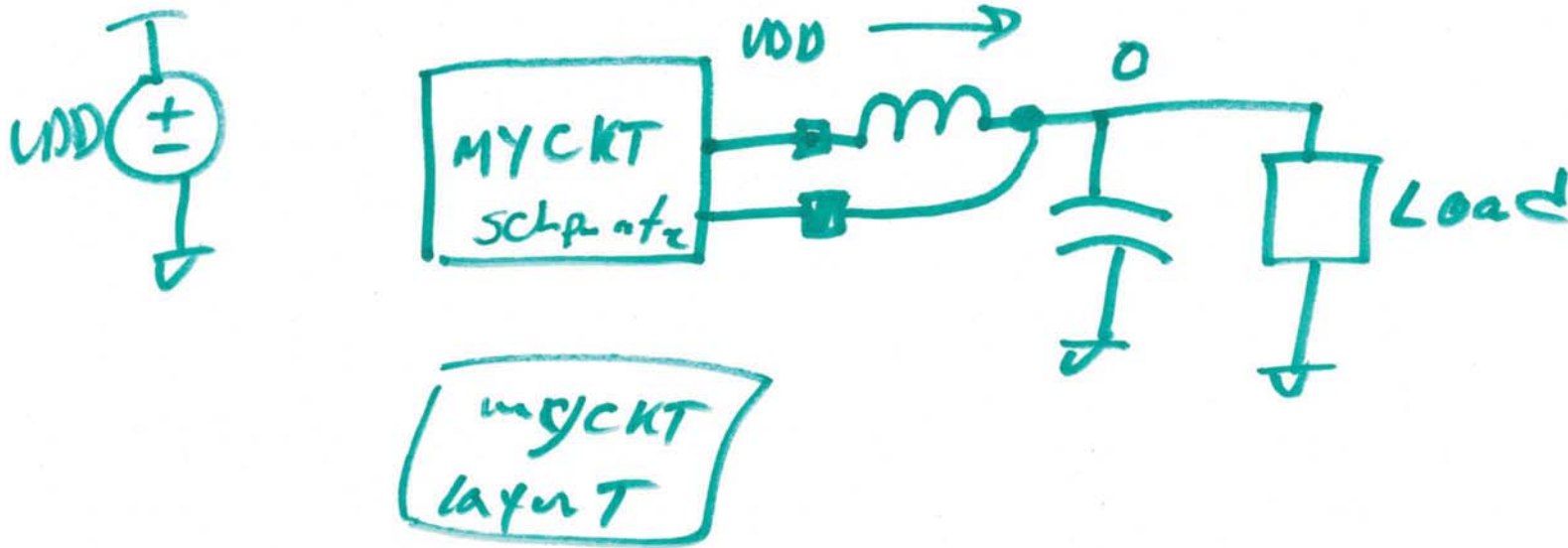


EE 421 / ECG 621

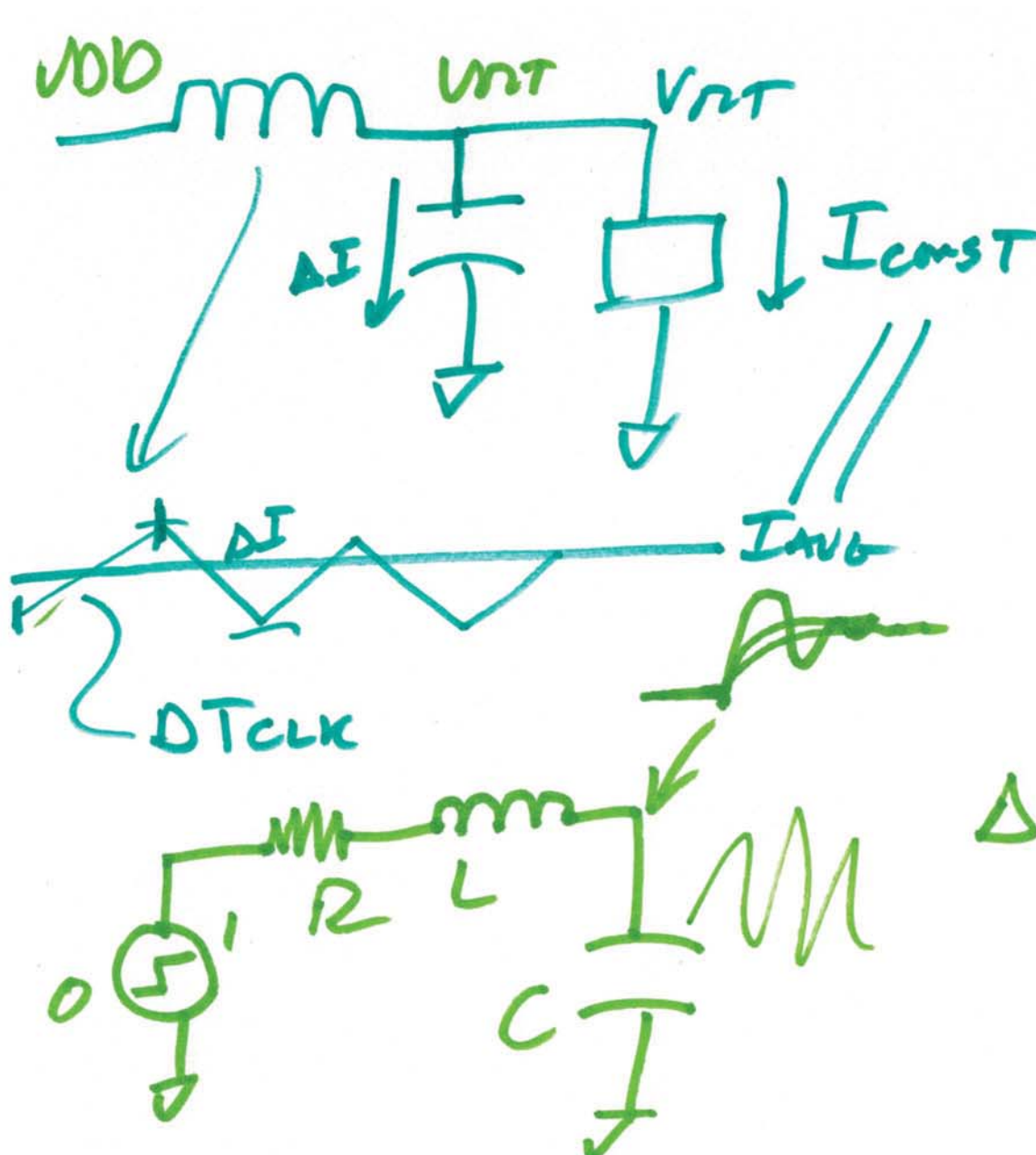
11/22/2017

Lecture 24

Sim



1)



$$\Delta I = C \cdot \frac{\Delta V}{\Delta t} \quad \leftarrow \text{Ripple}$$

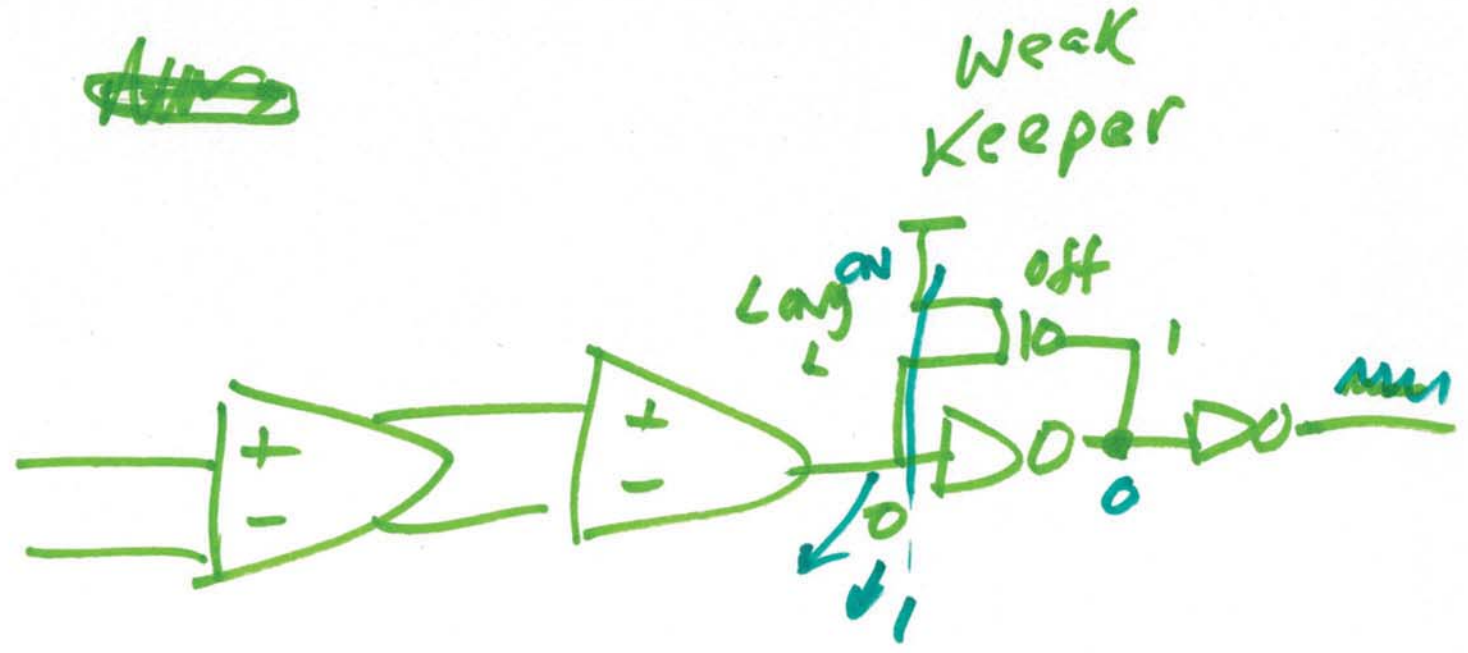
$$\Delta V = \frac{\Delta I \cdot DT_{CLK}}{C}$$

$$\Delta V = L \cdot \frac{\Delta I}{DT_{CLK}}$$

$$\Delta I = \frac{(V_{DD} - V_{OUT}) \cdot DT_{CLK}}{L}$$

2)

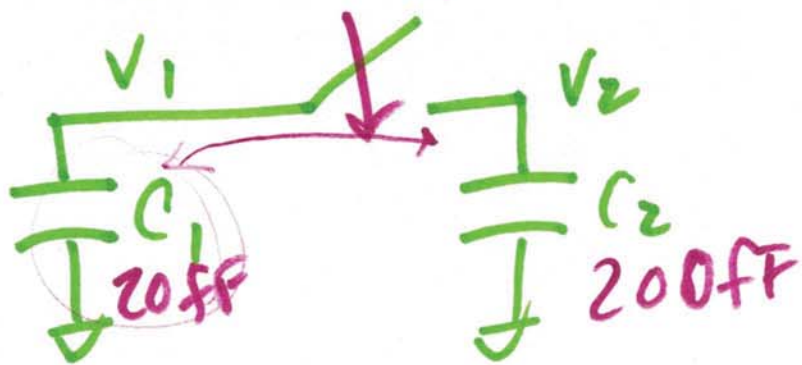
~~Hand~~



3)

ITIC $\mathcal{E} = \frac{1}{2} CV^2 \rightarrow i(t) = C \frac{dv(t)}{dt}$

$CV = Q \quad v_f$



$$\mathcal{E} = \int_0^V p(t) \cdot dt$$

$$= \int_0^V i(t) \cdot v(t) \cdot dt$$

$Q_B = C_1 v_1 + C_2 v_2$

$\mathcal{E}_B = \frac{1}{2} C_1 v_1^2 + \frac{1}{2} C_2 v_2^2$

$$= \int_0^V \dot{i}(t) \cdot C \frac{dv(t)}{dt} \cdot dt$$

$$= \frac{1}{2} C x^2 \Big|_0^V$$

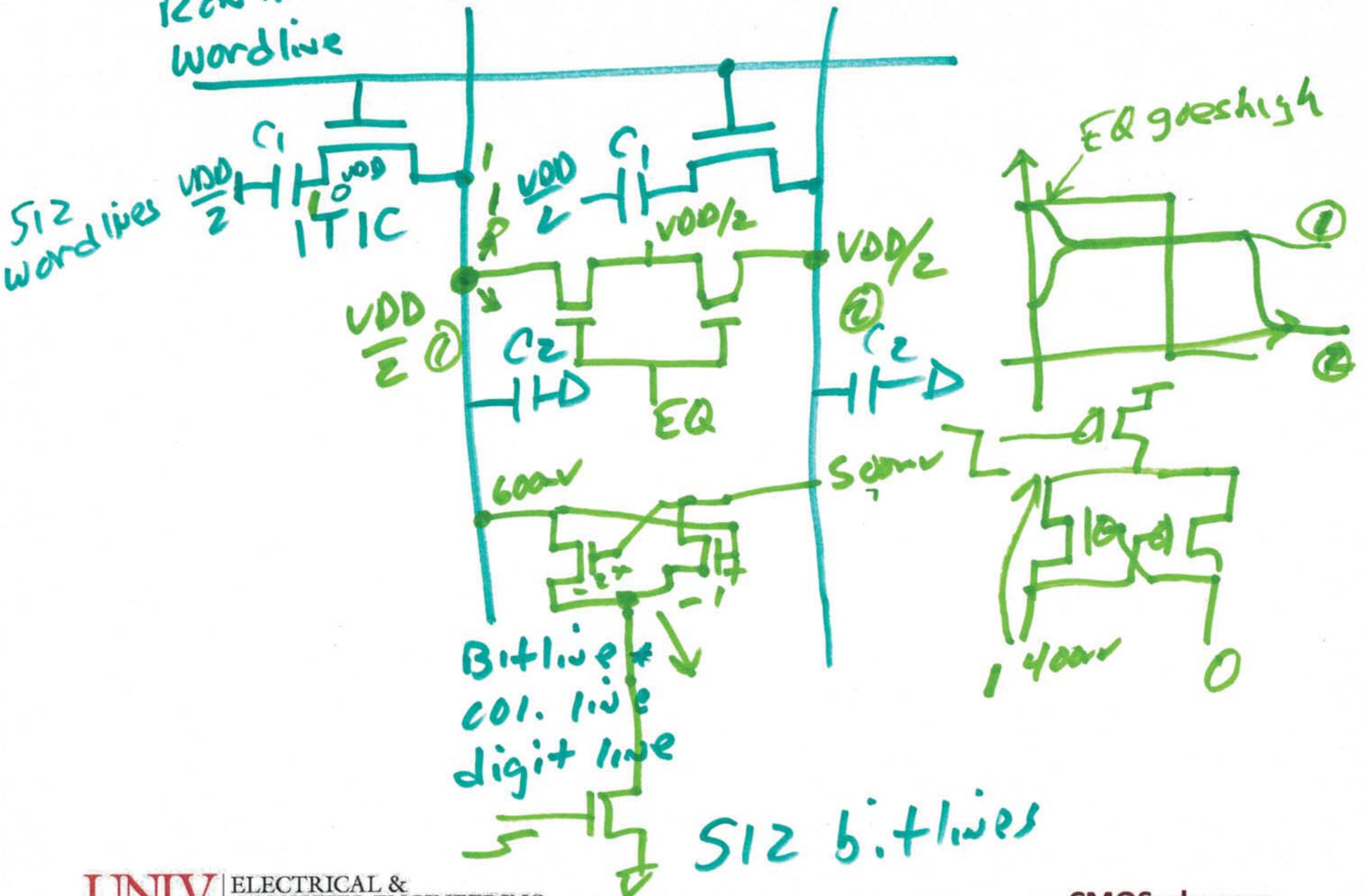
$$= \frac{1}{2} CV^2$$

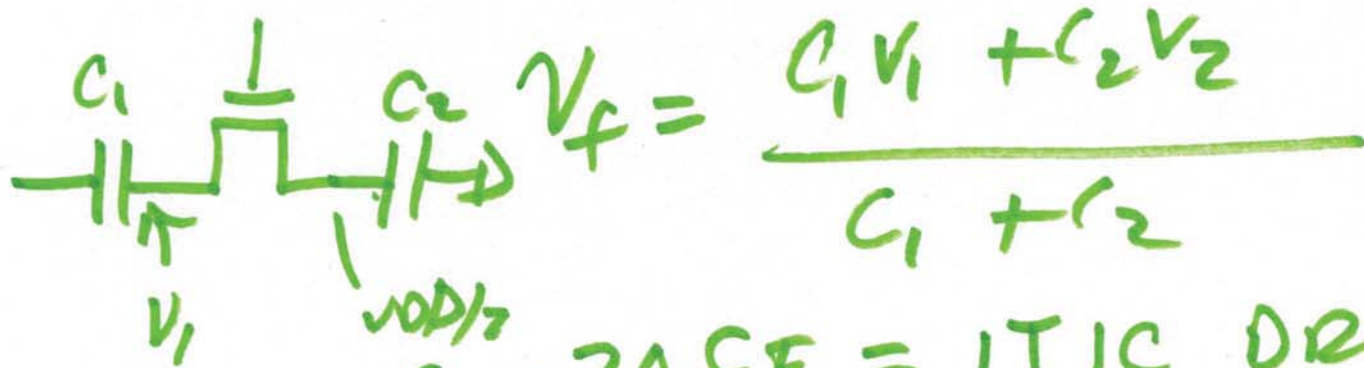
$Q_A = v_f (C_1 + C_2)$

$Q_A = Q_B, \quad v_f = \frac{C_1 v_1 + C_2 v_2}{C_1 + C_2}$

$\mathcal{E}_A = \frac{1}{2} (C_1 + C_2) v_f^2 = \frac{1}{2} \frac{(Cv_1 + Cv_2)^2}{C_1 + C_2}$

Dynamic RAM





$$V_f = \frac{C_1 V_1 + C_2 V_2}{C_1 + C_2}$$

$C_1 = 20 \text{ fF} = \text{1TIC DRAM} - \text{Memory Cell CAP}$

$C_2 = 200 \text{ fF} = \text{Bit line CAP}$

$V_1 = 1 \text{ V}$ starting a "1"

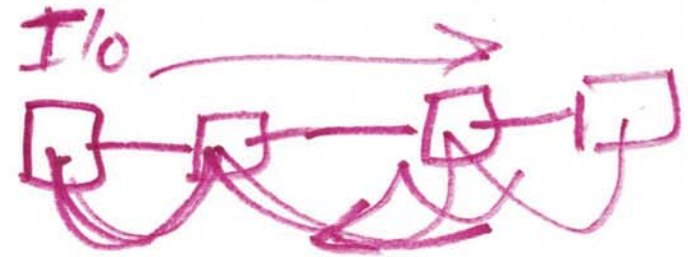
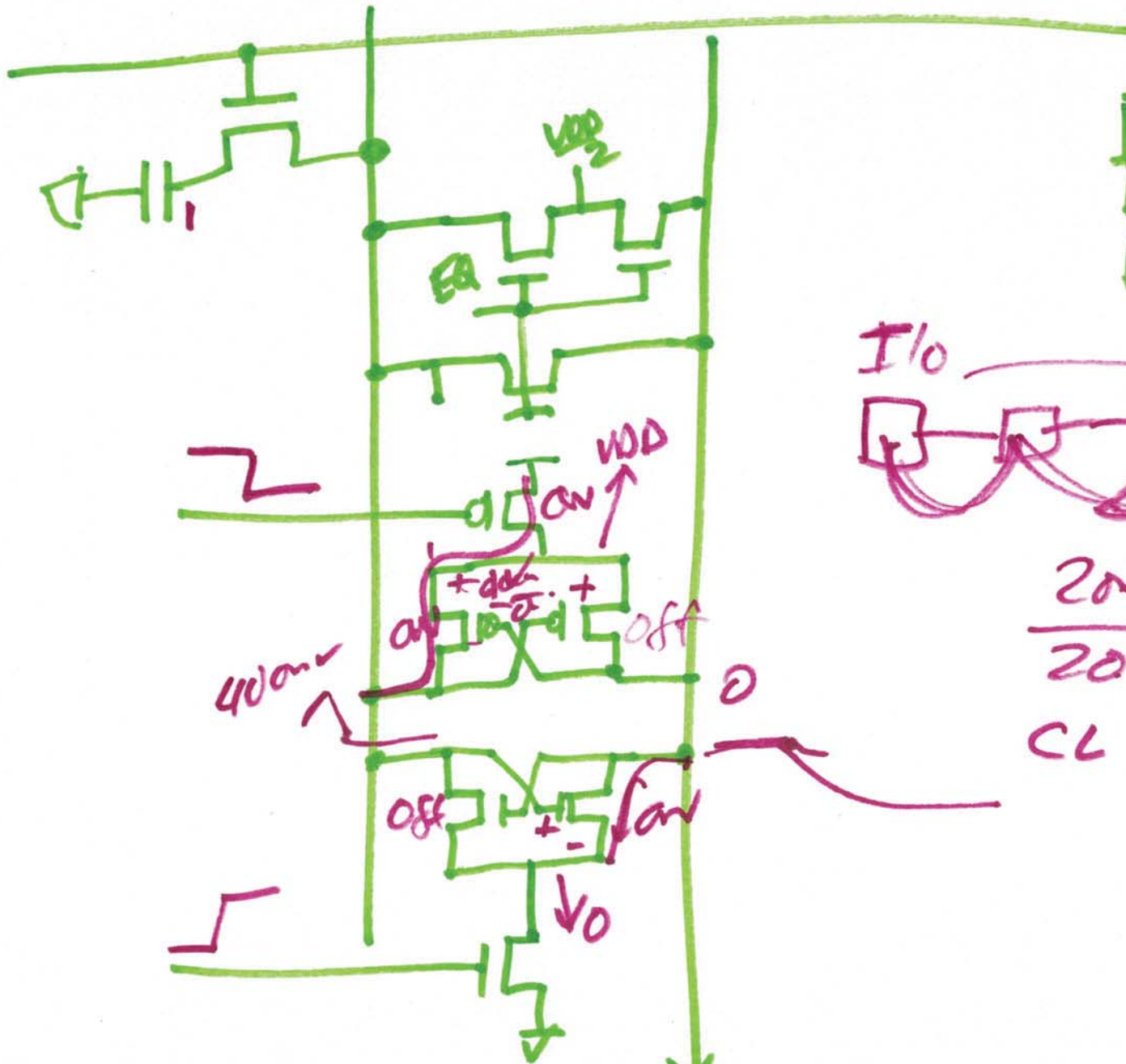
$V_2 = \frac{1}{2}$ precharged to $\frac{V_{DD}}{2}$

20 fF 100 fF

$$V_f = \frac{20 \text{ fF} \cdot 1 + 200 \text{ fF} \cdot \frac{1}{2}}{20 \text{ fF} + 200 \text{ fF}}$$

$$= \frac{120}{220} = .545 \text{ V}$$

6)



$$\frac{20\text{ns}}{20} \\ \text{CL}$$

to other
Array

7)