TISP5070H3BJ THRU TISP5190H3BJ

FORWARD-CONDUCTING UNIDIRECTIONAL THYRISTOR OVERVOLTAGE PROTECTORS

TISP5xxxH3BJ Overvoltage Protector Series

Analogue Line Card and ISDN Protection

- Analogue SLIC
- ISDN U Interface
- ISDN Power Supply

8 kV 10/700, 200 A 5/310 ITU-T K.20/21/45 rating

Ion-Implanted Breakdown Region
- Precise and Stable Voltage

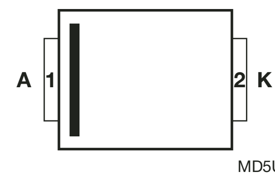
Low Voltage Overshoot under Surge

Device Name	V_{DRM} V	$V_{(BO)}$ V
TISP5070H3BJ	-58	-70
TISP5080H3BJ	-65	-80
TISP5095H3BJ	-75	-95
TISP5110H3BJ	-80	-110
TISP5115H3BJ	-90	-115
TISP5150H3BJ	-120	-150
TISP5190H3BJ	-160	-190

Rated for International Surge Wave Shapes

Wave Shape	Standard	I_{PPSM} A
2/10	GR-1089-CORE	500
8/20	ANSI C62.41	300
10/160	TIA-968-A	250
10/700	ITU-T K.20/21/45	200
10/560	TIA-968-A	160
10/1000	GR-1089-CORE	100

SMB Package (Top View)



Device Symbol

UL .... UL Recognized Component

Description

These devices are designed to limit overvoltages on the telephone and data lines. 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 ISDN power supply feeds. Two devices, one for the Ring output and the other for the Tip output, will provide protection for single supply analogue SLICs. A combination of three devices will give a low capacitance protector network for the 3-point protection of ISDN lines.

The protector consists of a voltage-triggered unidirectional thyristor with an anti-parallel diode. Negative 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. Positive overvoltages are limited by the conduction of the anti-parallel diode.

How to Order

Device	Package	Carrier	For Standard Termination Finish Order As	For Lead Free Termination Finish Order As	Marking Code	Std. Quantity
TISP5xxxH3BJ	BJ (J-Bend DO-214AA/SMB)	Embossed Tape Reeled	TISP5xxxH3BJR	TISP5xxxH3BJR-S	5xxxH3	3000

Insert xxx value corresponding to protection voltages of 070, 080, 110, 115 and 150.

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

Rating		Symbol	Value	Unit
Repetitive peak off-state voltage (see Note 1)	'5070H3BJ	V_{DRM}	-58	V
	'5080H3BJ		-65	
	'5095H3BJ		-75	
	'5110H3BJ		-80	
	'5115H3BJ		-90	
	'5150H3BJ		-120	
	'5190H3BJ		-160	
Non-repetitive peak impulse current (see Notes 2, 3 and 4)		I_{PPSM}		A
2/10 µs (GR-1089-CORE, 2/10 µs voltage wave shape)			±500	
8/20 µs (IEC 61000-4-5, 1.2/50 µs voltage, 8/20 µs current combination wave generator)			±300	
10/160 µs (TIA-968-A, 10/160 µs voltage wave shape)			±250	
5/200 µs (VDE 0433, 10/700 µs voltage waveshape)			±220	
0.2/310 µs (I3124, 0.5/700 µs waveshape)			±200	
5/310 µs (ITU-T K.44, 10/700 µs voltage waveshape used in K.20/21/45)			±200	
5/310 µs (FTZ R12, 10/700 µs voltage waveshape)			±200	
10/560 µs (TIA-968-A, 10/560 µs voltage wave shape)			±160	
10/1000 µs (GR-1089-CORE, 10/1000 µs voltage wave shape)			±100	
Non-repetitive peak on-state current (see Notes 2, 3 and 5)		I_{TSM}		A
20 ms, 50 Hz (full sine wave)			55	
16.7 ms, 60 Hz (full sine wave)			60	
1000 s 50 Hz/60 Hz a.c.			2.1	
Initial rate of rise of on-state current, GR-1089-CORE 2/10 µs wave shape		di_T/dt	±400	A/µs
Junction temperature		T_J	-40 to +150	°C
Storage temperature range		T_{stg}	-65 to +150	°C

NOTES:
1. See Figure 9 for voltage values at lower temperatures.
2. Initially the device must be in thermal equilibrium with T_J = 25 °C.
3. The surge may be repeated after the device returns to its initial conditions.
4. See Figure 10 for current ratings at other temperatures.
5. 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. See Figure 8 for current ratings at other durations.

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			-5	µA
			T_A = 85 °C			-10	
$V_{(BO)}$	Breakover voltage	dv/dt = -250 V/ms, R_{SOURCE} = 300 Ω	'5070H3BJ			-70	V
			'5080H3BJ			-80	
			'5095H3BJ			-95	
			'5110H3BJ			-110	
			'5115H3BJ			-115	
			'5150H3BJ			-150	
			'5190H3BJ			-190	
$V_{(BO)}$	Impulse 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	'5070H3BJ			-80	V
			'5080H3BJ			-90	
			'5095H3BJ			-105	
			'5110H3BJ			-120	
			'5115H3BJ			-125	
			'5150H3BJ			-160	
			'5190H3BJ			-200	

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APPLICATIONS INFORMATION

ISDN Device Selection

The ETSI Technical Report ETR 080:1993 defines several range values in terms of maximum and minimum ISDN feeding voltages. The following table shows that ranges 1 and 2 can use a TISP5110H3BJ protector and ranges 3 to 5 can use a TISP5150H3BJ protector.

Range	Feeding Voltage Minimum V	Feeding Voltage Maximum V	Standoff Voltage V_{DRM} V	Device Name
1	51	69	-75	TISP5095H3BJ
2	66	70	-80	TISP5110H3BJ
3	91	99	-120	TISP5150H3BJ
4	90	110		
5	105	115		

Impulse Testing

To verify the withstand capability and safety of the equipment, standards require that the equipment is tested with various impulse wave forms. The table below shows some common values.

Standard	Peak Voltage Setting V	Voltage Waveshape µs	Peak Current Value A	Current Waveshape µs	TISP5xxxH3BJ 25 °C Rating A	Series Resistance Ω
GR-1089-CORE	2500	2/10	500	2/10	500	0
	1000	10/1000	100	10/1000	100	
TIA-968-A	1500	10/160	200	10/160	250	0
	800	10/560	100	10/560	160	0
	1500	9/720 †	37.5	5/320 †	200	0
	1000	9/720 †	25	5/320 †	200	0
I3124	1500	0.5/700	37.5	0.2/310	200	0
ITU-T K.20/21/45	1500 4000 6000	10/700	37.5 100 150	5/310	200	0

† TIA-968-A terminology for the waveforms produced by the ITU-T recommendation K.21 10/700 impulse generator.

If the impulse generator current exceeds the protector's current rating then a series resistance can be used to reduce the current to the protector's rated value and so prevent possible failure. The required value of series resistance for a given waveform is given by the following calculations. First, the minimum total circuit impedance is found by dividing the impulse generator's peak voltage by the protector's rated current. The impulse generator's fictive impedance (generator's peak voltage divided by peak short circuit current) is then subtracted from the minimum total circuit impedance to give the required value of series resistance. In some cases the equipment will require verification over a temperature range. By using the rated waveform values from Figure 10, the appropriate series resistor value can be calculated for ambient temperatures in the range of -40 °C to 85 °C.

If the devices are used in a star-connection, then the ground return protector, Th3 in Figure 13, will conduct the combined current of protectors Th1 and Th2. Similarly in the bridge connection (Figure 14), the protector Th1 must be rated for the sum of the conductor currents. In these cases, it may be necessary to include some series resistance in the conductor feed to reduce the impulse current to within the protector's ratings.