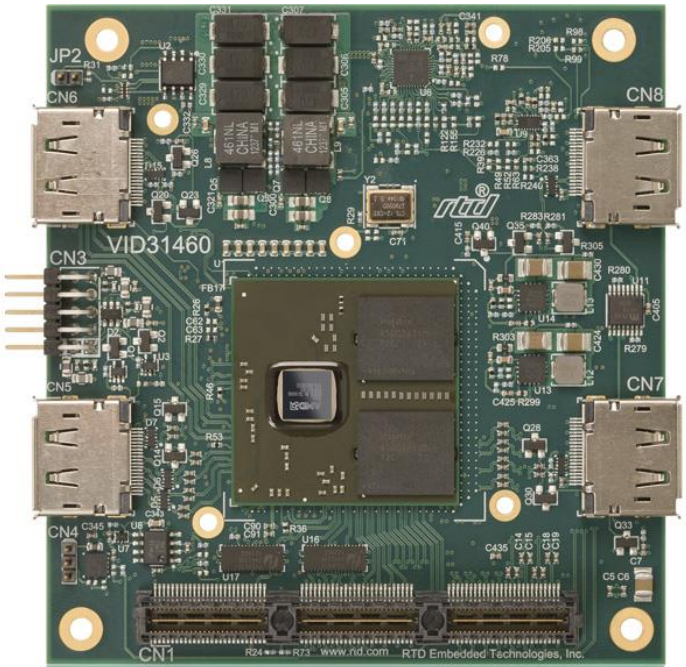
VID31460ER/VID31760ER
VID34460ER/VID34760ER

PCI Express Video Controller

User's Manual

BDM-610020109 Rev. C



RTD Embedded Technologies, Inc.
AS9100 and ISO 9001 Certified

RTD Embedded Technologies, Inc.
103 Innovation Boulevard
State College, PA 16803 USA
Telephone: 814-234-8087
Fax: 814-234-5218

www.rtd.com

sales@rtd.com
techsupport@rtd.com

Revision History

Rev A	Initial Release
Rev B	Added thermal management section. Added information about DP++ Added VID31760ER
Rev C	Added VID34460ER and VID34760ER Added IDAN Picture and connector dimension

Advanced Analog I/O, Advanced Digital I/O, aAIO, aDIO, a2DIO, Autonomous SmartCal, "Catch the Express", cpuModule, dspFramework, dspModule, expressMate, ExpressPlatform, HiDANplus, "MIL Value for COTS prices", multiPort, PlatformBus, and PC/104EZ are trademarks, and "Accessing the Analog World", dataModule, IDAN, HiDAN, RTD, and the RTD logo are registered trademarks of RTD Embedded Technologies, Inc. (formerly Real Time Devices, Inc.). PS/2 is a trademark of International Business Machines Inc. PCI, PCI Express, and PCIe are trademarks of PCI-SIG. PC/104, PC/104-Plus, PCI-104, PCIe/104, PCI/104-Express and 104 are trademarks of the PC/104 Embedded Consortium. All other trademarks appearing in this document are the property of their respective owners.

Failure to follow the instructions found in this manual may result in damage to the product described in this manual, or other components of the system. The procedure set forth in this manual shall only be performed by persons qualified to service electronic equipment. Contents and specifications within this manual are given without warranty, and are subject to change without notice. RTD Embedded Technologies, Inc. shall not be liable for errors or omissions in this manual, or for any loss, damage, or injury in connection with the use of this manual.

Copyright © 2015 by RTD Embedded Technologies, Inc. All rights reserved.

Table of Contents

1 Introduction **6**

1.1 Product Overview 6

1.2 Board Features 6

1.3 Ordering Information 6

1.4 Contact Information 7
- 1.4.1 Sales Support 7
- 1.4.2 Technical Support 7

2 Specifications **8**

2.1 Operating Conditions 8

2.2 Electrical Characteristics 8

3 Board Connection **9**

3.1 Board Handling Precautions 9

3.2 Physical Characteristics 9
- 3.2.1 Thermal Management 10

3.3 Connectors and Jumpers 11
- 3.3.1 External I/O Connectors 11
  - CN3: VGA Connector 11
  - CN4: Fan Header 11
  - CN5, CN6, CN7 & CN8: DisplayPort Connector 12
- 3.3.2 Bus Connectors 12
  - CN1 (Top) & CN2 (Bottom): PCIe Connector 12
- 3.3.3 Jumpers 12

3.4 Steps for Installing 13

4 IDAN Connections **14**

4.1 Module Handling Precautions 14

4.2 Physical Characteristics 14

4.3 Connectors 15
- 4.3.1 External I/O Connectors 15
  - VGA Connector 15
  - DisplayPort Connector 15
- 4.3.2 Bus Connectors 15
  - CN1 (Top) & CN2 (Bottom): PCIe Connector 15

4.4 Steps for Installing 16

5 Functional Description **17**

5.1 Block Diagram 17

5.2 AMD GPU Controller 17
- 5.2.1 Multiple Displays 17

6 Software **18**

6.1 Drivers 18

6.2 BIOS Settings for RTD's CMA22/CMX32 18

7 Troubleshooting **19**

8 Additional Information **20**

8.1 PC/104 Specifications 20

8.2 PCI and PCI Express Specification 20

9 Limited Warranty **21**

Table of Figures

Figure 1: Board Dimensions 9
Figure 2: Board with Heatsink 10
Figure 3: Board Connections 11
Figure 4: Example 104™ Stack 13
Figure 5: IDAN Dimensions 14
Figure 6: Example IDAN System 16
Figure 7: VID31x60 Block Diagram 17

Table of Tables

Table 1: Ordering Options 6
Table 2: Operating Conditions 8
Table 3: Electrical Characteristics 8
Table 4: CN3 VGA Connector 11
Table 5: CN4 Fan Header 11
Table 6: IDAN-VID31x60 15-Pin High Density "D" Connector 15

1 Introduction

1.1 Product Overview

The VID31460 is a PCIe/104 video controller that uses the AMD E6460 GPU. The VID31760 is a PCIe/104 video controller that uses the AMD E6760 GPU. This powerful video controller offers 5 video outputs. By supporting DisplayPort++, the video outputs can interface with almost any standard monitor (analog or digital). The VID31x60 provides an excellent power to performance ratio with the use of the AMD PowerPlay technology. By utilizing the PCIe x16 link the VID31x60 ensures maximum performance with the CPU.

The VID34460 and VID34760 utilizing the PCIe x4 to provide external GPU support to CPUs that only support PCIe x4.

1.2 Board Features

- PC/104 form factor
- PCIe/104 stackable bus structure
- AMD E6460 GPU
  - Entry-level desktop graphics, multimedia and computing capabilities
  - 160 shader processors
  - 64-bit memory interface with 512MB GDDR5
  - Up to 4 simultaneous displays with AMD Eyefinity technology
- AMD E6760 GPU
  - 460 shader processors
  - 128-bit memory interface with 1GB GDDR5
  - Up to 5 simultaneous displays with AMD Eyefinity technology
- Both processors feature
  - Microsoft® DirectX® 11 support
  - Third generation unified video decoder
  - Support for H.264 VC-1, MPEG-2/4 decode
  - Dual HD decode, Blu-ray & stereo 3D
  - AMD Accelerated Parallel Processing (APP) technology
- Versatile Video Output
  - Analog and Digital
  - DisplayPort++ enables support for any common video outputs standards
    - Analog VGA
    - DisplayPort
    - DVI
    - HDMI
- Utilizes the PCIe X16 Link below the CPU(VID31460/VID31760)
- Utilizes the PCIe X4 Link(VID34460/VID34760)

1.3 Ordering Information

The VID31x60 is available with the following options:

Table 1: Ordering Options

Part Number	Description
VID31460ER	PCIe/104 x16 Video Controller with AMD E6460
VID34460ER	PCIe/104 x4 Video Controller with AMD E6460
VID31760ER	PCIe/104 x16 Video Controller with AMD E6760
VID34760ER	PCIe/104 x4 Video Controller with AMD E6760
IDAN-VID31460ER	PCIe/104 x16 Video Controller with AMD E6460 in IDAN enclosure
IDAN-VID34460ER	PCIe/104 x4 Video Controller with AMD E6460 in IDAN enclosure
IDAN-VID31760ER	PCIe/104 x16 Video Controller with AMD E6760 in IDAN enclosure
IDAN-VID34760ER	PCIe/104 x4 Video Controller with AMD E6760 in IDAN enclosure

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.

1.4 Contact Information

1.4.1 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

1.4.2 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_{cc5}	5V Supply Voltage		4.75	5.25	V
V_{cc3}	3.3V Supply Voltage		n/a	n/a	V
V_{cc12}	12V Supply Voltage		10.8	13.2	V
T_a	Operating Temperature		-40	+70	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		894,286	Hours

2.2 Electrical Characteristics

Table 3: Electrical Characteristics

Symbol	Parameter	Test Condition	Min	Typical	Max	Unit
P	5V Power Consumption	VID31460		3		W
	12V Power Consumption	V_{cc5} = 5.0V, V_{cc12} = 12.0V		5		W
	Total Power Consumption	1 Display with 3D screen saver		8		W
I_{cc5}	5V Input Supply Current	VID31460, Active		0.6		A
I_{cc12}	12V Input Supply Current	VID31460, Active		0.416		A
P	5V Power Consumption	VID31760		3		W
	12V Power Consumption	V_{cc5} = 5.0V, V_{cc12} = 12.0V		9.5		W
	Total Power Consumption	1 Display with 3D screen saver		12.4		W
I_{cc5}	5V Input Supply Current	VID31760, Active		0.6		A
I_{cc12}	12V Input Supply Current	VID31760, Active		0.79		A
PCIe Bus						
	Differential Output Voltage		0.8		1.2	V
	DC Differential TX Impedance		80		120	Ω
	Differential Input Voltage		0.175		1.2	V
	DC Differential RX Impedance		80		120	Ω
	Electrical Idle Detect Threshold		65		175	mV
VGA Port						
	Output Voltage High HSYNC,VSYNC	I_{OH}= -8.0mA	3.8		5.0	V
	Output Voltage Low HSYNC,VSYNC	I_{OL}= 8.0mA	0.0		0.44	V
	Output Voltage High DDCCLK,DDCDATA	I_{OH}= -4.0mA	4.75		5.0	V
	Output Voltage Low DDCCLK,DDCDATA	I_{OL}= 8.0mA	0.0		0.3	V
	5V Overcurrent Limit		690			mA
DisplayPort						
	Differential Output Voltage		0.34		0.92	V
	AUX Differential Output Voltage		525		621	mV
	AUX Common-Mode Voltage		550		620	mV
	3.3V Overcurrent Limit		690			mA
	Supports DisplayPort V1.2	CN5,CN6,CN8				
	Supports DisplayPort V1.1	CN7				

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 0.14 Kg (0.30 lbs.) with heat sink
- Dimensions: 90.17 mm L x 95.89 mm W (3.550 in L x 3.775 in W)
- 22mm PCIe Bus connector

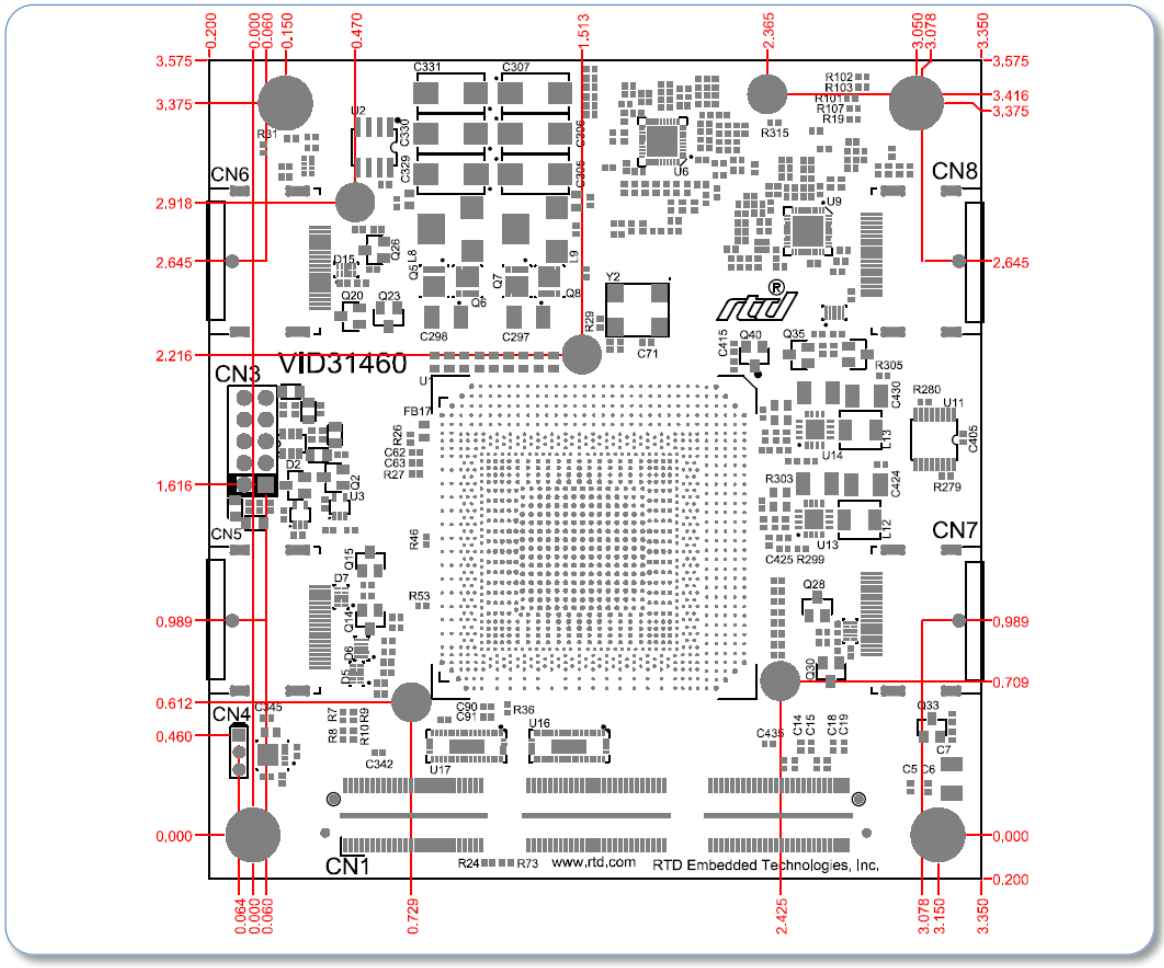


Figure 1: Board Dimensions

3.2.1 THERMAL MANAGEMENT

The VID31x60ER/ VID34x60ER are provided with an active heat sink solution to provide thermal cooling for the GPU. It uses auto fan control to the heat sink fan, allowing the fan to only run when needed. The GPU uses internal thermal monitoring to throttle the processor and memory when it exceeds its thermal limit. This thermal limit cannot be modified.

In order to maintain maximum performance over the full temperature range, it is recommended that a PCIe spacer be used between the VID31x60ER/VID34x60ER and any board immediately above it.

Figure 2: Board with Heatsink

3.3 Connectors and Jumpers

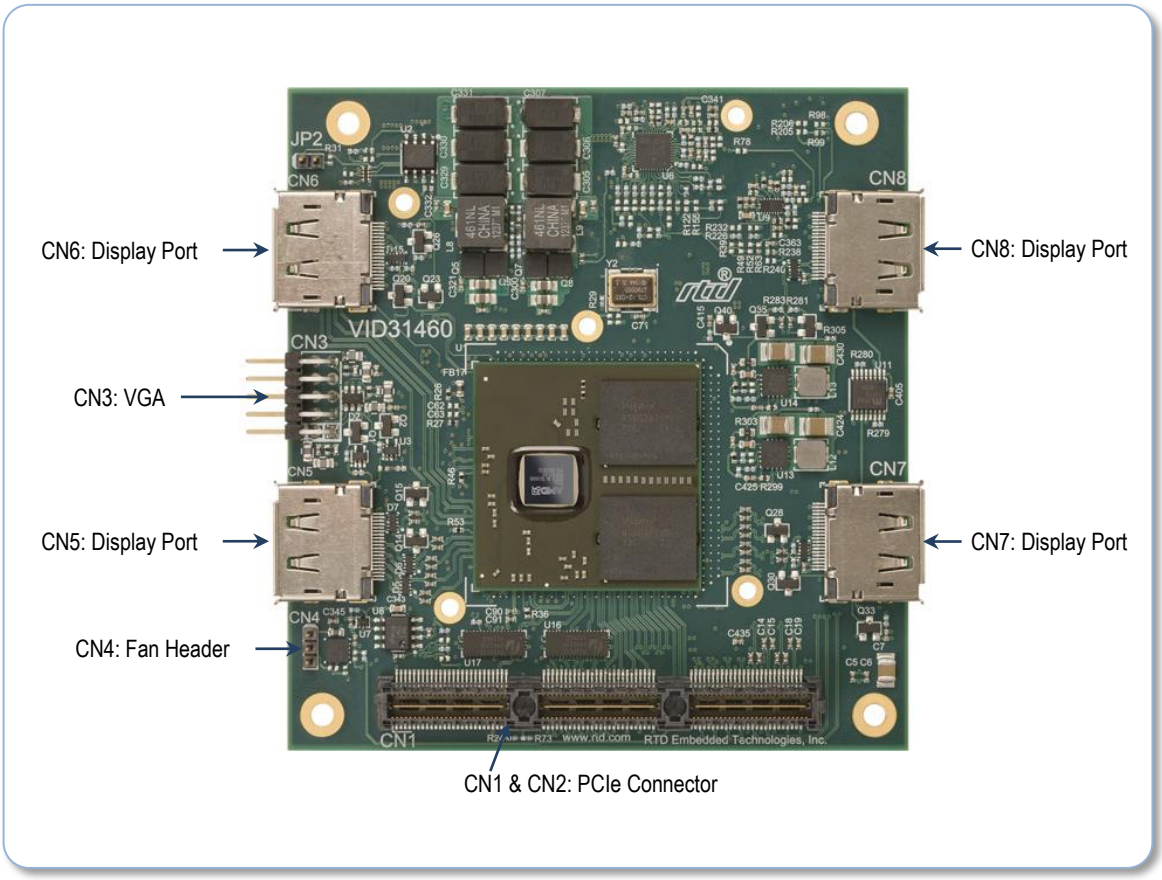


Figure 3: Board Connections

3.3.1 External I/O Connectors

CN3: VGA Connector

The VGA Connector is a 2 x 4, 0.1" spacing right-angle connector. The pin assignments are shown in Table 4 below.

Table 4: CN3 VGA Connector

HSYNC	2	1	VSYNC
RED	4	3	DDCCLK
GREEN	6	5	DDCDATA
BLUE	8	7	+5V
GND	10	9	GND

CN4: Fan Header

The Fan header is a 1 x 3, 2mm spacing vertical connector. The pin assignments are shown in Table 5 below.

Table 5: CN4 Fan Header

1	+5V_ PWM
2	GND
3	N/C

CN5, CN6, CN7 & CN8: DisplayPort Connector

The DisplayPort connector uses a standard DisplayPort Male Receptacle, P/N: Molex 47272-0001.

Using off the shelve adaptors these connectors can support Analog VGA, DVI, and HDMI.

3.3.2 BUS CONNECTORS

CN1 (Top) & CN2 (Bottom): PCIe Connector

The PCIe connector is the connection to the system CPU. The position and pin assignments are compliant with the *PCI/104-Express Specification*. (See PC/104 Specifications on page 20)

The VID31x60 has Type 1 PCIe/104 connector. The VID31x60 use the x16 link and must be located below the CPU.

3.3.3 JUMPERS

JP2 is for Factory Use only

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.

NOTE: In Order to maintain maximum performance over the full temperature range, it is recommended that a PCIe spacer be used between the VID31x60 and any board immediately above it.

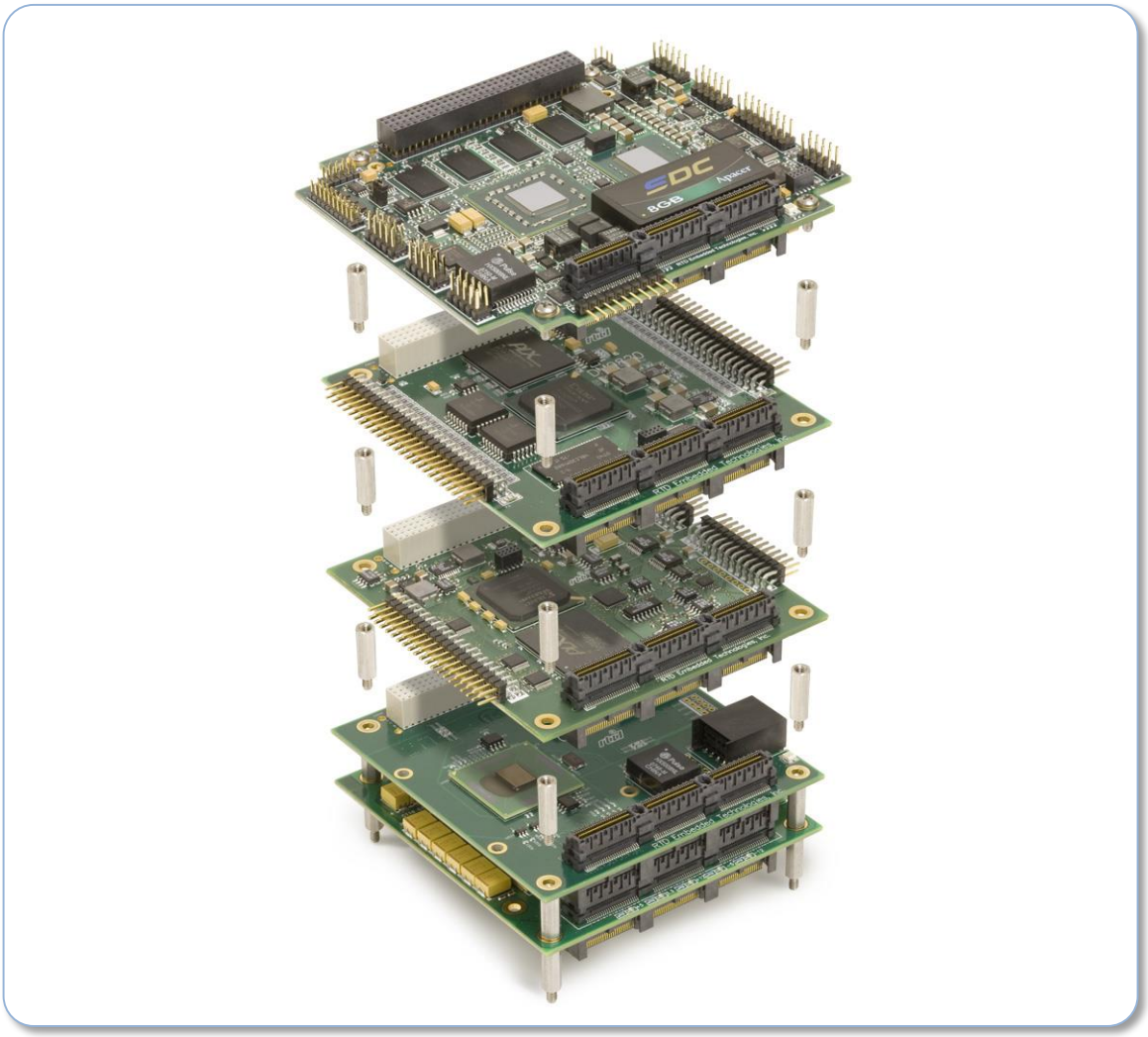


Figure 4: Example 104™ Stack

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 Physical Characteristics

- Weight: Approximately 0.21 Kg (0.46 lbs.)
- Dimensions: 152 mm L x 130 mm W x 24 mm H (5.98 in L x 5.12 in W x 0.93 in H)

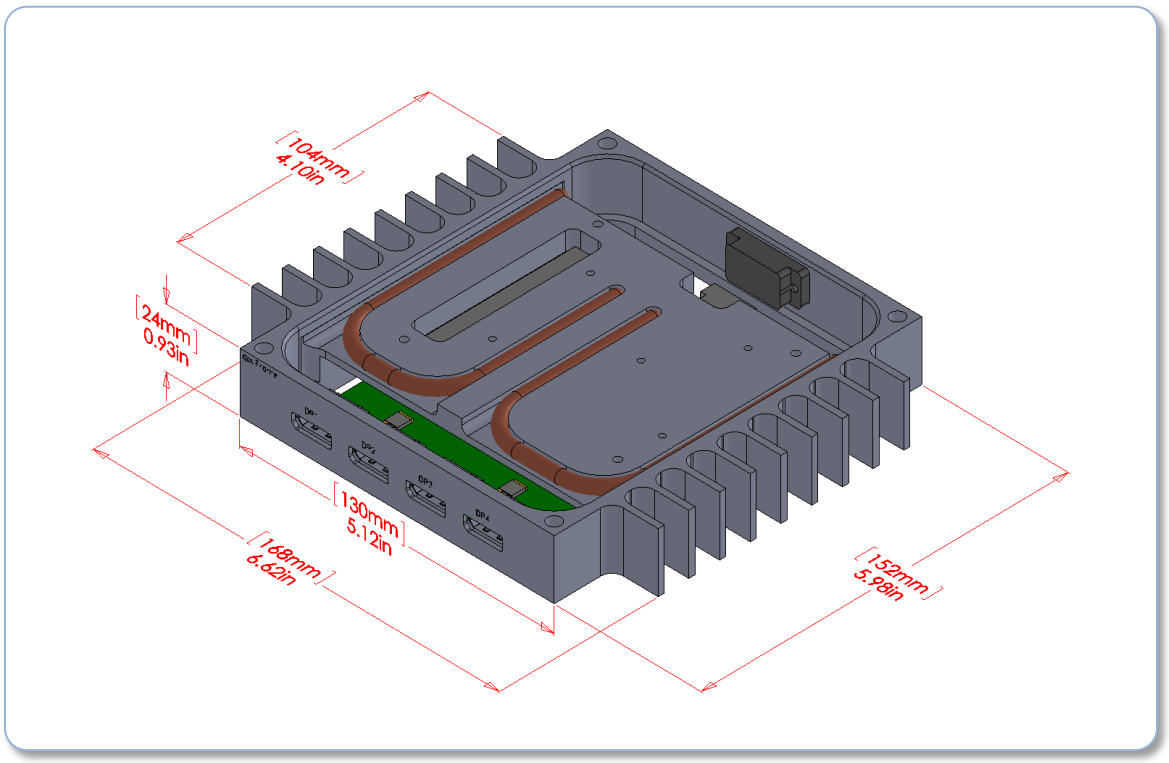
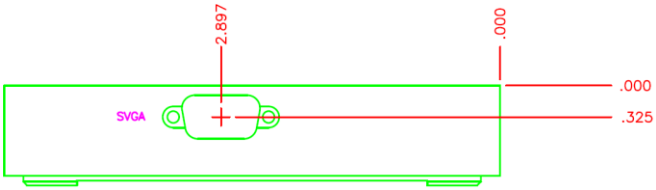


Figure 5: IDAN Dimensions

4.3 Connectors

4.3.1 External I/O Connectors

VGA Connector

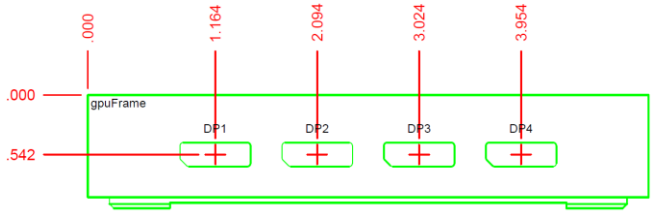


Connector Part #: AMP 5747229-8 **Sample Mating Connector:** AMP 747531-8

Table 6: IDAN-VID31x60 15-Pin High Density "D" Connector

IDAN Pin#	Signal	VID31x60 CN3 Pin #
1	Red	4
2	Green	6
3	Blue	8
4	Reserved	-
5	GND	9
6	GND	9
7	GND	9
8	GND	10
9	+5V	7
10	GND	10
11	Reserved	-
12	DDCDATA	5
13	HSYNC	2
14	VSYNC	1
15	DDCCLK	3

DisplayPort Connector



The DisplayPort connector uses a standard DisplayPort Male Receptacle, P/N: Molex 47272-0001.

4.3.2 Bus Connectors

CN1 (Top) & CN2 (Bottom): PCIe Connector

The PCIe connector is the connection to the system CPU. The position and pin assignments are compliant with the *PCI/104-Express Specification*. (See PC/104 Specifications on page 20)

The VID31x60 has Type 1 PCIe/104 connector. The VID31x60 use the x16 link and must be located below the CPU.

4.4 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.

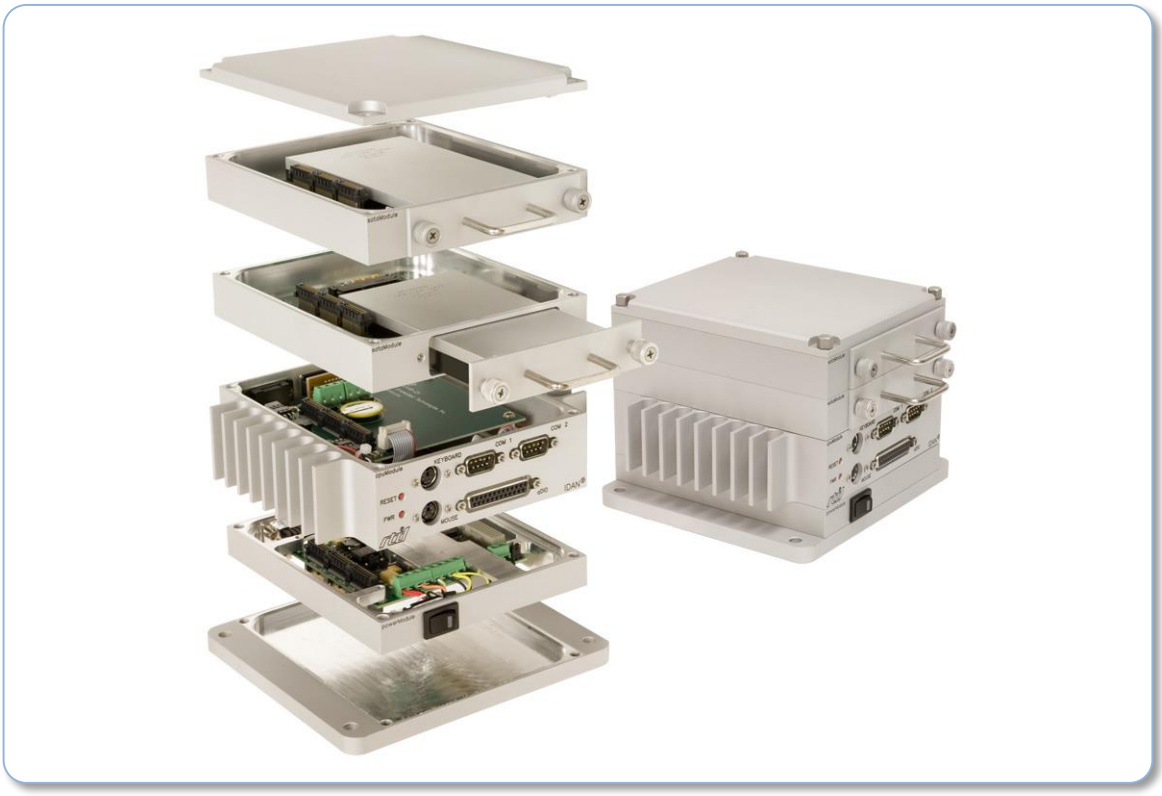


Figure 6: Example IDAN System

5 Functional Description

5.1 Block Diagram

The Figure below shows the functional block diagram of the VID31x60/VID34x60. The various parts of the block diagram are discussed in the following sections.

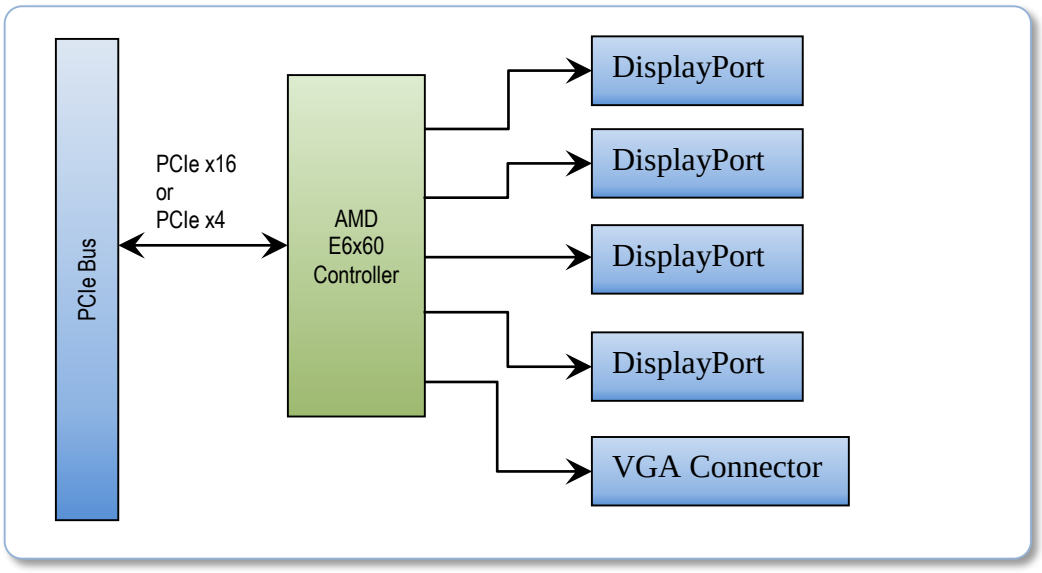


Figure 7: VID31x60 Block Diagram

5.2 AMD GPU Controller

The VID31460/VID34460 features the AMD E6460 GPU controller. This controller features up to 4 displays, 160 shader processors and 512MB GDDR5 memory. It's unified video decoder and integrated HD-Audio codec allows for superior multimedia experience. The AMD E6460 also features a PCIe x16 link that utilizes the Type 1 PCIe connector to maximum its performance with the CPU. The VID34460 use the Type 2 PCIe connector to allow commutation with CPUs with only PCIe x4 link.

The VID31760 features the AMD E6760 GPU controller. This controller features up to 5 displays, 460 shader processors and 1GB GDDR5 memory. It's unified video decoder and integrated HD-Audio codec allows for superior multimedia experience. The AMD E6760 also features a PCIe x16 link that utilizes the Type 1 PCIe connector to maximum its performance with the CPU. The VID34760 use the Type 2 PCIe connector to allow commutation with CPUs with only PCIe x4 link

5.2.1 Multiple Displays

The AMD E6460 supports up to 4 displays. The VID31460/VID34460 provides 4 DisplayPorts and one VGA connector to utilize this capability of the E6460. When connecting to these connectors the 4 DisplayPorts will take priority over the VGA connector.

NOTE: When 4 DisplayPorts are connected no video will be displayed on the VGA connector

The AMD E6760 supports up to 5 displays. The VID31760/VID34760 provides 4 DisplayPorts and one VGA connector to utilize this capability of the E6460. All displays may be used simultaneously.

6 Software

6.1 Drivers

VID31x60//VID34x60 uses the standard AMD Embedded Radeon E6460/E6760 drivers. Drivers can be found on the RTD companion CD or at RTD's website, http://www.rtd.com. For the latest AMD drivers, refer to AMD's website, http://www.amd.com.

6.2 BIOS Settings for RTD's CMA22/CMX32

When using the VID31x60 with RTD's CMA22/CMX32, the follow BIOS settings need changed for the module to function properly.

1. Advanced/Video Configuration/Graphic Adapter Priority should be set to either '***PEG/IGD'*** or ***'PEG/PCI'***.
2. Under Advanced/Video Configuration/Internal Graphics Mode Select needs set to '***Disabled***'.
3. Under Advanced/PCI Express Configuration/x16 Links Operational Mode needs set to ***'Enable x16 Always'***.

NOTE: When using the VID31x60, the CPU internal graphics control may have to be disabled for the VID31x60 to work properly.

7 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.

8 Additional Information

8.1 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

8.2 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

9 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.

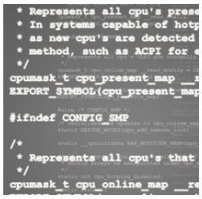
Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, and some states do not allow limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you.

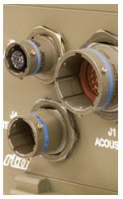
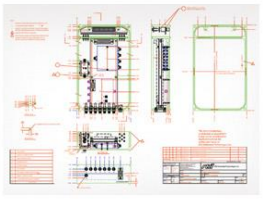
This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

RTD Embedded Technologies, Inc.
103 Innovation Boulevard
State College, PA 16803 USA
Telephone: 814-234-8087
Fax: 814-234-5218

www.rtd.com

sales@rtd.com
techsupport@rtd.com



Copyright 2015 by RTD Embedded Technologies, Inc. All rights reserved.