



# HP SSD S700 M.2

## Product Specification

Capacity: 120GB, 250GB, 500GB

Components: 3D TLC NAND Flash

## Read and Write IOPS

(Iometer\* Queue Depth 32)

—120 GB

Random 4 KB reads: Up to 35 K IOPS

Random 4 KB writes: Up to 75 K IOPS

— 250 GB

Random 4 KB reads: Up to 50 K IOPS

Random 4 KB writes: Up to 80 K IOPS

—500 GB

Random 4 KB reads: Up to 70 K IOPS

Random 4 KB writes: Up to 85 K IOPS

## Bandwidth Performance

— 120 GB

Sustained sequential read: Up to 555 MB/s

Sustained sequential write: Up to 470 MB/s

— 250 GB

Sustained sequential read: Up to 560MB/s

Sustained sequential write: Up to 510MB/s

— 500 GB

Sustained sequential read: Up to 560 MB/s

Sustained sequential write: Up to 510MB/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 M.2 2280 SSD

— Dimensions: 80 mm x 22 mm

— Thickness: <=3.8 mm

— Weight: ≤5 grams

Power Management

— 3.3 V M.2 SSD power supply

—M.2 SSD interface power management

Power (Mobile Mark\* 2007 Workload)

— Idle: 0.38 W (TYP)

— max: 1.63 W (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: 0.046ms (TYP)

Write: 0.191ms (TYP)

—250 GB

Read: 0.050ms (TYP)

Write: 0.182ms (TYP)

—500 GB

Read: 0.035ms (TYP)

Write: 0.190ms (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

— UL\*

— CE\*

— FCC\*

— RoHS\*

## Order Information

Country/Region	PN	Capacity
APJ	2LU78AA#UUF	120GB
	2LU79AA#UUF	250GB
	2LU80AA#UUF	500GB
NA	2LU78AA#ABC	120GB
	2LU79AA#ABC	250GB
	2LU80AA#ABC	500GB
EURO	2LU78AA#ABB	120GB
	2LU79AA#ABB	250GB
	2LU80AA#ABB	500GB



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## 1.0 Overview

HP SSD S700 M.2 Series delivers compact storage and optimized performance for traditional and innovative small-form-factor and embedded platforms in 3 capacity sizes: 120GB 、 250GB and 500GB.

By combining advanced NAND Flash controller with SATA 6Gb/s interface and 3D NAND Flash, S700 M.2 delivers sequential read speed up to 560MB/s and sequential write speed up to 500MB/s, which makes it a ideal solution for computing device, 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 S700 M.2 offers these key features:

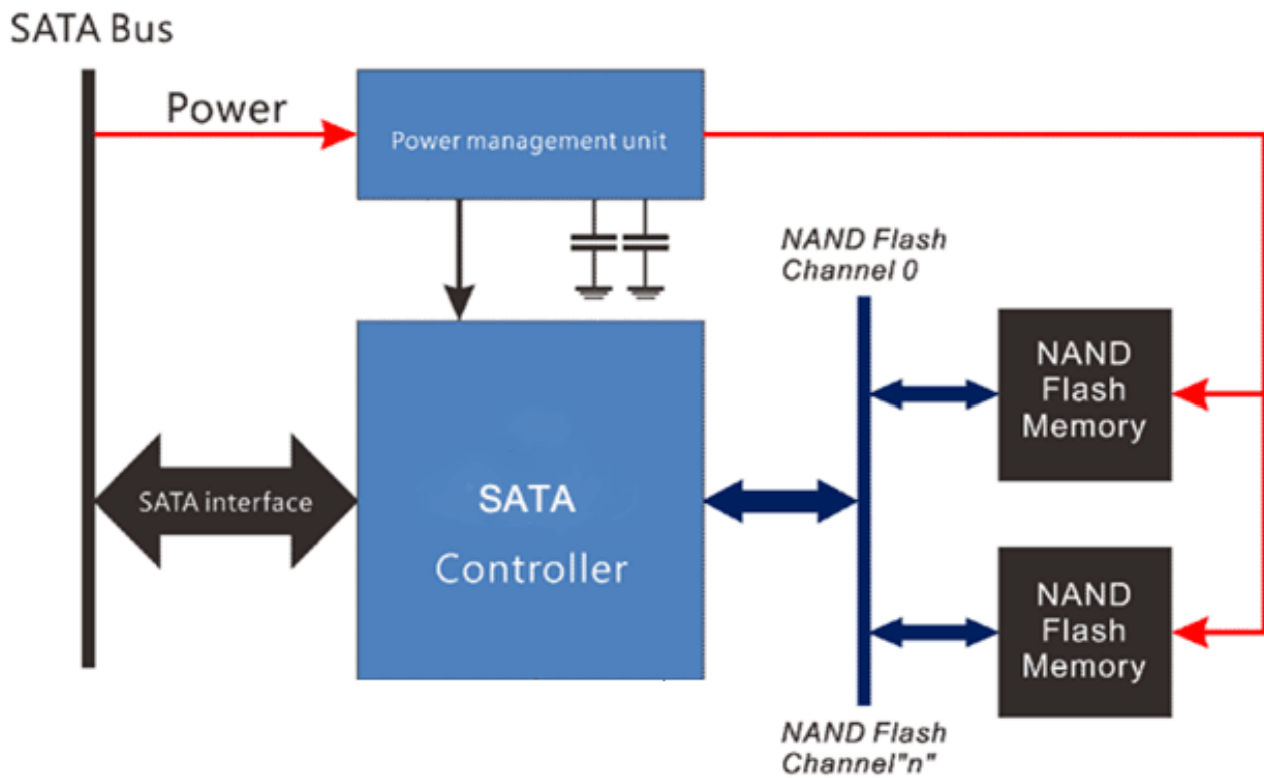
- High performance
- Low power
- Increased system responsiveness
- High reliability
- Small form-factor
- Minimum weight
- Enhanced ruggedness



## 2.0 Architecture

HP SSD S700 M.2 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 4 channels.

Figure 1. Block Diagram





## 3.0 Product Specifications

This section provides details on HP SSD S700 M.2 product specifications.

### 3.1 Capacity

**Table 1. User Addressable Sectors**

Unformatted Capacity	120GB	250GB	500GB
Total User Addressable Sectors	234,438,656	488,396,800	976,793,600

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	250GB	500GB
Random Read/Write IOPS (Input/Output Operations per Second)(1)			
4K Read	Up to 35,000	Up to 50,000	Up to 70,000
4K Write	Up to 75,000	Up to 80,000	Up to 85,000
Maximum Sustained Read and Write Bandwidth(2)			
Sequential Read	Up to 555MB/s	Up to 560MB/s	Up to 560 MB/s
Sequential Write	Up to 470MB/s	Up to 510MB/s	Up to 510 MB/s
Latency(3)			
Read	Read: 0.046 ms	Read: 0.050 ms	Read: 0.035 ms
Write	Write: 0.191 ms	Write: 0.182 ms	Write: 0.190 ms



**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	250GB	500GB
Operating Voltage for 5V (+/- 5%)			
Min	3.13 V		
Max	3.47 V		
Power Consumption (Typical)			
Active1	1.45 W	1.58 W	1.63 W
Idle	0.33 W	0.33 W	0.33 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 no 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 S700 M.2 , 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 S700 M.2 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

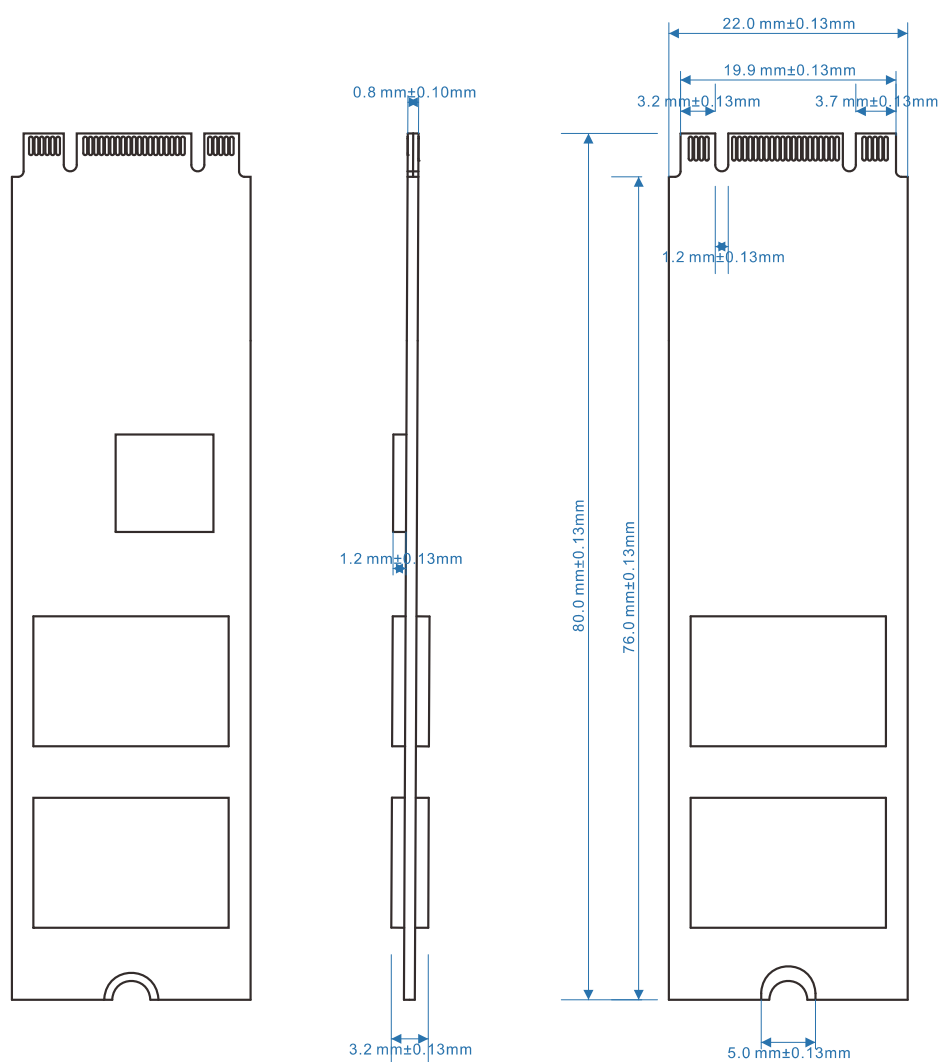


## 4.0 Mechanical Information

Figure 2 shows the physical dimension of HP SSD S700 M.2 Series.

All dimensions are in millimeters.

**Figure 2. HP SSD S700 M.2 Dimensions**

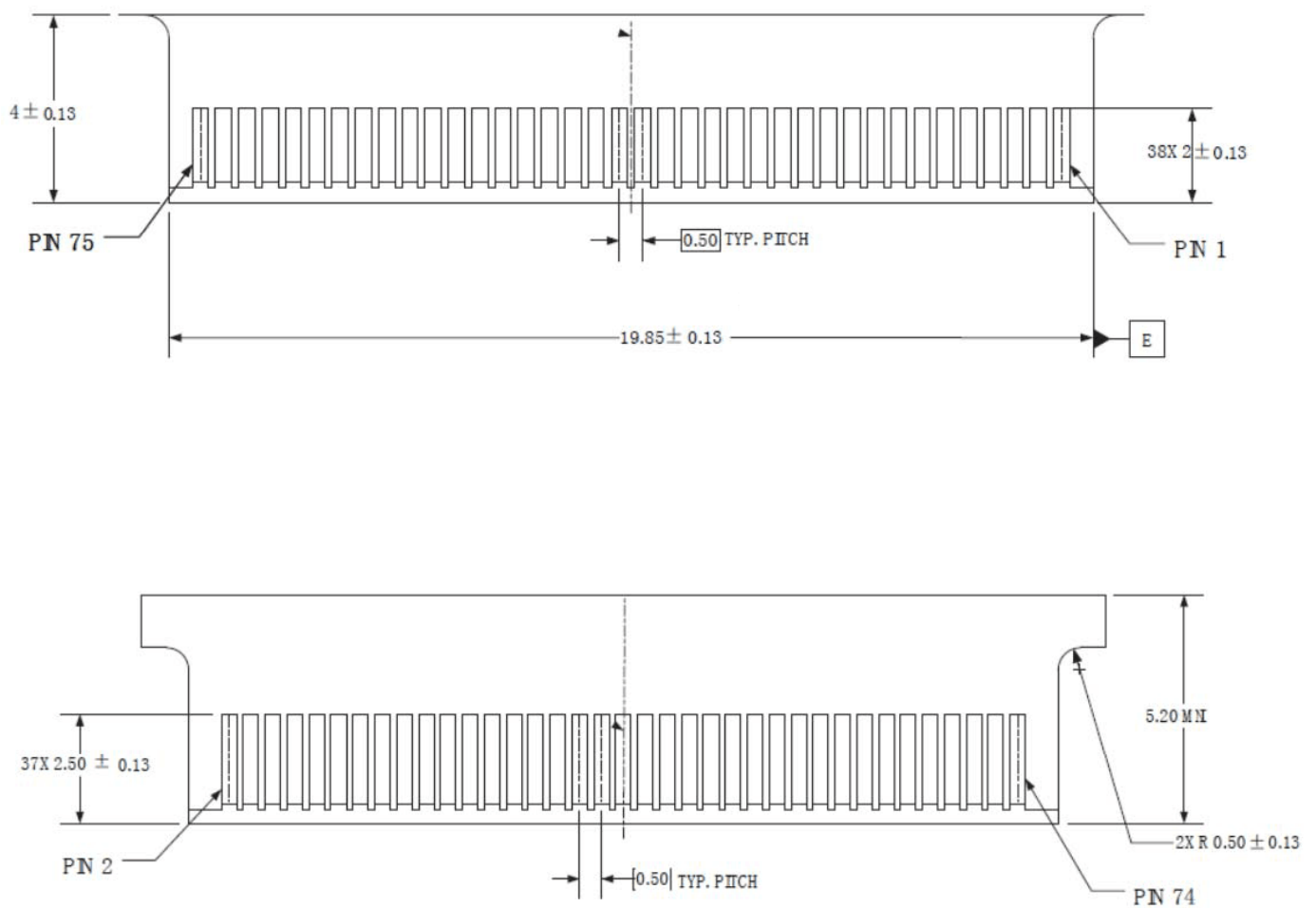




## 5.0 Pin and Signal Descriptions

### 5.1 Pin Locations

Figure 3. Signal and Power Segment Pins





## 5.2 Signal Description

**Table 6.Connector Pin Signal Definitions**

Pin#	Assignment	Description	Pin#	Assignment	Description
1	CONFIG_3	Defines module type	21	CONFIG_0	Defines module type
2	+3.3V	3.3V source	22	NA	NA
3	GND	Return Current Path	23	NA	NA
4	+3.3V	3.3V source	24	NA	NA
5	NA	NA	25	NA	NA
6	NA	NA	26	NA	NA
7	NA	NA	27	GND	Return Current Path
8	NA	NA	28	NA	NA
9	NA	NA	29	NA	NA
10	NA	NA	30	NA	NA
11	NA	NA	31	NA	NA
12	(removed for key)	Mechanical Notch B	32	NA	NA
13	(removed for key)	Mechanical Notch B	33	GND	Return Current Path
14	(removed for key)	Mechanical Notch B	34	NA	NA
15	(removed for key)	Mechanical Notch B	35	NA	NA
16	(removed for key)	Mechanical Notch B	36	NA	NA
17	(removed for key)	Mechanical Notch B	37	NA	NA
18	(removed for key)	Mechanical Notch B	38	DEVSLP	Device Sleep, Input
19	(removed for key)	Mechanical Notch B	39	GND	Return Current Path
20	NA	NA	40	NA	NA



**Table 6.Connector Pin Signal Definitions**

Pin#	Assignment	Description	Pin#	Assignment	Description
41	SATA-B+/PERn0	Host receiver differential signal pair	61	NOTCH	Mechanical Notch M
42	NA	NA	62	NOTCH	Mechanical Notch M
43	SATA-B-/PERp0	Host receiver differential signal pair	63	NOTCH	Mechanical Notch M
44	NA	NA	64	NOTCH	Mechanical Notch M
45	GND	Return Current Path	65	NOTCH	Mechanical Notch M
46	NA	NA	66	NOTCH	Mechanical Notch M
47	SATA-A-/PETn0	Host transmitter differential signal pair	67	NA	NA
48	NA	NA	68	NA	NA
49	SATA-A+/PETp0	Host transmitter differential signal pair	69	CONFIG_1	Defines module type
50	NA	NA	70	+3.3V	3.3V source
51	GND	Return Current Path	71	GND	Return Current Path
52	NA	NA	72	+3.3V	3.3V source
53	NA	NA	73	GND	Return Current Path
54	NA	NA	74	+3.3V	3.3V source
55	NA	NA	75	CONFIG_2	Defines module type
56	NA	NA			
57	GND	Return Current Path			
58	NA	NA			
59	NOTCH	Mechanical Notch M			
60	NOTCH	Mechanical Notch M			



## 6.0 Supported Command Sets

HP SSD S700 M.2 supports ATA (Advanced Technology Attachment) commands described in this section.

### 6.1 ATA General Feature Command Set

HP SSD S700 M.2 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 S700 M.2 also supports the following optional commands:

- READ BUFFER
- WRITE BUFFER
- NOP
- DOWNLOAD MICROCODE



## **6.2 Power Management Command Set**

HP SSD S700 M.2 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 S700 M.2 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 S700 M.2 supports the SMART command set, which consists of:

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

HP SSD S700 M.2 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 S700 M.2 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 S700 M.2 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 S700 M.2 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 S700 M.2 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 S700 M.2 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 C1001 Series supports the General Purpose Log command set, which consists of:

- READ LOG EXT
- WRITE LOG EXT

## 6.10 Native Command Queuing

HP SSD S700 M.2 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 S700 M.2 supports the SET FEATURES parameter to enable/disable the preservation of software settings.

## 6.12 Device Initiated Power Management (DIPM)

HP SSD S700 M.2 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 S700 M.2

**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
April 2017	V1.0	Initial release