



HP SSD S600 Series

Product Specification

Capacity: 120GB, 240GB,

Components: 3D TLC NAND Flash

Read and Write IOPS

(Iometer* Queue Depth 32)

— 120 GB

Random 4 KB reads: Up to 23 K IOPS

Random 4 KB writes: Up to 58 K IOPS

— 240 GB

Random 4 KB reads: Up to 24 K IOPS

Random 4 KB writes: Up to 59 K IOPS

Bandwidth Performance

— 120 GB

Sustained sequential read: Up to 524 MB/s

Sustained sequential write: Up to 496 MB/s

— 240 GB

Sustained sequential read: Up to 525 MB/s

Sustained sequential write: Up to 520 MB/s

SATA 1.5 Gb/s ,3 Gb/s and 6 Gb/s interface

— ATA/ATAPI-7

— SSD-enhanced S.M.A.R.T. ATA feature

— Native Command Queuing (NCQ)

command set

— Data set management command

Trim attribute

Form Factor: Full-sized 2.5 inch SSD

— Dimensions: 100.2 mm x 69.8 mm

— Thickness: <=7 mm

— Weight: <=80 grams

Power Management

— 5 V 2.5 inch SSD power supply

— 2.5 inch SSD interface power management

Power (Mobile Mark* 2007 Workload)

— Idle: 380 mW (TYP)

— max: 1.4W (TYP)

Temperature

— Operating: 0°C to 70°C

— Non-Operating: -40°C to 85°C

Shock (operating and non-operating)

— 100 G/6 msec

Vibration(operating and non-operating)

—3.1G RMS (2-500 Hz)



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Latency

— 120 GB

Read: 0.24ms (TYP)

Write: 0.89ms (TYP)

—240 GB

Read: 0.25ms (TYP)

Write: 0.96ms (TYP)

Reliability

— Uncorrectable Bit Error Rate (UBER):

1 sector in 10^{16} bits read

— Mean Time Between Failures (MTBF):

2,000,000 hours

Certifications and Declarations

— CB

— cTUVus & FCC

— CE & RoHS

Order Information

Country/Region	PN	Capacity
APJ	4FZ32AA#UUF	120GB
	4FZ33AA#UUF	240GB
NA	4FZ32AA#ABC	120GB
	4FZ33AA#ABC	240GB
EURO	4FZ32AA#ABB	120GB
	4FZ33AA#ABB	240GB
LA	4FZ32AA#ABL	120GB
	4FZ33AA#ABL	240GB



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1.0 Overview

HP SSD S600 Series delivers compact storage and optimized performance for traditional and innovative small-form-factor and embedded platforms in 2 capacity sizes: 120GB , 240GB.

The case 2.5 inch SSD design has a significantly smaller footprint than a 2.5 inch hard disk drive (HDD), and enables fast read/write access times and a significant I/O and throughput performance improvement as compared to HDDs. This design makes it ideal for new and innovative small form factor computing platforms that have size and weight requirements that traditional 2.5 inch HDD s cannot meet; such as, notebook, thin-and-light systems, mini- and sub-notebooks, all in-one computers, and embedded platforms.

As compared to standard mobile HDDs, HP SSD S600 Series offers these key features:

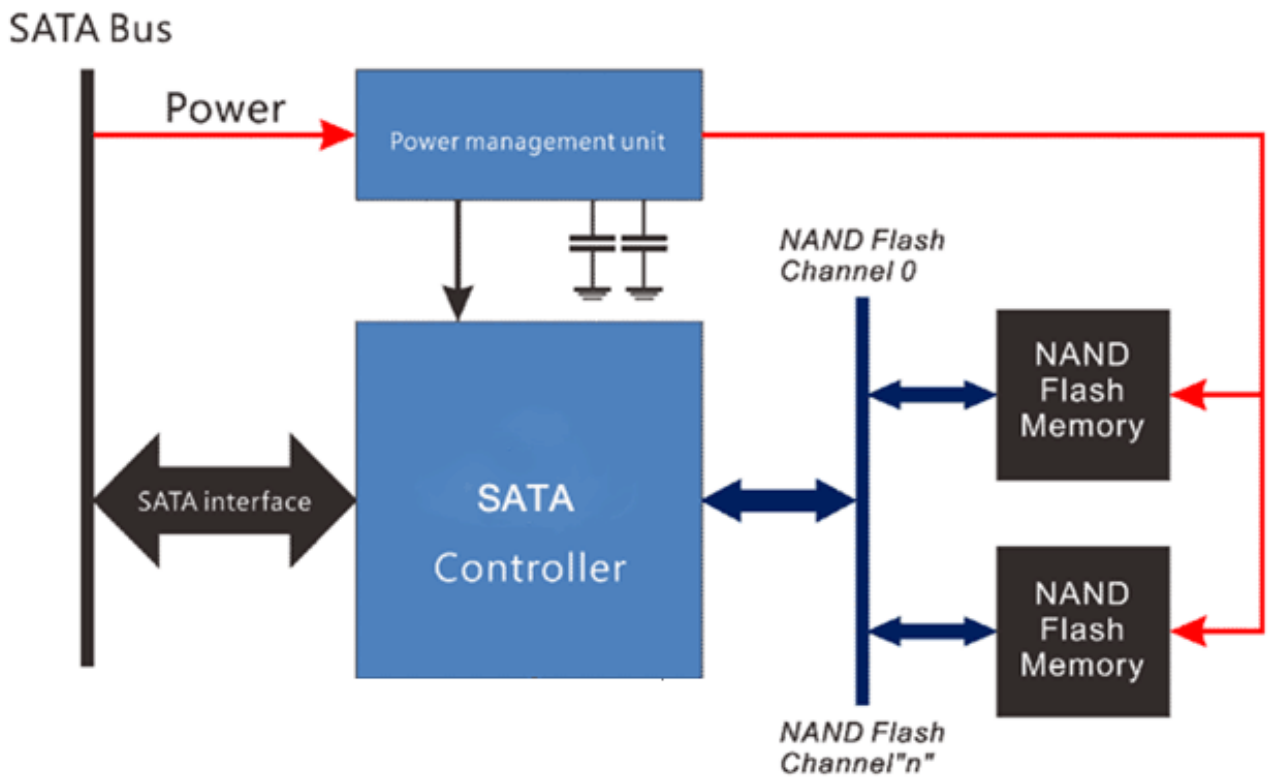
- High performance
- Low power
- Increased system responsiveness
- High reliability
- Small form-factor
- Minimum weight
- Enhanced ruggedness



2.0 Architecture

HP SSD S600 Series utilizes a cost-effective, high-performance HP SATA-to-NAND controller to manage a full SATA 6 Gb/s bandwidth with the host while managing multiple NAND flash memory devices on 2 channels.

Figure 1. Block Diagram





3.0 Product Specifications

This section provides details on HP SSD S600 Series product specifications.

3.1 Capacity

Table 1. User Addressable Sectors

Unformatted Capacity	120GB	240GB
Total User Addressable Sectors	234,438,656	468,875,312

Notes: LBA count shown represents total user storage capacity and will remain the same throughout the life of the drive.

The total usable capacity of the SSD may be less than the total physical capacity because a small portion of the capacity is reserved for NAND flash management and maintenance purposes.

1 GB = 1,000,000,000 bytes; 1 sector = 512 bytes.

3.2 Performance

Table 2. Read/Write IOPS, Bandwidth, Latency

Performance	120GB	240GB
Random Read/Write IOPS (Input/Output Operations per Second)(1)		
4K Read	Up to 23,000	Up to 24,000
4K Write	Up to 58,000	Up to 59,000
Maximum Sustained Read and Write Bandwidth(2)		
Sequential Read	Up to 524 MB/s	Up to 525 MB/s
Sequential Write	Up to 496 MB/s	Up to 520 MB/s
Latency(3)		
Read Write	Read: 0.24 ms Write: 0.89ms	Read: 0.25 ms Write: 0.96ms



Notes:

(1). Performance measured using Iometer with queue depth set to 32; Measurements are performed on 8 GB of LBA range. Write Cache enabled.

(2). Performance measured using Iometer with queue depth equal to 32.

Sequential performance measurements assume 1 MB/sec = 1,048,576 bytes/sec.

(3). Device measured using Iometer; Read/Write latency measured on sequential 4 K transfers with queue depth set to 1.

Write Cache Enabled.

Power On To Ready time measured from power rail rising edge to the first DRDY issued from the drive.



3.3 Electrical

Table 3. Operating Voltage and Power Consumption

Electrical Characteristics	120GB	240GB
Operating Voltage for 5V (+/- 5%)		
Min	4.75V	
Max	5.25V	
Power Consumption (Typical)		
Active1	1.05 W	1.4 W
Idle	0.38 W	0.38 W

Notes:

1. Active power measured during execution of MobileMark* 2007 with DIPM (Device Initiated Power Management) enabled.
2. Idle power defined as SSD at idle with DIPM enabled.



3.4 Environmental Conditions

Table 4. Temperature, Shock, Vibration

Temperature	Range
Ambient Temperature	
Operating	0 to 70 °C
Non-operating	-40 to 85 °C
Temperature Gradient(1)	
Operating	20 (Typical) °C/hr
Non-operating	30 (Typical) °C/hr
Humidity	
Operating	5 - 95 %
Non-operating	5 - 95 %
Shock, Vibration, Acoustics	Range
Shock(2)	
Operating	100 G/6 msec
Non-operating	100 G/6 msec
Vibration(3)	
Operating	3.1 GRMS (2-500 Hz)
Non-operating	3.1 GRMS (2-500 Hz)

Notes:

(1). Temperature gradient measured without condensation.

(2). Shock specifications assume the SSD is mounted securely with the input vibration applied to the drive-mounting screws. Stimulus may be applied in the X, Y or Z axis. Shock specification is measured using root mean square (RMS) value.

(3). Vibration specifications assume the SSD is mounted securely with the input vibration applied to the drive-mounting screws.

Stimulus may be applied in the X, Y or Z axis. The measured specification is in root mean squared form. Vibration specification is measured using RMS value.



3.5 Reliability

Table 5. Reliability Specifications

Parameter	Value
<p>Uncorrectable Bit Error Rate (UBER)</p> <p>Unrecoverable read bit error rate will not exceed one sector in the specified number of bits read. In the extremely unlikely event of a non-recoverable read error, the SSD will report it as a read failure to the host; the sector in error is considered corrupt and is not returned to the host.</p>	1 sector in 10^{16} bits read, max
<p>Mean Time Between Failure (MTBF)</p> <p>Mean time between failures (MTBFs) for the SSD can be predicted based on the component reliability data using the methods referenced in the Telcordia SR-332 reliability prediction procedures for electronic equipment.</p>	2,000,000 hours
<p>Power On/Off Cycles</p> <p>Power On/Off Cycles is defined as power being removed from HP SSD S600, and then restored. Most host systems remove power from the SSD when entering suspend and hibernate as well as on a system shutdown.</p>	10,000 cycles
<p>Minimum Useful Life</p> <p>HP SSD S600 will have a minimum of three years of useful life under typical client workloads with up to 60% of the full capacity of host writes per day.</p>	3 years

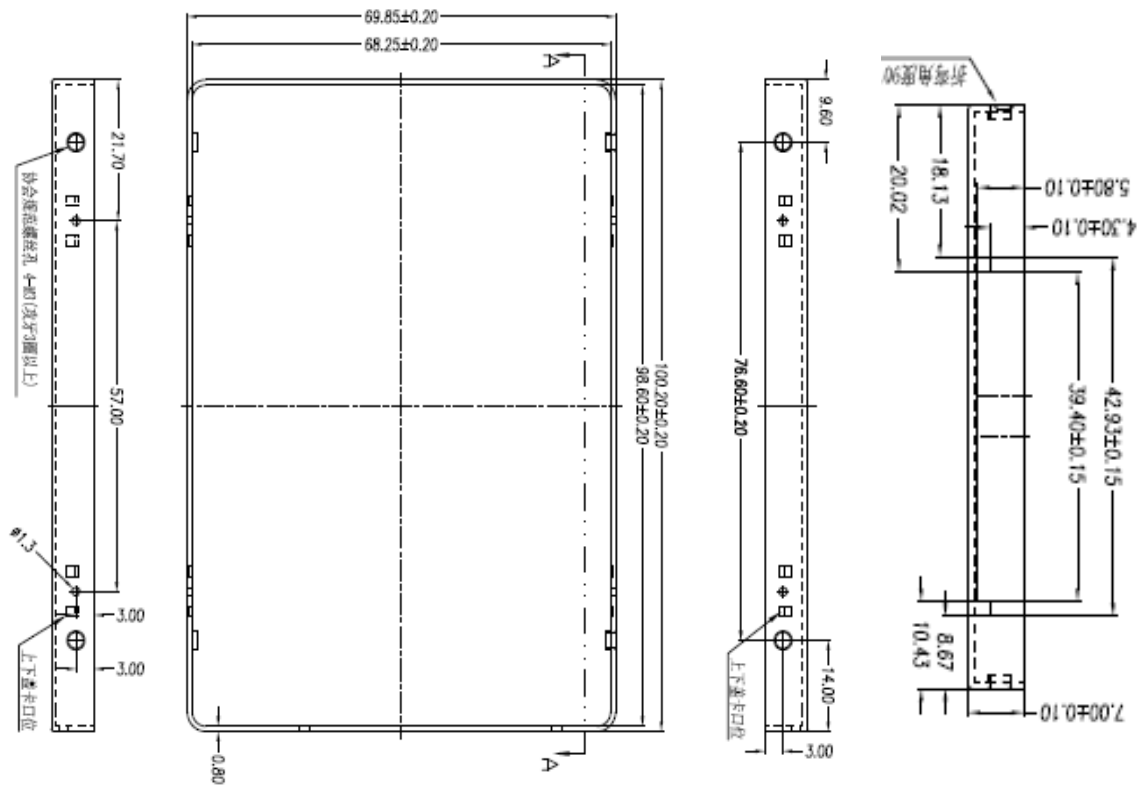


4.0 Mechanical Information

Figure 2 shows the physical dimension of HP SSD S600 Series.

All dimensions are in millimeters.

Figure 2. HP SSD S600 Dimensions

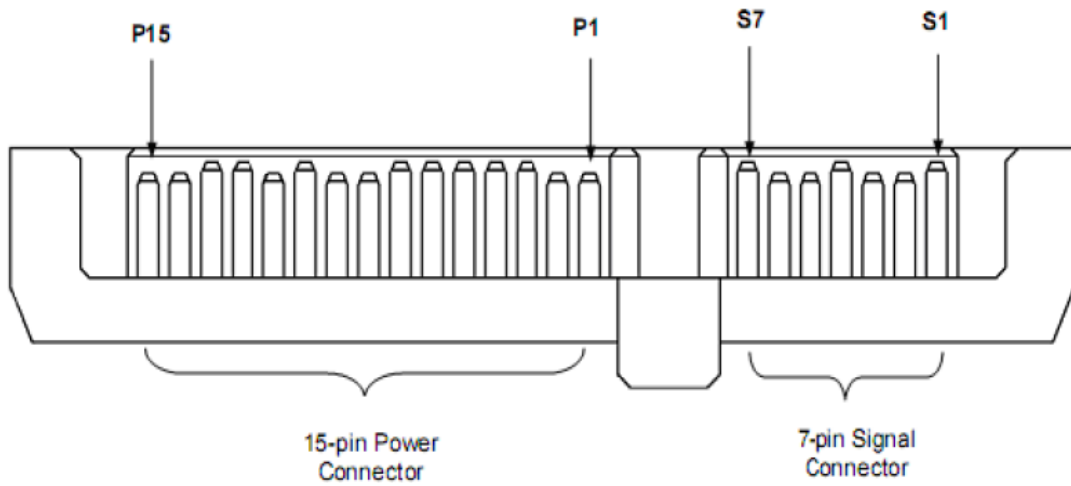




5.0 Pin and Signal Descriptions

5.1 Pin Locations

Figure 3. Signal and Power Segment Pins





5.2 Signal Description

Table 6.Connector Pin Signal Definitions

Pin#	Assignment	Description
Signal		
S1	GND	2 nd mate
S2	A+	Differential signal pair A From physical layer electronics
S3	A-	
S4	GND	2 nd mate
S5	B-	Differential signal pair B From physical layer electronics
S6	B+	
S7	GND	2 nd mate
Power		
P1	V33	3.3V power (Unused)
P2	V33	3.3V power (Unused)
P3	V33	3.3V power (Unused)
P4	GND	1 st mate
P5	GND	2 nd mate
P6	GND	2 nd mate
P7	V5	5V power, pre-charge, 2 nd mate
P8	V5	5V power
P9	V5	5V power
P10	GND	2 nd mate
P11	DAS/DSS	NC
P12	GND	2 nd mate
P13	V12	12V power, pre-charge, 2 nd mate (Unused)
P14	V12	12V power (Unused)
P15	V12	12V power (Unused)



6.0 Supported Command Sets

HP SSD S600 Series supports ATA (Advanced Technology Attachment) commands described in this section.

6.1 ATA General Feature Command Set

HP SSD S600 Series supports the ATA General Feature command set (non-PACKET), which consists of:

- EXECUTE DEVICE DIAGNOSTIC
- FLUSH CACHE
- IDENTIFY DEVICE
- READ DMA
- READ SECTOR(S)
- READ VERIFY SECTOR(S)
- SEEK
- SET FEATURES
- WRITE DMA
- WRITE SECTOR(S)
- READ MULTIPLE
- SET MULTIPLE MODE
- WRITE MULTIPLE

HP SSD S600 Series also supports the following optional commands:

- READ BUFFFER
- WRITE BUFFER
- NOP
- DOWNLOAD MICROCODE



6.2 Power Management Command Set

HP SSD S600 Series supports the Power Management command set, which consists of:

- CHECK POWER MODE
- IDLE
- IDLE IMMEDIATE
- SLEEP
- STANDBY
- STANDBY IMMEDIATE

6.3 Security Mode Feature Set

HP SSD S600 Series supports the Security Mode command set, which consists of:

- SECURITY SET PASSWORD
- SECURITY UNLOCK
- SECURITY ERASE PREPARE
- SECURITY ERASE UNIT
- SECURITY FREEZE LOCK
- SECURITY DISABLE PASSWORD



6.4 smart Command Set

HP SSD S600 Series supports the SMART command set, which consists of:

- SMART ENABLE OPERATIONS
- SMART DISABLE OPERATIONS
- SMART ENABLE/DISABLE AUTOSAVE
- SMART RETURN STATUS

HP SSD S600 Series also supports the following optional commands:

- SMART EXECUTE OFF-LINE IMMEDIATE
- SMART READ DATA
- SMART READ LOG
- SMART WRITE LOG

6.5 Data Set Management Command Set

HP SSD S600 Series supports the Data Set Management command set Trim attribute, which consists of:

- DATA SET MANAGEMENT EXT



6.6 Host Protected Area Command Set

HP SSD S600 Series supports the Host Protected Area command set:

READ NATIVE MAX ADDRESS

SET MAX ADDRESS

READ NATIVE MAX ADDRESS EXT

- SET MAX ADDRESS EXT

HP SSD S600 Series also supports the following optional commands:

SET MAX SET PASSWORD

SET MAX LOCK

SET MAX FREEZE LOCK

- SET MAX UNLOCK

6.7 48-Bit Address Command Set

HP SSD S600 Series supports the 48-bit Address command set, which consists of:

- FLUSH CACHE EXT
- READ DMA EXT
- READ NATIVE MAX ADDRESS EXT
- READ SECTOR(S) EXT
- READ VERIFY SECTOR(S) EXT
- SET MAX ADDRESS EXT
- WRITE DMA EXT
- WRITE MULTIPLE EXT
- WRITE SECTOR(S) EXT
- WRITE UNCORRECTABLE EXT



6.8 Device Configuration Overlay Command Set

HP SSD S600 Series supports the Device Configuration Overlay command set, which consists of:

- DEVICE CONFIGURATION FREEZE LOCK
- DEVICE CONFIGURATION IDENTITY
- DEVICE CONFIGURATION RESTORE
- DEVICE CONFIGURATION SET

6.9 General Purpose Log Command Set

The S600 Series supports the General Purpose Log command set, which consists of:

- READ LOG EXT
- WRITE LOG EXT

6.10 Native Command Queuing

HP SSD S600 Series supports the Native Command Queuing (NCQ) command as

- READ FPDMA QUEUED
- WRITE FPDMA QUEUED

Note: *With a maximum queue depth equal to 32.*

6.11 Software Settings Preservation

HP SSD S600 Series supports the SET FEATURES parameter to enable/disable the preservation of software settings.

6.12 Device Initiated Power Management (DIPM)

HP SSD S600 Series supports the SET FEATURES parameter to enable Device Initiated Power Management.



7.0 Certifications and Declarations

Table 7 describes the Device Certifications supported by HP SSD S600.

Table 7. Device Certifications and Declarations

Certification	Description
CE Compliant	Indicates conformity with the essential health and safety requirements set out in European Directives Low Voltage Directive and EMC Directive.
UL Certified	Underwriters Laboratories, Inc. Component Recognition UL60950-1.
RoHS Compliant	Restriction of Hazardous Substance Directive

8.0 Revision History

Date	Revision	Description
May 2018	V1.0	Initial release
June 2018	V2.0	Update the IOPS data
July 2018	V3.0	Adding the Order information