

UD info Corp.

Enterprise PCIe 5.0 EDSFF E3.S

ED/EF Series

Product DataSheet

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Revision History

Revision	Draft Date	History	Author
1.0	2025/4/17	New release	Golden Lee



Product Overview

- **Capacity**
 - OP=7%: 1920/3840/7680/15360 GB
 - OP=28%: 1600/3200/6400/12800 GB
- **Form Factor**
 - E3.S
- **PCIe Interface**
 - PCIe Gen5 x4
 - Single Port x4 lanes / Dual Port x2 lanes
 - PCIe AER (Advanced Error Reporting)
- **Compliance**
 - PCIe Express Base 5.0
 - NVMe Express 2.0
 - NVMe Express Management Interface Rev 1.2
 - SNIA™ SFF-TA-1009/1008
- **Performance**
 - Sequential Read: up to 14,800MB/s
 - Sequential Write: up to 8,700MB/s
 - Random Read: up to 3,300K IOPS
 - Random Write: up to 900K IOPS
- **Power Consumption¹**
 - Active Power: 25 W
 - Idle Power: <5W
- **Endurance/Reliability**
 - MTBF²: 2.5 million hours
 - UBER: < 1 sector per 10¹⁸ bits
 - DWPD³: 1 & 3
 - TBW³
- **Physical Dimension**
 - E3.S: 112.75(L) x 76(W) x 7.45(H)mm
- **Environmental Specification**
 - Temperature Range:
 - Operating: 0°C ~ 70°C with specified airflow
 - Non-operating: -40°C - 85°C
 - Shock:
 - Operating: 500G, 2ms
 - Non-operating: 1000G, 0.5ms
 - Vibration:
 - Operating: 2.17 Grms (7 - 800 Hz)
 - Non-operating: 16.3 Grms (10 - 2000 Hz)
 - Drop: 80cm, 6 surfaces
 - Bending: 50N, 60s
- **Enterprise Features Support List**
 - LBAF: 512 / 512+8 / 4K / 4K+8 / 4K+64 Bytes
 - 128 Namespace
 - Single Port / Dual Port
 - Reservation
 - Metadata Protection
 - Thermal throttling
 - Power Loss Protection
 - Hardware AES-XTS 256-bit Encryption
 - Support SMBus
- **Certifications and Declarations**
 - CE, FCC, BSMI, VCCI, UKCA, RCM, ICES, KCC, CB, UL
- **Product Ecological Compliance**
 - RoHS compliant

Notes:

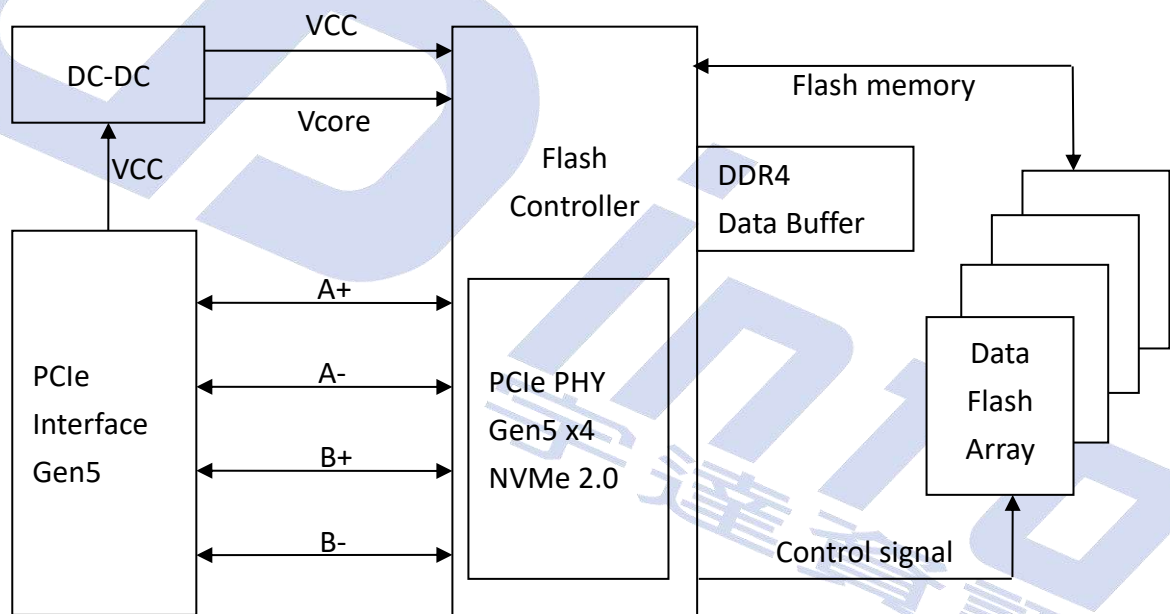
1. Please see "Power Consumption" Chapter 4.2 for details.
2. MTBF is a prediction simulation based on Telcordia SR-332 model.
3. Please see "TBW & DWPD" Chapter 2.4 for details.

1. INTRODUCTION

1.1. General Description

UDinfo's E3.S Solid State Disk (SSD) delivers all the advantages of flash disk technology with PCIe Gen5 x4 interface, including being fully compliant with standard E3.S form factor, providing hot-swapping capability when removing/replacing/upgrading flash disks. It offers a wide range of capacities up to 16TB and its performance can reach up to 14,800 MB/s (for sequential read) and 8,700 MB/s (for sequential write) based on TLC NAND flash with the DDR4. Moreover, the power consumption of E3.S SSD is much lower than traditional hard drives, making it the best embedded solution for new platforms.

1.2. Block Diagram



E3.S PCIe SSD Block Diagram

2. PRODUCT SPECIFICATIONS



2.1. Product Specifications

- PCI Express® Base Specification Ver. 5.0
- NVMe Express™ Base Specification Rev. 2.0
- PCIe Gen 5 x 4 lanes & backward compatible to PCIe Gen 4, Gen 3, Gen 2 and Gen 1 Device Capacity
- SNIA™ SFF-TA-1009/1008
- 256 IO queues supported (1 admin queue and 8 IO queue). Each IO queue support 8K entries

2.2. Device Capacity

Table 2-1 User Capacity and Addressable Sectors

DWPD = 1	User Addressable Sectors	Bytes per Sector
1,920GB	3,750,748,848	512 Byte
3,840GB	7,501,476,528	
7,680GB	15,002,931,888	
15,360GB	30,001,856,512	
DWPD = 3	User Addressable Sectors	Bytes per Sector
1,600GB	3,125,627,568	512 Byte
3,200GB	6,251,233,968	
6,400GB	12,502,446,768	
12,800GB	25,000,148,992	

Notes:

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

Capacity	Model	Sequential 512KB (QD=32, Jobs=1)	
		Read (MB/s)	Write (MB/s)
1,600GB	EME3S	14,800	4,300
1,920GB	ERE3S	14,800	4,300
3,200GB	EME3S	14,800	8,600
3,840GB	ERE3S	14,800	8,600
6,400GB	EME3S	14,800	8,700
7,680GB	ERE3S	14,800	8,700
12,800GB	EME3S	14,800	8,500
15,360GB	ERE3S	14,800	8,500

Notes:

- Performance is measured with the following conditions
 - FIO on Linux: 512KB sequential read/write for full drive
 - SSD is unformatted drive.
- Performance platform:
 - Mother board: MS03-CE0-000
 - CPU: Intel Xeon 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.

2.3.2. Random Read/ Write Performance

Table 2-3 Sustained Random Read/ Write Performance

Capacity	Model	Random 4K (QD=128, Jobs=8)	
		Read (IOPS)	Write (IOPS)
1,600GB	EME3S	2,400K	390K
1,920GB	ERE3S	2,400K	140K
3,200GB	EME3S	3,300K	790K
3,840GB	ERE3S	3,300K	320K
6,400GB	EME3S	3,200K	900K
7,680GB	ERE3S	3,200K	460K
12,800GB	EME3S	2,600K	900K
15,360GB	ERE3S	2,600K	420K

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: MS03-CE0-000
 - CPU: Intel Xeon 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.

2.3.3. IOPS Consistency

Table 2-4 IOPS Consistency

Capacity	Model	Random 4K (QD=1, Jobs=1)		Random 4K (QD=8, Jobs=4)	
		Read (%)	Write (%)	Read (%)	Write (%)
1,600GB	EME3S	95	95	95	90
1,920GB	ERE3S	95	95	95	95
3,200GB	EME3S	95	95	95	90
3,840GB	ERE3S	95	95	95	95
6,400GB	EME3S	95	95	95	90
7,680GB	ERE3S	95	95	95	95
12,800GB	EME3S	95	95	95	90
15,360GB	ERE3S	95	95	95	95

Notes:

- Consistency Definition: (IOPS in the 99.9% 1-second interval) / (average IOPS during the test)
- Performance is measured with the following conditions
 - IOPS consistency on Linux: 4KB random read/write for full drive
 - SSD is unformatted drive.
- Performance platform:
 - Mother board: MS03-CE0-000
 - CPU: Intel Xeon 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.

2.3.4. Latency

Table 2-5 Latency

Capacity	Model	Random 4K (QD=1, Jobs=1)		Random 4K (QD=8, Jobs=4)	
		Read (μs)	Write (μs)	Read (μs)	Write (μs)
1,600GB	EME3S	60	9	70	100
1,920GB	ERE3S	60	9	70	250
3,200GB	EME3S	60	9	70	50
3,840GB	ERE3S	60	9	70	110
6,400GB	EME3S	60	9	70	50
7,680GB	ERE3S	60	9	70	90
12,800GB	EME3S	60	9	70	50
15,360GB	ERE3S	60	9	70	100

Notes:

- Latency is measured with the following conditions
 - Latency on Linux: 4KB random read/write for full drive
 - SSD is unformatted drive.
- Performance platform:
 - Mother board: MS03-CE0-000
 - CPU: Intel Xeon 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=99%, QoS=99.99%)

Table 2-6 Quality of Service (QoS=99%)

Capacity	Model	4KB Random Read/Write Quality of Service (QoS=99%)			
		QD=1, Jobs=1		QD=8, Jobs=4	
		Read (μs)	Write (μs)	Read (μs)	Write (μs)
1,600GB	EME3S	70	10	140	120
1,920GB	ERE3S	70	10	140	250
3,200GB	EME3S	70	10	130	120
3,840GB	ERE3S	70	10	130	150
6,400GB	EME3S	70	10	120	120
7,680GB	ERE3S	70	10	120	120
12,800GB	EME3S	70	10	120	120
15,360GB	ERE3S	70	10	120	120

Table 2-7 Quality of Service (QoS=99.99%)

Capacity	Model	4KB Random Read/Write Quality of Service (QoS=99.99%)			
		QD=1, Jobs=1		QD=8, Jobs=4	
		Read (μs)	Write (μs)	Read (μs)	Write (μs)
1,600GB	EME3S	75	13	240	500
1,920GB	ERE3S	75	13	240	500
3,200GB	EME3S	75	13	200	500
3,840GB	ERE3S	75	13	200	500
6,400GB	EME3S	75	13	180	500
7,680GB	ERE3S	75	13	180	500
12,800GB	EME3S	75	13	160	500
15,360GB	ERE3S	75	13	160	500

Notes:

- QoS is measured with the following conditions
 - QoS on Linux: 4KB random read/write for full drive
 - SSD is unformatted drive.
- Performance platform:
 - Mother board: MS03-CE0-000
 - CPU: Intel Xeon 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.

2.4. Reliability

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

Capacity	Flash Structure	Flash Type	TBW	DWPD
1,600GB	256GB x8, 512Gb, QDP, 32CE	3D TLC	8,760	3
1,920GB	256GB x8, 512Gb, QDP, 32CE	3D TLC	3,504	1
3,200GB	256GB x16, 512Gb, QDP, 64CE	3D TLC	17,520	3
3,840GB	256GB x16, 512Gb, QDP, 64CE	3D TLC	7,008	1
6,400GB	512GB x16, 512Gb, ODP, 128CE	3D TLC	35,040	3
7,680GB	512GB x16, 512Gb, ODP, 128CE	3D TLC	14,016	1
12,800GB	1TB x16, 512Gb, HDP, 128CE	3D TLC	70,080	3
15,360GB	1TB x16, 512Gb, HDP, 128CE	3D TLC	28,032	1

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

Capacity	UBER
1,600GB/1,920GB ~ 12,800GB/15,360GB	< 1 sector per 10^{18} bits read

Notes:

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

2.4.3. MTBF

Description	Value
Mean Time Between Failures	2.5 million hours

Notes:

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

3. ENVIRONMENTAL SPECIFICATIONS



3.1. Temperature and Humidity

Temperature	Operation	0°C to 70°C
	Non-operation	-40°C to 85°C
Relative Humidity	Operation	5% to 95%
	Non-operation	5% to 95%

3.2. Thermal Throttling

Item	Description	CE Judgement
Stage 1 No TMT	Idle state for entering TMT1 or TMT2 Tflash ~ 76 °C	Full CE
Stage 2 TMT1	When flash temperature reaches TMT1 (77°C ~ 81°C), the drive will speed down to TMT1 with performance (< 7300MB/S)	
Stage 3 TMT2	When flash temperature reaches TMT2 (81°C), the drive will speed down to TMT2 with performance (< 1700MB/S)	
Stage 4 TT Stable	To Keep TT stable within flash temp 77°C ~ 83°C. Would monitor temperature every second.	
TMT Protect	While flash temp reach 84°C	Force 1 ACTIVE DIE PER CH (~500MB)
TMT Fatal	Perform thermal shutdown process when flash temperature ≥ 85°C or controller temperature ≥ 115°C	
Resume TMT2 - TMT1	Tflash ≤ 75°C	Can only exit TT when temperature ≤ 75°C after enter TMT2. Will not change from TMT2 state to TMT 1 state
Resume TMT1 - Normal	Tflash ≤ 75°C	

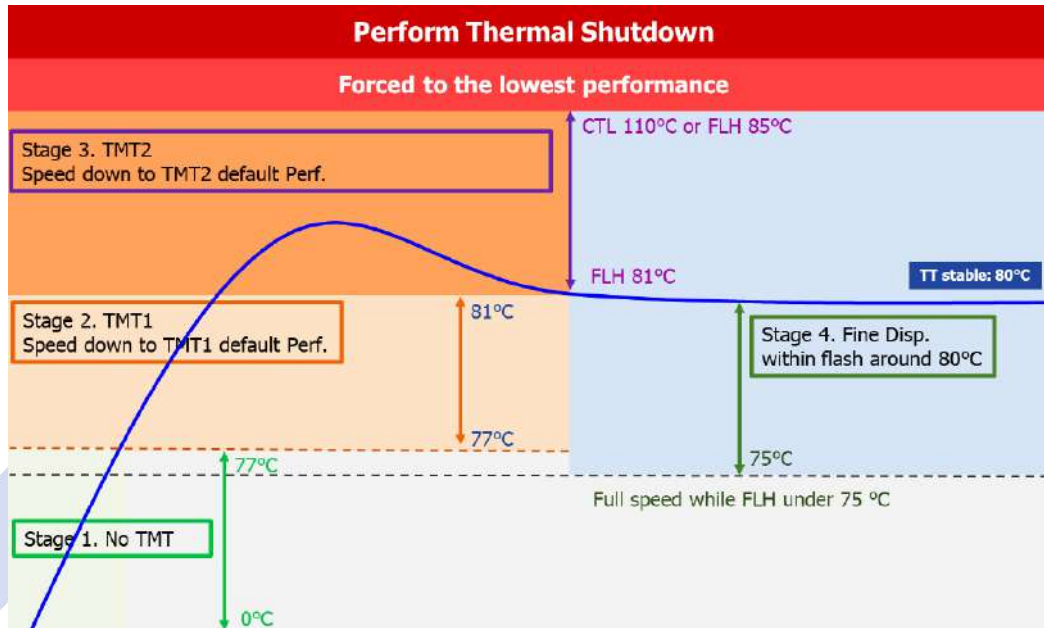


Figure 3-1 Thermal Throttling Mechanism

Notes:

1. The temperature for TMT is based on Tcase. (Tcase: temperate value of on SSD thermal sensor)
2. TMT levels maybe varying by different workloads.

3.3. Airflow Profile

Figure 3-2 depicts the minimum airflow a E3.S (8TB) needs to operate without triggering thermal throttling at ambient temperatures varied from 35°C to 65°C.

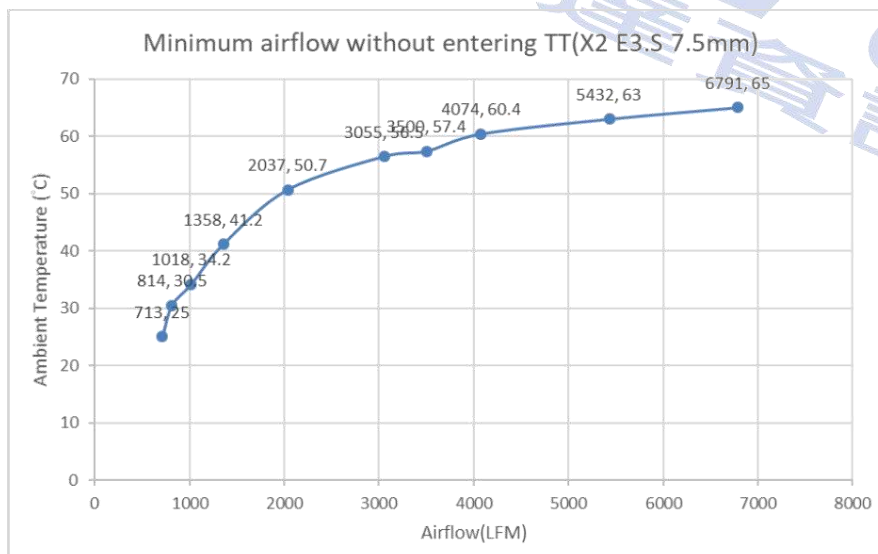


Figure 3-2 E3.S Airflow Curve

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

Shock	Operating	500G, 2ms
		1000G, 0.5ms
	Non-operating	500G, 2ms
		1000G, 0.5ms
Vibration	Operating	2.17 Grms (7 - 800 Hz)
	Non-operating	16.3 Grms (10 - 2000 Hz)
		0.4G/3G (2 - 500 Hz)
Drop	Non-operational	80cm, 6 surfaces
Shock	Non-operational	50N, 60s

3.5. Altitude

Altitude	Operation	0 to 18,000 feet
	Non-operation	0 to 40,000 feet

3.6. 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.

3.7. 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

12V Operating Voltage	12V, $\pm 10\%$
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

Notes:

1. Minimum time between power removed from SSD ($V_{cc} < 100 \text{ mV}$) and power re-applied to the drive.

4.2. Power Consumption

ERE3S	1,920GB	3,840GB	7,680GB	15,360GB
128K Sequential READ (Average RMS, W)	16	17	17	20
128K Sequential WRITE (Average RMS, W)	15	21	22	23
4KB Random READ (Average RMS, W)	15	18	20	22
4KB Random WRITE (Average RMS, W)	16	22	25	25
4KB 70/30 Random READ/WRITE (Average RMS, W)	14	18	21	25
Idle (Average RMS, W)	5	5	5	5

Unit: W

EME3S	1,600GB	3,200GB	6,400GB	12,800GB
128K Sequential READ (Average RMS, W)	17	17	17	20
128K Sequential WRITE (Average RMS, W)	15	21	22	23
4KB Random READ (Average RMS, W)	15	18	20	22
4KB Random WRITE (Average RMS, W)	16	22	23	24
4KB 70/30 Random READ/WRITE (Average RMS, W)	14	18	20	23
Idle (Average RMS, W)	5	5	5	5

Unit: W

Notes:

1. Power consumption is measured in average RMS on full speed mode.
2. Power consumption 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. Power consumption platform:
 - (a) Mother board: MS03-CE0-000
 - (b) CPU: Intel Xeon Gold 5416S
 - (c) DRAM: DDR5 64G
 - (d) OS version: Ubuntu 20.04.2 LTS
4. Power consumption 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

Operating Voltage	Inrush Current
12V	2.5A

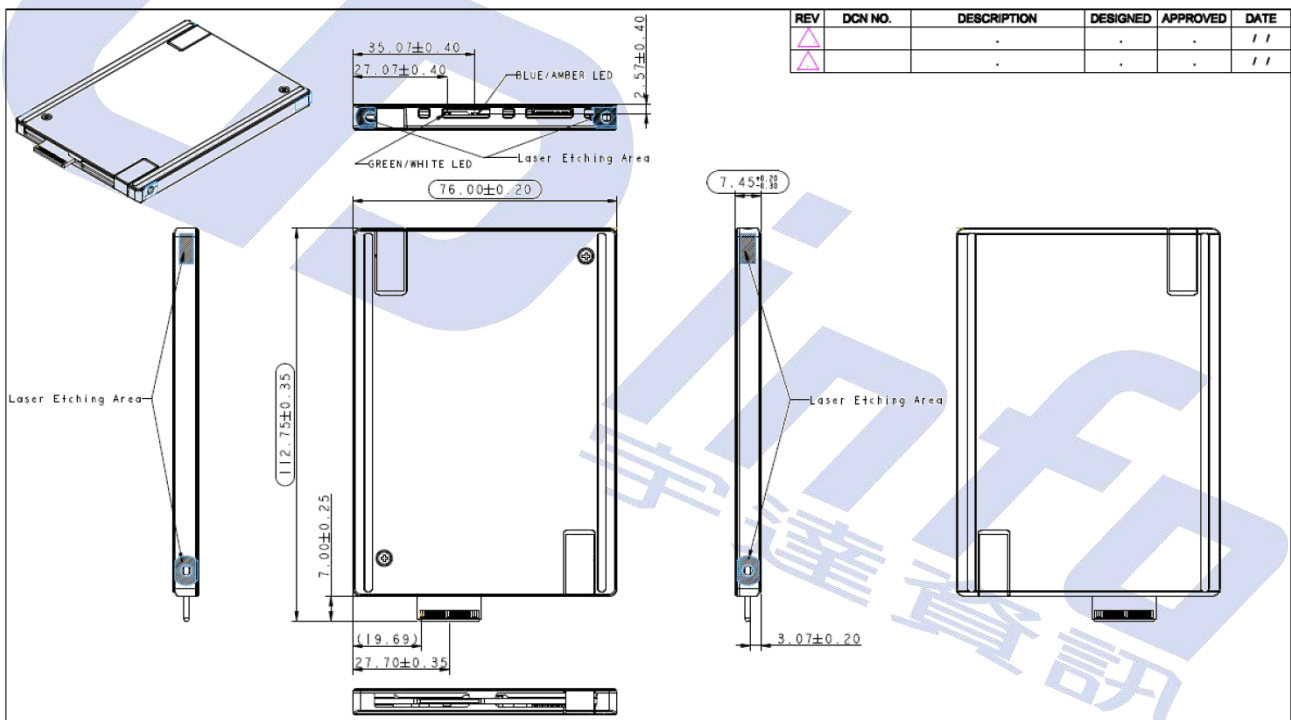
5. PHYSICAL DIMENSION



5.1. E3.S Dimension

Table 5-1 Physical Dimensions and Weight

Parameter	Unit	1600GB 1920GB	3200GB 3840GB	6400GB 7680GB	12800GB 15360GB
Length	mm	112.75 ± 0.35			
Width	mm	76 ± 0.2			
Height	mm	7.45			
Weight	g	106	114	117	119



Unit: mm

Figure 5-1 E3.S Mechanical information

6. INTERFACE



6.1. EDSFF E3.S Pin Assignment and Descriptions

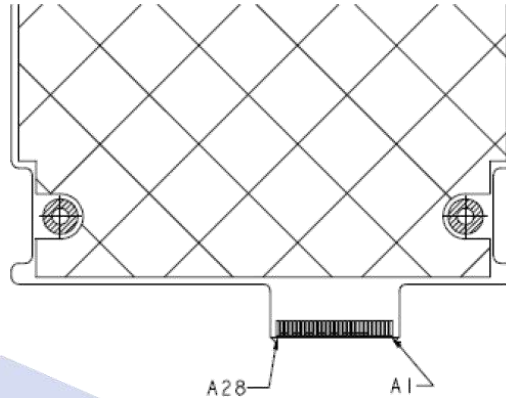


Table 6-1 Pin Assignment and Description of EDSFF E3.S

Pin #	PCIe Pin	Description
A1	GND	Ground
A2	GND	Ground
A3	GND	Ground
A4	GND	Ground
A5	GND	Ground
A6	GND	Ground
A7	SMBCLK	SMBCLK: Open Drain with pull-up on host. SMBus Clock.
A8	SMBDATA	SMBDATA: Open Drain with pull-up on host. SMBus Data.
A9	SMRST#	Active low signal. SMRST# is a reset for the management interface.
A10	LED	Drive LED state
A11	CLKREQ#/PERSTB#	Clock request/Fundamental reset for second x2 port
A12	PRSNT0#	Presence detect
A13	GND	Ground
A14	REFCLKB-	Reference clock (differential pair) for second X2 port
A15	REFCLKB+	Reference clock (differential pair) for second X2 port
A16	GND	Ground
A17	PERn0	Receiver differential pair, E3.S Lane 0
A18	PERp0	Receiver differential pair, E3.S Lane 0
A19	GND	Ground
A20	PERn1	Receiver differential pair, E3.S Lane 1
A21	PERp1	Receiver differential pair, E3.S Lane 1

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Pin #	PCle Pin	Description
A22	GND	Ground
A23	PERn2	Receiver differential pair, E3.S Lane 2
A24	PERp2	Receiver differential pair, E3.S Lane 2
A25	GND	Ground
A26	PERn3	Receiver differential pair, E3.S Lane 3
A27	PERp3	Receiver differential pair, E3.S Lane 3
A28	GND	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
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	PFU	Reserved
B9	DualPortEn#	Dual-port Enable
B10	PERST#	Fundamental reset (if Single Port mode enabled, first x2 port)
B11	3.3 Vaux	3.3V auxiliary power
B12	PWRDIS	Power Disable
B13	GND	Ground
B14	REFCLKn0	Reference clock (if dual-port enabled, first X2 port)
B15	REFCLKp0	Reference clock (if dual-port enabled, first X2 port)
B16	GND	Ground
B17	PETn0	Transmitter differential pair, E3.S Lane 0
B18	PETp0	Transmitter differential pair, E3.S Lane 0
B19	GND	Ground
B20	PETn1	Transmitter differential pair, E3.S Lane 1
B21	PETp1	Transmitter differential pair, E3.S Lane 1
B22	GND	Ground
B23	PETn2	Transmitter differential pair, E3.S Lane 2
B24	PETp2	Transmitter differential pair, E3.S Lane 2
B25	GND	Ground
B26	PETn3	Transmitter differential pair, E3.S Lane 3
B27	PETp3	Transmitter differential pair, E3.S Lane 3
B28	GND	Ground

7. SUPPORTED COMMANDS



7.1. NVMe Command List

Table 7-1 Admin Commands

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

Table 7-2 I/O Commands

Identifier	O/M	Supported	Command Description
00h	M	Y	Flush
01h	M	Y	Write
02h	M	Y	Read
04h	O	Y	Write Uncorrectable
05h	O	Y	Compare
08h	O	Y	Write Zeroes
09h	O	Y	Dataset Management (Trim only)

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0Ch	O	Y	Verify
0Dh	O	Y	Reservation Register
0Eh	O	Y	Reservation Report
11h	O	Y	Reservation Acquire
15h	O	Y	Reservation Release

Table 7-3 Set Feature Commands

Identifier	O/M	Supported	Command Description
01h	M	Y	Arbitration
02h	M	Y	Power Management
04h	M	Y	Temperature Threshold
05h	M	Y	Error Recovery
07h	M	Y	Number of Queues
08h	M	Y	Interrupt Coalescing
09h	M	Y	Interrupt Vector Configuration
0Ah	M	Y	Write Atomicity Normal
0Bh	M	Y	Asynchronous Event Configuration
0Eh	O	Y	Timestamp
10h	O	Y	Host Controlled Thermal Management
17h	O	Y	Sanitize Config
18h	O	Y	Endurance Group Event Configuration
7Eh	M	Y	Controller Metadata (NVMe MI)
7Fh	M	Y	Namespace Metadata (NVMe MI)
81h	O	Y	Host Identifier
82h	O	Y	Reservation Notification Mask
83h	O	Y	Reservation Persistence
C0h	O	Y	Error Injection
C1h	O	Y	Clear FW Update History
C2h	O	Y	EOL/PLP Failure Mode
C3h	O	Y	Clear PCIe Correctable Error Counters
C4h	O	Y	Enable IEEE1667
C5h	O	Y	Latency Monitor
C6h	O	Y	PLP Health Check Interval
C7h	O	Y	DSSD Power State

Table 7-4 Get Log Page Commands

Identifier	O/M	Supported	Command Description
00h	O	Y	Reserved
01h	M	Y	Error Information
02h	M	Y	SMART / Health Information
03h	M	Y	Firmware Slot Information
04h	O	Y	Changed Namespace List
05h	O	Y	Commands Supported and Effects
06h	O	Y	Device Self-test
07h	O	Y	Telemetry Host-Initiated
08h	O	Y	Telemetry Controller-Initiated
09h	O	Y	Endurance Group Information
0Dh	O	Y	Persistent Event Log
0Fh	O	Y	Endurance Group Event Aggregate
12h	O	Y	Feature Identifiers Supported and Effects
13h	O	Y	NVMe-MI Commands Supported and Effects
14h	O	Y	Command and Feature Lockdown
80h	O	Y	Reservation Notification
81h	O	Y	Sanitize Status
C0h	O	Y	SMART/Health Information Extended
C1h	O	Y	Error Recovery
C2h	O	Y	Firmware Activation History
C3h	O	Y	Latency Monitor
C4h	O	Y	Device Capabilities
C5h	O	Y	Unsupported Requirements

Table 7-5 NVMe Management Interface Commands

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

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Table 7-6 SMBus / I²C Elements Supported

SMBus / I ² C Element	SMBus / I ² C Address(8bit)	
	Hex Format	Binary Format
FRU Information Device (for NVMe Storage Device)	A6h	1010_011xb
SMBus / I ² C 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)	0x00, 1 port 0x03, 2 ports
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 Level support bitmap (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	
252:240	-	Refer to the NVMe Management Interface	
253	M	NVM Subsystem Report (NVMSR)	0x01
254	M	VPD Write Cycle Information (VWCI)	0x00
255	M	Management Endpoint Capabilities (MEC)	0x03
257:256	M	Optional Admin Command Support (OACS)	0x045F
258	M	Abort Command Limit (ACL)	0x07
259	M	Asynchronous Event Request Limit (AERL)	0x0F

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Bytes	O/M	Description	Default Value
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
269:268	M	Critical Composite Temperature Threshold (CCTEMP)	0x0166
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)	0x40000002, nonSED 0x40000003, SED 0x40000003, ISE 0x40000003, FIPS
335:332	O	Host Memory Buffer Min. Descriptor Entry Size (HMMINDS)	0x00000000
337:336	O	Host Memory Maximum Descriptor Entries (HMMAXD)	0x0000
339:338	O	NVM Set ID Maximum (NSETIDMAX)	0x0000
341:340	O	Endurance Group ID Maximum (ENDGIDMAX)	0x0001
342	O	ANA Maximum Transition Time (ANATT)	0x00
343	O	Asymmetric Namespace Access Capabilities (ANACAP)	0x00
347:344	O	ANA Group ID Maximum (ANAGRPMAX)	0x00000000
351:348	O	Number of ANA Group IDs (NANAGRPID)	0x00000000
355:352	O	Persistent Event Log Size (PELS)	0x63

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Bytes	O/M	Description	Default Value
511:356	-	Reserved	0x00

Table 7-8 NVM 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 ports
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 Namespace (MNAN)	0x00000000
767:544	M	Reserved	0x00
1023:768	M	NVM Subsystem NVMe Qualified Name (SUBNQN)	TBD

Table 7-9 IO Command Set Attributes

Bytes	O/M	Description	Default Value
2079:2048	M	Power State 0 Descriptor (PSD0)	
Bit[255:184]		Reserved	0x0
Bit[183:182]		Active Power Scale (APS)	0x2
Bit[181:179]		Reserved	0x0
Bit[178:176]		Active Power Workload (APW)	0x0
Bit[175:160]		Active Power (ACTP)	0xBB8
Bit[159:152]		Reserved	0x0
Bit[151:150]		Idle Power Scale (IPS)	0x0
Bit[149:144]		Reserved	0x0
Bit[143:128]		Idle Power (IDL P)	0x0

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Bytes	O/M	Description	Default Value
Bit[127:125]		Reserved	0x0
Bit[124:120]		Relative Write Latency (RWL)	0x0
Bit[119:117]		Reserved	0x0
Bit[116:112]		Relative Write Throughput (RWT)	0x0
Bit[111:109]		Reserved	0x0
Bit[108:104]		Relative Read Latency (RRL)	0x0
Bit[103:101]		Reserved	0x0
Bit[100:96]		Relative Read Throughput (RRT)	0x0
Bit[95:64]		Exit Latency (EXLAT)	0x0
Bit[63:32]		Entry Latency (ENLAT)	0x0
Bit[31:26]		Reserved	0x0
Bit[25]		Non-Operational State (NOPS)	0x0
Bit[24]		Max Power Scale (MPS)	0x0
Bit[23:16]		Reserved	0x0
Bit[15:0]		Maximum Power (MP)	0xBB8
2111:2080	O	Power State 1 Descriptor (PSD1)	
Bit[255:184]		Reserved	0x0
Bit[183:182]		Active Power Scale (APS)	0x2
Bit[181:179]		Reserved	0x0
Bit[178:176]		Active Power Workload (APW)	0x0
Bit[175:160]		Active Power (ACTP)	0x9C4
Bit[159:152]		Reserved	0x0
Bit[151:150]		Idle Power Scale (IPS)	0x0
Bit[149:144]		Reserved	0x0
Bit[143:128]		Idle Power (IDLP)	0x0
Bit[127:125]		Reserved	0x0
Bit[124:120]		Relative Write Latency (RWL)	0x1
Bit[119:117]		Reserved	0x0
Bit[116:112]		Relative Write Throughput (RWT)	0x1
Bit[111:109]		Reserved	0x0
Bit[108:104]		Relative Read Latency (RRL)	0x1
Bit[103:101]		Reserved	0x0
Bit[100:96]		Relative Read Throughput (RRT)	0x1
Bit[95:64]		Exit Latency (EXLAT)	0x0
Bit[63:32]		Entry Latency (ENLAT)	0x0

Bytes	O/M	Description	Default Value
Bit[31:26]		Reserved	0x0
Bit[25]		Non-Operational State (NOPS)	0x0
Bit[24]		Max Power Scale (MPS)	0x0
Bit[23:16]		Reserved	0x0
Bit[15:0]		Maximum Power (MP)	0x9C4
2143:2112	O	Power State 2 Descriptor (PSD2)	
Bit[255:184]		Reserved	0x0
Bit[183:182]		Active Power Scale (APS)	0x2
Bit[181:179]		Reserved	0x0
Bit[178:176]		Active Power Workload (APW)	0x0
Bit[175:160]		Active Power (ACTP)	0x7D0
Bit[159:152]		Reserved	0x0
Bit[151:150]		Idle Power Scale (IPS)	0x0
Bit[149:144]		Reserved	0x0
Bit[143:128]		Idle Power (IDL P)	0x0
Bit[127:125]		Reserved	0x0
Bit[124:120]		Relative Write Latency (RWL)	0x2
Bit[119:117]		Reserved	0x0
Bit[116:112]		Relative Write Throughput (RWT)	0x2
Bit[111:109]		Reserved	0x0
Bit[108:104]		Relative Read Latency (RRL)	0x2
Bit[103:101]		Reserved	0x0
Bit[100:96]		Relative Read Throughput (RRT)	0x2
Bit[95:64]		Exit Latency (EXLAT)	0x0
Bit[63:32]		Entry Latency (ENLAT)	0x0
Bit[31:26]		Reserved	0x0
Bit[25]		Non-Operational State (NOPS)	0x0
Bit[24]		Max Power Scale (MPS)	0x0
Bit[23:16]		Reserved	0x0
Bit[15:0]		Maximum Power (MP)	0x7D0
2175:2144	O	Power State 3 Descriptor (PSD3)	
Bit[255:184]		Reserved	0x0
Bit[183:182]		Active Power Scale (APS)	0x2
Bit[181:179]		Reserved	0x0
Bit[178:176]		Active Power Workload (APW)	0x0

Bytes	O/M	Description	Default Value
Bit[175:160]		Active Power (ACTP)	0x708
Bit[159:152]		Reserved	0x0
Bit[151:150]		Idle Power Scale (IPS)	0x0
Bit[149:144]		Reserved	0x0
Bit[143:128]		Idle Power (IDL P)	0x0
Bit[127:125]		Reserved	0x0
Bit[124:120]		Relative Write Latency (RWL)	0x3
Bit[119:117]		Reserved	0x0
Bit[116:112]		Relative Write Throughput (RWT)	0x3
Bit[111:109]		Reserved	0x0
Bit[108:104]		Relative Read Latency (RRL)	0x3
Bit[103:101]		Reserved	0x0
Bit[100:96]		Relative Read Throughput (RRT)	0x3
Bit[95:64]		Exit Latency (EXLAT)	0x0
Bit[63:32]		Entry Latency (ENLAT)	0x0
Bit[31:26]		Reserved	0x0
Bit[25]		Non-Operational State (NOPS)	0x0
Bit[24]		Max Power Scale (MPS)	0x0
Bit[23:16]		Reserved	0x0
Bit[15:0]		Maximum Power (MP)	0x708
2207:2176	O	Power State 4 Descriptor (PSD4)	
Bit[255:184]		Reserved	0x0
Bit[183:182]		Active Power Scale (APS)	0x2
Bit[181:179]		Reserved	0x0
Bit[178:176]		Active Power Workload (APW)	0x0
Bit[175:160]		Active Power (ACTP)	0x5DC
Bit[159:152]		Reserved	0x0
Bit[151:150]		Idle Power Scale (IPS)	0x0
Bit[149:144]		Reserved	0x0
Bit[143:128]		Idle Power (IDL P)	0x0
Bit[127:125]		Reserved	0x0
Bit[124:120]		Relative Write Latency (RWL)	0x4
Bit[119:117]		Reserved	0x0
Bit[116:112]		Relative Write Throughput (RWT)	0x4
Bit[111:109]		Reserved	0x0

Bytes	O/M	Description	Default Value
Bit[108:104]		Relative Read Latency (RRL)	0x4
Bit[103:101]		Reserved	0x0
Bit[100:96]		Relative Read Throughput (RRT)	0x4
Bit[95:64]		Exit Latency (EXLAT)	0x0
Bit[63:32]		Entry Latency (ENLAT)	0x0
Bit[31:26]		Reserved	0x0
Bit[25]		Non-Operational State (NOPS)	0x0
Bit[24]		Max Power Scale (MPS)	0x0
Bit[23:16]		Reserved	0x0
Bit[15:0]		Maximum Power (MP)	0x5DC
2239:2208	O	Power State 5 Descriptor (PSD5)	
Bit[255:184]		Reserved	0x0
Bit[183:182]		Active Power Scale (APS)	0x2
Bit[181:179]		Reserved	0x0
Bit[178:176]		Active Power Workload (APW)	0x0
Bit[175:160]		Active Power (ACTP)	0x4B0
Bit[159:152]		Reserved	0x0
Bit[151:150]		Idle Power Scale (IPS)	0x0
Bit[149:144]		Reserved	0x0
Bit[143:128]		Idle Power (IDL P)	0x0
Bit[127:125]		Reserved	0x0
Bit[124:120]		Relative Write Latency (RWL)	0x5
Bit[119:117]		Reserved	0x0
Bit[116:112]		Relative Write Throughput (RWT)	0x5
Bit[111:109]		Reserved	0x0
Bit[108:104]		Relative Read Latency (RRL)	0x5
Bit[103:101]		Reserved	0x0
Bit[100:96]		Relative Read Throughput (RRT)	0x5
Bit[95:64]		Exit Latency (EXLAT)	0x0
Bit[63:32]		Entry Latency (ENLAT)	0x0
Bit[31:26]		Reserved	0x0
Bit[25]		Non-Operational State (NOPS)	0x0
Bit[24]		Max Power Scale (MPS)	0x0
Bit[23:16]		Reserved	0x0
Bit[15:0]		Maximum Power (MP)	0x4B0

Bytes	O/M	Description	Default Value
2271:2240	O	Power State 6 Descriptor (PSD6)	0x00
2303:2272	O	Power State 7 Descriptor (PSD7)	0x00
2335:2304	O	Power State 8 Descriptor (PSD8)	0x00
2367:2336	O	Power State 9 Descriptor (PSD9)	0x00
2399:2368	O	Power State 10 Descriptor (PSD10)	0x00
2431:2400	O	Power State 11 Descriptor (PSD11)	0x00
2463:2432	O	Power State 12 Descriptor (PSD12)	0x00
2495:2464	O	Power State 13 Descriptor (PSD13)	0x00
2527:2496	O	Power State 14 Descriptor (PSD14)	0x00
2559:2528	O	Power State 15 Descriptor (PSD15)	0x00
2591:2560	O	Power State 16 Descriptor (PSD16)	0x00
2623:2592	O	Power State 17 Descriptor (PSD17)	0x00
2655:2624	O	Power State 18 Descriptor (PSD18)	0x00
2687:2656	O	Power State 19 Descriptor (PSD19)	0x00
2719:2688	O	Power State 20 Descriptor (PSD20)	0x00
2751:2720	O	Power State 21 Descriptor (PSD21)	0x00
2783:2752	O	Power State 22 Descriptor (PSD22)	0x00
2815:2784	O	Power State 23 Descriptor (PSD23)	0x00
2847:2816	O	Power State 24 Descriptor (PSD24)	0x00
2879:2848	O	Power State 25 Descriptor (PSD25)	0x00
2911:2880	O	Power State 26 Descriptor (PSD26)	0x00
2943:2912	O	Power State 27 Descriptor (PSD27)	0x00
2975:2944	O	Power State 28 Descriptor (PSD28)	0x00
3007:2976	O	Power State 29 Descriptor (PSD29)	0x00
3039:3008	O	Power State 30 Descriptor (PSD30)	0x00
3071:3040	O	Power State 31 Descriptor (PSD31)	0x00

Table 7-10 IO Vendor Specific

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

Notes:

* The OUI shall be a valid IEEE/RAC assigned identifier that may be registered at

<http://standards.ieee.org/develop/regauth/oui/public.html>.

** 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
30	O	Namespace Multi-path I/O and Namespace Sharing Capabilities (NMIC)	0x01, 1 port 0x02, 2 ports
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 IO 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 Deallocation(Trim) Granularity (NPDG)	0x0000, 4K LBA size 0x0007, 512B LBA size
71:70	O	Namespace Preferred Deallocation(Trim) 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 Groput Identifier (ANAGRPID)	0x00000000

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Bytes	O/M	Description	Default Value
98:96	-	Reserved	
99	O	Namespace Attributes (NSATTR)	0x00
101:100	O	NVM Set Identifier (NVMSETID)	0x0000
103:102	O	Endurance Group Identifier // NVMe 1.4 add (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:

* According to IDEMA SPEC

** According to IEEE EUI-64 SPEC

● List of Identify Namespace Data Structure for Each Capacity

Capacity (GB)	Byte[7:0]: Namespace Size (NSZE)
1,600GB	BA4D4AB0h
1,920GB	DF8FE2B0h
3,200GB	1749A42B0h
3,840GB	1BF1F72B0h
6,400GB	2E93432B0h

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7,680GB	37E3E92B0h
12,800GB	5D2200000h
15,360GB	6FC400000h
12,800GB	5D26812B0h
15,360GB	6FC7CD2B0h



7.3. SMART Attributes

Table 7-12 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 7-13 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

E3.S devices can support Read and Write to Vital Product Data (VPD).

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.

9. PART NUMBER DECODER



X ¹	X ²	X ³	X ⁴	X ⁵	-	X ⁶	X ⁷	X ⁸	X ⁹	X ¹⁰	X ¹¹	X ¹²	-	X ¹³	X ¹⁴	X ¹⁵	-	X ¹⁶	X ¹⁷
E	R	E	3	S	-	E	D	3	0	T	7	B	-	E	L	P			

X¹ E: PCIe SSD	
X² R: Read intensive workload (DWPD 1) M: Mix workload (DWPD 3)	
X³X⁴X⁵ E3S: E3.S form factor	
X⁶X⁷ ED: Single Port EF: Dual Port	
X⁸X⁹X¹⁰X¹¹X¹² 1600G: 1600GB 1920G: 1920GB 3200G: 3200GB 3840G: 3840GB	6400G: 6400GB 7680G: 7680GB 12T8B: 12800GB 15T3B: 15360GB
X¹³ E: 3D eTLC Standard (0°C ~ +70°C)	
X¹⁴ L: Gen5 x4	
X¹⁵ P: PCB version	
X¹⁶X¹⁷ Blank: Standard	

10. REFERENCE



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

Table 10-1 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-1009/1008	https://www.snia.org/technology-communities/sff/specifications