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SFF Committee

SFF-8071 Specification

for

SFP+ 1X 0.8mm Card Edge Connector

Rev 1.7 September 22, 2014

Secretariat: SFF Committee

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 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 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.

Amphenol
Avago
Cinch
EMC
ETRI
FCI
Finisar
Foxconn
Hewlett Packard
JDS Uniphase
LSI
Luxtera
Molex
QLogic
Shenzhen
Sumitomo
Sun Microsystems
TE Connectivity

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

Applied Micro
Arista Networks
Dell Computer
Emulex
Fujitsu CPA
HGST
Meritec
NetApp
Oclaro
Sandisk
Seagate
Toshiba
Vitesse Semiconductor
Volex
Western Digital

The user's attention is called to the possibility that implementation to this Specification may require use of an invention covered by patent rights. By distribution of this Specification, no position is taken with respect to the validity of this claim or of any patent rights in connection therewith. Members of the SFF Committee, which advise that a patent exists, are required to provide a statement of willingness to grant a license under these rights on reasonable and non-discriminatory terms and conditions to applicants desiring to obtain such a license.

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

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.

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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

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

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-8418	SFP+ High Speed Electrical Interface
SFF-8419	SFP+ Low Speed Electrical Interface
SFF-8432	SFP+ Module and Cage
SFF-8433	SFP+ Ganged Cage

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).

EIA documents are available at http://global.ihs.com

2.4 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

2.5 Definitions

For the purpose of this specification, the following definitions apply:

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, paddle card chamfers 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. Other terms sometimes used to describe this part of a cable assembly are: housing, nosepiece, cowling, and metal shroud.

Maximum component height: Distance from board surface to farthest overall module/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.

Offset: An alignment shift from the centerline of the connector. Connector contacts may be offset from the CL

Optional: This term describes features that are not required by this specification. However, if any feature defined by this 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 surface of 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 pin 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.

2.6 Abbreviations

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

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.

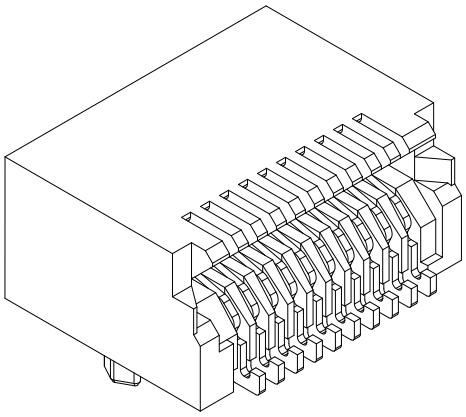


FIGURE 4-1 GENERAL VIEW OF RIGHT-ANGLED BODY RECEPTACLE

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.

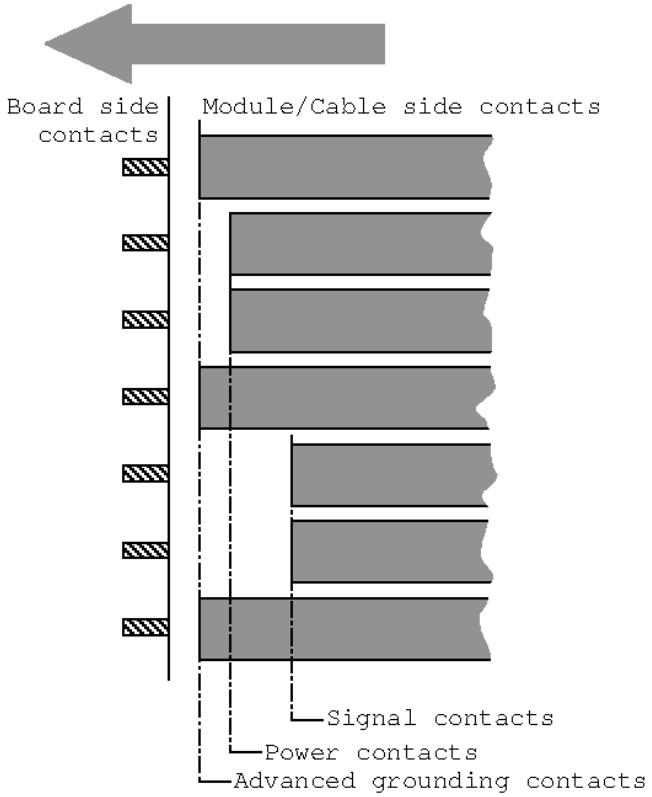


FIGURE 4-2 CONTACT SEQUENCING

6.4 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

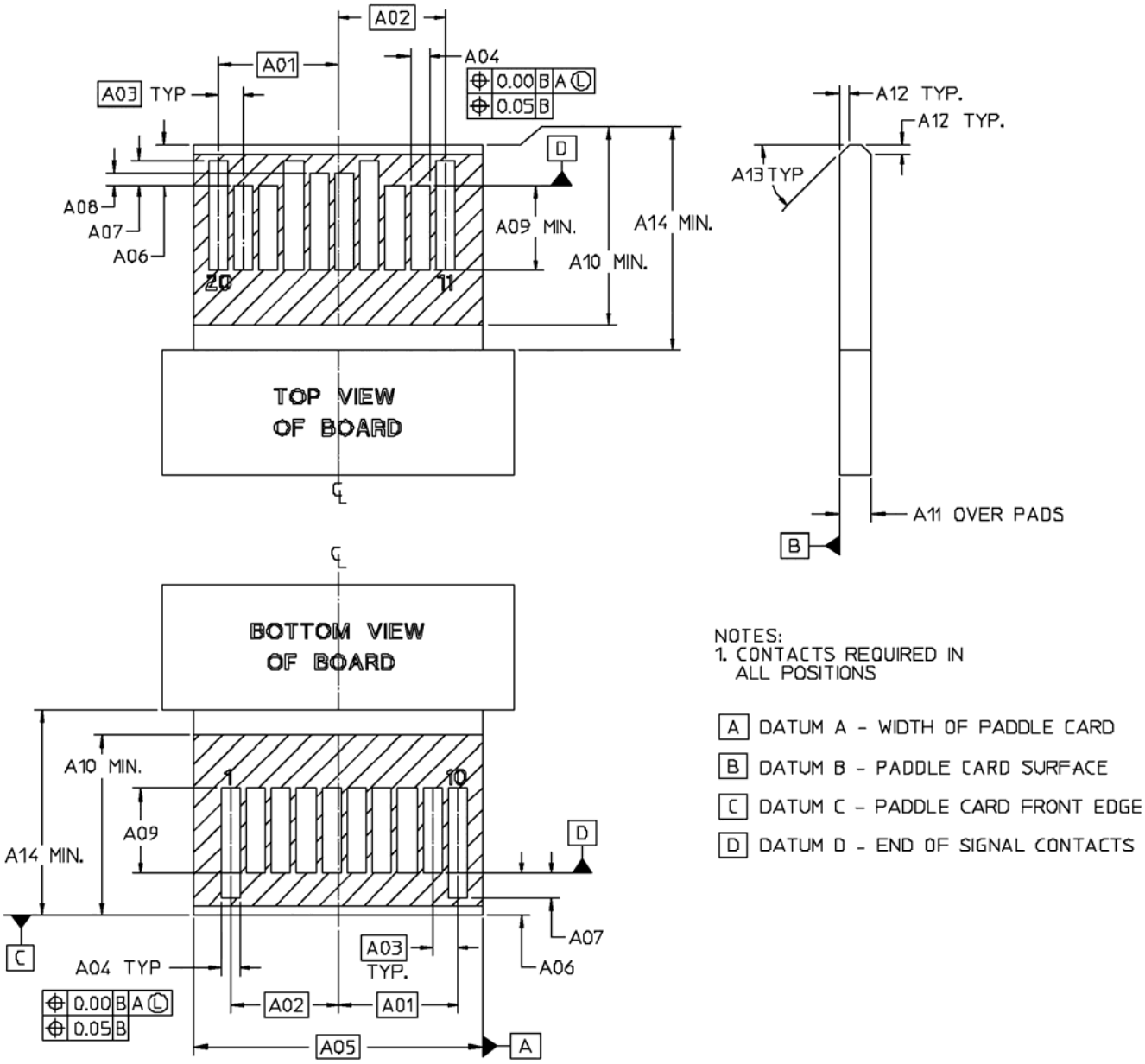
Contacts	
1	20
2	19
3	18
4	17
5	16
6	15
7	14
8	13
9	12
10	11

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	Pad width	0.60	+/-0.05
A05	Paddle card width	9.20	+/-0.10
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

5.2 Board Side Connector

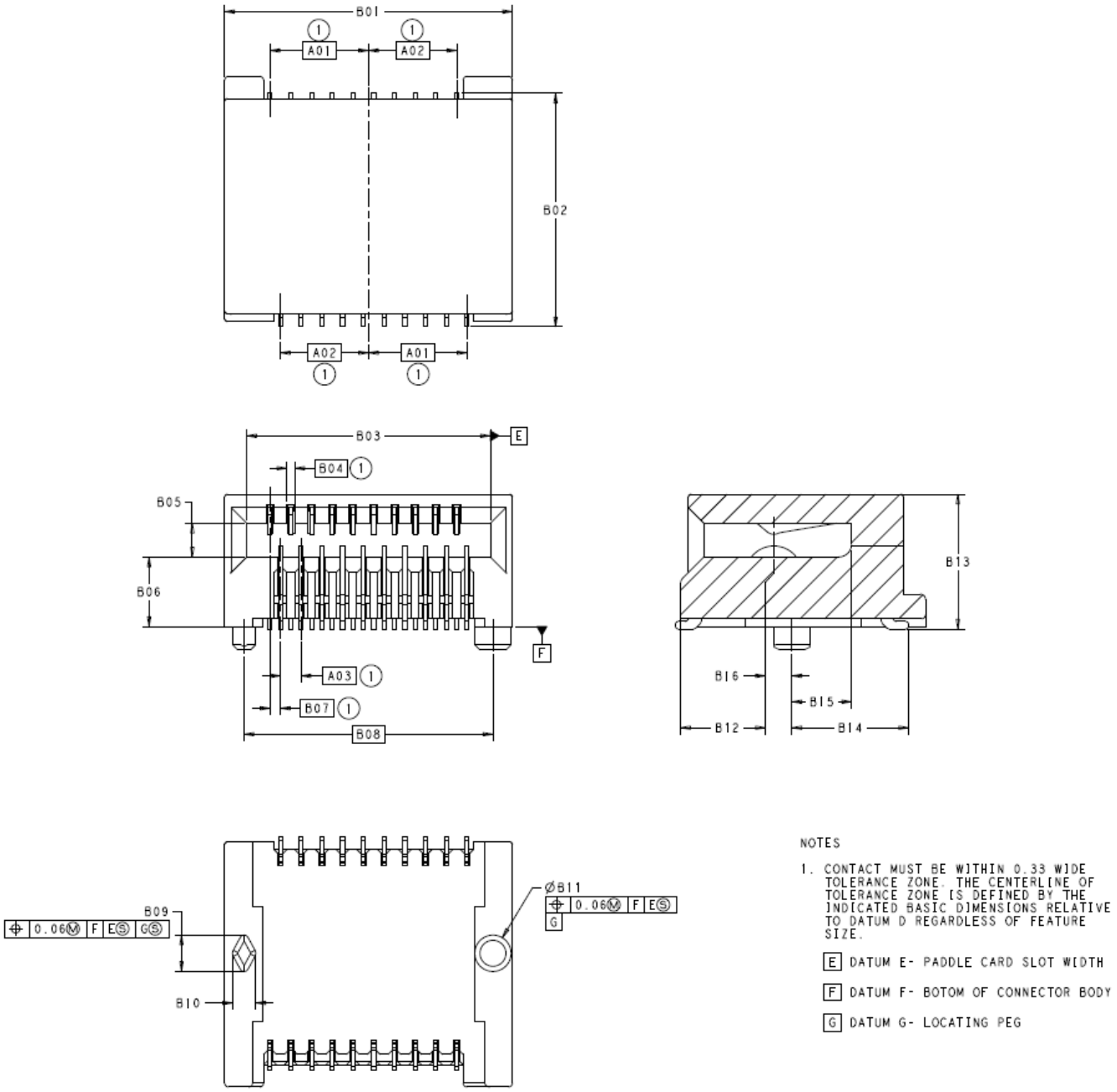
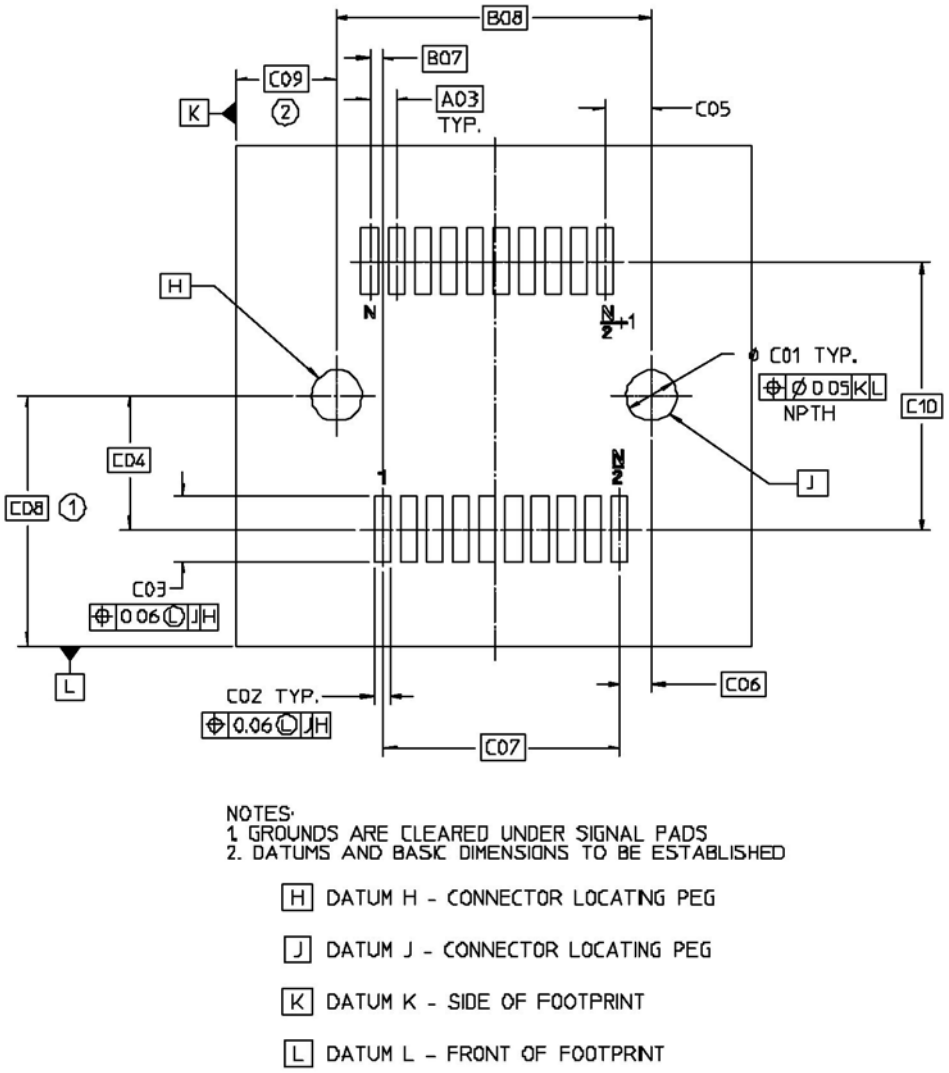


FIGURE 5-2 BOARD SIDE CONNECTOR

TABLE 5-2 BOARD SIDE CONNECTOR DIMENSIONS

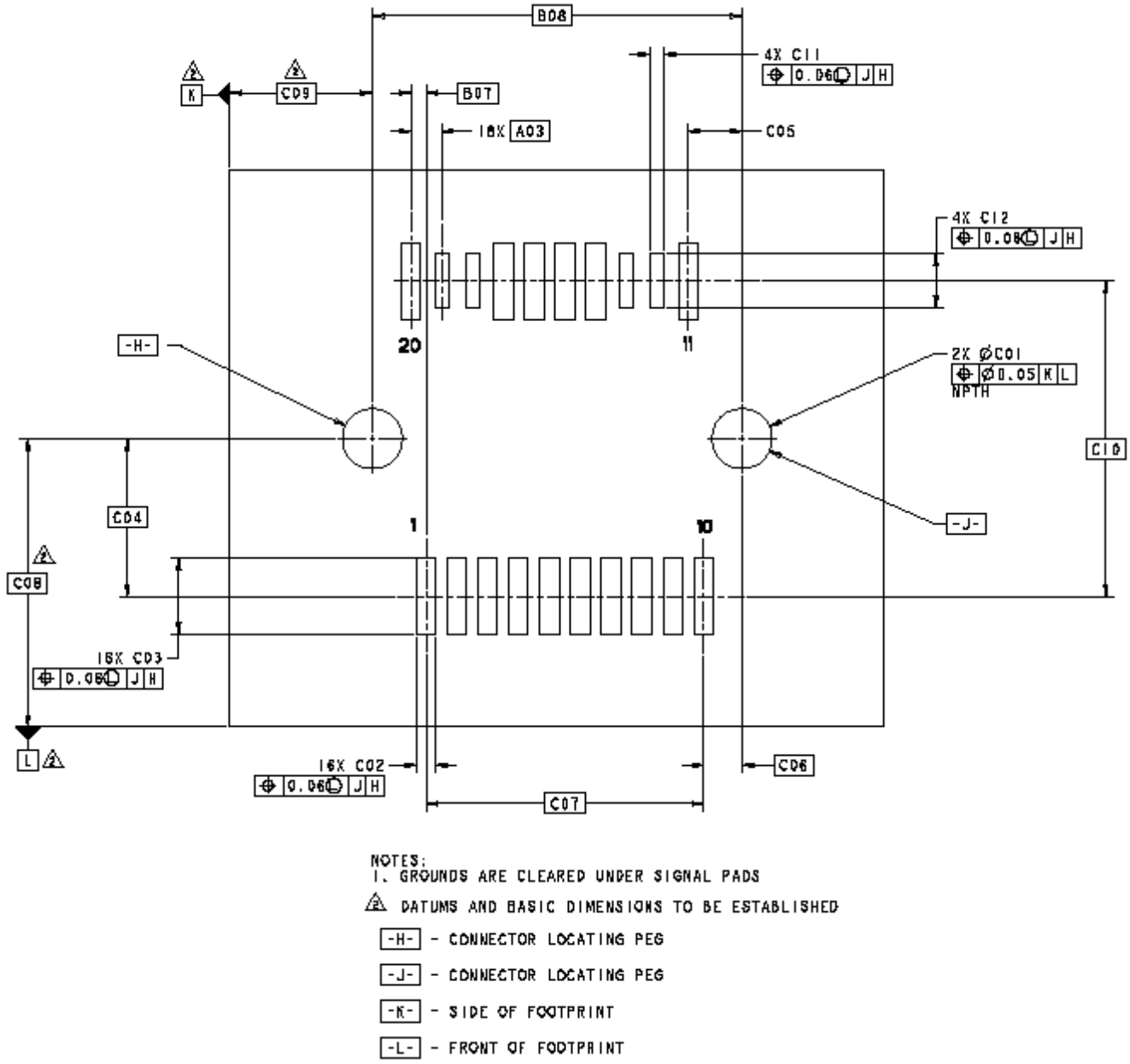
Designator	Description	mm	Tolerance
A01	CL to last	3.80	Basic
A02	CL to first	3.40	Basic
A03	Contact pitch within row	0.80	Basic
B01	Overall width	11.20	Maximum
B02	Overall depth	9.20	Maximum
B03	Paddle card slot width	9.40	+/-0.05
B04	Contact tolerance zone	0.33	Maximum
B05	Paddle card slot height	1.35	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



Note 2: Datums and Basic dimensions to be established by the board designer.

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

Note 2: Datums and Basic dimensions to be established by the board designer.

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

TABLE 6-2 ELECTRICAL REQUIREMENTS

Description	Requirement	Procedure
Current	0.5 A per contact	
Voltage	30 VDC per contact	
Low Level Contact Resistance	Baseline	EIA 364-23 20 mVDC, 10 mA
Insulation Resistance	1000 Megaohms minimum between adjacent contacts	100 VDC
Dielectric Withstanding Voltage	No defect or breakdown between adjacent contacts	300 VDC minimum for 1 minute

TABLE 6-3 MECHANICAL REQUIREMENTS

From SFF-8084

Items	Conditions	Acceptance Limits	Unit
Durability for Connector	EIA 364-09 Durability cycles are in Table 6-1, but the number is 250, not 100	100	Cycles
Durability for Mating Paddle Card	EIA 364-09 Table 6-1 has no spec for the paddle card	50	Cycles
Mating Force	EIA 364-13: Measurement speed: 12.7 mm per minute maximum Same procedure but values differ	30 Max	N
Un-mating Force	EIA 364-13: Measurement speed: 12.7 mm per minute maximum with retention latch disengaged Same procedure but values differ	20 Max	N

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

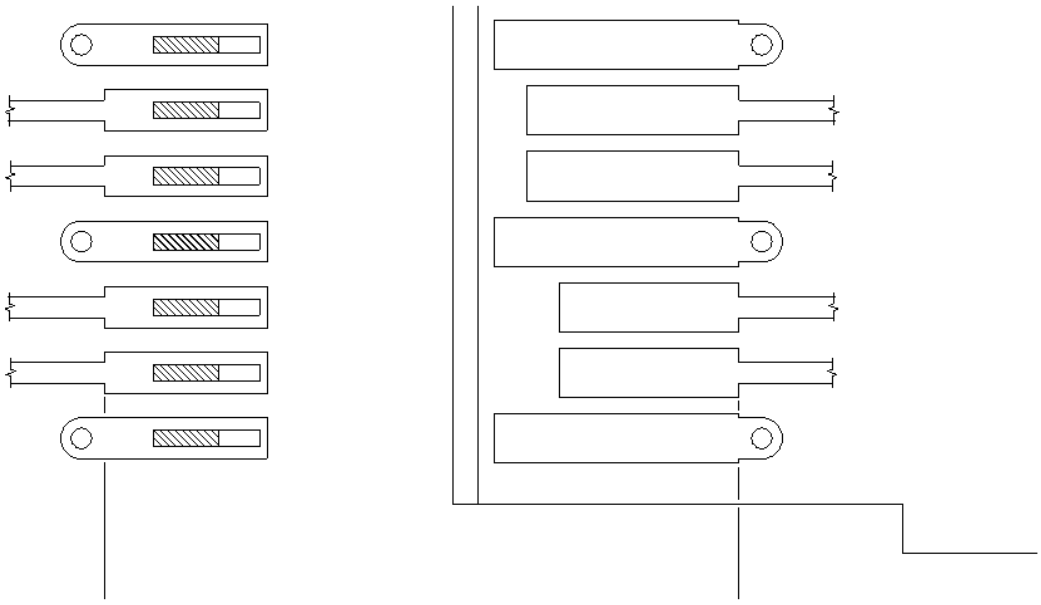
Description	Requirement	Procedure
Mating Force	150N maximum	EIA 364-13
Un-mating Force	50N maximum	EIA 364-13
Vibration	- No Damage - No discontinuity longer than 1 microsecond allowed. - 20 milliohms maximum change from initial (baseline) contact resistance	EIA 364-28
Mechanical Shock	- No Damage -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

TABLE 6-4 ENVIRONMENTAL REQUIREMENTS

Description	Requirement	
Storage Temperature	-20C to +85C degrees	
Humidity	80 percent Relative 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