KIOXIA

Frequently Asked Questions

Questions You Need to Ask About 24G SAS and PM7 Series SSDs

What is 24G SAS?

24G SAS (SAS-4) is the next SAS interface being promoted by the SCSI Trade Association. It effectively doubles the bandwidth from the 12 gigabits per second (Gb/s) line rate and has been improved with new capabilities such as 128b/150b encoding, 20-bit Forward Error Correction (FEC), optimal operation in high-speed and noisy environments, improved write stream management, and backwards compatibility with SAS-3, SAS-2 and 6 Gb/s SATA devices.

What does 24G SAS bring to enterprise SSDs?

Performance is the overwhelming benefit that 24G SAS delivers to enterprise SSDs. Each 24G SAS lane supports a line rate of 22.5 Gb/s, effectively doubling the bandwidth from 12 Gb/s. When compared to 6 Gb/s SATA, 24G SAS delivers about four times the bandwidth and is about eight times the bandwidth when running in full-duplex mode. As data traffic increases, particularly data-intensive and computational workloads, 24G SAS performance can meet these requirements.

To meet the requirements of the 22.5 Gb/s line rate, 24G SAS incorporates a new 128b/150b encoding method that improves link efficiency and enables 24G SAS to achieve the same level of data fidelity as 12 Gb/s even though it is transferring data at twice the rate. The new encoding process also includes 20-bit FEC that enables errors to be corrected on-the-fly, without requiring a retransmission, so that optimal throughput can be maintained under less than ideal operating conditions. Additionally, a new adaptive PHY training algorithm (APTA) enables 24G SAS to operate in extremely dynamic environments with noisy signal lines, severe temperature ranges or volatile operating voltage changes.

In 24G SAS, additional storage intelligence enables applications to manage write streams for better control over background housekeeping tasks and to help reduce garbage collection interruptions and write amplification that can improve performance and help extend SSD life.

Is SAS still viable in today's data centers?

SAS is geared toward applications that place a premium on performance, high availability and data protection. It is one of the main storage interfaces between computing and storage subsystems in data centers worldwide. The SAS infrastructure enables added value as SATA drives (SSDs and/or HDDs) can connect to SAS backplanes, host bus adapters (HBAs) or RAID controllers in servers and storage systems. Since most of today's servers are equipped with a SAS infrastructure, SAS and SATA drives can be used in the same drive bay, or as future storage requirements change, SATA drives can be easily replaced with SAS SSDs without any changes required to the server or infrastructure. As such, the customer's initial SATA infrastructure investment is extended.

The SAS interface is also well-positioned for large data center topologies where thousands of drives are required in support of a range of applications as it can support up to 65,535 devices through expanders. To protect the customer's SAS investment, 24G SAS is backwards-compatible with earlier SAS generations (12 Gb/s and 6 Gb/s) as well as 6 Gb/s SATA.

What are the key use cases for 24G SAS?

24G SAS SSD Target Use Cases	
Read-intensive Use Cases	**Mixed Use Cases**
Large Data Center Topologies	*Virtualized Environments*
Media Streaming / Video on Demand	*Online Transaction Processing / e-Commerce*
Data Warehousing	*High Performance Computing*
Content Delivery Networks	*Databases*
	Software-Defined Storage
	Data Analytics

Does KIOXIA offer 24G SAS SSDs?

KIOXIA introduced its 2nd generation of 24G SAS SSDs with the PM7 Series. These 24G SAS SSDs leverage 112-layer BiCS FLASH™ 3D flash memory technology while delivering 2.5-inch[1] SAS SSD capacities that range from 1.6 terabytes[2] (TB) to at 30.72 TB[2]. The series also supports endurance options, security options and single- or dual-port capabilities to meet the most demanding enterprise application and workload requirements of tier 1 server and storage OEMs. The PM7 Series represents KIOXIA's 7th SAS SSD generation that builds on the company's successes as a leading SAS SSD vendor.

KIOXIA PM7-R Series SSDs: *for read-intensive applications*
Models range from 1.92 TB[2] to 30.72 TB[2] capacities
at 1 Drive Write Per Day[3] (DWPD)

KIOXIA PM7-V Series SSDs: *for mixed-use applications*
Models range from 1.6 TB[2] to 12.8 TB[2] capacities at 3 DWPD[3]

How does PM7 Series performance compare to leading 12 Gb/s SAS SSDs?

KIOXIA compared[4] its PM7 Series SSDs (22.5 Gb/s line rate) to 12 Gb/s SAS SSDs with the focus on read-intensive models as they are the most popular and represent the widest range of supported capacities. Only the read-intensive performance advantages are presented, however, the performance improvements are comparable in mixed use environments.

The performance comparisons include PM7-R Series 24G SAS SSDs versus the latest and currently shipping 12 Gb/s SAS SSDs (from a leading vendor), with supported capacities from 1.92 TB[2] to 30.72 TB[2] (at 1 DWPD[3] endurances):

PM7-R Series Performance Advantages vs. Leading 12 Gb/s SAS SSDs

PM7-R Series (24G SAS) SSDs

SPECIFICATION	Units	1.92 TB	3.84 TB	7.68 TB	15.36 TB	30.72 TB
Sequential Read *(128 KB; QD=32; 18W)*	MB/s	4,200	4,200	4,200	4,200	4,150
Sequential Write *(128 KB; QD=32; 18W)*	MB/s	3,400	3,650	4,100	4,100	3,200
Random Read *(4 KB; QD=256; 18W)*	KIOPS	720	720	720	720	720
Random Write *(4 KB; QD=32; 18W)*	KIOPS	155	155	175	160	80
Random Read Latency *(QD=1; 18W)*	µs	80	80	80	80	155
Random Write Latency *(QD=1; 18W)*	µs	15	15	15	15	60

12 Gb/s SAS SSDs

SPECIFICATION	Units	1.92 TB	3.84 TB	7.68 TB	15.36 TB	30.72 TB
Sequential Read *(128 KB; QD=64; 13.5W)*	MB/s	2,100	2,100	2,100	2,100	2,100
Sequential Write *(128 KB; QD=64; 13.5W)*	MB/s	1,800	2,000	2,000	1,800	1,700
Random Read *(4 KB; QD=64; 13.5W)*	KIOPS	440	450	400	400	400
Random Write *(4 KB; QD=64; 13.5W)*	KIOPS	46	58	70	60	50
Random Read Latency *(QD=1; 13.5W)*	µs	120	120	130	130	130
Random Write Latency *(QD=1; 13.5W)*	µs	45	45	45	45	45

Up to 100% faster sequential read performance

Up to 80% faster random read performance

Up to 38% faster random read latency

Up to 127% faster sequential write performance

Up to 236% faster random write performance

Up to 66% faster random write latency

What features does the PM7 Series offer to advance reliability, high availability and data protection?

The PM7 Series continues to support both dual-port and single-port capabilities. Dual-port functionality enables high availability so if one of the PM7 Series SSD ports fail, or the data path becomes compromised, the other port continues operating as if no failure had occurred. The addition of 20-bit FEC enables errors to be corrected on-the-fly, and a powerful high reliability feature. From a data security perspective, PM7 Series SSDs support Sanitize Instant Erase[5] (SIE), Self-Encrypting Drive[6] (SED) and SED FIPS 140-2[7] options.

PM7 Series SSDs are specified with an industry-high mean-time to failure (MTTF) of 2.5 million hours and an uncorrectable bit-error rate (UBER) of 1e-17. PM7 Series SSDs are backed by KIOXIA's reputation for reliability and a 5-year warranty.

When will KIOXIA PM7 Series 24G SAS SSDs become available in the market?

Market availability for KIOXIA's PM7 Series of 24G SAS SSDs is expected in servers and storage systems from leading OEMs in the second half of 2022.

Notes:

[1] 2.5-inch indicates the form factor of the SSD and not its physical size.

[2] Definition of capacity - KIOXIA Corporation defines a megabyte (MB) as 1,000,000 bytes, a gigabyte (GB) as 1,000,000,000 bytes and a terabyte (TB) as 1,000,000,000,000 bytes. A computer operating system, however, reports storage capacity using powers of 2 for the definition of 1Gbit = 2^{30} bits = 1,073,741,824 bits, 1GB = 2^{30} bytes = 1,073,741,824 bytes and 1TB = 2^{40} bytes = 1,099,511,627,776 bytes and therefore shows less storage capacity. Available storage capacity (including examples of various media files) will vary based on file size, formatting, settings, software and operating system, and/or pre-installed software applications, or media content. Actual formatted capacity may vary.

[3] Drive Write(s) per Day (DWPD): One full drive write per day means the drive can be written and re-written to full capacity once a day, every day, for the specified lifetime. Actual results may vary due to system configuration, usage, and other factors.

[4] Based on publicly available and published performance specifications as of this publication date covering all KIOXIA PM7 Series capacities and all capacities from a leading 12 Gb/s SAS SSD series. The full results appear in the PM7 Series Performance Brief.

[5] The Sanitize Instant Erase (SIE) option supports Crypto Erase, which is a standardized feature defined by the technical committees (T10) of INCITS (InterNational Committee of Information Technology Standards).

[6] Self Encrypting Drive (SED) supports TCG-Enterprise SSCs. For more details, please make inquiries through "Contact us" in each region's website, https://business.kioxia.com/

[7] FIPS 140-2 (Level 2) defines security requirements for cryptographic module by NIST (National Institute of Standards and Technology). For the latest validation status of each model, please contact us in each region's website, https://business.kioxia.com/