Monolithic Silicon Power — F. Moravej

Application Note 2 (Op-Amp) — 3/8/2021

$\Rightarrow$ As Frequency rolls off, loop Gain which is $A(s)\beta$ will drop and gain Error will increase

$$\%\ \text{Error} = \frac{100}{A(s)\beta} \qquad A(s) = \frac{A_0}{1 + j\,\omega/\omega_p}$$

$$\%\ \text{Error} = \frac{100}{|A(s)\beta|} = \frac{100}{\frac{A_0\beta}{\sqrt{1+(f/f_p)^2}}}$$

$$\%\ \text{Error}_{dc} = \frac{100}{A_0\beta} \qquad \%\ \text{Error}(\omega) = \sqrt{1+(f/f_p)^2}\ \varepsilon_{dc}$$

ε_{dc} = DC Gain Error

For DC operation, $\frac{100}{A_0\beta}$ is prevalent, however as Frequency is deviating from DC, Error will increase

As an example if $f_p = 10Hz$, Then at $f = f_p$, The gain error is up by $\sqrt{2}$ or 40% over DC gain Error

for $f \gg f_p$ $\quad \%\ \text{Error} = \frac{100}{A_0\beta}\ f/f_p$