3 μP I/O LINE PROTECTORS

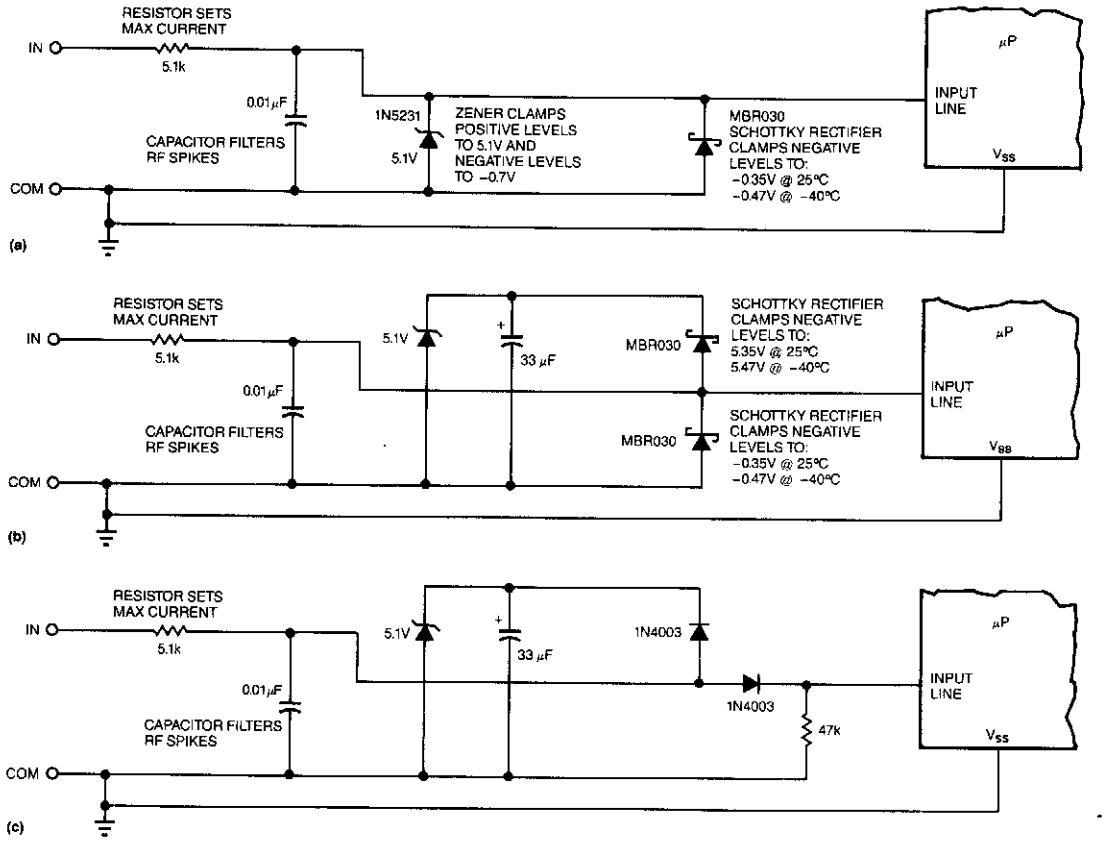

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Fig. 20-3

In Fig. 20-3(a), a 5.1-V zener diode clamps positive-going transients, and a Schottky rectifier clamps negative-going transients. The Schottky rectifier has problems at both ends of the temperature scale. At 125°C (257°F), its leakage current can reach 50 μA when the input line is at 5 V. This leakage is not a big deal unless the input resistor has a value of 100 kΩ or more. More troubling, at temperatures below −40°C (−40°F), the Schottky rectifier's forward voltage rises to about 0.47 V, which is perilously close to the −0.50-V max spec that most HCMOS-type μP's inputs can tolerate.

The third circuit, Fig. 20-3(c), uses two regular silicon rectifiers. One rectifier is connected in series with the input line, thereby isolating the μP's inputs from negative-going voltage spikes. The other rectifier is in series with a 5.1-V zener, which clamps positive-going transients.