UNIT & SYMBOL

- THE OHM (SYMBOL: Ω) IS THE SI UNIT OF ELECTRICAL RESISTANCE, NAMED AFTER GEORG SIMON OHM.

- AN OHM IS EQUIVALENT TO A VOLT PER AMPERE

- OTHER DERIVED UNITS ARE MILLI OHM (1 MΩ = 10^{-3} Ω), KILO OHM (1 KΩ = 10^{3} Ω), AND MEGA OHM (1 MΩ = 10^{6} Ω).

FIXED RESISTOR

VARIABLE RESISTOR

FIXED RESISTOR

- CARBON COMPOSITE RESISTOR
- FILM RESISTOR
- WIRE WOUND RESISTOR
- RESISTANCE WIRE

VARIABLE RESISTOR

- RHEOSTAT
- POTENTIOMETER
- THERMISTOR
- HUMISTOR
- VARISTOR
- PHOTORESISTOR

Types of variable resistor

Preset

Cermat

Trimpot

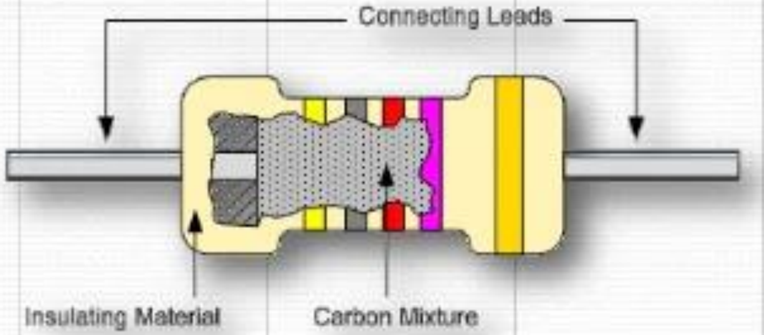
Rotatory
Potentiometer

Sliding
Potentiometers

Rheostat

CARBON COMPOSITE RESISTOR

- LOW INDUCTANCE
- IDEAL FOR HIGH FREQUENCY APPLICATIONS
- VERY CHEAP TO MAKE
- HAVE VERY LARGE TOLERANCES

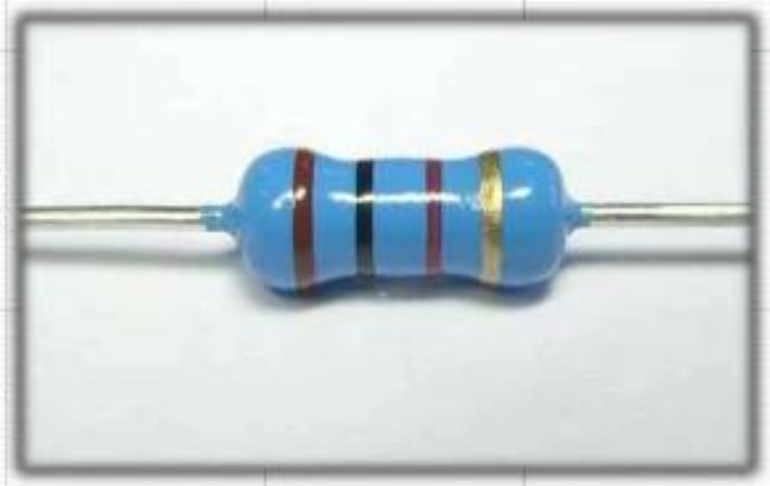


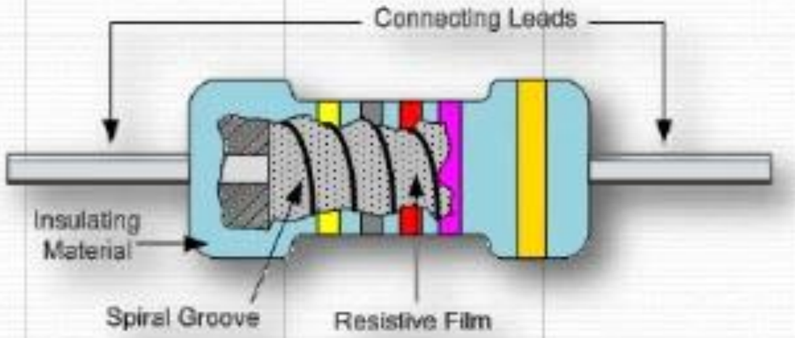
FILM RESISTOR

- THE RESISTIVE VALUE OF THE RESISTOR IS CONTROLLED BY INCREASING THE DESIRED THICKNESS OF THE DEPOSITED FILM.

- RESISTANE UPTO 10MΩ CAN BE OBTAINED.

- HAVE TOLERANCE 1% OR LESS

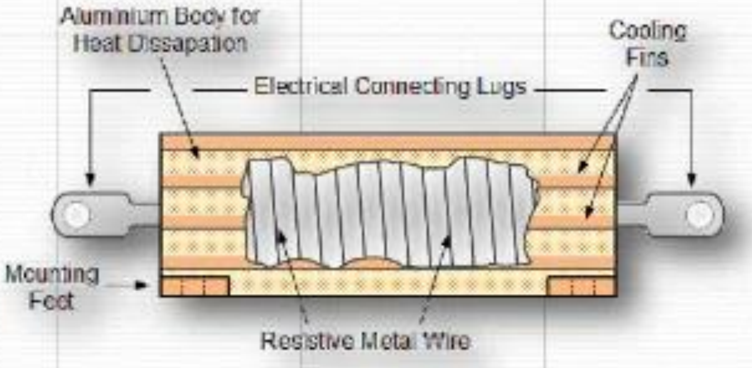




WIRE WOUND RESISTOR

- MADE BY WINDING A THIN METAL ALLOY WIRE ONTO AN INSULATING CERAMIC FORMER IN THE FORM OF A SPIRAL HELIX

- AVAILABLE IN VERY LOW OHMIC AND HIGH PRECISION VALUES
(FROM 0.01 TO 100KΩ)



RHEOSTAT

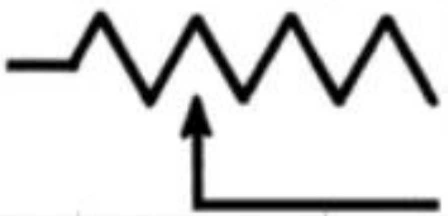
- RHEOSTAT IS A ADJUSTABLE RESISTOR USED IN APPLICATIONS THAT REQUIRE ADJUSTMENT OF CURRENT OR VARYING OF RESISTANCE IN AN ELECTRIC CIRCUIT

- A SPECIAL TYPE OF RHEOSTAT IS THE POTENTIOMETER

POTENTIOMETER

- A POTENTIOMETER IS, A POT, IN ELECTRONICS TECHNOLOGY IS A THREE-TERMINAL RESISTOR WITH A SLIDING CONTACT THAT FORMS AN ADJUSTABLE VOLTAGE DIVIDER.

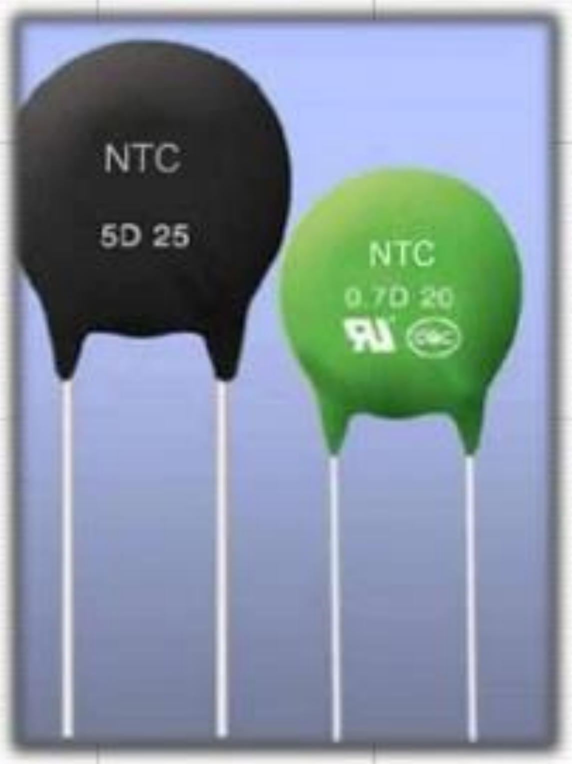
- POTENTIOMETERS ARE COMMONLY USED TO CONTROL ELECTRICAL DEVICES SUCH AS VOLUME CONTROLS, JOYSTICKS ETC.



THERMISTOR

- A THERMISTOR IS A TYPE OF RESISTOR WHOSE RESISTANCE VARIES SIGNIFICANTLY WITH TEMPERATURE

- THERMISTORS CAN BE USED AS CURRENT-LIMITING DEVICES FOR CIRCUIT PROTECTION, AS REPLACEMENTS FOR FUSES



HUMISTOR

➢A HUMISTOR IS A TYPE OF RESISTOR WHOSE RESISTANCE VARIES SIGNIFICANTLY WITH HUMIDITY

➢A HUMIDITY SENSOR MEASURES THE HUMIDITY LEVELBY MEASURING THE CHANGE IN THE RESISTANCE OF AN ELEMENT

VARISTOR

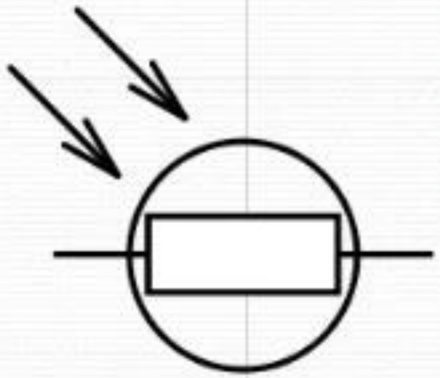
➢ A VARISTOR (OR VOLTAGE DEPENDENT RESISTOR) FUNCTION IS TO CONDUCT SIGNIFICANTLY INCREASED CURRENT WHEN VOLTAGE IS EXCESSIVE.

HIGH VOLTAGE VARISTOR

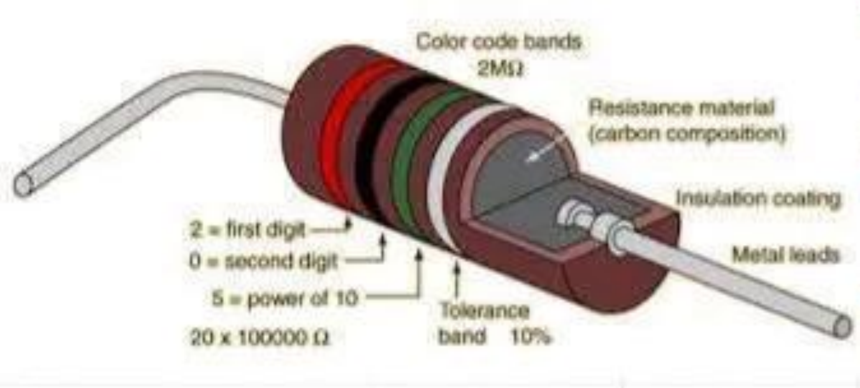
PHOTORESISTOR

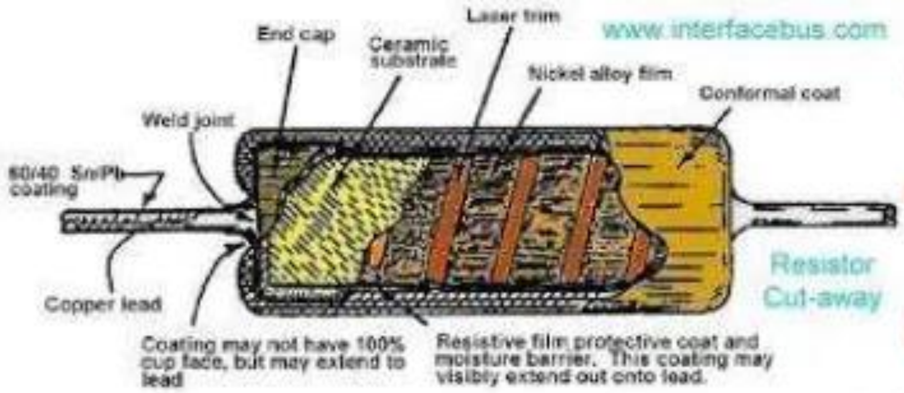
- A PHOTORESISTOR OR LIGHT DEPENDENT RESISTOR (LDR) EXHIBITS PHOTOCONDUCTIVITY.

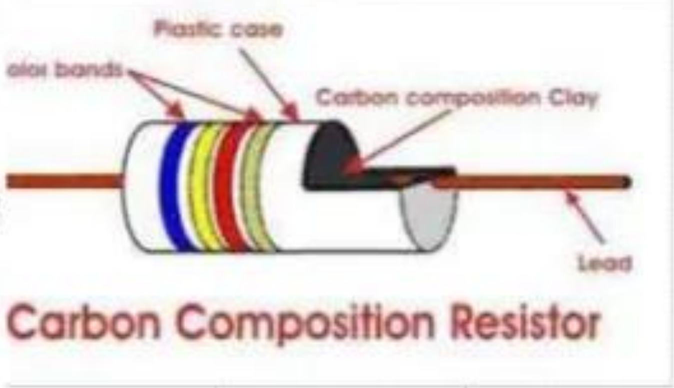
- PHOTORESISTORS IN MANY CONSUMER ITEMS SUCH AS STREET LIGHTS, CLOCK RADIOS, ALARM DEVICES ETC



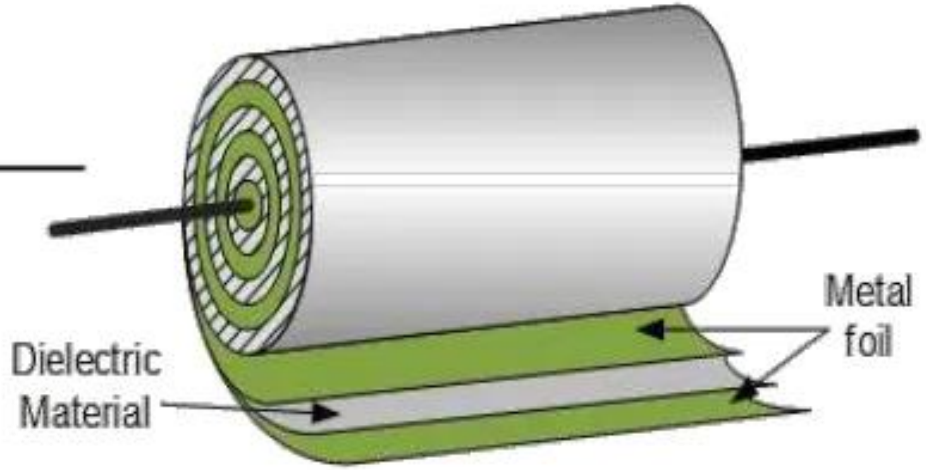
TYPES OF RESISTOR





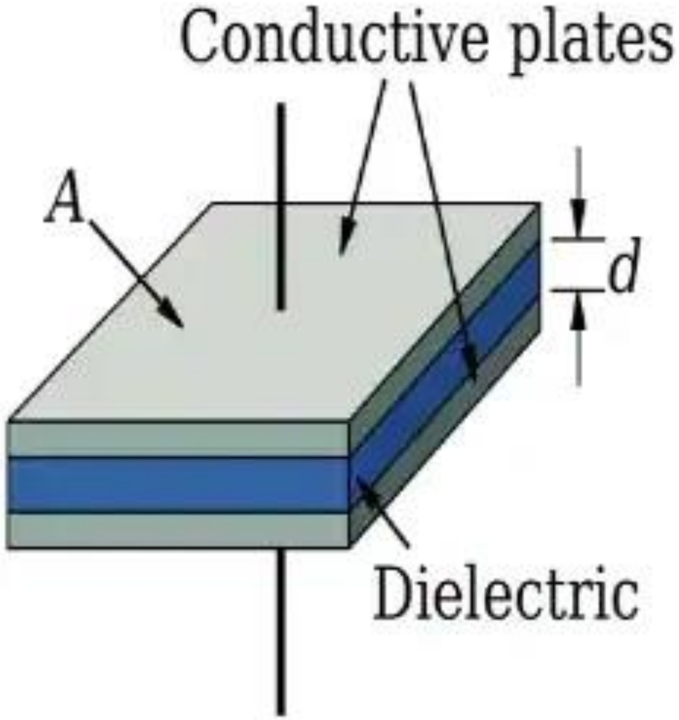


CAPACITOR



What is the capacitor?

The capacitor is passive device consists of tow plats and separated by an insulator material.



Reason for use the capacitor in the circuit is a **storage the energy.**

The Symbol of Capacitor

Polarized Capacitor

Axial Electrolytic Capacitor

Radial Electrolytic Capacitor

Surface Mount Electrolytic Capacitor

Polarized Capacitor

CAN Capacitor

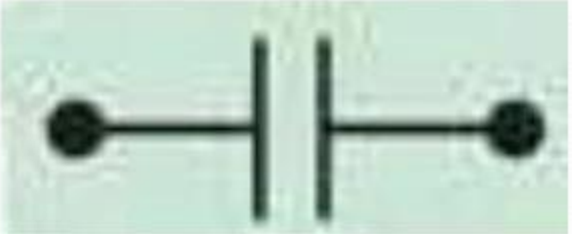
Tantalum Capacitor

SMD Tantalum Capacitor

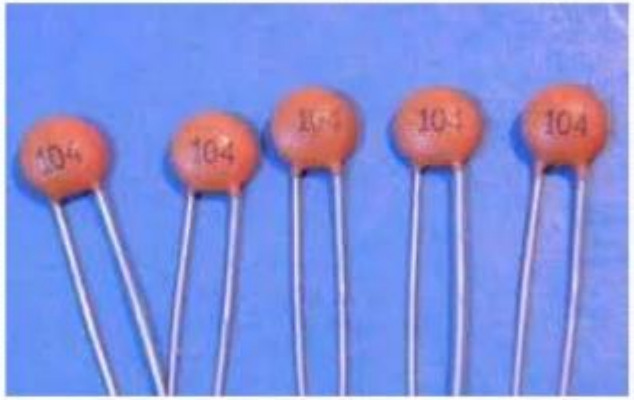
Application : Power Supply Circuits, Timer, Coupling Capacitor

Non-Polarized Caps

- Def: which can be charged in only direction or doesn't have any polarities.
- Schematic Symbol:

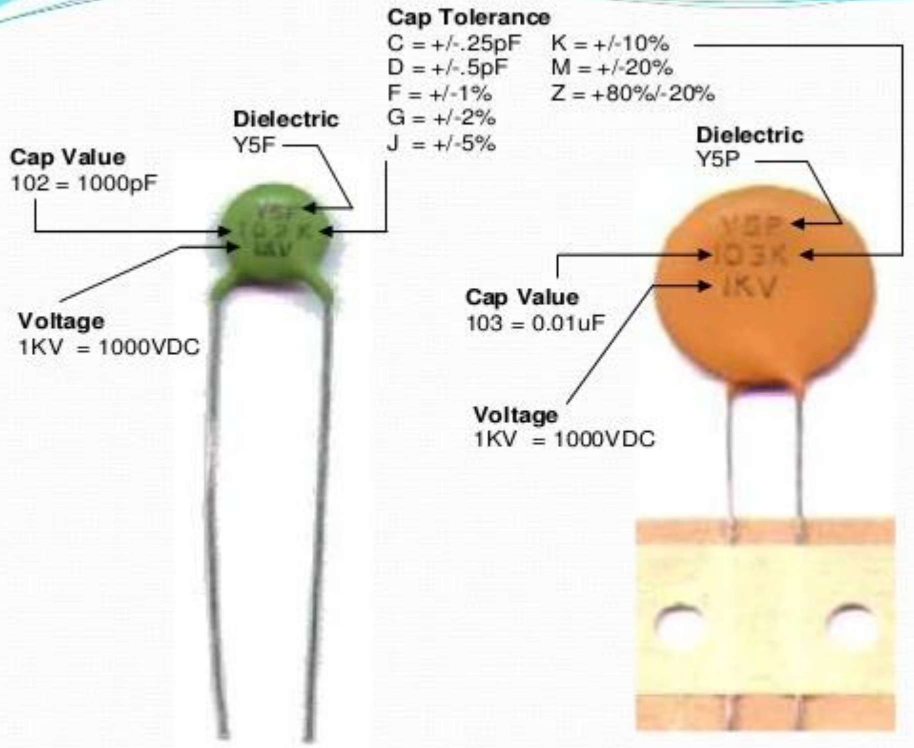


- Types :



Ceramic Capacitor

Conversion tables



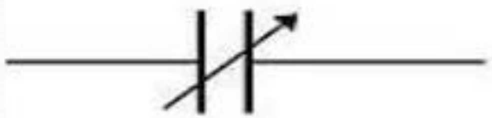
Example shown
P/N: NCD102K1KVY5F

Example shown
P/N: NCD103K1KVY5PTR

TRIMMER

Variable Capacitor

Variable Capacitor



GANG Capacitor

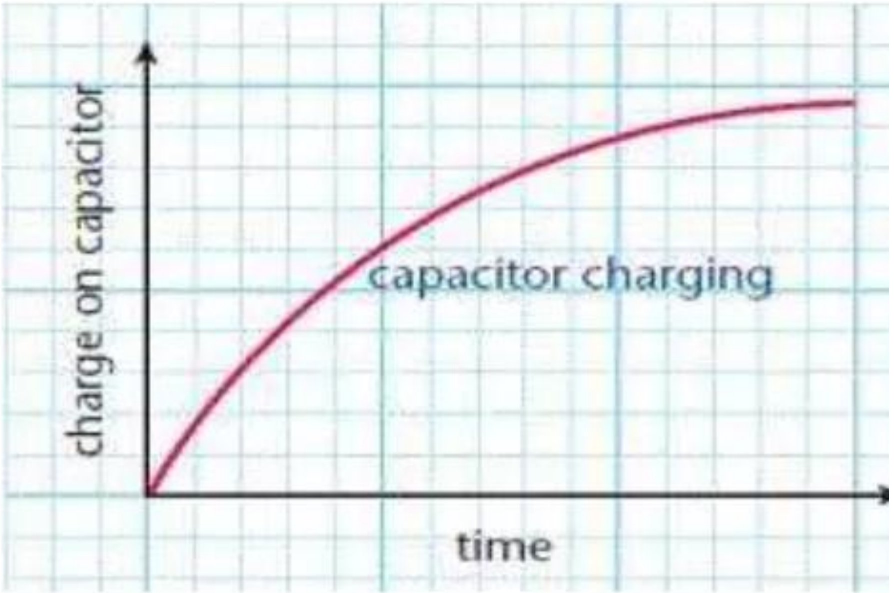
APPLICATION : Impedance Matching in Radio , Tuned Ckt, TV Tuners , Oscillators

The Unity of Measurement The Capacitor

μF uF mF	MICROFARAD	10^{-6}F
nF	NANOFARAD	10^{-9}F
pF mmf uuf	PICOFARAD	10^{-12}F

Charging the capacitor (curve).

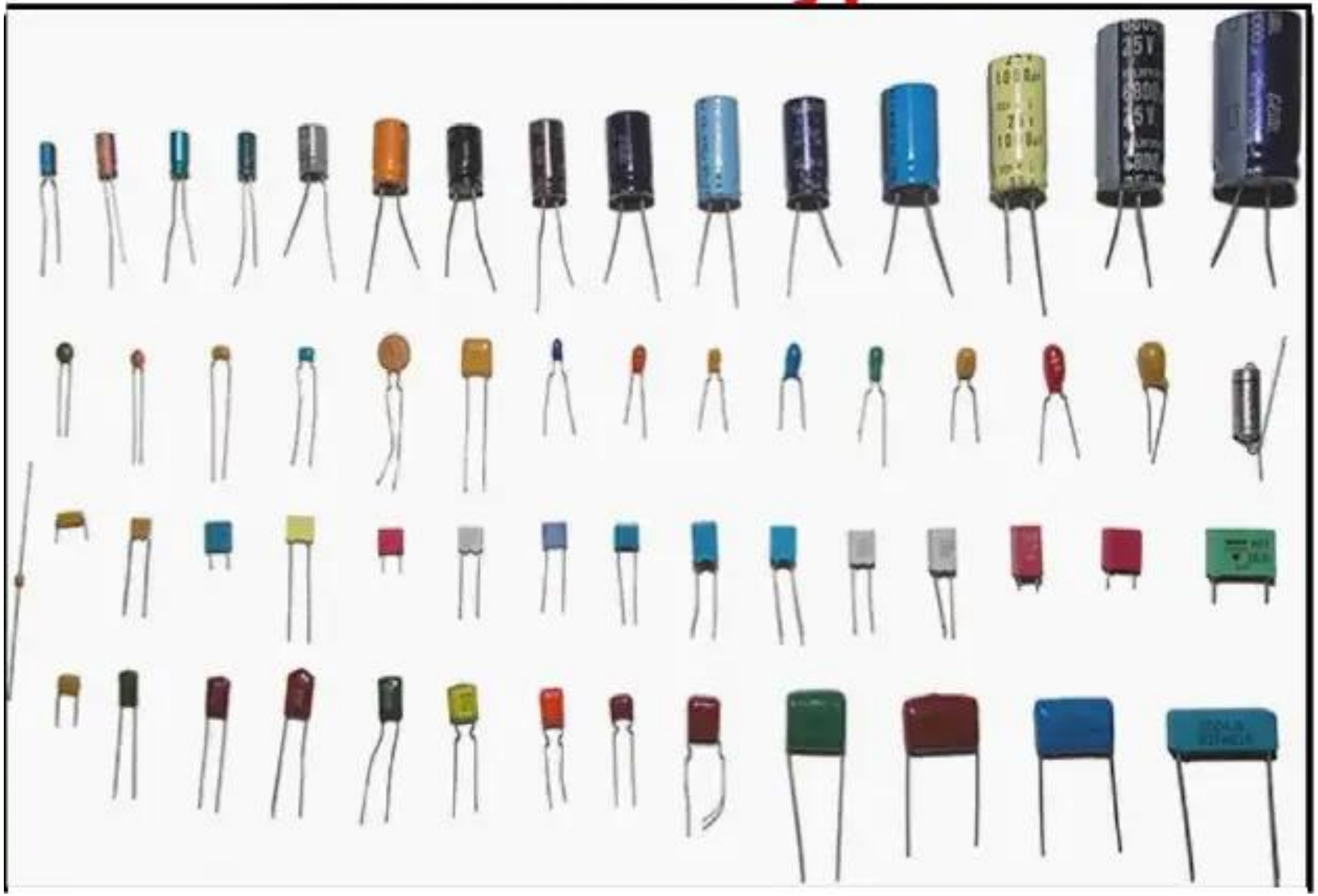
Charging



Discharging the capacitor (curve)

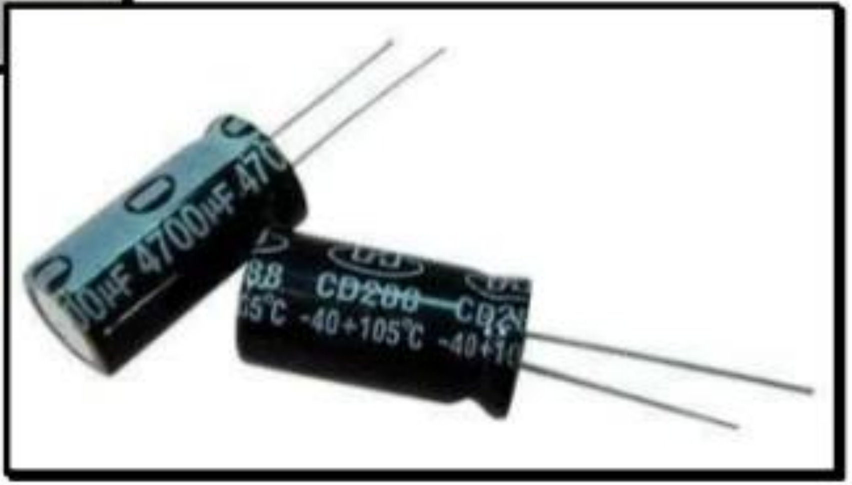
- Discharging

Different Types Of



Reading Values of capacitance Capacitors

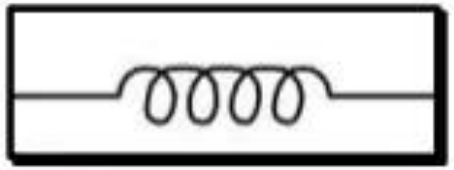
Fixed And Variable Capacitors



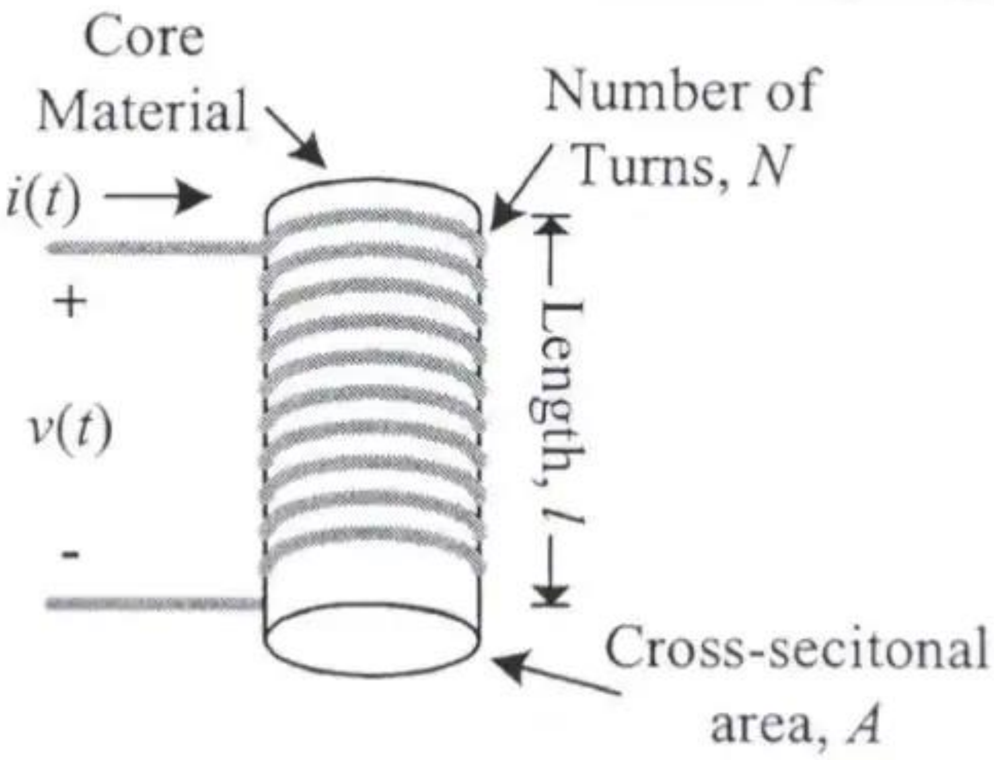
Inductor

Inductors

- ***Definition: An inductor is a passive electronic component that stores energy in the form of a magnetic field.***
- In its simplest form, an inductor consists of a wire loop or coil. The inductance is directly proportional to the number of turns in the coil.
- Inductance also depends on the radius of the coil and on the type of material around which the coil is wound.

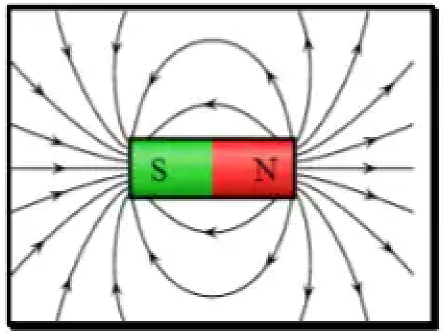


Inductor



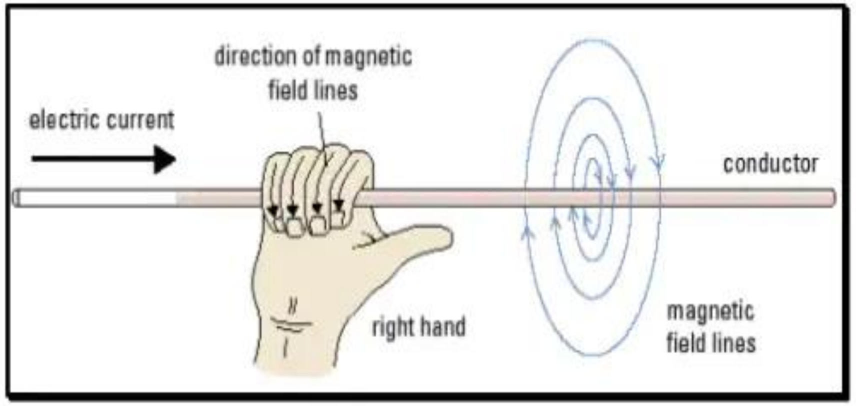
Magnetism

- Any material possessing the property of magnetism is a magnet.
- Every magnet has both a north (N) pole and a south (S) pole.
- Just as "like" electric charges repel each other and "unlike" charges attract, "like" magnetic poles repel each other and "unlike" poles attract.

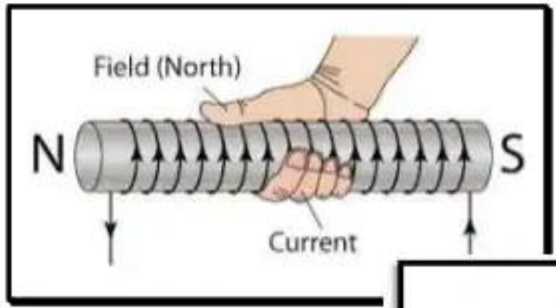


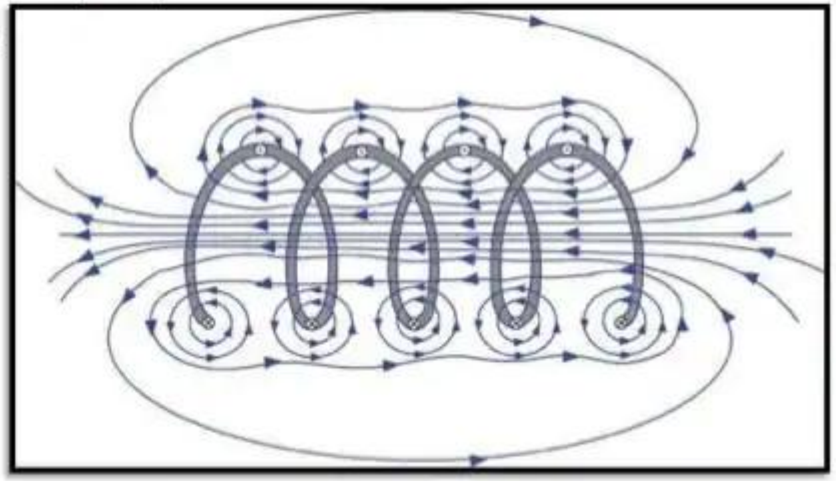
Magnetic Field In Current Carrying Conductor

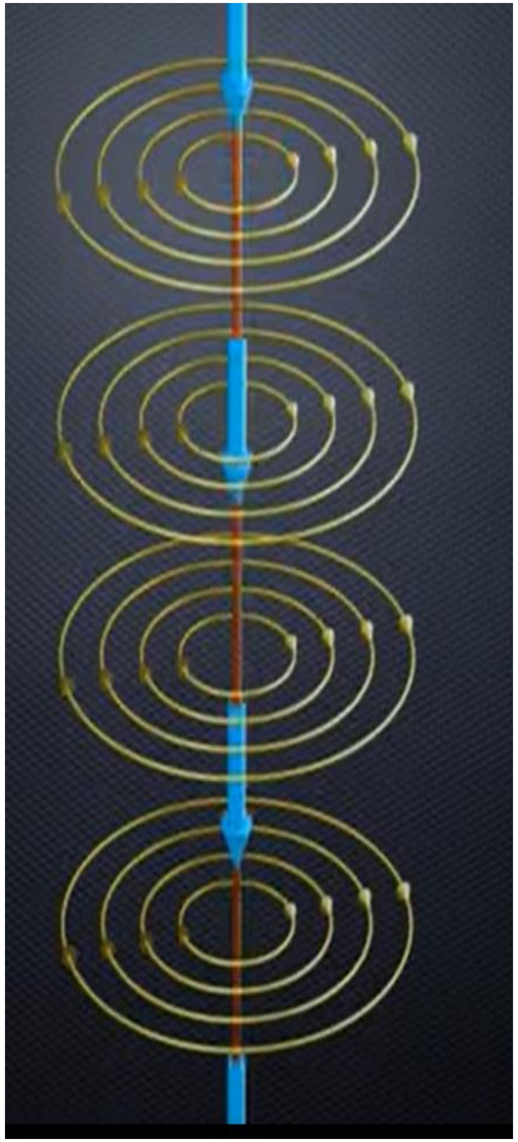
- A magnetic filed is associated with a moving charge.
- When current passes through a conductor, charges are moving and so magnetic filed is created around it.

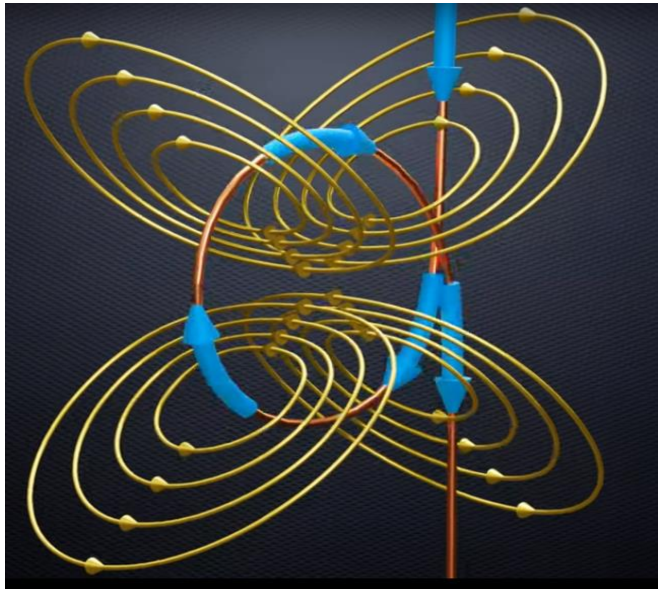


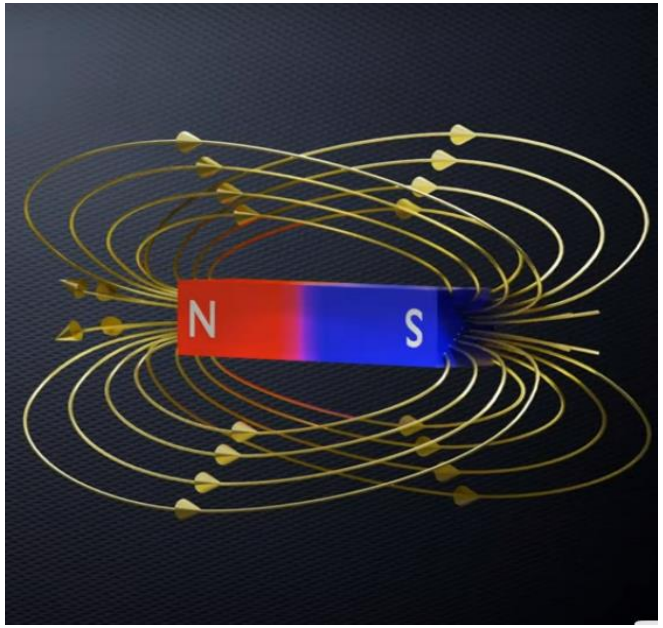
Magnetic Field In Current Carrying Conductor



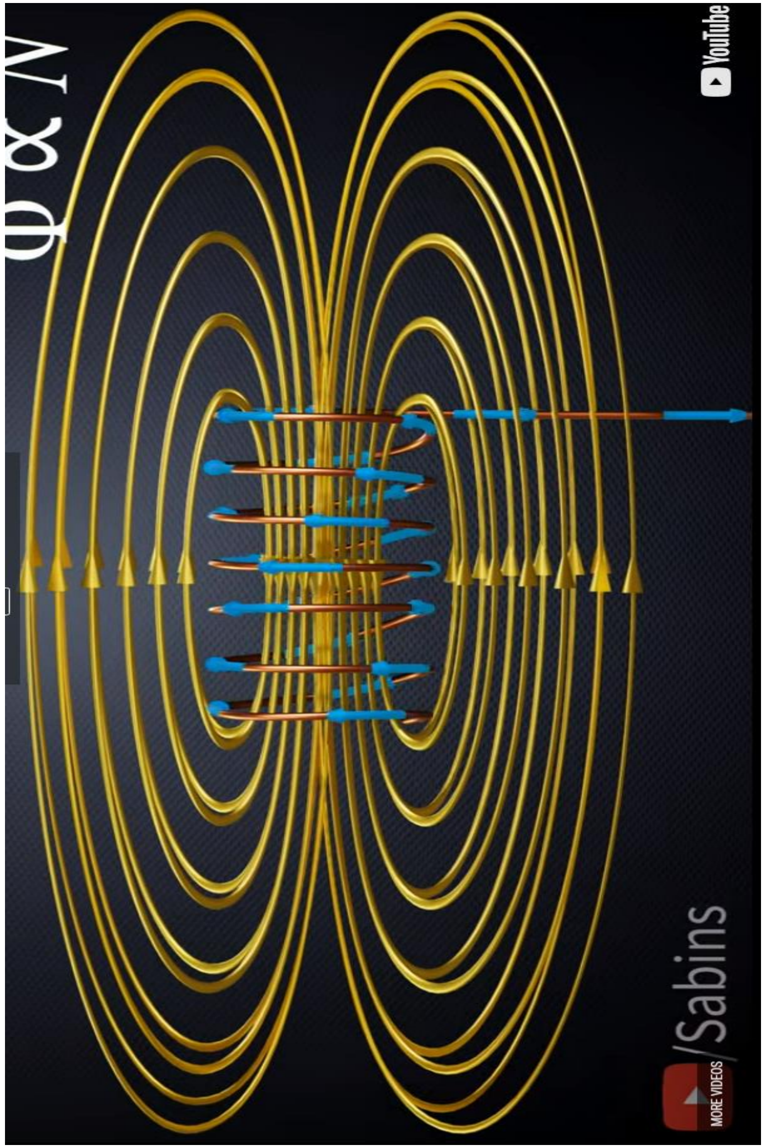






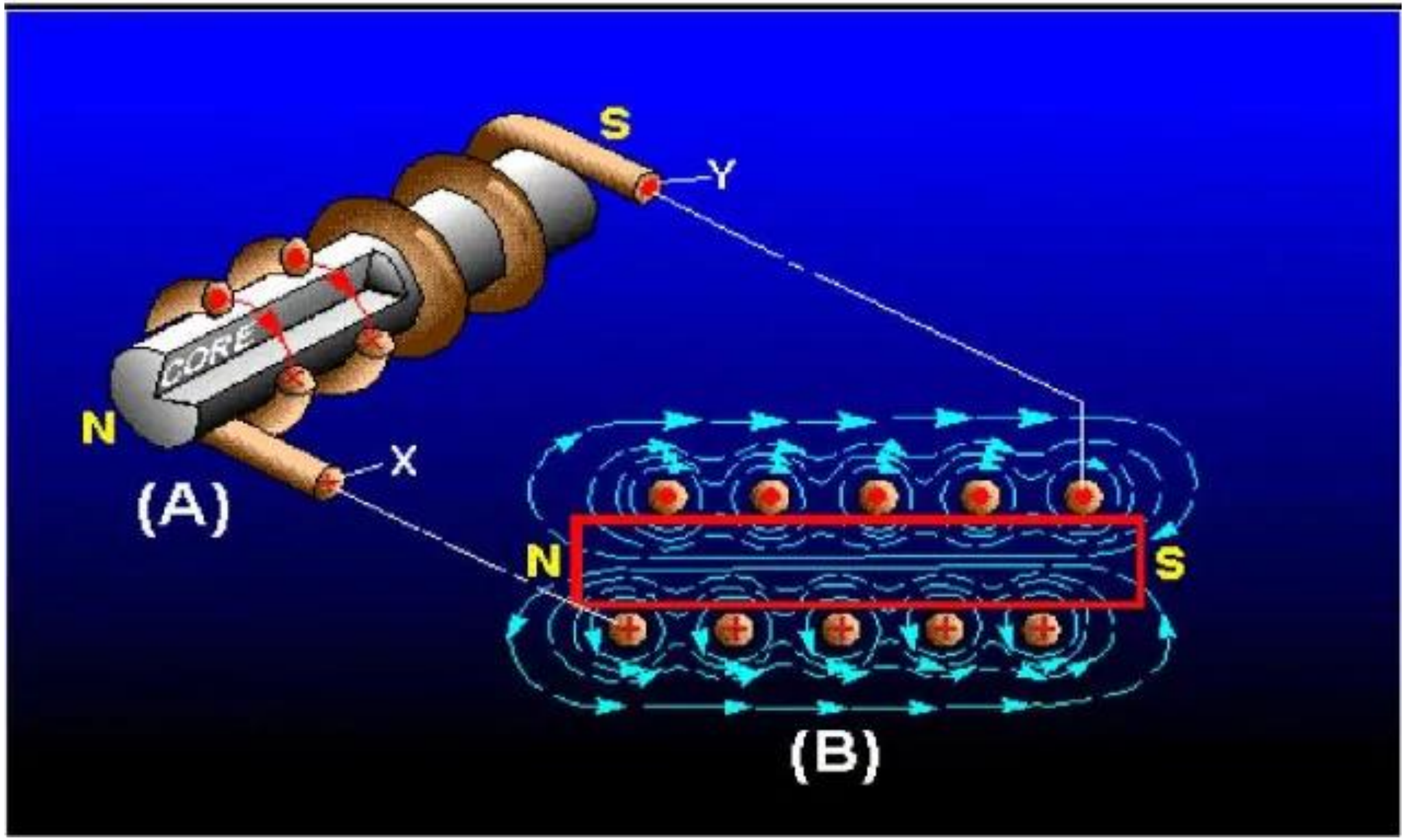


N
S



$\Phi \propto N$
/Sabins
YouTube
MORE VIDEOS

Magnetic Field In Current Carrying Conductor



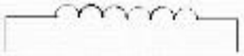
Types of Inductor

- Fixed Types: With irrespective any parameter changing, value of inductor remains constant or fixed.

Air wound inductor

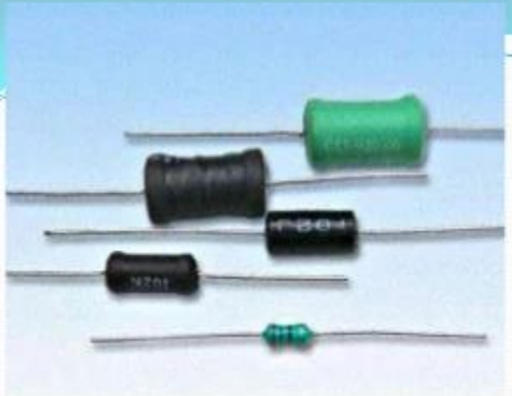
Ferrite core toroidal inductor

SMT Inductors



Air Core

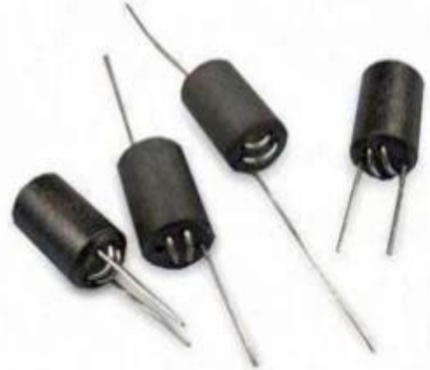
Ferrite Core



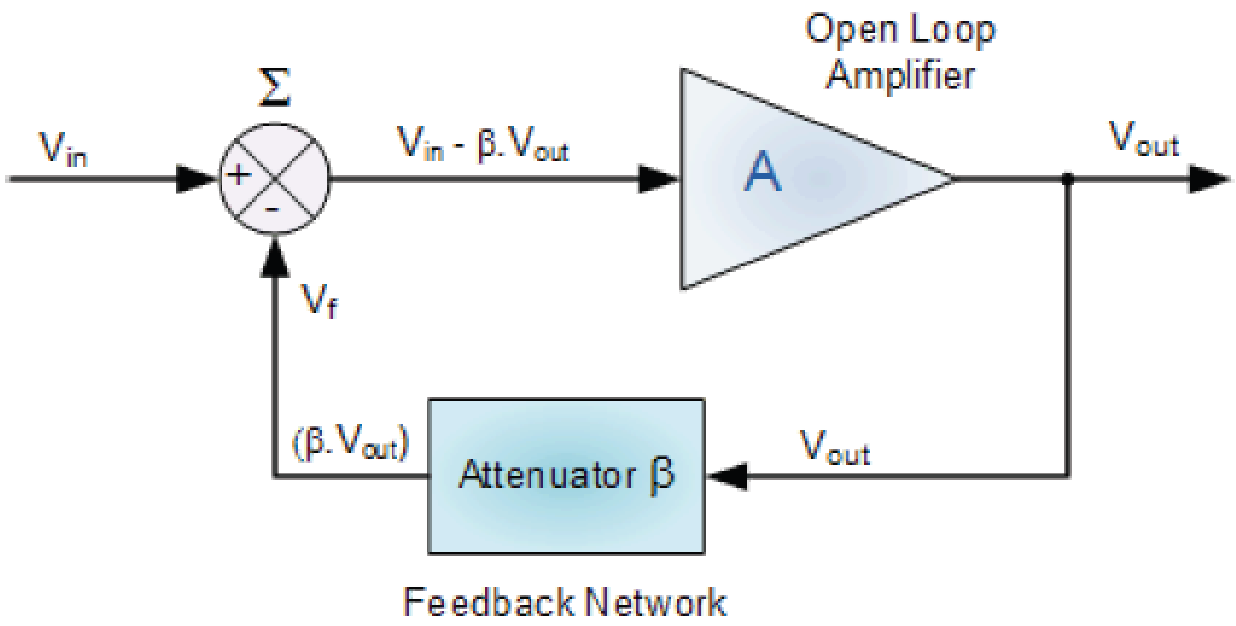
Axial Power Inductor

Radial Lead Inductor

SMD Power Inductor



Beads Inductor


Open Loop
Amplifier
Σ
V_{in}
+
-
V_{in} - β.V_{out}
A
V_{out}
V_f
(β.V_{out})
Attenuator β
V_{out}
Feedback Network

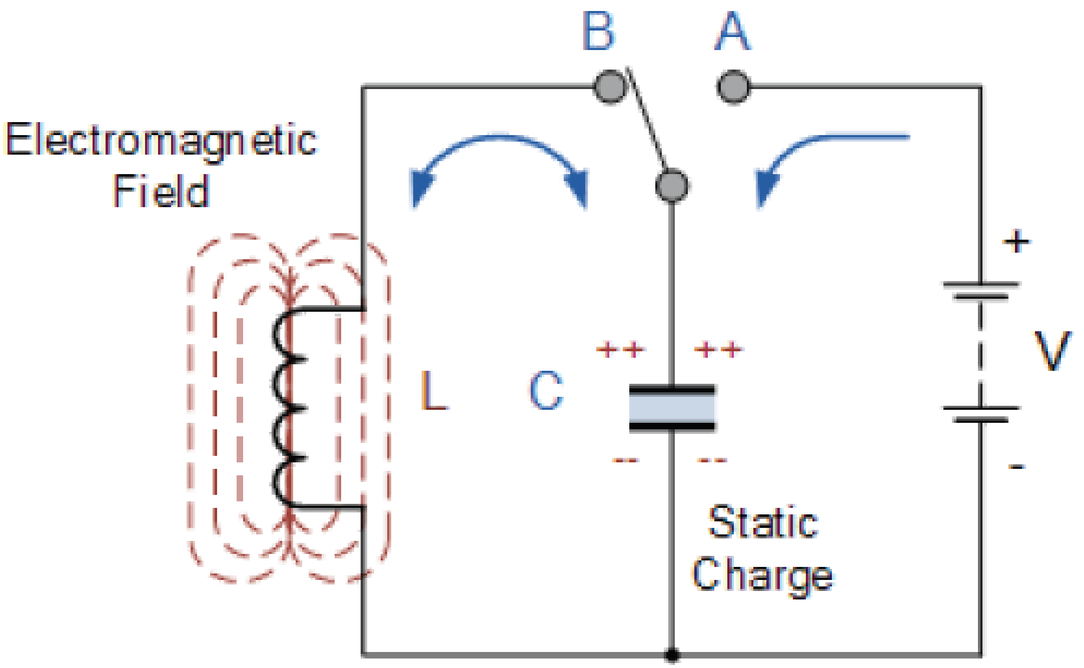
Basis for Comparison	Positive Feedback	Negative Feedback
Also called as	Regenerative feedback	Degenerative feedback
Relation between input and output	In phase	Out of phase
Overall gain	Greater than the gain of the system where feedback is not present.	Smaller than the gain of the system where feedback is absent.
Effective input	Sum of applied input and fed back signal.	Difference of applied input and fed back signal
Transfer function of system with respective feedback	$\frac{G}{1-GH}$	$\frac{G}{1+GH}$
Stability	Less	Comparatively more
Phase shift	0° or 360°	180°
Feedback is taken from	Non-inverting terminal of op-amp	Inverting Terminal of op-amp
Sensitivity	Low	High
Use	In oscillators.	In amplifiers.

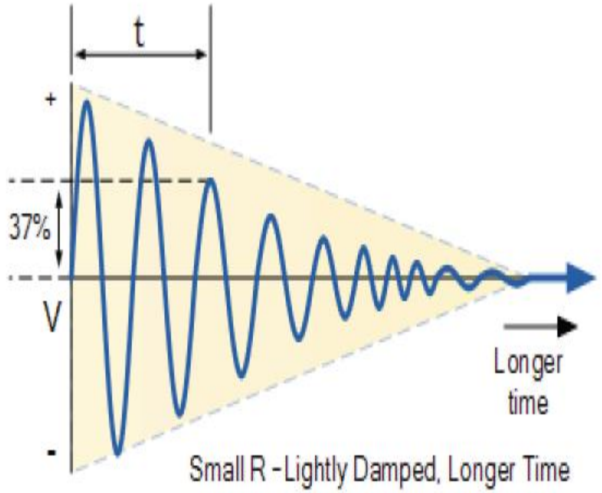
Oscillators convert a DC input (the supply voltage) into an AC output (the waveform), which can have a wide range of different wave shapes and frequencies that can be either complicated in nature or simple sine waves depending upon the application.

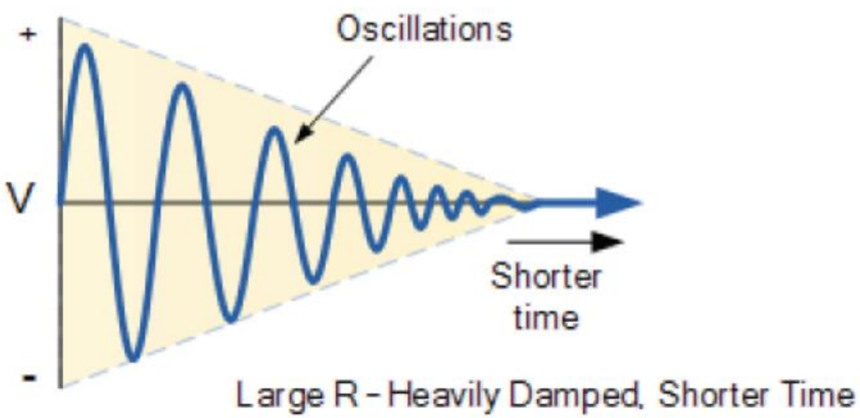
Oscillators are also used in many pieces of test equipment producing either sinusoidal sine waves, square, sawtooth or triangular shaped waveforms or just a train of pulses of a variable or constant width. **LC Oscillators** are commonly used in radio-frequency circuits because of their good phase noise characteristics and their ease of implementation.

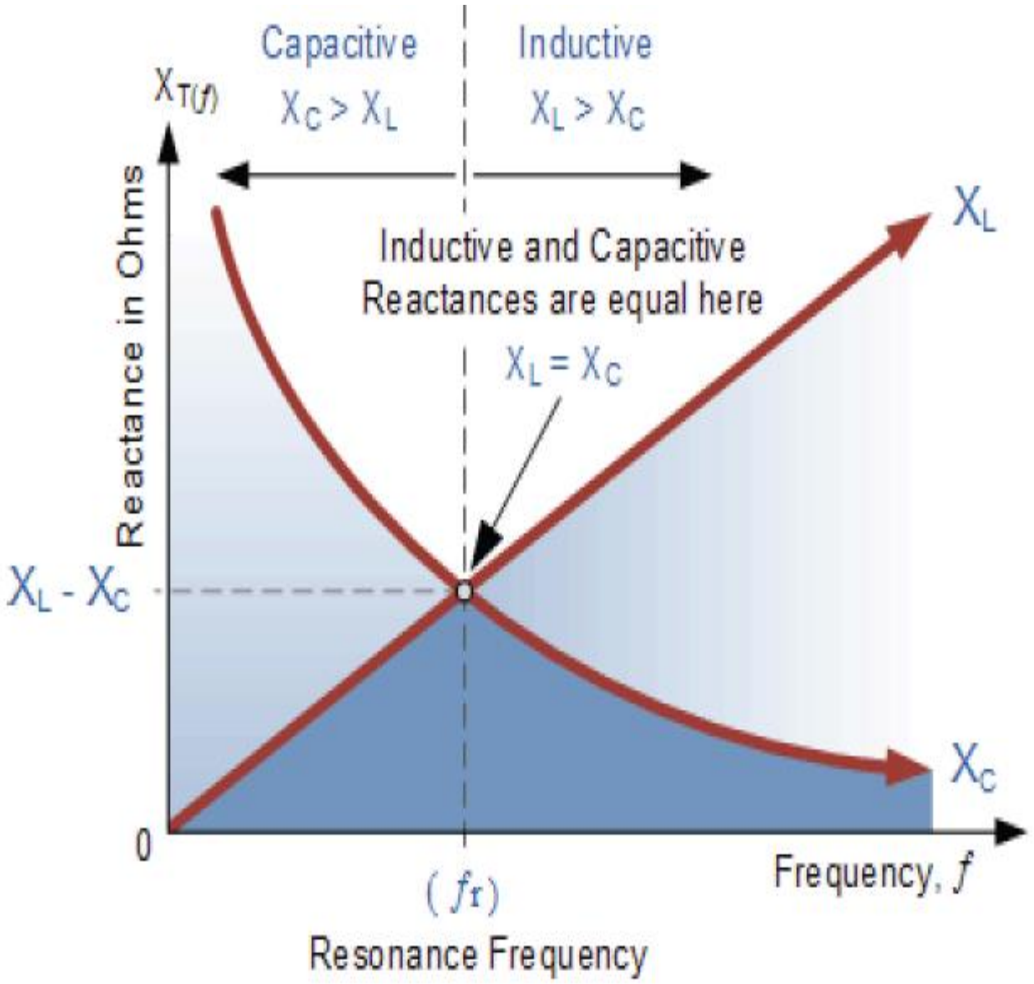
An **Oscillator** is basically an Amplifier with "Positive Feedback", or regenerative feedback (in-phase) and one of the many problems in electronic circuit design is stopping amplifiers from oscillating while trying to get oscillators to oscillate.

Damped Oscillations









$$X_L = 2\pi f L \quad \text{and} \quad X_C = \frac{1}{2\pi f C}$$

$$\text{at resonance:} \quad X_L = X_C$$

$$\therefore \; 2\pi f L = \frac{1}{2\pi f C}$$

$$2\pi f^2 L = \frac{1}{2\pi C}$$

$$\therefore \; f^2 = \frac{1}{(2\pi)^2 LC}$$

$$f = \frac{\sqrt{1}}{\sqrt{(2\pi)^2 LC}}$$

$$\boxed{f_r = \frac{1}{2\pi\sqrt{LC}}}$$

S.No.	RC phase shift oscillators	Wien bridge oscillators
1	The feedback network of RC phase shift oscillator consists of RC network with three RC sections.	The feedback network is a lead-lag network.
2	The phase shift introduced by the feedback network is 180°.	The feedback network does not introduce any phase shift.
3	The phase shift introduced by the op-amp in the circuit is 180°.	The op-amp in the circuit does not introduce any phase shift.
4	The op-amp is used in an inverting mode.	The op-amp is used in a non-inverting mode.
5	The oscillation frequency is $f_o = \dfrac{1}{2\pi\sqrt{6}RC}$.	The oscillation frequency is $f_o = \dfrac{1}{2\pi RC}$.
6	The amplifier gain condition is $\lvert A\rvert \geq 29$.	The amplifier gain condition is $\lvert A\rvert \geq 3$.

Amplifier	oscillators
Amplifier is an electronic circuit which gives output as amplified form of input.	Oscillator is an electronic circuit which gives output without application of input.
The amplifier does not generate any periodic signal.	The oscillator is generating of the periodic electronic signal.
Amplifier uses negative feedback.	Oscillator uses positive feedback.
Amplifier operates as a multiplier.	Oscillator operates as a source
The Amplifier provides amplified signal.	Oscillator is gives oscillatory signal.
Amplifiers do nothing till input signal is fed to the input.	Oscillators produce signals from the moment of powered.