



SFF-TA-1007

Specification for

Enterprise and Datacenter 1U Long ~~SSD-Device~~ Form Factor (E1.L)

Rev 1.1.2 ~~March 11, 2019~~ June 4th, 2021

SECRETARIAT: SFF TA TWG

This specification is made available for public review at <https://www.snia.org/sff/specifications>. Comments may be submitted at <https://www.snia.org/feedback>. Comments received will be considered for inclusion in future revisions ~~of this specification.~~

The description of the form factor in this specification does not assure that the specific component is available from suppliers. If such a form factor is supplied, it should comply with this specification to achieve interoperability between suppliers.

ABSTRACT: This specification defines the mechanical attributes of a 1U long form factor with multiple thicknesses for a ~~solid-state-driven device~~ that will fit in vertically in a standard 1U rack mounted host systems designed to support this new form factor.

This specification provides a common reference for host systems manufacturers, host system integrators, and device suppliers. This specification originates from Enterprise and Datacenter SSD Form Factor Working Group (EDSFF). Based on non-SSD devices also using EDSFF and agreement from the EDSFF Working Group, the SFF TA TWG agreed changing EDSFF to Enterprise and Datacenter Standard Form Factor.

The description of the device in this specification does not assure that the specific component is actually available from device suppliers. If such a device is supplied it shall comply with this specification to achieve interoperability between device suppliers.

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Foreword

The development work on this specification was done by the SNIA SFF TWG, an industry group. Since its formation as the SFF Committee in August 1990, the membership has included a mix of companies which are leaders across the industry.

For those who wish to participate in the activities of the SFF TWG, the signup for membership can be found at <https://www.snia.org/sff/join>.

Revision History

Rev 1.0 *February 02, 2018:*

- Initial release

Rev 1.1 *March 11, 2018:*

- Converted to the new SFF document template
- Added new name (E1.L).
- Clarified abstract.
- Updated foreword per current policy.
- Section 2.3: Corrected ASME reference for consistency.
- Section 2.4: Reordered definitions alphabetically.
- Section 3: Clarified latch/front plate may add additional length.
- Section 4: Added clarification to label placement in presence of fins.
- Section 4: Added statement that Device requires LED isolation from LED bleeding.
- Figure 4-1: Datum F placement corrected along with measurement (no change to table).
- Figure 4-4: Added label area to top of device.
- Table 4-1: Modified Dimensions A7 and C4.
- Section 5, 7: Clarified power is a recommendation.
- Section 5: Reworded light bleeding portion.
- Table 5-1: Modified nominal dimensions for C3 due to reference change to Datum W.
- Table 5-1: Modified nominal dimensions of A7, C4, D4.
- Table 5-1: Modified tolerances of A5, A7, C2, C4, C9.
- Table 5-1: Modified comment for C4.
- Section 5-2: Added Datum W to figures.
- Section 7.1: Editorial change to description.

Rev 1.1.1 *April 30, 2021:*

- Changed SSD to device and abstract edit to reflect EDSFF name change.
- Section 5: Removal of Power references apart from section 5.1 recommendations.
- Section 5.1: Clarification that both 1C and 2C card edges are allowed.
- Section 5.2: Datum name change from "Y" to "G" to align with SFF-TA-1002 Datum.
- Section 5.2: Note added for recommended ground contact.
- Section 7: Deleted informative thermal guidance. Replaced with power and thermal requirements.

Rev 1.1.2 *June 4, 2021:*

- Editorial changes to match the latest SFF document template.
- Section 5: Moved the power references in section 5.1 to an informative table.
- Section 5.1: Added statement allowing security labels to be placed anywhere on the enclosure.
- Table 5-1: Removed x and y reference to mounting hole measurements.

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1. Scope

This specification defines the mechanical attributes of a new form factor for a ~~solid-state drive~~device that will fit in 1U rack mounted host systems designed to support this form factor.

1.1 Application Specific Criteria

This 1U long form factor provides external dimensions, card edge placement, mounting holes for the front panel and latch, and LED placement to assist host system manufacturers in integration of this form factor.

The environment for the 1U long form factor is an enclosure connecting one or more ~~drives~~devices in a ~~restricted~~dedicated packaging environment.

2. References and Conventions

2.1 Industry Documents

The following documents are relevant to this specification:

- ASME Y14.5-2009 Dimensioning and Tolerancing published by ASME at <https://www.asme.org>~~Published by ASME~~
- SNIA SFF-TA-1002 Protocol Agnostic Multi-Lane High Speed Connector specification available at <https://www.snia.org>
- SNIA SFF-TA-1009 Enterprise and Datacenter Standard Form Factor Pin and Signal Specification available at <https://www.snia.org>
- SNIA SFF-TA-1023 Thermal Characterization Specification for EDSFF Devices available at <https://www.snia.org>

2.2 Sources

The complete list of SFF documents which have been published, are currently being worked on, or that have been expired by the SFF Committee can be found at <https://www.snia.org/sff/specifications>. Suggestions for improvement of this specification will be welcome, they should be submitted to <https://www.snia.org/feedback>.

Copies of ASME standards may be obtained from the American Society of Mechanical Engineers (<https://www.asme.org>).

2.3 Conventions

The following conventions are used throughout this document:

DEFINITIONS

Certain words and terms used in this standard have a specific meaning beyond the normal English meaning. These words and terms are defined either in the definitions or in the text where they first appear.

ORDER OF PRECEDENCE

If a conflict arises between text, tables, or figures, the order of precedence to resolve the conflicts is text; then tables; and finally figures. Not all tables or figures are fully described in the text. Tables show data format and values.

DIMENSIONING CONVENTIONS

The dimensioning conventions are described in ASME-Y14.5, Geometric Dimensioning and Tolerancing. All dimensions are in millimeters, which are the controlling dimensional units (if inches are supplied, they are for guidance only).

NUMBERING CONVENTIONS

The ISO convention of numbering is used (i.e., the thousands and higher multiples are separated by a space and a period is used as the decimal point). This is equivalent to the English/American convention of a comma and a period.

American	French	ISO
0.6	0,6	0.6
1,000	1 000	1 000
1,323,462.9	1 323 462,9	1 323 462.9

3. Keywords, Acronyms, and Definitions

For the purposes of this document, the following keywords, acronyms, and definitions apply.

3.1 Keywords

May: Indicates flexibility of choice with no implied preference.

May ~~or~~ may not: Indicates flexibility of choice with no implied preference.

Obsolete: Indicates that an item was defined in prior specifications but has been removed from this specification.

Optional: Describes features which are not required by the SFF specification. However, if any feature defined by the SFF specification is implemented, it shall be done in the same way as defined by the specification. Describing a feature as optional in the text is done to assist the reader.

Prohibited: Describes a feature, function, or coded value that is defined in a referenced specification to which this SFF specification makes a reference, where the use of said feature, function, or coded value is not allowed for implementations of this specification.

Reserved: Defines the signal on a connector contact ~~{when}~~ its actual function is set aside for future standardization. It is not available for vendor specific use. Where this term is used for bits, bytes, fields, and code values; the bits, bytes, fields, and code values are set aside for future standardization. The default value shall be zero. The originator is required to define a Reserved field or bit as zero, but the receiver should not check Reserved fields or bits for zero.

Restricted: Refers to features, bits, bytes, words, and fields that are set aside for other standardization purposes. If the context of the specification applies the restricted designation, then the restricted bit, byte, word, or field shall be treated as a value whose definition is not in scope of this document, and is not interpreted by this specification, a reserved bit, byte, word, or field (e.g., a restricted byte uses the same value as defined for a reserved byte).

Shall: Indicates a mandatory requirement. Designers are required to implement all such mandatory requirements to ensure interoperability with other products that conform to this specification.

Should: Indicates flexibility of choice with a strongly preferred alternative.

Vendor specific: Indicates something (e.g., a bit, field, code value) that is not defined by this specification. Specification of the referenced item is determined by the manufacturer and may be used differently in various implementations.

3.2 Acronyms and Abbreviations

EDSFF: Enterprise and Datacenter Standard Form Factor

NVM: Non-Volatile Memory

SSD: Solid State Drive

3.3 Definitions

1U: 1 Standard Unit or Rack Unit 44.45 mm (1.75 inches).

Add-In Card: Refers to the device plugged into a connector

Device: Refers to the interface ~~slave~~target

Enclosure: The housing that protects the internal components and acts as a heat sink.

Host: Refers to the interface source or ~~initiator~~master

Thickness: Form factor dimension including PCB thickness, z-height of all components plus mechanicals.

4. General Description

4.1 Configuration Overview/Descriptions

The application environment for the 1U long form factor is a cabinet or enclosure connecting to one or more add in cards. 1U refers to 1 standard unit of an IT equipment rack and the IT enclosures that fit in this space. The SSD-device form factor is intended for use in enclosures that fit within that given space. The primary usage is for SSDs-devices in storage systems that require very high capacities in a 1U. The device connects electrically to the system through a card edge connector as defined in SFF-TA-1002. The 1U long form factor is specified including an enclosure and mounting points for a latch/front plate. The latch/front plate is beyond the scope of the specification and may add additional dimensional impact beyond what is documented. There are multiple thicknesses of the 1U long form factor depending on the max power rating.

Figure 4-1 represents an example system implementation using this form factor.



Figure 4-1. Example system implementation of 1U long form factor.

5. Mechanical Specification

5.1 Overview

This section specifies the dimensions for the 1U long form factor. The dimensioning convention is per ASME-Y14.5-2009 Dimensioning and Tolerancing. For mating interface details, Datum "E" and Datum "F", refer to SFF-TA-1002. There are two thicknesses specified:

- A 9.5mm thick form factor ~~with a recommended power rating of 25W~~
- An 18mm thick form factor ~~with a recommended power rating of 40W~~

No part of the host chassis/guide rails of a host enclosure or parts connected to the mounting holes (e.g., a latch) should encroach into any part of the bounding volume of the device form factor dimensions and tolerances as specified in this standard when the device is inserted into the host enclosure.

For the label/Fin placement area and Dimension "B1" (Device Width), dimensions for a surface apply to a single point minimum. If a surface is not flat, the dimension applies to the highest raised location on that surface. Except for the card edge connector, each defined edge may have rounding. Labels shall be placed in the label/fin placement area. Security labels are permitted on any surface of the enclosure. Fins may be eliminated to accommodate the label, but integrity of the thermal solution should be ensured. The device supports either the 1C or 2C card edge as defined in SFF-TA-1002.

The device is responsible for sufficient light isolation between the two LEDs to prevent light bleed.

5.2 Physical Definition: 1U Long Form Factor

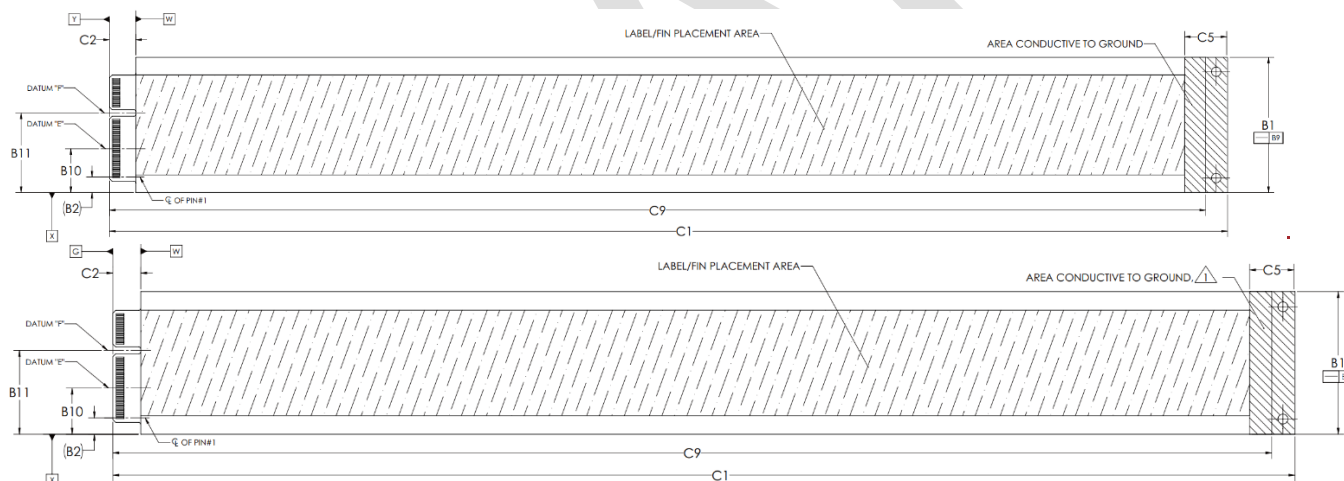


Figure 5-1. Primary Side of 1U long

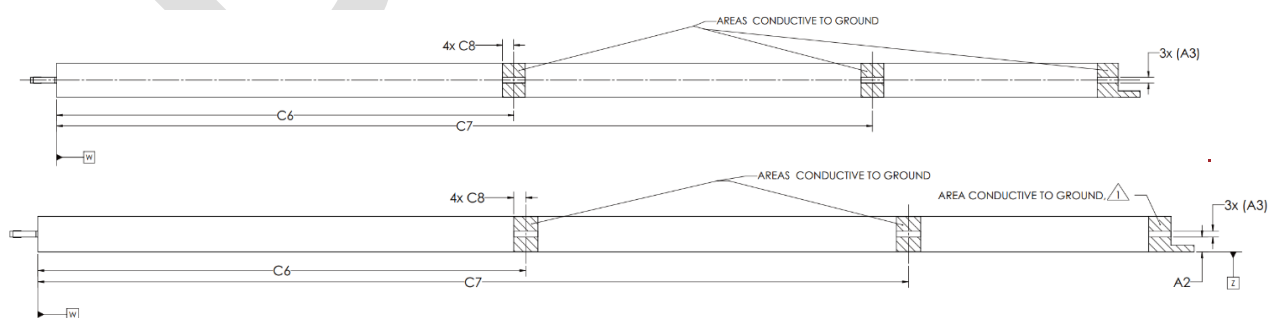
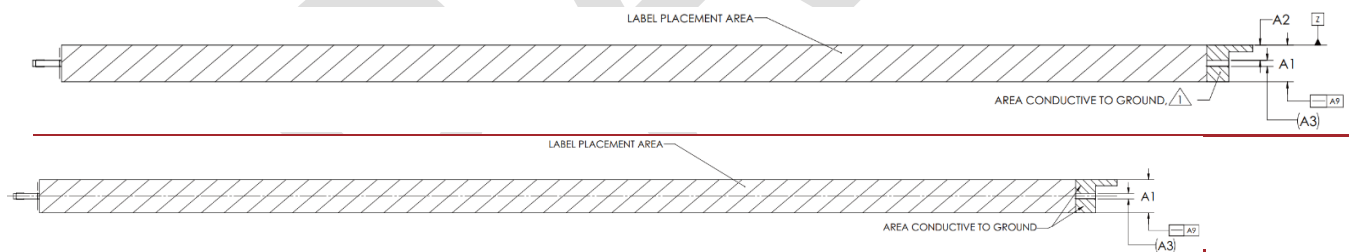
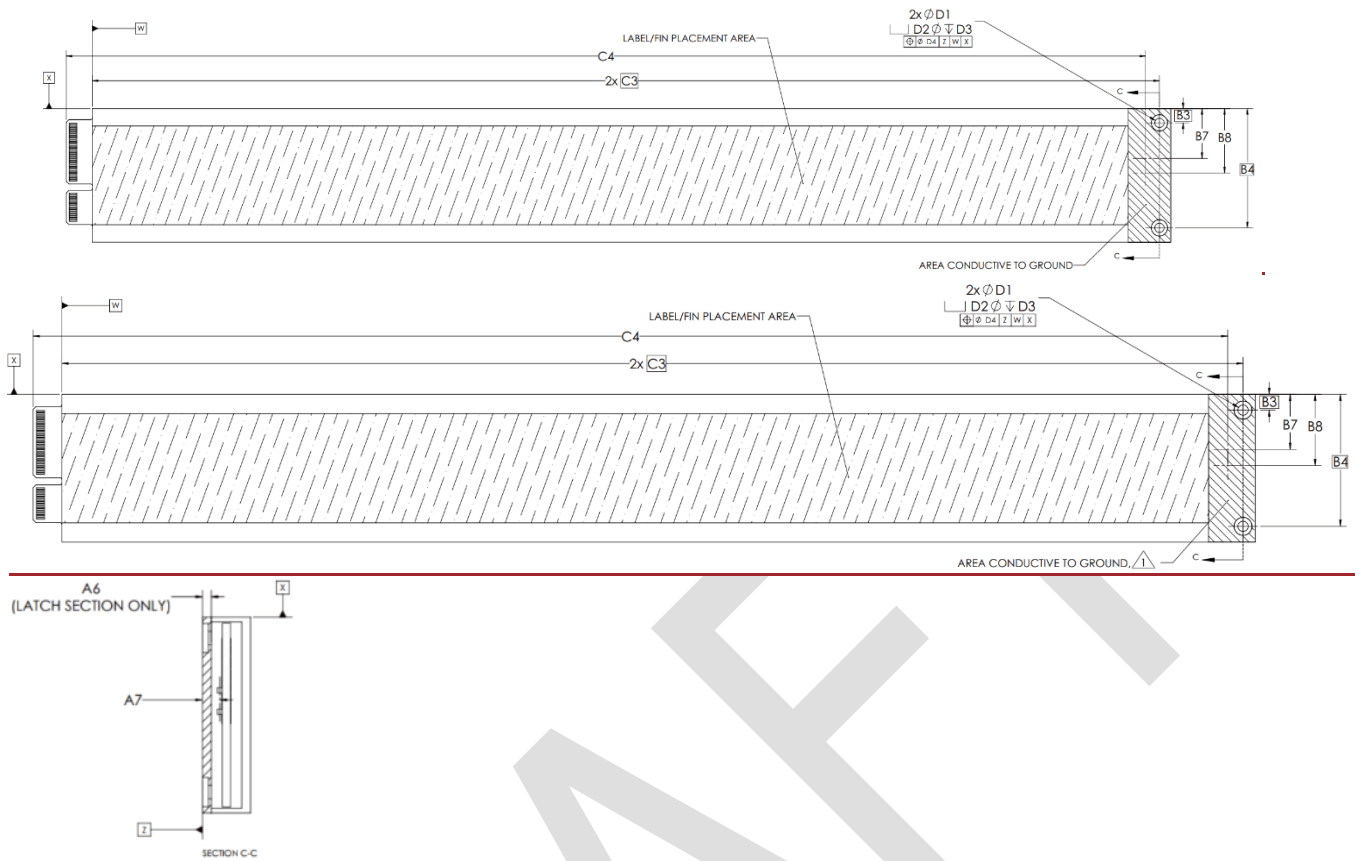


Figure 5-2. Bottom side of 1U long

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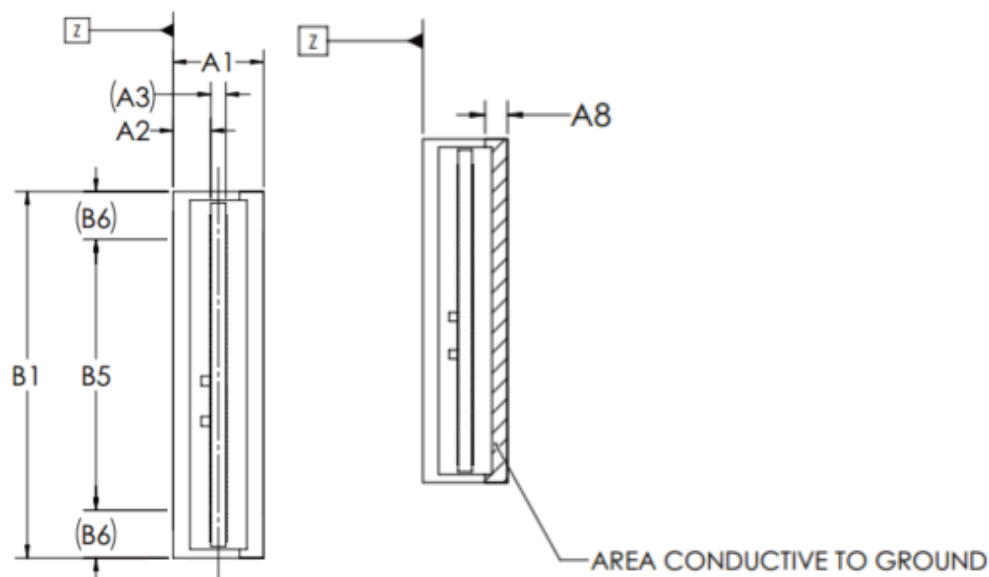


Figure 5-5. Back of 1U long (connector facing) of 9.5mm Thick (25W) device

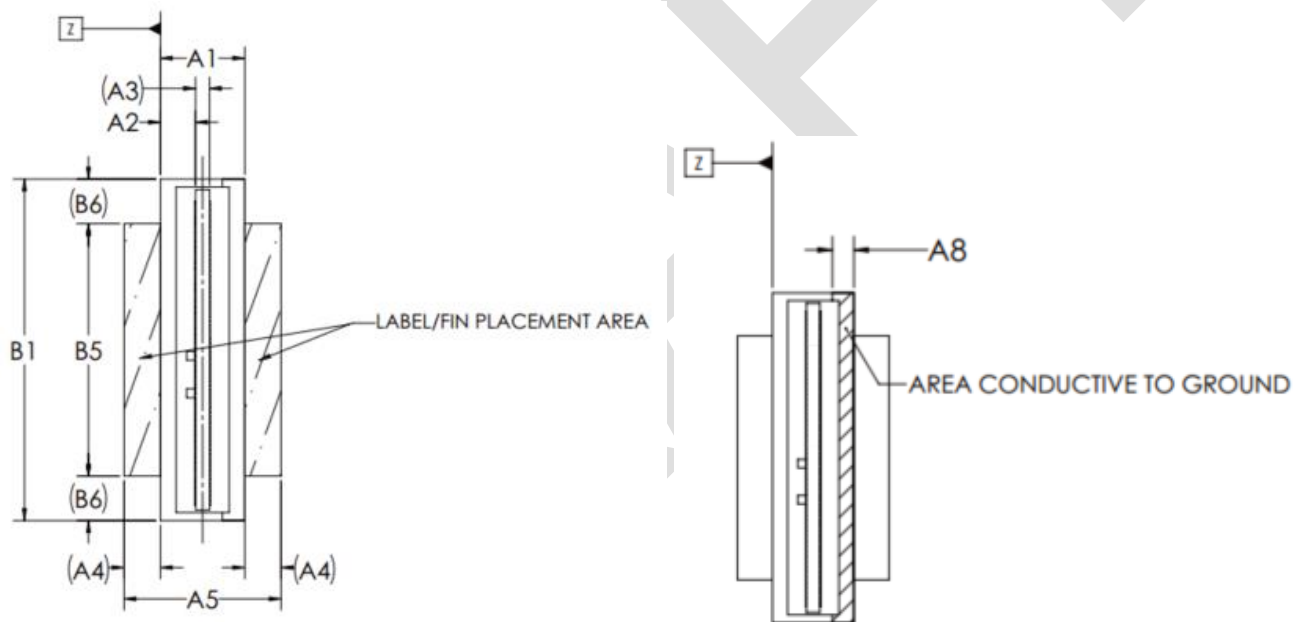


Figure 5-6. Back of 1U long (connector facing) of 18mm Thick (40W) device

Notes:

1. Recommendation that host makes grounding contact to at least 1 of these surfaces at the front of the device.

5.2.1 1U Long Form Factor

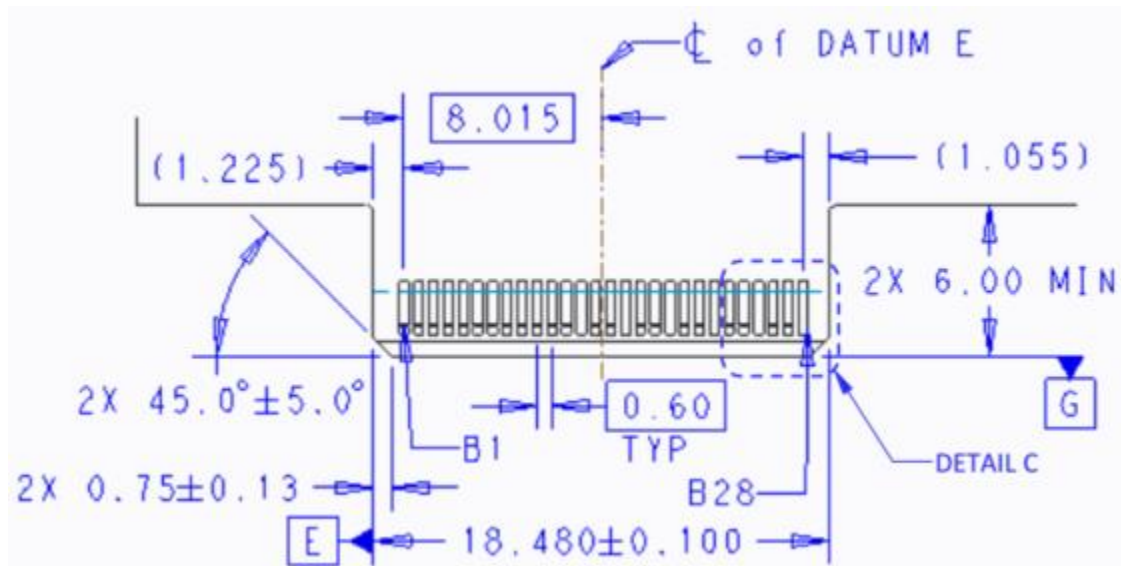
Table 5-1. 1U Long Form Factor Dimensions

Dimensions	Millimeters	Tolerance	Comment
A1	9.5	0.35	Device Thickness for 25W-max 9.5mm device
A2	3.96	0.15	PCB Card Edge location
A3	1.57	REF	PCB card edge Thickness (Ref: See SFF-TA-1002)
A4	4.25	REF	Fin height (reference)
A5	18	+0.35/-0.60	Device thickness including fins for 40W-max 18mm device
A6	2.2	0.15	Latch mounting area thickness
A7	3.46	0.50	LED center position
A8	2.35	MIN	Conductive area thickness on back of drive device
A9	0.4	MAX	Straightness
B1	38.4	0.25	Device width
B2	4.4	REF	Center - Connector Pin A1 location from Datum X
B3	4.1	BASIC	Mounting Hole 1 -y position
B4	34.3	BASIC	Mounting Hole 2 -y position
B5	28.4	0.25	Fin, label placement region
B6	5	REF	Host alignment structure region (reference)
B7	14.33	0.35	Attention or error (Amber) LED center position
B8	18.53	0.35	Power and activity (Green) LED center position
B9	0.4	MAX	Straightness
B10	12.415	0.35	Control dimension for x4 card edge; TA-1002 DATUM "E"
B11	22.605	0.35	Control dimension for x8 card edge; TA-1002 DATUM "F"
C1	318.75	0.55	Device length
C2	7.5	0.25	Card edge length
C3	308	BASIC	Mounting Hole 1 -x and 2 -x position
C4	311.05	0.45	LED edge closest to latch area
C5	12	MIN	Minimum Conductive area length
C6	131.3	0.15	Bottom conductive area 1 -x position
C7	234.3	0.15	Bottom conductive area 2 -x position
C8	3.2	MIN	Bottom conductive area length
C9	312.5	+0.15/-0.95	Datum -Y G to latch area keep out zone
D1	2.7	0.15	
D2	4.7	0.15	
D3	1.2	0.1	
D4	0.25	MAX	Position Tolerance

6. Informative: SFF-TA-1002 edge (plug) Mechanical drawing

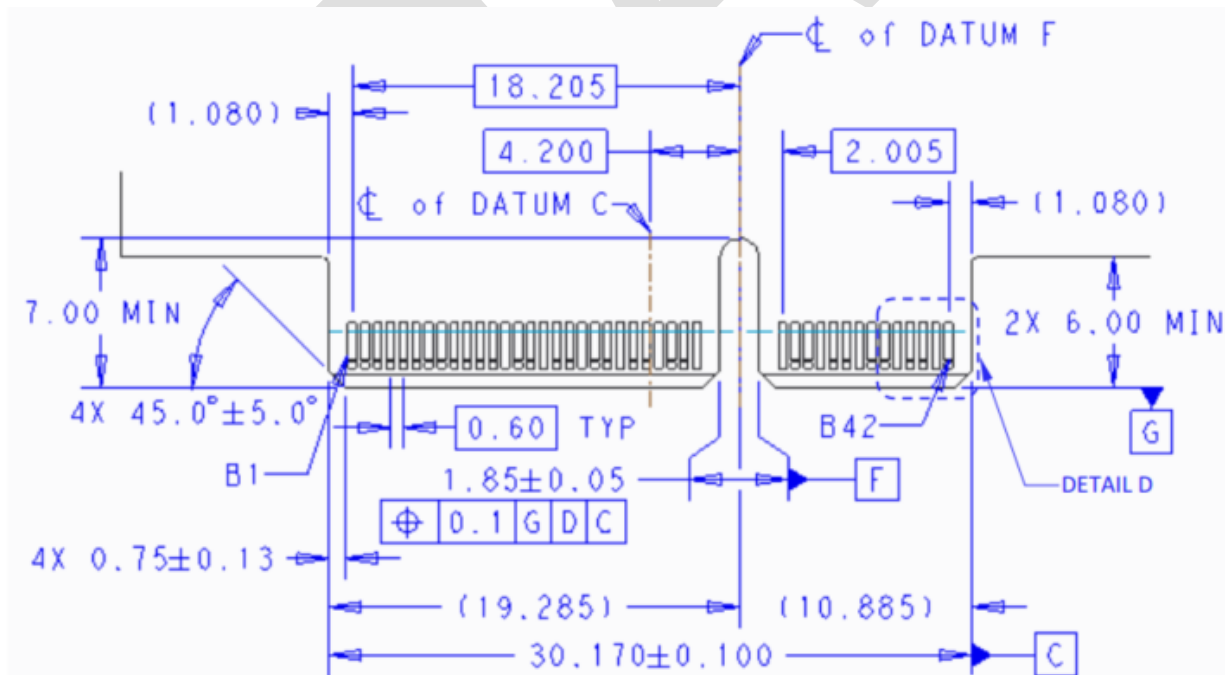
6.1 Overview

This section shows the card edge mechanical drawing for convenience only. See SFF-TA-1002 for normative and performance requirements.



Note: Position A1 on opposite side of card of B1

Figure 6-1. 1C (x4) Mating Card Dimensions



Note: Position A1 on opposite side of card of B1

Figure 6-2. 2C (x8) Mating Card Dimensions

7. E1.L Power/Thermal Requirements

The following section covers the power and thermal requirements of the device.

7.1 Power

Table 7-1 defines the initial slot power limit for the device. For more details about this and other power requirements, refer to SFF-TA-1009 *Enterprise and Datacenter Standard Form Factor Pin and Signal Specification*.

Table 7-1. Power Requirements for a 1U short (E1.L) system implementation

Parameter	E1.L
Initial Slot Power Limit (12Vpinit)	25 W

7.2 Thermals

For detailed device thermal requirements, refer to SFF-TA-1023 *Thermal Specification for EDSFF Devices*.

7.3 Informative: Recommended Max Power

Table 7-2 defines the recommended maximum sustained power allowed by each device variation.

Table 7-2. Maximum Form Factor Power

Device	E1.L (9.5mm)	E1.L (18 mm)	Comment
Max Power	25 W	40 W	Refer to Section 7.2

~~7. Informative: System Thermal Design Guidelines~~

~~7.1 Overview~~

~~The following thermal guidelines are provided to assist in the storage subsystem implementation of the EDSFF 1U long form factor specification. An example implementation is shown in Figure 7-1. In this example, there are 32, 9.5mm thick add in cards connected to a midplane with fans pulling air across the add in cards. Each add in card plugs into a connector that is mounted onto the midplane.~~

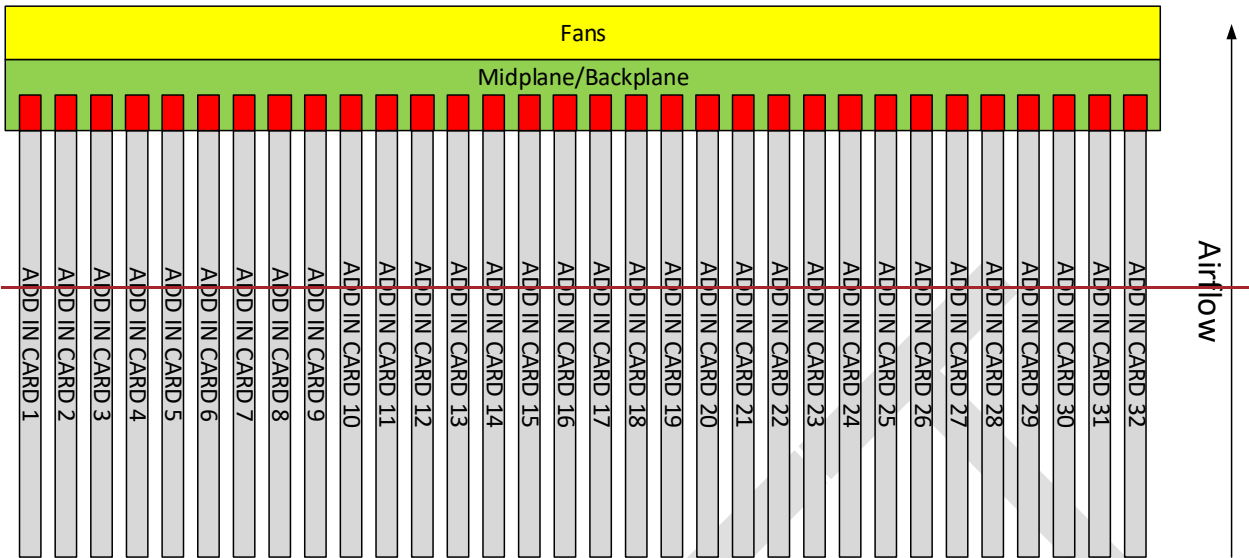


Figure 7-1. Example implementation of 1U long add in cards in an enclosure (Top View)

There are 2 thickness for 1U long add in cards: 9.5mm and 18mm. The 9.5mm thick add in card has an enclosure which helps spread the heat but is not sufficient beyond a certain power. The 18mm thick add in card adds a heat sink to the implementation which allows for better cooling at the expense of less add in cards being able to fit within the enclosure. This may be used for higher power or lower airflow support versus the 9.5mm thick device. Details of the heatsink are outside the scope of this specification and are add in card design dependent. **It is highly recommended that with the 18mm thick add in card, the heatsink implements fins to allow a larger cooling surface with sufficient airflow.**

To prevent the add in cards from throttling or overheating, system guidelines for both the 9.5mm and 18mm thick add in cards are provided in Table 7-1.

Table 7-1. Thermal guidelines for a 1U long system implementation

Enclosure Parameter	9.5mm thick device	18mm thick device- (low fan)	18mm thick device- (high fan)
Recommended sustained power (W)	25	25	40
Add in card Touch point Temperature limit (°C)	70	70	70
Enclosure Max Inlet air temperature, < 950 m (°C)	40	40	40
Enclosure Max Inlet air temperature, 950 m to 3050 m (°C)	40 (1° C for every 175 m over 950 m)	40 (1° C for every 175 m over 950 m)	40 (1° C for every 175 m over 950 m)
Add in card to add in card pitch (mm)	12.5	19	19
Fan Pressure Deficit across device, Min (Pascal)	197	67	137
Airflow, average min per device (CFM). 1 CFM = 1.7 m³/h)	3.6 (0.06 CFM for every 1° C below 40° C inlet temp)	3.6 (0.08 CFM for every 1° C below 40° C inlet temp)	5.9 (0.15 CFM for every 1° C below 40° C inlet temp)