ThinkSystem PM9A3 Read Intensive NVMe PCIe 4.0 SSDs

Product Guide

The ThinkSystem PM9A3 Read Intensive NVMe Solid-State Drives (SSDs) are general-purpose yet high-performance family of NVMe SSDs. They are engineered for greater performance and endurance in a cost-effective design, and to support a broader set of workloads.

Figure 1. ThinkSystem PM9A3 Read Intensive NVMe SSDs

Did you know?

The PM9A3 SSDs are follow-ons to the PM983 drives. The PM9A3 SSDs offer improved performance, both in terms of random read/write performance (IOPS) and sequential read/write bandwidth (MB/s). Sequential write latency has also been improved.

Lenovo Read Intensive (Entry) SSDs are suitable for read-intensive and general-purpose data center workloads, however their NVMe PCIe interface means the drives also offer high performance. Overall, these SSDs provide outstanding IOPS/watt and cost/IOPS for enterprise solutions.

Part number information

The following table lists the part numbers and feature codes for the PM9A3 SSDs.

Table 1. Ordering information

Part number	Feature code	Description	Vendor part number
2.5-inch hot-swap drives			
4XB7A90099	BXMB	ThinkSystem 2.5" U.2 PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 HS SSD	MZQL2960HCJR-00A07
4XB7A90100	BXMA	ThinkSystem 2.5" U.2 PM9A3 1.92TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	MZQL21T9HCJR-00A07
4XB7A79697	BNM6	ThinkSystem 2.5" U.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	MZQL23T8HCLS-00B7C
4XB7A90101	BXM9	ThinkSystem 2.5" U.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	MZQL23T8HCLS-00A07
7mm hot-swap drives			
4XB7A90096	BXMN	ThinkSystem 7mm U.2 PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 HS SSD	MZQL2960HCJR-00A07
4XB7A90097	BXMM	ThinkSystem 7mm U.2 PM9A3 1.92TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	MZQL21T9HCJR-00A07
4XB7A90098	BXML	ThinkSystem 7mm U.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	MZQL23T8HCLS-00A07
M.2 drives			
4XB7A90102	BXMH	ThinkSystem M.2 PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	MZ1L2960HCJR-00A07
4XB7A90103	BXMG	ThinkSystem M.2 PM9A3 1.92TB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	MZ1L21T9HCLS-00A07
4XB7A90104	BXMF	ThinkSystem M.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	MZ1L23T8HBLA-00A07
7mm trayless drives			
4XB7A90115	BXME	ThinkSystem 2.5" U.2 7mm PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 Trayless SSD	MZQL2960HCJR-00A07
4XB7A90116	BXMD	ThinkSystem 2.5" U.2 7mm PM9A3 1.92TB Read Intensive NVMe PCIe 4.0 x4 Trayless SSD	MZQL21T9HCJR-00A07
4XB7A90117	BXMC	ThinkSystem 2.5" U.2 7mm PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 Trayless SSD	MZQL23T8HCLS-00A07

The part numbers include the following items:

- One solid-state drive
- Documentation flyer

Features

Non-Volatile Memory Express (NVMe) is PCIe high performance SSD technology that provides high I/O throughput and low latency. NVMe interfaces remove SAS/SATA bottlenecks and unleash all of the capabilities of contemporary NAND flash memory. Each NVMe PCI SSD has direct PCIe x4 connection, which provides at least 2x more bandwidth and 2x less latency than SATA/SAS-based SSD solutions. NVMe drives are also optimized for heavy multi-threaded workloads by using internal parallelism and many other improvements, such as enlarged I/O queues.

The ThinkSystem PM9A3 Read Intensive NVMe SSDs have the following features:

- Available in multiple form factors:
  - 2.5-inch hot-swap
  - 7mm hot-swap
  - 7mm trayless
  - M.2 22110
- Low cost, read-intensive SSD from Samsung
- Direct PCIe 4.0 x4 connection for each NVMe drive, resulting in up to 8 GBps overall throughput.
- TCG Opal SED drive encryption
- Advanced ECC Engine and End-to-End Data Protection
- Samsung 32 layer V-NAND stacks the vertical NAND layers in three dimensions, solving the cell-to-cell interference that causes data corruption in planar NAND.
- Protect data integrity from unexpected power loss with Samsung's advanced power-loss protection architecture
- Supports Self-Monitoring, Analysis and Reporting Technology (S.M.A.R.T).
- Compliant with the following specifications:
  - PCI Express Base Specification Rev. 4.0
  - NVM Express Specification Rev. 1.4

Read Intensive SSDs and Write Intensive SSDs have similar read IOPS performance, but the key difference between them is their endurance -- how long they can reliably perform write operations. Read Intensive SSDs have a better cost/IOPS ratio but lower endurance compared to Write Intensive SSDs. SSD write endurance is typically measured by the number of program/erase (P/E) write cycles that the drive incurs over its lifetime, listed as the total bytes of written data (TBW) in the device specification.

The TBW value assigned to a solid-state device is the total bytes of written data (based on the number of P/E cycles) that a drive can be guaranteed to complete (% of remaining P/E cycles = % of remaining TBW). Reaching this limit does not cause the drive to immediately fail. It simply denotes the maximum number of writes that can be guaranteed. A solid-state device will not fail upon reaching the specified TBW. At some point based on manufacturing variance margin, after surpassing the TBW value, the drive will reach the end-of-life point, at which the drive will go into a read-only mode.

Because of such behavior by Read Intensive solid-state drives, careful planning must be done to use them only in read-intensive or mixed use (70% read/30% write) environments to ensure that the TBW of the drive will not be exceeded before the required life expectancy.

For example, the 3.84TB PM9A3 drive has an endurance of 7,008 TB of total bytes written (TBW). This means that for full operation over five years, write workload must be limited to no more than 3,840 GB of writes per day, which is equivalent to 1.0 full drive writes per day (DWPD). For the device to last three years, the drive write workload must be limited to no more than 6,400 GB of writes per day, which is equivalent to 1.7 full drive writes per day.

The benefits of drive encryption

Self-encrypting drives (SEDs) provide benefits in three main ways:

- By encrypting data on-the-fly at the drive level with no performance impact
- By providing instant secure erasure (cryptographic erasure, thereby making the data no longer readable)
- By enabling auto-locking to secure active data if a drive is misplaced or stolen from a system while in use

The following sections describe the benefits in more details.

Automatic encryption

It is vital that a company keep its data secure. With the threat of data loss due to physical theft or improper inventory practices, it is important that the data be encrypted. However, challenges with performance, scalability, and complexity have led IT departments to push back against security policies that require the use of encryption. In addition, encryption has been viewed as risky by those unfamiliar with key management, a process for ensuring a company can always decrypt its own data. Self-encrypting drives comprehensively resolve these issues, making encryption both easy and affordable.

When the self-encrypting drive is in normal use, its owner need not maintain authentication keys (otherwise known as credentials or passwords) in order to access the data on the drive. The self-encrypting drive will encrypt data being written to the drive and decrypt data being read from it, all without requiring an authentication key from the owner.

Drive retirement and disposal

When hard drives are retired and moved outside the physically protected data center into the hands of others, the data on those drives is put at significant risk. IT departments retire drives for a variety of reasons, including:

- Returning drives for warranty, repair, or expired lease agreements
- Removal and disposal of drives
- Repurposing drives for other storage duties

Nearly all drives eventually leave the data center and their owner's control. Corporate data resides on such drives, and when most leave the data center, the data they contain is still readable. Even data that has been striped across many drives in a RAID array is vulnerable to data theft because just a typical single stripe in today’s high-capacity arrays is large enough to expose for example, hundreds of names and bank account numbers.

In an effort to avoid data breaches and the ensuing customer notifications required by data privacy laws, companies use different methods to erase the data on retired drives before they leave the premises and potentially fall into the wrong hands. Current retirement practices that are designed to make data unreadable rely on significant human involvement in the process, and are thus subject to both technical and human failure.

The drawbacks of today's drive retirement practices include the following:

- Overwriting drive data is expensive, tying up valuable system resources for days. No notification of completion is generated by the drive, and overwriting won't cover reallocated sectors, leaving that data exposed.
- Methods that include degaussing or physically shredding a drive are expensive. It is difficult to ensure the degauss strength is optimized for the drive type, potentially leaving readable data on the drive. Physically shredding the drive is environmentally hazardous, and neither practice allows the drive to be returned for warranty or expired lease.
- Some companies have concluded the only way to securely retire drives is to keep them in their control, storing them indefinitely in warehouses. But this is not truly secure because a large volume of drives coupled with human involvement inevitably leads to some drives being lost or stolen.
- Professional disposal services is an expensive option and includes the cost of reconciling the services as well as internal reports and auditing. Transporting of the drives also has the potential of putting the data at risk.

Self-encrypting drives eliminate the need to overwrite, destroy, or store retired drives. When the drive is to be retired, it can be cryptographically erased, a process that is nearly instantaneous regardless of the capacity of the drive.

Instant secure erase

The self-encrypting drive provides instant data encryption key destruction via cryptographic erasure. When it is time to retire or repurpose the drive, the owner sends a command to the drive to perform a cryptographic erasure. Cryptographic erasure simply replaces the encryption key inside the encrypted drive, making it impossible to ever decrypt the data encrypted with the deleted key.

Self-encrypting drives reduce IT operating expenses by reducing asset control challenges and disposal costs. Data security with self-encrypting drives helps ensure compliance with privacy regulations without hindering IT efficiency. So called "Safe Harbor" clauses in government regulations allow companies to not have to notify customers of occurrences of data theft if that data was encrypted and therefore unreadable.

Furthermore, self-encrypting drives simplify decommissioning and preserve hardware value for returns and repurposing by:

- Eliminating the need to overwrite or destroy the drive
- Securing warranty returns and expired lease returns
- Enabling drives to be repurposed securely

Auto-locking

Insider theft or misplacement is a growing concern for businesses of all sizes; in addition, managers of branch offices and small businesses without strong physical security face greater vulnerability to external theft. Self-encrypting drives include a feature called auto-lock mode to help secure active data against theft.

Using a self-encrypting drive when auto-lock mode is enabled simply requires securing the drive with an authentication key. When secured in this manner, the drive's data encryption key is locked whenever the drive is powered down. In other words, the moment the self-encrypting drive is switched off or unplugged, it automatically locks down the drive's data.

When the self-encrypting drive is then powered back on, it requires authentication before being able to unlock its encryption key and read any data on the drive, thus protecting against misplacement and theft.

While using self-encrypting drives just for the instant secure erase is an extremely efficient and effective means to help securely retire a drive, using self-encrypting drives in auto-lock mode provides even more advantages. From the moment the drive or system is removed from the data center (with or without authorization), the drive is locked. No advance thought or action is required from the data center administrator to protect the data. This helps prevent a breach should the drive be mishandled and helps secure the data against the threat of insider or outside theft.

Technical specifications

In this section:

Technical specifications for 2.5-inch and 7mm

The following tables present technical specifications for the ThinkSystem PM9A3 Read Intensive NVMe SSDs in the 2.5-inch and 7mm form factors.

Table 2. Technical specifications for 2.5-inch and 7mm

Feature	**960 GB drive**	**1.92 TB drive**	**3.84 TB drive**
Interface	PCIe 4.0 x4	PCIe 4.0 x4	PCIe 4.0 x4
Capacity	960 GB	1.92 TB	3.84 TB
SED encryption	TCG Opal	TCG Opal	TCG Opal
Endurance (total bytes written)	1752 TB	3504 TB	7008 TB
Endurance (drive writes per day for 5 years)	1.0 DWPD	1.0 DWPD	1.0 DWPD
Data reliability (UBER)	< 1 in 10^{17} bits read	< 1 in 10^{17} bits read	< 1 in 10^{17} bits read
MTBF	2,000,000 hours	2,000,000 hours	2,000,000 hours
Performance - PCIe 4.0 host interface			
IOPS reads (4 KB blocks)	580,000	850,000	1,000,000
IOPS writes (4 KB blocks)	70,000	130,000	190,000
Sequential read rate (128 KB blocks)	6500 MBps	6800 MBps	6900 MBps
Sequential write rate (128 KB blocks)	1500 MBps	2700 MBps	4100 MBps
Latency (random R/W)	80 µs / 35 µs	80 µs / 30 µs	80 µs / 30 µs
Latency (sequential R/W)	20 µs / 20 µs	20 µs / 20 µs	20 µs / 20 µs
Environment			
Shock, non-operating	1,500 G (Max) at 0.5 ms	1,500 G (Max) at 0.5 ms	1,500 G (Max) at 0.5 ms
Vibration, non-operating	20 G_{RMS} (10-2000 Hz)	20 G_{RMS} (10-2000 Hz)	20 G_{RMS} (10-2000 Hz)
Typical power (R/W)	9.5 W / 8.0 W	10.0 W / 12.5 W	11.0 W / 13.5 W

Technical specifications for M.2

The following tables present technical specifications for the ThinkSystem PM9A3 Read Intensive NVMe SSDs in the M.2 form factor.

Table 3. Technical specifications for M.2

Feature	**960 GB drive**	**1.92 TB drive**	**3.84 TB drive**
Interface	PCIe 4.0 x4	PCIe 4.0 x4	PCIe 4.0 x4
Form factor	22110	22110	22110
Capacity	960 GB	1.92 TB	3.84 TB
SED encryption	TCG Opal	TCG Opal	TCG Opal
Endurance (total bytes written)	1752 TB	3504 TB	7008 TB
Endurance (drive writes per day for 5 years)	1.0 DWPD	1.0 DWPD	1.0 DWPD
Data reliability (UBER)	< 1 in 10^{17} bits read	< 1 in 10^{17} bits read	< 1 in 10^{17} bits read
MTBF	2,000,000 hours	2,000,000 hours	2,000,000 hours
M.2 performance - PCIe 4.0 host interface			
IOPS reads (4 KB blocks)	550,000	800,000	800,000
IOPS writes (4 KB blocks)	60,000	85,000	85,000
Sequential read rate (128 KB blocks)	5000 MBps	5500 MBps	5500 MBps
Sequential write rate (128 KB blocks)	1400 MBps	2000 MBps	2000 MBps
Latency (random R/W)	75 µs / 30 µs	75 µs / 30 µs	75 µs / 30 µs
Latency (sequential R/W)	20 µs / 20 µs	20 µs / 20 µs	20 µs / 20 µs
Environment			
Shock, non-operating	1,500 G (Max) at 0.5 ms	1,500 G (Max) at 0.5 ms	1,500 G (Max) at 0.5 ms
Vibration, non-operating	20 G_{RMS} (10-2000 Hz)	20 G_{RMS} (10-2000 Hz)	20 G_{RMS} (10-2000 Hz)
Typical power (R/W)	7.5 W / 6.5 W	8.0 W / 8.2 W	8.2 W / 8.2 W

Server support

The following tables list the ThinkSystem servers that are compatible.

Table 4. Server support (Part 1 of 3)

Part Number	Description	Edge				1S Intel V2			AMD V3					Intel V3					
		SE350 (7Z46 / 7D1X)	SE350 V2 (7DA9)	SE360 V2 (7DAM)	SE450 (7D8T)	ST50 V2 (7D8K / 7D8J)	ST250 V2 (7D8G / 7D8F)	SR250 V2 (7D7R / 7D7Q)	SR635 V3 (7D9H / 7D9G)	SR655 V3 (7D9F / 7D9E)	SR645 V3 (7D9D / 7D9C)	SR665 V3 (7D9B / 7D9A)	SR675 V3 (7D9Q / 7D9R)	ST650 V3 (7D7B / 7D7A)	SR630 V3 (7D72 / 7D73)	SR650 V3 (7D75 / 7D76)	SR850 V3 (7D97 / 7D96)	SR860 V3 (7D94 / 7D93)	SR950 V3 (7DC5 / 7DC4)
2.5-inch hot-swap drives																			
4XB7A90099	ThinkSystem 2.5" U.2 PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A90100	ThinkSystem 2.5" U.2 PM9A3 1.92TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A79697	ThinkSystem 2.5" U.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A90101	ThinkSystem 2.5" U.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
7mm hot-swap drives																			
4XB7A90096	ThinkSystem 7mm U.2 PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A90097	ThinkSystem 7mm U.2 PM9A3 1.92TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A90098	ThinkSystem 7mm U.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
M.2 drives																			
4XB7A90102	ThinkSystem M.2 PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A90103	ThinkSystem M.2 PM9A3 1.92TB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A90104	ThinkSystem M.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
7mm trayless drives																			

Part Number	Description	Edge				1S Intel V2			AMD V3					Intel V3					
		SE350 (7Z46 / 7D1X)	SE350 V2 (7DA9)	SE360 V2 (7DAM)	SE450 (7D8T)	ST50 V2 (7D8K / 7D8J)	ST250 V2 (7D8G / 7D8F)	SR250 V2 (7D7R / 7D7Q)	SR635 V3 (7D9H / 7D9G)	SR655 V3 (7D9F / 7D9E)	SR645 V3 (7D9D / 7D9C)	SR665 V3 (7D9B / 7D9A)	SR675 V3 (7D9Q / 7D9R)	ST650 V3 (7D7B / 7D7A)	SR630 V3 (7D72 / 7D73)	SR650 V3 (7D75 / 7D76)	SR850 V3 (7D97 / 7D96)	SR860 V3 (7D94 / 7D93)	SR950 V3 (7DC5 / 7DC4)
4XB7A90115	ThinkSystem 2.5" U.2 7mm PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 Trayless SSD	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A90116	ThinkSystem 2.5" U.2 7mm PM9A3 1.92TB Read Intensive NVMe PCIe 4.0 x4 Trayless SSD	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A90117	ThinkSystem 2.5" U.2 7mm PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 Trayless SSD	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Table 5. Server support (Part 2 of 3)

Part Number	Description	Dense V3				2S Intel V2				AMD V1					Dense V2				4S V2		8S
		SD665 V3 (7D9P)	SD665-N V3 (7DAZ)	SD650 V3 (7D7M)	SD650-I V3 (7D7L)	ST650 V2 (7Z75 / 7Z74)	SR630 V2 (7Z70 / 7Z71)	SR650 V2 (7Z72 / 7Z73)	SR670 V2 (7Z22 / 7Z23)	SR635 (7Y98 / 7Y99)	SR655 (7Y00 / 7Z01)	SR655 Client OS	SR645 (7D2Y / 7D2X)	SR665 (7D2W / 7D2V)	SD630 V2 (7D1K)	SD650 V2 (7D1M)	SD650-N V2 (7D1N)	SN550 V2 (7Z69)	SR850 V2 (7D31 / 7D32)	SR860 V2 (7Z59 / 7Z60)	SR950 (7X11 / 7X12)
2.5-inch hot-swap drives																					
4XB7A90099	ThinkSystem 2.5" U.2 PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	N
4XB7A90100	ThinkSystem 2.5" U.2 PM9A3 1.92TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	N
4XB7A79697	ThinkSystem 2.5" U.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	Y	Y	N	N	N	N	Y	Y	N	N	N	N	N	N	N
4XB7A90101	ThinkSystem 2.5" U.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	N
7mm hot-swap drives																					

Part Number	Description	Dense V3				2S Intel V2				AMD V1					Dense V2				4S V2		8S
		SD665 V3 (7D9P)	SD665-N V3 (7DAZ)	SD650 V3 (7D7M)	SD650-I V3 (7D7L)	ST650 V2 (7Z75 / 7Z74)	SR630 V2 (7Z70 / 7Z71)	SR650 V2 (7Z72 / 7Z73)	SR670 V2 (7Z22 / 7Z23)	SR635 (7Y98 / 7Y99)	SR655 (7Y00 / 7Z01)	SR655 Client OS	SR645 (7D2Y / 7D2X)	SR665 (7D2W / 7D2V)	SD630 V2 (7D1K)	SD650 V2 (7D1M)	SD650-N V2 (7D1N)	SN550 V2 (7Z69)	SR850 V2 (7D31 / 7D32)	SR860 V2 (7Z59 / 7Z60)	SR950 (7X11 / 7X12)
4XB7A90096	ThinkSystem 7mm U.2 PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	Y	Y	N	N	N	N	Y	Y	Y	N	N	N	Y	Y	N
4XB7A90097	ThinkSystem 7mm U.2 PM9A3 1.92TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	Y	Y	N	N	N	N	Y	Y	Y	N	N	N	Y	Y	N
4XB7A90098	ThinkSystem 7mm U.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	Y	Y	N	N	N	N	Y	Y	Y	N	N	N	Y	Y	N
M.2 drives																					
4XB7A90102	ThinkSystem M.2 PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	N	N	N	N	Y	Y	Y	Y	N	N	N	Y	Y	N	N	N	Y	N	Y	N
4XB7A90103	ThinkSystem M.2 PM9A3 1.92TB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	N	N	N	N	Y	Y	Y	Y	N	N	N	Y	Y	N	N	N	Y	N	Y	N
4XB7A90104	ThinkSystem M.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	N	N	N	N	Y	Y	Y	Y	N	N	N	Y	Y	N	N	N	Y	N	Y	N
7mm trayless drives																					
4XB7A90115	ThinkSystem 2.5" U.2 7mm PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 Trayless SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N
4XB7A90116	ThinkSystem 2.5" U.2 7mm PM9A3 1.92TB Read Intensive NVMe PCIe 4.0 x4 Trayless SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N
4XB7A90117	ThinkSystem 2.5" U.2 7mm PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 Trayless SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N

Table 6. Server support (Part 3 of 3)

Part Number	Description	4S V1			1S Intel V1				2S Intel V1								Dense V1			
		SR850 (7X18 / 7X19)	SR850P (7D2F / 2D2G)	SR860 (7X69 / 7X70)	ST50 (7Y48 / 7Y50)	ST250 (7Y45 / 7Y46)	SR150 (7Y54)	SR250 (7Y52 / 7Y51)	ST550 (7X09 / 7X10)	SR530 (7X07 / 7X08)	SR550 (7X03 / 7X04)	SR570 (7Y02 / 7Y03)	SR590 (7X98 / 7X99)	SR630 (7X01 / 7X02)	SR650 (7X05 / 7X06)	SR670 (7Y36 / 7Y37)	SD530 (7X21)	SD650 (7X58)	SN550 (7X16)	SN850 (7X15)
2.5-inch hot-swap drives																				
4XB7A90099	ThinkSystem 2.5" U.2 PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A90100	ThinkSystem 2.5" U.2 PM9A3 1.92TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A79697	ThinkSystem 2.5" U.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A90101	ThinkSystem 2.5" U.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
7mm hot-swap drives																				
4XB7A90096	ThinkSystem 7mm U.2 PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A90097	ThinkSystem 7mm U.2 PM9A3 1.92TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A90098	ThinkSystem 7mm U.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
M.2 drives																				
4XB7A90102	ThinkSystem M.2 PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A90103	ThinkSystem M.2 PM9A3 1.92TB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A90104	ThinkSystem M.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 NHS SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
7mm trayless drives																				
4XB7A90115	ThinkSystem 2.5" U.2 7mm PM9A3 960GB Read Intensive NVMe PCIe 4.0 x4 Trayless SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Part Number	Description	4S V1			1S Intel V1				2S Intel V1								Dense V1			
		SR850 (7X18 / 7X19)	SR850P (7D2F / 2D2G)	SR860 (7X69 / 7X70)	ST50 (7Y48 / 7Y50)	ST250 (7Y45 / 7Y46)	SR150 (7Y54)	SR250 (7Y52 / 7Y51)	ST550 (7X09 / 7X10)	SR530 (7X07 / 7X08)	SR550 (7X03 / 7X04)	SR570 (7Y02 / 7Y03)	SR590 (7X98 / 7X99)	SR630 (7X01 / 7X02)	SR650 (7X05 / 7X06)	SR670 (7Y36 / 7Y37)	SD530 (7X21)	SD650 (7X58)	SN550 (7X16)	SN850 (7X15)
4XB7A90116	ThinkSystem 2.5" U.2 7mm PM9A3 1.92TB Read Intensive NVMe PCIe 4.0 x4 Trayless SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A90117	ThinkSystem 2.5" U.2 7mm PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 Trayless SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Storage controller support

NVMe PCIe SSDs require a NVMe drive backplane and some form of PCIe connection to processors. PCIe connections can take the form of either an adapter (PCIe Interposer or PCIe extender) or simply a cable that connects to an onboard NVMe connector.

Consult the relevant server product guide for details about required components for NVMe drive support.

Operating system support

The following tables list the supported operating systems.

Tip: These tables are automatically generated based on data from Lenovo ServerProven.

Table 7. Operating system support for ThinkSystem 2.5" U.2 PM9A3 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD, 4XB7A79697

Operating systems	SR630 V2	SR650 V2	SR645	SR665	SD530 (Xeon Gen 1)	SN550 (Xeon Gen 1)	SN850 (Xeon Gen 1)	SR570 (Xeon Gen 1)	SR590 (Xeon Gen 1)	SR630 (Xeon Gen 1)	SR650 (Xeon Gen 1)	SR850 (Xeon Gen 1)	SR860 (Xeon Gen 1)	SR950 (Xeon Gen 1)	ST550 (Xeon Gen 1)
Microsoft Windows Server 2016	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Microsoft Windows Server 2019	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Microsoft Windows Server 2022	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 7.6	N	N	Y [1]	Y [1]	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 7.7	N	N	Y [1]	Y [1]	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 7.8	N	N	Y [1]	Y [1]	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 7.9	Y	Y	Y [1]	Y [1]	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 8.1	N	N	Y [1]	Y [1]	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 8.2	Y	Y	Y [1]	Y [1]	N	N	N	N	N	N	N	N	N	N	N

Operating systems	SR630 V2	SR650 V2	SR645	SR665	SD530 (Xeon Gen 1)	SN550 (Xeon Gen 1)	SN850 (Xeon Gen 1)	SR570 (Xeon Gen 1)	SR590 (Xeon Gen 1)	SR630 (Xeon Gen 1)	SR650 (Xeon Gen 1)	SR850 (Xeon Gen 1)	SR860 (Xeon Gen 1)	SR950 (Xeon Gen 1)	ST550 (Xeon Gen 1)
Red Hat Enterprise Linux 8.3	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 8.4	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 8.5	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 8.6	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 8.7	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 8.8	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 9.0	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 9.1	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Red Hat Enterprise Linux 9.2	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
SUSE Linux Enterprise Server 12 SP5	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
SUSE Linux Enterprise Server 12 SP5 with Xen	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
SUSE Linux Enterprise Server 15 SP1	N	N	Y [1]	Y [1]	N	N	N	N	N	N	N	N	N	N	N
SUSE Linux Enterprise Server 15 SP1 with Xen	N	N	Y [1]	Y [1]	N	N	N	N	N	N	N	N	N	N	N
SUSE Linux Enterprise Server 15 SP2	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
SUSE Linux Enterprise Server 15 SP2 with Xen	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
SUSE Linux Enterprise Server 15 SP3	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
SUSE Linux Enterprise Server 15 SP3 with Xen	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
SUSE Linux Enterprise Server 15 SP4	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
SUSE Linux Enterprise Server 15 SP4 with Xen	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
SUSE Linux Enterprise Server 15 SP5	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
SUSE Linux Enterprise Server 15 SP5 with Xen	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
Ubuntu 18.04.5 LTS	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
Ubuntu 20.04 LTS	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
Ubuntu 22.04 LTS	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
VMware vSphere Hypervisor (ESXi) 6.7 U3	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
VMware vSphere Hypervisor (ESXi) 7.0	N	N	Y [1]	Y [1]	N	N	N	N	N	N	N	N	N	N	N
VMware vSphere Hypervisor (ESXi) 7.0 U1	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N
VMware vSphere Hypervisor (ESXi) 7.0 U2	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
VMware vSphere Hypervisor (ESXi) 7.0 U3	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
VMware vSphere Hypervisor (ESXi) 8.0	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N
VMware vSphere Hypervisor (ESXi) 8.0 U1	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N

[1] The OS is not supported with EPYC 7003 processors.

IBM SKLM Key Management support

To effectively manage a large deployment of SEDs in Lenovo servers, IBM Security Key Lifecycle Manager (SKLM) offers a centralized key management solution. Certain Lenovo servers support Features on Demand (FoD) license upgrades that enable SKLM support.

The following table lists the part numbers and feature codes to enable SKLM support in the management processor of the server.

Table 8. FoD upgrades for SKLM support

Part number	Feature code	Description
Security Key Lifecycle Manager - FoD (United States, Canada, Asia Pacific, and Japan)		
00D9998	A5U1	SKLM for System x/ThinkSystem w/SEDs - FoD per Install w/1Yr S&S
00D9999	AS6C	SKLM for System x/ThinkSystem w/SEDs - FoD per Install w/3Yr S&S
Security Key Lifecycle Manager - FoD (Latin America, Europe, Middle East, and Africa)		
00FP648	A5U1	SKLM for System x/ThinkSystem w/SEDs - FoD per Install w/1Yr S&S
00FP649	AS6C	SKLM for System x/ThinkSystem w/SEDs - FoD per Install w/3Yr S&S

The IBM Security Key Lifecycle Manager software is available from Lenovo using the ordering information listed in the following table.

Table 9. IBM Security Key Lifecycle Manager licenses

Part number	Description
7S0A007FWW	IBM Security Key Lifecycle Manager Basic Edition Install License + SW Subscription & Support 12 Months
7S0A007HWW	IBM Security Key Lifecycle Manager For Raw Decimal Terabyte Storage Resource Value Unit License + SW Subscription & Support 12 Months
7S0A007KWW	IBM Security Key Lifecycle Manager For Raw Decimal Petabyte Storage Resource Value Unit License + SW Subscription & Support 12 Months
7S0A007MWW	IBM Security Key Lifecycle Manager For Usable Decimal Terabyte Storage Resource Value Unit License + SW Subscription & Support 12 Months
7S0A007PWW	IBM Security Key Lifecycle Manager For Usable Decimal Petabyte Storage Resource Value Unit License + SW Subscription & Support 12 Months

Warranty

The PM9A3 SSDs carry a one-year, customer-replaceable unit (CRU) limited warranty. When the SSDs are installed in a supported server, these drives assume the system’s base warranty and any warranty upgrades.

Solid State Memory cells have an intrinsic, finite number of program/erase cycles that each cell can incur. As a result, each solid state device has a maximum amount of program/erase cycles to which it can be subjected. The warranty for Lenovo solid state drives (SSDs) is limited to drives that have not reached the maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the SSD product. A drive that reaches this limit may fail to operate according to its Specifications.

Physical specifications

The PM9A3 SSDs have the following physical specifications:

Dimensions and weight of the 2.5-inch and 7mm drives (without the drive tray):

- Height: 7 mm (0.3 in.)
- Width: 70 mm (2.8 in.)
- Depth: 100 mm (4.0 in.)
- Weight: 70 g (2.5 oz)

Dimensions and weight of the M2 drives:

- Width: 22 mm
- Length: 110 mm
- Thickness: 3.8 mm
- Weight: 9 g

Shipping dimensions and weight for the 2.5-inch drives and 7mm drives (approximate):

- Height: 63 mm (2.5 in.)
- Width: 133 mm (5.2 in.)
- Depth: 174 mm (6.9 in.)
- Weight (with drive tray): 433 g (1.0 lb)

Operating environment

The PM9A3 SSDs are supported in the following environment:

- Temperature:
  - Operating: 0 to 70 °C (32 to 158 °F)
  - Non-operating: -40 to 85 °C (-40 to 185 °F)
- Relative humidity, Non-operating: 5 to 95% (noncondensing)
- Maximum altitude: 3,050 m (10,000 ft)
- Shock, non-operating: 1,500 G (Max) at 0.5 ms
- Vibration, non-operating: 20 G_{RMS} (10-2000 Hz)

Agency approvals

The PM9A3 SSDs conform to the following regulations:

- c-UL-us
- CE
- TUV
- CB
- CE (EU)
- BSMI (Taiwan)
- KC (South Korea)
- VCCI (Japan)
- RCM (Australia)
- FCC (USA)
- IC (CANADA)

Related publications and links

For more information, see the following documents:

- Lenovo ThinkSystem storage options product web page
  https://lenovopress.com/lp0761-storage-options-for-thinksystem-servers
- Samsung product page for Enterprise SSDs
  http://www.samsung.com/semiconductor/products/flash-storage/enterprise-ssd/

Related product families

Product families related to this document are the following:

- Drives

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