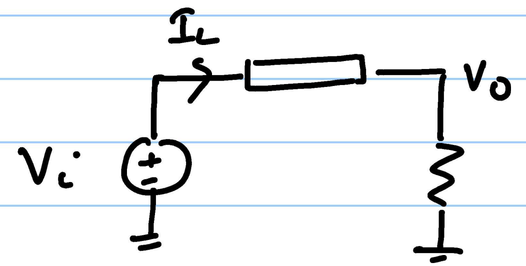
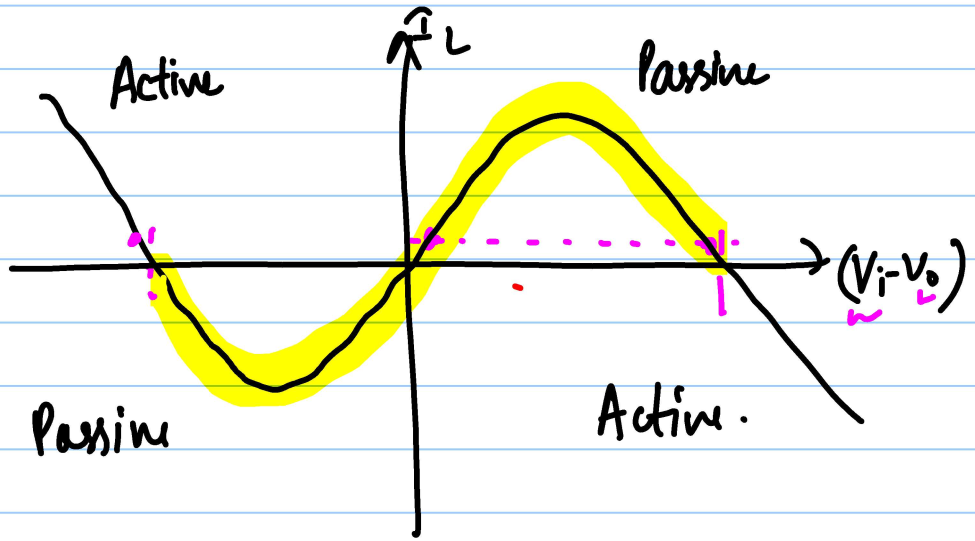
Note Title 09-09-2021

Lecture # 16

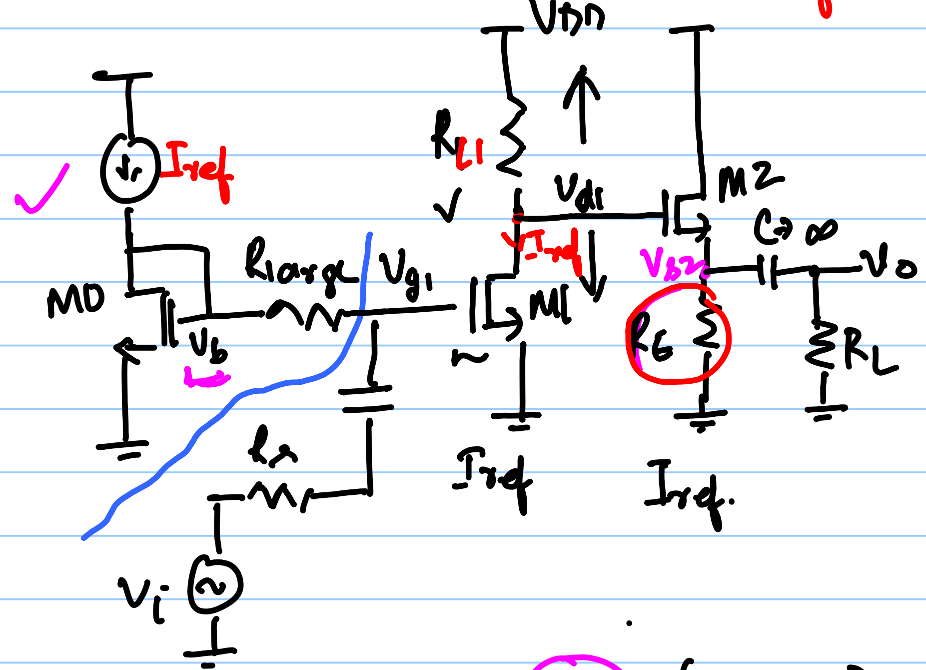


$$I_L = \alpha_1 (V_i - V_o) - \alpha_2 (V_i - V_o)^3 = \frac{V_o}{R_L}$$

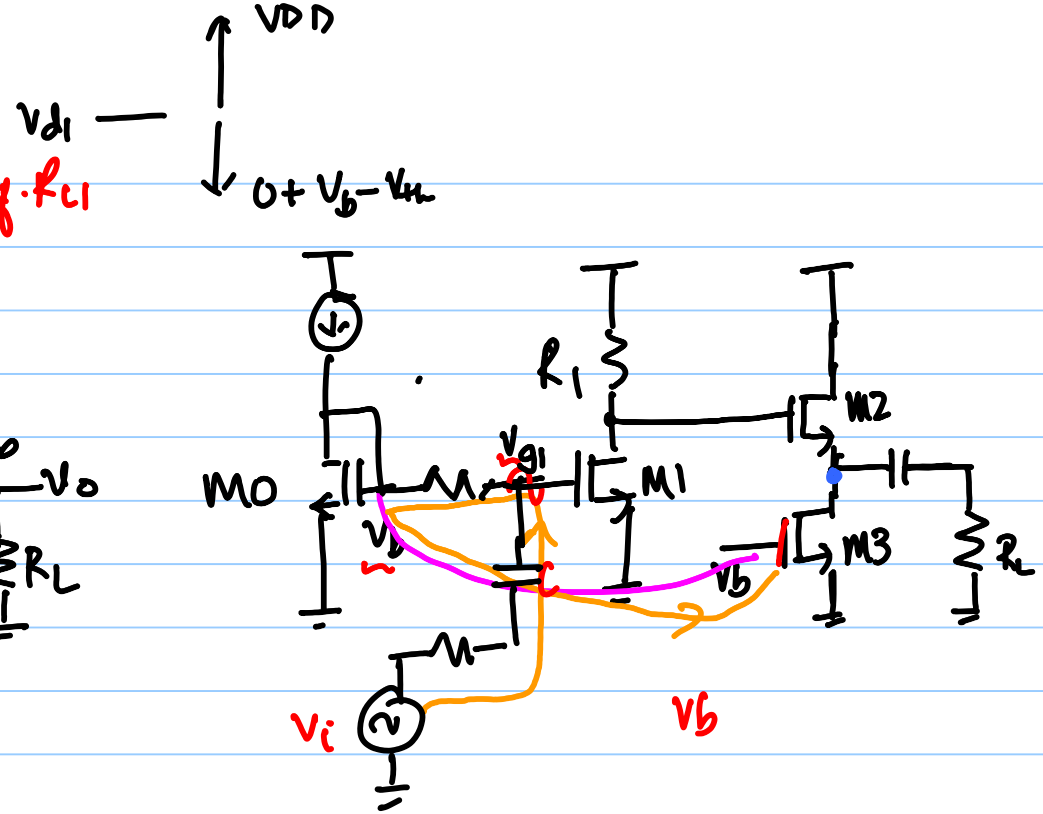
$V_o =$



CS - CD amplifier



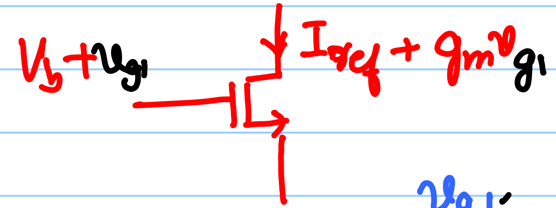
$VDD - I_{ref} \cdot R_{L1}$

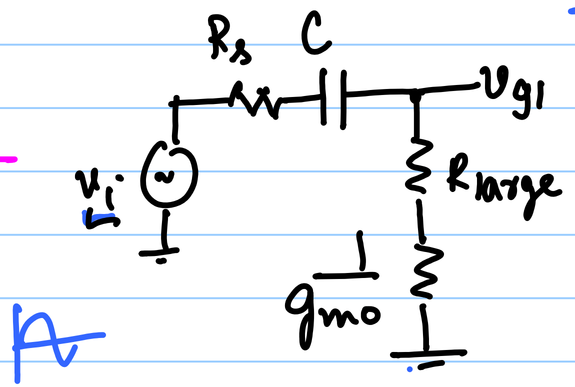


$$\frac{v_o}{v_i} = -g_{m1} R_1 \times \frac{g_{m2}(R_E \| R_L)}{1 + g_{m2}(R_E \| R_L)}$$

$$\approx \frac{g_{m2} R_E}{1 + g_m R_E}$$

M0, M1, M2 (W/L)

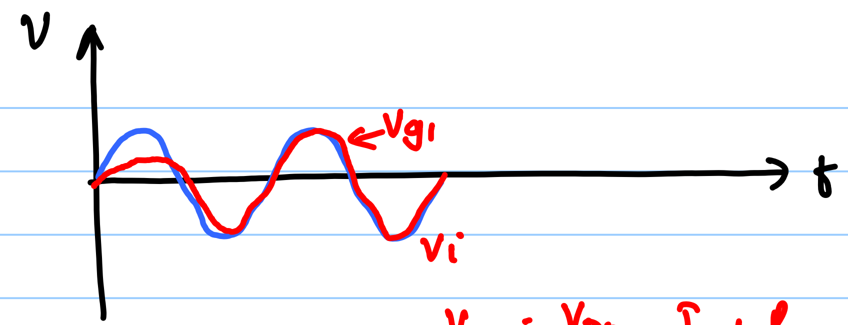




$$\frac{v_{g1}}{v_i} = \frac{R_{large} + \frac{1}{g_{m0}}}{\frac{1}{g_{m0}} + R_{large} + R_s + \frac{1}{sC}}$$

$$\approx \frac{sC R_{large}}{1 + sC R_{large}}$$

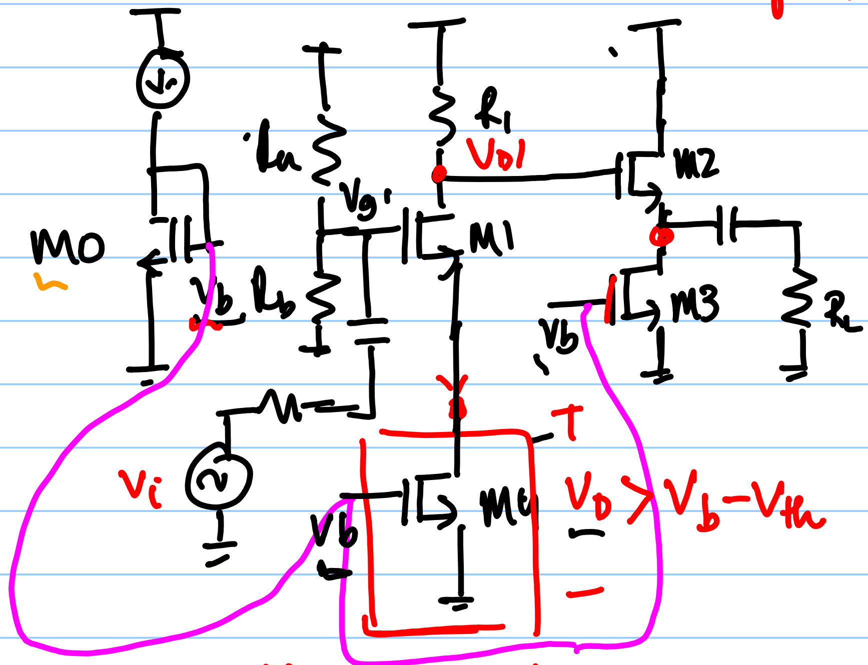
A



$$H(s) = \frac{v_{g1}}{v_i} = \frac{sCR_{large}}{1+sCR_{large}}.$$

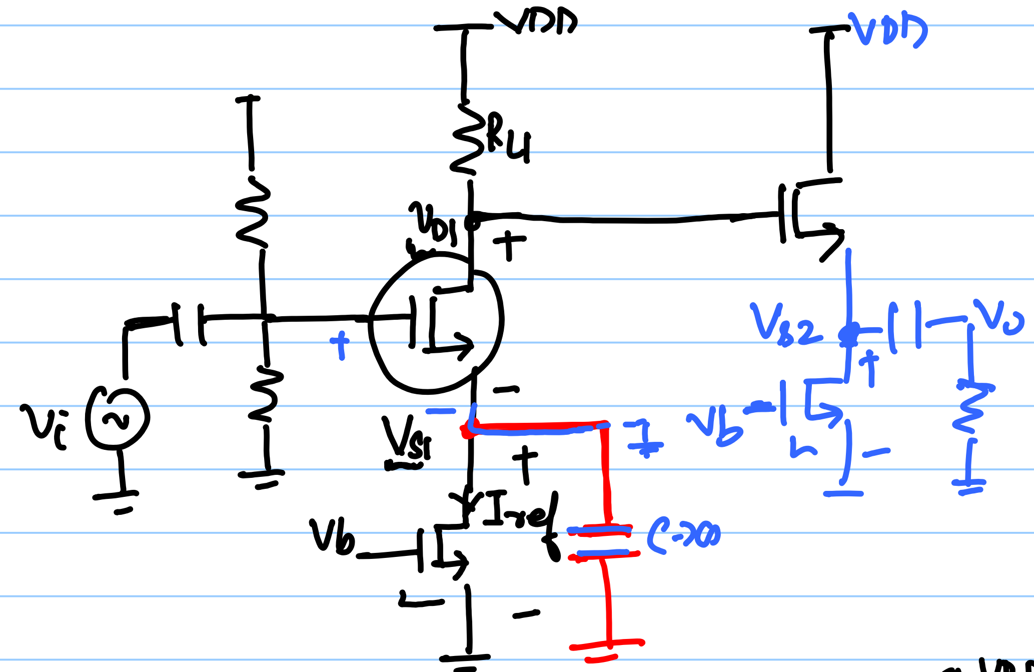
$$v_i = \sin(\omega_0 t)\ u(t)$$

$$V_{D1} = V_{DD} - I_{ref} \cdot R_{L1}$$



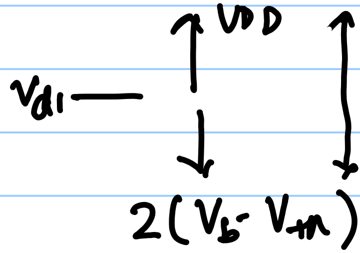
$$V_{GS} - V_{th} = V_b - V_{th}$$

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

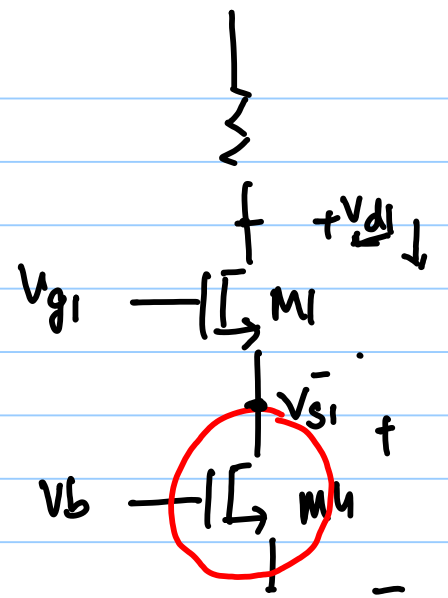


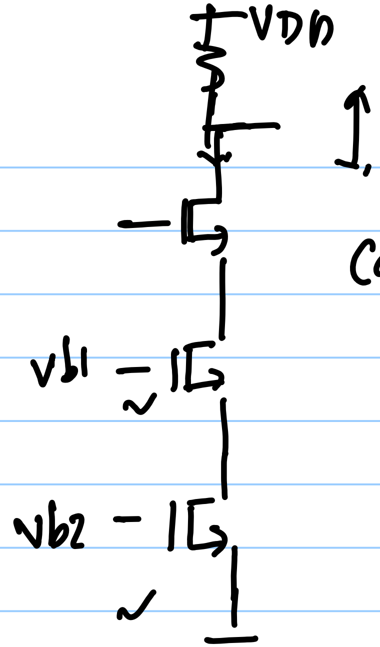
$$\frac{v_{D1}}{v_i} = -g_{m1} \cdot R_{L1}$$

$$V_{S1} > V_b - V_{th}$$

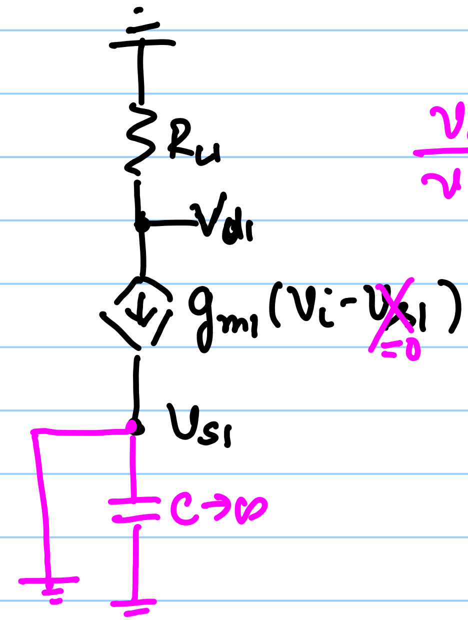


$$V_{D1} = VDD - I_{ref} \cdot R_{L1} - g_{m1} \cdot v_i \cdot R_{L1}$$





Cascoding more transistors in same branch, output swing limits reduces.



$$\frac{V_{d1}}{V_i} = -g_{m1} R_{L1}$$

M4: $V_{GS} - V_{th} = V_b - V_{th}$

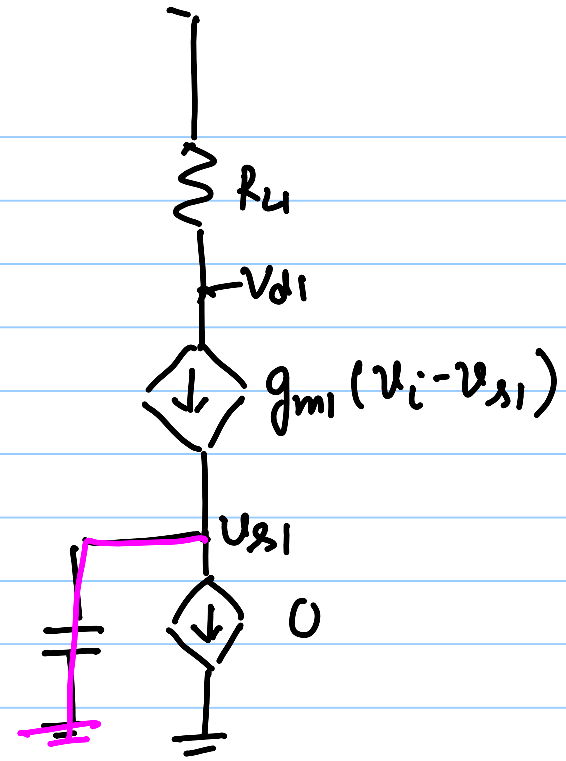
$V_{s1} - 0 \geq V_{GS} - V_{th}$

$V_{s1} \geq V_b - V_{th}$.

M1: $V_{g1} - V_{s1} - V_{th} = V_b - V_{th}$

$V_{d1} - V_{s1} \geq V_{g1} - V_{s1} - V_{th}$

$V_{d1} \geq V_{g1} - V_{th} = V_{s1} + V_b - V_{th}$



RL
vd1
gm1(vi-vs1)
vs1
0