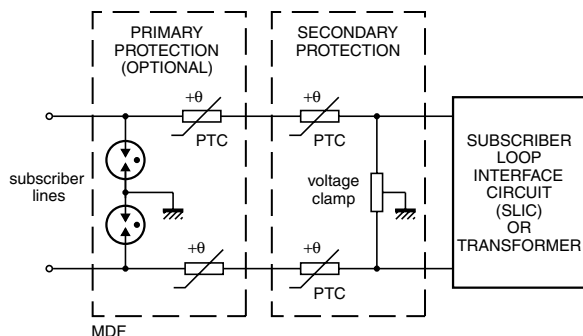


PTC Thermistors, Overload Protection For Telecommunication



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

DESCRIPTION

Advanced developments in telephone equipment in recent years have radically altered the protection requirements for both exchange and subscriber equipment. The Vishay BCcomponents range of Positive Temperature Coefficient (PTC) thermistors includes devices specially designed to provide overcurrent protection.

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 ≤ 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
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

APPLICATIONS

- Main Distribution Frame (MDF)
- Central Office Switching (C.O.)
- Subscriber Terminal Equipment (T.E.)
- Set-top box (S.B.)

MARKING

Clear marking on a grey coated body
BC and R25 value

| 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 ⁽⁴⁾ | CATALOG NUMBER | |
| R ₂₅ (Ω) | TOL. (%) | | | I _{NT} (mA) | AT T (°C) | I _T (mA) | AT T (°C) | | | | TT (S) | I _{MAX.} (A) |
| 25 | ± 20 | 1.0 | 220 | 70 | 70 | 200 | 25 | 2.5 | 4.0 | C.O. | 2381 661 93048 ⁽¹⁾ | PTCTL4MR250GTE ⁽¹⁾ |
| 10 | ± 20 | 1.0 | 230 | 100 | 70 | 250 | 25 | 3.0 | 2.0 | MDF; ISDN | 2381 661 93147 ⁽¹⁾ | PTCTL3MR100GTE ⁽¹⁾ |
| 33 | ± 20 | 1.5 | 245 | 75 | 70 | 150 | 10 | 1.2 | 1.0 | C.O. | 2381 661 93037 | PTCTL3MR330GTE |
| 25 | ± 15 | no | 245 | 70 | 70 | 200 | 25 | 5.0 | 2.6 | C.O. | 2381 661 93175 ^{(1) (3)} | PTCTL4NR250GTE ^{(1) (3)} |
| 16 | ± 20 | no | 245 | 140 | 55 | 270 | 25 | 8.0 | 1.6 | T.E. | 2381 662 93081 ^{(1) (3)} | PTCTL6NR160GTE ^{(1) (3)} |
| 10 | ± 20 | no | 245 | 140 | 55 | 270 | 25 | 8.0 | 2.0 | T.E. | 2381 662 93074 ^{(1) (3)} | PTCTL6NR100GTE ^{(1) (3)} |
| 25 | ± 20 | 1.0 | 250 | 70 | 70 | 175 | 25 | 1.3 | 3.2 | MDF; C.O. | 2381 661 93148 ⁽¹⁾ | PTCTL3MR250HTE ⁽¹⁾ |
| 10 | ± 20 | no | 250 | 100 | 70 | 450 | 0 | 40.0 | 10.0 | T.E. | 2381 663 93025 ⁽¹⁾ | PTCTL8NR100HBE ⁽¹⁾ |
| 8 | ± 25 | 0.5 | 285 | 135 | 95 | 400 | 25 | 6.0 | 0.6 | MDF; ISDN | 2381 661 93078 ⁽¹⁾ | PTCTL4MR080JBE ⁽¹⁾ |
| 16 | ± 25 | no | 300 | 100 | 70 | 250 | 25 | 2.0 | 2.6 | MDF; T.E. | 2381 661 93121 ⁽¹⁾ | PTCTL3NR160KTE ⁽¹⁾ |
| 10 | ± 20 | no | 350 | 100 | 70 | 270 | 25 | 4.0 | 1.0 | T.E.; S.B. | 2381 661 93124 ⁽¹⁾ | PTCTL4NR100LBE ⁽¹⁾ |
| 10 | ± 20 | 1.0 | 350 | 100 | 70 | 270 | 25 | 4.0 | 1.0 | C.O. | 2381 661 93146 ⁽¹⁾ | PTCTL4MR100LTE ⁽¹⁾ |
| 50 | ± 20 | 1.0 | 600 | 50 | 70 | 140 | 25 | 1.0 | 1.0 | C.O. | 2381 661 93135 ⁽¹⁾ | PTCTL4MR500SBE ⁽¹⁾ |
| 35 | ± 20 | 3.0 | 600 | 70 | 70 | 600 | 0 | 3.0 | 1.0 | C.O. | 2381 661 93056 ⁽¹⁾ | PTCTL4MR350STE ⁽¹⁾ |
| 25 | ± 20 | 0.5 | 600 | 70 | 70 | 170 | 25 | 2.5 | 2.0 | C.O. | 2381 661 93139 ⁽¹⁾ | PTCTL4MR250STE ⁽¹⁾ |
| 25 | ± 20 | 0.5 | 600 | 70 | 70 | 170 | 25 | 5.0 | 2.0 | C.O. | 2381 662 93129 ⁽¹⁾ | PTCTL6MR250STE ⁽¹⁾ |
| 10 | ± 20 | 0.5 | 600 | 175 | 25 | 400 | 25 | 7.0 | 1.0 | C.O. | 2381 662 93114 ⁽²⁾ | PTCTL7MR100SBE ⁽²⁾ |
| 10 | ± 20 | no | 600 | 175 | 25 | 400 | 25 | 7.0 | 1.0 | T.E.; S.B. | 2381 662 93131 ⁽²⁾ | PTCTL7NR100SBE ⁽²⁾ |

Notes

- ⁽¹⁾ These types pass ITU-T K20-21-45 edition 2003 telecommunication protection recommendation
- ⁽²⁾ UL 1434 approved types and compatible with UL1459 and GR1089
- ⁽³⁾ These types are compatible with FTCSE 131
- ⁽⁴⁾ 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 examples:

- 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 on page 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.

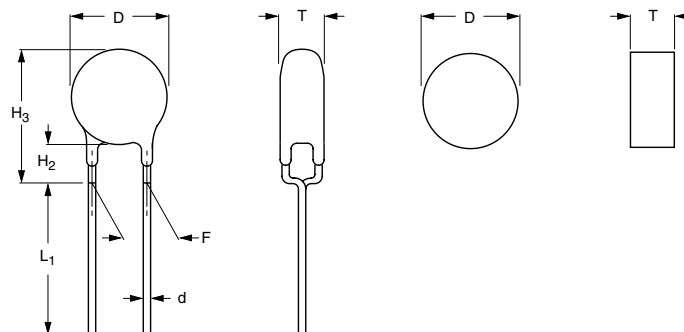
In case of overcurrent due to short-term induction of alternating voltages, currents of several AMPs with voltages as high as 650 V_{RMS} can be present for several seconds

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.

On request, Vishay BCcomponents can supply matched or binned PTC thermistors with R₂₅ values matched to as close as 0.5 Ω.

PTC THERMISTORS IN BULK


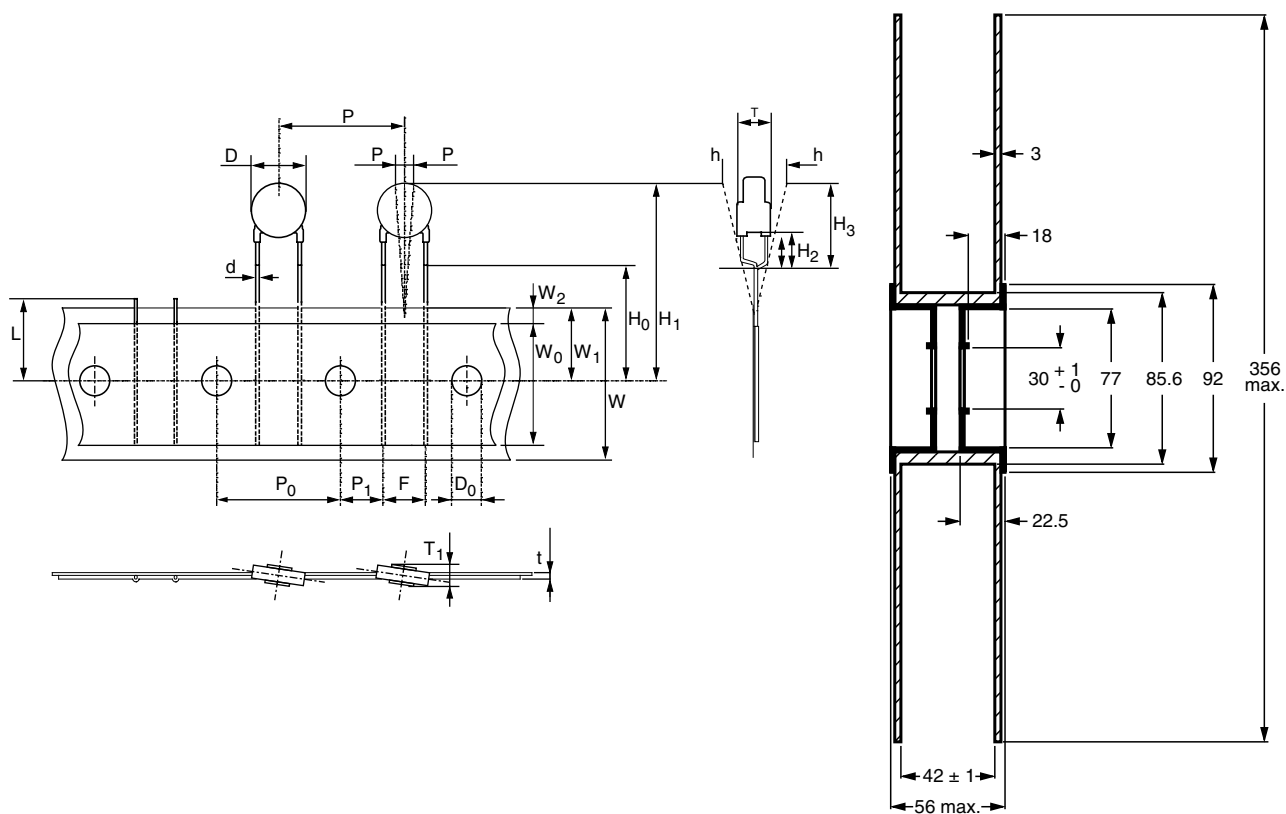
| COMPONENT DIMENSIONS | | | | | | | | | |
|----------------------|-------------------|------------------------|------------------------|--------------------------------|------------------------|------------------------------|------|-------------------------------|-------------------------------|
| D MAX. (mm) | T MAX. (mm) | H ₂ (mm) | L ₁ (mm) | H ₃ MAX. (mm) | H ₀ (mm) | PACKAGING ^{(1) (2)} | | CATALOG NUMBER | |
| | | | | | | TYPE | SPQ | 12 NC | SAP CODING |
| 8.5 | 5.0 | 1.5 to 3.0 | - | 11.5 | 16 | Taped on Reel | 1500 | 2381 661 93048 | PTCTL4MR250GTE |
| 7.0 | 4.0 | 2.0 ± 0.5 | - | 9.8 | 18 | Taped on Reel | 1500 | 2381 661 93147 | PTCTL3MR100GTE |
| 7.0 | 5.0 | 1.5 to 3 | - | 10.0 | 16 | Taped on Reel | 1500 | 2381 661 93037 | PTCTL3MR330GTE |
| 8.3 | 4.0 | 1.5 to 3.0 | - | 11.0 | 18 | Taped on Reel | 1500 | 2381 661 93175 ⁽³⁾ | PTCTL4NR250GTE ⁽³⁾ |
| 11 | 4.5 | 4.0 ± 1.0 | - | 15.5 | 16 | Taped on Reel | 1500 | 2381 662 93081 | PTCTL6NR160GTE |
| 11 | 4.5 | 4.0 ± 1.0 | - | 15.5 | 16 | Taped on Reel | 1500 | 2381 662 93074 ⁽³⁾ | PTCTL6NR100GTE ⁽³⁾ |
| 7.0 | 4.0 | 2.0 ± 0.5 | - | 9.8 | 18 | Taped on Reel | 1500 | 2381 661 93148 | PTCTL3MR250HTE |
| 13.6 | 6.0 | 4.0 ± 1.0 | 20 ± 4.0 | 18.6 | - | Bulk | 200 | 2381 663 93025 ⁽³⁾ | PTCTL8NR100HBE ⁽³⁾ |
| 8.3 | 5.0 | 1.5 ± 0.5 | 20 ± 3.0 | 10.3 | - | Bulk | 250 | 2381 661 93078 | PTCTL4MR080JBE |
| 7.0 | 4.0 | 2.5 ± 0.5 | - | 10.0 | 16 | Taped on Reel | 1500 | 2381 661 93121 | PTCTL3NR160KTE |
| 8.5 | 4.0 | 2.5 ± 0.5 | 4.1 ± 0.5 | 11.5 | - | Bulk | 500 | 2381 661 93124 | PTCTL4NR100LBE |

| COMPONENT DIMENSIONS | | | | | | | | | |
|----------------------|-------------------|------------------------|------------------------|--------------------------------|------------------------|------------------------------|------|----------------|----------------|
| D MAX. (mm) | T MAX. (mm) | H ₂ (mm) | L ₁ (mm) | H ₃ MAX. (mm) | H ₀ (mm) | PACKAGING ^{(1) (2)} | | CATALOG NUMBER | |
| | | | | | | TYPE | SPQ | 12 NC | SAP CODING |
| 8.5 | 4.0 | 2.5 ± 0.5 | - | 11.5 | 16 | Taped on Reel | 1500 | 2381 661 93146 | PTCTL4MR100LTE |
| 8.5 | 4.0 | 2.5 ± 0.5 | 4.1 ± 0.5 | 11.5 | - | Bulk | 500 | 2381 661 93135 | PTCTL4MR500SBE |
| 8.0 | 5.0 | 2.5 ± 0.5 | - | 11.0 | 16 | Taped on Reel | 1500 | 2381 661 93056 | PTCTL4MR350STE |
| 8.5 | 4.0 | 2.0 ± 0.5 | - | 11.0 | 16 | Taped on Reel | 1500 | 2381 661 93139 | PTCTL4MR250STE |
| 10.5 | 5.0 | 2.0 ± 0.5 | - | 12.6 | 16 | Taped on Reel | 1500 | 2381 662 93129 | PTCTL6MR250STE |
| 13 | 5.5 | 4.0 ± 1.0 | 20 min. | 18.0 | - | Bulk | 200 | 2381 662 93114 | PTCTL7MR100SBE |
| 13 | 5.5 | 4.0 ± 1.0 | 20 min. | 18.0 | - | Bulk | 200 | 2381 662 93131 | PTCTL7NR100SBE |

Notes

- (1) Taped in accordance with "IEC 60286-2"
- (2) Naked disc ceramic for substrate mounting, available on request
- (3) Insulated version is also available

PTC THERMISTORS ON TAPE ON REEL



Dimensions of the reel



| TAPE AND REEL ACCORDING TO IEC60286-2 DIMENSIONS in millimeters | | | | |
|--|---------------------------------|------------|----------------|--|
| SYMBOL | PARAMETER | DIMENSIONS | TOLERANCE | REMARKS |
| D | Body diameter | See table | Max. | |
| T | Total maximum thickness | See table | Max. | |
| d | Lead diameter | 0.6 | ± 10 % | |
| P | Pitch between thermistors | 12.7 | ± 1 | |
| P ₀ | Feed hole pitch | 12.7 | ± 0.3 | Cumulative pitch error ± 1 mm/20 pitches |
| P ₁ | Feed hole centre to lead centre | 3.81 | ± 0.7 | Guaranteed between component and tape |
| Δh | Component alignment | 0 | ± 1.3 | |
| F | Lead to lead distance | 5 | + 0.6 to - 0.1 | Guaranteed between component and tape |
| Δh | Component alignment | 0 | ± 2 | |
| W | Tape width | 18 | + 1 to - 0.5 | |
| W ₀ | Hold down tape width | ≥ 12.3 | - | |
| W ₁ | Hole position | 9 | ± 0.5 | |
| W ₂ | Hold down tape position | ≤ 3.0 | - | |
| H ₂ | Component body to seating plane | 4 | ± 1 | |
| H ₃ | Component top to seating plane | See table | | |
| H ₀ | Lead-wire clinch height | See table | ± 0.5 | |
| D ₀ | Feed hole diameter | 4 | ± 0.2 | |
| t | Total tape thickness | ≤ 0.9 | - | With cardboard tape 0.5 mm ± 0.1 mm |
| L | Length of snipped lead | ≤ 11 | - | |



Disclaimer

All product specifications and data are subject to change without notice.

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