

Monolithic Silicon Power

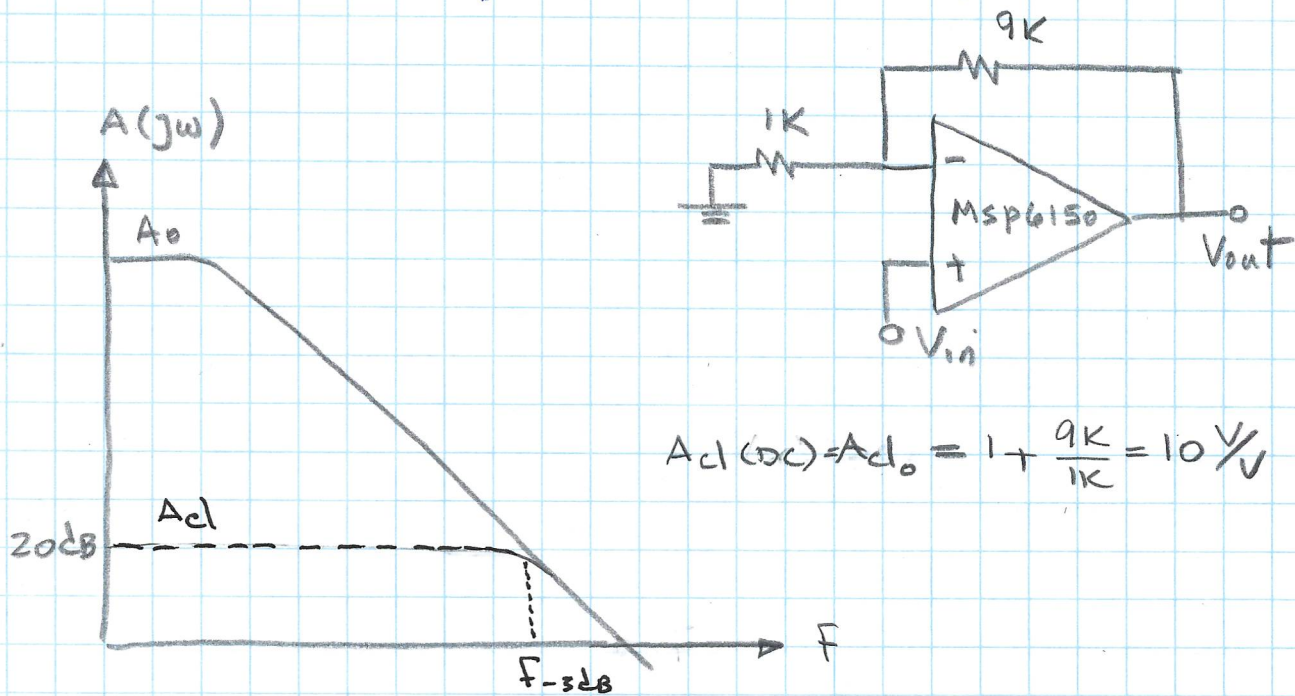
F. Moraveji

OP-Amp App Note 2

3/11/2021

OP-Amp Bandwidth Error

⇒ In this section, we like to study the effect of frequency on the closed-loop gain



$$A_{cl}(f) = \frac{A_{cl0}(DC)}{1 + j \frac{f}{f_{-3dB}}} \Rightarrow 1 + j \frac{f}{f_{-3dB}} = \frac{A_{cl0}}{A_{cl}(f)}$$

$$f = \left[\sqrt{\left(\frac{A_{cl0}}{A_{cl}(f)} \right)^2 - 1} \right] f_{-3dB} \Rightarrow \text{suppose } GBW = 100 \text{ MHz}$$

$$A_{cl0} = \text{DC Gain} = 10 \frac{V}{V} \Rightarrow f_{-3dB} = 10 \text{ MHz}$$

To obtain a frequency up to which gain is flat to

$$0.1 \text{ dB} \Rightarrow \text{Gain} = 19.9 \text{ dB} = 9.8855 \frac{V}{V} = A_{cl0.1dB}$$

$$f_{0.1dB} = f_{-3dB} \sqrt{\left(\frac{A_{cl0}}{A_{cl0.1dB}} \right)^2 - 1} = \left(\sqrt{\left(\frac{10}{9.8855} \right)^2 - 1} \right) 10 \text{ MHz}$$

$$f_{0.1dB} = 1.526 \text{ MHz}$$