TVS Power Derating vs. Temperature

Transient voltage suppressors are designed to work over a wide temperature range. If the application requires the TVS to operate at elevated temperatures, the characteristics of the device must be considered at the expected extremes.

Power Derating Curve

During surge conditions, the transient power is dissipated within the TVS diode and is limited by the maximum allowable junction temperature. If the ambient temperature is increased, the power dissipating capability of the device decreases. The peak pulse power capability of the device derates linearly from 25ºC to $T_{(max)}$. To determine the power or current handling capability of the device at elevated temperatures, a power derating curve is used (Figure 1). For example, at an operating temperature of 100ºC, the device is capable of dissipating 40% of the rated peak pulse current.

Clamping Voltage

Device clamping voltage is normally specified for a junction temperature of 25ºC before surge. To extrapolate for other junction temperatures, the following formula may be used :

$$\Delta V_{BR} = \alpha T_{(VBR)} * (T_j - 25) * V_{BR}$$

Where :

ΔV_{BR} = Change in voltage (V)

$\alpha T_{(VBR)}$ = Temperature coefficient of breakdown voltage (V/ºC)

V_{BR} = Breakdown (or clamping) voltage (V)

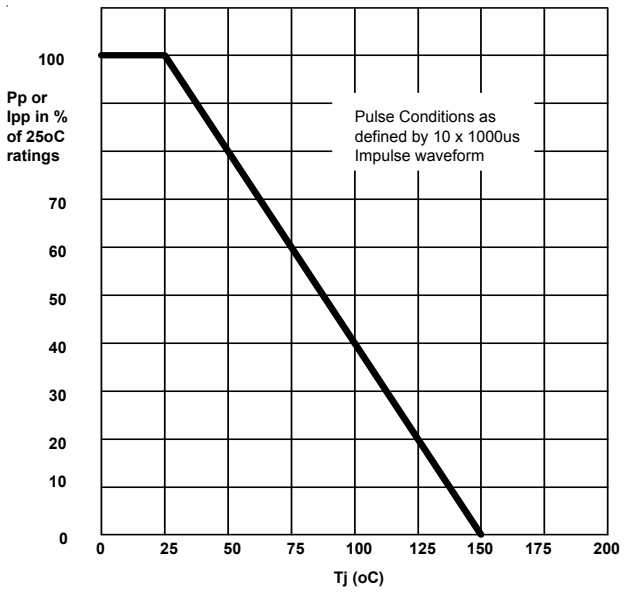

Figure 1 - Peak Pulse Power vs. Pulse Duration for a 1500W TVS Diode