 | ± 0.2 |
| T | Total thickness | 5.0 | max. |



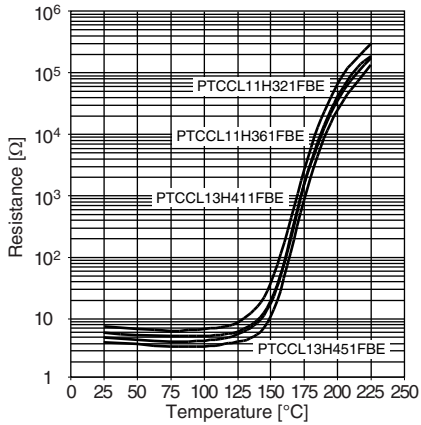
TYPICAL RESISTANCE / TEMPERATURE CHARACTERISTIC



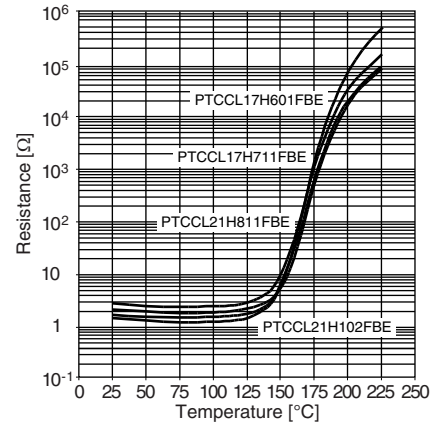
TYPICAL RESISTANCE / TEMPERATURE CHARACTERISTIC



TYPICAL RESISTANCE / TEMPERATURE CHARACTERISTIC



TYPICAL RESISTANCE / TEMPERATURE CHARACTERISTIC





Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.