

# EE 240B – Spring 2018

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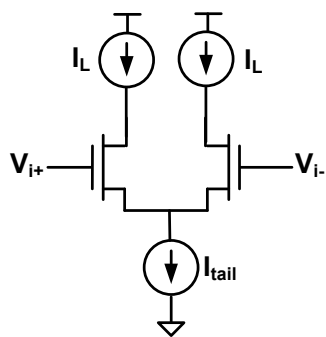
## Advanced Analog Integrated Circuits Lecture 13: Common-Mode Feedback



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### Review: CMRR Limit

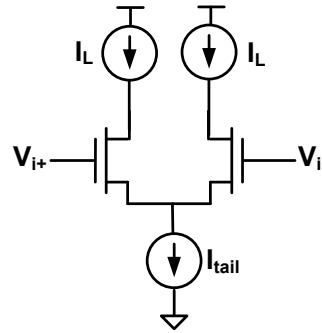
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## A Related Problem

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- What if  $I_L < I_{tail}/2$ ?
  - Does (typical) feedback solve this?



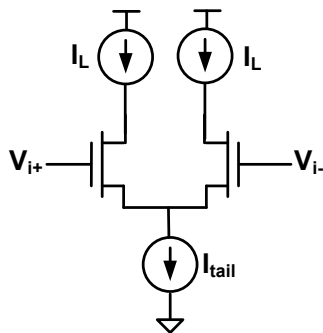
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## Solution: Common-Mode Feedback

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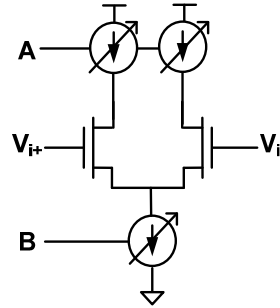
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## Adjusting Common-Mode

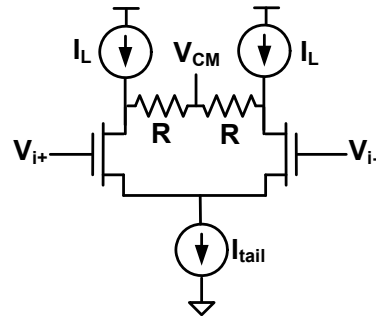
- Really only two knobs:
- Knob A: adjust load current
- Knob B: adjust tail current



## Knob A vs. Knob B

## Common-Mode Sensing

- Simplest CM sensor: pair of resistors
- How to pick value of R?

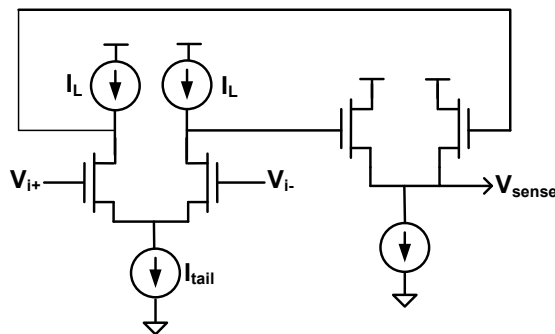


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## Isolated Sensing



- Works well as long as stay in the linear range of the “diff. pair”
  - Otherwise  $V_{\text{sense}}$  tracks just one side

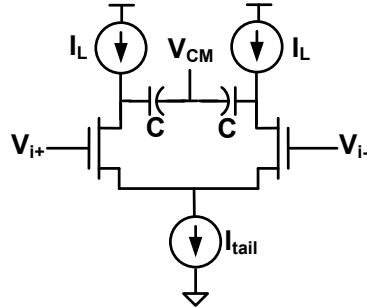
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## Capacitive Sensing

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- **Avoids DC loading**
  - But can't fix DC (biasing) concerns
  - And does add extra capacitive loading

## Common Implementation

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## **Methodology Implications (Noise-Limited)**

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## **Methodology Implications (GBW-Limited)**

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## **GBW-Limited CMFB**

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