BIDIRECTIONAL THYRISTOR OVERVOLTAGE PROTECTORS

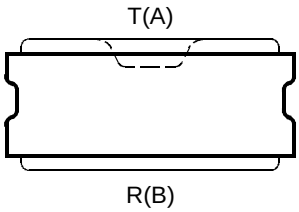
 JANUARY 1999

TELECOMMUNICATION SYSTEM PRIMARY PROTECTION

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

DEVICE	$V_{(BR)}$ MINIMUM V	$V_{(BO)}$ MINIMUM V	$V_{(BO)}$ MAXIMUM V
7EL2	±245	±265	±400

CELL PACKAGE (SIDE VIEW)



MD4XACA

- **Rated for International Surge Wave Shapes**

DEVICE	ITU-T K28 (10/700) I_{TSP} A	GR-974-CORE (10/1000) I_{TSP} A
7EL2	±400	±300

device symbol

SD4XAA

Terminals T and R correspond to the alternative line designators of A and B

- **Gas Discharge Tube (GDT) Replacement**
- **Planar Passivated Junctions in a Protected Cell Construction**
  Low Off-State Current
  Extended Service Life
- **Soldered Copper Electrodes**
  High Current Capability
  Cell Construction Short Circuits Under Excessive Current Conditions

description

These devices are primary protector components for semiconductor arrester assemblies intended to meet the generic requirements of Bellcore GR-974-CORE (November 1994) or ITU-T Recommendation K28 (03/93). To conform to the specified environmental requirements, the 7EL2 must be installed in a housing which maintains a stable microclimate during these tests.

The protector consists of a symmetrical voltage-triggered bidirectional thyristor. Overvoltages are initially clipped by breakdown clamping until the voltage rises to the breakover level, which causes the device to crowbar into a low-voltage on state. This low-voltage on state causes the current resulting from the overvoltage to be safely diverted through the device. The high crowbar holding current prevents d.c. latchup as the diverted current subsides. The 7EL2 is guaranteed to voltage limit and withstand the listed international lightning surges in both polarities.

These monolithic protection devices are constructed using two nickel plated copper electrodes soldered to each side of the silicon chip. This packaging approach allows heat to be removed from both sides of the silicon, resulting in the doubling of the devices thermal capacity, enabling a power line cross current capability of 10 A rms for 1 second. One of the 7EL2's copper electrodes is specially shaped to promote a progressive shorting action (at 50/60 Hz currents greater than 60 A). The assembly must hold the 7EL2 in compression, so that the cell electrodes can be forced together during overstress testing. Under excessive power line cross conditions the 7EL2 will fail short circuit, providing maximum protection to the equipment.

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absolute maximum ratings, T_A = 25°C (unless otherwise noted)

RATING		SYMBOL	VALUE	UNIT
Non-repetitive peak on-state pulse current (see Notes 1 and 2)				
5/310 µs (ITU-T K28, 10/700 µs voltage wave shape)	-20°C to 65°C	I_{TSP}	400	A
10/1000 µs (GR-974-CORE, 10/1000 µs voltage wave shape)	-20°C to 65°C		300	
Non-repetitive peak on-state current (see Note 1)				
full sine wave, 50/60 Hz, 1 s	-40°C to 65°C	I_{TSM}	10	A rms
Junction temperature		T_J	-40 to +150	°C
Storage temperature range		T_{stg}	-40 to +150	°C

NOTES: 1. The surge may be repeated after the device has returned to thermal equilibrium.
2. Most PTT's quote an unloaded voltage waveform. In operation the 7EL2 essentially shorts the generator output. The resulting loaded current waveform is specified.

electrical characteristics for the T and R terminals, T_A = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
$V_{(BR)}$	Breakdown Voltage	$I_{(BR)}$ = ±20 mA, (see Note 3)	-40°C to 65°C	±245			V
$V_{(BO)}$	Breakover voltage	dv/dt = ±0.2 V/s, R_{SOURCE} > 200 Ω	+15°C to 25°C	±265			V
			-40°C to 65°C			±400	
$V_{(BO)}$	Impulse breakover voltage	100 V/µs ≤ dv/dt ≤ ±1000 V/µs, di/dt ≤ 10 A/µs	-40°C to 65°C			±400	V
	Impulse reset	Sources are 52.5 V O.C., 260 mA S.C. and 135 V O.C., 200 mA S.C. on-state current 25 A, 10/1000 µs impulse	-40°C to 65°C			20	ms
I_D	Off-state current	V_D = ±50 V (see Note 4)	-40°C to 65°C			±0.5	µA
		V_D = ±200 V	-40°C to 65°C			±10	
C_{off}	Off-state capacitance	f = 1 MHz, V_d = 1 Vrms, V_D = 0,	-40°C to 65°C			200	pF

NOTES: 3. Meets Bellcore GR-974-CORE Issue 1, November 1994 - Rated Voltage Test (4.7)
4. This device is sensitive to light. Suggest that this parameter be measured in a dark environment

PARAMETER MEASUREMENT INFORMATION

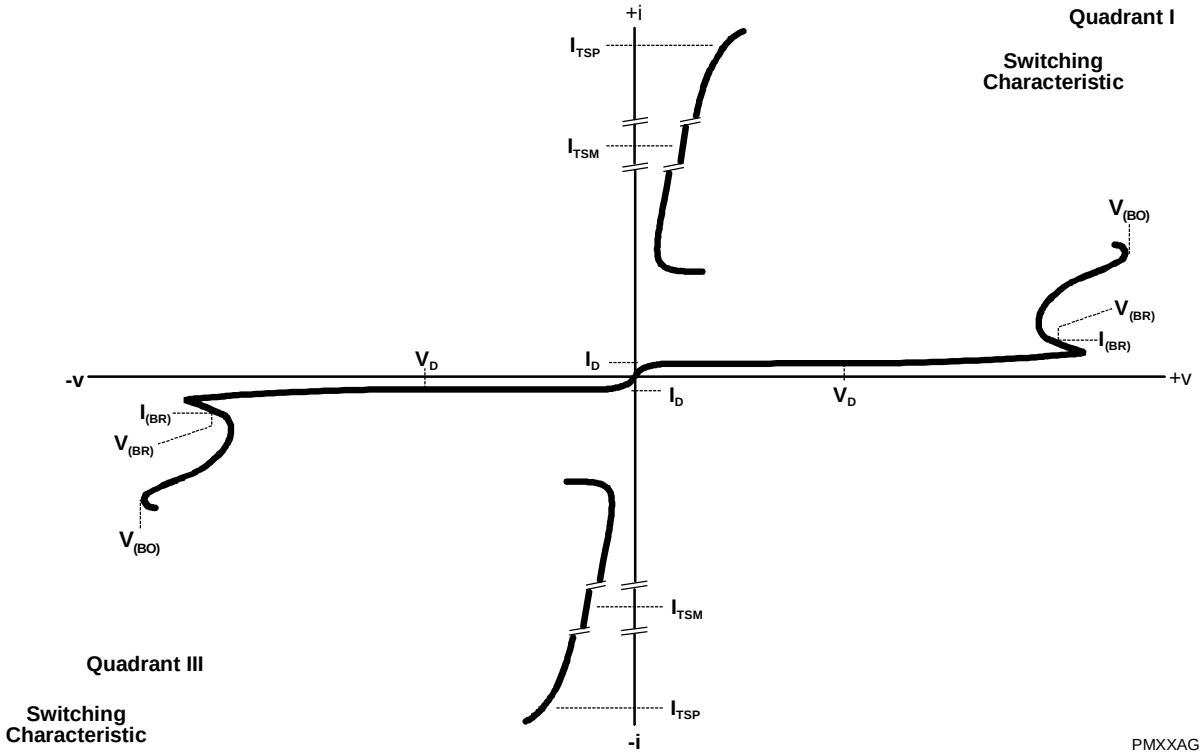

Figure 1. VOLTAGE-CURRENT CHARACTERISTIC FOR T AND R TERMINALS
ALL MEASUREMENTS ARE REFERENCED TO THE R TERMINAL

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TYPICAL CHARACTERISTICS

OFF-STATE CURRENT vs JUNCTION TEMPERATURE

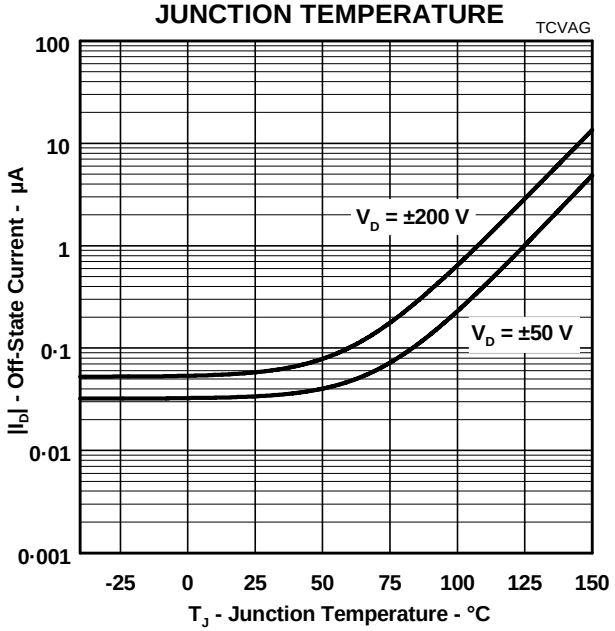


Figure 2.

NORMALISED BREAKDOWN VOLTAGE ($V_{(BR)}$) vs JUNCTION TEMPERATURE

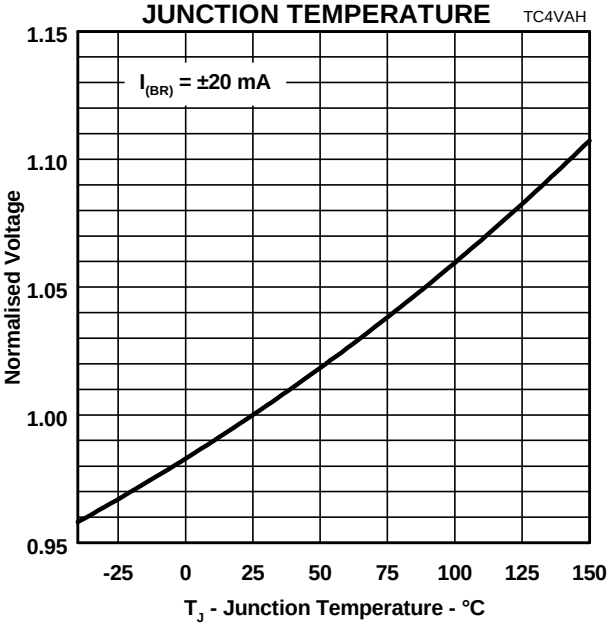


Figure 3.

NORMALISED BREAKOVER VOLTAGE ($V_{(BO)}$) vs JUNCTION TEMPERATURE

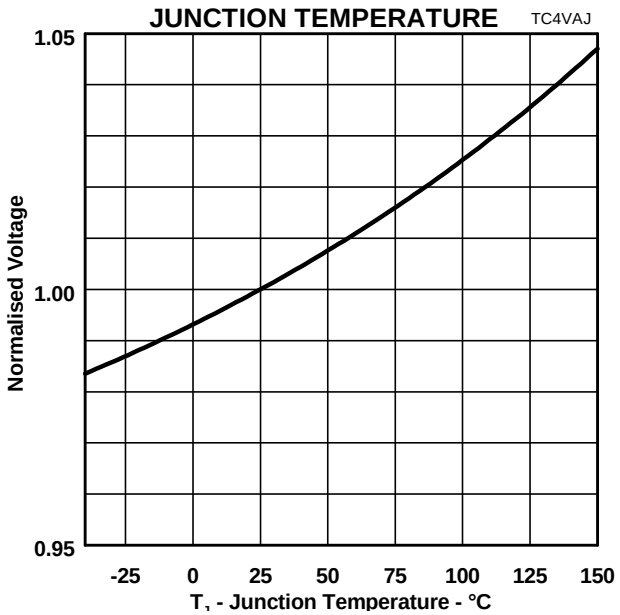


Figure 4.

NORMALISED HOLDING CURRENT vs JUNCTION TEMPERATURE

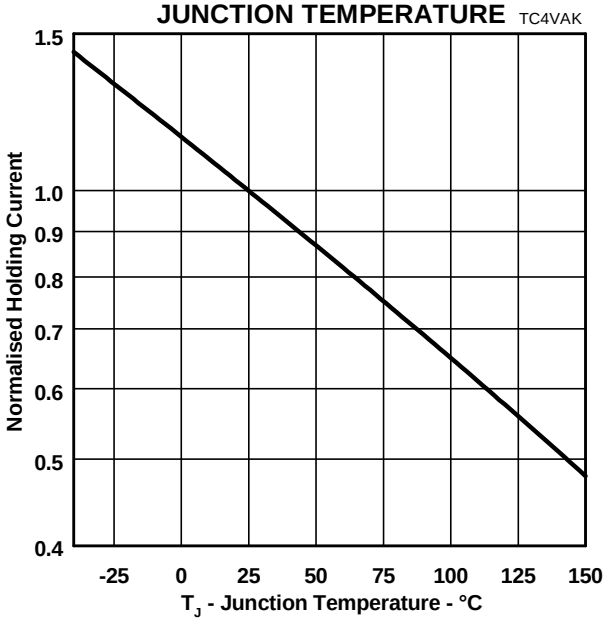


Figure 5.

PRODUCT INFORMATION

TYPICAL CHARACTERISTICS

OFF-STATE CAPACITANCE vs TERMINAL VOLTAGE

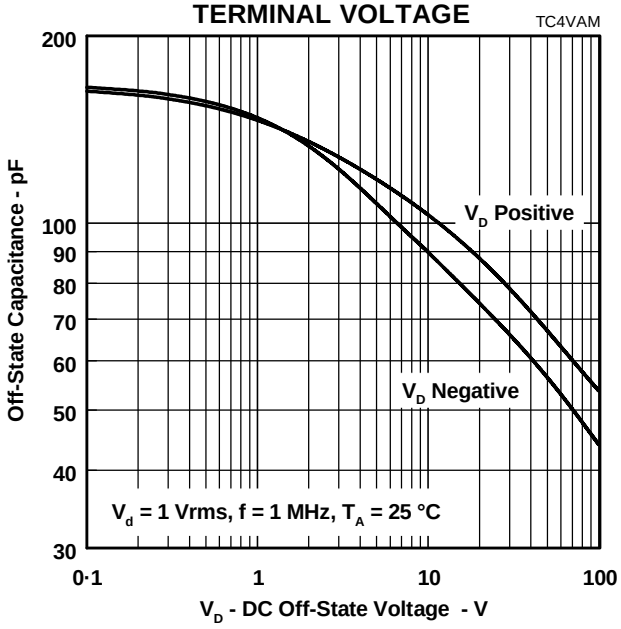


Figure 6.

OFF-STATE CAPACITANCE vs JUNCTION TEMPERATURE

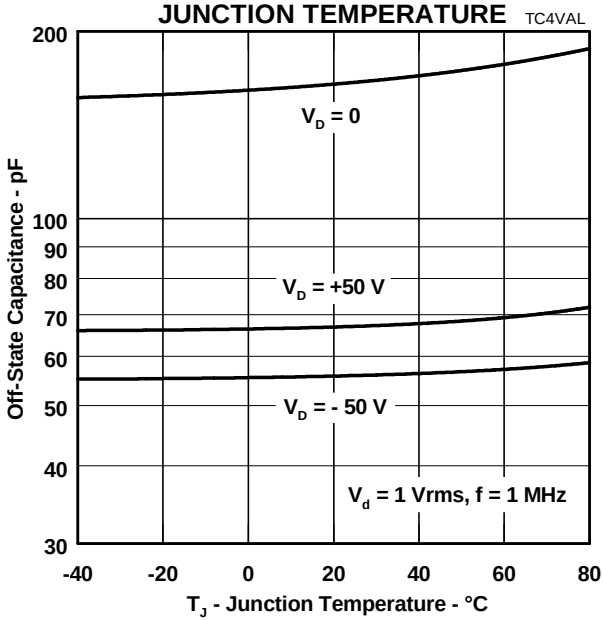


Figure 7.

CUMULATIVE POPULATION vs 10/1000 CURRENT CAPABILITY

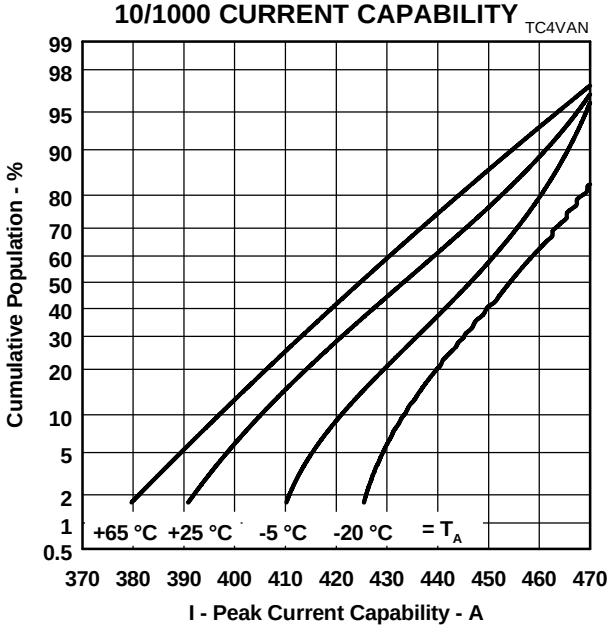


Figure 8.

RATING AND THERMAL INFORMATION

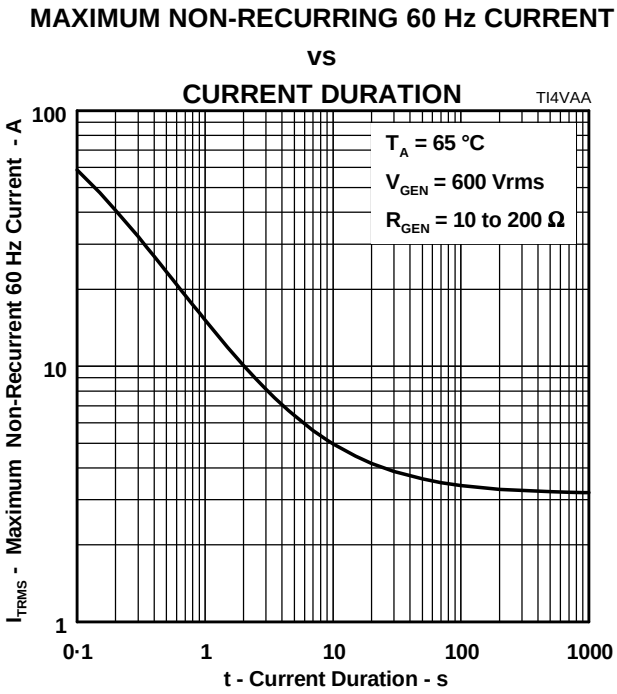
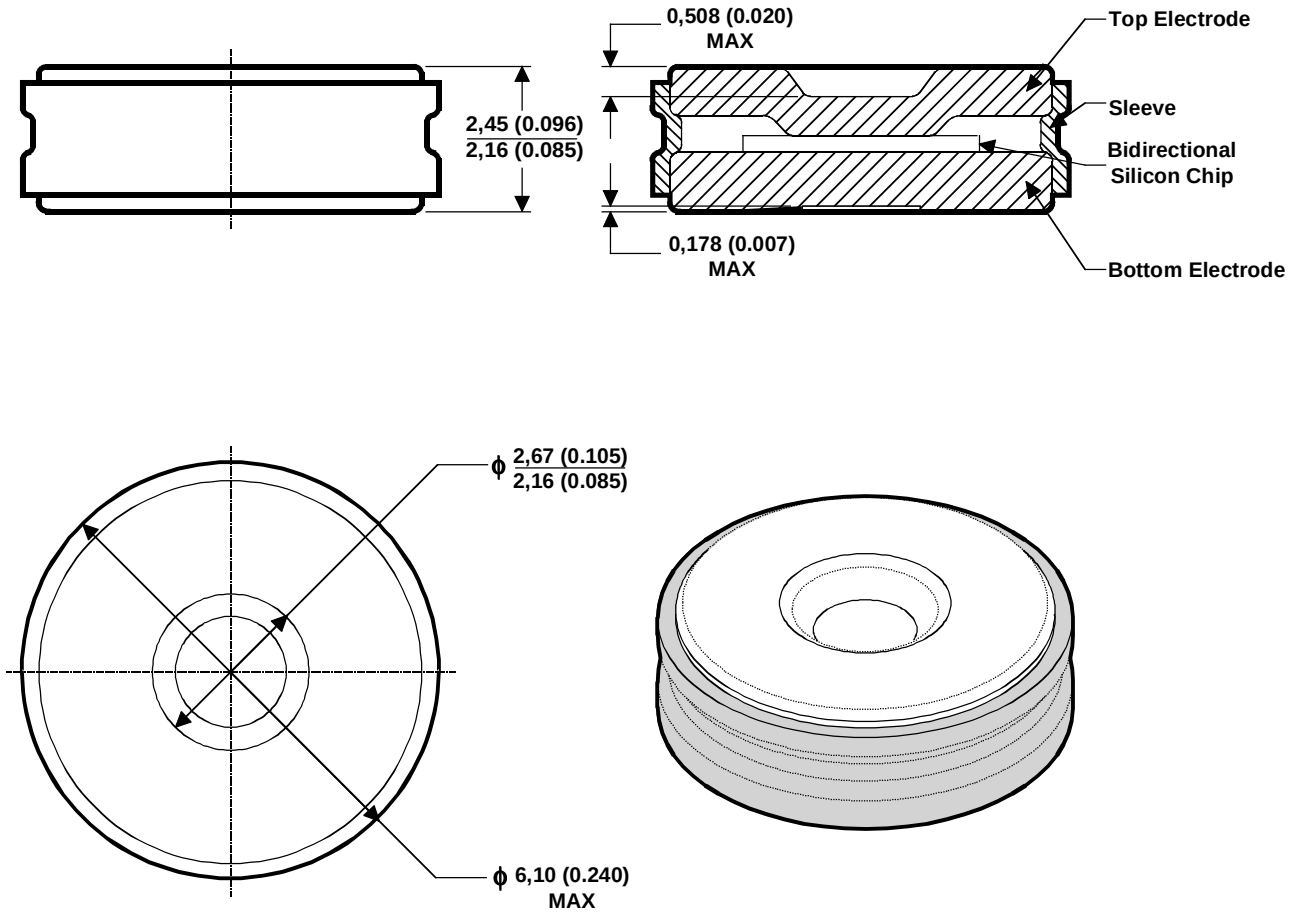


Figure 9.

MECHANICAL DATA

cell package

BUTTON CELL 7EL2



ALL LINEAR DIMENSIONS IN MILLIMETERS AND PARENTHETICALLY IN INCHES

MD4XAO

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