Differential Position Sensing

Example: ADXL-50

Suspension Beam in Tension

Proof Mass

Sense Finger

Fixed Electrodes

Tethers with fixed ends

$V_p$ - $V_p + (2g) \frac{C_1}{C_{C1}}$

$V_o = \frac{C_2}{C_{C2} + C_{fp}} V_p$

$C_1$

$C_2$

$C_{fp}$

$V_o$

$V_p$

$+V_p$

-\( V_p \)

Buffer-Bootstrapped Position Sensing

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

$C_{gd}$ = gate-to-drain capacitance of the input MOS transistor

* 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

$\frac{V_o}{V_p}$ = $\frac{C_{C2}}{C_{fp}}$

$R_1 \gg \frac{1}{2C_{gs}}$

Can drive next stage's $R_2$ into interference to transfer function!

$A_{v0} = -\frac{C_{C2}}{C_{fp}}$

$A_v = -\frac{C_{C2}}{C_{fp}}$

$A_v$ is seemingly perfect differential sensor/amplifier output! ...but only when the op amp is ideal...