

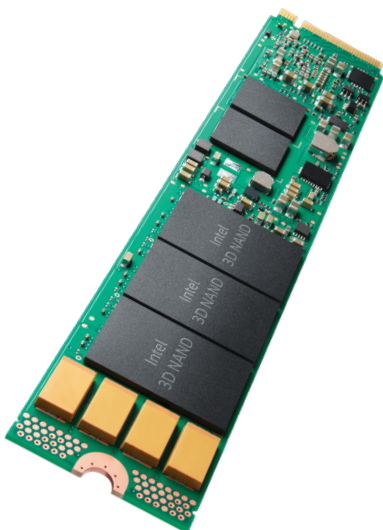
## PRODUCT BRIEF

Intel® SSD DC P4511 Series  
Data Center (DC), PCI Express\* (P), 64-Layer TLC 3D NAND



# Cloud Inspired. Optimized for Low Power Storage.

**Designed to meet today's increasingly demanding service levels and support broader cloud workloads, while reducing costs for power conscious and space constrained storage solutions.**



Built from the success of its cloud-inspired predecessor and architected with 64-layer TLC Intel® 3D NAND technology, the Intel® SSD DC P4511 Series delivers performance, quality of service (QoS), and capacity improvements to further optimize storage efficiency, enabling data centers to do more per server, minimize service disruptions, and efficiently manage at scale.

Built on NVMe\* specification 1.2, these PCIe\* SSDs are available in 1TB, and 2TB in the M.2 (110mm) form factor.

### Power-Efficient SSD Built for Cloud Storage Architectures

Multi-cloud has become a core element for any enterprise strategy, and top cloud providers have responded by openly embracing PCIe/NVMe-based SSDs with scalable performance, low latency, and continued innovation.

As software-defined and converged infrastructures are swiftly adopted, the need increases to maximize efficiency, revitalize existing hardware, deploy new workloads, and yet reduce operational expenditures.

The Intel SSD DC P4511 Series meets these requirements. It significantly increases server agility and utilization, and accelerates applications across a wide range of cloud workloads.

### Do More per Server

Built on 64-layer TLC 3D NAND technology, the SSD DC P4511 enables data centers to optimize for space and power-efficient capacities in a M.2 (110mm) form factor. The DC P4511 delivers up to 5x faster read bandwidth, up to 1.5x performance/watt, and up to 3.4x reduction of service time at QoS metric of 99.99% availability for random access workload.<sup>1,2,3</sup> Better QoS is ensured with an intelligent firmware algorithm that keeps host and background data reads and writes at an optimum balance.

With this level of workload ability and agility, data centers can refresh existing hardware and reduce operational expenditures.

### Minimize Service Disruptions

To ensure telemetry information without disrupting ongoing I/Os, the DC P4511 includes enhanced SMART monitoring of drive health and status, using an in-band mechanism and out-of-band access. A power loss imminent (PLI) protection scheme – with a built-in self-test – guards against data loss if system power is suddenly cut.

Coupled with our industry-leading end-to-end data path protection scheme, PLI features enables ease of deployment into resilient data centers where data corruption from system-level glitches is not tolerated.<sup>6</sup> The DC P4511 combines firmware enhancements with new 3D NAND features to prioritize host workload and ensure better service levels.

## Efficiently Manage at Scale<sup>4</sup>

To help data centers make the most of increased SSD capacity per server, dynamic namespace management delivers the flexibility to permit more users and scale deployment.

With the capability to manage multiple firmware versions on a drive and to support updates without a reset, the DC P4511 improves integration and increases the ease and efficiency of deploying at scale.

## Choose the DC P4511 for Data Center Storage

With the increased density of Intel 64-layer 3D NAND and enhanced firmware features, the DC P4511 is built to handle read-intensive workloads and beyond. The DC P4511 provides energy and space efficient storage solutions for greater quality of service, bandwidth, and performance,

leading data centers through their evolving transformation.<sup>1,2,3</sup>

Features At-a-Glance	
Model Name	Intel® Solid State Drive DC P4511 Series
Capacity	1TB, 2TB
Performance <sup>5</sup>	128k Sequential Read/Write – up to 1900/1430 MB/s Random 4KB R/W: Up to 295K/36K IOPs
Reliability <sup>6</sup>	End-to-end data protection from silent data corruption, uncorrectable bit error rate < 1 sector per 10 <sup>17</sup> bits read
Interface	PCIe 3.1 x4, NVMe 1.2
Form Factor	M.2 (110mm x 22mm)
Media	Intel® 3D NAND technology, 64-layer, TLC
Endurance	Up to 0.9 DWPD (JESD219 workload)
Power <sup>7</sup>	Up to 8.25 Watt
Warranty	5-year limited warranty



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1. Intel test: Comparing 128KB Sequential Read Bandwidth between Intel® SSD DC S3520 Series 760GB and Intel® SSD DC P4511 Series 1TB. Measured bandwidth was 400MB/sec and 2.0GB/sec respectively. FIO\* was used using the configuration listed on footnote 5.
2. Intel test: Comparing 4KB 70/30 Random Read/Write queue depth 1 latency at 99.99% percentile, between Intel® SSD DC S3520 Series 760GB and Intel® SSD DC P4511 Series 1TB Any differences in your system hardware, software or configuration may affect your actual performance. Intel expects to see certain level of variation in data measurement across multiple drives. FIO\* uses the configuration listed on footnote 5.
3. Intel test: Comparing Sequential Write bandwidth and power for 128KB transfer size with queue depth 128 between Intel® SSD DC P4510 Series 2TB and Intel® SSD DC P4500 Series 2TB. Also comparing S3520 and P4511 drives. FIO\* was used using the configuration listed on footnote 5.
4. All manageability features are not available at the time of the product release but will be available in future maintenance release. Please refer to product specification for details about feature description and availability.
5. Test and System Configuration: Processor: Intel®Xeon® Gold 6140 CPU @ 2.30GHz, DRAM: DDR4 – 32GB, OS: Linux\* Centos\* 7.3 kernel 4.8.6/4.15.rc1, Intel® SSD DC P4610 Series, firmware version VDV10301. Intel BIOS Patch rev13 was used -<https://ark.intel.com/products/89010/Intel-Server-System-R2208WFTZS>.
6. Source - Intel. End-to-end data protection refers to the set of methods used to detect and correct the integrity of data across the full path as it is read or written between the host and the SSD controller and media. Claim is based on average of Intel drive error rates vs. average of competitor drive error rates. Neutron radiation is used to determine silent data corruption rates and as a measure of overall end-to-end data protection effectiveness. Silent errors were measured at run-time and at post-reboot after a drive "hang" by comparing expected data vs actual data returned by drive. The annual rate of data corruption was projected from the rate during accelerated testing divided by the acceleration of the beam (see JEDEC standard JESD89A).
7. Average power measured by sequential write workload with transfer size of 128KB and queue depth of 128. FIO\* uses the configuration listed in footnote 5.

Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software, or service activation. Performance varies depending on system configuration. No computer system can be absolutely secure. Check with your system manufacturer or retailer to learn more.

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The benchmark results may need to be revised as additional testing is conducted. The results depend on the specific platform configurations and workloads utilized in the testing, and may not be applicable to any particular user's components, computer system or workloads. The results are not necessarily representative of other benchmarks and other benchmark results may show greater or lesser impact from mitigations.

Tests document performance of components on a particular test, in specific systems. Differences in hardware, software, or configuration will affect actual performance. Consult other sources of information to evaluate performance as you consider your purchase.

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors.

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