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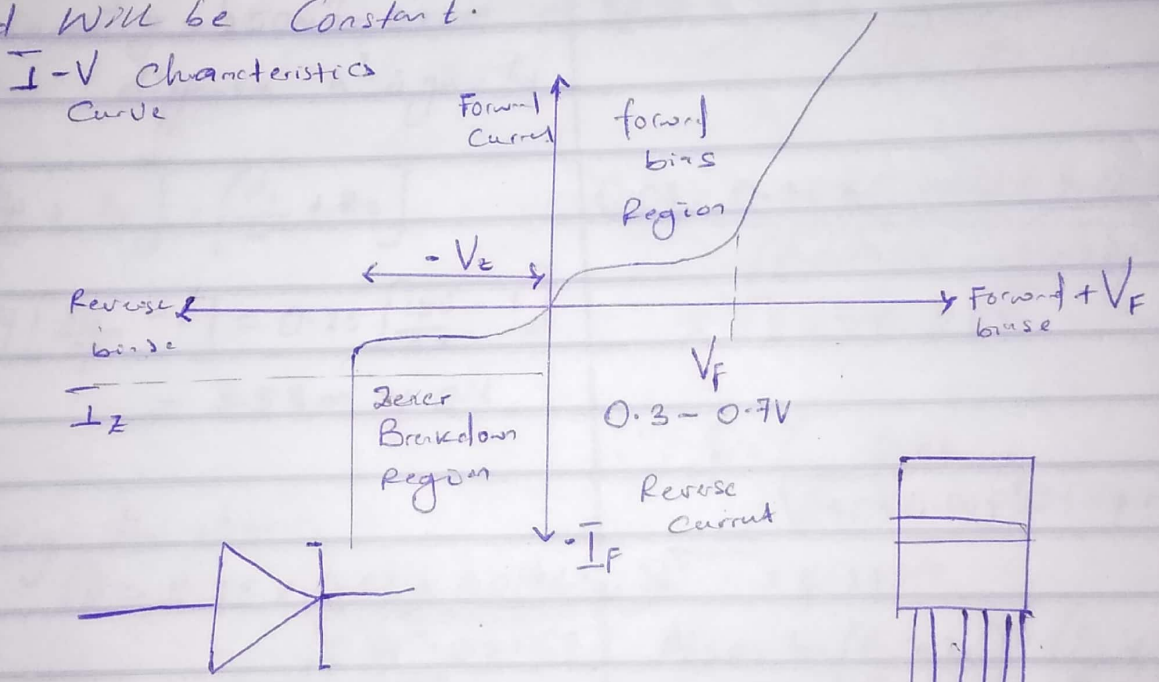
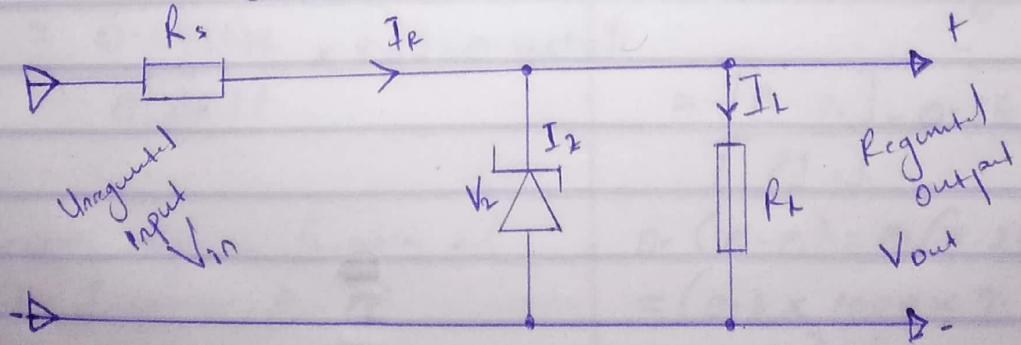
(1.) The zener diodes are used as shunt voltage regulators to regulate voltage across small loads. Zener diodes have a sharp reverse breakdown voltage and breakdown voltage will be constant for a wide range of currents. Hence the zener diodes will be connected parallel to the load such that the applied voltage will be reverse biased. If the reverse bias - voltage across the zener diode surpasses the knee voltage, the voltage across the Load will be Constant.



ZENER DIODE VOLTAGE REGULATOR Voltage Regulator

CIRCUIT DIAGRAM



2(I) Maximum Current = $\frac{\text{Watts}}{\text{Output voltage}}$

Watts = 5W

Max current = 500MA

Output voltage = ?

$V_s = 20 V_{max}$

$500MA = \frac{5}{V}$

$500V = 5$

Output Voltage = $\frac{5}{500MA} = \frac{5}{0.5A} = 10V_2$ (output voltage)

Minimum Value of the series resistor

$$R_s = \frac{V_s - V_2}{I_2}$$

recall $V_s = \frac{20 V_{max}}{\pi}$

$V_s = 0.318 \times 20$

$V_s = 6.36 V_{dc}$

$$R_s = \frac{V_s - V_2}{I_2}$$

$= \frac{6.36 - 10}{500MA} = -\frac{3.64}{0.5A} = -7.28\Omega$

(II) Load ~~Resisto~~ Current across the diode at 500Ω

$I_L = \frac{V_2}{R_L} = 10/100 = 20mA$ (0.02A)

∴ Zener Current $I_Z = I_s - I_L$

$= 500mA - 20MA = 480MA$ (0.48A)