

BIDIRECTIONAL THYRISTOR OVERVOLTAGE PROTECTORS

TISP4310T3BJ Overvoltage Protector

Industry-Leading V_{DRM} to $V_{(BO)}$ Ratio

Modem Protection Against:
- **TIA-968-A Type A & B Surge**
- **UL 60950, Clause 6. Power Cross**
- **CSA 22.2 No. 60950, Clause 6. Power Cross**

Ion-Implanted Breakdown Region
- **Precise and Stable Voltage**

Low Voltage Overshoot Under Surge

Device Name	V_{DRM} V	$V_{(BO)}$ V
TISP4310T3BJ	269	310

Rated for International Surge Wave Shapes

Wave Shape	Standard	I_{PPSM} A
10/160 µs	TIA-968-A	150
10/700 µs	ITU-T K.20/21/45	120
9/720 µs	TIA-968-A	120
10/560 µs	TIA-968-A	100
10/1000 µs	GR-1089-CORE	80

SMB Package (Top View)



Terminal typical application names shown in parenthesis

MD-SMB-007-a

Device Symbol



SD-TISP4-001-a

Additional Information

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Agency Recognition

Description	
UL	File Number: E215609

.....UL Recognized Component

How to Order

Device	Package	Carrier	Order As	Marking Code	Standard Quantity
TISP4310T3BJ	SMB	Embossed Tape Reeled	TISP4310T3BJR-S	4310T3	3000

Description

This device is designed to limit overvoltages on the telephone line. Overvoltages are normally caused by a.c. power system or lightning flash disturbances which are induced or conducted on to the telephone line. A single device provides 2-point protection and is typically used for the protection of 2-wire telecommunication equipment (e.g. between the Ring and Tip wires for telephones and modems). Combinations of devices can be used for multi-point protection (e.g. 3-point protection between Ring, Tip and Ground).

The device consists of a symmetrical voltage-triggered bidirectional thyristor. Overvoltages are initially clipped by breakdown clamping. If sufficient current is available from the overvoltage, the breakdown voltage will rise to the breakover level, which causes the device to switch into a low-voltage on-state condition. This switching action removes the high-voltage stress from the following circuitry and causes the current resulting from the overvoltage to be safely diverted through the device. The high holding (switch off) current helps prevent d.c. latchup as the diverted current subsides. This device is designed to voltage limit and withstand the listed lightning surges in both polarities.

WARNING Cancer and Reproductive Harm
www.P65Warnings.ca.gov

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*RoHS Directive 2015/863, Mar 31, 2015 and Annex.
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Description (Continued)

After a TIA-968-A Type A surge, the equipment can be faulty, provided that the fault mode causes the equipment to be unusable. There are two wave shapes used: 10/160 for longitudinal surges and 10/560 for metallic surges. For modems with a TISP4310T3BJ connected between the Ring and Tip wires (and without overvoltage protection to ground), the longitudinal 10/160 surge applied to both Ring and Tip will not activate the TISP4310T3BJ, giving an operational pass. The metallic 10/560 surge is applied between Ring and Tip wires and will operate the TISP4310T3BJ. As the TISP4310T3BJ has a current rating of 100 A 10/560, it will survive the TIA-968-A Type A 100 A 10/560 metallic surge, giving an operational pass.

After a TIA-968-A Type B surge, the equipment must be operational. The 9/720 wave shape is used for both longitudinal surges and metallic surges. For modems with a TISP4310T3BJ connected between the Ring and Tip wires (and without overvoltage protection to ground), the longitudinal 9/720 surge applied to both Ring and Tip will not activate the TISP4310T3BJ, giving an operational pass. The metallic 9/720 surge is applied between Ring and Tip wires and will operate the TISP4310T3BJ. As the TISP4310T3BJ has a current rating of 120 A 9/720, it will survive the TIA-968-A Type B 25 A 9/720 metallic surge, giving an operational pass.

The TIA-968-A B-type ringer has voltages of 56.5 V d.c. and up to 150 V rms a.c., giving a peak voltage of 269 V. The TISP4310T3BJ will not clip the B-type ringing voltage, as it has a high impedance up to 269 V.

Absolute Maximum Ratings, T_A = 25 °C (Unless Otherwise Noted)

Rating	Symbol	Value	Unit
Repetitive peak off-state voltage (see Note 1)	V_{DRM}	±269	V
Non-repetitive peak impulse current (see Notes 1 and 2) 10/160 µs (TIA-968-A, 10/160 µs voltage wave shape) 5/310 µs (ITU-T K.44, 10/700 µs voltage wave shape used in K.20/21/45) 5/320 µs (TIA-968-A, 9/720 µs voltage wave shape) 10/560 µs (TIA-968-A, 10/560 µs voltage wave shape) 10/1000 µs (GR-1089-CORE, 10/1000 µs voltage wave shape)	I_{PPSM}	 ±150 ±120 ±120 ±100 ±80	A
Non-repetitive peak on-state current (see Notes 1, 2 and 3) 20 ms, 50 Hz (full sine wave) 16.7 ms, 60 Hz (full sine wave) 1000 s, 50 Hz or 60 Hz a.c.	I_{TSM}	 25 30 2.1	A
Initial rate of rise of on-state currrent, exponential current ramp. Maximum ramp value < 50 A	di_T/dt	500	A/µs
Junction temperature	T_J	-40 to +150	°C
Storage temperature range	T_{stg}	-65 to +150	°C

NOTES: 1. Initially the device must be in thermal equilibrium with T_J = 25 °C.
2. The surge may be repeated after the device returns to its initial conditions.
3. EIA/JESD51-2 environment and EIA/JESD51-3 PCB with standard footprint dimensions connected with 5 A rated printed wiring track widths. Derate current values at -0.61 %/°C for ambient temperatures above 25 °C.

Recommended Operating Conditions

	Component	Min	Typ	Max	Unit
R_S	Series resistor for TIA-968-A, 10/160 type A surge survival (T-G or R-G connection)	2.5			Ω
	Series resistor for TIA-968-A, 10/560 type A surge survival	0			
	Series resistor for TIA-968-A, 9/720 type B surge survival	0			
	Series resistor for GR-1089-CORE first-level surge survival	5			
	Series resistor for K.20, K.21 and K.45 1.5 kV, 10/700 surge survival	0			
	Series resistor for K.20, K.21 and K.45 co-ordination with a 400 V primary protector	6			

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Electrical Characteristics, T_A = 25 °C (Unless Otherwise Noted)

Parameter		Test Conditions		Min	Typ	Max	Unit
I_{DRM}	Repetitive peak off-state current	$V_D = V_{DRM}$	T_A = 25 °C T_A = 85 °C			±5 ±10	µA
$V_{(BO)}$	Breakover voltage	dv/dt = ±250 V/ms, R_{SOURCE} = 300 Ω				±310	V
$I_{(BO)}$	Breakover current	dv/dt = ±250 V/ms, R_{SOURCE} = 300 Ω				±800	mA
V_T	On-state voltage	I_T = ±5 A, t_w = 100 µs				±3	V
I_H	Holding current	I_T = ±5 A, di/dt = ±30 mA/ms		±150			mA
dv/dt	Critical rate of rise of off-state voltage	Linear voltage ramp Maximum ramp value < 0.85V_{DRM}		±5			kV/µs
C_O	Off-state capacitance	f = 1 MHz, V_d = 1 V rms	V_D = 0 V_D = -1 V V_D = -2 V V_D = -50V V_D = -100 V		54 48 43 20 16	65 58 52 24 19	pF

Thermal Characteristics, T_A = 25 °C (Unless Otherwise Noted)

Parameter		Test Conditions	Min	Typ	Max	Unit
$R_{\theta JA}$	Junction to ambient thermal resistance	EIA/JESD51-3 PCB, $I_T = I_{TSM(1000)}$ (see Note 4)			115	°C/W
		265 mm x 210 mm populated line card, 4-layer PCB, $I_T = I_{TSM(1000)}$		52		

NOTE: 4. EIA/JESD51-2 environment and PCB has standard footprint dimensions connected with 5 A rated printed wiring track widths.

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Parameter Measurement Information

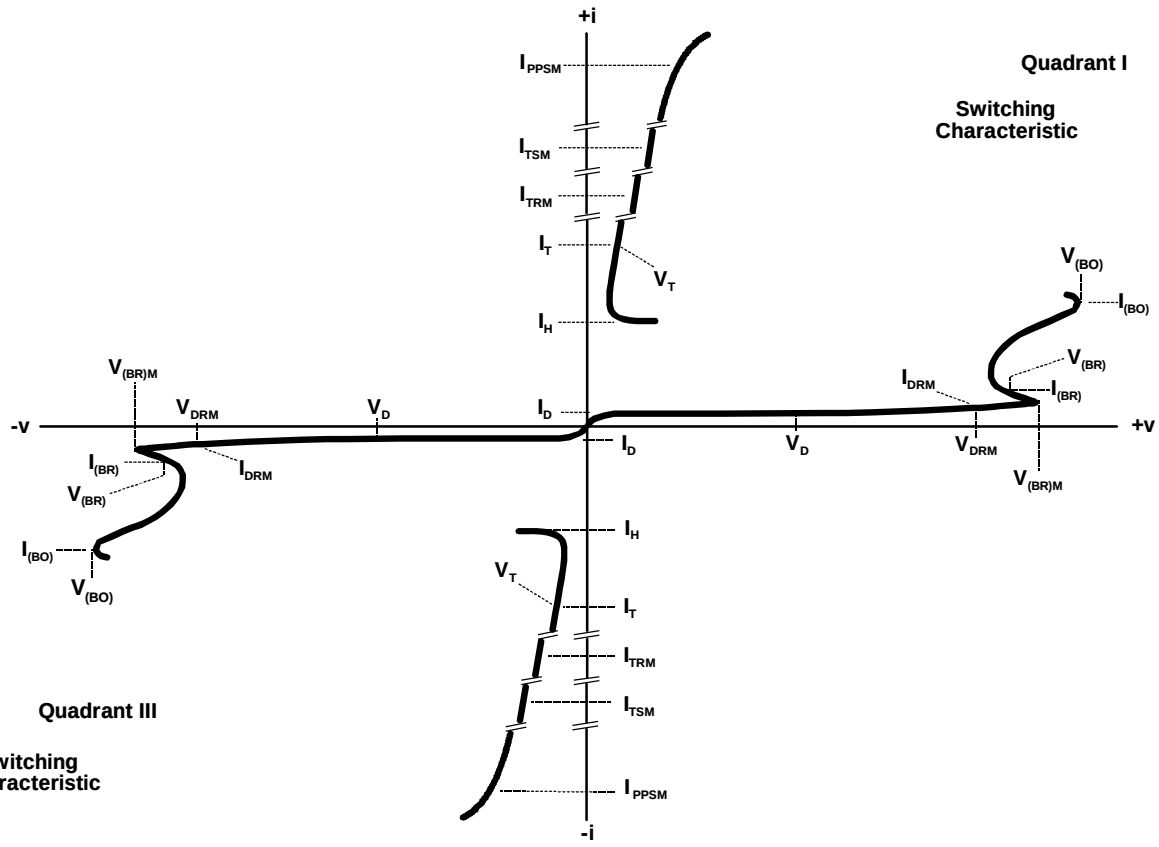


Figure 1. Voltage-Current Characteristic for the Ring and Tip Terminals
All Measurements are Referenced to the Ring Terminal

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