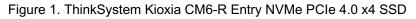# ThinkSystem Kioxia CM6-R Entry NVMe PCIe 4.0 x4 SSDs
Product Guide

The ThinkSystem Kioxia CM6-R Entry NVMe PCIe 4.0 x4 solid-state drives (SSDs) in capacities up to 7.68 TB are advanced data center SSDs optimized for read-intensive 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.

Figure 1. ThinkSystem Kioxia CM6-R Entry NVMe PCIe 4.0 x4 SSD

Did you know?

The Kioxia CM6 drives have a PCIe 4.0 (Gen 4) host interface, where sequential performance is doubled over the PCIe 3.0 host interface. The drives are also fully compatible with a PCIe 3.0 host interface providing optimal performance and enabling compatibility across server families.

NVMe (Non-Volatile Memory Express) is a technology that overcomes SAS/SATA SSD performance limitations by optimizing hardware and software to take full advantage of flash technology. The use of NVMe drives means data is transferred more efficiently from the processor to the drives compared to the legacy Advance Host Controller Interface (AHCI) stack, thereby reducing latency and overhead. These SSDs connect directly to the processor via the PCIe bus, further reducing latency and TCO.

Part number information

The following table lists the part numbers and feature codes for ThinkSystem servers.

Table 1. Part numbers and feature codes for ThinkSystem

Part number	Feature code	Description
2.5-inch drives		
4XB7A64141	BE2G	ThinkSystem U.3 Kioxia CM6-R 3.84TB Entry NVMe PCIe 4.0 x4 Hot Swap SSD
4XB7A64142	BE2H	ThinkSystem U.3 Kioxia CM6-R 7.68TB Entry NVMe PCIe 4.0 x4 Hot Swap SSD

The part numbers include the following items:

- One 2.5-inch solid-state drive installed in a hot-swap tray
- Documentation

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 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 Kioxia CM6-R Entry NVMe SSDs have the following features:

- 2.5-inch NVMe (U.3, which is backward compatible with U.2) hot-swap drive tray
- Based on the Kioxia KCM61RUL drives (formerly Toshiba)
- 96-layer BiCS FLASH 3D TLC memory
- 1 drive-write-per-day (DWPD) SSD for read-intensive workloads
- PCIe 4.0 x4 host connection for each NVMe drive, resulting in up to 6.9 GBps overall throughput.
- Full Power-Loss-Protection and End-to-End Data Protection
- Low power consumption (maximum 20 W)

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, 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 3.84TB 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.

Technical specifications

The following table presents technical specifications for the ThinkSystem Kioxia CM6-R Entry NVMe SSDs.

Table 2. Technical specifications

Feature	3.84 TB drive	7.68 TB drive
Host interface	PCIe 4.0 x4	PCIe 4.0 x4
Capacity	3.84 TB	7.68 TB
SED encryption	None	None
Endurance (total bytes written)	7,008 TB	14,016 TB
Endurance (drive writes per day for 5 years)	1.0 DWPD	1.0 DWPD
Data reliability (UBER)	< 1 in 10^{17} bits read	< 1 in 10^{17} bits read
MTBF	2,500,000 hours	2,500,000 hours
IOPS reads (4 KB blocks, PCIe 4.0)	1,400,000	1,400,000
IOPS writes (4 KB blocks, PCIe 4.0)	170,000	170,000
Sequential read rate (128 KB blocks, PCIe 4.0)	6900 MBps	6900 MBps
Sequential write rate (128 KB blocks, PCIe 4.0)	4200 MBps	4000 MBps
Latency (random read)	90 µs	90 µs
Latency (random write)	20 µs	20 µs
Maximum power	19 W	20 W

Server support

The following tables list the ThinkSystem servers that are compatible.

Table 3. Server support (Part 1 of 2)

Part Number	Description	Edge		1S Intel V2			2S Intel V2				AMD				Dense V2				4S V2		8S
		SE350 (7Z46 / 7D1X)	SE450 (7D8T)	ST50 V2 (7D8K / 7D8J)	ST250 V2 (7D8G / 7D8F)	SR250 V2 (7D7R / 7D7Q)	ST650 V2 (7Z75 / 7Z74)	SR630 V2 (7Z70 / 7Z71)	SR650 V2 (7Z72 / 7Z73)	SR670 V2 (7Z22 / 7Z23)	SR635 (7Y98 / 7Y99)	SR655 (7Y00 / 7Z01)	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)
4XB7A64141	ThinkSystem U.3 Kioxia CM6-R 3.84TB Entry NVMe PCIe 4.0 x4 Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N
4XB7A64142	ThinkSystem U.3 Kioxia CM6-R 7.68TB Entry NVMe PCIe 4.0 x4 Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N

Table 4. Server support (Part 2 of 2)

Part Number	Description	1S Intel V1				2S Intel V1								Dense V1				4S V1		
		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)	SR850 (7X18 / 7X19)	SR850P (7D2F / 2D2G)	SR860 (7X69 / 7X70)
4XB7A64141	ThinkSystem U.3 Kioxia CM6-R 3.84TB Entry NVMe PCIe 4.0 x4 Hot Swap SSD	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N
4XB7A64142	ThinkSystem U.3 Kioxia CM6-R 7.68TB Entry NVMe PCIe 4.0 x4 Hot Swap SSD	N	N	N	N	N	N	N	N	N	Y	Y	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 Kioxia CM6-R drives 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). 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 table lists the supported operating systems.

Tip: This table is automatically generated based on data from Lenovo ServerProven.

Table 5. Operating system support for ThinkSystem U.3 Kioxia CM6-R 3.84TB Entry NVMe PCIe 4.0 x4 Hot Swap SSD, 4XB7A64141

Operating systems	SR645	SR665	SR630 (Gen 2)	SR650 (Gen 2)	SR630 (Gen 1)	SR650 (Gen 1)
Microsoft Windows Server 2016	Y	Y	Y	Y	Y	Y
Microsoft Windows Server 2019	Y	Y	Y	Y	Y	Y
Microsoft Windows Server 2022	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 6.10	N	N	N	N	Y	Y
Red Hat Enterprise Linux 6.9	N	N	N	N	Y	Y
Red Hat Enterprise Linux 7.3	N	N	N	N	Y	Y
Red Hat Enterprise Linux 7.4	N	N	N	N	Y	Y
Red Hat Enterprise Linux 7.5	N	N	N	N	Y	Y
Red Hat Enterprise Linux 7.6	Y [1]	Y [9]	Y	Y	Y	Y
Red Hat Enterprise Linux 7.7	Y [2]	Y [2]	Y	Y	Y	Y
Red Hat Enterprise Linux 7.8	Y [3]	Y [3]	Y	Y	Y	Y
Red Hat Enterprise Linux 7.9	Y [4]	Y [4]	Y	Y	Y	Y
Red Hat Enterprise Linux 8.0	N	N	Y	Y	Y	Y
Red Hat Enterprise Linux 8.1	Y [5]	Y [5]	Y	Y	Y	Y
Red Hat Enterprise Linux 8.2	Y [6]	Y [6]	Y	Y	Y	Y
Red Hat Enterprise Linux 8.3	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.4	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.5	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 8.6	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 9.0	Y	Y	Y	Y	Y	Y

Operating systems	SR645	SR665	SR630 (Gen 2)	SR650 (Gen 2)	SR630 (Gen 1)	SR650 (Gen 1)
SUSE Linux Enterprise Server 11 SP4	N	N	N	N	Y	Y
SUSE Linux Enterprise Server 11 SP4 with Xen	N	N	N	N	Y	Y
SUSE Linux Enterprise Server 12 SP2	N	N	N	N	Y	Y
SUSE Linux Enterprise Server 12 SP2 with Xen	N	N	N	N	Y	Y
SUSE Linux Enterprise Server 12 SP3	N	N	N	N	Y	Y
SUSE Linux Enterprise Server 12 SP3 with Xen	N	N	N	N	Y	Y
SUSE Linux Enterprise Server 12 SP4	N	N	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP4 with Xen	N	N	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP5	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 12 SP5 with Xen	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15	N	N	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP1	Y [7]	Y [7]	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP1 with Xen	Y [8]	Y [8]	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP2	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP2 with Xen	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP3	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP3 with Xen	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP4	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 SP4 with Xen	Y	Y	Y	Y	Y	Y
SUSE Linux Enterprise Server 15 with Xen	N	N	Y	Y	Y	Y
Ubuntu 22.04 LTS	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 7.0 U3	Y	Y	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 8.0	Y	Y	Y	Y	Y	Y

[1] RHEL7.6 Not support with EPYC 7003 processors

[2] RHEL7.7 Not support with EPYC 7003 processors

[3] RHEL7.8 Not support with EPYC 7003 processors

[4] RHEL7.9 Not support with EPYC 7003 processors

[5] RHEL8.1 Not support with EPYC 7003 processors

[6] RHEL8.2 Not support with EPYC 7003 processors

[7] SLES15 SP1 Not support with EPYC 7003 processors

[8] SLES15 SP1 Xen Not support with EPYC 7003 processors

[9] RHEL7.6 Not support with EPYC 7003 processors.

Warranty

The ThinkSystem Kioxia CM6-R Entry NVMe 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 ThinkSystem Kioxia CM6-R Entry NVMe 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: 130 g (5.3 oz)

Operating environment

The ThinkSystem Kioxia CM6-R Entry NVMe SSDs are supported in the following environment:

- Temperature:
    - Operating: 0 to 70 °C (32 to 158 °F)
    - Transport: -40 to 80 °C (-40 to 176 °F)
- Relative humidity: 5 to 95% (non-condensing)
- Maximum altitude:
    - Operating: 5,486 m (18,000 ft)
    - Non-operating: 12,192 m (40,000 ft)
- Shock: 1,000 G (Max) at 0.5 ms
- Vibration: 2.17 G_{RMS} (5-800 Hz)

Agency approvals

The ThinkSystem Kioxia CM6-R Entry NVMe SSDs conform to the following regulations:

- Underwriters Laboratories: UL60950-1
- Canada: CAN/CSA-C22.2 No.60950-1
- TUV: EN 60950-1
- BSMI (Taiwan): CNS 13438 (CISPR Pub. 22 Class B): D33003
- MSIP: KN22, KN24 (CISPR Pub. 22 Class B)
- Australia/New Zealand: AS/NZS CISPR32:2015 Class B
- Canada: ICES-003 Issue 6 Class B
- EMC: EN55022 (2015) Class B
- EMC: EN55035 (2017)
- RoHS 2011/65/EU: EN50581 (2012) Category 3

Related publications and links

For more information, see the following documents:

- Lenovo ThinkSystem SSD Portfolio
  https://lenovopress.com/lp1261-lenovo-thinksystem-ssd-portfolio
- Lenovo ThinkSystem storage options product web page
  https://lenovopress.com/lp0761-storage-options-for-thinksystem-servers
- Kioxia product page for the CM6-R product family:
  https://business.kioxia.com/en-us/ssd/enterprise-ssd/cm6-r.html

Related product families

Product families related to this document are the following:

- Drives

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