



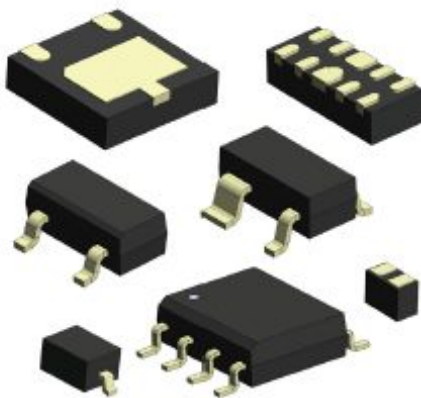
Eaton TVS diode whitepaper

Eaton TVS Diode ESD Suppressors

Introduction to overvoltage

Transient voltages and electrostatic discharge (ESD) are typical problems that impact the reliability and durability of electronic equipment. Transient voltage suppression (TVS) diodes provide surge protection to protect internal electronics from damage.

TVS Diode



Electronic devices and equipment function optimally within a specified maximum working voltage, above which latent or catastrophic failures may occur in internal components. An overvoltage condition occurs when the supply voltage in electronic equipment exceeds its absolute maximum rated voltage. It can result from several sources, including lightning strikes, electrostatic discharge, insulation failure, arcing, or switching electromagnetic pulses (SEMPs). Particularly for electronic devices, ESD events can occur in normal product use and also in the manufacturing process, and it is crucial to protect against ESD threats.

The following are fundamental ratings and terminologies associated with Eaton TVS diode ESD suppressors:

Nominal reverse working voltage (V_{RWM}): Also referred to as reverse standoff voltage, V_{RWM} is the voltage at which the TVS diode draws minimal leakage current (typically a few microamperes) from the circuit. It is the maximum operating voltage of a TVS diode when it is "OFF"

Breakdown voltage (V_{BR}): This is the voltage at which avalanche breakdown occurs in a TVS diode, resulting in low impedance.

Reverse leakage current (I_R): The leakage current that flows through a TVS diode when it is reverse biased.

Clamping voltage (V_C): This is the voltage across a TVS diode at its peak pulse current (I_{PP}) rating. The clamping voltage of the TVS diode must be lower than the failure voltage of the circuit. The closer the clamping voltage is to the normal operating voltage, the more effective the protection.

Capacitance: A measure of stored charge, generally in picofarads (pF), between the input pin and another reference point (often ground/earth), typical with a 1 MHz signal.

Peak Current (I_{PP}): The difference between the maximum positive and maximum negative amplitudes of a current waveform.

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