



TISP4290T3BJ, TISP4350T3BJ, TISP4400T3BJ

BIDIRECTIONAL THYRISTOR OVERVOLTAGE PROTECTORS

TISP4xxxT3BJ Overvoltage Protector Series

MODEM Protection against:

- TIA/EIA-IS-968 Type A & B surge
- UL 60950, Clause 6. power cross
- CSA 22.2 No. 60950, Clause 6. power cross

Low Differential Capacitance23 pF typ.

Ion-Implanted Breakdown Region

- Precise and Stable Voltage
- Low Voltage Overshoot Under Surge

Device	V _{DRM} V	V _(BO) V
'4290T3	220	290
'4350T3	275	350
'4400T3	335	400

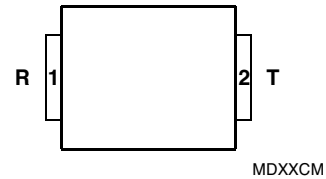
Rated for International Surge Wave Shapes

Wave Shape	Standard	I _{PPSM} A
2/10	GR-1089-CORE	250
8/20	IEC 61000-4-5	250
10/160	TIA/EIA-IS-968	150
10/700	ITU-T K.20/.21/.45	120
9/720	TIA/EIA-IS-968	120
10/560	TIA/EIA-IS-968	100
10/1000	GR-1089-CORE	80

Agency Recognition

Description	
UL	File Number: E215609

SMB Package (Top View)



Device Symbol



..... UL Recognized Component

How to Order

Device	Package	Carrier	Order As
TISP4xxxT3BJ	BJ (SMB/DO-214AA J-Bend)	R (Embossed Tape Reeled)	TISP4xxxT3BJR-S

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 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 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 helps prevent 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 TIA/EIA-IS-968 (replaces FCC Part 68) 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 TISP4350T3BJ connected between the Ring and Tip wires (and without overvoltage protection to ground), the longitudinal 10/160 applied to both Ring and Tip will not activate the TISP4350T3BJ, giving an operational pass. The metallic 10/560 is applied between Ring and Tip wires and will operate the TISP4350T3BJ. As the TISP4350T3BJ has a current rating of 100 A, 10/560 it will survive the FCC Part Type A 100 A, 10/560 metallic surge giving an operational pass.

DECEMBER 2001 – REVISED JULY 2019

*RoHS Directive 2015/863, Mar 31, 2015 and Annex. Specifications are subject to change without notice. Users should verify actual device performance in their specific applications.

The products described herein and this document are subject to specific legal disclaimers as set forth on the last page of this document, and at www.bourns.com/docs/legal/disclaimer.pdf.



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

TISP4xxxT3BJ Overvoltage Protector Series

BOURNS®

Description (Continued)

After a TIA/EIA-IS-968 Type B surge the equipment must be operational. As the TISP4350T3BJ has a current rating of 120 A, it will survive both Type B surges, metallic (25 A, 9/720) and longitudinal (37.5 A, 9/720), giving an operational pass to FCC Part 68 Type B surges.

The TIA/EIA-IS-968 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 TISP4350T3BJ will not clip the B type ringing voltage as it has a high impedance up to 275 V.

Absolute Maximum Ratings, $T_A = 25\text{ }^\circ\text{C}$ (Unless Otherwise Noted)

Rating	Symbol	Value	Unit
Repetitive peak off-state voltage (see Note 1)	V_{DRM}	'4290T3 ±220 '4350T3 ±275 '4400T3 ±335	V
Non-repetitive peak on-state pulse current (see Notes 1 and 2)	I_{PPSM}		A
2/10 (Telcordia GR-1089-CORE, 2/10 voltage wave shape)		±250	
8/20 (IEC 61000-4-5, combination wave generator, 1.2/50 voltage wave shape)		±250	
10/160 (TIA/EIA-IS-968 (replaces FCC Part 68), 10/160 voltage wave shape)		±150	
5/310 (ITU-T K.44, 10/700 voltage wave shape used in K.20/45/21)		±120	
5/320 (TIA/EIA-IS-968 (replaces FCC Part 68), 9/720 voltage wave shape)		±120	
10/560 (TIA/EIA-IS-968 (replaces FCC Part 68), 10/560 voltage wave shape)		±100	
10/1000 (Telcordia GR-1089-CORE, 10/1000 voltage wave shape)		±80	
Non-repetitive peak on-state current (see Notes 1, 2 and 3)	I_{TSM}	25 30 2.1	A
20 ms (50 Hz), full sine wave			
16.7 ms (60 Hz), full sine wave			
1000 s 50 Hz/60 Hz			
Initial rate of rise of on-state current, Linear current ramp, Maximum ramp value < 50 A	di_{T}/dt	500	A/ μs
Junction temperature	T_{J}	-40 to +150	$^\circ\text{C}$
Storage temperature range	T_{stg}	-65 to +150	$^\circ\text{C}$

NOTES: 1. Initially, the device must be in thermal equilibrium with $T_{\text{J}} = 25\text{ }^\circ\text{C}$.

2. These non-repetitive rated currents are peak values of either polarity. 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 $-0.61\text{ }^\circ\text{C}$ for ambient temperatures above $25\text{ }^\circ\text{C}$.

Overload Ratings, $T_A = 25\text{ }^\circ\text{C}$ (Unless Otherwise Noted)

Rating	Symbol	Value	Unit
Peak overload on-state current, a.c. power line cross tests UL 60950 (see Note 4)	$I_{\text{T(OV)M}}$	See Figure 4 for current versus time	A rms

NOTE 4: These electrical stress levels may damage the device silicon chip. After test, the pass criterion is either that the device is functional or, if it is faulty, that it has a short circuit fault mode. In the short circuit fault mode, the following equipment is protected as the device is a permanent short across the line. The equipment would be unprotected if an open circuit fault mode developed.

DECEMBER 2001 – REVISED JULY 2019

Specifications are subject to change without notice.

Users should verify actual device performance in their specific applications.

The products described herein and this document are subject to specific legal disclaimers as set forth on the last page of this document, and at www.bourns.com/docs/legal/disclaimer.pdf.

TISP4xxxT3BJ Overvoltage Protector Series

BOURNS®

Recommended Operating Conditions

Component		Min	Typ	Max	Unit
R _S	Series resistor for TIA/EIA-IS-968 (replaces FCC Part 68), 10/160 type A surge survival (T-G or R-G connection)	2.5			Ω
	Series resistor for TIA/EIA-IS-968 (replaces FCC Part 68), 10/560 type A surge survival	0			
	Series resistor for TIA/EIA-IS-968 (replaces FCC Part 68), 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 coordination with a 400 V primary protector	6			

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) AC breakover voltage	dv/dt = ±250 V/ms, R _{SOURCE} = 300 Ω '4290T3 '4350T3 '4400T3			±290 ±350 ±400	V
I _(BO) AC breakover current	dv/dt = ±250 V/ms, R _{SOURCE} = 300 Ω			±800	A
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	±0.15			A
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 = 1 MHz, V _d = 1 V rms, V _D = 0, f = 1 MHz, V _d = 1 V rms, V _D = -1 V f = 1 MHz, V _d = 1 V rms, V _D = -2 V f = 1 MHz, V _d = 1 V rms, V _D = -50 V f = 1 MHz, V _d = 1 V rms, V _D = -100 V		54 48 43 20 16	65 58 52 24 19	pF

Thermal Characteristics

Parameter	Test Conditions	Min	Typ	Max	Unit
R _{θJA} Junction to free air thermal resistance	EIA/JESD51-3 PCB, T _A = 25 °C, (see Note 5)			115	°C/W
	265 mm x 210 mm populated line card, 4-layer PCB, I _T = I _{TSM(1000)} , T _A = 25 °C		52		

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

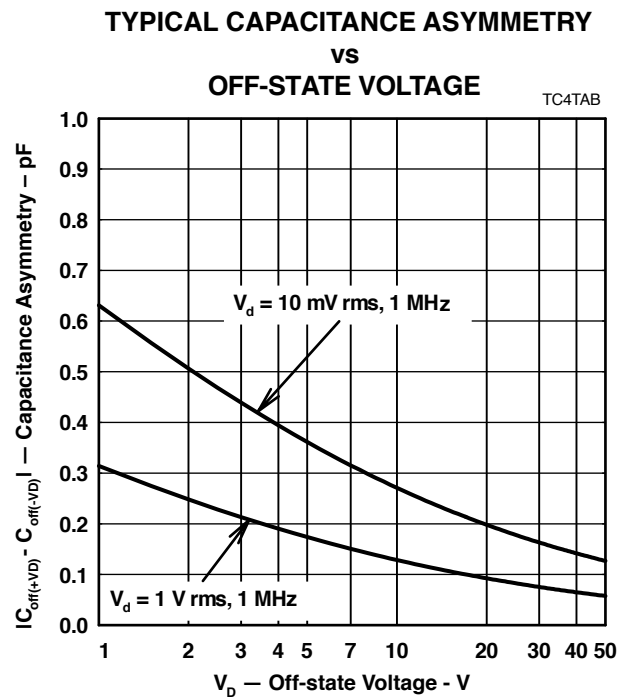
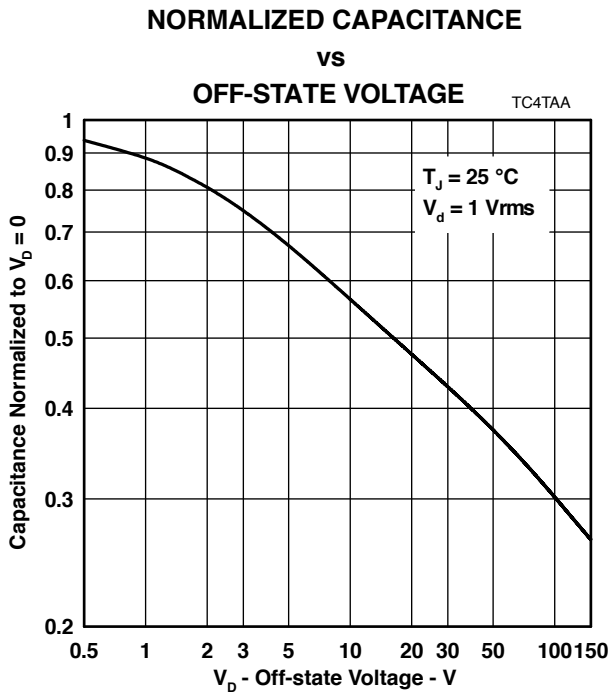
DECEMBER 2001 – REVISED JULY 2019

Specifications are subject to change without notice.

Users should verify actual device performance in their specific applications.

The products described herein and this document are subject to specific legal disclaimers as set forth on the last page of this document, and at www.bourns.com/docs/legal/disclaimer.pdf.

Typical Characteristics



Rating and Thermal Information

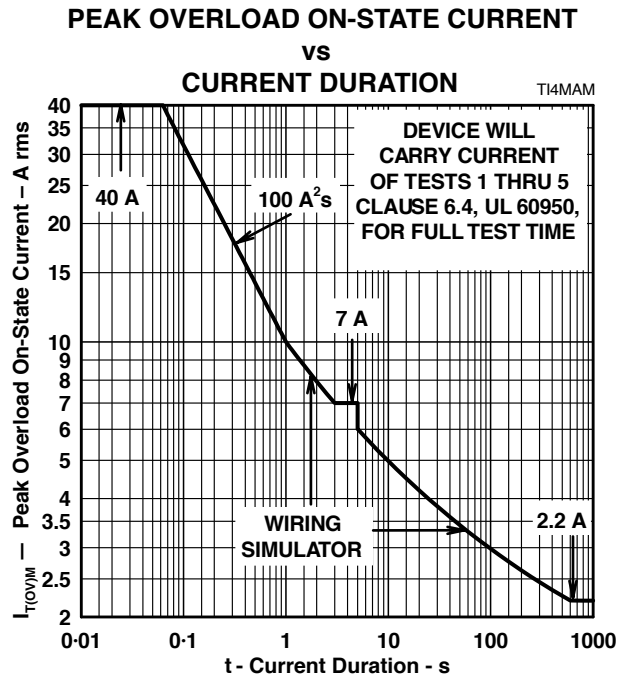


Figure 4. Peak Overload On-state Current against Duration

Asia-Pacific: Tel: +886-2 2562-4117 • Email: asiacus@bourns.com
Europe: Tel: +36 88 885 877 • Email: eurocus@bourns.com
The Americas: Tel: +1-951 781-5500 • Email: americus@bourns.com
www.bourns.com

DECEMBER 2001 – REVISED JULY 2019

"TISP" is a trademark of Bourns, Ltd., a Bourns Company, and is registered in the U.S. Patent and Trademark Office.

"Bourns" is a registered trademark of Bourns, Inc. in the U.S. and other countries.

Specifications are subject to change without notice.

Users should verify actual device performance in their specific applications.

The products described herein and this document are subject to specific legal disclaimers as set forth on the last page of this document, and at www.bourns.com/docs/legal/disclaimer.pdf.

This legal disclaimer applies to purchasers and users of Bourns® products manufactured by or on behalf of Bourns, Inc. and its affiliates (collectively, “Bourns”).

Unless otherwise expressly indicated in writing, Bourns® products and data sheets relating thereto are subject to change without notice. Users should check for and obtain the latest relevant information and verify that such information is current and complete before placing orders for Bourns® products.

The characteristics and parameters of a Bourns® product set forth in its data sheet are based on laboratory conditions, and statements regarding the suitability of products for certain types of applications are based on Bourns’ knowledge of typical requirements in generic applications. The characteristics and parameters of a Bourns® product in a user application may vary from the data sheet characteristics and parameters due to (i) the combination of the Bourns® product with other components in the user’s application, or (ii) the environment of the user application itself. The characteristics and parameters of a Bourns® product also can and do vary in different applications and actual performance may vary over time. Users should always verify the actual performance of the Bourns® product in their specific devices and applications, and make their own independent judgments regarding the amount of additional test margin to design into their device or application to compensate for differences between laboratory and real world conditions.

Unless Bourns has explicitly designated an individual Bourns® product as meeting the requirements of a particular industry standard (e.g., ISO/TS 16949) or a particular qualification (e.g., UL listed or recognized), Bourns is not responsible for any failure of an individual Bourns® product to meet the requirements of such industry standard or particular qualification. Users of Bourns® products are responsible for ensuring compliance with safety-related requirements and standards applicable to their devices or applications.

Bourns® products are not recommended, authorized or intended for use in nuclear, lifesaving, life-critical or life-sustaining applications, nor in any other applications where failure or malfunction may result in personal injury, death, or severe property or environmental damage. Unless expressly and specifically approved in writing by two authorized Bourns representatives on a case-by-case basis, use of any Bourns® products in such unauthorized applications might not be safe and thus is at the user’s sole risk. Life-critical applications include devices identified by the U.S. Food and Drug Administration as Class III devices and generally equivalent classifications outside of the United States.

Bourns expressly identifies those Bourns® standard products that are suitable for use in automotive applications on such products’ data sheets in the section entitled “Applications.” Unless expressly and specifically approved in writing by two authorized Bourns representatives on a case-by-case basis, use of any other Bourns® standard products in an automotive application might not be safe and thus is not recommended, authorized or intended and is at the user’s sole risk. If Bourns expressly identifies a sub-category of automotive application in the data sheet for its standard products (such as infotainment or lighting), such identification means that Bourns has reviewed its standard product and has determined that if such Bourns® standard product is considered for potential use in automotive applications, it should only be used in such sub-category of automotive applications. Any reference to Bourns® standard product in the data sheet as compliant with the AEC-Q standard or “automotive grade” does not by itself mean that Bourns has approved such product for use in an automotive application.

Bourns® standard products are not tested to comply with United States Federal Aviation Administration standards generally or any other generally equivalent governmental organization standard applicable to products designed or manufactured for use in aircraft or space applications. Bourns expressly identifies Bourns® standard products that are suitable for use in aircraft or space applications on such products’ data sheets in the section entitled “Applications.” Unless expressly and specifically approved in writing by two authorized Bourns representatives on a case-by-case basis, use of any other Bourns® standard product in an aircraft or space application might not be safe and thus is not recommended, authorized or intended and is at the user’s sole risk.

The use and level of testing applicable to Bourns® custom products shall be negotiated on a case-by-case basis by Bourns and the user for which such Bourns® custom products are specially designed. Absent a written agreement between Bourns and the user regarding the use and level of such testing, the above provisions applicable to Bourns® standard products shall also apply to such Bourns® custom products.

Users shall not sell, transfer, export or re-export any Bourns® products or technology for use in activities which involve the design, development, production, use or stockpiling of nuclear, chemical or biological weapons or missiles, nor shall they use Bourns® products or technology in any facility which engages in activities relating to such devices. The foregoing restrictions apply to all uses and applications that violate national or international prohibitions, including embargos or international regulations. Further, Bourns® products and Bourns technology and technical data may not under any circumstance be exported or re-exported to countries subject to international sanctions or embargoes. Bourns® products may not, without prior authorization from Bourns and/or the U.S. Government, be resold, transferred, or re-exported to any party not eligible to receive U.S. commodities, software, and technical data.

To the maximum extent permitted by applicable law, Bourns disclaims (i) any and all liability for special, punitive, consequential, incidental or indirect damages or lost revenues or lost profits, and (ii) any and all implied warranties, including implied warranties of fitness for particular purpose, non-infringement and merchantability.

For your convenience, copies of this Legal Disclaimer Notice with German, Spanish, Japanese, Traditional Chinese and Simplified Chinese bilingual versions are available at:

Web Page: <http://www.bourns.com/legal/disclaimers-terms-and-policies>

PDF: <http://www.bourns.com/docs/Legal/disclaimer.pdf>