ThinkSystem 9400 MAX Mixed Use NVMe PCIe 4.0 x4 SSDs
Product Guide

The ThinkSystem 9400 MAX Mixed Use NVMe SSDs are advanced data center SSDs optimized for mixed read-write performance, endurance, and strong data protection for Lenovo servers. With a PCIe 4.0 x4 interface, they are designed for greater performance and endurance in a cost-effective design, and to support a broader set of workloads.

No SED support: The drive described in this product guide does not supported SED encryption.

Figure 1. ThinkSystem 9400 MAX Mixed Use NVMe SSDs

Did you know?

Lenovo Mixed Used SSDs like the 9400 MAX SSDs are suitable for mixed read-write 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 9400 MAX SSDs.

Table 1. Part number information

Part number	Feature	Description	Supplier model
4XB7A91175	BZEH	ThinkSystem 2.5 U.2 9400 MAX 25.6TB Mixed Use NVMe PCIe 4.0 x4 HS SSD (Non-SED)	MTFDKCC25T6TGJ-1BC1ZABYY

The part numbers include the following items:

- One solid-state drive
- Hot swap drives include a hot-swap tray
- 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 9400 MAX Mixed Use NVMe SSDs have the following features:

- NVMe SSD with PCIe 4.0 performance and a U.2 interface

- Based on the Micron 9400 MAX family of SSDs

- Micron 232-layer 3D TLC NAND

- Direct PCIe 4.0 x4 connection for each NVMe drive, resulting in up to 8 GBps overall throughput.

- Advanced ECC Engine and End-to-End Data Protection

- Protect data integrity from unexpected power loss with advanced power-loss protection architecture

- Adaptive Thermal Monitoring to monitor the internal temperature of the drive with power adjustment to ensure operation within thermal limits

- Supports Self-Monitoring, Analysis and Reporting Technology (S.M.A.R.T).

- Enterprise-level security features:
    - Secure Execution Environment - dedicated security processing hardware with physical isolation
    - Asymmetric Roots of Trust - Enables authenticated revocation of root keys
    - Strong Asymmetric Key Support - Uses standard, NIST-approved algorithms with 208-bit/3072-bit RSA keys
    - RSA Delegation Key Support - Enables customers to maintain ownership of RSA keys
    - Secure Boot - Helps ensure firmware integrity on running platform
    - Key-Based Firmware Update - Validates firmware using public key-based authentication prior to firmware update
    - Key-Based Privileged Access - Protects against unauthorized privileged SSD function execution with public key-based authorization

SSDs have a huge but finite number of program/erase (P/E) cycles, which affect how long they can perform write operations and thus their life expectancy. Mixed Use SSDs have a higher write endurance compared to Read Intensive SSDs. SSD write endurance is typically measured by the number of program/erase cycles that the drive can incur over its lifetime, which is listed as total bytes written (TBW) in the device specification.

The TBW value that is assigned to a solid-state device is the total bytes of written data that a drive can be guaranteed to complete. Reaching this limit does not cause the drive to immediately fail; the TBW simply denotes the maximum number of writes that can be guaranteed. A solid-state device does *not* fail upon reaching the specified TBW. However, at some point after surpassing the TBW value (and based on manufacturing variance margins), the drive reaches the end-of-life point, at which time the drive goes into read-only mode.

Because of such behavior, careful planning must be done to use SSDs in the application environments to ensure that the TBW of the drive is not exceeded before the required life expectancy.

For example, the 25.6 TB 9400 MAX drive has an endurance of 140,160 TB of total bytes written (TBW). This means that for full operation over five years, write workload must be limited to no more than 76,800 GB of writes per day, which is equivalent to 3.0 full drive writes per day (DWPD). For the device to last three years, the drive write workload must be limited to no more than 128,000 GB of writes per day, which is equivalent to 5.0 full drive writes per day.

Technical specifications

The following table presents technical specifications for the ThinkSystem 9400 MAX Mixed Use NVMe SSDs.

Table 2. Technical specifications

Feature	25.6 TB drive
Interface	PCIe 4.0 x4
Capacity	25.6 TB
SED encryption	None
Endurance (total bytes written) (100% 4KB Random)	140,160TB
Endurance (drive writes per day for 5 years)	3.0 DWPD
Data reliability (UBER)	< 1 in 10^{17} bits read
MTBF	2,000,000 hours
IOPS reads (4 KB blocks)	1,500,000
IOPS writes (4 KB blocks)	500,000
Sequential read rate (128 KB blocks)	7000 MBps
Sequential write rate (128 KB blocks)	7000 MBps
Latency (random R/W)	69 µs / 10 µs
Typical power (R/W)	21 / 25 W

Server support

The following tables list the ThinkSystem servers that are compatible.

Table 3. 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)	SE455 V3 (7DBY)	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)
4XB7A91175	ThinkSystem 2.5 U.2 9400 MAX 25.6TB Mixed Use NVMe PCIe 4.0 x4 HS SSD (Non-SED)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Table 4. 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)
4XB7A91175	ThinkSystem 2.5 U.2 9400 MAX 25.6TB Mixed Use NVMe PCIe 4.0 x4 HS SSD (Non-SED)	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N

Table 5. 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)
4XB7A91175	ThinkSystem 2.5 U.2 9400 MAX 25.6TB Mixed Use NVMe PCIe 4.0 x4 HS SSD (Non-SED)	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 table lists the supported operating systems.

Tip: This table is 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 6. Operating system support for ThinkSystem 2.5 U.2 9400 MAX 25.6TB Mixed Use NVMe PCIe 4.0 x4 HS SSD (Non-SED), 4XB7A91175

Operating systems	SR645 V3	SR635
Microsoft Windows Server 2016	N	Y
Microsoft Windows Server 2019	Y	Y
Microsoft Windows Server 2022	Y	Y
Red Hat Enterprise Linux 7.7	N	Y [1]
Red Hat Enterprise Linux 7.8	N	Y [1]
Red Hat Enterprise Linux 7.9	N	Y [1]
Red Hat Enterprise Linux 8.0	N	Y [1]
Red Hat Enterprise Linux 8.1	N	Y [1]
Red Hat Enterprise Linux 8.2	N	Y [1]
Red Hat Enterprise Linux 8.3	N	Y
Red Hat Enterprise Linux 8.4	N	Y
Red Hat Enterprise Linux 8.5	N	Y
Red Hat Enterprise Linux 8.6	Y	Y
Red Hat Enterprise Linux 8.7	Y	Y
Red Hat Enterprise Linux 8.8	Y	Y
Red Hat Enterprise Linux 9.0	Y	Y
Red Hat Enterprise Linux 9.1	Y	Y
Red Hat Enterprise Linux 9.2	Y	Y
Ubuntu 20.04.5 LTS	Y	N
Ubuntu 22.04 LTS	Y	Y
VMware vSphere Hypervisor (ESXi) 6.5 U3	N	Y [1]
VMware vSphere Hypervisor (ESXi) 6.7 U3	N	Y
VMware vSphere Hypervisor (ESXi) 7.0	N	Y [1]
VMware vSphere Hypervisor (ESXi) 7.0 U1	N	Y [1]
VMware vSphere Hypervisor (ESXi) 7.0 U2	N	Y
VMware vSphere Hypervisor (ESXi) 7.0 U3	Y	Y
VMware vSphere Hypervisor (ESXi) 8.0	Y	Y
VMware vSphere Hypervisor (ESXi) 8.0 U1	Y	Y
VMware vSphere Hypervisor (ESXi) 8.0 U2	Y	Y

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

Warranty

The 9400 MAX 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 9400 MAX SSDs have the following physical specifications:

- Height: 15mm (0.6 in.)
- Width: 70 mm (2.8 in.)
- Depth: 100 mm (4.0 in.)
- Weight: 235 g (8.3 oz)

Operating environment

The 9400 MAX 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 90% (non-condensing)

- Maximum altitude: 3,050 m (10,000 ft)

- Shock, non-operating: 1,500 G (Max) at 0.5 ms

- Vibration, non-operating: 9.1 G_{RMS} (5-800 Hz)

Agency approvals

The 9400 MAX SSDs conform to the following regulations:

- CE (Europe): EN55032, EN55024 Class B, RoHS
- FCC: CFR Title 47, Part 15, Class B
- UL/cUL: approval to UL-60950-1, 2nd Edition, IEC 60950-1:2005 (2nd Edition); EN 60950-1 (2006) + A11:2009+ A1:2010 + A12:2011 + A2:2013
- BSMI (Taiwan): approval to CNS 13438, Class B, CNS 15663
- RCM (Australia, New Zealand): AS/NZS CISPR32 Class B
- KC RRL (Korea): approval to KN32 Class B, KN 35 Class B
- W.E.E.E.: Compliance with EU WEEE directive 2012/19/EC.
- TUV (Germany): approval to IEC60950/EN60950
- VCCI (Japan): 2015-04 Class B
- IC (Canada): ICES-003 Class B
- Morocco: EN55032, EN55024 Class B
- UkrSEPRO (Ukraine): EN55032 Class B, IEC60950/EN60950, RoHS (Resolution 2017 No. 139)
- UKCA (UK): SI 2016/1091 Class B and SI 2012/3032 RoHS

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

- Micron 9400 product page
  https://www.micron.com/products/ssd/product-lines/9400

Related product families

Product families related to this document are the following:

- Drives

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