

Design And Analysis of Butterworth Sallen-Key Active Low-pass Filter Using eSim

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Theory:

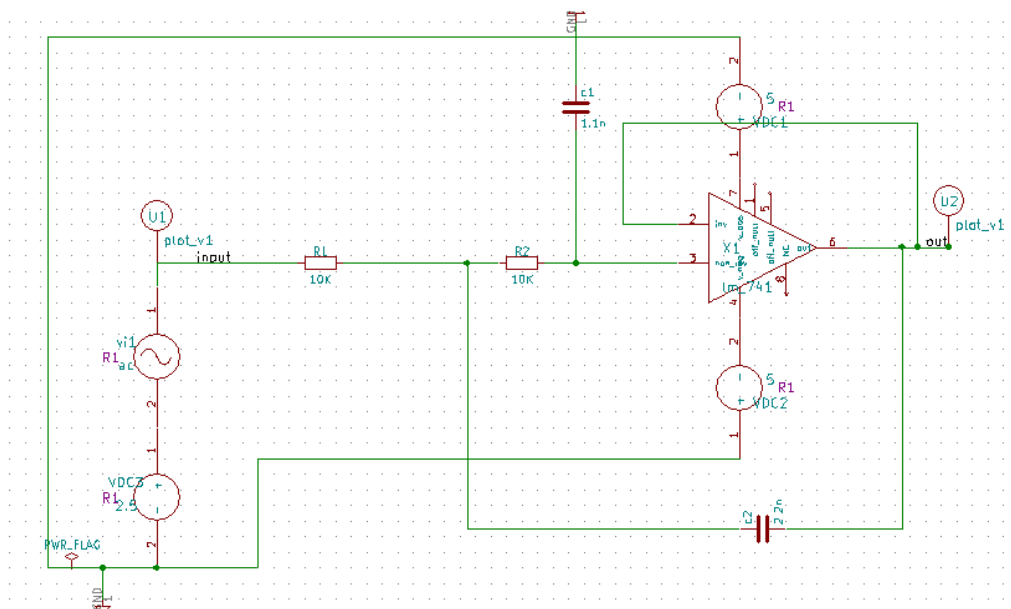
This project explores the design and functionality of a Active Low-Pass Filter. The Butterworth Sallen-Key low-pass filter is a second-order active filter. Vref provides a DC offset to accommodate for single-supply applications. A Sallen-Key filter is usually preferred when small Q factor is desired, noise rejection is prioritized, and when a non-inverting gain of the filter stage is required. The Butterworth topology provides a maximally flat gain in the pass band.

Though there are many types of filters, **Buterworth** provides maximum pass-band flatness below the cut-off frequency. And **Sallen-Key** is topology which is not sensitive to component variation at unity gain

In an **Butterworth Sallen-Key Active low-pass filter**, the circuit includes:

- Two resistors and two capacitors for defining the cutoff frequency and controlling the roll-off.
- An operational amplifier (LM-741) to provide gain and buffering, ensuring a stronger and more stable output signal.

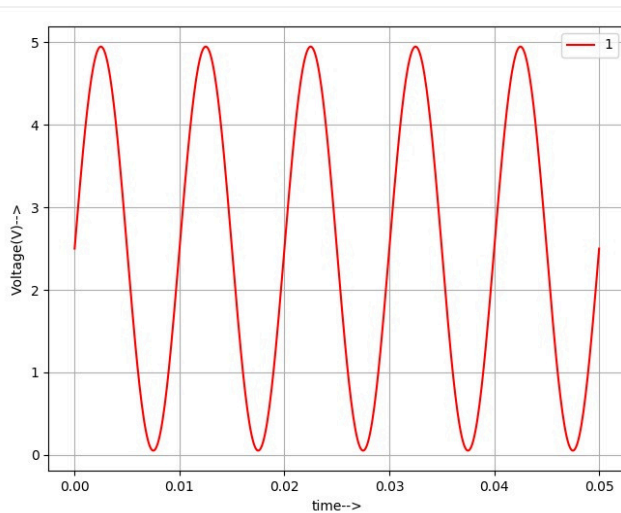
Circuit Design:



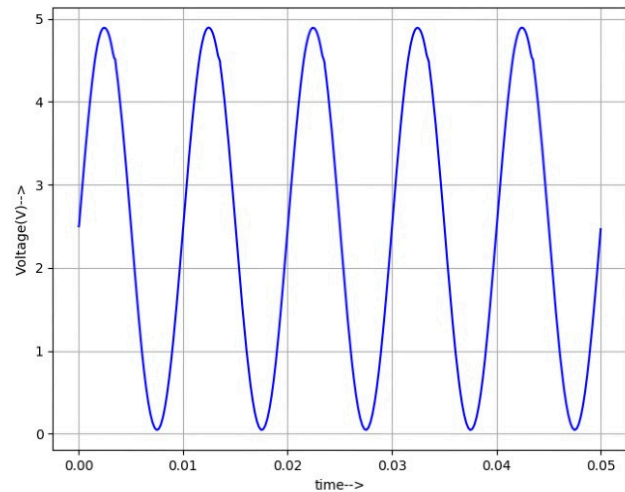
Design Simulations:

Transient Simulation Results :

The following image shows the filter output in response to 5-Vpp, 100Hz input signal (gain = 1V / V).



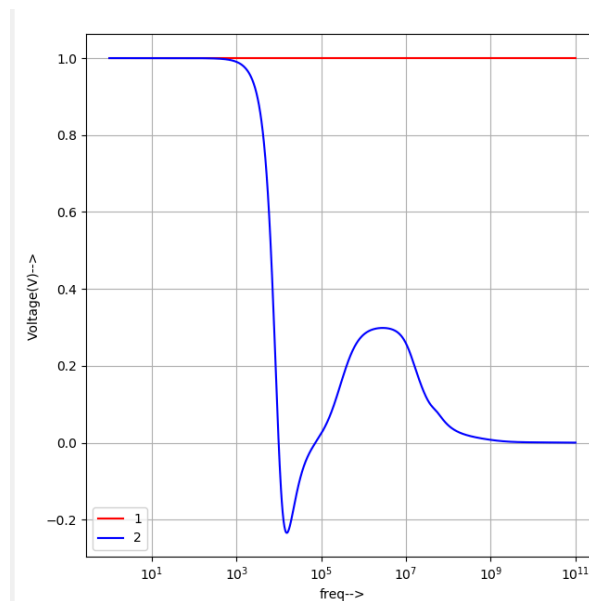
Input Wave Form



Output Wave Form

AC Simulation Results:

The following image shows the filter output response with cut-off frequency 10KHz .



1.RED : Input

2.Blue Output

References:

1. [Butterworth Sallen-key Active Low-Pass Filter](#)