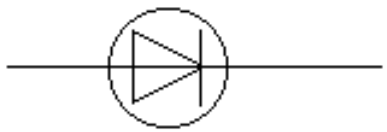
Introduction to Electronics

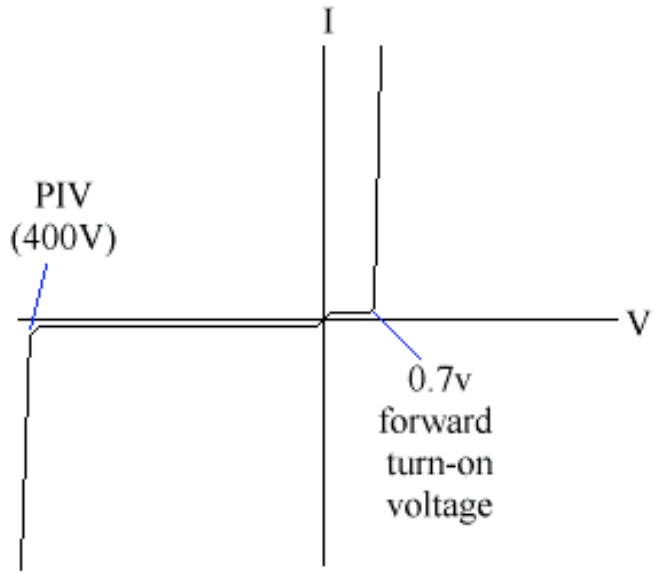
Active Devices

Diodes

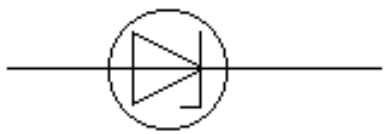
- Silicon Diode



  – A “one-way” valve



- Zener diode

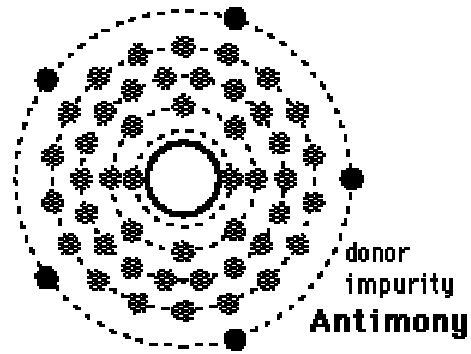


  – These are specially made with low (accurate) peak inverse voltages.
  – They are used to give a reference voltage

Doping Semiconductors

- The addition of a small percentage of foreign atoms in the regular crystal lattice of silicon or germanium produces dramatic changes in their electrical properties, producing n-type and p-type semiconductors.
- **Pentavalent** impurities (5 valence electrons) produce n-type semi-conductors by contributing extra electrons.
- **Trivalent** impurities (3 valence electrons) produce p-type semiconductors by producing a "hole" or electron deficiency.

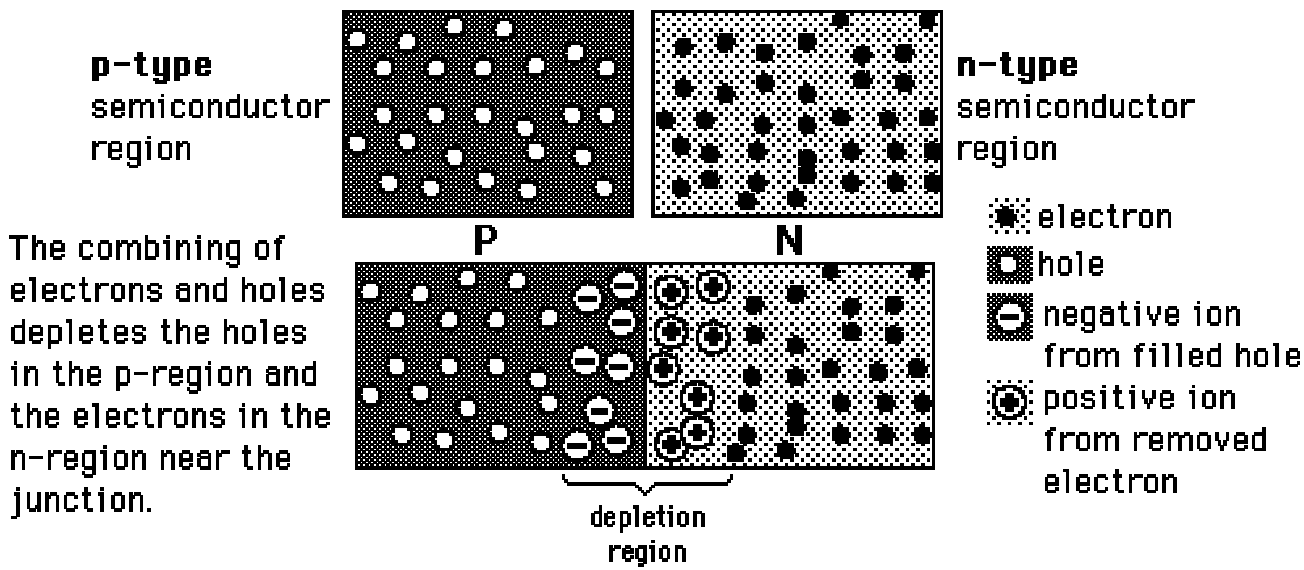
Antimony
Arsenic
Phosphorous



Boron
Aluminum
Gallium

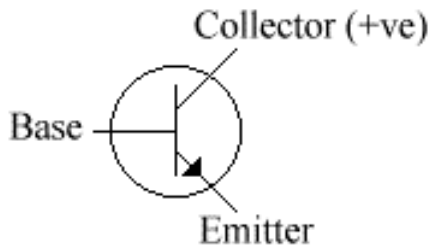
Depletion Region

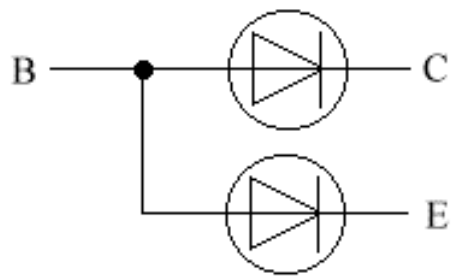
- When a p-n junction is formed, some of the free electrons in the n-region diffuse across the junction and combine with holes to form negative ions. In so doing they leave behind positive ions at the donor impurity sites.



Bipolar Transistor

- A current-controlled valve
  - The current flow from collector to emitter is β (a high number) times the base current
  - The base to emitter voltage is 0.7 V when the transistor is on.





Field Effect Transistors

- A voltage-controlled valve