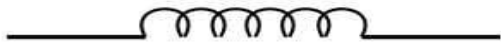


## Inductors

Inductor is a passive electronic component that stores the energy in the form of a magnetic field when electric current flows through it.

Just like resistor that opposes the flow of current, an inductor opposes the change in flow of current.



Electrical symbol of inductor



An inductor is simply a coil of wire. It consists of conductor such as a wire, usually wound into a coil.

They are used to block the flow of AC current while allowing DC to pass ,inductors designed for this purpose are called chokes.

When current flows through it, energy is stored temporarily in a magnetic field in a coil.

It is measured in Inductance. It is represented by  $L$  in the circuit. The unit of inductance is henry(H).

Inductance is the property of an inductor that opposes any change in the current flowing through it.

Whenever a varying current(Alternating Current AC) flowing through the inductor, produces a magnetic field around that, which is perpendicular to the current then it induces a voltage across the coil which is called electro motive force (e.m.f) and the process is known as faraday law of electromagnetic induction.

The induced voltage (e.m.f) opposes the applied voltage in the circuit.

Note when direct current(DC) is applied across an inductor,the inductor behaves as a short circuit with zero resistance.

In DC ,the rate of flow of current changes is zero,so there is no voltage is induced and hence the inductor does not oppose the flow of DC.

Inductors are used for choking, filtering or smoothing, attenuating and blocking high frequency noise in an electrical circuit.

Their physical sizes vary from tiny sizes to the huge transformer, depending on the power being handled and the frequency of AC being used.

**Different types of inductors :-**

### Air core inductor

It usually consists of a coil typically insulated copper, wrapped into an iron core. These inductors are used when the amount of inductance required is low.



Air core inductor

### Iron core inductor

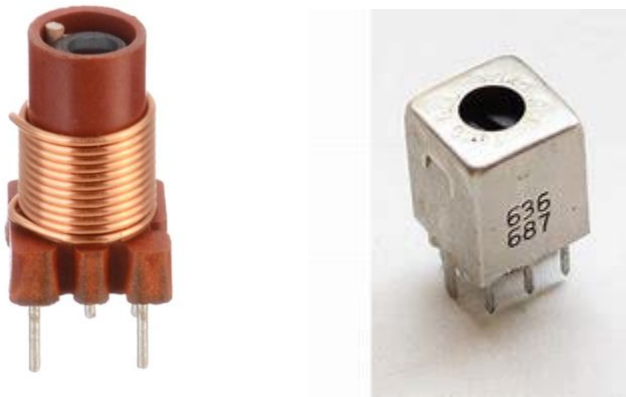
The core of this type of inductor is made of iron. These inductors have high power and high inductance value. These inductors are used in audio equipment, power transfer in SMPS etc.



Iron core inductor

## Variable core inductor

It consists of coil and a moveable ferrite magnetic core, which can be slid or screwed in or out of the coil. Moving the core farther into the coil increases the permeability, increasing the magnetic field and the inductance. These inductors are used in radio applications use adjustable cores in order to tune such inductors to their desired value.



Variable core inductors

## Powdered iron core inductor

In this type of inductor, the core is iron oxide. They are formed by very fine and insulating particles of pure iron powder. They are mainly used in switching power supply.



Powdered iron core inductor

### Ferrite core inductor

It consists of coil and a ferrite core. Mixing iron oxide( $\text{Fe}_2\text{O}_3$ ) in combination with other metal oxide like (Mn),zinc(Zn) or magnesium(Mg) will form ferrite. These inductors have high permeability and high electrical resistivity. These are used in high and medium frequencies, switching circuits etc.



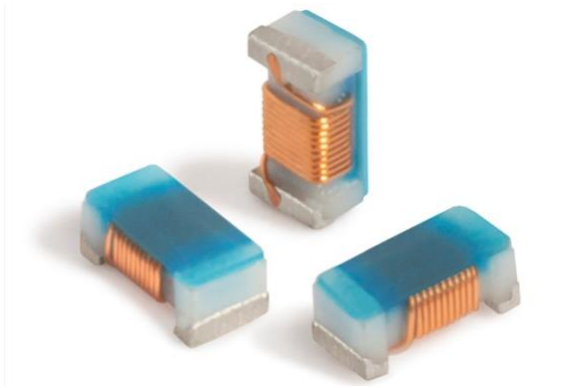
Ferrite core inductor

### Ferromagnetic core inductor

Ferromagnetic-core inductors use a magnetic core made up of ferromagnetic material. These are used in radio circuits.



signals. These are used in Radio circuits, mobile communication devices etc.



Radio Frequency inductors

### Toroidal core inductor

Toroidal inductors consist of a ring-shaped magnetic core which is wound with a length of copper wire. They are compact in shape and, because of the close loop core, it will have a high magnetic field. It has high efficiency and high inductance. These are used in a wide range of applications such as TV, telecommunications, musical instruments etc.



Toroidal inductor

## Multilayer ceramic inductor

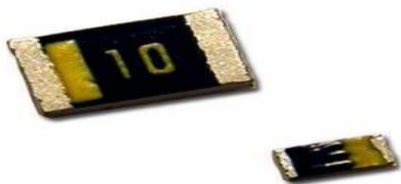
Multilayer ceramic inductors are designed for high frequency circuits. These are used in Bluetooth device, W-LAN, tuners etc.



## Multilayer ceramic inductor

## Film inductor

Film inductors consist of thin film coil shaped like spirals. It is used as filters, powering equipment and storing energy.



## Film inductors

## Coupled inductor



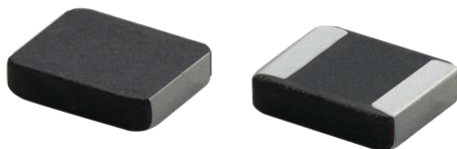
A coupled inductor has two or more windings on a common core. They are used in power transfer devices, Transformers etc.



Coupled inductor

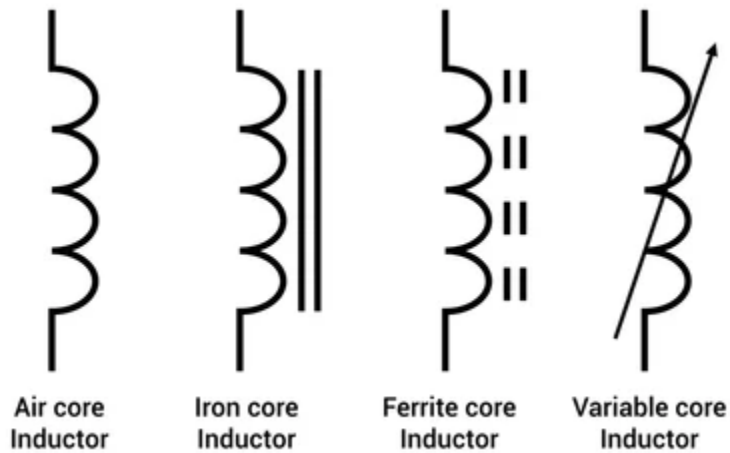
### Molded inductor

Molded inductors are constructed by molding a magnetic material around a pre wound coil and lead frame to form the inductor. It is used in computers, telecommunication devices etc.



## Molded inductor

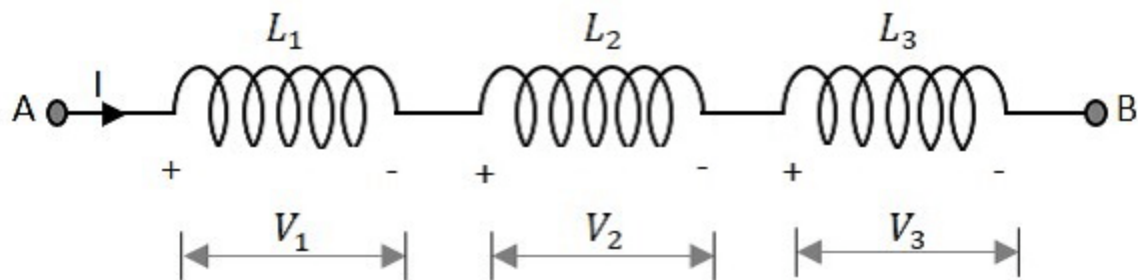
### Electrical symbols of different inductors



## Inductors in series and parallel circuits

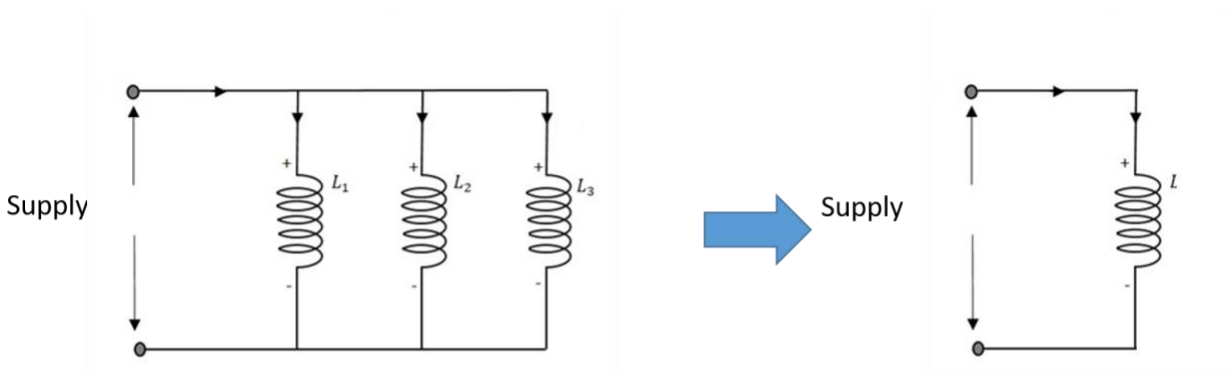
When inductors are connected in series, the total inductance is the sum of the individual inductors' inductances.

### Inductors in Series



**Equivalent inductance or Total inductance  $L_{eq} = L_1 + L_2 + L_3$**

When inductors are connected in parallel, the total inductance is less than any one of the parallel inductors' inductances.



Inductor in Parallel formula to get net inductance of circuit

$$\frac{1}{L} = \frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3}$$

# INDUCTOR COLOUR CODE

Result:  $\mu\text{H}$

4-BAND-CODE



$270\mu\text{H} \pm 5\%$

COLOR	1st BAND	2nd BAND	MULTIPLIER	TOLERANCE
BLACK	0	0	1	$\pm 20\%$
BROWN	1	1	10	$\pm 1\%$
RED	2	2	100	$\pm 2\%$
ORANGE	3	3	1,000	$\pm 3\%$
YELLOW	4	4	10,000	$\pm 4\%$
GREEN	5	5		
BLUE	6	6		
VIOLET	7	7		
GREY	8	8		
WHITE	9	9		
GOLD			0.1	5%
SILVER			0.01	10%