Georgia Institute of Technology

Introduction to Electronics

Dr. Bonnie H. Ferri
Professor and Associate Chair
School of Electrical and
Computer Engineering

An introduction to electronic components and a study of circuits containing such devices.

Georgia Institute of Technology

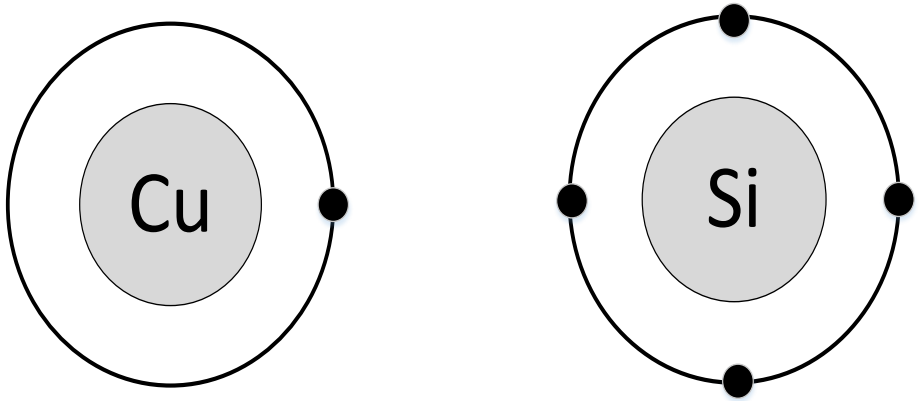
Module 3: Diodes
Introduction To PN Junctions

Dr. Bonnie H. Ferri
Professor and Associate Chair
School of Electrical and
Computer Engineering

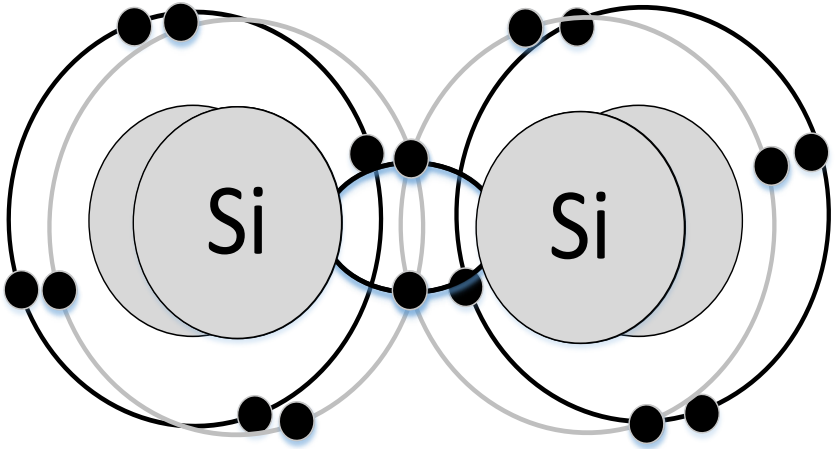
Introduce PN junctions and explain their physical behavior.

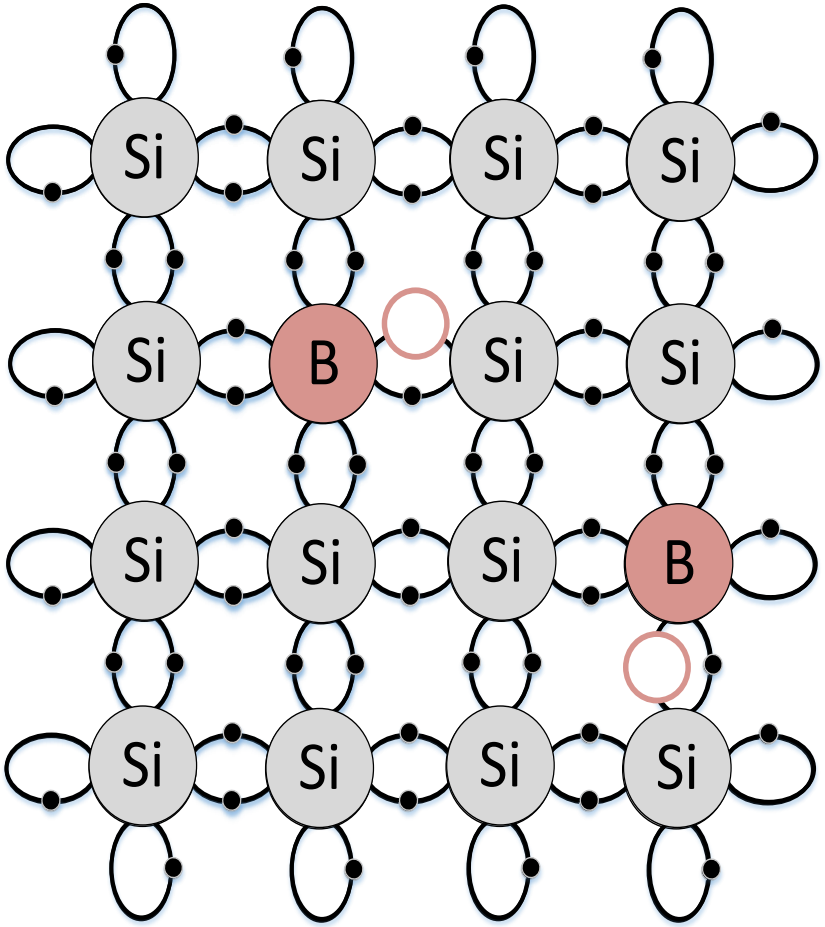
Lesson Objectives

- Demonstrate the physics of semiconductors
- Introduce PN Junctions



Semiconductor


Si
Si

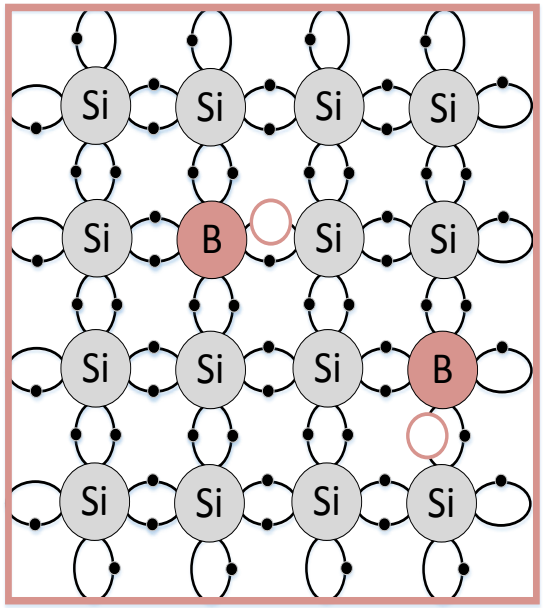


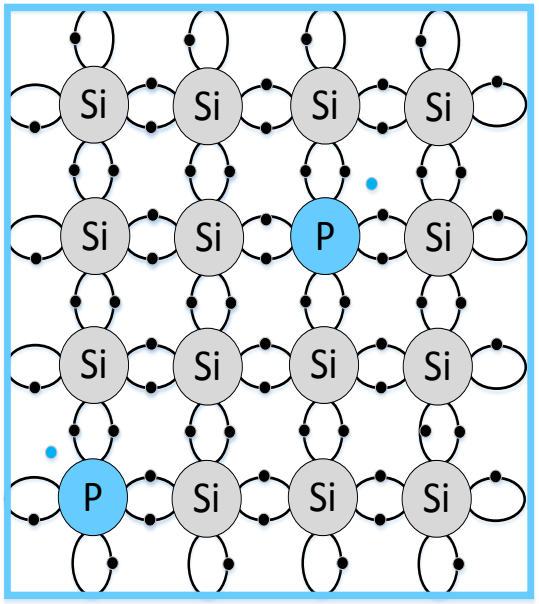
Doping - Add impurities such as Boron or Phosphorus

Number of electrons in outer shell:

- Boron has 3 electrons
- Phosphorus has 5 electrons

P-Type and N-Type Semiconductors

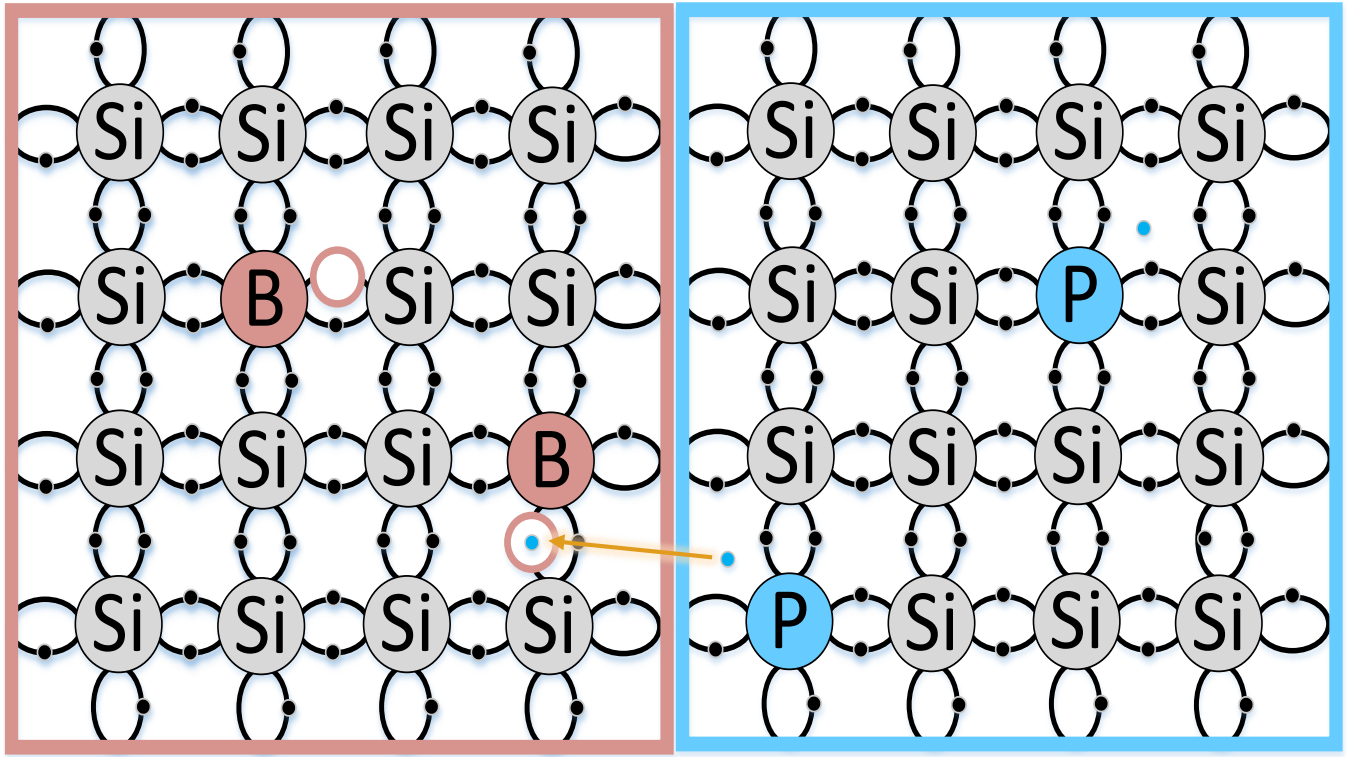




P-Type: extra holes

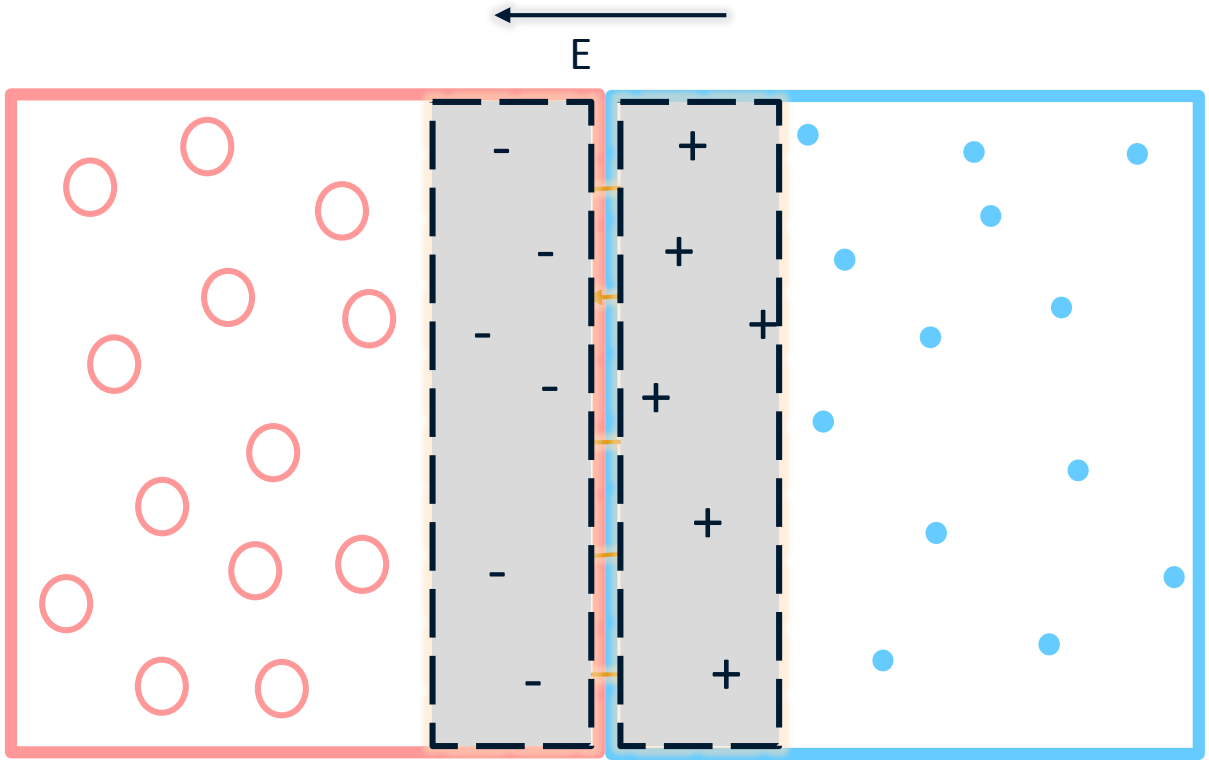
N-Type: extra free electrons

PN Junction



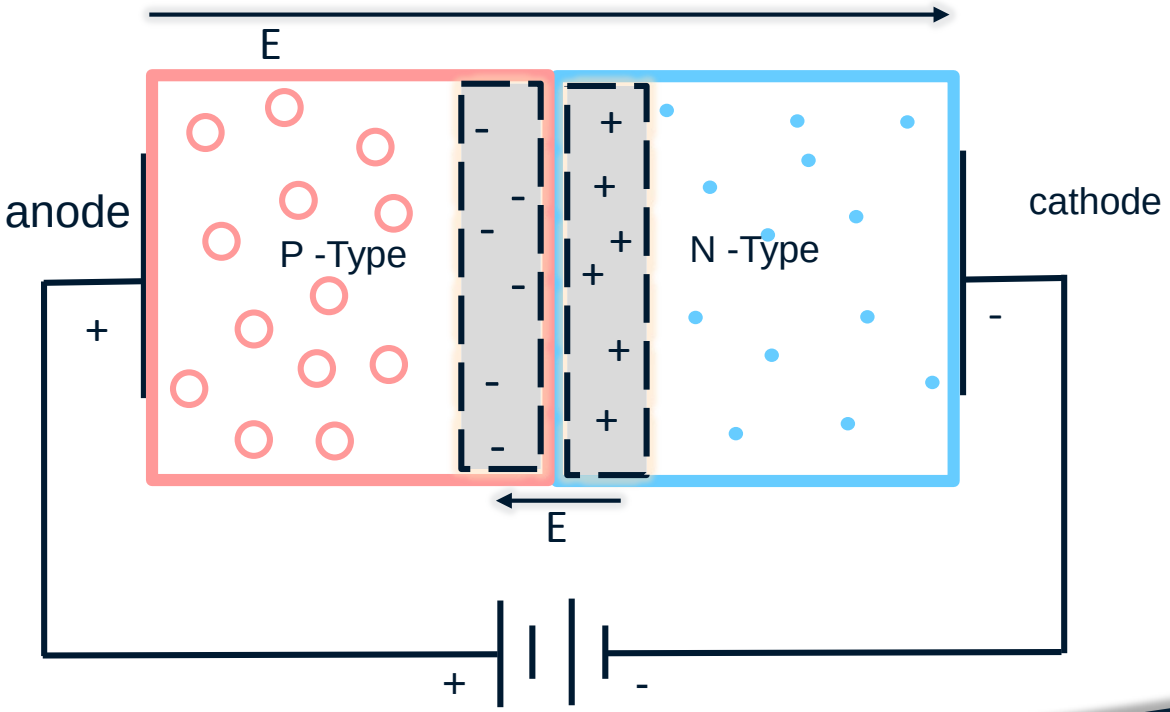
Energy – heat or light makes electrons at the junction diffuse to fill nearest holes

PN Junction

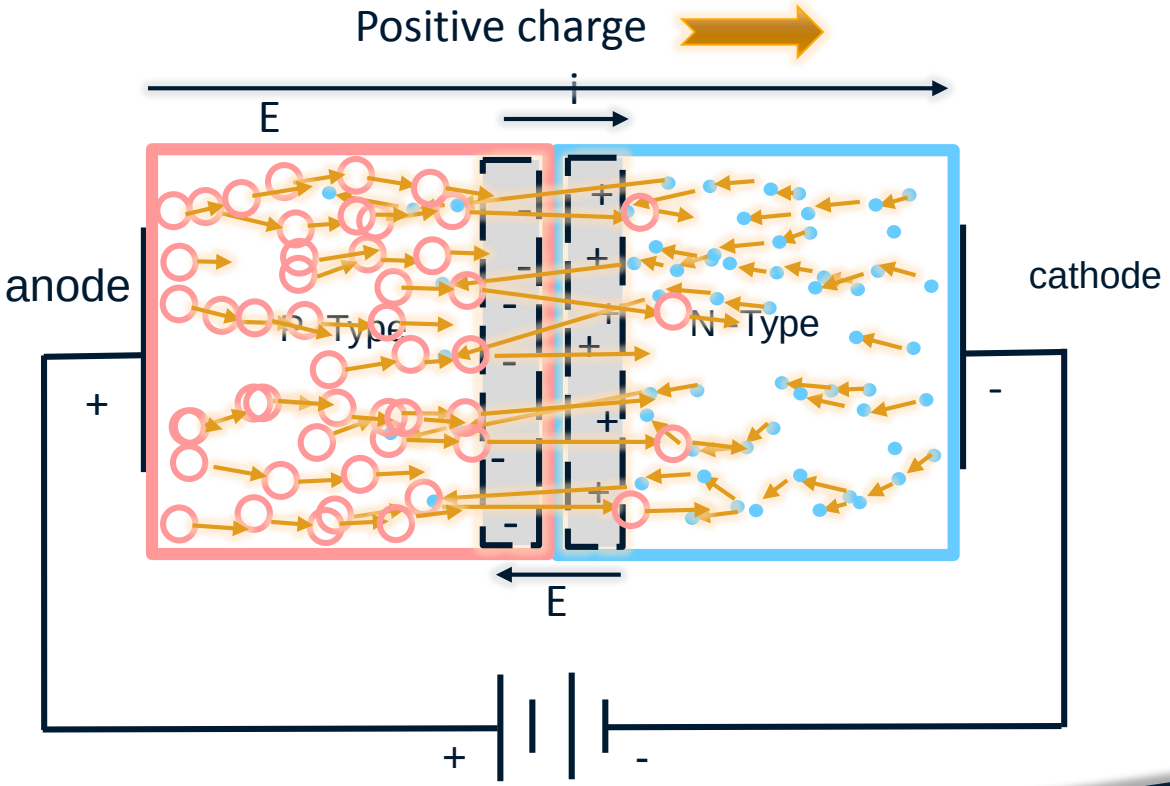


Depletion Region

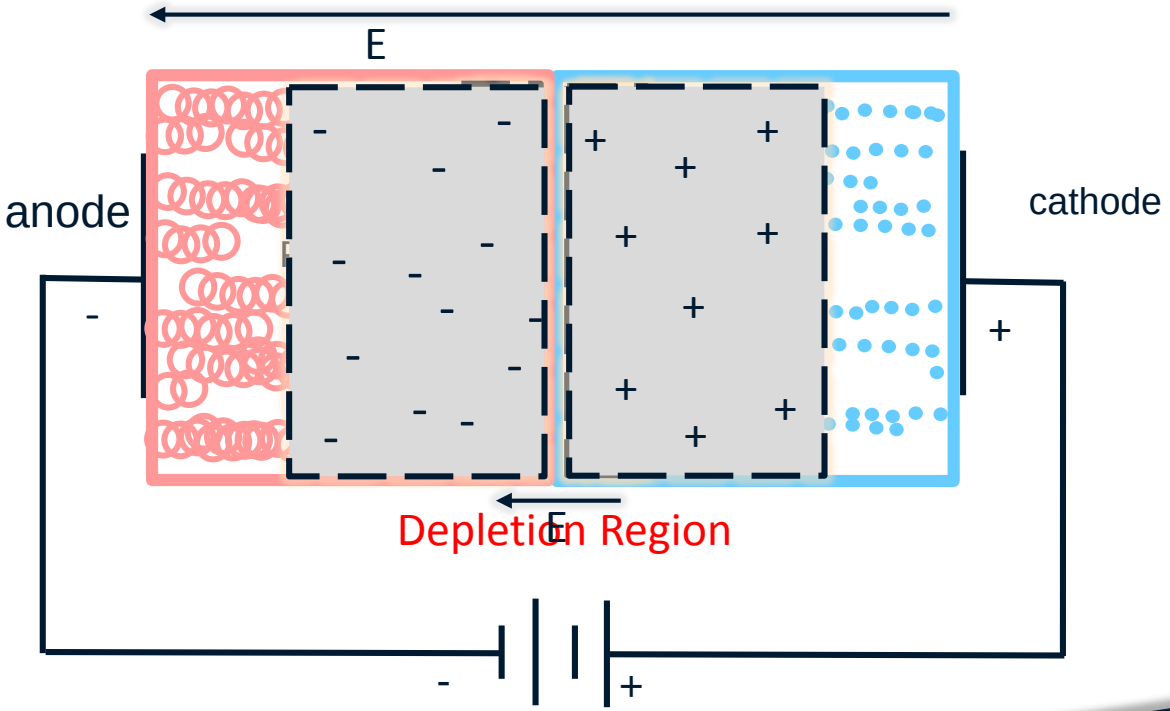
PN Junction: Conducting



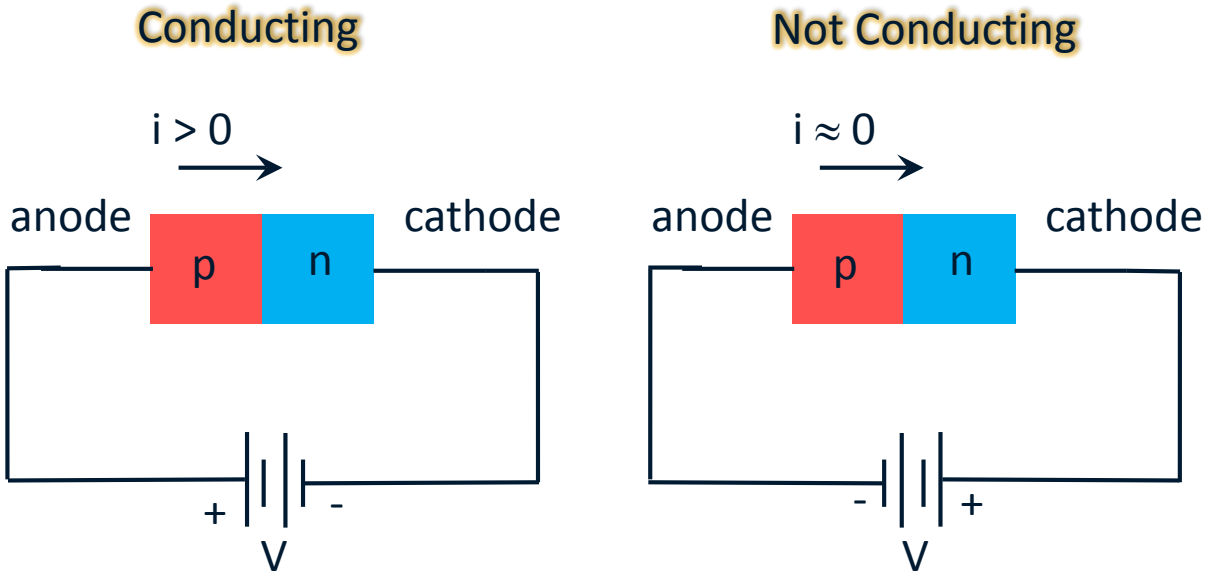
PN Junction: Conducting



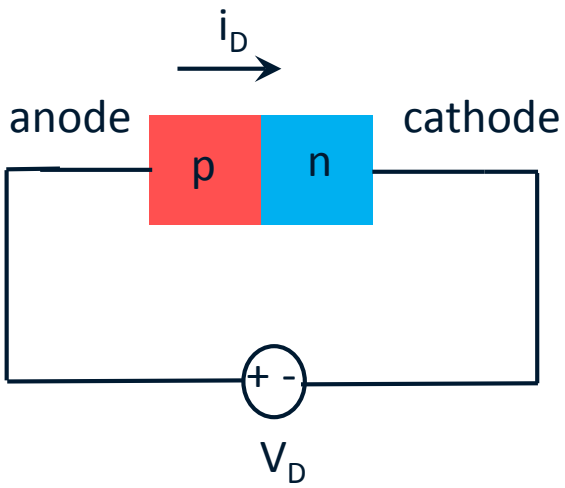
PN Junction: Not Conducting

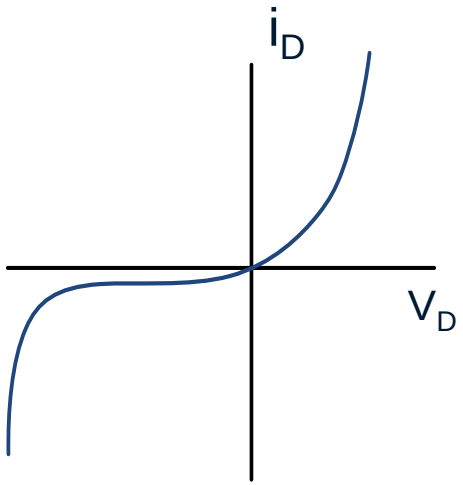


Summary of Behavior



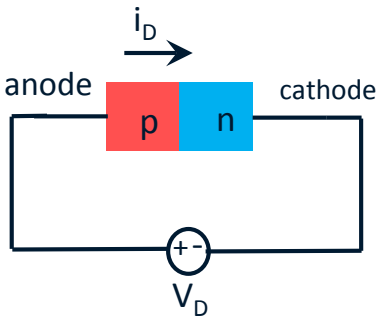
Diode

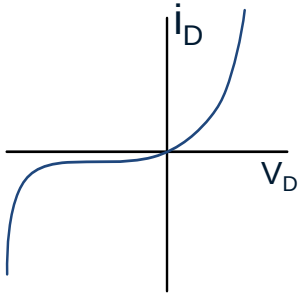




Summary

- Semiconductors become better conductors when
  - Doped
  - Exposed to heat or light
- PN Junctions (Diodes)





Remainder of Module 3: Diodes

- Circuit analysis with simple diode models
- Applications: rectifiers, AM detector, LEDs, voltage limiters, voltage regulators, AC to DC conversion