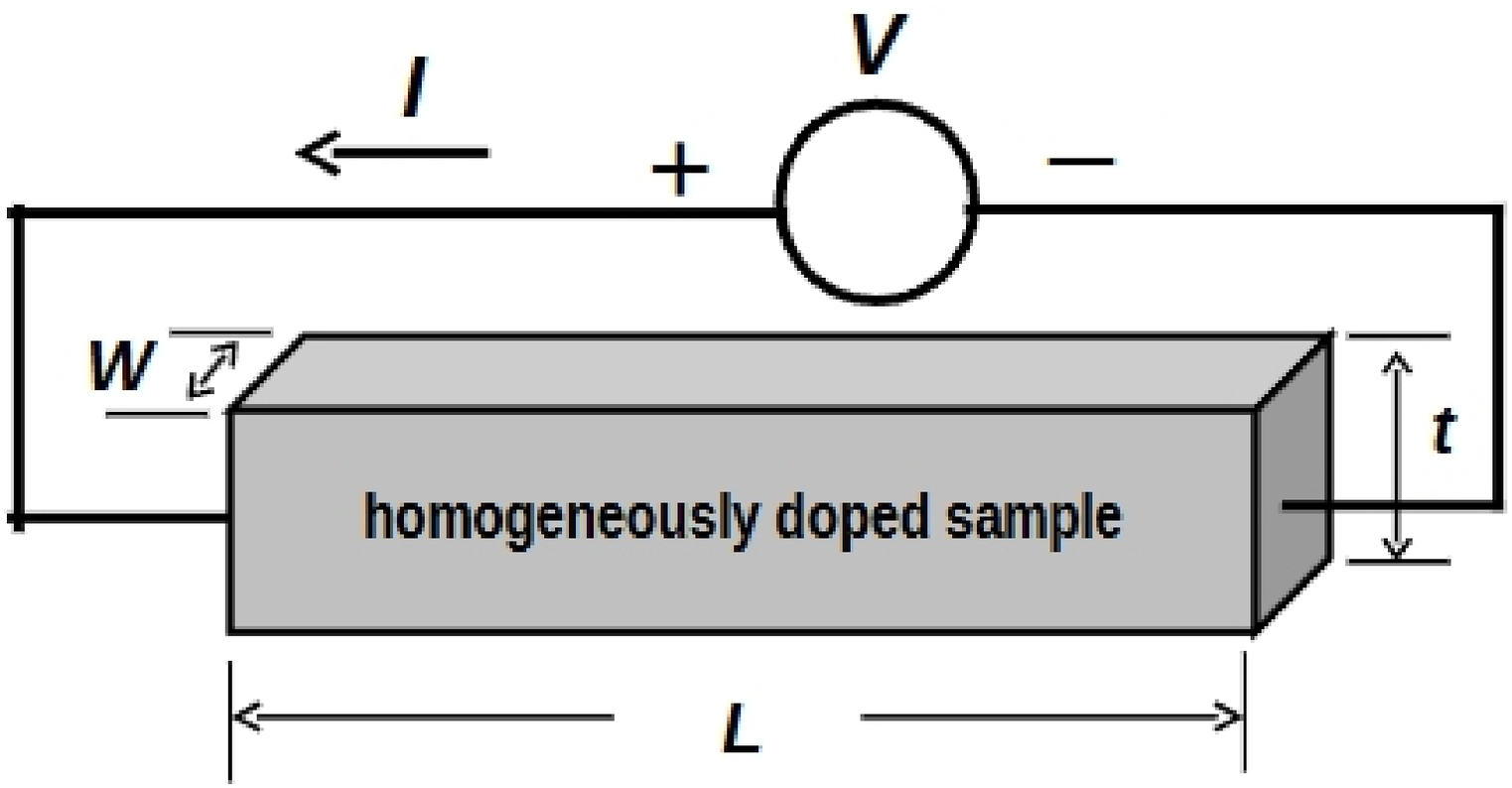
Lecture 3

OUTLINE

- Semiconductor Basics (cont'd)
  - Carrier drift and diffusion
- PN Junction Diodes
  - Electrostatics
  - Capacitance

Reading: Chapter 2.1-2.2

Electrical Resistance

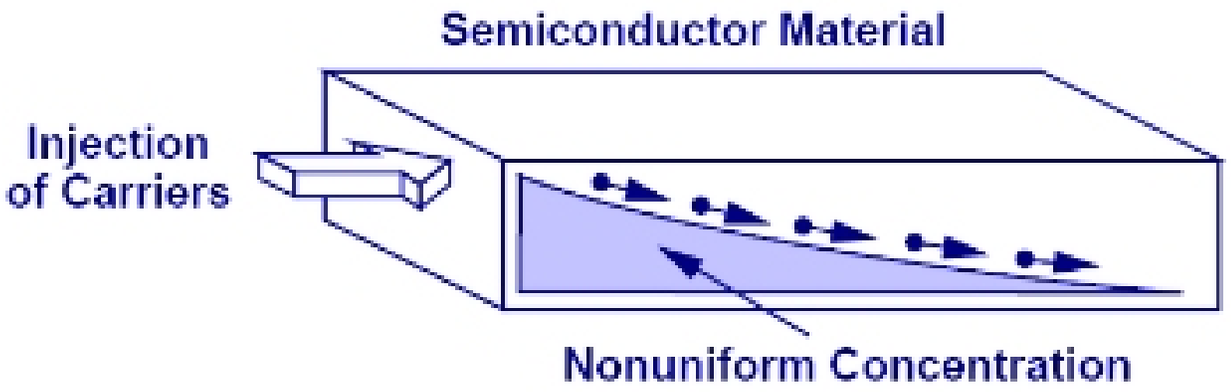


Resistance $$R \equiv \frac{V}{I} = \rho \frac{L}{Wt}$$ **(Unit: ohms)**

where ρ is the resistivity

Carrier Diffusion

- Due to thermally induced random motion, mobile particles tend to move from a region of high concentration to a region of low concentration.
  - Analogy: ink droplet in water
- Current flow due to mobile charge diffusion is proportional to the carrier concentration gradient.
  - The proportionality constant is the ***diffusion constant***.



$$J_p = -qD_p \frac{dp}{dx}$$

Notation:

$D_p \equiv$ hole diffusion constant (cm^2/s)

$D_n \equiv$ electron diffusion constant (cm^2/s)