

Intel P3700 NVMe Enterprise Performance PCIe SSDs Product Guide (withdrawn product)

The Intel P3700 NVMe Enterprise Performance PCIe SSDs are a new family of solid-state drives (SSDs) that provides high-performance data transfers from storage, at rates significantly faster than SAS or SATA-based SSDs.

The Intel P3700 NVMe Enterprise Performance PCIe SSDs are based on Intel-developed controller, firmware, and leading manufacturing process NAND flash memory. Rigorous qualification and compatibility testing by Lenovo ensures a highly reliable SSD. By combining Flash NAND management techniques and NAND silicon enhancements, High Endurance Technology (HET) enables the P3700 Series to achieve up to 17 drive writes per day over a 5 year drive life.

The P3700 SSD is shown in the following figure.



Figure 1. Intel P3700 NVMe Enterprise Performance PCIe SSDs

Did You Know?

NVMe (Non-Volatile Memory Express) is a technology that overcomes SAS/SATA SSD performance limitations by optimizing hardware and software to take full advantage of flash technology. Intel Xeon processors efficiently transfer data in fewer clock cycles with the NVMe optimized software stack compared to the legacy Advance Host Controller Interface (AHCI) stack, thereby reducing latency and overhead. These SSDs connect directly to the processor via the PCIe bus, further reducing latency and TCO.

Part number information

The following table lists the ordering part numbers and feature codes for the SSDs.

Withdrawn: All drives listed in this product guide are withdrawn from marketing.

Table 1. Ordering part numbers and feature codes

Part number	Feature	Description
00YA818	AT7V	Intel P3700 400GB NVMe 2.5" G3HS Enterprise Performance PCIe SSD
00YA821	AT7W	Intel P3700 800GB NVMe 2.5" G3HS Enterprise Performance PCIe SSD
00YA824	AT7X	Intel P3700 1.6TB NVMe 2.5" G3HS Enterprise Performance PCIe SSD
00YA827	AT7Y	Intel P3700 2.0TB NVMe 2.5" G3HS Enterprise Performance PCIe SSD

The part numbers for the adapters include the following items:

- One drive with a System x G3HS tray attached
- Warranty flyer and Important Notices document

Features

Non-Volatile Memory Express (NVMe) is new PCIe 3.0 high performance SSD technology that provides high I/O throughput and low latency. NVMe interfaces remove SAS/SATA bottlenecks and unleash all of the capabilities of contemporary NAND flash memory. Each NVMe PCI SSD has direct PCIe 3.0 x4 connection, which provides at least 2x more bandwidth and 2x less latency than SATA/SAS-based SSD solutions. NVMe drives are also optimized for heavy multi-threaded workloads by using internal parallelism and many other improvements, such as enlarged I/O queues.

The Intel P3700 NVMe drives have the following key characteristics:

- Direct PCIe 3.0 connection. There is a PCIe 3.0 x4 connection for each NVMe drive with up to 4 GBps overall throughput.
- Low I/O latency. The average read/write latency for the P3700 drives is 20 μ s.
- Up to 2800 MBps sequential read speed with 128 KB blocks, and up to 2000 MBps sequential write speed with 128 KB blocks per drive.
- Up to 460,000 IOPS of random read with 4 KB blocks, and up to 175,000 IOPS of random writes with 4 KB blocks.
- A total of 65,536 I/O queues supported and 65,536 commands per queue supported, which provides great performance on heavily multithreaded workloads with combined sequential and random access.
- High endurance: The P3700 drives include High Endurance Technology (HET) which combines NAND silicon enhancements and SSD NAND management techniques to extend SSD write endurance up to 17 drive writes per day (DWPD) for 5 years.
- Available drive capacities of 400 GB, 800 GB, 1.6 TB, and 2.0 TB.
- Support for software RAID under operating system management.
- Hot add and hot remove features are available with supported operating systems.
- Most operating systems have native support of NVMe drives or provides support through software drivers, such as RHEL 6.5 and later, RHEL 7.0 and later, SLES 11 SP3, SLES 12, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, and VMware vSphere (ESXi) 5.5 and 6.0.
- NVMe drives can be used as boot drives.

Technical specifications

The following table present technical specifications for the Intel P3700 NVMe Enterprise Performance PCIe SSDs.

Table 2. Technical specifications

Feature	400 GB drive	800 GB drive	1.6 TB drive	2.0 TB drive
Part number	00YA818	00YA821	00YA824	00YA827
Form factor	2.5-inch G3HS	2.5-inch G3HS	2.5-inch G3HS	2.5-inch G3HS
Interface	PCIe 3.0 x4	PCIe 3.0 x4	PCIe 3.0 x4	PCIe 3.0 x4
Capacity	400 GB	800 GB	1.6 TB	2.0 TB
Endurance (total bytes written)	7.3 PB	14.6 PB	43.8 PB	62.05 PB
Endurance (drive writes per day over 5 years)	10 DWPD	10 DWPD	15 DWPD	17 DWPD
Data reliability	< 1 in 10 ¹⁷ bits read	< 1 in 10 ¹⁷ bits read	< 1 in 10 ¹⁷ bits read	< 1 in 10 ¹⁷ bits read
MTBF, hours	2,000,000	2,000,000	2,000,000	2,000,000
IOPS read (4 KB blocks)	450,000	450,000	450,000	450,000
IOPS write (4 KB blocks)	75,000	90,000	150,000	175,000
Sequential read rate	2.7 GBps	2.8 GBps	2.8 GBps	2.8 GBps
Sequential write rate	1.08 GBps	1.9 GBps	1.9 GBps	1.9 GBps
Read access latency sequential*	20 µs	20 µs	20 µs	20 µs
Read access latency random*	115 µs	115 µs	115 µs	115 µs
Write access latency sequential*	20 µs	20 µs	20 µs	20 µs
Write access latency random*	25 µs	25 µs	25 µs	25 µs
Shock, operating	1,000 G (Max) at 0.5 ms	1,000 G (Max) at 0.5 ms	1,000 G (Max) at 0.5 ms	1,000 G (Max) at 0.5 ms
Vibration, max, operating	2.17 G _{RMS} (5-700 Hz)	2.17 GRMS (5-700 Hz)	2.17 GRMS (5-700 Hz)	2.17 GRMS (5-700 Hz)
Typical power	12 W	18 W	22 W	25 W

* Latency measured using 4 KB transfer size with queue depth = 1 on a sequential workload using Windows Server 2012 R2 drivers. Power mode set at 25W.

Server support

The following tables list the server compatibility information for the Intel P3700 NVMe Enterprise Performance PCIe SSDs.

Support for System x and dense servers with Xeon E5/E7 v4 and E3 v5 processors

Table 3. Support for System x and dense servers with Xeon E5/E7 v4 and E3 v5 processors

Part number	Description	x3250 M6 (3943)		x3250 M6 (3633)		x3550 M5 (8869)		x3650 M5 (8871)		x3850 X6/x3950 X6 (6241, E7 v4)		nx360 M5 (5465, E5-2600 v4)		sd350 (5493)	
00YA818	P3700 400GB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N
00YA821	P3700 800GB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N
00YA824	P3700 1.6TB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N
00YA827	P3700 2.0TB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N

Support for System x and dense servers with Intel Xeon v3 processors

Table 4. Support for servers with Intel Xeon v3 processors

Part number	Description	x3100 M5 (5457)		x3250 M5 (5458)		x3500 M5 (5464)		x3550 M5 (5463)		x3650 M5 (5462)		x3850 X6/x3950 X6 (6241, E7 v3)		nx360 M5 (5465)	
00YA818	Intel P3700 400GB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	N	N	N	N	N	N	Y	Y	Y	Y	N	N	N	N
00YA821	Intel P3700 800GB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	N	N	N	N	N	N	Y	Y	Y	Y	N	N	N	N
00YA824	Intel P3700 1.6TB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	N	N	N	N	N	N	Y	Y	Y	Y	N	N	N	N
00YA827	Intel P3700 2.0TB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	N	N	N	N	N	N	Y	Y	Y	Y	N	N	N	N

Support for servers with Intel Xeon v2 processors

Table 5. Support for servers with Intel Xeon v2 processors

Part number	Description	x3500 M4 (7383, E5-2600 v2)	x3530 M4 (7160, E5-2400 v2)	x3550 M4 (7914, E5-2600 v2)	x3630 M4 (7158, E5-2400 v2)	x3650 M4 (7915, E5-2600 v2)	x3650 M4 BD (5466)	x3650 M4 HD (5460)	x3750 M4 (8752)	x3750 M4 (8753)	x3850 X6/x3950 X6 (3837)	x3850 X6/x3950 X6 (6241, E7 v2)	dx360 M4 (E5-2600 v2)	nx360 M4 (5455)
00YA818	Intel P3700 400GB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	N	N	N	N	N	N	N	N	N	N	Y	N	N
00YA821	Intel P3700 800GB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	N	N	N	N	N	N	N	N	N	N	Y	N	N
00YA824	Intel P3700 1.6TB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	N	N	N	N	N	N	N	N	N	N	Y	N	N
00YA827	Intel P3700 2.0TB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	N	N	N	N	N	N	N	N	N	N	Y	N	N

Support for Flex System compute nodes

Table 6. Support for Flex System servers

Part number	Description	x220 (7906)	x222 (7916)	x240 (8737, E5-2600)	x240 (8737, E5-2600 v2)	x240 (7162)	x240 M5 (9532, v3 & v4)	x440 (7917)	x440 (7167)	x880/x480/x280 X6 (7903)	x280/x480/x880 X6 (7196)
00YA818	Intel P3700 400GB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	N	N	N	N	N	Y	N	N	N	N
00YA821	Intel P3700 800GB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	N	N	N	N	N	Y	N	N	N	N
00YA824	Intel P3700 1.6TB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	N	N	N	N	N	Y	N	N	N	N
00YA827	Intel P3700 2.0TB NVMe 2.5" G3HS Enterprise Performance PCIe SSD	N	N	N	N	N	Y	N	N	N	N

Operating system support

The Intel P3700 NVMe Enterprise Performance PCIe SSDs support the following operating systems:

- Microsoft Windows Server 2008 R2
- Microsoft Windows Server 2012 R2
- Microsoft Windows Server 2012
- Red Hat Enterprise Linux 6 Server x64 Edition
- Red Hat Enterprise Linux 7
- SUSE LINUX Enterprise Server 11 for AMD64/EM64T
- SUSE LINUX Enterprise Server 11 with Xen for AMD64/EM64T
- SUSE Linux Enterprise Server 12
- SUSE Linux Enterprise Server 12 with XEN
- VMware vSphere 5.5 (ESXi)
- VMware vSphere 6.0 (ESXi)

For more information about the specific supported versions and service packs, see ServerProven: <http://www.lenovo.com/us/en/serverproven/xseries/storage/hssdmatrix.shtml>

Warranty

The Intel P3700 NVMe Enterprise Performance PCIe SSDs carry a 1-year, customer-replaceable unit (CRU) limited warranty. When installed in a supported Lenovo server, these drives assume the system's base warranty and any warranty upgrade.

Solid State Memory cells have an intrinsic, finite number of program/erase cycles that each cell can incur. As a result, each solid state device has a maximum amount of program/erase cycles to which it can be subjected. The warranty for Lenovo solid state drives (SSDs) is limited to drives that have not reached the maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the SSD product. A drive that reaches this limit may fail to operate according to its Specifications.

Physical specifications

The Intel P3700 NVMe Enterprise Performance PCIe SSDs have the following physical specifications.

Dimensions and weight (approximate):

- Height: 7 mm (0.3 in.)
- Width: 70 mm (2.8 in.)
- Depth: 100 mm (4.0 in.)
- Weight:
 - 400 GB and 800 GB drives: 115 g (0.25 lb)
 - 1.6 TB and 2.0 TB drives: 125 g (0.27 lb)

Shipping dimensions:

- Height: 25 mm (1.0 in.)
- Width: 139 mm (5.4 in.)
- Depth: 106 mm (4.1 in.)

Operating environment

The Intel P3700 NVMe Enterprise Performance PCIe SSDs are supported in the following environment:

- Temperature (operational): 0 - 35 °C (32 - 95 °F) at 0 - 3,048 m (0 - 10,000 ft)
- Relative humidity: 5 - 95% (non-condensing)
- Maximum altitude (operational): 3,048 m (10,000 ft)
- Shock: 1,000 G (Max) at 0.5 ms
- Vibration: 2.17 G_{RMS} (5-700 Hz)

Agency approvals

The Intel P3700 NVMe Enterprise Performance PCIe SSDs conform to the following regulations:

- FCC Title 47, Part 15 Subpart B, Class B
- CAN ICES-3 (B) NMB-3 (B)
- EN 55022: 2010
- EN 61000-3-2: 2006 plus A1:2009 and A2:2009
- EN 61000-3-3: 2008
- EN 55024: 2010
- VCCI V-3/2013.04 Class B
- ANSI C63.4: 2009 Class B
- BSMI CNS 13438: 2006 Class B
- AS/NZS CISPR 22
- KCC MSIP-REM-CPU-SSDPIA
- EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011
- DIRECTIVE 2011/65/EU

Related publications and links

For more information, see the following documents:

- Lenovo System x storage options product page
<https://www3.lenovo.com/us/en/data-center/servers/server-options/system-x-options/server-storage/c/system-x-storage>
- US Announcement letter
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS115-154>
- ServerProven for SSDs
<http://www.lenovo.com/us/en/serverproven/xseries/storage/hssdmatrix.shtml>
- Intel SSD DC family for PCIe product page
<http://www.intel.com/content/www/us/en/solid-state-drives/intel-ssd-dc-family-for-pcie.html>
- Intel P3700 specifications
<http://www.intel.com/content/www/us/en/solid-state-drives/ssd-dc-p3700-spec.html>
- Intel P3700 product brief
<http://www.intel.com/content/www/us/en/solid-state-drives/intel-ssd-dc-family-for-pcie-brief.html>

Related product families

Product families related to this document are the following:

- [Drives](#)

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