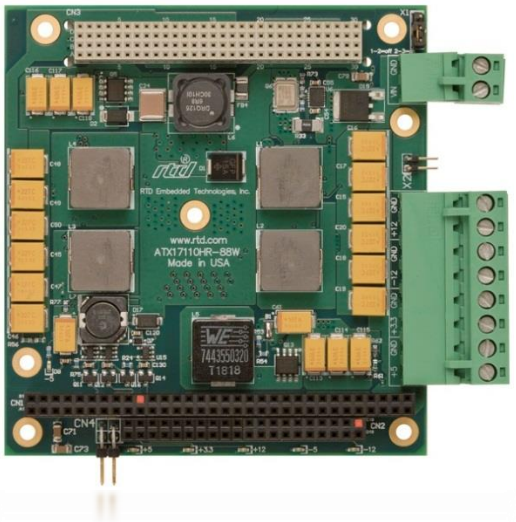
ATX104plusHR / ATX17110HR

PC/104 DC/DC Power Supply

User's Manual



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Revision History

Rev A	10/23/2012	Initial Release
Rev B	12/10/2013	Corrected Table 6 description of X1
Rev C	02/28/2014	Further clarified the function of X1 and X2, added ATX104plusHR to manual and added IDAN information
Rev D	08/02/2019	Corrected Table 8

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1 Introduction

1.1 Product Overview

The ATX104PLUSHR / ATX17110HR was designed to meet the power requirements of the PC/104-Plus Specification Version 2.01.

1.2 Board Features

- PCI and PC/104 pass through bus
- 10.0 Amps of 5V
- 2.0 Amps of 12V
- 0.5 Amps of -12V
- 0.1 amps of -5V
- 2.0 Amps of 5VSB
- Remote ON/OFF control
- Reverse voltage protection
- Input over voltage protection
- Input over current protection
- ATX functionality

The ATX104PLUSHR / ATX17110HR is available with the following options:

Table 1: Ordering Options

Part Number	Description
ATX104PLUSHR	Standard Configuration as pictured on cover
IDAN-ATX104PLUSHR	Board Mounted in IDAN frame
ID-ATX104PLUSHR	Board with screw terminals for power connections
ATX104PLUSHR -XNS	Standard Configuration as pictured on cover, except without downward express connector installed.
ID-ATX104PLUSHR -XNS	Board with screw terminals for power connections, except without downward express connector installed.

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

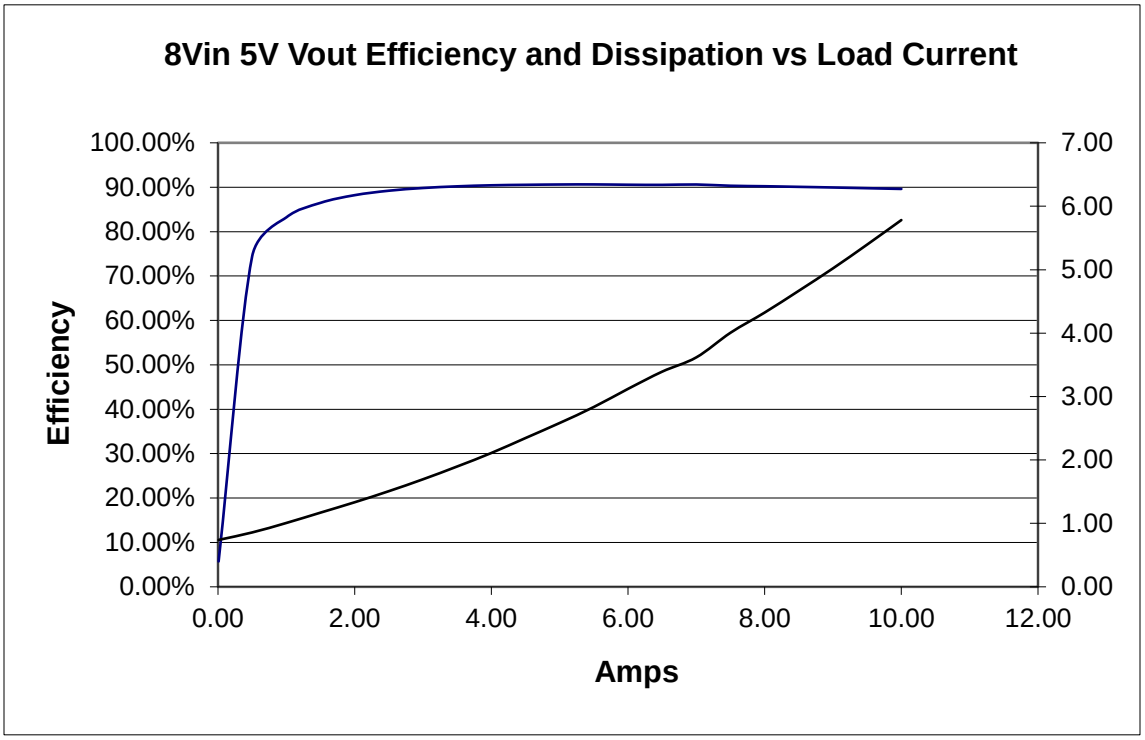
Table 2: Operating Conditions

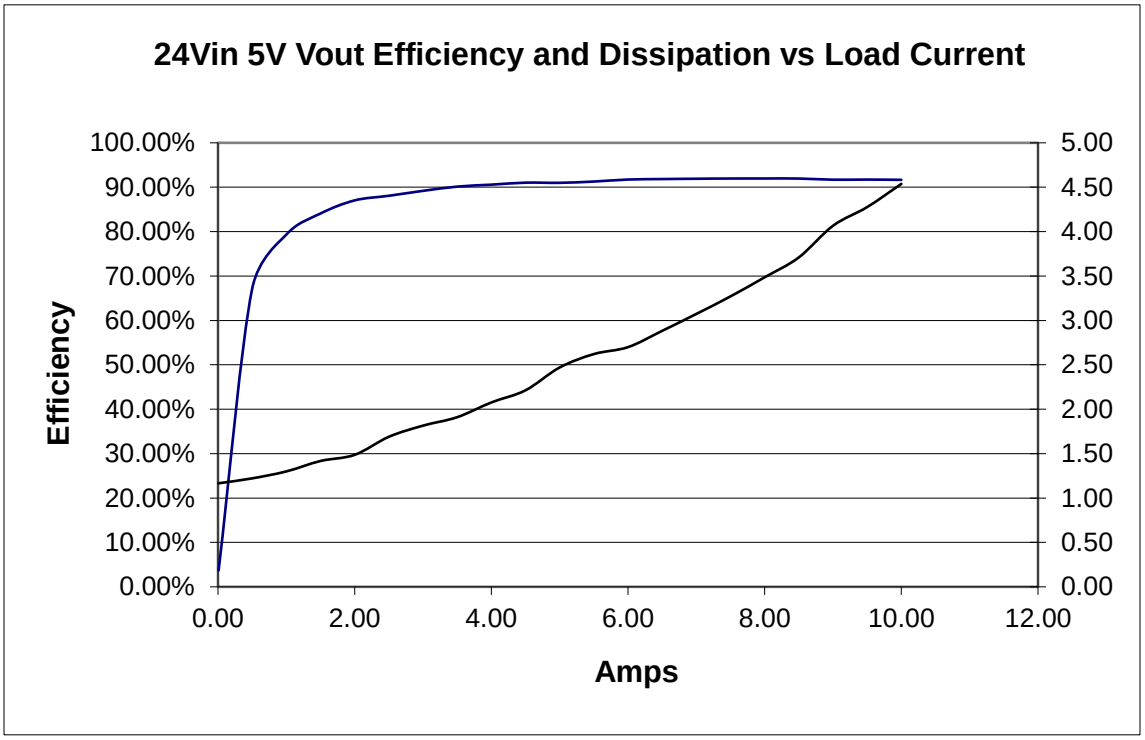
Symbol	Parameter	Test Condition	Min	Max	Unit
V_{in}	Supply Voltage		8.00	36.00	V
T_a	Operating Temperature		-40	+85	C
T_s	Storage Temperature		-55	+125	C
RH	Relative Humidity	Non-Condensing	0	90%	%
MTBF	Mean Time Before Failure	Telcordia Issue 2 30°C, Ground benign, controlled		TBD	Hours

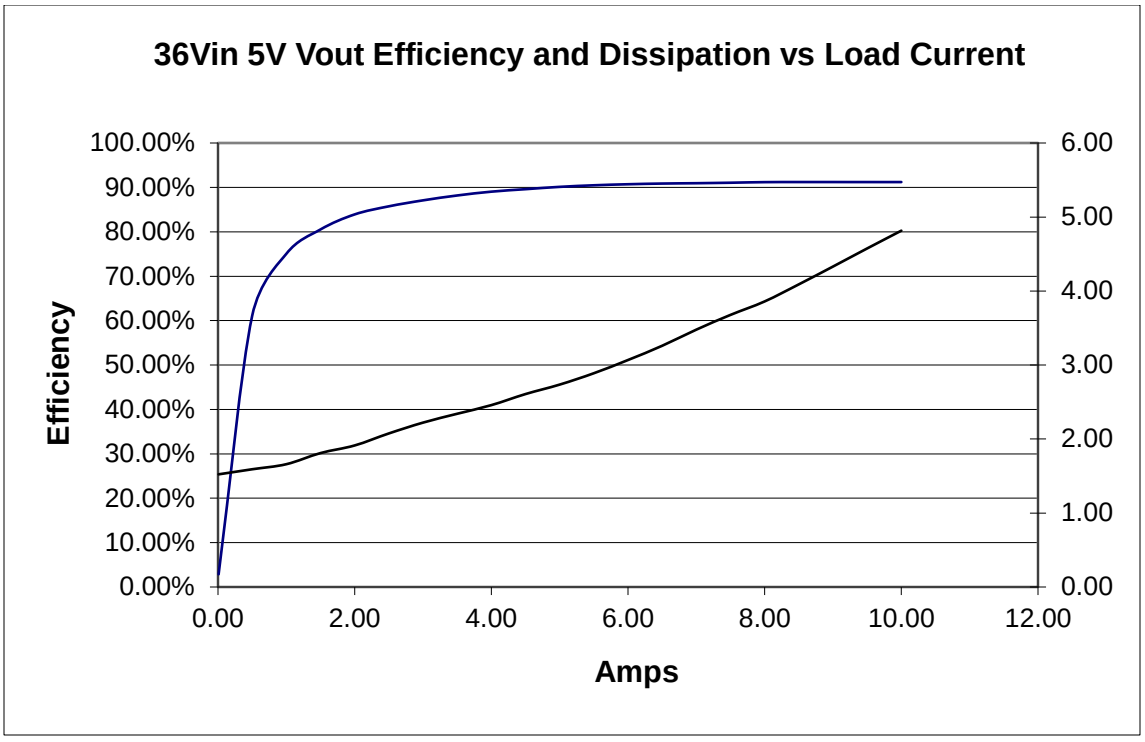
2.2 Electrical Characteristics

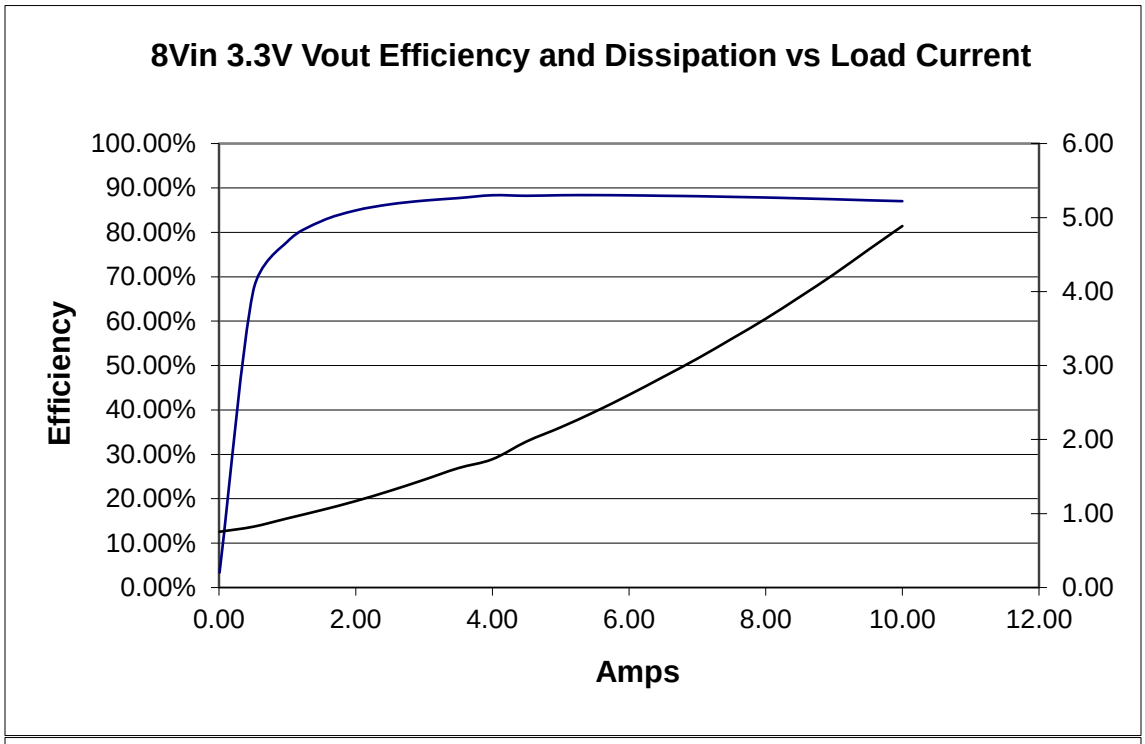
Parameter	Test Condition	Max	Unit
Power Dissipation	23°C 36.00V Vin	14.69	W
Combined Efficiency 8Vin	23°C Max load	85.19	%
Combined Efficiency 24Vin	23°C Max load	84.49	%
Combined Efficiency 36Vin	23°C Max load	85.62	%
5V Efficiency with 8Vin	23°C 10.0 Amp load	89.62	%
5V Efficiency with 24Vin	23°C 10.0 Amp load	91.66	%
5V Efficiency with 36Vin	23°C 10.0 Amp load	91.20	%
3.3V Efficiency with 8Vin	23°C 10.0 Amp load	87.02	%
3.3V Efficiency with 24Vin	23°C 10.0 Amp load	87.93	%
3.3V Efficiency with 36Vin	23°C 10.0 Amp load	86.83	%
5VSB Efficiency with 8Vin	23°C 2 Amp load	85.59	%
5VSB Efficiency with 24Vin	23°C 2 Amp load	83.09	%
5VSB Efficiency with 36Vin	23°C 2 Amp load	80.36	%
12V Efficiency all input range	23°C 2.0 Amp load	93.34	%
-12V Efficiency all input range	23°C 0.5 Amp load	88.96	%
-5V Efficiency all input range	23°C 0.1 Amp load	40.12	%
Switching Frequency	23°C	243	KHz+-2%
Reverse Voltage Protection	23°C	-36	V

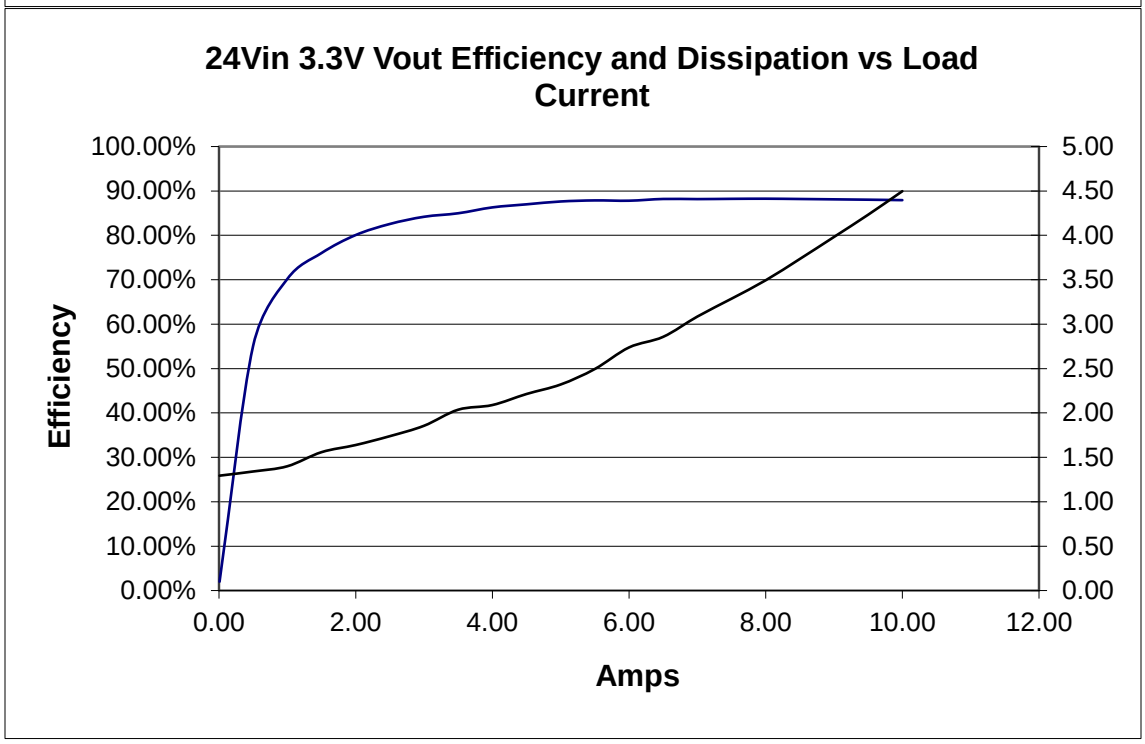
2.3 Efficiency Graphs

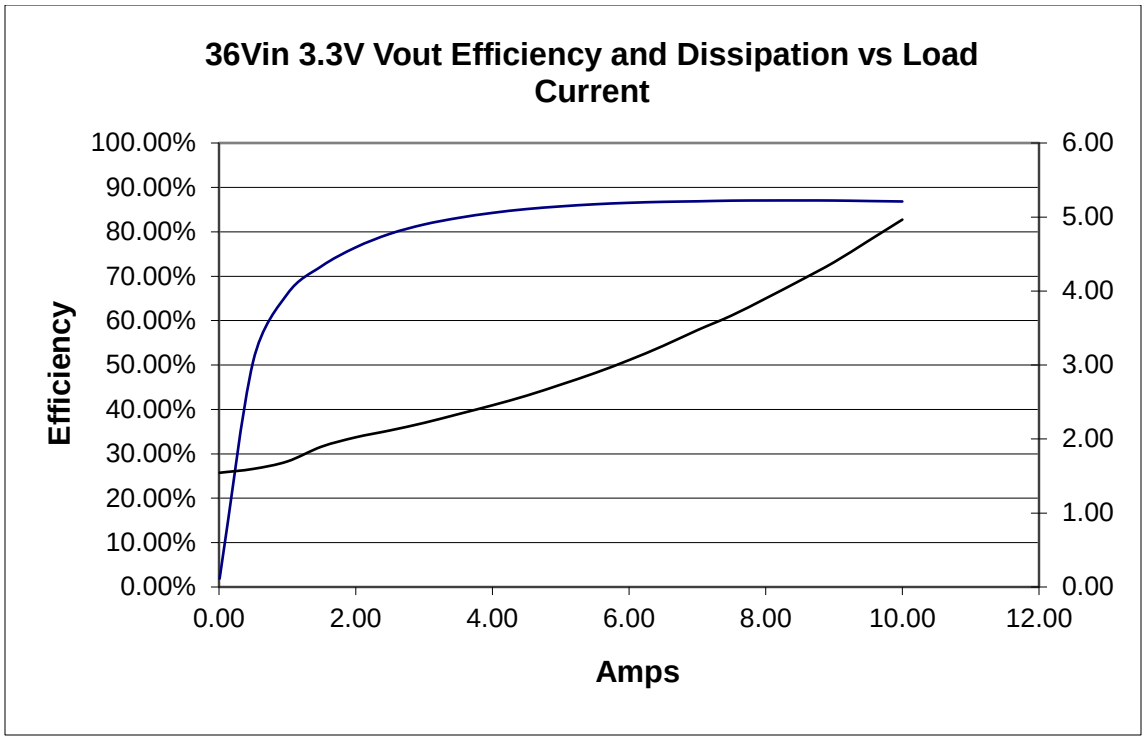


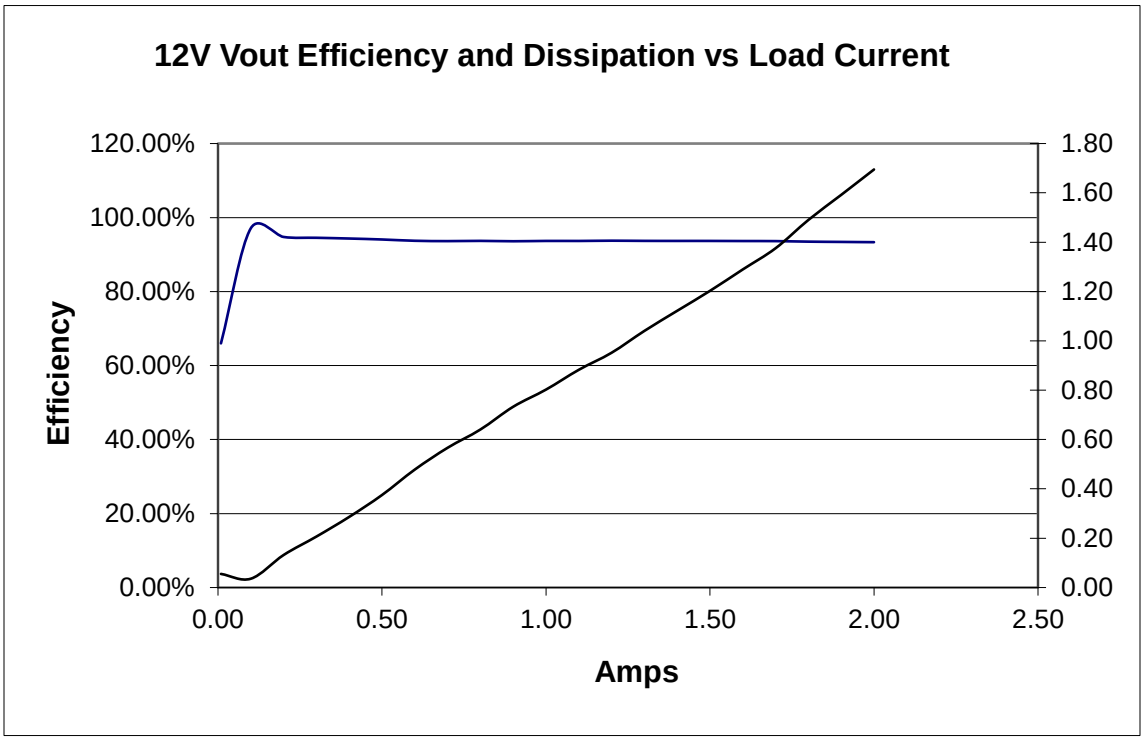


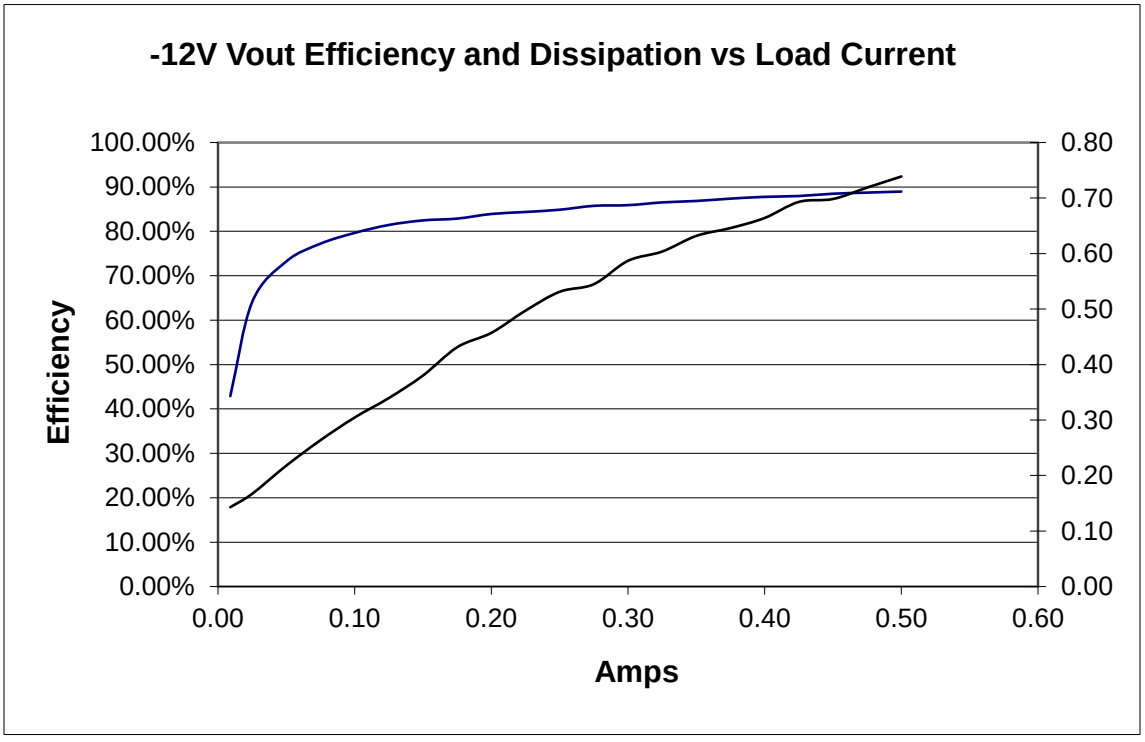

36Vin 5V Vout Efficiency and Dissipation vs Load Current
Efficiency
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
Amps

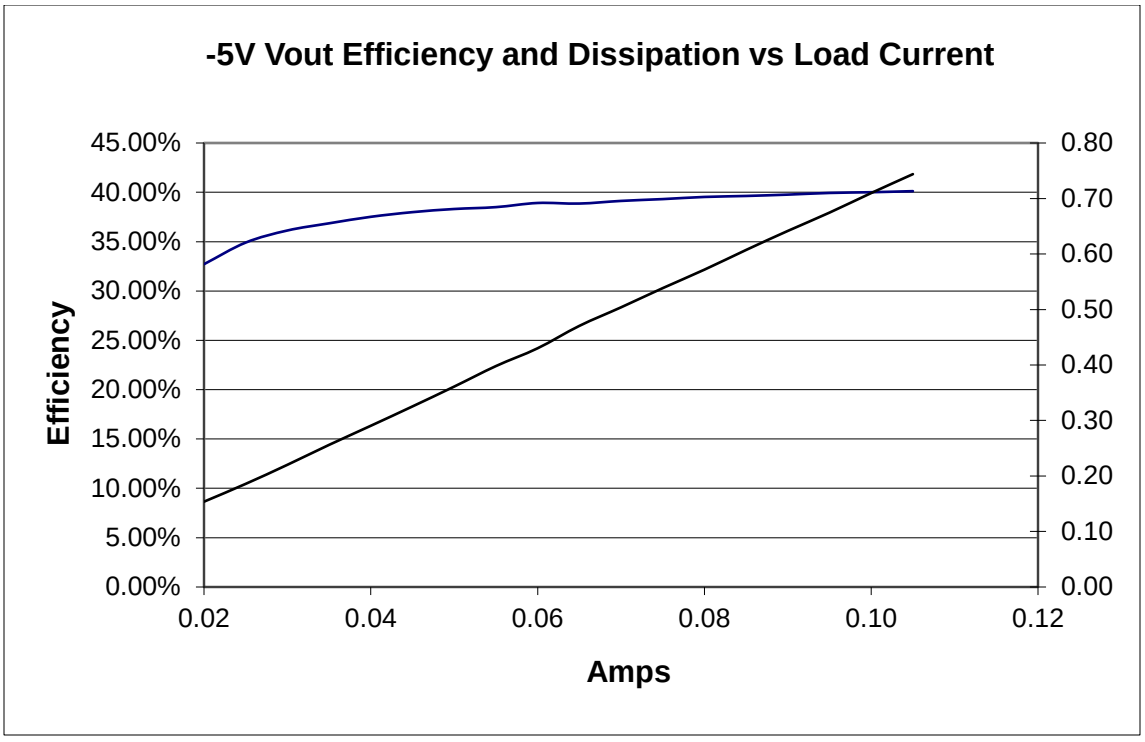

8Vin 3.3V Vout Efficiency and Dissipation vs Load Current
Efficiency
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
Amps

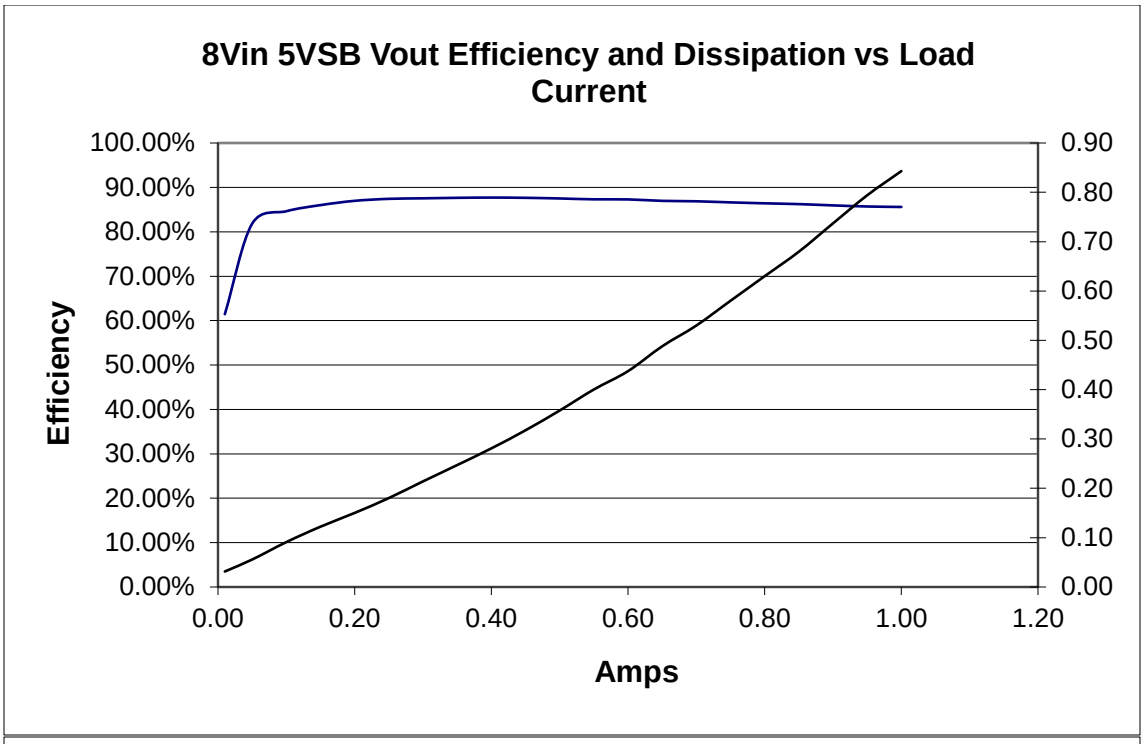

24Vin 3.3V Vout Efficiency and Dissipation vs Load Current
Efficiency
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
Amps

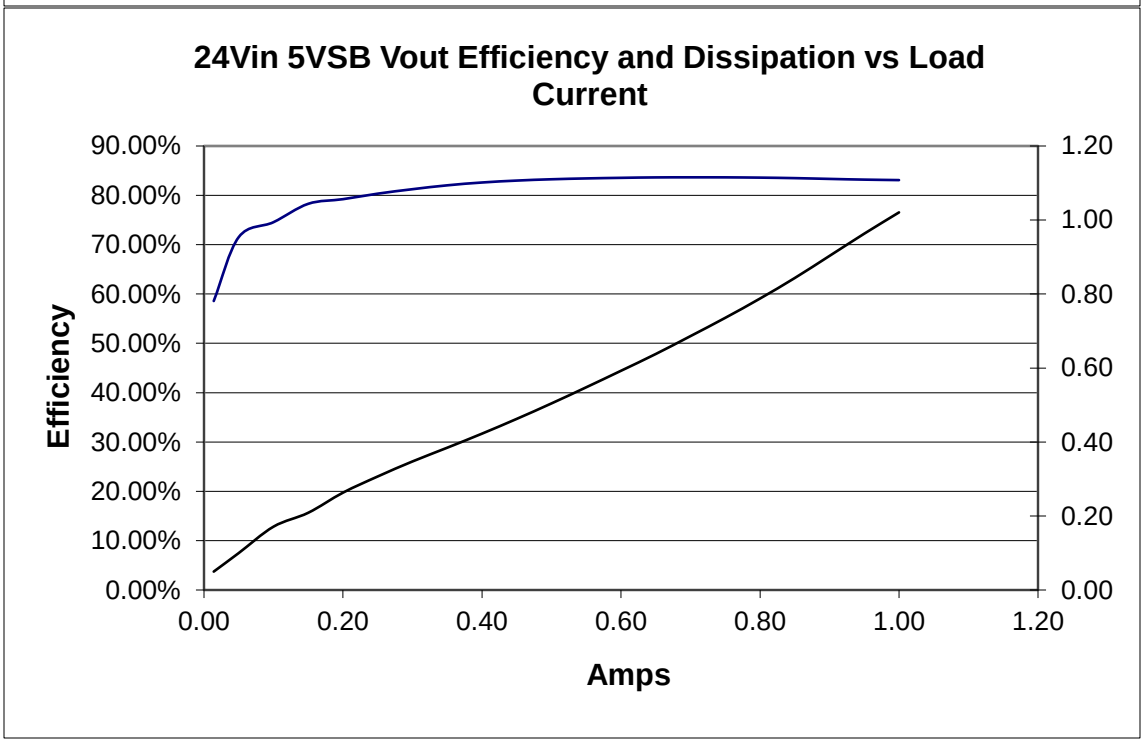

36Vin 3.3V Vout Efficiency and Dissipation vs Load Current
Efficiency
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
Amps

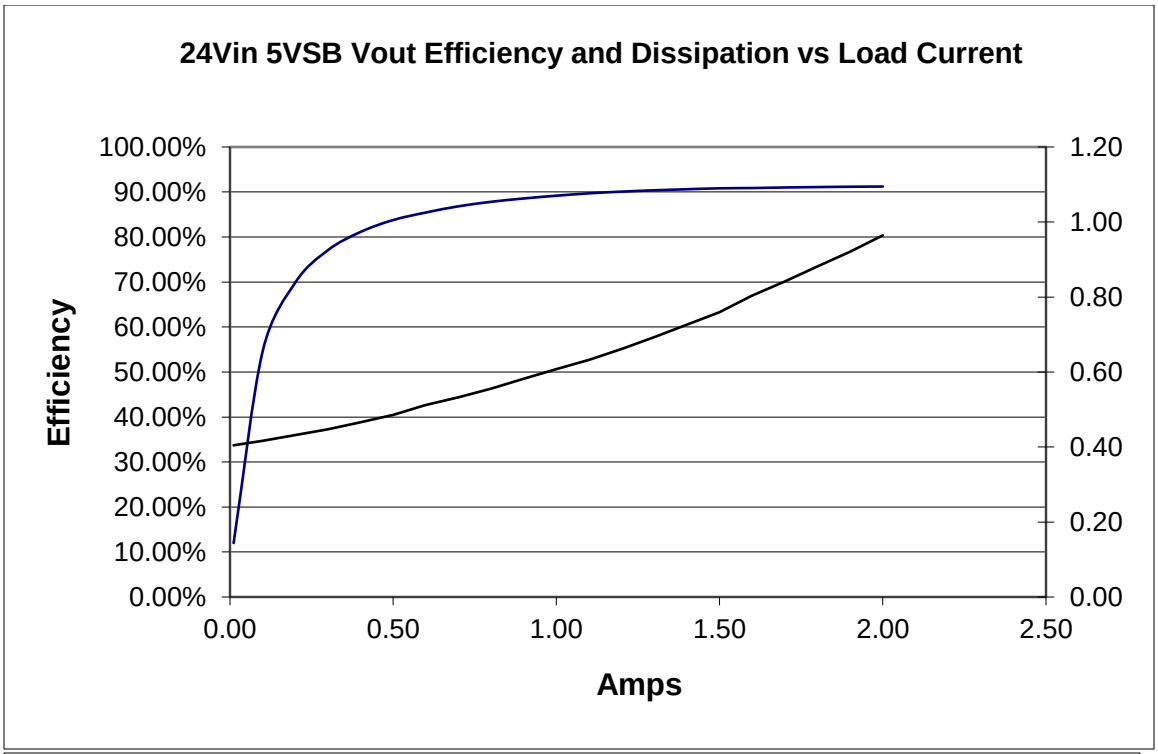

12V Vout Efficiency and Dissipation vs Load Current
120.00%
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
Efficiency
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
0.50
1.00
1.50
2.00
2.50
Amps

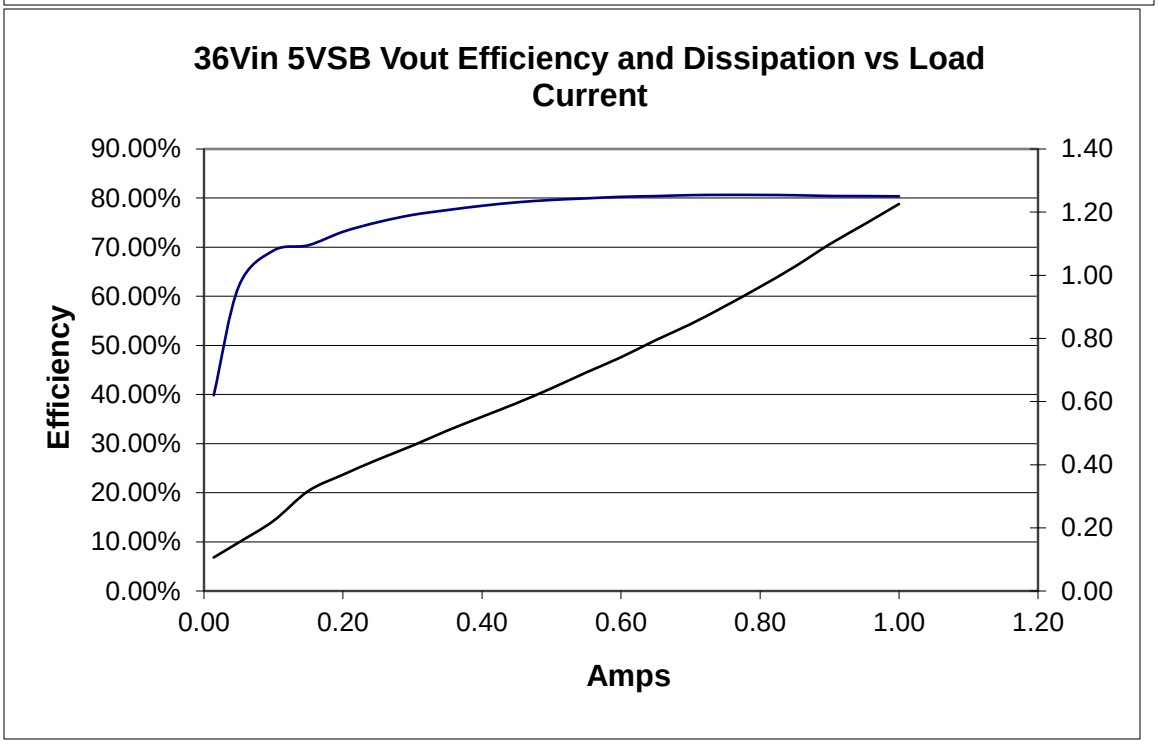

-12V Vout Efficiency and Dissipation vs Load Current
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Efficiency
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.10
0.20
0.30
0.40
0.50
0.60
Amps


-5V Vout Efficiency and Dissipation vs Load Current
Efficiency
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.02
0.04
0.06
0.08
0.10
0.12
Amps

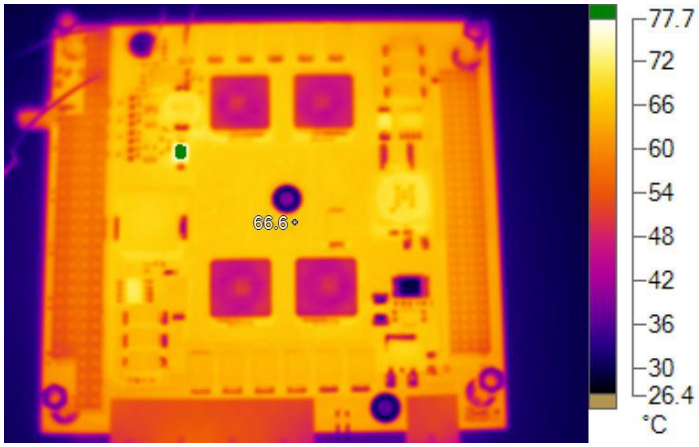

8Vin 5VSB Vout Efficiency and Dissipation vs Load Current
Efficiency
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Amps


24Vin 5VSB Vout Efficiency and Dissipation vs Load Current
Efficiency
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Amps

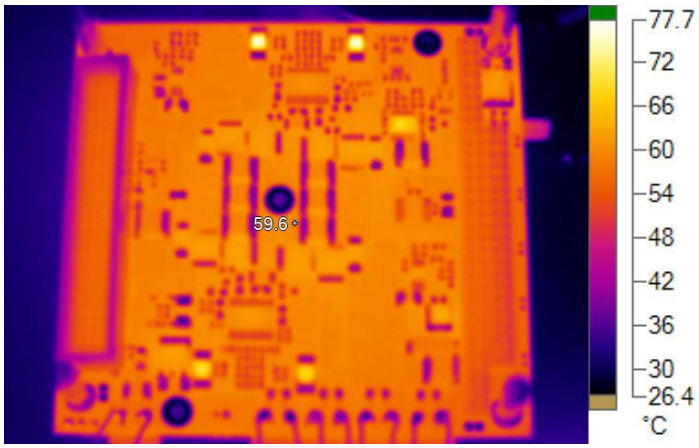

24Vin 5VSB Vout Efficiency and Dissipation vs Load Current
Efficiency
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
0.50
1.00
1.50
2.00
2.50
Amps


36Vin 5VSB Vout Efficiency and Dissipation vs Load Current
Efficiency
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.00
0.20
0.40
0.60
0.80
1.00
1.20
Amps

2.4 Thermal Image



Top; No Heat Sink, 23°C, Max Load, 24Vin, At thermal equilibrium, Max temperature is 66.6C



Bottom; No Heat Sink, 23°C, Max Load, 24Vin, At thermal equilibrium, Max temperature is 59.6C

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 172g (0.38 lbs.) board only
- Dimensions: 90.17 mm L x 95.89 mm W (3.550 in L x 3.775 in W)

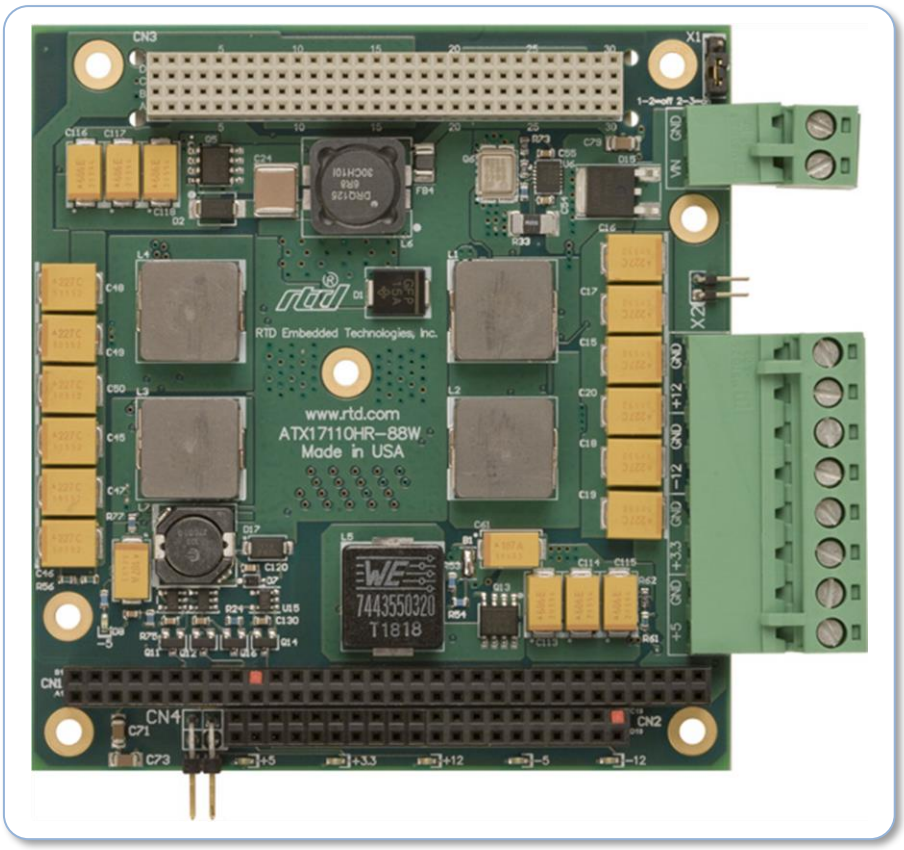


Figure 1 Board Photo

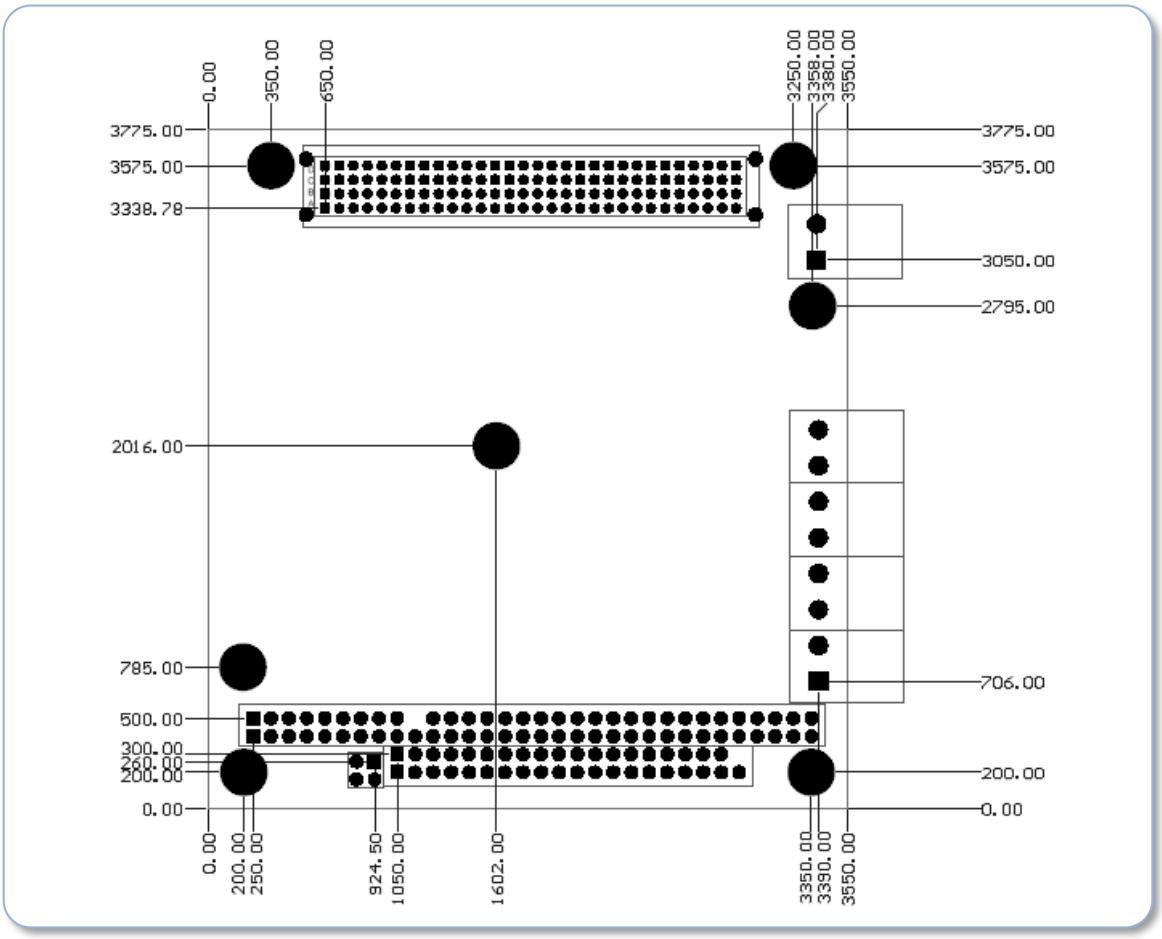


Figure 2: Board Dimensions

3.3 Connectors, Jumpers, and LEDs

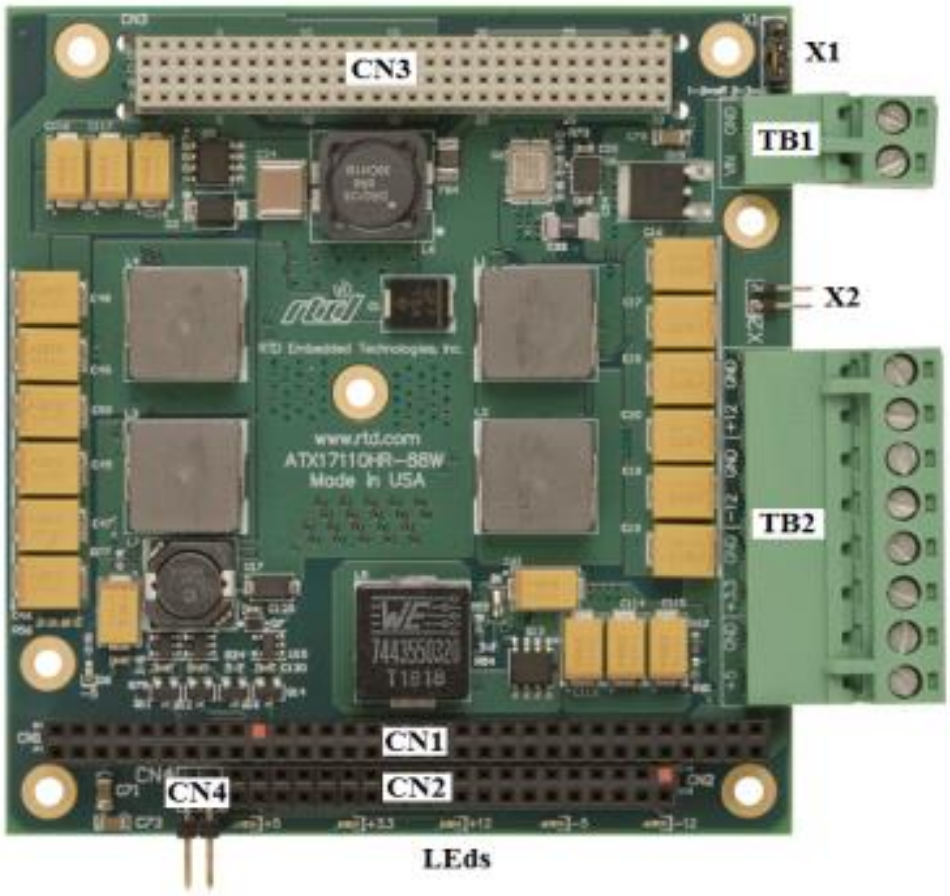


Figure 3: Board Connections, Jumpers, and LEDs

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 six pin input power connector. Each pin is labeled on the PCB.

Table 3 TB1 Vin Connector

TB1 Pin	Pin Name	Function	IDAN LEMO EEG.1B.302.CLL
1	Vin	8V to 36V input	1 (by key)
2	GND	Ground connection	2

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.

Table 4 TB2 Vout Connector

TB2 Pin	Pin Name	Function	IDAN 9-pin "D"
1	+5V	5V auxiliary output	1 and 6
2	GND	Ground connection	2
3	+3.3V	3.3V auxiliary output	8
4	GND	Ground connection	9
5	-12V	-12V auxiliary output	5
6	GND	Ground connection	9
7	+12V	12V auxiliary output	3
8	GND	Ground connection	4

CN1 and CN2 PC/104 Bus

CN1 and CN2 are the PC/104 connectors. Pins marked on PCB.

Table 5 CN1 and CN2 PC/104 Bus

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

CN3 PCI Bus

CN3 pins marked on PCB.

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

CN4 ATX Signals

Pin Number	Name
1	GND
2	PS_ON#
3	PWRGD
4	5VSB

X1 Jumper

The default position of X1 is 2 and 3 shorted. The X1 jumper is the enable for the 5V, 3.3V, 12V, and -12V. X1 does not affect 5V_STBY. Pin 1 is not connected, pin 2 is GND, and pin 3 is the PS_ON# ATX signal. There is silk on the board next to the X1 jumper. The silk is "1-2=off 2-3=on". Position 1-2 is labeled "off" because without any CPU attached to drive the PS_ON# signal the main rails will remain off. Position 2-3 is labeled "on" because it shorts the PS_ON# signal to GND. Shorting PS_ON# to GND enables the main rails (5V, 3.3V, 12V, and -12V).

Table 6 X1 PS_ON# Jumper

X1 Pin	Signal	Function	Default
2-3	RUN	Sets PS_ON# shorted to GND	YES
1-2	Pull-high	Sets PS_ON# pulled up to 5V	NO

X2 Jumper

The X2 jumper is the enable for the entire board. Default is open or attached to the power switch in IDAN. Board is labeled with settings. When set to OFF, all supplies on the board are disabled. When set to ON, The board is controlled via the X1 jumper. If there is no jumper on X1 PS_ON# is pulled high.

Table 7 X2 Board Enable Jumper

X2 state	Function
Short	All supplies are off
Open	Board under X1 control

X1 and X2 Operation

Further explanation of X1 and X2 involve their combinations. The Table below clarifies. A further note is when X1 is open, the CPU will control the state of PS_ON#.

Table 8 X1 X2 Operation

	X1=1-2 (PS_ON# control)	X1=2-3
X2=installed	5V=off 12V=off -12V=off 3.3V=off 5Vstby=off	5V=off 12V=off -12V=off 3.3V=off 5Vstby=off
X2=open	5V=PS_ON# 12V=PS_ON# -12V=PS_ON# 3.3V=PS_ON# 5Vstby=on	5V=on 12V=on -12V=on 3.3V=on 5Vstby=on

3.3.2 LEDs

Voltage indicator LEDs

There are six LEDs on the board. They are labeled by CN2 by their voltage. If an LED is lighted, the respective voltage is good. The 5VSB LED resides near the 5VSB supply.

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.

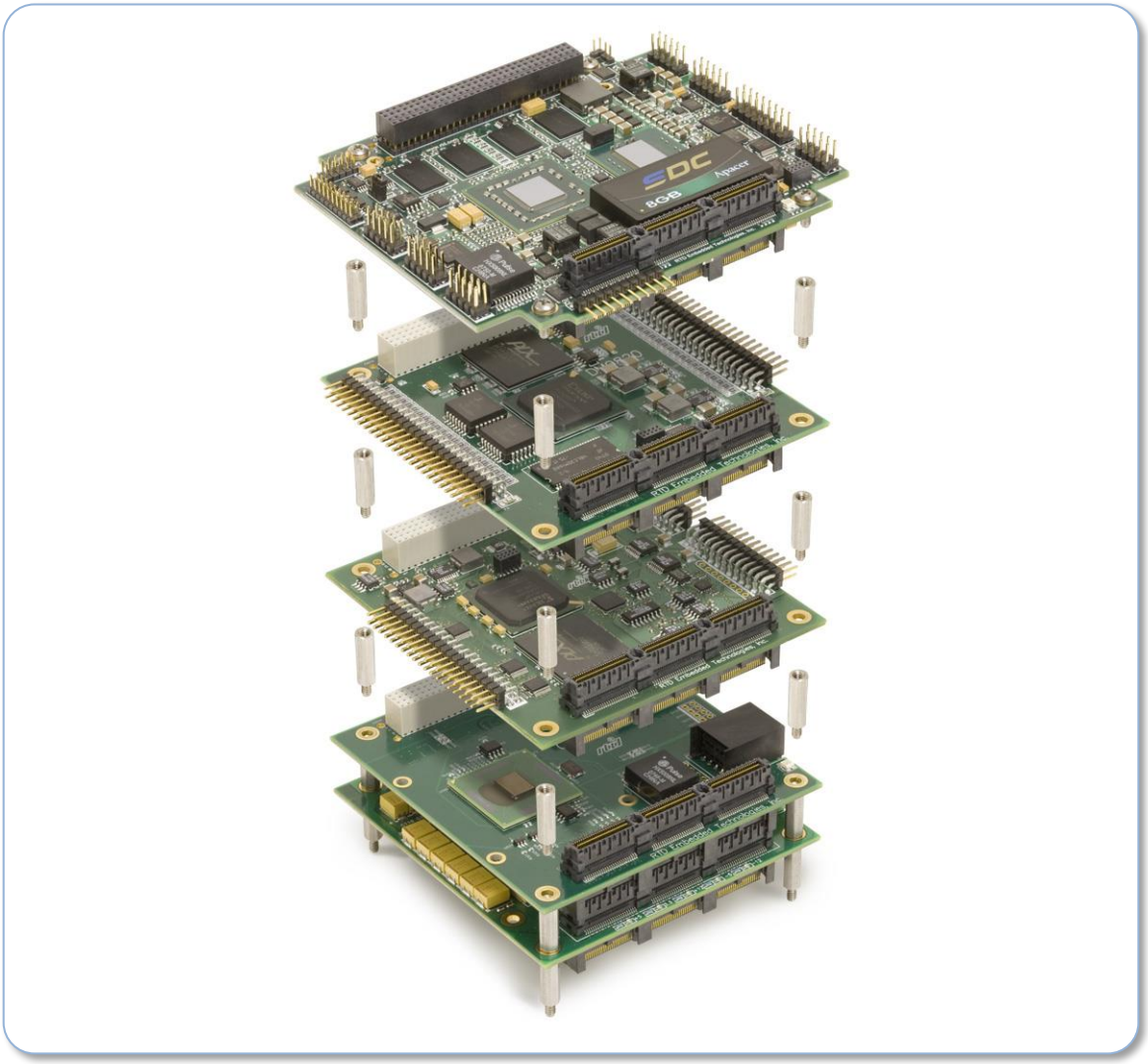


Figure 4: Example 104™ Stack

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 6-pin push-pull power input connector and the 9-pin "D" power output connector are brought out of the back of the frame.

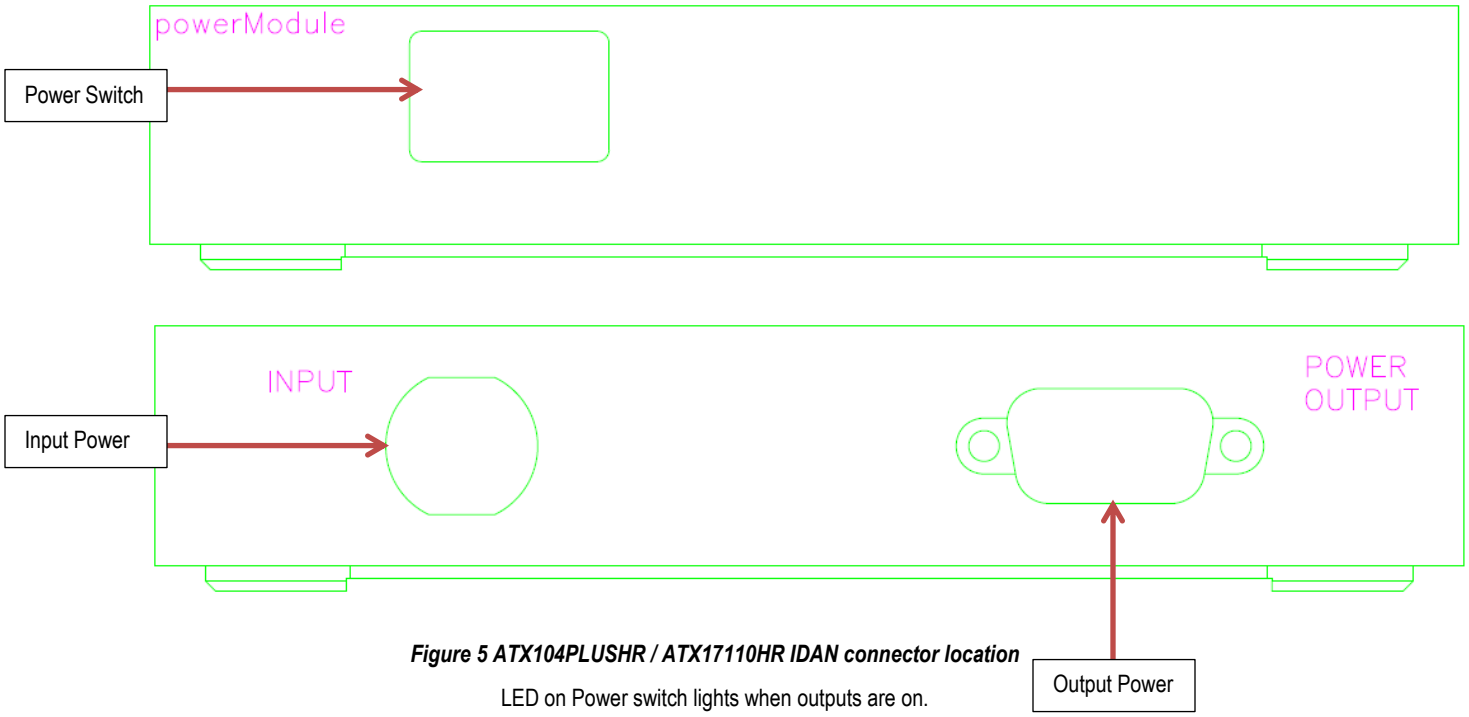


Figure 5 ATX104PLUSHR / ATX17110HR IDAN connector location

LED on Power switch lights when outputs are on.

Figure 6 IDAN frame rear view

Figure 7 IDAN frame front view

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.

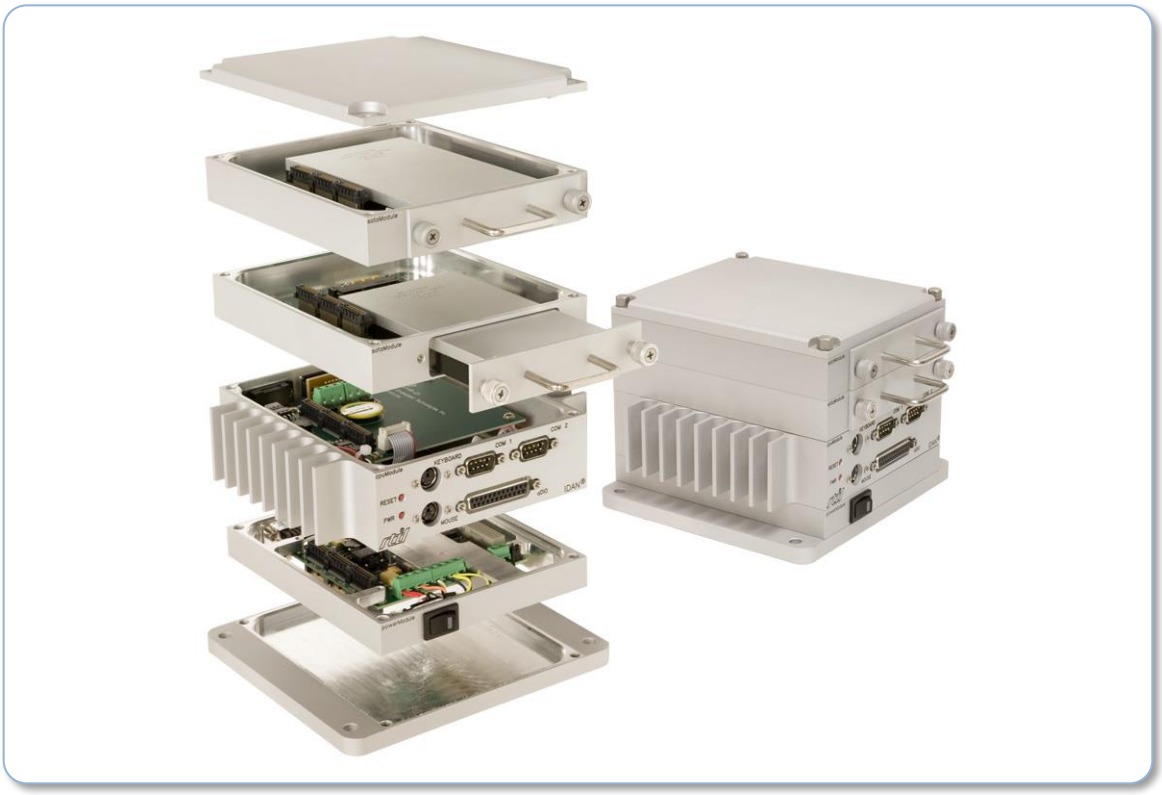


Figure 8: Example IDAN System

4.4 IDAN Pinouts, Parts, and Dimensions

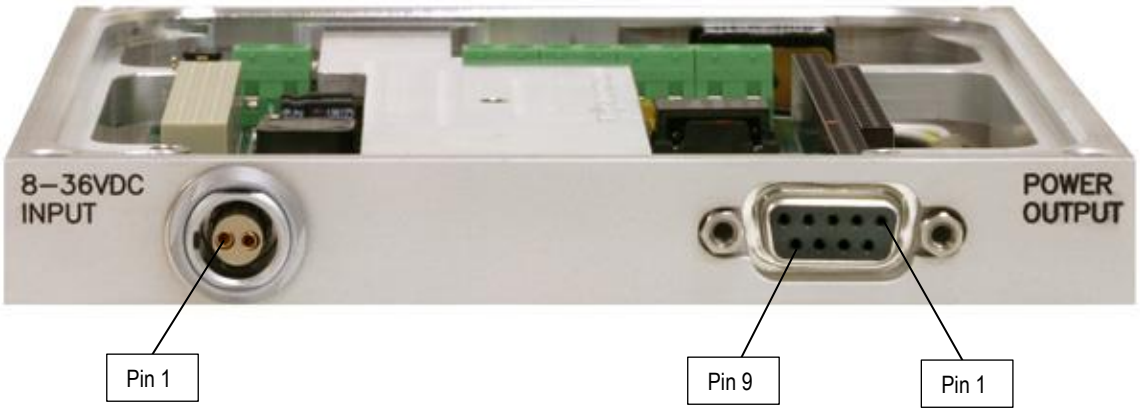


Table 9: IDAN Power Out Pin-out

Power Output – 9 Pin "D" Connector (Female)	
IDAN Pin#	**Signal**
1	+5 Volts
2	Ground
3	+12 Volts
4	Ground
5	-12 Volts
6	+5 Volts
7	Ground
8	+3.3 Volts
9	Ground

Table 10: IDAN Input Power Pin-out

Power Input – 2 Pin Quick Disconnect Connector (Female)	
IDAN Pin#	**Signal**
1	8-36 VDC
2	Ground

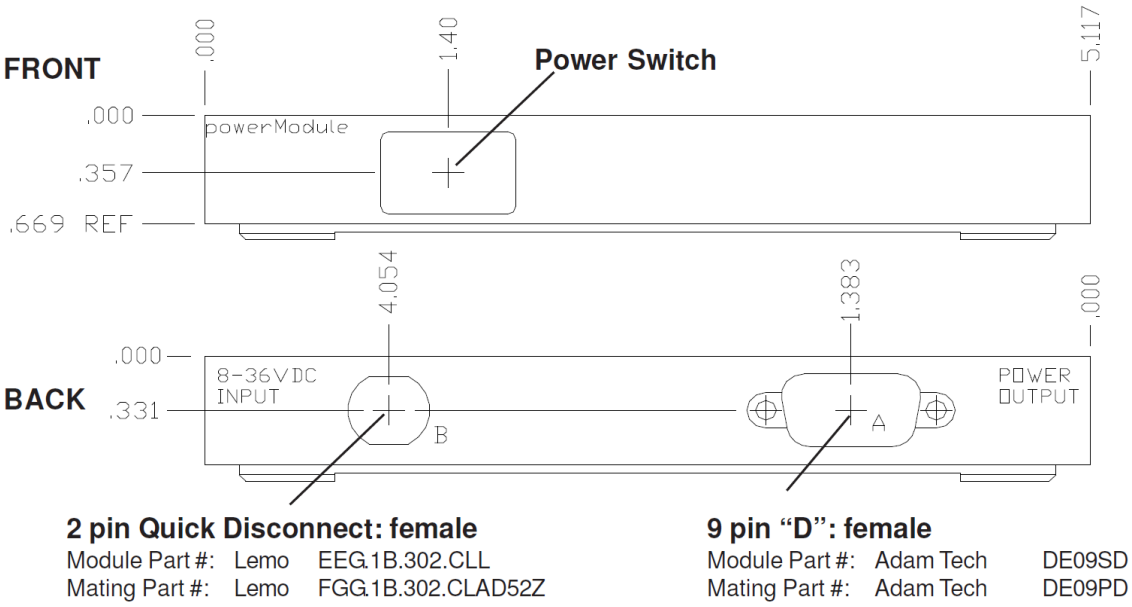


Figure 9: IDAN Connector Part Numbers

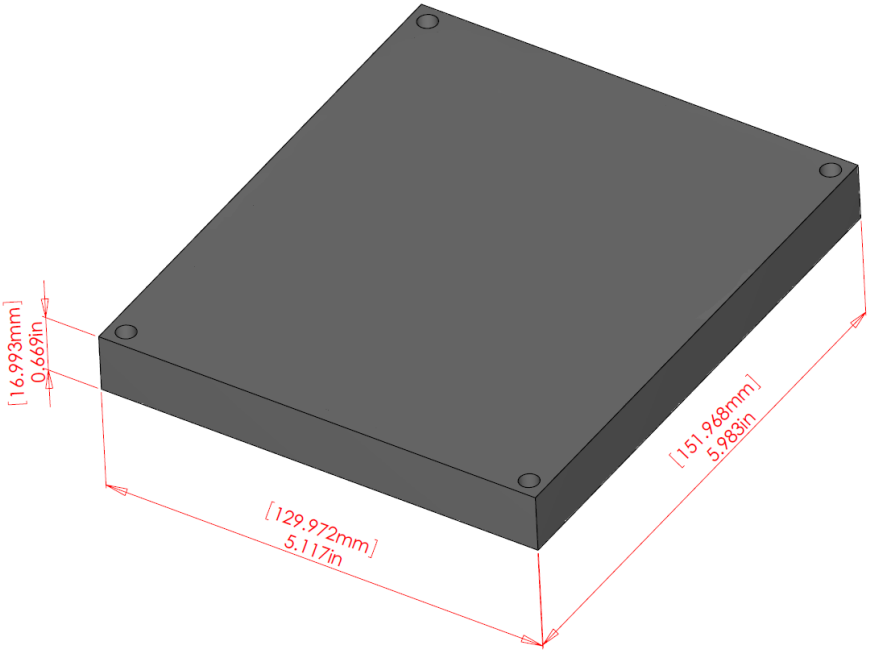


Figure 10: IDAN Dimensions

5 Functional Description

5.1 Block Diagram

The Figure below shows the functional block diagram of the ATX104PLUSHR / ATX17110HR. The various parts of the block diagram are discussed in the following sections.

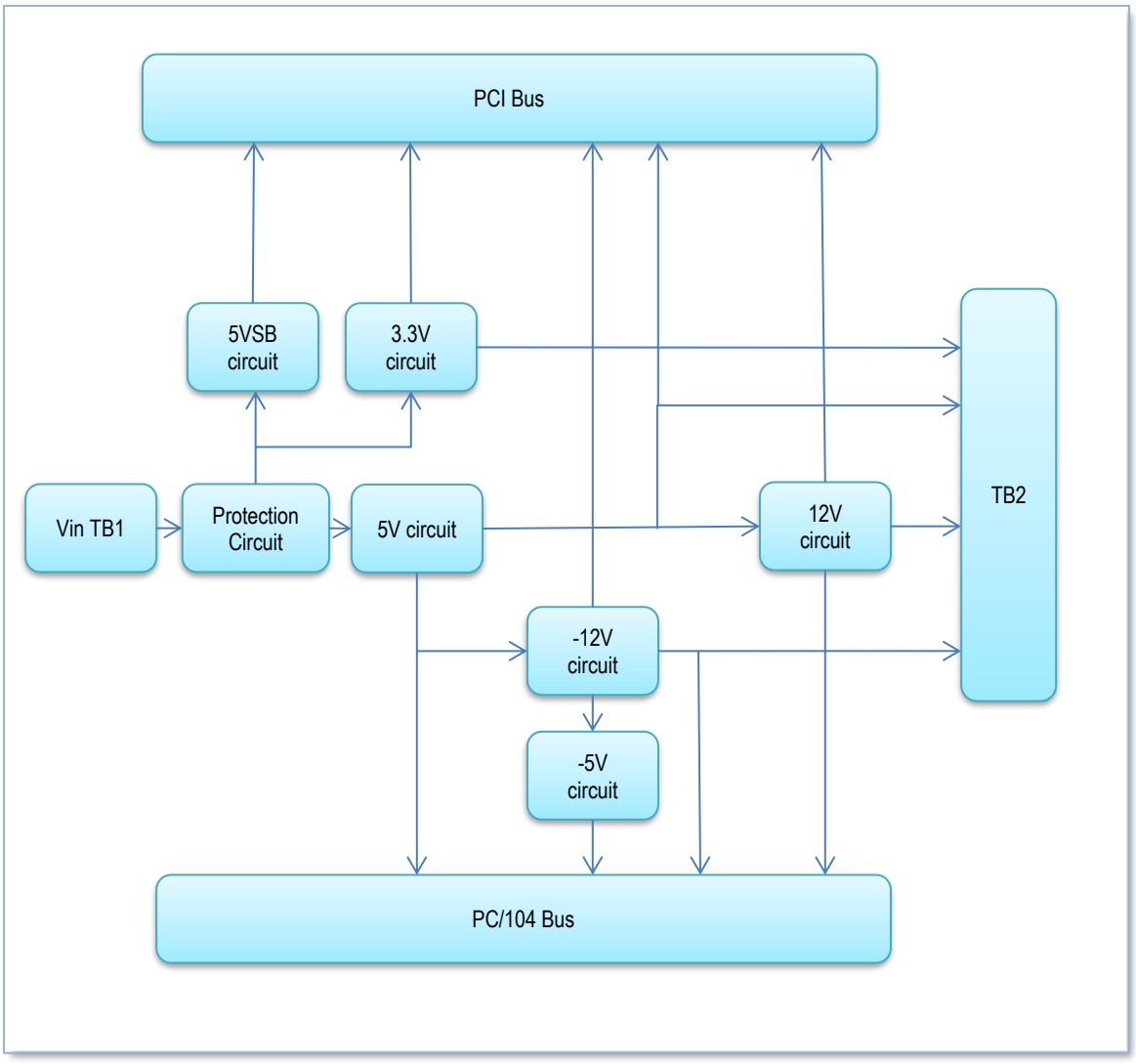


Figure 11: ATX104PLUSHR / ATX17110HR Block Diagram

5.2 Synchronization

The board is designed that all supplies are synchronized out of phase. This characteristic results in less input ripple current.

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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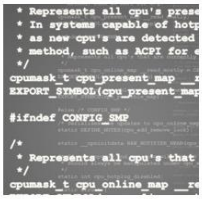

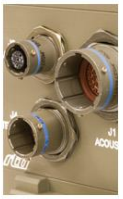
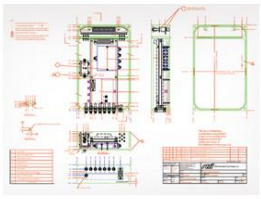

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