OKAWA Electric Design

English | Japanese

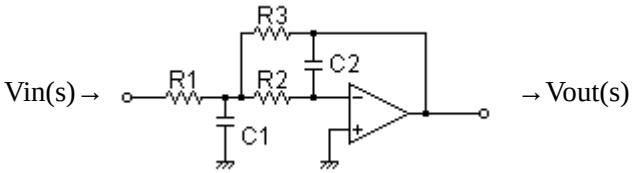
Top > Tools > Filters > Multiple Feedback Low-pass Filter Design Tool

Multiple Feedback Low-pass Filter Design Tool

This page is a web application that design a multiple feedback low-pass filter. Use this utility to simulate the Transfer Function for filters at a given frequency, damping ratio ζ, Q or values of R and C. The response of the filter is displayed on graphs, showing Bode diagram, Nyquist diagram, Impulse response and Step response.

Sample calculation

Calculate the transfer function for multiple feedback low-pass filter with R and C values



Transfer function:

$$\frac{vo}{vi} = \frac{-\frac{1}{C1C2R1R2}}{s^2 + s\frac{1}{C1}\left(\frac{1}{R1}+\frac{1}{R2}+\frac{1}{R3}\right)+\frac{1}{C1C2R2R3}}$$

R1= Ω C1= F

R2= Ω C2= F

Calculate the R and C values for the multiple feedback filter at a given frequency and Q factor

R3= Ω

p:pico, n:nano, u:micro, k:kilo, M:mega

Frequency analysis

- [x] Bode diagram
  - (•) Phase ( ) Group delay
- [x] Nyquist diagram
- [x] Pole, zero
- [x] Phase margin
- [x] Oscillation analysis

Upper and lower frequency limits:

f1= - f2= [Hz]

(frequency limits are optional)

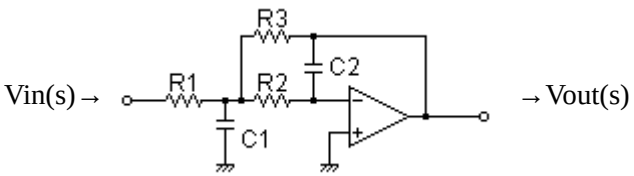
Transient analysis

- [x] Step response
- [ ] Impulse response
- [x] Overshoot
- [x] Final value of the step response

Simulation time:

0 - [sec] (optional)

Calculate



Cut-off frequency:

$$fc = \frac{1}{2\pi\sqrt{R2R3C1C2}}$$

Transfer function:

$$\frac{Vout(s)}{Vin(s)} = \frac{(2\pi f_c)^2 K}{s^2 + 2\zeta(2\pi f_c)s + (2\pi f_c)^2}$$

$$Q = \frac{1}{2\zeta}$$

$$K = -\frac{R3}{R1}$$

Ge

f_c= Hz

K= -1 at f=0Hz (K<0)

Q factor | Damping ratio ζ

○ Quality factor Q = 0.707

◉ Damping ratio ζ = 1

C1 = F C2 = F

C1, C2 is optional. But when setting these capacitances, C1 and C2 of both are needed to give following the equation

$(C2/C1) \leq \zeta^2/(1-K)$

$(C1/C2) \geq 4Q^2(1-K)$

Select Capacitor Sequence: E6

Select Resistor Sequence: E24

Frequency analysis

- [x] Bode diagram
  - (•) Phase ( ) Group delay
- [x] Nyquist diagram
- [x] Pole, zero
- [x] Phase margin
- [x] Oscillation analysis

Upper and lower frequency limits:

f1= - f2= [Hz]

(frequency limits are optional)

Transient analysis

- [x] Step response
- [ ] Impulse response
- [x] Overshoot
- [x] Final value of the step response

Simulation time:

0 - [sec] (optional)

Calculate

Filter tools

RC LPF
RC HPF
LR LPF
LR HPF
RLC LPF
RLC HPF
RLC BPF
RLC BEF
Sallen-Key LPF
Sallen-Key HPF
3rd order SallenKeyLPF
3rd order SallenKeyHPF
Multiple feedback LPF
Multiple feedback HPF
Multiple feedback BPF
3rd order Multiple feedback LPF
3rd order Multiple feedback HPF
TwinT notch
CR-2nd order Active filter LPF,HPF,BPF

Filter index