

# Customer Premise Equipment

## Application Overview

### Problem/Solution

Customer premise equipment (CPE), also known as subscriber equipment, includes any equipment that is connected to the telecommunications network and located at a customer's site. Examples of CPE include: 56k modems, cable modems, ADSL modems, phone sets, fax equipment, answering machines, POS equipment and PBX systems.

Since CPE equipment connects to the copper infrastructure of the Public Switched Telephone Network (PSTN), it is subject to overcurrent and overvoltage hazards from AC power cross, power induction, and lightning surges which may appear on the premise wiring. If left unprotected from these hazards, CPE may fail to operate or may risk the safety of subscribers and maintenance personnel. PolySwitch resettable devices and SiBar thyristors provide coordinated resettable protection against these faults, thereby protecting equipment

from damage and minimizing field services and warranty costs.

### Typical Protection Requirements

In most cases, CPE is powered from the central office with nominal battery voltages around  $-48V_{DC}$  and  $90V_{RMS}$  ringing signals superimposed when needed. However, TIA-968-A does specify that a CPE system must be designed to also operate with  $-56.6V_{DC}$  and a superimposed  $150V_{RMS}$  simulated ringing signal. Thus, the actual system implementation must accommodate maximum voltages as high as  $268.8V_{PEAK}$ —this in turn specifies the rating of the over-voltage device to have a  $V_{DM} < 270V$  (see SiBar Thyristors section on pg. 339). Corresponding system loop currents typically fall in the 20–70mA range.

Customer premise equipment is generally ungrounded and therefore requiring only metallic protection architecture against lightning and AC power faults as



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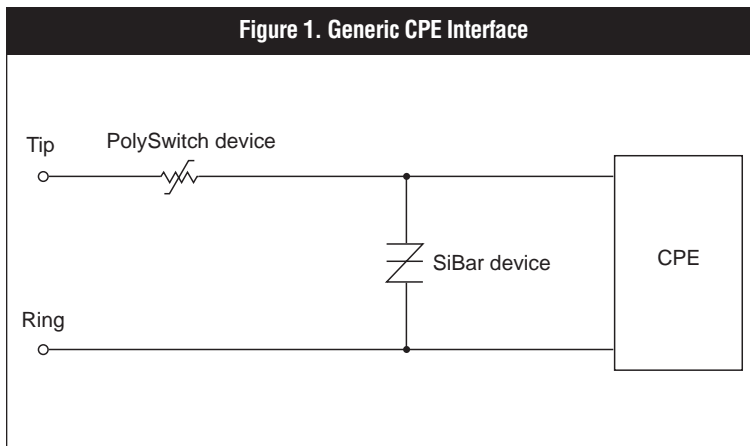
shown in Figure 1. A PolySwitch device can provide overcurrent protection against AC power faults, and a SiBar Thyristor protection against lightning hazards. This interface circuit is generally placed directly behind the RJ-11 jack (or appropriate system interface) to protect downstream circuit components.

Figure 2 provides recommended protection circuitry for a modem interface, such as may be found on a 56k analog modem, cable modem, set-top box, POS terminal, or digital modem.

### Device Selection for Agency Approval Requirements

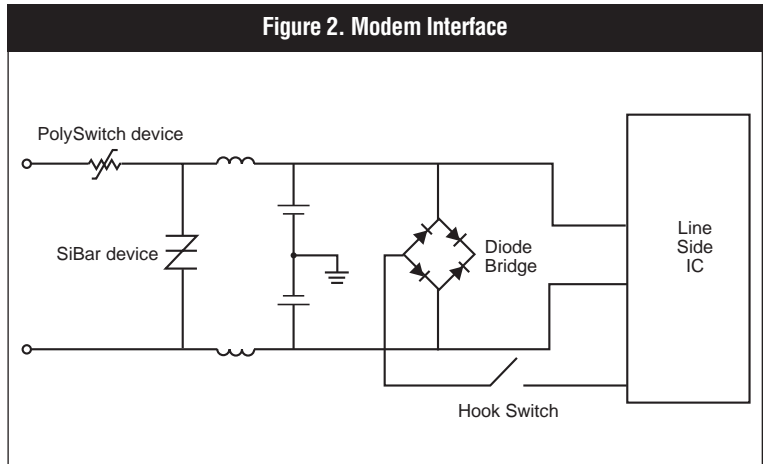
Protection for customer premise equipment is typically designed to meet the requirements of UL60950 and TIA-968-A for North American use and of ITU-T K.21 for rest-of-world use. Overviews of the requirements for each of these standards can be found as application notes in this Databook.

Figure 1. Generic CPE Interface



PolySwitch devices should be selected with voltage ratings based on the regulatory standards for which the equipment is being designed. Surface-mount TS600 or TSM600 and radial-leaded TR600 devices are applicable for North American GR-1089 standards and for UL60950 standards, while surface-mount TS250 and TSV250 and radial-leaded TR250 products are applicable for ITU-T K.21 standards.

SiBar devices should be selected with surge current ratings based on the regulatory standards for which the equipment is being designed and with off-state voltage ratings based on normal system operation. SiBar thyristor



devices with off-state voltage  $V_{DM}$  ratings of 270V are applicable for CPE equipment with maximum peak voltages up to  $270V_{DM}$ . For systems with lower expected volt-

ages, designers should consult Section 4 for devices with lower voltage ratings.

**Table 1. Recommended Circuit Protection Devices**

Regulatory Standard	PolySwitch Device		SiBar Device
UL1459/UL60950, TIA-968-A, (formerly FCC Part 68)	TS600-170	(SMT)	TVB270SA
	TRF600-150	(Thru-hole)	
ITU-T K.21	TS250-130	(SMT)	TVB270SA
	TSV250-130	(SMT)	
	TR250-120	(Thru-hole)	
	TR250-145	(Thru-hole)	

