Overview

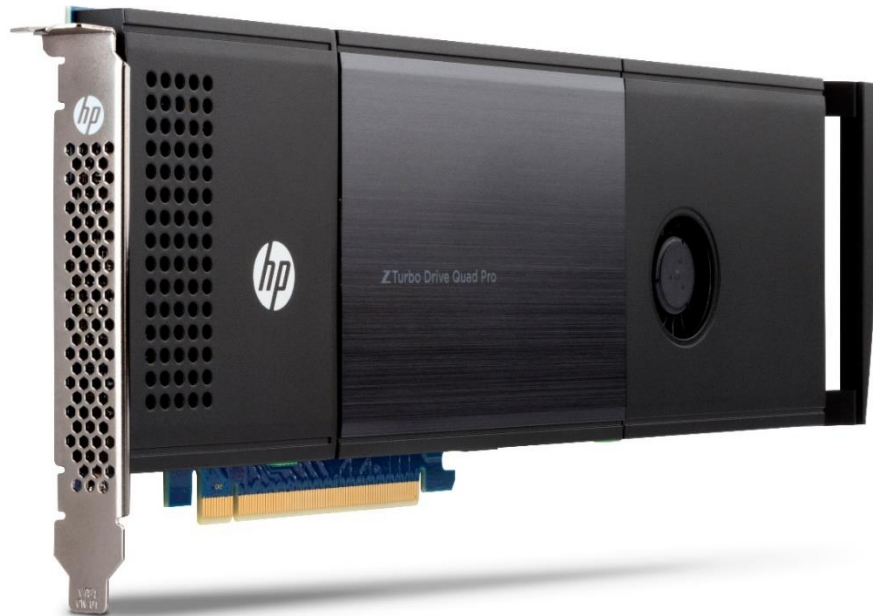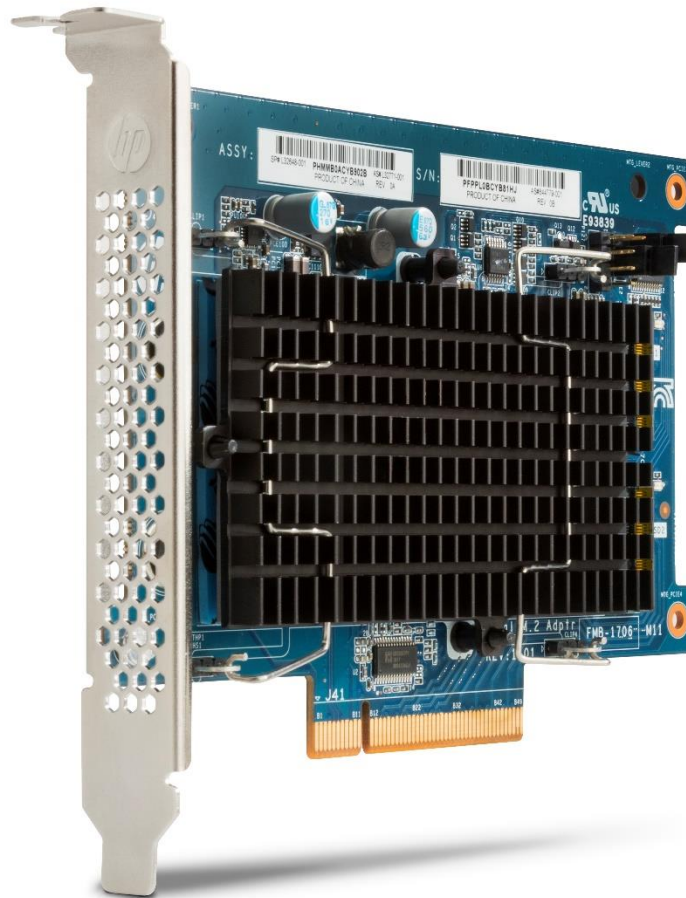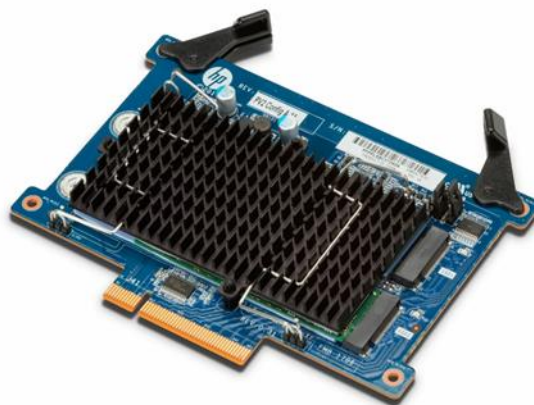### PCIe Solid State Drives for HP Workstations

HP Z Turbo Quad Pro PCIe Add-in-Card (for Z4, Z6 and Z8 G4 PCIe slots)

Overview

HP Dual Pro PCIe Add-in-Card (for Z4, Z6 and Z8 G4 PCIe slots)

HP M.2 Personality Module Carrier for Z8 G4 Only

Overview

HP Z Turbo Drive

Introduction

Storage technology with NAND media is outgrowing the bandwidth limitations of the SATA bus. New high performance Storage solutions will connect directly to the PCIe bus for revolutionary performance improvements. These components will be available in a variety of form factors and performance levels, designed specifically for certain market segments, and ultimately the costs will continue to decline as the technology evolves.

Performance

HP Z Turbo Drive

The HP Z Turbo Drive features the next generation PCIe NVMe SSD. This M.2 form factor device uses PCIe Gen3 x4 which enables performance levels greater than 3GB/s, which is roughly 6x greater than SATA SSDs. The Random Read performance is significantly improved also, due to the NVMe controller technology used on the device. This performance is available at a price that is comparable to commercial SATA SSDs.

The HP Z Turbo Drive will be supported on desktop platforms of HP Z Workstations including Z2 G4 SFF and tower, Z2 G4 Mini, Z4, Z6 and Z8 G4, Z240, Z440, Z640 and Z840. It will support storage configurations as a Boot device and as a Data device. It also can be configured with other storage components including SATA and SAS drives and controllers. Not all configurations are available from the factory.

It is also supported by our current offering of Operating Systems, including Linux, and may require a separate driver, depending on OS. It does require a BIOS update for Z440, Z640 and Z840 systems shipped prior to the Z Turbo Drive launch, minimum BIOS is 1.53. Z2 G4, Z4 G4, Z6 G4, and Z8 G4 have been enabled for Z Turbo Drive prior to launch, and do not require a minimum BIOS revision.

The HP Z Turbo Drive comes with a custom thermal solution to keep the device within full performance operating temperatures. This solution consists of a heat sink and thermal pads to make a solid thermal connection between the heatsink and the M.2 SSD. Without adequate cooling, PCIe NVMe SSDs will throttle down their performance significantly, until the device cools off, to get back in the acceptable operating temperature range.

NVMe devices require a driver for proper detection and operation. Microsoft Windows 8 and higher have an inbox NVMe driver. For Windows 7, HP recommends the Microsoft hotfix which provides an NVMe driver (listed below). In addition, the Samsung NVMe driver, version 2.1.7.1701, can be used with specific Samsung M.2 devices. (available at www.hp.com). Also note that the new NVMe driver will not support the original HP Z Turbo Drive, which requires an AHCI driver.

KB2990941 (https://support.microsoft.com/en-us/kb/2990941)

Overview

KB3087873 (https://support.microsoft.com/en-us/kb/3087873)

Operating System Support
Microsoft Windows 7 64-bit, Microsoft Windows 10 64-bit, RHEL 6,7; SUSE 11,12; Ubuntu 14.04.
Note: Not supported for 32-bit Microsoft Windows Operating Systems.

Support for OPAL hardware encryption: No
Support for Secure Erase: Yes
Supported in HP Performance Advisor: yes (includes wear gauge)

Approved PCIe slots:
Recommended slot ordering
Z840 – Slot 1, Slot 6, Slot 3 (Requires 2nd CPU), Slot 4 (Requires 2nd CPU)
Z640 – Slot 4, Slot 5, Slot 3 (in order of preference)
Z440 – Slot 4, Slot 5, Slot 3 (in order of preference)
Z240 – Native Motherboard slot first, then available PCIe Gen3 slot (either #1 or #4)

Z8 G4 – up to four M.2 modules can be installed in Personality Modules
1.   Personality Module Slot 1 provides support for up to two Z Turbo Drives
2.   Personality Module Slot 2 provides support for up to two Z Turbo Drives (requires 2nd CPU)
       Quad Pro or Dual Pro PCIe Add-in-Card recommended slot ordering
3.   Slot x, Slot y, Slot z

Z6 G4 – Down M.2 Slot 1, Down M.2 Slot 2 (M.2 drive includes a customized heat sink)
       Quad Pro or Dual Pro PCIe Add-in-Card recommended slot ordering
       Slot x, Slot y, Slot z

Z4 G4 – Down M.2 Slot 1, Down M.2 Slot 2 (M.2 drive includes a customized heat sink)
       Quad Pro or Dual Pro PCIe Add-in-Card recommended slot ordering
       Slot x, Slot y, Slot z

Z2 G4 – Down M.2 Slot 1, Down M.2 Slot 1 (M.2 drive include a customized heat sink)

Z2 Mini G3 and G4 – Down M.2 Slot 1 (M.2 drive include a customized heat sink)

For RAID support, there are some specific differences and thus restrictions as compared to SATA/SAS HDDs or SSDs. Software RAID is used, as there is not a good solution today for hardware based RAID.

- •   Windows RAID with Boot Configuration: Limited support for RAID 1*, No support for RAID 0, 5, 10
- •   Windows RAID with Data Configuration: Support for RAID 0, 1; No support for RAID 5, 10
- •   Linux RAID with Boot Configuration: Functional for RAID 0, 1*; No support for RAID 5, 10
- •   Linux RAID with Data Configuration: Functional for RAID 0, 1, 5, 10**

*RAID 1 can be set up, yet will not provide complete, redundant protection as the boot partition is not replicated on both drives. An OS boot partition cannot be protected by software RAID 1.
** Limited testing has been done with Linux to confirm RAID support and performance characteristics

On Z8 G4, Z6 G4, and Z4 G4, bootable RAID support can be configured via VROC. VROC is an Intel technology that allows NVMe devices to be configured and included in RAID arrays.

There are two versions of VROC available to customers:

- -   Standard – This version enables RAID 0, RAID 1, and RAID 10. RAID volumes are bootable as long as the configured devices are all on the same PCIe Root Port.
- -   Premium – This version enables all RAID levels available in the Standard version and adds RAID 5.

Overview

Z1 G3 Platform Note

There are two, adjacent Z Turbo Drive native slots. The Thermal Solution for Z1 G3 is a one-piece heatsink which accommodates both M.2 modules, thus only 1 Thermal Solution kit is required when using one or two M.2 modules. When ordering M.2 modules with the original configuration from the factory, the Thermal Solution will be included.

QuickSpecs

Overview

Models

HP Z2 Mini G4 Z Workstation

HP Z Turbo Drive 256GB TLC (Z2 Mini)	Y7B60AA
HP Z Turbo Drive 512GB TLC Z2 G4 Mini SSD Kit	5SA16AA
HP Z Turbo Drive 1TB TLC Z2 G4 Mini SSD Kit	5RR60AA
HP Z Turbo Drive 256GB SED TLC Z2 G4 Mini SSD Kit	5RR63AA
HP Z Turbo Drive 512GB SED TLC Z2 G4 Mini SSD Kit	5RR64AA
HP Z Turbo Drive 1TB SED Z2 G4 Mini TLC SSD Kit	6YT78AA
HP 256GB M.2 2280 PCIe NVMe TLC SSD Z2 Mini Kit	8PE65AA
HP 512GB M.2 2280 PCIe NVMe TLC SSD Z2 Mini Kit	8PE66AA
HP 1B M.2 2280 PCIe NVMe TLC SSD Z2 Mini Kit	8PE67AA

HP Z2G4 Tower and SFF Z Workstation

HP Z Turbo Drive 256GB SED TLC Z2 G4 SSD Kit	5RR61AA
HP Z Turbo Drive 512GB SED TLC Z2 G4 SSD Kit	5RR62AA
HP Z Turbo Drive 1TB SED Z2 G4 TLC SSD Kit	6YT77AA
HP Z Turbo Drive 256GB TLC Z2 G4 SSD	6EU82AA/AT
HP Z Turbo Drive 512GB TLC Z2 G4 SSD Kit	6EU83AA/AT
HP Z Turbo Drive 1TB TLC Z2 G4 SSD Kit	6EU84AA/AT
HP Z Turbo Drive 2TB TLC Z2 G4 SSD Kit	3KP45AA
HP 256GB M.2 2280 PCIe NVMe TLC SSD Z2/Z4/Z6 Kit	8PE68AA
HP 512GB M.2 2280 PCIe NVMe TLC SSD Z2/Z4/Z6 Kit	8PE69AA
HP 1TB M.2 2280 PCIe NVMe TLC SSD Z2/Z4/Z6 Kit	8PE70AA

HP Z4/Z6 G4 Z Workstation

HP Z Turbo Drive 256GB TLC Z4/Z6 G4 SSD Kit	1PD59AA
HP Z Turbo Drive 512GB TLC Z4/Z6 G4 SSD Kit	1PD60AA
HP Z Turbo Drive 1TB TLC Z4/Z6 G4 SSD Kit	1PD61AA
HP Z Turbo Drive 2TB TLC Z4/Z6 G4 SSD Kit	3KP39AA
HP 256GB M.2 2280 PCIe NVMe TLC SSD Z2/Z4/Z6 Kit	8PE68AA
HP 512GB M.2 2280 PCIe NVMe TLC SSD Z2/Z4/Z6 Kit	8PE69AA
HP 1TB M.2 2280 PCIe NVMe TLC SSD Z2/Z4/Z6 Kit	8PE70AA

HP Z8 G4 Z Workstation

HP Z Turbo Drive 256GB TLC Z8 G4 SSD Kit	1PD47AA
HP Z Turbo Drive 512GB TLC Z8 G4 SSD Kit	1PD48AA
HP Z Turbo Drive 1TB TLC Z8 G4 SSD Kit	1PD49AA
HP Z Turbo Drive 2TB TLC Z8 G4 SSD Kit	3KP40AA
HP Z Turbo Drive 256GB TLC Z8G4 SSD Module	1PD53AA
HP Z Turbo Drive 512GB TLC Z8G4 SSD Module	1PD54AA
HP Z Turbo Drive 1TB TLC Z8G4 SSD Module	1PD55AA
HP Z Turbo Drive 2TB TLC Z8G4 SSD Module	3KP41AA
HP 1x256GB M.2 2280 PCIe NVMe TLC SSD Z8 G4 Kit	8PE71AA
HP 1x512GB M.2 2280 PCIe NVMe TLC SSD Z8 G4 Kit	8PE72AA
HP 1x1TB M.2 2280 PCIe NVMe TLC SSD Z8 G4 Kit	8PE73AA
HP 256GB M.2 2280 PCIe NVMe TLC SSD Module	8PE62AA
HP 512GB M.2 2280 PCIe NVMe TLC SSD Module	8PE63AA
HP 1TB M.2 2280 PCIe NVMe TLC SSD Module	8PE64AA

Overview

HP Z Turbo Quad Pro Drive

HP Z Turbo Drive Quad Pro 2x256GB PCIe TLC SSD	4YZ38AA
HP Z Turbo Drive Quad Pro 2x512GB PCIe TLC SSD	4YZ39AA
HP Z Turbo Drive Quad Pro 2x1TB PCIe TLC SSD	4YZ40AA
HP Z Turbo Drive Quad Pro 2x2TB TLC PCIe SSD	3KP42AA
HP Z Turbo Drive Quad Pro 256GB TLC SSD module	4YZ35AA
HP Z Turbo Drive Quad Pro 512GB TLC SSD module	4YZ36AA
HP Z Turbo Drive Quad Pro 1TB TLC SSD module	4YZ37AA
HP Z Turbo Drive Quad Pro 2TB TLC SSD module	3KP43AA

HP Z Turbo Dual Pro

HP Z Turbo Drive Dual Pro 256GB SSD	4YF60AA
HP Z Turbo Drive Dual Pro 512GB SSD	4YF61AA
HP Z Turbo Drive Dual Pro 1TB SSD	4YF62AA
HP Z Turbo Drive Dual Pro 2TB TLC SSD	4YF63AA

NOTE 1: Not available today as After Market Option

Technical Specifications

PCIe SSDs for HP Workstations	HP Z Turbo Drive 256GB SSD	Capacity	256GB	
		Protocol	PCIe	
		Form Factor	M.2 in Half-height, half-length card	
		Controller	NVMe	
		NAND Type	3D TLC	
		Endurance	200TBW (TB Written)	
		Reliability (MTBF)	1.5M hours	
		Interface	PCI Express 3.0 x4 electrical x4 physical	
		Operating Temperature	32° to 158° F (0° to 70° C)	
		Performance	Sequential Read	3500 MB/s
			Sequential Write	2200 MB/s
			Random Read	240K IOPS
			Random Write	480K IOPS
	HP Z Turbo Drive 512GB SSD	Capacity	512GB	
		Protocol	PCIe	
		Form Factor	M.2 in Half-height, half-length card	
		Controller	NVMe	
		NAND Type	3D TLC	
		Endurance	300TBW (TB Written)	
		Reliability (MTBF)	1.5M hours	
		Interface	PCI Express 3.0 x4 electrical x4 physical	
		Operating Temperature	32° to 158° F (0° to 70° C)	
		Performance	Sequential Read	3500 MB/s
			Sequential Write	2900 MB/s
			Random Read	460K IOPS
			Random Write	500K IOPS
	HP Z Turbo Drive 1TB SSD	Capacity	1TB	
		Protocol	PCIe	
		Form Factor	M.2 in Half-height, half-length card	
		Controller	NVMe	
		NAND Type	3D TLC	
		Endurance	400TBW (TB Written)	
		Reliability (MTTF)	1.5M hours	
		Interface	PCI Express 3.0 x4 electrical x4 physical	
		Operating Temperature	32° to 158° F (0° to 70° C)	
		Performance	Sequential Read	3500 MB/s
			Sequential Write	3000 MB/s
			Random Read	580K IOPS
			Random Write	500K IOPS

Technical Specifications

HP Z Turbo Drive 2TB SSD			
Capacity	2TB		
Protocol	PCIe		
Form Factor	M.2 in Half-height, half-length card		
Controller	NVMe		
NAND Type	3D TLC		
Endurance	600TBW (TB Written)		
Reliability (MTTF)	1.5M hours		
Interface	PCI Express 3.0 x4 electrical x4 physical		
Operating Temperature	32° to 158° F (0° to 70° C)		
Performance	**Sequential Read**	3500 MB/s	
	Sequential Write	3000 MB/s	
	Random Read	600K IOPS	
	Random Write	500K IOPS	

Technical Specifications

HP Z Turbo Drive Quad Pro 2x256GB PCIe SSD		
Capacity	512GB (2x256GB)	
Protocol	PCIe	
Form Factor	M.2 in Half-height, half-length card	
Controller	NVMe	
NAND Type	3D TLC	
Endurance	200TBW (TB Written)	
Reliability (MTBF)	1.5M hours	
Interface	PCI Express 3.0 x4 electrical x4 physical	
Operating Temperature	32° to 158° F (0° to 70° C)	
Performance	**Sequential Read**	3500 MB/s
	Sequential Write	2200 MB/s
	Random Read	240K IOPS
	Random Write	480K IOPS

HP Z Turbo Drive Quad Pro 2x512GB PCIe SSD		
Capacity	1TB (2x512GB)	
Protocol	PCIe	
Form Factor	PCIe Card, Full Height PCIe Slot	
Controller	NVMe	
NAND Type	3D TLC	
Endurance	300TBW (TB Written)	
Reliability (MTBF)	1.5M hours	
Interface	PCIe Gen3 x4 architecture	
Operating Temperature	32° to 158° F (0° to 70° C)	
Performance	**Sequential Read**	3500 MB/s
	Sequential Write	2900 MB/s
	Random Read	460K IOPS
	Random Write	500K IOPS

HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD		
Capacity	2TB (2x1TB)	
Protocol	PCIe	
Form Factor	PCIe Card, Full Height PCIe Slot	
Controller	NVMe	
NAND Type	3D TLC	
Endurance	400TBW (TB Written)	
Reliability (MTBF)	1.5M hours	
Interface	PCI Express 3.0 x4 electrical x4 physical	
Operating Temperature	32° to 158° F (0° to 70° C)	
Performance	Sequential Read	3500 MB/s
	Sequential Write	3000 MB/s
	Random Read	580K IOPS
	Random Write	500K IOPS

Capacity	2TB	

Technical Specifications

HP Z Turbo Drive Quad Pro 2x2TB PCIe SSD	**Protocol**	PCIe
	Form Factor	M.2
	Controller	NVMe
	NAND Type	3D TLC
	Endurance	500TBW (TB Written)
	Reliability (MTBF)	1.5M hours
	Interface	PCI Express 3.0 x4 electrical x4 physical
	Operating Temperature	32° to 158° F (0° to 70° C)
	Performance	Sequential Read 3500 MB/s
		Sequential Write 3000 MB/s
		Random Read 600K IOPS
		Random Write 500K IOPS
HP Z Turbo Drive Quad Pro 256GB SSD module	**Capacity**	256GB (one M.2 PCIe NVMe module)
	Interface	PCI Express 3.0 x4 electrical x4 physical
	Operating Temperature	32° to 158° F (0° to 70° C)
HP Z Turbo Drive Quad Pro 512GB SSD module	**Capacity**	512GB (one M.2 PCIe NVMe module)
	Interface	PCI Express 3.0 x4 electrical x4 physical
	Operating Temperature	32° to 158° F (0° to 70° C)
HP Z Turbo Drive Quad Pro 1TB SSD module	**Capacity**	1TB (one M.2 PCIe NVMe module)
	Interface	PCI Express 3.0 x4 electrical x4 physical
	Operating Temperature	32° to 158° F (0° to 70° C)
HP Z Turbo Drive Quad Pro 2TB SSD module	**Capacity**	2TB (one M.2 PCIe NVMe module)
	Interface	PCI Express 3.0 x4 electrical x4 physical
	Operating Temperature	32° to 158° F (0° to 70° C)
HP Z Turbo Drive 2TB TLC Z4/Z6 G4 SSD Kit	**Dimensions**	7.24 x 9.13 x 3.7 in
		18.40 x 23.19 x 9.5 cm
	Weight	0.68 lb
		0.3 kg
HP Z Turbo Drive 2TB TLC Z8G4 SSD Module	**Dimensions**	7.24 x 9.13 x 3.7 in
		18.40 x 23.19 x 9.5 cm
	Weight	0.68 lb
		0.3 kg

Value Drives	**HP 256GB M.2 2280 PCIe NVMe TLC SSD**	**Capacity**	256GB
		Protocol	PCIe

Technical Specifications

	Form Factor	M.2 in native slot on motherboard (MB)	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	200TBW (TB Written)	
	Reliability (MTBF)	1.5M hours	
	Interface	PCI Express 3.0 x4 electrical x4 physical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	3100 MB/s
		Sequential Write	1400 MB/s
		Random Read	200K IOPS
		Random Write	320K IOPS
HP 512GB M.2 2280 PCIe NVMe TLC SSD	**Capacity**	512GB (one M.2 PCIe NVMe module)	
	Protocol	PCIe	
	Form Factor	M.2 in native slot on motherboard	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	300TBW (TB Written)	
	Reliability (MTBF)	1.5M hours	
	Interface	PCI Express 3.0 x4 electrical x4 physical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	3400 MB/s
		Sequential Write	2500 MB/s
		Random Read	380K IOPS
		Random Write	430K IOPS
HP 1TB M.2 2280 PCIe NVMe TLC SSD	**Capacity**	1TB	
	Protocol	PCIe	
	Form Factor	M.2 in native slot on motherboard	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	400TBW (TB Written)	
	Reliability (MTBF)	1.5M hours	
	Interface	PCI Express 3.0 x4 electrical x4 physical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	3400 MB/s
		Sequential Write	2500 MB/s
		Random Read	500K IOPS
		Random Write	440K IOPS
HP Z Turbo Drive Dual Pro 256GB SSD	**Capacity**	256GB	
	Protocol	PCIe	
	Form Factor	M.2 in Half-height, half-length card	

Technical Specifications

	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	200TBW (TB Written)	
	Reliability (MTBF)	1.5M hours	
	Interface	PCI Express 3.0 x4 electrical x4 physical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	3500 MB/s
		Sequential Write	2200 MB/s
		Random Read	240K IOPS
		Random Write	480K IOPS
HP Z Turbo Drive Dual Pro 512GB SSD	**Capacity**	512GB	
	Protocol	PCIe	
	Form Factor	M.2 in Half-height, half-length card	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	150TBW (TB Written)	
	Reliability (MTBF)	1.5M hours	
	Interface	PCI Express 3.0 x4 electrical x4 physical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	3400 MB/s
		Sequential Write	2500 MB/s
		Random Read	380K IOPS
		Random Write	430K IOPS
HP Z Turbo Drive Dual Pro 1TB SSD	**Capacity**	1TB	
	Protocol	PCIe	
	Form Factor	M.2 in Half-height, half-length card	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	300TBW (TB Written)	
	Reliability (MTBF)	1.5M hours	
	Interface	PCI Express 3.0 x4 electrical x4 physical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	3400 MB/s
		Sequential Write	2500 MB/s
		Random Read	500K IOPS
		Random Write	440K IOPS
HP Z Turbo Drive Dual Pro 2TB SSD	**Capacity**	2TB	
	Protocol	PCIe	
	Form Factor	M.2 in Half-height, half-length card	
	Controller	NVMe	
	NAND Type	3D TLC	

Technical Specifications

Endurance	300TBW (TB Written)	
Reliability (MTBF)	1.5M hours	
Interface	PCI Express 3.0 x4 electrical x4 physical	
Operating Temperature	32° to 158° F (0° to 70° C)	
Performance	**Sequential Read**	3500 MB/s
	Sequential Write	3000 MB/s
	Random Read	600K IOPS
	Random Write	500K IOPS

Technical Specifications

HP Z Turbo Drive 256GB SED SSD			
Capacity	256GB		
Protocol	PCIe		
Form Factor	M.2 in Half-height, half-length card Or M.2 in native slot on motherboard		
Controller	NVMe		
NAND Type	3D TLC		
Endurance	150TBW (TB Written)		
Reliability (MTBF)	1.5M hours		
Interface	PCI Express 3.0 x4 electrical x4 physical		
Operating Temperature	32° to 158° F (0° to 70° C)		
Performance	**Sequential Read**	3500 MB/s	
	Sequential Write	2200 MB/s	
	Random Read	240K IOPS	
	Random Write	480K IOPS	
Self-Encrypting Drive Support	OPAL 2		

HP Z Turbo Drive 512GB SED SSD			
Capacity	512GB		
Protocol	PCIe		
Form Factor	M.2 in Half-height, half-length card Or M.2 in native slot on motherboard		
Controller	NVMe		
NAND Type	3D TLC		
Endurance	300TBW (TB Written)		
Reliability (MTBF)	1.5M hours		
Interface	PCI Express 3.0 x4 electrical x4 physical		
Operating Temperature	32° to 158° F (0° to 70° C)		
Performance	**Sequential Read**	3400 MB/s	
	Sequential Write	2500 MB/s	
	Random Read	380K IOPS	
	Random Write	430K IOPS	
Self-Encrypting Drive Support	OPAL 2		

HP Z Turbo Drive 1TB SED SSD		
Capacity	1TB	
Protocol	PCIe	
Form Factor	M.2 in Half-height, half-length card Or M.2 in native slot on motherboard	
Controller	NVMe	
NAND Type	3D TLC	
Endurance	400TBW (TB Written)	
Reliability (MTBF)	1.5M hours	
Interface	PCI Express 3.0 x4 electrical x4 physical	
Operating Temperature	32° to 158° F (0° to 70° C)	

QuickSpecs

Technical Specifications

	Performance	**Sequential Read**	3500 MB/s
		Sequential Write	3000 MB/s
		Random Read	580K IOPS
		Random Write	500K IOPS
	Self-Encrypting Drive Support	OPAL 2	

HP Z Turbo Drive 2TB SED SSD	**Capacity**	2TB	
	Protocol	PCIe	
	Form Factor	M.2 in Half-height, half-length card Or M.2 in native slot on motherboard	
	Controller	NVMe	
	NAND Type	3D TLC	
	Endurance	500TBW (TB Written)	
	Reliability (MTBF)	1.5M hours	
	Interface	PCI Express 3.0 x4 electrical x4 physical	
	Operating Temperature	32° to 158° F (0° to 70° C)	
	Performance	**Sequential Read**	3500 MB/s
		Sequential Write	3000 MB/s
		Random Read	600K IOPS
		Random Write	500K IOPS
	Self-Encrypting Drive Support	OPAL 2	

QuickSpecs

Summary of Changes

Date of change:	Version History:		Description of change:
	From v1 to v2		
June 11, 2014	From v3 to v4	Removed	Removed the Z Turbo Drives.
September 2. 2014	From v4 to v5	Added	Add slot recommendations for Z840, Z640, Z440, details for Boot, note for support of Secure erase, and Linux support
December 1, 2014	From v5 to v6	Changed	HP Z Turbo Drive compatibility
February 1, 2015	From v6 to v7	Added	Support for Z440, 640 and 840 Workstations
		Removed	third party tools support for Secure Erase
April 1, 2015	From v7 to v8	Added	Z Turbo Drives G2 256 and 512GB
		Removed	Fusion ioFX
June 1, 2015	From v8 to v9	Added	RAID Compatibility
		Changed	Messaging and Compatibility
February 1, 2016	From v9 to v10	Added	HP Z240 Workstations compatibility
		Changed	Z Turbo Drives and Z Turbo Drive Quad Pro Specs
March 1, 2016	From v10 to v11	Changed	Z Turbo G2 NVMe devices comments and driver links
April 1, 2015	From v11 to v12	Added	HP Z Turbo Drive G2 1TB for all current platforms, 256,512GB and 1TB; Support Z240 and Z1 G3, HP Z Turbo Drive Thermal Solution (Z1 G3)
June 7, 2016	From v12 to v13	Added	Z1 G3 Platform Note
		Changed	HP Z Turbo Drive 256GB & 512GB SSD combined performance specs
September 1, 2016	From v13 to v14	Added	new models for SED versions and Turbo Drives Quad Pro, 256GB TLC drive, as well as Z240 specs
		Changed	edits to MTTF info
October 1, 2016	From v14 to v15	Added	Minor specs to TLC drive, as well as Z1 G3, and Z2 drives
		Changed	updates for TLC and SED parts
November 1, 2016	From v15 to v16	Added	HP Z Turbo Drive Quad Pro 2x1TB PCIe SSD
January 1, 2017	From v16 to v17	Added	HP Z Turbo Drive G2 256GB TLC, HP Z Turbo Drive G2 512GB TLC, HP Z Turbo Drive G2 1TB TLC
June 1, 2017	From v17 to v18	Changed	Performance section, Updated all G2 products
		Removed	HP Z Turbo Drive 256GB SSD & HP Z Turbo Drive 512GB SSD also removed references to Z Turbo Drive G1
October 16, 2017	From v18 to v19	Added	HP Z Turbo Drive G2 models to page 4 and pictures to page 2
		Changed	Model list rearranged
November 15, 2018	From v19 to v20	Added	HP Z Turbo Drive Quad Pro 2x2TB PCIe SSD, HP Z Turbo Drive Dual Pro 256GB SSD, HP Z Turbo Drive Dual Pro 512GB SSD, HP Z Turbo Drive Dual Pro 1TB SSD, HP Z Turbo Drive Dual Pro 2TB SSD and HP Z Turbo Drive Quad Pro 2TB SSD Module
January 10, 2020	From v20 to v21	Added	HP Z Turbo Drive 2TB TLC Z4/Z6 G4 SSD Kit and HP Z Turbo Drive 2TB TLC Z8G4 SSD Module specs
January 14, 2020	From v21 to v22	Changed	Format page 5
February 4, 2020	From v22 to v23	Changed	Model list rearranged and changed complete format
February 26, 2020	From v23 to v24	Changed	Model list rearranged, Updated slotting information