EDSFF Overview

jim@intel.com

December 7, 2018
First:

Let’s Turn Back the Clock to 2014
U.2 SSDs are Introduced

U.2 (Formerly SFF-8639)

U.2 Brought PCIe Attached Storage into the Mainstream

Note: Always pronounced “U dot 2”
U.2 Design Priority

Projected more than 86% of all SSD units sold on all interfaces between 2015-2019

Compatibility with the Ubiquitous 2.5” HDD
Question:

Do we really need, or even want, continued compatibility with HDDs?
Industry Leaders work together to limit storage form factor proliferation

For more Information, visit: https://edsffspec.org/
EDSFF Overview

**E1.L (SFF-TA-1007)**
- Density Optimized
- 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
- Up to 12 Standard NAND sites
- Supports >12W

**E3 (SFF-TA-1008)**
- Ultra high-performance applications
- (104.9/142.2) x 78mm
- Supports up to 70W
- Up to 48 Standard NAND sites

**EDSFF Advantages**
- Same Protocol: NVMe
- Same Interface: PCIe
- Same Connector: SFF-TA-1002
- Same Pinout and Functions

**Different Usages**
**Same Expectations!**
EDSFF Gains Industry Collaboration Advantages

- **Capacity Scaling**
  - E1.L: Up to 3X more capacity per drive vs. U.2
  - E1.S: 2x more than M.2

- **Performance Scaling**
  - Support for x4, x8, x16

- **Thermally Efficient**
  - E1.L: Up to 2x less airflow required per drive vs. U.2 15mm
  - E1.L: Up to 3x less than U.2 7mm

- **Future Proofing**
  - PCIe* 4.0 and 5.0 ready; enabling scalability & interoperability to be the innovation form factor for the next 20 years

- **Solution Range**
  - E1.L, E1.S: case and caseless designs

---

1 Source: Microsoft, FMS 8/8/2018
2 Source: Microsoft, FMS 8/8/2018
3 Source: Microsoft, FMS 8/8/2018
EDSFF Connector
SFF-TA-1002

TE CONNECTIVITY’S SLIVER 2.0 CONNECTOR CHOOSEN AS NEW STORAGE STANDARD
SFF-TA-1002 CONNECTOR

- X4 Orthogonal connector configuration
- Allows airflow through the connector
- Connector tips card edge up for front mounting
- Connectors ‘gang’ together in a frame
- Frame attaches to PCB for integrity
- Improved cost, reliability

Source: https://www.amphenol-icc.com/product-series/mini-cool-edge-0-60mm.html
EDSFF: Built from the ground up for SSDs

General Purpose Scalable Connector
- Flexible: multiple orientations, widths, PCIe5* support
- Supports multiple interoperable specs (EDSFF, OCP Mezz, GenZ)

Break from legacy to optimize for SSDs
- 50% to 100% increase in media package sites

Improved thermal efficiency
- 2-3X less airflow needed
- Or, support higher power devices

Source: Microsoft, FMS 8/8/2018


Source – Intel. Comparing airflow required to maintain equivalent temperature of a 4TB U.2 15mm Intel® SSD DC P4500 to a 4TB 1U L form factor for Intel® SSD DC P4500.

Source – Intel. Comparing airflow required to maintain equivalent temperature of an 8TB U.2 7mm Intel® SSD DC P4600 to a 8TB EDSFF 1U-Short form factor for Intel® SSD DC P4610.

Results have been estimated or simulated using internal analysis or architecture simulation or modeling, and provided for informational purposes. Simulation involves three drives for each form factor in a sheet metal representation of a server, 12.5mm pitch for E1.L form factor, 1000m elevation, limiting SSD on case temp of 75C or thermal throttling performance, whichever comes first. 5C guard band. Results used as a proxy for airflow anticipated on EDSFF spec compliant E1.L form factor, Intel® SSD P4610.
EDSFF and SFF-TA-1002: Improved Thermals

2x less airflow$^3$ vs U.2 15mm

Source: Intel, FMS 8/8/2018
Intel ‘pre-standard’ Example

Before EDSFF

1PB IN 42u w/2 TB HDDs

With EDSFF

STORAGE CAPACITY
1PB IN 1U
INTEL® 3D NAND SSD, 32TB RULER

Opening up new use cases in warm storage with disruptive total cost of ownership
Thank You

jim@intel.com