

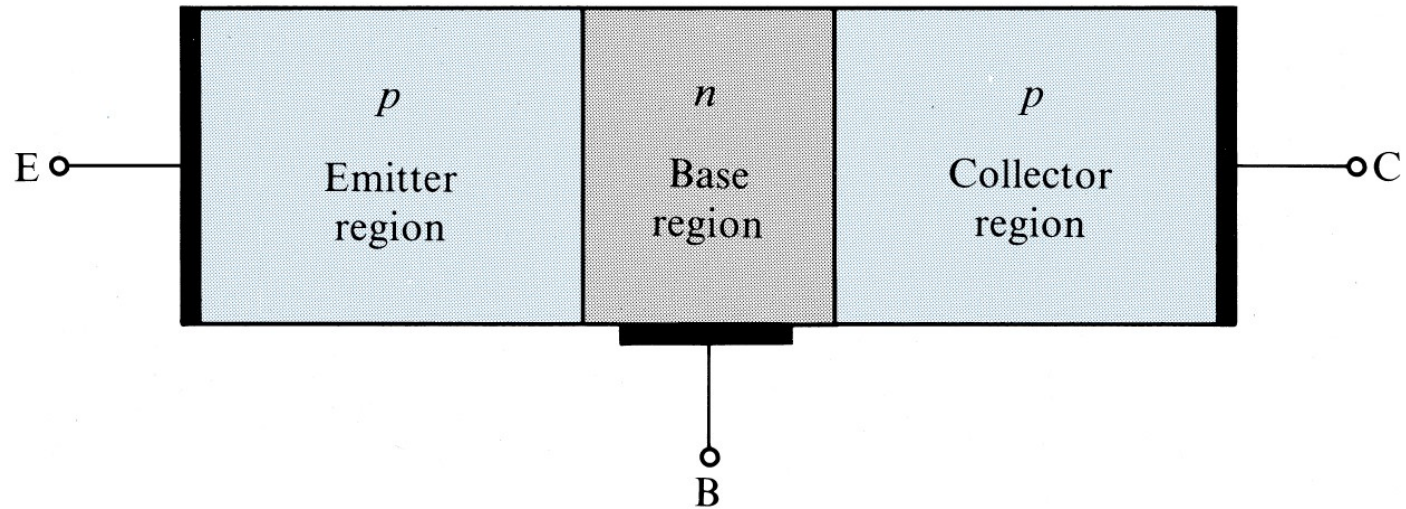
BJT transistors



BJT transistors

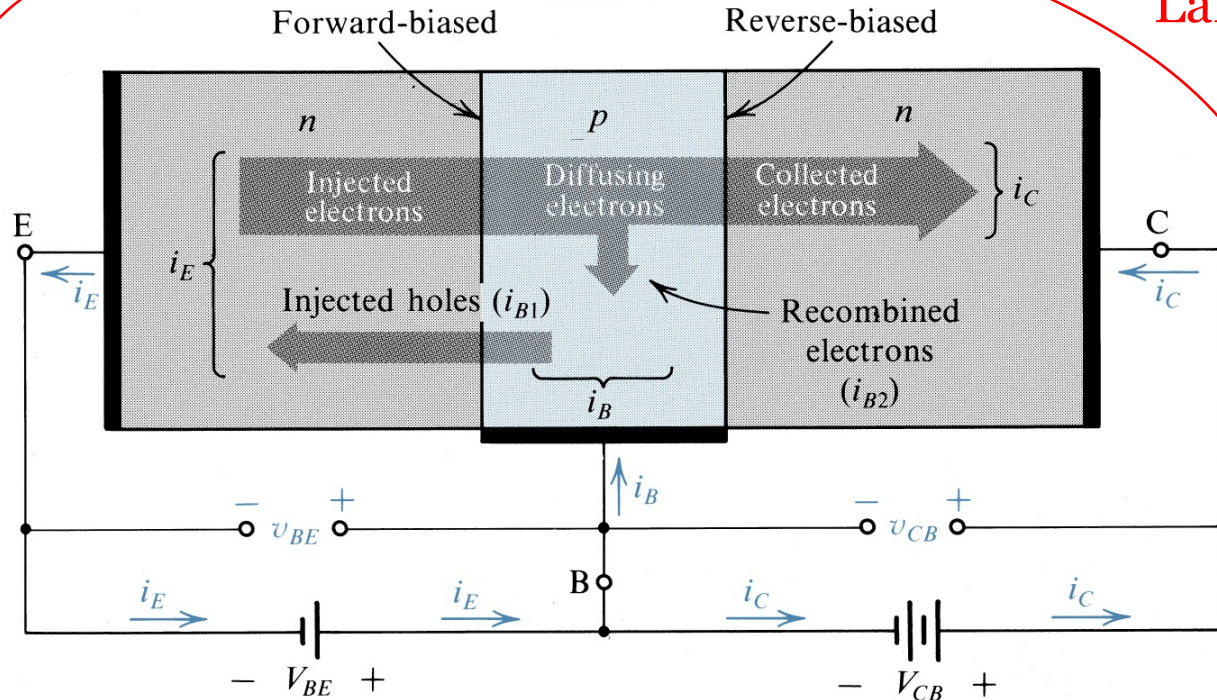
- Widely used in amplifier circuits
- Formed by junction of 3 materials
- npn or pnp structure

pnp transistor



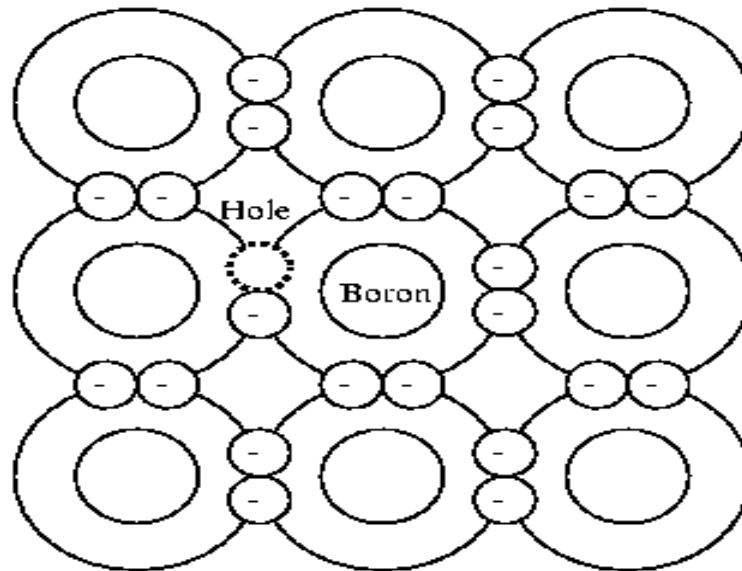
Operation of npn transistor

Large current



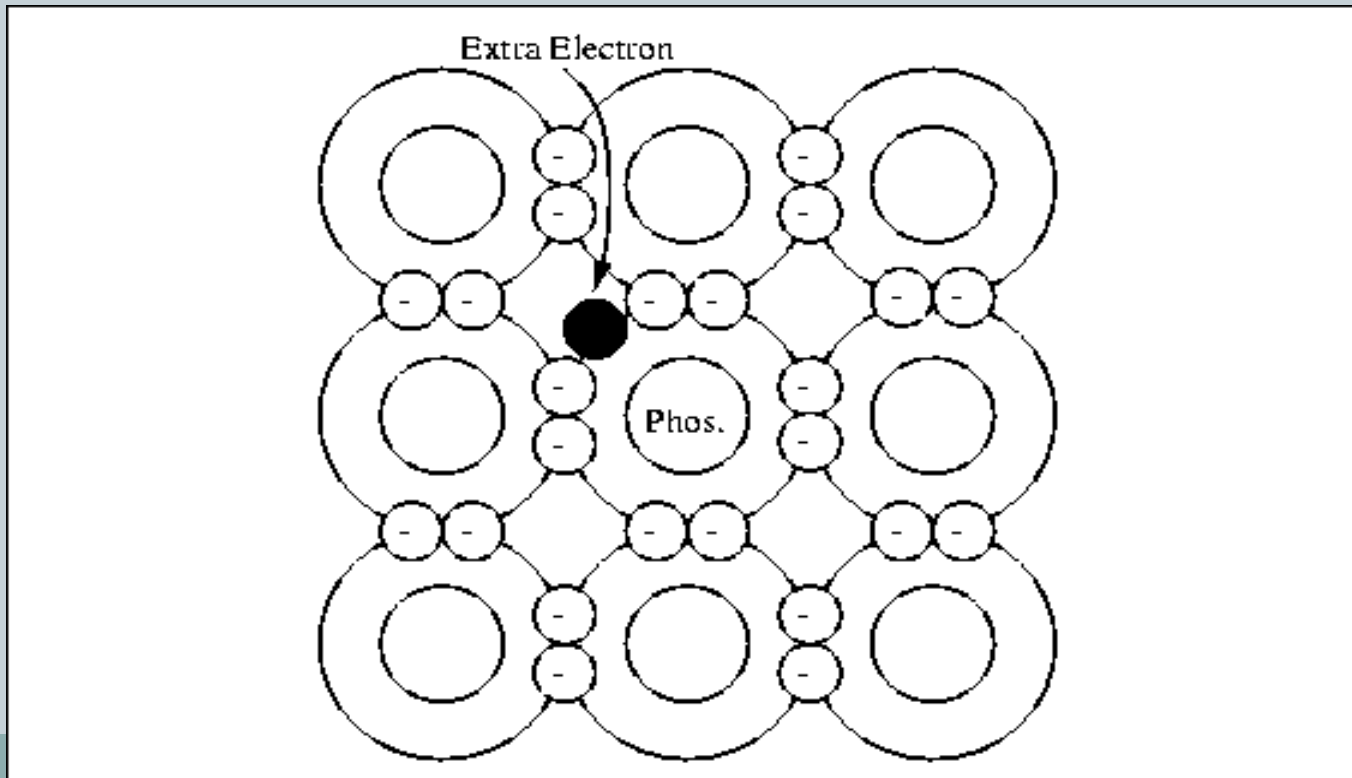
Doping

- Foreign elements are added to the semiconductor to make it electropositive or electronegative
- P-type semiconductor (positive type)
 - Dopants include Boron, Aluminum, Gallium, Indium, and Thallium
 - Ex: Silicon doped with Boron
 - The boron atom will be involved in covalent bonds with three of the four neighboring Si atoms. The fourth bond will be missing



Doping

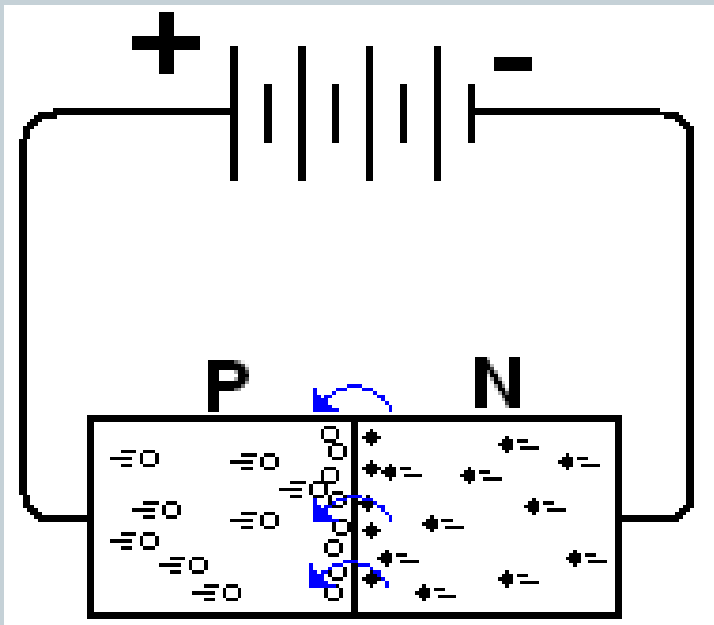
- N-type semiconductor (negative type)
 - Dopants include Nitrogen, Phosphorous, Arsenic, Antimony, and Bismuth
- Ex: Silicon doped with Phosphorous
 - The Phosphorous atom will contribute and additional electron to the Silicon giving it an excess negative charge



P-N Junction Diodes

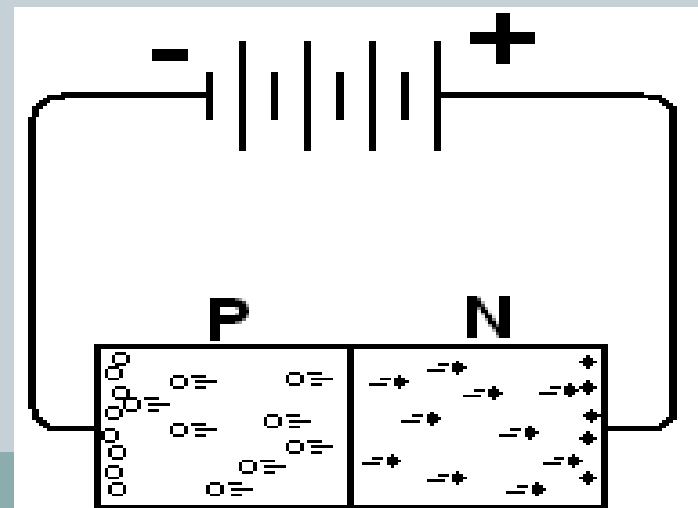
- Forward Bias

- Current flows from P to N



- Reverse Bias

- No Current flows
- Excessive heat can cause dopants in a semiconductor device to migrate in either direction over time, degrading diode
- Ex: Dead battery in car from rectifier short
- Ex: Recombination of holes and electrons cause rectifier open circuit and prevents car alternator from charging battery



Modes of operation of a BJT transistor

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<u>Mode</u>	<u>BE junction</u>	<u>BC junction</u>
cutoff	reverse biased	reverse biased
linear(active)	forward biased	reverse bi
saturation	forward biased	forward biased

Summary of npn transistor behavior

