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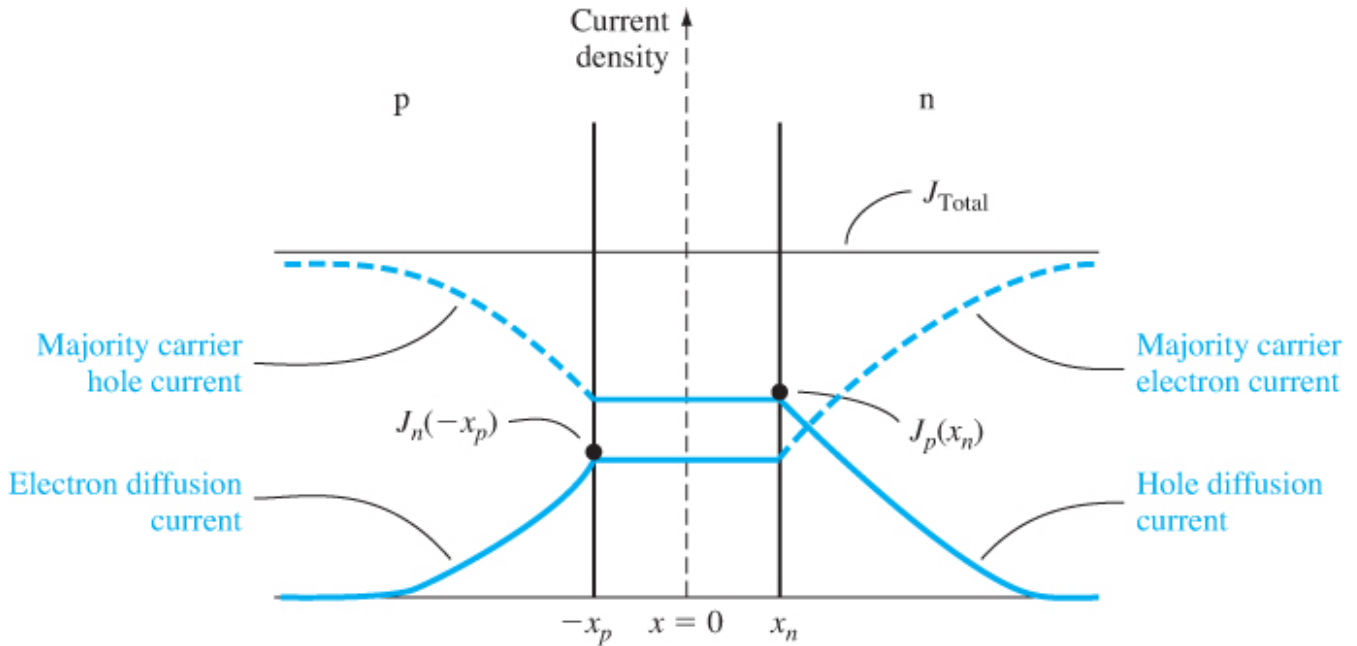


Figure 8.10 | Ideal electron and hole current components through a pn junction under forward bias.

➤ $J_{\text{Total}} = J = \left[\frac{eD_p p_{n0}}{L_p} + \frac{eD_n n_{p0}}{L_n} \right] \left(e^{eV_a/k_B T} - 1 \right) = J_s \left(e^{V_a/V_t} - 1 \right)$

➤ At 300 K, $V_t = k_B T / e = 0.025852 \text{ V}$.

➤ **p region** minority current density, $J_n(x) = \left[\frac{eD_n n_{p0}}{L_n} \right] \left(e^{V_a/V_t} - 1 \right) e^{(x_p+x)/L_n} \quad (x \leq x_p)$

➤ **p region** majority current density, $J_{p,\text{maj}}(x) = J - J_n(x) \quad (x \leq x_p)$

➤ **n region** minority current density, $J_p(x) = \left[\frac{eD_p p_{n0}}{L_p} \right] \left(e^{V_a/V_t} - 1 \right) e^{(x_n-x)/L_p} \quad (x \geq x_n)$

➤ **n region** majority current density, $J_{n,\text{maj}}(x) = J - J_p(x) \quad (x \geq x_n)$