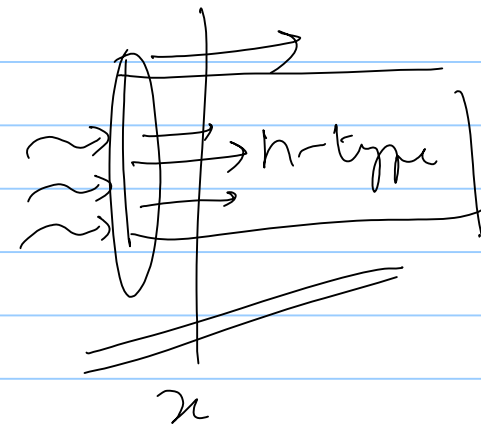
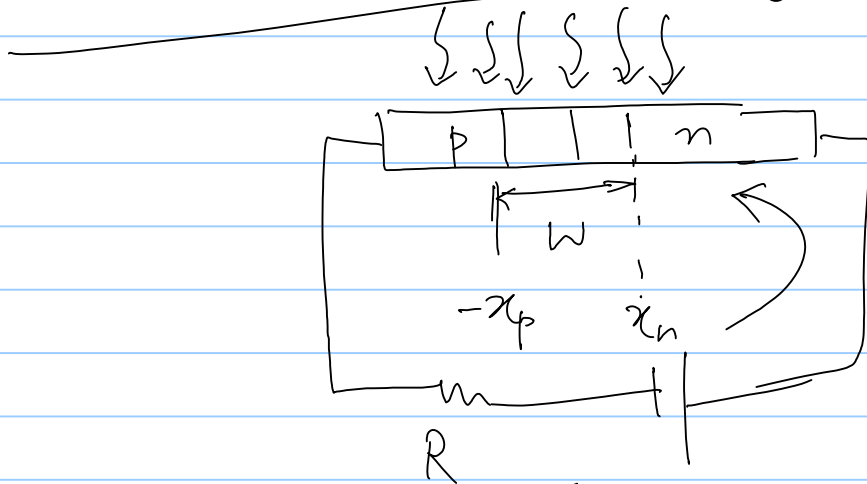


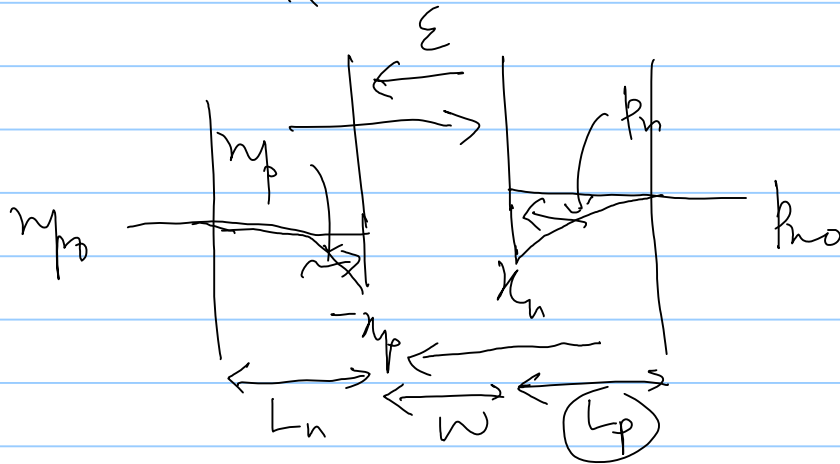
Photonic Application

13/10/2014

Photo-diode $h\nu > E_g$



$$J(x) = 0$$



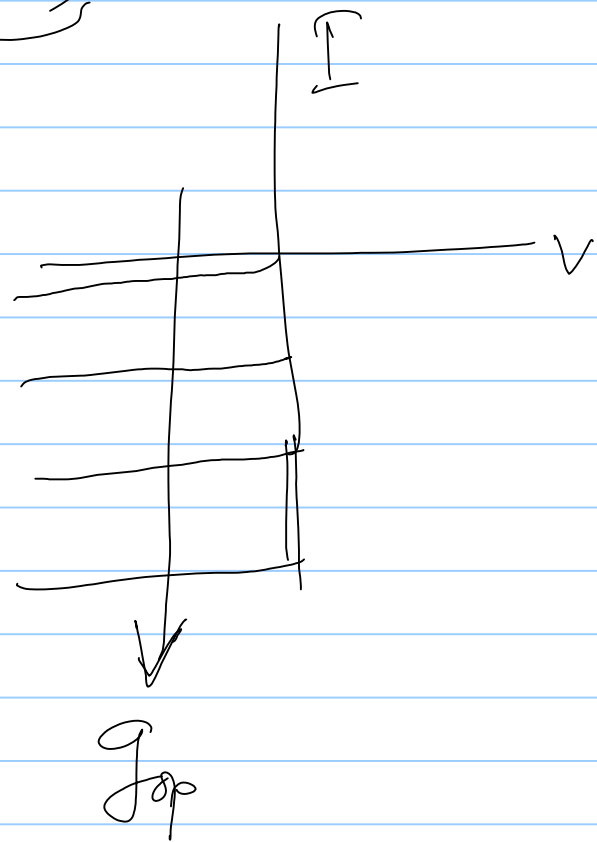
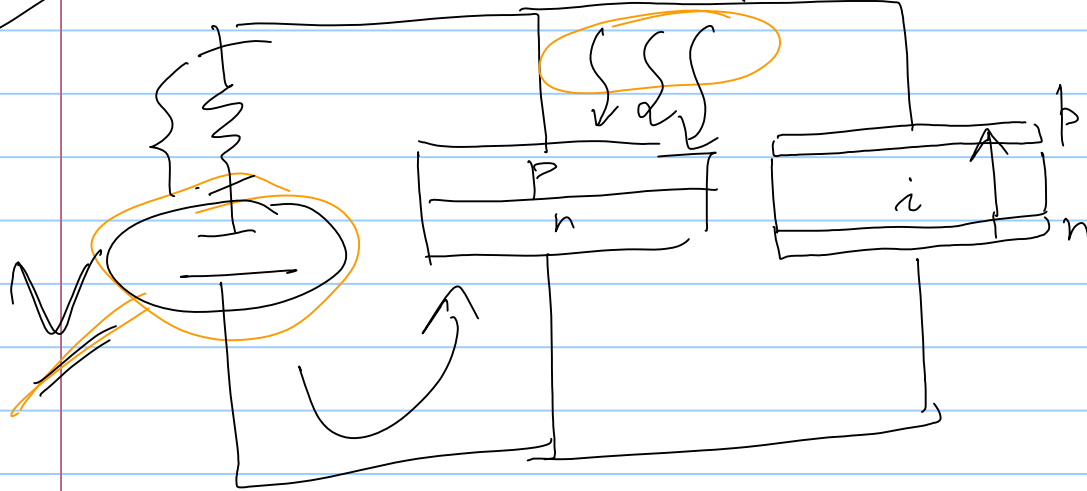
$$I = I_0 (e^{V/V_T} - 1) - I_{op}$$

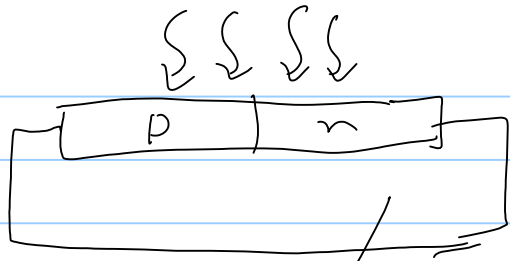
$$I_{op} = qA g_{op} (L_n + L_p + W)$$

$$g_{op} \rightarrow \text{EHP/cm}^3\text{-sec}$$

Avalanche
photo-detector

$$I = -I_0 - I_{op}$$





Short ckt

$$I_{sh} = I_0 (e^{0/V_T} - 1) - I_{op} = -I_{op}$$

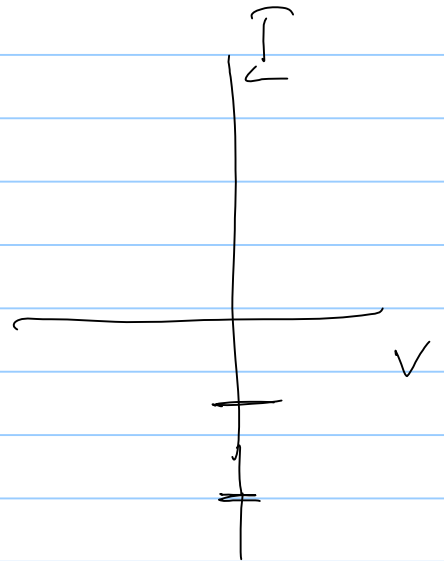
Open ckt

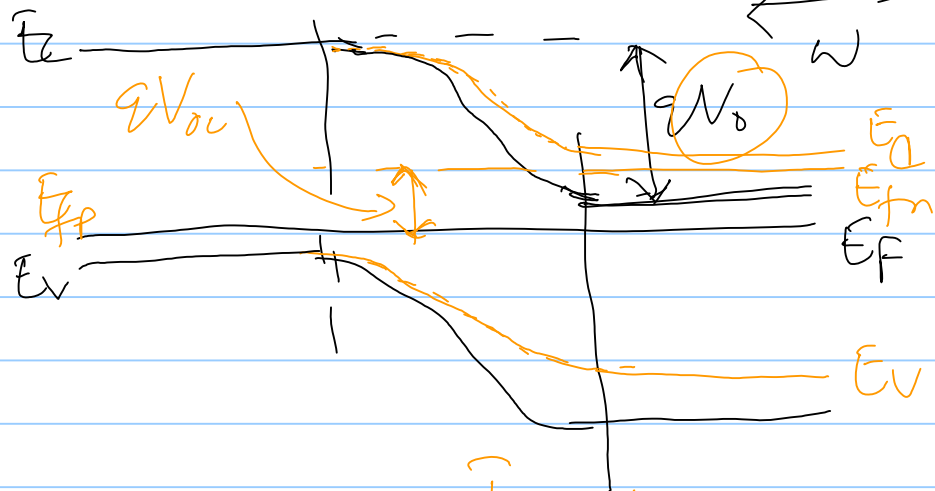
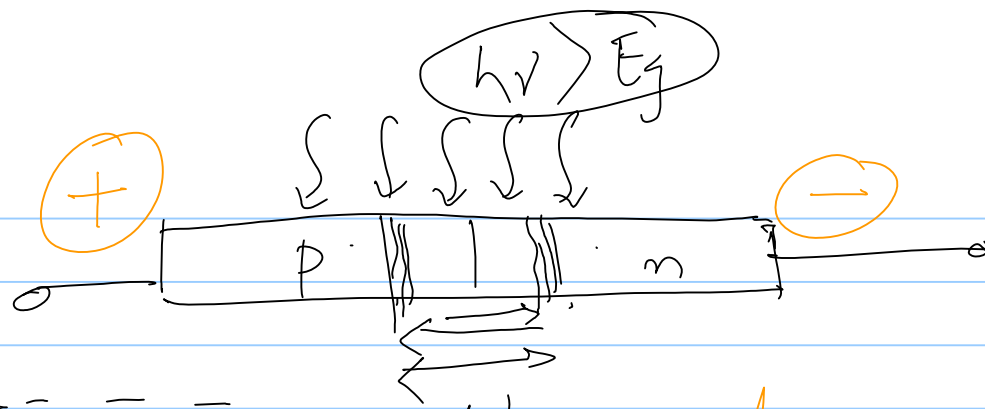
$$I = 0 = I_0 (e^{V/V_T} - 1) - I_{op}$$

$$V_{oc} = V_T \ln \left[1 + I_{op}/I_0 \right]$$

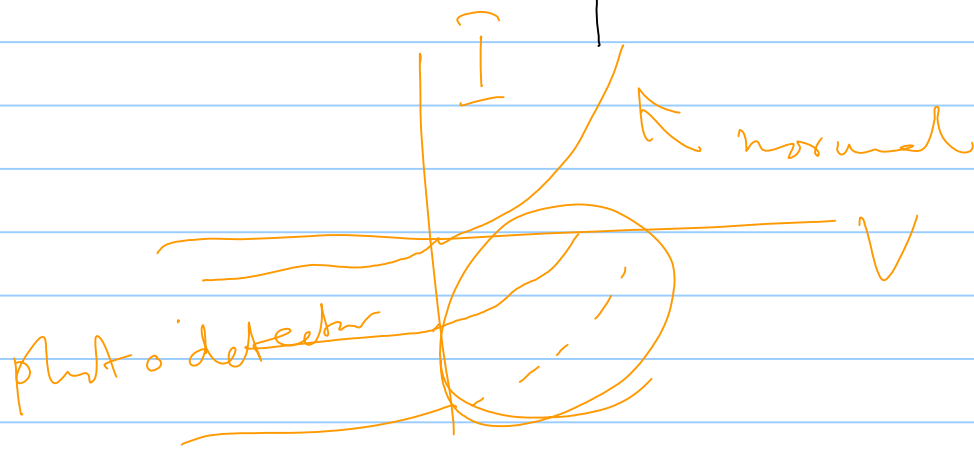
$$= V_T \ln \left[1 + \frac{I_{op} (L_n + L_p + W)}{\dots} \right]$$

$$\left(\frac{L_n}{2L_n} \alpha_{pno} + \frac{L_p}{4} \beta_{no} \right)$$





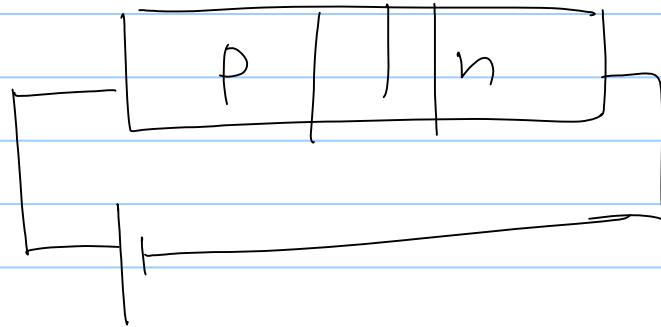
Appearance of forward bias due to light in a p-n junction is known as photo-voltaic effect.



LED / LASER →

population inversion
stimulated

Light Emitting Diode



Recombination

E_g

Indirect Bandgap semiconductor //

↳ photon

Direct Bandgap semiconductor $\lambda = \frac{hc}{E_g}$

GaAs. → Radiative recombination