

## QSFP-DD800 Specification

### QSFP-DD specification for 800G operation

**Rev 1.0 March 6, 2020**

Abstract: This specification defines the mechanical requirements of the pluggable QSFP Double Density (QSFP-DD800) module, connector and cage system. This document provides a common specification for systems manufacturers, system integrators, and suppliers of modules. It is intended to be added as an additional section to the QSFP-DD Hardware Specification.

#### Change History:

Revision	Date	Changes
1.0	March 6, 2020	First public release
2.0		Second public release
3.0		Third public release
4.0		
5.0		

#### Foreword

The development work on this specification was done by the QSFP-DD800 MSA group.

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## **QSFP-DD800 8X Pluggable Transceiver**

### **1 Scope**

The scope of this specification is the definition of a high density 100G/ per electrical lane capable 8-channel (8x) module, cage and connector system. QSFP-DD800 supports up to 800 Gb/s in aggregate over an 8 x 100 Gb/s electrical interface. The cage and connector design provides backwards compatibility to legacy QSFP-DD and all QSFP modules, which can be inserted into a QSFP-DD800 port.

### **2 Introduction**

This Specification is a follow on to the QSFP-DD Hardware Specification. It increases the data rate of each of the eight lanes to 100 Gbps. The specification is intended to be an incremental specification to the existing QSFP-DD Hardware Specification. The intention of this specification is to identify the differences from the QSFP-DD Hardware Specification required to support 800 Gb/s operation. If is not covered in the specification, the QSFP-DD Hardware Specification will be in force.

This specification covers the following items:

a) Mechanical specifications including dimensions and tolerances for the connector, cage and module system. Includes details of the requirements for correct mating of the module and host sides of the connector.

b) Host PCB layout requirements.

The cage and connector system on a circuit board are defined in this specification to ensure that QSFP-DD800 products are mechanically interchangeable.

### **3 Mechanical and Board Definition**

#### **3.1 Introduction**

##### Transceiver/DAC

The module paddle card dimensions of the QSFP-DD800 have been modified to support 100Gbps serial data rates. See Section 3.2.2.

Connectors/cage

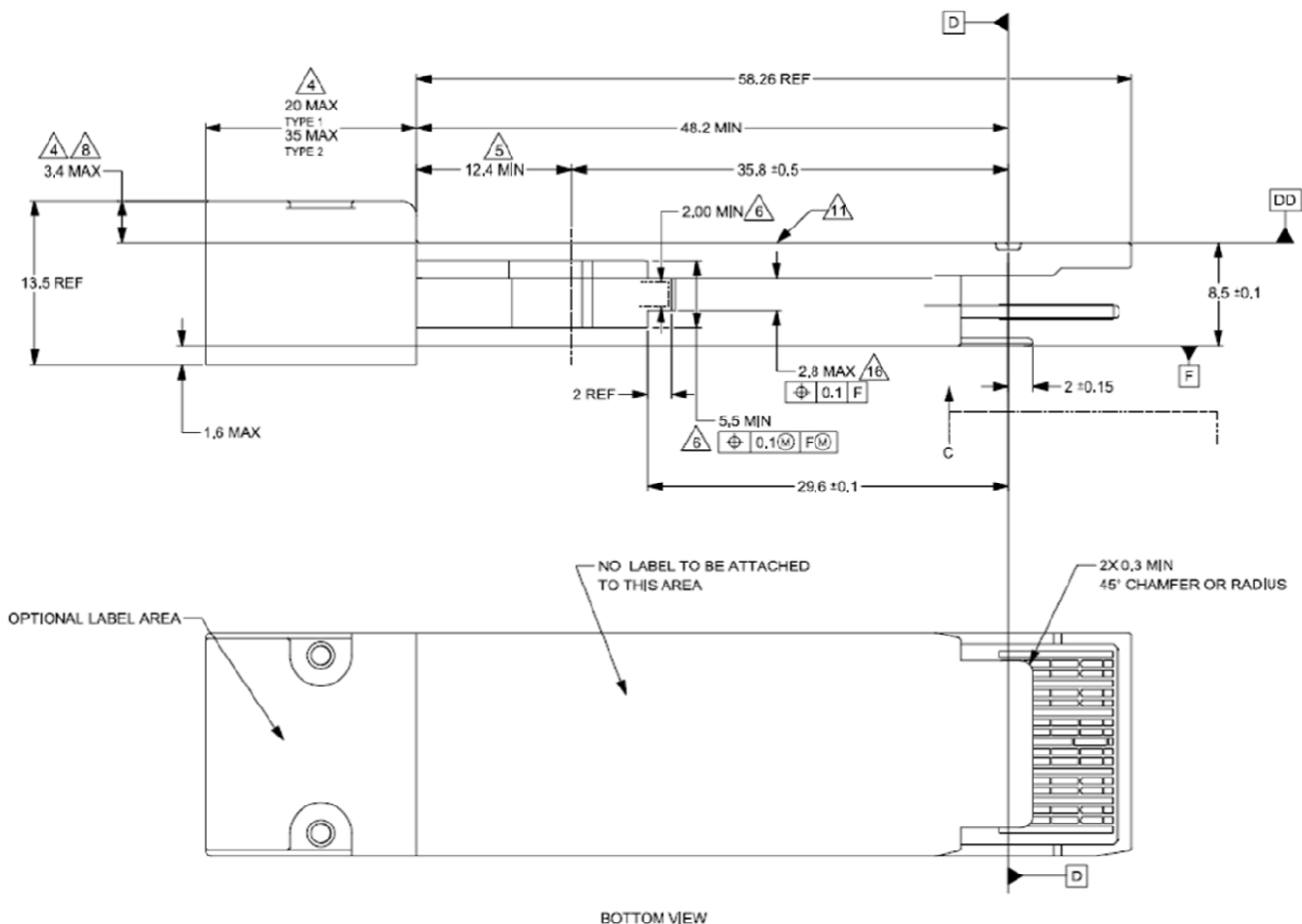
Multiple connector/cage form factors are supported by this specification. All combinations of cages/connectors defined in the specification are backwards compatible to accept QSFP-DD and QSFP legacy modules.

- 1) a 1x1 surface mount connector/cage
- 2) a 2x1 surface mount connector/cage
- 3) a 2x1 surface mount connector/cage with cabled high-speed host interconnects on the top connector/cage.

## 3.2 Transceiver/DAC

### 3.2.1 Module Mechanical Dimensions













For QSFP-DD800 modules the bottom surface of the module within the cage shall be flat. 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. Flatness and roughness specs as defined in QSFP-DD Hardware Specification apply for both top and bottom surfaces of QSFP-DD800, except for power class 1 copper cables, whereas a flatness of 0.15 is allowed. See Figure 3-1.

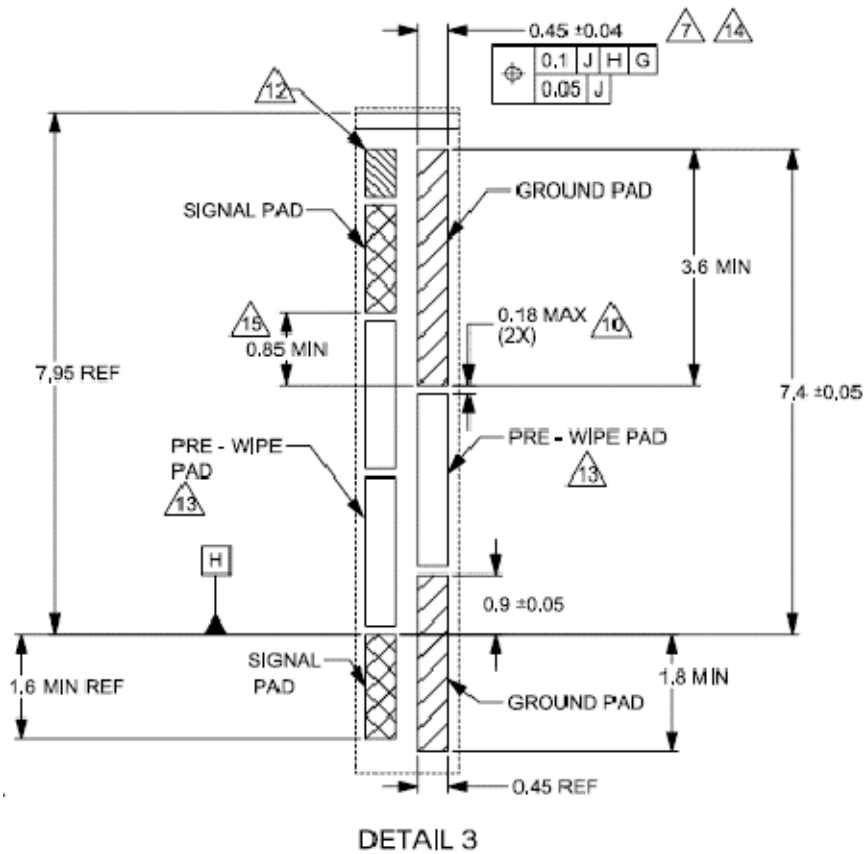
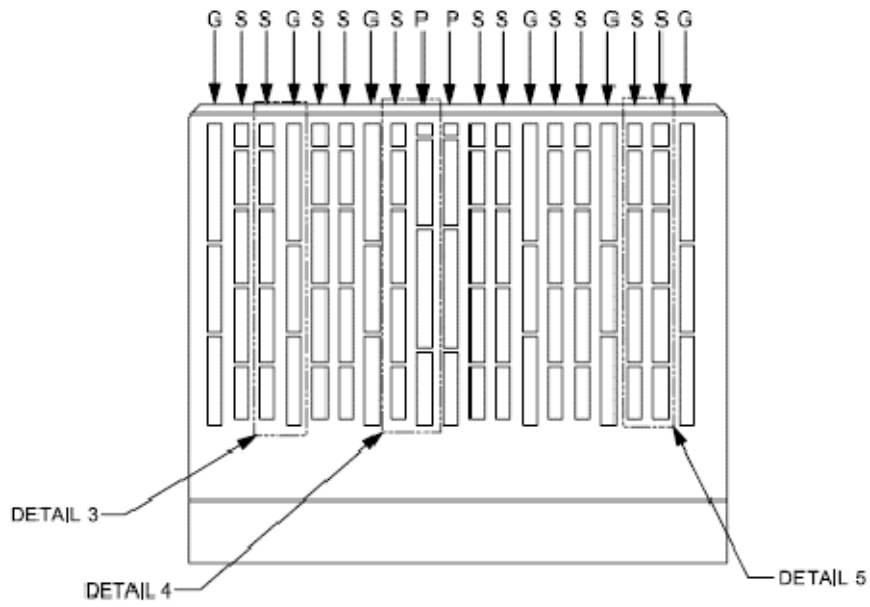


**FIGURE 3-1: MODULE DIMENSIONS**

### 3.2.2 Module paddle card dimensions

The module paddle card pad dimensions of the QSFP-DD800 have been modified to support 100Gbps serial data rates. See Figure 3-2 for QSFP-DD800 updated paddle card pad dimensions. All other module dimensions, except for the pads, remain the same as in the QSFP-DD Hardware Specification.

1. Pre-wipe pads (shaded area) on module card host side are optional
2. A single, double or triple split in the pre-wipe signal pad is optional, and if implemented, the resulting 2, 3 or 4 pads shall be separated with a gap of 0.13 +/- 0.05
3. Dimensioning and tolerancing conform to ASME Y14.5-2009
4. All dimensions are in millimeters
5. No solder mask within 0.05 mm of all defined contact pad edges.
6. No solder mask between end contacts and the sides of the paddle card
7.  Dimension and tolerance applies to all ground pads on both top and bottom of paddle card
8.  Dimension and tolerance applies to all power pads on both top and bottom of paddle card
9.  Dimension and tolerance applies to all signal pads on both top and bottom of paddle card
10.  A zero gap is allowed for a continuous pad option
11.  Applies to all signal pad to pad spacing
12.  Pre-wipe pads (shaded area) on module card host side are optional
13.  Pre-wipe pads (unshaded area) are required except in continuous power or ground pad designs
14.  Paddle card thickness is measured over pads, vias must not be proud of the pad surface
15.  Minimum dimension required for mating sequence between signal and ground pads
16.  Minimum dimension required for mating sequence between signal and power pads
17.  See QSFP-DD Hardware Specification Fig. 21
18.  A single split in the pre-wipe signal pad is optional, and if implemented, the resulting 2 pads shall be separated with a gap of 0.13 +/-0.05
19. Contact pad plating
  - 0.38 micrometers minimum gold over
  - 1.27 micrometers minimum nickel
 Alternate contact pad plating
  - 0.05 micrometers minimum gold over
  - 0.30 micrometers minimum palladium over
  - 1.27 micrometers minimum nickel



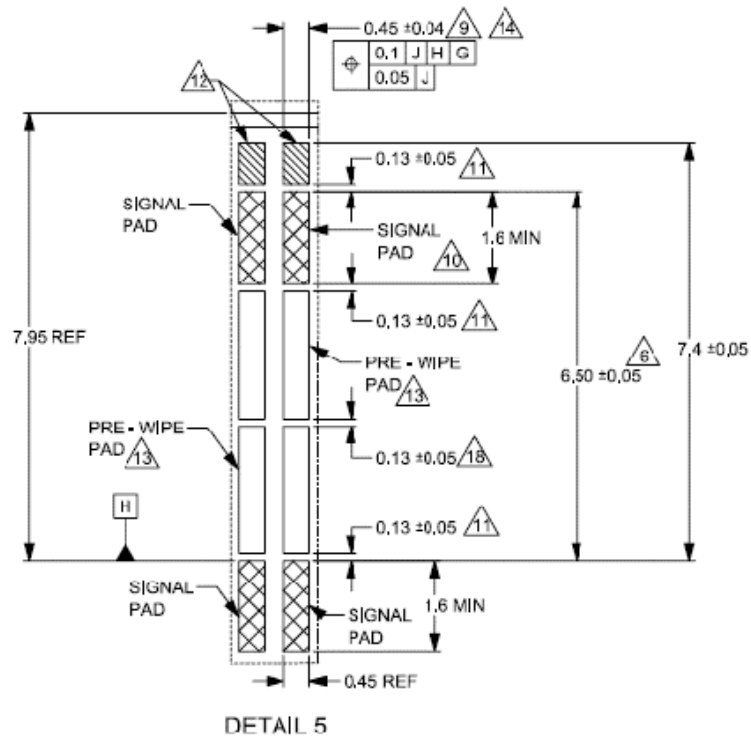
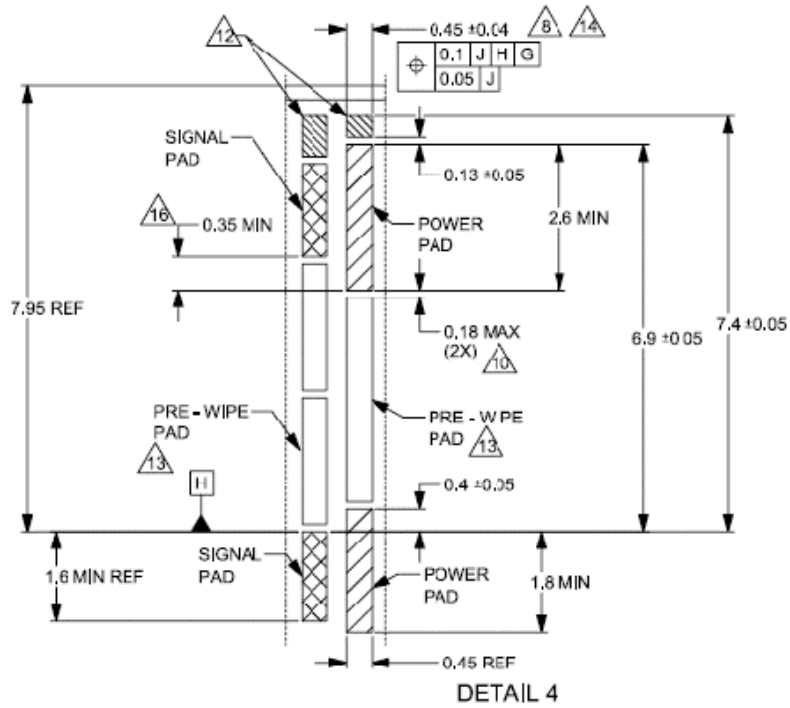


FIGURE 3-2: QSFP-DD800 MODULE PAD DIMENSIONS

### 3.3 1x1 SMT connector/cage

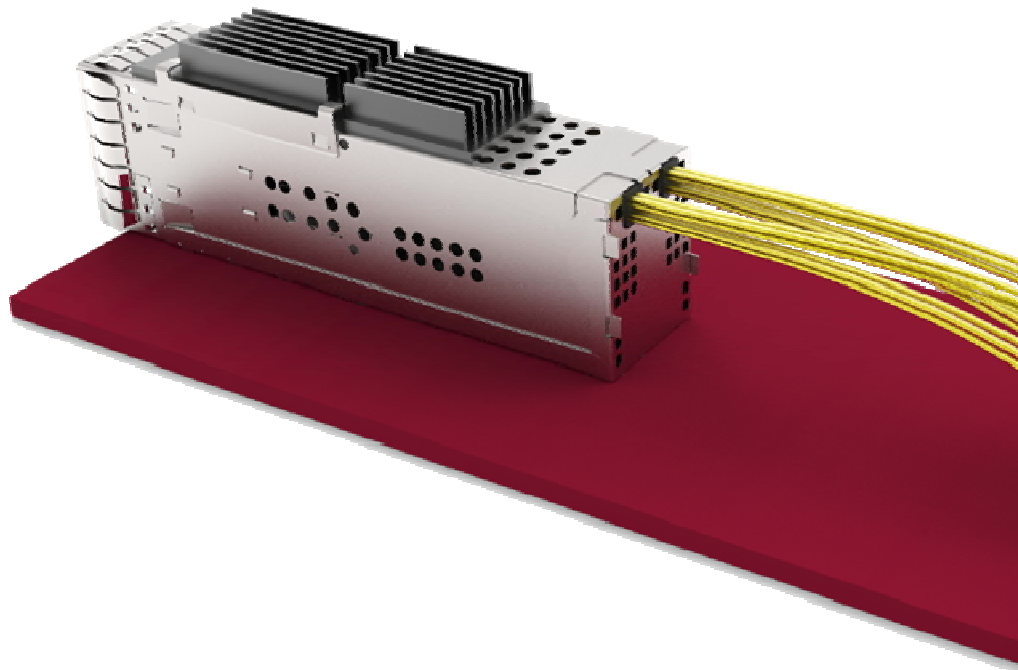
The 1x1 mechanical outline for the 100 Gb/s connector/cage for QSFP-DD800 will be identical to the QSFP-DD 1x1 connector/cage. See QSFP-DD Hardware Specification section 5.8.

### 3.4 2x1 SMT connector/cage

The 2x1 mechanical outline for the 100 Gb/s SMT connector/cage design for QSFP-DD800 will be updated in the future.

### 3.5 2x1 cabled connector/cage

The 2x1 mechanical outline for the 100 Gb/s cabled connector/cage contains an upper cabled port and a lower SMT port. The lower SMT port is identical to the 1x1 connector/cage in section 3.2. The upper connector/cage contains low speed and power contacts that are press fit to the PCB and high-speed signals that are connected to cables. The cables are routed from the upper connector/cage to the host ASIC. This specification does not define the cable construction or the near ASIC connection. The connector/cage defined in this section is illustrated in Figure 3-3. All pluggable modules and direct attach cable plugs (Type 1, Type 2 and Type 2A) must mate to the connectors and cages defined in this specification.



**FIGURE 3-3: 2x1 CABLED UPPER CONNECTOR/CAGE**

#### 3.5.1 2x1 cabled connector/cage Electrical Connector Mechanical

The 2x1 stacked cabled cage is illustrated in Figure 3-4. Figure 3-5 shows the stacked connector placement over the surface mount connector. Figure 3-6 shows the placement of the cabled upper connector press fit connector over the existing surface mount connector. Detailed drawings are shown in Figure 3-7, Figure 3-8, Figure 3-9, Figure 3-10 and Figure 3-11.



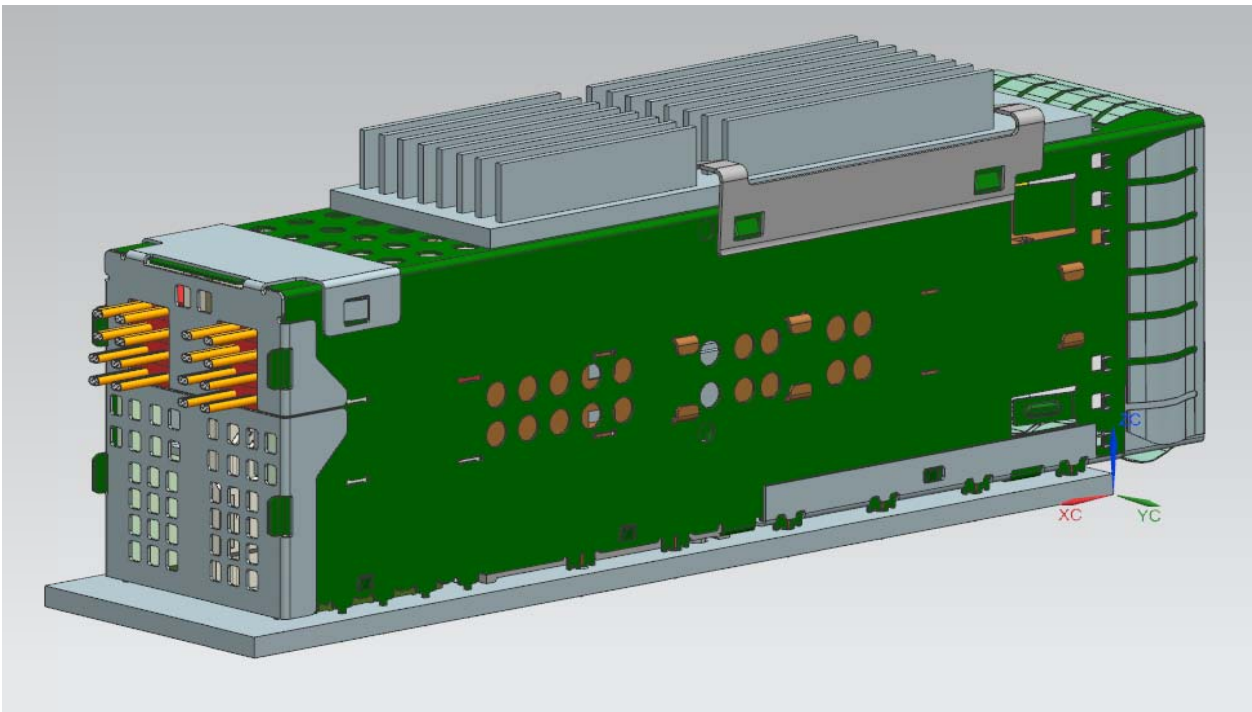
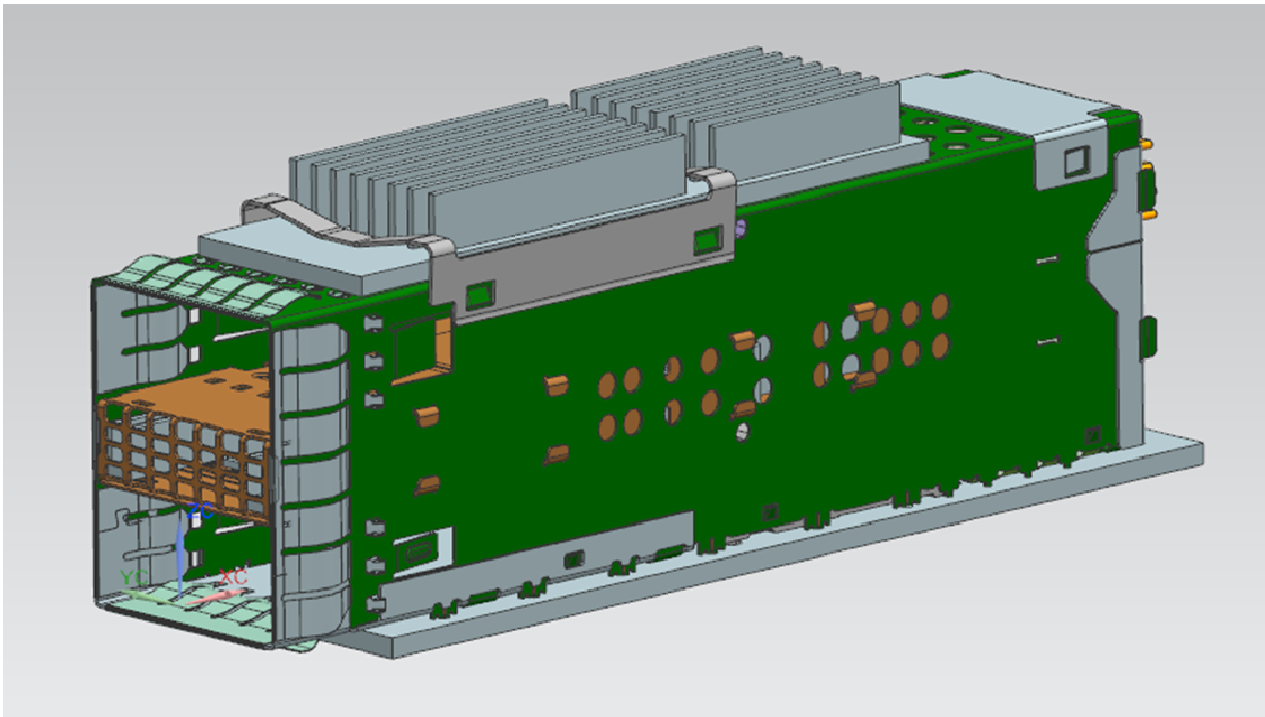


FIGURE 3-4: 2x1 CABLED UPPER CONNECTOR/CAGE ILLUSTRATION

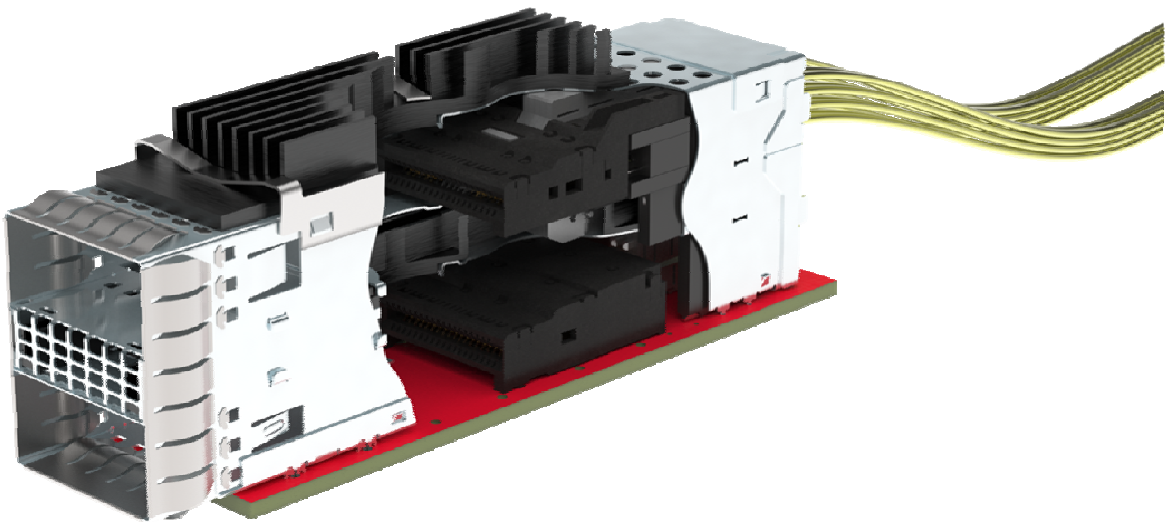
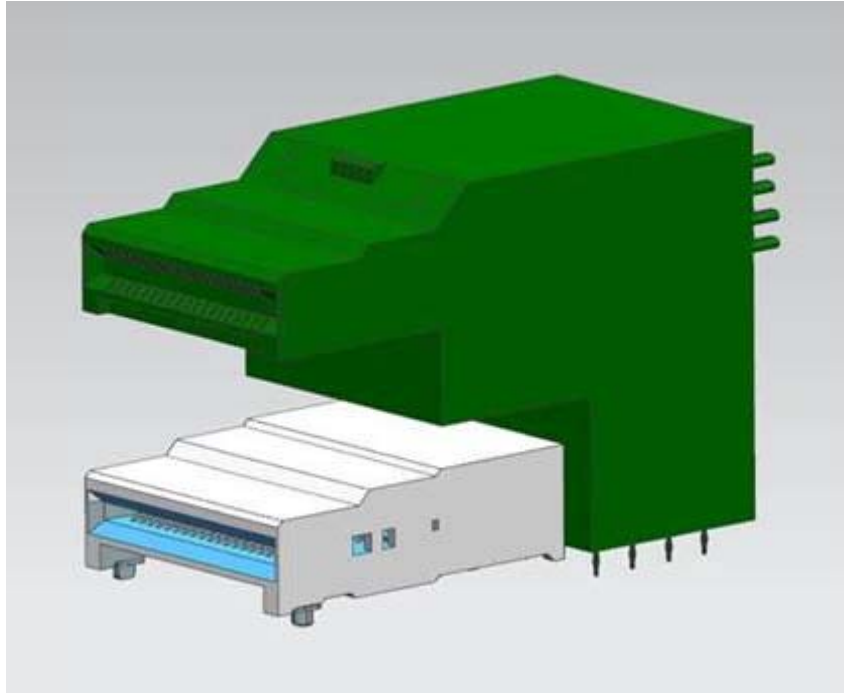


FIGURE 3-5: CABLED UPPER CONNECTOR OVER EXISTING SURFACE MOUNT CONNECTOR

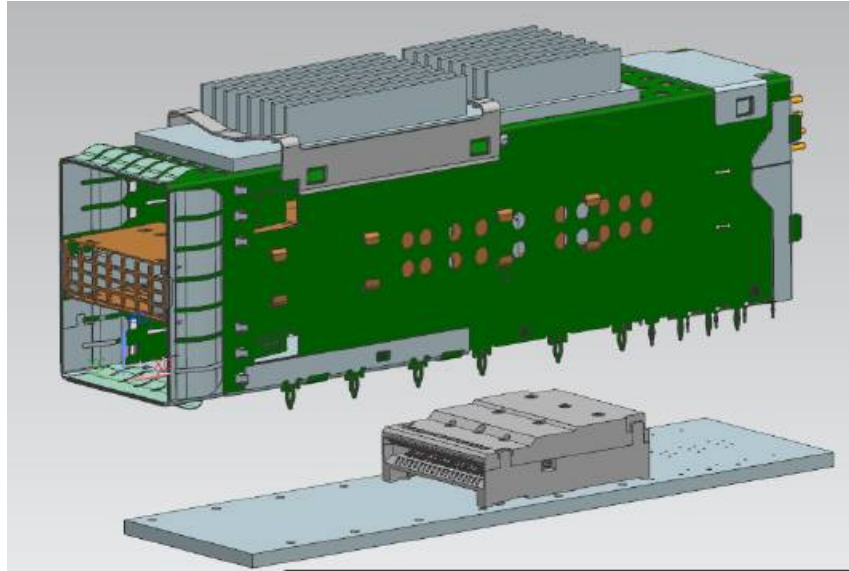
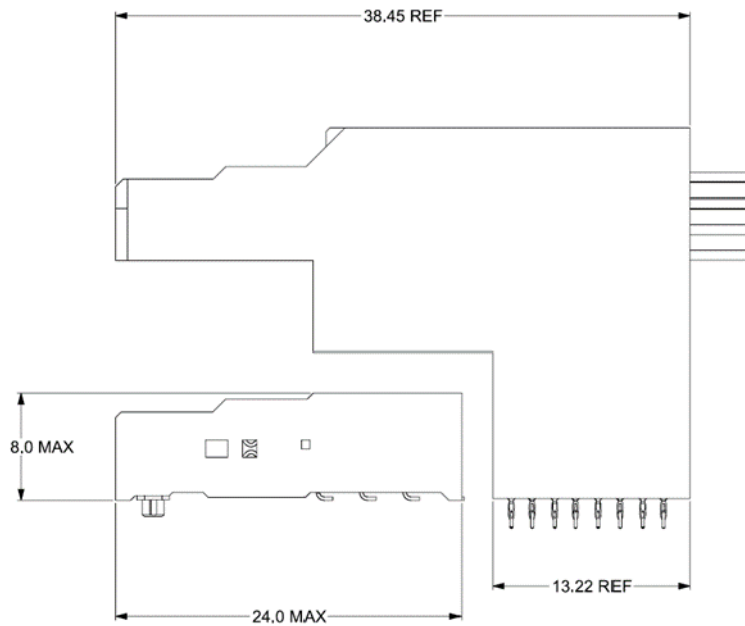


FIGURE 3-6: CABLED UPPER CONNECTOR/CAGE SHOWN OVER EXISTING SURFACE MOUNT CONNECTOR BEFORE BEING PRESS FIT INTO THE PCB



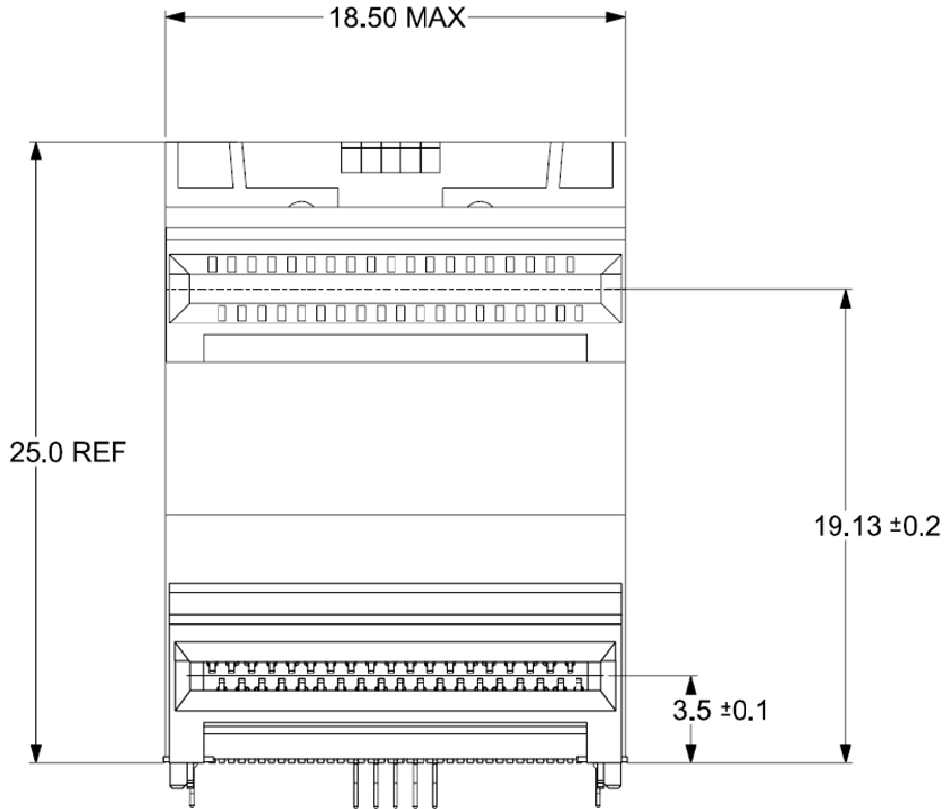


FIGURE 3-7: CABLED UPPER CONNECTOR AND SURFACE MOUNT CONNECTOR DIMENSIONS

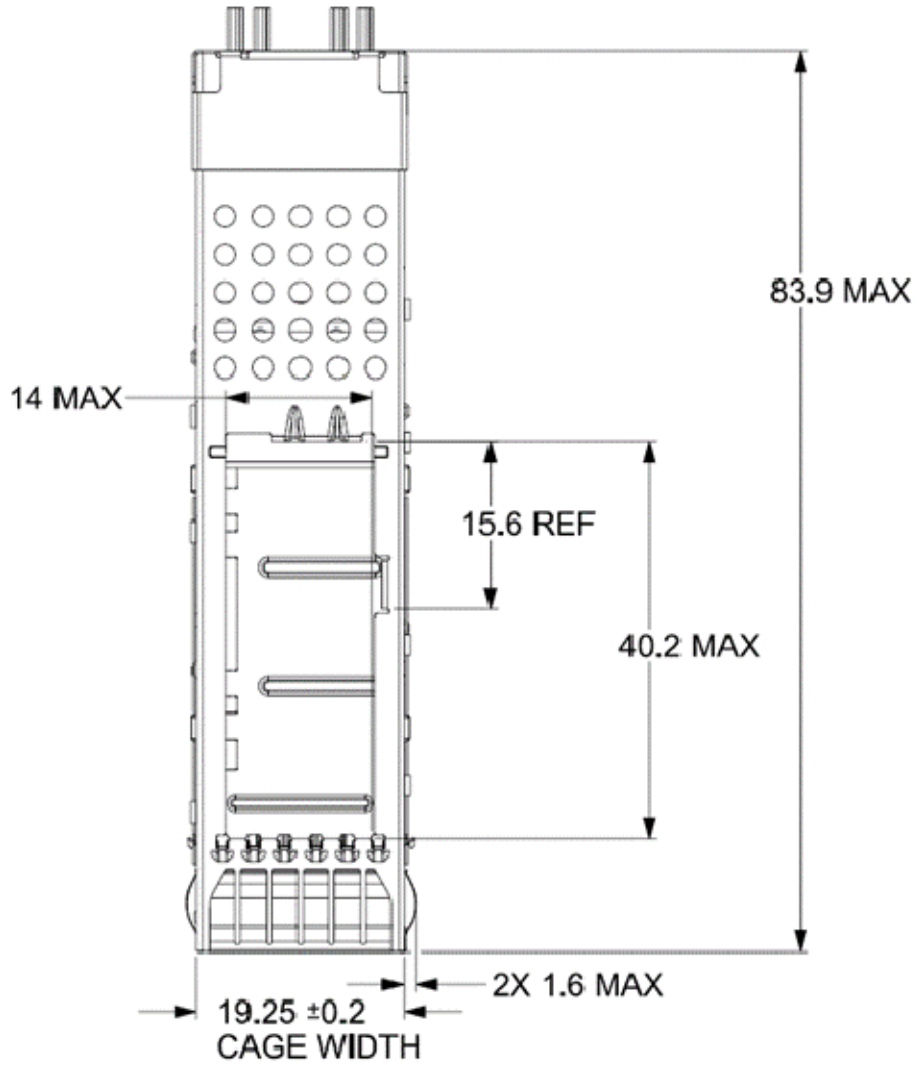


FIGURE 3-8: 2X1 CABLED UPPER CONNECTOR/CAGE TOP VIEW

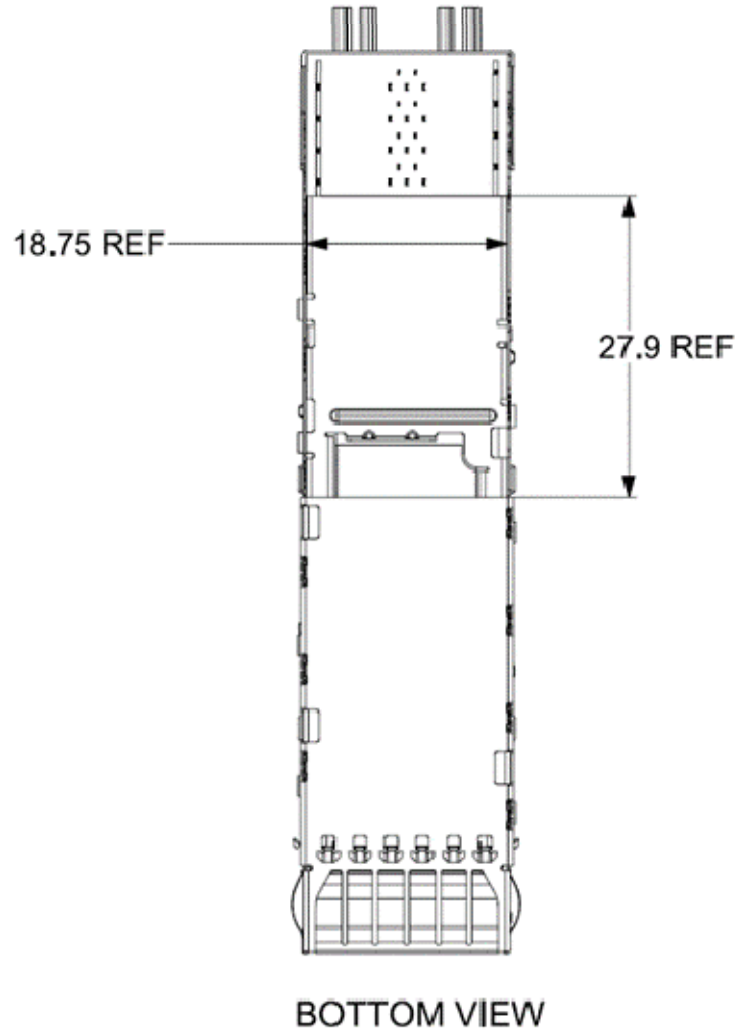
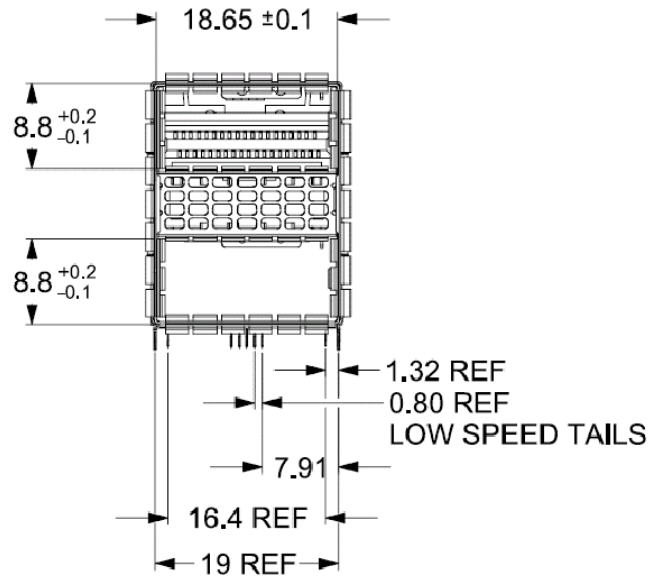


FIGURE 3-9: 2X1 CABLED UPPER CONNECTOR/CAGE BOTTOM VIEW



FRONT VIEW

FIGURE 3-10: 2x1 CABLED UPPER CONNECTOR/CAGE FRONT VIEW

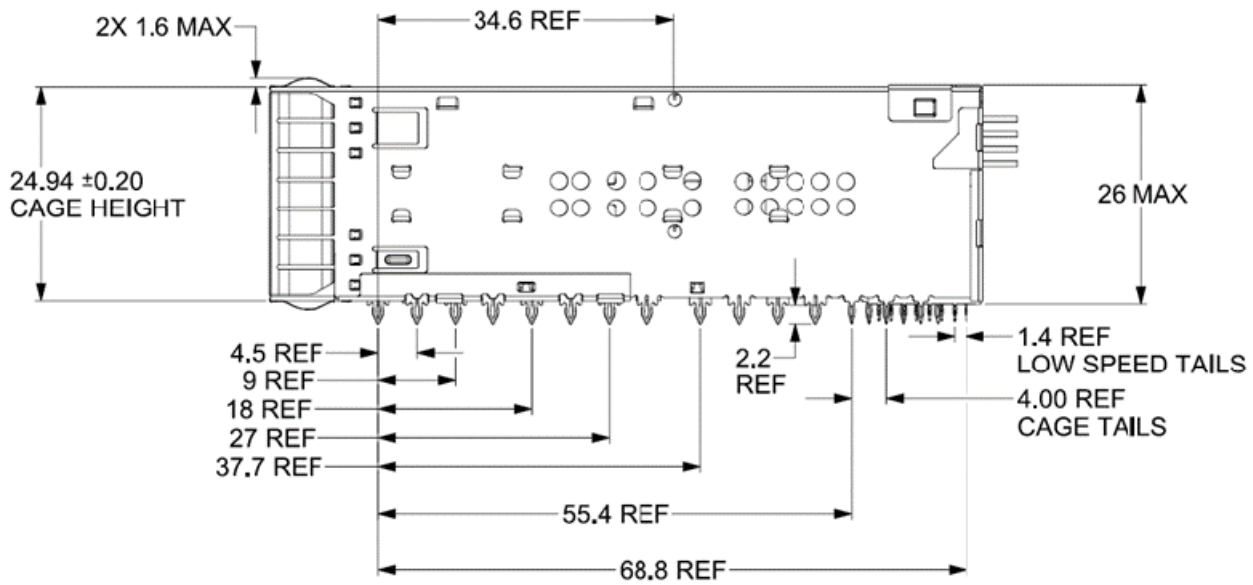
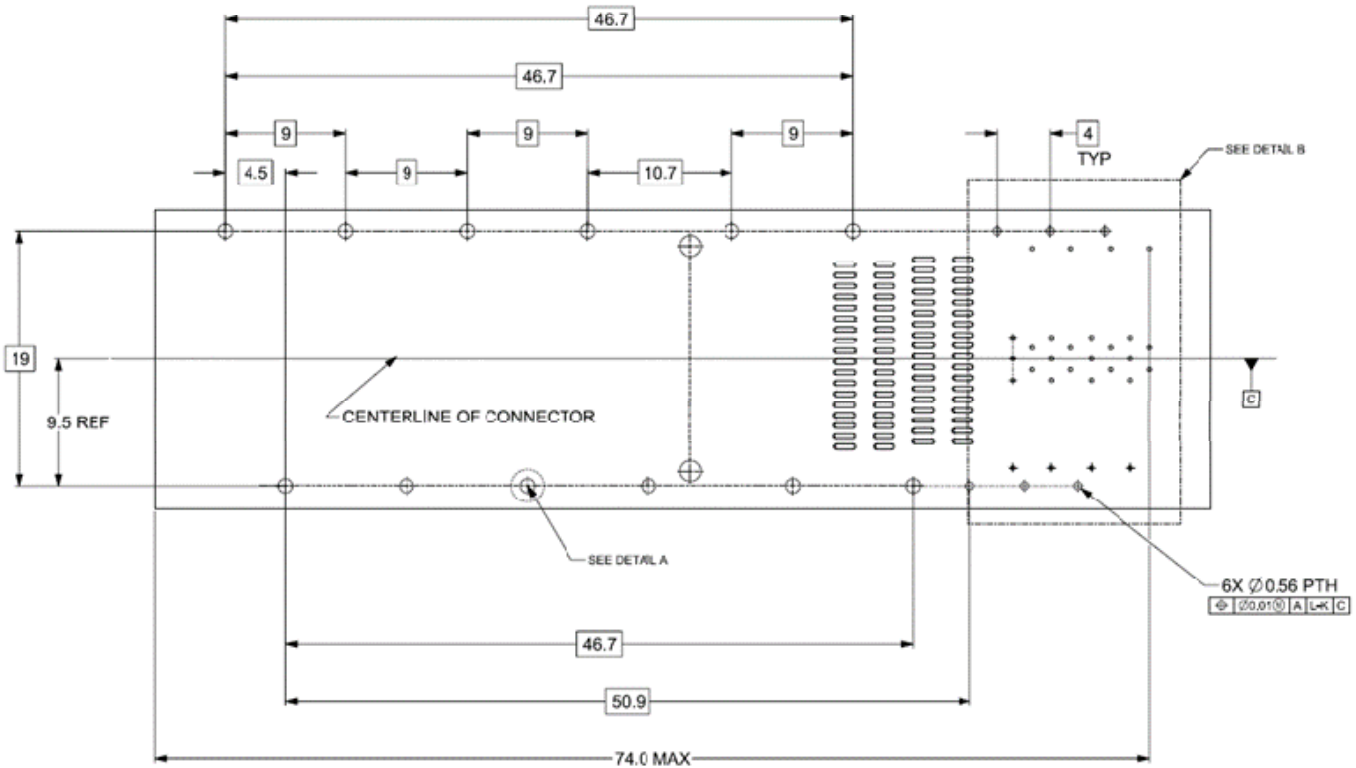


FIGURE 3-11: 2x1 CABLED UPPER CONNECTOR/CAGE SIDE VIEW

### 3.5.2 2x1 Connector and Cage host PCB layout

A typical host board mechanical layout for attaching the QSFP-DD800 2x1 stacked cabled Connector and Cage system is shown in Figure 3-12 and Figure 3-13. The location of the pattern on the host board is application specific. To achieve 100 Gbps performance pad dimensions and associated tolerances must be adhered to and attention paid to the host board layout.



**FIGURE 3-12: 2X1 CABLED UPPER CONNECTOR/CAGE HOST BOARD CONNECTOR CONTACTS**



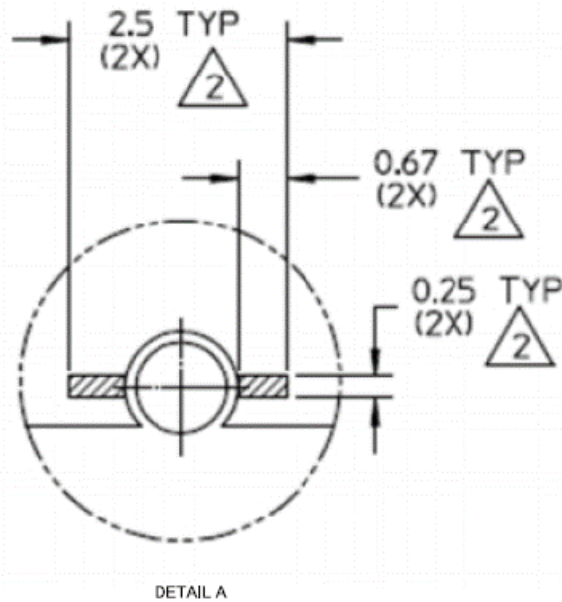
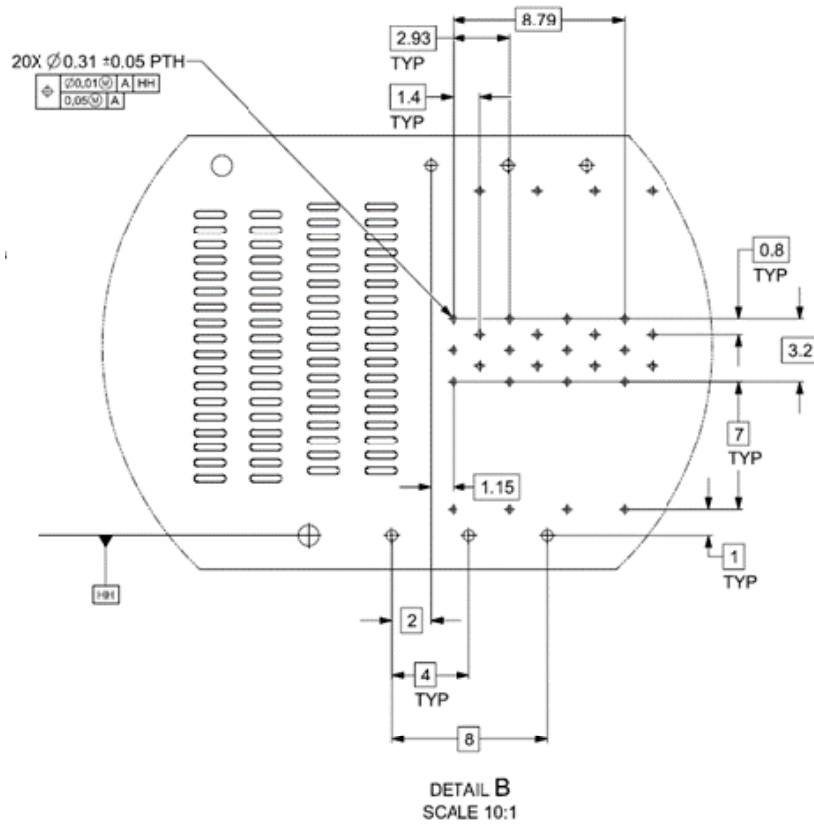


FIGURE 3-13: 2X1 CABLED UPPER CONNECTOR/CAGE PAD LAYOUT

## 4 Informative Annex – Optional Heat Sink and EMI Solutions

### 4.1 Scope

This Annex details an optional MSA compliant cage design which can provide improved EMI and thermal performance. Implementation of this option does not require a change to either the QSFP-DD host PCB layout, front panel cutout or the module.

### 4.2 Introduction

The QSFP DD-800 cage design is an integral element of the EMI and thermal design strategy in QSFP -DD800 based architectures. In this annex a cage design is described with features specifically targeting these design elements. The key features are as follows:

- a) A dual row EMI spring clip which has been shown to enhance the shielding performance of the cage
- b) A heat sink attach mechanism which has been shown to enhance the heat dissipation properties of the module when inserted into the cage.

### 4.3 Mechanical Definition

#### 4.3.1 EMI Spring Clip

Figure 4-1 illustrates the connection of the transceiver to the front panel using a dual contact EMI Spring Clip. The additional connection provided by path #2 in Figure 4-1 serves to reduce the transfer impedance of this connection resulting in improved shielding performance. Figure 4-2 shows the detail of the EMI Spring clip.

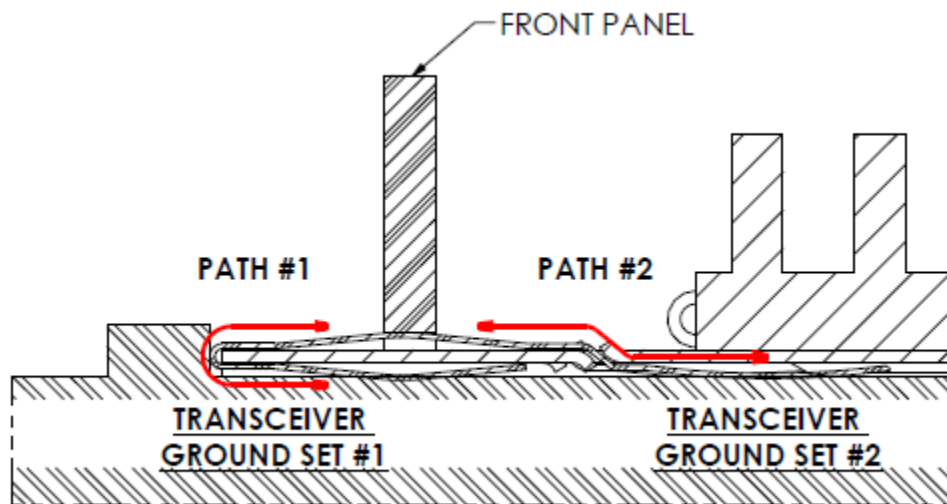


Figure 4-1: Dual Grounding Path for EMI Spring Clip

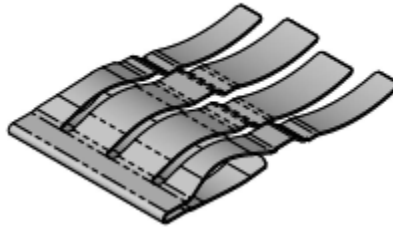


Figure 4-2: EMI Spring Clip

### 4.3.2 Heat Sink Attach Mechanism

A cage and heat sink attached mechanism is shown in Figure 4-3 and Figure 4-4. This cage implementation maximizes the heat sink surface area and the corresponding module heat dissipation. This cage design relies on an integrated heat sink clips at the front and rear of the cage. This approach reduces part count and allows for the use of a heat sink that is the full length of the cage

This cage design also incorporates an EMI latch shield. This optional shield covers an aperture in the cage due to the latching mechanism resulting in improved shielding performance.

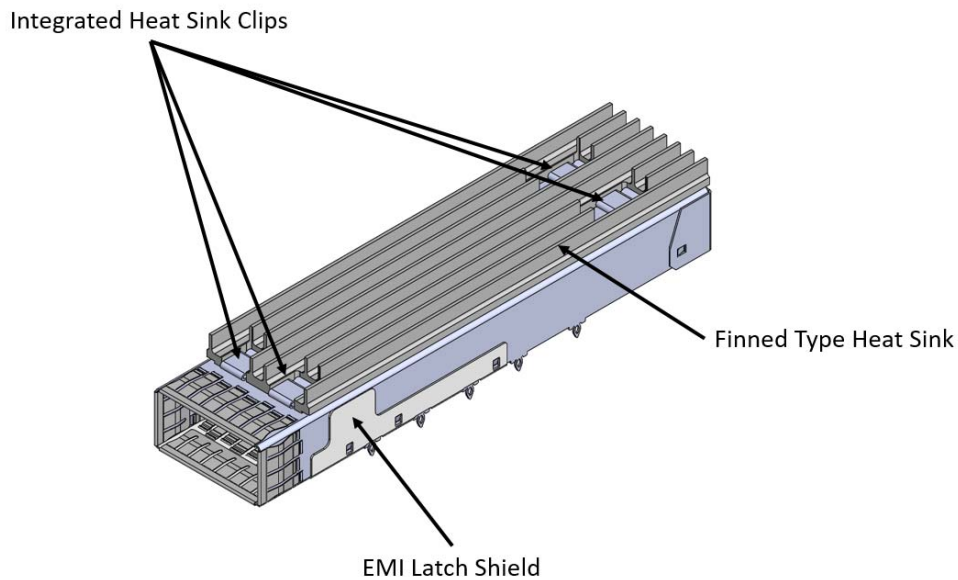
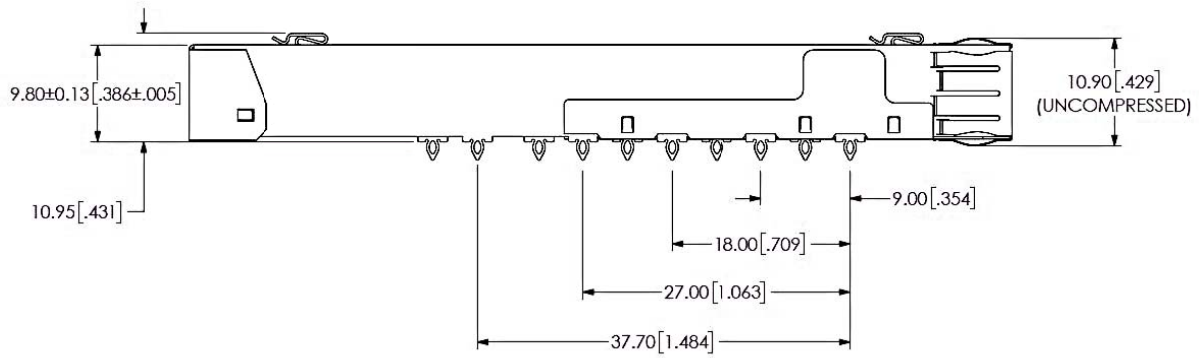


FIGURE 4-3: CAGE WITH INTEGRATED HEAT SINK CLIPS AND EMI LATCH SHIELD



**FIGURE 4-4:** 1XN CAGE (SIDE VIEW)

### 4.3.3 Host PCB Layout

The features identified in this Annex do not impact the host PCB layout. Footprint compatibility permits the cage implementation in the Annex to be applied in designs with more challenging EMI and thermal objectives.

### 4.3.4 Front Panel Cutout

The EMI spring clip and cage design does not require a change to the front panel cutout allowing for mechanical design compatibility between different cage options.