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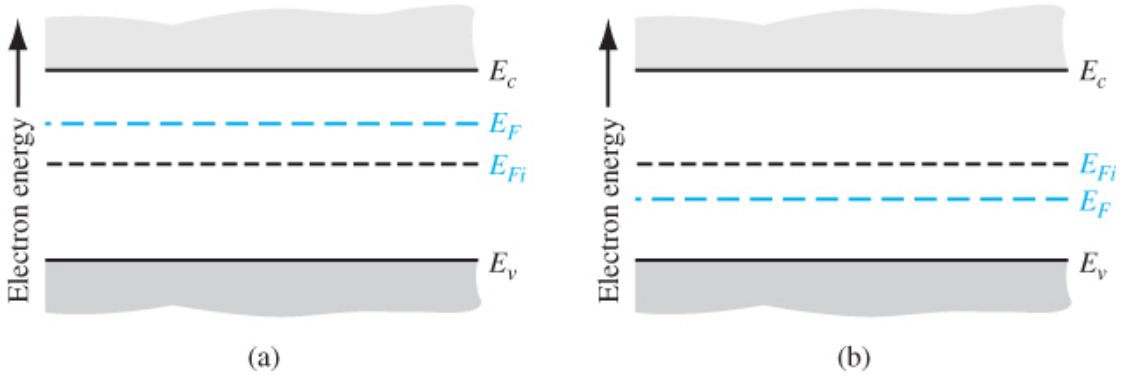

Figure 6.14 | Thermal-equilibrium energy-band diagrams for (a) n-type semiconductor and (b) p-type semiconductor.

- For ***n*-type** extrinsic semiconductors (left), E_F is greater than E_{Fi}, i.e., E_F gets closer to E_c.
- For ***p*-type** extrinsic semiconductors (right), E_F is less than E_{Fi}, i.e., E_F gets closer to E_v.

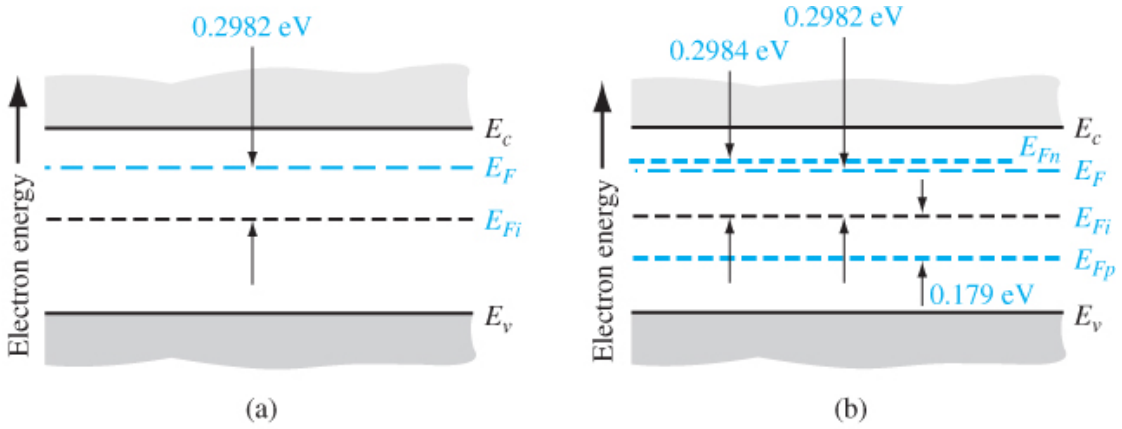

Figure 6.15 | (a) Thermal-equilibrium energy-band diagram for $N_d = 10^{15}$ cm^{-3} and $n_i = 10^{10}$ cm^{-3}. (b) Quasi-Fermi levels for electrons and holes if 10^{13} cm^{-3} excess carriers are present.

- For an ***n*-type** extrinsic semiconductor where $N_d = 10^{15}$ cm^{-3} (left), E_F is greater than E_{Fi}, i.e., E_F gets closer to E_c, as expected.
- When excess charge carriers $\delta p = \delta n = 10^{13}$ cm^{-3} are introduced, note that the quasi-Fermi energy level E_{Fn} for the **majority** electrons is only slightly larger than E_F. However, E_{Fp} for the **minority** holes moves dramatically toward E_v as δp is a big increase on top of p_0.