



## Performance Brief

### New 2nd Generation PM7 Series Represents KIOXIA's Fastest 24G SAS SSDs

KIOXIA released its new PM7 Series of 24G SAS SSDs featuring a range of performance capabilities, capacities, endurance options, security options, and dual-port functionality to meet most any enterprise application requirement. The series supports 2.5-inch<sup>1</sup> drive capacities from 1.6 terabytes<sup>2</sup> (TB) to 30.72 TB<sup>2</sup>. SSDs based on the Serial-Attached SCSI (SAS) interface are used for business-critical applications that place a premium on performance, high availability and data protection. The interface is supported by an [industry consortium](#) and a defined technology roadmap that 'effectively' doubles bandwidth for each new SAS generation. The current generation is 24G SAS (SAS-4) and includes key improvements over the 12 gigabits per second (Gb/s) generation (SAS-3):

Performance Improvements	Reliability Improvements	Flexible and Adaptable
Doubles the effective bandwidth: 12 Gb/s SAS vs 24G SAS	128b/150b encoding 20-bit Forward Error Correction Adaptive PHY Training Algorithm (APTA)	Fairness enhancements SMP priorities Storage intelligence Backwards-compatible

With a faster SAS interface, 24G SAS SSDs are able to achieve significant throughput, Input/Output Operations Per Second (IOPS) and latency advantages over 12 Gb/s SAS SSDs, and is the focus of this performance brief. KIOXIA compared<sup>3</sup> its new PM7 Series 24G SAS SSDs (22.5 Gb/s line rate) to a leading and currently shipping 12 Gb/s SAS SSD series in a read-intensive environment, at 1 Drive Write Per Day<sup>4</sup> (DWPD), as this enterprise SAS configuration is popular and showcases a wide range of supported capacities. Performance and latency comparisons, and a summary of PM7 Series 24G SAS SSD performance and latency gains is also presented.

### Read-Intensive Performance Comparisons

The following performance comparisons include KIOXIA PM7 Series 24G SAS SSDs for read-intensive applications (PM7-R Series) versus the latest and currently shipping 12 Gb/s SAS SSDs from a leading vendor, with capacities ranging from 1.92 TB<sup>2</sup> to 30.72 TB<sup>2</sup> (at 1 DWPD<sup>4</sup>):

#### 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

## PM7-R Series Advantages

SPECIFICATION	1.92 TB	3.84 TB	7.68 TB	15.36 TB	30.72 TB
Sequential Read	+100%	+100%	+100%	+100%	+97%
Sequential Write	+88%	+82%	+105%	+127%	+88%
Random Read	+63%	+60%	+80%	+80%	+80%
Random Write	+236%	167%	+150%	+166%	+60%
Random Read Latency	-33%	-33%	-38%	-38%	+19%
Random Write Latency	-66%	-66%	-66%	-66%	+33%

In summary, the PM7 Series 24G SAS SSDs for read-intensive applications (PM7-R Series) demonstrated the following performance improvements over the leading 12 Gb/s SAS SSD:

- Up to 100% faster sequential read performance
- Up to 127% faster sequential write performance
- Up to 80% faster random read performance
- Up to 236% faster random write performance
- Up to 38% faster random read latency
- Up to 66% faster random write latency

For applications that require a mixed-use of read and write operations, KIOXIA's PM7-V Series 24G SAS SSDs also deliver performance improvements over 12 Gb/s SAS SSDs, with supported capacities from 1.6 TB<sup>2</sup> to 12.8 TB<sup>2</sup>, at 3 DWPD<sup>4</sup> endurance ratings. The PM7 Series is targeted for the following applications:

PM7 Series Target Use Cases	
PM7-R Series: Read-intensive Use Cases	PM7-V Series: Mixed Use Cases
<p><i>Large Data Center Topologies</i></p> <p><i>Media Streaming / Video on Demand</i></p> <p><i>Data Warehousing</i></p> <p><i>Content Delivery Networks</i></p>	<p><i>Virtualized Environments</i></p> <p><i>Online Transaction Processing / e-Commerce</i></p> <p><i>High Performance Computing</i></p> <p><i>Databases</i></p> <p><i>Software-Defined Storage</i></p> <p><i>Data Analytics</i></p>

## PM7 Series Overview

Building on the company's successes as a leading SAS SSD vendor, the PM7 Series is KIOXIA's 7<sup>th</sup> SAS SSD generation. The series leverages 112-layer BiCS FLASH™ 3D flash memory technology and is optimized for tier 1 server and storage OEMs and includes data security options (e.g., Sanitize Instant Erase<sup>®</sup> (SIE), Self-Encrypting Drive6 (SED) and SED FIPS 140-2<sup>7</sup>).

Sanitize Instant Erase Drives	Self-Encrypting Drives	FIPS 140-2-Certified Drives
<p><i>Enables Cryptographic Erase capabilities to quickly facilitate making data unreadable when an SSD is taken out of commission or repurposed.</i></p>	<p><i>Encrypts/decrypts data written to and retrieved from an SSD via a password-protected alphanumeric key (and continuously encrypts and decrypts the data).</i></p>	<p><i>Validates that SSD cryptographic module is in compliance with the FIPS 140-2 standard developed by NIST through its rigorous Cryptographic Module Validation Program<sup>®</sup> (CMVP) certification process.</i></p>

Market availability in servers from leading OEMs is scheduled for the second half of 2022.

## Summary

SAS is one of the main storage interfaces between computing and storage subsystems in data centers worldwide. In comparison to the previous generation 12 Gb/s SAS interface, 24G SAS effectively doubles the bandwidth and demonstrates significant performance improvements in throughput and IOPS performance.

With the greatest breadth of 24G SAS SSDs available, KIOXIA's PM7 Series includes read-intensive and mixed-use SSDs in a variety of capacities, endurance, security options, and with single- or dual-port capabilities. The addition of 20-bit Forward Error Correction (FEC) that corrects errors on-the-fly provides further reliability to PM7 Series SSDs that will help extend KIOXIA's reputation and leadership position in enterprise SAS.



**NOTES:**

<sup>1</sup> 2.5-inch indicates the form factor of the SSD and not its physical size.

<sup>2</sup> 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.

<sup>3</sup> 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.

<sup>4</sup> 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.

<sup>5</sup> 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).

<sup>6</sup> 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/>

<sup>7</sup> 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/>

<sup>8</sup> More information on the NIST Cryptographic Module Validation Program (CMVP) is available at: <https://csrc.nist.gov/projects/cryptographic-module-validation-program>

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