

TISP4070J3BJ THRU TISP4395J3BJ

BIDIRECTIONAL THYRISTOR OVERVOLTAGE PROTECTORS

TISP4xxxJ3BJ Overvoltage Protector Series

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

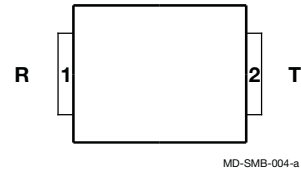
- Designed for Transformer Center Tap (Ground Return) Overvoltage Protection**
- Enables GR-1089-CORE Compliance
 - High Holding Current Allows Protection of Data Lines with d.c. Power Feed

Can be Used to Protect Rugged Modems Designed for Exposed Applications Exceeding TIA-968-A

| Device Name | V _{DRM} V | V _(BO) V |
|--------------|-----------------------|------------------------|
| TISP4070J3BJ | 58 | 70 |
| TISP4080J3BJ | 65 | 80 |
| TISP4095J3BJ | 75 | 95 |
| TISP4115J3BJ | 90 | 115 |
| TISP4125J3BJ | 100 | 125 |
| TISP4145J3BJ | 120 | 145 |
| TISP4165J3BJ | 135 | 165 |
| TISP4180J3BJ | 145 | 180 |
| TISP4200J3BJ | 155 | 200 |
| TISP4219J3BJ | 180 | 219 |
| TISP4250J3BJ | 190 | 250 |
| TISP4290J3BJ | 220 | 290 |
| TISP4350J3BJ | 275 | 350 |
| TISP4395J3BJ | 320 | 395 |

 UL Recognized Component

SMB Package (Top View)



Device Symbol



Rated for International Surge Wave Shapes

| Wave Shape | Standard | I _{PPSM} A |
|------------|------------------|------------------------|
| 2/10 | GR-1089-CORE | 1000 |
| 8/20 | IEC 61000-4-5 | 800 |
| 10/160 | TIA-968-A | 400 |
| 10/700 | ITU-T K.20/21/45 | 350 |
| 10/560 | TIA-968-A | 250 |
| 10/1000 | GR-1089-CORE | 200 |

Description

The range of TISP4xxxJ3BJ devices are designed to limit overvoltages on telecom lines. The TISP4xxxJ3BJ is primarily designed to address GR-1089-CORE compliance on data transmission lines with d.c. power feeding. When overvoltage protection is applied to transformer coupled lines from the transformer center tap to ground, the total ground return current can be 200 A, 10/1000 and 1000 A, 2/10. The high 150 mA holding current is set above common d.c. feed system levels to allow the TISP4xxxJ3BJ to reset following a disturbance.

These devices allow signal voltages, without clipping, up to the maximum off-state voltage value, V_{DRM}, see Figure 1. Voltages above V_{DRM} are limited and will not exceed the breakover voltage, V_(BO), level. If sufficient current flows due to the overvoltage, the device switches into a low voltage on-state condition, which diverts the current from the overvoltage through the device. When the diverted current falls below the holding current, I_H, level the devices switches off and restores normal system operation.

How to Order

| Device | Package | Carrier | Order As | Marking Code | Std. Qty. |
|--------------|----------------|----------------------|-----------------|--------------|-----------|
| TISP4xxxJ3BJ | SMB (DO-214AA) | Embossed Tape Reeled | TISP4xxxJ3BJR-S | 4xxxJ3 | 3000 |

Insert xxx value corresponding to device name.

*RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.

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TISP4xxxJ3BJ Overvoltage Protector Series

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

| Rating | Symbol | Value | Unit |
|---|------------|---|------------------|
| Repetitive peak off-state voltage | '4070J3BJ | ±58 | V |
| | '4080J3BJ | ±65 | |
| | '4095J3BJ | ±75 | |
| | '4115J3BJ | ±90 | |
| | '4125J3BJ | ±100 | |
| | '4145J3BJ | ±120 | |
| | '4165J3BJ | ±135 | |
| | '4180J3BJ | ±145 | |
| | '4200J3BJ | ±155 | |
| | '4219J3BJ | ±180 | |
| | '4250J3BJ | ±190 | |
| | '4290J3BJ | ±220 | |
| | '4350J3BJ | ±275 | |
| '4395J3BJ | ±320 | | |
| Non-repetitive peak impulse current (see Notes 1 and 2) 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 wave shape) 10/160 μs (TIA-968-A, 10/160 μs voltage wave shape) 4/250 μs (ITU-T K.20/21, 10/700 μs voltage waveshape, simultaneous) 5/310 μs (ITU-T K.20/21, 10/700 μs voltage wave shape, single) 5/320 μs (TIA-968-A, 9/720 μs voltage waveshape, single) 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} | ±1000 ±800 ±400 ±370 ±350 ±350 ±250 ±200 | A |
| Non-repetitive peak on-state current (see Notes 1 and 2) 20 ms, 50 Hz (full sine wave) | I_{TSM} | 50 | A |
| Initial rate of rise of on-state current. Linear current ramp. Maximum ramp value < 50 A | di_T/dt | 800 | A/ μs |
| Junction temperature | T_J | -40 to +150 | °C |
| Storage temperature range | T_{stg} | -65 to +150 | °C |

NOTES: 1. Initially the device must be in thermal equilibrium with $T_J = 25\text{ °C}$.

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.

Electrical Characteristics, $T_A = 25\text{ °C}$ (Unless Otherwise Noted)

| Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|---|-----|-----|---|---------------|
| I_{DRM} Repetitive peak off-state current | $V_D = V_{DRM}$ $T_A = 25\text{ °C}$ $T_A = 85\text{ °C}$ | | | ±5 ±10 | μA |
| $V_{(BO)}$ AC Breakover voltage | $dv/dt = \pm 250\text{ V/ms}$, $R_{SOURCE} = 300\ \Omega$ | | | ±70 ±80 ±95 ±115 ±125 ±145 ±165 ±180 ±200 ±219 ±250 ±290 ±350 ±395 | V |

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TISP4xxxJ3BJ Overvoltage Protector Series

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Electrical Characteristics, $T_A = 25\text{ °C}$ (Unless Otherwise Noted)

| Parameter | Test Conditions | Min | Typ | Max | Unit | | |
|--|--|-----|---------|-----------|-------------------|----|-----|
| $V_{(BO)}$ Ramp breakover voltage | dv/dt \leq $\pm 1000\text{ V}/\mu\text{s}$, Linear voltage ramp, Maximum ramp value = $\pm 500\text{ V}$ di/dt = $\pm 20\text{ A}/\mu\text{s}$, Linear current ramp, Maximum ramp value = $\pm 10\text{ A}$ | | | ± 77 | V | | |
| | | | | ± 88 | | | |
| | | | | ± 104 | | | |
| | | | | ± 125 | | | |
| | | | | ± 135 | | | |
| | | | | ± 156 | | | |
| | | | | ± 177 | | | |
| | | | | ± 192 | | | |
| | | | | ± 212 | | | |
| | | | | ± 231 | | | |
| | | | | ± 263 | | | |
| | | | | ± 303 | | | |
| | | | | ± 364 | | | |
| ± 409 | | | | | | | |
| $I_{(BO)}$ Breakover current | dv/dt = $\pm 250\text{ V}/\text{ms}$, $R_{\text{SOURCE}} = 300\ \Omega$ | | | ± 900 | mA | | |
| I_H Holding current | $I_T = \pm 5\text{ A}$, di/dt = $\pm 30\text{ mA}/\text{ms}$ | | | ± 150 | mA | | |
| | | | | ± 600 | | | |
| | | | | | | | |
| dv/dt Critical rate of rise of off-state voltage | Linear voltage ramp Maximum ramp value $< 0.85V_{\text{DRM}}$ | | ± 5 | | kV/ μs | | |
| I_D Off-state current | $V_D = \pm 50\text{ V}$ | | | ± 10 | μA | | |
| C_O Off-state capacitance | f = 1 MHz, $V_d = 1\text{ V rms}$, $V_D = 0$ | | | 195 | 235 | pF | |
| | | | | 120 | 145 | | |
| | | | | 105 | 125 | | |
| | f = 1 MHz, $V_d = 1\text{ V rms}$, $V_D = -1\text{ V}$ | | | | 180 | | 215 |
| | | | | | 110 | | 132 |
| | | | | | 95 | | 115 |
| | f = 1 MHz, $V_d = 1\text{ V rms}$, $V_D = -2\text{ V}$ | | | | 165 | | 200 |
| | | | | | 100 | | 120 |
| | | | | | 90 | | 105 |
| | f = 1 MHz, $V_d = 1\text{ V rms}$, $V_D = -50\text{ V}$ | | | | 85 | | 100 |
| | | | | | 50 | | 60 |
| | | | | | 42 | | 50 |
| | f = 1 MHz, $V_d = 1\text{ V rms}$, $V_D = -100\text{ V}$ (see Note 3) | | | | 40 | | 50 |
| | | | | | 35 | | 40 |

NOTE: 3. To avoid possible clipping, the TISP4125J3BJ is tested with $V_D = -98\text{ V}$.

Thermal Characteristics

| Parameter | Test Conditions | Min | Typ | Max | Unit |
|--|--|-----|-----|-----|-----------------------------|
| $R_{\theta JA}$ Junction to ambient thermal resistance | EIA/JESD51-3 PCB, $I_T = I_{\text{TSM}(1000)}$ (see Note 4) | | | 90 | $^{\circ}\text{C}/\text{W}$ |

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

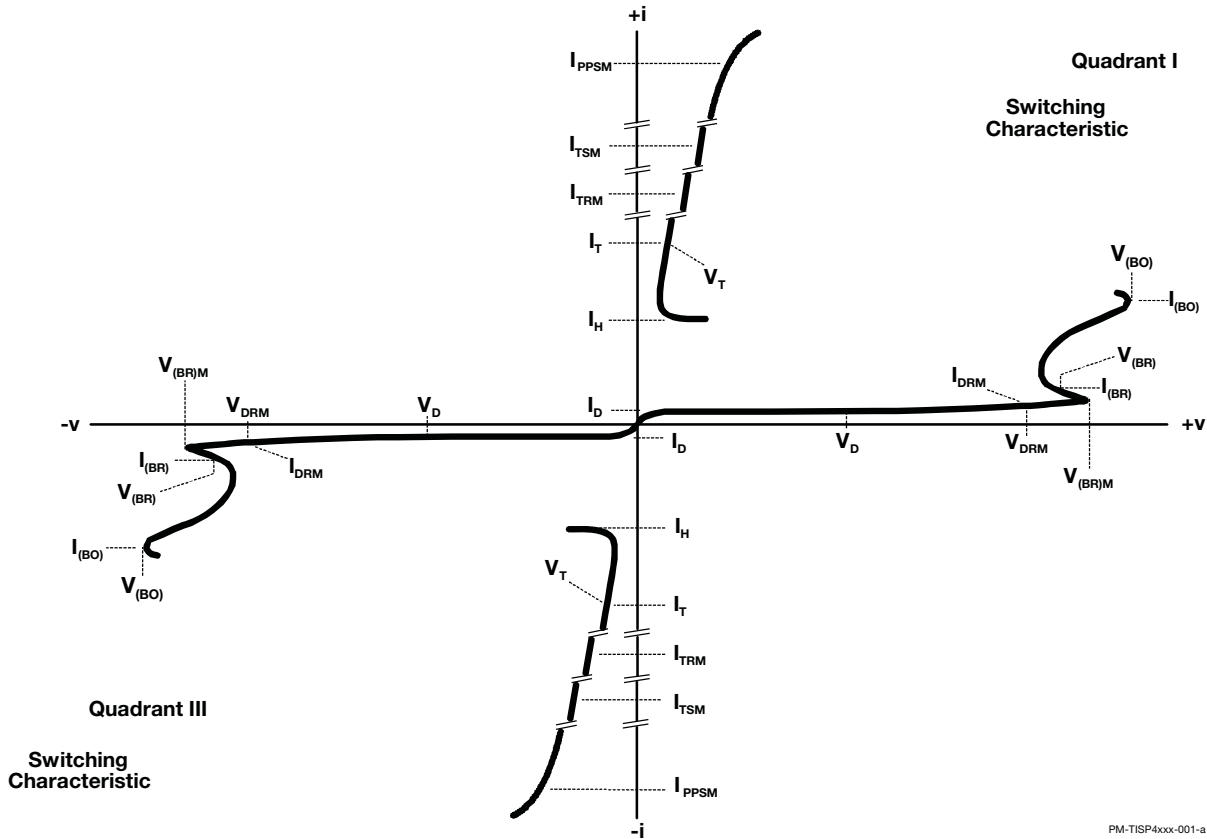
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Parameter Measurement Information



PM-TISP4xxx-001-a

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

Typical Characteristics

**OFF-STATE CURRENT
VS
JUNCTION TEMPERATURE**

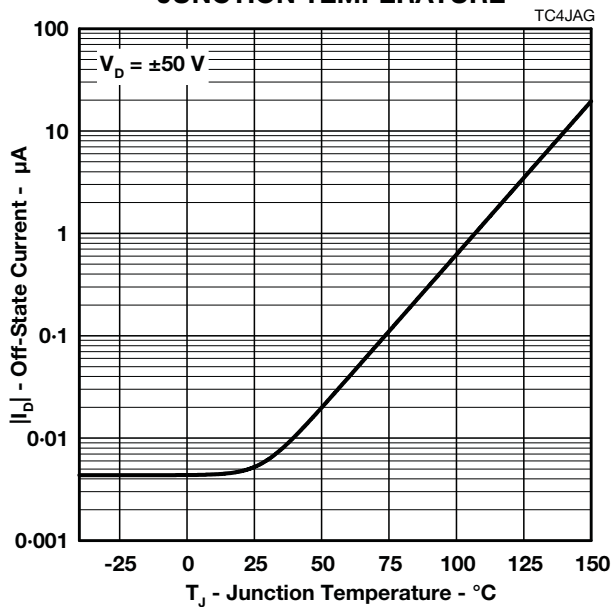


Figure 2.

**NORMALIZED BREAKOVER VOLTAGE
VS
JUNCTION TEMPERATURE**

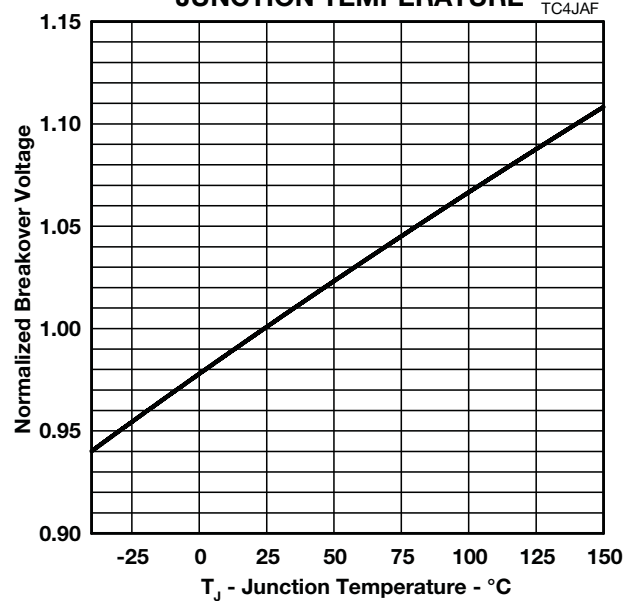


Figure 3.

**NORMALIZED HOLDING CURRENT
VS
JUNCTION TEMPERATURE**

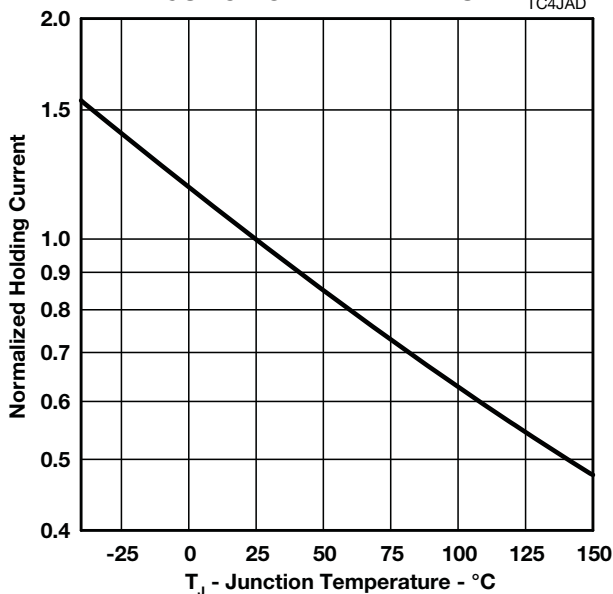


Figure 4.

**NORMALIZED CAPACITANCE
VS
OFF-STATE VOLTAGE**

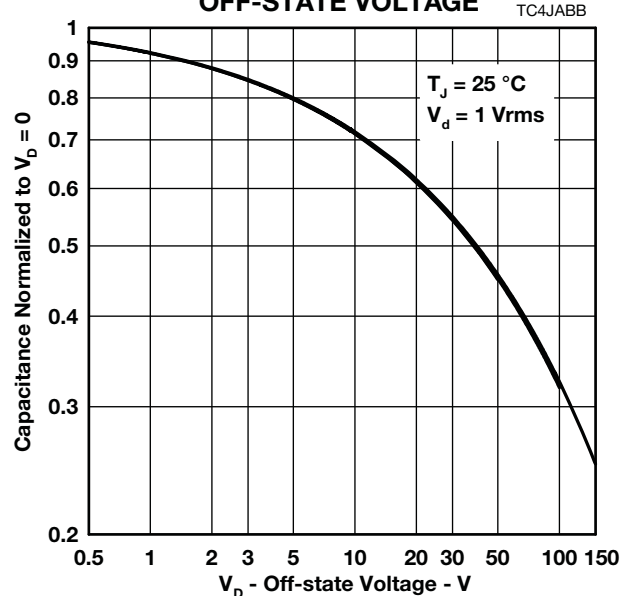


Figure 5.

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Rating and Thermal Characteristics

NON-REPETITIVE PEAK ON-STATE CURRENT VS CURRENT DURATION

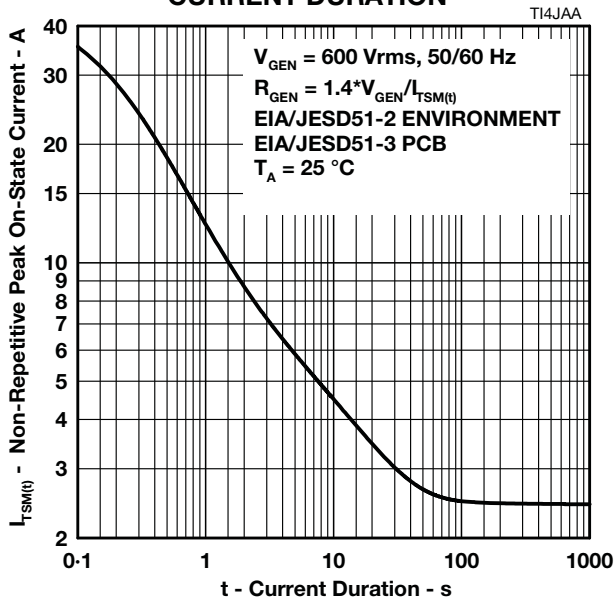


Figure 6.

V_{DRM} DERATING FACTOR VS MINIMUM AMBIENT TEMPERATURE

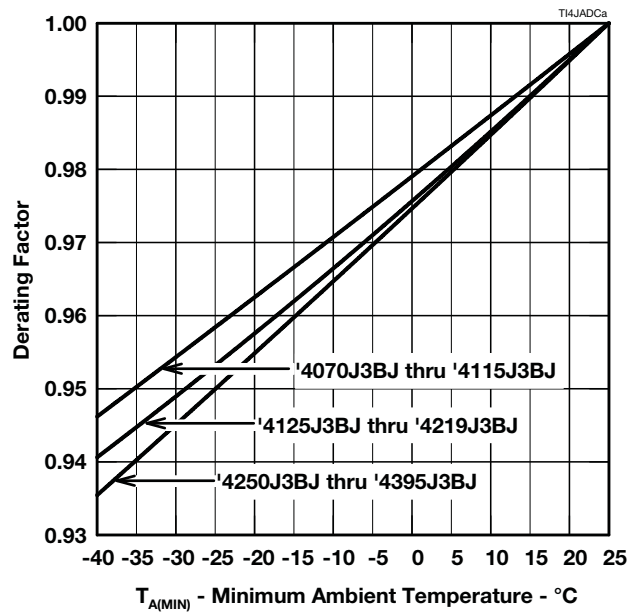


Figure 7.

Applications Information

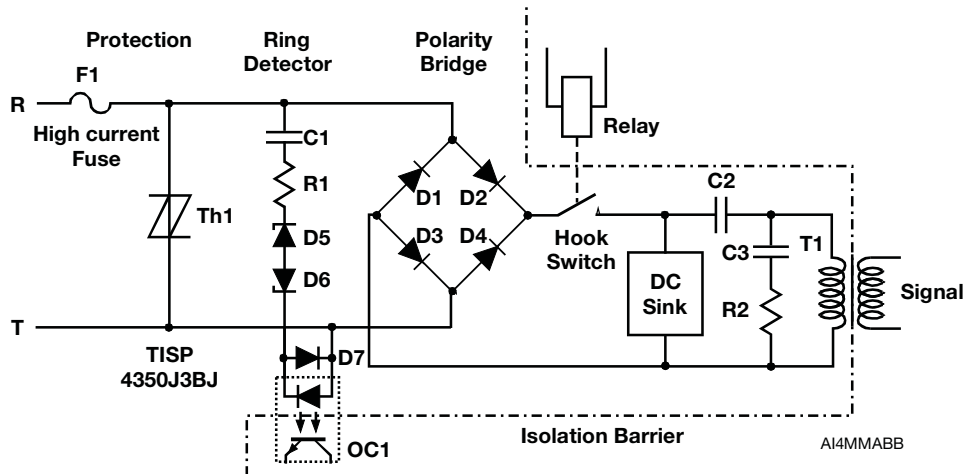


Figure 8. Typical Application Circuit

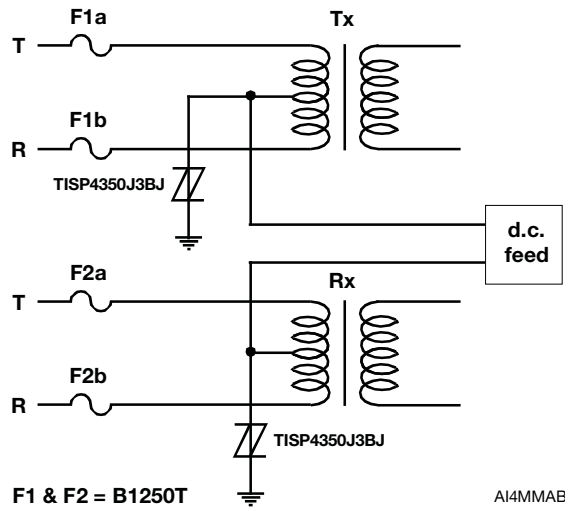


Figure 9. Typical Application Circuit

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