

Chapter 14-2. Schottky diode I-V characteristics

Schottky diode is a metal-semiconductor (MS) diode

Historically, Schottky diodes are the oldest diodes

MS diode electrostatics and the general shape of the MS diode I-V characteristics are similar to p^+n diodes, but the details of current flow are different.

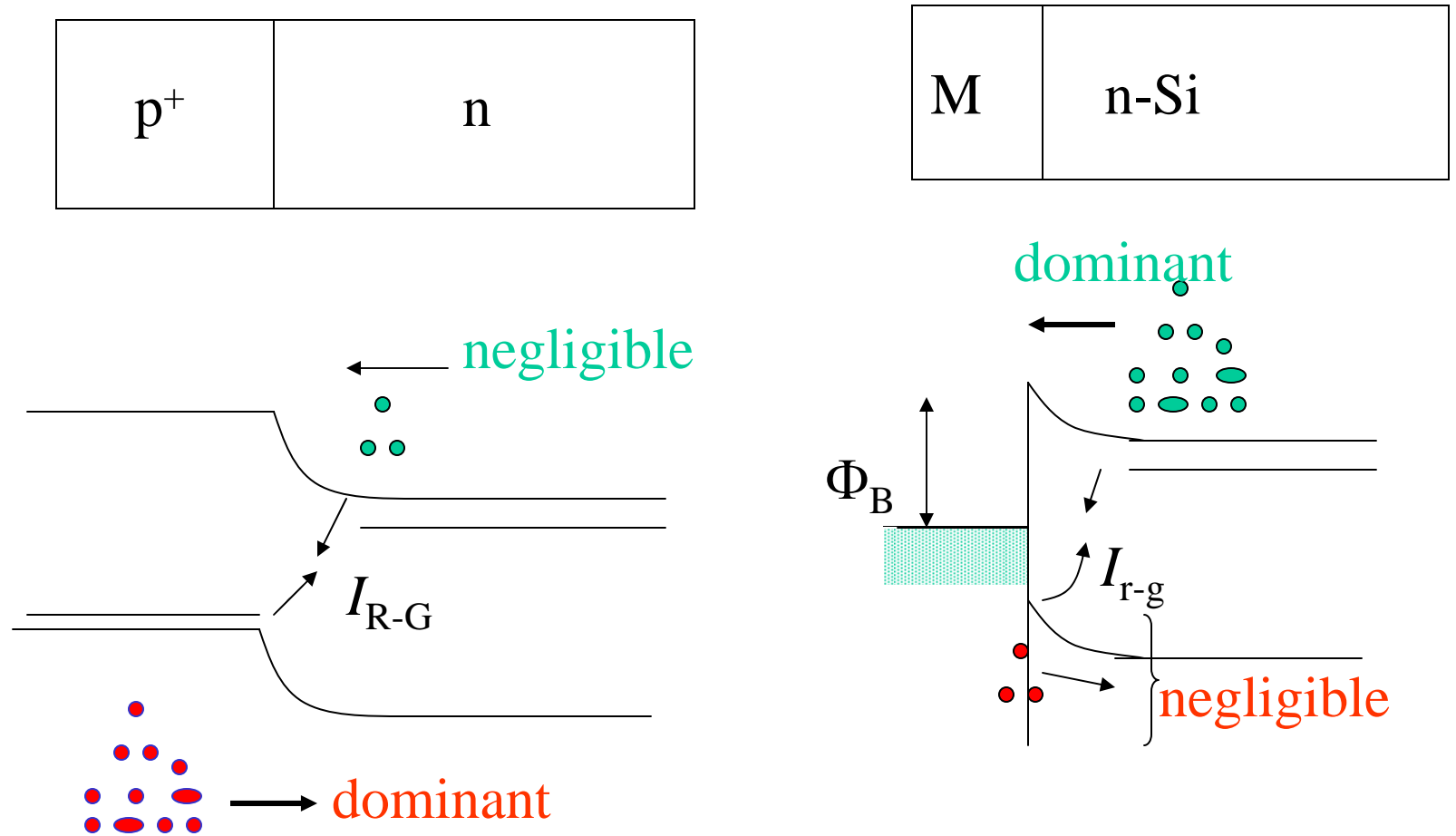
Dominant currents in a p^+n diode

- arise from recombination in the depletion layer under small forward bias.
- arise from hole injection from p^+ side under larger forward bias.

Dominant currents in a MS Schottky diodes

- Electron injection from the semiconductor to the metal.

Current components in a p⁺n and MS Schottky diodes



I-V characteristics

$$I = I_s \left(e^{\frac{qV_A}{kT}} - 1 \right) \quad \text{where} \quad I_s = A\mathcal{A}^* T^2 e^{-\frac{\Phi_B}{kT}}$$

where Φ_B is Schottky barrier height, V_A is applied voltage, A is area, and \mathcal{A}^* is Richardson's constant.

The reverse leakage current for a Schottky diode is generally much larger than that for a p⁺n diode.

Since MS Schottky diode is a majority carrier devices, the frequency response of the device is much higher than that of equivalent p⁺ n diode.