2500 SSD Series Technical Product Specification

For additional technical and warranty information, contact your Micron sales representative.

Features

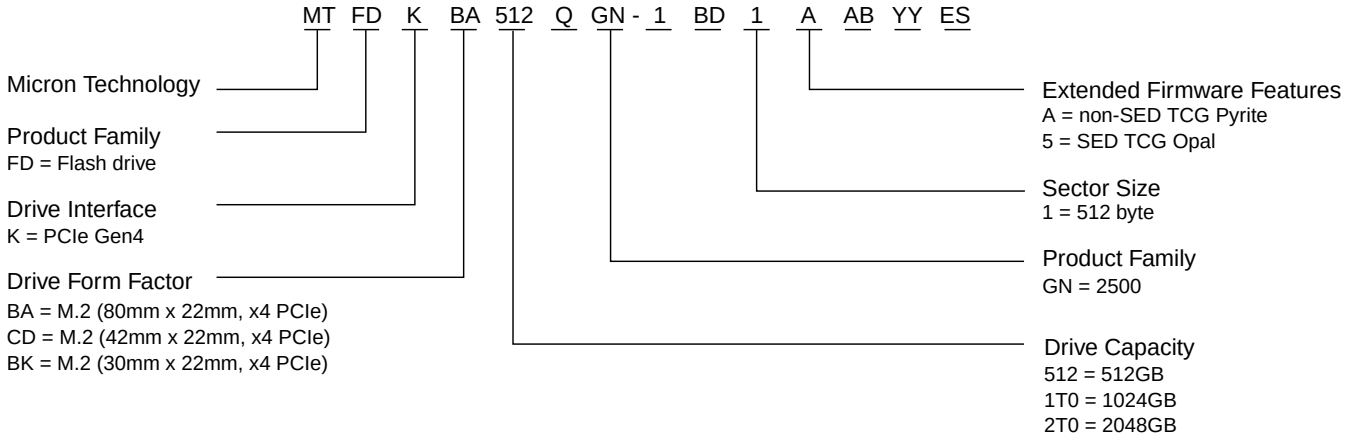
- Micron® 3D QLC NAND Flash
- PCIe® Gen4 x4
- NVMe 1.4c
  - Number of namespaces supported: 1
  - Round robin arbitration: not weighted
  - Autonomous power state transitions
- TCG/Pyrite 2.01 compliant non-self-encrypting drive (non-SED)
- TCG/Opal 2.02 compliant self-encrypting drive (SED)
- Capacity (unformatted)[1]: 512GB, 1024GB, 2048GB
- Endurance: Total bytes written (TBW): Up to 600TB
- HMB (Host Memory Buffer)
- DRAM-Less
- Industry-standard 512 byte sector size support
- Security
  - Digitally signed firmware
- Self-monitoring, analysis, and reporting technology (SMART)
- Device self-test
- Power loss protection for data-at-rest
- Power loss signal support
- Performance[2]
  - Sequential 1MB READ: Up to 7100 MB/s
  - Sequential 1MB WRITE: Up to 6000 MB/s
  - Random 4KB READ: Up to 1000 KIOPS
  - Random 4KB WRITE: Up to 1000 KIOPS
- Latency[3]
  - Read (TYP): 50µs
  - Write (TYP): 12µs
- Reliability
  - MTTF: 2 million device hours[4]
  - Static and dynamic wear leveling
  - Uncorrectable bit error rate (UBER): <1 sector per 10^{15} bits read
- Operating temperature[5]
  - Commercial (0°C to +70°C)
  - System management bus temperature monitoring (SMBus)
- Micron redundant array of independent NAND (RAIN) technology
- Field upgradeable firmware
  - Firmware activation without reset
- Form factor
  - M.2 Type 2280, 2242, 2230
  - Single sided S3
- Electrical specification
  - Power supply: 3.3V ±5%

Notes: 1. User capacity: 1GB = 1 billion bytes.
2. Typical I/O performance numbers as measured fresh-out-of-box (FOB).
3. 4KB, queue depth 1 transfers used for READ/WRITE latency values.
4. The product achieves a mean time to failure (MTTF) based on population statistics not relevant to individual units.
5. Temperature measured by T_{CASE}.

Part Numbering Information

Micron's 2500 SSD is available in different configurations and capacities. The chart below is a comprehensive list of options for the 2500 series devices; not all options listed can be combined to define an offered product. Visit www.micron.com for a list of valid part numbers.

Figure 1: Part Number Chart



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Critical Applications. Products are not authorized for use in applications in which failure of the Micron component could result, directly or indirectly in death, personal injury, or severe property or environmental damage ("Critical Applications"). Customer must protect against death, personal injury, and severe property and environmental damage by incorporating safety design measures into customer's applications to ensure that failure of the Micron component will not result in such harms. Should customer or distributor purchase, use, or sell any Micron component for any critical application, customer and distributor shall indemnify and hold harmless Micron and its subsidiaries, subcontractors, and affiliates and the directors, officers, and employees of each against all claims, costs, damages, and expenses and reasonable attorneys' fees arising out of, directly or indirectly, any claim of product liability, personal injury, or death arising in any way out of such critical application, whether or not Micron or its subsidiaries, subcontractors, or affiliates were negligent in the design, manufacture, or warning of the Micron product.

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Limited Warranty. In no event shall Micron be liable for any indirect, incidental, punitive, special or consequential damages (including without limitation lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort, warranty, breach of contract or other legal theory, unless explicitly stated in a written agreement executed by Micron's duly authorized representative.

Performance

Measured performance can vary for a number of reasons. The major factors affecting drive performance are the capacity of the drive and the interface of the host. Additionally, overall system performance can affect the measured drive performance. When comparing drives, it is recommended that all system variables are the same, and only the drive being tested varies.

Performance numbers will vary depending on the host system configuration.

For SSDs designed for the client computing market, Micron specifies performance in fresh-out-of-box (FOB) state.

For a description of these performance states and of Micron's best practices for performance measurement, refer to Micron's technical marketing brief, Best Practices for SSD Performance Measurement, on micron.com.

Table 1: Drive Performance

Parameter PCIe Gen 4	Capacity			Unit
	512GB	1024GB	2048GB	
Seq read (1MB transfer)	6600	7100	7100	MB/s
Seq write (1MB transfer)	3650	5800	6000	MB/s
Random read (4KB transfer)	530	900	1000	KIOPS
Random write (4KB transfer)	860	1000	1000	KIOPS

Notes: 1. Performance values measured under the following conditions:
- CrystalDiskMark 8.0.4
- Drive write cache enabled
- NVMe power state 0
- Sequential workloads measured using CDM with 1M Q8T1
- Random workloads measured using CDM with 4K Q32T16

2. Performance values measured with the following system configuration:
- ASUS® Pro WS X570-ACE Motherboard
- AMD® X570 Chipset
- AMD® Ryzen™ 7 3700X Processor
- Crucial® 16GB (2 x 8GB) DDR4-3600 SDRAM

3. Latency values measured under the following conditions:
- Random workloads using FIO with 4KB transfers and a queue depth of 1
- TYP = median, 50th percentile

4. System variations will affect measured results.

Endurance

Endurance for the SSD can be predicted based on the usage conditions applied to the device, the internal NAND component cycles, the write amplification factor, and the wear-leveling efficiency of the drive. The tables below show the drive lifetime for each SSD capacity by client computing and sequential input and based on predefined usage conditions.

Table 2: Total Bytes Written

Capacity	Total Bytes Written
512GB	200TB
1024GB	300TB
2048GB	600TB

Notes: 1. Total bytes written validated with the drive 90% full.
2. SSD volatile write cache is enabled.
3. Access patterns used during reliability testing are 25% sequential and 75% random and consist of the following: 1% are 512B; 24% are 4 KiB; 10% are 8 KiB; 10% are 16 KiB; 17% are 32 KiB; 18% are 64 KiB; 10% are 128 KiB; and 10% are 256 KiB.
4. Host workload parameters, including write cache settings, I/O alignment, transfer sizes, randomness, and percent full, that are substantially different than the described notes may result in varied endurance results.
5. GB/day can be estimated by dividing the total bytes written value by (365 × number of years). For example: 100TB/3 years/365 days = 91GB/day for 3 years.

Electrical Characteristics

Table 3: NVMe Power Consumption

Capacity	NVMe Power State							Unit
	PS4	PS3	PS2	PS1	PS0			
	Sleep	Slumber	Heavy Throttle	Light Throttle	Active Idle	Active Writes	Active Reads	
						PCIe Gen4	PCIe Gen4	
512GB	<2.5	<30	<1500	<3000	<150	<6300	<6300	mW
1024GB	<2.5	<30	<1500	<3000	<150	<6300	<6300	mW
2048GB	<2.5	<30	<1500	<3000	<150	<6300	<6300	mW

Notes: 1. Active read power is a typical RMS active average power measurement performed using FIO with 128KB sequential read transfers.
2. Active write power is a typical RMS active average power measurement performed using FIO with 128KB sequential write transfers.
3. PS3 power measured at 25°C.

Table 4: Maximum Ratings

Parameter/Condition	Symbol	Min	Max	Unit
Voltage input	3.3V	3.135	3.465	V
Operating temperature[1]	T_C	0	70	°C
Non-operating temperature	–	–40	85	°C
Rate of temperature change	–	–	20	°C/hour
Relative humidity (non-condensing)	–	5	95	%

Note: 1. Temperature measured in T_{CASE} and $T_{JUNCTION}$ by SMART.

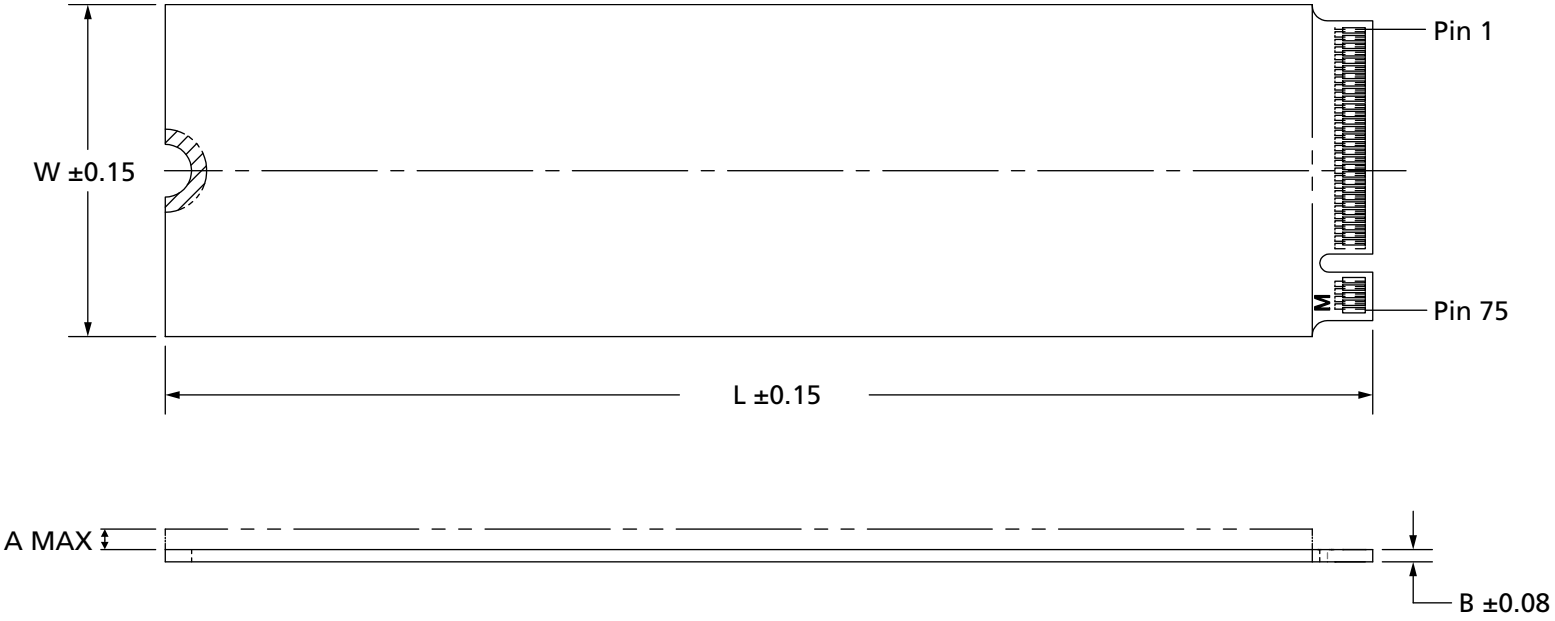
Physical Configuration

M.2 Type 2280, 2242, 2230

Product mass: 10 grams MAX

Physical dimensions conform to the applicable form factor specifications as listed in the figure below.

Figure 2: M.2 Type 2280, 2242, 2230 Form Factor



Note: 1. All dimensions are in millimeters.

Table 5: M.2 Type 2280, 2242, 2230 Form Factor Dimensions

Capacity (GB)	Type	W	L	A	B	Unit
512	2280-S3-M	22.00	80.00	1.50	0.80	mm
1024						
2048						
512	2242-S3-M	22.00	42.00	1.50	0.80	mm
1024						
2048						
512	2230-S3-M	22.00	30.00	1.50	0.80	mm
1024						
2048						

Note: 1. Dimension values per PCI Express M.2 Electromechanical Specification, Revision 1.1.

Compliance

The SSDs comply with the following:

- Micron Green Standard
- CE (Europe): EN55032, EN55024 Class B, RoHS
- UKCA (UK): EN 55032, EN 55024, Class B, RoHS
- Built with sulfur-resistant resistors
- FCC: CFR Title 47, Part 15, Class B
- UL/cUL: approval to UL/IEC 60950 and UL/IEC 62368
- BSMI (Taiwan): approval to CNS 13438 Class B, CNS15663
- RCM (Australia, New Zealand): AS/NZS CISPR32 Class B
- KC RRL (Korea): approval to KN32 Class B, KN 35 Class B

  B 급 기기 (가정용 정보통신기기) 이 기기는 가정용으로 전자파적합등록을한 기기로서 주거 지역에서는 물론 모든지역에서 사용할 수 있습니다.

- W.E.E.E.: Compliance with EU WEEE directive 2012/19/EC. Additional obligations may apply to customers who place these products in the markets where WEEE is enforced.
- TUV (Germany): approval to IEC/EN 60950 and IEC/EN 62368
- V_{CCI} (Japan): 2015-04 Class B

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  取扱説明書に従って正しい取り扱いをして下さい。
  VCCIーB

- IC (Canada): ICES-003 Class B

  - This Class B digital apparatus complies with Canadian ICES-003.
  - Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

- Morocco: EN55032, EN55024 Class B
- UkrSEPRO (Ukraine): EN55032 Class B, IEC60950/EN60950, RoHS (Resolution 2017 No. 139)

FCC Rules

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Revision History

Rev. A – 4/2024

- Initial release

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