

# 24G NVMe™ Tri-mode RAID and HBA Storage Adapters





## Smart Storage Performance, Security and Management

As data is being created at a hyper-exponential rate, data storage solution requirements are also rapidly advancing. Adaptec® Smart Storage adapters meet these demanding storage requirements for data center deployments by providing solutions that have been evaluated and deployed by leading data center clients to address the most important challenges of performance and reliability, simplifying and automated bring-up, management, and securing critical assets. With a comprehensive portfolio of storage solutions and design support, we can help you build the data center of today that scales with your requirements well into the future.

Our storage adapters deliver scalable, manageable, and secure storage solutions that support the latest data center and cloud computing growth and technology advancements.

Adaptec has the industry's broadest portfolio of qualified tri-mode adapter products on the market. These products enable data center customers the flexibility to hit a broad range of cost and performance targets with connectivity to 24G SAS, SATA and NVMe™ storage devices—all in a single-drive slot.

The adapter's PCIe® Gen 4 NVMe and 24G SAS media interface supports and delivers the maximum bandwidth and IOPS performance available from increasingly sophisticated Flash-based Solid-State Storage Drives (SSDs) and emerging memory media technologies. Advanced storage scaling capabilities such as Dynamic Channel Multiplexing (DCM) enable customers to build high-density aggregation solutions of lower cost SAS and SATA media without compromising performance.

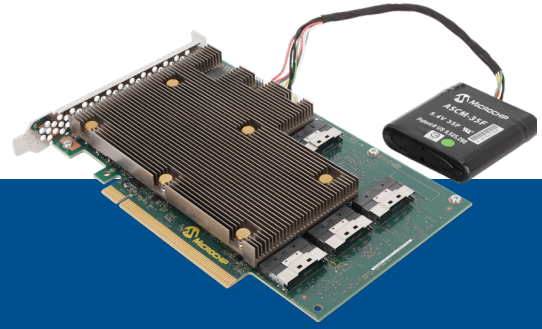
Security is one of the highest priorities for data centers and cloud computing environments as enterprises seek to safeguard the supply chain, deploy storage infrastructure and protect confidential customer data.

Our storage adapters deliver trusted platform support with built-in technologies such as hardware root of trust, and data protection technologies with Controller-Based Encryption (CBE) and Self-Encrypting Drive (SED) management support, for a new level of security.

Industry-standard management tools, certified OS support, proven compatibility, interoperability and expert customer support shortens your development and time to market.

Our storage adapters support the industry's broadest range of applications and deliver reliable adapters that meet your long-term storage strategies. These solutions span the full range of capacity-optimized, software-defined, hybrid storage and all-Flash use cases for applications such as video production, surveillance, virtualization, analytics, high-performance computing and AI. We have the right solution to fit your needs.





## SmartRAID 3200 NVMe/SAS/SATA RAID Adapters

Built on our proven 5th generation storage controller, the SmartROC 3200, our SmartRAID 3200 adapters support both ×8 and ×16 PCIe Gen 4 host interface with 32, 16 and 8 media-facing port variants for both internal and external tri-mode connectivity, enabling superior performance and bandwidth up to 29.6 GB/s throughput and 3.5M+ IOPs 4K Random Reads. Microchip's Trusted Platform support delivers a new level of compute and supply chain security based on a hardware root of trust and our unique maxCrypto™ Controller-Based Encryption (CBE) solution has now been expanded to support SAS, SATA, and now NVMe media. With familiar management tools and industry-standards based management tools, storage management has never been easier.

With unique features such as maxCache SSD caching, adapter power management (ADM) to reduce power consumption, triple mirroring for data migration and Flash-based cache backup that ensures data backup in case of power loss along with the ability to operate in all three modes concurrently, our SmartRAID adapters scale further and are able to evolve with your current data center platform needs now and into the future.

## Advanced Data Protection

Our industry-leading smart storage stack delivers maximum reliability and best-in-class performance at all RAID levels and includes unique features like mixed-mode support (you can use RAID and HBA devices simultaneously), adapter power management to reduce power consumption by up to 30 percent and triple mirroring features that allow data migration from existing RAID arrays to new ones. The SmartRAID 3200 series integrates Flash-based cache backup to enable instant cache protection with an on-board capacitor module (ASCM) on popular board variants. The Adaptec ASCM capacitor module supports a five-year lifetime and is continuously monitored by smart firmware to ensure safe data backup to the on-board Flash in case of power loss.

Product Name	Part Number	RAID Levels	Host Interface	SAS/SATA/NVMe Ports	Cache	Cache Width	Cache Backup (ZMCP)	maxCache™ 4.0	maxCrypto™ Support
SmartRAID Ultra 3258p-32i /e	3258UPC32IXS	0, 1, 5, 6, 10, 50, 60, 1 Triple, 10 Triple	16-lane PCIe® Gen 4	32 internal	8 GB	128-bit	Yes, integrated	Yes, integrated	Yes
SmartRAID Ultra 3258p-16i /e	3258UPC16IXS			16 internal	DDR4/3200 MHz				Yes
SmartRAID Ultra 3254-16e /e	3254UC16EXS			16 external	4 GB				Yes
SmartRAID 3258-16i /e	3258C16IXS		8-lane PCIe Gen 4	16 internal	8 GB	64-bit			Yes
SmartRAID 3254-16i /e	3254C16IXS			16 internal	4 GB				Yes
SmartRAID 3254-16e /e	3254C16EXS			16 external	DDR4/3200 MHz				Yes
SmartRAID 3252-8i /e	3252C8IXS			8 internal	2 GB				Yes
SmartRAID 3254-8i	32548IXS			8 internal	DDR4/3200 MHz				No
SmartRAID 3204-8i	32048IXS			8 internal	4 GB				No
					DDR4/3200 MHz				No



## Performance

*As businesses contend with the perpetual growth of data, infrastructure must adapt to handle new rigorous application workloads with a smaller infrastructure footprint to accelerate how data is captured, preserved and accessed—all while reducing total cost of ownership. Smart Storage adapters deliver the high-speed IO needed for storage design flexibility that enables new applications and capabilities for faster real-time workload processing in the data center.*

The SmartRAID 3200 RAID and HBA 1200 adapters with a x16 host interfaces increase performance by four times over the previous generation product and enables the highest throughput on redundant RAID writes and NVMe Controller-Based Encryption (CBE). These devices support up to 11.7 GB/s throughput on RAID5 redundant writes, which is 45 percent higher than 72-bit products and 17 GB/s throughput on NVMe CBE-enabled devices using maxCrypto™ technology.

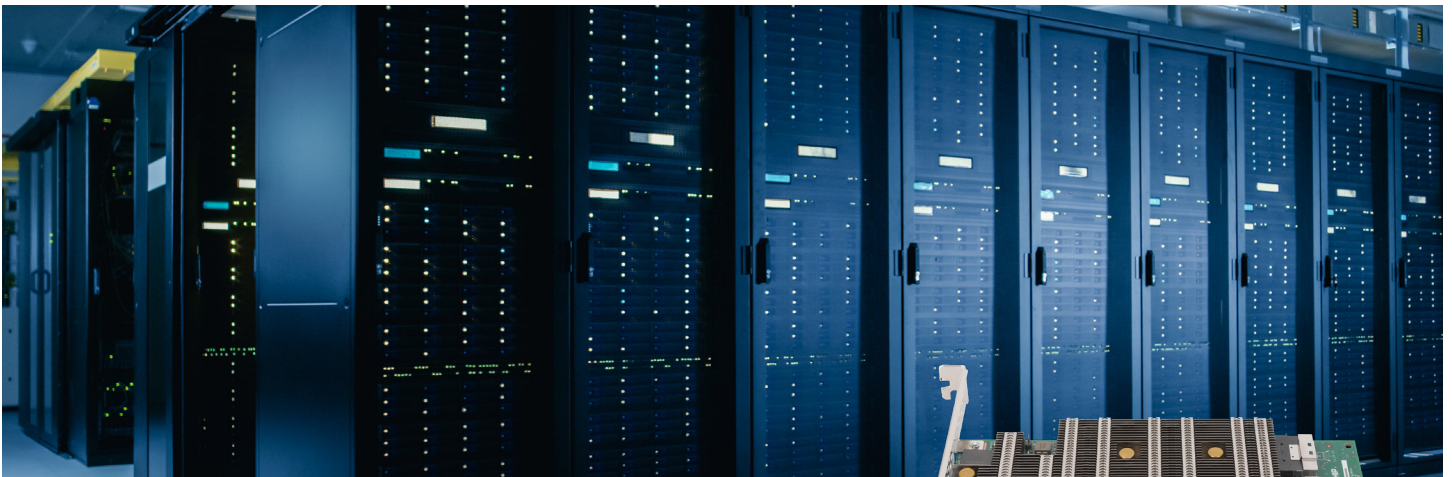
The SmartRAID Ultra 3258p-32i and HBA Ultra 1200p-32i adapters deliver the optimal solution for high bandwidth NVMe and high fanout SAS/SATA use. One 32i adapter can deliver maximum performance for eight x4 NVMe SSDs in a single standard drive cage or maximum fanout for 32 SAS/SATA devices across four standard drive cages, reducing the need for multiple adapters to deliver the same connectivity.

### Dynamic Channel Multiplexing (DCM)

These adapters are the first in the industry to support 24G SAS for both high speed SAS-4 connectivity and DCM technology for aggregating expander-attached SAS or SATA hard drives onto 24G SAS infrastructure with near 100% link efficiency for unparalleled throughput, regardless of block sizes or mix of drive rates and media types. This link aggregation technology enables cloud, data center, server and storage solutions to take full advantage of 24G SAS data rates while utilizing unmodified and existing 6G and 12G media endpoints and infrastructure. DCM reduces component and cabling costs, extends the useful lifetime of existing 6G SAS/SATA and 12G SAS-based infrastructure and lowers ongoing support costs.

### DirectPath Technology

The SmartROC 3200 controller's Direct Path technology delivers the industry's lowest latency, highest bandwidth, and most flexible NVMe solution by including an integrated PCIe switch. The controller supports x1, x2, x4, and x8 bifurcation support for a wide range of NVMe SSDs at different cost and performance points.



## SmartHBA 2200 HBAs

### Tri-Mode NVMe/SAS/SATA HBA with Basic Hardware RAID

Our SmartHBA 2200 NVMe Tri-Mode adapter is the industry's most versatile, scalable, full-featured and secure tri-mode NVMe/SAS/SATA HBA with basic hardware RAID to enable high-performance connectivity solutions for server OEM, storage systems, data center and enterprise customers. The SmartHBA 2200's PCIe Gen 4 host interface and tri-mode media support delivers an HBA that is flexible and high performing, but also optimized for cost.

Built on our proven 5th generation storage controller, the SmartIOC 22200, the SmartHBA 2200-16i supports a x8 PCIe Gen4 host interface and x16 Tri-Mode media connectivity.

Designed specifically for the most demanding NVMe and multi-port SAS SSD applications, the SmartHBA 2200 offers superior performance reaching up to 13 GB/s throughput and 3.5M+ IOPs 4K random reads.

Product Name	Part Number	Form Factor	Host Interface	Tri-Mode Ports
SmartHBA 2200-16i	220016IXS	LP/MD2	8-Lane PCIe® Gen 4	16 internal



## Security

*With the explosion of data being created and consumed in the world today, data centers have become the target of individual-, corporate- and even government-sponsored attacks to compromise, steal and exploit personal, financial, medical, military and other important data. A compromised company's brand, revenue and customer loyalty are at stake. Smart Storage adapters offer multiple security features that help you mitigate and eliminate the risks associated with security vulnerabilities without affecting performance or cost.*

### Trust Platform

We are committed to aligning with industry security requirements, driving security awareness and defining common security requirements for all data centers. Our security features include:

- Hardware-Based Root of Trust (HWRoT), which enables signature validation and embedded public signing keys to support a variety of security use cases during the life cycle of the product, including key revocation, to ensure a safe and secure signing environment
- Multi-staged secure boot process rooted in the hardware to establish and extend the sequential chains of trust starting from the HWRoT through loading firmware from external SPI Flash to the final code execution, preventing any malware from loading
- Secure firmware update eliminates any backdoor methods to upgrade non-authenticated firmware
- Signature verification is performed by the active firmware image to ensure any new firmware image that will be programmed into the nonvolatile memory is correctly signed.

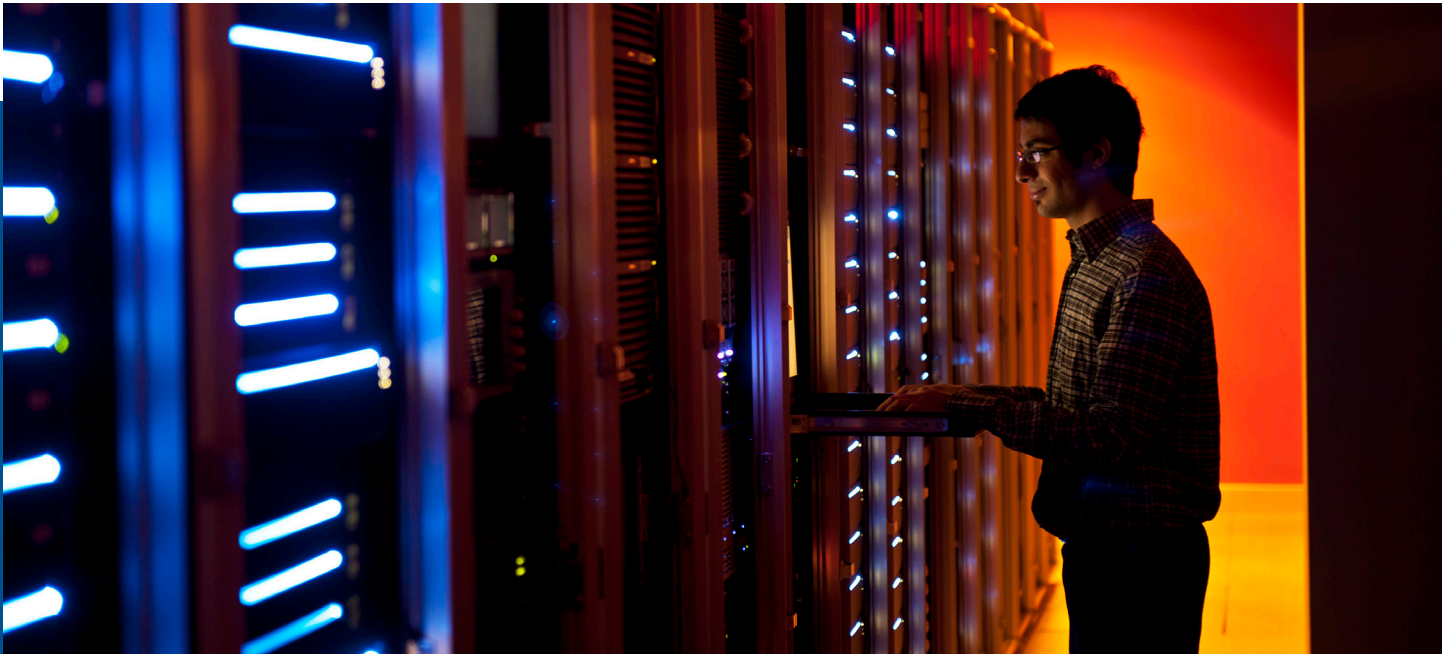
### Controller-Based Encryption (CBE)

Adaptec SmartRAID adapters are the industry's only storage adapters that offer CBE for SAS, SATA and NVMe. Our maxCrypto controller-based encryption technology delivers a secure, high performance encryption solution that is independent of media type or vendor because it is implemented in the adapter. maxCrypto technology ensures that customer-sensitive data is encrypted and protected by secure 256-bit AES and in-line encryption, and as soon as the unique maxCrypto key associated with a specific controller is removed, data is unreadable.

### Self-Encrypting Drives (SEDs)

Adaptec SmartRAID adapters now support self-encrypting drives (SED) that are being increasingly deployed in mission-critical applications.





## HBA 1200

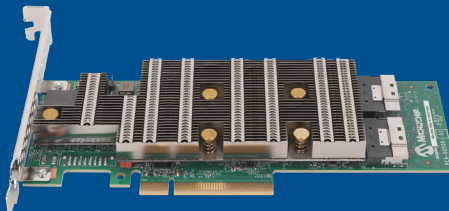
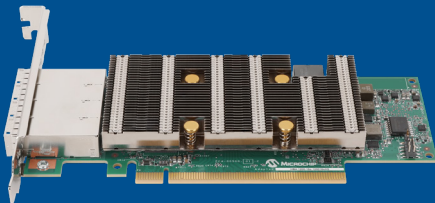
### Tri-Mode NVMe/SAS/SATA HBA

Our HBA 1200 HBAs are the industry's most versatile, scalable, full-featured and secure tri-mode NVMe/SAS/SATA HBA enabling high-performance connectivity solutions for server OEM, storage systems, data center and enterprise customers.

Built on our proven 5th generation storage controller, the SmartIOC 2200 and the HBA 1200 support both  $\times 8$  and  $\times 16$  PCIe Gen4 HBA with variants for 32, 16 and 8 media-facing ports for internal and external tri-mode connectivity.

Designed specifically for the most demanding NVMe and multi-port SAS SSD applications, the HBA 1200 offers superior performance reaching up to 13 GB/s throughput and 3.5M+ IOPs 4K random reads.

Product Name	Part Number	Form Factor	Host Interface	Tri-Mode Ports
HBA Ultra 1200-32i	1200UP32IXS	FH/HL	16-Lane PCIe® Gen 4	32 internal
HBA Ultra 1200-16i	1200UP16IXS	LP/MD2		16 internal
HBA Ultra 1200-16e	1200U16EXS	LP/MD2		16 external
HBA 1200-16i	120016IXS	LP/MD2	8-Lane PCIe Gen 4	16 internal
HBA 1200-16e	120016EXS	LP/MD2		16 external
HBA 1200-8i	12008IXS	LP/MD2		8 internal
HBA 1200-8e	12008EXS	LP/MD2		8 external





## Management

*Storage management just got easier with persistent unified storage management tools, new streamlined industry-standard storage management capabilities such as integrated BMC management, intelligent backplane management and new PLDM/RDE management support for hassle-free integration to get you to market faster.*

We offer multiple management tools to simplify the configuration, management and monitoring of our Smart Storage adapters. These tools allow you to manage our adapters through maxView™, our proprietary web-based GUI, a Command Line Interface (CLI) or uEFI BIOS configuration utility in the pre-boot environment during deployment of an operating system and after deployment. The Smart Storage platform now delivers a standards-based storage management interface which significantly simplifies integration with our support for Platform Level Data Model (PLDM)/Redfish® Device Enablement (RDE).

Adaptec Smart Storage adapter management tools support a wide range of Base Management Controller (BMC) use cases and configurations to reduce data center development and operational costs. The Smart Storage adapters support remote management enabling remote management

capabilities including platform status monitoring and problem notifications, diagnosis and recovery. Out-of-band management enables the adapters to be reached directly over a network connection if the server is powered off or unresponsive and improves security by eliminating the need for proprietary software or host tools on either the server or storage system.

The Smart Storage Platform supports both Intel® Virtual Pin Port (VPP) for intelligent backplane management and SFF's Universal Backplane Management (UBM) standards to simplify integration and enhance product flexibility for system integrators. UBM enables auto-detection of the media type and interface bifurcation. SGPIO and SCSI Enclosure Services (SES) allow a common way to manage device status and activity for directly connected storage devices or for devices connected behind a SAS expander.





### Adaptec SmartRAID 3200/SmartHBA 2200/HBA 1200 Tri-Mode SAS/SATA/NVMe™ Cable Guide

Adaptec SmartRAID 3200, SmartHBA 2200 and HBA 1200 tri-mode adapters are configured and tested for maximum performance and connectivity through use of our tri-mode, NVMe and SAS/SATA cables.

### Internal Cables

Compatible Products	Use	Connectivity Type	Cable	To Adapter	To End-Point	Orderable Part #
<b>SmartRAID 3200 RAID Adapters</b>	Backplane	Tri-mode	ACK-I-SlimSASx8-SlimSASx8-0.8M	1 x8 SFF-8654	1 x8 SFF-8654	2305000-R
			ACK-I-SlimSASx8-2SlimSASx4-0.8M	1 x8 SFF-8654	2 x4 SFF-8654	2305900-R
		NVMe™	ACK-I-SlimSASx8-2Oculinkx4-0.8M	1 x8 SFF-8654	2 x4 SFF-8612	2304800-R
			ACK-I-SlimSASx8-2MiniSAS-HDx4-SMC-0.8M	1 x8 SFF-8654	2 x4 SFF-8643	2305100-R
		SAS/SATA	ACK-I-SlimSASx8-2MiniSAS-HDx4-0.8M	1 x8 SFF-8654	2 x4 SFF-8643	2304900-R
<b>SmartHBA 2200 Host Bus Adapter</b>	Direct Attached	Tri-mode	ACK-I-SlimSASx8-2SFF-8639x4-U.3-0.8M	1 x8 SFF-8654	2 x4 SFF-8639 U.3	2305200-R
			ACK-I-SlimSASx8-4SFF-8639x2-U.3-0.8M	1 x8 SFF-8654	4 x2 SFF-8639 U.3	2305300-R
			ACK-I-SlimSASx8-8SFF-8639x1-U.3-0.8M	1 x8 SFF-8654	8 x1 SFF-8639 U.3	2305400-R
<b>HBA 1200 Host Bus Adapters</b>		NVMe	ACK-I-SlimSASx8-2SFF-8639x4-U.2-0.8M	1 x8 SFF-8654	2 x4 SFF-8639 U.2	2305500-R
			ACK-I-SlimSASx8-4SFF-8639x2-U.2-0.8M	1 x8 SFF-8654	4 x2 SFF-8639 U.2	2305600-R
			ACK-I-SlimSASx8-8SFF-8639x1-U.2-0.8M	1 x8 SFF-8654	8 x1 SFF-8639 U.2	2305700-R
			SATA	ACK-I-SlimSASx8-8SATAx1-0.8M	1 x8 SFF-8654	8 x1 SFF-8482

### External Cables

Compatible Products	Use	Connectivity Type	Cable	To Adapter	To End-Point	Orderable Part #
<b>SmartRAID 3200 RAID Adapters</b> <b>HBA 1200 Host Bus Adapters</b>	JBOD	SAS/SATA	ACK-E-MiniSAS-HDx4-MiniSAS-HDx4-SAS-2M	1 x4 SFF-8643	1 x4 SFF-8644	2306000-R



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