NVMe PCIe4.0x4 M.2 2280 SSD

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Revision History

Revision	History	Draft Date	Remark	Created By	Review By
A/00	1. initial version	Mar 01st, 2023	Wugj	Wugj	Stanley Chuang
A/01	1.Add 4TB	July 28th ,2023	Wanghh	Wanghh	Fox xiao
A/02	1.add VIN Power on/off Sequence figure	August 24th , 2023	Wanghh	Wanghh	Fox xiao

M.2 2280 PCIE Gen4*4

Features
PCIe 4.0 x 4
2400MT/s NAND Interface Speed
3rd Agile ECC Correction
HMB Management
SLC Cache
3D TLC NAND
PLP Protection
Support Admin & NVM Command Set
NVMe1.4

Drive Configuration	
Capacity	512GB~4096GB
Interface	M.2 M-Key
Bytes per Sector	512 Bytes

Performance Specifications [1]	
Sequential Read	Up to 7000MB/s
Sequential Write	(512GB)Up to 3600MB/s (1024GB/2048/4096GB) Up to 6500MB/s
Random Read	Up to 900K IOPS
Random Write	Up to 800K IOPS

Reliability Specifications	
UBER[3]	< 1.0 x 10^{-15}
MTBF[4]	1.5 million hours

Environmental Specifications	
Operation Temperature	0~70℃
Non-operation Temperature	-40~85℃
Non-operation Humidity	5%~95%RH
Linear Shock(0.5ms duration with 1/2 sine wave)	1500Gpeak

Power Specifications	
Supply Voltage	3.3V ± 5%
Read Power Consumption	4.1W
Write Power Consumption	4.4W
Idle Power Consumption	0.7W

Physical Dimension	
Length	80.0 ±0.15mm
Width	22.0 ±0.15mm
Height	2.3 ±0.15mm
Weight	<= 10 g

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

1) All performance test data are obtained at Shenzhen Pancun Technology Co., Ltd. Testing Laboratory;
2) Uncorrectable Bit Error Rate
3) Mean Time between Failures

Contents

1. Introduction

1.1 General Description

The PCGNVXXGT07CT3 is a high-performance DRAM less PCIe 4.0 x 4 solution with M.2 M-key 2280 appearance, is the ideal option for consumer computer and Laptop. It depends on 3rd Agile ECC Technology and Write
Booster2, advanced Flash Management Algorithm to ensure data security and reliability, performance.

Part Number	Capacity	LBA Count	Interface
PCGNV256GT07CT3	512GB	1000215216	M.2 M-Key
PCGNV512GT07CT3	1024GB	2000409264	
PCGNV001TT07CT3	2048GB	4000797360	
PCGNV002TT07CT3	4096GB	8001573552	

2.Product Specification

2.1 Product Function

- SLC Cache
- HMB Management
- 2400MT/s NAND Interface Speed
- PLP Protection
- PCIe Gen4,Compatible with Gen3、Gen2 and Gen1

2.2 Flash Management

- Dynamic/Static Wear Leveling
- Bad Block Management
- Garbage Collection
- S.M.A.R.T
- 3rd Agile ECC

2.3 TeraBytes Written

The value of TeraBytes Written reflects the durability of SSDs, which is calculated based on several factors related to usage, such as the total amount of data written to the SSD, block management conditions, and daily workload of the drive, to comprehensively predict the durability of the device. In addition, key factors such as

Capacity	TBW	DWPD[1)]
512 GB	300TB	0.5
1024 GB	600TB	0.5
2048 GB	1200TB	0.5
4096GB	2400TB	0.5

Attention:

1) Drive Writes Per Day, 3years.

2.4 Power Consumption

Table 1 Supply Voltage

Capacity	Voltage	Unit
512GB	3.3 (+/- 5%)	V
1024GB	3.3 (+/- 5%)	V
2048GB	3.3 (+/- 5%)	V
4096GB	3.3 (+/- 5%)	V

Table 2 Power Consumption

Capacity	Description	Power Consumption	Unit
512GB	Sequential Read	3600.0	mW
	Sequential Write	3800.0	mW
	Idle	700	mW
1024GB	Sequential Read	3820	mW
	Sequential Write	3960	mW
	Idle	808	mW
2048GB	Sequential Read	4290	mW
	Sequential Write	4320	mW
	Idle	782	mW
4096GB	Sequential Read	4950	mW
	Sequential Write	4620	mW
	Idle	858	mW

Attention:

The workload is 128KB, 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.

2.5 Performance

Table 3 Performance

Parameter	512GB	1024GB	2048GB	4096GB	Unit
Sequential Read	7000	7000	7100	7000	MB/s
Sequential Write	3600	6500	6600	6400	MB/s
Random Read	800	900	820	780	K IOPS
Random Write	600	800	670	780	K IOPS

Attention:

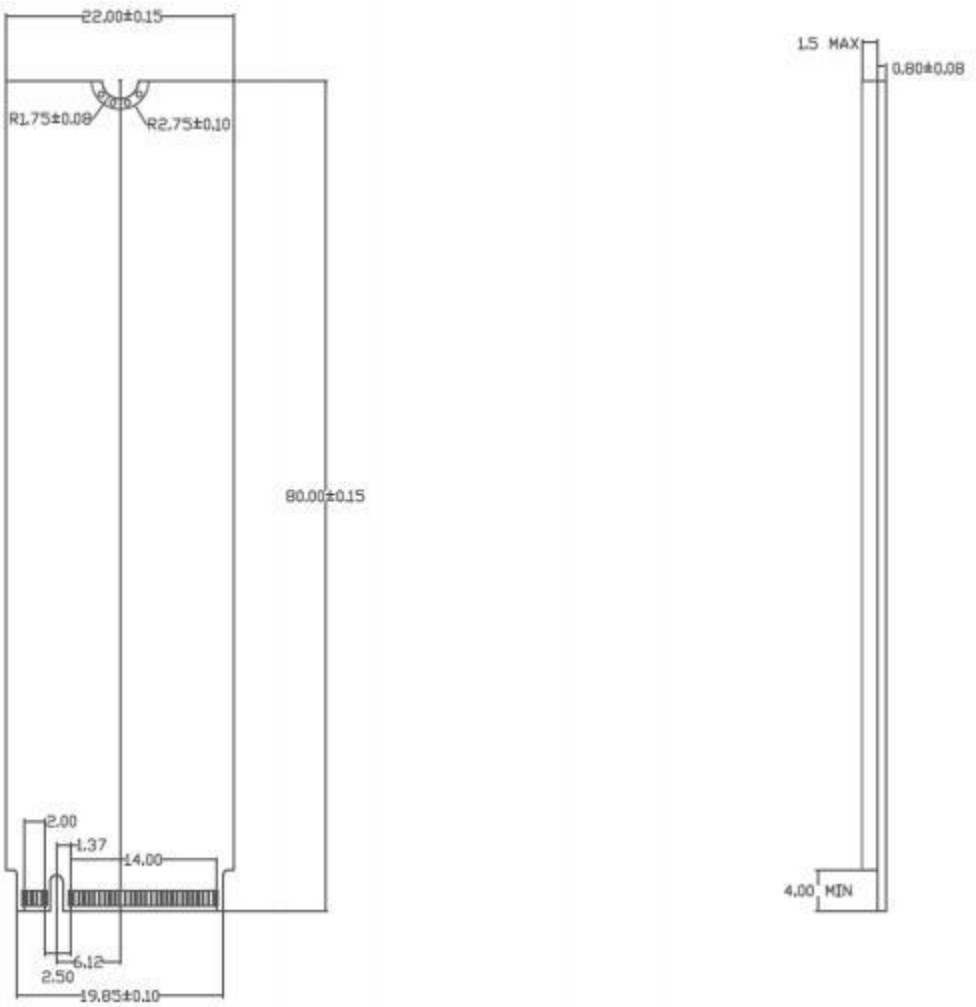
1) The performance test results were all obtained using CrystalDiskMark (v8.0.4) software on Windows 10 Professional Edition 64 bit operating system. The interface was GEN4 x 4 during the test, and the total data block size read and write was 1GB. The queue depth for 128K sequential reads and writes 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 Shenzhen Pancun 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	5%~95% RH
Vibration	7~800Hz, 3.08Grms, 30min/axis(X,Y,Z)
Shock	1500G, during 0.5ms， 1/2 sine wave

2.7 Physical Dimensions

Figure 1 Physical Dimensions



3.Interface Specification

3.1 Pin Assignments and Definitions

The Pancun's SSD M.2 board data and power pin definitions are shown in the table below.

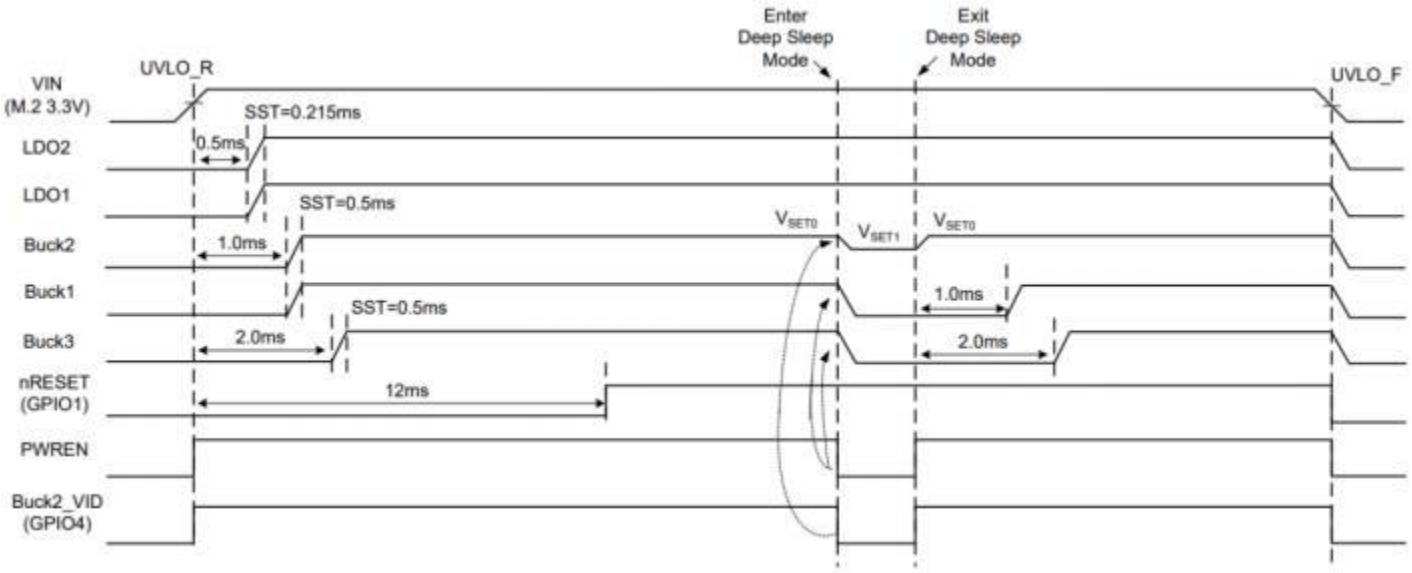
Table 4 Pin Assignments and definitions

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	Reserved	59	CONNECTOR Key M
56	Reserved	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

3.2VIN Power on/off Sequence

Figure 2. VIN Power on/off Sequence



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
10h	Firmware Commit
11h	Firmware Image download
14h	Device Self-test
80h	Format NVM
81h	Security Send
82h	Security Receive
84h	Sanitize

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

Table 7 Supported Configuration Command

Opcode	Command Name
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
80h	Software Progress Marker

Table 8 Supported Log Commands

Opcode	Command Name
01h	Error Information
02h	SMART / Health Information
03h	Firmware Slot Information
04h	Changed Namespace List
06h	Device Self-test

81h	Sanitize Status

5. Identify Command

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

Table 9 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	0x01	Recommended Arbitration Burst (RAB)
75:73	TBD	IEEE OUI Identifier (IEEE)
76	0x00	Controller Multi-Path I/O and Namespace Sharing Capabilities (CMIC)
77	0x09	Maximum Data Transfer Size (MDTS)
79:78	0x0001	Controller ID (CNTLID)
83:80	0x00010300	Version (VER)
87:84	0x001E8480 (2 Sec)	RTD3 Resume Latency (RTD3R)
91:88	0x00989680 (10 Sec)	RTD3 Entry Latency (RTD3E)
95:92	0x00000300	Optional Asynchronous Events Supported (OAES)
99:96	0x0002	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	0x03	Abort Command Limit (ACL)
259	0x03	Asynchronous Event Request Limit (AERL)
260	0x1F	Firmware Updates (FRMW)

261	0x0C	Log Page Attributes (LPA)
262	0x3E	Error Log Page Entries (ELPE)
263	4	Number of Power States Support (NPSS)
264	0x01	Admin Vendor Specific Command Configuration (AVSCC)
265	0x01	Autonomous Power State Transition Attributes (APSTA)
267:266	0x0157 (70C)	Warning Composite Temperature Threshold (WCTEMP)
269:268	0x0161 (80C)	Critical Composite Temperature Threshold (CCTEMP)
271:270	0x0000 (No Report)	Maximum Time for Firmware Activation (MTFA)
275:272	0x00000000	Host Memory Buffer Preferred Size (HMPRE)
279:276	0x00000000	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 10 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