Position Sensing Circuits

Position-to-Voltage Conversion

- To sense position (i.e., displacement), use a capacitive load.

Problems With Pure-C Position Sensing

- To sense position (i.e., displacement), use a capacitive load.
**The Op Amp Integrator Advantage**

- The virtual ground provided by the ideal op amp eliminates the parasitic capacitance $C_p$

**Differential Position Sensing**

- Example: ADXL-50

- Proof Mass
- Tethers with fixed ends
- Sense Finger

- Suspension Beam in Tension

- Fixed Electrodes

- Includes capacitance from interconnects, bond pads, and $C_{gs}$ of the op amp

- Bootstrap the ground lines around the interconnect and bond pads
- No voltage across $C_p$
- It's effectively not there!
Integrator-Based Diff. Position Sensing

\[ \begin{align*}
\dot{V}_p &= \frac{1}{C_p} \left( i_0 + V_p \right) \\
\dot{V}_p &= \frac{1}{C_F} \left( i_0 - V_p \right) \\
\end{align*} \]

For biasing:

\[ R_2 \gg \frac{1}{sC_2} \]

Can easily drive the next stage!