TVS Devices & Transmission Rates

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Device capacitance is often a decisive factor in higher data rate applications (see Table 1). A TVS diode, like other semiconductors, has an inherent capacitance.

TABLE 1 - DATA TRANSMISSION RATES

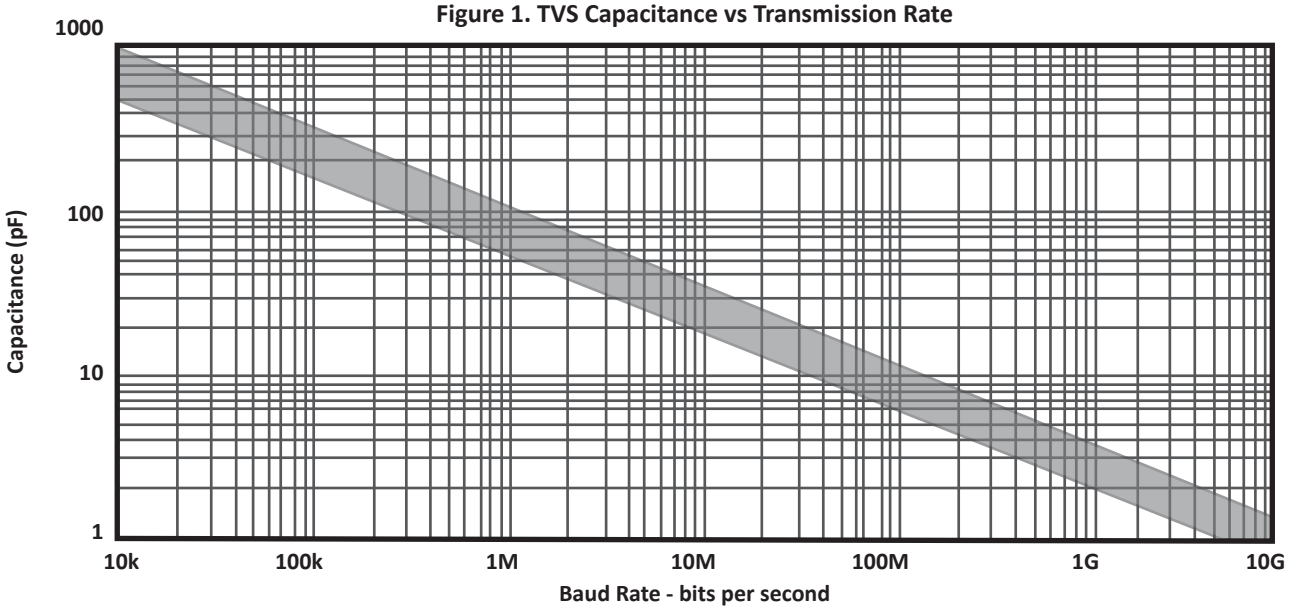
APPLICATON	RATE
RS-232	20kbps
T1	1.54Mbps
I2C	3.4Mbps
Fast Ethernet - 100 Base T	100Mbps
USB 2.0	480Mbps
USB 3.0	5Gbps
Thunderbolt	10Gbps
HDMI 1.3	10.2Gbps

Capacitance is dependent on junction area, doping concentration and the voltage across the diode terminals. The reverse bias voltage is inversely related to device capacitance, as reverse bias increases the device capacitance decreases. As the doping concentration increases, the voltage rating of the diode decreases and device capacitance increases. On the other hand, devices with higher voltage values have smaller junction capacitance. Larger junction area relates to higher current handling capability. But as the device or junction size increases the device capacitance increases along with it.

One of the characteristics of a capacitor is lower impedance to time varying signals. The higher the frequency of a signal, lower the resistance offered to it. So when a TVS diode is used in a high data rate application, the intrinsic device capacitance tends to attenuate the signal. Hence, when the device capacitance is large the attenuation suffered by the high frequency signal is greater.

Figure 1 is a very good approximation of device capacitance and the data rate it can support. The curve represents the approximate limiting frequency for the capacitance(y-axis). A device with a capacitance value below the curve should not have any appreciable attenuation for a given signal.

Figure 1. TVS Capacitance vs Transmission Rate



COMPANY INFORMATION

COMPANY PROFILE

In business more than 20 years, ProTek Devices™ is a privately-held company located in Tempe, Arizona, that offers a product line of transient voltage suppressors (TVS); avalanche breakdown diodes; steering diode TVS arrays and other surge suppressor component products. These TVS devices protect electronic systems from the effects of lightning, electrostatic discharge (ESD), nuclear electromagnetic pulses (NEMP), inductive switching and EMI / RFI. ProTek Devices also offers high performance interface and linear products that include analog switches; multiplexers; LED drivers; audio control ICs; RF and related high frequency products. The analog devices work in a host of consumer; industrial; automotive and other applications.

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