TVS Placement
The Critical Path to the Leading Edge

By Jon Schleisner

Reverse avalanche transient suppressors have excellent turn-on characteristics. Typically these devices turn on in sub-nano second time frames. When protecting small geometry integrated circuits it is important to “catch” the leading edge of transient surges with very steep rise times.

Parasitic inductance in the circuit configuration and component layout inhibit the suppressor’s ability to catch the leading edge of an ESD surge or other very fast pulses.

The suppressor should be as physically close to the vulnerable component’s ground return as possible (see Fig. 1). The lower the parasitic inductance between the ground plane of the component to be protected and the TVS, the more effective the suppressor will be.

ESD can have rise times as steep as 64 kV/ms or 30 kA/ms. Though the total energy is minimal, the peak is easily capable of rupturing the gate oxide at the input stage of a data transceiver chip. Fortunately it is possible to use the parasitic inductance of the PCB to your advantage.

In Fig. 2 it is shown that the inductance inherent in the PCB conductive traces can be used to slow down the leading edge of an incoming transient, thereby reducing the importance of the inductance between the TVS diode element and the critical ground path.

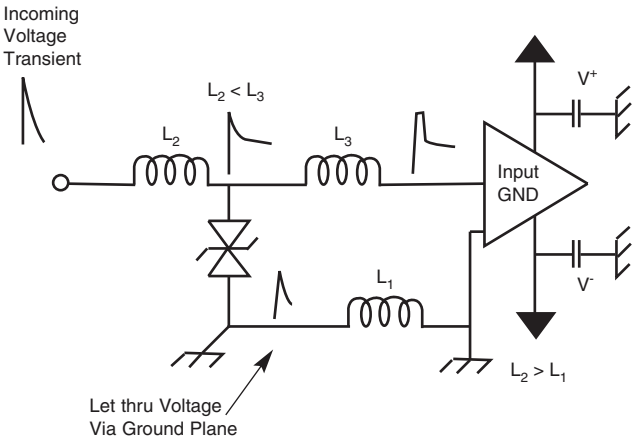

Fig. 1

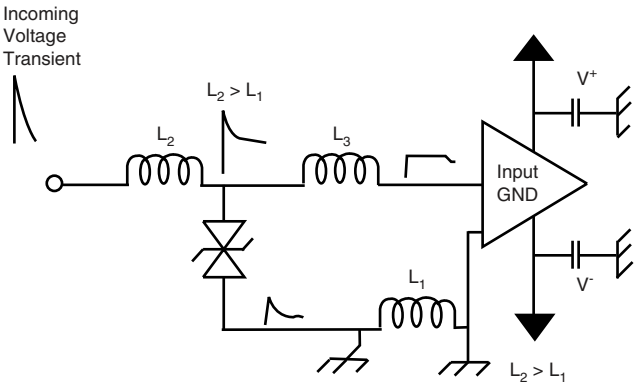

Fig. 2

For both Fig. 1 and Fig. 2:

L_1 = inductance of ground plane

L_1 = inductance of PCB trace from input to TVS

L_1 = inductance of PCB trace from TVS to transceiver into pin

APPLICATION NOTE