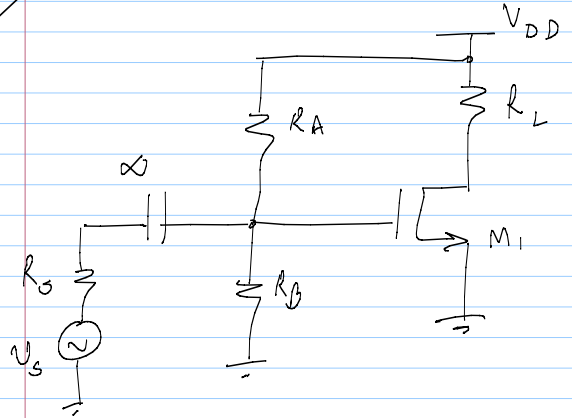
9/9/14

lec 19



Issues

* Nonlinearity - swing limit
* ∞ caps
  - use caps that are large enough dep. on w, R_s
* V_{GS_1}, I_{D_1}, g_m, A are functions of device parameters

μ_n, C_{ox}, V_T ← device parameters

fn. of Temp ← R's → tolerance

$$V_{GS_1} = \frac{R_B}{R_A + R_B} \cdot V_{DD}$$

* Ratio of resistances remains almost the same on a particular IC even if absolute values may be diff. from designed value

$\frac{R_B}{R_A+R_B}$ will not change

$\Rightarrow V_{GS_1}$ stays the same

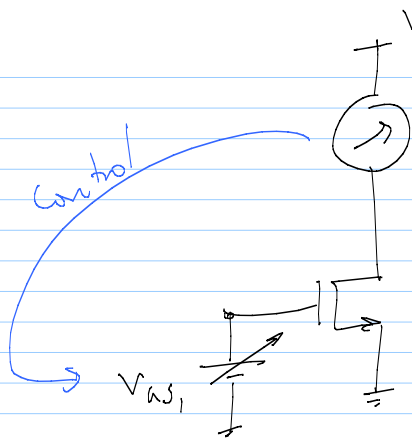
$$I_D = f(V_{GS_1} - V_T)$$

↑ varies

* MOSFETs on the same IC are identical

$$g_m = f(I_D)$$
$$V_{DS_1} = f(I_D)$$

We want to maintain constant I_D



* Measure I_D
* If $I_D > 1mA$, reduce V_{GS_1}
* If $I_D < 1mA$, increase V_{GS_1}

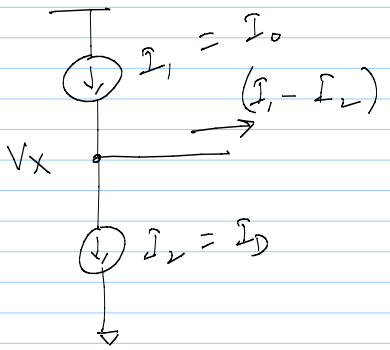
e.g. $I_D = 1mA$

"Negative feedback"

Compare I_D & I_o

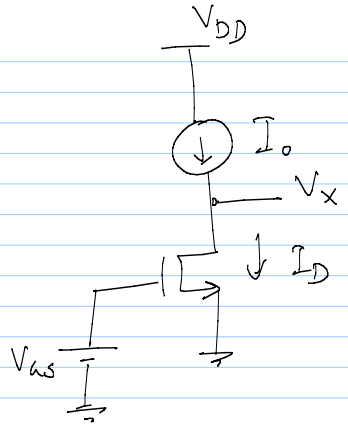
$\Rightarrow (I_D - I_o)$

drive $(I_D - I_o)$ to 0



If $I_1 > I_2$, $V_X \downarrow$

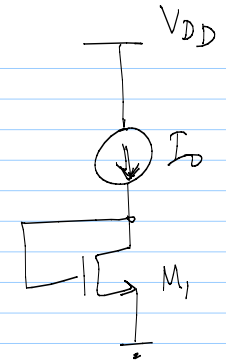
$I_1 < I_2$, $V_X \uparrow$



* $I_o > I_D$, we want to inc. V_{GS} (V_X increases)

* $I_o < I_D$, we want to decr. V_{GS} (V_X decreases)

Why not connect X to h?

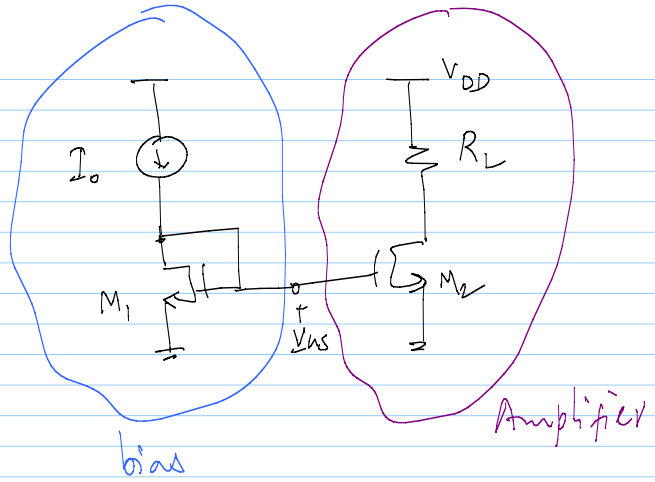


V_{GS} will adjust to a value so that $I_D = I_o$

$$I_o = \frac{1}{2}\mu_n C_{ox}\left(\frac{W}{L}\right)(V_{GS} - V_T)^2$$

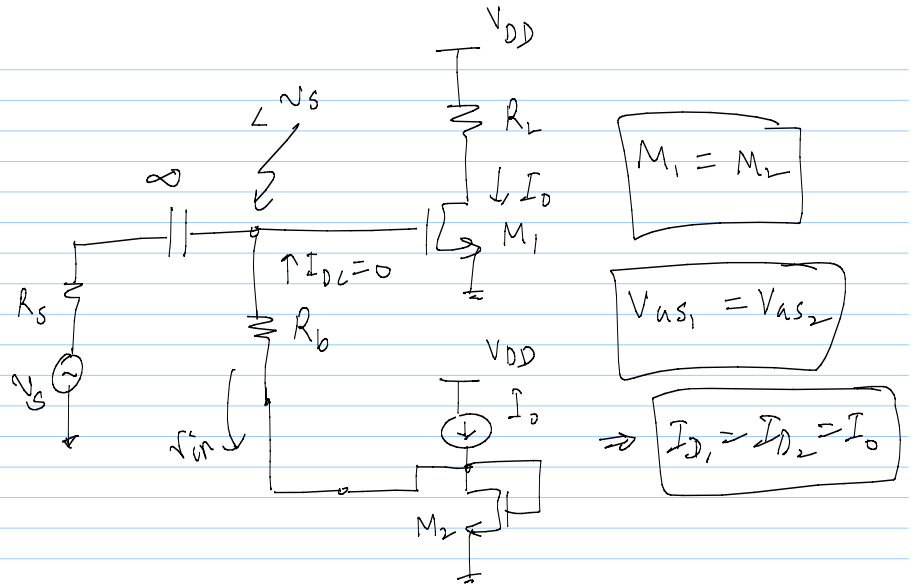
$\Rightarrow$ will set V_{GS}

$V_{DS} = V_{GS}$) M_1 is in saturation



"CURRENT MIRROR"

* M_1 & M_2 should be in sat.



$M_1 = M_2$

$V_{GS_1} = V_{GS_2}$

$\Rightarrow I_{D_1} = I_{D_2} = I_o$