SAS MLC Enterprise SSDs for System x
Product Guide (withdrawn product)

The SAS MLC Enterprise solid-state drives (SSDs) for System x® employ MLC NAND technology to provide an affordable, but performance-driven solution for applications requiring enterprise workloads with a mix of read/write operations. These industry standard 2.5-inch and 3.5-inch form factor SSDs use a single-chip controller with a SAS interface on the system side and 16 channels of NAND flash internally. They provide outstanding performance, endurance, reliability, and energy efficiency for random read- and write-intensive enterprise workloads such as databases, data warehouses, corporate email and collaboration, actively connected users, caching and tiering applications, and others.

Figure 1 shows the SAS 2.5-inch MLC Enterprise SSD.

Figure 1. SAS 2.5-inch MLC Enterprise SSD

Did you know?

With SanDisk FlashGuard protection, SAS MLC Enterprise SSDs can be fully rewritten up to ten times per day throughout their entire five-year life expectancy. Unlike SATA drives, the SAS interface supports full duplex data transfer for higher performance, as well as dual port connectivity and enterprise-level error recovery for better availability.

Rigorous testing of SAS Enterprise MLC SSDs by Lenovo through the ServerProven® program assures a high degree of confidence in storage subsystem compatibility and reliability. Providing additional peace of mind, these drives are covered under warranty.

Part number information

The following table lists the information for ordering part numbers and feature codes.

> **Withdrawn**: All drives listed here are now withdrawn from marketing

Table 1. Ordering part numbers and feature codes

Part number	Feature code	Description
2.5-inch hot-swap drives with G3HS trays		
00AJ207	A4UA	200GB SAS 2.5" MLC G3HS Enterprise SSD
00AJ212	A4UB	400GB SAS 2.5" MLC G3HS Enterprise SSD
00AJ217	A4UC	800GB SAS 2.5" MLC G3HS Enterprise SSD
00AJ222	A4UD	1.6TB SAS 2.5" MLC G3HS Enterprise SSD
2.5-inch hot-swap drives with G2HS trays		
49Y6129	A3EW	200GB SAS 2.5" MLC HS Enterprise SSD
49Y6134	A3EY	400GB SAS 2.5" MLC HS Enterprise SSD
49Y6139	A3F0	800GB SAS 2.5" MLC HS Enterprise SSD
49Y6195	A4GH	1.6TB SAS 2.5" MLC HS Enterprise SSD
2.5-inch simple-swap drives		
49Y6144	A3EX	200GB SAS 2.5" MLC SS Enterprise SSD
49Y6149	A3EZ	400GB SAS 2.5" MLC SS Enterprise SSD
49Y6154	A3F1	800GB SAS 2.5" MLC SS Enterprise SSD
49Y6200	A4GJ	1.6TB SAS 2.5" MLC SS Enterprise SSD
3.5-inch hot-swap drives		
00W1306	A3HT	200GB SAS 3.5" MLC HS Enterprise SSD
00W1311	A4N8	400GB SAS 3.5" MLC HS Enterprise SSD
00W1316	A4N9	800GB SAS 3.5" MLC HS Enterprise SSD

The part numbers for the SSDs include the following items:

- One SSD with either a hot-swap or simple-swap tray, depending on the part number
- Technical Update Flyer
- Warranty Flyer
- *Important Notices* document

Figure 2 shows the SAS 3.5-inch MLC Enterprise SSD.

Figure 2. SAS 3.5-inch MLC Enterprise SSD

Features

The SAS MLC Enterprise SSDs have the following features:

- Industry standard 2.5-inch or 3.5-inch drive form factor
- Utilizes 19 nm MLC NAND technology
- Cost-effective MLC SAS drive with high read and write performance to fulfill client needs in the enterprise space
- High endurance, with up to 29.2 PB of total bytes written (TBW) to withstand applications with intensive read/write workloads
- Energy saving, with as little as 7 watt power consumption per drive
- Absence of moving parts to reduce potential failure points in the server
- S.M.A.R.T. support
- Advanced Encrypting Standard (AES) 256-bit encryption
- FlashGuard technology extends the native endurance of commercial-grade MLC flash
  - Aggregated Flash Management
  - Advanced Signal Processing
  - Enhanced Error Correction
- DataGuard technology protects against data corruption and loss
  - Full data path protection
  - Flexible Redundant Array of Memory Elements (F.R.A.M.E.) data recovery algorithm
- EverGuard technology protects data in the event of unplanned power outages
- Static wear leveling evenly distributes data across the drive
- Bad block management replaces failed blocks with new ones from the spare pool
- Thermal throttling to extend the life of the drive
- Data retention management to ensure availability and integrity of stored data
- Minimal write amplification for efficient flash utilization and extended lifetime

The key difference between Enterprise SSDs such as the SAS MLC Enterprise SSDs and other SSDs is their endurance (or life expectancy). SSDs have a huge but finite number of program/erase (P/E) cycles, which affects how long they can perform write operations and thus their life expectancy. Enterprise SSDs have significantly better endurance but higher cost/IOPS ratio compared to Enterprise Value SSDs. SSD write endurance is typically measured by the number of program/erase cycles that the drive can incur over its lifetime, listed as 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 will not fail upon reaching the specified TBW, but at some point after surpassing the TBW value (and based on manufacturing variance margins), the drive will reach the end-of-life point, at which time the drive will go 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 will not be exceeded prior to the required life expectancy.

For example, with SAS MLC Enterprise SSDs, the entire drive can be fully re-written up to ten times per day to meet the five-year lifetime expectation of the drive, while Enterprise Entry SSDs can sustain less than 1 full-drive write per day to provide the same five-year lifetime.

Technical specifications

The following table lists the technical specifications for the SAS MLC Enterprise solid-state drives.

Table 2. Technical specifications

Specification	200 GB drive	400 GB drive	800 GB drive	1.6 TB drive
Part number & form factor	00AJ207 - 2.5" G3HS 49Y6129 - 2.5" G2HS 49Y6144 - 2.5" SS 00W1306 - 3.5" HS	00AJ212 - 2.5" G3HS 49Y6134 - 2.5" G2HS 49Y6149 - 2.5" -SS 00W1311 - 3.5" HS	00AJ217 - 2.5" G3HS 49Y6139 - 2.5" G2HS 49Y6154 - 2.5" SS 00W1316 - 3.5" HS	00AJ222 - 2.5" G3HS 49Y6195 - 2.5" G2HS 49Y6200 - 2.5" SS
Interface	6 Gbps SAS	6 Gbps SAS	6 Gbps SAS	6 Gbps SAS
Capacity	200 GB	400 GB	800 GB	1.6 TB
Endurance (drive writes per day)	10 DWPD	10 DWPD	10 DWPD	10 DWPD
Endurance (total bytes written)*	3.65 PB	7.3 PB	14.6 PB	29.2 PB
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
MTBF	> 2,500,000 hours	> 2,500,000 hours	> 2,500,000 hours	> 2,500,000 hours
IOPS read (4 KB blocks)	95,000	95,000	95,000	95,000
IOPS write (4 KB blocks)	40,000	40,000	40,000	40,000
Sequential read rate (128 KB blocks)	550 MBps	550 MBps	550 MBps	550 MBps
Sequential write rate (128 KB blocks)	380 MBps	540 MBps	540 MBps	540 MBps
Access time	< 0.1 ms	< 0.1 ms	< 0.1 ms	< 0.1 ms
Shock	1000 g, 0.5 ms	1000 g, 0.5 ms	1000 g, 0.5 ms	1000 g, 0.5 ms
Vibration	2.17 g_{RMS} 7-800 Hz	2.17 g_{RMS} 7-800 Hz	2.17 g_{RMS} 7-800 Hz	2.17 g_{RMS} 7-800 Hz
Typical power	7 W	7 W	7 W	7 W

* over a 5-year period

Server support

The SAS MLC Enterprise SSDs can be installed in the servers listed in the following tables.

Support for servers with Intel Xeon v3 processors

Table 3. 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)
00AJ207	200GB SAS 2.5" MLC G3HS Enterprise SSD	N	N	Y	Y	Y	Y	N
00AJ212	400GB SAS 2.5" MLC G3HS Enterprise SSD	N	N	Y	Y	Y	Y	N
00AJ217	800GB SAS 2.5" MLC G3HS Enterprise SSD	N	N	Y	Y	Y	Y	N
00AJ222	1.6TB SAS 2.5" MLC G3HS Enterprise SSD	N	N	Y	Y	Y	Y	N
49Y6129	200GB SAS 2.5" MLC HS Enterprise SSD	Y	N	N	N	N	N	N
49Y6134	400GB SAS 2.5" MLC HS Enterprise SSD	Y	N	N	N	N	N	N
49Y6139	800GB SAS 2.5" MLC HS Enterprise SSD	Y	N	N	N	N	N	N
49Y6195	1.6TB SAS 2.5" MLC HS Enterprise SSD	N	N	N	N	N	N	N
49Y6144	200GB SAS 2.5" MLC SS Enterprise SSD	N	N	N	N	N	N	N
49Y6149	400GB SAS 2.5" MLC SS Enterprise SSD	N	N	N	N	N	N	N
49Y6154	800GB SAS 2.5" MLC SS Enterprise SSD	N	N	N	N	N	N	N
49Y6200	1.6TB SAS 2.5" MLC SS Enterprise SSD	N	N	N	N	N	N	N
00W1306	200GB SAS 3.5" MLC HS Enterprise SSD	N	N	N	N	N	N	N
00W1311	400GB SAS 3.5" MLC HS Enterprise SSD	N	N	N	N	N	N	N
00W1316	800GB SAS 3.5" MLC HS Enterprise SSD	N	N	N	N	N	N	N

Support for servers with Intel Xeon v2 processors

Table 4. Support for servers with Intel Xeon v2 processors

Part number	Description	x3500 M4 (7383, E5-2600 v2)	x3530 M4 (7160, E5-2400 v2)	x3550 M4 (7914, E5-2600 v2)	x3630 M4 (7158, E5-2400 v2)	x3650 M4 (7915, E5-2600 v2)	x3650 M4 BD (5466)	x3650 M4 HD (5460)	x3750 M4 (8752)	x3750 M4 (8753)	x3850 X6/x3950 X6 (3837)	x3850 X6/x3950 X6 (6241, E7 v2)	dx360 M4 (E5-2600 v2)	nx360 M4 (5455)
00AJ207	200GB SAS 2.5" MLC G3HS Enterprise SSD	N	N	N	N	N	N	N	N	N	Y	Y	N	N
00AJ212	400GB SAS 2.5" MLC G3HS Enterprise SSD	N	N	N	N	N	N	N	N	N	Y	Y	N	N
00AJ217	800GB SAS 2.5" MLC G3HS Enterprise SSD	N	N	N	N	N	N	N	N	N	Y	Y	N	N
00AJ222	1.6TB SAS 2.5" MLC G3HS Enterprise SSD	N	N	N	N	N	N	N	N	N	Y	Y	N	N
49Y6129	200GB SAS 2.5" MLC HS Enterprise SSD	Y	Y	Y	N	Y	N	Y	Y	Y	N	N	N	N
49Y6134	400GB SAS 2.5" MLC HS Enterprise SSD	Y	Y	Y	N	Y	N	Y	Y	Y	N	N	N	N
49Y6139	800GB SAS 2.5" MLC HS Enterprise SSD	Y	Y	Y	N	Y	N	Y	Y	Y	N	N	N	N
49Y6195	1.6TB SAS 2.5" MLC HS Enterprise SSD	Y	Y	Y	N	Y	N	Y	Y	Y	N	N	N	N
49Y6144	200GB SAS 2.5" MLC SS Enterprise SSD	N	Y	N	N	N	N	N	N	N	N	N	N	N
49Y6149	400GB SAS 2.5" MLC SS Enterprise SSD	N	Y	N	N	N	N	N	N	N	N	N	Y	N
49Y6154	800GB SAS 2.5" MLC SS Enterprise SSD	N	Y	N	N	N	N	N	N	N	N	N	Y	N
49Y6200	1.6TB SAS 2.5" MLC SS Enterprise SSD	N	Y	N	N	N	N	N	N	N	N	N	Y	N
00W1306	200GB SAS 3.5" MLC HS Enterprise SSD	N	N	N	Y	N	N	N	N	N	N	N	N	N
00W1311	400GB SAS 3.5" MLC HS Enterprise SSD	N	N	N	Y	N	N	N	N	N	N	N	N	N
00W1316	800GB SAS 3.5" MLC HS Enterprise SSD	N	N	N	Y	N	N	N	N	N	N	N	N	N

Support for servers with Intel Xeon v1 processors

Table 5. Support for servers with Intel Xeon v1 processors

Part number	Description	x3100 M4 (2582)	x3250 M4 (2583)	x3300 M4 (7382)	x3500 M4 (7383, E5-2600)	x3530 M4 (7160, E5-2400)	x3550 M4 (7914, E5-2600)	x3630 M4 (7158, E5-2400)	x3650 M4 (7915, E5-2600)	x3690 X5 (7147)	x3750 M4 (8722)	x3850 X5 (7143)	dx360 M4 (7912, E5-2600)
00AJ207	200GB SAS 2.5" MLC G3HS Enterprise SSD	N	N	N	N	N	N	N	N	N	N	N	N
00AJ212	400GB SAS 2.5" MLC G3HS Enterprise SSD	N	N	N	N	N	N	N	N	N	N	N	N
00AJ217	800GB SAS 2.5" MLC G3HS Enterprise SSD	N	N	N	N	N	N	N	N	N	N	N	N
00AJ222	1.6TB SAS 2.5" MLC G3HS Enterprise SSD	N	N	N	N	N	N	N	N	N	N	N	N
49Y6129	200GB SAS 2.5" MLC HS Enterprise SSD	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N
49Y6134	400GB SAS 2.5" MLC HS Enterprise SSD	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N
49Y6139	800GB SAS 2.5" MLC HS Enterprise SSD	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N
49Y6195	1.6TB SAS 2.5" MLC HS Enterprise SSD	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N
49Y6144	200GB SAS 2.5" MLC SS Enterprise SSD	N	Y	N	N	Y	N	N	N	N	N	N	Y
49Y6149	400GB SAS 2.5" MLC SS Enterprise SSD	N	Y	N	N	Y	N	N	N	N	N	N	Y
49Y6154	800GB SAS 2.5" MLC SS Enterprise SSD	N	Y	N	N	Y	N	N	N	N	N	N	Y
49Y6200	1.6TB SAS 2.5" MLC SS Enterprise SSD	N	Y	N	N	Y	N	N	N	N	N	N	Y
00W1306	200GB SAS 3.5" MLC HS Enterprise SSD	N	N	N	N	N	N	Y	N	N	N	N	N
00W1311	400GB SAS 3.5" MLC HS Enterprise SSD	N	N	N	N	N	N	Y	N	N	N	N	N
00W1316	800GB SAS 3.5" MLC HS Enterprise SSD	N	N	N	N	N	N	Y	N	N	N	N	N

Support for Flex System compute nodes

Table 6. Support for Flex System servers

Part number	Description	x220 (7906)	x222 (7916)	x240 (8737, E5-2600)	x240 (8737, E5-2600 v2)	x240 (7162)	x240 M5 (9532)	x440 (7917)	x440 (7167)	x880/x480/x280 X6 (7903)	x280/x480/x880 X6 (7196)	Storage Expansion Node
00AJ207	200GB SAS 2.5" MLC G3HS Enterprise SSD	N	N	N	N	N	Y	N	N	Y	Y	N
00AJ212	400GB SAS 2.5" MLC G3HS Enterprise SSD	N	N	N	N	N	Y	N	N	Y	Y	N
00AJ217	800GB SAS 2.5" MLC G3HS Enterprise SSD	N	N	N	N	N	Y	N	N	Y	Y	N
00AJ222	1.6TB SAS 2.5" MLC G3HS Enterprise SSD	N	N	N	N	N	Y	N	N	Y	N	N
49Y6129	200GB SAS 2.5" MLC HS Enterprise SSD	Y	N	Y	Y	Y	N	Y	Y	N	N	Y
49Y6134	400GB SAS 2.5" MLC HS Enterprise SSD	Y	N	Y	Y	Y	N	Y	Y	N	N	Y
49Y6139	800GB SAS 2.5" MLC HS Enterprise SSD	Y	N	Y	Y	Y	N	Y	Y	N	N	Y
49Y6195	1.6TB SAS 2.5" MLC HS Enterprise SSD	Y	N	Y	Y	Y	N	Y	Y	N	N	Y
49Y6144	200GB SAS 2.5" MLC SS Enterprise SSD	N	N	N	N	N	N	N	N	N	N	N
49Y6149	400GB SAS 2.5" MLC SS Enterprise SSD	N	N	N	N	N	N	N	N	N	N	N
49Y6154	800GB SAS 2.5" MLC SS Enterprise SSD	N	N	N	N	N	N	N	N	N	N	N
49Y6200	1.6TB SAS 2.5" MLC SS Enterprise SSD	N	N	N	N	N	N	N	N	N	N	N
00W1306	200GB SAS 3.5" MLC HS Enterprise SSD	N	N	N	N	N	N	N	N	N	N	N
00W1311	400GB SAS 3.5" MLC HS Enterprise SSD	N	N	N	N	N	N	N	N	N	N	N
00W1316	800GB SAS 3.5" MLC HS Enterprise SSD	N	N	N	N	N	N	N	N	N	N	N

Support for BladeCenter servers

Table 7. Support for BladeCenter servers

Part number	Description	HS22 (7870)	HS23 (7875, E5-2600)	HS23 (7875, E5-2600 v2)	HS23E (8038)	HX5 (7873)
00AJ207	200GB SAS 2.5" MLC G3HS Enterprise SSD	N	N	N	N	N
00AJ212	400GB SAS 2.5" MLC G3HS Enterprise SSD	N	N	N	N	N
00AJ217	800GB SAS 2.5" MLC G3HS Enterprise SSD	N	N	N	N	N
00AJ222	1.6TB SAS 2.5" MLC G3HS Enterprise SSD	N	N	N	N	N
49Y6129	200GB SAS 2.5" MLC HS Enterprise SSD	Y	Y	Y	Y	N
49Y6134	400GB SAS 2.5" MLC HS Enterprise SSD	Y	Y	Y	Y	N
49Y6139	800GB SAS 2.5" MLC HS Enterprise SSD	Y	Y	Y	Y	N
49Y6195	1.6TB SAS 2.5" MLC HS Enterprise SSD	Y	Y	Y	Y	N
49Y6144	200GB SAS 2.5" MLC SS Enterprise SSD	N	N	N	N	N
49Y6149	400GB SAS 2.5" MLC SS Enterprise SSD	N	N	N	N	N
49Y6154	800GB SAS 2.5" MLC SS Enterprise SSD	N	N	N	N	N
49Y6200	1.6TB SAS 2.5" MLC SS Enterprise SSD	N	N	N	N	N
00W1306	200GB SAS 3.5" MLC HS Enterprise SSD	N	N	N	N	N
00W1311	400GB SAS 3.5" MLC HS Enterprise SSD	N	N	N	N	N
00W1316	800GB SAS 3.5" MLC HS Enterprise SSD	N	N	N	N	N

See the followoing ServerProven® web page for the latest compatibility information:
http://www.lenovo.com/us/en/serverproven/xseries/storage/hssdmatrix.shtml

Storage controller support

The SAS MLC Enterprise SSDs require a supported disk controller. The following tables list the controllers that support these SSDs installed in a supported server.

Controllers supported in servers with Intel Xeon v3 processors

Table 8. Controllers supported in servers with Intel Xeon v3 processors

Part number	Description	x3100 M5 (5457)	x3500 M5 (5464)	x3550 M5 (5463)	x3650 M5 (5462)	x3850 X6/x3950 X6 (6241, E7 v3)
46C9110	ServeRAID M5210 SAS/SATA Controller	N	Y	Y	Y	Y
81Y4481	ServeRAID M5110 SAS/SATA Controller	Y	N	N	N	N
46C9114	ServeRAID M1215 SAS/SATA Controller	N	Y	Y	Y	N
81Y4448	ServeRAID M1115 SAS/SATA Controller	Y	N	N	N	N
81Y4492	ServeRAID H1110 SAS/SATA Controller	Y	N	N	N	N
46C8988	N2115 SAS/SATA HBA	Y	N	N	N	N
47C8675	N2215 SAS/SATA HBA	N	Y	Y	Y	Y

Controllers supported in servers with Intel Xeon v2 processors

Table 9. Controllers supported in servers with Intel Xeon v2 processors

Part number	Description	x3500 M4 (7383, E5-2600 v2)	x3530 M4 (7160, E5-2400 v2)	x3550 M4 (7914, E5-2600 v2)	x3630 M4 (7158, E5-2400 v2)	x3650 M4 (7915, E5-2600 v2)	x3650 M4 HD (5460)	x3750 M4 (8752)	x3750 M4 (8753)	x3850 X6/x3950 X6 (3837)	x3850 X6/x3950 X6 (6241, E7 v2)	dx360 M4 (E5-2600 v2)
Onboard	ServeRAID M5210e SAS/SATA Controller	N	N	N	N	N	Y	Y	Y	N	N	N
46C9110	ServeRAID M5210 SAS/SATA Controller	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y
46C9114	ServeRAID M1215 SAS/SATA Controller	Y	N	Y	N	N	N	N	N	N	N	N
Onboard	ServeRAID M5110e SAS/SATA Controller	N	N	N	N	Y	N	N	N	N	N	N
81Y4481	ServeRAID M5110 SAS/SATA Controller	Y	Y	Y	Y	Y	N	N	N	N	N	Y
81Y4448	ServeRAID M1115 SAS/SATA Controller	Y	Y	Y	Y	N	N	N	N	N	N	Y
81Y4492	ServeRAID H1110 SAS/SATA Controller	N	Y	Y	Y	N	Y	N	N	N	N	Y
46M0912	6Gb Performance Optimized HBA	Y	Y	Y	Y	Y	N	N	N	N	N	Y
46C8988	N2115 SAS/SATA HBA	Y	N	Y	Y	Y	N	N	N	N	N	N
47C8675	N2215 SAS/SATA HBA	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y

Controllers supported in servers with Intel Xeon v1 processors

Table 10. Controllers supported in servers with Intel Xeon v1 processors

Part number	Description	x3100 M4 (2582)	x3250 M4 (2583)	x3300 M4 (7382)	x3500 M4 (7383, E5-2600)	x3530 M4 (7160, E5-2400)	x3550 M4 (7914, E5-2600)	x3630 M4 (7158, E5-2400)	x3650 M4 (7915, E5-2600)	x3690 X5 (7147)	x3750 M4 (8722)	x3850 X5 (7143)	dx360 M4 (7912, E5-2600)
46C9110	ServeRAID M5210 SAS/SATA Controller	N	N	N	Y	N	Y	N	Y	N	N	N	Y
46C9114	ServeRAID M1215 SAS/SATA Controller	N	N	N	Y	N	Y	N	N	N	N	N	N
Onboard	ServeRAID M5110e SAS/SATA Controller	N	N	N	N	N	N	N	Y	N	N	N	N
81Y4481	ServeRAID M5110 SAS/SATA Controller	N	N	Y	Y	Y	Y	Y	Y	N	Y	N	Y
81Y4448	ServeRAID M1115 SAS/SATA Controller	N	N	Y	Y	Y	Y	Y	N	N	N	N	Y
81Y4492	ServeRAID H1110 SAS/SATA Controller	Y	Y	Y	N	Y	Y	Y	N	N	N	N	Y
90Y4304	ServeRAID M5016 SAS/SATA Controller	N	N	N	N	N	N	N	N	Y	N	Y	N
46M0829	ServeRAID M5015 SAS/SATA Controller	Y	Y	N	N	N	N	N	N	Y	N	Y	N
46M0916	ServeRAID M5014 SAS/SATA Controller	Y	Y	N	N	N	N	N	N	Y	N	Y	N
46M0831	ServeRAID M1015 SAS/SATA Controller	Y	Y	N	N	N	N	N	N	Y	N	Y	N
46M0912	6Gb Performance Optimized HBA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
46C8988	N2115 SAS/SATA HBA	N	N	Y	Y	N	Y	Y	Y	N	Y	Y	N
47C8675	N2215 SAS/SATA HBA	N	N	N	Y	N	Y	N	Y	N	N	N	Y

Controllers supported in Flex System compute nodes

Table 11. Controllers supported in Flex System servers

Part number	Description	x220 (7906)	x222 (7916)	x240 (8737, E5-2600)	x240 (8737, E5-2600 v2)	x240 (7162)	x240 M5 (9532)	x440 (7917)	x440 (7167)	x880/x480/x280 X6 (7903)	x280/x480/x880 X6 (7196)
00JX142	ServeRAID M5215 with 2GB Flash Enablement	N	N	N	N	N	Y	N	N	N	N
Onboard	ServeRAID M1210e SAS/SATA Controller	N	N	N	N	N	N	N	N	Y	Y
44T1316	ServeRAID M1200 Series Flex System Flash Kit for X6	N	N	N	N	N	N	N	N	N	Y
44T1178	ServeRAID M5100 Series Flex System Flash Kit for X6*	N	N	N	N	N	N	N	N	N	Y
90Y4390	ServeRAID M5115 SAS/SATA Controller	Y	N	Y	Y	Y	N	Y	Y	N	N
90Y4750	ServeRAID H1135 Controller	Y	N	N	N	N	N	N	N	N	N
Onboard	Integrated SATA Controller (Intel C600 chipset)	N	Y	N	N	N	N	N	N	N	N

Controllers supported in BladeCenter servers

Table 12. Controllers supported in BladeCenter servers

Part number	Description	HS22 (7870)	HS23 (7875, E5-2600)	HS23 (7875, E5-2600 v2)	HS23E (8038)	HX5 (7873)
90Y4750	ServeRAID H1135 Controller	N	N	N	Y	N
Onboard	Integrated LSI SAS2004	N	Y	Y	N	N
Onboard	Integrated LSI SAS1064e	Y	N	N	N	N
46M6908	SSD Expansion Card for BladeCenter HX5	N	N	N	N	Y

See the ServerProven website for the latest information about the adapters supported by each System x server type: http://www.lenovo.com/us/en/serverproven/

Operating system support

Solid-state drives operate transparently to users, storage systems, applications, databases, and operating systems. The controllers that support SSDs are supported by the following operating systems:

- Microsoft Windows Server 2012 R2
- Microsoft Windows Server 2012
- Microsoft Windows Server 2008 R2
- Microsoft Windows Server 2008, Datacenter x64 Edition
- Microsoft Windows Server 2008, Datacenter x86 Edition
- Microsoft Windows Server 2008, Enterprise x64 Edition
- Microsoft Windows Server 2008, Enterprise x86 Edition
- Microsoft Windows Server 2008, Standard x64 Edition
- Microsoft Windows Server 2008, Standard x86 Edition
- Microsoft Windows Server 2008, Web x64 Edition
- Microsoft Windows Server 2008, Web x86 Edition
- Microsoft Windows Server 2008 Foundation
- Microsoft Windows Server 2008 HPC Edition
- Microsoft Windows HPC Server 2008
- Microsoft Windows Small Business Server 2008 Premium Edition
- Microsoft Windows Small Business Server 2008 Standard Edition
- Microsoft Windows Essential Business Server 2008 Premium Edition
- Microsoft Windows Essential Business Server 2008 Standard Edition
- Red Hat Enterprise Linux 7
- Red Hat Enterprise Linux 6 Server Edition
- Red Hat Enterprise Linux 6 Server x64 Edition
- Red Hat Enterprise Linux 5 Server Edition
- Red Hat Enterprise Linux 5 Server Edition with Xen
- Red Hat Enterprise Linux 5 Server with Xen x64 Edition
- Red Hat Enterprise Linux 5 Server x64 Edition
- Red Hat Enterprise Linux 4 AS for AMD64/EM64T
- Red Hat Enterprise Linux 4 AS for x86
- SUSE Linux Enterprise Server 11 for AMD64/EM64T
- SUSE Linux Enterprise Server 11 for x86
- SUSE Linux Enterprise Server 11 with Xen for AMD64/EM64T
- SUSE Linux Enterprise Server 10 for AMD64/EM64T
- SUSE Linux Enterprise Server 10 for x86
- SUSE Linux Enterprise Server 10 with Xen for AMD64/EM64T
- SUSE Linux Enterprise Server 10 with Xen for x86
- VMware vSphere 5.5 (ESXi)
- VMware vSphere 5.1 (ESXi)
- VMware vSphere 5.0 (ESXi)
- VMware ESX 4.1
- VMware ESXi 4.1
- VMware ESX 4.0
- VMware ESXi 4.0

See the ServerProven website for the latest information about the specific versions and service packs supported:
http://www.lenovo.com/us/en/serverproven/xseries/controllers/matrix.shtml

Click the check mark that is associated with the System x server in question to see the details about operating system support.

Warranty

The SAS MLC Enterprise SSDs carry a 1-year, customer-replaceable unit (CRU) limited warranty. When installed in a supported Lenovo server, these drives assume the system's base warranty and any warranty upgrade.

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 SAS MLC Enterprise SSDs have the following physical specifications.

Dimensions and weight (approximate, without the tray):

- Height
  - 200 GB, 400 GB, and 800 GB drives: 9.5 mm (0.4 in.)
  - 1.6 TB drives: 14.8 mm (0.6 in.)
- Width: 70 mm (2.8 in.)
- Depth: 100 mm (3.9 in.)
- Weight: 122 g (0.3 lb)

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

- Height: 63 mm (2.5 in.)
- Width: 174 mm (6.9 in.)
- Depth: 133 mm (5.2 in.)
- Weight: 448 g (1.0 lb)

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

- Height: 95 mm (3.7 in.)
- Width: 257 mm (10.1 in.)
- Depth: 193 mm (7.6 in.)
- Weight: 484 g (1.1 lb)

Operating environment

The SAS MLC Enterprise SSDs are supported in the following environment:

- Temperature: 0 - 70 °C (32 - 158°F)
- Relative humidity: 8 - 85% (noncondensing)
- Maximum altitude: 3,050 m (10,000 ft)

Agency approvals

The SAS MLC Enterprise SSDs have the following agency approvals:

- UL
- CSA
- TUV
- FCC
- EMC
- CE Mark
- C-Tick Mark
- Taiwan (BSMI Certification)
- Korea EMI

Related publications and links

For more information, see the following documents:

- Lenovo product page for Enterprise SSDs
  http://shop.lenovo.com/us/en/systems/servers/options/systemx/storage/solid-state/enterprise/

- US Announcement Letter SAS 2.5-inch G3HS MLC Enterprise SSDs
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS114-031

  US Announcement Letter SAS 3.5-inch MLC Enterprise SSDs
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS113-137

- US Announcement Letter 1.6TB SAS 2.5-inch MLC Enterprise SSDs
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS113-120

- US Announcement Letter 200GB, 400GB, and 800GB SAS 2.5-inch MLC Enterprise SSDs
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS113-024

- ServeRAID Adapter Quick Reference
  http://lenovopress.com/tips0054

- SanDisk product page
  https://www.sandisk.com/business/datacenter/products/flash-devices/ssds/sas-ssd/optimus

- *System x Configuration and Options Guide*
  http://www.ibm.com/systems/xbc/cog/

- ServerProven
  http://www.lenovo.com/us/en/serverproven/

Related product families

Product families related to this document are the following:

- Drives

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