

ECE 523/421 – Analog Electronics

Lecture 14: Differential Amplifiers: Non-ideal Effects

Payman Zarkesh-Ha

Office: ECE Bldg. 230B

Office hours: Tuesday 2:00-3:00PM or by appointment

E-mail: pzarkesh@unm.edu

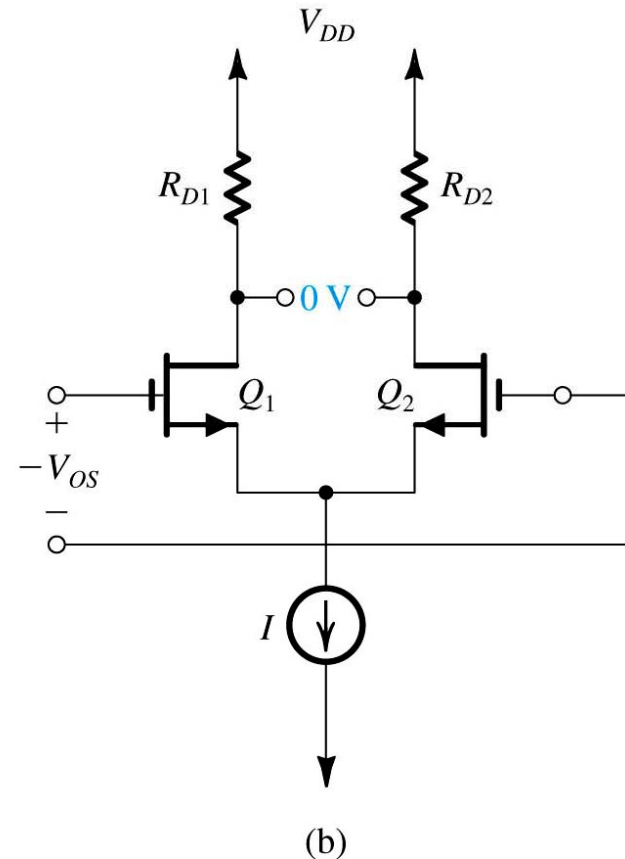
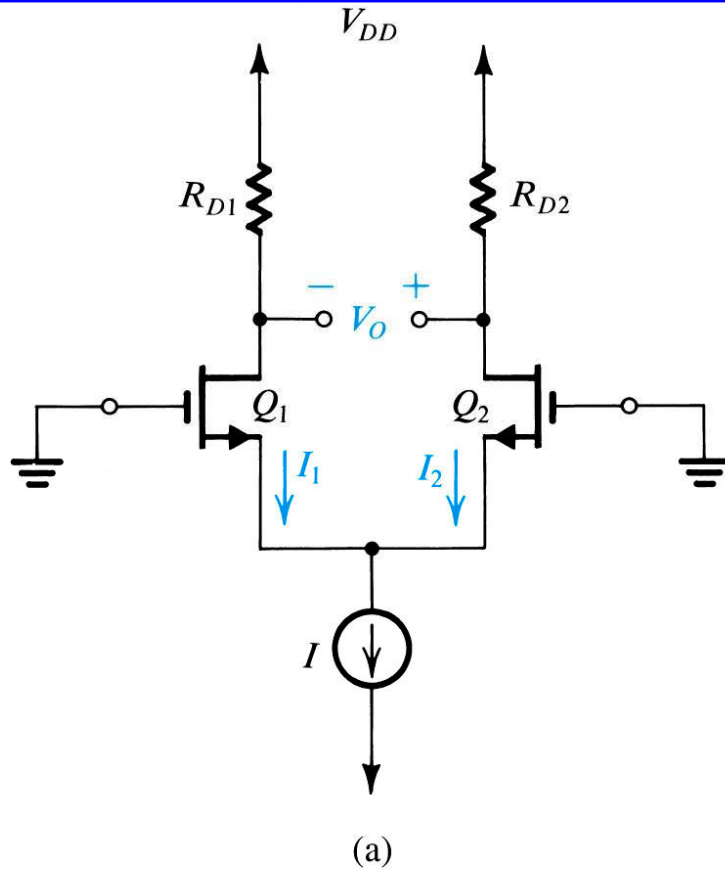
Review of Last Lecture

- ☐ BJT Large Signal Differential Amplifier
- ☐ Half-Circuit Differential Mode
- ☐ Half-Circuit Common Mode
- ☐ CMRR

Today's Lecture

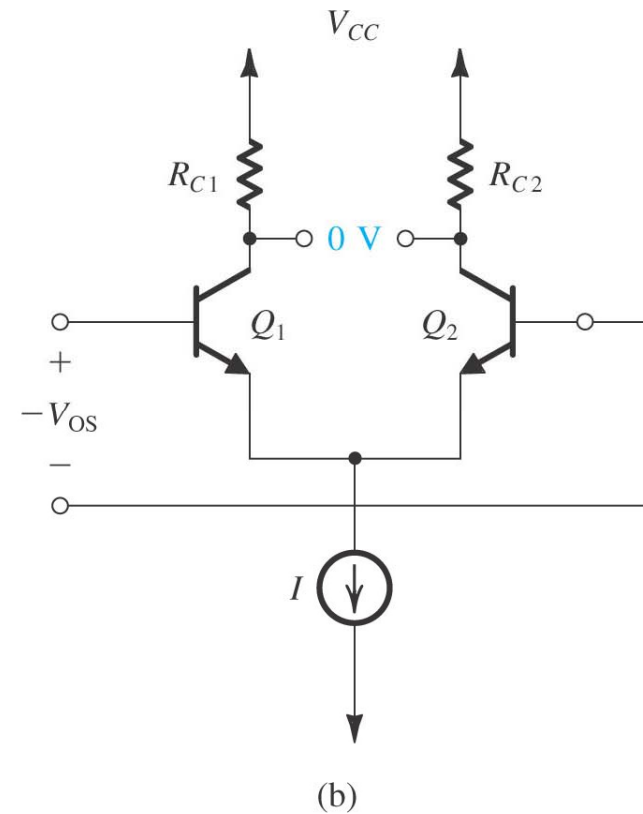
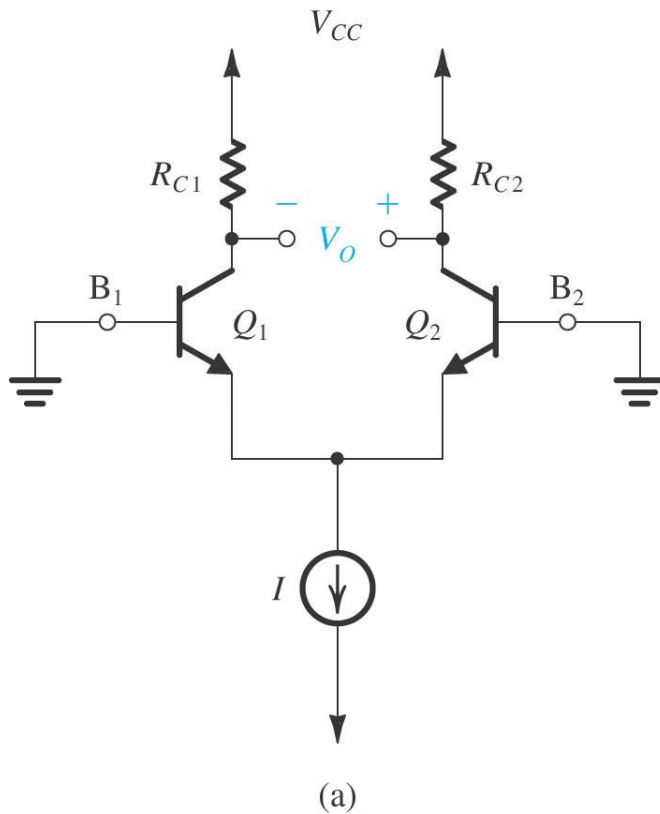
- ☐ Offset in MOS Differential Amplifier
- ☐ Offset in BJT Differential Amplifier

Input Offset Voltage of MOS Diff-Amp



$$V_{OS} \approx \sqrt{\left(\frac{V_{OV}}{2} \frac{\Delta R_D}{R_D}\right)^2 + \left(\frac{V_{OV}}{2} \frac{\Delta(W/L)}{W/L}\right)^2 + (\Delta V_t)^2}$$

Input Offset Voltage of BJT Diff-Amp



$$V_{OS} \approx V_T \sqrt{\left(\frac{\Delta R_C}{R_C}\right)^2 + \left(\frac{\Delta I_S}{I_S}\right)^2}$$

$$I_{OS} \approx I_B \left(\frac{\Delta \beta}{\beta} \right)$$