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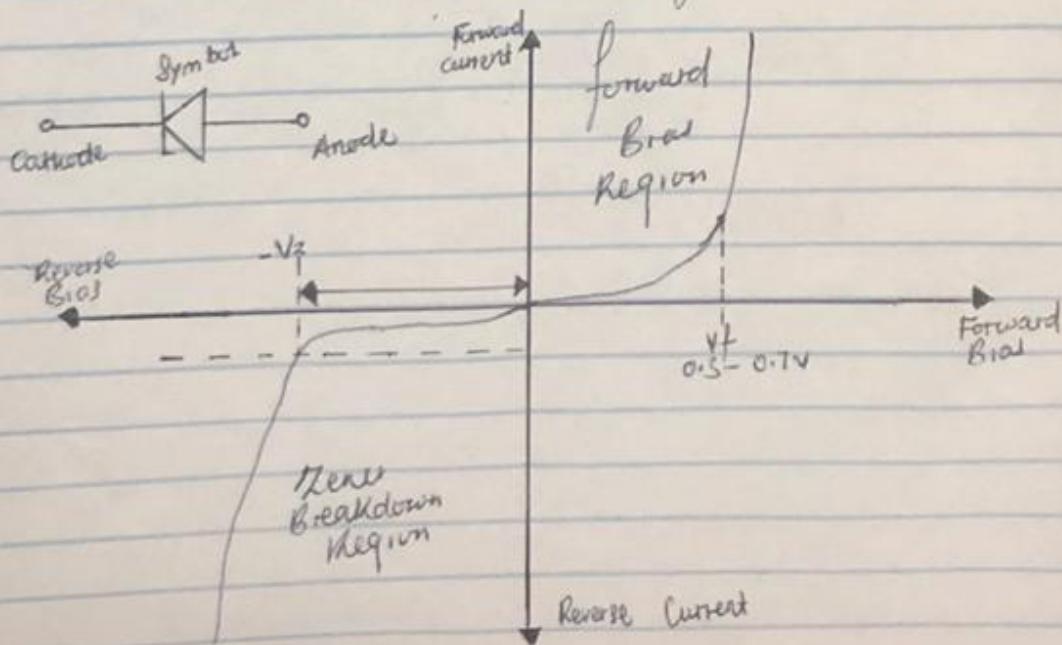
A Zener diode behaves just like a normal general-purpose diode consisting of a silicon PN junction and when biased in the forward direction, that is Anode positive with respect to its Cathode, it behaves just like a normal signal diode passing the rated current.

The current now when the reverse voltage is applied across the zener diode now goes beyond the rated voltage this process can be called Avalanche Breakdown.

Now the current now flowing through the zener diode increases dramatically to the maximum circuit value and once this happens the reverse saturation current remains fairly constant over a wide range of reverse voltages.

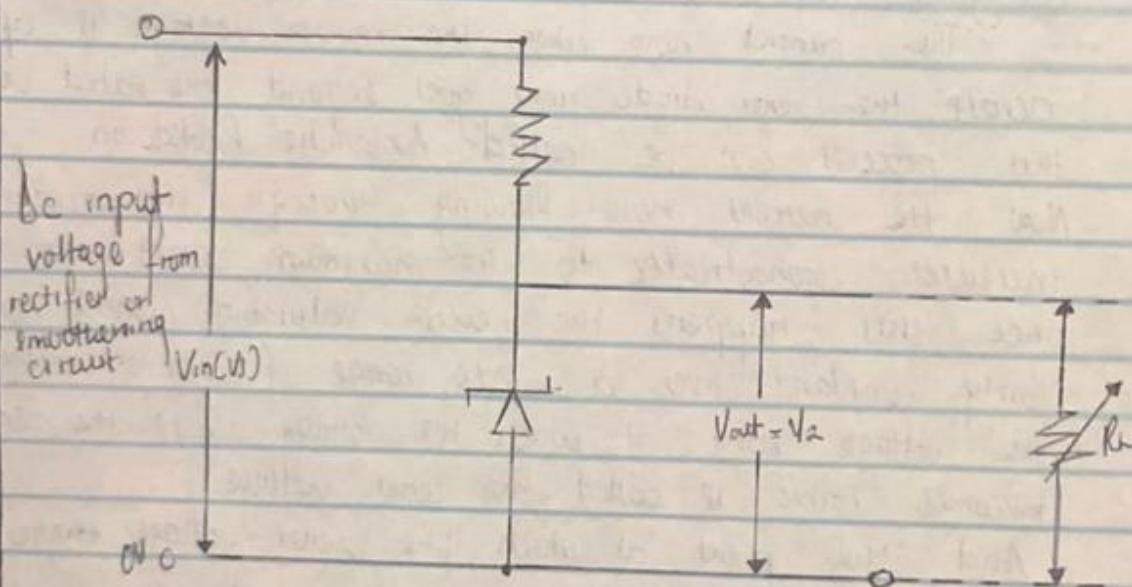
The voltage point at which the voltage across the zener diode becomes stable is called the zener voltage.

And the point at which the zener voltage triggers the current to flow through the diode can be controlled.



i. Circuit Diagram

The Zener Diode Regulator used to produce a stabilised voltage output with low ripple under varying load current conditions. By passing a small current through the diode from a voltage source, a suitable current limiting resistor (R_L) , the zener diode will conduct sufficient current to maintain a voltage drop of V_{out} .



$$2 \quad \text{Max Power} = 5W$$

$$I_Z = 500mA = 0.5A$$

$$20V_{max} = V$$

$$\therefore \text{The Maximum Current} = \frac{\text{Max Power}}{\text{Voltage}} = \frac{5W}{V}$$
$$= 0.5A$$

$$\text{But } V_Z = 10 \text{ volts}$$

But in Series

$$V_R + V_Z = V_{dc}$$

$$\text{And } V_{dc} = 2V_{max} / \pi$$

$$= 0.637V_{max} \quad 0.637V_{max}$$

$$V_R + V_Z = 12.74V$$

$$V_R + 10 = 12.74V$$

$$V_R = 12.74 - 10V$$

$$V_R = 2.74V$$

$$V_{dc} = 0.637 \times 20$$
$$= 12.74V_{dc}$$

$$\text{Minimum Resistance} = \frac{V_1 - V_2}{I_Z}$$

$$\text{While Minimum Resistance} = \frac{12.74 - 10}{0.5} = 5.48\Omega$$

$$\text{ii) Load Current } I_L, V_Z = 10, 0.02A \text{ or } 20mA$$
$$R = 500$$

$$I_L = V - I_Z \quad : \quad 500 - 20 = 480mA$$