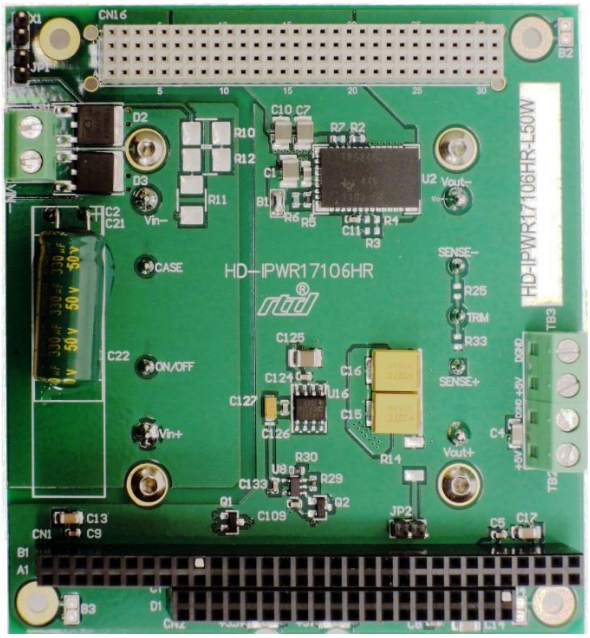
IPWR17106HR

PCI/104-Express DC/DC Power Supply

User's Manual

BDM-610020133 Rev. A



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Rev A	09/02/2015	Initial Release

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1 Introduction

1.1 Product Overview

The IPWR17106HR was designed to meet the power requirements of the PCI/104-Express Specification.

1.2 Board Features

- PCI pass through bus
- ISA pass through bus
- 9.0V to 36.0V DC voltage input range
- 10.0 Amps of 5V
- 6.0 Amps of 3.3V
- Remote ON/OFF control
- Reverse voltage protection
- Input surge protection

The IPWR17106HR is available with the following options:

Table 1: Ordering Options

Part Number	Description
IPWR17106HR	Standard Configuration as pictured on cover

Note: Contact RTD sales if you want a custom configuration.

The Intelligent Data Acquisition Node (IDAN™) building block can be used in just about any combination with other IDAN building blocks to create a simple but rugged 104™ stack. This module can also be incorporated in a custom-built RTD HiDAN™ or HiDANplus High Reliability Intelligent Data Acquisition Node. Contact RTD sales for more information on our high reliability systems.

1.3 Contact Information

1.3.1 Sales Support

For sales inquiries, you can contact RTD Embedded Technologies sales via the following methods:

Phone: 1-814-234-8087 Monday through Friday, 8:00am to 5:00pm (EST).
E-Mail: sales@rtd.com

1.3.2 Technical Support

If you are having problems with you system, please try the steps in the Troubleshooting section of this manual.

For help with this product, or any other product made by RTD, you can contact RTD Embedded Technologies technical support via the following methods:

Phone: 1-814-234-8087 Monday through Friday, 8:00am to 5:00pm (EST).
E-Mail: techsupport@rtd.com

2 Specifications

2.1 Operating Conditions

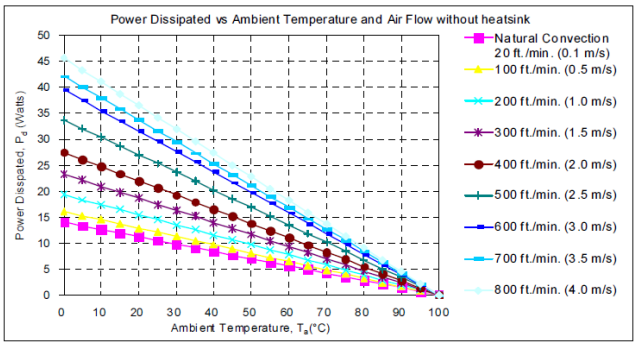
Table 2: Operating Conditions

Symbol	Parameter	Test Condition	Min	Max	Unit
V_{in}	Supply Voltage		9.00	36.00	V
T_a	Operating Temperature		-40	+85	C
T_s	Storage Temperature		-55	+125	C
RH	Relative Humidity	Non-Condensing	0	90%	%
MTBF	Mean Time Before Failure	Telcordia Issue 2 30°C, Ground benign, controlled		TBD	Hours

2.2 Electrical Characteristics

Parameter	Test Condition	Max	Unit
Maximum Power Dissipation	25°C 10.00V Vin four Hour Soak no Airflow no Heat Sink	14.58	W
5V Efficiency with 9Vin	25°C 10.0 Amp load	77.96	%
5V Efficiency with 24Vin	25°C 10.0 Amp load	80.42	%
5V Efficiency with 36Vin	25°C 10.0 Amp load	78.89	%
3.3V Efficiency with 5Vin	25°C 6.00 Amp load	89.43	%
5V P-P voltage ripple	25°C 10.0 Amp load 24Vin	44.0	mV
3.3V P-P voltage ripple	25°C 6.00 Amp load 24 Vin	16.0	mV
5V Switching Frequency	25°C	306	KHz+-2%
3.3V Switching Frequency	25°C	629	KHz+-2%
Reverse Voltage Protection	25°C	-36	V
Galvanic Isolation voltage	25°C	1500	V
Module Thermal Shutdown	Case Temp.	100	C

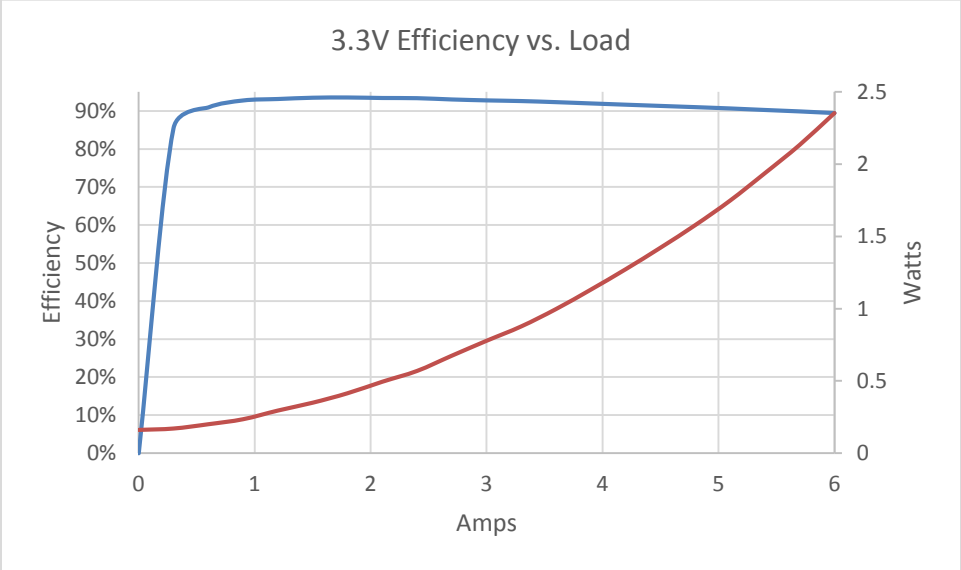
2.2.1 DERATING:



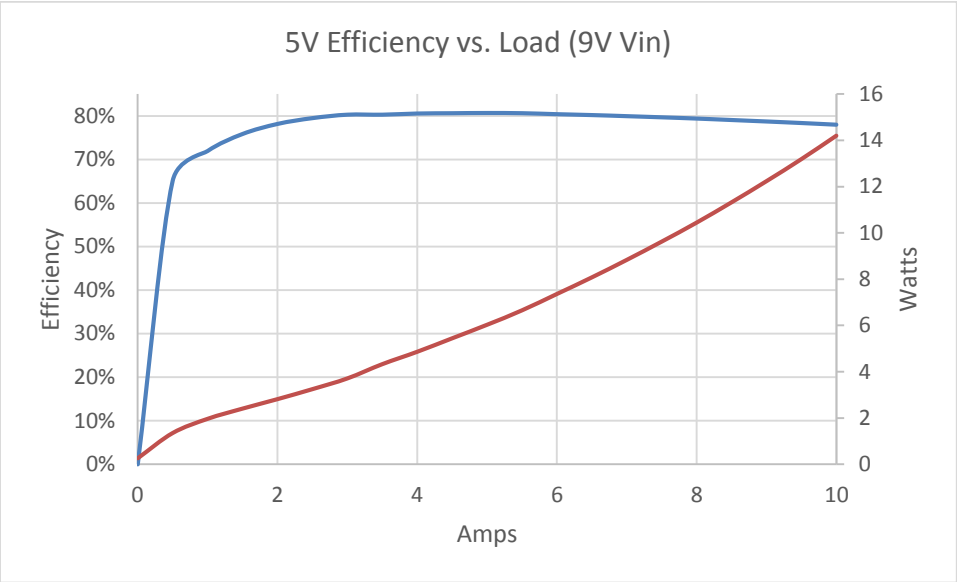
AIR FLOW RATE	TYPICAL R_{ca}
Natural Convection 20ft./min. (0.1m/s)	7.12°C/W
100 ft./min. (0.5m/s)	6.21°C/W
200 ft./min. (1.0m/s)	5.17°C/W
300 ft./min. (1.5m/s)	4.29°C/W
400 ft./min. (2.0m/s)	3.64°C/W
500 ft./min. (2.5m/s)	2.96°C/W
600 ft./min. (3.0m/s)	2.53°C/W
700 ft./min. (3.5m/s)	2.37°C/W
800 ft./min. (4.0m/s)	2.19°C/W

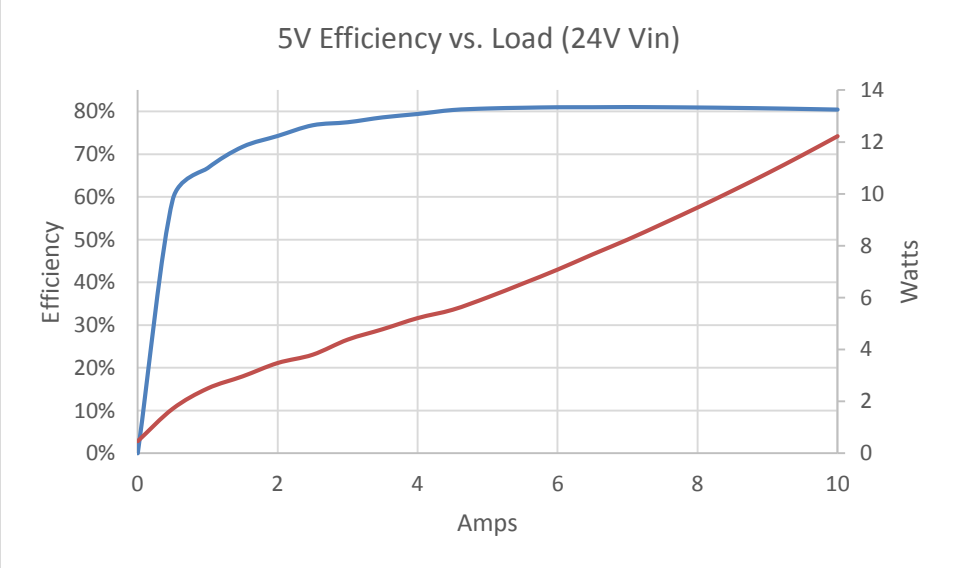
2.3 Efficiency and Dissipation Graphs

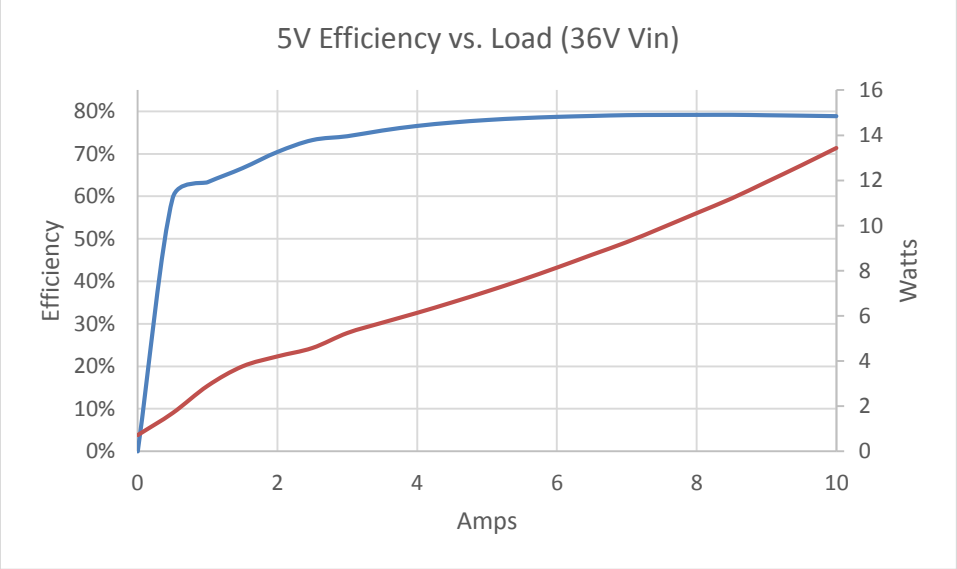
2.3.1 3.3V Efficiency Graph



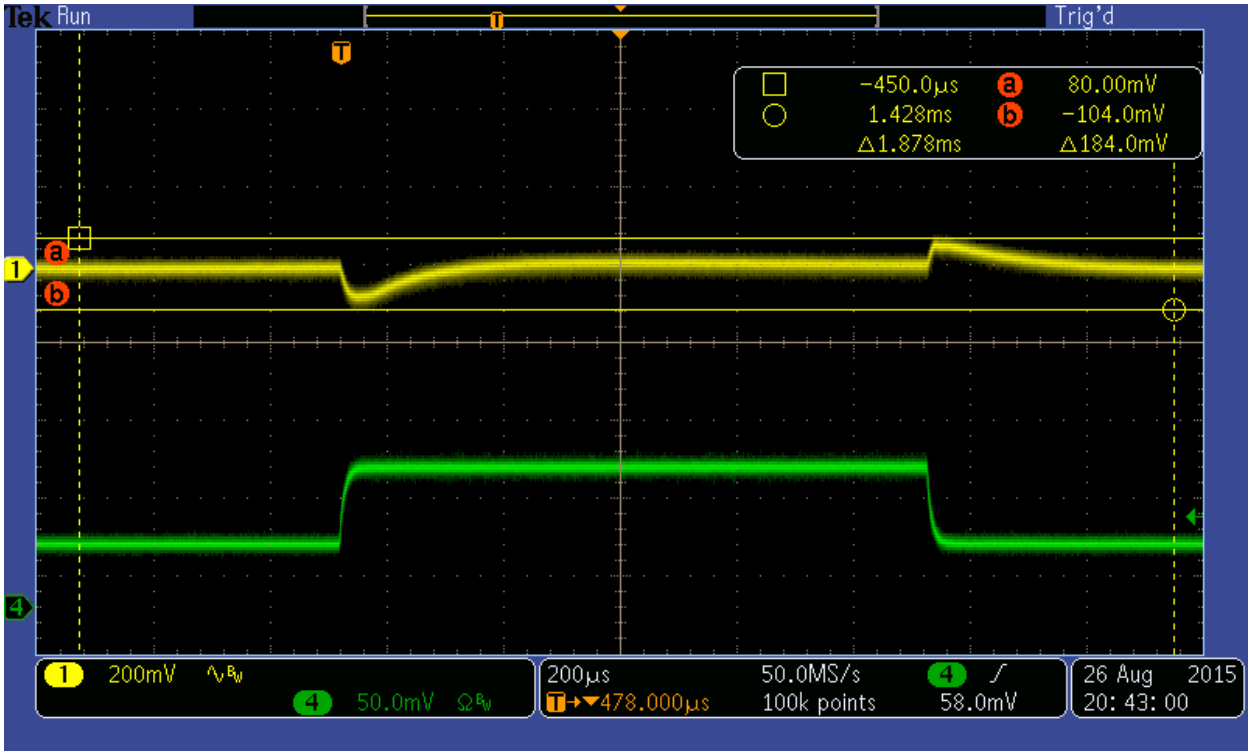
2.3.2 5V EFFICIENCY GRAPHS



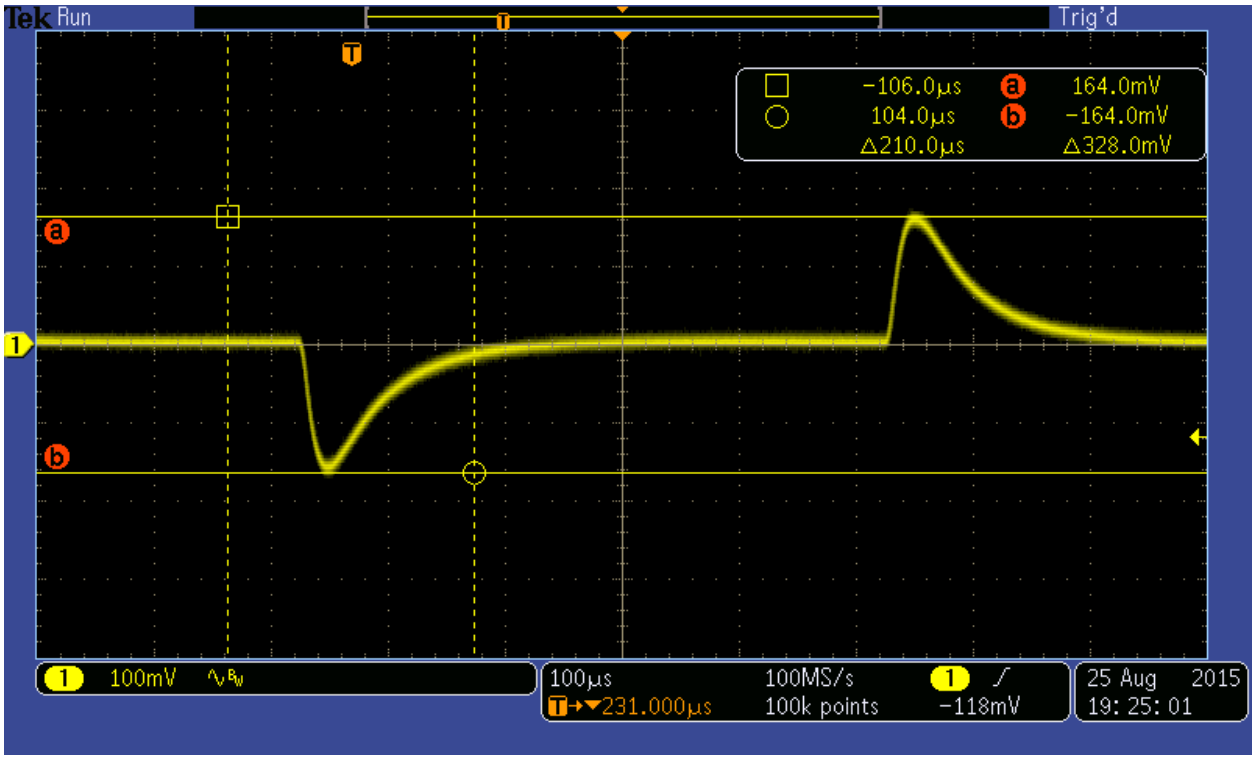




2.4 5V Step Response

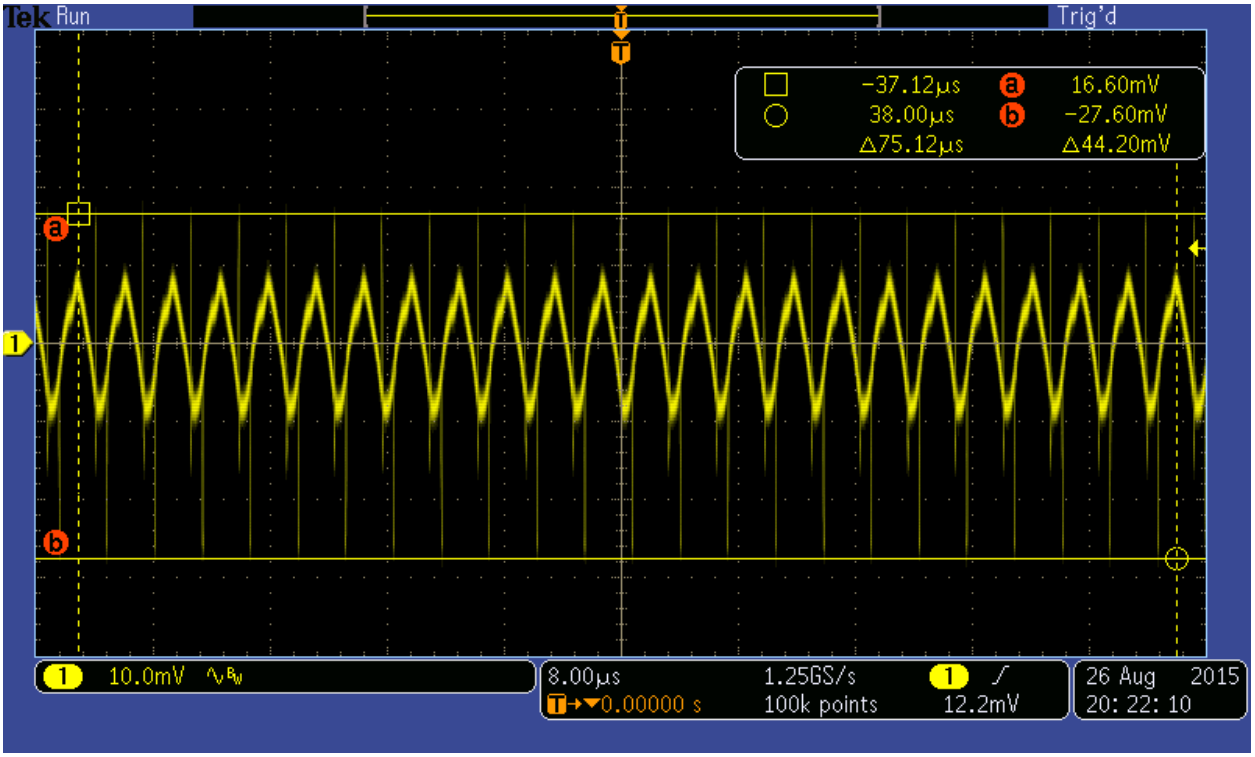


AC coupled, 20MHz BWL, 5V output, step load response from 4.0 amps to 9.0 Amps 24V Vin. Peak to Peak deviation is 184 mV

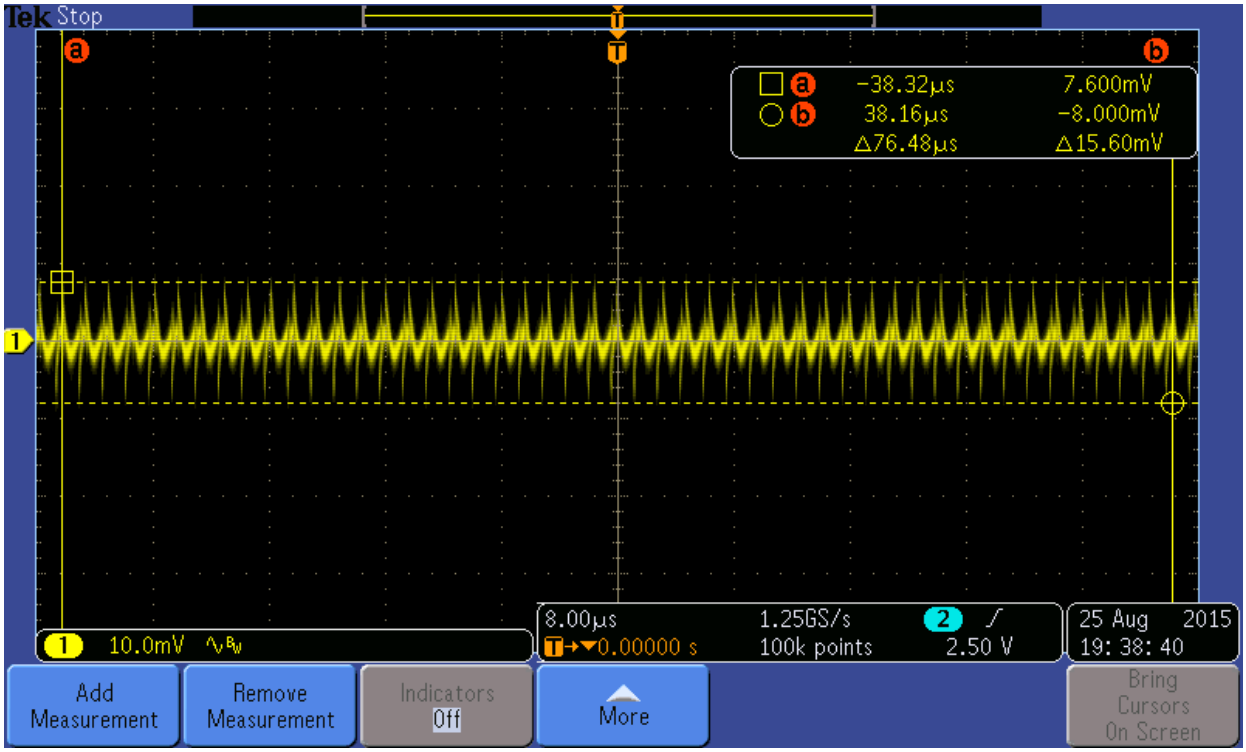


AC coupled, 20MHz BWL, 3.3V step response current step. (0.5A to 4.5A) 24Vin Peak to Peak deviation is 328 mV

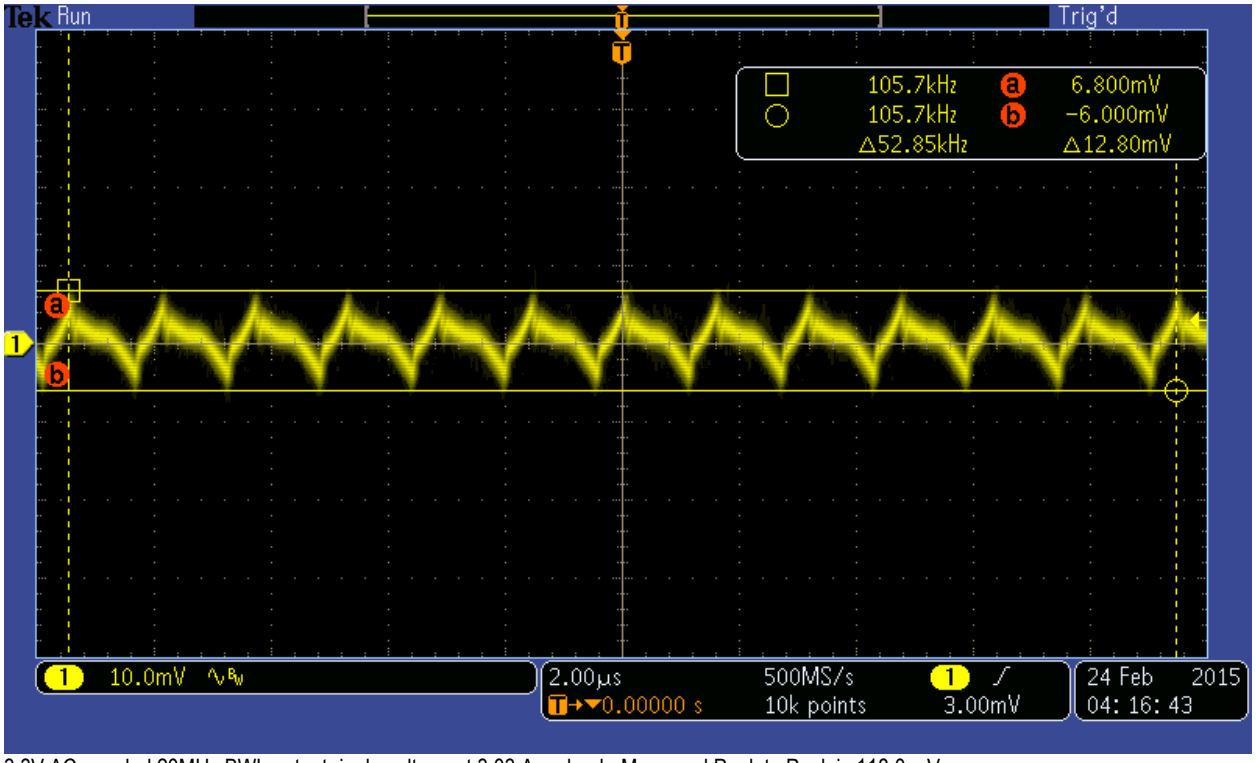
2.5 Ripple Voltage



5V AC coupled 20MHz BWL output ripple voltage at 10.0 Amp load. Measured Peak to Peak is 44.2 mV.



3.3V AC coupled 20MHz BWL output ripple voltage at 6.00 Amp load. Measured Peak to Peak is 15.6 mV.



3.3V AC coupled 20MHz BWL output ripple voltage at 3.03 Amp load. Measured Peak to Peak is 118.0 mV.

3 Board Connection

3.1 Board Handling Precautions

To prevent damage due to Electrostatic Discharge (ESD), keep your board in its antistatic bag until you are ready to install it into your system. When removing it from the bag, hold the board at the edges, and do not touch the components or connectors. Handle the board in an antistatic environment, and use a grounded workbench for testing and handling of your hardware.

3.2 Physical Characteristics

- Weight: Approximately 226g (0.498 lbs.) no heat sink
- Board Dimensions: 93.52 mm L x 95.89 mm W (3.682 in L x 3.775 in W)

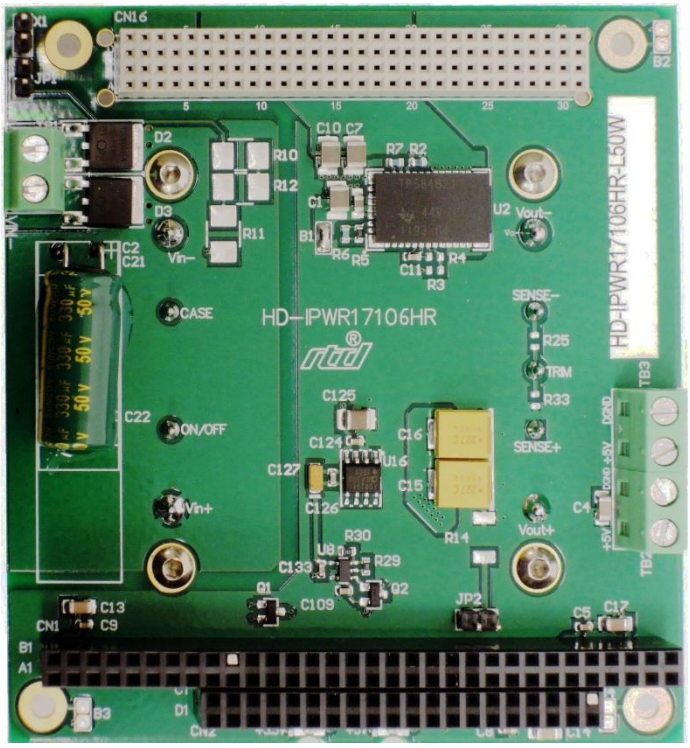


Figure 1 Board Pictured with IDAN power connectors

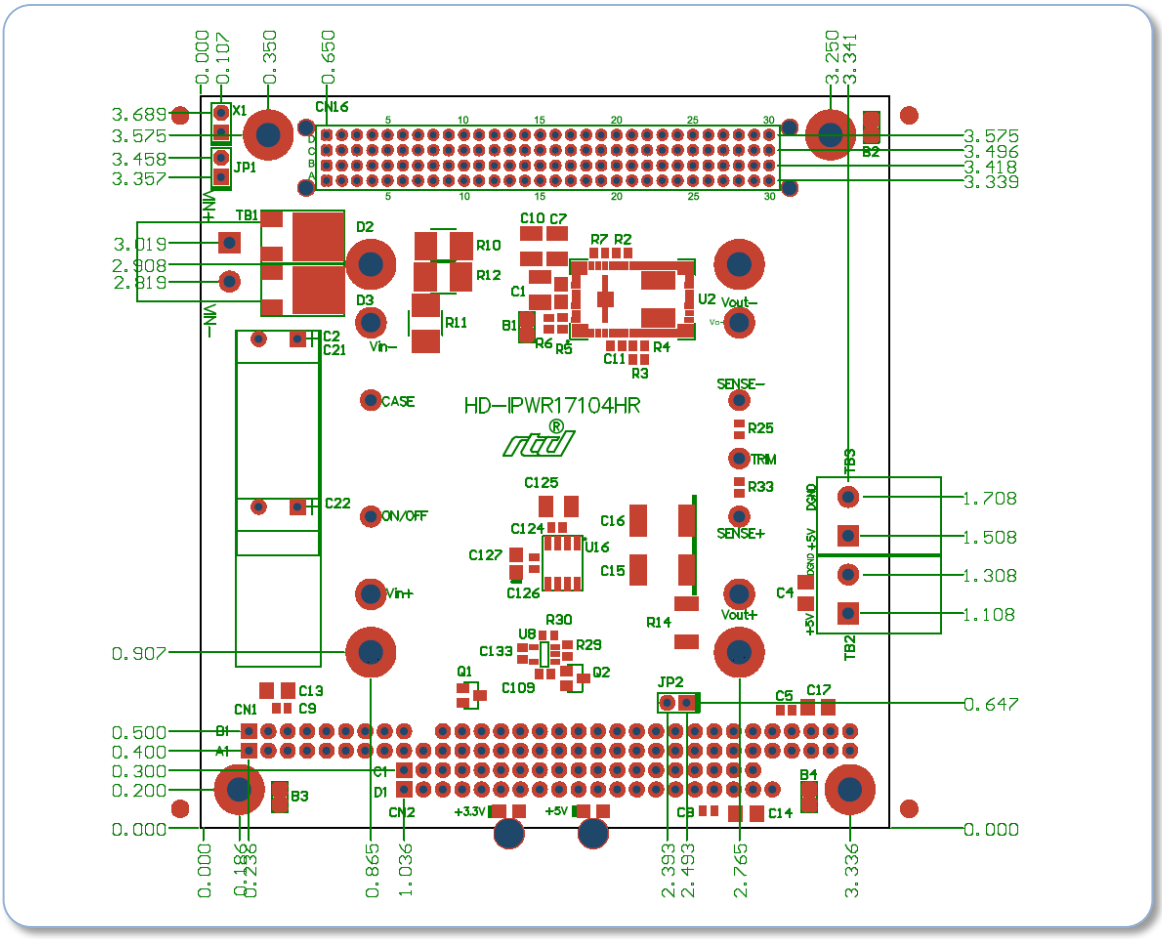


Figure 2: Board Dimensions

3.3 Connectors, Jumpers, and LEDs

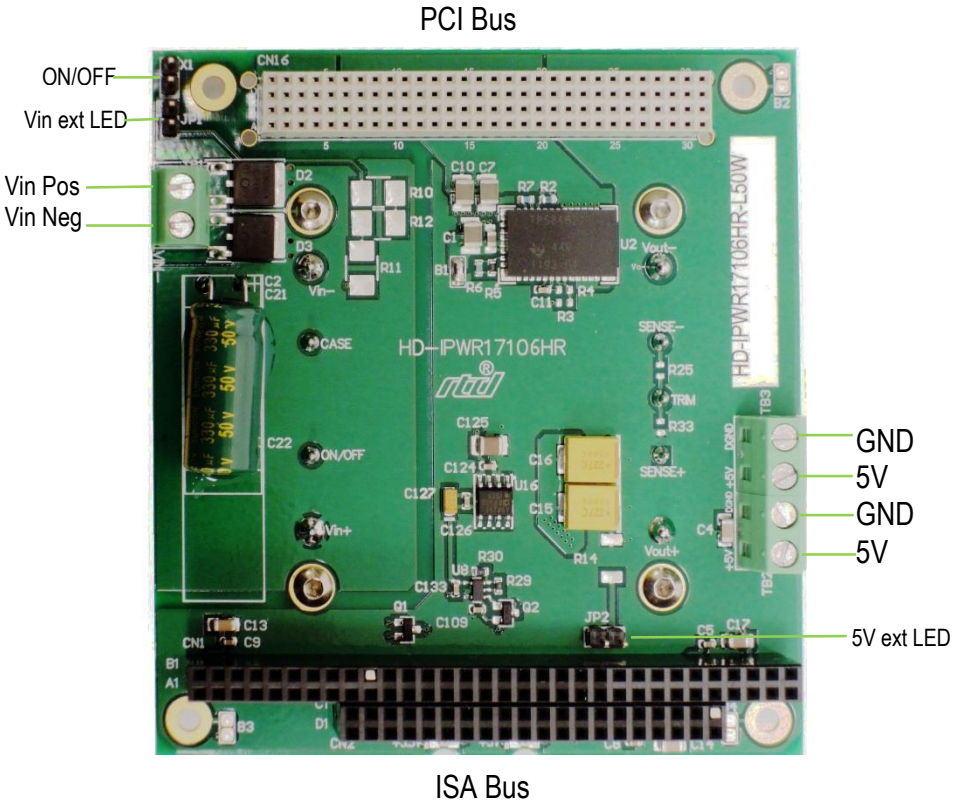


Figure 3: Board Connections, Jumpers

3.3.1 CONNECTORS AND JUMPERS

All I/O connectors have Pin 1 designated by a thick white silkscreen line, and/or a square pad on the PCB.

Power Connectors

TB1 is a two pin input power connector. Each pin is labeled on the PCB. Mating connector is a Pheonix contact 1779987 (www.Pheonixcontact.com)

Facing the connector, from left to right, the pin out is:

Table 3 TB1 Vin Connector

TB1 Pin	Pin Name	Function	IDAN
1	Vin+	9V to 36V input	?
2	Vin-	Input Negative	?

TB2 is a six pin auxiliary power connector. Both +5V pins are sourced from the same 5V supply. Each pin is labeled on the PCB. Mating connector is a Pheonix contact 1780002 (www.Pheonixcontact.com)

Facing the connector, from left to right, starting at pin one, the pin out is:

Table 4 TB2 Vout Connector

TB2 Pin	Pin Name	Function	IDAN 9-pin "D"
1	+5V	5V auxiliary output	?
2	GND	Ground connection	?
3	+5V	3.3V auxiliary output	?
4	GND	Ground connection	?

CN1 and CN2 ISA Bus

CN1 and CN2 are the ISA bus connectors.

Table 5 CN1 and CN2 ISA Bus

CN2 Pin	Row D	Row C	CN1 Pin	Row A	Row B
			1	CHK#	GND
			2	SD7	RESET
			3	SD6	+5 V
			4	SD5	IRQ9
			5	SD4	–5 V
			6	SD3	DRQ2
			7	SD2	-12V
0	GND	GND	8	SD1	SRDY#
1	MEMCS16#	SBHE#	9	SD0	+12 V
2	IOCS16#	LA23	10	IOCHRDY	KEY
3	IRQ10	LA22	11	AEN	SMEMW#
4	IRQ11	LA21	12	SA19	SMEMR#
5	IRQ12	LA20	13	SA18	IOW#
6	IRQ15	LA19	14	SA17	IOR#
7	IRQ14	LA18	15	SA16	DACK3#
8	DACK0#	LA17	16	SA15	DRQ3
9	DRQ0	MEMR#	17	SA14	DACK1#
10	DACK5#	MEMW#	18	SA13	DRQ1
11	DRQ5	SD8	19	SA12	REFRESH#
12	DACK6#	SD9	20	SA11	BCLK
13	DRQ6	SD10	21	SA10	IRQ7
14	DACK7#	SD11	22	SA9	IRQ6
15	DRQ7	SD12	23	SA8	IRQ5
16	+5V	SD13	24	SA7	IRQ4
17	MASTER#	SD14	25	SA6	IRQ3
18	GND	SD15	26	SA5	DACK2#
19	GND	KEY	27	SA4	TC
			28	SA3	BALE
			29	SA2	+5V
			30	SA1	OSC
			31	SA0	GND
			32	GND	GND

Note: +12V, -12V, and -5 are not supplied.

CN16 PCI Bus

Table 6 CN16 PCI Bus

Pin Number	A row	B row	C row	D row
1	GND	5VSB	+5V	N/C
2	N/C	N/C	N/C	+5V
3	N/C	GND	N/C	N/C
4	N/C	N/C	GND	N/C
5	GND	N/C	N/C	GND
6	N/C	N/C	N/C	N/C
7	N/C	N/C	GND	N/C
8	+3.3V	N/C	N/C	+3.3V
9	N/C	GND	PS_ON#	N/C
10	GND	N/C	+3.3V	N/C
11	N/C	+3.3V	N/C	GND
12	+3.3V	N/C	GND	N/C
13	N/C	GND	N/C	+3.3V
14	GND	N/C	+3.3V	N/C
15	N/C	+3.3V	N/C	GND
16	N/C	N/C	GND	N/C
17	+3.3V	N/C	N/C	+3.3V
18	N/C	GND	N/C	N/C
19	N/C	N/C	N/C	N/C
20	GND	N/C	N/C	GND
21	N/C	+5V	N/C	N/C
22	+5V	GND	GND	N/C
23	N/C	N/C	N/C	N/C
24	GND	N/C	+5V	N/C
25	N/C	N/C	N/C	GND
26	+5V	N/C	GND	N/C
27	N/C	+5V	N/C	GND
28	GND	+5V	+5V	N/C
29	+12V	N/C	N/C	N/C
30	-12V	N/C	N/C	GND

Note: +12V, -12V, 5VSB, and PS_ON# not supplied

X1 Jumper

The X1 jumper is part of a four pin jumper located near the input power connector. Default is open or attached to the power switch in IDAN. The board is labeled with settings. When the jumper is open, all main supplies on the board are controlled via PS_ON# (normal ATX functionality). When the jumper is shorted, the board be powered on when the input is present (assuming X2 is open). The only LEDs that should be on when PS_ON# is not asserted is the input power LED and the 5VSTBY LED.

Table 7 X1 Board Enable Jumper

X1 pin	Signal	Function	IDAN	note
1	GND	Reference	Power Switch	Board Pin 1 is indicated By a square pad
2	ON/OFF	Short to Pin 1 = OFF Open = ON	Power Switch	

JP1 Vin External LED Connection

The JP1 LED connection is intended to accept an external LED, if the customer should specify it. There are onboard positions for resistors to set the current through the LED. By default, these resistor positions are not populated. The customer's choice of LED on current will be used to set the correct values.

Table 8 JP1 Vin External LED Connection

JP1 Pin	Signal	IDAN
1	Anode	Anode
2	Cathode	Cathode

Note: LED is referenced to Vin minus

JP2 5V External LED Connection

The JP2 LED connection is intended to accept an external LED, if the customer should specify it. There are onboard positions for resistors to set the current through the LED. By default, these resistor positions are not populated. The customer's choice of LED on current will be used to set the correct values.

Table 9 JP2 5V External LED Connection

JP2 Pin	Signal	IDAN
1	Anode	Anode
2	Cathode	Cathode

Note: LED is referenced to Vout Ground

Solder Jumpers B2, B3, and B4

The solder jumpers, B2, B3, and B4 are frame ground connections to output ground. By default, these connections are open and can be shorted, if the customer requires them.

3.3.2 VOLTAGE INDICATOR LEDS

There are six LEDs on the board. Four are labeled by CN1 (PCIe bus) by their voltage. If one of these four LEDs is on, the respective voltage is good. The remaining two LEDs, of the six, are input power indicators. They are located on the bottom of the board by the input power connector. The green one is labeled "Vin is On" and the red one is labeled "Reversed". When the green LED is on, there is a voltage present at the input connector. When the red LED is on, the input leads have been reversed.

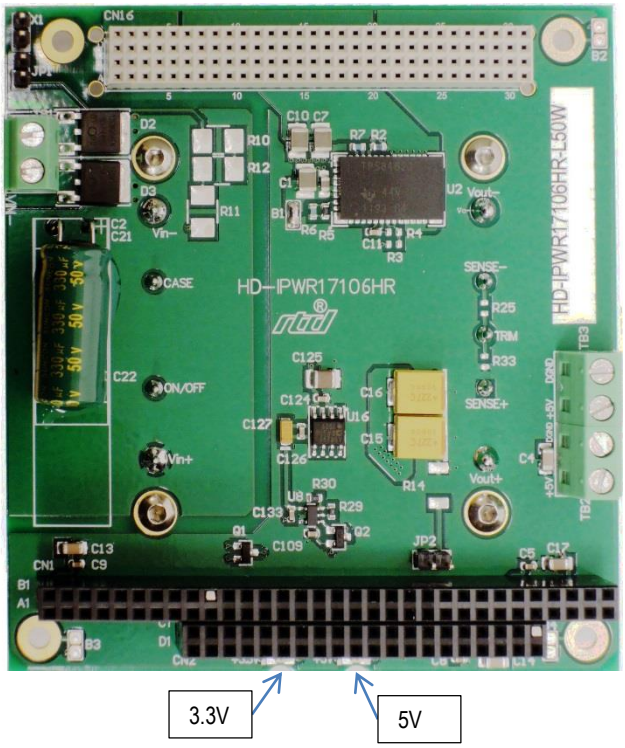


Figure 4 LED Locations

3.4 Steps for Installing

1. Always work at an ESD protected workstation, and wear a grounded wrist-strap.
2. Turn off power to the PC/104 system or stack.
3. Select and install stand-offs to properly position the module on the stack.
4. Remove the module from its anti-static bag.
5. Check that pins of the bus connector are properly positioned.
6. Check the stacking order; make sure all of the busses used by the peripheral cards are connected to the cpuModule.
7. Hold the module by its edges and orient it so the bus connector pins line up with the matching connector on the stack.
8. Gently and evenly press the module onto the PC/104 stack.
9. If any boards are to be stacked above this module, install them.
10. Attach any necessary cables to the PC/104 stack.
11. Re-connect the power cord and apply power to the stack.
12. Boot the system and verify that all of the hardware is working properly.
13. Any wires into or out of the board should be twisted to reduce inductance.
14. Wires are to be kept as short as possible to reduce unnecessary voltage drops.
15. Power wires should be able to carry at least 10 Amps of current.

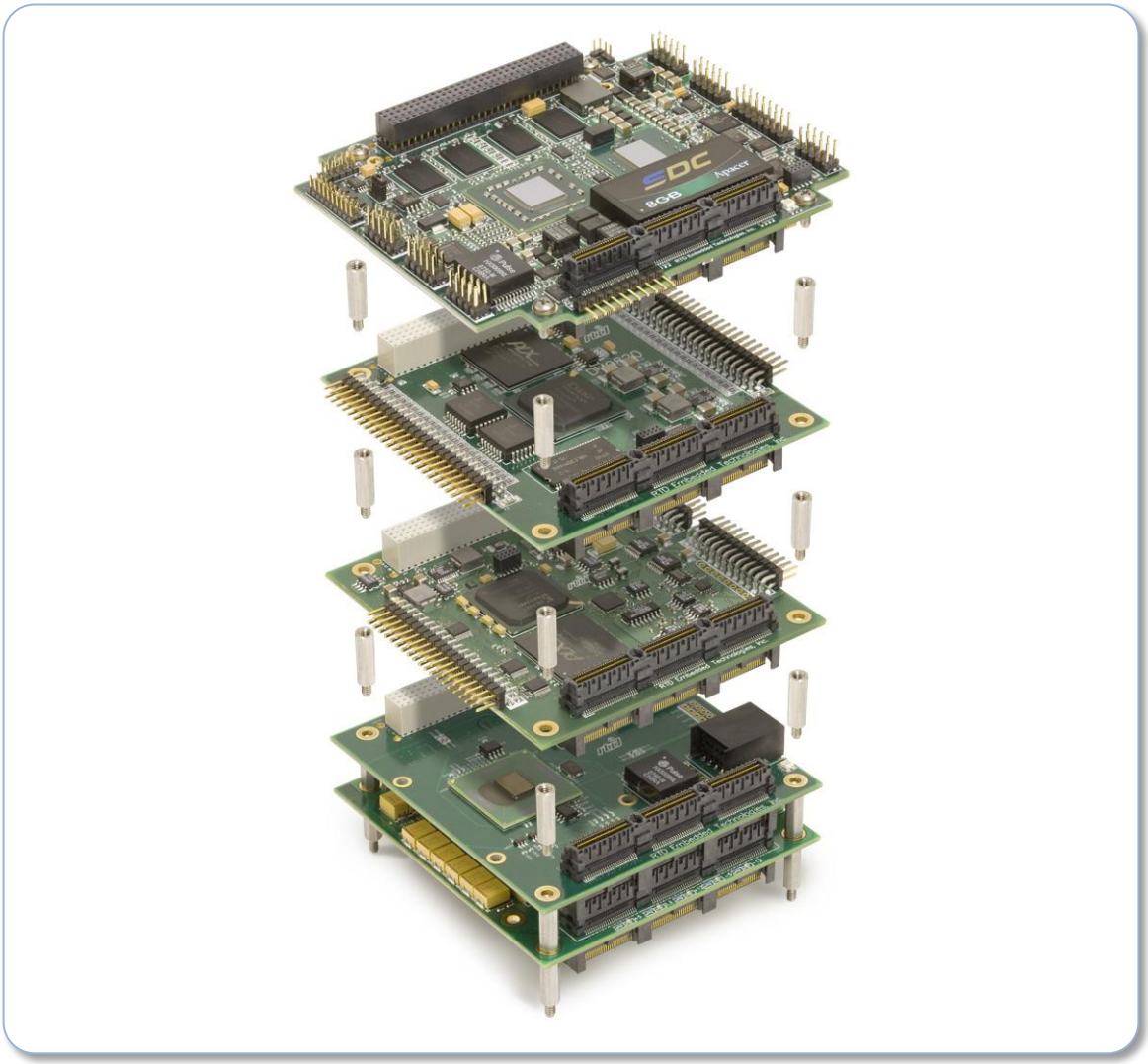


Figure 5: Example 104™ Stack

4 IDAN Connections

4.1 Module Handling Precautions

To prevent damage due to Electrostatic Discharge (ESD), keep your module in its antistatic bag until you are ready to install it into your system. When removing it from the bag, hold the module by the aluminum enclosure, and do not touch the components or connectors. Handle the module in an antistatic environment, and use a grounded workbench for testing and handling of your hardware.

4.2 Connectors

4.2.1 External I/O Connectors

The power ON/OFF switch with LED is located on the front of the frame. The 2-pin push-pull power input connector and the 9-pin "D" power output connector are brought out of the back of the frame.

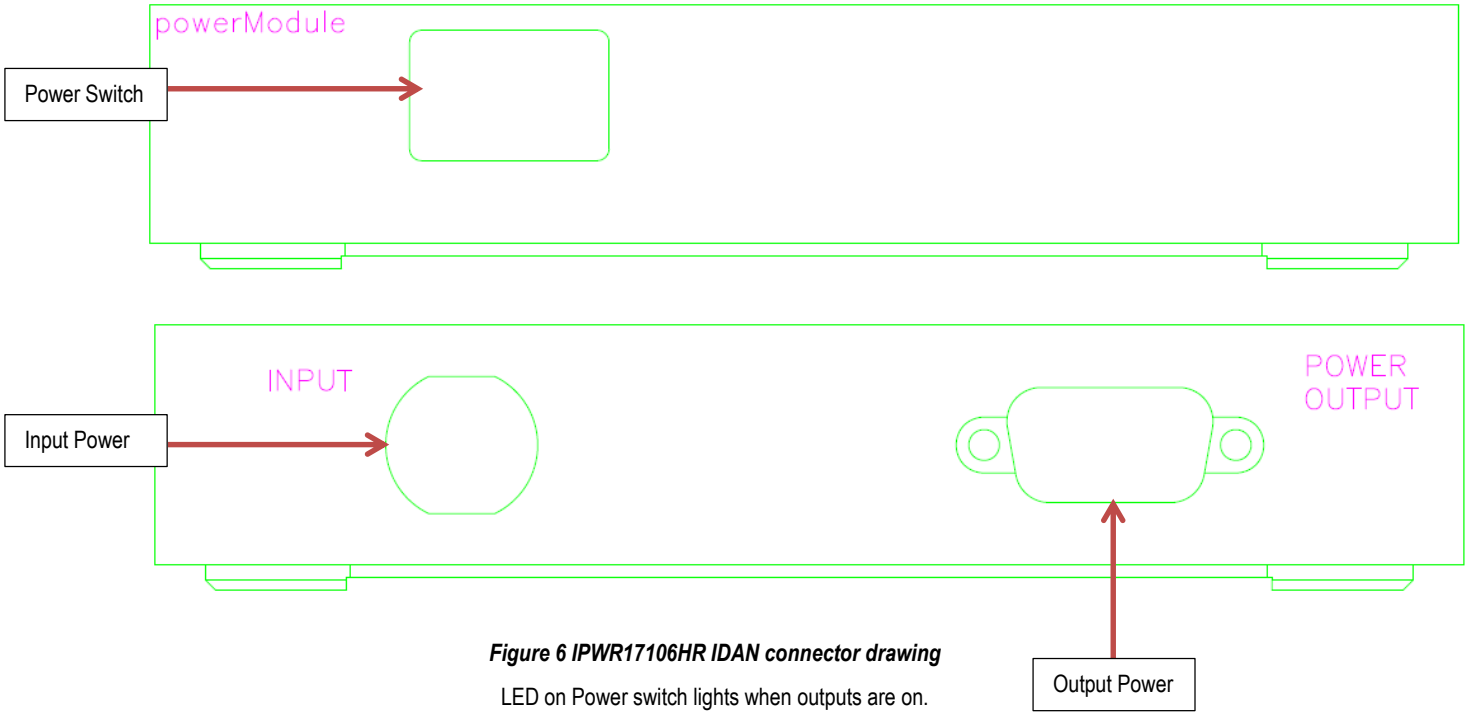


Figure 6 IPWR17106HR IDAN connector drawing

LED on Power switch lights when outputs are on.

Image to be added later

Figure 7 IDAN frame rear view

Image to be added later

Figure 8 IDAN frame front view

Figure 9 Power Output Connector Female DB9

Table 10: IDAN Power Output Connector Pin-out

Pin Number	Description
1	5V
2	GND
3	N/C
4	N/C
5	N/C
6	5V
7	GND
8	N/C
9	N/C

Three Amp current rating per pin.

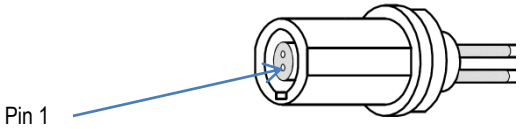


Figure 10 IDAN Input Power Connector

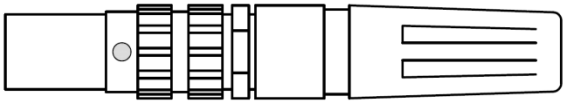


Figure 11 IDAN Power Mating Connector

The mating connector is a Souriau JBXFD1G02MSSDSMR

Table 11: IDAN Power Input Connector Pin-out

Pin Number	Description
1	Vin+
2	Vin-

Ten Amp current rating per pin.

Figure 12 IDAN Power Mating Cable

Mating cable IDAN-XKCM18 is shipped with IDAN configuration.

4.3 Steps for Installing

1. Always work at an ESD protected workstation, and wear a grounded wrist-strap.
2. Turn off power to the IDAN system.
3. Remove the module from its anti-static bag.
4. Check that pins of the bus connector are properly positioned.
5. Check the stacking order; make sure all of the busses used by the peripheral cards are connected to the cpuModule.
6. Hold the module by its edges and orient it so the bus connector pins line up with the matching connector on the stack.
7. Gently and evenly press the module onto the IDAN system.
8. If any boards are to be stacked above this module, install them.
9. Finish assembling the IDAN stack by installing screws of an appropriate length.
10. Attach any necessary cables to the IDAN system.
11. Re-connect the power cord and apply power to the stack.
12. Boot the system and verify that all of the hardware is working properly.

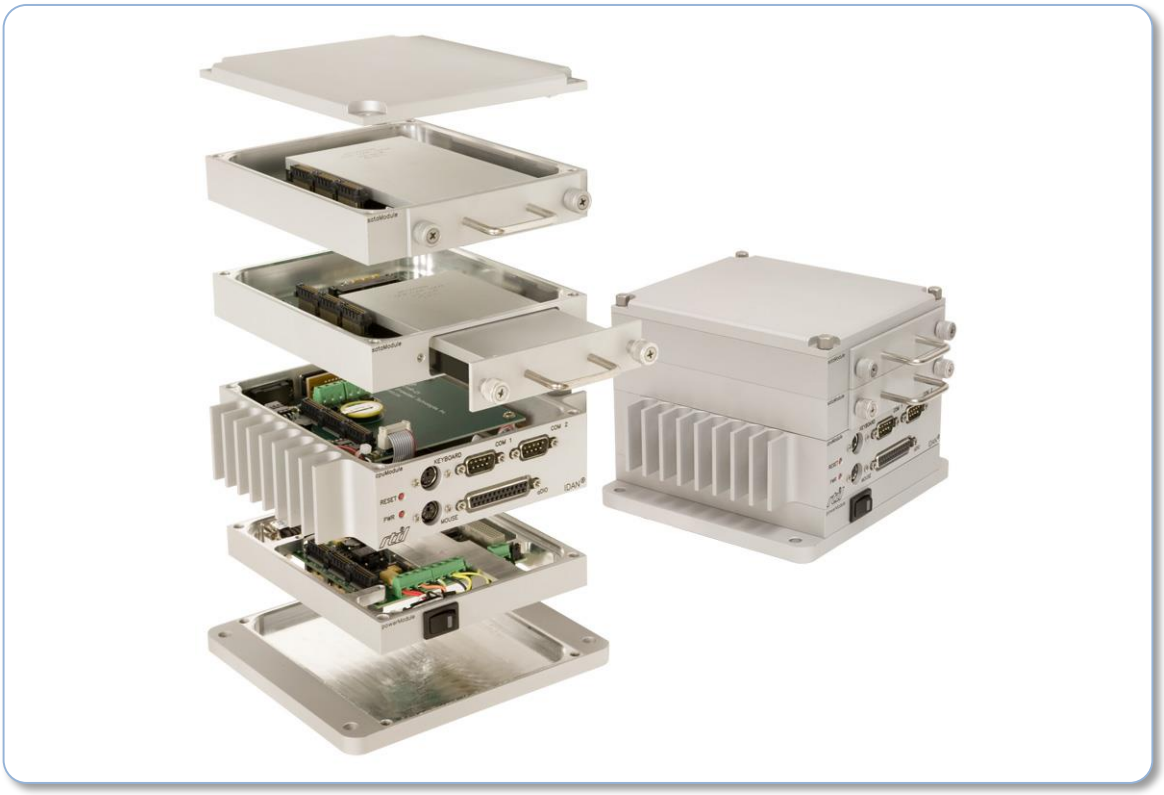


Figure 13: Example IDAN System

5 Functional Description

5.1 Block Diagram

The Figure below shows the functional block diagram of the IPWR17106HR.

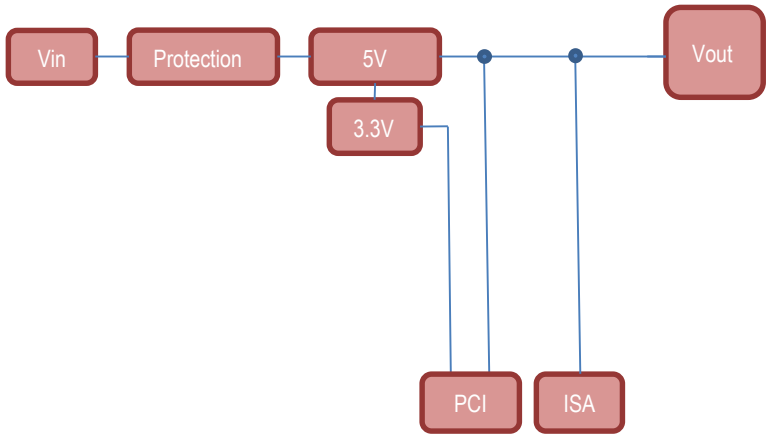


Figure 14: IPWR17106HR Block Diagram

6 Troubleshooting

If you are having problems with your system, please try the following initial steps:

- **Simplify the System** – Remove modules one at a time from your system to see if there is a specific module that is causing a problem. Perform you troubleshooting with the least number of modules in the system possible.

- **Swap Components** – Try replacing parts in the system one at a time with similar parts to determine if a part is faulty or if a type of part is configured incorrectly.

If problems persist, or you have questions about configuring this product, contact RTD Embedded Technologies via the following methods:

Phone: +1-814-234-8087
E-Mail: techsupport@rtd.com

Be sure to check the RTD web site (http://www.rtd.com) frequently for product updates, including newer versions of the board manual and application software.

7 Additional Information

7.1 PC/104 Specifications

A copy of the latest PC/104 specifications can be found on the webpage for the PC/104 Embedded Consortium:

www.pc104.org

7.2 PCI and PCI Express Specification

A copy of the latest PCI and PCI Express specifications can be found on the webpage for the PCI Special Interest Group:

www.pcisig.com

8 Limited Warranty

RTD Embedded Technologies, Inc. warrants the hardware and software products it manufactures and produces to be free from defects in materials and workmanship for one year following the date of shipment from RTD Embedded Technologies, Inc. This warranty is limited to the original purchaser of product and is not transferable.

During the one year warranty period, RTD Embedded Technologies will repair or replace, at its option, any defective products or parts at no additional charge, provided that the product is returned, shipping prepaid, to RTD Embedded Technologies. All replaced parts and products become the property of RTD Embedded Technologies. Before returning any product for repair, customers are required to contact the factory for a Return Material Authorization (RMA) number.

This limited warranty does not extend to any products which have been damaged as a result of accident, misuse, abuse (such as: use of incorrect input voltages, improper or insufficient ventilation, failure to follow the operating instructions that are provided by RTD Embedded Technologies, “acts of God” or other contingencies beyond the control of RTD Embedded Technologies), or as a result of service or modification by anyone other than RTD Embedded Technologies. Except as expressly set forth above, no other warranties are expressed or implied, including, but not limited to, any implied warranties of merchantability and fitness for a particular purpose, and RTD Embedded Technologies expressly disclaims all warranties not stated herein. All implied warranties, including implied warranties for merchantability and fitness for a particular purpose, are limited to the duration of this warranty. In the event the product is not free from defects as warranted above, the purchaser's sole remedy shall be repair or replacement as provided above. Under no circumstances will RTD Embedded Technologies be liable to the purchaser or any user for any damages, including any incidental or consequential damages, expenses, lost profits, lost savings, or other damages arising out of the use or inability to use the product.

Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, and some states do not allow limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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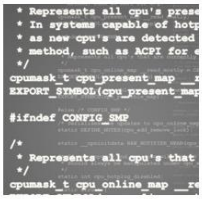

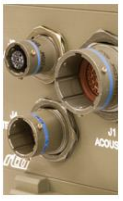
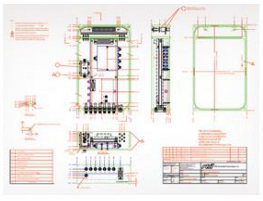

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