

# Product Brief

Intel® SSD D5-P5316

Data Center, PCIe 4.0, 144-Layer QLC Intel® 3D NAND



## Cloud Inspired. Storage Optimized.

Combining the industry's first 144-layer QLC NAND and PCIe 4.0, the read-optimized Intel® SSD D5-P5316 enables significant TCO savings while accelerating warm storage.



- Built on industry's first 144-layer QLC.
- Consolidate and accelerate warm storage.
- Enables up to 1PB of storage in just 1U.
- Same quality and reliability as TLC.
- Available in U.2 & E1.L form factor.

As data volume increases, storage becomes a growing challenge in terms of cost-effectiveness, physical footprint, and performance. Built with Intel's most advanced Quad-Level Cell NAND, the Intel® SSD D5-P5316 addresses those challenges by delivering industry-leading SSD storage density with the high bandwidth performance of a PCIe 4.0 interface.

The Intel SSD D5-P5316 includes up to 30.72TB of capacity, and as an E1.L, provides up to 1 petabyte of storage in just 1U of rack space. The result is massive storage consolidation for lower TCO.

### Unlock the value of stored data

Based on PCIe 4.0, the SSD D5-P5316 not only accelerates legacy HDD-based systems but also prior generation Intel SSD-based systems. Compared to HDDs, Intel's newest SSD can accelerate access to stored data by up to 25x<sup>1</sup> while performance optimizations bring up to 2x higher sequential read performance,<sup>2</sup> up to 38% higher random read performance,<sup>3</sup> up to 48% better latency,<sup>4</sup> and up to 5x higher endurance versus the previous generation Intel SSD family.<sup>5</sup>

In addition to increased performance, the Intel SSD D5-P5316 offers storage footprint consolidation with up to 20x reduction of warm storage footprint.<sup>6</sup> Storage consolidation enables further operational savings, including power consumption, cooling costs, drive replacement, and technician support.

### Firmware enhancements for drive performance, IT efficiency, data security, and manageability

The Intel SSD D5-P5316 includes numerous firmware enhancements specifically optimized for both enterprise and cloud workloads to deliver better latency,<sup>4</sup> expanded management capabilities, and critical new NVMe features.

- NVMe 1.3c and NVMe-MI1.0a- compliant.
- Scatter Gather List (SGL) removes the need to double-buffer host data.
- Persistent Event Log exposes deeper drive history for debugging at scale.
- Designed to enhance security with AES-256 Hardware Encryption, NVMe Sanitize, Firmware Measurement.
- Telemetry makes a wide range of stored data accessible and includes intelligent error tracking and logging. This increases the reliability of finding and mitigating issues and supports accelerated qualification cycles—all of which result in increased IT efficiency.

## Accelerate a range of data center workloads

The SSD D5-P5316 is designed from the ground up to optimize and accelerate storage in a range of Data Center workloads including but not limited to Content Delivery Network (CDN), Hyper Converged Infrastructure (HCI), Big Data, Artificial Intelligence (AI), Cloud Elastic Storage (CES) and, High Performance Computing (HPC). Key architectural improvements accelerate a broad range of read workloads as well as large block sequential/random writes, while maintaining fast response time SLAs. The SSD D5-P5316 can support all write sizes with a Quality of Service improvement scheme that maintains low read latency under write pressure.

## NAND technology industry leader

Intel's 144-layer 3D NAND technology delivers industry-leading areal density<sup>7</sup> and data retention,<sup>8</sup> enabling enterprise customers to confidently scale storage arrays to meet their growing needs. The swift adoption of software-defined and hyperconverged infrastructures increases the requirement to maximize efficiency, revitalize existing hardware, and increase server agility—all while maintaining operational reliability.

### Features At-a-Glance

Model	<b>Intel® SSD D5-P5316</b>
Capacity and Form Factor	U.2 15mm/E1.L: 15.36TB, 30.72TB
Interface	PCIe 4.0 x4, NVMe 1.3c
Media	Intel® 3D NAND Technology, 144-layer, QLC
Performance	128K Sequential R/W up to 7,000/3,600 MB/s Random 4K Read up to 800K IOPS Random 64K Write up to 510 MBps Random 64K 70/30 R/W up to 1,170 MBps
Endurance	0.41 DWPD (100% 64KB Random Write workload)
Reliability	UBER: 1 sector per 10 <sup>17</sup> bits read MTBF: 2 million hours
Power	Max Avg. Active Write: 25W Idle: 5W
Warranty	5-year limited warranty



Test and System Configuration for footnotes 1-6: Testing by Intel. Mainboard: Intel® Server Board S2600WFT, Version: R2208WFTZS, BIOS: SE5C620.86B.00.01.0014.070920180847, Platform architecture: x86\_64, CPU: Intel® Xeon® Gold 6140 CPU @ 2.30GHz, CPU Sockets: 2, RAM Capacity: 32G, RAM Model: DDR4, OS version: centos-release-7-5, Build id: 1804, kernel: 4.14.74, NVMe Driver: Inbox, Fio version: 3.5, G4SAC PCIe Gen4 switch PCIe card (Microsemi). Intel® SSD D5-P5316 was tested on ACV10100 firmware. Testing as of March 2021.

1. Sequential read performance based on Intel® SSD D5-P5316 compared to Seagate Exos X18 (seagate.com/files/www-content/datasheets/pdfs/exos-x18-channel-DS2045-1-2007GB-en\_sg.pdf).

2. Up to 2x higher sequential read - Comparing 128K sequential read bandwidth between Intel® SSD D5-P5316 15.36TB (7.0 GB/s) and Intel® SSD D5-P4326 15.36TB (3.2 GB/s).

3. Up to 38% higher random read - Comparing 4K random read between Intel® SSD D5-P5316 15.36TB (800K IOPS) and Intel® SSD D5-P4326 15.36TB (580K IOPS)

4. Up to 48% better latency performance at 99.999%: Source=Intel product specification. Comparing measured performance for 4KB Random Read, QD1 latency performance at 99.999% between Intel® SSD D5-P5316 15.36TB with Intel® SSD D5-P4326 15.36TB. Measured performance are 600us and 1150 us for Intel® SSD D5-P5316 and Intel® SSD D5-P4326 respectively. Percentage change is 48%.

5. Up to 5x higher endurance gen over gen - Comparing endurance (64K random write) between Intel® SSD D5-P5316 30.72TB (22,930 TBW) and Intel® SSD D5-P4326 15.36TB (4,400 TBW).

6. Up to 20x Reduction of Warm Storage Footprint. With 4TB HDD drive, it takes 10 (2U) of rack space to fill up 1PB of storage. With Intel® SSD D5-P5316 30.72TB E1.L or U.2, it takes 1U of rackspace to fill up 1PB of storage. That's up to 20x greater rack consolidation.

7. 7. Source: ISSCC 2015, J. Im; ISSCC 2017 R Yamashita; ISSCC 2018 C Kim; ISSCC 2018; H. Maejima; ISSCC 2019 C. Siau.

8. Measurements were performed on components from SSDs using floating gate and charge trap flash technology. Measurement platform used was Teradyne Magnum 2 Memory test systems, and programming using random patterns and margins were quantified using customer commands. Data measured in 08/2019.

Performance varies by use, configuration and other factors. Learn more at [www.intel.com/PerformanceIndex](http://www.intel.com/PerformanceIndex).

Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See backup for configuration details. No product or component can be absolutely secure.

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