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The information below should be used instead of the equivalent herein.

POINTS OF CONTACT:

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If you are interested in participating in the activities of the SFF TWG, the membership application can be found at:

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

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

The operations which complement the SNIA's TWG Policies & Procedures to guide the SFF TWG can be found at:

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

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SFF-8614 Specification
for
Mini Multilane 4/8X Shielded Cage/Connector (HDsh)

Rev 3.4 September 22, 2014

Secretariat: SFF Committee

Abstract: This specification defines the physical interface and general performance requirements for the Mini Multilane connector, which is designed for use in high speed serial, interconnect applications at multi-gigabit speeds. This connector is popularly referred to as the Mini-SAS HD (High Density) Connector system.

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.

GLGnet Electronics
Hewlett Packard
HGST
IBM
Molex
Seagate
Shinning Electronics
TE Connectivity

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

Amphenol
FCI
Foxconn

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

Broadcom
EMC
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JDS Uniphase
QLogic
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Update History:

The content of this specification was formerly contained in SFF-8644, and it was broken out into a separate specification so that it could be referenced by higher speed variations.

November 5, 2010:

- Sorted dimension designators to alphabetic order for all figures
- Changed Figure 5.1: from 18.01 to 18.00 and from 0.86 to 0.88
- Changed TR01 from 15.61 to 15.46
- Changed R03 from 10.50 to 10.43
- Changed R04 from 1.25 to 1.18
- Changed R07 from 1.95 to 1.80
- Changed R08 from 22.25 Min to 22.10 +/- 0.15
- Changed P01 from 3.75 to 3.00
- Changed P02 from 5.50 to 4.75
- Changed P03 from 14.25 to 13.50
- Changed P04 from 16.00 to 15.25
- Changed P05 from 24.75 to 24.00
- Changed P06 from 26.50 to 25.75
- Changed P15 from 14.22 to 13.24
- Changed P16 from 12.59 to 11.62
- Changed P17 from 2.80 to 2.05
- Changed P18 from 1.17 to 0.42

November 19, 2010:

- Dimension values replaced with dimension designators on Datums figure
- Changed P06 from 25.25 to 25.75
- Added P10 as 'application specific'

December 7, 2010

- Changed title to 'Shielded 8/4 Channel for 6 Gbs Applications'

Rev 2.5 January 11, 2011

- Changed R07 from 1.80 to 1.70
- Changed N03 from 2.15 to 2.25
- Changed A11 from 0.105 +/- 0.025 to 0.10 +/- 0.05
- Added note to G11 to clarify contact zone
- Title added for Section 8.1

Rev 2.8 May 5, 2011

- Changed title to 'Mini Multilane 12 Gbs 4/8X Shielded Connector'
- Expanded notes on Plug Latch figure
- Added Datum E, hard stop text and updated description on Plug EMI figure
- Added notes to 8X Plug figure

Rev 2.9 August 9, 2012

- Editorial revision to adopt latest template
- Removed electrical performance requirements specified by the using interface
- Simplified titling of sections, figures and tables
- Replaced double drawings of Figure 2-1
- Sections made consistent between SFF-8643 and SFF-8644

Rev 3.0 April 22, 2013

- Adopt editorial convention of Gb/s
- Title change for commonality in style with QSFP

Rev 3.1 May 29, 2014

- Added plug versions to Table 3-1
- Renamed B20 as 'Snout Groove Lead-in Width'
- Corrected the descriptions of G17-G24
- Renamed H01 as 'Cage Attachment Hole Diameter'
- Changed use of 'nut' to 'fastener' throughout Section 6.3
- Removed the M2 location notes from Figures 6-7, 6-8, 6-9
- Table 8-3 revised
 - o Expanded plug only Mating/Un-mating descriptions
 - o Changed mating force requirement from 150 to 60N maximum
 - o Added Latched Plug Pullout Force of 75N minimum
 - o Added Primary Key Withstand Force Strength of 70N minimum
 - o Added test criteria notes

Rev 3.2 June 11, 2014

- G20 changed to 1.12 MIN

Rev 3.3 August 4, 2014

- Completed revisions agreed to in the SSWG
 - o deleted test criteria notes
 - o blocking key withstand force removed
 - o added cautionary note to Figures 6-7, 6-8, 6-9 regarding choice of attachment screw length
 - o changed Mating Force from 60N to 62N in Table 8-3

Rev 3.4 September 22, 2014

- This specification created with the connector content removed from SFF-8644

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 current projects 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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1 Scope

This specification defines the Mini Multilane shielded cable plug, the shielded host board receptacle, and the latching requirements for them based upon the mating interface defined herein.

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.

- INCITS 519 SAS-3 (Serial Attached SCSI 3)
- INCITS 534 SAS-4 (Serial Attached SCSI 4)
- SFF-8410 High Speed Serial Testing for Copper Links
- SFF-8643 Mini Multilane 4/8X 12 Gb/s Unshielded Connector (HD12un)
- SFF-8644 Mini Multilane 4/8X 12 Gb/s Shielded Connector (HD12sh)
- SFF-8673 Mini Multilane 4/8X 24 Gb/s Unshielded Connector (HD24un)
- SFF-8674 Mini Multilane 4/8X 24 Gb/s Shielded Connector (HD24sh)

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>).

2.4 Conventions

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

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 |

2.5 Definitions

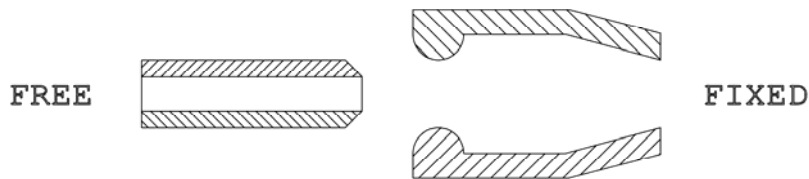
For the purpose of SFF Specifications, the following definitions apply:

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 3-1.

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 3-1.

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.



Note: The fixed gender is used on the device side except in the case of wire termination.

FIGURE 2-1 MATING SIDE GENDER DEFINITION

Press-fit: Press-fit is a compliant pin, solder free process used to connect connector pins and tabs to a PCB. The mechanical and electrical interfaces between the connector and the PCB are made by a spring-like compliant pin and a plated thru hole (via).

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 Description

The connector system is based upon an integrated right angle receptacle (fixed) 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 and also provides the latching points for the plug connector. This connector system provides positive retention along with ease of insertion and removal.

3.1 General View

This specification provides for a 1x1, 1x2 and 1x4 integrated receptacle/cage (fixed side) as well as a 1x1 (4X) and a 1x2 (8X) mating cable plug (free side)

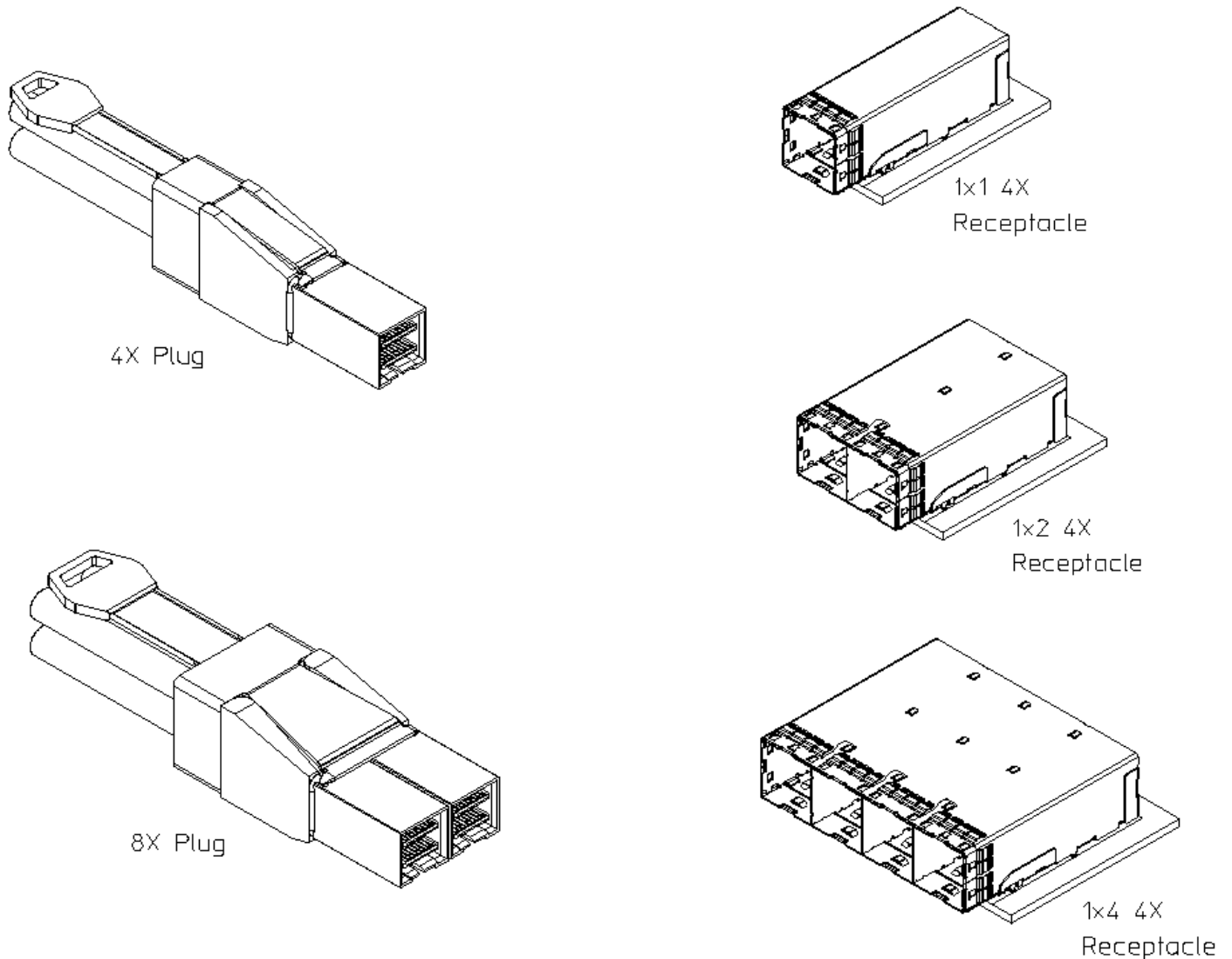


FIGURE 3-1 GENERAL VIEW OF CONFIGURATIONS

TABLE 3-1 CONFIGURATIONS SUPPORTED

| Port | Positions | Host Connector Orientation | Plug |
|------|-----------|----------------------------|------|
| 1x1 | 36 | Right Angle | 1x1 |
| 1x2 | 72 | Right Angle | 1x2 |
| 1x4 | 144 | Right Angle | N/A |

3.2 Pin Assignments

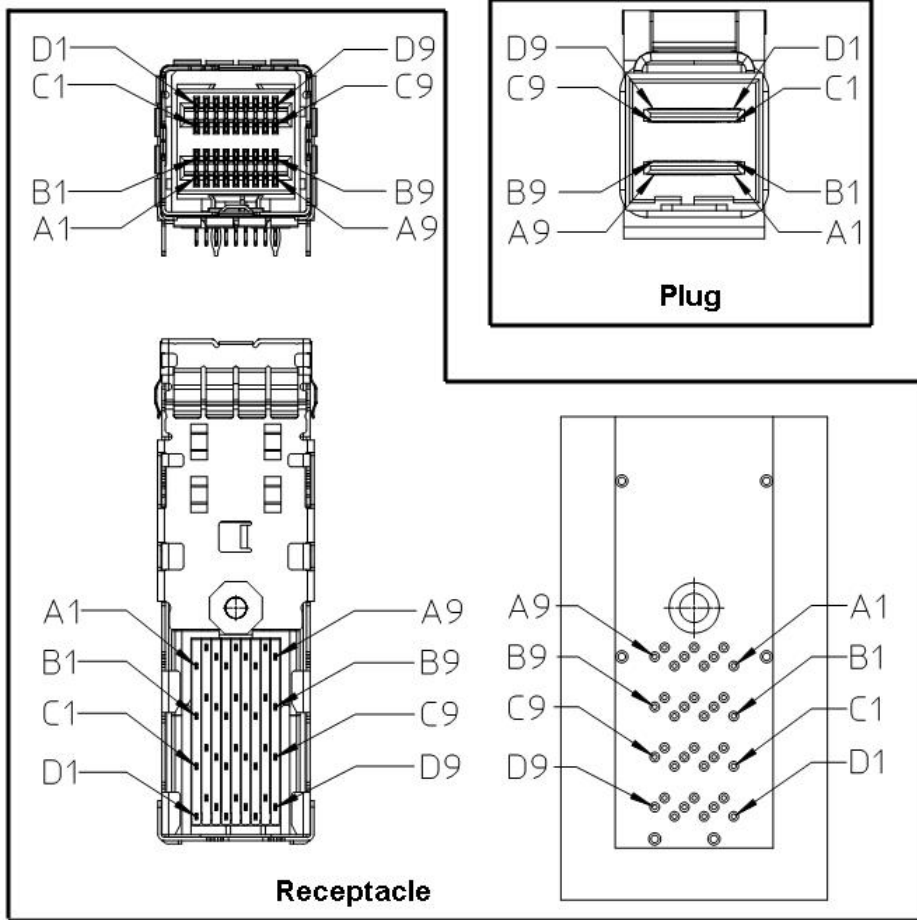


FIGURE 3-2 PIN ASSIGNMENTS

4 Datums

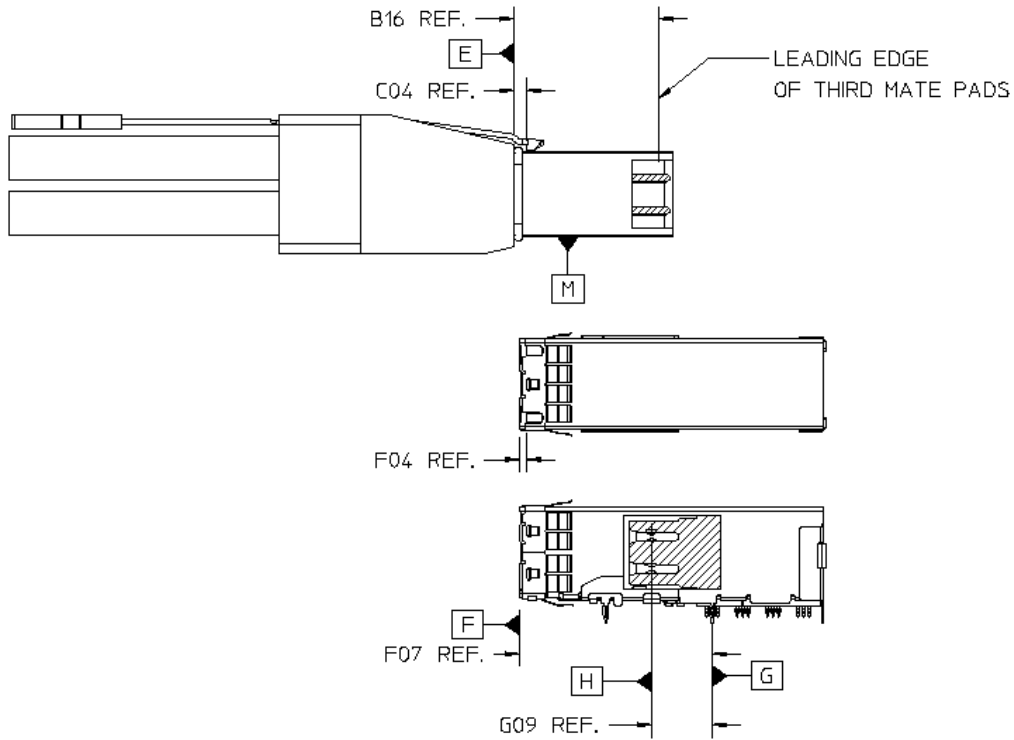


FIGURE 4-1 DATUMS (NOT ALL SHOWN)

TABLE 4-1 DATUM DESCRIPTIONS

| Datum | Description |
|-------|--|
| A | Width of Paddle Card |
| B | Top Surface of Paddle Card |
| C | Leading Edge of Third Mate Signal Pad on Paddle Card |
| D | Width of Plug Snout |
| E | Leading Edge of Plug Body |
| F | Front Edge of Receptacle Snout |
| G | Centerline of Second Row of First Group of Compliant Tails |
| H | Centerline of Receptacle Contacts - Lower Row |
| J | Centerline of Outer Holes |
| K | Centerline of Second Row of First Group of PCB Holes |
| L | Surface of PCB |
| M | Bottom of Plug Body |
| P | Width of Receptacle Snout |
| R | Bottom of Receptacle (PCB Interface) |
| X, Y | Reference 0, 0 on Host Board |

5 Plug Requirements

5.1 Plug Paddle Card

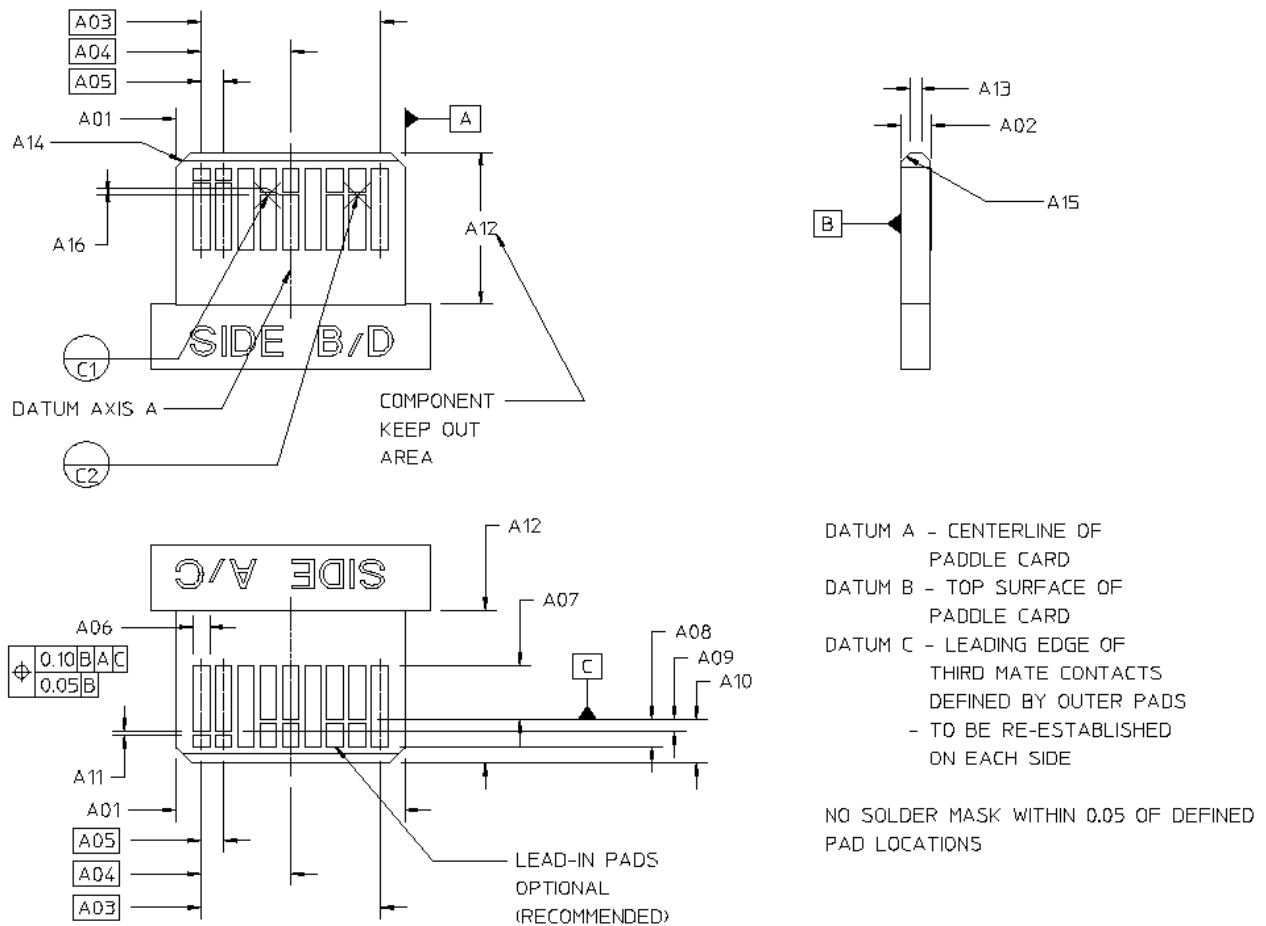


FIGURE 5-1 PLUG PADDLE CARD

TABLE 5-1 PLUG 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 | 0.57 | 0.03 |
| A07 | Pad Length - Third Mate | 1.85 | 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 | 0.10 | 0.05 |
| A12 | Component Keep Out Area | 5.40 | Min |
| A13 | Lead-in Flat | 0.40 | Ref |
| A14 | Lead-in Chamfer x 45 degrees | 0.50 | 0.05 |
| A15 | Lead-in Chamfer x 45 degrees | 0.30 | 0.05 |
| A16 | Third Mate Pad to Datum C | 0.00 | 0.03 |

5.2 4X Plug

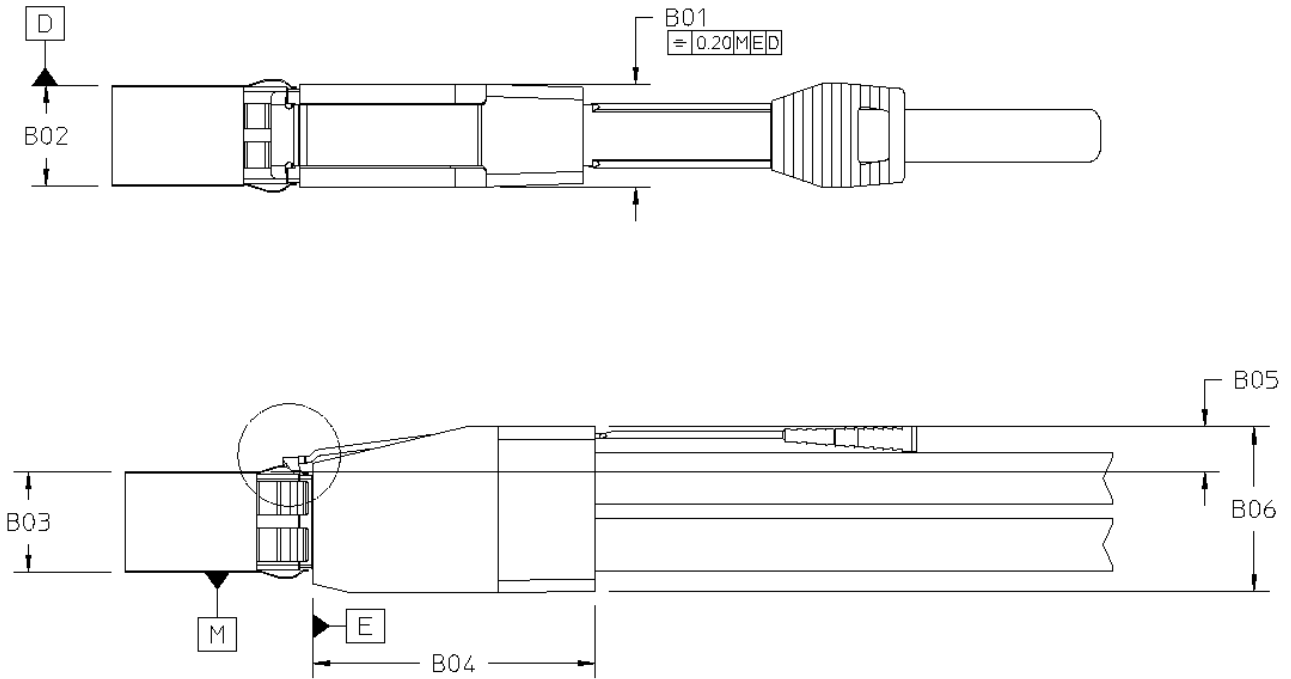
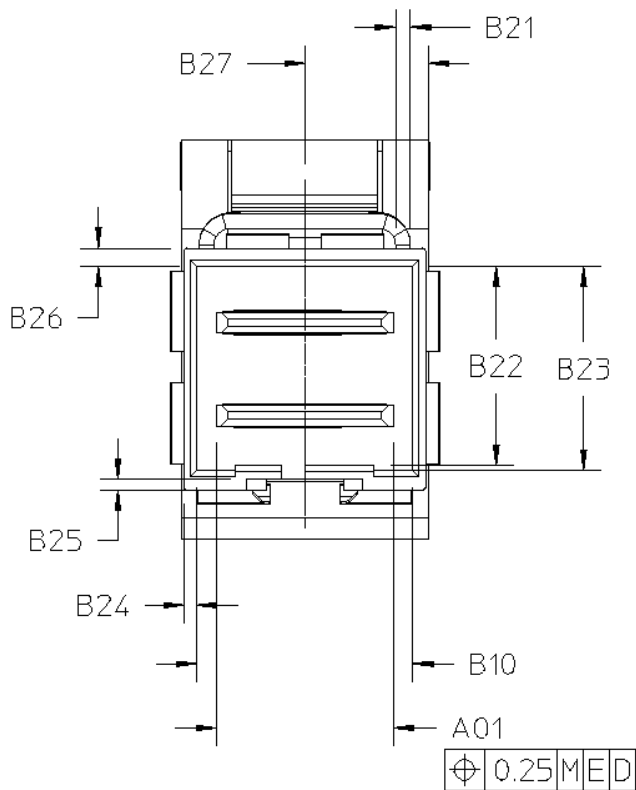


FIGURE 5-2 4X PLUG



THE GEOMERY OF LATCH RETENTION FEATURES MUST MATE WITH THE CAGE LATCH HOLES AS DEFINED BY F03 & F05 IN FIGURE 7.1.1

FIGURE 5-3 4X PLUG RETENTION

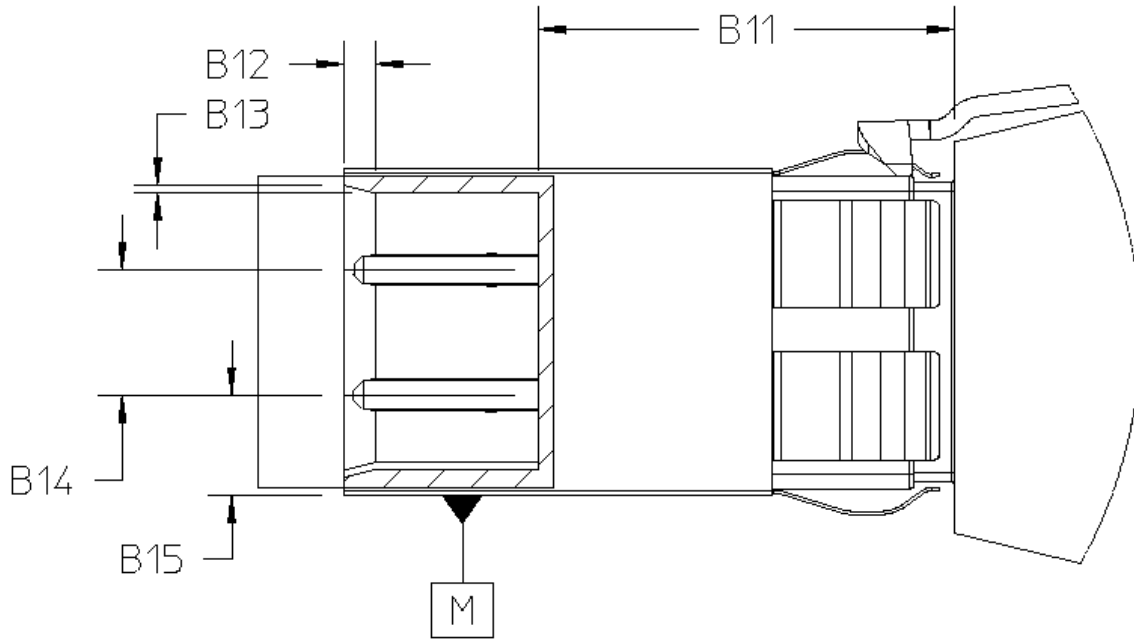


FIGURE 5-4 4X PLUG HOUSING

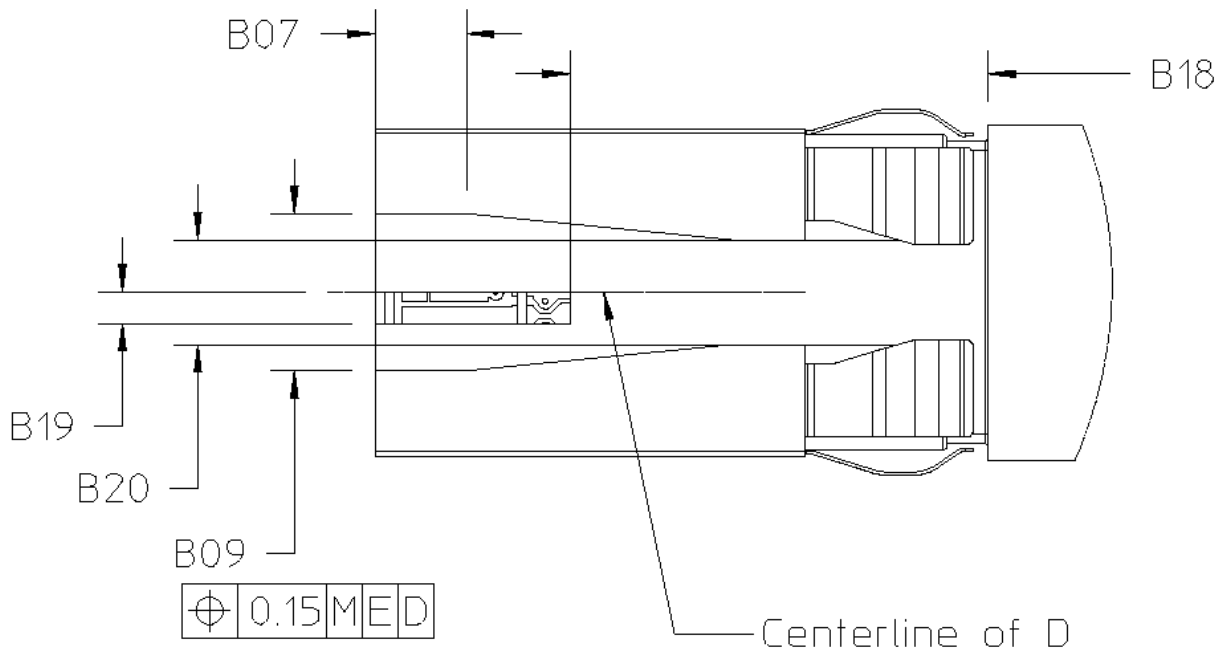


FIGURE 5-5 4X PLUG KEY SLOT

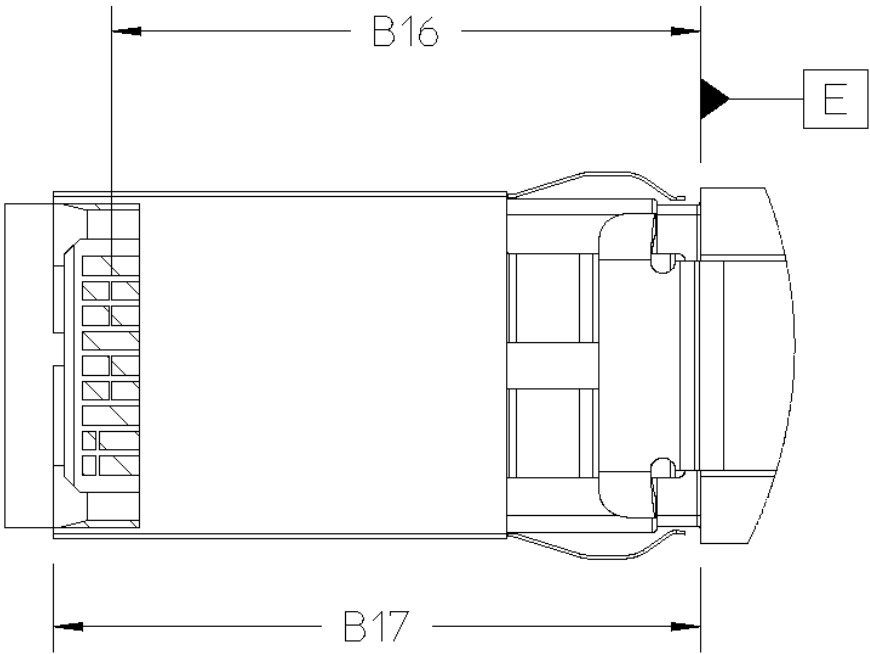
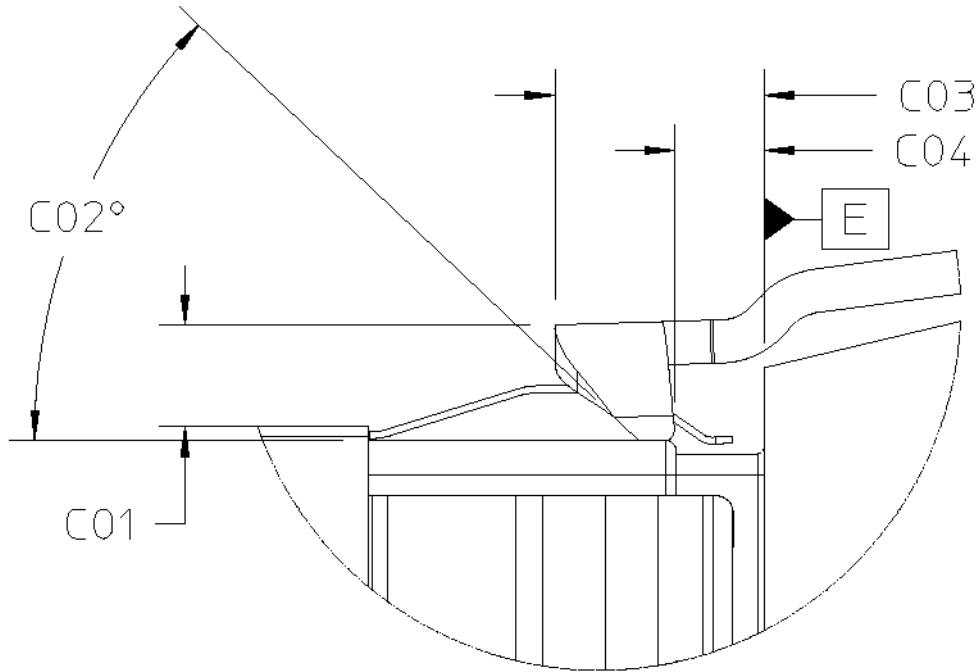


FIGURE 5-6 4X PLUG LATCH STOP TO CONTACT

TABLE 5-2 4X PLUG DIMENSIONS

| Designator | Description | Dimension | Tolerance +/- |
|------------|--------------------------------------|-----------|---------------|
| B01 | Plug Body Width | 10.85 | Max |
| B02 | Snout Width | 10.45 | 0.15 |
| B03 | Snout Height | 10.45 | 0.15 |
| B04 | Plug Body Length | 32.00 | Max |
| B05 | Snout Top to Plug Body Top | 4.70 | 0.15 |
| B06 | Plug Body Height | 20.30 | Max |
| B07 | Snout Groove Lead-in Length | 2.92 | 0.25 |
| B08 | Datum E to Snout Groove End | 1.50 | 0.10 |
| B09 | Snout Groove Lead-in Width | 5.00 | 0.15 |
| B10 | Snout Inside Width | 9.35 | Ref |
| B11 | Datum E to Internal Keep Out Area | 13.33 | 0.10 |
| B12 | Lead-in Chamfer | 1.00 | 0.15 |
| B13 | Lead-in Chamfer | 0.25 | 0.10 |
| B14 | PCB Centerline to PCB Centerline | 4.00 | 0.10 |
| B15 | Snout Bottom to Lower PCB Centerline | 3.22 | 0.10 |
| B16 | Plug Body to PCB Datum | 17.80 | 0.25 |
| B17 | Snout Length | 19.56 | 0.10 |
| B18 | Datum E to Blocking Key Slot End | 13.33 | 0.10 |
| B19 | Blocking Key Slot Width | 1.00 | 0.15 |
| B20 | Snout Groove Lead-in Width | 3.34 | 0.15 |
| B21 | Latch Barb Zone | 0.70 | Ref |
| B22 | Snout Inside Height | 8.62 | 0.10 |
| B23 | Snout Inside Height | 8.85 | 0.10 |
| B24 | Plug Side Wall Thickness | 0.55 | 0.08 |
| B25 | Snout Groove Height | 0.45 | 0.10 |
| B26 | Snout Top Thickness | 0.78 | 0.10 |
| B27 | Latch Catch Width | 4.57 | Ref |

5.3 4X Plug Latch

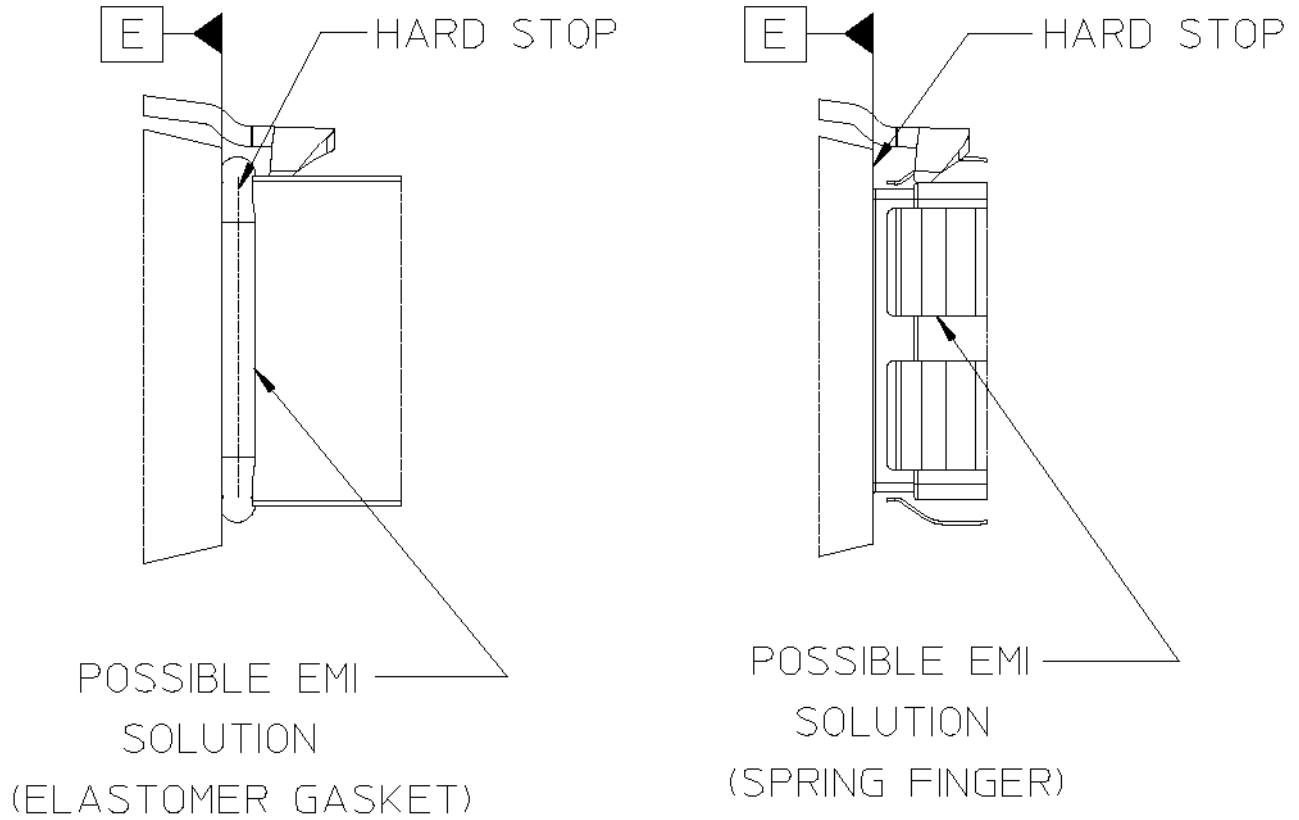


- Figure shown is one possible EMI solution / Latch configuration.
- Datum E is the leading edge of the plug body and in this configuration acts as the hard stop for the plug against the receptacle cage.
- For other configurations, dimensions taken from Datum E (i.e. C03 and C04) must be adjusted to reflect the equivalent hard stop location from Datum E (i.e. using the compression of the elastomeric gasket to define the hard stop).

FIGURE 5-7 4X PLUG LATCH

TABLE 5-3 4X PLUG LATCH DIMENSIONS

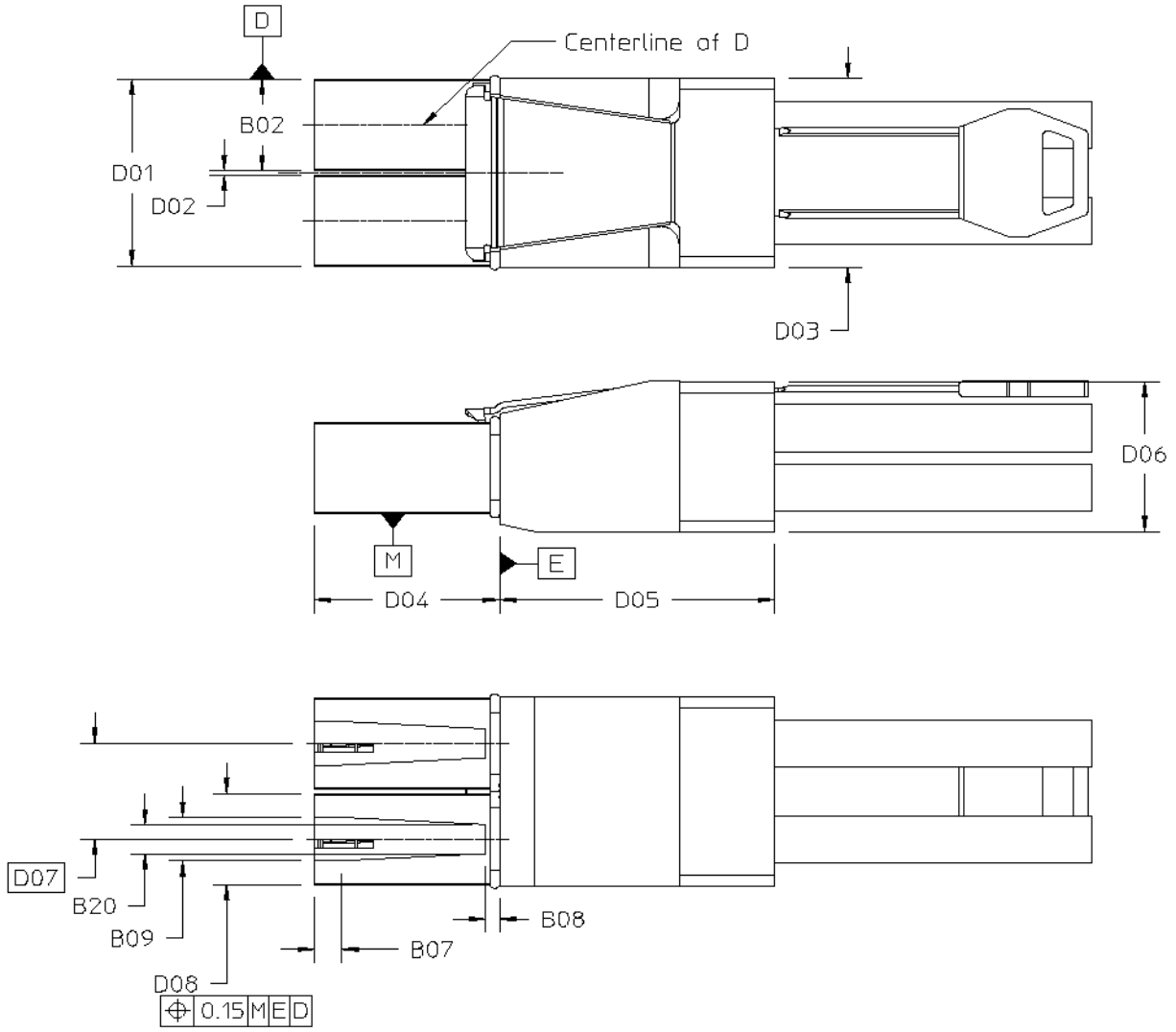
| Designator | Description | Dimension | Tolerance +/- |
|------------|---------------------|-----------|---------------|
| C01 | Latch Height | 1.51 | Ref. |
| C02 | Latch Lead-In Angle | 43° | Ref. |
| C03 | Latch Length | 3.70 | Max |
| C04 | Latch Barb Location | 1.32 | 0.15 |



- Figure shows two possible EMI solutions.
- Other EMI solutions or configurations are possible based on the application requirements.

FIGURE 5-8 4X PLUG EMI OPTIONS

5.4 8X Plug



Note: This Figure is shown with one possible elastomeric gasket solution and Datum E and the dimensions established from that datum have been adjusted accordingly for this solution's equivalent hard stop.

FIGURE 5-9 8X PLUG

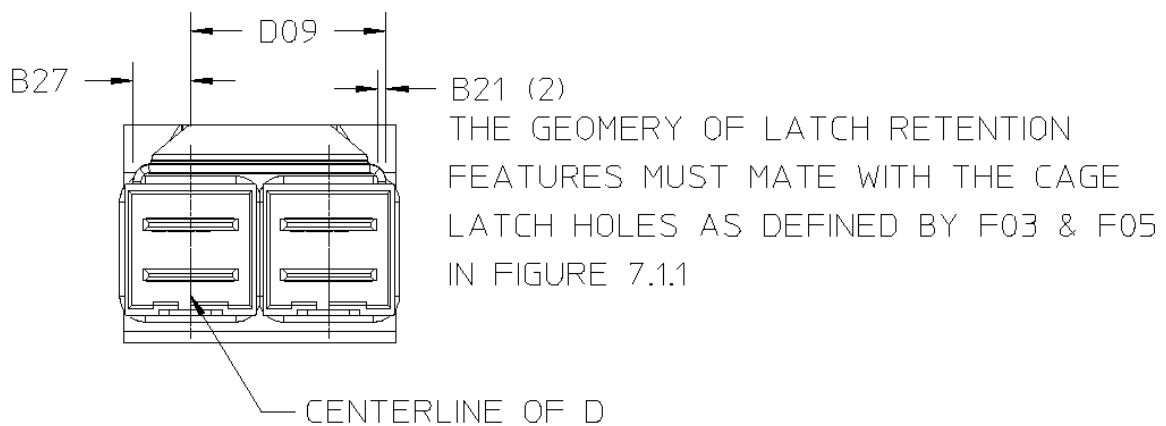


FIGURE 5-10 8X PLUG RETENTION

TABLE 5-4 8X PLUG DIMENSIONS

| Designator | Description | Dimension | Tolerance +/- |
|------------|------------------------|-----------|---------------|
| D01 | Snout Width - Overall | 21.45 | 0.20 |
| D02 | Snout Gap | 0.55 | Ref. |
| D03 | Plug Body Width | 21.90 | Max |
| D04 | Snout Length | 19.76 | 0.10 |
| D05 | Plug Body Length | 32.00 | Max |
| D06 | Plug Body Height | 20.30 | Max |
| D07 | Snout to Snout Pitch | 11.00 | Basic |
| D08 | Snout Width | 10.45 | 0.15 |
| D09 | Datum D to Latch Catch | 15.57 | Ref. |

5.5 Plug Pull Tab

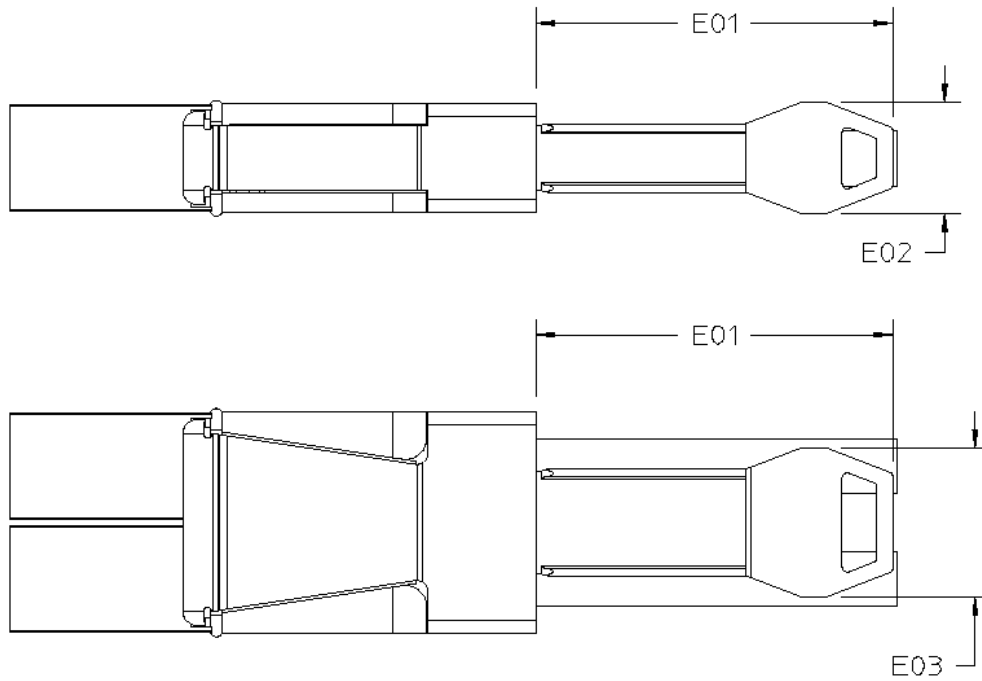


Figure shown is one possible solution.
 Other configurations to remain within the E02 dimensions
 Specific standards may employ color coding for Pull Tabs

FIGURE 5-11 PLUG PULL TAB

TABLE 5-5 PLUG PULL TAB DIMENSIONS

| Designator | Description | Dimension | Tolerance +/- |
|------------|---------------------|-----------|---------------|
| E01 | Latch Pull Length | 40.00 | Ref |
| E02 | 4X Latch Pull Width | 10.90 | Max |
| E03 | 8X Latch Pull Width | 15.00 | Max |

5.6 Plug Thermal Interface

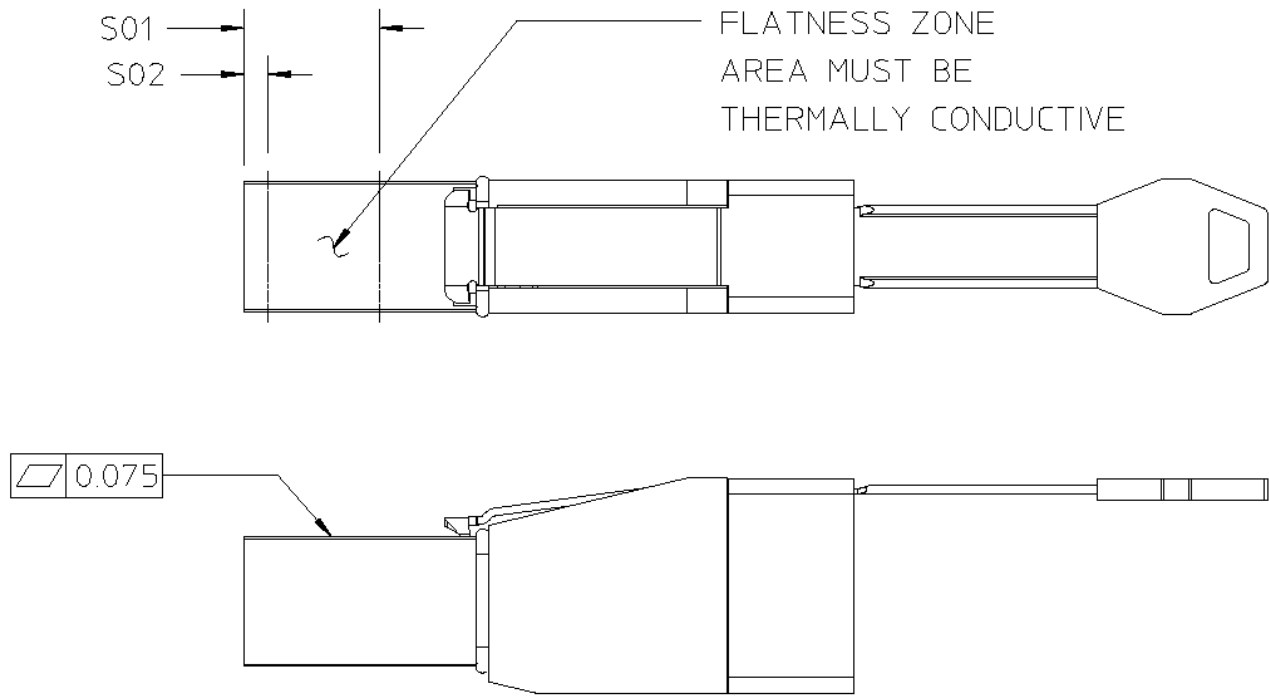


FIGURE 5-12 PLUG THERMAL INTERFACE

TABLE 5-6 PLUG THERMAL INTERFACE DIMENSIONS

| Designator | Description | Dimension | Tolerance +/- |
|------------|---------------------------|-----------|---------------|
| S01 | Heat Sink Engagement Zone | 11.00 | Min |
| S02 | Heat Sink Engagement Zone | 2.00 | Max |

6 Receptacle Requirements

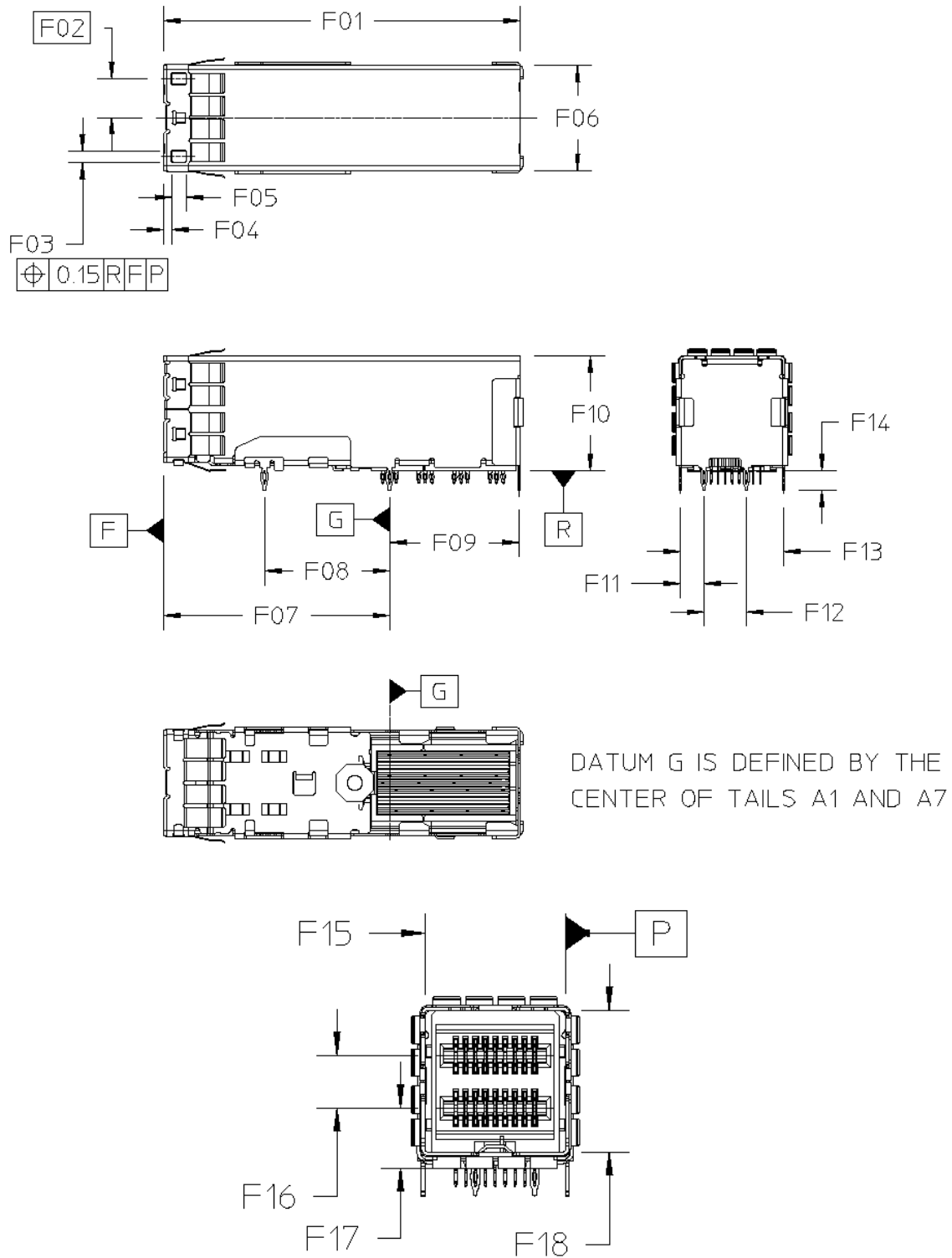


FIGURE 6-1 RECEPTACLE

TABLE 6-1 RECEPTACLE DIMENSIONS

| Designator | Description | Dimension | Tolerance +/- |
|------------|------------------------------------|-----------|---------------|
| F01 | Cage Length | 38.00 | 0.15 |
| F02 | Cage Center to Latch Hole Center | 4.15 | Basic |
| F03 | Latch Hole Width | 1.20 | 0.10 |
| F04 | Cage Front to Latch Hole Front | 0.88 | 0.05 |
| F05 | Latch Hole Length | 1.40 | Min |
| F06 | Cage Width | 11.25 | 0.10 |
| F07 | Datum G to Front Face | 24.06 | 0.10 |
| F08 | Datum G to Cage Tail | 13.31 | 0.05 |
| F09 | Datum G to Cage Tail | 13.81 | 0.05 |
| F10 | Cage Height | 12.24 | 0.13 |
| F11 | Cage Tail to Tail | 2.51 | 0.10 |
| F12 | Cage Tail to Tail | 4.50 | 0.05 |
| F13 | Cage Tail to Tail | 11.00 | 0.10 |
| F14 | Cage Tail Length | 2.50 | Max. |
| F15 | Cage Opening - Width | 10.75 | 0.08 |
| F16 | Lower Card Slot to Upper Card Slot | 4.00 | 0.05 |
| F17 | Datum R to Lower Card Slot | 4.55 | 0.10 |
| F18 | Cage Opening - Height | 10.76 | 0.08 |

6.1 Receptacle Contact Locations

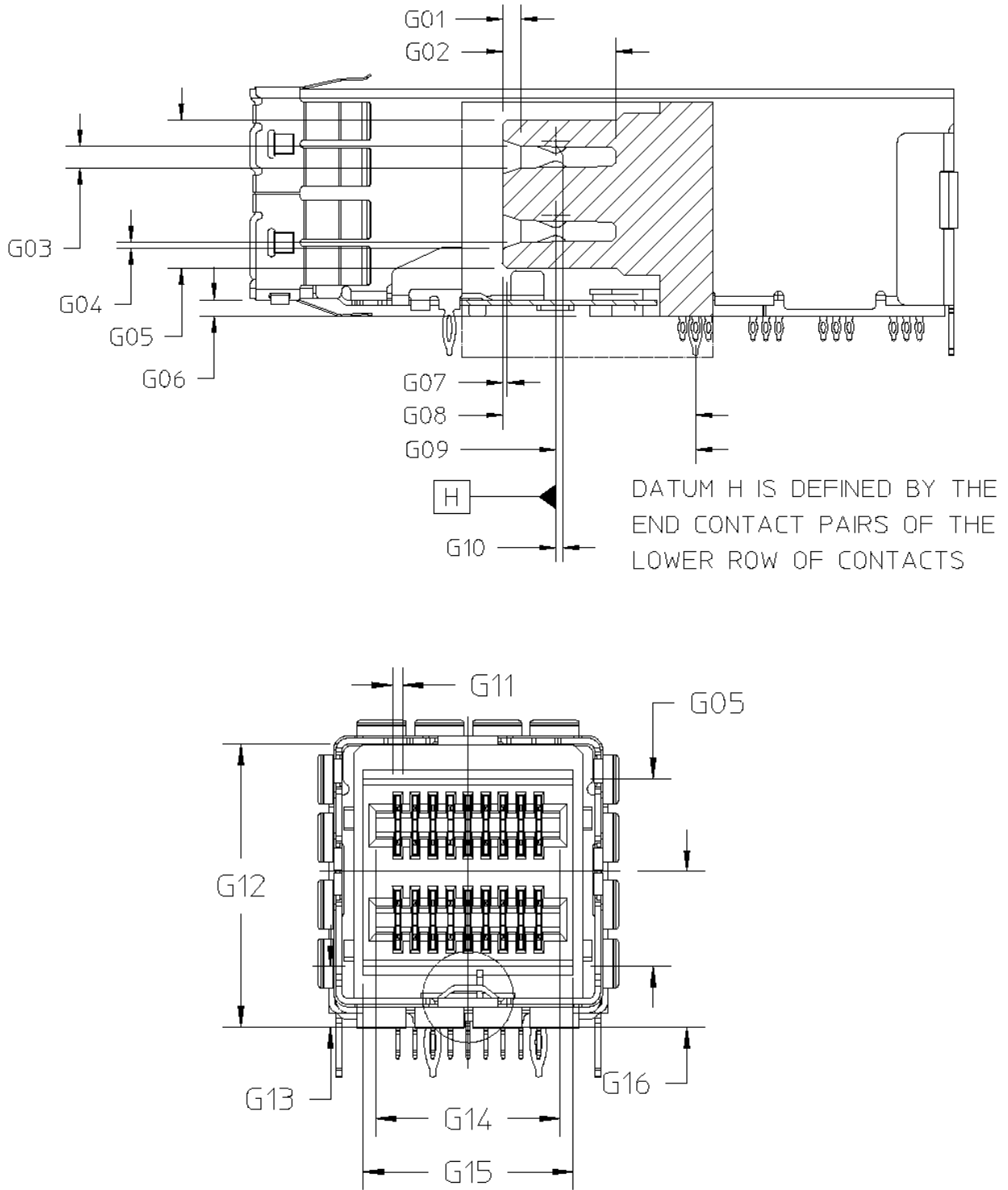


FIGURE 6-2 RECEPTACLE CONTACT LOCATIONS

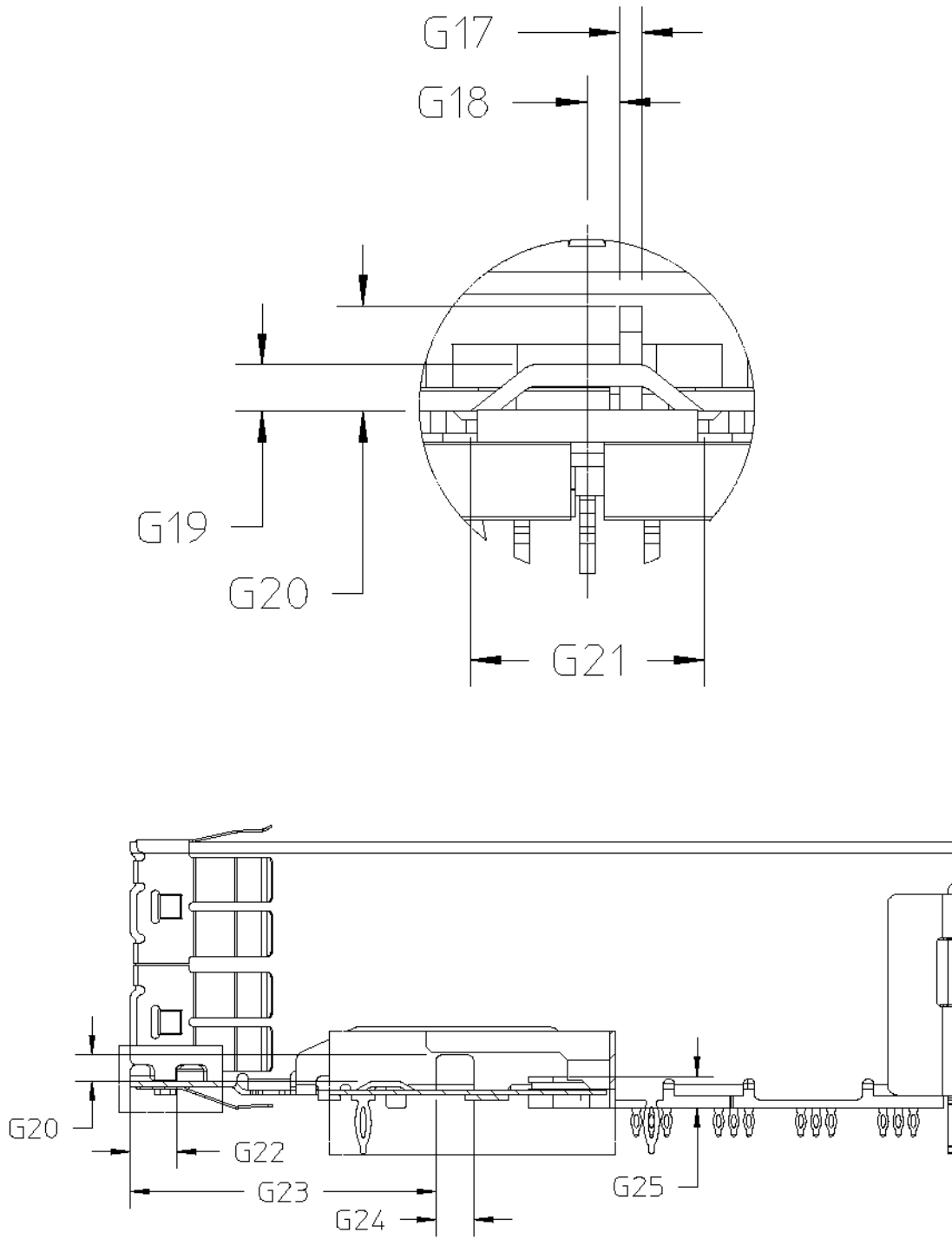


FIGURE 6-3 RECEPTACLE BLOCKING KEY

TABLE 6-2 RECEPTACLE CONTACT LOCATION AND BLOCKING KEY DIMENSIONS

| Designator | Description | Dimension | Tolerance +/- |
|--|---|-----------|---------------|
| G01 | Receptacle Card Slot Lead-In | 1.00 | 0.25 |
| G02 | Receptacle Snout Length | 6.13 | 0.08 |
| G03 | Receptacle Card Slot Height | 1.20 | 0.08 |
| G04 | Receptacle Card Slot Lead-In | 0.30 | 0.10 |
| G05 | Receptacle Snout Height | 7.94 | 0.10 |
| G06 | Cage Snout Offset | 0.86 | 0.15 |
| G07 | Housing Chamfer x 45° | 0.25 | 0.10 |
| G08 | Datum G to Receptacle Front | 10.43 | 0.10 |
| G09 | Datum G to Lower Contact Interface | 7.56 | 0.10 |
| G10 | Lower Contact to Upper Contact | 0.00 | 0.05 |
| G11 (*) | Contact Zone (0.18 wide terminal) | 0.30 | Max |
| | Contact Zone (0.20 wide terminal) | 0.32 | Max |
| | Contact Zone (0.22 wide terminal) | 0.34 | Max |
| G12 | Cage Opening to Cage Bottom | 11.98 | 0.10 |
| G13 | Datum R to Receptacle Snout | 2.58 | 0.08 |
| G14 | Receptacle Card Slot Width | 7.85 | 0.05 |
| G15 | Receptacle Body Width | 8.95 | 0.10 |
| G16 | Datum R to Centerline of Cage Snout Opening | 6.60 | 0.10 |
| G17 | Primary Blocking Key Width | 0.25 | 0.05 |
| G18 | Primary Blocking Key Location 1 | 0.37 | 0.10 |
| G19 | Preliminary Blocking Key Height | 0.54 | 0.10 |
| G20 | Primary Blocking Key Height | 1.12 | Min |
| G21 | Preliminary Blocking Key Width | 3.00 | Max |
| G22 | Preliminary Blocking Key Location | 2.10 | 0.13 |
| G23 | Primary Blocking Key Location 2 | 14.10 | 0.13 |
| G24 | Primary Blocking Key Length | 1.75 | Min |
| G25 | M2 Threaded Height to Cage Bottom | 1.45 | Max |
| (*) Note: Contact Zone is defined as a zone with its centerline located at the theoretical contact centerline and the contact must always be completely located within it. | | | |

6.2 Receptacle Footprints

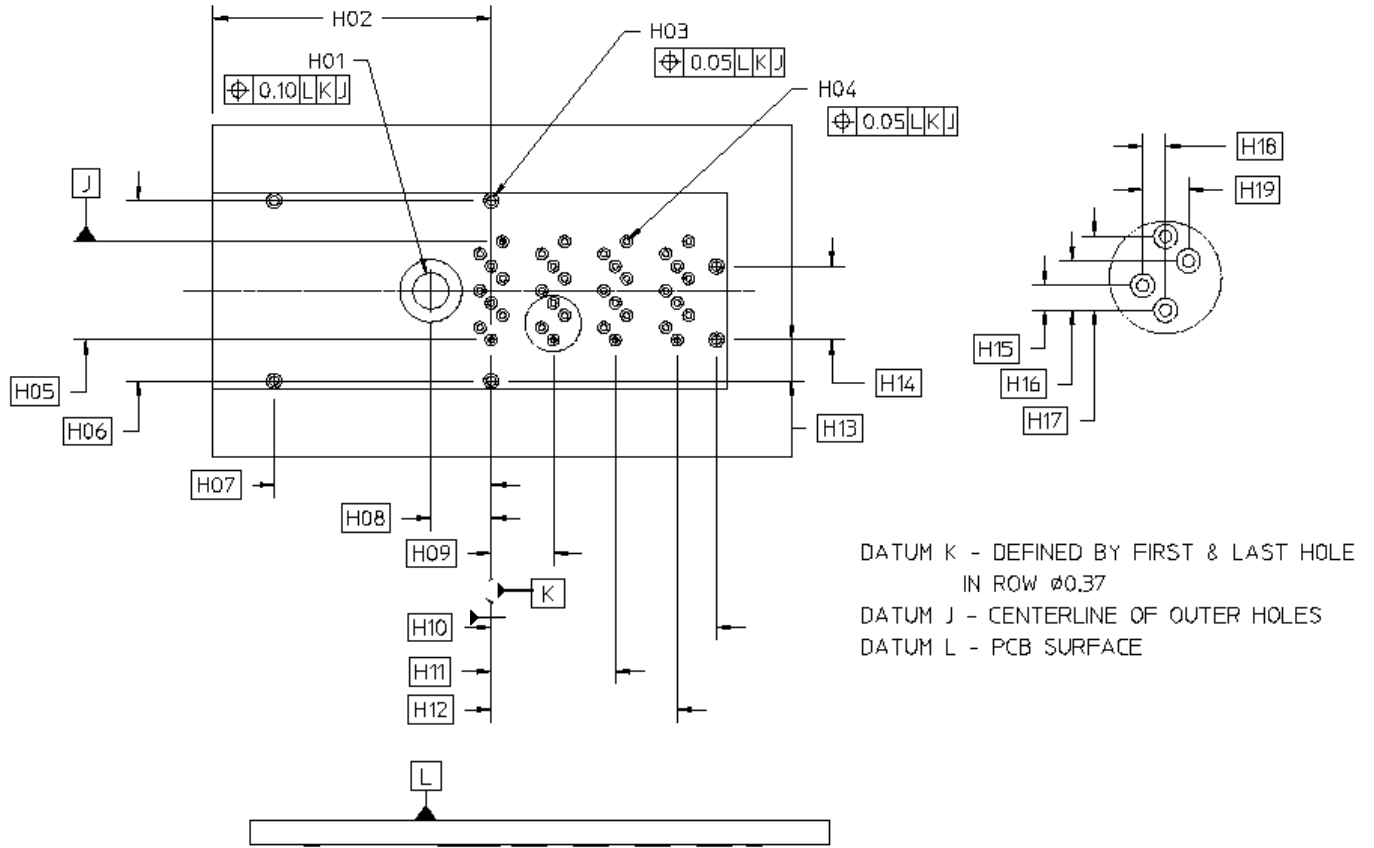


FIGURE 6-4 1X1 RECEPTACLE FOOTPRINT

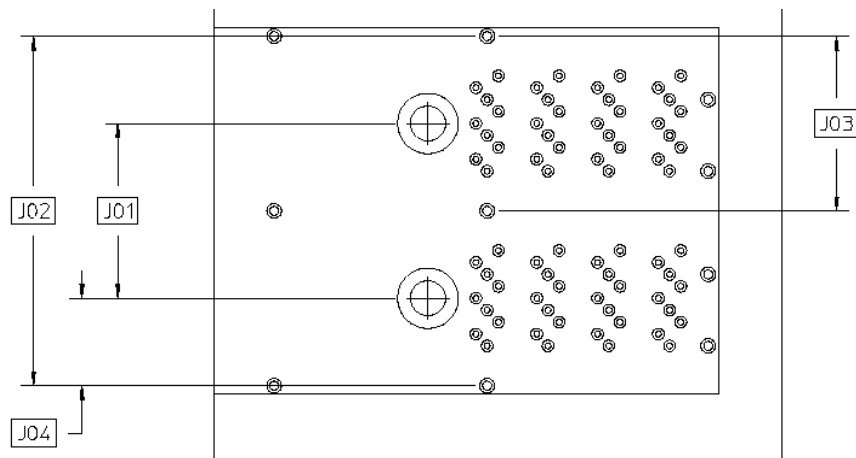


FIGURE 6-5 1X2 RECEPTACLE FOOTPRINT

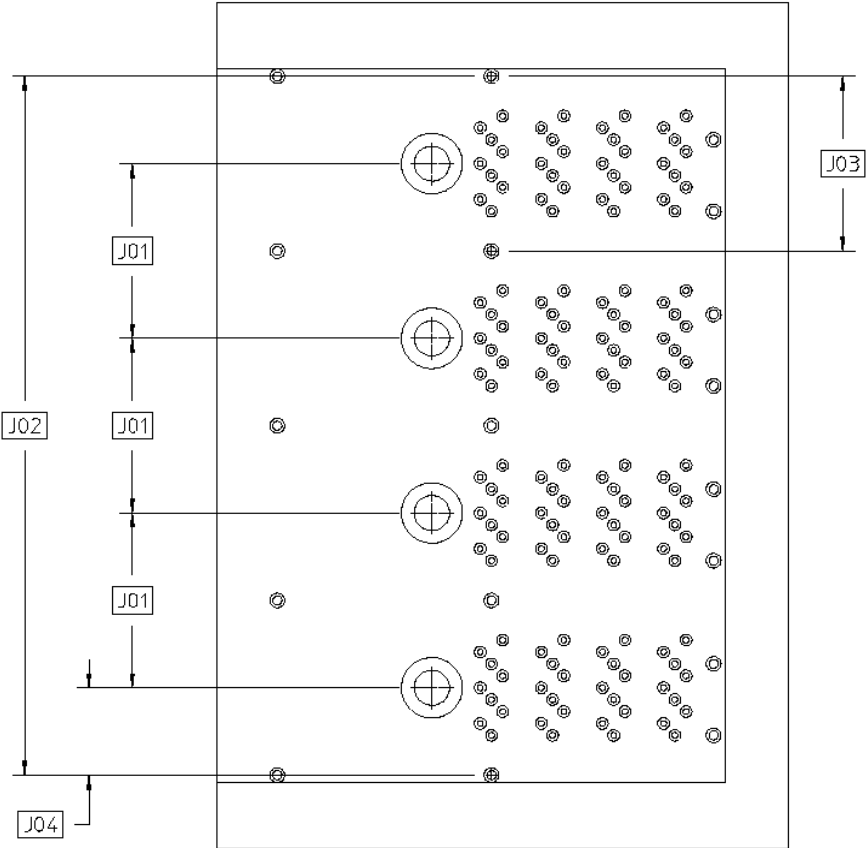
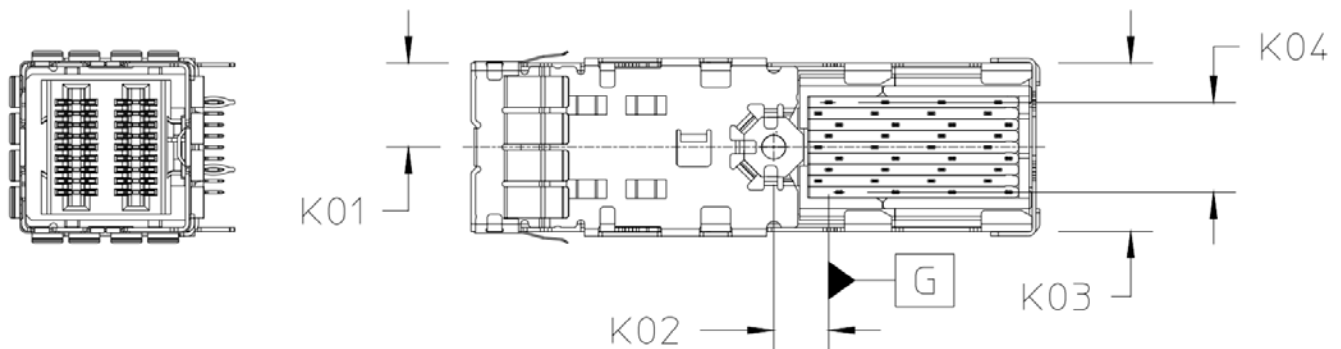


FIGURE 6-6 1X4 RECEPTACLE FOOTPRINT

TABLE 6-3 RECEPTACLE FOOTPRINT DIMENSIONS

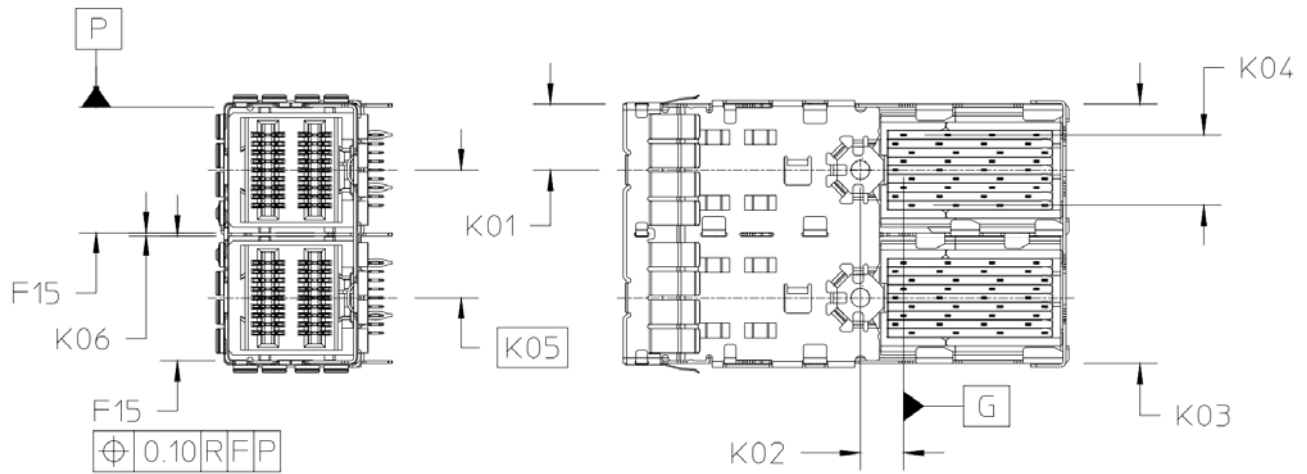
| Designator | Description | Dimension | Tolerance +/- |
|------------|--|-----------|---------------|
| H01 | Cage Attachment Hole Diameter | 2.20 | 0.10 |
| H02 | Datum to Front Edge of PCB PCI Add-in Card Applications | 17.10 | 0.15 |
| H02 | Datum to Front Edge of PCB All other (M/B) Applications | 18.19 | 0.15 |
| H03 | EMI Cage Hole Diameter | 0.57 | 0.05 |
| H04 | Receptacle Hole Diameter | 0.37 | 0.05 |
| H05 | Receptacle Pin, Center to Center | 6.00 | Basic |
| H06 | EMI Cage Hole to Hole | 11.00 | Basic |
| H07 | Datum K to Front Holes | 13.31 | Basic |
| H08 | Datum K to Mounting Hole | 3.70 | Basic |
| H09 | Datum K to Second Group | 3.80 | Basic |
| H10 | Datum K to Back Holes | 13.81 | Basic |
| H11 | Datum K to Third Group | 7.60 | Basic |
| H12 | Datum K to Fourth Group | 11.40 | Basic |
| H13 | EMI Cage Hole to Hole | 2.50 | Basic |
| H14 | EMI Cage Hole to Hole | 4.50 | Basic |
| H15 | Receptacle Hole to Hole | 0.75 | Basic |
| H16 | Receptacle Hole to Hole | 1.50 | Basic |
| H17 | Receptacle Hole to Hole | 2.25 | Basic |
| H18 | Receptacle Hole to Hole | 0.70 | Basic |
| H19 | Receptacle Hole to Hole | 1.40 | Basic |
| J01 | Port to Port Spacing | 11.00 | Basic |
| J02 | 1x2 Shield Hole to Hole | 22.00 | Basic |
| J02 | 1x4 Shield Hole to Hole | 44.00 | Basic |
| J03 | Shield Hole to Hole | 11.00 | Basic |
| J04 | Shield Hole to Mounting Hole | 5.50 | Basic |

6.3 Receptacle Compliant Tail to Attachment Fastener



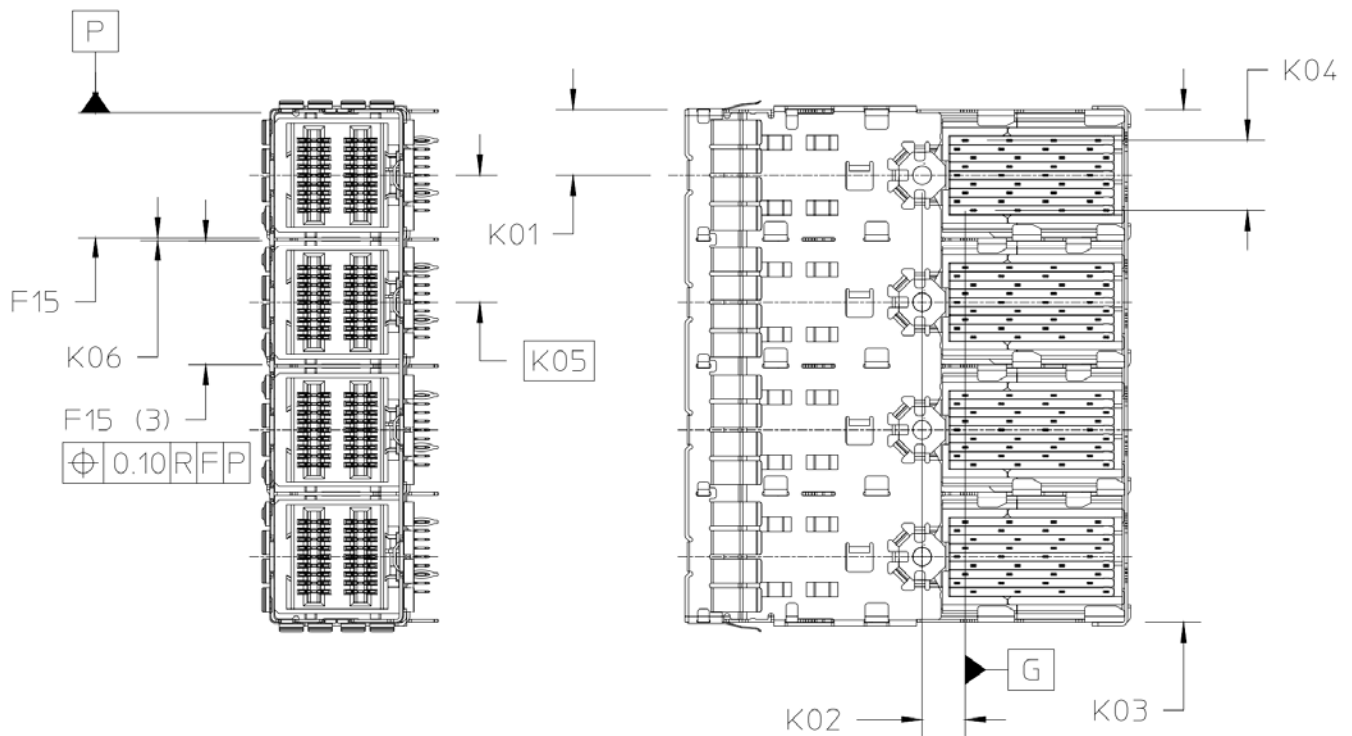
Caution - Special attention is required when choosing the length of the required M2 connector to PCB attachment screw. The end of the screw must not interfere with full insertion of the mating plug. The appropriate length is determined by the thickness of the PCB and its associated tolerances.

FIGURE 6-7 1X1 RECEPTACLE COMPLIANT TAIL TO ATTACHMENT FASTENER



Caution - Special attention is required when choosing the length of the required M2 connector to PCB attachment screw. The end of the screw must not interfere with full insertion of the mating plug. The appropriate length is determined by the thickness of the PCB and its associated tolerances.

FIGURE 6-8 1X2 RECEPTACLE COMPLIANT TAIL TO ATTACHMENT FASTENER



Caution - Special attention is required when choosing the length of the required M2 connector to PCB attachment screw. The end of the screw must not interfere with full insertion of the mating plug. The appropriate length is determined by the thickness of the PCB and its associated tolerances.

FIGURE 6-9 1X4 RECEPTACLE COMPLIANT TAIL TO ATTACHMENT FASTENER

TABLE 6-4 RECEPTACLE ATTACHMENT FASTENER DIMENSIONS

| Designator | Description | Dimension | Tolerance +/- |
|------------|---|-----------|---------------|
| K01 | Outside of Cage to M2 Fastener Centerline | 5.625 | Ref |
| K02 | Datum G to Shield M2 Fastener Thread | 3.70 | Ref |
| K03 | 1x1 Connector | 11.25 | 0.10 |
| K03 | 1x2 Connector | 22.25 | 0.10 |
| K03 | 1x4 Connector | 44.25 | 0.10 |
| K04 | Receptacle Tail to Receptacle Tail | 6.00 | Ref |
| K05 | Port to Port Spacing | 11.00 | Basic |
| K06 | Cage Internal Wall Thickness | 0.25 | 0.03 |

6.4 Receptacle to Bezel

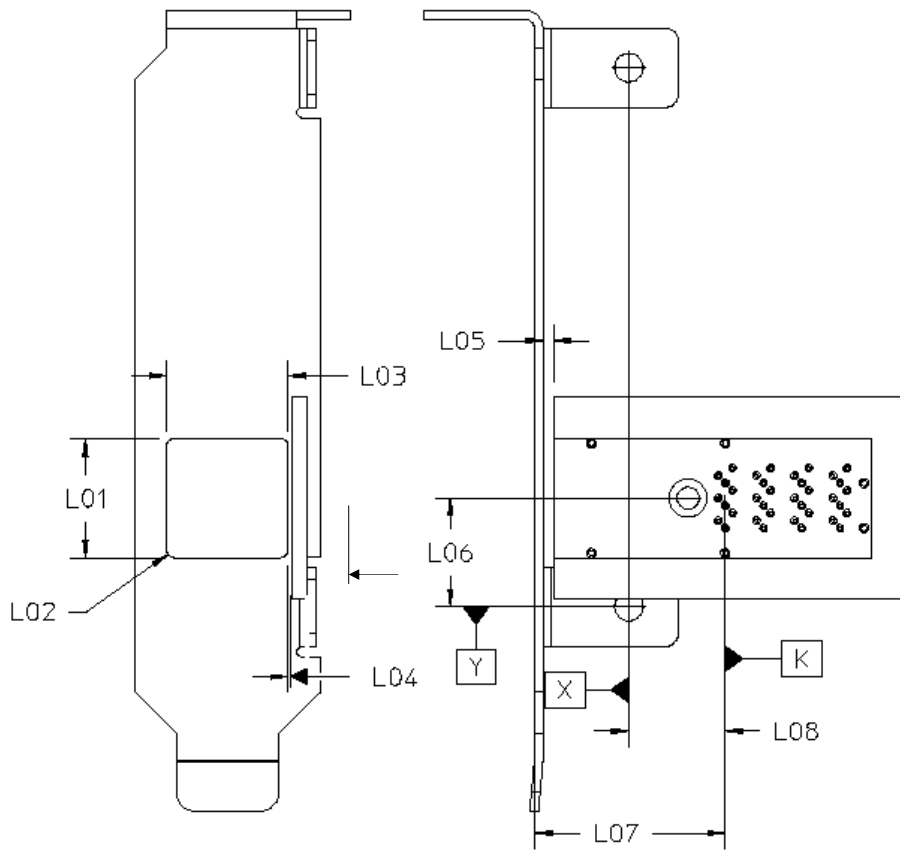


FIGURE 6-10 1X1 RECEPTACLE TO BEZEL

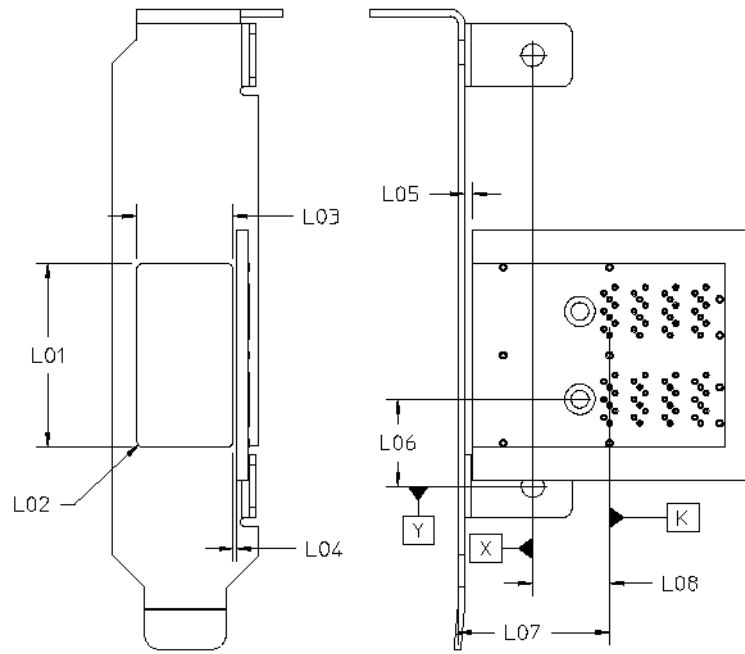


FIGURE 6-11 1X2 RECEPTACLE TO BEZEL

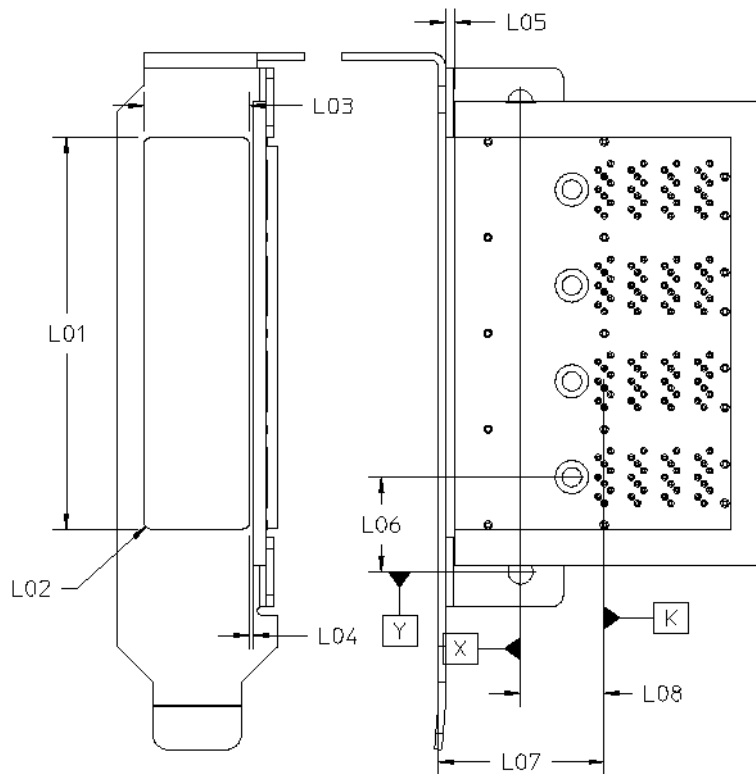


FIGURE 6-12 1X4 RECEPTACLE TO BEZEL

TABLE 6-5 1X1 RECEPTACLE TO BEZEL DIMENSIONS

| Designator | Description | Dimension | Tolerance +/- |
|------------|--|-----------|---------------|
| L01 | 1x1 Bracket Cut Out Width | 11.90 | 0.10 |
| L01 | 1x2 Bracket Cut Out Width | 22.90 | 0.10 |
| L01 | 1x4 Bracket Cut Out Width | 44.90 | 0.10 |
| L02 | Bracket Cut Out Radius | 0.75 | Max |
| L03 | Bracket Cut Out Height | 12.07 | 0.10 |
| L04 | PCB Surface to Bracket Cut Out | 0.38 | 0.10 |
| L05 | Bracket Back to PCB Front Edge | 1.03 | Ref |
| L06 | Mounting Hole to Manufacturer Fiducial | Basic | N/A |
| L07 | Bracket Front to Datum K PCI Add-in Card Applications | 19.00 | 0.15 |
| L07 | Bracket Front to Datum K All Other (M/B) Applications | 20.08 | 0.15 |
| L08 | Mounting Hole to Manufacturer Fiducial | Basic | N/A |

6.5 Receptacle Minimum Pitch

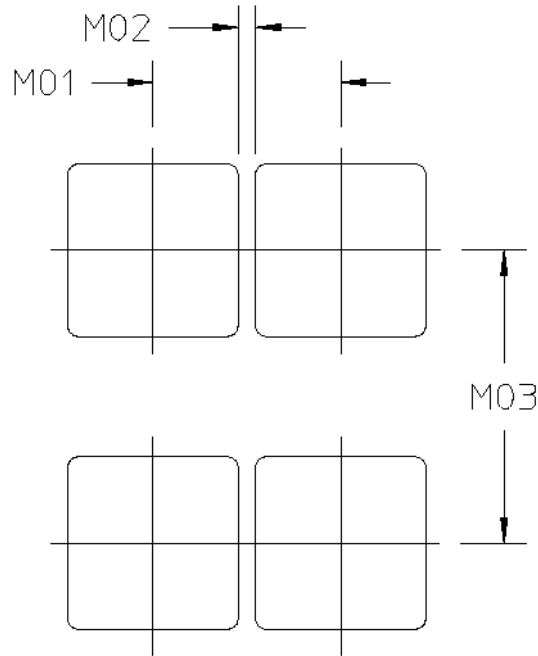


FIGURE 6-13 RECEPTACLE MINIMUM PITCH DIMENSIONS

TABLE 6-6 RECEPTACLE MINIMUM PITCH DIMENSIONS

| Designator | Description | Dimension | Tolerance +/- |
|------------|---------------------------|-----------|---------------|
| M01 | Port to Port - Horizontal | 13.25 | Min |
| M02 | Bracket Web | 1.00 | Min |
| M03 | Port to Port - Vertical | 20.50 | 0.10 |

6.6 Receptacle Dust Cover

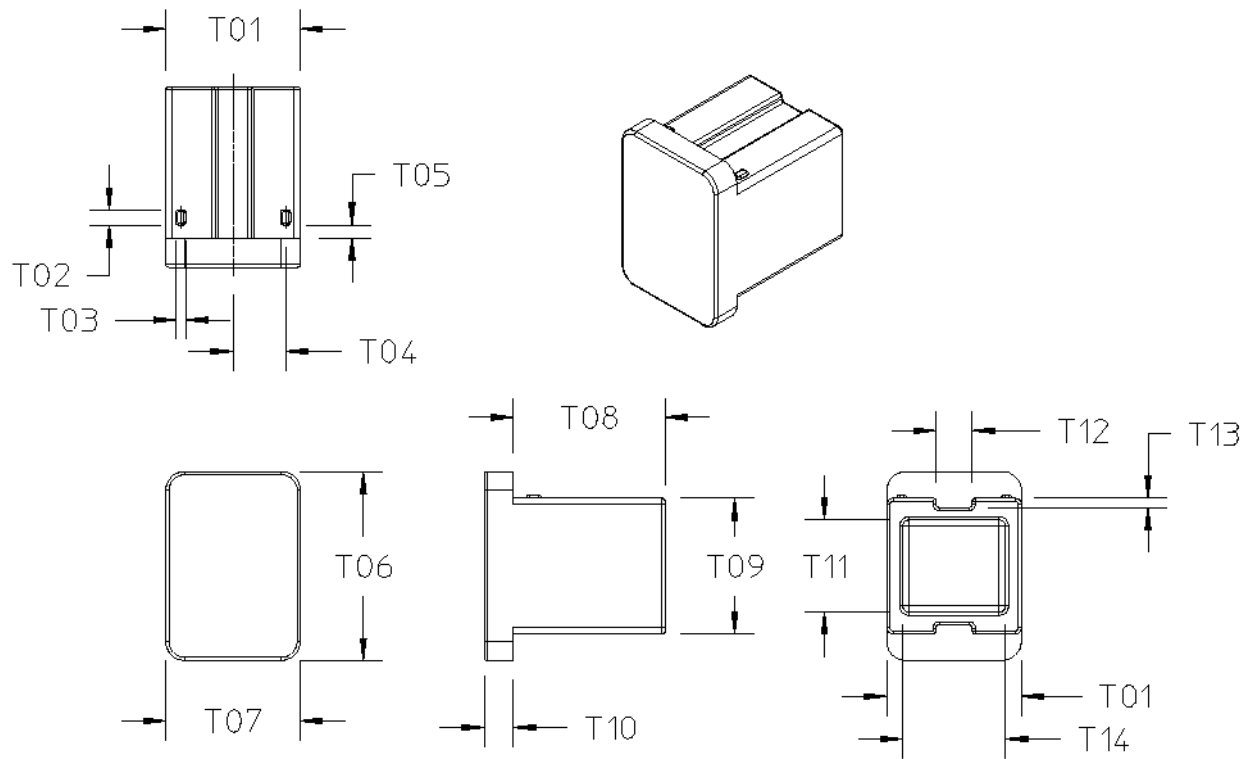


FIGURE 6-14 RECEPTACLE DUST COVER

TABLE 6-7 RECEPTACLE DUST COVER DIMENSIONS

| Designator | Description | Dimension | Tolerance +/- |
|------------|---------------------------|-----------|---------------|
| T01 | Plug Body Width | 10.65 | 0.10 |
| T02 | Dimple Length | 1.20 | 0.10 |
| T03 | Dimple Width | 0.80 | 0.10 |
| T04 | Dimple Location | 4.15 | 0.10 |
| T05 | Dimple Location | 1.03 | 0.10 |
| T07 | Plug Front Width | 10.65 | Max |
| T06 | Plug Front Height | 14.95 | 0.25 |
| T08 | Plug Body Length | 12.00 | Max |
| T09 | Plug Body Height | 10.76 | 0.10 |
| T10 | Plug Front Thickness | 2.00 | Min |
| T11 | Plug Body Height - Inside | 7.30 | 0.25 |
| T12 | Groove Width | 2.85 | 0.25 |
| T13 | Groove Depth | 0.73 | 0.25 |
| T14 | Plug Body Width - Inside | 8.15 | 0.25 |

7 Thermal Solutions

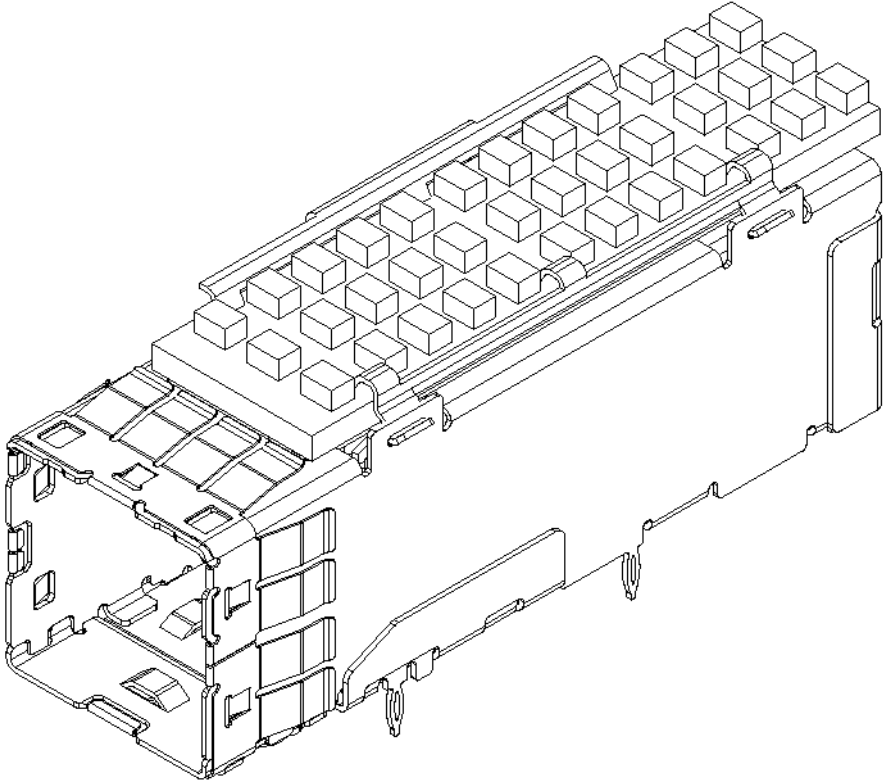


FIGURE 7-1 CAGE WITH HEAT SINK

7.1 Cage Heat Sink

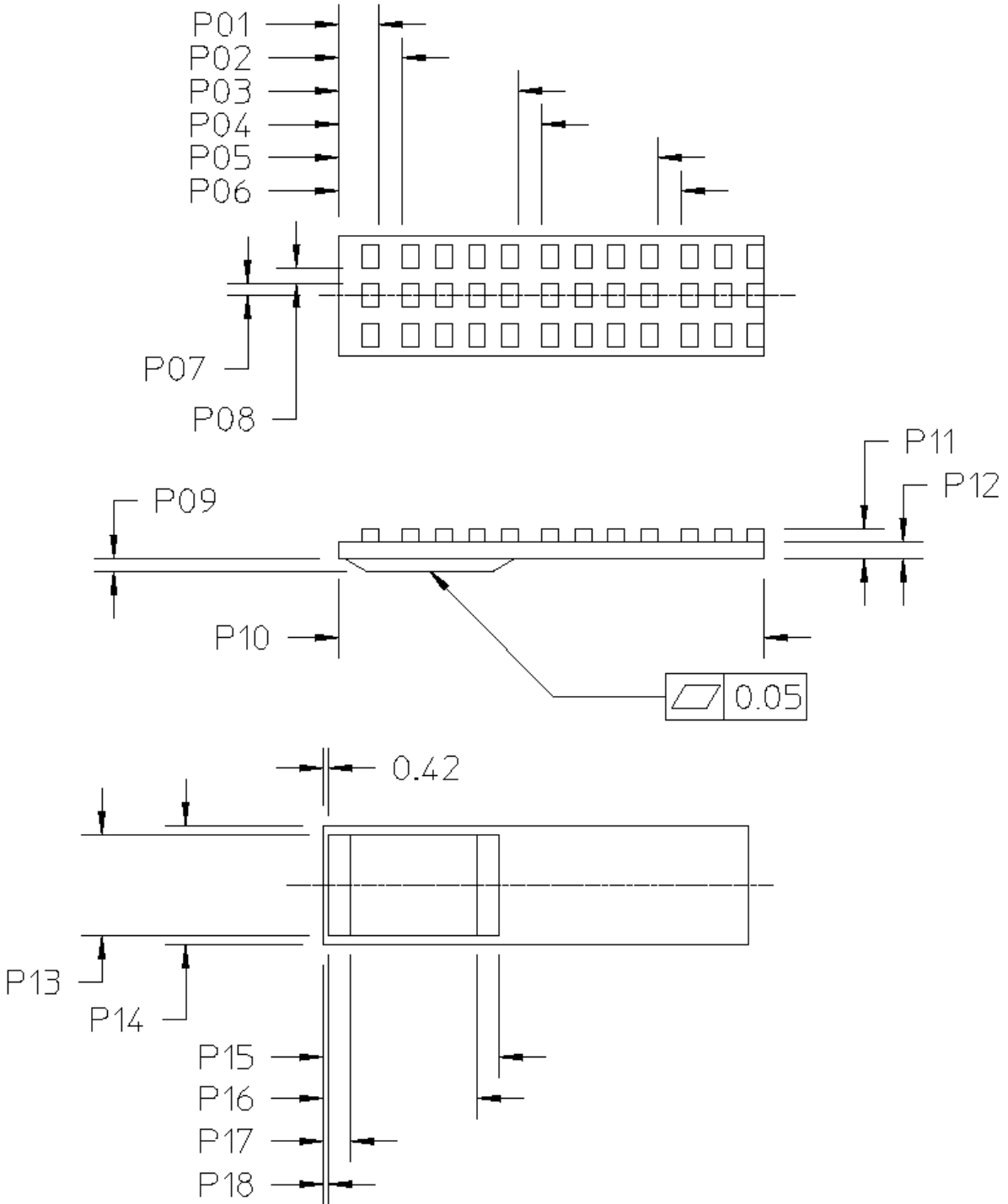


FIGURE 7-2 CAGE HEAT SINK

TABLE 7-1 CAGE HEAT SINK DIMENSIONS

| Designator | Description | Dimension | Tolerance +/- |
|------------|---|-----------|---------------|
| P01 | Heat Sink Clip Groove Start | 3.00 | 0.10 |
| P02 | Heat Sink Clip Groove End | 4.75 | 0.10 |
| P03 | Heat Sink Clip Groove Start | 13.50 | 0.10 |
| P04 | Heat Sink Clip Groove End | 15.25 | 0.10 |
| P05 | Heat Sink Clip Groove Start | 24.00 | 0.10 |
| P06 | Heat Sink Clip Groove End | 25.75 | 0.10 |
| P07 | Heat Sink Clip Groove End | 0.88 | 0.10 |
| P08 | Heat Sink Clip Groove End | 1.25 | 0.10 |
| P09 | Heat Sink Pad Height | 0.94 | 0.10 |
| P10 | Heat Sink Length (application specific) | 32.75 | Ref. |
| P11 | Heat Sink Height (application specific) | 2.27 | Ref. |
| P12 | Heat Sink Base Thickness | 1.25 | 0.15 |
| P13 | Heat Sink Pad Width | 7.50 | 0.15 |
| P14 | Heat Sink Width | 9.00 | 0.25 |
| P15 | Heat Sink Front to Chamfer End | 13.24 | 0.15 |
| P16 | Heat Sink Front to Chamfer Start | 11.62 | 0.15 |
| P17 | Heat Sink Front to Chamfer End | 2.05 | 0.15 |
| P18 | Heat Sink Front to Chamfer Start | 0.42 | 0.15 |

7.2 Cage Heat Sink Attachment

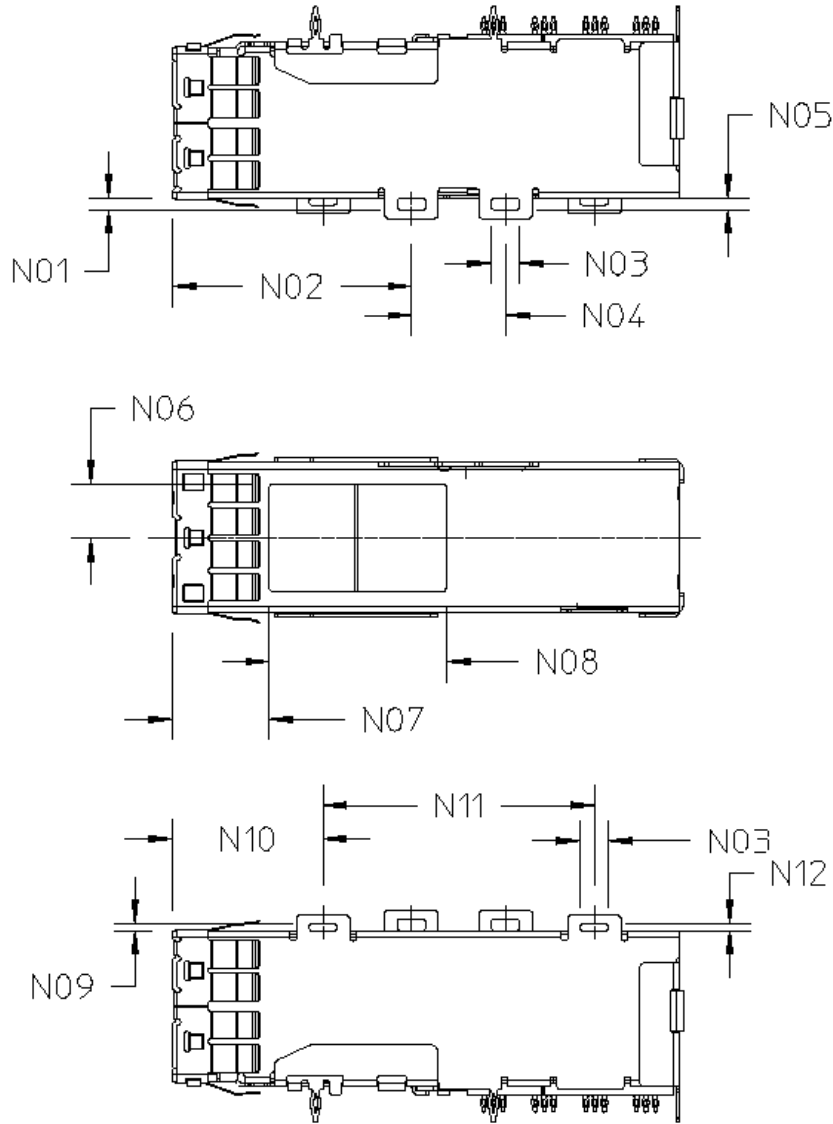


FIGURE 7-3 CAGE HEAT SINK ATTACHMENT

TABLE 7-2 CAGE HEAT SINK ATTACHMENT DIMENSIONS

| Designator | Description | Dimension | Tolerance +/- |
|------------|--|-----------|---------------|
| N01 | Top of Cage to Top of Slot | 0.86 | 0.10 |
| N02 | Front of Cage to Front Slot Centerline | 17.93 | 0.10 |
| N03 | Slot Width | 2.25 | 0.10 |
| N04 | Front Slot to Back Slot | 7.03 | 0.10 |
| N05 | Slot Height | 0.85 | Min |
| N06 | Heat Sink Cut Out Width | 4.00 | 0.10 |
| N07 | Shield Front to Heat Sink Cut Out | 7.28 | 0.10 |
| N08 | Heat Sink Cut Out Length | 13.25 | 0.10 |
| N09 | Top of Cage to Top of Slot | 0.50 | 0.10 |
| N10 | Front of Cage to Front Slot Centerline | 11.30 | 0.10 |
| N11 | Front Slot to Back Slot | 20.30 | 0.10 |
| N12 | Slot Height | 0.40 | Min |

7.3 Cage Heat Sink Attachment Clip Design

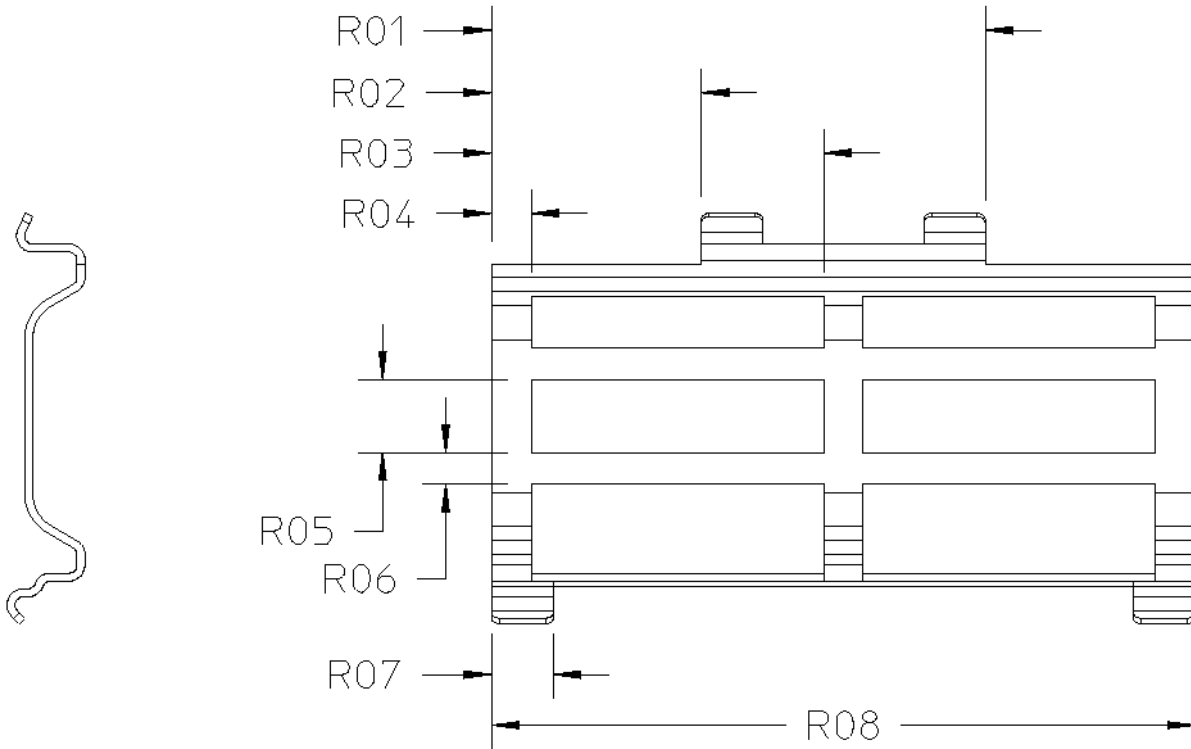


FIGURE 7-4 CAGE HEAT SINK ATTACHMENT CLIP

TABLE 7-3 CAGE HEAT SINK ATTACHMENT CLIP DIMENSIONS

| Designator | Description | Dimension | Tolerance +/- |
|------------|-----------------|-----------|---------------|
| R01 | Tab Location | 15.46 | 0.10 |
| R02 | Tab Location | 6.63 | 0.10 |
| R03 | Strap Location | 10.43 | 0.10 |
| R04 | Strap Width | 1.18 | 0.10 |
| R05 | Window Height | 2.30 | 0.10 |
| R06 | Strap Height | 1.00 | 0.10 |
| R07 | Latch Tab Width | 1.70 | 0.10 |
| R08 | Clip Length | 22.10 | 0.15 |

8 Performance Requirements

This specification conforms to the test sequences as defined in EIA-364 TS-1000.

TABLE 8-1 TS-1000 REQUIREMENTS

| Description | Requirement |
|--|-------------------------|
| Rated Durability Cycles | 250 |
| Field Life (3, 5, 7, or 10 years) | 10 year |
| Field Temperature (57, 60, 65, 75, or 85C) | 65C degrees |
| Test Group 4 Option | 1B |
| Plating Type (Precious / non-Precious) | Precious |
| Surface Treatment (Lubricated or non-Lubricated) | Manufacturer to specify |

TABLE 8-2 ELECTRICAL REQUIREMENTS

| Description | Requirement | Procedure |
|---------------------------------|--|------------------------------|
| Current | 0.5 A per contact | |
| Voltage | 30 VDC per contact | |
| Low Level Contact Resistance | Baseline | EIA 364-23 20 mVDC, 10 mA |
| Insulation Resistance | 1000 Megaohms minimum between adjacent contacts | 100 VDC |
| Dielectric Withstanding Voltage | No defect or breakdown between adjacent contacts | 300 VDC minimum for 1 minute |

TABLE 8-3 MECHANICAL REQUIREMENTS

| Description | Requirement | Procedure |
|---|--|------------|
| Mating Force (plug only, latch de-activated) | 62N maximum | EIA 364-13 |
| Un-mating Force (plug only, latch de-activated) | 30N maximum | EIA 364-13 |
| Latched Plug Pullout Force | 75N minimum | |
| Vibration | - No Damage - No discontinuity longer than 1 microsecond allowed. - 20 milliohms maximum change from initial (baseline) contact resistance | EIA 364-28 |
| Mechanical Shock | - No Damage - 20 milliohms maximum change from initial (baseline) contact resistance | EIA 364-27 |

TABLE 8-4 ENVIRONMENTAL REQUIREMENTS

| Description | Requirement |
|---------------------|------------------------------|
| Storage Temperature | -20C to +85C degrees |
| Humidity | 80 percent Relative Humidity |