

A Band Pass Filter allows a specific range of frequencies to pass, while blocking lower and higher frequencies. It passes frequencies between two cut-off frequencies while attenuating frequencies outside the cut-off frequencies.

A good application of a band pass filter is in audio signal processing, where a specific range of desired frequencies of sound are passed while blocking the rest. Another application is in the selection of a specific signal from a range of signals in communication systems.

A band pass filter may be constructed by cascading a High Pass RL filter with a roll-off frequency f_L and a Low Pass RC filter with a roll-off frequency f_H . The Lower cut-off frequency is given as: $f_L = R/2\pi L$ and the higher cut-off frequency is given as: $f_H = 1/2\pi RC$. The Band Width of the frequencies passed is given by: $BW = f_H - f_L$

- 1) Build the circuit shown in figure, preferably on your solderless breadboard.

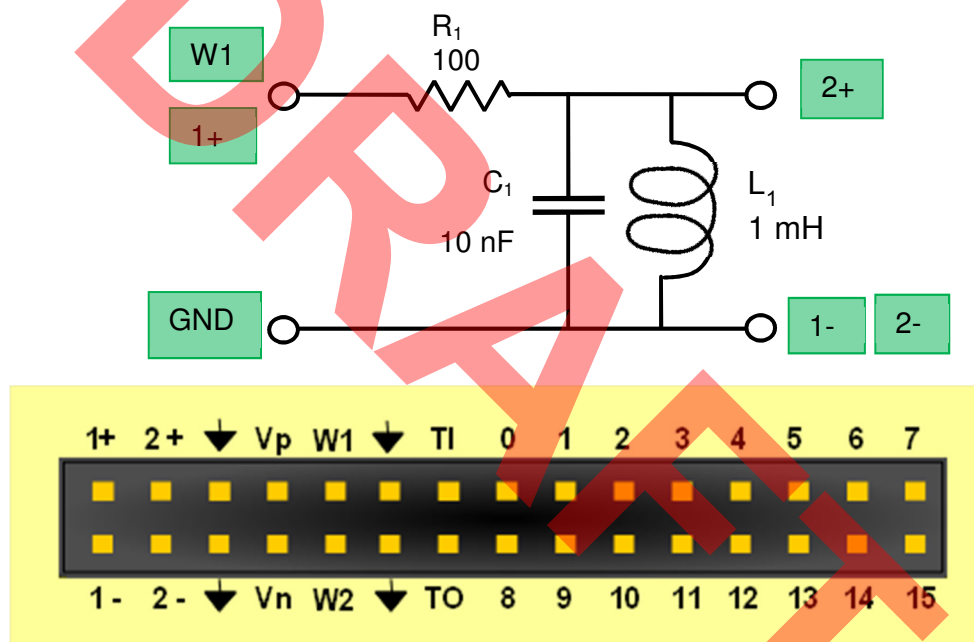
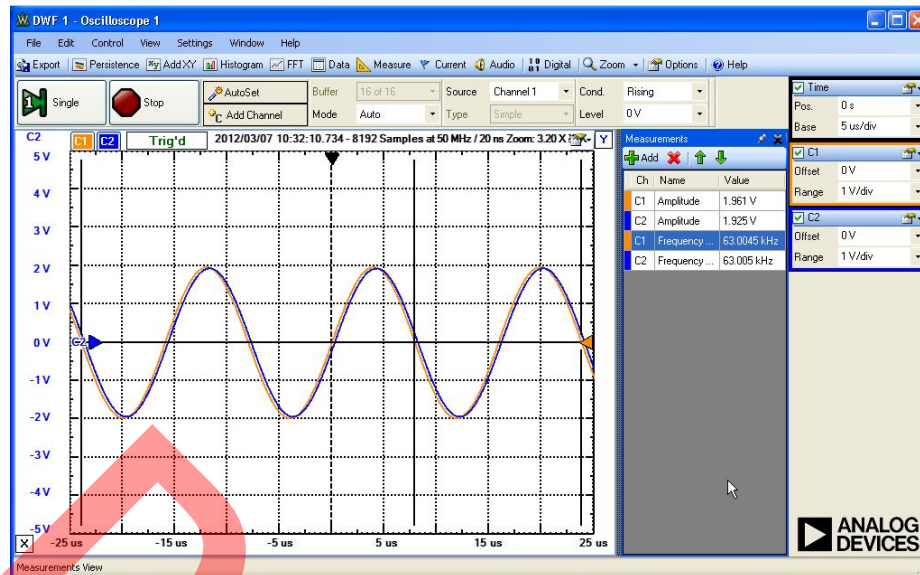


Figure 1 LC band pass filter

- 2) Connect waveform generator 1 and the two scope channels to the RC circuit as shown.
- 3) Start the Waveforms software.
- 4) Start up the WaveGen tool. In the AWG window, set the excitation signal for the band pass filter circuit: Shape = Sine, Frequency = 63KHz, Amplitude = 2V, Offset = 0V, Phase = 0. Click Run All or Run AWG1.
- 5) Start the Scope tool. Set the scope for a good view of the excitation and output signals: Trigger Mode = Auto, Trigger Source = Channel 1, Trigger Cond. = Rising, Trigger Level = 0V, Time Base = 5us/div, Channel 1 and Channel 2 Offset = 0V, Range = 1V/div. Click Run.



- 6) With the measurements display open, compute 70% of input amplitude (C1) and obtain the frequencies at which this occurs on the output signal (C2). (Note that it occurs twice on a band pass filter, near lower cutoff and near upper cutoff). This gives the 3 dB cut-off frequencies for the Band Pass filter you constructed.

Using the Bode Analyzer:

The Bode Analyzer is used to plot the frequency response of an AC circuit. It displays the Bode Plots which are the magnitude and the phase versus the frequency of a given network. The procedure is as follows:

- 1) Select the Bode Transfer Function instrument from the Miscellaneous Instruments tab in the main launcher window. Set the frequency sweep mode to Log 3 decades, and the magnitude representation to Show dB. Set the End Frequency to 1MHz, the amplitude to 2 Volts and the offset to 0V. Set the run time to 10s and the max gain to 5 dB. Hit the green Run Single button. You should see the frequency response in dB of the voltage across the inductor and capacitor.

