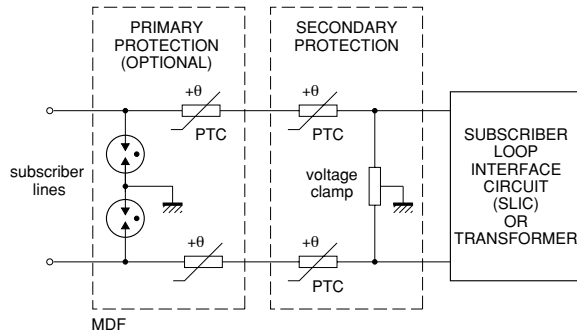


## PTC Thermistors, Overload Protection For Telecommunication



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

### DESCRIPTION

Advanced developments in telephony 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 4... to 70  $\Omega$
- Fast protection against power contact faults
- Withstand high overload currents of up to 10 A
- High voltage withstanding capabilities for the larger sized thermistors
- Good tracking over a wide temperature range for all matched or binned types
- UL1434 approved types available (XGPU2)
- Excellent stability over extended time
- All telecom PTCs are coated with a high temperature silicon lacquer (UL94V0) to protect them from any harsh environments and to improve their lifetime.

### 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 $\Omega$	$V_{MAX.}$ (Vrms)	NON-TRIP CURRENT		TRIP CURRENT		MAX. TRIP TIME at 1A	$I_{MAX.}$ at $V_{MAX.}$	APPLICATION AREA <sup>(4)</sup>	CODE NUMBER 2322 ... ..
R <sub>25</sub> ( $\Omega$ )	TOL (%)			$I_{nt}$ (mA)	at T ( $^{\circ}C$ )	$I_t$ (mA)	at T ( $^{\circ}C$ )	$t_t$ (s)	$I_{MAX}$ (A)		
25	$\pm 20$	1.0	220	70	70	200	25	2.5	4.0	C.O.	661 93048 <sup>(1)</sup>
10	$\pm 20$	1.0	230	100	70	250	25	3.0	2.0	MDF; ISDN	661 93147 <sup>(1)</sup>
33	$\pm 20$	1.5	245	75	70	150	10	1.2	1.0	C.O.	661 93037
25	$\pm 15$	no	245	70	70	200	25	5.0	2.6	C.O.	661 93175 <sup>(1)(3)</sup>
16	$\pm 20$	no	245	140	55	270	25	8.0	1.6	T.E.	662 93081 <sup>(1)(3)</sup>
10	$\pm 20$	no	245	140	55	270	25	8.0	2.0	T.E.	662 93074 <sup>(1)(3)</sup>
20	+10/-20	1.0	250	100	40	220	25	1.0	1.6	MDF	661 93118
25	$\pm 20$	1.0	250	70	70	175	25	1.3	3.2	MDF; C.O.	661 93148 <sup>(1)</sup>
10	$\pm 20$	no	250	100	70	450	0	40.0	10.0	T.E.	663 93025 <sup>(1)</sup>
8	$\pm 25$	0.5	285	135	95	400	25	6.0	0.6	MDF; ISDN	661 93078 <sup>(1)</sup>
16	$\pm 25$	no	300	100	70	250	25	2.0	2.6	MDF; T.E.	661 93121 <sup>(1)</sup>
10	$\pm 20$	no	350	100	70	270	25	4.0	1.0	T.E.; S.B.	661 93124 <sup>(1)</sup>
10	$\pm 20$	1.0	350	100	70	270	25	4.0	1.0	C.O.	661 93146 <sup>(1)</sup>
50	$\pm 20$	1.0	600	50	70	140	25	1.0	1.0	C.O.	661 93135 <sup>(1)</sup>
35	$\pm 20$	3.0	600	70	70	600	0	3.0	1.0	C.O.	661 93056 <sup>(1)</sup>
25	$\pm 20$	0.5	600	70	70	170	25	2.5	2.0	C.O.	661 93139 <sup>(1)</sup>
25	$\pm 20$	0.5	600	70	70	170	25	5.0	2.0	C.O.	662 93129 <sup>(1)</sup>
10	$\pm 20$	0.5	600	175	25	400	25	7.0	1.0	C.O.	662 93114 <sup>(2)</sup>
10	$\pm 20$	no	600	175	25	400	25	7.0	1.0	T.E.; S.B.	662 93131 <sup>(2)</sup>

#### 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<sub>RMS</sub> can be present for several seconds

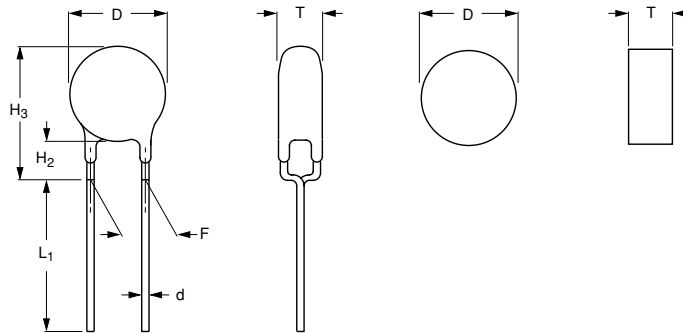
For standard high voltage applications, resistance values from 25 to 50  $\Omega$  are available. However, ISDN networks which carry high-frequency sound and vision, need lower line impedance.

Telecommunication designers are therefore demanding high voltage thermistors with much lower R<sub>25</sub> values, which places even greater demands on the manufacture of PTC thermistors. For these applications PTC thermistors which have a R<sub>25</sub> value of 10  $\Omega$  with voltages in the 300 to 600 V<sub>RMS</sub> 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<sub>25</sub> values matched to as close as 0.5  $\Omega$ .

## PTC THERMISTORS IN BULK



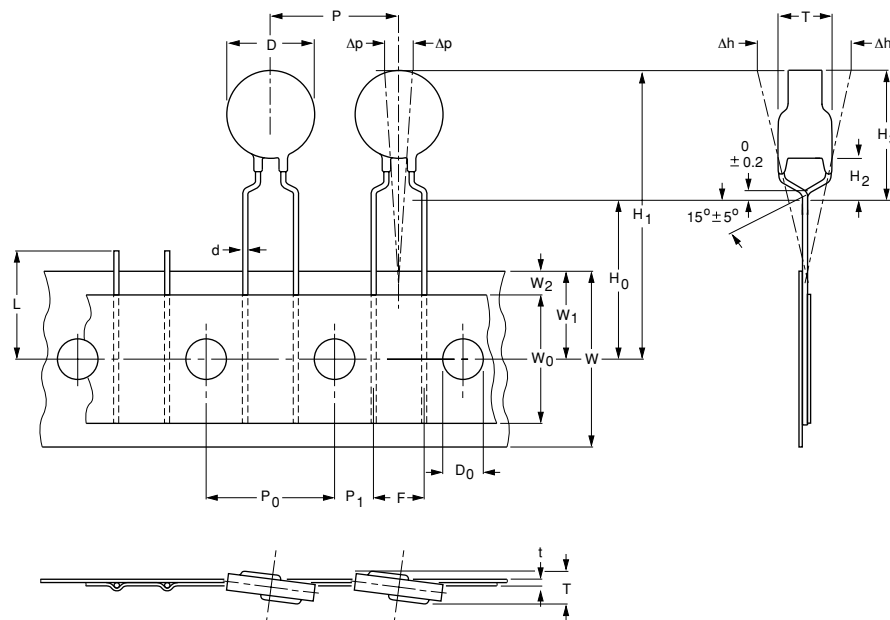
### COMPONENT DIMENSIONS AND PACKAGING in millimeters

D MAX. (MM)	T MAX. (MM)	H <sub>2</sub> (MM)	L <sub>1</sub> (MM)	H <sub>3</sub> MAX. (MM)	H <sub>0</sub> (MM)	PACKAGING <sup>(1)(2)</sup>			CATALOG NUMBER 2322 ... ..
						TYPE	S.P.Q.	P.Q.	
8.5	5.0	1.5 to 3.0	–	11.5	16	Taped on Reel	3,000	6,000	661 93048
7.0	4.0	2.0 ±0.5	–	9.8	18	Taped on Reel	3,000	6,000	661 93147
7.0	5.0	1.5 to 3	–	10.0	16	Taped on Reel	3,000	6,000	661 93037
8.3	4.0	1.5 to 3.0	–	11.0	18	Taped on Reel	3,000	6,000	661 93175
11	4.5	4.0 ±1.0	–	15.5	16	Taped on Reel	3,000	6,000	662 93081
11	4.5	4.0 ±1.0	–	15.5	16	Taped on Reel	3,000	6,000	662 93074
6.7	1.8	–	–	–	–	disc on tray	5,600	5,600	661 93118
7.0	4.0	2.0 ±0.5	–	9.8	18	Taped on Reel	3,000	6,000	661 93148
13.6	6.0	4.0 ±1.0	20 ±4.0	18.6	–	Bulk	200	6,000	663 93025
8.3	5.0	1.5 ±0.5	20 ±3.0	10.3	–	Bulk	250	6,000	661 93078
7.0	4.0	2.5 ±0.5	–	10.0	16	Taped on Reel	3,000	6,000	661 93121
8.5	4.0	2.5 ±0.5	4.1 ±0.5	11.5	–	Bulk	500	6,000	661 93124

D MAX. (MM)	T MAX. (MM)	H <sub>2</sub> (MM)	L <sub>1</sub> (MM)	H <sub>3</sub> MAX. (MM)	H <sub>0</sub> (MM)	PACKAGING <sup>(1)(2)</sup>			CATALOG NUMBER 2322 ... ..
						TYPE	S.P.Q.	P.Q.	
8.5	4.0	2.5 ±0.5	–	11.5	16	Taped on Reel	3,000	6,000	661 93146
8.5	4.0	2.5 ±0.5	4.1 ±0.5	11.5	–	Bulk	500	6,000	661 93135
8.0	5.0	2.5 ±0.5	–	11.0	16	Taped on Reel	3,000	6,000	661 93056
8.5	4.0	2.0 ±0.5	–	11.0	16	Taped on Reel	3,000	6,000	661 93139
10.5	5.0	2.0 ±0.5	–	12.6	16	Taped on Reel	3,000	6,000	662 93129
13	5.5	4.0 ±1.0	20 min.	18.0	–	Bulk	200	6,000	662 93114
13	5.5	4.0 ±1.0	20 min.	18.0	–	Bulk	200	6,000	662 93131

**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.

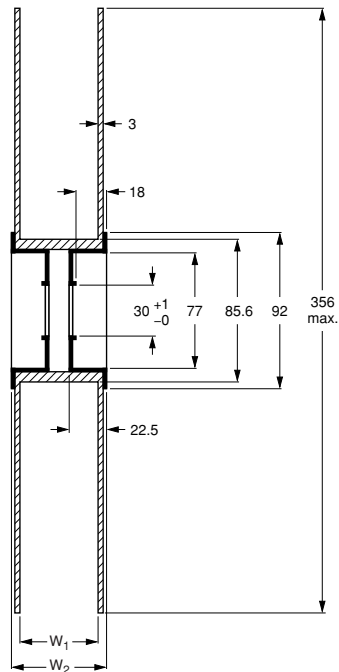
**PTC THERMISTORS ON TAPE ON REEL**


<b>TAPE AND REEL ACCORDING TO IEC60286-2 DIMENSIONS</b> 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 mm	12.7	±1	
	∅ ≥ 12 mm	25.4	±2	
P <sub>0</sub>	feed hole pitch	12.7	±0.3	cumulative pitch error ±1 mm/20 pitches



TAPE AND REEL ACCORDING TO IEC60286-2 DIMENSIONS in millimeters				
SYMBOL	PARAMETER	DIMENSIONS	TOLERANCE	REMARKS
P <sub>1</sub>	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 <sub>0</sub>	hold down tape width	≥12.3	-	
W <sub>1</sub>	hole position	9	±0.5	
W <sub>2</sub>	hold down tape position	≤3.0	-	
H <sub>1</sub>	component height	see table		
H <sub>2</sub>	component body to seating plane	4	±1	
H <sub>3</sub>	component top to seating plane	see table		
H <sub>0</sub>	lead-wire clinch height	see table	±0.5	
D <sub>0</sub>	feed hole diameter	4	±0.2	
t	total tape thickness	≤0.9	-	with cardboard tape 0.5 ±0.1 mm
L	length of snipped lead	≤11	-	

**REEL SPECIFICATIONS** in millimeters



REEL DIMENSIONS in millimeters		
DIAMETER Ø	W <sub>1</sub>	W <sub>2</sub> MAX.
<12	42 ±1	56
12	46 ±1	60