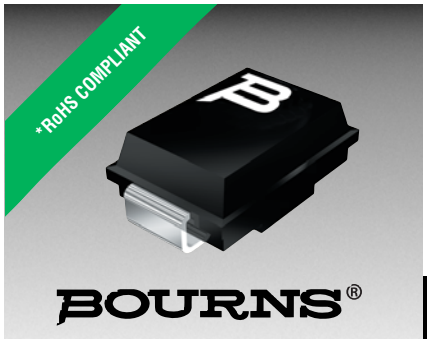


# TISP4070J3BJ THRU TISP4395J3BJ

## 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)


MD-SMB-004-a

### Device Symbol


SD-TISP4xxx-001-a

**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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## Absolute Maximum Ratings, $T_A$ = 25 °C (Unless Otherwise Noted)

| Rating | | Symbol | Value | Unit |
|---|---|---|---|---|
| Repetitive peak off-state voltage | ‘4070J3BJ | $V_{DRM}$ | ±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) | | $I_{PPSM}$ | | A |
| 2/10 µs (GR-1089-CORE, 2/10 µs voltage wave shape) | | | ±1000 | |
| 8/20 µs (IEC 61000-4-5, combination wave generator, 1.2/50 µsvoltage wave shape) | | | ±800 | |
| 10/160 µs (TIA-968-A, 10/160 µs voltage wave shape) | | | ±400 | |
| 4/250 µs (ITU-T K.20/21, 10/700 µs voltage waveshape, simultaneous) | | | ±370 | |
| 5/310 µs (ITU-T K.20/21, 10/700 µs voltage wave shape, single) | | | ±350 | |
| 5/320 µs (TIA-968-A, 9/720 µs voltage waveshape, single) | | | ±350 | |
| 10/560 µs (TIA-968-A, 10/560 µs voltage wave shape) | | | ±250 | |
| 10/1000 µs (GR-1089-CORE, 10/1000 µs voltage wave shape) | | | ±200 | |
| Non-repetitive peak on-state current (see Notes 1 and 2) | | $I_{TSM}$ | | A |
| 20 ms, 50 Hz (full sine wave) | | | 50 | |
| 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 °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 °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 °C | | | ±5 | µA |
| | | | $T_A$ = 85 °C | | | ±10 | |
| $V_{(BO)}$ | AC Breakover voltage | dv/dt = ±250 V/ms, $R_{SOURCE}$ = 300 Ω | ‘4070J3BJ | | | ±70 | V |
| | | | ‘4080J3BJ | | | ±80 | |
| | | | ‘4095J3BJ | | | ±95 | |
| | | | ‘4115J3BJ | | | ±115 | |
| | | | ‘4125J3BJ | | | ±125 | |
| | | | ‘4145J3BJ | | | ±145 | |
| | | | ‘4165J3BJ | | | ±165 | |
| | | | ‘4180J3BJ | | | ±180 | |
| | | | ‘4200J3BJ | | | ±200 | |
| | | | ‘4219J3BJ | | | ±219 | |
| | | | ‘4250J3BJ | | | ±250 | |
| | | | ‘4290J3BJ | | | ±290 | |
| | | | ‘4350J3BJ | | | ±350 | |
| | | | ‘4395J3BJ | | | ±395 | |

## Electrical Characteristics, $T_A$ = 25 °C (Unless Otherwise Noted)

| Parameter | | Test Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{(BO)}$ | Ramp breakover voltage | dv/dt ≤ ±1000 V/µs, Linear voltage ramp, Maximum ramp value = ±500 V, di/dt = ±20 A/µs, Linear current ramp, Maximum ramp value = ±10 A | ‘4070J3BJ | | | ±77 | V |
| | | | ‘4080J3BJ | | | ±88 | |
| | | | ‘4095J3BJ | | | ±104 | |
| | | | ‘4115J3BJ | | | ±125 | |
| | | | ‘4125J3BJ | | | ±135 | |
| | | | ‘4145J3BJ | | | ±156 | |
| | | | ‘4165J3BJ | | | ±177 | |
| | | | ‘4180J3BJ | | | ±192 | |
| | | | ‘4200J3BJ | | | ±212 | |
| | | | ‘4219J3BJ | | | ±231 | |
| | | | ‘4250J3BJ | | | ±263 | |
| | | | ‘4290J3BJ | | | ±303 | |
| | | | ‘4350J3BJ | | | ±364 | |
| | | | ‘4395J3BJ | | | ±409 | |
| $I_{(BO)}$ | Breakover current | dv/dt = ±250 V/ms, $R_{SOURCE}$ = 300 Ω | ‘4070J3BJ thru ‘4115J3BJ | | | ±900 | mA |
| | | | ‘4125J3BJ thru ‘4219J3BJ | | | ±800 | |
| | | | ‘4250J3BJ thru ‘4395J3BJ | | | ±600 | |
| $I_H$ | Holding current | $I_T$ = ±5 A, di/dt = ±30 mA/ms | | ±150 | | ±600 | mA |
| dv/dt | Critical rate of rise of off-state voltage | Linear voltage ramp, Maximum ramp value < 0.85$V_{DRM}$ | | ±5 | | | kV/µs |
| $I_D$ | Off-state current | $V_D$ = ±50 V | $T_A$ = 85 °C | | | ±10 | µA |
| $C_O$ | Off-state capacitance | f = 1 MHz, $V_d$ = 1 V rms, $V_D$ = 0 | ‘4070J3BJ thru ‘4115J3BJ | | 195 | 235 | pF |
| | | | ‘4125J3BJ thru ‘4219J3BJ | | 120 | 145 | |
| | | | ‘4250J3BJ thru ‘4395J3BJ | | 105 | 125 | |
| | | f = 1 MHz, $V_d$ = 1 V rms, $V_D$ = -1 V | ‘4070J3BJ thru ‘4115J3BJ | | 180 | 215 | |
| | | | ‘4125J3BJ thru ‘4219J3BJ | | 110 | 132 | |
| | | | ‘4250J3BJ thru ‘4395J3BJ | | 95 | 115 | |
| | | f = 1 MHz, $V_d$ = 1 V rms, $V_D$ = -2 V | ‘4070J3BJ thru ‘4115J3BJ | | 165 | 200 | |
| | | | ‘4125J3BJ thru ‘4219J3BJ | | 100 | 120 | |
| | | | ‘4250J3BJ thru ‘4395J3BJ | | 90 | 105 | |
| | | f = 1 MHz, $V_d$ = 1 V rms, $V_D$ = -50 V | ‘4070J3BJ thru ‘4115J3BJ | | 85 | 100 | |
| | | | ‘4125J3BJ thru ‘4219J3BJ | | 50 | 60 | |
| | | | ‘4250J3BJ thru ‘4395J3BJ | | 42 | 50 | |
| | | f = 1 MHz, $V_d$ = 1 V rms, $V_D$ = -100 V (see Note 3) | ‘4125J3BJ thru ‘4219J3BJ | | 40 | 50 | |
| | | | ‘4250J3BJ thru ‘4395J3BJ | | 35 | 40 | |

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

## Thermal Characteristics

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

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

## Parameter Measurement Information

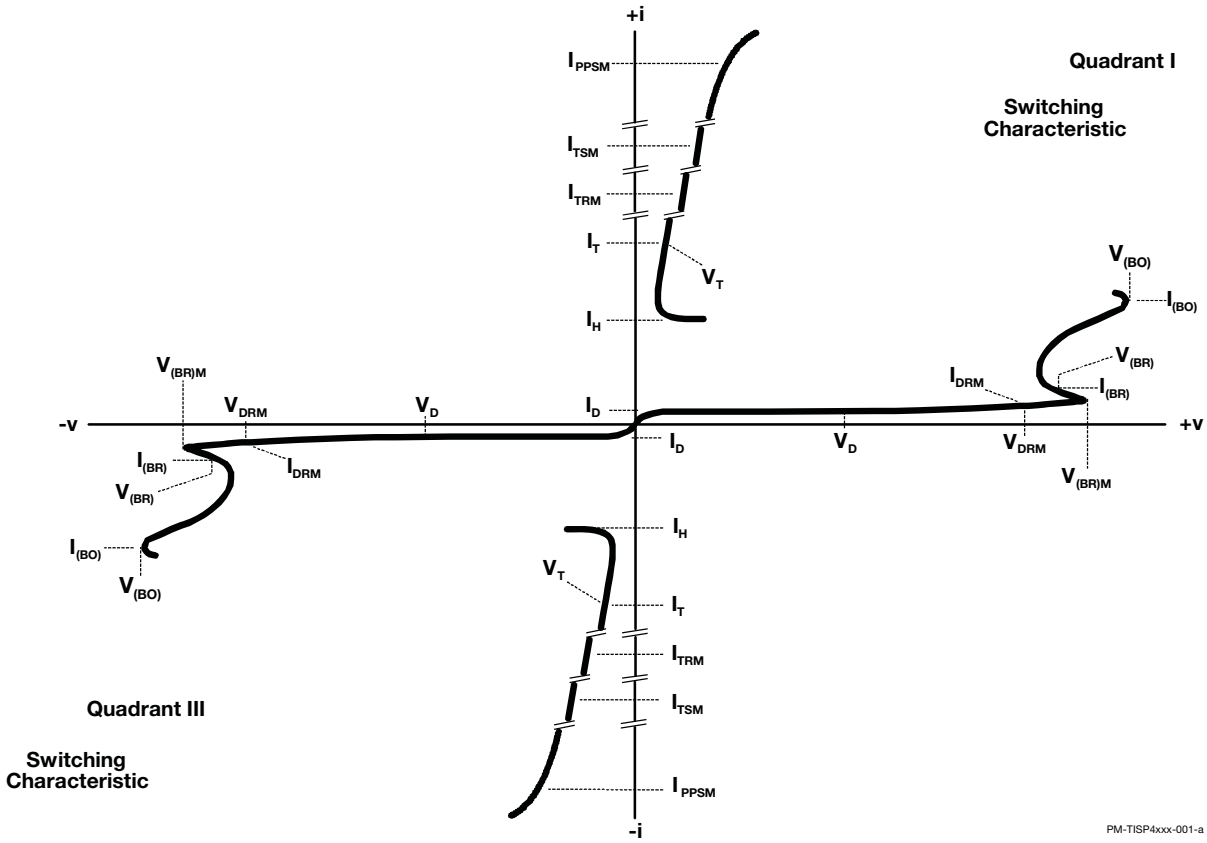


**Figure 1. Voltage-Current Characteristic for T and R Terminals**
**All Measurements are Referenced to the R Terminal**

## Typical Characteristics

**OFF-STATE CURRENT vs JUNCTION TEMPERATURE**

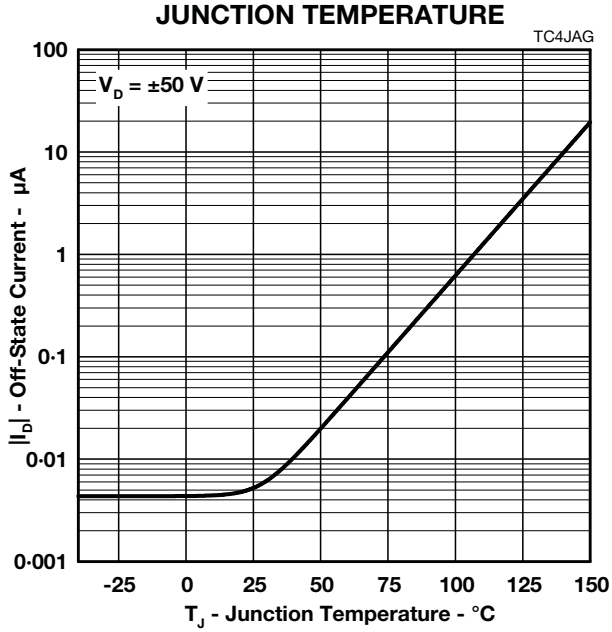


Figure 2.

**NORMALIZED BREAKOVER VOLTAGE vs JUNCTION TEMPERATURE**

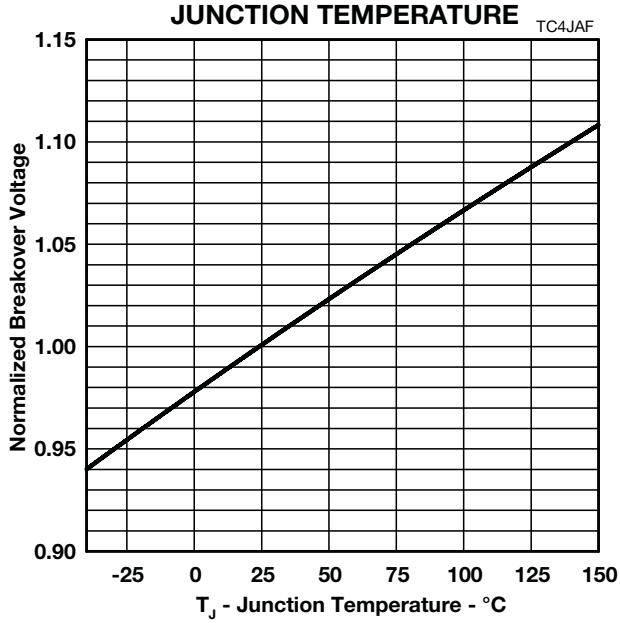


Figure 3.

**NORMALIZED HOLDING CURRENT vs JUNCTION TEMPERATURE**

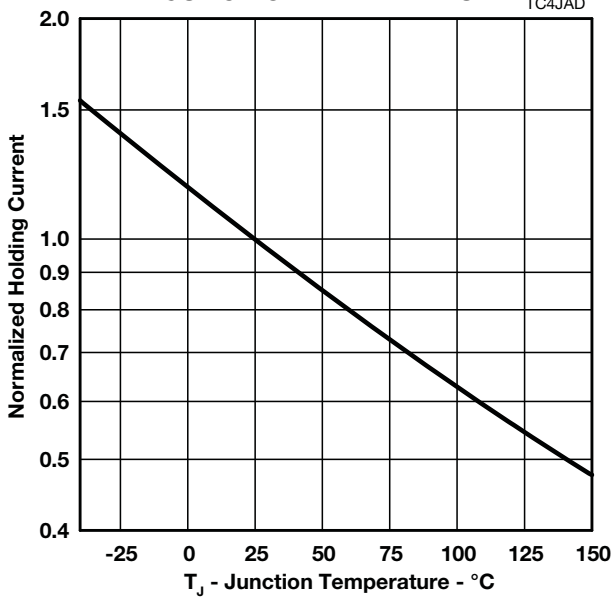


Figure 4.

**NORMALIZED CAPACITANCE vs OFF-STATE VOLTAGE**

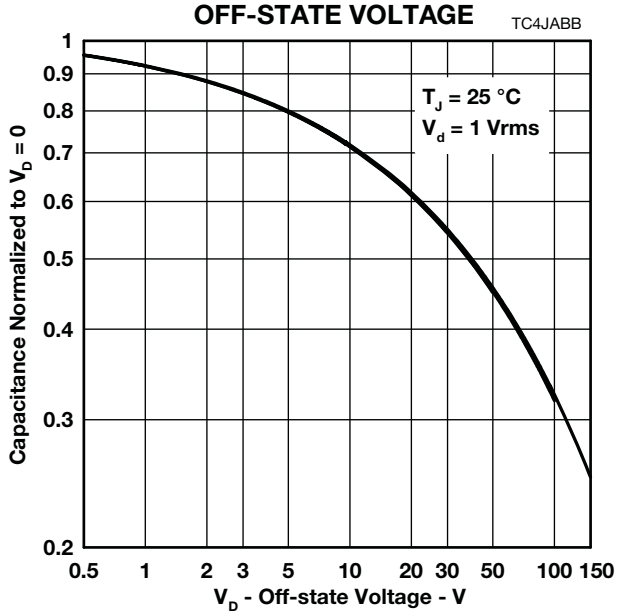


Figure 5.

## Rating and Thermal Characteristics

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

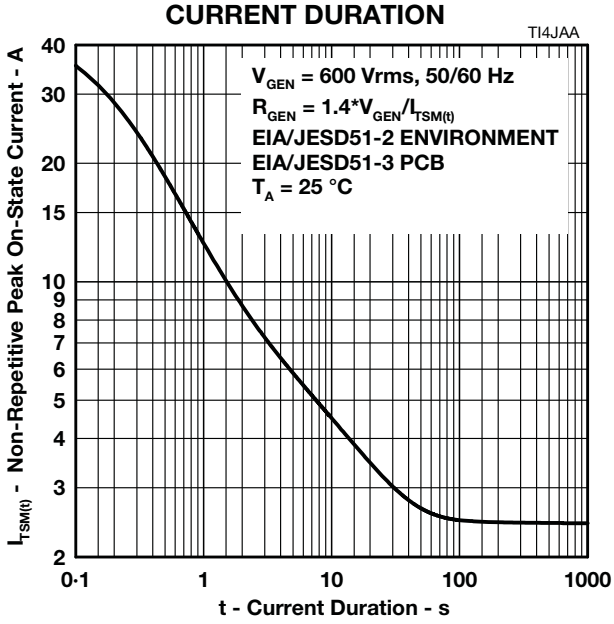


**Figure 6.**

**$V_{DRM}$ DERATING FACTOR vs MINIMUM AMBIENT TEMPERATURE**

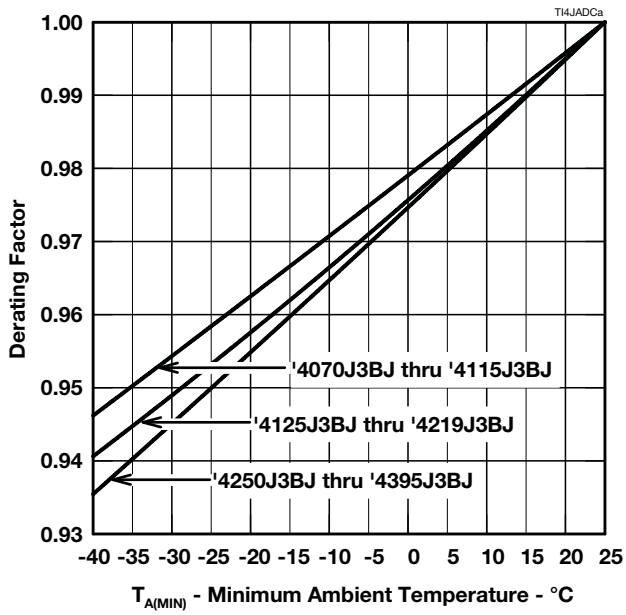


**Figure 7.**

## Applications Information

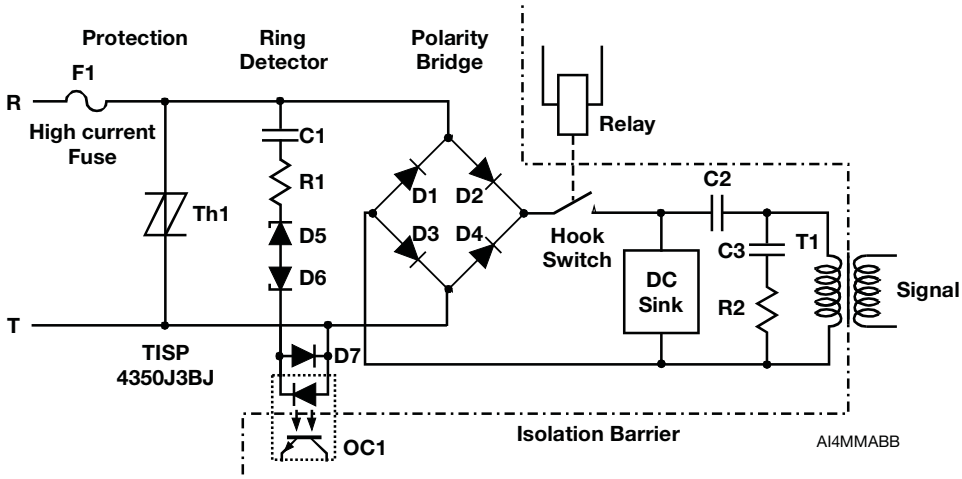


**Figure 8. Typical Application Circuit**

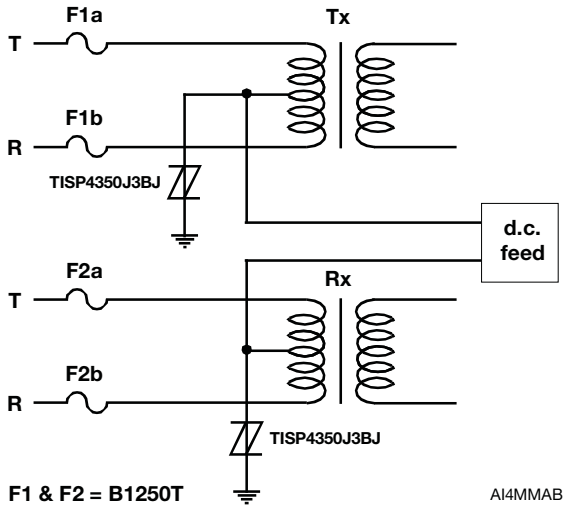


**Figure 9. Typical Application Circuit**



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