Name: Emmanuel Chris 1st May, 2020.
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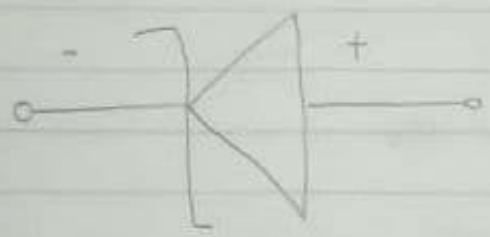
Dept: Mechatronics engineering

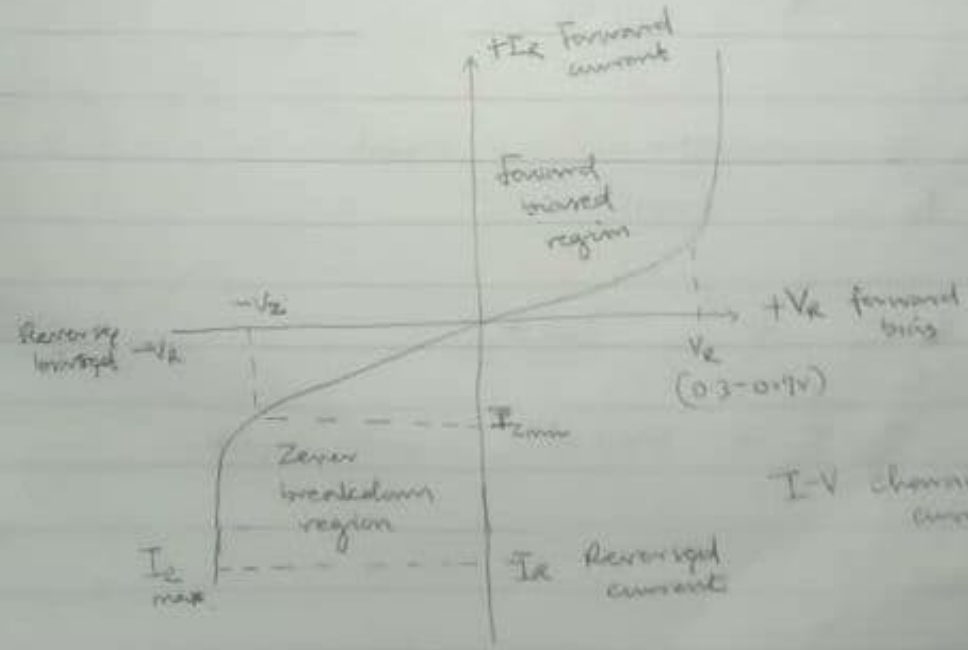
1. A zener diode is a general purpose signal diode consisting of a silicon PN junction. When the diode is forward-biased it behaves as a normal diode would, allowing the rated current to pass. When the reverse voltage applied across the zener diode exceeds the rated voltage of the device, the diode breakdown voltage is reached. This breakdown occurs in the semiconductor depletion layer and a current starts to flow through the diode to limit the increase in voltage.

i



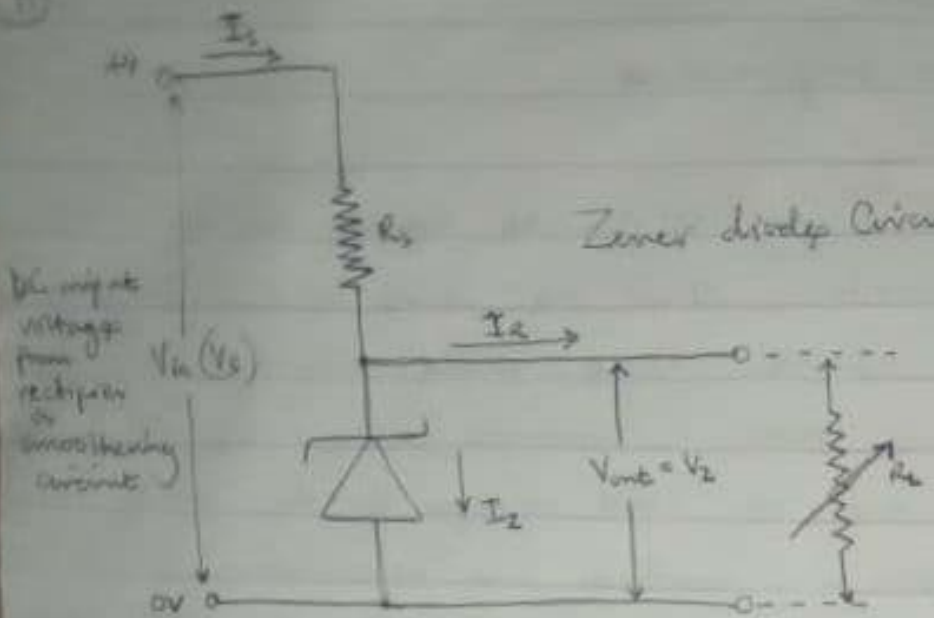
Zener diode symbol

ii



I-V characteristic curve

(1)



Zener diode Circuit diagram.

(2.) $P_z = 5W$

$I_s = 500mA$

$V_s = 20V_{max}$

$V_z = ?$, $R_s = ?$, $I_z = ?$

$$V_z = \frac{P_z}{I_s} = \frac{5}{500\times10^{-3}} = 10V$$

$$V_{DC} = \frac{2V_{max}}{\pi} = \frac{2\times20}{\pi} = 12.73V_{DC}$$

(1) $$R_s = \frac{V_s - V_z}{I_z} = \frac{12.73 - 10}{500\times10^{-3}} = 5.46\Omega$$

(2) $$I_L = \frac{V_z}{R_L} = \frac{10}{500} = 0.02A$$

$$I_z = I_s - I_L = 500\times10^{-3} - 0.02 = 0.48A.$$