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Determining Clamping Voltage Levels for a Broad Range of Pulse Currents

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In Transient Voltage Suppressor (TVS) data sheets, all clamping voltage (Vc) levels are specified at maximum rated peak pulse current (IPP). How do you interpolate the Vc levels for transient currents (IP) other than the rated maximum?

This figure is easily calculated using the parameters on the data sheet with the formula:

VC = (Ip/Ipp)(VC max. - V(BR) max.) + V(BR) max.

Where: Ip = test pulse current IPP = max rated pulse current Vc max. = maximum specified clamping voltage V(BR) max. = upper limit of breakdown voltage

This calculation assumes a linear increase in Vc between V_(BR) and V_C max, which is realistic. Figure 1 illustrates the DVc vs DIP relationship for two voltage levels, 10V and 64V. in the SMB 600W series between V(BR) and Vc as determined by this formula. Results are linear as expected. V(RR) max is used in this calculation as it is the upper limit of specified breakdown voltage.

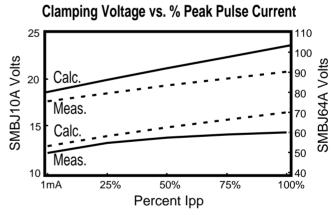
In those instances where $V_{(BR)}$ max is not given on the data sheet, it can be closely approximated. For "A" suffix parts, multiply the minimum $V_{(BR)}$ by 1.11 and for non-suffix parts, multiply by 1.22 to obtain the maximum $V_{(BR)}$.

The curves derived from measured data are compared with calculated values in Fig. 1. Surge tests were performed for a 30 piece sample at 25°C ambient with a 10/1000µs waveform.

Note that the curves based on actual surge data have a more shallow slope than those from the calculation. indicating that the devices are conservatively rated and that the formula shown provides a sufficient level of confidence for worst-case design.

Fig. 1 V_C vs I_{PP} for SMBJ10A and SMBJ64A Calculated and Measured

SMBJ64A /SMBJ10A



- SMBJ64A calculated
- SMBJ64A measured
- - SMBJ10A calculated
- SMBJ10A measured

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