Lecture 18

ANNOUNCEMENTS

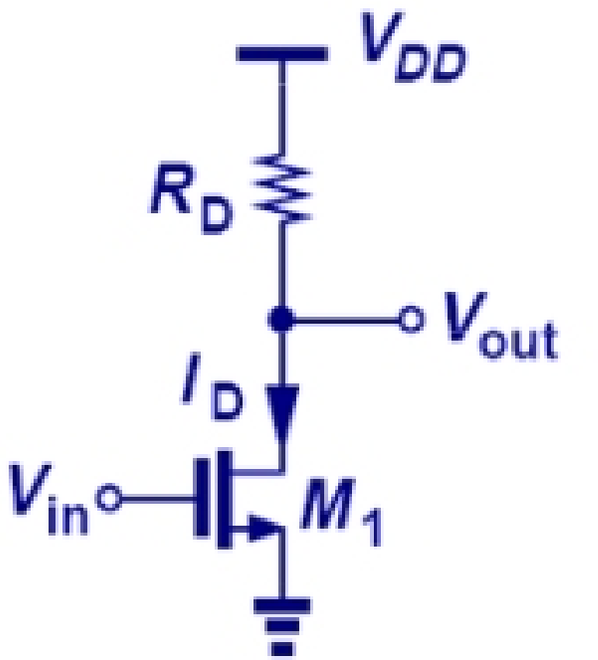
- HW#10 will be posted tonight

OUTLINE

- Basic MOSFET amplifier
- MOSFET biasing
- MOSFET current sources
- Common-source amplifier

Reading: Chapter 7.1-7.2

Basic MOSFET Amplifier

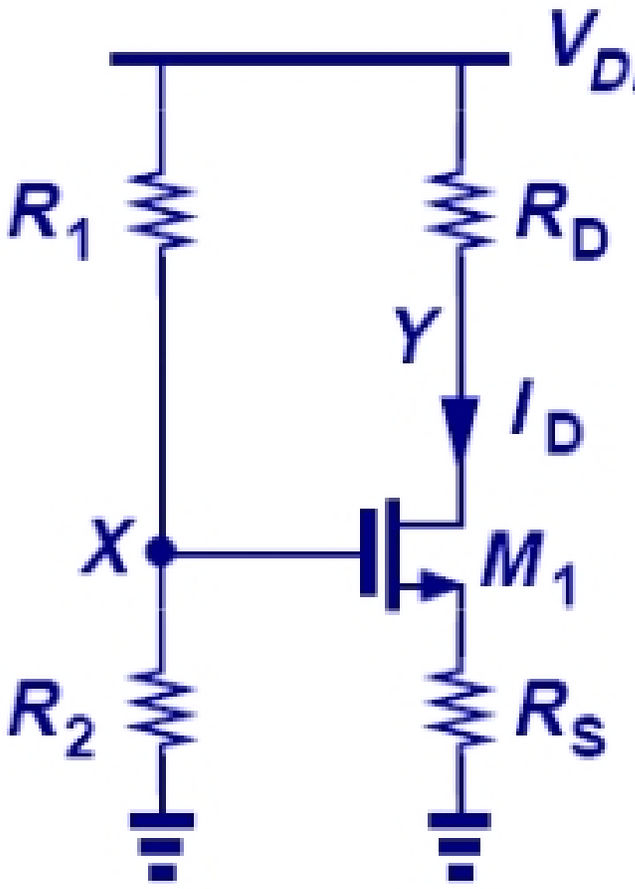


- For large small-signal gain, the MOSFET should be operated in the saturation region.
  → V_{out} should not fall below V_{in} by more than V_{TH}.

MOSFET Biasing

The voltage at node X is determined by V_{DD}, R_1, and R_2: $V_X = \frac{R_2}{R_1 + R_2} V_{DD}$

Also, $V_X = V_{GS} + I_D R_S$



$$I_D = \frac{1}{2} \mu_n C_{ox} \frac{W}{L} (V_{GS} - V_{TH})^2$$

$$\Rightarrow V_{GS} = -(V_1 - V_{TH}) + \sqrt{V_1^2 + 2V_1 \left(\frac{R_2 V_{DD}}{R_1 + R_2} - V_{TH} \right)}$$

$$\text{where } V_1 = \frac{1}{\mu_n C_{ox} \frac{W}{L} R_S}$$