

Understanding TVS Clamping

By: Ivan G. Lawson

Transient Voltage Suppressors (TVS) limit voltage spikes to an acceptable level through clamping. A clamp device begins conducting when its threshold voltage is exceeded, then restores to a non-conducting mode when the voltage drops below the threshold level. As a result, voltage spikes are "clamped" off to safe levels.

The PSD05C has the following electrical characteristics:

- Rated Stand-Off Voltage (V_{WM}): 5.0 Volts
- Minimum Breakdown Voltage (V_{BR}): 6.0 Volts
- Clamping Voltage (V_c) @ 1A : 9.8 Volts
- Maximum Clamping Voltage (8/20 μ s) @ 28A: 14.5 Volts
- Maximum Leakage Current (I_{l0}) @VWM: 10 μ A

The rated stand-off voltage (Figure 1: $V_{WM}@I_{RM}$) for the PSD05C is 5.0 Volts. Looking at the breakdown region of a TVS, as shown in Figure 1, as the diode

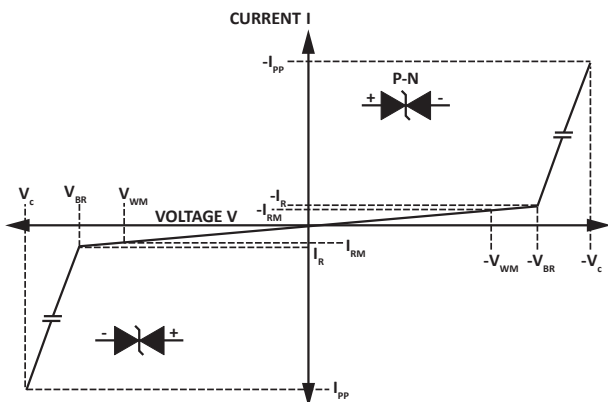


Figure 1. Bidirectional V-I Curve

starts conducting (clamping) at the minimum breakdown voltage (6V: $V_{BR}@I_{R}$) in a negative direction, there will be an increase in current in the positive direction of the 8/20 μ s pulse.

When the transient current drawn by the PSD05C is at 1 Amp, the device clamping will be at 9.8 Volts. As the surge current is increased, the diode will continue to conduct (clamp) until it reaches its maximum clamping capability. For a PSD05C, the maximum clamping is 14.5 Volts at 28.0 Amps (for an 8/20 μ s waveshape), as shown in Figure 2.

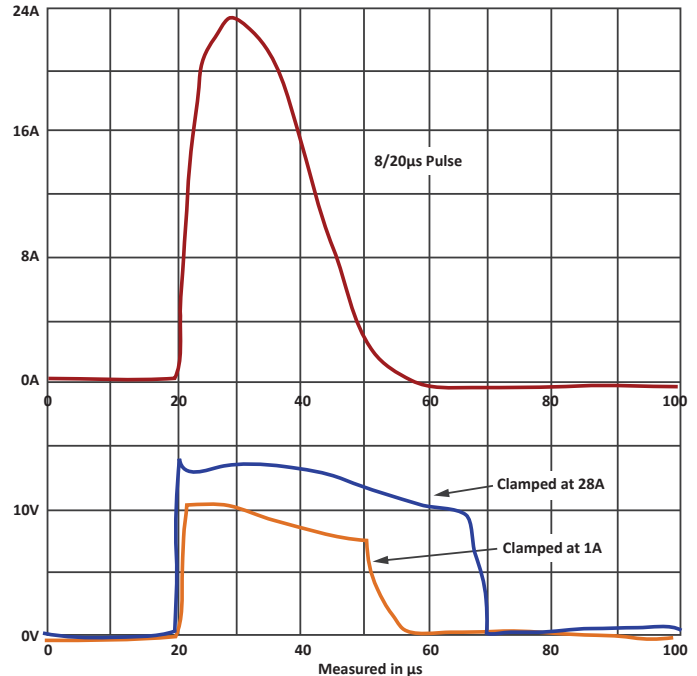


Figure 2. PSD05C Clamping

The PSD05C is a bidirectional device, so when a negative 8/20 μ s pulse is applied to the input, the diode will undergo the same clamping characteristics just in the opposite direction. However, the PSD05, the unidirectional equivalent to the PSD05C, will only clamp in one direction as shown in Figure 3.

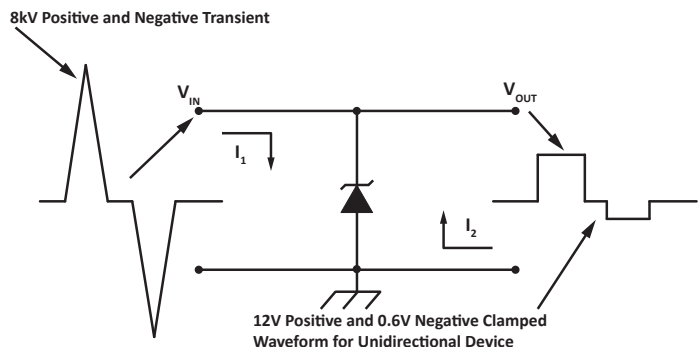


Figure 3. Unidirectional Device (Asymmetrical Clamping)

COMPANY INFORMATION

COMPANY PROFILE

ProTek Devices, based in Tempe, Arizona USA, is a manufacturer of Transient Voltage Suppression (TVS) products designed specifically for the protection of electronic systems from the effects of lightning, Electrostatic Discharge (ESD), Nuclear Electromagnetic Pulse (NEMP), inductive switching and EMI/RFI. With over 25 years of engineering and manufacturing experience, ProTek designs TVS devices that provide application specific protection solutions for all electronic equipment/systems.

ProTek Devices Analog Products Division, also manufactures analog interface, control, RF and power management products.

CONTACT US

Corporate Headquarters

2929 South Fair Lane
Tempe, Arizona 85282
USA

By Telephone

General: 602-431-8101
Sales: 602-414-5109
Customer Service: 602-414-5114

By Fax

General: 602-431-2288

By E-mail:

Sales: sales@protekdevices.com
Customer Service: service@protekdevices.com
Technical Support: support@protekdevices.com

Web

www.protekdevices.com
www.protekanalog.com

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