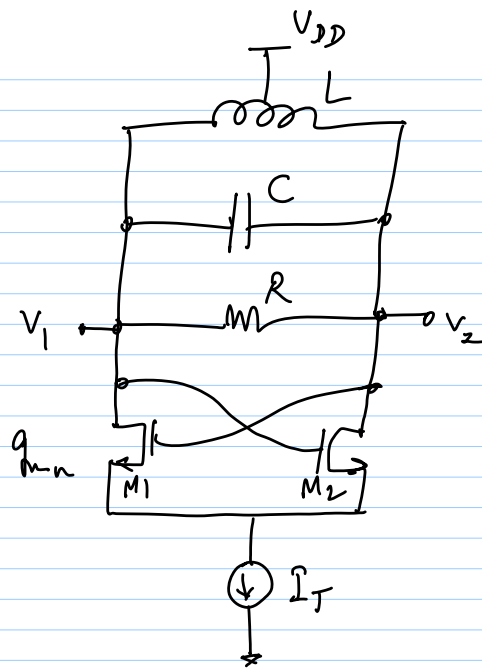
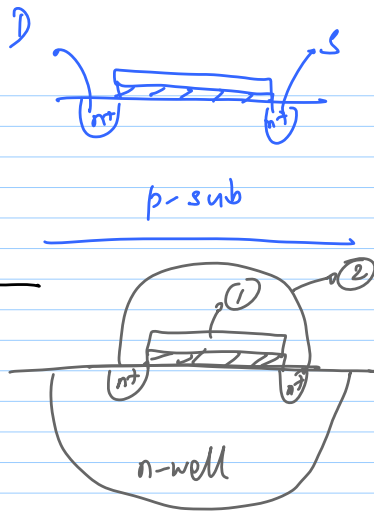
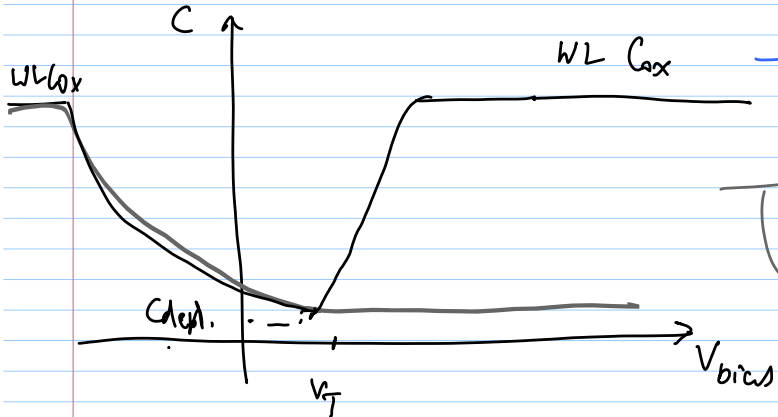


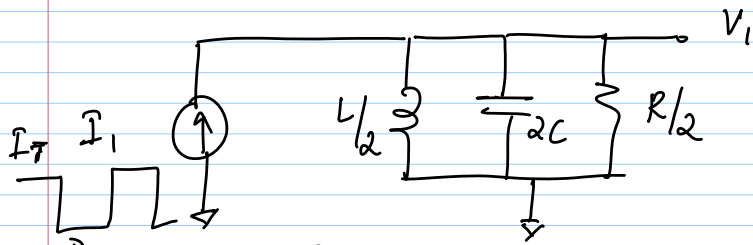
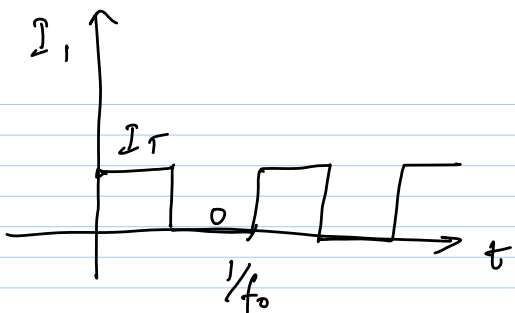
28/10/13

Lec 35

MOS Varactor



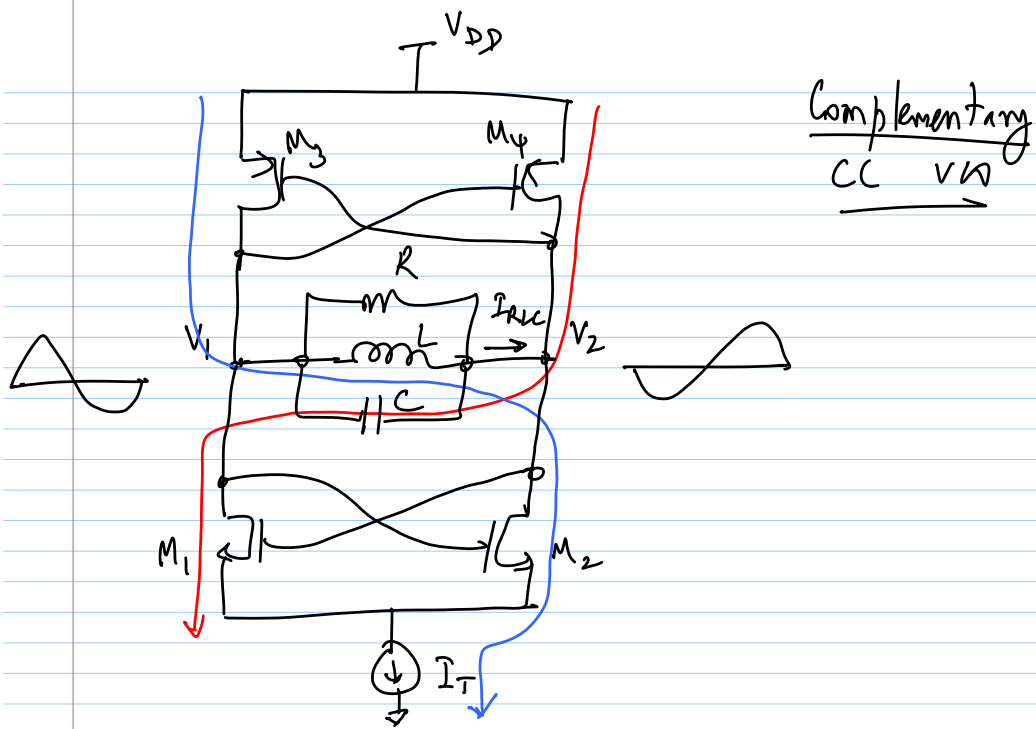
* NMOS CC pair
switches @ f_0
* +ve feedback due
to CC makes
switching fast



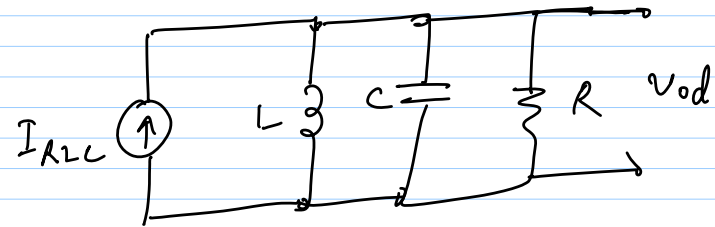
$$I_1 = I_T \left\{ \frac{1}{2} + \frac{2}{\pi} \left[\sin \omega_0 t + \frac{1}{3} \sin 3\omega_0 t + \dots \right] \right\}$$

$$\begin{aligned} V_1 &= I_1(\omega_0) \cdot R/2 \\ &= \frac{2}{\pi} I_T \sin \omega_0 t \cdot R/2 \\ &= \frac{I_T R}{\pi} \sin \omega_0 t \end{aligned}$$

$$V_{od} = \frac{2 I_T R}{\pi} \sin \omega_0 t$$



$$I_{RLC} \uparrow \quad I_{RLC} = \frac{4}{\pi} I_T \left[\sin \omega_0 t + \frac{1}{3} \sin 3\omega_0 t + \dots \right]$$

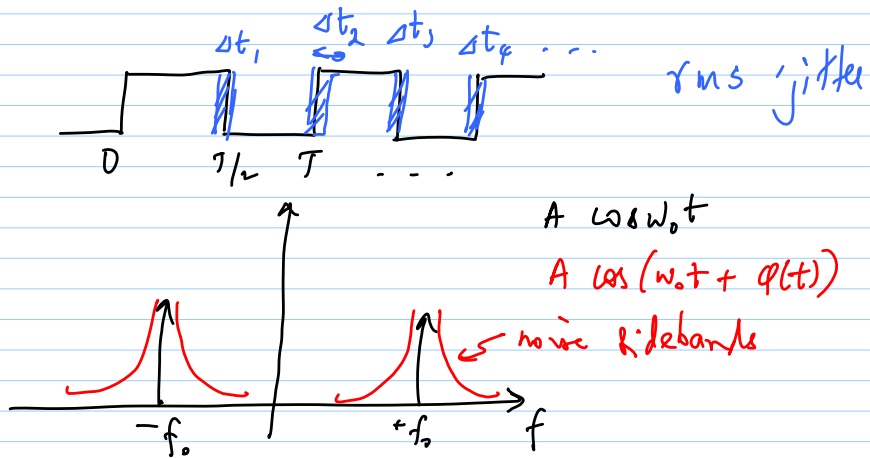


$$V_{od} = \frac{4}{\pi} I_T R \sin \omega_0 t$$

← twice the amplitude \rightarrow NMOS C-L-V₀

Imperfections in zero crossings

- Jitter in time domain
- Phase Noise in f-domain



Phase Noise

$$-SNR = \frac{\text{Noise}}{\text{Signal}}$$

Important Metrics of a VCO

- 1) f_{out}
- 2) Power consumption
- 3) Amplitude
- 4) phase noise
- 5) Tuning Range
- 6) K_{vco}
- 7) Supply pushing/pulling