

30 V to 60 V PTC Thermistors For Overload Protection



FEATURES

- Wide range of trip and non-trip currents:
From 94 mA up to 2 A for the trip current
- Small ratio between trip and non-trip currents
($I_t/I_{nt} = 1.5$ at 25 °C)
- High maximum overload current (up to 23 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 naked disk with two tinned brass or copper clad steel leads and are coated with a high temperature silicone UL 94 V-0 coating. 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 |
| Maximum voltage (DC or AC) | 30 to 60 | V |
| Holding current | 0.094 to 2 | A |
| Resistance at 25 °C (R_{25}) | 0.3 to 50 | Ω |
| I_{max} . | 0.8 to 23 | A |
| Switch temperature | 140 | °C |
| Operating temperature range at max. voltage | - 40 to + 85 | °C |
| Climatic category | 40/125/56 | |

| ELECTRICAL DATA AND ORDERING INFORMATION for 2381 66. 5...1; max. voltage = 30 V to 60 V (AC or DC) ⁽¹⁾ | | | | | | | | | |
|---|--------------------------------|---------------------------|------------------|---|--|-----------------------------|---------------------|-----------------|----------------|
| I_{nt} MAX. at 25 °C (mA) | I_t MIN. at 25 °C (mA) | R_{25} ± 20 % (Ω) | V MAX. (V) | I MAX. ⁽²⁾ at 25 °C (mA) | I_{res} MAX. at V_{max} . and 25 °C (mA) | DISSIP. FACTOR (mW/K) | Ø D MAX. (mm) | CATALOG NUMBERS | |
| | | | | | | | | BULK | TAPE ON REEL |
| 94 | 145 | 50 | 60 | 800 | 22 | 6.9 | 5 | 2381 660 59491 | 2381 660 69491 |
| 130 | 195 | 25 | 60 | 1200 | 25 | 6.9 | 5 | 2381 660 51311 | 2381 660 61311 |
| 180 | 270 | 13 | 30 | 1700 | 45 | 6.9 | 5 | 2381 660 51811 | 2381 660 61811 |
| 270 | 405 | 6 | 30 | 2500 | 60 | 6.9 | 5 | 2381 660 52711 | 2381 660 62711 |
| 320 | 480 | 5 | 30 | 3500 | 62 | 7.8 | 7 | 2381 661 53211 | 2381 661 63211 |
| 410 | 615 | 3 | 30 | 4500 | 65 | 7.8 | 7 | 2381 661 54111 | 2381 661 64111 |
| 470 | 705 | 2.5 | 30 | 5000 | 70 | 8.8 | 8.5 | 2381 661 54711 | 2322 661 64711 |
| 540 | 810 | 1.9 | 30 | 6000 | 75 | 8.8 | 8.5 | 2381 661 55411 | 2381 661 65411 |
| 610 | 915 | 1.7 | 30 | 7000 | 80 | 9.9 | 10.5 | 2381 662 56111 | 2381 662 66111 |
| 700 | 1050 | 1.3 | 30 | 8000 | 90 | 9.9 | 10.5 | 2381 662 57011 | 2381 662 67011 |
| 830 | 1245 | 1.1 | 30 | 10 000 | 100 | 11.5 | 12.5 | 2381 662 58311 | 2381 662 68311 |
| 920 | 1380 | 0.9 | 30 | 11 000 | 105 | 11.5 | 12.5 | 2381 662 59211 | 2381 662 69211 |
| 1170 | 1755 | 0.7 | 30 | 13 500 | 140 | 14.5 | 16.5 | 2381 663 51121 | - |
| 1390 | 2085 | 0.5 | 30 | 16 000 | 170 | 14.5 | 16.5 | 2381 663 51321 | - |
| 1770 | 2655 | 0.4 | 30 | 20 000 | 200 | 18.7 | 20.5 | 2381 664 51721 | - |
| 2050 | 3075 | 0.3 | 30 | 23 000 | 220 | 18.7 | 20.5 | 2381 664 52021 | - |

Notes

⁽¹⁾ The thermistors are clamped at the seating plane.

⁽²⁾ I_{max} is the maximum overload current that may flow through the PTC when it passes from the low ohmic to the high ohmic state.

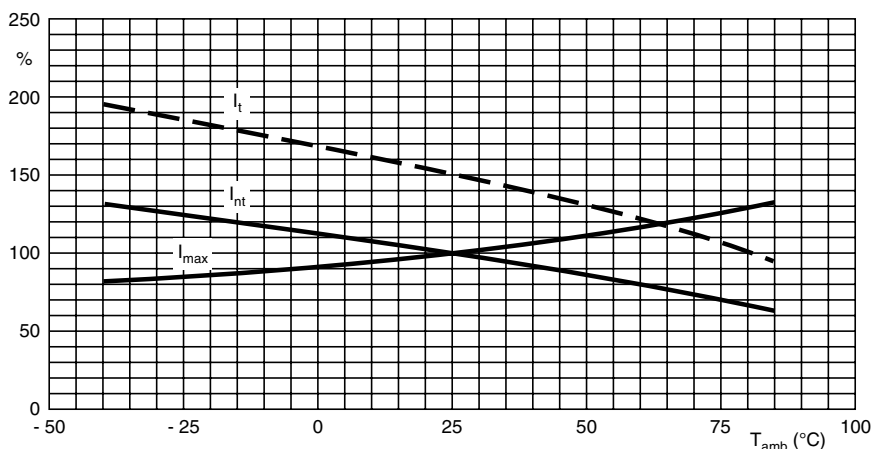
UL approval: $I_{max} \times 0.85$

| SAP AND 12NC PART NUMBERS | | | |
|----------------------------------|-----------------|----------------|-----------------|
| 12NC | SAP CODING | 12NC | SAP CODING |
| 2381 660 x9491 | PTCCL05H940EyE | 2381 662 x6111 | PTCCL11H6111DyE |
| 2381 660 x1311 | PTCCL05H1311EyE | 2381 662 x7011 | PTCCL11H7011DyE |
| 2381 660 x1811 | PTCCL05H1811DyE | 2381 662 x8311 | PTCCL13H8311DyE |
| 2381 660 x2711 | PTCCL05H2711DyE | 2381 662 x9211 | PTCCL13H9211DyE |
| 2381 661 x3211 | PTCCL07H3211DyE | 2381 663 51121 | PTCCL17H112DBE |
| 2381 661 x4111 | PTCCL07H4111DyE | 2381 663 51321 | PTCCL17H132DBE |
| 2381 661 x4711 | PTCCL09H4711DyE | 2381 664 51721 | PTCCL21H172DBE |
| 2381 661 x5411 | PTCCL09H5411DyE | 2381 664 52021 | PTCCL21H202DBE |

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

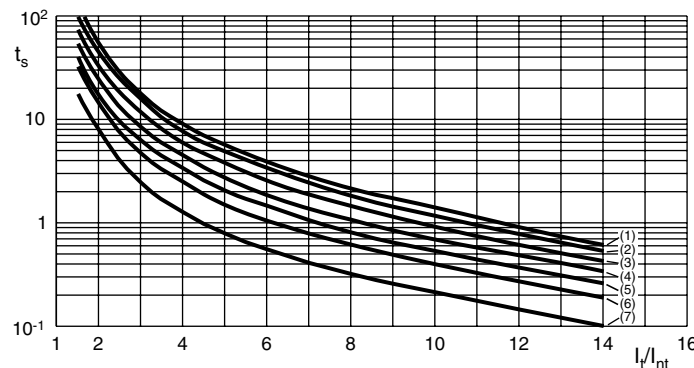


VOLTAGE DERATING AS A FUNCTION OF AMBIENT TEMPERATURE

ELECTRICAL CHARACTERISTICS I_{max}. 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: $\varnothing D_{max} = 20.5$ mm
 - Curve 2: $\varnothing D_{max} = 16.5$ mm
 - Curve 3: $\varnothing D_{max} = 12.5$ mm
 - Curve 4: $\varnothing D_{max} = 10.5$ mm
 - Curve 5: $\varnothing D_{max} = 8.5$ mm
 - Curve 6: $\varnothing D_{max} = 7.0$ mm
 - Curve 7: $\varnothing D_{max} = 5.0$ 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 $I_{ol} = 3$ A and $T_{amb} = 0$ °C of a thermistor type 2381 661 54711; 2.5 Ω ; $\varnothing D_{max} = 8.5$ mm:

I_{nt} from the table: 470 mA at 25 °C

I_{nt} : 470 x 1.12 = 526 mA (at 0 °C).

Overload current = 3 A; factor I_t/I_{nt} : $3/0.526 = 5.70$. In the typical trip-time as a function of trip current ratio graph, at the 8.5 mm line and $I_t/I_{nt} = 5.70$, the typical trip-time is 1.7 s.

| COMPONENTS OUTLINE | | | |
|--------------------|----------------|------|---------|
| CODE NUMBER 2381 | | SPQ | OUTLINE |
| 660 | 5...1 | 500 | Fig. 1a |
| | 6...1 | 1500 | Fig. 1b |
| 661 | 5...1 | 250 | Fig. 1a |
| | 6...1 | 1500 | Fig. 1b |
| 662 | 5...1 | 250 | Fig. 1a |
| | 66111 to 67011 | 1500 | Fig. 1b |
| | 68311 to 69211 | 750 | Fig. 1b |
| 663 | 5...1 | 200 | Fig. 1a |
| 664 | 5...1 | 100 | Fig. 1a |

PTC THERMISTORS IN BULK

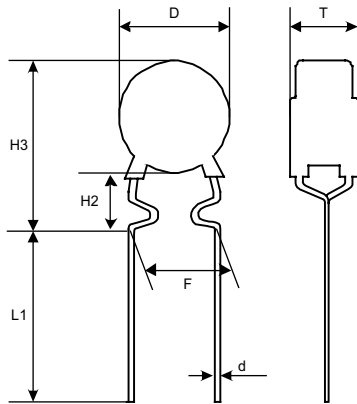


Fig. 1a

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

PTC THERMISTORS ON TAPE ON REEL

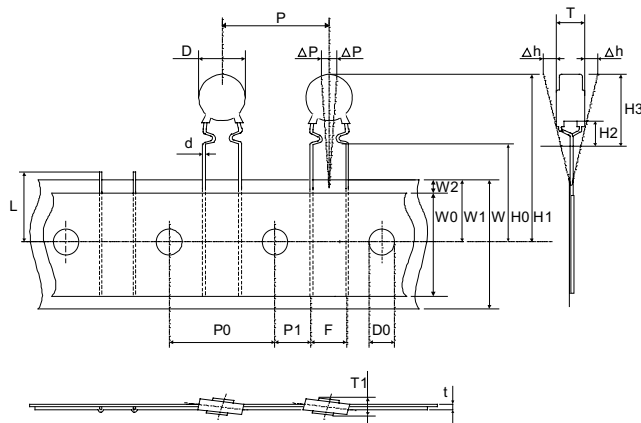


Fig. 1b

| 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 | Diameter < 12 mm | ± 1.0 |
| | | Diameter ≥ 12 mm | ± 2.0 |
| P ₀ | Feedhole pitch | 12.7 | ± 0.3 |
| F | Leadcenter to leadcenter distance (between component and tape) | 5.0 | + 0.6 - 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. |
| T | Total thickness | 4.0 | max. |



TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTIC



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TYPICAL RESISTANCE/TEMPERATURE CHARACTERISTIC





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