DC/DC Boost Converter Module, 250W

User Manual

Model XDC-250W

Rev 1.1

Xkitz Electronics

Features

- Regulated, adjustable 250W DC/DC boost converter
- Converts a low voltage on the input to a higher voltage on the output
- Output voltage is adjustable 7V–33V DC, up to 8 Amps
- Two phase DC/DC converter circuit to provide clean, quiet, solid output voltage – optimized for audio applications
- Designed to be used stand-alone, or as a DC/DC converter module in a larger system
- Adjustable output voltage controlled by on-board trim pot
- Output voltage On/Off can be controlled by:
  - Jumper or external switch
  - Programmatically controlled by a PIO pin
- Input voltage: 7V–30V DC
- Applications
  - Voltage step-up for portable or car audio amplifiers
  - Robotics power supply
- Dimensions: 1.75" x 1.75" x 1" High (44mm x 44mm x 25mm)
- Weight: 1oz

Basic Stand-Alone Operation

In normal stand-alone configuration the connections and operation are simple:

- Connect the input voltage 7V-30V DC to the 'VIN(+)' and 'VIN(-)' terminals
- Connect your DC load to the terminals marked 'HV_OUT(+)' and 'HV(-)'
- Adjust the output voltage with the on-board trim-pot
- The green LED indicates when the HV-OUT output voltage is ON
- A Power On/Off switch can be connected to the pins 2-3 of jumper J2

Programmable DC/DC Power Supply Module

For use as a modular power supply integrated into a larger system, the XDC-250W has two modular connector footprints. These connectors are not populated by default and must be soldered in place if you want to use them. These connectors provide signals to control the HV_OUT On/Off, and connections to all of the power rails and ground. Through use of the signals on these connectors, an external micro controller can control the output voltage on/off state. All voltage connections on the terminal posts are also available on the modular connectors, so there is no need for wiring to the terminals when modular configuration is in use.

Voltage Adjustment

The trim-pot on the board controls the output voltage. Turn the pot counter-clockwise to reduce the voltage, clockwise to increase the voltage. The voltage can be adjusted between 7V and 33V, but the output voltage cannot go lower than the input voltage. So, for example, if the input voltage is 12V, the output voltage will have a range of 12V-33V.

LED Indicators

The Green LED indicates when the HV-OUT DC/DC converter voltage is ON

HV OUT Output Voltage On/Off Control

The HV_OUT On/Off state can be controlled with jumper J2 (see diagram below):

- Removing the jumper shunt will disable the HV_OUT output voltage
- Inserting the shunt across J2 pins 2 and 3 will enable HV_OUT
- Inserting the jumper shunt across J2 pins 1 and 2 will allow the HV_OUT On/Off state to be controlled by modular connector J3 pin 5. Apply 3.3V to enable HV_OUT, 0V to disable. Higher voltages can be used as well, provided an appropriate current limiting resistor is wired in series to limit the current to 25mA. (e.g. for 12V control, add a 470 ohm resistor in series with HV_EN).

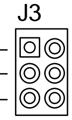
For remote control of the HV-Out ON/OFF control, you can wire a switch between jumper J2 pins 2 and 3.

Modular Connector Pin-Outs

When the XDC-250W is used as a DC/DC converter module integrated into a larger system, two modular connectors are used to connect to the system. One 6 pin connector, J3, and one 8 pin connector, J4. These are standard dual-inline header type connectors, with 0.1" pitch (2.54mm). The square shaped pad is pin 1. See Fig. 2 'Dimensions' diagram below for precise X,Y locations of these connectors for PCB layout footprints.

J3

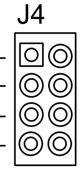
Pin	Signal	Description
1	Reserved	No not connect
3	Reserved	Do not connect
5	HV_EN	HV_OUT Enable, 3.3V at 25mA enables the HV_OUT



Pin	Signal	Description
2	GND	Connect to system ground
4	GND	"
6	GND	"

J4

Pin	Signal	Description
1	HV-OUT(+)	DC/DC Converter Output Voltage
3	GND	Connect to system ground
5	GND	"
7	VIN(+)	VIN plus connection



Pin	Signal	Description
2	HV-OUT(+)	DC/DC Converter Output Voltage
4	GND	Connect to system ground
6	GND	"
8	VIN(+)	VIN plus connection

DC/DC Boost Converter Specs

The DC/DC boost converter employs a unique two-phase design, which gives a much cleaner output voltage compared to a standard single phase converter. It also reduces the output capacitance requirement, since the converter can respond very quickly to changes in load current, like those caused by powerful audio transients. For these reasons, this converter is very well suited for audio applications.

- Output Voltage: Adjustable from 7V-33V
- Output Current: 8 Amps Max.
- Output Power 250W Max.
- Operating frequency: 500Khz, far above audible frequencies
- Efficiency: > 95%

The DC/DC boost converter gives the added benefit of keeping the output voltage constant as the input voltage drops, as is often the case in battery powered applications. If you power your system directly from the battery, you'll see that the voltage drops as the battery drains. For example, a 14.8V Li-Ion battery starts out at about 16.8V on a full charge, but it drops to under 13V when fully discharged. But with the XDC-250W if you set the output to 30V, it will remain rock solid at the 30V until the battery is completely drained and shuts off.

<u>Input Current vs. Output Current</u>

As the output voltage is stepped up, the available output current is reduced proportionally. E.g. if the input voltage is 10V DC and can source a max of 1 amp, and the output voltage is set to 20V, the max output current available will be approximately 0.5 amp. You also have to factor in the power lost in the conversion process, which is referred to as the 'efficiency' of the converter. The XDC-250W has an efficiency of about 95%, so the actual output current available in the above example would be 0.5 amp * 0.95 = 0.475 amp.

You can calculate the input current that would be required for a given output current as follows:

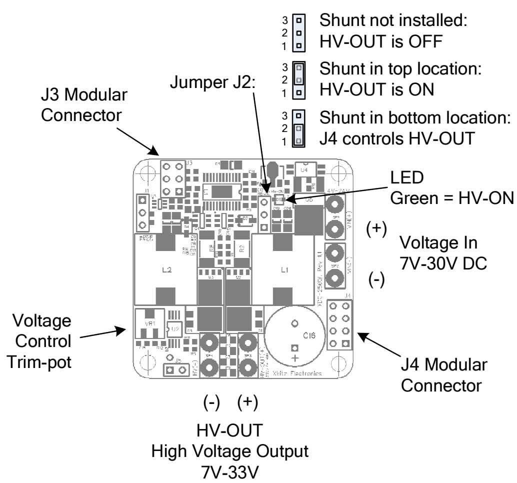
Input Current = (Output Current * Boost Factor) / 0.95

For example, if you need an output voltage at 28V that can source 4 amps, and your input voltage is 12V:

The Boost factor is: 28 / 12 = 2.33 (divide the output voltage by the input voltage)

The input current that would be required is: (4 * 2.33) / .95 = 9.8 amps

Figure 1. Board Connections



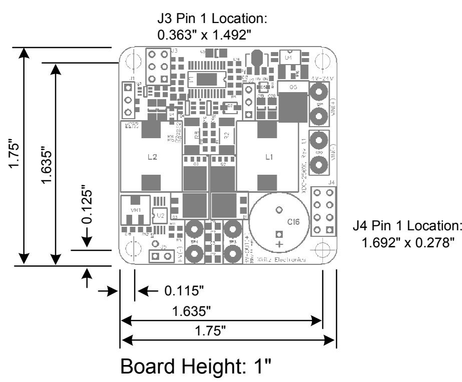


Figure 2. Board Dimensions