LSISAS9205-8e
PCI Express to 6Gb/s Serial Attached SCSI (SAS) Host Bus Adapter

User Guide

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User Guide

1 Overview

The LSISAS9205-8e PCI Express® (PCIe®)-to-Serial Attached SCSI (SAS) host bus adapter (HBA) provides high performance storage connectivity to computers, workstations, and servers via the new LSISAS2308 controller chip. The low profile design of the 8-lane HBA includes a low profile mounting bracket that makes it easy to add SAS 2.0 interface devices to *PCI Specification Revision 2.0* hosts. The HBA stores BIOS information and its own Fusion-MPT™ operating firmware in onboard non volatile memory. The associated Fusion-MPT software drivers assure the LSISAS9205-8e is compatible with all major operating systems.

The LSISAS9205-8e provides 8-lanes of 6Gb/s SAS connectivity via two external, 4-lane SFF8088 Multilane connectors. The HBA supports over 1000 SAS addresses and has processing power to support over 500,000 I/Os per second.

2 Features

This section lists the LSI PCIe-to-SAS HBA features.

- Supports serial SCSI protocol (SSP), serial ATA tunneling protocol (STP), and serial management protocol (SMP), as defined, in the *Serial Attached SCSI (SAS) Specification*, version 2.0.
- Supports SATA, as defined in the *Serial ATA Specification Revision 2.6*.
- Provides configurable drive spin-up sequencing on a per-phy basis.
- Simplifies cabling with a point-to-point, serial architecture.
- Provides smaller and thinner cables that promote unrestricted airflow.
- Provides a serial, point-to-point, enterprise-level storage interface.
- Transfers data using SCSI information units.
- Provides compatibility with SATA target devices.
- Supports CRC generation and checking on the PCIe buses and the SAS buses.
- Supports narrow ports and wide ports, as described in the following table.

Table 1 6Gb/s SAS Bandwidths

Half Duplex	Full Duplex
Narrow Port (1 Lane), 600 MB/s	Narrow Port (1 Lane), 1200 MB/s
Wide Port (4 Lanes), 2400 MB/s	Wide Port (4 Lanes), 4800 MB/s

3 PCI Performance

The LSI PCIe-to-SAS HBA supports the following features of the PCIe interface.

- A single-phy (one lane) link transfer rate up to 5Gb/s in each direction.
- Link widths of x8, x4, x2, and x1.
- Automatic downshift. The HBA automatically downshifts to a x4 link if plugged into a x8 connector that is wired as a x4 connector.

- A scalable interface.

Table 2 Aggregate Bandwidth

Lanes	Single Direction	Dual Direction
Single-lane (x1)	5Gb/s	10Gb/s
Quad-lane (x4)	20Gb/s	40Gb/s
Eight-lane (x8)	40Gb/s	80Gb/s

- Serial, point-to-point interconnections between devices.
  - Reduces the electrical load of the connection
  - Enables higher transmission and reception frequencies
- Lane reversal and polarity inversion.
- PCIe hot plug.
- Power management.
  - Supports PCI Power Management 1.2
  - Supports active-state power management (ASPM), including the L0 states, by placing links in a power-saving mode when there is no link activity
- A replay buffer that preserves a copy of the data for retransmission in case a cyclic redundancy check (CRC) error occurs.
- PCIe advanced error-reporting capabilities.
- Packetized and layered architecture.
- High bandwidth per pin with low overhead and low latency.
- Software compatibility with PCI and PCI-X software.
  - Leverages existing PCI device drivers
  - Supports the memory, I/O, and configuration address spaces
  - Supports memory read/write transactions, I/O read/write transactions, and configuration read/write transactions
- Four kilobytes of PCI configuration address space per device.
- Posted transactions and non-posted transactions.
- Quality-of-service (QOS) link configuration and arbitration policies.
- Traffic Class 0 and one virtual channel.
- Message-signaled interrupts (both MSI and MSI-X), and INTx interrupt signaling for legacy PCI support.
- End-to-end CRC (ECRC) and advanced error reporting.

4 Software

The following table shows all of the available software drivers for the different operating systems that the LSI PCIe-to-SAS HBA supports.

Table 3 Operating System (OS) Drivers

OS Support	Versions
Windows®	Server 2003/2008, XP/Vista/Windows 7
Linux®: Red Hat® Enterprise Linux® (RHEL)	4 and 5
Linux: SUSE® Enterprise Server (SLES)	9, 10, and 11
Sun™ SPARC® Solaris™	Solaris 10, Update 8
VMware® (ESXi)	4.1 and 5.0
FreeBSD®	8.1 or 8.2-Release
Utilities	Flash and BIOS Configuration Utility

The LSI HBA uses the Fusion-MPT architecture for all major operating systems, which permits thinner drivers for better performance. To obtain a device driver that supports your operating system, contact the LSI Technical Support team or visit the LSI website.

5 Hardware Installation

This section provides both quick instructions and detailed instructions on how to install your LSI PCIe-to-SAS HBA.

5.1 Quick Installation Instructions

Use the following quick installation instructions to install your LSI PCIe-to-SAS HBA if you are comfortable with the abbreviated installation instructions. The following section provides detailed installation instructions.

1. Unpack the HBA and inspect it for damage.
2. Turn off the system and disconnect any power cords.
3. Remove the cover from the chassis.
4. Insert the HBA into an available and appropriate sized PCIe slot.
5. Secure the bracket to the system's chassis.
6. Connect serial cables between the HBA and any serial hard disk drives (HDDs) or external enclosure. Figure 1 shows the locations of the connectors on your HBA.
7. Replace the cover and any power cords, and power up the system.

The hardware installation of your LSI HBA is complete.

5.2 Detailed Installation Instructions

Detailed installation instructions for the LSI PCIe-to-SAS HBA follow.

1. **Unpack the HBA and inspect it for damage.** Unpack the HBA in a static-free environment. Remove the HBA from the antistatic bag and carefully inspect it for damage. If you notice any damage, or if any component is missing, contact LSI or your reseller support representative.

CAUTION Make a backup of your data before changing your system configuration.

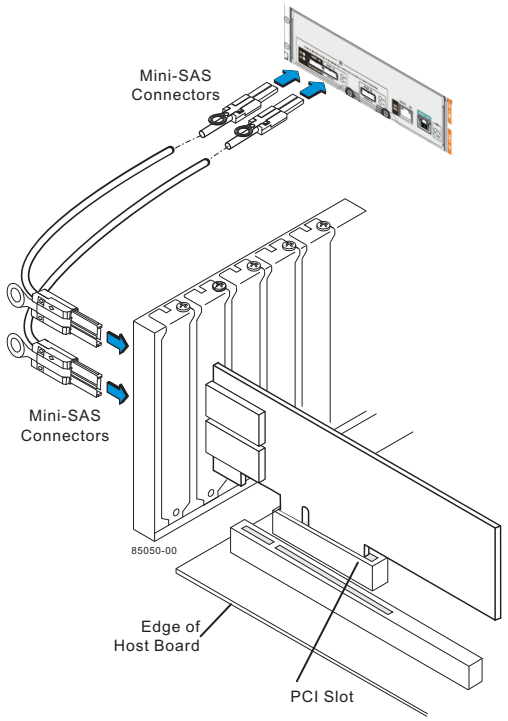
2. **Prepare the computer.** Turn off the computer and disconnect the power cord from the back of the power supply.
3. **Remove the cover from the chassis.**

WARNING Be certain to disconnect the computer from the power supply and from any networks before installing the HBA.

4. **Replace the mounting bracket (system dependent).** If required for your system, replace the full-length mounting bracket that ships on the LSISAS9205-8e HBA with the shorter bracket supplied. Save and reuse the two screws that attach the long bracket to attach the short bracket.
5. **Insert the HBA in an available PCIe slot.** Locate an empty PCIe slot. Remove the blank bracket panel on the back of the computer that aligns with the empty PCIe slot. Save the bracket screw, if applicable.

   Align the HBA to a PCIe slot. Press down gently but firmly to properly seat the HBA in the slot. The following figure shows how to insert the HBA in a PCIe slot.

Figure 1 Installing an LSI PCIe to SAS x8 HBA in a PCI Express Slot



NOTE The shape, size, and locations of components on your HBA and its bracket might vary from this illustration. The LSISAS9205-8e HBA requires a x8 PCIe slot.

6. **Secure the bracket to the system's chassis.** Install the bracket screw, if applicable, or engage the system retention mechanism to secure the HBA to the system's chassis.
7. **Connect serial cables between the HBA and any serial HDDs.** Connect serial cables between the host adapter and any HDDs. Figure 1 shows the locations of the HBA connectors.
8. **Replace the cover and any power cords and power up the system.** Replace the system's cover, reconnect any power cords, and reconnect any network cables. Turn on the power.

The installation of your LSI PCIe-to-SAS HBA is complete.

6 Characteristics of the LSI PCIe-to-SAS HBA

The LSISAS2308 controller brings 6Gb/s SAS performance to HBA, workstation, and server designs, making it easy to add a SAS interface to any PCIe system. Each of the eight SAS phys on the LSISAS2308 controller is capable of up to 6Gb/s SAS or SATA link rates.

6.1 Flash

The LSISAS9205-8e HBA has onboard Flash ROM for firmware and BIOS. The LSI PCIe-to-SAS HBA provides one 8M x 8-bit Flash ROM for storing the BIOS and firmware.

6.2 AVSO

The LSISAS9205-8e supports Adaptive Voltage Scaling and Optimization (AVSO). AVSO dynamically adjusts voltage based on process monitors to reduce a high power value and achieve the required performance at a minimum voltage.

6.3 LED

The LSISAS9205-8e HBA heartbeat LED blinks green to indicate that the HBA is capable of general activity.

6.4 Connectors

This section describes the different connectors on the LSISAS9205-8e HBA. See Figure 2 for connector locations.

PCIe Connector (EC1). The LSISAS9205-8e HBA supports a x8 interface. The PCIe connection is through the edge connector (EC1) which provides connections on both the top (EC1B) and bottom (EC1A) of the board. The signal definitions and pin numbers conform to the PCIe specification.

SAS/SATA Connectors (J5 and J6). The LSISAS9205-8e HBA supports SAS/SATA connections through connectors J5 and J6, which are SFF-8088 mini-SAS, external, right-angle connectors.

ICE JTAG Connector (J1) The LSISAS9205-8e HBA supports an ICE JTAG header for debug through the edge connector, J1.

Table 4 LSISAS9205-8e ICE JTAG Header Pinout

Pin	Function	Pin	Function
1	ICE_TDO	9	ICE_TMS
2	NC	10	NC
3	ICE_TDI	11	HDR_SYS_HALT_L

Table 4 LSISAS9205-8e ICE JTAG Header Pinout

Pin	Function	Pin	Function
4	R_ICE_TRST_L	12	NC
5	NC	13	NC
6	1.8 V	14	NC
7	ICE_TCK	15	NC
8	NC	16	Gnd

UART Connector (J4) The UART connector debug port requires a special cable and LSI support to gather detailed IOC status.

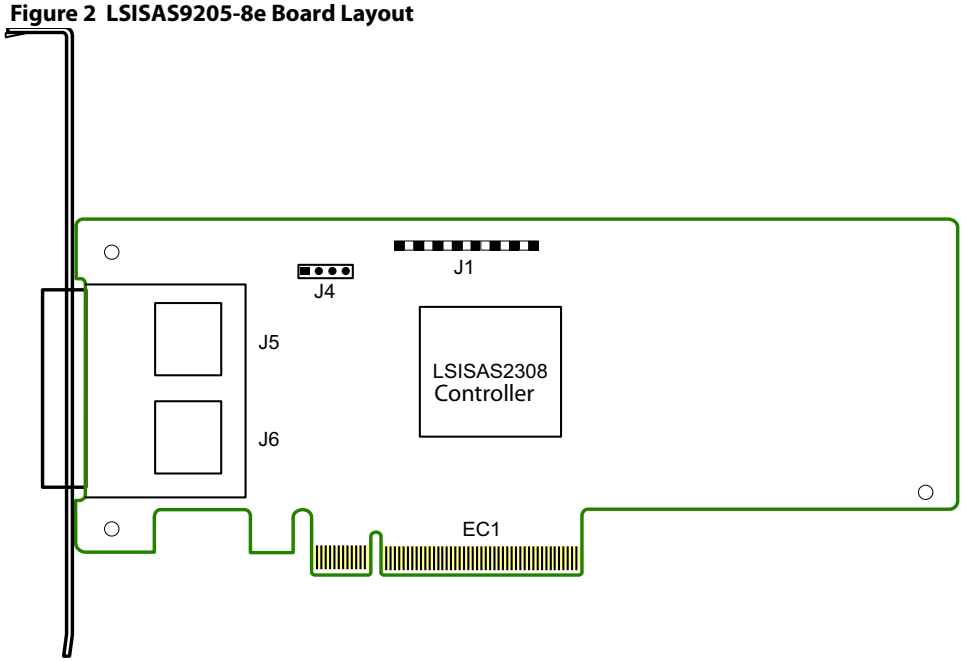
Table 5 LSISAS9205-8e UART Pinout

Pin	Function
1	UART_TX
2	Gnd
3	UART_RX
4	+1.8 V

6.5 Physical Characteristics

The LSISAS9205-8e HBA is a 6.6-in. x 2.713-in., low-profile board. The component height on the top and bottom of the LSISAS9205-8e HBA follows the PCIe specification. The following figure shows the board connectors.

Figure 2 LSISAS9205-8e Board Layout



- EC1: PCIe x8-lane board edge connector
- J1: ICE JTAG debug connection
- J4: UART connection
- J5, J6: SFF-8088 mini-SAS, external, right-angle connectors

7 Electrical and Environmental Specifications

The design and implementation of the LSI PCIe-to-SAS HBA minimizes electromagnetic emissions, susceptibility to radio frequency energy, and the effects of electrostatic discharge. The board carries the CE mark, C-Tick mark, Canadian Compliance Statement, Korean KCC, Taiwan BSMI, Japan VCCI, and FCC Class B, and it is marked with the FCC Self-Certification logo. The board also meets the requirements of CISPR Class B.

7.1 Electrical Characteristics

The maximum power requirements for the LSISAS9205-8e HBA under normal operation are as follows:

- PCIe 12.0 V = 1.26 A
- Power = 15.15 W
- Operation range = 0 °C to 55 °C

7.2 Thermal and Atmospheric Characteristics

The atmospheric characteristics for the LSI PCIe-to-SAS HBA are as follows:

- Temperature range: 0 °C to 55 °C (dry bulb)
- Relative humidity range: 5% to 90% non-condensing
- Maximum dew point temperature: 32 °C

The following parameters define the storage and transit environment for the LSI PCIe-to-SAS HBA:

- Temperature range: -45 °C to +105 °C (dry bulb)
- Relative humidity range: 5% to 90% non-condensing

7.3 Safety Characteristics

All LSI PCIe-to-SAS HBAs meet or exceed the requirements of UL flammability rating 94V-0. Each bare board is marked with the supplier's name or trademark, type, and UL flammability rating. Because these boards are installed in a PCIe bus slot, all voltages are below the SELV 42.4-V limit.


LSI