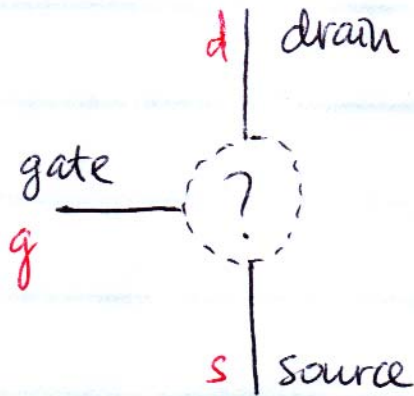


Lecture 20

MOSFET

Metal-Oxide-Semiconductor Field Emitting Transistor

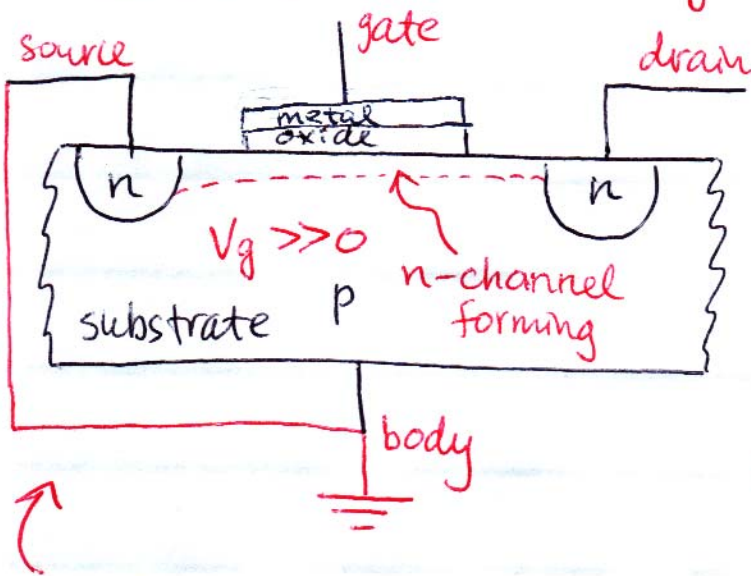
— most common transistor (b/c used in  $\mu$ -processors ;  
 ~100 million on single chip)



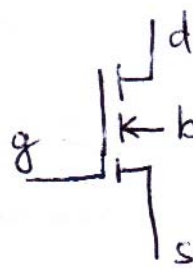
— 3-terminal device

— volt. controlled (at gate) current source (curr. flows d & s)

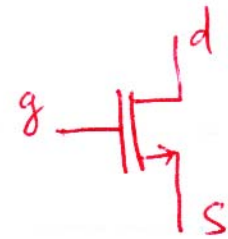
—  $I_g \rightarrow 0$  ( $\sim fA$ ) ;  $R_{in}$  can be very large



(s & b shorted)



official symbol



simplified symbol

n-channel enhancement mode MOSFET

Q:  $V_g = 0$ ,  $I_{ds} - ?$

A: two reverse diodes  $\Rightarrow I_{ds} = 0$

2N7000



(silly green dog)

(BJT: evil blue cat)

# P-channel enhancement mode ~ (pnp)

(2)

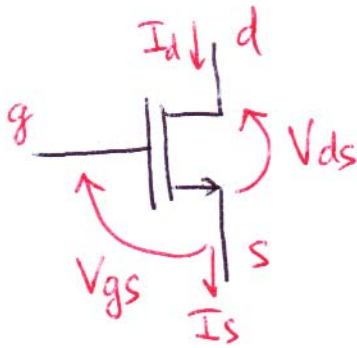
to go between n-, p-channel types  
reverse all volt. & currents

p-chan.

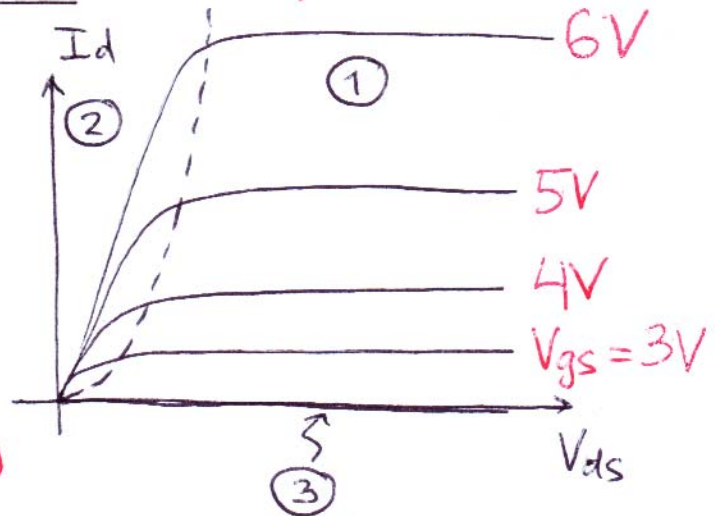


simplified symb.

## Transfer characteristics (n-chan.)



$$I_d = I_s$$

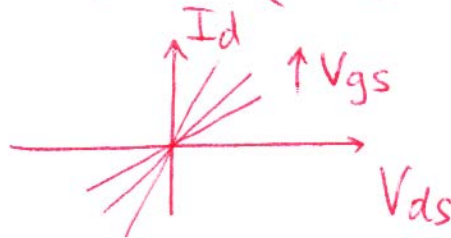


(mode names not like BJT!)

① "saturation" : voltage controlled current source  
 $V_{ds} > V_{gs} - V_T$   
    ← some threshold ( $\sim 1.5-2V$ )

② "ohmic" : voltage controlled resistance

$V_{ds} < V_{gs} - V_T$  ( $V_{ds} = V_{gs} - V_T$  ← boundary between ① & ②)



③ "cutoff"

$$V_{gs} < V_T$$