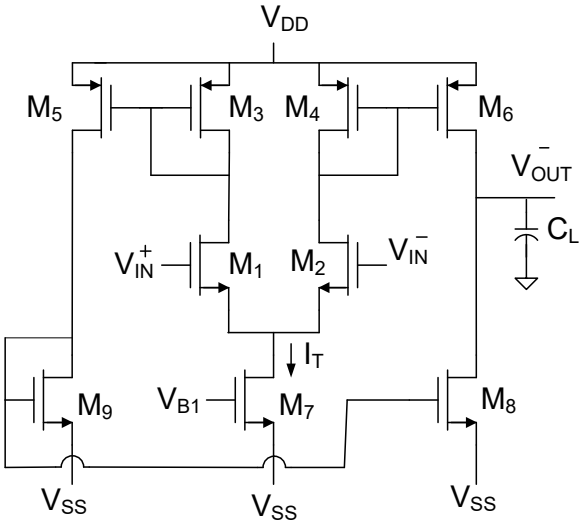
EE435 Lab 3
Spring 2024

Current-Mirror Operational Amplifier Design

The current mirror op amp is shown below. This can be used as a standard operational amplifier in a feedback configuration though when it was introduced the primary focus was on using it in open-loop applications as an Operational Transconductance Amplifier (OTA).



1. Design this op amp in a 0.18µm process with supply voltages of V_{DD}=1.5V and V_{SS}=-1.5V. In this design, the lengths of all devices should be $5xL_{min}$, the mirror gains M_{35} and M_{46} should be 10, the mirror gain M_{98} should be 1, the power dissipation should be 1mW, and V_{EB} should be 100mV for all devices.

2. Analytically determine the differential voltage gain, the BW, the GB, and the SR of this amplifier. Assume C_L=20pF.

3. Analytically determine the output signal swing for a common-mode input of -200mV.

4. Compare the results obtained in part 2 and part 3 with computer simulations.

5. What is the 3dB bandwidth when feedback is applied to form a unity-gain buffer?

6. What is the response of the unity-gain feedback amplifier to a 100mV step input with a common-mode input of -200mV?

7. Determine the poles and zeros using a Spice analysis for both the open-loop and closed-loop amplifier. The feedback should provide a dc gain of +1. Plot the two dominant open-loop and closed-loop poles.