SFF-TA-1027

Specification for

QSFP2 Cage, Connector, & Module Specification

Rev 1.0 May 30, 2023

SECRETARIAT: SFF TA TWG
This specification is made available for public review at https://www.snia.org/sff/specifications. Comments may be submitted at https://www.snia.org/feedback. Comments received will be considered for inclusion in future revisions of this specification.

The description of the connector in this specification does not assure that the specific component is available from connector suppliers. If such a connector is supplied, it should comply with this specification to achieve interoperability between suppliers.

ABSTRACT: This specification defines the mechanical requirements of the pluggable QSFP2 cages, connectors, and modules that enable QSFP operation at higher speeds. This specification defines both 1x1 and 2x1 stacked cage/ connector configurations. All combinations of cages and connectors defined in this specification are backwards compatible to accept legacy QSFP28 and QSFP+ modules. In addition, the module defined is compatible with QSFP, QSFP+, QSFP28, and QSFP56 hosts for operation at lower speeds with options for potential improved thermal performance.

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FOREWORD

Much of the development work on this specification was done by the QSFP-DD MSA and given to the SFF TA TWG, a SNIA Technical Affiliate Technical Working Group, for continued development. Since its formation of the SFF Committee in August 1990, the membership has included a mix of companies which are leaders across the industry. In 2016, the SFF Committee became a Technical Affiliate of SNIA (Storage Networking Industry Association).

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

REVISION HISTORY

Rev 1.0 *May 30, 2023:*

- First Publication

CONTENTS

FIGURES

TABLES

1. Scope

This specification defines the mechanical requirements of the pluggable QSFP2 cages, connectors, and modules that enable QSFP operation at higher speeds. This specification defines:

- Connector
  - 1x1 (Styles A & B)
  - 2x1 (Styles A, B, C, & D)
- Cage (1x1 & 2x1)
- Module (Types 1, 2, 2A, & 2B)

All combinations of cages and connectors defined in this specification are backwards compatible to accept legacy QSFP28 and QSFP+ modules. In addition, the module defined is compatible with QSFP, QSFP+, QSFP28, and QSFP56 hosts for operation at lower speeds with options for potential improved thermal performance. Refer to SFF-8665 for additional information on mating with legacy cages and modules and QSFP2 implementation details including electrical and management interface specifications.

2. References and Conventions

2.1 Industry Documents

The following documents are relevant to this specification:

- ASME Y14.5 Dimensioning and Tolerancing
- EIA-364-1000 Environmental Test Methodology for Assessing the Performance of Electrical Connectors and Sockets Used in Controlled Environment Applications
- QSFP-DD/QSFP-DD800/QSFP112 HW QSFP-DD/QSFP-DD800/QSFP112 Hardware Specification for QSFP DOUBLE DENSITY 8X AND QSFP 4X PLUGGABLE TRANSCEIVERS
- REF-TA-1011 Cross Reference to Select SFF Connectors
- SFF-8661 QSFP+ 4X Module
- SFF-8663 QSFP+ 28 Gb/s Cage (Style A)
- SFF-8665 QSFP+ 4X Pluggable Transceiver Solutions
- SFF-8679 QSFP+ 4X Hardware and Electrical Specification

2.2 Sources

The complete list of SFF documents which have been published, are currently being worked on, or that have been expired by the SFF Committee can be found at https://www.snia.org/sff/specifications. Suggestions for improvement of this specification are welcome and should be submitted to https://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
IEEE	Institute of Electrical and Electronics Engineers (IEEE)	https://www.ieee.org
OIF	Optical Internetworking Forum (OIF)	https://www.oiforum.com
QSFP-DD	QSFP-DD MSA	http://www.qsfp-dd.com

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 purposes of this document, the following keywords, acronyms, and definitions apply.

3.1 Keywords

May: 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.

Shall: Indicates a mandatory requirement. Designers are required to implement all such mandatory requirements to ensure interoperability with other products that conform to this specification.

Should: Indicates flexibility of choice with a strongly preferred alternative.

3.2 Acronyms and Abbreviations

PCB: Printed Circuit Board
Ra: The profile surface roughness parameter representing the arithmetic average of the surface roughness

3.3 Definitions

Basic (dimension): The theoretical exact size, profile, orientation, or location of a feature. It is used as the basis from which permissible variations are established by tolerances in notes or in feature control frames (GD&T).

Connector: Each half of an interface that, when joined together, establish electrical contact and mechanical retention between two components. In this specification, the term connector does not apply to any specific gender; it is used to describe the receptacle, the plug or the card edge, or the union of receptacle to plug or card edge. Other common terms include: connector interface, mating interface, and separable interface.

Contacts: A term used to describe connector terminals that make electrical connections across a separable interface.

Datum: A point, line, plane, etc. assumed to be exact for the purposes of computation or reference, as established from actual features, and from which the location or geometric relationship of either feature is established.

JL: A connector contact configuration that describes the tail direction; connector contact tails in different rows point in opposite same directions ("J" towards front of connector, "L" towards back of connector) as shown in Figure 3-1a.

LL: A connector contact configuration that describes the tail direction; connector contact tails in different rows point in the same direction (towards the back of the connector), as shown in Figure 3-1b.

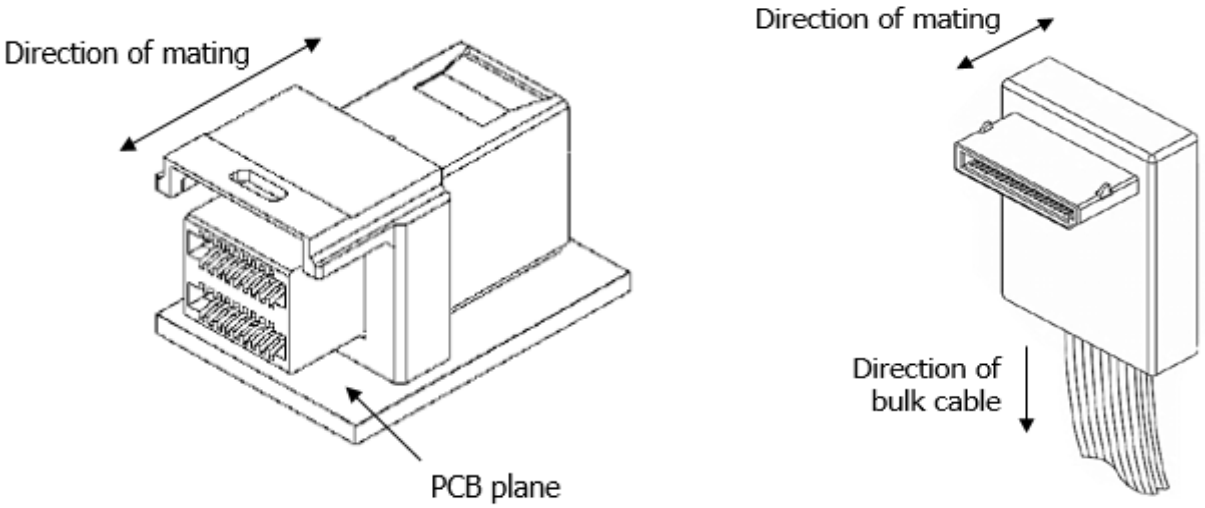
a. "JL" Tail Configuration **b. "LL" Tail Configuration**

Figure 3-1 Connector Contact Configurations

Module: In this specification, module may refer to a plug assembly at the end of a copper (electrical) cable (passive or active), an active optical cable assembly, an optical transceiver, or a loopback.
Power class: A classification that dictates the maximum power a module is permitted to consume.

Reference (dimension): A dimension provided for information or convenience. It has no tolerance and is not to be used for inspection or conformance. It can be calculated from other tolerance dimensions or can be found elsewhere on the drawing with a tolerance. If removed, it would have no impact on the defined object or the ability or reproduce it.

Right Angle: A term used to describe either a connector design where the mating direction is parallel to the plane of the printed circuit board upon which the connector is mounted or a cable assembly design where the mating direction is perpendicular to the bulk cable.



a) Right angle connector b) Right angle cable assembly

Figure 3-2 Right Angle Connector and Cable Assembly

Surface mount: A term used to describe a termination style in which solder tails sit on pads on the surface of a PCB and are then soldered to keep the connector or cage in place. Other common terms are surface mount technology or SMT.

Wipe: The distance a contact travels on the surface of its mating contact during the mating cycle as shown in Figure 3-3.

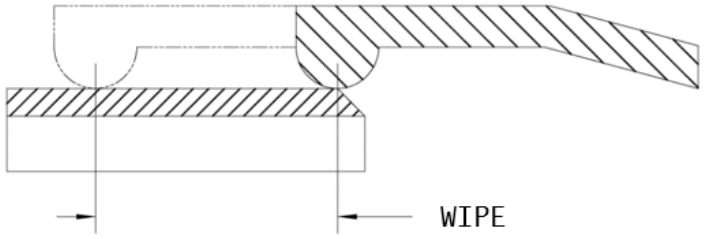


Figure 3-3 Wipe for a Continuous Contact

4. General Description

4.1 Configuration Overview/Descriptions

The QSFP2 connector/ cage/ module system has multiple components:

a. Connector
   A. 1x1 (Footprint Styles A & B)
   B. 2x1 (Footprint Styles A, B, C, & D)
b. Cage (1x1 and 2x1 stacked)
c. Module (Types 1, 2, 2A, & 2B)

Each of these components are detailed in the following sections. For reference, the QSFP2 1x1 cage and connector are shown in Figure 4-1 and the QSFP2 2x1 stacked cage and connector are shown in Figure 4-2. Connectivity for the 1x1 and 2x1 configurations are shown in Table 4-1 and Table 4-2, respectively.

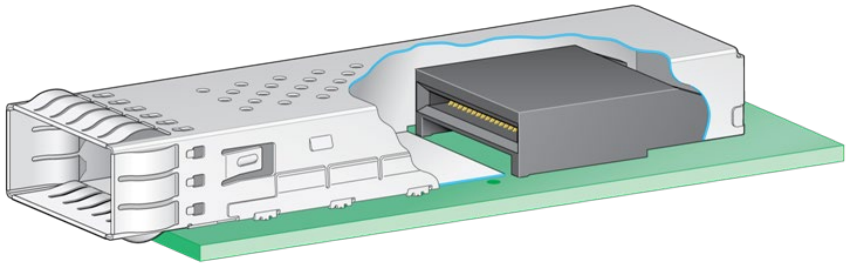


Figure 4-1 QSFP2 1x1 Cage and Connector

Table 4-1 QSFP2 1x1 Connector, Cage, and Module Implementations

1x1 Footprint Style	1x1 Footprint Description	1x1 Cage	Module
Style A	"LL" connector footprint	QSFP2 1x1 Cage (see Note 1), OR SFF-8663 Cage (see Note 2)	Type 1, 2, 2A, or 2B (see Note 3)
Style B	"JL" connector footprint		

NOTES:
1. Refer to Section 6.2.1 for information
2. Refer to SFF-8663 for more information.
3. Refer to Section 7.2 for more information.

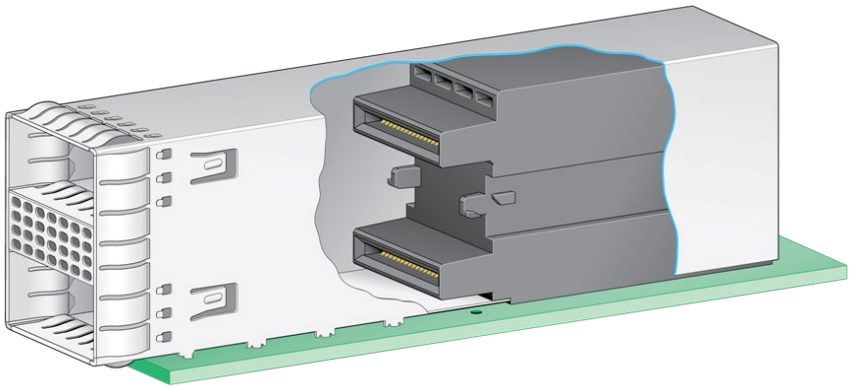


Figure 4-2 QSFP2 2x1 Stacked Cage and Connector

Table 4-2 QSFP2 2x1 Stacked Connector, Cage, and Module Implementations

2x1 Stacked Footprint Style	2x1 Stacked Connector Description	Cage	Module
Style A	"LL" connector footprint with retention pin	QSFP2 2x1 Stacked Cage (see Note 1)	Type 1, 2, 2A, or 2B (see Note 2)
Style B	"JL" connector footprint with retention pin		
Style C	"LL" connector footprint with glue pad		
Style D	"JL" connector footprint with glue pad		
NOTES: 1. Refer to Section 6.2.2 for more information. 2. Refer to Section 7.2 for more information.			

4.2 Contact Numbering

The electrical contacts for the 1x1 connector are numbered as shown in Figure 4-3. The electrical contacts for the 2x1 stacked connector are numbered as shown in Figure 4-4. Additionally, the footprint pad numbering for the 1x1 and 2x1 connectors are shown in Figure 4-5 and Figure 4-6, respectively. Contact numbering on the module paddle card is shown in Figure 7-5.

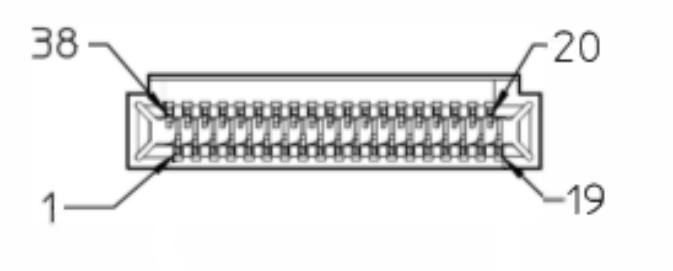


Figure 4-3 QSFP2 1x1 Connector Contact Numbering

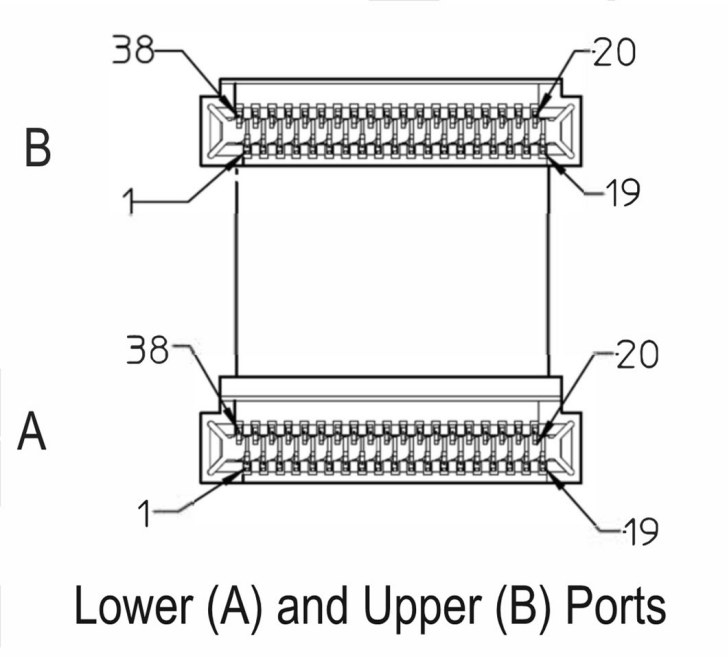


Figure 4-4 QSFP2 2x1 Stacked Connector Contact Numbering

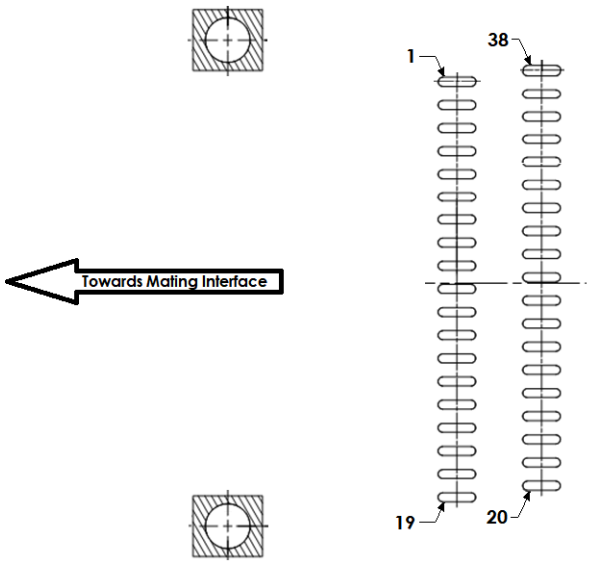


Figure 4-5 QSFP2 1x1 Connector Footprint Pad Numbering

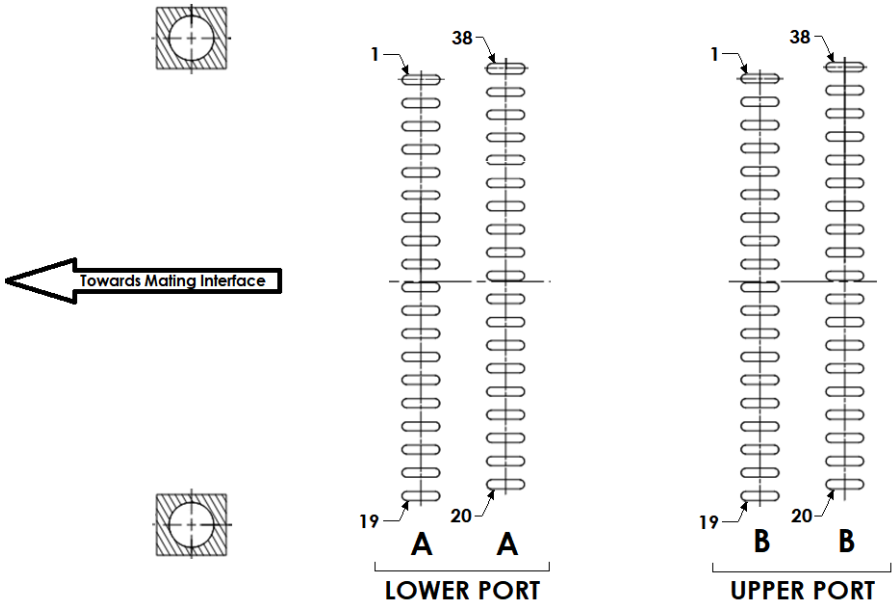


Figure 4-6 QSFP2 2x1 Stacked Connector Footprint Pad Numbering

4.3 Datums

Datum definitions for the 1x1 and 2x1 stacked QSFP2 cages, connectors, and modules are shown in Figure 4-7 and Figure 4-8, respectively. Datum descriptions are provided in Table 4-3. The alignments of some of the datums are noted. To reduce the complexity of the drawings, all dimensions are considered centered unless otherwise specified. Dimensions and tolerancing conform to ASME Y14.5-2009. All dimensions are in millimeters.

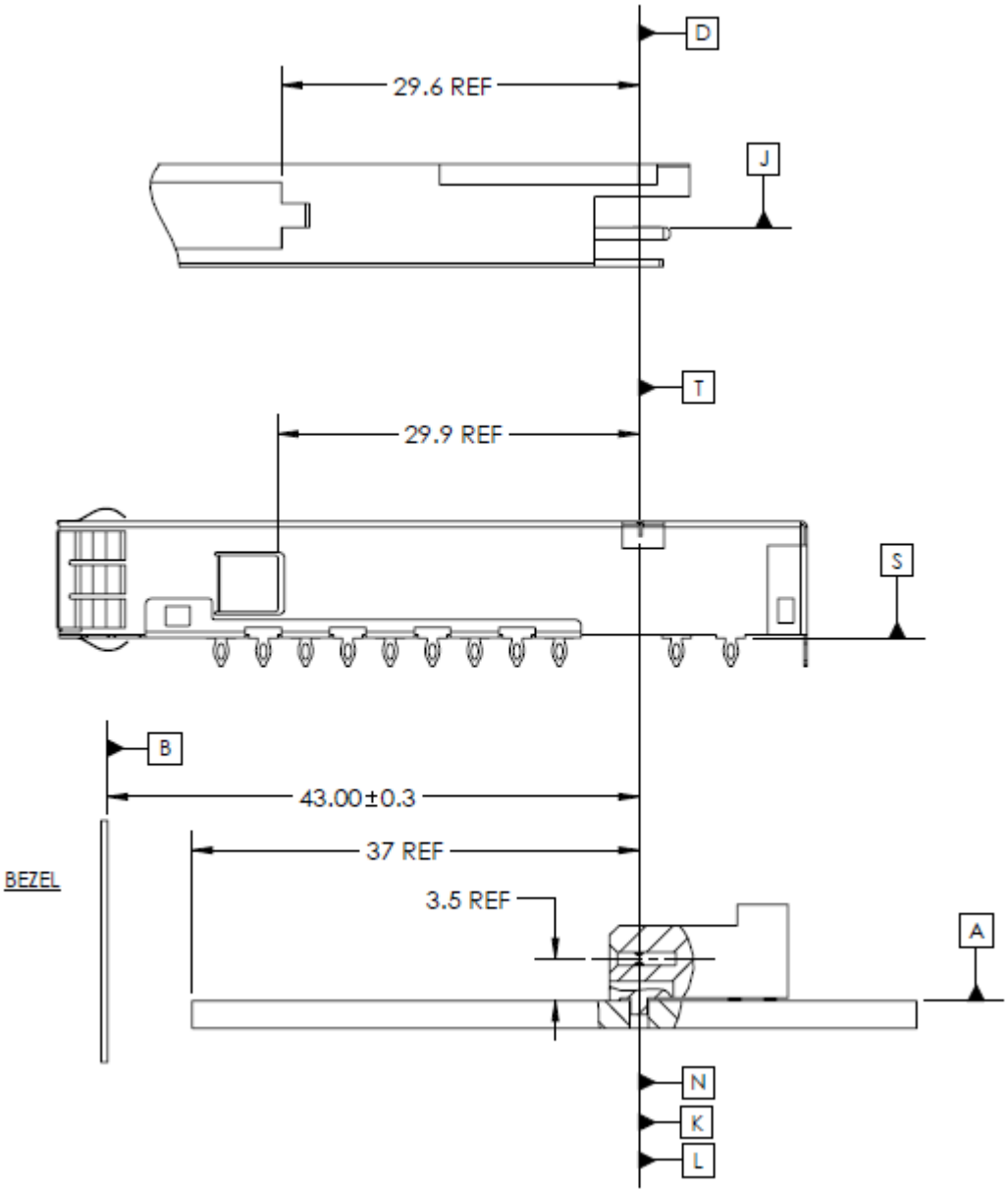


Figure 4-7 QSFP2 Module, 1x1 Connector, and 1x1 Cage Datums

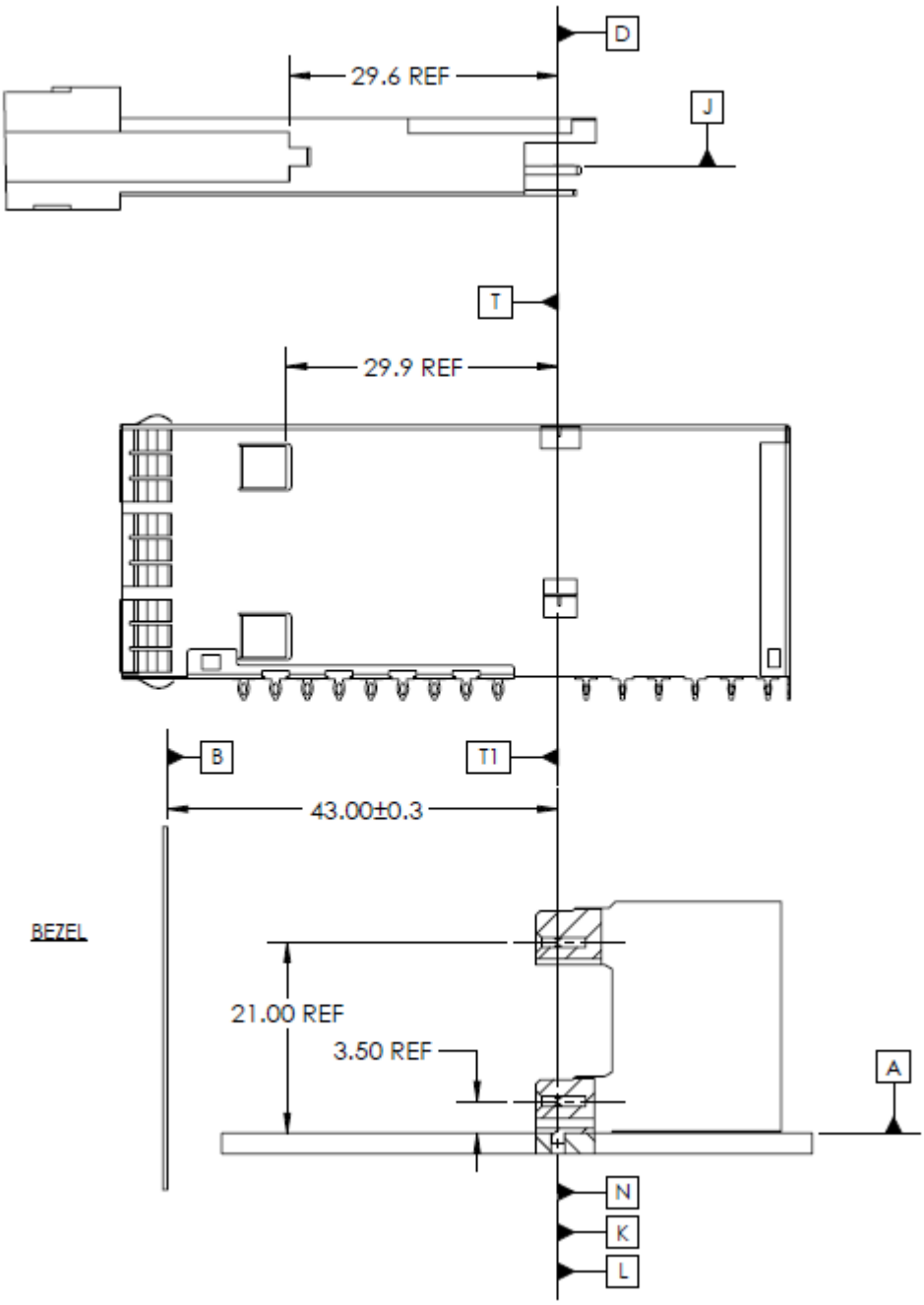


Figure 4-8 QSFP2 Module, 2x1 Stacked Connector, and 2x1 Stacked Cage Datums

Table 4-3 Datum Descriptions

Datum[1]	Description
A	Host Board Top Surface
B	Inside surface of bezel
C	Distance between Connector alignment holes on host PCB[3]
D	Hard stop on module[2]
E	Width of module[3]
F	Height of module housing
G	Width of module pc board[3]
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 guidepost[2]
L	Host board thru hole #2 to accept connector guidepost[2]
M	Width of bezel cut out[3]
N	Connector Alignment Post
P	Vertical Center line of internal surface of cage
S	Seating plane of cage on host board
T	Hard stop on cage[2]
AA	Connector slot width[3]
BB	Seating plane of connector on host board
DD	Top surface of module housing
FF	Centerline of upper port cage height
GG	Centerline of lower port cage height

Notes:
1. All dimensions are in mm.
2. Datums D, K, L, N and T are aligned when assembled (see Figure 4-7 and Figure 4-8).
3. Centerlines of datums C, E, G, M, and AA are aligned on the same vertical plane.

5. Connector Mechanical Specification

5.1 Overview

QSFP2 connectors come in 1x1 and 2x1 stacked configurations. The QSFP2 1x1 connector, shown in Figure 5-1, is a right-angle connector with 38 contacts. It comes in two Footprint Styles, A and B; refer to Section 8.1 for details. The QSFP2 2x1 stacked connector, shown in Figure 5-2, is a right-angle connector with upper and lower ports, both of which contain 38 contacts. It comes in four Footprint Styles: A, B, C, and D; refer to Section 8.2 for details.

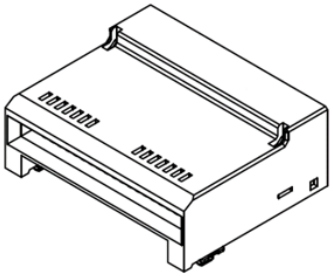


Figure 5-1 QSFP2 1x1 Connector

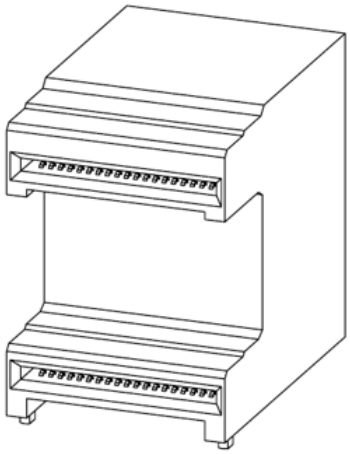


Figure 5-2 QSFP2 2x1 Stacked Connector

5.2 Mechanical Description: Connector

5.2.1 1x1 Connector

QSFP2 1x1 connector front and side views are shown in Figure 5-3. Refer to Section 8.1 for footprint information.

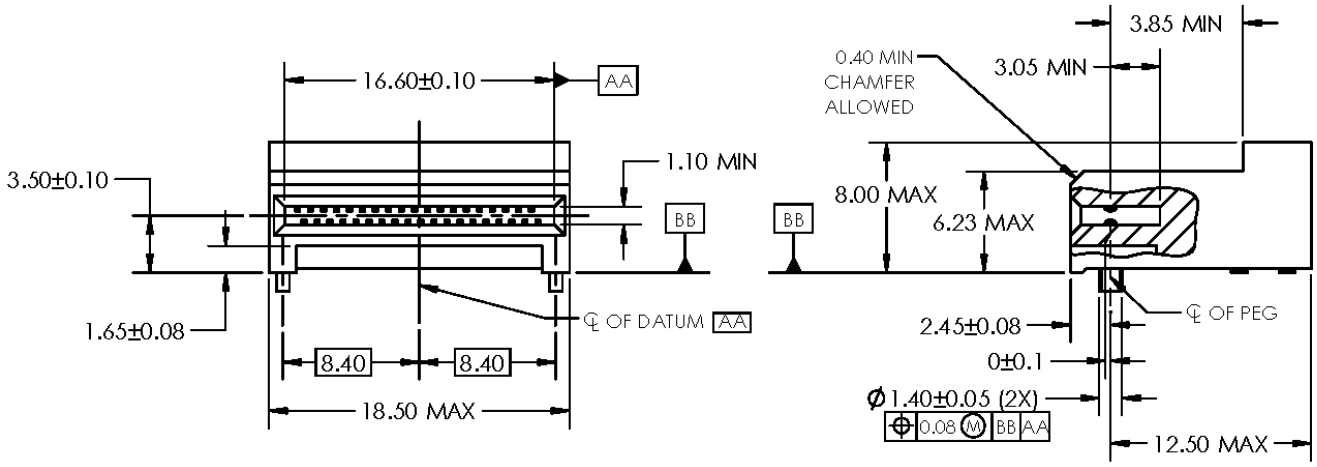


Figure 5-3 QSFP2 1x1 Connector Dimensions

5.2.2 2x1 Stacked Connector

QSFP2 2x1 stacked connector front and side views are shown in Figure 5-4. Refer to Section 8.2 for footprint information.

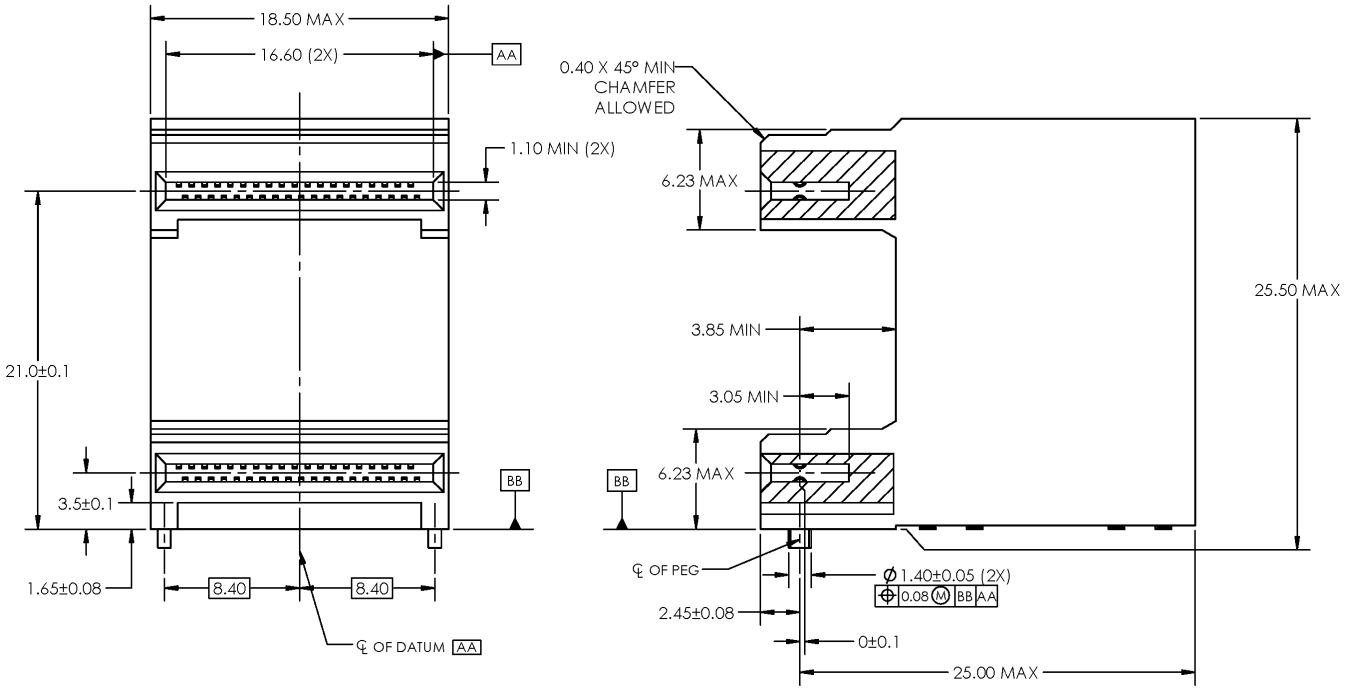


Figure 5-4 QSFP2 2x1 Stacked Connector Dimensions

6. Cage Mechanical Specification

6.1 Overview

Detailed drawings for QSFP2 cages are provided in the following sections. Refer to Section 8 for footprint details and Appendix A for information about bezel openings.

6.2 Mechanical Description: Cage

6.2.1 1x1 Cage

The QSFP2 1x1 cage is illustrated in Figure 6-1 and is backwards compatible with QSFP+ and QSFP28 cages. A detailed drawing is provided in Figure 6-2. The location of the pattern on the host board is application specific. Refer to Section 8.1 for footprint information. Refer to Appendix A for information about bezel openings.

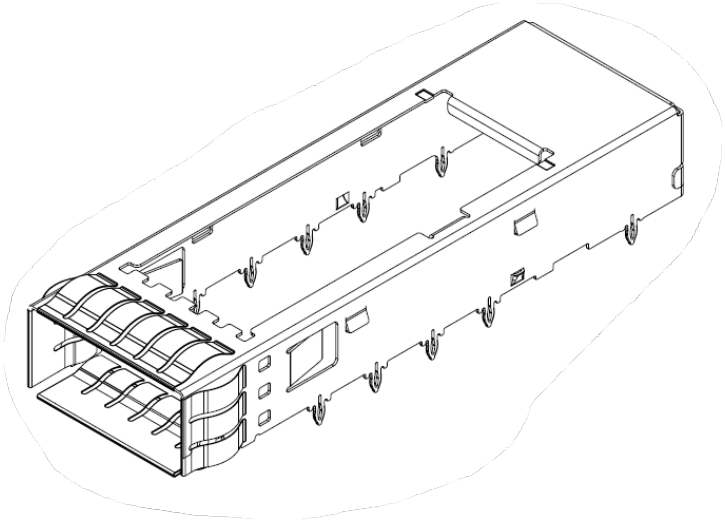


Figure 6-1 QSFP2 1x1 Cage

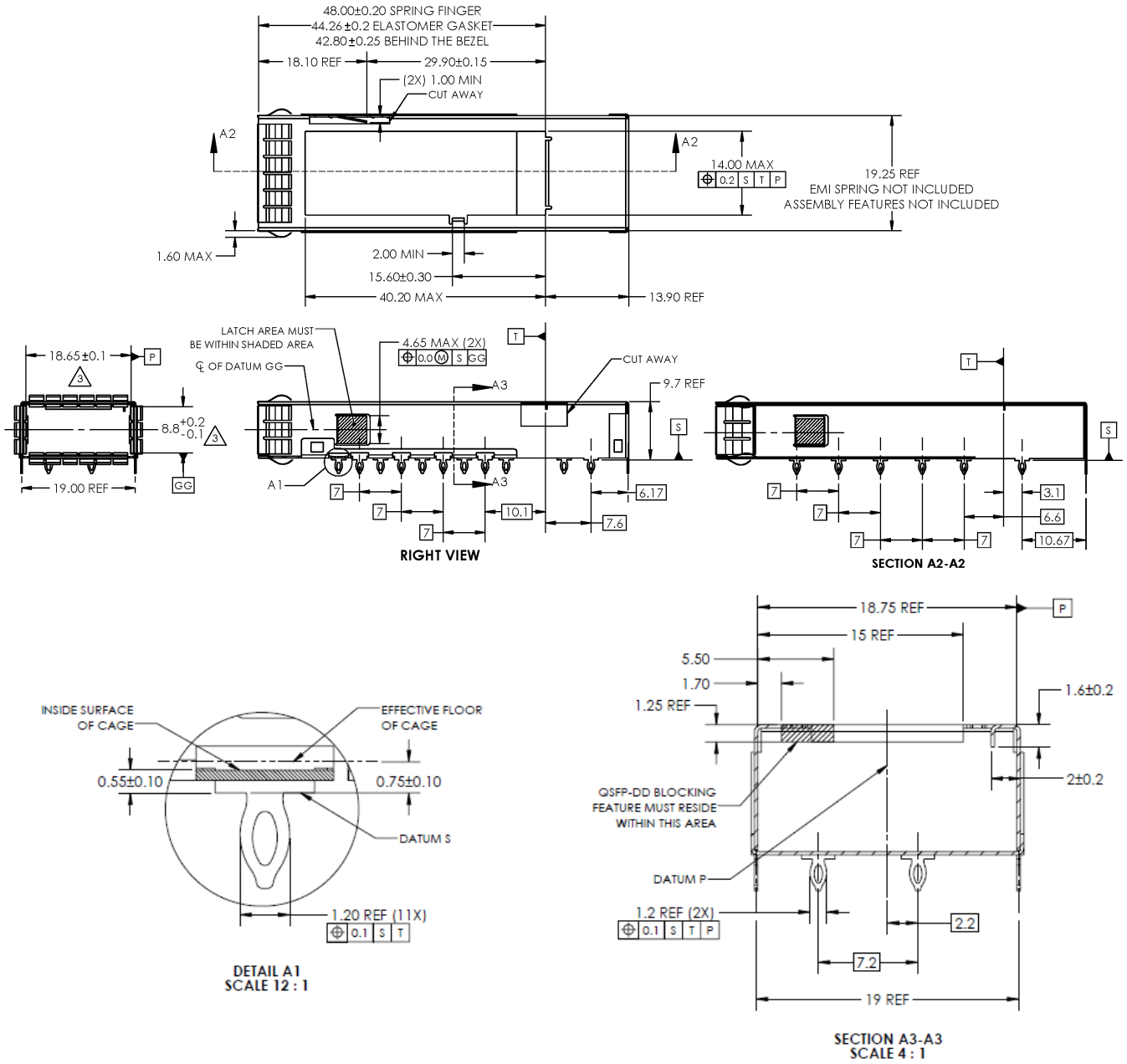


Figure 6-2 QSFP2 1x1 Cage Dimensions (1 of 2)

NOTES: (for QSFP2 1x1 cage dimensions)

1. DIMENSIONS AND TOLERANCING CONFORM TO ASME Y15.5-2009.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSIONS FROM INSIDE SURFACES OF SPRING FINGERS WHEN FULLY DEPRESSED.
4. CONNECTOR REMOVED FOR CLARITY.
5. APPLIES TO ALL SPRING FINGERS ON ALL SIDES.
6. EXTERNAL CAGE DIMENSIONS DO NOT INCLUDE FOLDED ASSEMBLY TABS.
7. LENGTH OF CAGE AND SIGNAL TAILS
8. PRESS FIT CAGE PINS APPLY TO RIGHT SIDE OF CAGE.
9. PRESS FIT CAGE PINS APPLY TO LEFT SIDE OF CAGE.
10. PRESS FIT OFFSET BETWEEN RIGHT AND LEFT SIDE OF CAGE.
11. DIMENSIONS INCLUDE BACK COVER.
12. SIZE AND POSITION OF CAGE AND CONNECTOR PRESS FIT PINS SHALL BE DEFINED BY EACH SUPPLIER BASED UPON THE PCB FORMAT FOOTPRINT LAYOUT.
13. CAVITY FOR HEATSINK IS OPTIONAL.

Figure 6-2 QSFP2 1x1 Cage Dimensions (2 of 2)

6.2.2 2x1 Stacked Cage

The QSFP2 2x1 stacked cage is shown in Figure 6-3. A detailed drawing is provided in Figure 6-4. The location of the pattern on the host board is application specific. Refer to Section 8.2 for footprint information. Refer to Appendix A for information about bezel openings.

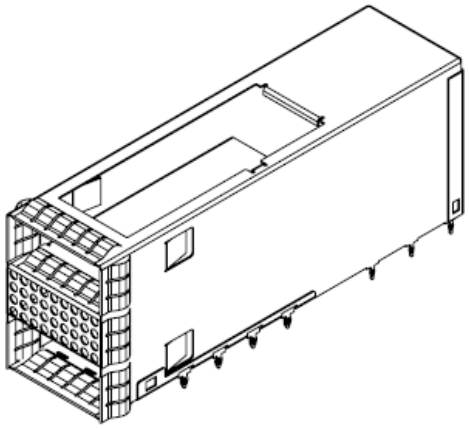


Figure 6-3 QSFP2 2x1 Stacked Cage

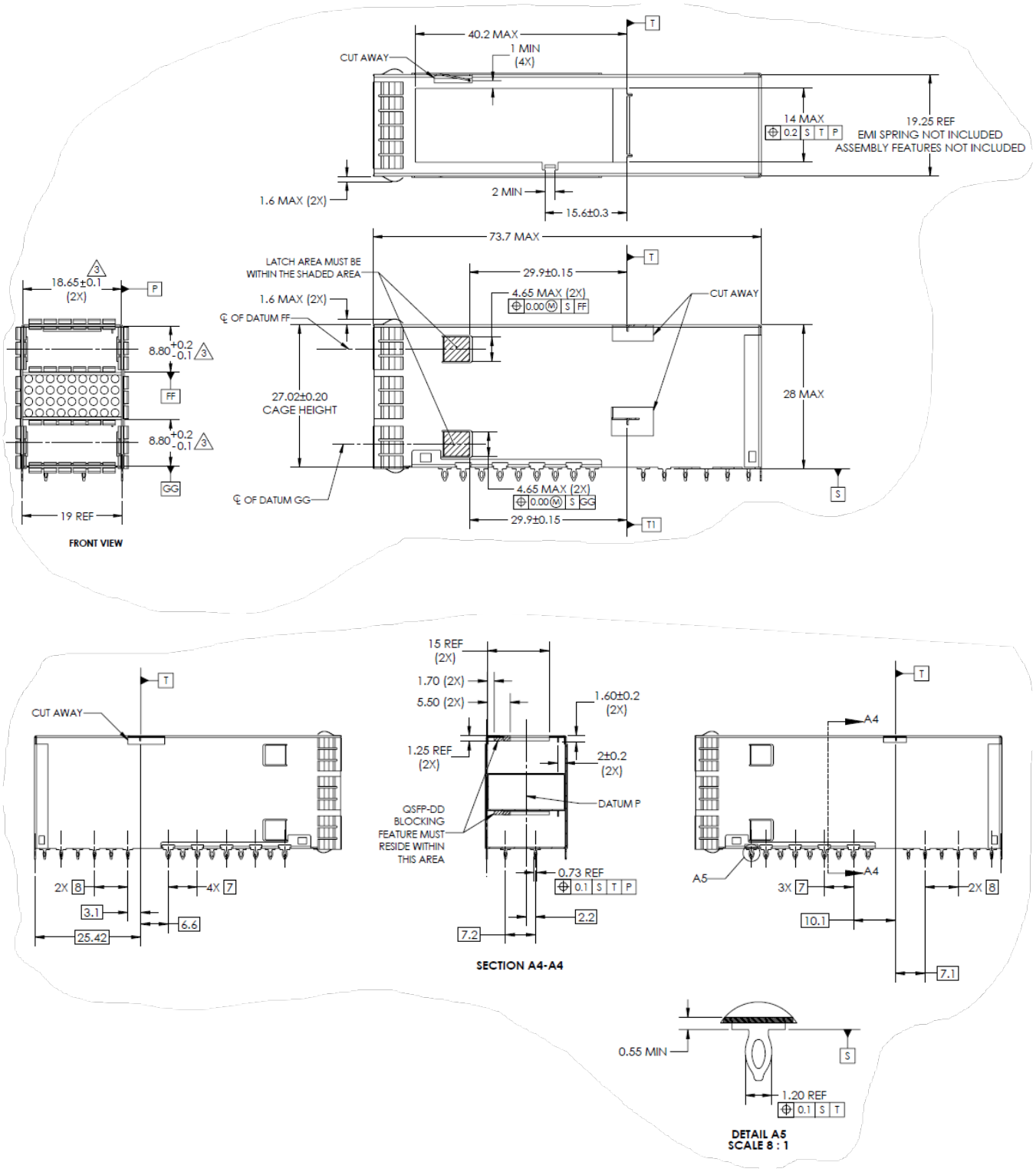


Figure 6-4 QSFP2 2x1 Stacked Cage Dimensions (1 of 2)

NOTES: (for QSFP2 2x1 cage dimensions)

1. DIMENSIONS AND TOLERANCING CONFORM TO ASME Y15.5-2009.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSIONS FROM INSIDE SURFACES OF SPRING FINGERS WHEN FULLY DEPRESSED.
4. CONNECTOR REMOVED FOR CLARITY.
5. APPLIES TO ALL SPRING FINGERS ON ALL SIDES.
6. EXTERNAL CAGE DIMENSIONS DO NOT INCLUDE FOLDED ASSEMBLY TABS.
7. LENGTH OF CAGE AND SIGNAL TAILS
8. PRESS FIT CAGE PINS APPLY TO RIGHT SIDE OF CAGE.
9. PRESS FIT CAGE PINS APPLY TO LEFT SIDE OF CAGE.
10. PRESS FIT OFFSET BETWEEN RIGHT AND LEFT SIDE OF CAGE.
11. DIMENSIONS INCLUDE BACK COVER.
12. SIZE AND POSITION OF CAGE AND CONNECTOR PRESS FIT PINS SHALL BE DEFINED BY EACH SUPPLIER BASED UPON THE PCB FORMAT FOOTPRINT LAYOUT.
13. CAVITY FOR HEATSINK IS OPTIONAL.
14. CONTACT PIN DIMENSION MEASURED FROM DATUM T.
15. CONTACT PIN DIMENSION MEASURED FROM DATUM T1.

Figure 6-4 QSFP2 2x1 Stacked Cage Dimensions (2 of 2)

6.3 Thermal Management

The thermal management of connectors systems and modules described in this document is the responsibility of the implementer. Each system is different and may require specialized solutions. This document outlines the physical characteristics of the module for interoperability with provisions to promote heat transfer. The connectors/cages support external heatsinks, and in the case of the 2x1 stacked connector/cage, an internal heatsink between ports. The cages are not limited to specific heatsink or venting configurations. This document does not suggest any air flow requirements. The implementation of thermal components is not described.

7. Module Mechanical Specification

7.1 Overview

The QSFP2 module mechanical dimensions are identical to QSFP+ and QSFP28 modules unless specified otherwise (refer to SFF-8661). For QSFP2 modules, the bottom surface of the module within the cage shall be flat without a pocket. The options for the position of the label could include the bottom surface of the module that protrudes outside the bezel of the cage or etched into the metal surface. Caution should be exercised that any etchings do not affect thermal performance.

7.2 Mechanical Description: Module

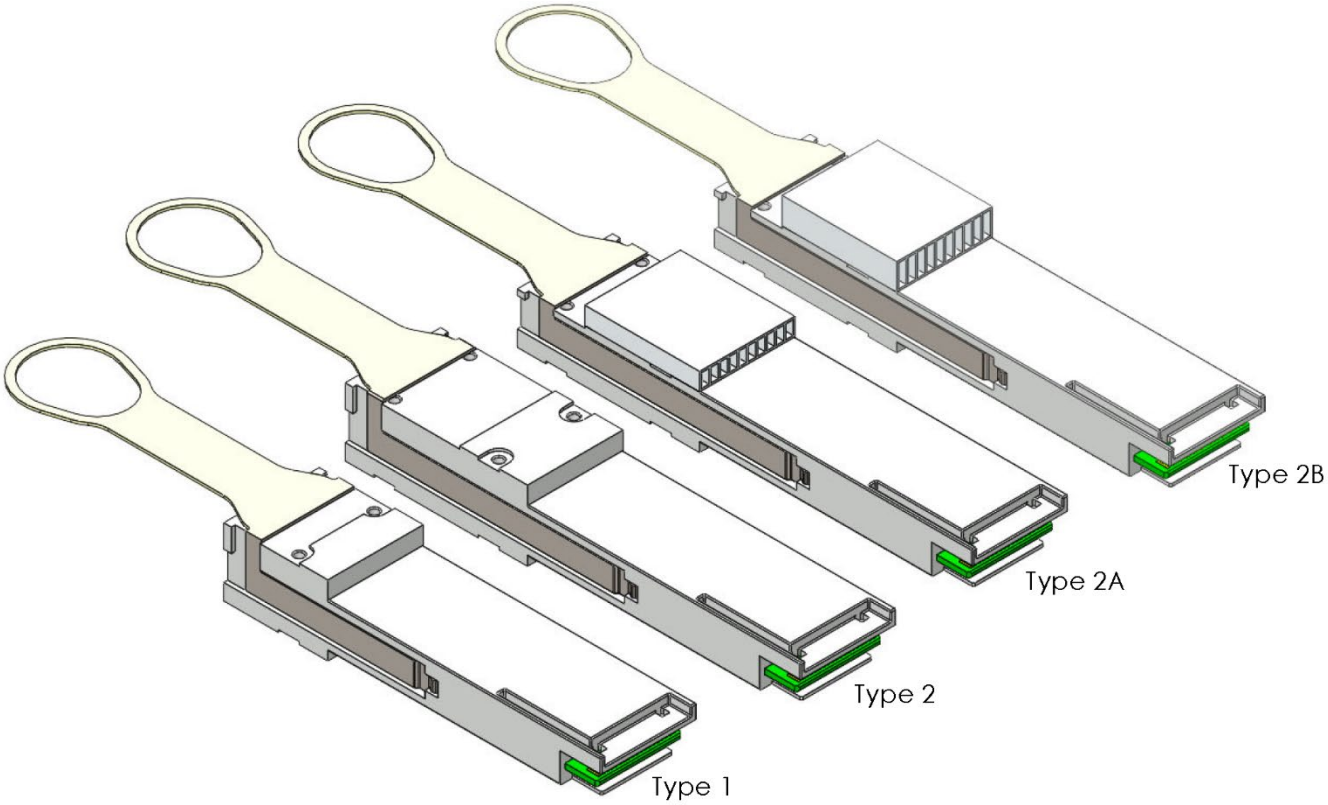
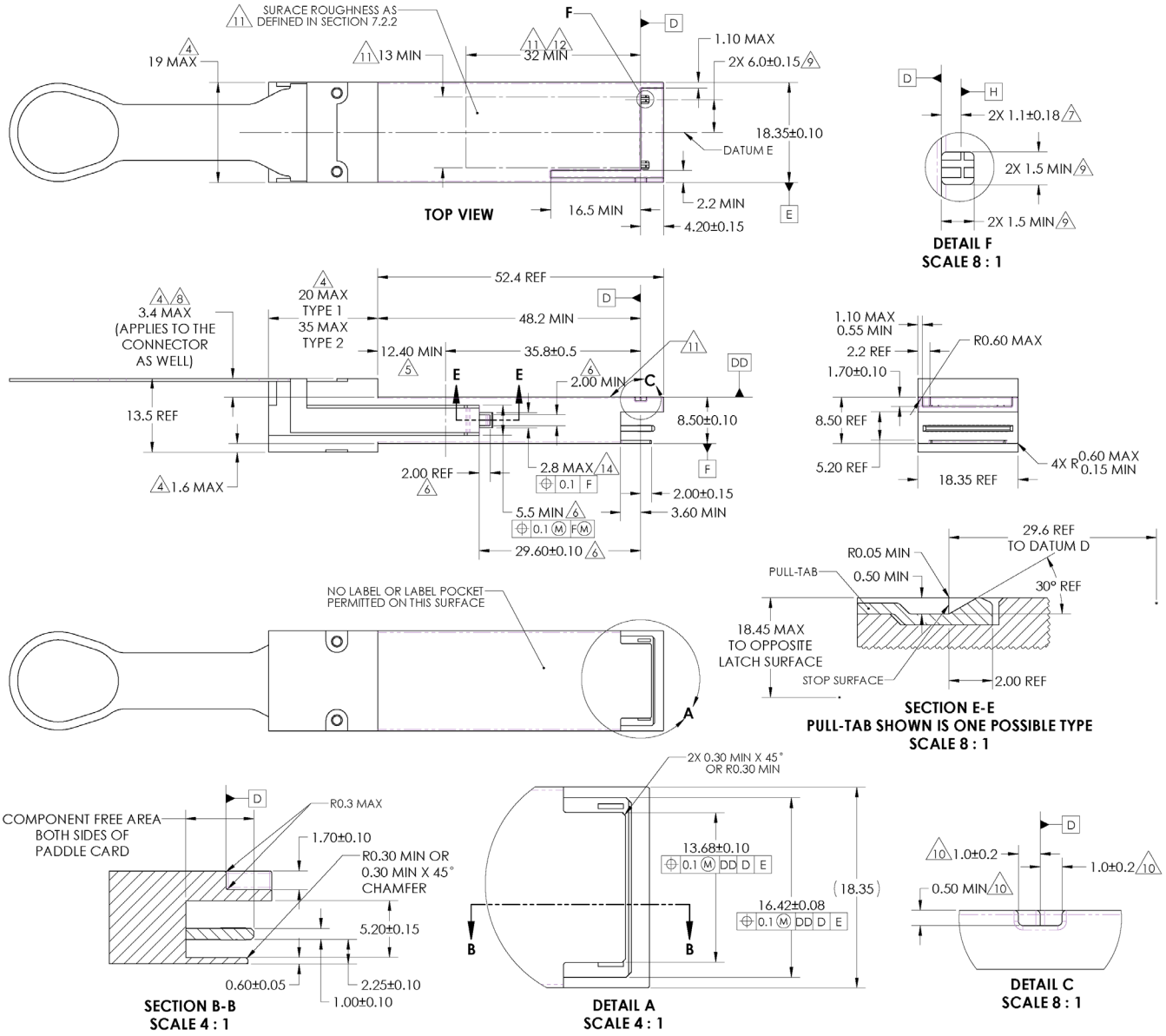


Figure 7-1 QSFP2 Module Types

7.2.1 Module Mechanical Dimensions



NOTE: Heat sink definitions for QSFP2 2A & 2B module types are shown in Figure 7-4.

Figure 7-2 QSFP2 Module Dimensions (Type 1, 2, 2A, and 2B)

NOTES: (for QSFP2 module dimensions)

1. DIMENSIONS AND TOLERANCING CONFORM TO ASME Y15.5-2009.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. UNLESS OTHERWISE SPECIFIED, SHARP CORNERS, EDGES, AND BURRS ARE NOT ALLOWED. ROUND OFF ALL EDGES AND CORNERS TO A MINIMUM RADIUS OF 0.20 MM.

4 DIMENSION DEFINES ENLARGED SECTION OF MODULE THAT EXTENDS OUTSIDE OF CAGE TO ACCOMMODATE MATING PLUG AND ACTUATOR MECHANISM.

5 SURFACES ON ALL 4 SIDES OF THE 12.4 MIN DIMENSION TO BE CONDUCTIVE FOR CONNECTION TO CHASSIS GROUND.

6 DIMENSION APPLIES TO LATCH MECHANISM.

7 DIMENSION APPLIES TO THE LOCATION OF THE EDGE OF THE MODULE PADDLE CARD PAD, DATUM H. CONTACTS 21, 22, 36, AND 37 ARE VISIBLE.

8 DIMENSION TO INCLUDE BAIL TRAVEL.

9 DIMENSIONS APPLY TO OPENINGS IN THE HOUSING.

10 OPTIONAL FEATURE TO AID INSPECTION OF DIMENSIONS FROM DATUM D.

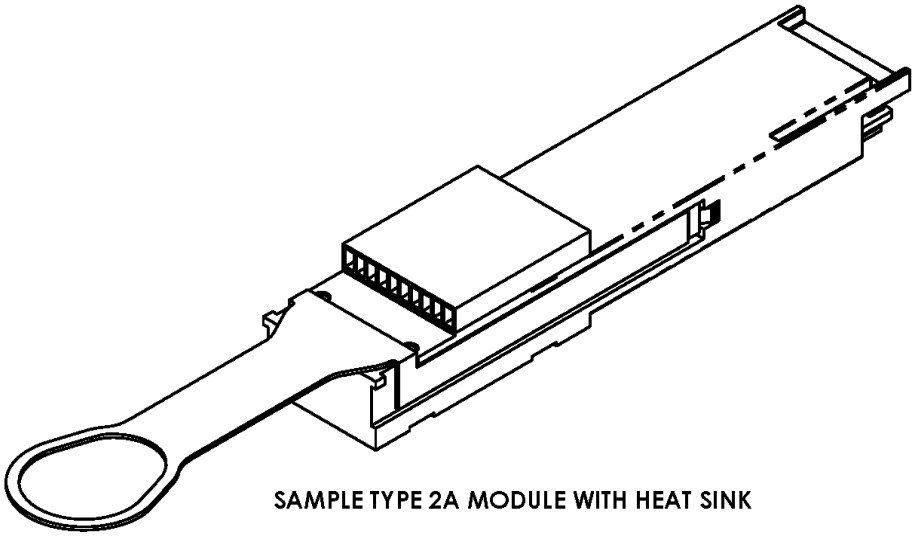
11 FLATNESS AND SURFACE ROUGHNESS (Ra) APPLIES FOR INDICATED LENGTH AND MIN WIDTH OF 13 MM. SURFACE TO BE THERMALLY CONDUCTIVE. SEE SECTION 7.2.2, TABLE 7-1, FOR FLATNESS AND ROUGHNESS REQUIREMENTS.

12 HIGHER WATTAGE MODULES MAY REQUIRE ADDITIONAL SPACE FOR COOLING.

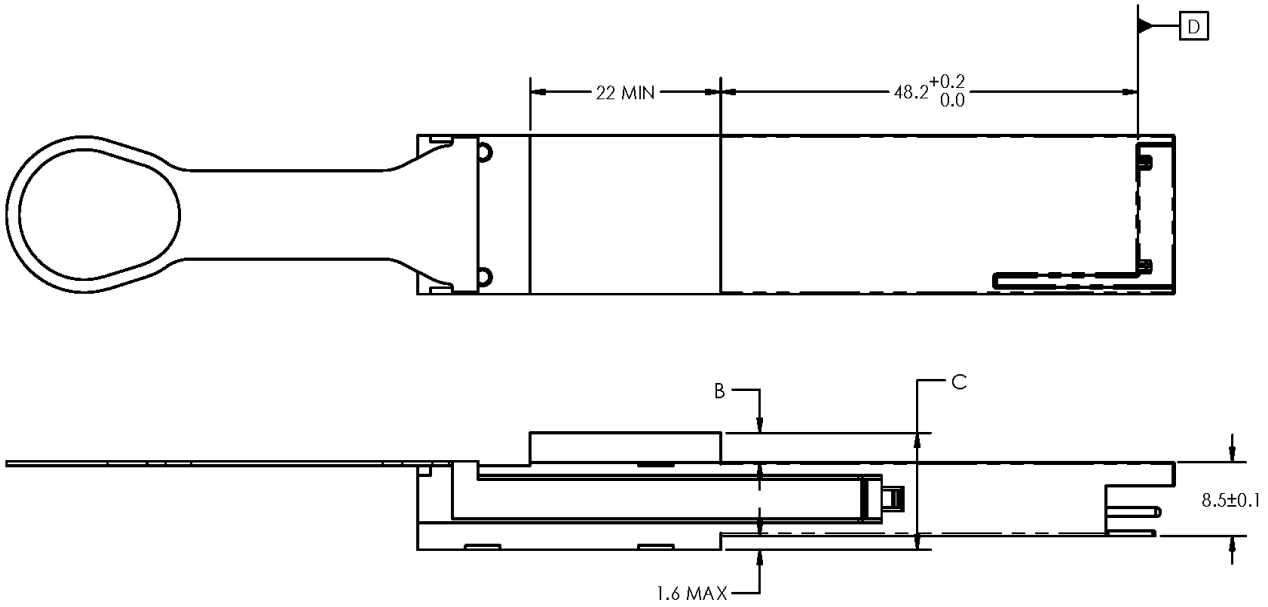
13 NO LABEL MATERIAL SHALL BE APPLIED IN THIS AREA. ETCHINGS ARE ALLOWED, BUT MUST NOT AFFECT THERMAL PERFORMANCE.

14 DIMENSION APPLIES TO LATCH POCKET.

Figure 7-3 QSFP2 Module Dimensions (Type 1, 2, 2A, and 2B) Continued



SAMPLE TYPE 2A MODULE WITH HEAT SINK



QSFP2 Module Type	Dim "B" (MAX)	Dim "C" (REF)
Type 2A	3.4	13.5
Type 2B	5.1	15.2

Figure 7-4 QSFP2 Module Type 2A, Type 2B Details

7.2.2 Module Flatness and Surface Roughness

Module flatness and surface roughness are specified for QSFP2 modules to improve thermal characteristics when used with a riding heat sink. Relaxed specifications are used for lower power modules to potentially reduce cost. The flatness and surface roughness specifications are shown in Table 7-1 and apply to the specified heat sink contact area. Flatness and roughness specifications apply to both top and bottom surfaces of modules. Power Class 1Cu is dedicated to passive copper cables with a more relaxed flatness of 0.15 mm.

Table 7-1 QSFP2 Module Flatness And Surface Roughness Specifications

Power Class[1]	Module Flatness (mm)	Surface Roughness (Ra, µm)
1Cu[2]	0.15	1.6
1	0.075	1.6
2	0.075	1.6
3	0.075	1.6
4	0.075	1.6
5	0.075	1.6
6	0.075	1.6
7	0.075	1.6
8	0.050	0.8
1. QSFP2 Power Classes are defined in SFF-8679. 2. Power Class 1Cu maximum power dissipation is the same as Power Class 1.		

To improve thermal performance, optional enhanced surface specifications are specified in Table 7-2. This is an optional specification and does not override the required specifications in Table 7-1.

Table 7-2 Optional Enhanced Module Flatness Specifications

Power Class	Module Flatness (mm)	Surface Roughness (Ra, µm)
8	0.025	0.4

7.2.3 Card Edge Description (Mechanical Interface)

The QSFP2 module paddle card width, pad, and chamfer dimensions have been modified compared to legacy QSFP+/QSFP28 module paddle cards (defined in SFF-8662) to support higher data rates. See Figure 7-5 for QSFP2 module paddle card dimensions. All other module paddle card dimensions, except for the card width, pads, and chamfers, remain the same as the QSFP+ and QSFP28 specifications. Refer to SFF-8662 for more information, including Section 6.1 Free (Module) Paddle Card, where TABLE 6-1 FREE (MODULE) PADDLE CARD DIMENSIONS in that specification identifies the pad types.

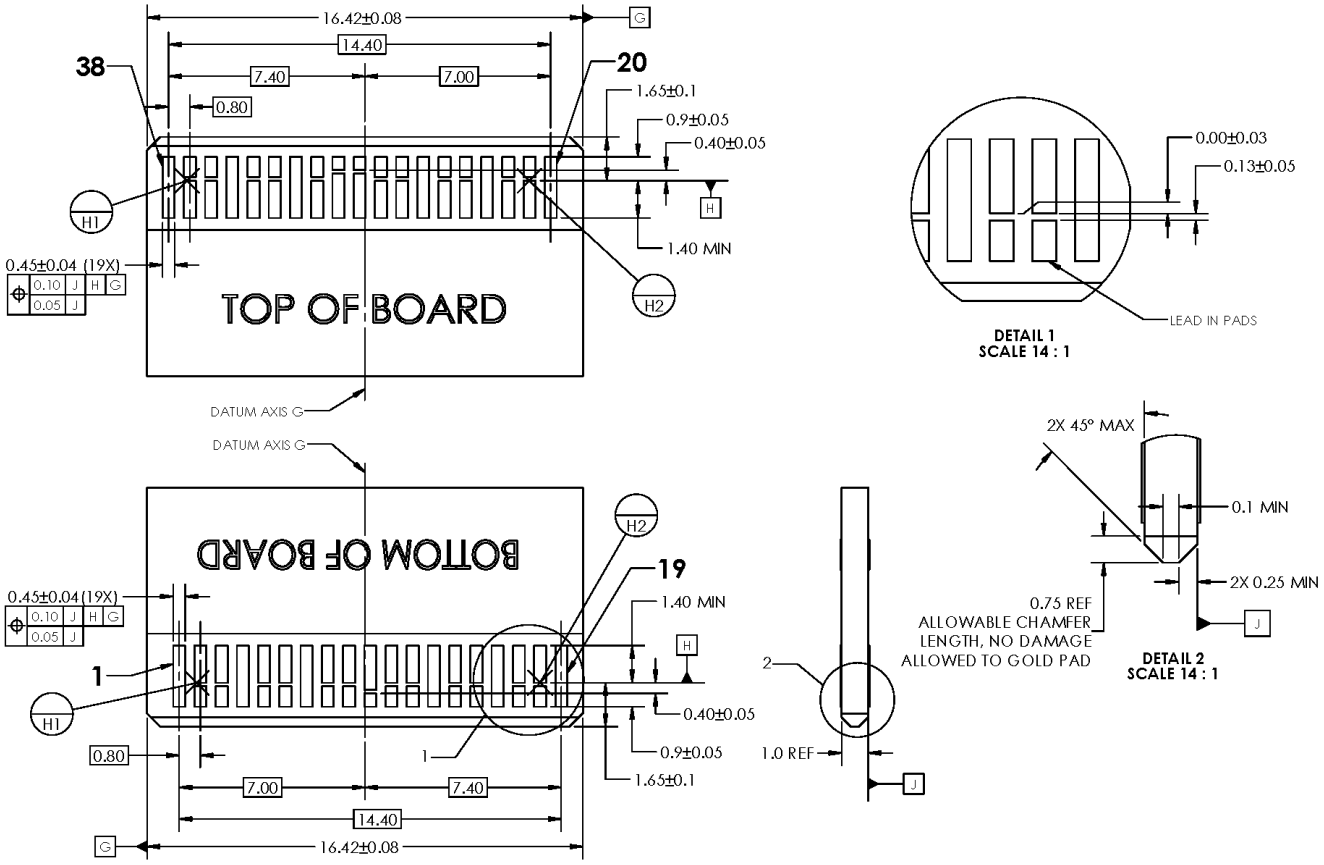


Figure 7-5 QSFP2 Paddle Card Dimensions

8. Footprints

To achieve operation at higher data rates, the QSFP2 footprint pad dimensions and associated tolerances have been improved compared to QSFP+/ QSFP28.

8.1 1x1 Connector Footprints

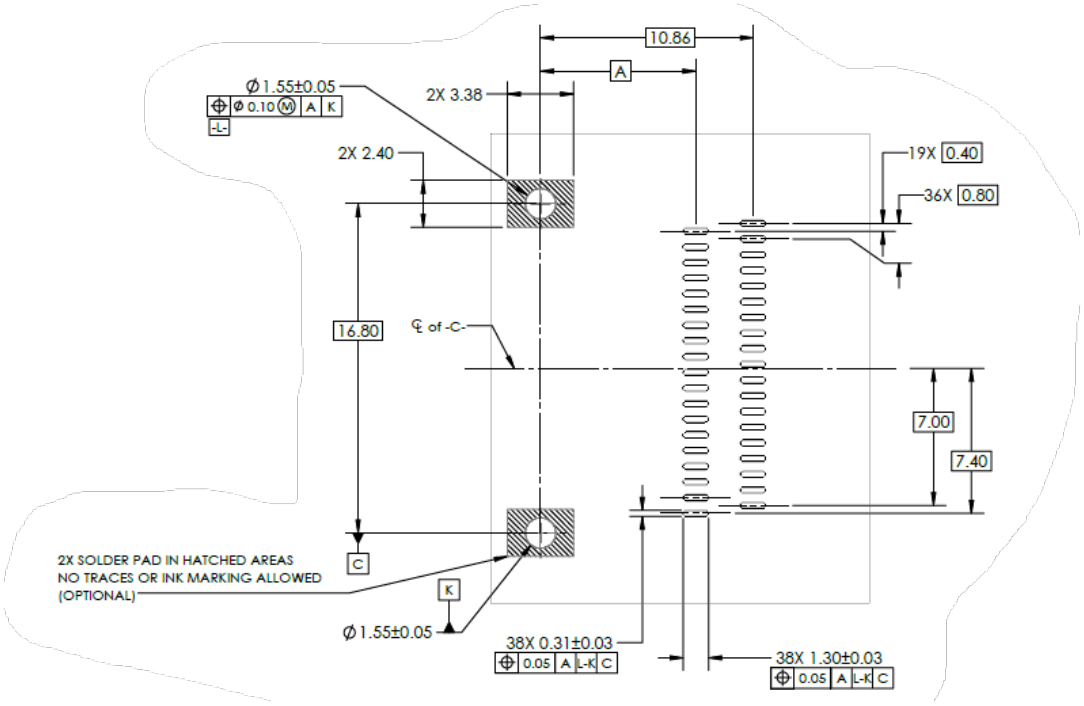
There are two QSFP2 1x1 footprint styles, summarized in Table 8-1, designed to aid in the implementation of different connector tail configurations:

Table 8-1 QSFP2 1x1 Connector Footprint Styles

Footprint Style	Description
Style A	"LL" 0.8mm pitch connector footprint
Style B	"JL" 0.8mm pitch connector footprint

This document does not dictate connector tail directions. However, QSFP2 1x1 connector footprint styles are shown in Figure 8-1.

The mechanical layout for attaching the QSFP2 1x1 connector and cage to a host board is shown in Figure 8-2. Alternatively, a QSFP28 Style A cage can be used with the QSFP2 1x1 connector by combining the QSFP2 connector footprint with the QSFP28 cage footprint. Refer to SFF-8663 for more information.



QSFP2 1x1 Footprint Style	Dim "A"
Style A	7.93
Style B	7.05

Figure 8-1 PCB Layout for QSFP2 1x1 Connector (Footprint Styles A & B)

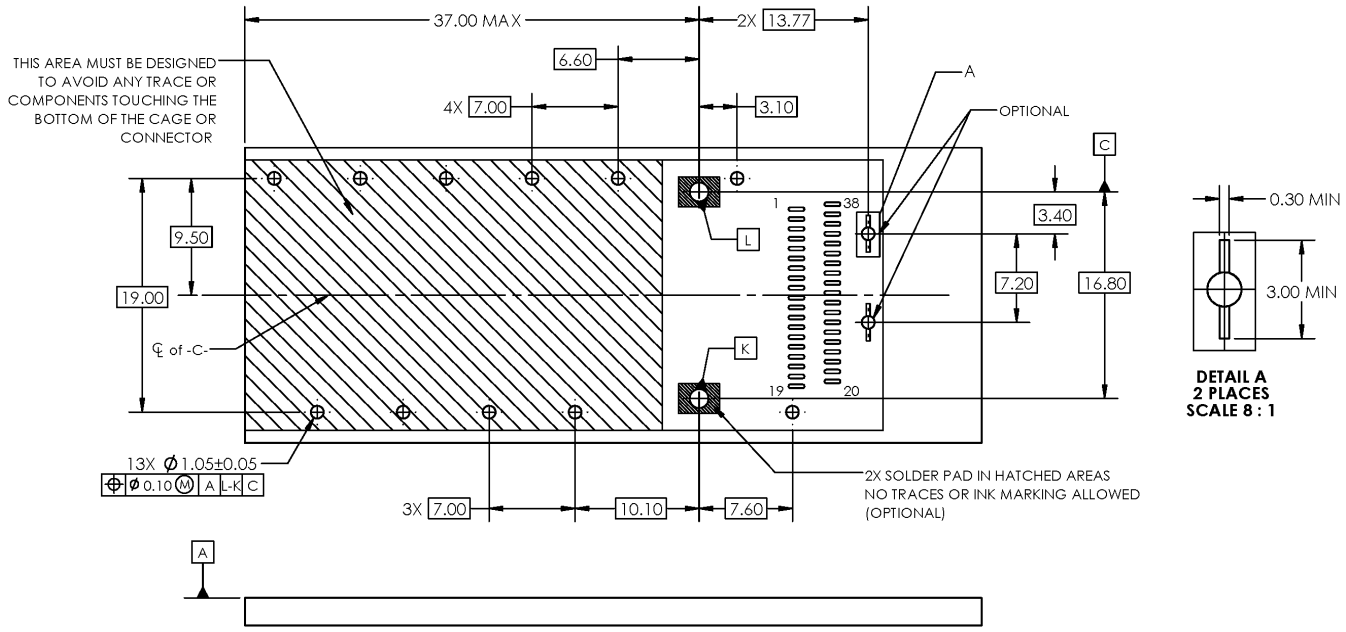


Figure 8-2 PCB Layout for QSFP2 1x1 Cage & Connector (Footprint Styles A & B)

8.2 2x1 Stacked Connector Footprints

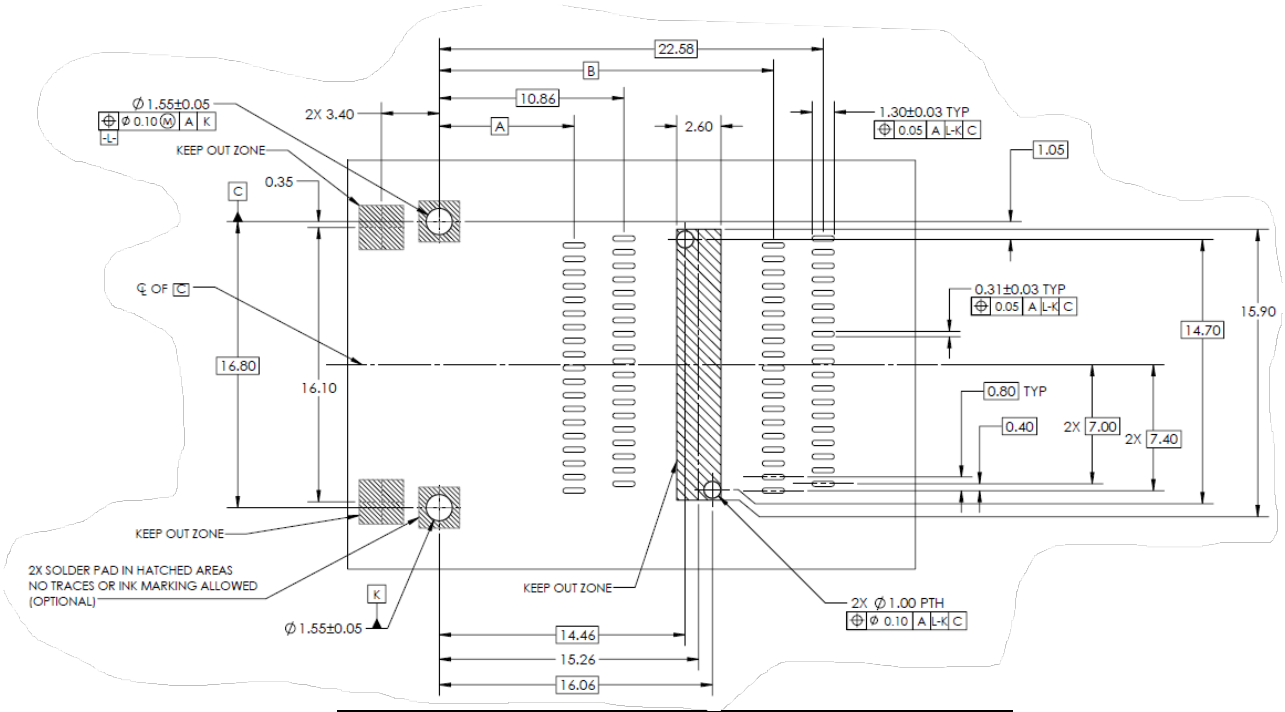
There are four QSFP2 2x1 stacked footprint styles, summarized in Table 8-2, designed to aid in the implementation of different connector tail configurations:

Table 8-2 QSFP2 2x1 Stacked Connector Footprint Styles

Style	Retention Method	Description
Style A	Retention Pin	"LL" 0.8mm pitch connector footprint with retention pin
Style B	Retention Pin	"JL" 0.8mm pitch connector footprint with retention pin
Style C	Glue	"LL" 0.8mm pitch connector footprint with glue pad
Style D	Glue	"JL" 0.8mm pitch connector footprint with glue pad

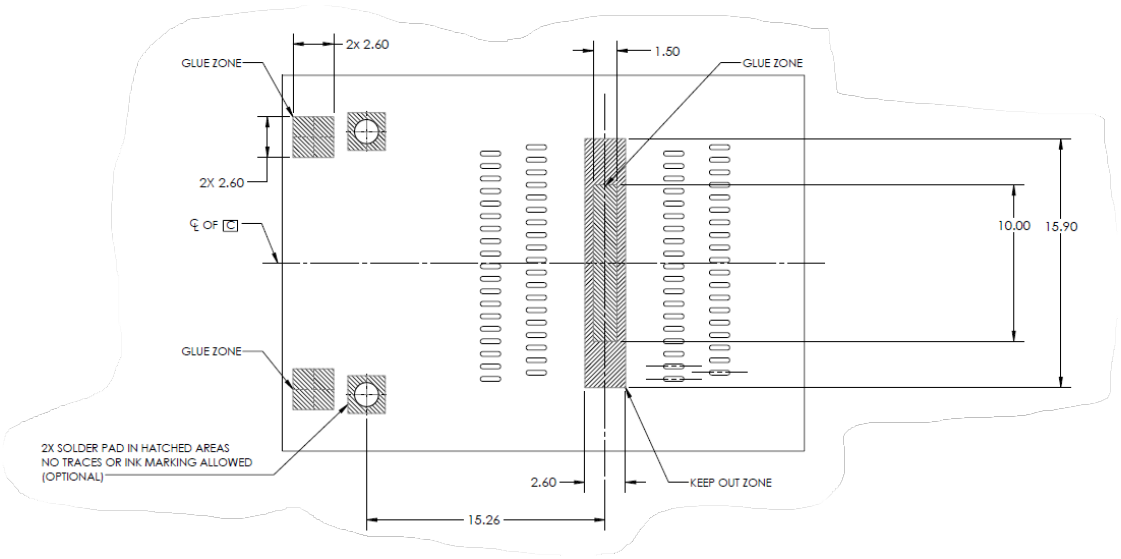
This document does not dictate the connector tail directions. However, QSFP2 2x1 stacked connector footprints are shown in Figure 8-3 and Figure 8-4.

The mechanical layout for attaching the QSFP2 2x1 stacked connector and cage to a host board is shown in Figure 8-5.



QSFP2 2x1 Stacked Footprint Style	Dim "A"	Dim "B"
Style A	7.93	19.65
Style B	7.05	18.77
Style C (see Note)	7.93	19.65
Style D (see Note)	7.05	18.77
NOTE: Styles C & D utilize glue pads instead of retention pins. Refer to Figure 8-4 for details.		

Figure 8-3 PCB Layout for QSFP2 2x1 Stacked Connector (Footprint Styles A, B, C, & D)



NOTE: For remaining dimensions, including values for Dim A & Dim B, refer to Figure 8-3.

Figure 8-4 PCB Layout for QSFP2 2x1 Stacked Connector (Footprint Styles C & D)

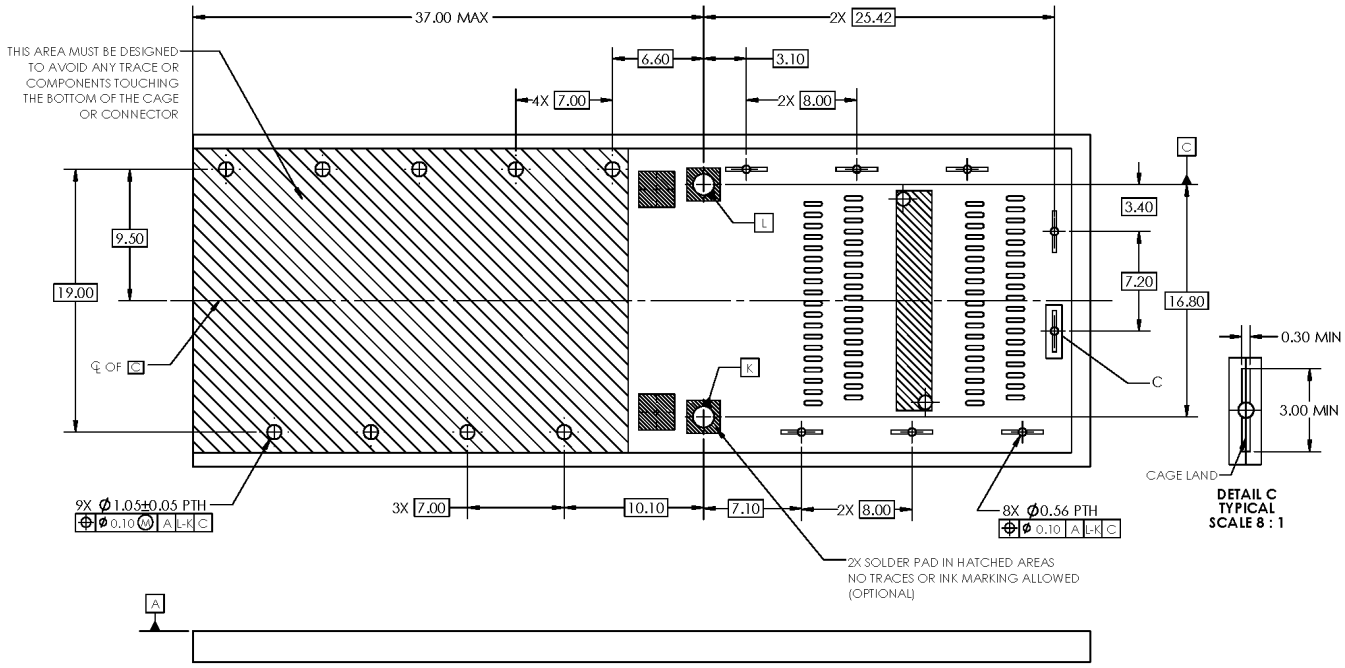


Figure 8-5 PCB Layout for QSFP2 2x1 Stacked Cage & Connector (Footprint Styles A, B, C, & D)

9. Test Requirements and Methodologies (TS-1000, etc.)

9.1 Performance Tables

EIA-364-1000 (TS-1000) shall be used to define the test sequences and procedures for evaluating the connector system described in this document. Where multiple test options are available, the manufacturer shall select the appropriate option where not previously specified. The selected procedure should be noted when reporting data. If there are conflicting requirements or test procedures between EIA-364 procedures and those contained within this document, this document shall be considered the prevailing authority.

Unless otherwise specified, procedures for sample size, data, and collection to be followed as specified in EIA-364-1000. See EIA-364-1000 Annex B for objectives of tests and test groups.

Table 9-1 summarizes the performance criteria that are to be satisfied by the connector described in this document. Most performance criteria are validated by EIA-364-1000 testing, but this test suite leaves some test details to be determined. To ensure that testing is repeatable, these details are identified in Table 9-2. Finally, testing procedures used to validate any performance criteria not included in EIA-364-1000 are provided in Table 9-3.

Table 9-1 Form Factor Performance Requirements

Performance Parameters	Description/ Details	Requirement
Mechanical/ Physical Requirements		
Plating Type	Plating type on connector contacts	Precious
Surface Treatment	Surface treatment on connector contacts, if surface treatment is applied, Test Group 6 is required.	Manufacturer to specify
Wipe length	Designed distance a contact traverses over a mating contact surface during mating and resting at a final position. If less than 0.127 mm, Test Group 6 is required	Manufacturer to specify
Rated Durability Cycles	The expected number of durability cycles a component is expected to encounter over the course of its life	Connector/ cage: 100 MIN cycles Module: 50 MIN cycles
Mating Force* (See Note 2)	Amount of force needed to mate a module with a connector (without heat sink) when latches are deactivated	60 N MAX
Unmating Force* (See Note 2)	Amount of forced needed to separate a module from a connector (without heat sink) when latches are deactivated	30 N MAX
Latch Retention* (See Note 2)	Amount of force the latching mechanism can withstand	90 N MIN
Cage Latch Strength*	The amount of force that the cage latches can hold without being damaged.	125 N MIN
Cage Retention to Host Board*	Amount of force a cage can withstand without separating from the host board	114 N MIN
Environmental Requirements		
Field Life	The expected service life for a component	10 years
Field Temperature	The expected service temperature for a component (ambient air temperature around the component)	65°C, applicable to the mated cage, connector, and module only
Electrical Requirements		
Current	Maximum current to which a contact is exposed in use	0.5 A per signal contact MAX 1.5 A per power contact MAX
Operating Rating Voltage	Maximum voltage to which a contact is exposed in use	29.9 V DC per contact MAX

NOTES:
1. Performance criteria denoted with stars (*) are not validated by EIA-364-1000 testing. Refer to **Table 9-3** for test procedures and pass/fail criteria.
2. Refer to the QSFP-DD MSA for the interactions of QSFP modules with QSFP-DD connectors and cages.

Table 9-2 describes the details necessary to perform the tests described in the EIA-364-1000 test sequences. Testing shall be done in accordance with EIA-364-1000 and the test procedures it identifies in such a way that the parameters/ requirements defined in Table 9-1 are met. Any information in this table supersedes EIA-364-1000.

Table 9-2 EIA-364-1000 Test Details

Test	Test Descriptions and Details	Pass/ Fail Criteria
Mechanical/ Physical Tests		
Durability (preconditioning)	EIA-364-09 To be tested with connector, cage, and module (Latches may be locked out to aid in automated cycling)	No evidence of physical damage
Durability (see Note 1)	EIA-364-09 To be tested with connector, cage, and module (Latches may be locked out to aid in automated cycling)	No visual damage to mating interface or latching mechanism
Environmental Tests		
Cyclic Temperature and Humidity	EIA-364-31 Method IV omitting step 7a. Test Duration B	No intermediate test criteria
Vibration	EIA-364-28 Test Condition VII Test Condition Letter D Test set-up: Connectors may be restrained by a plate that replicates the system panel opening as defined in this specification. External cables may be constrained to a non-vibrating fixture a minimum of 8 inches from the module. For cabled connector solutions: Wires may be attached to PCB or fixed to a non-vibrating fixture.	No evidence of physical damage -AND- No discontinuities longer than 1 µs allowed
Mixed Flowing Gas	EIA-364-65 Class II See Table 4.1 in EIA-364-1000 for exposure times. Test option per EIA-364-1000: Option 3	No intermediate test criteria during the EIA-364-65 portion of the EIA-364-1000 Group 4 testing
Electrical Tests		
Low Level Contact Resistance (see Note 2)	EIA-364-23 20 mV DC MAX, 100 mA MAX To include wire termination or connector-to-board termination	20 mΩ MAX change from baseline
Dielectric Withstanding Voltage	EIA-364-20 Method B 300 VDC minimum for 1 minute Applied voltage may be product / application specific	No defect or breakdown between adjacent contacts -AND- 5 mA Max Leakage Current

NOTES:
1. Since the durability requirement on the connector and cage is greater than that of the module, modules may be replaced after their specified durability rating.
2. The first low level contact resistance reading in each test sequence is used to determine a baseline measurement. Subsequent measurements in each sequence are measured against this baseline.

Table 9-3 describes the testing procedures necessary to validate performance criteria not validated by EIA-364-1000 testing. The tests are to be performed in such a way that the parameters/ requirements defined in Table 9-1 are met.

Table 9-3 Additional Test Procedures

Test	Test Descriptions and Details	Pass/ Fail Criteria
Mechanical/ Physical Tests		
Mating Force (See Note 1)	EIA-364-13 To be tested with cage, connector, and module. Latching mechanism deactivated (locked out).	Refer to Table 9-1 -AND- No physical damage to any components
Unmating Force (See Note 1)	EIA-364-13 To be tested with cage, connector, and module. Latching mechanism deactivated (locked out).	
Latch Retention	EIA-364-13 To be tested with cage, connector, and module without heat sinks Latching mechanism engaged (not locked out)	
Latch Strength	An axial load applied using a static load or ramped loading to the specified load. To be tested with cage, connector, and module or module representative tool without heat sinks Latching mechanism engaged (not locked out).	
Cage Retention to Host Board	Tested with module, a module analog, or fixtures mated to cage. Pull cage in a direction perpendicular to the board at a rate of 25.4mm/min to the specified force.	No physical damage to any components -AND- Cage shall not separate from board
Electrical Tests		
Current	EIA-364-70 Method 3, 30-degree temperature rise. Contacts energized: All signal and power contacts tested simultaneously.	Refer to Table 9-1 for current magnitude
NOTES: 1. Values listed in **Table 9-1** for these tests apply without the presence of a riding heat sink.		

Appendix A. Bezel Panel Cut-Out Recommendations (Informative)

A.1 1x1 Bezel Panel Cut-Out

The recommended bezel panel cut-out for a QSFP2 1x1 cage is shown in Figure A-1. An example of a QSFP2 1x1 bezel design for use with Type 2A & 2B modules is shown in Figure A-2.

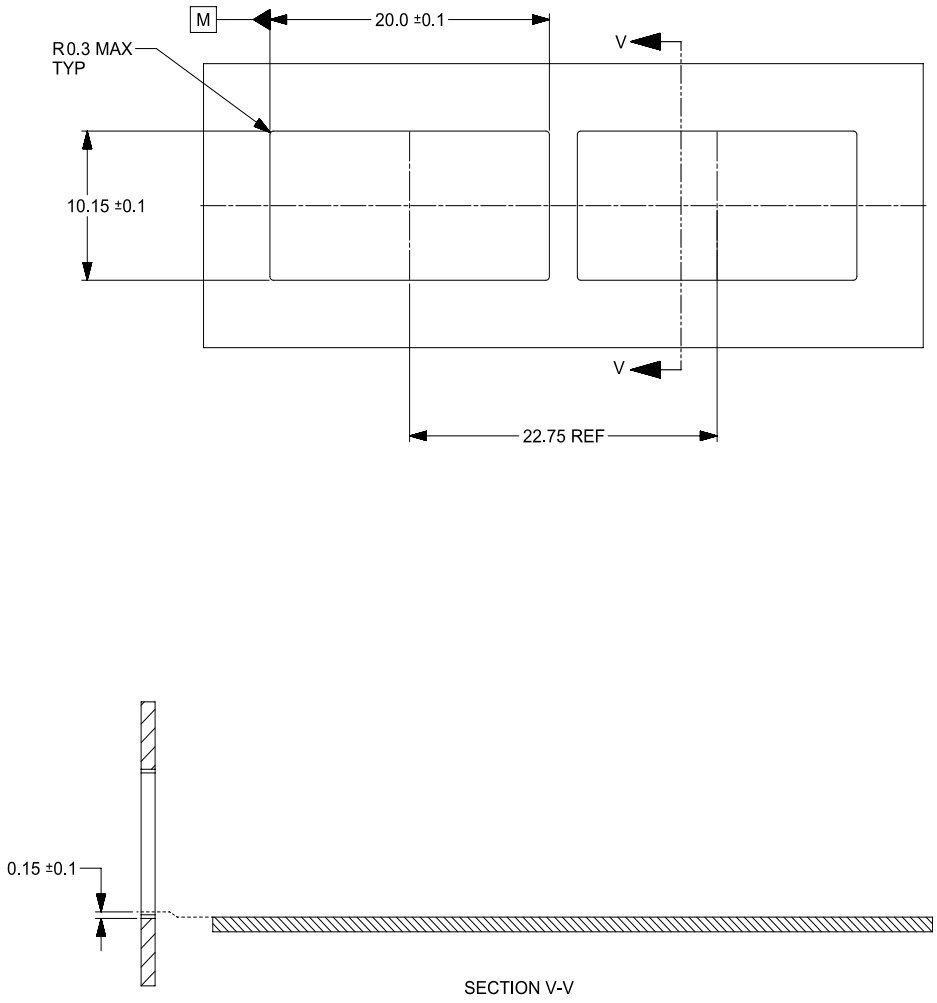


Figure A-1 Recommended QSFP2 1x1 Bezel Panel Cut-Out

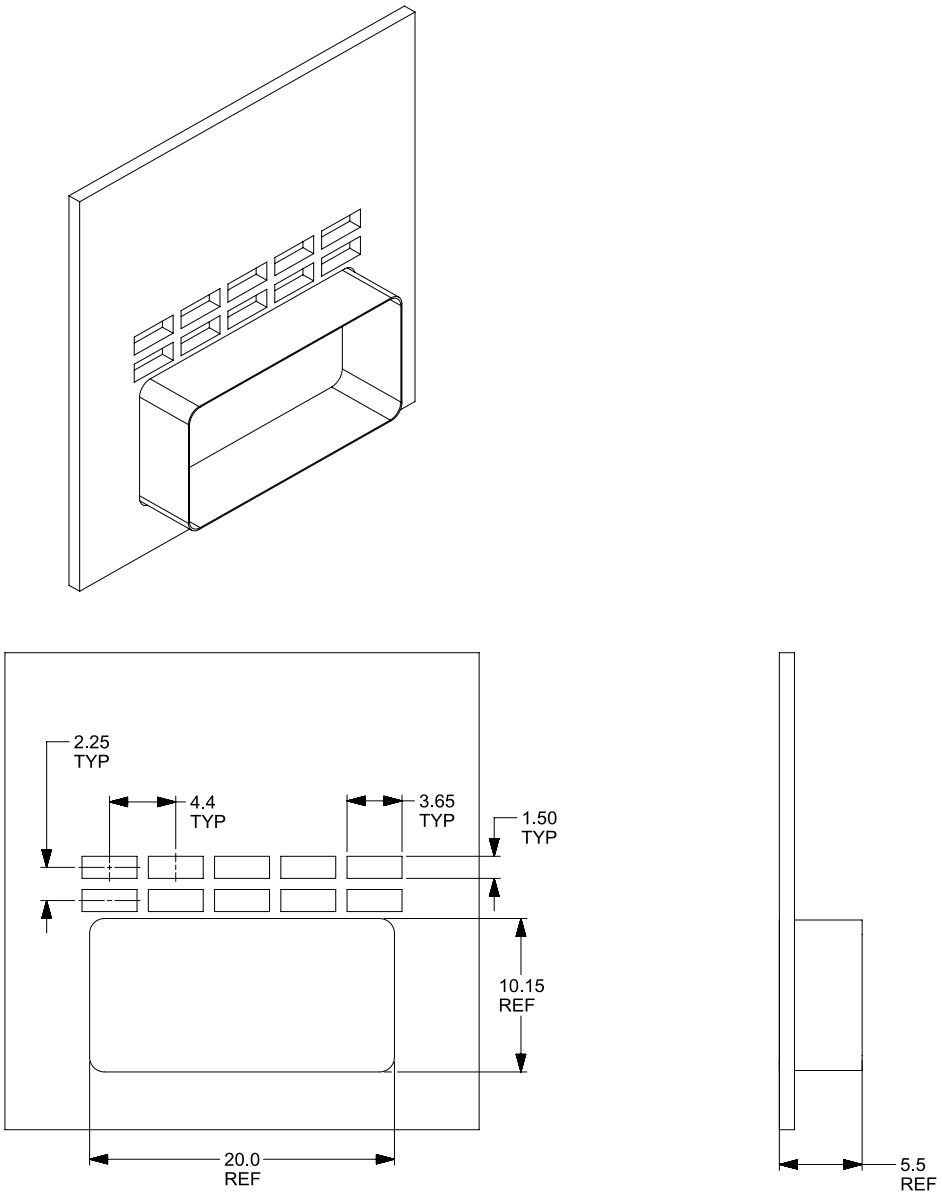


Figure A-2 Example of QSFP2 1x1 Bezel Design for Use with Type 2A & 2B Modules

A.2 Stacked 2x1 Bezel Panel Cut-Out

The recommended bezel panel cut-out for a QSFP2 2x1 stacked cage is shown in Figure A-3. An example of a QSFP2 2x1 stacked bezel design for use with Type 2A & 2B modules is shown in Figure A-4.

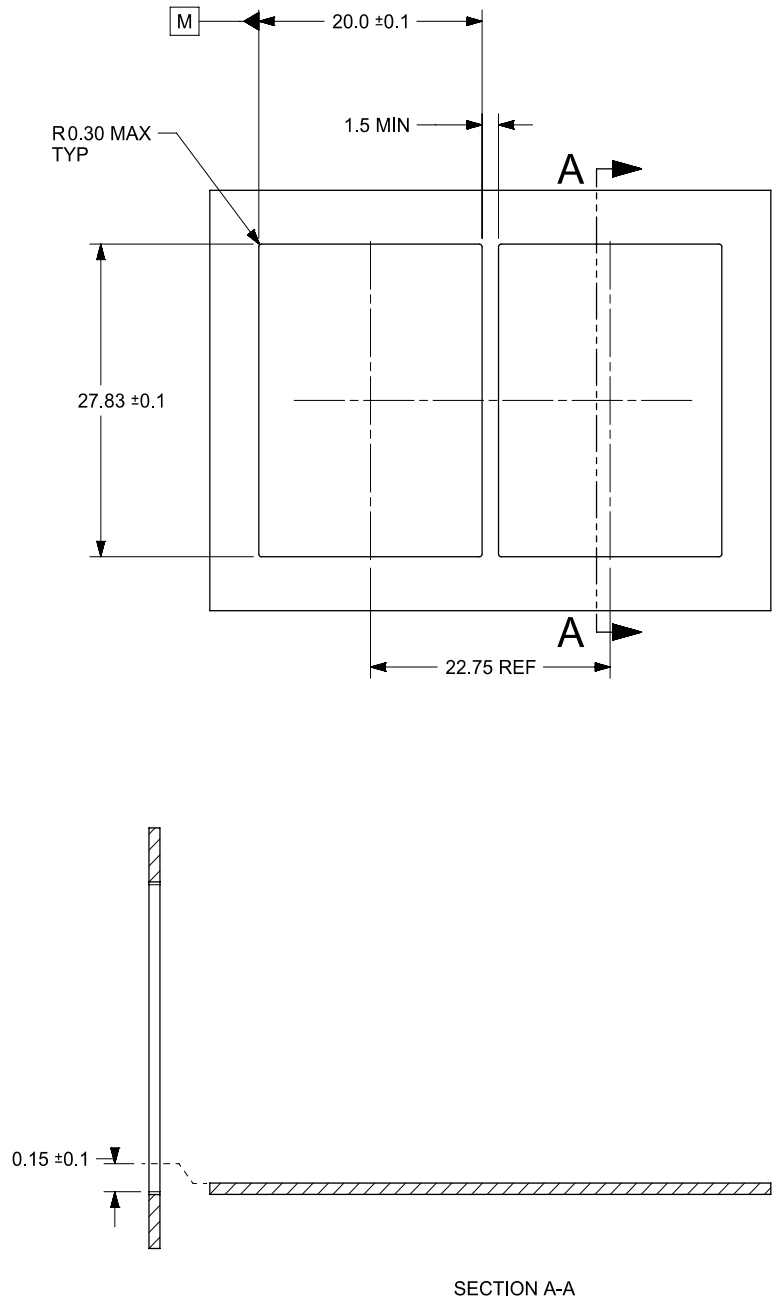


Figure A-3 Recommended QSFP2 2x1 Stacked Bezel Panel Cut-Out

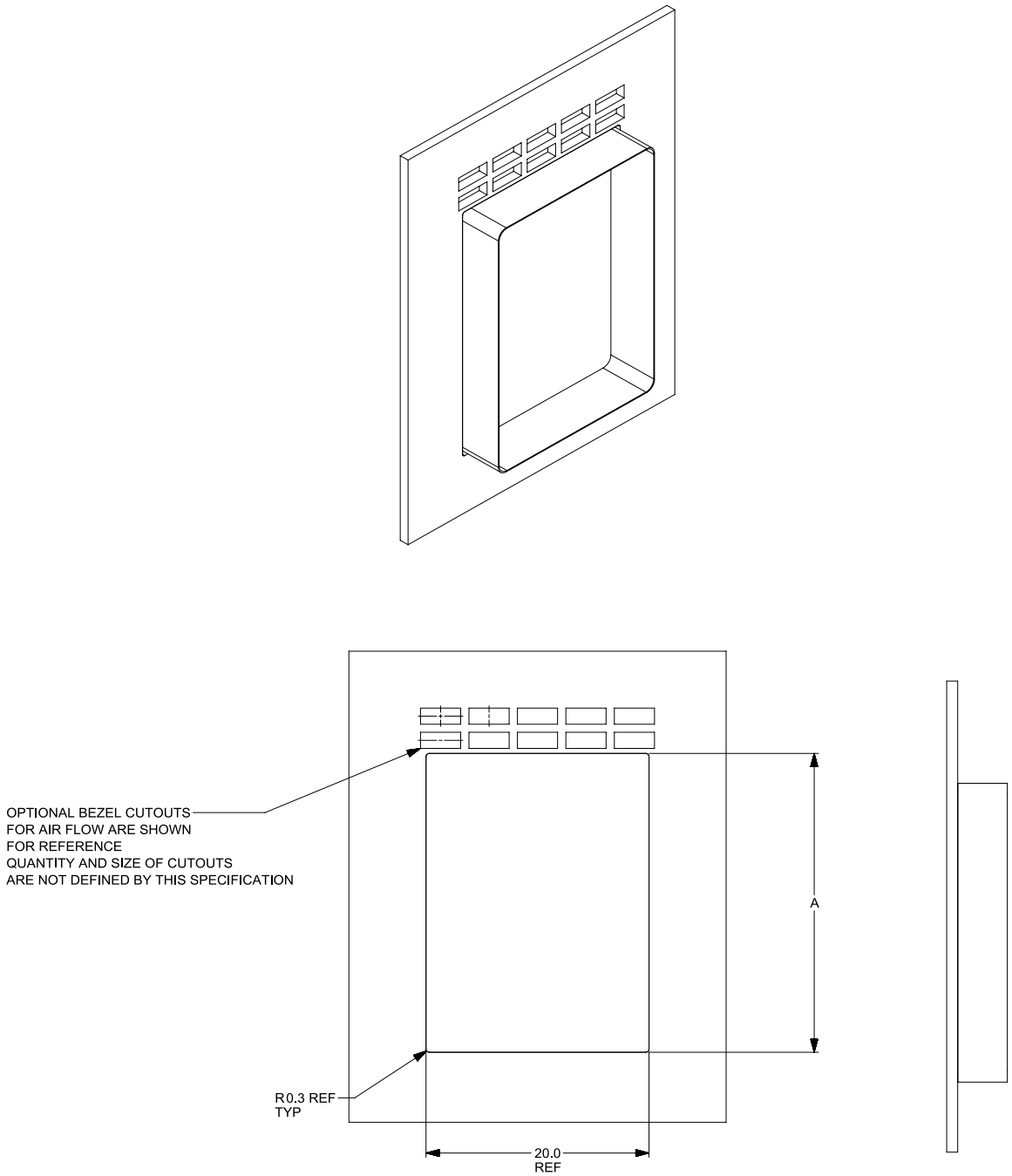


Figure A-4 Example of QSFP2 2x1 Stacked Bezel Design for Use with Type 2A & 2B Modules