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Redefining Flash Storage Solution

Through Capacity + Efficiency + Performance + Form

Holistic Approach to Redefine Flash Storage

Novachips is a leading provider of a broad range of Flash storage processors and storage drives with breakthrough capacity and scalability. We reimagined Flash storage from the inside out and offer the SSD (Solid State Drive) industry's most advanced capabilities with high storage capacity for enterprise-class storage applications.

Novachips products are built upon the company's unique Flash memory architecture, which significantly outpaces the scalability, performance and reliability of SSDs that use NAND Flash.

Why Integration Matters

Three key components in SSD systems
- Flash Memory: HLNAND Flash (Next Generation Flash Memory)
- Controller: SSD/HLSSD controller
- Firmware: customized firmware based on workload

Full control over Flash memory, controller and firmware to maximize performance and reliability.

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Flash Storage System	
SSD Device	
SSD Controller	Firmware
Next Generation Flash Memory (HLNAND)	

Highly Integrated
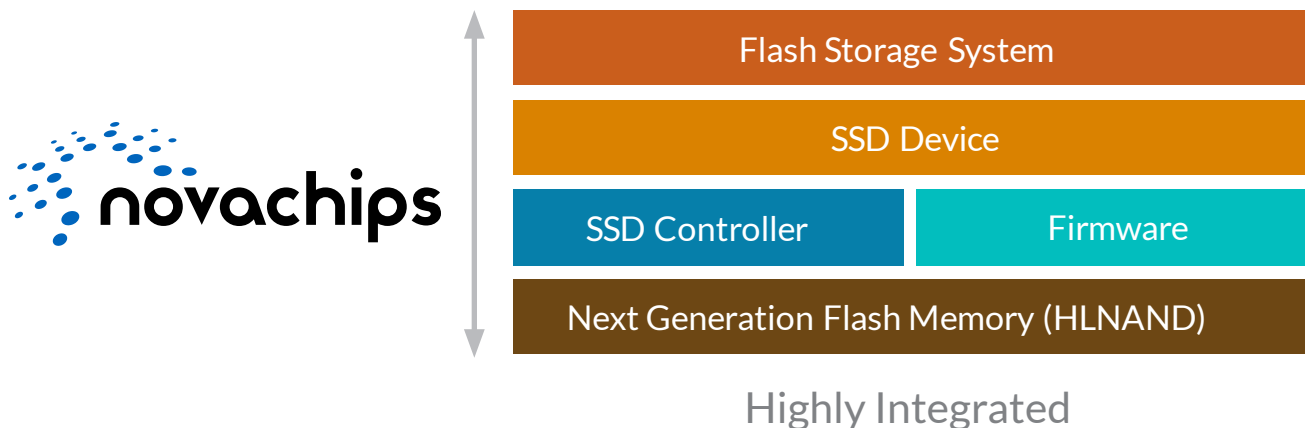
256GB/512GB/1TB

2TB/4TB/8TB/16TB

High Performance
(NS560)

High Performance & Extreme
Capacity (NS570)

Main Stream
(NS360)

Extreme Capacity
(NS370)

PCIe

SATA3

Host Interface

Toggle & ONFI NAND

HLNAND

Flash Type

Powered by HL NAND

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NS360 SSD

Redefining Flash Storage from the inside out

- SATA 6.0Gbps host interface
- 8 NAND channels at 400MT/s
- Excellent performance — up to 540 MB/s for sequential Read/Write, up to 80K IOPS for random Read/Write
- Ultimate reliability — optimized for wide temperature operation from -40℃ to 85℃
- Enhanced SMART ATA feature set
- End-to-End Data Protection - with advanced error correction scheme and in-transit data protection
- Supported sector size: 512 Bytes
- Hardware-based AES-256 encryption engine (optional)
- Self-encrypting models conform to TCG Opal 2.0 specification (optional)
- Hot-pluggable removal and insertion providing in-service replacement options
- Secure firmware update with digitally signed firmware image
- Power and thermal throttling — auto peak power control by monitoring on-board temperature sensor
- 256GB/512GB/1TB capacity available in 2.5" FF, 7mm height

SCALAR SERIES

NS370 HLSSD

Redefining Flash Storage from the inside out

- SATA 6.0Gbps host interface

- 8 HLNAND channels at 533MT/s

- Breakthrough capacity and scalability — up to 8TB SSD in 2.5" form factor with a single ASIC SSD controller

- Revolutionary HyperLink NAND (HLNAND) technology — no practical limit on number of devices per channel with ring architecture

- Excellent performance — point-to-point connection provides excellent signal integrity — up to 540MB/s for sequential Read/Write, up to 80K IOPS for random Read/Write

- Ultimate reliability — optimized for wide temperature operation from -40°C to 85°C

- Low power consumption — single controller, low voltage IO, un-terminated bus, data truncation, hierarchical MCP

- Enhanced SMART ATA feature set

- Ultimate endurance — optimized for client workloads up to 3,900 Tera-Bytes Written

- End-to-End Data Protection - with advanced error correction scheme and in-transit data protection

- Supported sector size: 512 Bytes

- Hardware-based AES-256 encryption engine (optional)

- Self-encrypting models conform to TCG Opal 2.0 specification (optional)

- Hot-pluggable removal and insertion providing in-service replacement options

- Secure firmware update with digitally signed firmware image

- Power and thermal throttling — auto peak power control by monitoring on-board temperature sensor

- Up to 4TB/8TB capacity available in 2.5" FF, 7mm / 15mm z-heights for space-constrained applications

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NS560 SSD

Redefining Flash Storage from the inside out

- PCIe Gen2 x4 host interface with NVMe 1.1a support
- U.2 (SFF-8639) standard connector
- 8 NAND channels at 400MT/s
- Revolutionary HyperLink NAND (HLNAND) technology — no practical limit on number of devices per channel with ring architecture
- Excellent performance — up to 1.5GB/s for sequential Read/Write
- Ultimate reliability — optimized for wide temperature operation from -40°C to 85°C
- Full End-to-End Data Protection - with advanced error correction scheme and in-transit data protection
- Ultra-high capacity solid state storage solution for various rugged and mission critical applications
- Supported sector size: 512, 4096 Bytes
- Hardware-based AES-256 encryption engine (optional)
- Self-encrypting models conform to TCG Opal 2.0 specification (optional)
- Hot-pluggable removal and insertion providing in-service replacement options
- Enhanced Power Loss Data Protection — securing data responded to host with internal power back-up solution
- Power and thermal throttling — auto peak power control by monitoring on-board temperature sensor
- 256GB/512GB/1TB capacity available in 2.5" FF, 9.5mm height

EXPRESS SERIES

NS570 HLSSD

Redefining Flash Storage from the inside out

- PCIe Gen2 x4 host interface with NVMe 1.1a support
- U.2 (SFF-8639) standard connector
- 8 HLNAND channels at 533MT/s
- Breakthrough capacity and scalability — up to 8TB SSD in 2.5" form factor and up to 16TB SSD in FHHL/HHHL form factor with a single SSD controller
- Revolutionary HyperLink NAND (HLNAND) technology — no practical limit on number of devices per channel with ring architecture
- Excellent performance — point-to-point connection provides excellent signal integrity with up to 1.5GB/s for sequential Read/Write
- Low power consumption — single controller, low voltage IO, un-terminated bus, data truncation, hierarchical MCP
- Reduced system cost — single controller, small footprint, reduced networking infrastructure for lower Total Cost of Ownership (TCO)
- Ultimate reliability — optimized for wide temperature operation from -40°C to 85°C
- Full End-to-End Data Protection - with advanced error correction scheme and in-transit data protection
- Ultra-high capacity solid state storage solution for various rugged and mission critical applications
- Supported sector size: 512, 4096 Bytes
- Hardware-based AES-256 encryption engine (optional)
- Self-encrypting models conform to TCG Opal 2.0 specification (optional)
- Hot-pluggable removal and insertion providing in-service replacement options
- Enhanced Power Loss Data Protection — securing data responded to host with internal power back-up solution
- Power and thermal throttling — auto peak power control by monitoring on-board temperature sensor
- Chip-level RAID—data protection beyond ECC and single die failure recovery
- 4TB/8TB capacity available in 2.5" FF, 9.5mm/15.0mm z-heights for space-constrained applications
- 8TB/16TB capacity available in HHHL/FHHL AIC for space-constrained rack units in data centers
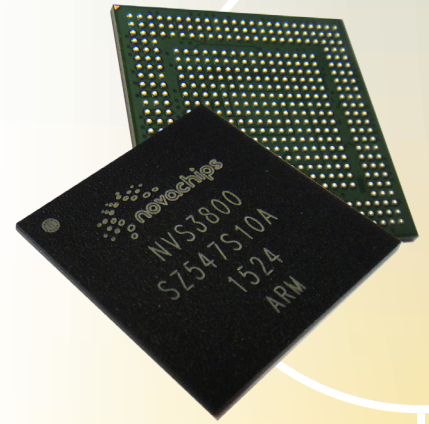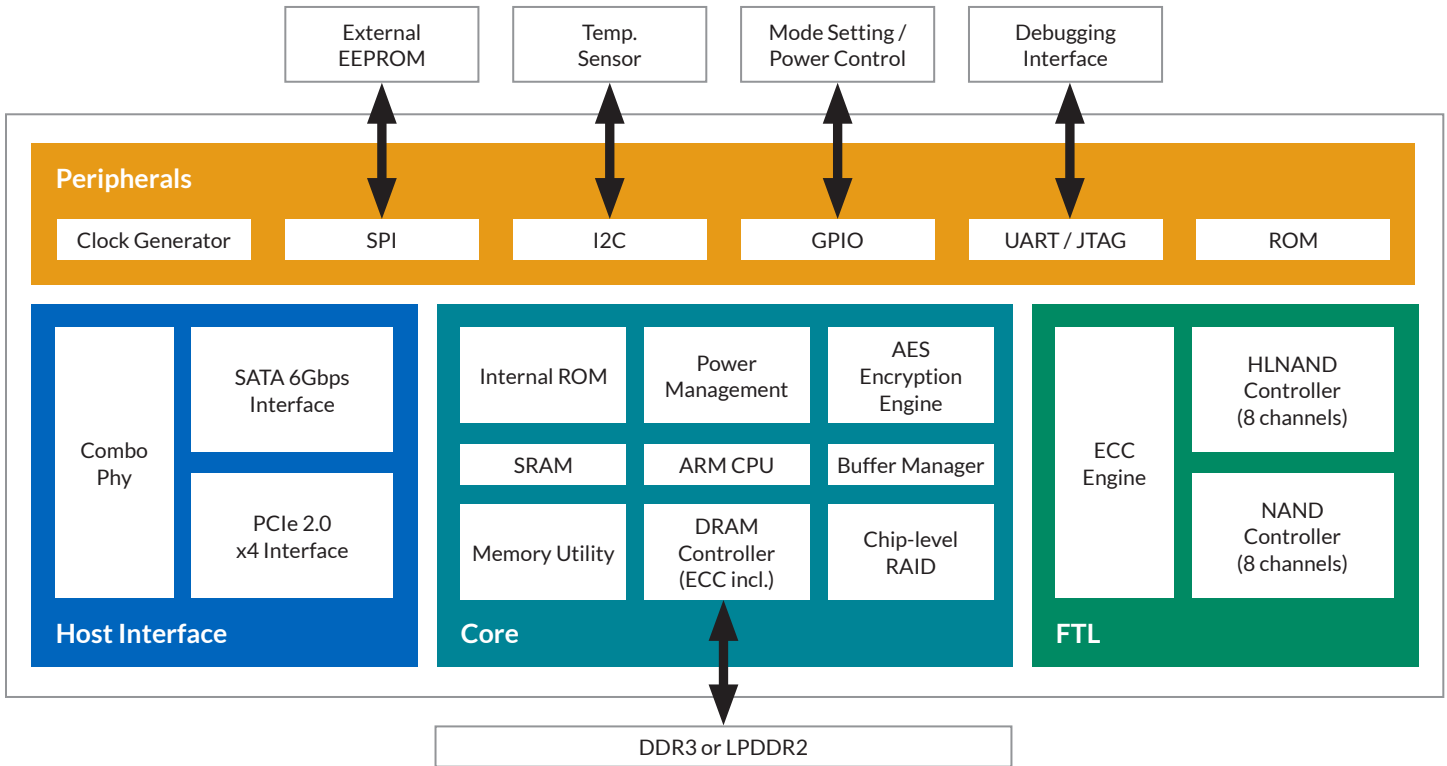
NVS3800
FLASH STORAGE PROCESSOR

Processor Features

- Host Interface
  - SATA 6Gb/s, 3Gb/s and 1.5Gb/s
  - Native PCIe Gen2 x2/x4, NVMe 1.1a

- NAND Flash Memory Support
  - 1y/1x/2x/3x nm SLC/MLC/eMLC/TLC from All NAND Vendors
  - ONFI 2.0/3.0 and Toggle 1.0/2.0 Interface up to 533MT/s
  - HLNAND Interface up to 667MT/s
  - 4/8/16/32KB Page NAND

Max. Capacity
  - 1TB with ONFI NAND and Toggle NAND
  - 16TB with HLNAND

- Reliability
  - Up to 128bit BCH ECC & Enhanced ECC for Metadata, Max. 2KB Unit
  - Enhanced NAND Reliability with Static & Dynamic Wear Leveling
  - Read Refresh by Bit Error Monitoring
  - 2 Dimension Data Randomization
  - 2-level Bad Block Management
  - Intelligent Sudden Power-off Recovery
  - Data Path Protection (DPP)
  - Hardware-based RAID
  - End-to-end Data Protection

- Low Power Consumption Design
  - Smart Peak Power Control
  - Low Power Design – HW Controlled IO/Low Clock & MCU/HW Read-retry/28nm Process Technology
  - Supports ASPM : L0/L1/L1.1/L1.2 (PCIe only), DEVSLP (SATA only)

- Security
  - Full Disk Encryption
  - AES128/256 ECB/CBC/CTR/XTS
  - TCG OPAL 2.0

- Package
  - 508-ball CABGA, 17 x 17mm, 0.65mm Ball Pitch

External EEPROM | Temp. Sensor | Mode Setting / Power Control | Debugging Interface

Peripherals

| Clock Generator | SPI | I2C | GPIO | UART / JTAG | ROM |

Host Interface

Combo Phy | SATA 6Gbps Interface | PCIe 2.0 x4 Interface

Core

Internal ROM | Power Management | AES Encryption Engine
SRAM | ARM CPU | Buffer Manager
Memory Utility | DRAM Controller (ECC incl.) | Chip-level RAID

FTL

ECC Engine | HLNAND Controller (8 channels) | NAND Controller (8 channels)

DDR3 or LPDDR2

NVS Flash Controller Family	SATA3		PCIe	
	NVS3800-37	**NVS3800-39**	**NVS3800-57**	**NVS3800-59**
Applications	Client	Client / Data Center	Client / Data Center	Data Center
Host Interface	SATA 6Gb/s	SATA 6Gb/s	PCIe Gen2 x2/x4 (NVMe 1.1a)	PCIe Gen2 x2/x4 (NVMe 1.1a)
Max Capacity Supported[1]	1 TB	16 TB	1 TB	16 TB
NAND Flash Support	MLC/TLC 1y/1x/2x/3x nm ONFI 2/3, Toggle 1/2	HLNAND	SLC/MLC/TLC/eMLC 1y/1x/2x/3x nm ONFI 2/3, Toggle 1/2	HLNAND
NAND Page Size Support	4/8/16/32KB			
Sector Size Support	512B/4096B			
Security	Full Disk Encryption AES128/256 ECB/CBC/CTR/XTS TCG OPAL 2.0			
Reliability	Up to 128bit BCH ECC & Enhanced ECC for Metadata, Max. 2KB Unit Enhanced NAND Reliability with Static & Dynamic Wear Leveling Read Refresh by Bit Error Monitoring 2 Dimension Data Randomization 2-level Bad Block Management			
Data Protection	Data Path Protection (DPP), Hardware-based RAID, End-to-end Data Protection			
Power Fail Protection	Intelligent Sudden Power-off Recovery			
Power Saving	Smart Peak Power Control, DEVSLP		Smart Peak Power Control, ASPM : L0/L1/L1.1/L1.2	
Package	508-ball CABGA, 17 x 17mm, 0.65mm pitch			
Compliance	RoHS, Halogen-Free, Green			

1. One gigabyte (GB) is equal to one billion bytes, one terabyte (TB) equals 1,000GB (one trillion bytes), and one petabyte (PB) equals 1,000TB (one quadrillion bytes) when referring to hard drive or solid state drive capacity. Accessible capacity will vary from the stated capacity due to formatting and partitioning of the drive, the computer's operating system, and other factors.

Powered by HL NAND

HL NAND

Next Generation Flash Memory for Hyper-Scalability

- High Capacity: 1Tb & 2Tb HLNAND, 4Tb 3D HLNAND

- High Speed Interface: 533/667/800/1066/1333 MT/s

- Low Power: Ring Topology without On-die Termination & Intelligent IO Switching Power Truncation

- Ideal Signal Integrity: Point-to-Point Daisy Chain for High Speed Channel

- NAND Agnostic: SLC, MLC, TLC
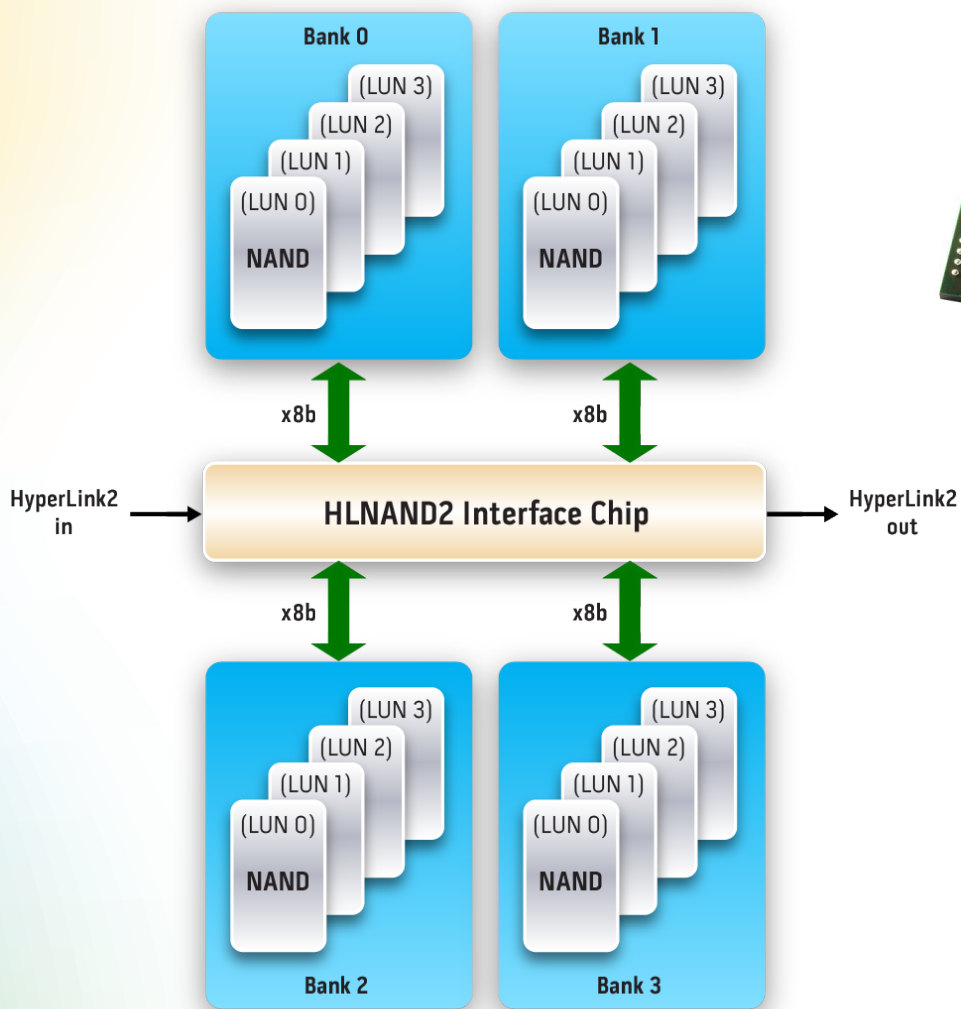
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Novachips HLSSD/SSD Product Lineup

Product Series		SCALAR-1T			SCALAR-2T			SCALAR-4T			SCALAR-8T			EXPRESS-2T			EXPRESS-4T			EXPRESS-8T			EXPRESS-10T	
Interface		SATA 6Gbps (SATA 3.1)			SATA 6Gbps (SATA 3.1)			SATA 6Gbps (SATA 3.1)			SATA 6Gbps (SATA 3.1)			PCIe Gen2 x4 (NVMe 1.1a)			PCIe Gen2 x4 (NVMe 1.1a)			PCIe Gen2 x4 (NVMe 1.1a)			PCIe Gen2 x4 (NVMe 1.1a)	
Form Factor		2.5" SATA 7mm			2.5" SATA 7mm			2.5" SATA 7mm			2.5inch SATA 15mm			2.5" NVMe (U.2/SFF-8639)			2.5" NVMe (U.2/SFF-8639)			2.5" NVMe (U.2/SFF-8639)			PCIe Card (FHHL)	
		client	ind/mil	SLC	client	ind/mil	SLC	client	ind/mil	SLC	client	ind/mil	SLC	client	ind/mil	SLC	client	ind/mil	SLC	client	ind/mil	SLC	client	SLC
Part Number		360C	360I	360S	370C	370I	370S	370C	370I	370S	370C	370I	370S	570C	570I	570S	570C	570I	570S	570C	570I	570S	570C	570S
LBA / User Capacity (GB)1		1,000GB	1,000GB	400 GB	2,000GB	2,000 GB	800 GB	4,000GB	4,000 GB	1,600 GB	8,000GB	8,000GB	3,200GB	1,600GB	1,600GB	800 GB	3,200GB	3,200GB	1,600GB	6,400GB	6,400 GB	3,200GB	10,000GB	4,800 GB
Firmware / Components / Operating Temperature (°C)		0 ~ 70°C	-45 ~ 85°C		0 ~ 70°C	-45 ~ 85°C		0 ~ 70°C	-45 ~ 85°C		0 ~ 70°C	-45 ~ 85°C		0 ~ 70°C	-45 ~ 85°C		0 ~ 70°C	-45 ~ 85°C		0 ~ 70°C	-45 ~ 85°C		0 ~ 70°C	
Seq Read (max)		540MB/s	540MB/s	540MB/s	540MB/s	540MB/s	540MB/s	540MB/s	540MB/s	540MB/s	540MB/s	540MB/s	540MB/s	1.5GB/s	1.5GB/s	1.5GB/s	1.5GB/s	1.5GB/s	1.5GB/s	1.5GB/s	1.5GB/s	1.5GB/s	1.5GB/s	1.5GB/s
Seq Write (max)		500MB/s	500MB/s	500MB/s	500MB/s	500MB/s	500MB/s	500MB/s	500MB/s	500MB/s	500MB/s	500MB/s	500MB/s	1.4GB/s	1.4GB/s	1.4GB/s	1.4GB/s	1.4GB/s	1.4GB/s	1.4GB/s	1.4GB/s	1.4GB/s	1.4GB/s	1.4GB/s
Performance2 / Random 4K Read (max IOPS)		70K	70K	70K	70K	70K	70K	70K	70K	70K	70K	70K	70K	200K	200K	200K	200K	200K	200K	200K	200K	200K	200K	200K
Random 4K Write (max IOPS)		80K	80K	80K	80K	80K	80K	80K	80K	80K	80K	80K	80K	180K	180K	180K	180K	180K	180K	180K	180K	180K	180K	180K
Seq Read (RMS avr ~ burst)		3.2 ~ 4.4W (@ 5V)			3.2 ~ 4.4W (@ 5V)			3.6 ~ 6.0W (@ 5V)			5.0 ~ 8.5W (@5V)			T.B.D.			T.B.D.			T.B.D.			T.B.D.	
Seq write (RMS avr ~ burst)		5.2 ~ 7.5W (@ 5V)			5.2 ~ 8.5W (@ 5V)			5.5 ~ 8.5W (@ 5V)			6.0 ~ 9.0W (@5V)			T.B.D.			T.B.D.			T.B.D.			T.B.D.	
Power Consumption / Random 4K Read (RMS avr ~ burst)		2.9 ~ 4.7W (@ 5V)			3.0 ~ 4.8W (@5V)			3.3 ~ 5.0W (@ 5V)			4.0 ~ 5.5W (@5V)			T.B.D.			T.B.D.			T.B.D.			T.B.D.	
Random 4K Write (RMS avr ~ burst)		5.9 ~ 8.4W (@5V)			4.7 ~ 8.0W (@5V)			4.8 ~ 8.4W (@ 5V)			6.0 ~ 9.5W (@5V)			T.B.D.			T.B.D.			T.B.D.			T.B.D.	

1. One gigabyte (GB) is equal to one billion bytes, one terabyte (TB) equals 1,000GB (one trillion bytes), and one petabyte (PB) equals 1,000TB (one quadrillion bytes) when referring to hard drive or solid state drive capacity. Accessible capacity will vary from the stated capacity due to formatting and partitioning of the drive, the computer's operating system, and other factors.

2. Based on internal testing, performance may be lower depending upon host device, OS and application.

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What if it was possible to put 10x the storage in the same space you already own?

8TB/16TB/24TB HLSSD in 2.5" FF