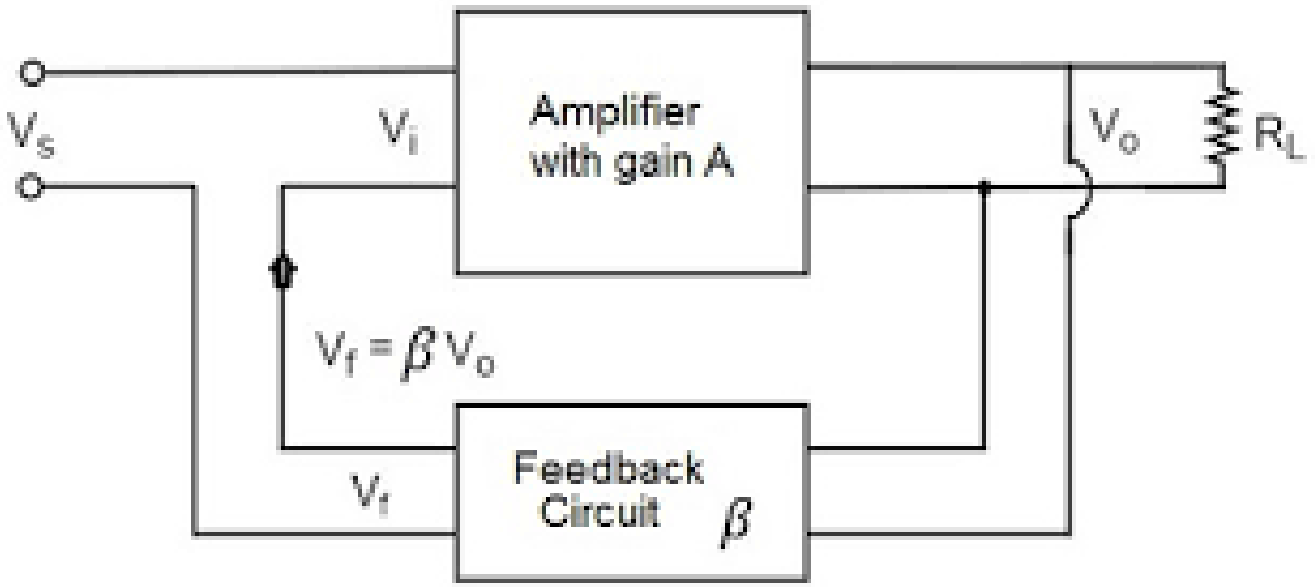
Effects of Negative Feedback on Amplifier Parameters

Applicable for Voltage Amplifier with Voltage Series Feedback



- Input Impedance is Increased

$$R_{i(feedback)} = R_i(1+\beta A)$$

- Output Impedance is Decreased

$$R_{i(\,feedback\,)} = \frac{R_i}{(1+\beta A)}$$

- Voltage Gain with Neg.Feedback (A_F) Decreases

$$A_{Feedback} = \frac{A}{(1+\beta A)}$$

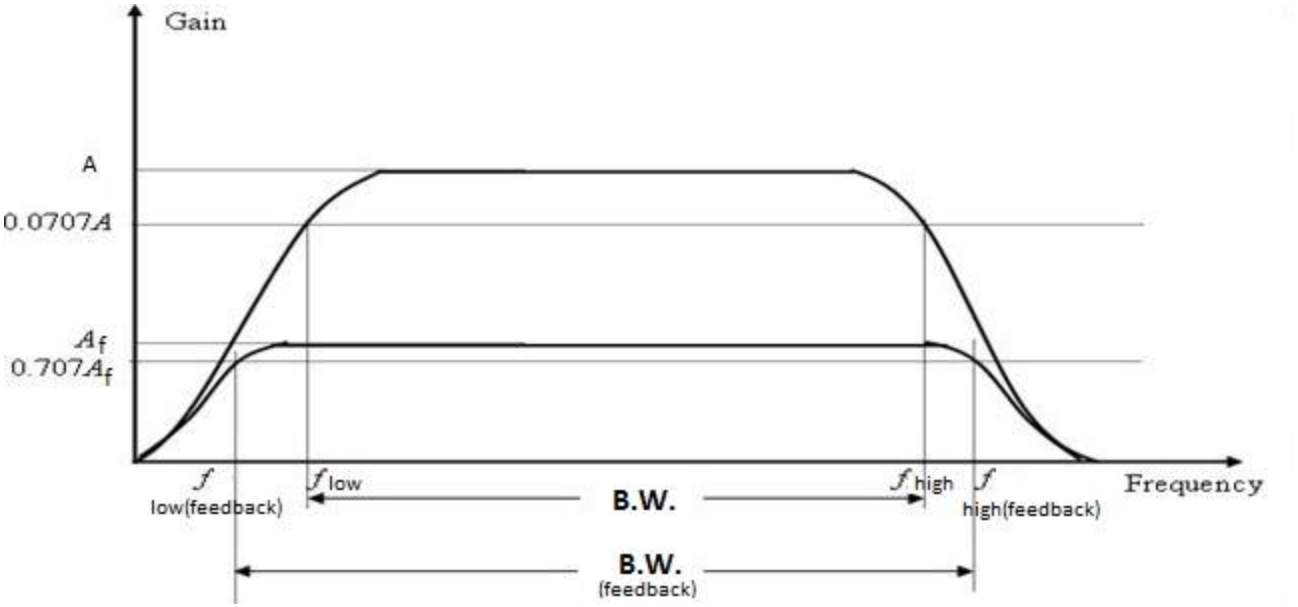
- **Bandwidth is Increased (B.W. = $f_{high} - f_{low}$)**

- **Higher cut-off frequency is Increased with Neg. Feedback**

$$f_{high(Feedback)} = f_{high}(1+\beta A)$$

- **Lower cut-off frequency is Decreased with Neg. Feedback**

$$f_{low(Feedback)} = \frac{f_{low}}{(1+\beta A)}$$



- **Gain Sensitivity is Reduced**

$$\left|\frac{dA_F}{A_F}\right| = \frac{1}{\left|1+\beta A\right|}\left|\frac{dA}{A}\right|$$

- If Amplifier has 20dB of Neg. Feedback $i.e.\left[(1+\beta A) = 10\right]$
- **So, if** $\left|\frac{dA}{A}\right| = 10\%$

- **(i.e if there is 10% change in differential Volt.Gain without Feedback)**

- **Then we have** $\left|\frac{dA_F}{A_F}\right| = 1\%$

(only 1% change in differential Volt.Gain with Neg. Feedback)

•Reduction in Non-Linear Distortion (NLD)

- •NLD occurs with large input signals and produces harmonics of the input signal
- •Negative Feedback reduces Total Harmonic Distortion (THD)

$$(THD)_F = \frac{THD}{(1+\beta A)}$$

•So, if | βA | >> 1 Then $(THD)_F$ << THD

•Stability of Gain (A_F) is Improved

-So, if | βA | >> 1 Then $A_F \approx 1/\beta$

- So, Closed-loop Gain (A_F) can be made insensitive (independent) of Open loop Gain (A)

•Noise is Reduced & Signal-to-Noise Ratio is Improved