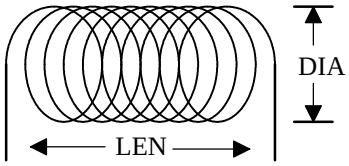
RF Inductors

Recall inductor impedance is given by $Z_L(\omega) = j\omega L = jX_L$ where $X_L = 2\pi fL$

Classic Solenoid (Air Core)

Create inductor by wrapping magnet wire around an appropriate size form (such as a drill bit).



$$L \approx \frac{N^2\ DIA^2}{18\ DIA + 40\ LEN}$$

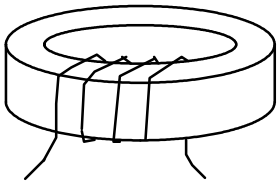
where L is in uH, DIA, LEN are in inches, and N is the number of turns

Example: DIA = 0.2" LEN = 1" N = 10 => L = 0.092uH = 92 nH X_L = 58Ω @ 100MHz

NOTE: Experience in EECE662 indicates that this formula gives an L that is up to 30% too large, especially for small L values.

Toroid with Magnetic Core

Create inductor with magnet wire wrapped around an appropriate toroid form.



$$L \approx k\ N^2$$

where k is a constant (determined by the core material/size) and N is the number of turns. The constant k is sometimes given in nH/turn^2, but is often quoted as the inductance for a given number of turns (e.g. uH for 100 turns).

Example: T37-2 core (0.37" outside diameter, number 2 material) with 10 turns. For this core, k = 4nH/turn^2 (± 10%). Hence, L = 400 nH and X_L = 250 Ohms @ 100 MHz.

9/7/98 WBK