SFF Committee documentation may be purchased in hard copy or electronic form.
SFF specifications are available at ftp://ftp.seagate.com/sff

SFF-8644 Specification

for

MINI MULTILANE SERIES: SHIELDED INTEGRATED HIGH DENSITY (HD) CONNECTOR

Rev 1.7 June 1,2009

Secretariat: SFF Committee

Abstract: This specification defines the physical interface and general performance requirements for the Mini Multilane Shielded Integrated HD Connector, which is designed for use in high speed serial, interconnect applications at speeds up through 12 Gigabits/second. Usage includes the SAS high density external I/O.

This specification provides a common reference for systems manufacturers, system integrators, and suppliers. This is an internal working specification of the SFF Committee, an industry ad hoc group.

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 a connector in this specification does not assure that the specific component is actually available from connector suppliers. If such a connector is supplied it must comply with this specification to achieve interoperability between suppliers.

Support: This specification is supported by the identified member companies of the SFF Committee.

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EXPRESSION OF SUPPORT BY MANUFACTURERS

The following member companies of the SFF Committee voted in favor of this industry specification.

tbd

The following member companies of the SFF Committee voted against this industry specification.

tbd

The following member companies of the SFF Committee voted to abstain on this industry specification.

tbd

The user's attention is called to the possibility that implementation to this Specification may require use of an invention covered by patent rights. By distribution of this Specification, no position is taken with respect to the validity of this claim or of any patent rights in connection therewith. Members of the SFF Committee, which advise that a patent exists, are required to provide a statement of willingness to grant a license under these rights on reasonable and non-discriminatory terms and conditions to applicants desiring to obtain such a license.

Foreword

The development work on this specification was done by the SFF Committee, an industry group. The membership of the committee since its formation in August 1990 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 first use of these disk drives was in specific applications such as laptop portable computers and system integrators worked individually with vendors to develop the packaging. The result was wide diversity, and incompatibility.

The problems faced by integrators, device suppliers, and component suppliers led to the formation of the SFF Committee as an industry ad hoc group to address the marketing and engineering considerations of the emerging new technology.

During the development of the form factor definitions, other activities were suggested because participants in the SFF Committee faced more problems than the physical form factors of disk drives. 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.

Those companies which have agreed to support a specification are identified in the first pages of each SFF Specification. Industry consensus is not an essential requirement to publish an SFF 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 Committee meetings are held during T10 weeks (see www.t10.org), and Specific Subject Working Groups are held at the convenience of the participants. Material presented at SFF Committee meetings becomes public domain, and there are no restrictions on the open mailing of material presented at committee meetings.

Most of the specifications developed by the SFF Committee have either been incorporated into standards or adopted as standards by EIA (Electronic Industries Association), ANSI (American National Standards Institute) and IEC (International Electrotechnical Commission).

If you are interested in participating or wish to follow the activities of the SFF Committee, the signup for membership and/or documentation can be found at:

http://www.sffcommittee.com/ie/join.html

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

ftp://ftp.seagate.com/sff/SFF-8000.TXT

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

ftp://ftp.seagate.com/sff/SFF-8032.TXT

Suggestions for improvement of this specification will be welcome. They should be sent to the SFF Committee, 14426 Black Walnut Ct, Saratoga, CA 95070.

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SFF Committee

Mini Multilane Shielded Integrated High Density Connector

1. Scope

This specification defines the plug, the integrated high density receptacle, and latching requirements for the Mini Multilane Shielded Integrated High Density Connector based upon the mating interface defined herein.

1.1 Description of Clauses

Clause 1 contains the Scope
Clause 2 contains References, Related Standards and SFF Specifications
Clause 3 contains the Definitions and Conventions
Clause 4 contains the Description
Clause 5 defines the Datums
Clause 6 defines the Dimensions

2. References

The SFF Committee activities support the requirements of the storage industry, and it is involved with several standards.

2.1 Industry Documents

The following interface standards and specifications are relevant to this Specification.

- T10 / 1601D SAS 1-1 (Serial Attached SCSI – SAS 3.0
- SFF-8410 High Speed Serial Testing for Copper Links
- SFF-8643 Mini Multilane Series: Unshielded Integrated High Density Connector

2.2 SFF Specifications

There are several projects active within the SFF Committee. The complete list of specifications which have been completed or are still being worked on are listed in the specification at ftp://ftp.seagate.com/sff/SFF-8000.TXT

2.3 Sources

Those who join the SFF Committee as an Observer or Member receive electronic copies of the minutes and SFF specifications (http://www.sffcommittee.com/ie/join.html).

Copies of ANSI standards may be purchased from the Inter-National Committee for Information Technology Standards (http://tinyurl.com/c4psg).

Copies of SFF, ASC T10 (SCSI), T11 (Fibre Channel) and T13 (ATA/SATA) standards and standards still in development are available on the HPE version of CD_Access (http://tinyurl.com/85fts).

3. Definitions and Conventions

3.1 Definitions

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

Fixed: Used to describe the gender of the mating side of the connector that accepts its mate upon mating. This gender is frequently, but not always, associated with the common terminology “receptacle”. Other terms commonly used are “female” and “socket connector”. The term “fixed” is adopted from EIA standard terminology as the gender that most commonly exists on the fixed end of a connection, for example, on the board or bulkhead side. In this specification “fixed” is specifically used to describe the mating side gender illustrated in Figure 2.

Free: Used to describe the gender of the mating side of the connector that penetrates its mate upon mating. This gender is frequently, but not always, associated with the common terminology “plug”. Other terms commonly used are “male” and “pin connector”. The term “free” is adopted from EIA standard terminology as the gender that most commonly exists on the free end of a connection, for example, on the cable side. In this specification “free” is specifically used to describe the mating side gender illustrated in Figure 2.

Height: Distance from board surface to farthest overall connector feature

Mating Side: The side of the connector that joins and separates from the mating side of a connector of opposite gender. Other terms commonly used in the industry are mating interface, separable interface and mating face.

FIGURE 3.1. Mating Side Gender Definition

Right Angle: A connector design for use with printed circuit board assembly technology where the mating direction is parallel to the plane of the printed circuit board.

Straight: A connector design for use with printed circuit board assembly technology where the mating direction is perpendicular to the plane of the printed circuit board.

Surface Mount: A connector design and a printed circuit board design style where the connector termination points do not penetrate the printed circuit board and are subsequently soldered to the printed circuit board.

Termination Side: The side of the connector opposite the mating side that is used for permanently attaching conductors to the connector. Due to pin numbering differences between mating side genders the termination side shall always be specified in conjunction with a mating side of a specific gender. Other terms commonly used in the industry are: back end, non-mating side, footprint, pc board side, and post side.

Through Hole: A connector design and a printed circuit board design style where the connector termination points penetrates the printed circuit board and are subsequently soldered to the printed circuit board.

3.2 Conventions

The American convention of numbering is used i.e., a comma separates the thousands and higher multiples, and a period is used as the decimal point. This is equivalent to the ISO/IEC convention of a space and comma.

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

4. Description

This connector system provides positive retention along with ease of insertion and removal.

4.0 General View

The connector system is based upon an integrated receptacle connector and guide shell. The host board footprint positioning holes contain the critical dimensions for locating the integrated receptacle/guide shell. The receptacle guide shell functions as the guide and strain relief for the free (plug) connector interface.

FIGURE 4.1 illustrates examples of several such configurations.

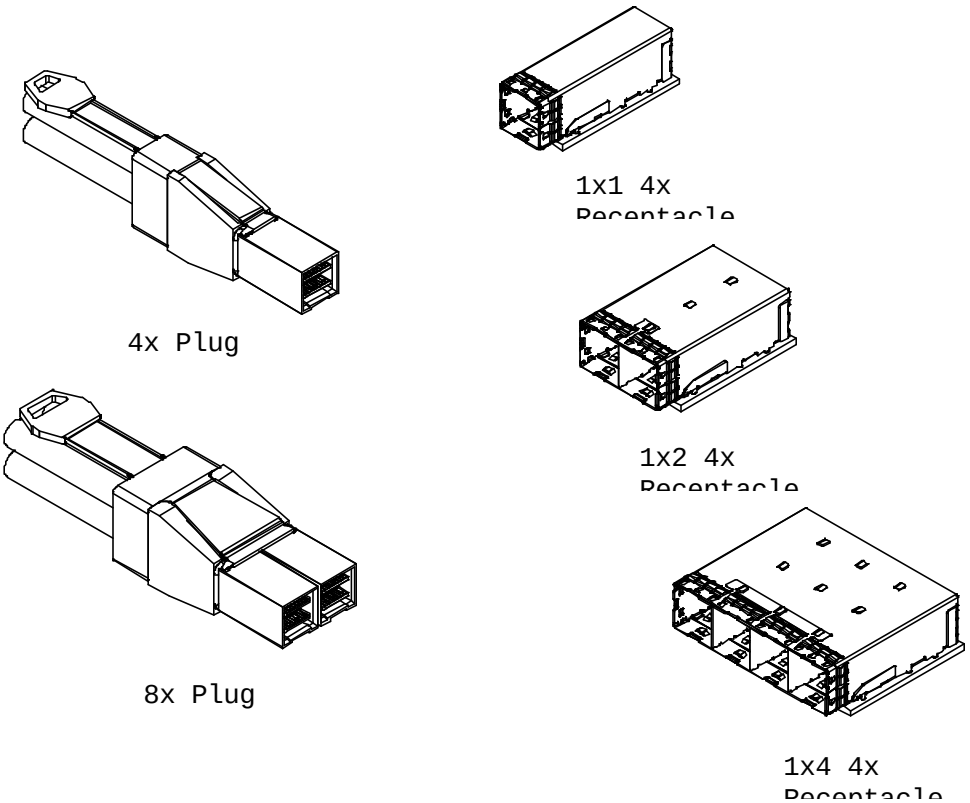


FIGURE 4.1. GENERAL VIEW OF SHIELDED INTEGRATED HD CONNECTORS

4.1 Shielded Integrated HD Connector Configurations

TABLE 4.1. Shielded Integrated Connector Configurations

Ports	Shielded Positions	Orientation
1x1	**36 Position**	Right Angle
1x2	**72 Position**	Right Angle
1x4	**144 Position**	Right Angle

The dimensioning conventions are described in ANSI-Y14.5M, Geometric Dimensioning and Tolerancing. All dimensions are in millimeters.

Dimension related requirements for the connector system addressed in this document are specified in the tables and figures in this clause.

5.1 Datum Definitions

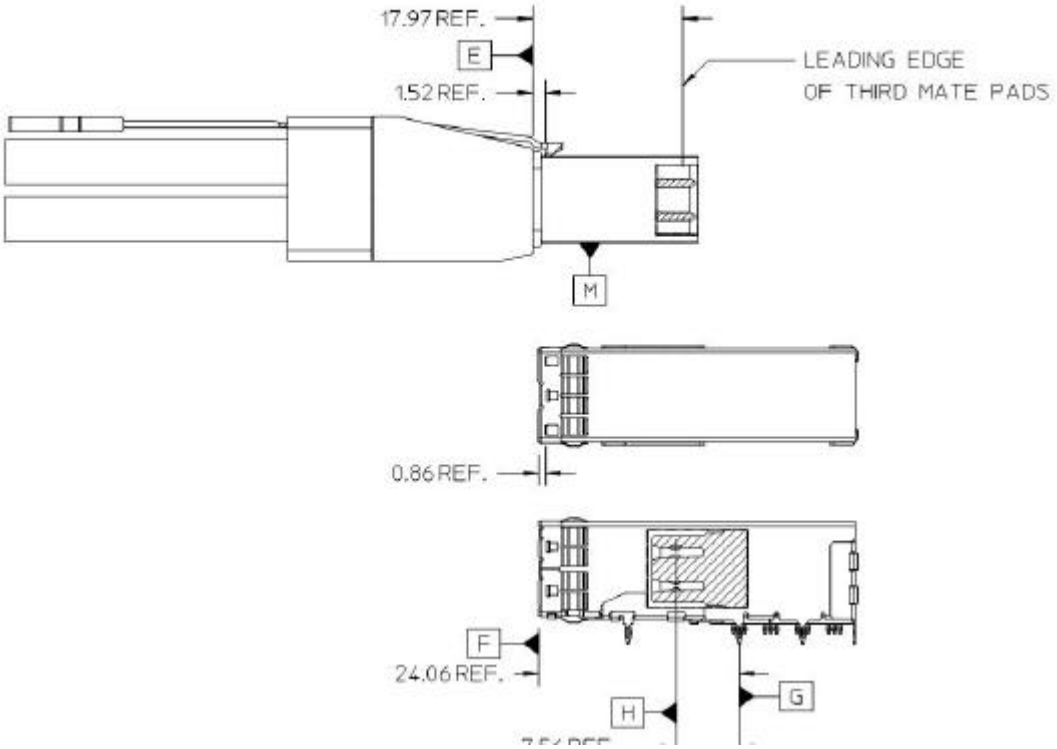


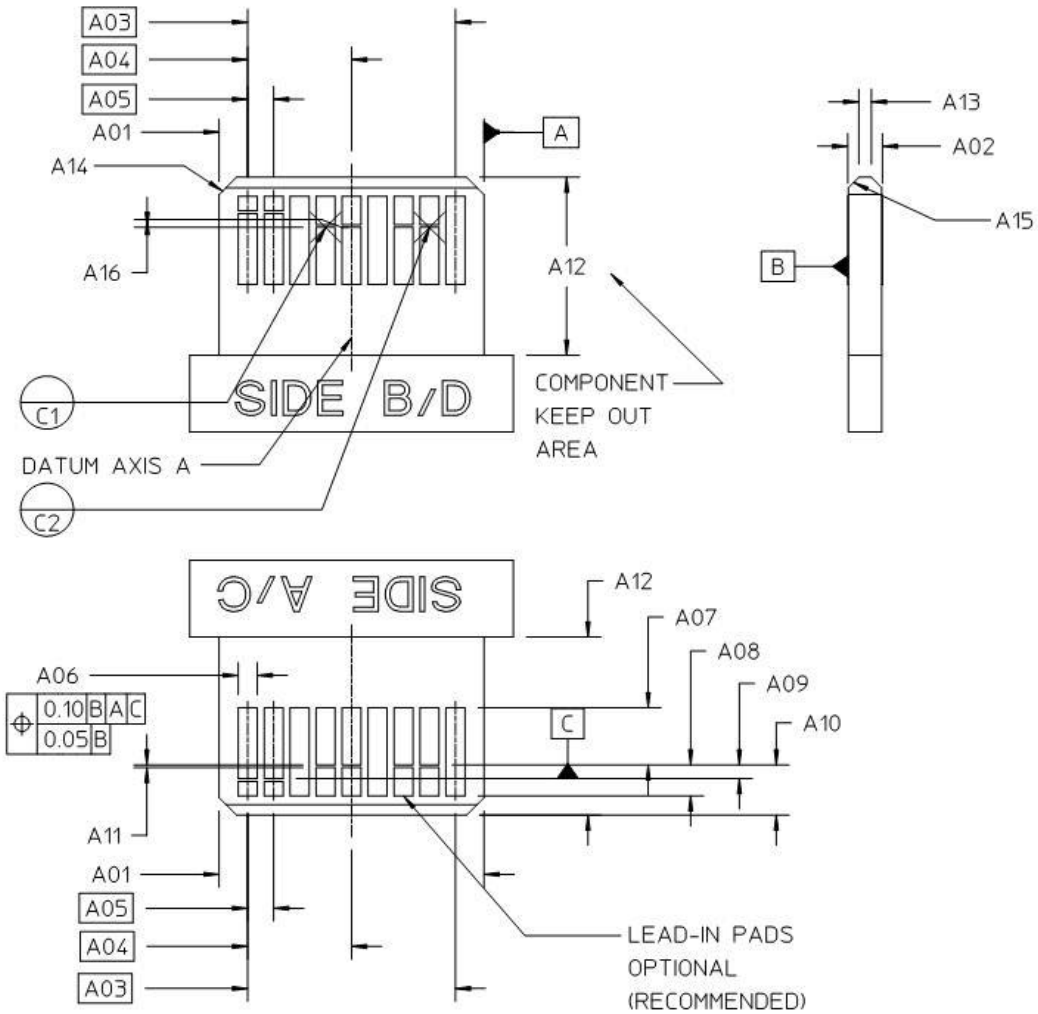
Figure 5.1 Definition of Datums

Datum	Description
A	Width of Paddle Card
B	Top Surface of Paddle Card
C	Front Edge of Signal Pad on Paddle Card
D	Width of Plug Snout
E	Body of Plug
F	Front Edge of Receptacle Snout
G	Centerline of First Row of Compliant Tails
H	Centerline of Receptacle Contacts
I	Width of Receptacle Snout
J	Centerline of Outer Holes
K	Centerline of First Row of PCB Holes
L	Surface of PCB
M	Bottom of Plug Body
N	Centerline of Plug Snout Opening
X, Y	Reference 0, 0 on Host Board

Table 5.1 Definition of Datums

6.0 Shielded Integrated Connector Dimensional Requirements

6.1 Shielded Free (Plug) Integrated Connector Paddle Card



DATUM A – CENTERLINE OF PADDLE CARD
DATUM B – TOP SURFACE OF PADDLE CARD
DATUM C – LEADING EDGE OF THIRD MATE
CONTACTS DEFINED BY OUTER PADS

NO SOLDER MASK WITHIN 0.05 OF DEFINED
PAD LOCATIONS

Figure 6.1 Shielded Free (Plug) HD Connector Paddle Card Dimensions

Designator	Description	Dimension	Tolerance
A01	Paddle Card Width	7.65	0.10
A02	Paddle Card Thickness (across pads)	1.00	0.10
A03	First to Last Pad Centers	6.00	Basic
A04	Card Center to Outer Pad Center	3.00	Basic
A05	Pad Center to Center (Pitch)	0.75	Basic
A06	Pad Width	0.55	0.03
A07	Pad Length - Third Mate	1.55	Min.
A08	Third Mate to First Mate	0.90	0.05
A09	Third Mate to Second Mate	0.40	0.05
A10	Card Edge to Third Mate Pad	1.45	0.10
A11	Pad to Pre-Pad	0.08	0.015
A12	Component Keep Out Area	5.40	Min.
A13	Lead-in Flat	0.36	Ref
A14	Lead-in Chamfer x 45º	0.50	0.05
A15	Lead-in Chamfer x 45º	0.30	0.05
A16	Third Mate Pad to Datum C	0.00	0.03

TABLE 6.1 SHIELDED FREE (PLUG) HD CONNECTOR PADDLE CARD DIMENSIONS

6.2 SHIELDED FREE (PLUG) 4X INTEGRATED HD CABLE CONNECTOR

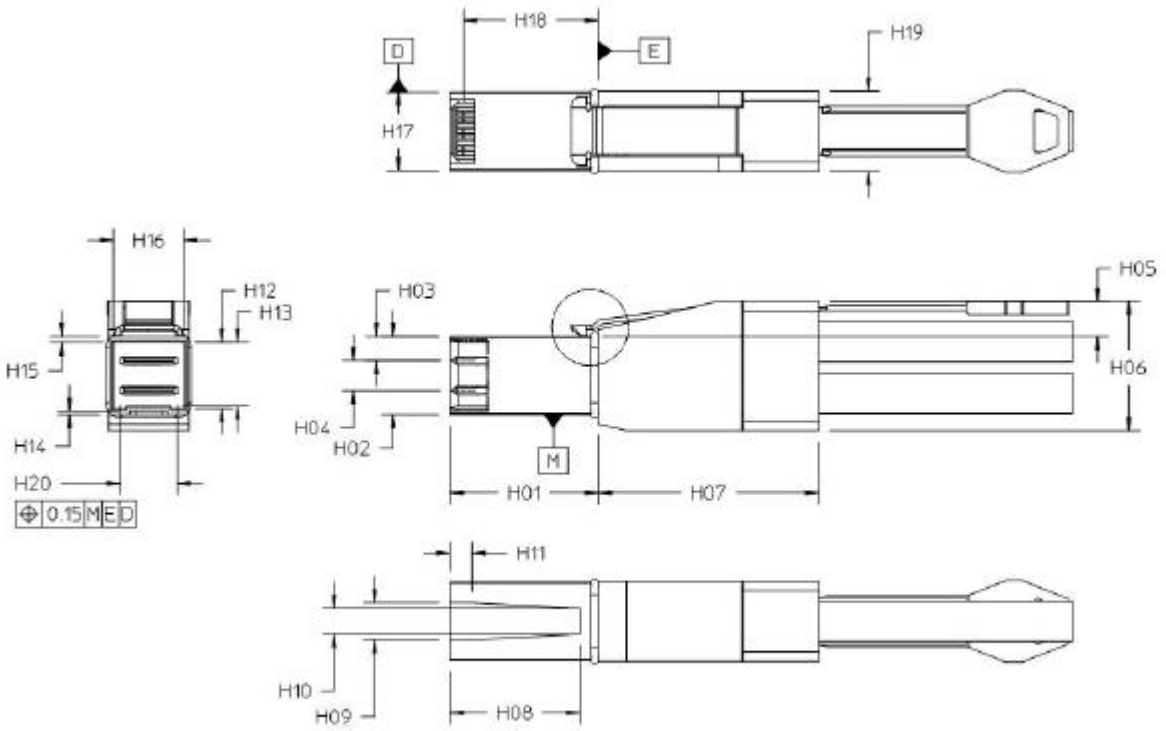
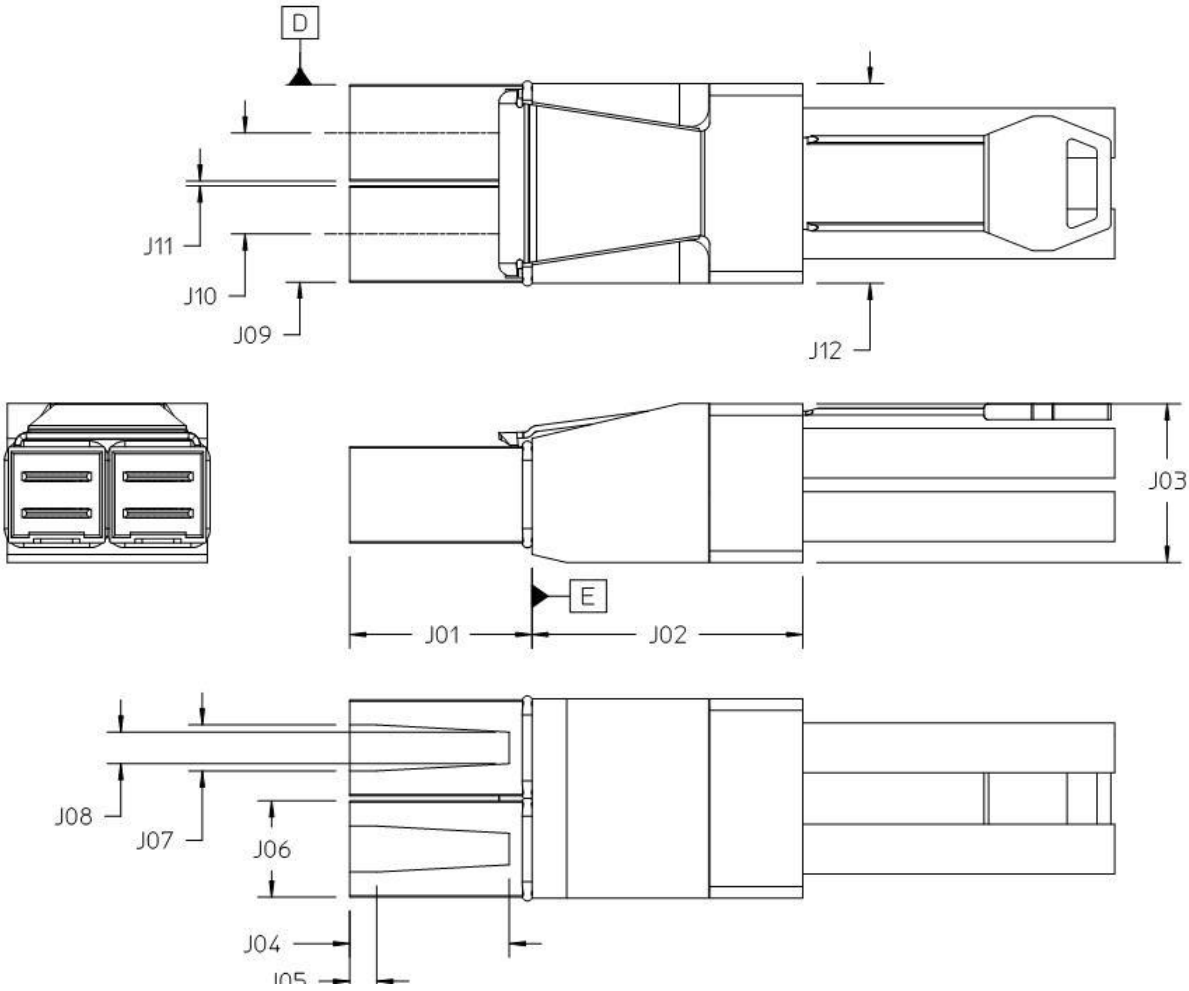
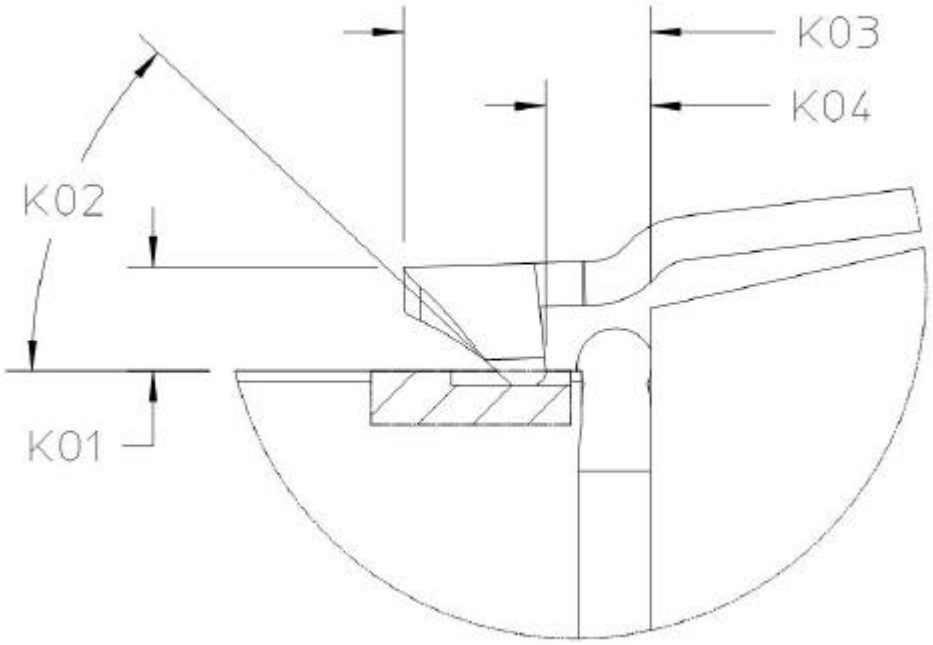


FIGURE 6.2. Shielded Free (Plug) HD Integrated Cable Connector

Designator	Description	Dimension	Tolerance
H01	Snout Length	19.77	0.05
H02	Snout Height	10.45	0.05
H03	Snout Top to PCB Centerline	3.23	0.05
H04	PCB Centerline to PCB Centerline	4.00	0.05
H05	Snout Top to Plug Body Top	4.68	0.15
H06	Plug Body Height - 28-30 AWG	17.40	Max
H06	Plug Body Height - 24-26 AWG	20.30	Max
H07	Plug Body Length	32.00	Max
H08	Snout Groove Length	17.30	0.10
H09	Snout Groove Width	5.00	0.10
H10	Snout Groove Width	3.44	0.10
H11	Snout Groove Length	2.93	0.25
H12	Snout Inside Height	8.85	0.05
H13	Snout Inside Height	8.52	0.05
H14	Snout Groove Height	0.45	0.05
H15	Snout Top Thickness	0.78	0.05
H16	Latch Catch Width	9.35	0.10
H17	Snout Width	10.45	0.05
H18	Plug Body to PCB Datum	17.97	0.15
H19	Plug Body Width	10.70	0.15
H20	PCB Width	7.65	0.10

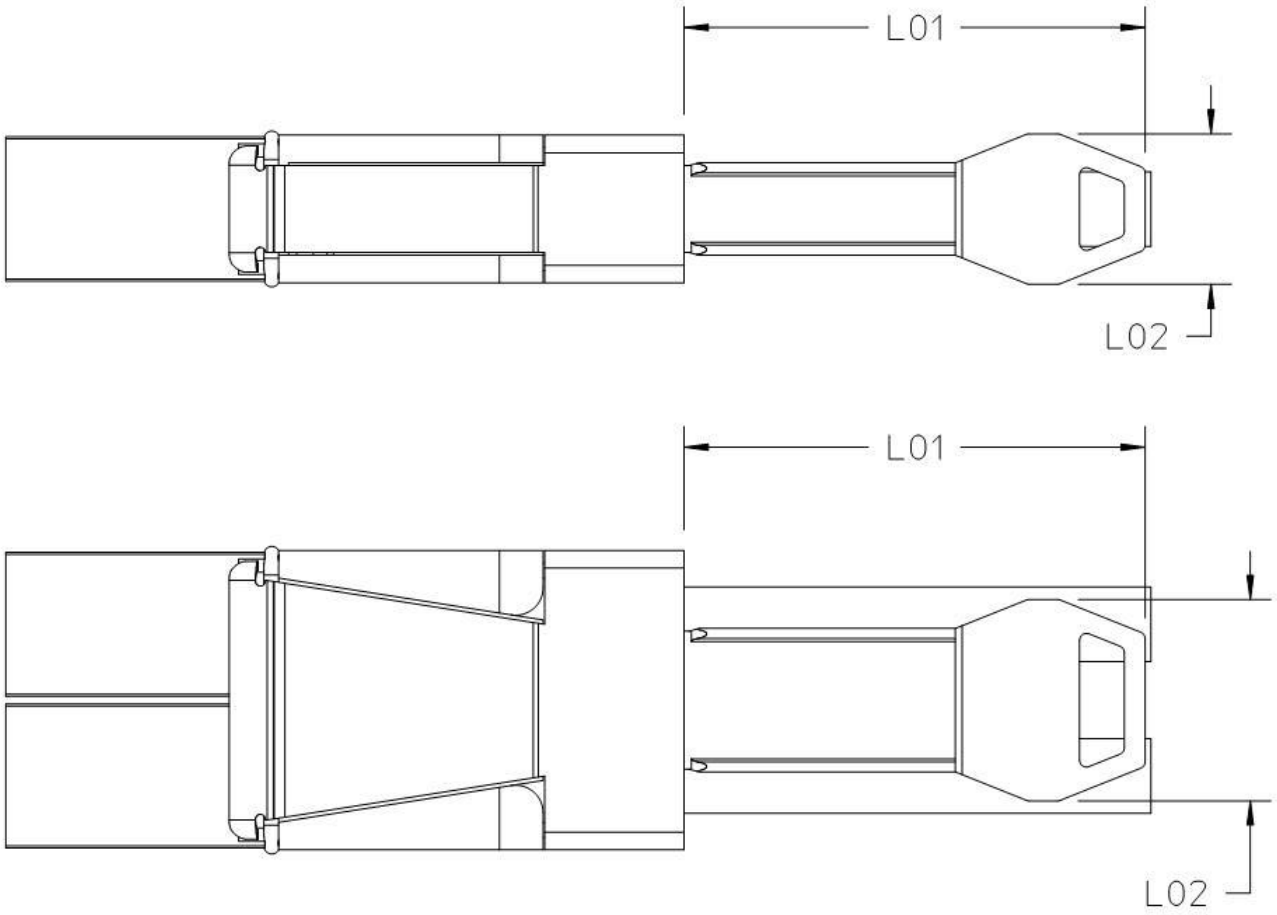


Designator	Description	Dimension	Tolerance
J01	Snout Length	19.77	0.05
J02	Plug Body Length	32.00	Max
J03	Plug Body Height - 28-30 AWG	17.40	Max
J03	Plug Body Height - 24-26 AWG	20.30	Max
J04	Snout Groove Length	17.30	0.10
J05	Snout Groove Length	2.93	0.25
J06	Snout Width	10.45	0.05
J07	Snout Groove Width	5.00	0.10
J08	Snout Groove Width	3.44	0.10
J09	Snout Width - Overall	21.45	0.05
J10	Snout to Snout Pitch	11.00	~
J11	Snout Gap	0.55	Ref.
J12	Plug Body Width	21.70	0.15



Designator	Description	Dimension	Tolerance
K01	Latch Height	1.51	0.15
K02	Latch Lead-In Angle	43°	2°
K03	Latch Length	3.59	Max
K04	Latch Barb Location	1.52	0.15

6.3 Shielded Free (Plug) HD Integrated Cable Connector Pull Tab



If required, the pull tab color may be specified by a specific standard.

Figure shown is one approved solution.
Other configurations to remain within the C01 and C03 dimensions.

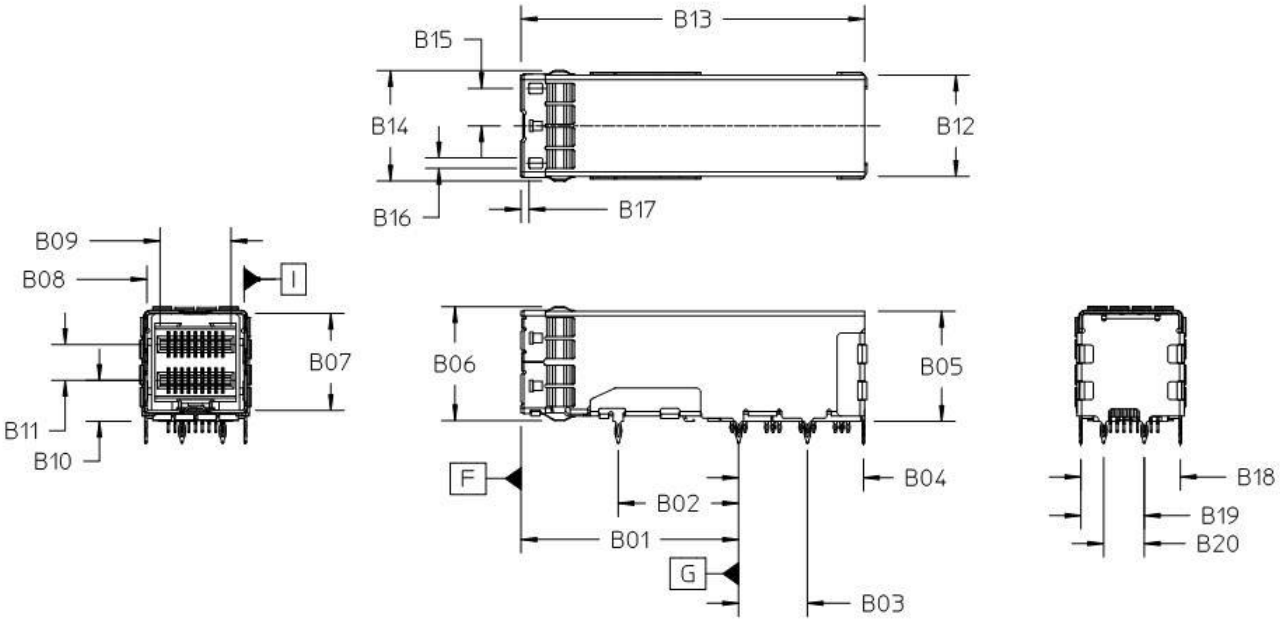
FIGURE 6.3. SHIELDED FREE (PLUG) INTEGRATED HD CABLE CONNECTOR PULL TAB

designator	Description	Dimension	Tolerance
L01	Latch Pull Length	40.00	Max

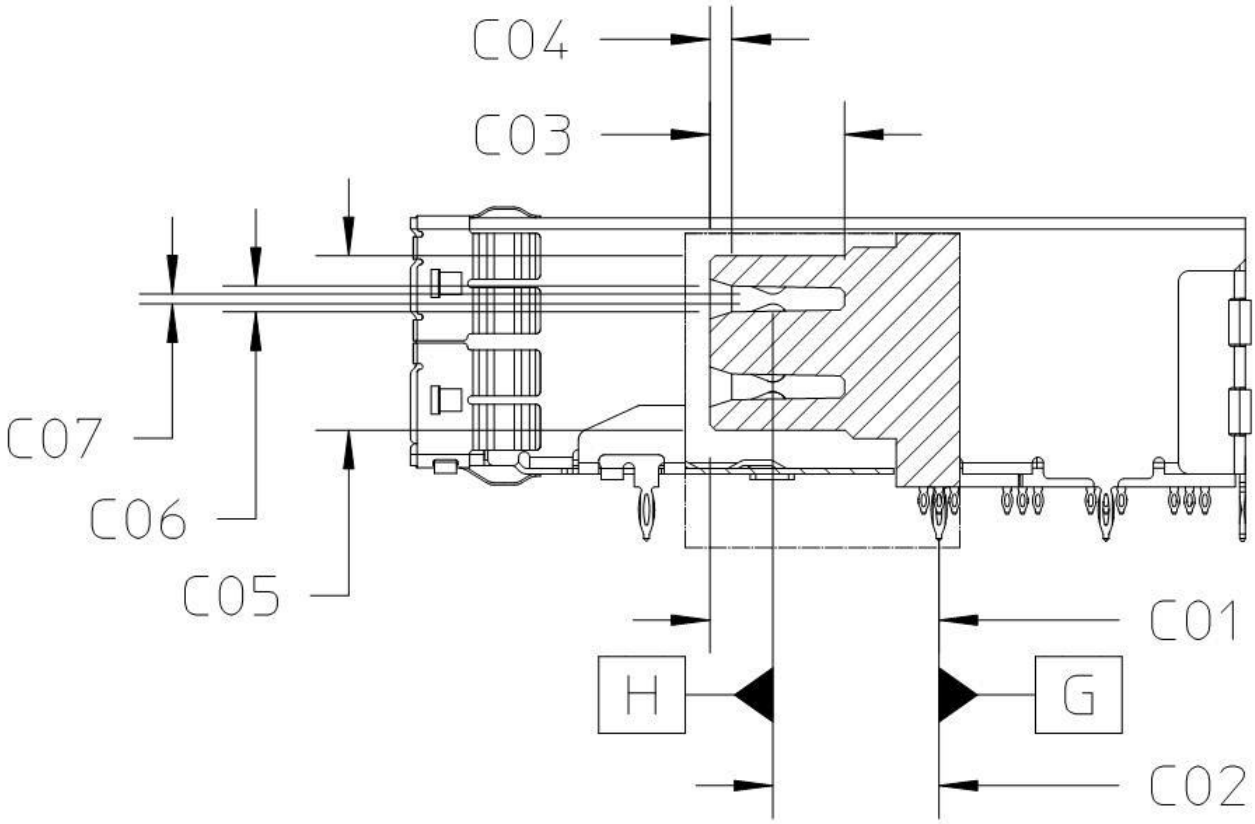
L02	4x Latch Pull Width	11.00	Max
L02	8x Latch Pull Width	15.00	Max

TABLE 6.3. Shielded Free (Plug) HD Integrated Cable Connector Pull Tab

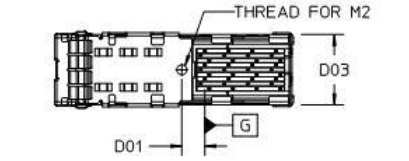
6.7. SHIELDED FIXED (RECEPTACLE) RIGHT ANGLE HD INTEGRATED 4X CONNECTOR DIMENSIONS



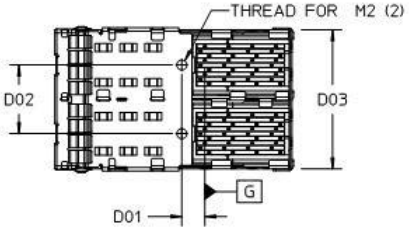
Designator	Description	Dimension	Tolerance
B01	Datum G to Front Face	24.06	0.10
B02	Datum G to Shield Tail	13.31	0.05
B03	Datum G to Shield Tail	7.60	0.05
B04	Datum G to Shield Tail	13.81	0.05
B05	Shield Height	12.24	0.13
B06	EMI Finger Height	12.65	0.13
B07	EMI Snout Opening - Height	10.76	0.08
B08	EMI Snout Opening - Width	10.75	0.08
B09	Receptacle Card Slot Width	7.85	0.08
B10	Lower Card Slot Location	4.55	0.10
B11	Lower Card Slot to Upper Card Slot	4.00	0.05
B12	Shield Width	11.25	0.10
B13	Shield Length	38.00	0.15
B14	EMI Finger Width	12.25	0.13
B15	Shield Center to Latch Hole Center	4.15	0.15
B16	EMI Latch Hole Width	1.17	0.10
B17	Shield Front to Latch Hole Front	0.88	0.05
B18	Shield Tail to Tail	11.00	0.10
B19	Shield Tail to Tail	7.01	0.10
B20	Shield Tail to Tail	20.00	0.05



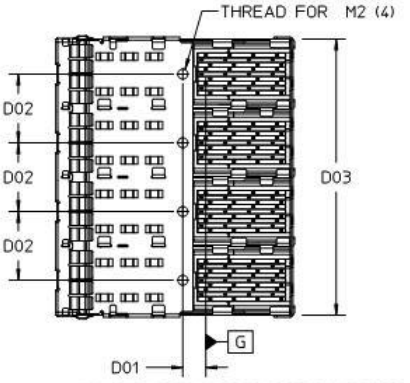
Designator	Description	Dimension	Tolerance
C01	Datum G to Receptacle Front	10.43	0.10
C02	Datum G to Contact Interface	7.56	0.10
C03	Receptacle Snout Length	6.13	0.15
C04	Receptacle Card Slot Lead-In	1.00	0.25
C05	Receptacle Snout Height	7.94	0.10
C06	Receptacle Card Slot Height	1.18	0.08
C07	Contact Gap	0.45	0.15



1X1 SHIELDED INTEGRATED CONNECTOR

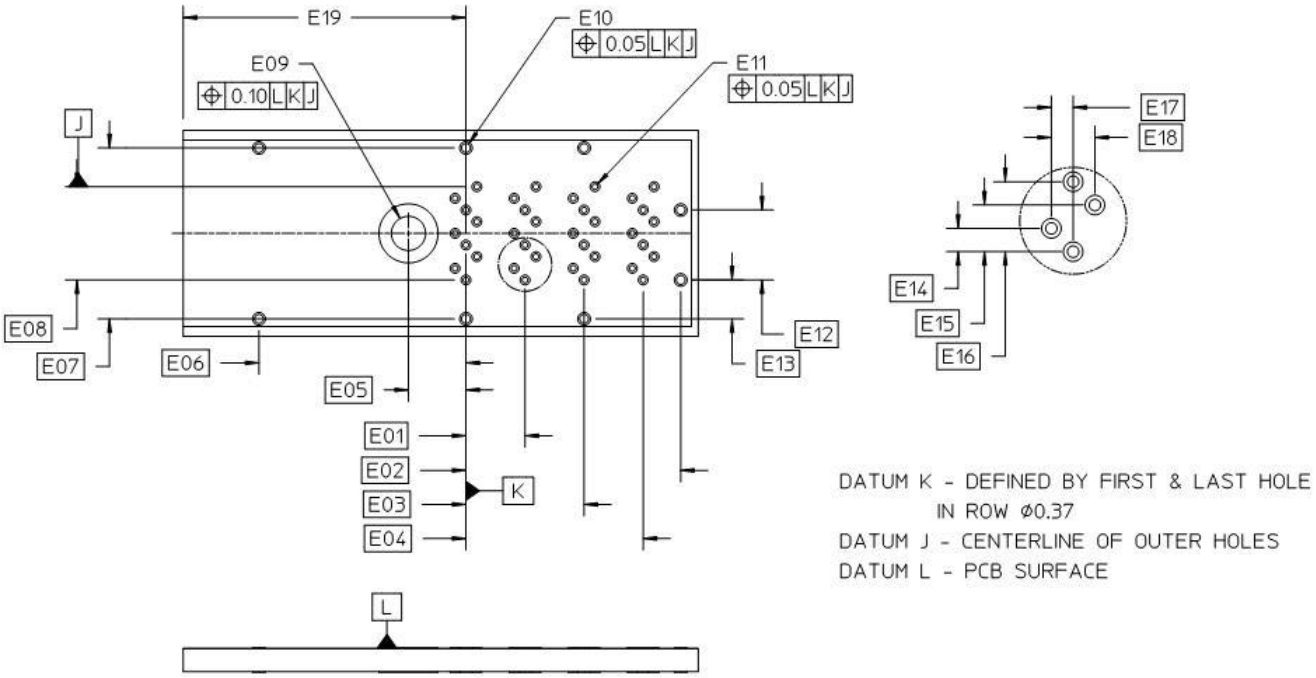


1X2 SHIELDED INTEGRATED CONNECTOR

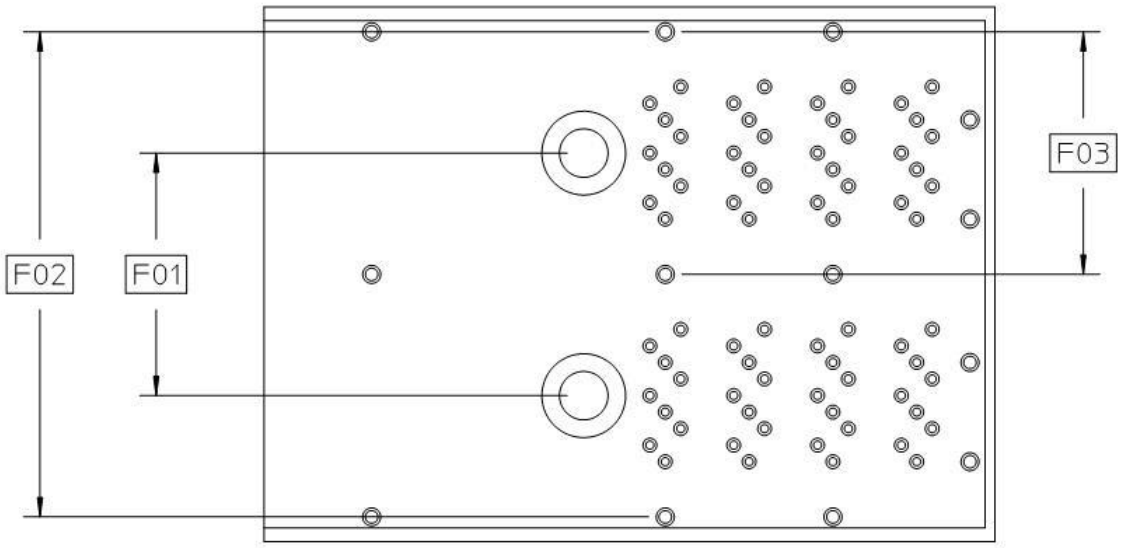


1X4 SHIELDED INTEGRATED CONNECTOR

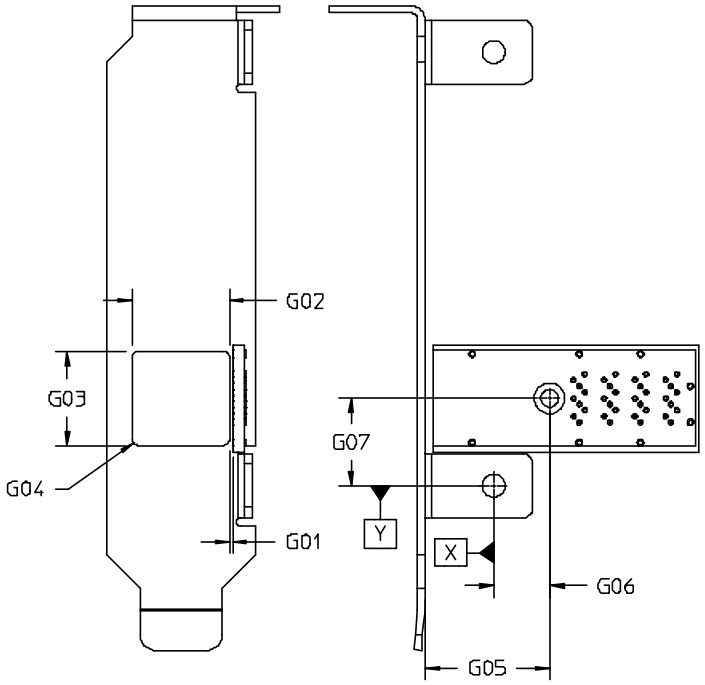
Designator	Description	Dimension	Tolerance
D01	Datum G to Shield M2 Thread	3.70	0.15
D02	Port to Port Spacing	11.00	0.05
D03	1x1 Shielded HD Integrated Connector	11.25	0.10
D03	1x2 Shielded HD Integrated Connector	22.25	0.10
D03	1x4 Shielded HD Integrated Connector	44.25	0.10

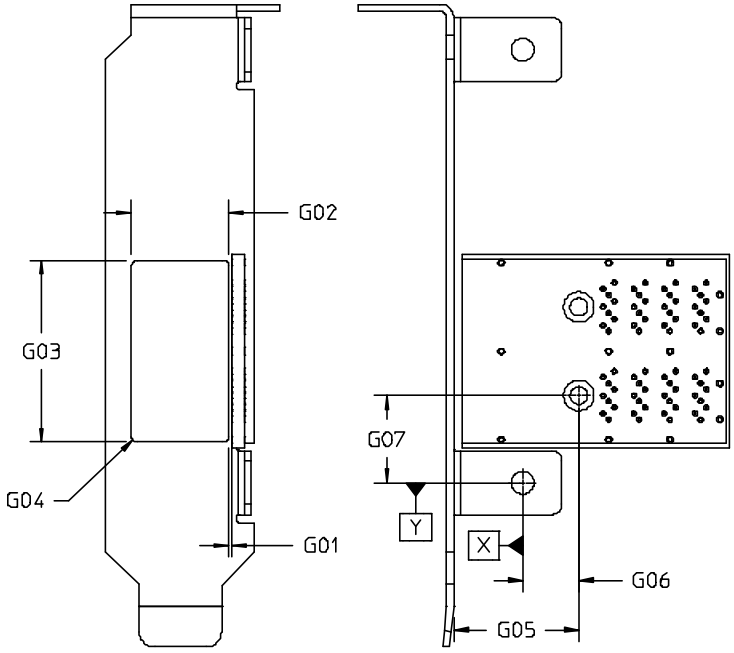


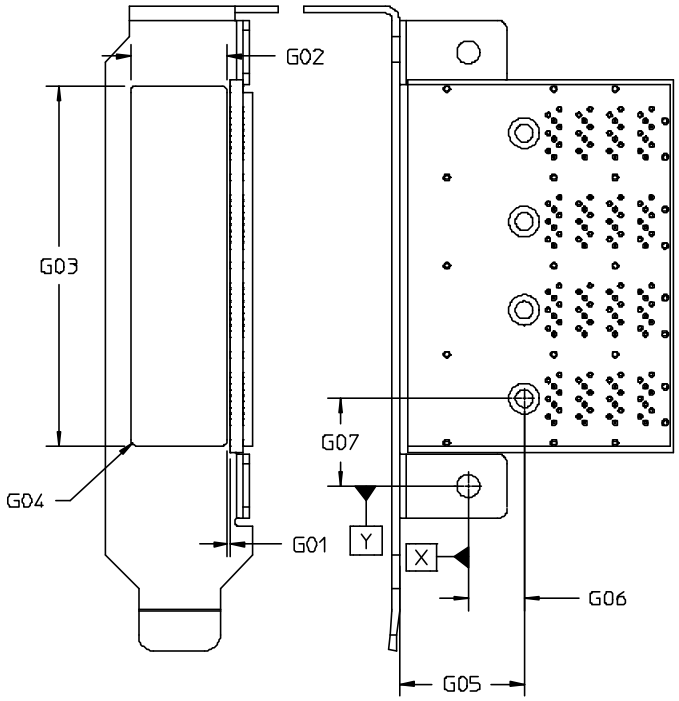
Designator	Description	Dimension	Tolerance
E01	Datum K to Second Group	3.80	Basic
E02	Datum K to Back Holes	13.81	Basic
E03	Datum K to Third Group	7.60	Basic
E04	Datum K to Fourth Group	11.40	Basic
E05	Datum K to Mounting Hole	3.70	Basic
E06	Datum K to Front Holes	13.31	Basic
E07	EMI Cage Hole to Hole	11.00	Basic
E08	Receptacle Pin, Center to Center	6.00	Basic
E09	Mounting Hole Diameter	2.20	0.10
E10	EMI Cage Hole Diameter	0.57	0.05
E11	Receptacle Hole Diameter	0.37	0.05
E12	EMI Cage Hole to Hole	4.50	Basic
E13	EMI Cage Hole to Hole	2.50	Basic
E14	Receptacle Hole to Hole	0.75	Basic
E15	Receptacle Hole to Hole	1.50	Basic
E16	Receptacle Hole to Hole	2.25	Basic
E17	Receptacle Hole to Hole	0.70	Basic
E18	Receptacle Hole to Hole	1.40	Basic



Designator	Description	Dimension	Tolerance
F01	Port to Port Spacing	11.00	Basic
F02	1x2 Shield Hole to Hole	22.00	Basic
F02	1x4 Shield Hole to Hole	44.00	Basic
F03	Shield Hole to Hole	11.00	Basic


G02
G03
G04
G01
G07
Y
X
G06
G05


G02
G03
G04
G01
G07
Y
X
G06
G05



Designator	Description	Dimension	Tolerance
G01	PCB Surface to Bracket Cut Out	0.38	0.10
G02	Bracket Cut Out Height	12.07	0.10
G03	1x1 Bracket Cut Out Width	11.68	0.10
G03	1x2 Bracket Cut Out Width	22.68	0.10
G03	1x4 Bracket Cut Out Width	44.68	0.10
G04	Bracket Cut Out Radius	0.75	Max
G05	Bracket Back to Mounting Hole	15.52	0.15
G06	Mounting Hole to Manufacturer Fiducial	Basic	N/A
G07	Mounting Hole to Manufacturer Fiducial	Basic	N/A

FIGURE 6.4. SHIELDED FIXED (RECEPTACLE) RIGHT ANGLE HD INTEGRATED CONNECTOR DIMENSIONS

6.8. MINIMUM SPACING FOR SHIELDED HD INTEGRATED RECEPTACLES

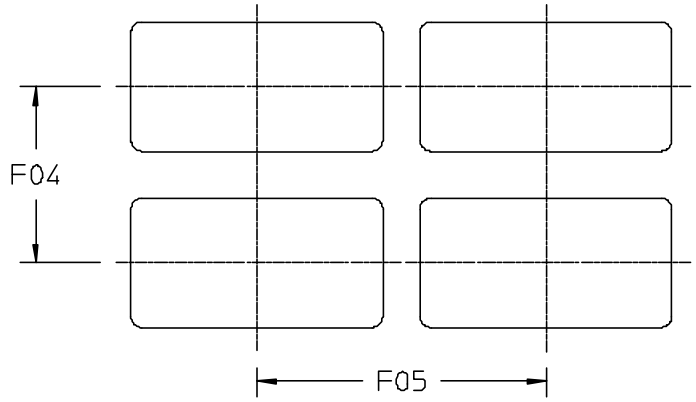


Figure 6.8. Minimum Horizontal & Vertical Pitch

Table 6.8. Dimensions for Minimum Port Spacing

Designator	Description	Dimension	Tolerance
F04	Vertical Pitch	16.50	0.10
F05	Horizontal Pitch (individual receptacles)	27.00	0.13

6.9. Keying

An orientation key is required to prevent misplugging in other than the correct orientation.

FIGURE 6.9. KEYING SCHEME

6.10 Thermal Solution

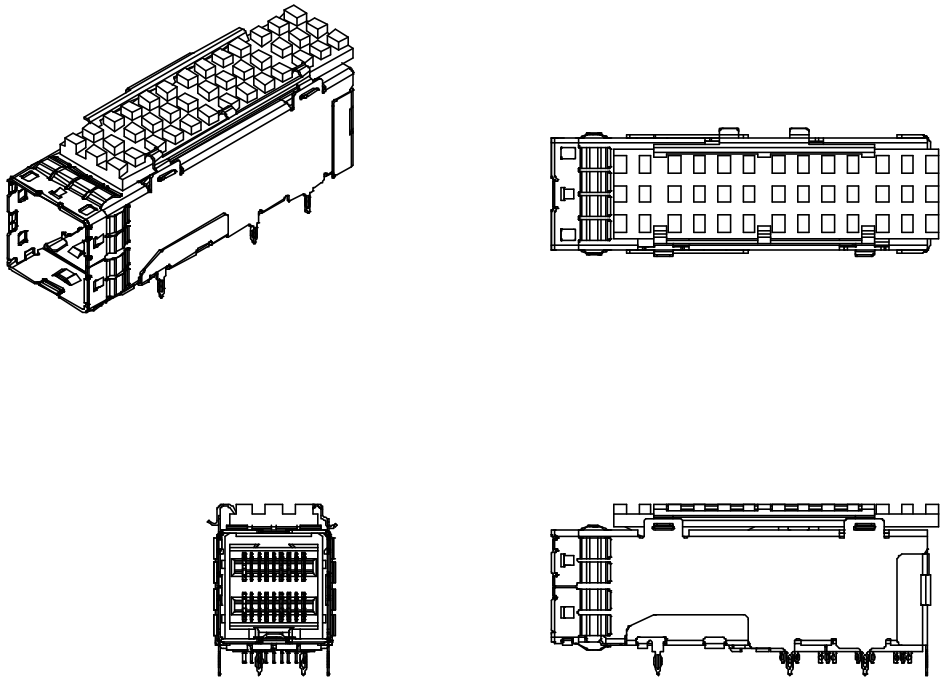


Figure 6.10 HD Integrated Receptacle Connector with Spring-loaded Heat sink & Clip

6.11. Thermal Interface Definition on Plug

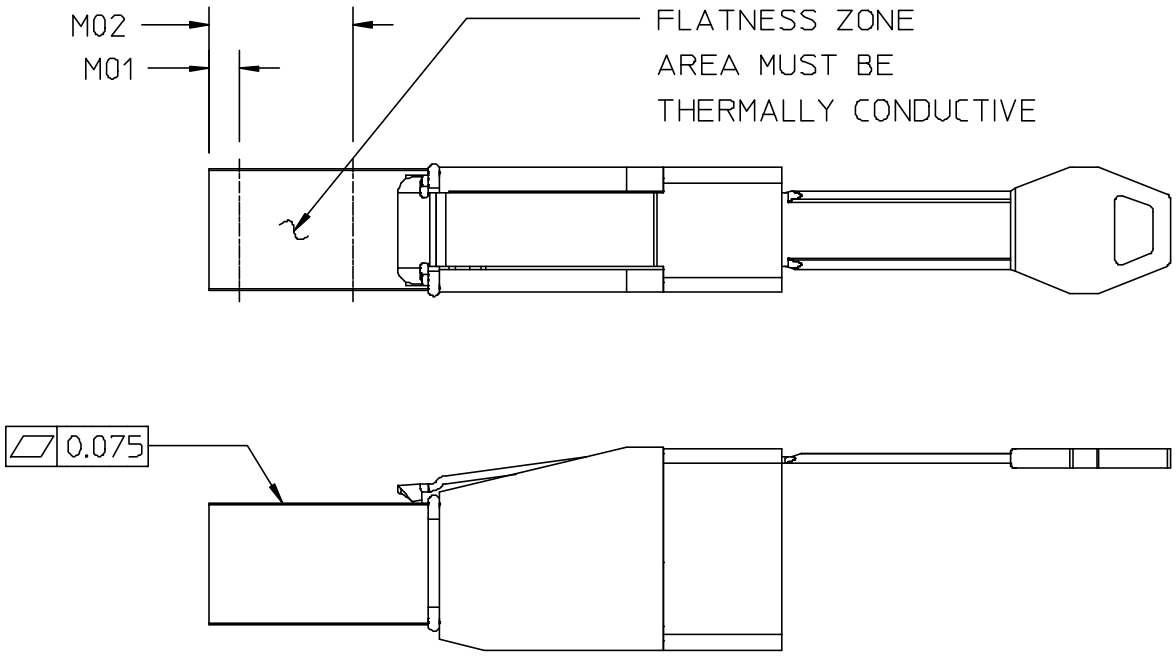


Figure 6.11. Thermal Interface Definition for HD Integrated Plug Connector

Designator	Description	Dimension	Tolerance
M01	Heat Sink Engagement Zone	2.50	Min
M02	Heat Sink Engagement Zone	12.25	Max

6.12. Heat Sink Configuration

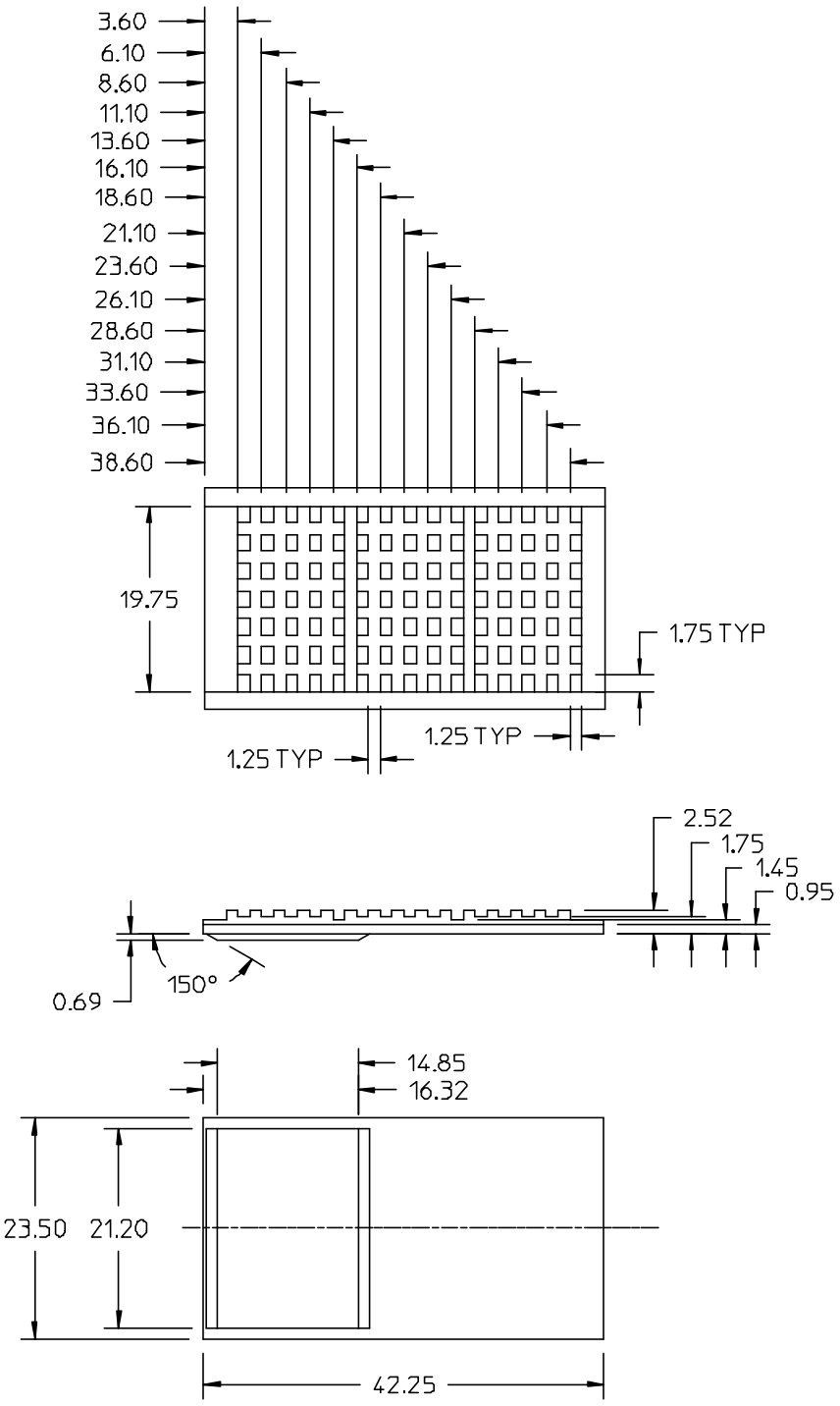


Figure 6.12. Heat Sink Profile for HD Integrated Receptacle for PCIe Card Applications

6.13. Heat Sink Clip

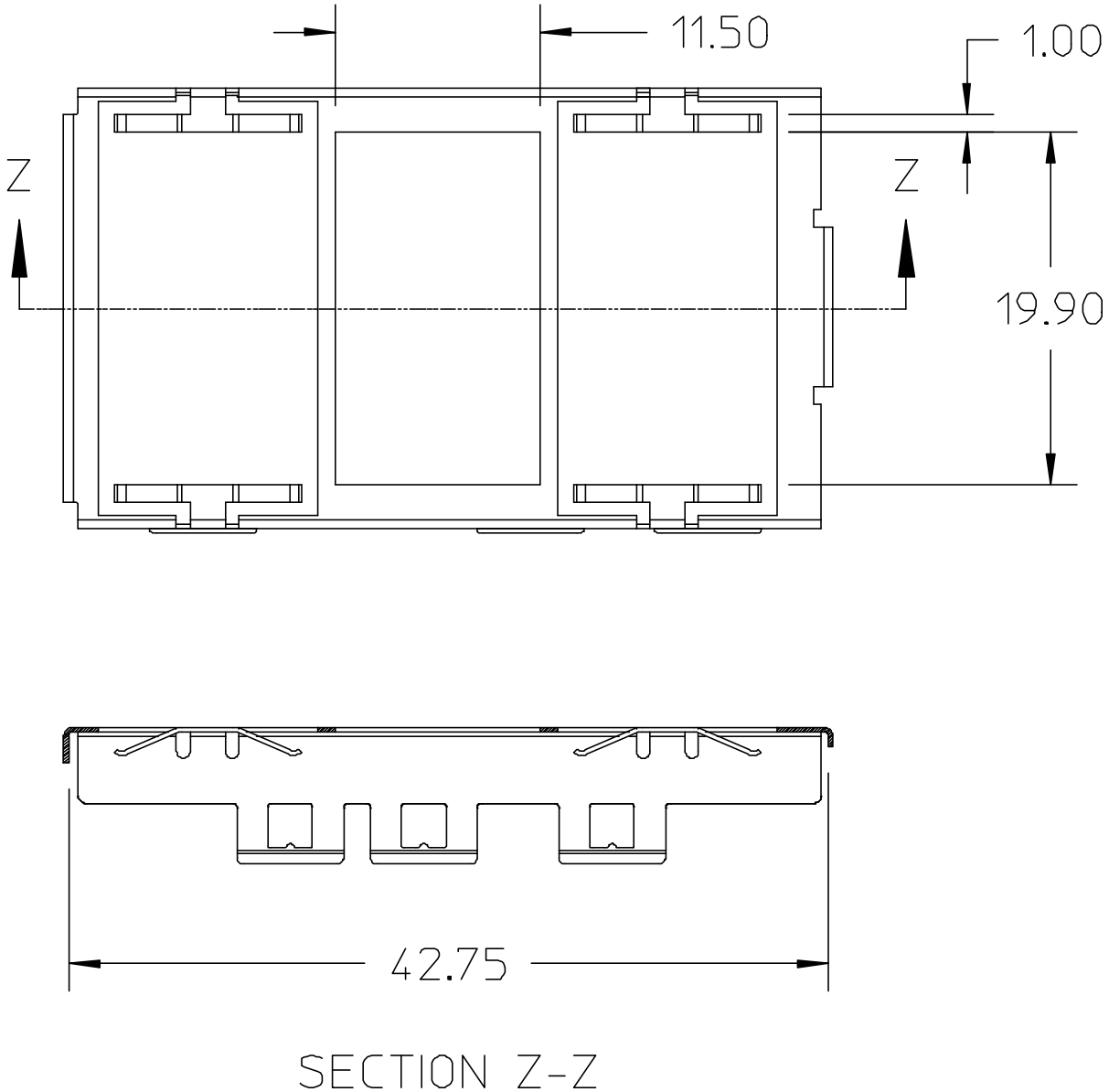


Figure 6.13. Heat Sink Clip Dimensions

6.14. Dust Cover for HD Integrated Receptacle Ports

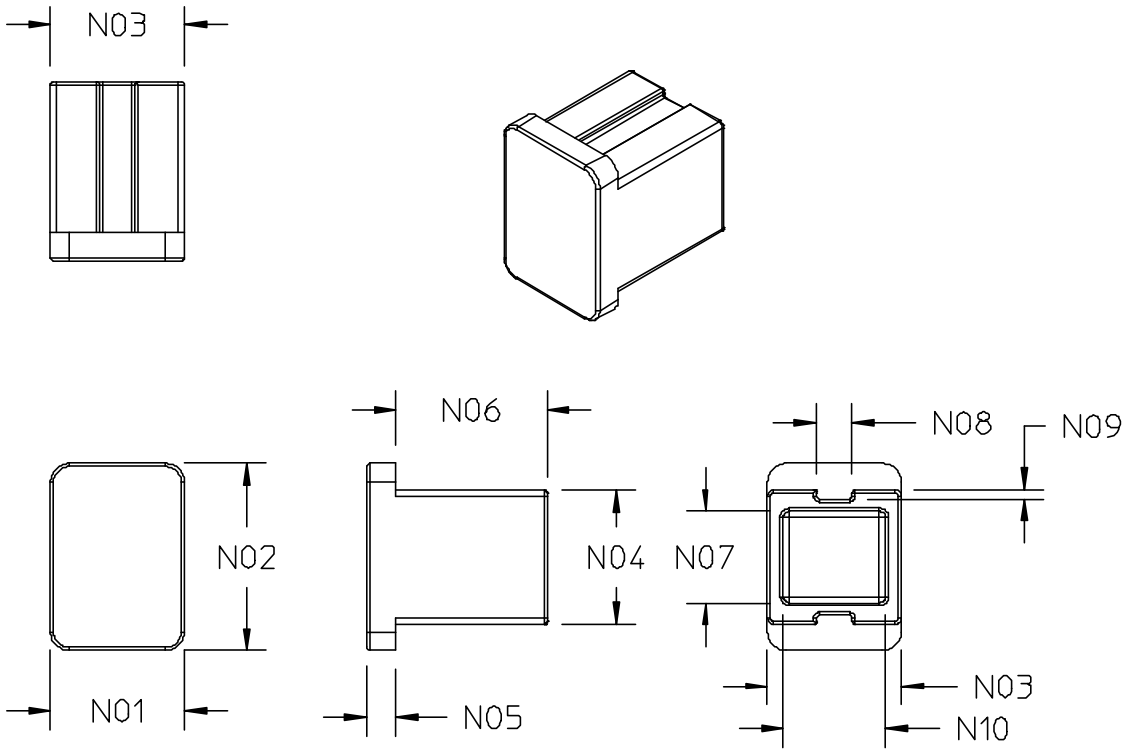


Figure 6.14. Dust Cover Dimensions

Designator	Description	Dimension	Tolerance
N01	Plug Front Width	10.65	Max
N02	Plug Front Height	14.95	0.25
N03	Plug Body Width	10.65	0.10
N04	Plug Body Height	10.76	0.10
N05	Plug Front Thickness	2.00	Min
N06	Plug Body Length	12.00	Max
N07	Plug Body Height - Inside	7.30	0.25
N08	Groove Width	2.85	0.25
N09	Groove Depth	0.73	0.25
N10	Plug Body Width - Inside	8.15	0.25