2.5-inch U.3, 15mm, NVMe SSD
3.84TB, 7.68TB, 15.36TB[1]

Features

- Western Digital NVMe 1.4 Compliant Controller; PCIe® 4.0
- Western Digital BiCS5 3D TLC NAND
- U.3 interface (U.2 Backplane Compatible)
- 1.0 DW/D
- Enterprise features including:
  - Power Loss Protection
  - End-to-End data Path Protection
  - Variable Sector Sizes
  - NVMe-MI™ 1.1b

Applications/Environments

- Cloud datacenters
- Scale-out or Software Defined Solutions
- Big Data
- NoSQL or Distributed databases
- AI/ML Deep Learning
- Data Archiving

Unlocking the Full Potential of Enterprise SSDs

Western Digital NVMe™ solid state drives provide the trusted performance reliability, and security demanded by enterprise environments. The Ultrastar DC SN655 NVMe SSD expands the Ultrastar SN65x family with a dual-port drive, expanded encryption capabilities, and added performance. Ultrastar NVMe SSDs continue to be the ideal solution for cloud and server providers who need performant, high-capacity, cost-optimized, read-intensive performance for their data-intensive applications.

With dual-port redundancy and failover capability, end-to-end data protection and additional enterprise features, the SN655 helps ensure your data is secure and available when needed. With high-capacity, low-latency performance reaching up to 1.1M IOPs, storage providers are efficiently able to increase capacity for modern applications processing large unstructured datasets for analytics, artificial intelligence, or machine learning. With these workloads growing to gigabytes and even petabytes, storage-optimized Ultrastar NVMe SSDS are reducing time-to-insights of big data and enabling efficient machine learning.

Features

The new Ultrastar DC SN655 NVMe SSDs includes the next generation Western Digital NVMe 1.4b controller with PCIe Generation 4.0 interface and Western Digital BiCS5 TLC 3D NAND. NVMe provides hosts low-latency access to direct attached NVMe SSDs or to NVMe-oF™ storage arrays. BiCS5 TLC 3D NAND is the next generation of 3D NAND driving higher bit densities per mm² for higher capacities than prior generations, up to 15.36TB. Equipped with the latest PCIe Generation 4.0, the SN655 enables performance at scale for increasingly larger application workloads. Designed and built for the standard 2.5" SSD storage infrastructure, the SN655 includes support for U.2 and U.3 backplanes. And with enterprise grade power loss protection, 2.5M MTBF (projected) and 1.0 DW/D with a 5 year limited warranty, cloud and IT managers can deploy and scale their datacenters confidently.

Emerging Workloads

Ultrastar DC SN650 and SN655 NVMe SSDs are optimized for cloud and scale-out workloads, providing high capacities, higher QoS consistency, and better utilization for cloud as-a-service offerings, virtualization, and object or file storage. Emerging workloads for big data, artificial intelligence, and machine learning are increasing in size and complexity and are typically stored across distributed, tiered, or disaggregated architectures. The SN65x NVMe SSDs are optimized for moving these large data sets fast and servicing multiple hosts with performance consistency making them the ideal solution for scaling capacity and maximizing GB/watt.

Ultrastar® DC SN655

Product Information

Capacity[1]	3.84TB	7.68TB	15.38TB
Endurance[2]	1 DW/D		
Petabytes Written	7	14	28
Security	SE, ISE, TCG		
Form Factor	U.3 15mm		
Interface	PCIe Gen4, NVMe 1.4		

Performance[3]

Read Throughput (max GB/s, Seq 128KiB)	6.8GB/s	6.8GB/s	6.8GB/s
Write Throughput (max GB/s, Seq 256KiB)	2.6GB/s	2GB/s	3.7GB/s
Read IOPS (max, Rnd 4KiB)	1000K	980K	1100K
Write IOPS (max, Rnd 4KiB)	112K	78K	125K
Read Latency (µS)[4]	80	100	100
Write Latency (µS)[4]	10	15	10

Reliability

MTBF[5] (hours, projected)	2.5M
Uncorrectable Bit Error Rate (UBER)	1 in 10^{17}
Annualized Failure Rate[5] (AFR, projected)	0.35%
Limited Warranty[6] (years)	5

Power

Requirement (DC, +/- 10%)	+12v
Operating Modes (typical)	16W, 20W
Idle (Average)	<8W

Physical Size

z-height (mm)	15mm
Dimensions (width x length, mm)	69.85 x 100.45

Environmental

Operating Temperature (Ambient)[7]	0°C to 70°C
Non-Operating Temperature[8]	-40°C to 85°C

Part Number

Feature	Part Number	Model Number	Capacity[1]	DW/D
SE	0TS2458	WUS5EA138ESP7E1	3.84TB	1.0
SE	0TS2459	WUS5EA176ESP7E1	7.68TB	1.0
SE	0TS2460	WUS5EA1A1ESP7E1	15.36TB	1.0
ISE	0TS2461	WUS5EA138ESP7E3	3.84TB	1.0
ISE	0TS2462	WUS5EA176ESP7E3	7.68TB	1.0
ISE	0TS2463	WUS5EA1A1ESP7E3	15.36TB	1.0
TCG-Ruby	0TS2467	WUS5EA138ESP7E4	3.84TB	1.0
TCG-Ruby	0TS2468	WUS5EA176ESP7E4	68TB	1.0
TCG-Ruby	0TS2469	WUS5EA1A1ESP7E4	15.36TB	1.0

z = Encryption Setting
1 = Secure Erase
3 = Instant secure erase

[1] One megabyte (MB) is equal to one million bytes, one gigabyte (GB) is equal to 1,000MB (one billion bytes), one terabyte (TB) is equal to 1,000GB (one trillion bytes), and one petabyte (PB) is equal to 1,000TB. Actual user capacity may be less due to operating environment.

[2] Endurance rating based on DW/D using 4KiB 100% random write and JESD 219 workloads over 5 years.

[3] Based on internal testing. Performance will vary by capacity point, or with the changes in useable capacity. Consult product manual for further details. All performance measurements are in full sustained mode and are peak values. Subject to change.

[4] Average random read latency at 4KiB, QD=1

[5] MTBF and AFR specifications will be based on a sample population and are estimated by statistical measurements and acceleration algorithms under typical operating conditions for this drive model. MTBF and AFR ratings do not predict an individual drive's reliability and do not constitute a warranty.

[6] The warranty for the product will expire on the earlier of (i) the date when the flash media has reached one-percent (1%) of its remaining life or (ii) the expiration.

[7] Composite temperature reading

[8] Values are based on ambient temperature. Avoid non-operational exposure to temperatures in excess of 40°C for periods exceeding three months.

2.5-inch U.3, 15mm, NVMe SSD
7.68TB[1], 15.36TB[1]

Features

- Western Digital NVMe 1.4 Compliant Controller; PCIe 4.0
- Western Digital BiCS5 3D TLC NAND
- U.3 interface (U.2 backplane compatible)
- 1DW/D
- Enterprise features including:
  - Power Loss Protection
  - 128 Namespaces
  - Full Data-Loss Protection
  - End-to-End data Path Protection
  - Variable Sector Sizes
  - NVMe-MI 1.1b
- MTBF rating of 2 million hours (projected)
- Secure Erase (SE)
- 5-year limited warranty[6]

Applications/Environments

- Cloud datacenters
- Scale-out or Software Defined Solutions
- Big Data
- NoSQL or Distributed databases
- AI/ML Deep Learning
- Data Archiving

High Capacity NVMe™ SSD and Disaggregated Storage Architecture

As cloud and scale-out data centers have become more and more disaggregated, storage has been able to scale independently from compute, giving businesses elasticity during peak demands while avoiding data silos and improving TCO.

Disaggregating storage is ideal for cloud service providers. It offers a variety of storage services that combine to deliver a higher quality-of-service, improved performance consistency, and higher storage utilization.

For scale-out data center customers, disaggregated storage provides managed service providers to efficiently increase capacity for modern applications processing large unstructured datasets.

As workloads grow to petabytes, high capacity, cost-optimized storage SSDs have an increasingly important role to play. The Ultrastar DC SN650 NVMe SSD can reduce those time-to-insights.

PCIe® Gen 4.0

The new Ultrastar DC SN650 NVMe SSD includes the next generation Western Digital® controller, PCIe Gen 4.0 interface, and Western Digital BiCS5 TLC 3D NAND.

BiCS5 TLC 3D NAND, with higher bit density per mm[2], is the next generation of 3D NAND driving higher capacities, up to 15.36TB[1]. With the latest PCIe Generation 4.0, the Ultrastar DC SN650 enables performance at scale for increasingly larger application workloads. Designed and built for the standard 2.5″ SSD storage infrastructure, it includes support for U.2 and U.3 backplanes.

Emerging Workloads

The Ultrastar DC SN650 NVMe SSD is optimized for cloud and scale-out workloads requiring higher QoS consistency, and better storage utilization for block, object or file storage.

Emerging workloads for big data, artificial intelligence, and machine learning are increasing in size and complexity. They are typically stored across distributed, tiered, or disaggregated architectures. The Ultrastar DC SN650 NVMe SSD is optimized for moving these large datasets fast and servicing multiple hosts with performance consistency, making them ideal for scaling capacity and maximizing GB/watt for these emerging larger workloads.

Safeguarding data

The Ultrastar DC SN650 NVMe SSD ensures that if you lose power, you don't lose your data. The drive comes with Power Loss Protection that keeps your data safe should you experience a sudden and unexpected interruption in power supply. And if you ever need to decommission the drive, Secure Erase provides you with entire drive erase options.

Reliability

The Ultrastar DC SN650 NVMe SSD is built for reliability, incorporating enterprise-class features such as power-loss protection, 2M hour reliability (projected) and 1 DW/D. And if that weren't enough, it also comes with a five-year limited warranty.

Ultrastar® DC SN650

Product Information

Capacity[1]	7.68TB	15.36TB
Endurance[2]	1 DW/D	1 DW/D
Maximum Petabytes Written	14.0	28.0
Security	SE, ISE	
Form Factor	U.3 15mm	
Interface	PCIe Gen4, NVMe 1.4b	

Performance[3]

Read Throughput (max MB/s, Seq 128KiB)	6500MB/s	6600MB/s
Write Throughput (max MB/s, Seq 128KiB)	1900MB/s	2800MB/s
Read IOPS (max, Rnd 4KiB)	705K	970K
Write IOPS (max, Rnd 4KiB)	74K	109K
Read Latency (uS)[4]	115	120
Write Latency (uS)[4]	30	20

Reliability

MTBF[5] (hours, projected)	2.0M
Uncorrectable Bit Error Rate (UBER)	1 in 10^{17}
Annualized Failure Rate[5] (AFR, projected)	0.44%
Limited Warranty[6] (years)	5

Power

Requirement (DC, +/-10%)	+12v, 3.3v	
Operating Modes (typical)	16W, 18W	
Idle (Average)	8W	9W

Physical Size

z-height (mm)	15mm
Dimensions (width x length, mm)	69.85 x 100.45

Environmental

Operating Temperature (Ambient)	0°C to 70°C
Non-Operating Temperature[7]	-40°C to 85°C

Part Number

SE	ISE	Model Number	Capacity[1]	DW/D
0TS2433	–	WUS5EA176ESP5E1	7.68TB	1
0TS2434	–	WUS5EA1A1ESP5E1	15.36TB	1
–	0TS2374	WUS5EA176ESP5E3	7.68TB	1
–	0TS2375	WUS5EA1A1ESP5E3	15.36TB	1

z = Encryption Setting
1 = Secure Erase
3 = Instant secure erase

[1] One megabyte (MB) is equal to one million bytes, one gigabyte (GB) is equal to 1,000MB (one billion bytes), one terabyte (TB) is equal to 1,000GB (one trillion bytes), and one petabyte (PB) is equal to 1,000TB. Actual user capacity may be less due to operating environment.

[2] Endurance rating based on DW/D using 4KiB 100% random write and JESD 219 workloads over 5 years.

[3] All performance and latency specifications are preliminary and subject to change. Performance is measured at max power operating mode.

[4] Average random latency at 4KiB, QD=1.

[5] MTBF and AFR specifications will be based on a sample population and are estimated by statistical measurements and acceleration algorithms under typical operating conditions for this drive model. MTBF and AFR ratings do not predict an individual drive's reliability and do not constitute a warranty.

[6] The warranty for the product will expire on the earlier of (i) the date when the flash media has reached one-percent (1%) of its remaining life or (ii) the expiration of the time period associated with the product.

[7] Values are based on ambient temperature. Avoid non-operational exposure to temperatures in excess of 40°C for periods exceeding three months and in excess of 70°C for periods exceeding two weeks.

Western Digital