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

SFF Committee

SFF-8484 Specification for

Multilane Unshielded Serial Attachment Connectors

Rev 2.0 March 03, 2006

Secretariat: SFF Committee

Abstract: This specification defines a connector system useful for multilane unshielded serial attachment applications.

This specification provides a common specification for systems manufacturers and system integrators. 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.

Adaptec
Amphenol
Comax
Dell
EMC
ENDL
FCI
Hewlett Packard
Hitachi Cable
Hitachi GST
Intel
LSI Logic
Molex
Seagate
Sun Microsystems
Tyco AMP
Unisys

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

Emulex
Foxconn
Fujitsu CPA
Hitachi GST
Infineon
LSI Logic
Maxtor
Toshiba America
Vitesse Semi

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, 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:

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.

SFF Committee --

Multilane Unshielded Serial Attachment Connectors

1. Scope

This specification defines the interface and footprints of connectors for serial signals. Included are board mount free connectors (plugs) and cable fixed connectors (receptacles). These connectors are intended for internal use with multiple lane Serial Attachment systems.

The SFF Committee was formed in August, 1990 to broaden the applications for storage devices, and is an ad hoc industry group of companies representing system integrators, peripheral suppliers, and component suppliers.

1.1 Description of Clauses

Clause 1 contains the Scope and Purpose.
Clause 2 contains Referenced and Related Standards and SFF Specifications.
Clause 3 contains the General Description.
Clause 4 contains the Connector Detail
Clause 5 contains the Ratings
Clause 6 contains the Performance Requirements
Clause 7 contains the Dimensions and Tolerances

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 are relevant to many SFF Specifications.

T10/1601-D Serial Attached SCSI (SAS), 1.1
Serial ATA II: Cable and Connector, Vol. 2 Specification

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 International Committee for Information Technology Standards (http://tinyurl.com/c4psg).

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

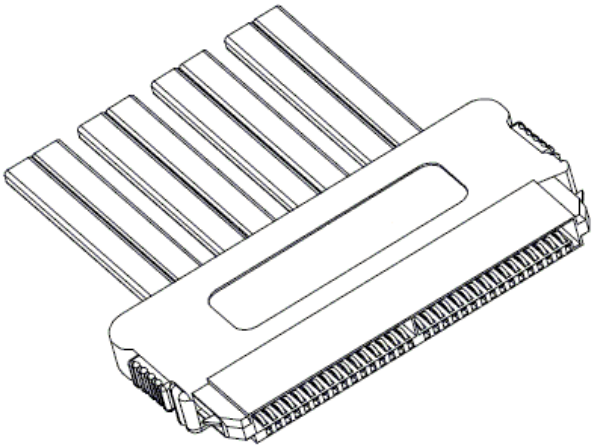
3. General Description

The connector system specified in this document is designed for supporting multiple lanes of differential serial signals in a single cable assembly. The system also supports multilane PCB to PCB connections. Possible applications for the PCB to PCB systems include HBA (Host Bus Adapter) to backplane connection. The multilane cable assembly connector could be applied to a fan out connection between a disk array controller PCB and multiple storage devices.

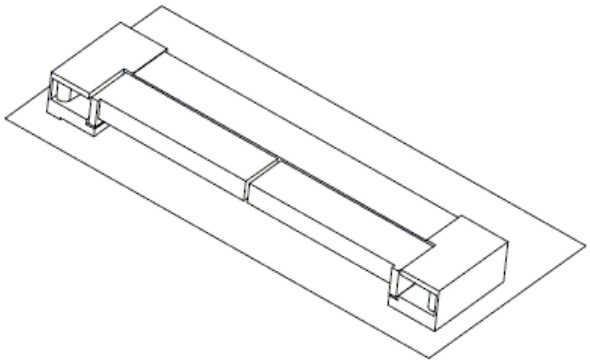
The 2 Lane Version has 19 contacts.
The 4 Lane Version has 32 contacts.
Note: The functions of the specific contacts vary by application. See the relevant application standard (e.g., SAS, SATA) for the functional map that applies.

Neither hot plug, nor blind mating is supported by this specification.

The connector system uses a latched based positive retention scheme.



Cable Fixed (Receptacle) Interface



Board Mount Free (Plug) Interface

Figure 1: General View

3.1 Definitions

Fixed: Used to describe the gender of the mating side of a 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 document “fixed” is specifically used to describe the mating side gender in Figure 1.

Free: Used to describe the gender of the mating side of a 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 document “free” is specifically used to describe the mating side gender in Figure 1.

4. Dimensioning requirements

The figures referenced in the table below provide the necessary dimensions for the appropriate Versions and Footprints for the Multilane interface.

Figure	Description
2 & 3	Straight Free Versions
4 & 5	Right Angle Free Versions
6 & 7	Cable Assembly Fixed Versions
8 & 9	Straight Through Hole Footprints
11 & 12	Right Angle Through Hole Footprints
13 & 14	Straight Surface Mount Footprints
15	Multilane Fanout Assemblies

4.1 Footprints.

The following PCB footprints (in figures 8, 9, 11, 12, 13 and 14) are specified to allow functional multi-sourcing of board mounted versions. These footprints do not include requirements for electrical performance or details of PCB construction beyond the interface to the connector back end.

- Through Hole Straight (Press Fit and Solder Pin)
- Through Hole Right Angle
- Surface Mount

4.2 Connector Keep Out Zones.

This area (in figures 8, 9, 11, 12, 13 and 14) is reserved for the Multilane connector housing. It is recommended that no other components be placed in this area.

5. Ratings

5.1 Nominal Operating Current

1.5 Amps D.C., maximum per mated contact for all contacts,

5.2 Ambient Temperature

Operating: 0°C to 55°C in stagnant air.
Non Operating: -40°C to 85°C, absolute limits to avoid damage.

6. Performance Requirements

6.1 Electrical Requirements

Description	Test Condition	Requirement
Contact Resistance (Low Level)	Mate connectors and apply a maximum voltage of 20 mVolts and a current of 100 mAmps per EIA 364-23	30 mOhms maximum (initial)
Insulation Resistance	Apply a voltage of 500 Volts DC for 1 minute between adjacent terminals per EIA 364-21	1000 MOhms minimum
Dielectric Withstanding Voltage	Apply a voltage of 500 Volts AC for 1 minute between adjacent terminals per EIA 364-20, method B	No breakdown

6.2 Mechanical Requirements

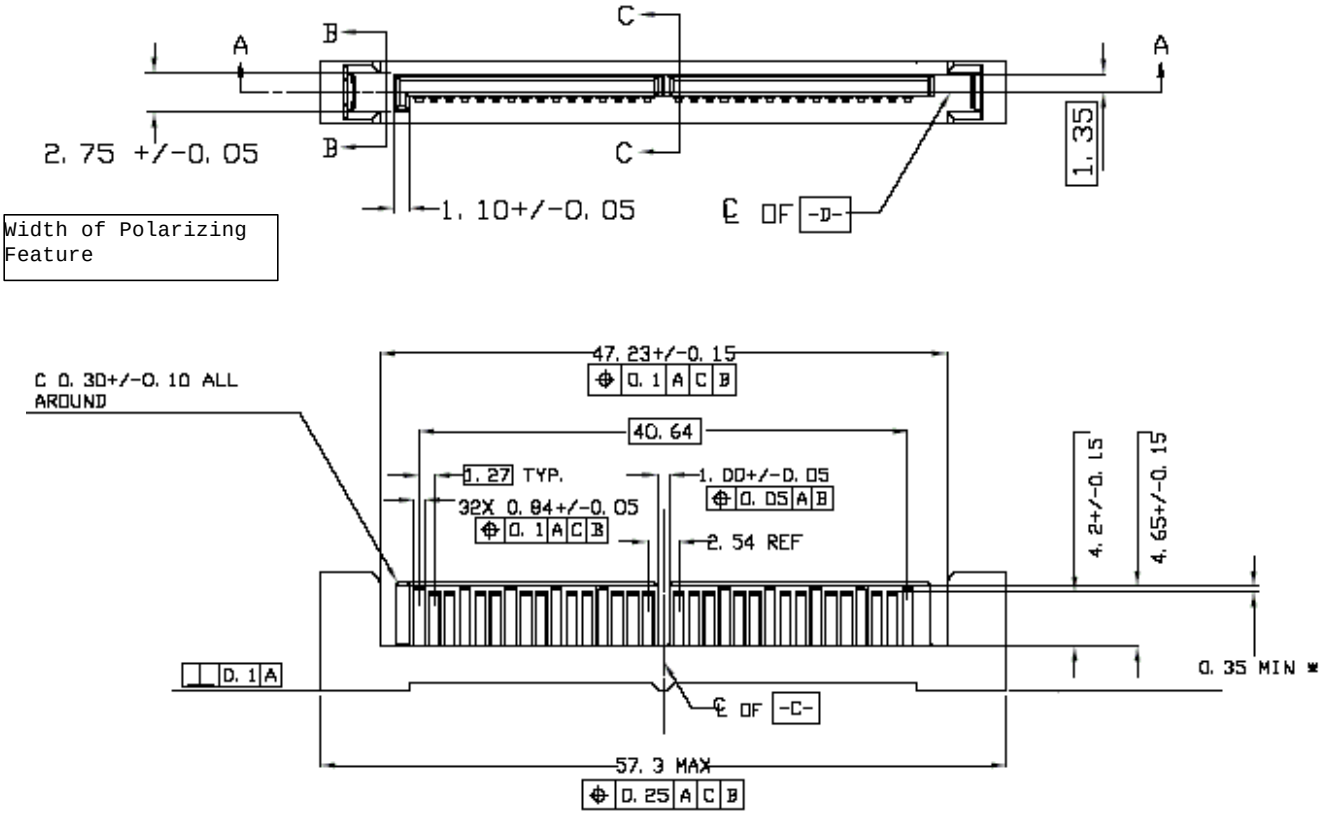
Description	Test Condition	Requirement
Connector mating forces	Mate at a rate of 12.5 mm per minute per EIA 364-13	45 N max. for 4 Lane connector 30 N max. for 2 Lane connector
Retention forces	Un-mate at a rate of 12.5 mm per minute per EIA 364-13	20 N minimum after 50 mating cycles, without damage for both 4 Lane and 2 Lane connectors (latches engaged)
Durability	Contacts: Mate and un-mate connectors at a rate of 25 mm per minute for 50 cycles per EIA 364-13	No damage. 15 mOhms max. change from initial contact resistance
Vibration (random)	Mate connectors and vibrate per EIA 364-28, condition V, method A, subject mated connectors to 5.35 g’s RMS. 30 minutes in each of three mutually perpendicular	Discontinuity < 1 µsec. and 15 mOhms max. change from initial contact resistance
Shock (mechanical)	Mate connectors and shock at 50 g’s with ½ sine wave (11 msec.) shock on each X,Y&Z axis (18 shocks total) per EIA 364-27	Discontinuity < 1 µsec. and 15 mOhms max. change from initial contact resistance

6.3 Environmental Requirements

Description	Test Condition	Requirement
Humidity	Subject mated connectors to 96 hours at 40°C with 90-95% relative humidity per EIA 364-31, Test Condition A, Method II	No damage. 15 mOhms max. change from initial contact resistance
Temperature Life	Subject mated connectors to +85°C for 500 hours per EIA 364-17, Test Condition III, Method A	No damage. 15 mOhms max. change from initial contact resistance
Thermal Shock	Subject mated connectors to 10 cycles between -55°C and +85°C per EIA 364-32, Test Condition I	No damage. 15 mOhms max. change from initial contact resistance
Mixed Flowing Gas	1 half of samples are exposed un-mated for 7 days and then mated for 7 additional days. The other half of samples are exposed mated for full 14 days test period per EIA 364-65, Class 2A	No damage. 15 mOhms max. change from initial contact resistance

7. Dimensions and Tolerances

The following figures specify the dimensions and tolerances.



Note: Contacts 14-19 may be either pin length (4.2mm or 4.65mm).

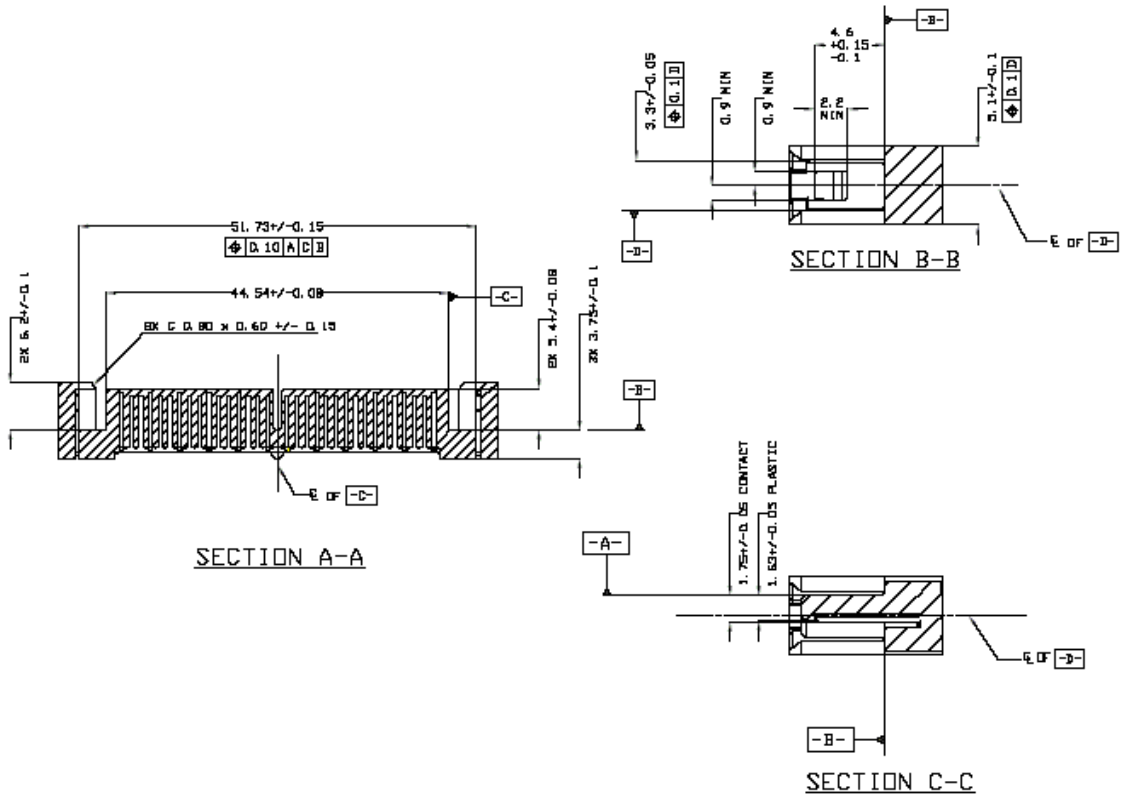
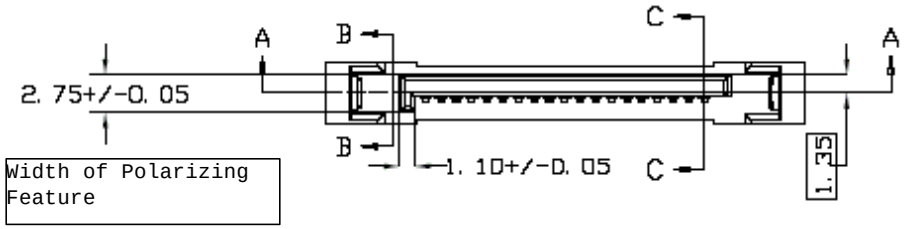
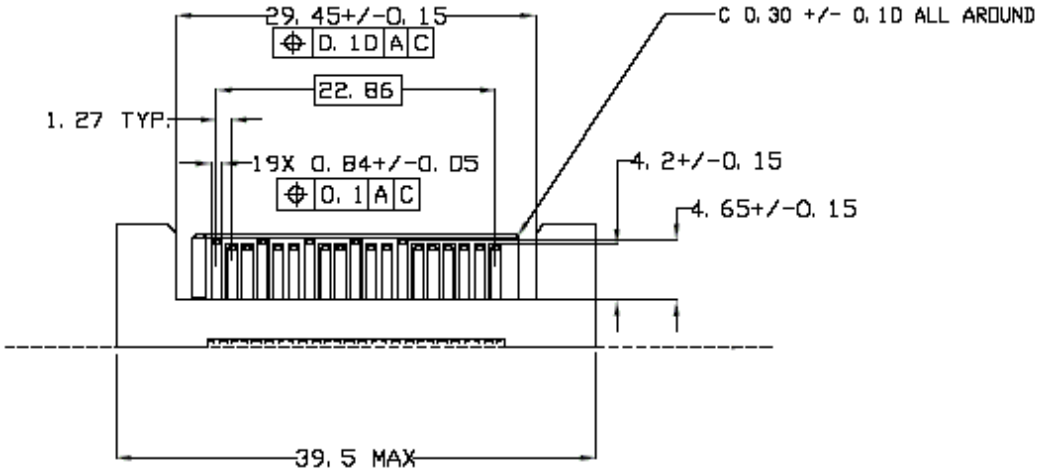


Figure 2: 4 Lane Straight Free (Plug) Interface





Note: Contacts 14-19 may be either pin length (4.2mm or 4.65mm).

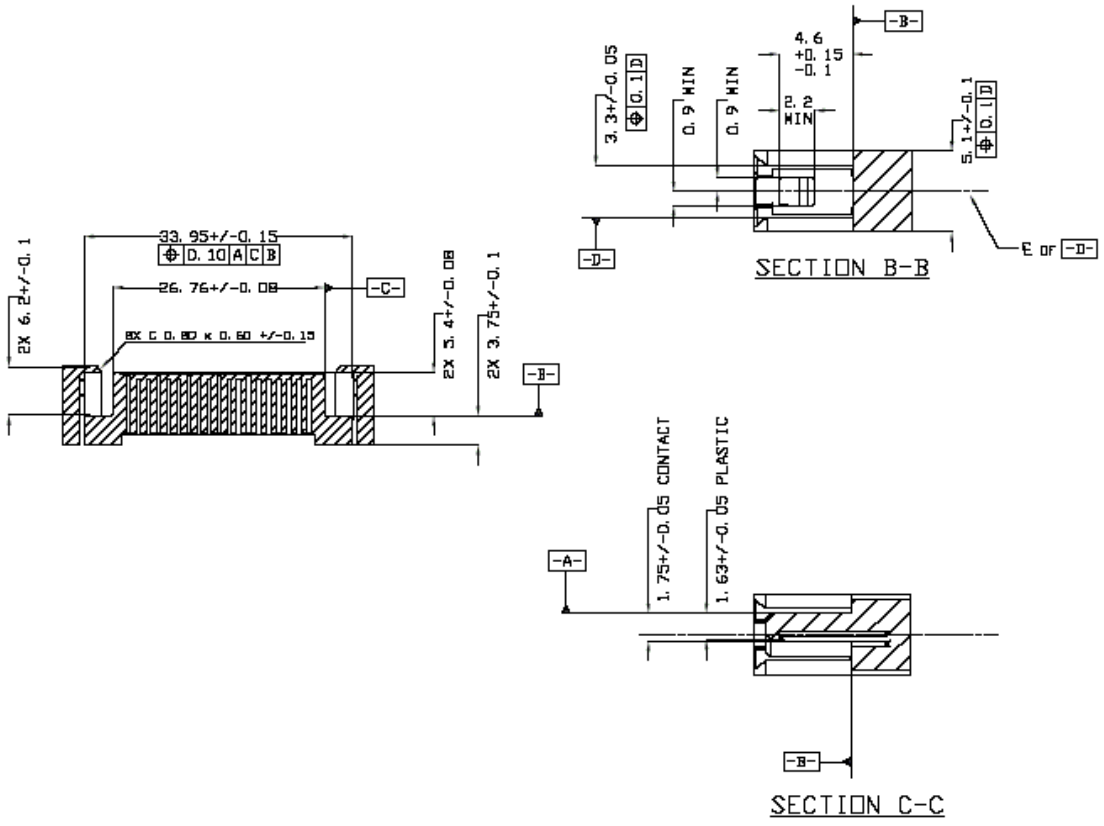
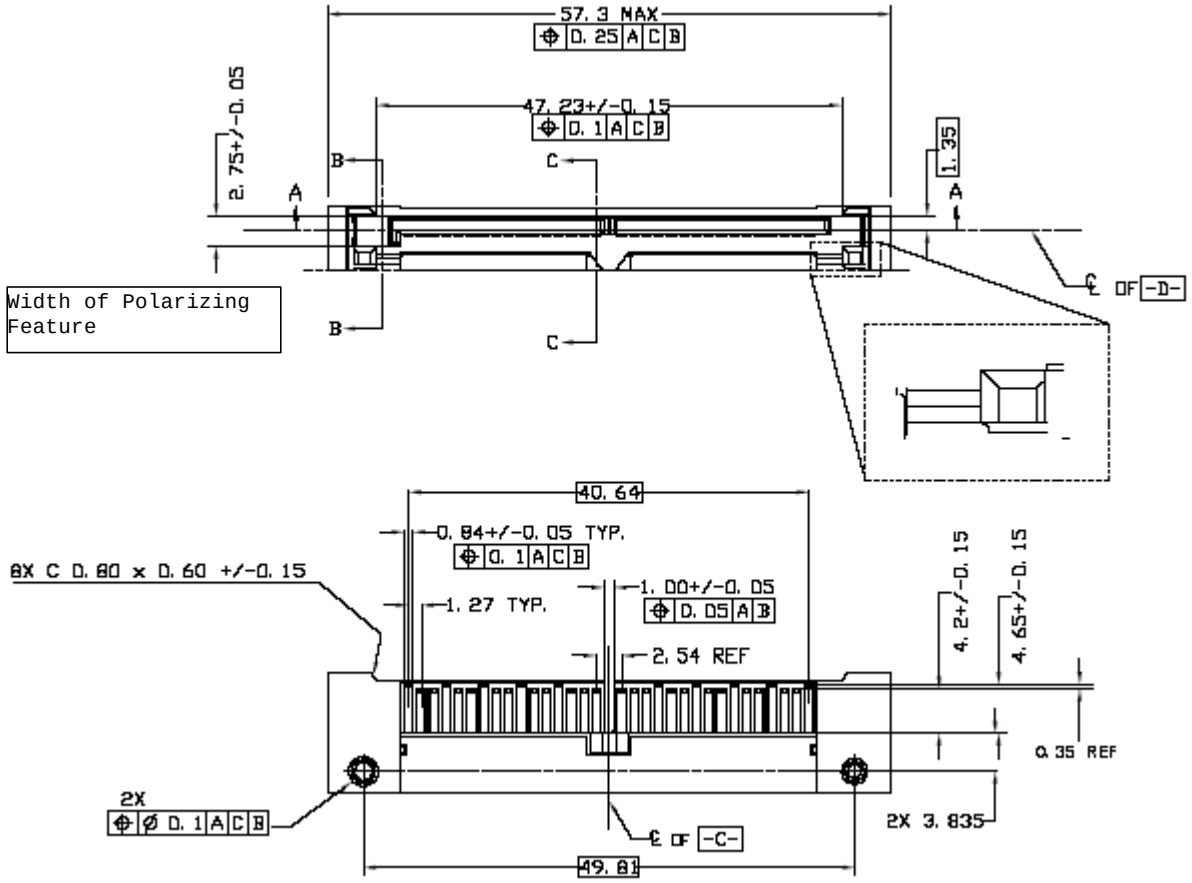


Figure 3: 2 Lane Straight Free (Plug) Interface



Note: Contacts 14-19 may be either pin length (4.2mm or 4.65mm).

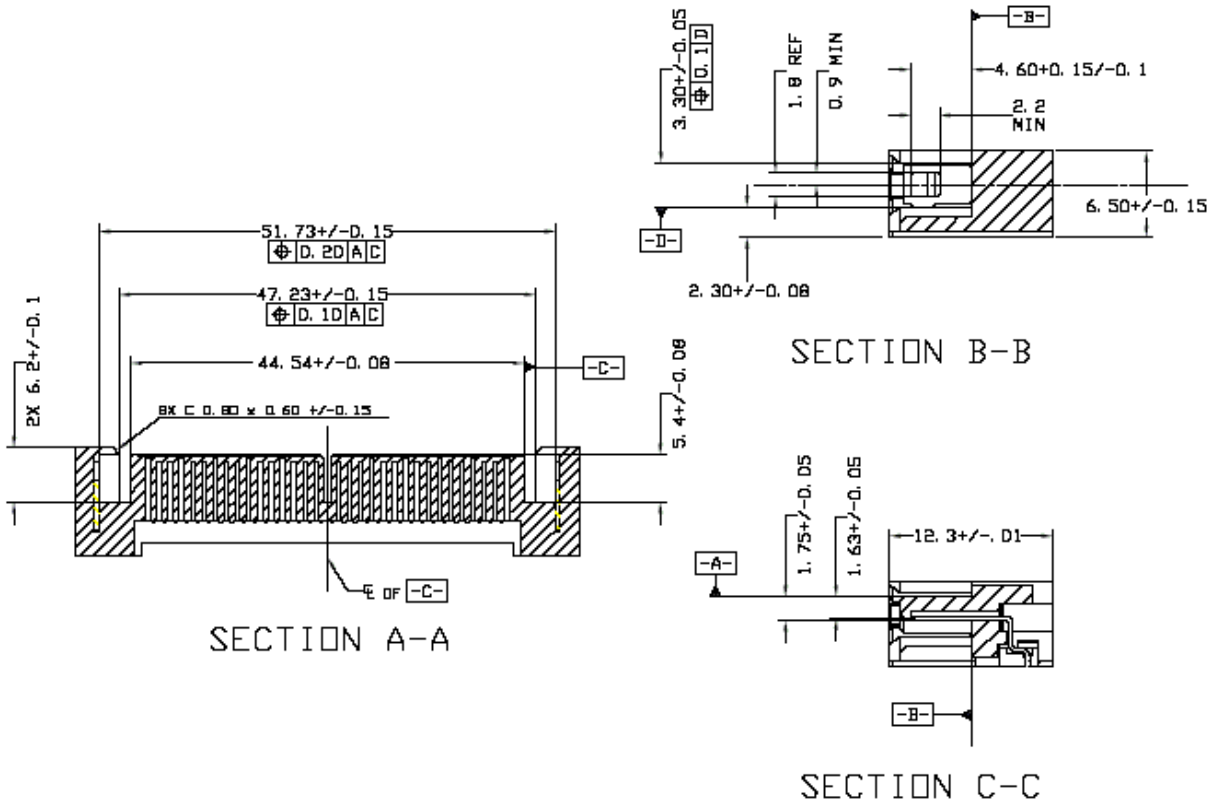
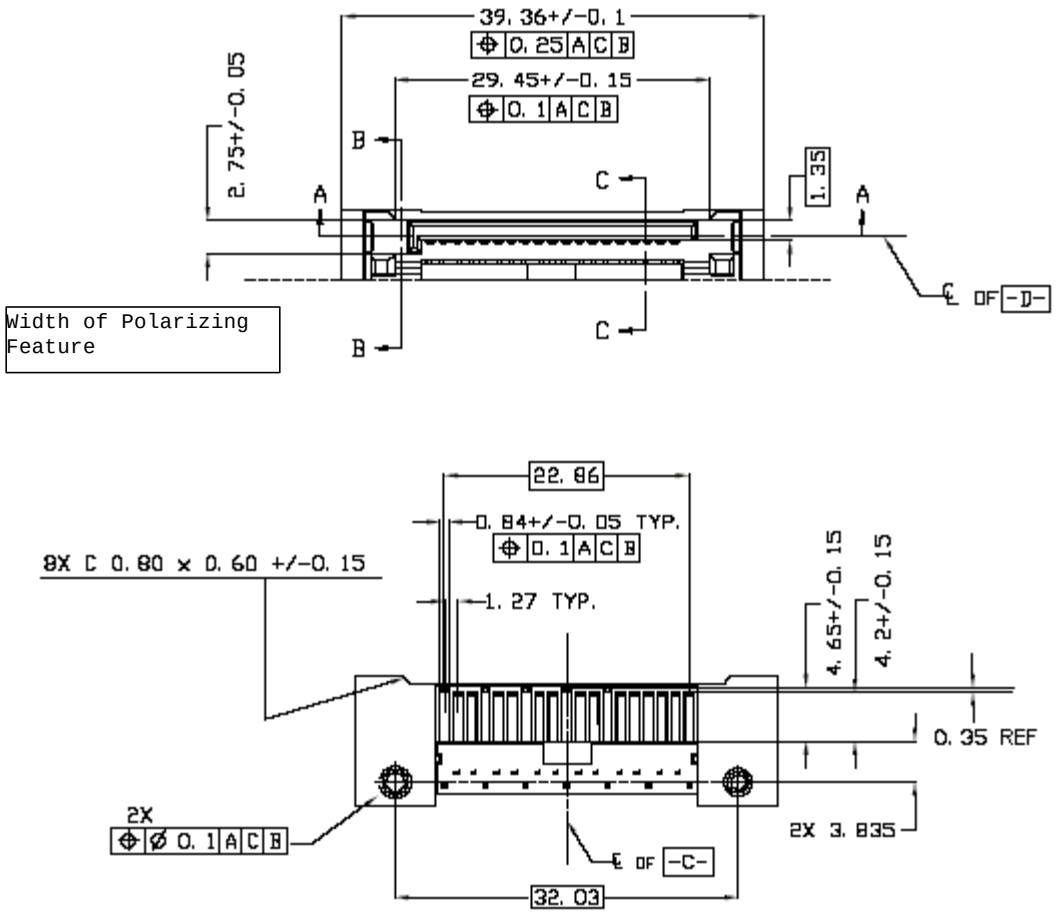


Figure 4: 4 Lane Right Angle Free (Plug) Interface



Note: Contacts 14-19 may be either pin length (4.2mm or 4.65mm).

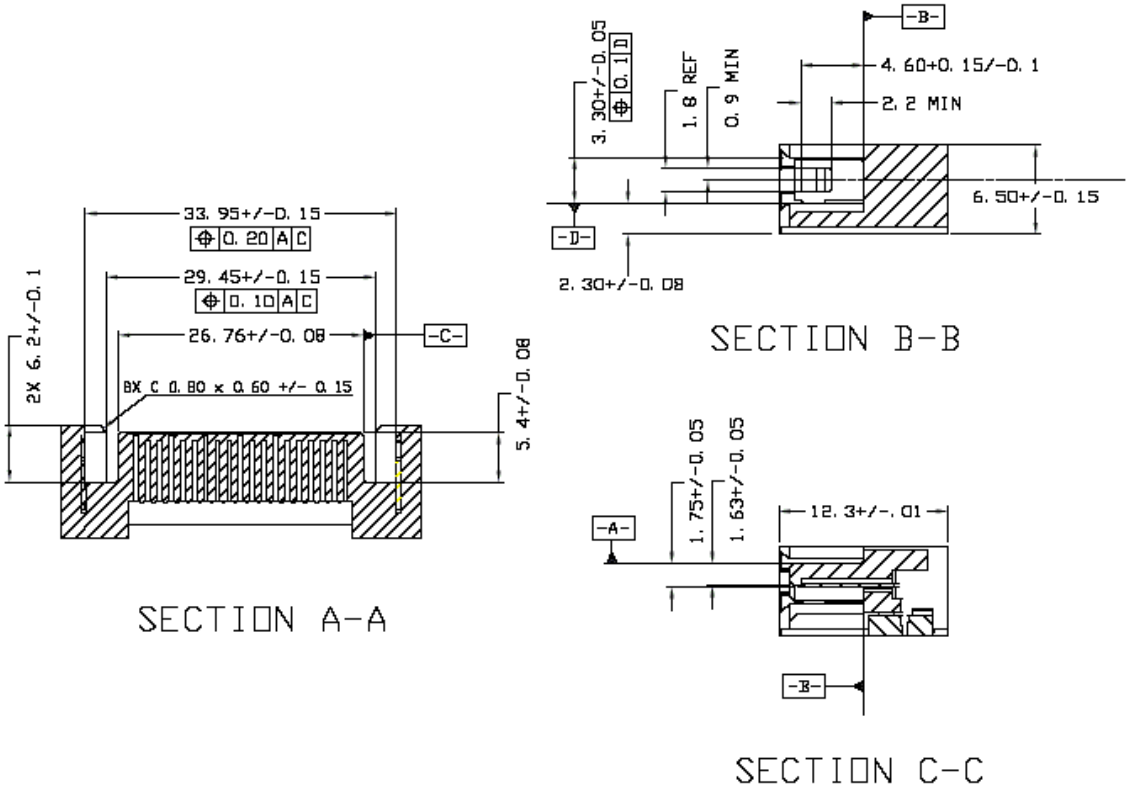
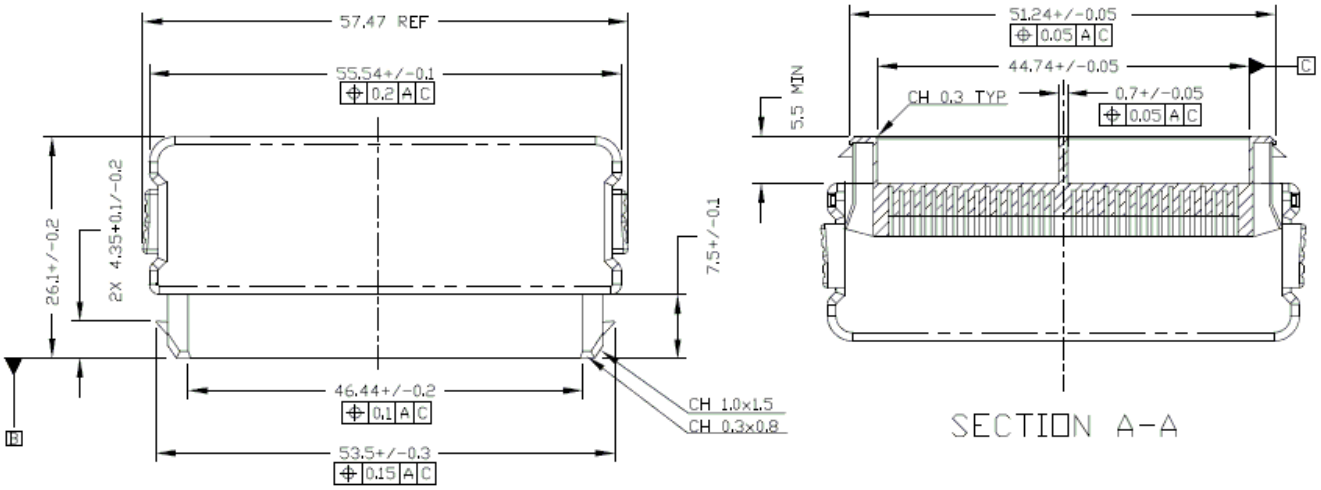
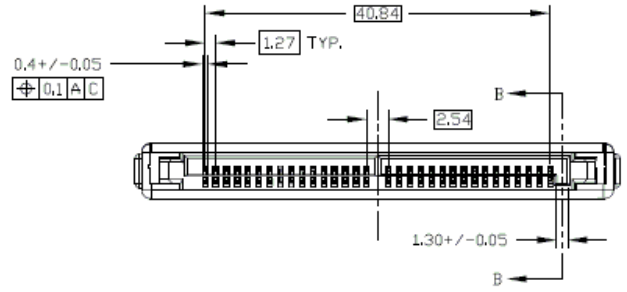
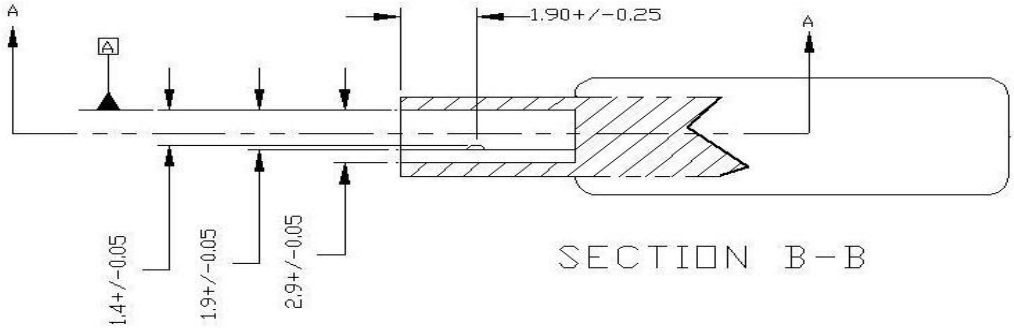


Figure 5: 2 Lane Right Angle Free (Plug) Interface


57.47 REF
55.54+/-0.1
0.2 A C
26.1+/-0.2
2X 4.35+0.1/-0.2
7.5+/-0.1
46.44+/-0.2
0.1 A C
53.5+/-0.3
0.15 A C
B
CH 1.0x1.5
CH 0.3x0.8
51.24+/-0.05
0.05 A C
44.74+/-0.05
C
5.5 MIN
CH 0.3 TYP
0.7+/-0.05
0.05 A C
SECTION A-A


40.84
1.27 TYP.
0.4+/-0.05
0.1 A C
B
2.54
1.30+/-0.05
B


A
A
1.90+/-0.25
A
1.4+/-0.05
1.9+/-0.05
2.9+/-0.05
SECTION B-B

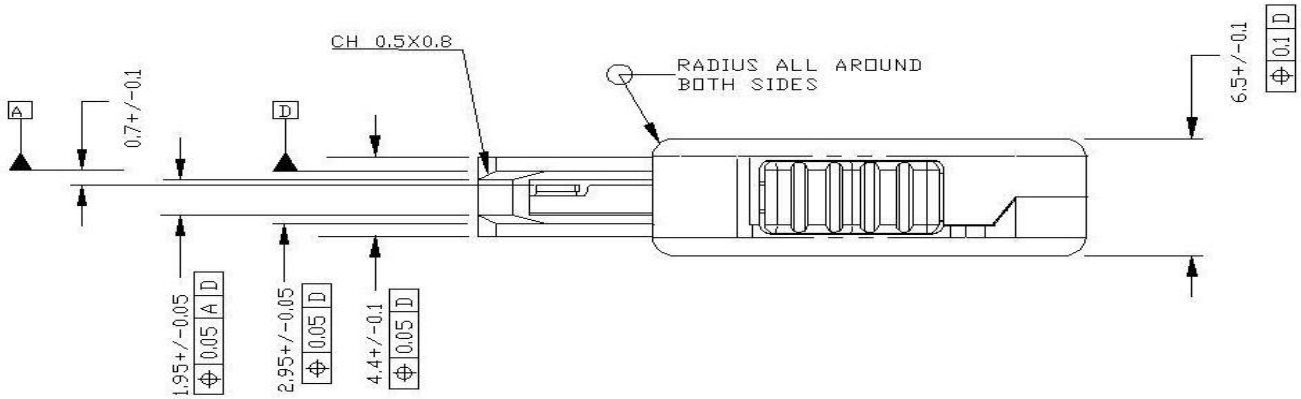

CH 0.5X0.8
RADIUS ALL AROUND
BOTH SIDES
6.5+/-0.1
0.1 D
A
0.7+/-0.1
D
1.95+/-0.05
0.05 A D
2.95+/-0.05
0.05 D
4.4+/-0.1
0.05 D

Figure 6: 4 Lane Cable Fixed (Receptacle) Dimensions Including Backshell

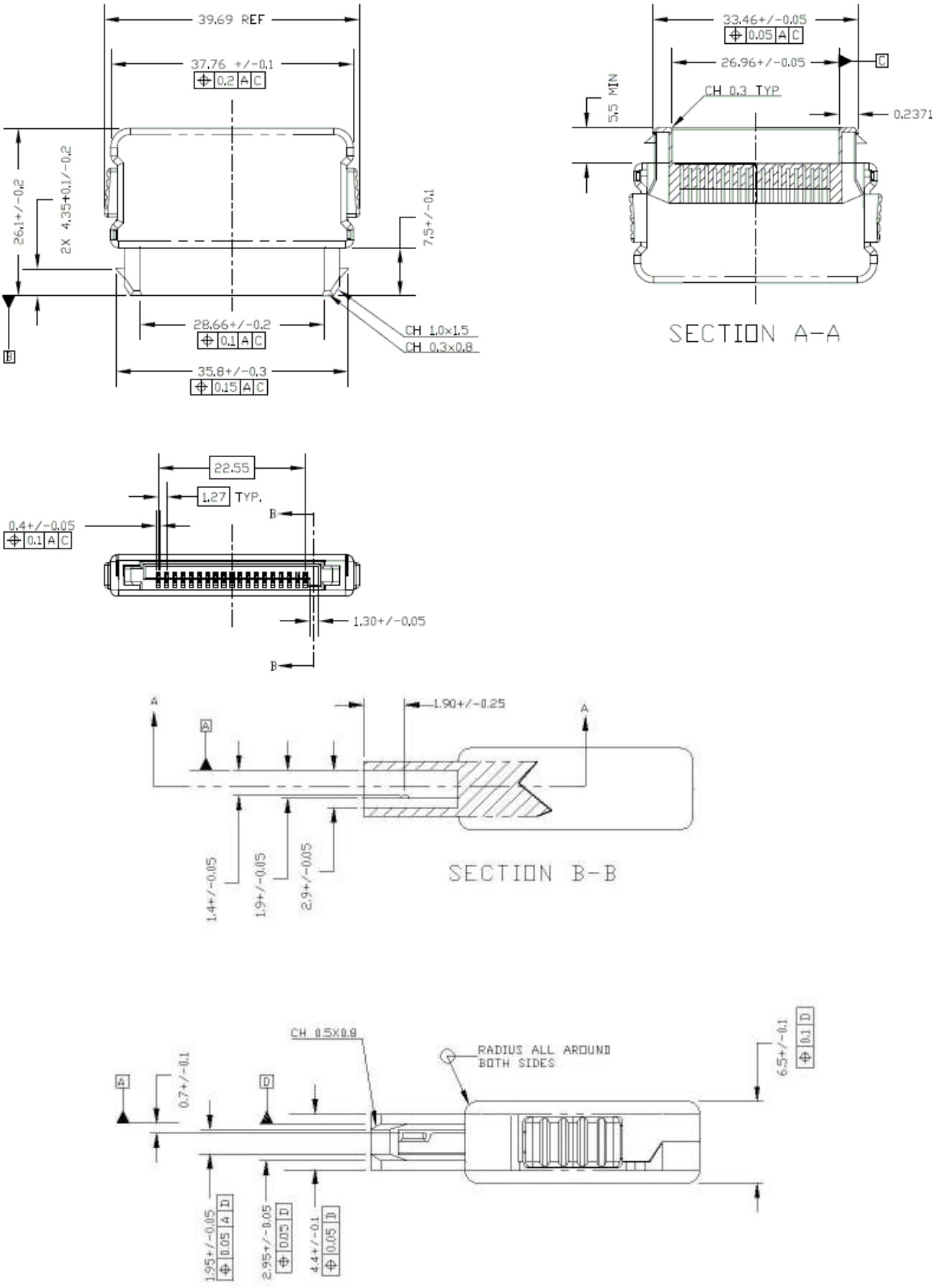
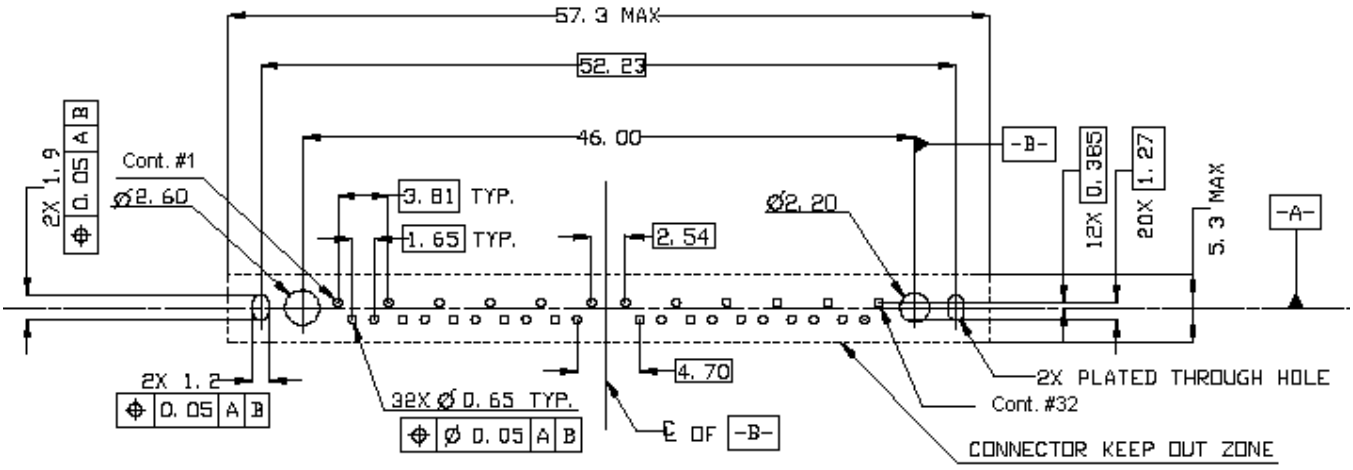
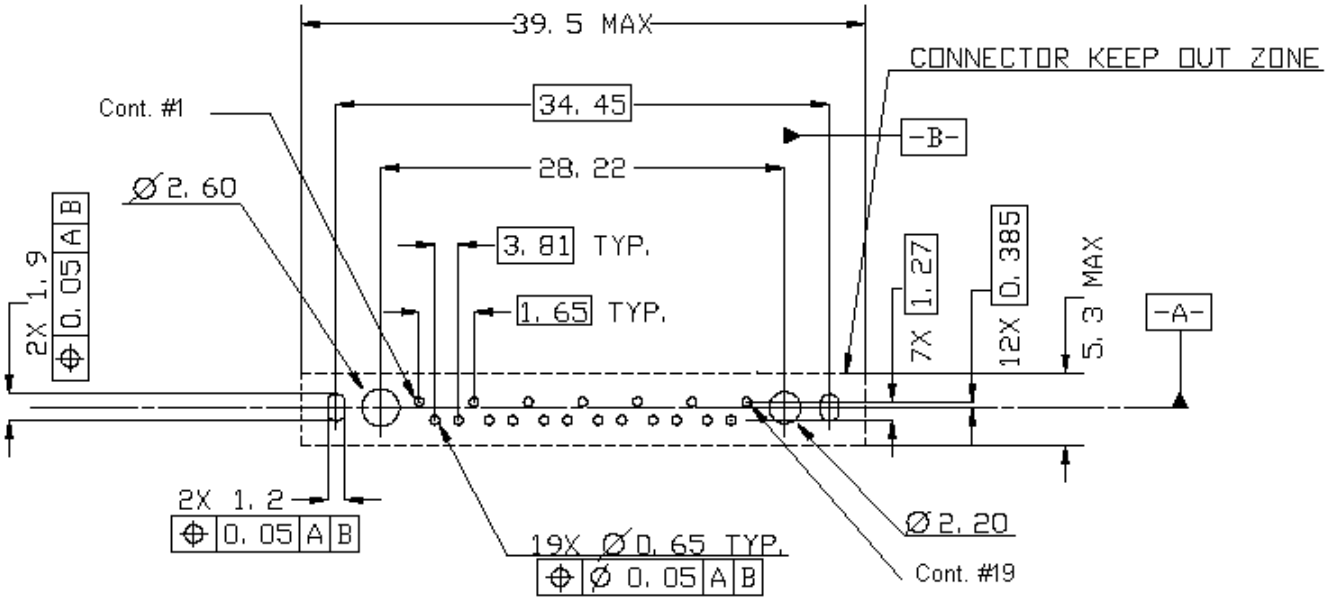


Figure 7: 2 Lane Cable Fixed (Receptacle) Dimensions Including Backshell



All tolerances are +/- 0.05

Figure 8: 4 Lane Straight Through Hole/Press Fit Free (Plug) Footprint



All tolerances are +/- 0.05

Figure 9: 2 Lane Straight Through Hole/Press Fit Free (Plug) Footprint

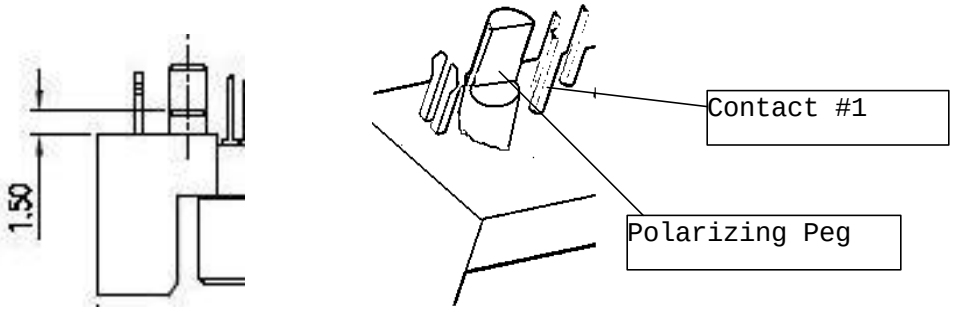
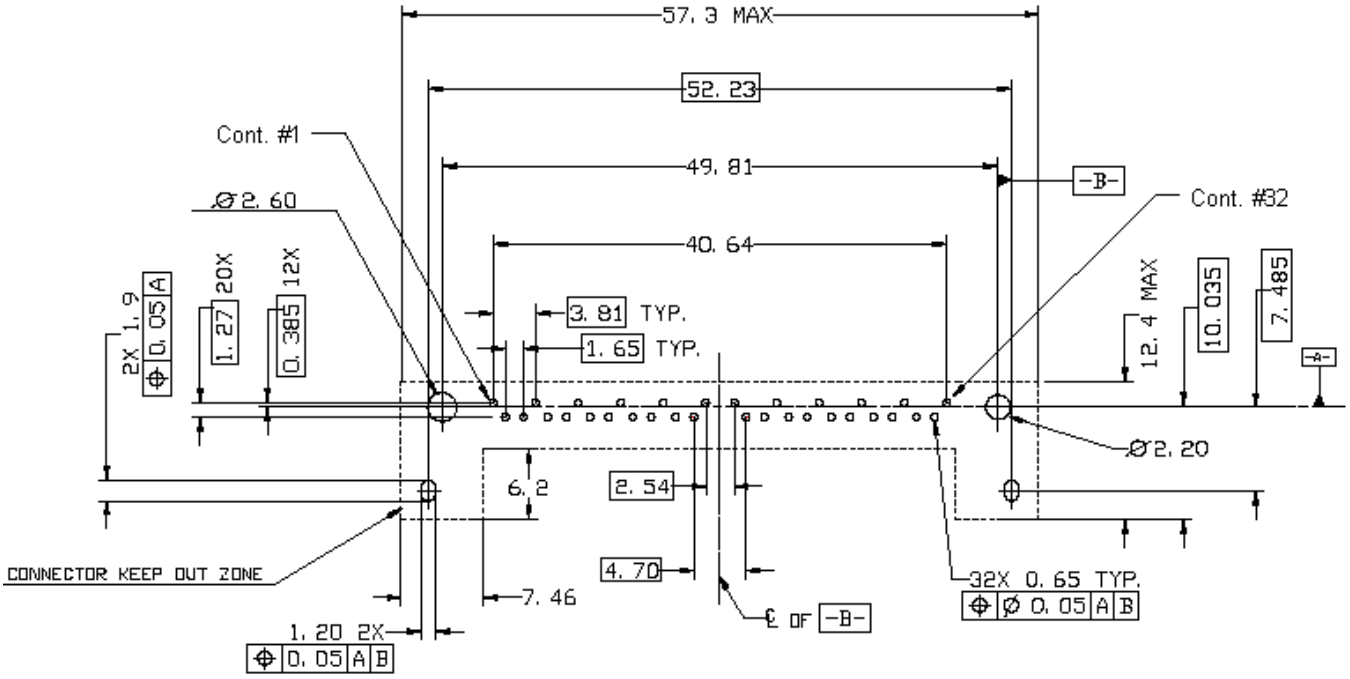


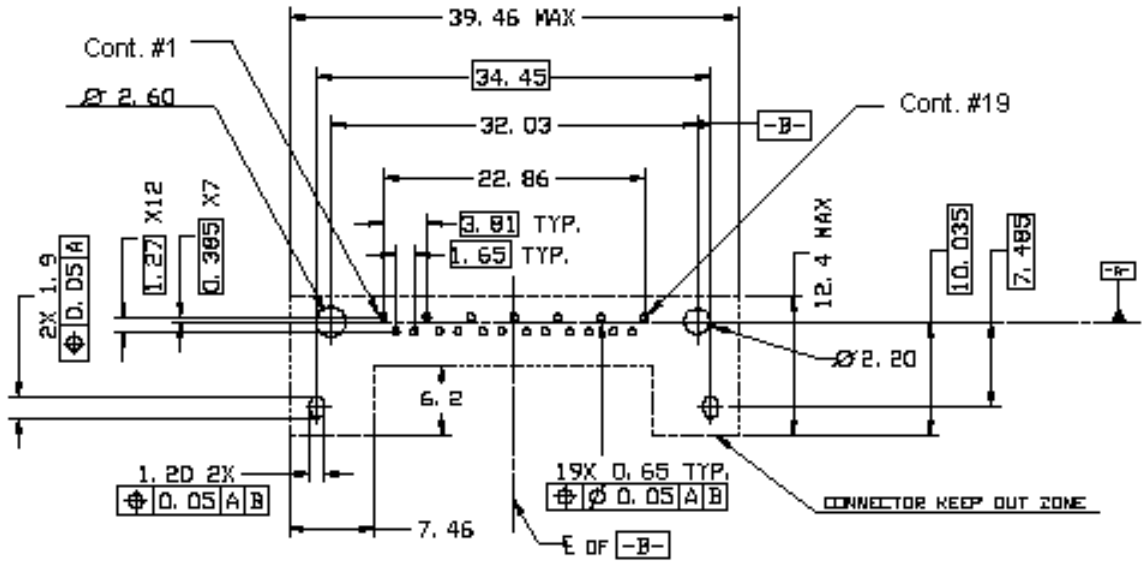
Figure 10: Vertical Through Hole Polarizing Peg Design

Note: The semi-circular design is on both polarizing pegs. The semi-circle should

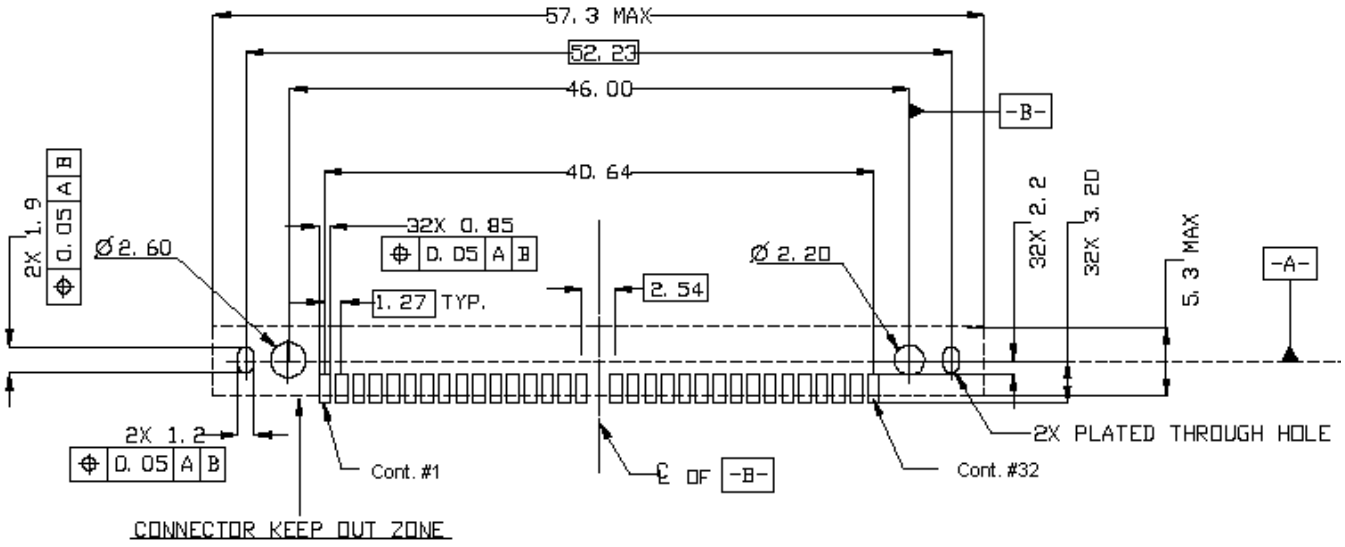
be oriented such that the feature assists the solderability of the “near” contacts (#1 and #32).



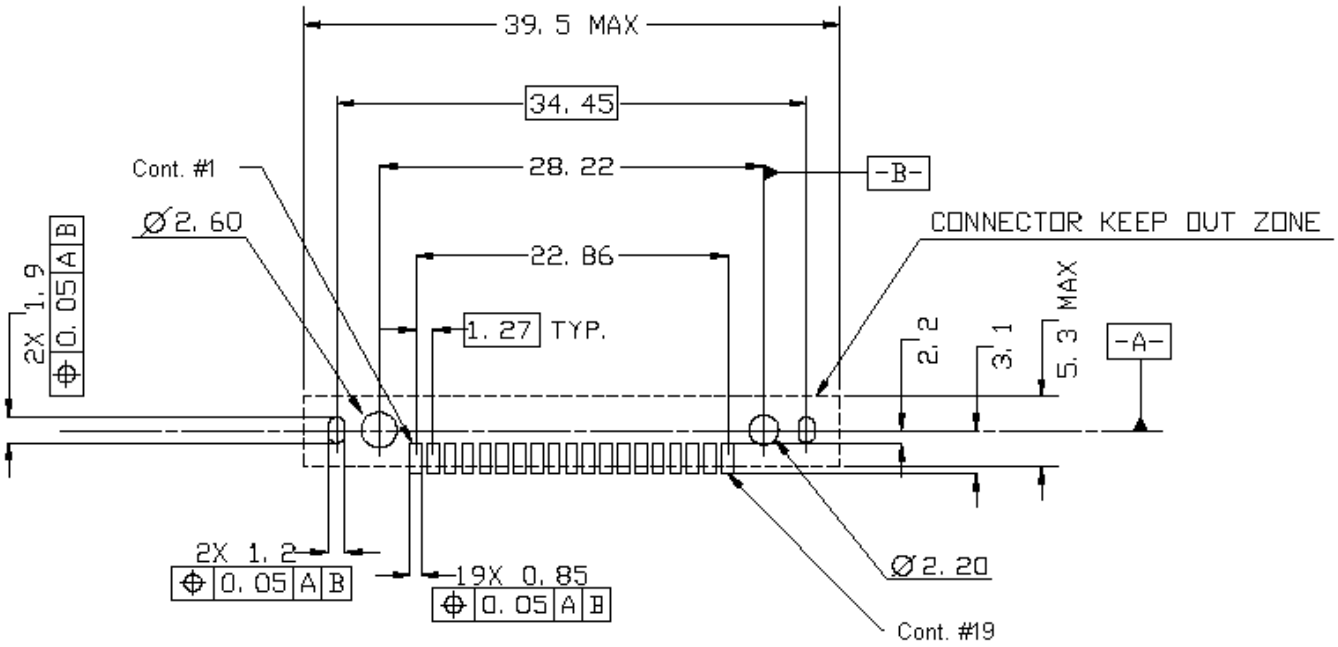
All tolerances are +/- 0.05
Figure 11: 4 Lane Right Angle Through Hole/Press Fit Free (Plug) Footprint



All tolerances are +/- 0.05
Figure 12: 2 Lane Right Angle Through Hole/Press Fit Free (Plug) Footprint



All tolerances are +/- 0.05
Figure 13: 4 Lane Straight SMT Free Connector (Plug) Footprint



All tolerances are +/- 0.05
Figure 14: 2 Lane Straight SMT Free (Plug) Footprint

Note: Pad widths listed as reference dimensions are left open to the manufacturer to determine based on their internal design standards. In order to determine the pad widths for Surface Mount leads, the following dimensions and tolerances shall apply:
Solder Leads on 1.27 mm spacing = 0.40+/-0.08 mm

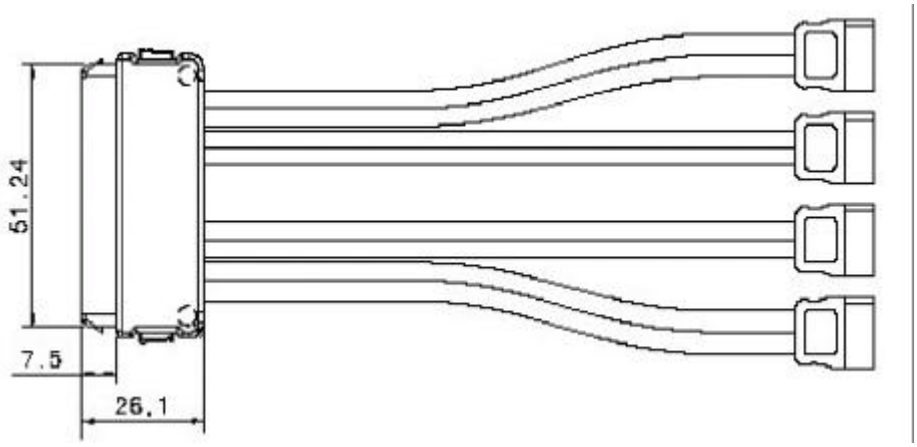


Figure 15: 4 Lane Fanout Assembly

Note: Pinout determines Host Base vs. Target Base assembly. See the relevant interface standard.