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SFF Committee

SFF-8661

Specification for

QSFP+ 4X Pluggable Module

Rev 2.3 September 13, 2014

Secretariat: SFF Committee

Abstract: This specification defines the mechanical specifications for the QSFP+ Pluggable Module/Plug Formfactor.

The mechanical dimensioning allows backwards mechanical compatibility between QSFP+ Pluggable Modules and Cable Plugs plugged into most QSFP+ cages which have been implemented to SFF-8436. The EMI leakage is expected to be similar to that when QSFP+ modules and cages are mated.

Superior EMI performance can only be expected with mated combinations of Pluggable modules/Cable plugs and cages.

This specification provides a common reference for systems manufacturers, system integrators, and suppliers, of module style interconnects. 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 in this specification does not assure that the specific component is actually available from suppliers. If such is supplied it shall comply with this specification to achieve interoperability between suppliers.

Support: This specification is supported by the identified member companies of the SFF Committee.

POINTS OF CONTACT:

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EXPRESSION OF SUPPORT BY MANUFACTURERS

The following member companies of the SFF Committee voted in favor of this industry specification.

All Best
AMI
Amphenol
Broadcom
Cinch
ETRI
FCI
Finisar
Foxconn
Hewlett Packard
HGST
JDS Uniphase
Jess-Link
Lotes Tech
LSI
Molex
NetApp
NetLogic uSyst
Oclaro
Panduit
QLogic
Seagate
Sumitomo
Sun Microsystems
TE Connectivity
Volex

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

Applied Micro
Avago
Dell Computer
EMC
Emulex
Luxshare-ICT
Sandisk
Shenzhen
Toshiba
Xyratex

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:

December 28, 2010:
Section 3:
  Divided Figure 3-1 into two figures (3-1 and 3-2) and updated titles accordingly
Section 4:
  Added "Datum Definitions" table
  Updated Figure 4-1 with the following changes:
    Added "Module/Plug" description to top view
    Added appropriate SFF document reference to each view
    Extended datum line through all 3 views
    Replaced "SEE FIGURES 12A AND 12B" WITH "EMI SOLUTION DEPENDENT"
Section 5:
  Updated Figure 5-1 with the following changes:
    Added note triangle 2 to 32 MIN. dimension
    Added 19 MAX., 13.5 REF., 3.4 MAX. and 1.6 MAX. dimensions
  Updated Figure 5-2 with the following changes:
    Added "MAX." and "MIN." to 1.10 / 0.55 dimension (View K-K)
  Updated Figure 5-3 with the following changes:
    Replaced SFP+ PCB with QSFP+ PCB
  Updated description of Figure 5-3
Section 6:
  Updated title (previously was Section 7)
  Replaced Table 7-1 AND 7-2 (SFP+ requirements) with Table 6-1
    Added text to clarify that connector is included in module insertion/extraction

June 12, 2011
Global
  Removed redundant use of 25G throughout body
  All references to 25G were replaced by 32 Gb/s
  Specification Titles updated to current usage
  Added Table of Contents

January 30, 2012
  All references to 32 Gb/s were replaced by 28 Gb/s

May 21, 2012
  Expanded list of Industry Documents

July 7, 2012
  Figure 5-1 was redrawn
    o Note 4 was clarified
    o Note 9 re higher wattage models added
    o length of transceiver outside of cage restored to the 20 Max of the MSA

Rev 1.7 May 22, 2013
 - Corrected title (removed 'Style')

Rev 1.8 July 29, 2013
- Identified Datums to be corrected on Figure 4-1, Figure 5-1 and Figure 5-2

Rev 1.9 October 16, 2013
- Replaced Figure 4-1
    o Sidebar shows how Style A and B create a common figure
- Updated Figure 5-1
- Updated Figure 5-2
  o Added Datums D and H to Detail 1
- Revised Table 5-1 (was 6-1) cage retention force from 180N to 125N

Rev 2.0 February 21, 2014
- Replaced reference to SFF-8436 with EIA 964 in 2-1
- Replaced figures 4-1, 5-1, 5-2 to improve quality
- Deleted two rows in Table 6-1 that did not apply to the Plug/Module

Rev 2.1 May 25, 2014
- Restored two rows in Table 6-1 that should not have been deleted

Rev 2.2 August 7, 2014
- Replaced Figure 5-2 (the view of section J-J had the radius 0.05 MIN and the dimension 29.60 REF pointing to the wrong location).

Rev 2.3 September 13, 2014
- Removed references to 28 Gb/s

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.

TABLE OF CONTENTS

FIGURES

TABLES

SFF Committee --

QSFP+ 4X Pluggable Module

1 Scope

This specification defines the terminology and mechanical requirements for a pluggable transceiver module/plug. This specification is also intended to facilitate the implementation of the 1 x "n" ganged and the 2 x "n" stacked cage configurations based on the mechanical form factor defined in this specification.

The need for this specification became evident when it was realized that some QSFP+ modules and cage designs do not meet the needs for the higher data rates. The QSFP+ is an improved transceiver style which has enhanced EMI characteristics when mated with a cage designed for the module. Please note that there are additional cage requirements specified in this document to allow proper function of the modules in application. These improvements make this Pluggable module/plug suitable for current QSFP+ applications as well as those at higher transfer rates.

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 documents are relevant.

- Ethernet IEEE 802.3ba 40G
- Ethernet IEEE 802.3bj 100G
- 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
- EIA-964 QSFP+ 10 Gb/s 4X Pluggable Transceiver
- SFF-8024 SFF Committee Cross Reference to Industry Product Names
- SFF-8410 High Speed Serial Testing for Copper Links
- SFF-8635 QSFP+ 10 Gb/s 4X Pluggable Transceiver Solution (QSFP10)
- SFF-8662 QSFP+ 28 Gb/s 4X Connector (Style A)
- SFF-8665 QSFP+ 28 Gb/s 4X Pluggable Transceiver Solution (QSFP28)
- SFF-8672 QSFP+ 28 Gb/s 4X Connector (Style B)
- SFF-8682 QSFP+ 4X Connector
- SFF-8683 QSFP+ Cage
- SFF-8685 QSFP+ 14 Gb/s 4X Pluggable Transceiver Solution (QSFP14)

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).

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 SFF Specifications, the following definitions apply:

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.

Dimension, Reference: 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.

3 General Description

This specification defines the complete mechanical dimensions of the QSFP+ Pluggable transceiver module/Cable plug. This Pluggable module/plug provides interoperability and EMI control for the QSFP system.

The dimensions for the module/plug are normative.

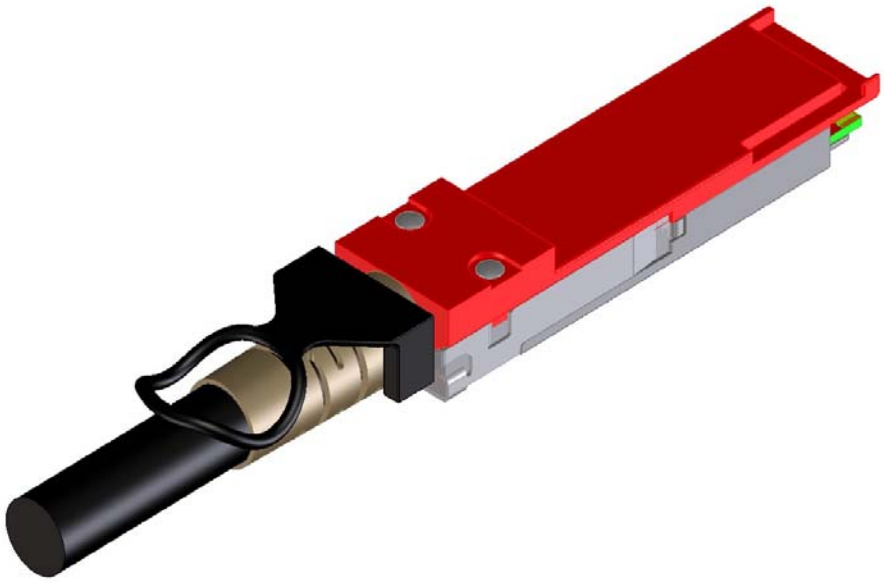


FIGURE 3-1 TYPICAL CABLE PLUG

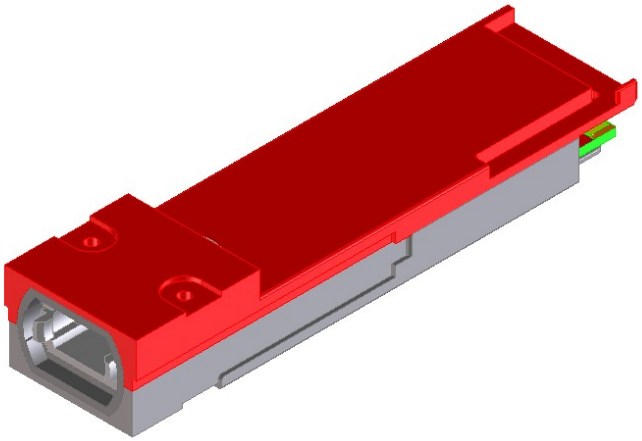


FIGURE 3-2 TYPICAL PLUGGABLE MODULE

4 Datums

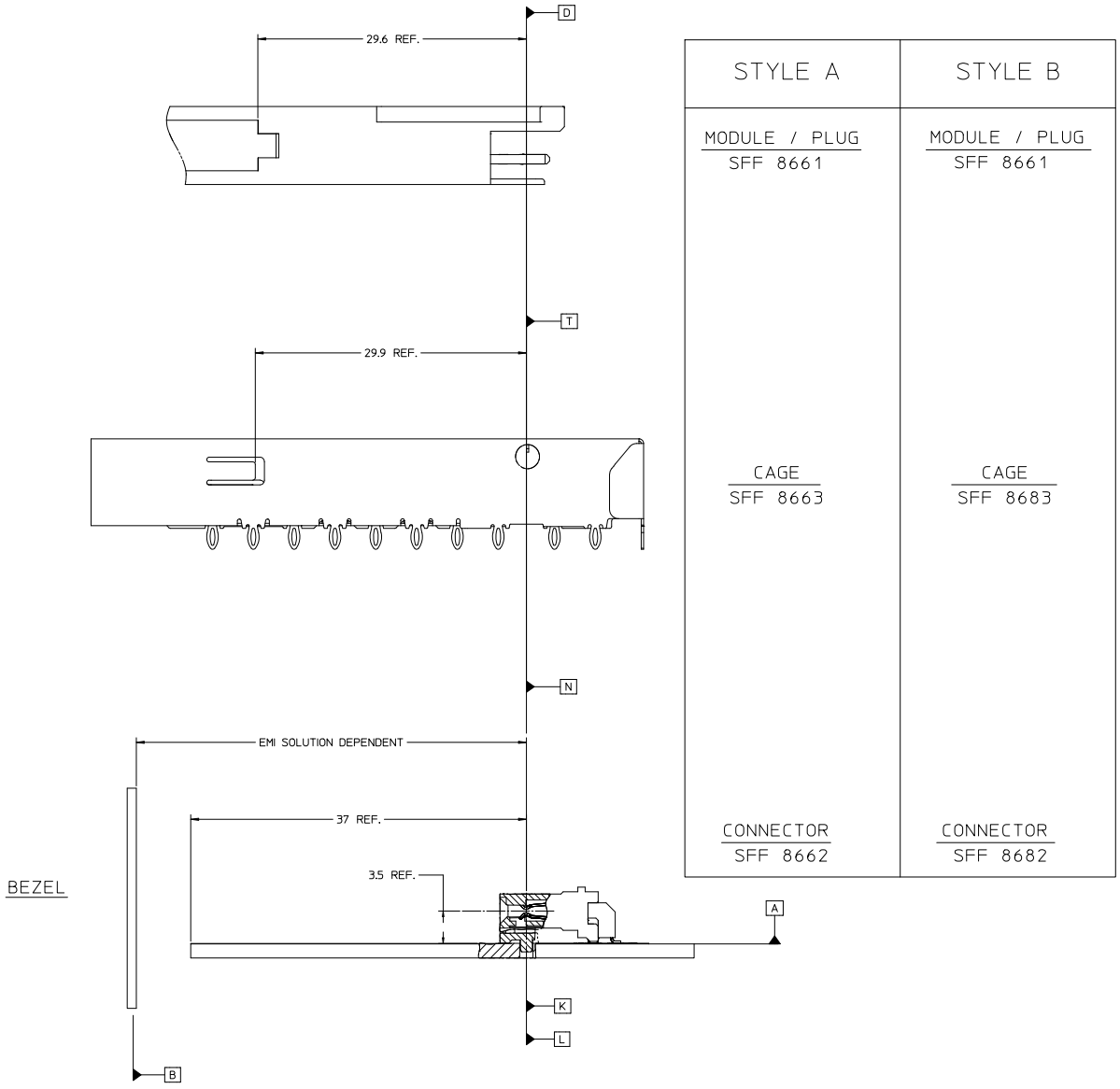


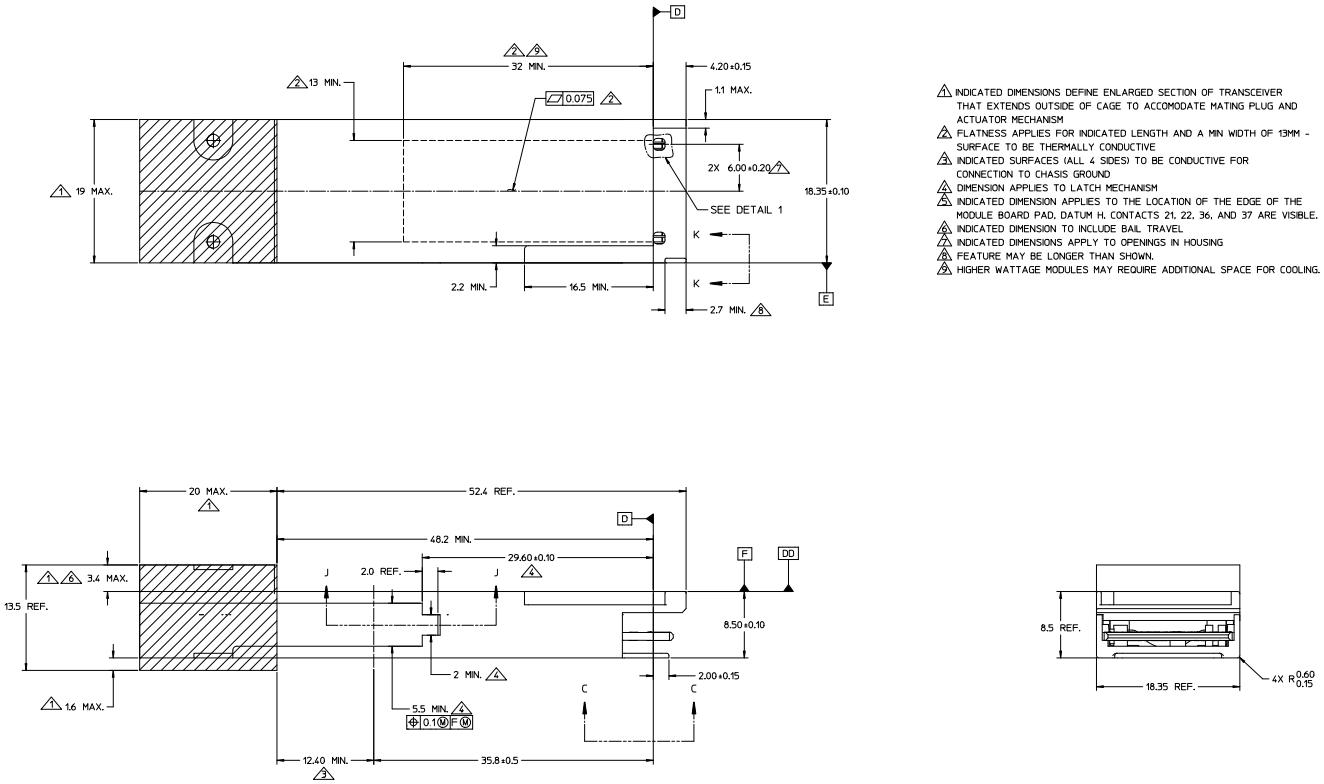
FIGURE 4-1 DATUM DEFINITIONS

TABLE 4-1 DATUM DEFINITIONS

Datum	Description
A	Host Board Top Surface
B	Centerline of bezel
D	*Hard stop on Module
E	**Width of Module
F	Height of Module housing
H	Leading edge of signal contact pads on Module pc board
J	Top surface of Module pc board
K	*Host board thru hole #1 to accept connector guide post
L	*Host board thru hole #2 to accept connector guide post
N	*Connector alignment pin
T	*Hard stop on cage
AA	**Connector slot width
DD	Top surface of connector backshell
*Datums D, K, L, N and T are aligned when assembled.	
**Centerlines of Datums AA, E and Z are aligned on the same vertical axis.	
***All dimensions shown are in millimeters.	

5 Pluggable Module

5.1 Dimensions



1. INDICATED DIMENSIONS DEFINE ENLARGED SECTION OF TRANSCEIVER THAT EXTENDS OUTSIDE OF CAGE TO ACCOMODATE MATING PLUG AND ACTUATOR MECHANISM
2. FLATNESS APPLIES FOR INDICATED LENGTH AND A MIN WIDTH OF 13MM - SURFACE TO BE THERMALLY CONDUCTIVE
3. INDICATED SURFACES (ALL 4 SIDES) TO BE CONDUCTIVE FOR CONNECTION TO CHASIS GROUND
4. DIMENSION APPLIES TO LATCH MECHANISM
5. INDICATED DIMENSION APPLIES TO THE LOCATION OF THE EDGE OF THE MODULE BOARD PAD, DATUM H. CONTACTS 21, 22, 36, AND 37 ARE VISIBLE.
6. INDICATED DIMENSION TO INCLUDE BAIL TRAVEL
7. INDICATED DIMENSIONS APPLY TO OPENINGS IN HOUSING
8. FEATURE MAY BE LONGER THAN SHOWN.
9. HIGHER WATTAGE MODULES MAY REQUIRE ADDITIONAL SPACE FOR COOLING.

FIGURE 5-1 BASIC VIEWS

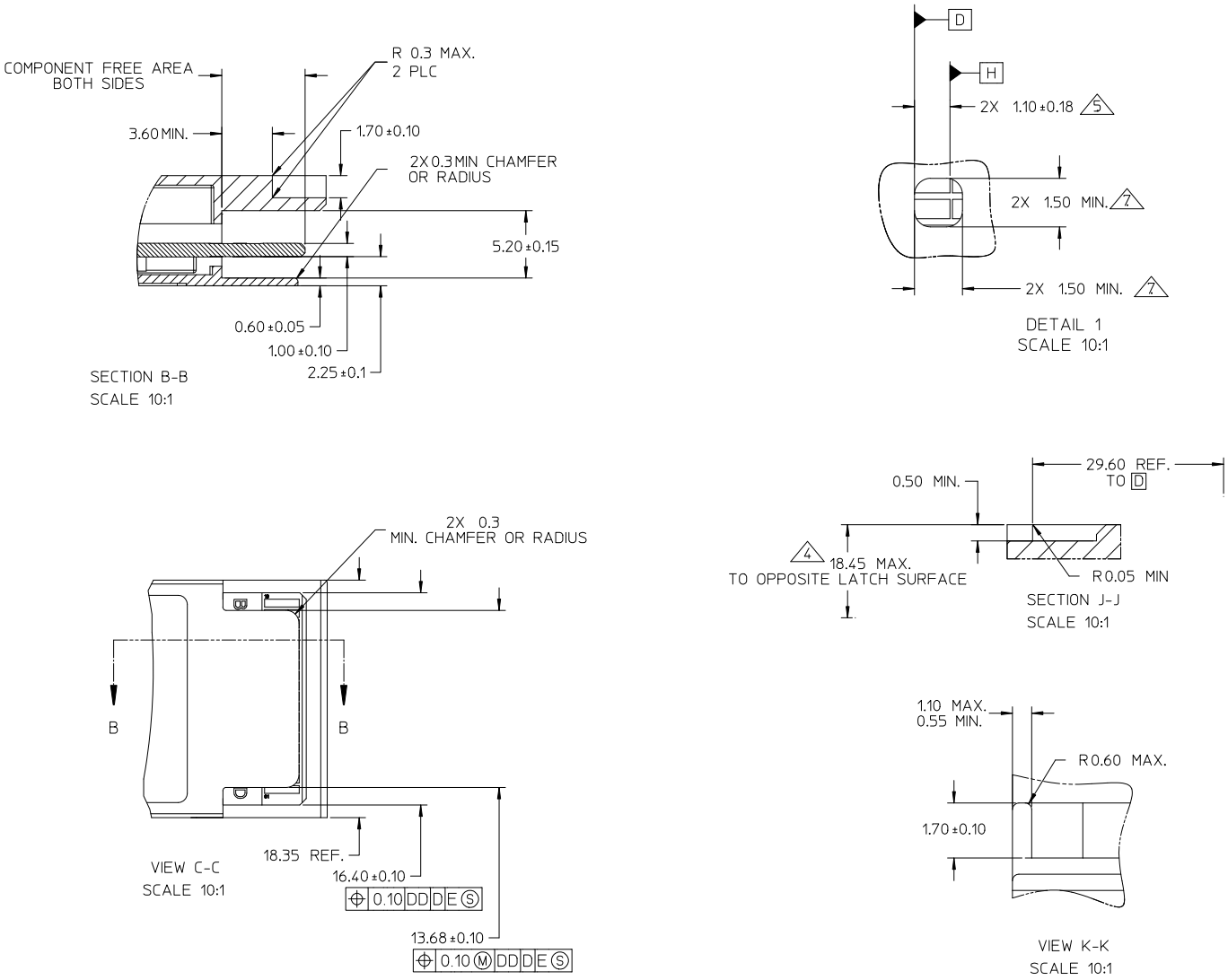


FIGURE 5-2 ENLARGED VIEW OF PLUG

5.2 Electrical Interface

The QSFP+ module/plug contains a printed circuit board that mates with an appropriately designed connector. The pads are designed for a sequence mating:

First mate --> Ground contacts
Second mate --> Power contacts
Third mate --> Signal contacts

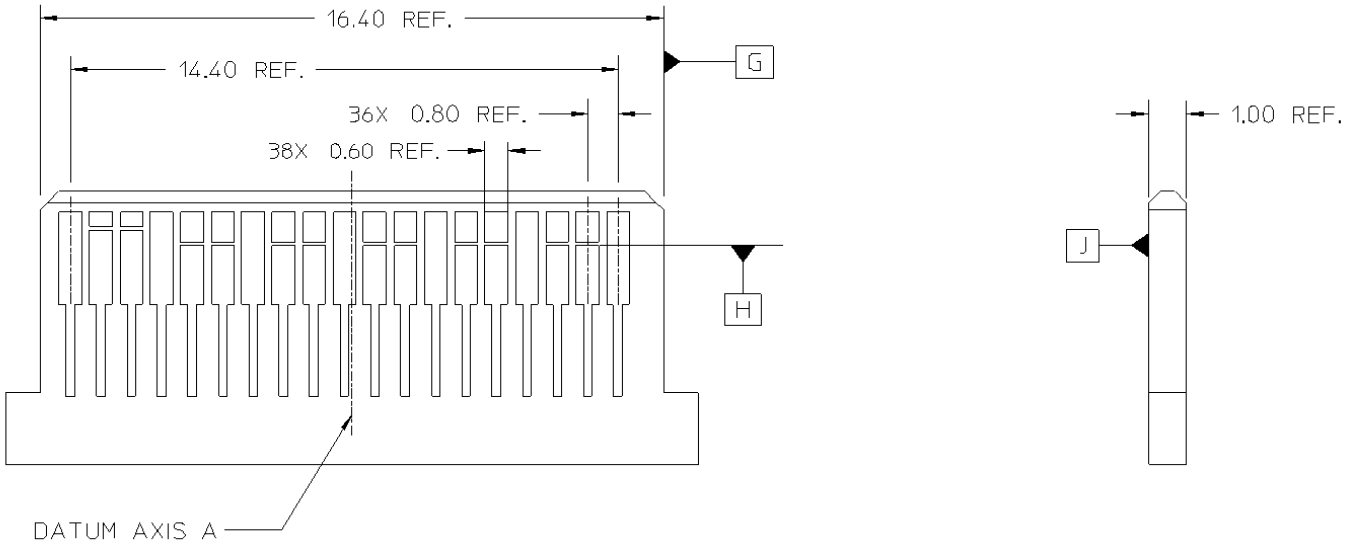


FIGURE 5-3 MODULE ELECTRICAL INTERFACE

View is shown for reference only
See the appropriate specification for dimensional values
See the appropriate standard for the pad layout and definitions

5.3 Insertion, Extraction and Retention Forces

TABLE 5-1 INSERTION, EXTRACTION AND RETENTION FORCES

Measurement	Min	Max	Units	Comments
QSFP+ Module Insertion	0	40	N	Test to include cage and connector
QSFP+ Module Extraction	0	30	N	Test to include cage and connector
QSFP+ Module Retention	90	N/A	N	No damage to module below 90N
Latch strength (cage retention)	125	N/A	N	No damage to cage latch below 125N
Insertion / removal cycles, connector / cage	100	N/A	Cycles	Number of cycles for the connector and cage with multiple modules
Insertion / removal cycles, QSFP+ Module	50	N/A	Cycles	Number of cycles for an individual module into a cage and connector