NVMe PCIe3.0x4 M.2 2280 SSD for RC3200 (MSNCxxxxNxAE1C110) Datasheet

Version: A/00

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Revision History

Revision	**History**	**Draft Date**	**Remark**	**Created By**	**Review By**
A/00	1. Initial version	Jan 8th, 2025	Hu yawu	Hu yawu	Fox Xiao

RC3200 Series

Features
● PCIe3.0x4
● Wear Leveling
● Bad Block Management
● Trim
● SMART
● End to End Data Protection
● NVMe1.3
● LDPC ECC
● HMB
● ASPM

Drive Configuration	
Capacity	128~1024GB
Interface	M.2 M-Key
Bytes per Sector	512 Bytes

Performance Specifications 1)	
Sequential Read	1700/2850/3100/3100 MB/s
Sequential Write	1200/2100/2200/2200 MB/s
Random Read	150/330/420/380 KIOPS
Random Write	200/400/460/500 KIOPS

Reliability Specifications	
MTBF2)	1.5 million hours
UBER	<1 x 10^{-16}

Environmental Specifications	
Operation Temperature	0~70℃
Non-operation Temperature	-40~85℃
Non-operation Humidity	Up to 93% RH
Linear Shock (0.5ms duration with 1/2 sine wave)	1500Gpeak

Power Specifications	
Supply Voltage	3.3V ± 5%
Read Power Consumption	⩽4.3W
Write Power Consumption	⩽4.3W
Idle Power Consumption	⩽1.3W

Physical Dimension	
Length	80.0 ± 0.15mm
Width	22.0 ± 0.15mm
Height	2.0 ± 0.15mm
Weight	<= 10 g

Attention: The content of the specification may be modified without notice.

1) All performance test data are obtained at Yangtze Mason Semiconductor Technology Co., Ltd Testing Laboratory
2) Mean Time between Failures

Contents

1. Introduction

1.1 General Description

The RC3200 is a highly reliable DRAM less PCIe 3.0x4 solution with an M.2 M-Key 2280 design, providing capacity 128~1024GB. It also adopts end-to-end data protection technology, and advanced NAND flash memory management algorithm, providing strong data protection and strong reliability.

1.2 Product List

Part Number	Capacity	LBA Count	Interface
MSNC128GNSAE1C110	128GB	250069680	M.2 M-key
MSNC256GNSAE1C110	256GB	500118192	
MSNC512GNDAE1C110	512GB	1000215216	
MSNC001TNQAE1C110	1024GB	2000409264	

2. Product Specification

2.1 Product Function

- End to End Data Protection
- PCIe3.0x4
- NVMe1.3
- ASPM
- HMB

2.2 Flash Management

- Wear Leveling
- LDPC ECC
- Bad Block Management
- Trim
- SMART

2.3 TeraBytes Written

TBW (Terabytes Written) is a measurement of SSDs' expected lifespan, which represents the amount of data written to the device. To calculate the TBW of a SSD, the following equation is applied:

TBW = [(NAND Endurance) x (SSD Capacity)] / [WAF]

NAND Endurance: NAND endurance refers to the P/E (Program/Erase) cycle of a NAND flash.

SSD Capacity: The SSD capacity is the specific capacity in total of SSD.

WAF: Write Amplification Factor (WAF) is a numerical value representing the ratio between the amount of data that SSD controller needs to write and the amount of data that the host's flash controller writes.

Note: TBW in this document is based on JEDEC 218/219 workload.

2.4 Power Consumption

Table 1 Supply Voltage

Capacity	Voltage	Unit
128GB	3.3 (+/- 5%)	V
256GB	3.3 (+/- 5%)	V
512GB	3.3 (+/- 5%)	V
1024GB	3.3 (+/- 5%)	V

Table 2 Power Consumption

Capacity	Description	Power Consumption
128GB	Sequential Read	1.56W
	Sequential Write	1.67W
	Idle	0.42W
256GB	Sequential Read	1.89W
	Sequential Write	1.98W
	Idle	0.44W
512GB	Sequential Read	1.99W
	Sequential Write	2.17W
	Idle	0.43W
1024GB	Sequential Read	2.14W
	Sequential Write	2.29W
	Idle	0.47W

Attention:

The workload is 1024KB, queue depth is 256, sequential writes, measured root mean square power (RMS) over a 500ms sampling period. The performance and power consumption values are typical and may vary depending on platform settings.

2.5Performance

Table 3 Performance

Parameter	128GB	256GB	512GB	1024GB	Unit
Sequential Read	1700	2850	3100	3100	MB/s
Sequential Write	1200	2100	2200	2200	MB/s
Random Read	150	330	420	380	K IOPS
Random Write	200	400	460	500	K IOPS

Attention:

1) The performance test results were all obtained using CrystalDiskMark (v8.0.4) software on Windows 10 Professional Edition 64bit operating system. The interface was GEN4 x 4 during the test, and the total data block size read and write was 1GB. The queue depth for 128K sequential reads and writes is 32, and the thread is 1; The queue depth for 4K random reads and writes is 8, and the thread is 8.
2) 1 MB/s = 1,048,576 bytes/s.
3) The test results are all obtained from internal testing at Yangtze Mason Semiconductor Technology Co., Ltd Testing Laboratory, and there may be differences in the test results obtained from different platforms or testing software.

2.6 Environmental Specification

Parameter	Specification
Operation Temperature	0 ℃ ~ 70 ℃
Non-operation Temperature	-40 ℃ ~ 85 ℃
Non-operation Humidity	Up to 93% RH
Vibration	Frequency/Acceleration: 80~2000Hz/20G
Shock	1500G, during 0.5ms, 1/2 sine wave

3. Interface Specification

3.1 Pin Assignments and Definitions

The RC3200 series SSD M.2 board data and power pin definitions are shown in the table below.

Table 4 Pin Assignments and definitions

Pin	Description	Pin	Description
74	3.3 V	75	GND
72	3.3 V	73	GND
70	3.3 V	71	GND
68	NC	69	NC
66	CONNECTOR Key M	67	NC
64	CONNECTOR Key M	65	CONNECTOR Key M
62	CONNECTOR Key M	63	CONNECTOR Key M
60	CONNECTOR Key M	61	CONNECTOR Key M
58	NC	59	CONNECTOR Key M
56	NC	57	GND
54	NC	55	REFCLKp
52	CLKREQ#	53	REFCLKn
50	PERST#	51	GND
48	NC	49	PETp0
46	NC	47	PETn0
44	ALERT#	45	GND
42	SMB_DATA	43	PERp0
40	SMB_CLK	41	PERn0
38	NC	39	GND
36	NC	37	PETp1
34	NC	35	PETn1
32	NC	33	GND
30	PLA_S3#	31	PERp1
28	NC	29	PERn1
26	NC	27	GND

24	NC	25	PETp2
22	NC	23	PETn2
20	NC	21	GND
18	3.3 V	19	PERp2
16	3.3 V	17	PERn2
14	3.3 V	15	GND
12	3.3 V	13	PETp3
10	LED_1#	11	PETn3
8	PLN#	9	GND
6	NC	7	PERp3
4	3.3 V	5	PERn3
2	3.3 V	3	GND
		1	GND

4. Supported Command Set

Table 5 Supported Admin Command

Opcode	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 Feature
0Ah	Get Feature
0Ch	Asynchronous Event Request
0Dh	Namespace Management
10h	Firmware Commit
11h	Firmware Image download
14h	Device Self-test
80h	Format NVM
81h	Security Send
82h	Security Receive
83h-BFh	IO Command Set Specific

Table 6 Supported I/O Command

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

5. Identify Command

The device information returned by the sector after issuing the Identify Device command is shown in the following table.

Table 7 Identify Controller Data Structure

Bytes	Default	Description
01:00	TBD	PCI Vendor ID (VID)
03:02	TBD	PCI Subsystem Vendor ID (SSVID)
23:04	TBD	Serial Number (SN)
63:24	TBD	Model Number (MN)
71:64	TBD	Firmware Revision (FR)
72	0x06	Recommended Arbitration Burst (RAB)
75:73	TBD	IEEE OUI Identifier (IEEE)
76	0x00	Controller Multi-Path I/O and Namespace Sharing Capabilities (CMIC)
77	0x06	Maximum Data Transfer Size (MDTS)
79:78	0x0001	Controller ID (CNTLID)
83:80	0x00010300	Version (VER)
87:84	0x000249F0	RTD3 Resume Latency (RTD3R)
91:88	0x00013880	RTD3 Entry Latency (RTD3E)
95:92	0x00000200	Optional Asynchronous Events Supported (OAES)
99:96	0x00000000	Controller Attributes (CTRATT)
239:100	0x00	Reserved
255:240	0x00	Refer to the NVMe Management Interface Specification for definition
257:256	0x0017	Optional Admin Command Support (OACS)
258	0x04	Abort Command Limit (ACL)
259	0x07	Asynchronous Event Request Limit (AERL)
260	0x12	Firmware Updates (FRMW)
261	0x03	Log Page Attributes (LPA)
262	0x3F	Error Log Page Entries (ELPE)

263	0x04	Number of Power States Support (NPSS)
264	0x00	Admin Vendor Specific Command Configuration (AVSCC)
265	0x01	Autonomous Power State Transition Attributes (APSTA)
267:266	0x0164	Warning Composite Temperature Threshold (WCTEMP)
269:268	0x0166	Critical Composite Temperature Threshold (CCTEMP)
271:270	0x0064	Maximum Time for Firmware Activation (MTFA)
275:272	0x00004000	Host Memory Buffer Preferred Size (HMPRE)
279:276	0x00004000	Host Memory Buffer Minimum Size (HMMIN)
295:280	**	Total NVM Capacity (TNVMCAP)
311:296	**	Unallocated NVM Capacity (UNVMCAP)
315:312	0x00000000	Replay Protected Memory Block Support (RPMBS)
511:316	Non-zero	Reserved

6. S.M.A.R.T Information

Table 8 S.M.A.R.T Information

Bytes	Default Value	Description
0	0	Critical Warning
2:1	Current Temperature (K)	Temperature
3	100	Available Spare
4	10	Available Spare Threshold
5	0	Percentage Used
31:6	0	Reserved
47:32	0	Data Units Read
63:48	0	Data Units Written
79:64	0	Host Read Commands
95:80	0	Host Write Commands
111:96	0	Controller Busy Time
127:112	0	Power Cycles
143:128	0	Power On Hours
159:144	0	Unsafe Shutdowns
175:160	0	Media and Data Integrity Errors
191:176	0	Number of Error Information Log Entries

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