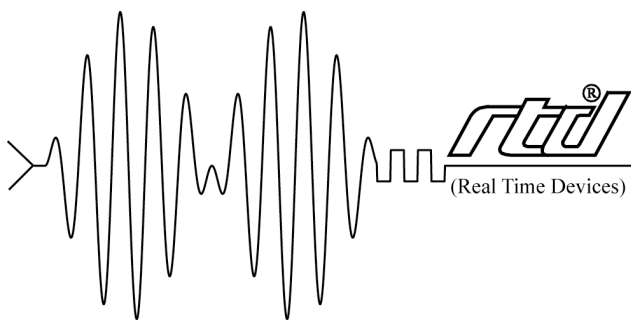


APWR25110HR/35110HR/9104HR-70W Filtered Avionics Power Supply Module

User's Manual



RTD Embedded Technologies, Inc.

"Accessing the Analog World"®

BDM-610020095
Rev F

APWR25110HR/35110HR/9104HR-70W
Filtered Avionics Power Supply Module
User's Manual



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Revision History

15 Feb 2012	Rev A -- Initial release.
04 Feb 2013	Rev B – Changed title of manual too include APWR35110 and APWR25110 versions
05 May 2015	Rev C – X1 & X2 descriptions added. In the table on page 5, -12 VDC was changed to +12 VDC
24 Mar. 2016	Rev D Added information about MIL-STD-704
26 May 2017	Rev E reversed the wording about X1 and X2 on page 10 so that the description matched the circuitry.
15 Nov. 2018	Rev F added more information about X1 and X2

Published by:

RTD Embedded Technologies, Inc.
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Chapter 1 INTRODUCTION

This manual gives information on the APWR25110HR/35110HR/9104HR-70W Filtered Avionics Power Module. This manual also covers the APWR35110HR-70W and the APWR25110HR-70W.

APWR25110HR/35110HR/9104HR-70W Filtered Avionics Power Module

The APWR25110HR/35110HR/9104HR-70W Filtered Avionics Power Module was designed to power a PCIe/104 system from the typical unregulated, noisy 28 VDC aircraft power.

Features

The following are major features of the APWR25110HR/35110HR/9104HR-70W powerModule.

Input:

- 16 – 40 VDC

Outputs:

- +5 VDC at 10 Amps for 50 Watts
- + 12 VDC at 1.67Amps for 20 Watts

HighRel:

- Input voltage: 16 - 40 VDC
- Reverse polarity and transient protection
- Isolation voltage 500V
- 50V for 1 second (meets MIL-STD-704F Voltage Transient for 28 volts DC system)
- Uses Mil modules that meet MIL-STD-461C CE03 and meets MIL-STD-461D and C CE102
- Mil modules protect against voltage spikes specified in MIL_STD-461C and conducted susceptibility specified in MIL-STD-461C, CS01 and CS02
- Mil modules reduce reflected noise of the DC-DC converters to meet MIL-STD-461C CE03 and MILSTD-461D CE102 limits
- Hermetically sealed

Connectors

Connectors provided are:

- CN1 and CN2 PCIE/104 bus
 - (populated on APWR25110HR-70W and APWR35110HR-70W)
- CN3 PCI bus
 - (populated on APWR35110HR-70W and APWR9104HR-70W)
- TB1, 16 – 40 VDC input
- TB3, +5 VDC output
- TB4, +12 VDC output

General Specifications

- Dimensions: 3.8 x 4.75 x 0.6" (97 x 120 x 16 mm) including connectors
- Weight (mass):
 - 0.44 lb, (0.2 Kg)
- Operating conditions:
 - Temperature:
 - -40 to +85 degrees C, operational
 - Relative humidity: 0 - 95%, non-condensing
 - Storage temperature: -65 to +150 degrees C

Chapter 2 **INSTALLING THE UTILITYMODULE**

Recommended Procedure

We recommend you follow the procedure below to ensure that stacking of the modules does not damage connectors or electronics.

- Turn off power to the PCIE/104 system or stack.
- Select and install standoffs to properly position the utilityModule on the PCIE/104 stack.
- Touch a grounded metal part of the stack to discharge any buildup of static electricity.
- Remove the utilityModule from its anti-static bag.
- Check that the PCIE/104 bus connector is properly positioned.
- Gently and evenly press the utilityModule onto the PCIE/104 stack.

CAUTION: Do not force the module onto the stack! Wiggling the module or applying too much force may damage it. If the module does not readily press into place, remove it, check for bent pins and try again.

Chapter 3 CONNECTING THE UTILITYMODULE

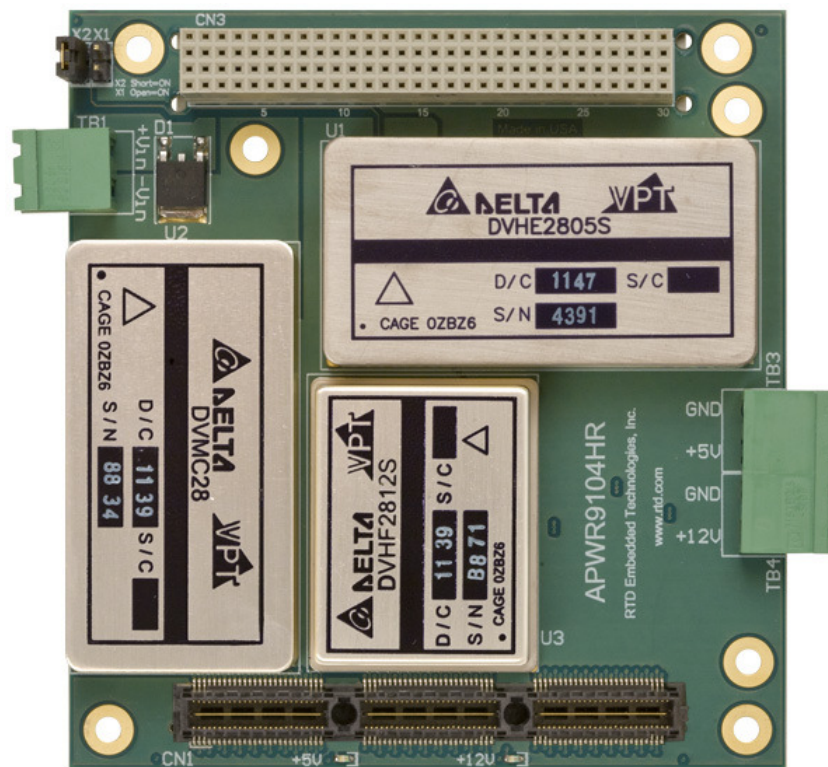
The following sections describe connectors of the utilityModule.

Finding Pin 1 of Connectors

Pin 1 of connectors is indicated by a square solder pad visible on the bottom of the PC board.

Component Locations(APWR9104HR shown)

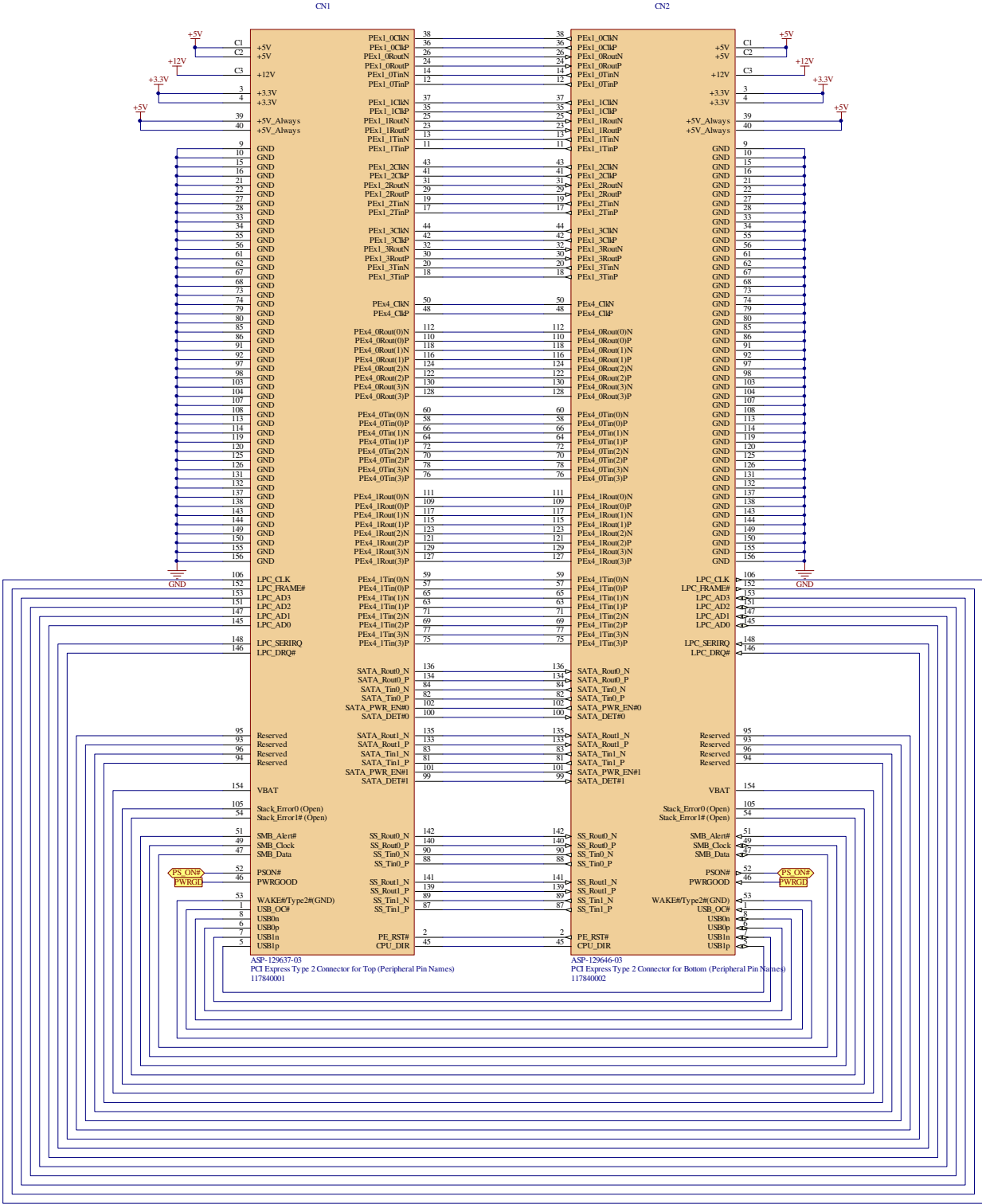
The figure below shows locations of major components, including connectors.



Connector	Function	Dimension	Default
CN1 and CN2	XT PCIE/104 bus	156 pin	N/A
CN3	PCI bus	120 pin	N/A
TB1	16-50 VDC Input	2 terminal	N/A
TB3	+5 VDC Output	2 terminal	N/A
TB4	-12 VDC Output	2 terminal	N/A
X1	Digital ON/OFF*	0.1" jumper	short
X2	Switch ON*/OFF	0.1" jumper	open

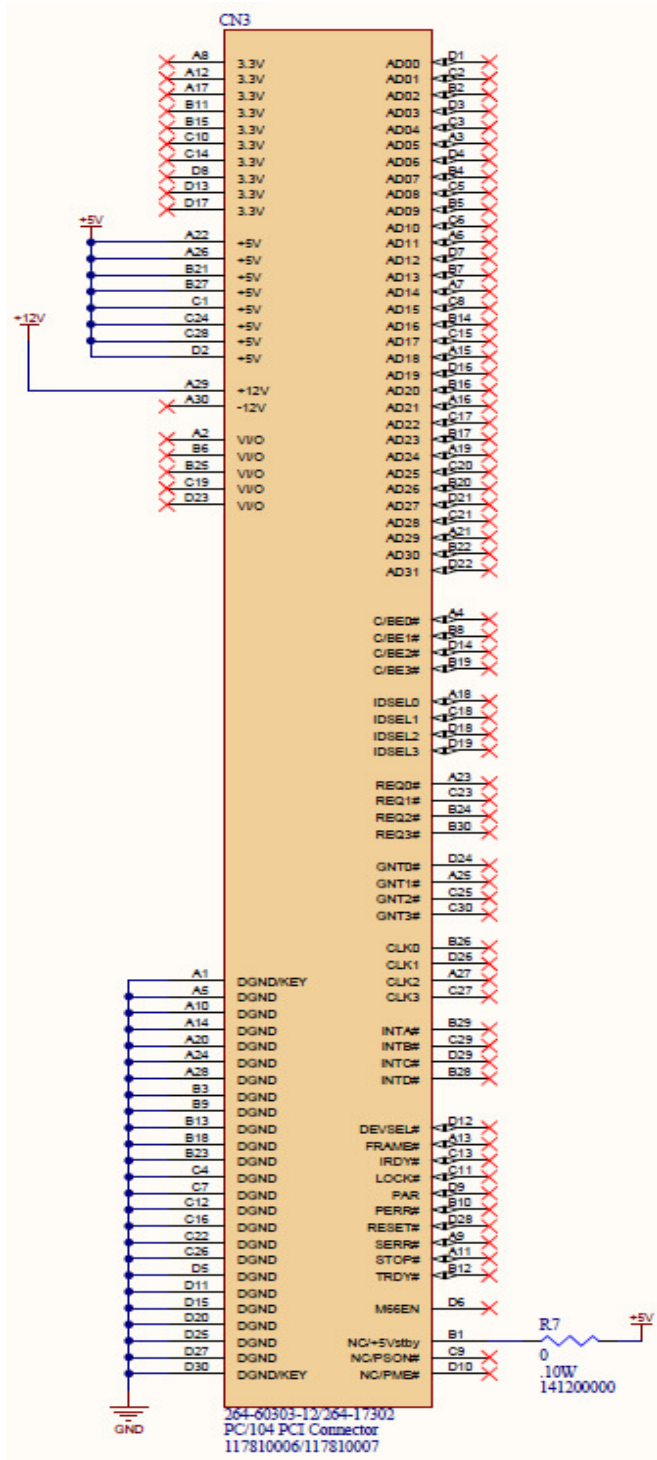
PCIE/104 Bus Connector CN1 and CN2

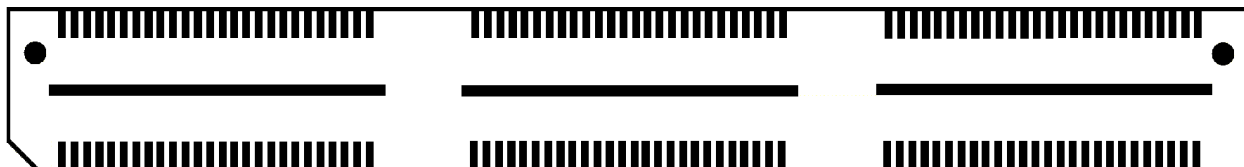
The following pictures or tables list the connector pinouts: Complies with PCIe/104 Specification Version 2.01



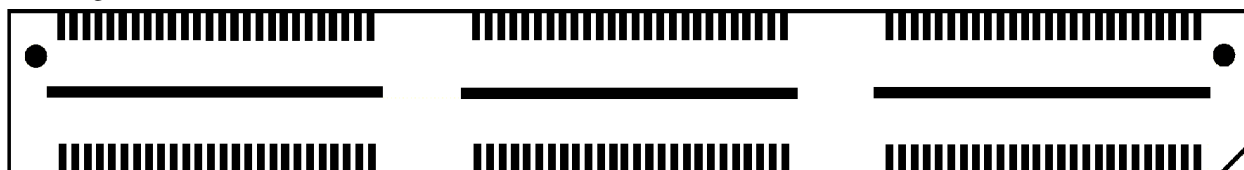
PCI Bus Connector CN3

The following picture shows the PCI connector: Complies with PCIe/104 Specification Version 2.01





CN1 pin one is at the bottom left of the above screen image as viewed from the top of the board by the LEDs. The odd numbered pins run along the bottom of the image and the even pins run along the top. Low order pin numbers are to the left and high order pin numbers are to the right. The three blades in the center of the connector are, from left to right, +5V, +5V, and +12V.



CN2 pin one is at the bottom right of the above screen image as viewed from the bottom of the board. The odd numbered pins run along the bottom of the image and the even pins run along the top. Low order pin numbers are to the right and high order pin numbers are to the left. The three blades in the center of the connector are, from left to right, +12V, +5V, and +5V.

+16 – 40 VDC Input, TB1

Terminal block TB1 is the input power connection for the APWR25110HR/35110HR/9104HR-70W. The input range is 16 - 40 VDC. Fully loaded this input can require 4 amps, therefore 22 gauge wire or larger is recommended. Keep in mind that wire has both resistance and inductance associated with it.

Pin	Signal	Function	in/out
1	Vin +	+16 – 40 VDC input	in
2	Vin -	Ground input	in

+5 VDC Output, TB3

The +5 VDC output is supplied to the +5 V pins on the PCIE/104 bus and to terminal block TB2. This supply can provide 10 amps total that is shared by the PCIE/104 bus devices and any devices connected to TB3.

Pin	Signal	Function	in/out
1	+5 VDC	Regulated +5 VDC Output	out
2	Ground	Ground	out

+12 VDC Output, TB4

The +12 VDC output of the APWR25110HR/35110HR/9104HR-70W-50W is supplied to the +12 V pins on the PCIE/104 bus and to terminal block TB4. This supply is capable of providing 1.67 amps total that is shared by the PCIE/104 bus devices and any devices connected to TB4. Note that the total power drawn from the +12 VDC cannot exceed 20 watts.

Pin	Signal	Function	in/out
1	+12 VDC	Regulated +12 VDC Output	out
2	Ground	Ground	out

Digital ON/OFF*, X1, X2

X1 and X2 are combined in a four-pin connector located in the corner of the board.

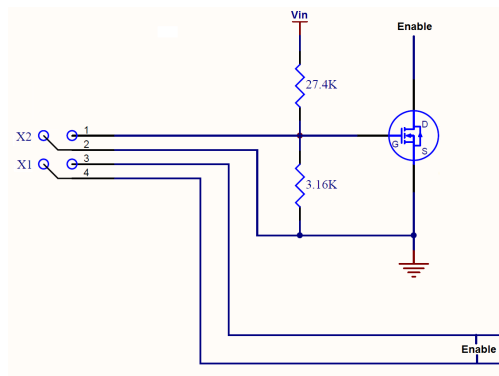


Figure 1 X1 and X2 Circuitry

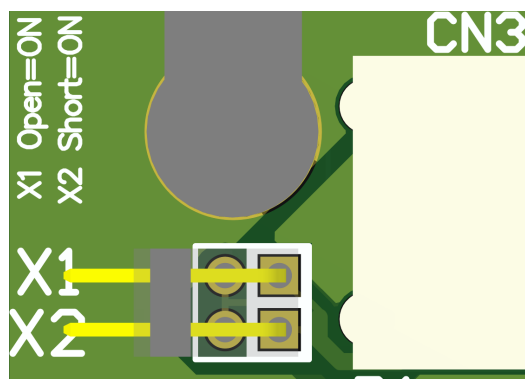


Figure 2 X1, X2 Jumper Location

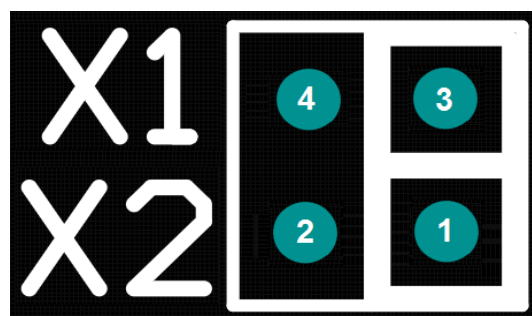


Figure 3 X1, X2 pinout

The X1 and X2 jumpers function as an ON/OFF switch for the board's output power. The X1 jumper should be shorted to disable the output (logic level low); or left open to enable the output (logic level high). By default, the jumper is open. X2 must be shorted when using X1. The ground referenced in Figure 1 is to the input ground. Pin 2 and pin 4 are connected to input ground.

Table 1 X1 and X2 Description

Logic Level	Signal	X1 Pins	X2 Pins	Function
High (float)	7 to 11 VDC	3-4 = Open (Default)	1-2 = Short (Default)	Enable Output
Low	0 V	3-4 = Shorted	1-2 = Short (Default)	Disable Output
High	3.3 V or 5 V	1-2 = Open	1-2 = Open	Disable Output
Low	0 V	1-2 = Open	1-2 = Short	Enable Output

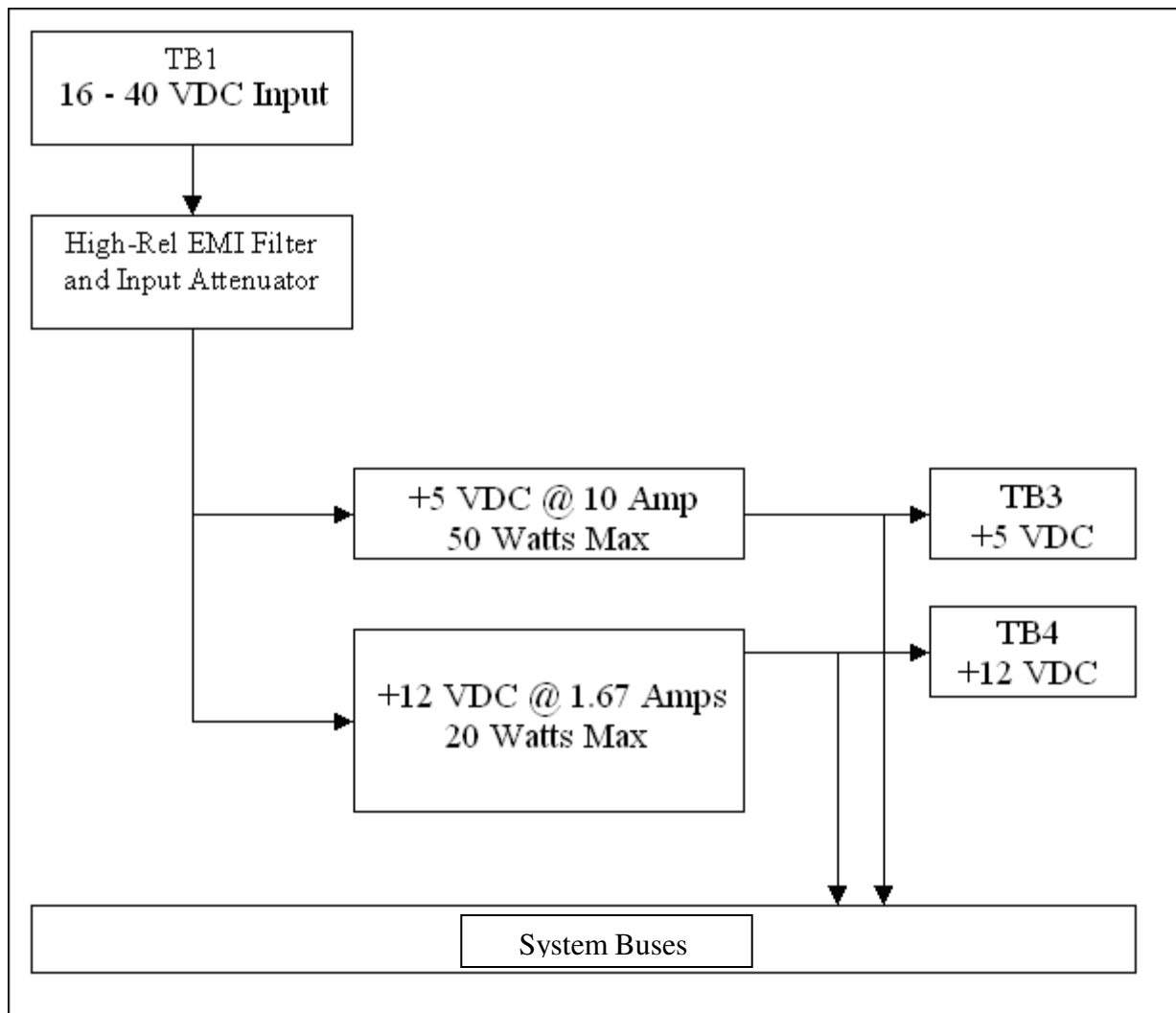
As a truth table, where '0' is an open and '1' is a short, the following table describes the behavior of X1 and X2. A '1' indicates On and a '0' indicates Off

Table 2 X1 and X2 Truth Table

X1, X2	On/Off (1/0)
0,0	0
0,1	1
1,0	0
1,1	0

Chapter 4 USING THE UTILITYMODULE

Using the utilityModule is straightforward. Connect the input to TB1 using good wiring practices keeping the wires as short and as heavy as possible. Make sure the wires are twisted to reduce inductance. The +5 VDC is provided. Below is the block diagram:



Chapter 5 SPECIFICATIONS

(All measurements taken at 25C)

Input Voltage Range:

16V to 40V DC

Max Input Current:

4 Amps

Output Voltages:

+5V and +12V

Output Currents:

5V output:

10 amps

12V output:

1.67 Amps

Overall Efficiency at full load:

82.9% at 24V DC input voltage

78.3% at 16V DC input voltage

83.8% at 40V DC input voltage

5V full load efficiency

83.7% at 24V DC input voltage

12V full load efficiency

74.96% at 24V DC input voltage

Maximum Overall Dissipation at full load:

19.27 Watts

5V full load dissipation at 24V DC input voltage

9.657 Watts

12V full load dissipation at 24V DC input voltage

6.689 Watts

Derating: (controlled by 4 Amp input current limit)

Minimum input voltage for 70 Watt output load.

21V DC

Maximum 12V load at 16VDC input voltage and 5V full load

240mA

Maximum 5V load at 16V DC input voltage given a 12V full load

6.178 Amps

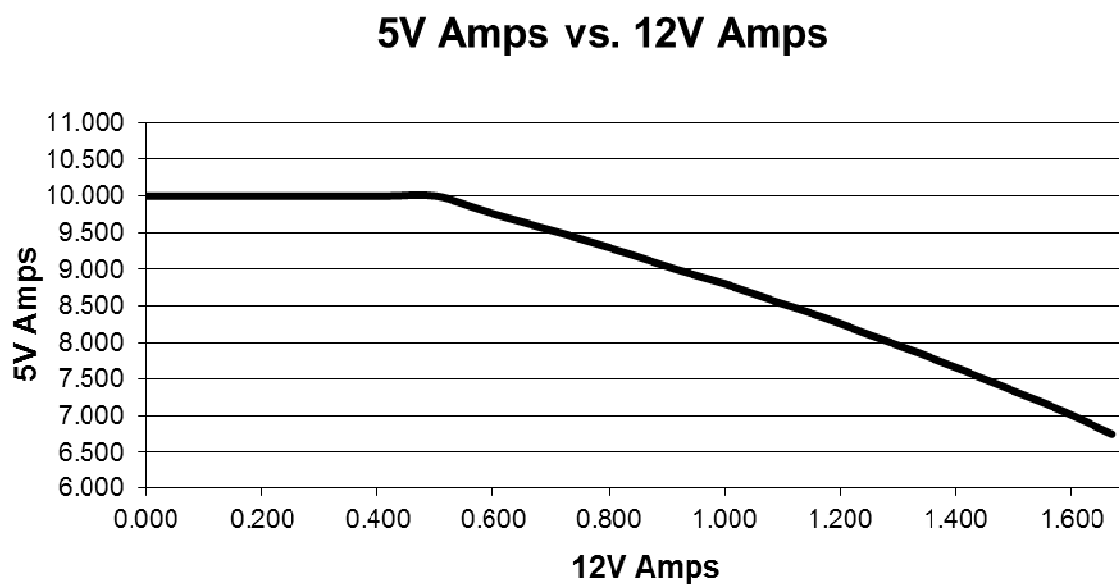
Max Voltage drop to 5V and 12V converters at 4 Amps input current.

0.93V

Operating Temperature Range:
-40C to 85C

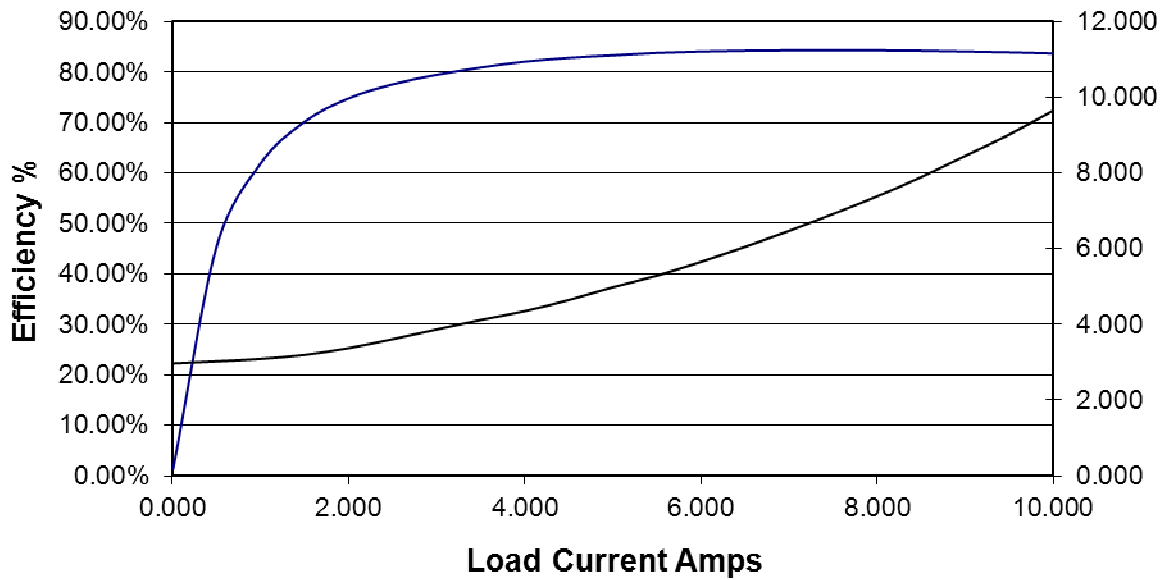
Maximum case temperature of any module.
125C

Derating of Modules with no heat sink:
Derated linearly to zero at 125C case temperature



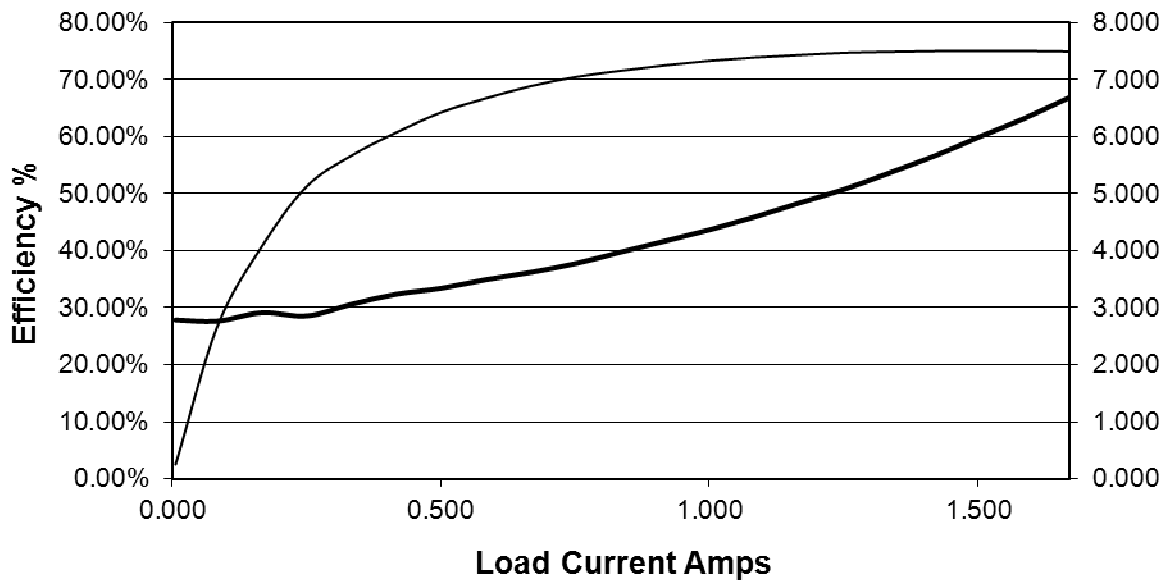
The above graph is at 16.93V DC input voltage. It shows the maximum loading of the 5V and 12V supplies.

5V Efficiency and Dissipation Vs. Load Current



5V efficiency curve with dissipation curve at 24V DC input voltage

12V Efficiency and Dissipation Vs. Load Current



12V efficiency curve with dissipation curve at 24V DC input voltage

Chapter 6 RETURN POLICY AND WARRANTY

Return Policy

If the utilityModule requires repair, you may return it to us by following the procedure listed below:

Caution: Failure to follow this return procedure will *almost always* delay repair! Please help us expedite your repair by following this procedure.

- 1) Read the limited warranty which follows.
- 2) Contact the factory and request a Returned Merchandise Authorization (RMA) number.
- 3) On a sheet of paper, write the name, phone number, and fax number of a technically-competent person who can answer questions about the problem.
- 4) On the paper, write a detailed description of the problem with the product. Answer the following questions:
 - Did the product ever work in your application?
 - What other devices were connected to the product?
 - How was power supplied to the product?
 - What features did and did not work?
 - What was being done when the product failed?
 - What were environmental conditions when the product failed?
- 5) Indicate the method we should use to ship the product back to you.
 - We will return warranty repairs by UPS Ground at our expense.
 - Warranty repairs may be returned by a faster service at your expense.
 - Non-warranty repairs will be returned by UPS Ground or the method you select and will be billed to you.
- 6) Clearly specify the address to which we should return the product when repaired.
- 7) Enclose the paper with the product being returned.
- 8) Carefully package the product to be returned *using anti-static packaging!* We will not be responsible for products damaged in transit for repair.
- 7) Write the RMA number on the outside of the package.
- 8) Ship the package to:

RTD Embedded Technologies, Inc.
103 Innovation Blvd.
State College PA 16804-0906
USA

Limited Warranty

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