



TISP1120F3D

**DUAL FORWARD-CONDUCTING UNIDIRECTIONAL THYRISTOR OVERVOLTAGE PROTECTOR**

**TISP1120F3D Overvoltage Protector**

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

**Planar Passivated Junctions**  
- Low Off-State Current <10  $\mu$ A

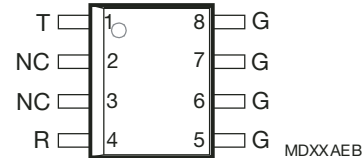
**Low Voltage Overshoot Under Surge**

Device Name	$V_{DRM}$ V	$V_{(BO)}$ V
TISP1120F3D	-97	-120

**Rated for International Surge Wave Shapes**

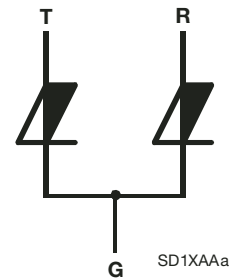
Wave Shape	Standard	$I_{PPSM}$ A
2/10	GR-1089-CORE	120
8/20	IEC 61000-4-5	70
10/160	TIA-968-A	60
10/700	ITU-T K.20/21/45	50
10/560	TIA-968-A	45
10/1000	GR-1089-CORE	35

**8-SOIC Package (Top View)**



NC - No internal connection

**Device Symbol**



**Description**

This dual forward-conducting unidirectional overvoltage protector is designed for the overvoltage protection of ICs used for the SLIC (Subscriber Line Interface Circuit) function. The IC line driver section is typically powered with 0 V and a negative supply. The TISP1120F3D limits voltages that exceed these supply rails.

High voltages can occur on the line as a result of exposure to lightning strikes and a.c. power surges. Negative transients are initially limited by breakdown clamping until the voltage rises to the breakover level, which causes the device to crowbar. The high crowbar holding current helps prevent d.c. latchup as the current subsides. Positive transients are limited by diode forward conduction. These protectors are designed to suppress and withstand the listed international lightning surges on any terminal pair.

This monolithic protection device is fabricated in an ion-implanted planar structure to ensure precise and matched breakover control, and is virtually transparent to the system in normal operation.

**How to Order**

Device	Package	Carrier	Order As	Marking Code	Standard Quantity
TISP1120F3D	8-SOIC	Embossed Tape Reeled	TISP1120F3DR-S	1120F3	2500

\*RoHS Directive 2002/95/EC Jan 27 2003 including Annex  
JULY 2005 – REVISED JANUARY 2007  
Specifications are subject to change without notice.  
Customers should verify actual device performance in their specific applications.

# TISP1120F3D Overvoltage Protector

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

Rating	Symbol	Value	Unit
Repetitive peak off-state voltage	$V_{\text{DRM}}$	-97	V
Non-repetitive peak impulse current (see Note 1) 2/10 $\mu\text{s}$ (GR-1089-CORE, 2/10 $\mu\text{s}$ voltage wave shape) 8/20 $\mu\text{s}$ (IEC 61000-4-5, combination wave generator, 1.2/50 $\mu\text{s}$ voltage waveshape) 10/160 $\mu\text{s}$ (TIA-968-A, 10/160 $\mu\text{s}$ voltage wave shape) 5/310 $\mu\text{s}$ (ITU-T K.44, 10/700 $\mu\text{s}$ voltage wave shape used in K.20/21/45) 5/320 $\mu\text{s}$ (TIA-968-A, 9/720 $\mu\text{s}$ voltage waveshape) 10/560 $\mu\text{s}$ (TIA-968-A, 10/560 $\mu\text{s}$ voltage wave shape) 10/1000 $\mu\text{s}$ (GR-1089-CORE, 10/1000 $\mu\text{s}$ voltage wave shape)	$I_{\text{PPSM}}$	2 x $\pm 120$ 2 x $\pm 70$ 2 x $\pm 60$ 2 x $\pm 50$ 2 x $\pm 50$ 2 x $\pm 45$ 2 x $\pm 35$	A
Non-repetitive peak on-state current, $0\text{ }^\circ\text{C} < T_A < 70\text{ }^\circ\text{C}$ 1 s, 50 Hz	$I_{\text{TSM}}$	2 x 4.3	A
Initial rate of rise of on-state current, linear current ramp, maximum ramp value $< 38\text{ A}$	$di_{\text{T}}/dt$	250	A/ $\mu\text{s}$
Junction temperature	$T_{\text{J}}$	-65 to +150	$^\circ\text{C}$
Storage temperature range	$T_{\text{stg}}$	-65 to +150	$^\circ\text{C}$

NOTE: 1. Initially the device must be in thermal equilibrium with  $0\text{ }^\circ\text{C} < T_{\text{J}} < 70\text{ }^\circ\text{C}$ . The surge may be repeated after the device returns to its initial conditions.

## Electrical Characteristics for Terminals T and R, $T_A = 25\text{ }^\circ\text{C}$ (Unless Otherwise Noted)

Parameter	Test Conditions	Min	Typ	Max	Unit
$I_{\text{DRM}}$ Repetitive peak off-state current	$V_{\text{D}} = \pm V_{\text{DRM}}$			$\pm 5$	$\mu\text{A}$
				$\pm 10$	
$V_{(\text{BO})}$ Breakover voltage	$dv/dt = -250\text{ V/ms}$ , $R_{\text{SOURCE}} = 300\ \Omega$			$\pm 123$	V
$I_{\text{H}}$ Holding current	$I_{\text{T}} = \pm 5\text{ A}$ , $di/dt = \pm 30\text{ mA/ms}$	$\pm 150$			mA

## Electrical Characteristics for Terminals T and G or R and G, $T_A = 25\text{ }^\circ\text{C}$ (Unless Otherwise Noted)

Parameter	Test Conditions	Min	Typ	Max	Unit
$I_{\text{DRM}}$ Repetitive peak off-state current	$V_{\text{D}} = V_{\text{DRM}}$			-5	$\mu\text{A}$
				-10	
$V_{(\text{BO})}$ Breakover voltage	$dv/dt = -250\text{ V/ms}$ , $R_{\text{SOURCE}} = 300\ \Omega$			-120	V
$V_{(\text{BO})}$ Impulse breakover voltage	$dv/dt \leq -1000\text{ V}/\mu\text{s}$ , Linear voltage ramp, Maximum ramp value = -500 V $di/dt \leq -20\text{ A}/\mu\text{s}$ , Linear current ramp, Maximum ramp value = -10 A			-130	V
$I_{(\text{BO})}$ Breakover current	$dv/dt = -250\text{ V/ms}$ , $R_{\text{SOURCE}} = 300\ \Omega$	-100		-600	mA
$I_{\text{H}}$ Holding current	$I_{\text{T}} = -5\text{ A}$ , $di/dt = +30\text{ mA/ms}$	-150			mA
$V_{\text{T}}$ On-state voltage	$I_{\text{T}} = -5\text{ A}$ , $t_{\text{w}} = 100\ \mu\text{s}$			-3	V
$V_{\text{F}}$ Forward voltage	$I_{\text{F}} = +5\text{ A}$ , $t_{\text{w}} = 100\ \mu\text{s}$			+3	V
$V_{\text{FRM}}$ Peak forward recovery voltage	$dv/dt \leq +1000\text{ V}/\mu\text{s}$ , Linear voltage ramp, Maximum ramp value = +500 V $di/dt \leq +20\text{ A}/\mu\text{s}$ , Linear current ramp, Maximum ramp value = +10 A		+3.3		V
$dv/dt$ Critical rate of rise of off-state voltage	Linear voltage ramp, maximum ramp value $< 0.85V_{\text{DRM}}$	-5			kV/ $\mu\text{s}$
$C_{\text{O}}$ Off-state capacitance	$f = 1\text{ MHz}$ , $V_{\text{d}} = 1\text{ V rms}$		60	65	$\mu\text{F}$
			20	25	

# TISP1120F3D Overtoltage Protector

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

Parameter	Test Conditions	Min	Typ	Max	Unit
$R_{\theta JA}$ Junction to ambient thermal resistance	$P_{tot} = 0.8\text{ W}$ 5 cm <sup>2</sup> FR4 PCB			160	$^\circ\text{C/W}$

## Parameter Measurement Information

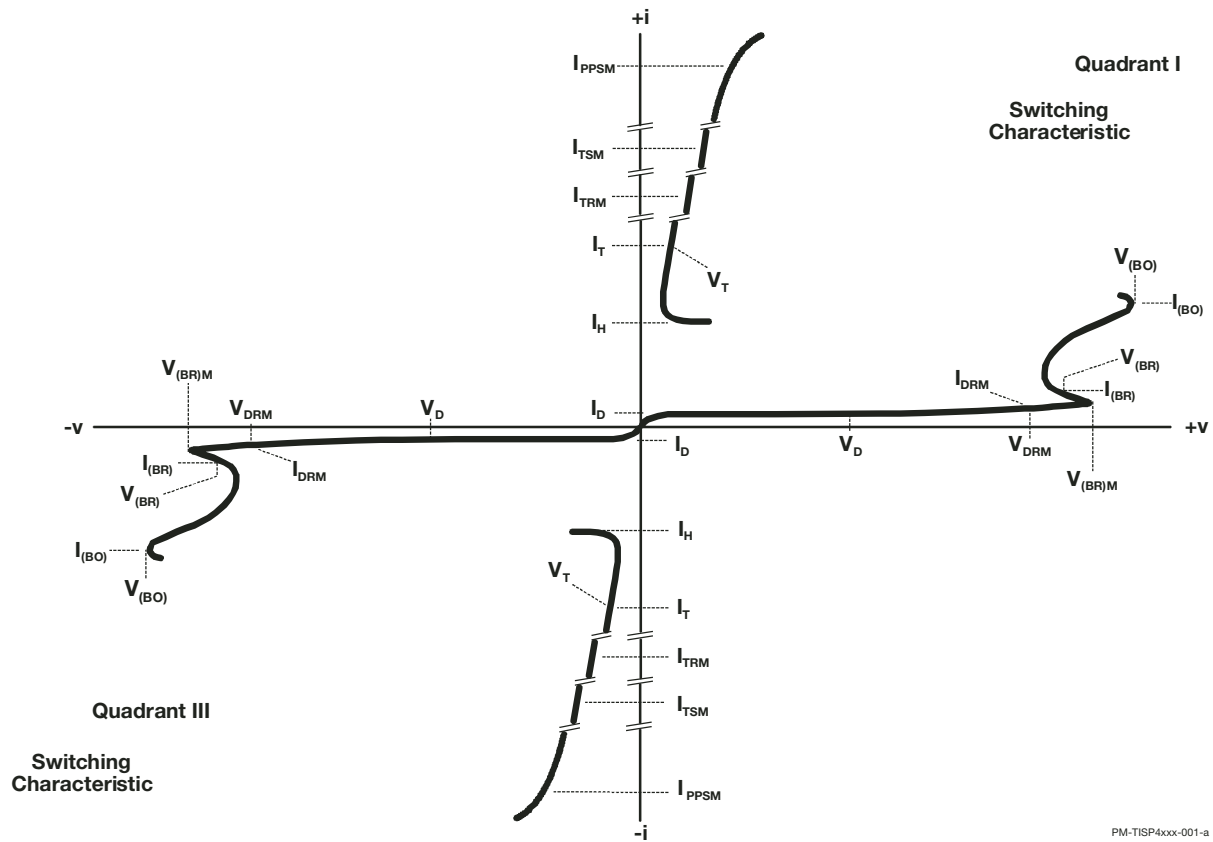


Figure 1. Voltage-Current Characteristic for the Terminals T and R  
All Measurements are Referenced to Terminal R

## Parameter Measurement Information (Continued)

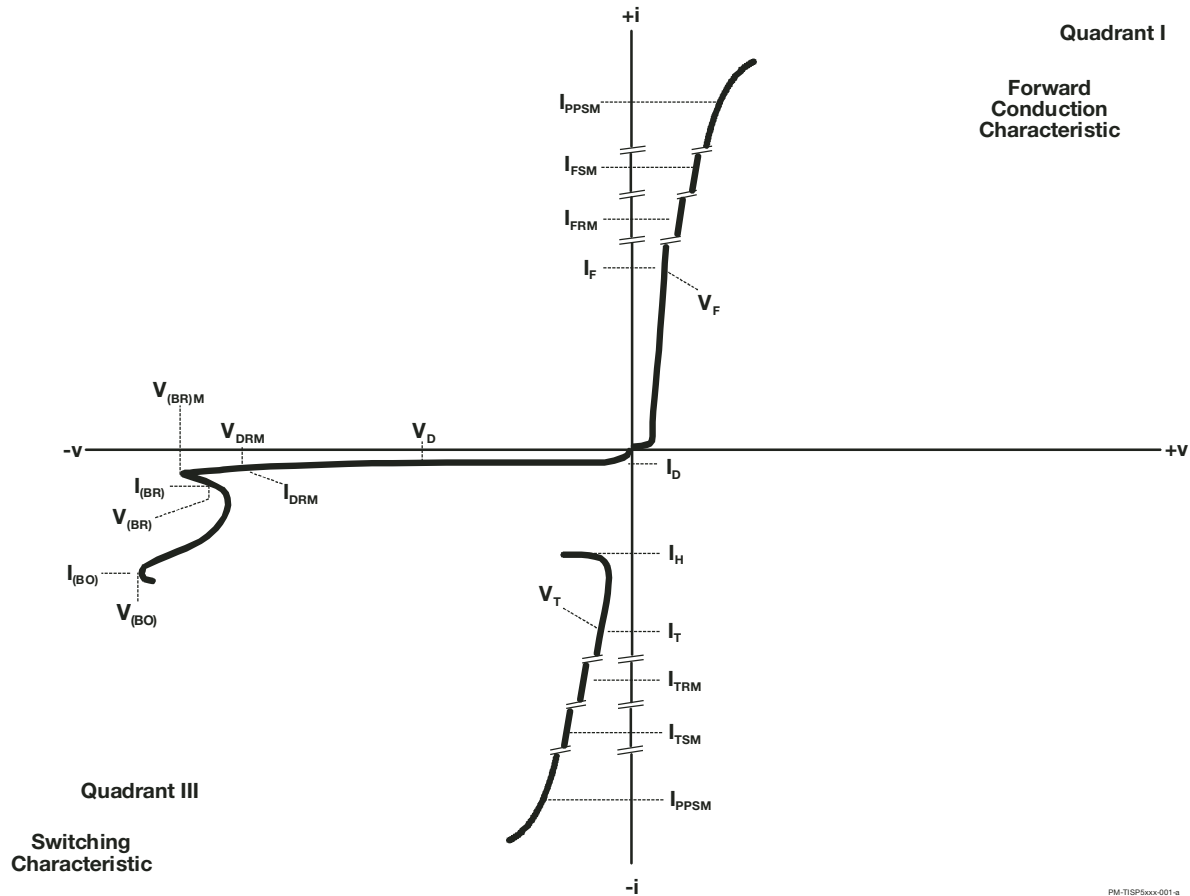


Figure 2. Voltage-Current Characteristic for Terminals T and G or R and G  
All Measurements are Referenced to Terminal G

PM-TISPxxxx-001-a

### **Bourns Sales Offices**

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### **Technical Assistance**

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