IOM35106

PCI Express to SATA Module

User's Manual

BDM-610020097 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	Device drivers and BIOS software links updated

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1 Introduction

1.1 Product Overview

The IOM35106 is designed to provide a PCI Express (PCIe) to SATA Controller. It uses a PCIe x1 link to provide two SATA connections links. The onboard drive utilizes the first SATA link provide by the controller, while the second link utilizes the right angle connector and will need external out-of-stack cabling. It is compatible with all PCI Express cpuModules.

The IOM35106 drive carrier provides power to the onboard SATA drive, sourcing the power from the cpuModule's onboard connector, while the other SATA link will still need external out-of-stack cabling for power.

The IOM35106 SATA controller currently supports Windows XP/VISTA/7 with use of drivers, and native driver support in Linux with Kernel version 2.6.19 or higher.

1.2 Board Features

- Adds one 2.5" SATA (Serial ATA) drive and one external SATA connector to a system using the PCI Express cpuModules
  - Flashable bios extension for non-RAID and RAID configuration
    - Supports RAID 0 and 1 among SATA devices on the same controller
- Benefits of SATA over PATA (Parallel ATA)
  - Transfer rates to 3.0 Gbps is faster and efficient than PATA
  - Dedicated SATA links for each drive in the system eliminate master/slave addressing jumpers
  - Backwards compatibility with PATA permits use of Legacy Mode
- Stackable Express Platform Expansion Bus
  - Permits system expandability by passing unused SATA links, PCIe links, and USB ports from the cpuModule to the next expansion module in the system
- Physical and environmental characteristics
  - Supports 2.5" SATA rotating or flash drives
  - 0 to 70°C operating temperature
- PCI Express Bus
  - PCIe/104 Universal Board
    - Interfaces with Type 1 or Type 2 bus
    - Supports re-population
  - Provides 2.5 Gbps in each direction
  - In-band interrupts and messages
  - Message Signaled Interrupt (MSI) support

1.3 Ordering Information

The IOM35106 is available in the following options:

Table 1: Ordering Options

Part Number	Description
IOM35106ER	PCIe/104 PCIe to SATA Controller Module
IDAN-IOM35106ER	PCIe/104 PCIe to SATA Controller Module 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		n/a	n/a	V
T_a	Operating Temperature		0	+70	C
T_s	Storage Temperature		-40	+85	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

Table 3: Electrical Characteristics

Symbol	Parameter	Test Condition	Min	Max	Unit
P	Power Consumption	V_{cc5} = 5.0V		2.6	W
I_{cc}	5V Input Supply Current	Active		520	mA
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 70 g (0.16 lbs.)
- Dimensions: 112.776 mm L x 95.89 mm W (4.44 in L x 3.775 in W)

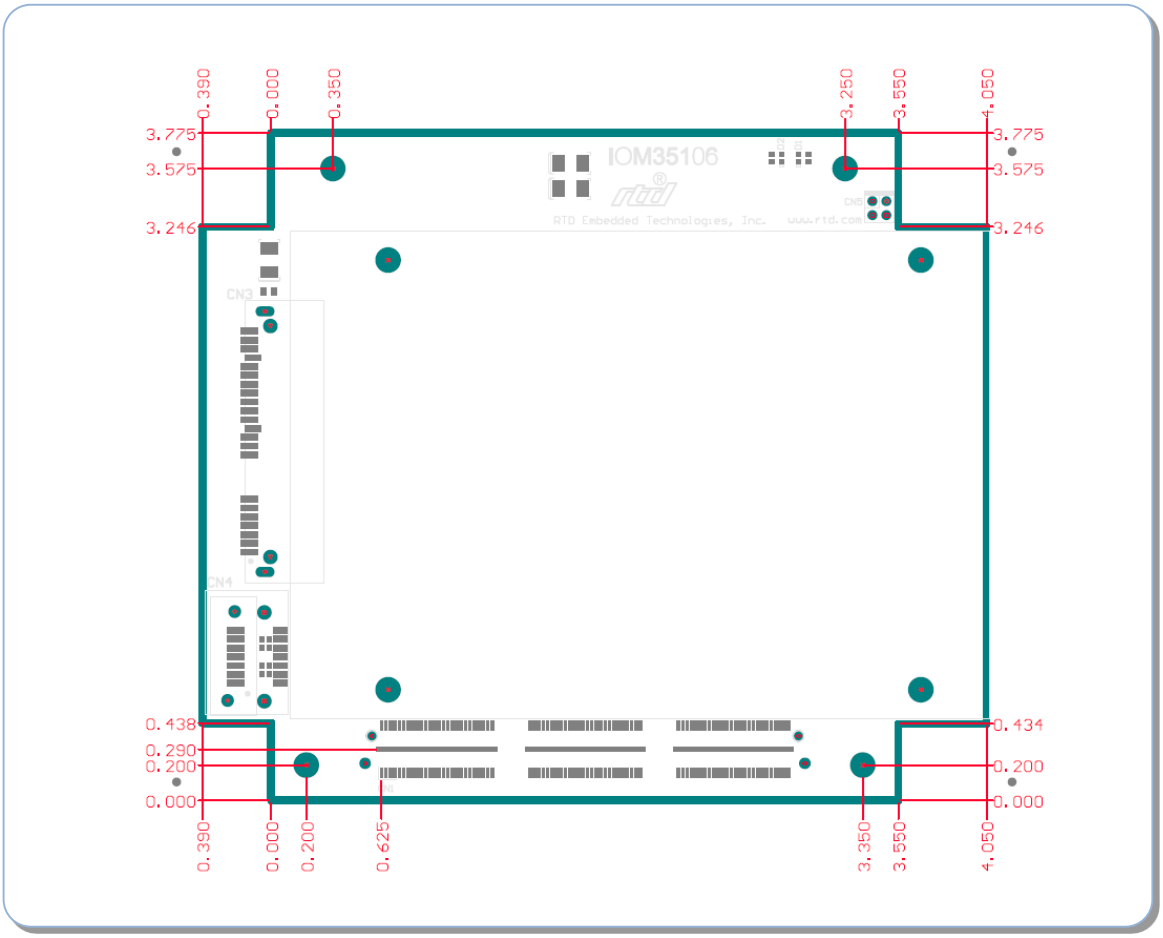

Figure 1: Board Dimensions

3.3 Connectors and Jumpers

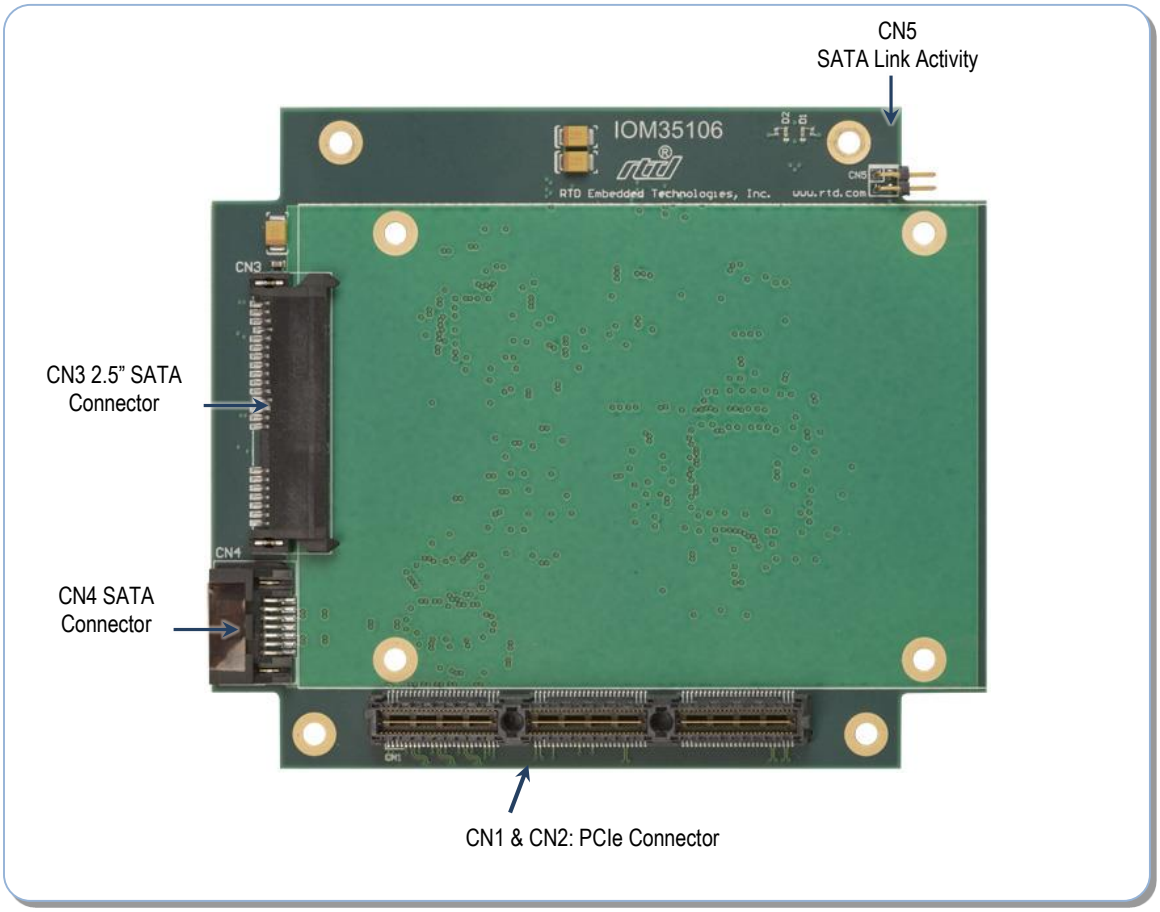

Figure 2: Board Connections

3.3.1 I/O CONNECTORS

CN3: 2.5" Onboard SATA Drive Connector

The 2.5" onboard SATA drive connector works with both flash and rotating 2.5" SATA drives. This onboard connector also supplies power to the drive from the PCIe connector

CN4: External SATA Connector

The external SATA connector can be used to add a second drive to the system. This drive will need an external out-of-stack cabling for power, since power is not supplied to this connector with the PCIe connector.

CN5: Link Activity

External connector used to indicate SATA link activity.

Table 4: CN5 Link Activity

+5V	2	1	Link 0 activity
+5V	4	3	Link 1 activity

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 IOM35106 is a "Universal" board, and can connect to either a Type 1 or Type 2 PCIe/104 connector.

3.3.3 JUMPERS

There are no jumpers on the IOM35106.

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.

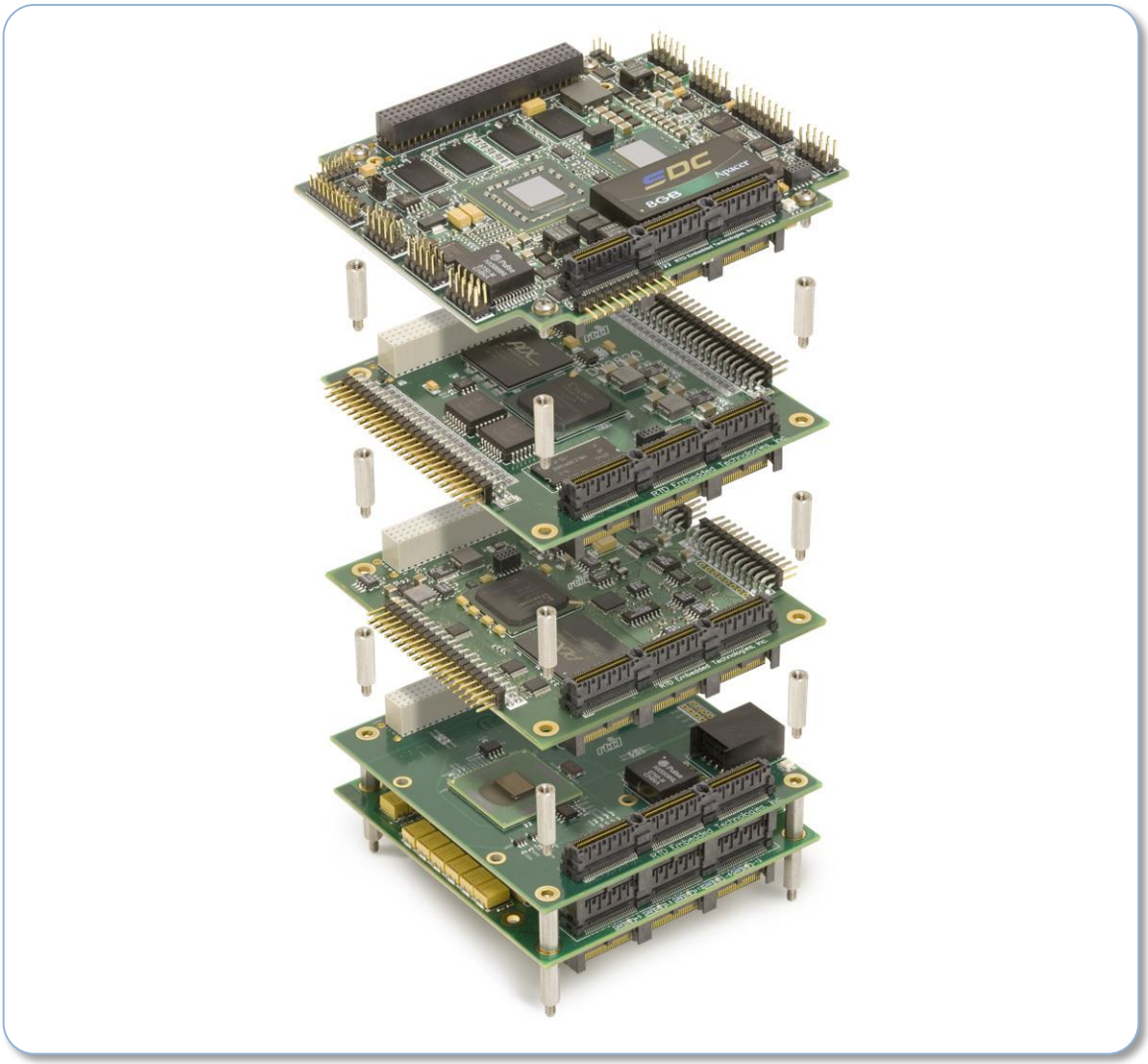

Figure 3: Example 104™ Stack

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)

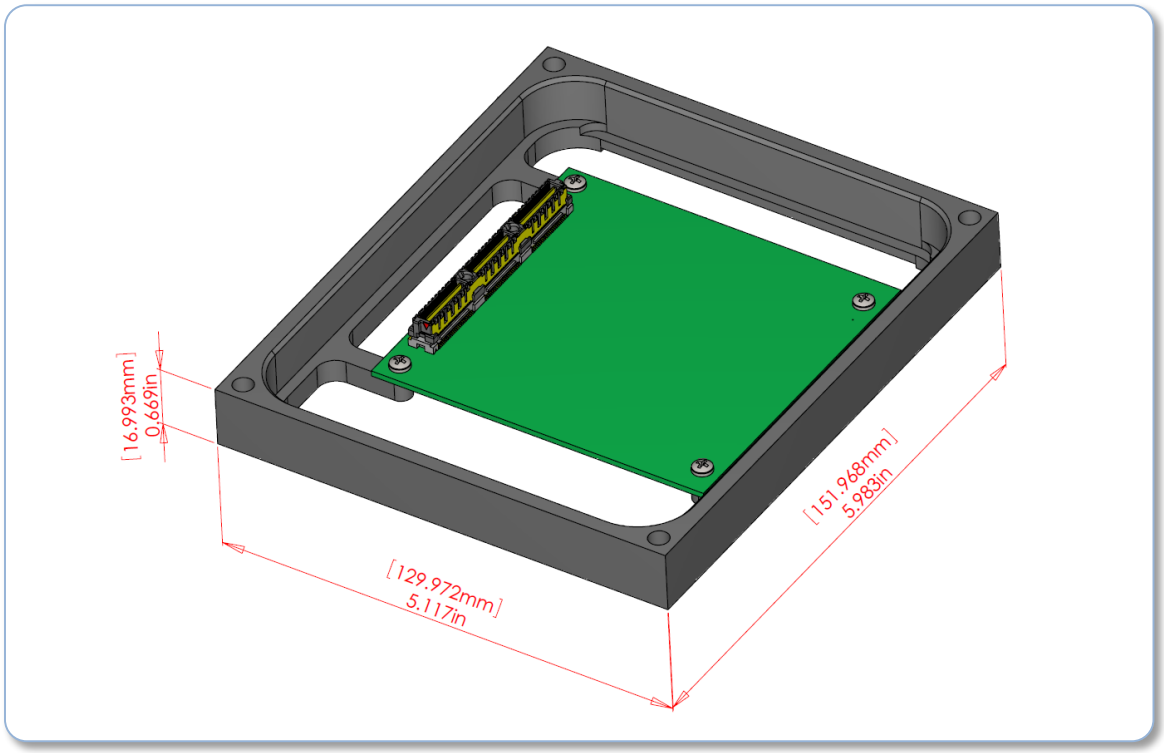

Figure 4: IDAN Dimensions

4.3 Connectors

4.3.1 External I/O Connectors

There are no external I/O connectors on the IOM35106

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 IOM35106 is a "Universal" board, and can connect to either a Type 1 or 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.

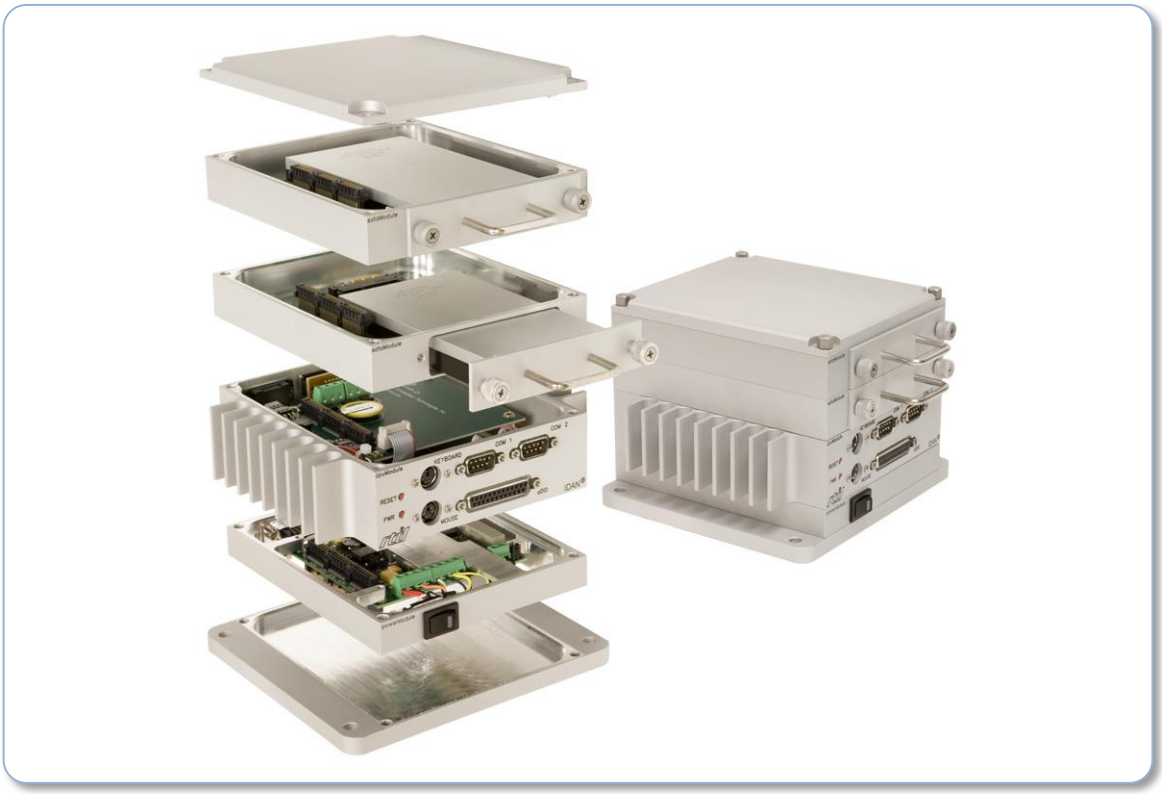

Figure 5: Example IDAN System

5 Functional Description

5.1 Block Diagram

The Figure below shows the functional block diagram of the IOM35106. The various parts of the block diagram are discussed in the following sections.

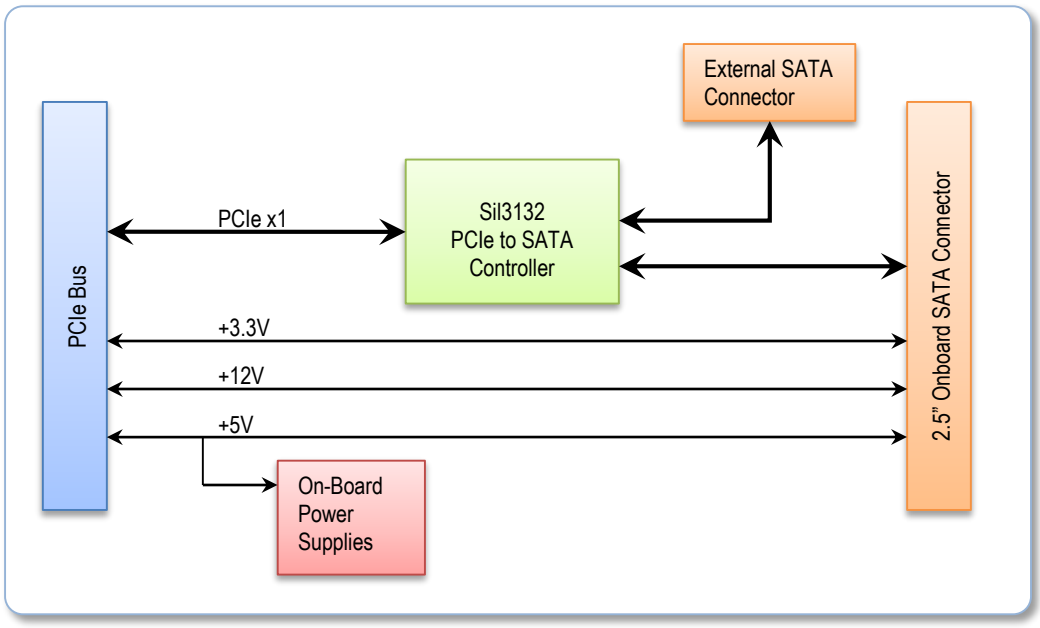

Figure 6: IOM35106 Block Diagram

5.2 PCIe to SATA Controller

The PCI Express to SATA controller utilizes a PCIe x1 link to produce two 3.0Gbps SATA links. By only utilizing the PCIe x1 link it allows the board to be "Universal" allowing for connection to either Type 1 or Type 2 PCIe/104 connector. Another feature that this controller supports is RAID0 and RAID1.

6 RAID Configuration

6.1 Flashing BIOS

The IOM35106 is factory shipped with the non-RAID flash configuration. To access the RAID mode of this module the IOM35106 will need the RAID BIOS flashed to its configuration chip. When flashing the module you have two flash configurations to choose from, RAID and non-RAID. The RAID drivers and BIOS can be located at http://www.siliconimage.com/support by selecting Sil3132 under the product support field, the drivers and BIOS are not shipped with the module and vary with OS. Silicon Image currently only supports flashing in Windows and DOS.

6.1.1 Flashing IOM35106 from Windows

To flash the module you want to configure for RAID or non-RAID, click **Start** and right-click on **My Computer**, then select **Manage, Device Manager** and expand the **SCSI and RAID Controllers** item. Right-click on the RAID controller you want to view, and click on **Properties.**

Click the **Flash BIOS** tab on the Properties Dialog box.

The **Flash BIOS** tab displays information about the current BIOS and allows you to download a BIOS version onto the Sil3132 controller. To download a new BIOS version, enter the filename or click on the **Browse…** button to navigate to it, and then clock on the **Program Flash**. Do not interrupt the download before it is completed.

6.1.2 Flashing IOM35106 from DOS

To flash the module you want to configure for RAID or non-RAID from DOS you need to download the DOS utility, **updflash.exe**, from Silicon Image site. Once you have obtained both the DOS utility and BIOS, boot the system with the IOM35106 module into DOS.

Once in DOS, change to the directory where the **updflash.exe** and **BIOS** file is located. Use the following syntax to flash the device:

updflash ***.bin –a**

When the device is flashed, verify the return code for completion using the following list:

- 0 – Update BIOS/Read Flash succeeded
- 1 – Update BIOS/Read Flash failed
- 2 – BIOS is already up to date
- 3 – No Silicon Image controller is found
- 4 – Cannot open input file
- 5 – Flash memory chip is not supported
- 6 – Input file is for motherboard BIOS
- 7 – Verify Failed.

6.2 Silicon Image RAID BIOS Utility

Once the IOM35106 module is flashed with the Silicon Image RAID BIOS configuration, the Silicon Image BIOS Utility becomes available. To access the RAID BIOS Utility during the system boot-up process, before the Operating System loads, press CTRL+S or F4 to the enter the utility.

To setup two drives for RAID once inside the BIOS utility, it is recommended to run the quick low level format on both drives before configuration.

1. Select **Create RAID set** from the main menu window.
2. Select with RAID0 (Striped) or RAID1 (Mirrored) and press **Enter**.
3. Select either **Auto configuration** or **Manual configuration** of the RAID Set and press **Enter**.
4. Then select RAID size and press **Enter**.
5. After, you are finished creating the RAID set press **CTRL+E** to exit the utility.

7 Windows Install

7.1 Windows XP

When installing Windows XP on Hard Drive using the IOM35106 module, the use of drivers are needed. There are separate drivers for RAID and non-RAID configurations. All necessary drivers and BIOS can be found by going to http://www.siliconimage.com/support and selecting Sil3132 in the product field. These drivers will need to be placed on a floppy driver for Windows XP install.

During Windows XP install press **F6** when indicated by "Press F6 if you need to install a third party SCSI or RAID driver". Windows will continue to load systems files and you then be prompted.

- If Windows automatically detects the drivers located on the floppy, Press **Enter** to continue with install.
- If Windows doesn't automatically detects the drivers located on the floppy Press **S** and insert the floppy with drivers into the drive, then press **Enter**. Select the following driver and press **Enter** to continue with the install.
  "Silicon Image Sil 3132 SATALink Controller for Windows XP/Server 2003" - Non-RAID

After the drivers are loaded continue Windows install as normal.

NOTE: Second SATA link of the IOM35106 module cannot be used for CDROM for install; this will cause the system to crash when loading drivers.

7.2 Windows 7

When installing Windows 7 on Hard Drive using the IOM35106 module, the use of drivers are needed. There are separate drivers for RAID and non-RAID configurations. These drivers can be found at http://www.siliconimage.com/support by selecting Sil3132 in the product support field. These drivers will need to be placed on an external source floppy drive/USB drive/etc. for Windows 7 install.

During Windows 7 install, the installer will prompt you to load a driver for this module.

- If Windows automatically detects the drivers located on the floppy, click **Next** to continue with install.
- If Windows doesn't automatically detect the drivers located on the external source, click **Browse** and assign the location where the drivers are located and press **OK**. Select the following driver and click **Next** to continue with the install.
  "Silicon Image Sil 3132 SATALink Controller" – Non-RAID

After the drivers are loaded continue Windows install as normal.

NOTE: An installation error may occur when selecting the disk partition when the system is booted with a USB drive installed. If this error occurs remove the USB drive and reboot system and restart Windows install.

8 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.

9 Additional Information

9.1 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

9.2 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

9.3 Silicon Image SATA Controller

A copy of the latest drivers, bios, bios tool and bios configuration guide for the SiI3132 can be found on the webpage for Silicon Image:

www.siliconimage.com

10 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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State College, PA 16803 USA
Telephone: 814-234-8087
Fax: 814-234-5218

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sales@rtd.com
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