EE105 - Fall 2005

Microelectronic Devices and Circuits

Lecture 6

Currents in PN Junction

MOS Capacitor

Announcements

- Homework 3, due next week
- Reading: Chapter 3 (3.7-3.9)

Lecture Material

- Last lecture
  - PN junction
  - Diode capacitance
- This lecture
  - Diode currents
  - MOS capacitor

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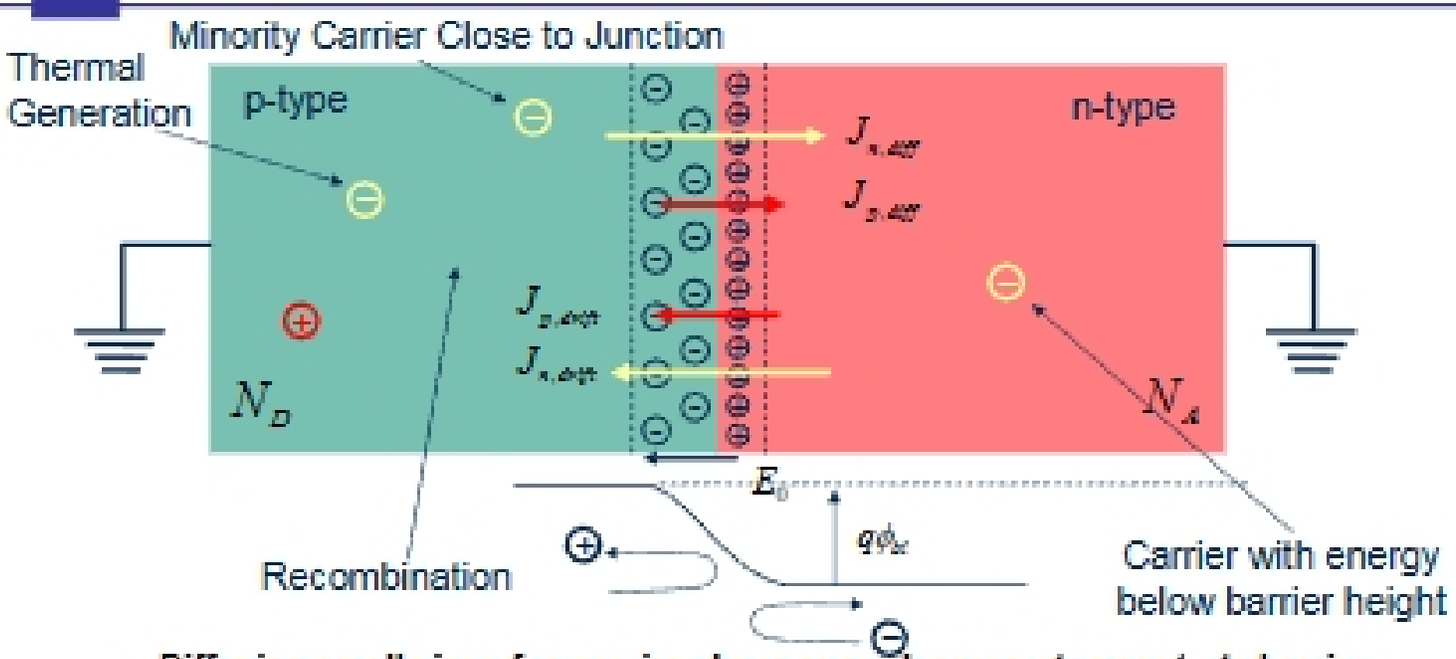
Diode under Thermal Equilibrium



- Diffusion small since few carriers have enough energy to penetrate barrier
- Drift current is small since minority carriers are few and far between: Only minority carriers generated within a diffusion length can contribute current
- Important Point: Minority drift current independent of barrier!
- Diffusion current strong (exponential) function of barrier

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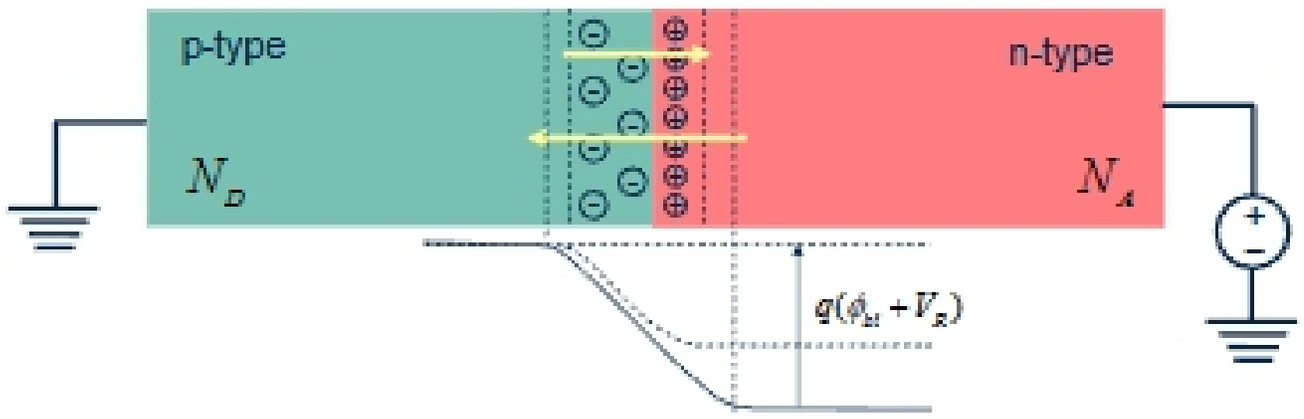
Reverse Bias

- Reverse Bias causes an increases barrier to diffusion
- Diffusion current is reduced exponentially



- Drift current does not change
- Net result: Small reverse current

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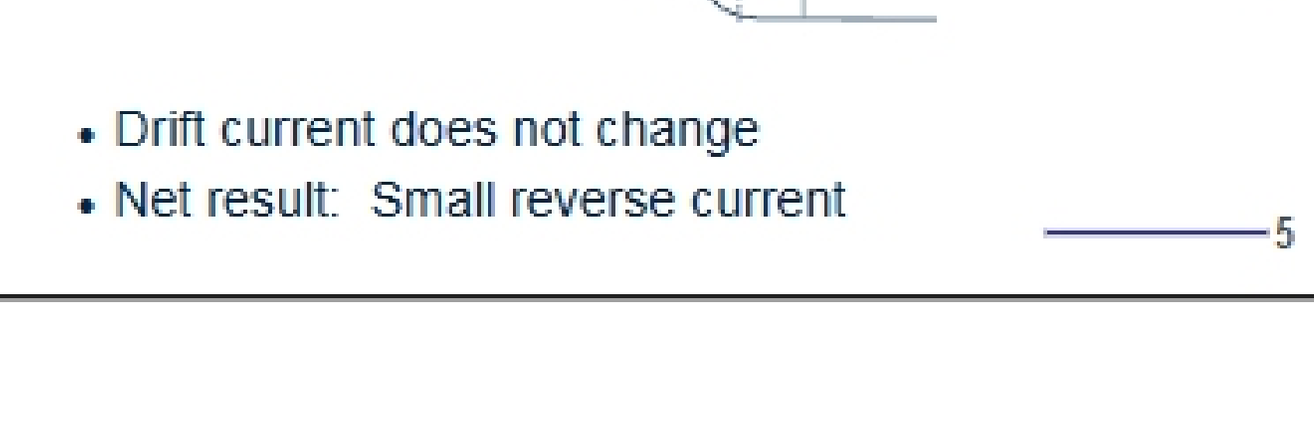
Forward Bias

- Forward bias causes an exponential increase in the number of carriers with sufficient energy to penetrate barrier
- Diffusion current ***increases*** exponentially



- Drift current does not change
- Net result: Large forward current

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