

The Transient Voltage Suppressor diode (T.V.S.) is specifically designed to protect electronic circuits against transients and over voltages. It is a silicon avalanche device available in both uni-directional or bi-directional configurations. With a uni-directional, the specified clamping characteristic is only apparent in one direction, the other direction exhibiting a VF normally experienced with conventional rectifier diodes. All electrical characteristics are specified at 25 degrees C.

When selecting a T.V.S. device there are some important parameters to be considered, these are; Reverse Standoff Voltage ( $V_R$ ), Peak Pulse Current ( $I_{PP}$ ) and Maximum Clamping Voltage ( $V_C \text{ max}$ ).

The most important is  $V_R$ , this is the parameter that is the key to selecting a T.V.S. diode. The  $V_R$  of the device should be equal to, or greater than, the peak operating level of the circuit (or part of the circuit) to be protected. This will ensure that the T.V.S. does not clip the circuit drive voltage.

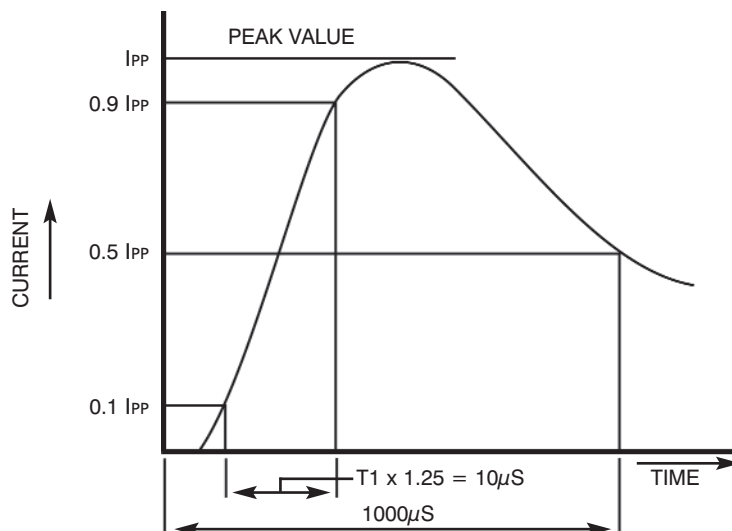
The Peak Pulse Current ( $I_{PP}$ ) is the maximum current the T.V.S. can withstand without damage. The required  $I_{PP}$  can only be determined by dividing the peak transient voltage by the source impedance. Of course, in many cases, the very nature of transient occurrence makes this parameter difficult to determine. The T.V.S. failure mechanism is a short circuit, therefore if the device fails due to a transient, the circuit will still be protected.

In secondary protection applications, any series impedances due to resistors, transformers and inductors will have a limiting effect on the peak pulse current. In some cases these may be due to long lengths of interconnecting wire.

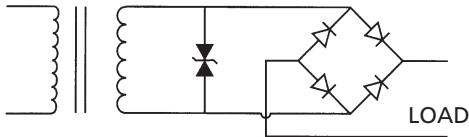
The Maximum Clamping Voltage ( $V_C \text{ max}$ ) is the peak voltage that will appear across the T.V.S. device when subjected to the Peak Pulse Current ( $I_{PP}$ ), based on a 1ms exponential waveform. This waveform is a 10/1000 microsecond waveform as shown in Figure 1.

This pulse is a standard test waveform used for protection devices.

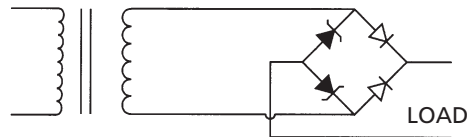
FIGURE 1



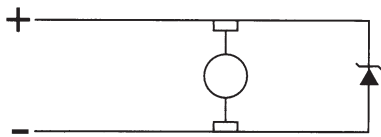
**FIGURE 1**  
PROTECTING POWER SUPPLIES  
USING BI-DIRECTIONAL CON  
AVALANCHE DIODE



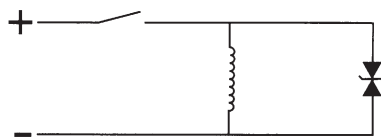
**FIGURE 2**  
USING 2 UNI-DIRECTIONAL SILICON  
AVALANCHE DIODES IN THE BRIDGE TO  
PROVIDE RECTIFICATION & PROTECTION  
OF BOTH LOAD & SUPPLY



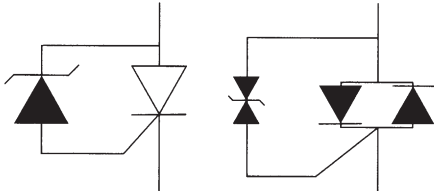
**FIGURE 3**  
REDUCING EMI. DC MOTOR



**FIGURE 4**  
LIMITING TRANSIENTS DUE  
TO BACK E.M.F. ON RELAY  
& CONTRACTOR COILS



**FIGURE 5**  
PREVENTING FALSE GATE  
TRIGGERING ON THYRISTOR &  
TRIACS DUE TO OVER VOLTAGES



The above are all examples of Centralised protection. On more complex circuits however, it is necessary to provide protection at several points in the circuit, this is especially true on systems with several I/O ports or internal communication.

