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**SFF-8662**

**Specification for**

**QSFP+ 4X 28 Gb/s Connector (Style A)**

**Rev 2.9** June 8, 2018

Secretariat: SFF TA TWG

Abstract: This specification defines the physical interface and general performance requirements of the QSFP+ 0.8mm Connector that is designed for use in high speed serial interconnect applications. One such use is as the 28 Gb/s QSFP+ host receptacle mated to 28 Gb/s QSFP+ modules or cables.

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

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.

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

Change History

November 5, 2010:
- Section 3: 15 ps was 100 ps
- Section 5: Datum table added
- Section 6:
  - Datums shown in figures changed to agree with SFF-8436
  - Table 6-1: A09 & A11 descriptions reversed
  - Table 6-2: B23 & B24 descriptions reversed, B21 spelling corrected
- Table 7-2: Vdc was vDC, 9.6 ps was 50 ps, 2 ps was 5 ps, additional test parameters added

November 30, 2010:
- Section 3: 25 Gigabits/second was gigabit, minimization was Minimization
- Table 6-1: A12: ±0.05 was ±0.03

December 15, 2010:
- Table 6-1: 16.42±0.08, 0.54±0.04 option added
- Table 6-2: contact zone definition added
- Table 7-3: 30 N was 20 N

December 22, 2010:
- Table 6-1: Datum H was Datum C
- Figure 6-1: Detail view added, pad lengths reflect pin assignment
April 6, 2011:
- Change History: Vdc was vDC, vDC was Vdc, 50 was 15
- Title & Footer: 32 Gbps was 25 Gb/s
- Abstract: 32 Gb/s was 25G
- Table of Contents: updated, bold removed from table area
- Table 6.2.1:
  - B13 6.23 Max was 6.1010.13
  - B18 12.82 Max was 12.6910.13
- Section 1: 32 Gb/s was 25G
- Section 2: 2.2 was 2.1, 2.3 was 2.2
- Section 3:
  - 32 Gb/s was 25G
  - 9.6(20-80) ps was 15 ps
- Section 4: "circuit board." was "circuit. board"
- Section 6:
  - A10 - 0.90 was 0.40, A11 - 0.40 was 0.90
  - B01 - 14.80 was 14.40, C11 - Pad was Pac
- Section 7:
  - Table 7-2 was 7-3, Table 7-3 was 7-5, Table 7-4 was 7-6
  - 16 GHz was 25 GHz
  - Table 7 For Reference Only added
  - Table 7 "Includes host board interface, connector and edge card interface" was changed to "Includes connector cable to connector interface and board termination pads and vias."

May 5, 2011
- Title changed to 32 Gb/s

June 16, 2011
- Editorial pass to improve appearance
- Sections restructured to match 8661/8663
- 'G' changed to Gb/s

June 29, 2011
- Added explanation to Table 7-2 about testing to 28 GHz as per OIF

November 29, 2011
- Corrected rating on power pins in Table 7-2.

January 31, 2012
- All references to 32 Gb/s were replaced by 28 Gb/s
- Added Section 1.2 as explanation of titling
- Revised Table 7-2 Electrical Test Parameters

Rev 2.1 (May 21, 2012)
- Removed note about 'fastest' rate in 1.2
- Expanded list of Industry Documents

Rev 2.2 (July 27, 2013)
- Harmonized values of B20/B21 and C02/C03 with SFF-8663

Rev 2.3 (August 1, 2013)
- Corrected A10 and A11 descriptions in Table 6-1, and added mating sequence
Rev 2.4 (October 16, 2013)
- Updated Figure 6-1 with Datum H
- Clarified note below Fig-1 title
- Clarified PCB width to contact width descriptions in Table 6-1
- Harmonized figures with SFF-8682

Rev 2.6 (March 27, 2014)
- Updated Table 5-1 with correct dimensions for A01
- Adopted common name of Pad Contact Width

Rev 2.7 (July 24, 2014)
- Corrected introduced error in Tolerance of A01*2

Rev 2.8 (March 2, 2018)
- Updated to SNIA format
- Reformatted Change History
- Fixed broken links in Foreword
- Updated Applications (Section 1.1)
- Added EIA document references
- Clarified “fixed” and “free” definitions
- All references to “pluggable modules,” “plugs,” or “modules” changed to “module”; added definition for “module”
- Minor editorial issues resolved
- Edited Table captions
- The tolerance for lead-in chamfer (dimension A16) was changed from 0.05mm to 0.10mm. The 0.05mm tolerance was found to be too tight to be easily manufactured in large volumes. This change was made based on the results of the straw poll that closed January 12, 2018.
- Updated Section 7 (Connector Performance Requirements) to agree with other SFF documentation for QSFP
- NOTE: During the review period for this revision, a comment to make the connector footprint informative was submitted. Resolution of this comment has been deferred until a future revision of this specification.

Rev 2.9 (June 8, 2018)
- Updated tolerance of dimension A14 in Table 6-1
Foreword

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

When 2 1/2" diameter disk drives were introduced, there was no commonality on external dimensions e.g. physical size, mounting locations, connector type, connector location, between vendors. The SFF Committee provided a forum for system integrators and vendors to define the form factor of disk drives.

During their definition, other activities were suggested because participants in SFF faced more challenges than the form factors. In November 1992, the charter was expanded to address any issues of general interest and concern to the storage industry. The SFF Committee became a forum for resolving industry issues that are either not addressed by the standards process or need an immediate solution.

In July 2016, the SFF Committee transitioned to SNIA (Storage Networking Industry Association), as a TA (Technology Affiliate) TWG (Technical Work Group).

Industry consensus is not a requirement to publish a specification because it is recognized that in an emerging product area, there is room for more than one approach. By making the documentation on competing proposals available, an integrator can examine the alternatives available and select the product that is felt to be most suitable.

SFF meets during the T10 (see www.t10.org) and T11 (see www.t11.org) weeks, and SSWGs (Specific Subject Working Groups) are held at the convenience of the participants.

Many of the specifications developed by SFF have either been incorporated into standards or adopted as standards by ANSI, EIA, JEDEC and SAE.

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

The complete list of SFF Specifications which have been completed or are currently being worked on by the SFF Committee is contained in the document SFF-8000 which can be found at:
http://www.snia.org/sff/specifications

Suggestions for improvement of this specification will be welcome, they should be submitted to:
http://www.snia.org/feedback
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1. Scope

This specification was developed in conjunction with the InfiniBand Trade Association. It defines the terminology and physical requirements for the mating interface and physical embodiment of the 28 Gb/s 0.8mm Connector. See SFF-8663 for the mechanical design of the 28 Gb/s Cage/Shield which enables a shielded interface and SFF-8661 for the physical embodiment of the mating Module.

InfiniBand, Ethernet, Fibre Channel, SAS, and other standards define requirements on the characteristic impedance and ability to transmit multi-gigabit signals for cable assemblies and backplanes. When this connector is used in such an application, it is subject to the requirements of the appropriate standard.

1.1 Application Specific Criteria

SAS, InfiniBand, IEEE, and Fibre Channel define respective electrical performance requirements for the transmission of multi-gigabit signals through this interface. When this connector is used for any of these applications, its performance shall meet the requirements of the appropriate standard. This connector shall intermate with previous generations of lower speed QSFP connectors.

1.2 Copyright

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Suggestions for revisions should be directed to http://www.snia.org/feedback/
2. References

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

2.1 Industry Documents

- Ethernet IEEE 802.3ba 40GbE
- Ethernet IEEE 802.3bj 100GbE
- InfiniBand IBTA QDR/FDR/EDR
- T10 SAS 2-1 (Serial Attached SCSI)
- T10 SAS-3
- T11 FC-PI-5 (Fibre Channel Physical Interface)
- T11 FC-PI-6
- SFF-8410 High Speed Serial Testing for Copper Links
- SFF-8661 QSFP+ 4X 28 Gb/s Module (Style A)
- SFF-8663 QSFP+ 28 Gb/s Cage (Style A)
- SFF-8665 QSFP+ 4X 28 Gb/s Pluggable Transceiver Solution (QSFP28)
- SFF-8683 QSFP+ Cage
- SFF-8672 QSFP+ 4X 28 Gb/s Connector (Style B)
- EIA-364-1000 Environmental Test Methodology for Assessing the Performance of Electrical Connectors and Sockets Used in Controlled Environment Applications
- EIA-364-09 Durability Test Procedure for Electrical Connectors and Contacts
- EIA-364-13 Mating and Unmating Forces Test Procedure for Electrical Connectors
- EIA-364-20 Withstanding Voltage Test Procedure for Electrical Connectors, Sockets and Coaxial Contacts
- EIA-364-21 Insulation Resistance Test Procedure for Electrical Connectors, Sockets, and Coaxial Connectors
- 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
- EIA-364-28 Vibration Test Procedure for Electrical Connectors and Sockets
- EIA-364-70 Temperature Rise versus Current Test Procedure for Electrical Connectors and Sockets

2.2 Sources

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

Copies of ANSI standards may be purchased from the InterNational Committee for Information Technology Standards ([http://www.techstreet.com/incitsgate.tmpl](http://www.techstreet.com/incitsgate.tmpl)).
2.3 Conventions

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

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.

<table>
<thead>
<tr>
<th>American</th>
<th>French</th>
<th>ISO</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>1,000</td>
<td>1 000</td>
<td>1 000</td>
</tr>
<tr>
<td>1,323,462.9</td>
<td>1 323 462,9</td>
<td>1 323 462.9</td>
</tr>
</tbody>
</table>

2.4 Definitions

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

**Advanced grounding contacts:** Connector contacts that mate first and break last and are capable of carrying power ground return currents and performing electrostatic discharge. Other terms sometimes used to describe these features are: grounding pins, ESD contacts, grounding contacts, static drain, and pre-grounding contacts.

**Alignment guides:** Connector features that preposition insulators prior to electrical contact. Other terms sometimes used to describe these features are: guide pins, guide posts, blind mating features, mating features, alignment features, and mating guides.

**Board Termination Technologies:** Surface mount single row, surface mount dual row, through hole, hybrid, straddle mount, pressfit.

**Cable Termination:** The attachment of wires to the termination side of a connector. Schemes commonly used in the industry are IDC (Insulation Displacement Contact), IDT (Insulation Displacement Termination), wire slots, solder, weld, crimp, braise, etc.

**Contact mating sequence:** Order of electrical contact during mating/unmating process. Other terms sometimes used to describe this feature are: contact sequencing, contact positioning, make first/break last, EMLB (early make late break) staggered contacts, and long pin / short pin.

**Fixed:** Adopted from EIA standard terminology as the gender that most commonly exists on the fixed end of a connection, for example, on the board or bulkhead side. In this specification "fixed" is specifically used to describe the mating side gender illustrated in Figure 2-1. It is typically used to describe the gender of the mating side of the connector that accepts its mate upon mating. Other common terms are "receptacle," "female," and "socket connector."

**Fixed Board:** A connector that uses a fixed gender mating side and a termination side suitable for any of the printed circuit board termination technologies.

**Free:** Adopted from EIA standard terminology as the gender that most commonly exists on the free end of a connection, for example, on the cable side. In this specification "free" is specifically used to describe the mating side gender illustrated in Figure 2-1. It is typically used to describe the gender of the mating side of the connector that penetrates its mate upon mating. Other common terms are "plug" or "module," "male," and "pin connector."
**Free Board:** A connector that uses a free gender mating side and a termination side suitable for any of the printed circuit board termination technologies.

**Frontshell:** That metallic part of a connector body that directly contacts the backshell or other shielding material that provides mechanical and shielding continuity between the connector and the cable media. Other terms sometimes used to describe this part of a cable assembly are: housing, nosepiece, cowling, and metal shroud.

**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.

**Module:** In this specification, refers to direct attach copper (DAC), direct attach optics, and pluggable optics.

**Offset:** An alignment shift from the center line of the connector.

**Optional:** This term describes features which are not required by the SFF Specification. However, if any feature defined by the SFF Specification is implemented, it shall be done in the same way as defined by the Specification. Describing a feature as optional in the text is done to assist the reader. If there is a conflict between text and tables on a feature described as optional, the table shall be accepted as being correct.

**QSFP:** Quad Small FormFactor Pluggable.

**Reference Dimension:** A dimension used for information purposes only. A reference dimension is a repeat of a dimension or is derived from other values shown on the drawing or on related drawings. It is considered auxiliary information and does not govern production or inspection operations.

**Reserved:** Where this term is used for defining the signal on a connector contact its actual function is set aside for future standardization. It is not available for vendor specific use. Where this term is used for bits, bytes, fields and code values; the bits, bytes, fields and code values are set aside for future standardization. The default value shall be zero. The originator is required to define a Reserved field or bit as zero, but the receiver should not check Reserved fields or bits for zero.

**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.

**Single row:** A connector design for use with surface mount printed circuit board assembly technology where the termination side points are arranged in one line.
**Single sided termination:** A cable termination assembly style and a connector design style where only one side of the connector is accessible when attaching wires. This style frequently has IDC termination points that point in the same direction.

**Straddle mount:** A connector design style and a printed circuit board design style that uses surface mount termination points on both sides of the board. The connector is frequently centered between the top and bottom surfaces of the 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 (SMT).

**Termination side:** The side of the connector opposite the mating side that is used for permanently attaching conductors to the connector. Due to contact 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. General Description

The 28 Gb/s 0.8 mm connection system is based on industry-proven card edge style contacts, which mate with a single wipe, and are physically robust.

The mating interfaces of paddle card to receptacle body and receptacle body to circuit board are enabled with SFF-8663 Cage.

The cage/shield is mounted separately to the host board so that the stress imposed by insertion and removal of the cable module does not affect the signal/body solder joints.

This connector system was designed to satisfy the needs for 28 Gigabits/second serial data transmission applications where signals have rise times typically in the range of 9.6(20-80) ps over a nominal 100 ohm differential balanced copper link. Design goals were minimization of crosstalk and minimum transmission line impedance discontinuity across the connector interface at speeds of up to 28 Gigabits/second on both rows of contacts.

The transmission line impedance of the connector itself (not including the termination interface to the wire or board) matches the electrical bulk cable within the tolerances allowed for the bulk cable. This connection scheme may be used in multiple places within a cabling environment. Though it has been designed for a 100 ohm environment this connector will function acceptably at other impedance levels (to be optimized on a case by case basis).

This specification includes the Minimum lengths, widths and positional tolerances of the contacts.

The connector is of a straightforward construction that does not rely on advanced materials or processes while offering superior performance.
4. Datums

**FIGURE 4-1 DATUM DEFINITIONS**

**TABLE 4-1 DATUM DESCRIPTIONS**

<table>
<thead>
<tr>
<th>Datum</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Host Board Top Surface</td>
</tr>
<tr>
<td>C</td>
<td>Distance between Connector Housing Pegs on host board</td>
</tr>
<tr>
<td>G</td>
<td>Width of Module pc board</td>
</tr>
<tr>
<td>H</td>
<td>Leading edge of signal contact pads on Module pc board</td>
</tr>
<tr>
<td>J</td>
<td>Top surface of Module pc board</td>
</tr>
<tr>
<td>K</td>
<td>Host board thru hole #1 to accept connector guide post</td>
</tr>
<tr>
<td>L</td>
<td>Host board thru hole #2 to accept connector guide post</td>
</tr>
<tr>
<td>N</td>
<td>Connector alignment pin</td>
</tr>
<tr>
<td>AA</td>
<td>Connector slot width</td>
</tr>
<tr>
<td>BB</td>
<td>Seating plane of cage on host board</td>
</tr>
</tbody>
</table>
5. Connector Description

The 28 Gb/s 0.8mm connector relies on a receiving body and paddle card, which are the primary elements to construct connectors.

The primary elements provide a flexible means to implement solutions for diverse applications e.g., direct board-to-board implementations can incorporate the module into the side of one board and mate directly to a receiving body on the other.

Figure 5-1 is an example, which illustrates a receiving body and how it becomes a receptacle to receive the module.

![Figure 5-1: General View of Fixed (Receptacle)](image)

The entire interface is defined and controlled by SFF-8661, SFF-8662, and SFF-8663.

SFF-8661 defines the free module that incorporates the paddle card and the shell, which are used to form a complete assembly for use in shielded applications.

SFF-8663 defines the shell/cage which provides guidance and retention for the free side, and absorbs the stress imposed by insertion and removal of the free module. This protects the signal quality of the solder joints to the body.

6. Connector Dimensions

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

Dimension related requirements for the connector system addressed in this specification are specified in the tables and figures in this clause.
6.1 Free (Module) Paddle Card

FIGURE 6-1 FREE (MODULE) PADDLE CARD
<table>
<thead>
<tr>
<th>Designator</th>
<th>Description</th>
<th>Dimension</th>
<th>Tolerance (±)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A01 (*1)</td>
<td>Paddle Card Width (Pad Contact Width 0.54)</td>
<td>16.42</td>
<td>0.08</td>
</tr>
<tr>
<td>A01 (*2)</td>
<td>Paddle Card Width (Pad Contact Width 0.60)</td>
<td>16.40</td>
<td>0.10</td>
</tr>
<tr>
<td>A02</td>
<td>Paddle Card Thickness (across pads)</td>
<td>1.00</td>
<td>0.10</td>
</tr>
<tr>
<td>A03</td>
<td>First to Last Pad Centers</td>
<td>14.40</td>
<td>Basic</td>
</tr>
<tr>
<td>A04</td>
<td>Card Center to Outer Pad Center</td>
<td>7.00</td>
<td>Basic</td>
</tr>
<tr>
<td>A05</td>
<td>Card Center to Outer Pad Center</td>
<td>7.40</td>
<td>Basic</td>
</tr>
<tr>
<td>A06</td>
<td>Pad Center to Center (Pitch)</td>
<td>0.80</td>
<td>Basic</td>
</tr>
<tr>
<td>A07 (*1)</td>
<td>Pad Contact Width (Paddle Card Width 16.42)</td>
<td>0.54</td>
<td>0.04</td>
</tr>
<tr>
<td>A07 (*2)</td>
<td>Pad Contact Width (Paddle Card Width 16.40)</td>
<td>0.60</td>
<td>0.03</td>
</tr>
<tr>
<td>A08</td>
<td>Pad Length - Third Mate</td>
<td>1.60</td>
<td>Min.</td>
</tr>
<tr>
<td>A09</td>
<td>Third Mate to Card Edge (see note re Datum H)</td>
<td>1.45</td>
<td>0.10</td>
</tr>
<tr>
<td>A10</td>
<td>Third Mate to First Mate</td>
<td>0.90</td>
<td>0.05</td>
</tr>
<tr>
<td>A11</td>
<td>Third Mate to Second Mate</td>
<td>0.40</td>
<td>0.05</td>
</tr>
<tr>
<td>A12</td>
<td>Pad to Pre-Pad</td>
<td>0.10</td>
<td>0.05</td>
</tr>
<tr>
<td>A13</td>
<td>Component Keep Out Area</td>
<td>5.40</td>
<td>Min.</td>
</tr>
<tr>
<td>A14</td>
<td>Lead-in Chamfer x 45 degrees</td>
<td>0.30</td>
<td>0.10</td>
</tr>
<tr>
<td>A15</td>
<td>Third Mate Pad to Datum H</td>
<td>0.00</td>
<td>0.03</td>
</tr>
<tr>
<td>A16</td>
<td>Lead-in Chamfer x 45 degrees</td>
<td>0.30</td>
<td>0.10</td>
</tr>
<tr>
<td>A17</td>
<td>Lead-in Flat</td>
<td>0.40</td>
<td>Ref</td>
</tr>
</tbody>
</table>

Mating sequence: First Mate - Ground Contacts  
Second Mate - Power Contacts  
Third Mate - Signal Contacts

(*) Dimensions of the Pad Contact Width and the Paddle Card Width are such that the centerline of the terminal does not go off the edge of the Pad. An implementer may use either 16.42/0.54 or 16.40/0.60 for the A01/A07 dimensions.
6.2 Fixed (Receptacle) Right Angle Connector

FIGURE 6-2 FIXED (RECEPTACLE) RIGHT ANGLE CONNECTOR
### TABLE 6-2  FIXED (RECEPTACLE) RIGHT ANGLE CONNECTOR DIMENSIONS

<table>
<thead>
<tr>
<th>Designator</th>
<th>Description</th>
<th>Dimension</th>
<th>Tolerance (±)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B01</td>
<td>First to Last Contact</td>
<td>14.80</td>
<td>Basic</td>
</tr>
<tr>
<td>B02</td>
<td>Centerline to First Contact</td>
<td>7.00</td>
<td>Basic</td>
</tr>
<tr>
<td>B03</td>
<td>Centerline to Last Contact</td>
<td>7.40</td>
<td>Basic</td>
</tr>
<tr>
<td>B04</td>
<td>Contact Pitch (within Row)</td>
<td>0.80</td>
<td>Basic</td>
</tr>
<tr>
<td>B05</td>
<td>Contact Pitch (Row to Row)</td>
<td>0.40</td>
<td>Basic</td>
</tr>
<tr>
<td>B06</td>
<td>Peg to Peg</td>
<td>16.8</td>
<td>Basic</td>
</tr>
<tr>
<td>B07</td>
<td>Leg to Leg</td>
<td>15.53</td>
<td>0.13</td>
</tr>
<tr>
<td>B08</td>
<td>Peg Diameter</td>
<td>1.40</td>
<td>0.05</td>
</tr>
<tr>
<td>B09</td>
<td>Card Slot Width</td>
<td>16.60</td>
<td>0.10</td>
</tr>
<tr>
<td>B10 (*)</td>
<td>Contact Zone (0.18 wide terminal)</td>
<td>0.30</td>
<td>Max</td>
</tr>
<tr>
<td>B11</td>
<td>Card Slot Height</td>
<td>1.14</td>
<td>Min</td>
</tr>
<tr>
<td>B12</td>
<td>Peg Length</td>
<td>0.95</td>
<td>0.13</td>
</tr>
<tr>
<td>B13</td>
<td>Overall Height</td>
<td>6.23</td>
<td>Max</td>
</tr>
<tr>
<td>B14</td>
<td>Mating Zone Height</td>
<td>5.35</td>
<td>0.13</td>
</tr>
<tr>
<td>B15</td>
<td>PCB to Card Slot Centerline</td>
<td>3.50</td>
<td>0.10</td>
</tr>
<tr>
<td>B16</td>
<td>Height Under Receptacle</td>
<td>1.65</td>
<td>0.08</td>
</tr>
<tr>
<td>B17</td>
<td>Receptacle Width</td>
<td>18.20</td>
<td>0.10</td>
</tr>
<tr>
<td>B18</td>
<td>Receptacle Length</td>
<td>12.82</td>
<td>Max</td>
</tr>
<tr>
<td>B19</td>
<td>Front Face to Peg</td>
<td>2.90</td>
<td>Basic</td>
</tr>
<tr>
<td>B20</td>
<td>Peg to Row A</td>
<td>7.37</td>
<td>0.10</td>
</tr>
<tr>
<td>B21</td>
<td>Peg to Row B</td>
<td>9.88</td>
<td>0.10</td>
</tr>
<tr>
<td>B22</td>
<td>Peg to Contact Centerline</td>
<td>0.00</td>
<td>0.10</td>
</tr>
<tr>
<td>B23</td>
<td>Card Slot Depth</td>
<td>3.25</td>
<td>Min</td>
</tr>
<tr>
<td>B24</td>
<td>Paddle Card Seating Location</td>
<td>2.50</td>
<td>Ref</td>
</tr>
</tbody>
</table>

(*) 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.
6.3 Fixed (Receptacle) Right Angle Connector Footprint

![Diagram of Fixed (Receptacle) Right Angle Connector Footprint]

**NOTES:**
1. DIMENSION TO CENTERLINE OF PAD
2. DATUM A IS THE TOP SURFACE OF THE HOST BOARD

**FIGURE 6-3 FIXED (RECEPTACLE) RIGHT ANGLE CONNECTOR FOOTPRINT**

**TABLE 6-3 FIXED (RECEPTACLE) RIGHT ANGLE CONNECTOR FOOTPRINT DIMENSIONS**

<table>
<thead>
<tr>
<th>Designator</th>
<th>Description</th>
<th>Dimension</th>
<th>Tolerance (±)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C01</td>
<td>Locating Hole to Hole</td>
<td>16.80</td>
<td>Basic</td>
</tr>
<tr>
<td>C02</td>
<td>Locating Hole to Row A</td>
<td>7.37</td>
<td>Basic</td>
</tr>
<tr>
<td>C03</td>
<td>Row A to Row B</td>
<td>2.51</td>
<td>Basic</td>
</tr>
<tr>
<td>C04</td>
<td>Card Center to Outer Pad Center</td>
<td>7.00</td>
<td>Basic</td>
</tr>
<tr>
<td>C05</td>
<td>Card Center to Outer Pad Center</td>
<td>7.40</td>
<td>Basic</td>
</tr>
<tr>
<td>C06</td>
<td>Card Center to Inner Pad Center</td>
<td>0.20</td>
<td>Basic</td>
</tr>
<tr>
<td>C07</td>
<td>Pad Pitch</td>
<td>0.80</td>
<td>Basic</td>
</tr>
<tr>
<td>C08</td>
<td>Pad Width</td>
<td>0.35</td>
<td>0.03</td>
</tr>
<tr>
<td>C09</td>
<td>Pad Length</td>
<td>1.80</td>
<td>0.03</td>
</tr>
<tr>
<td>C10</td>
<td>Locating Hole Diameter</td>
<td>1.55</td>
<td>0.05</td>
</tr>
<tr>
<td>C11</td>
<td>Card Center to Pad Center</td>
<td>0.20</td>
<td>Basic</td>
</tr>
</tbody>
</table>
7. Connector Performance Requirements

The connector conforms to the test sequence as defined in EIA-364 TS-1000. The following tables define the performance criteria and test procedures for those test sequences.

### TABLE 7-1 TS-1000 TEST PARAMETERS

<table>
<thead>
<tr>
<th>Test Parameter</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Durability</td>
<td>Pre-condition: 25 cycles Group 7: 100 cycles</td>
</tr>
<tr>
<td>Field Life (3, 5, 7, or 10 years)</td>
<td>10 years</td>
</tr>
<tr>
<td>Field Temperature (57, 60, 65, 75, or 85°C)</td>
<td>65 degrees C</td>
</tr>
<tr>
<td>Test Group 4 Option</td>
<td>Manufacturer to specify</td>
</tr>
<tr>
<td>Plating Type</td>
<td>Precious</td>
</tr>
<tr>
<td>Surface Treatment</td>
<td>Manufacturer to specify</td>
</tr>
</tbody>
</table>

### TABLE 7-2 TS-1000 PERFORMANCE REQUIREMENTS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Condition</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>EIA 364-70</td>
<td>- Signal contacts: 0.5 A per contact MAX</td>
</tr>
<tr>
<td></td>
<td>30 degree C temperature rise</td>
<td>- Designated power contact: 1.0 A per contact MAX</td>
</tr>
<tr>
<td>Low Level Contact</td>
<td>EIA 364-23</td>
<td>20 mOhms deviation from initial (baseline) contact resistance</td>
</tr>
<tr>
<td>Resistance</td>
<td>20 mVDC, 100 mA</td>
<td></td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>EIA 364-21</td>
<td>1000 Mohms minimum</td>
</tr>
<tr>
<td></td>
<td>100 VDC between adjacent contacts</td>
<td></td>
</tr>
<tr>
<td>Dielectric Withstanding</td>
<td>EIA 364-20</td>
<td>- 1 mA MAX leakage</td>
</tr>
<tr>
<td>Voltage</td>
<td>300 VDC minimum for 1 minute</td>
<td>- No breakdown</td>
</tr>
<tr>
<td></td>
<td>between adjacent contacts</td>
<td></td>
</tr>
<tr>
<td>Vibration</td>
<td>EIA 364-28</td>
<td>- No damage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- No discontinuity longer than 1 microsecond allowed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 20 mOhm MAX change from initial (baseline) contact resistance</td>
</tr>
<tr>
<td>Mechanical Shock</td>
<td>EIA 364-27</td>
<td>- No damage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 20 mOhm MAX change from initial (baseline) contact resistance</td>
</tr>
</tbody>
</table>
### TABLE 7-3 MECHANICAL PERFORMANCE REQUIREMENTS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Procedure</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insertion Force</td>
<td>EIA 364-13 Test with connector, cage &amp; module</td>
<td>60N MAX</td>
</tr>
<tr>
<td></td>
<td>(latch disengaged, without heat sink)</td>
<td></td>
</tr>
<tr>
<td>Extraction Force</td>
<td>EIA 364-13 Test with connector, cage &amp; module</td>
<td>30N MAX</td>
</tr>
<tr>
<td></td>
<td>(latch disengaged, without heat sink)</td>
<td></td>
</tr>
<tr>
<td>Contact Normal Force</td>
<td>Manufacturer specified test to evaluate the normal</td>
<td>0.5N MIN</td>
</tr>
<tr>
<td></td>
<td>force applied by a single contact</td>
<td></td>
</tr>
<tr>
<td>Connector/ Cage Durability</td>
<td>EIA 364-09 Test with connector, cage &amp; module</td>
<td>100 cycles MIN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module Durability</td>
<td>EIA 364-09 Test with connector, cage &amp; module</td>
<td>50 cycles MIN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**
1. In addition to the requirements listed, all parts must be free of visible damage after testing.
2. Modules may be replaced every 50 cycles.

### TABLE 7-4 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Temperature</td>
<td>-20°C to +85°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>80%</td>
</tr>
</tbody>
</table>