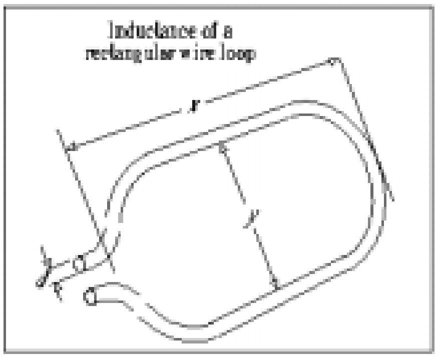
INDUCTANCE OF RECTANGULAR LOOPS file: rectangl.mcd
Script: High Speed Digital Design - 1993, by: Johnson/Graham, page: 419
Formulas included in this spreadsheet:
Inductance of rectangular wire loop. LRECT()
Impedance magnitude of inductor at one frequency. XLF()
Impedance magnitude of inductor to rising edge. XLR()



Variables used:

d Diameter of wire (in.) $D := 15.9 \cdot 10^{-3}$
x Length of wire loop (in.) $X := 1$
y Breadth of wire loop (in.) $Y := 1$

Inductance of wire loop (H):

$$LRECT(d, x, y) := 10.16 \cdot 10^{-9} \cdot \left(x \cdot \ln\left(\frac{2 \cdot y}{d}\right) + y \cdot \ln\left(\frac{2 \cdot x}{d}\right) \right)$$

$$LRECT(D, X, Y) = 9.824 \cdot 10^{-8}$$

A loop of 26-gage wire 1" x 1" has about 100nH of inductance. Changing the wire diameter from AWG 30 to AWG 10 makes little difference. The log function is very insensitive to wire size. If your loop consists of different-sized conductors, use the diameter of the smallest one.

Impedance magnitude of inductor at frequency f (Ω):
l Inductance (H) $L := LRECT(D, X, Y)$
f Frequency (Hz) $F := 100 \cdot 10^{6}$

$$XLF(l, f) := 2 \cdot \pi \cdot f \cdot l$$

$$XLF(L, F) = 61.725 \quad \Omega$$

The impedance, at 100MHz, of a 100nH inductor is 62Ω.
Impedance magnitude of inductor as seen by rising edge (Ω):
l Inductance (H) (as defined above)
tr 10-90% rise time (s) $TR := 5 \cdot 10^{-9}$

$$XLT(l, tr) := \frac{\pi \cdot l}{tr}$$

$$XLT(L, TR) = 61.725 \quad \Omega$$

The impedance, as seen by a 5ns rising edge, of a 100nH inductor is 62Ω.

Appendix:
Wire Chart in Mils

Gage		Diameter
10	-	102.0
11	-	91.0
12	-	81.0
13	-	72.0
14	-	64.0
15	-	57.0
16	-	51.0
17	-	45.0
18	-	40.0
19	-	36.0
20	-	32.0
21	-	28.5
22	-	25.3
23	-	22.6
24	-	20.1
25	-	17.9
26	-	15.9
27	-	14.2
28	-	12.6
29	-	11.3
30	-	10.0