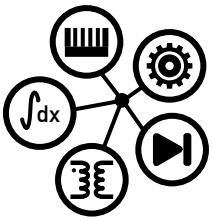

PLECS

DEMO MODEL

Buck-Boost Converters

Last updated in PLECS 4.3.1

1 Overview

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

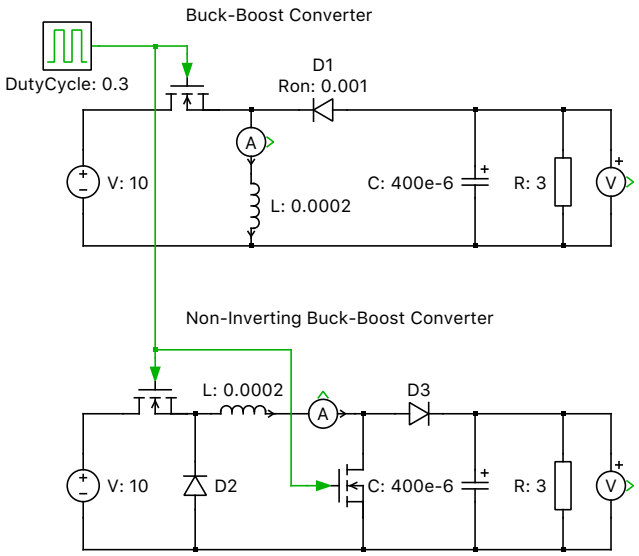

Fig. 1: Buck-boost Converter

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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PLECS Demo Model