PASCARI

X200P

White Paper

PHISON

Phison PASCARI X200P: The Data Center Storage Revolution

The advent of modern AI and machine learning workloads in the data center has created unprecedented demand for high-speed, high-capacity, and high-endurance storage solutions. The Phison PASCARI X200P enterprise SSDs address this market with cutting-edge performance, designed to handle a variety of data center workloads. They're especially well-suited for the complex operations required for training AI models, with solutions tailored for both on-premises and cloud storage solutions.

AI applications are transforming data center storage needs. Training and inference on large language models, coupled with real-time analytics, require rapid access to vast datasets. Traditional storage solutions often fall short in meeting the low-latency and high-throughput demands of AI and ML. Data centers are updating to the latest standards and interfaces to keep pace with the evolving requirements. Phison has been a leader in SSD storage and flash memory devices for decades, with its own line of data center drives tailor-made for today's workloads.

The Pascari X200P SSDs provide significant benefits for data centers that adopt the latest storage technologies, delivering sustained high performance and responsiveness while running intensive operations. The combination of the latest PCI Express 5.0 interface, advanced controller, and state-of-the-art 3D NAND solutions raises the ceiling on performance and throughput, increasing the scalability and reliability of data center storage.

Pascari X200P: the Culmination of 15 Years of SSD Technologies

Advancements in SSDs over the past 15 years have dramatically changed the storage landscape. Where the first SSDs had relatively limited capacities and extreme prices, improvements in NAND, including the advent of 3D NAND solutions, greatly increased the speed and capacity available while at the same time reducing the cost per GB.

Phison's SSD controllers support NAND solutions from all the major manufacturers, including Kioxia, Micron, SanDisk, SK hynix, and others. By working with multiple NAND vendors, Phison maintains flexibility and the option to adopt new solutions more quickly as they become available.

The Pascari X200P utilizes SK Hynix 176-layer 3D TLC NAND packages running at 1,600 MT/s. X200P U.2 and E3.S SSDs can use up to sixteen NAND packages, currently providing up to 32 TB of raw NAND capacity. Overprovisioning brings the visible storage capacity down to 30.72 TB.

PCI Express 5.0 Delivers Unparalleled Performance for AI Workloads

Phison was the first company to offer PCIe 5.0 storage controllers to the consumer market, with its E26 controller built on TSMC's 12nm process node. The X2 family of enterprise SSDs leverages the learnings from that design and improves upon them, creating the enterprise-grade X2 controller at the heart of the X200P. Built using TSMC's 12nm process node with a 16-channel design, the X2 controller delivers unmatched levels of performance and efficiency.

The combination of the latest PCI Express 5.0 interface, advanced controller, and state-of-the-art 3D NAND solutions raises the ceiling on performance and throughput, increasing the scalability and reliability of data center storage.

The benefits of the faster interface speeds offered by PCIe 5.0 are crucial for AI and data center storage workloads. The fastest PCIe 4.0 SSDs can only deliver up to 7.5 GB/s of sequential throughput, with less advanced controllers that result in lower IOPS for random workloads. PCIe 5.0 doubles the potential bandwidth to 15.0 GB/s for sequential reads and writes, and the X200P can max out the read speed for the interface.

Random reads and writes, which can be even more important for data centers, see similarly large gains. The X200P delivers up to 3.3 million 4K random IOPS, which equates to 13.5 GB/s of random IO — nearly double the throughput achievable with the fastest PCIe 4.0 SSDs. X200P's ability to deliver high performance at higher queue depths ensures a consistent experience, even under the most demanding conditions.

Phison PASCARI X200P SSD Family

The Pascari X200 series is Phison's current flagship line of enterprise SSDs. Engineered to meet the rigorous demands of modern data centers, the X200P family comes in capacities ranging from 1.92 TB up to 30.72 TB.

All Pascari X200P models come with the same core features, regardless of capacity. These include Phison's in-house designed X2 controller with 16-channel of 3D TLC NAND support and a PCIe 5.0 x4/2x2 interface using the NVMe 2.0 protocol. The X200P drives are available in both U.2 and E3.S form factors in capacities ranging from 1.92 TB to 30.72 TB, with the main difference being the drive dimensions.

X200P SSDs can be configured for single-port or dual-port operation. Dual-port operation improves reliability in servers with failover features, allowing two mirrored servers to directly connect with each drive. In the event of a server failure, operations can seamlessly migrate to the other server with no interruptions. The X200P drives also support power loss protection, ISE, TCG Opal 2.0, AES-XTS 256-bit encryption, and SECDED, with separate models for ISE, SED, and non-SED drives at each capacity.

Sequential read and write speeds on the Pascari X200P can reach up to 14.8 GB/s and 8.7 GB/s, respectively. 4K random read and write operations can exceed 3.3 million and 390K IOPS from a single drive. Multiple drives can be combined via RAID to achieve even higher levels of performance.

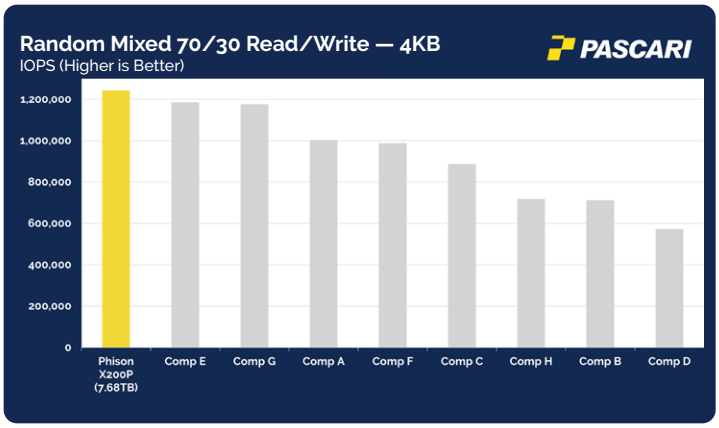
The X200P drives are rated for up to one DWPD (drive write per day) of endurance for five years, with 7% over provisioning. The baseline 1.92 TB model has an endurance rating of 3,504 TBW (terabytes written), and that doubles with each capacity increase up to a current maximum of 56,064 TBW on the 30.72 TB drive.

Pascari X200P Specifications

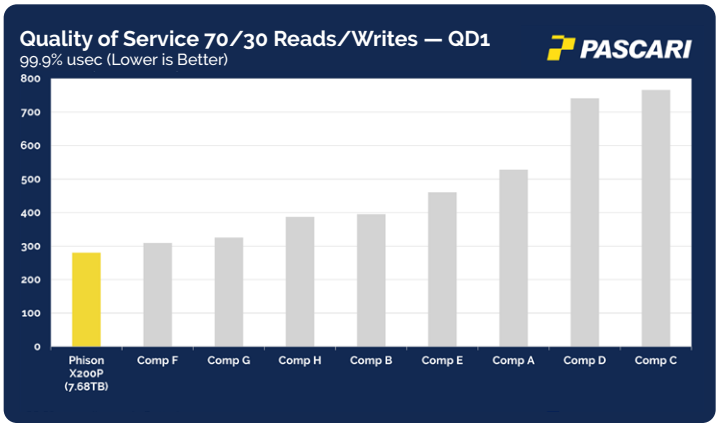
Capacity	1.92TB	3.84TB	7.68TB	15.36TB	30.72TB
Interface	PCIe 5.0 1x4, 2x2	PCIe 5.0 1x4, 2x2	PCIe 5.0 1x4, 2x2	PCIe 5.0 1x4, 2x2	PCIe 5.0 1x4, 2x2
NVMe Protocol	2.0	2.0	2.0	2.0	2.0
NAND Flash	3D TLC	3D TLC	3D TLC	3D TLC	3D TLC
Sequential Read (MB/s)	14,800	14,800	14,800	14,800	14,000
Sequential Write (MB/s)	4,300	8,600	8,700	8,500	7,400
4K Random Read (IOPS)	2,400K	3,300K	3,200K	2,800K	2,300K
4K Random Write (IOPS)	140K	320K	390K	420K	265K
Read Latency (µs)	60	60	60	60	65
Write Latency (µs)	9	9	9	9	10
Active Power (W)	16	22	23	24	25
Idle Power (W)	5	5	5	5	5
DWPD	1	1	1	1	1
Endurance (TBW)	3,504	7,008	14,016	28,032	56,064
Warranty	5	5	5	5	5

Pascari X200Z Performance vs. the Competition

Compared with leading competitors, Phison's Pascari X200P provides excellent performance across a wide range of scenarios. One of the most noteworthy test cases for AI-oriented workloads consists of the 4K random 70/30 percent mixed read/write test at higher queue depths. Here's how the X200P stacks up against some of the fastest competing drives.



The Pascari X200P delivers the best performance in the demanding mixed random 70/30 read/write testing, beating the nearest competing drives by 5%, and offering up to double the performance compared to other enterprise SSDs. That's thanks to the high-performance controller and NAND, coupled with Phison's firmware expertise.



It's not just about raw throughput, as the X200P also delivers the best quality of service. This shows that the drive offers consistent performance even under demanding workloads, giving end users a more consistent experience when interacting with servers running heavy workloads like AI, databases, and real-time analytics.

Pascari X200P provides scalability and flexibility for modern data centers

The Pascari X200P data center SSD offers the performance and scalability that's needed for modern data centers, particularly those focused on AI and ML solutions. The Pascari X200P provides unmatched performance, reliability, and scalability, with multiple form factors and a wide range of capacities to fit every need. Pascari X200P delivers flexibility with the option for single port/dual port functionality that caters to different infrastructures.

Phison's Pascari X200P is a cutting-edge drive designed for the next generation of data-intensive applications that will shape the future of computing. With a high-speed controller that supports the latest PCI Express 5.0 interface, a 16-channel design, DRAM caching, and advanced features to ensure consistent performance, the Pascari X200P provides storage for the next generation of servers powering the AI and ML revolution.