LSI® SAS 9211-4i PCI Express® to 6Gb/s Serial Attached SCSI (SAS) Host Bus Adapter

User Guide

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For a comprehensive list of changes to this document, see the Revision History.

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Table of Contents

LSI SAS 9211-4i PCI Express to 6Gb/s SAS HBA User Guide

1   Overview

The LSI® SAS 9211-4i PCI Express® (PCIe®)-to-Serial Attached SCSI (SAS) host bus adapter (HBA), hereinafter referred to as the LSI SAS 9211-4i HBA, provides high-performance internal storage connectivity for servers and workstations. The LSI SAS 9211-4i HBA provides four lanes of 6Gb/s SAS connectivity and is matched with four lanes of PCIe 2.0 5Gb/s performance. The low-profile design of the SAS HBA includes a full-height bracket and low-profile mounting bracket that creates a universal fit for any server. The LSI SAS 9211-4i HBA is based on the Fusion-MPT™ -architected LSI SAS 2004 controller that integrates the latest enhancements in PCIe 2.0 technology and 6Gb/s SAS technology.

The LSI SAS 9211-4i HBA has onboard Flash memory for the firmware, and BIOS and NVSRAM for Integrated RAID support (RAID 0, RAID 1, RAID 10, and RAID 1E).

2   HBA Features

This section lists the LSI SAS 9211-4i HBA features.

- Implements one LSI SAS 2004 four-port 6Gb/s to PCIe 2.0 controller
- Supports four-lane, full-duplex PCIe 2.0 performance
- Supports four internal 6Gb/s SATA+SAS ports
- Supports SATA and SAS link rates of 1.5Gb/s, 3.0Gb/s, and 6.0Gb/s
- Provides one x4 internal mini-SAS connector (SFF-8087)
- Supports passive cable
- Supports Integrated RAID (RAID 0, RAID 1, RAID 10, and RAID 1E)
- Supports up to 256 SATA or SAS end devices
- Offers a full-height bracket and low-profile bracket
- Provides activity LEDs
- Provides a universal asynchronous receiver/transmitter (UART) debug/diagnostic port

3   Functional Descriptions

3.1   PCIe

PCIe is a high-speed standard local bus for point-to-point interfacing of I/O components to the processor and the memory subsystems in a high-end personal computer (PC). The LSI SAS 2004 controller chip contains the PCIe functionality for the LSI SAS 9211-4i HBA. The LSI SAS 2004 controller chip connects directly to the PCIe bus and generates timing and protocol in compliance with the PCIe specifications.

The LSI SAS 2004 controller chip JTAG signals are not connected to the corresponding signals in the PCIe connector. The following table shows the LSI SAS 9211-4i HBA 5Gb/s PCIe performance.

Table 1 PCIe Aggregate Bandwidth

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

3.2   SATA and SAS

The LSI SAS 2004 controller chip contains the SATA+SAS functionality for the LSI SAS 9211-4i HBA. The following table shows the LSI SAS 9211-4i HBA 6 Gb/s SAS performance.

Table 2 6Gb/s SAS Bandwidths

Half Duplex	Full Duplex
Narrow port (one lane), 600MB/s	Narrow port (one lane), 1200MB/s
Wide port (four lanes), 2400MB/s	Wide port (four lanes), 4800MB/s

4   Operating System Support

The LSI SAS 9211-4i HBA supports all major operating systems: Windows®, Linux® Red Hat®, Linux SUSE® Enterprise Server (SLES), Solaris™, and VMware®. Refer to http://go.lsi.com/hbas for details on the software versions and device driver support. For Solaris support, contact the LSI Technical Support team.

5   LSI SAS 9211-4i HBA Characteristics

5.1   Flash

The LSI SAS 9211-4i HBA has onboard Flash ROM for the firmware and BIOS. The LSI SAS 9211-4i HBA provides one 4-M x 8-bit Flash ROM for storing the firmware and BIOS.

5.2   Connectors

This section describes the different connectors on the LSI SAS 9211-4i HBA. See Figure 1 for connector locations.

PCIe Connector (J1). The LSI SAS 9211-4i HBA supports a x4 interface. The PCIe connection is through the edge connector, J1, which provides connections on both the top (J1B) and bottom (J1A) of the board. The signal definitions and pin numbers conform to the PCIe specification.

SATA+SAS Connector (J7). The LSI SAS 9211-4i HBA supports SATA and SAS connections through connector J7, an SFF-8087 mini-SAS, internal, right-angle connector.

Activity LED Header (J3). The LSI SAS 9211-4i HBA has a 4-pin, right-angle, 0.1-in. pitch header for driving external activity LEDs. The 4-pin header connects to two LEDs, which indicate SAS activity on Port 0 and Port 1.

Table 3 LSI SAS 9211-4i HBA LED Header Pinout

Pin	Function
1	3.3 V
2	Port 0
3	Port 0
4	3.3 V

UART Connector (J5). The UART connector debug port requires a special cable and LSI support to gather detailed Input/Output Controller (IOC) status.

Table 4 LSI SAS 9211-4i UART Pinout

Pin	Function
1	UART0_TX
2	Gnd
3	UART0_RX
4	3.3 V

5.3   Physical Characteristics

The LSI SAS 9211-4i HBA is a 6.6-in. x 2.713-in., low-profile board. The component height on the top and bottom of the LSI SAS 9211-4i HBA is in accordance with the PCIe specification. The following figure shows the board connectors.

Figure 1 LSI SAS 9211-4i Board Layout

3_00002-03
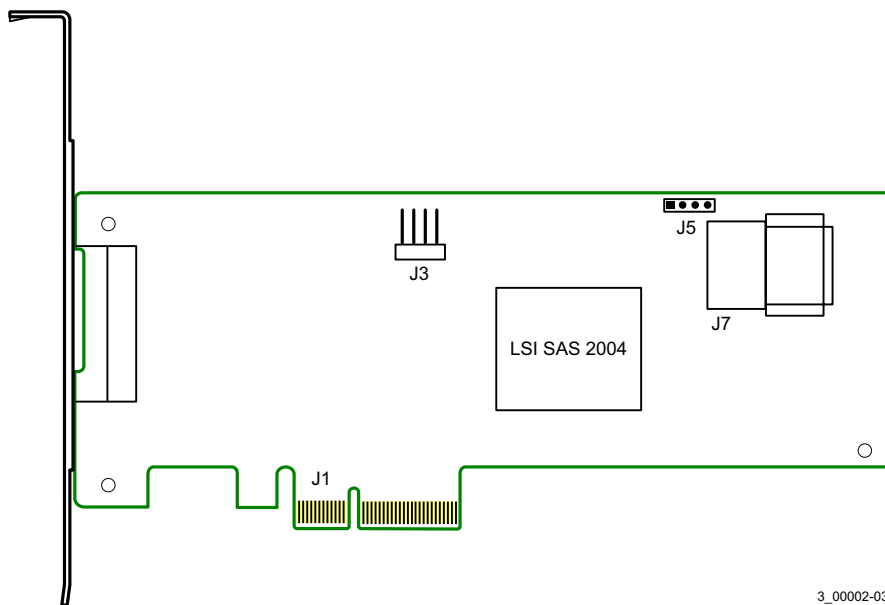
- J1: PCIe x4-lane board edge connector
- J3: 4-pin, right angle, 0.1-in. pitch, pin header for driving the external activity LED

■ J5: UART connection
■ J7: SFF-8087 mini-SAS, internal, right-angle connector

6 Electrical and Environmental Specifications

The design and implementation of the LSI SAS 9211-4i 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.

6.1 Electrical Characteristics

The maximum power requirements for the LSI SAS 9211-4i HBA under normal operation are as follows:

■ PCIe 12.0 V = 0.96 A
■ Power
  — Nominal = 6.24 W
  — Worst case = 11.51 W
■ Operation range = 0 °C to 55 °C (32 °F to 131 °F)

6.2 Thermal and Atmospheric Characteristics

The atmospheric characteristics for the LSI SAS 9211-4i HBA are as follows:

■ Temperature range: 0 °C to 55 °C (32 °F to 131 °F) (dry bulb)
■ Relative humidity range: 5 percent to 90 percent noncondensing
■ Maximum dew point temperature: 32 °C (89.6 °F)

The following parameters define the storage and transit environment for the LSI SAS 9211-4i HBA:

■ Temperature range: −45 °C to +105 °C (−49 °F to +221 °F) (dry bulb)
■ Relative humidity range: 5 percent to 90 percent noncondensing

6.3 Safety Characteristics

All LSI SAS 9211-4i 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.

7 Hardware Installation

This section provides detailed instructions on how to install your LSI SAS 9211-4i HBA.

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.

|	
ATTENTION	Make a backup of your data before changing your system configuration, or you might risk data loss.

2. **Prepare the system.** Turn off the computer, and disconnect the power cord from the rear of the power supply.

3. **Remove the cover from the chassis.**

> **CAUTION**   Disconnect the computer from the power supply and from any networks before you install the HBA, or you risk damaging the system.

4. **Replace the mounting bracket (system dependent).** If required for your system, replace the full-length mounting bracket that ships on the LSI SAS 9211-4i 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 rear of the computer that aligns with the empty PCIe slot. Save the bracket screw, if applicable.

   Align the HBA to the 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 2 Installing an LSI PCIe to SAS x8 HBA in a PCI Express Slot
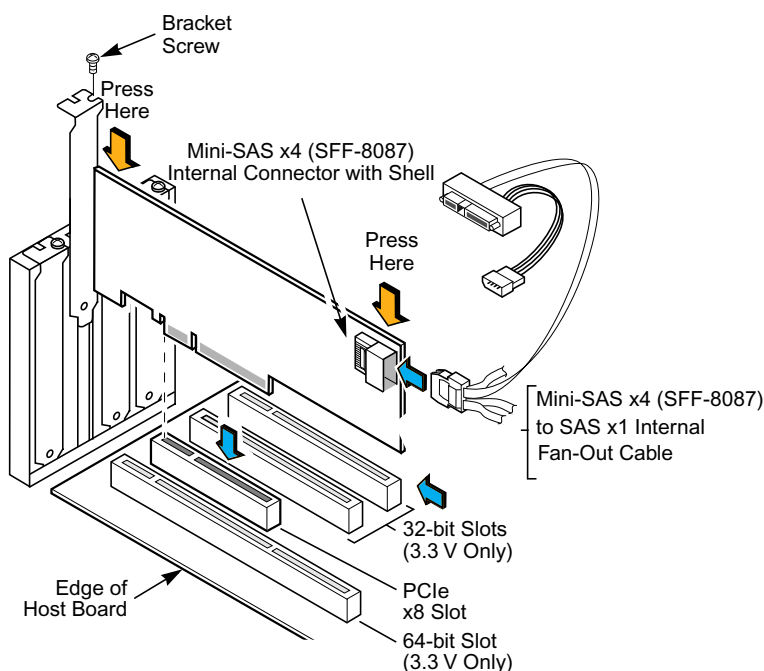
> **NOTE**   The shape, size, and locations of components on your HBA and its bracket might vary from this illustration. The LSI SAS 9211-4i HBA requires a x4 PCIe slot. The LSI SAS 9211-4i HBA can be up-plugged into a x8 slot or a x16 slot.

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.** Figure 1 shows the locations of the HBA connectors.

8. **Replace the cover and any power cords and power up the system.** Replace the chassis's cover, reconnect any power cords, and reconnect any network cables. Turn on the power.

The hardware installation of your LSI SAS 9211-4i HBA is complete.

8 Revision History

8.1 Version 1.1, October 2014

Made the following changes:

- Updated Operating System Support URL.
- Converted the book to the new template.

8.2 Version 1.0, August 2011

Initial release of the document.