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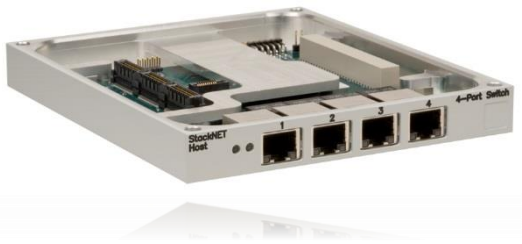
IDAN-LAN35H04HR-RJ &
IDAN-LAN35E04HR-RJ

Gigabit Ethernet Unmanaged Switches

User's Manual

BDM-610020132 Rev. A

IDAN-LAN35H04HR-RJ



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AS9100 and ISO 9001 Certified

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1 Introduction

1.1 Product Overview

The IDAN-LAN35H04HR-RJ and IDAN-LAN35E04HR-RJ are stackable 6-port unmanaged Gigabit Ethernet switches for expanding the networking capabilities of any system. The boards can be used in a PCIe/104 system or standalone. In a stack the IDAN-LAN35H04HR-RJ has a host interface x1 PCI Express link for an onboard Gigabit Ethernet controller that is connected to one port of the switch. The IDAN-LAN35E04HR-RJ does not have an Ethernet controller and is designed to stack above an IDAN-LAN35H04HR-RJ or another IDAN-LAN35E04HR-RJ to provide additional switch ports.

As standalone modules they each provide four Ethernet ports any one of which can be the upstream port and the remaining will be downstream ports. The IDAN-LAN35H04HR-RJ has a host interface and the IDAN-LAN35E04HR-RJ provides stackable expansion. This board is compatible with all PCI Express cpuModules and has only the PCIe/104 connector. The boards are available in IDAN frames with four RJ-45 connectors.

1.2 Board Features

- IDAN-LAN35H04HR-RJ with host interface
  - PCIe/104 PCI Express x1 link to onboard i210 Gigabit Ethernet controller connects to one switch port
  - 4 ports brought to four RJ-45 connectors
  - 1 port for up stacking switch expansion with IDAN-LAN35E04HR-RJ modules
  - Power connector for standalone applications
- IDAN-LAN35E04HR-RJ switch expansion
  - PCIe/104 stack through connector for power only
  - 1 port for stack down expansion connector
    - Note: The stackdown connector is not PC/104 compliant, so exercise care if placing it above something other than an IDAN-LAN35H04HR-RJ or another IDAN-LAN35E04HR-RJ
  - 4 ports brought to four RJ-45 connectors
  - 1 port for up stacking switch expansion with IDAN-LAN35E04HR modules
- BroadCom BCM53115 Gigabit Ethernet Switch:
  - 6 Full Duplex Unmanaged Gigabit Ethernet Ports
  - Any port can be the uplink, remaining links will be downlinks.
  - Ports have automatic MDI crossover to eliminate the need for crossover cables
  - Supports Jumbo frames up to 9720 bytes
  - Industrial Temperature rated: -40 to +85 C with supplied passive heatsink
- PCIe/104 Universal interface operates on Type 1 and Type 2 PCIe/104 buses
- PCI Express Bus:
  - Provides 2.5 Gbps in each direction
  - Single lane and single Virtual Channel operation
    - Compatible with multi-Virtual Channel chipsets
  - Packetized serial traffic with PCI Express Split Completion protocol
  - Data Link Layer Cyclic Redundancy Check (CRC) generator and checker
  - Automatic Retry of bad packets
  - In-band interrupts and messages
  - Message Signaled Interrupt (MSI) support

1.3 Ordering Information

The IDAN-LAN35H04HR-RJ & IDAN-LAN35E04HR-RJ are available with the following options:

Table 1: Ordering Options

Part Number	Description
IDAN-LAN35H04HR-RJ	4-port Gigabit Ethernet Switch in IDAN enclosure with four RJ-45 connectors, PCIe/104 bus, i210 Ethernet controller, and stacking expansion connector.
IDAN-LAN35E04HR-RJ	4-port Gigabit Ethernet Switch expansion in IDAN enclosure with four RJ-45 connectors and PCIe/104 bus and stacking expansion connector.

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
T_a	Operating Temperature	With supplied passive heatsink	-40	+85	C
T_s	Storage Temperature		-55	+125	C
RH	Relative Humidity	Non-Condensing	0	90%	%
MTBF	Mean Time Before Failure	IDAN-LAN35H04HR, 30C	907,357		Hours
MTBF	Mean Time Before Failure	IDAN-LAN35E04HR, 30C	1,165,832		Hours

2.2 Electrical Characteristics

Table 3: Electrical Characteristics

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
Power +5V	IDAN-LAN35H04HR Power Consumption	MAC/Phy linked at 1Gbps MAC/Phy plus 1 port linked at 1Gbps MAC/Phy plus 2 ports linked at 1Gbps MAC/Phy plus 3 ports linked at 1Gbps MAC/Phy plus 4 ports linked at 1Gbps MAC/Phy, up stacking and 4 ports linked at 1Gbps		1.5 2.0 2.6 3.2 3.7 4.1		W
Power +5V	IDAN-LAN35E04HR Power Consumption	No ports linked Down stacking port linked at 1Gbps Down stacking plus 1 ports linked at 1Gbps Down stacking plus 2 ports linked at 1Gbps Down stacking plus 3 ports linked at 1Gbps Down stacking plus 4 ports linked at 1Gbps Down and Up stacking plus 4 ports linked at 1Gbps		1.2 1.7 2.3 2.9 3.4 4.0 4.6		W
	PCIe/104 Bus					
	Differential Output Voltage		0.8		1.2	V
	DC Differential TX Impedance		95.2		116.9	Ω
	Differential Input Voltage		0.175		3.3	V
	DC Differential RX Impedance		92.7		115.8	Ω
	Electrical Idle Detect Threshold		61		173	mV

ps, yellow for 100 Mbps, and off for 10 Mbps. The function of the right LED is Green for link and flash with activity.

3 IDAN Connections

3.1 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.

3.2 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)

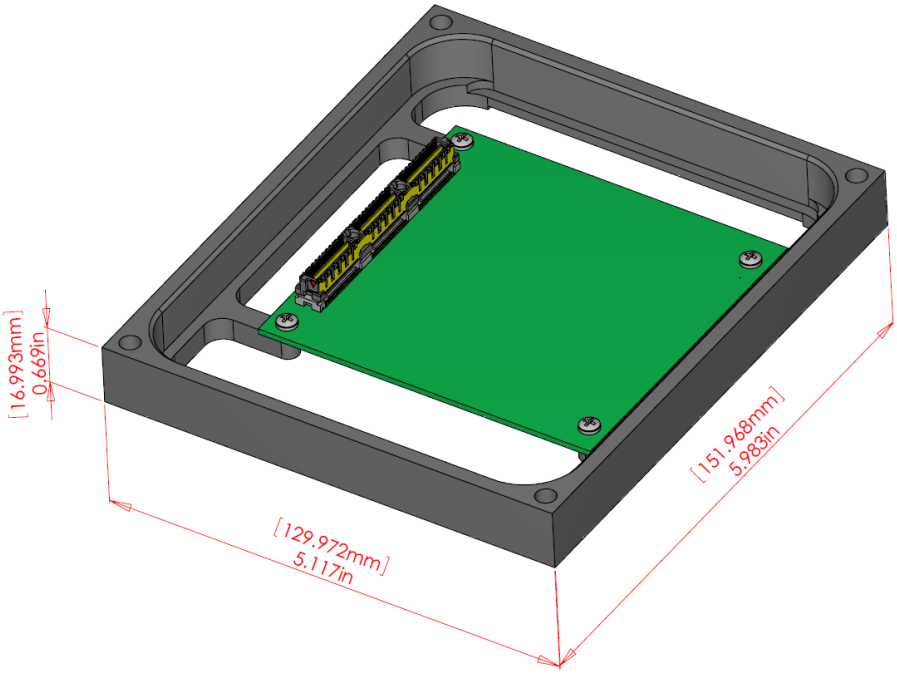


Figure 1: IDAN Dimensions

3.3 IDAN Versions

The Ethernet switch module is an IDAN version only. The IDAN-LAN35H04HR-RJ and IDAN-LAN35E04HR-RJ both feature RJ-45 connectors with LEDs.

3.3.1 IDAN-LAN35H04HR-RJ & IDAN-LAN35E04HR-RJ

These utilityModules are an IDAN configuration with four RJ-45 connectors. The LEDs indicate link and connection speed.

3.3.2 RJ45 Twisted Pair Ethernet, Port 1 – Port 4

Port 1 – Port 4 are UTP (Unshielded Twisted Pair) wiring normally used for 10/100/1000 Base-T Ethernet. The following table gives the pin out of Port 1 – Port 4.

Pin	1000 Function	10/100 Function
1	MDI_A+	Transmit +
2	MDI_A-	Transmit -
3	MDI_B+	Receive +
4	MDI_C+	Not Used
5	MDI_C-	Not Used
6	MDI_B-	Receive -
7	MDI_D+	Not Used
8	MDI_D-	Not Used

Table 4: RJ45 Signal Assignments

Port 1 – Port 4 are standard female RJ-45 connectors. The figure below shows the pin numbering when **looking into the connector**:

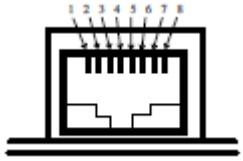


Figure 2: RJ-45 Jack Connector

3.3.3 CN1 (Top) & CN2 (Bottom) Bus Connectors

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 17)

The IDAN-LAN35H04HR is an "Universal" board and can connect to either a Type 1 or Type 2 PCIe/104 connector and uses a PCI Express x1 link. The IDAN-LAN35E04HR only gets power from the bus connector.



Figure 3: IDAN-LAN35H04HR-RJ Front View



Figure 4: IDAN-LAN38E04HR-RJ Front View

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 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.

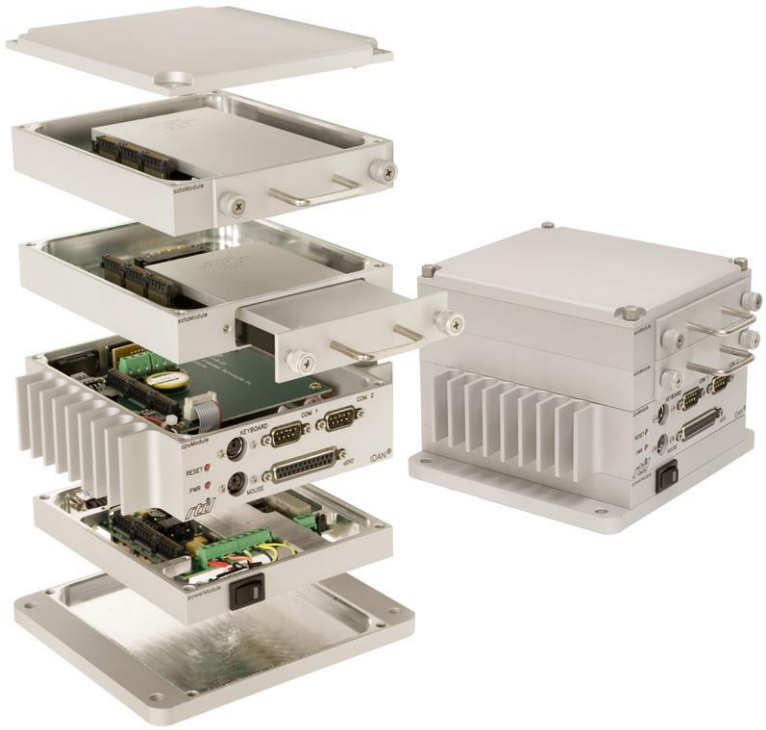


Figure 5: Example IDAN System

4 Functional Description

4.1 Block Diagrams

The Figures below shows the functional block diagram of the IDAN-LAN35H04HR-RJ and IDAN-LAN35E04HR-RJ. The various parts of the block diagram are discussed in the following sections.

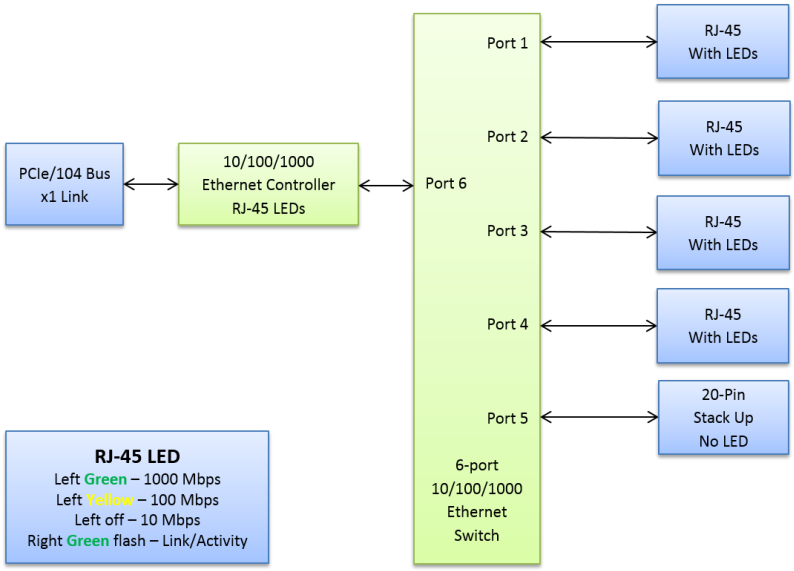


Figure 6: IDAN-LAN35H04HR-RJ Block Diagram

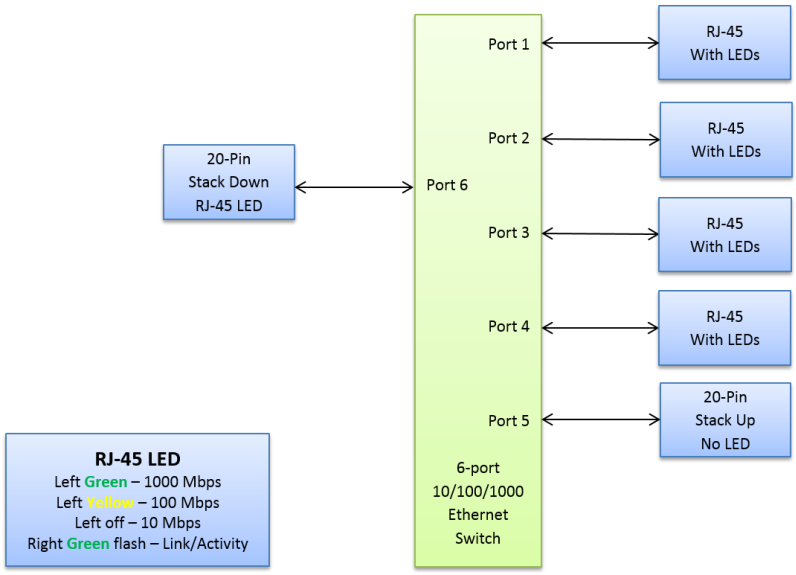


Figure 7: IDAN-LAN35E04HR-RJ Block Diagram

4.2 BroadCom Gig-Ethernet Switch

The main component of the IDAN-LAN35H04HR and IDAN-LAN35E04HR are the BroadCom BCM53115 Gigabit Ethernet switch. It is an industrial temperature rated, 6 port Gigabit Ethernet switch. This switch contains 5 full-duplex 10/100/1000 BASE-TX Ethernet transceivers for network interfacing and one port that connects to either a PCI Express Ethernet controller on the IDAN-LAN35H04HR-RJ or provides a down stacking interface on the IDAN-LAN35E04HR-RJ. Any port can be used as an upstream port to supply a connection to the other ports.

4.3 Jumbo Frame Support

The Broadcom Ethernet switch is capable of forwarding Ethernet frames up to 9720 bytes. The maximum frame size supported by the Intel Ethernet controller is 9.5 Kbytes. To use Jumbo frames, it must be enabled in the Ethernet Controller driver settings (e.g. via the Device Manager in Windows). Until this is enabled, the Intel controller will drop any Jumbo frames it receives. Note that to use Jumbo frames effectively, all devices connected to the network must have Jumbo frames enabled, AND must agree on the frame size (mismatched frame sizes will result in dropped packets).

4.4 Intel i210 Gigabit Ethernet Controller

The IDAN-LAN35H04HR has an onboard Gigabit Ethernet controller, the Intel i210. The Intel i210 is an industrial rated Gigabit Ethernet controller which features Auto-Crossover for MDI/MDI-X, 9.5K bytes Jumbo Frame support, packet buffer and IPv4/6 support. This controller connects to the host CPU through a x1 PCI Express link on the PCIe/104 connector and interfaces through the fifth port of the Ethernet switch to provide a host port for stacked systems.

4.5 LEDs

The IDAN-LAN35H04HR has a pair of front panel LEDs for each of the RJ-45 Ethernet ports on the board as well as the Ethernet controller or down stacking port. The RJ-45 port LEDs are built into the connectors and the other port is on the on the frame. The function of the left LED is green for 1000 Mb

5 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.

6 Additional Information

6.1 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

6.2 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

7 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.

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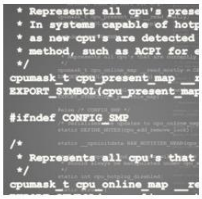
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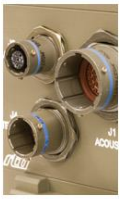
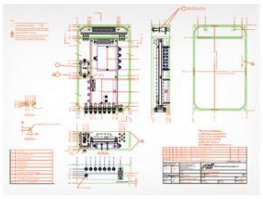
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