Semiconductors

●Seminconductor Materials

The working of diodes, transistors and other semiconductor devices depends on the controlled flow of current through semiconductor material. Semiconductor materials can be of two types, p-type and n-type. Silicon and germanium are examples of semiconductor material.

In an electric circuit, current flow occurs when negative electrons are attracted to positive. In semiconductor materials a current will only flow if there any free electrons within the atomic structure of the material. In a pure (Intrinsic) material the electrons are not free to move in the crystal structure and so no current will flow. By adding minute amounts of impurities, crystals can be created with extra electrons (n type) or with extra holes (p type). When a voltage is applied to the semiconductor, a current flows.

●The Diode

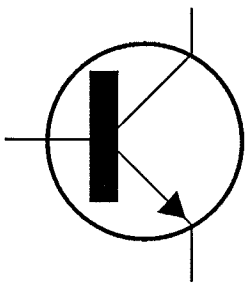
Diode means "having two electrodes" and the diode is simply a package with two terminals. It allows electrons to pass in one direction only from the cathode (negative terminal) to the anode (positive terminal). This is the forward direction. A diode consists of a small single piece of silicon or germanium in which one end has been made n-type and the other p-type

One of the main applications of diodes is to convert alternating current (ac) into direct current (dc). This function is called rectification.

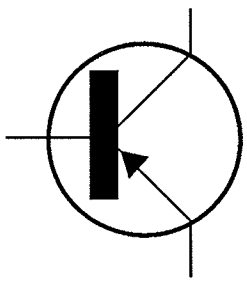
●Transistors

Transistors come in various shapes and sizes but they all have three leads. A transistor can be thought of as a switch which is triggered by the voltage applied to it.

There are two types of transistor, npn and pnp. Each device is made from a single piece of semiconductor material with the n-type and p-type regions being created chemically. Both types work in exactly the same manner, the only difference being that one works with a positive voltage and the other with a negative voltage. When the base voltage reaches a set value the transistor turns on and current flows between the collector and the emitter.



npn



pnp

The direction of current flow is indicated by the arrow. The npn transistor will only work when the base is more positive than the emitter.