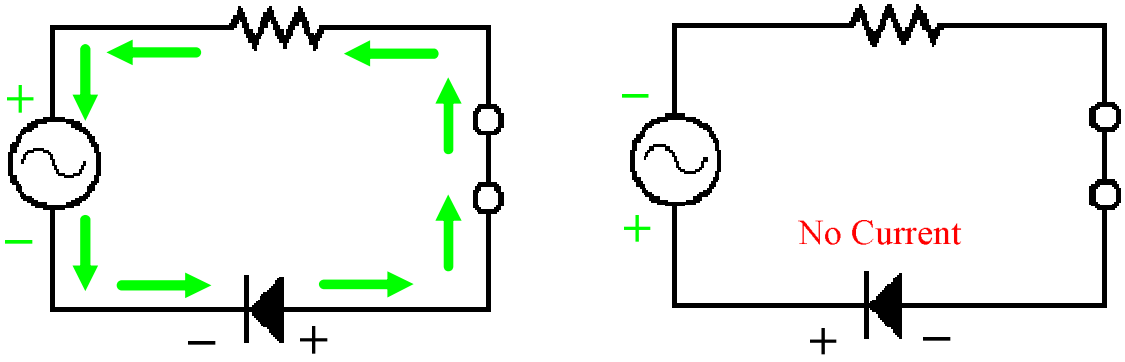
Diodes are made of semiconductor materials that have properties of both conductors and insulators.

Semi-conductors are called solid-state devices.

Solid State Device: An electronic component which operates by the movement of electrons within a solid piece of semiconductor material.

Diodes allow current flow in only one direction. They are the electrical equivalent to a check valve.

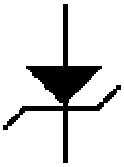


Reference designators for a diode are CR or D.

Junction Diode

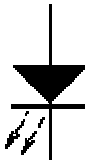
CR1 or
D1

Zener Diode



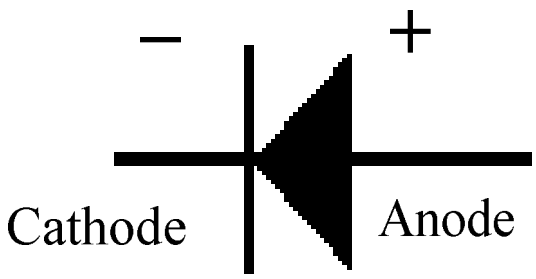
CR1 or
D1

LED

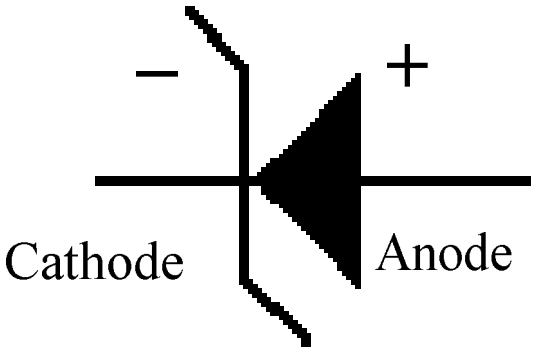


CR1 or
D1

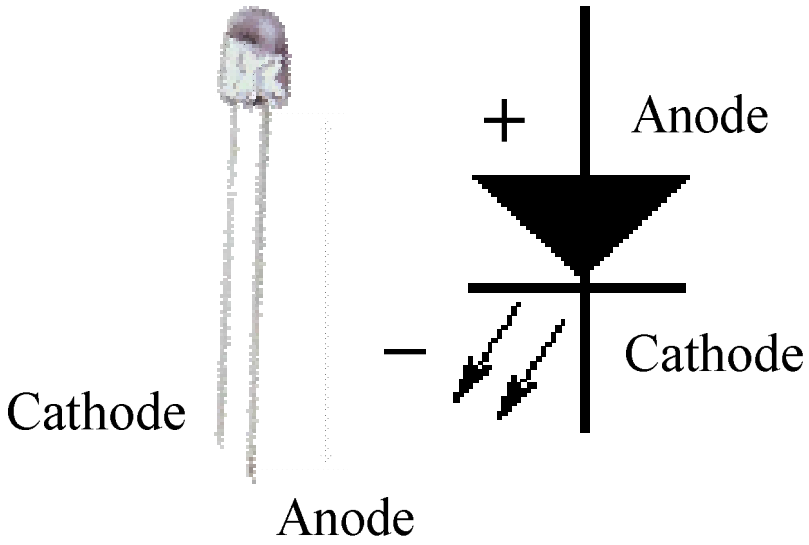
Junction Diode

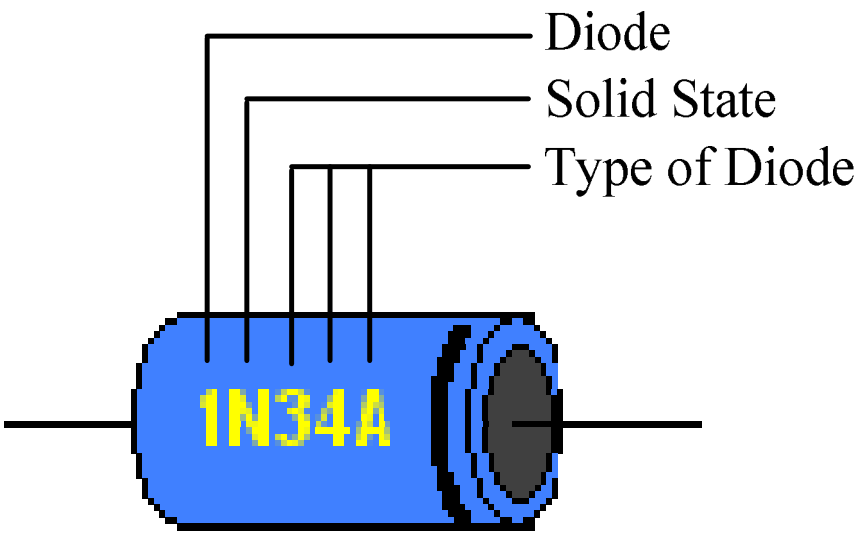


Zener Diode

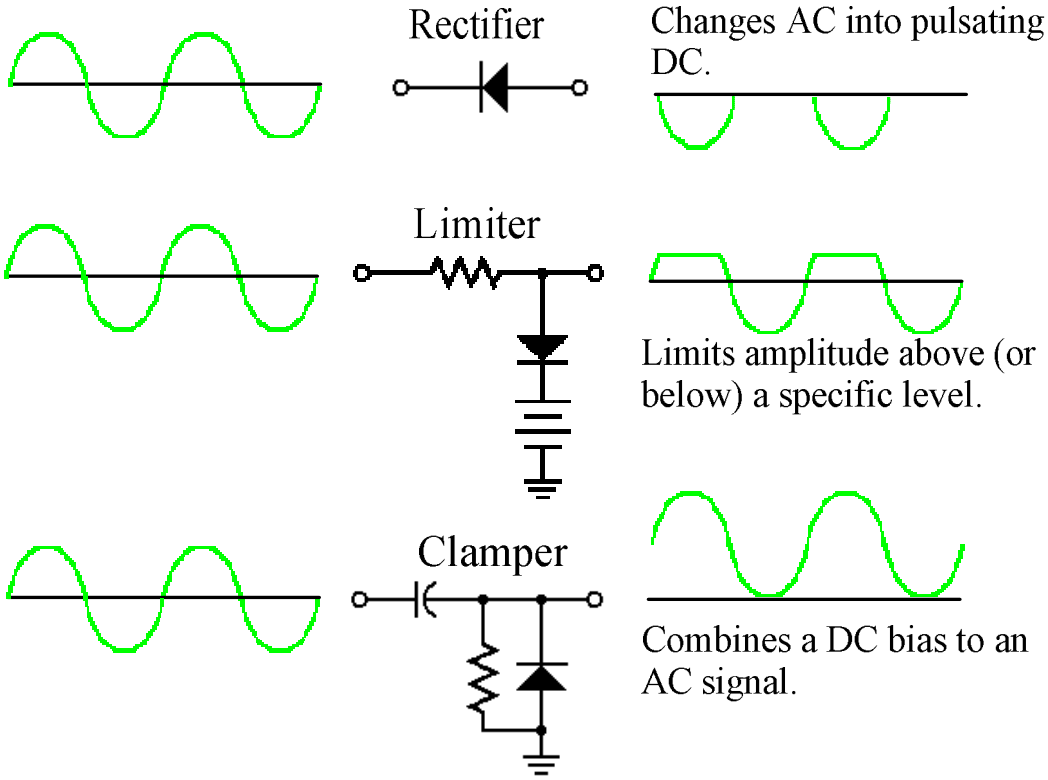


L.E.D.- Light Emitting Diode



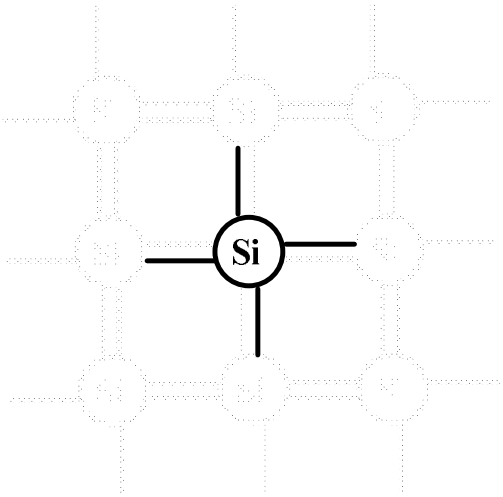

Diode
Solid State
Type of Diode
1N34A

Diode Applications:

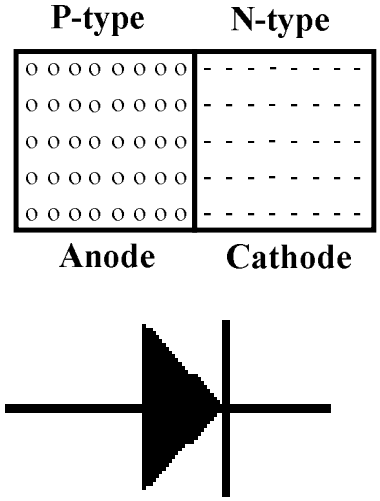


Diodes are made of semiconductors which are elements that have four electrons in their outer valence shell.

Common semiconductors are silicon and germanium.



The semiconductor material diodes are constructed from have impurities added to form a positive half and a negative half. These impurities are known as **dopants**.

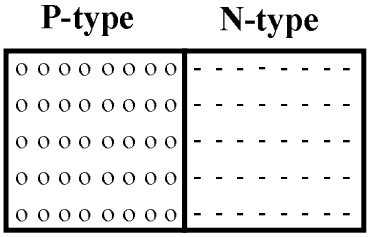


Cathode: **Doped** to produce current carriers. They have more electrons.

Anode: **Doped** to collect the current carriers from the cathode. Have more holes to receive the electrons from the cathode.

Diodes are solid state devices constructed of P-type and N-type dopants.

Dopants: Classified as either electron acceptors or donors; accept electrons if they are positively doped (p-type) and donate electrons if they are negatively doped(n-type).



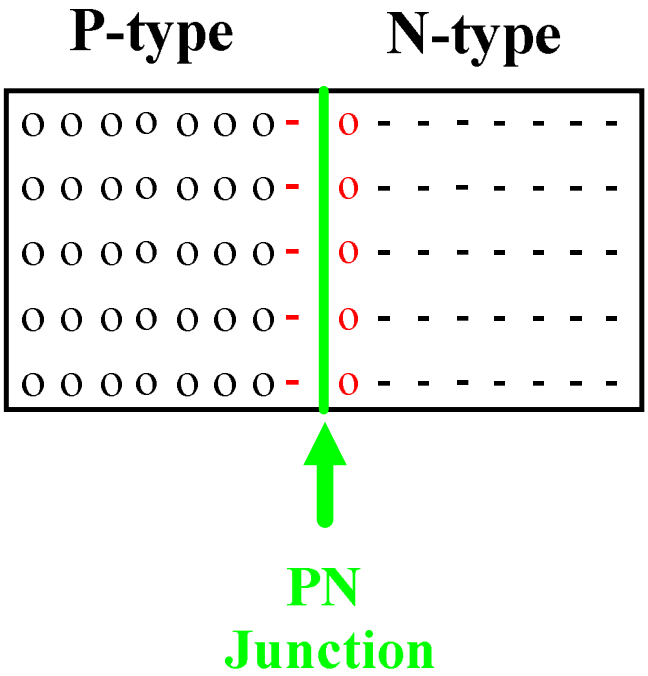
P-type dopants come from IUPAC group 13 and have three electrons in their outer valence shell compared to silicon which has four. They have one less electron.

P-type acceptors include: boron (B), aluminium (Al), gallium (Ga), indium (In), thallium (Tl), and ununtrium (Uut)

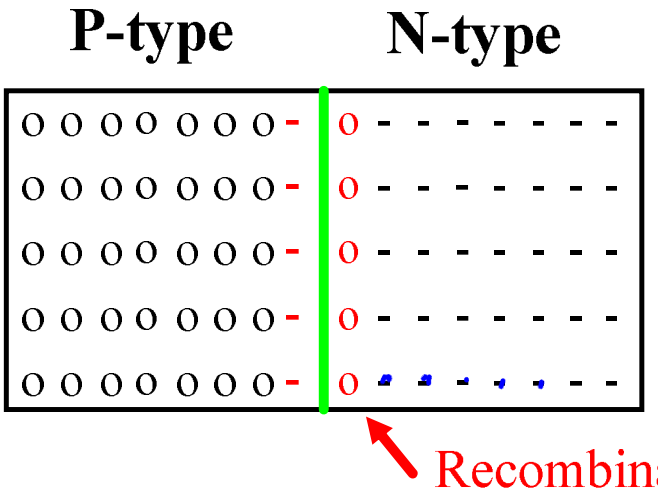
N-type dopants come from IUPAC group 15 and have five electrons in their outer valence shell. They have one extra electron.

N-type donors include: nitrogen (N), phosphorus (P), arsenic (As), antimony (Sb), bismuth (Bi) and ununpentium (Uup)

Diodes are made of half P-type material, half N-type material, and one PN junction.



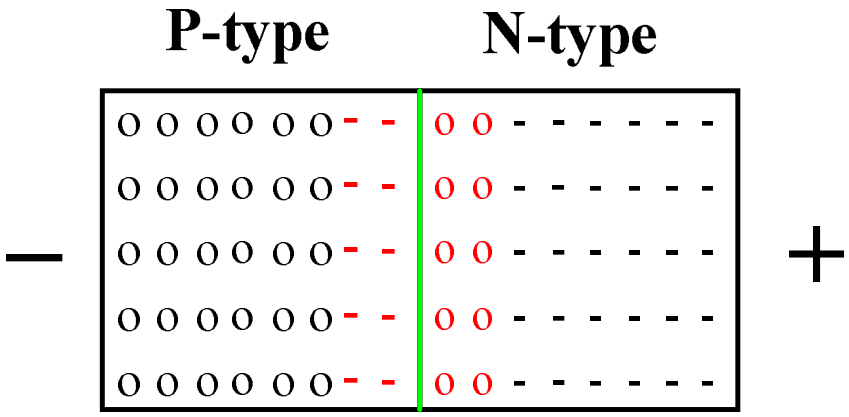
The PN junction is from the combination of free electrons and holes between the the P-type and N-type material.



This barrier is called the Depletion Area. It can be overcome by applying a DC voltage (called **bias**) to the diode.

The voltage potential must be greater (more positive) on the P-type material than the N-type material in order to overcome the barrier. This is called **Forward Bias**.

For silicone diodes, the barrier voltage must be greater than **.6 volts** and greater than **.3 volts** for germanium.

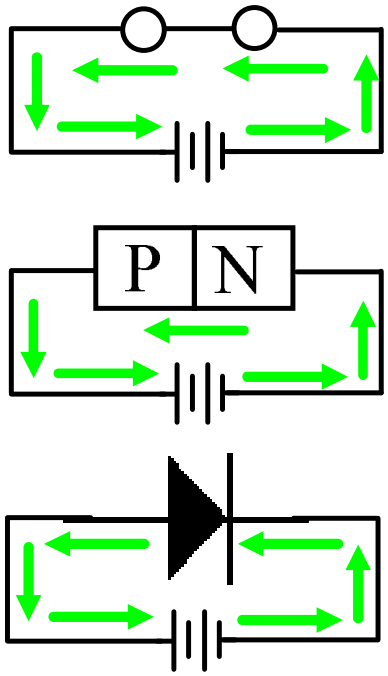


If the voltage potential is reversed, the depletion region at the PN junction would increase.

If the P-type material does not have a barrier voltage great enough to forward bias the diode, it is considered **reversed biased**.

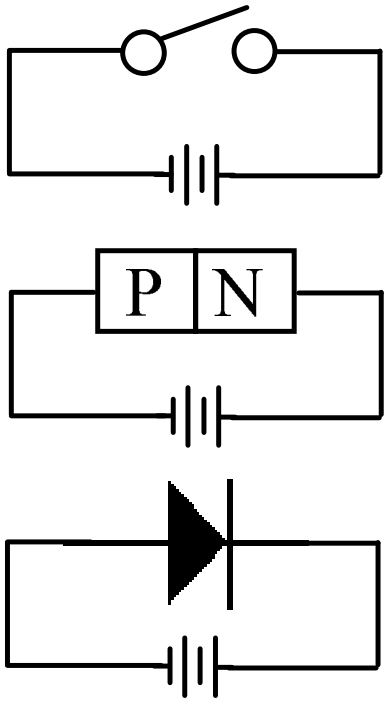
When the diode is reversed biased, it is off and no current flows.

When a diode is forward biased, it acts like a closed switch.



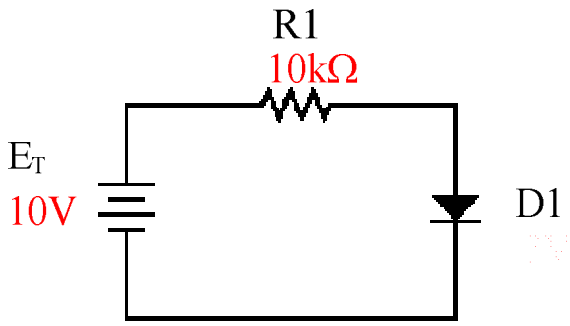
Current flows.

When a diode is reversed biased, it acts like a opened switch.



No Current

Calculating voltage drops and finding total current with a diode in the circuit.



First, check to see if the diode is forward biased.

Second, remember it takes more than .6 volts to forward bias the diode. Therefore, the diode is going to drop .7 volts.

The remaining voltage will be dropped across the resistor because it is the only other component in the circuit.

Finally, the total current can be calculated by taking the voltage drop across the resistor and dividing it by its resistance. This will be the total current because their is only one path in the circuit.