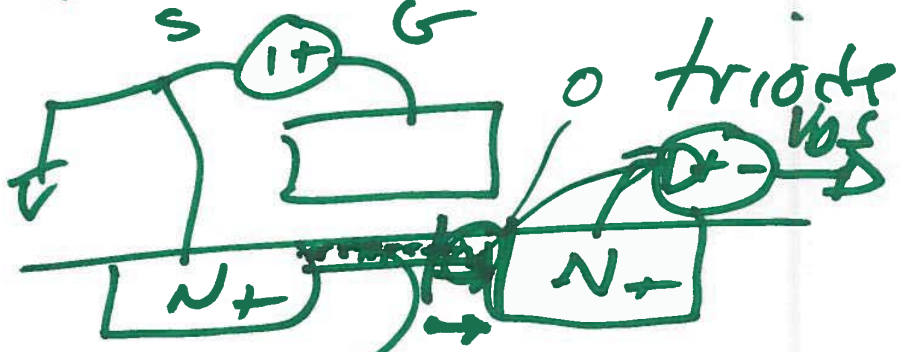
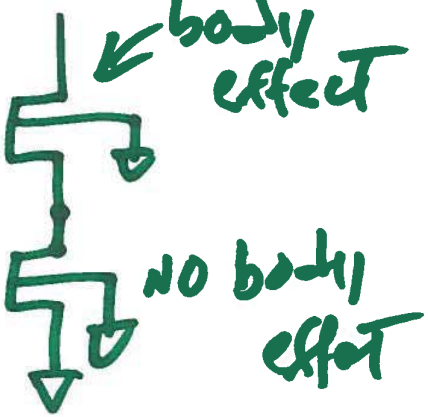
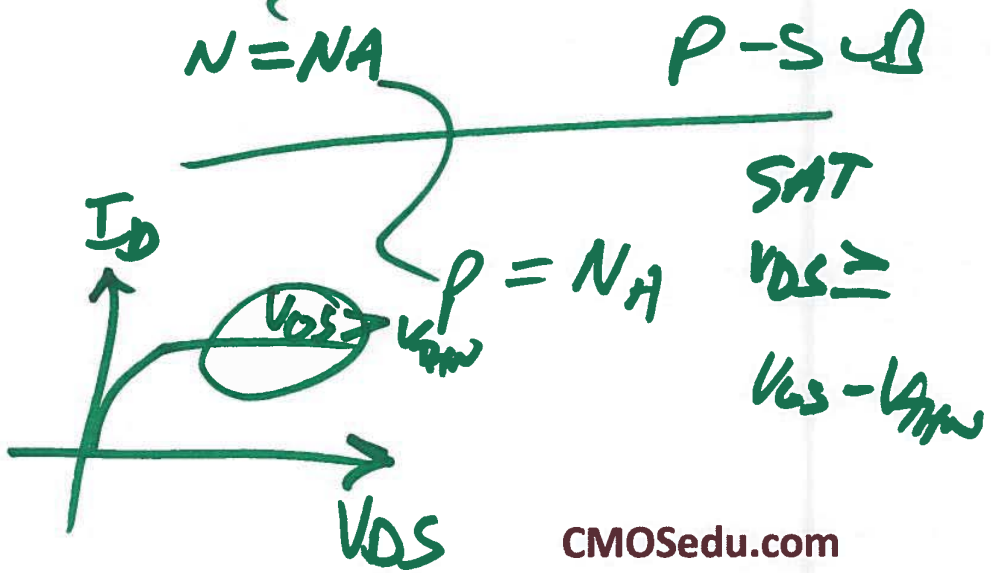
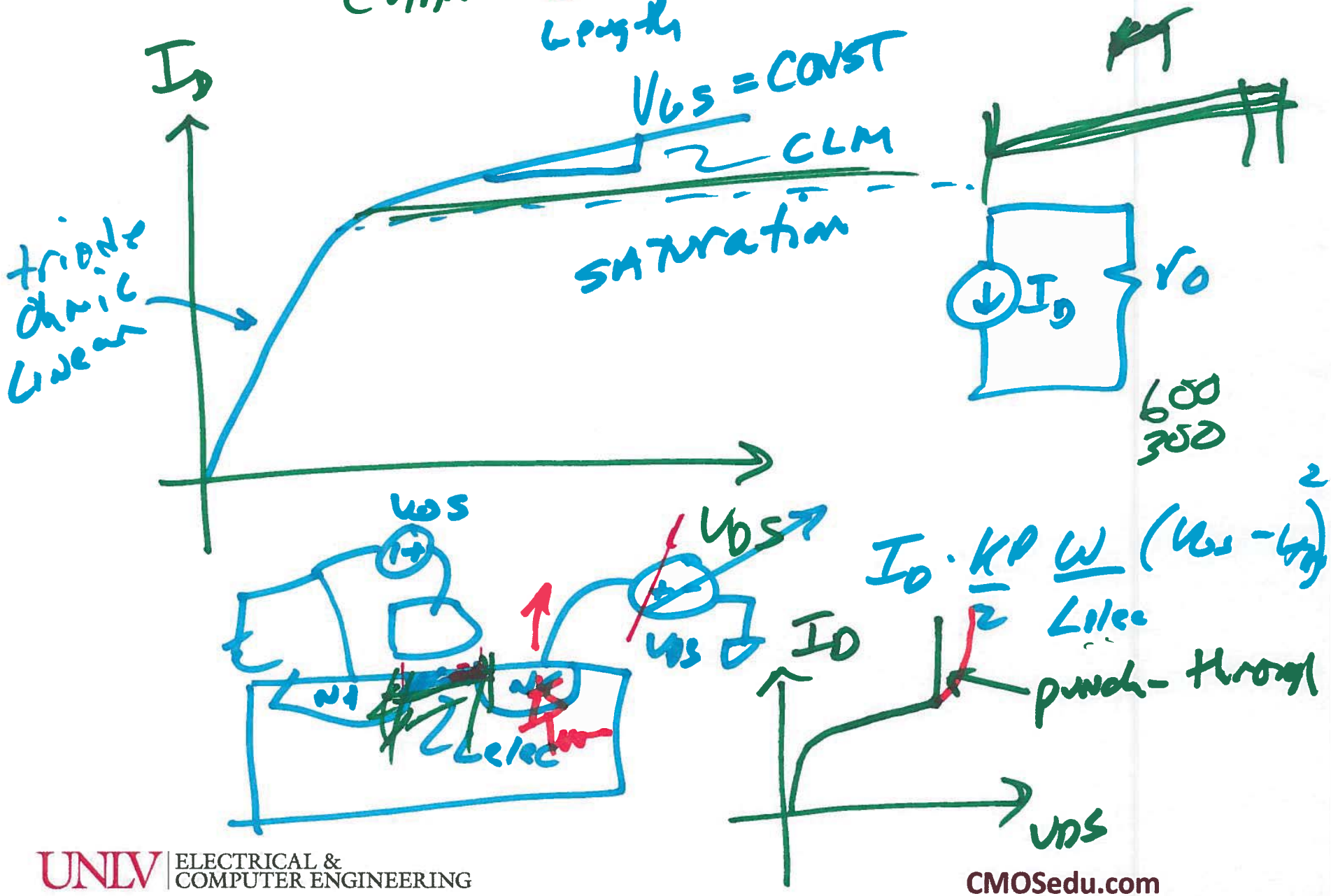
EE421/ECG 621
Digital IC Design
Lecture 13 OCT. 8, 2018

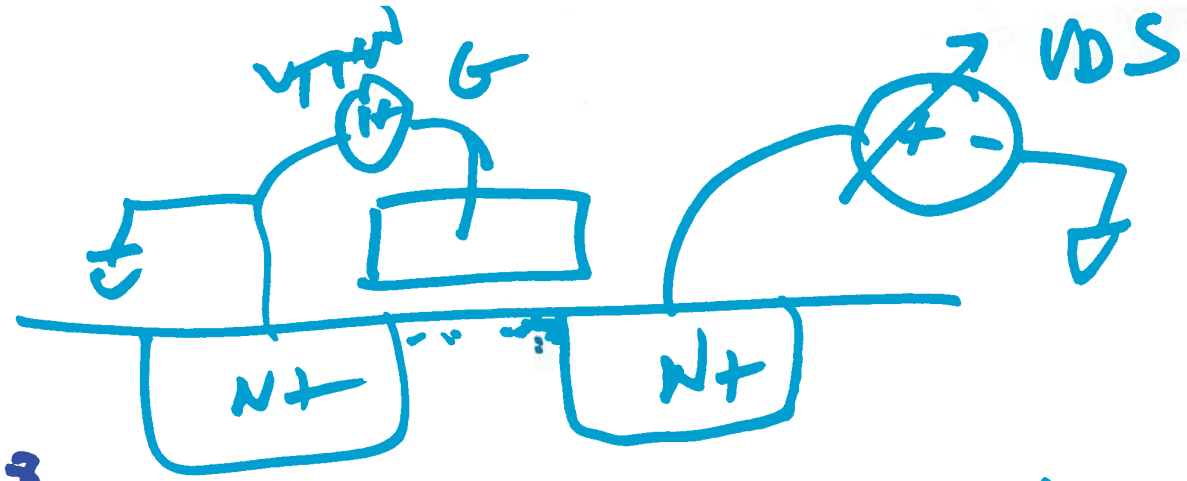


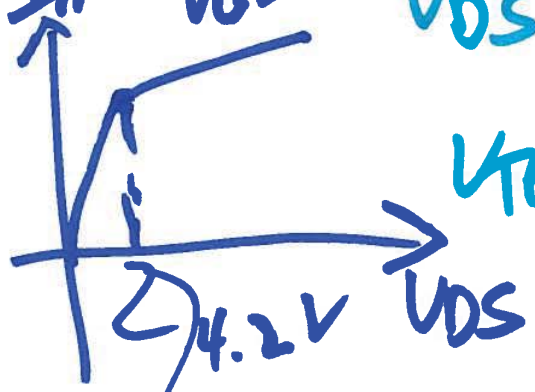




Channel Length Modulation (CLM)







V_{DS} ↑

V_{THN} ↓

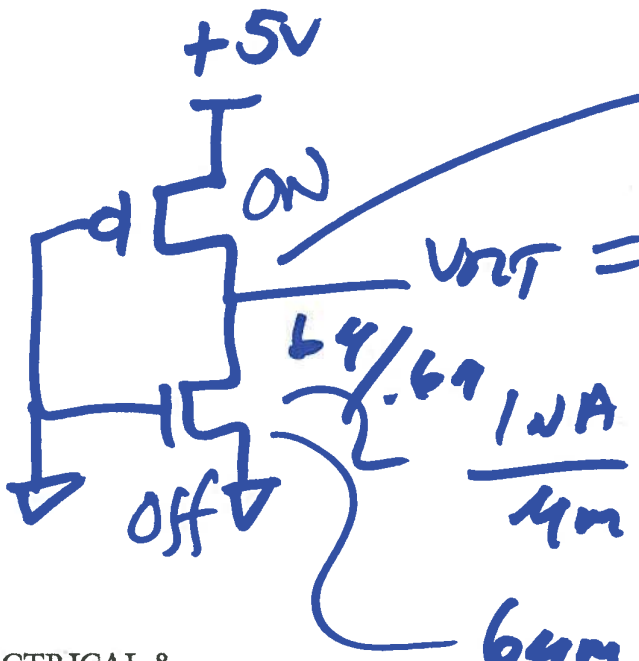
Drain induced barrier lowering (DIBL)

$$I_D = \frac{K_D}{2}\frac{W}{L}(V_{GS} - V_{THN})^2$$

$V_{DS} > V_{GS} - V_{THN} = 5 - .8 = 4.2$

off current

$I_D = I_{off} \Rightarrow I_{off} \cdot W$



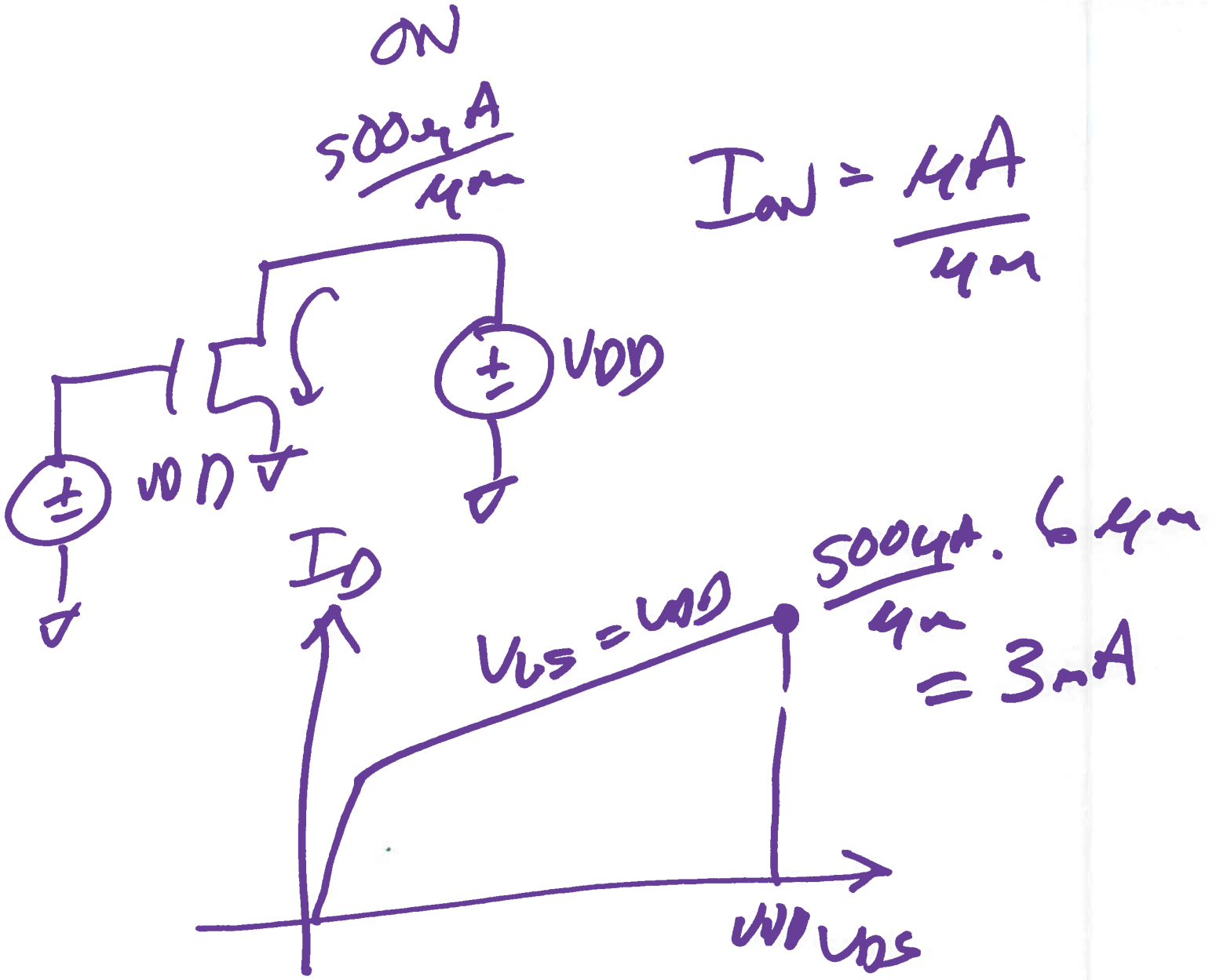
$6\mu A \cdot 5V = 30\mu W$ NMOS

$V_{OUT} = 5V = "1"$

$30 \cdot 10^{-9} \cdot 10^{7}$

$.03W$

$6\mu m \cdot \frac{1nA}{4m} = 6\mu A$


ON
500μA/μm
$I_{ON} = \frac{\mu A}{\mu m}$
VDD
VDD
I_D
$V_{DS} = V_{DD}$
500μA · 6 μm / μm = 3mA
V_{DD} V_{DS}

5)

Intuitively describe body effect