**Problem 2.54**  A touch sensor based on a piezoresistor built into a micromechanical cantilever made of silicon is connected in a Wheatstone-bridge configuration with a $V_0 = 1 \text{ V}$. If $L = 1.44 \text{ cm}$ and $W = 1 \text{ cm}$, what should the thickness $H$ be so that the touch sensor registers a voltage magnitude of $10 \text{ mV}$ when the touch pressure is $10 \text{ N}$?

**Solution:** According to the solution of Example 2-12,

$$V_{\text{out}} = \frac{V_0}{4} \alpha \frac{FL}{WH^2},$$

If

$$|V_{\text{out}}| = \left| \frac{V_0 \alpha FL}{4 WH^2} \right| = \frac{1 \times 10^{-9} \times 10 \times 1.44 \times 10^{-2}}{4 \times 1 \times 10^{-2}H^2} = 10^{-2} \text{ V},$$

then

$$H = 0.6 \text{ mm}.$$