SFF-TA-8613

Specification for

Mini Multilane 4/8X Unshielded Cage/ Connector (HDun)

Rev 3.5.4 January 18, 2021

SECRETARIAT: SFF TA TWG

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

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.

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- Results of IP Disclosures: http://www.snia.org/sffdisclosures
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Foreword

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

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

Revision History

Note: The content of this specification was formerly contained in SFF-8643, and it was broken out into a separate specification so that it could be reference by higher speed variations. Revision history prior to Rev 2.1 is unavailable.

Rev 2.1 *November 5, 2010:*
- Dimension designators changed to alpha order for Figures 6.2 through 6.8.

Rev 2.3 *January 11, 2011:*
- Title changed to "Unshielded 8/4 Channel for 12 Gb/s Applications"
- Changed A11 from 0.105 +/- 0.025 to 0.10 +/- 0.05
- Added note to E01 to clarify contact zone
- Figure 6.8 and Table 6.8 - 1x4 removed

Rev 2.6 *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 2.7 *April 22, 2013:*
- Adopt editorial convention of Gb/s

Rev 2.8 *June 3, 2013:*
- Added appropriate figures for the new vertical versions
- Dimensioned the keep-out areas in the connector footprints
- Added rib to top of the right angle latch area

Rev 2.9 *July 10, 2013:*
- Expanded Figure 3-1 to include more configurations
- Redrew figures and clarified dimensioning on vertical configurations

Rev 3.0 *July 27, 2013:*
- Corrected some dimensions in Tables 6-1, 6-2 and 6-4

Rev 3.1 *August 22, 2013:*
- Updated dimensions in Tables 6-1, 6-2 and 6-4
- Added R(ight angle) and V(ertical) suffixes to Tables 6-1 and 6-2
- Added optional holes to Figures 6-10 and 6-12

Rev 3.2 *February 26, 2014:*
- Revised description 3.0
- Updated Table 3-1 to list all versions
- Revised designators in Tables 6-1 and 6-2
- Removed revision note below Table 6-4
- Revised Table 6-5 dimensions

Rev 3.3 *May 15, 2014:*
- Title change for commonality in style with QSFP

Rev 3.4 *May 25, 2014:*
- Revised dimensions in Figures 6-1 and 6-2
- Added 6.2 section Title
- Revised Figure 6-7 and Table 6-3 titles
- Revised Titles for Figure 6-8 and Table 6-4
- Revised Table 6-4 to add the 1x2 size
- Revised text with section 6.3 and the section Title
- Revised Table 6-5 descriptions
- Revised Figure 6-12 Title
- Revised Figure 6-14 Title

Rev 3.5 *September 22, 2014:*
- This specification created with the connector content removed from SFF-8643

Rev 3.5.1 *July 31, 2020:*
- Updated to new document template
- Added several missing document references to Section 2.1
- Added SMT footprint option

Rev 3.5.2 *August 13, 2020:*
- Updated SMT footprint figures with alphanumeric designators

Rev 3.5.3 *October 2, 2020*:
- Corrected existing footprint name (changed from "press fit" to "though hole")
- Replaced Figure 5-20 so all callouts are visible

Rev 3.5.4 *January 18, 2021:*
- Added dimension description for V05
- Added tolerances for the following dimensions: V07, V08, V12, V15, V20, V21, V25, V34, and V54
- Updated Figure 5-21
- Filled in missing reliability information in Section 7.1

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1. Scope

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

2. References and Conventions

2.1 Industry Documents

The following documents are relevant to this specification:

- ASME Y14.5 Dimensioning and Tolerancing
- EIA-364-09 Durability Test Procedure for Electrical Connectors and Contacts
- EIA-364-13 Mating and Unmating Force Test Procedure for Electrical Connectors and Sockets
- EIA-364-20 Dielectric Withstanding Voltage Test Procedure for Electrical Connectors, Sockets and Coaxial Contacts
- EIA-364-23 Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets
- EIA-364-27 Mechanical Shock (Specified Pulse) Test Procedure for Electrical Connectors and Sockets
- EIA-364-28 Vibration Test Procedure for Electrical Connectors and Sockets
- EIA-364-31 Humidity Test Procedure for Electrical Connectors and Sockets
- EIA-364-32 Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors and Sockets
- EIA-364-65 Mixed Flowing Gas Test Procedure for Electrical Connectors and Sockets
- EIA-364-70 Temperature Rise Versus Current Test Procedure for Electrical Connectors and Sockets
- EIA-364-1000 Environmental Test Methodology for Assessing the Performance of Electrical Connectors and Sockets Used in Controlled Environment Applications
- 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 Sources

The complete list of SFF documents which have been published, are currently being worked on, or that have been expired by the SFF Committee can be found at 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.

Copies of SAS standards may be obtained from the International Committee for Information Technology Standards (INCITS) (http://www.incits.org).

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

2.3 Conventions

The following conventions are used throughout this document:

DEFINITIONS

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

ORDER OF PRECEDENCE

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

DIMENSIONING CONVENTIONS

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

NUMBERING CONVENTIONS

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

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

3. Keywords, Acronyms, and Definitions

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

3.1 Keywords

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

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

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

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

3.2 Acronyms and Abbreviations

HDun: Mini Multilane 4/8X Unshielded Connector
PCB: Printed Circuit Board
PF: Press Fit
PTH: Plated Through Hole
SMT: Surface Mount Technology

3.3 Definitions

Connector: Each half of an interface that, when joined together, establish electrical contact and mechanical retention between two components. In this specification, the term connector does not apply to any specific gender; it is used to describe the receptacle, the plug or the card edge, or the union of receptacle to plug or card edge. Other common terms include: connector interface, mating interface, and separable interface.

Contacts: A term used to describe connector terminals that make electrical connections across a separable interface.

Module: In this specification, module may refer to a plug assembly at the end of a copper (electrical) cable (passive or active), an active optical cable (AOC), an optical transceiver, or a loopback.

Plug: A term used to describe the connector that contains the penetrating contacts of the connector interface as shown in Figure 3-1. Plugs typically contain stationary contacts. Other common terms include male, pin connector, and card edge.

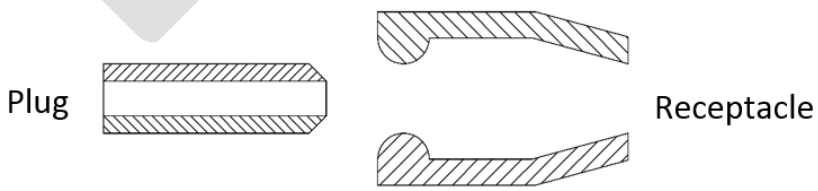


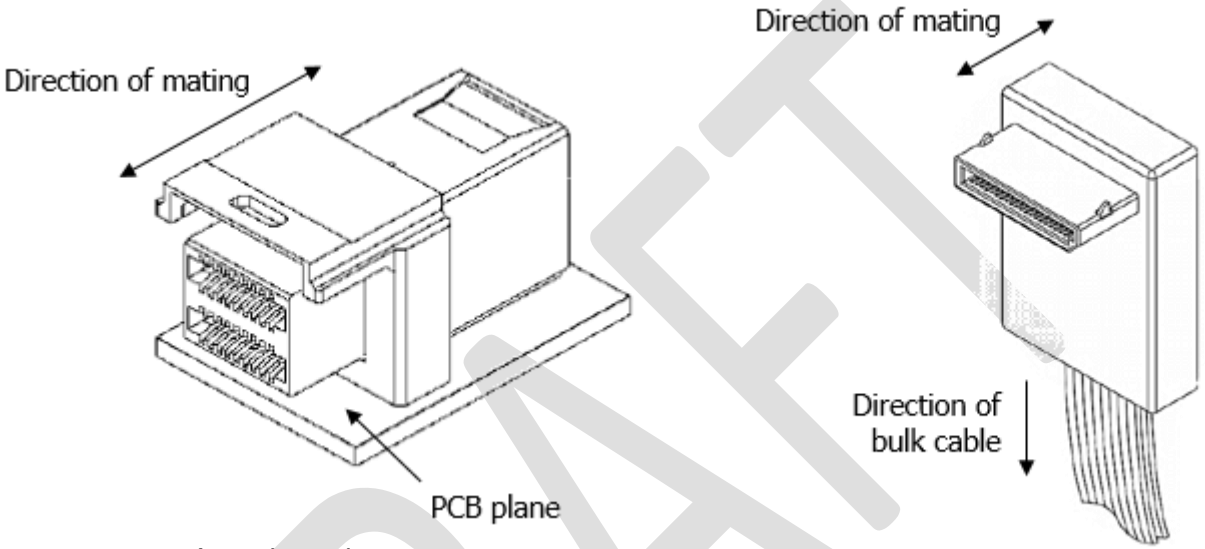
Figure 3-1 Plug and Receptacle Definition

Plated through hole termination: A term used to describe a termination style in which rigid pins extend into or through the PCB. Pins are soldered to keep the connector or cage in place. Other common terms are through hole or PTH.

Press fit: A term used to describe a termination style in which collapsible pins penetrate the surface of a PCB. Upon insertion, the pins collapse to fit inside the PCB's plated through holes. The connector or cage is held in place by the interference fit between the collapsed pins and the PCB.

Receptacle: A term used to describe the connector that contains the contacts that accept the plug contacts as shown in Figure 3-1. Receptacles typically contain spring contacts. Other common terms include female and socket connector.

Right Angle: A term used to describe either a connector design where the mating direction is parallel to the plane of the printed circuit board upon which the connector is mounted or a cable assembly design where the mating direction is perpendicular to the bulk cable.



a) Right angle connector

a) Right angle cable assembly

Figure 3-2 Right Angle Connector and Cable Assembly

Straight: A term used to describe a connector design where the mating direction is parallel to the bulk cable.

Surface mount: A term used to describe a termination style in which solder tails sit on pads on the surface of a PCB and are then soldered to keep the connector or cage in place. Other common terms are surface mount technology or SMT.

Vertical Unitary: A term used to describe a one-piece connector design where the mating direction is perpendicular to the plane of the printed circuit board upon which the connector is mounted.

4. General Description

4.1 Configuration Overview/Descriptions

The connector system is based upon vertical and right-angle receptacle (fixed) connectors and (free) mating plugs. The host board footprint mounting holes contain the critical dimensions for locating the receptacles to the host board. The integral receptacle guide shell functions as the guide and strain relief for the free (plug) connector interface and provides the latching points for the plug connector. This connector system provides positive retention along with ease of insertion and removal.

This specification provides for a 1x1, 1x2 and 1x4 receptacle (fixed side) as well as a 1x1 (4X) and a 1x2 (8X) vertical receptacles and the mating cable plugs (free side).

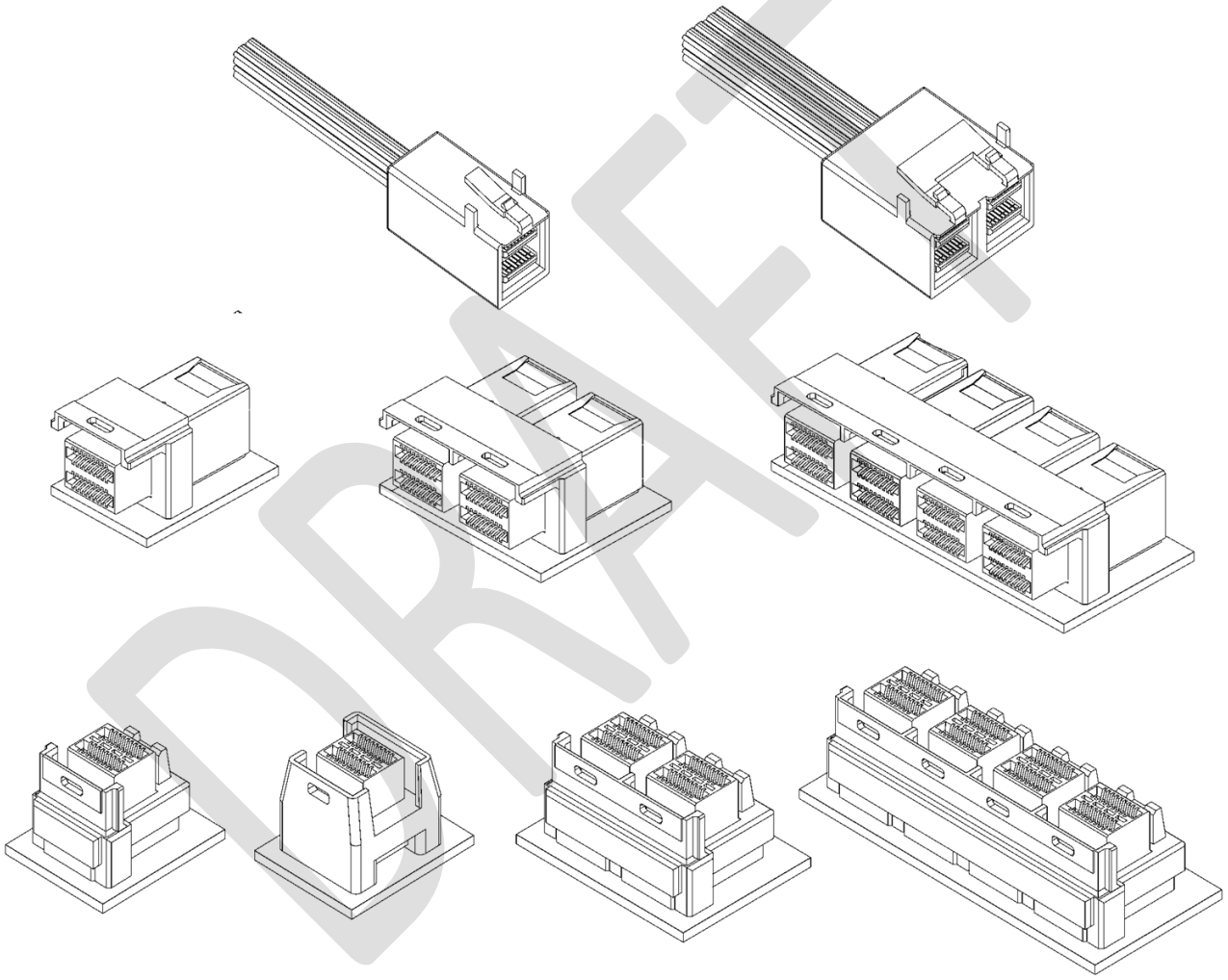


Figure 4-1 General View of Configurations

Table 4-1 Configurations Supported

Port	Positions	Right-Angle	Vertical Modular	Vertical Unitary	Plug
1x1	36	X	X	X	X
1x2	72	X	X	Not shown	X
1x4	144	X	X	Not shown~~X~~	NA

4.2 Contact Numbering

The pins or electrical contacts in this connector are numbered as shown in Figure 4-2.

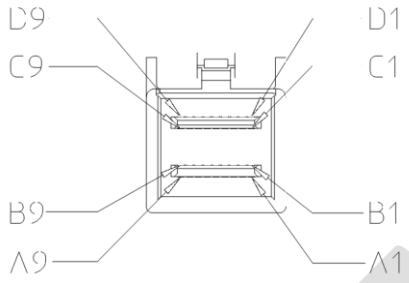


Figure 4-2 Contact Numbering

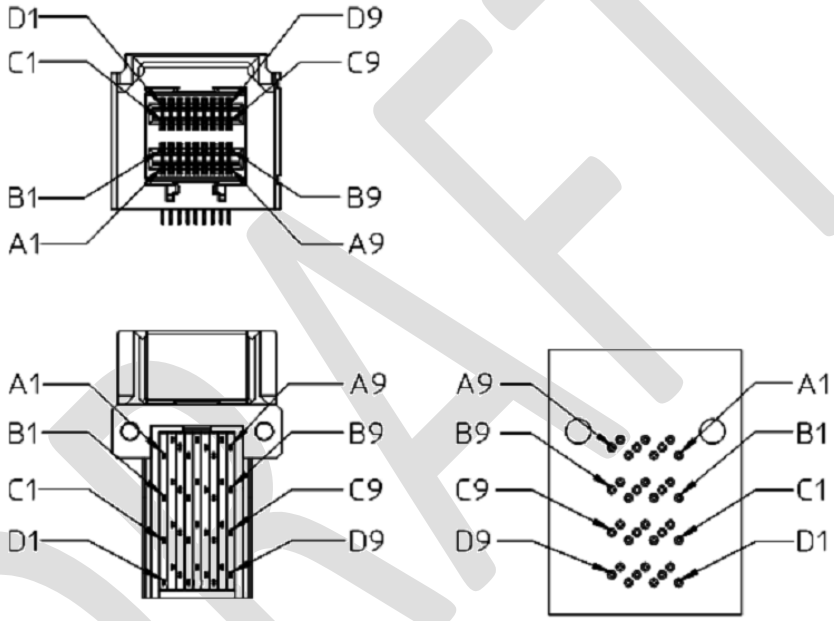


Figure 4-3 Right-angle Pin Assignments

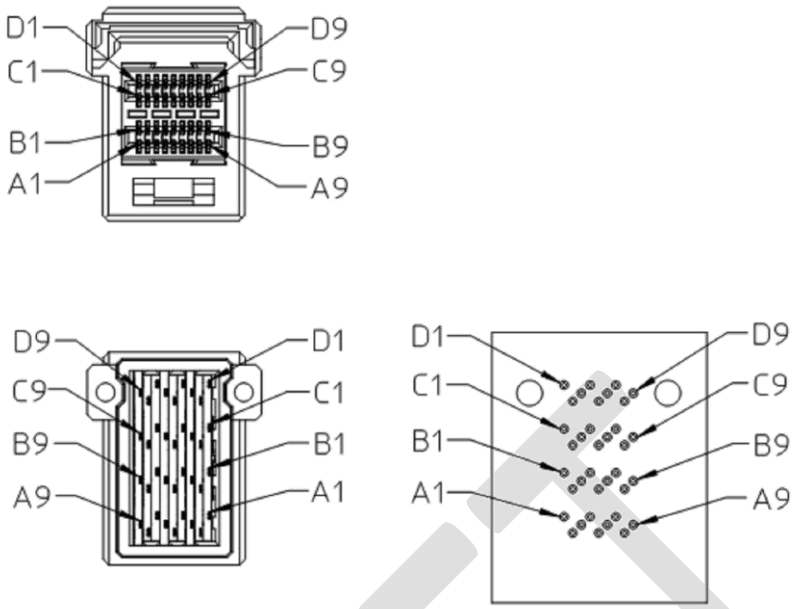


Figure 4-4 Vertical Pin Assignments

5. Connector Mechanical Specification

5.1 Datums

The datums defined in Figure 5-1 and Table 5-1 are used throughout the rest of the document to describe the dimensional requirements of this connector.

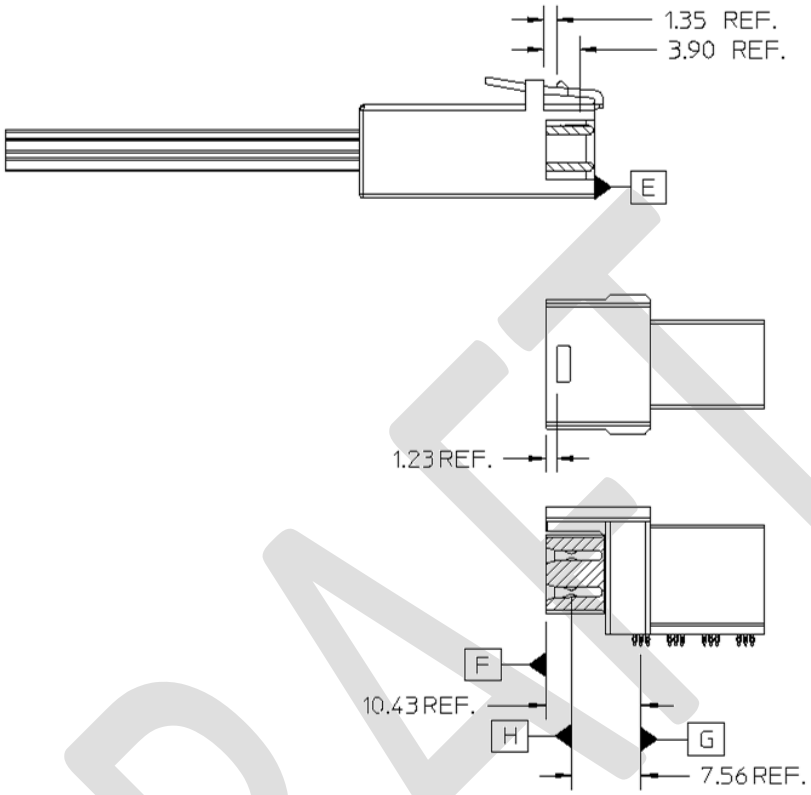
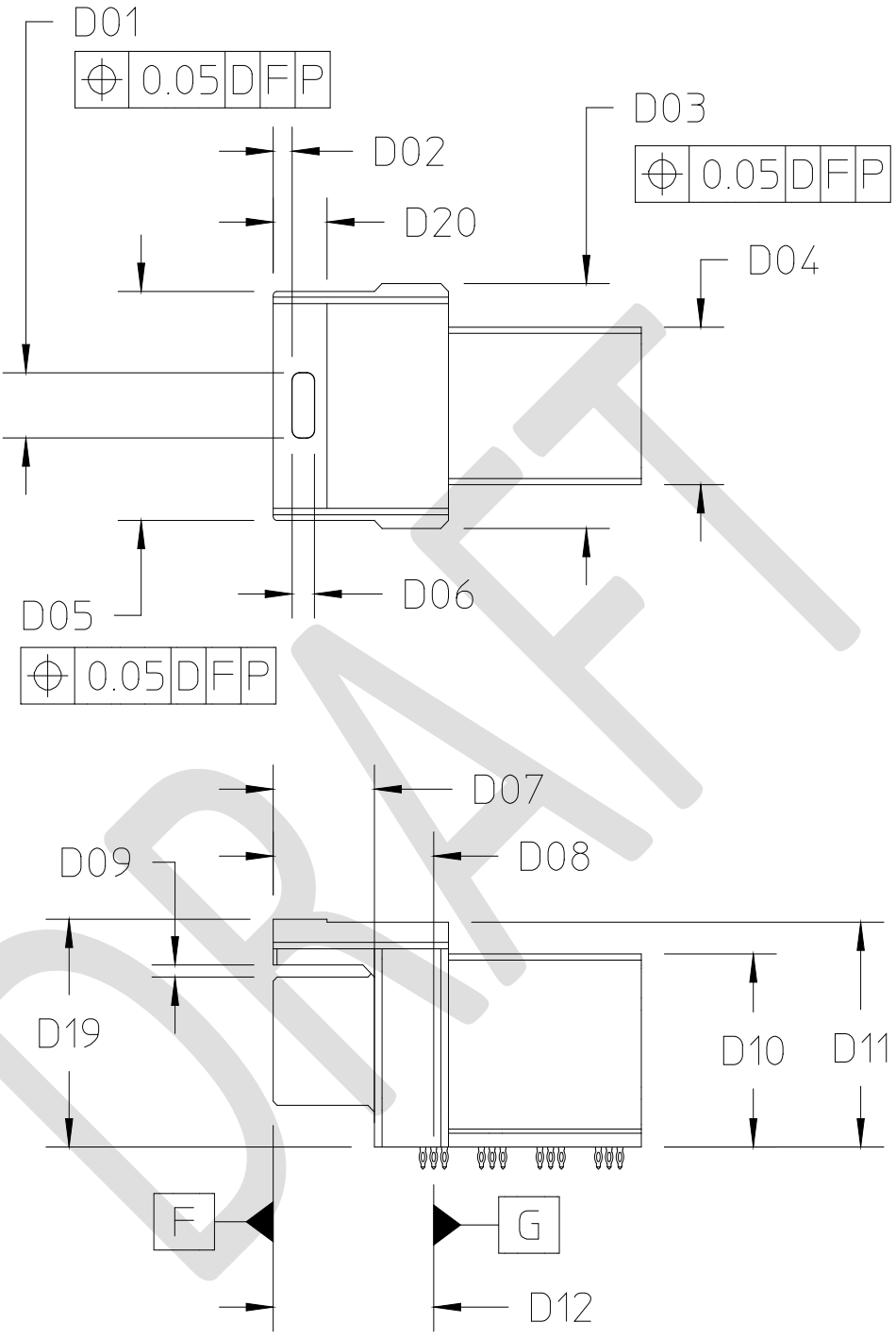


Figure 5-1 Datums (Not All Shown)

Table 5-1 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	Receptacle housing interface to PCB
E	Leading edge of plug body
F	Front edge of receptacle snout
G	Centerline of second row of first group of complaint 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
N	Width of receptacle snout
P	Width of receptacle card slot

5.2 Mechanical Description: Right-angle Connector



NOTE: Datum G is defined by the center of tail A1 and A7.

Figure 5-2 Right-angle Receptacle (1)

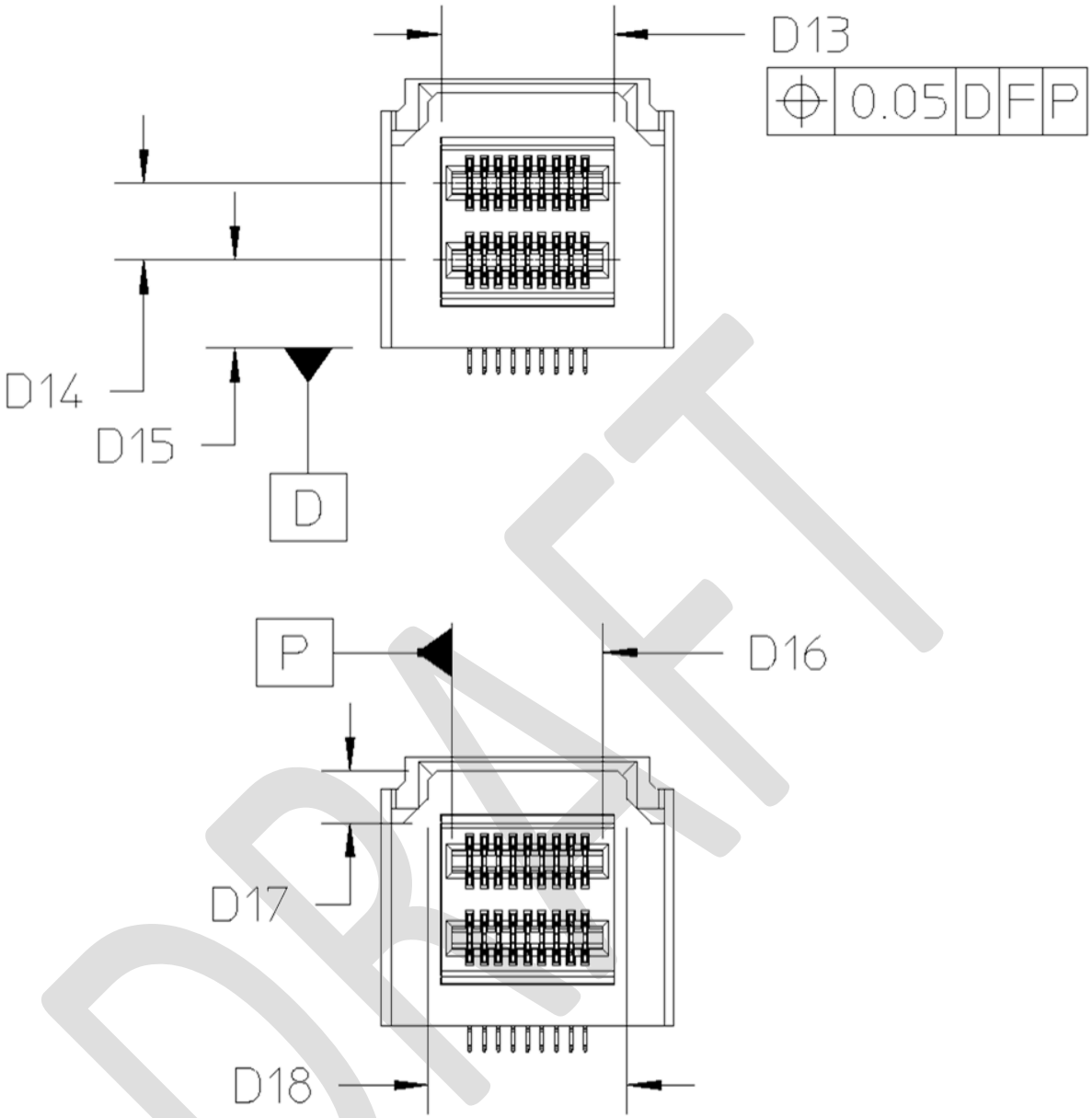


Figure 5-3 Right-angle Receptacle (2)

Table 5-2 Right-angle Receptacle Dimensions

Designator	Description	Dimension	Tolerance +/-
D01RA	Latch slot width	4.03	0.13
D02RA	Front face to latch slot	1.22	0.05
D03RA	Latch frame width	15.16	0.13
D04RA	Body width	9.75	0.25
D05RA	Latch frame width	14.17	0.13
D06RA	Latch slot length	1.35	MIN
D07RA	Length of snout from Datum F	6.58	0.08
D08RA	Datum G to front of latch frame	10.43	0.13
D09RA	Snout to latch frame, bottom-side	0.75	0.13
D10RA	Body height	11.95	0.25
D11RA	Overall height	13.92	0.25
D12RA	Datum G to front face	10.43	0.15
D13RA	Snout width	8.95	0.08
D14RA	Lower card slot to upper card slot	4.00	0.10
D15RA	Lower card slot location	4.55	0.10
D16RA	Receptacle card slot width	7.85	0.05
D17RA	Snout to latch frame bottom	2.70	0.10
D18RA	Latch frame opening	10.34	0.10
D19RA	Overall height	14.35	MAX
D20RA	Latch frame step width	3.50	MAX

5.3 Mechanical Description: Vertical Connector

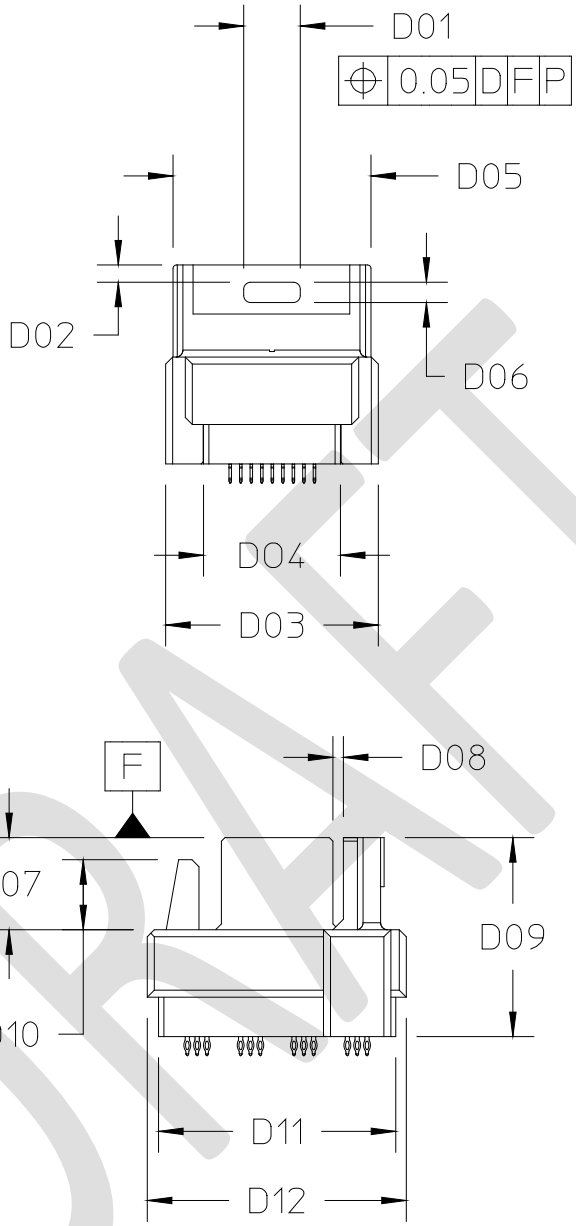


Figure 5-4 1x1 Vertical Modular Receptacle (1)

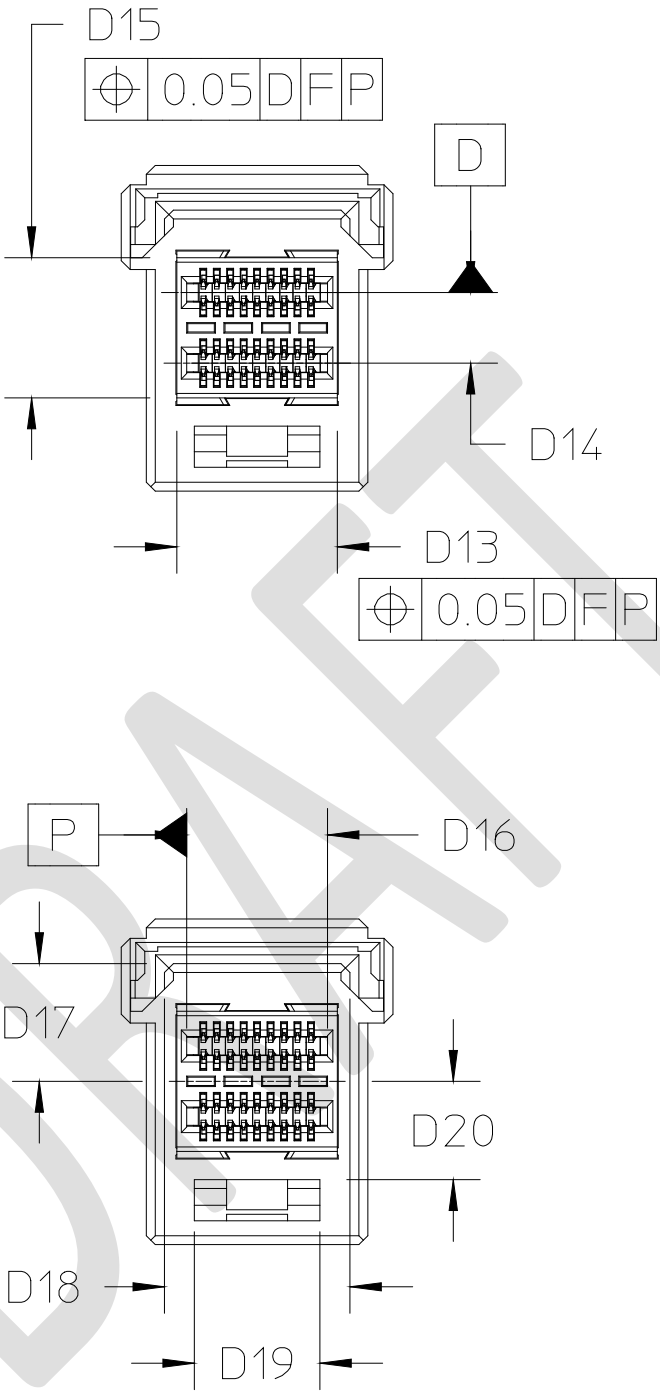


Figure 5-5 1x1 Vertical Modular Receptacle (2)

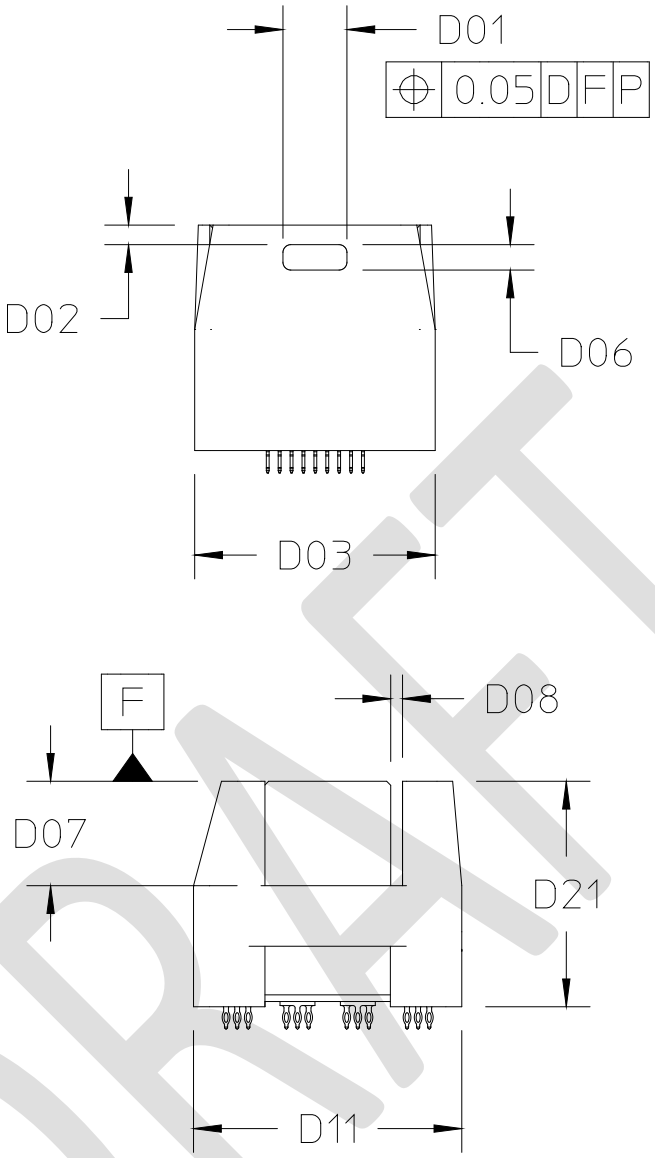


Figure 5-6 1x1 Vertical Unitary Receptacle (1)

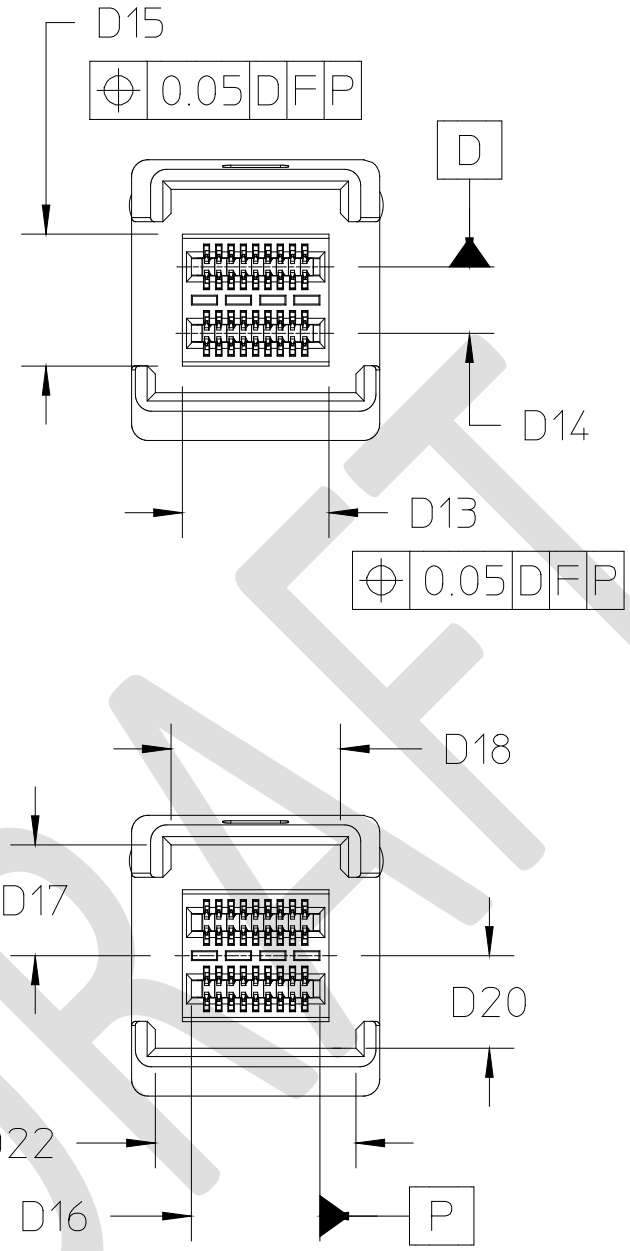
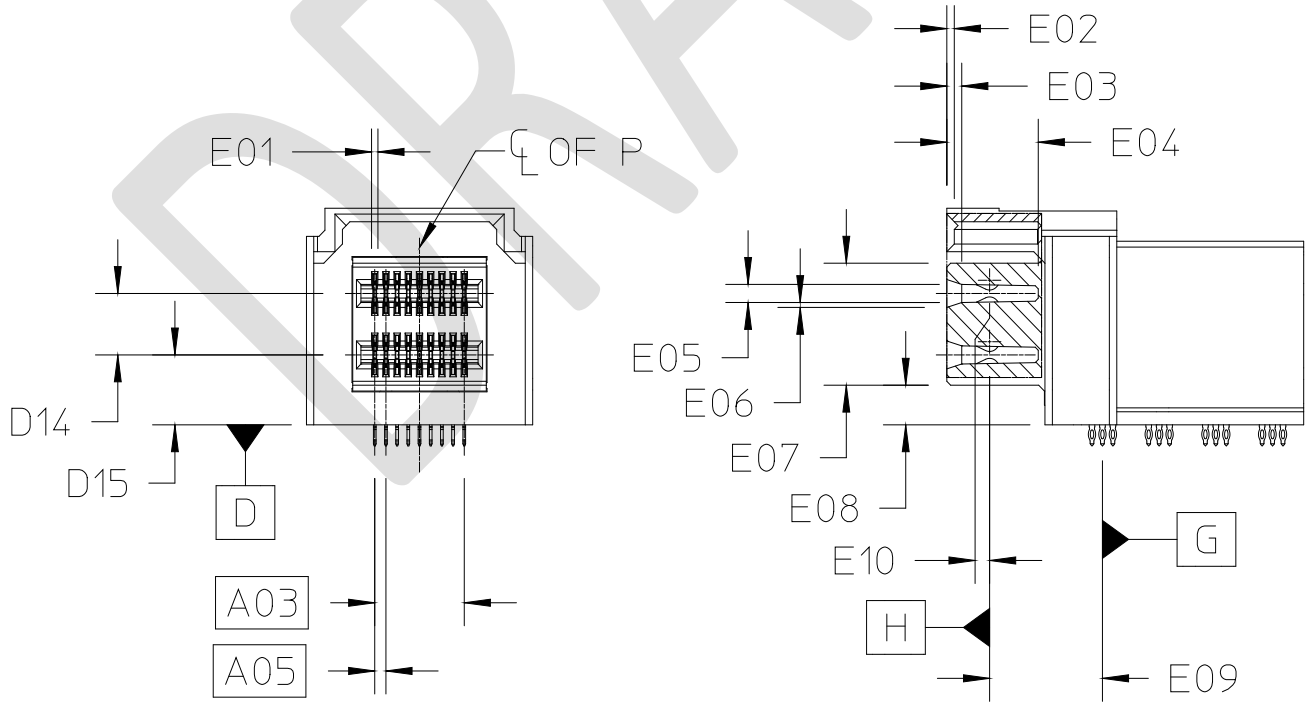


Figure 5-7 1x1 Vertical Unitary Receptacle (2)

Table 5-3 1x1 Vertical Receptacle Dimensions

Designator	Description	Dimension	Tolerance +/-
D01VT	Latch slot width	4.03	0.13
D02VT	Latch frame edge to slot	1.22	0.05
D03VT	Latch frame base width	15.16	0.13
D04VT	Housing body base width	9.75	0.25
D05VT	Latch frame width	14.17	0.13
D06VT	Latch slot length	1.35	MIN
D07VT	Length of snout from Datum F	6.58	0.08
D08VT	Snout to latch frame	0.75	0.13
D09VT	Overall height	13.92	0.25
D10VT	Plug anti-rotation rib height	5.00	0.25
D11VT	Housing body base length	17.03	MAX
D12VT	Latch frame length	18.45	0.13
D13VT	Snout width	8.95	0.08
D14VT	Lower card slot to upper card slot	4.00	0.10
D15VT	Snout length	7.94	0.08
D16VT	Card slot width	7.85	0.05
D17VT	Latch frame to Datum D centerline	6.67	0.10
D18VT	Latch frame plug opening	10.34	0.10
D19VT	Plug anti-rotation rib width	7.00	0.13
D20VT	Anti-rotation rib to Datum D centerline	5.47	MIN
D21VT	Overall height	14.45	MAX
D22VT	Latch frame anti-rotation plug opening	12.05	MIN

5.4 Receptacle Contact Locations



NOTE: Datum H is defined by the end contact pairs of the lower contacts.

Figure 5-8 1x1 Right-angle Receptacle Contact Locations

Table 5-4 1x1 Right-angle Receptacle Contact Locations

Designator	Description	Dimension	Tolerance +/-
E01 (*)	Contact zone (0.18 wide terminal)	0.28	MAX
	Contact zone (0.20 wide terminal)	0.30	MAX
	Contact zone (0.22 wide terminal)	0.32	MAX
	Contact zone (0.24 wide terminal)	0.34	MAX
E02	Latch chamfer x 45°	0.50	0.15
E03	Card slot lead-in	1.00	0.25
E04	Card slot depth	6.13	0.15
E05	Receptacle card slot height	1.20	0.08
E06	Receptacle card slot lead-in	0.30	0.10
E07	Receptacle snout height	7.94	0.10
E08	Receptacle snout bottom to receptacle bottom	2.58	0.10
E09	Datum G to contact interface	7.56	0.10
E10	Upper to lower row of contacts	0.00	0.05
(*) 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.			

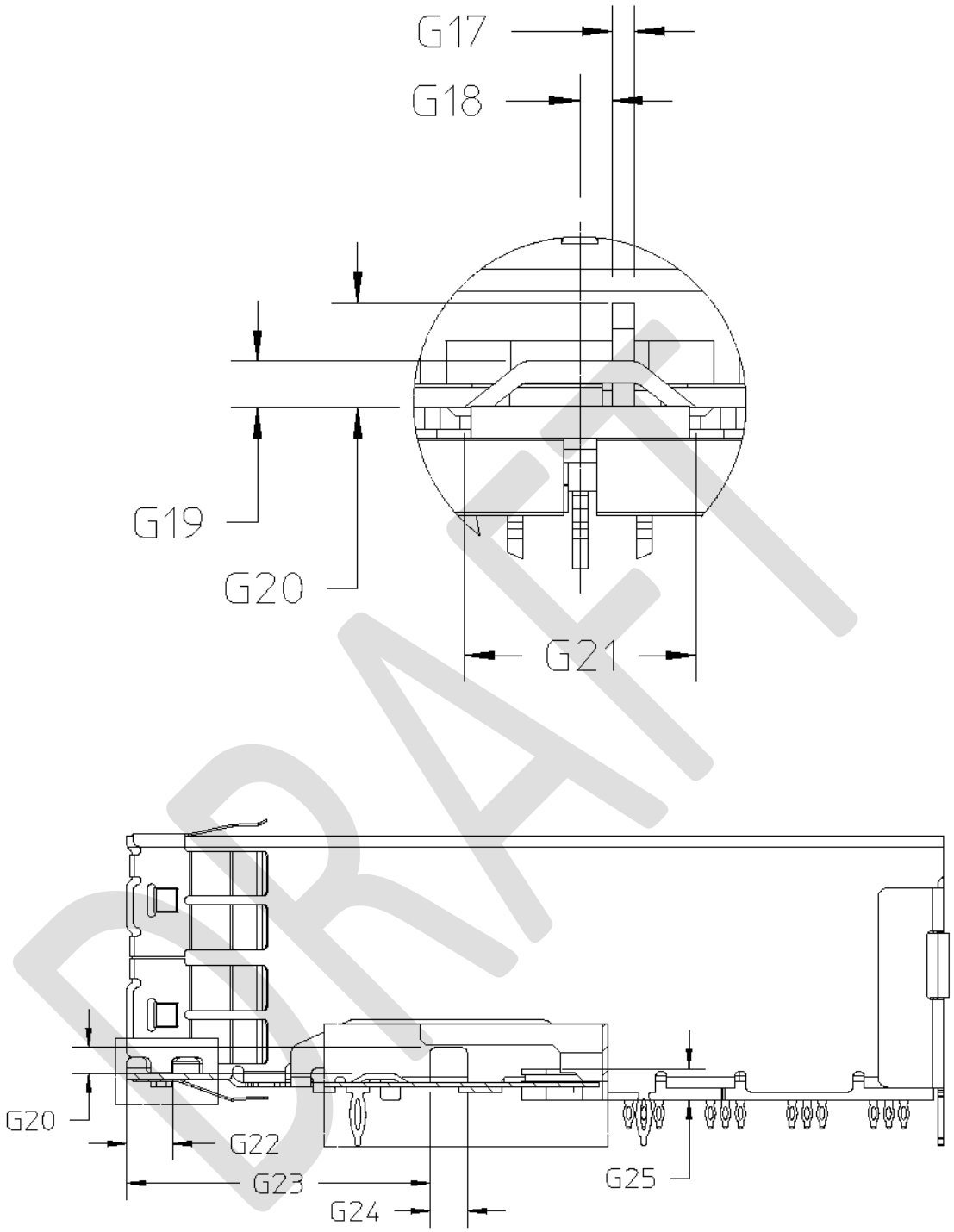


Figure 5-9 Receptacle Blocking Key

Table 5-5 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.			

5.5 Receptacle Hold-down and Pitch

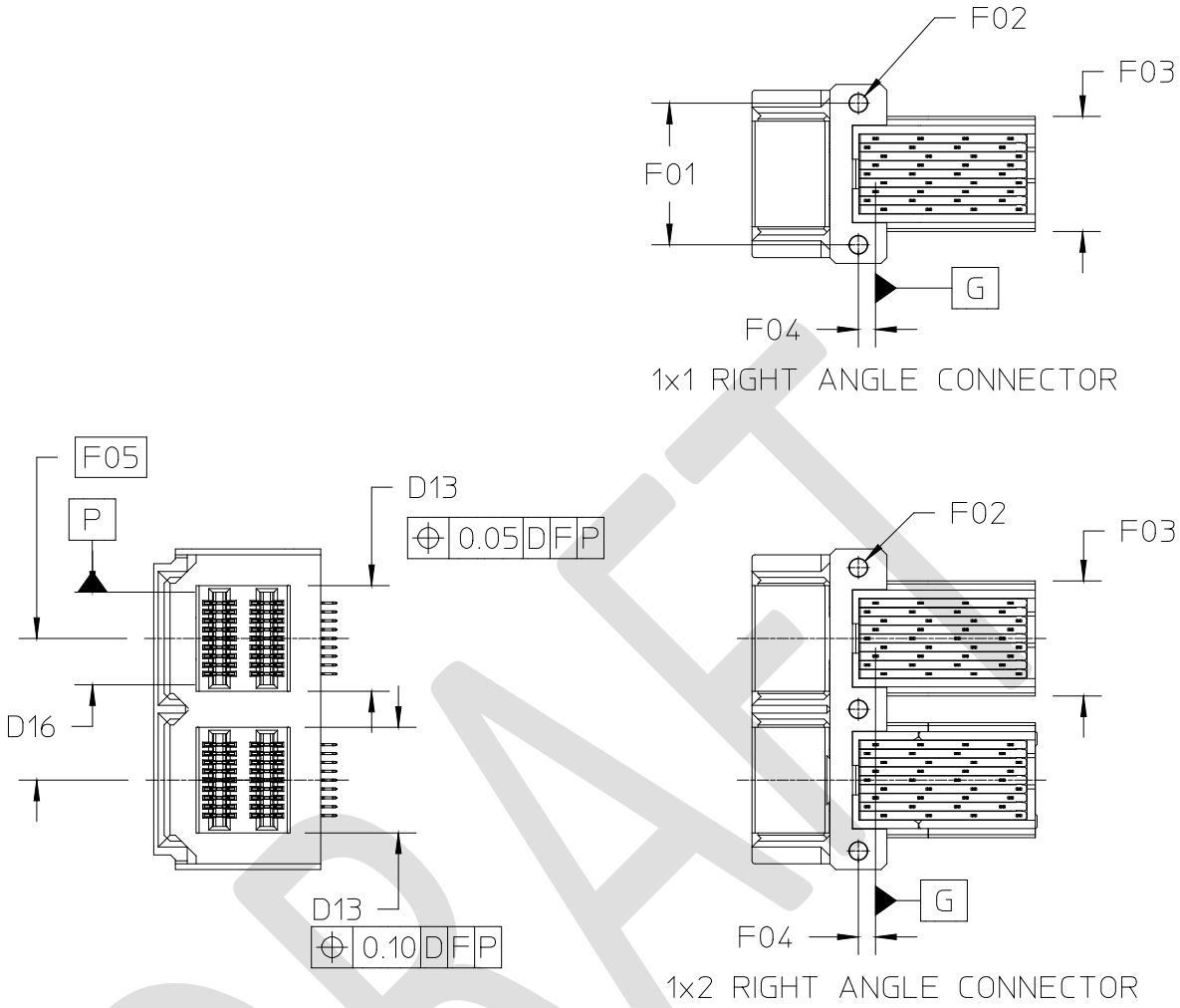


Figure 5-10 1x2 Right-angle Hold-down and Pitch

Table 5-6 1x2 Right-angle Receptacle Hold-down and Pitch Dimensions

Designator	Description	Dimension	Tolerance +/-
F01	Mounting hole-to-mounting hole	12.00	0.05
F02	Mounting hole diameter	1.80	REF
F03	1x1 right-angle connector body width	9.75	0.25
	1x2 right-angle connector body width	21.75	0.25
F04	Datum G to mounting hole	1.45	0.15
F05	1xn port-to-port spacing	12.00	Basic

5.6 Receptacle Footprints

For applications requiring higher PCB-to-receptacle retention, optional mounting hole(s) may be implemented in the defined location on the footprint(s) and the corresponding Vertical Unitary receptacle versions.

Two footprint options are specified: through hole and SMT.

5.6.1 ~~Press Fit~~Through Hole Option

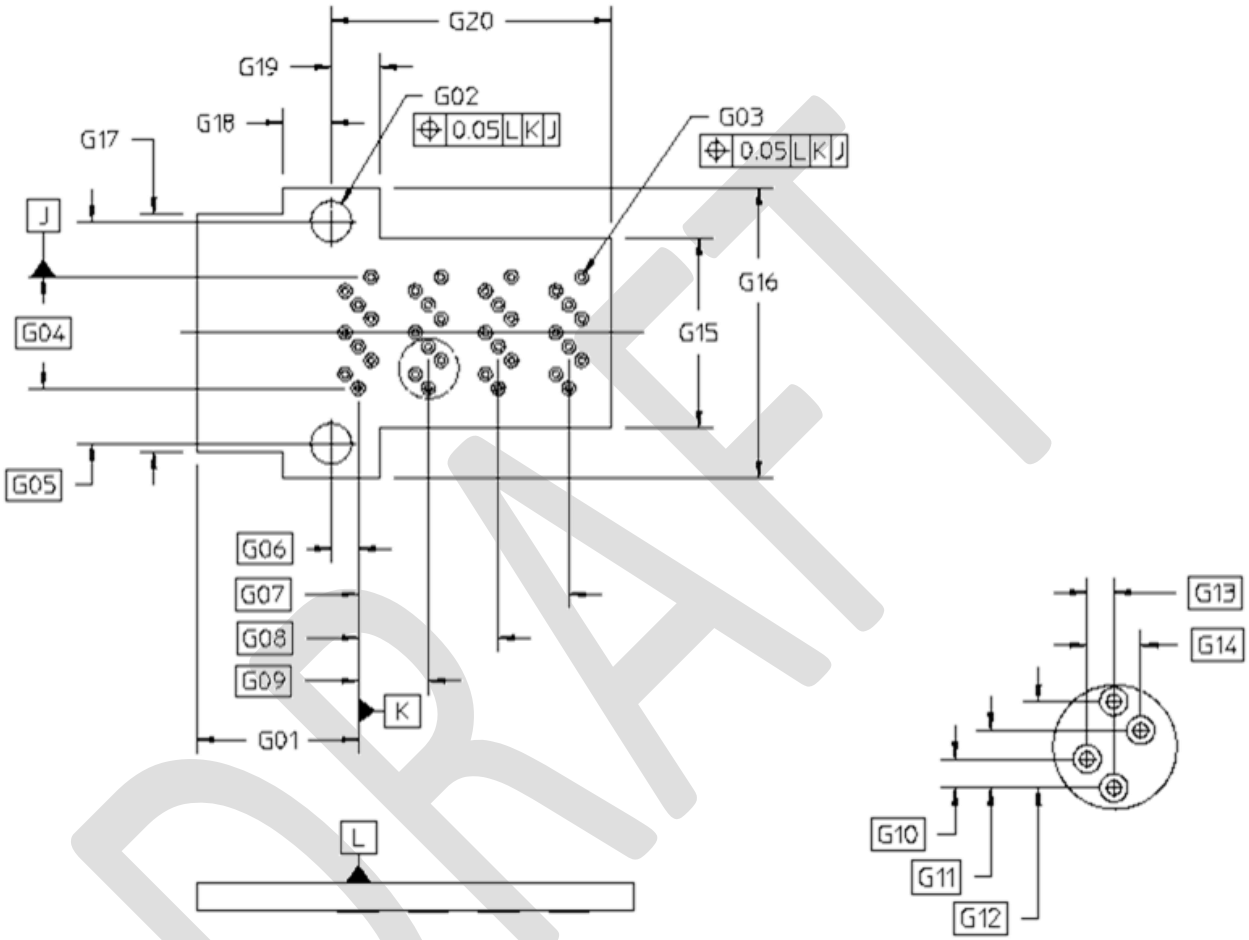


Figure 5-11 1x1 Right-angle ~~Press Fit~~Through Hole Receptacle Footprint Option

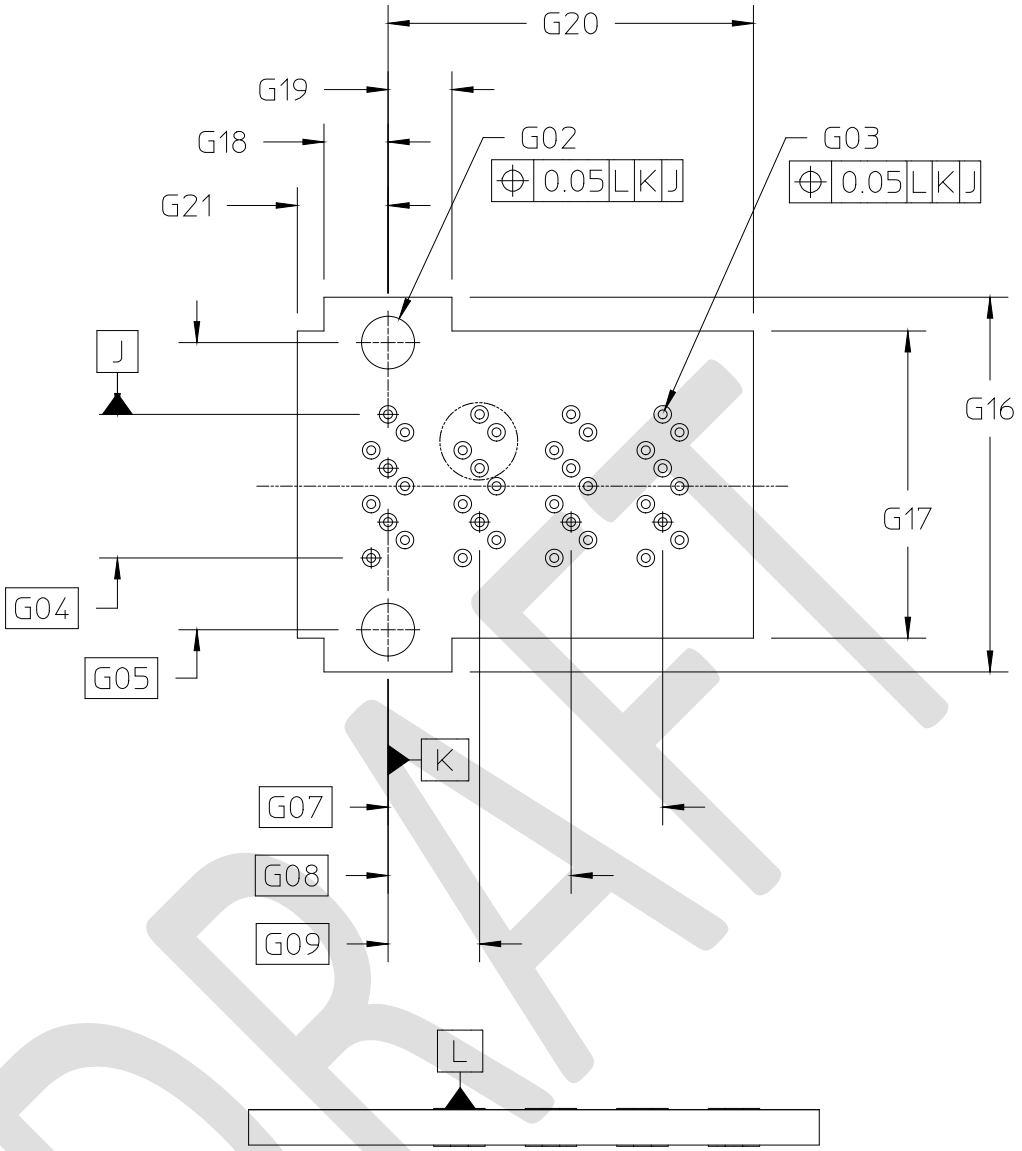


Figure 5-12 1x1 Vertical Modular ~~Press Fit~~Through Hole Receptacle Option

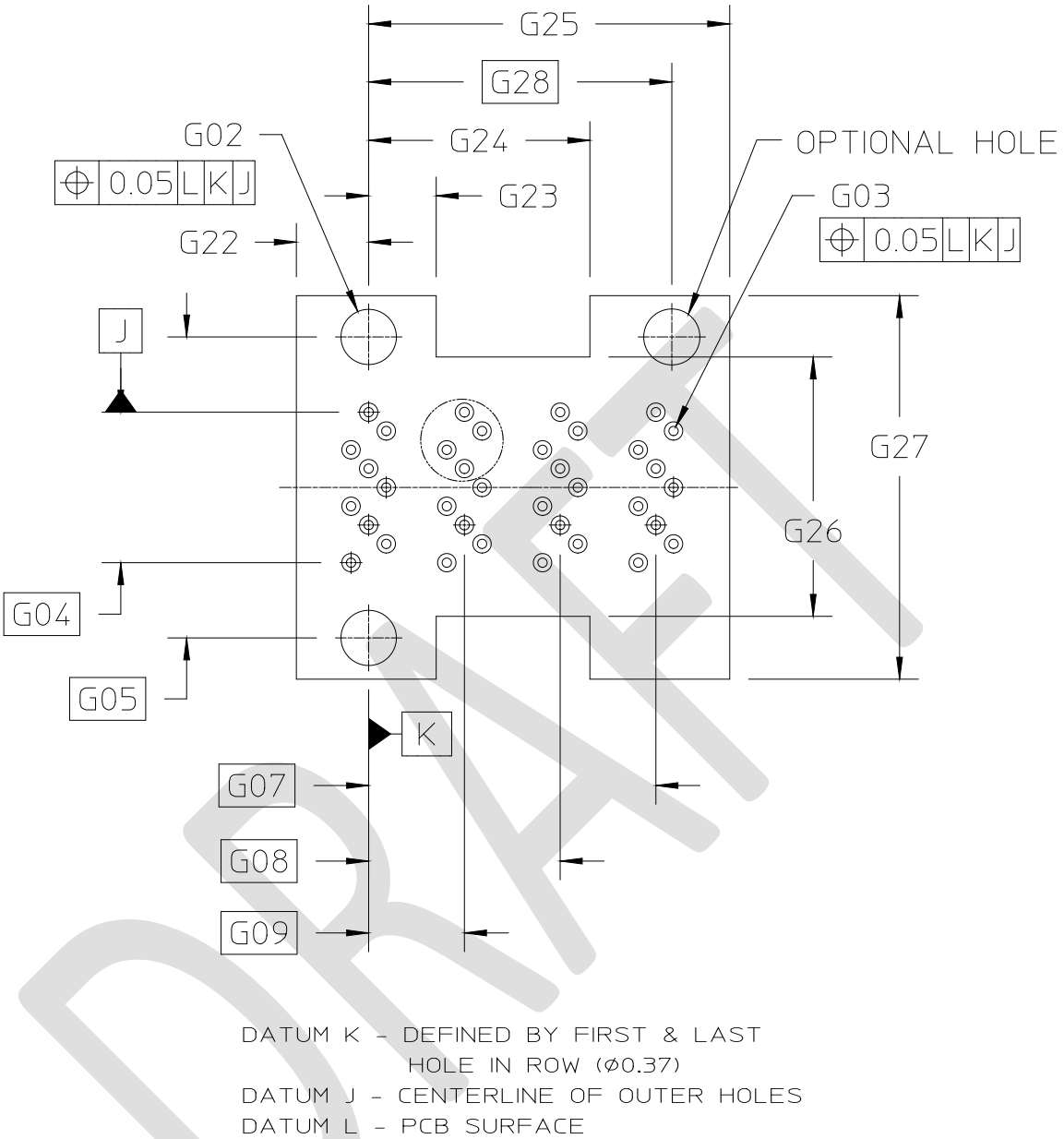


Figure 5-13 1x1 Vertical Unitary ~~Press Fit~~Through Hole Receptacle Footprint Option

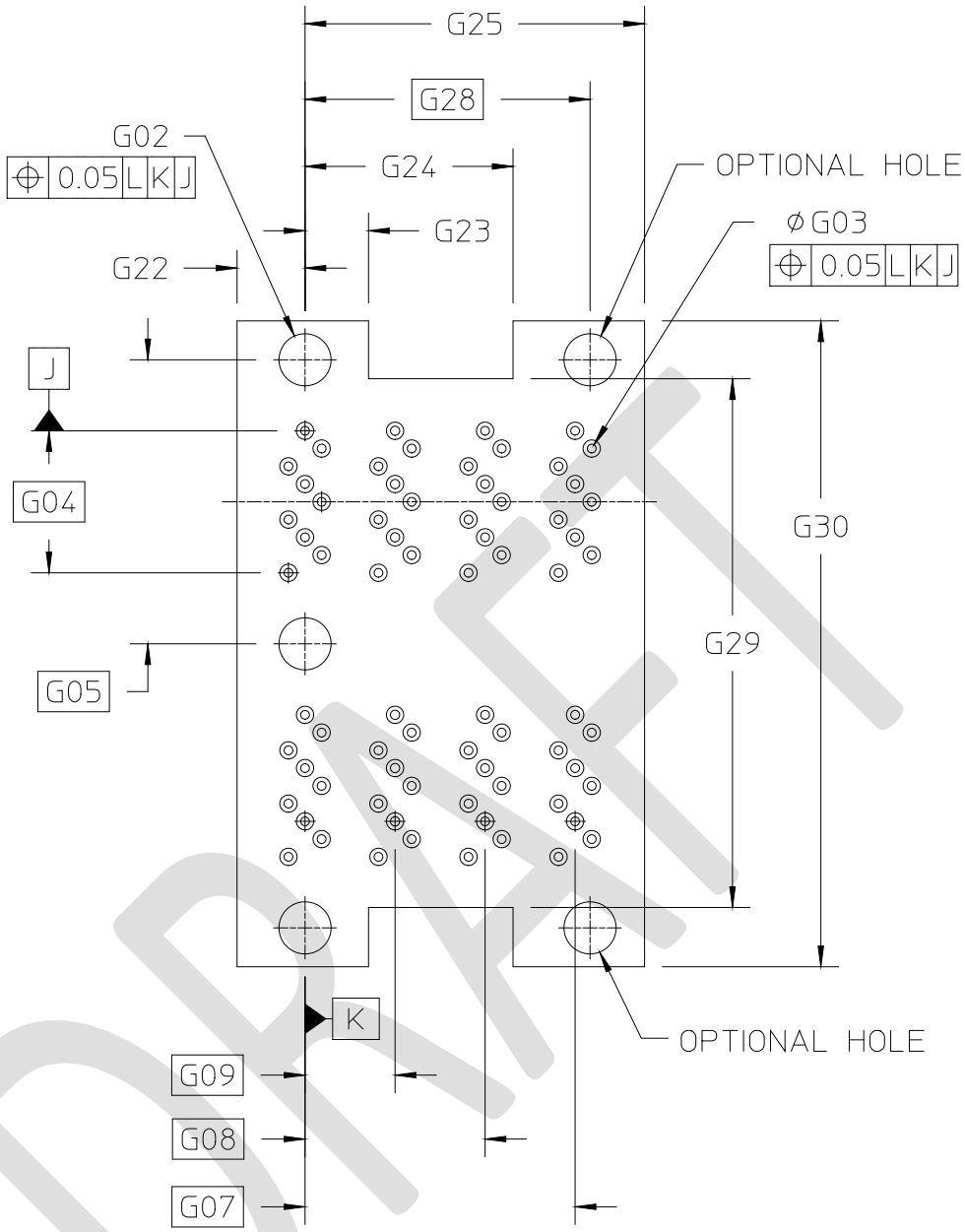


Figure 5-14 1x2 Vertical Unitary ~~Press Fit~~Through Hole Receptacle Option

Table 5-7 ~~Press Fit~~Through Hole Receptacle Footprint Dimensions

Designator	Description	Dimension	Tolerance +/-
G01 (*)	Datum to front edge of PCB	8.75	Min
G02	1xn mounting hole diameter	2.20	0.10
G03	1xn receptacle (finished PTH) hole diameter	0.37	0.05
G04	1xn receptacle pin, center-to-center	6.00	Basic
G05	1xn mounting hole-to-mounting hole	12.00	Basic
G06	1xn RA Datum K to mounting hole	1.45	Basic
G07	1xn Datum K to fourth group	11.40	Basic
G08	1xn Datum K to third group	7.60	Basic
G09	1xn Datum K to second group	3.80	Basic
G10	1xn receptacle hole-to-hole within group	0.75	Basic
G11	1xn receptacle hole-to-hole within group	1.50	Basic
G12	1xn receptacle hole-to-hole within group	2.25	Basic
G13	1xn receptacle hole-to-hole within group	0.70	Basic
G14	1xn receptacle hole-to-hole within group	1.40	Basic
G15	RA connector keep-out area	10.25	MIN
G16	RA connector keep-out area	15.66	MIN
G17	RA connector keep-out area	12.85	MIN
G18	RA connector keep-out area	2.65	MIN
G19	RA connector keep-out area	2.66	MIN
G20	RA connector keep-out area	15.19	MIN
G21	Connector keep-out area	3.77	MIN
G22	1xn VT connector keep-out area	2.87	MIN
G23	1xn VT connector keep-out area	2.68	MIN
G24	1xn VT connector keep-out area	8.78	MAX
G25	1xn VT connector keep-out area	14.33	MIN
G26	VT connector keep-out area	10.34	MIN
G27	VT connector keep-out area	15.29	MIN
G28	Optional mounting hole	12.03	Basic
G29	1x2 VT connector keep-out area	22.34	MIN
G30	1x2 VT connector keep-out area	27.29	MIN
(*) NOTE: Dimension to front edge of PCB must be maintained to ensure the plug cannot be reverse-mated with the right-angle receptacle.			

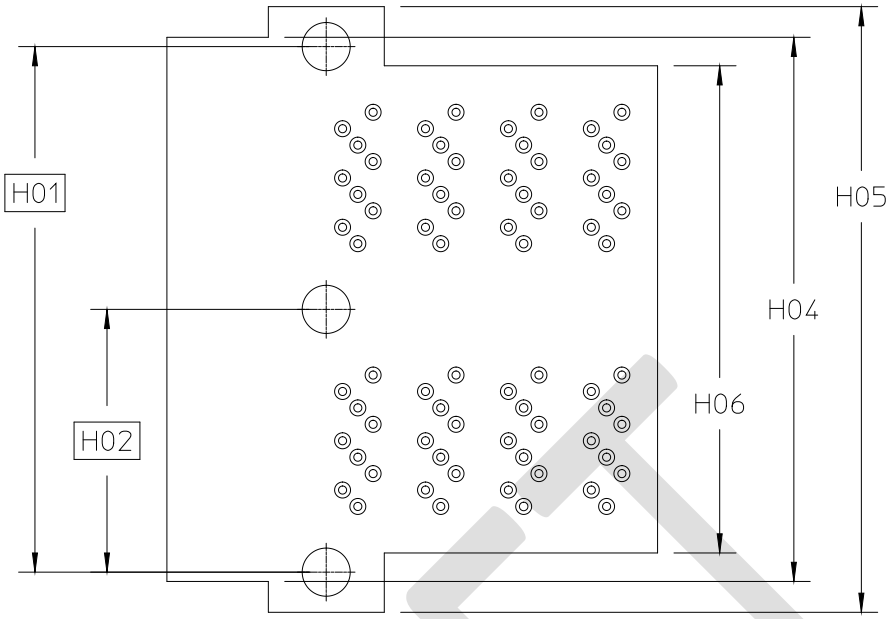


Figure 5-15 1x2 Right-angle ~~Press Fit~~Through Hole Receptacle Option

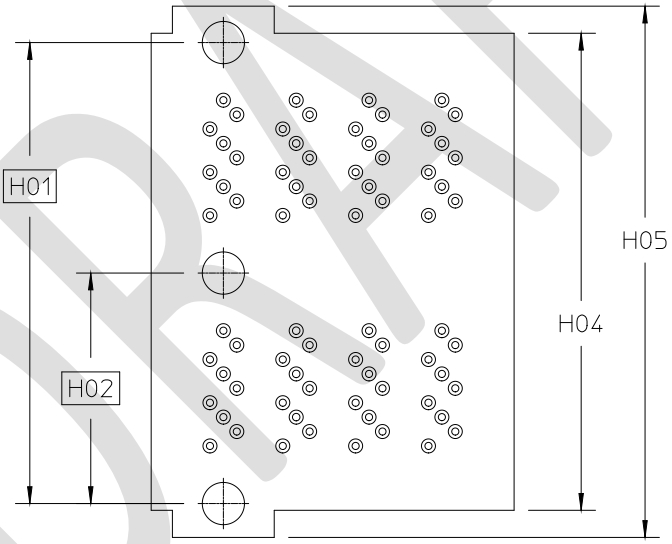


Figure 5-16 1x2 Vertical Modular ~~Press Fit~~Through Hole Receptacle Footprint Option

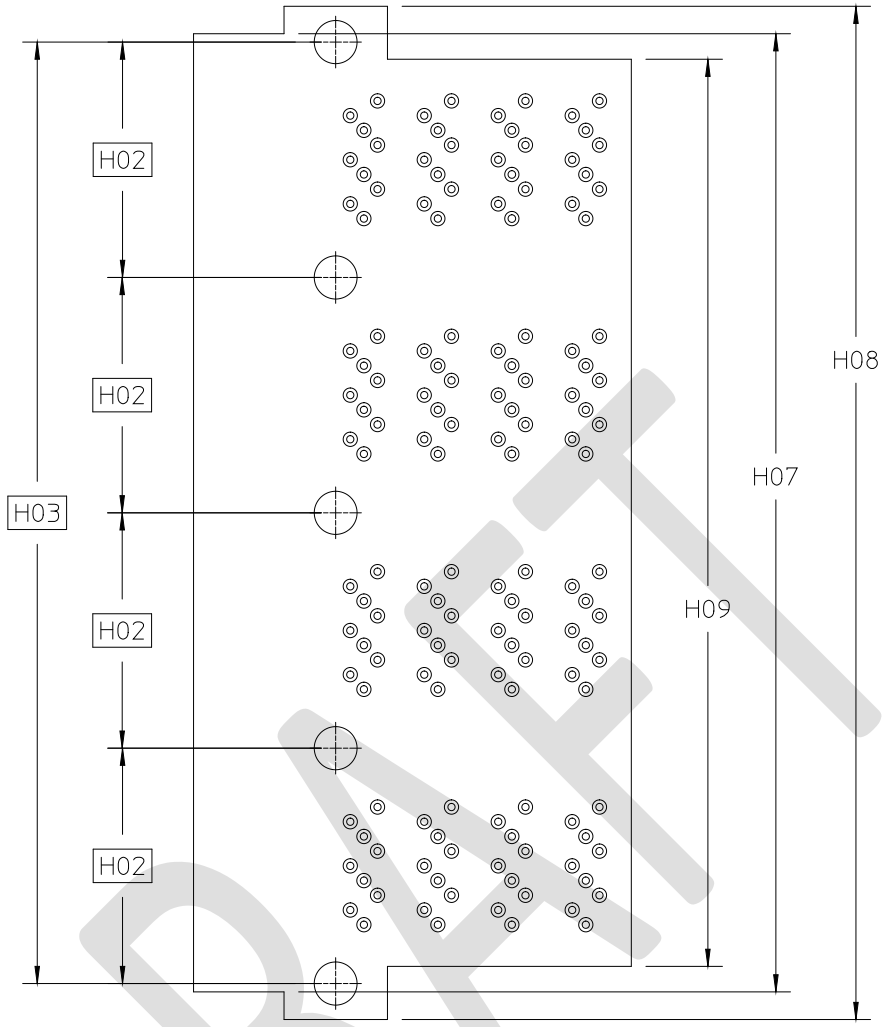


Figure 5-17 1x4 Right-angle ~~Press Fit~~Through Hole Receptacle Footprint Option

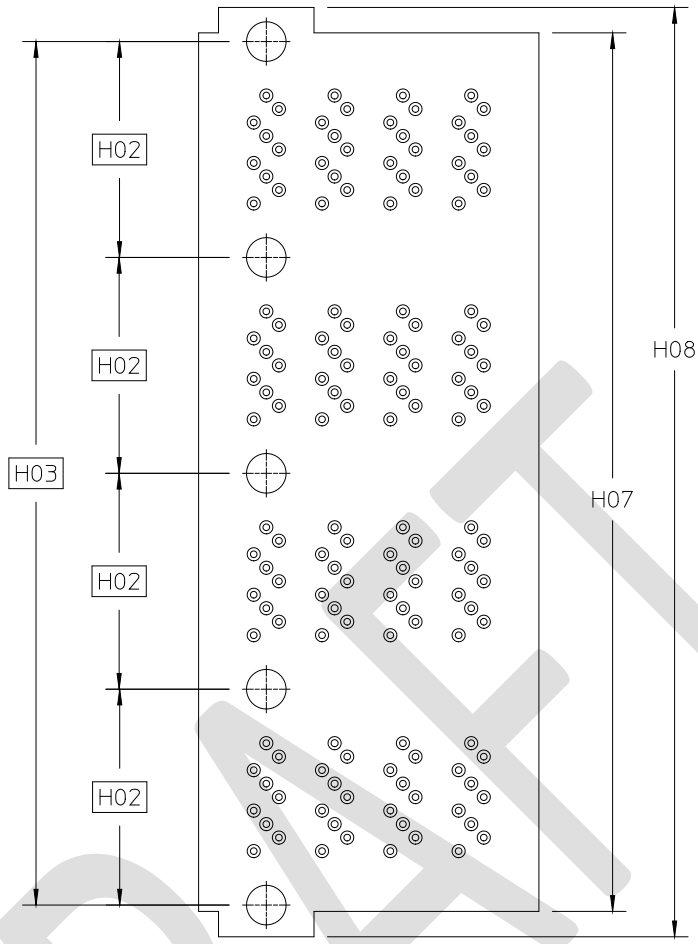


Figure 5-18 1x4 Vertical Modular ~~Press Fit~~Through Hole Receptacle Option

Table 5-8 Press Fit Receptacle Keep-out Dimensions

Designator	Description	Dimension	Tolerance +/-
H01	1x2 mounting hole-to-hole	24.00	Basic
H02	Port-to-port spacing	12.00	Basic
H03	1x4 mounting hole-to-hole	48.00	Basic
H04	Connector keep-out area	24.85	MIN
H05	Connector keep-out area	27.66	MIN
H06	Connector keep-out area	22.25	MIN
H07	Connector keep-out area	48.85	MIN
H08	Connector keep-out area	51.66	MIN
H09	Connector keep-out area	46.25	MIN

5.6.2 SMT Option

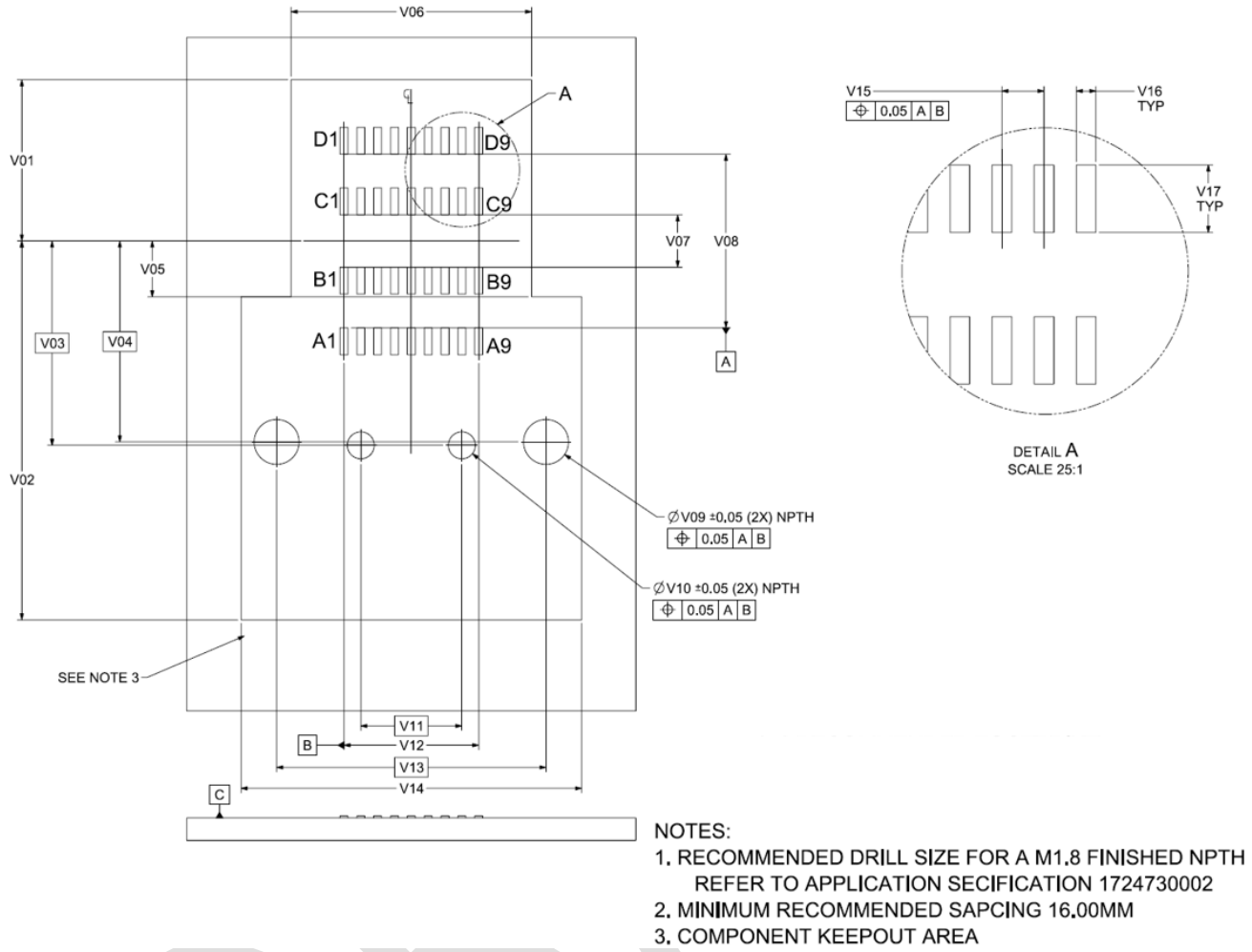


Figure 5-19 Table 10 1x1 Receptacle SMT Footprint Options

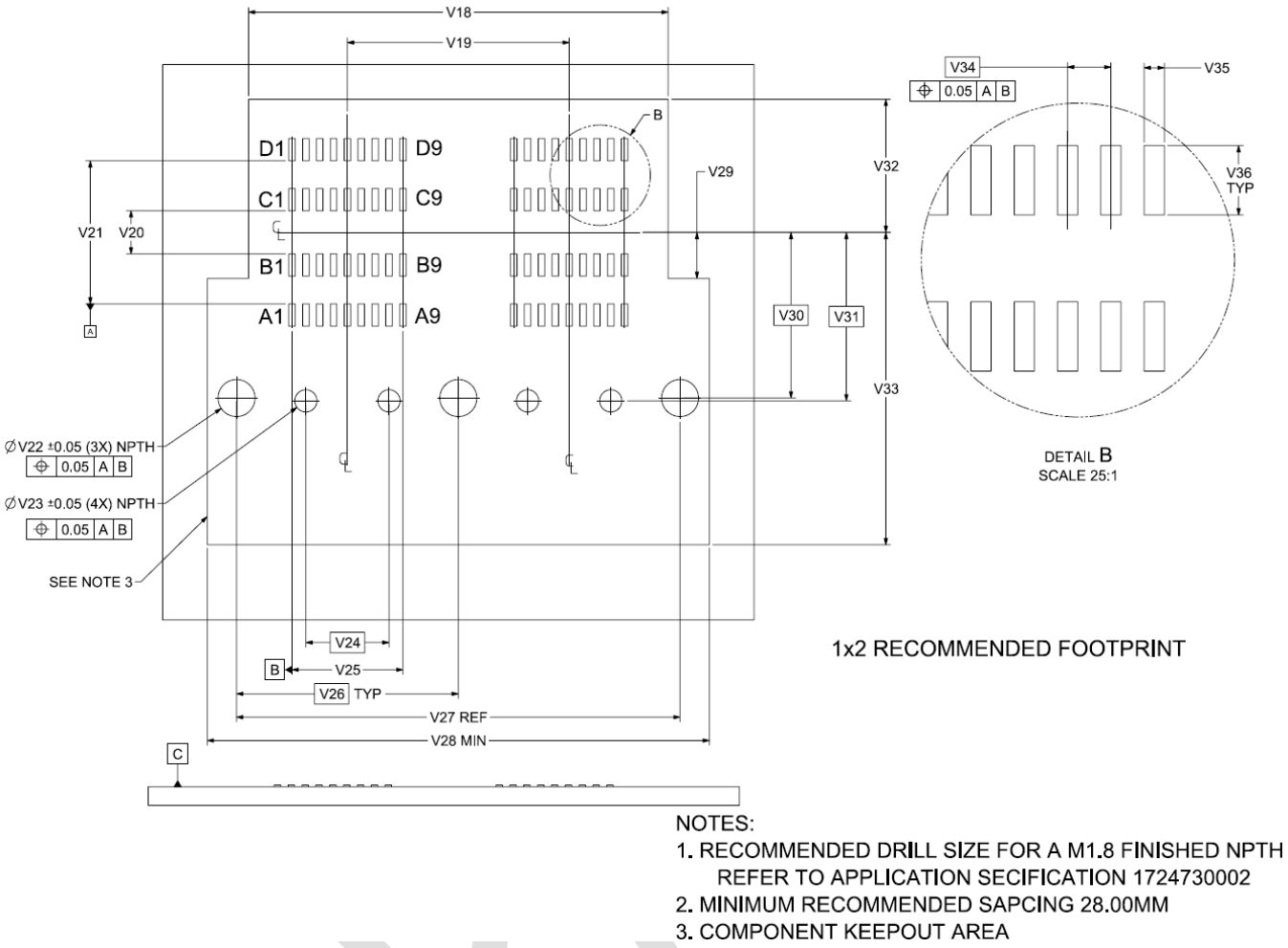
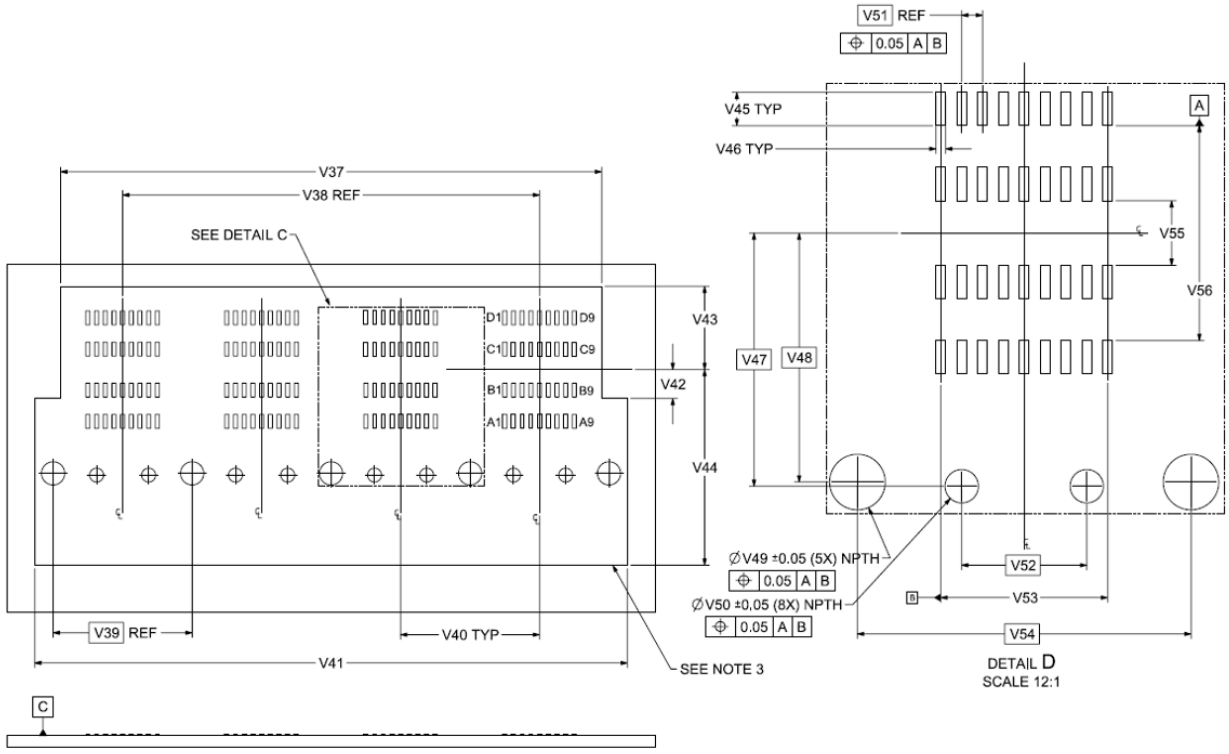


Figure 5-20 1x2 Receptacle SMT Footprint Option



NOTES:
1. RECOMMENDED DRILL SIZE FOR A M1.8 FINISHED NPTH
   REFER TO APPLICATION SECIFICATION 1724730002
2. MINIMUM RECOMMENDED SAPCING 52.00MM
3. COMPONENT KEEPOUT AREA

Figure 5-21 1x4 Receptacle SMT Footprint Option

Table 5-9 SMT Footprint Option Dimensions

Designator	Description	Dimension	Tolerance +/-
V01	Centerline between receptacle contacts and connector keep-out area	7.18	MIN
V02	Centerline between receptacle contacts and connector keep-out area	16.88	MIN
V03	Centerline between receptacle contacts and locating pegs	9.10	Basic
V04	Centerline between receptacle contacts and hold downs	8.95	Basic
V05	Centerline between receptacle contacts and connector keep-out area	2.49	MIN
V06	1x1 connector keep-out area	10.71	MIN
V07	Distance between Row B and Row C receptacle contacts	2.33	0.10
V08	Distance between Row A and Row D receptacle contacts	7.73	0.10
V09	Hold down diameter (2X)	2.00	0.05
V10	Locating peg diameter (2X)	1.20	0.05
V11	Distance between locating pegs	4.50	Basic
V12	Center-to-center distance between first and ninth receptacle contacts	6.00	0.10

V13	Distance between hold downs	12.00	Basic
V14	Connector keep-out area width	15.17	MIN
V15	Distance between adjacent receptacle contacts	0.75	0.10
V16	Receptacle contact width	0.35	TYP
V17	Receptacle contact length	1.20	TYP
V18	1x2 connector keep-out area	22.71	MIN
V19	Port-to-port spacing	12.00	
V20	Distance between Row B and Row C receptacle contacts	2.33	0.10
V21	Distance between Row A and Row D receptacle contacts	7.73	0.10
V22	Hold down diameter (2X)	2.00	0.05
V23	Locating peg diameter (2X)	1.20	0.05
V24	Distance between locating pegs	4.50	Basic
V25	Center-to-center distance between first and ninth receptacle contacts	6.00	0.10
V26	Distance between hold downs	12.00	TYP
V27	Distance between outer hold downs	24.00	REF
V28	1x2 connector keep-out area width	27.17	MIN
V29		2.49	MIN
V30	Centerline between receptacle contacts and hold downs	8.95	Basic
V31	Centerline between receptacle contacts and locating pegs	9.10	Basic
V32	Centerline between receptacle contacts and connector keep-out area	7.18	MIN
V33	Centerline between receptacle contacts and connector keep-out area	16.88	MIN
V34	Distance between adjacent receptacle contacts	0.75	0.10
V35	Receptacle contact width	0.35	TYP
V36	Receptacle contact length	1.20	TYP
V37	1x4 connector keep-out area width	46.71	MIN
V38	Port-to-port spacing between first and fourth ports	36.00	REF
V39	Spacing between adjacent hold downs	12.00	REF
V40	Port-to-port spacing between adjacent ports	12.00	TYP
V41	1x4 connector keep-out area width	51.17	MIN
V42		2.49	MIN
V43	Centerline between receptacle contacts and connector keep-out area	7.18	MIN
V44	Centerline between receptacle contacts and connector keep-out area	16.88	MIN
V45	Receptacle contact length	1.20	TYP
V46	Receptacle contact width	0.35	TYP
V47	Centerline between receptacle contacts and locating pegs	9.10	Basic
V48	Centerline between receptacle contacts and hold downs	8.95	Basic
V49	Hold down diameter (2X)	2.00	0.05
V50	Locating peg diameter (2X)	1.20	0.05
V51	Distance between adjacent receptacle contacts	0.75	REF
V52	Distance between adjacent locating pegs within a port	4.50	Basic
V53	Port-to-port spacing between first and fourth ports	6.00	0.10
V54	Distance between adjacent hold downs within a port	12.00	Basic

6. Plug Mechanical Specification

6.1 Paddle Card

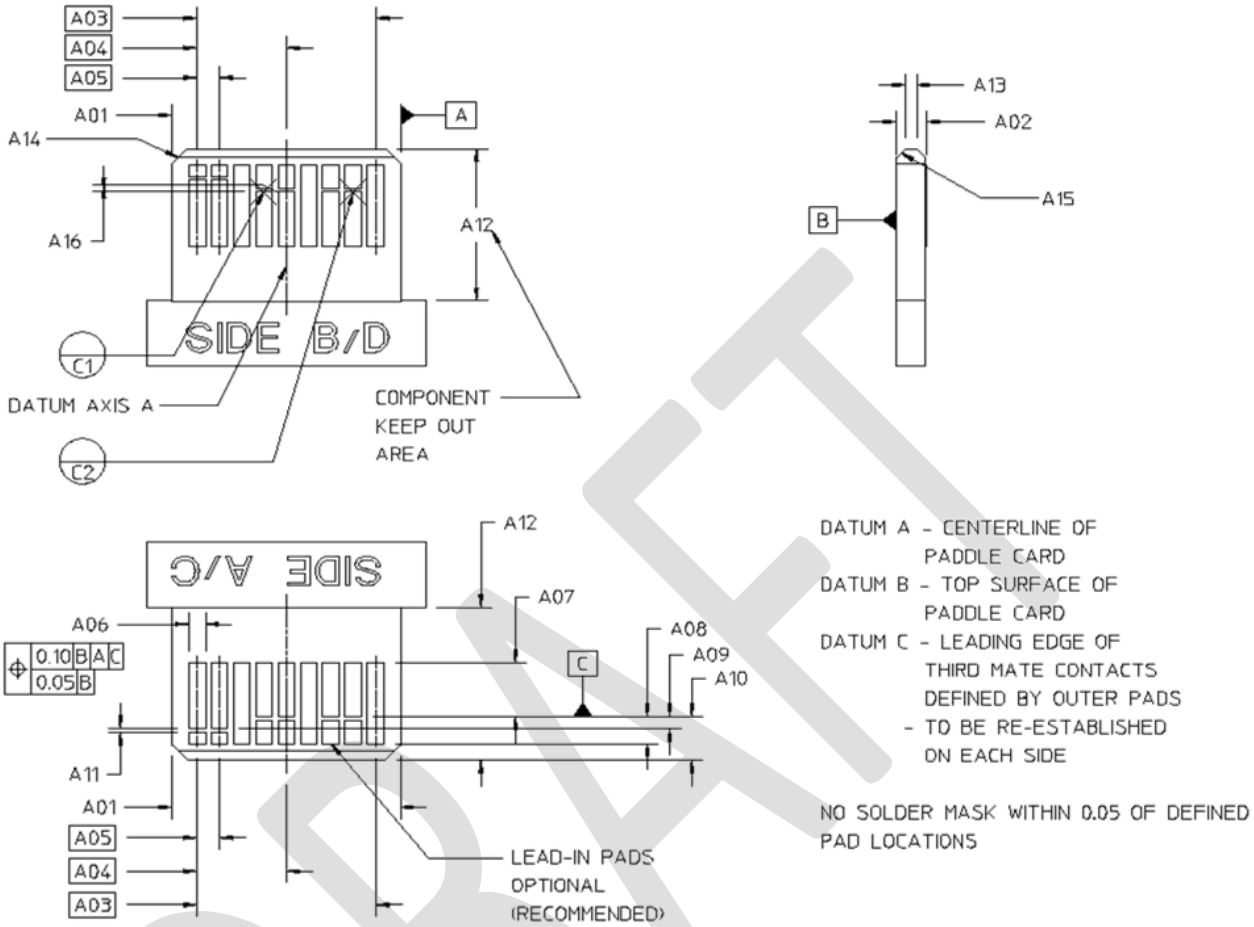


Figure 6-1 Plug Paddle Card

1 **Table 6-1 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 mated pad to Datum C	0.00	0.03

6.2 X4 Plug

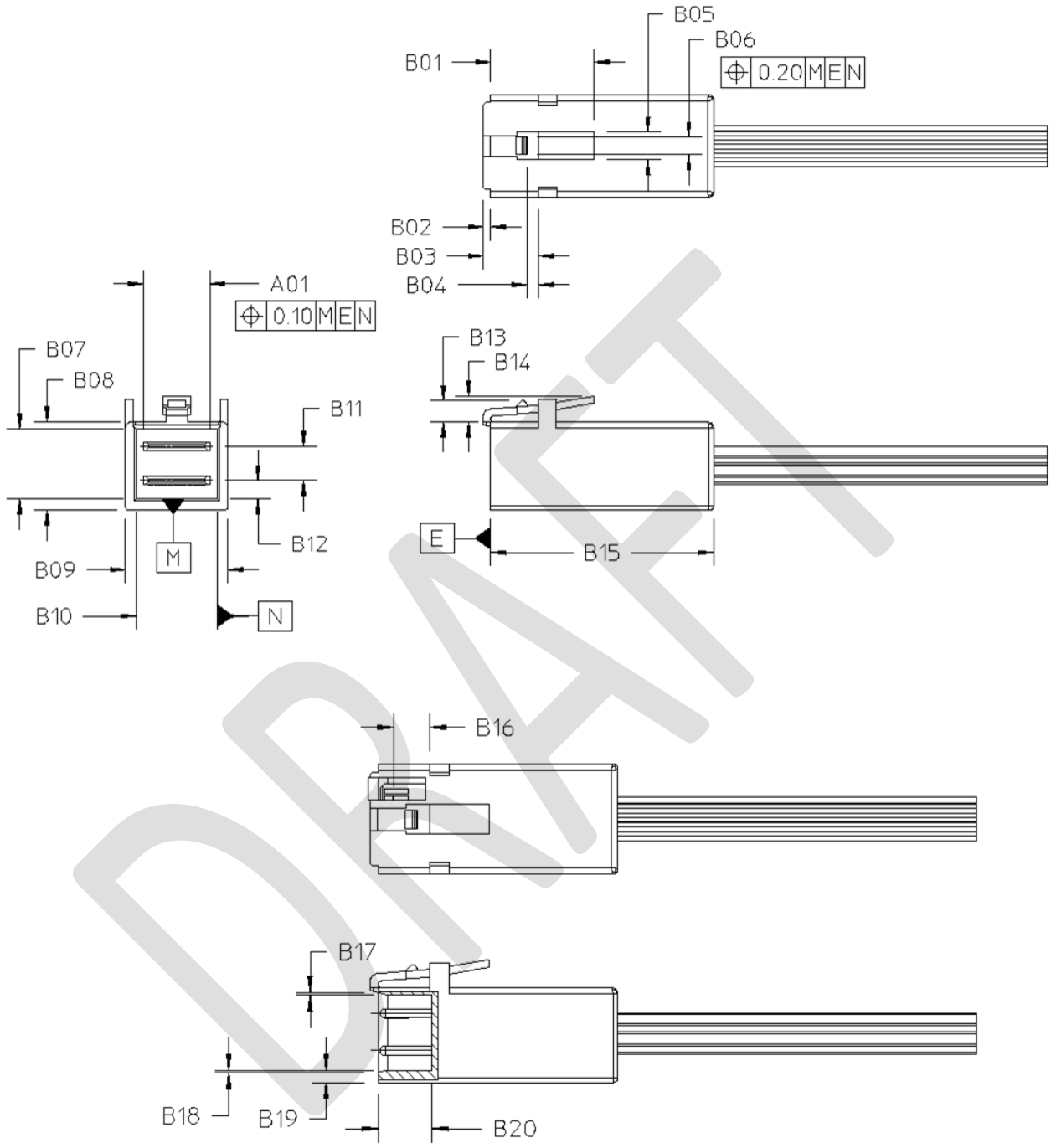


Figure 6-2 4X Plug

Table 6-2 4X Plug Dimensions

Designator	Description	Dimension	Tolerance +/-
B01	Plug front to latch	11.00	MIN
B02	Plug lead0in	0.83	0.15
B03	Plug front to latch stop	6.39	0.08
B04	Plug front to latch barb	1.35	0.08
B05	Latch width	3.20	REF
B06	Latch barb width	2.00	0.15
B07	Snout height- inside	8.15	0.08
B08	Snout height- outside	10.28	0.10
B09	Snout height- outside	11.85	0.10
B10	Snout height- inside	9.40	0.08
B11	Upper PCB to lower PCB	4.00	0.10
B12	Snout top to upper PCB	2.14	0.10
B13	Latch barb height	2.49	REF
B14	Latch height	3.00	0.75
B15	Plug body length	27.00	MAX
B16	Latch barb to PCB third mate pad front	3.90	0.08
B17	Plug opening lead-in	0.25	0.10
B18	Plug opening lead-in	0.25	0.10
B19	Snout- lower thickness	1.33	0.05
B20	Plug opening depth	5.80	MIN

6.3 8X Plug

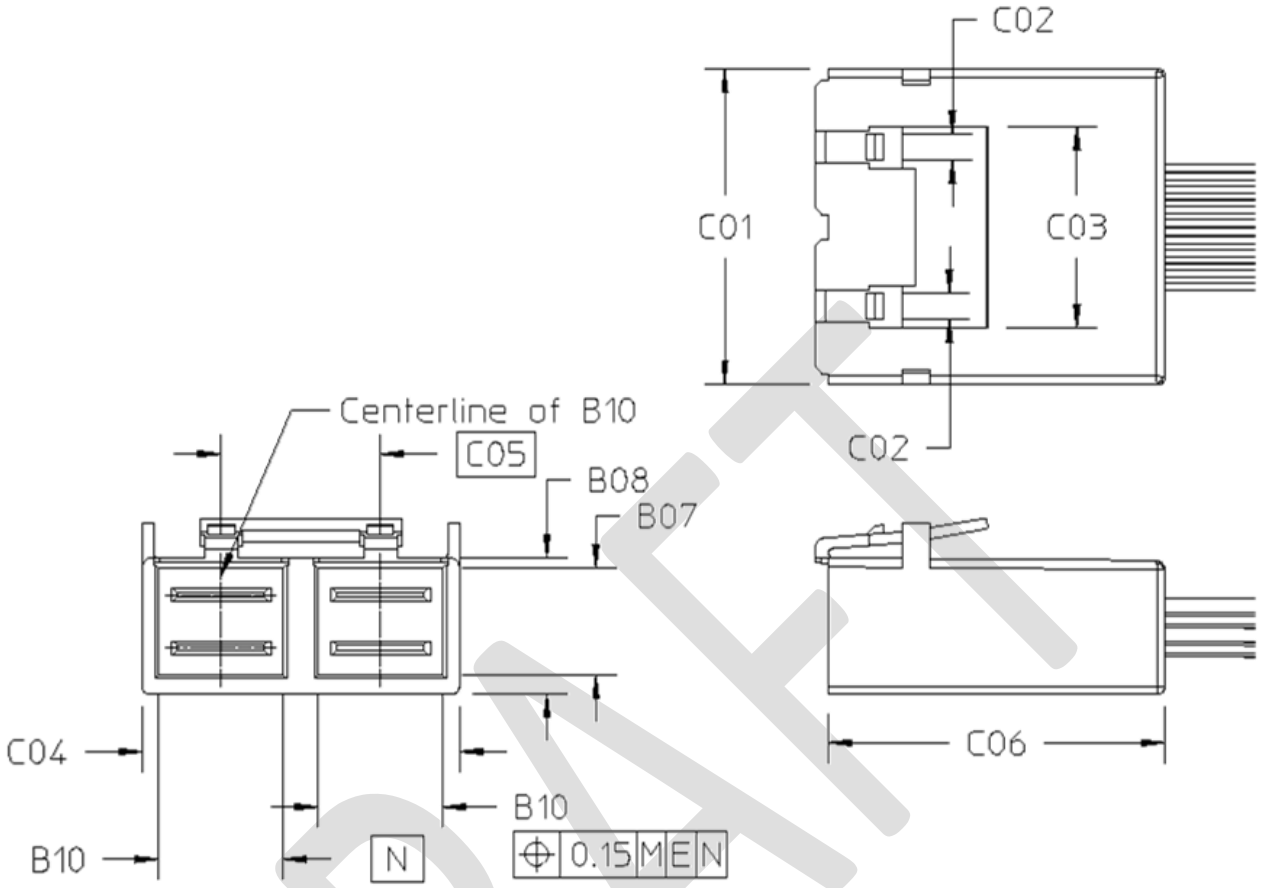


Figure 6-3 8X Plug

Table 6-3 8X Plug Dimensions

Designator	Description	Dimension	Tolerance +/-
C01	Plug body width	23.85	0.15
C02	Latch barb width	2.00	0.15
C03	Latch width	15.20	REF
C04	Snout width- outside	23.85	0.10
C05	Port spacing	12.00	Basic
C06	Plug body length	27.00	MAX

7. Test Requirements and Methodologies (TS-1000, etc.)

7.1 Performance Tables

EIA-364-1000 (TS-1000) shall be used to define the test sequences and procedures for evaluating the connector system described in this document. Where multiple test options are available, the manufacturer shall select the appropriate option where not previously specified. The selected procedure shall be noted when reporting data. If there are conflicting requirements or test procedures between EIA-364 procedures and those contained within this document, this document shall be considered the prevailing authority.

Unless otherwise specified, procedures for sample size, data, and collection to be followed as specified in EIA-364-1000. See EIA-364-1000 Annex B for objectives of tests and test groups.

Table 7-1 summarizes the performance criteria that are to be satisfied by the connector described in this document. Most performance criteria are validated by EIA-364-1000 testing, but this test suite leaves some test details to be determined. To ensure that testing is repeatable, these details are identified in Table 7-2. Finally, testing procedures used to validate any performance criteria not included in EIA-364-1000 are provided in Table 7-3.

Table 7-1 Form Factor Performance Requirements

Performance Parameters	Description/ Details	Requirement
Mechanical/ Physical Requirements		
Plating Type	Plating type on connector contacts	Precious
Surface Treatment	Surface treatment on connector contacts; Test Group 6 required if surface treatment is applied	Manufacturer to specify
Wipe length	Designed distance a contact traverses over a mating contact surface during mating and resting at a final position; Test Group 6 required if wipe length is less than 0.127mm	~~Less than 0.127mm~~ ~~Greater than 0.127mm~~ Manufacturer to specify
Rated Durability Cycles	The expected number of durability cycles a component is expected to encounter over the course of its life	250 cycles
Mating Force*	Amount of force needed to mate a module with a connector when latches are deactivated	150 N MAX
Unmating Force*	Amount of forced needed to separate a module from a connector when latches are deactivated	50 N MAX
Latch Retention*	Amount of force the latching mechanism can withstand	75 N MIN
Environmental Requirements		
Field Life	The expected service life for a component	10 years
Field Temperature	The expected service temperature for a component	65°C
Storage Temperature*	The expected storage temperature for a component when not in use	-20°C to +85°C
Storage Humidity*	The expected storage humidity for a component when not in use	80% Relative Humidity
Electrical Requirements		
Current*	Maximum current to which a contact is exposed in use	0.5A per contact MAX
Operating Rating Voltage	Maximum voltage to which a contact is exposed in use	30V DC per contact MAX
NOTE: Performance criteria denoted with stars (*) are not validated by EIA-364-1000 testing. Refer to Table 7-3 for test procedures and pass/fail criteria.		

Table 7-2 describes the details necessary to perform the tests described in the EIA-364-1000 test sequences. Testing shall be done in accordance with EIA-364-1000 and the test procedures it identifies in such a way that the parameters/ requirements defined in
Table 7-1 are met. Any information in this table supersedes EIA-364-1000.

Table 7-2 EIA-364-1000 Test Details

Test	Test Descriptions and Details	Pass/ Fail Criteria
Mechanical/ Physical Tests		
Durability (preconditioning)	EIA-364-09 To be tested with connector, cage, and module (Latches should~~/ should not~~ be locked)	No evidence of physical damage
Durability	EIA-364-09 To be tested with connector, cage, and module (Latches should~~/ should not~~ be locked out per EIA-364-1000)	No visual damage to mating interface or latching mechanism
Vibration		
Environmental Tests		
Mixed Flowing Gas (see Note 1)	EIA-364-65 Class II See Table 4.1 in EIA-364-1000 for exposure times Test option Per EIA-364-1000: 1B	No intermediate test criteria
Electrical Tests		
Low Level Contact Resistance (see Note 2)	EIA-364-23 20 mV DC MAX, 100 mA MAX To include wire termination or connector-to-board termination	20 mΩ MAX change from baseline
Dielectric Withstanding Voltage	EIA-364-20 Method B 300 VDC minimum for 1 minute Applied voltage may be product / application specific	No defect or breakdown between adjacent contacts ~~-AND-~~ ~~1 mA Max Leakage Current~~
NOTES: 1. Temperature and duration must be reported. 2. The first low level contact resistance reading in each test sequence is used to determine a baseline measurement. Subsequent measurements in each sequence are measured against this baseline.		

Table 7-3 describes the testing procedures necessary to validate performance criteria not validated by EIA-364-1000 testing. The tests are to be performed in such a way that the parameters/ requirements defined in Table 7-1 are met.

Table 7-3 Additional Test Procedures

Test	Test Descriptions and Details	Pass/ Fail Criteria
Mechanical/ Physical Tests		
Mating Force	EIA-364-13 To be tested with cage, connector, and module without heat sinks Latching mechanism deactivated (locked out)	Refer to Table 7-1 -AND- No physical damage to any components
Unmating Force	EIA-364-13 To be tested with cage, connector, and module without heat sinks Latching mechanism deactivated (locked out)	
Latch Retention	EIA-364-13 To be tested with cage, connector, and module without heat sinks Latching mechanism engaged (not locked out)	
Vibration	EIA-364-28 ~~Additional test detail needed?~~	No physical damage -AND- No discontinuity longer than 1 microsecond -AND- 20 mΩ MAX change from baseline
Mechanical Shock	EIA-364-27 ~~Additional test detail needed?~~	No physical damage -AND- 20 mΩ MAX change from baseline
Environmental Tests		
Storage Temperature	EIA-364-32 Method A, Test Condition 1, Duration 4 Use min and max Field Temperatures listed in Table 7-1 for temperature range	Refer to Table 7-1
Storage Humidity	EIA-364-31	Refer to Table 7-1
Electrical Tests		
Current	EIA-364-70 Method 3, 30-degree temperature rise Contacts energized: ~~All / specific contacts [Identify which contacts]~~Manufacturer to specify	Refer to Table 7-1 for current magnitude
Insulation Resistance	100 VDC	1000 Megaohms minimum between adjacent contacts