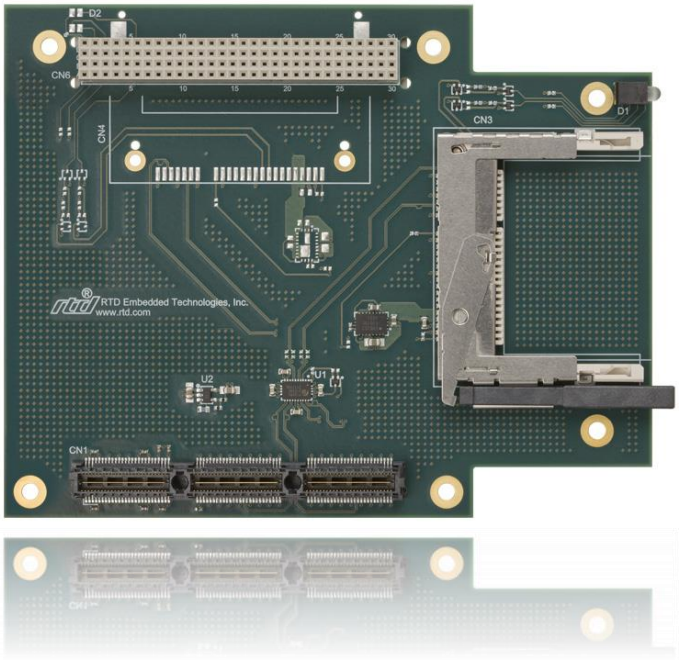
CF24118HR/CF34118HR

PCI/104-Express CFast Drive Carrier

User's Manual

BDM-610020139 Rev. B



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	Change part number from CF25118HR/CF35118HR to CF24118HR/CF34118HR to reflect the PCIe/104 Type 2 bus connectors

Advanced Analog I/O, Advanced Digital I/O, aAIO, aDIO, a2DIO, Autonomous SmartCal, "Catch the Express", cpuModule, dspFramework, dspModule, expressMate, ExpressPlatform, "MIL Value for COTS prices", multiPort, PlatformBus, and PC/104EZ are trademarks, and "Accessing the Analog World", dataModule, IDAN, HiDAN, HiDANplus, 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 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 © 2016 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
2.1.1 CFast Card Operating Conditions 8

2.2 Electrical Characteristics 8

3 Board Connection **9**

3.1 Board Handling Precautions 9

3.2 Physical Characteristics 9

3.3 Connectors and Jumpers 10
3.3.1 CFast Connector 10
3.3.2 Bus Connectors 10
CN1(Top) & CN2(Bottom): PCIe Connector 10
CN16: PCI Connector (CF24118HR Only) 10

3.4 Stacking Requirements 11

3.5 Steps for Installing 11

4 IDAN Connections **12**

4.1 Module Handling Precautions 12

4.2 Physical Characteristics 12

4.3 Connectors 13
4.3.1 CFast Connector 13
4.3.2 Bus Connectors 13
CN1(Top) & CN2(Bottom): PCIe Connector 13
CN16: PCI Connector (CF24118HR Only) 13

4.4 Steps for Installing 14

5 Functional Description **15**

5.1 Block Diagram 15

5.2 CFast Connector 15
5.2.1 Hot Plug 15

5.3 LED 15

5.4 Power 16

6 Troubleshooting **17**

7 Additional Information **18**

7.1 PC/104 Specifications 18

7.2 PCI and PCI Express Specification 18

8 Limited Warranty **19**

Table of Figures

Figure 1: Board Dimensions 9
Figure 2: Board Connections 10
Figure 3: Example 104™Stack 11
Figure 4: IDAN-CF24118HRS and IDAN-CF34118HR-1S Dimensions 12
Figure 5: IDAN-CF34118HR-2S Dimensions 13
Figure 6: Example IDAN System 14
Figure 7: CF24118HR/CF34118HR Block Diagram 15

Table of Tables

Table 1: Ordering Options 6
Table 2: Operating Conditions 8
Table 3: Electrical Characteristics 8

1 Introduction

1.1 Product Overview

The CF24118HR/CF34118HR CFast drive carrier modules provide a low cost removable drive solution for PC/104 systems. They utilize the SATA links on the PCIe/104 bus connector on select RTD PCIe/104 cpuModules. The onboard drive utilizes the first SATA link on the connector, while the other SATA link is lane-shifted up the stack to permit stacking multiple SATA drive carrier modules within one system.

1.2 Board Features

- PC/104 form factor
  - PCIe/104 stackable bus structure
  - PCIe Type 2 expansion bus
  - Uses a SATA link
- Single connector supports CFast or CFast 2.0 cards.
  - Dedicated SATA links for each drive in the system eliminates master/slave addressing jumpers
  - Transfer rates to 6.0 Gbps
- Available in stackable, rugged enclosures
- Requires only +5 VDC for operation
- Selected CFast card may affect standard operating temperature and power requirements
- Requires additional SATA controller (note that RTD CPUs with Type 2 PCI Express connectors satisfy this requirement)

1.3 Ordering Information

The CF24118HR/CF34118HR is available with the following options:

Table 1: Ordering Options

Part Number	Description
CF24118HR	PCI/104-Express CFast Carrier (front load)
CF34118HR-1	PCIe/104 CFast Carrier (front load)
CF34118HR-2	PCIe/104 CFast Carrier (side load)
IDAN-CF24118HRS	PCI/104-Express CFast Carrier (front load) in IDAN enclosure
IDAN-CF34118HR-1S	PCIe/104 CFast Carrier (front load) in IDAN enclosure
IDAN-CF34118HR-2S	PCIe/104 CFast Carrier (side load) 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 your 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		n/a	n/a	V
V_{cc-12}	-12V Supply Voltage		n/a	n/a	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		16,327,929	Hours

2.1.1 CFast Card Operating Conditions

Each CFast card has its own individual operating conditions which will vary from one manufacturer to another. Installing third party CFast card on the CF24118HR/CF34118HR can affect the overall operating temperature of the system. Make sure to verify the operating conditions of third party 2.5" SATA drives before using the CF24118HR/CF34118HR in extreme conditions.

2.2 Electrical Characteristics

Table 3: Electrical Characteristics

Symbol	Parameter	Test Condition	Min	Max	Unit
P	Power Consumption	V_{cc5} = 5.0V		0.750	W
I_{cc5}	5V Input Supply Current	Active, including CFast card		150	mA
CFast Connector					
I_{cc33}	Supply current to CFast card	V_{CC} = 3.3V		2.0	A

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

A STEP model is available upon request; contact RTD Tech Support for more information.

- Weight: Approximately 0.16 lbs. (0.07 Kg)
- Dimensions
  - Length (L): 3.895 inches (98.93 mm)
  - Width (W): 4.915 inches (124.8 mm)
  - Stand-off Height: 0.600 inches (15.24 mm)

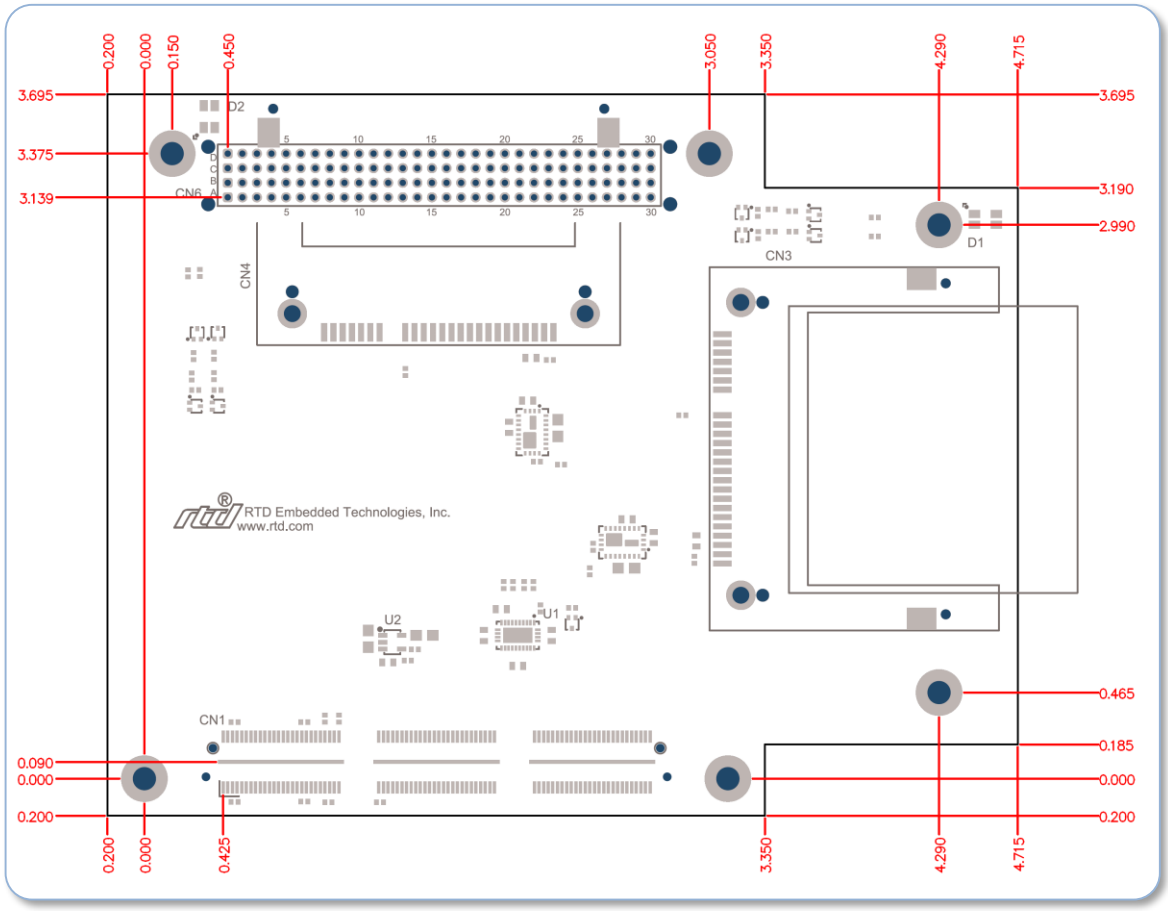


Figure 1: Board Dimensions

3.3 Connectors and Jumpers

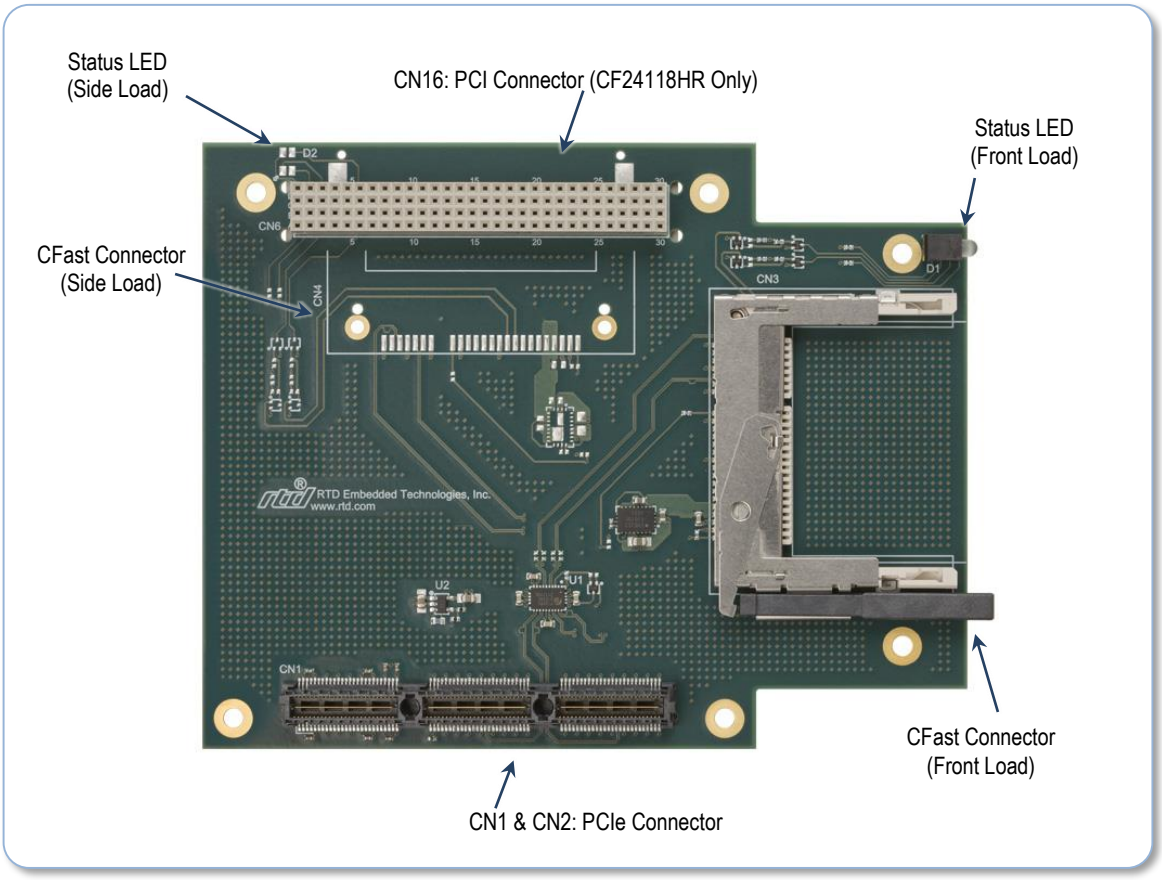


Figure 2: Board Connections

3.3.1 CFast Connector

The CF24118HR/CF34118HR includes a single CFast connector. Depending on the version of the board, it is either installed for "front load" or "side load" as shown in the Figure above.

The CFast connector supports both CFast and CFast 2.0 cards.

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 18)

The CF24118HR/CF34118HR is a Type 2 board utilizing a single SATA link.

CN16: PCI Connector (CF24118HR Only)

The PCI connector is the connection to PCI peripheral modules. The position and pin assignments are compliant with the *PCI/104-Express Specification*. (See PC/104 Specifications on page 18)

This connector is pass-through only.

3.4 Stacking Requirements

It is common that the host cpuModule of the system requires that high speed peripherals like the CF24118HR/CF34118HR are installed within six boards of the CPU. With today's wide array of high speed modules (SATA, USB 3.0, PCI Express, etc.), PCI devices connected to PCI/104-Express cpuModules are forced to be stacked farther away from the cpuModule.

The PCI-104 connector on the CF24118HR permits installing the SATA drive carrier near the CPU to meet this requirement, without hindering the PCI bus to pass through to PCI peripherals that are farther away from the CPU in the system.

The CF24118HR/CF34118HR may be installed either above or below the CPU. Check the CPU manual for the number of links supported above and below the CPU.

3.5 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.

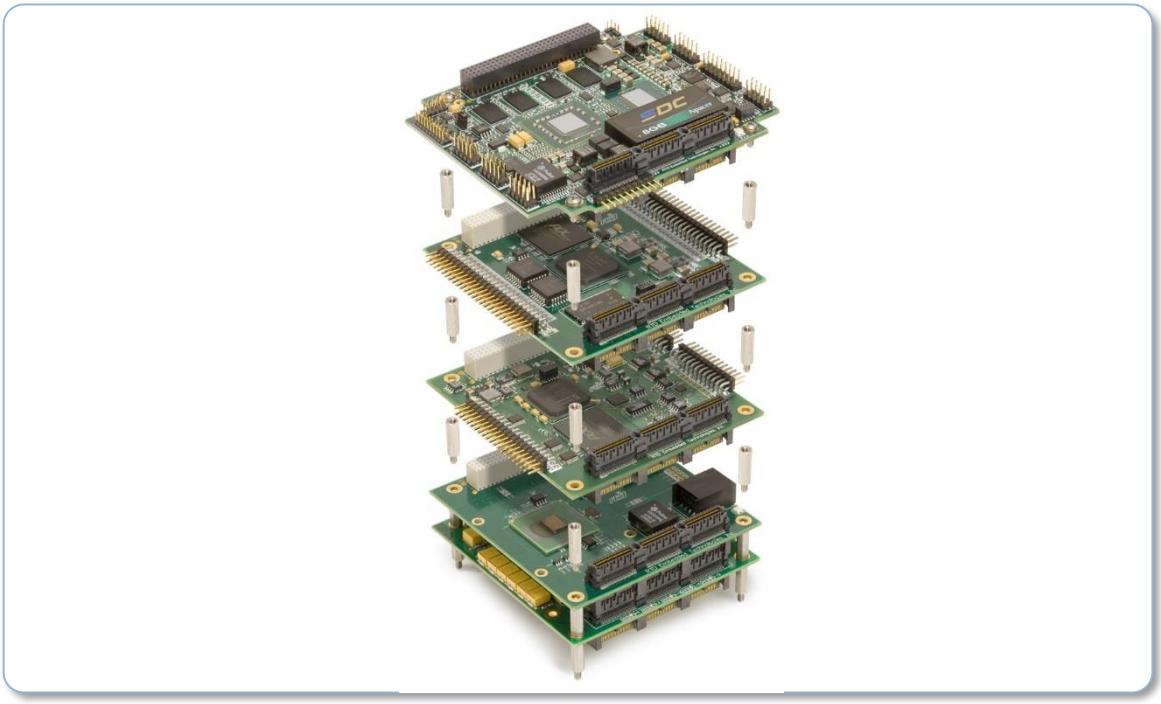


Figure 3: Example 104™ Stack

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: 151.972 mm L x 129.978 mm W x 16.993 mm H (5.983 in L x 5.117 in W x 0.669 in H)

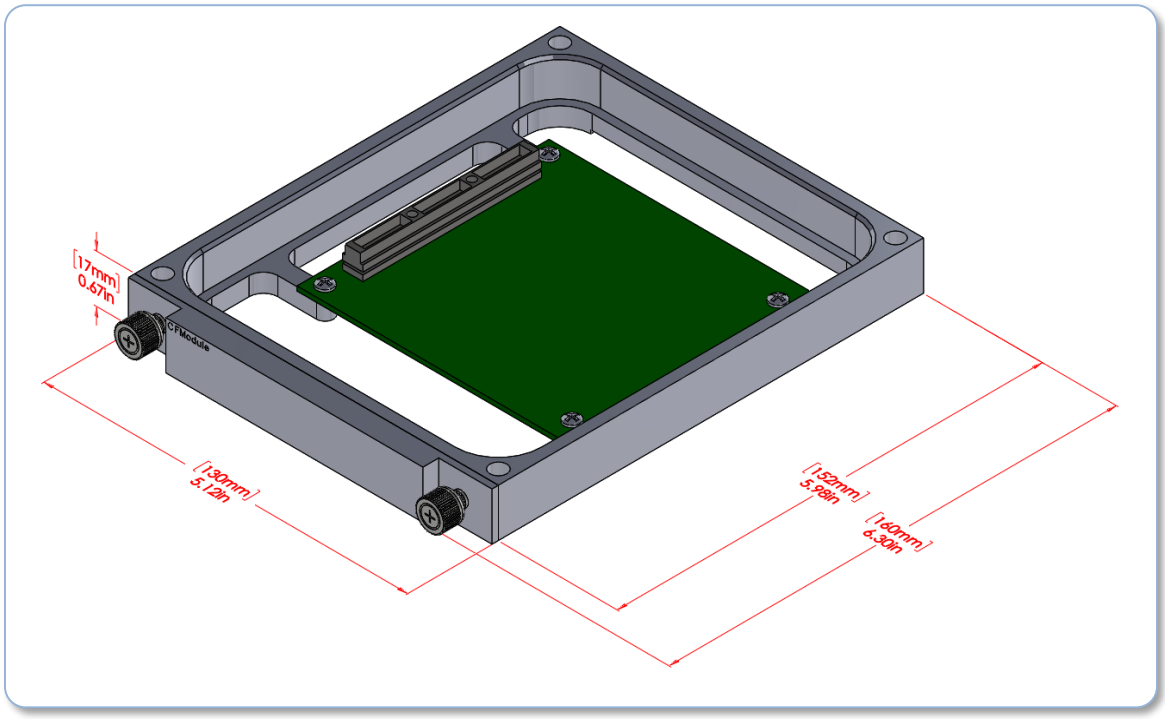


Figure 4: IDAN-CF24118HRS and IDAN-CF34118HR-1S Dimensions

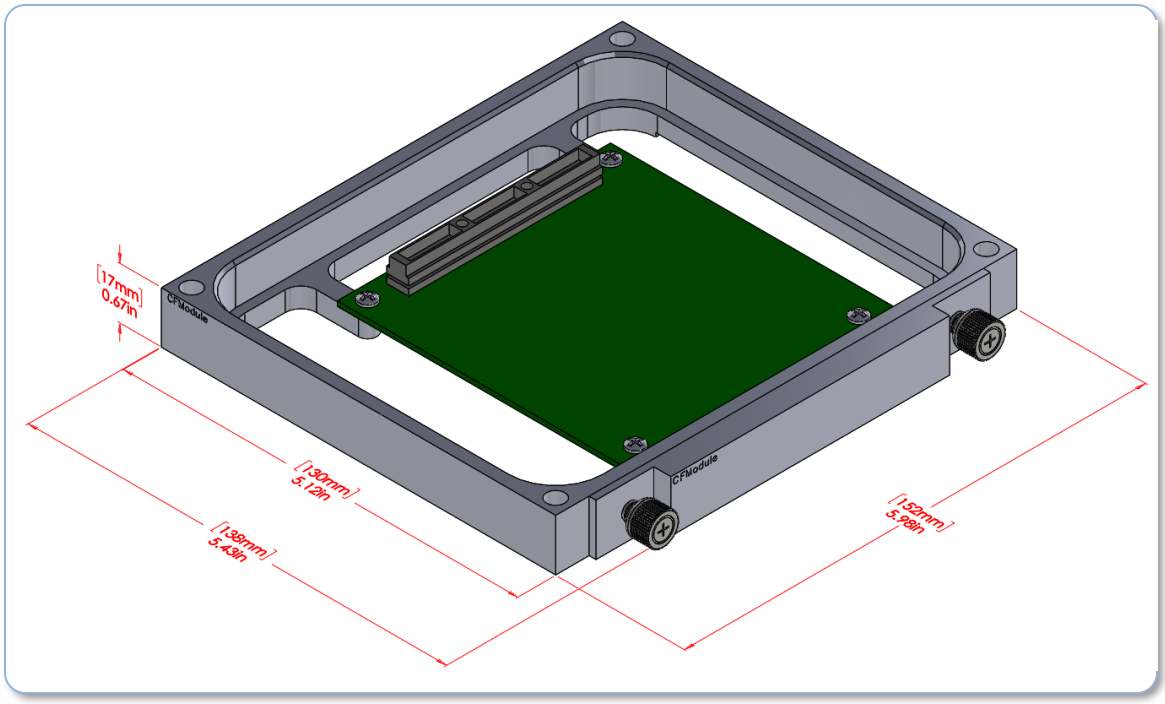


Figure 5: IDAN-CF34118HR-2S Dimensions

4.3 Connectors

4.3.1 CFast Connector

The CF24118HR/CF34118HR includes a single CFast connector. Depending on the version of the board, it is either installed for "front load" or "side load" as shown in the Figure above.

The CFast connector supports both CFast and CFast 2.0 cards.

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 18)

The CF24118HR/CF34118HR is a Type 2 board utilizing a single SATA link.

CN16: PCI Connector (CF24118HR Only)

The PCI connector is the connection to PCI peripheral modules. The position and pin assignments are compliant with the *PCI/104-Express Specification*. (See PC/104 Specifications on page 18)

This connector is pass-through only.

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.

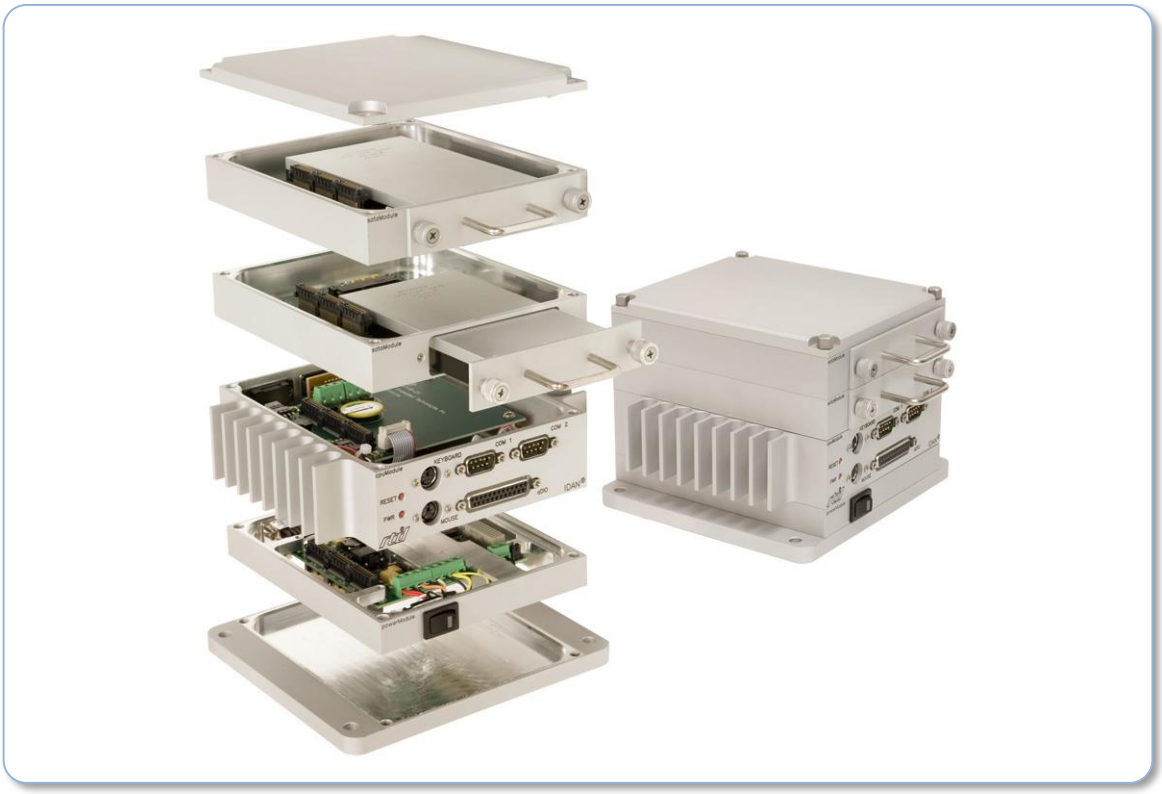


Figure 6: Example IDAN System

5 Functional Description

5.1 Block Diagram

The Figure below shows the functional block diagram of the CF24118HR/CF34118HR. The various parts of the block diagram are discussed in the following sections.

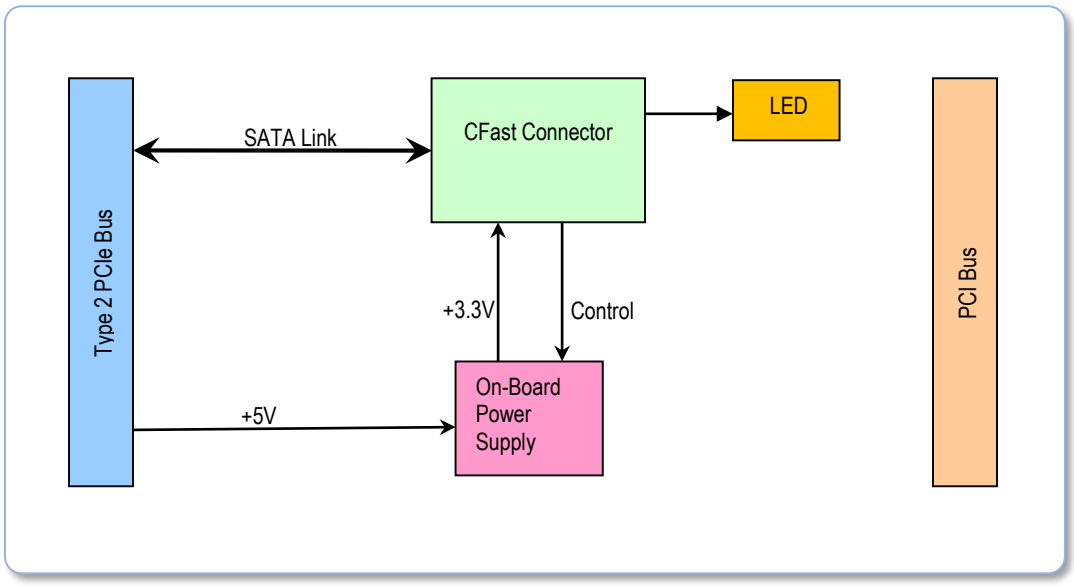


Figure 7: CF24118HR/CF34118HR Block Diagram

5.2 CFast Connector

The CFast connector allows you to install a readily-available CFast or CFast 2.0 card to provide high-speed, removable storage to your system.

Multiple CF24118HR/CF34118HR board may be used in a system, and they may be used with other SATA drive carriers. The total number is limited by the number of SATA links provided by the CPU. This can allow for the use of RAID arrays, if supported by the CPU.

5.2.1 Hot Plug

Hot plug is supported by this board. However, the CPU and the operating system must be configured correctly for successful hot plug. In the BIOS setup utility for the CPU, "Hot-Plug" must be enabled for the SATA link that is utilized for this board. Contact your CPU vendor for more details.

The ability to Hot Plug may also be affected by the driver that is used by the operating system. On Windows operating systems, some versions of the Intel Rapid Storage Technology Framework do not allow the drive to show up in the "Safely Remove Hardware" tray icon. In this case, the Framework can be uninstalled and the default Windows driver used.

Some CPUs require a delay between removing the CFast card and inserting another. Most notably, the Intel Core 2 Duo and Intel Celeron M (ULV 722) processor families from RTD require approximately 10 seconds between a removal event and an insertion event. If the CFast card is inserted before then, it will not be detected.

5.3 LED

An LED is provided to indicate drive status information. The LED is controlled by the CFast card, and therefore the meaning of it is dependent on the CFast card that is used. Note that some CFast cards do not drive the LED signals at all.

The LED is Yellow when the LED1 signal is asserted low, and Green when the LED2 signal is asserted low.

5.4 Power

A power supply is provided to convert 5V from the PCIe/104 bus to 3.3V for the CFast card.

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.

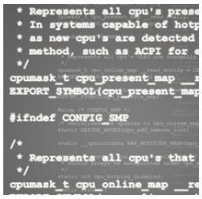
Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, and some states do not allow limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you.

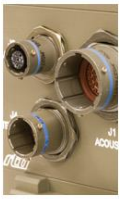
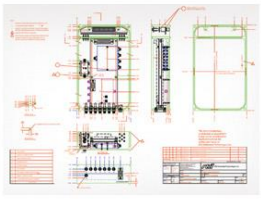
This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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 2016 by RTD Embedded Technologies, Inc. All rights reserved.