SLPSE43 - JANUARY 1994 - REVISED SEPTEMBER 1994

## SOLID STATE REPLACEMENT FOR GAS DISCHARGE TUBES

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

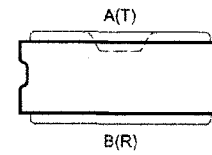
| | |
|---|---|
| $V_{(BO)}$ min | 200 V @ 250 V/ms |
| $V_{(BO)}$ max | 265 V @ 250 V/ms |

- **Planar Passivated Junctions**
  **Low Off-State Current < 0.5 μA**
  **Extended Service Life**
- **Rated for International Surge Wave Shapes**

| WAVE SHAPE | STANDARD | $I_{TSP}$ |
|---|---|---|
| 10/700 μs | CCITT IX K17 | 5 kV |
| 10/1000 μs | Bellcore | 100 A |

- **Fast Response to Transients Gives**
  **Low Let Through Voltage**
  **< 350 V @ 1000 V/μs**
- **Sealed Cell Construction**
  **High Current Capability**
- **Soldered Copper Electrodes for**
  **High Strength**
- **Fails Short Circuit Under Excessive**
  **Current Conditions**

CELL PACKAGE
(SIDE VIEW)




MD4XAC

**device symbol**


SD4XAD

### description

The 9EL3 Primary Protector is designed specifically for applications required to be Bellsouth compliant. This device consists of a bidirectional suppressor element connecting the A and B terminals. Typically, the 9EL3 is used as a replacement for conventional gas discharge tubes (GDT's) which are utilized to protect telephone exchange equipment from lightning and transients induced by ac power lines.

High level transients are initially clipped by breakdown clamping until the voltage rises to the breakover level, which causes the device to crowbar. The high crowbar holding current prevents dc latchup as the transient subsides.

These monolithic protection devices are constructed using two nickel plated 4.95 mm (0.195") diameter 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. This improves the power line cross current capability enabling conformance to international requirements such as 10 A for 1 second. One of the 9EL3's copper electrodes is specially shaped to promote a progressive shorting action (@ 50/60 Hz currents greater than 60 A) when mounted under compression inside a protection module. Under excessive power line cross conditions the 9EL3 will fail short circuit, providing maximum protection to the equipment.

For added environmental and physical protection, the 9EL3 utilizes a black plastic sleeve which shrouds the entire silicon chip.

ADVANCE INFORMATION

## absolute maximum ratings at specified temperature

| RATING | SYMBOL | TEMPERATURE $T_J$ INITIAL | VALUE | UNIT |
|---|---|---|---|---|
| Non-repetitive peak on-state pulse current (see Notes 1 and 2) | | | | |
| 5/310 µs (CCITT IX K17, open-circuit voltage wave shape 5 kV, 10/700 µs) | $I_{TSP}$ | 0 to +65°C | 125 | A |
| 10/1000 µs (Bellcore, open-circuit voltage wave shape 1 kV, 10/1000 µs) | | 0 to +65°C | 100 | |
| 50/60 Hz rms on-state current 1 s, (see Note 1) | $I_{TSM}$ | 0 to +65°C | 10 | A rms |
| Junction temperature | $T_J$ | | 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 9EL essentially shorts the generator output. The resulting loaded current waveform is specified.

## electrical characteristics at specified temperature

| PARAMETER | | TEST CONDITIONS | TEMPERATURE $T_J$ INITIAL | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| $V_{(BO)}$ | Breakover voltage | ≤ 250 V/ms, ≤ 1 A/ms | +15 to +25°C | ± 200 | | | V |
| | | ≤ 250 V/ms, ≤ 1 A/ms | 0 to +65°C | | | ± 265 | V |
| | | ≤ 100 V/µs, ≤ 10 A/µs | 0 to +65°C | | | ± 350 | V |
| | | ≤ 1 kV/µs, ≤ 10 A/µs | 0 to +65°C | | | ± 350 | V |
| | Impulse reset | 52.5 V, 260 mA S.C., dc<br>135 V, 200 mA S.C., dc<br>1000 V, 25 A S.C., 10/1000 µs | 0 to +50°C | | | 20 | ms |
| $I_D$ | Off-state current | $V_D$ = ± 50 V (see Note 3) | 0 to +65°C | | | ± 0.5 | µA |
| | | $V_D$ = ± 200 V | 0 to +65°C | | | ± 1 | µA |
| $C_{off}$ | Off-state capacitance | 1 Vrms, 1 MHz, $V_D$ = 0 Vdc bias | 0 to +65°C | | | 150 | pF |

NOTE 3: This device can be sensitive to light. Suggest this parameter be measured in a dark environment.

## PARAMETER MEASUREMENT INFORMATION

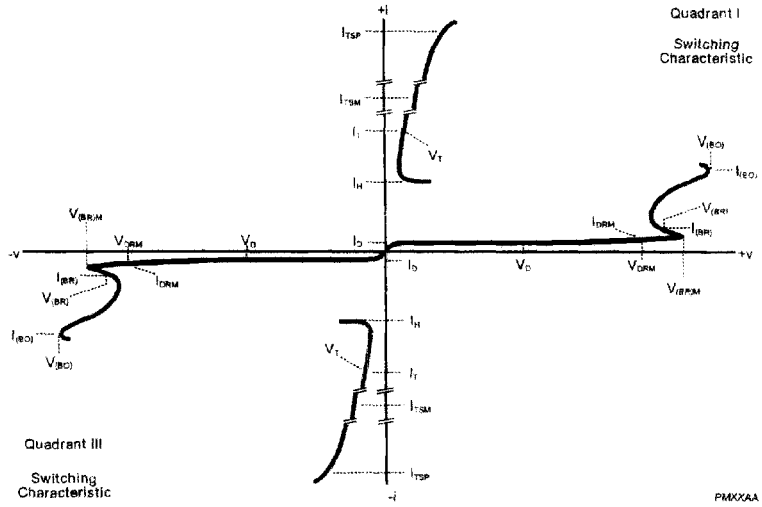



**Figure 1. VOLTAGE-CURRENT CHARACTERISTICS**