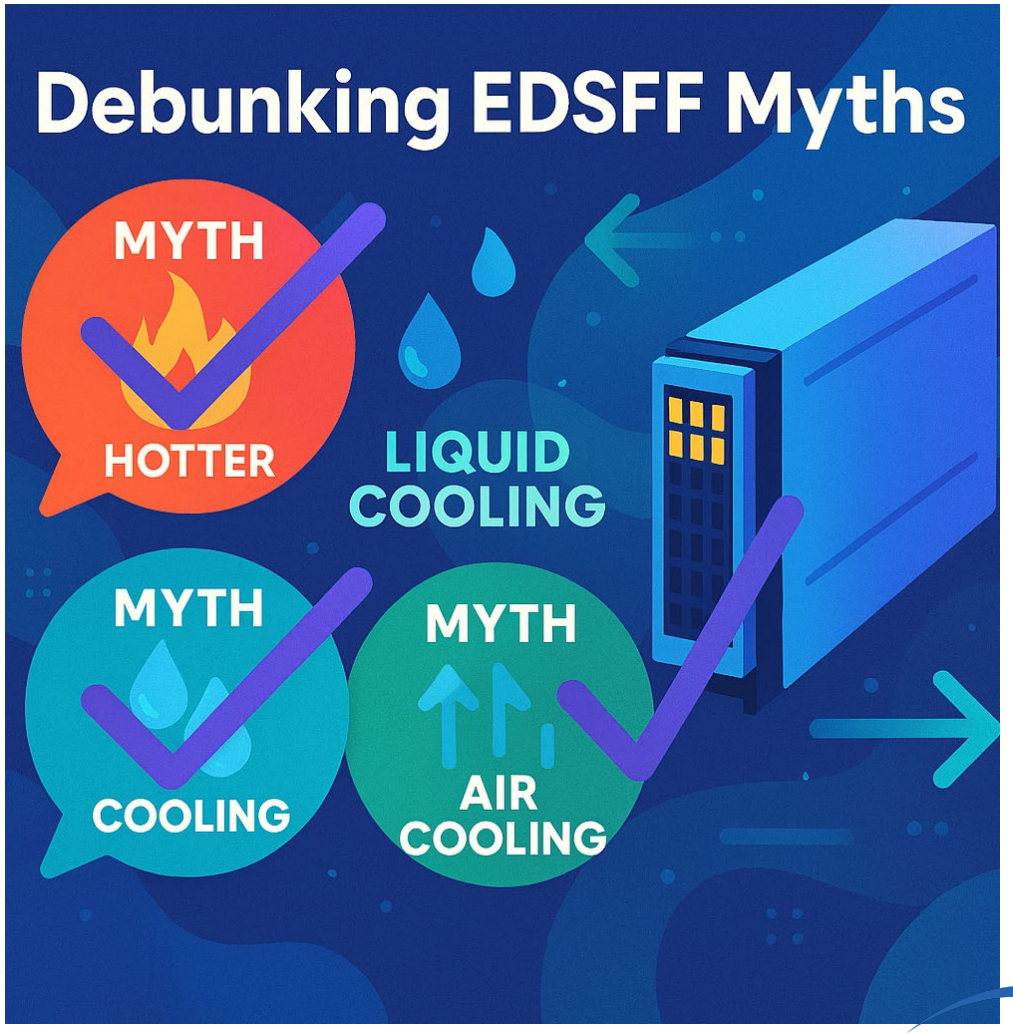
EDSFF – how it enables & addresses emerging AI servers

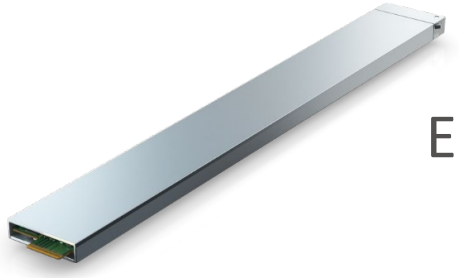
Ratnesh Muchhal
Product Marketing, Solidigm
Aug. 5, 2025

“Think You Know EDSFF? Let’s Bust Some Myths”

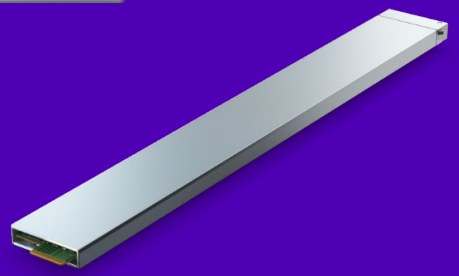
- Liquid-cooled SSDs can’t be hot-swapped & front supported
- EDSFF runs hotter than U.2
- E1.S are limited to 20W.
- Current EDSFF can only support low densities
- Air cooling is enough for AI servers.
- EDSFF isn't ready for PCIe Gen6 or CXL.



Form Factor Transitions

Legacy	Usages	EDSFF
U.2 	**2U density-optimized** ❑ Higher power, performance servers ❑ Mixed device servers (FGPA, Accelerators, SSDs)	 E3.S
	1U performance-optimized ❑ Small footprint high density + high IOPS ❑ Blade servers, edge compute and storage ❑ Boot drives	 E1.S
M.2 	**1U density-optimized** ❑ Small footprint high density ❑ Cloud storage ❑ JBOFs, storage arrays and pipelines	 E1.L

Enterprise and Datacenter Standard Form Factor (EDSFF)



Advancing Storage Density and Efficiency

Improved serviceability

- More front serviceable drives per rack unit
- Programmable LED's on-drive help reduce cost and ease integration
- Customizable latch for 'tool-less' serviceability

More space efficient capacity

- More drives per rack unit
- More media sites per drive enabling drive density scaling

More flexible and future-proofed

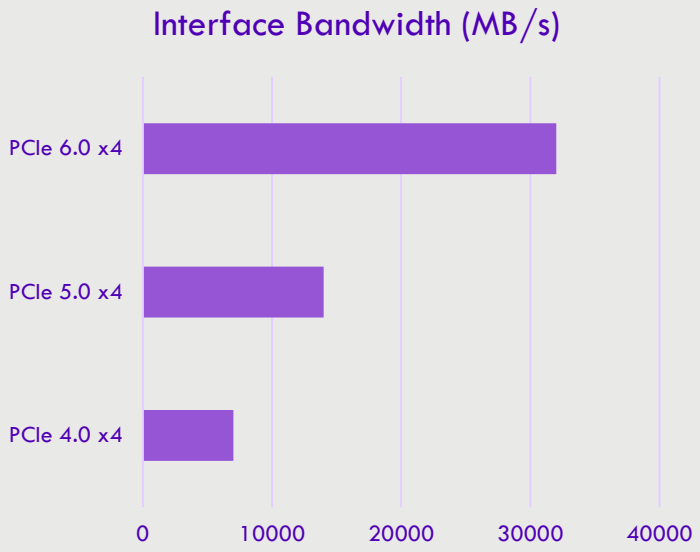
- Common pinout and connector
- Scales to PCIe 5, PCIe 6 and CXL
- Intermix NVMe and CXL devices
- Higher IOPS and capacity density

Better server-level airflow

- Smaller connector = smaller backplane for reduced airflow impedance
- Vertical 'sail connector' enables horizontal backplane
- Higher storage density enables dedicated airflow channels
- Enables higher TDP devices

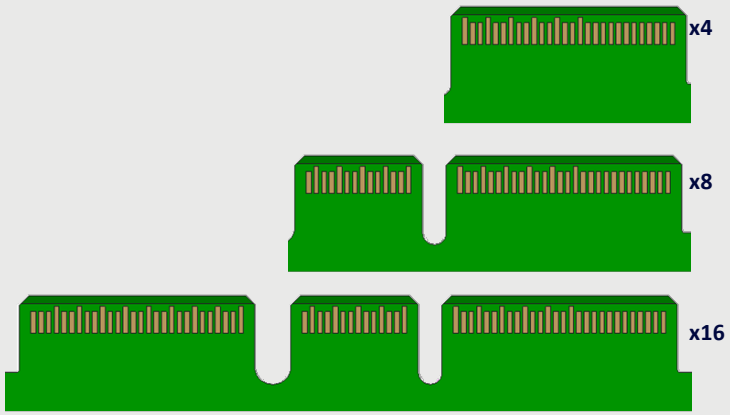
Flexibility & Scaling

Bandwidth



Support across multiple PCIe generations enables wider storage choices

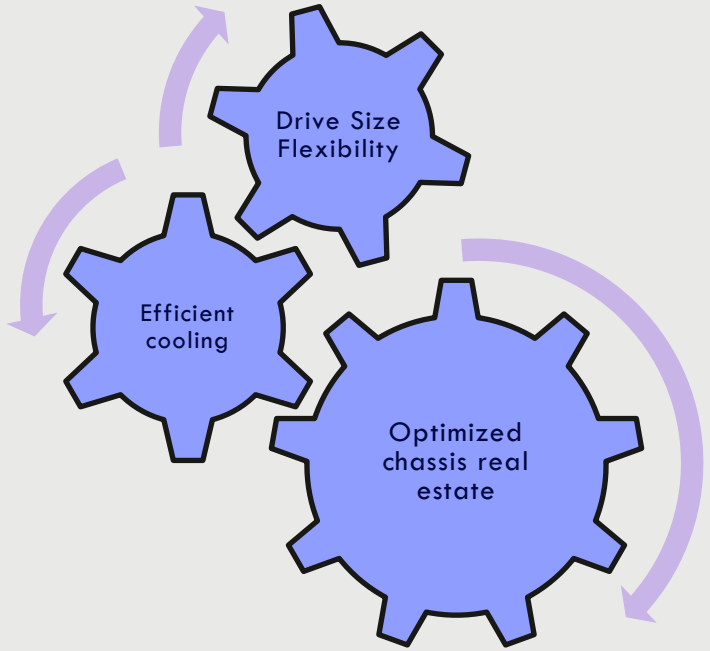
Connector



Universal connector across E1 and E3 FF

Standardized connector enables scalability to multiple gens & lanes of PCIe

Density



Higher degree of Capacity scaling possible due to many advantages with EDSFF

E1.S 9.5mm - Advantages over U.2 15mm

Improved serviceability

- Up to 32 front serviceable drives vs. 10 in 1U[1]
- Programmable LEDs to efficiently identify drives
- Customizable latch for 'tool-less' serviceability

More space efficient capacity

- Up to 32 drives in 1U drives vs. 10[1]
- 1.6X more media sites in fully populated 1U[2]

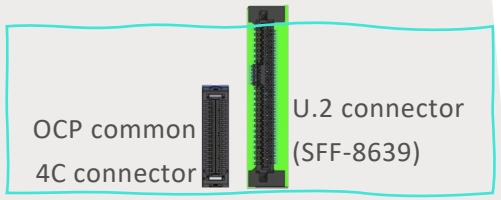
More flexible and future-proofed

- Common pinout and connector[3]
- Scales to PCIe 5, PCIe 6 and CXL
- Intermix NVMe and CXL devices
- Higher IOPS/capacity per area increases flexibility

OCP NVMe SSD Spec.

Better server-level airflow

- Smaller connector = smaller backplane for reduced airflow impedance
- Vertical 'sail connector' enables horizontal backplane

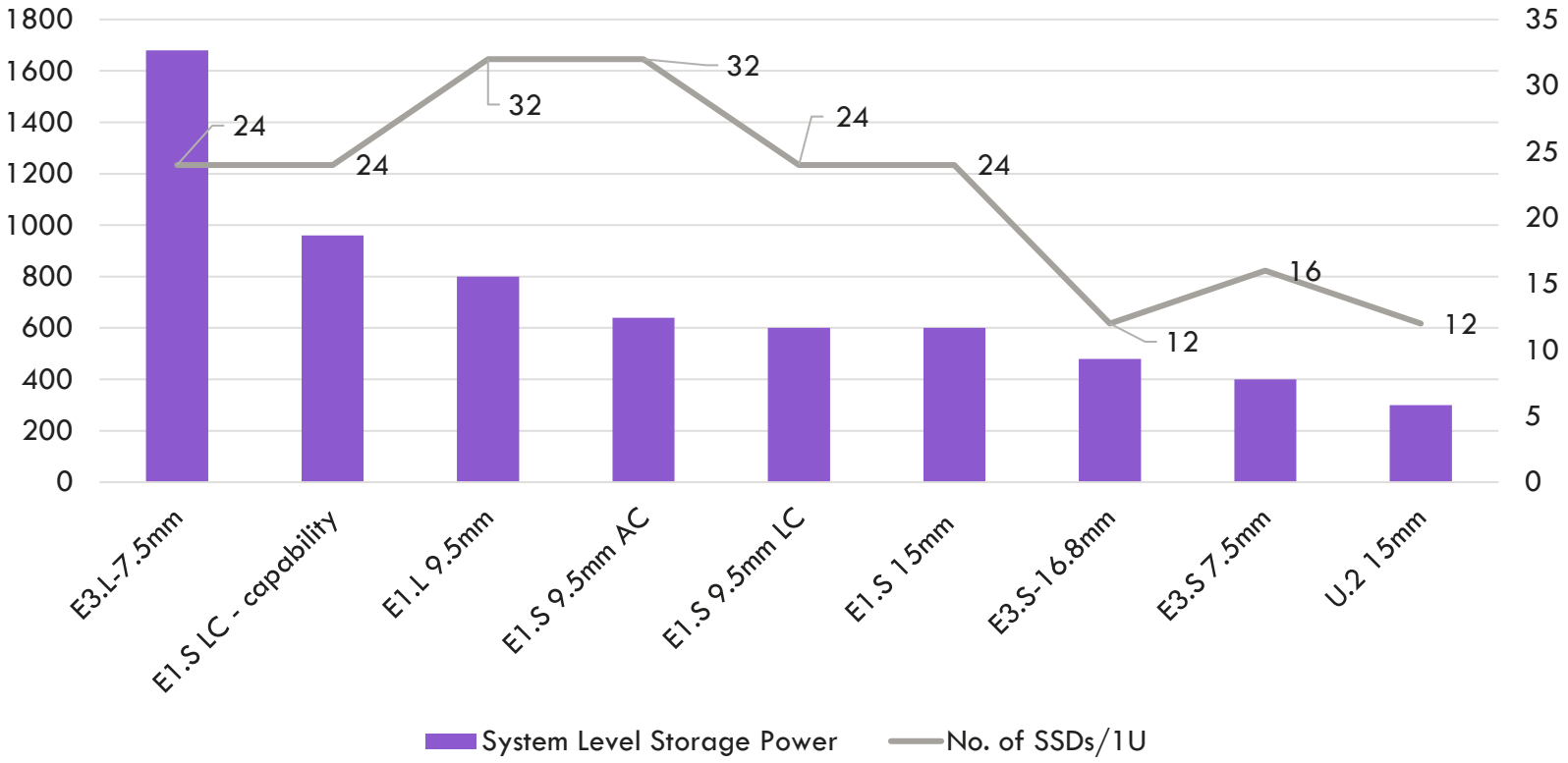


- Higher density enables dedicated airflow channels
- Enables higher TDP devices

1. E1.S 9.5mm compared to U.2 15mm
2. Fully populated 1U: E1.S = 8 sites/drive x 32 drives = 256 sites, U.2 15mm = 16 sites/drive x 10 drives = 160 sites.
3. Connector spec and pinout spec SFF-TA-1009

Thermals & Power

Max. Performance/Power per 1U & Form factor

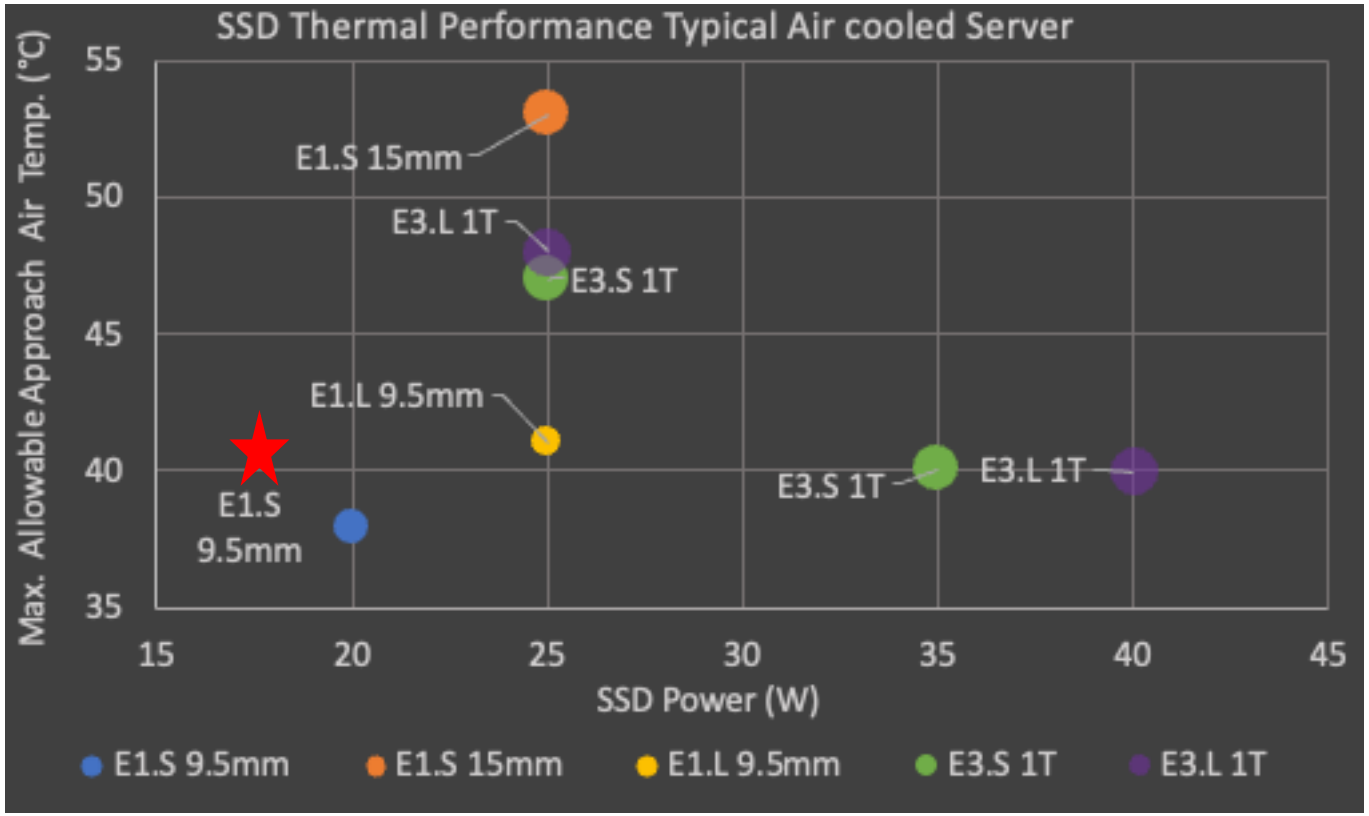


Form Factor	1U SSD	Power (W)	System Level Storage Power
E3.L-7.5mm	24	70	1680
E1.S LC - capability	24	40	960
E1.L 9.5mm	32	25	800
E1.S 9.5mm AC	32	20	640
E1.S 9.5mm LC	24	25	600
E1.S 15mm	24	25	600
E3.S-16.8mm	12	40	480
E3.S 7.5mm	16	25	400
U.2 15mm	12	25	300

E1.S 9.5mm Liquid Cooled SSDs enables

- High performance at up to 40W capability
- Maximum density in 1U with optimal length

Thermals – at typical airflow



★ **With advent of liquid cooled E1.S 9.5mm, E1.S can support up to 35-40W**

Why Liquid Cooling

High Power SSDs (up to 70W)

GB200 racks (>130kW) leave little thermal headroom

Enables fanless server designs for latest Nvidia AI servers

Front-drive bays block airflow to other components

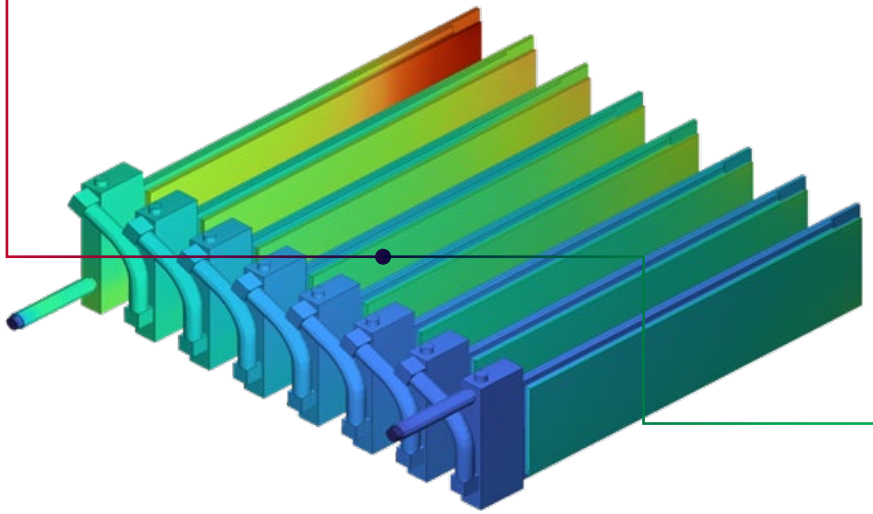
Ensures highest performance & reliability

Leverages existing liquid loops in AI racks

SSD **Liquid Cooling for the AI Era**

Problem

SSDs using liquid cooling dissipate heat primarily from the side of the drive touching the cold plate, but both sides get hot.



Solution

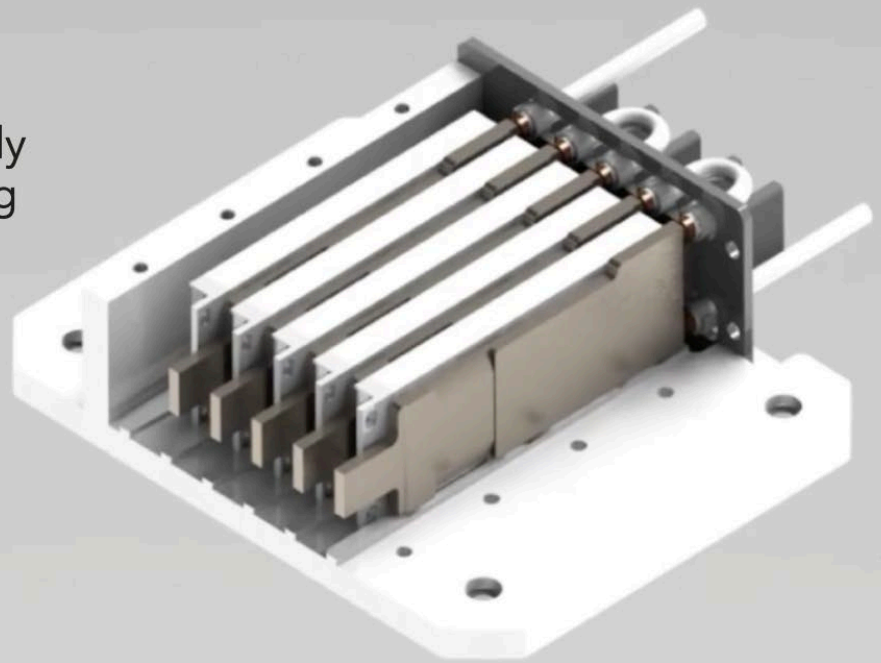
SSD enclosure with a thermal solution that actively cools both sides of an E1.S drive using a single cold plate.

Enables fan-less GPU servers for increased DC-wide energy efficiency

Liquid Cooling Meets **Hot-swap Serviceability**

Problem

SSDs using liquid cold plate cooling are not easily hot-swappable, increasing maintenance cost.



Solution

A unique, spring-loaded mechanism that allows for quick release and swapping.

Front-accessible hot-swap capability reduces maintenance headaches

Scalable to **Higher Temps and Rack Densities**

NVDIA GB300 **NVL72**

18 Compute Servers per Rack

NVDIA Vera Rubin **NVL144**

18 Compute Servers per Rack

NVDIA Rubin Ultra **NVL576**

72 Compute Blades per Rack
(18 Blades x4 Chassis)

Next-Gen GPU racks require very dense, liquid cooled storage solutions

EDSFF Ecosystem

Standards

EDSFFspec.org

- Original EDSFF Working group, now part of SNIA

SNIA.org

- Body currently responsible for standardization
- E1.S: SFF-TA-1006
- E1.L: SFF-TA-1007
- E3: SFF-TA-1008

Storage Suppliers

EDSFF storage suppliers have an increasing portfolio

Equipment manufacturers

EDSFF allows more scalable and efficient designs for enterprise equipment manufacturers

US & PRC CSPs

EDSFF allows more scalable and efficient designs for enterprise equipment manufacturers

The storage industry is accelerating EDSFF adaption

Key Takeaways

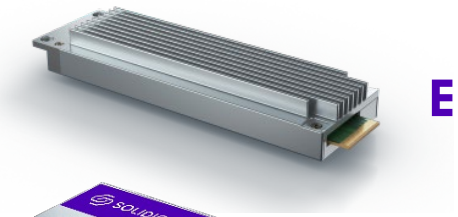
- New AI servers are demanding performance with Gen5/6 SSDs
  - E1.S 9.5mm Liquid cooled SSDs enables solves
    - High performance SSDs up to 35-40W (future capability proof)
    - Compact form factor that can fit within AI servers without comprising performance
    - Creates a truly fanless server

Solidigm's EDSFF Portfolio

OPEN Compute Project SOLUTION PROVIDER®

OPEN INSPIRED™

Series	Interface	Media	Product	Form Factors & Capacities
D7	PCIe Gen 5.0	TLC	D7-PS1010	**E1.S 9.5mm, 15mm:** 3.84 | 7.68TB
	PCIe Gen 4.0		D7-P5520	**E1.S 9.5mm, 15mm:** 1.92 | 3.84 | 7.68TB **E1.L 9.5mm:** 15.36TB
D5	PCIe Gen 4.0	QLC	D5-P5430	**E1.S 9.5mm:** 3.84 | 7.68TB | 15.36TB **E3.S 7.5mm:** 3.84 | 7.68 | 15.36 | 30.72TB
			D5-P5316	**E1.L 9.5mm:** 15.36 | 30.72TB
			D5-P5336	**E3.S 7.5mm:** 7.68 | 15.36 | 30.72TB **E1.L 9.5mm:** 15.36 | 30.72 | 61.44TB | 122.88TB



E1.S 15mm

E1.S 9.5mm

E1.L 9.5mm

E3.S 7.5mm