NVMe PCIe3.0x4 M.2 2280 SSD
for PCGNVXXGT07CT3

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Revision History

Revision	History	Draft Date	Remark	Created By	Review By
A/00	1. initial version	Mar 18th , 2023	Zhaozx	Zhaozx	Stanley Chuang
A/01	1.add capacity of 256GB	June 7th , 2023	Zhaozx	Zhaozx	Stanley Chuang
A/02	1.add VIN Power on/off Sequence figure	August 24th , 2023	Wanghh	Wanghh	Fox xiao
A/03	1.add capacity of 2048GB	Sep 26th , 2023	Wanghh	Wanghh	Fox xiao

Specifications

Features
PCIe 3.0 x 4
1600MT/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	256GB~2048GB
Interface	M.2 M-Key
Bytes per Sector	512 Bytes

Performance Specifications 1)	
Sequential Read	Up to 3500MB/s
Sequential Write	(256GB)Up to 1300MB/s
	(512GB) Up to 2700MB/s
	(1TB) Up to 3100MB/s
	(2TB) Up to 2900MB/s
Random Read	(256GB)Up to 110K IOPS
	(512GB)Up to 220K IOPS
	(1TB)Up to 410K IOPS
	(2TB)Up to 500K IOPS
Random Write	(256GB)Up to 250K IOPS
	(512GB)Up to 380K IOPS
	(1TB)Up to 390K IOPS
	(2TB)Up to 340K IOPS

Reliability Specifications	
UBER3)	< 1.0 x 10^{-15}
MTBF4)	1.5 million hours
Environmental Specifications	
Operation Temperature	-10℃~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	2.91W
Write Power Consumption	3.73W
Idle Power Consumption	0.3W
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 3.0 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.

1.2 Product List

Part Number	Capacity	LBA Count	Interface
PCGNV256GT07CT3	256GB	500118192	M.2 M-Key
PCGNV512GT07CT3	512GB	1000215216	
PCGNV01TT07CT3	1024GB	2000409264	
PCGNV02TT07CT3	2048GB	4000797360	

2.Product Specification

2.1 Product Function

- SLC Cache
- HMB Management
- 1600MT/s NAND Interface Speed
- PLP Protection
- PCIe Gen3, Compatible with 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)]
256 GB	150TB	0.5
512 GB	300TB	0.5
1024 GB	600TB	0.5
2048 GB	1200TB	0.5

Attention:

1) Drive Writes Per Day, 3years.

2.4 Power Consumption

Table 1 Supply Voltage

Capacity	Voltage	Unit
256GB	3.3 (+/- 5%)	V
512GB	3.3 (+/- 5%)	V
1024GB	3.3 (+/- 5%)	V
2048GB	3.3 (+/- 5%)	V

Table 2 Power Consumption

Capacity	Description	Power Consumption	Unit
256GB	Sequential Read	2800.0	mW
	Sequential Write	3500.0	mW
	Idle	300	mW
512GB	Sequential Read	3000.0	mW
	Sequential Write	3700.0	mW
	Idle	300	mW
1024GB	Sequential Read	4100.0	mW
	Sequential Write	4400.0	mW
	Idle	400	mW
2048GB	Sequential Read	3141	mW
	Sequential Write	2775	mW
	Idle	669	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.

2.5Performance

Table 3 Performance

Parameter	256GB	512GB	1024GB	2048GB	Unit
Sequential Read	3500	3500	3500	3500	MB/s
Sequential Write	1300	2700	3100	2900	MB/s
Random Read	110	220	410	500	K IOPS
Random Write	250	380	390	340	K IOPS

Attention:

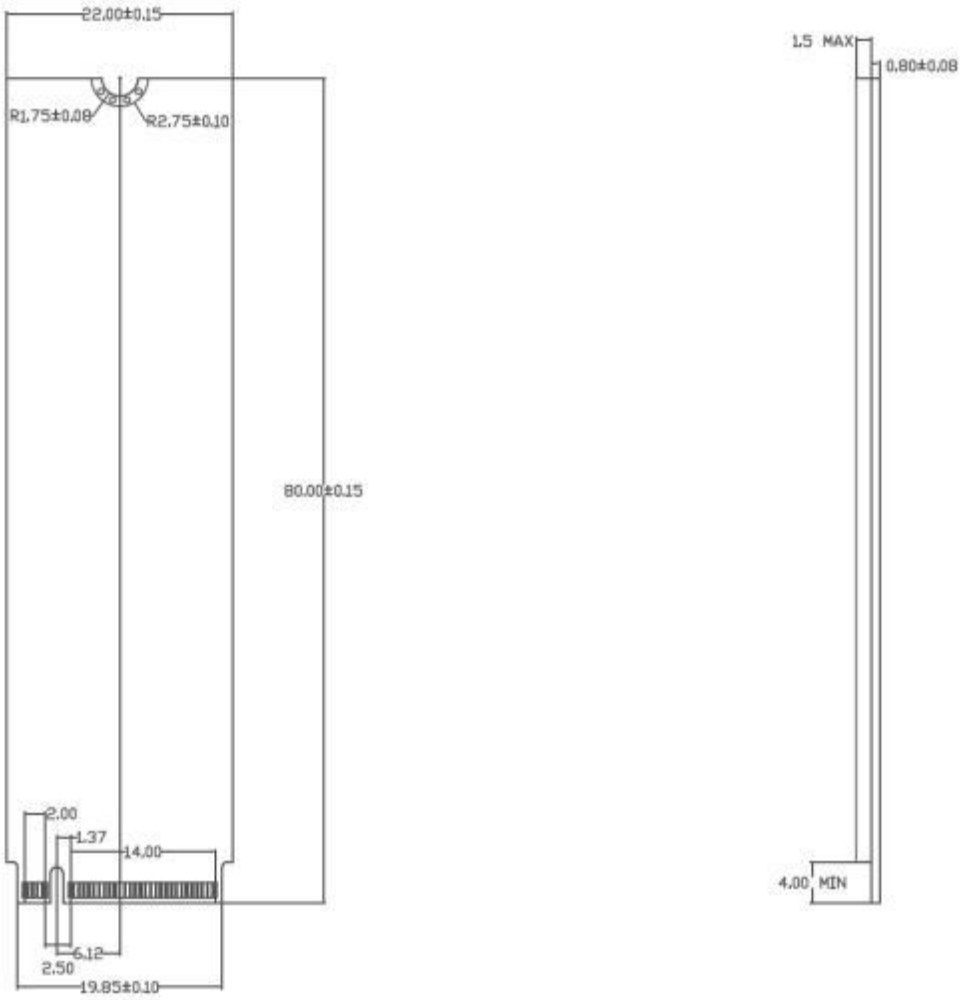
1) The performance test results were all obtained using CrystalDiskMark (v8.0.4) software on Windows 10 Professional Edition 64 bit operating system. The interface was Gen3 x 4 during the test, and the total data block size read and write was 1GB. The queue depth for 128K sequential reads and writes 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.

2.6Environmental Specification

Parameter	Specification
Operation Temperature	-10 ℃ ~ 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 PCGNVXXGT07CT3 series SSD M.2 board data and power pin definitions are shown in the table below.

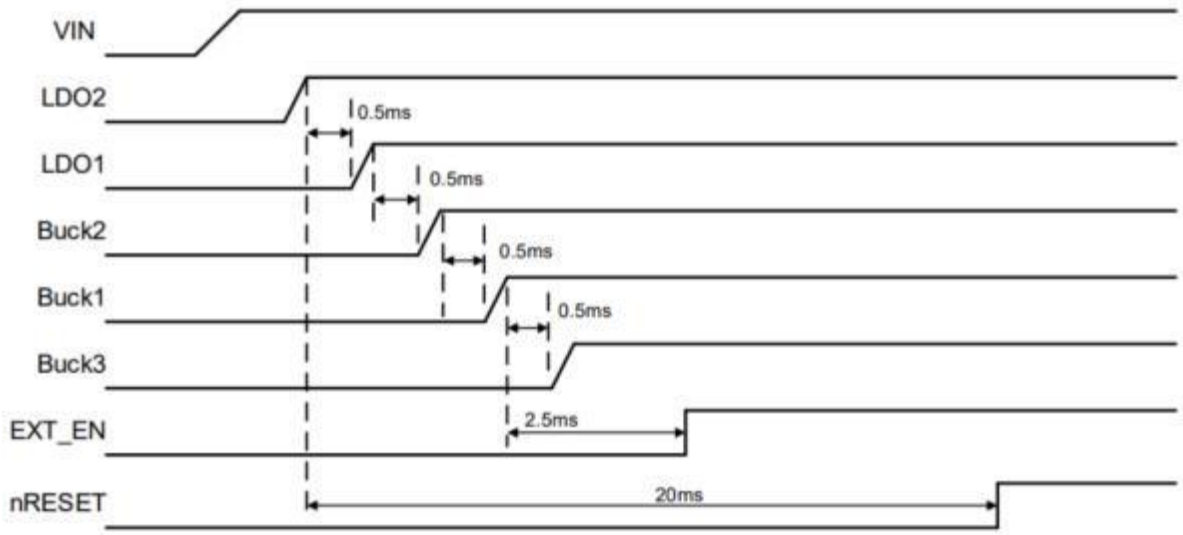
Table 4 Pin Assignments and definitions

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	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

3.2 VIN 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	1E4Bh	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	0x0	Recommended Arbitration Burst (RAB)
75:73	TBD	IEEE OUI Identifier (IEEE)
76	0x0	Controller Multi-Path I/O and Namespace Sharing Capabilities (CMIC)
77	0x09	Maximum Data Transfer Size (MDTS)
79:78	0x0	Controller ID (CNTLID)
83:80	0x10400	Version (VER)
87:84	0x7A120	RTD3 Resume Latency (RTD3R)
91:88	0x1E8480	RTD3 Entry Latency (RTD3E)
95:92	0x00000200	Optional Asynchronous Events Supported (OAES)
99:96	0x0000	Controller Attributes (CTRATT)
111:100	0x0	Reserved
127:112	0x0	FRU Globally Unique Identifier(FGUID)
239:128	0x0	Reserved
255:240	0x0	Refer to the NVMe Management Interface Specification for definition
257:256	0x0006	Optional Admin Command Support (OACS)

258	0x02	Abort Command Limit (ACL)
259	0x03	Asynchronous Event Request Limit (AERL)
260	TBD	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	0x01	Admin Vendor Specific Command Configuration (AVSCC)
265	0x01	Autonomous Power State Transition Attributes (APSTA)
267:266	TBD	Warning Composite Temperature Threshold (WCTEMP)
269:268	TBD	Critical Composite Temperature Threshold (CCTEMP)
271:270	TBD	Maximum Time for Firmware Activation (MTFA)
275:272	TBD	Host Memory Buffer Preferred Size (HMPRE)
279:276	TBD	Host Memory Buffer Minimum Size (HMMIN)
295:280	0x0	Total NVM Capacity (TNVMCAP)
311:296	TBD	Unallocated NVM Capacity (UNVMCAP)
315:312	0x0	Replay Protected Memory Block Support (RPMBS)
317:316	0x0	Extended Device Self-test Time(EDSTT)
318	0x0	Device Self-test Options(DSTO)
319	0x01	Firmware Update Granularity(FWUG)
321:320	0x0	Keep Alive Support(KAS)
323:322	0x01	Host Controlled Thermal Management Attributes(HCTMA)
325:324	TBD	Minimum Thermal Management Temperature(MNTMT)
327:326	TBD	Maximum Thermal Management Temperature (MXTMT)
331:328	0x02	Sanitize Capabilities (SANICAP)
511:332	0x0	Reserved

512	0x66	Submission Queue Entry Size (SQES)
513	0x44	Completion Queue Entry Size (CQES)
515:514	0x0	Maximum Outstanding Commands (MAXCMD)
519:516	0x0	Number of Namespaces (NN)
521:520	0x1F	Optional NVM Command Support (ONCS)
523:522	0x0	Fused Operation Support (FUSES)
524	0x01	Format NVM Attributes (FNA)
525	0x01	Volatile Write Cache (VWC)
527:526	0x0	Atomic Write Unit Normal (AWUN)
529:528	0x0	Atomic Write Unit Power Fail (AWUPF)
530	0x0	NVM Vendor Specific Command Configuration (NVSCC)
531	0x0	Reserved
533:532	0x0	Atomic Compare & Write Unit (ACWU)
535:534	0x0	Reserved
539:536	0x0	SGL Support (SGLS)
767:540	0x0	Reserved
1023:768	0x0	NVM Subsystem NVMe Qualified Name (SUBNQN)
1791:1024	0x0	Reserved
2047:1792	0x0	Refer to the NVMe over Fabrics specification.
2079:2048	TBD	Power State 0 Descriptor (PSD0)
2111:2080	TBD	Power State 1 Descriptor (PSD1)
2143:2112	TBD	Power State 2 Descriptor (PSD2)
2175:2144	TBD	Power State 3 Descriptor (PSD3)

2207:2176	TBD	Power State 4 Descriptor (PSD4)
2239:2208	0x0	Power State 5 Descriptor (PSD5)
2271:2240	0x0	Power State 6 Descriptor (PSD6)
2303:2272	0x0	Power State 7 Descriptor (PSD7)
2335:2304	0x0	Power State 8 Descriptor (PSD8)
2367:2336	0x0	Power State 9 Descriptor (PSD9)
2399:2368	0x0	Power State 10 Descriptor (PSD10)
2431:2400	0x0	Power State 11 Descriptor (PSD11)
2463:2432	0x0	Power State 12 Descriptor (PSD12)
2495:2464	0x0	Power State 13 Descriptor (PSD13)
2527:2496	0x0	Power State 14 Descriptor (PSD14)
2559:2528	0x0	Power State 15 Descriptor (PSD15)
2591:2560	0x0	Power State 16 Descriptor (PSD16)
2623:2592	0x0	Power State 17 Descriptor (PSD17)
2655:2624	0x0	Power State 18 Descriptor (PSD18)
2687:2656	0x0	Power State 19 Descriptor (PSD19)
2719:2688	0x0	Power State 20 Descriptor (PSD20)
2751:2720	0x0	Power State 21 Descriptor (PSD21)
2783:2752	0x0	Power State 22 Descriptor (PSD22)
2815:2784	0x0	Power State 23 Descriptor (PSD23)
2847:2816	0x0	Power State 24 Descriptor (PSD24)
2879:2848	0x0	Power State 25 Descriptor (PSD25)

2911:2880	0x0	Power State 26 Descriptor (PSD26)
2943:2912	0x0	Power State 27 Descriptor (PSD27)
2975:2944	0x0	Power State 28 Descriptor (PSD28)
3007:2976	0x0	Power State 29 Descriptor (PSD29)
3039:3008	0x0	Power State 30 Descriptor (PSD30)
3071:3040	0x0	Power State 31 Descriptor (PSD31)
4095:3072	0x0	Vendor Specific

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