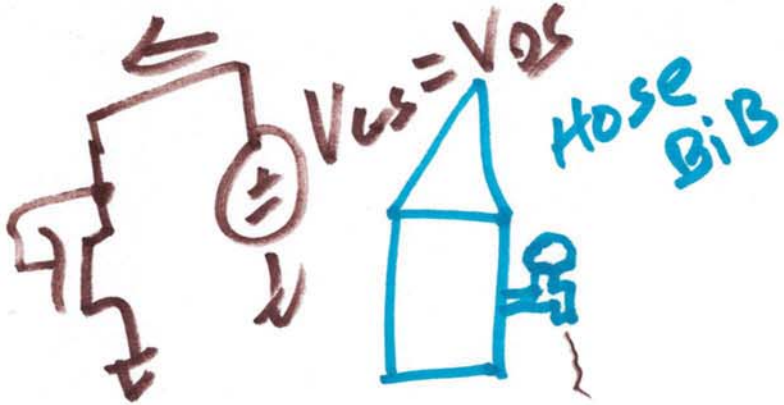
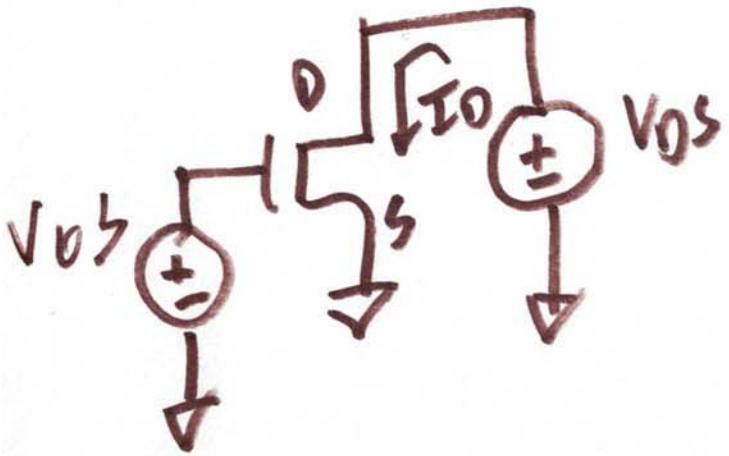
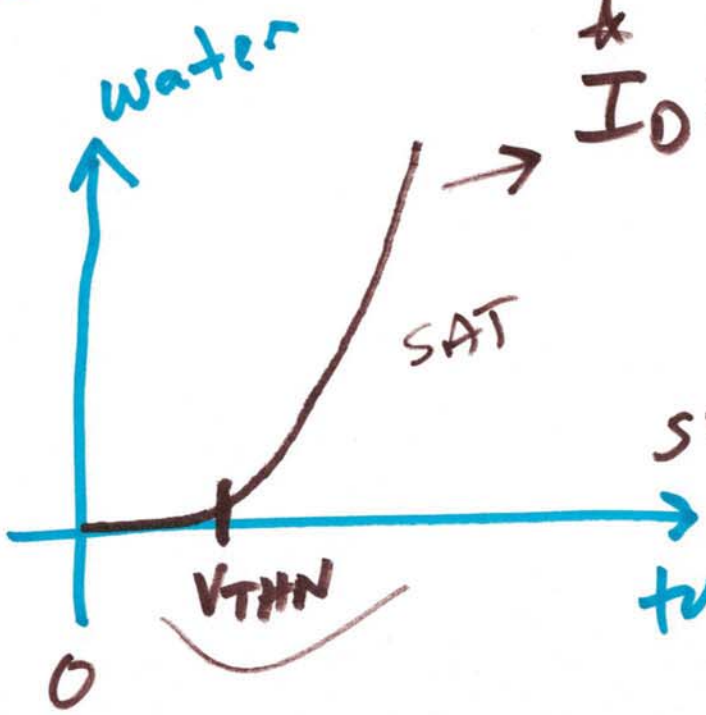
EE 420/ECE 620

Lecture 2

JAN. 21, 2016







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

$V_{GS} > V_{THN}$

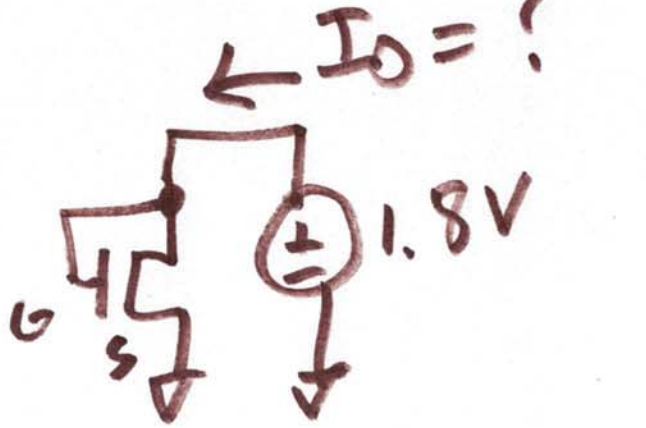
$V_{DS} > V_{GS} - V_{THN}$

SAT

$V_{DS} \geq V_{GS} - V_{THN}$

saturation

Ex.

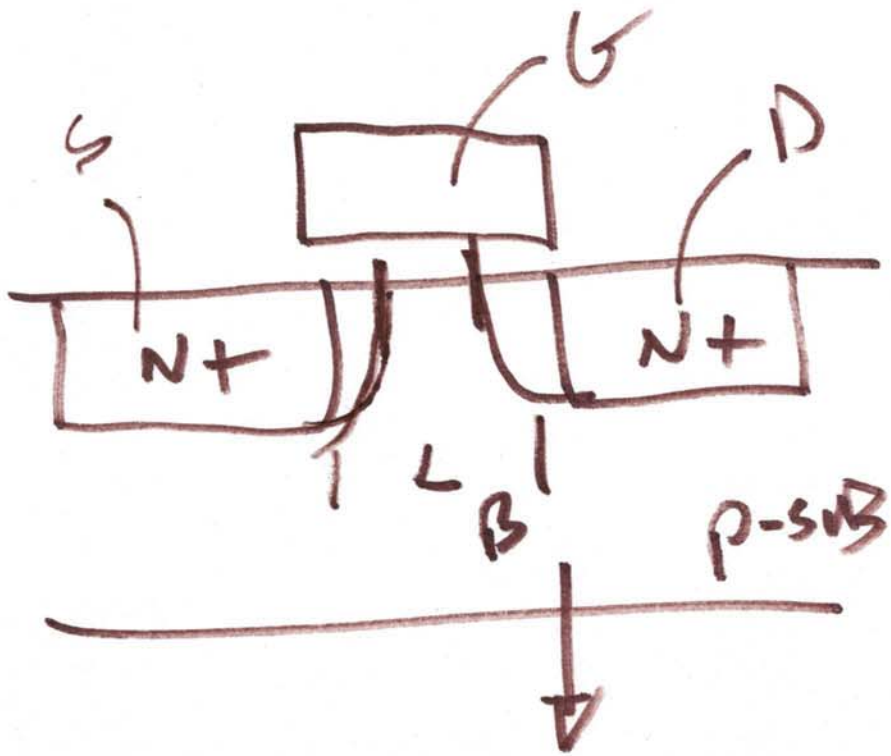


Use book's 1/4m process

Assume $\frac{W}{L} = 10$

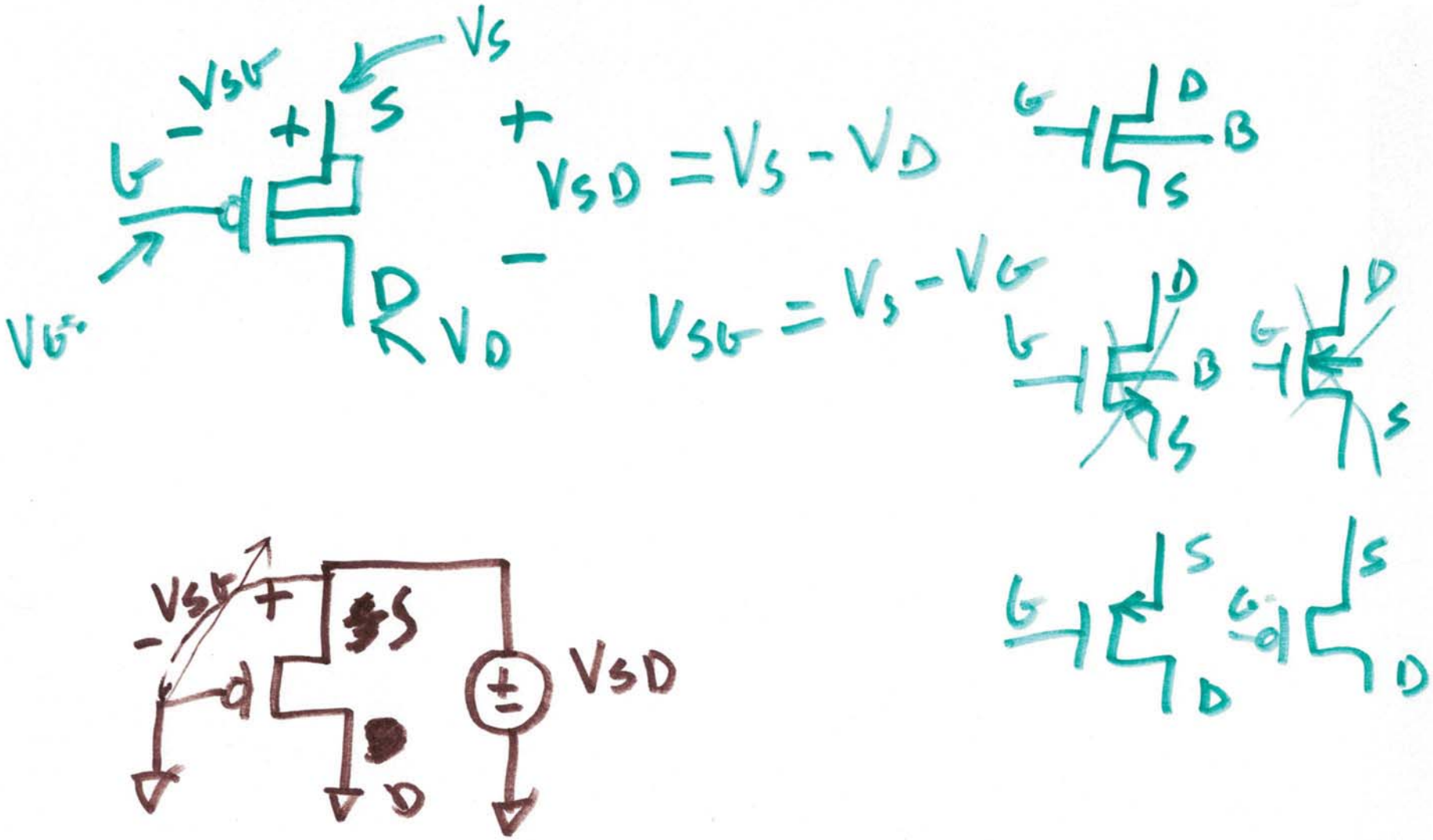
$KP_N = 120\,\mu A/V^2$

$V_{THN} = 0.8V$



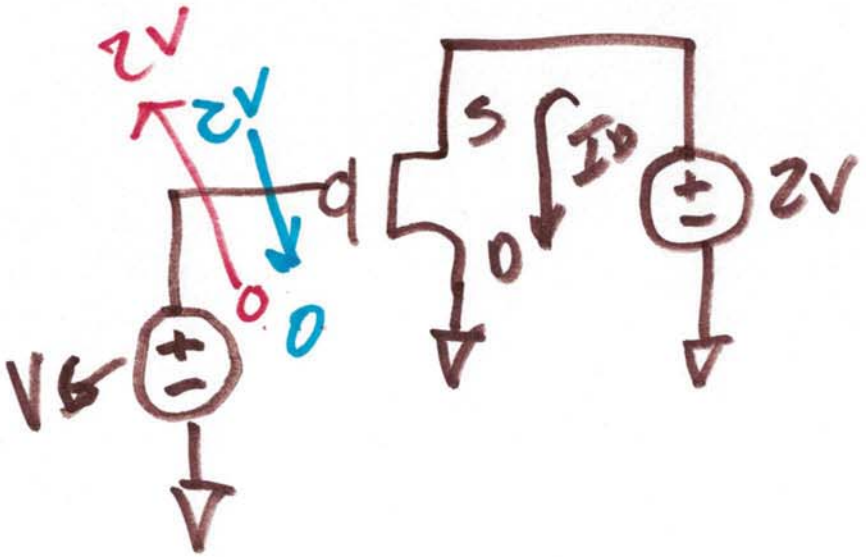
$$I_D = \frac{120\mu A/V^2}{2} \cdot 10 \cdot (1.8-.8)^2$$

$$= \underline{\underline{600\mu A}}$$

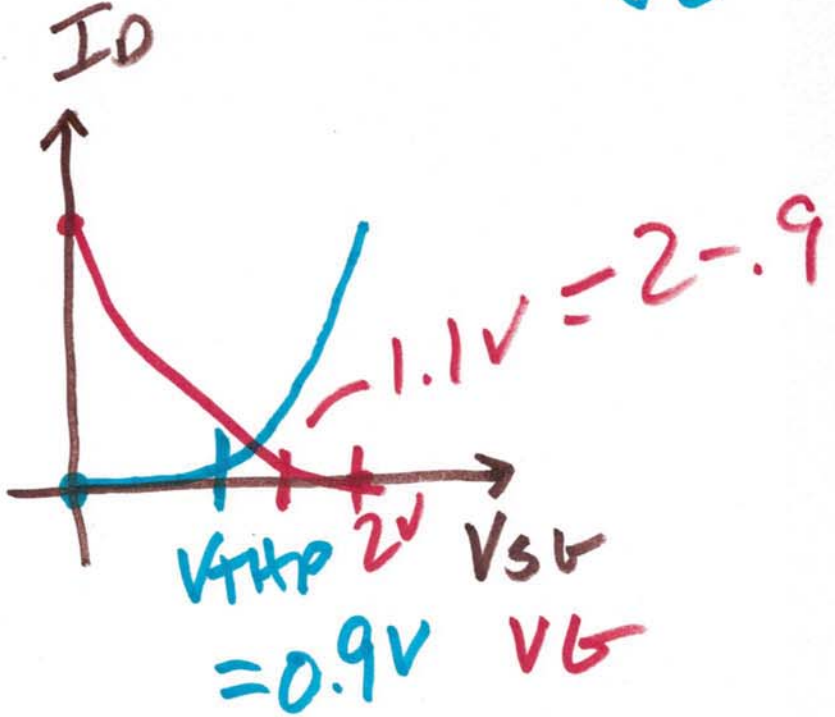

VSG
VS
S
+
VSD = VS - VD
G
D
B
S
VG
R
VD
VSG = VS - VG

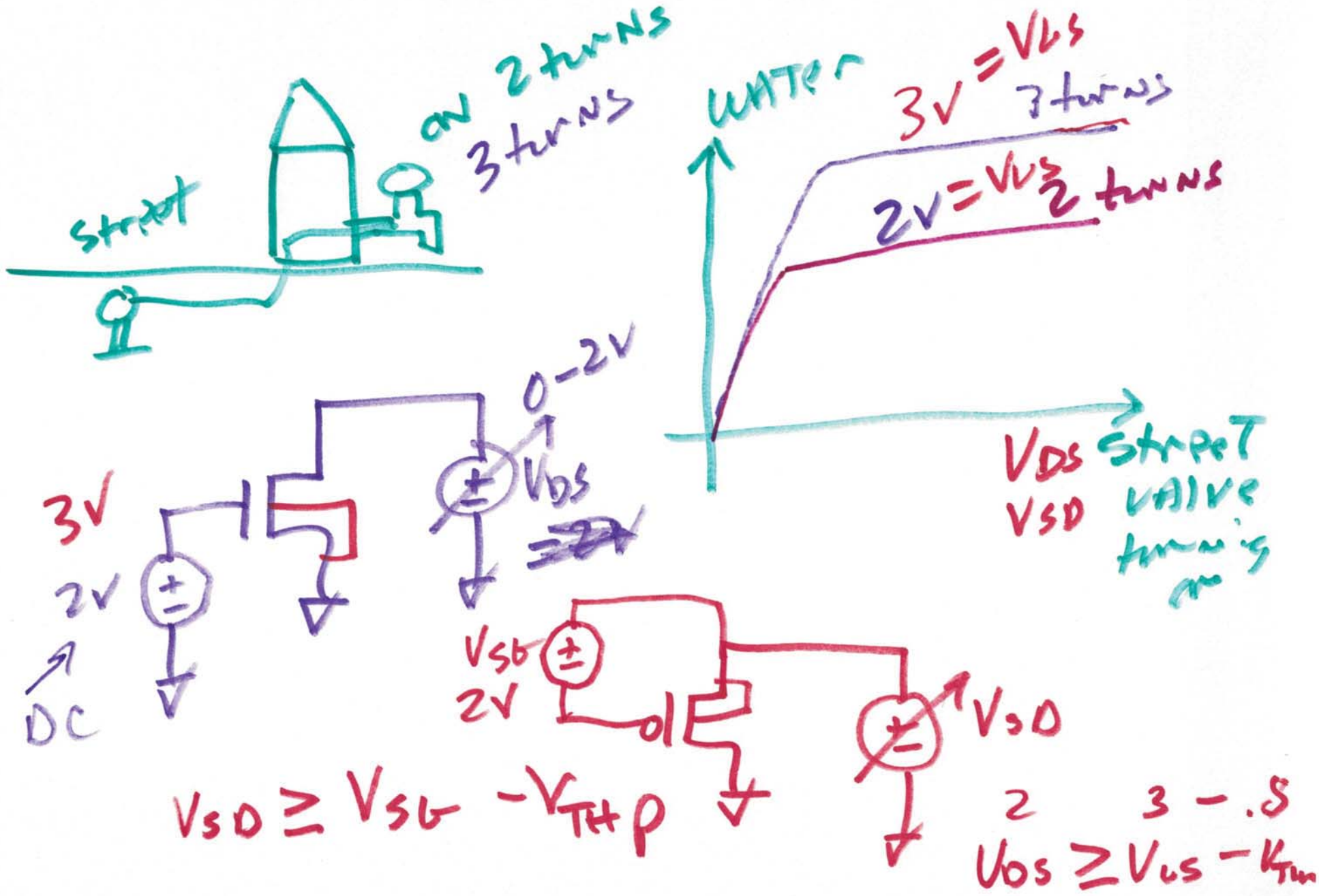
VSG
+
S
VSD
D

G
S
D



$V_S^2 - V_G^2$




on 2 turns
3 turns
street
WATER
3V = VGS
7 turns
2V = VGS
2 turns
VDS
VSD
Vout
0-2V
VDS
3V
2V
DC
VSD
2V
VSD
$V_{SD} \geq V_{SG} - V_{THp}$
$V_{OS} \geq V_{GS} - V_{Tn}$

Saturation

$$I_D = \frac{KP}{2} \cdot \frac{W}{L} \left(V_{GS} - V_{THN}\right)^2 \left(1 + \lambda (V_{DS} - V_{DS,sat})\right)$$

$$V_{GS} > V_{THN}$$

$$V_{DS} \geq V_{GS} - V_{THN}$$

Triode

$$I_D = KP \cdot \frac{W}{L} \left(\left(V_{GS} - V_{THN}\right) \cdot V_{DS} - \frac{V_{DS}^2}{2} \right)$$

$$V_{GS} > V_{THN}$$

$$V_{DS} \leq V_{GS} - V_{THN}$$