Learning Objective: PN Junction Diode Physics

Problem 1. A Silicon PN junction diode is designed to operate at $T = 300$ K such that the diode current is 10 mA at a forward bias diode voltage of 0.65 V. The current density is 20 A/cm^2 under this operating condition.

(a) Suppose $N_D = 5 \times 10^{17}$ cm^{-3}, $N_A = 5 \times 10^{15}$ cm^{-3}, calculate the **build-in potential barrier** of the PN junction diode.

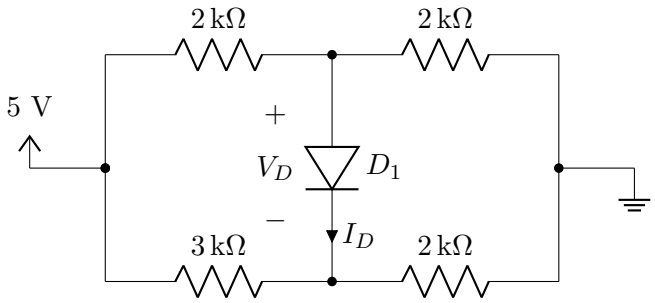
(b) Calculate the **power consumption** of this PN junction diode.

(c) Determine the **cross sectional area** of this diode.

(d) Determine the **reverse saturation current density** of this diode.

Learning Objective: PN Junction Diode DC Analysis

Problem 2. Calculate the **diode current** and **diode reverse saturation current** at $T = 300$ K from the circuit shown below, under diode voltage of (a) $V_D = 0.6$ V, (b) $V_D = 0.7$ V.



Problem 3. Calculate the **diode current $\mathbf{I_D}$** and **diode voltage $\mathbf{V_D}$** at $T = 300$ K from the circuit shown below. Assume the diode D_1 is ideal. (Use $I_s = 10^{-12}$ A)