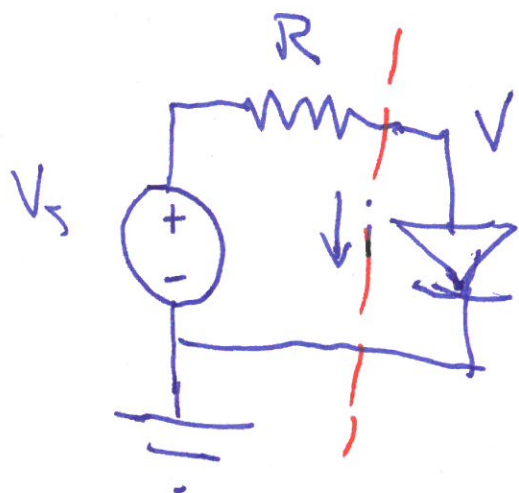
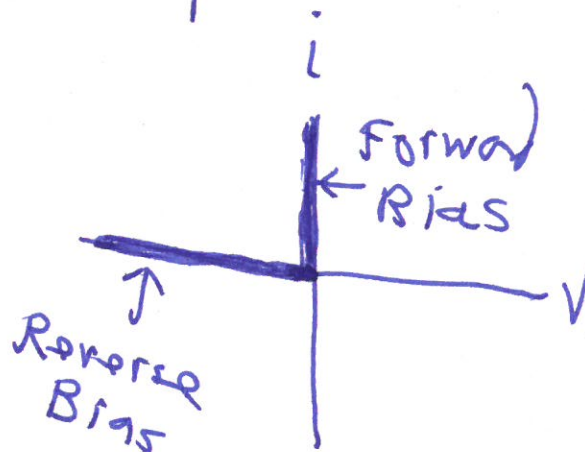
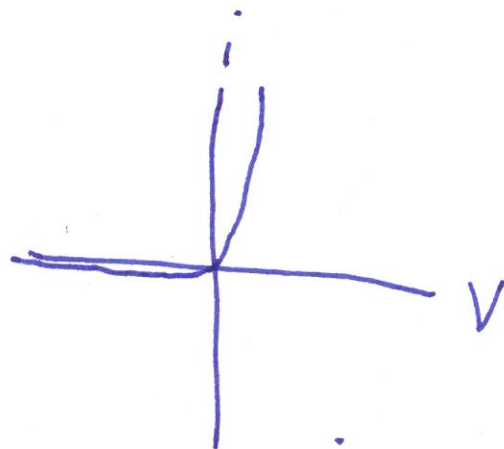


~~Wed~~ Wed 28 Sep 2018

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Simple ~~Diode~~ PNL



$$V = V_s - iR$$

$$i = \frac{V_s}{R} - \frac{V}{R}$$

Two Points

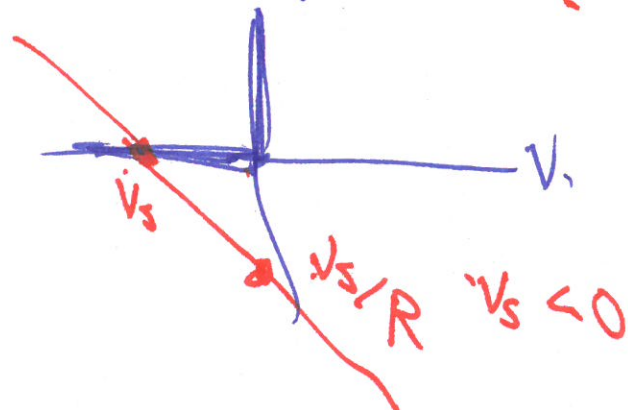
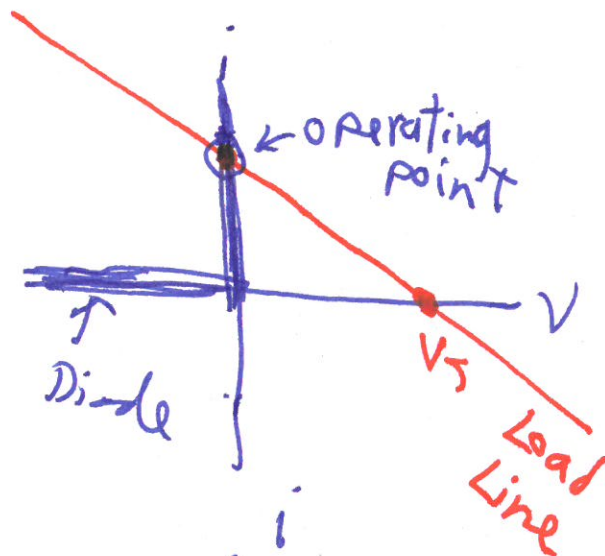
$$i = 0, V = V_s$$

$$V = 0, i = V_s/R$$

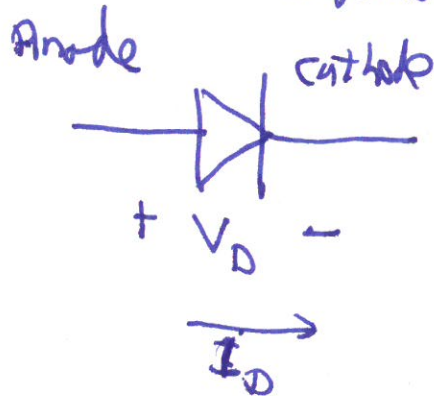
Diode Equations

$$V = 0, i > 0$$

$$i = 0, V < 0$$



Diode Symbol



Electrons

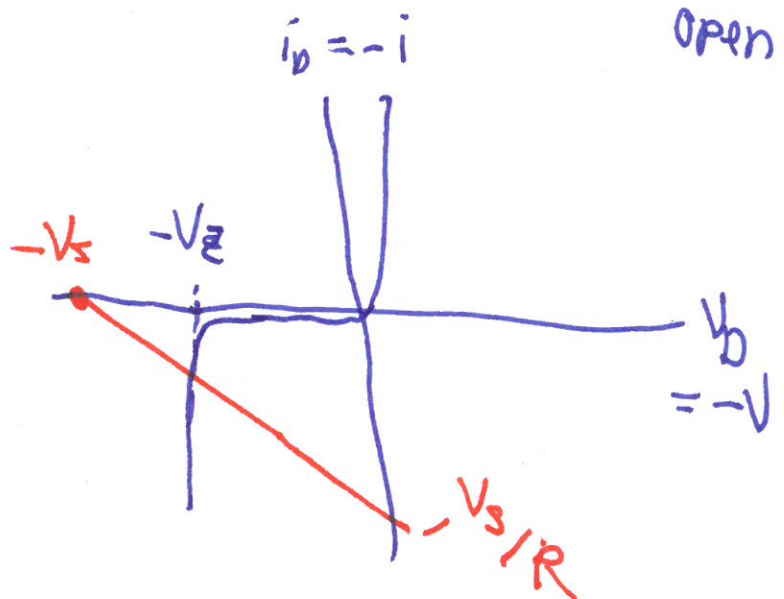
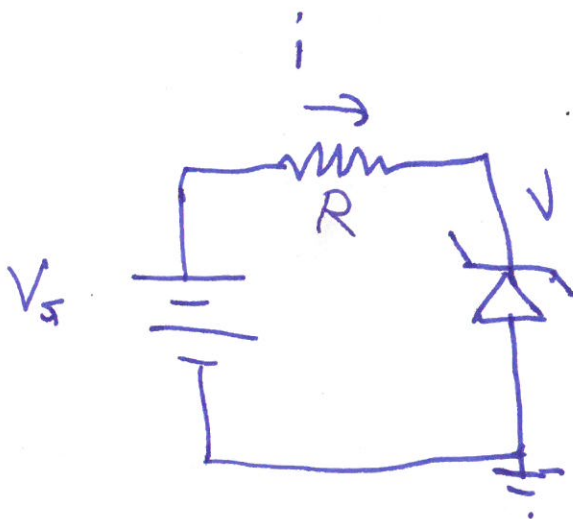


Short



Forward Bias $\rightarrow$ Diode on

Reverse " $\rightarrow$ " off
 $\downarrow$
 Open



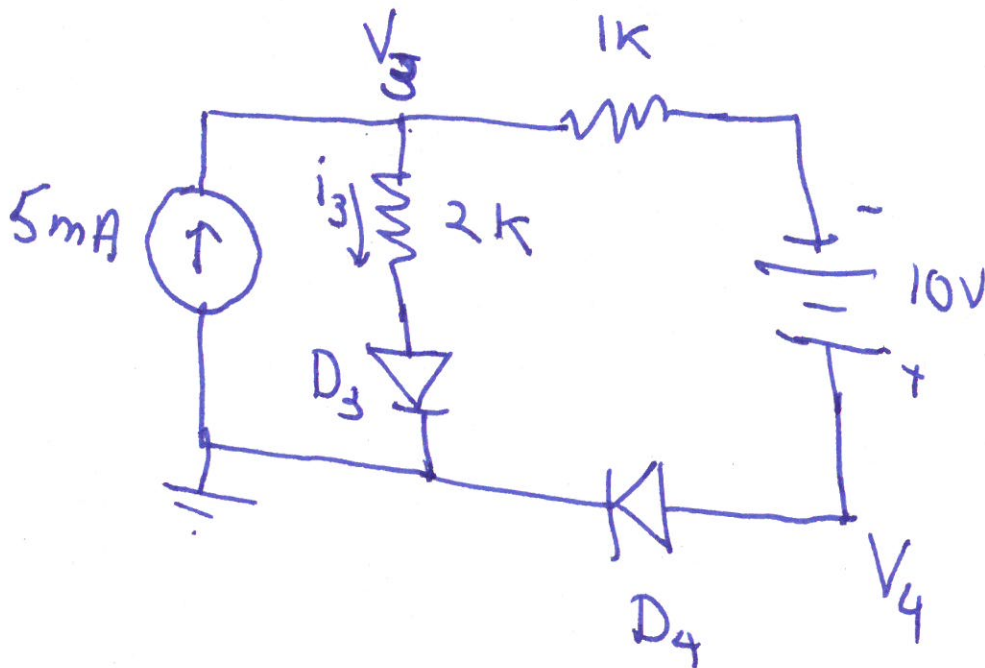
Breakdown Region

$$V = -V_B$$

Zener Region

$$V = -V_Z$$

(39)



Assume D_3 on $V_3 = 0$ $i_3 > 0$ $(?)$

D_4 on $V_4 = 0$ $i_4 > 0$ $(?)$

$$5\text{mA} = \frac{V_3}{2\text{k}} + \frac{V_3 - 10\text{V}}{1\text{k}}$$

$$5\text{mA} - 10\text{mA} = V_3 \left(\frac{1}{2\text{k}} + \frac{1}{1\text{k}} \right)$$

$$\frac{-5\text{mA}}{\frac{1}{2\text{k}} + \frac{1}{1\text{k}}} = V_3 = -3.33\text{V}$$

$$i_3 = \frac{-3.33\text{V}}{2\text{k}} < 0 \quad \underline{\text{Fail!}}$$

Assume D_3 off

$$i_3 = 0$$

$$V_3 < 0$$

D_4 on

$$V_4 = 0$$

$$i_4 > 0$$

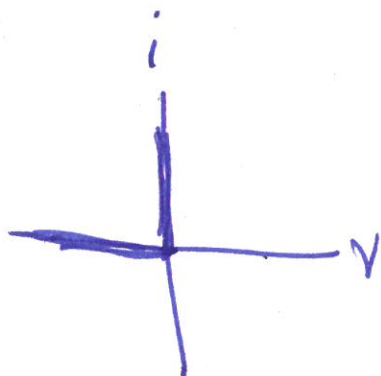
$$V_3 = 5 \text{ mA} \times 1 \text{ K} = 5 \text{ V} = -5 \text{ V}$$

$$V_3 < 0 \quad \underline{\text{OK}}$$

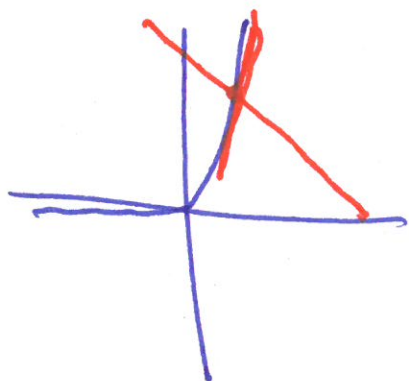
$$i_4 = 5 \text{ mA}$$

$$i_4 > 0$$

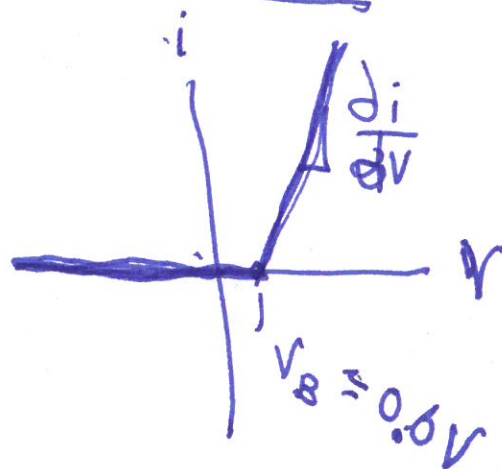
OK



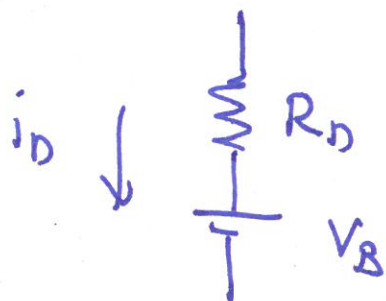
Simple



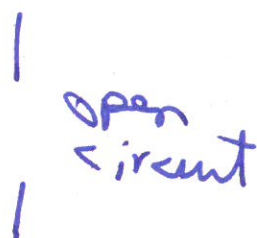
Real Diode



Better Approx



Forward Bias model



Reverse Bias model