TISP4070L3LM, TISP4350L3LM

BIDIRECTIONAL THYRISTOR OVERVOLTAGE PROTECTORS

TISP4xx0L3LM Overvoltage Protector Series

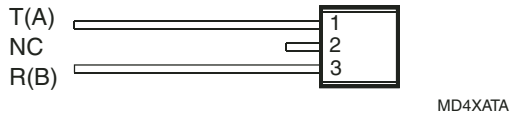
Ion-Implanted Breakdown Region
Precise and Stable Voltage
Low Voltage Overshoot under Surge

Device	V_{DRM} V	$V_{(BO)}$ V
'4070	58	70
'4350	275	350

Ring-Tip Protection TISP4350L3LM
Electronics Protection TISP4070L3LM
Rated for UL 1950, ITU-T and TIA/EIA-IS-968

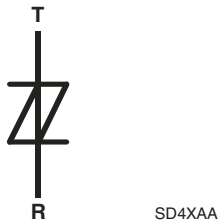
Surge Type	Standard	Wave Shape	I_{TSP} A
A	TIA/EIA-IS-968 (formerly FCC Part 68)	10/160	50
		10/560	30
B	TIA/EIA-IS-968 UL 1950/ ITU-T K.21	9/720 10/700	40

LM Package (Top View)



NC - No internal connection on pin 2

Device Symbol



Terminals T and R correspond to the alternative line designators of A and B

Description

These devices are 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 to 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 protector consists of a symmetrical voltage-triggered bidirectional thyristor. Overvoltages are initially clipped by breakdown clamping until the voltage rises to the breakover level, which causes the device to crowbar into a low-voltage on state. This low-voltage on state causes the current resulting from the overvoltage to be safely diverted through the device. The high crowbar holding current prevents d.c. latchup as the diverted current subsides.These protectors are guaranteed to voltage limit and withstand the listed lightning surges in both polarities.
After a Type A surge (200 A, 10/160, and 100 A, 10/560) the equipment is allowed to be non-operational or operational. For an operational pass, series resistance must be added to reduce the Type A currents to within the TISP4xxxL3LM ratings (50 A, 10/160 and 30 A, 10/560). Alternatively, a series fuse with an I^2t greater than 0.45 A^2s and less than 5.6 A^2s could be used to give a non-operational pass. After a Type B surge the equipment must be operational. As the TISP4xxxL3LM has a current rating of 40 A, will survive both Type B surges, metallic (25 A, 9/720) and longitudinal (37.5 A, 9/720), giving an operational pass to Type B surges.

For metallic protection, the TISP4350L3LM is connected between the Ring and Tip conductors. For longitudinal protection two TISP4350L3LM protectors are used; one between the Ring conductor to ground and the other between the Tip conductor to ground. The FCC Part 68 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 TISP4350L3LM will not clip the B type ringing voltage as it has a high impedance up to 275 V.

The TISP4070L3LM should be connected after the hook switch to protect the following electronics. As the TISP4070L3LM has a high impedance up to 58 V, it will switch off after a surge and not be triggered by the normal exchange battery voltage.

How To Order

Device	Package Type	Carrier	Quantity	Order As
TISP4070L3	LM (Straight Lead DO-92)	Bulk Pack	2000	TISP4070L3LM-S
TISP4350L3	LM (Straight Lead DO-92)	Bulk Pack	2000	TISP4350L3LM-S

*RoHS Directive 2002/95/EC Jan 27 2003 including Annex
JULY 2000 - REVISED JANUARY 2007

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

Rating		Symbol	Value	Unit
Repetitive peak off-state voltage	'4070 '4350	V_{DRM}	± 58 ± 275	V
Non-repetitive peak on-state pulse current (see Notes 1 and 2) 10/160 (TIA/EIA-IS-968 (formerly FCC Part 68), 10/160 µs voltage wave shape) 5/310 (ITU-T K.21, 10/700 voltage wave shape) 5/320 (TIA/EIA-IS-968 (formerly FCC Part 68), 9/720 µs voltage wave shape) 10/560 (TIA/EIA-IS-968 (formerly FCC Part 68), 10/560 µs voltage wave shape)		I_{TSP}	 50 40 40 30	A
Non-repetitive peak on-state current (see Notes 2 and 3) 50/60 Hz, 1 s		I_{TSM}	4	A
Initial rate of rise of on-state current, Linear current ramp, Maximum ramp value < 38 A		di_T/dt	250	A/µs
Junction temperature		T_J	-40 to +150	°C
Storage temperature range		T_{stg}	-65 to +150	°C

NOTES: 1. Initially, the TISP4xxxL3LM must be in thermal equilibrium with T_J = 25 °C
2. The surge may be repeated after the TISP4xxxL3LM 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.

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	'4070 '4350			±70 ±350	V
$V_{(BO)}$	Breakover voltage	dv/dt = ±1000 V/µs, Linear voltage ramp, Maximum ramp value = ±500 V di/dt = ±20 A/µs, Linear current ramp, Maximum ramp value = ±10 A	'4070 '4350			±78 ±359	V
$I_{(BO)}$	Breakover current	dv/dt = ±250 V/ms, R_{SOURCE} = 300 Ω		±40		±250	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		±120		±350	mA
dv/dt	Critical rate of rise of off-state voltage	Linear voltage ramp, Maximum ramp value < 0.85 V_{DRM}		±5			kV/µs
I_D	Off-state current	V_D = ±50 V	T_A = 85 °C			±10	µA
C_{off}	Off-state capacitance	f = 100 kHz, V_d = 1 V rms, V_D = 0, V_D = 1 V, V_D = 5 V f = 100 kHz, V_d = 1 V rms, V_D = 0, V_D = 1 V, V_D = 5 V	'4070 '4350 		40 38 31 26 24 20	50 48 39 33 30 25	pF

Thermal Characteristics

Parameter		Test Conditions	Min	Typ	Max	Unit
$R_{\theta JA}$	Junction to free air thermal resistance	EIA/JESD51-3 PCB, $I_T = I_{TSM(1000)}$, T_A = 25 °C, (see Note 4)			120	°C/W
		265 mm x 210 mm populated line card, 4-layer PCB, $I_T = I_{TSM(1000)}$, T_A = 25 °C		57		

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

Parameter Measurement Information

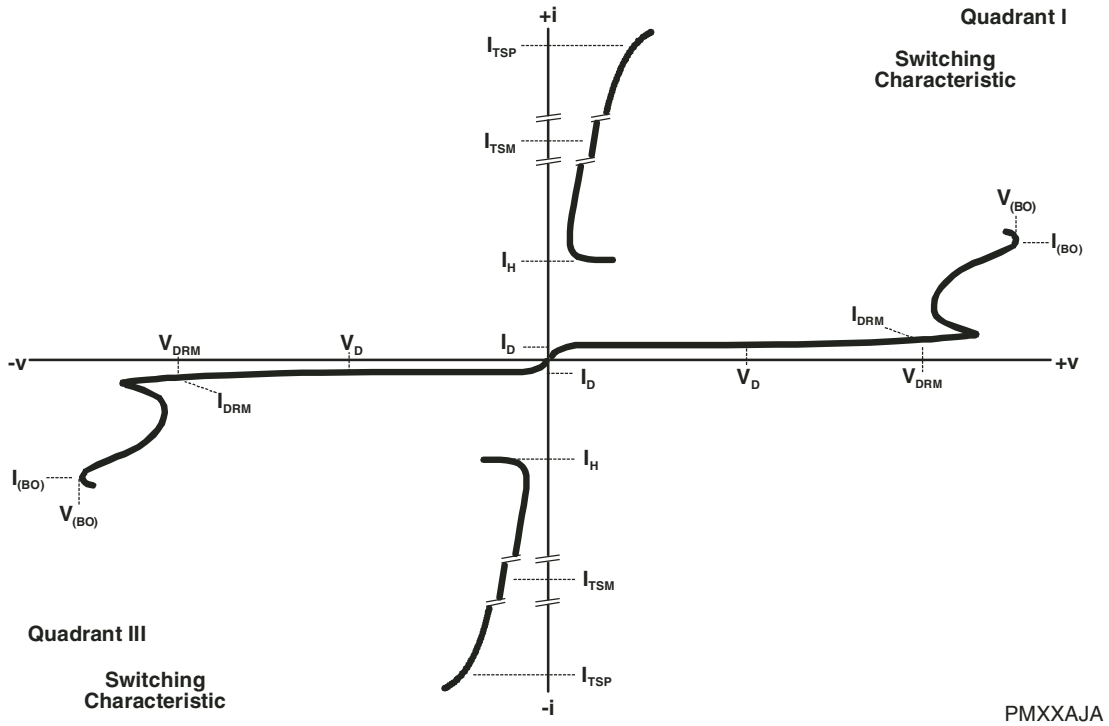


Figure 1. Voltage-Current Characteristic for T and R Terminals
All Measurements are Referenced to the R Terminal

MECHANICAL DATA

Device Symbolization Code

Devices will be coded as below.

Device	Symbolization Code
TISP4070L3	4070L3
TISP4350L3	4350L3

JULY 2000 - REVISED JANUARY 2007