

Lecture 13

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

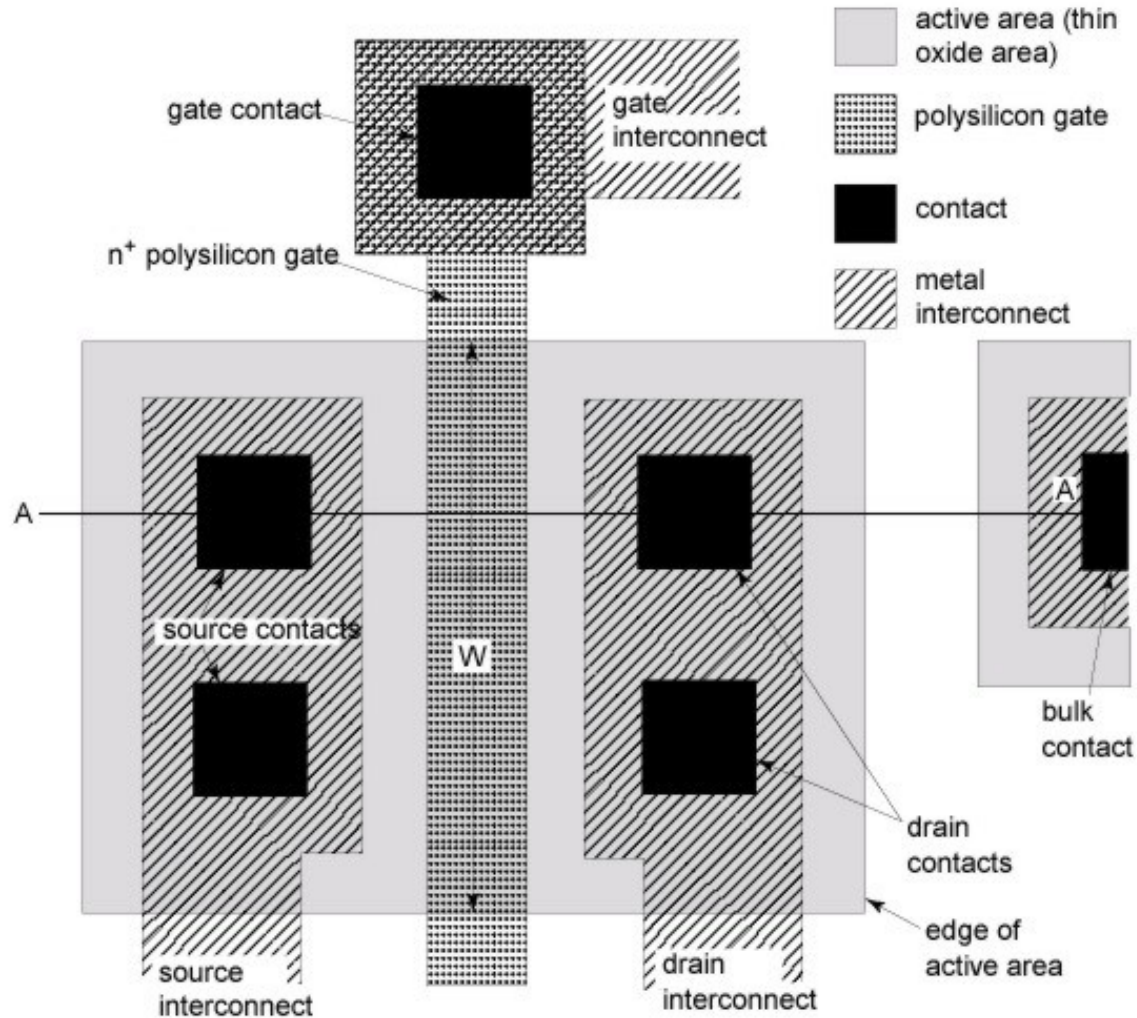
MOSFET Concept

Add 4th terminal to MOS capacitor:

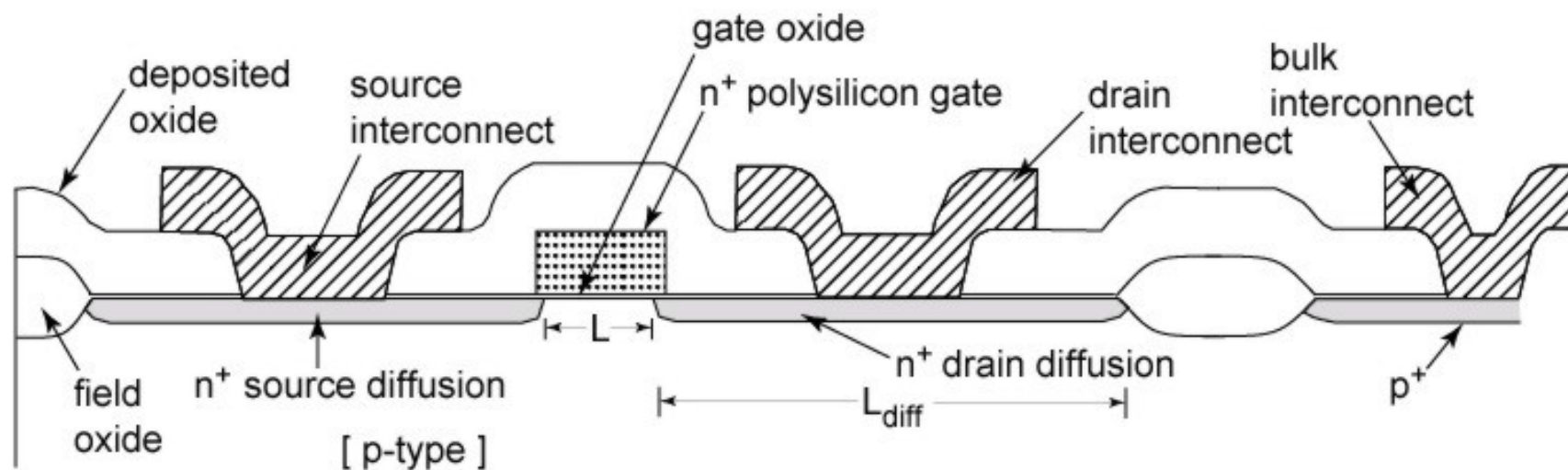
lateral current carried by inversion charge →
controlled by gate

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

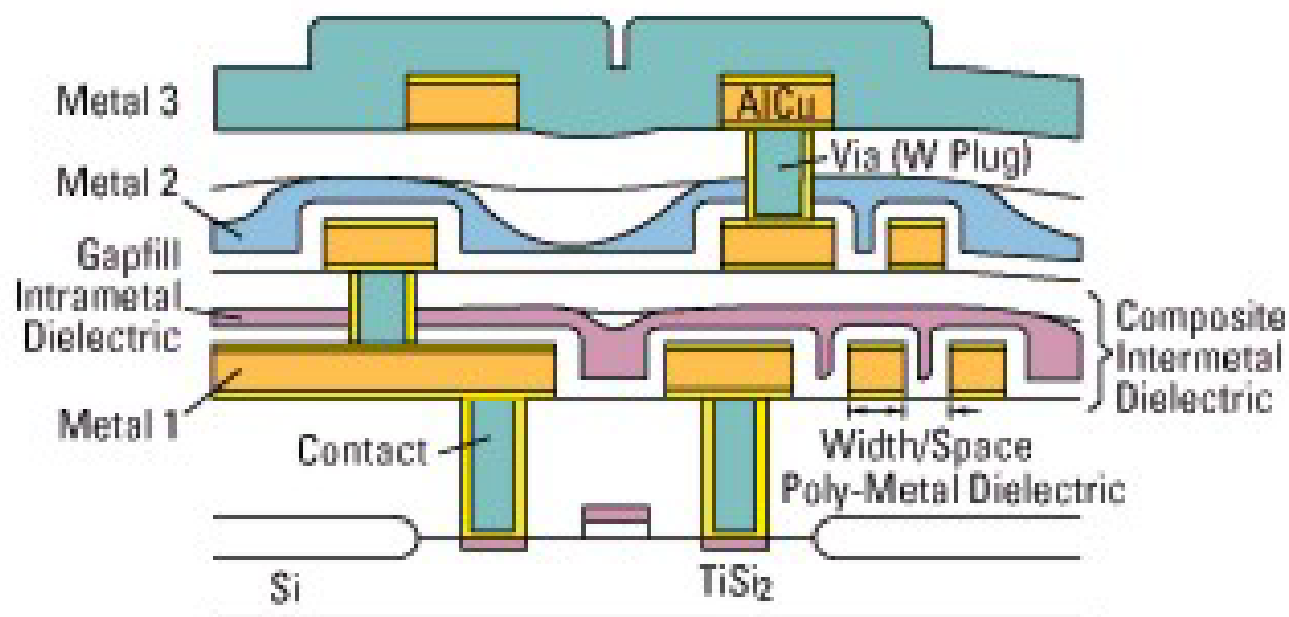
MOSFET Layout



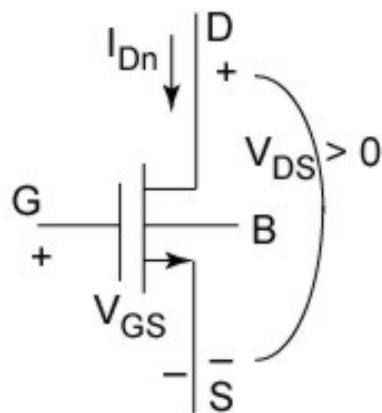
MOSFET Cross Section



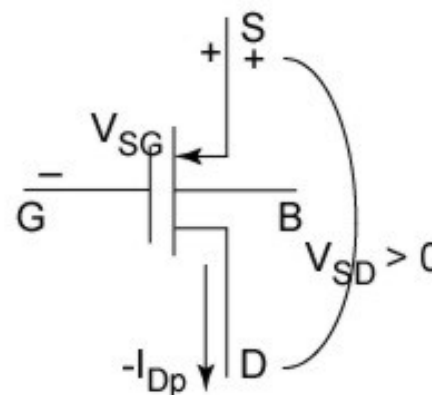
Modern MOSFET Cross Section



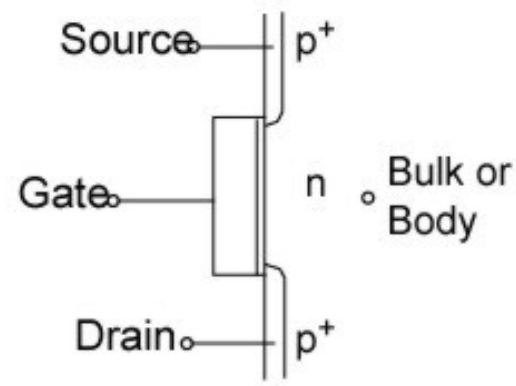
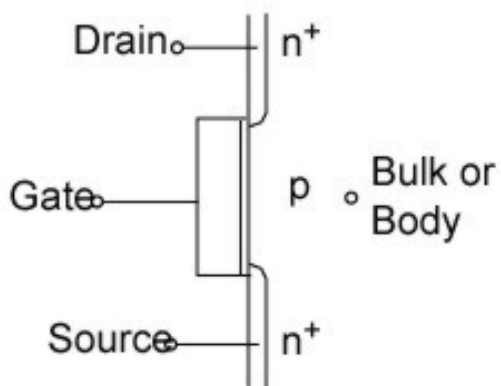
MOSFET “Analog” Symbols



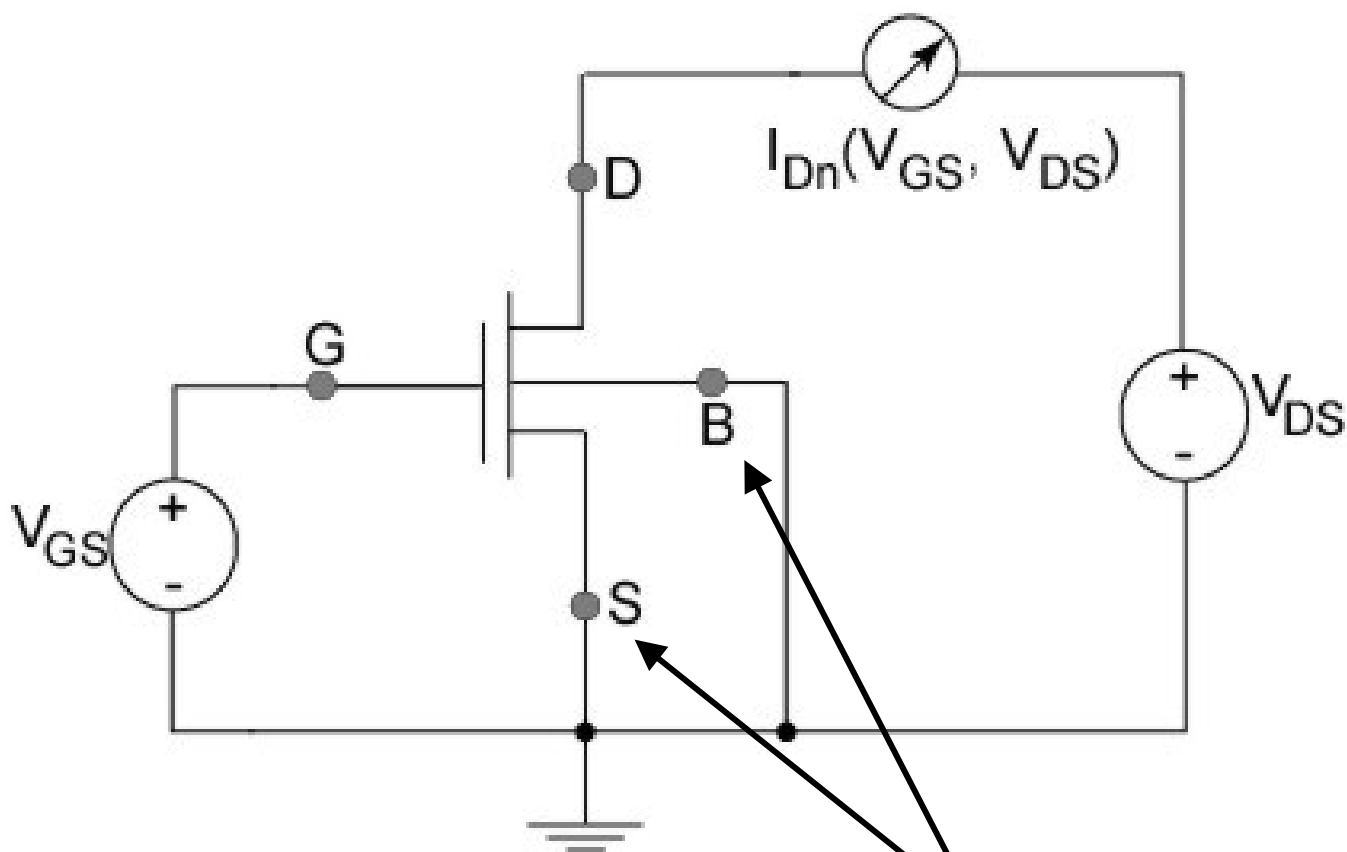
n-channel MOSFET



p-channel MOSFET

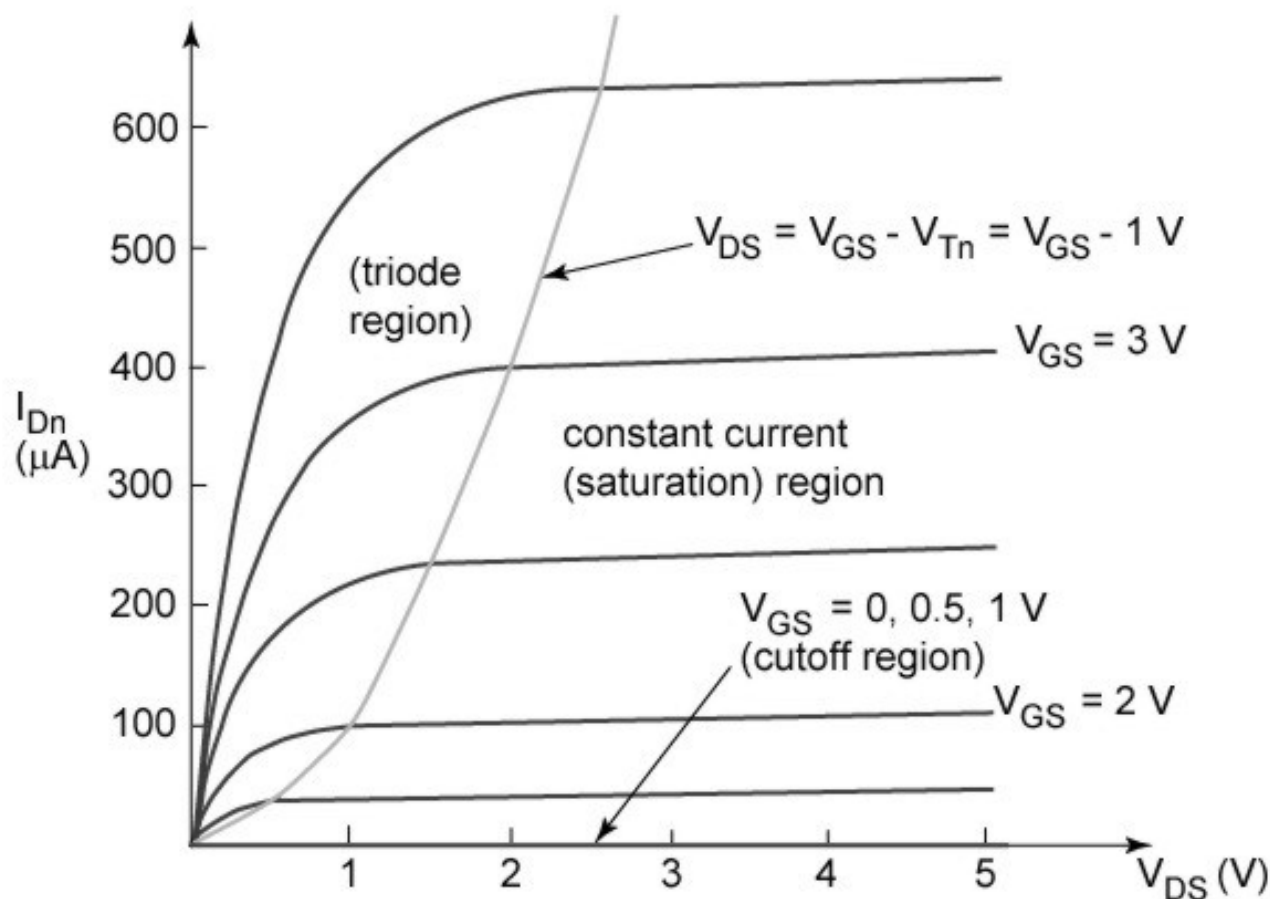


Measuring “Drain Characteristic”

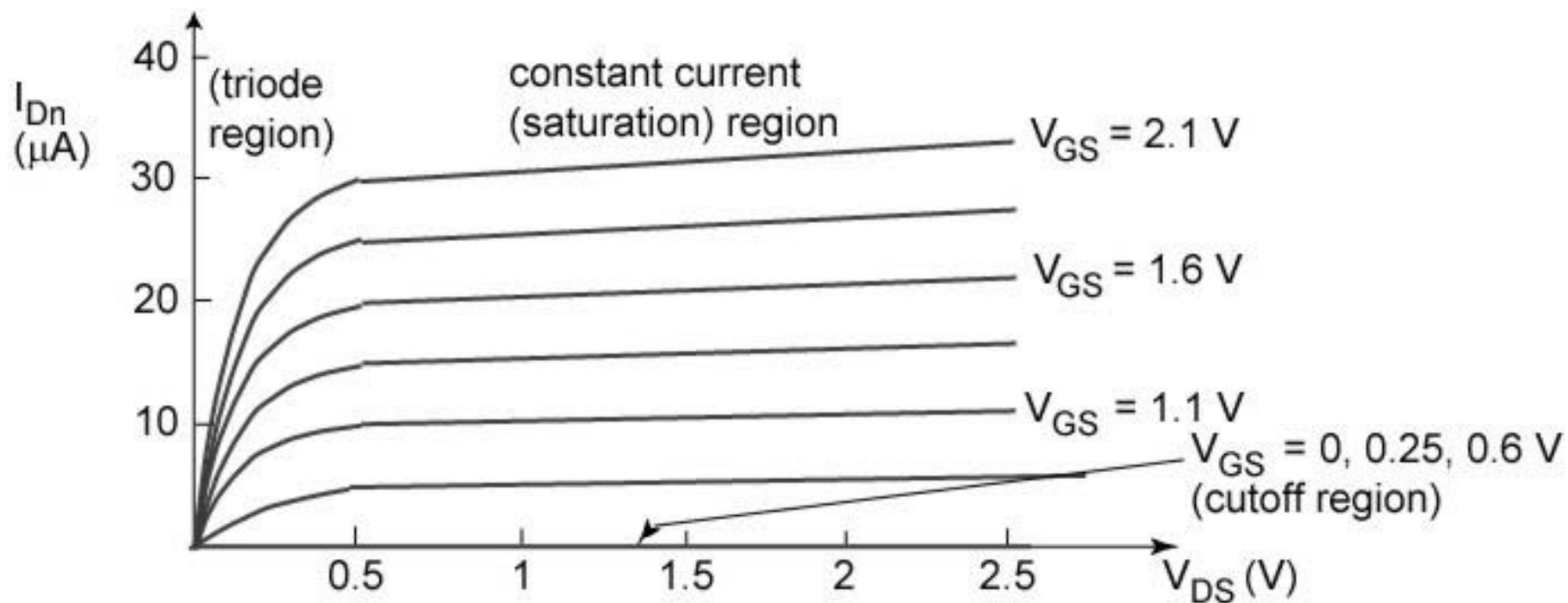


Choose $V_{SB} = 0$ V

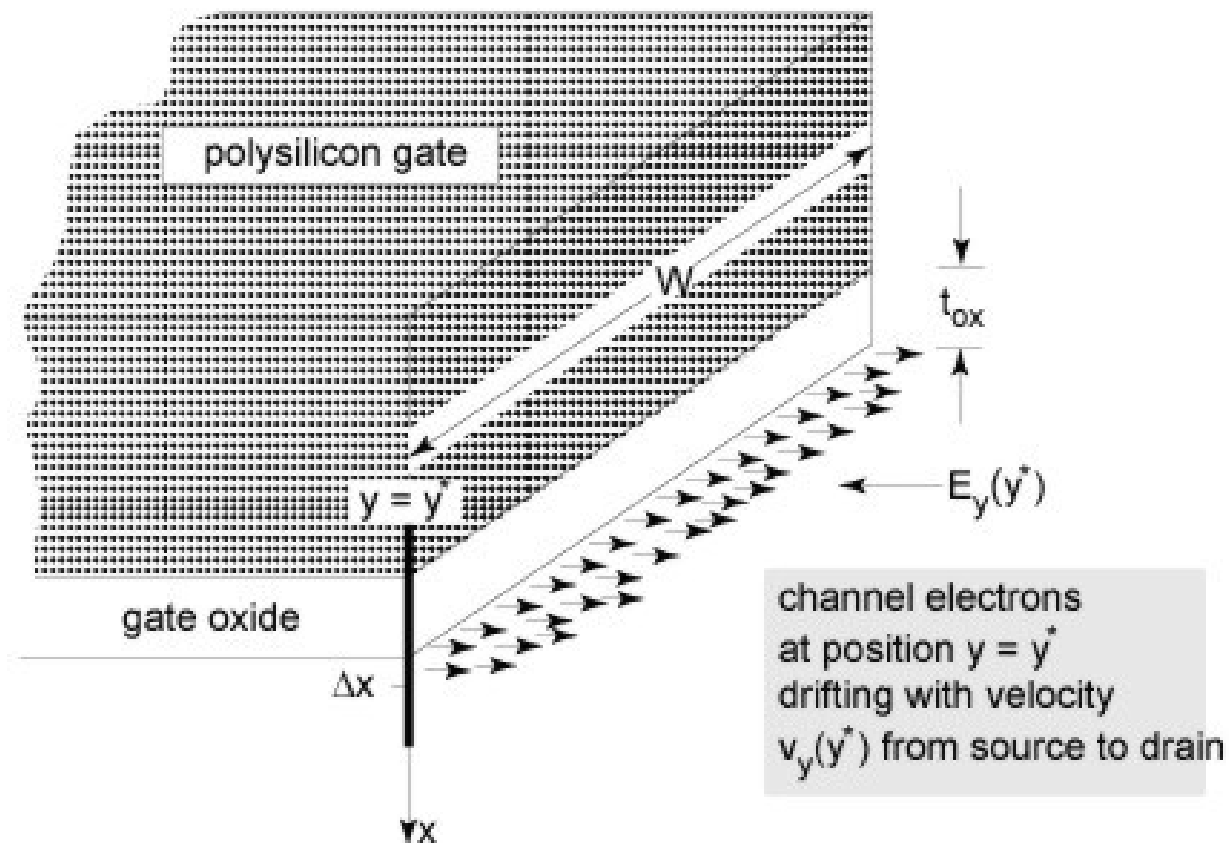
“Square-Law” I-V Characteristics



“Linear” I-V Characteristics



Channel Current in MOSFET



Channel Current Equation

Drift current density: $J_n(y^*) =$

Drift current (a constant, independent of y^* along the channel (why?); the reference direction is “+ in”)

$$I_D =$$