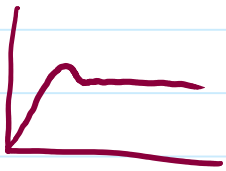
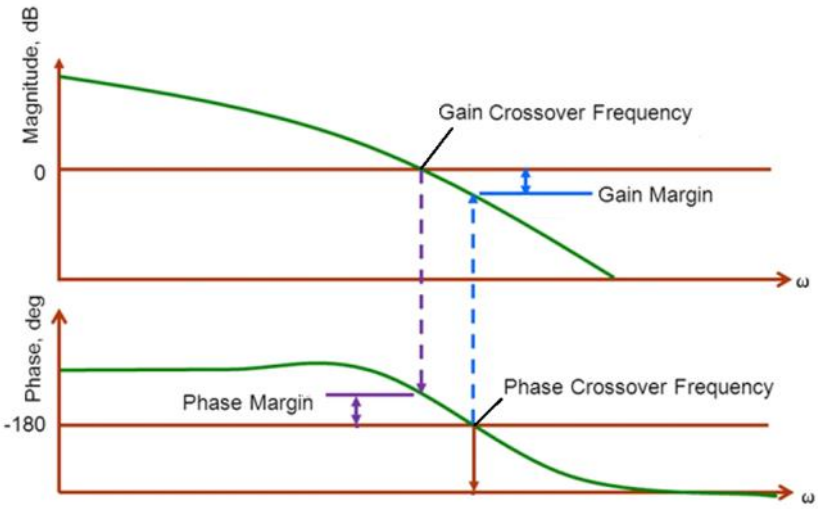
Gain and Phase Margin

Phase Margin → $180 - |\phi|$

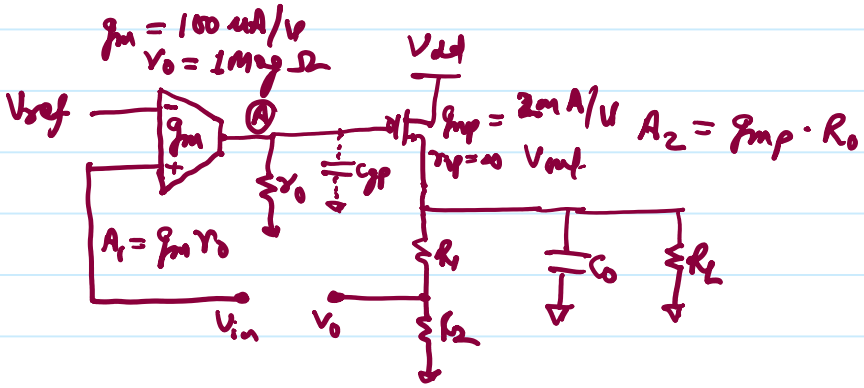
Phase margin ≥ 60 degrees



Gain Margin → Gain at $|\phi| = 180°$



Frequency Response of LDO



$$H(s) \text{ or } LG(s) = \frac{A_1 \cdot A_2}{(1 + r_o C_{gp} s)(1 + R_o C_o)} \times \beta$$

$R_1 + R_2 = 100\ K\Omega$

$R_L = 1\ K\Omega$

$R_o = (R_1 + R_2) \| R_L$

$A_1 \cdot A_2 \approx 100 \times 2$

$46\ dB$

$\beta = \frac{R_2}{R_1 + R_2}$

$V_{ref} = 0.6V \quad V_{out} = 1.2V$

$\beta = 1/2$

$C_{gp} = 1\ pF$

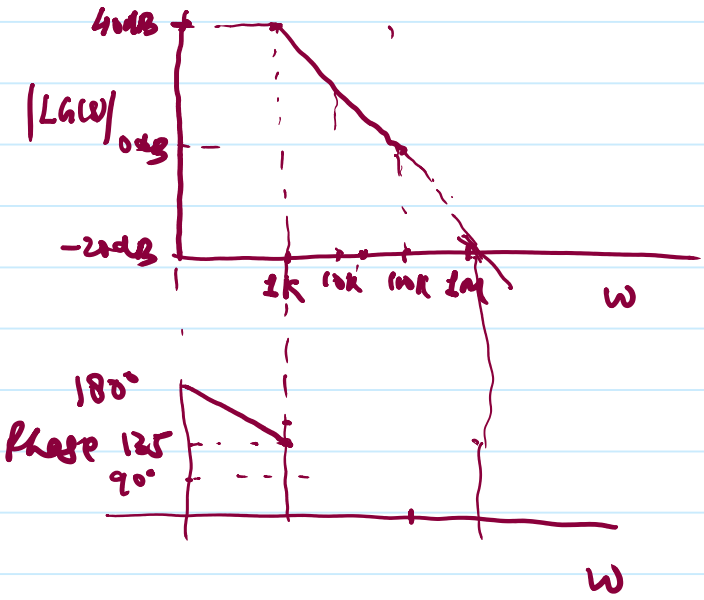
$$\omega_{p_1} = \frac{1}{r_o C_{gp}} = \frac{1}{1\ M\Omega \times 1\ pF} = 1\ M\ rad/s$$

$C_o = 1\ nF$

$$\omega_{p_2} \approx \frac{1}{R_L \cdot C_o} = \frac{1}{1K \times 1n} = 1\ K\ rad/s$$

$$LG(s) = \frac{100}{(1 + s/\omega_{p_1})(1 + s/\omega_{p_2})}$$

Frequency Response of LDO



assume $C_0 = 10nF$, $R_1 + R_2 >> R_L$

$$\omega_{p2} = \frac{1}{C_0 R_0} = \frac{1}{10n \times 1K} = 100K \text{ rad/s}$$