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SNIA™
SFF TWG
Technology Affiliate

SFF-8071

Specification for

SFP+ 1X 0.8mm Card Edge Connector

Rev 1.8.1 October 30, 2018

Secretariat: SFF TA TWG

Abstract: This specification defines the 0.8mm 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 using generations based on electrical performance.

4 Gb/s	SFP+	SFF-8084
10 Gb/s	SFP10	SFF-8083
16 Gb/s	SFP16	SFF-8081
28 Gb/s	SFP28	SFF-8402

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.

POINTS OF CONTACT:

Jay Neer
Molex
2222 Wellington Court
Lisle, IL 60532
Ph: 561-447-2907 X3889
Email: jay.neer_at_molex_dot_com

Chairman SFF TA TWG
Email: SFF-Chair@snia.org

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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.

Change 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.

Rev 1.3 - Removed all but the 20 contact configurations
Rev 1.4 - Added multiple generations table to Abstract.
Rev 1.5 - Changed title to correlate with QSFP+ family of specifications
- Added Figure 3-1 with explanation
Rev 1.6 - Correct FC-PI-3 reference to FC-PI-2
Rev 1.7 - SFF-8071 created with the connector content removed from SFF-8084
Rev 1.8 – Updated to SNIA template
- Added gold finger width option
- ~~Consolidated Section 6.1 & aligned requirements with other SFP specifications~~
- Removed MSA abbreviation (not used)

Rev 1.8.1 (October 29, 2018)
- Updated front matter: Intellectual Property, Copyright, Disclaimer, and Foreword
- Consolidated Section 6.1 & aligned requirements with other SFP specifications *(Editor's Note: this item wasn't completed last time this document was edited)*
- Editorial changes throughout document

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. Material presented to SFF becomes public domain, and there are no restrictions on the open mailing of the presented material by Members.

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 can be found at:

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

If you wish to know more about the SFF TWG, the principles which guide the activities can be found at:

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

Suggestions for improvement of this specification will be welcome, they should be submitted to:

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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.

1.1 Copyright

1.2 Disclaimer

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

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)
- 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
- ANSI 352:2002 FC-PI (Fibre Channel Physical Interface)
- ANSI 404:2006 FC-PI-2 (Fibre Channel Physical Interface 2) / T11/1506D
- INF-8074i SFP (Small Formfactor Pluggable) 1 Gb/s Transceiver
- 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

There are several projects active within the SFF TWG. The complete list of specifications which have been completed or are still being worked on are listed in http://www.snia.org/sff/specifications/SFF-8000.TXT

Copies of ANSI standards may be purchased from the InterNational Committee for Information Technology Standards (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.

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

2.4 Definitions

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

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

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.

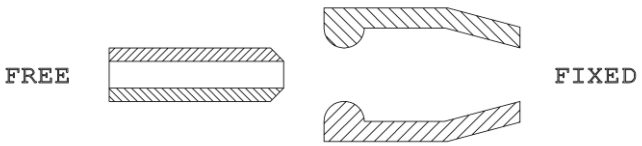
Alignment guides: Connector features that preposition insulators prior to electrical contact. Other terms sometimes used to describe these features are: guide pins, guide posts, blind mating features, mating features, alignment features, and mating guides

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.

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.

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



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

FIGURE 2-1 MATING SIDE GENDER DEFINITION

Maximum Component Height: Distance from board surface to farthest overall connector feature

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.

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

Surface mount: A connector design and a printed circuit board design style where the connector termination points do not penetrate the printed circuit board and are subsequently soldered to the printed circuit board

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

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

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

4. Mechanical Specifications

4.1 Connector Configurations

The 0.8mm 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.

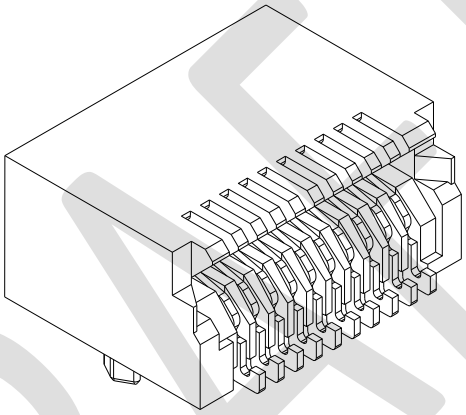


FIGURE 4-1 GENERAL VIEW OF RIGHT-ANGLED BODY RECEPTACLE

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.

4.2 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 4-2 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 5-1.

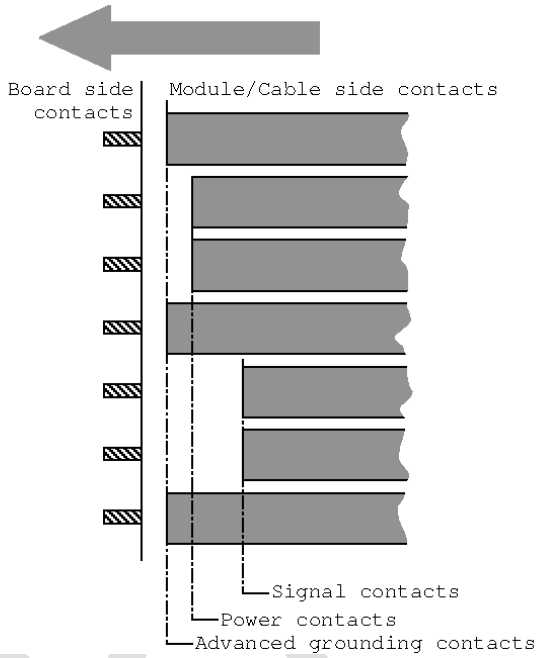


FIGURE 4-2 CONTACT SEQUENCING

4.3 Contact Numbering

The contact numbering is shown in the table. For location of contacts A01 and B01, see Figure 5-1 and Figure 5-2.

TABLE 4-1 CONTACT NUMBERING

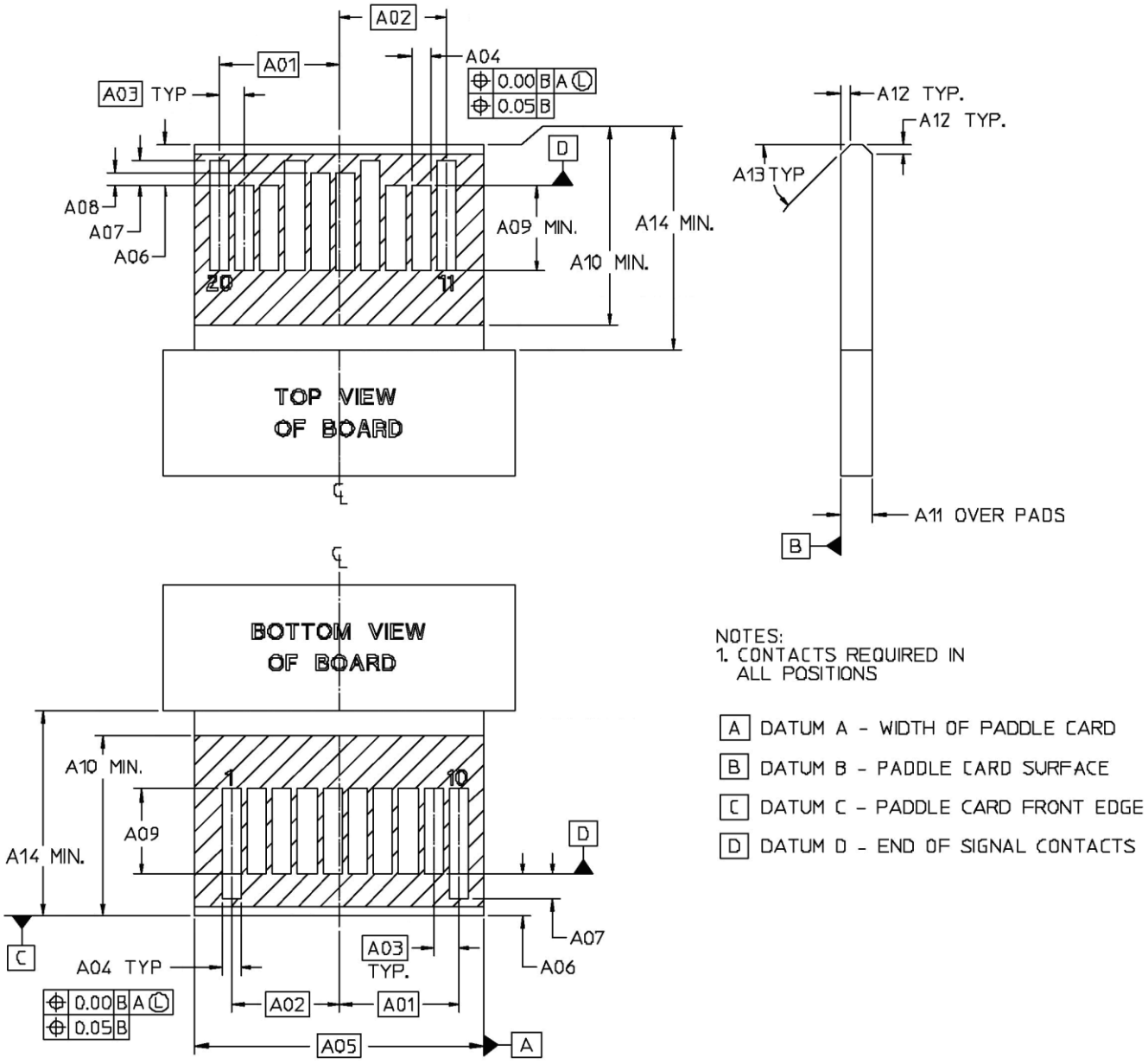
Contacts	
1	20
2	19
3	18
4	17
5	16
6	15
7	14
8	13
9	12
10	11

5. 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.

5.1 Paddle Card



Note: No solder mask within 0.05mm of the defined pad locations.

FIGURE 5-1 PADDLE CARD

TABLE 5-1 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)	0.054	+/-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 degrees	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 terminal does not go off the edge of the pad. An implementer may use with 0.60/9.20 or 0.54/9.22 for the A04/A05 dimensions.			

5.2 Board Side Connector

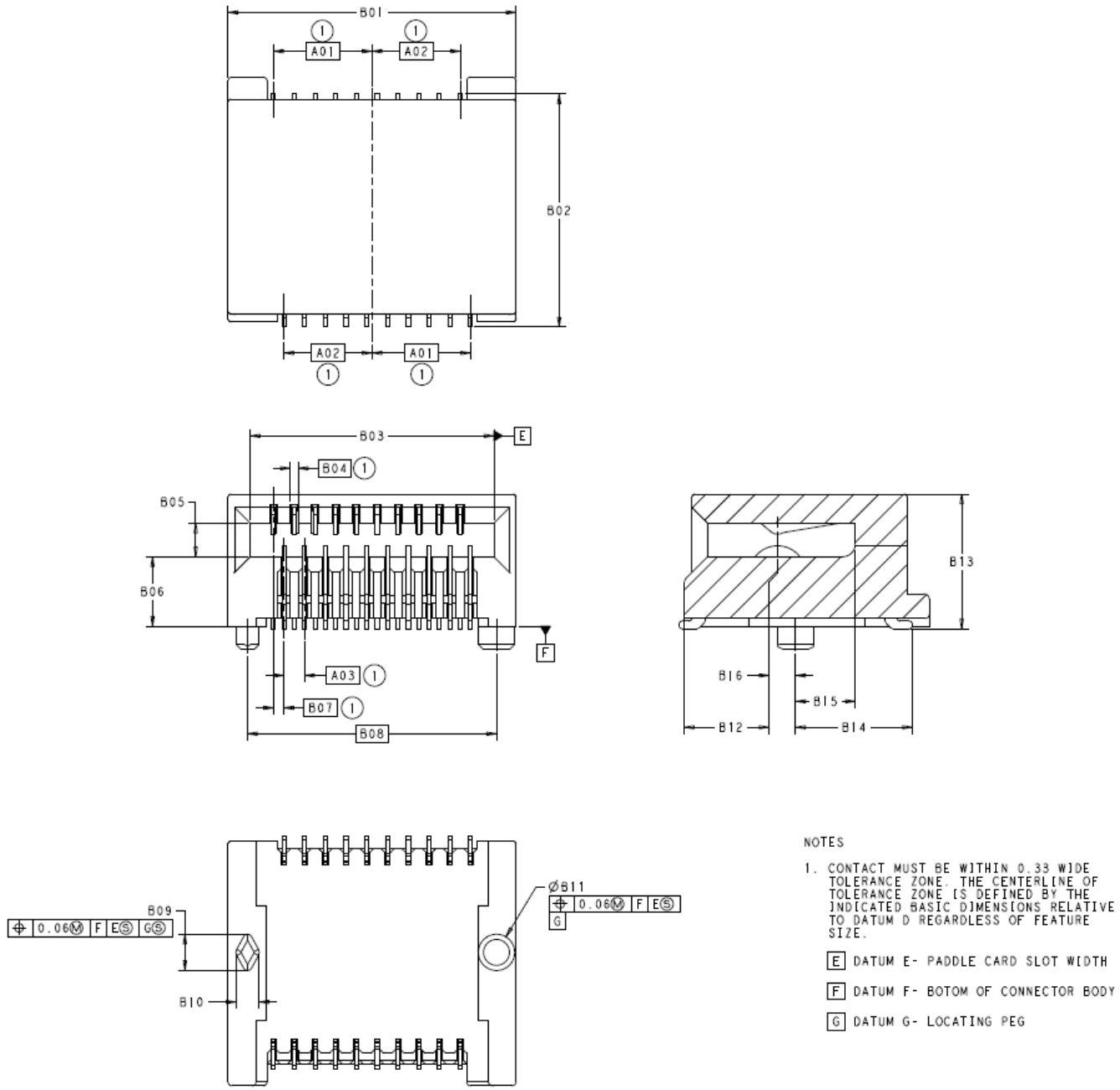
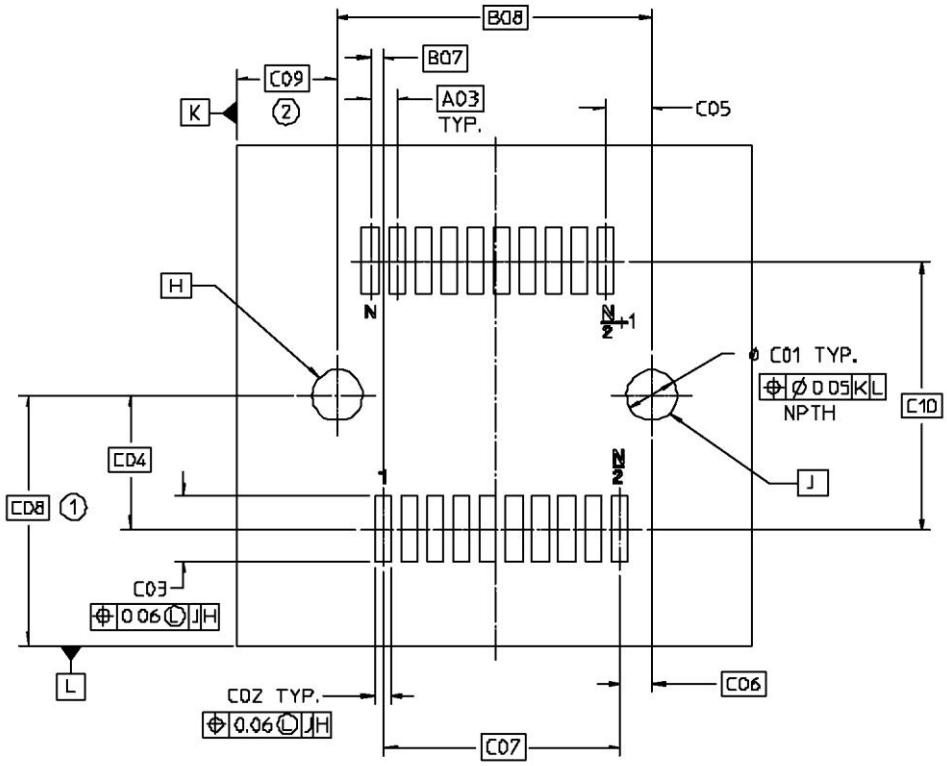


FIGURE 5-2 BOARD SIDE CONNECTOR

TABLE 5-2 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

5.3 Board Side Connector Footprints



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

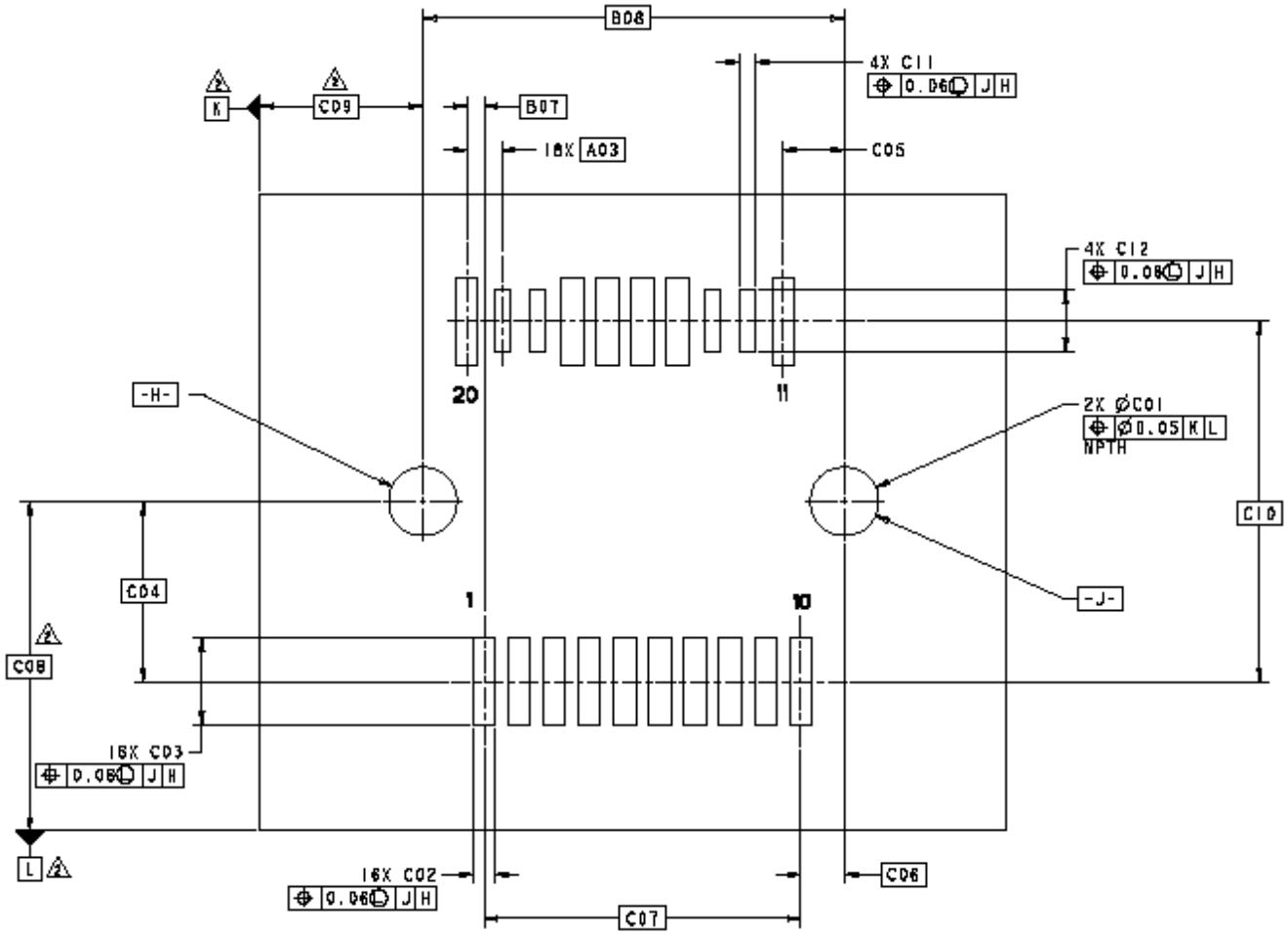
H DATUM H - CONNECTOR LOCATING PEG

J DATUM J - CONNECTOR LOCATING PEG

K DATUM K - SIDE OF FOOTPRINT

L DATUM L - FRONT OF FOOTPRINT

FIGURE 5-3 BOARD SIDE CONNECTOR FOOTPRINT



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

-H- - CONNECTOR LOCATING PEG

-J- - CONNECTOR LOCATING PEG

-K- - SIDE OF FOOTPRINT

-L- - FRONT OF FOOTPRINT

FIGURE 5-4 ALTERNATE BOARD SIDE CONNECTOR FOOTPRINT

TABLE 5-3 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

6. Performance Requirements

6.1 Test Sequences

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

TABLE 6-1 TS-1000 REQUIREMENTS

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

TABLE 6-2 ELECTRICAL REQUIREMENTS

~~Description~~Parameter	~~Requirement~~Procedure	~~Procedure~~Requirement
Current	EIA-364-70~~0.5 A per contact~~ 30 degree C temperature rise	0.5 A per contact~~-~~
~~Voltage~~	~~30 VDC per contact~~	~~-~~
Low Level Contact Resistance	EIA-364-23 20 mV DC, 100 mA ~~Baseline~~	20 mOhm deviation from baseline~~EIA-364-23 20 mVDC, 10 mA~~
Insulation Resistance	~~1000 Megaohms minimum between adjacent contacts~~EIA-364-21 100 V DC between adjacent contacts	100 MOhm~~VDC~~ minimum
Dielectric Withstanding Voltage	~~No defect or breakdown between adjacent contacts~~EIA-364-20 300 V DC minimum for 1 minute between adjacent contacts	~~300 VDC minimum for 1 minute~~1 mA max leakage and no breakdown

TABLE 6-3 MECHANICAL REQUIREMENTS

~~From SFF-8084~~

~~Items~~Parameter	Procedure~~Conditions~~	~~Acceptance Limits~~Requirement[1]
~~Durability for Connector~~	~~EIA 364-09~~ ~~Durability cycles are in Table 6-1, but the number is 250, not 100~~	~~100~~
~~Durability for Mating Paddle Card~~	~~EIA 364-09~~ ~~Table 6-1 has no spec for the paddle card~~	~~50~~
~~Mating~~ Insertion Force	EIA 364-13~~: Measurement speed: 12.7 mm per minute maximum~~ ~~Same procedure but values differ~~ Test with connector, cage, and module[2] (latch disengaged, without heatsink)	~~43~~0 N Max
~~Un-mating~~Extraction Force	EIA 364-13~~: Measurement speed: 12.7 mm per minute maximum with retention latch disengaged~~ ~~Same procedure but values differ~~ Test with connector, cage, and module[2] (Latch disengaged, without heatsink)	~~20~~ 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
Cage 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.

~~From common requirements used by SFF-8639, 8680 et el~~

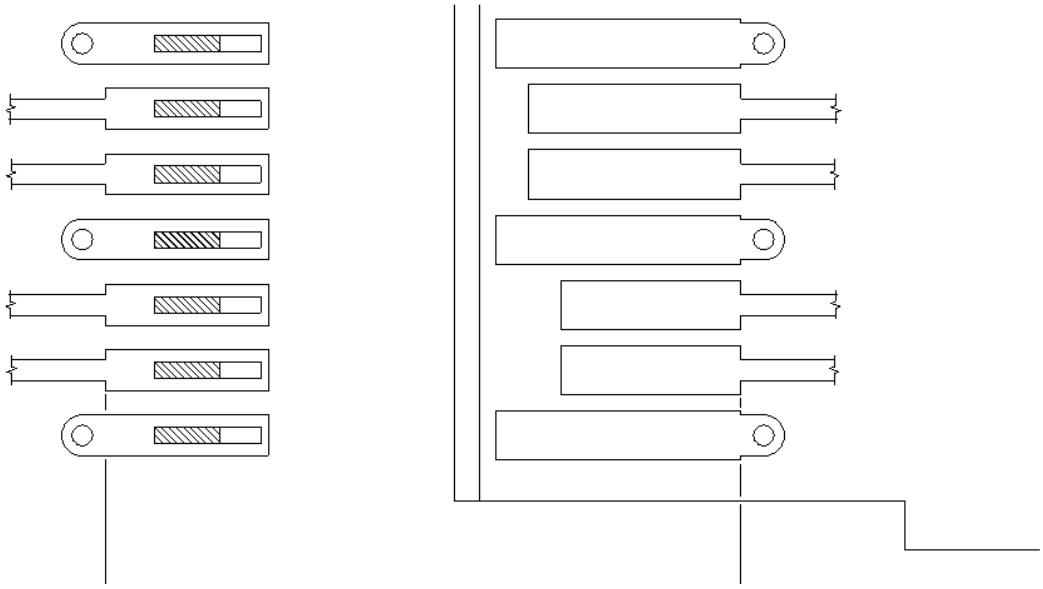
~~Description~~	~~Requirement~~	~~Procedure~~
~~Mating Force~~	~~150N maximum~~	~~EIA 364-13~~
~~Un-mating Force~~	~~50N maximum~~	~~EIA 364-13~~
~~Vibration~~	~~- No Damage~~ ~~- No discontinuity longer than 1 microsecond allowed.~~ ~~- 20 milliohms maximum change from initial (baseline) contact resistance~~	~~EIA 364-28~~
~~Mechanical Shock~~	~~- No Damage~~ ~~- 20 milliohms maximum change from initial (baseline) contact resistance~~	~~EIA 364-27~~

TABLE 6-4 ENVIRONMENTAL REQUIREMENTS

~~Description~~Parameter	~~Requirement~~Specification
Storage Temperature	-20C to +85C degrees
Humidity	80 percent r~~R~~elative ~~H~~humidity

6.2 High Frequency Performance Requirements

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



Host Board Side Footprint
De-embedding reference plane at end of contact pads as defined in Figure 5-3 and Figure 5-4.

Paddle Card Side Contact
De-embedding reference plane at end of contact pads as defined in Figure 5-1.

FIGURE 6-1 DE-EMBEDDING REFERENCE PLANE