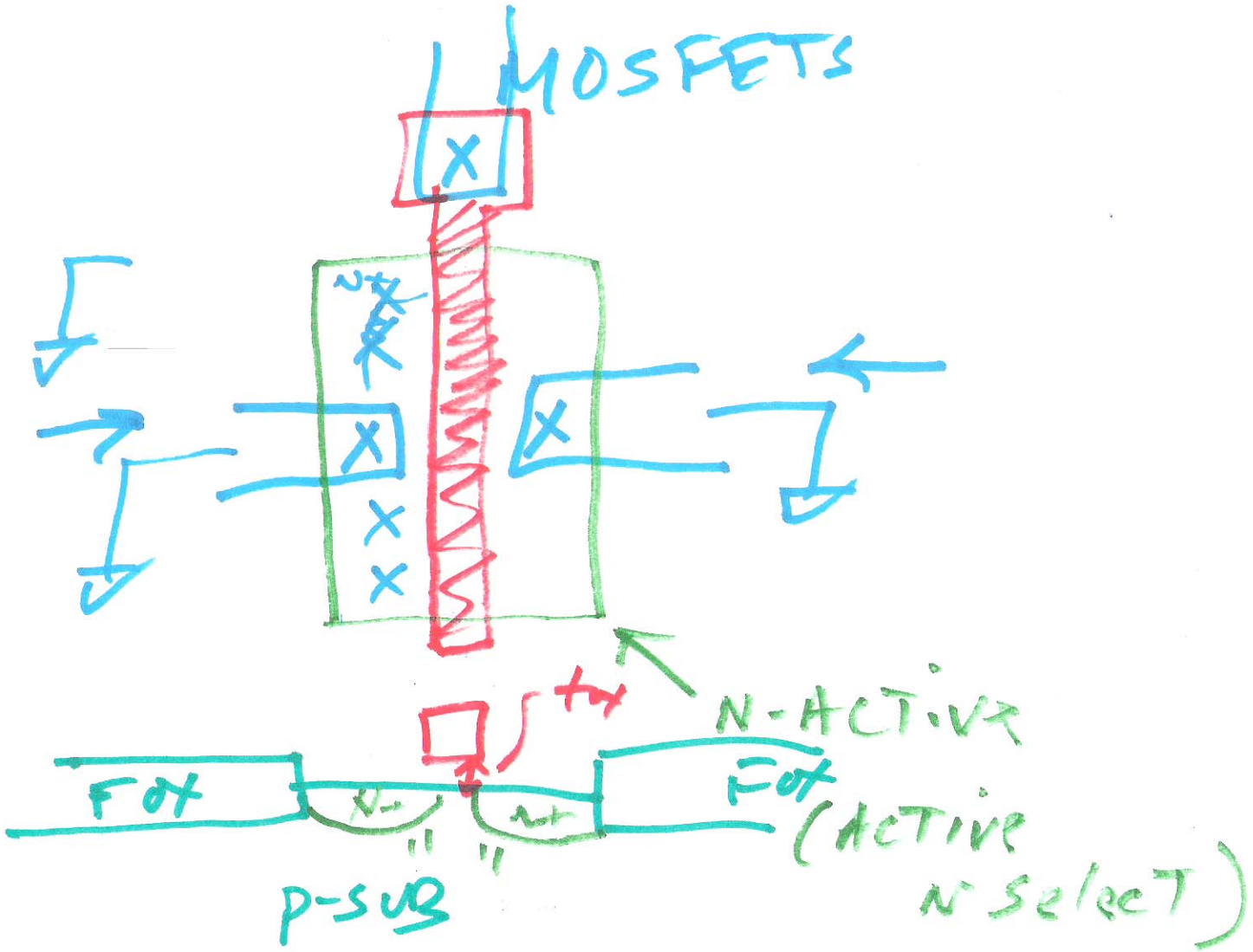
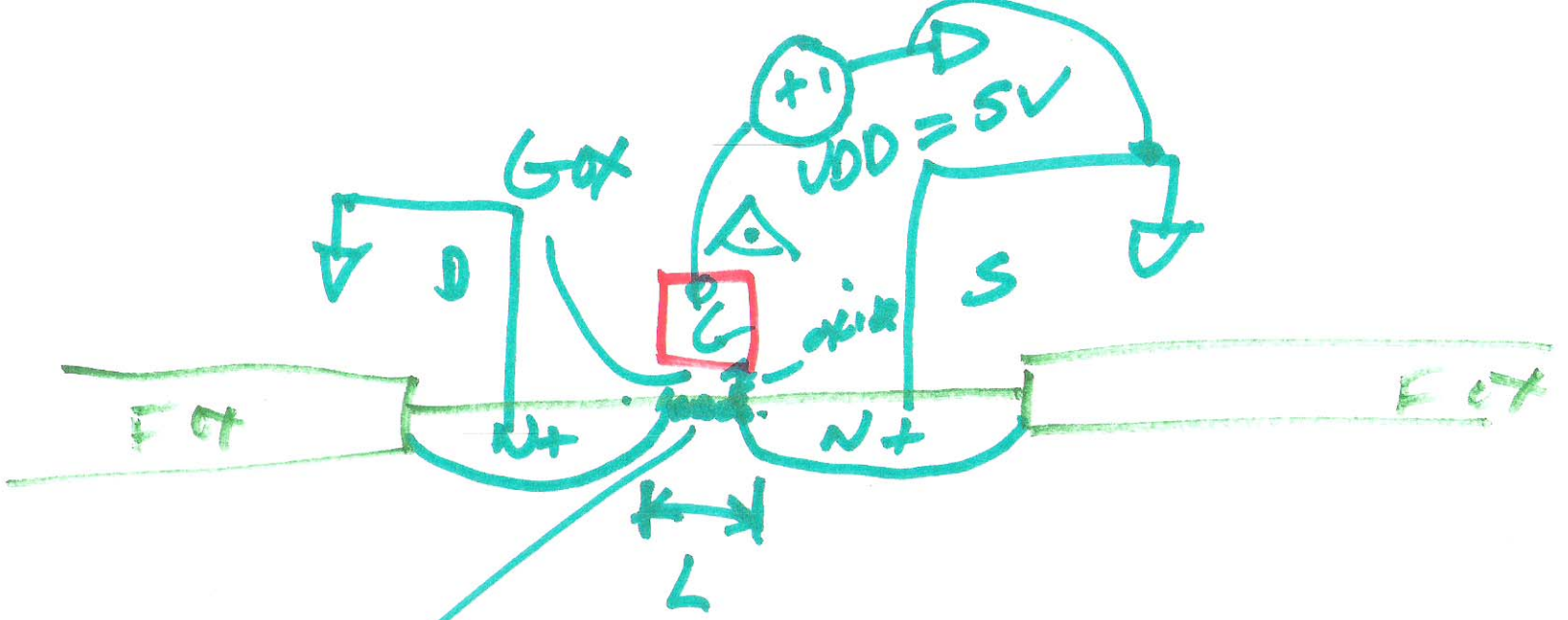
OCT. 6, 2014

Lecture 12

MOSFETS





Inverted

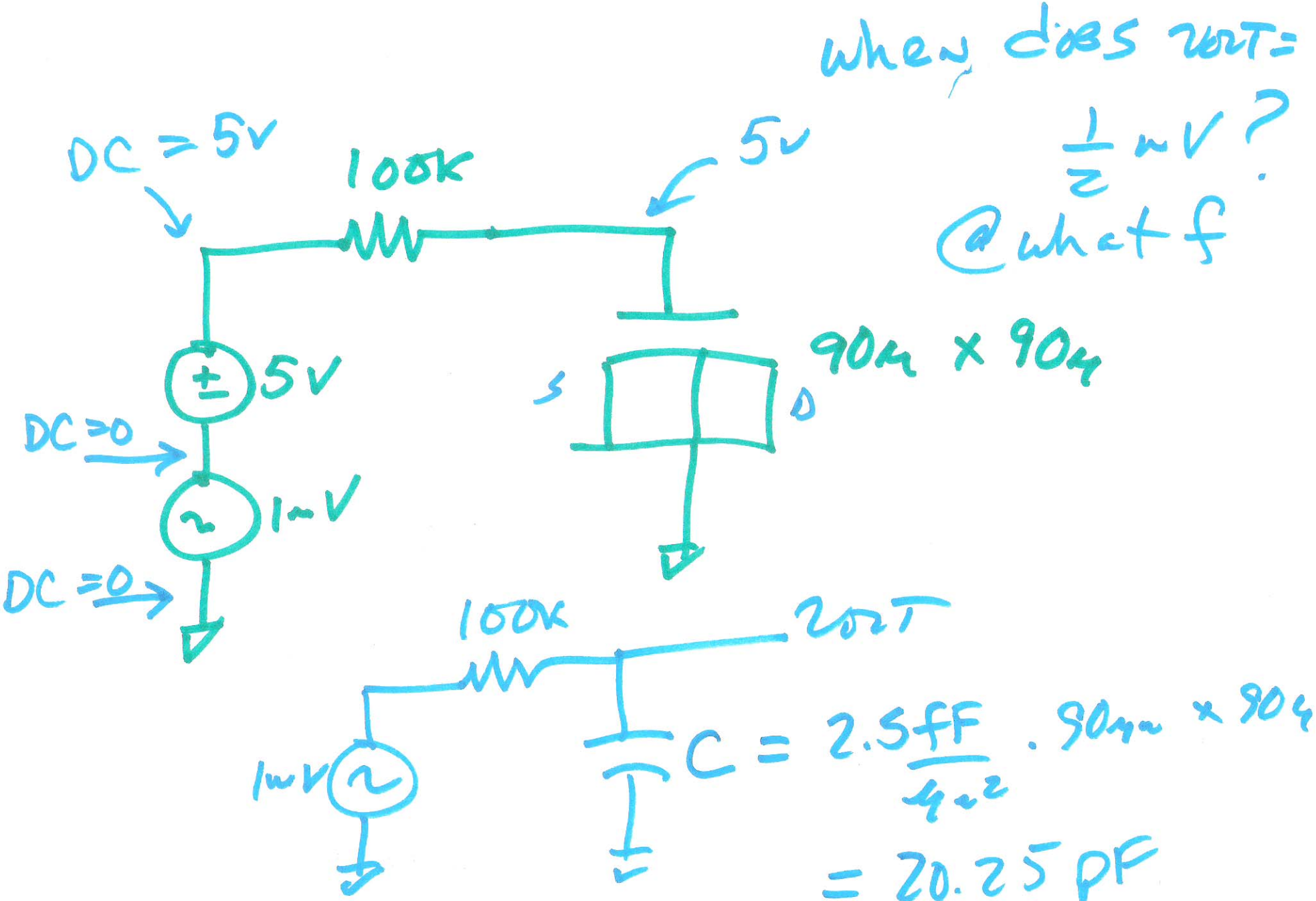
strong inversion!

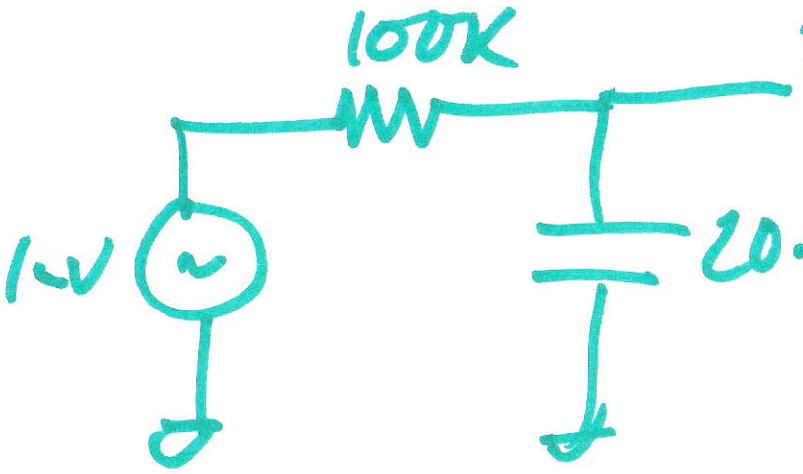
$$C = \frac{\epsilon_{ox}}{t_{ox}} \cdot L \cdot W$$

$$C_{ox}' = \frac{\epsilon_{ox}}{t_{ox}} = \frac{3.97 \cdot 8.85\,aF/\mu m}{0.0139\,\mu m}$$

$$= 2.5\,fF/\mu m^2$$

C_{ox}' in $F/\mu m^2$


When does 20dT =
1/2 mV?
@ what f
DC = 5V
100K
5V
±
5V
DC = 0
~
1mV
DC = 0
S
D
90n x 90n
100K
20dT
1mV
~
C = 2.5fF/4u² . 90n x 90u
= 20.25 pF



$\frac{1}{2}V_{out} = 1mV \cdot \frac{\frac{1}{j\omega 20.25pF}}{\frac{1}{j\omega 20.25p} + 100k}$

$$\left|\frac{1}{2}\right| = \left|\frac{1}{1 + j2\pi f(100k \cdot 20.25pF)}\right|$$

$10^{5} \cdot 10^{-12}$

what I am trying to find 10^{-7} 2.025×10^{-6}

$$\frac{1}{2} = \frac{1}{\sqrt{1 + (2\pi f\, 2.025e\text{-}6)^2}}$$

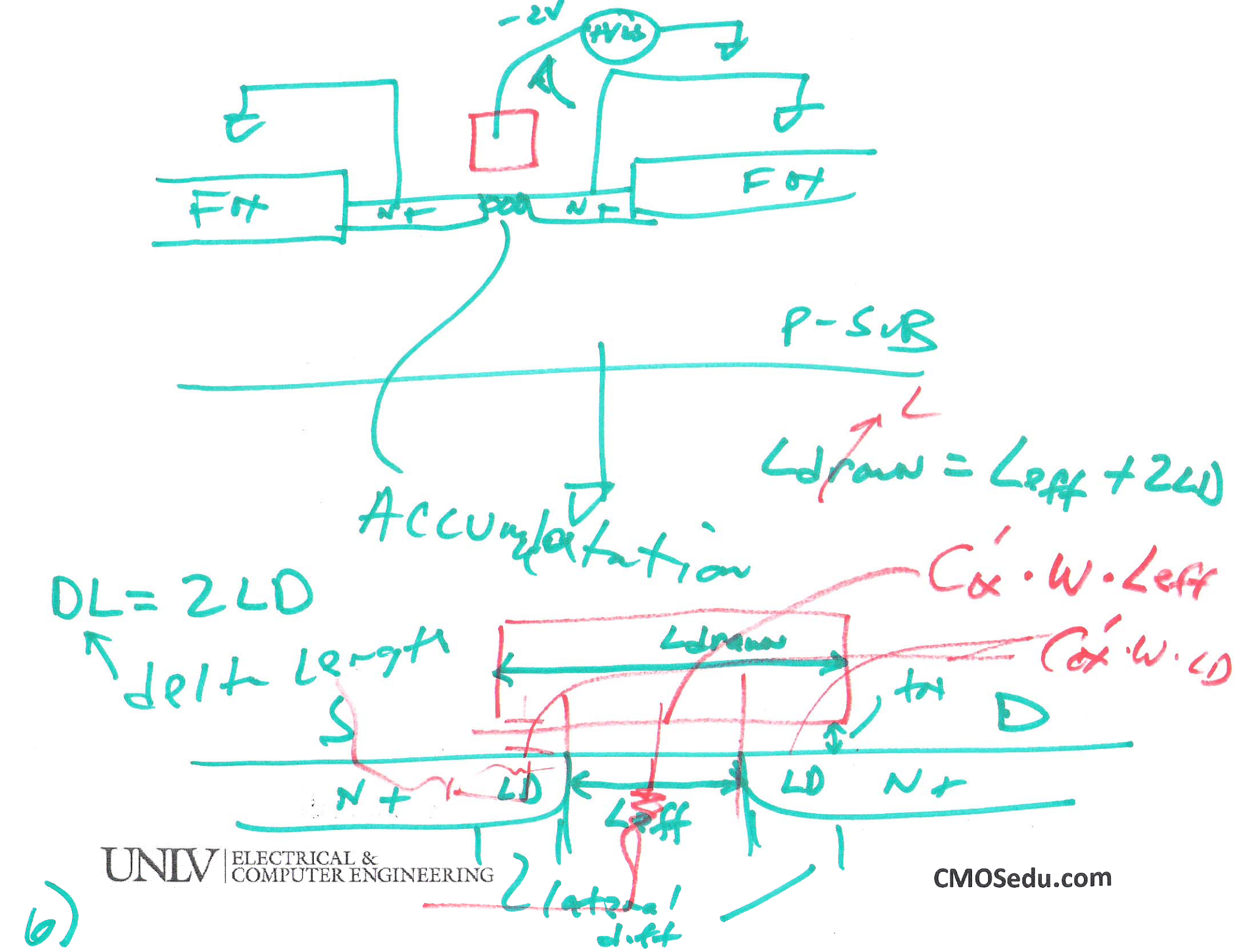
$$1 + (2\pi f \, 2.025e\text{-}6)^2 = 4$$

$$2\pi f \cdot 2.025e\text{-}6 = \sqrt{3}$$

$$f = \frac{\sqrt{3}}{6.28 \cdot 2.025e\text{-}6}$$

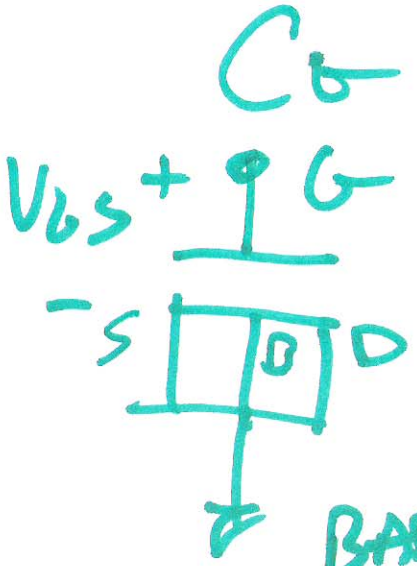
$$\boxed{f = 136.2 \text{ kHz}}$$

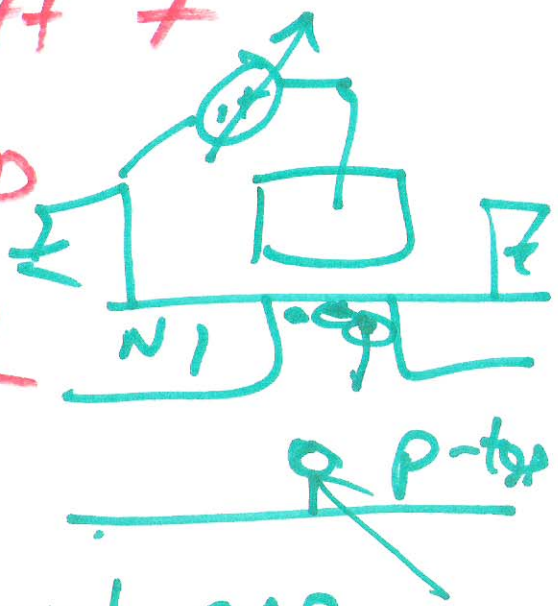
5)

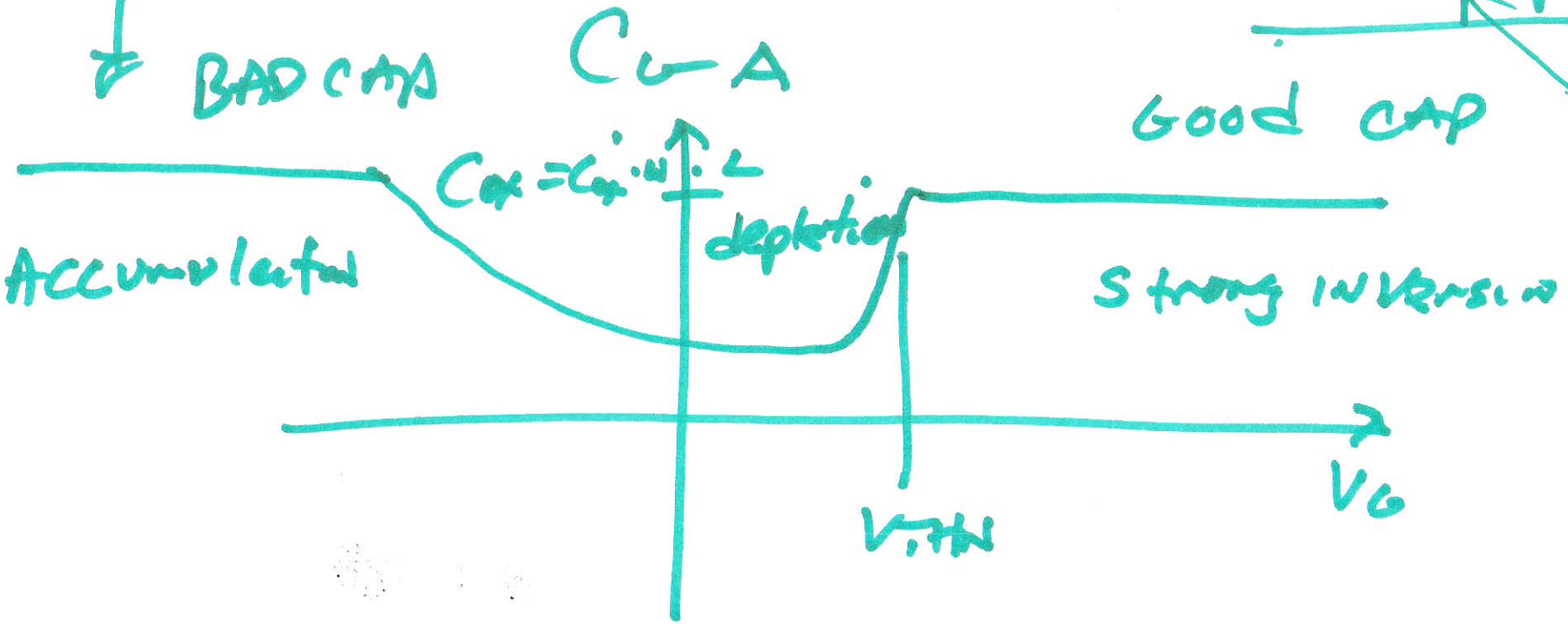

-2V
HVLS
FET
FET
N+
N+
P-SUB
ACCUMULATION
Ldrawn = Leff + 2LD
DL = 2LD
delta length
Cox · W · Leff
Cox · W · LD
Ldrawn
tox
S
D
N+
LD
Leff
LD
N+
Total diff

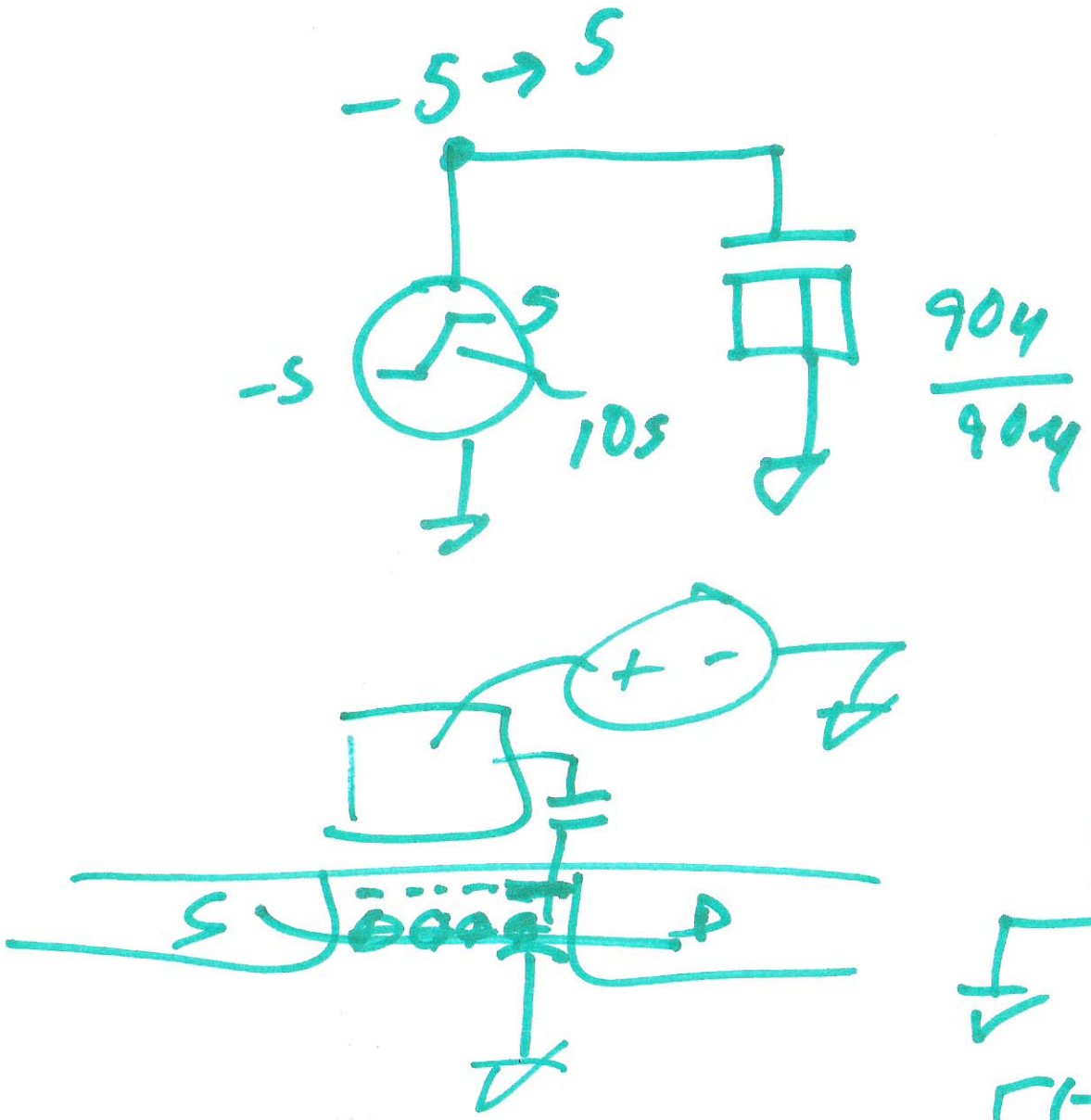
Accumulation

$$C = C_{ox}' \cdot W \cdot L_{eff} + 2 \cdot C_{ox}' \cdot W \cdot L_D = C_{ox}' \cdot W \cdot L$$







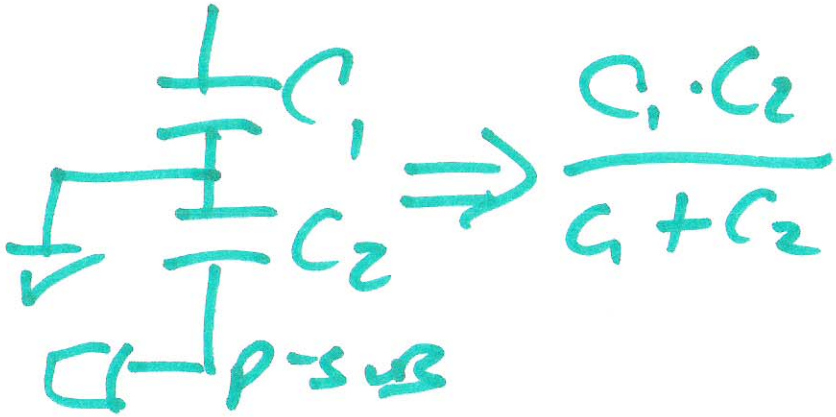


$$I = C\frac{dV}{dt}$$

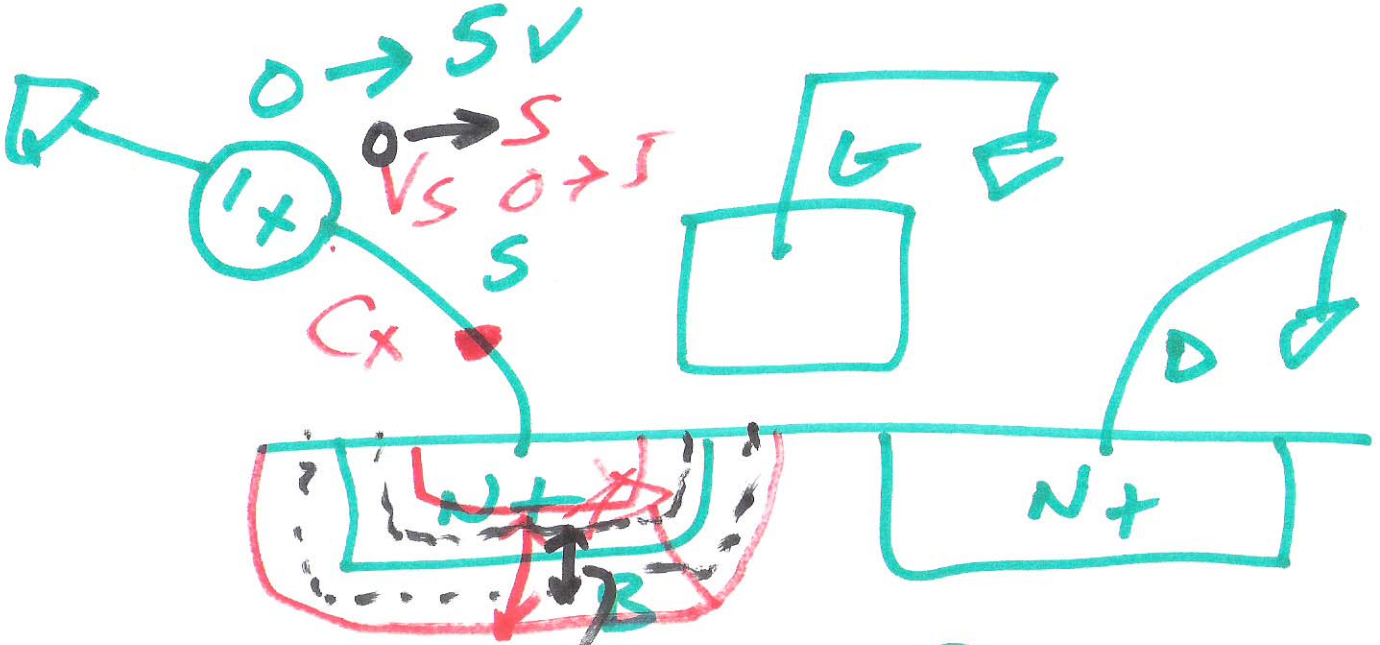
$$C = \frac{I \cdot dt}{dV}$$

$$C = I \cdot \frac{10s}{10V}$$

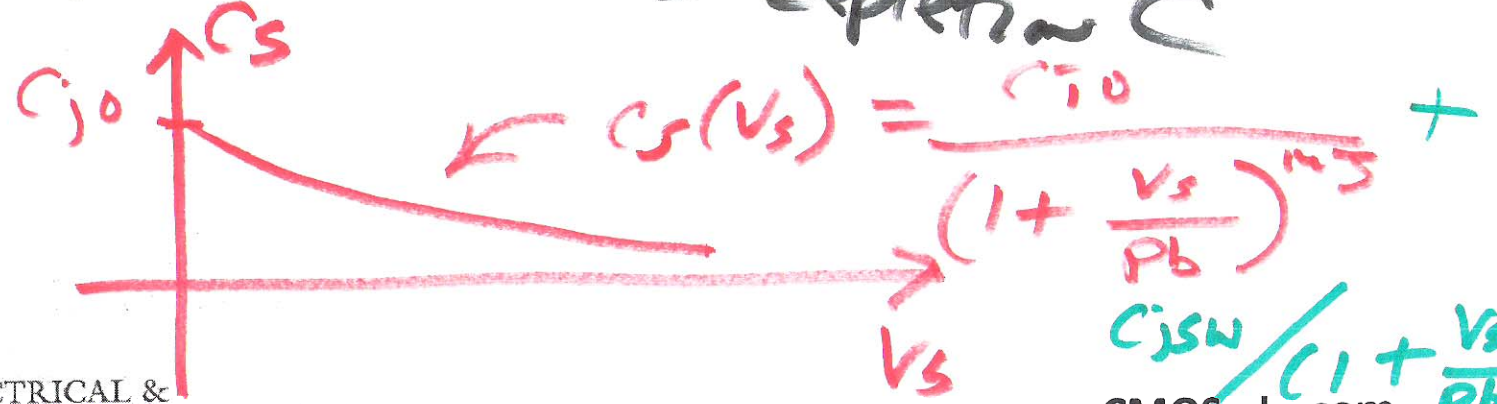
$$C = I$$



$$\Rightarrow \frac{C_1 \cdot C_2}{C_1 + C_2}$$



C_{j0} = zero b.s depletion C



$$C_s(V_s) = \frac{C_{j0}}{\left(1 + \frac{V_s}{P_b}\right)^{m_j}} + \frac{C_{jsw}}{\left(1 + \frac{V_{sjsw}}{P_{bsw}}\right)^{m_{jsw}}}$$