



SATAIII 2.5" Solid State Drive

Opalus-MMSC350

64GB、128GB、256GB、512GB、
1TB

Product Datasheet

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Version 1.7

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Revision History

Revision	Date	Modified By	Description
1.0	2018/01/29	Rain Wang	Initial Release
1.1	2018/07/17	Rain Wang	1. Modify 3.3.1 / 3.3.2 / 3.3.3 / 3.4.2 2. Revise 6.2 Drawings
1.2	2018/08/19	Rain Wang	Modify 3.1 Performance 128GB (Read / Write: 500/450 MB/s)
1.3	2019/02/26	Rain Wang	Increase 1TB Spec.
1.4	2019/05/24	Rain Wang	Detail modification
1.5	2019/07/25	Rain Wang	Detail modification
1.6	2020/11/01	Qunhong Zhang	Update performance parameter
1.7	2023/01/04	Weixian Yan	Update performance parameter

Content

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1. General Description

The Opalus – MMSC350 series is the 2.5 inch SSD that include capacity range from 64GB to 1TB. MMSC350 series designed with SATAIII interface and complies with SATA Rev3.1 spec. MMSC350 features distinct advantages of NAND Flash Disk than traditional HDD as well supports NCQ command set, S.M.A.R.T. feature and Trim command.

MMST350 is a cost effective solution with high performance and low power consumption which uses high performance flash memory using TLC NAND flash with DDRII interface to perform high sequential and random access capability.

2. Product Overview

The following table list is the models of Opalus-MMSC350 series SSD.

No.	Product Name	Capacity	NAND Flash	Form Factor	Color
1	HC064GS6AA7T	64GB	3D TLC	2.5 Inch SATA	Black
2	HC128GS6AA7T	128GB	3D TLC	2.5 Inch SATA	Black
3	HC256GS6AA7T	256GB	3D TLC	2.5 Inch SATA	Black
4	HC512GS6AA7T	512GB	3D TLC	2.5 Inch SATA	Black
5	HC001TS6AA7T	1TB	3D TLC	2.5 Inch SATA	Black

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3. Product Specification

3.1 Key Feature

- Capacity : 64GB/128GB/256GB/512GB/1TB
- Form-Factor : 2.5 inch SSD
- Flash Interface :
 - Mounted 1pcs to 4pcs of BGA Package
 - Support NV-DDRII / Toggle DDRII
- SATA Interface Compatibility
 - Complies With SATA Rev3.1/6Gbps/Backward
 - Complies With ATA-8 Standard
 - S.M.A.R.T. / NCQ / TRIM Supported
- Specific Feature
 - MTBF : 2,000,000 hours
 - TBW : 64GB/50, 128GB/100, 256GB/200, 512GB/400, 1TB/800
 - Performance : Read up to 540MB/s & Write up to 500MB/s
(128GB Read up to 500MB/s & Write up to 490MB/s)
 - IOPS (4K-64 Thrd) : Read 43K & Write 75K
- Input Power:DC 5.0V +/-5%
- RoHS Compliant
- Power Consumption (Maximum) : <1.8W
- Operating Temperature Range : 0℃ ~ 70℃
- Storage Temperature Range : -40℃ ~ 85℃

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3.2 Capacity

Model	MMSC350				
Capacity	64GB	128GB	256GB	512GB	1TB

3.3 Performance

3.3.1 Read/Write & CDM Performance

Item	Crystal Disk Mark 6.0.0 (x64)				
Capacity	64GB (MB/s)	128GB (MB/s)	256GB (MB/s)	512GB (MB/s)	1TB (MB/s)
Sequential Q32 Read	261	500	510	510	540
Sequential Q32 Write	234	490	500	500	500
4K-QD32 Read	57	120	150	200	200
4K-QD32 Write	181	270	270	280	280

Note:1.) Seq. Read & Write speed test by CDM ,The Test Platform Z370 ,Test system Win10 (64Bit).

2.) Performance may vary based on SSD capacity, hardware test platform, test software, Operating system, and other system variables.



3.3.2 Read/Write & AS-SSD Performance

Item	AS SSD BenchMark 1.9				
Capacity	64GB (MB/s)	128GB (MB/s)	256GB (MB/s)	512GB (MB/s)	1TB (MB/s)
Sequential Read	244	480	480	480	480
Sequential Write	217	450	450	450	450
Capacity	64GB (IOPS)	128GB (IOPS)	256GB (IOPS)	512GB (IOPS)	1TB (IOPS)
4K-64Thrd Read	13519	21000	32000	40000	43000
4K-64Thrd Write	41040	75000	75000	75000	75000
Note:1.) Seq. Read & Write speed test by AS-SSD with Random pattern, The Test Platform Z370 Test system Win10 (64Bit). 2.) Performance may vary based on SSD capacity, hardware test platform, test software, Operating system, and other system variables					

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3.4 Electrical

3.4.1 Operating Voltage

Item	Operating Voltage
Input Power	DC 5.0V $\pm$ 5%
Maximum Ripple	100mV p-p or less

3.4.2 Power Consumption

Mode	64GB	128GB	256GB	512GB	1TB	Unit
Idle	0.27	0.27	0.27	0.27	0.27	W
Sleep	0.0005	0.0005	0.0005	0.0005	0.0005	W
Sequential Read	1.4	1.70	1.8	1.60	1.61	W
Sequential Write	1.2	1.40	1.60	1.60	1.62	W
Note:1.) Measured by CDM(Crystal Disk Mark 5.1.2 (x64),The test result is the maximum value. 2.) The system conditions and test environment may affect test result						



3.5 Environmental Conditions

Item	Operating	Non-Operating
Temperature	0° C to 70° C	-40° C to 85° C

3.6 Reliability

3.6.1 MTBF

Item	Value
MTBF	2,000,000 hours
Remark: Mean Time Between Failures (MTBF)	

3.6.2 TBW

Total Byte Written (TBW)	64GB	128GB	256GB	512GB	1TB
	50	100	200	400	800

4. S. M. A. R. T Support

The S.M.A.R.T is about the computer data drive monitoring system during operation and reponse the drive status and “health”. S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology; often written as SMART) is a monitoring system included in computerhard disk drives (HDDs), solid-state drives (SSDs). Its primary function is to detect and report various indicators of drive reliability with the intent of anticipating imminent hardware failures

When S.M.A.R.T. data indicates a possible imminent drive failure, software running on the host system may notify the user so preventative action can be taken to prevent data loss, and the failing drive can be replaced and data integrity maintained. Below table shows the S.M.A.R.T. command set.

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ID	Attribute Name	Comment
0x01	Read Error Rate	TotalNewBadCnt/TotalHostRdCnt
0x05	Reallocated Sectors Count	TotalNewBadCnt
0x09	Power-On Hours Count	Number of hours elapsed in the power-on state. The value shall be incremented by one every one hour.
0x0C	Drive Power Cycle Count	Number of device power cycling. The value shall be incremented by one on each power cycling after disk initialization is done
0xA0	Online Uncorrect Sector Count	Uncorrectable Sector Count when read/write
0xA1	Number Of Valid SpareBlocks	Number of vaild spare block
0xA3	Number of initial invalid block	Number of initial invalid block
0xA4	Totla Erase Count (TLC Block)	Total erase count
0xA5	Maximum P/E Cycles (TLC)	Maximum erase count
0xA6	Minimum P/E Cycles (TLC)	Minimum Erase count
0xA7	Average P/E Cycles (TLC)	Average erase count
0xA8	Max Erase Count in Spec	Max Erase Count of Spec
0xA9	Remain Life Percentage	Remain Life(%)
0xAF	Worst Component Program Fail Count	Program fail count in worst die
0xB0	Worst Component Erase Fail Count	Erase fail count in worst die
0xB1	Wearleveling Count	Total wearlevel count
0xB2	Grown Bad Block Count	Runtime invalid block count
0xB5	Program Fail Count	Total program fail count
0xB6	Erase Fail Count	Total Erase fail count
0xC0	Sudden Power Count	Number of times unexpected power off occurred. (power off when drive is in active state) The value shall be incremented by one on each unexpected power off.
0xC2	Enclosure Temperature	On-chip temperature sensor value.
0xC3	Hardware ECC recovered	Retry Pass Count
0xC4	Reallocation Event Count	Retry Fail Count
0xC5	Current Pending Sector Count	waiting move sector count
0xC6	Reported Uncorrectable Errors	Total uncorrectable count when off-line
0xC7	CRC Error Count	UltraDMA CRC Error Count
0xE8	Available Reserve Space	Remain Space(%)
0xF1	Host 32MB/unit Written (TLC)	Total LBAs Written (each write unit = 32MB)
0xF2	Host 32MB/unit Read (TLC)	Total LBAs Read (each read unit = 32MB)
0xF5	NAND 32MB/unit Written (TLC)	Total sector write to flash (each write unit = 32MB)

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5. Pin assignment and descriptions

SATA Interface (7+15Pin)

Signals	S1	GND	System Ground
	S2	RX+	Differential signals pair Receive
	S3	RX-	
	S4	GND	System Ground
	S5	TX-	Differential signals pair Transmit
	S6	TX+	
	S7	GND	System Ground
Power	P1	V33	+3.3V Power supply
	P2	V33	
	P3	DEVSLP	Device Sleep Signal Pin
	P4	GND	System Ground
	P5	GND	
	P6	GND	
	P7	V5/PC	+5V Power supply, 2nd Pre-charge
	P8	V5	+5V Power supply
	P9	V5	
	P10	GND	System Ground
	P11	DAS	Reserved
	P12	GND	System Ground
	P13	V12/PC	+12V Power supply, 2nd Pre-Charge
	P14	V12	+12V Power supply
	P15	V12	

6. Product Mechanical Specification

6.1 Dimensions and Weight

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Model	Length (mm)	Width (mm)	Height (mm)	Weight (gram)
64GB	99.80 ± 0.3	69.80 ± 0.3	6.90 ± 0.2	Max 45.5
128GB	99.80 ± 0.3	69.80 ± 0.3	6.90 ± 0.2	Max 45.5
256GB	99.80 ± 0.3	69.80 ± 0.3	6.90 ± 0.2	Max 45.5
512GB	99.80 ± 0.3	69.80 ± 0.3	6.90 ± 0.2	Max 45.5
1TB	99.80 ± 0.3	69.80 ± 0.3	6.90 ± 0.2	Max 45.5

6.2 Dimension Drawing

Unit : mm

