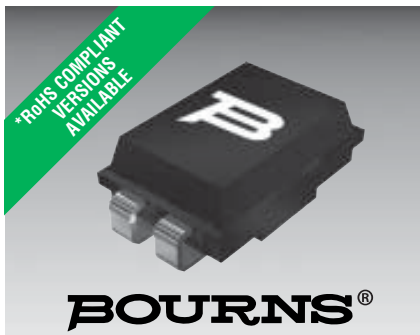




## TISP1070H3BJ THRU TISP1120H3BJ

### DUAL FORWARD-CONDUCTING UNIDIRECTIONAL THYRISTOR OVERVOLTAGE PROTECTORS

## TISP1xxxH3BJ Overvoltage Protector Series

#### Overvoltage Protection for Negative Rail SLICs

#### Dual High Current Protectors in a Space Efficient Package

- 2 x 100 A 10/1000 Current Rating
- SMB03 Package (3-pin Modified SMB/DO-214AA)
- 50 % Space Saving over Two SMBs

#### Ion-Implanted Breakdown Region

- Precise and Stable Voltage
- Low Voltage Overshoot under Surge

| Device Name  | $V_{DRM}$<br>V | $V_{(BO)}$<br>V |
|--------------|----------------|-----------------|
| TISP1070H3BJ | -58            | -70             |
| TISP1080H3BJ | -65            | -80             |
| TISP1095H3BJ | -75            | -95             |
| TISP1120H3BJ | -95            | -120            |

#### Rated for International Surge Wave Shapes

| Wave Shape | Standard                | $I_{PPSM}$<br>A |
|------------|-------------------------|-----------------|
| 2/10       | GR-1089-CORE            | 500             |
| 8/20       | IEC 61000-4-5           | 300             |
| 10/160     | TIA-968-A (FCC Part 68) | 200             |
| 10/700     | ITU-T K.20/21/45        | 150             |
| 10/560     | TIA-968-A (FCC Part 68) | 120             |
| 10/1000    | GR-1089-CORE            | 100             |

#### Description

These dual unidirectional thyristor devices protect SLICs and ISDN power feeds in central office, access and customer premises equipment against overvoltages on the telecom line. Each protector section consists of a voltage-triggered unidirectional thyristor with an anti-parallel diode. In the negative polarity, the thyristor allows signal voltages, without clipping, up to the maximum off-state voltage value,  $V_{DRM}$ , see Figure 1. Voltages exceeding  $V_{DRM}$  are limited and will not exceed the breakover voltage,  $V_{(BO)}$ , level. If sufficient current flows due to the overvoltage, the thyristor switches into a low-voltage on-state condition, which diverts the current from the overvoltage through the thyristor. When the diverted current falls below the holding current,  $I_H$ , level the thyristor switches off and restores normal system operation. Positive overvoltages are limited by the conduction of the anti-parallel diode.

The TISP1xxxH3BJ is available in four voltages and has a 100 A 10/1000 current rating. These protectors have been designed particularly for use in equipment that must meet the following standards and recommendations: GR-1089-CORE, TIA-968-A (replaces FCC Part 68), ITU-T K.20, K.21 and K.45. Housed in a SMB03 package (3-pin modified SMB/DO-214AA), these parts are space efficient to replace protection designs of 100 A 10/1000 or less which use multiple SMBs or a 6-pin SMT package.

#### How to Order

| Device       | Package                             | Carrier              | For Standard Termination Finish Order As | For Lead Free Termination Finish Order As | Marking Code | Std. Qty. |
|--------------|-------------------------------------|----------------------|------------------------------------------|-------------------------------------------|--------------|-----------|
| TISP1xxxH3BJ | SMB03 (3-pin modified SMB/DO-214AA) | Embossed Tape Reeled | TISP1xxxH3BJR                            | TISP1xxxH3BJR-S                           | 1xxxH3       | 3000      |

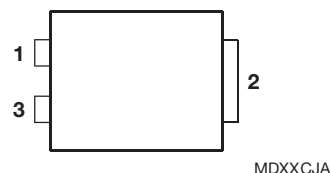
Insert xxx value corresponding to device name.

\*RoHS Directive 2002/95/EC Jan 27 2003 including Annex JUNE 2003 - REVISED FEBRUARY 2005

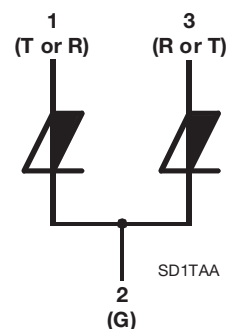
Specifications are subject to change without notice.

Customers should verify actual device performance in their specific applications.

#### SMB03 Package (Top View)



#### Device Symbol



..... UL Recognized Component

# TISP1xxxH3BJ Overvoltage Protector Series

**BOURNS®**

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

| Rating                                                                                   | Symbol            | Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Unit             |
|------------------------------------------------------------------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Repetitive peak off-state voltage, (Terminals 1-2 and 3-2) (see Note 1)                  | $V_{\text{DRM}}$  | <div>'1070 -58</div> <div>'1080 -65</div> <div>'1095 -75</div> <div>'1120 -95</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | V                |
| Non-repetitive peak on-state pulse current (see Notes 2 and 3)                           | $I_{\text{PPSM}}$ | <div>2/10 (Telcordia GR-1089-CORE, 2/10 voltage wave shape) 2x500</div> <div>8/20 (IEC 61000-4-5, combination wave generator, 1.2/50 voltage wave shape) 2x300</div> <div>10/160 (TIA-968-A (replaces FCC Part 68), 10/160 <math>\mu\text{s}</math> voltage wave shape) 2x200</div> <div>5/310 (ITU-T K.44, 10/700 <math>\mu\text{s}</math> voltage wave shape used in K.20/45/21) 2x150</div> <div>5/320 (TIA-968-A (replaces FCC Part 68), 9/720 <math>\mu\text{s}</math> voltage wave shape) 2x150</div> <div>10/560 (TIA-968-A (replaces FCC Part 68), 10/560 <math>\mu\text{s}</math> voltage wave shape) 2x120</div> <div>10/1000 (Telcordia GR-1089-CORE, 10/1000 voltage wave shape) 2x100</div> | A                |
| Non-repetitive peak on-state current (see Notes 2 and 3)                                 | $I_{\text{TSM}}$  | <div>50 Hz, 1 cycle 2x30</div> <div>60 Hz, 1 cycle 2x35</div> <div>1000 s 50 Hz/60 Hz a.c. 2x1.2</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | A                |
| Initial rate of rise of on-state current, Linear current ramp, Maximum ramp value < 50 A | $di_T/dt$         | 500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | A/ $\mu\text{s}$ |
| Junction temperature                                                                     | $T_J$             | -40 to +150                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | $^\circ\text{C}$ |
| Storage temperature range                                                                | $T_{\text{stg}}$  | -65 to +150                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | $^\circ\text{C}$ |

NOTES: 1. At  $-40\text{ }^\circ\text{C}$  derate linearly to  $0.93 \times V_{\text{DRM}}$  ( $25\text{ }^\circ\text{C}$ )  
2. Initially the device must be in thermal equilibrium with  $T_J = 25\text{ }^\circ\text{C}$ .  
3. These non-repetitive rated currents are peak values of either polarity. The rated current values are applied to the terminals 1 and 3 simultaneously (in this case the terminal 2 return current will be the sum of the currents applied to the terminals 1 and 3). The surge may be repeated after the device returns to its initial conditions.

## Electrical Characteristics for the 1 and 2 or the 3 and 2 Terminals, $T_A = 25\text{ }^\circ\text{C}$ (Unless Otherwise Noted)

| Parameter                                          | Test Conditions                                                                                                        | Min  | Typ | Max                       | Unit              |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|------|-----|---------------------------|-------------------|
| $I_{\text{DRM}}$ Repetitive peak off-state current | $V_D = V_{\text{DRM}}$<br>$T_A = 25\text{ }^\circ\text{C}$<br>$T_A = 85\text{ }^\circ\text{C}$                         |      |     | -5<br>-10                 | $\mu\text{A}$     |
| $V_{(\text{BO})}$ AC breakover voltage             | $dv/dt = -250\text{ V/ms}$ , $R_{\text{SOURCE}} = 300\text{ }\Omega$<br><div>'1070<br/>'1080<br/>'1095<br/>'1120</div> |      |     | -70<br>-80<br>-95<br>-120 | V                 |
| $I_{(\text{BO})}$ Breakover current                | $dv/dt = -250\text{ V/ms}$ , $R_{\text{SOURCE}} = 300\text{ }\Omega$                                                   |      |     | -800                      | mA                |
| $I_H$ Holding current                              | $I_T = -5\text{ A}$ , $di/dt = +30\text{ mA/ms}$                                                                       | -150 |     |                           | mA                |
| $dv/dt$ Critical rate of rise of off-state voltage | Linear voltage ramp, Maximum ramp value < $0.85 \times V_{\text{DRM}}$                                                 | -5   |     |                           | kV/ $\mu\text{s}$ |
| $I_D$ Off-state current                            | $V_D = -50\text{ V}$<br>$T_A = 85\text{ }^\circ\text{C}$                                                               |      |     | -10                       | $\mu\text{A}$     |
| $V_F$ Forward voltage                              | $I_F = +5\text{ A}$ , $t_W = 500\text{ }\mu\text{s}$                                                                   |      |     | 3                         | V                 |

# TISP1xxxH3BJ Overvoltage Protector Series

**BOURNS®**

## Electrical Characteristics for the 1 and 2 or the 3 and 2 Terminals, $T_A = 25\text{ }^{\circ}\text{C}$ (Unless Otherwise Noted)

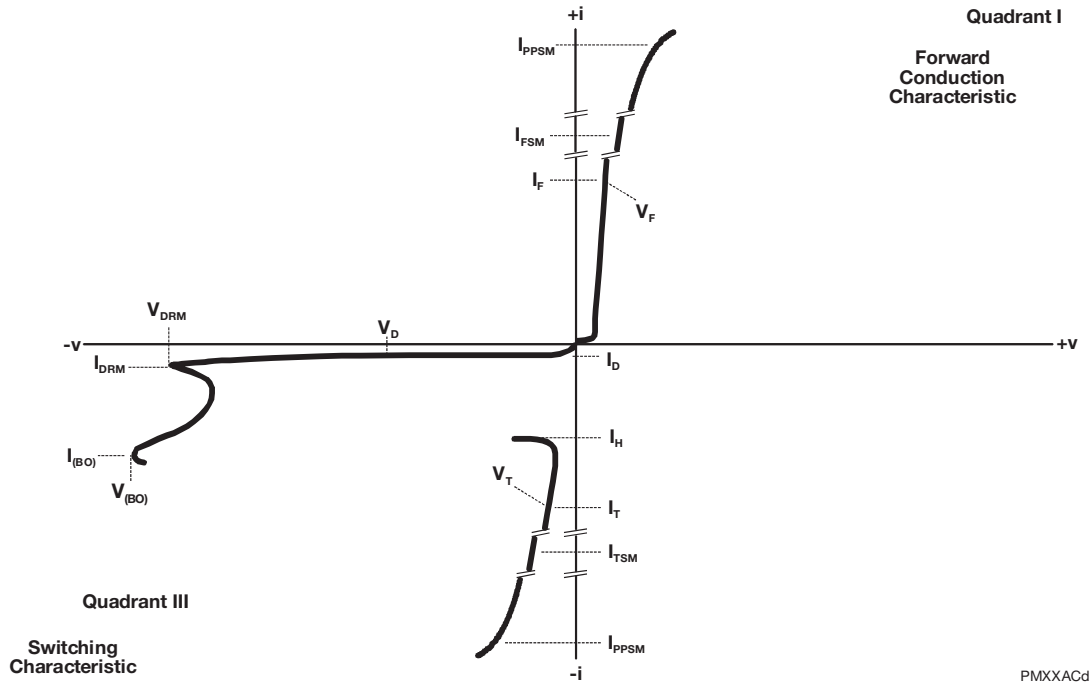
| Parameter                              | Test Conditions                                                    | Min   | Typ | Max | Unit |
|----------------------------------------|--------------------------------------------------------------------|-------|-----|-----|------|
| $C_{\text{off}}$ Off-state capacitance | $f = 1\text{ MHz}$ , $V_d = 1\text{ V rms}$ , $V_D = -2\text{ V}$  | '1070 | 161 |     | pF   |
|                                        |                                                                    | '1080 | 152 |     |      |
|                                        |                                                                    | '1095 | 139 |     |      |
|                                        |                                                                    | '1120 | 116 |     |      |
|                                        | $f = 1\text{ MHz}$ , $V_d = 1\text{ V rms}$ , $V_D = -50\text{ V}$ | '1070 | 58  |     |      |
|                                        |                                                                    | '1080 | 55  |     |      |
|                                        |                                                                    | '1095 | 50  |     |      |
|                                        |                                                                    | '1120 | 42  |     |      |

## Thermal Characteristics

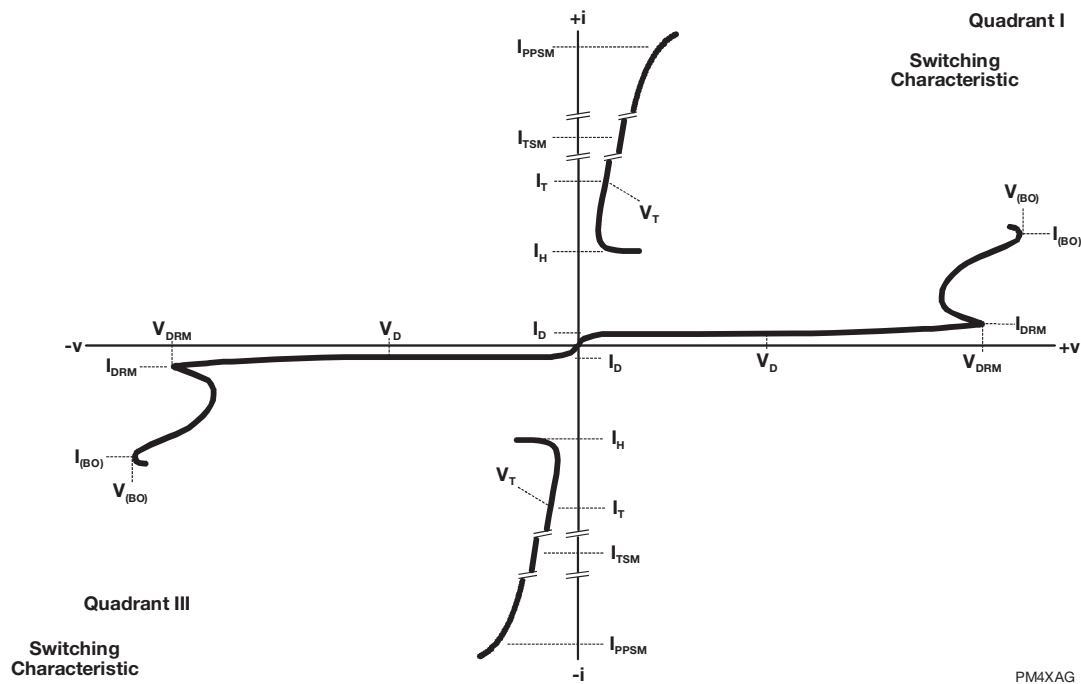
| Parameter                                               | Test Conditions                                                                                                 | Min | Typ | Max | Unit                 |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----|-----|-----|----------------------|
| $R_{\theta JA}$ Junction to free air thermal resistance | EIA/JESD51-3 PCB,<br>$T_A = 25\text{ }^{\circ}\text{C}$ , (see Note 4)                                          |     |     | 113 | $^{\circ}\text{C/W}$ |
|                                                         | 265 mm x 210 mm populated line card,<br>4-layer PCB, $I_T = I_{TSM(1000)}$ , $T_A = 25\text{ }^{\circ}\text{C}$ |     | 52  |     |                      |

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

## Parameter Measurement Information



**Figure 1. Voltage-Current Characteristic for Terminal Pairs 1-2 and 3-2**  
All Measurements are Referenced to Terminal 2



**Figure 2. Voltage-Current Characteristic for Terminal Pair 1-3**  
All Measurements are Referenced to Terminal 3

## Typical Characteristics

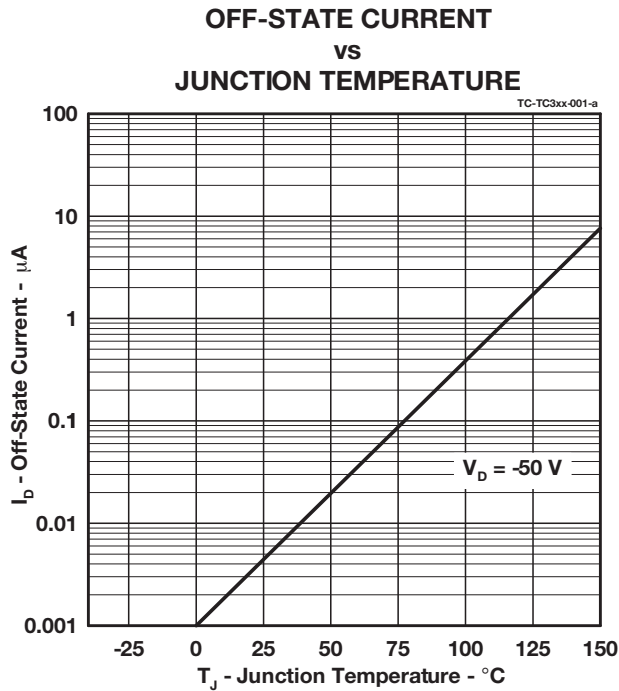


Figure 3.

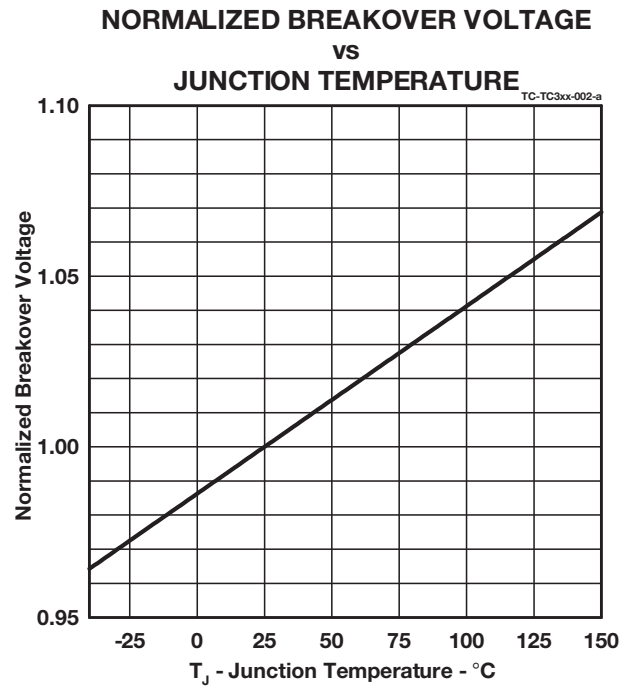


Figure 4.

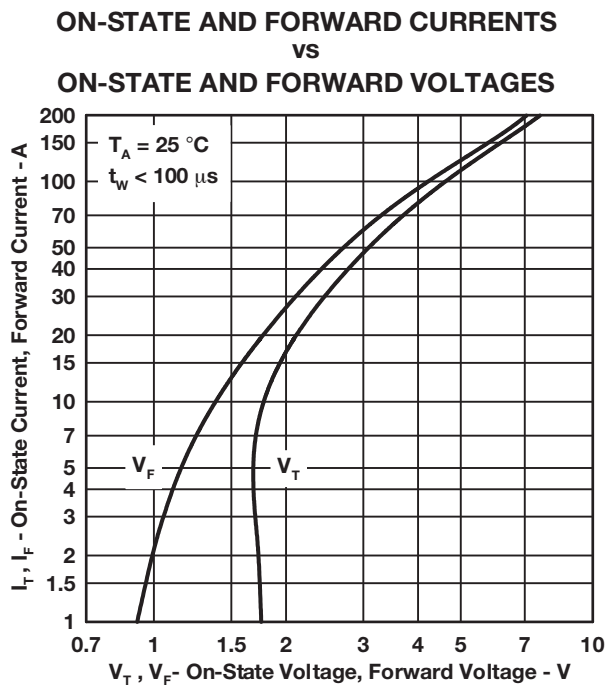


Figure 5.

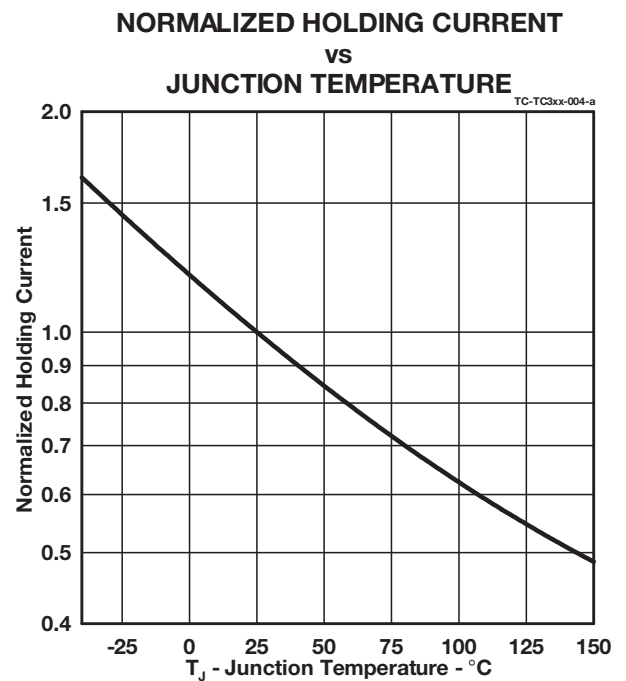


Figure 6.

## Typical Characteristics (Continued)

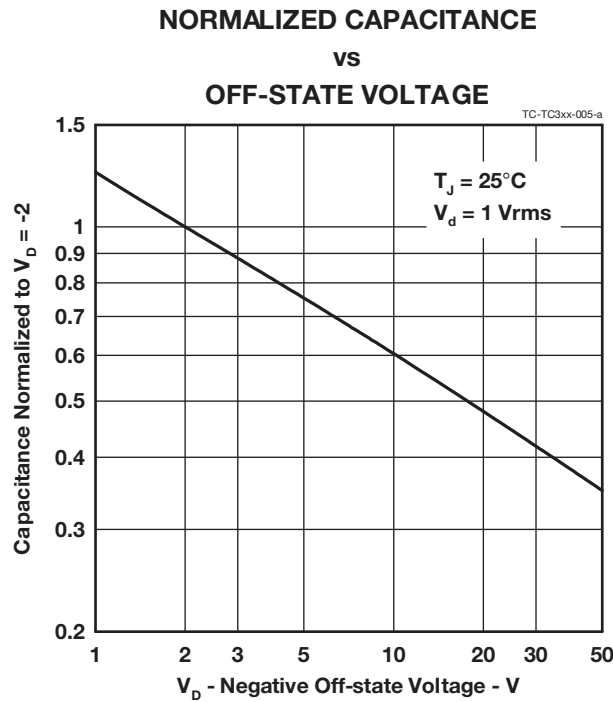


Figure 7.

## Rating and Thermal Information

### NON-REPETITIVE PEAK ON-STATE CURRENT vs CURRENT DURATION

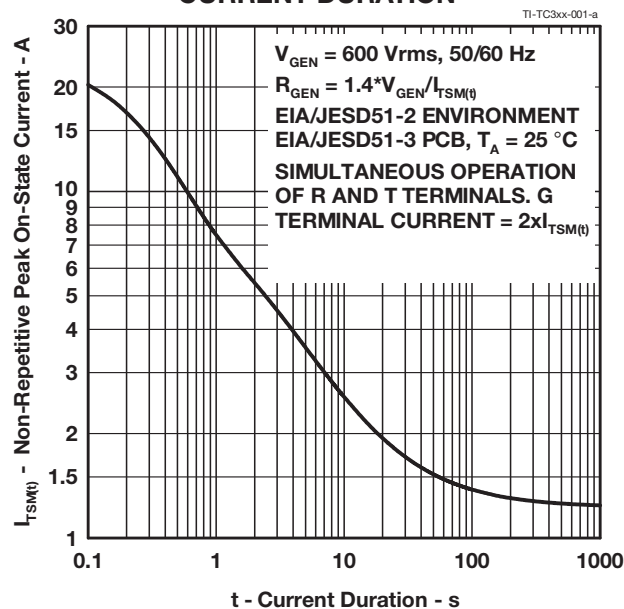


Figure 8.

### **Bourns Sales Offices**

| Region        | Phone                              | Fax                                                |
|---------------|------------------------------------|----------------------------------------------------|
| The Americas: | +1-909-781-5500<br>+1-951-781-5500 | +1-909-781-5700<br>+1-951-781-5700 (after 7/17/04) |
| Europe:       | +41 (0)41-7685555                  | +41 (0)41-7685510                                  |
| Asia-Pacific: | +886-2-25624117                    | +886-2-25624116                                    |

### **Technical Assistance**

| Region        | Phone                              | Fax                                                |
|---------------|------------------------------------|----------------------------------------------------|
| The Americas: | +1-909-781-5500<br>+1-951-781-5500 | +1-909-781-5700<br>+1-951-781-5700 (after 7/17/04) |
| Europe:       | +41 (0)41-7685555                  | +41 (0)41-7685510                                  |
| Asia-Pacific: | +886-2-25624117                    | +886-2-25624116                                    |

**[www.bourns.com](http://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*

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

COPYRIGHT© 2004, BOURNS, INC. LITHO IN U.S.A. e 05/04/TSP0332