INDUCTOR

An **inductor**, also called a coil or reactor, is a passive two-terminal electrical component which resists changes in electric current passing through it. It consists of a conductor such as a wire, usually wound into a coil. When a current flows through it, energy is stored temporarily in a magnetic field in the coil.

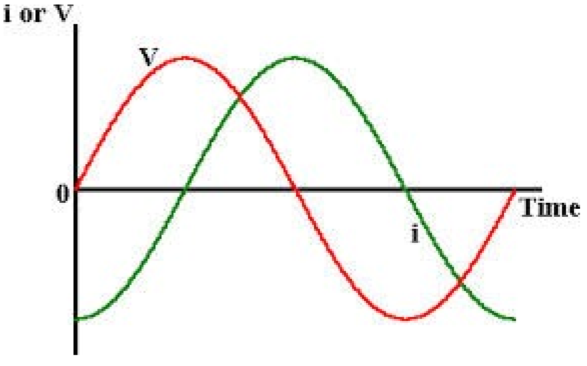
CHARACTERISTICS OF AN INDUCTOR

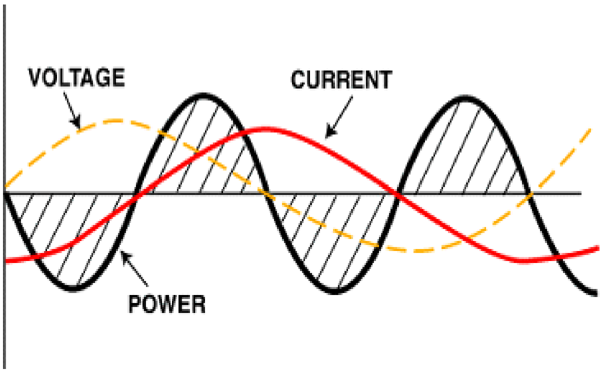
- **Current & Voltage Phase shift**

  In a purely inductive circuit the voltage and current waveforms are not in phase. Inductance opposes change in current due to the back emf effect. This causes the current to reach its peak value some time after the voltage. So in an inductive circuit, current "LAGS" voltage.

  *I*n DC circuits the current eventually settles to a steady state value, and the period of change prior to steady state depends on the time constant (i.e. the component values) of the circuit. In an AC circuit however, as the voltage is continually changing, the current also continues to change, and in a purely inductive circuit, the peak values of current occur a quarter of a cycle (90°) after those of the voltage.

Waveform





- **Does not consume power**

  Power is equal to 1/T times the integral of e time i dt. The voltage and current in an inductor or capacitor are always 90 degrees out of phase so the integral is always zero. This is applicable to all circuits, but it is easiest to understand for a steady state AC circuit

Proof

$$V = L\frac{dI}{dt}$$

lets,

$$I = Asin(\omega t)$$

$$V = \frac{Ld(Asin(\omega t))}{dt}$$

$$V = L\omega Acos(\omega t)$$

$$Prms = \frac{1}{T}\int_T VIdt$$

$$= \frac{1}{\omega T}\int_T A^2 L\omega sin(\omega t)cos(\omega t)dt$$

$$= \frac{1}{2\pi}\int_0^{2\pi} A^2 L\omega sin(\theta)cos(\theta)d\theta$$

$$= \frac{1}{2\pi}\int_0^{2\pi} \frac{A^2 L\omega}{2} sin(2\theta)d\theta$$

$Prms = 0$ (Hence it consumes no Power)