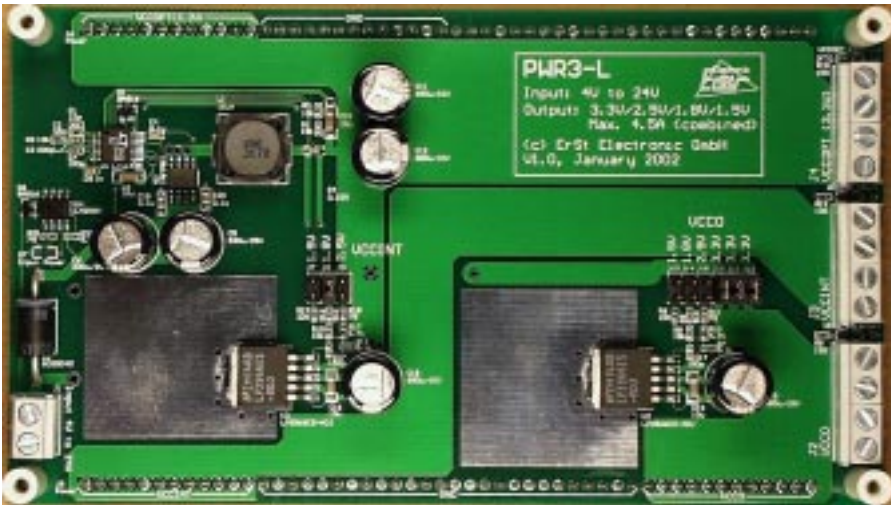


Power Module PWR3-L

User Manual







Manual Version: PWR3-L Version 1.0 February 2002

This manual describes the technical properties and the usage of the following products:

Power Module PWR3-L: Version 1.0 January 2002

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Important Note:

The power module PWR3-L has been designed and tested exclusively for the usage as a development tool. In particular, strong electromagnetic radiation may be produced.

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1 Introduction

The PWR3-L power supply module is a lower cost alternative to the PWR3, lacking some features that are only very rarely used. In particular, there are no longer eight individual reference voltages, there are no 5V and adjustable output voltage options and the total (sum of all outputs) output current is limited to 4A.

The output current capability is sufficient to supply one EVAL-series board with a Virtex-E, Virtex, Spartan-II-E or Spartan-II FPGA device. Depending on the power consumption of the implemented hardware design, supplying more than one board is possible.

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2 Overview

2.1 Key Features

- Input power supply voltage range 5 - 24V
- Linear regulator for VCCINT (1.5V, 1.8V or 2.5V)
- Linear regulator for VCCO (1.5V, 1.8V, 2.5V or 3.3V)
- Switching regulator for 3.3V (VCCOPT)
- Output voltages selectable with jumper
- All regulators are protected against short circuits
- The linear regulators are protected against thermal overload
- Max. 4A load current combined for all output voltages
- Min. 2A load current available on linear regulator outputs
- All output voltages available on header connectors and power connectors
- Output power sufficient for one or more EVAL-series board module(s)
- Specially made to be stacked with EVAL board modules for Spartan-II, Spartan-IIE, Virtex and Virtex-E
- Board dimension 86mm x 150mm



Absolute Maximum Ratings

Symbol	Description		Unit
V_{IN}	Input voltage ¹⁾	-24 ... 24	V
$I_{OUTVCCINT}$	Output current for VCCINT ²⁾	3	A
$I_{OUTVCCO}$	Output current for VCCO ²⁾	3	A
$I_{OUTVCCOPT}$	Output current for VCCOPT ³⁾	4.5	A
$T_{SHORTOUT}$	Duration of output voltage short circuit against ground ⁴⁾	Continuous	
T_{AMB}	Ambient temperature ⁵⁾	0 ... 70	°C

Note 1): The input is protected with a series diode. A reversed input voltage should not cause any harm to the device.

Note 2): This is the maximal output current of the linear regulator. The regulator circuit is thermally and short circuit protected. It shuts down if the power dissipation exceeds its limit.

Note 3): This is the maximal output current of the switching regulator. The regulator circuit is short circuit protected and shuts down if the current load exceeds its limit.

Note 4): One output at a time.

Note 5): The maximal possible output current is reduced at high ambient temperatures.

Recommended Operating Conditions

Symbol	Description		Unit
V_{IN}	Input voltage	5 ... 24	V
$I_{OUTVCCINT}$	Output current for VCCINT ¹⁾	2	A
$I_{OUTVCCO}$	Output current for VCCO ¹⁾	2	A
$I_{OUTVCCOPT}$	Output current for VCCOPT ¹⁾	4	A
T_{AMB}	Ambient temperature	0 ... 40	°C

Note 1): Continuous operation without additional cooling at 25 °C. The sum of all output currents should not exceed 4A.

Typical Performance ($V_{IN} = 12V$, $T_{AMB} = 25$ °C unless otherwise noted)

Description	Condition		Unit
Output ripple voltage (V_{p-p}) on VCCOPT (3.3V)	$I_{OUT} = 4A$	20	mV
Quiescent current		40	mA
Efficiency of switching regulator	$V_{OUT} = 3.3V$, $I_{OUT} = 4A$	83	%
Output voltage tolerance		4	%



2.2 Function Description

The power module PWR3-L generates three regulated output voltages from a single unregulated power supply. A block diagram is pictured in Figure 1.

The input supply voltage can be in the range from 4V to 24V. A series diode at the input protects the module from reversed supply voltages.

The 3.3V output voltage is generated with a switching regulator working at 400kHz operating frequency and having an output current capability of at least 4A. The output is short circuit protected.

VCCINT and VCCO output voltages are generated with low dropout linear regulators that respond very fast to step changes in load which makes them suitable for the supply of low voltage high speed digital chips. The output voltage is configurable with jumpers. VCCINT can be set to 1.5V, 1.8V and 2.5V. VCCO can be set to 1.5V, 1.8V, 2.5V and 3.3V. All three output voltages are available on header and power connectors. Each of the power connectors allows the connection of four wires, two for ground and two for output power.

Four LEDs show the state of the three output voltages and the power supply. The three LEDs that correspond to the three output voltages are driven directly. The input power LED is driven by an operational amplifier used as a constant current source.

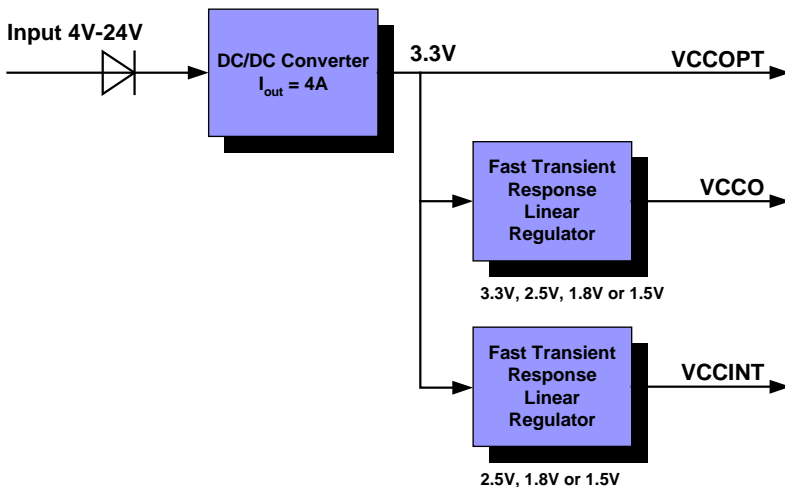


Figure 1: Block diagram of the PWR3-L module



3 Technical Information

3.1 Input Voltage

The input voltage of the power module may be chosen in the range of 5V to 24V and is connected to a two pin power connector. A series diode protects the module in the case of an accidental application of a reversed input supply voltage.

Due to the function principle of switching regulators the input current is higher at low input voltages than at higher input voltages. The efficiency is also not constant over the whole input voltage range but differs only by a few percent.

3.2 Indicator LEDs

The three output voltages and the input voltage can be monitored with indicator LEDs.

The indicator LEDs of the output voltages are placed next to the appropriate power connector. The indicator LED of the input voltage is placed next to the input series diode.

3.3 Output Voltages

The three output voltages are denoted with VCCINT, VCCO and VCCOPT. VCCOPT is fixed at 3.3V and is generated with a switching regulator working at 400kHz. Its output current capability is at least 4A. VCCINT and VCCO are derived from linear regulators getting their input from VCCOPT. Each of the linear regulators is capable of delivering up to 2-3A and is thermally and short circuit protected.

The value of each of the output voltages is selectable by a jumper. *Table 1* shows the jumper settings and the resulting output voltage values. Only one jumper must be set at a time (setting VCCO at 3.3V is an exception). During operation, the jumper settings may be changed without danger since the output voltage falls to 1.2V when all jumpers are removed.

Jumper	VCCINT
J9	2.5V
J8	1.8V
J7	1.5V

Jumper	VCCO
J10,J11,J12	3.3V
J15	2.5V
J14	1.8V
J13	1.5V

Table 1: Configuration of the output voltages



The output voltages are routed to power connectors and to header connectors. The naming and positioning of the signals on the header connectors corresponds with according connectors on board modules. *Table 2* shows the pins and signals on the header connectors.

Connector	Pin Number	Signal Name
J6	1 to 12	VCCOPT
	13 to 25	GND
	26 to 42	Reserved
J5	1 to 12	VCCINT
	13 to 38	GND
	39 to 50	VCCO

Table 2: Pin numbers and signals on the header connectors