

## Excerpts from SN75240 Datasheets

### 3 Description

The SN65220 device is a dual, and the SN65240 and SN75240 devices are quadruple, unidirectional transient voltage suppressors (TVS). These devices provide electrical noise transient protection to Universal Serial Bus (USB) low and full-speed ports.

The input capacitance of 35 pF makes it unsuitable for high-speed USB 2.0 applications.

### 11.2 Typical Application

Figure 5 illustrates a typical USB system and application of the SN75240, SN65240, and SN65220 devices. Connections to pin A from the D+ data line, pin B from the D- data line, and the device grounds from the GND line that already exists are necessary to increase the amount of ESD protection provided to the USB port.

The design of the suppressor gives it very low maximum current leakage of 1  $\mu$ A, a very low typical capacitance of 35 pF, and a standoff voltage minimum of 6 V. Because of these levels, the SN75240, SN65240, and SN65220 devices will provide added protection to the USB system hardware during ESD events without introducing the high capacitance and current leakage levels typical of external transient voltage suppressors. The addition of an SN75240, SN65240, or SN65220 device is beneficial to both full-speed and low-speed USB 1.1 bandwidth standards.

#### 11.2.2 Detailed Design Procedure

To effectively protect USB transceivers, use TVS diodes with breakdown voltages close to 6 V, such as the SN65220, SN65240, or SN75220 devices.

Because of the TVS junction capacitance of 35 pF, apply these TVS diodes only to USB transceivers with full-speed capability that is 12 Mbps maximum.

Place the TVS diodes as close to the board connector as possible to prevent transient energies from entering further board space.

Connect the TVS diode between the data lines (D+, D-) and local circuit ground (GND).

Because noise transient represents high-speed frequencies, ensure low-inductance return paths for the transient currents by providing a solid ground plane and using two VIAs connecting the TVS terminals to ground.