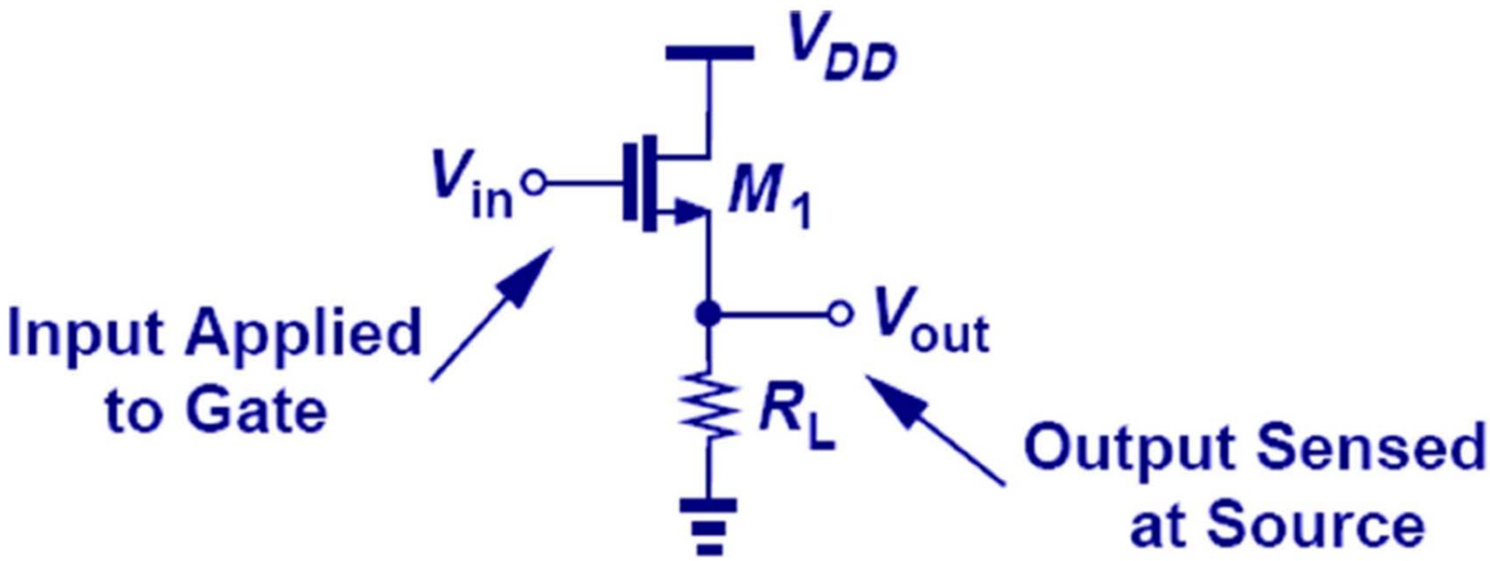
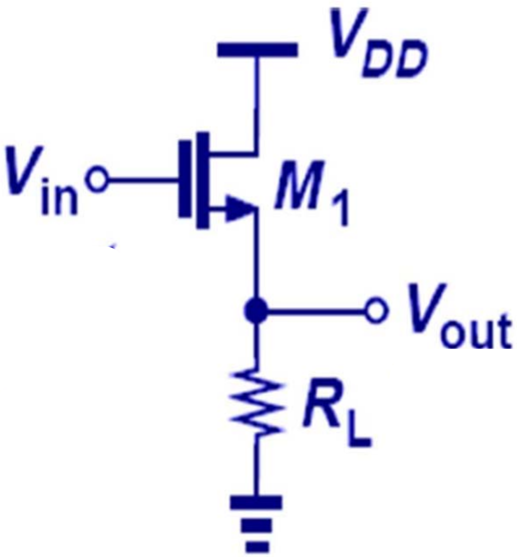
Lect. 6: CMOS Amplifiers (2)

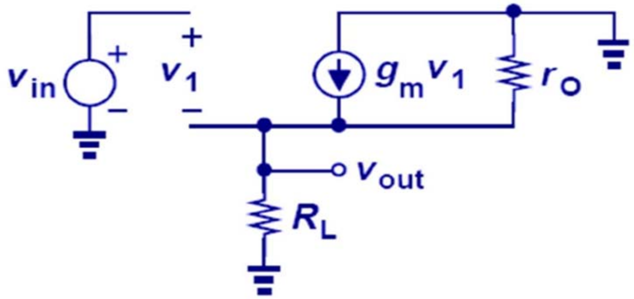
- Source Follower (Common Drain)



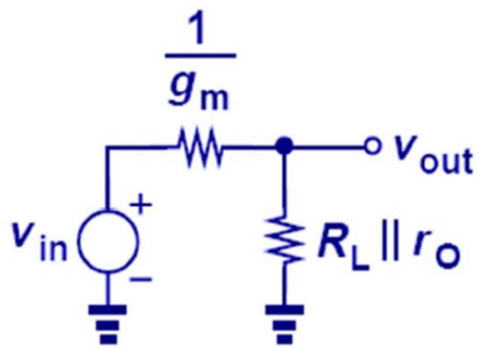
Lect. 6: CMOS Amplifiers (2)

- Source Follower



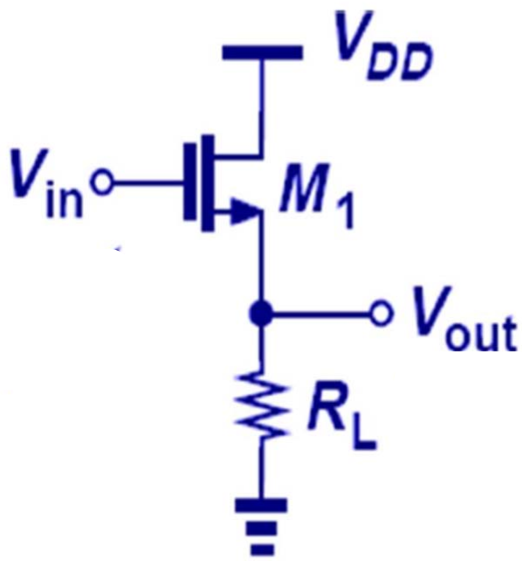


$$A_v = \frac{v_{out}}{v_{in}} = \frac{r_O \parallel R_L}{\frac{1}{g_m} + r_O \parallel R_L} < 1$$



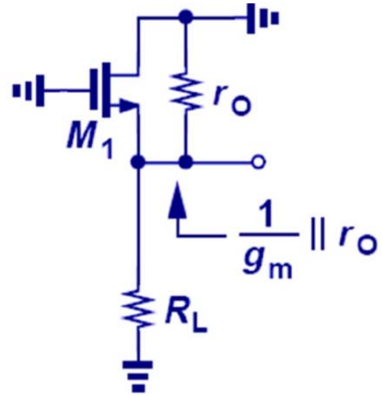
Lect. 6: CMOS Amplifiers (2)

- Source Follower



- R_{in}?

- R_{out}?



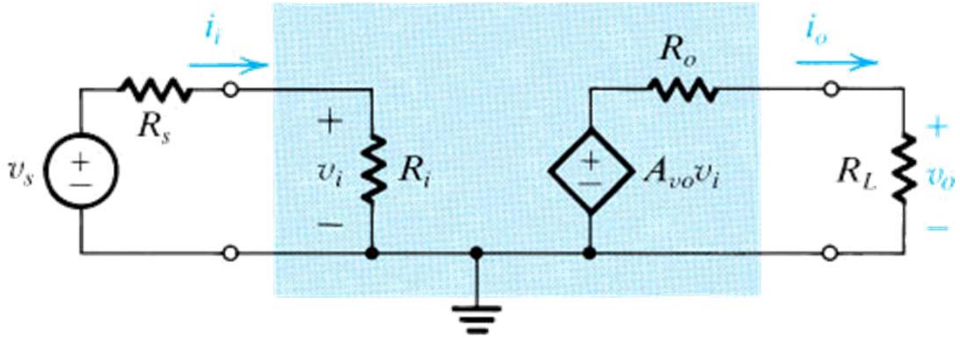
$$R_{out} = \frac{1}{g_m} \| r_O \| R_L$$

- Large R_{in}, small R_{out}

Is this good for voltage amplifier?

Lect. 6: CMOS Amplifiers (2)

- Model for voltage amplifier

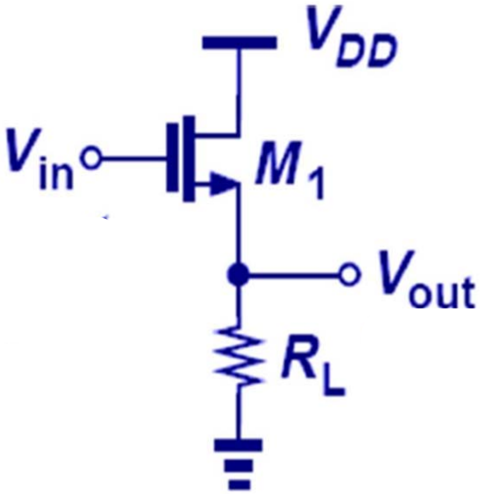


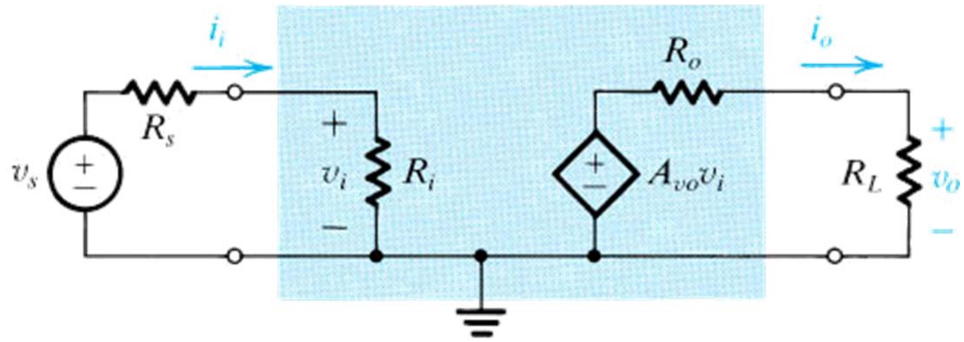
$$v_o = \frac{R_L}{R_L + R_o} A_{vo} v_i = \frac{R_L}{R_L + R_o} A_{vo} \frac{R_i}{R_i + R_s} v_s$$

Voltage amplifier needs large R_{in} and small R_{out}

Lect. 6: CMOS Amplifiers (2)

SF





$$v_o = \frac{R_L}{R_L + R_o} A_{vo} v_i = \frac{R_L}{R_L + R_o} A_{vo} \frac{R_i}{R_i + R_s} v_s \quad \sim v_s$$

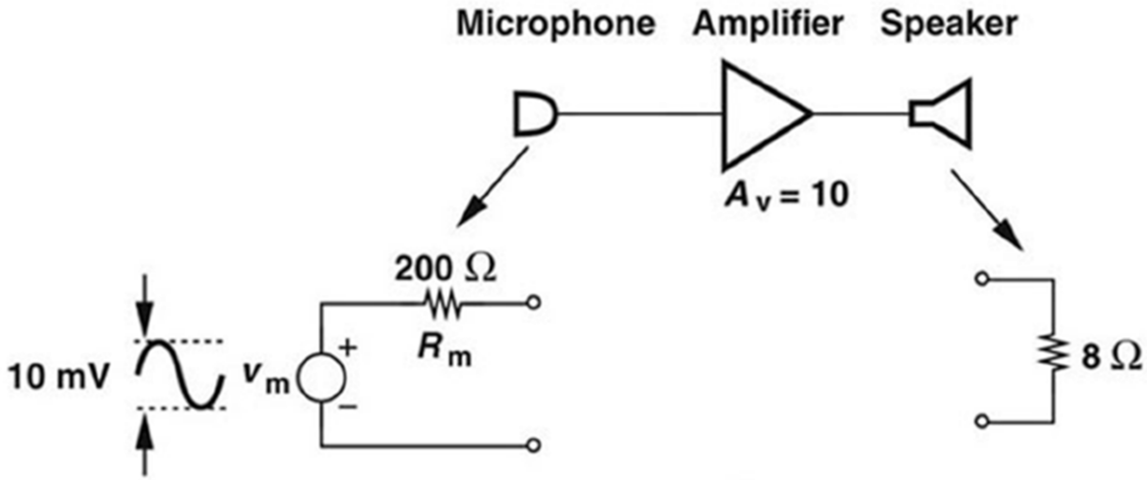
$A_v < 1$
R_{in}: Large
R_{out}: Small

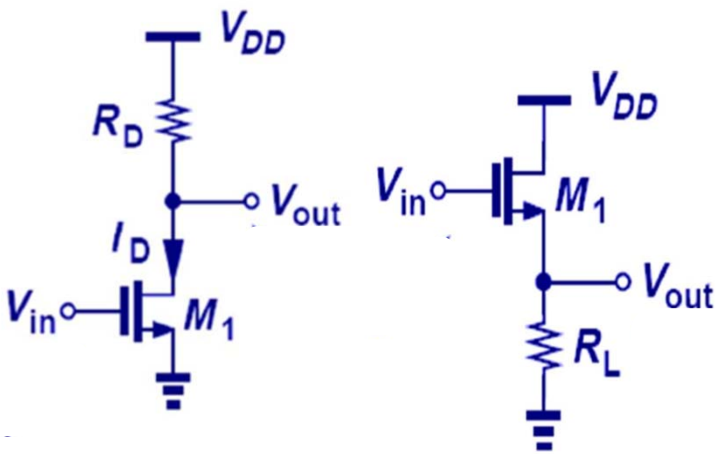
Transform output impedance from R_s to R_o so that R_L loading can be avoided

➔ Voltage buffer

Is this a good voltage amplifier?

Lect. 6: CMOS Amplifiers (2)





For example, CS and SF can be cascaded for better voltage amplifier performance

Lect. 6: CMOS Amplifiers (2)

- Homework: Prob. 7. 50 in Razavi