Open for All.
EDSFF – A Dynamic Family of Form Factors for Data Center SSDs
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EDSFF Family Overview

- Family of form factors and standards for data center NVMe SSDs
- E1.S for scalable & flexible performance storage
- E1.L for high capacity storage (e.g. QLC)
- E3 high performance SSD for 2U server / storage
What is EDSFF?

• A family of form factors and standards for data center SSDs
• Improved SSD capacity, thermals, power, and scalability
• Flexible options for high density and improved data center TCO (E1.L), scalable performance (E1.S) and mainstream 2U server/storage (E3)
• High-speed multi use connector with robust ecosystem
• Full hotplug support
• Built in LEDs, carrier-less design, enclosures for ESD
• Fully customizable latch (OCP opportunity!) for toolless serviceability
• Common pinout for SSD
EDSFF History

Q1 2017
EDSFF group formed

Q3 2017
Intel launches “ruler” SSD at FMS, and intention to contribute to EDSFF

Q4 2017
EDSFF hands off specs to SNIA SFF-TA

Q2 2018:
- pin/signal spec Rev 2.0, E1.S 1.1, errata

Q2 2019
E1.S Rev 1.2 to add support for 9.5mm and 25mm thick enclosures

Q3 2019
E1.S Rev 1.3a to add x8 support

Q4 2019
OCP Storage Workgroup discuss use of EDSFF

Q1 2020
E1.S 1.4 add 15mm

SFF-TA-1009 1.0 published (pin/signal spec)
Connector Ecosystem

**SFF-TA-1002** Connector versions: Vertical (like PCIe CEM), Right-Angle (Like PCIe M.2), Orthogonal, Straddle, Cable. High speed up to 112 GT/s PAM4

**SFF-TA-1012** shows pinout differences between EDSFF, OCP, Gen Z, etc.

## E1.S Thermal Options and Use Cases

<table>
<thead>
<tr>
<th>Enclosure Parameter</th>
<th>5.9mm Device</th>
<th>Device with Heat Spreader (8.01mm)</th>
<th>Device with Symmetric Enclosure (9.5mm)</th>
<th>Device with Asymmetric Enclosure (15mm)</th>
<th>Device with Asymmetric Enclosure (25mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended sustained power (W)</td>
<td>12</td>
<td>16</td>
<td>20</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Enclosure Max Inlet air temperature, 950 m to 3050 m (° C)</td>
<td>35 - (1° C for 175 m of elevation gain)</td>
<td>35 - (1° C for 175 m of elevation gain)</td>
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</tr>
<tr>
<td>Add in card to add in card pitch (mm)</td>
<td>9</td>
<td>11</td>
<td>13</td>
<td>17</td>
<td>26</td>
</tr>
<tr>
<td>Recommended Fan Pressure loss across device (Pascal)</td>
<td>83</td>
<td>52</td>
<td>64</td>
<td>40</td>
<td>21</td>
</tr>
<tr>
<td>Airflow, average min per device (CFM). 1 CFM = 1.7 m³/h</td>
<td>1.41 – (0.01 CFM for every 1° C below 35° C inlet temp)</td>
<td>1.71 – (0.06 CFM for every 1° C below 35° C inlet temp)</td>
<td>2.02 - (0.02 CFM for every 1° C below 35° C inlet temp)</td>
<td>1.5 - (0.02 CFM for every 1° C below 35° C inlet temp)</td>
<td>4.10 - (0.04 CFM for every 1° C below 35° C inlet temp)</td>
</tr>
</tbody>
</table>

Source: SFF-TA-1006 rev 1.4

Touch point Temperature limit (80 °C)

Enclosure Max Inlet air temperature, < 950 m (35 °C)
New – proposed at OCP, E1.S 15mm

- E1.S new thickness at 15mm, up to 25-35W @ 35C, 24x drives in 1U server
- Higher performance than U.2 in smaller form factor
- Scales to PCIe 5.0, 3D NAND and storage class memory (e.g. Intel® Optane™ SSD)
- Performance, power, and thermals for mainstream SSD capacities (4, 8, 16TB) in the next 2-5 years
System designs for E1.S

SuperServer SSG-1029P-NES32R
(Angled View – System)

E1.S optimized for IOPS intensive workloads

up to 36 E1.S in 1U for scalable performance

https://www.asicpc.com/en/productdetail/51120
System designs for E1.L

SuperStorage SSG-1029P-NEL32R

(Angled View – System)

E1.L optimized for lowest TCO on QLC NVMe

E1.L optimized for TB/rack unit & performance

EDSFF Future

The OCP Cloud NVMe SSD Specification is Built on EDSFF

**E1.S**
- U.2 like performance with better thermals
- Hot-Plug & serviceability
- Flexible heat sink options for different solutions
- Compute/Server Optimized

**E1.L**
- Best TCO for QLC, high performance TLC
- Hot-Pluggable & Front Serviceable
- 9.5mm & 18mm
- 2x more thermally efficient vs U.2
- Cloud Storage Optimized
Call to Action

- Attend OCP Storage Workgroup! Start building on EDSFF today
- E1.S 15mm by mid 2020
- Find more info about Intel EDSFF here
- Find more details about EDSFF at SNIA here
  - [https://www.snia.org/forums/sssi/knowledge/formfactors](https://www.snia.org/forums/sssi/knowledge/formfactors)
  - [www.edsffspec.org](http://www.edsffspec.org)
  - [https://www.snia.org/technology-communities/sff/specifications](https://www.snia.org/technology-communities/sff/specifications)