PLECS

DEMO MODEL

Diode Rectifier

Last updated in PLECS 4.3.1

1   Overview

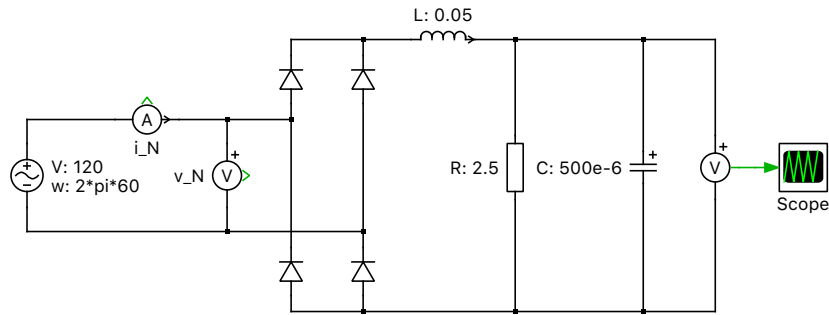This example shows a single-phase full-wave diode rectifier.

Figure 1: Diode rectifier

2   Electrical model

A diode rectifier is used for AC/DC conversion and allows the flow of current only in the direction of input to output. A full-wave rectifier converts both the positive and negative halves of the sinusoidal input waveform into positive half waves of the same waveform, essentially yielding the absolute magnitude of the AC input. An output filter is then required to condition the output to be DC. In reality the output contains a certain amount of ripple, but filtering can achieve a specific target of reduced high frequency distortion. The output voltage is calculated by:

$$V_{\text{out}} = \frac{2 \cdot V_{\text{peak}}}{\pi}$$

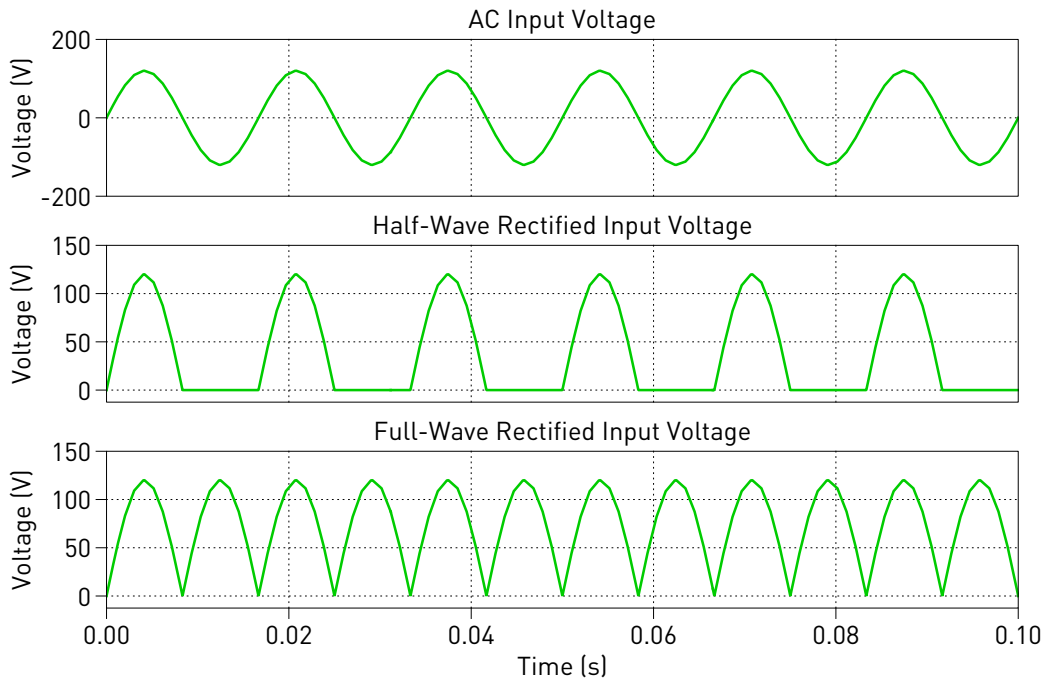where V_{peak} is the amplitude of the AC voltage.

Figure 2: Diode Rectifier Scope

Single-phase rectifiers supplying inductive loads will draw chopped currents from the source and return undesired reactive power back into the grid. Power factor correction (PFC) is done to keep the phase difference between the source side voltage and current to a minimum. A demonstration of a single-phase full-wave diode rectifier with power factor correction is given in the demo model "Single-Phase Diode Rectifier with PFC" in the PLECS demo models library.

3 Simulation

Run the simulation with the model as provided to view the signals and verify that the load voltage

$$V_{\text{out}} = \frac{2 \cdot V_{\text{peak}}}{\pi} = \frac{240 \cdot V}{\pi}$$

or approximately $76\,\text{V}$. Observe that the full-wave rectifier uses the entire AC waveform. Double the capacitance value and observe the reduced ripple in the output voltage. Also notice that the input current is a chopped waveform and that the diode pairs conduct when their anode voltage (AC input side) is higher than their cathode voltage (rectified DC side).

Revision History:

PLECS 4.3.1   First release

How to Contact Plexim:

PLECS Demo Model