BASIC ELECTRONICS (3320701)

Introduction to Analog Electronics

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Active and Passive Components.

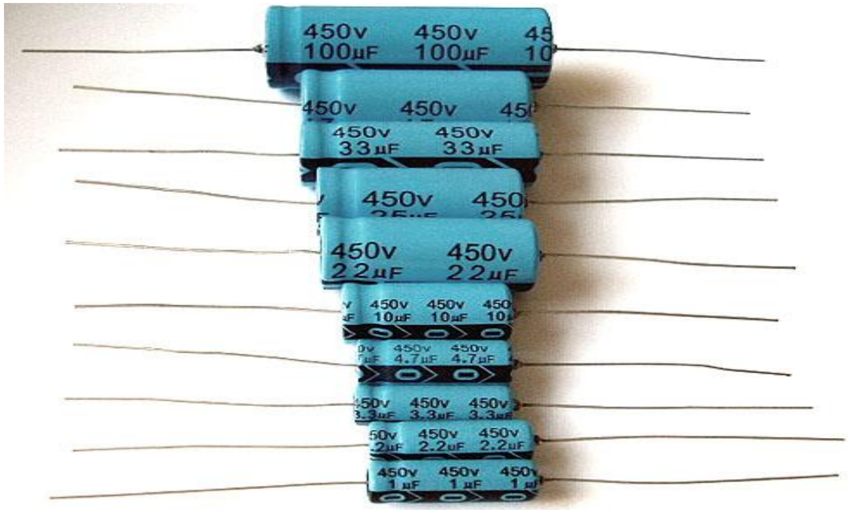
->Active electronic components are those that can control the flow of electricity. Most electronic printed circuit boards have at least one active component. Some examples of active electronic components are transistors, vacuum tubes, silicon-controlled rectifiers (SCRs).

->Passive electronic components are those that don’t have the ability to control current by means of another electrical signal. Examples of passive electronic components are capacitors, resistors, inductors, transformers, and diodes.

->A **Resistor** is an electrical device that resists the flow of electrical current. It is a passive device used to control, or impede the flow of, electric current in an electric circuit by providing resistance, thereby developing a drop in voltage across the device.

-> A **Capacitor** is a passive electrical component that can store energy in the electric field between a pair of conductors called “plates”. The process of storing energy in the capacitor is known as “charging”. The ability of a capacitor to store charge is measured by its capacitance. Capacitors are used in electronic circuits as energy storage devices. They are also be used to differentiate between high-frequency and low-frequency signals. A wide variety of capacitors are available, including electrolytic capacitors, basic parallel-plate capacitors, and mechanical variable capacitors

CAPACITOR DIAGRAM



-> A **Diode** is a one-way valve for electricity. Diodes allow flow of electricity in one direction. Most diodes have a painted line on one end showing the direction or flow. The negative side is normally white.

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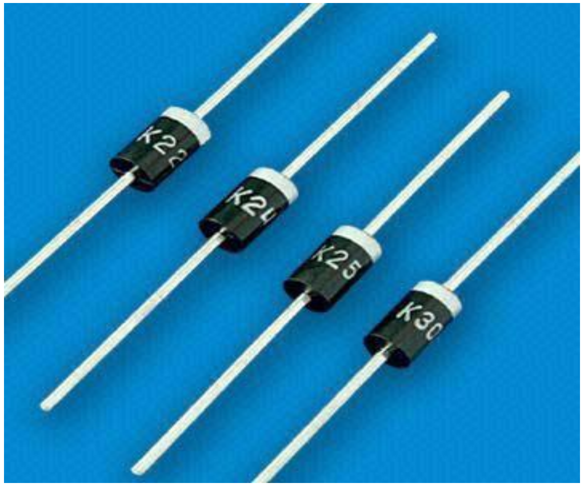
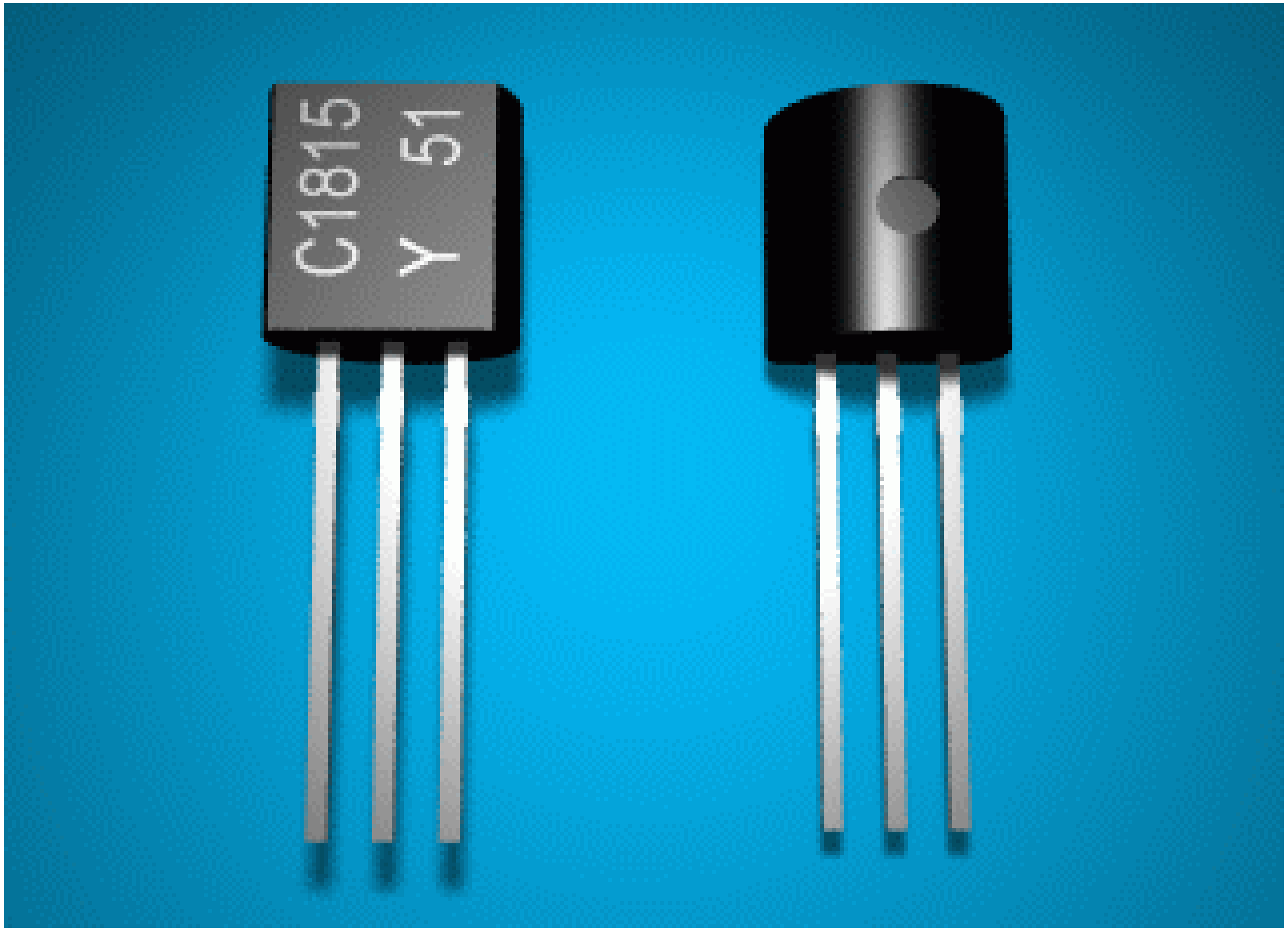


->A **Transistor** is a semiconductor device. It is the fundamental building block of the circuitry in mobile phones, computers, and several other electronic devices. A transistor has very fast response and is used in a number of functions including voltage regulation, amplification, switching, signal modulation, and oscillators. Transistors may be packaged individually or they can be a part of an integrated circuit. Some of the ICs have billion of transistors in a very small area.

TRANSISTOR DIAGRAM.



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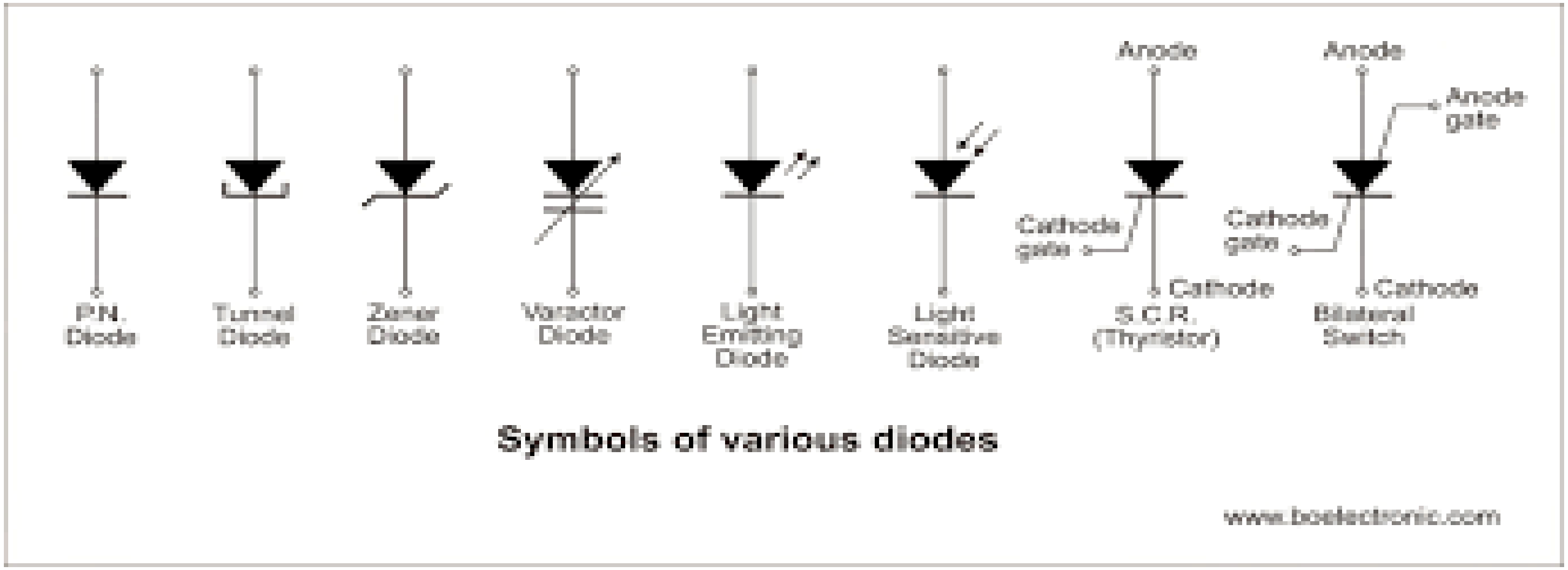
- Draw symbols of various semiconductor devices.



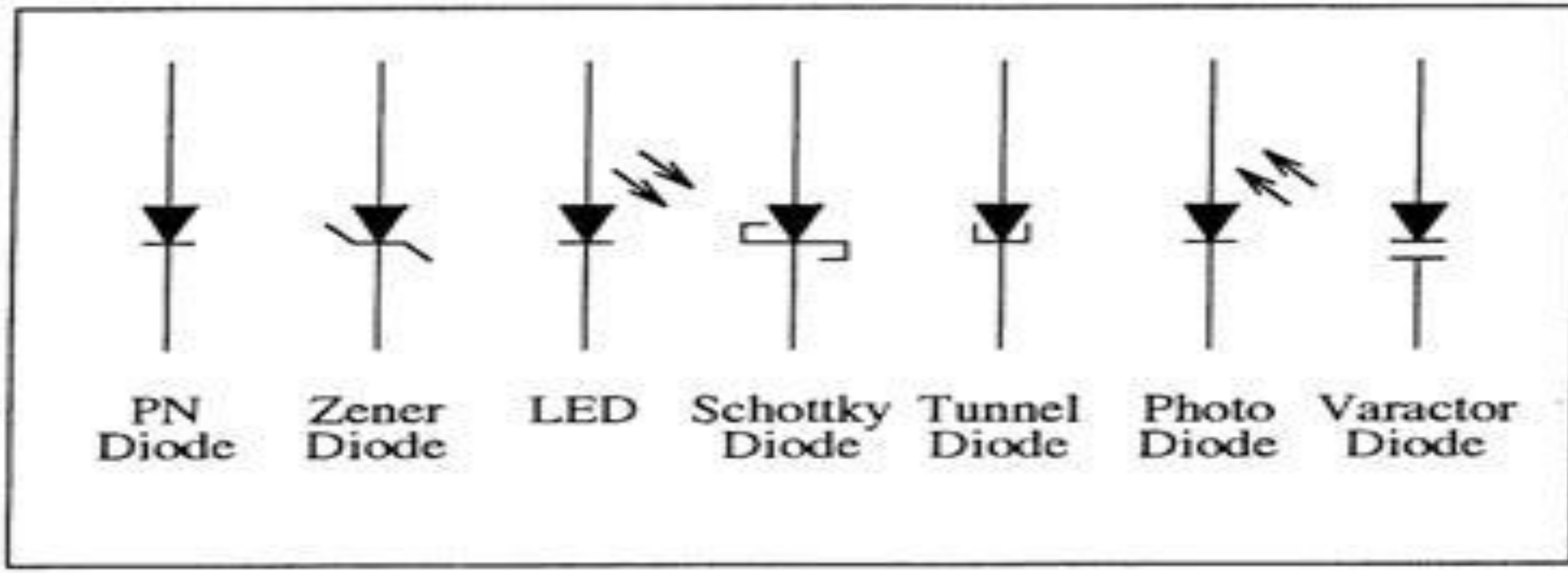


Figure 6.5: Diode Symbols

•Define following terms:

-> Cycle:-

One complete set of positive and negative values of a signal is known as cycle.

A cycle is normally specified in terms of angular measure spread over 360o or 2π radian

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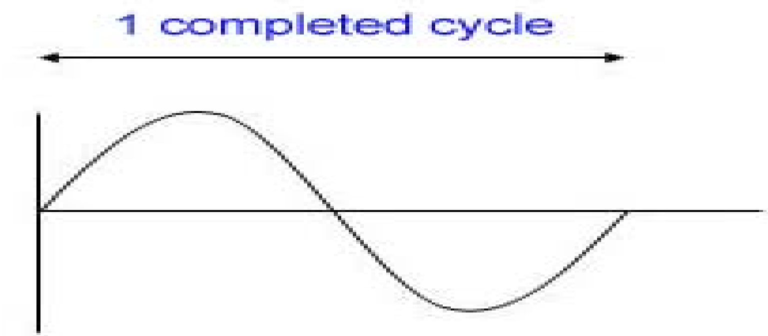


->Frequency:-
*** Frequency** is a measurement of how many cycles can happen in a certain amount of Time cycle per second.
->Frequency is the number of waves per unit time. Period is the reciprocal of that the duration of a single wave.
->If a motor is running so that it completes 50 revolutions in one second, I would say that it has a **frequency** of 50 Hertz.

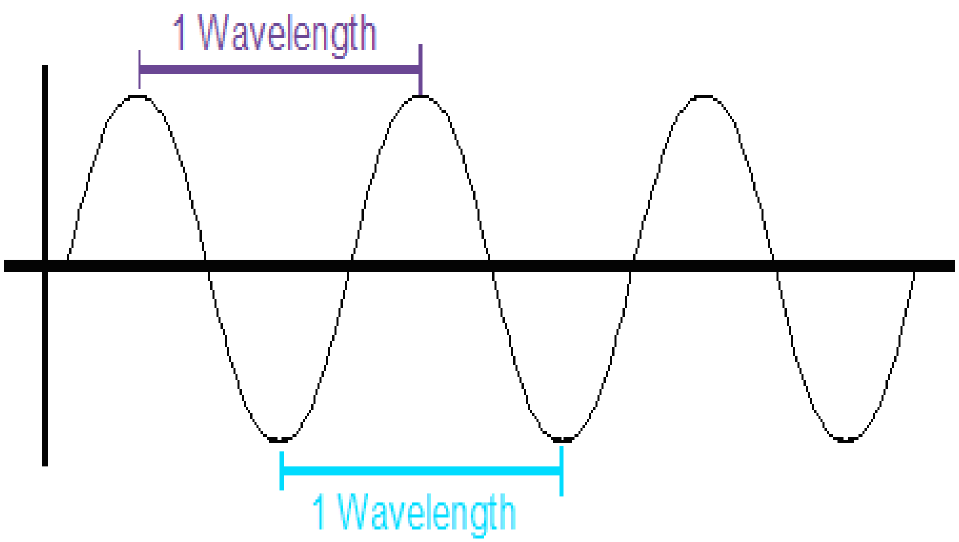
- **Hertz** is the unit of **frequency**, and just means how many cycles per second.
  - It is abbreviated as **Hz**.
  - It is named after Heinrich Hertz, one member of the Hertz family that made
- many important contributions to physics.
- In formulas **frequency** appears as an "**f**".
- Since **frequency** and period are exact inverses of each other, there is a very basic pair of
- formulas you can use to calculate one if you know the other…

$$f = \frac{1}{T}$$

$$T = \frac{1}{f}$$

Wavelength

Wavelength is defined as the distance from a particular height on the wave to the next spot on the wave where it is at the same height and going in the same direction.



->Usually it is measured in meters, just like any length.

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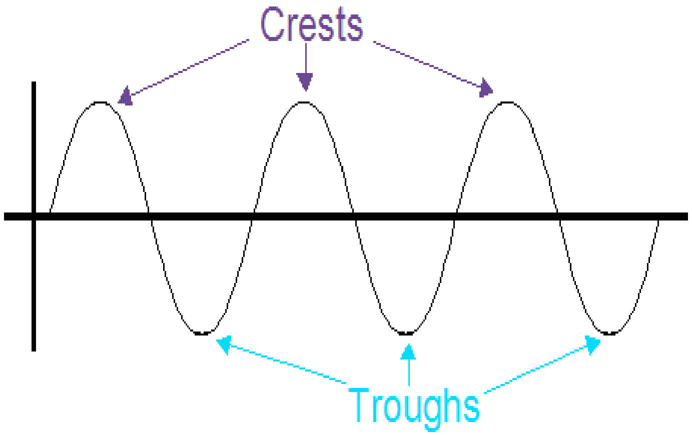


•Any of the parts of the wave that are pointing up like mountain are called **crests**. Any part that is sloping down like a valley is a **trough**.

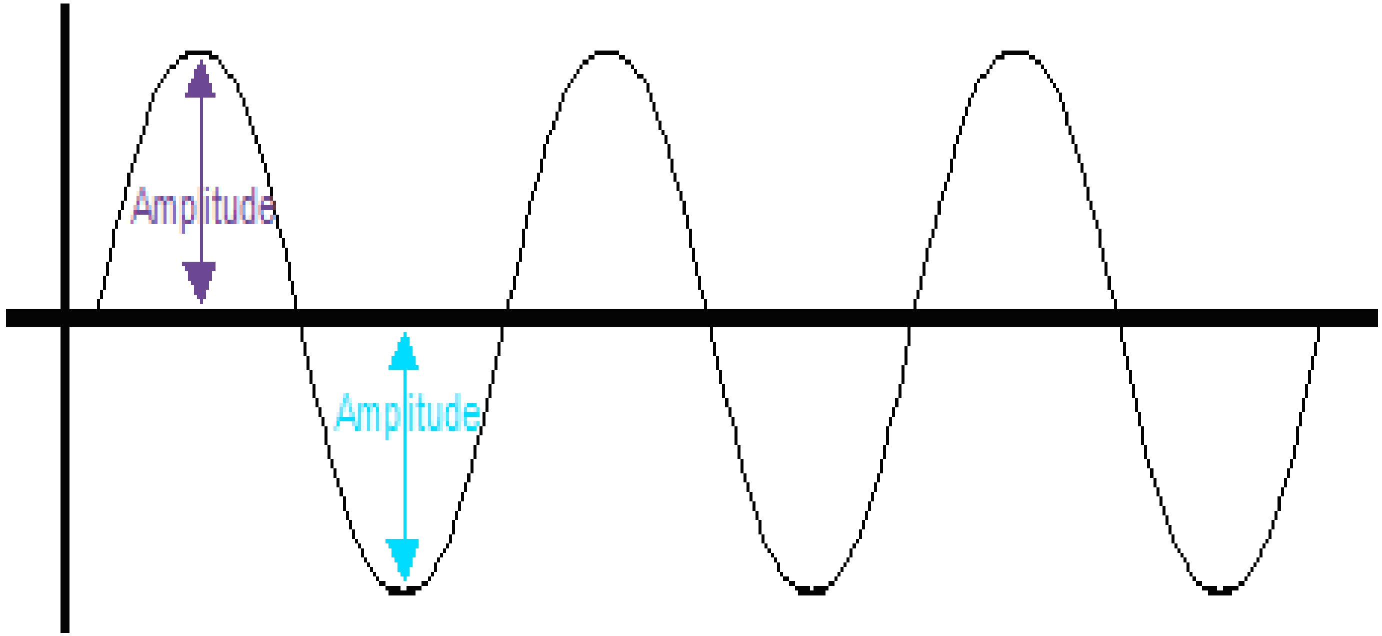
AMPLITUDE :-

Amplitude is the magnitude of the wave - how high it goes on the y axis. Wavelength is basically the same thing as period - the length of a single wave on the x axis..The **amplitude** of a wave is measured as:

1. the height from the equilibrium point to the highest point of a **crest** ***or***

2. the depth from the equilibrium point to the lowest point of a **trough.**

Amplitude diagram



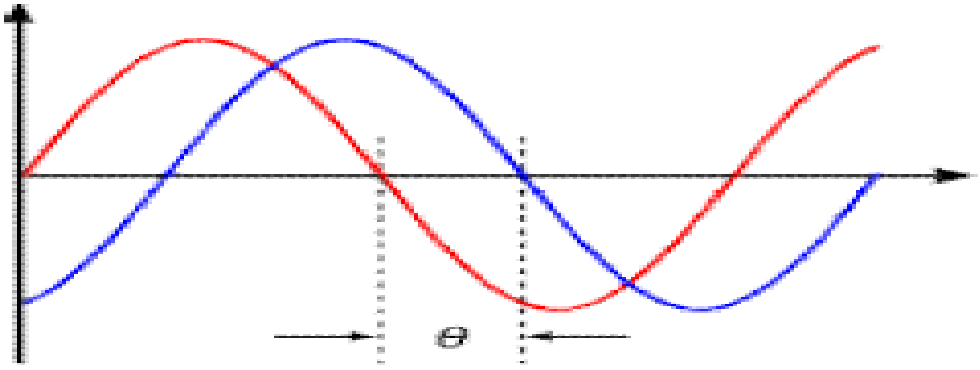
PHASE:-

- **Phase** denotes the particular point in the cycle of a waveform, measured as an angle in degrees.

->Phase difference:-

- **Phase difference** is the difference, expressed in electrical degrees or time, between two waves having the same frequency and referenced to the same point in time

PHASE DIAGRAM:-



->Illustration of phase shift. The horizontal axis represents an angle (phase) that is Increasing with time.