



IoT

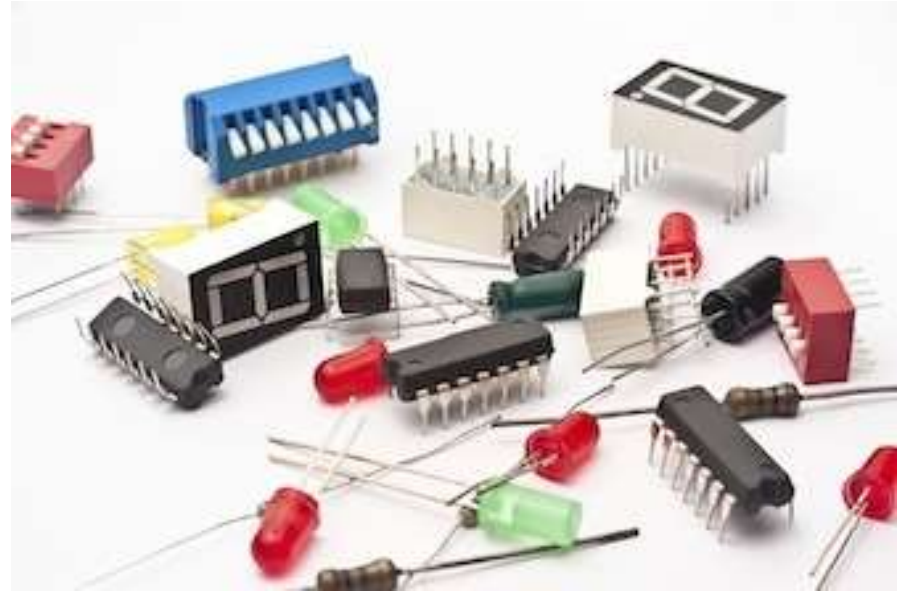
Basic Electronics

Dr. Sarwan Singh
Deputy Director
NIELIT Chandigarh



Agenda

- Resistance
- Capacitor
- Diode
- Rectifier
- Power Supply



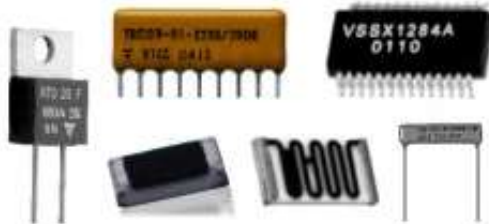
Resistance

Resistor is two terminal electrical component that implements electrical resistance as a circuit elements.

Carbon & Metal Film



Thick Film



Thin Film



Wire-Wound



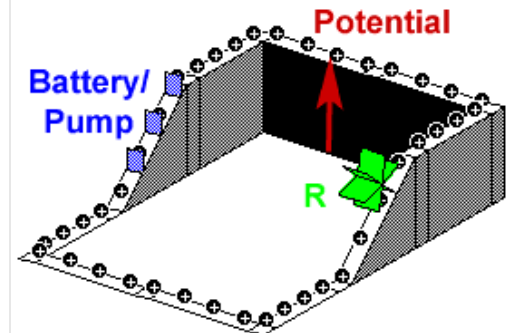
Special-Purpose



Adjustable

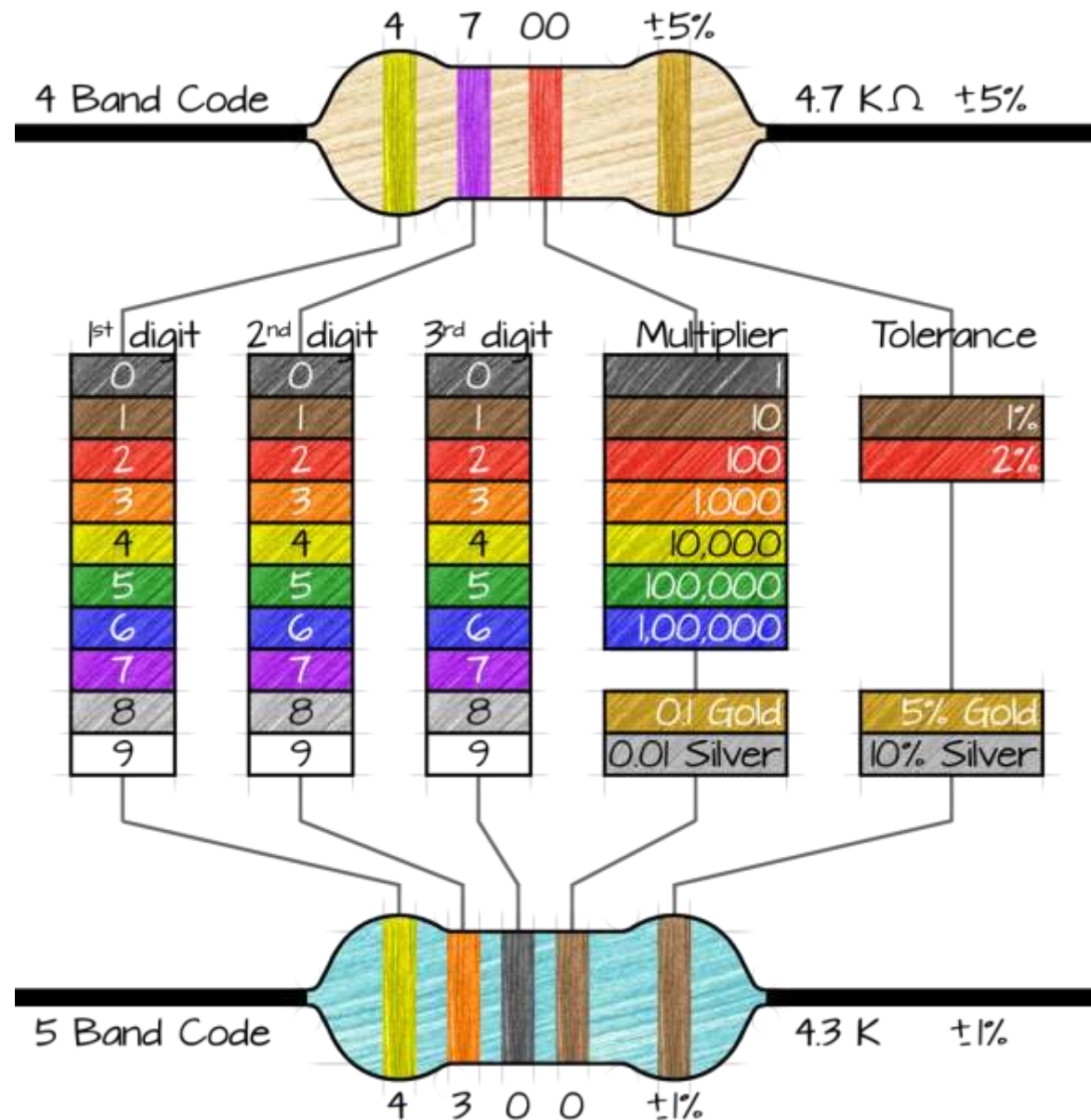


Compilation by
www.RFCafe.com



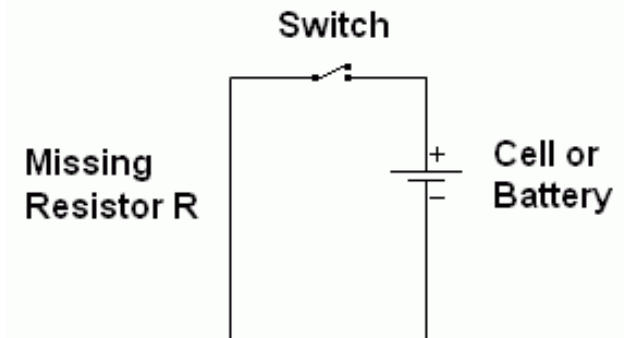
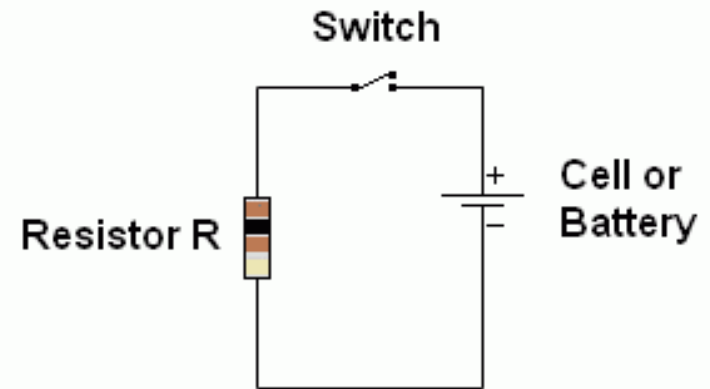
Calculate Resistance

- Black
- Brown
- Red
- Orange
- Yellow
- Green
- Blue
- Violet
- Grey
- White



Resistance - Measured in Ohms

- In a simple circuit, the resistor limits the current to a small steady safe level.
- Without a current limiting resistor, the current is very large and possibly dangerous. There is a fire risk. This is called a **short circuit**

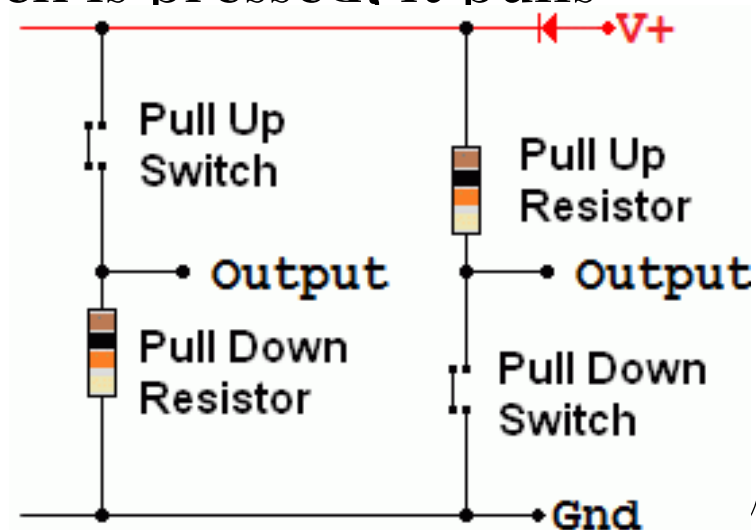


What Resistors Do

- Resistors limit the current flowing to a smaller safe level.
- Voltage dividers can use potentiometers to make volume controls.
- A timing resistor is used in conjunction with a capacitor to make a timing circuit.
- A **pull-up resistor** increases the voltage, usually close to the positive power supply voltage.
- A **pull-down resistor** drops the voltage close to zero or perhaps to the negative power supply voltage.

What Resistors Do

- switch is like a resistor. When it's on, the resistance is very close to zero. When it's off, the resistance is very close to infinity.
- the pull-down resistor pulls the voltage down to zero. If the pull-up switch is pressed, it pulls the voltage up to whatever the $+$ supply is.
- the pull-up resistor pulls the voltage up to whatever the $+$ supply is. If the pull-down switch is pressed, it pulls the voltage down to zero.



Type of Resistors



.25w (+1%)



.25w (+5%)



1/8W (+ 1%)



1/8W (+ 5%)



1/8W (+0.1%)



1W (+ 5%)



2W (+ 5%)



5W (+ 5%)



10W (+ 5%)



DIP Resistor Network



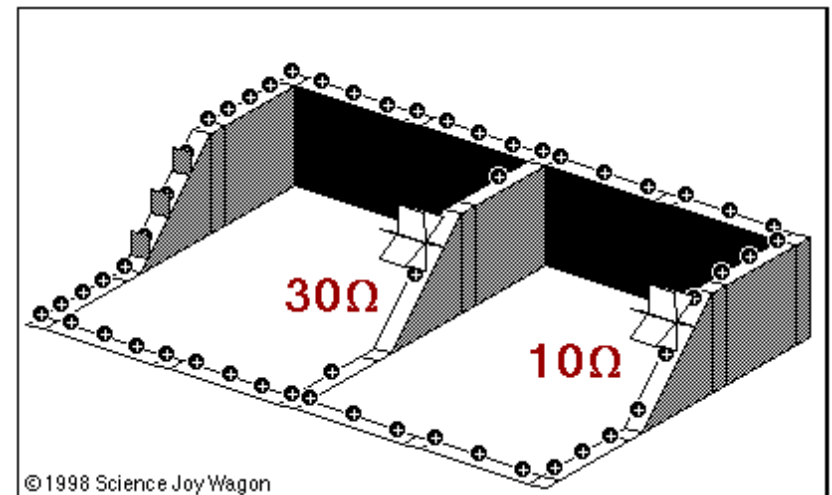
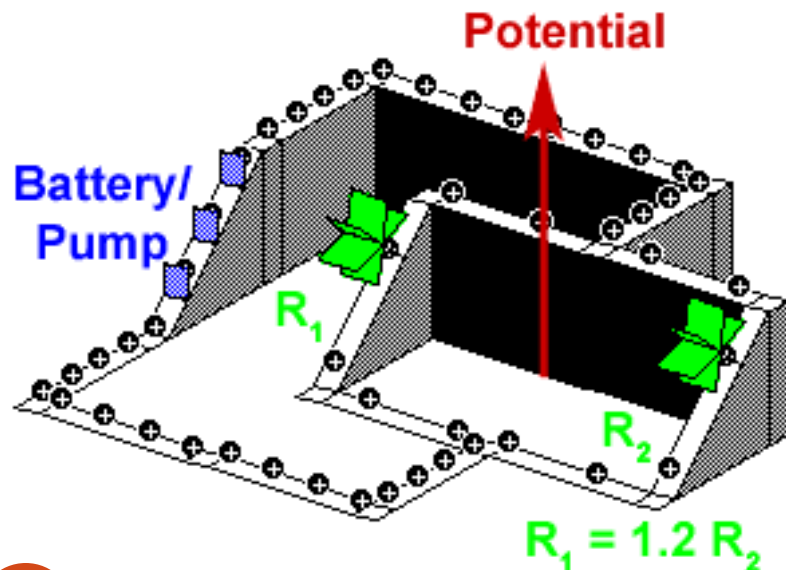
SIP Resistor Network



SMD Resistors

Resistors in Series – Parallel

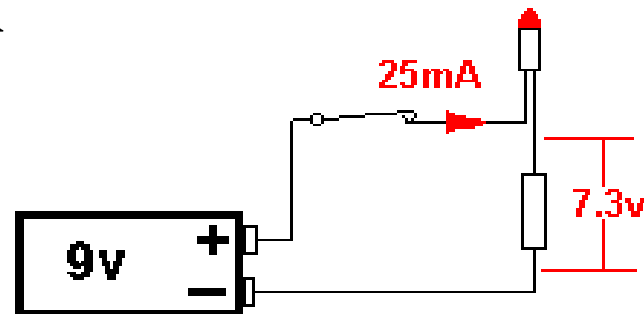
- In Series resistances gets added $R_{\text{total}} = R_1 + R_2 + \dots$
- In Parallel combination the total resistance value is calculated as $1/R_{\text{total}} = 1/R_1 + 1/R_2 + \dots$



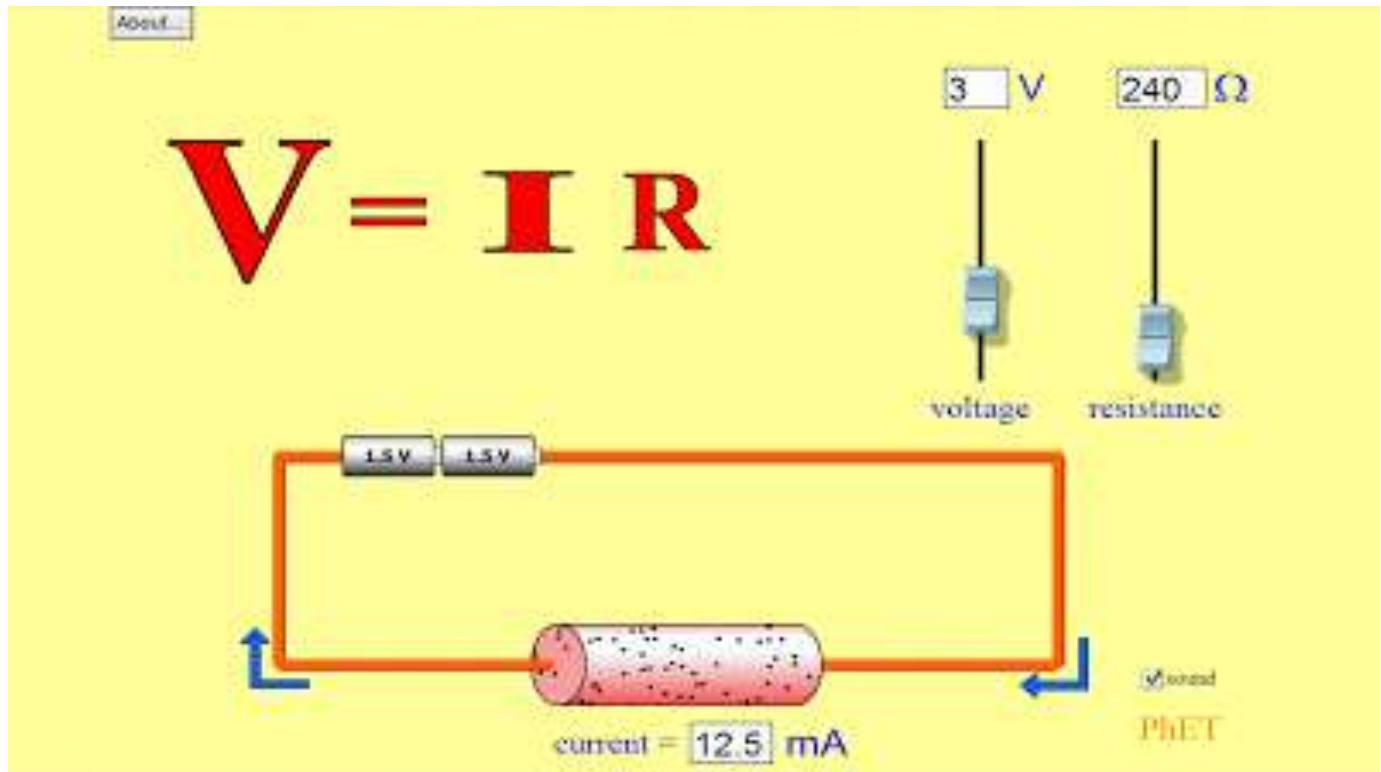
©1998 Science Joy Wagon

Ohm's Law

- The electric potential difference between two points on a circuit (ΔV) is equivalent to the product of the current between those two points (I) and the total resistance of all electrical devices present between those two points (R). Often referred to as the **Ohm's law** equation, this equation is a powerful predictor of the relationship between potential difference, current and resistance.
- Suppose a resistance having a value of R ohms carries a current of I amperes. Then the voltage across the resistor is equal to the product IR . $V = I \times R$

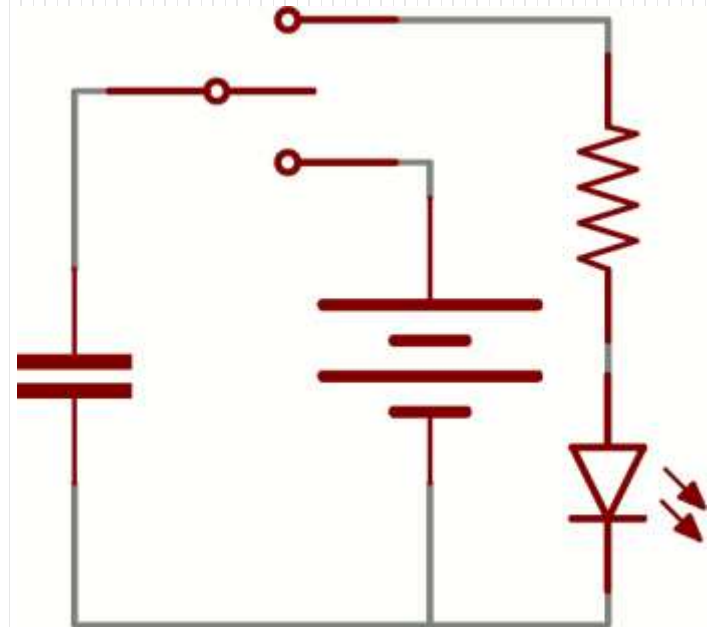
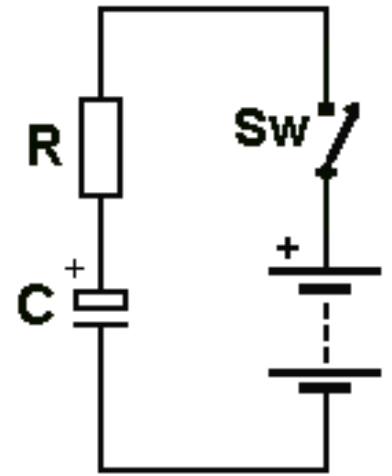


Ohm's Law



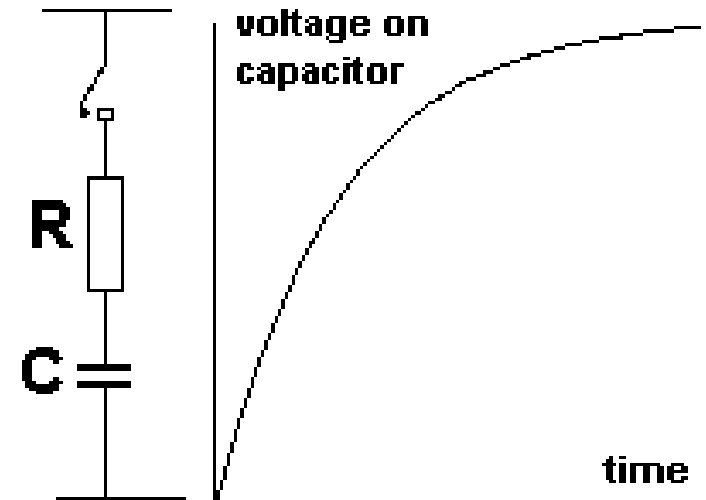
Capacitor

- Capacitor stores charge
- Measured in Farad (F)



Working of capacitor

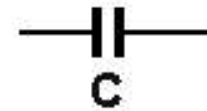
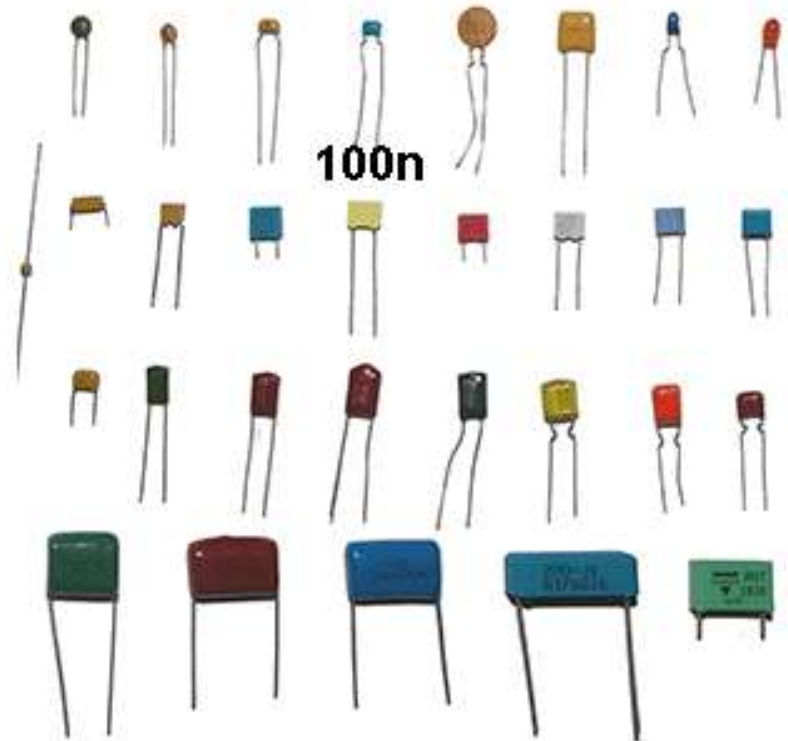
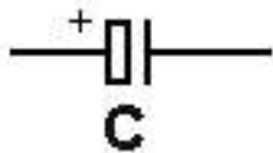
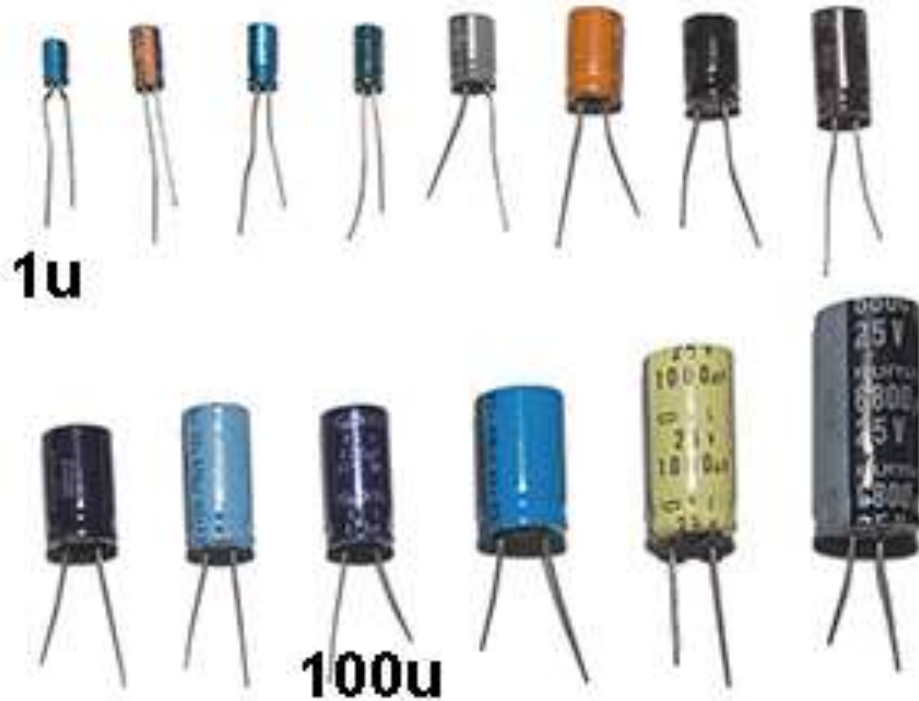
- capacitor is connected in series with a resistor and this makes the capacitor charge slowly.
- As the capacitor charges, the voltage across it **INCREASES** but the increase is not linear. The voltage increases quickly at the beginning but gets slower and slower



Working of Capacitor

- Its **function** is to store the electrical energy and give this energy again to the circuit when necessary.
- In other words, it charges and discharges the electric charge stored in it.
- Besides this, the **functions of a capacitor** are as follows: It blocks the flow of DC and permits the flow of AC.

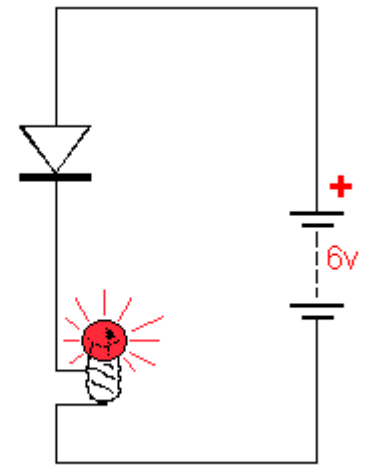
Type of Capacitor



Functions of Capacitor

- It blocks the flow of DC and permits the flow of AC.
- It is used for coupling of the two sections.
- It bypasses (grounds) the unwanted frequencies.
- It feeds the desired signal to any section.
- It is used for phase shifting.
- It is also used for creating a delay in time.
- It is also used for filtration, especially in removing ripples from rectified waveform.
- It is used to get tuned frequency.
- It is used as a motor starter.
- It is also used in conjunction with a resistor to filter ripples in a rectifier circuit.

Diode



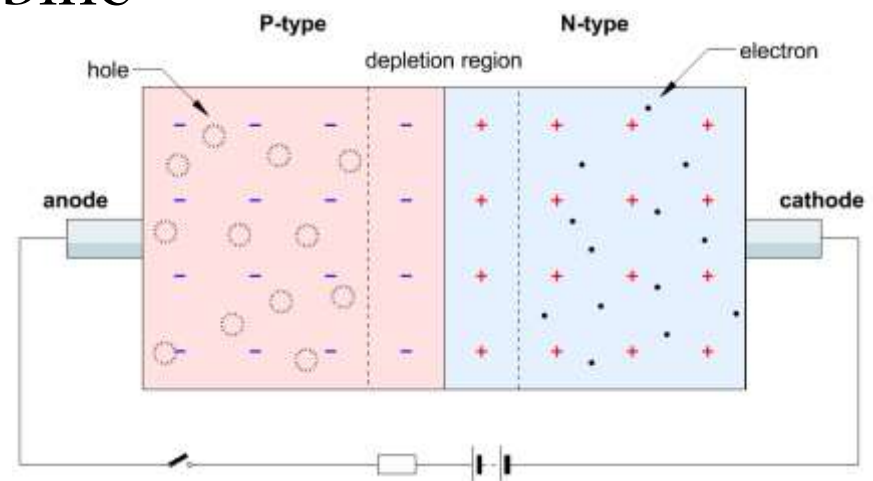
How a diode works

- **diode** allows an electric current to pass in one direction (called the **diode's** forward direction), while blocking it in the opposite direction (the reverse direction).
- As such, the **diode** can be viewed as an electronic version of a check valve.



pn junction Diode

- Battery connected across the p-n junction **makes** the **diode** forward biased, pushing electrons from the n-type to the p-type and pushing holes in the opposite direction.
- Electrons and holes cross the junction and combine. Photons (particles of light) are given off as the electrons and holes recombine

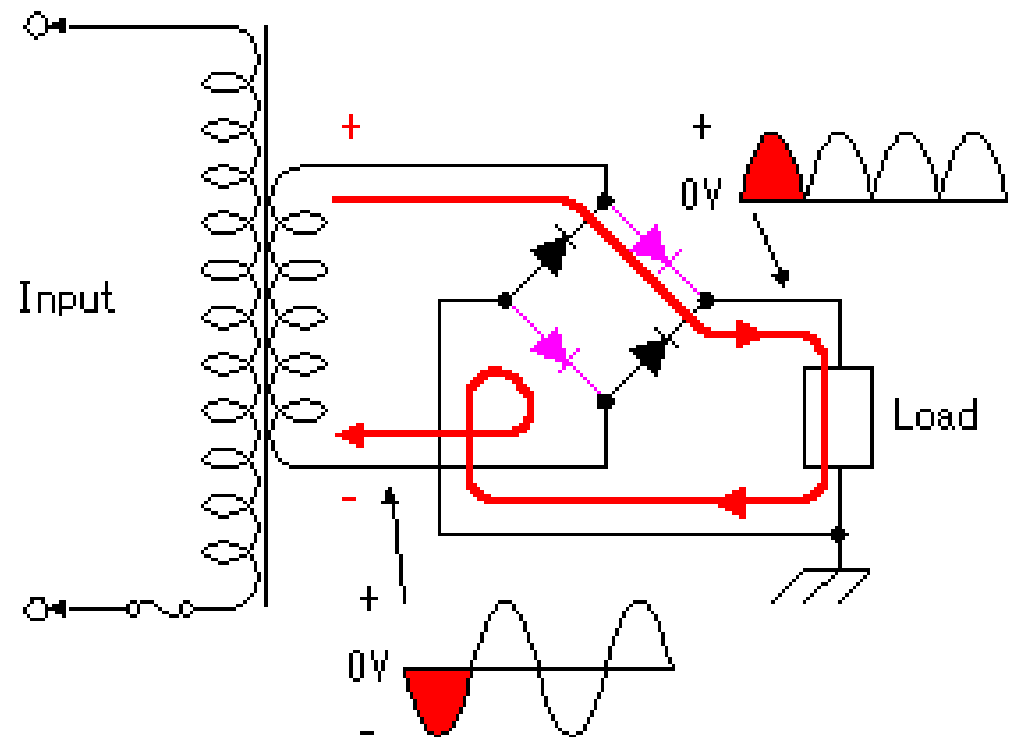
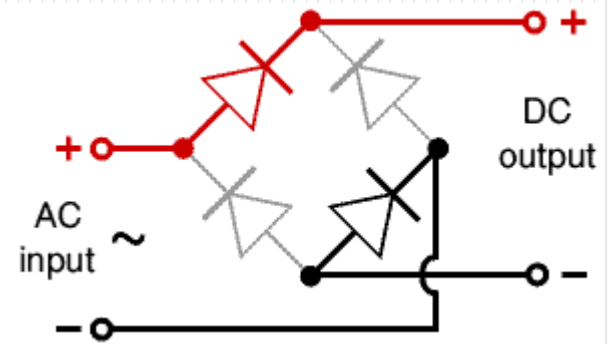


Type of Diode



Types of Diode

Rectifier



Power Supply

- Rectifier
- Filter circuit
- Regulator
- load