



PLECS

*DEMO MODEL*

## Buck-Boost Converters

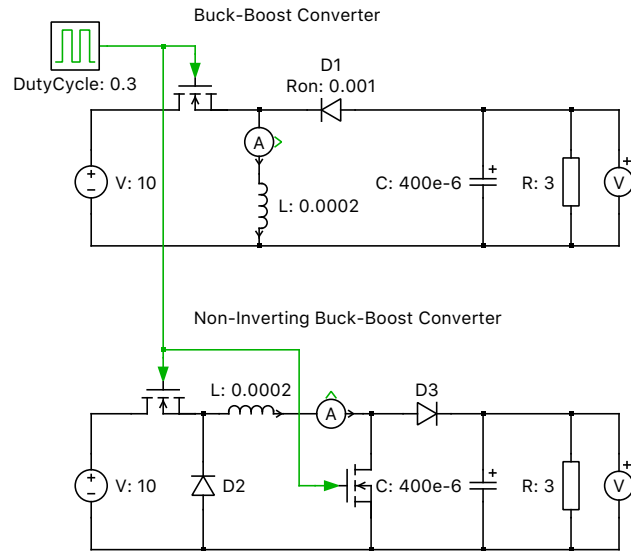
Last updated in PLECS 4.3.1

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# 1 Overview

This demonstration shows an inverting and a non-inverting buck-boost converter, both unregulated.



**Fig. 1: Buck-boost Converter**

## 2 Electrical model

The buck-boost is a DC/DC converter which can be configured to produce an output voltage either lower or higher than the input voltage. Two different topologies exist: one has an inverting output where the polarity is the opposite the input, and the second maintains the same polarity at the output as at the input.

The inverting buck-boost converter has an ideal transfer function of:

$$\frac{V_{\text{out}}}{V_{\text{in}}} = \frac{-D}{1-D}$$

where  $D$  is the duty cycle.

This means that a duty cycle value of 0.5 will create a unity gain of 1 with opposite polarity, and values higher or lower than 0.5 will step-up or step-down the output voltage, respectively.

The second topology is essentially a buck converter followed by a boost converter, where a single inductor is shared by both and connects the two in series. The ideal transfer function is the same, except that the non-inverting buck-boost converter will produce an output polarity consistent with that of the input.

## 3 Simulation

The first Scope shows the output voltage and the source current for the regular converter and the second Scope for the non-inverting converter. As the circuits have the same passive component parameters, the currents in the inductor are shown to be the equal while the output voltages are of opposite polarity.

## Revision History:

PLECS 4.3.1      First release

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