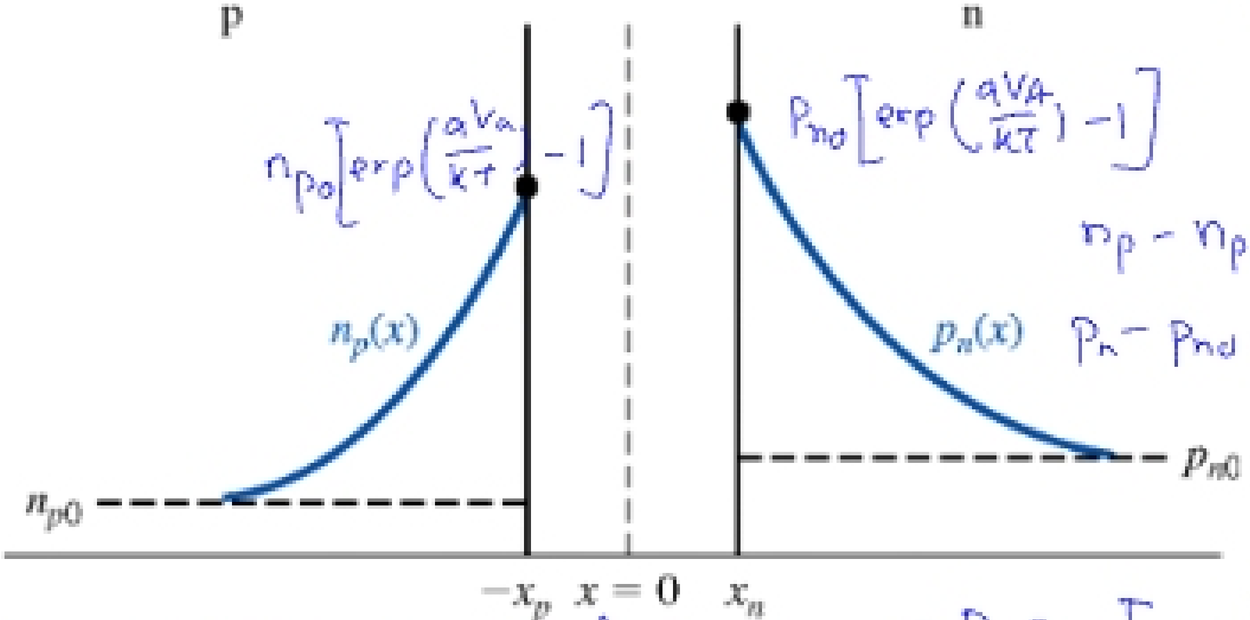
PENNSTATE

Minority Carrier Distribution



$$n_{po}\left[\exp\left(\frac{qV_a}{kT}\right)-1\right]$$

$$p_{no}\left[\exp\left(\frac{qV_A}{kT}\right)-1\right]$$

$$n_p - n_{po} = n_{po}\left[\exp\left(\frac{qV_a}{kT}\right)-1\right]\exp\left[\frac{x+x_p}{L_n}\right]$$

$$p_n - p_{no} = p_{no}\left[\exp\left(\frac{qV_a}{kT}\right)-1\right]\exp\left[\frac{x_n-x}{L_p}\right]$$

$$J_n(-x_p) = qD_n\frac{dn_p}{dx}\bigg|_{x=-x_p} = \frac{qD_n n_{po}}{L_n}\left[\exp\left(\frac{qV_a}{kT}\right)-1\right]$$

$$J_p(x_n) = -qD_p\frac{dp_n}{dx}\bigg|_{x=x_n} = \frac{qD_p p_{no}}{L_p}\left[\exp\left(\frac{qV_a}{kT}\right)-1\right]$$

$$J_{total} = J_n(-x_p) + J_p(x_n)$$

$$= \left[\frac{qD_n n_{po}}{L_n} + \frac{qD_p p_{no}}{L_p}\right]\left[\exp\left(\frac{qV_a}{kT}\right)-1\right]$$

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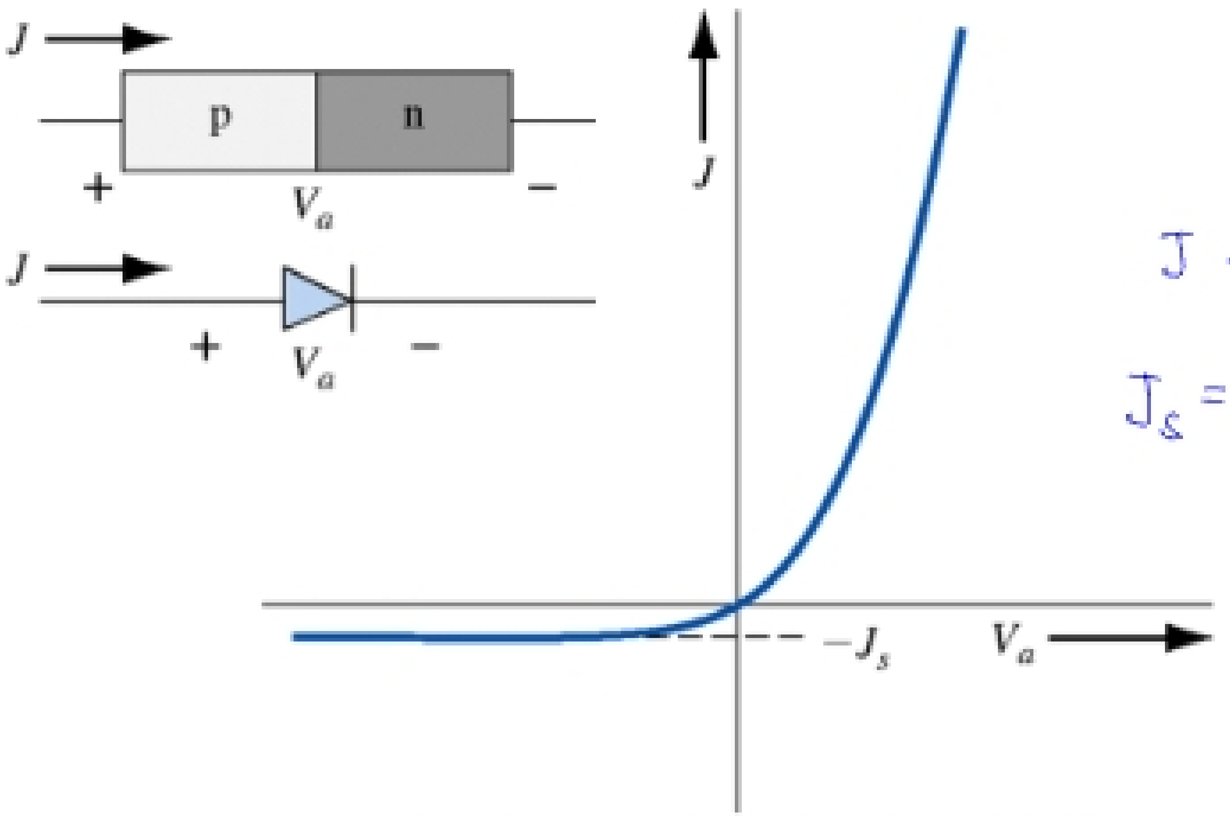

$$J = J_s\left[\exp\left(\frac{qV_a}{kT}\right) - 1\right]$$

$$J_s = \left[\frac{qD_n n_{po}}{L_n} + \frac{qD_p p_{no}}{L_p}\right]$$

J_s is referred to as the reverse saturation current density.

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