SFF-TA-1027
Specification for
QSFP2 Cage, Connector, & Module Specification

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

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- Initial draft

Rev 0.0.2 July 29, 2022:
- Update Datum Definitions
- Updated drawing views (Track Changes was not turned on when replacing images, for clarity)
1 CONTENTS

2 1. Scope 6
3 2. References and Conventions 6
4 2.1 Industry Documents 6
5 2.2 Sources 6
6 2.3 Conventions 7
7 3. Keywords, Acronyms, and Definitions 8
8 3.1 Keywords 8
9 3.2 Acronyms and Abbreviations 8
10 3.3 Definitions 8
11 4. General Description 10
12 4.1 Configuration Overview/Descriptions 10
13 4.2 Contact Numbering 12
14 4.3 Datums 14
15 5. Connector Mechanical Specification 17
16 5.1 Overview 17
17 5.2 Mechanical Description: Connector 17
18 5.2.1 1x1 Connector 17
19 5.2.2 2x1 Stacked Connector 18
20 6. Cage Mechanical Specification 19
21 6.1 Overview 19
22 6.2 Mechanical Description: Cage 19
23 6.2.1 1x1 Cage 19
24 6.2.2 2x1 Stacked Cage 21
25 6.3 Thermal Management 23
26 7. Module Mechanical Specification 24
27 7.1 Overview 24
28 7.2 Mechanical Description: Module 24
29 7.2.1 Module Mechanical Dimensions 25
30 7.2.2 Module Flatness and Surface Roughness 27
31 7.2.3 Card Edge Description (Mechanical Interface) 28
32 8. Footprints 29
33 8.1 1x1 Connector Footprints 29
34 8.2 2x1 Stacked Connector Footprints 31
35 9. Test Requirements and Methodologies (TS-1000, etc.) 33
36 9.1 Performance Tables 33
37 Appendix A. Bezel Panel Cut-Out Recommendations (Informative) 37
38 A.1 1x1 Bezel Panel Cut-Out 37
39 A.2 Stacked 2x1 Bezel Panel Cut-Out 39
40
41

QSFP2 Cage, Connector, & Module Specification

Page 4
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FIGURES
1. Figure 3-1 Connector Contact Configurations
2. Figure 3-3 Right Angle Connector and Cable Assembly
3. Figure 3-4 Wipe for a Continuous Contact
4. Figure 4-1 QSFP2 1x1 Cage and Connector
5. Figure 4-2 QSFP2 1x1 Stacked Cage and Connector
6. Figure 4-3 QSFP2 1x1 Connector Contact Numbering
7. Figure 4-4 QSFP2 1x1 Stacked Connector Contact Numbering
8. Figure 4-5 QSFP2 1x1 Connector Footprint Pad Numbering
9. Figure 4-6 QSFP2 1x1 Stacked Connector Footprint Pad Numbering
10. Figure 4-7 QSFP2 Module, 1x1 Connector, and 1x1 Cage Datums
11. Figure 4-8 QSFP2 Module, 2x1 Stacked Connector, and 2x1 Stacked Cage Datums
12. Figure 5-1 QSFP2 1x1 Connector
13. Figure 5-2 QSFP2 2x1 Stacked Connector
14. Figure 5-3 QSFP2 1x1 Connector Dimensions
15. Figure 5-4 QSFP2 2x1 Stacked Connector Dimensions
16. Figure 6-1 QSFP2 1x1 Cage
17. Figure 6-2 QSFP2 1x1 Cage Dimensions
18. Figure 6-3 QSFP2 2x1 Stacked Cage
19. Figure 6-4 QSFP2 2x1 Stacked Cage Dimensions
20. Figure 7-1 QSFP2 Module Types
21. Figure 7-2 QSFP2 Module Dimensions (Type 1, 2, 2A, and 2B)
22. Figure 7-3 QSFP2 Module Type 2A, Type 2B Details
23. Figure 7-4 QSFP2 Paddle Card Dimensions
24. Figure 8-1 PCB Layout for QSFP2 1x1 Connector (Footprint Styles A & B)
25. Figure 8-2 PCB Layout for QSFP2 1x1 Cage & Connector (Footprint Styles A & B)
26. Figure 8-3 PCB Layout for QSFP2 2x1 Stacked Connector (Footprint Styles A, B, C, & D)
27. Figure 8-4 PCB Layout for QSFP2 2x1 Stacked Connector (Footprint Styles C & D)
28. Figure 8-5 PCB Layout for QSFP2 2x1 Stacked Cage & Connector (Footprint Styles A, B, C, & D)
29. Figure 9-1 Recommended QSFP2 1x1 Bezel Panel Cut-Out
30. Figure 9-2 Example of QSFP2 1x1 Bezel Design for Use with Type 2A & 2B Modules
31. Figure 9-3 Recommended QSFP2 2x1 Stacked Bezel Panel Cut-Out
32. Figure 9-4 Example of QSFP2 2x1 Stacked Bezel Design for Use with Type 2A & 2B Modules

TABLES
37. Table 4-1 QSFP2 1x1 Connector, Cage, and Module Implementations
38. Table 4-2 QSFP2 2x1 Stacked Connector, Cage, and Module Implementations
39. Table 4-3 Datum Descriptions
40. Table 7-1 QSFP2 Module Flatness And Surface Roughness Specifications
41. Table 7-2 Optional Enhanced Module Flatness Specifications
42. Table 8-1 QSFP2 1x1 Connector Footprint Styles
43. Table 8-2 QSFP2 2x1 Stacked Connector Footprint Styles
44. Table 9-1 Form Factor Performance Requirements
45. Table 9-2 EIA-364-1000 Test Details
46. Table 9-3 Additional Test Procedures
47.
48.
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
- 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 will be welcome, they should be submitted to https://www.snia.org/feedback.

Other standards may be obtained from the organizations listed below:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Organization</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASME</td>
<td>American Society of Mechanical Engineers (ASME)</td>
<td><a href="https://www.asme.org">https://www.asme.org</a></td>
</tr>
<tr>
<td>EIA</td>
<td>Electronic Components Industry Association (ECIA)</td>
<td><a href="https://www.ecianow.org">https://www.ecianow.org</a></td>
</tr>
<tr>
<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers (IEEE)</td>
<td><a href="https://www.ieee.org">https://www.ieee.org</a></td>
</tr>
<tr>
<td>OIF</td>
<td>Optical Internetworking Forum (OIF)</td>
<td><a href="http://www.oiforum.com">http://www.oiforum.com</a></td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>American</th>
<th>French</th>
<th>ISO</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>0,6</td>
<td>0,6</td>
</tr>
<tr>
<td>1,00</td>
<td>1 000</td>
<td>1 000</td>
</tr>
<tr>
<td>1,323,462.9</td>
<td>1 323 462,9</td>
<td>1 323 462,9</td>
</tr>
</tbody>
</table>
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

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 the same direction ("J" towards front of connector, "L" towards back of connector) as shown in Error! Reference source not found. a. "JL" Tail Configuration b. "LL" Tail Configuration

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 Error! Reference source not found.
**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.

**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

<table>
<thead>
<tr>
<th>1x1 Footprint Style</th>
<th>1x1 Footprint Description</th>
<th>1x1 Cage</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style A</td>
<td>“LL” connector footprint</td>
<td>QSFP2 1x1 Cage (see Note 1), OR SFF-8663 Cage (see Note 2)</td>
<td>Type 1, 2, 2A, or 2B (see Note 3)</td>
</tr>
<tr>
<td>Style B</td>
<td>“JL” connector footprint</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>2x1 Stacked Footprint Style</th>
<th>2x1 Stacked Connector Description</th>
<th>Cage</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style A</td>
<td>&quot;LL&quot; connector footprint with retention pin</td>
<td>QSFP2 2x1 Stacked Cage (see Note 1)</td>
<td>Type 1, 2, 2A, or 2B (see Note 2)</td>
</tr>
<tr>
<td>Style B</td>
<td>&quot;JL&quot; connector footprint with retention pin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Style C</td>
<td>&quot;LL&quot; connector footprint with glue pad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Style D</td>
<td>&quot;JL&quot; connector footprint with glue pad</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1. Refer to Section 0 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 stacked 2x1 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 7-4.

Figure 4-3 QSFP2 1x1 Connector Contact Numbering

Figure 4-4 QSFP2 2x1 Stacked Connector Contact Numbering

Lower (A) and Upper (B) Ports
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 stacked 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.
Commented [HA1]: Need to include drawing notes here?
### Table 4-3 Datum Descriptions

<table>
<thead>
<tr>
<th>Datum</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Host Board Top Surface</td>
</tr>
<tr>
<td>B</td>
<td>Inside surface of bezel</td>
</tr>
<tr>
<td>C</td>
<td>Distance between Connector terminal thru holes on host board and alignment holes on host PCB³</td>
</tr>
<tr>
<td>D</td>
<td>Hard stop on module²</td>
</tr>
<tr>
<td>E</td>
<td>Width of module³</td>
</tr>
<tr>
<td>F</td>
<td>Height of module housing</td>
</tr>
<tr>
<td>G</td>
<td>Width of module pc board³</td>
</tr>
<tr>
<td>H</td>
<td>Leading edge of signal contact pads on module pc board</td>
</tr>
<tr>
<td>J</td>
<td>Top surface of module pc board</td>
</tr>
<tr>
<td>K</td>
<td>Host board thru hole #1 to accept connector guidepost²</td>
</tr>
<tr>
<td>L</td>
<td>Host board thru hole #2 to accept connector guidepost²</td>
</tr>
<tr>
<td>M</td>
<td>Width of bezel cut out³</td>
</tr>
<tr>
<td>N</td>
<td>Connector Alignment Post</td>
</tr>
<tr>
<td>P</td>
<td>Vertical Center line of internal surface of cage</td>
</tr>
<tr>
<td>S</td>
<td>Seating plane of cage on host board</td>
</tr>
<tr>
<td>T</td>
<td>Hard stop on cage²</td>
</tr>
<tr>
<td>AA</td>
<td>Connector slot width³</td>
</tr>
<tr>
<td>BB</td>
<td>Seating plane of connector on host board</td>
</tr>
<tr>
<td>DD</td>
<td>Top surface of module housing</td>
</tr>
<tr>
<td>EE</td>
<td>Centerline of module opening to locate paddle card Datum H</td>
</tr>
<tr>
<td>FF</td>
<td>Centerline of upper port cage height</td>
</tr>
<tr>
<td>GG</td>
<td>Centerline of lower port cage height</td>
</tr>
<tr>
<td>HH</td>
<td>Primary Datum hole for 2x1 Host PCB</td>
</tr>
</tbody>
</table>

**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 stacked 2x1 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 stacked 2x1 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.

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 5-1 QSFP2 1x1 Connector

Figure 5-2 QSFP2 2x1 Stacked Connector

Figure 5-3 QSFP2 1x1 Connector Dimensions
5.2.2 Stacked 2x1 Stacked Connector

QSFP2 stacked 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 Stacked 2x1 Stacked Connector Dimensions](image-url)
6. Cage Mechanical Specification

6.1 Overview

The QSFP2 1x1 cage is backwards compatible with QSFP+ and QSFP28 cages. 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 shown 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 Overview
Figure 6-2 QSFP2 1x1 Cage Dimensions (1 of 2)
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.
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 Stacked 2x1 Stacked Cage

The QSFP2 stacked 2x1 stacked cage is shown in Figure 6-3 Error! Reference source not found.. 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 6-4 QSFP2 2x1 Stacked Cage Dimensions (1 of 2)
6.3 Thermal Management

The thermal management of connectors systems and modules described in this document is the responsibility of the implementor. 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.

Commented [SM3]: Need to review if heatsinks should be included. Define heatsink flatness.
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](image)

Commented [SM4]: Make key full length
7.2.1 Module Mechanical Dimensions

NOTE: Heat sink definitions for QSFP2 2A & 2B module types are shown in Figure 7-3.

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

<table>
<thead>
<tr>
<th>QSFP2 Module Type</th>
<th>Dim “B” (MAX)</th>
<th>Dim “C” (REF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 2A</td>
<td>3.4</td>
<td>13.5</td>
</tr>
<tr>
<td>Type 2B</td>
<td>5.1</td>
<td>15.2</td>
</tr>
</tbody>
</table>

Description of dimensions: Dim “B” and Dim “C”.
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

<table>
<thead>
<tr>
<th>Power Class</th>
<th>Module Flatness (mm)</th>
<th>Surface Roughness (Ra, µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Cu²</td>
<td>0.15</td>
<td>1.6</td>
</tr>
<tr>
<td>1</td>
<td>0.075</td>
<td>1.6</td>
</tr>
<tr>
<td>2</td>
<td>0.075</td>
<td>1.6</td>
</tr>
<tr>
<td>3</td>
<td>0.075</td>
<td>1.6</td>
</tr>
<tr>
<td>4</td>
<td>0.075</td>
<td>1.6</td>
</tr>
<tr>
<td>5</td>
<td>0.075</td>
<td>1.6</td>
</tr>
<tr>
<td>6</td>
<td>0.075</td>
<td>1.6</td>
</tr>
<tr>
<td>7</td>
<td>0.075</td>
<td>1.6</td>
</tr>
<tr>
<td>8</td>
<td>0.050</td>
<td>0.8</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Power Class</th>
<th>Module Flatness (mm)</th>
<th>Surface Roughness (Ra, µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>0.025</td>
<td>0.4</td>
</tr>
</tbody>
</table>
7.2.3 Card Edge Description (Mechanical Interface)

The QSFP2 module paddle card pad dimensions have been modified compared to legacy QSFP+/QSFP28 module paddle cards (defined in SFF-8661) to support higher data rates. See Figure 7-4 for QSFP2 module paddle card dimensions. All other module dimensions, except for the pads, remain the same as the QSFP+ and QSFP28 specifications. Refer to SFF-8661 for more information.

![QSFP2 Paddle Card Dimensions](image)
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>
<thead>
<tr>
<th>Footprint Style</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style A</td>
<td>&quot;LL&quot; 0.8mm pitch connector footprint</td>
</tr>
<tr>
<td>Style B</td>
<td>&quot;JL&quot; 0.8mm pitch connector footprint</td>
</tr>
</tbody>
</table>

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.

![Figure 8-1 PCB Layout for QSFP2 1x1 Connector, (Footprint Styles A & B)](image)

<table>
<thead>
<tr>
<th>QSFP2 1x1 Footprint Style</th>
<th>Dim &quot;A&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style A</td>
<td>7.93</td>
</tr>
<tr>
<td>Style B</td>
<td>7.05</td>
</tr>
</tbody>
</table>
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>
<thead>
<tr>
<th>Style</th>
<th>Retention Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style A</td>
<td>Retention Pin</td>
<td>“LL” 0.8mm pitch connector footprint with retention pin</td>
</tr>
<tr>
<td>Style B</td>
<td>Retention Pin</td>
<td>“JL” 0.8mm pitch connector footprint with retention pin</td>
</tr>
<tr>
<td>Style C</td>
<td>Glue</td>
<td>“LL” 0.8mm pitch connector footprint with glue pad</td>
</tr>
<tr>
<td>Style D</td>
<td>Glue</td>
<td>“JL” 0.8mm pitch connector footprint with glue pad</td>
</tr>
</tbody>
</table>

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.

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

**Table 8-2 QSFP2 2x1 Stacked Connector Footprint Styles**

<table>
<thead>
<tr>
<th>Style</th>
<th>Dim &quot;A&quot;</th>
<th>Dim &quot;B&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style A</td>
<td>7.93</td>
<td>19.65</td>
</tr>
<tr>
<td>Style B</td>
<td>7.05</td>
<td>18.77</td>
</tr>
<tr>
<td>Style C (see Note)</td>
<td>7.93</td>
<td>19.65</td>
</tr>
<tr>
<td>Style D (see Note)</td>
<td>7.05</td>
<td>18.77</td>
</tr>
</tbody>
</table>

NOTE: Styles C & D utilize glue pads instead of retention pins. Refer to Figure 8-4 for details.
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

<table>
<thead>
<tr>
<th>Performance Parameters</th>
<th>Description/ Details</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical/ Physical Requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plating Type</td>
<td>Plating type on connector contacts</td>
<td>Precious</td>
</tr>
<tr>
<td>Surface Treatment</td>
<td>Surface treatment on connector contacts, if surface treatment is applied, Test Group 6 is required.</td>
<td>Manufacturer to specify</td>
</tr>
<tr>
<td>Wipe length</td>
<td>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</td>
<td>Manufacturer to specify</td>
</tr>
<tr>
<td>Rated Durability Cycles</td>
<td>The expected number of durability cycles a component is expected to encounter over the course of its life</td>
<td></td>
</tr>
<tr>
<td>Latched Mating Force*</td>
<td>Amount of force needed to mate a module with a connector when latches are deactivated</td>
<td>60 N MAX</td>
</tr>
<tr>
<td>Latched Unmating Force*</td>
<td>Amount of force needed to separate a module from a connector when latches are deactivated</td>
<td>30 N MAX</td>
</tr>
<tr>
<td>Latch Retention*</td>
<td>Amount of force the latching mechanism can withstand</td>
<td>90 N MIN</td>
</tr>
<tr>
<td>Cage Latch Strength*</td>
<td>The amount of force that the cage latches can hold without being damaged.</td>
<td>125 N MIN</td>
</tr>
<tr>
<td>Cage Retention to Host Board*</td>
<td>Amount of force a cage can withstand without separating from the host board</td>
<td>114 N MIN</td>
</tr>
<tr>
<td>Environmental Requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field Life</td>
<td>The expected service life for a component</td>
<td>10 years</td>
</tr>
<tr>
<td>Field Temperature</td>
<td>The expected service temperature for a component (ambient air temperature around the component)</td>
<td>65°C</td>
</tr>
<tr>
<td>Electrical Requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>Maximum current to which a contact is exposed in use</td>
<td>0.5 A per signal contact MAX 1.5 A per power contact MAX</td>
</tr>
<tr>
<td>Operating Rating Voltage</td>
<td>Maximum voltage to which a contact is exposed in use</td>
<td>30 V DC per contact MAX</td>
</tr>
</tbody>
</table>

**NOTE:** 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.
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>
<thead>
<tr>
<th>Test</th>
<th>Test Descriptions and Details</th>
<th>Pass/ Fail Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mechanical/ Physical Tests</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durability (preconditioning)</td>
<td>EIA-364-09 To be tested with connector, cage, and module (Latches may be locked out to aid in automated cycling)</td>
<td>No evidence of physical damage</td>
</tr>
<tr>
<td>Durability (see Note 1)</td>
<td>EIA-364-09 To be tested with connector, cage, and module (Latches may be locked out to aid in automated cycling)</td>
<td>No visual damage to mating interface or latching mechanism</td>
</tr>
<tr>
<td><strong>Environmental Tests</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclic Temperature and Humidity</td>
<td>EIA-364-31 Method IV omitting step 7a. Test Duration B</td>
<td>No intermediate test criteria</td>
</tr>
<tr>
<td>Vibration</td>
<td>EIA-364-28 Test Condition VII Test Condition Letter CD 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.</td>
<td>No evidence of physical damage -AND- No discontinuities longer than 1 μs allowed</td>
</tr>
<tr>
<td>Mixed Flowing Gas</td>
<td>EIA-364-65 Class II See Table 4.1 in EIA-364-1000 for exposure times. Test option per EIA-364-1000: Option 3</td>
<td>No intermediate test criteria</td>
</tr>
<tr>
<td><strong>Electrical Tests</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Level Contact Resistance (see Note 2)</td>
<td>EIA-364-23 20 mV DC MAX, 100 mA MAX To include wire termination or connector-to-board termination</td>
<td>20 mΩ MAX change from baseline</td>
</tr>
<tr>
<td>Dielectric Withstanding Voltage</td>
<td>EIA-364-20 Method B 300 VDC minimum for 1 minute Applied voltage may be product / application specific</td>
<td>No defect or breakdown between adjacent contacts -AND- 1 mA Max Leakage Current</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Test</th>
<th>Test Descriptions and Details</th>
<th>Pass/ Fail Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mechanical/ Physical Tests</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 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). | Refer to Table 9-1  
-AND-  
No physical damage to any components |
| 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 energized simultaneously. | Refer to Table 9-1 for current magnitude |

**NOTES:**
1. Values listed in Table 9-1 for these tests apply with or 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 9-1. An example of a QSFP2 1x1 bezel design for use with Type 2A & 2B modules is shown in Figure 9-2.

Figure 9-1 Recommended QSFP2 1x1 Bezel Panel Cut-Out
Figure 9-2 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 9-3. An example of a QSFP2 2x1 stacked bezel design for use with Type 2A & 2B modules is shown in Figure 9-4.

Figure 9-3 Recommended QSFP2 2x1 Stacked Bezel Panel Cut-Out
Figure 9-4 Example of QSFP2 2x1 Stacked Bezel Design for Use with Type 2A & 2B Modules