Schmartboard RLC Divider Board Application Examples

(Part# 710-0012-01)

The RLC Divider board was developed to easily implement passive filters and electronic networks. This is accomplished by placing the necessary components on the board and then configuring the board through the proper placement of shunts.

Following are examples of how to implement various circuits. The components that are gray are not stuffed.

Although the schematic and board component labels indicate, R, C or L, other components, such as diodes, can be used.

Circuit Simulation using LTspiceIV

Some of these examples have SPICE simulation files on the SchmartBOARD website. These use LTspiceIV which can be downloaded for free from the Linear Technology website. The following describe the setup necessary to run these files.

There are two types of simulation used in this app note.

1) Transient analysis.
   This calculates the circuit response to various transient waveforms such as a pulse, pulses, square waves, triangle waves etc. The output is similar to what would be seen when observing the various points in the circuit when using an oscilloscope.
2) Frequency analysis.
   This calculates the general frequency response of the circuit. The output is a BODE plot as would be seen when using a spectrum analyzer. It shows the gain and phase response to a swept frequency sine wave input.

Installing and Running LTspiceIV

First download the LTspiceIV from http://www.linear.com/solutions/ltspice

Install LTspiceIV by double clicking on the downloaded .exe file

Once it is installed, it will ask if you want to update it. Answer Yes.

The simulation files included with this app note can then be run either by opening the .asc simulation file or by opening it from within LTspice.

Once the simulation file is opened, select **Run** in the **Simulate** menu.

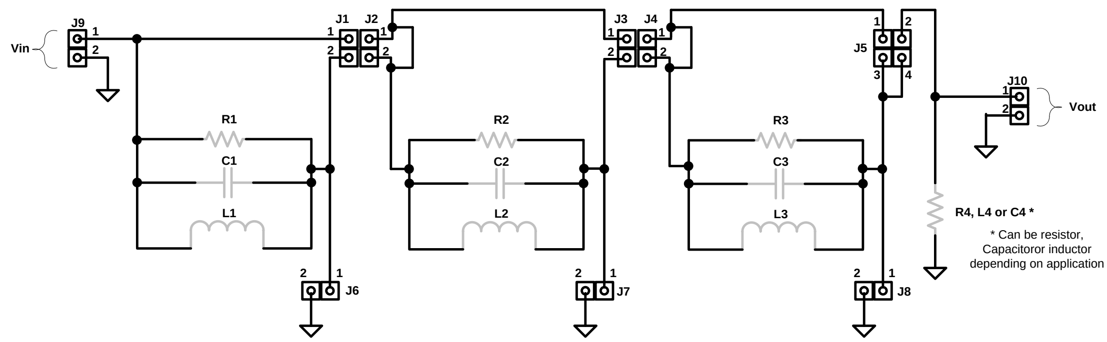
After the simulation is finished, an oscilloscope looking window will pop up if a transient analysis is run or a spectrum analyzer looking window will open if it is an AC analysis is run. In either case, click the cursor on the point in the circuit that you want to see. That waveform results at that point in the circuit will show up in the appropriate window.

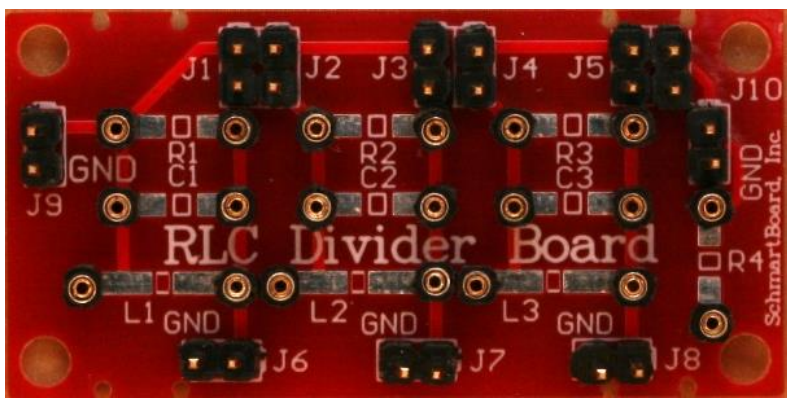
There will be one or two type of simulation files for most applications. For transient simulation, the last four letters in the filename will be TRAN and for AC simulation the last two letters in the filename will be AC.

For example,
1KHZHighPassFilterwTermTRAN.asc is a simulation file for a transient simulation,
1KHZHighPassFilterwTermAC.asc is a simulation file for AC analysis.

Basic RLC Divider Board Schematic

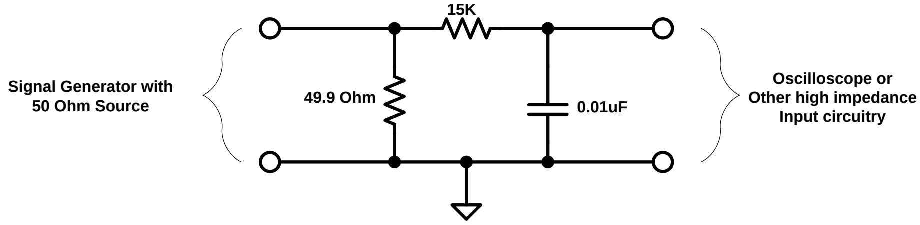
This is the basic schematic of the RLC board and a photo of a blank board.



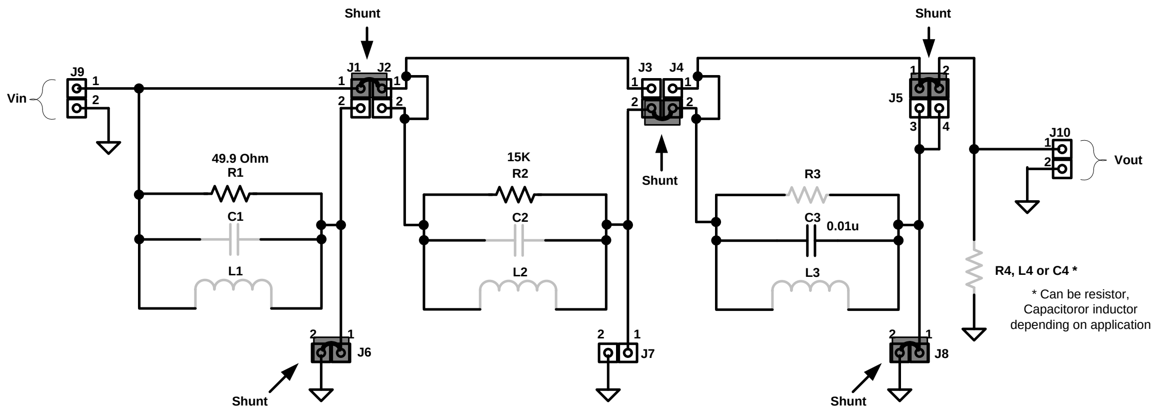


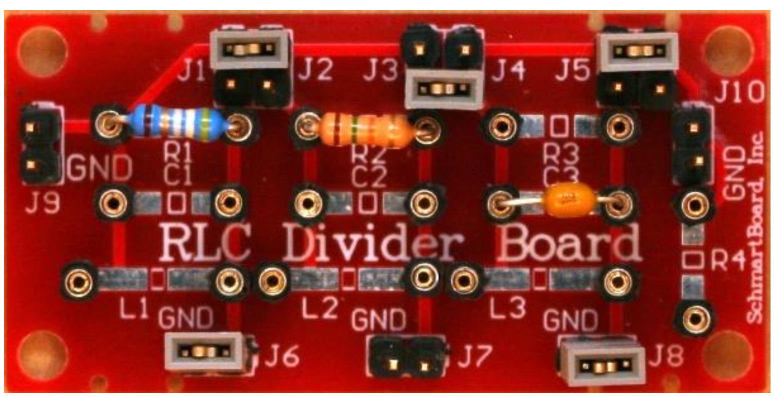
Example of 1KHz low pass filter with 50 Ohm input termination

LTspiceIV source file name is,
1KHZLowPassFilterwTermAC.asc
1KHZLowPassFilterwTermTRAN.asc



Circuit to be implemented
1KHz low pass filter with 50 ohm input termination.





Implementation of 1KHz low pass filter with 50 Ohm input termination.

Example of 1KHz high pass filter with 50 Ohm input termination

LTspiceIV source file name is,
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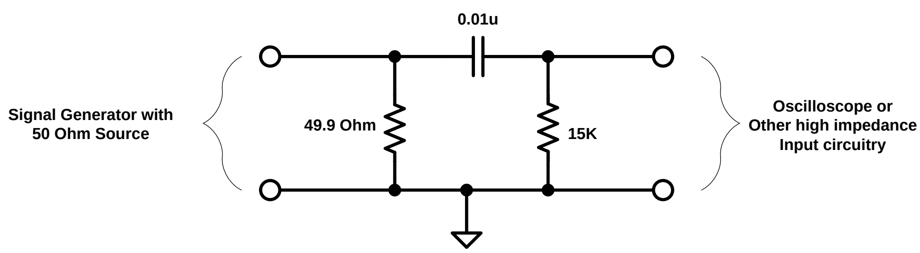
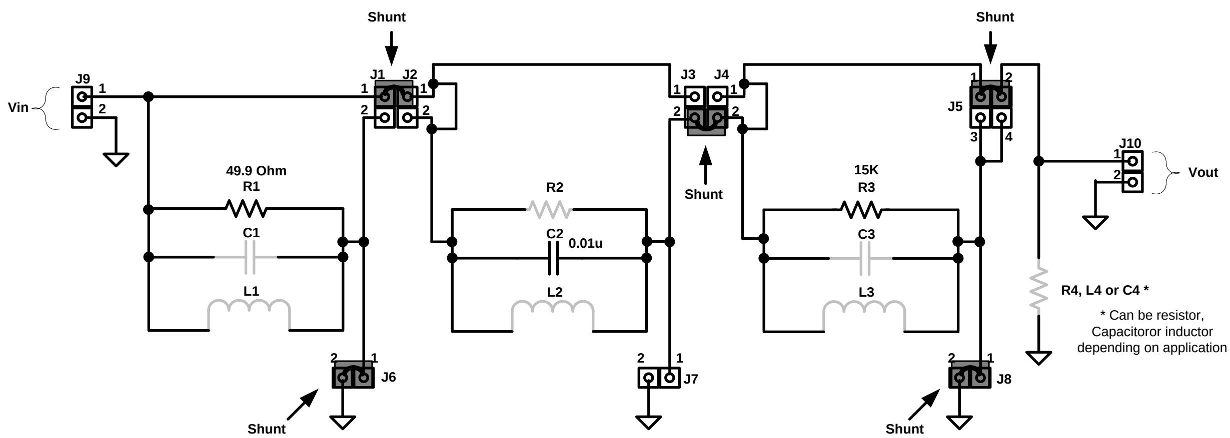
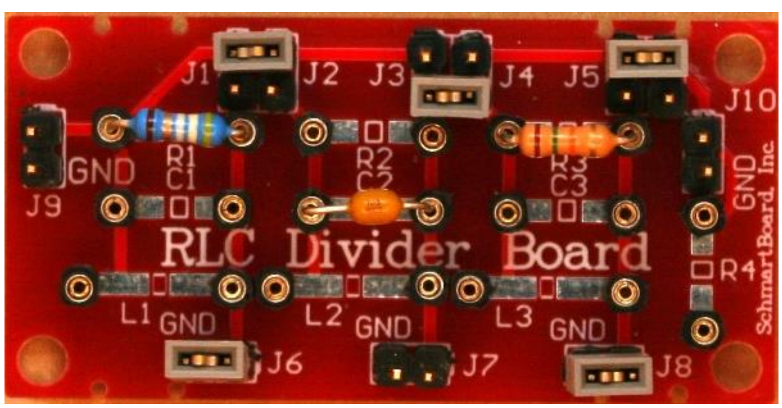
1KHZHighPassFilterwTermTRAN.asc



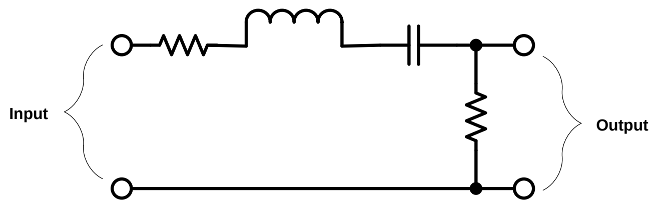
Circuit to be implemented
1KHz high pass filter with 50 ohm input termination.





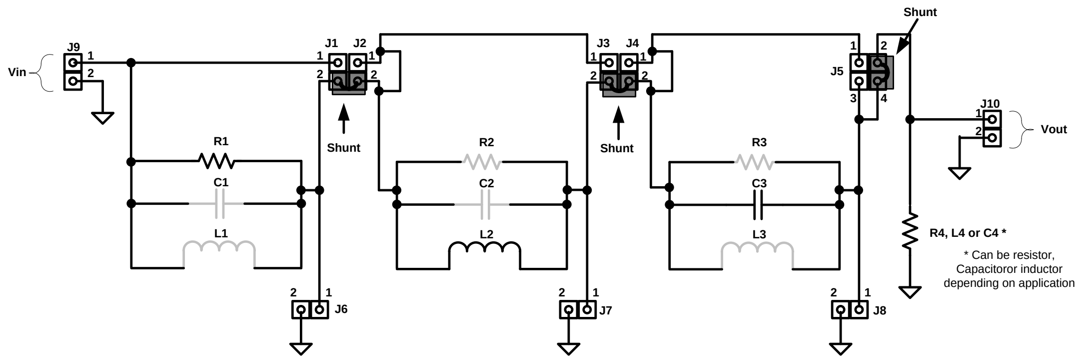
Implementation of 1KHz high pass filter with 50 Ohm input termination.

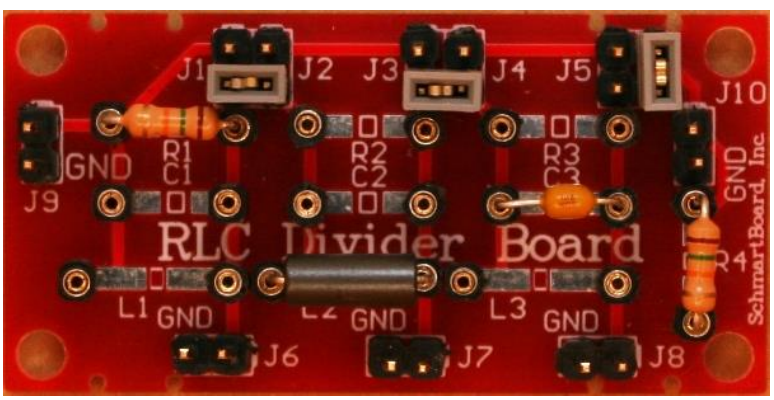
Example of generic RLC filter



Circuit to be implemented
Generic RLC filter

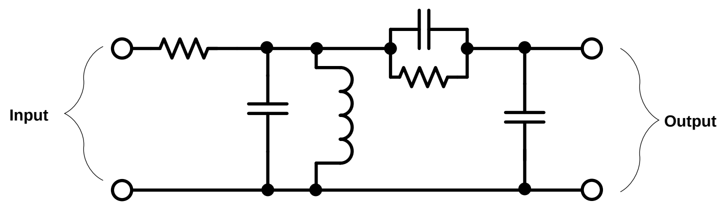
Implementation of generic RLC filter.





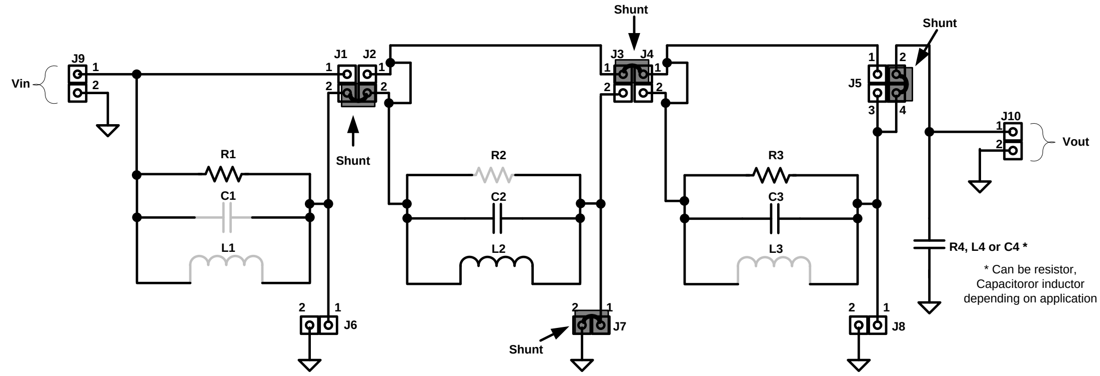
Implementation of generic RLC filter.

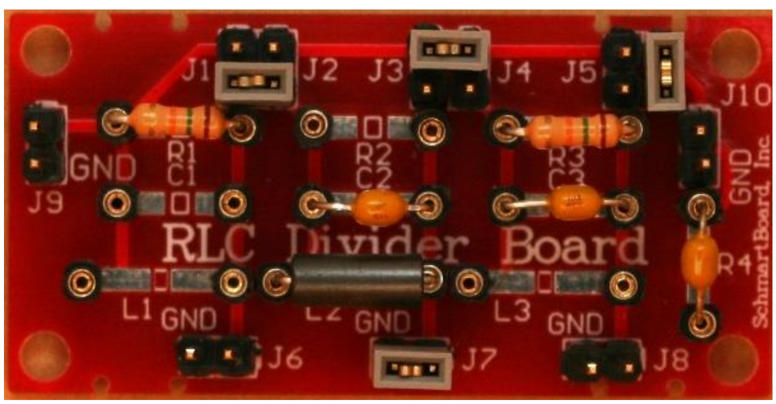
2nd Example of generic RLC filter



Circuit to be implemented
RLC filter

<u>Implementation of 2nd generic RLC filter.</u>



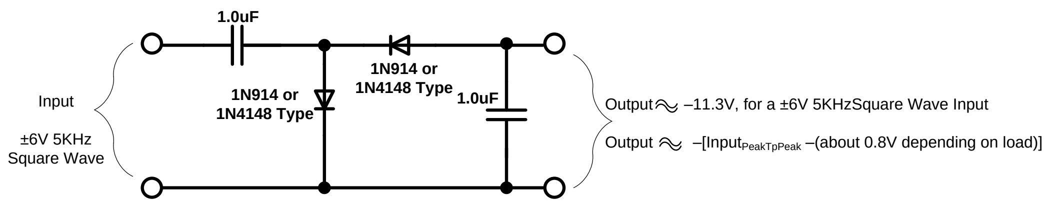


2nd example of implementation of generic RLC filter.

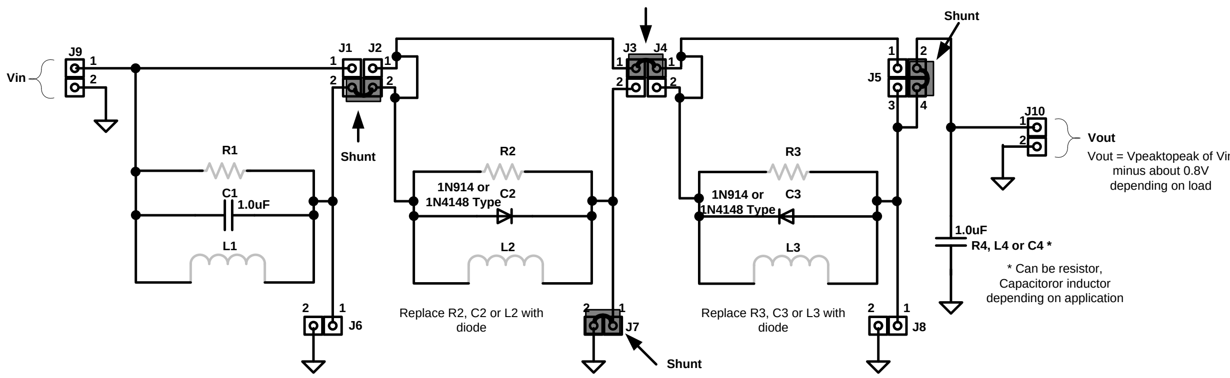
Example of generating a negative voltage using capacitors and diodes

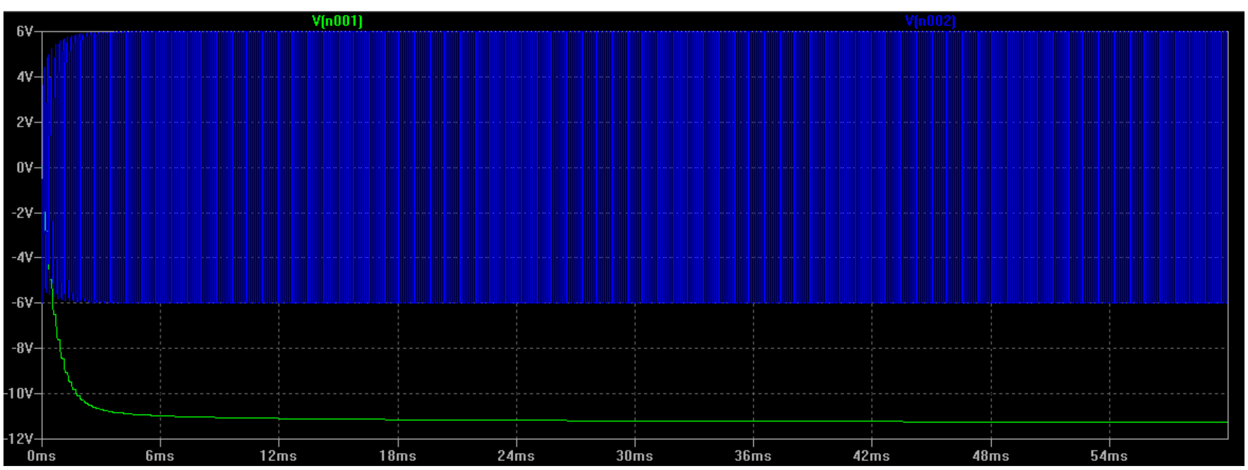
This circuit does not provide a lot of output current but it can power the negative supply of an op-amp.

LTspiceIV source file name is,
NegativeVusingCapDiodeTRAN.asc



<u>Implementation of generating a positive voltage using capacitors and diodes.</u>



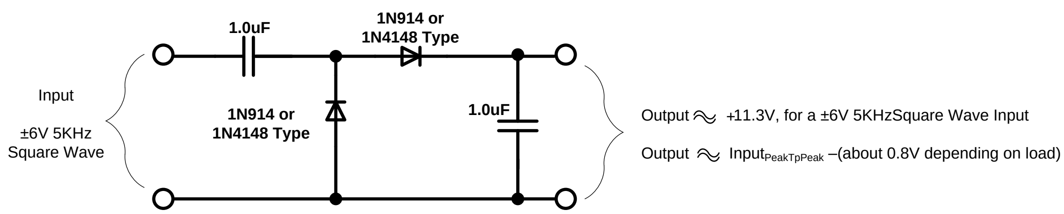


Simulation results. Green is the output and blue is the input. Input is a ±6V 5KHz square wave.

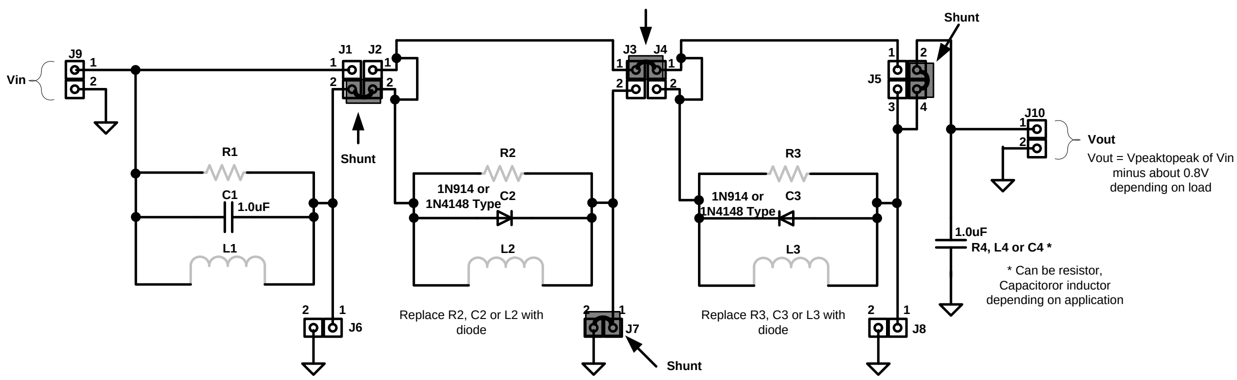
Example of generating a positive voltage using capacitors and diodes

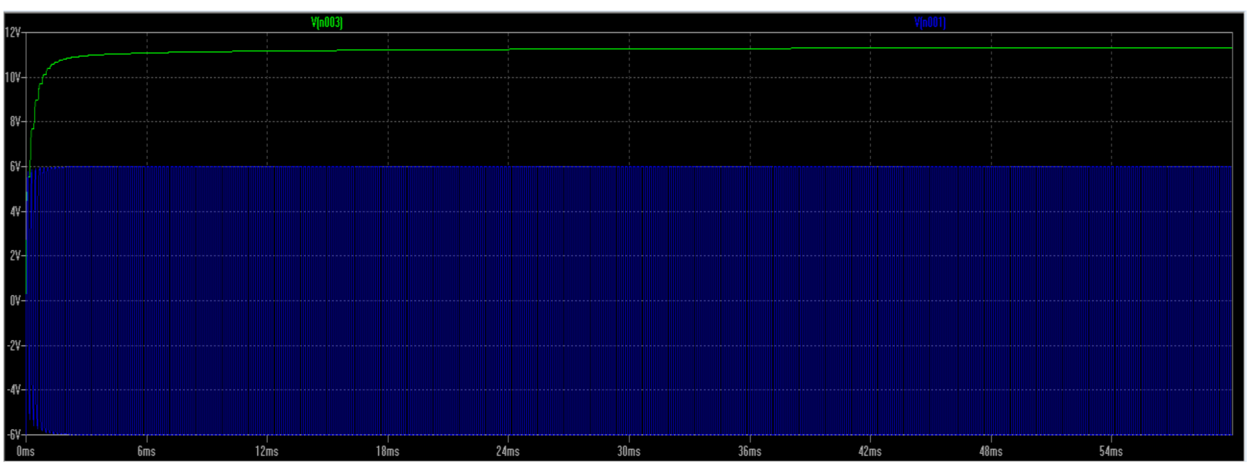
This circuit does not provide a lot of output current but it can power the positive supply of an op-amp.

LTspiceIV source file name is,
PositiveVusingCapDiodeTRAN.asc



Implementation of generating a positive voltage using capacitors and diodes.





Simulation results. Green is the output and blue is the input. Input is a ±6V 5KHz square wave.

Electronics For Everyone

SchmartBOARD™

Schmartboard, Inc.
37423 Fremont Boulevard
Fremont, CA 94536
510-744-9900 (Phone)
510-744-9909(Fax)
info@schmartboard.com
www.schmartboard.com
www.facebook.com/schmartboard
www.twitter.com/schmartboard