

TEAM MP44L SSD

M.2 PCIe Gen4 x4 with NVMe



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- Revision History

Documentation Revise History:

Version	Revision Description	Date	Remark
A.0	Initial Release	2024-05-24	Rita WU

1. Product General Description

MP44L M.2 PCIe4.0 SSD adopts the PCIeGen4x4 interface. It features read/write speeds of up to 5,000/4,500 MB/s and a maximum storage capacity of 2TB. It is equipped with TEAMGROUP's exclusive patented heat dissipating graphene label less than 1mm thick, which is also compatible with the onboard M.2 heat sink for superior heat dissipation performance to that of the native motherboard heat sink alone. It is undoubtedly the best enhancement to native heat sinks. MP44L M.2 PCIe4.0 SSD also comes with a five-year warranty and recyclable packaging for user reassurance.

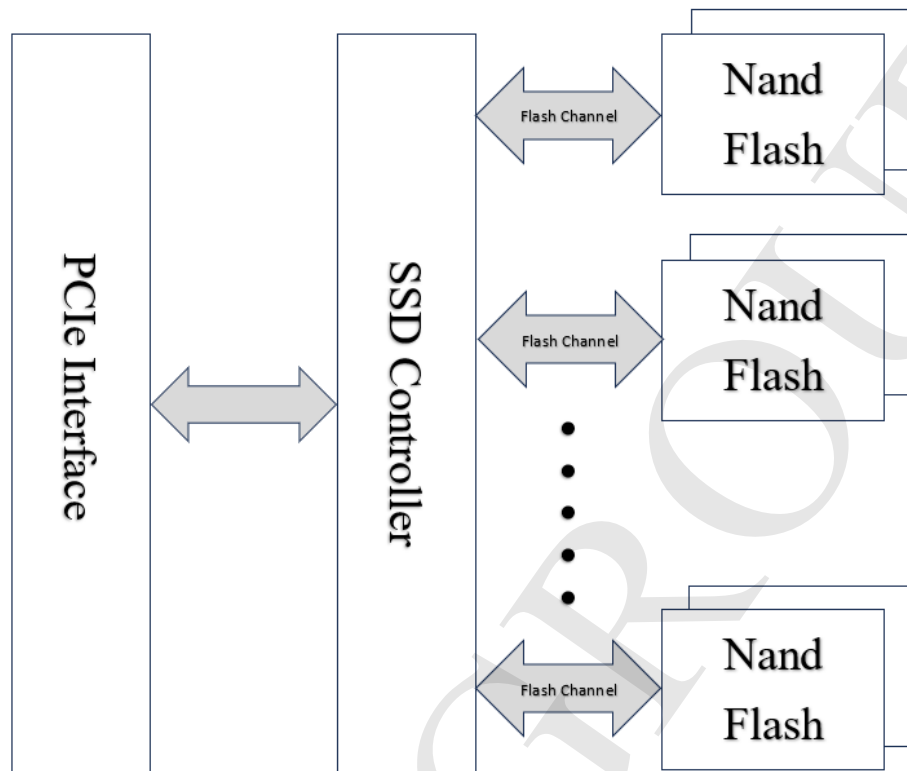
1.1 Main Feature

- Heat dissipating graphene SSD label.
- Supporting SLC Cache enhancing work efficiency drastically.
- Diversified optimization technology for stability, durability, and enhanced reliability.
- Supporting the latest NVMe standards.
- S.M.A.R.T. monitoring software.
- Trustworthy and reliable five-year warranty.
- Taiwan Utility Patent (number: M628748)
- China Utility Patent (number: CN 217135922 U)

1.2 Specification

Item	Specification
Model	MP44L M.2 PCIe 4.0 SSD
Interface	PCIe Gen4 x4 with NVMe
Capacity	250GB / 500GB / 1TB / 2TB
Voltage	DC +3.3V
Operating Temperature	0°C to 70°C
Storage Temperature	-40°C to 85°C
DRAM Cache	No
Terabyte Written	250GB - 200TBW 500GB - 300TBW 1TB - 600TBW 2TB - 1,200TBW
Performance	Crystal Disk Mark: 250GB: Read up to 4,650 MB/s; Write up to 1,900 MB/s 500GB : Read up to 5,000 MB/s; Write up to 2,500 MB/s 1TB : Read up to 5,000 MB/s; Write up to 4,500 MB/s 2TB : Read up to 4,800 MB/s; Write up to 4,400 MB/s IOPS: 250GB Read/Write : up to 220K / 470K IOPS Max 500GB Read/Write : up to 440K / 545K IOPS Max 1TB Read/Write : up to 525K / 550K IOPS Max 2TB Read/Write : up to 525K / 550K IOPS Max
P/E Cycle	3,000
Weight	7g
Dimensions	80.0(L) x 22.0(W) x 2.25 (H) mm
Humidity	RH 90% under 40°C (operational)
Vibration	80Hz ~ 2,000 Hz / 20G
Shock	1,500G/0.5ms
MTBF	1,500,000 hours
Operation System	Compatible with Intel and AMD platforms and has one of the following operating systems: • Windows 11/ 10 / 8 / 7 / Vista or later • Linux 2.6.33 or later
Warranty	5-year limited warranty
NOTES: [1] 1GB=1,000,000,000 Bytes. In OS system, it would be displayed as 1,000,000,000 Bytes/1024/1024/1024 = 0.93GB [2] Definition and conditions of TBW (Terabytes Written) are based on JEDEC standard. [3] Transmission speed will vary according to different hardware/software conditions; therefore, the data can only use for basic reference. [4] All the test data is provided by TEAMGROUP's laboratory, and the information of test data is only for reference. We reserve the right to modify product specifications without prior notice. [5] M.2 SSD Installation Instructions	

1.3 Product Block Diagram



1.4 Flash Management

1.4.1 LDPC ECC

The LDPC ECC engine executes parity generation and error detection/correction features and enhances decoding throughput and data reliability. With LDPC of correction capability $1e-2$ RBER, the hard and soft decoding mechanism provides powerful error correction. Hence the Controller can enhance the endurance and retention of TLC NAND and extends the SSD lifespan.

1.4.2 Wear Leveling algorithm

The controller supports static/dynamic wear leveling. When the host writes data, the controller will find and use the block with the lowest erase count among the free blocks. This is known as dynamic wear leveling. When the free blocks' erase count is higher than the data blocks', it will activate the static wear leveling, replacing the not-so-frequently-used user blocks with the high erase count free blocks.

1.4.3 Bad Block Management

Bad blocks are blocks that do not function properly or contain more invalid bits causing stored data unstable, and their reliability is not guaranteed. Bad blocks that are developed during the lifespan of the flash are named "Later Bad Blocks". Team implements an efficient bad block management. This practice prevents data being stored into bad blocks and further improves the data reliability.

1.4.4 Enhanced SMART function

Team's SSDs support the innovative SMART command (Self-Monitoring, Analysis, and Reporting Technology) that allows the users to evaluate the health information of their SSD in an efficient way.

1.4.5 Data Security

Security commands can be used to lock and unlock the drive by password or through a hardware switch. For those users who require the highest level of security, the controller provides an enhanced data security option¹. By utilizing the latest data management techniques such as AES and TCG Opal, the full data encryption on SSD can eventually ensure the security of confidential data and information.

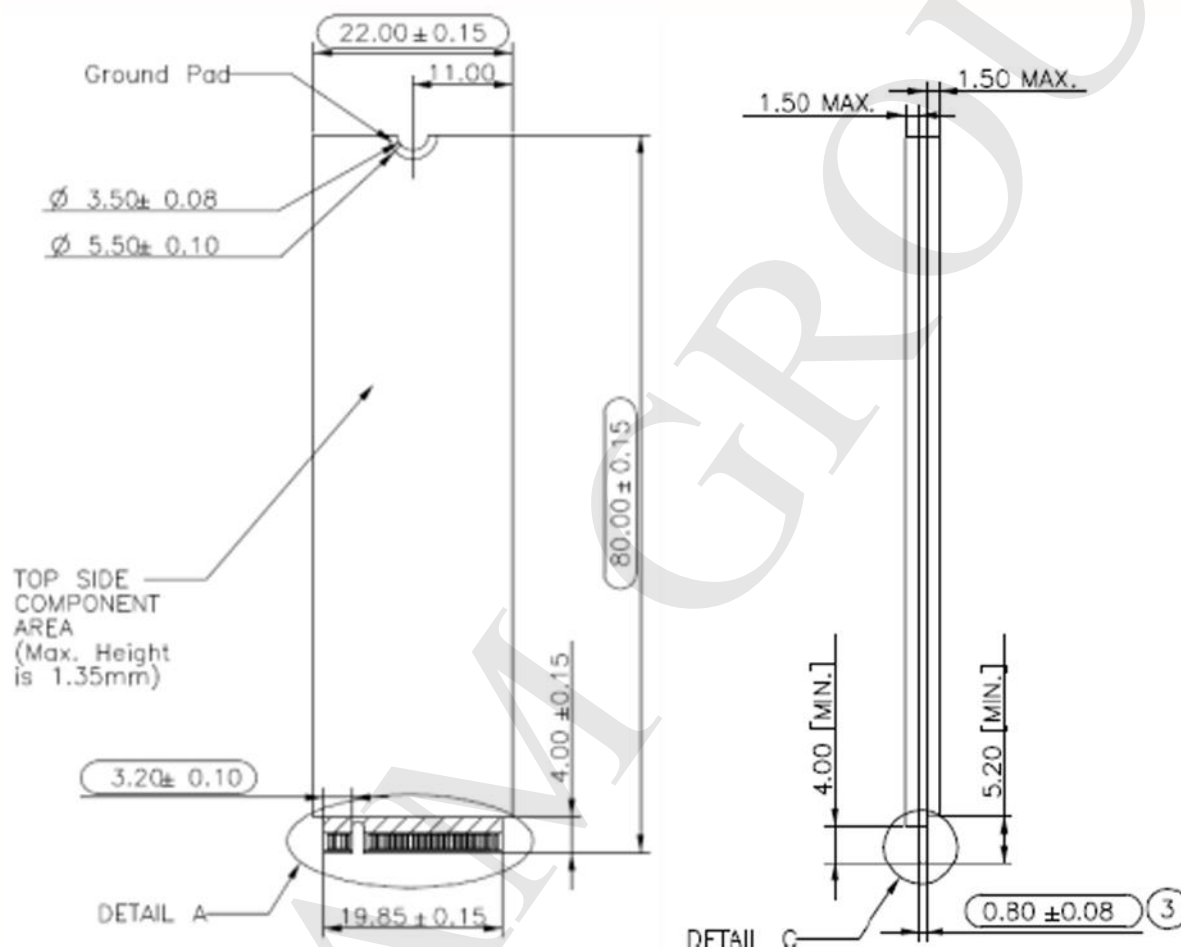
1.4.6 Thermal Throttling

The purpose of thermal throttling is to prevent any components in a SSD from over-heating during read and write operations. The controller is designed with an on-die thermal sensor and with its accuracy; firmware can apply different levels of throttling to achieve the purpose of protection efficiently and proactively via SMART reading.

2. Mechanical Specification

2.1 M.2 (PCIe) 2280 Physical dimensions

Model	Height (mm)	Width (mm)	Length (mm)
MP44L	2.25 (Max)	22 (+/- 0.15)	80 (+/- 0.15)



3. Product Specification

3.1 Electrical/Physical Interface

- PCIe Interface
- Compliant with NVMe
- PCIe Express Base Ver 4.0
- PCIe Gen 4 x 4 lane & backward compatible to PCIe Gen 3, PCIe Gen 2 and Gen 1

3.2 Supported NAND Flash

- Support up to 4pcs BGA132 flash.
- Support ONFI 2.3, ONFI 3.0, ONFI 3.2, ONFI 4.0, ONFI 4.2 and ONFI 5.0 interface

3.3 ECC Scheme

- M.2 2280 (MP44L) PCIe SSD applies the fourth LDPC generation of ECC algorithm.

3.4 Sector Size Support

- 512Bytes
- 4KB

3.5 UART/ GPIO

3.6 Support SMART and TRIM commands

3.7 LBA Range

- IDEMA standard

3.8 Certification & Compliance

- RoHS
- WHQL
- PCI Express Base 4.0
- UNH-IOL NVM Express Logo

3.9 Performance

3.9.1 MP44L PCIe SSD (Unit: MB/s, Max.)

Capacity	Sequential (Crystal Disk Mark)		IOPS (Random)	
	Read	Write	Read	Write
250GB	4,650	1,900	220K	470K
500GB	5,000	2,500	440K	545K
1TB	5,000	4,500	525K	550K
2TB	4,800	4,400	525K	550K

Note:

- Performance may differ according to flash configuration and platform.
- The tables are for reference only. Any criteria for accepting goods shall be further discussed based on different flash configurations.
- Performance is measured with the following conditions:
 - * CrystalDiskMark 6.0.2 x64
 - * OS Version: Win10

3.10 TBW (Terabytes Written)

Capacity	TBW
250GB	200
500GB	300
1TB	600
2TB	1,200

4. Environmental Specifications

4.1 Temperature range

Temperature	Range
Operating	0°C to +70°C
Storage	-40°C to +85°C

4.2 Shock and Vibration

Reliability	Test Conditions
Vibration (Operating)	80Hz – 2,000 Hz / 20G
Shock (Operating)	1500 G / 0.5 ms

4.3 Humidity

Relative Humidity: 90% under 40°C, non-condensing

4.4 MTBF

MTBF, Mean Time Between Failures, is a measure of reliability of a device. Its value represents the average time between a repair and the next failure. The unit of MTBF is smaller in 1,500,000 hours. The higher the MTBF value, the higher the reliability of the device.

5. Electrical Specification

5.1 Supply Voltage

Item	Symbol	Rating	Unit
Input Voltage	V _{IN}	+3.3V DC +/- 5%	V

5.2 Power Consumption Unit: mA (Max)

Capacity	Idle	Read	Write
250GB	270	1,440	1,075
500GB	250	1,095	1,015
1TB	145	830	1,065
2TB	240	1,725	1,795

6. Interface

6.1 Pin Assignments and Descriptions

Pin#	Name	Description	Pin#	Name	Description
1	GND	Config_3=Ground	2	3.3V	3.3 Source
3	GND	Ground	4	3.3V	3.3 Source
5	PETn3	PCIe TX Differential	6	N/C	No connect
7	PETp3	PCIe TX Differential	8	N/C	No connect
9	GND	Ground	10	DAS/DSS (O)	Device Activity Signal / Disable Staggered Spinup
11	PERn3	PCIe RX Differential	12	3.3V	3.3 Source
13	PERp3	PCIe RX Differential	14	3.3V	3.3 Source
15	GND	Ground	16	3.3V	3.3 Source
17	PETn2	PCIe TX Differential	18	3.3V	3.3 Source
19	PETp2	PCIe TX Differential	20	N/C	No connect
21	GND	Config_0=Ground	22	N/C	No connect
23	PERn2	PCIe RX Differential	24	N/C	No connect
25	PERp2	PCIe RX Differential	26	N/C	No connect
27	GND	Ground	28	N/C	No connect
29	PETn1	PCIe TX Differential	30	N/C	No connect
31	PETp1	PCIe TX Differential	32	N/C	No connect
33	GND	Ground	34	N/C	No connect
35	PERn1	PCIe RX Differential	36	N/C	No connect
37	PERp1	PCIe RX Differential	38	N/C	No connect
39	GND	Ground	40	N/C	No connect
41	PETn0	PCIe TX Differential	42	N/C	No connect
43	PETp0	PCIe TX Differential	44	N/C	No connect
45	GND	Ground	46	N/C	No connect
47	PERn0	PCIe RX Differential	48	N/C	No connect
49	PERp0	PCIe RX Differential	50	PERST#(I) (0/3.3V)	PCIe reset
51	GND	Ground	52	CLKREQ#(I/O) (0/3.3V)	Reference clock request signal
53	REFCLKn	PCIe Reference Clock signals (100 MHz)	54	PEWAKE#(I/O) (0/3.3V)	PCIe PME Wake. Open Drain with pull up on platform; Active Low.
55	REFCLKp	PCIe Reference Clock signals (100 MHz)	56	MFG1	Reserved for SSD manufacturing only. Pins should be left N/C in platform Socket.
57	GND	Ground	58	MFG2	Reserved for SSD manufacturing only. Pins should be left N/C in

					platform Socket
59	Module key M	Module key	60	Module key M	Module key
61	Module key M		62	Module key M	
63	Module key M		64	Module key M	
65	Module key M		66	Module key M	
67	N/C	No Connect	68	SUSCLK (I)(0/3.3V)	32.768kHz clock supply input that is provided by the platform chipset
69	PEDET (NC- PCIe)	Config_1=No Connect	70	3.3V	3.3 Source
71	GND	Ground	72	3.3V	3.3 Source
73	GND	Ground	74	3.3V	3.3 Source
75	GND	Config_2=Ground			

7. Supported Commands

7.1 Admin Command list

Op-Code	O/M	Command Description
00h	M	Delete I/O Submission Queue
01h	M	Create I/O Submission Queue
02h	M	Get Log Page
04h	M	Delete I/O Completion Queue
05h	M	Create I/O Completion Queue
06h	M	Identify
08h	M	Abort
09h	M	Set Features
0Ah	M	Get Features
0Ch	M	Asynchronous Event Request
10h	O	Firmware Commit
11h	O	Firmware Image Download
14h	O	Device Self-test

7.2 Admin Commands-NVM Command Set Specific

80h	O	Format NVM
81h	O	Security Send
82h	O	Security Receive
84h	O	Sanitize

7.3 NVM Commands

Op-Code	O/M	Command Description
00h	O	Flush
01h	O	Write
02h	O	Read
04h	O	Write Uncorrectable
05h	O	Compare
08h	O	Write Zeroes
09h	O	Dataset Management

● Drive Capacity

Capacity	Total Bytes
250GB	≥250,000,000,000
500GB	≥500,000,000,000
1TB	≥1,000,000,000,000
2TB	≥2,000,000,000,000

8. SMART Attributes

Team SSD provides SMART and general health information. The information provided is over the life of the controller and is retained across power cycles.

Bytes Index	Bytes	Description
[0]	1	Critical Warning
[2:1]	2	Composite Temperature
[3]	1	Available Spare
[4]	1	Available Spare Threshold
[5]	1	Percentage Used
[31:6]	26	Reserved
[47:32]	16	Data Units Read
[63:48]	16	Data Units Written
[79:64]	16	Host Read Commands
[95:80]	16	Host Write Commands
[111:96]	16	Controller Busy Time
[127:112]	16	Power Cycles
[143:128]	16	Power On Hours
[159:144]	16	Unsafe Shutdowns
[175:160]	16	Media and Data Integrity Errors
[191:176]	16	Number of Error Information Log Entries
[195:192]	4	Warning Composite Temperature Time
[199:196]	4	Critical Composite Temperature Time
[215:214]	2	Temperature Sensor 8 (N/A)
[511:216]	296	Reserved

9. Product Ordering Information

➤ The ordering number rule is as below:

Capacity	Team P/N
250GB	TM8FPK250G0C101
500GB	TM8FPK500G0C101
1TB	TM8FPK001T0C101
2TB	TM8FPK002T0C101

1	2	3	4	5	6	7
T	M8	F	PK	XXXX	0C	101

1. **T:** Team Group

2. **Form Factor:**

- **M8:** M.2 2280

3. **Interface:**

- **F:** PCI-E

4. **Solution:**

- **PK:** Gen4x4 MP44L

5. **Capacity:**

- **250G:** 250GB
- **500G:** 500GB
- **001T:** 1TB
- **002T:** 2TB

6. **Flash Type & Temperature:**

- **0C:** 0°C - 70°C

7. **Feature & Package:**

- **101:** STD RETAIL