Lecture 34

• Last time:
  – Improved current sources and current mirrors
  – Start multistage amplifiers
• Today :
  – More examples of cascades
  – DC coupling issues

Multistage Current Buffers

Are two cascaded common-base stages better than one?

\[ R_{\text{in}} = R_{\text{in}1} \]
Two-Port Models

\[ R_{out} = R_{out2} \cong r_{02} \left( 1 + g_{m2} R_{S2} \right) \parallel r_{oc2} \]

Common-Gate 2\textsuperscript{nd} Stage

\[ R_{out} = R_{out2} \cong r_{02} \left( 1 + g_{m2} R_{S2} \right) \parallel r_{oc2} \]
Summary of Cascaded Amplifiers

*General goals:*

1. Boost the gain parameter (except for buffers)
2. Optimize the input and output resistances

\[ R_{in} \quad R_{out} \]

Voltage:
Current:
Transconductance:
Transresistance:

Second Design Issue: DC Coupling

*Constraint:* large inductors and capacitors are not available

Output of one stage is directly connected to the input of the next stage \( \rightarrow \) must consider DC levels … why?
Alternative CG-CC Cascade

Use a PMOS CD Stage: DC level shifts upward

CG Cascade: DC Biasing

Two stages can have different supply currents

Extreme case: \( I_{BIAS2} = 0 \) A
CG Cascade: Sharing a Supply

First stage has no current supply of its own \( \rightarrow \) its output resistance is modified.

Two-Port Model of Common-Gate Cascade with Shared Current Supply