EDSFF 1 Year In: What Have We Learned?

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FMS 2018:

Scalable Family for Different Usages

- Same Protocol: NVMe
- Same Interface: PCIe
- Same Connector: SFF-TA-1002
- Same Pinout and Functions (hot plug, serviceable)
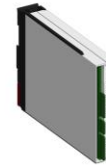- Different Usages, Same Expectations!

E1.L (SFF-TA-1007)
- 318.75 x 38.4 mm
- Supports > 40W
- Up to 48 Standard NAND sites

E1.S (SFF-TA-1006)
- 111.5 x 31.5 mm
- Supports >12W
- Up to 12 Standard NAND sites

E3 (SFF-TA-1008)
- (104.9/142.2) x 76mm
- Supports up to 70W
- Up to 48 Standard NAND sites

Santa Clara, CA
August 2018

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Challenges to Address

Need More NVM Sites

less packages/SSD = more dies/package = lower yield/package

Support SSDs and MORE

Legacy connectors have been SSD only.

Optimize for NVM

Legacy form factors in Enterprise and Datacenter based on HDDs or client SSDs.

Thermals and TCO Matter

Legacy SSDs not thermally optimized. Airflow to CPU restricted.

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Specs: What's Changed?

E1.L (SFF-TA-1007) Rev 1.1

- 318.75 x 38.4 mm
- Supports > 40W
- X4, x8 interface

- **Learnings, errata**

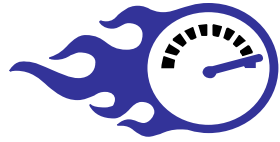**E1.S (SFF-TA-1006) Rev 1.3**

- 111.5 x 31.5 mm
- Supports >12W
- X4 interface

- **New: 9.5mm enclosure (20W)**
- **New: 25mm enclosure (25W)**
- **New: X8 interface for enclosures**
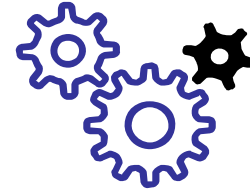- **Learnings, errata**

Benefits of the Changes

Higher Power Capability for E1.S
- ✓ Slower Fan Rate
- ✓ Higher Performance (comparable to a U.2)

X8 PCIe Interface on E1.S
- ✓ Higher throughput for usages beyond storage

Learning, Errata for dimensions, LEDs, etc.
- ✓ More robust interoperability between hosts and devices
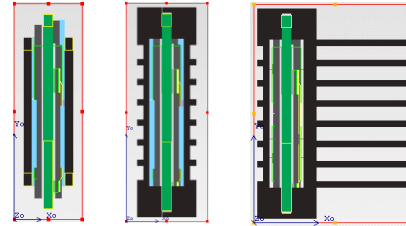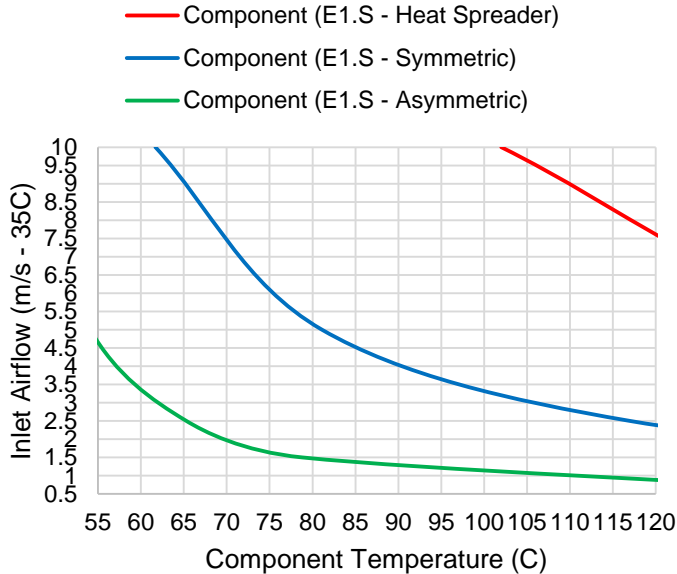
E1.S Thermal Analysis

Memory Component Temperature

— Component (E1.S - Heat Spreader)
— Component (E1.S - Symmetric)
— Component (E1.S - Asymmetric)

Inlet air temp: 35°C

Board power: ~16.5W (avg)

Cross section & airflow
- Heat spreader: 11 x 35mm / Longitudinal downstream
- Symmetrical: 13 x 35mm / Longitudinal downstream
- Asymmetrical: 26 x 35mm / Longitudinal downstream

Toshiba Memory has the upcoming EDSFF E1.S form factor with asymmetric enclosure at their booth #307, demonstrating higher power/performance, better thermals and hot-pluggability compared to M.2

Note:
- CFD thermal analysis simulation
- 16.5W with typical parts placement and does not represent any Toshiba Memory product offering.
- SFF-TA-1006 R1.3a airflow/temp and CFM cross section assumptions from Table
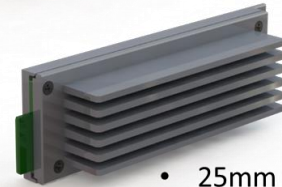- Results are preliminary and subject to change without notice

E1.S with Asymmetric Enclosure is a superior choice for high-density NVMe™ storage applications

NVMe is a trademark of NVM Express, Inc.

E1.S Thermal Analysis

Credit: David Wright - WD

9.5mm Device w/ Symmetric Enclosure
25mm Device w/ Asymmetric Enclosure

Power (W) vs AirFlow (LFM)
Inlet Air Temp: 35° C
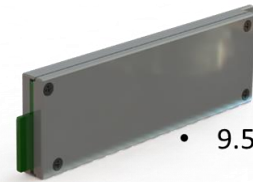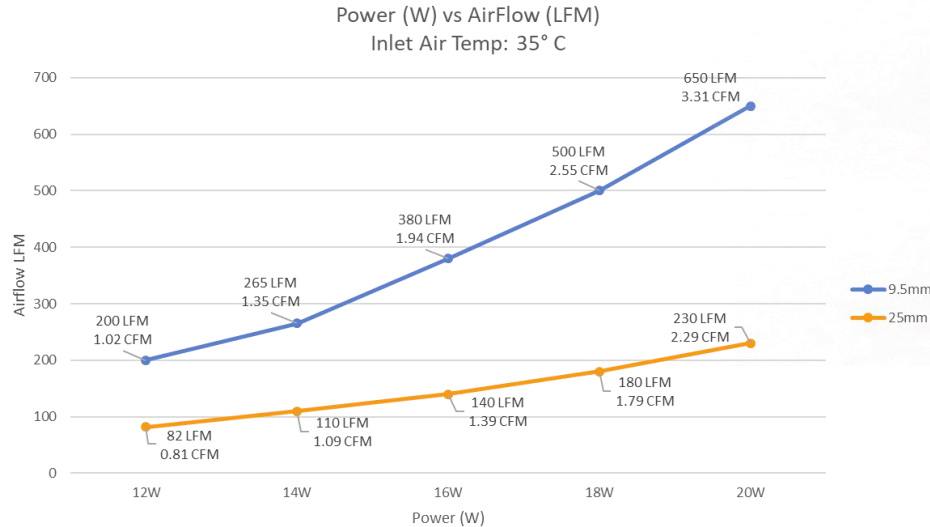
- 9.5mm enclosure (20W)

- 25mm enclosure (25W)

E1.S (SFF-TA-1006) Rev 1.3
- 111.5mm x 31.5mm
- Supports ≥ 12W
- X4 interface
- Thermal guidelines @35C allows:
  - 9.5mm 2.02CFM for 20W
  - 25mm 4.1CFM for 25W

Western Digital.

E1.S w/asymmetric enclosure provides superior cooling and requires less airflow for the same device power levels

- These are simulated results
- Case temps exceed 80° C in these scenarios
- Data is preliminary and subject to change without notice

We Have Made Progress!

Optimized for Storage

E1.L 18mm

E1.L 9.5mm

Intel® SSD D5-P4326
Available Now
Intel® SSD DC P4510
Available 2nd half 2019†

Optimized for Compute/Server

E1.S 5.9mm

Intel® SSD DC P4511
Available 2nd half 2019†

The Shape of the Future
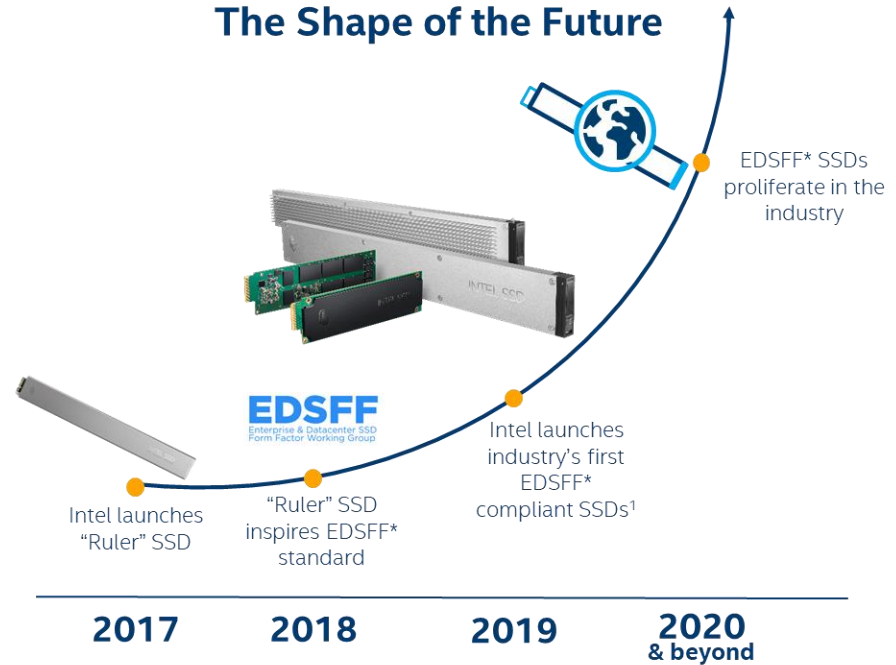
EDSFF* SSDs proliferate in the industry

EDSFF
Enterprise & Datacenter SSD
Form Factor Working Group

Intel launches "Ruler" SSD

"Ruler" SSD inspires EDSFF* standard

Intel launches industry's first EDSFF* compliant SSDs[1]

2017   2018   2019   2020 & beyond

Santa Clara, CA
August 2019
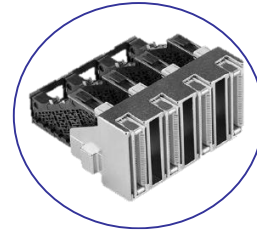
The Shape of the Future is Here with EDSFF
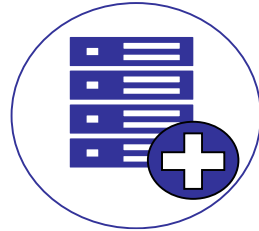
EDSFF is the building block for storage & more

Future proof your system for the connector (SFF-TA-1002)

For more information: http://www.snia.org/sff/specifications

Connector: SFF-TA-1002 Rev 1.2: Card Edge multilane protocol agnostic connector

E1.S form factor: SFF-TA-1006 Rev 1.3: Enterprise and Datacenter 1U Short SSD Form Factor

E1.L form factor: SFF-TA-1007 Rev 1.1: Enterprise and Datacenter 1U Long SSD Form Factor

E3 form factor: SFF-TA-1008 Rev 1.0: Enterprise and Datacenter 3" Media Device Form Factor

Pin list/other: SFF-TA-1009 Rev 2.0: Enterprise and Datacenter SSD Pin and Signal Specification