

Intel S3510 Enterprise Entry SATA SSDs

Product Guide

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Abstract

The Intel S3510 Enterprise Entry SATA solid-state drives (SSDs) for System x use 16nm Intel NAND flash memory technology with a SATA 6Gbps interface to provide an affordable storage solution in either 2.5-inch or 3.5-inch drive form factor.

This product guide provides essential presales information to understand the S3510 SSD offerings, their key features and specifications, components and options, and configuration guidelines. This guide is intended for technical specialists, sales specialists, sales engineers, IT architects, and other IT professionals who want to learn more about S3510 SSDs and consider their use in IT solutions.

Change History

Changes in the May 10 update:

- Added the x3250 M6 server to the Server support and Storage controller support sections

Introduction

The S3510 Enterprise Entry SATA solid-state drives (SSDs) for System x use 16 nm Intel NAND flash memory technology with a SATA 6Gbps interface to provide an affordable solution with industry leading performance. Compared with the Intel S3500 series, these new drives offer increased performance in terms of sequential bandwidth and random I/O operations per second (IOPS). The S3510 SSDs are optimized for read-intensive applications such as boot, web servers, lower data rate operational databases and analytics.

The S3510 is shown in the following figure.



Figure 1. Intel S3510 Enterprise Entry SATA SSD in a 2.5-inch hot-swap form factor

Did you know?

By combining the latest 16 nm MLC NAND flash memory technology with Intel's latest controller technology, the design of the S3510 Enterprise Entry SATA SSDs delivers consistent performance, reduced power consumption, and end-to-end data protection, as well as being optimized for IOPS/watt and cost/IOPS.

Rigorous testing of S3510 Enterprise Entry SATA SSDs by Lenovo through the ServerProven® program assures a high degree of storage subsystem compatibility and reliability. Providing additional peace of mind, these drives are covered under Lenovo warranty.

Part number information

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

Table 1. Ordering information

Part number	Feature	Description
2.5-inch drives		
00WG620	AT93	Intel S3510 120GB Enterprise Entry SATA G3HS 2.5" SSD

Part number	Feature	Description
00WG625	AT94	Intel S3510 240GB Enterprise Entry SATA G3HS 2.5" SSD
00WG630	AT95	Intel S3510 480GB Enterprise Entry SATA G3HS 2.5" SSD
00WG635	AT96	Intel S3510 800GB Enterprise Entry SATA G3HS 2.5" SSD
3.5-inch drives		
00WG770	AT97	Intel S3510 120GB Enterprise Entry SATA HS 3.5" SSD
00WG775	AT98	Intel S3510 240GB Enterprise Entry SATA HS 3.5" SSD
00WG780	AT99	Intel S3510 480GB Enterprise Entry SATA HS 3.5" SSD

The part numbers include the following items:

- One SSD with a hot-swap tray attached
- Support flyer for SSDs
- Warranty flyer and Important Notices document

Features

The Intel S3510 Enterprise Entry SATA SSDs have the following features:

- Industry standard 2.5-inch or 3.5-inch form factors
- Cost-effective Intel 16 nm Multi-Level Cell (MLC) NAND flash memory
- Endurance of 0.3 drive writes per day (DWPD) for 5 years, using Intel Standard Endurance Technology (SET). This equates to a total bytes written (TBW) value of:
 - 120 GB drive: 70 TB
 - 240 GB drive: 140 TB
 - 480 GB drive: 275 TB
 - 800 GB drive: 450 TB
- SATA MLC solid-state drive with high read performance and consistently low latencies to fulfill client needs in the enterprise space
- High reliability and enhanced ruggedness
- Energy savings, with 5.6 W typical 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
- Full end-to-end data path protection
- Thermal throttling to extend the life of the drive
- Enhanced power loss data protection

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. Enterprise Entry SSDs typically have a better cost per read IOPS ratio but lower endurance and performance compared to Enterprise Performance 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 Intel S3510 240GB Enterprise Entry SATA G3HS 2.5" SSD has an endurance of 140 TB of total bytes written (TBW) over five years. This means that for full operation over five years, write workload must be limited to no more than 77 GB of writes per day. For the device to last three years, the drive write workload must be limited to no more than 128 GB of writes per day.

Technical specifications

The following table presents technical specifications for the Intel S3510 Enterprise Entry SATA SSDs.

Table 2. Technical specifications

Feature	120 GB drive	240 GB drive	480 GB drive	800 GB drive
Part number	00WG620, 00WG770	00WG625, 00WG775	00WG630, 00WG780	00WG635
Hot-swap drive	Yes	Yes	Yes	Yes
Form factor	2.5-inch & 3.5-inch	2.5-inch & 3.5-inch	2.5-inch & 3.5-inch	2.5-inch only
Interface	6 Gbps SATA	6 Gbps SATA	6 Gbps SATA	6 Gbps SATA
Capacity	120 GB	240 GB	480 GB	800 GB
Endurance (drive writes per day)	0.3 DWPD	0.3 DWPD	0.3 DWPD	0.3 DWPD
Endurance (total bytes written)	70 TB	140 TB	275 TB	450 TB
Data reliability	< 1 in 10 ¹⁷ bits read			
MTBF	2,000,000 hours	2,000,000 hours	2,000,000 hours	2,000,000 hours
IOPS reads (4 KB blocks)	68,000	68,000	68,000	68,000
IOPS writes (4 KB blocks)	20,000	20,000	20,000	20,000
Sequential read rate (128 KB blocks)	500 MBps	500 MBps	500 MBps	500 MBps
Sequential write rate (128 KB blocks)	460 MBps	460 MBps	460 MBps	460 MBps
Read latency (seq)	55 µs	55 µs	55 µs	55 µs
Write latency (seq)	66 µs	66 µs	66 µs	66 µs
Shock, operating	1,000 G (Max) at 0.5 ms			
Vibration, operating	2.17 G _{RMS} (5-700 Hz)			
Vibration, non-operating	3.13 G _{RMS} (5-700 Hz)			
Typical power	5.6 W	5.6 W	5.6 W	5.6 W

Server support

The following tables list the servers that support the Intel S3510 Enterprise Entry SATA SSDs.

Support for System x and dense servers with Intel Xeon v4 processors

Table 3. Support for System x and dense servers with Intel Xeon v4 processors

Part number	Description	x3250 M6 (3943)	x3250 M6 (3633)	x3550 M5 (8869)	x3650 M5 (8871)	nx360 M5 (5465, E5-2600 v4)
00WG620	Intel S3510 120GB Enterprise Entry SATA G3HS 2.5" SSD	Y	Y	Y	Y	Y
00WG625	Intel S3510 240GB Enterprise Entry SATA G3HS 2.5" SSD	Y	Y	Y	Y	Y
00WG630	Intel S3510 480GB Enterprise Entry SATA G3HS 2.5" SSD	Y	Y	Y	Y	Y
00WG635	Intel S3510 800GB Enterprise Entry SATA G3HS 2.5" SSD	Y	Y	Y	Y	Y
00WG770	Intel S3510 120GB Enterprise Entry SATA HS 3.5" SSD	N	N	N	N	N
00WG775	Intel S3510 240GB Enterprise Entry SATA HS 3.5" SSD	N	N	N	N	N
00WG780	Intel S3510 480GB Enterprise Entry SATA HS 3.5" SSD	N	N	N	N	N

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

Table 4. Support for System x and dense 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)
00WG620	Intel S3510 120GB G3HS 2.5" SSD	N	N	Y	Y	Y	Y	Y
00WG625	Intel S3510 240GB G3HS 2.5" SSD	N	N	Y	Y	Y	Y	Y
00WG630	Intel S3510 480GB G3HS 2.5" SSD	N	N	Y	Y	Y	Y	Y
00WG635	Intel S3510 800GB G3HS 2.5" SSD	N	N	Y	Y	Y	Y	Y
00WG770	Intel S3510 120GB HS 3.5" SSD	Y	N	N	Y	Y	N	N
00WG775	Intel S3510 240GB HS 3.5" SSD	Y	N	N	Y	Y	N	N
00WG780	Intel S3510 480GB HS 3.5" SSD	Y	N	N	Y	Y	N	N

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Support for System x servers with Intel Xeon v2 processors

Table 5. Support for System x 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)
00WG620	Intel S3510 120GB G3HS 2.5" SSD	N	N	N	N	N	N	N	N	N	N	Y	N	N
00WG625	Intel S3510 240GB G3HS 2.5" SSD	N	N	N	N	N	N	N	N	N	N	Y	N	N
00WG630	Intel S3510 480GB G3HS 2.5" SSD	N	N	N	N	N	N	N	N	N	N	Y	N	N
00WG635	Intel S3510 800GB G3HS 2.5" SSD	N	N	N	N	N	N	N	N	N	N	Y	N	N
00WG770	Intel S3510 120GB HS 3.5" SSD	N	N	N	N	N	N	N	N	N	N	N	N	N
00WG775	Intel S3510 240GB HS 3.5" SSD	N	N	N	N	N	N	N	N	N	N	N	N	N
00WG780	Intel S3510 480GB HS 3.5" SSD	N	N	N	N	N	N	N	N	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
00WG620	Intel S3510 120GB G3HS 2.5" SSD	N	N	N	N	N	Y	N	N	N	Y	N
00WG625	Intel S3510 240GB G3HS 2.5" SSD	N	N	N	N	N	Y	N	N	N	Y	N
00WG630	Intel S3510 480GB G3HS 2.5" SSD	N	N	N	N	N	Y	N	N	N	Y	N
00WG635	Intel S3510 800GB G3HS 2.5" SSD	N	N	N	N	N	Y	N	N	N	Y	N
00WG770	Intel S3510 120GB HS 3.5" SSD	N	N	N	N	N	N	N	N	N	N	N

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
00WG775	Intel S3510 240GB HS 3.5" SSD	N	N	N	N	N	N	N	N	N	N	N
00WG780	Intel S3510 480GB HS 3.5" SSD	N	N	N	N	N	N	N	N	N	N	N

Storage controller support

The S3510 Enterprise Entry SATA SSDs require a supported disk controller. The following table lists the controllers and the servers that support those controllers.

Table 7. Controllers for supported servers

Part number	Description	Xeon v3						Xeon v4					Flex	
		x3100 M5 (5457)	x3500 M5 (5464)	x3550 M5 (5463)	x3650 M5 (5462)	x3850 X6/x3950 X6 (6241, E7 v3)	nx360 M5 (5465, E5-2600 v3)	x3250 M6 (3943)	x3250 M6 (3633)	x3550 M5 (8869)	x3650 M5 (8871)	nx360 M5 (5465, E5-2600 v4)	x240 M5 (9532)	v280/v480/v880 X6 (7106)
81Y4492	ServeRAID H1110 Controller	Y	N	N	N	N	N	N	N	N	N	N	N	N
81Y4448	ServeRAID M1115 Controller	Y	N	N	N	N	N	N	N	N	N	N	N	N
Onboard	ServeRAID M1200e Controller	N	N	N	N	N	N	N	N	N	N	N	Y	Y
00JY194	ServeRAID M1210 Controller	N	N	N	N	N	N	Y	Y	N	N	N	N	N
46C9114	ServeRAID M1215 Controller	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N
81Y4481	ServeRAID M5110 Controller	Y	N	N	N	N	N	N	N	N	N	N	N	N
46C9110	ServeRAID M5210 Controller	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
00JX142	ServeRAID M5215 Controller	N	N	N	N	N	N	N	N	N	N	N	Y	N
46C8988	N2115 SAS/SATA HBA	Y	N	N	N	N	N	N	N	N	N	N	N	N
47C8675	N2215 SAS/SATA HBA	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N

Operating system support

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 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 2012
- Microsoft Windows Server 2012 R2
- Red Hat Enterprise Linux 5 Server Edition
- Red Hat Enterprise Linux 5 Server with Xen x64 Edition
- Red Hat Enterprise Linux 5 Server x64 Edition
- Red Hat Enterprise Linux 6 Server Edition
- Red Hat Enterprise Linux 6 Server x64 Edition
- Red Hat Enterprise Linux 7
- SUSE LINUX Enterprise Server 10 for AMD64/EM64T
- SUSE LINUX Enterprise Server 10 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
- VMware ESX 4.1
- VMware ESXi 4.1
- VMware vSphere 5.0 (ESXi)
- VMware vSphere 5.1 (ESXi)
- VMware vSphere 5.5 (ESXi)

For the latest information about the specific supported operating system versions and service packs, see ServerProven:

<http://www.lenovo.com/us/en/serverproven/xseries/controllers/matrix.shtml>
(<http://www.lenovo.com/us/en/serverproven/xseries/controllers/matrix.shtml>)

Select the check mark box that is associated with the Controller and server combination in question to see the details about operating system support.

Warranty

The Intel S3510 Enterprise Entry SATA 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.

Physical specifications

The drives have the following physical specifications (approximate, without the tray):

- Height: 7 mm (0.3 in.)
- Width: 70 mm (2.8 in.)
- Depth: 100 mm (4.0 in.)
- Weight: 66 g (0.15 lb)

Shipping dimensions and weight - 2.5-inch drives (approximate, including the tray):

- Height: 63 mm (2.5 in.)
- Width: 174 mm (6.9 in.)
- Depth: 133 mm (5.2 in.)
- Weight: 434 g (1.0 lb)

Shipping dimensions and weight - 3.5-inch drives (approximate, including the tray):

- 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 SSDs are supported in the following environment:

- Temperature: 0 - 70°C (32 - 158°F)
- Relative humidity: 5 - 95% (noncondensing)
- Maximum altitude: 3,050 m (10,000 ft)

Agency approvals

The Intel S3510 Enterprise Entry SATA SSDs conform to the following regulations:

- FCC Title 47, Part 15B, Class B
- CA/CSA-CEI/IEC CISPR 22:02
- EN 55024: 1998
- EN 55022: 2006
- EN-60950-1 2nd Edition
- UL/CSA EN-60950-1 2nd Edition
- Low Voltage Directive 2006/95/EC
- C-Tick: AS/NZS3584
- BSMI: CNS 13438
- KCC Article 11.1
- RoHS DIRECTIVE 2011/65/EU
- WEEE Directive 2002/96/EC

Related publications and links

For more information, see the following documents:

- Lenovo Enterprise SSD product page
<http://shop.lenovo.com/us/en/systems/servers/options/systemx/storage/solid-state/enterprise/>
(<http://shop.lenovo.com/us/en/systems/servers/options/systemx/storage/solid-state/enterprise/>)
- US Announcement letter
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS115-154>
(<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS115-154>)
- Intel SSD Data Center S3510 Series product page
<http://www.intel.com/content/www/us/en/solid-state-drives/solid-state-drives-dc-s3510-series.html>
(<http://www.intel.com/content/www/us/en/solid-state-drives/solid-state-drives-dc-s3510-series.html>)
- ServerProven for SSDs
<http://www.lenovo.com/us/en/serverproven/xseries/storage/hssdmatrix.shtml>
(<http://www.lenovo.com/us/en/serverproven/xseries/storage/hssdmatrix.shtml>)
- ServeRAID Adapter Quick Reference
<http://lenovopress.com/tips0054> (<http://lenovopress.com/tips0054>)

Related product families

Product families related to this document are the following:

- Drives (/servers/options/drives)

[Newsletter \(/newsletter\)](#)

[Privacy \(http://www.lenovo.com/privacy/us/en/\)](http://www.lenovo.com/privacy/us/en/)

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