

LSI® SAS 9311-4i4e PCI Express® to 12Gb/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](#).

Corporate Headquarters

San Jose, CA

Email

globalsupport.pdl@avagotech.com

Website

www.lsi.com

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1 Overview

The LSI® PCI Express® (PCIe®)-to-Serial Attached SCSI (SAS) host bus adapter (HBA), referred to as the LSI 12Gb/s SAS HBA, provides high-performance external and internal storage connectivity for servers and workstations. The LSI 12Gb/s SAS HBA provides four lanes of 12Gb/s SAS connectivity and is matched with eight lanes of PCIe 3.0 8Gb/s performance. The low-profile design of the SAS HBA includes a full-height bracket and low-profile mounting bracket that create a universal fit for any server. The LSI 12Gb/s SAS HBA is based on the Fusion-MPT™-architected LSI SAS 3004 controller that integrates the latest enhancements in PCIe 3.0 technology and 12Gb/s SAS technology.

The LSI 12Gb/s SAS HBA has onboard Flash memory for the firmware.

2 Features

This section lists the LSI 12Gb/s SAS HBA features.

- Implements one LSI SAS 3008 four-port 12Gb/s SAS to PCIe 3.0 controller
- Supports eight-lane, full-duplex PCIe 3.0 performance
- Supports SATA link rates of 3Gb/s and 6Gb/s
- Supports SAS link rates of 3Gb/s, 6Gb/s, and 12Gb/s
- Provides one x4 internal mini-SAS HD connector (SFF-8643) and one x4 external mini-SAS HD connector (SFF-8644)
- Supports passive copper cable, active copper cable, and optical cable
- Can upgrade to support Integrated RAID (RAID 0, RAID 1, RAID 10, and RAID 1E)
- Supports up to 1024 SATA or SAS end devices
- Offered with a full-height bracket and a low-profile vented bracket
- Provides one heartbeat LED

3 Functional Descriptions

3.1 PCI Express Interface

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 high-end computers and servers. The LSI SAS 3008 controller chip contains the PCIe functionality for the LSI 12Gb/s SAS HBA. The LSI SAS 3008 controller chip connects to the PCIe bus and generates timing and protocol in compliance with the PCIe specifications.

The LSI 12Gb/s SAS HBA supports eight-lane PCIe performance up to 64Gb/s single direction and 128Gb/s dual direction.

3.2 SAS-3 Interface

The LSI SAS 3008 controller chip contains the SATA+SAS functionality for the LSI 12Gb/s SAS HBA. The following table shows the LSI SAS 12Gb/s SAS performance.

Half Duplex	Full Duplex
Narrow port (one lane), 1200 MB/s	Narrow port (one lane), 2400 MB/s
Wide port (four lanes), 4800 MB/s	Wide port (four lanes), 9600 MB/s

3.3 Active Cable Management Support

The HBA optionally supports active cable management. To enable this feature, download and implement the firmware option labeled SAS93xx_xx_IT_ACM, where xx_xx matches your product. You must enable active cable management for applications with active optical cables.

4 Operating System Support

The LSI 12Gb/s SAS HBA supports all major operating systems: Windows®, Linux® Red Hat®, Linux SUSE® Enterprise Server (SLES), and VMware®. The HBA also supports Solaris® 11 Update 2. Refer to <http://go.lsi.com/hbas> for details on the software versions and device driver support. For Solaris support, contact the Avago® Technical Support team.

5 LSI SAS 9311-4i4e HBA Characteristics

5.1 Memory

The LSI 12Gb/s SAS HBA provides one 4-M × 16-bit Flash ROM to store the firmware and the BIOS. The LSI 12Gb/s SAS HBA can provide up to 32 K × 8-bit NVSRAM for storing nonvolatile RAID information when a system failure occurs or to reflash the board to run Integrated RAID (IR) firmware.

5.2 LED

The LSI 12Gb/s SAS HBA Heartbeat LED, CR1, blinks green to indicate the HBA is capable of general activity.

5.3 Connectors

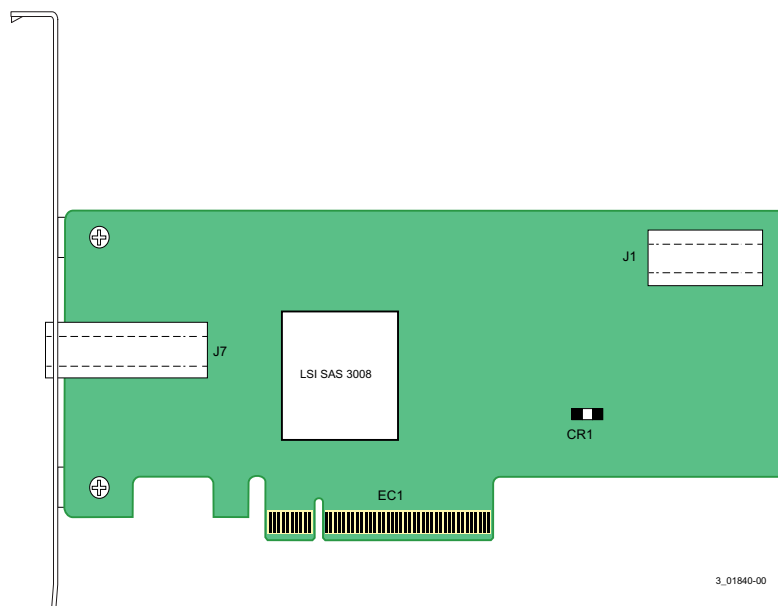
PCIe Connector (EC1). The LSI 12Gb/s SAS HBA supports a x8 interface. The PCIe host interface connection is through the edge connector, EC1, which provides connections on both the top (EC1 B) and bottom (EC1 A) of the board. The signal definitions and pin numbers conform to the PCIe specification.

SATA+SAS Connectors (J1 and J7). The LSI 12Gb/s SAS HBA supports SATA and SAS connectors through connector J1, which is an SFF-8643 mini-SAS HD internal connector, and connector J7, which is an SFF-8644 mini-SAS HD external connector.

5.4 Physical Characteristics

The LSI 12Gb/s SAS HBA is a 6.0-in. × 2.7-in., low-profile board. The component height on the top and bottom of the LSI 12Gb/s SAS HBA is in accordance with the PCIe specification. The following figure shows the HBA board layout.

Figure 1 LSI SAS 9311-4i4e HBA Board Layout



- **EC1** – PCIe x8 board edge connector
- **CR1** – Heartbeat LED
- **J1** – SFF-8643 mini-SAS HD, internal, right-angle connector
- **J7** – SFF-8644 mini-SAS HD, external, right-angle connector

5.5 Electrical Characteristics

The power requirements for the HBA under normal operation are as follows:

- PCIe 12.0 V = 1.97 A
- Power values:
 - Nominal = 14.25 W
 - Worst case = 23.6 W

5.6 Thermal and Atmospheric Limits

The atmospheric limits for the LSI 12Gb/s SAS HBA are as follows:

- Temperature range: 0 °C to 55 °C (32 °F to 131 °F) (dry bulb)
- Relative humidity range: 5% to 90% noncondensing
- Maximum dew point temperature: 32 °C (89.6 °F)
- Minimum airflow: 200 linear feet per minute at 55 °C inlet temperature

The following limits define the storage and transit environment for the LSI 12Gb/s SAS HBA:

- Temperature range: –45 °C to +105 °C (–49 °F to +221 °F) (dry bulb)
- Relative humidity range: 5% to 90% noncondensing

6 LSI 12Gb/s SAS HBA Certifications and Safety Characteristics

All LSI 12Gb/s 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 less than the SELV 42.4-V limit.

The design and implementation of the LSI 12Gb/s SAS HBA minimizes electromagnetic emissions, susceptibility to radio frequency energy, and the effects of electrostatic discharge.

The LSI 12Gb/s SAS HBA meets the following integrated electromagnetic interference (EMI) compliance labels:

- CE mark
- RCM mark
- Canadian Compliance Statement
- FCC Class B, marked with the FCC Self-Certification logo
- UL Listed Mark for Canada/U.S.
- Japan VCCI
- Korean KCC
- Taiwan BSMI

The LSI 12Gb/s SAS HBA meets the following environmental directives:

- Restriction of Hazardous Substances (RoHS)
- Waste of electrical and electronic equipment (WEEE)

7 Hardware Installation Instructions

To install the LSI 12Gb/s SAS HBA, follow these steps:

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 the device for damage. If you notice any damage, contact Avago or your reseller support representative.

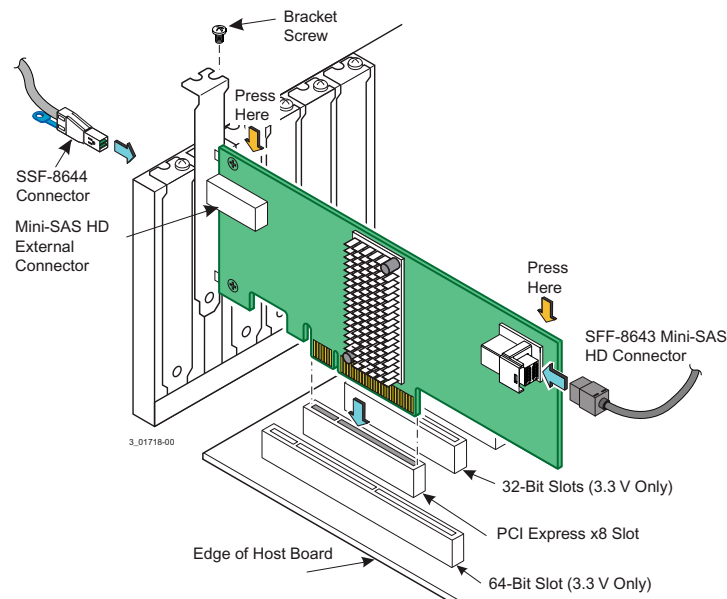
ATTENTION To avoid the risk of data loss, back up your data before changing your system configuration.

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

CAUTION Disconnect the computer from the power supply and from any networks to which you will install the HBA, or you risk damaging the system or experiencing electrical shock.

3. **Remove the cover from the chassis.**
4. **Check the mounting bracket on the HBA (system-dependent).** If required for your system, replace the full-height mounting bracket that ships on the HBA with the low-profile bracket supplied.
5. **Insert the HBA into an available PCIe slot.** Locate an empty x8 PCIe slot. Remove the blank bracket panel on the rear of the computer that aligns with the empty PCIe slot. Save this bracket screw, if applicable. Align the HBA to a PCIe slot. Press down gently, but firmly, to seat the HBA correctly in the slot. The following figure shows how to insert the HBA into a PCIe slot.

Figure 2 Install an LSI 12Gb/s x8 HBA in a PCIe Slot



NOTE

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

6. **Secure the HBA 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 internal SAS cables between the HBA and the SAS backplane, any other SATA or SAS devices in the system chassis, or both.** The LSI 12Gb/s SAS HBA has one SFF-8643, internal x4, mini-SAS HD connector. Use a cable with an internal mini-SAS HD connector on one end (to connect to the HBA) and the appropriate connector to attach to the SAS or SATA devices or the backplane on the other end.
8. **Replace the cover of the chassis.**
9. **Connect SAS cables between the HBA and the SAS enclosure that contains SATA or SAS devices.** The LSI 12Gb/s SAS HBA has one SFF-8644, external x4, mini-SAS HD connector. Use a cable with an external mini-SAS HD connector (SFF-8644) on one end (to connect to the HBA) and the appropriate connector to attach to the enclosure that contains SAS or SATA devices on the other end.
10. **Reconnect any power cords, and power up the system.** Reconnect any power cords and reconnect any network cables. Turn on the power.

The hardware installation of your LSI 12Gb/s SAS HBA is complete.

8 Technical Support

For assistance installing, configuring, or running the LSI 12Gb/s SAS HBA, contact Technical Support:

Email: globalsupport.pdl@avagotech.com

Website: <http://www.lsi.com/support/pages/submit-support-request.aspx>

Revision History

Version 1.3, March 2015

The following document change was made:

- Changed Solaris operating system support.

Version 1.2, September 2014

The following document changes were made:

- Added [Active Cable Management Support](#) section.
- Updated support contact information.
- Template update.

Version 1.1, December 2013

The following document change was made:

- Updated RAID 1E information.

Version 1.0, March 2013

Initial document release.

