



• HW 4 SOLUS.

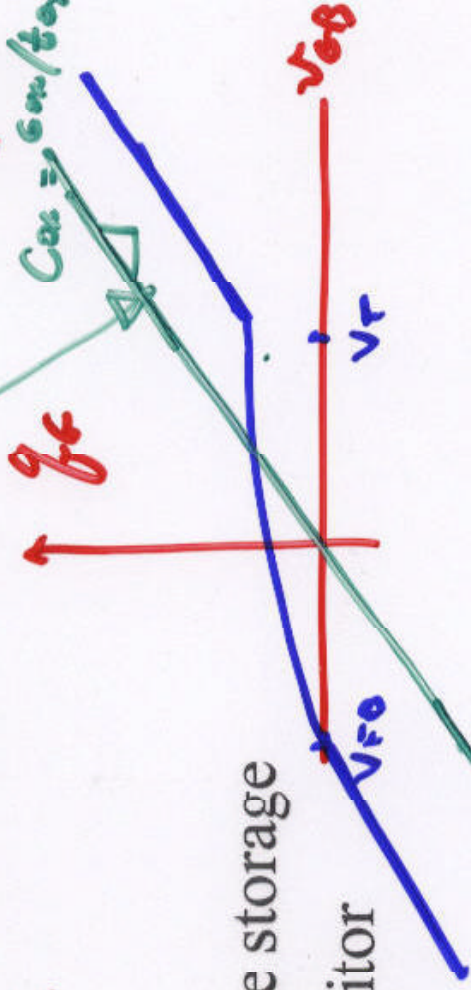
• HW 5 ... DUE
NEPT WED.

Lecture 13



p-Si

$C_{ox} = 6 \text{ m} / \text{top}$



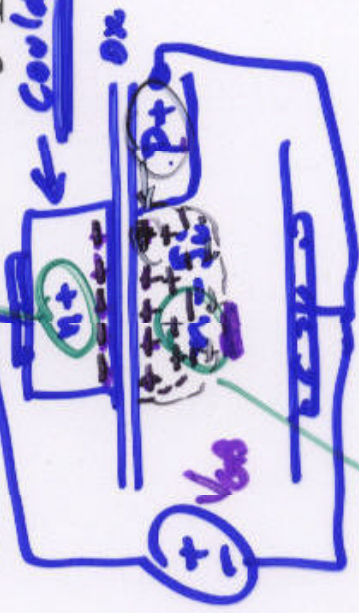
- Last time:
 - MOS charge storage
 - MOS capacitor
- Today :
 - MOS field effect transistor (MOSFET) current-voltage characteristics

EE 130 ... 10/19

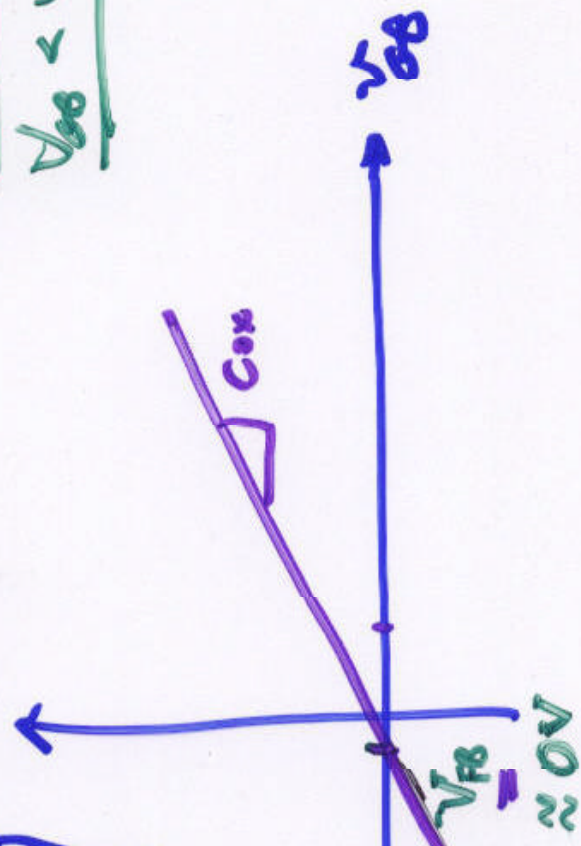
N-Type Substrate Case

← Could be p⁺, Al.

$$\frac{V_{FB} > -V_{FB}}{V_{FB} < -V_{FB}}$$



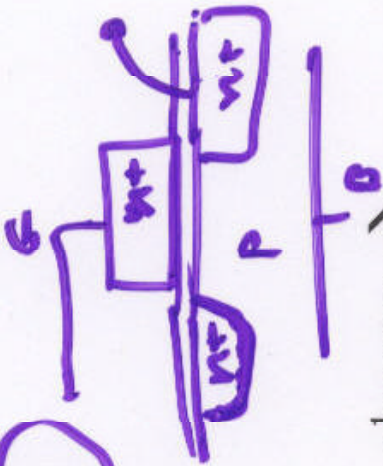
$$10^{17} \text{ cm}^{-3}, V_{Tf} \approx -1V$$



INVERSION.

CHAPTER 4.

MOSFET Concept



Add 4th terminal to MOS capacitor:

lateral current carried by inversion charge \rightarrow controlled by gate

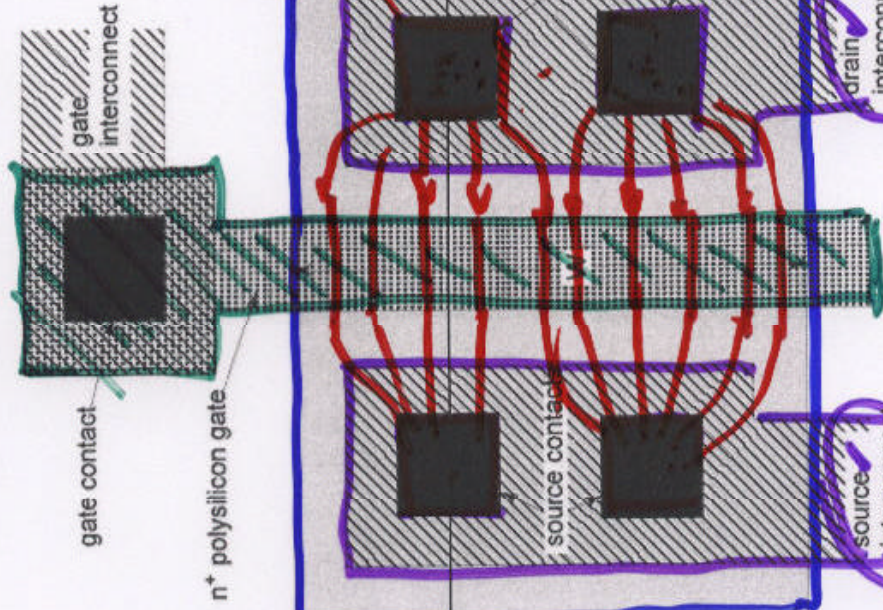
advantages: no DC control power required, relatively simple to fabricate.

$I_G = 0$.
+ 1937. \rightarrow 1968... 1973.



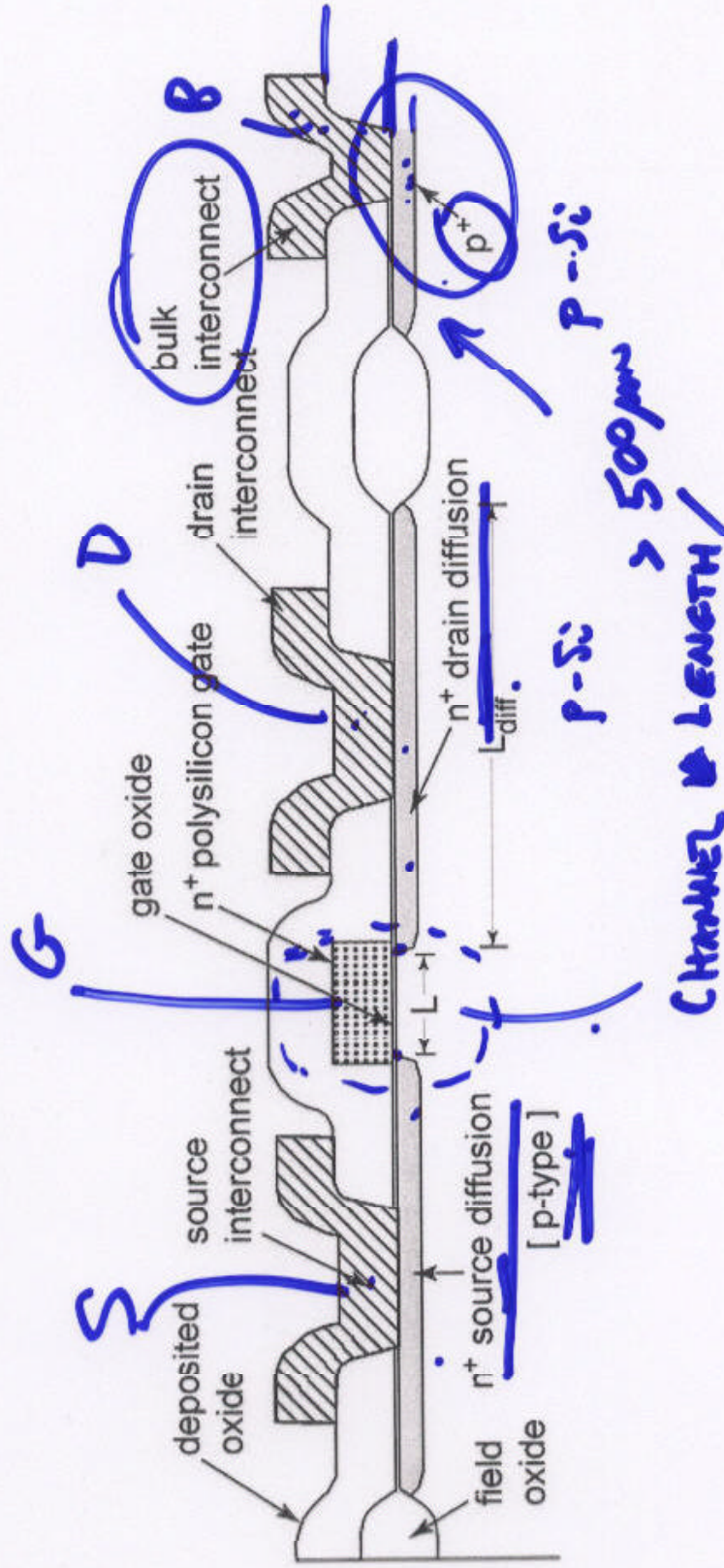
MOSFET Layout

- active area (thin oxide area)
- polysilicon gate
- contact
- metal interconnect

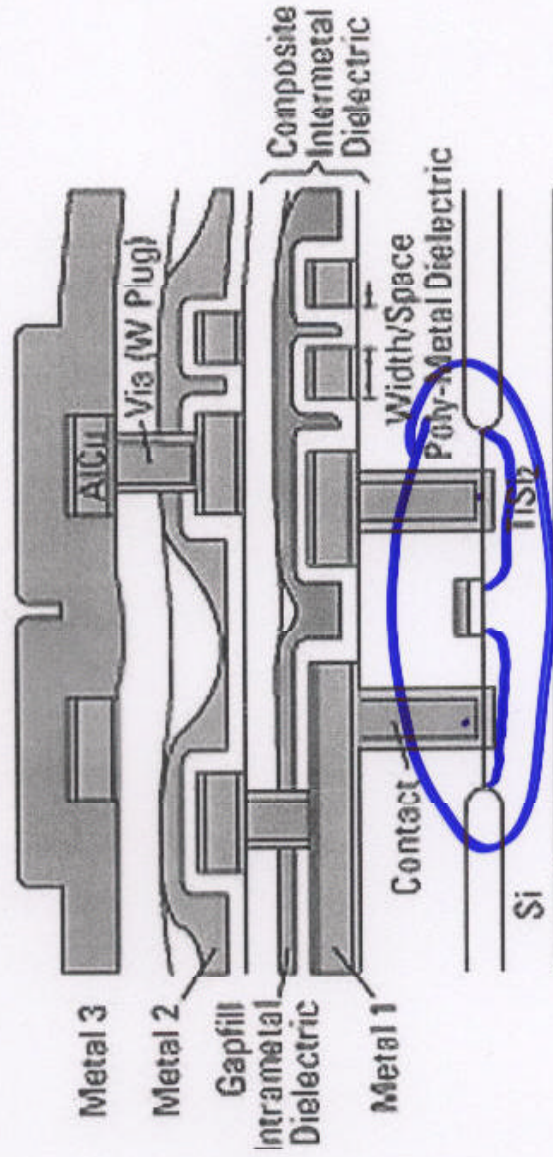


N-CHANNEL

N-MOSFET Cross Section

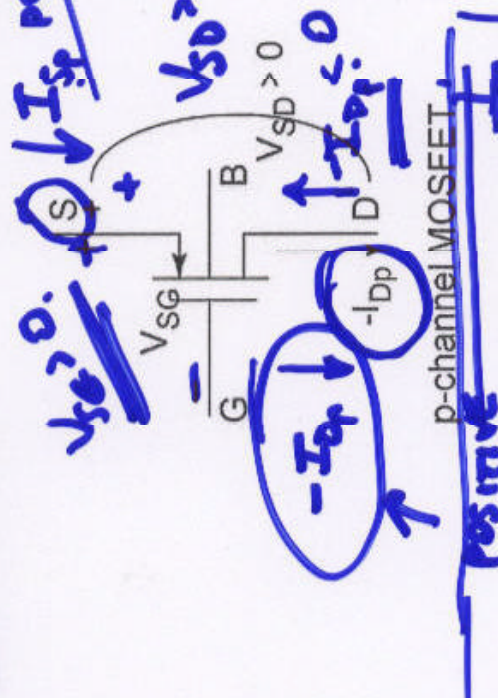
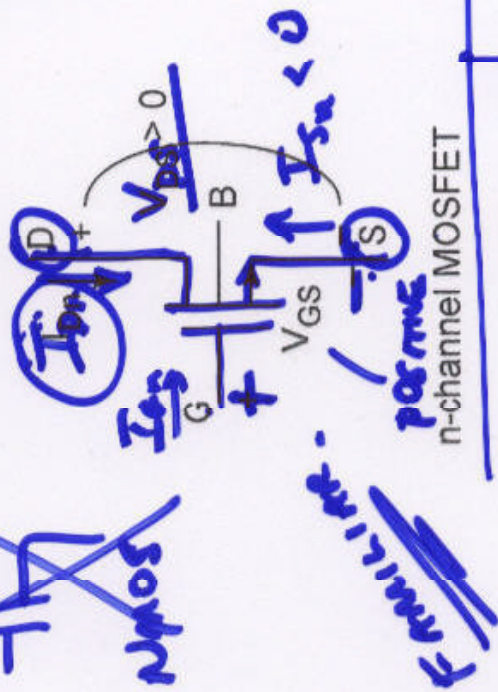
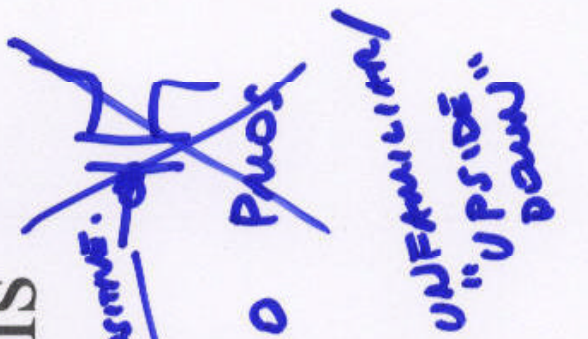


Modern MOSFET Cross Section

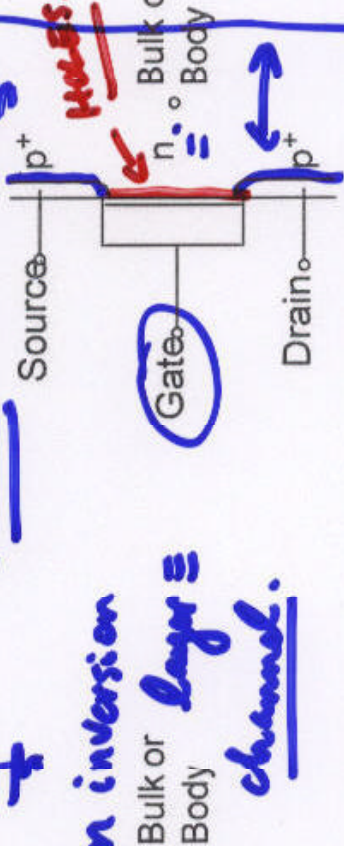
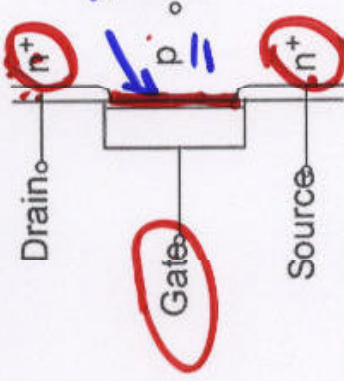


V_{DD} \rightarrow V_{DD}

MOSFET "Analog" Symbols



UNFAMILIAR!
"UPSIDE"
DOWN!

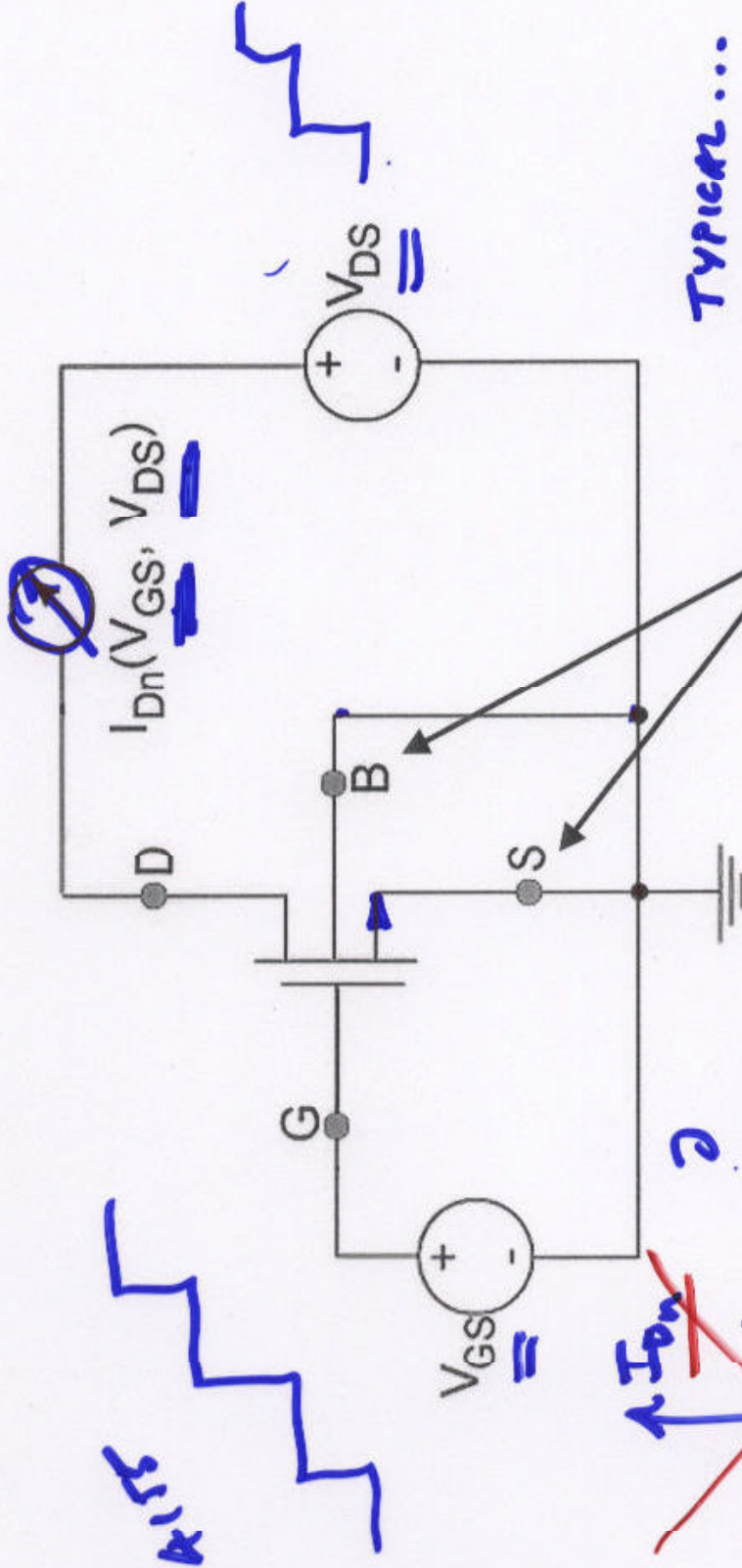


DRAIN IS HIGHER
POTENTIAL

SOURCE IS THE
HIGHER POTENTIAL

105 Lab.

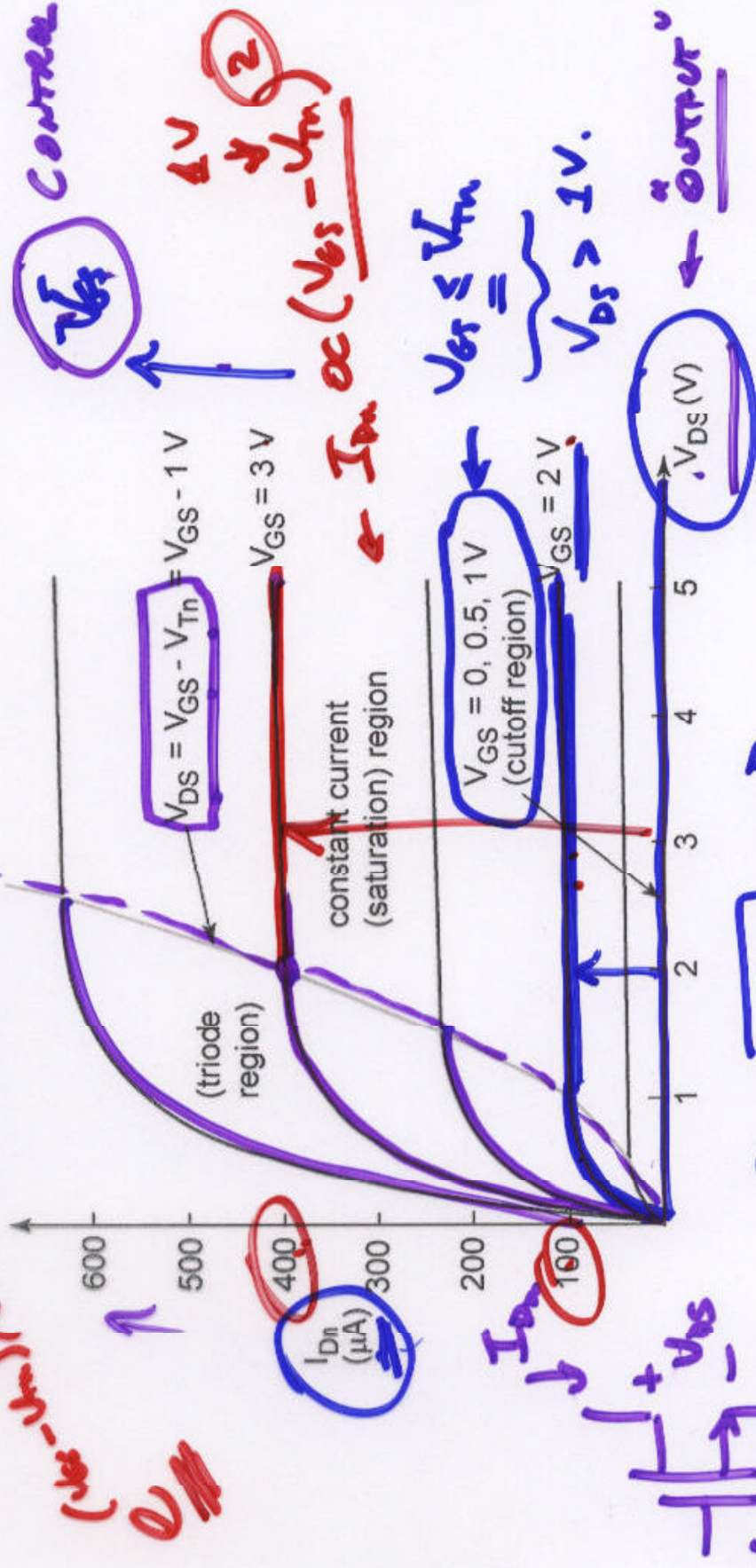
Measuring "Drain Characteristic"



Choose $V_{SB} = 0\text{ V}$

Classic.

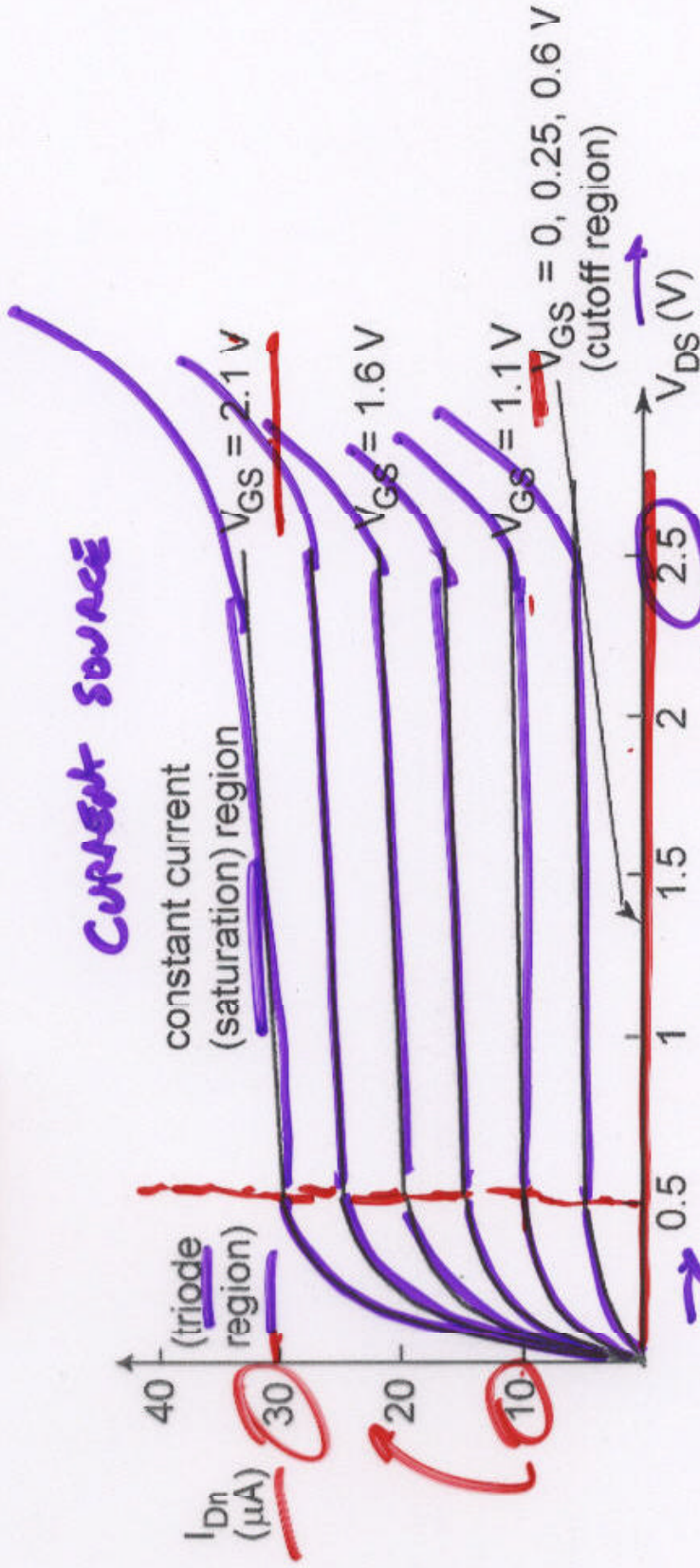
"Square-Law" I-V Characteristics



no e^- under gate.

VELOCITY SATURATED ... "BIONIC"

"Linear" I-V Characteristics



$$V_{tn} = 0.6 \text{ V}$$

$$(V_{GS} - 0.6 \text{ V}) = 0.5 \text{ V} \rightarrow 3\times$$

$$\propto (V_{GS} - V_{tn})^2$$

$$(2.1 - 0.6) = 1.5$$