

PTC Thermistors, Overload Protection for Telecommunication


RoHS
COMPLIANT

FEATURES

- Wide resistance range in telecom area from 4 Ω to 70 Ω
- Fast protection against power contact faults
- Withstand high overload currents of up to 10 A
- High voltage withstanding capabilities for the larger sized thermistors (up to 600 V)
- Good tracking over a wide temperature range for all matched or binned thermistors (matching at 85 °C \leq 2 x matching at 25 °C)
- UL1434 approved types available (XGPU2)
- All telecom PTCs are coated with a high temperature silicon lacquer (UL 94 V-0) to protect them from any harsh environments and to improve their lifetime
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

Over-temperature/over-load protection:

- Main distribution frame (MDF)
- Central office switching (C.O.)
- Subscriber terminal equipment (T.E.)
- Set-top box (S.B.)

MARKING

Clear marking on a gray coated body
BC and R_{25} value

| QUICK REFERENCE DATA | | |
|---|--------------|-----------|
| PARAMETER | VALUE | UNIT |
| Maximum voltage (RMS or DC) | 220 to 600 | V_{RMS} |
| Maximum holding current (I_{nt}) | 100 to 175 | mA |
| Resistance at 25 °C (R_{25}) | 8 to 50 | Ω |
| Tolerance on R_{25} value | 15 to 25 | % |
| Maximum overload current I_{ol} | 0.6 to 10.0 | A |
| Tripping time at 1 A | 1 to 40 | s |
| Operating temperature range at max. voltage | 0 to 70 (95) | °C |

| ELECTRICAL DATA AND ORDERING INFORMATION | | | | | | | | | | | |
|--|----------|-----------------------|--------------------------|------------------|-----------|--------------|-----------|-----------------------|--------------------------|----------------------|-----------------------|
| RESISTANCE | | MATCHING (Ω) | $V_{max.}$ (V_{RMS}) | NON-TRIP CURRENT | | TRIP CURRENT | | MAX. TRIP TIME at 1 A | $I_{max.}$ AT $V_{max.}$ | APPLICATION AREA (2) | ORDERING PART NUMBERS |
| R_{25} (Ω) | TOL. (%) | | | I_{nt} (mA) | at T (°C) | I_t (mA) | at T (°C) | $t_{max.}$ (S) | $I_{max.}$ (A) | | |
| 25 | ± 20 | 1.0 | 220 | 70 | 70 | 200 | 25 | 2.5 | 4.0 | C.O. | PTCTL4MR250GTE |
| 10 | ± 20 | 1.0 | 230 | 100 | 70 | 250 | 25 | 3.0 | 2.0 | MDF; ISDN | PTCTL3MR100GTE |
| 25 | ± 15 | no | 245 | 70 | 70 | 200 | 25 | 5.0 | 2.6 | C.O. | PTCTL4NR250GTE |
| 16 | ± 20 | no | 245 | 140 | 55 | 270 | 25 | 8.0 | 1.6 | T.E. | PTCTL6NR160GTE |
| 10 | ± 20 | no | 245 | 140 | 55 | 270 | 25 | 8.0 | 2.0 | T.E. | PTCTL6NR100GTE |
| 25 | ± 20 | 1.0 | 250 | 70 | 70 | 175 | 25 | 1.3 | 3.2 | MDF; C.O. | PTCTL3MR250HTE |
| 10 | ± 20 | no | 250 | 100 | 70 | 450 | 0 | 40.0 | 10.0 | T.E. | PTCTL8NR100HBE |
| 8 | ± 25 | 0.5 | 285 | 135 | 95 | 400 | 25 | 6.0 | 0.6 | MDF; ISDN | PTCTL4MR080JBE |
| 16 | ± 25 | no | 300 | 100 | 70 | 250 | 25 | 2.0 | 2.6 | MDF; T.E. | PTCTL3NR160KTE |
| 10 | ± 20 | no | 350 | 100 | 70 | 270 | 25 | 4.0 | 1.0 | T.E.; S.B. | PTCTL4NR100LBE |
| 10 | ± 20 | 1.0 | 350 | 100 | 70 | 270 | 25 | 4.0 | 1.0 | C.O. | PTCTL4MR100LTE |
| 50 | ± 20 | 1.0 | 600 | 50 | 70 | 140 | 25 | 1.0 | 1.0 | C.O. | PTCTL4MR500SBE |
| 35 | ± 20 | 3.0 | 600 | 70 | 70 | 600 | 0 | 3.0 | 1.0 | C.O. | PTCTL4MR350STE |
| 25 | ± 20 | 0.5 | 600 | 70 | 70 | 170 | 25 | 2.5 | 2.0 | C.O. | PTCTL4MR250STE |
| 25 | ± 20 | 0.5 | 600 | 70 | 70 | 170 | 25 | 5.0 | 2.0 | C.O. | PTCTL6MR250STE |
| 10 | ± 20 | 0.5 | 600 | 175 | 25 | 400 | 25 | 7.0 | 1.0 | C.O. | PTCTL7MR100SBE (1) |
| 10 | ± 20 | no | 600 | 175 | 25 | 400 | 25 | 7.0 | 1.0 | T.E.; S.B. | PTCTL7NR100SBE (1) |

Notes

- All types pass ITU-T K20-21-45 telecommunication protection recommendation
- (1) UL 1434 approved types and compatible with UL1459 and GR1089
- (2) MDF: Main Distribution Frame; C.O.: Central Office Switching; T.E.: Subscriber Terminal Equipment; S.B.: Set-top Box

OVERCURRENT PROTECTION OF TELECOMMUNICATION LINES

The PTC thermistor must protect the telephone line circuit against overcurrent which may be caused by the following events:

- Surges due to lightning strikes on or near to the line plant.
- Short-term induction of alternating voltages from adjacent power lines or railway systems, usually caused when these lines or systems develop faults.
- Direct contact between telephone lines and power lines.

To provide good protection under such conditions a PTC thermistor is connected in series with each line, usually as secondary protection; see Typical Telephone Line drawing fig. 1. However, even with primary line protection (usually a gas discharge tube), the PTC thermistor must fulfil severe requirements.

Surge pulses of up to 2 kV can occur and in order to withstand short-term power induction the PTC thermistor must withstand high voltages. If the line has primary protection a 220 V to 300 V PTC thermistor is adequate. Without primary protection, however, a 600 V PTC device is necessary. Vishay BCcomponents manufactures a range of PTC thermistors (see Electrical Data and Ordering Information Table) covering both requirements.

In the case of direct contact between the telephone line and a power line, the PTC thermistor must withstand very high inrush power at normal mains voltage. Under such conditions, overload currents of up to 10 A on a 230 V mains could occur for up to several hours. To handle this power, the resistance/temperature characteristic of the thermistor must have a very steep slope and the ceramic must be extremely homogeneous.

In case of overcurrent due to short-term induction of alternating voltages, currents of several amperes with voltages as high as 650 V_{RMS} can be present for several seconds.

For standard high voltage applications, resistance values from 25 Ω to 50 Ω are available. However, ISDN networks which carry high-frequency sound and vision, need lower line impedance.

Telecommunication designers are therefore demanding high voltage thermistors with much lower R₂₅ values, which places even greater demands on the manufacture of PTC thermistors. For these applications PTC thermistors which have a R₂₅ value of 10 Ω with voltages in the 300 V_{RMS} to 600 V_{RMS} range are available.

In a typical telephone line application, two PTC thermistors are used, one each for the tip and ring (or A and B) wire together with their series resistors. For good line balance it is important that the thermistor and resistor pairs are matched.

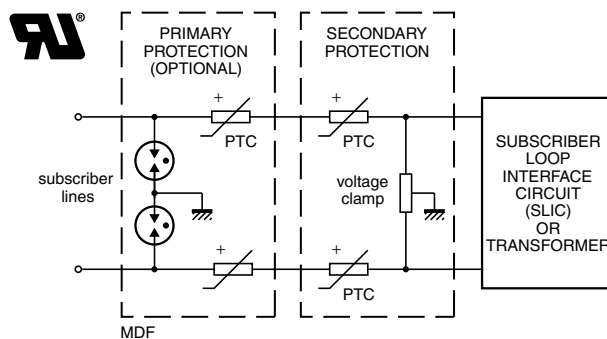
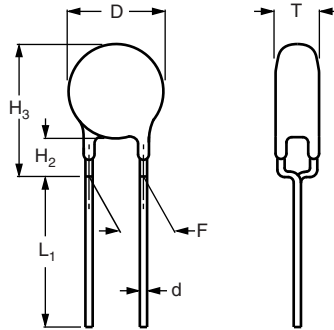


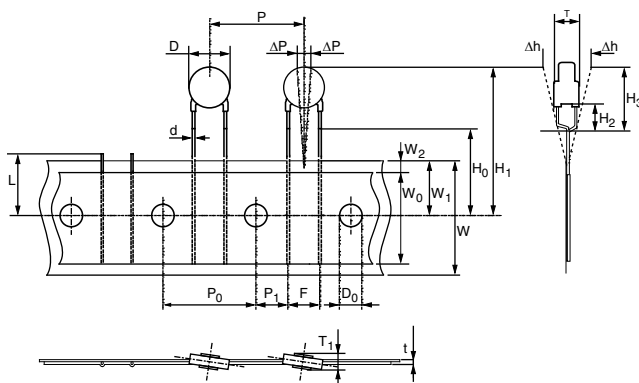
Fig. 1 - Typical telephone line showing where PTC thermistors can be used for overcurrent protection.

PTC THERMISTORS IN BULK


| COMPONENT DIMENSIONS (in mm) | | | | | | | | |
|------------------------------|-----------|----------------|----------------|------------------------|----------------|-----------------------------|------|-------------------------------|
| D MAX. | T MAX. | H ₂ | L ₁ | H ₃ MAX. | H ₀ | PACKAGING ⁽¹⁾⁽²⁾ | | ORDERING PART NUMBER |
| | | | | | | TYPE | SPQ | |
| 8.5 | 5.0 | 1.5 to 3.0 | - | 11.5 | 16 | Taped on reel | 1500 | PTCTL4MR250GTE |
| 7.0 | 4.0 | 2.0 ± 0.5 | - | 9.8 | 18 | Taped on reel | 1500 | PTCTL3MR100GTE |
| 8.3 | 4.0 | 1.5 to 3.0 | - | 11.0 | 18 | Taped on reel | 1500 | PTCTL4NR250GTE ⁽³⁾ |
| 11 | 4.5 | 4.0 ± 1.0 | - | 15.5 | 16 | Taped on reel | 1500 | PTCTL6NR160GTE |
| 11 | 4.5 | 4.0 ± 1.0 | - | 15.5 | 16 | Taped on reel | 1500 | PTCTL6NR100GTE ⁽³⁾ |
| 7.0 | 4.0 | 2.0 ± 0.5 | - | 9.8 | 18 | Taped on reel | 1500 | PTCTL3MR250HTE |
| 13.6 | 6.0 | 4.0 ± 1.0 | 20 ± 4.0 | 18.6 | - | Bulk | 200 | PTCTL8NR100HBE ⁽³⁾ |
| 8.3 | 5.0 | 1.5 ± 0.5 | 20 ± 3.0 | 10.3 | - | Bulk | 250 | PTCTL4MR080JBE |
| 7.0 | 4.0 | 2.5 ± 0.5 | - | 10.0 | 16 | Taped on reel | 1500 | PTCTL3NR160KTE |
| 8.5 | 4.0 | 2.5 ± 0.5 | 4.1 ± 0.5 | 11.5 | - | Bulk | 500 | PTCTL4NR100LBE |
| 8.5 | 4.0 | 2.5 ± 0.5 | - | 11.5 | 16 | Taped on reel | 1500 | PTCTL4MR100LTE |
| 8.5 | 4.0 | 2.5 ± 0.5 | 4.1 ± 0.5 | 11.5 | - | Bulk | 500 | PTCTL4MR500SBE |
| 8.0 | 5.0 | 2.5 ± 0.5 | - | 11.0 | 16 | Taped on reel | 1500 | PTCTL4MR350STE |
| 8.5 | 4.0 | 2.0 ± 0.5 | - | 11.0 | 16 | Taped on reel | 1500 | PTCTL4MR250STE |
| 10.5 | 5.0 | 2.0 ± 0.5 | - | 12.6 | 16 | Taped on reel | 1500 | PTCTL6MR250STE |
| 13 | 5.5 | 4.0 ± 1.0 | 20 min. | 18.0 | - | Bulk | 200 | PTCTL7MR100SBE |
| 13 | 5.5 | 4.0 ± 1.0 | 20 min. | 18.0 | - | Bulk | 200 | PTCTL7NR100SBE |

Notes

- (1) Taped in accordance with IEC 60286-2
- (2) Metallized ceramic pellet for clamping or substrate mounting, available on request
- (3) Insulated version is also available

PTC THERMISTORS ON TAPE AND REEL

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 between thermistors | 12.7 | ± 1 |
| P ₀ | Feedhole pitch | 12.7 | ± 0.3 |
| F | Leadcenter to leadcenter distance (between component and tape) | 5 | + 0.5 / - 0.2 |
| H ₀ | Lead wire clinch height | see table | ± 0.5 |
| H ₂ | Component bottom to seating plane | see table | see table |
| H ₃ | Component top to seating plane | see table | max. |
| T | Total thickness | see table | max. |



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