

### TELECOMMUNICATION SYSTEM SECONDARY PROTECTION

- **Ion-Implanted Breakdown Region**  
**Precise and Stable Voltage**  
**Low Voltage Overshoot under Surge**

| DEVICE | $V_{(Z)}$<br>V | $V_{(BO)}$<br>V |
|--------|----------------|-----------------|
| '2290  | 200            | 290             |

- **Planar Passivated Junctions**  
**Low Off-State Current** < 10  $\mu$ A
- **Rated for International Surge Wave Shapes**

| WAVE SHAPE      | STANDARD         | $I_{TSP}$<br>A |
|-----------------|------------------|----------------|
| 8/20 $\mu$ s    | ANSI C62.41      | 150            |
| 10/160 $\mu$ s  | FCC Part 68      | 60             |
| 10/560 $\mu$ s  | FCC Part 68      | 45             |
| 0.2/310 $\mu$ s | RLM 88           | 38             |
| 10/700 $\mu$ s  | FTZ R12          | 50             |
|                 | VDE 0433         | 50             |
|                 | CCITT IX K17/K20 | 50             |
| 10/1000 $\mu$ s | REA PE-60        | 50             |

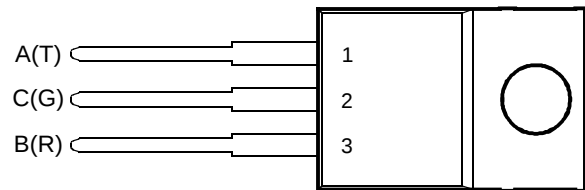
- **UL Recognized, E132482**

#### description

The TISP2290 is designed specifically for telephone equipment protection against lightning and transients induced by a.c. power lines. These devices will suppress voltage transients between terminals A and C, B and C, and A and B.

Transients are initially clipped by zener action until the voltage rises to the breakover level, which causes the device to crowbar. The high crowbar holding current prevents d.c. latchup as the transient subsides.

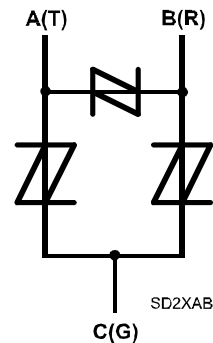
TO-220 PACKAGE  
(TOP VIEW)



Pin 2 is in electrical contact with the mounting base.

MDXXANA

#### device symbol



These monolithic protection devices are fabricated in ion-implanted planar structures to ensure precise and matched breakover control and are virtually transparent to the system in normal operation.

### PRODUCT INFORMATION

Information is current as of publication date. Products conform to specifications in accordance with the terms of Power Innovations standard warranty. Production processing does not necessarily include testing of all parameters.

# TISP2290

## DUAL SYMMETRICAL TRANSIENT VOLTAGE SUPPRESSORS

NOVEMBER 1986 - REVISED SEPTEMBER 1997

### absolute maximum ratings at 25°C case temperature (unless otherwise noted)

| RATING                                                                                   | SYMBOL     | VALUE       | UNIT       |
|------------------------------------------------------------------------------------------|------------|-------------|------------|
| Non-repetitive peak on-state pulse current (see Notes 1, 2 and 3)                        | $I_{TSP}$  | 150         | A          |
| 8/20 $\mu$ s (ANSI C62.41, open-circuit voltage wave shape 1.2/50 $\mu$ s)               |            | 60          |            |
| 10/160 $\mu$ s (FCC Part 68, open-circuit voltage wave shape 10/160 $\mu$ s)             |            | 50          |            |
| 5/200 $\mu$ s (VDE 0433, open-circuit voltage wave shape 2 kV, 10/700 $\mu$ s)           |            | 38          |            |
| 0.2/310 $\mu$ s (RLM 88, open-circuit voltage wave shape 1.5 kV, 0.5/700 $\mu$ s)        |            | 50          |            |
| 5/310 $\mu$ s (CCITT IX K17/K20, open-circuit voltage wave shape 2 kV, 10/700 $\mu$ s)   |            | 50          |            |
| 5/310 $\mu$ s (FTZ R12, open-circuit voltage wave shape 2 kV, 10/700 $\mu$ s)            |            | 45          |            |
| 10/560 $\mu$ s (FCC Part 68, open-circuit voltage wave shape 10/560 $\mu$ s)             |            | 50          |            |
| 10/1000 $\mu$ s (REA PE-60, open-circuit voltage wave shape 10/1000 $\mu$ s)             |            |             |            |
| Non-repetitive peak on-state current, 50 Hz, 2.5 s (see Notes 1 and 2)                   | $I_{TSM}$  | 10          | A rms      |
| Initial rate of rise of on-state current, Linear current ramp, Maximum ramp value < 38 A | $di_T/dt$  | 250         | A/ $\mu$ s |
| Junction temperature                                                                     | $T_J$      | 150         | °C         |
| Operating free - air temperature range                                                   |            | 0 to 70     | °C         |
| Storage temperature range                                                                | $T_{stg}$  | -40 to +150 | °C         |
| Lead temperature 1.5 mm from case for 10 s                                               | $T_{lead}$ | 260         | °C         |

- NOTES: 1. Above 70°C, derate linearly to zero at 150°C case temperature  
2. This value applies when the initial case temperature is at (or below) 70°C. The surge may be repeated after the device has returned to thermal equilibrium.  
3. Most PTT's quote an unloaded voltage waveform. In operation the TISP essentially shorts the generator output. The resulting loaded current waveform is specified.

### electrical characteristics for the A and B terminals, $T_J = 25^\circ\text{C}$

| PARAMETER                       | TEST CONDITIONS                          | MIN       | TYP | MAX      | UNIT          |
|---------------------------------|------------------------------------------|-----------|-----|----------|---------------|
| $V_Z$ Reference zener voltage   | $I_Z = \pm 1\text{mA}$                   | $\pm 200$ |     |          | V             |
| $I_D$ Off-state leakage current | $V_D = \pm 50\text{V}$                   |           |     | $\pm 10$ | $\mu\text{A}$ |
| $C_{off}$ Off-state capacitance | $V_D = 0$ $f = 1\text{kHz}$ (see Note 4) |           | 40  | 100      | pF            |

NOTE 4: These capacitance measurements employ a three terminal capacitance bridge incorporating a guard circuit. The third terminal is connected to the guard terminal of the bridge.

### electrical characteristics for the A and C or the B and C terminals, $T_J = 25^\circ\text{C}$

| PARAMETER                                                 | TEST CONDITIONS                           | MIN        | TYP       | MAX       | UNIT          |
|-----------------------------------------------------------|-------------------------------------------|------------|-----------|-----------|---------------|
| $V_Z$ Reference zener voltage                             | $I_Z = \pm 1\text{mA}$                    | $\pm 200$  |           |           | V             |
| $\alpha V_Z$ Temperature coefficient of reference voltage |                                           |            | 0.1       |           | %/°C          |
| $V_{(BO)}$ Breakover voltage                              | (see Notes 5 and 6)                       |            |           | $\pm 290$ | V             |
| $I_{(BO)}$ Breakover current                              | (see Note 5)                              | $\pm 0.15$ |           | $\pm 0.6$ | A             |
| $V_{TM}$ Peak on-state voltage                            | $I_T = \pm 5\text{A}$ (see Notes 5 and 6) |            | $\pm 1.9$ | $\pm 3$   | V             |
| $I_H$ Holding current                                     | (see Note 5)                              | $\pm 150$  |           |           | mA            |
| $dv/dt$ Critical rate of rise of off-state voltage        | (see Note 7)                              |            |           | $\pm 5$   | kV/ $\mu$ s   |
| $I_D$ Off-state leakage current                           | $V_D = \pm 50\text{V}$                    |            |           | $\pm 10$  | $\mu\text{A}$ |
| $C_{off}$ Off-state capacitance                           | $V_D = 0$ $f = 1\text{kHz}$ (see Note 4)  |            | 110       | 200       | pF            |

- NOTES: 5. These parameters must be measured using pulse techniques,  $t_w = 100\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
6. These parameters are measured with voltage sensing contacts separate from the current carrying contacts located within 3.2 mm (0.125 inch) from the device body.  
7. Linear rate of rise, maximum voltage limited to 80 %  $V_Z$  (minimum)..

## PRODUCT INFORMATION

PARAMETER MEASUREMENT INFORMATION

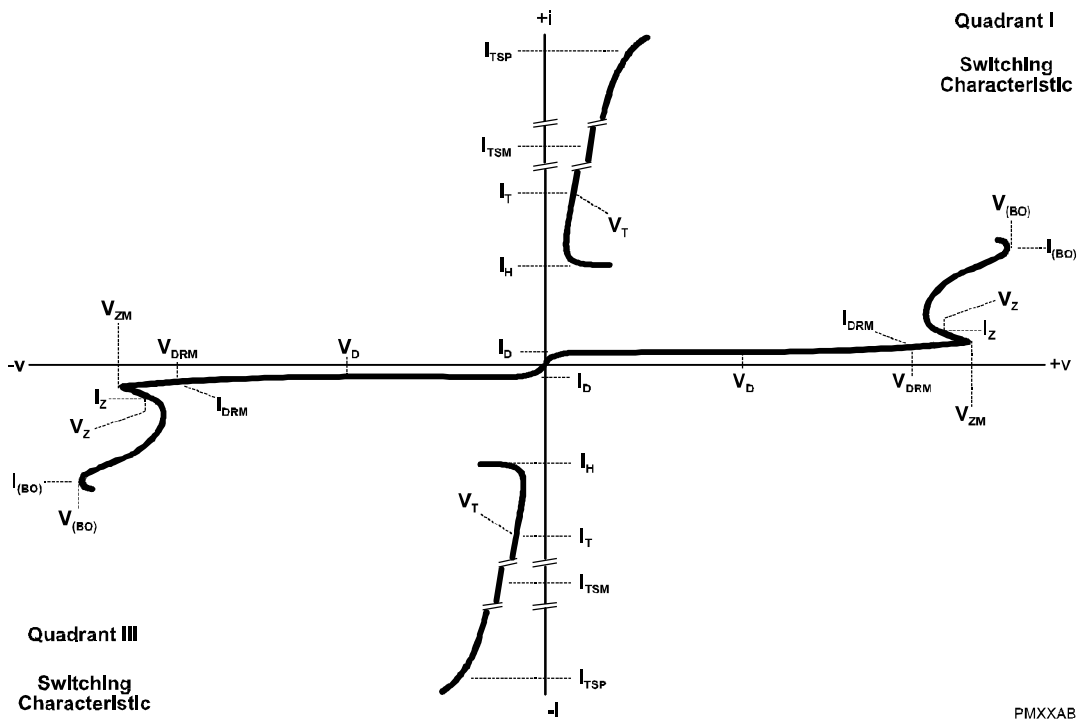


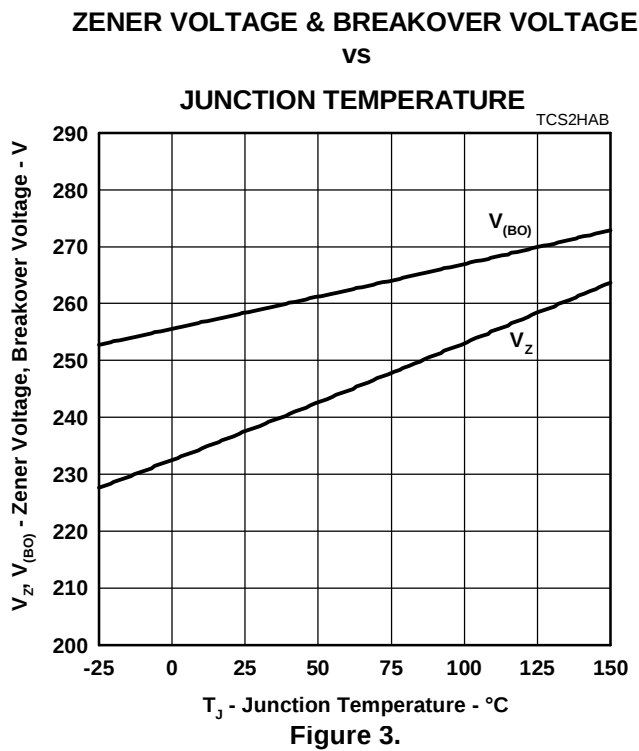
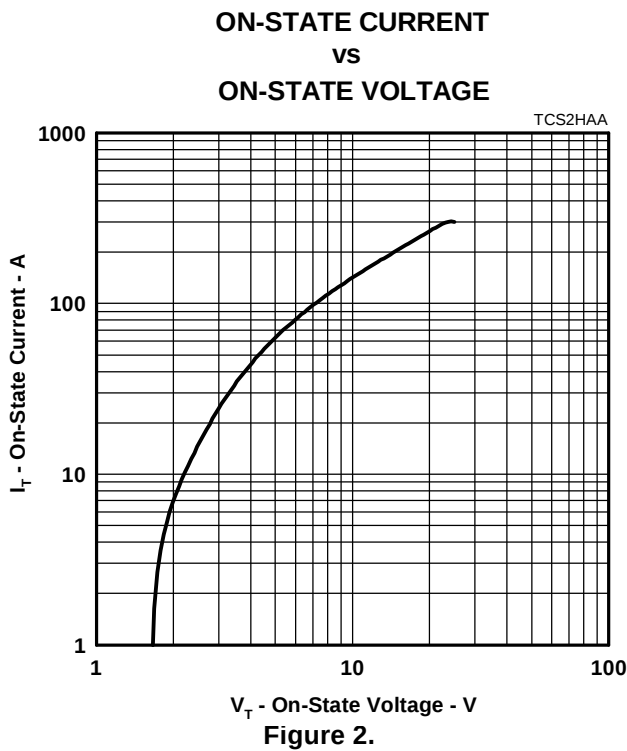
Figure 1. VOLTAGE-CURRENT CHARACTERISTIC FOR ANY PAIR OF TERMINALS

The high level characteristics for terminals A and B are not guaranteed.

thermal characteristics

| PARAMETER        |                                         | MIN | TYP | MAX  | UNIT |
|------------------|-----------------------------------------|-----|-----|------|------|
| R <sub>θJA</sub> | Junction to free air thermal resistance |     |     | 62.5 | °C/W |

TYPICAL CHARACTERISTICS  
A and C, or B and C terminals



### TYPICAL CHARACTERISTICS A and C, or B and C terminals

**HOLDING CURRENT & BREAKOVER CURRENT  
 VS**

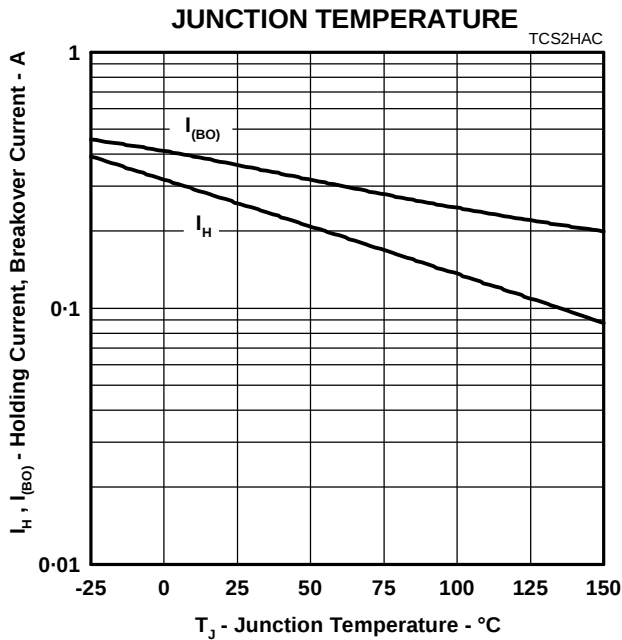


Figure 4.

**OFF-STATE CURRENT  
 VS**

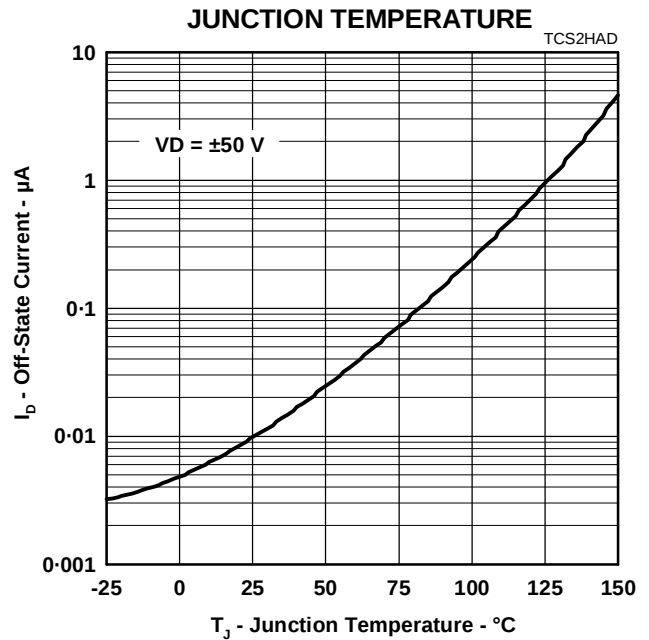


Figure 5.

**ON-STATE VOLTAGE  
 VS**

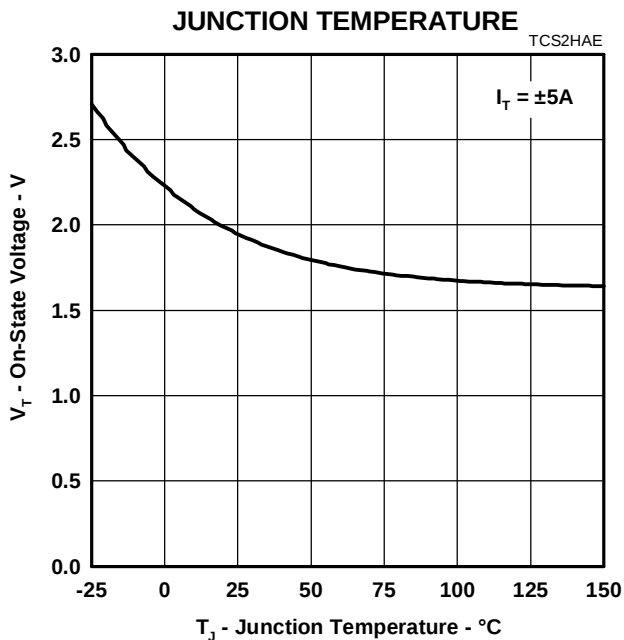


Figure 6.

**NORMALISED BREAKOVER VOLTAGE  
 VS**

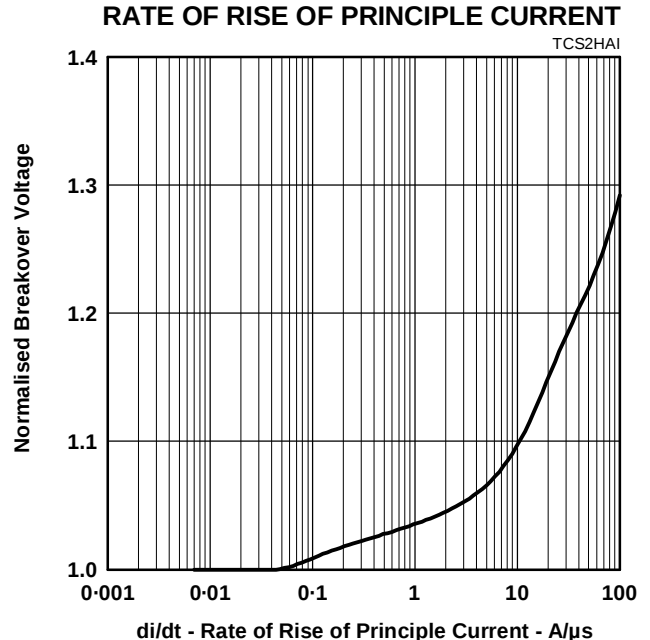
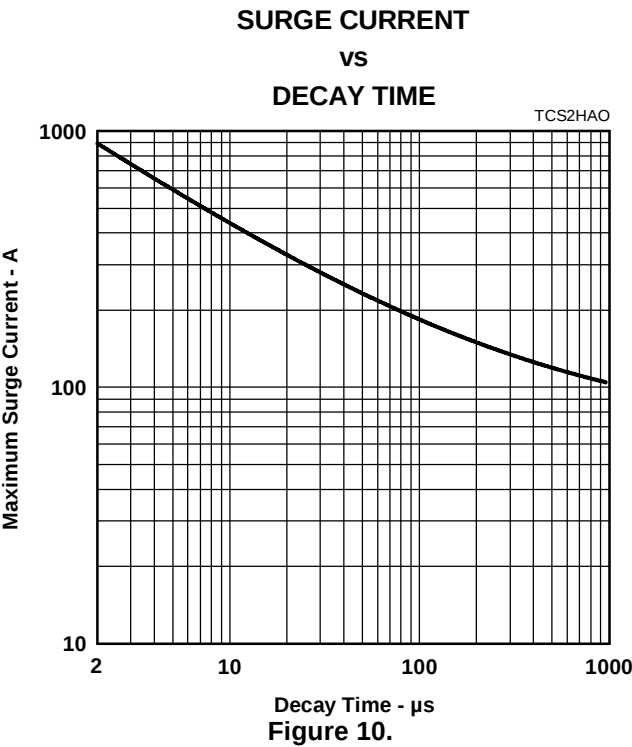
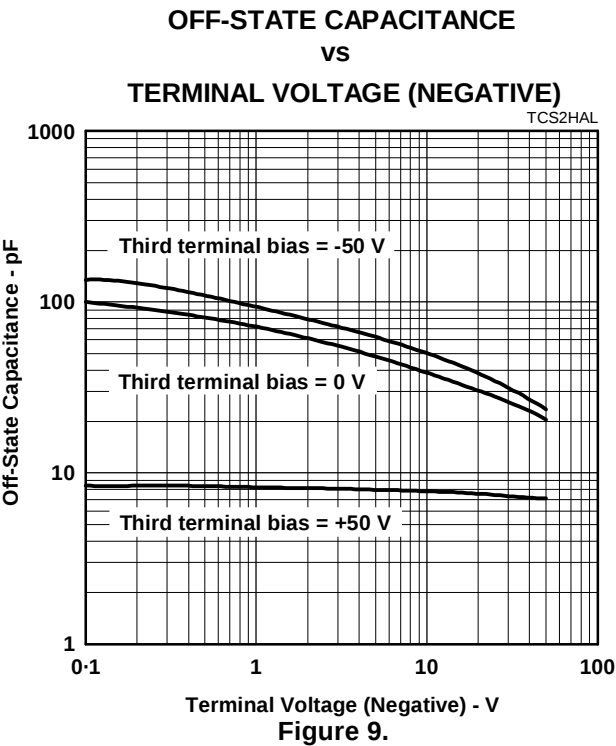
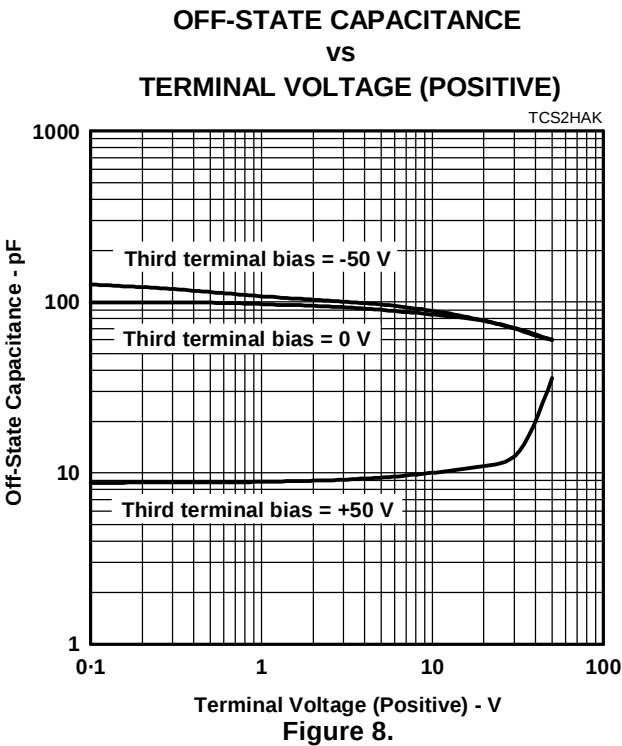


Figure 7.

TYPICAL CHARACTERISTICS  
A and C, or B and C terminals



### TYPICAL CHARACTERISTICS A and B terminals

#### ZENER VOLTAGE & BREAKOVER VOLTAGE VS

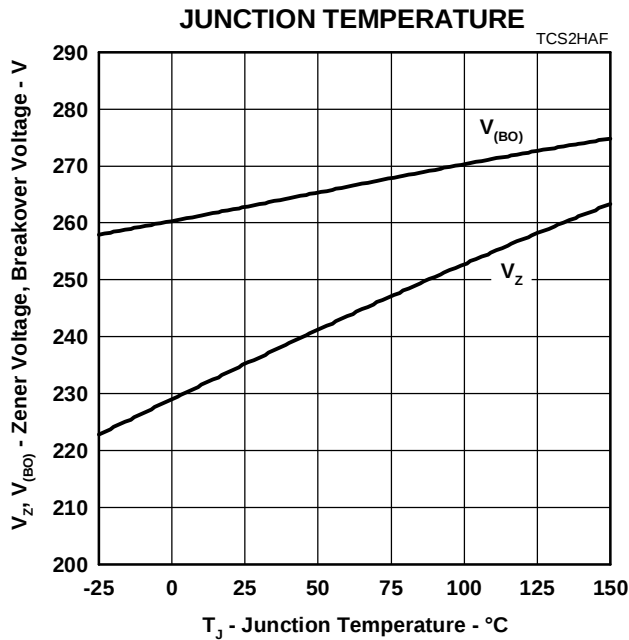


Figure 11.

#### HOLDING CURRENT & BREAKOVER CURRENT VS

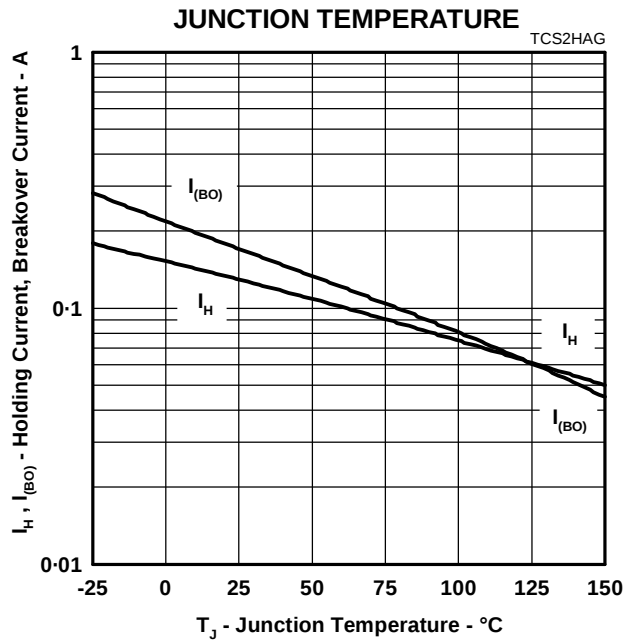


Figure 12.

#### OFF-STATE CURRENT VS

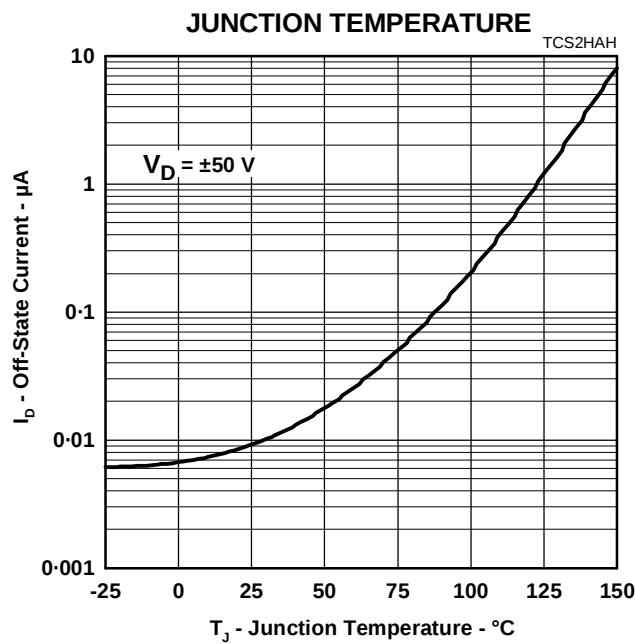
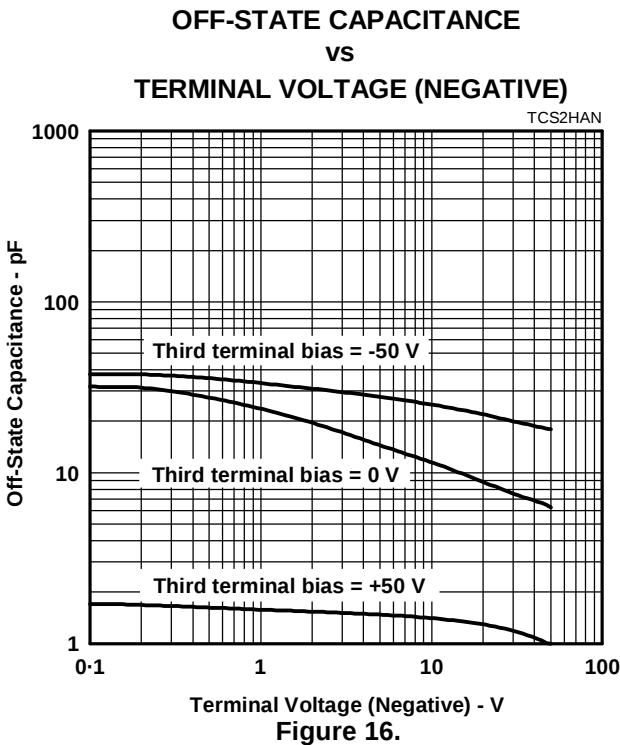
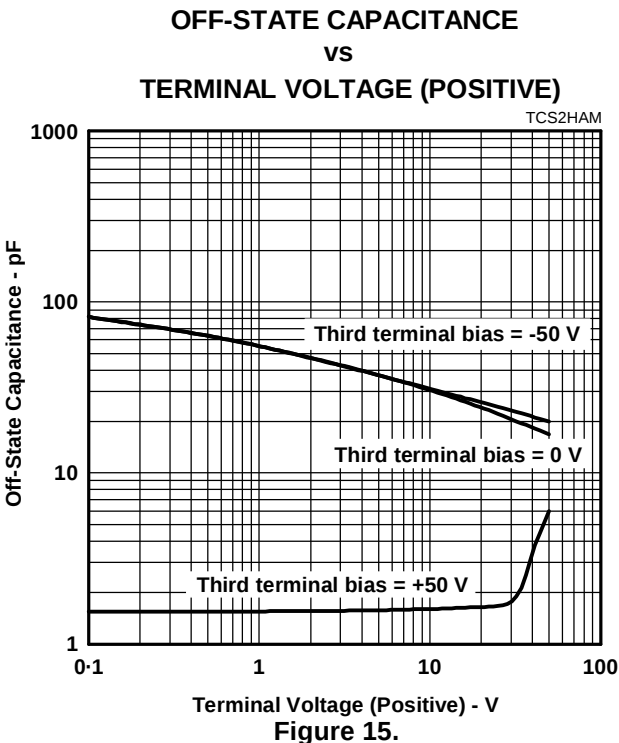
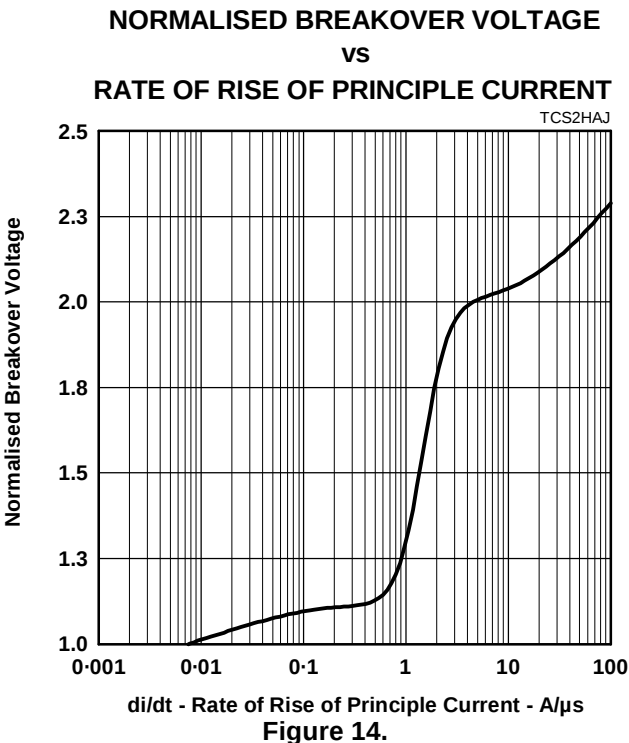


Figure 13.

TYPICAL CHARACTERISTICS  
A and B terminals



### THERMAL INFORMATION

**THERMAL RESPONSE**

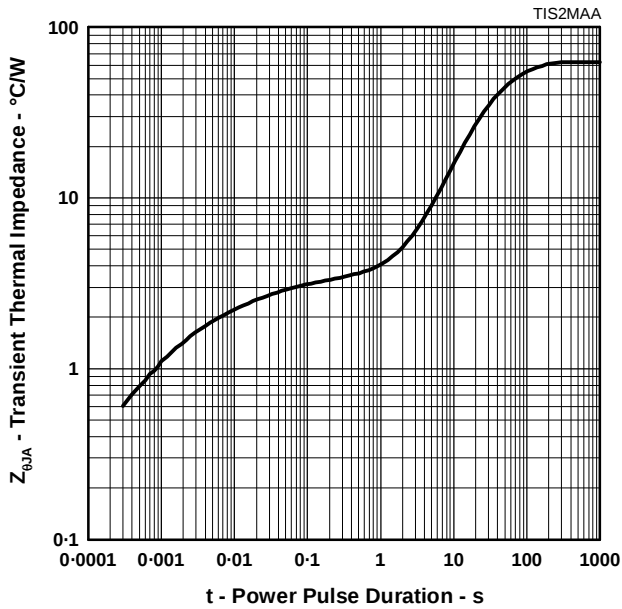


Figure 17.

**MAXIMUM NON-RECURRENT 50Hz CURRENT  
 VS  
 CURRENT DURATION**

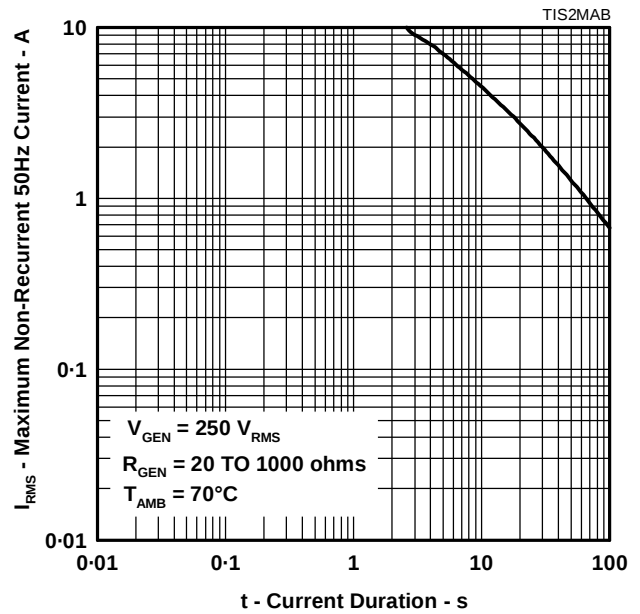


Figure 18.

### FREE AIR TEMPERATURE

**DERATING CURVE**

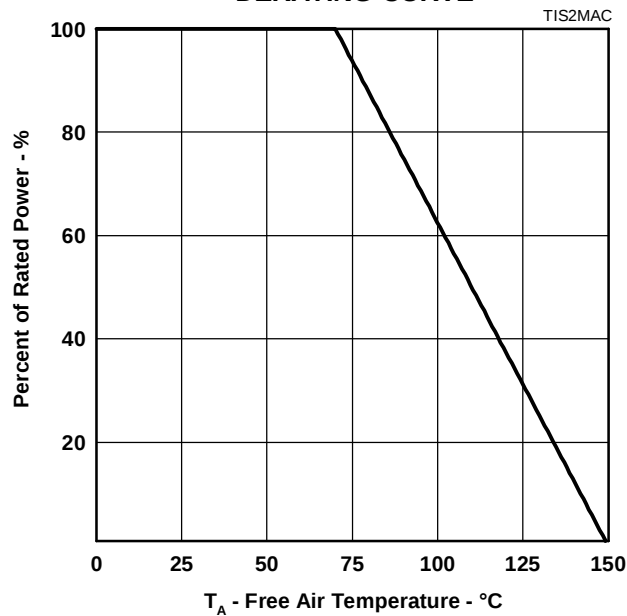


Figure 19.

# TISP2290

## DUAL SYMMETRICAL TRANSIENT VOLTAGE SUPPRESSORS

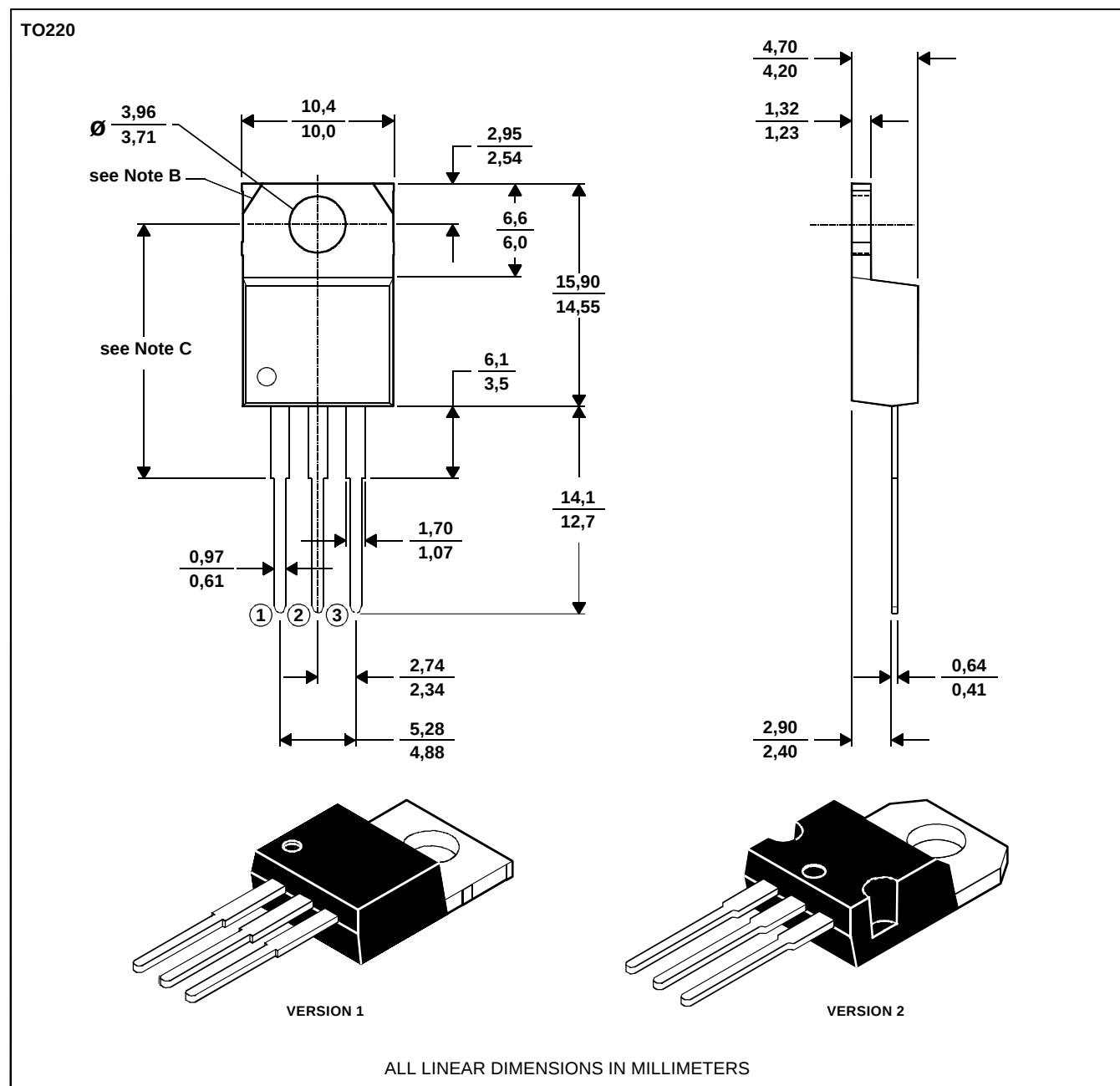
NOVEMBER 1986 - REVISED SEPTEMBER 1997

### MECHANICAL DATA

#### TO-220

#### 3-pin plastic flange-mount package

This single-in-line package consists of a circuit mounted on a lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high humidity conditions. Leads require no additional cleaning or processing when used in soldered assembly.



- NOTES: A. The centre pin is in electrical contact with the mounting tab.  
 B. Mounting tab corner profile according to package version.  
 C. Typical fixing hole centre stand off height according to package version.  
 Version 1, 18.0 mm. Version 2, 17.6 mm.

MDXXBE

### PRODUCT INFORMATION

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