Surge Devices Protect Subscriber-Line Interface Circuits

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A subscriber-line interface circuit card (SLIC) supplies the interface between the analog loop of the telecommunication network and a digital central office (CO). It does so by providing what's commonly referred to as the BORSCHT functions:

B—battery feed
O—overvoltage protection
R—ringing
S—signaling
C—coding (analog-to-digital conversion and digital-to-analog conversion)
H—hybrid (two- to four-wire conversion)
T—test

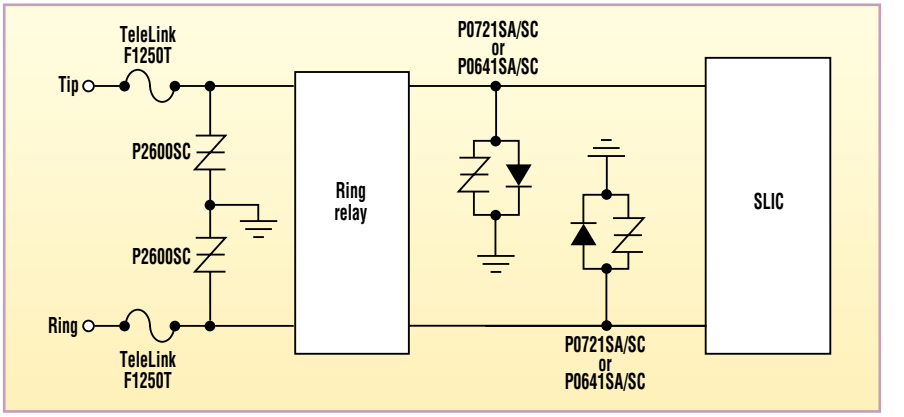
Network hazards such as lightning and power-line-cross conditions can pose a serious threat to line cards deployed at central offices, remote switching locations, and customer premises. To minimize the danger, both overvoltage and overcurrent protection are required. These features guarantee reliable line-card operation and provide regulatory compliance.

SLIC line cards should be protected against overvoltages that can exceed:

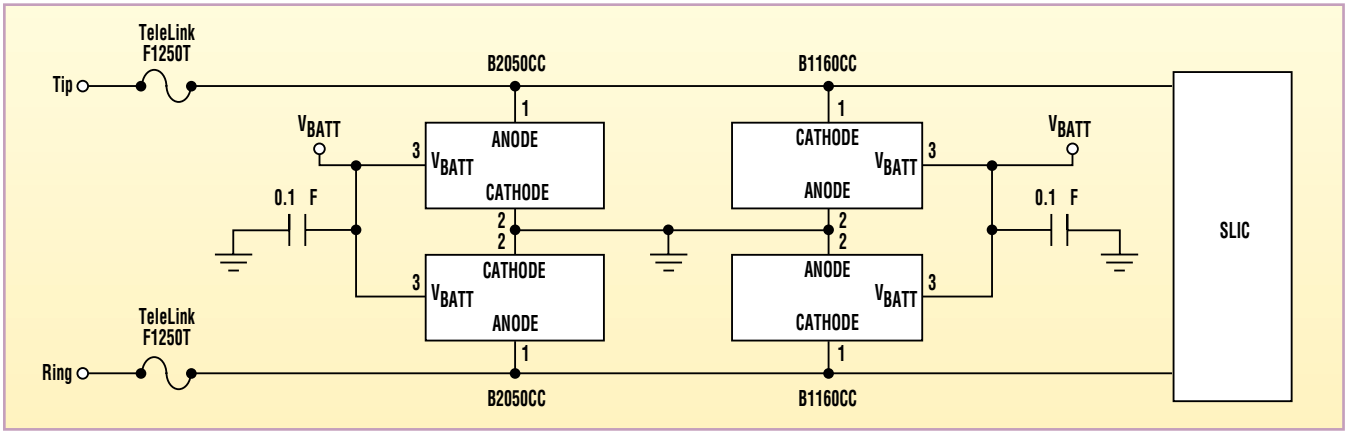
- 2500 V and overcurrents up to 500 A for central office and remote switching locations
- 1500 V and 200 A for customer premises applications, and
- 800 V/100 A for intrabuilding requirements.

Many different environments benefit from SLIC cards. Among them are typical CO-to-customer-premises connections, private branch exchange (PBX), remote terminal (RT), and digital loop carrier (DLC) systems. As seen here, each of these applications has very unique requirements:

- Some SLIC applications may use a fixed voltage supply such as –24, –48, –72, or –90 V.
- Other SLIC applications may need to be flexible enough to use any of these supply voltages.
- Some applications will require two different power supplies, one negative and one positive. In this case, the ring signal can be driven to a positive and negative threshold, which extends the SLIC's transmission capability.
- Some SLICs use a ring relay to add ringing signals to the line, while other SLICs have the ringing function inte-



1. The SLIC application shown requires overvoltage protection for both the on-hook condition and the off-hook condition to provide reliable operation and meet FCC compliance criteria.



2. A SLIC chip with integrated ringing requires both positive (B2050CC) and negative (B1160CC) surge protection. If no positive battery supply is used, the B2050 devices are replaced by two diodes, which will short all positive events to ground.

grated within the SLIC chip.

Each configuration's surge protection device has a peak-pulse current (I_{pp}) rating able to withstand the lightning immunity regulatory requirements without the use of an additional series resistance. Likewise, the fuse is chosen with an amps^{2}time (I^2t) rating large enough to withstand the appropriate lightning immunity tests. Yet it's small enough to open safely during severe power-cross conditions.

This SLIC application requires overvoltage protection for both the on-hook condition and the off-hook condition *(Fig. 1)*. The two P2600SC SIDACtor devices furnish the ring-relay protection for the on-hook condition. Their standoff voltage parameter is high enough to pass the FCC Part 68.306 leakage-current requirements. Either the P0721SA/SC or the P0641SA/SC SIDACtor devices supply the off-hook condition protection. If the battery supply is higher than 75 V, then the P0901 and/or the P1101 may be used here instead. The integrated diode in these off-hook-mode protection devices eliminates the need for external discrete diodes (which offer protection from voltage levels exceeding ground potential).

Overcurrent protection also is needed for this application. The two TeleLink fuses provide overcurrent protection that doesn't operate during surge conditions. Although this prevents nuisance openings during lightning-induced surge events, it also furnishes the required power-cross protection.

Shown here are a negative Battrax (B1160CC) and a positive Battrax (B2050CC) surge protector *(Fig. 2)*. Once the positive Battrax is referenced to the positive power supply, it shunts all surge events exceeding the positive supply voltage. The B1160 Battrax device shunts all surge events exceeding the negative supply voltage. If no positive battery supply is used, then the two B2050 devices are replaced with two diodes. These diodes provide the positive surge protection by shorting all positive events to ground.

The two TeleLink fuses provide overcurrent protection for the circuit.