University of Melbourne
ELEN90062 High Speed Electronics
GROUP X

WORKSHOP 2

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I Colpitts Oscillator Simulation

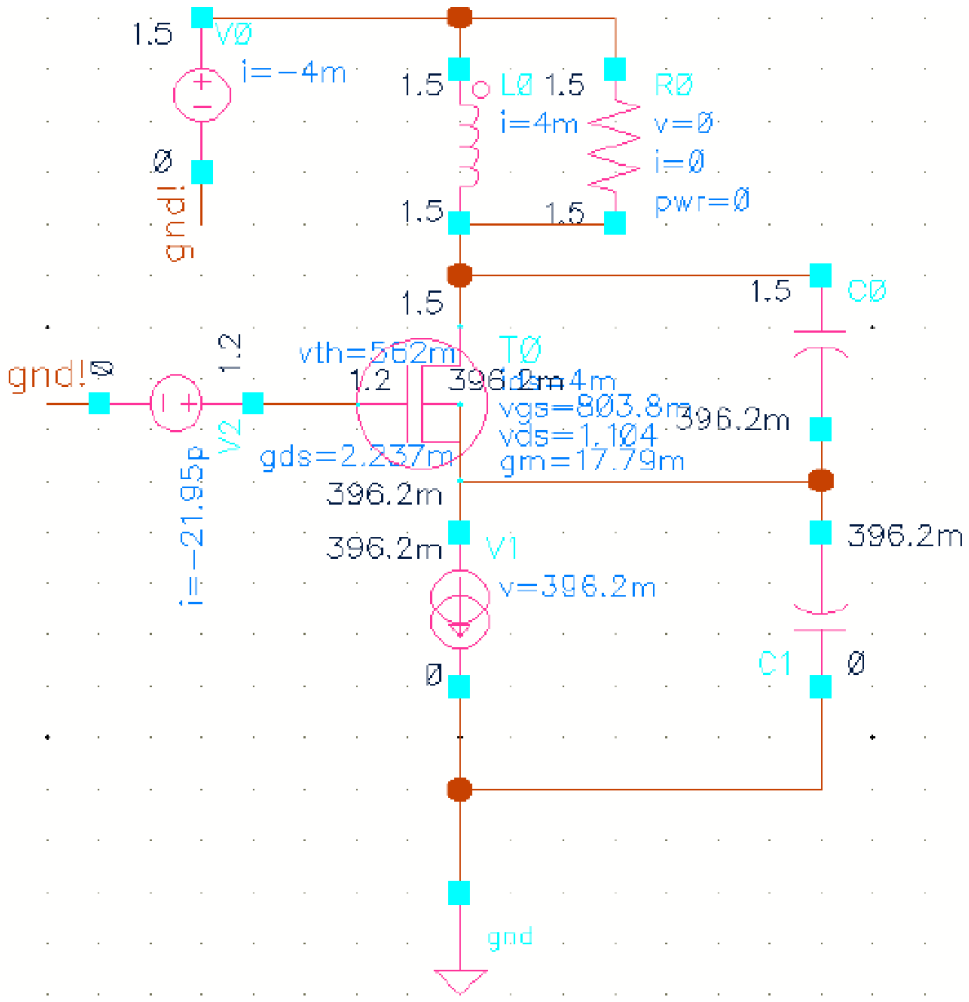

Figure 1: Schemetic

As we are given $L = 1nH$, $C1 = C2 = 24pF$, and $R = 500\Omega$ respectively:

I.1 Calculate the minimum gain (gm), required to start the oscillations.

$$g_m > \frac{1}{R(n - n^2)} \tag{1}$$

Where:

$$n = \frac{C1}{C1 + C2} \tag{2}$$

$$= \frac{1}{2} \tag{3}$$

Hence:

$$g_m > \frac{1}{5000 \times (\frac{1}{4})} \tag{4}$$

$$> 0.0008 \tag{5}$$

I.2 Calculate the frequency of oscillations, f.

$$f = \frac{1}{2\pi\sqrt{L(\frac{C_1C_2}{C_1+C_2})}} \tag{6}$$

$$= \frac{1}{2\pi\sqrt{1 \times 10^{-9}\frac{(24\times10^{-12})^2}{48\times10^{-12}}}} \tag{7}$$

$$\approx 1.453 \times 10^9 \tag{8}$$

$$\tag{9}$$