BROADCOM®

Product Brief

9600 Series 24G PCIe 4.0 Tri-Mode RAID Adapters and eHBAs

3rd-Generation Tri-Mode x8 and x16 NVMe/ SAS/SATA MegaRAID® Adapters and eHBAs

The High-Performing 16- and 24-Port Family of 9600 RAID and eHBAs Delivers Breakthrough RAID Rebuild Times, Application Storage Performance, and Advanced Data Protection Capabilities.

Applications

- High-port, direct-attached SAS/ SATA/NVMe high-connectivity applications
- Flexible solutions for cloud computing
- Server and external storage applications

Key Features

- 3rd-Generation Tri-Mode Storage Interface
- 22.5, 12, and 6Gb/s SAS and 6Gb/s SATA data transfer rates
- x16 and x8 PCIe Gen 4.0 Host Interface
- Hardware Secure Boot and Attestation
- Universal Backplane Management (UBM) ready (SFF-TA-1005)
- Unified Drivers and Utilities

Performance

- MegaRAID:
  - 6M to 6.4M IOPS (4K RR – JBOD)
  - 4.5M to 6.4M RAID O/1 IOPS (4K RR)
  - 900K to 1.1M RAID 5 IOPS (4K RW)
- eHBAs: 6M to 6.4M IOPS (4K RR)

Overview

The new Broadcom® 9600 family of 24G SAS MegaRAID adapters and HBAs address the performance shift that today's data centers are facing as they transition to higher core count CPUs and SSD-based server storage. The 9600 series Tri-Mode RAID adapters and eHBAs enable high-performing 24G serial-attached SCSI (SAS), PCIe Gen 4.0 storage connectivity, and flexible system designs to support NVMe, SAS, and SATA devices.

The 16- and 24-port 9600 series adapters are powered by the Broadcom 8th generation of Tri-Mode 4000 series I/O Controllers (IOC) and 4100 series RAID-on-Chip (ROC) families, based on the industry-leading Fusion-MPT (Message Passing Technology). MegaRAID and eHBA 9600 series of adapters deliver 2x the bandwidth and up to 2x the IOPS (4K RR); with the MegaRAID adapters also delivering more than 3x the RAID 5 IOPS (4K RW).

Broadcom continues to offer the industry's broadest portfolio of storage solutions, backed by decades of experience and trusted by the world's leading server and storage suppliers. Broadcom provides the building blocks for storage solutions that help customers prioritize, store, protect, and secure critical data.

Tri-Mode SerDes Technology

Broadcom Tri-Mode SerDes technology enables the operation of NVMe, SAS, and SATA storage devices in a single drive bay. A single RAID or eHBA adapter can operate in all three modes concurrently servicing NVMe, SAS, or SATA drives. The adapter can negotiate between speeds and protocols to seamlessly work with any of the three types of storage devices. Tri-Mode support provides a non-disruptive way to evolve existing data infrastructure. By upgrading to a Tri-Mode adapter, users can expand beyond SAS/SATA and use NVMe without major changes to other system configurations. The 9600 series adapters are compatible with SlimSAS 24G SFF-8654 internal or SFF-8674 external connectors. The 9600 adapters are also compatible with existing PCI Express SFF-8639 Module (U.2) backplanes allowing users to boost performance for today's ever increasing bandwidth requirements.

Tri-Mode SerDes Technology (cont.)

The introduction of PCIe devices executing NVMe command sets to the existing SAS/SATA infrastructure makes industry-standard hot-pluggable drive bays even more versatile. The Tri-Mode interface provides SAS data transfer rates of 22.5, 12, and 6Gb/s per lane, SATA at 6Gb/s data transfer rates per lane, or PCIe data transfer rates of up to 16.0 GT/s per lane and is backward compatible to 5.0/2.5 GT/s. The storage controllers automatically negotiate between the speeds and protocols. A T-10 End-to-End Data Protection (EEDP) model for early detection of and recovery from data corruption, and Spread Spectrum Clocking (SSC) for EMI reduction are supported. Additional features include SAS 2.1 power management and DataBolt2 technology, allowing users to take advantage of 24Gb/s speeds while utilizing existing 12 and 6Gb/s drives and backplanes.

As next-generation systems expand the adoption of Tri-Mode SerDes technology through implementation of the SFF-TA-1001 and SFF-TA-1005 standards, the 9600 series adapters allow users to get the most performance and flexibility. The SFF-TA-1001 specification commonly known as U.3 defines a common bay type and connector for SAS (x1, x2), SATA, and NVMe (x1, x2, x4) devices. The creation of the U.3 standard gives unprecedented flexibility to system OEMs and data centers that want to support the latest storage technologies at the lowest cost and system complexity. With a single 9600 series adapter, system implementers can take full advantage of SAS, SATA, and x1, x2, and x4 NVMe drives in U.3-based backplane.

Control and management of multi-protocol (SAS/SATA/NVMe) backplanes has been loosely defined in previous generations of products. Recognizing this, Broadcom worked with key industry members to introduce Universal Backplane Management (UBM) or SFF-TA-1005. UBM builds upon current management frameworks to provide a comprehensive approach to managing SAS, SATA, and NVMe. The 9600 series adapters are UBM ready, and customers can immediately integrate these adapters into their U.3 backplanes utilizing UBM.

Hardware Secure Boot and Device Attestation

The adapter's ROC or IOC controller supports hardware secure boot and device authentication to help protect against malicious activity. Hardware secure boot permits only authenticated firmware to execute on the controller. Broadcom provides the signed firmware images—making the use of hardware secure boot transparent to customers while providing confidence in the security of the solution. Device authentication provides a mechanism for the adapter to prove its unique device identity to another entity in the platform as part of a platform attestation implementation. Unique device identity is proven through a device ID certificate and a challenge protocol. Use of device authentication is optional, but available to those needing extra security for their implementation.

RAID and eHBA Features

Broadcom's 9660/9670 RAID adapter family improves upon the long history of MegaRAID quality, incorporating the best used features and functions into a high-performance PCIe Gen 4.0, SAS4-capable solution, full RAID 0/1/5/6 support, global, dedicated and emergency hot spare support with automatic rebuild and full controller cache data protection with CacheVault technology.

The 9620 eHBA adapters launch a new set of features and functionality for MegaRAID users who value simple RAID 0/1/10 with hot spare support plus additional direct device connectivity to the host.

Broadcom's 9600 eHBA adapters deliver increased connectivity and maximum performance for servers and appliances with internal storage, or connected to large scale storage enclosures.

The entire Broadcom 9600 RAID and eHBA family share the same drivers and tools, including management with LSA GUI Manager and StorCLI2 command line tool, plus a full range of OS drivers.

9600 Series Comparison

Feature	9670W-16i	9670-24i	9660-16i	9620-16i	9600-24i	9600-16i	9600W-16e	9600-16e	9600-8i8e
Adapter Type	MegaRAID	MegaRAID	MegaRAID	eHBA	eHBA	eHBA	eHBA	eHBA	eHBA
Ports	16 internal	24 internal	16 internal	16 internal	24 internal	16 internal	16 external	16 external	8 internal 8 external
Storage Controller	SAS4116W ROC	SAS4124 ROC	SAS4116 ROC	SAS4016 IOC	SAS4024 IOC	SAS4016 IOC	SAS4016W IOC	SAS4016 IOC	SAS4016 IOC
PCIe Host Interface	x16, Gen 4.0	x8, Gen 4.0	x8, Gen 4.0	x8, Gen 4.0	x8, Gen 4.0	x8, Gen 4.0	x16, Gen 4.0	x8, Gen 4.0	x8, Gen 4.0
Storage Interface	Gen 4.0 PCIe (NVMe), 24Gb/s SAS, 6Gb/s SATA								
RAID Levels	0, 1, 10, 5, 50, 6, 60	0, 1, 10, 5, 50, 6, 60	0, 1, 10, 5, 50, 6, 60	0, 1, 10	–	–	–	–	–
Max SAS/ SATA PDs	240	240	240	32	240*	240*	240*	240*	240*
Max NVMe PDs	32	32	32	32	32*	32*	32*	32*	32*
Connectors	2 ×8 SFF-8654	3 x8 SFF-8654	2 ×8 SFF-8654	2 ×8 SFF-8654	3 ×8 SFF-8654	2 ×8 SFF-8654	4 ×4 SFF-8674	4 ×4 SFF-8674	1 ×8 SFF-8654 2 ×4 SFF-8674
Form Factor	FH-MD2	FH-MD2	LP-MD2	LP-MD2	LP-MD2	LP-MD2	LP-MD2	LP-MD2	LP-MD2
Dimensions	9660-8i, 9660-16i, 9600-24i, 9600-16i: 155.52 mm (± 0.13 mm) x 68.77 mm (± 0.13 mm) 9600W-16e, 9600-8i8e: 167.51 mm (± 0.13 mm) x 68.78 mm (± 0.13 mm) 9600-16e: 167.51 mm (± 0.13 mm) x 68.77 mm (± 0.13 mm) 9670W-16i: 167.52 mm (± 0.13 mm) x 111.15 mm (± 0.13 mm) 9670-24i: 167.65 mm (± 0.13 mm) x 111.15 mm (± 0.13 mm)								
Typical Power	28W	28W	20W	17W	20W	17W	20W	17W	17W
Operating Conditions	200 LFM at 55°C	200 LFM at 55°C	250 LFM at 55°C	150 LFM at 55°C	150 LFM at 55°C	150 LFM at 55°C	200 LFM at 55°C	200 LFM at 55°C	200 LFM at 55°C
Energy Backup	CVPM05 (FBU345)	CVPM05 (FBU345)	CVPM05 (FBU345)	–	–	–	–	–	–
Security	HW Secure Boot and Attestation								
Driver	Unified MPI3 Driver								
OS Support	Microsoft Windows, VMware vSphere/ESXi, Red Hat Enterprise Linux, SuSE Linux, Ubuntu Linux, Citrix XenServer, CentOS Linux, Debian Linux, Oracle Enterprise Linux, Fedora, FreeBSD. See www.broadcom.com/support/download-search for details on versions.								

** For a configuration requiring more than 240 SAS/SATA or more than 32 NVMe devices, contact your sales representative.*

Ordering Information	9670W-16i	9670-24i	9660-16i	9620-16i	9600-24i	9600-16i	9600W-16e	9600-16e	9600-8i8e
Single Pack	05-50113-00	05-50123-00	05-50107-00	05-50111-02	05-50111-01	05-50111-00	05-50108-00	05-50118-00	05-50145-00
CVPM05	05-50039-00	05-50039-00	05-50039-00	–	–	–	–	–	–

Product Series Features List

Product Series	Features
9660/9670 RAID Features	• RAID Levels 0, 1, 5, and 6 • RAID spans 10, 50, and 60 • JBOD PD state for SDS environments • Online Capacity Expansion (OCE) • Auto resume after loss of system power during array rebuild or OCE • Single controller multipathing • Load balancing • Fast initialization for quick array setup • Check consistency for background data integrity • SSD support with SSD Guard™ technology • Patrol read for media scanning and repairing • 64 complex virtual drive support • 240 single PD RAID 0 support • DDF compliant Configuration on Disk (COD) • S.M.A.R.T. support • Global and dedicated Hot Spare with Revertible Hot Spare support: – Automatic rebuild – Enclosure affinity – Emergency SATA hot spare for SAS arrays • Enclosure management: – Universal Backplane Management (UBM) – SES (inband) – SGPIO (sideband) – VPP • DataBolt bandwidth optimizer technology support for compatible expander-based enclosures • Shield state drive diagnostic technology • MegaRAID SafeStore Software for SED Key Management
9620 eHBA Features	• RAID Levels 0 and 1 • RAID spans 10 • JBOD PD state for SDS environments • Single controller multipathing • Load balancing • Fast initialization for quick array setup • Check consistency for background data integrity • SSD support with SSD Guard™ technology • Patrol read for media scanning and repairing • 4 virtual drive support • DDF compliant Configuration on Disk (COD) • S.M.A.R.T. support • Global Hot Spare with Revertible Hot Spare support: – Automatic rebuild – Emergency SATA hot spare for SAS arrays • Enclosure management: – Universal Backplane Management (UBM) – SES (inband) – SGPIO (sideband) – VPP • DataBolt bandwidth optimizer technology support for compatible expander-based enclosures • Shield state drive diagnostic technology • MegaRAID SafeStore Software for SED Key Management
9600 eHBA Features	• 240 SAS/SATA device support • 32 NVMe SSD support • Shingled Magnetic Recording (SMR) support* • Multi-Actuator (MA) support* • MegaRAID SafeStore Software for SED Key Management*

* Available in a later firmware release.

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