Design Example

• What are the specs?
  • And where do they come from?

• Example: 50MS/s, ~11-bit ADC
  • Accuracy:
  • Settling time:
  • Dynamic range:
  • Closed-loop gain:
  • Power:

Finding $C_L$
### Problem with Common-Mode

- **What if** \( I_L < \frac{I_{tail}}{2}? \)
  - Will capacitive feedback solve this?
- **Typical solution:**
  - Common-mode feedback
  - Sense CM at output
  - Adjust some knob to alter CM

### Common-Mode Sensing

- **Simplest CM sensor:** pair of resistors
- Resistors load the OTA (reduce gain)
  - If make \( R \) large, get slow \( V_{cm} \) tracking
  - Is this a problem?

### Sensing Scheme #2

- **Isolated CM sensing**
  - Works reasonably well
  - But hard to use with wide swing amplifier output
### Capacitive Sensing

- Capacitive sensing avoids DC loading
  - (still creates AC load though)
- Needs to be reset to remove initial offset
  - Just like capacitive feedback

### Adjusting Common-Mode

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

### Capacitive CMFB

- How to choose $C_{cm}$?
  - “Small”: CM loop gain low
  - “Large”: Loading on diff. output high

### Example Common-Mode Feedback

- Secondary amplifier enforces $V_{cm} = V_{cm\_ref}$
- Place dominant pole at $V_{bp}$ or $V_{cm}$?
“Continuous” CMFB