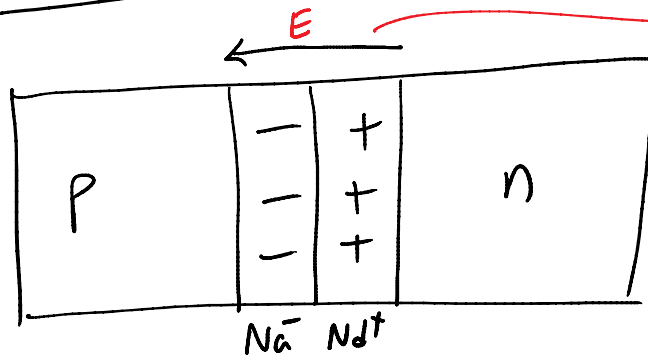


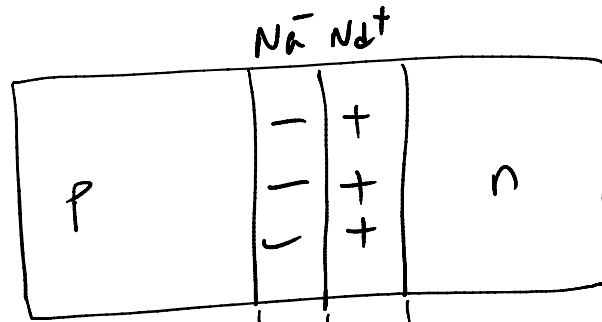
LECTURE 13

SPACE CHARGE AT A PN JUNCTION



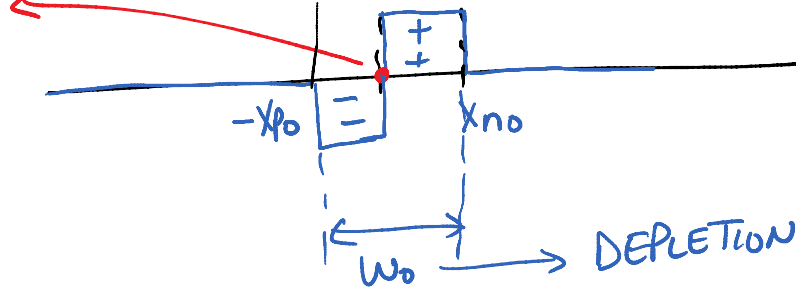
ENSURES THAT
THERE ARE
NO CARRIERS
AT ANY GIVEN
TIME IN THE
TRANSITION REGION

∴ SPACE CHARGE IN THE TRANSITION REGION
IS ONLY DUE TO UNCOMPENSATED DONOR
AND ACCEPTOR IONS



X-DIRECTION

ORIGIN



A → AREA

P_{SIDE}

$$Q_- = -q (N_{a\bar{}} - N_{d+}) A x_{p0}$$

$$= -q (N_{a\bar{}})_{eff} A x_{p0}$$

N_{SIDE}

$$Q_+ = q (N_{d+} - N_{a\bar{}}) A x_{n0}$$

$$= q (N_{d+})_{eff} A x_{n0}$$

AT EQUILIBRIUM \rightarrow SPACE CHARGE
EQUILIBRIUM

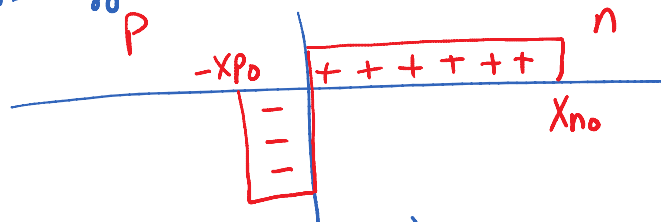
$$|Q_-| = |Q_+|$$

$$\Rightarrow (N_{A\bar{p}} - N_{Dp^+}) x_{p0} = (N_{Dn^+} - N_{A\bar{n}}) x_{n0}$$

$$(N_{A\bar{p}})_{\text{eff}} x_{p0} = (N_{Dn^+})_{\text{eff}} x_{n0}$$

IF $(N_{A\bar{p}})_{\text{eff}} = (N_{Dn^+})_{\text{eff}} \Rightarrow x_{p0} = x_{n0}$

IF $(N_{A\bar{p}})_{\text{eff}} = 100 (N_{Dn^+})_{\text{eff}} \Rightarrow 100 x_{p0} = x_{n0}$



IF $100 (N_{A\bar{p}})_{\text{eff}} = (N_{Dn^+})_{\text{eff}} \Rightarrow x_{p0} = 100 x_{n0}$

