



PCIe M.2 2280

MMSP450

Solid State Drive

256GB、512GB、1TB、2TB

Product Datasheet

Version 1.1

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Revision History

Revision	Date	Modified By	Description
1.0	2022/09/23	Weixian Yan	Initial Release
1.1	2022/11/08	Weixian Yan	Add 2TB product

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1. General Description

This document describes the specifications of MMSP450 SSD series which support PCIe Gen4x4 interface and compliant with NVMe 1.4. It not only provide high performance throughput, but also have low power consumption.

MMSP450 SSD Series is a DRAM-less PCIe SSD module and designed in a M.2 2280 form factor, the capacity range provide from 256GB to 2TB. The MMSP450 series use a high efficiency solid-state drive controller and cooperate outstanding firmware architecture to provide excellent read/write performance, high storage density, and good reliability with 3D TLC NAND Flash. MMSP450 use LDPC-ECC error correction mechanism to ensure faster and more reliable data access to enhance the SSD reliability.

2. Product Overview

The following table lists the models of PCIe series SSD.

No.	Model Number	Capacity	NAND Flash	Form Factor
1	HC256GP4KM3T	256GB	3D TLC	M.2 2280
2	HC512GP4KM3T	512GB	3D TLC	M.2 2280
3	HC001TP4KM3T	1TB	3D TLC	M.2 2280
4	HC002TP4KM3T	2TB	3D TLC	M.2 2280



3. Product Specifications

3.1 Key Feature

- Capacity : 256GB/512GB/1TB/2TB
- Form-Factor : M.2 22mm x80mm
- Compliant Feature :
 - PCIe Gen4 16Gb/s with 4 lanes interface
 - Compliant with NVMe Express revision 1.4
 - Support Host Memory Buffer access
 - Support ASPM L1.2
- Specific Feature
 - MTBF : 1,500,000 hours
 - Endurance : 365/730/1500/2900 TBW
 - Performance : Read up to 5050MB/s & Write up to 4500MB/s
 - IOPS (4K QD64) : Read up to 530,000 & Write up to 656,000
- Input Power : DC 3.3V
- RoHS Compliant
- Power Consumption (Maximum) : < 4.5W
- Operating Temperature Range : 0°C ~ 70°C
- Storage Temperature Range : -40°C ~ 85°C



3.2 Capacity

MMSP450 Series				
Capacity	256 GB	512 GB	1TB	2TB
Unformatted Capacity	238.47 GB	476.94 GB	953.86GB	1907.73GB
User Addressable Sector	500,118,192	1,000,215,216	2,000,409,264	3,907,029,168
Sector	512 Bytes			

NOTE : 1. Megabyte (MB) = 1 Million bytes; 1 Gigabyte (GB) =1 Billion bytes

2. User Addressable Sectors in LBA mode is based on IDEMA rule.

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3.3 Performance

3.3.1 Read/Write & CDM Performance

Parameter	CrystalDiskMark 7.0.0 (x64)			
Capacity	256GB (MB/s)	512GB (MB/s)	1TB (MB/s)	2TB (MB/s)
Sequential Q8 Read	4500	5050	5050	4800
Sequential Q8 Write	1300	2700	4500	4400
4K-Q32T16 Read	800	1500	2600	2550
4K-Q32T16 Write	900	2150	2950	2900
Note: 1.) Seq. Read & Write speed test by CrystalDiskMark, The Test Platform is ASUS B660 and OS using Win10 x64. 2.) Performance may vary based on PCIe bandwidth, hardware test platform, test software, operating system, and other system variables.				



3.3.2 Read/Write & AS-SSD Performance

Parameter	AS SSD BenchMark 2.0 (Unit:MB/s)			
Capacity	256GB	512GB	1TB	2TB
Sequential Read	2700	3800	4450	3633
Sequential Write	1100	2100	4200	3443
Item	AS SSD BenchMark 2.0 (Unit:IOPS)			
4K-64Thrd Read	204,000	265,000	415,000	531,000
4K-64Thrd Write	247,000	499,000	656,000	633,000
Note: 1.) Seq. Read & Write speed test by AS-SSD with Random pattern, The Test Platform is ASUS B660 and OS using Win10 x64. 2.) Performance may vary based on PCIe bandwidth, hardware test platform, test software, operating system, and other system variables.				

3.4 Electrical

3.4.1 Operating Voltage

Item	Operating Voltage
Input Power	DC 3.3V $\pm$ 5%
Maximum Ripple	100mV p-p or less

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3.4.2 Power Consumption

Parameter	256GB	512GB	1TB	2TB	Unit
Sequential Read	3.0	3.5	3.5	3.5	W
Sequential Write	1.7	3.0	4.5	4.5	W
L1.2	3.5	3.5	3.5	3.5	mW
Note: : 1.) Measured by CDM(Crystal Disk Mark 7.0.0 (x64), The test result is the maximum value. 2.) The system conditions and test environment may affect test result					

3.4.3 Power Management

Power State				
PS0	PS1	PS2	PS3	PS4
< 4.5 W	< 2.5 W	< 2.0 W	< 14.0 mW	< 3.5 mW

3.5 Environmental Specifications

Item	Operating	Non-Operating
Temperature	0° C to 70° C	- 40° C to 85° C
Humidity	5% to 95%, non-condensing	

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3.6 Reliability

3.6.1 MTBF

Capacity	256GB	512GB	1TB	2TB
MTBF	1, 500, 000 Hours			
Remark: Mean Time Between Failures (MTBF), confidential level=60%				

3.6.2 Endurance

Capacity	256GB	512GB	1TB	2TB
TBW	365	730	1500	2900

4. Support Command Set and Feature

The MMSP450 Series supports Admin and I/O command sets defined in NVMe revision 1.4.

MMSP450 series supports commands and feature, which are :

- Admin Command Set
- NVMe I/O Command Set
- Feature Identifiers
- Log Page Identifier
- SMART / Health Information

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4.1 Admin Command Set

Opcode (Hex)	Command Name
00h	Delete I/O Submission Queue
01h	Create I/O Submission Queue
02h	Get Log Page
04h	Delete I/O Completion Queue
05h	Create I/O Completion Queue
06h	Identify
08h	Abort
09h	Set Features
0Ah	Get Features
0Ch	Asynchronous Event Request
10h	Firmware Commit
11h	Firmware Image Download
14h	Device Self-test
80h	Format NVM
81h	Security Send
82h	Security Receive
84h	Sanitize

4.2 NVM Express I/O Command Set

Opcode (Hex)	Command Name
00h	Flush
01h	Write
02h	Read
04h	Write Uncorrectable
05h	Compare
08h	Write Zeroes
09h	Dataset Management

4.3 Feature Identifiers

Feature Identifier (Hex)	Description
00h	Reserved
01h	Arbitration
02h	Power Management
03h	LBA Range Type
04h	Temperature Threshold
05h	Error Recovery
06h	Volatile Write Cache
07h	Number of Queues
08h	Interrupt Coalescing

09h	Interrupt Vector Configuration
0Ah	Write Atomicity Normal
0Bh	Asynchronous Event Configuration
0Ch	Autonomous Power State Transition
0Dh	Host Memory Buffer
0Eh	Timestamp
10h	Host Controlled Thermal Management
11h	Non-Operational Power State Config
0Eh-7Dh	Reserved
80h	Software Progress Marker

4.4 Log Page Identifiers

Log Identifier (Hex)	Description
00h	Reserved
01h	Error Information
02h	SMART / Health Information
03h	Firmware Slot Information
04h	Change Namespace List
06h	Device Self-test
09-7Fh	Reserved
81h	Sanitize Status



82h-FFh	Reserved
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4.5 SMART / Health Information

Bytes	Description
01	Critical Warning
02	Temperature
03	Available Spare
04	Available Spare Threshold
05	Percentage Used
06	Data Units Read
07	Data Units Written
08	Host Read Commands
09	Host Write Commands
0A	Controller Busy Time
0B	Power Cycles
0C	Power On Hours
0D	Unsafe Shutdowns
0E	Media Errors
0F	Number of Error Information Log Entries

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5. Pin assignment and descriptions

5.1. PCIe M.2 M Key Interface

Pin	Signal Name	Pin	Signal Name
1	GND		
3	GND	2	3.3V
5	PETn3	4	3.3V
7	PETp3	6	NC
9	GND	8	NC
11	PERn3	10	LED_1# (O)(OD)
13	PERp3	12	3.3V
15	GND	14	3.3V
17	PETn2	16	3.3V
19	PETp2	18	3.3V
21	GND	20	NC
23	PERn2	22	NC
25	PERp2	24	NC
27	GND	26	NC
29	PETn1	28	NC
31	PETp1	30	NC



Pin	Signal Name	Pin	Signal Name
33	GND	32	NC
35	PER _n 1	34	NC
37	PER _p 1	36	NC
39	GND	38	NC
41	PET _n 0	40	SMB_CLK
43	PET _p 0	42	SMB_DATA
45	GND	44	ALERT
47	PER _n 0	46	NC
49	PER _p 0	48	NC
51	GND	50	PERST# (I/O)(0/3.3V)
53	REFCLK _n	52	CLKREQ# (I/O)(0/3.3V)
55	REFCLK _p	54	PEWAKE# (I/O)(0/3.3V)
57	GND	56	Reserved/MFG Data
59	CONNECTOR KEY M	58	Reserved/MFG Clock
61	CONNECTOR KEY M	60	CONNECTOR KEY M
63	CONNECTOR KEY M	62	CONNECTOR KEY M
65	CONNECTOR KEY M	64	CONNECTOR KEY M
67	NC	66	CONNECTOR KEY M
69	CONFIG	68	NC
71	GND	70	3.3V
73	GND	72	3.3V
75	GND	74	3.3V

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6.1 Dimensions and Weight

6.2 Dimension Drawing (Unit : mm)

