Samsung SSD PM1725a

Exceptionally fast speeds and ultra-low latency for enterprise servers

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Extreme performance from an SSD technology leader

Maximize data transfer with the high-performance, reliable PM1725a

Enterprise environments have unique requirements to ensure that they operate optimally 24/7, 365 days a year. A varied level of performance with low latency is essential.

It is also critical that these environments remain stable when processing various read and write workloads. And the most crucial criteria of all are protection from data corruption or loss due to unexpected power outages.

Considering each of these factors, IT and data center managers are tasked with finding high performing, dependable memory solutions.

Samsung is well-equipped to offer enterprise environments superb SSDs. The drives deliver exceptional performance in multithread applications, such as compute and virtualization, relational databases, and storage.

These high-performing SSDs also provide outstanding reliability for continual operation regardless of unanticipated power loss. Their reliability also extends to non-interrupt service in case a failure occurs on one of the paths to a port.

Using its proven expertise and wealth of experience in cutting-edge SSD technology, Samsung memory solutions helps data centers operate continually at the highest performance levels.

Samsung has the added advantage of being the sole manufacturer of all of its SSD components. This advantage helps ensure end-to-end integration, quality assurance and the utmost compatibility.

Samsung PM1725a NVMe SSD delivers:

- **Exceptional value:** The PM1725a utilizes Samsung V-NAND flash memory, which features a unique design that stacks 48 layers on top of another. It also employs cost-effective TLC (triple-level cell) flash memory, which delivers higher reliability than MLC (multi-level cell) planar NAND flash memory SSDs. With this architecture, the PM1725a can deliver enterprise-level performance economically.

- **Consistently high performance:** The PM1725a HHHL (half-height, half-length) card delivers a wide bandwidth of up to 6,400/3,000 MB/s sequential R/W speeds respectively, using under 23 W of power. It delivers up to 1,080K and

170K IOPS for random 4KB read and write, respectively. The PM1725a 2.5-inch SSD delivers a bandwidth of up to 3,300/2,950 MB/s for sequential R/W and up to 800K/160K IOPS for random 4KB R/W, respectively. The PM1725a delivers QoS (quality of service, 99%) of 95μs for random 4KB reads and 60μs for random 4KB writes.

- **Outstanding reliability:** Even though the PM1725a employs a TLC V-NAND flash memory, it boasts 5 DWPD (drive writes per day) for 5 years. This rate translates to writing a total of 32 TB each day during that time, which means users can write 6,400 files of 5 GB-equivalent data every day. This level of reliability is more than sufficient for enterprise storage systems that have to perform ultrafast transmissions of large amounts of data.

- **High density:** By fitting more memory cells in less space in a V-NAND chip, it provides significantly more capacities of up to 6.4 TB in both the PM1725a 2.5-inch and HHHL card SSDs. Depending on your storage requirements and applications, 800 GB, 1.6TB, 3.2 TB and 6.4 TB capacities are available.

Optimized for enterprise environments

The Samsung PM1725a SSD is optimized to excel in virtually any data center scenario. This enterprise-level, ultra-high performance SSD provides unsurpassed random read performance and is particularly suitable for read-intensive data center applications. When compared with other standardized Samsung SSDs, the PM1725a SSD provides the highest random read IOPS performance.

The PM1725a is equipped with Samsung 3rd-generation TLC V-NAND technology. This technology eliminates performance and reliability issues that result from capacity limitations found in planar NAND technologies.

The Samsung V-NAND technology delivers reliable and consistent performance at lower costs for today's demanding data-centric world.

Superb performance over SAS SSDs

The PM1725a uses a state-of-the-art NVMe interface to overcome bottlenecks experienced in SAS (serial-attached SCSI) and SATA interfaces. Furthermore, the PM1725a employs the highest density to successfully process intensive and heavy enterprise workloads.

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Samsung PM1725a puts an end to performance and efficiency bottlenecks

The following figures compare the performance of a Samsung enterprise SAS SSD, which uses MLC V-NAND flash memory, with the TLC-based PM1725a. With comparable cost, the PM1725a provides up to 4.3 times more bandwidth than the MLC-based SAS SSD for sequential read and up to 5 times more IOPS for 4 KB random read.
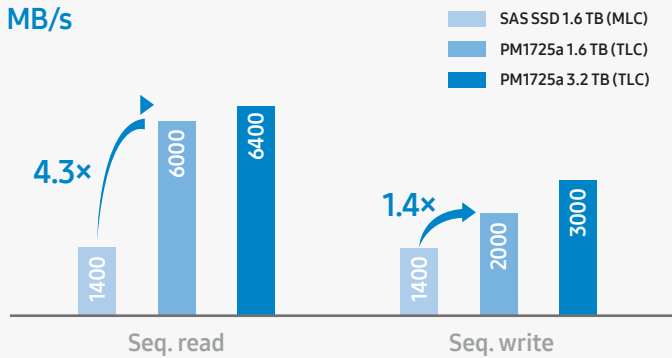
MB/s

Legend:
- SAS SSD 1.6 TB (MLC)
- PM1725a 1.6 TB (TLC)
- PM1725a 3.2 TB (TLC)

Seq. read: 1400, 6000, 6400 — 4.3×
Seq. write: 1400, 2000, 3000 — 1.4×

Figure 1. Sequential R/W performance comparison between an MLC SAS SSD and the 1.6 and 3.2 TB TLC PM1725a

K IOPS

Sustained random read: 200K, 1000K, 1080K — 5.0×
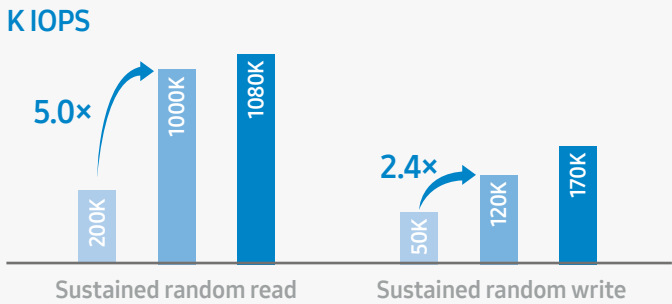Sustained random write: 50K, 120K, 170K — 2.4×

Figure 2. Sustained random R/W performance comparison between an MLC SAS SSD and the 1.6 and 3.2 TB PM1725a

Enterprise-grade power-loss protection

During normal power-off periods, the host server allocates time to maintain data integrity by transmitting standby commands to each device. In the event of an unexpected power loss, though, the SSD immediately uses the stored energy from tantalum capacitors to provide enough time to transfer the cached data in DRAM to the flash memory. This process helps ensure no loss of data.

Power loss can occur with power outages or when users unplug devices from the system. However, the PM1725a NVMe SSD has been designed to prevent data loss with its PLP (power-loss protection) architecture. In the event of sudden power off or

power failure, the PLP solution can help ensure that data issued by the host system is written to the storage media to reduce the risk of loss of data.

Dual-port capability

IT and data center managers need features that can provide access to storage data without interruptions.

Samsung has taken this need into consideration by including a key feature that provides access by smartly using dual-port PCIe® (PCI Express®) SSDs to get the most out of high-performance enterprise applications.

Samsung has enabled this feature in the PM1725a 2.5-inch drives, which provides the ability to create two fault domains and increases availability, providing non-interrupt service for accessing storage data.

Even if a failure occurs in one of the paths to a port, preventing access along that path, the device is still accessible using the second port. The PM1725a provides virtually non-stop service with this dual-port feature support.

SR-IOV support

SR-IOV (single-root I/O virtualization) is a PCI-SIG® specification for I/O virtualization. It provides a standard mechanism for devices to advertise their ability to be simultaneously shared among multiple VMs (virtual machines).
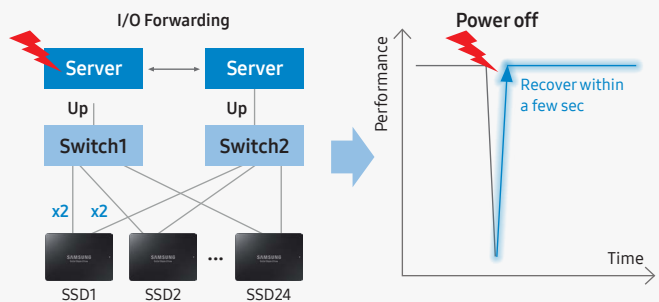
Figure 3. High availability with the Samsung dual-port NVMe SSD

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Samsung SSD Toolkit provides simplified management and diagnostics

It also allows for the partitioning of a PCI® function into many virtual interfaces for the purpose of sharing the resources of a PCIe device in a virtual environment.

PM1725a drives support SR-IOV, which enables the efficient sharing of PCIe devices among virtual machines running on the same host. Hypervisor overhead is reduced by providing an independent, direct I/O path between VMs and devices.

The PM1725a can attain its maximum random read performance, even in a virtualized environment, using SR-IOV. Also the direct I/O path between VMs and devices eliminates hypervisor bottlenecks, as illustrated in the figure below.
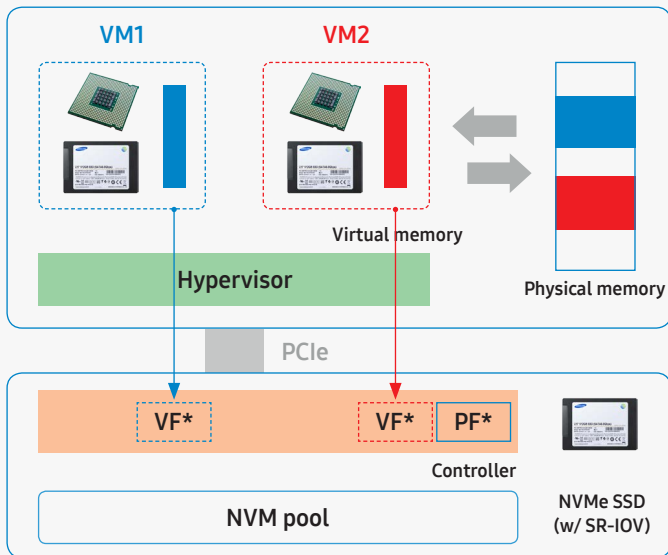
* VF: Virtual function   * PF: Physical function

Figure 4. PM1725a SSD usage in SR-IOV environments

Multi-namespace

The PM1725a supports multiple namespaces, where a single SSD can be partitioned into multiple hardware partitions. A namespace can be assigned to multiple hosts or dedicated to a single host. The PM1725a supports up to 32 multiple namespaces.

Remote health monitoring

The PM1725a provides a remote health-monitoring feature by the Samsung SSD Toolkit. The Samsung SSD Toolkit is proprietary software designed to help users with easy-to-use SSD management and diagnostic features for server and data center usage.

The CLI (command line interface) tool currently supports Samsung data center and enterprise NVMe SSDs and supports Linux®.

The Samsung SSD Toolkit is available from the Samsung SSD website. Remote health monitoring features:

- **Health monitoring:** Provides vital drive status information and supports users to update firmware, measure drive performance, initialize drives, calculate drive lifetime and more.

- **Remote health monitoring for FA (failure analysis):** Provides a smart way for resolving field issues by the remote health monitoring feature. This way of issue handling reduces turnaround time compared to the traditional way of handling the issue, such as dispatching an engineer, and provides quicker resolution. The customer can get the initial resolution in two steps: first by running the SSD Toolkit and second by sending the debug information back to Samsung and getting the resolution effectively.

1. http://www.samsung.com/global/business/semiconductor/minisite/SSD/global/html/support/server_downloads.html

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Specifications

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	Samsung PM1725a	
Form factor	2.5 inch	HHHL
Capacity [2]	800 GB, 1.6 TB, 3.2 TB, 6.4 TB	1.6 TB, 3.2 TB, 6.4 TB
Host interface	PCI Express Gen3 x 4	PCI Express Gen3 x 8
Spec compliance	PCI Express base specification rev. 3.0, NVM Express spec rev. 1.2, enterprise SSD form factor ver. 1.0a	
NAND flash memory	Samsung V-NAND	
MTBF	2,000,000 hours	
UBER	1 sector per 10^{17} bits read	
Power consumption [3]	Active: 23 Watt, Idle: 7.7 Watt	
Endurance	5 DWPD for 5 years	
Sequential read [4]	Up to 3,300 MB/s	Up to 6,400 MB/s
Sequential write	Up to 2,950 MB/s	Up to 3,000 MB/s
Random read	Up to 800,000 IOPS	Up to 1,080,000 IOPS
Random write	Up to 160,000 IOPS	Up to 170,000 IOPS
Latency, read/write [5]	90/20 µs	
Quality of Service, read/write (99%) [6]	95/60 µs	
Physical dimensions	69.85 x 100.20 x 14.80 mm	69.90 x 167.65 x 18.71 mm
Weight	Up to 190 grams	Up to 330 grams

2. 1 MB = 1,000,000 Bytes, 1 GB = 1,000,000,000 Bytes, 1 TB = 1,000,000,000,000 Bytes, unformatted capacity.

3. Active power is measured using IOMeter-2006 on Microsoft® Windows® Win Server 2012 R2.

4. Based on PCI Express Gen3 x 4 for 2.5-inch and PCI Express Gen3 x 8 for HHHL card SSD. Random performance measured using Fio® in CentOS® 7.0 with queue depth 32 by 16 workers and sequential performance with queue depth 32 by 16 workers. Actual performance may vary depending on use conditions and environment.

5. The read latency is measured by using Fio in CentOS 7.0 and 4 KB transfer size with queue depth 1 on a random workload of sustained state. The write latency is measured by using Fio in CentOS 7.0 and 4 KB transfer size with queue depth 1 on a sequential workload of sustained state.

6. QoS is measured using FIO (99%) with queue depth 1 on 4KB random read and write.

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Legal and additional information

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Samsung Electronics Co., Ltd. inspires the world and shapes the future with transformative ideas and technologies. The company is redefining the worlds of TVs, smartphones, wearable devices, tablets, cameras, digital appliances, printers, medical equipment, network systems, and semiconductor and LED solutions. For the latest news, please visit the Samsung Newsroom at news.samsung.com.

For more information

For more information about the Samsung Semiconductor, visit samsung.com/semiconductor.

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