SAMSUNG

SSD 845DC PRO

EXCEPTIONAL PERFORMANCE AND HIGH ENDURANCE ESPECIALLY DESIGNED FOR DEMANDING DATA CENTERS

Sustain consistent performance with an SSD engineered by a memory technology leader.

Entrust your valuable data to Samsung's high-performance, high-endurance SSD 845DC PRO.

Data centers have unique requirements to ensure they operate at optimal performance levels 24/7, 365 days a year. Consistent performance with low latency is essential. It is also critical that data centers maintain optimal stability when processing various read and write workloads. Most crucial of all is protection from data corruption or loss due to unexpected power outages. With all this in mind, IT and property managers are tasked with sourcing high-performing and dependable memory solutions.

As an industry leader in high-end memory technology, Samsung is equipped to offer data centers superb solid state drives (SSDs) that deliver exceptional performance in write-intensive applications, such as mail servers, data warehousing and high-performance computing (HPC). These high-quality SSDs also deliver outstanding reliability and high endurance for continual operation regardless of power losses.

With our proven expertise and wealth of experience in cutting-edge SSD technology, Samsung memory solutions help data centers operate continually at optimal performance levels. Samsung also has the added advantage of being the sole manufacturer of all the SSD components, ensuring end-to-end integration, quality assurance and the utmost compatibility.

Samsung 845DC PRO SSD delivers:

- **Exceptional Performance**

  Consistently high performance with unsurpassed sustained write speeds and a low latency rate using Samsung's innovative 3D vertical NAND (V-NAND) flash memory and the inclusion of an optimized controller.

- **Outstanding Reliability**

  Self-Monitoring, Analysis and Reporting Technology (S.M.A.R.T.) failure detection monitoring, enterprise-level power-loss protection (PLP) architecture and advanced signal processing algorithms for integrity assurance.

- **High Endurance**

  Endurance levels are ten times higher than current 2D NAND flash memory using innovative 3D V-NAND technology.

Realize superb performance with low latency in read and write workloads.

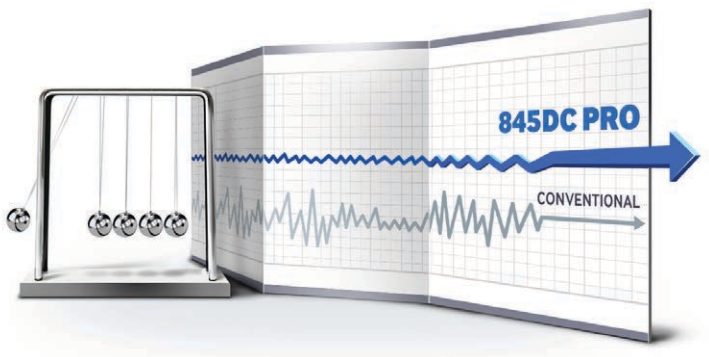
To satisfy a data center's exceptionally high demands, an SSD must maintain sustained performance over long periods of time and provide mixed performance for the variety of workloads that simultaneously access the device. In addition, the SSD must provide performance consistency to satisfy grueling Quality of Service (QoS) requirements.

Deliver highly optimized performance for various data center applications.

The Samsung 845DC PRO is specially optimized to excel in virtually any data center scenario. This enterprise-level, ultra high-performance SSD provides unsurpassed sustained random and sequential read/write performance for a diverse range of RAID configurations, and is particularly suitable for write-intensive data center applications. When compared with other industry-standard 800GB SSDs in internal tests, the 845DC PRO showed the highest random read IOPS performance and a remarkable improvement in random write IOPS performance. The 845DC PRO also showed lower latency under various workloads in the performance evaluations and the highest write performance consistency.

800GB-Based		845DC PRO	A
Seq. (MB/s)	Read	530	500
	Write	460	460
Ran. (IOPS,4K QD32)	Read	92,000	75,000
	Write	51,000	36,000

Sustained sequential and random read/write performance of the 845DC PRO (800GB).

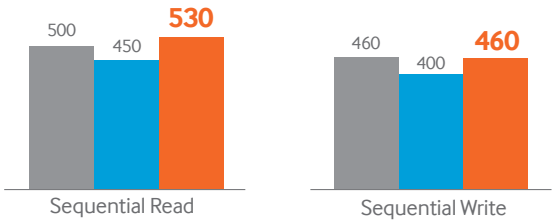


Operate your data center at peak level using Samsung advanced 3D V-NAND flash memory technology.

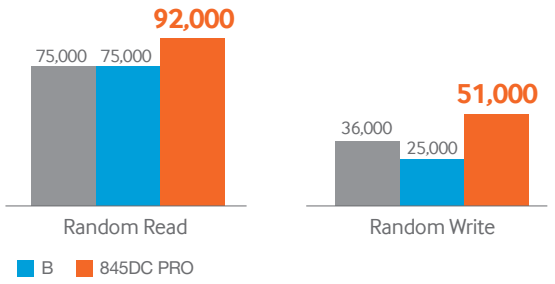
In internal sequential and random performance comparison tests with the industry standard and cloud speeds, the 845DC PRO again came out ahead in both read and write performance. When tested against the 845DC EVO and the industry standard in a 10-hour 4KB random write sustained performance evaluation, the 845DC PRO excelled over its counterparts.

The 845DC PRO boasts Samsung's cutting-edge 3D V-NAND MLC flash memory. This 3D V-NAND flash memory uses an innovative vertical architecture that stacks 24 cell layers on top of each other, rather than trying to decrease the cells' length and width to fit in today's ultra-small form factors. The result is higher density and higher performance in a smaller footprint.

SEQUENTIAL PERFORMANCE (MB/s)

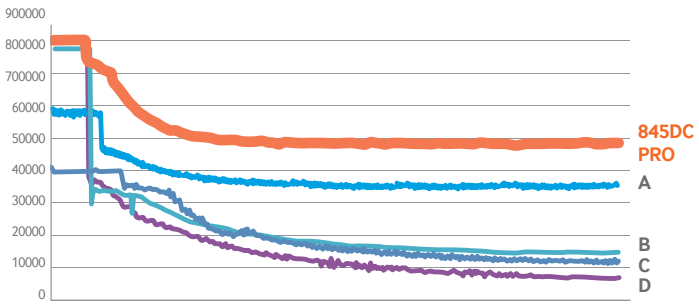


RANDOM PERFORMANCE (IOPS)



Sequential and random read/write performance comparison (800GB).

SUSTAINED PERFORMANCE



Sustained performance comparison.
10-hour 4KB random write sustained performance @IOmeter.

Obtain consistent performance with low latency.

It's essential to data center storage to limit the percentage of response times falling below a given value to maintain QoS, which is measured by the consistency of steady performance the device delivers. Also of key importance in satisfying QoS requirements is low latency. Low latency is defined by how long it takes for a request to complete its round-trip cycle, and is measured by a single input/output (I/O) request on sequential and random workloads, respectively. Cloud data centers in particular must be cognizant of QoS, as they are expected to provide the level of performance guaranteed by a Service Level Agreement (SLA) through parallel and real-time processing.

			845DC PRO	A
Latency (usec)	Sequential	Read	45	50
		Write	40	65
QoS (msec, QD1, 4KB)	99.9%	Read	0.2	0.5
		Write	0.2	0.5
	Max (99.9999%)	Read	1.0	5.0
		Write	5.0	5.0
QoS (msec, QD32, 4KB)	99.9%	Read	0.6	1.0
		Write	5.0	10.0
	Max (99.9999%)	Read	3.0	5.0
		Write	12.0	20.0

QoS performance of 845DC PRO.
QoS measured simultaneously with sustained performance at steady state.

The MLC 3D V-NAND flash memory, when combined with Samsung's 3-core MDX controller, enables the 845DC PRO to deliver an exceptionally consistent level of input/output per second (IOPS) performance, as well as consistent I/O latency. When performance consistency is 99 percent in random read and 95 percent in random write, only 1 percent of the read performance and 5 percent of the write performance results are below the QoS standards. In addition, the 845DC PRO can be configured into various RAID levels based on performance needs, workloads and costs.

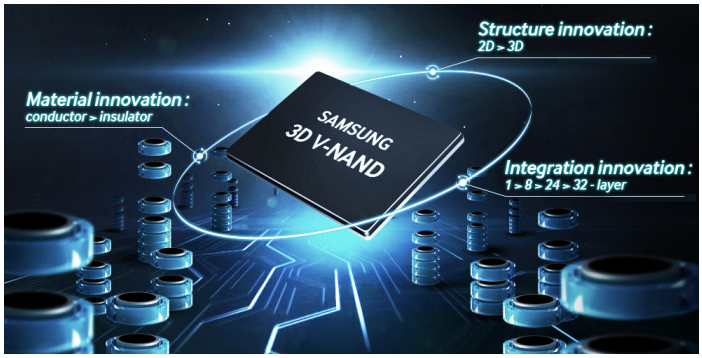
		845DC PRO	A
IOPS consistency (QD32) [%]	Read	90	90
	Write	95	90

IOPS consistency of the 845DC PRO.
IOPS consistency measured simultaneously with sustained performance at steady state.

Trust the 845DC PRO to deliver the solid dependability your data center demands.

Depend on outstanding reliability with 3D V-NAND technology.

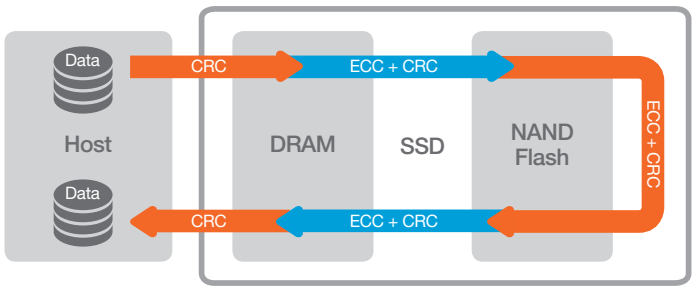
The 3D V-NAND technology in the 845DC PRO offers enhanced data reliability by using advanced data protection technologies that improve the 845DC PRO's lifetime reliability.



Advanced ECC engine and end-to-end data protection.

Among the most crucial algorithms in the 845DC PRO is the Error-Correcting Code (ECC) engine, used to detect signal discrepancies and proactively remedy them in real time. Implementing this process significantly improves the reliability of the SSD, thereby ensuring the integrity of the data read from each NAND chip. In addition, end-to-end data protection extends error detection throughout the entire path from the host interface to the NAND flash memory in the SSD using a cyclic redundancy check (CRC).

Specific algorithms monitor every endurance cycle and tune each cell for higher endurance as needed. Wear leveling and block replacements are managed proactively by periodically monitoring the effective endurance level of the NAND.



Overlapping data protection gates check and correct errors to ensure the entire data path is always protected.

Enterprise-grade power-loss protection.

During normal power off states, the host server allocates time to preserve the data integrity by transmitting standby commands to the devices. In the event of an unexpected power loss, though, the cached data in the device's internal buffers (DRAM) can be lost. This kind of unexpected power loss can result from sudden battery loss, users unplugging the power from the system without notice, unexpected power outages or users unplugging devices from the system.

The 845DC PRO has been designed to prevent data loss resulting from unexpected power shutdowns with power-loss protection architecture. Upon immediate detection of an external power failure, the SSD uses the electricity from a tantalum capacitor to provide enough time to transfer the cached data in DRAM to the flash memory, ensuring no loss of data.

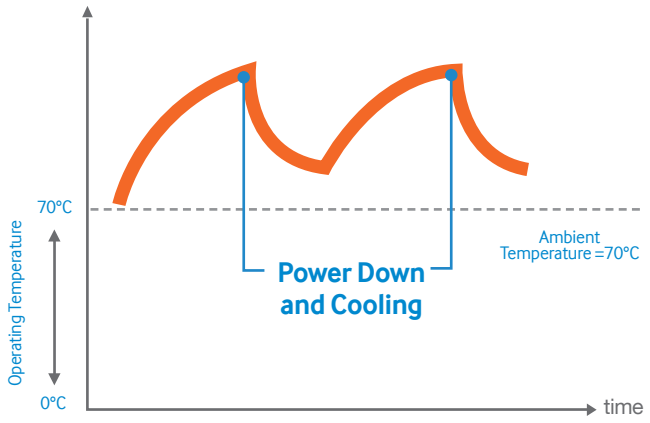
SMART failure detection monitoring.

Smart-Monitoring, Analysis and Reporting Technology (SMART) monitors the computer drives to detect and report on a variety of reliability indicators. If a failure is anticipated, SMART warns the user of an imminent drive failure, which gives the user time to replace the ailing drive, thereby avoiding data loss or unexpected outages. However, SMART can only warn of predictable errors, such as mechanical problems. It cannot warn of errors that result from unpredictable failures such as electrical surges, which have no measurable variables to track and analyze. To safeguard against data loss in these situations, SMART-enabled drives are capable of reporting SMART status, indicating that the drive will not perform within the manufacturer's specifications. Therefore, rather than experiencing complete data loss, the drive may simply begin to run slower.

Partner with a proprietary SSD component manufacturer for uncompromising performance and endurance.

Dynamic Thermal Guard protection.

Built within the 845DC PRO is the Dynamic Thermal Guard protection mechanism, which automatically regulates the SSD's temperature internally and protects it from overheating. Whenever the temperature exceeds a safe threshold, the 845DC PRO delays the handling of requests internally to gain time for the temperature to drop back down to normal operating levels, thereby protecting both the user's data and the hardware.



Dynamic Thermal Guard protects the drive and data by maintaining optimal operating temperatures.

Experience the high endurance benefits of 3D V-NAND technology.

Today's data centers are increasingly seeking higher write-endurance SSDs to meet skyrocketing computing capacity demands, from Big Data to virtual and cloud infrastructures. Because write-intensive operations place a burden on latency and consistency QoS over time, typically the lifespan of an SSD shortens. However, the Samsung MLC 3D V-NAND flash technology boasts incredibly high endurance levels, enabling the 845DC PRO to achieve 10 Drive Writes per Day (DWPD) over a five-year warranty period.

Samsung SSD for Data Center	845DC PRO	
	400GB	800GB
Warranty	5-year limited	
Endurance	10 DWPD*	

High endurance levels of the 845DC PRO.
*DWPD: Drive Writes per Day

Rely on the experts in memory for over 20 years to handle your data center's critical performance needs.

As data center demand for QoS in performance and enhanced storage security continually increases, it is vitally important that your SSDs can manage the workload 365 days a year without interruption. With consistent performance, high-endurance 3D V-NAND technology and power-loss protection, you can rest assured the 845DC PRO will keep your data center functioning efficiently, reliably, safely and continually.

And because Samsung manufacturers each component, from the 3D V-NAND and 3-core MDX controller to the DRAM and firmware, our engineers can ensure the components all work in complete harmony. As a leader in the global memory market for more than two decades, Samsung has gained a wealth of knowledge and expertise in NAND manufacturing.

Samsung is the smart choice to answer all your SSD data center needs. No wonder so many data centers have placed their trust – and their valuable data – in Samsung SSDs.

"Fast, reliable and with excellent endurance credentials to boot, made possible by 3D V-NAND, the Samsung 845DC PRO is a high-quality data center-centric drive that's easy to recommend."
-HEXUS-

Samsung SSD 845DC PRO

"The Samsung 845DC PRO is an outstanding drive which offers class-leading performance for intensive random write workloads, together with excellent endurance."
-Myce-

Specifications	845DC PRO
Capacity	400GB, 800GB
Application	Mixed and write-intensive usages are recommended
Dimensions(L x W x H)	(100.2±0.25) x (69.85±0.25) x (6.8±0.2)mm
Weight	Max. 65g (800GB)
Interface	Serial ATA 6Gbps (compatible with SATA 3Gb/s and SATA 1.5Gbps) Fully complies with ATA/ATAPI-7 standard (Partially complies with ATA /ATAPI-8) Supports Native Command Queuing (NCQ): Up to 32 depth
Form factor	2.5" type
Controller	Samsung 3-core MDX controller
NAND flash memory	Samsung 24-layer 3D V-NAND 2-bit MLC
DRAM cache memory	512MB (400GB), 1GB (800GB)
Performance*	Sequential Read: Up to. 530 MB/s
	Sequential Write: Up to. 460 MB/s
	Random Read (4KB, QD32): Max. 92,000 IOPS
	Random Write (4KB, QD32): Max. 50,000 IOPS (400GB), Max. 51,000 IOPS (800GB)
Quality of Service (4KB, QD32)	99.9% Read: 0.6ms / Write: 5ms
	Max. Read: 3ms / Write: 12ms
Quality of Service (4KB, QD32)	Sequential Read: 45us / Write: 40us
	Random Read: 110us / Write: 50us
Reliability	Mean Time Between Failures (MTBF): 2,000,000 hours Uncorrectable Bit Error Rate (UBER): 1 sector per 1017 bits read End-to-end data protection
Terabytes written (TBW)	10 Drive Writes per Day (DWPD)
Power consumption	Active (read / write): 1.7Watt / 3.1Watt (400GB), 3.3Watt (800GB) Idle: 1Watt
Temperature	Operating: 0°C to 70°C
	Non-Operating: -40°C to 85°C
Humidity	5% to 95%, non-condensing
Vibration	Non-Operating: 20 ~ 2,000Hz, 20G
Shock	Non-Operating: 1,500G, duration 0.5m sec, 3 axis
Certification	CE, BSMI, KCC, VCCI, C-tick, FCC, IC, UL, TUV, CB
RoHS compliance	RoHS2
Warranty	5-year limited

* Actual performance may vary depending on use conditions and environment. Performance measured using FIO with queue depth 32. Measurements are performed on the whole logical block address (LBA) range. Write cache enabled.
1 MB/sec = 1,048,576 bytes/sec was used in sequential performance. Uncorrectable Bit Error Rate (UBER) and endurance (TBW) is based on JEDED standard.

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Samsung SSD activated

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