

BASIC ELECTRONICS

CONTENT

- ❖ Resistor
- ❖ Capacitor
- ❖ Diode
- ❖ Transistor

RESISTOR

A Resistor is a two terminal passive electronic component. It is an electrical component that limit the flow of current in an electronic circuit. Resistors can also be used to provide a specific voltage for an active device such as transistor.

➤ **Symbol :**



Resistor

➤ **SI Unit is : OHM**

➤ **Symbol of OHM : Ω**

➤ **Notation for Resistor**

O – for Ohm

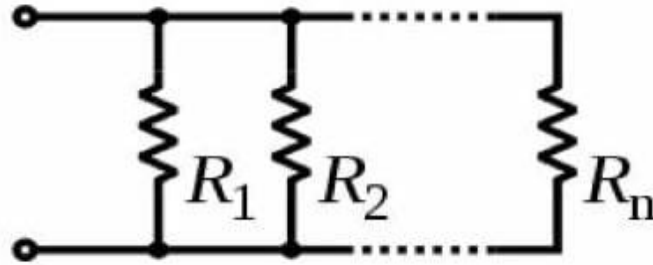
K – for kilo Ohm

M – for Mega Ohm

Combination of Resistor

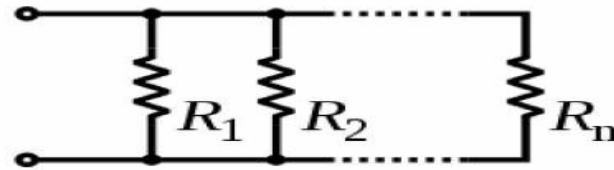
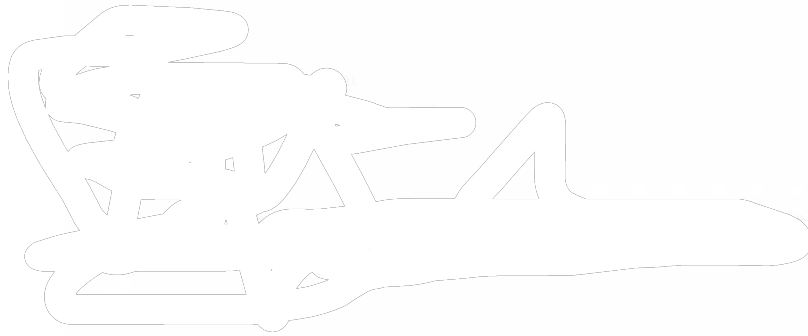
- Series Combination
- Parallel Combination

Series Combination



$$\frac{1}{R_{\text{eq}}} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_n}$$

➤ Parallel Combination



$$\frac{1}{R_{\text{eq}}} = \frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_n}$$

- In Series the current remains same.
- In Parallel the voltage remains same.

OHMS LAW

- **Ohm's Law** states that the current through a conductor between two points is directly proportional to the potential difference across the two points, and inversely proportional to the resistance between them.
- The mathematical equation that describes this relation is:

$$I = V/R$$

Resistor Color Code

Resistor color code table

Color	Color	1st Band	2nd Band	3rd Band Multiplier	4th Band Tolerance
Black		0	0	x1 Ω	
Brown		1	1	x10 Ω	$\pm 1\%$
Red		2	2	x100 Ω	$\pm 2\%$
Orange		3	3	x1k Ω	
Yellow		4	4	x10k Ω	
Green		5	5	x100k Ω	$\pm 0.5\%$
Blue		6	6	x1M Ω	$\pm 0.25\%$
Violet		7	7	x10M Ω	$\pm 0.10\%$
Grey		8	8	x100M Ω	$\pm 0.05\%$
White		9	9	x1G Ω	
Gold				x0.1 Ω	$\pm 5\%$
Silver				x0.01 Ω	$\pm 10\%$

Resistor color code table

Why we use Resistor?

- Limiting of Current
- Limiting of Voltage
- Power dissipation

Capacitor

- A **Capacitor** is a device for storing electric charge.
- A Capacitor is a passive electronic component consisting of conductors separated by a dielectric (insulator).

Capacitance

- This is a measure of a capacitance's ability to store charge.
- A large capacitance means that more charge can be stored
- Capacitance can be measured using formula:

Where

C = Capacitance,

Q = Charge,

V = Potential Difference,

- Unit of Capacitance is Farad (F)

Combination of Capacitors

- **Series Combination**
- **Parallel Combination**

Series Combination

- When capacitors are connected in series, the capacitance decreases.
- In series, total capacitance is given by the formula :

$$1/C_1 = 1/C_1 + 1/C_2 \dots\dots\dots$$

Parallel Combination

- When capacitors are connected in parallel, the capacitance increases.
- In parallel, total capacitance is given by the formula :

$$C_1 = C_1 + C_2 \dots\dots C_n$$

Types of Capacitors

- **Polarized Capacitor**
- **Non Polarized Capacitor**

Non Polarized Capacitor

- The Capacitor which do not have a polarity.

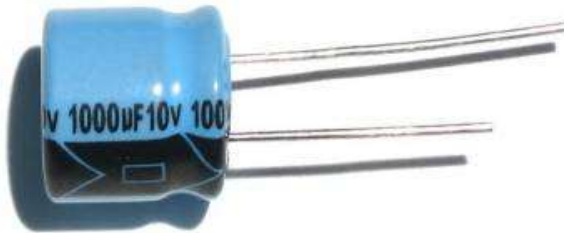
Non Polarized capacitor

- The capacitor which do not have a polarity

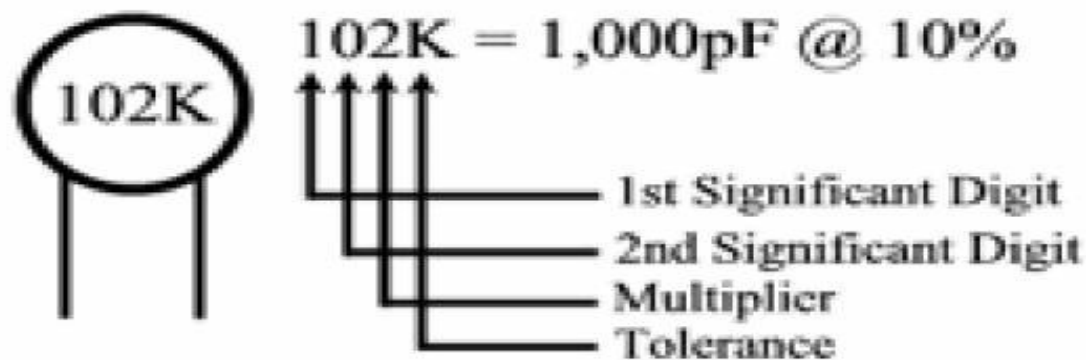


Polarised capacitor

- The capacitor which have a polarity



How to Read Ceramic Capacitor



Features

- Capacitors offers low impedance to AC.
- It offers high impedance to DC.
- Reactance of capacitance is given by :

$$X_c = 1/2\pi f c$$

Application

- Blocking DC Voltage.
- Adjusting Frequency.
- Use to generate a time delay application.
- Smoothing of DC voltage.

Diode

- **Diode** is an electronic component which permits the flow of current in one direction only.
- Today diodes are made up of semiconductor material, therefore they are often called semiconductor diodes or crystal diodes.

Why we use it?

- Diodes are used for rectification.
- Diodes are used in electrical meters for there protection.
- Diodes are used in wave shaping circuits.
- Diodes (LED) are used in display.

Material

- Diodes are semiconductor devices
- Silicon(Si) or Germanium(Ge) are used.

Types

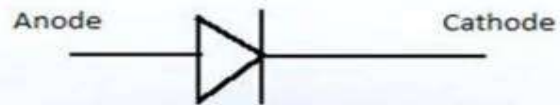
- PN Junction diode
- Zener Diode
- Light Emitting Diode (LED)
- Photo Diodes

PN Junction Diode

- This diode is made by p-type & n-type material
- This PN junction diode works in forward bias i.e., anode is connected to positive terminal & cathode is connected to negative terminal.

Symbol

Diagram
equivivalent:



Real life
image:

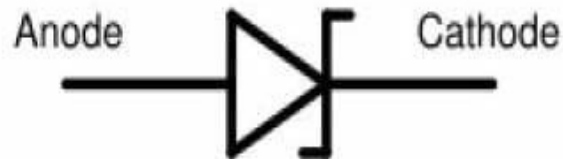


Current flow:



Zener Diode

- Zener diode works in reverse bias
- Symbol of Zener Diode.



How can we recognize Zener Diode?

- There is black band which is negative terminal & other one is positive terminal



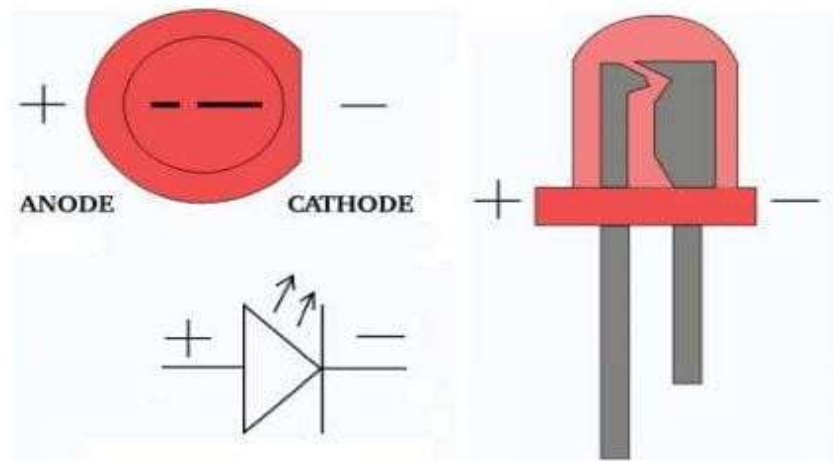
Light Emitting Diode

- Light Emitting Diode (LED) operates in forward bias.
- It emits light when connected in circuit.
- Symbol of LED



How can we recognize LED?

- The shorter lead of the LED is negative terminal & longer one is positive, also on the negative terminal there is a flat spot when we see from the top.



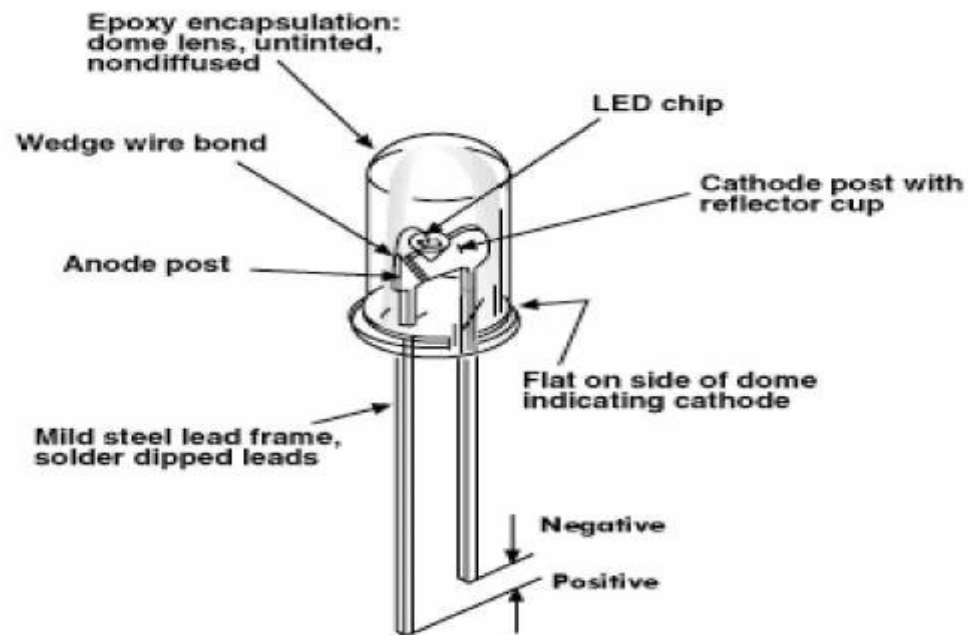


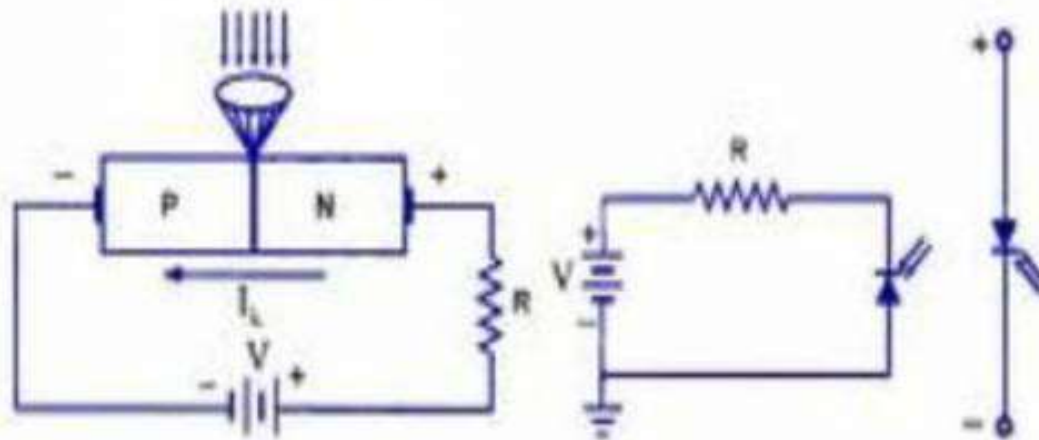
Photo Diode

- Often known as Photo Detector
- Photo Diode operates in reverse bias
- Light falls on the PN Junction of the photo diode which creates electron-hole pair in the depletion layer which causes flow of current.
- Current depends upon the light intensity
- When light incident on the photodiode then current flows in the circuit.

Physical view of Photo Diode:



Working of Photodiode



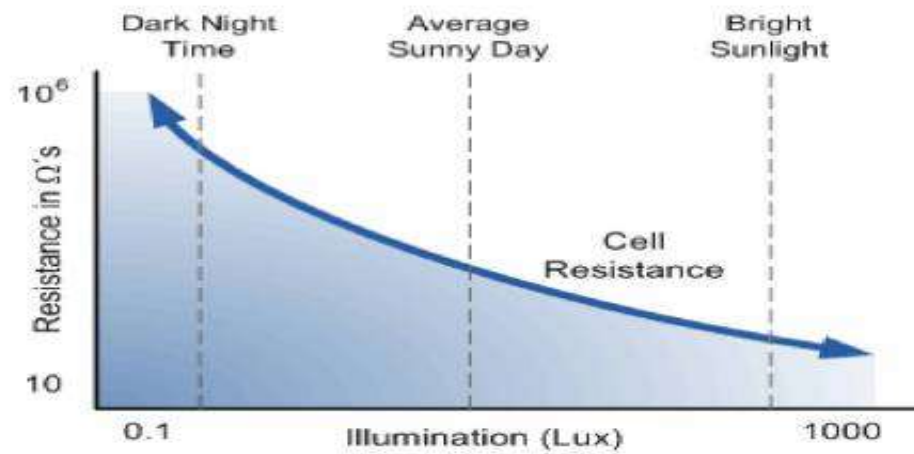
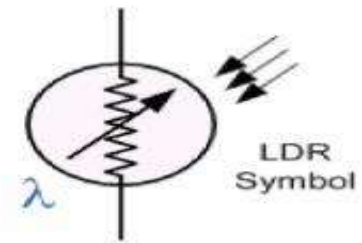
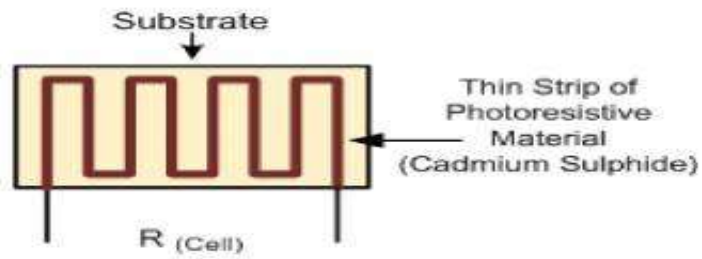
Basic Biasing arrangement and construction of photodiode



Photodiode

LDR(Light Dependent Resistor)

- A light dependent resistor is a semiconductor electric device that has a very high resistance to the flow of electrical current in the absence of light.
- When light strikes the device, it lowers its resistance, allowing electrical current to flow through it and on to other devices or electrical circuits.



Transistor

- A **Transistor** is a semiconductor device used to amplify and switch electronic signals. It is made of a solid piece of Semiconductor material, with at least three terminals for connection to an external circuit.
- Device with three terminals where one terminal can be use to control the flow of current through the other two terminals.

- The three terminals are Emitter ,
Base and Collector



Types of Transistors

- **Junction transistor**
- **Field Effect transistor**

Junction Transistor

➤ Transistor are of two types:

1.) **n-p-n**



2.) **p-n-p**



n-p-n as a switch

- **When base of n-p-n is connected with logic voltage then it short circuit emitter and collector (SWITCH ON).**
- **When base of n-p-n is connected with logic low voltage then it open circuit both emitter and collector (SWITCH OFF).**

THE END