

## BIDIRECTIONAL THYRISTOR OVERVOLTAGE PROTECTORS



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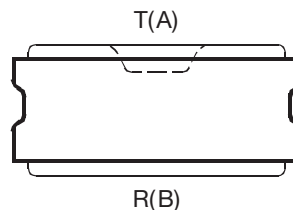
## 9ELx Primary Protector Series

## Ion-Implanted Breakdown Region

- Precise and Stable Voltage
- Low Voltage Overshoot under Surge

Device	$V_{(BR)}$	$V_{(BO)}$	$V_{(BO)}$
	Minimum V	Minimum V	Maximum V
9EL2	±245	±265	±400
9EL3		±200	±265

## Cell Package (Side View)



MD4XACAa

## Rated for International Surge Wave Shapes

Device	ITU-T K28 (10/700)	GR-974-CORE (10/1000)
	$I_{TSP}$ A	$I_{TSP}$ A
9EL2	±200	±150
9EL3	±125	±100

## 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



..... UL Recognized Components

## Description

These devices are primary protector components for semiconductor arrester assemblies intended to meet the generic requirements of Telcordia GR-974-CORE or ITU-T Recommendation K28 (03/93). To conform to the specified environmental requirements, the 9ELx must be installed in a housing which maintains a stable microclimate during these tests (e.g. FIGURE I.1/K28).

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. In usual applications, the high crowbar holding current prevents d.c. latchup as the diverted current subsides. This 9ELx range consists of two voltage variants to meet various maximum system voltage levels. They are designed 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 9ELx'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 9ELx in compression, so that the cell electrodes can be forced together during overstress testing. Under excessive power line cross conditions the 9ELx will fail short circuit, providing maximum protection to the equipment.

JANUARY 1994 - REVISED OCTOBER 2003

Specifications are subject to change without notice.

Customers should verify actual device performance in their specific applications.

# 9ELx Primary Protector Series

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

Rating	Symbol	Value	Unit
Non-repetitive peak on-state pulse current (see Notes 1 and 2) 5/310 $\mu\text{s}$ (ITU-T K28, 10/700 $\mu\text{s}$ voltage wave shape)	$I_{TSP}$	9EL2 -20 $^\circ\text{C}$ to 65 $^\circ\text{C}$	200
		9EL3 0 $^\circ\text{C}$ to 65 $^\circ\text{C}$	125
10/1000 $\mu\text{s}$ (GR-974-CORE, 10/1000 $\mu\text{s}$ voltage wave shape)		9EL2 -20 $^\circ\text{C}$ to 65 $^\circ\text{C}$	150
		9EL3 0 $^\circ\text{C}$ to 65 $^\circ\text{C}$	100
Non-repetitive peak on-state current (see Note 1) full sine wave, 50/60 Hz, 1 s	$I_{TSM}$	9EL2 -40 $^\circ\text{C}$ to 65 $^\circ\text{C}$	10
		9EL3 0 $^\circ\text{C}$ to 65 $^\circ\text{C}$	10
Junction temperature	$T_J$	-40 to +150	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-40 to +150	$^\circ\text{C}$

- NOTES: 1. The surge may be repeated after the device has returned to thermal equilibrium.  
2. Most PTTs quote an unloaded voltage waveform. In operation the 9ELx essentially shorts the generator output. The resulting loaded current waveform is specified.

## Electrical Characteristics for the R and T Terminals, $T_A = 25\text{ }^\circ\text{C}$ (Unless Otherwise Noted)

Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{(BR)}$ Breakdown Voltage	$I_{(BR)} = \pm 20\text{ mA}$ , (see Note 3)	9EL2 -40 $^\circ\text{C}$ to 65 $^\circ\text{C}$	$\pm 245$		V
$V_{(BO)}$ Breakover voltage	$dv/dt = \pm 0.2\text{ V/s}$ , $R_{SOURCE} > 200$	9EL2 +15 $^\circ\text{C}$ to 25 $^\circ\text{C}$	$\pm 265$	$\pm 400$	V
		9EL3 -40 $^\circ\text{C}$ to 65 $^\circ\text{C}$	$\pm 200$	$\pm 265$	
$V_{(BO)}$ Impulse breakover voltage	100 $\text{V}/\mu\text{s} \leq dv/dt \leq \pm 1000\text{ V}/\mu\text{s}$ , $di/dt \leq 10\text{ A}/\mu\text{s}$	9EL2 -40 $^\circ\text{C}$ to 65 $^\circ\text{C}$		$\pm 400$	V
		9EL3 0 $^\circ\text{C}$ to 65 $^\circ\text{C}$		$\pm 350$	
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 $\mu\text{s}$ impulse	9EL2 -40 $^\circ\text{C}$ to 65 $^\circ\text{C}$		20	ms
		9EL3 0 $^\circ\text{C}$ to 65 $^\circ\text{C}$		20	
$I_D$ Off-state current	$V_D = \pm 50\text{ V}$ (see Note 4) $V_D = \pm 200\text{ V}$	9EL2 -40 $^\circ\text{C}$ to 65 $^\circ\text{C}$		$\pm 0.5$	$\mu\text{A}$
		9EL3 0 $^\circ\text{C}$ to 65 $^\circ\text{C}$		$\pm 0.5$	
		9EL2 -40 $^\circ\text{C}$ to 65 $^\circ\text{C}$		$\pm 10$	
		9EL3 +15 $^\circ\text{C}$ to 25 $^\circ\text{C}$		$\pm 1$	
$C_{off}$ Off-state capacitance	$f = 1\text{ MHz}$ , $V_d = 1\text{ Vrms}$ , $V_D = 0$ ,	9EL2 -40 $^\circ\text{C}$ to 65 $^\circ\text{C}$		150	pF
		9EL3 0 $^\circ\text{C}$ to 65 $^\circ\text{C}$		150	

- NOTES: 3. Meets Telcordia GR-974-CORE Issue 2, December 1999 - 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

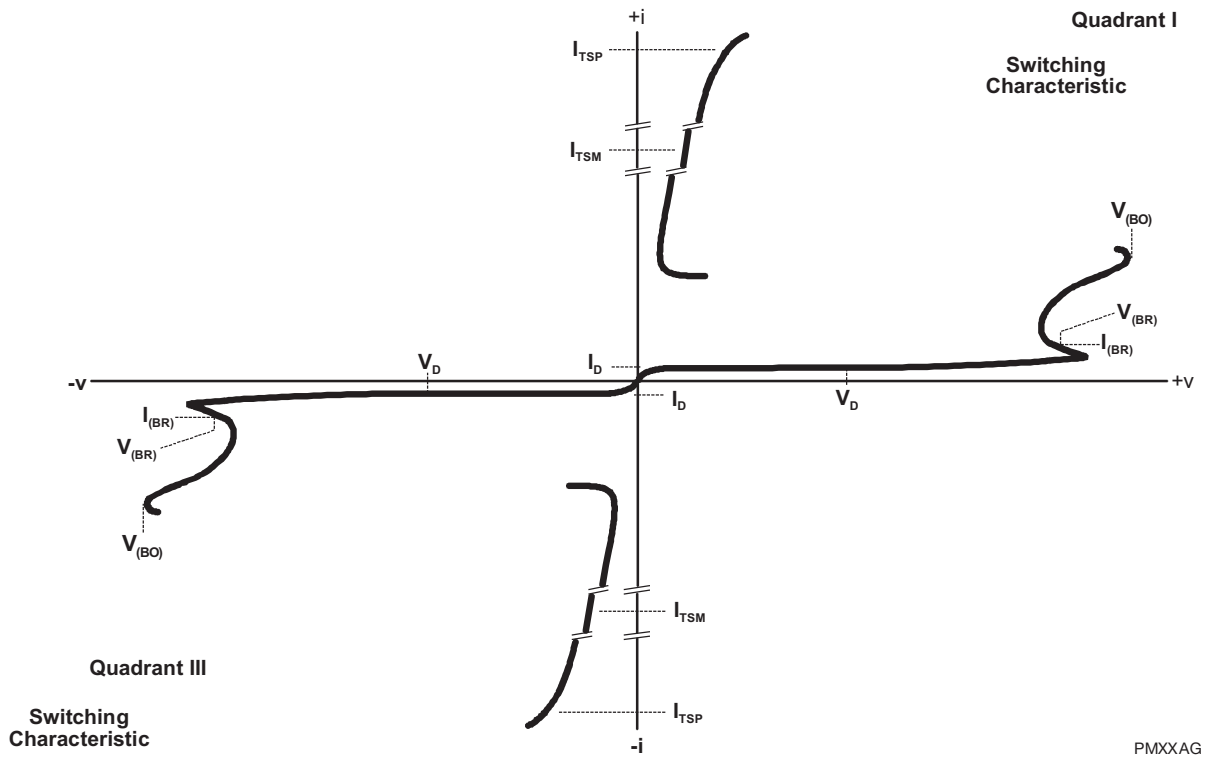


Figure 1. Voltage-Current Characteristic for the T and R Terminals  
All Measurements are Referenced to the R Terminal

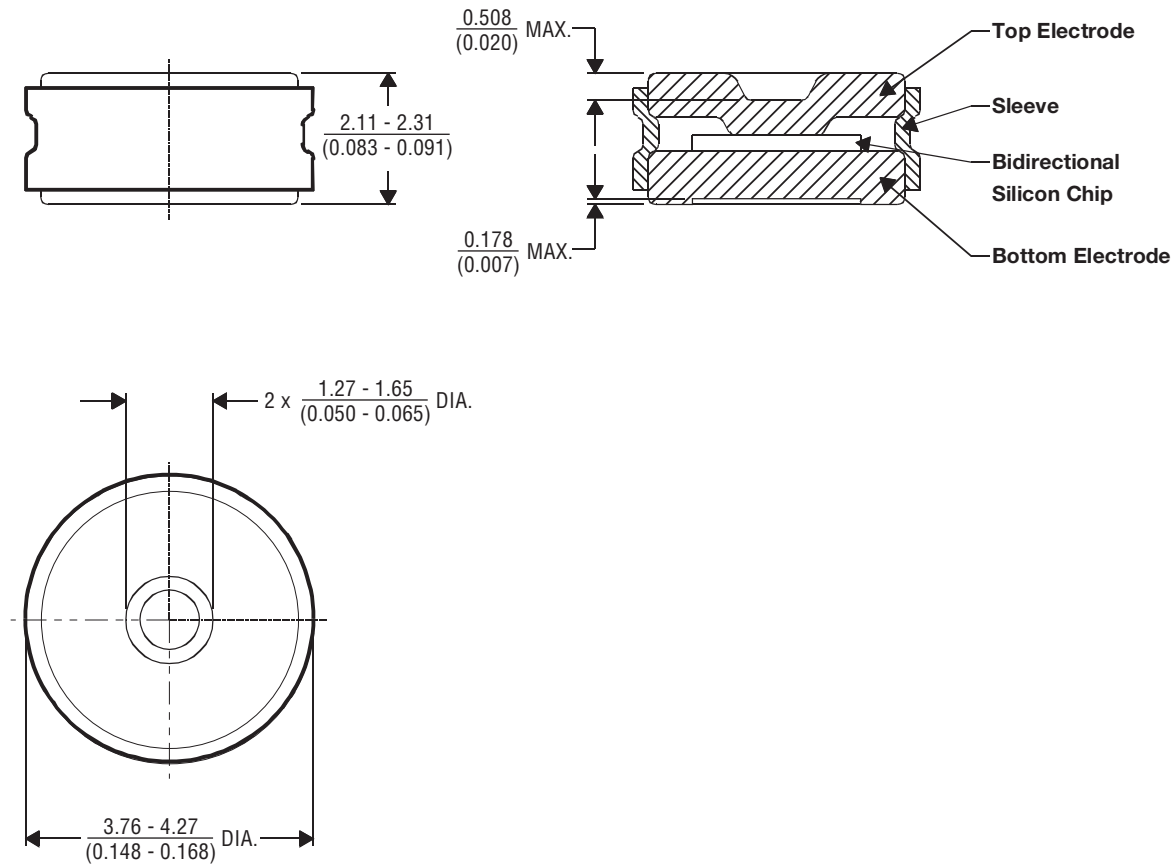
PMXXAG

# 9ELx Primary Protector Series

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## Cell Package

### BUTTON CELL 9ELx



DIMENSIONS ARE :  $\frac{\text{MILLIMETERS}}{\text{(INCHES)}}$

MDXXAVAA