Luke Parker RFID Reader Calculations for 125kHz Propeller Antenna 9/9/2008

$C1 := 1000 \cdot 10^{-12}$

$C2 := 2200 \cdot 10^{-12}$

$C3 := 1000 \cdot 10^{-12}$

$C4 := 1500 \cdot 10^{-12}$

$Vdd := 3.3$ Supply Voltage

$Vss := 0$ Ground

$R1 := 1000000$

$R2 := 100000$

$R3 := 100000$

$R4 := 1800000$

$N := 24$

$a := \frac{114 + 2}{2}$

$h := 5$

$b := 2$

Resistance := 3

$$L := \frac{0.31 \cdot (a \cdot N)^2}{6 \cdot a + 9 \cdot h + 10 \cdot b}$$ $L = 1454$ µH

$$f_0 := \frac{1}{2 \cdot \pi \cdot \sqrt{L \cdot C1}} \cdot 1000$$ Operating Frequency $f_0 = 131970$

$$peaktopeak := \frac{1}{f_0} \cdot 1000000$$ $peaktopeak = 7.577$ µsec

$$Q := \frac{2 \cdot \pi \cdot f_0 \cdot L}{Resistance}$$ Theoretical Q $Q = 4 \times 10^8$

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Minimalist proof-of-concept RFID Reader.

Schematic:
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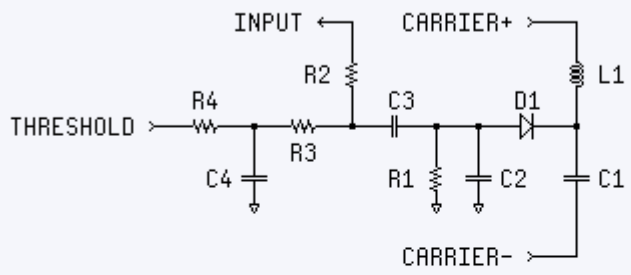


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C1, C3   1000 pF
C2       2200 pF
C4       1500 pF
R1       1 MΩ
R2, R4   100 kΩ
R3       1.8 MΩ
D1       Some garden variety sigal diode from my junk drawer.
L1       About 30 turns of magnet wire on a 5.5x7 inch wooden block.
         (Tune for 125 kHz resonance with C1.)

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INDUCTANCE OF N-TURN MULTILAYER CIRCULAR COIL

**FIGURE 8: N-TURN MULTILAYER CIRCULAR COIL**

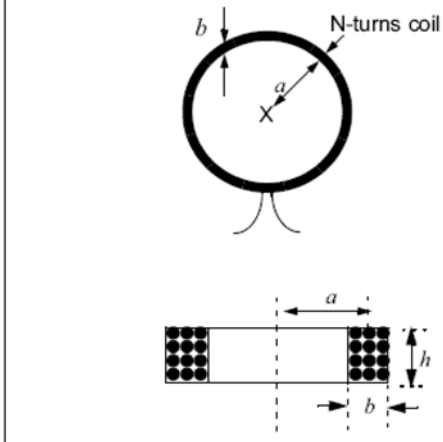


Figure 8 shows an N-turn inductor of circular coil with multilayer. Its inductance is calculated by:

**EQUATION 24:**

$$L = \frac{0.31(aN)^2}{6a + 9h + 10b} \quad (\mu H)$$

where:

- $a$ = average radius of the coil in cm
- $N$ = number of turns
- $b$ = winding thickness in cm
- $h$ = winding height in cm