PTC Thermistors, Overload Protection for Telecommunication

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
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

QUICK REFERENCE DATA

PARAMETER	VALUE	UNIT
Maximum voltage (RMS or DC)	220 to 600	V_{RMS}
Maximum holding current (I_{hd})	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

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

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_{hd} (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

For technical questions, contact: nlr@vishay.com
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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 manufacturers 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 R_{25} values, which places even greater demands on the manufacture of PTC thermistors. For these applications PTC thermistors which have a R_{25} 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.

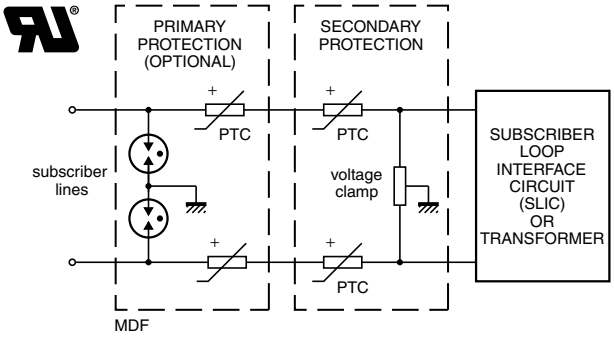

Fig. 1 - Typical telephone line showing where PTC thermistors can be used for overcurrent protection.

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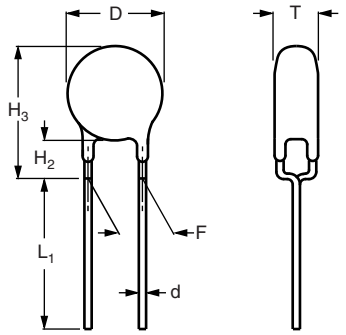
PTC THERMISTORS IN BULK



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

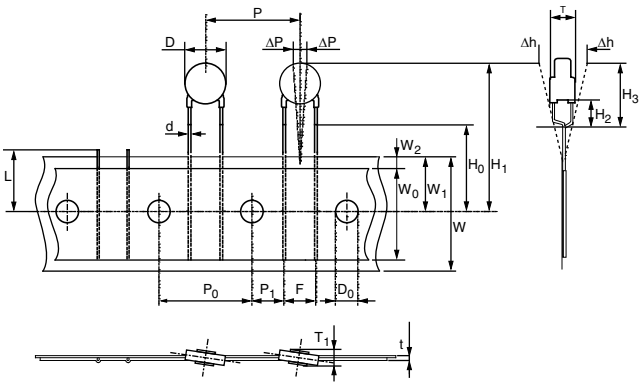
Notes

(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
H0	Lead wire clinch height	see table	± 0.5
H2	Component bottom to seating plane	see table	see table
H3	Component top to seating plane	see table	max.
T	Total thinkness	see table	max.

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