# Intel® I/O Expansion Modules

## *Hardware Specification*

*Intel order number: D44901-006*

**Revision 1.0**

**March 2009**

**Enterprise Platforms and Services Division**

# Revision History

| Date | Revision Number | Modifications |
|---|---|---|
| March 2009 | 1.0 | First Release |
| | | |
| | | |

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# 1. Introduction

The Intel® Server Boards support a variety of Intel® I/O Expansion Module options using x4 PCI Express* Gen2 Mezzanine connectors on the server board. Each mezzanine connector is a 50-pin, surface mount, 0.8mm pitch, header.
The Legacy modules provide:

- Dual Port Intel 82571EB GbE I/O Module
- External 4-port SAS (LSI1064e) I/O Module
- Single InfiniBand* (SDR) Module

The double-wide modules consist of:

- Internal 4-port Intel 82576EB GbE*
- Dual Port Intel 82598EB 10GbE I/O Module
- Internal 4-port LSI* 1064e SAS I/O Module
- Internal 4-port LSI* 1078e SAS I/O Module
- Single-port InfiniBand (QDR)*

The Intel® I/O Expansion Modules are designed to fit Intel® Server Boards. The table below shows the support matrix for the Intel® I/O Expansion Modules.

**Table 1. I/O Module Support Matrix**

| **Intel® I/O Expansion Module** | **S5000PAL** | **S5400SF** | **S5520UR** | **S5500WB** | **S5520HC** | **S5520SC** | **S5500BC** |
|---|---|---|---|---|---|---|---|
| Dual-port Intel 82571EB GbE | ✓ | ✓ | ✓ | ✓ | × | × | × |
| External 4-port SAS (LSI1064e) | ✓ | ✓ | ✓ | ✓ | × | × | × |
| Single-port InfiniBand* (SDR) | ✓ | ✓ | ✓ | × | × | × | × |
| Dual-port Intel 82598EB 10GbE* | × | × | ✓ | ✓ | × | × | × |
| Internal 4-port Intel 82576EB GbE* | × | × | ✓ | ✓ | × | × | × |
| Single-port InfiniBand (QDR)* | × | × | ✓ | ✓ | × | × | × |
| 4-port Internal SAS (LSI1064e)* | × | × | ✓ | ✓ | ✓ | ✓ | × |
| 4-port Internal SAS HW RAID (LSI1078)* | × | × | ✓ | ✓ | ✓ | ✓ | × |

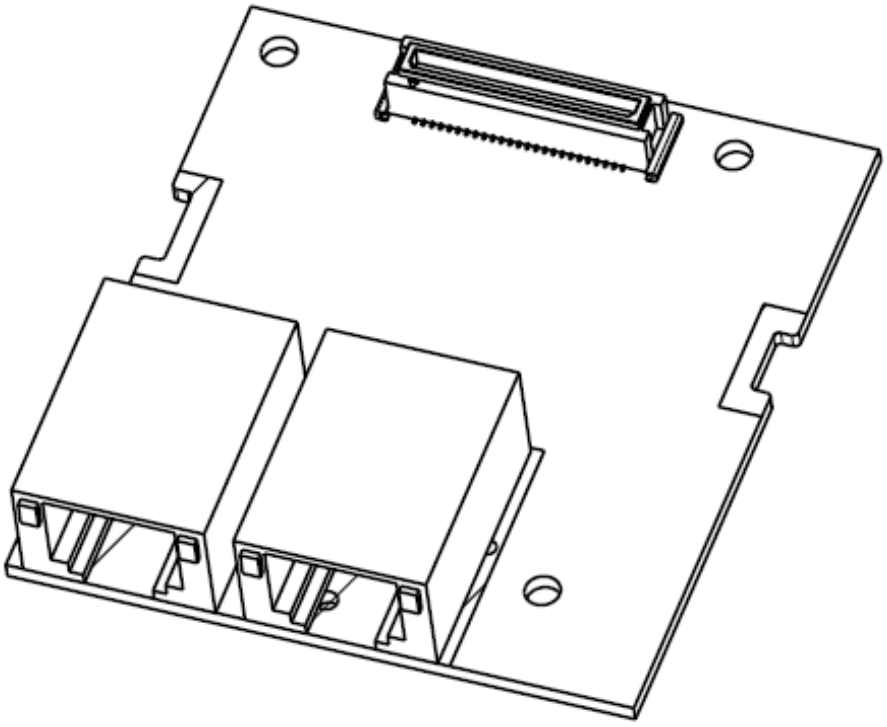
The following table details the pin-out of the I/O module connector.

**Table 2: 50-pin I/O Module Connector Pin-Out**

| Pin | Name | Pin | Name |
|---|---|---|---|
| 1 | 3V3_STBY | 2 | 3V3_STBY |
| 3 | PE_RST_G2_PM_N | 4 | GND |
| 5 | GND | 6 | PE0_DUAL_TX_DP<0> |
| 7 | GND | 8 | PE0_DUAL_TX_DN<0> |
| 9 | PE0_DUAL_RX_DP<0> | 10 | GND |
| 11 | PE0_DUAL_RX_DN<0> | 12 | GND |
| 13 | GND | 14 | PE0_DUAL_TX_DP<1> |
| 15 | GND | 16 | PE0_DUAL_TX_DN<1> |
| 17 | PE0_DUAL_RX_DP<1> | 18 | GND |
| 19 | PE0_DUAL_RX_DN<1> | 20 | GND |
| 21 | GND | 22 | PE0_DUAL_TX_DP<2> |
| 23 | GND | 24 | PE0_DUAL_TX_DN<2> |
| 25 | PE0_DUAL_RX_DP<2> | 26 | GND |
| 27 | PE0_DUAL_RX_DN<2> | 28 | GND |
| 29 | GND | 30 | PE0_DUAL_TX_DP<3> |
| 31 | GND | 32 | PE0_DUAL_TX_DN<3> |
| 33 | PE0_DUAL_RX_DP<3> | 34 | GND |
| 35 | PE0_DUAL_RX_DN<3> | 36 | GND |
| 37 | GND | 38 | CLK_100M_LP_PE_P |
| 39 | GND | 40 | CLK_100M_LP_PE_N |
| 41 | PE_WAKE_N | 42 | GND |
| 43 | 3V3 | 44 | 3V3 |
| 45 | 3V3 | 46 | 3V3 |
| 47 | 3V3 | 48 | 3V3 |
| 49 | 3V3 | 50 | 3V3 |

# 2. Dual Port GbE I/O Module (AXXGBIOMOD)

The dual Gigabit (Gb) I/O module provides two additional 10/100/1000Mbit external connections. This section provides a high-level description of the implementation of this I/O module.



## 2.1 Feature Set

The dual Gb Ethernet I/O module supports the following feature set:

- Intel® 82571EB Gb Ethernet Controller
  - Dual port
  - Ethernet interface for 1000BASE-T, 100BASE-TX, and 10BASE-T
  - Can be implemented in a very small area
  - Onboard System Management Bus (SMB) ports
  - PCI Express* x4 interface
- Supports two external Gb Ethernet ports

## 2.2 Functional Block Diagram

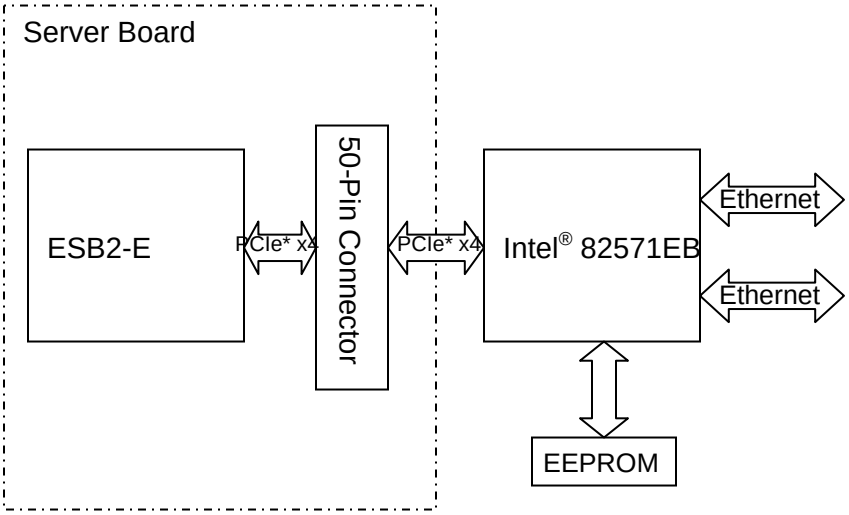



**Figure 1. Dual Gb Ethernet I/O Module Block Diagram**

## 2.3 Mechanical Dimensions

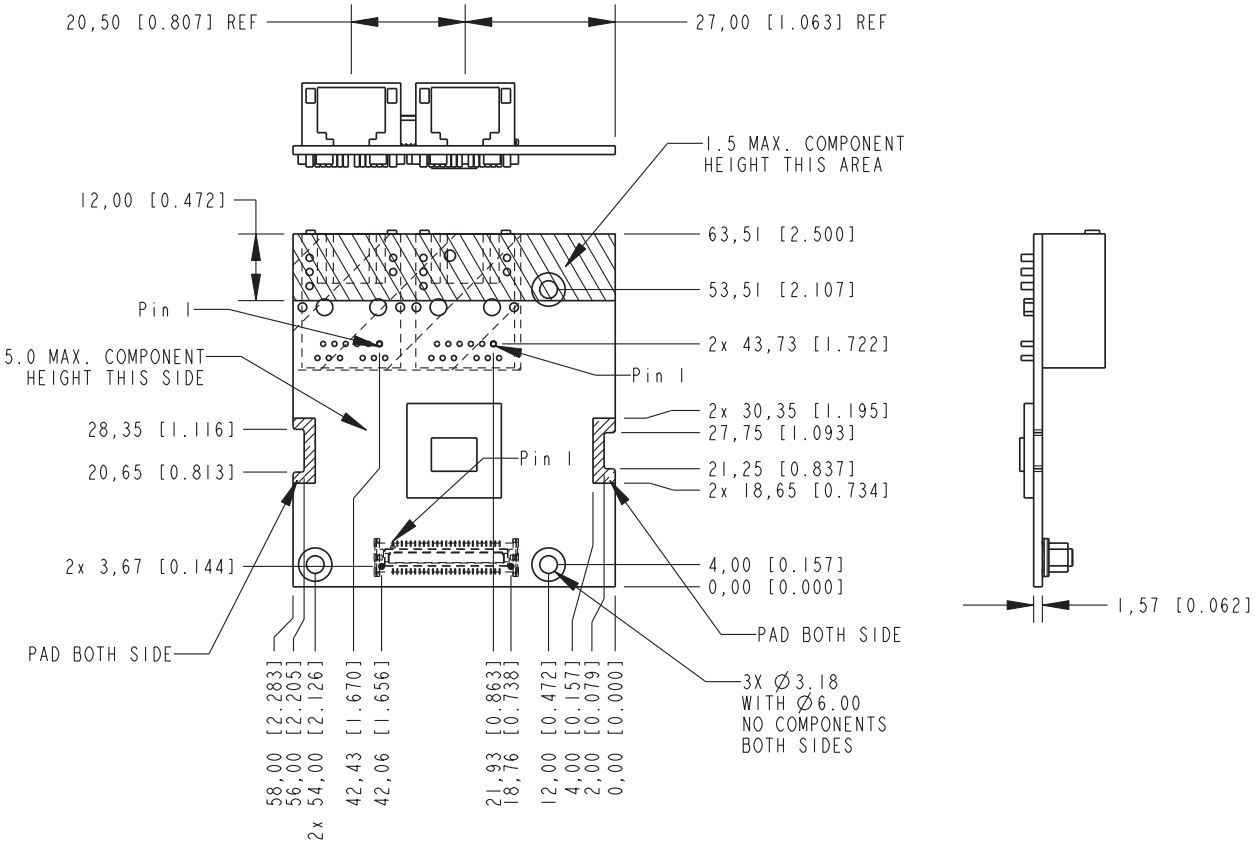



**Figure 2: Dual Gb Ethernet I/O Module Dimensions; Top and Side Views**

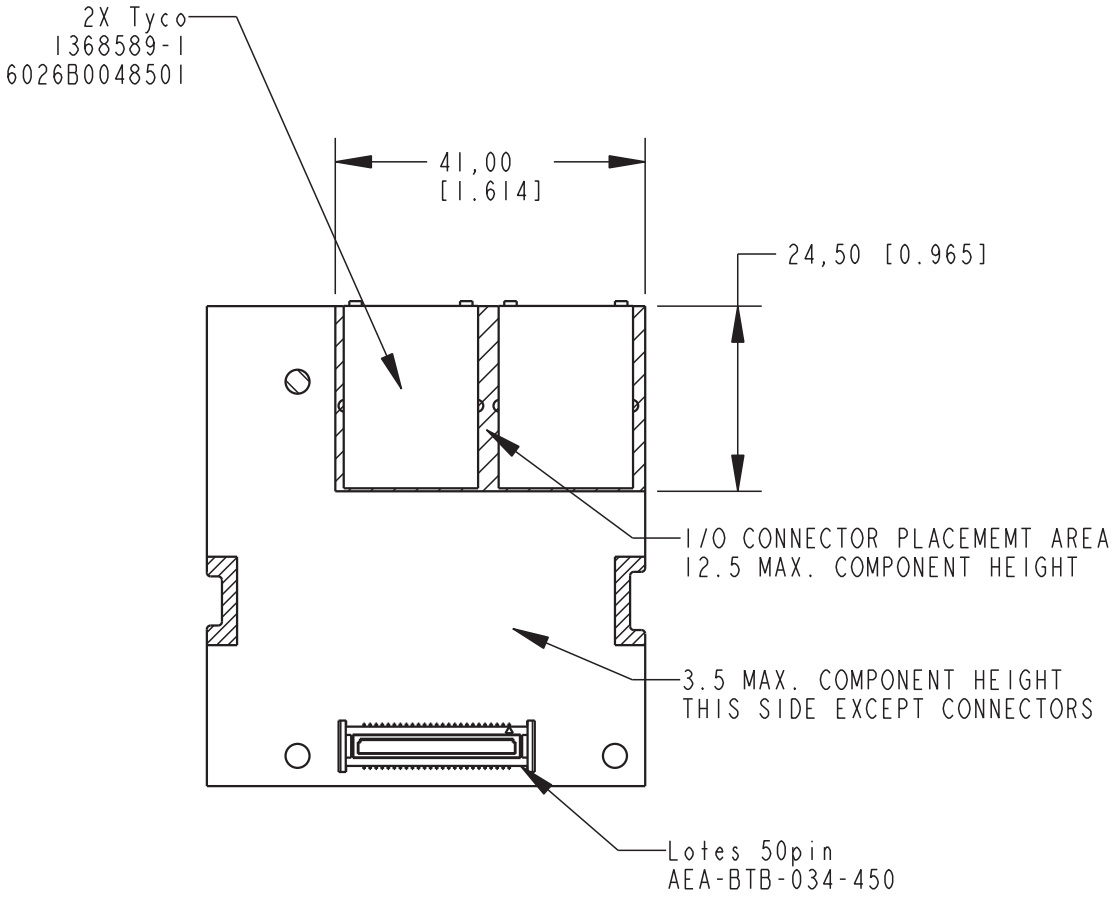



**Figure 3: Dual Gb Ethernet I/O Module Dimensions; Bottom View**

## 2.4 Intel® 82571EB Gb Ethernet Controller

The Intel® 82571EB Gb Ethernet Controller is a single, compact component with two fully integrated Gb Ethernet Media Access Control (MAC) and physical layer (PHY) ports.This device uses the PCI Express* architecture (Rev. 1.0a) and also enables a dual-port Gb Ethernet implementation. The Intel® 82571EB Gb Ethernet Controller provides two IEEE 802.3 Ethernet interfaces for 1000BASE-T, 100BASE-TX, and 10BASE-T applications. Both ports also integrate a Serializer-Deserializer (SerDes) to support 1000BASE-SX or 1000BASE-LX (optical fiber) and Gb backplane applications. In addition to managing MAC and PHY Ethernet layer functions, the controller manages PCI Express* packet traffic across its transaction, link, and physical/logical layers.

The Intel® 82571EB Gb Ethernet Controller for PCI Express* is designed for high-performance and low memory latency. The device is optimized to connect to a system Memory Control Hub (MCH) using up to four PCI Express* lanes. Wide internal data paths eliminate performance bottlenecks by efficiently handling large address and data words. Combining parallel and pipelined logic architecture optimized for Gb Ethernet and for independent transmit and receive queues, the controller efficiently handles packets with minimum latency. The controller includes advanced interrupt-handling features and uses efficient ring-buffer descriptor data structures with up to 64 packet descriptors cached on chip. A large 48 Kbyte per port on-chip packet buffer maintains superior performance. Using hardware acceleration, the controller offloads tasks from

the host, such as checksum calculations for transmission control protocol (TCP), user datagram protocol (UDP), and Internet protocol (IP); header and data splitting; and TCP segmentation.

## 2.5 EEPROM

The Dual Gb Ethernet I/O module provides a SPI serial EEPROM to store configuration and informational data. This includes pre-boot configuration data, MAC addresses, and serial numbers for the 82571EB.

## 2.6 PCI Express* x4 Connector

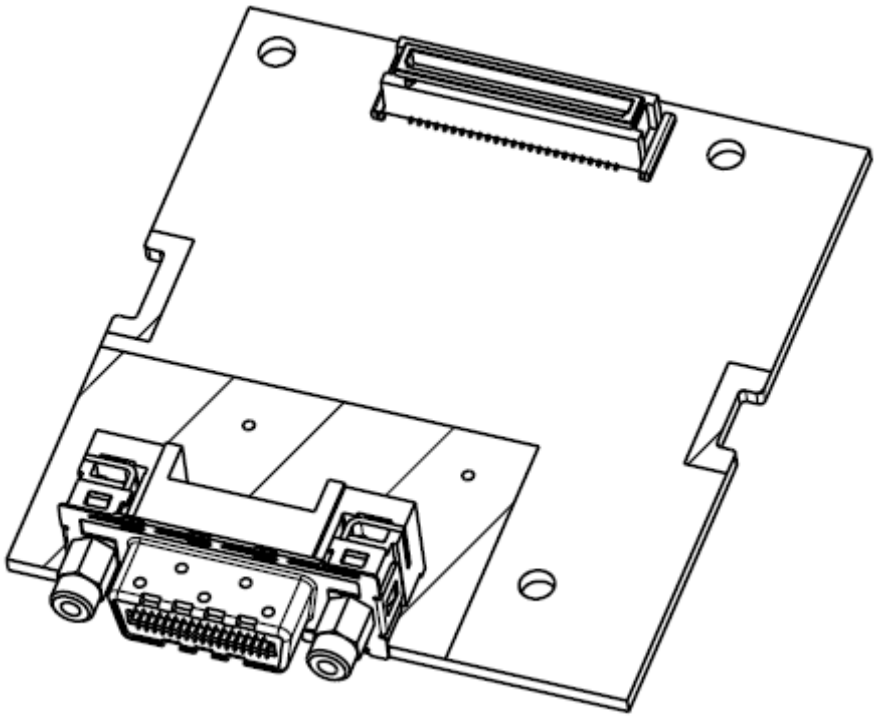
The Dual Gb Ethernet I/O module contains one 50-pin connector.

## 2.7 Ethernet Magjack

The Dual Gb Ethernet I/O module contains two Ethernet Magjacks which are compatible with 10/100/1000 Mbps Ethernet connection.

# 3. External 4 Port SAS I/O Module (AXXSASIOMOD)

The SAS I/O module provides the availability to connect up to four external SAS ports to an Intel® Server Board. This section provides a high-level description of the implementation of this Intel® I/O Expansion Modules.



## 3.1 Feature Set

The SAS I/O module supports the following feature set:

- LSI* LSISAS1064E SAS/SATA controller
  - Four-port, 3.0 Gbit/s SAS/SATA controller
  - Integrated Arm966 microprocessor core
  - Compliant with Fusion-MPT* architecture
  - x4 PCI Express*
- Provides four external SAS/SATA ports for connecting multiple SAS/SATA devices

## 3.2 Functional Block Diagram

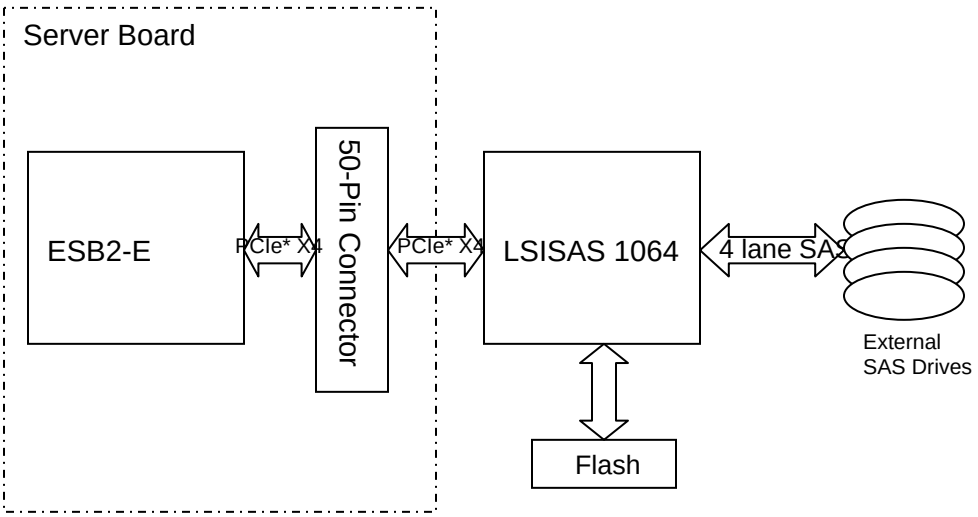



**Figure 4. External SAS I/O Module Block Diagram**

## 3.3 Mechanical Dimensions

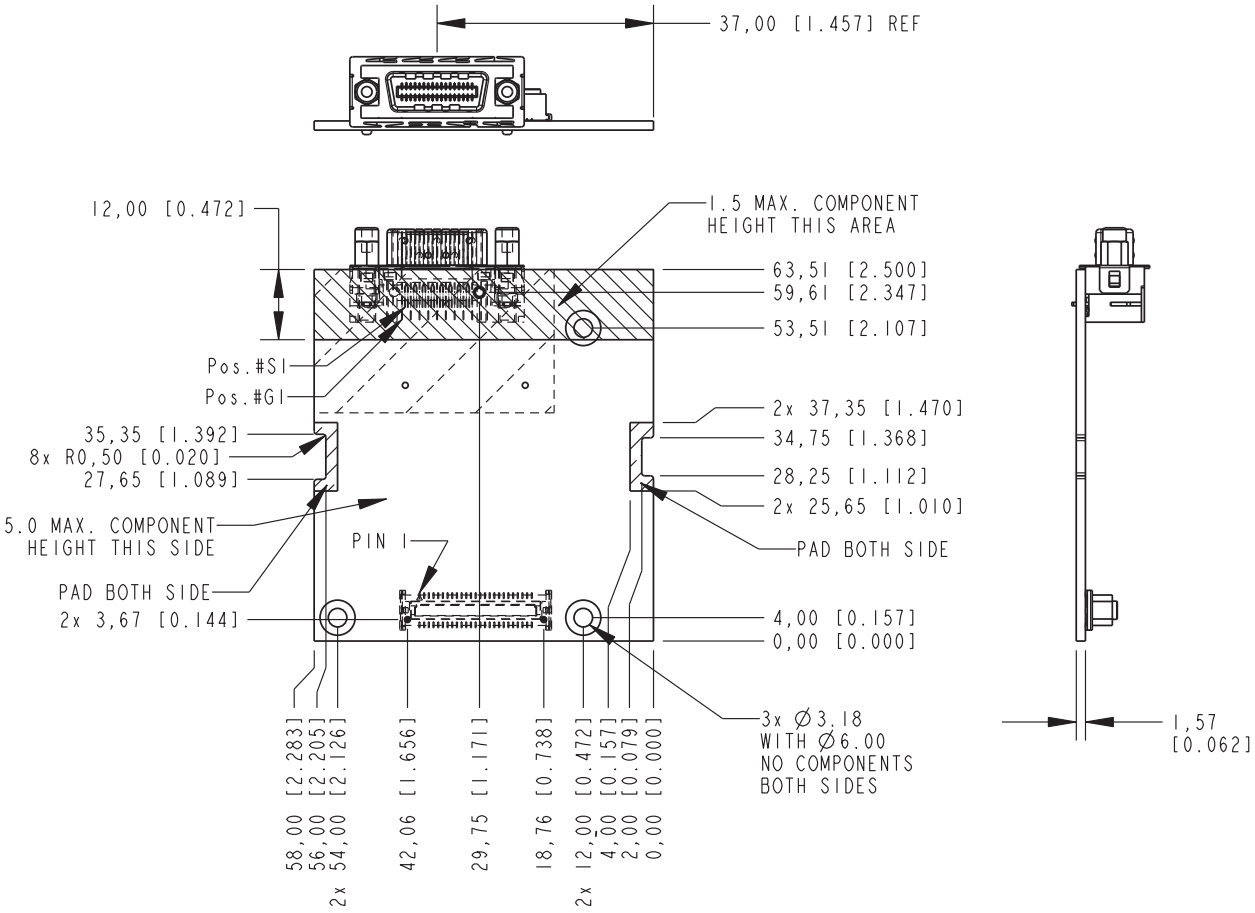



**Figure 5: SAS I/O Module Dimensions; Top and Side Views**

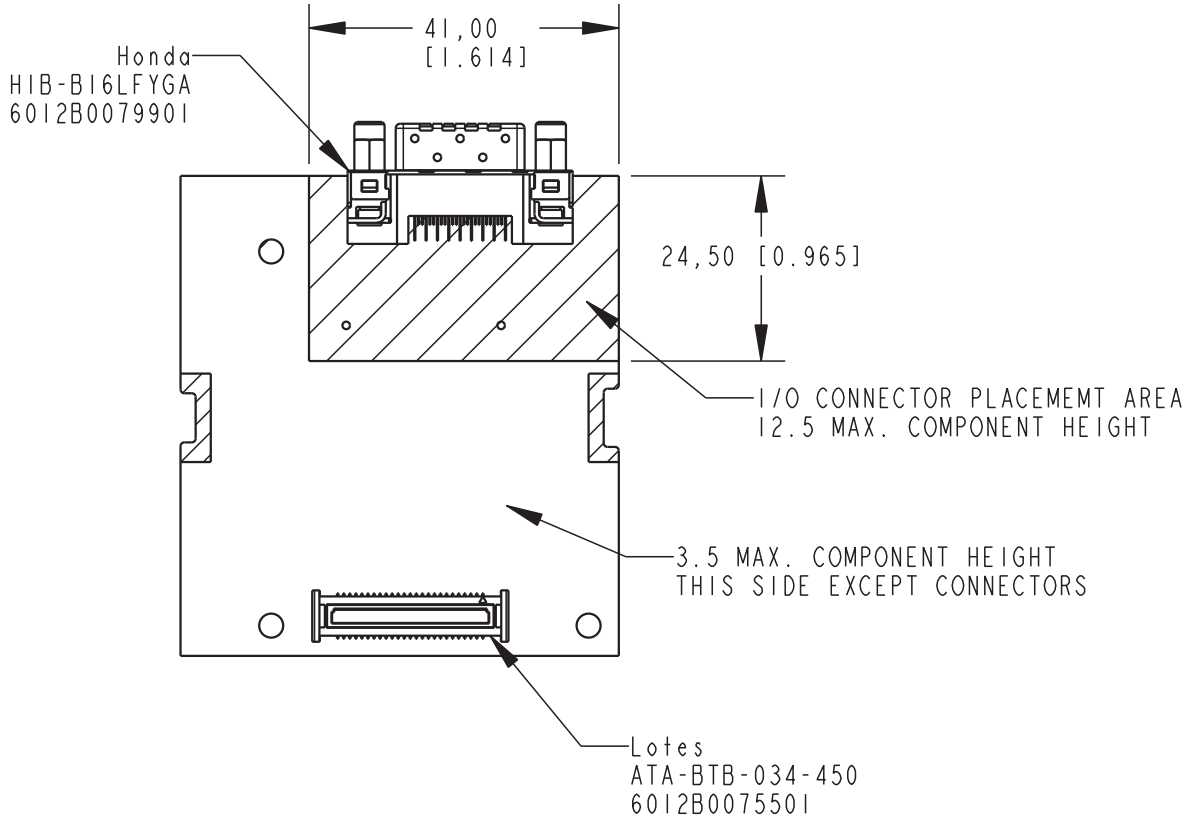



**Figure 6: SAS I/O Module Dimensions; Bottom View**

## 3.4 LSI* SAS1064E 3.0 Gbit/s Serial Attached SCSI Controller

Integrated on the SAS I/O module is an LSI* SAS1064E Serial Attached SCSI (SAS) controller. The LSISAS1064E is a four-port, 3.0 Gbit/s SAS/SATA controller compliant with the Fusion-MPT* architecture, and provides a four-lane PCI Express* interface. The point-to-point interconnect feature of the PCI Express* bus limits the electrical load on links, allowing increased transmission and reception frequencies. PCI Express* transmission and reception data rates for each full-duplex interconnect is 2.5 Gbit/s.

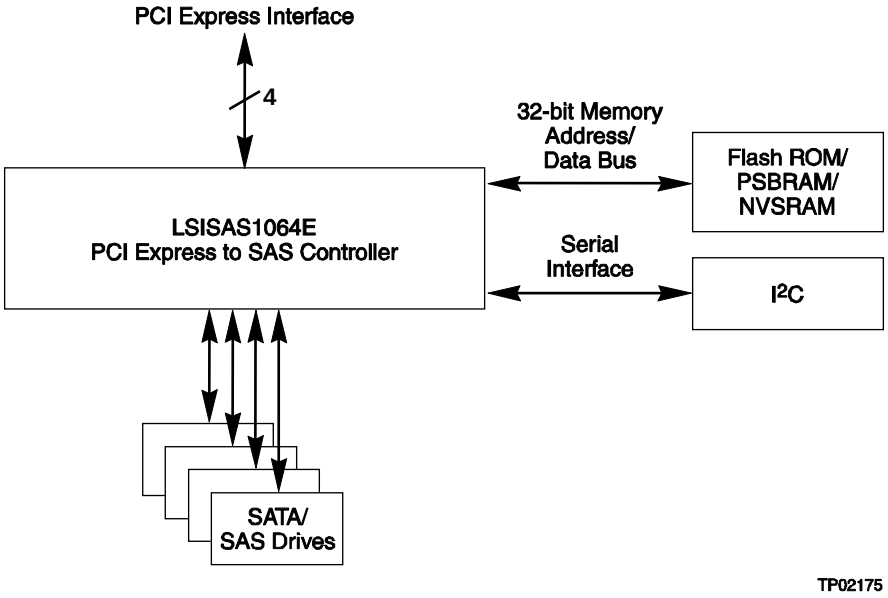



**Figure 7: LSI* SAS1064E Block Diagram**

PCI Express* implements a switch-based technology to interconnect a large number of devices. Communication over the serial interconnect is accomplished using packet-based communication protocol. Quality of Service (QOS) features provide differentiated transmission performance for different applications. Hot plug/hot swap support enables “always-on” systems. Enhanced error handling features, such as end-to-end CRC (ECRC) and Advanced Error Reporting, make PCI Express suitable for robust, high-end server applications. Hot plug, power management, error handling, and interrupt signaling are accomplished using packet-based messaging rather than sideband signals.

Each of the four SAS PHYs on the LSISAS1064E is capable of SAS/SATA link rates of 3.0 Gbit/s and 1.5 Gbit/s. The user can configure ports as wide or narrow. Narrow ports have one PHY per port. Wide ports have two, three, or four PHYs per port. Each port supports the SSP, SMP, STP, and SATA protocols.

The SAS interface uses the proven SCSI command set to ensure reliable data transfers, while providing the connectivity and flexibility of point-to-point serial data transfers. The SAS interface provides improved performance, simplified cabling, smaller connectors, lower pin count, and lower power requirements when compared to parallel SCSI. SAS controllers leverage an electrical and physical connection interface that is compatible with Serial ATA technology.

The LSISAS1064E uses the Fusion-MPT* (Message Passing Technology) architecture, which features a performance-based message passing protocol that offloads the host CPU by completely managing all I/Os and minimizes system bus overhead by coalescing interrupts. The proven Fusion-MPT architecture requires only thin, easy-to-develop device drivers independent of the I/O bus. LSI* Logic provides these device drivers.

### 3.4.1 Features of the LSI* SAS1064E

SAS and SSP features:

- Each PHY supports 3.0 Gbit/s and 1.5 Gbit/s SAS data transfers
- Provides a serial, point-to-point, enterprise-level storage interface
- Supports wide transfers consisting of 2, 3, or 4 PHYs
- Supports narrow ports consisting of a single PHY
- Transfers data using SCSI information units
- Compatible with SATA target devices

SATA and STP Features:

- Supports 3.0 Gbit/s and 1.5 Gbit/s SATA data transfers
- Supports 3.0 Gbit/s and 1.5 Gbit/s STP data transfers

Usability features:

- Simplifies cabling with point-to-point, serial architecture
- Provides drive spin-up sequencing control
- Provides up to two LED signals for each SAS/SATA PHY to indicate drive activity and faults
- Provides an SGPIO interface

## 3.5 External Flash Memory

The SAS I/O module provides a non-volatile 2X8Mbit Flash memory device that stores the configuration data and operating firmware executed by the LSI1064E embedded CPU.

## 3.6 PCI Express* x4 Connector

The SAS I/O Module contains one 50-pin SFF-8470 connector matching the one available on the Intel® S5000PAL Server Board.

## 3.7 External 4 SAS Connector

The SAS I/O module contains a x4 SAS/SATA connector which allows connections to four external SAS devices. The pin-out of the external SAS connector is detailed in the following table.

**Table 3: External SAS x4 Connector Pin-Out**

| Pin | Name |
|---|---|
| S1 | SAS0_C_RX_DP |
| S2 | SAS0_C_RX_DN |
| S3 | SAS1_C_RX_DP |
| S4 | SAS1_C_RX_DN |
| S5 | SAS2_C_RX_DP |
| S6 | SAS2_C_RX_DN |
| S7 | SAS3_C_RX_DP |
| S8 | SAS3_C_RX_DN |
| S9 | SAS3_C_TX_DN |
| S10 | SAS3_C_TX_DP |
| S11 | SAS2_C_TX_DN |
| S12 | SAS2_C_TX_DP |
| S13 | SAS1_C_TX_DN |
| S14 | SAS1_C_TX_DP |
| S15 | SAS0_C_TX_DN |
| S16 | SAS0_C_TX_DP |
| 1 | GND |
| 2 | GND |
| 3 | GND |
| 4 | GND |
| 5 | GND |
| 6 | GND |
| 7 | GND |
| 8 | GND |
| 9 | GND |
| 10 | GND |
| 11 | GND |

# 4. InfiniBand* (SDR) Module (AXXIBIOMOD)

The 4X SDR InfiniBand* I/O module is based on the Mellanox InfiniHost* MT25204 device with the integrated Physical Layer SerDes. This card has a single 4X InfiniBand copper port for connecting InfiniBand traffic at up to 10Gbps. This section provides a high-level description of the implementation of this I/O module. This module is expected to end-of-life with the S5000PAL/S5400SF server boards, not available for extended life support

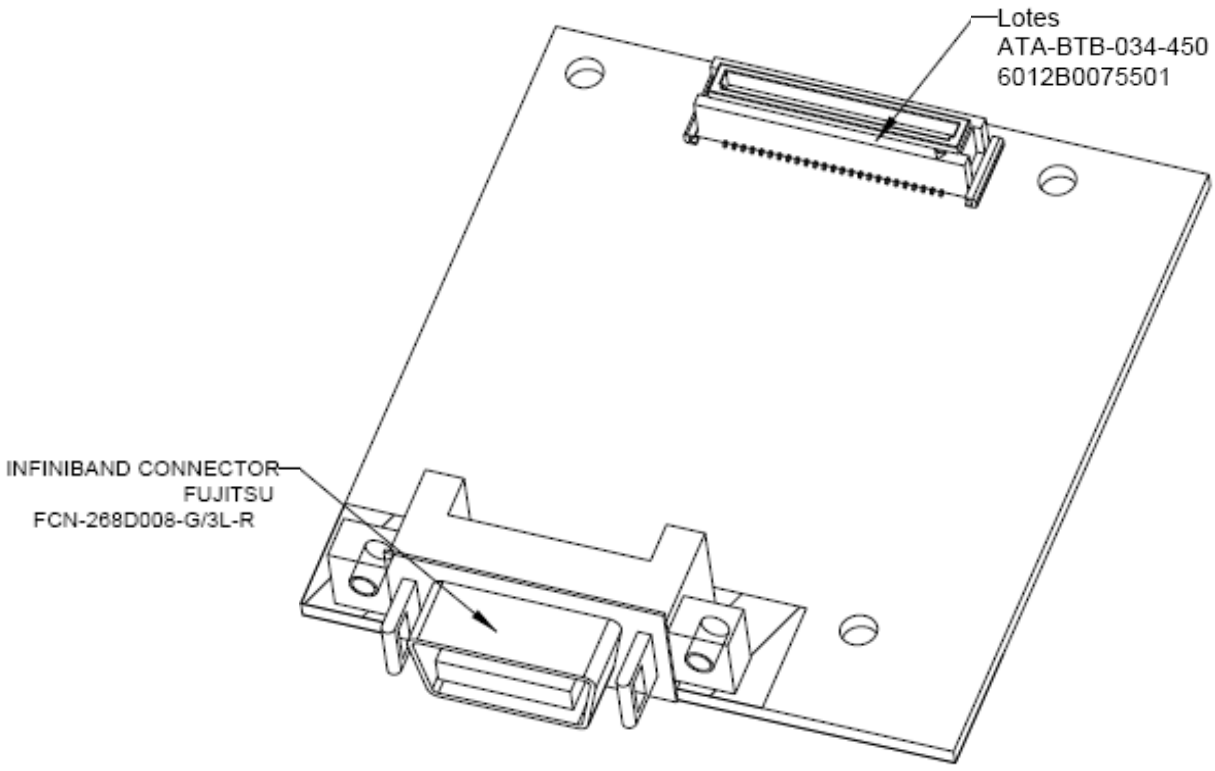



**Figure 8: Single InfiniBand* (SDR) Module (AXXIBIOMOD)**

## 4.1 Feature Set

The InfiniBand* I/O module supports the following feature set:

- 3.3V 4x PCI Express* interface
- InfiniHost* Lx MT25204 controller chip with integrated InfiniBand SerDes
- One 10Gbps copper port (with 4X IB connector)
- 16MBits SPI Flash memory for firmware and configuration
- 32KBytes EEPROM for VPD data
- LEDs for physical and logical link status

- Power supply circuitry that generates 1.8V and 1.2V rails

## 4.2 Functional Block Diagram

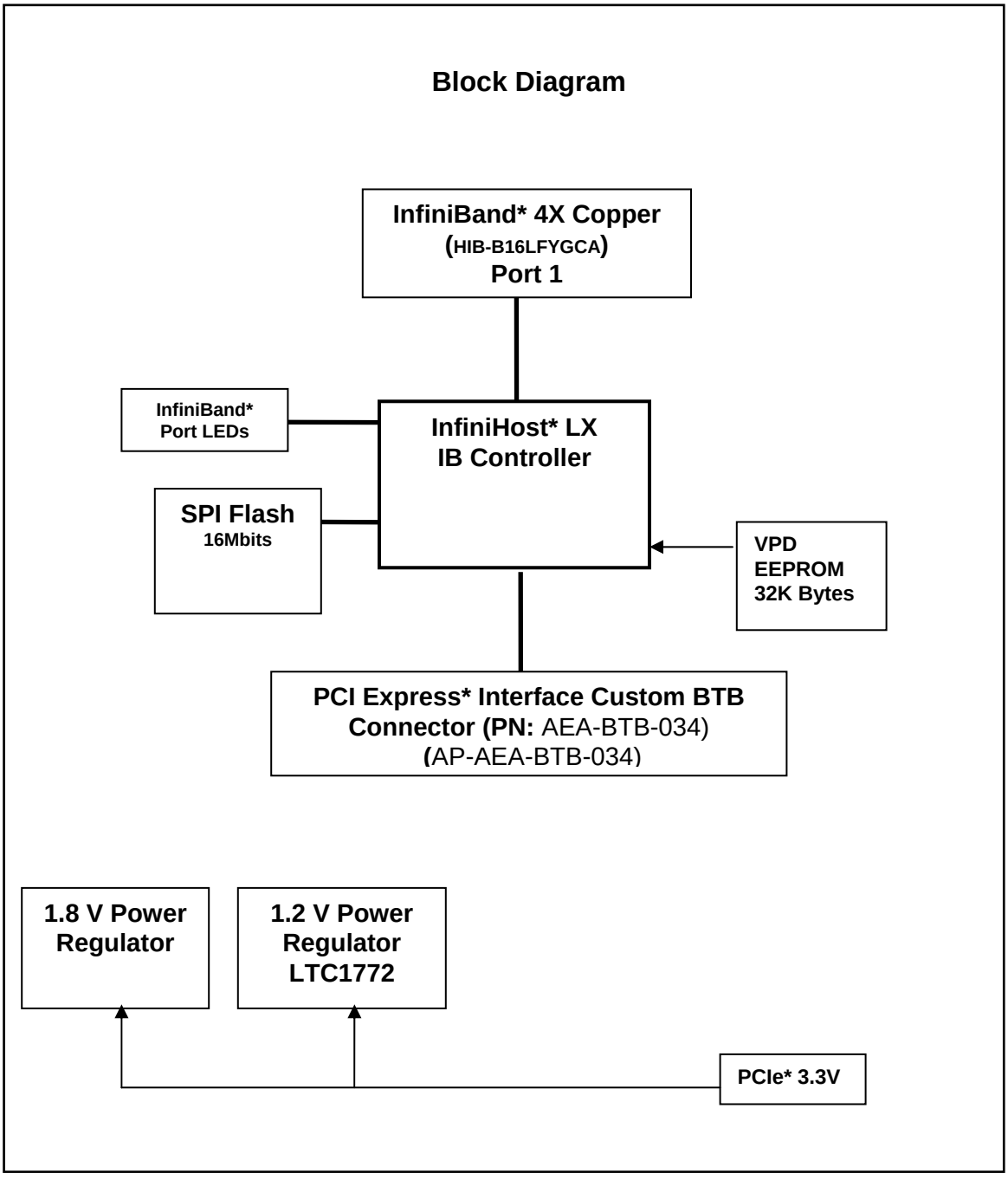



**Figure 9: InfiniBand* I/O Module Block Diagram**

## 4.3 Mechanical Dimensions

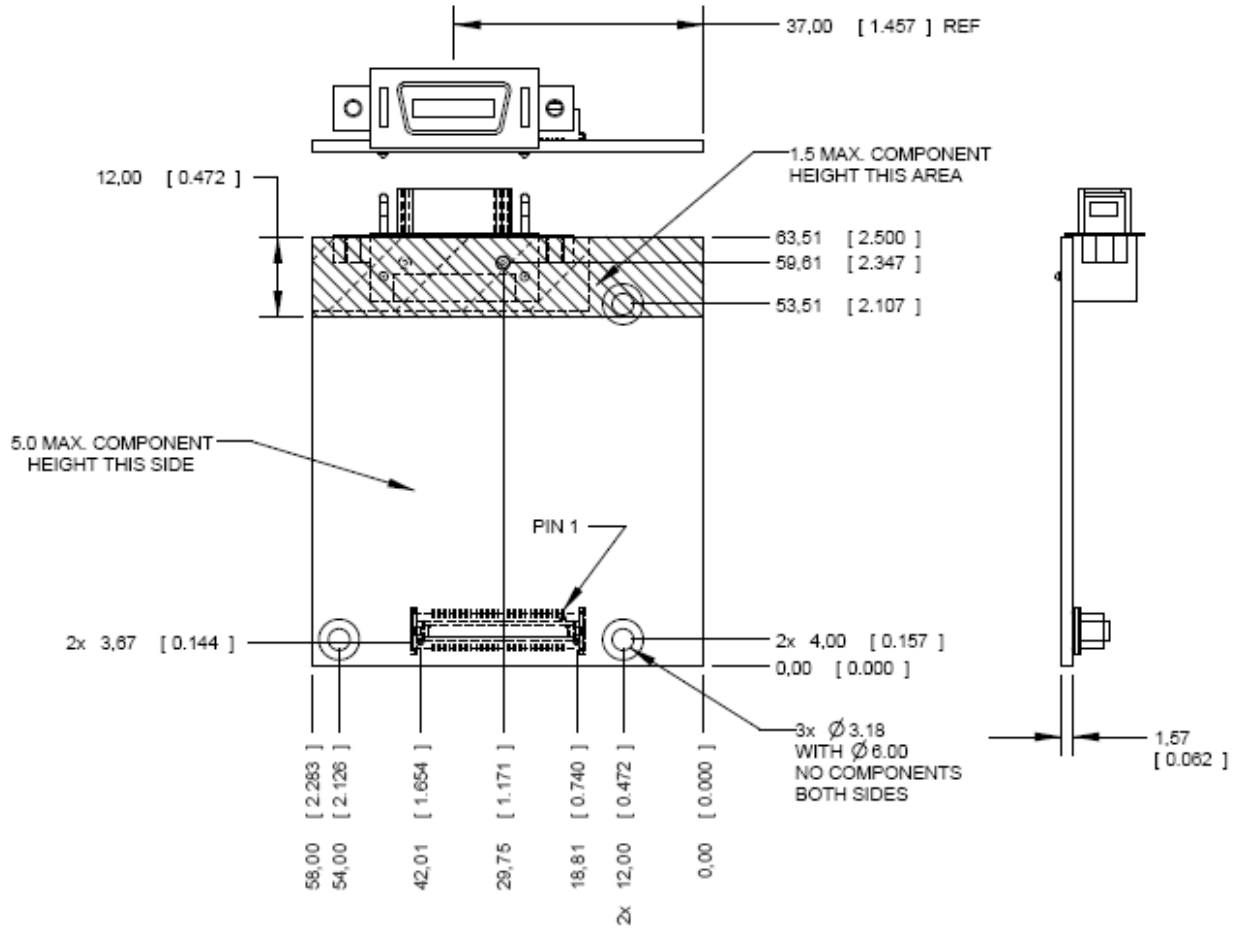



**Figure 10: InfiniBand* I/O Module Dimensions; Top and Side Views**

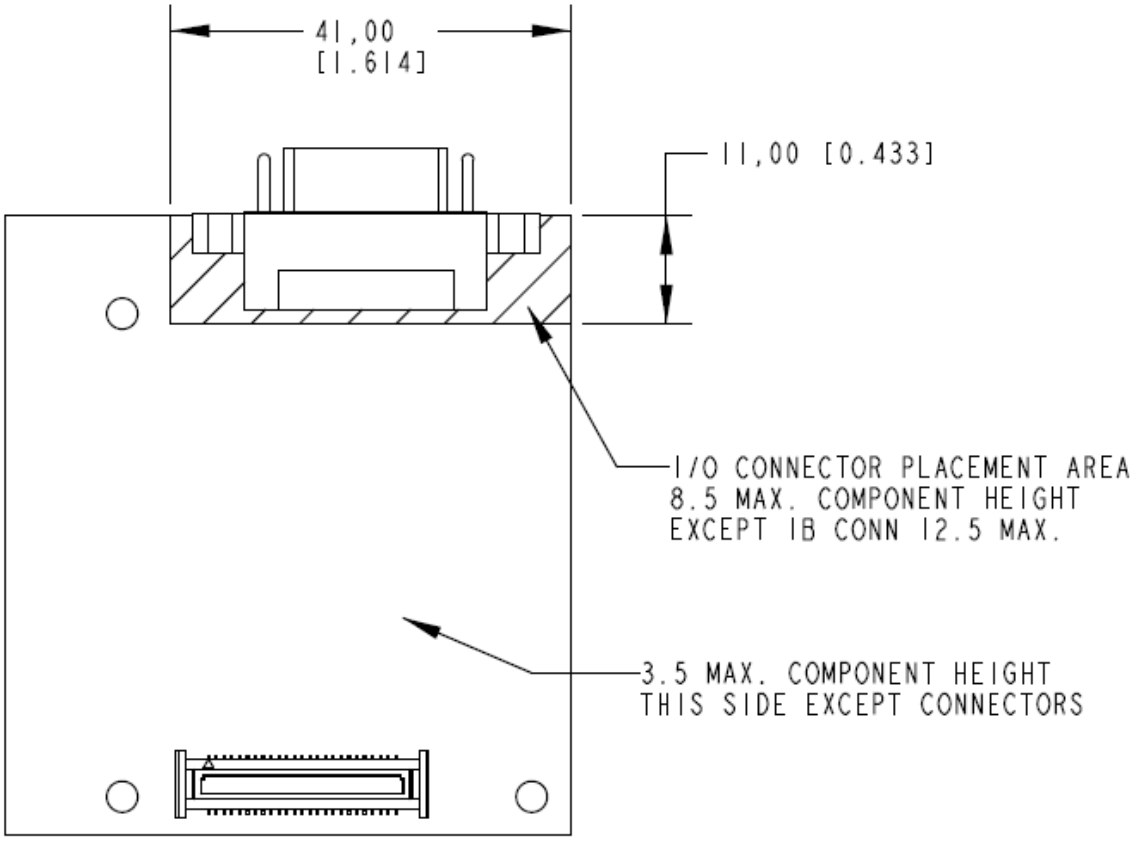



**Figure 11: InfiniBand* I/O Module Dimensions; Bottom View**

## 4.4 LED Functionality

The InfiniBand* I/O module has two LEDs for debug only. They are not visible from the rear panel.

Physical Link LED (Green)

- *Steady On*: Physical link established
- *Off:* Physical link error, poor connection quality, or no physical connection

Activity LED (Yellow)

- *Steady On*: Data transferring to/from the card across the wire (solid stream)
- *Blinking*: Data transferring to/from the card across the wire
- *Off*: Logical link error or no Rx Char detected

## 4.5 PCI Express* x4 Connector

The InfiniBand* I/O Module contains one 50-pin connector.

## 4.6 External Connector

The InfiniBand* I/O module contains a x4 InfiniBand connector which allows a 10 Gbps connection to an InfiniBand Fabric.

# 5. Internal 4-port LSI 1064e SAS I/O Module (AXX4SASMOD)

The optional Intel® SAS Entry RAID Module AXX4SASMOD includes a SAS1064e controller that supports x4 PCI Express* link widths and is a single-function PCI Express* end-point device. The SAS controller supports the SAS protocol as described in the Serial Attached SCSI Standard, version 1.0, and also supports SAS 1.1 features. A 32-bit external memory bus off the SAS1064e controller provides an interface for Flash ROM and NVSRAM (Non-volatile Static Random Access Memory) devices.

The optional Intel® SAS Entry RAID Module AXX4SASMOD provides four SAS connectors that support up to four hard drives with a non-expander backplane or up to eight hard drives with an expander backplane.

For more details refer to the Intel® SAS Entry RAID Module Hardware Specification

## 5.1 Major Component Diagram

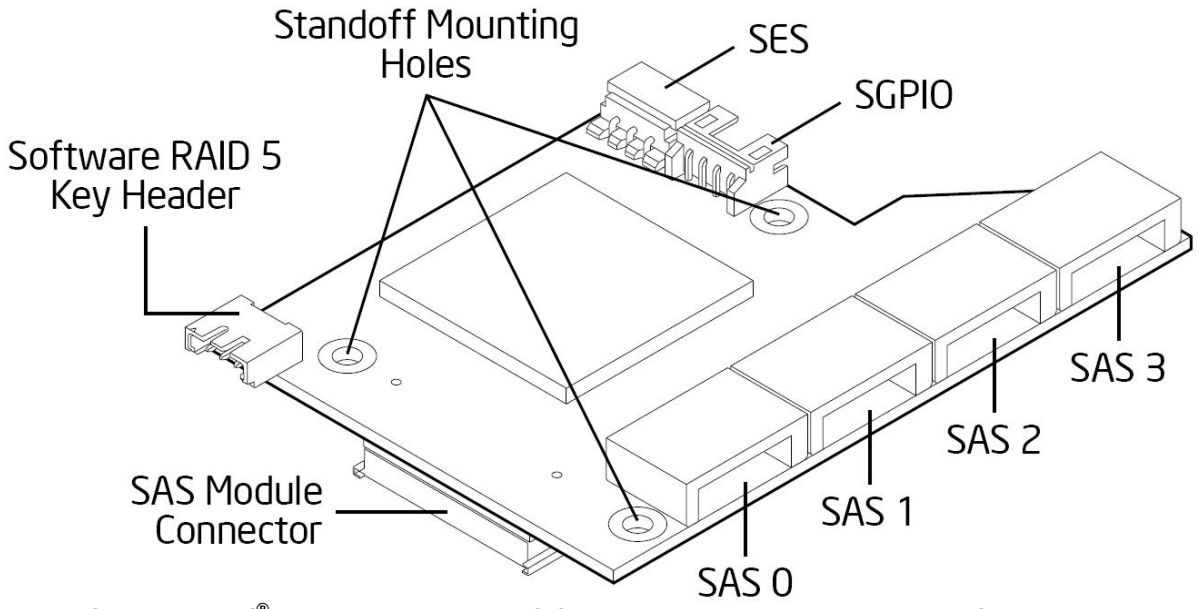



**Figure 12.Intel® SAS Entry RAID Module AXX4SASMOD Component and Connector**

| Connector | Reference Designators | Connector Type | Pin Count |
|---|---|---|---|
| SAS Connector 0-3 | J1B2, J2B1, J3B2, J3B3 | Header | 7 |
| SES | J2A1 | Header | 3 |
| SGPIO | J2A2 | Header | 4 |
| Software RAID 5 Key Header | J1A1 | Key holder | 3 |
| SAS Module Connector | J3M1 | Mezzanine slot | 50 |

## 5.2 Functional Block Diagram

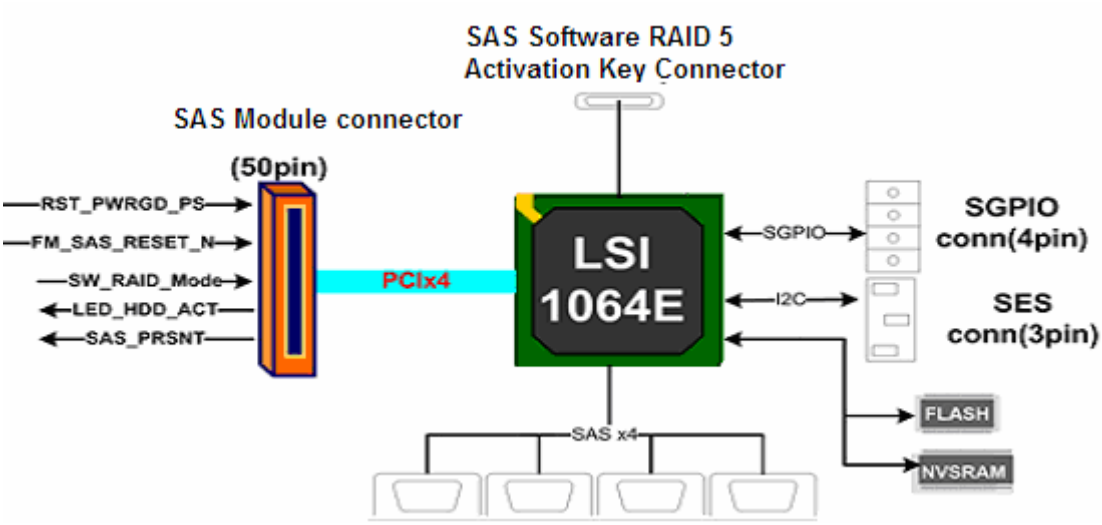



**Figure 13. Intel® SAS Entry RAID Module AXX4SASMOD Functional Block Diagram**

## 5.3 Feature Set

- LSI* LSISAS1064E SAS/SATA controller
  - Four-port, 3.0 Gbit/s SAS/SATA controller
  - Integrated Arm966 microprocessor core
  - Compliant with Fusion-MPT* architecture
  - x4 PCI Express*
- Provides 4 SAS/SATA ports for connecting multiple SAS/SATA devices
- Intel® Embedded Server RAID Technology II mode provides RAID 0, RAID 1, RAID 10, and RAID 5 support. RAID 5 is available with optional RAID 5 activation key accessory (AXXRAKSW5).
- IT/IR RAID mode supports entry hardware RAID 0, RAID 1, RAID 10, RAID 10E, and native SAS pass through mode.
- Serial General Purpose Input/Output (SGPIO) connector and SCSI Enclosure Services (SES) support for hard drive backplane LED control

**Table 4: AXX4SASMOD Storage Mode**

| Storage Mode | Description | RAID Types and Levels Supported | Driver | RAID Management Software | RAID Software User's Guide |
|---|---|---|---|---|---|
| IT/IR RAID | 4 SAS Ports<br>Up to 10 SAS or SATA drives via expander backplanes | Native SAS pass through mode without RAID function.<br>Entry Hardware RAID.<br>- RAID 1 (IM mode)<br>- RAID 10/10E (IME mode)<br>- RAID 0 (IS Mode) | SAS MPT driver (Fully open-source driver)<br>Broad OS support | Intel® RAID Web Console 2 | IT/IR RAID Software User's Guide |
| SW RAID | 4 SAS Ports<br>Up to 8 SAS or SATA drives via expander backplanes | SW RAID 0/1/10 standard<br>SW RAID 5 with optional AXXRAKSW5 | ESRTII Driver<br>Microsoft Windows* and selected Linux* Versions only | Intel® RAID Web Console 2 | Intel® RAID Software User's Guide |

## 5.4 Mechanical Drawings

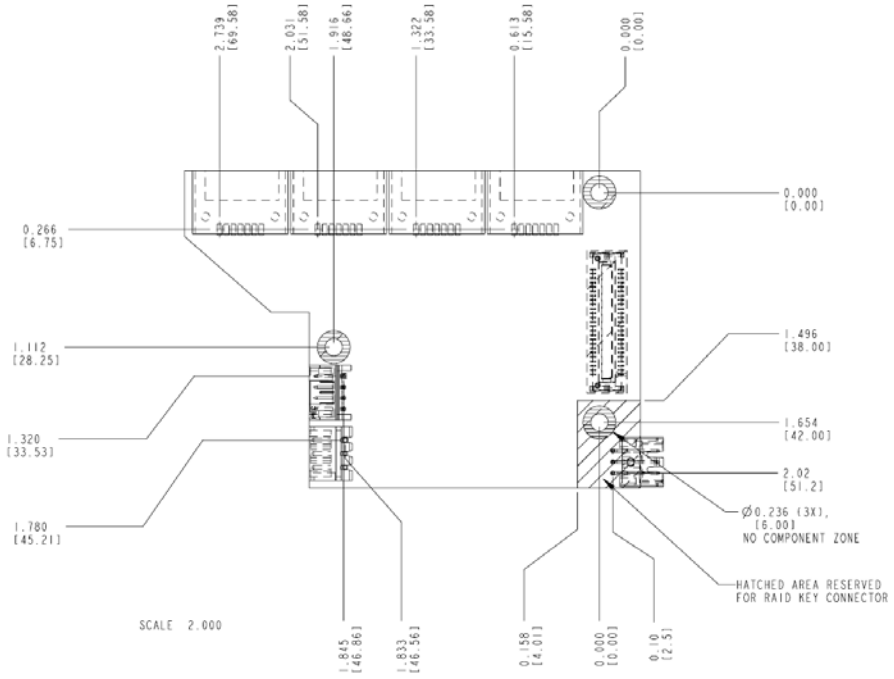



**Figure 14. AXX4SASMOD Mechanical Dimensions (Top View)**

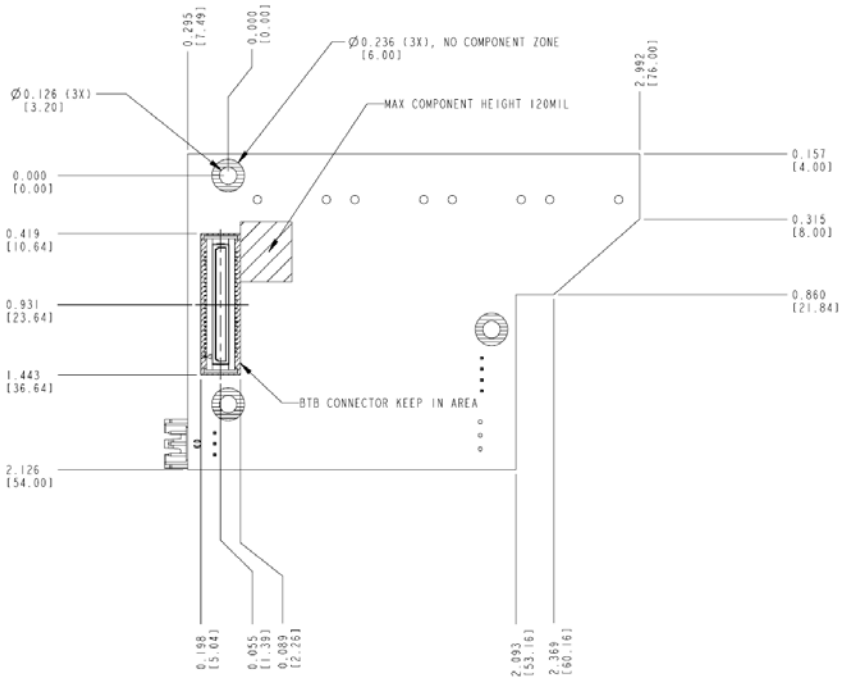



**Figure 15. AXX4SASMOD Mechanical Dimensions (Bottom View)**

# 6. Intel® Integrated RAID Module SROMBSASMR (AXXROMBSASMR)

Internal 4-port SAS module based on LSI 1078e* controller with hardware RAID support. For more information, refer to the Intel® Integrated RAID Controller SROMBSASMR (AXXROMBSASMR) Technical Product Specification.

## 6.1 Product Overview

The Intel® Integrated RAID Controller SROMBSASMR supports both enterprise-class serial ATA (SATA) and serial-attached SCSI (SAS) disk drives, which allows customized solutions for performance, reliability, system expansion flexibility, and hard drive capacity. It provides such flexibility and helps lower the total cost of ownership with a standardized server and storage infrastructure.

This RAID controller is designed with four internal SAS/SATA ports through four individual connectors and uses a custom board-to-board 50-pin connector to provide x4 PCI Express* support.

## 6.2 Hardware Architectural Features

**Table 5. Hardware Architectural Features**

| Feature | Intel Integrated RAID Controller SROMBSASMR |
|---|---|
| RAID Levels | 0, 1, 5, 6, 10, 50, 60 |
| Number of devices | Up to 16 devices per controller |
| Device types | SAS and SATA hard drives |
| Data transfer rate | 300 MB/s per port |
| PCI bus | 50-pin board-to-board connector with x4 PCI Express* |
| Memory | 128 MB ECC DDR2 667 MHz SDRAM Integrated on the controller |
| Battery backup (optional) | Intel® RAID Smart Battery AXXRSBBU3 |
| SAS/SATA connector | Four internal SAS/SATA connectors |
| ROC | LSI* 1078 SAS ROC which performs hardware-exclusive OR (XOR) assistance |
| Weight | 46 oz |
| Serial port | 4-pin serial debug (requires transceiver) |
| Compatible devices | 16 physical devices, 64 logical drives, mixed capacity, SAS and SATA hard drives; non-disk devices including expanders |
| Firmware | 4 MB in flash ROM |

## 6.3 Block Diagram

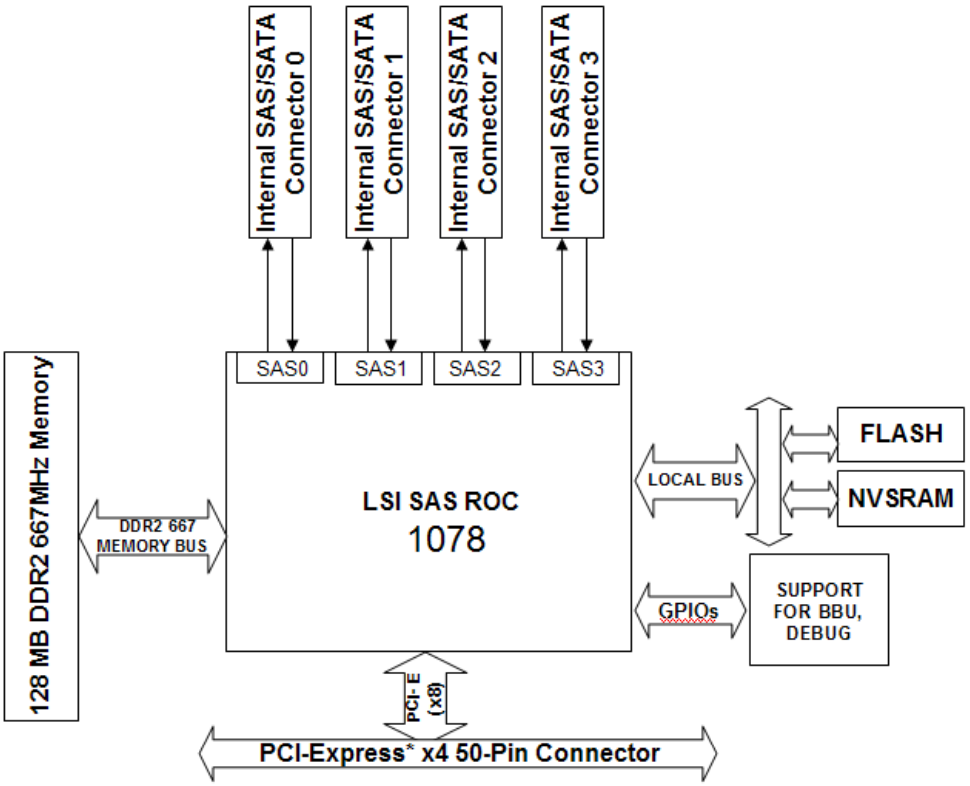



**Figure 16. Hardware Block Diagram**

## 6.4 Controller Layout

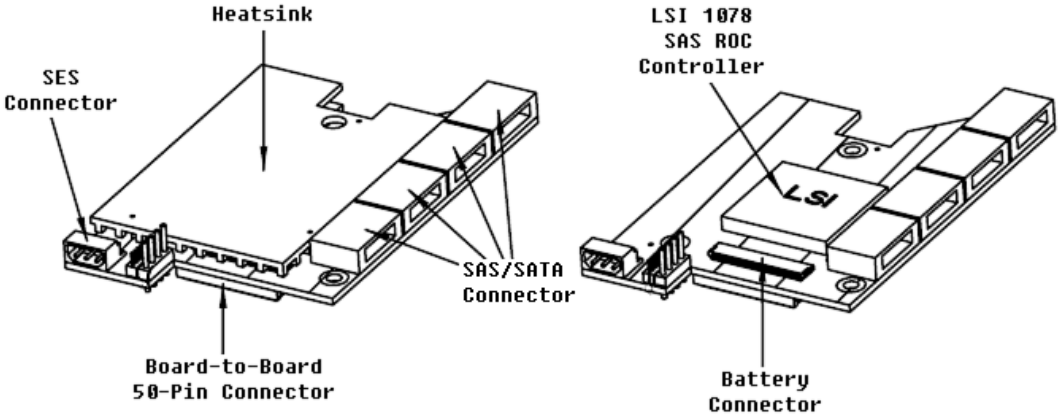



**Figure 17. Intel® Integrated RAID Controller SROMBSASMR Physical Layout**

### 6.4.1 Mechanical Drawings

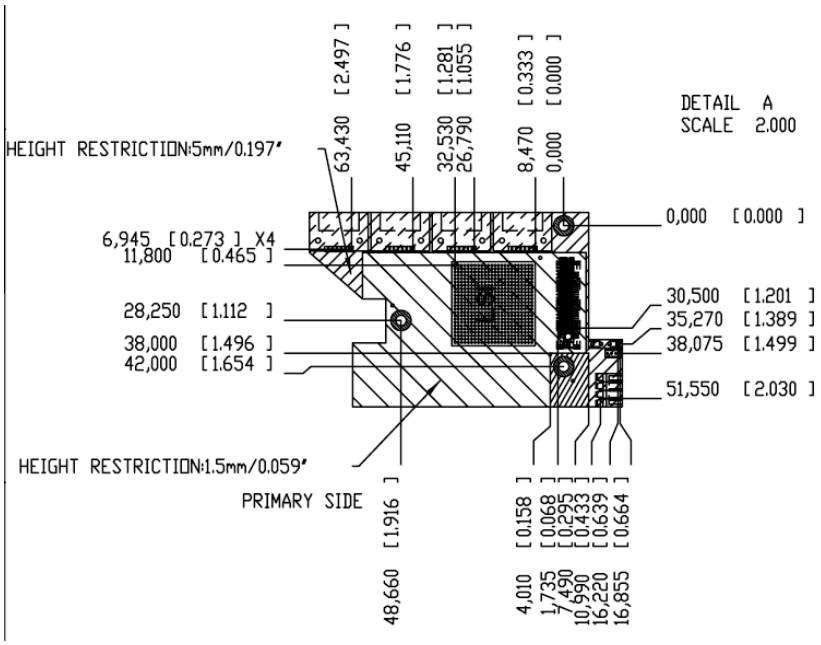



**Figure 18. Primary Side**

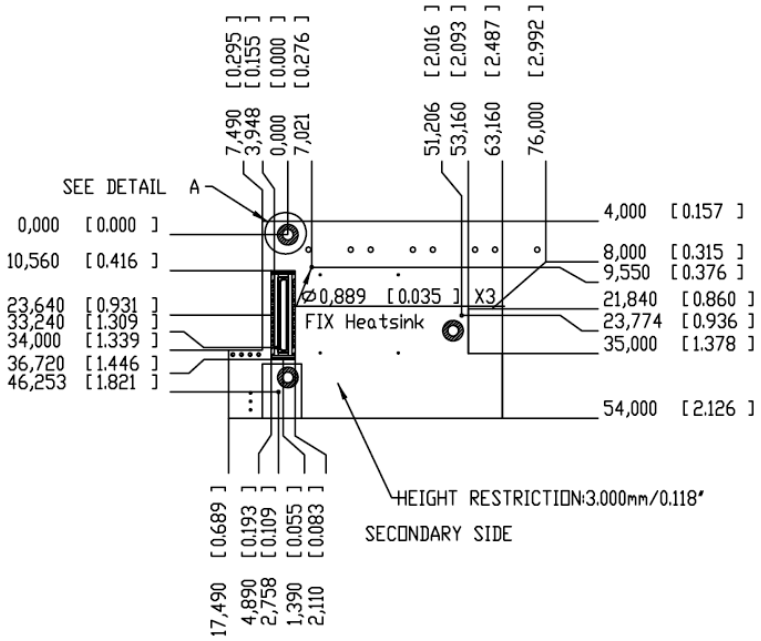
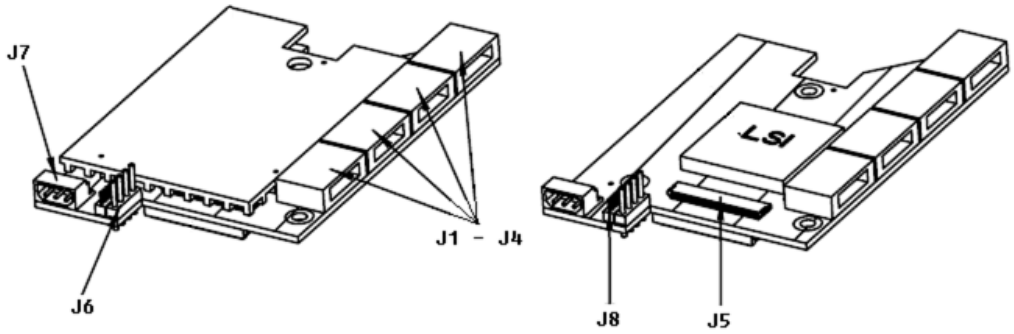



**Figure 19. Secondary Side**

### 6.4.2 Jumpers and Connectors




| Jumper/Connector | Description | Type | Comments |
|---|---|---|---|
| J1-J4 | Internal SAS/SATA Port Connector, Ports 0-3 | N/A | Connection to SAS/SATA devices:<br>▪ J1 = SAS/SATA Port 0<br>▪ J2 = SAS/SATA Port 1<br>▪ J3 = SAS/SATA Port 2<br>▪ J4 = SAS/SATA Port 3 |
| J5 | Board-to-board Connector for Battery Backup Unit | 20-pin connector | Provides an interface to the daughter card that contains the battery backup unit. |
| J6 | Universal Asynchronous Receiver/Transmitter (UART) | 4-pin connector | For factory and debug use |
| J7 | Keyed I2C Connector | 3-pin keyed connector | Out-of-band enclosure management (SES2) |
| J8 | Debug Connector | 4-pin connector | Reserved |

**Figure 20. Jumpers and Connectors**

# 7. Quad Port GbE I/O Module (AXX4GBIOMOD2)

The dual Intel® 82576 Gb NIC I/O module provides four additional 1 Gbit external Ethernet connections.

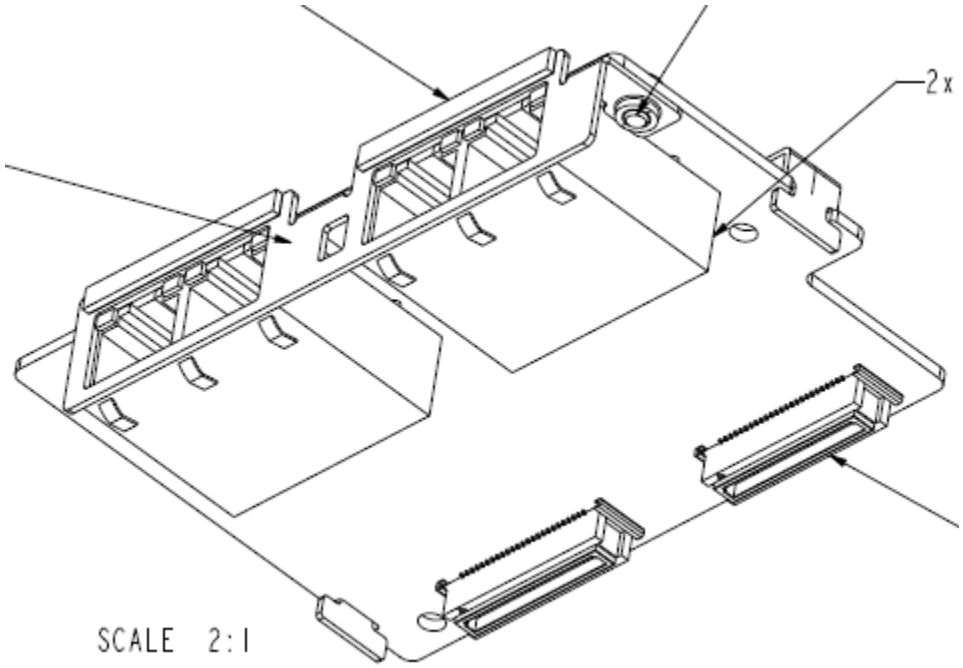



**Figure 21. Quad-Port GbE I/O Module (AXX4GBIOMOD2)**

## 7.1 Feature Set

The quad-port Gb Ethernet I/O module supports the following feature set:

- Intel® 82576 Gb Ethernet Controller
  - Dual Ethernet Interface
  - Support IOAT V3.0
  - Virtualization Ready
  - PCI Express* x4 Gen2 interface

Supports four external 1 Gb Ethernet ports by using two NIC chips.

## 7.2 Functional Block Diagram

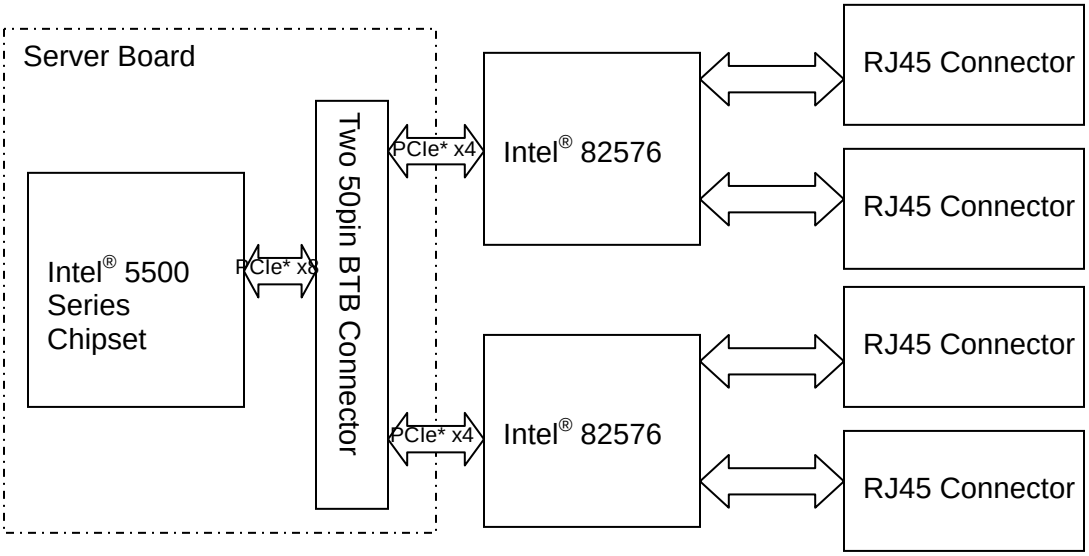



**Figure 22. Quad-port Gigabit Ethernet I/O Module Block Diagram**

## 7.3 Mechanical Drawings

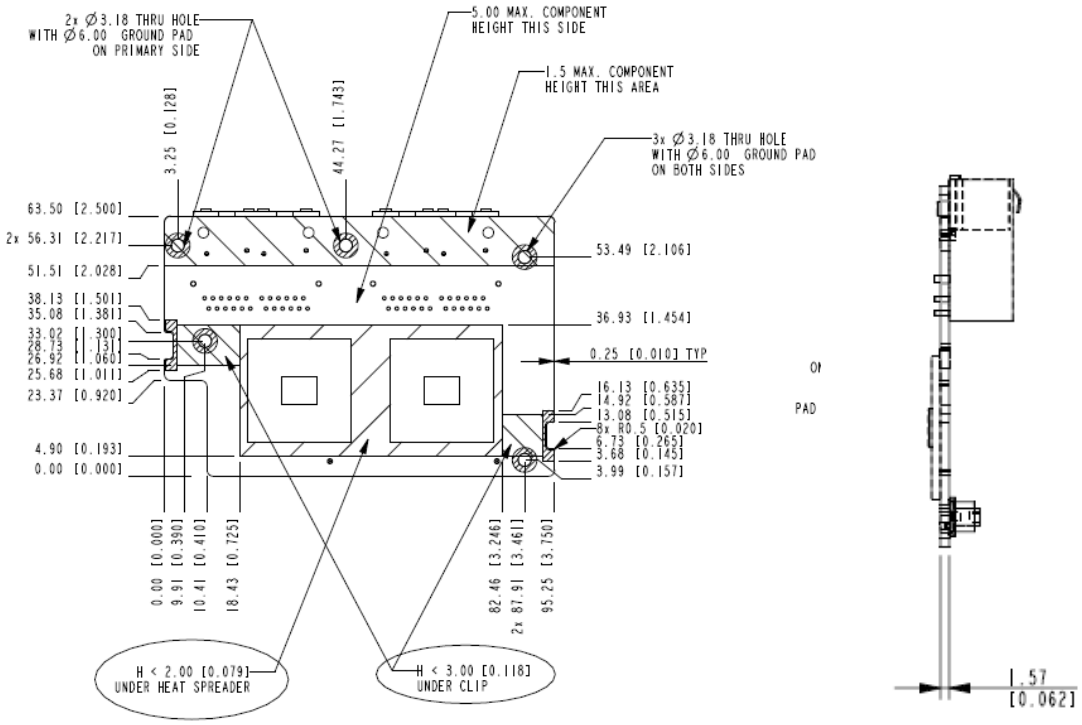



**Figure 23. Quad-Port GbE I/O Module Mechanical Drawing**

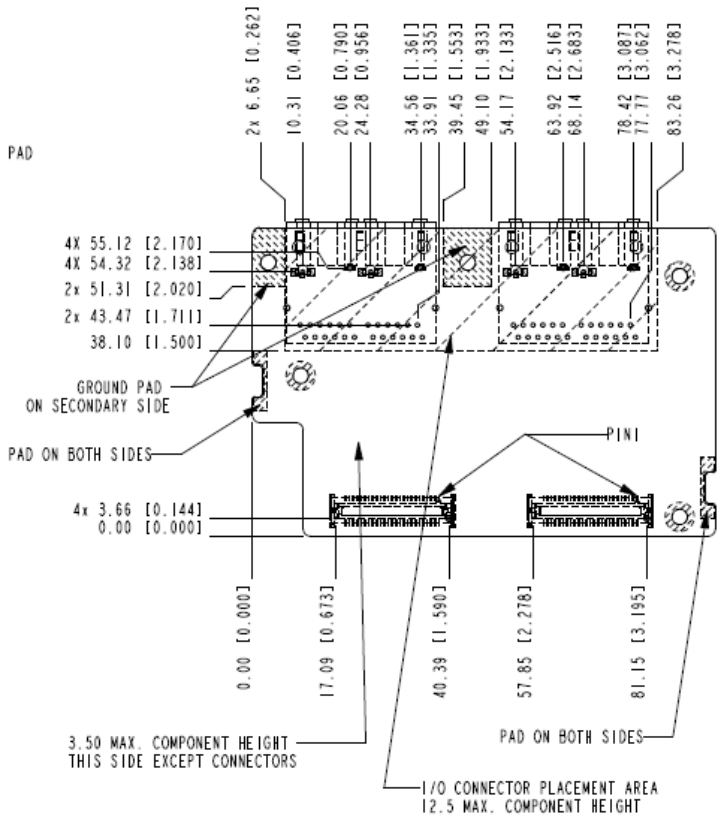



**Figure 24. Quad-Port GbE I/O Module Mechanical Drawing**

## 7.4 Intel® 82576 1 Gb Ethernet Controller

The Intel® 82576 1 Gb Ethernet Controller is a single, compact component with two fully integrated 1 Gb Ethernet Media Access Control (MAC).

The Intel® 82576 supports X4 PCI-Express Gen2 connection, and support I/OAT V3.0 (Input/Output Acceleration Technology). These give the device a high-performance and low-host memory access latency feature. In addition, the wide internal data path eliminates performance bottlenecks by efficiently handling large address and data words. To further optimize the latency from system level, the PCI-Express* x8 interface is directly connected to IOH.

## 7.5 EEPROM

The Quad Port Gb Ethernet I/O module provides a SPI serial EEPROM to store configuration and informational data. This includes pre-boot configuration data, MAC address, and serial numbers for the 82576.

## 7.6 PCI Express* x8 Connector

The I/O module contains two 50-pin connectors to provide X8 PCI Express* Gen2 interface. They mate with I/O module connector available on the Intel® Server Boards S5520UR and S5500WB.

## 7.7 Gbit Ethernet Connector

The Quad Port Gb Ethernet I/O module contains four 1 Gbit Ethernet Magjack connectors.

# 8. Dual Port 10GbE I/O Module (AXX10GBIOMOD)

The dual 10 Gb I/O module provides two 10 Gbit external Ethernet connections. This section provides a high level description of the implementation of this I/O module.

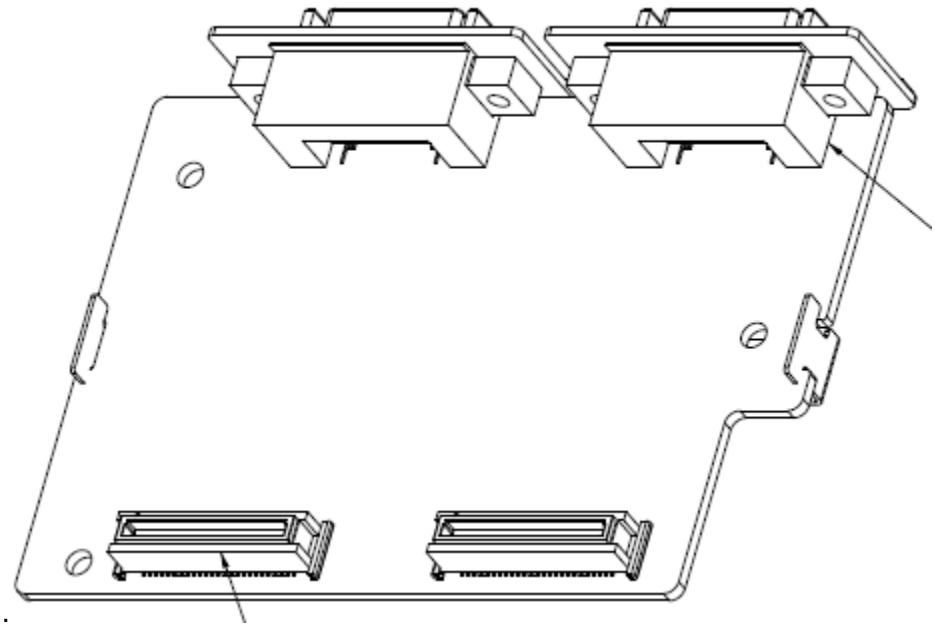


**Figure 25. Dual Port 10GbE I/O Module**

## 8.1 Feature Set

The dual 10 Gb Ethernet I/O module supports the following feature set:

- Intel® 82598EB 10 Gb Ethernet Controller
  - Dual CX4 port
  - Support IOAT V2.0
  - Virtual Queue for Virtualization
  - Can be implemented in small form factor for 10 Gbit Ethernet function
  - PCI Express* x8 Gen2 interface
- Supports two external CX4 10 Gb Ethernet ports
- Support active cable (copper-fiber optic-copper)

## 8.2 Functional Block Diagram

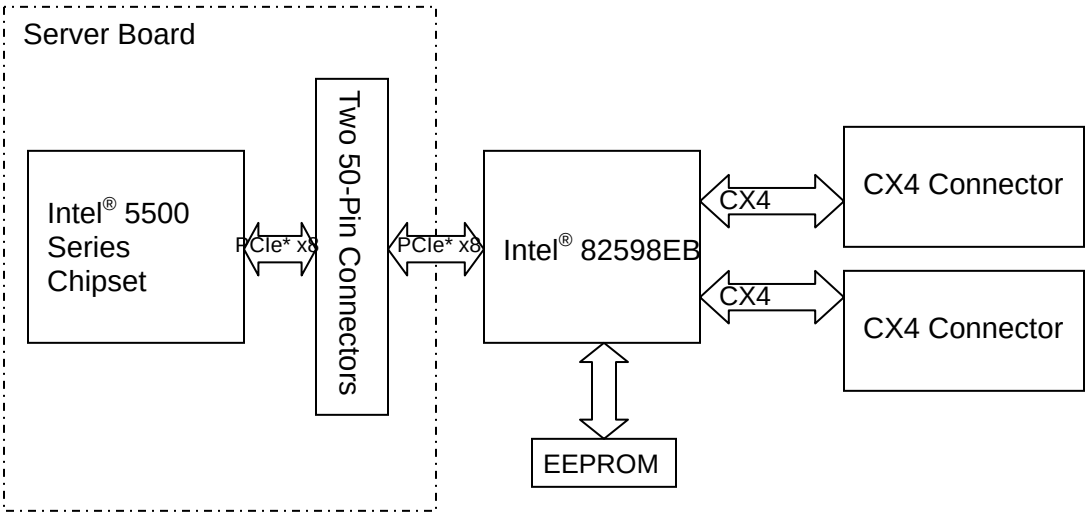



**Figure 26. Dual 10 Gb Ethernet I/O Module Block Diagram**

## 8.3 Mechanical Drawings

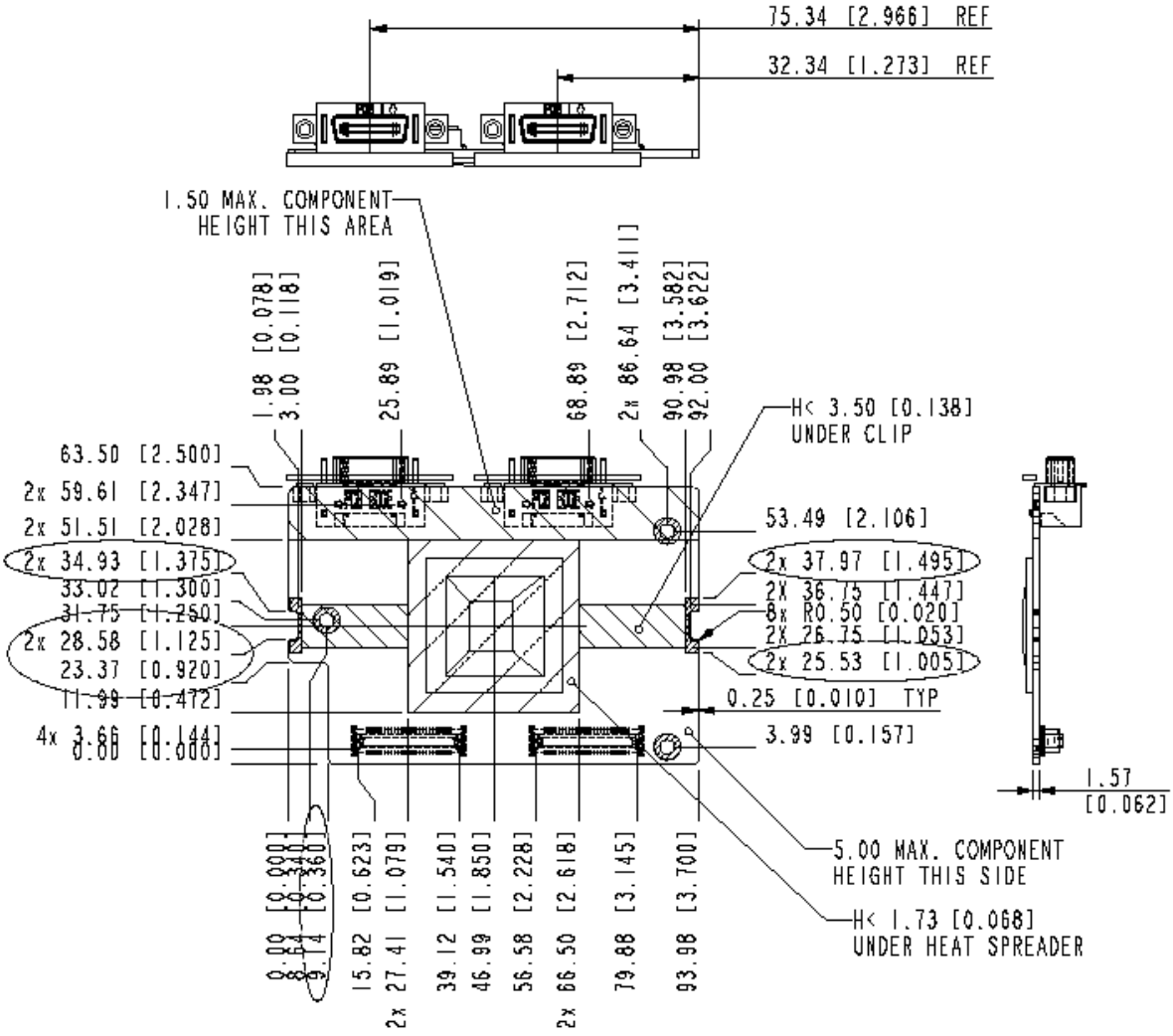



**Figure 27. : Dual 10 Gb Ethernet I/O Module Dimensions: Top and Side Views**

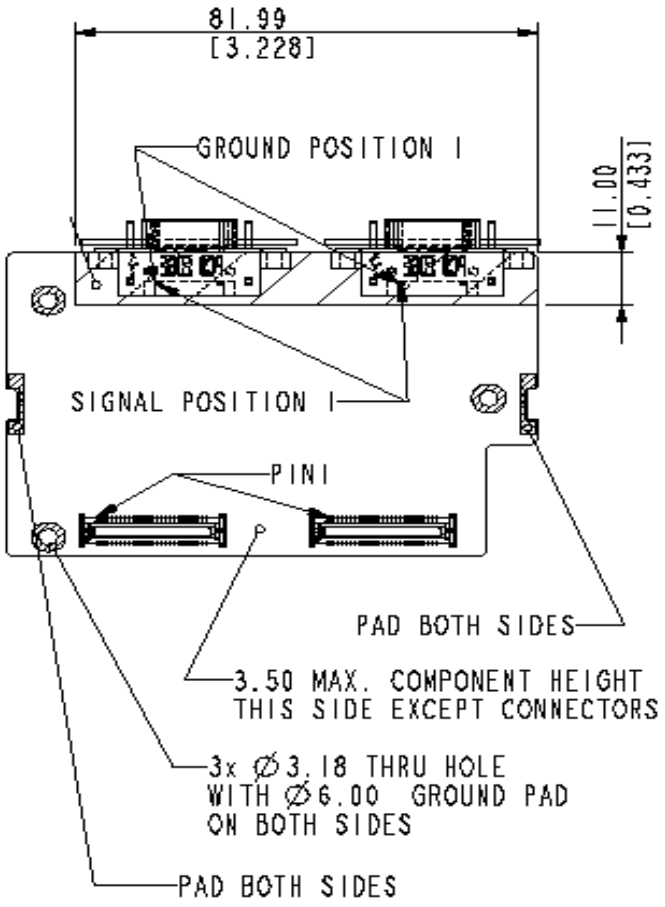



**Figure 28. Dual 10 Gb Ethernet I/O Module Dimensions: Bottom View**

## 8.4 Intel® 82598 10 Gb Ethernet Controller

The Intel® 82598EB 10 Gb Ethernet Controller is a single, compact component with two fully integrated 10 Gb Ethernet Media Access Control (MAC) and XAUI ports.

The Intel® 82598EB is a follow-on design to the prior generations of Intel® 1Gbit, 10 Gbit Ethernet controllers. It provides new features and retains many of its predecessors' features.

The Intel® 82598EB supports X8 PCI-Express Gen2 connection and I/OAT V2.0 (Input/Output Acceleration Technology). These give the device a high-performance and low-host memory access latency feature. In addition, the wide internal data path eliminates performance bottlenecks by efficiently handling large address and data words. The parallel and pipelined logic combined architecture is optimized for Ethernet and independent transmit and receive queues, this means the 82598EB can process the packet with minimum latency. To further optimize the latency from system level, the PCI-Express* x8 interface is connected to IOH directly.

## 8.5 EEPROM

The Dual Gb Ethernet I/O module provides a SPI serial EEPROM to store configuration and informational data. This includes pre-boot configuration data, MAC addresses, SMBus Address, and serial numbers for the 82598EB.

## 8.6 PCI Express* x8 Connector

The Dual 10 Gb Ethernet I/O module contains two 50-pin connectors to provide x8 PCI Express* Gen2 interface. They mate with I/O module connector available on the Intel® Server Boards S5520UR and S5500WB.

## 8.7 CX4 Ethernet Connector

The Dual Gb Ethernet I/O module contains two CX4 10 Gbit Ethernet connectors compatible with 10 Gbit Ethernet CX4 connections. The CX4 port embeds the feature which can support active cable (copper-fiber optic – copper), so it enlarges the distance of the 10 Gbit Ethernet connections from 10 m up to 100 m.

# 9. InfiniBand* (QDR) I/O Expansion Module

Preliminary information for the InfiniBand* I/O Expansion Module, (QDR). Details are subject to change.

## 9.1 Feature List

**Table 6. Infiniband (QDR) Feature List**

| Name | Description |
|---|---|
| HCA InfiniBand Chip | MT25408A0-FCC-QIS |
| HCA Speed | Quad Data Rate (40Gb/s) |
| Number of ports | One QDR Speed 4x InfiniBand port (no Ethernet support) |
| HCA On-Board Memory | None. |
| Connector type | CX-4 |
| Active Cable Support | The InfiniBand port is capable to supporting active copper and optical cable assemblies |
| PCI Bus Support | The HCA supports x8 PCI 2.0 Gen2 |