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Co-Chair
SNIA Solid State Drive
Special Interest Group

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KIOXIA
Co-Chair
SNIA Solid State Drive
Special Interest Group
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What Does SNIA Do?

- SNIA is a non-profit global organization dedicated to developing standards and education programs to advance storage and information technology.

Who is CMSI?

- Part of SNIA, the SNIA Compute, Memory, and Storage Initiative is a community of storage professionals and technical experts who support:
  - The industry drive to combine processing with memory and storage,
  - The creation of new compute architectures and software to analyze and exploit the explosion of data creation over the next decade.

- CMSI’s three Special Interest Groups – Computational Storage, Persistent Memory, and Solid State Drives – evangelize and educate on these technologies to the industry

www.snia.org/cmsi
Visit the SNIA Solid State Drive Form Factors webpage
https://www.snia.org/forums/cmsi/knowledge/formfactors

- Provides descriptions, dimensions, and listings of mechanical/electrical specifications, connector specifications, and protocols for
  - E1.S and E1.L
  - M.2
  - U.3
  - Add-in cards

Solid State Drive Form Factors

- Basic Page Solid State Drive Form Factors has been updated.

Solid-state drives (SSDs) are commonly used in client, hyperscale and enterprise compute environments. They typically come in three flavors: NVMe™, SAS, and SATA. Since SSDs are made from flash memory, they can be built in many different form factors. This resource guide is designed to provide information on the most common and current SSDs in their various form factors. In addition to the form factor dimensions, information such as use case, interface, protocol, and mechanical/electrical and connector specifications are provided.

Click on the names below to learn more about the many different SSD sizes and formats in a variety of form factors:

- EDSFF
- M.2
- 2.5-inch (U.2)
- Add in Cards

NVMe SSDs service many use cases in the data center. The NVMe SSD Classification page shows the different types of NVMe SSDs for different hyperscale and enterprise use cases.

The SNIA SFF Technology Affiliate is developing a broad range of standards for new connectors, form factors, and transceivers. Learn more about their work.

And for the latest on EDSFF form factors, view the PDF from an EDSFF Update Panel at Flash Memory Summit 2022 and download new white papers written by SNIA members Dell, HPE, KIOXIA, Meta, and Microsoft.
## Updated EDSFF Specifications - as of 11/10/22

### E3 Form Factors

<table>
<thead>
<tr>
<th>Description</th>
<th>SNIA SFF-TA-1008 Rev 2.0.2</th>
<th>SNIA SFF-TA-1002 Rev 1.3</th>
<th>SNIA SFF-TA-1009 Rev 3.0a</th>
<th>SNIA SFF-TA-1023 Rev 1.0a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise and Datacenter Device Form Factor (E3)</td>
<td></td>
<td>Protocol Agnostic Multi-Lane High Speed Connector</td>
<td>Enterprise and Datacenter Standard Pin and Signal Specification (EDSFF)</td>
<td>Thermal Characterization Specification for EDSFF Devices</td>
</tr>
</tbody>
</table>

### E1 Form Factors

<table>
<thead>
<tr>
<th>Description</th>
<th>SNIA SFF-TA-1006 Rev 1.5</th>
<th>SNIA SFF-TA-1007 Rev 1.2</th>
<th>SNIA SFF-TA-1002 Rev 1.3</th>
<th>SNIA SFF-TA-1009 Rev 3.0a</th>
<th>SNIA SFF-TA-1012 Rev 1.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise and Datacenter 1U Short Device Form Factor (E1.S)</td>
<td></td>
<td>Enterprise and Datacenter 1U Long Device Form Factor (E1.L)</td>
<td>Protocol Agnostic Multi-Lane High Speed Connector</td>
<td>Enterprise and Datacenter Standard Pin and Signal Specification (EDSFF)</td>
<td>Pin Assignment Reference for SFF-TA-1002 Connectors</td>
</tr>
</tbody>
</table>
Form Factor Volume Estimates

Source: TRENDFOCUS

Note: Data excludes SSD consumption where companies buy NAND and build SSDs for internal use.

Key Message: SSD Unit and Byte volume forecasted to shift to EDSFF. M.2 volume winding down.
Form Factor Mix – 3 Major Variants

Go watch the EDSFF presentations in the storage track!

https://www.youtube.com/c/OpencomputeOrg
Thermal Characterization (SFF-TA-1023)

Figure 4-4: Example Device Thermal Profile
Changes to E3 (SFF-TA-1008)

- Primary 1C
- Secondary 1C for x8 CXL in x4 ecosystem
- Existing 4C
- New 4C+
Hyperscale
Yosemite V3: Sierra Point E1.S 2OU Flash Blade and Expansion Board Design Specification
E1.S Faceplate Reference Design

In figure 5-3, you can see a reference implementation of the E1.S faceplates in a server design.

Figure 4-1 – Faceplate design for Optional 25mm Asymmetric Enclosure

Figure 4-2 – Faceplate design for Optional 9.5mm Symmetric Enclosure

Figure 4-3 Example Implementation of E1.S Faceplate in System
E1.S 1OU Flash Blade and Expansion Board Design Specification – Vernal Falls

Up to 4x E1.S populated on 1U expansion card
1U Open Storage Solution with E1.S
Microsoft

ST5100 Wiwynn JBOF

Sapphire Rapids Compute Server with 8 E1.S 15mm at PCIe 5.0
Asrock
Dell Prototype E3.S System
### HPE ProLiant DL325 Gen11

**Cost Optimized Solution**
- **1U, 1P**

**HPE ProLiant DL325 Gen11**

<table>
<thead>
<tr>
<th>FEATURE</th>
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<tbody>
<tr>
<td>Processors</td>
<td>1x 4th Generation AMD EPYC™ processors up to 96 cores</td>
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<tr>
<td>Memory</td>
<td>Up to 3TB DDR5*, CXL 1.1 supported</td>
</tr>
<tr>
<td>Front Drive Count</td>
<td>Up to 4 LFF HDD/SSD, SAS/SATA</td>
</tr>
<tr>
<td>Rear Drive Count</td>
<td>Up to 20 EDSFF 3.5&quot; 1TB NVMe</td>
</tr>
<tr>
<td>Boot Options</td>
<td>Up to 1x internal access SATA/NVMe M.2 or 1x External access hot-pluggable RAID M.2 NVMe</td>
</tr>
<tr>
<td>GPU Support</td>
<td>Up to 25W or 2DW*</td>
</tr>
<tr>
<td>I/O</td>
<td>Up to 2 x16 PCIe Gen6 slots</td>
</tr>
<tr>
<td>Storage Controller</td>
<td>Gen5 I/O, Gen5I controllers (PCIe and OROC)</td>
</tr>
<tr>
<td>Chassis Depth</td>
<td>SFF, 25.5&quot;, LFF/EDSFF, 27.9&quot;, GPU front end, 32.2&quot;</td>
</tr>
<tr>
<td>Targeted Workloads</td>
<td>Software Defined Compute, CDN, low-end VDI</td>
</tr>
</tbody>
</table>

*EDSFF high-capacity EDSFF, GPU and EDSFF chassis support will be available 3H 2023

### HPE ProLiant DL345 Gen11

**Single-socket scalable solution**
- **2U, 1P**

**HPE ProLiant DL345 Gen11**

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<td>Software Defined Storage, Video Transcoding</td>
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**Edge optimized**
- **1U, 1P**

**HPE ProLiant DL325 Gen11**

- **AMD 6th Gen EPYC™ Processor**

**Software Defined Compute**
- Price performance
- Optimized core count
- Network bandwidth

**Storage optimized**
- **2U, 1P**

**HPE ProLiant DL345 Gen11**

- **AMD 6th Gen EPYC™ Processor**

**High-performance compute**
- Front-end scalability
- Compute density

**Density optimized**
- **1U, 2P**

**HPE ProLiant DL365 Gen11**

- **AMD 6th Gen EPYC™ Processor**

**Max GPU support**
- Network bandwidth
- Core count
- I/O bandwidth

**Accelerator optimized**
- **2U, 2P**

**HPE ProLiant DL385 Gen11**

- **AMD 6th Gen EPYC™ Processor**

**Scale-out**
- Cloud-native compute
- Service providers/Digital First
- Core count

**Cloud optimized**
- **1U, 1P**

**HPE ProLiant RL300 Gen11**

- **Ampere, Altair and Amperia, Altair Max**

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Lenovo

Up to 10x 2.5-inch hot-swap drive bays (combinations of SAS/SATA, NVMe or AnyBay)

Up to 8x 2.5-inch hot-swap drive bays (SAS/SATA) with integrated diagnostics panel

Up to 16x hot-swap EDSFF drive bays (NVMe)

Up to 4x 3.5-inch hot-swap drives (SAS/SATA or AnyBay)
2U Open Solution with E3.S

High-density E3.S on Inspur’s 2U next-generation CPU architecture brings greater performance and flexible expansion for a variety of workloads.

V2 Features

- Higher Performance with PCIe Gen5
- Greater Capacity with EDSFF E3 Form Factor
- Flexible Expansion with AI/ML accelerators, CXL Memory Expanders
- Two types of backplanes Supporting E3.S and 2T

Modular Design, Versatile Configurations:

- High-Performance Shared Storage E3.S SSD x 24
- High-Memory Server for Cloud Service CXL Memory Expander x 8 + SSD x 8
- Accelerator Server for AI/ML E3.S SSD x 8 + SmartSSD x 8
Drive Vendors
KIOXIA

- PCIe® 4.0 and 5.0 versions
- E1.L sample of Software-Enabled Flash™ module (not shown)
SK Hynix
Questions?
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- Please rate this webcast and provide us with feedback
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- You can also find this webcast and many other videos and presentations on today’s topics in the SNIA Educational Library
- A Q&A from this webcast will be posted to the SNIA Compute, Memory, and Storage Blog
- Learn more about Solid State Drive technology at https://www.snia.org/technology-focus/physical-storage