



COMPONENT NEWS

EVALUATION ENGINEERING

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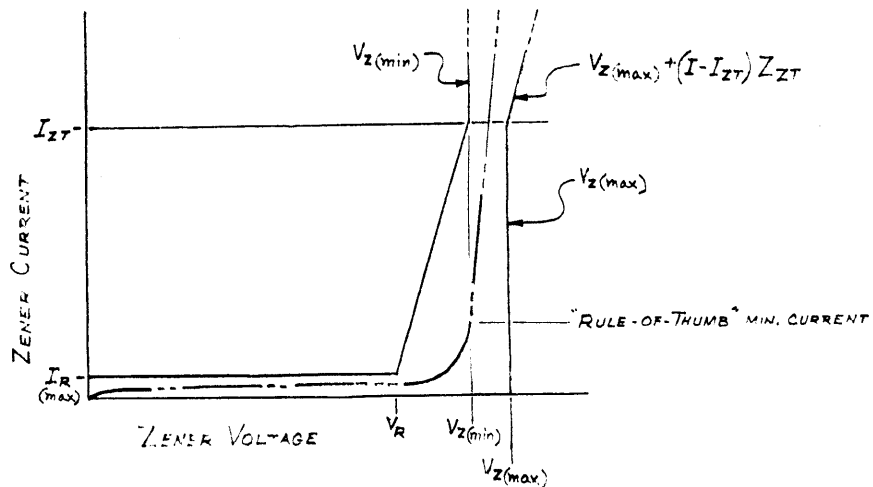
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COMPILED BY PRODUCT RELIABILITY INFORMATION

NO. 130 DATE 5-5-70

WORST-CASE ZENER VOLTAGE DETERMINATION

Zener diode voltage is normally specified at a single test current, I_{ZT} , which is about 10 to 30 percent of maximum current. A maximum impedance is normally specified at this same test current. Impedance decreases with increasing current. At higher currents the zener voltage will not be less than the minimum voltage at I_{ZT} , and will not be greater than the maximum voltage plus the maximum impedance times the additional current. At current levels below I_{ZT} the highest zener voltage will be no greater than the maximum at I_{ZT} . However, it is very difficult to determine the actual minimum voltage at any given current.



A maximum leakage current is often specified at a voltage which is usually equal to 80 percent of V_Z (min). The zener voltage below this current is completely indeterminate. If the zener is to be used as a maximum voltage clamp this fact must be kept in mind. The zener voltage will not fall below a line drawn between the points of maximum leakage at V_R and minimum voltage at I_{ZT} .

This procedure works well on all devices where these parameters are specified. Unfortunately, zeners below about 6.8V, which have the poorest knee characteristics, have the loosest specifications. There are two solutions to prevent problems when using these devices. One is to go to the additional expense of a new part number with the voltage specified at the actual operating current. The other is to design the circuit to provide a minimum current which is great enough to be above the curve of the zener knee. The following table lists such "Rule-of-Thumb" currents for various nominal zener voltages for 400mW devices. Although the zeners which we purchase normally have sharper knees than indicated by the minimum current values shown, it

is possible for a customer to purchase replacement parts which are this poor. For unlisted voltages use the current indicated for the next lower voltage.

<u>VOLTAGE</u>	<u>MIN. CURRENT</u>	<u>VOLTAGE</u>	<u>MIN. CURRENT</u>
2.7V	20mA	5.1V	5 mA
3.0	19	5.6	3
3.6	16	6.2	2
3.9	13	6.8	1
4.3	10	7.5	.5
4.7	7	10.0	.25

When using all of the preceding information keep in mind that the zener voltage also changes with temperature. Temperature coefficient information can be obtained from the latest issue of the Tektronix Semiconductor Directory.

For more information, contact me at Ext 345.

-Norm Dodge