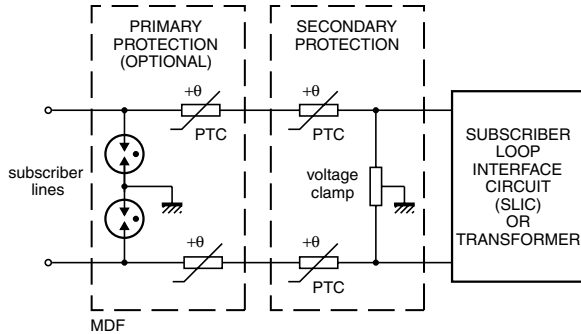**VISHAY.**

PTC Thermistors, Overload Protection
For Telecommunication

Typical telephone line showing where PTC thermistors can be used for 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 $\leq$ 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
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC

RoHS COMPLIANT

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 in specific telecom applications.

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 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. (%)			Int (mA)	at T (°C)	I_t (mA)	at T (°C)	$t_{MAX.}$ (s)	$I_{MAX.}$ (A)		12NC	SAP CODING
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

For technical questions, contact: nlr@vishay.com

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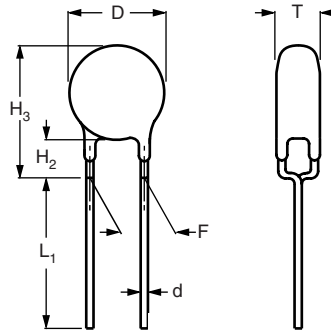
In case of overcurrent due to short-term induction of alternating voltages, currents of several AMPs with voltages as high as 650 V_{RMS} can be present for several seconds

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 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.

On request, Vishay BCcomponents can supply matched or binned PTC thermistors with R_{25} 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	12NC	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

COMPONENT DIMENSIONS

D MAX. (mm)	T MAX. (mm)	H₂ (mm)	L₁ (mm)	H₃ MAX. (mm)	H₀ (mm)	PACKAGING [1] [2]		CATALOG NUMBER	
						TYPE	SPQ	12NC	SAP CODING
8.5	4.0	2.5 ± 0.5	4.1 ± 0.5	11.5	-	Bulk	500	2381 661 93124	PTCTL4NR100LBE
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 TAPE ON REEL ACCORDING IEC 60286-2
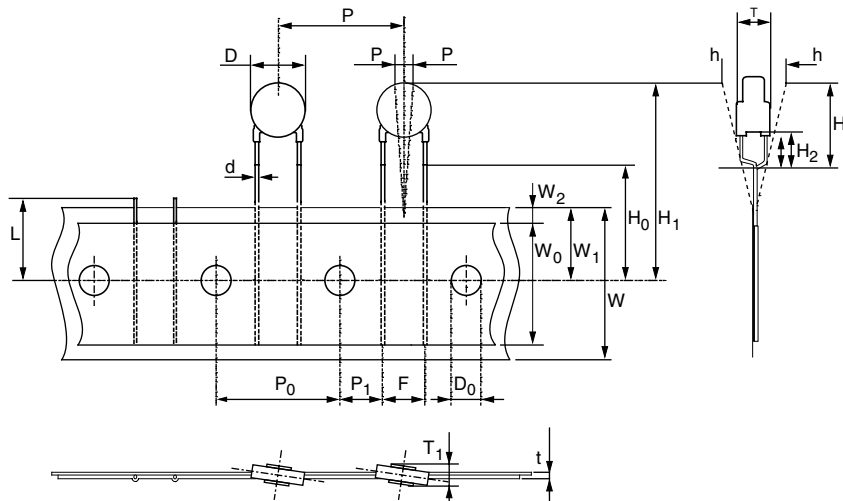
Dimensions of the reel

TAPE AND REEL ACCORDING TO IEC60286-2 DIMENSIONS in millimeters				
SYMBOL	PARAMETER	DIMENSIONS	TOLERANCE	REMARKS
d	Lead diameter	0.6	± 10 %	
P	Pitch between thermistors	12.7	± 1	
F	Lead to lead distance	5	+ 0.6 to - 0.1	Guaranteed between component and tape
H2	Component body to seating plane	4	± 1	
H₀	Lead-wire clinch height	See table	± 0.5	

For technical questions, contact: nlr@vishay.com

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