

# ThinkSystem PM1733a Read Intensive NVMe PCIe 4.0 SSDs

## Product Guide

The ThinkSystem PM1733a Read Intensive NVMe SSDs, available in capacities up to 30.72TB, are general-purpose yet high-performance NVMe PCIe SSDs. They are engineered for greater performance and endurance in a cost-effective design, and to support a broader set of workloads. Now with SED encryption as standard, these drives help ensure data security, even when the drive is removed from the server.

**SED support:** All drives listed in this product guide include SED drive encryption. Our naming convention for new drives doesn't include SED in the name.



Figure 1. ThinkSystem PM1733a Read Intensive NVMe SSDs

### Did you know?

The PM1733a SSDs are part of the growing family of PCIe 4.0 SSDs that match the performance of the ThinkSystem V2 family of servers. By having a Gen 4 host interface, sequential performance is doubled compared to Gen 3 SSDs. The NVMe host interface also maximizes flash storage performance and minimizes latency. The PM1733a SSDs drives offer 40% and 60% improvements in latency over SAS and SATA SSDs respectively.

Lenovo Read Intensive SSDs like the PM1733a 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 ThinkSystem servers.

Table 1. Ordering information

Part number	Feature	Description	Supplier part number
4XB7A81951	BPKX	ThinkSystem 2.5" U.3 PM1733a 1.92TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	MZWLR1T9HCJR-00A07
4XB7A81952	BPKY	ThinkSystem 2.5" U.3 PM1733a 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	MZWLR3T8HCLS-00A07
4XB7A81953	BPKZ	ThinkSystem 2.5" U.3 PM1733a 7.68TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	MZWLR7T6HBLA-00A07
4XB7A81954	BPL0	ThinkSystem 2.5" U.3 PM1733a 15.36TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	MZWLR15THBLA-00A07
4XB7A81999	BPL1	ThinkSystem 2.5" U.3 PM1733a 30.72TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	MZWLR30THBLA-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 a significantly greater bandwidth and lower 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 PM1733a Read Intensive NVMe SSDs have the following features:

- Direct PCIe 4.0 x4 connection for each NVMe drive, resulting in up to 7 GBps overall throughput.
- Also supports PCIe 3.0 host connection for servers with first and second-generation Intel Xeon Scalable processors or with PCIe 3.0 NVMe switch adapters
- Low cost, read-intensive SSD from Samsung using TLC flash technology
- Advanced ECC Engine and End-to-End Data Protection
- Samsung's SSD virtualization technology allows a single SSD to be subdivided into smaller SSDs, up to 64, providing independent virtual workspaces. It also enables SSDs to take on certain tasks typically carried out by the server CPUs, such as Single-Root I/O Virtualization (SR-IOV), requiring fewer server CPUs and SSDs.
- V-NAND Machine Learning enables the SSD to accurately predict and verify cell characteristics, as well as detect any variations in circuit patterns.
- Fail-In-Place technology ensures the SSD operates normally even when errors occur at the chip level. It allows the PM1733 to identify failing NAND cells, and actually recover then relocate the data without interrupting normal operations or impacting performance.
- 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).

- Supports the following specifications:
  - PCI Express Base Specification Rev. 4.0
  - NVMe Express Specification Rev. 1.3
  - NVMe Express Management Interface Specification Rev. 1.0a

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 up to 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 PM1733a 1.92 TB drive has an endurance of 3,504 TB of total bytes written (TBW). This means that for full operation over five years, write workload must be limited to no more than 1,920 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 3,200 GB of writes per day, which is equivalent to 1.7 full drive writes per day.

## **The benefits of drive encryption**

All ThinkSystem PM1733a Read Intensive NVMe SSDs support 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

The following tables present the technical specifications for the PM1733a SSDs. Note that the performance data and power consumption is based on a PCIe 4.0 host interface.

Table 2. Technical specifications

Feature	1.92 TB drive	3.84 TB drive	7.68 TB drive	15.36 TB drive	30.72 TB drive
Interface	PCIe 4.0 x4	PCIe 4.0 x4	PCIe 4.0 x4	PCIe 4.0 x4	PCIe 4.0 x4
Capacity	1.92 TB	3.84 TB	7.68 TB	15.36 TB	30.72 TB
SED encryption	TCG Opal	TCG Opal	TCG Opal	TCG Opal	TCG Opal
Endurance (drive writes per day for 5 years)	1 DWPD	1 DWPD	1 DWPD	1 DWPD	1 DWPD
Endurance (total bytes written)	3504 TB	7008 TB	14,016 TB	28,032 TB	56,064 TB
Data reliability (UBER)	< 1 in 10 <sup>17</sup> bits read	< 1 in 10 <sup>17</sup> bits read	< 1 in 10 <sup>17</sup> bits read	< 1 in 10 <sup>17</sup> bits read	< 1 in 10 <sup>17</sup> bits read
MTBF	2,000,000 hours	2,000,000 hours	2,000,000 hours	2,000,000 hours	2,000,000 hours
<b>Performance &amp; Power - PCIe 4.0 host interface</b>					
IOPS reads (4 KB blocks)	1,400,000	1,600,000	1,600,000	1,600,000	1,600,000
IOPS writes (4 KB blocks)	100,000	170,000	170,000	170,000	170,000
Sequential read rate (128 KB blocks)	7500 MBps	7500 MBps	7500 MBps	7500 MBps	7500 MBps
Sequential write rate (128 KB blocks)	2500 MBps	4100 MBps	4100 MBps	4100 MBps	4100 MBps
Latency (random R/W)	100 µs / 25 µs	100 µs / 25 µs	100 µs / 25 µs	100 µs / 25 µs	100 µs / 25 µs
Latency (sequential R/W)	270 µs / 100 µs	270 µs / 100 µs	270 µs / 100 µs	270 µs / 100 µs	270 µs / 100 µs
Typical power (R/W)	15.5 W / 14.5 W	17.5 W / 19 W	18 W / 19 W	19 W / 20.5 W	20 W / 21 W

## Server support

The following tables list the ThinkSystem servers that are compatible.

Table 3. Server support (Part 1 of 4)

Part Number	Description	AMD V3				2S Intel V3			4S 8S Intel V3			Multi Node		GPU Rich			1S V3				
		SR635 V3 (7D9H / 7D9G)	SR655 V3 (7D9F / 7D9E)	SR645 V3 (7D9D / 7D9C)	SR665 V3 (7D9B / 7D9A)	ST650 V3 (7D7B / 7D7A)	SR630 V3 (7D72 / 7D73)	SR650 V3 (7D75 / 7D76)	SR850 V3 (7D97 / 7D96)	SR860 V3 (7D94 / 7D93)	SR950 V3 (7DC5 / 7DC4)	SD535 V3 (7DD8 / 7DD1)	SD530 V3 (7DDA / 7DD3)	SD550 V3 (7DD9 / 7DD2)	SR670 V2 (7Z22 / 7Z23)	SR675 V3 (7D9Q / 7D9R)	SR680a V3 (7DHE)	SR685a V3 (7DHC)	ST50 V3 (7DF4 / 7DF3)	ST250 V3 (7DCF / 7DCE)	SR250 V3 (7DCM / 7DCL)
4XB7A81951	ThinkSystem 2.5" U.3 PM1733a 1.92TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N
4XB7A81952	ThinkSystem 2.5" U.3 PM1733a 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	Y	Y	N	N	N	N	N	Y	N	N	N	N	N	N	N
4XB7A81953	ThinkSystem 2.5" U.3 PM1733a 7.68TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	Y	Y	N	N	N	N	N	Y	N	N	N	N	N	N	N
4XB7A81954	ThinkSystem 2.5" U.3 PM1733a 15.36TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N
4XB7A81999	ThinkSystem 2.5" U.3 PM1733a 30.72TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N

Table 4. Server support (Part 2 of 4)

Part Number	Description	Edge					Super Computing					1S Intel V2			2S Intel V2		
		SE350 (7Z46 / 7D1X)	SE350 V2 (7DA9)	SE360 V2 (7DAM)	SE450 (7D8T)	SE455 V3 (7DBY)	SD665 V3 (7D9P)	SD665-N V3 (7DAZ)	SD650 V3 (7D7M)	SD650-I V3 (7D7L)	SD650-N V3 (7D7N)	ST50 V2 (7D8K / 7D8J)	ST250 V2 (7D8G / 7D8F)	SR250 V2 (7D7R / 7D7Q)	ST650 V2 (7Z75 / 7Z74)	SR630 V2 (7Z70 / 7Z71)	SR650 V2 (7Z72 / 7Z73)
4XB7A81951	ThinkSystem 2.5" U.3 PM1733a 1.92TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	
4XB7A81952	ThinkSystem 2.5" U.3 PM1733a 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	
4XB7A81953	ThinkSystem 2.5" U.3 PM1733a 7.68TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	
4XB7A81954	ThinkSystem 2.5" U.3 PM1733a 15.36TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	
4XB7A81999	ThinkSystem 2.5" U.3 PM1733a 30.72TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	



Table 5. Server support (Part 3 of 4)

Part Number	Description	AMD V1				Dense V2				4S V2	8S	4S V1		1S Intel V1						
		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)	SR850 (7X18 / 7X19)	SR850P (7D2F / 2D2G)	SR860 (7X69 / 7X70)	ST50 (7Y48 / 7Y50)	ST250 (7Y45 / 7Y46)	SR150 (7Y54)	SR250 (7Y52 / 7Y51)
4XB7A81951	ThinkSystem 2.5" U.3 PM1733a 1.92TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	N	N	N	N	N	N	N	N
4XB7A81952	ThinkSystem 2.5" U.3 PM1733a 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	N	N	N	N	N	N	N	N
4XB7A81953	ThinkSystem 2.5" U.3 PM1733a 7.68TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	N	N	N	N	N	N	N	N
4XB7A81954	ThinkSystem 2.5" U.3 PM1733a 15.36TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	N	N	N	N	N	N	N	N
4XB7A81999	ThinkSystem 2.5" U.3 PM1733a 30.72TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	N	N	N	N	N	N	N	N

Table 6. Server support (Part 4 of 4)

Part Number	Description	2S Intel V1							Dense V1				
		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)
4XB7A81951	ThinkSystem 2.5" U.3 PM1733a 1.92TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	Y	Y	N	Y	N	N	N
4XB7A81952	ThinkSystem 2.5" U.3 PM1733a 3.84TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	Y	Y	N	Y	N	N	N
4XB7A81953	ThinkSystem 2.5" U.3 PM1733a 7.68TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	Y	Y	N	Y	N	N	N
4XB7A81954	ThinkSystem 2.5" U.3 PM1733a 15.36TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	N	N	N	N	N	Y	Y	N	Y	N	N	N
4XB7A81999	ThinkSystem 2.5" U.3 PM1733a 30.72TB Read Intensive NVMe PCIe 4.0 x4 HS SSD	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/switch adapter) or simply a cable that connects to an onboard NVMe connector.

**PCIe 3.0 support:** The PM1733a SSDs offer a PCIe 4.0 host interface, however they are backward compatible with a PCIe 3.0 host interface. Note however that servers with a PCIe 3.0 host interface will not see the same performance levels (especially sequential read and write rates). Some ThinkSystem NVMe switch adapters also provide a PCIe 3.0 host interface to attached drives.

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](#).

**VMware vSAN certification:** The drives listed in this product guide are VMware vSAN certified, however in the [VMware Compatibility Guide](#) (VCG), they are listed under the drive vendor company name instead of Lenovo. To check a drive for vSAN certification, search the VCG using the Supplier part number as listed in Table 1 in the [Part number information](#) section.

Table 7. Operating system support for ThinkSystem 2.5" U.3 PM1733a 1.92TB Read Intensive NVMe PCIe 4.0 x4 HS SSD, 4XB7A81951

Operating systems	SN550 V2	SR630 V2	SR650 V2	SR670 V2	SR850 V2	SR860 V2	ST650 V2	SR635	SR645	SR655	SR665	SD530 (Xeon Gen 2)	SR630 (Xeon Gen 2)	SR650 (Xeon Gen 2)	SD530 (Xeon Gen 1)	SR630 (Xeon Gen 1)	SR650 (Xeon Gen 1)
Microsoft Windows 10	N	N	N	N	N	N	N	N	N	Y <sup>2</sup>	N	N	N	N	N	N	N
Microsoft Windows 11	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N
Microsoft Windows Server 2016	N	N	N	N	N	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	Y
Microsoft Windows Server 2019	N	N	N	N	N	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	Y
Microsoft Windows Server 2022	N	N	N	N	N	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	Y
Microsoft Windows Server version 1709	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
Microsoft Windows Server version 1803	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
Red Hat Enterprise Linux 6.10	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
Red Hat Enterprise Linux 6.9	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
Red Hat Enterprise Linux 7.3	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
Red Hat Enterprise Linux 7.4	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
Red Hat Enterprise Linux 7.5	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
Red Hat Enterprise Linux 7.6	N	N	N	N	N	N	N	Y <sup>1</sup>	N	Y <sup>1</sup>	N	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.7	N	N	N	N	N	N	N	Y <sup>1</sup>	N	Y <sup>1</sup>	N	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 7.8	N	N	N	N	N	N	N	Y <sup>1</sup>	N	Y <sup>1</sup>	N	Y	Y	Y	Y	Y	Y

Operating systems	SN550 V2	SR630 V2	SR650 V2	SR670 V2	SR850 V2	SR860 V2	ST650 V2	SR635	SR645	SR655	SR665	SD530 (Xeon Gen 2)	SR630 (Xeon Gen 2)	SR650 (Xeon Gen 2)	SD530 (Xeon Gen 1)	SR630 (Xeon Gen 1)	SR650 (Xeon Gen 1)
Red Hat Enterprise Linux 7.9	N	N	N	N	N	N	N	Y <sup>1</sup>	N	Y <sup>1</sup>	N	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.0	N	N	N	N	N	N	N	Y <sup>1</sup>	N	Y <sup>1</sup>	N	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.1	N	N	N	N	N	N	N	Y <sup>1</sup>	Y <sup>1</sup>	Y <sup>1</sup>	Y <sup>1</sup>	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N
Red Hat Enterprise Linux 8.2	Y	Y	Y	Y	Y	Y	Y	Y <sup>1</sup>	Y <sup>1</sup>	Y <sup>1</sup>	Y <sup>1</sup>	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.6	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.7	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.8	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.9	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
Red Hat Enterprise Linux 9.0	Y	Y	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	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 9.2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 9.3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
Red Hat Enterprise Linux 9.4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N
SUSE Linux Enterprise Server 11 SP4	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
SUSE Linux Enterprise Server 11 SP4 with Xen	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
SUSE Linux Enterprise Server 12 SP2	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
SUSE Linux Enterprise Server 12 SP2 with Xen	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
SUSE Linux Enterprise Server 12 SP3	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
SUSE Linux Enterprise Server 12 SP3 with Xen	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
SUSE Linux Enterprise Server 12 SP4	N	N	N	N	N	N	N	Y <sup>1</sup>	N	Y <sup>1</sup>	N	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP4 with Xen	N	N	N	N	N	N	N	Y <sup>1</sup>	N	Y <sup>1</sup>	N	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP5	N	N	N	N	N	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP5 with Xen	N	N	N	N	N	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP1	N	N	N	N	N	N	N	Y <sup>1</sup>	N	Y <sup>1</sup>	N	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP1 with Xen	N	N	N	N	N	N	N	Y <sup>1</sup>	N	Y <sup>1</sup>	N	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP2	N	N	N	N	N	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP2 with Xen	N	N	N	N	N	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP3	N	N	N	N	N	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP3 with Xen	N	N	N	N	N	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP4 with Xen	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Operating systems	SN550 V2	SR630 V2	SR650 V2	SR670 V2	SR850 V2	SR860 V2	ST650 V2	SR635	SR645	SR655	SR665	SD530 (Xeon Gen 2)	SR630 (Xeon Gen 2)	SR650 (Xeon Gen 2)	SD530 (Xeon Gen 1)	SR630 (Xeon Gen 1)	SR650 (Xeon Gen 1)
SUSE Linux Enterprise Server 15 SP5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP5 with Xen	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP6	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N
SUSE Linux Enterprise Server 15 with Xen	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y
Ubuntu 22.04 LTS	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.0 U3	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.5	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.5 U1	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.5 U2	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.5 U3	N	N	N	N	N	N	N	Y <sup>1</sup>	N	Y <sup>1</sup>	N	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7 U1	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7 U2	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7 U3	N	N	N	N	N	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0	N	N	N	N	N	N	N	Y <sup>1</sup>	N	Y <sup>1</sup>	N	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0 U1	N	N	N	N	N	N	N	Y <sup>1</sup>	N	Y <sup>1</sup>	N	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0 U2	N	N	N	N	N	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0 U3	N	N	N	N	N	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 8.0	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 8.0 U1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 8.0 U2	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 8.0 U3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N

<sup>1</sup> The OS is not supported with EPYC 7003 processors.

<sup>2</sup> ISG will not sell/preload this OS, but compatibility and cert only.

## 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

The following tables list the ThinkSystem servers that support the FoD license upgrade.

Table 10. IBM SKLM Key Management license upgrade support (Part 1 of 4)

Part Number	Description	AMD V3				2S Intel V3			4S 8S Intel V3			Multi Node			GPU Rich			1S V3			
		SR635 V3 (7D9H / 7D9G)	SR655 V3 (7D9F / 7D9E)	SR645 V3 (7D9D / 7D9C)	SR665 V3 (7D9B / 7D9A)	ST650 V3 (7D7B / 7D7A)	SR630 V3 (7D72 / 7D73)	SR650 V3 (7D75 / 7D76)	SR850 V3 (7D97 / 7D96)	SR860 V3 (7D94 / 7D93)	SR950 V3 (7DC5 / 7DC4)	SD535 V3 (7DD8 / 7DD1)	SD530 V3 (7DDA / 7DD3)	SD550 V3 (7DD9 / 7DD2)	SR670 V2 (7Z22 / 7Z23)	SR675 V3 (7D9Q / 7D9R)	SR680a V3 (7DHE)	SR685a V3 (7DHC)	ST50 V3 (7DF4 / 7DF3)	ST250 V3 (7DCF / 7DCE)	SR250 V3 (7DCM / 7DCL)
A5U1	SKLM for System x w/SEDs - FoD per Install w/1Yr S&S	N	N	Y	N	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	Y	Y
AS6C	SKLM for System x w/SEDs - FoD per Install w/3Yr S&S	N	N	Y	N	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	Y	Y

Table 11. IBM SKLM Key Management license upgrade support (Part 2 of 4)

Part Number	Description	Edge						Super Computing				1S Intel V2		2S Intel V2		
		SE350 (7Z46 / 7D1X)	SE350 V2 (7DA9)	SE360 V2 (7DAM)	SE450 (7D8T)	SE455 V3 (7DBY)	SD665 V3 (7D9P)	SD665-N V3 (7DAZ)	SD650 V3 (7D7M)	SD650-I V3 (7D7L)	SD650-N V3 (7D7N)	ST50 V2 (7D8K / 7D8J)	ST250 V2 (7D8G / 7D8F)	SR250 V2 (7D7R / 7D7Q)	ST650 V2 (7Z75 / 7Z74)	SR630 V2 (7Z70 / 7Z71)
A5U1	SKLM for System x w/SEDs - FoD per Install w/1Yr S&S	N	N	N	N	N	N	N	N	N	N	Y	Y	N	Y	Y
AS6C	SKLM for System x w/SEDs - FoD per Install w/3Yr S&S	N	N	N	N	N	N	N	N	N	N	Y	Y	N	Y	Y

Table 12. IBM SKLM Key Management license upgrade support (Part 3 of 4)

Part Number	Description	AMD V1				Dense V2			4S V2	8S	4S V1	1S Intel V1								
		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)	SR850 (7X18 / 7X19)	SR850P (7D2F / 2D2G)	SR860 (7X69 / 7X70)	ST50 (7Y48 / 7Y50)	ST250 (7Y45 / 7Y46)	SR150 (7Y54)	SR250 (7Y52 / 7Y51)
A5U1	SKLM for System x w/SEDs - FoD per Install w/1Yr S&S	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N
AS6C	SKLM for System x w/SEDs - FoD per Install w/3Yr S&S	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N

Table 13. IBM SKLM Key Management license upgrade support (Part 4 of 4)

Part Number	Description	2S Intel V1							Dense V1			
		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)
A5U1	SKLM for System x w/SEDs - FoD per Install w/1Yr S&S	Y	Y	N	Y	Y	Y	Y	N	N	N	N
AS6C	SKLM for System x w/SEDs - FoD per Install w/3Yr S&S	Y	Y	N	Y	Y	Y	Y	N	N	N	N

## Warranty

The PM1733a SSDs carry a one-year, customer-replaceable unit (CRU) limited warranty. When the SSDs are installed in a supported server, these drives assume the server'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 PM1733a SSDs have the following physical specifications:

Dimensions and weight (approximate, without the drive tray):

- Height: 15 mm (0.6 in.)
- Width: 70 mm (2.8 in.)
- Depth: 100 mm (4.0 in.)
- Weight: 190 g (6.7 oz)

## Operating environment

The PM1733a SSDs are supported in the following environment:

- Temperature (operating): 0 to 70 °C (32 to 158 °F)
- Temperature (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: 20 G<sub>PEAK</sub> (10-2000 Hz) at 4 min/cycle, 4 cycle/axis on 3 axis.

## Agency approvals

The PM1733a SSDs conform to the following regulations:

- cUL
- CE
- TUV-GS
- 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 SSD Portfolio Comparison  
<https://lenovopress.com/lp1261-lenovo-thinksystem-ssd-portfolio>
- Lenovo ThinkSystem storage options product web page  
<https://lenovopress.com/lp0761-storage-options-for-thinksystem-servers>
- Samsung product page for Enterprise SSDs  
<https://www.samsung.com/semiconductor/ssd/enterprise-ssd/>

## Related product families

Product families related to this document are the following:

- [Drives](#)



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