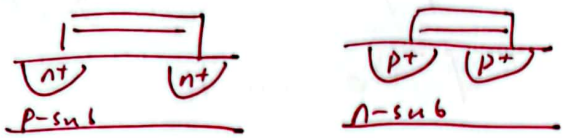
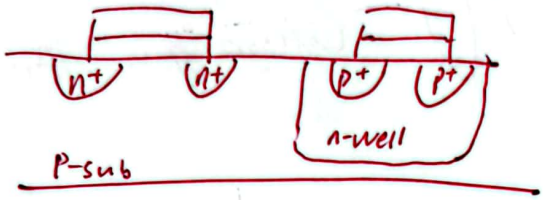
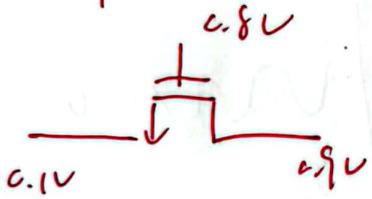
CMOS Technology



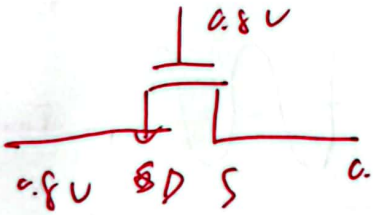


expensive, but worth it.

Example $V_{THN} = 0.5V$ $V_{THP} = -0.6V$

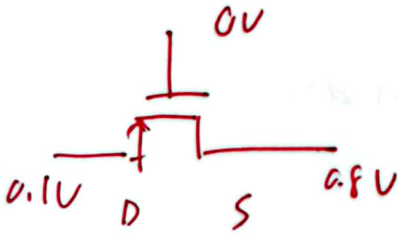


=> sat

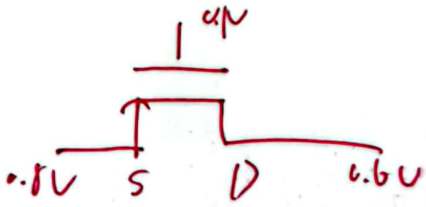


the arrow only indicates the N/P mos but not the D or S.
so here the left is D, right is S

=> sat.



$(0.1V - 0V) < |0.6V|$ => sat.

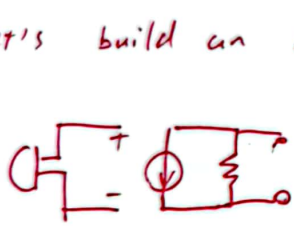


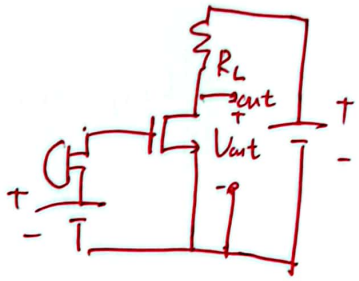
$0.5V < |-0.6V|$ => sat.

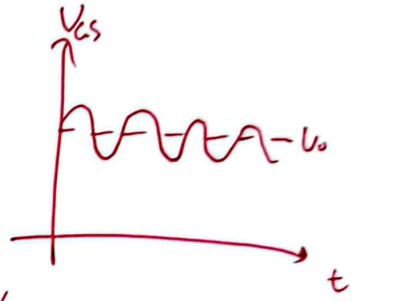
CMOS Amplifiers

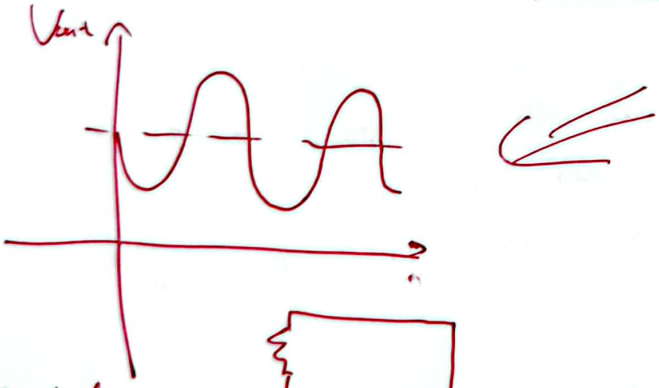
- Amp design procedure
  - ① select an amp topology
  - ② Bias the transistor(s) to obtain proper values for g_m, r_o, ...
  - ③ Determine the characteristics of the circuit.
- Amp Characteristics
  - ① Gain  Voltage gain A_V.
  - ② Power Dissipation
  - ③ ...

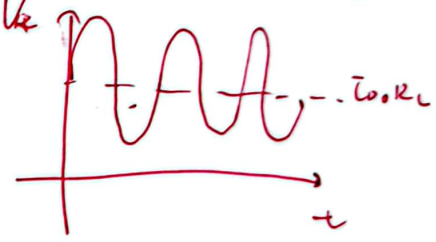
Let's build an amp

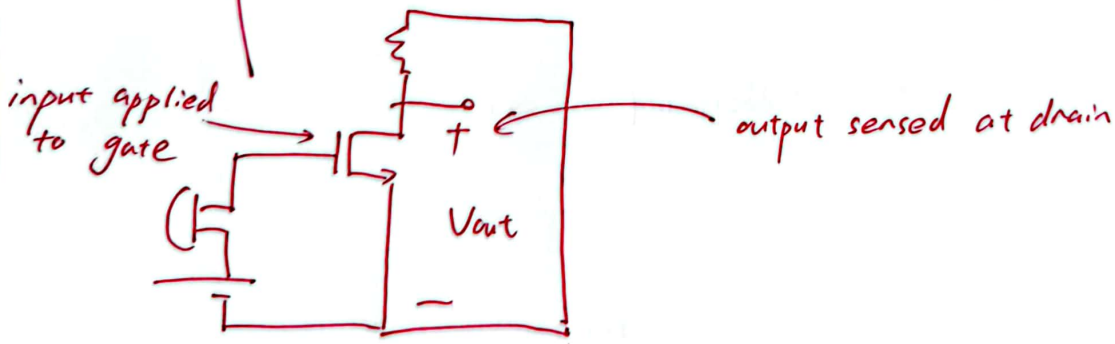


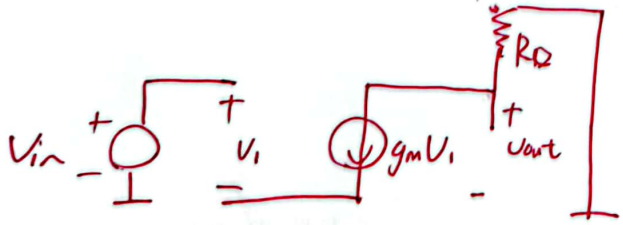












$$\begin{cases} \frac{V_{out}}{R_D} + g_m V_1 = 0 \\ V_1 = V_{in} \end{cases} \Rightarrow \frac{V_{out}}{V_{in}} = -g_m R_D$$