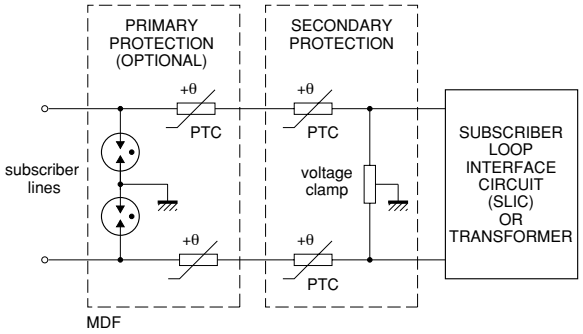
PTC Thermistors, Overload Protection For Telecommunication



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

FEATURES

- Wide resistance range in telecom area 4... 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
- 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.).

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.

MARKING

Clear marking on a grey coated body.

BC and R25 value.

ELECTRICAL DATA AND ORDERING INFORMATION

V MAX. (V)	NON-TRIP CURRENT		RESISTANCE		MATCHED PAIRS	TRIP CURRENT		MAX. TRIP TIME at 25 °C		APPLICATION AREA[1]	COMPATIBILITY	CATALOG NUMBER 2322 ... .
	I_{nt} (mA)	at T (°C)	R_{25} (Ω)	TOL (%)		I_t (mA)	at T (°C)	t_t (s)	at I_t (mA)			
220	70	70	25	±20	1 Ω	200	25	2.5	1000	C.O.	K20/21	661 93048
230	100	70	10	±20	1 Ω	250	25	3	1000	MDF; ISDN	K20/21	661 93147
245	60	70	70	+10/−15	no	180	25	60	220	C.O.	–	661 93025
245	75	70	33	±20	±5%	150	10	1.2	1000	C.O.	–	661 93037
245	70	70	25	±15	no	200	25	20	400	C.O.	K20/21; FTCSE I31-24	661 93175
245	65	85	25	±20	2%	200	25	3.40	650	C.O.	K20/21	661 93142
245	140	55	16	±20	no	270	25	8	1000	T.E.	K20/21; FTCSE I31-21	662 93081
245	140	55	10	±20	no	270	25	8	1000	T.E.	K20/21; FTCSE I31-21	662 93074
250	100	40	20	+10/−20	1 Ω	220	25	1	1000	MDF	–	661 93118
250	70	70	25	±20	1 Ω	175	25	1.3	1000	MDF; C.O.	K20/21	661 93148
250	100	70	10	±20	no	450	0	0.30	8000	T.E.	K20/21	663 93025
285	135	95	8	±25	0.5 Ω	400	25	6	1000	MDF; ISDN	K20/21	661 93078
300	100	70	16	±25	no	250	25	2.0	1000	MDF; T.E.	K20/21	661 93121
350	100	70	10	±20	no	270	25	4.0	1000	T.E.; S.B.	K20/21	661 93124
350	100	70	10	±20	1 Ω	270	25	4.0	1000	C.O.	K20/21	661 93146
600	50	70	50	±20	1 Ω	140	25	1	1000	C.O.	K20/21	661 93135
600	70	70	35	±20	3 Ω	600	0	3	1000	C.O.	K20/21	661 93056
600	70	70	25	±20	2%	170	25	4	700	C.O.	K20/21	661 93139
600	70	70	25	±20	2%	170	25	8	700	C.O.	K20/21	662 93129
600	175	25	10	±20	0.5 Ω	400	25	7	1000	C.O.	UL1459/GR1089	662 93114[2]
600	175	25	10	±20	no	400	25	7	1000	T.E.; S.B.	UL1459/GR1089	662 93131[2]

Notes

1. MDF: Main Distribution Frame; C.O.: Central Office Switching; T.E.: Subscriber Terminal Equipment; S.B.: Set-top Box.
2. UL 1434 approved types.

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 to 50 Ω are available. However, ISDN networks which carry high-frequency sound and vision, need lower line impedance.

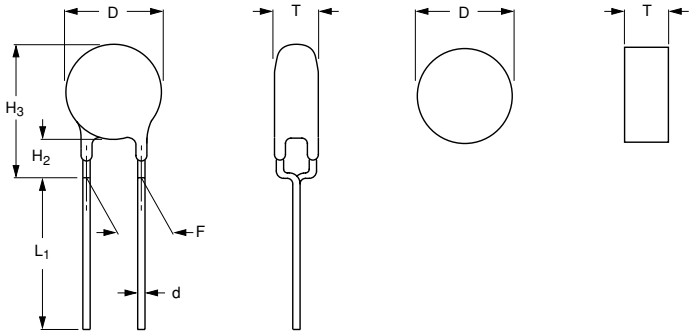
Telecommunication designers are therefore demanding high voltage thermistors with much lower R_{25} values, which places even greater demands on the manufacture of PTC thermistors. For these applications PTC thermistors which have a R_{25} value of 10 Ω with voltages in the 300 to 600 V_{RMS} range are 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.

DIMENSIONS in millimeters

COMPONENT OUTLINE



For dimensions see Specific Physical Dimentions and Packaging table.

Lead pitch F = 5 mm +0.6/-0.1.

Lead thickness d = 0.6 mm ±10%.

SPECIFIC PHYSICAL DIMENSIONS AND PACKAGING in millimeters

D MAX.	T MAX.	H_2	L_1	H_3 MAX.	PACKAGING(1)(2)	CATALOG NUMBER 2322 ... .
7.0	4.0	3.5 ±0.5	–	11.0	taped H0 = 16 mm	661 91066
8.5	5.0	1.5 to 3.0	–	11.5	taped H0 = 16 mm	661 93048
7.0	4.0	2.0 ±0.5	–	9.8	taped H0 = 18 mm	661 93147
6.7	4.0	1.5 to 3.0	–	10.0	taped H0 = 18 mm	661 93025
7.0	5.0	1.5 to 3	–	10.0	taped H0 = 16 mm	661 93037
8.3	4.0	1.5 to 3.0	–	11.0	taped H0 = 18 mm	661 93175(3)
6.8	4.3	1.5 to 3.0	–	10.1	taped H0 = 16 mm	661 93142
11	4.5	4.0 ±1.0	–	15.5	taped H0 = 16 mm	662 93081
11	4.5	4.0 ±1.0	–	15.5	taped H0 = 16 mm	662 93074(3)
6.7	1.8	–	–	–	disc on tray	661 93118
7.0	4.0	2.0 ±0.5	–	9.8	taped H0 = 18 mm	661 93148
13.6	6.0	4.0 ±1.0	20 ±4.0	18.6	bulk	663 93025(3)
8.3	5.0	1.5 ±0.5	20 ±3.0	10.3	bulk	661 93078

D MAX.	T MAX.	H_2	L_1	H_3 MAX.	PACKAGING(1)(2)	CATALOG NUMBER 2322 ... .
7.0	4.0	2.5 ±0.5	–	10.0	taped H0 = 16 mm	661 93121
8.5	4.0	2.5 ±0.5	4.1 ±0.5	11.5	bulk	661 93124
8.5	4.0	2.5 ±0.5	–	11.5	taped H0 = 16 mm	661 93146
8.5	4.0	2.5 ±0.5	4.1 ±0.5	11.5	bulk	661 93135
8.0	5.0	2.5 ±0.5	–	11.0	taped H0 = 16 mm	661 93056
8.5	4.0	2.0 ±0.5	–	11.0	taped H0 = 16 mm	661 93139
10.5	5.0	2.0 ±0.5	–	12.6	taped H0 = 16 mm	662 93129
13	5.5	4.0 ±1.0	20 min.	18.0	bulk	662 93114
13	5.5	4.0 ±1.0	20 min.	18.0	bulk	662 93131

Notes

1. Taped in accordance with *"IEC 60286-2"*; standard packaging: 1500 units/reel.
2. Naked disc ceramic for substrate mounting, available on request.
3. Insulated version is also available.

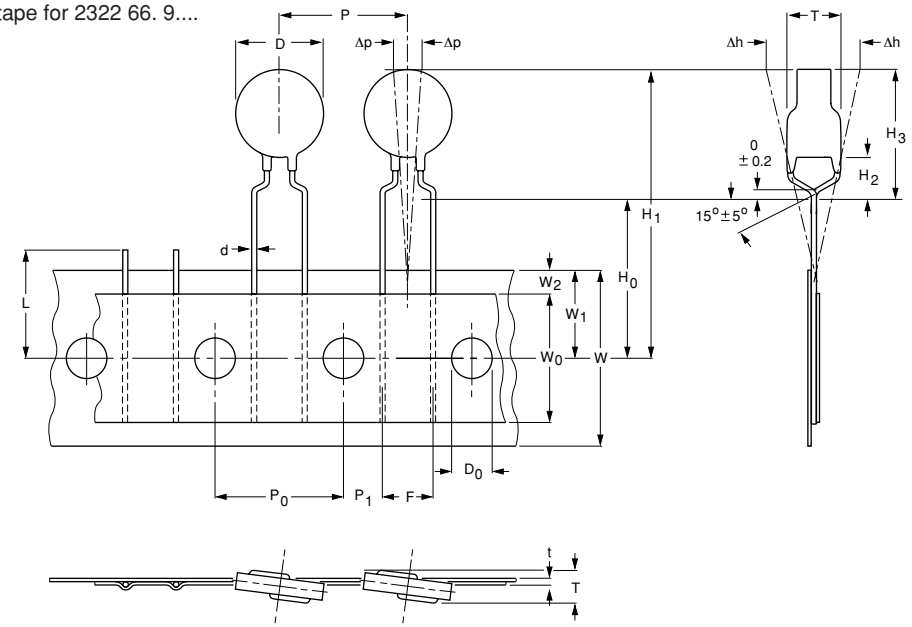
PACKAGING

All tape and reel specifications are in accordance with *"IEC 60286-3"*. Basic dimensions are given in the drawing below, the Dimensions of the Reel drawing, and tape and other Devices and Reel Dimensions tables.

TAPE SPECIFICATIONS

Thermistors with ∅D ≤ 12 mm on tape for 2322 66. 9....

For dimensions, see Tape and other Devices table.



TAPE AND OTHER DEVICE DIMENSIONS in millimeters				
SYMBOL	PARAMETER	DIMENSIONS	TOLERANCE	REMARKS
D	body diameter	see Specific Physical Dimensions table	±0.5	
T	total maximum thickness	see Specific Physical Dimensions table		
d	lead diameter	0.6	±10%	
P	pitch between thermistors: ∅ < 12 mm ∅ ≥ 12 mm	 12.7 25.4	 ±1 ±2	
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	

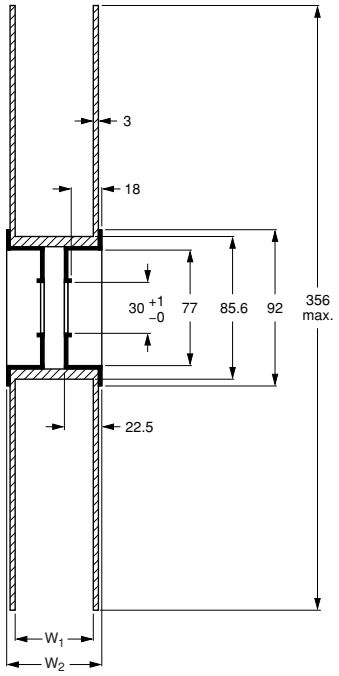
SYMBOL	PARAMETER	DIMENSIONS	TOLERANCE	REMARKS
F	lead to lead distance	5	+0.6 to −0.1	guaranteed between component and tape
Δh	component alignment	0	±2	
W	tape width	18	+1 to −0.5	
W_0	hold down tape width	≥12.3	–	
W_1	hole position	9	±0.5	
W_2	hold down tape position	≤3.0	–	
H_1	component height	see Specific Physical Dimensions table		
H_2	component body to seating plane	4	±1	
H_3	component top to seating plane	see Specific Physical Dimensions table		
H_0	lead-wire clinch height	16	±0.5	
D_0	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	–	

CHARACTERISTICS CONCERNING TAPED THERMISTORS	
PARAMETER	**VALUE**
Minimum pull out force of the component	5 N
Minimum pull off force of adhesive tape	6 N
Minimum tearing force tape	15 N
Maximum pull off force tape-reel	5 N
Storage conditions	
Storage temperature range	−25 to +40 °C
Maximum relative humidity	80%

REEL SPECIFICATIONS in millimeters

Dimensions of the reel for 2322 66. 6...1/2/3

For W_1 and W_2, see Reel Dimensions table



REEL DIMENSIONS in millimeters		
DIAMETER Ø	**W_1**	**W_2 MAX.**
<12	42 ±1	56
12	46 ±1	60