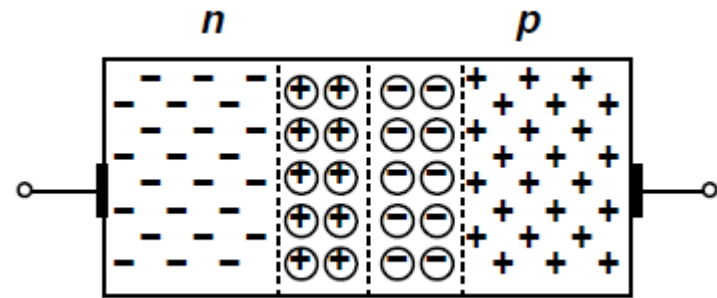
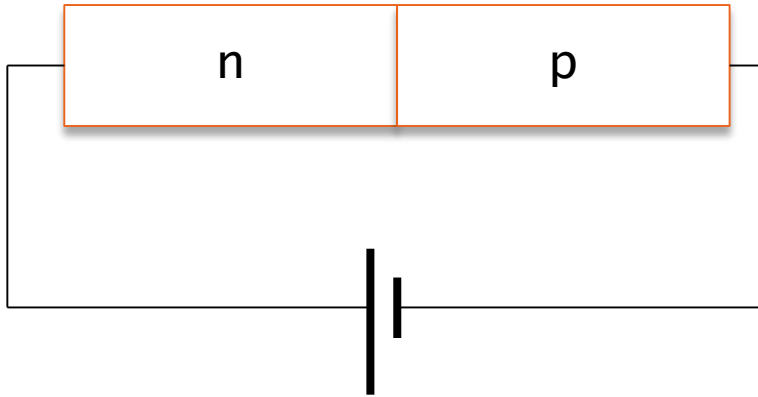


# Lesson 5. PN Junction with Bias

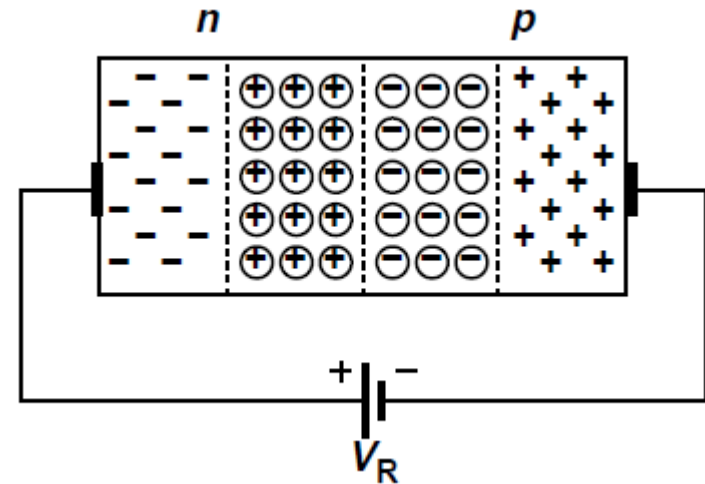
2014142086 Lee Youngchang

# Lesson 5. PN Junction with Bias

## ▶ Reverse Bias

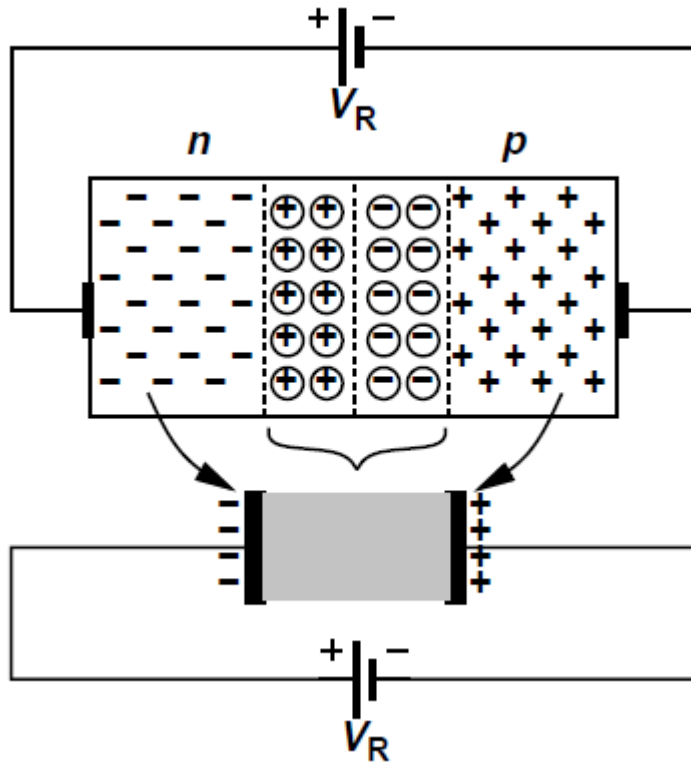


Current : negligible



# Lesson 5. PN Junction with Bias

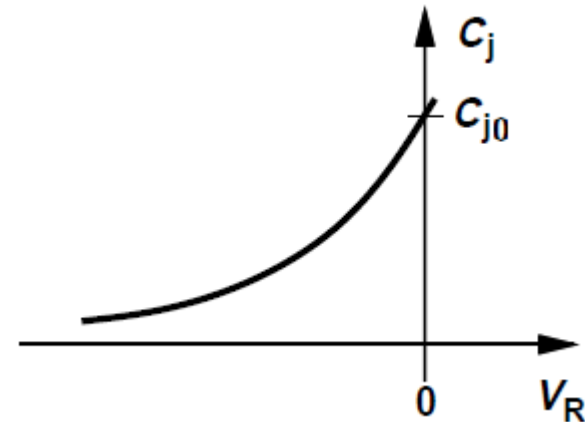
## ▶ Reverse Bias



Capacitance : controlled by  $V_R$

➔ Electronically variable capacitor (varactor)

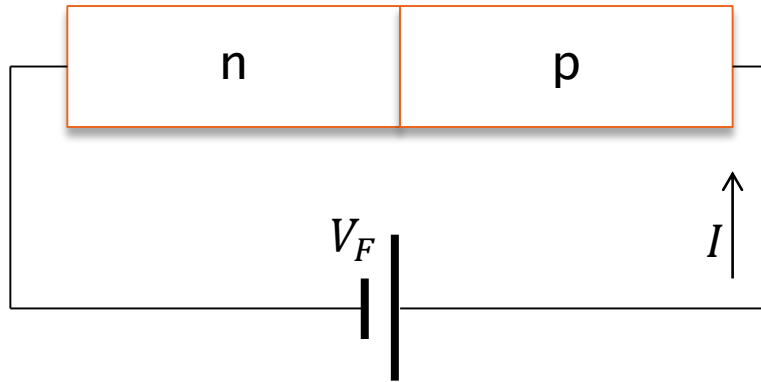
$$C_j = \frac{C_{j0}}{\sqrt{1 - \frac{V_R}{V_0}}} \quad (V_R < 0)$$



$$C_{j0} = \sqrt{\frac{\epsilon q}{2} \frac{N_A N_D}{N_A + N_D} \frac{1}{V_0}}$$

# Lesson 5. PN Junction with Bias

## ▶ Forward Bias



Current flows well

$$I = I_s \left( \exp \frac{V_F}{V_T} - 1 \right) \quad V_T = \frac{kT}{q}$$

$$V_F > 4V_T \Rightarrow I \approx I_s \exp \frac{V_F}{V_T}$$

$$I_s = Aqn_i^2 \left( \frac{D_n}{N_a L_n} + \frac{D_p}{N_d L_p} \right)$$

