TISP2290
DUAL SYMMETRICAL TRANSIENT VOLTAGE SUPPRESSORS

NOVEMBER 1986 - REVISED SEPTEMBER 1997

TELECOMMUNICATION SYSTEM SECONDARY PROTECTION

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

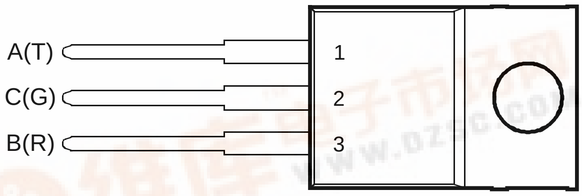
DEVICE	$V_{(Z)}$ V	$V_{(BO)}$ V
'2290	200	290

- **Planar Passivated Junctions**
  Low Off-State Current < 10 µA
- **Rated for International Surge Wave Shapes**

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

- **UL Recognized, E132482**

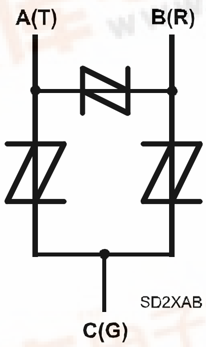
TO-220 PACKAGE (TOP VIEW)



Pin 2 is in electrical contact with the mounting base.

MDXXANA

device symbol



description

The TISP2290 is designed specifically for telephone equipment protection against lightning and transients induced by a.c. power lines. These devices will supress 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.

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.

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)			
8/20 µs (ANSI C62.41, open-circuit voltage wave shape 1.2/50 µs)	I_{TSP}	150	A
10/160 µs (FCC Part 68, open-circuit voltage wave shape 10/160 µs)		60	
5/200 µs (VDE 0433, open-circuit voltage wave shape 2 kV, 10/700 µs)		50	
0.2/310 µs (RLM 88, open-circuit voltage wave shape 1.5 kV, 0.5/700 µs)		38	
5/310 µs (CCITT IX K17/K20, open-circuit voltage wave shape 2 kV, 10/700 µs)		50	
5/310 µs (FTZ R12, open-circuit voltage wave shape 2 kV, 10/700 µs)		50	
10/560 µs (FCC Part 68, open-circuit voltage wave shape 10/560 µs)		45	
10/1000 µs (REA PE-60, open-circuit voltage wave shape 10/1000 µs)		50	
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/µs
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.

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electrical characteristics for the A and B terminals, T_J = 25°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_Z	Reference zener voltage	I_Z = ± 1mA	± 200			V
I_D	Off-state leakage current	V_D = ± 50 V			± 10	µA
C_{off}	Off-state capacitance	V_D = 0 f = 1 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°C

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

NOTES: 5. These parameters must be measured using pulse techniques, t_w = 100 µs, duty cycle ≤ 2%.
6. These parameters are measured with voltage sensing contacts seperate 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)..

PARAMETER MEASUREMENT INFORMATION

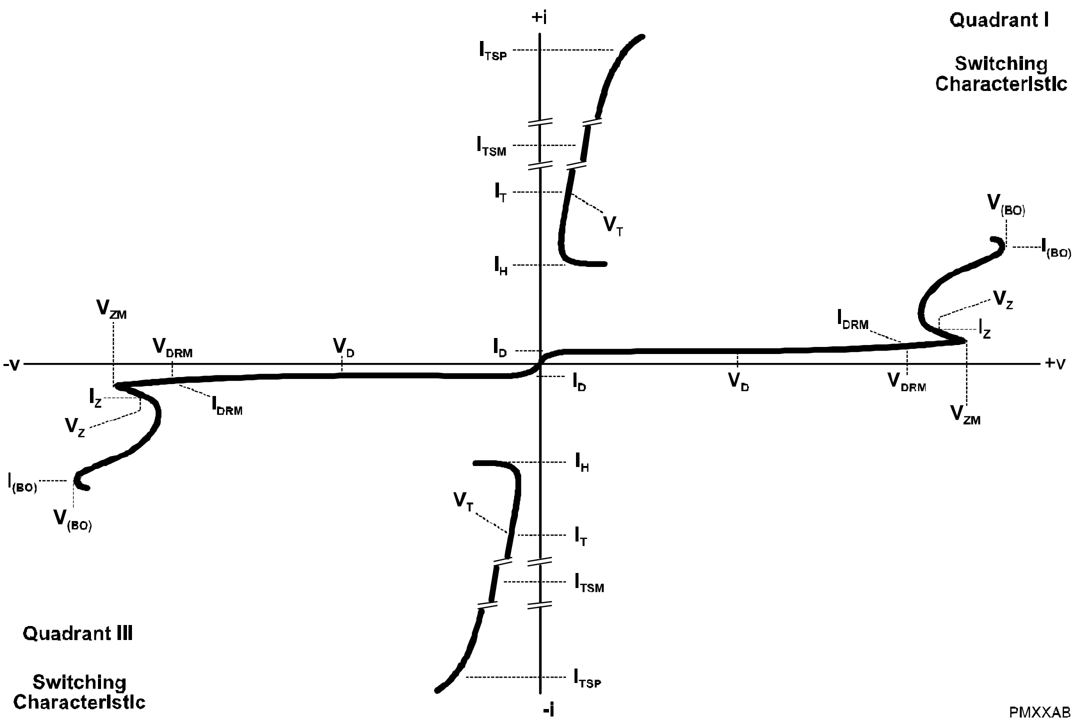


Figure 1. VOLTAGE-CURRENT CHARACTERISTIC FOR ANY PAIR OF TERMINALS

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

thermal characteristics

PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JA}$	Junction to free air thermal resistance			62.5	°C/W

TYPICAL CHARACTERISTICS
A and C, or B and C terminals

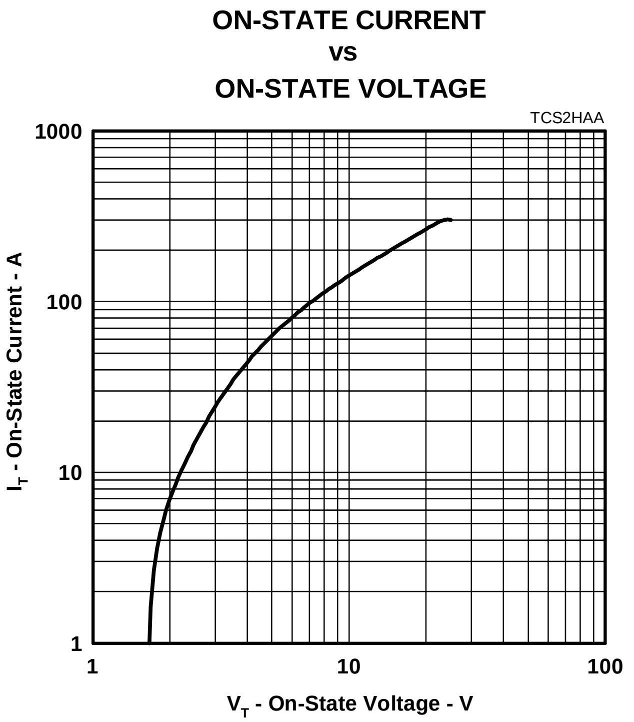


Figure 2.

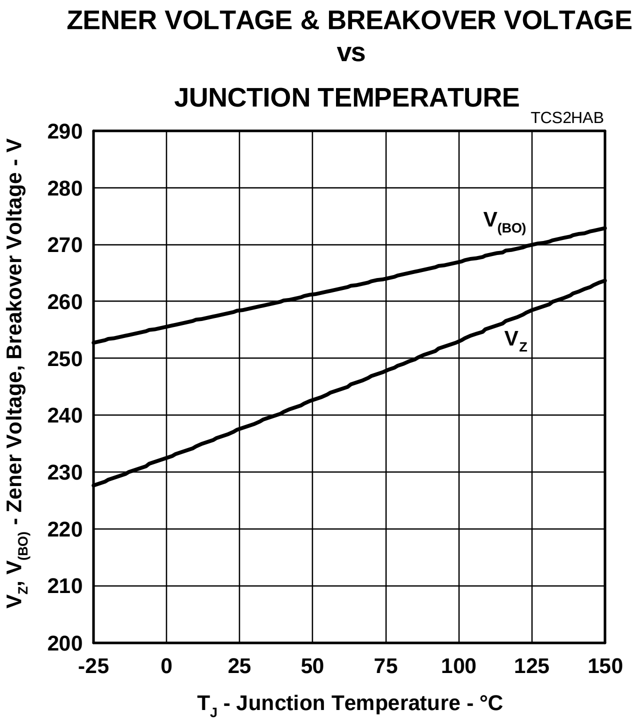


Figure 3.

TYPICAL CHARACTERISTICS
A and C, or B and C terminals

HOLDING CURRENT & BREAKOVER CURRENT vs JUNCTION TEMPERATURE

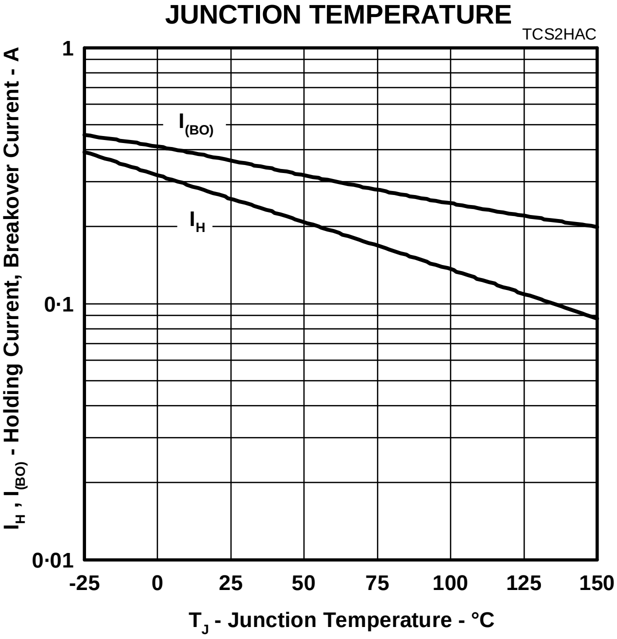


Figure 4.

OFF-STATE CURRENT vs JUNCTION TEMPERATURE

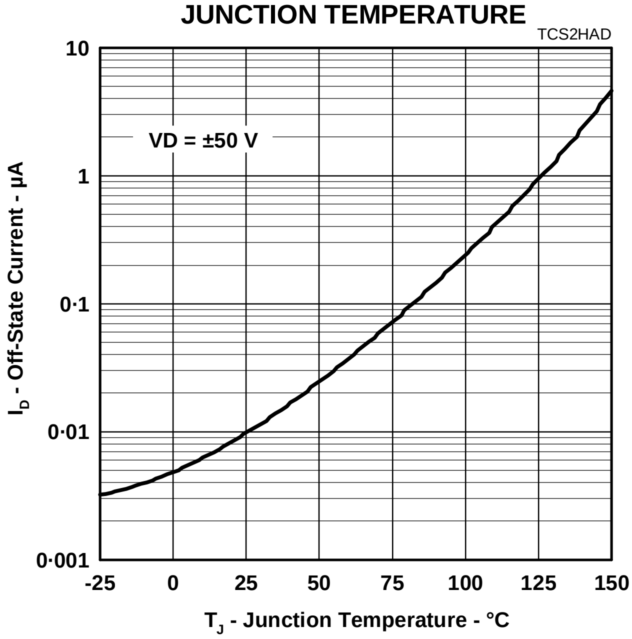


Figure 5.

ON-STATE VOLTAGE vs JUNCTION TEMPERATURE

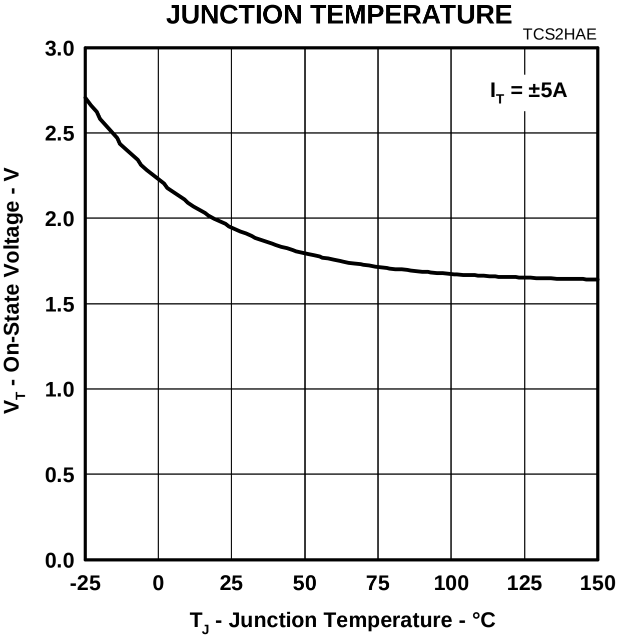


Figure 6.

NORMALISED BREAKOVER VOLTAGE vs RATE OF RISE OF PRINCIPLE CURRENT

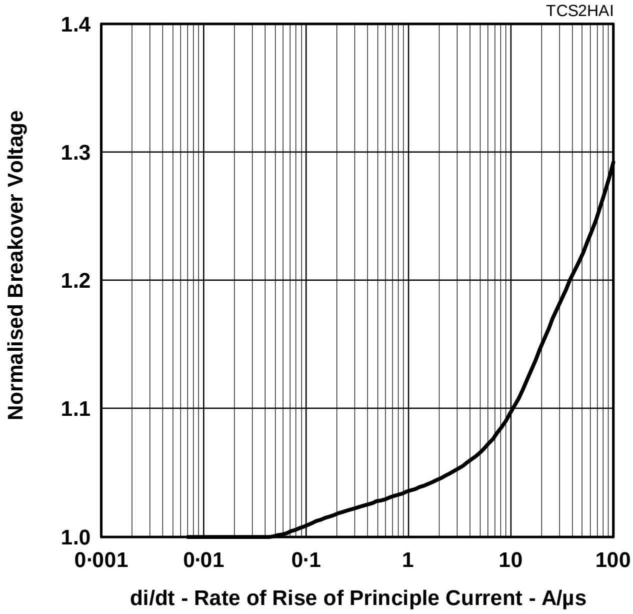


Figure 7.

TYPICAL CHARACTERISTICS
A and C, or B and C terminals

OFF-STATE CAPACITANCE vs TERMINAL VOLTAGE (POSITIVE)

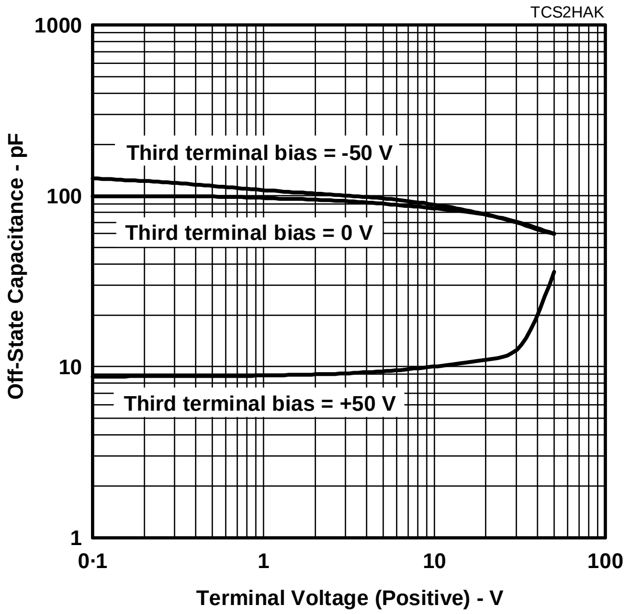


Figure 8.

OFF-STATE CAPACITANCE vs TERMINAL VOLTAGE (NEGATIVE)

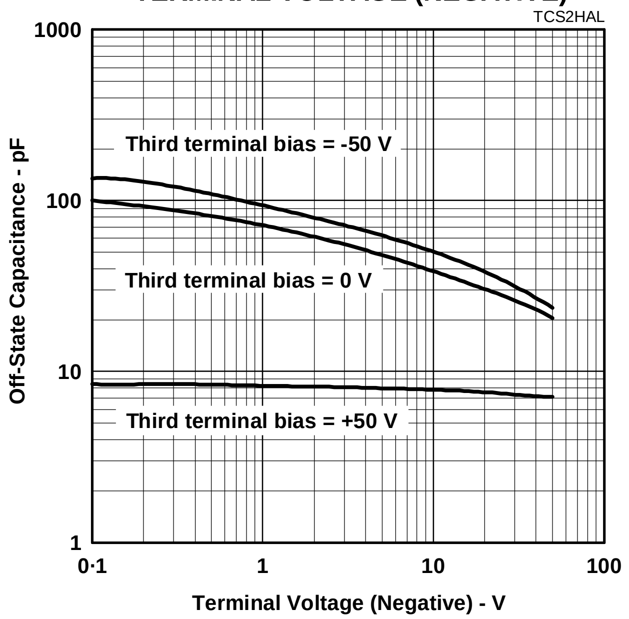


Figure 9.

SURGE CURRENT vs DECAY TIME

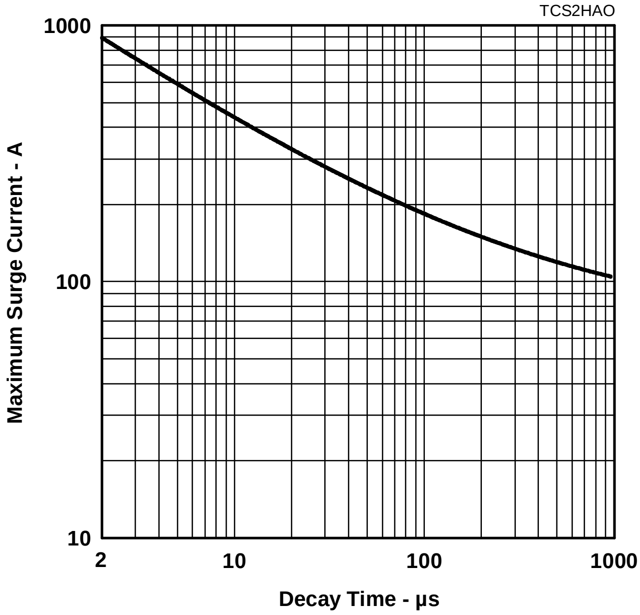


Figure 10.

TYPICAL CHARACTERISTICS
A and B terminals

ZENER VOLTAGE & BREAKOVER VOLTAGE vs JUNCTION TEMPERATURE

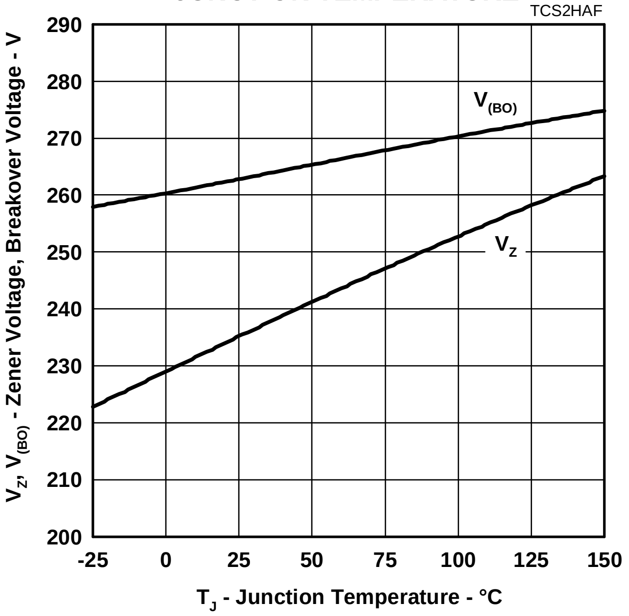


Figure 11.

HOLDING CURRENT & BREAKOVER CURRENT vs JUNCTION TEMPERATURE

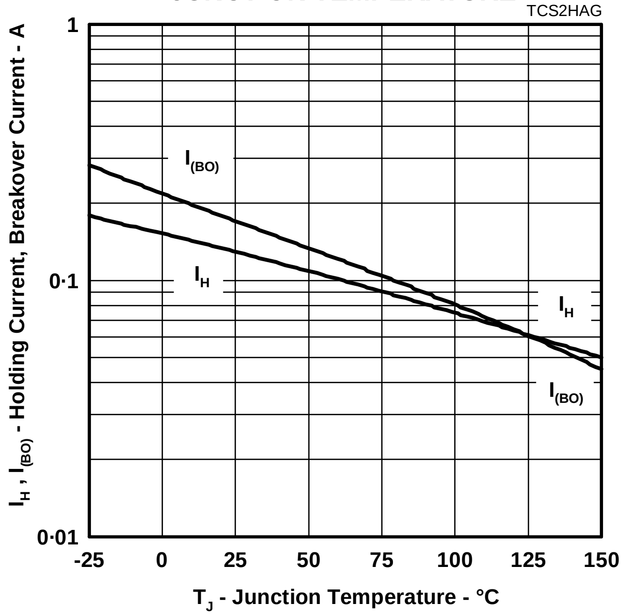


Figure 12.

OFF-STATE CURRENT vs JUNCTION TEMPERATURE

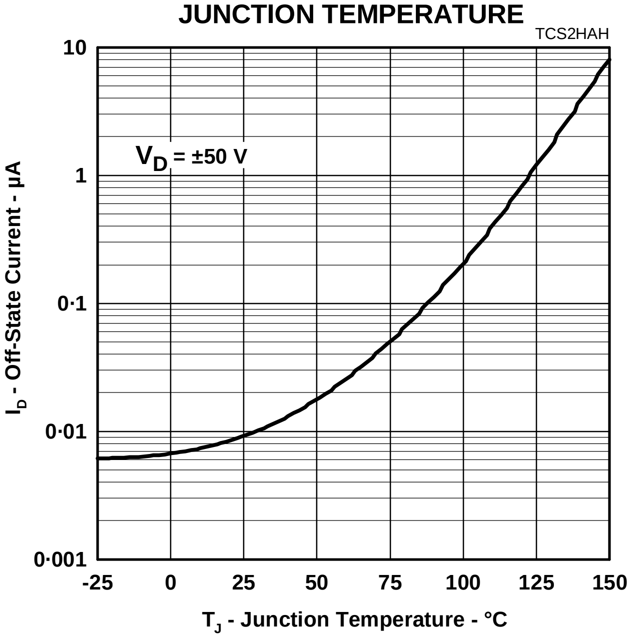


Figure 13.

TYPICAL CHARACTERISTICS
A and B terminals

NORMALISED BREAKOVER VOLTAGE vs RATE OF RISE OF PRINCIPLE CURRENT

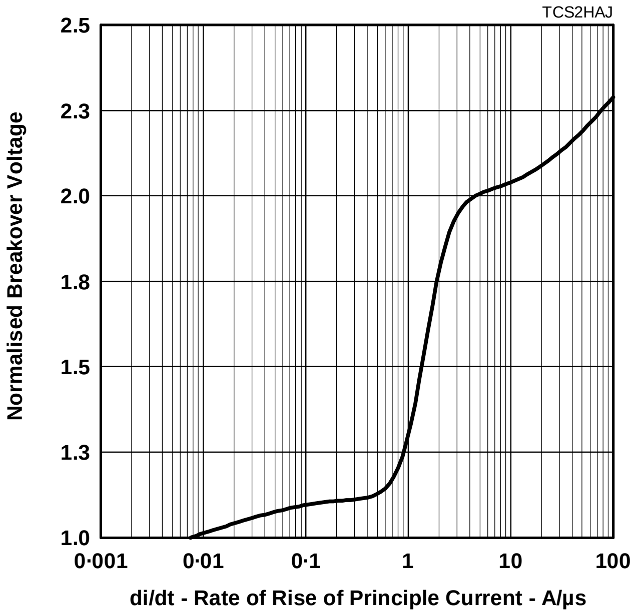


Figure 14.

OFF-STATE CAPACITANCE vs TERMINAL VOLTAGE (POSITIVE)

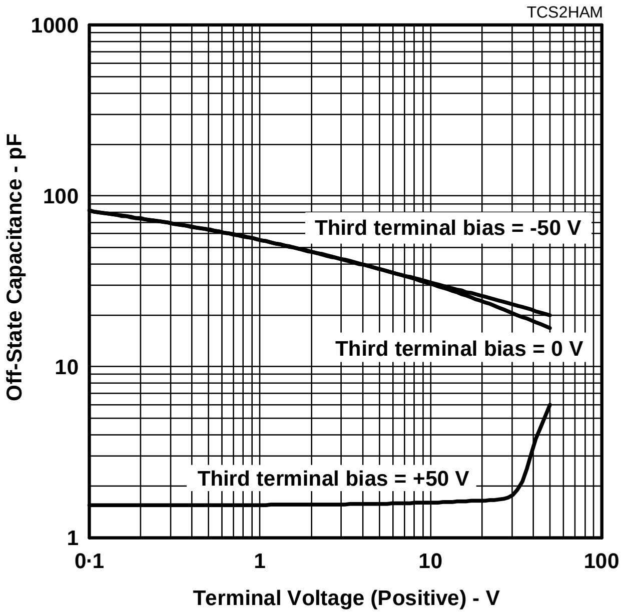


Figure 15.

OFF-STATE CAPACITANCE vs TERMINAL VOLTAGE (NEGATIVE)

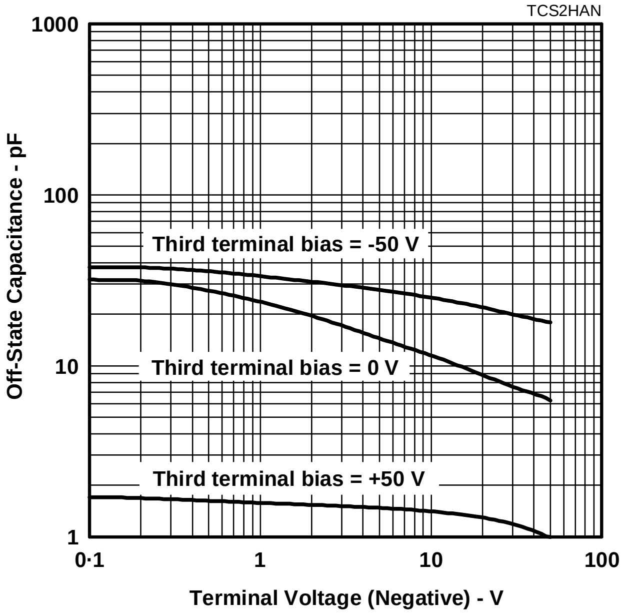


Figure 16.

THERMAL INFORMATION

THERMAL RESPONSE

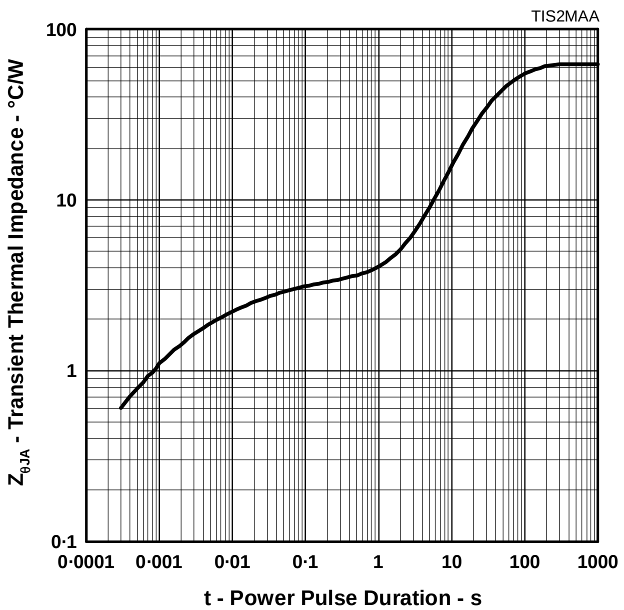


Figure 17.

MAXIMUM NON-RECURRENT 50Hz CURRENT vs CURRENT DURATION

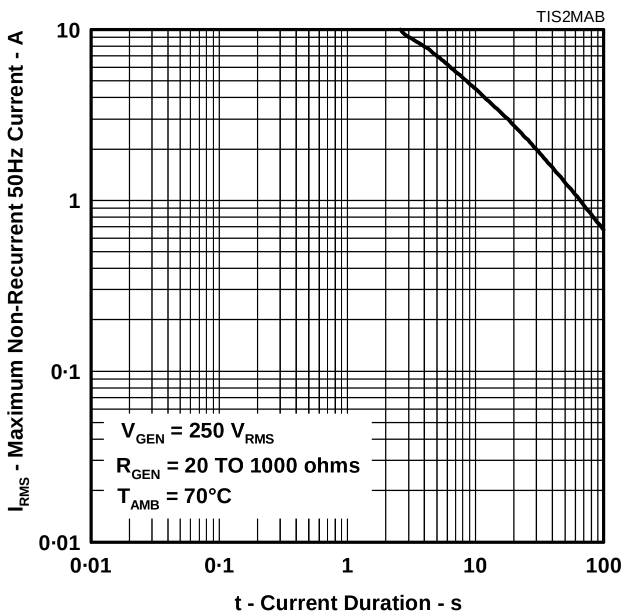


Figure 18.

FREE AIR TEMPERATURE

DERATING CURVE

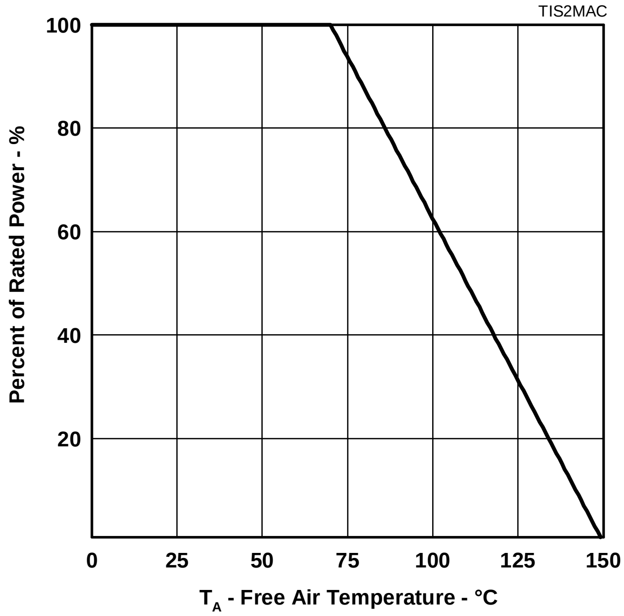


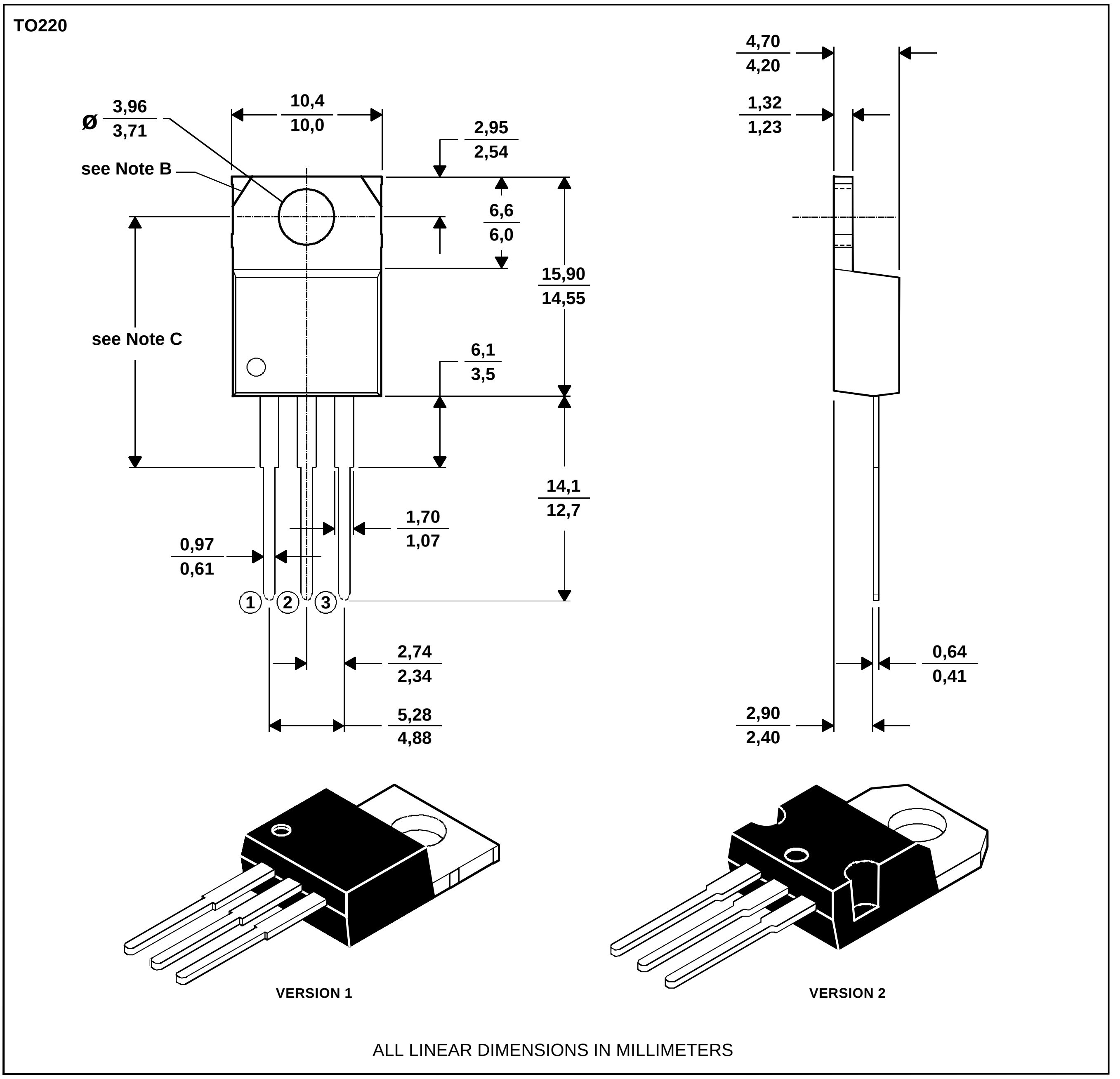
Figure 19.

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

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