

Structured Electronic Design

Design of the Bandwidth of Negative Feedback Amplifiers

Bandwidth definition

Bandwidth definition

$$A_f = A_{f\infty} \frac{-L}{1-L}$$

Bandwidth definition

$$A_f = A_{f\infty} \frac{-L}{1-L}$$

Source-to-load
transfer

Bandwidth definition

$$A_f = A_{f\infty} \frac{-L}{1-L}$$

Source-to-load transfer

Asymptotic gain
equals ideal gain
(proper IgRef selection)

Bandwidth definition

$$A_f = A_{f\infty} \frac{-L}{1-L}$$

Source-to-load transfer

Asymptotic gain equals ideal gain (proper IgRef selection)

← Loop gain

Bandwidth definition

$$A_f = A_{f\infty} \frac{-L}{1-L}$$

Source-to-load transfer

Asymptotic gain equals ideal gain (proper IgRef selection)

Loop gain

Servo function deviates from unity as a result of a finite loop gain

The diagram shows the equation $A_f = A_{f\infty} \frac{-L}{1-L}$. The term A_f is annotated with 'Source-to-load transfer'. The term $A_{f\infty}$ is annotated with 'Asymptotic gain equals ideal gain (proper IgRef selection)'. The fraction $\frac{-L}{1-L}$ is circled in blue. An arrow points from the text 'Loop gain' to the variable L in the numerator. Another arrow points from the text 'Servo function deviates from unity as a result of a finite loop gain' to the denominator $1-L$.

Bandwidth definition

$$A_f = A_{f\infty} \left(\frac{-L}{1-L} \right)$$

Source-to-load transfer

Asymptotic gain equals ideal gain (proper IgRef selection)

Loop gain

Servo function deviates from unity as a result of a finite loop gain

The diagram shows the equation $A_f = A_{f\infty} \left(\frac{-L}{1-L} \right)$. An arrow points from the text 'Source-to-load transfer' to the A_f term. Another arrow points from 'Asymptotic gain equals ideal gain (proper IgRef selection)' to the $A_{f\infty}$ term. A third arrow points from 'Loop gain' to the $-L$ in the numerator of the fraction. A fourth arrow points from 'Servo function deviates from unity as a result of a finite loop gain' to the entire fraction $\frac{-L}{1-L}$, which is enclosed in a circle.

1. Desired filter characteristic designed with the ideal gain

Bandwidth definition

$$A_f = A_{f\infty} \left(\frac{-L}{1-L} \right)$$

Source-to-load transfer

Asymptotic gain equals ideal gain (proper IgRef selection)

Loop gain

Servo function deviates from unity as a result of a finite loop gain

The diagram shows the equation $A_f = A_{f\infty} \left(\frac{-L}{1-L} \right)$. An arrow points from the text 'Source-to-load transfer' to the A_f term. Another arrow points from 'Asymptotic gain equals ideal gain (proper IgRef selection)' to the $A_{f\infty}$ term. A third arrow points from 'Loop gain' to the $-L$ in the numerator of the fraction. A fourth arrow points from 'Servo function deviates from unity as a result of a finite loop gain' to the entire fraction $\frac{-L}{1-L}$, which is enclosed in a circle.

1. Desired filter characteristic designed with the ideal gain
2. Bandwidth definition decoupled from desired filter characteristic

Bandwidth definition

$$A_f = A_{f\infty} \left(\frac{-L}{1-L} \right)$$

Source-to-load transfer

Asymptotic gain equals ideal gain (proper IgRef selection)

Loop gain

Servo function deviates from unity as a result of a finite loop gain

The diagram shows the equation $A_f = A_{f\infty} \left(\frac{-L}{1-L} \right)$. An arrow points from the text 'Source-to-load transfer' to A_f . Another arrow points from 'Asymptotic gain equals ideal gain (proper IgRef selection)' to $A_{f\infty}$. A third arrow points from 'Loop gain' to the fraction $\frac{-L}{1-L}$. A fourth arrow points from 'Servo function deviates from unity as a result of a finite loop gain' to the same fraction. The fraction is enclosed in a circle.

1. Desired filter characteristic designed with the ideal gain
2. Bandwidth definition decoupled from desired filter characteristic
3. Bandwidth will be defined as difference between low-pass -3dB and high-pass -3dB frequencies of servo function

Bandwidth definition

$$A_f = A_{f\infty} \left(\frac{-L}{1-L} \right)$$

Source-to-load transfer

Asymptotic gain equals ideal gain (proper IgRef selection)

Loop gain

Servo function deviates from unity as a result of a finite loop gain

The diagram shows the equation $A_f = A_{f\infty} \left(\frac{-L}{1-L} \right)$. An arrow points from the text 'Source-to-load transfer' to the A_f term. Another arrow points from 'Asymptotic gain equals ideal gain (proper IgRef selection)' to the $A_{f\infty}$ term. A third arrow points from 'Loop gain' to the $-L$ in the numerator of the fraction. A fourth arrow points from 'Servo function deviates from unity as a result of a finite loop gain' to the entire fraction $\frac{-L}{1-L}$, which is enclosed in a circle.

1. Desired filter characteristic designed with the ideal gain
2. Bandwidth definition decoupled from desired filter characteristic
3. Bandwidth will be defined as difference between low-pass -3dB and high-pass -3dB frequencies of servo function