

ThinkSystem PM1643 Capacity/Entry SAS 12Gb SSDs Product Guide (withdrawn product)

The ThinkSystem PM1643 Capacity SAS 12Gb solid-state drives (SSDs) are next-generation high-capacity SSDs suitable for a wide range of applications. The PM1643 Capacity SAS SSDs are designed for dense storage and with a 12 Gb SAS interface, these drives feature all the capacity and performance that is needed to replace large numbers of 15K rpm and 10K rpm spinning disks, and consolidate storage into tightly packed server configurations.

The PM1643 SSDs are the follow-on to the PM1633a SSDs and offer significantly improved performance, both for random and sequential workloads.



Figure 1. ThinkSystem PM1643 Capacity SAS 12Gb SSDs

Did you know?

Capacity SSDs are a category of cost-effective high-capacity SSDs where it makes sense to store all of your data on the SSDs, and not use the SSDs only for caching or indexes. Unlike SATA drives, the 12 Gb/s SAS interface on these drives supports full duplex data transfer for higher performance, as well as dual port connectivity and enterprise-level error recovery for better availability.

Part number information

Withdrawn: All drives listed in this product guide are now withdrawn from marketing.

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

Table 1. Ordering part numbers and feature codes - ThinkSystem

Part number	Feature code	Description
2.5-inch hot-swap drives		
4XB7A17168	B6TL	ThinkSystem 2.5" PM1643 960GB Entry SAS 12Gb Hot Swap SSD
4XB7A13645	B4A7	ThinkSystem 2.5" PM1643 3.84TB Capacity SAS 12Gb Hot Swap SSD
4XB7A13646	B4A6	ThinkSystem 2.5" PM1643 7.68TB Capacity SAS 12Gb Hot Swap SSD
3.5-inch hot-swap drives		
4XB7A13649	B4A8	ThinkSystem 3.5" PM1643 3.84TB Capacity SAS 12Gb Hot Swap SSD

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

Table 2. Ordering part numbers and feature codes - System x

Part number	Feature code	Description
2.5-inch hot-swap drives with G3HS tray		
4XB7A13665	B4A9	PM1643 3.84TB Enterprise Capacity 12Gb SAS G3HS 2.5" SSD

The part numbers include the following items:

- One solid-state drive (HS parts include a hot-swap tray)
- Documentation flyer

Features

The ThinkSystem PM1643 Capacity SAS SSDs have the following features:

- High capacity server SSD suitable for read-intensive workloads
- Based on Samsung 64-layer V-NAND technology and TLC flash memory
- Endurance of 1 drive-write per day (DWPD) over 5 years
- 2.5-inch or 3.5-inch industry standard form factor with hot-swap tray
- SAS 12 Gbps interface
- Active-active dual port host interface
- 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)
- End-to-end data protection
- Support 16 Initiator with Tag Command Queuing (TCQ) Command Set with a queue-depth of up to 128 commands
- Compliant with SCSI Specification (SAS-3 / SPL-3 / SBC-4 / SPC-4 / SAM-5)
- RoHS Compliant

Enterprise Capacity SSDs have similar read and write IOPS performance and similar endurance to Entry SSDs, however, the key difference is density - the total amount of storage in each 2.5-inch drive. With large configurations, more storage can be installed internal to the server, changing the need for external JBOD connections thereby saving power and rack space.

SSD write endurance is typically measured by the number of program/erase (P/E) 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.

For example, the 3.84 TB PM1643 drive has an endurance of 7 PB 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 tables present technical specifications for the PM1643 Capacity and PM1643 Entry SSDs.

Table 3. Technical specifications

Feature	960 GB drive	3.84 TB drive	7.68 TB drive	15.36 TB drive*	30.72 TB drive*
Interface	12 Gbps SAS	12 Gbps SAS	12 Gbps SAS	12 Gbps SAS	12 Gbps SAS
Capacity	960 GB	3.84 TB	7.68 TB	15.36 TB	30.72 TB
Endurance (drive writes per day for 5 years)	1 DWPD	1 DWPD	1 DWPD	1 DWPD	1 DWPD
Endurance (total bytes written)	1,752 TB	7,008 TB	14,016 TB	28,032 TB	56,064 TB
Data reliability (UBER)	< 1 in 10 ¹⁷ bits read	< 1 in 10 ¹⁷ bits read	< 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	2,000,000 hours	2,000,000 hours
IOPS reads (4 KB blocks)	230,000	230,000	230,000	230,000	230,000
IOPS writes (4 KB blocks)	30,000	40,000	40,000	40,000	25,000
Sequential read rate (128 KB blocks)	1,000 MBps	1,000 MBps	1,000 MBps	1,000 MBps	1,000 MBps
Sequential write rate (128 KB blocks)	1,000 MBps	1,000 MBps	1,000 MBps	950 MBps	750 MBps
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	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)	20 G _{RMS} (10- 2000 Hz)	20 G _{RMS} (10- 2000 Hz)
Typical power (R / W)	9 W / 9 W	9 W / 9 W	9 W / 9 W	9 W / 9 W	9 W / 9 W

* The 15TB and 30TB drives are available via Special Bid.

Server support - ThinkSystem

The following tables list the ThinkSystem servers that are compatible.

Table 4. Server support - ThinkSystem (Part 1 of 4)

Part Number	Description	AMD V3				2S Intel V3/V4						4S 8S Intel V3		Multi Node V3/V4		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)	SR630 V4 (7DG8 / 7DG9)	SR650 V4 (7DGC / 7DGD)	SR650a V4 (7DGC / 7DGD)	SR850 V3 (7D97 / 7D96)	SR860 V3 (7D94 / 7D93)	SR950 V3 (7DC5 / 7DC4)	SD535 V3 (7DD8 / 7DD1)	SD530 V3 (7DDA / 7DD3)	SD550 V3 (7DD9 / 7DD2)	ST45 V3 (7DH4 / 7DH5)	ST50 V3 (7DF4 / 7DF3)	ST250 V3 (7DCF / 7DCE)	SR250 V3 (7DCM / 7DCL)
2.5-inch hot-swap drives																					
4XB7A17168	ThinkSystem 2.5" PM1643 960GB Entry SAS 12Gb Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
4XB7A13645	ThinkSystem 2.5" PM1643 3.84TB Capacity SAS 12Gb Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
4XB7A13646	ThinkSystem 2.5" PM1643 7.68TB Capacity SAS 12Gb Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
3.5-inch hot-swap drives																					
4XB7A13649	ThinkSystem 3.5" PM1643 3.84TB Capacity SAS 12Gb Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	

Table 5. Server support - ThinkSystem (Part 2 of 4)

Part Number	Description	GPU Rich					Edge					Super Computing							
		SR670 V2 (7Z22 / 7Z23)	SR675 V3 (7D9Q / 7D9R)	SR680a V3 (7DHE)	SR685a V3 (7DHC)	SR780a V3 (7DJ5)	SE100 (7DGR)	SE350 (7Z46 / 7D1X)	SE350 V2 (7DA9)	SE360 V2 (7DAM)	SE450 (7D8T)	SE455 V3 (7DBY)	SC750 V4 (7DDJ)	SC777 V4 (7DKA)	SD665 V3 (7D9P)	SD665-N V3 (7DAZ)	SD650 V3 (7D7M)	SD650-I V3 (7D7L)	SD650-N V3 (7D7N)
2.5-inch hot-swap drives																			
4XB7A17168	ThinkSystem 2.5" PM1643 960GB Entry SAS 12Gb Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A13645	ThinkSystem 2.5" PM1643 3.84TB Capacity SAS 12Gb Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A13646	ThinkSystem 2.5" PM1643 7.68TB Capacity SAS 12Gb Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
3.5-inch hot-swap drives																			
4XB7A13649	ThinkSystem 3.5" PM1643 3.84TB Capacity SAS 12Gb Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Table 6. Server support - ThinkSystem (Part 3 of 4)

Part Number	Description	1S Intel V2		2S Intel V2		AMD V1				Dense V2		4S V2	8S						
		ST50 V2 (7D8K / 7D8J)	ST250 V2 (7D8G / 7D8F)	SR250 V2 (7D7R / 7D7Q)	ST650 V2 (7Z75 / 7Z74)	SR630 V2 (7Z70 / 7Z71)	SR650 V2 (7Z72 / 7Z73)	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																			
4XB7A17168	ThinkSystem 2.5" PM1643 960GB Entry SAS 12Gb Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4XB7A13645	ThinkSystem 2.5" PM1643 3.84TB Capacity SAS 12Gb Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y
4XB7A13646	ThinkSystem 2.5" PM1643 7.68TB Capacity SAS 12Gb Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y
3.5-inch hot-swap drives																			
4XB7A13649	ThinkSystem 3.5" PM1643 3.84TB Capacity SAS 12Gb Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N

Table 7. Server support - ThinkSystem (Part 4 of 4)

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																				
4XB7A17168	ThinkSystem 2.5" PM1643 960GB Entry SAS 12Gb Hot Swap SSD	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	Y	N	N	N
4XB7A13645	ThinkSystem 2.5" PM1643 3.84TB Capacity SAS 12Gb Hot Swap SSD	Y	Y	Y	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y
4XB7A13646	ThinkSystem 2.5" PM1643 7.68TB Capacity SAS 12Gb Hot Swap SSD	Y	Y	Y	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y
3.5-inch hot-swap drives																				
4XB7A13649	ThinkSystem 3.5" PM1643 3.84TB Capacity SAS 12Gb Hot Swap SSD	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N

Server support - System x

The following tables list the System x servers that are compatible with the PM1643 Capacity SSDs.

Support for System x and dense servers with Xeon E5/E7 v4 and E3 v5 processors

Table 8. Support for System x and dense servers with Xeon E5/E7 v4 and E3 v5 processors

Part number	Description	x3250 M6 (3943)	x3250 M6 (3633)	x3550 M5 (8869)	x3650 M5 (8871)	x3850 X6/x3950 X6 (6241, E7 v4)	nx360 M5 (5465, E5 v4)	sd350 (5493)
4XB7A13665	PM1643 3.84TB Enterprise Capacity 12Gb SAS G3HS 2.5" SSD	N	N	N	Y	Y	N	N

Support for System x and dense servers with Intel E5 v3 and E3 v3 processors

Table 9. Support for servers with Intel Xeon v3 processors

Part number	Description	x3100 M5 (5457)	x3250 M5 (5458)	x3500 M5 (5464)	x3550 M5 (5463)	x3650 M5 (5462)	x3850 X6/x3950 X6 (6241, E7 v3)	nx360 M5 (5465, E5 v3)
4XB7A13665	PM1643 3.84TB Enterprise Capacity 12Gb SAS G3HS 2.5" SSD	N	N	N	N	N	N	N

Server support - Flex System

The PM1643 Capacity SAS 12Gb SSDs are supported in the following Flex System compute nodes.

Tip: The SN550 and SN850 compute nodes are listed in the [ThinkSystem support table](#).

Table 10. Support for Flex System compute nodes

Part number	Description	x240 (8737, E5-2600 v2)	x240 (7162)	x240 M5 (9532, E5-2600 v3)	x240 M5 (9532, E5-2600 v4)	x440 (7167)	x880/x480/x280 X6 (7903)	x280/x480/x880 X6 (7196)
4XB7A13665	PM1643 3.84TB Enterprise Capacity 12Gb SAS G3HS 2.5" SSD	N	N	N	N	N	N	N

Operating system support

SAS and SATA SSDs operate transparently to users, storage systems, applications, databases, and operating systems.

Operating system support is based on the controller used to connect to the drives. Consult the controller product guide for more information:

- RAID controllers: <https://lenovopress.com/servers/options/raid>
- SAS HBAs: <https://lenovopress.com/servers/options/hba>

Warranty

The PM1643 Capacity SAS 12Gb 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 PM1643 Capacity SAS 12Gb SSDs have the following physical specifications:

Dimensions and weight (approximate, without the hot-swap tray, if applicable):

- Height: 15 mm (0.6 in.)
- Width: 70 mm (2.8 in.)
- Depth: 100 mm (4.0 in.)
- Weight: 158 g (5.6 oz)

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

- Height: 63 mm (2.5 in.)
- Width: 133 mm (5.2 in.)
- Depth: 174 mm (6.9 in.)

Shipping dimensions and weight for the 3.5-inch drives (approximate):

- Height: 95 mm (3.7 in.)
- Width: 194 mm (7.6 in.)
- Depth: 257 mm (10.0 in.)

Operating environment

The PM1643 Capacity SAS 12Gb SSDs are supported in the following environment:

- Temperature, operating: 0 - 70 °C (32 - 158 °F)
- Temperature, non-operating: -40 to 85 °C (-40 - 185 °F)
- Relative humidity: 5 - 95% (noncondensing)
- Maximum altitude: -300 - 4,572 m (-1,000 to 15,000 feet)

Agency approvals

The PM1643 Capacity SAS 12Gb SSDs conform to the following regulations:

- UL
- TUV
- FCC
- IC
- CB
- CE Mark
- C-Tick Mark
- BSMI (Taiwan)
- KCC (Korea EMI)
- VCCI

Related publications and links

For more information, see the following documents:

- Lenovo Press product guides and papers on RAID adapters and HBAs
<https://lenovopress.com/servers/options/raid>
- Lenovo RAID Management Tools and Resources
<https://lenovopress.com/lp0579-lenovo-raid-management-tools-and-resources>
- Lenovo RAID Introduction
<https://lenovopress.com/lp0578-lenovo-raid-introduction>

Related product families

Product families related to this document are the following:

- [Drives](#)

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This document, LP0929, was created or updated on July 21, 2021.

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