Georgia Institute of Technology

Introduction to Electronics

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

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Diode Behavior and Models

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Introduce ideal and non-ideal diode I-V curves

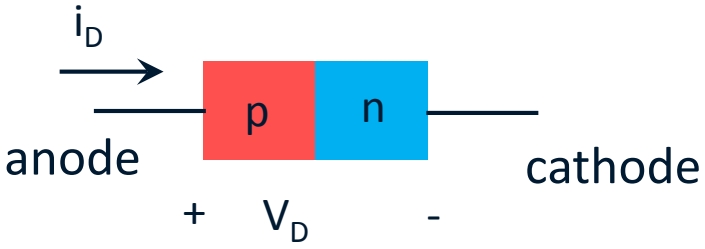
Previous Lesson

- The physics of PN junctions

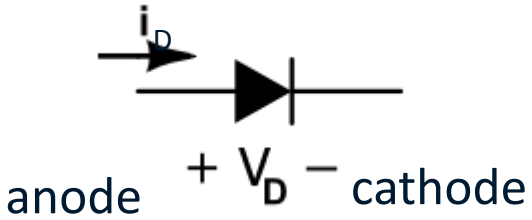
Lesson Objectives

- Analyze diode behavior
- Introduce diode applications
- Describe different operating regions
- Introduce simple diode models that approximate the actual device

Background



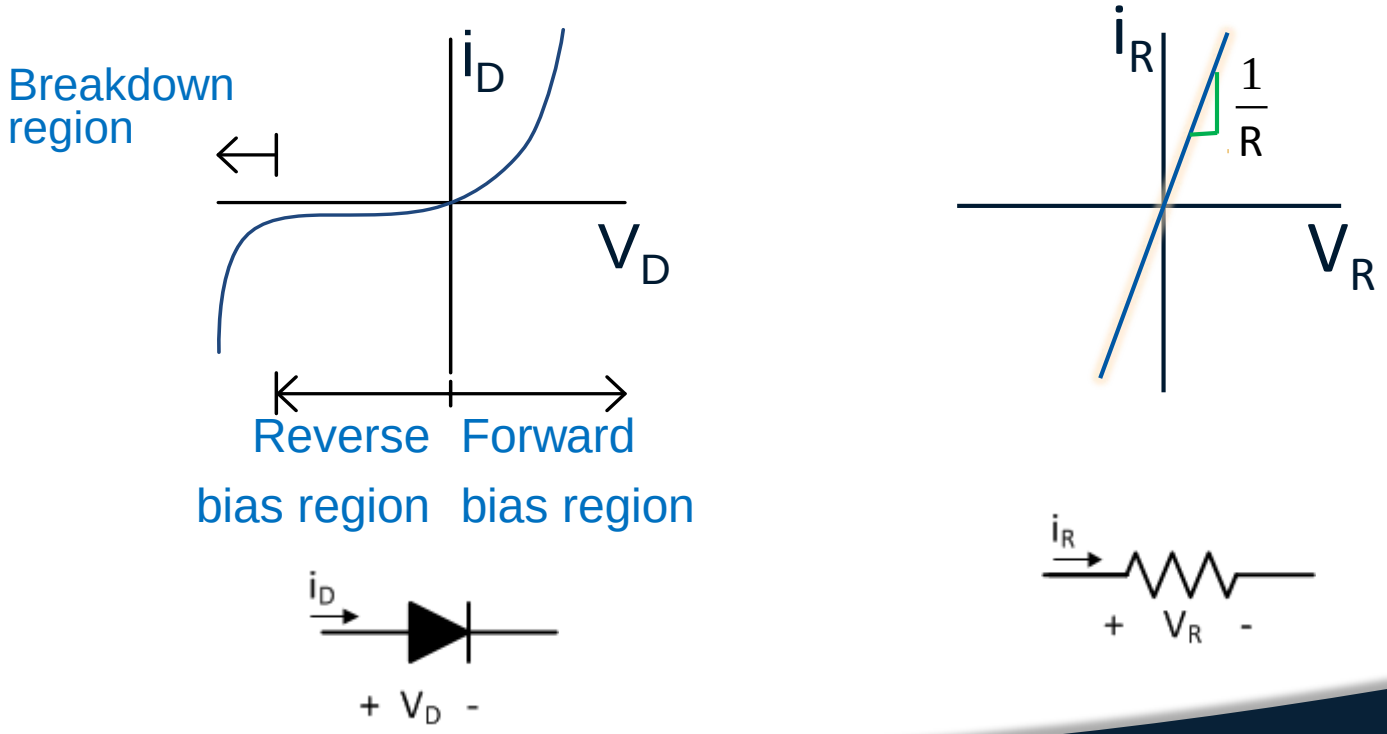
Circuit Symbol:



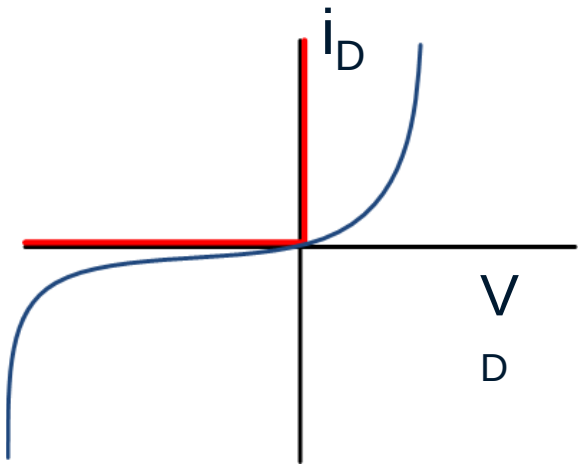
Uses:

- **Block current flow** in a specific direction
- **Rectifier** (AC to DC conversion)
- **Voltage regulator** and **limiter** (protection)
- **Light Emitting Diodes** (LEDs)
- **AM Detectors**
- **Electronic tuners**
- **Photodiodes**

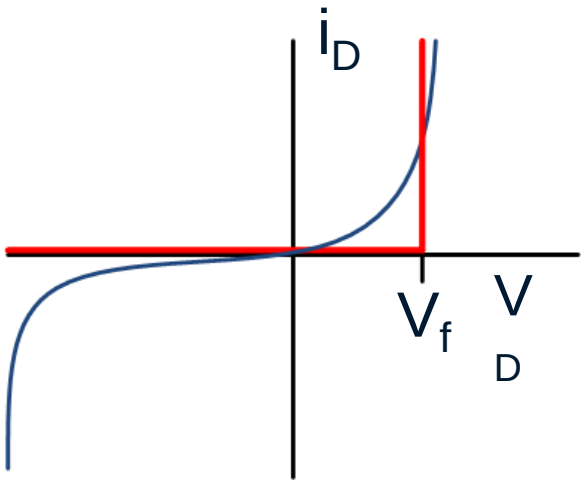
I-V Characteristics



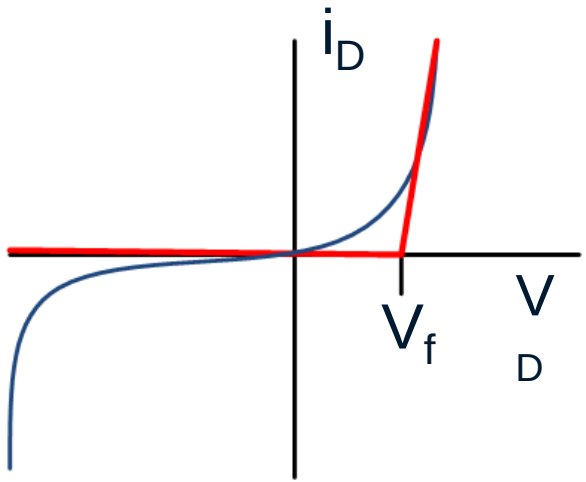
Simple Diode Models



Ideal Diode Model

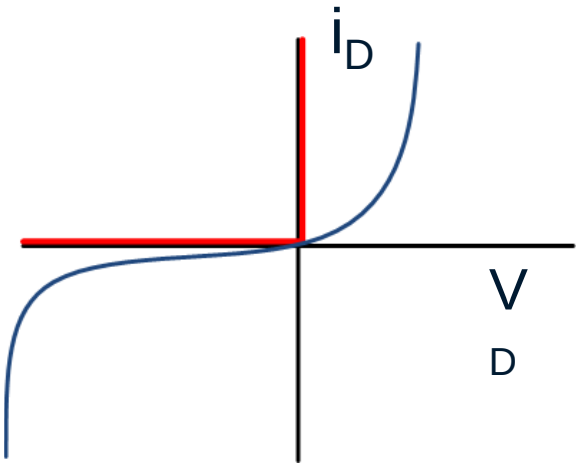


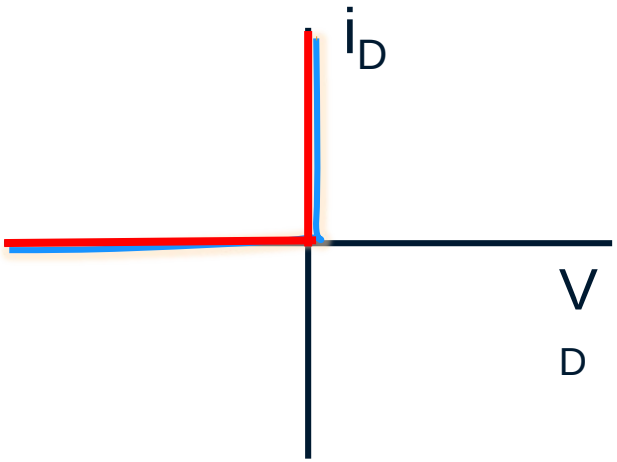
Ideal Diode + Voltage Source Model



Ideal Diode + Voltage Source + Resistor Model

Ideal Diode





Summary

- Diodes have three operating regions
  - Forward bias, $i_D > 0$
  - Reverse bias, $V_D < 0$
  - Breakdown
- Ideal diodes only allow current to flow in one direction
- Three models: ideal, ideal + voltage source, ideal + voltage source + resistor

Next Lesson

- Ideal diode behavior