



SFF-8071

Specification for

SFP+ 1X 0.8 mm Card Edge Connector

Rev 1.10.1 December 15, 2021

Secretariat: SFF TA TWG

Abstract: This specification defines the 0.8 mm card edge connector for multigigabit applications using the upper row of contacts. One such use is as the receptacle connector for Fibre Channel.

There are multiple generations based on electrical performance. Some examples are:

4 Gb/s	SFP+	SFF-8084
10 Gb/s	SFP10	SFF-8083
16 Gb/s	SFP16	SFF-8081
28 Gb/s	SFP28	SFF-8402
56 Gb/s	SFP56	SFF-8402 (with PAM4 signaling)

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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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

The content of this specification was formerly contained in SFF-8084, and it was broken out into a separate specification so that it could be referenced by higher speed variations.

- 14 **Rev 1.3** - Removed all but the 20 contact configurations
- 15 **Rev 1.4** - Added multiple generations table to Abstract.
- 16 **Rev 1.5** - Changed title to correlate with QSFP+ family of specifications
- 17 - Added Figure 3-1 with explanation
- 18 **Rev 1.6** - Correct FC-PI-3 reference to FC-PI-2
- 19 **Rev 1.7** - SFF-8071 created with the connector content removed from SFF-8084
- 20 **Rev 1.8** - Updated to SNIA template
- 21 - Added gold finger width option
- 22 - Removed MSA abbreviation (not used)
- 23 **Rev 1.9** *October 30, 2018*
- 24 - Updated front matter: Intellectual Property, Copyright, Disclaimer, and Foreword
- 25 - Consolidated Section 6.1 & aligned requirements with other SFP specifications
- 26 - Editorial changes throughout document
- 27 - Changed text in Table 6-3 to accurately reflect performance requirements
- 28 **Rev 1.9a** *October 30, 2018*
- 29 - Corrected metadata
- 30 **Rev 1.10** *December 13, 2019*
- 31 - Corrected typo in Table 6-1 (removed an extra "0" for dimension value for A04 (*2))
- 32 - Various editorial changes
- 33 - Added new, clearer figures (no changes to content)
- 34 **Rev 1.10.1** *December 15, 2021*
- 35 - Removed note about solder mask from Figure 6-1
- 36 - Changed current requirement in Table 7-2 to support power class III modules per SFF-8418

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1. Scope

This specification defines the terminology and physical requirements for the mating interface and physical characteristics of the 0.8 mm card edge connector to support multi gigabit applications. The dimensions specified apply to connectors with 20 contacts.

The using interfaces define requirements on the characteristic impedance and ability to transmit multi-gigabit signals to and from optical pluggable modules, and in some cases via cable assemblies. When this connector is used in such an application, it is subject to the requirements of those documents.

2. References

2.1 Industry Documents

The following standards and specifications are relevant to this Specification.

- ANSI/ASME Y14.5M Geometric Dimensioning and Tolerancing (GD&T)
- ANSI 352 FC-PI (Fibre Channel Physical Interface)
- ANSI 404 FC-PI-2 (Fibre Channel Physical Interface 2) / T11/1506D
- ANSI 450 FC-PI-4 (Fibre Channel Physical Interface 4)/ T11/1861D
- ANSI 479 FC-PI-5 (Fibre Channel Physical Interface 5)/ T11/2118D
- ANSI 512 FC-PI-6 (Fibre Channel Physical Interface 6)/ T11/2221D
- EIA 364-06 Contact Resistance Test Procedure for Electrical Connectors
- EIA 364-09 Durability Test Procedure for Electrical Connectors and Contacts
- EIA 364-13 Mating and Unmating Forces Test Procedures for Electrical Connectors
- EIA 364-21 Insulation Resistance Test Procedure for Electrical Connectors Sockets and Coaxial Contacts
- INF-8074i SFP (Small Formfactor Pluggable) 1 Gb/s Transceiver
- REF-TA-1011 Cross Reference to Select SFF Connectors and Modules
- SFF-8075 SFP Cage 10 Gb/s 2X: PCI Card Version
- SFF-8081 SFP+ 16 Gb/s 1X Pluggable Transceiver Solution (SFP16)
- SFF-8083 SFP+ 10 Gb/s 1X Pluggable Transceiver Solution (SFP10)
- SFF-8084 SFP+ 4 Gb/s 1X Pluggable Transceiver Solution
- SFF-8402 SFP+ 28 Gb/s 1X Pluggable Transceiver Solution (SFP28)
- SFF-8410 HSS Copper Testing and Performance Requirements
- SFF-8419 SFP+ Low Speed Electrical Interface
- SFF-8431 SFP+ High Speed Electrical Interface
- SFF-8432 SFP+ Module and Cage
- SFF-8433 SFP+ Ganged Cage

2.2 Sources

The complete list of SFF documents (SFF, INF, and REF 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>.

Other standards may be obtained from the organizations listed below:

Standard	Organization	Website
ASME	American Society of Mechanical Engineers (ASME)	https://www.asme.org
Electronic Industries Alliance (EIA)	Electronic Components Industry Association (ECIA)	https://www.ecianow.org
ANSI & INCITS	International Committee for Information Technology Standards (INCITS)	http://www.incits.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.

LISTS

Lists sequenced by lowercase or uppercase letters show no ordering relationship between the listed items.

EXAMPLE 1 - The following list shows no relationship between the named items:

- a. red (i.e., one of the following colors):
 - A. crimson; or
 - B. pink;
- b. blue; or
- c. green.

Lists sequenced by numbers show an ordering relationship between the listed items.

EXAMPLE 2 -The following list shows an ordered relationship between the named items:

1. top;
2. middle; and
3. bottom.

Lists are associated with an introductory paragraph or phrase and are numbered relative to that paragraph or phrase (i.e., all lists begin with an a. or 1. entry).

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 purpose 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.

3.2 Acronyms and Abbreviations

CL: Centerline
PCB: Printed Circuit Board
SFP: Small Formfactor Pluggable
SMT: Surface-mount technology

3.3 Definitions

Advanced grounding contacts: Connector contacts that make 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.

Centerline or CL: A real or imaginary line that is equidistant from the surface or sides of something.

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.

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



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

FIGURE 3-1 MATING SIDE GENDER DEFINITION

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.

4. General Description

The 0.8 mm connection system is based on industry-proven card edge style contacts, which mate with a single wipe.

0.8 mm card edge connectors find their most important application where signals have rise times typically in the range of 25 ps and where positive retention is needed but ease of insertion and removal is also desired. This covers virtually all of the external inter-enclosure applications for gigabit serial applications that use balanced copper media for transmission.

Design goals were minimization of crosstalk and minimum transmission line impedance discontinuity across the connector interface at the specified signaling rates on the upper row of contacts. The lower row of contacts is rated at signaling rates up to 2.5 Gb/s.

The shield (cage) contact (not shown or part of this specification) is required to make contact before any of the signal contacts upon insertion and to break contact only after all contacts are separated upon removal. This ensures that any ground potential differences between enclosures are first exposed to the shield and thereby minimizes the risk of damaging the sensitive input and output stages of the transceivers when the signal contacts are mated.

A cage or latching device (not shown or part of this specification) is required to guide the mating interface (paddle card) into the connector, provide sufficient wipe on the contact interface, provide a hard stop which prevents the transceiver side from bottoming in the connector, and keeps the paddle card contacts on the connector contacts during use. See REF-TA-1011 and its references for more information about this form factor.

This connector is mated with either a pluggable module or a cable assembly.

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

5. Mechanical Specifications

5.1 Connector Configurations

The 0.8 mm card edge connector relies on a receiving body and paddle card, which are the primary elements of a connector used for the application.

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

The figure is an example which illustrates one style of receiving body and how they become receptacles to receive the plug when encapsulated by the shell that is designed for an unshielded connector application.

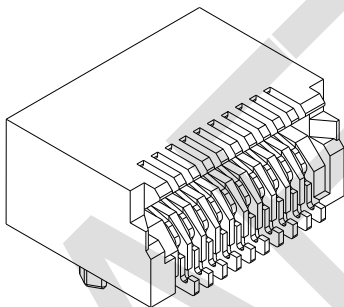


FIGURE 5-1 GENERAL VIEW OF RIGHT-ANGLED BODY RECEPTACLE

The cage provides guidance and retention for the cable plug or pluggable module, and absorbs the stress imposed by insertion and removal of the plug or module. This protects the quality of the solder joints between the body and host board.

5.2 Contact Sequencing

To combat electrostatic discharge, static drain, protect signal pins, or for other purposes, it may be desirable that during module/cable insertion some contacts make contact first and that during extraction these contacts break last. This function can be achieved with contact sequencing. Figure 5-2 shows an example where first the advanced grounding contacts make contact with the board side contacts and then the power contacts make contact, and that the signal pins make contact after ground and power has been established. During extraction the reverse process happens. For details on the sequencing dimensions see Figure 6-1.

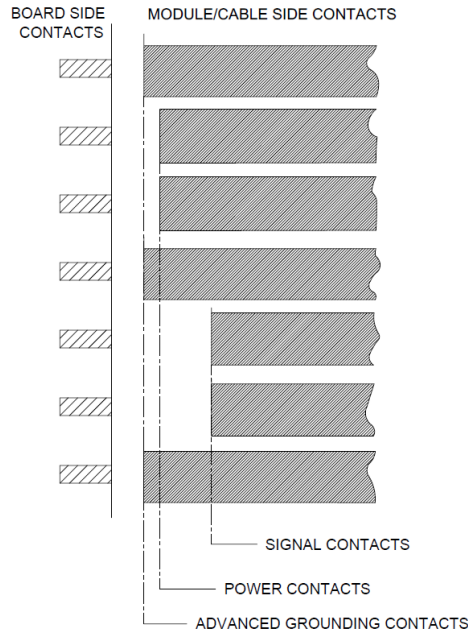


FIGURE 5-2 CONTACT SEQUENCING

5.3 Contact Numbering

The contact numbering is shown in the table. For location of contacts 1, 10, 11, and 20, see Figure 6-1.

TABLE 5-1 CONTACT NUMBERING

Contacts	
1	20
2	19
3	18
4	17
5	16
6	15
7	14
8	13
9	12
10	11

6. Connector Dimensions

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

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

6.1 Paddle Card

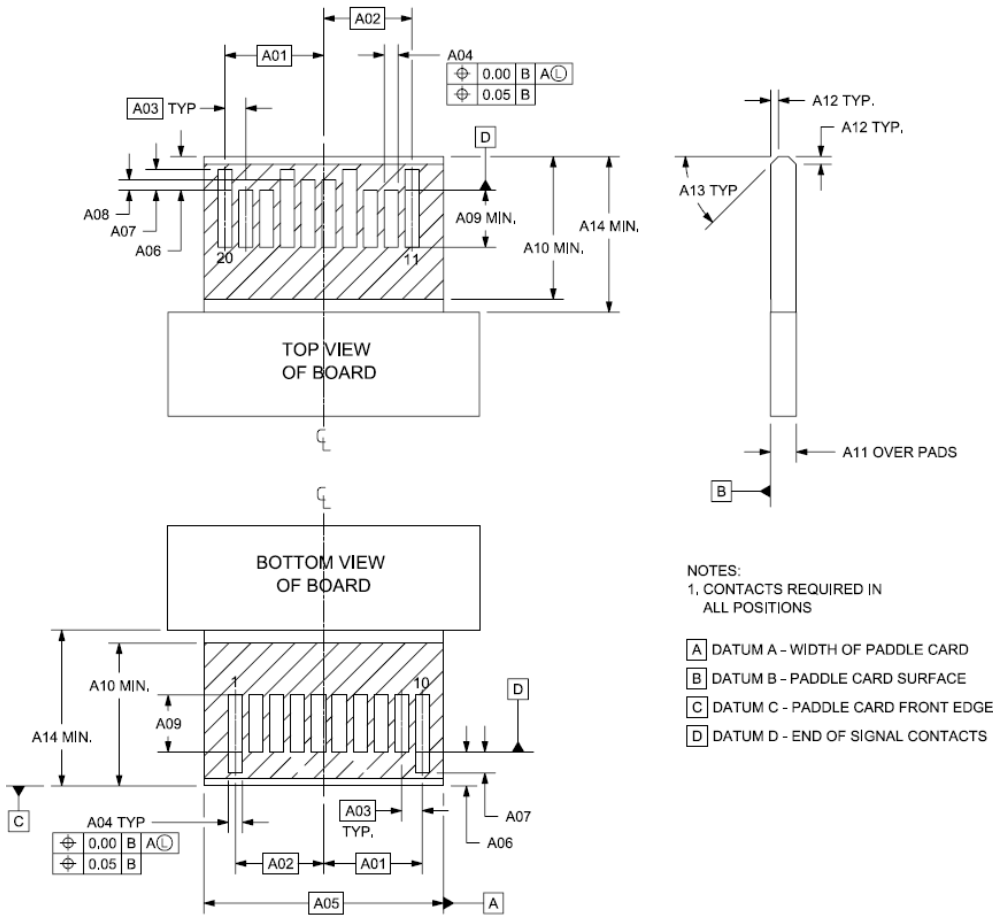


FIGURE 6-1 PADDLE CARD

Commented [HA1]: Figure modified to remove note about solder mask (NOTE: No solder mask within 0.05mm if the defined pad locations)

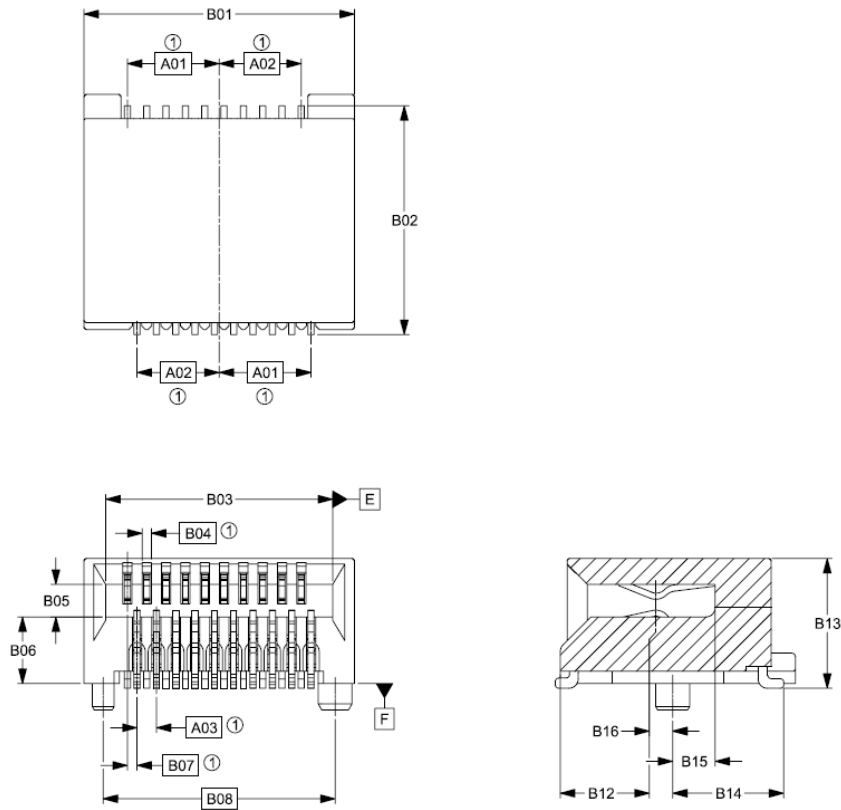
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9
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TABLE 6-1 PADDLE CARD DIMENSIONS

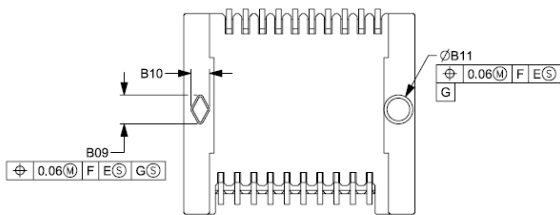
Designator	Description	mm	Tolerance
A01	CL to last	3.80	Basic
A02	CL to first	3.40	Basic
A03	Contact pad pitch within row	0.80	Basic
A04 (*1)	Pad width (paddle card width 9.20)	0.60	+/-0.05
A04 (*2)	Pad width (paddle card width 9.22)	0.54	+/-0.04
A05 (*1)	Paddle card width (pad width 0.60)	9.20	+/-0.10
A05 (*2)	Paddle card width (pad width 0.54)	9.22	+/-0.08
A06	End of paddle card to datum D	1.30	+/-0.10
A07	Start of ground pad to datum D	0.80	+/-0.05
A08	Start of power pad to datum D	0.40	+/-0.05
A09	Length of signal pad	2.20	Minimum
A10	Length of component/solder mask keep-out area	5.50	Minimum
A11	Paddle card thickness	1.00	+/-0.10
A12	Paddle card end chamfer	0.30	+0.10/-0.20
A13	Paddle card end chamfer angle	45°	Reference
A14	Length from front edge to shoulder	6.00	Minimum

(*) Dimensions of the pad width and the paddle card width are such that the centerline of the connector contact does not go off the edge of the pad. An implementer may use either 0.60/9.20 or 0.54/9.22 mm for the A04/A05 dimensions.

1 **6.2 Board Side Connector**



2



NOTES: BOTTOM OF CONNECTOR BODY

- CONTACT MUST BE WITHIN 0.33 WIDE TOLERANCE ZONE. THE CENTERLINE OF TOLERANCE ZONE IS DEFINED BY THE INDICATED BASIC DIMENSIONS RELATIVE TO DATUM D REGARDLESS OF FEATURE SIZE.

- [E] DATUM E- PADDLE CARD SLOT WIDTH
- [F] DATUM F- BOTTOM OF CONNECTOR BODY
- [G] DATUM G- LOCATING PEG

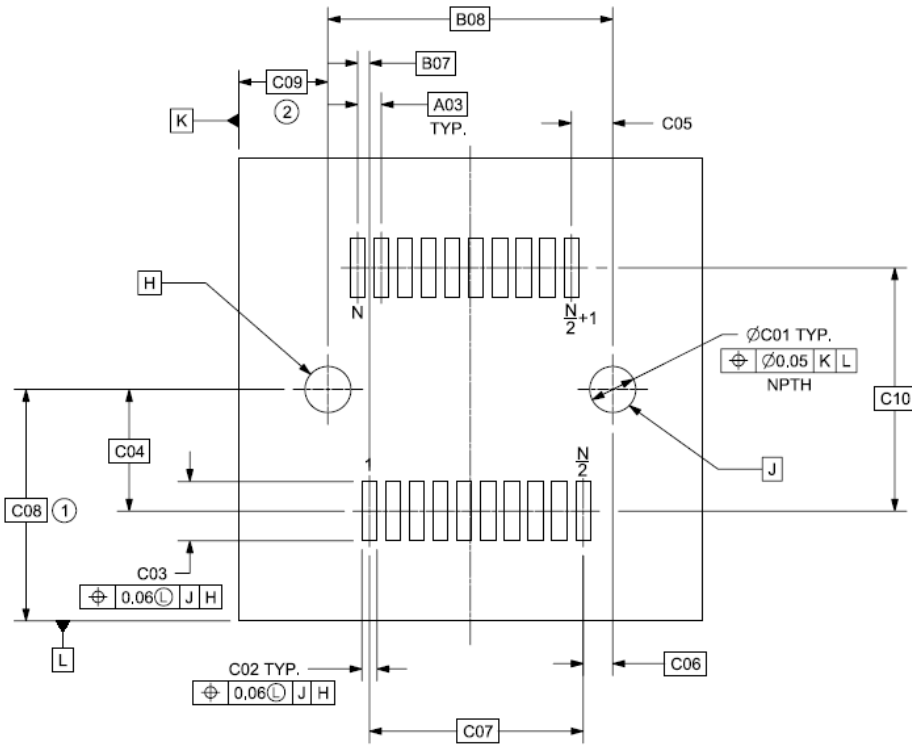
FIGURE 6-2 BOARD SIDE CONNECTOR

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4
5

TABLE 6-2 BOARD SIDE CONNECTOR DIMENSIONS

Designator	Description	mm	Tolerance
A01	CL to last	3.80	Basic
A02	CL to first	3.40	Basic
A03	Contact pitch within row	0.80	Basic
B01	Overall width	11.20	Maximum
B02	Overall depth	9.20	Maximum
B03	Paddle card slot width	9.40	+/-0.05
B04	Contact tolerance zone	0.33	Maximum
B05	Paddle card slot height	1.35	Maximum
B06	Paddle card slot to datum F	2.75	+/-0.15
B07	Contact pitch row to row	0.40	Basic
B08	Peg to peg	9.60	Basic
B09	Peg height	1.40	+/-0.05
B10	Peg width	0.90	Reference
B11	Peg diameter	1.40	+/-0.05
B12	Housing front to contact CL	3.95	Maximum
B13	Overall height	5.40	Maximum
B14	Peg CL to solder foot	4.65	Reference
B15	Peg CL to card slot	2.20	Minimum
B16	Peg CL to contact CL	0.70	+/-0.25

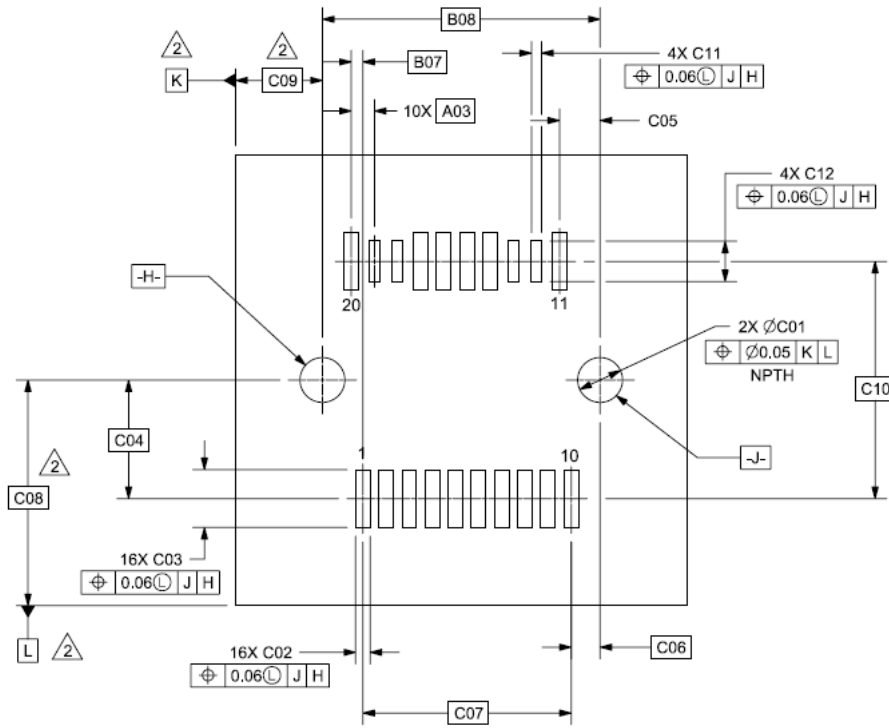
1 6.3 Board Side Connector Footprints



NOTES:
 1. GROUNDS ARE CLEARED UNDER SIGNAL PADS
 2. DATUMS AND BASIC DIMENSIONS TO BE ESTABLISHED

- [H] DATUM H - CONNECTOR LOCATING PEG
- [J] DATUM J - CONNECTOR LOCATING PEG
- [K] DATUM K - SIDE OF FOOTPRINT
- [L] DATUM L - FRONT OF FOOTPRINT

2
 3
 ▼
FIGURE 6-3 BOARD SIDE CONNECTOR FOOTPRINT



- NOTES:
1. GROUNDS ARE CLEARED UNDER SIGNAL PADS
DATUMS AND BASIC DIMENSIONS TO BE ESTABLISHED
 2. △ - CONNECTOR LOCATING PEG
 - H- - CONNECTOR LOCATING PEG
 - J- - CONNECTOR LOCATING PEG
 - K- - SIDE OF FOOTPRINT
 - L- - FRONT OF FOOTPRINT

FIGURE 6-4 ALTERNATE BOARD SIDE CONNECTOR FOOTPRINT

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TABLE 6-3 FOOTPRINT DIMENSIONS

Designator	Description	mm	Tolerance
A03	Contact pitch within row	0.80	Basic
B07	Contact pitch row to row	0.40	Basic
B08	Peg to peg	9.60	Basic
C01	Locator peg hole diameter	1.55	+/-0.05
C02	Pad width	0.50	+/-0.03
C03	Pad length	2.00	+/-0.05
C04	Peg hole CL to pad CL	4.10	Basic
C05	Locator peg hole CL to pad CL	1.40	Reference
C06	Locator peg hole CL to pad CL	1.00	Basic
C07	Pad CL to pad CL within row	7.20	Basic
C08	Datum L to locator peg hole CL	See Note 2	Basic
C09	Datum K to locator peg hole CL	See Note 2	Basic
C10	Row CL to row CL	8.20	Basic
C11	High speed signal pad width	0.35	+/-0.03
C12	High speed signal pad length	1.40	+/-0.05

7. Performance Requirements

7.1 Test Sequences

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

TABLE 7-1 TS-1000 REQUIREMENTS

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

TABLE 7-2 ELECTRICAL REQUIREMENTS

Parameter	Procedure	Requirement
Current	EIA-364-70 30°C temperature rise	<u>For connectors supporting Power Level III Modules (per SFF-8418):</u> <u>0.5 A per signal contacts & 1.5 A per power contacts</u> <u>For all other connectors:</u> <u>0.5 A per contact</u>
Low Level Contact Resistance	EIA-364-23 20 mV DC, 100 mA	20 mOhm deviation from baseline
Insulation Resistance	EIA-364-21 100 V DC between adjacent contacts	100 MOhm minimum
Dielectric Withstanding Voltage	EIA-364-20 300 V DC minimum for 1 minute between adjacent contacts	1 mA max leakage and no breakdown

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TABLE 7-3 MECHANICAL REQUIREMENTS

Parameter	Procedure	Requirement ¹
Insertion Force	EIA 364-13 Test with connector, cage, and module ² (latch disengaged, without heatsink)	40 N Max
Extraction Force	EIA 364-13 Test with connector, cage, and module ² (Latch disengaged, without heatsink)	12.5 N Max
Latch Strength	Pull to separate module from cage Test with connector, cage, and module (latch engaged)	90-170 N
Connector/ Cage Durability	EIA-364-09 Test with connector, cage, and module ²	100 cycles
Module Durability	EIA-364-09 Test with connector, cage, and module ²	50 cycles
Notes:		
1. In addition to the requirements listed, all parts must be free of visible damage after testing.		
2. Modules may be replaced after 50 cycles.		

TABLE 7-4 ENVIRONMENTAL REQUIREMENTS

Parameter	Specification
Storage Temperature	-20°C to +85°C
Humidity	80% relative humidity

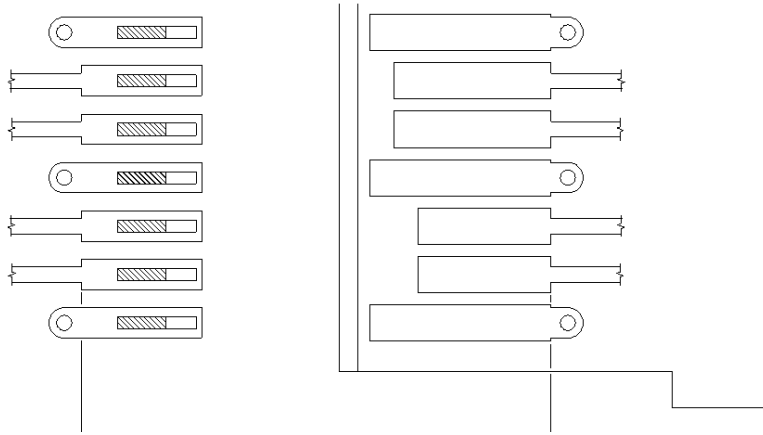
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1 **7.2 High Frequency Performance Requirements**

2 For better performance, it is recommended that grounds are cleared from underneath signal pads.

3



Host Board Side Footprint

De-embedding reference plane at end of contact pads as defined in Figure 6-3 and Figure 6-4.

Paddle Card Side Contact

De-embedding reference plane at end of contact pads as defined in Figure 6-1.

4
5

FIGURE 7-1 DE-EMBEDDING REFERENCE PLANE