

2/17/09

$$x^2 - .36x^2 - .36 = 0$$

$$.64x^2 - .36 = 0$$

$$x^2 - \frac{.36}{.64} = 0$$

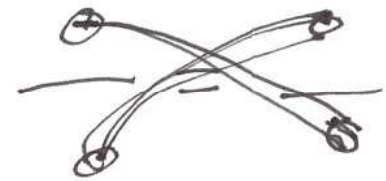
$$x = \sqrt{\frac{.36}{.64}} = \frac{6}{8} = \frac{3}{4}$$

$$2\pi f_{in} \cdot 10^{-7} = \frac{3}{4} \rightarrow 10^{-7}$$

$$f_{in} = \frac{3}{4} \frac{1}{2\pi} \cdot 10 \text{ MHz}$$

$$\approx 1.18 \text{ MHz}$$

$$T_{in} = \frac{1}{1.18 \text{ MHz}} = \underline{\underline{900 \text{ ns}}}$$



$$10^7 = 10 \text{ MHz}$$

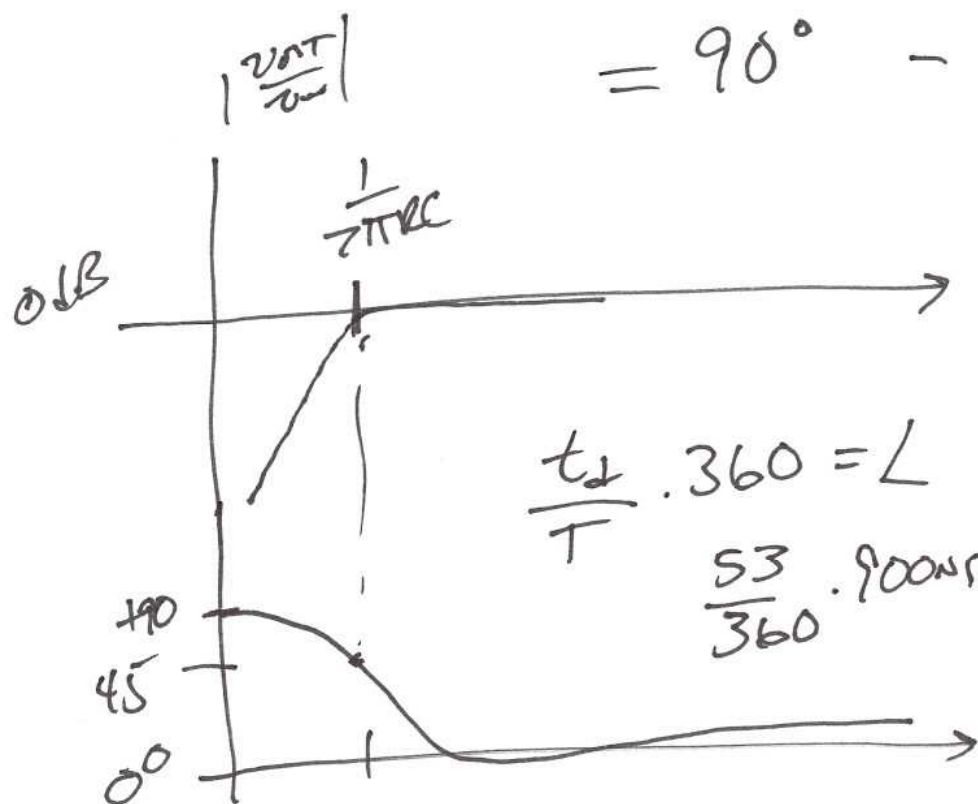
1)

$$L = \tan^{-1} \frac{2\pi f_w RC}{0} - \tan^{-1} \frac{2\pi f_w RC}{1}$$

.707
.60

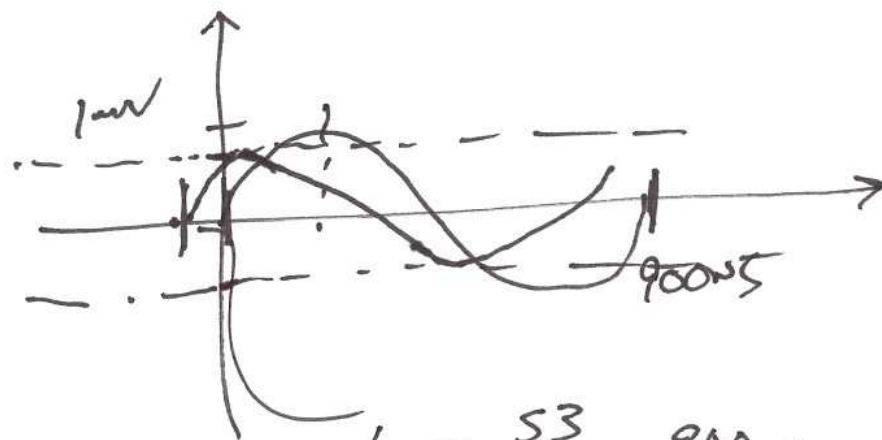
$$= 90^\circ - \tan^{-1} \frac{3}{4}$$

$$= 90^\circ - \cancel{35^\circ} = + \cancel{35^\circ} 53$$



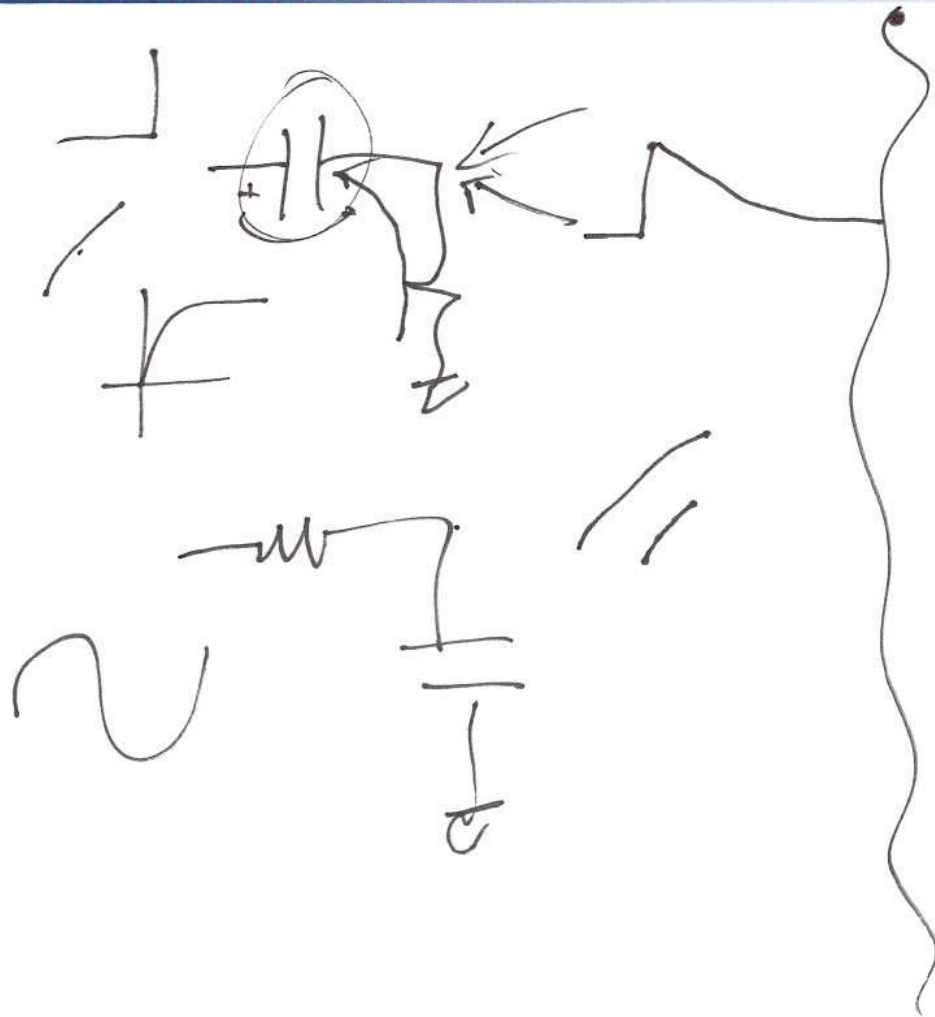
$$\frac{t_d}{T} \cdot 360 = L$$

$$\frac{53}{360} \cdot 900 \mu\text{s}$$



$$t_d = \frac{53}{360} \cdot 900 \approx 130 \mu\text{s}$$

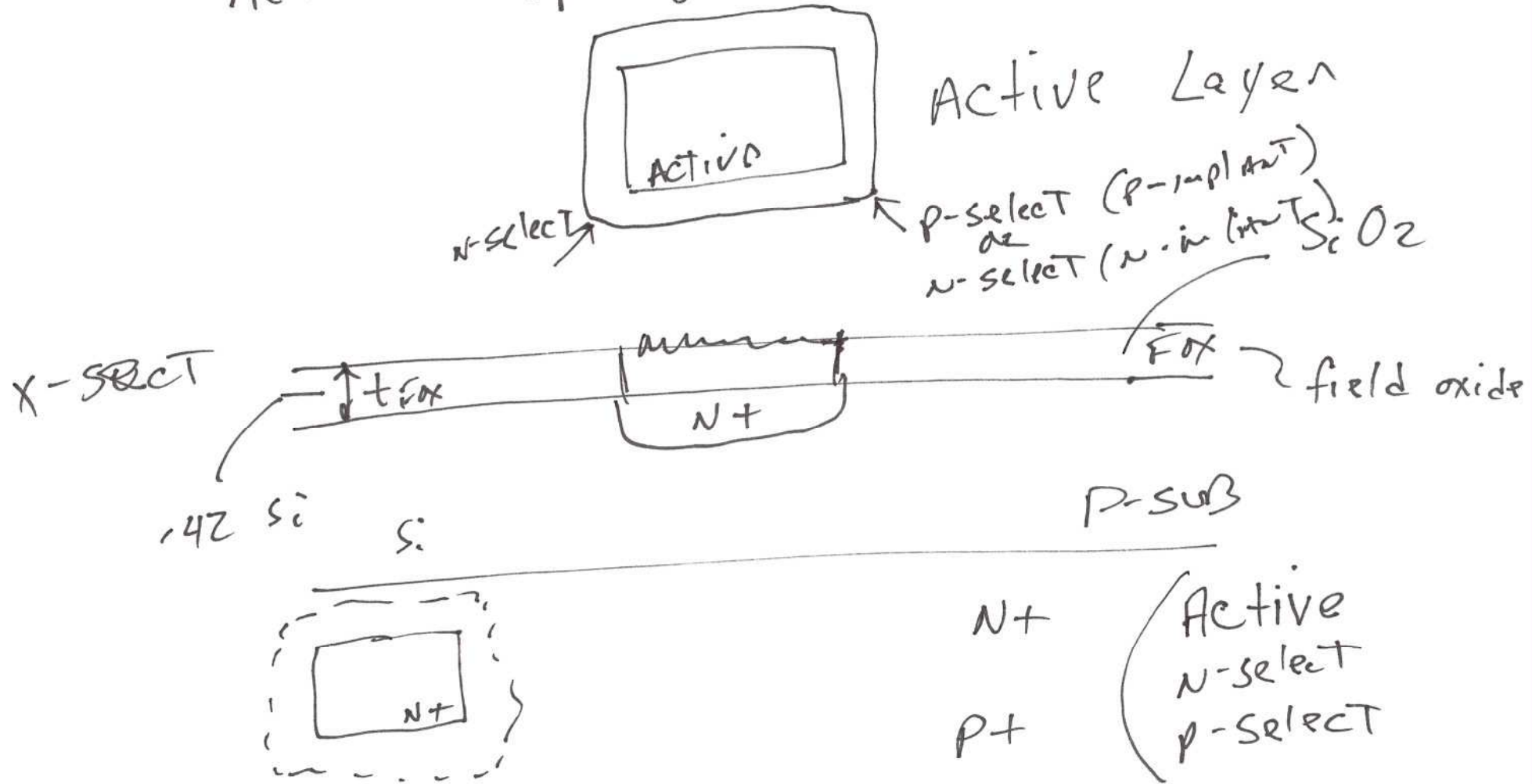
2)



N-well
M1
M2
M3
VIA1
VIA2
OUG-2 (PASSIVATION)

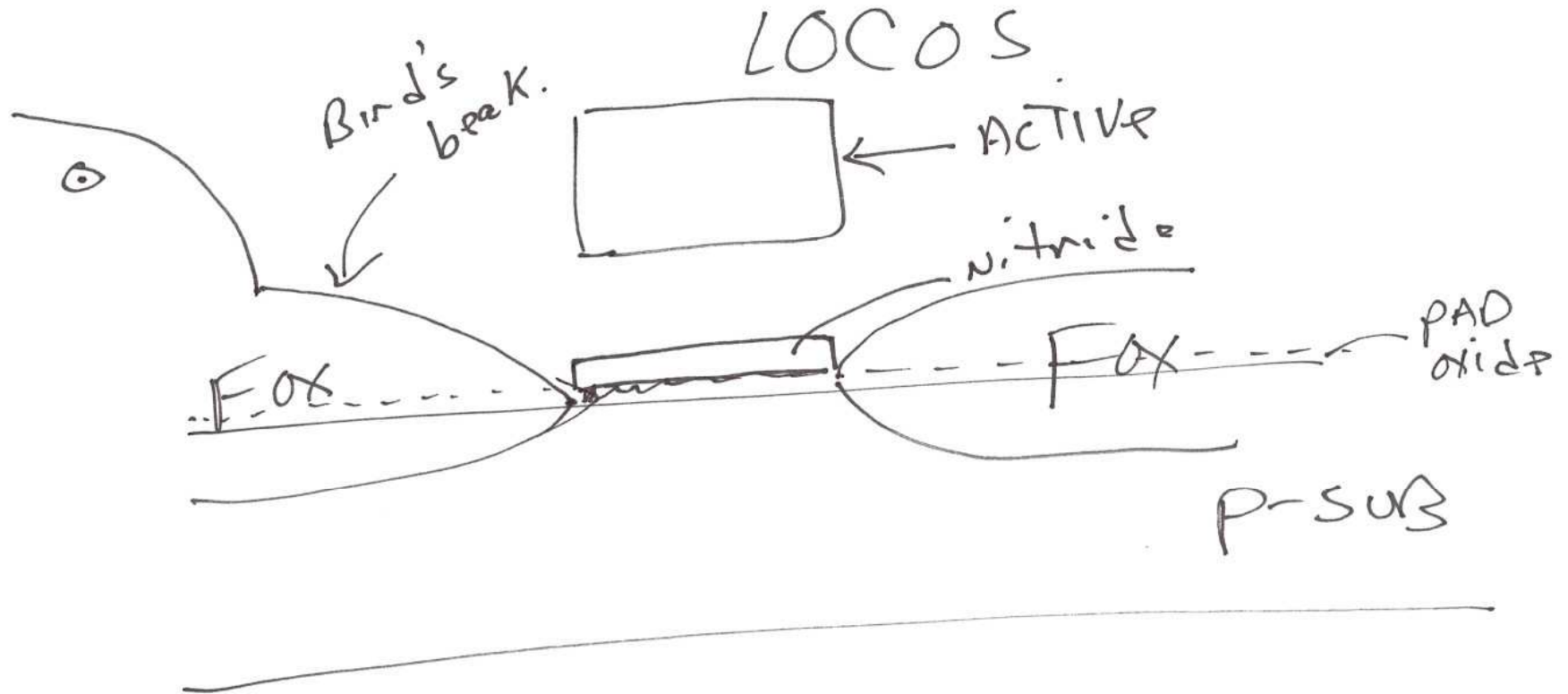
3)

Active → openings in the FOX



4)

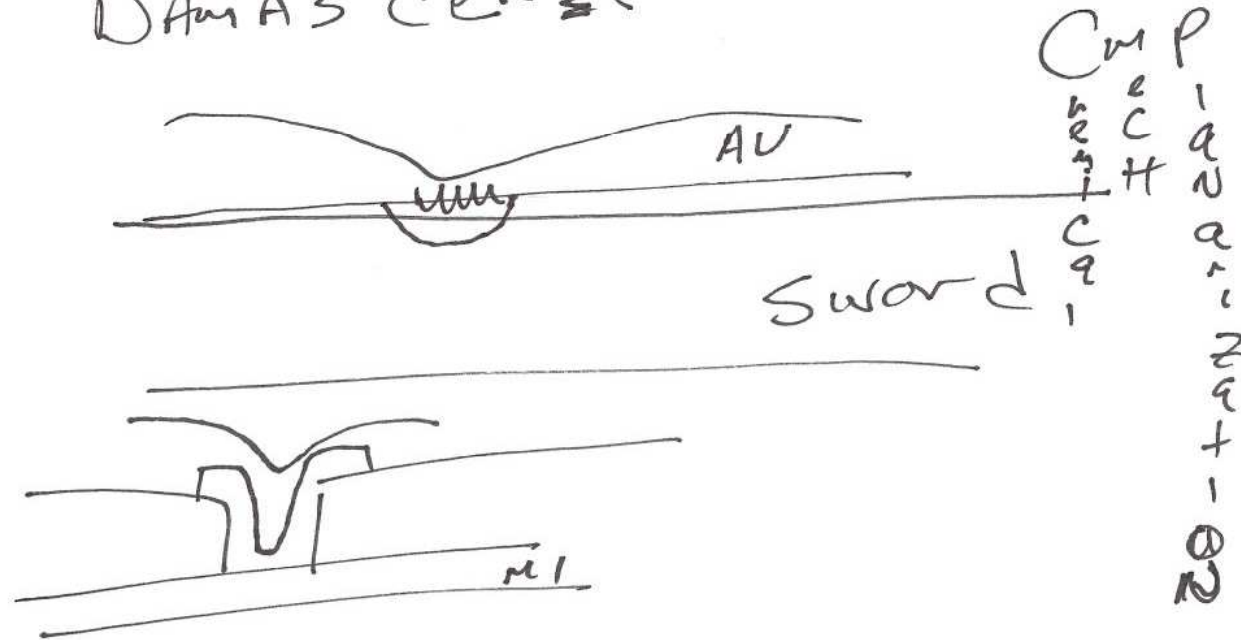
History - Local Oxidation of Silicon



5)

Nowadays - Shallow Trend
(ST I)

DAMASCENE



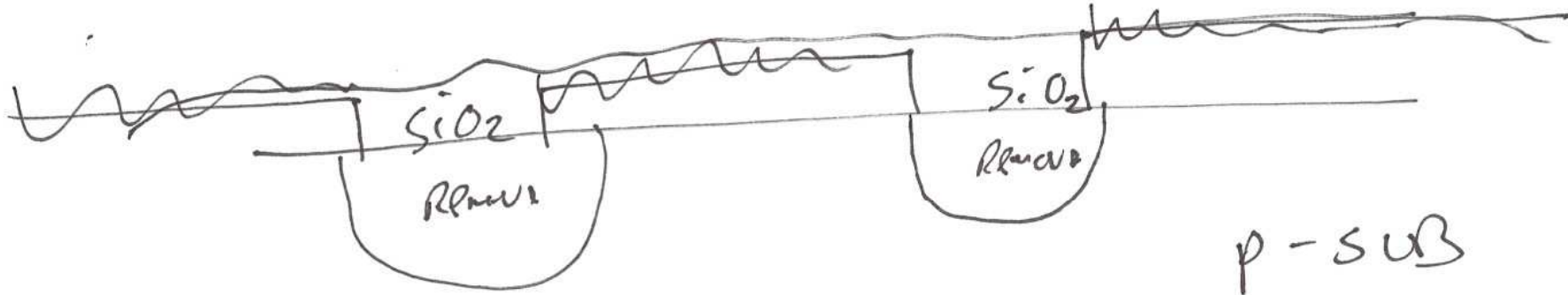
b)

STI

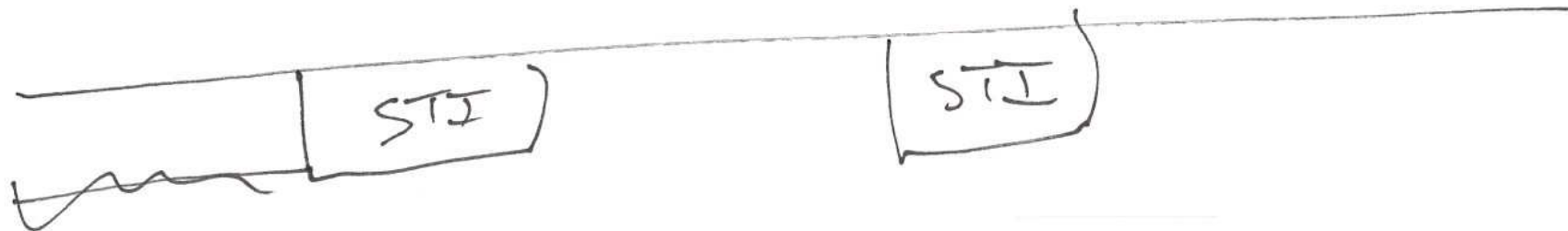
ACTIVE

ACTIVE

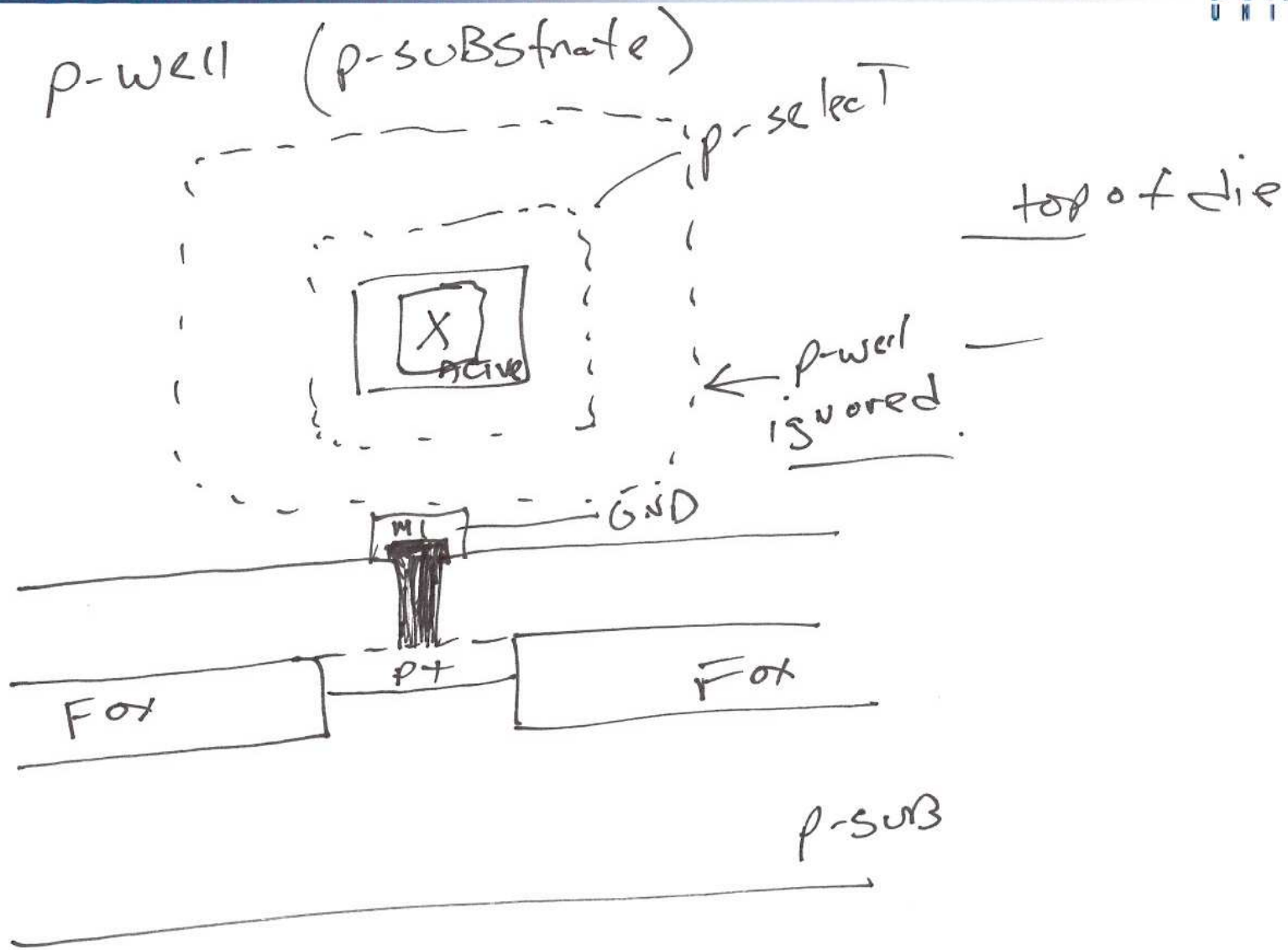
ACTIVE

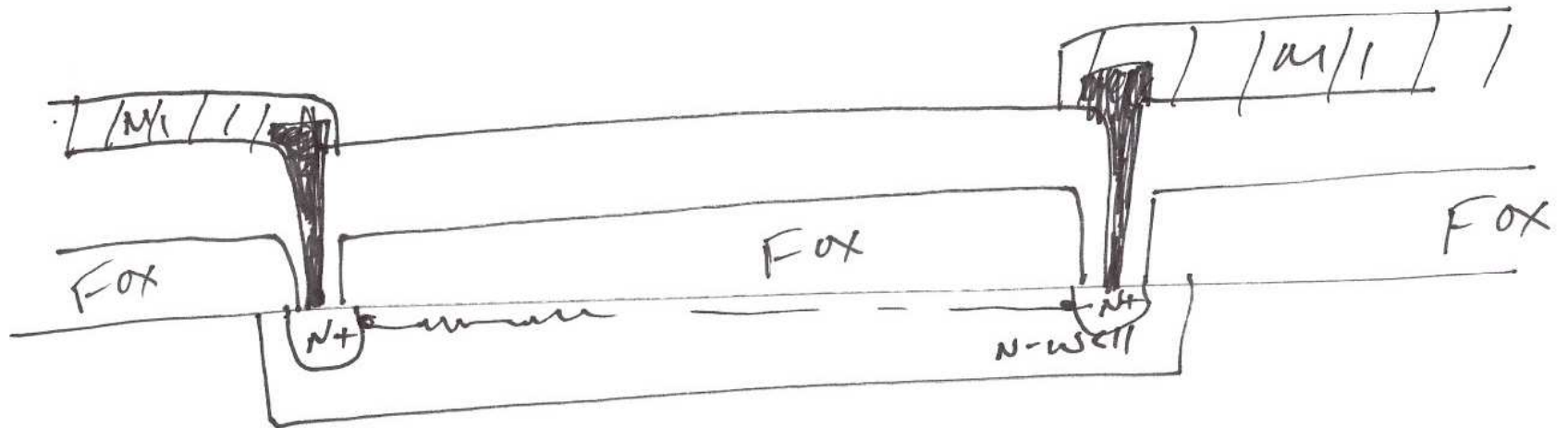
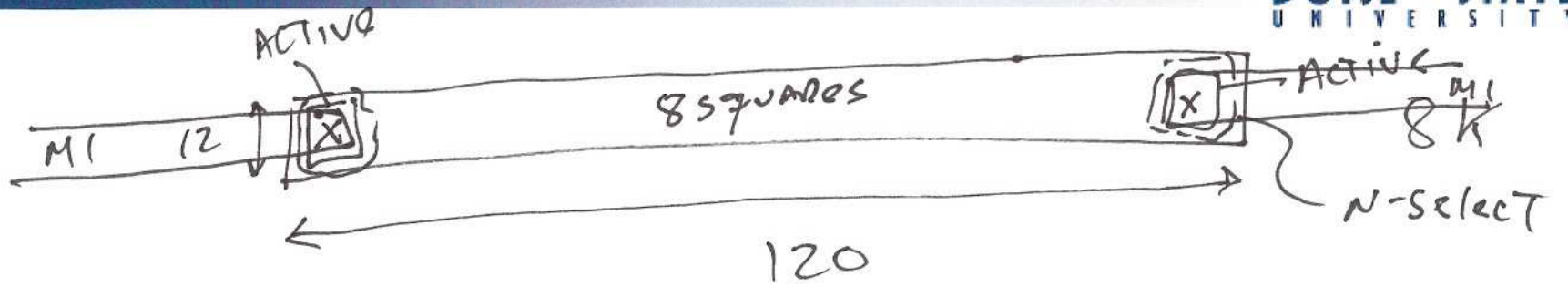


p-SUB



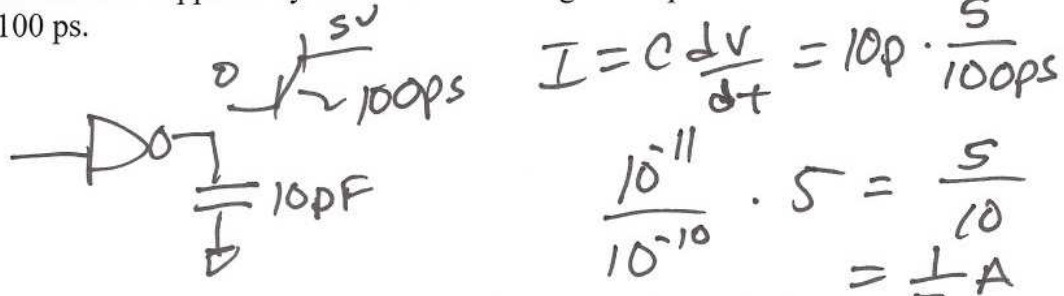
7)



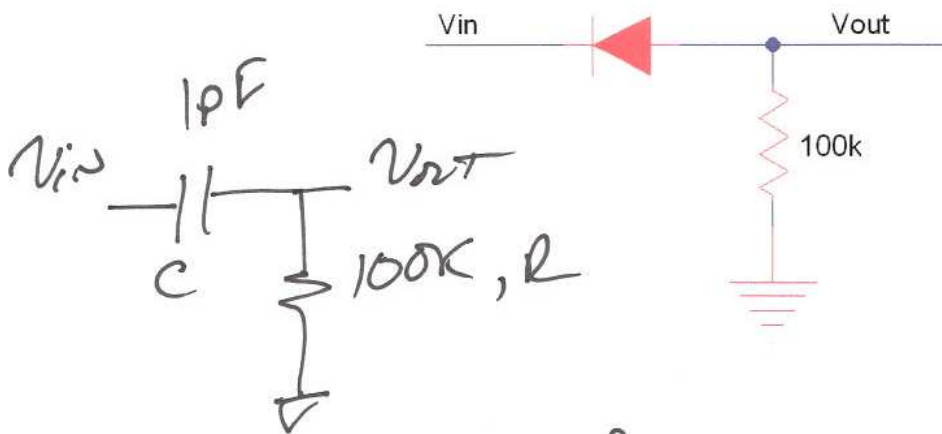


9)

1. Estimate the peak current supplied by an inverter driving a 10 pF load from ground to 5V in 100 ps.



2. If the diode's capacitance in the circuit seen below is 1 pF estimate the input frequency when the output is 60% of the input. Sketch the input and output voltages when the input is 1 mV AC at this frequency.



Handwritten calculation for problem 2:

$$1\text{pF} \cdot 100\text{k}$$

$$10^{-12} \cdot 10^5 = 10^{-7}$$

Handwritten transfer function for problem 2:

$$V_{out} = V_{in} \cdot \frac{R}{R + 1/j\omega C}$$

Handwritten transfer function for problem 2:

$$\Rightarrow \frac{V_{out}}{V_{in}} = \frac{0 + j\omega RC}{1 + j\omega RC}$$

Handwritten magnitude equation for problem 2:

$$\left| \frac{V_{out}}{V_{in}} \right| = 0.6 = \frac{2\pi f_{in} \cdot 10^{-7}}{\sqrt{1 + (2\pi f_{in} \cdot 10^{-7})^2}}$$

Handwritten substitution for problem 2:

$$\text{let } x = 2\pi f_{in} \cdot 10^{-7}$$

Handwritten equation for problem 2:

$$0.6 = \frac{x}{\sqrt{1 + x^2}}$$

Handwritten equation for problem 2:

$$0.36 = \frac{x^2}{1 + x^2}$$

end)