EXPERIMENT NO: 1

Author: Gaurav Supal, Vineeta Parmar
Date: March 2, 2016

Aim:

Analysis of Fullwave Bridge rectifier using eSim.

Theory:

Bridge Rectifier of single phase rectifier uses four individual rectifying diodes connected in a closed loop bridge configuration to produce the desired output. The main advantage of this bridge circuit is that it does not require a special centre tapped transformer, thereby reducing its size and cost. The single secondary winding is connected to one side of the diode bridge network and the load to the other side.

The four diodes are arranged in series pairs with only two diodes conducting current during each half cycle. As the current flowing through the load is unidirectional, so the voltage developed across the load is also unidirectional, therefore the average DC voltage across theload is 0.637 Vmax. However in reality, during each half cycle the current flows through two diodes instead of just one so the amplitude of the output voltage is two voltage drops (2 x 0.7 = 1.4 V) less than the input Vmax amplitude. The ripple frequency is now twice the supply frequency (e.g. 100 Hz for a 50 Hz supply)

Procedure:

1. Create the schematic of the Fullwave Bridge Rectifier as shown in Figure-1.
2. Annotate the schematic.
3. Test Electric rules.
4. Generate the netlist.
5. Insert analysis for transient analysis from 0 to 100 ms with a step time of 10 ms.
6. Insert Source Details.
7. Add D.lib model in Device Modeling.

8. Convert KiCad netlist to Ngspice netlist.
9. Simulate the Ngspice netlist using Ngspice simulator.

Source Parameters:

Following are the input sine wave parameters:

1. Enter Offset Value- 0
2. Enter Amplitude - 5
3. Enter Frequency- 50
4. Enter Delay Time- 0
5. Enter Damping Factor- 0

Schematic Diagram:

The circuit schematic of fullwave bridge rectifier in eSim is as shown below:

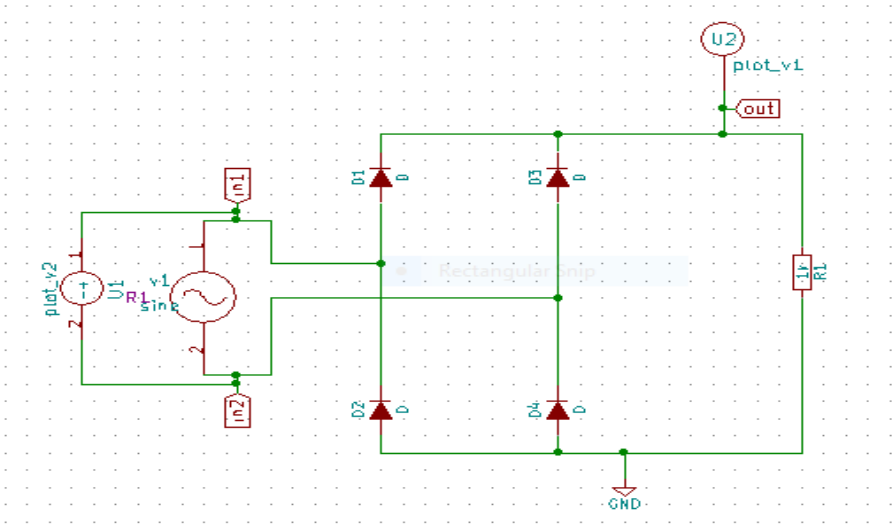

Figure 1: Fullwave Bridge Rectifier

Simulation Results:

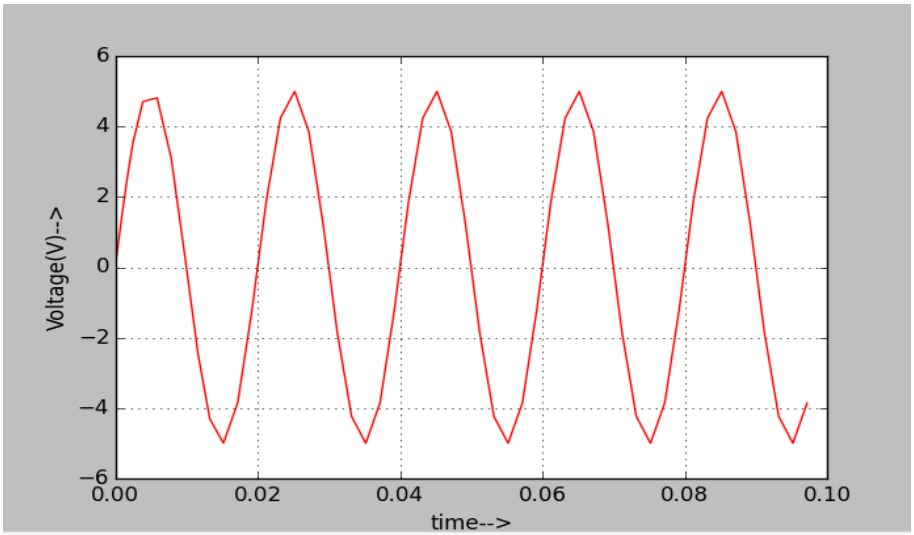

Figure 2: Python Plot Input

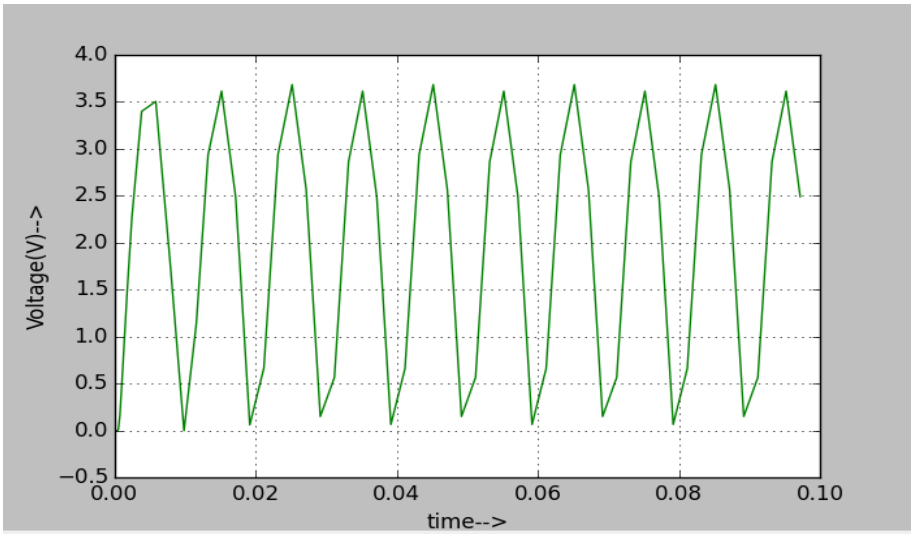

Figure 3: Python Plot Output

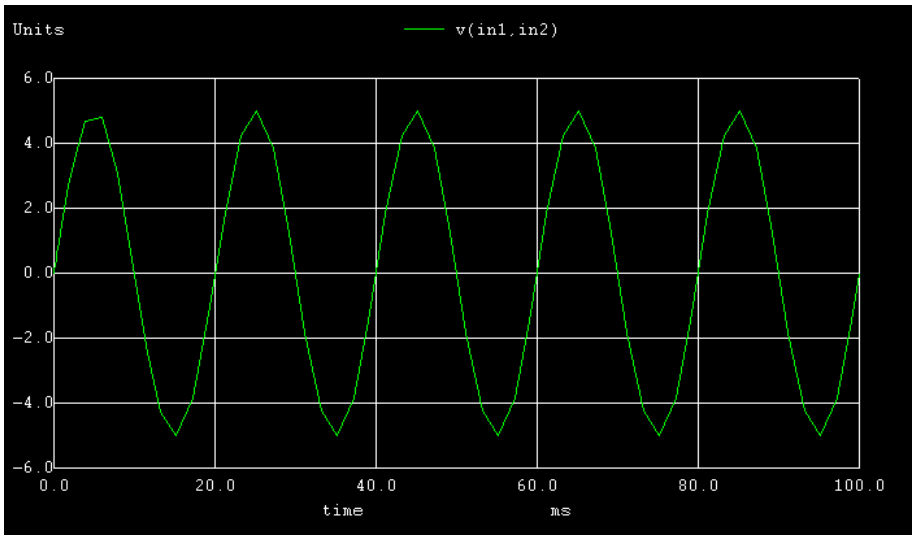

Figure 4: Ngspice Plot Input

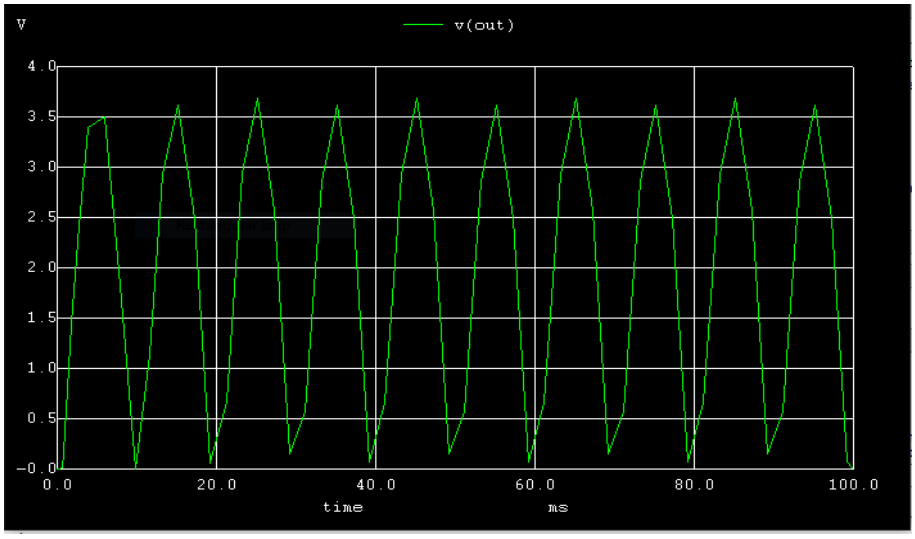

Figure 5: Ngspice Plot Output

Conclusion:

Thus, we have studied the Fullwave Bridge rectifier using eSim and we get the appropriate waveforms.

References:

http://www.electronics-tutorials.ws