

Tutorial #3

Problem 1 – pn junction electrostatics

Consider a pn junction with $N_a = 5 \times 10^{17} \text{ cm}^{-3}$ and $N_d = 10^{17} \text{ cm}^{-3}$ as sketched below in Figure T3.1.

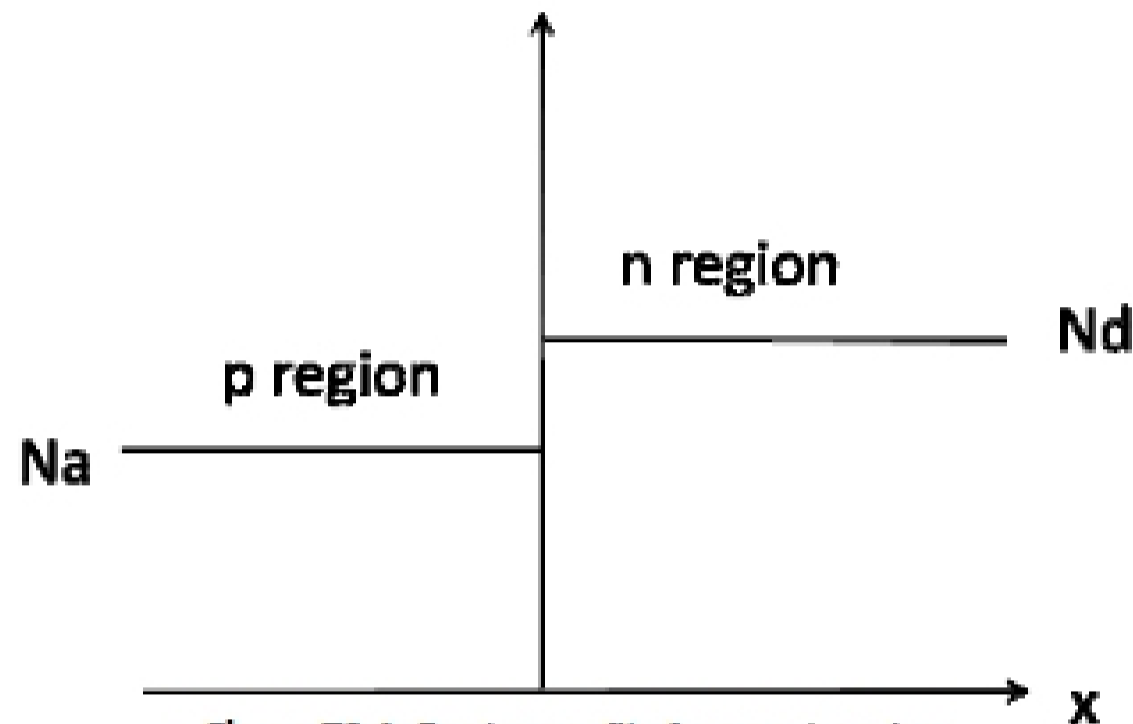


Figure T3.1: Doping profile for a pn junction

- What is the junction potential drop across the pn junction $\phi_j = \phi_b$ in thermal equilibrium?
- What is the depletion layer width X_{d0} in thermal equilibrium?
- What is the electrostatic field at $x=0$, $E(0)$, in thermal equilibrium?
- What is the electrostatic potential at $x=0$, $\phi(0)$, in thermal equilibrium?
- What is the total amount of charge per unit area on the p-type side of the junction in thermal equilibrium?
- What is depletion capacitance, C_v , in thermal equilibrium?
- How do parts a)-f) change with a reverse bias of $V_b = -3V$?

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