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SFF-TA-1007

Specification for

Enterprise and Datacenter 1U Long SSD Form Factor

Rev 1.0.0

February 7, 2018

Secretariat: SFF TA TWG

Abstract: This specification defines the mechanical attributes of a 1U long form factor with multiple thicknesses for a solid state drive that will fit in 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).

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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- Results of IP Disclosures: <http://www.snia.org/sffdisclosures>
- SNIA IP Policy: <http://www.snia.org/ippolicy>

Change History

February 2018 – Initial Release

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.

When 2 1/2" diameter disk drives were introduced, there was no commonality on external dimensions e.g. physical size, mounting locations, connector type, and connector location, between vendors. The SFF Committee provided a forum for system integrators and vendors to define the form factor of disk drives.

During their definition, other activities were suggested because participants in SFF faced more challenges than the form factors. In November 1992, the charter was expanded to address any issues of general interest and concern to the storage industry. The SFF Committee became a forum for resolving industry issues that are either not addressed by the standards process or need an immediate solution.

In July 2016, the SFF Committee transitioned to SNIA (Storage Networking Industry Association), as a TA (Technology Affiliate) TWG (Technical Work Group).

Industry consensus is not a requirement to publish a specification because it is recognized that in an emerging product area, there is room for more than one approach. By making the documentation on competing proposals available, an integrator can examine the alternatives available and select the product that is felt to be most suitable.

SFF meets during the T10 (see www.t10.org) and T11 (see www.t11.org) weeks, and SSWGs (Specific Subject Working Groups) are held at the convenience of the participants. Material presented to SFF becomes public domain, and there are no restrictions on the open mailing of the presented material by Members.

Many of the specifications developed by SFF have either been incorporated into standards or adopted as standards by ANSI, EIA, JEDEC and SAE.

For those who wish to participate in the activities of the SFF TWG, the sign up for membership can be found at:

<http://www.snia.org/sff/join>

The complete list of SFF Specifications which have been completed or are currently being worked on by the SFF Committee can be found at:

<http://www.snia.org/sff/specifications/SFF-8000.xls>

If you wish to know more about the SFF TWG, the principles which guide the activities can be found at:

<http://www.snia.org/sff/specifications/SFF-8032.PDF>

Suggestions for improvement of this specification will be welcome, they should be submitted to:

<http://www.snia.org/feedback>

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1. Scope

This specification defines the mechanical attributes of a new form factor for a solid state drive 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 in a restricted packaging environment.

1.2 Copyright

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Suggestions for revisions should be directed to <http://www.snia.org/feedback/>

2. References

2.1 Industry Documents

- ASME Y14.5-2009 published by ASME
- SNIA SFF-TA-1002 Protocol Agnostic Multi-Lane High Speed Connector specification available at <http://www.snia.org>.

2.2 Sources

There are several projects active within the SFF TWG. The complete list of specifications which have been completed or are still being worked on are listed in <http://www.snia.org/sff/specifications/SFF-8000.xls>

ASME documents are available at <https://www.asme.org>

2.3 Conventions

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

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

2.4 Definitions

For the purpose of SFF Specifications, the following definitions apply:

Host: Refers to the interface source or master

Device: Refers to the interface slave

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

1U: 1 Standard Unit or Rack Unit 44.50 mm (1.752 inches).

NVM: Acronym for Non-Volatile Memory

SSD: Acronym for Solid State Drive

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

3. General Description

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 form factor is intended for use in enclosures that fit within that given space. The primary usage is for SSDs 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. There are multiple thicknesses of the 1U long form factor depending on the max power rating. Figure 3-1 represents an example system implementation using this form factor.

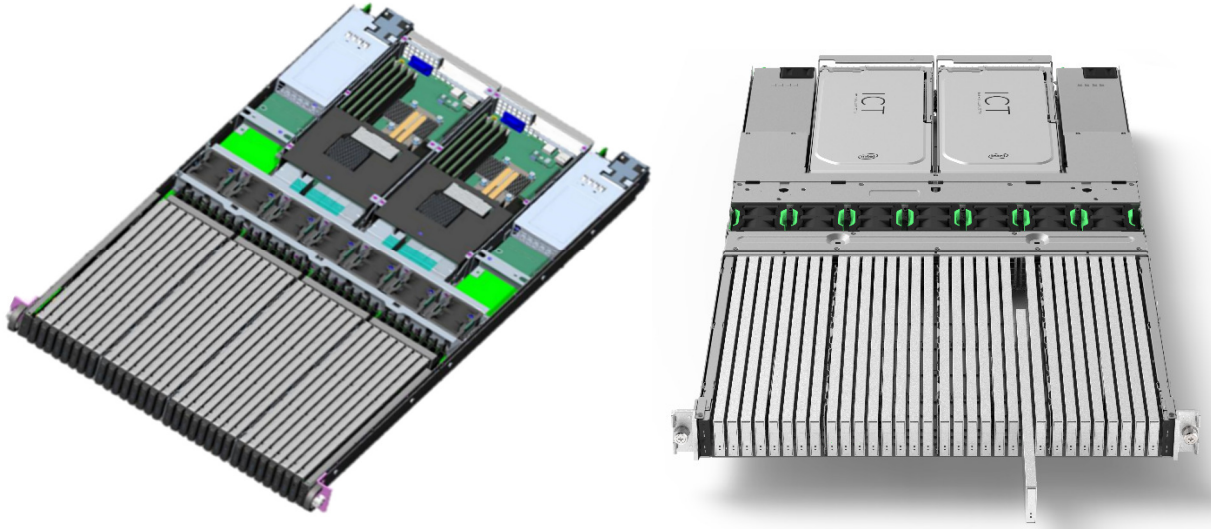


FIGURE 3-1. EXAMPLE SYSTEM IMPLEMENTATION OF 1U LONG FORM FACTOR.

4. Physical Definition: 1U Long Form Factor

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 in addition to Datum “E” and Datum F”, refer to SFF-TA-1002. There are two thicknesses specified:

- A 9.5mm thick form factor with a max sustained power rating of up to 25W
- An 18mm thick form factor with a max sustained power rating of up to 40W

No part of the host chassis/guide rails of a host enclosure 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.

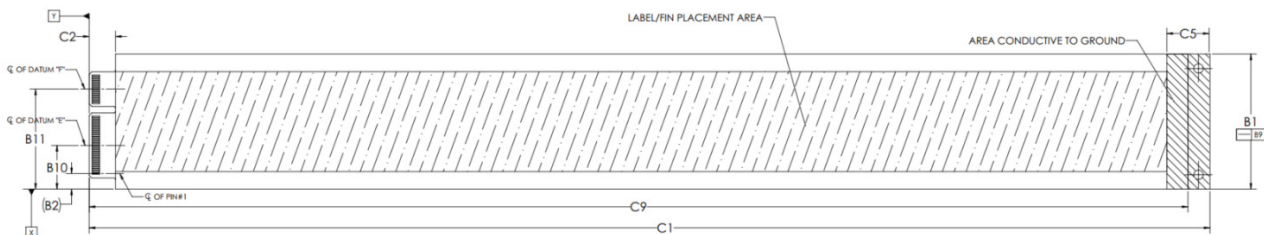


FIGURE 4-1. PRIMARY SIDE OF 1U LONG

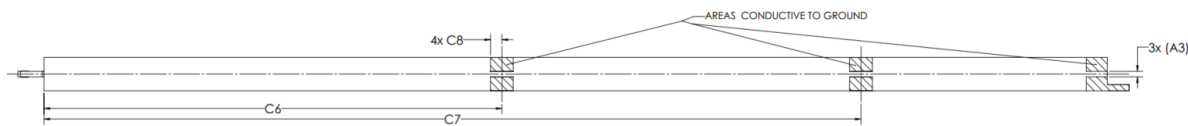


FIGURE 4-2. BOTTOM SIDE OF 1U LONG

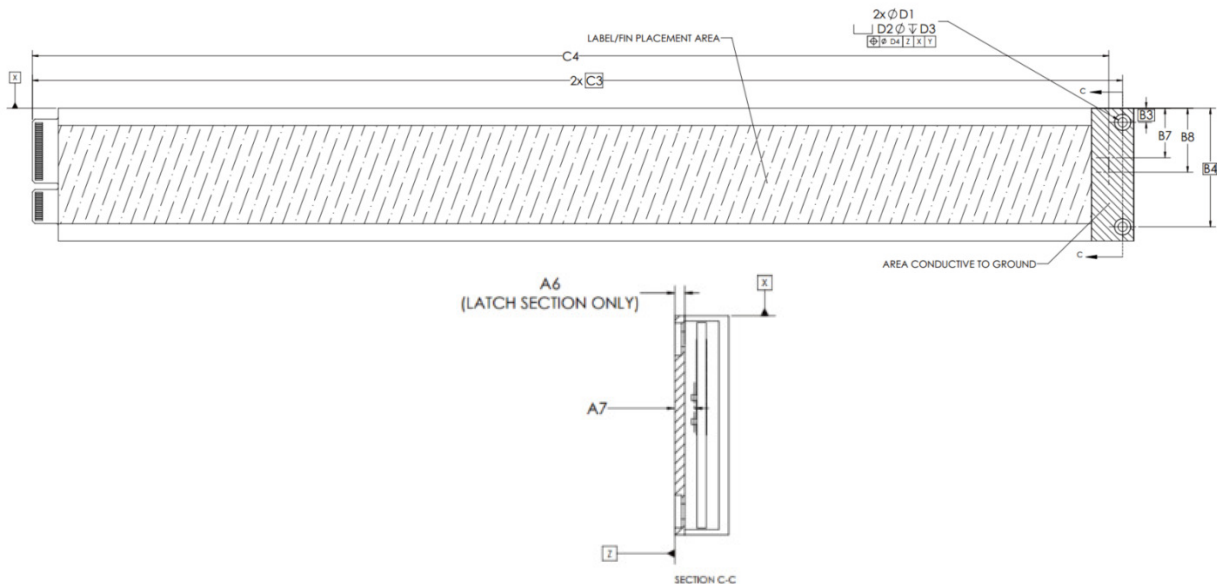


FIGURE 4-3. SECONDARY SIDE OF 1U LONG AND LATCH SECTION



FIGURE 4-4. TOP SIDE OF 1U LONG

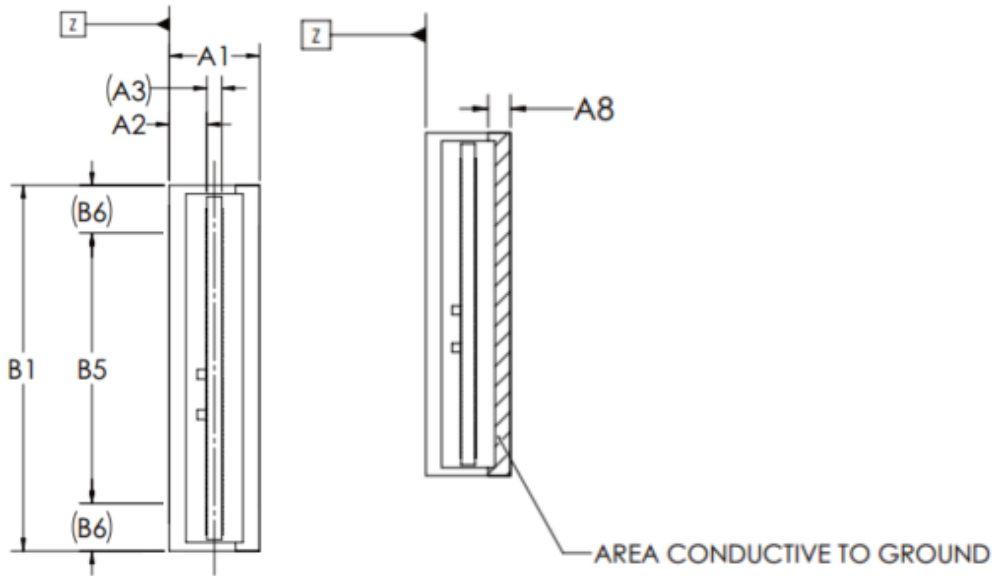
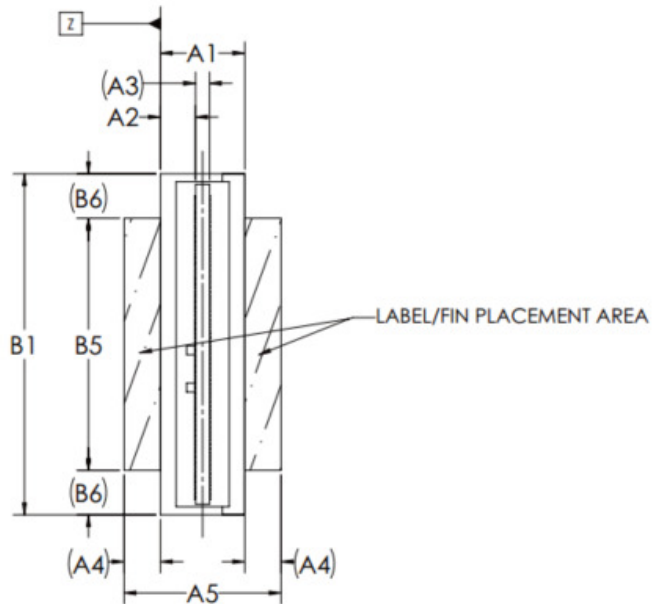


FIGURE 4-5. BACK OF 1U LONG (CONNECTOR FACING) OF 9.5MM THICK (25W)



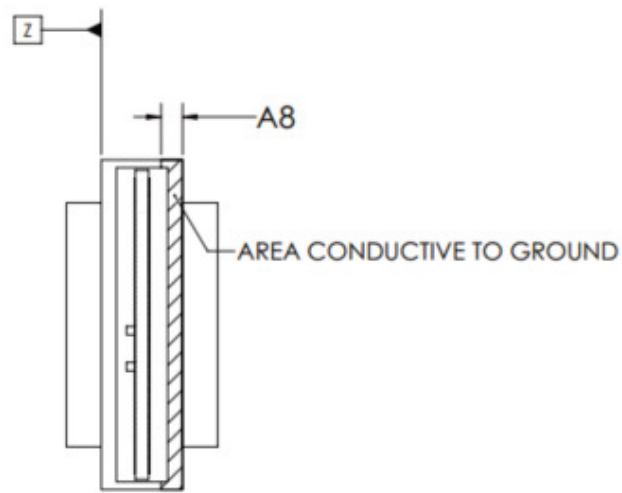


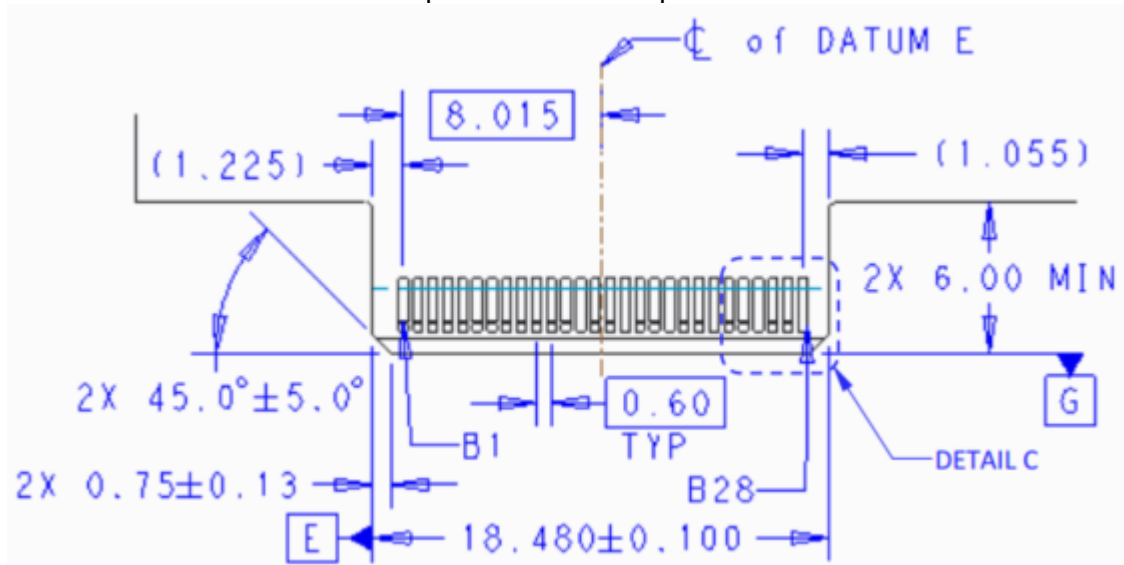
FIGURE 4-6. BACK OF 1U LONG (CONNECTOR FACING) OF 18MM THICK (40W)

Dimensions	Millimeters	Tolerance	Comment
A1	9.5	0.35	Device Thickness for 25W max 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	Device thickness including fins for 40W max device
A6	2.2	0.15	Latch mounting area thickness
A7	3.44	0.15	LED center position
A8	2.35	MIN	Conductive area thickness on back of drive
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	0.15	Card edge length
C3	315.5	BASIC	Mounting Hole 1 x and 2 x position
C4	311.5	MAX	Maximum LED position
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	Datum Y to latch area keep out zone
D1	2.7	0.15	
D2	4.7	0.15	
D3	1.2	0.1	
D4	0.3	MAX	Position Tolerance

TABLE 4-1. 1U LONG FORM FACTOR DIMENSIONS

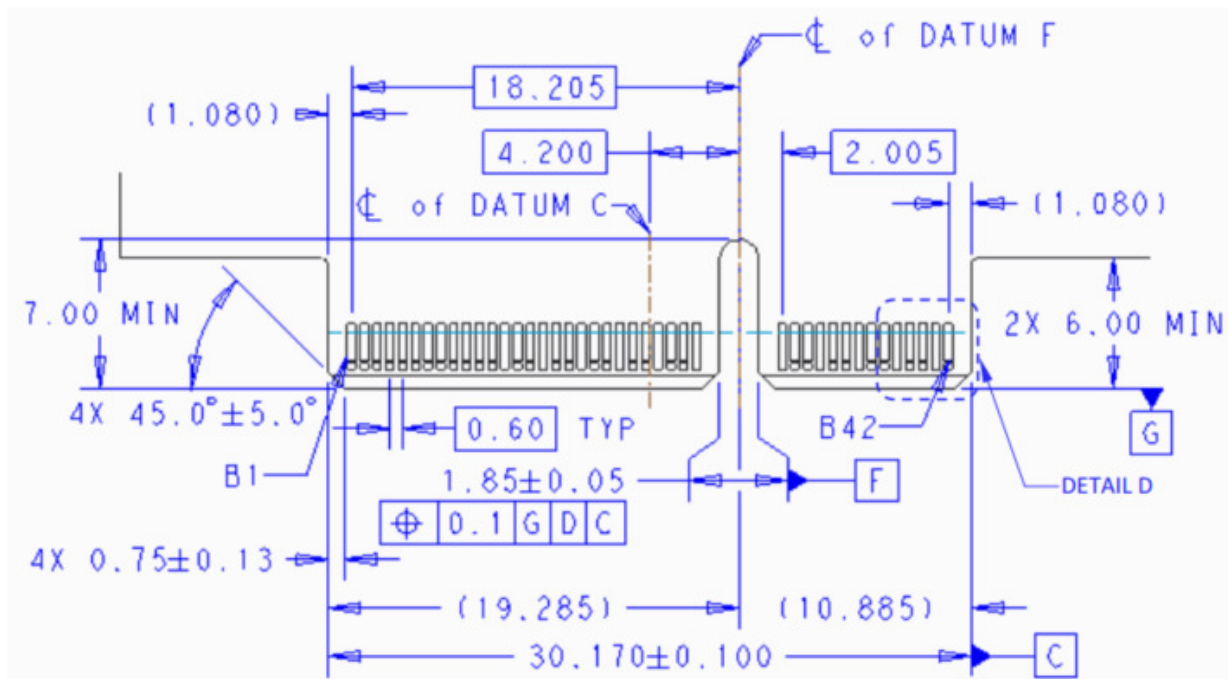
5. Informative: SFF-TA-1002 edge (plug) Mechanical drawing

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 5-1. 1C (X4) MATING CARD DIMENSIONS



Note: Position A1 on opposite side of card of B1

FIGURE 5-2. 2C (X8) MATING CARD DIMENSIONS

6. Informative: System Thermal Design Guidelines

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 6-1. 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.

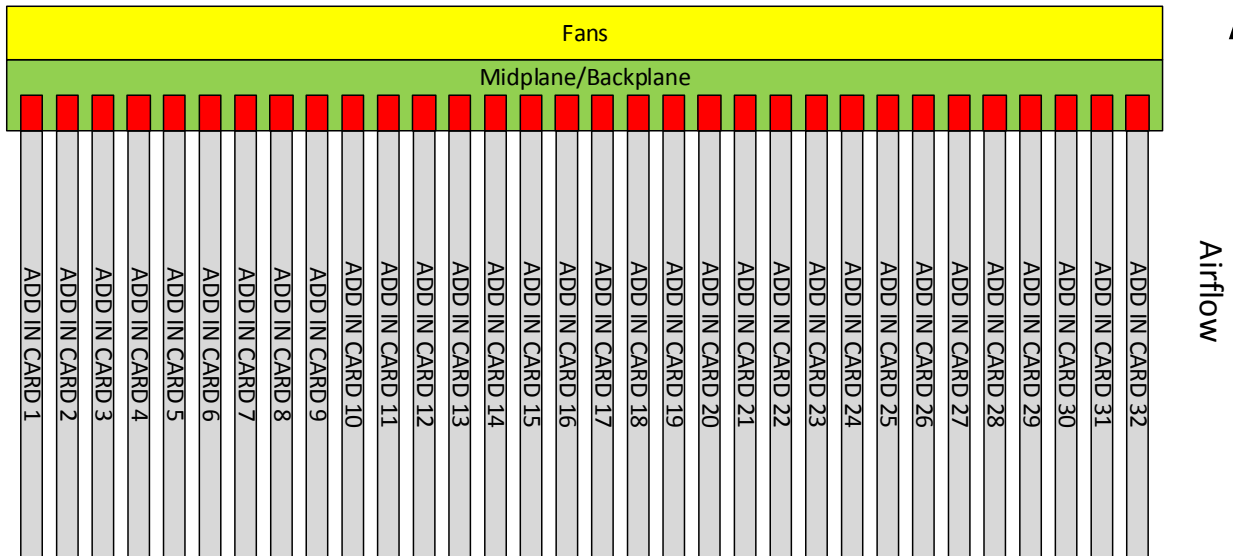


FIGURE 6-1. EXAMPLE IMPLEMENTATION OF 1U LONG ADD IN CARDS IN AN ENCLOSURE (TOP VIEW)

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 can 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 6-1.

Enclosure Parameter	9.5mm thick device	18mm thick device (low fan)	18mm thick device (high fan)
Recommended max 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 m ³ /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)

TABLE 6-1. THERMAL GUIDELINES FOR A 1U LONG SYSTEM IMPLEMENTATION