Loongtion ®

M.2 NVMe Series
Solid State Drive
Product Manual

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Revision History

Date	Revised By	Version	Remark
2022.01.04	Tian Yue	**1.0**	Initial document
2023.10.15	Tian Yue	**1.1**	Modified document format
2024.01.10	Tian Yue	**2.0**	Removed 128GB capacity
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1. Introduction

1.1 Document Purpose

1) This document provides a detailed and comprehensive introduction to the parameters and electrical performance of the M.2 NVMe series solid-state drives, and includes general descriptions of the product's environmental adaptability, reliability, and endurance;

2) This document will serve as a reference for engineering and technical personnel in the selection of product capacity, product grade, and other aspects.

1.2 Document Scope

This document is primarily intended for engineering and technical personnel for product selection.

1.3 Terms and Abbreviations

TBW: Total Bytes Written;

ECC: Error Correction Code;

MTBF: Mean Time Between Failures;

1.4 Operating Conditions

Unless otherwise specified, for modules developed or produced under this series, the recommended operating ambient temperature and storage temperature are as follows:

Table 1

Grade	Category	Operating Ambient Temperature	Storage Temperature
I	Industrial Grade	-40℃~85℃	-45℃~90℃

2. Product Overview

The M.2 NVMe series SSDs utilize a high-performance controller and TLC NAND Flash as storage media, featuring large capacity, high speed, and excellent heat dissipation.

2.1 Typical Applications

● Embedded devices and systems;

●Industrial medical;

●Commercial computer.

2.2 Product Features

● PCIe 3.0 x4, compliant with NVMe 1.4 protocol;

● China-domestic controller, DRAM-less design;

● Wear leveling algorithm;

● High-reliability power management with short-circuit and under-voltage protection;

● NAND Flash type: TLC;

● PE Cycle: 3000；

● TLC capacities: 256 GB to 2 TB; 2242 form factor max capacity 1 TB;

● Supports TRIM, NCQ, S.M.A.R.T.;

2.3 System Configuration Requirements

● Supply voltage: 3.3 V;

● Interface: Standard M.2 interface;

● Installation Requirement: The hardware system supports NVMe protocol.

2.4 Working Principle

The main function of an M.2 NVMe interface SSD is to store and read user data. The SSD controller interacts with the host port via the NVMe interface. After parsing and link verification through the PCIe protocol, valid data is distributed to the NAND flash memory array for storage management. The internal functional block diagram of an M.2 interface SSD is shown in Figure 1:

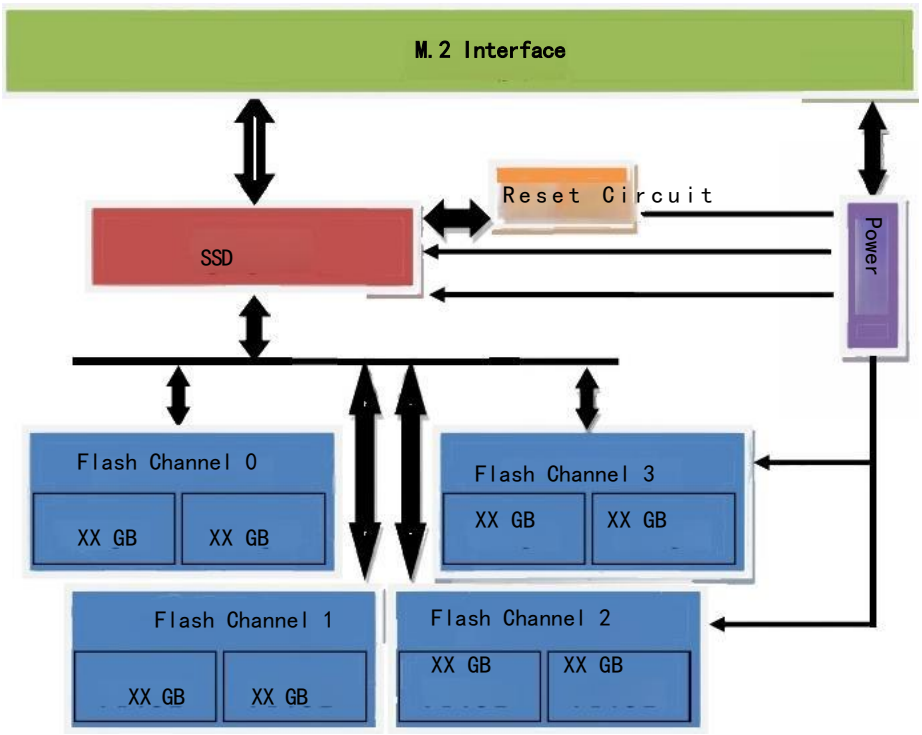


Figure 1 M.2 Interface SSD Internal Architecture Block Diagram

3. Physical Characteristics

3.1 Interface Definition

The M.2 interface pinout diagram is shown in Figure 2, and the interface signal definitions are shown in Table 1:

PCIe M.2 Finger

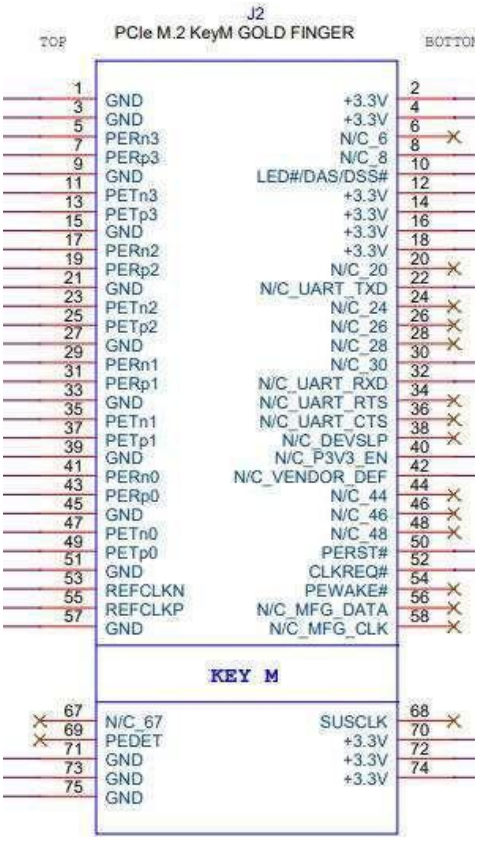


Figure 2 Pinout Diagram

This product uses a standard M.2 interface, and its electrical characteristics comply with the NVMe protocol specification. Interface signal definitions are shown in Table 1.

Table 1 M.2 SSD Interface Pin Definitions

Pin No.	Signal*15	I/O Type*16	Category	Description
1	GND	GND	Ground	Ground
2	3.3V	PWR	Power	3.3V Power
3	GND	GND	Ground	Ground
4	3.3V	PWR	Power	3.3V Power
5	PERn3	I	PCIe	PCIe Lane 3 Receiver Differential Signal N
6	NC_6	NC	RSVD	No connection, reserved
7	PERp3	I	PCIe	PCIe Lane 3 Receiver Differential Signal P
8	NC_8	NC	RSVD	No connection, reserved
9	GND	GND	Ground	Ground

10	LED#	0	LED Drive	Signal output, drives external transistor to provide LED status indication (active low)
11	PETn3	0	PCIe	PCIe Lane 3 Transmitter Differential Signal N
12	3.3V	PWR	Power	3.3V Power
13	PETp3	0	PCIe	PCIe Lane 3 Transmitter Differential Signal P
14	3.3V	PWR	Power	3.3V Power
15	GND	GND	Ground	Ground
16	3.3V	PWR	Power	3.3V Power
17	PERn2	I	PCIe	PCIe Lane 2 Receiver Differential Signal N
18	3.3V	PWR	Power	3.3V Power
19	PERp2	I	PCIe	PCIe Lane 2 Receiver Differential Signal P
20	NC_20	NC	RSVD	No connection, reserved
21	GND	GND	Ground	Ground
22	NC_UART_TXD	NC	RSVD	Reserved for UART_TXD (UART Transmit/Output)
23	PETn2	0	PCIe	PCIe channel 2 transmitter differential signal N
24	NC_24	NC	RSVD	No connection, reserved
25	PETp2	0	PCIe	PCIe channel 2 transmitter differential signal P
26	NC_26	NC	RSVD	No connection, reserved
27	GND	GND	Ground	Ground
28	NC_28	NC	RSVD	No connection, reserved
29	PERnl	I	PCIe	PCIe channel 1 receiver differential signal N
30	NC_30	NC	RSVD	No connection, reserved
31	PERp1	I	PCIe	PCIe channel 1 receiver differential signal P
32	NC_UART_RXD	NC	RSVD	No connection, reserved for UART_RXD (UART receive/input)
33	GND	GND	Ground	Ground
34	NC_UART_RTS	NC	RSVD	No connection, reserved for UART_RTS
35	PETn1	0	PCIe	PCIe Lane 1 Transmitter Differential Signal N
36	NC_UART_CTS	NC	RSVD	No connection, reserved for UART_CTS

37	PETp1	0	PCIe	PCIe Lane 1 Transmitter Differential Signal P
38	N/C	NC	RSVD	No connection, reserved
39	GND	GND	Ground	Ground
40	NC_P3V3_EN	NC	RSVD	No connection, reserved for P3V3_EN (3.3V enable)
41	PERn0	I	PCIe	PCIe Lane 0 Receiver Differential Signal N
42	NC_VENDOR_DEF	NC	RSVD	No connection, reserved for VENDOR_DEF (Vendor Defined)
43	PERp0	I	PCIe	PCIe Lane 0 Receiver Differential Signal P
44	NC_44	NC	RSVD	No connection, reserved
45	GND	GND	Ground	Ground
46	NC_46	NC	RSVD	No connection, reserved
47	PETn0	0	PCIe	PCIe Lane 0 Transmitter Differential Signal N
48	NC_48	NC	RSVD	No connection, reserved
49	PETp0	0	PCIe	PCIe Lane 0 Transmitter Differential Signal P
50	PERST#	I	PCIe	PCIe Reset, Active Low
51	GND	GND	Ground	Ground
52	CLKREQ#	I/O	PCIe	PCIe Clock Request, Active Low
53	REFCLKN	I	PCIe	PCIe Reference Clock N
54	PEWAKE#	NC	RSVD	Reserved for PEWAKE# (PCIe Wake, Active Low)
55	REFCLKP	I	PCIe	PCIe Reference Clock P
56	NC_MFG_DATA	NC	RSVD	Reserved for MFG_DATA (Manufacturing Data line)
57	GND	GND	Ground	Ground
58	NC_MFG_CLK	NC	RSVD	Reserved for MFG_CLK (Manufacturing Clock line)
67	QE	NC	RSVD	For Intelligent Soft Erase function
68	SUSCLK	NC	RSVD	Reserved for SUSCLK (Suspend Clock)
69	PEDET	NC	RSVD	Host interface indicator: No connection, reserved
70	3.3V	PWR	Power	3.3V Power

71	GND	GND	Ground	Ground
72	3.3V	PWR	Power	3.3V Power
73	GND	GND	Ground	Ground
74	3.3V	PWR	Power	3.3V Power
75	GND	GND	Ground	Ground
This series of products features a soft self-destruct function. The interface can be customized by the customer as needed, and is generally defined as pin 67.				

3.2 Weight

Total weight <20 g.

3.3 Physical Dimensions

M.2 NVMe series SSDs are available in two form factors: 2280 and 2242.

The 2280 form factor dimensions are: 80 mm (length) × 22 mm (width), with a total height not exceeding 5 mm. The length and width tolerances are ±0.2 mm. Dimensions are shown in Figure 3:

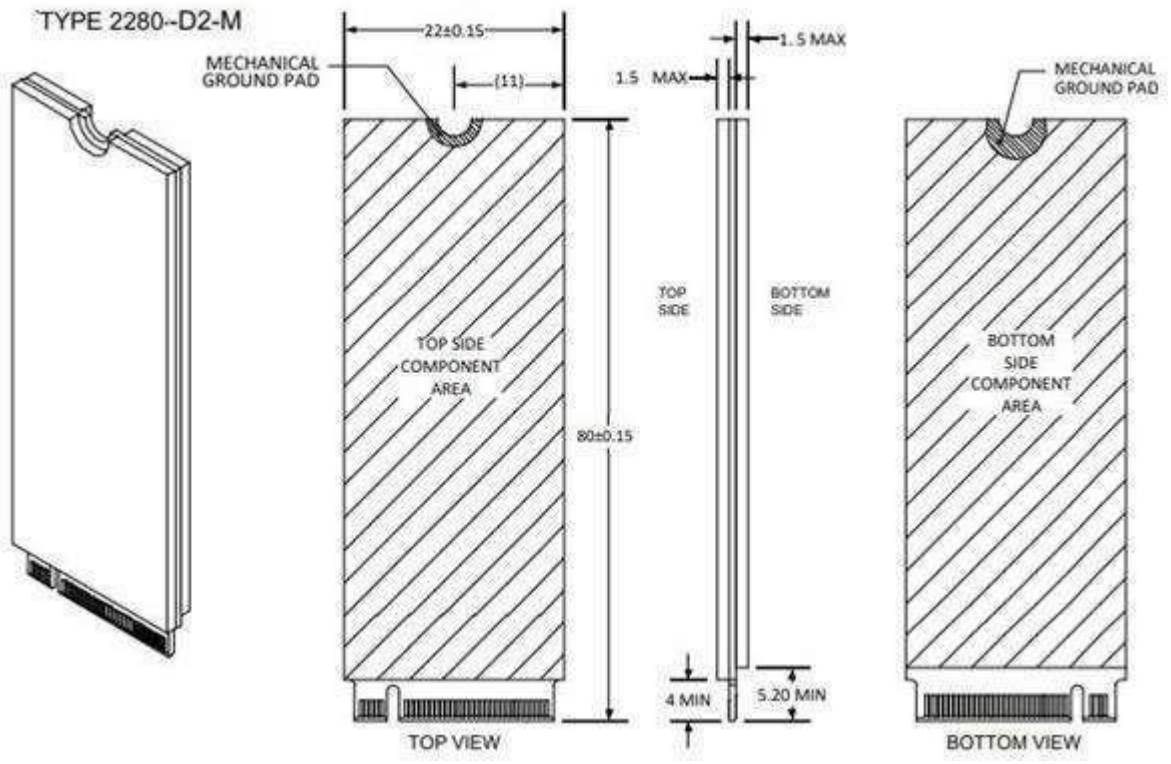


Figure 3 M.2 Interface SSD Dimensions Diagram

The 2242 form factor dimensions are: 42 mm (length) × 22 mm (width), with a total height not exceeding 5 mm. The length and width tolerances are ±0.2 mm. Dimensions are shown in Figure 3:

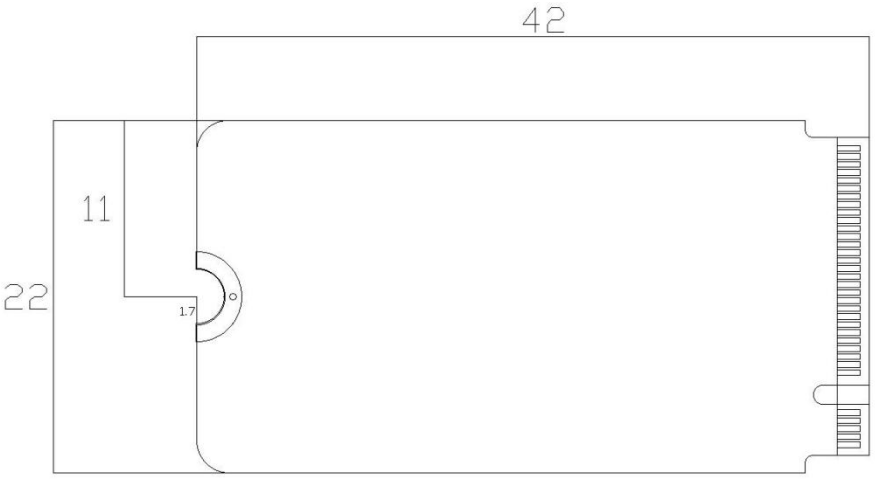


Figure 3 M.2 2242 Interface SSD Dimensions Diagram

4. Electrical Characteristics

4.1 Interface

● Standard M.2 gold finger interface with gold plating thickness of 3 µin;

● Standard NVMe 1.4 protocol.

4.2 Voltage

Table 2 Voltage Parameters

Parameter	Reference Value
Voltage Range	3.15-3.45V
Noise/Ripple Range	50 mV p-p or Less

4.3 Product Capacity

Table 3 Product Capacity

Nominal Capacity	Usable Capacity
256 GB	238 GB
512 GB	476 GB
1TB	**943 GB**
2TB	**1.86TB**

*Tolerance between nominal capacity and usable capacity is ±10%.

4.4 Transfer Speed

Table 4 Technical Parameters

Performance	Capacity	256GB	**512GB**	**1TB**	**2TB**
	Average Sequential Read Speed	≥1500MB/s	≥2000MB/s	**≥2200MB/s**	**≥2500MB/s**
	Average Sequential Write Speed	≥700MB/s	≥900MB/s	**≥1400MB/s**	**≥1800MB/s**

*Test speed is for reference only.

4.5 Power Consumption

Table 5 Power Consumption Parameters

	256GB	**512GB**	**1TB**	**2TB**
Sleep Power Consumption	0.3W	**0.317W**	**0.31W**	**0.3W**
Standby Power Consumption	0.415W	**0.4W**	**0.4W**	**0.4W**
Maximum Sequential Read Power Consumption	1.25W	**1.32W**	**1.43W**	**1.65W**
Maximum Sequential Write Power Consumption	0.99W	**1.12W**	**1.18W**	**1.495W**

*Test data is for reference only.

5. Inspection and Testing

5.1 Product Marking

Markings on the solid-state drive shall be placed in appropriate locations and shall be accurate, clear, and legible, containing the following:

a) Model or code of the solid-state drive;

b) Year of production, lot number, and serial number;

c) Manufacturer code.

If there are special requirements, they shall be determined according to relevant documents.

5.2 Appearance Quality

The surface of the solid-state drive enclosure shall be free from burrs, deformation, contamination, and corrosion.

The coating shall be uniform, without condensation, peeling, bubbles, paint film cracking, and other defects.

The enclosure fasteners shall be complete, without looseness or damage.

The SSD marking shall be clear and legible.

5.3 Electrical Performance Test

5.3.1 Electrical Performance Test Requirements

Table 6 Electrical Performance Test Requirements

No.	Test Item	Requirement	Remark
1	Nominal Capacity, Usable Capacity	Per Section 4.3	
2	Average Sequential Read Speed	Per Section 4.4	
3	Average Sequential Write Speed	Per Section 4.4	
4	Power Consumption	per clause 4.5	

5.3.2 S.M.A.R.T. Information Check Test

The SSD drive name and interface protocol shall comply with the requirements of relevant documents.

5.3.3 File System Data Read/Write Test

After the file system data read/write test, the SSD shall ensure normal data copying and correct file verification.

5.4 Environmental Adaptability

5.4.1 Room Temperature Electrical Test

Under normal atmospheric conditions and rated operating conditions, the product shall be powered on for electrical testing. Its appearance shall comply with clauses 5.1 and 5.2, and its performance shall meet the requirements of clauses 5.3.1 to 5.3.3.

5.4.2 Reliability

Warranty: 5 years.

5.4.3 Endurance (TBW)

Table 7 Product Endurance

Nominal Capacity	Total Data Written
256GB	**180TB**
512GB	360TB
1TB	720TB
2TB	1400TB

*Data written tolerance: ±10%.

5.5 Ordering Information

Table 8 Ordering Information

Grade	Nominal Capacity	Product Model (Standard)		Custom Model (Soft Self-Destruct)	
		2280	2242	2280	2242

Industrial Grade (I)	256GB	YIDJ256NZT-S	YIDJ256VZT-S	**YIDJ256NZT-SD**	/
	512GB	YIDJ512NZT-S	YIDJ512VZT-S	**YIDJ512NZT-SD**	/
	1TB	YIDJ01TNZT-S	YIDJ01TVZT-S	**YIDJ01TNZT-SD**	/
	2TB	YIDJ02TNZT-S	/	**YIDJ02TNZT-SD**	/

6. Delivery Preparation

6.1 Packaging Requirements

The product is packaged in anti-static bags. The packaging shall be clean and dry, providing good protection for the product. The product packaging box shall include anti-static foam, a certificate of conformity, and corresponding test reports.

6.2 Transportation

a) Packaged products may be transported using ordinary means of transport. Measures shall be taken to protect against rain and snow during transportation.

b) Do not transport together with corrosive substances such as acids and alkalis.

c) Do not stack heavy objects on top of the product.

d) Handle with care during loading and unloading.

6.3 Storage

The product should be stored in a dedicated warehouse with a temperature range of 0°C to 35°C, relative humidity not exceeding 80%, and free from strong magnetic fields. Do not store the product together with acids, alkalis, or corrosive materials.