

PHISON

PASCARI

**D200
E1.S**

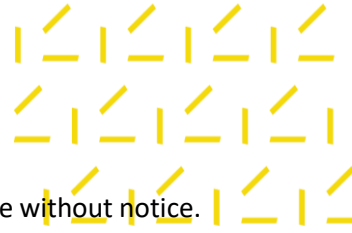
V1.4



Phison Electronics Corporation

Tel: +886-37-586-896 Fax: +886-37-587-868

E-mail: sales@phisonenterprise.com / support@phisonenterprise.com

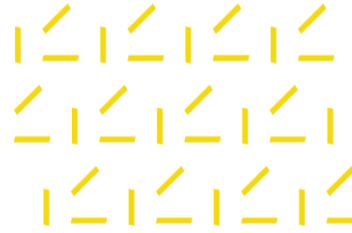


Phison may make changes to specifications, components and product description at any time without notice.

PHISON and the Phison logo are trademarks of Phison Electronics Corporation, registered in the United States and other countries. Products and specifications discussed herein are for reference purposes only. Copies of documents which include information of part number or ordering number, or other materials may be obtained by emailing us at sales@phisonenterprise.com or support@phisonenterprise.com.

©2025 Phison Electronics Corp. All Rights Reserved.

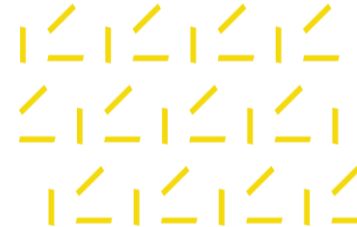
PHISON Confidential



REVISION HISTORY

Revision	Draft Date	History
0.1	2024/7/30	Preliminary Version, 1 st release
0.2	2024/8/9	Update 2TB/4TB performance, latency, IOPS consistency, QoS and 8TB est. performance, capacity, etc.
0.3	2024/8/21	Update MPN
0.4	2024/8/29	Update TBW
0.5	2025/2/13	Update performance & datasheet format
1.0	2025/2/26	Update 4T MPN, Supply Voltage, and 8TB weight
1.1	2025/3/21	Update SNIA™ Compliance Ver.
1.2	2025/4/17	Update 8TB airflow profile
1.3	2025/5/16	Update 7.68TB Part Number
1.4	2025/6/10	Update Thermal Throttling Mechanism for 6400/7680GB

This specification is based on current mass production firmware version of D200-series and is subject to change without notice. Any deviation on following firmware revisions will not be updated unless the deviation is more than 5%.



PRODUCT OVERVIEW

Capacities

- OP=7%: 1,920/3,840/7,680 GB
- OP=28%: 1,600/3,200/6,400 GB

Form Factor

- EDSFF E1.S

PCIe Interface

- PCIe Gen5x4
- PCIe AER (Advanced Error Reporting)

Compliance

- PCI Express® Base Specification Rev. 5.0
- NVMe Express® Base Specification Rev. 2.0
- NVMe Express® Management Interface Rev 1.2
- Datacenter NVMe® SSD Specification V2.0
- SNIA™ SFF-TA-1009 R3.1.1 /1006 R1.5 /1020 Rev1.1 /1023 Rev 1.0

Performance¹

- Sequential Read: 14,000 MB/s
- Sequential Write: UP to 8,500 MB/s
- Random Read: UP to 3,300 KIOPS
- Random Write: UP to 880 KIOPS

Power Consumption³

- Active Read (Avg. RMS): 20 W
- Active Write (Avg. RMS): 23 W
- Max. Idle Power: 4.9W

Endurance/Reliability

- MTBF : 2.5 million hrs
- UBER : < 1 sector per 10¹⁸ bits read
- DWPD: 1 / 3
- TBW:
1,600GB SSD – 8,760 TB
1,920GB SSD – 3,504 TB
3,200GB SSD – 17,520 TB
3,840GB SSD – 7,008 TB

6,400GB SSD – 35,040 TB

7,680GB SSD – 14,016TB

Environmental Specifications

- Temperature Range²
Operating: 0°C - 70°C with specified airflow
Non-operating: -40°C - 85°C
- Shock:
Operating: 1000G, 0.5ms
Non-operating: 1500G, 0.5ms
- Vibration:
Operating: 1.52mm/20G (20~2000 Hz)
Non-operating: 3.08Grms (7~800Hz)
- Drop: 80cm height
- Bending: ≤50N

Certifications and Declarations

- CE, FCC, BSMI, VCCI, UKCA, RCM, ICES, KCC, CB, UL

Product Ecological Compliance

- RoHS
- REACH

Features Support List:

- 128 Namespaces
- Single Port
- Reservation
- Metadata Protection
- Thermal throttling
- Power Loss Protection
- SMBus
- End-to-End Data Path Protection
- TCG Opal 2.0⁴
- Hardware AES-XTS 256-bit Encryption
- Sanitize⁴

Physical Dimension

- E1.S 9.5mm, 118.75(L)x33.75(W)x9.5(H) mm
- E1.S 15 mm, 118.75(L)x33.75(W)x15(H) mm

NOTES:

1. Refer to Chapter 2 for more details
2. Operation temperature is measured by device temperature sensor. Airflow is suggested and it will allow device to be operated at appropriate temperature for each component during heavy workloads environment. Refer to Chapter3, Section 3.1 Temperature and Humidity for more details.
3. Refer to Chapter4, Section 4.2 Power Consumption for more details.
4. Supported by a separate firmware setting. Further information available upon request.

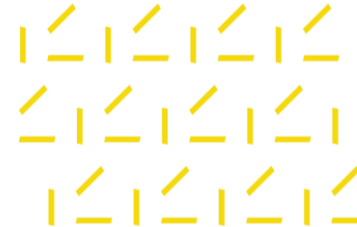
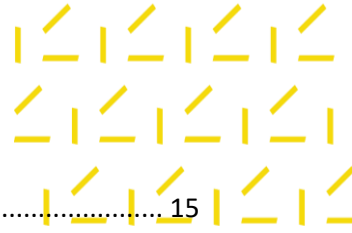
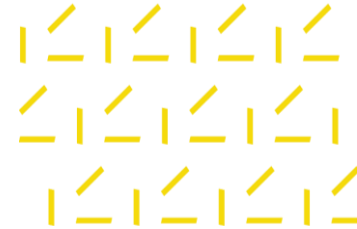


TABLE OF CONTENTS

REVISION HISTORY	2
PRODUCT OVERVIEW	3
TABLE OF CONTENTS	1
LIST OF FIGURES.....	3
LIST OF TABLES.....	4
1. INTRODUCTION.....	6
1.1. General Description	6
1.2. SSD List.....	6
2. PRODUCT SPECIFICATIONS.....	7
2.1. Electrical/Physical Interface.....	7
2.2. Device Capacity.....	7
2.3. Performance	7
2.3.1. Sequential Read/Write Performance.....	7
2.3.2. Random Read/Write Performance	8
2.3.3. IOPS Consistency.....	8
2.3.4. Latency.....	9
2.3.5. Quality of Service (QoS).....	9
2.4. Reliability	10
2.4.1. TBW (TeraBytes Written) and DWPD (Drive Write Per Day)	10
2.4.2. UBER	10
2.4.3. MTBF.....	11
3. ENVIRONMENTAL SPECIFICATIONS.....	12
3.1. Temperature and Humidity.....	12
3.2. Thermal Throttling.....	12
3.3. Airflow Profile.....	13
3.4. Mechanical (Shock/Vibration/Drop/Bending)	14
3.5. Electrostatic Discharge (ESD)	14
3.6. EMI Compliance.....	14
4. ELECTRICAL SPECIFICATIONS.....	15
4.1. Supply Voltage	15

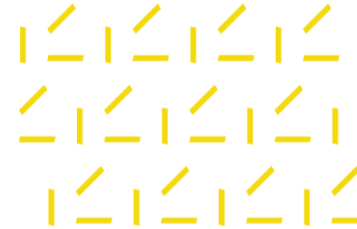


4.2.	Power Consumption	15
4.3.	Inrush Current.....	16
5.	PHYSICAL DIMENSION	17
5.1.	Physical Information	17
6.	INTERFACE	19
6.1.	PCIe E1.S Pin Assignment and Descriptions	19
7.	SUPPORTED COMMANDS	21
7.1.	NVMe Command List.....	21
7.2.	Identify Device Command	23
7.3.	SMART Attributes	29
8.	VITAL PRODUCT DATA.....	31
9.	PRODUCT COMPLIANCE	32
10.	PRODUCT WARRANTY POLICY	33
11.	REFERENCE	35



LIST OF FIGURES

Figure 3-1 Thermal Throttling Mechanism	12
Figure 3-2 D200 E1.S 9.5mm Airflow Curve.....	13
Figure 3-3 D200 E1.S 15mm Airflow Curve.....	13
Figure 5-1 EDSFF E1.S 9.5mm Mechanical Diagram for 1,600/1,920/3,200/3,840GB (Top View)	17
Figure 5-2 EDSFF E1.S 9.5mm Mechanical Diagram for 1,600/1,920/3,200/3,840GB (Bottom View).....	17
Figure 5-3 EDSFF E1.S 9.5mm Mechanical Diagram for 1,600/1,920/3,200/3,840GB (Side View)	17
Figure 5-4 EDSFF E1.S 15mm Mechanical Diagram for 6,400/7,680GB (Top View)	18
Figure 5-5 EDSFF E1.S 15mm Mechanical Diagram for 6,400/7,680GB (Bottom View)	18
Figure 5-6 EDSFF E1.S 15mm Mechanical Diagram for 6,400/7,680GB (Side View)	18
Figure 6-1 D200 E1.S PCIe SSD Pin Assignment.....	19



LIST OF TABLES

Table 1-1 D200 SSD List.....	6
Table 2-1 User Capacity and Addressable Sectors.....	7
Table 2-2 Sequential Read / Write Performance	7
Table 2-3 Random Read / Write Performance.....	8
Table 2-4 IOPS Consistency.....	8
Table 2-5 Latency.....	9
Table 2-6 QoS (99%).....	9
Table 2-7 QoS (99.99%).....	9
Table 2-8 TBW & DWPD.....	10
Table 2-9 UBER.....	10
Table 2-10 MTBF	11
Table 3-1 Temperature and Humidity Specification	12
Table 3-2 Thermal Throttling Mechanism for 1600/1920/3200/3840/6400/7680GB	12
Table 3-3 Mechanical Test Condition.....	14
Table 3-4 Electrostatic Discharge (ESD)	14
Table 3-5 EMI Compliance.....	14
Table 4-1 Supply Voltage.....	15
Table 4-2 D200P Power Consumption	15
Table 4-3 D200E Power Consumption	15
Table 4-4 Inrush Current.....	16
Table 5-1 Physical Dimensions and Weight	17
Table 6-1 Pin Assignment and Descriptions.....	19
Table 7-1 Admin Commands.....	21

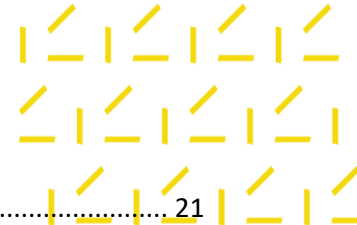
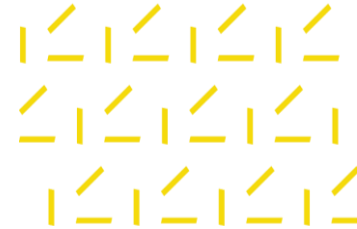


Table 7-2 I/O Commands	21
Table 7-3 Set Feature Commands	21
Table 7-4 Get Log Page Commands	22
Table 7-5 NVMe Management Interface Commands	22
Table 7-6 SMBus / I2C Elements Supported	23
Table 7-7 Identify Controller Data Structure	23
Table 7-8 NVMe Command Set Attributes.....	24
Table 7-9 I/O Command Set Attributes.....	25
Table 7-10 I/O Vendor Specific	27
Table 7-11 Identify Namespace Data Structure & NVM Command Set Specific	27
Table 7-12 List of Identify Namespace Data Structure for Each Capacity (512+0)	29
Table 7-13 SMART Attributes (Log Identifier 02h)	29
Table 7-14 SMART Attributes (Log Identifier C0h)	29
Table 9-1 Product Regulatory Compliance and Certifications	32
Table 11-1 List of References	35



1. INTRODUCTION

1.1. General Description

Phison's E1.S Solid State Disk (SSD) delivers all the advantages of flash disk technology with PCIe Gen5x4 interface, including being fully compliant with standard E1.S form factor, providing low power consumption compared to traditional hard drive and hot-swapping when removing/replacing/upgrading flash disks. D200 series offers a wide range of capacities up to 7,680GB and its performance can reach up to 14,000 MB/s (for sequential read) and 8,500 MB/s (for sequential write) based on 3D TLC NAND flash with the LPDDR5. Moreover, the power consumption of D200 series SSD is much lower than traditional hard drives, making it the best embedded solution for new platforms.

1.2. SSD List

Table 1-1 D200 SSD List

Model Name	Form Factor	DWPD	Capacity	Security	Part Number
D200P	EDSFF E1.S	1	1920GB	ISE	DP20AH031T92P312T0410
				SED	DP20AH031T92P212T0410
			3840GB	ISE	DP20AH033T84P314T0910
				SED	DP20AH033T84P214T0910
			7680GB	ISE	DP20BH037T68P318T1910
				SED	DP20BH037T68P218T1910
D200E	EDSFF E1.S	3	1600GB	ISE	DP20AH031T60E312T0410
				SED	DP20AH031T60E212T0410
			3200GB	ISE	DP20AH033T20E314T0910
				SED	DP20AH033T20E214T0910
			6400GB	ISE	DP20BH036T40E318T1910
				SED	DP20BH036T40E218T1910



2. PRODUCT SPECIFICATIONS

2.1. Electrical/Physical Interface

- PCI Express® Base Specification Rev. 5.0
- NVM Express® Base Specification Rev. 2.0
- NVM Express® Management Interface Rev 1.2
- Datacenter NVMe® SSD Specification V2.0
- PCIe Gen 5 x 4 lanes & backward compatible to PCIe Gen 4, Gen 3, Gen 2 and Gen 1 Device Capacity
- SNIA™ SFF-TA-1009 R3.1.1 / 1006 R1.5 / 1020 Rev1.1 / 1023 Rev 1.0

2.2. Device Capacity

Table 2-1 User Capacity and Addressable Sectors

Model Name	Capacity	User Addressable Sectors	Bytes per Sector
D200P	1,920GB	3,750,748,848	512 Bytes
	3,840GB	7,501,476,528	
	7,680GB	15,002,931,888	
D200E	1,600GB	3,125,627,568	
	3,200GB	6,251,233,968	
	6,400GB	12,502,446,768	

NOTES:

1. 1 Gigabyte (GB) is equal to 1,000,000,000 bytes; 1 sector is equal to 512 bytes.
2. The total actual usable capacity of the SSD may be less than the total physical capacity because internal NAND management, SSD format, SSD partition, operating system and so on.
3. The count of User Addressable Sectors is calculated by the formula of IDEMA.

2.3. Performance

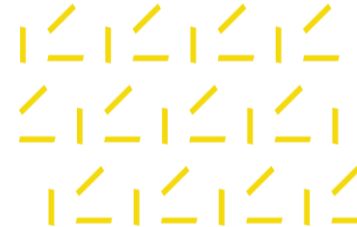
2.3.1. Sequential Read/Write Performance

Table 2-2 Sequential Read / Write Performance

Model Name	Capacity	Flash Type	Sequential 512KB (QD=32, Job=1)	
			Read (MB/s)	Write (MB/s)
D200P	1,920GB	3D TLC	14,000	4,200
	3,840GB	3D TLC	14,000	8,400
	7,680GB	3D TLC	14,000	8,500
D200E	1,600GB	3D TLC	14,000	4,200
	3,200GB	3D TLC	14,000	8,400
	6,400GB	3D TLC	14,000	8,500

NOTES:

1. Performance is measured with the following conditions
 - (a) FIO on Linux for full drive.
 - (b) SSD is unformatted drive.
2. Performance platform:



- (a) Mother board: Giga Computing MS03-CE0-000
- (b) CPU: Intel(R) Xeon(R) Gold 5416S
- (c) DRAM: DDR5 64G
- (d) OS version: Ubuntu 20.04.2 LTS
3. Performance may differ according to flash configuration and platform.
4. The tables are for reference only. Any criteria for accepting goods shall be further discussed based on different flash configurations.

2.3.2. Random Read/Write Performance

Table 2-3 Random Read / Write Performance

Model Name	Capacity	Flash Type	Random 4KB (QD=128, Jobs=8)	
			Read (IOPS)	Write (IOPS)
D200P	1,920GB	3D TLC	2,350K	140K
	3,840GB	3D TLC	3,300K	220K
	7,680GB	3D TLC	3,200K	420K
D200E	1,600GB	3D TLC	2,350K	390K
	3,200GB	3D TLC	3,300K	670K
	6,400GB	3D TLC	3,200K	880K

NOTES:

1. Performance is measured with the following conditions
 - (a) FIO on Linux for full drive.
 - (b) SSD is unformatted drive.
2. Performance platform:
 - (c) Mother board: Giga Computing MS03-CE0-000
 - (d) CPU: Intel(R) Xeon(R) Gold 5416S
 - (e) DRAM: DDR5 64G
 - (f) OS version: Ubuntu 20.04.2 LTS
3. Performance may differ according to flash configuration and platform.
4. The tables are for reference only. Any criteria for accepting goods shall be further discussed based on different flash configurations.

2.3.3. IOPS Consistency

Table 2-4 IOPS Consistency

Model Name	Capacity	Flash Type	Random 4KB (QD=1, Job=1)		Random 4KB (QD=8, Jobs=4)	
			Read	Write	Read	Write
D200P	1,920 GB	3D TLC	95%	95%	95%	95%
	3,840 GB	3D TLC	95%	95%	95%	95%
	7,680GB	3D TLC	95%	95%	95%	95%
D200E	1,600 GB	3D TLC	95%	95%	95%	90%
	3,200 GB	3D TLC	95%	95%	95%	90%
	6,400GB	3D TLC	95%	95%	95%	90%

NOTES

1. Performance is measured with the following conditions
 - (a) FIO on Linux: 4KB random read/write for full drive.
 - (b) SSD is unformatted drive.
2. Performance Platform
 - (a) Mother board: Giga Computing MS03-CE0-000
 - (b) CPU: Intel(R) Xeon(R) Gold 5416S
 - (c) DRAM: DDR5 64G
 - (d) OS version: Ubuntu 20.04.2 LTS
3. IOPS Consistency (%) = (99.9% IOPS) / (Average IOPS) x 100
4. Performance may differ according to flash configuration and platform.

5. The tables are for reference only. Any criteria for accepting goods shall be further discussed based on different flash configurations.

2.3.4. Latency

Table 2-5 Latency

Model Name	Capacity	Flash Type	Random 4KB (QD=1, Job=1)		Random 4KB (QD=8, Jobs=4)	
			Read (μs)	Write (μs)	Read (μs)	Write (μs)
D200P	1,920 GB	3D TLC	60	9	70	250
	3,840 GB	3D TLC	60	9	70	150
	7,680GB	3D TLC	60	9	70	100
D200E	1,600 GB	3D TLC	60	9	70	100
	3,200 GB	3D TLC	60	9	70	50
	6,400GB	3D TLC	60	9	70	50

NOTES

- Performance is measured with the following conditions
 - FIO on Linux: 4KB random read/write for full drive.
 - SSD is unformatted drive.
- Performance Platform
 - Mother board: Giga Computing MS03-CE0-000
 - CPU: Intel(R) Xeon(R) Gold 5416S
 - DRAM: DDR5 64G
 - OS version: Ubuntu 20.04.2 LTS
- Performance may differ according to flash configuration and platform.
- The tables are for reference only. Any criteria for accepting goods shall be further discussed based on different flash configurations.

2.3.5. Quality of Service (QoS)

Table 2-6 QoS (99%)

Model Name	Capacity	Flash Type	4KB Random Read/Write Quality of Service (QoS=99%)			
			(QD=1, Job=1)		(QD=8, Jobs=4)	
			Read (μs)	Write (μs)	Read (μs)	Write (μs)
D200P	1,920 GB	3D TLC	70	10	140	250
	3,840 GB	3D TLC	70	10	130	180
	7,680GB	3D TLC	70	10	120	120
D200E	1,600 GB	3D TLC	70	10	140	120
	3,200 GB	3D TLC	70	10	130	120
	6,400GB	3D TLC	70	10	120	120

Table 2-7 QoS (99.99%)

Model Name	Capacity	Flash Type	4KB Random Read/Write Quality of Service (QoS=99.99%)			
			(QD=1, Job=1)		(QD=8, Jobs=4)	
			Read (μs)	Write (μs)	Read (μs)	Write (μs)
D200P	1,920 GB	3D TLC	75	13	240	500
	3,840 GB	3D TLC	75	13	200	500
	7,680GB	3D TLC	75	13	180	500
D200E	1,600 GB	3D TLC	75	13	240	500
	3,200 GB	3D TLC	75	13	200	500
	6,400GB	3D TLC	75	13	180	500

NOTES

- Performance is measured with the following conditions
 - FIO on Linux: 4KB random read and write for full drive.

- (b) SSD is unformatted drive.
- 2. Performance Platform
 - (a) Mother board: Giga Computing MS03-CE0-000
 - (b) CPU: Intel(R) Xeon(R) Gold 5416S
 - (c) DRAM: DDR5 64G
 - (d) OS version: Ubuntu 20.04.2 LTS
- 3. Performance may differ according to flash configuration and platform.
- 4. The tables are for reference only. Any criteria for accepting goods shall be further discussed based on different flash configurations.

2.4. Reliability

2.4.1. TBW (TeraBytes Written) and DWPD (Drive Write Per Day)

Table 2-8 TBW & DWPD

Model Name	Capacity	TBW	DWPD
D200P	1,920GB	3,504	1
	3,840GB	7,008	1
	7,680GB	14,016	1
D200E	1,600GB	8,760	3
	3,200GB	17,520	3
	6,400GB	35,040	3

NOTES

1. The JEDEC Enterprise 219A workload.
2. Warranty is 5 years.
3. $DWPD = TBW / (365 \times 5 \text{ years} \times \text{User capacity})$

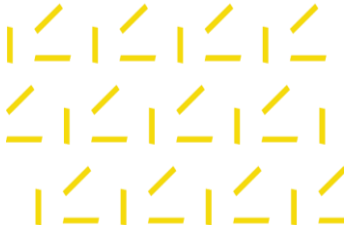
2.4.2. UBER

Table 2-9 UBER

Capacity	UBER
1,600GB	< 1 sector per 10^{18} bits read
1,920GB	
3,200GB	
3,840GB	
6,400GB	
7,680GB	

NOTES

1. UBER (Uncorrectable Bit Error Rates) means the uncorrectable error per bits read.



2.4.3. MTBF

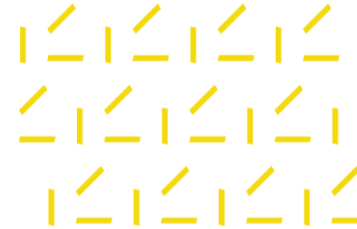
Table 2-10 MTBF

Capacity	MTBF
1,600GB	2.5 million hours
1,920GB	
3,200GB	
3,840GB	
6,400GB	
7,680GB	

NOTES

1. MTBF (Mean Time Between Failures) represents the average operational time between failures of the drive

PHISON Confidential



3. ENVIRONMENTAL SPECIFICATIONS

3.1. Temperature and Humidity

Table 3-1 Temperature and Humidity Specification

Temperature	Operating	0°C to 70°C ¹
	Non-operating	-40°C to 85°C
Relative Humidity	Operating	5% to 90%
	Non-operating	5% to 93%

NOTES:

- Operating temperature is measured by device temperature sensor. Airflow is suggested and it will allow device to be operated at appropriate temperature for each component during heavy workloads environment.

3.2. Thermal Throttling

Table 3-2 Thermal Throttling Mechanism for 1600/1920/3200/3840/6400/7680GB

Item	Description
Stage 1 No TMT	Full Speed
Stage2 TMT1	While flash temp reach TMT1 (flash 77 °C), it would trigger TMT to decrease Performance lightly.
Stage3 TMT2	While flash temp reach TMT2 (flash 81 °C), it would trigger TMT to decrease Performance heavily.
Stage 4 TT Stable	To keep TT stable within flash temp 77~83°C, would monitor temp every 1 sec.
TMT Protect	While flash temp reach 84°C, keep seq write performance (~500MB)
Fatal	Turn off PMIC (Power Management IC) due to flash Tc = 85°C or controller TJ=115°C. To shut down power supply. The SSD state is shutdown.
Exit TT	While temperature <=75°C, Device exit TT(Full speed)

NOTES:

- The temperature for TMT is based on T_{case} . (T_{case} : temperate value of on SSD thermal sensor)
- TMT levels maybe varying by different workloads.

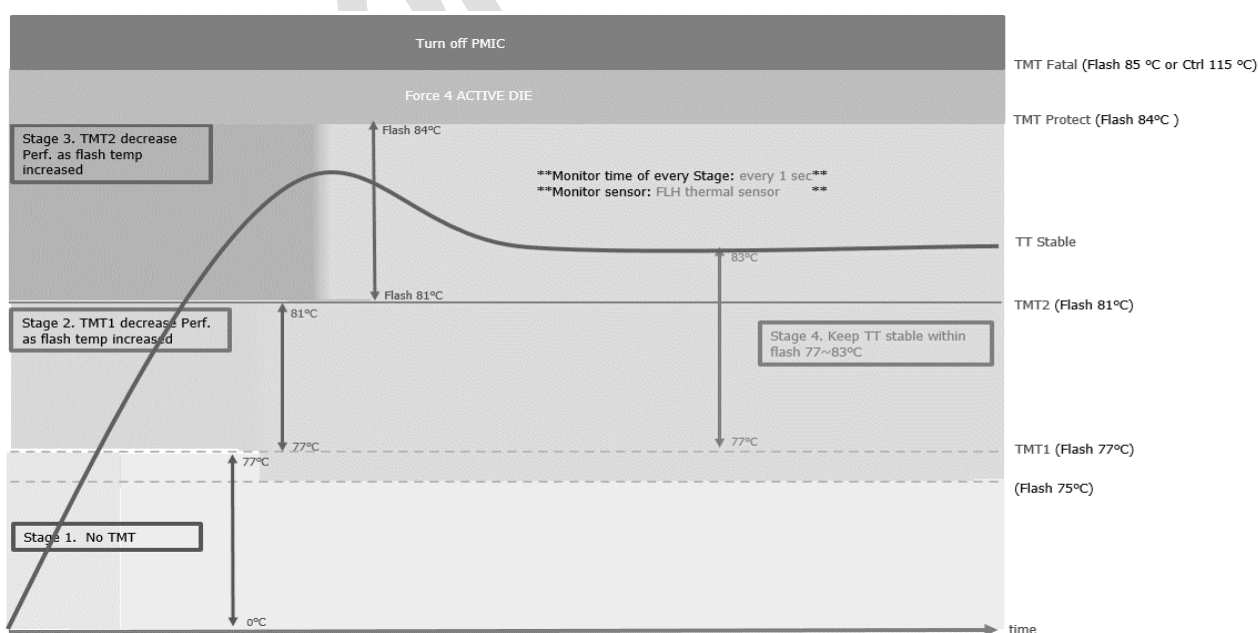
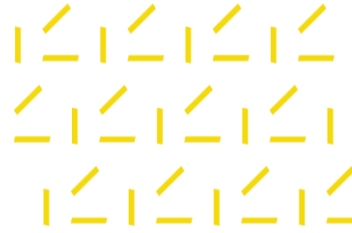


Figure 3-1 Thermal Throttling Mechanism



3.3. Airflow Profile

Figure 3-2 depicts the minimum airflow a D200 E1.S (4TB) SSD needs to operate without triggering thermal throttling at different ambient temperatures.

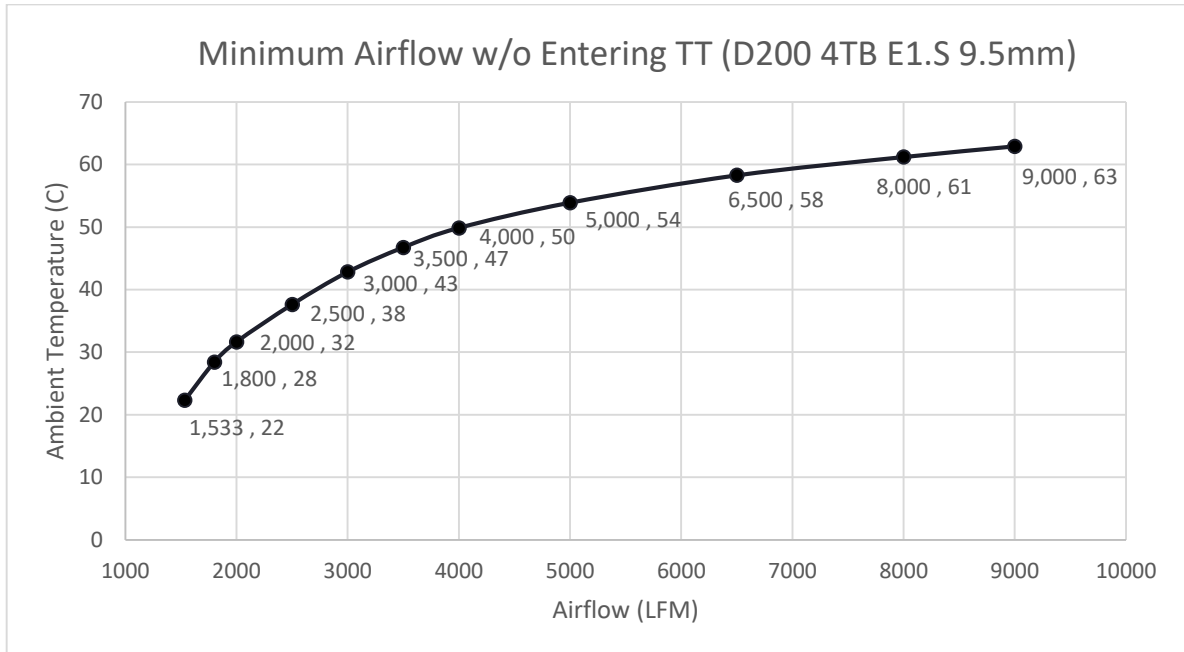


Figure 3-2 D200 E1.S 9.5mm Airflow Curve

Figure 3-3 depicts the minimum airflow a D200 E1.S (8TB) SSD needs to operate without triggering thermal throttling at different ambient temperatures.

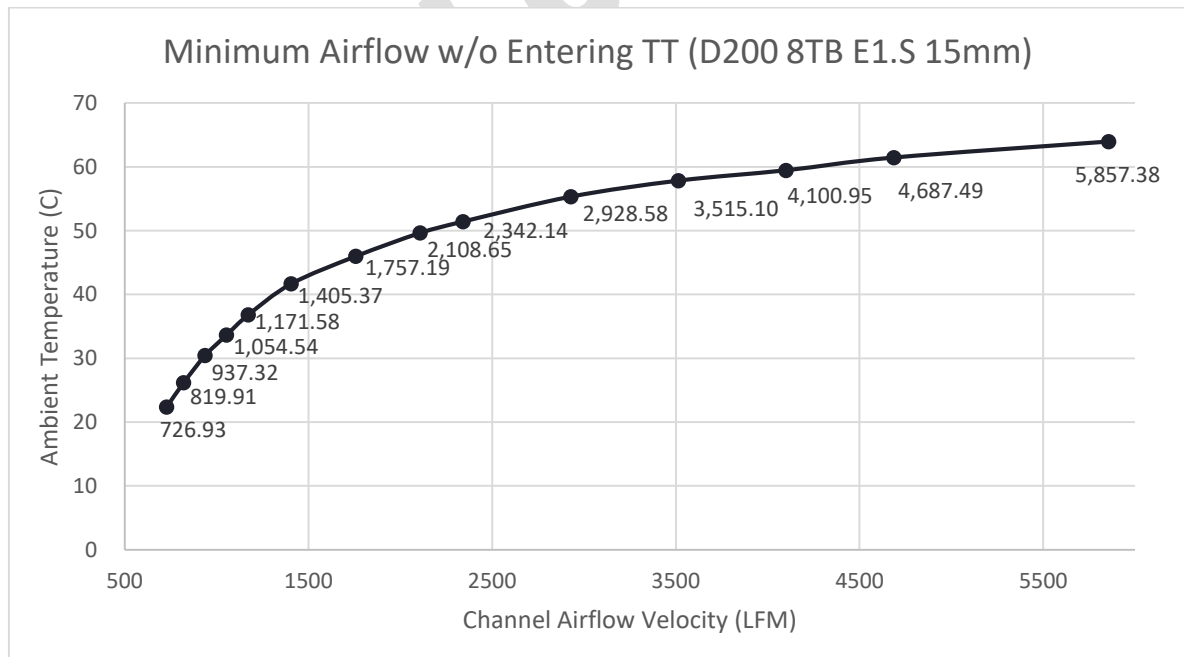
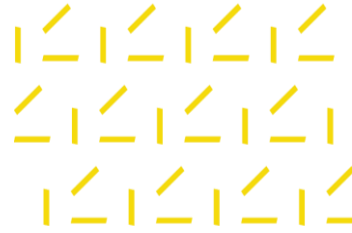


Figure 3-3 D200 E1.S 15mm Airflow Curve



3.4. Mechanical (Shock/Vibration/Drop/Bending)

Table 3-3 Mechanical Test Condition

Shock	Operating	1000G, 0.5ms
	Non-operating	1500G, 0.5ms
Vibration	Operating	3.08Grms (7 - 200Hz)
	Non-operating	20G (20 - 2000Hz)
Drop	Non-operating	80cm
Bending	Non-operating	50N

3.5. Electrostatic Discharge (ESD)

Table 3-4 Electrostatic Discharge (ESD)

Specification	+/- 4KV
EN 55035, CISPR 35 EN 61000-4-2 and IEC 61000-4-2	Device functions are affected, but EUT will be back to its normal or operational state automatically.

3.6. EMI Compliance

Table 3-5 EMI Compliance

Specification
EN 55032, CISPR 32(CE) AS/NZS CISPR 32(CE) ANSI C63.4 (FCC) CNS 15936 (BSMI) VCCI-CISPR 32 (VCCI)



4. ELECTRICAL SPECIFICATIONS

4.1. Supply Voltage

Table 4-1 Supply Voltage

12V Operating Voltage	12V, +/- 10%
12V Rise Time (Max/Min)	2ms/ 100ms
12V Fall Time (Max/Min)	0.1ms / 5s
12V Noise Level	240mVp-p, 0-20MHz
Min. Off Time ¹ (under 0.1 V)	500ms
3.3Vaux Operating Voltage	3.3V, +5%/- 10%
3.3Vaux Rise Time (Max/Min)	2ms / 100ms
3.3Vaux Fall Time (Max/Min)	0.1ms / 5s
3.3Vaux Noise Level	66mVp-p, 0-20MHz

NOTE:

1. Minimum time between power removed from SSD (Vcc < 100 mV) and power re-applied to the drive.

4.2. Power Consumption

Table 4-2 D200P Power Consumption

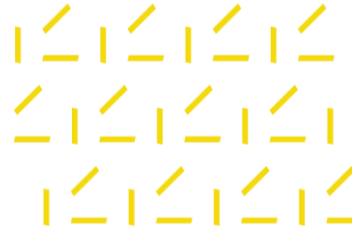
Model Name	D200P		
Capacity	1920GB	3840GB	7680GB
128K Sequential READ (Average RMS, W)	16	16	17
128K Sequential WRITE (Average RMS, W)	14	19	20
4KB Random READ (Average RMS, W)	15	17	20
4KB Random WRITE (Average RMS, W)	16	18	23
4KB 70/30 Random READ/WRITE (Average RMS, W)	13	17	20
Idle (Average RMS, W)	4.9	4.9	4.9

Table 4-3 D200E Power Consumption

Model Name	D200E		
Capacity	1600GB	3200GB	6400GB
128K Sequential READ (Average RMS, W)	17	17	17
128K Sequential WRITE (Average RMS, W)	14	19	20
4KB Random READ (Average RMS, W)	15	17	20
4KB Random WRITE (Average RMS, W)	15	20	22
4KB 70/30 Random READ/WRITE (Average RMS, W)	13	17	20
Idle (Average RMS, W)	4.9	4.9	4.9

NOTES:

1. Power consumption is measured in average RMS on full speed mode.
2. Performance is measured with the following conditions
 - (a) Power Consumption: 128KB seq. read/write & 4K random read/write for full drive.
 - (b) SSD is unformatted drive.
3. Performance platform:
 - (a) Mother board: Gigabyte Technology Co., Ltd. Z790 AERO G
 - (b) CPU: 13th Gen Intel(R) Core(TM) i5-13500
 - (c) OS version: Ubuntu 20.04.2 LTS
4. Performance may differ according to flash configuration and platform.
5. The tables are for reference only. Any criteria for accepting goods shall be further discussed based on



different flash configurations.

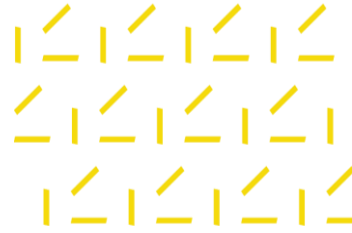
6. Power consumption is measured in average RMS on full speed mode.
7. Data collection procedure – Average RMS (500ms resolution)
 - (a) Run entire test script one time.
 - (b) Run every condition in this script
 - (c) Calculate average value for every condition then choose Average RMS
 - (d) Note value for every condition
 - (e) 3pcs sample for every capacity.

4.3. Inrush Current

Table 4-4 Inrush Current

Inrush current	1,600GB/1,920GB	3,200GB/3,840GB	6,400 GB/7,680 GB
12V	2.0A		

PHISON Confidential



5. PHYSICAL DIMENSION

5.1. Physical Information

Table 5-1 Physical Dimensions and Weight

Parameter	Unit	1,600/1,920GB	3,200/3,840GBGB	6,400/7,680GB
Length	mm	118.75 ± 0.55		
Width	mm	33.75 ± 0.25		
Height	mm	9.50 ± 0.35		
Weight	g	<80	<80	<100

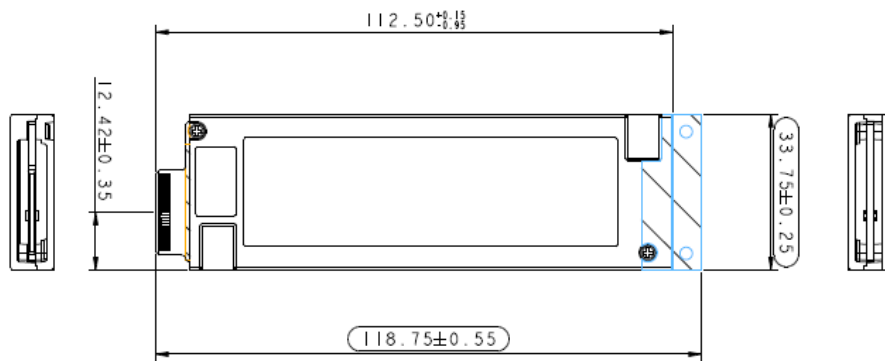


Figure 5-1 EDSFF E1.S 9.5mm Mechanical Diagram for 1,600/1,920/3,200/3,840GB (Top View)

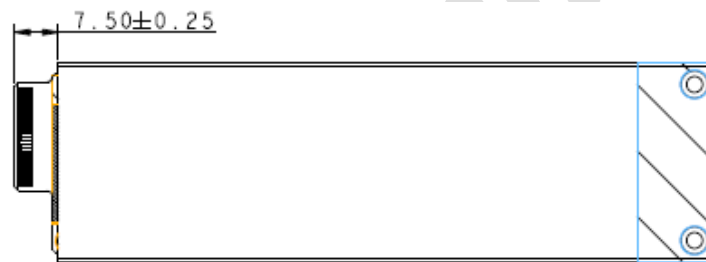


Figure 5-2 EDSFF E1.S 9.5mm Mechanical Diagram for 1,600/1,920/3,200/3,840GB (Bottom View)

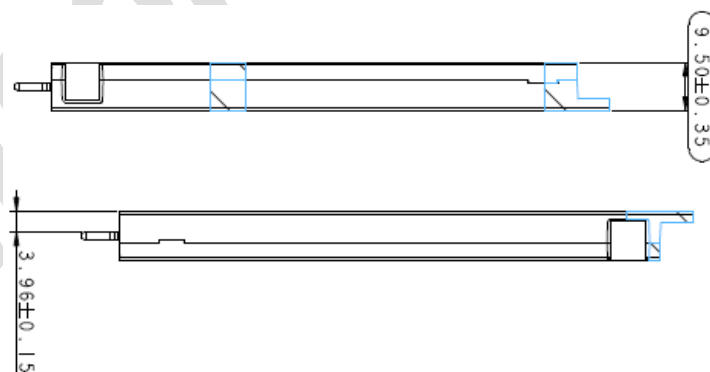


Figure 5-3 EDSFF E1.S 9.5mm Mechanical Diagram for 1,600/1,920/3,200/3,840GB (Side View)

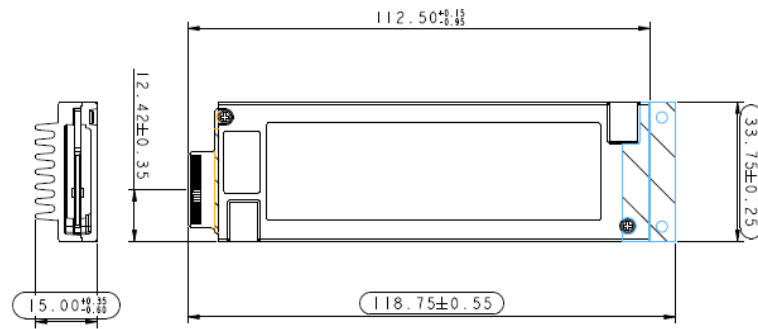


Figure 5-4 EDSFF E1.S 15mm Mechanical Diagram for 6,400/7,680GB (Top View)

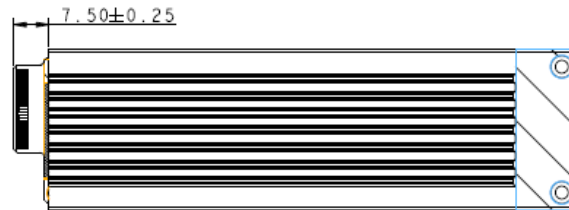


Figure 5-5 EDSFF E1.S 15mm Mechanical Diagram for 6,400/7,680GB (Bottom View)

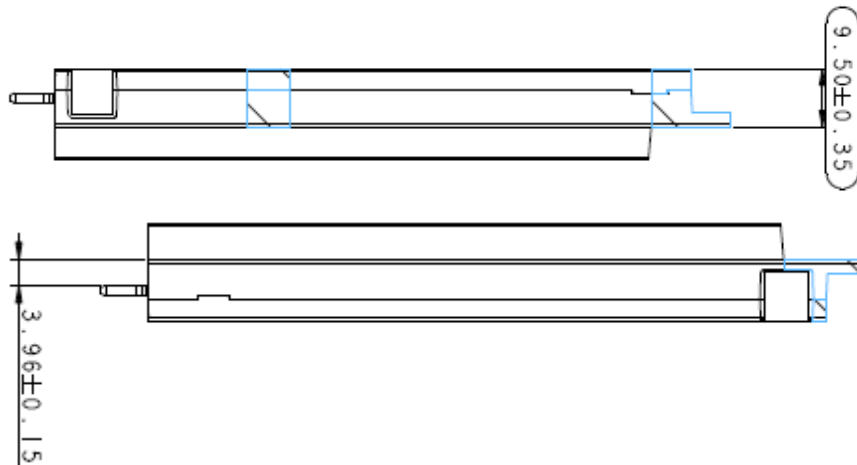
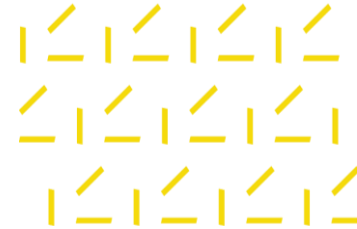


Figure 5-6 EDSFF E1.S 15mm Mechanical Diagram for 6,400/7,680GB (Side View)



6. INTERFACE

6.1. PCIe E1.S Pin Assignment and Descriptions

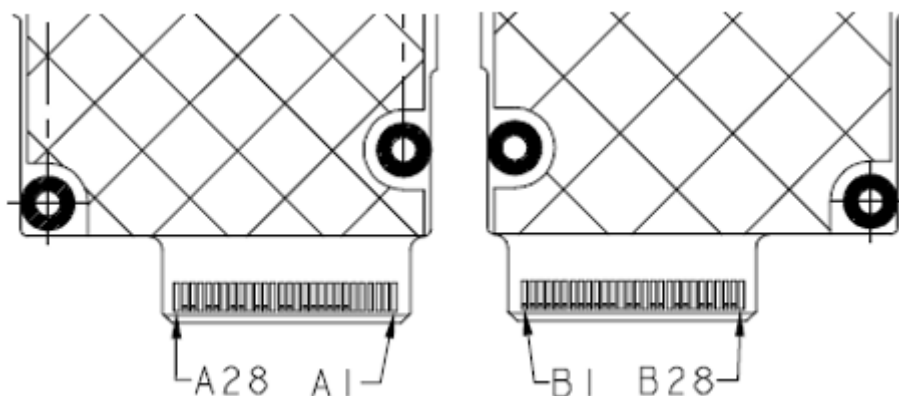
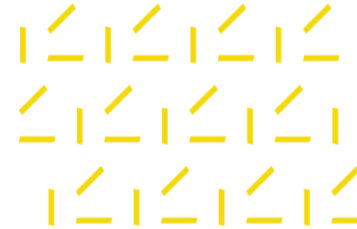


Figure 6-1 D200 E1.S PCIe SSD Pin Assignment

Table 6-1 Pin Assignment and Descriptions

Pin No.	PCIe Pin	Description
A1	Ground	Ground
A2	Ground	Ground
A3	Ground	Ground
A4	Ground	Ground
A5	Ground	Ground
A6	Ground	Ground
A7	SMCLK	SMBus (System Management Bus) clock
A8	SMDAT	SMBus (System Management Bus) data
A9	SMRST#	SMBus (System Management Bus) reset
A10	LED	Drive LED state
A11	CLKREQ#/PERSTB#	Clock request/Fundamental reset for second x2 port
A12	PRSNT#	Presence detect
A13	Ground	Ground
A14	REFCLKB-	Reference clock (differential pair) for second X2 port
A15	REFCLKB+	Reference clock (differential pair) for second X2 port
A16	Ground	Ground
A17	E1.S RX n0	Receiver differential pair, E1.S Lane 0
A18	E1.S RX p0	Receiver differential pair, E1.S Lane 0
A19	Ground	Ground
A20	E1.S RX n1	Receiver differential pair, E1.S Lane 1
A21	E1.S RX p1	Receiver differential pair, E1.S Lane 1
A22	Ground	Ground
A23	E1.S RX n2	Receiver differential pair, E1.S Lane 2
A24	E1.S RX p2	Receiver differential pair, E1.S Lane 2
A25	Ground	Ground
A26	E1.S RX n3	Receiver differential pair, E1.S Lane 3
A27	E1.S RX p3	Receiver differential pair, E1.S Lane 3
A28	Ground	Ground
B1	+12V	+12V for SFF-TA-1009 power
B2	+12V	+12V for SFF-TA-1009 power
B3	+12V	+12V for SFF-TA-1009 power

Pin No.	PCIe Pin	Description
B4	+12V	+12V for SFF-TA-1009 power
B5	+12V	+12V for SFF-TA-1009 power
B6	+12V	+12V for SFF-TA-1009 power
B7	MFG	Manufacturing mode
B8	RFU	Reserved
B9	DualPortEn#	Dual-port Enable
B10	PERST#	Fundamental reset (if Single Port mode enabled, first x2 port)
B11	+3.3 Vaux	3.3 V auxiliary power
B12	PWRDIS	Power disable
B13	Ground	Ground
B14	REFCLK-	Reference clock (if dual-port enabled, first X2 port)
B15	REFCLK+	Reference clock (if dual-port enabled, first X2 port)
B16	Ground	Ground
B17	E1.S TX n0	Transmitter differential pair, E1.S Lane 0
B18	E1.S TX p0	Transmitter differential pair, E1.S Lane 0
B19	Ground	Ground
B20	E1.S TX n1	Transmitter differential pair, E1.S Lane 1
B21	E1.S TX p1	Transmitter differential pair, E1.S Lane 1
B22	Ground	Ground
B23	E1.S TX n2	Transmitter differential pair, E1.S Lane 2
B24	E1.S TX p2	Transmitter differential pair, E1.S Lane 2
B25	Ground	Ground
B26	E1.S TX n3	Transmitter differential pair, E1.S Lane 3
B27	E1.S TX p3	Transmitter differential pair, E1.S Lane 3
B28	Ground	Ground



7. SUPPORTED COMMANDS

7.1. NVMe Command List

Table 7-1 Admin Commands

Identifier	O/M	Command Description
00h	M	Delete I/O Submission Queue
01h	M	Create I/O Submission Queue
02h	M	Get Log Page
04h	M	Delete I/O Completion Queue
05h	M	Create I/O Completion Queue
06h	M	Identify
08h	M	Abort
09h	M	Set Feature
0Ah	M	Get Feature
0Ch	M	Asynchronous Event Request
0Dh	O	Namespace Management
10h	O	Firmware Commit
11h	O	Firmware Image Download
14h	O	Device Self-test
15h	O	Namespace Attachment
1Dh	O	NVMe-MI Send
1Eh	O	NVMe-MI Receive
80h	O	Format NVM
81h	O	Security Send
82h	O	Security Receive
84h	O	Sanitize

Table 7-2 I/O Commands

Identifier	O/M	Command Description
00h	M	Flush
01h	M	Write
02h	M	Read
04h	O	Write Uncorrectable
05h	O	Compare
08h	O	Write Zeroes
09h	O	Dataset Management (Trim only)
0Ch	O	Verify
0Dh	O	Reservation Register
0Eh	O	Reservation Report
11h	O	Reservation Acquire
15h	O	Reservation Release

Table 7-3 Set Feature Commands

Identifier	O/M	Command Description
01h	M	Arbitration
02h	M	Power Management
04h	M	Temperature Threshold
05h	M	Error Recovery
07h	M	Number Of Queues

Identifier	O/M	Command Description
08h	M	Interrupt Coalescing
09h	M	Interrupt Vector Configuration
0Ah	M	Write Atomicity Normal
0Bh	M	Asynchronous Event Configuration
0Eh	O	Timestamp
10h	O	Host Controlled Thermal Management
17h	O	Sanitize Config
18h	O	Endurance Group Event Configuration
7Dh	M	Enhanced controller metadata
7Eh	M	Controller Metadata (NVMe MI)
7Fh	M	Namespace Metadata (NVMe MI)
81h	O	Host Identifier
82h	O	Reservation Notification Mask
83h	O	Reservation Persistence

Table 7-4 Get Log Page Commands

Identifier	O/M	Command Description
00h	M	Supported Log Pages
01h	M	Error Information
02h	M	SMART / Health Information
03h	M	Firmware Slot Information
04h	O	Changed Namespace List
05h	O	Commands Supported and Effects
06h	O	Device Self-test
07h	O	Telemetry Host-Initiated
08h	O	Telemetry Controller-Initiated
12h	O	Feature Identifiers Supported and Effects Log
13h	O	NVMe-MI Commands Supported and Effects Log
14h	O	Command and Feature Lockdown Log
19h	O	Physical Interface Receiver Eye Opening Measurement Log Page(as per TP-4119)
0Dh	O	Persistent Event Log
0Fh	O	Endurance Group Event Aggregate
80h	O	Reservation Notification
81h	O	Sanitize Status

Table 7-5 NVMe Management Interface Commands

Identifier	O/M	Command Description
00h	M	Read NVMe-MI Data Structure
01h	M	NVM Subsystem Health Status Poll
02h	M	Controller Health Status Poll
03h	M	Configuration Set
04h	M	Configuration Get
05h	M	VPD Read
06h	M	VPD Write
07h	M	Reset

Table 7-6 SMBus / I2C Elements Supported

SMBus/I2C Element	SMBus/I2C Address(8bit)	
	Hex Format	Binary format
FRU Information Device (for NVMe Storage Device)	A6h	1010_011xb
SMBus/I2C Management Endpoint	3Ah	0011_101xb
Basic Management Command	D4h	1101_010xb

7.2. Identify Device Command

The following table details the sector data returned by the IDENTIFY DEVICE command.

Table 7-7 Identify Controller Data Structure

Bytes	O/M	Description	Default Value
01:00	M	PCI Vendor ID (VID)	0X1987
03:02	M	PCI Subsystem Vendor ID (SSVID)	0X1987
23:04	M	Serial Number (SN)	TBD
63:24	M	Model Number (MN)	TBD
71:64	M	Firmware Revision (FR)	TBD
72	M	Recommended Arbitration Burst (RAB)	0x00
75:73	M	IEEE OUI Identifier (IEEE)	TBD*
76	O	Controller Multi-Path I/O and Namespace Sharing Capabilities (CMIC)	0x03
77	M	Maximum Data Transfer Size (MDTS)	0x09
79:78	M	Controller ID (CNTLID)	0x0000
83:80	M	Version (VER)	0x00020000
87:84	M	RTD3 Resume Latency (RTD3R)	0x001E8480 (2 Sec)
91:88	M	RTD3 Entry Latency (RTD3E)	0x00989680
95:92	M	Optional Asynchronous Events Supported (OAES)	0x00004300
99:96	M	Controller Attributes (CTRATT)	0x00000290
101:100	O	Read Recovery Levels Supported (RRLS):	0x0000
110:102	-	Reserved	0x00
111	M	Controller Type (CNTRLTYPE)	0x01
127:112	O	FRU Globally Unique Identifier (FGUID):	TBD
129:128	O	Command Retry Delay Time 1 (CRDT1):	0x0000
131:130	O	Command Retry Delay Time 2 (CRDT2):	0x0000
133:132	O	Command Retry Delay Time 3 (CRDT3):	0x0000
239:134		Reserved	
255:240	-	Refer to the NVMe Management Interface Specification for definition	0x00
257:256	M	Optional Admin Command Support (OACS)	0x045F
258	M	Abort Command Limit (ACL)	0x07
259	M	Asynchronous Event Request Limit (AERL)	0x0F
260	M	Firmware Updates (FRMW)	0X1F
261	M	Log Page Attributes (LPA)	0X3E
262	M	Error Log Page Entries (ELPE)	0xFF
263	M	Number of Power States Support (NPSS)	5
264	M	Admin Vendor Specific Command Configuration (AVSCC)	0x01
265	O	Autonomous Power State Transition Attributes (APSTA)	0x00
267:266	M	Warning Composite Temperature Threshold (WCTEMP)	0x015E (70C)
269:268	M	Critical Composite Temperature Threshold (CCTEMP)	0x0166 (80C)

Bytes	O/M	Description	Default Value
271:270	O	Maximum Time for Firmware Activation (MTFA)	0x0032
275:272	O	Host Memory Buffer Preferred Size (HMPRE)	0x00000000
279:276	O	Host Memory Buffer Minimum Size (HMMIN)	0x00000000
295:280	O	Total NVM Capacity (TNVMCAP)	**
311:296	O	Unallocated NVM Capacity (UNVMCAP)	**
315:312	O	Replay Protected Memory Block Support (RPMBS)	0x00000000
317:316	O	Extended Device Self-test Time (EDSTT)	0x0002
318	O	Device Self-test Options (DSTO)	0x01
319	O	Firmware Update Granularity (FWUG)	0xFF
321:320	O	Keep Alive Support (KAS)	0x0000
323:322	O	Host Controlled Thermal Management Attributes (HCTMA)	0x0001
325:324	O	Minimum Thermal Management Temperature (MNTMT)	0x0111
327:326	O	Maximum Thermal Management Temperature (MXTMT)	0x01A2
331:328	O	Sanitize Capabilities (SANICAP)	0x40000003
335:332	O	Host Memory Buffer Minimum Descriptor Entry Size (HMMINDS):	0x00000000
337:336	O	Host Memory Maximum Descriptors Entries (HMMAXD):	0x0000
339:338	O	NVM Set Identifier Maximum (NSETIDMAX):	0x0000
341:340	O	Endurance Group Identifier Maximum (ENDGIDMAX):	0x0000
342	O	ANA Transition Time (ANATT):	0x00
343	O	Asymmetric Namespace Access Capabilities (ANACAP):	0x00
347:344	O	ANA Group Identifier Maximum (ANAGRPMAX):	0x00000000
351:348	O	Number of ANA Group Identifiers (NANAGRPID):	0x00000000
355:352	O	Persistent Event Log Size (PELS):	0x63
511:356		Reserved	0x0

Table 7-8 NVMe Command Set Attributes

Bytes	O/M	Description	Default Value
512	M	Submission Queue Entry Size (SQES)	0x66
513	M	Completion Queue Entry Size (CQES)	0x44
515:514		Maximum Outstanding Commands (MAXCMD)	0x0400 1 port 0x0200 2 port
519:516	M	Number of Namespaces (NN)	0x00000080
521:520	M	Optional NVM Command Support (ONCS)	0x00FF
523:522	M	Fused Operation Support (FUSES)	0x0001
524	M	Format NVM Attributes (FNA)	0x04
525	M	Volatile Write Cache (VWC)	0x06
527:526	M	Atomic Write Unit Normal (AWUN)	0x00FF
529:528	M	Atomic Write Unit Power Fail (AWUPF)	0x00FF
530	M	NVM Vendor Specific Command Configuration (NVSCC)	0x01
531	M	Namespace Write Protection Capabilities (NWPC):	0x00
533:532	O	Atomic Compare & Write Unit (ACWU)	0x00FF
535:534	M	Reserved	0x0000
539:536	O	SGL Support (SGLS)	0x000F0001
543:540	O	Maximum Number of Allowed Namespaces (MNAN):	0x00000000
767:544	M	Reserved	0x00
1023:768	M	NVM Subsystem NVMe Qualified Name (SUBNQN):	TBD

Table 7-9 I/O Command Set Attributes

Bytes	O/M	Description	Default Value
2079:2048	M	Power State 0 Descriptor (PSD0)	
Bit[255:184]		Reserved	0
Bit[183:182]		Active Power Scale (APS)	2
Bit[181:179]		Reserved	0
Bit[178:176]		Active Power Workload (APW)	0
Bit[175:160]		Active Power (ACTP)	0x9C4
Bit[159:152]		Reserved	0
Bit[151:150]		Idle Power Scale (IPS)	0
Bit[149:144]		Reserved	0
Bit[143:128]		Idle Power (IDLP)	0
Bit[127:125]		Reserved	0
Bit[124:120]		Relative Write Latency (RWL)	0
Bit[119:117]		Reserved	0
Bit[116:112]		Relative Write Throughput (RWT)	0
Bit[111:109]		Reserved	0
Bit[108:104]		Relative Read Latency (RRL)	0
Bit[103:101]		Reserved	0
Bit[100:96]		Relative Read Throughput (RRT)	0
Bit[95:64]		Exit Latency (EXLAT)	0
Bit[63:32]		Entry Latency (ENLAT)	0
Bit[31:26]		Reserved	0
Bit[25]		Non-Operational State (NOPS)	0
Bit[24]		Max Power Scale (MXPS)	0
Bit[23:16]		Reserved	0
Bit[15:0]		Maximum Power (MP)	0x9C4
2111:2080	O	Power State 1 Descriptor (PSD1)	
Bit[255:184]		Reserved	0
Bit[183:182]		Active Power Scale (APS)	2
Bit[181:179]		Reserved	0
Bit[178:176]		Active Power Workload (APW)	0
Bit[175:160]		Active Power (ACTP)	0x708
Bit[159:152]		Reserved	0
Bit[151:150]		Idle Power Scale (IPS)	0
Bit[149:144]		Reserved	0
Bit[143:128]		Idle Power (IDLP)	0
Bit[127:125]		Reserved	0
Bit[124:120]		Relative Write Latency (RWL)	1
Bit[119:117]		Reserved	0
Bit[116:112]		Relative Write Throughput (RWT)	1
Bit[111:109]		Reserved	0
Bit[108:104]		Relative Read Latency (RRL)	1
Bit[103:101]		Reserved	0
Bit[100:96]		Relative Read Throughput (RRT)	1
Bit[95:64]		Exit Latency (EXLAT)	0
Bit[63:32]		Entry Latency (ENLAT)	0
Bit[31:26]		Reserved	0
Bit[25]		Non-Operational State (NOPS)	0
Bit[24]		Max Power Scale (MXPS)	0
Bit[23:16]		Reserved	0

Bytes	O/M	Description	Default Value
Bit[15:0]		Maximum Power (MP)	0x708
2143:2112	O	Power State 2 Descriptor (PSD2)	
Bit[255:184]		Reserved	0
Bit[183:182]		Active Power Scale (APS)	2
Bit[181:179]		Reserved	0
Bit[178:176]		Active Power Workload (APW)	0
Bit[175:160]		Active Power (ACTP)	0x5DC
Bit[159:152]		Reserved	0
Bit[151:150]		Idle Power Scale (IPS)	0
Bit[149:144]		Reserved	0
Bit[143:128]		Idle Power (IDL P)	0
Bit[127:125]		Reserved	0
Bit[124:120]		Relative Write Latency (RWL)	2
Bit[119:117]		Reserved	0
Bit[116:112]		Relative Write Throughput (RWT)	2
Bit[111:109]		Reserved	0
Bit[108:104]		Relative Read Latency (RRL)	2
Bit[103:101]		Reserved	0
Bit[100:96]		Relative Read Throughput (RRT)	2
Bit[95:64]		Exit Latency (EXLAT)	0
Bit[63:32]		Entry Latency (ENLAT)	0
Bit[31:26]		Reserved	0
Bit[25]		Non-Operational State (NOPS)	0
Bit[24]		Max Power Scale (MXPS)	0
Bit[23:16]		Reserved	0
Bit[15:0]		Maximum Power (MP)	0x5DC
2175:2144	O	Power State 3 Descriptor (PSD3)	
Bit[255:184]		Reserved	0
Bit[183:182]		Active Power Scale (APS)	2
Bit[181:179]		Reserved	0
Bit[178:176]		Active Power Workload (APW)	0
Bit[175:160]		Active Power (ACTP)	0x4B0
Bit[159:152]		Reserved	0
Bit[151:150]		Idle Power Scale (IPS)	0
Bit[149:144]		Reserved	0
Bit[143:128]		Idle Power (IDL P)	0
Bit[127:125]		Reserved	0
Bit[124:120]		Relative Write Latency (RWL)	3
Bit[119:117]		Reserved	0
Bit[116:112]		Relative Write Throughput (RWT)	3
Bit[111:109]		Reserved	0
Bit[108:104]		Relative Read Latency (RRL)	3
Bit[103:101]		Reserved	0
Bit[100:96]		Relative Read Throughput (RRT)	3
Bit[95:64]		Exit Latency (EXLAT)	0
Bit[63:32]		Entry Latency (ENLAT)	0
Bit[31:26]		Reserved	0
Bit[25]		Non-Operational State (NOPS)	0
Bit[24]		Max Power Scale(MXPS)	0
Bit[23:16]		Reserved	0

Bytes	O/M	Description	Default Value
Bit[15:0]		Maximum Power (MP)	0x4B0
2207:2176	O	Power State 4 Descriptor (PSD4)	0
2239:2208	O	Power State 5 Descriptor (PSD5)	0
2271:2240	O	Power State 6 Descriptor (PSD6)	0
2303:2272	O	Power State 7 Descriptor (PSD7)	0
2335:2304	O	Power State 8 Descriptor (PSD8)	0
2367:2336	O	Power State 9 Descriptor (PSD9)	0
2399:2368	O	Power State 10 Descriptor (PSD10)	0
2431:2400	O	Power State 11 Descriptor (PSD11)	0
2463:2432	O	Power State 12 Descriptor (PSD12)	0
2495:2464	O	Power State 13 Descriptor (PSD13)	0
2527:2496	O	Power State 14 Descriptor (PSD14)	0
2559:2528	O	Power State 15 Descriptor (PSD15)	0
2591:2560	O	Power State 16 Descriptor (PSD16)	0
2623:2592	O	Power State 17 Descriptor (PSD17)	0
2655:2624	O	Power State 18 Descriptor (PSD18)	0
2687:2656	O	Power State 19 Descriptor (PSD19)	0
2719:2688	O	Power State 20 Descriptor (PSD20)	0
2751:2720	O	Power State 21 Descriptor (PSD21)	0
2783:2752	O	Power State 22 Descriptor (PSD22)	0
2815:2784	O	Power State 23 Descriptor (PSD23)	0
2847:2816	O	Power State 24 Descriptor (PSD24)	0
2879:2848	O	Power State 25 Descriptor (PSD25)	0
2911:2880	O	Power State 26 Descriptor (PSD26)	0
2943:2912	O	Power State 27 Descriptor (PSD27)	0
2975:2944	O	Power State 28 Descriptor (PSD28)	0
3007:2976	O	Power State 29 Descriptor (PSD29)	0
3039:3008	O	Power State 30 Descriptor (PSD30)	0
3071:3040	O	Power State 31 Descriptor (PSD31)	0
4095:3072	O	Vendor Specific.	0

Table 7-10 I/O Vendor Specific

Bytes	O/M	Description	Default Value
4095:3072	O	Vendor Specific (VS)	Phison Reserved

NOTES:

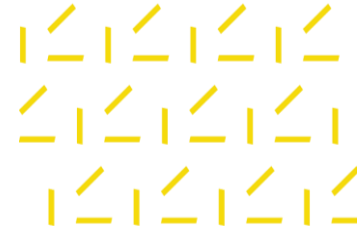
1. The OUI shall be a valid IEEE/RAC assigned identifier that may be registered at <http://standards.ieee.org/develop/regauth/oui/public.html>.
2. Depends on the using of capacity

Table 7-11 Identify Namespace Data Structure & NVM Command Set Specific

Bytes	O/M	Description	Default Value
7:0	M	Namespace Size (NSZE)	TBD*
15:8	M	Namespace Capacity (NCAP)	TBD*
23:16	M	Namespace Utilization (NUSE)	TBD*
24	M	Namespace Features (NSFEAT)	0x10
25	M	Number of LBA Formats (NLBAF)	0x04
26	M	Formatted LBA Size (FLBAS)	0x00
27	M	Metadata Capabilities (MC)	0x03
28	M	End-to-end Data Protection Capabilities (DPC)	0x13
29	M	End-to-end Data Protection Type Settings (DPS)	0x00

Bytes	O/M	Description	Default Value
30	O	Namespace Multi-path I/O and Namespace Sharing Capabilities (NMIC)	0x01
31	O	Reservation Capabilities (RESCAP)	0x83
32	O	Format Progress Indicator (FPI)	0x80
33	O	Deallocate Logical Block Features (DLFEAT):	0x19
35:34	O	Namespace Atomic Write Unit Normal (NAWUN)	0x0000
37:36	O	Namespace Atomic Write Unit Power Fail (NAWUPF)	0x0000
39:38	O	Namespace Atomic Compare & Write Unit (NACWU)	0x0000
41:40	O	Namespace Atomic Boundary Size Normal (NABSN)	0x0000
43:42	O	Namespace Atomic Boundary Offset (NABO)	0x0000
45:44	O	Namespace Atomic Boundary Size Power Fail (NABSPF)	0x0000
47:46	O	Namespace Optimal I/O Boundary (NOIOB):	0x0000
63:48	O	NVM Capacity (NVMCAP)	TBD*
65:64	O	Namespace Preferred Write Granularity (NPWG):	0x0000 4K LBA size 0x0007 512B LBA size
67:66	O	Namespace Preferred Write Alignment (NPWA):	0x0000 4K LBA size 0x0007 512B LBA size
69:68	O	Namespace Preferred Deallocate Granularity (NPDG):	0x0000 4K LBA size 0x0007 512B LBA size
71:70	O	Namespace Preferred Deallocate Alignment (NPDA):	0x0000 4K LBA size 0x0007 512B LBA size
73:72	O	Namespace Optimal Write Size (NOWS):	0x0000 4K LBA size 0x0007 512B LBA size
91:74	-	Reserved	0x00
95:92	O	ANA Group Identifier (ANAGRPID):	0x00000000
98:96	-	Reserved	
99	O	Namespace Attributes (NSATTR):	0x00
101:100	O	NVM Set Identifier (NVMSETID):	0x0000
103:102	O	Endurance Group Identifier (NEDGID)	0x0001
119:104	O	Namespace Globally Unique Identifier (NGUID)	TBD**
127:120	O	IEEE Extended Unique Identifier (EUI64)	TBD**
131:128	M	LBA Format 0 Support (LBAF0)	0x00090000
135:132	O	LBA Format 1 Support (LBAF1)	0x00090008
139:136	O	LBA Format 2 Support (LBAF2)	0x000C0000
143:140	O	LBA Format 3 Support (LBAF3)	0x000C0008
147:144	O	LBA Format 4 Support (LBAF4)	0x000C0040
151:148	O	LBA Format 5 Support (LBAF5)	0x00000000
155:152	O	LBA Format 6 Support (LBAF6)	0x00000000
159:156	O	LBA Format 7 Support (LBAF7)	0x00000000
163:160	O	LBA Format 8 Support (LBAF8)	0x00000000
167:164	O	LBA Format 9 Support (LBAF9)	0x00000000
171:168	O	LBA Format 10 Support (LBAF10)	0x00000000
175:172	O	LBA Format 11 Support (LBAF11)	0x00000000
179:176	O	LBA Format 12 Support (LBAF12)	0x00000000
183:180	O	LBA Format 13 Support (LBAF13)	0x00000000
187:184	O	LBA Format 14 Support (LBAF14)	0x00000000
191:188	O	LBA Format 15 Support (LBAF15)	0x00000000
383:192		Reserved	0x00
4095:384	O	Vendor Specific (VS)	0x00

NOTES:



1. According to IDEMA SPEC
2. According to IEEE EUI-64 SPEC

Table 7-12 List of Identify Namespace Data Structure for Each Capacity (512+0)

Capacity (GB)	Byte [7:0]: Namespace Size (NSZE)(Hex)	Byte [7:0]: Namespace Size (NSZE)(Dec)
7680	37E3E92B0	15,002,931,888
3840	1BF1F72B0	7,501,476,528
1920	DF8FE2B0	3,750,748,848

7.3. SMART Attributes

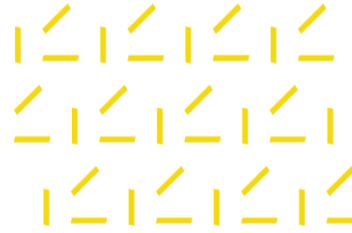
Table 7-13 SMART Attributes (Log Identifier 02h)

Bytes Index	Bytes	Description
[0]	1	Critical Warning
[2:1]	2	Composite Temperature
[3]	1	Available Spare
[4]	1	Available Spare Threshold
[5]	1	Percentage Used
[31:6]	26	Reserved
[47:32]	16	Data Units Read
[63:48]	16	Data Units Written
[79:64]	16	Host Read Commands
[95:80]	16	Host Write Commands
[111:96]	16	Controller Busy Time
[127:112]	16	Power Cycles
[143:128]	16	Power On Hours
[159:144]	16	Unsafe Shutdowns
[175:160]	16	Media and Data Integrity Errors
[191:176]	16	Number of Error Information Log Entries
[195:192]	4	Warning Composite Temperature Time
[199:196]	4	Critical Composite Temperature Time
[201:200]	2	Temperature Sensor 1 (Current Temperature)
[203:202]	2	Temperature Sensor 2 (N/A)
[205:204]	2	Temperature Sensor 3 (N/A)
[207:206]	2	Temperature Sensor 4 (N/A)
[209:208]	2	Temperature Sensor 5 (N/A)
[211:210]	2	Temperature Sensor 6 (N/A)
[213:212]	2	Temperature Sensor 7 (N/A)
[215:214]	2	Temperature Sensor 8 (N/A)
[219:216]	4	Thermal Management Temperature 1 Transition Count
[223:220]	4	Thermal Management Temperature 2 Transition Count
[227:224]	4	Total Time For Thermal Management Temperature 1 (seconds)
[231:228]	4	Total Time For Thermal Management Temperature 2 (seconds)
[511:232]	280	Reserved

Table 7-14 SMART Attributes (Log Identifier C0h)

Bytes Index	Bytes	Description
[15:0]	16	Physical Media Units Written
[31:16]	16	Physical Media Units Read
[39:32]	8	Bad User NAND Blocks

[47:40]	8	Bad System NAND Blocks
[55:48]	8	XOR Recovery Count
[63:56]	8	Uncorrectable Read Error Count
[71:64]	8	Soft ECC Error Count
[79:72]	8	End to End Correction Counts
[80]	1	System Data % Used
[87:81]	7	Refresh Counts
[95:88]	8	User Data Erase Counts
[97:96]	2	Thermal Throttling Status and Count
[103:98]	6	DSSD Specification Version
[111:104]	8	PCIe Correctable Error Count
[115:112]	4	Incomplete Shutdowns
[119:116]	4	Reserved
[120]	1	% Free Blocks
[127:121]	7	Reserved
[129:128]	2	Capacitor Health
[130]	1	NVMe Errata Version
[135:131]	5	Reserved
[143:136]	8	Unaligned I/O
[151:144]	8	Security Version Number
[159:152]	8	Total NUSE
[175:160]	16	PLP Start Count
[191:176]	16	Endurance Estimate
[199:192]	8	PCIe Link Retraining Count
[207:200]	8	Power State Change Count
[493:208]	286	Reserved
[495:494]	2	Log Page Version
[511:496]	16	Log Page GUID



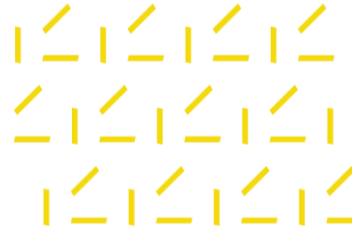
8. VITAL PRODUCT DATA

D200 E1.S device can support Read and Write to Vital Product Data (VPD). Est. VPD contains:

- Basic inventory information such as type and size of Enterprise PCIe SSD, manufacture, date, revision, and GUID.
- Power management data such as power level and power modes.
- Vendor specific data.

VPD is stored in a SMBus device with a slave address of 0xA6. VPD page can be read via SMBUS through address 0x53. Writes to the VPD page uses 0x53.

PHISON Confidential

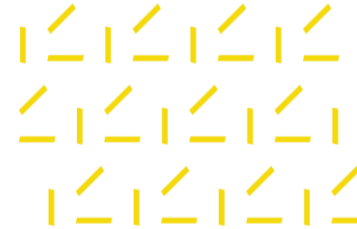


9. PRODUCT COMPLIANCE

Table 9-1 Product Regulatory Compliance and Certifications

Category	Certifications
EMC	CE
	FCC
	BSMI
	VCCI
	UKCA
	RCM
	ICES
	KCC
Safety	CB
	UL

PHISON Confidential



10. PRODUCT WARRANTY POLICY

Complete information regarding Phison's warranties to the Phison brand enterprise SSD product ("Product(s)") is listed below.

This limited warranty covers any defects in material or workmanship in the new Products accompanied by this limited warranty statement. This limited warranty does not apply to any Products on which the original identification information has been altered, obliterated or removed; that has not been handled or packaged correctly; that has been sold as secondhand; or that has been resold contrary to U.S.A. and other applicable export regulations.

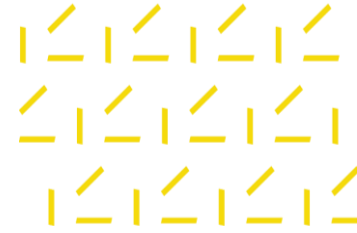
Duration of Warranty

For any other Product manufactured and supplied by Phison, Phison hereby certifies that in the event Product does not conform to the specification for (A) a period of five (5) years from the date of Phison's delivery of the Product or (B) the period ending on the date at which use of the Product exceeds Product's total terabytes written as recorded by or derived from Product's S.M.A.R.T. Attribute, including but not limited to, Product's drive life is used up in accordance with the S.M.A.R.T. Attribute, whichever occurs earlier ("Warranty Period"), and such inconformity is confirmed by Phison to be solely attributable to Phison, Phison's sole and maximum obligation shall be to repair or replace the nonconforming Product, free of charge, in Phison's sole discretion.

Exclusion of the Warranty

Notwithstanding the foregoing, the aforementioned warranty shall exclude the inconformity arising from, in relation to or associated with:

- (1) alternation, modification, improper use, misuse or excessive use of Phison Product;
- (2) failure to comply with Phison's instructions;
- (3) Phison's compliance with or use of the instructions, technologies, designs, specifications, devices, materials, components, parts, software and firmware provided, instructed or approved by Buyer (including any of its parents, subsidiaries, affiliates, suppliers, subcontractors or downstream customers);
- (4) combination of Phison Product with other materials, components, parts, goods, hardware, firmware or



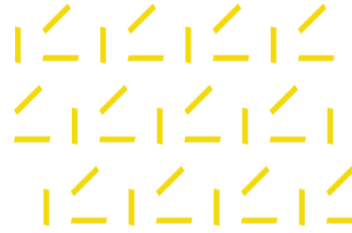
software not supplied by Phison;

- (5) any claim brought by a third party who is commonly known as intellectual property right assertion entity or patent troll;
- (6) NAND flash itself or NAND flash which is embedded into Phison Products;
- (7) Phison's compliance with general industry standards;
- (8) other error or failure not solely attributable to Phison's cause (including without limitation, normal wear or tear, manufacturing or assembly wastage, improper operation, virus, unauthorized maintenance or repair).

Disclaimer

NOTWITHSTANDING ANYTHING ELSE SET FORTH HEREIN, AND TO THE EXTENT NOT PROHIBITED BY APPLICABLE LAW, PHISON SHALL NOT BE LIABLE WITH RESPECT TO PRODUCTS UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER LEGAL OR EQUITABLE THEORY FOR ANY LOST DATA, LOST REVENUES, LOST SAVINGS, LOST PROFITS OR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING FROM THE PURCHASE OR USE OF OR INABILITY TO USE PHISON PRODUCTS, EVEN IF PHISON HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

UNLESS OTHERWISE AGREED TO BY PHISON IN WRITING, PHISON DOES NOT RECOMMEND NOR WARRANT PRODUCTS FOR USE IN LIFE SUPPORT, NUCLEAR, MEDICAL, MILITARY, TRANSPORTATION, AUTOMOTIVE (UNLESS OTHERWISE DEFINED BY PHISON AS "AUTOMOTIVE GRADE PRODUCT"), AVIATION, AEROSPACE INDUSTRY OR OTHER APPLICATIONS WHEREIN A FAILURE OR DEFECT OF THE PHISON PRODUCT MIGHT THREATEN LIFE, INJURY, HEALTH OR LOSS OF SIGNIFICANT AMOUNT OF MONEY ("CRITICAL USE"), AND BUYER AND USER HEREBY ASSUME ALL RISK OF ANY CRITICAL USE OF PRODUCT.



11. REFERENCE

The following table is to list out the standards that have been adopted for designing the product.

Table 11-1 List of References

Title	Source
PCI Express® Base Specification Rev. 5.0	https://www.pcisig.com/specifications/pciexpress/base3/
NVM Express® Base Specification Rev. 2.0	http://www.nvmexpress.org/
Solid-State Drive Requirements and Endurance Test Method (JESD219A)	http://www.jedec.org/standards-documents/docs/jesd219a
SNIA™ SFF-TA-1009 R3.1.1 /1006 R1.5 /1020 Rev1.1 /1023 Rev 1.0	https://www.snia.org/technology-communities/sff/specifications

PHISON Confidential