

PLECS

*DEMO MODEL*

## Diode Rectifier

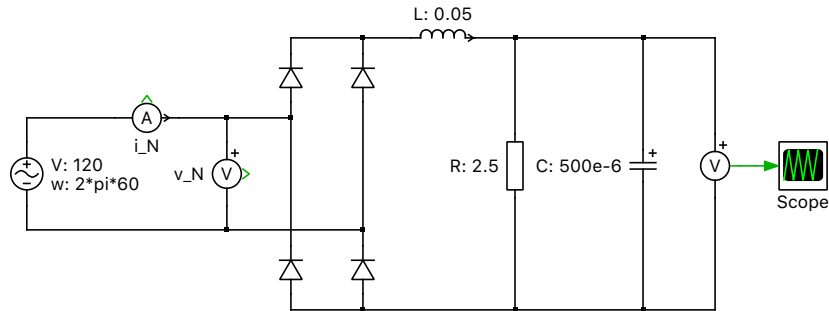
Last updated in PLECS 4.3.1

[www.plexim.com](http://www.plexim.com)

- ▶ Request a PLECS and PLECS Coder trial license
- ▶ Get the latest RT Box Target Support Package
- ▶ Check the PLECS and RT Box documentation

# 1 Overview

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



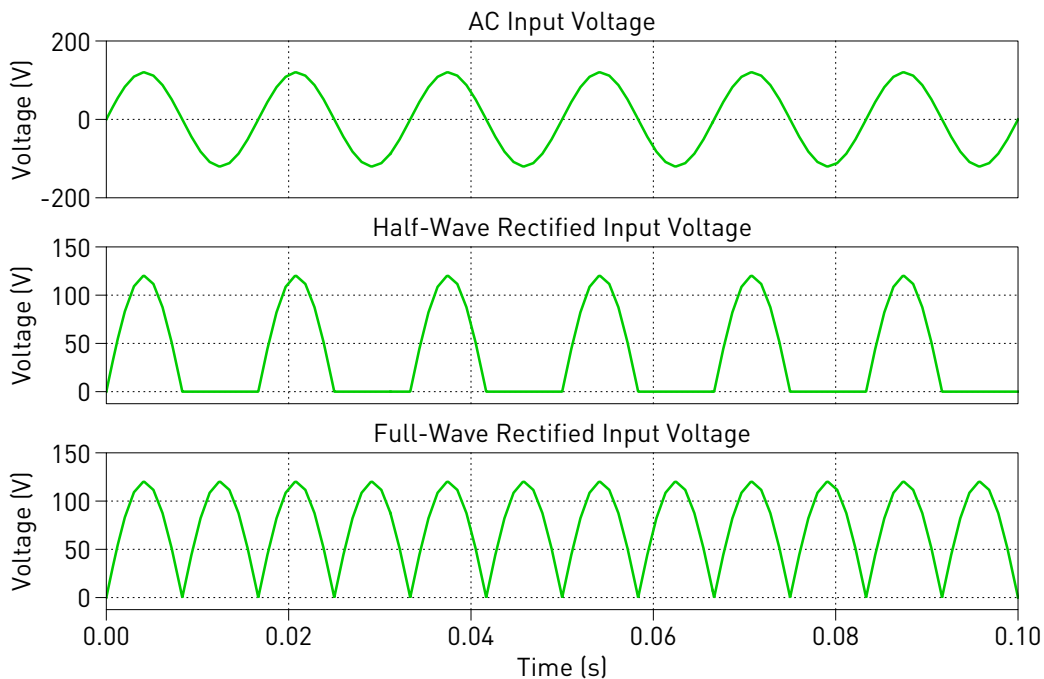
**Fig. 1: Diode rectifier**

## 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  $V_{\text{peak}}$  is the amplitude of the AC voltage.



**Fig. 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".

### 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 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:

+41 44 533 51 00	Phone
+41 44 533 51 01	Fax
Plexim GmbH Technoparkstrasse 1 8005 Zurich Switzerland	Mail
info@plexim.com	Email
<a href="https://www.plexim.com">https://www.plexim.com</a>	Web

## *PLECS Demo Model*

© 2002–2026 by Plexim GmbH

The software PLECS described in this document is furnished under a license agreement. The software may be used or copied only under the terms of the license agreement. No part of this manual may be photocopied or reproduced in any form without prior written consent from Plexim GmbH.

PLECS is a registered trademark of Plexim GmbH. MATLAB, Simulink and Simulink Coder are registered trademarks of The MathWorks, Inc. Other product or brand names are trademarks or registered trademarks of their respective holders.