

Diodes and Diode Circuits

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1. Introduction

- A diode is a semiconductor device that allows current to flow in one direction.
- It is formed by joining p-type and n-type materials at a PN junction.

2. Diode Operation

- **Forward bias:** the diode conducts when the anode is positive relative to the cathode.
- **Reverse bias:** the diode blocks current in the opposite direction.
- A small threshold voltage, about 0.7 V for silicon, is needed to conduct.

3. Types of Diodes

- **Rectifier diode:** converts AC to DC.
- **Zener diode:** conducts in reverse at a set voltage for regulation.
- LEDs emit light when forward biased.

4. Diode Circuits

- **Rectification:** half-wave and full-wave circuits produce DC from AC.
- Clipping circuits limit signal voltage levels.
- Clamping circuits shift a signal's DC level.

5. Applications

- Power supplies and battery chargers.
- Voltage regulation and protection against reverse polarity.
- Signal demodulation and indicator lights.