

## 265 V PTC Thermistors For Overload Protection



### FEATURES

- Wide range of trip and non-trip currents:  
From 11 mA up to 800 mA
- Small ratio between trip and non-trip currents  
( $I_t/I_{nt} = 1.5$  at 25 °C)
- High maximum inrush current (up to 5.5 A)
- Leaded parts withstand mechanical stresses and vibration
- UL file E148885 according to XGPU standard UL1434
- 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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC


**RoHS**  
COMPLIANT

### APPLICATIONS

Over-temperature/over-load protection:

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

### DESCRIPTION

These directly heated thermistors have a positive temperature coefficient and are primarily intended for overload protection. They consist of a metallized ceramic disk with two tinned brass or copper clad steel leads reflow soldered to it and coated with a high temperature silicone lacquer. Leadless disks and leaded disks without coating are available on request.

### MOUNTING

The PTC Thermistors are suitable for processing on automatic insertion equipment.

#### Typical soldering

235 °C; duration: 5 s (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     |
|---|--------------|----------|
| Holding current                             | 0.011 to 0.8 | A        |
| Resistance at 25 °C ( $R_{25}$ )            | 2.1 to 3000  | $\Omega$ |
| $I_{max}$                                   | 0.8 to 5.5   | A        |
| Switch temperature                          | 140          | °C       |
| Maximum voltage (RMS or DC)                 | 265          | V        |
| Operating temperature range at max. voltage | 0 to 70      | °C       |
| Climatic category                           | 25/125/56    |          |

| ELECTRICAL DATA AND ORDERING INFORMATION for 2381 66. 5...3; max. voltage = 265 V (AC or DC) <sup>(1)</sup> |   |                                  |   |  |                             |                     |                               |                |
|---|---|----------------------------------|---|--|-----------------------------|---------------------|-------------------------------|----------------|
| I <sub>nt</sub> MAX.<br>at 25 °C<br>(mA)  | I <sub>t</sub> MIN.<br>at 25 °C<br>(mA) | R <sub>25</sub><br>± 20 %<br>(Ω) | I <sup>(2)</sup> MAX.<br>at 25 °C<br>(mA) | I <sub>res</sub> MAX.<br>at V <sub>max.</sub><br>and 25 °C<br>(mA) | DISSIP.<br>FACTOR<br>(mW/K) | Ø D<br>MAX.<br>(mm) | CATALOG NUMBERS               |                |
|   |   |                                  |   |  |                             |                     | BULK                          | TAPE ON REEL   |
| 11  | 17                                      | 3000                             | 80  | 6.5  | 7.3                         | 5                   | 2381 660 51193                | 2381 660 61193 |
| 15  | 23                                      | 1900                             | 110                                       | 6.5  | 7.3                         | 5                   | 2381 660 51593                | 2381 660 61593 |
| 19  | 29                                      | 1200                             | 140                                       | 6.5  | 7.3                         | 5                   | 2381 660 51993                | 2381 660 61993 |
| 28  | 42                                      | 500                              | 200                                       | 6.8  | 7.3                         | 5                   | 2381 660 52893                | 2381 660 62893 |
| 39  | 59                                      | 260                              | 300                                       | 6.8  | 7.3                         | 5                   | 2381 660 53993                | 2381 660 63993 |
| 63  | 95                                      | 120                              | 450                                       | 7  | 7.3                         | 5                   | 2381 660 56393                | 2381 660 66393 |
| 76  | 115                                     | 85                               | 550                                       | 7  | 7.3                         | 5                   | 2381 660 57693                | 2381 660 67693 |
| 95  | 143                                     | 56                               | 600                                       | 7  | 7.3                         | 5                   | 2381 660 59593                | 2381 660 69593 |
| 110   | 165                                     | 48                               | 650                                       | 7.5  | 8.3                         | 7                   | 2381 661 51113                | 2381 661 61113 |
| 140   | 210                                     | 29                               | 800                                       | 8  | 8.3                         | 7                   | 2381 661 51413                | 2381 661 61413 |
| 170   | 255                                     | 22                               | 900                                       | 9  | 9                           | 8.5                 | 2381 661 51713                | 2381 661 61713 |
| 190   | 285                                     | 18                               | 1000                                      | 9.5  | 9                           | 8.5                 | 2381 661 51913                | 2381 661 61913 |
| 210   | 315                                     | 17                               | 1300                                      | 10   | 10.5                        | 10.5                | 2381 662 52113                | 2381 662 62113 |
| 250   | 375                                     | 12                               | 1500                                      | 11   | 10.5                        | 10.5                | 2381 662 52513                | 2381 662 62513 |
| 280   | 420                                     | 11                               | 1800                                      | 12   | 11.7                        | 12.5                | 2381 662 52813                | 2381 662 62813 |
| 320   | 480                                     | 8.4                              | 2200                                      | 13   | 11.7                        | 12.5                | 2381 662 53213                | 2381 662 63213 |
| 400   | 600                                     | 6.6                              | 3000                                      | 15   | 15.5                        | 16.5                | 2381 663 54013                | -              |
| 490   | 735                                     | 4.4                              | 3500                                      | 16   | 15.5                        | 16.5                | 2381 663 54913                | -              |
| 590   | 855                                     | 4                                | 4500                                      | 19.5   | 19.8                        | 20.5                | 2381 664 55913                | -              |
| 700   | 1050                                    | 2.8                              | 5500                                      | 21   | 19.8                        | 20.5                | 2381 664 57013                | -              |
| 800   | 1200                                    | 2.1                              | 5500                                      | 22.5   | 19.8                        | 20.5                | 2381 664 58013 <sup>(3)</sup> | -              |

**Notes**

- <sup>(1)</sup> The thermistors are clamped at the seating plane
- <sup>(2)</sup> I<sub>max.</sub> 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<sub>max.</sub> x 0.75
- <sup>(3)</sup> Not UL approved

| SAP AND 12NC PART NUMBERS |                |                |                |
|---------------------------|----------------|----------------|----------------|
| 12NC                      | SAP CODING     | 12NC           | SAP CODING     |
| 2381 660 x1193            | PTCCL05H110HyE | 2381 661 x1913 | PTCCL09H191HyE |
| 2381 660 x1593            | PTCCL05H150HyE | 2381 662 x2113 | PTCCL11H211HyE |
| 2381 660 x1993            | PTCCL05H190HyE | 2381 662 x2513 | PTCCL11H251HyE |
| 2381 660 x2893            | PTCCL05H280HyE | 2381 662 x2813 | PTCCL13H281HyE |
| 2381 660 x3993            | PTCCL05H390HyE | 2381 662 x3213 | PTCCL13H321HyE |
| 2381 660 x6393            | PTCCL05H630HyE | 2381 663 54013 | PTCCL17H401HBE |
| 2381 660 x7693            | PTCCL05H760HyE | 2381 663 54913 | PTCCL17H491HBE |
| 2381 660 x9593            | PTCCL05H950HyE | 2381 664 55913 | PTCCL21H591HBE |
| 2381 661 x1113            | PTCCL07H111HyE | 2381 664 57013 | PTCCL21H701HBE |
| 2381 661 x1413            | PTCCL07H141HyE | 2381 664 58013 | PTCCL21H801HBE |
| 2381 661 x1713            | PTCCL09H171HyE |                |                |

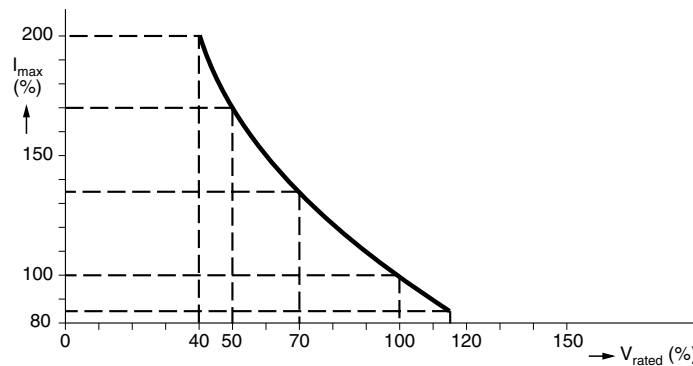
**Notes**

- For bulk parts replace x by "5" and y by "B"
- For taped on reel parts replace x by "6" and y by "T"

**CURRENT DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE**

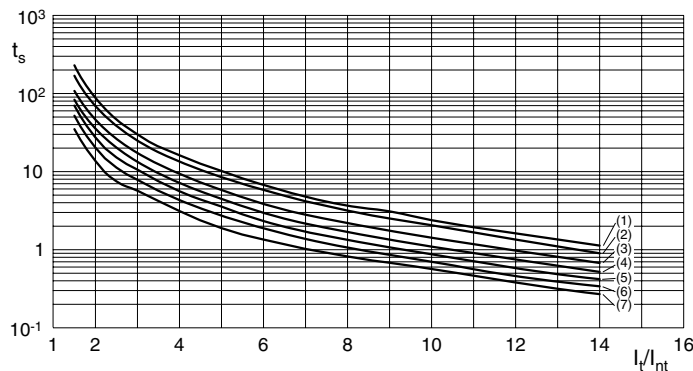


**VOLTAGE DERATING AS A FUNCTION OF AMBIENT TEMPERATURE**

**ELECTRICAL CHARACTERISTICS I<sub>max</sub>. AS A FUNCTION OF VOLTAGE**


$I_{max}$ . 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  $I_{max}$ . value can be derived from the above  $I_{max}$ . 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<sub>max</sub>. = 20.5 mm  
 Curve 2: Ø D<sub>max</sub>. = 16.5 mm  
 Curve 3: Ø D<sub>max</sub>. = 12.5 mm  
 Curve 4: Ø D<sub>max</sub>. = 10.5 mm  
 Curve 5: Ø D<sub>max</sub>. = 8.5 mm  
 Curve 6: Ø D<sub>max</sub>. = 7.0 mm  
 Curve 7: Ø D<sub>max</sub>. = 5.0 mm  
 Measured in accordance with "IEC 60738".

**Trip-time or switching time (t<sub>s</sub>)**

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  $T_{amb} = 50$  °C of a thermistor type 2381 661 51713; 22 Ω; Ø D<sub>max</sub>. = 8.5 mm:

$I_{nt}$  from the table: 170 mA at 25 °C

$I_{nt}$ : 170 x 0.87 = 148 mA (at 50 °C).

Overload current = 0.8 A; factor  $I_t/I_{nt}$ :  $0.8/0.148 = 5.40$ . In the typical trip-time as a function of trip current ratio graph, at the 8.5 mm line and  $I_t/I_{nt} = 5.40$ , the typical trip-time is 3.0 s.

| COMPONENTS OUTLINE |               |      |         |
|--------------------|---------------|------|---------|
| CODE NUMBER 2381   |               | SPQ  | OUTLINE |
| 660                | 5...3         | 500  | Fig. 1a |
|                    | 6...3         | 1500 | Fig. 1b |
| 661                | 5...3         | 250  | Fig. 1a |
|                    | 6...3         | 1500 | Fig. 1b |
| 662                | 5...3         | 200  | Fig. 1a |
|                    | 62113 - 62513 | 1500 | Fig. 1b |
|                    | 62813 - 63213 | 750  | Fig. 1c |
| 663                | 5...3         | 100  | Fig. 1a |
| 664                | 5...3         | 50   | Fig. 1a |

### PTC THERMISTORS IN BULK

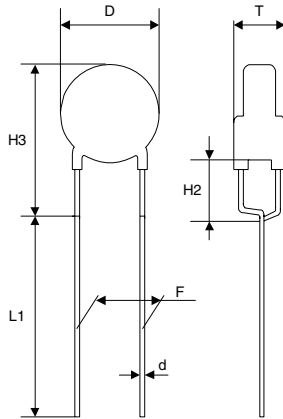


Fig. 1a

| DIMENSIONS OF BULK TYPE PTC'S (in mm) |            |
|---------------------------------------|------------|
| D                                     | See table  |
| d                                     | 0.6 ± 10 % |
| T                                     | 5.5 max.   |
| H2                                    | 4.0 ± 1.0  |
| H3                                    | D + 5 max. |
| L1                                    | 20 min.    |
| F                                     | 5.0        |

### PTC THERMISTORS ON TAPE ON REEL

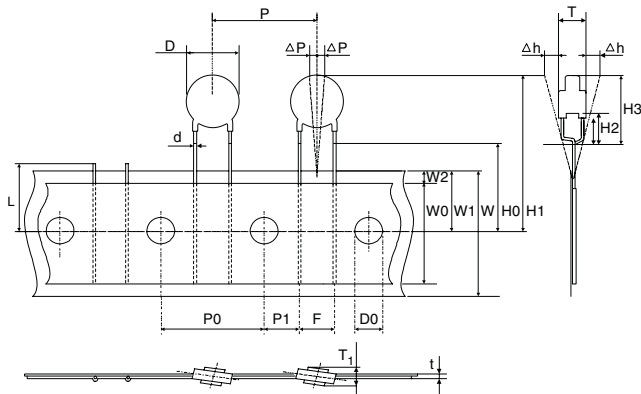


Fig. 1b

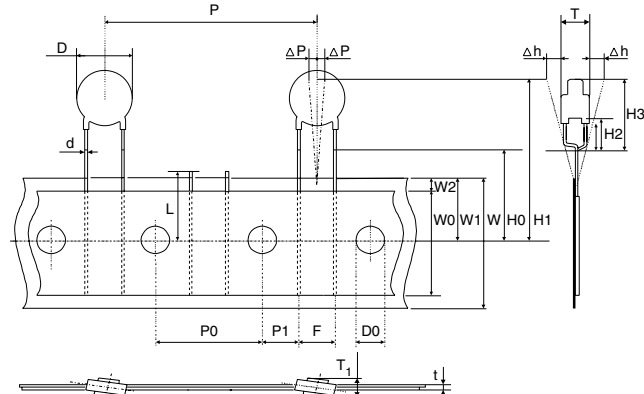


Fig. 1c

| TAPE AND REEL ACCORDING TO IEC 60286-2 dimensions in millimeters |   |            |                |
|--|---|------------|----------------|
| SYMBOL   | PARAMETER   | DIMENSIONS | TOLERANCE      |
| D  | Body diameter   | See table  | max.           |
| d  | Lead diameter   | 0.6        | ± 10 %         |
| P  | Pitch of components<br>Diameter < 12 mm<br>Diameter ≥ 12 mm       | 12.7       | ± 1.0          |
|  |   | 25.4       | ± 2.0          |
| F  | Leadcenter to leadcenter distance<br>(between component and tape) | 5.0        | + 0.6<br>- 0.1 |
| 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)                        | 0          | ± 0.2          |
| T  | Total thickness   | 5.5        | max.           |



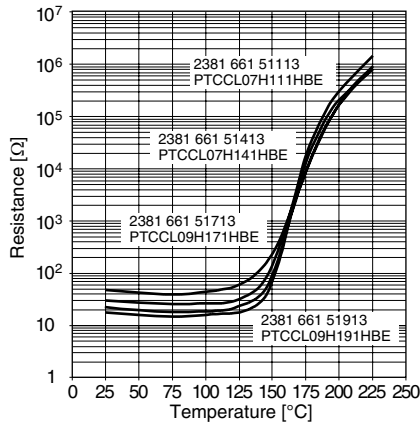
**TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTIC**



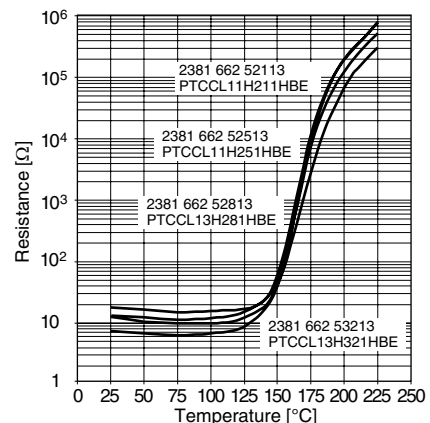
**TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTIC**



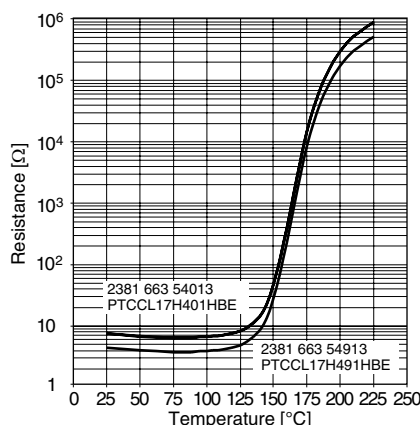
**TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTIC**



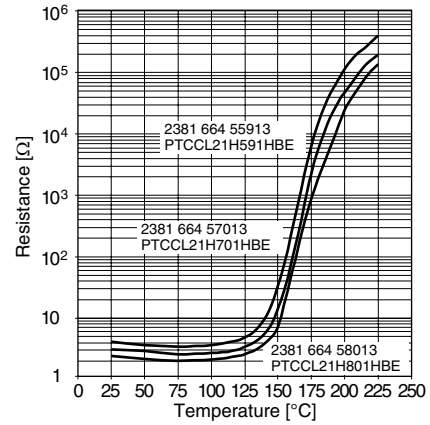
**TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTIC**



**TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTIC**



**TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTIC**





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