

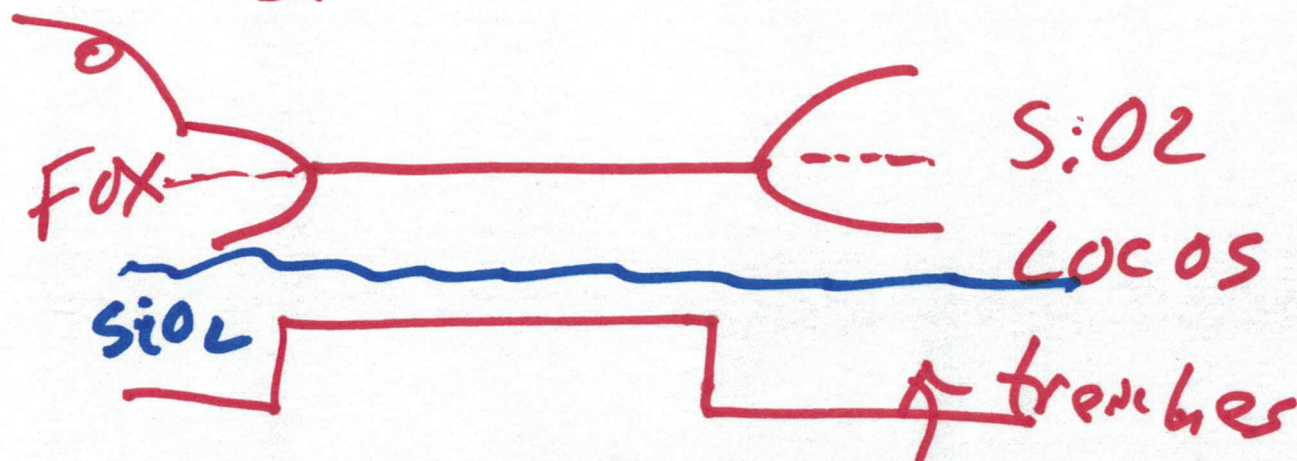
EE 421 / ECU 621

Digital IC Design

Lecture 10

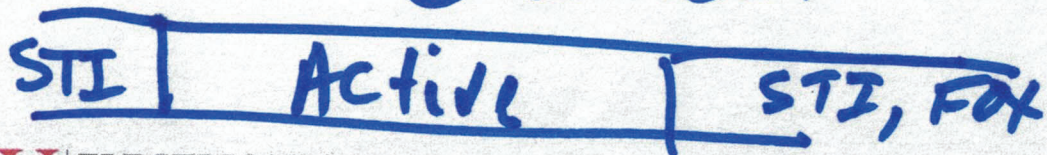
OCT. 2, 2023

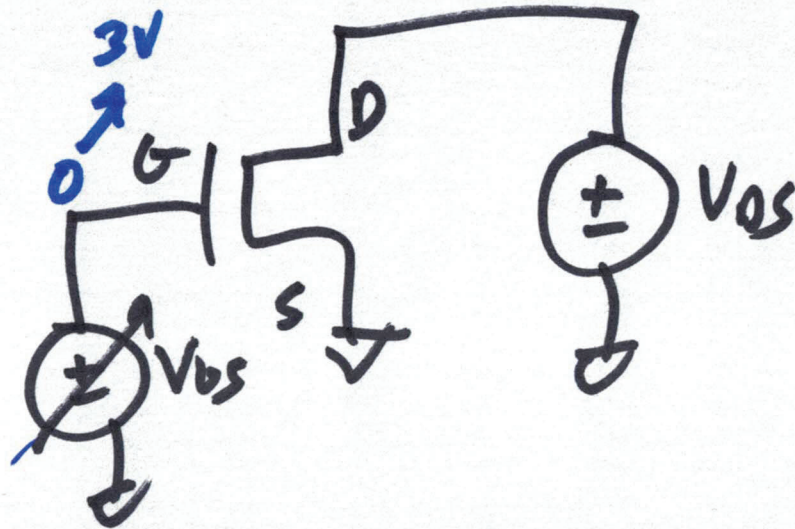
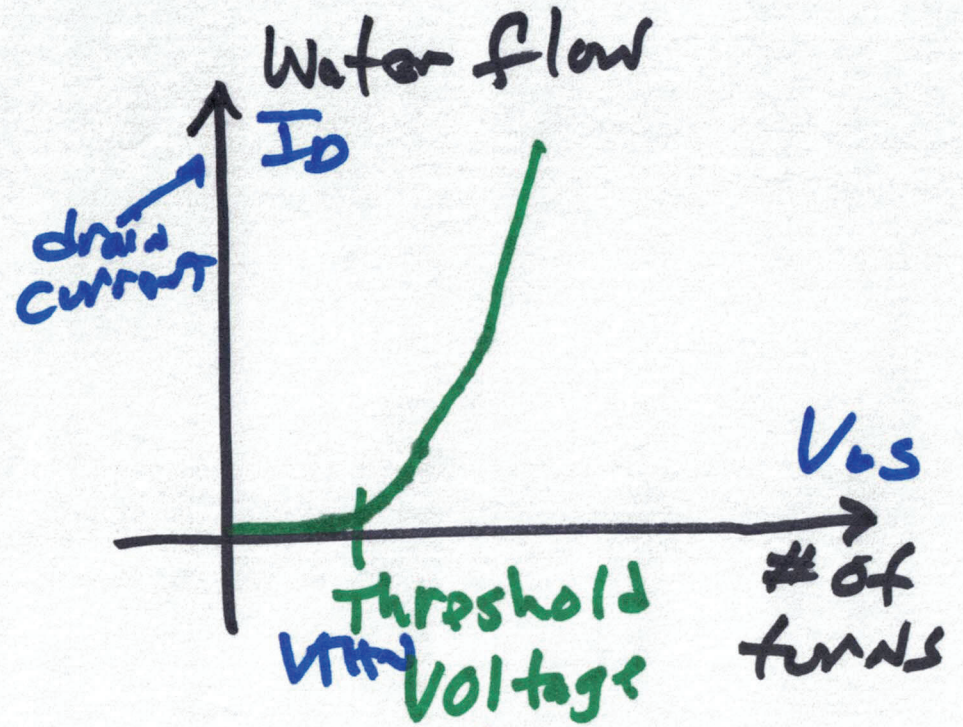
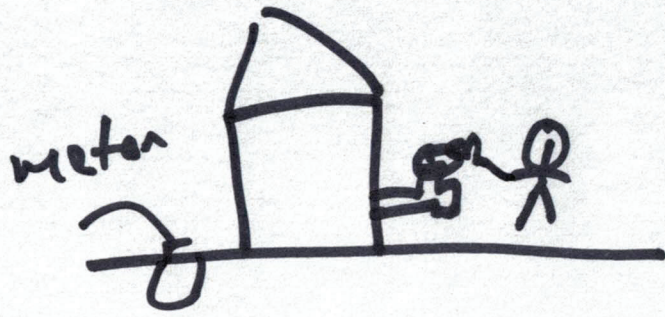
Local Oxidation of Silicon (LOCOS)



Chemical mechanical polishing

CMP





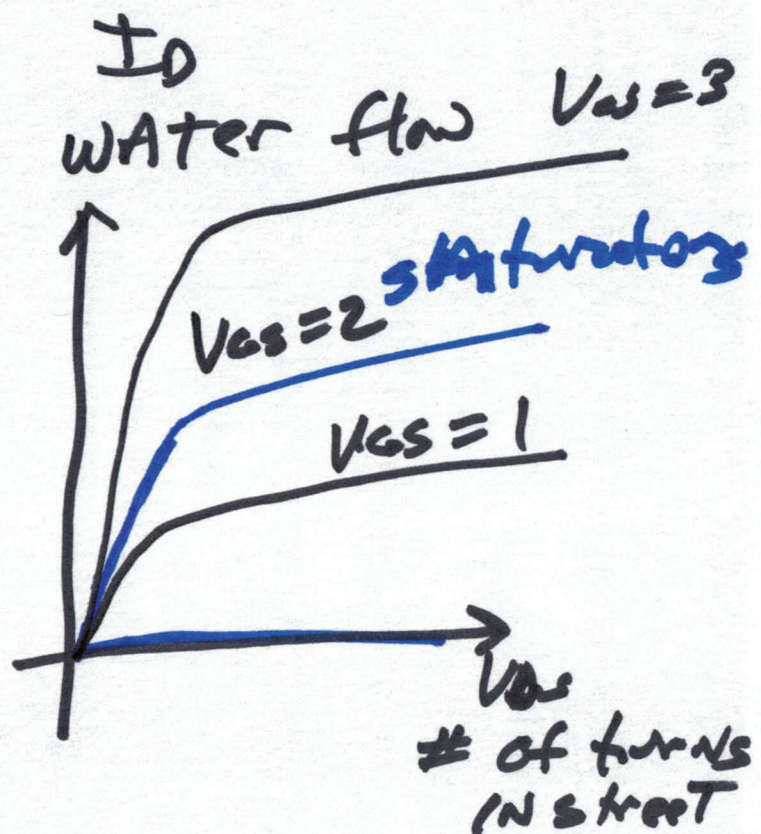
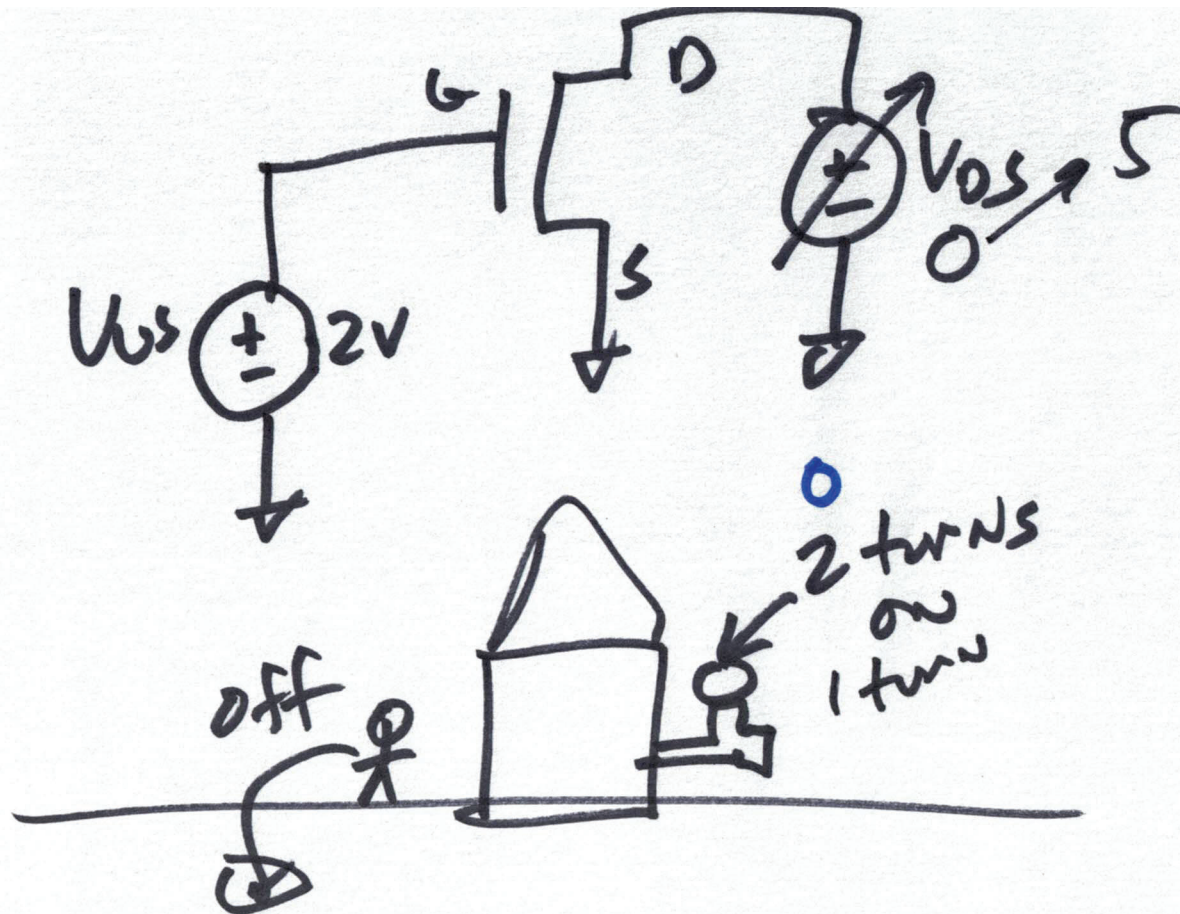
$$C_{ox}' = \frac{\epsilon_{ox} t_{ox}}{t_{ox}}$$

$$I_D = \frac{\mu_n \cdot C_{ox}'}{2} \cdot \frac{W}{L} (V_{GS} - V_{TH})^2$$

$$I_D = \frac{K_n}{2} (V_{GS} - V_{TH})^2$$

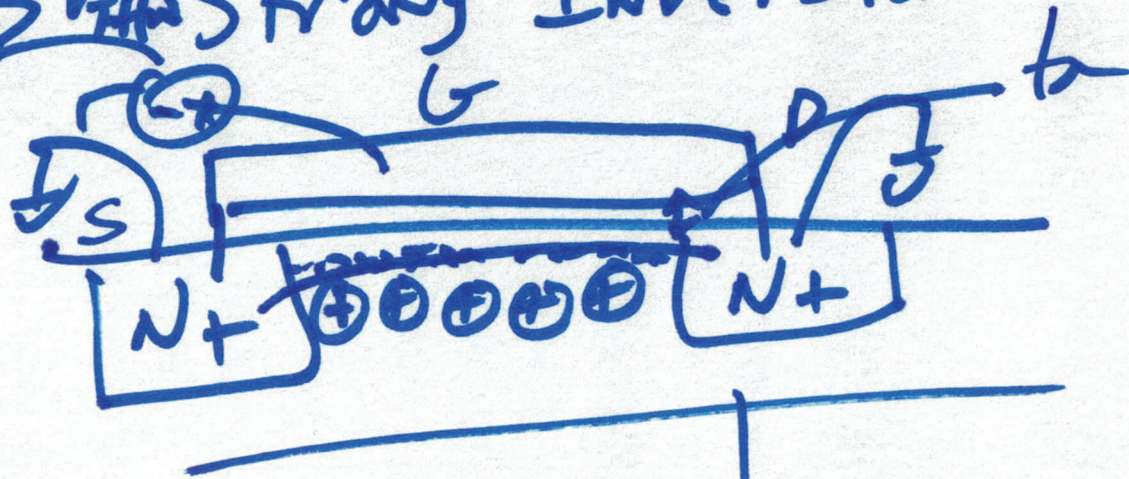
$$K_n = K_n' \cdot \frac{W}{L} = \mu_n C_{ox}' \frac{W}{L}$$

2)



3)

$V_{GS} \rightarrow V_{TH}$ Strong Inversion



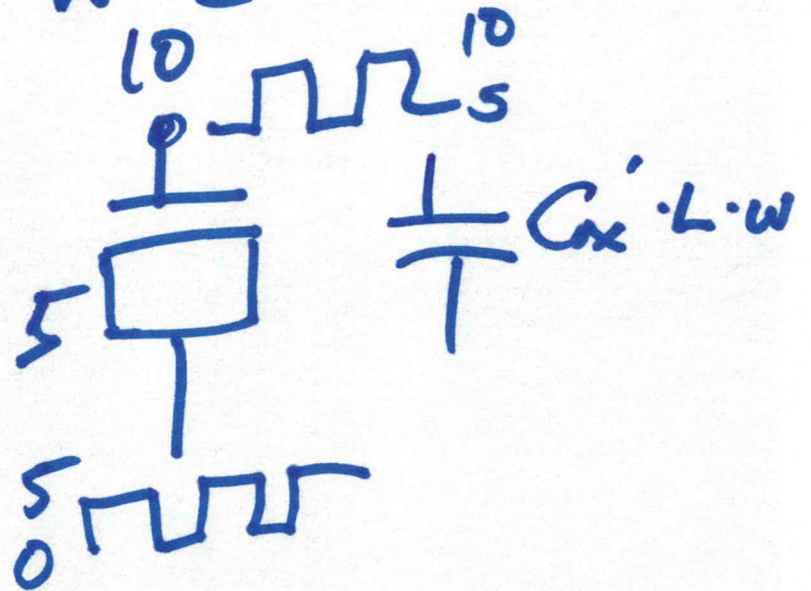
$$C_{gs,D,B} \rightarrow$$

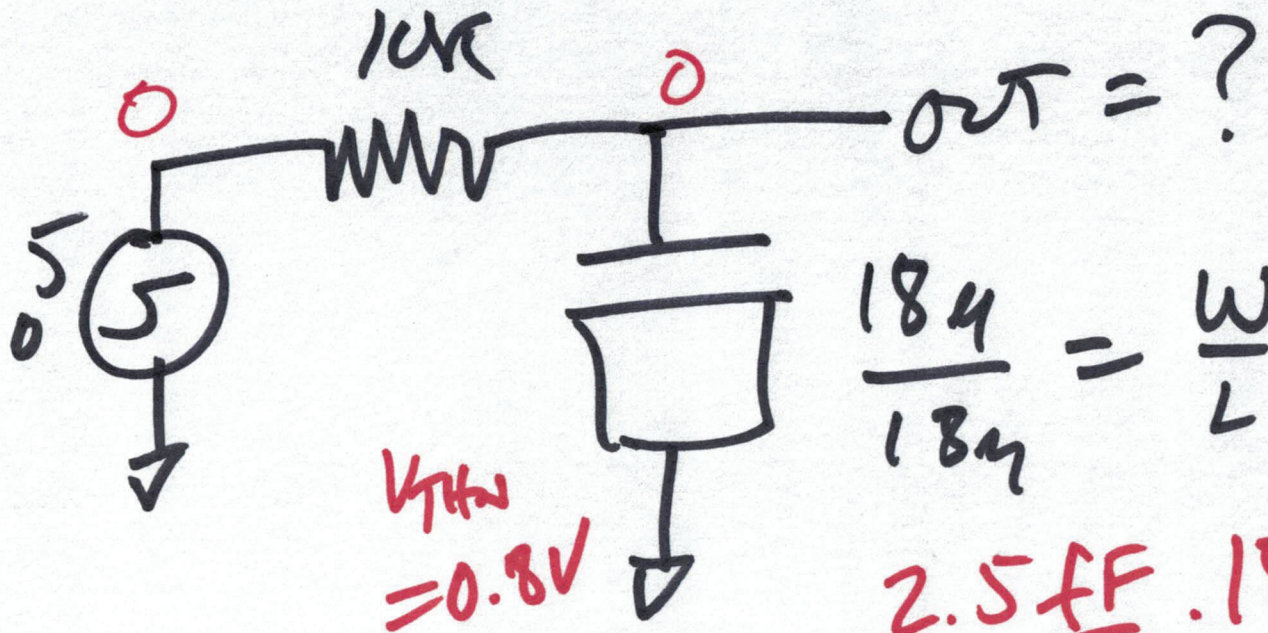
$$= C'_{ox} \cdot W \cdot L$$

$$C'_{ox} = \frac{\epsilon_{ox}}{0.0144}$$

$$= \frac{3.9 \cdot 8.85 \text{ aF}/\mu\text{m}}{0.0144 \mu\text{m}}$$

$$C'_{ox} = 2.5 \frac{\text{fF}}{\mu\text{m}^2}$$

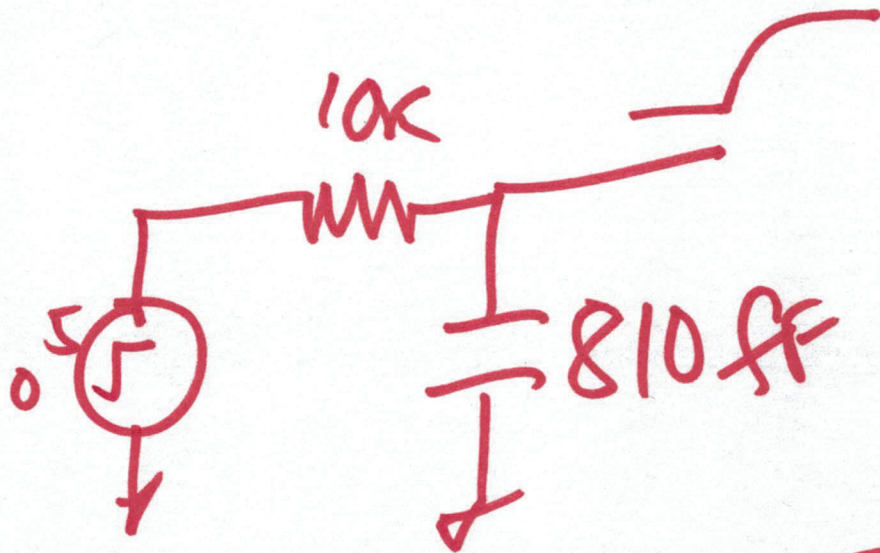




$$\frac{184}{184} = \frac{W}{L}$$

$$\frac{2.5 fF \cdot 184}{4} \cdot 184$$

$$810 fF$$



$$t_d = 0.7 \cdot 810 fF \cdot 10^{-15}$$

$$t_d = 5670 ps \cdot 10^3$$

$$5.67 ns$$