

Intel Outperforms Samsung In Head to Head Challenge

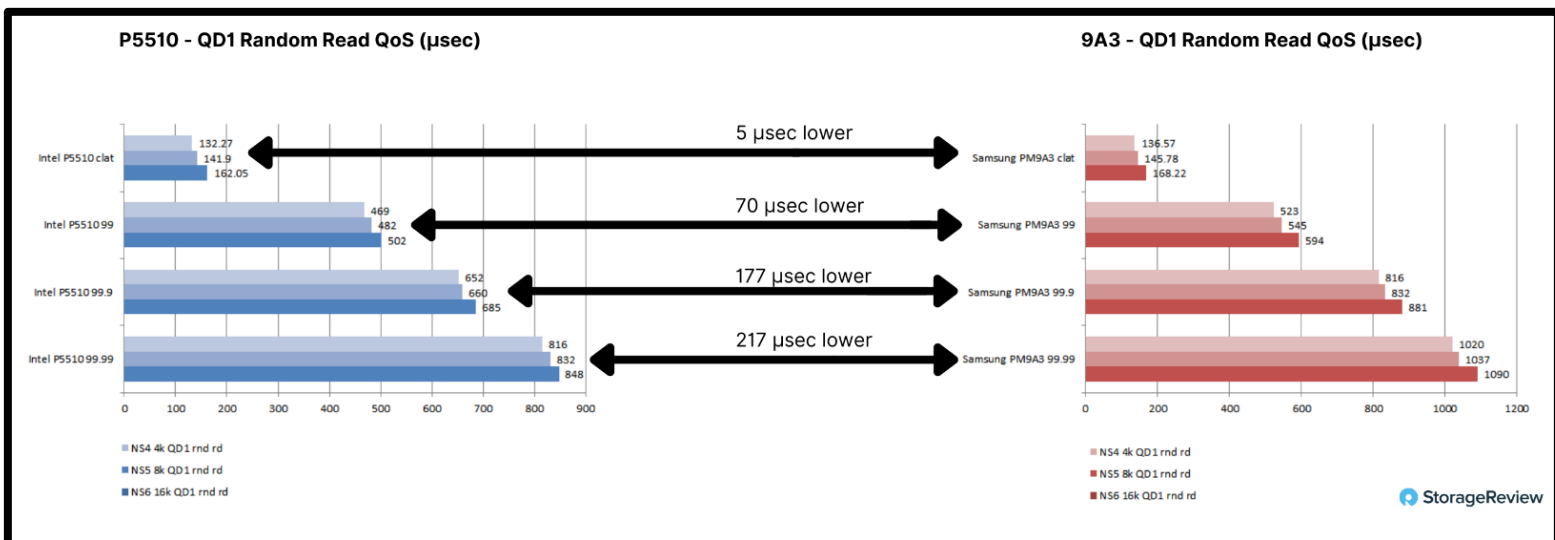


Storage Review's [analysis](#) of [Intel P5510](#) vs [Samsung PM9A3](#) Enterprise SSDs was thorough and intensive. While [Brian Beeler](#) was quick to politely comment on each and talk about the giants amongst us, and phew, what a whirlwind it was, we won't hesitate to declare a winner. Intel crushed Samsung – especially if you are actually looking for a bottom line, instead of a participation trophy for each. This is business and competition drives, motivates, propels companies to greatness (or demise). Let's not hesitate to call it like it is – for everyone's good, including the competitors.

From a similarities perspective, the [Intel P5510](#) NVMe SSD has 3.84TB and 7.68TB capacities, all in the U.2 form factor. The [Samsung PM9A3](#) Enterprise SSD has 960GB, 1.92TB, and 15.36TB capacities in a variety of form factors (though not all are available in every form factor). Both are rated at one drive write per day.

The two Intel SSD samples started with a completion latency (CLAT) of 78 microseconds and increased to 211 microseconds at a level of 700MB/s. The Samsung PM9A3 started at 82 microseconds to 251 microseconds at 700MB/s. At 800MB/s the Intel P5510 had a 108-microsecond lead over the Samsung PM9A3. For read-workloads NS4, NS5, and NS6, Intel P5510 measure 132, 141, and 162 microseconds compared to Samsung PM9A3 at 136, 145, and 168 microseconds. Moving up to 99th percentile latency, we measure Intel P5510 at 469, 482, and 502 microseconds for NS4, NS5, and NS6, compared to the Samsung PM9A3 at 523, 545, and 594 microseconds. At 99.9th, Intel P5510 measures 652, 660, and 685 microseconds versus Samsung PM9A3 at 816, 832, and 881 microseconds. At 99.99th, Intel clobbers Samsung with 816, 832, and 848 microseconds against Samsung PM9A3 with 1020, 1037, and 1090 microseconds.

Storage Review's Sysbench testing leveraged Percona PostGres SQL to drive I/O to a MySQL OLTP database. With a 16VM load (2VMs per SSD), Storage Review measured 38,838 TPS from the group of eight Intel P5510 SSDs, whereas the Samsung PM9A3 group measured 38,717 TPS. Lowering the load



to 8VMs or 1 per SSD, the Intel P5510 group measured 30,337 TPS while the Samsung PM9A3 group measured 29,438 TPS.

On the 99th percentile latency in Sysbench, the group of Intel P5510 SSDs was measured at 25.35ms running 16VMs and 14.50ms with a workload of 8VMs. This was in contrast to the Samsung PM9A3 SSDs measuring 26.21ms at 16VMs and 14.74ms at 8VMs.

In synthetic benchmarks, Intel P5510 led in workloads that focused on mixed data profiles, with a widening gap as the workload skewed more write-based and improved with increases in block sizes, where we see its growing lead moving from 4K to 8K to 16K transfer sizes.


Intel outperformed Samsung as an applied write workload increased in increments of 10MB/s up to 850MB/s. At 800MB/s, the Intel P5510 had a 108 microsecond lead over Samsung PM9A3 in completion latency and 196.5 microsecond lead in 99th percentile latency.

[Storage Review examined both products from every angle possible.](#) Noisy neighbor workload, mixed write workloads to three of six provisioned namespaces: Intel continued to maintain lower read latency, with an increasing gap as you looked up to four 9's of latency responsiveness. For application workload across the group of 8 Intel P5510 and Samsung PM9A3 SSDs, both drives were able to saturate our SQL Server test down to 1ms of total response time. In Sysbench, when CPUs were being fully utilized, the P5510 outperformed the PM9A3 in both 8VM and 16VM workloads.

Intel P5510 SSD drives consistently demonstrate less latency under the most demanding situations and they guarantee this performance with a five-year warranty versus Samsung's three-year warranty. Intel takes this head to head challenge, the clear winner.

Intel® SSD D7-P5510 Key Specifications

Performance ¹		
Comparison	Spec	Gen to gen
4K Rand. Read/Write	Up to 930K/190K IOPS	45% / 41% higher ²
Read/Write Bandwidth	Up to 7000/4194 MB/s	up to 118% / 35% higher ³
Mixed Performance IOPS	400K IOPS	up to 50% higher ⁴
Endurance	1+ DWPD	up to 17% higher ⁵
Average Latency	86/16µs	up to 14% better ⁶
Accelerated TRIM time	<100ms	up to ~100x better ⁷



New Features	
Health Monitoring	Improved drive monitoring and management
Dynamic Multiple Namespace	Flexibility for multi-tenant/virtualized environments
Cloud performance	New algorithms and features tuned for cloud workloads

Data Integrity and Security	
End-to-End Data Protection	Industry-leading protection from silent data corruption ⁸
PLI	Protection from unplanned power loss
Data Security	Enterprise security features

Form Factor & Capacities	
Form Factor	U.2 15mm
Storage capacity	3.84TB, 7.68TB

See Appendix for workloads and configurations. Results may vary.