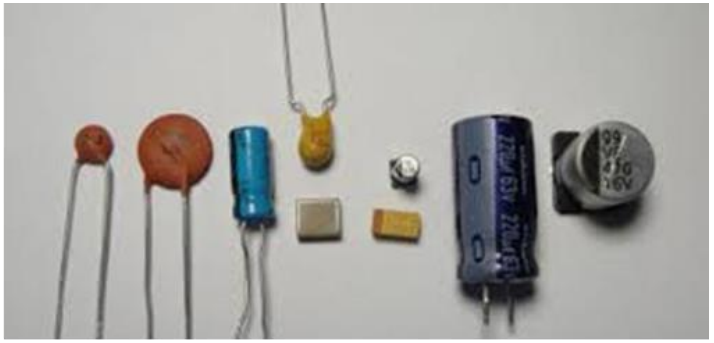
Roundup of Basic Electronics



Resistance

$$R = \rho \frac{l}{A}$$

R = Resistance

ρ = resistivity

A = Cross-sectional area

l = length

Capacitance

$$C = \varepsilon_0 \varepsilon_r \frac{A}{d}$$

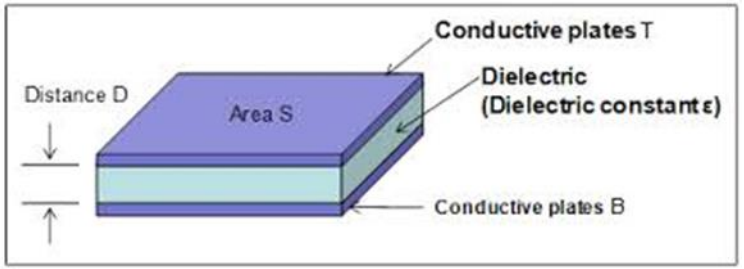
C = Capacitance

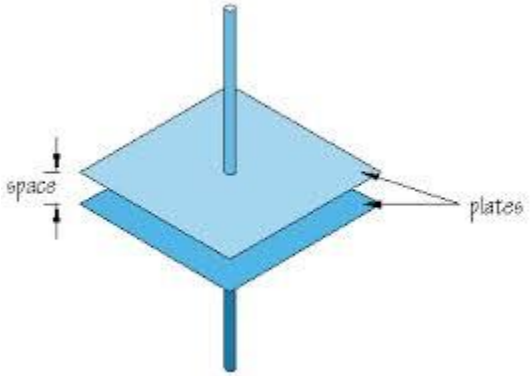
A = Area of plate

d = distance of plates

ε_0=vacuum permittivity

ε_r=relative permittivity





Inductance

$$L = \mu_0 \mu_r N^2 \frac{A}{l}$$

L = inductance

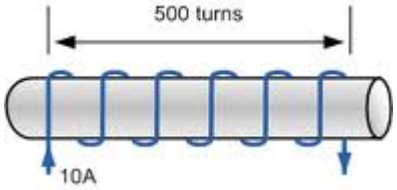
μ_0= vacuum permeability

μ_r = relative permeability

N = Number of turns

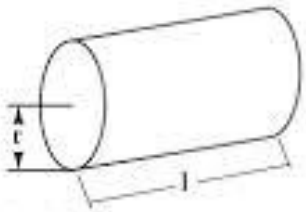
A = Cross-sectional area

l = length of a coil



$$L = \frac{N^2 \mu A}{l}$$

$$\mu = \mu_r \mu_0$$



Where,

L = Inductance of coil in Henrys

N = Number of turns in wire coil (straight wire = 1)

μ = Permeability of core material (absolute, not relative)

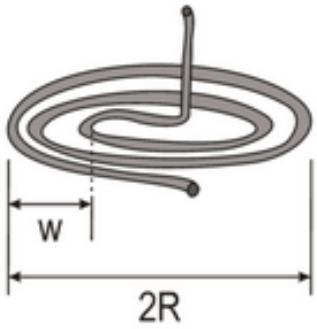
μ_r = Relative permeability, dimensionless (μ_0=1 for air)

μ_0 = 1.26×10^{-6} T-m/At permeability of free space

A = Area of coil in square meters = πr^2

l = Average length of coil in meters

Planar Inductance



N: number of turns

$$L = 31.33\mu_0 N^2 \frac{R^2}{8R + 11w}$$

(Wheeler formula)

Inductor calculators

http://www-smirc.stanford.edu/spiralCalc.html

http://www.pulsedpower.eu/toolbox/toolbox_inductances.html

Some Basic Laws

- Resistance **$R=\rho l/A$**, R=resistance, ρ=resistivity, l=length
- TC **$R_T=R_o(1+\alpha\Delta T)$**, R_T=Resistance in a new temperature, R_o=resistance in the nominal temp., α=TC, ΔT=temp. difference
- Ohms law **U=RI**, U=voltage, I=current
- Current **I=Q/t**, Q=charge, t=time
- Current density **J=I/A**, J=density, A=cross-section area
- Power **P=UI**, P=power, U=voltage, I=current
- Energy **W=Pt**, W=energy, t=time