Lenovo Enterprise Capacity Solid State Drives
Product Guide (withdrawn product)

Enterprise Capacity solid-state drives (SSDs) from Lenovo provide high-performance, reliable storage solutions for high-capacity enterprise applications. This new drive type supports highly demanding write workloads and uses a cost-effective 6 Gbps SAS interface and MLC NAND technology. Designed for dense storage, this drive features all of 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 Enterprise Capacity SSD, as shown in Figure 1, is designed to be the primary storage device for read-intensive applications, such as data warehousing, media streaming, web servers, video on demand (VOD), and web-based applications. Users also have the flexibility to use this drive for more write intensive applications because the drive can handle an average daily write workload of nearly 2 TB, which is the equivalent of a 200 GB SSD rated to 10 drive writes per day (DWPD).

Figure 1. Enterprise Capacity SSD

Did you know?

Enterprise Capacity SSDs are a new 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.

Enterprise Capacity SSDs have numerous data integrity features, including circuitry that is designed to ensure that data in transit is committed to flash if there is a power failure, temperature management that levels out heat generation thereby preventing overheating failures, and wear leveling capabilities that ensure a longer life of the SSD.

Part number information

The ordering part number and feature code information is listed in Table 1.

Withdrawn: All drives listed here are now withdrawn from marketing

Table 1. Ordering part numbers and feature codes

Part number	Feature code	Description
00NA671	ASW6	3.84 TB 6Gb SAS Enterprise Capacity G3HS MLC SSD
01GR871	AUBS	3.84TB 6Gb SAS 3.5" Enterprise Capacity HS MLC SSD

The part numbers for the SSDs include the following items:

- One SSD with a hot-swap drive tray
- SSD Information Flyer
- Important Notices and Warranty document

Features

The key feature of the Enterprise Capacity drives is storage capacity. With the equivalent capacity of 13x 300 GB 15K rpm SAS drives, the 3.84 TB 6 Gb SAS Enterprise Capacity G3HS MLC SSD uses 93% less power, generates less heat, and can provide up to twice the write performance and up to 11 times the read performance of the 15K spinning drives it replaces.

With large configurations, the SSD eliminates the need for external JBOD connections, which saves rack space. With applications that can maintain the availability of data, a densely configured server reduces the need to install a new SAN or the need to expand a SAN by installing the storage in the servers. As SSD capacities increase, NAND costs reduce, and 15,000 SAS HDDs continue to encounter technology limitations, the economics of deploying large-scale SSD configurations continue to improve.

With the new 3.5-inch form factor drive, you can now use Enterprise Capacity SSDs alongside high-capacity HDDs in servers that have 3.5-inch drive bays.

The Enterprise Capacity also includes the following features:

- 2.5-inch and 3.5-inch hot-swap form factors for support on System x and Flex System servers
- Uses industry-leading 19 nm eMLC NAND technology
- Cost-effective eMLC 6 Gbps SAS drive with read and write performance fulfills client needs in the enterprise space
- Achieves endurance values of 3.5 PB total bytes written (TBW)
- Saves energy, with as little as 7 watt power consumption per drive
- Eliminates moving parts to reduce potential failure points in the server
- Supports S.M.A.R.T.
- 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 if there is an unplanned power outages by using a third-

generation backup power circuit design and high reliability discrete capacitors

- Static wear leveling evenly distributes data across the drive
- Bad block management replaces failed blocks with new ones from the spare pool
- Thermal throttling extends the life of the drive
- Data retention management ensures the availability and integrity of stored data
- Minimal write amplification facilitates efficient flash usage and extended lifetime

Technical specifications

The following table lists the technical specifications for the Enterprise Capacity SSDs.

Table 2. Technical specifications

Parameter	**2.5-inch drive**	**3.5-inch drive**
Part number	00NA671	01GR871
Drive capacity	3.84 TB	
Form factor	2.5-inch hot-swap	3.5-inch hot-swap
Host interface	6 Gbps SAS	
Endurance	3.5 PB total bytes written (TBW) 0.5 drive writes per day over a 5-year lifetime	
Data reliability	< 1 in 10^{17} bits read	
MTBF, hours	> 2,500,000 hours	
IOPS read*	Up to 65,000 IOPS read	
IOPS write*	Up to 10,000 IOPS write	
Sequential read rate†	500 MBps	
Sequential write rate†	500 MBps	
Access time	< 0.1 ms	
Shock	1000 g, 0.5 ms	
Vibration	2.17 g rms 7-800 Hz	
Typical power	7 W	

* 4 KB block transfers
† 128 KB block transfers

Supported servers

The Enterprise Capacity SSDs are supported in the System x and Flex System servers that are listed in the following tables.

The following tables list the System x servers that are compatible.

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

Table 3. 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, E5-2600 v4)	sd350 (5493)
00NA671	3.84TB 6Gb SAS Enterprise Capacity G3HS MLC SSD	N	N	Y	Y	Y	Y	N
01GR871	3.84TB 6Gb SAS 3.5" Enterprise Capacity HS MLC SSD	N	N	N	Y	N	N	N

Support for System x and dense servers with Intel Xeon v3 processors

Table 4. 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)
00NA671	3.84TB 6Gb SAS Enterprise Capacity G3HS MLC SSD	N	N	Y	Y	Y	Y	Y
01GR871	3.84TB 6Gb SAS 3.5" Enterprise Capacity HS MLC SSD	N	N	N	N	N	N	N

Support for System x servers with Intel Xeon v2 processors

Table 5. Support for servers with Intel Xeon v2 processors

Part number	Description	x3300 M4 (7382)	x3500 M4 (7383, E5-2600 v2)	x3550 M4 (7914, E5-2600 v2)	x3630 M4 (7158, E5-2400 v2)	x3650 M4 (7915, E5-2600 v2)	x3650 M4 BD (5466)	x3750 M4 (8753)	x3850 X6/x3950 X6 (6241, E7 v2)
00NA671	3.84TB 6Gb SAS Enterprise Capacity G3HS MLC SSD	N	N	N	N	N	N	N	Y
01GR871	3.84TB 6Gb SAS 3.5" Enterprise Capacity HS MLC SSD	N	N	N	N	N	N	N	N

Support for Flex System compute nodes

Table 6. Support for Flex System servers

Part number	Description	x240 (8737, E5-2600 v2)	x240 (7162)	x240 M5 (9532)	x440 (7167)	x880/x480/x280 X6 (7903)	x280/x480/x880 X6 (7196)	Storage Expansion Node
00NA671	3.84TB 6Gb SAS Enterprise Capacity G3HS MLC SSD	N	N	Y	N	Y	N	N
01GR871	3.84TB 6Gb SAS 3.5" Enterprise Capacity HS MLC SSD	N	N	N	N	N	N	N

For more information about compatibility, see the following ServerProven® web page:
http://www.lenovo.com/us/en/serverproven/xseries/storage/hssdmatrix.shtml

Supported storage controllers

The Enterprise Capacity SSDs require a supported disk controller. The following table list the controllers that support the Enterprise Capacity SSDs that are installed in a supported server.

Table 7. Controllers for supported servers

		Xeon v3					Xeon v4				Flex	
Part number	**Description**	**x3500 M5 (5464)**	**x3550 M5 (5463)**	**x3650 M5 (5462)**	**x3850 X6/x3950 X6 (6241, E7 v3)**	**nx360 M5 (5465, E5-2600 v3)**	**x3550 M5 (8869)**	**x3650 M5 (8871)**	**x3850 X6/x3950 X6 (6241, E7 v4)**	**nx360 M5 (5465, E5-2600 v4)**	**x240 M5 (9532)**	**x280/x480/x880 X6 (7903)**
Onboard	ServeRAID M1200e Controller	N	N	N	N	N	N	N	N	N	Y	Y
46C9114	ServeRAID M1215 Controller	Y	Y	Y	N	Y	Y	Y	N	Y	N	N
46C9110	ServeRAID M5210 Controller	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
00JX142	ServeRAID M5215 Controller	N	N	N	N	N	N	N	N	N	Y	N
47C8675	N2215 SAS/SATA HBA	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N

Supported operating systems

SSDs 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 2008 R2
- Microsoft Windows Server 2012
- Microsoft Windows Server 2012 R2
- Red Hat Enterprise Linux 6 Server x64 Edition
- Red Hat Enterprise Linux 7
- SUSE LINUX Enterprise Server 11 for AMD64/EM64T
- SUSE LINUX Enterprise Server 11 with Xen for AMD64/EM64T
- VMware vSphere 5.1 (ESXi)
- VMware vSphere 5.5 (ESXi)

For more information about the specific versions and service packs that are supported, see the ServerProven website: http://www.lenovo.com/us/en/serverproven/index.shtml

Warranty

Enterprise Capacity 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 Lenovo Services 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 Enterprise Capacity SSDs have the following physical specifications:

- Dimensions and weight (approximate):
  - Height: 15 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 (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)

Operating environment

The Enterprise Capacity SSDs are supported in the following environment:

- Temperature: 0°C - 65° C (32° F - 149° F)
- Relative humidity: 8 - 85% (noncondensing)
- Maximum altitude: 3,050 m (10,000 ft)

Agency approvals

The Enterprise Capacity SSDs have the following agency approvals:

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

Related publications

For more information, see the following resources:

- Lenovo Solid-State Storage product website:
  http://shop.lenovo.com/us/en/systems/servers/options/systemx/storage/solid-state/
- SanDisk Optimus MAX SAS SSD product website:
  http://www.sandisk.com/enterprise/sas-ssd/optimus-max-ssd/
- ServerProven:
  http://www.lenovo.com/us/en/serverproven/
- US Announcement Letter 3.84TB 6Gb SAS Enterprise Capacity G3HS MLC SSD:
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS115-049

Related product families

Product families related to this document are the following:

- Drives

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