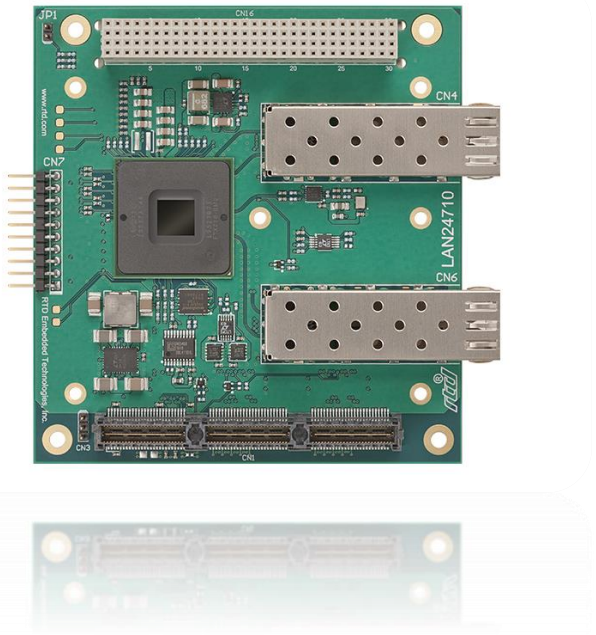
LAN24710/LAN34710

PCI/104-Express Dual 10Gb/s Fiber Ethernet Controller

User's Manual

BDM-610020157 Rev. A



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

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1 Introduction

1.1 Product Overview

The LAN24710 and LAN34710 are dual 10Gb/s Fiber Ethernet Modules. They provide two independent 10Gb/s fiber Ethernet connections using a single integrated controller chip. Fiber connectivity is provided by standard SFP+ modules (specific modules listed below have been validated by RTD to work with the LAN24710 and LAN34710). These boards run completely off of the PCI Express bus, utilizing Intel's X710 10 Gigabit Ethernet controller.

The LAN24710 is the PCI/104 Express version that has a pass-through PCI connector.

1.2 Board Features

- PC/104 form factor
- PCIe x4 Gen3 Interface
- PCIe/104 stackable bus structure
  - PCIe Type 2 expansion bus
  - PCI pass-through expansion bus (LAN24- versions only)
- 2 Independent 10Gb/s Fiber Ethernet Connections
  - Intel X710 controller chip
  - SFP+ module sockets to support the following standards:
    - 10GBASE-SR
    - 10GBASE-LR
    - SFP+ Direct Attach Cable
  - Backward compatibility with 1Gb/s standard
- 10/1 GbE data rate per port: support for vision systems, network and server virtualization, and LAN and SAN flexibility
- Connector for LEDs to monitor Link Status and Activity for each port

1.3 Ordering Information

The LAN24710/LAN34710 is available with the following options:

Table 1: Ordering Options

Part Number	Description
LAN24710	PCI/104 Express - Dual 10Gb/s Fiber Ethernet Controller
IDAN-LAN24710	Dual 10Gb/s Fiber Ethernet Controller in IDAN enclosure
LAN34710	PCIe/104 Dual 10Gb/s Fiber Ethernet Controller
IDAN-LAN34710	Dual 10Gb/s Fiber Ethernet Controller 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
T_a	Operating Temperature[1]		-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

1. Operating Temperature may be limited by any installed SFP modules

2.2 Electrical Characteristics

Table 3: Electrical Characteristics

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
P	Power Consumption	V_{cc5} = 5.0V		5		W
I_{cc}	5V Input Supply Current	Active		1.02		A
PCIe/104 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

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 158.76 g (0.35 lbs.)
- Dimensions: 90.17 mm L x 95.89 mm W (3.550 in L x 3.775 in W)

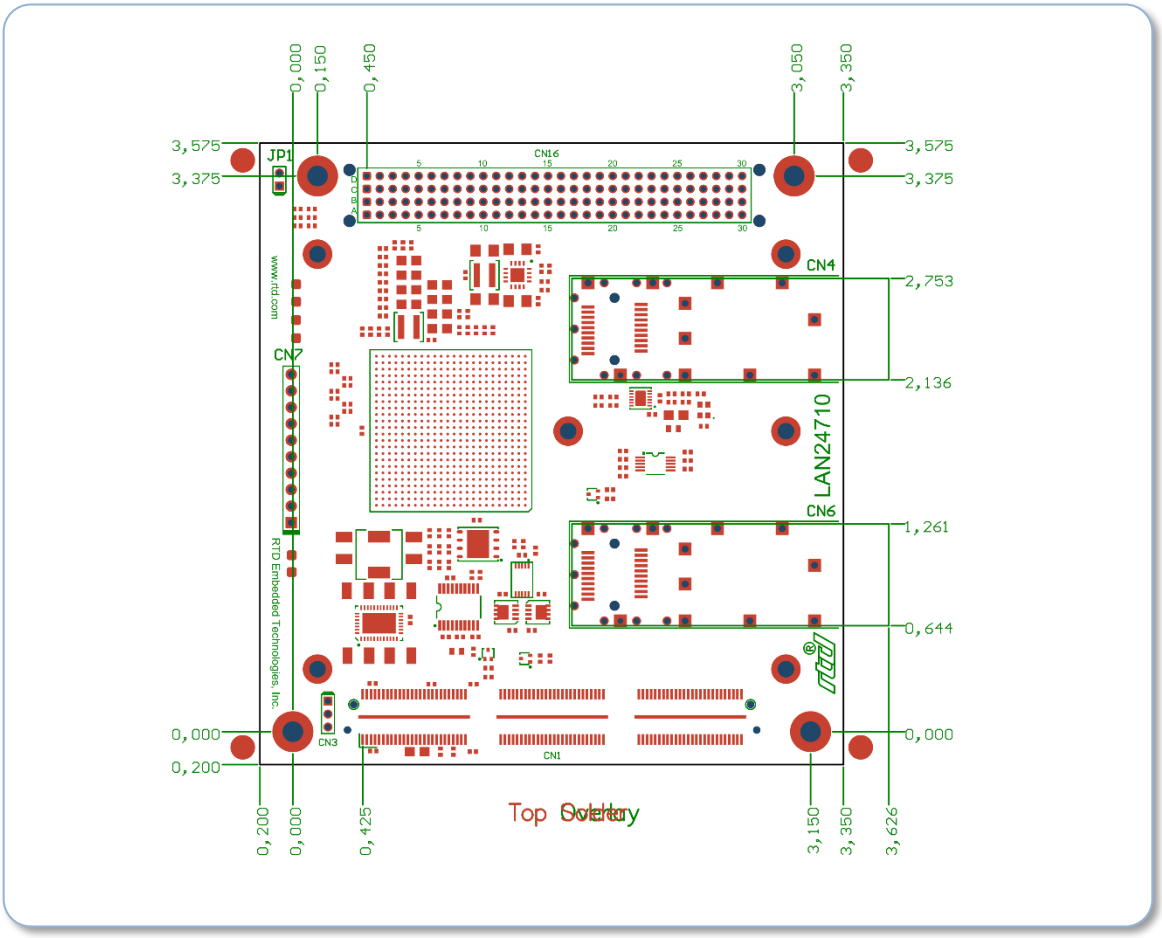
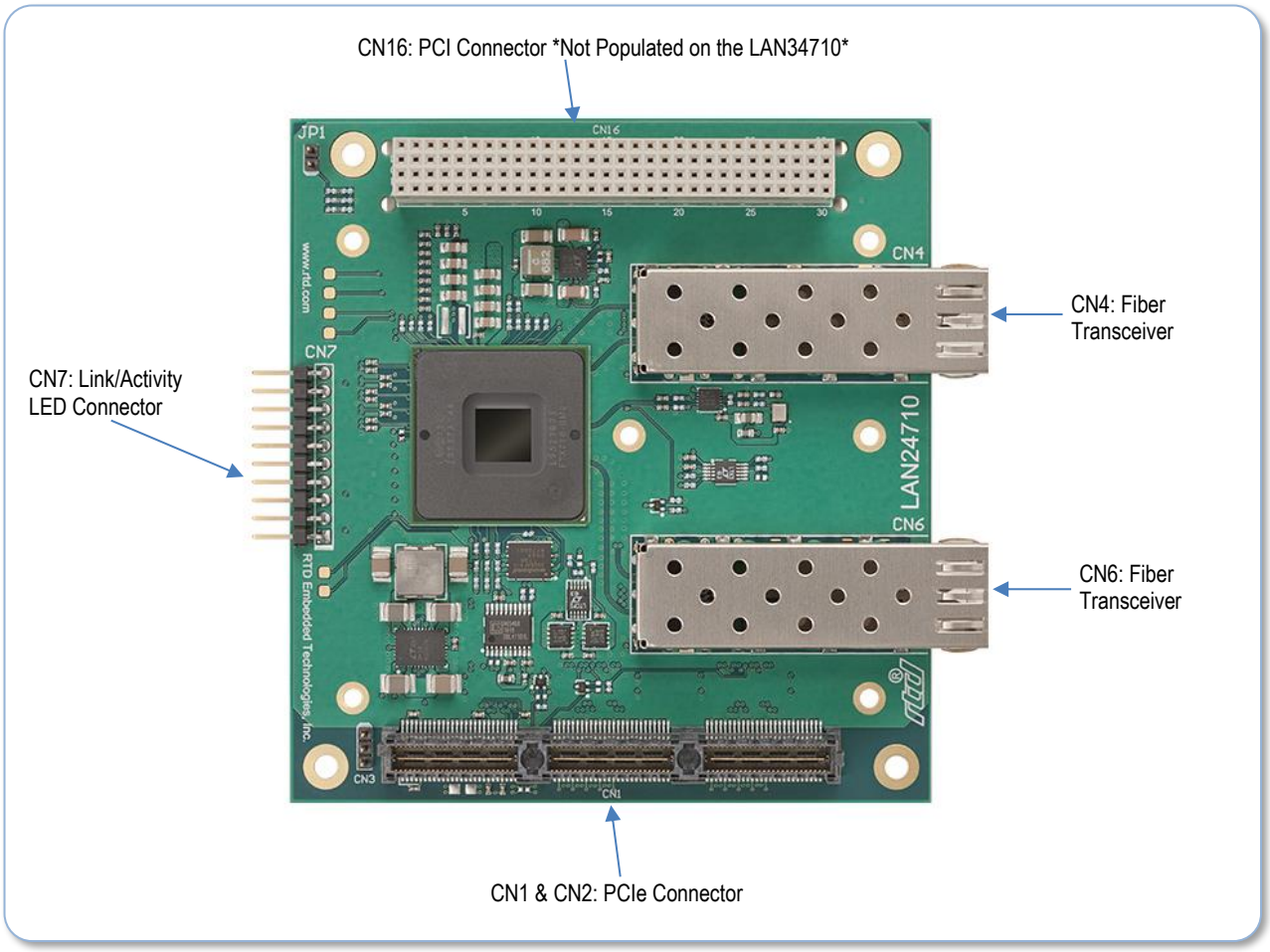


Figure 1: Board Dimensions

3.3 Connectors and Jumpers



3.3.1 External I/O Connectors

CN4: SFP+ Slot

Port 0 connector for SFP+ module

CN6: SFP+ Slot

Port 1 connector for SFP+ module

Link and Activity LEDs

Link and activity LEDs can be connected to CN7. This is a regular 10-pin, 100mil header that can be used with various connectors from different vendors. The pinout of this connector is the following:

Pin	Function	Port
1	LED0 Anode (+)	Port 0
2	LED0 Cathode (-)	
3	LED1 Anode (+)	
4	LED1 Cathode (-)	
5	NC	
6	NC	
7	LED0 Anode (+)	Port 1
8	LED0 Cathode (-)	
9	LED1 Anode (+)	
10	LED1 Cathode (-)	

The board contains the resistors for the LEDs, they should be attached directly to the appropriate pins.

3.3.2 Bus Connectors

CN16: PCI Connector

The PCI connector is the connection to PCI peripheral modules. This connector is used only as a pass through connector on this board. This connector is not populated on the LAN34710 version.

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 19)

The LAN24710/34710 is a Type 2 board, and can connect only to Type 2 PCIe/104 connector.

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.

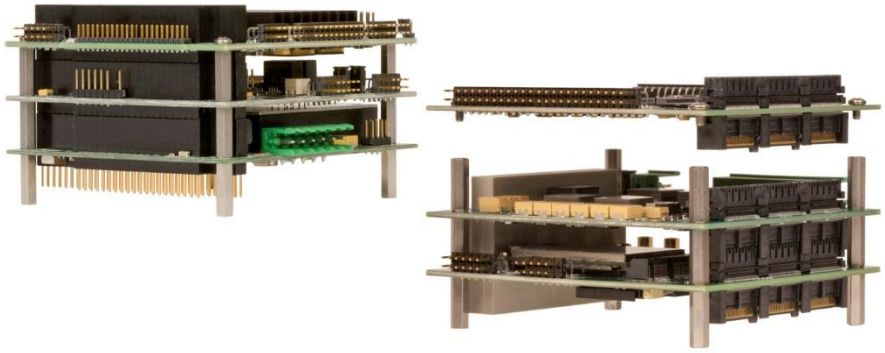


Figure 2: Example PC/104 Stacks

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 0.453 Kg (1 lbs.)
- Dimensions: 152.0 mm L x 130.0 mm W x 17.0mm H (5.98 in L x 5.12 in W x 0.67 in H)

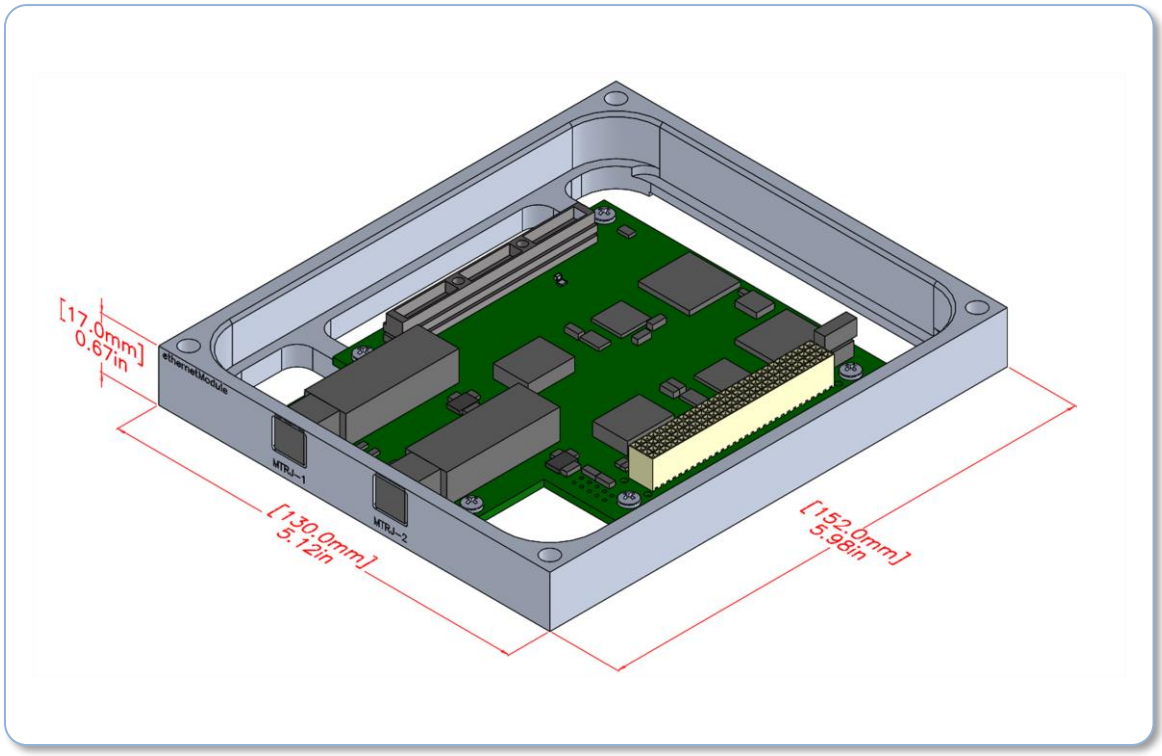


Figure 3: IDAN Dimensions

4.3 Connectors

4.3.1 External I/O Connectors

The Diagram below shows the connector locations for the transceivers of the LAN24710 as they are brought out on the front panel of the IDAN-LAN24710. For more information on of each connector on the LAN24710, refer to section 5.2 “Fiber Ethernet Connection” of this manual on page 16.

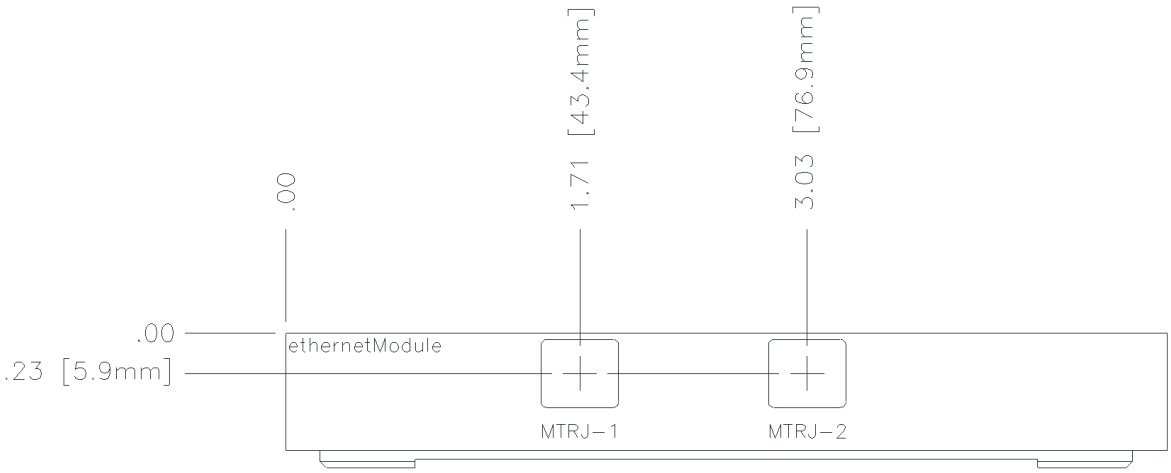


Figure 4: IDAN Front Panel Connectors

CN4: SFP+ Slot

Port 0 connector for SFP+ module

CN6: SFP+ Slot

Port 1 connector for SFP+ module

Link and Activity LEDs

Link and activity LEDs are provided on the side of the IDAN frame.

4.3.2 Bus Connectors

CN16: PCI Connector

The PCI connector is the connection to PCI peripheral modules. This connector is used only as a pass through connector on this board. This connector is not populated on the LAN35215 version.

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 19)

The LAN24710/34710 is a Type 2 board, and can connect only to Type 2 PCIe/104 connector

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.

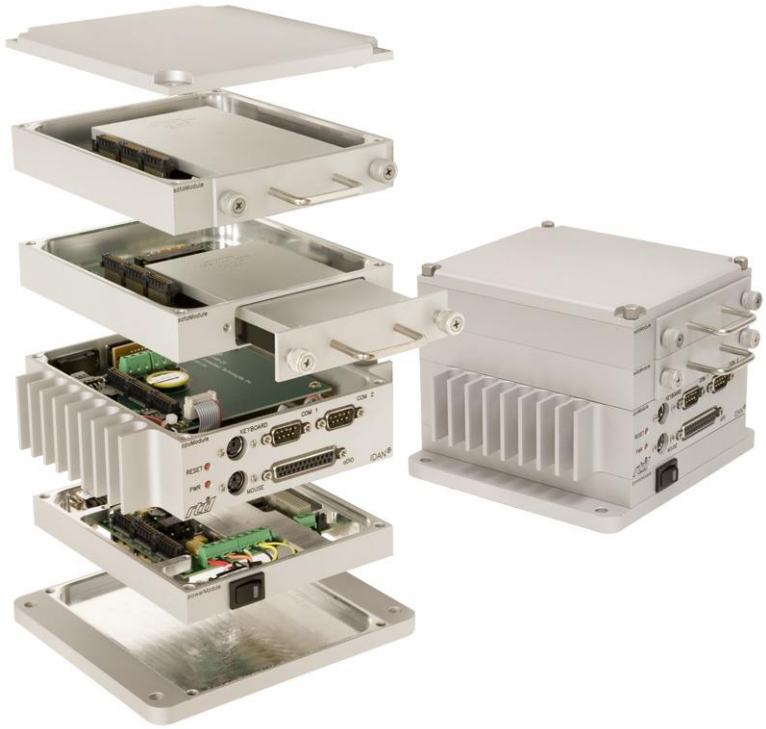


Figure 5: Example IDAN System

5 Functional Description

5.1 Block Diagram

The Figure below shows the functional block diagram of the LAN24710/34710. The various parts of the block diagram are discussed in the following sections.

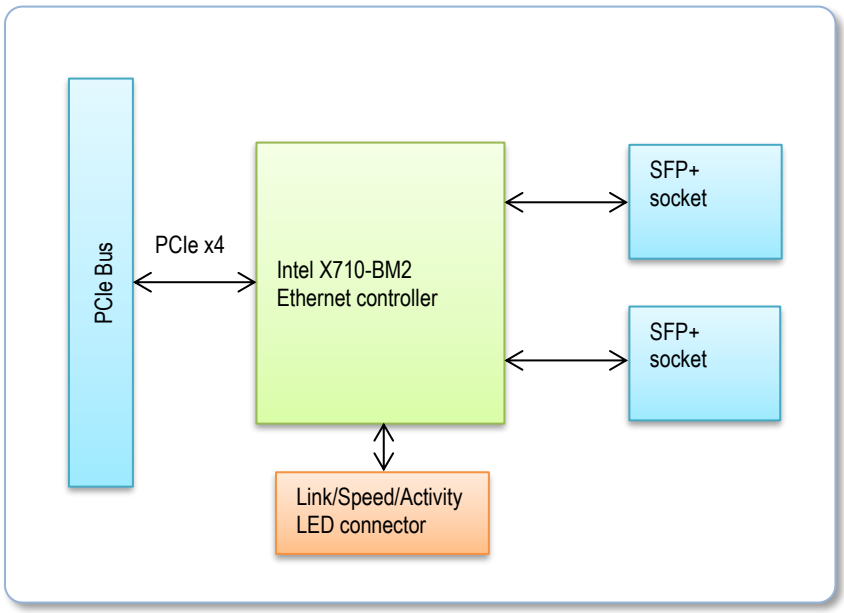


Figure 6: LAN24710/34710 Block Diagram

5.2 Fiber Ethernet Connection

5.2.1 Intel X710 10 Gigabit Ethernet Controller

The LAN24710/34710 features an Intel X710 10 Gigabit Ethernet controller used to interface with fiber Ethernet connections using SFP+ sockets. To maximize performance MSI-X support, multiple queues and various offloading functionalities are provided. For virtualized environments VMDQ (Virtual Machine Device Queue), SR-IOV (Single Root IO Virtualization), VLAN, FPP (Flexible Port Partitioning) and many other features are available.

5.2.2 SFP+ Sockets

Fiber connectivity is possible by means of SFP modules. Intel assures compatibility only with their own SFP+ modules. Operation with other type of SFP module cannot be guaranteed. The compatible modules are listed below[1]:

Name	Product Code or Part Number	Type	Temperature Range
Intel® Ethernet SFP SR Optics	E10GSFPSR	Dual Rate 10GBASE-SR/1000BASE-SX	0-70°
Intel® Ethernet SFP LR Optics	E10GSFPLR	Dual Rate 10GBASE-LR/1000BASE-LX	0-70°

[1] Refer: https://www.intel.com/content/www/us/en/support/articles/000007045/network-and-i-o/ethernet-products.html

The Intel® X710 Ethernet Controller uses open firmware designed to optimize compatibility with compliant SFP+ modules. RTD has validated board operation with the following modules:

- Intel e10gsfpsr (0-70°C, SR module)
- Intel e10gsfplr (0-70°C, LR module)
- Netgear AXM761 (0-70°C, SR module)

5.3 Driver Support

The Ethernet controller is supported by a driver provided by Intel, but only in Windows Server Editions. Check Intel's website (www.intel.com) for additional information and updates.

Under Linux, the Ethernet controller is supported via the ***i40e*** kernel module that is included with recent Linux 2.6.32 kernels. Most modern desktop Linux distributions will automatically detect the Ethernet controller and load the necessary drivers. Contact the vendor of your Linux distribution for more information.

For other operating systems, the Ethernet controller may be natively supported via built-in drivers. Your operating system vendor should be able to provide the necessary information.

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 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.

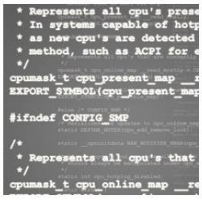
Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, and some states do not allow limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you.

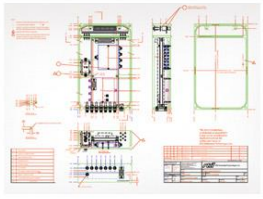
This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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





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