- Inductance -

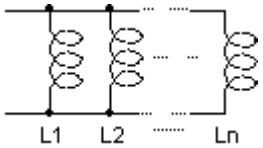
Vendor Application Notes

- CoilCraft

- Inductance Conversion page
- Inductor Vendors page

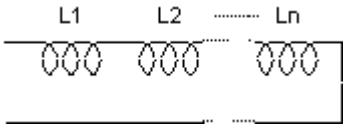
Parallel Inductors

$$\frac{1}{Lp} = \frac{1}{L1} + \frac{1}{L2} + \cdots + \frac{1}{Ln}$$

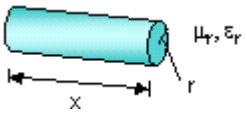


Series Inductors

Ls = L1 + L2 + ⋯ + Ln



Straight Wire

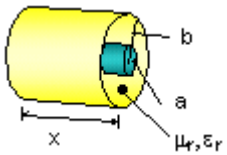


L (low freq) = 0.002x [ln(2x/r) - 0.75] μH
L (high freq) = 0.002x [ln(2x/r) - 1.00] μH

x = length, r = radius (use same units for both)

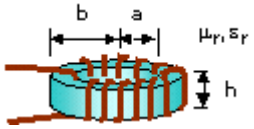
Look up wire diameter here.

Coaxial Cable



$$L = \frac{\mu_r \varepsilon_r \, x}{8\pi} \ln\left(\frac{b}{a}\right)$$

Closely Wound Toroid



$$L = \frac{\mu_r \varepsilon_r \, N^2 h}{2\pi} \ln\left(\frac{b}{a}\right)$$

Single-Layer Air-Core

$d^2 * n^2$

$W = 1/2 \, Li^2$

$$v(t) = L\frac{di(t)}{dt}$$

$$i(t) = \frac{1}{L}\int v(t)\,dt$$

$X_L = 2 \pi f L$

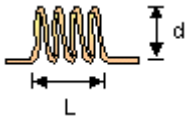
L = inductance (H)
N = number of turns
a = inner radius
b = outer radius
x = length
v = voltage (V)
W = energy (J)

"Q" Factor

- $Q = F_0/F_{3db}$
- $Q = E_{stored} / E_{loss\_per\_cycle}$
- $Q = R/(2*\pi*F_0*L)$ for paralell tank
- $Q = (2*\pi*F_0*L)/R$ for series tank
- $1/Q_{load} = 1/Q_{ext} + 1/Q_{tank}$

Where: L = inductance
E = energy
ext = external

$$\text{Inductance } (\mu H) = \frac{(18d + 40L)^2 \cdot n^2}{18d + 40L}$$



$$n = \frac{(18d + 40L) * \text{sqrt}(2 * \text{Inductance } [\mu H])}{2d * \text{sqrt}(9d + 20L)}$$

Where: d and L are in inches
n = number of turns

Note: If lead lengths are significant, use the straight wire calculation to add that inductance.