



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 $<10 \mu\text{A}$

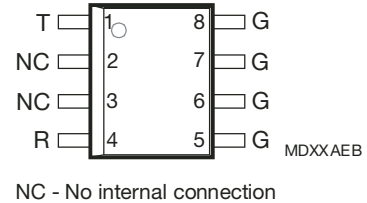
Low Voltage Overshoot Under Surge

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

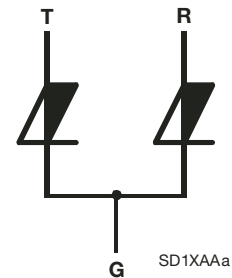
Rated for International Surge Wave Shapes

| 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)



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 |

TISP1120F3D Overvoltage Protector

BOURNS®

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

| Rating | Symbol | Value | Unit |
|--|-------------------|---|------------------|
| Repetitive peak off-state voltage | V_{DRM} | -97 | V |
| Non-repetitive peak impulse current (see Note 1) 2/10 μs (GR-1089-CORE, 2/10 μs voltage wave shape) 8/20 μs (IEC 61000-4-5, combination wave generator, 1.2/50 μs voltage waveshape) 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 waveshape) 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} | 2 x ± 120 2 x ± 70 2 x ± 60 2 x ± 50 2 x ± 50 2 x ± 45 2 x ± 35 | A |
| Non-repetitive peak on-state current, $0^\circ\text{C} < T_A < 70^\circ\text{C}$ 1 s, 50 Hz | I_{TSM} | 2 x 4.3 | A |
| Initial rate of rise of on-state current, linear current ramp, maximum ramp value $< 38\text{ A}$ | di_T/dt | 250 | A/ μs |
| Junction temperature | T_J | -65 to +150 | $^\circ\text{C}$ |
| Storage temperature range | T_{stg} | -65 to +150 | $^\circ\text{C}$ |

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

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

| Parameter | Test Conditions | Min | Typ | Max | Unit |
|--|--|--------------------------|-----|-----------|---------------|
| I_{DRM} Repetitive peak off-state current | $V_D = \pm V_{\text{DRM}}$ | $T_A = 25^\circ\text{C}$ | | ± 5 | μA |
| | | $T_A = 70^\circ\text{C}$ | | ± 10 | |
| $V_{(\text{BO})}$ Breakover voltage | $dv/dt = -250\text{ V/ms}$, $R_{\text{SOURCE}} = 300\ \Omega$ | | | ± 123 | V |
| I_H Holding current | $I_T = \pm 5\text{ A}$, $di/dt = \pm 30\text{ mA/ms}$ | ± 150 | | | mA |

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

| Parameter | Test Conditions | Min | Typ | Max | Unit |
|--|---|--------------------------|------|------|-------------------|
| I_{DRM} Repetitive peak off-state current | $V_D = V_{\text{DRM}}$ | $T_A = 25^\circ\text{C}$ | | -5 | μA |
| | | $T_A = 70^\circ\text{C}$ | | -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_H Holding current | $I_T = -5\text{ A}$, $di/dt = +30\text{ mA/ms}$ | -150 | | | mA |
| V_T On-state voltage | $I_T = -5\text{ A}$, $t_w = 100\ \mu\text{s}$ | | | -3 | V |
| V_F Forward voltage | $I_F = +5\text{ A}$, $t_w = 100\ \mu\text{s}$ | | | +3 | V |
| V_{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/ μs |
| C_O Off-state capacitance | $f = 1\text{ MHz}$, $V_d = 1\text{ V rms}$ | $V_D = -2\text{ V}$ | 60 | 65 | pF |
| | | $V_D = -50\text{ V}$ | 20 | 25 | |

TISP1120F3D Overvoltage Protector

BOURNS®

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 | $P_{\text{tot}} = 0.8\text{ W}$ 5 cm ² FR4 PCB | | | 160 | $^{\circ}\text{C/W}$ |

Parameter Measurement Information

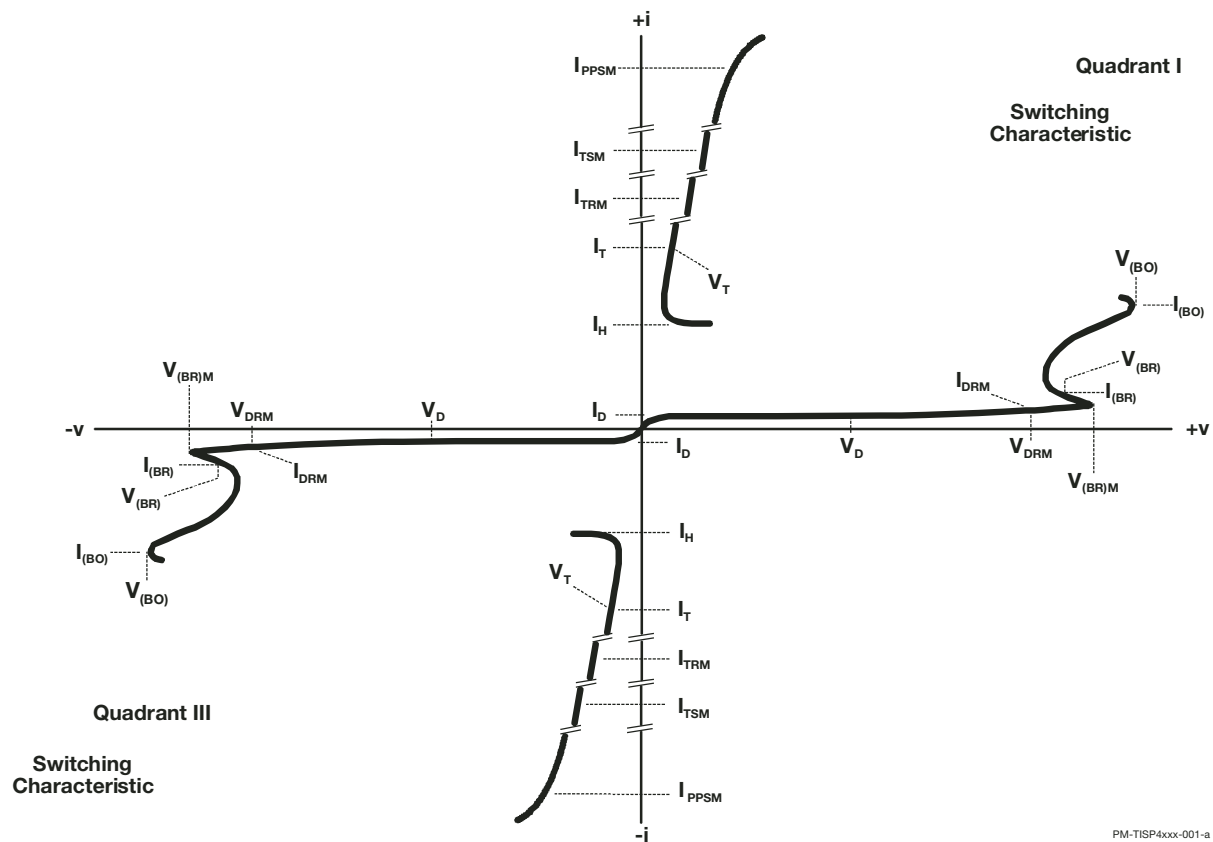


Figure 1. Voltage-Current Characteristic for the Terminals T and R
All Measurements are Referenced to Terminal R

TISP1120F3D Overvoltage Protector

BOURNS®

Parameter Measurement Information (Continued)

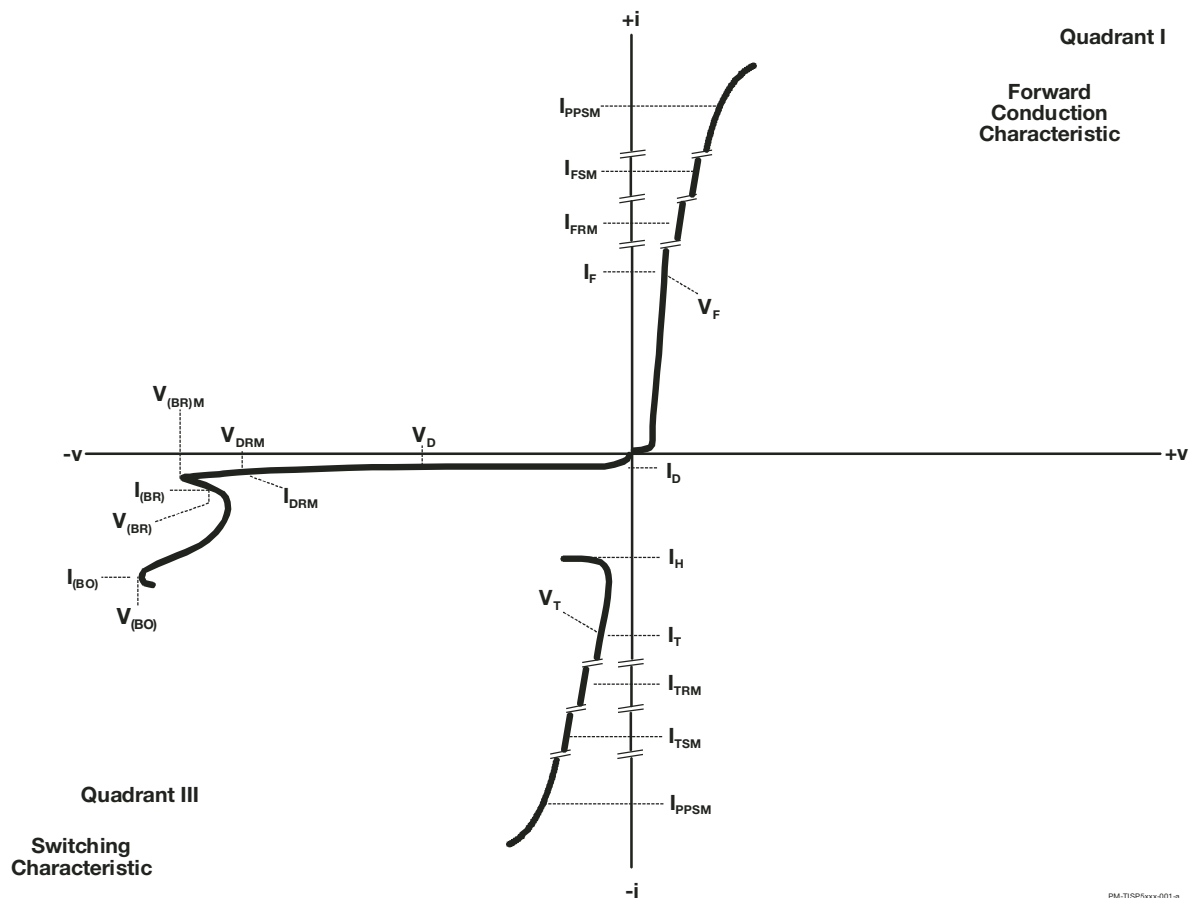


Figure 2. Voltage-Current Characteristic for Terminals T and G or R and G
All Measurements are Referenced to Terminal G

PM-TISP5xxx-001-a

Bourns Sales Offices

| Region | Phone | Fax |
|---------------|-----------------|-----------------|
| The Americas: | +1-951-781-5500 | +1-951-781-5700 |
| Europe: | +41-41-7685555 | +41-41-7685510 |
| Asia-Pacific: | +886-2-25624117 | +886-2-25624116 |

Technical Assistance

| Region | Phone | Fax |
|---------------|-----------------|-----------------|
| The Americas: | +1-951-781-5500 | +1-951-781-5700 |
| Europe: | +41-41-7685555 | +41-41-7685510 |
| Asia-Pacific: | +886-2-25624117 | +886-2-25624116 |

www.bourns.com

Bourns® products are available through an extensive network of manufacturer's representatives, agents and distributors. To obtain technical applications assistance, a quotation, or to place an order, contact a Bourns representative in your area.



Reliable Electronic Solutions