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## SFF-TA-1008

Specification for

### Enterprise and Datacenter SSD 3" Form Factor

Revision 1.0

March 30, 2018

Secretariat: SFF TA TWG

**Abstract:** This specification defines the mechanical attributes of a 3" (76mm) height form factor media device with dual length and thickness variants that will be used in 2U and 1U rack mounted host systems designed to support this form factor.

This specification provides a common reference for systems manufacturers, system integrators, and suppliers. This specification originates from Enterprise and Datacenter SSD Form Factor Working Group (EDSFF).

This specification is made available for public review, and written comments are solicited from readers. Comments received by the members will be considered for inclusion in future revisions of this specification.

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 suppliers.

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### Intellectual Property

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

### Change History

Rev 0.0.1 – First draft of specification formatted per SNIA guidelines

Rev 0.0.2 – Updated with the new foreword and SNIA intellectual property disclaimer

Rev 0.0.3 – Updated document with the latest template changes

Rev 0.0.4 – Updated document per the agreed comment resolutions

Rev 0.0.5 – Updated drawings per the agreed comment resolutions

Rev 1.0 – 1.0 Spec with editorial fixes to TOC and Fig 4-4, 4-5, 4-6, 5-1, 5-2, 5-3.

**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, 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](http://www.t10.org)) and T11 (see [www.t11.org](http://www.t11.org)) weeks, and SSWG's (Specific Subject Working Groups) are held at the convenience of the participants.

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 signup 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 is contained in the document SFF-8000 which can be found at:

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

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 3" high form factor for a device that fits in rack mounted host systems designed to support this form factor.

### 1.1 Application Specific Criteria

This form factor spec provides external dimensions, card edge placement, mounting hole locations, and LED placements to assist device and system manufacturers in design and integration of this form factor.

The environment for the form factor is an enclosure connecting one or more of the devices in a restricted packaging environment.

### 1.2 Copyright

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### 1.3 Disclaimer

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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 Dimensioning and Tolerancing published by ASME
- SNIA SFF-TA-1002 Protocol Agnostic Multi-Lane High Speed Connector specification
- SNIA SFF-TA-1009 Enterprise and Datacenter SSD Pin and Signal specification

### 2.2 Sources

There are several projects active within the SFF Committee. The complete list of specifications which have been completed or are still being worked on is contained in the document SFF-8000 which can be found at <http://www.snia.org/sff/specifications>

### 2.3 Conventions

The dimensioning conventions are described in ANSI-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).

Copies of ANSI standards may be purchased from the International Committee for Information Technology Standards (<http://www.techstreet.com/incitsgate.tpl>).

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:

**Mandatory:** Indicates items to be implemented as defined by this specification

**May:** Indicates flexibility of choice with no implied preference

**Optional:** This term 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. If there is a conflict between text and tables on a feature described as optional, the table shall be accepted as being correct.

**Reserved:** Where this term is used for defining the signal on a connector contact 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.

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

**Should:** Indicates flexibility of choice with a strongly preferred alternative. Equivalent to the phrase “it is recommended”.

## 2.5 Terms

**Host:** Refers to the interface source or master.

**Device:** Refers to the interface slave.

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

**2U:** 1 Standard Unit or Rack Unit 88.90 mm (3.50 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 3" form factor is a cabinet or enclosure connecting to one or more devices. The device connects electrically to the system through a card edge connector as defined in SFF-TA-1002. This form factor is intended for use in enclosures that fit within either a 1U or a 2U space (e.g., 1U refers to 1 standard unit of an IT equipment rack and the IT enclosures that fit in this space).

The primary usage is for SSDs in storage systems.

The form factor is specified including an enclosure, with two (2) mounting holes at the front of the device enclosure and two (2) additional mounting holes at the side of the device enclosure which may be used for latch and/or carrier attachment points. The latch/carrier is beyond the scope of the specification.

The form factor specifies the locations for two (2) LEDs as defined by the SFF-TA-1009 specification.

There are two thicknesses and two lengths of the 3" (76mm) form factor defined in this specification.

Figure 3-1 and 3-2 represent examples of two possible system implementations using the 3" form factor.

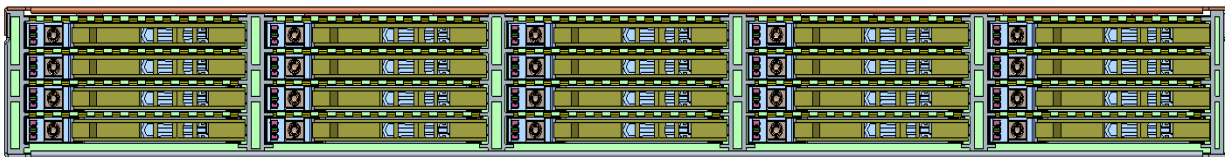


Figure 3-1. Example of a 1U system implementation with the 3" form factor

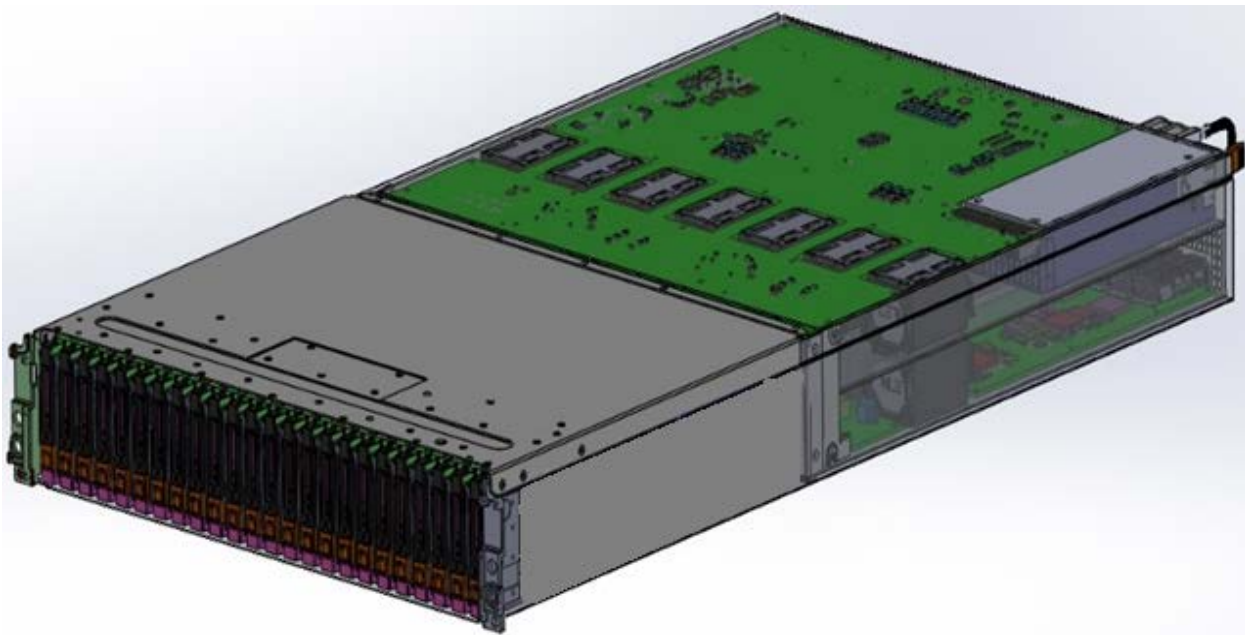


Figure 3-2. Example of a 2U system implementation with the 3" form factor



#### 4. Physical Configurations: 3" Form Factor

This section specifies the dimensions for the 3" form factor. For mating interface details refer to SFF-TA-1002.

There are two thicknesses and two lengths specified for the 3" form factor.

Note 1: Unless where indicated by Note 1(Ⓜ) or diameter targets for specific areas, 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. Unless otherwise specified, the tolerance of the diameter defined by the diameter targets is +/- 0.5mm.

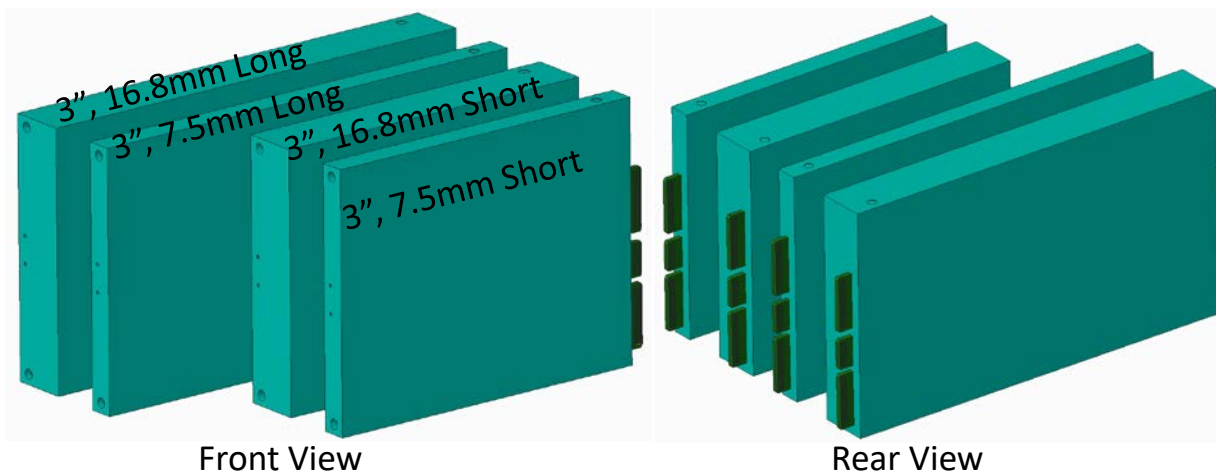
##### 4.1 Datum references

For all the dimensions shown for the different variants of the 3" form factor within this specification, the datums listed in Table 4-1 are defined by the SFF-TA-1002 specification mating card variants.

Datum	Reference
D	SFF-TA-1002
E	SFF-TA-1002
F	SFF-TA-1002
G	SFF-TA-1002

Table 4-1. Datum references for 3" Form Factor Dimensions

##### 4.2 EDSFF 3" Form Factor physical dimensions



Note: Shape of each form factor shown as example only.

Figure 4-1. Overview of 3" Form Factors

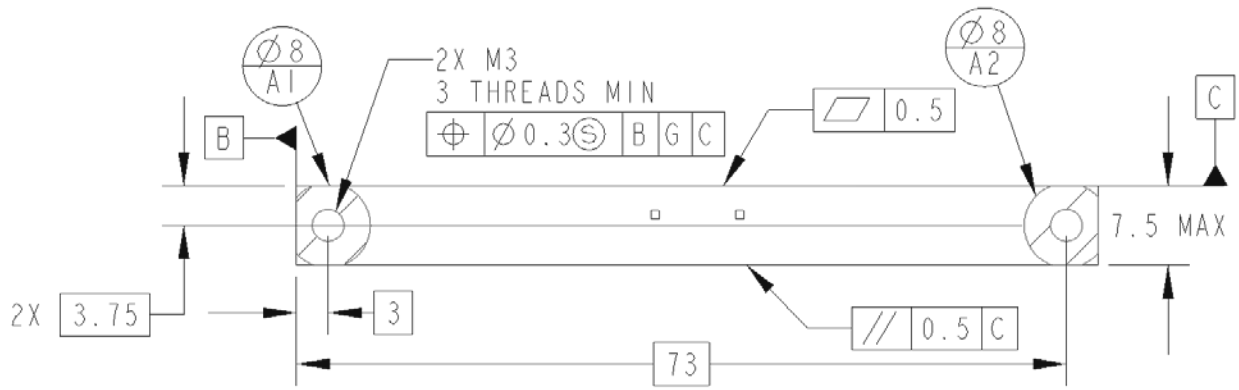
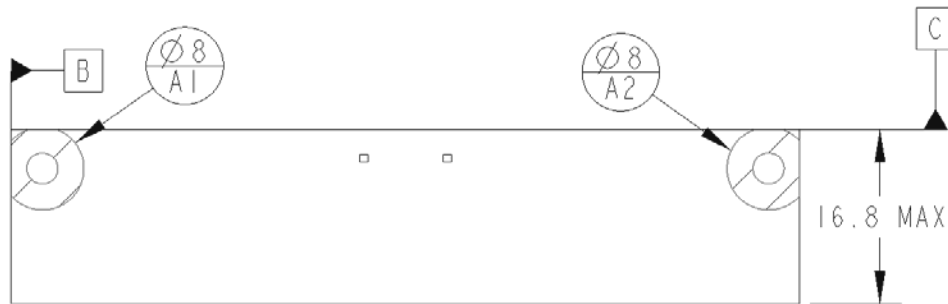


Figure 4-2. Front View of 3" Form Factor (7.5mm Thick)



Note: Dimensions not shown identical to 3", 7.5mm Form Factor

Figure 4-3. Front View of 3" Form Factor (16.8mm Thick)

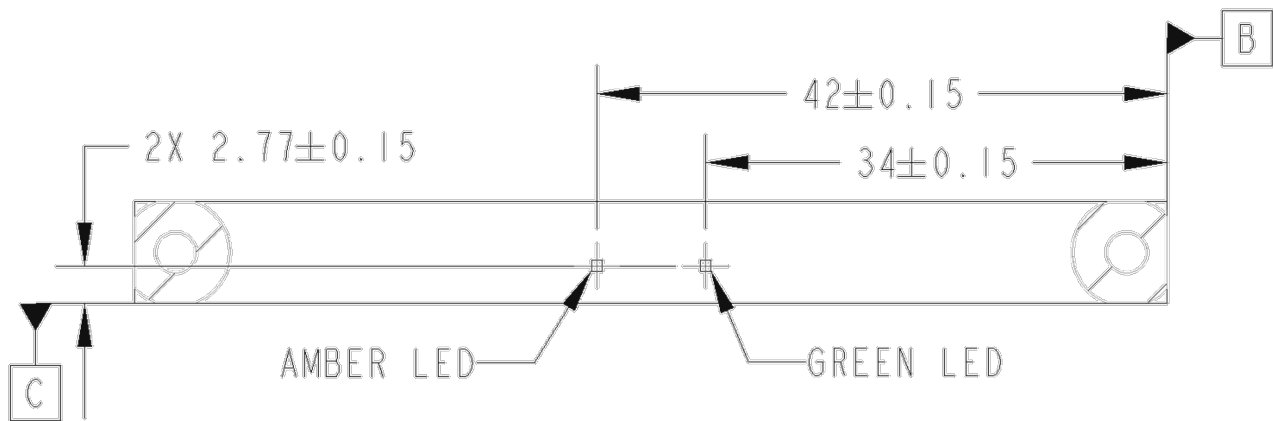


Figure 4-4. LED Position of all 3" Form Factor (7.5mm and 16.8mm Thick)

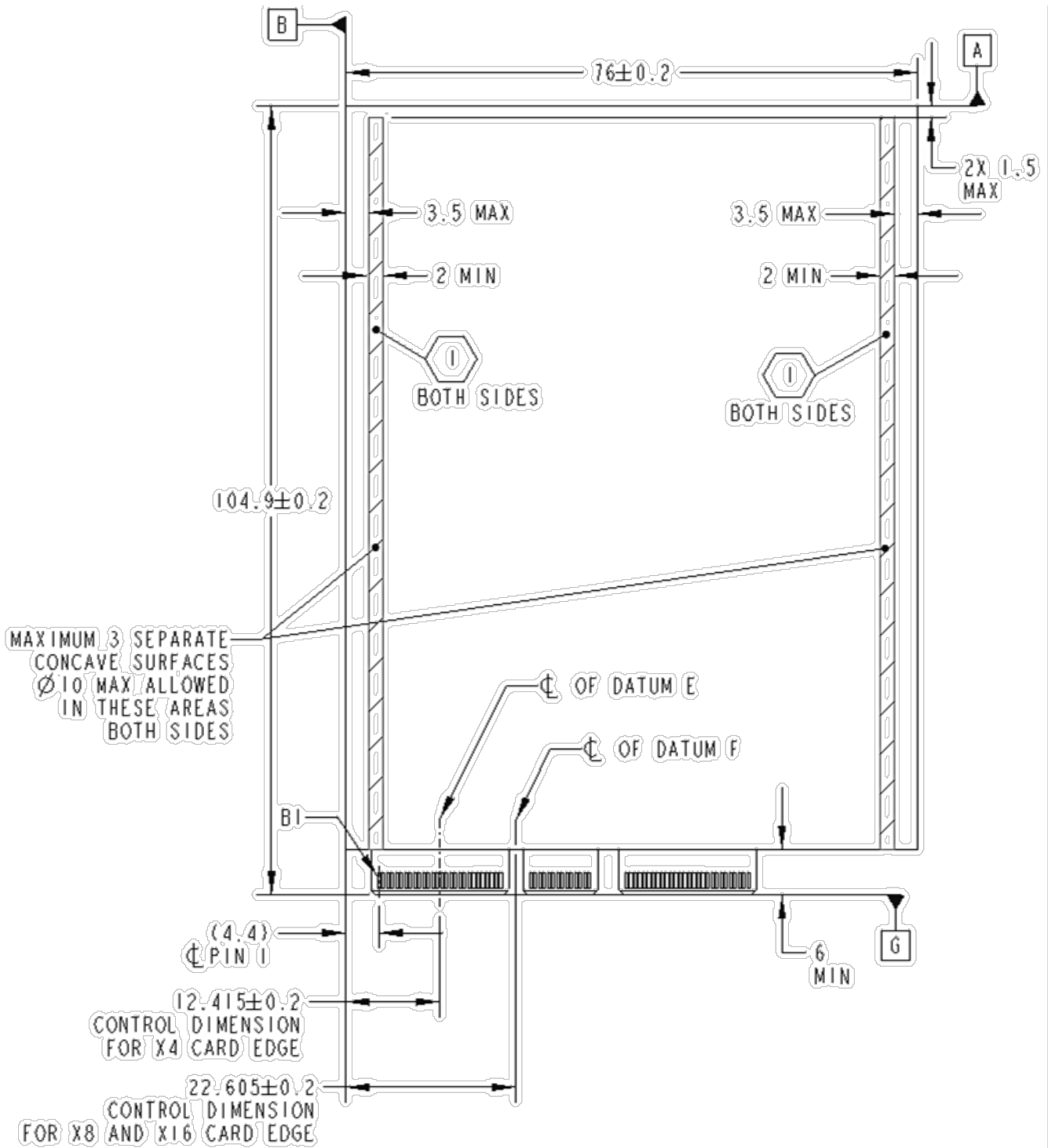
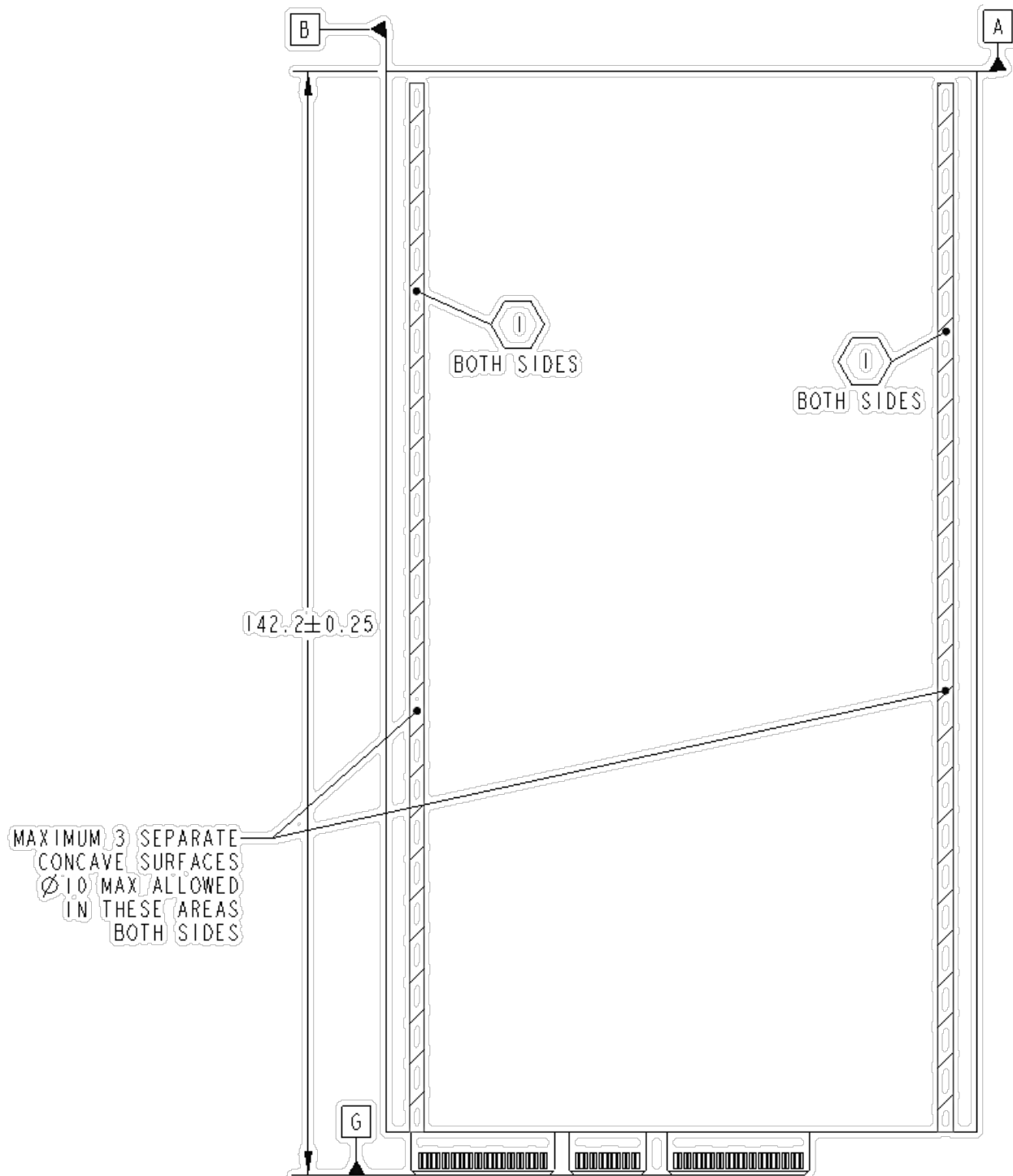


Figure 4-5. Top View of 3" Short Form Factor (7.5mm & 16.8mm)



Note: Dimensions not shown identical to 3" Short Form Factor

Figure 4-6. Top View of 3" Long Form Factor

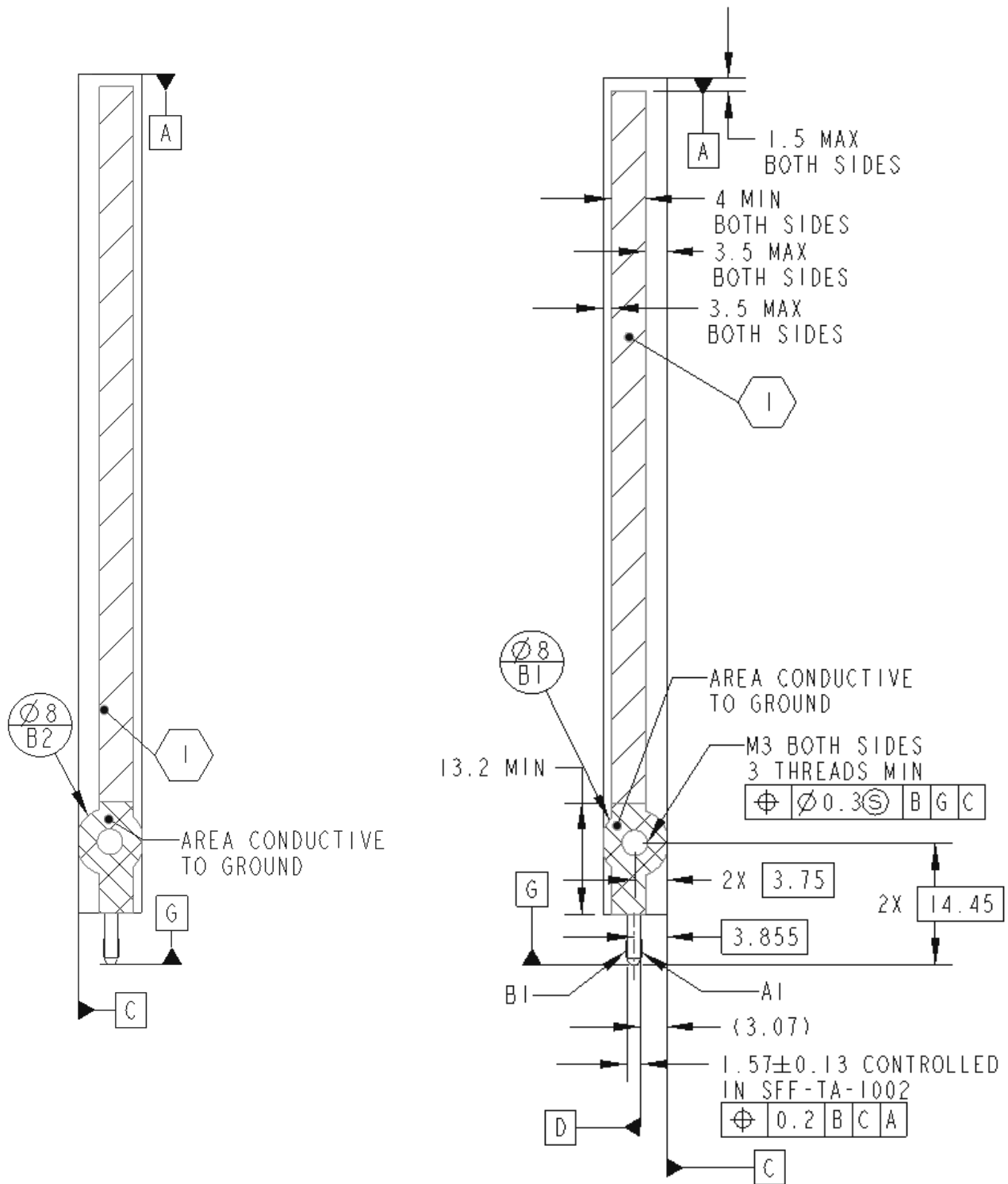
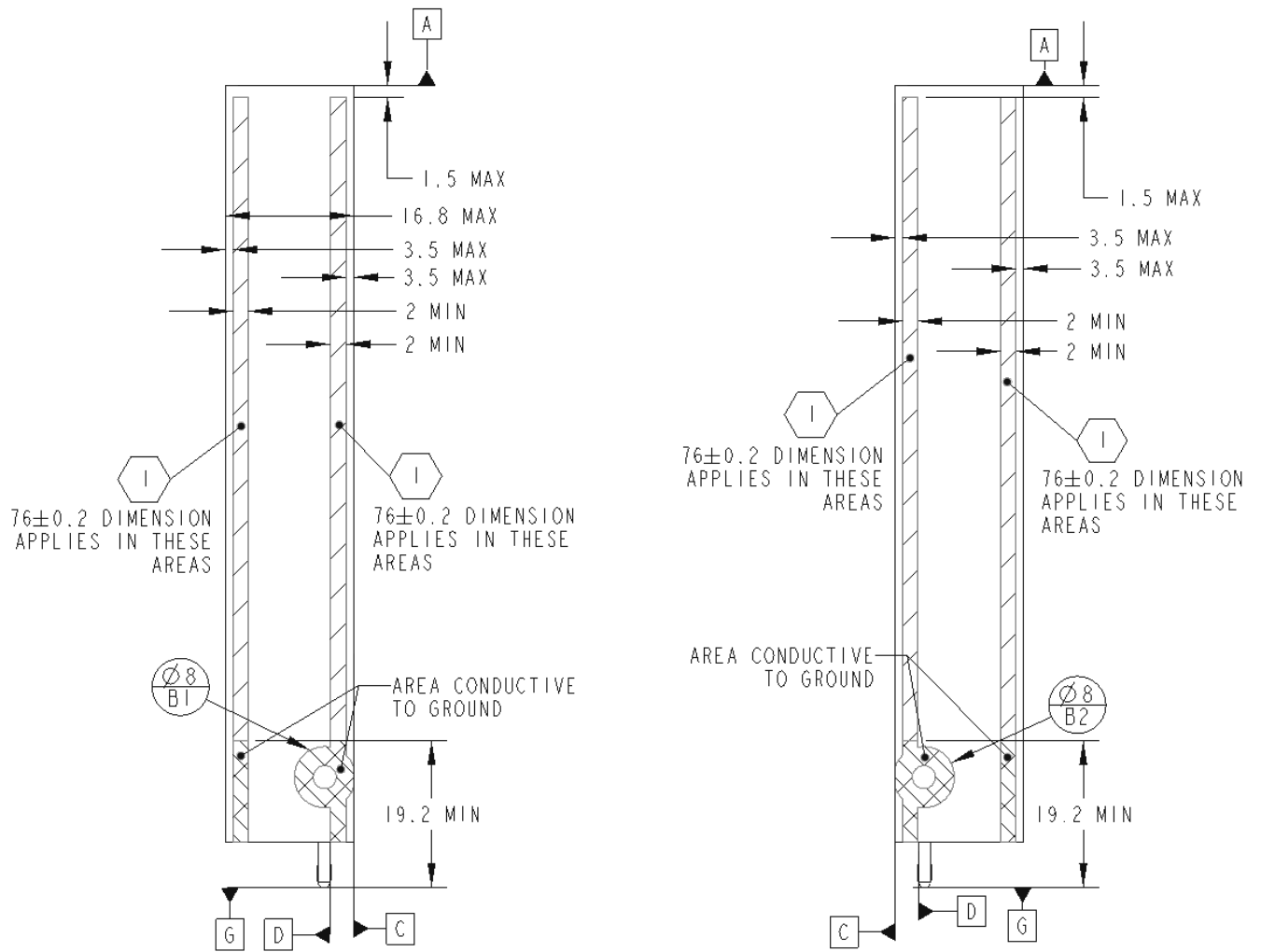


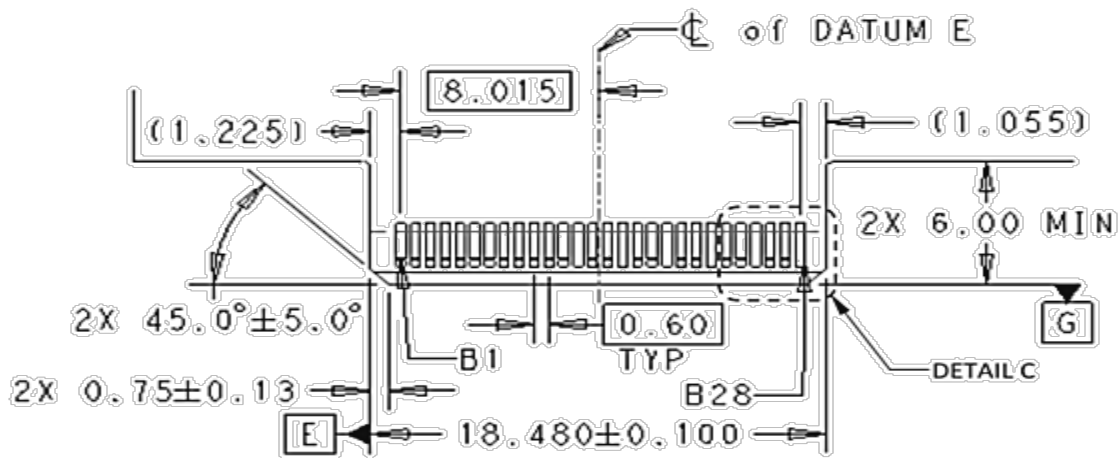
Figure 4-7. Side Views of 3", 7.5mm Form Factors



Note: Dimensions not shown identical to 3", 7.5mm Form Factor  
**Figure 4-8. Side Views of 3", 16.8mm Form Factors**

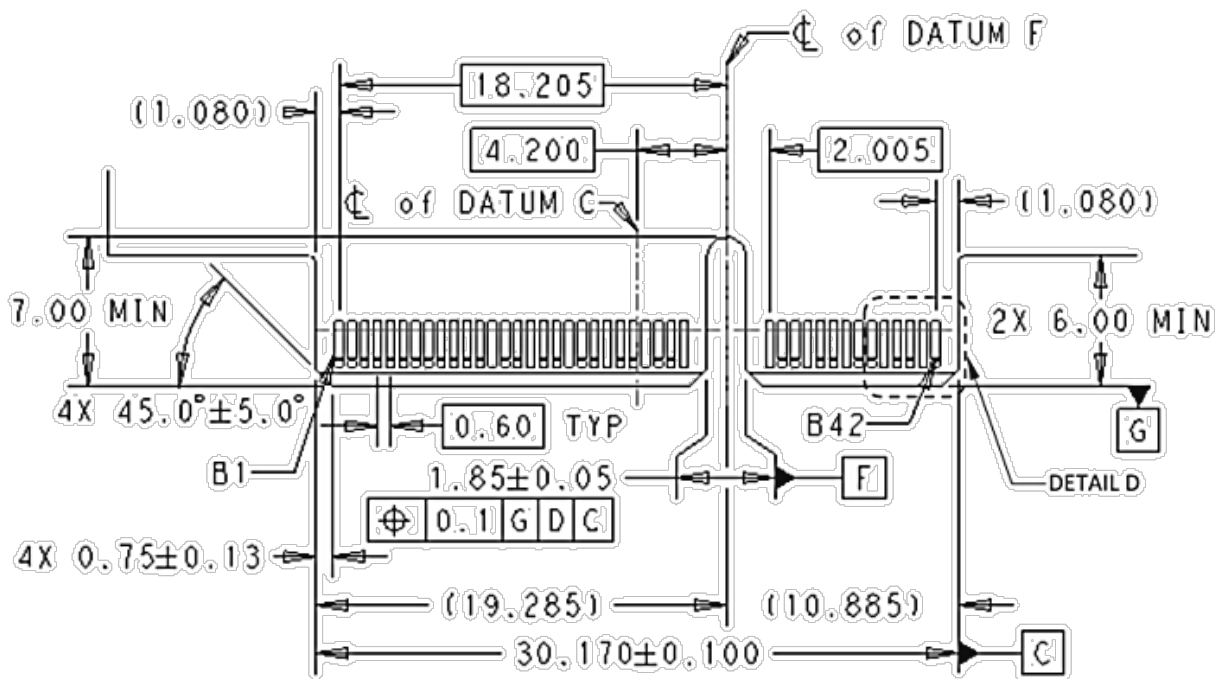
5. Informative: SFF-TA-1002 edge (plug) Mechanical drawing

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



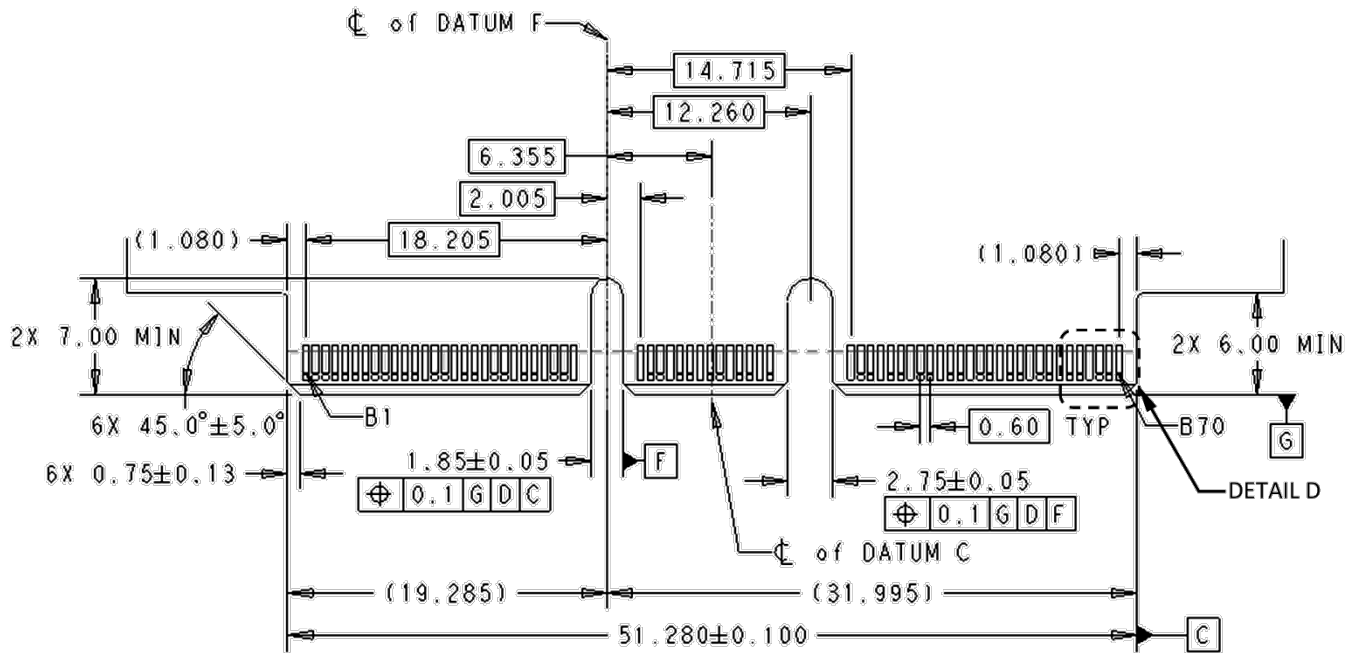
Note: Position A1 on opposite side of card of B1

Figure 5-1. IC (x4) Mating Card Dimensions



Note: Position A1 on opposite side of card of B1

Figure 5-2. 2C (x8) Mating Card Dimensions



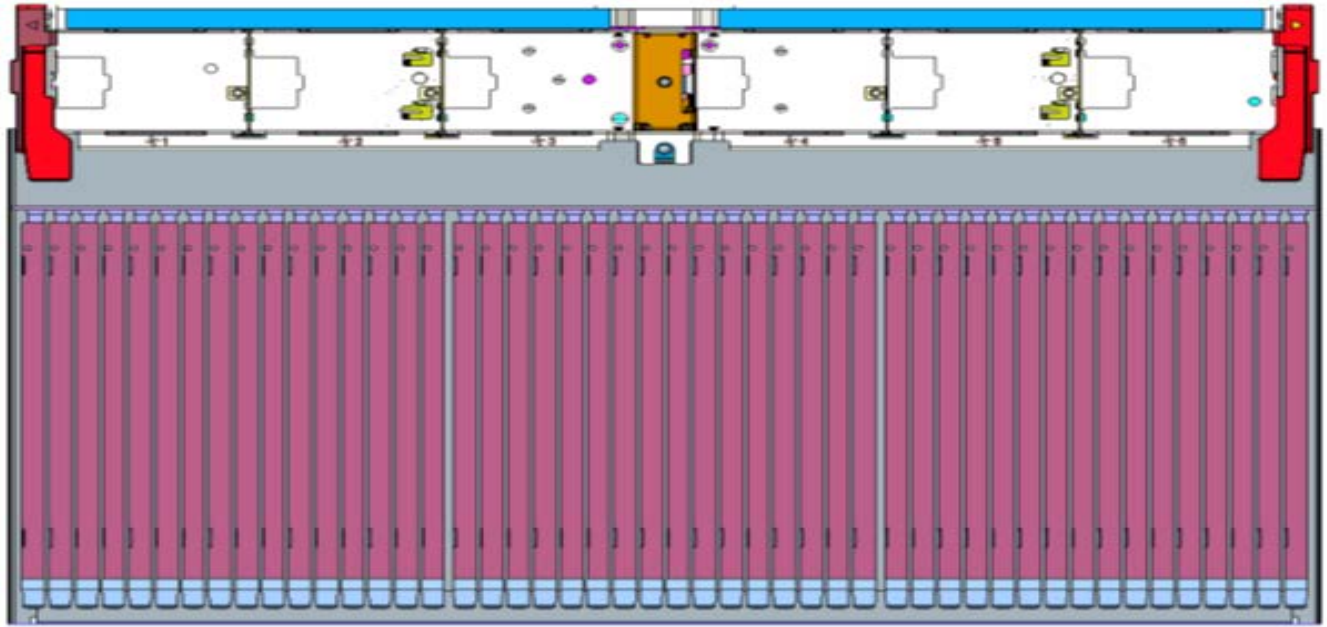
Note: Position A1 on opposite side of card of B1

Figure 5-3. 4C (x16) Mating Card Dimensions



### 6. Informative: System Thermal Design Guidelines

The following thermal guidelines are provided to assist in the storage subsystem implementation of the 3" form factor. An example implementation is shown in Figure 6-1. In this example, there are 44, 7.5mm thick SSDs connected to a midplane with fans pulling air across the SSDs. Each SSD plugs into a connector that is mounted onto the midplane.



**Airflow Direction**

**Figure 6-1. Top view example of vertical mounted SSDs in a 2U enclosure**

There are 2 thickness and 2 lengths for the 3" SSDs: 7.5mm and 16.8mm and either 104.9mm or 142.2mm long. The 7.5mm thick SSD has an enclosure which helps spread the heat but is not sufficient beyond a certain power load. The 16.8mm thick SSD adds additional space for taller heat sink to the implementation which allows for better cooling at the expense of less SSDs being able to fit within the enclosure. Details of the heatsink are outside the scope of this specification and are SSD design dependent.

To prevent the SSDs from throttling or overheating, system thermal guidelines for both the 7.5mm and 16.8mm thick SSDs are provided in Table 6-1. Values shown are simulated data using fluid properties at 950m altitude. 7.5mm thick values include the midplane blockage representing the width of x4 connector for the short form factor, and the width of a x8 connector for the long form factor. Required volume flow shown reflects the required air volume to maintain a maximum controller junction temperature of 105°C and a maximum NAND junction temperature of 85°C. For the 7.5 thickness drive, pressure drop is shown for the 7.5mm maximum thickness.

Enclosure Parameter	7.5mm thick		16.8mm thick	
	Short	Long	Short	Long
Recommended max sustained power (W)	20	35	40	70
Enclosure Max Inlet air temperature, < 950 m (°C)	35	35	35	35
SSD to SSD pitch (mm)	9.3	9.3	18.6	18.6
Fan Pressure Deficit, Min (Pascal)	68	156	43	106
Airflow requirement, average min per SSD (CFM) 1 CFM = 1.7 m <sup>3</sup> /h	1.8	2.7	2.8	4.2

**Table 6-1. Thermal guidelines for system implementation**

Note: Enclosure Max Inlet air temperature, 950 m to 3050 m (°C) - (1°C for every 175 m over 950 m).