

**NOTE**



*All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters. Unless otherwise specified, dimensions have a tolerance of  $\pm 0.13$  [ $\pm .005$ ] and angles have a tolerance of  $\pm 2^\circ$ . Figures and illustrations are for identification only and are not drawn to scale.*

## 1. INTRODUCTION

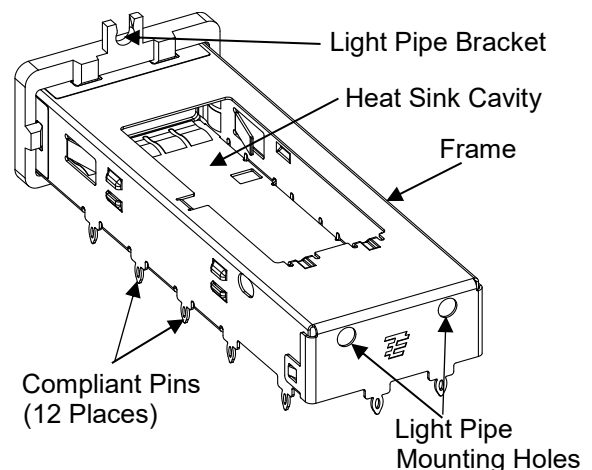
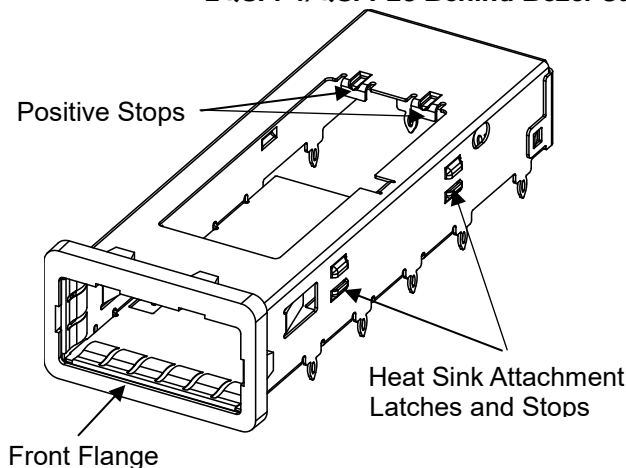
This specification covers the requirements for application of the zQSFP+/QSFP28 behind/Thru bezel cage assembly, heat sink, EMI/dust cover, and light pipe that are used in conjunction with 38-position, 0.8 mm pitch, right-angle surface mount, zQSFP+/QSFP28 connectors used in the communications industry. The cage assembly serves as a housing for the connector and mating transceiver. The cage assembly is a frame with compliant pins for mounting onto the host printed circuit (pc) board. The cage assembly features front perimeter electromagnetic interference (EMI) springs. These springs block any EMI emissions emanating from the transceiver when installed. The cage assembly is designed to be bezel mounted. Behind bezel type, the front flange provides a flat surface to contact the EMI gasket attached to the perimeter of the bezel cutout. Thru bezel type, the front perimeter EMI spring/conductive elastomeric gasket contact the perimeter of the bezel cutout directly. The cage assembly transceiver locking latches hold the transceiver in place, and the hard stop controls the insertion depth of the transceiver. The optional heat sink are located on the top of the cage assembly and are used to transmit heat from inside of cage assembly to outside. The optional light pipes are located outside of the cage assembly and are used to transmit light from up to LEDs on the pc board to a panel.

The EMI/dust cover is used to confine EMI emissions and prevent contaminants from entering the chassis when the transceiver is not installed.

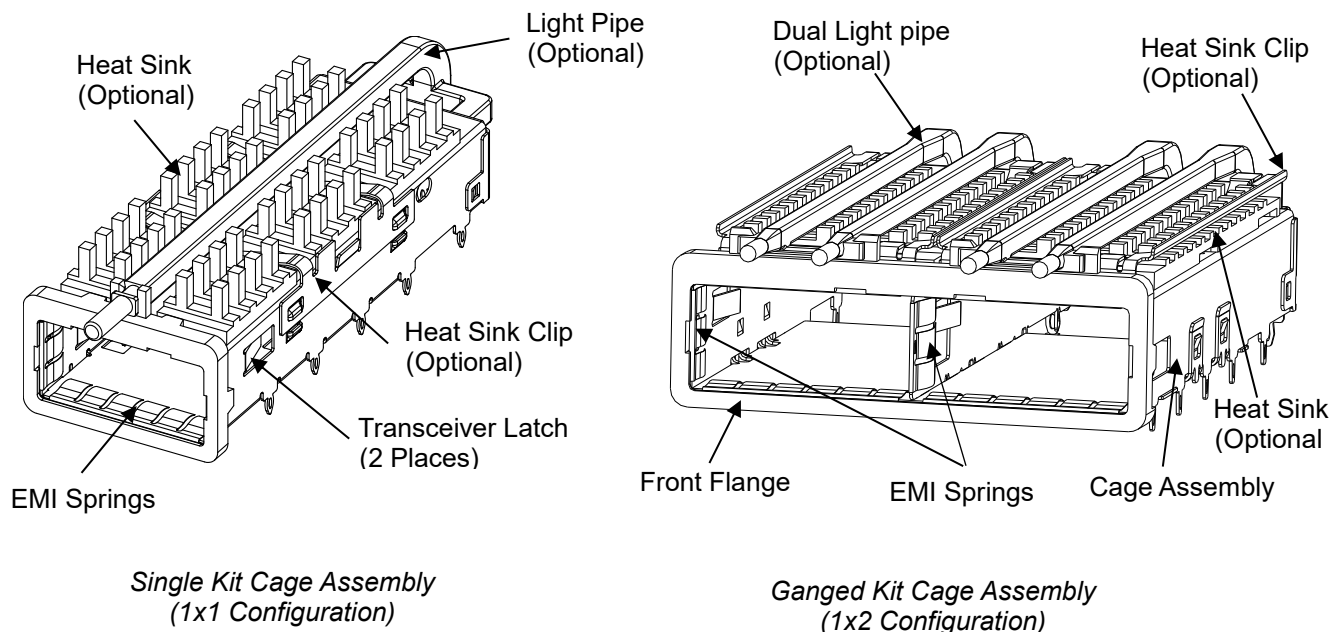
This specification covers the requirements for the zQSFP+/QSFP28 Cage Assemblies with EMI Spring Fingers onto printed circuit (pc) boards and bezel. The cage assemblies are available in single port 1x1 or ganged 1x2, 1x3, 1x4, 1x5, and 1x6 configurations. All configurations are available with, or without, optional heat sinks in different heights (PCI, SAN, NETWORKING, and CUSTOMIZED). All configurations are available with, or without, optional light pipes with three different display options (single, dual, and quad).

When corresponding with TE Connectivity Personnel, use the terminology provided in this specification to facilitate your inquiries for information. Basic terms and features of this product are provided in Figure 1.

**zQSFP+/QSFP28 Behind Bezel Cage Assembly with Heat Sink and Clip**

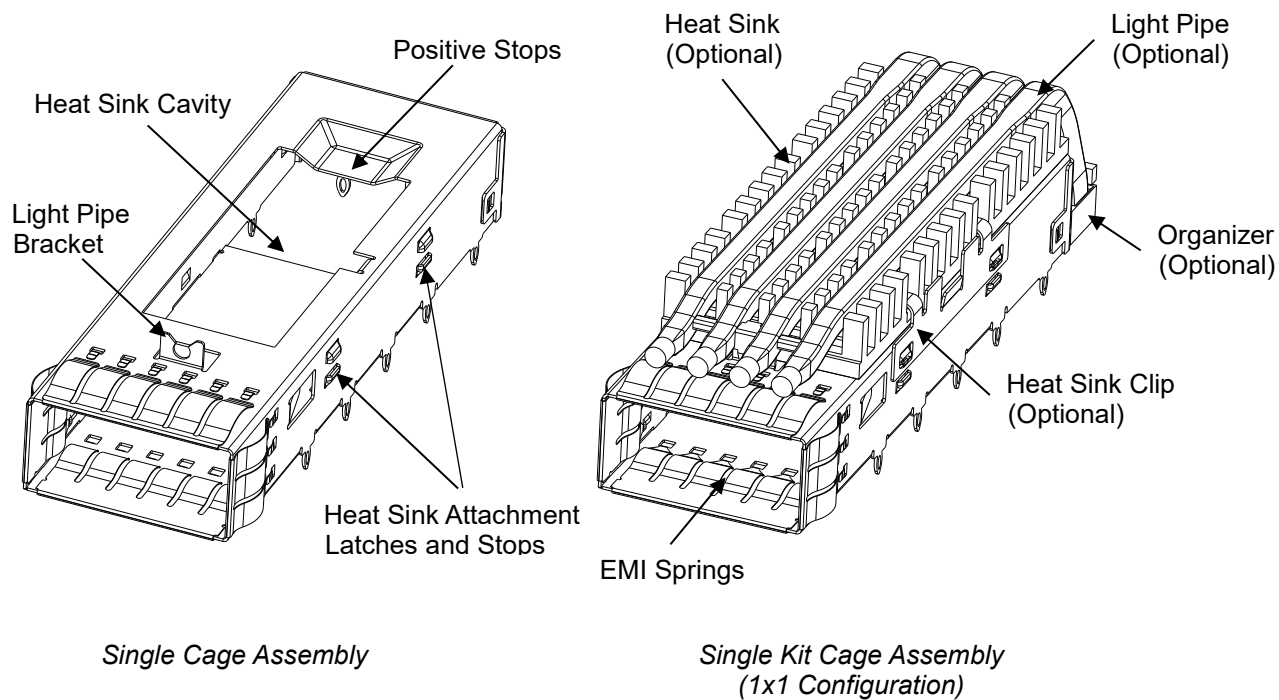


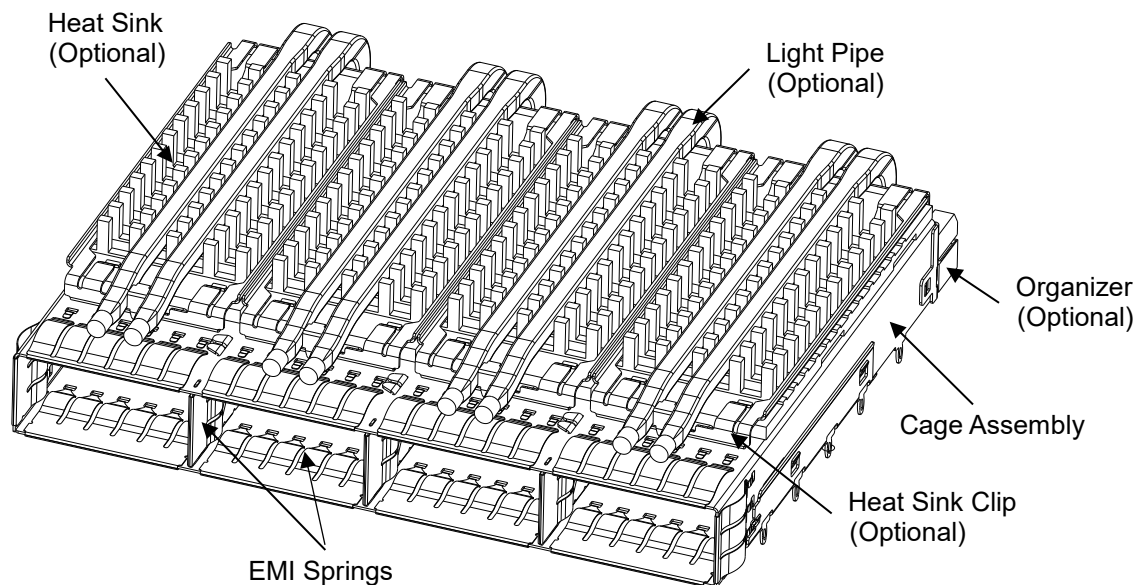
**Single Cage Assembly**



**Figure 1 (Cont'd)**

***zQSFP+/QSFP28 Thru Bezel Cage Assembly with Heat Sink and Clip (Spring type)***

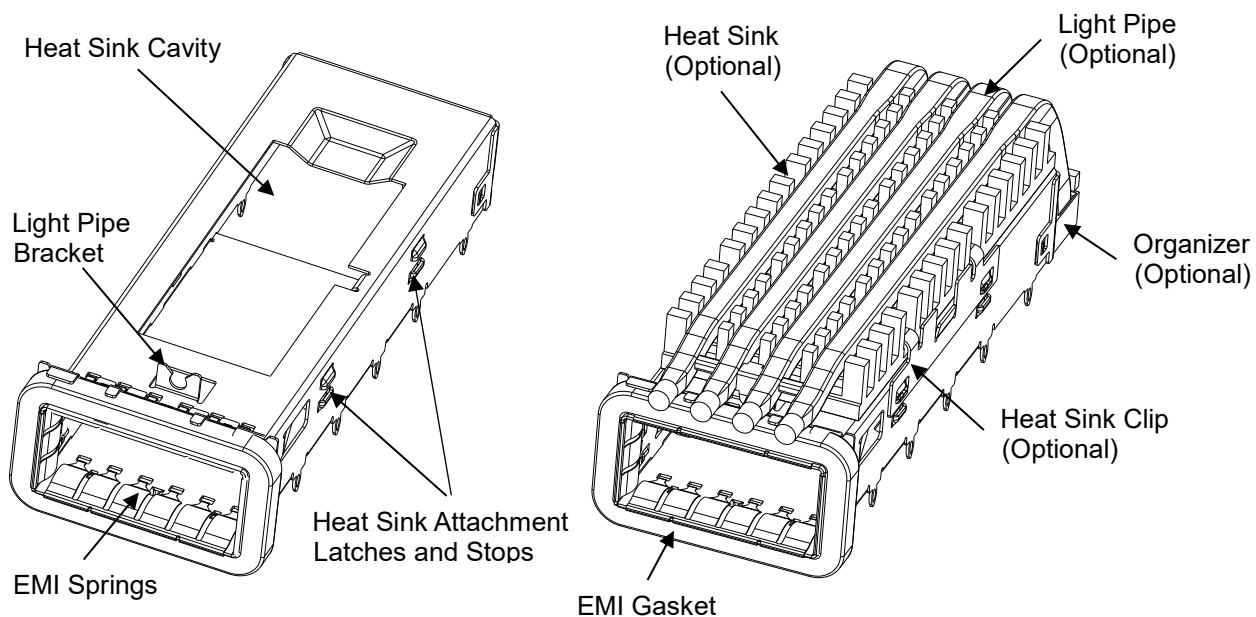




*Single Kit Cage Assembly  
(1x4 Configuration)*

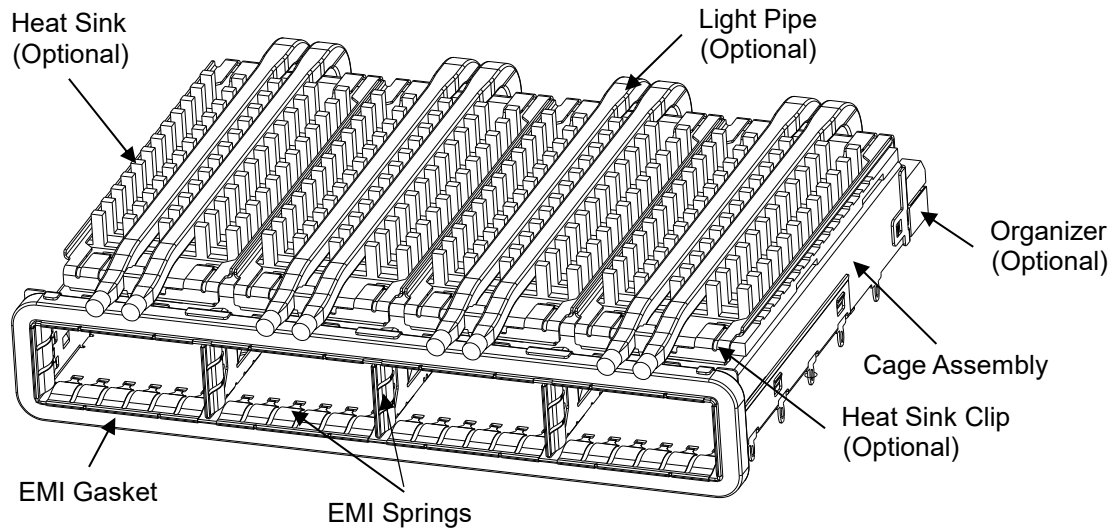
**Figure 1 (Cont'd)**

***zQSFP+/QSFP28 Thru Bezel Cage Assembly with Heat Sink and Clip (Gasket type)***



*Single Cage Assembly*

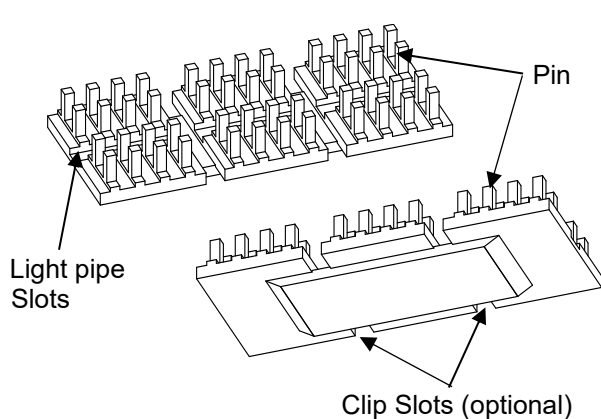
*Single Kit Cage Assembly  
(1x1 Configuration)*



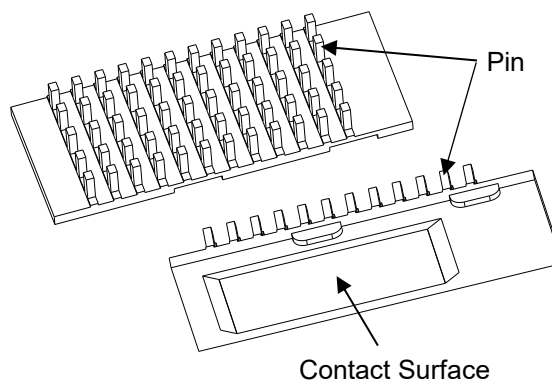
*Single Kit Cage Assembly  
(1x4 Configuration)*

**Figure 1 (Cont'd)**

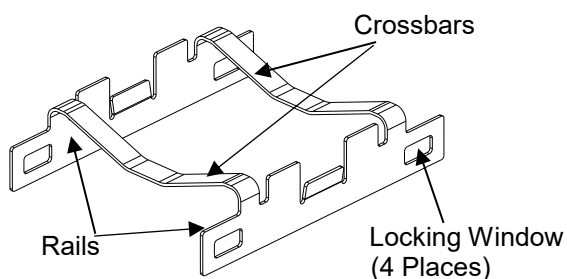
**Heat sink, Clip, Light Pipe, Dust Cover in zQSFP+/QSFP28 Cage Assembly**



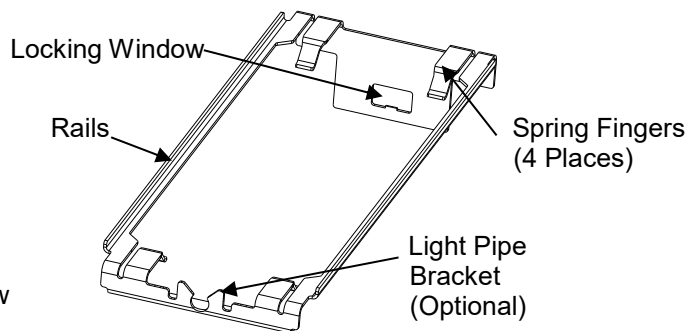
*Heat Sink (Single cage)*



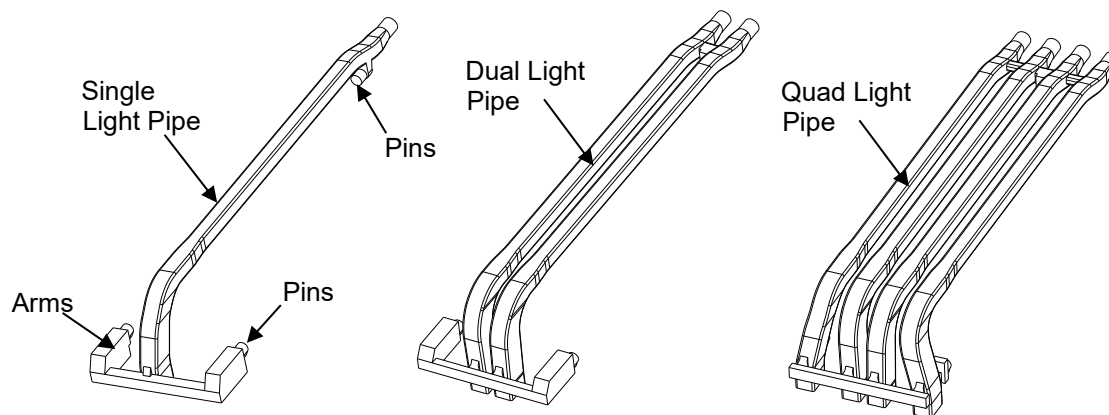
*Heat Sink (Ganged cage)*



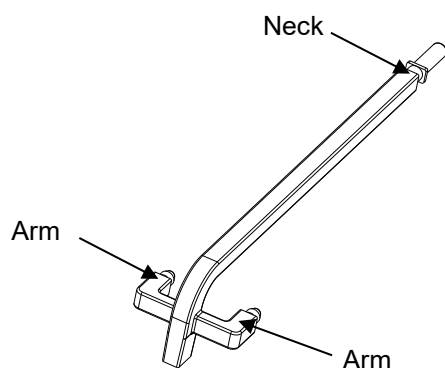
*Clip (Single cage)*



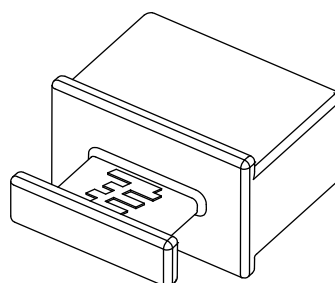
*Clip (Ganged cage)*



*Single, Dual and Quad Light Pipe (Thru bezel)*



*Single Light Pipe (behind bezel)*



*EMI/Dust Cover (1888810-2)*

**Figure 1 End**

In applications where heat dissipation is necessary, a heat sink can be used. The heat sink must be chosen to meet the need of the specific application. A sample of available heat sinks are shown in Figure 1. These heat sinks are designed to be attached to the cage assembly using a clip. This type allows insertion and extraction of the transceiver while maintaining the necessary contact between the heat sink and the transceiver. Basic terms and features of this product are provided in Figure 1.

The cage assemblies are available with or without a light pipe. The light pipe is used to transmit light from an LED on the pc board to a panel.

## 2. REFERENCE MATERIAL

### 2.1. Revision Summary

Revisions to this application specification include:

- Released a new revision with Thru bezel types of cage assembly.

### 2.2. Customer Assistance

Reference the following Product Base Part Numbers and Product Code X260 are representative of zQSFP+/QSFP28 Cage Assemblies. Use of these numbers will identify the product line and expedite your inquiries through a service network established to help you obtain product and tooling information. Such



information can be obtained through a local Representative or, after purchase, by calling PRODUCT INFORMATION at the number at the bottom of page 1.

### **Product Series**

### **Description**

#### **Behind Bezel Version**

1551891--* /1551892-*	1x1 Cage Assembly, / With Heat Sink
2227104-* /2227103-*	1x2 Cage Assembly, / With Heat Sink
2173238-* /2173239-*	1x3 Cage Assembly, / With Heat Sink
2227250-* /2227249-*	1x4 Cage Assembly, / With Heat Sink
-	1x5 Cage Assembly, / With Heat Sink
-	1x6 Cage Assembly, / With Heat Sink

#### **Thru Bezel Version with Spring**

2170703-* /2170704-* /2170705-*	1x1 Cage Assembly, / With Heat Sink, / With Heat Sink and Light Pipe
2170805-* /2170806-* /2170808-*	1x2 Cage Assembly, / With Heat Sink, / With Heat Sink and Light Pipe
2170737-* /2170738-* /2170740-*	1x3 Cage Assembly, / With Heat Sink, / With Heat Sink and Light Pipe
2170744-* /2170745-* /2170747-*	1x4 Cage Assembly, / With Heat Sink, / With Heat Sink and Light Pipe
-	1x5 Cage Assembly, / With Heat Sink, / With Heat Sink and Light Pipe
2170706-* /2170707-* /2170708-*	1x6 Cage Assembly, / With Heat Sink, / With Heat Sink and Light Pipe

#### **Thru Bezel Version with Gasket**

2170752-* /2170753-* /2170754-*	1x1 Cage Assembly, / With Heat Sink, / With Heat Sink and Light Pipe
2170811-* /2170812-* /2170814-*	1x2 Cage Assembly, / With Heat Sink, / With Heat Sink and Light Pipe
2170767-* /2170768-* /2170769-*	1x3 Cage Assembly, / With Heat Sink, / With Heat Sink and Light Pipe
2170782-* /2170783-* /2170785-*	1x4 Cage Assembly, / With Heat Sink, / With Heat Sink and Light Pipe
-	1x5 Cage Assembly, / With Heat Sink, / With Heat Sink and Light Pipe
-	1x6 Cage Assembly, / With Heat Sink, / With Heat Sink and Light Pipe

## **2.3. Drawings**

Customer Drawings for product part numbers are available from the service network. If there is a conflict between the information contained in the Customer Drawings and this specification or with any other technical documentation supplied, the information contained in the Customer Drawings takes priority.

## **2.4. Specifications**

Design Objective 108-19428 provides expected product performance and test information.

## **2.5. Instructional Material**

Instruction Sheets (408-series) provide product assembly instructions or tool setup and operation procedures. Documents available which pertain to this product are:

408-32021 zQSFP+ Connector, Behind Bezel Cage Assembly, Heat Sink, and Light Pipe

## **3. REQUIREMENTS**

### **3.1. Safety**

Do not stack product shipping containers so high that the containers buckle or deform.

### 3.2. Limitations

#### A. Transceiver Module

The top surface of the Transceiver Module is to be free of EMI bumps and maintain a flatness of 0.08 mm. The width of the mating transceiver module (outside of the cage assembly) cannot exceed 19 mm in order to prevent interference between transceivers inserted into adjacent ports.

#### B. Bezel

The bezel requirements given in this document are specifically configured for products used in the communications industry, and peripheral component interconnect (PCI) applications.

### 3.3. Material

The cage assembly frame is made of nickel silver alloy. The EMI springs are made from copper alloy plated with tin over nickel or only nickel. The EMI/dust cover and front flange are made of zinc plated with tin over nickel or only nickel. The heat sinks are made of nickel-plated aluminum. The heat sink clip is made of stainless steel. The light pipes are made of clear polycarbonate.

### 3.4. Storage

The cage assemblies should remain in the shipping containers until ready for use to prevent deformation to the contacts and compliant pins. The cage assemblies should be used on a first in, first out basis to avoid storage contamination that could adversely affect performance.

### 3.5. Chemical Exposure

Do not store cage assemblies or accessories near any chemical listed below as they may cause stress corrosion cracking in the contacts or compliant pins.

Alkalies	Ammonia	Citrates	Phosphates	Citrates	Sulfur Compounds
Amines	Carbonates	Nitrites	Sulfur	Nitrites	Tartrates

### 3.6. Host PC Board

#### A. Material and Thickness

The host pc board material shall be glass epoxy (FR-4 or G-10). The pc board thickness shall be a minimum of 1.44 mm for mounting the cage assembly to one side of the pc board, and the pc board thickness must be 2.2 mm minimum when mounting the cage assembly to both sides of the pc board.

**NOTE**

Contact PRODUCT INFORMATION at the number listed at the bottom of page 1 for suitability of other pc board materials.



#### B. Tolerance

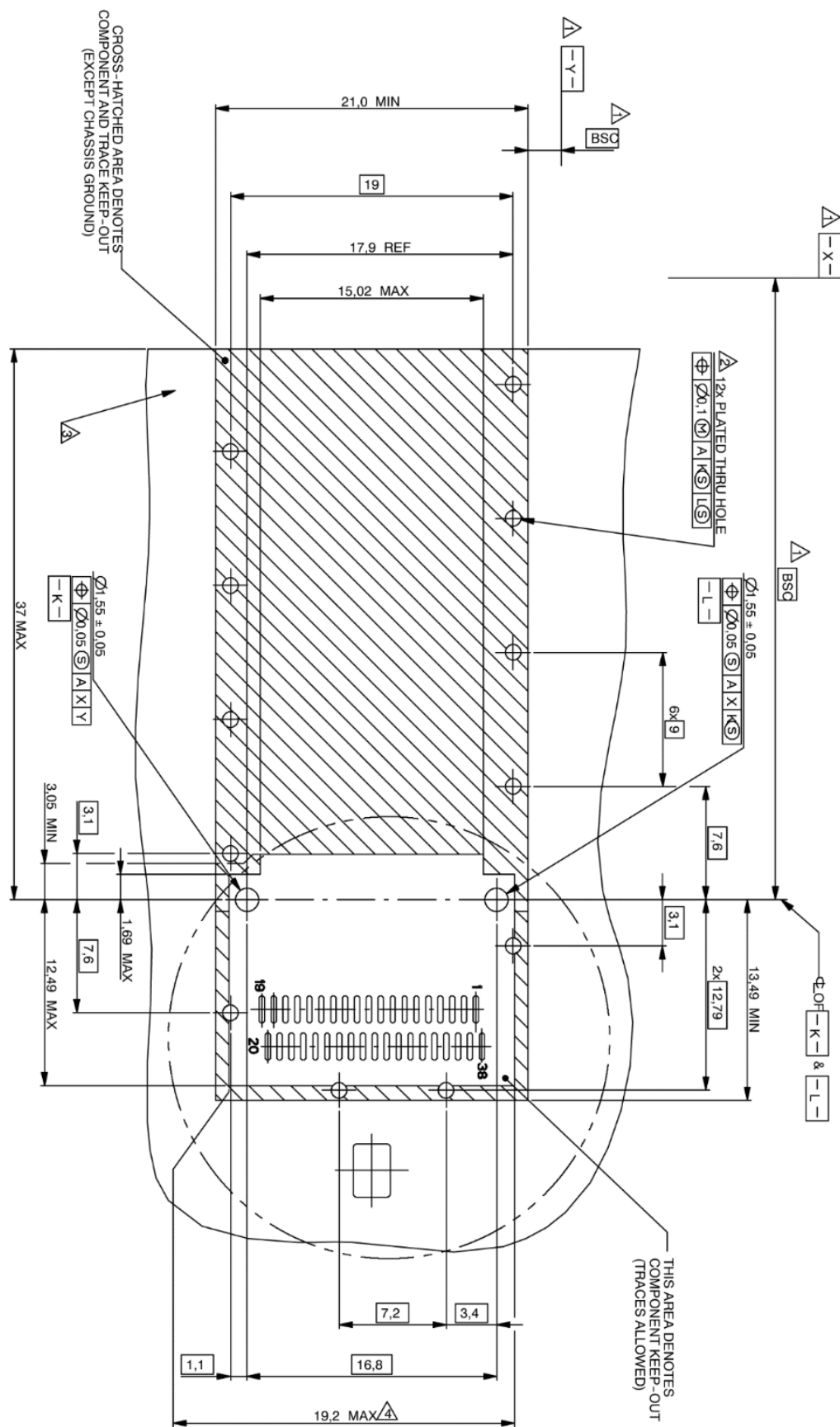
Maximum allowable bow of the pc board shall be 0.08 mm over the length of the cage assembly. The coplanarity of the pc board circuit pads must be 0.03 mm.

#### C. Circuit Pads

The circuit pads must be solderable in accordance with EIA-364-52.

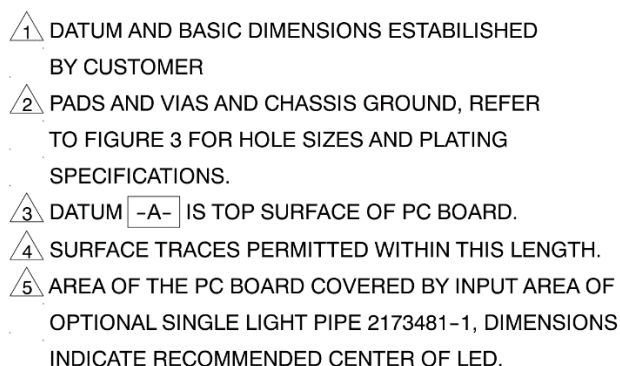
#### D. PC Board Layout

All holes and circuit pads must be precisely located on the pc board to ensure proper placement and optimum performance of the connector and cage assembly. Recommended circuit pad pattern, dimensions, and tolerances are provided in Figure 2.



**Figure 2 (Cont'd)**

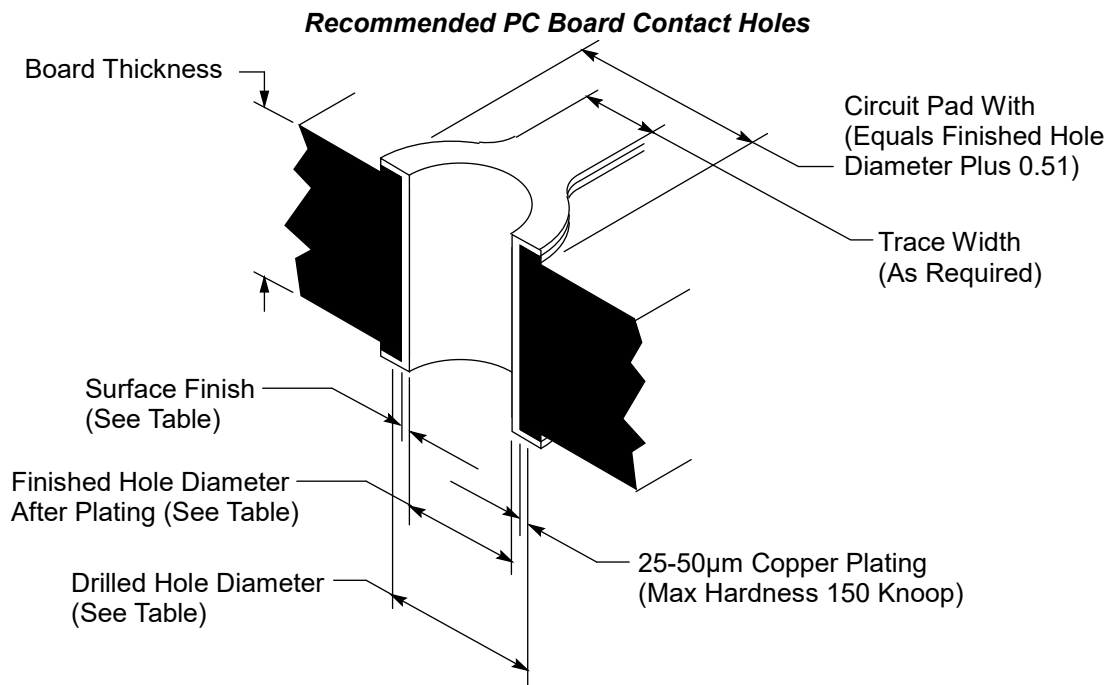




**Figure 2 End**

### E. Hole Dimensions

The contact alignment post holes and cage assembly compliant pin holes must be drilled and plated through to specific dimensions to prevent stubbing during placement of the connector and cage assembly on the pc board. The drilled hole size, plating types, and plating thickness are dependent on the application requirements. The finished hole size must be as stated to provide unrestricted insertion. See Figure 3.



DRILLED HOLE DIAMETER	FINISHED HOLE DIAMETER	SURFACE FINISH	
		MATERIAL	THICKNESS
1.15±0.02	1.05 Ref	HASL SnPb	0.004-0.010
		Immersion Tin (Sn)	0.0005 Min
		Organic Solderability Preservative (OSP)	0.0002-0.0005
		Immersion Gold (Au) Over Nickel (Ni)(ENIG)	0.004-0.0076 (Ni)/0.0001-0.0005 (Au)

**Figure 3**

### 3.7. EMI Gasket for Behind Bezel Type

It is recommended that a gasket be installed onto the back of the bezel for EMI suppression (between the cage assembly and the bezel). The design and material of the gasket can be specific to the application, but must cover the perimeter of the bezel cutout. The gasket can be attached to the bezel using a pressure-sensitive adhesive. There must be no gap between the gasket and the bezel. When the cage assembly (with the host pc board) is mounted onto the bezel, the gasket must be compressed to the recommended thickness specified by the manufacturer of the gasket. The thickness of the gasket can be determined by the following calculation:

$$GT = BKL - 42 \text{ mm} + 0.25 \text{ mm}$$

GT = thickness of compressed gasket

BKL = distance between back of bezel to the centerlines of datums K and L (see Figure 2)

The distance between the front of the bezel to datums K and L must not exceed 48 mm

### 3.8. Bezel

#### A. Thickness

The bezel thickness range shall be 0.8 through 2.6.

## B. Cutout

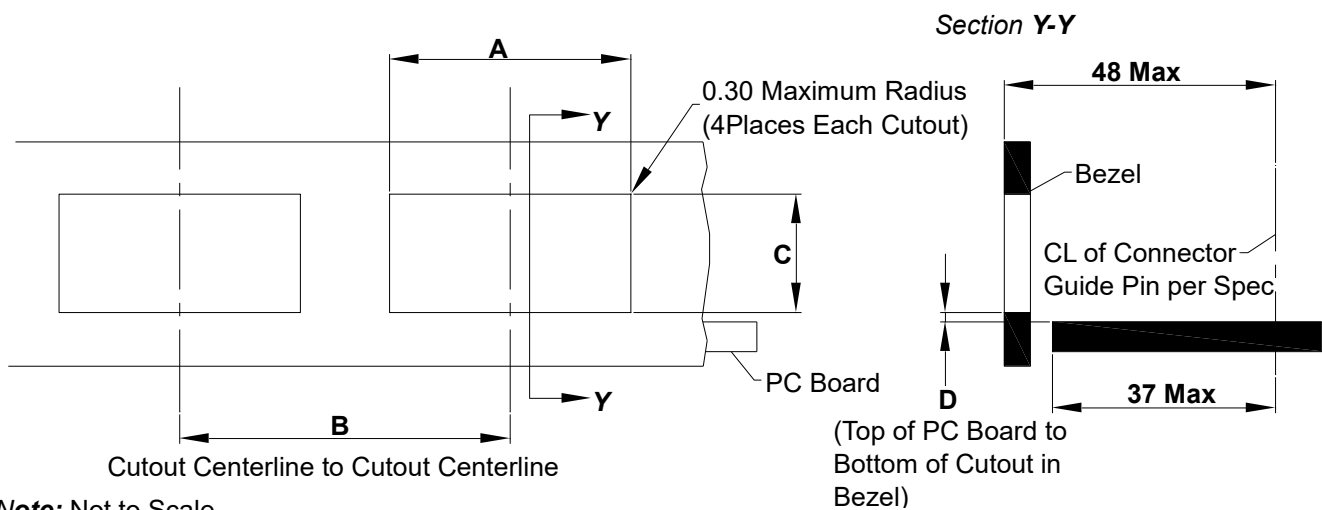
The bezel must provide a cutout that allows proper mounting of the cage assembly. The cage assembly EMI springs, elastomeric gasket or flange must be compressed by the bezel in order to provide an electrical ground between the connector and cage assembly and bezel for EMI suppression.

Care must be used to avoid interference between adjacent connector and cage assemblies and other components. The minimum allowable distance between connector and cage assemblies must be considered to ensure proper assembly. Dimensions for bezel cutout and minimum allowable distance between cutouts are shown in Figure 4.

## C. PC Board and Bezel Position

The bezel and host pc board must be positioned in relation to each other to avoid interference with the insertion and extraction of the transceiver. This relationship must conform to the dimensions given in Figure 4.

### Recommended Bezel Cutout (Minimum Pitch) and PC Board and Bezel Position – Behind Bezel Type



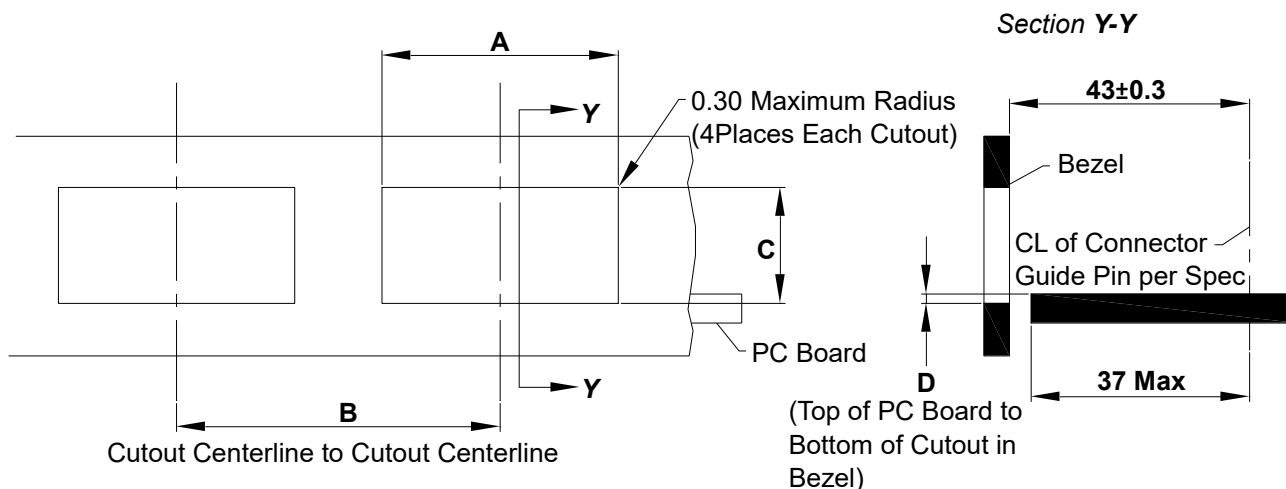
Note: Not to Scale

CAGE ASSEMBLY CONFIGURATION	DIMENSION (With Metal Flange)				
	A $\pm 0.10$	B $\pm 0.10$	C $\pm 0.10$	D $\pm 0.20$	D $\pm 0.10$ (PCI Application)
1 x 1 Ganged	19.50	22.50	9.70	0.30	0.40
1 x 2 Ganged	38.50	41.50	9.70	0.30	0.40
1 x 3 Ganged	57.50	60.50	9.70	0.30	0.40
1 x 4 Ganged	76.50	79.50	9.70	0.30	0.40
1 x 5 Ganged	95.50	98.50	9.70	0.30	0.40
1 x 6 Ganged	114.50	117.50	9.70	0.30	0.40

For the installation of EMI gasket of behind bezel type, please refer to 3.7.

Figure 4 (Cont'd)

### Recommended Bezel Cutout (Minimum Pitch) and PC Board and Bezel Position – Thru Bezel Type



**Note:** Not to Scale

CAGE ASSEMBLY CONFIGURATION	DIMENSION (With Metal EMI Spring)			
	A ±0.10	B (Min)	C ±0.10	D ±0.10
1 x 1 Ganged	20.00	22.75	10.15	0.15
1 x 2 Ganged	39.00	41.75	10.15	0.15
1 x 3 Ganged	58.00	60.75	10.15	0.15
1 x 4 Ganged	77.00	79.75	10.15	0.15
1 x 5 Ganged	96.00	98.75	10.15	0.15
1 x 6 Ganged	115.00	117.75	10.15	0.15
CAGE ASSEMBLY CONFIGURATION	DIMENSION (With Conductive Elastomeric EMI Gasket)			
	A ±0.10	B (Min)	C ±0.10	D ±0.10
1 x 1 Ganged	20.00	24.75	10.15	0.15
1 x 2 Ganged	39.00	43.75	10.15	0.15
1 x 3 Ganged	58.00	62.75	10.15	0.15
1 x 4 Ganged	77.00	81.75	10.15	0.15
1 x 5 Ganged	96.00	100.75	10.15	0.15
1 x 6 Ganged	115.00	119.75	10.15	0.15

Figure 4(End)

### 3.9. Cage Assembly Placement

#### NOTE

The connector must be soldered to the pc board BEFORE seating the cage.



#### A. Registration

The compliant pin contacts must be aligned with matching holes in the pc board, then inserted into the pc board simultaneously to prevent twisting or bending of these parts.

## B. Seating

### CAUTION



A customer supplied pc board support fixture must be used to provide proper support for the host pc board, and to prevent damage to the host pc board and adjacent components. Refer to Section 5 for design requirements.

Using proper seating force and seating height is essential to interconnection performance. The force used to seat the cage assembly must be applied evenly to prevent deformation or other damage to the compliant pin contacts. The force required to seat the cage assembly onto the pc board can be calculated by:

Amount of Compliant Pin Contacts X 44.5 N [10 lbs] (Force per Compliant Pin Contact) = Seating Force

### CAUTION



Over-driving the cage assembly will deform parts critical to the quality of the connection. Maximum force occurs prior to the cage assembly bottoming on the pc board.

When using tooling to seat the cage assembly, the shut height of the application tool must be specifically set for proper seating of the cage assembly. The shut height can be calculated by:

Seating Height (Cage Assembly Seated) + Height of Seating Tool +  
Combined Thickness of PC Board and PCB Support Fixture = Shut Height (Ram Down)

### CAUTION



The shut height may need to be adjusted to maintain the 0.10 mm maximum gap dimension between the standoffs of the cage assembly and the pc board.

The cage assembly must be seated on the pc board not exceeding the dimensions shown in Figure 5.

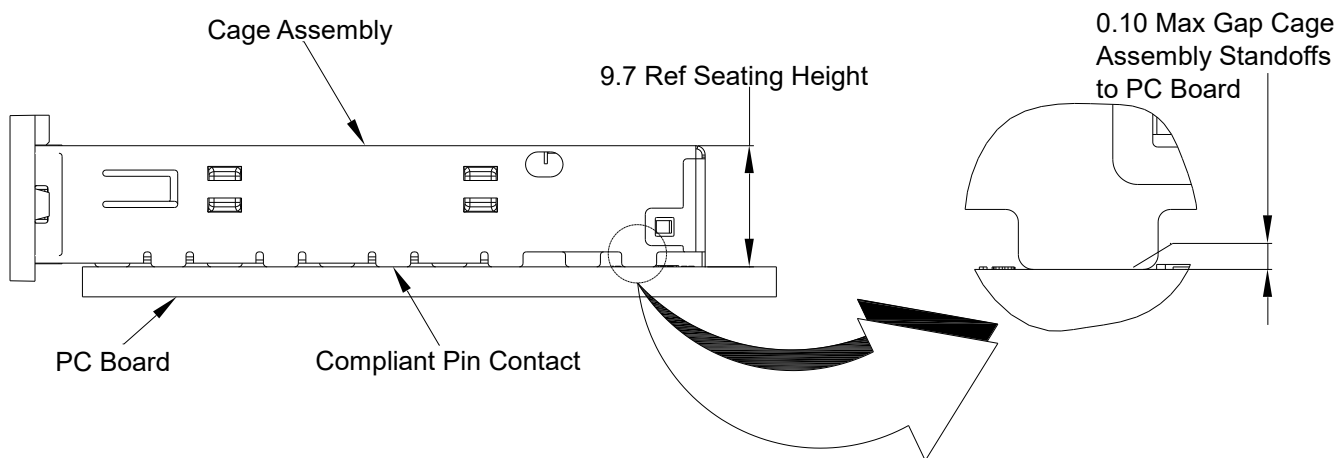
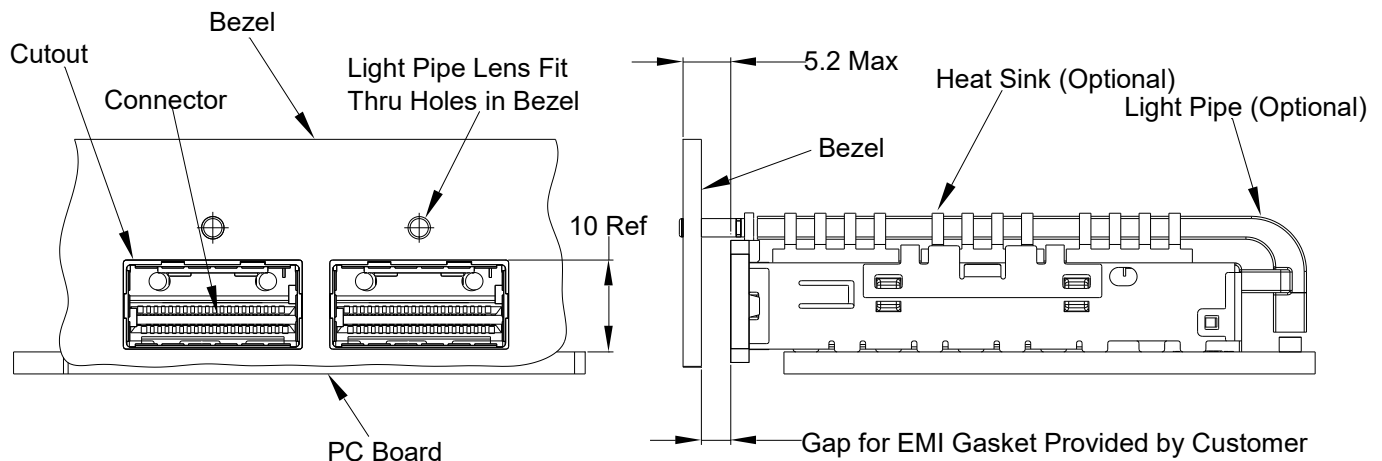


Figure 5

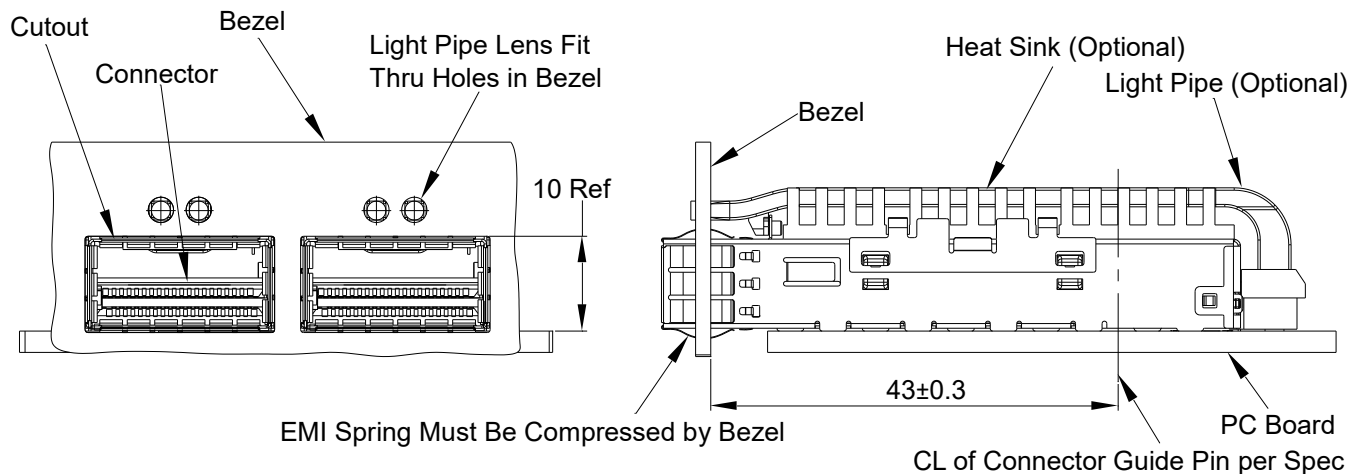
### 3.10. Checking Installed Cage Assembly

After installation, for behind bezel type, the EMI gasket supplied by the customer must be compressed around its entire perimeter by the front flange of the cage assembly. And, for thru bezel types, the cage assembly EMI springs must be compressed by the bezel or the elastomeric gasket must be flush against the bezel. A slight bow in the cage assembly is permitted. The bezel and pc board must be positioned according to the dimensions shown in Figure 6.

#### **Cage Assembly, PCB and Bezel Position (After Installation) – Behind Bezel Type (Front Flange)**



#### **Cage Assembly, PCB and Bezel Position (After Installation) – Thru Bezel Type (Metal EMI spring)**



**Figure 6 (Cont'd)**



### Cage Assembly, PCB and Bezel Position (After Installation) – Thru Bezel Type (Elastomeric EMI Gasket)

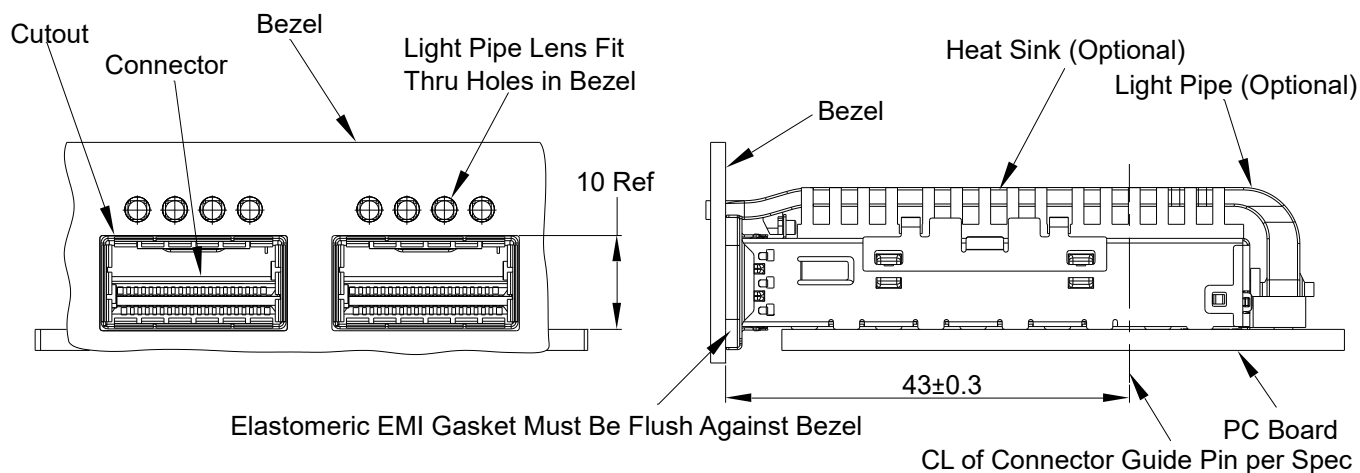


Figure 6 End

### 3.11. Heat Sink and Clip

The heat sink must be placed on the cage assembly and secured to the cage assembly using the clip. After the heat sink and clip are installed, the following requirements must apply (refer to Figure 7):

- The perimeter of the heat sink must be flush with the top of the frame of the cage assembly
- The raised boss must be centered in the cavity of the cage assembly
- The clip locking windows must be fully latched onto the cage locking latches of the cage assembly

Any heat sink used must be flush with and securely attached to the cage assembly.

NOTE: For Clarity, Connector, PC Board, and Bezel are Not Shown

#### Single Cage Assembly with Heat Sink and Clip

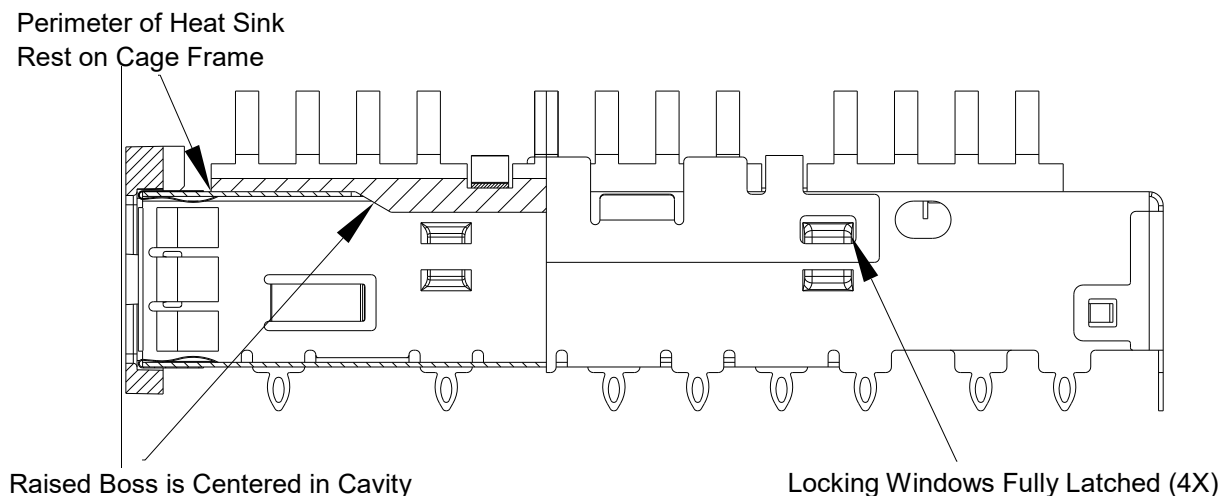
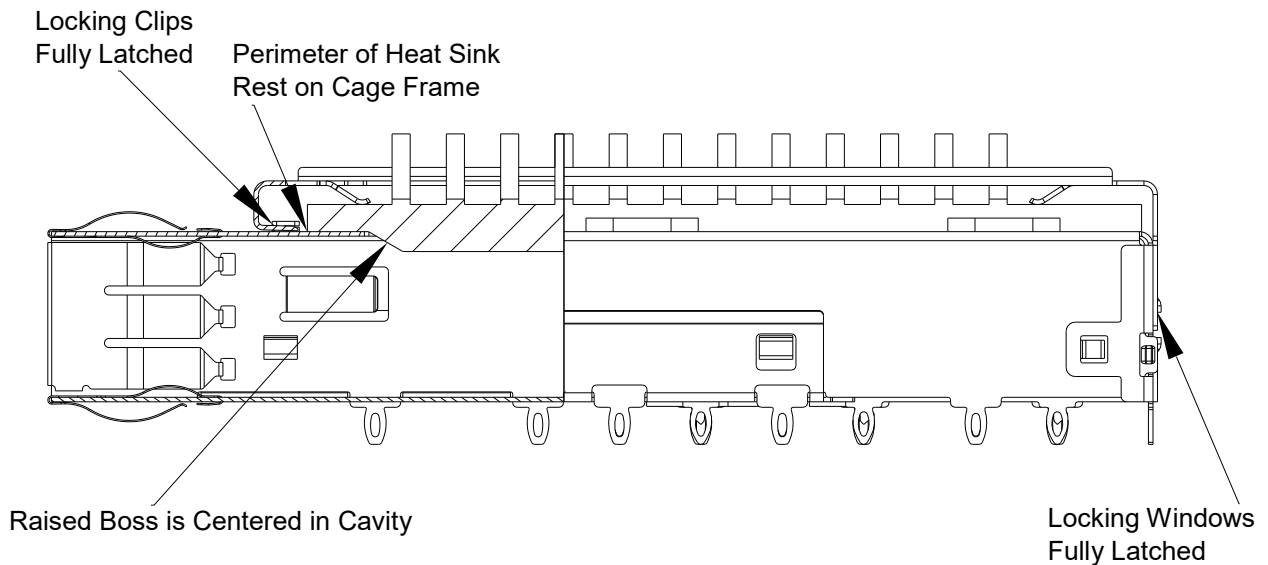


Figure 7 (Cont'd)

### Ganged Cage Assembly with Heat Sink and Clip



**Figure 7 End**

### 3.12. EMI/Dust Cover

An EMI/dust cover must be installed into the port when the module is not mated with the cage assembly.

### 3.13. Light Pipe

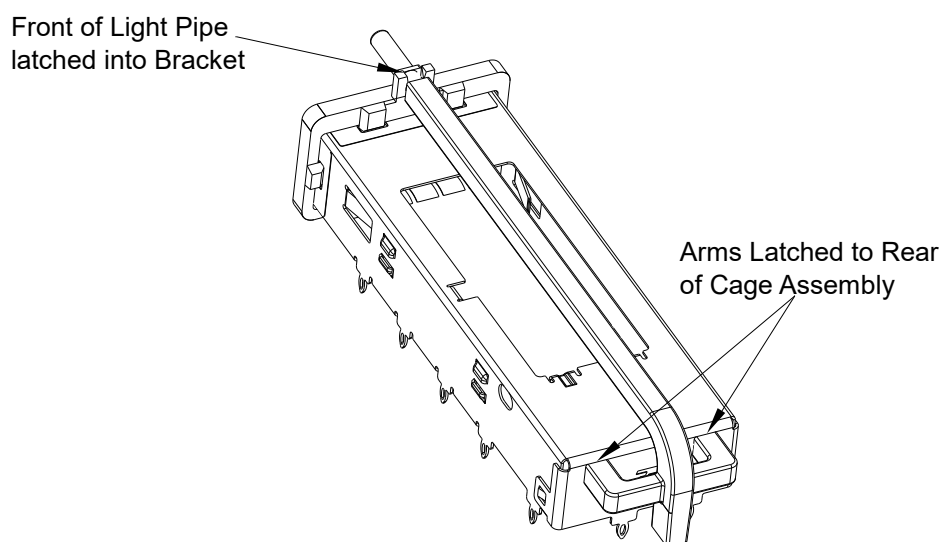
A light pipe may be installed on various zQSFP+/QSFP28 cage assemblies. They can be used either with or without the appropriate heat sink, but must be installed after the heat sink and heat sink clip if these items are being used. Contact PRODUCT INFORMATION at the bottom of page 1 for combinations of heat sinks and light pipes.

The bezel must have an additional cut-out for each port on which a light pipe will be installed. For placement of these cut-outs, please refer to the dimensions in customer drawings. The appropriate location of the LED's on the host pc board is provided in customer drawings.

When the light pipe is installed, both arms of the light pipe must be latched into the mounting holes on the rear of the cage assembly. The front of the light pipe must be latched into the light pipe bracket on the front of the cage assembly. See Figure 8.

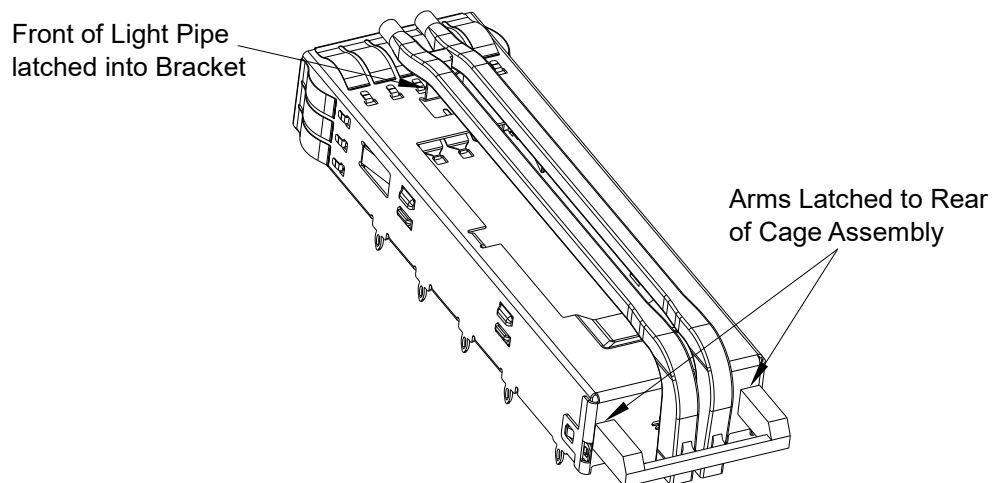
***Light Pipe on single cage (Behind bezel type – Bracket in Front Flange)***

***- Heat sink and Clip are omitted -***



***Light Pipe on single cage (Thru bezel type – Bracket in Top Cage)***

***- Heat sink and Clip are omitted -***



***Figure 8 (Cont'd)***

### Light Pipe on Ganged cage (Thru bezel type – Bracket in Clip)

- Heat Sink is omitted -

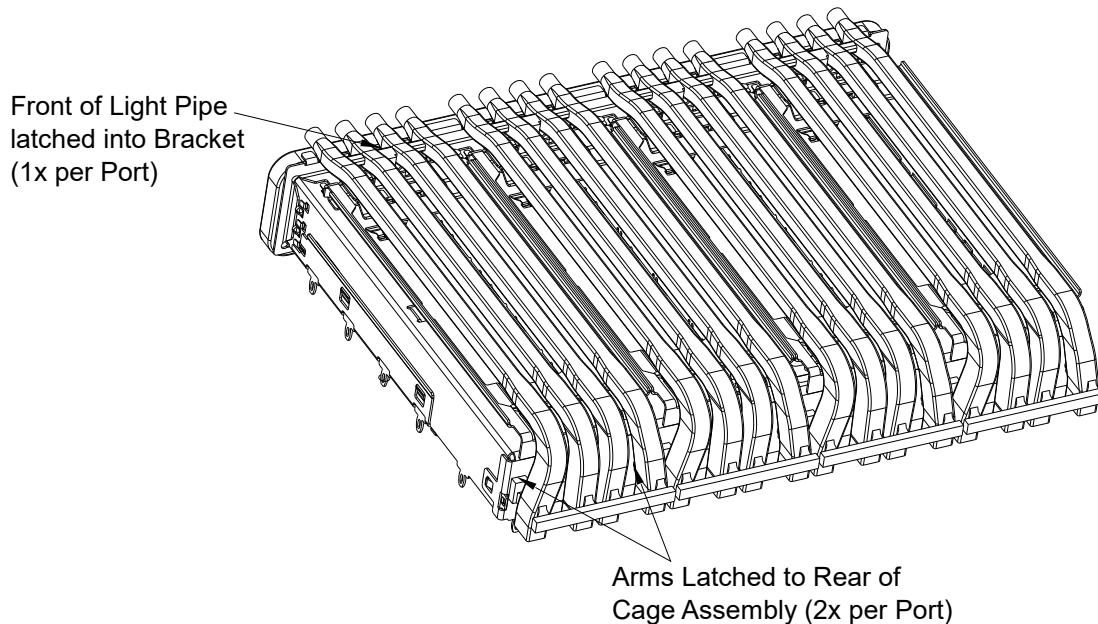


Figure 8 End

### 3.14. Removal and Repair

The optional light pipe can be removed by first lifting the front end of the light pipe out of the light pipe bracket on the front of the cage assembly. Then apply pressure to the outside of the arms of the light pipe, pressing them toward each other while gently pulling the light pipe back from the rear of the cage. As long as the light pipe is not cracked or warped, it can be re-used on any cage assembly that has a light pipe bracket.

The clip (that secures the heat sink) must be removed using a tool (such as a small screwdriver or hobby knife) according to the following:

1. Insert the tip of the tool into either release aperture of the clip, and rotate the tool until the corresponding locking windows are released from the cage locking latches of the cage assembly. Repeat this step for the remaining release aperture. See Section 6.
2. Lift the clip and heat sink from the cage assembly.

For the cage assembly with organizer of light pipe, it is hard to remove the light pipe and heat sink clip firstly, you can remove the whole cage assembly with heat sink and light pipe together. Sure, for the cage assembly without organizer of light pipe, you also can remove the whole cage assembly with heat sink and light pipe together.



The heat sink must be removed from the cage assembly before removing the cage assembly from the host pc board. A flat metal bar (or similar object) can be partially inserted into the front of the cage assembly (the object **MUST NOT** touch the connector; otherwise, damage to the contacts could occur). The cage assembly can then be removed by lifting it off the pc board. The cage assembly **MUST NOT** be re-used after removal.



The cage assembly must be removed from the host pc board before removing the connector. Standard de-soldering methods must be used to remove the connector from the host pc board. The connector **MUST NOT** be re-used after removal. The connector and cage assembly are not repairable. Any defective or damaged products **MUST NOT** be re-used.

Damaged or defective connector and cage assemblies must be removed and replaced. If repair or rework to the pc board requires soldering after the connector and cage assembly has been seated onto the pc board, the following must apply:

- After soldering, removal of fluxes, residues, and activators is necessary. Consult with the supplier of the solder and flux for recommended cleaning solvents. Cleaners must be free of dissolved flux and other contaminants. Even when using a "no clean" solder paste, it is imperative that the contact interface be kept clean of flux and residue (since it acts as an insulator).



*Consideration must be given to toxicity and other safety requirements recommended by the solvent manufacturer. Refer to the manufacturer's Material Safety Data Sheet (MSDS) for characteristics and handling of cleaners. Trichloroethylene and methylene chloride is not recommended because of harmful occupational and environmental effects. Both are carcinogenic (cancer-causing).*

- Air drying is recommended. Otherwise, temperature limitations must not exceeded: -55° to 105°C [-67° to 221°F]. Excessive temperatures may cause housing degradation.

After extraction, the connector and cage assembly should not be re-used.

## 4. QUALIFICATION

No outside agency approvals for stacked zQSFP+/QSFP28 connector and cage assembly (with metal EMI spring gasket or with conductive elastomeric EMI gasket) was defined at the time of publication of this document.

## 5. TOOLING

Tooling part numbers and instructional material packaged with the tooling are given in Figure 9.

### 5.1. Seating Tool

The seating tool is used to seat the connector and cage assembly onto the pc board. The seating tool is available in a kit, which contains a wall support used to support the individual ports of the cage assembly.

### 5.2. Extraction Tool

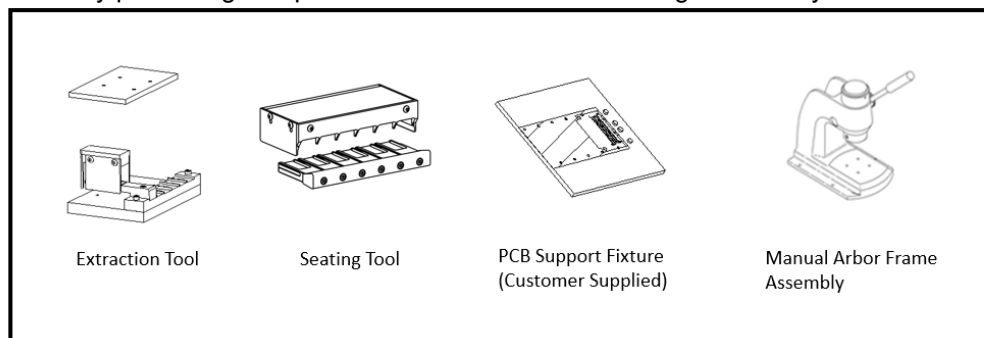
The extraction tool is used to remove the connector and cage assembly from the pc board by pushing the pc board off of the connector and cage assembly. The extraction tool is available in a kit, which includes a wall support used to support the individual ports of the cage assembly.

### 5.3. Application Tool

Power for the seating tool and extraction tool must be provided by an application tool (with a ram) capable of supplying a downward force of cage assembly. The manual arbor frame assembly is available for use with these tools.

### 5.4. PC Board Support Fixture

A pc board support must be used with the seating tool and the extraction tool. The support fixture provides proper support for the pc board and protects the pc board and the connector and cage assembly from damage. The support fixture must be customer designed. It is recommended that the support fixture be at least 25.4 longer and wider than the pc board and have flat surfaces with holes or a channel large enough and deep enough to receive any protruding components of the connector and cage assembly.

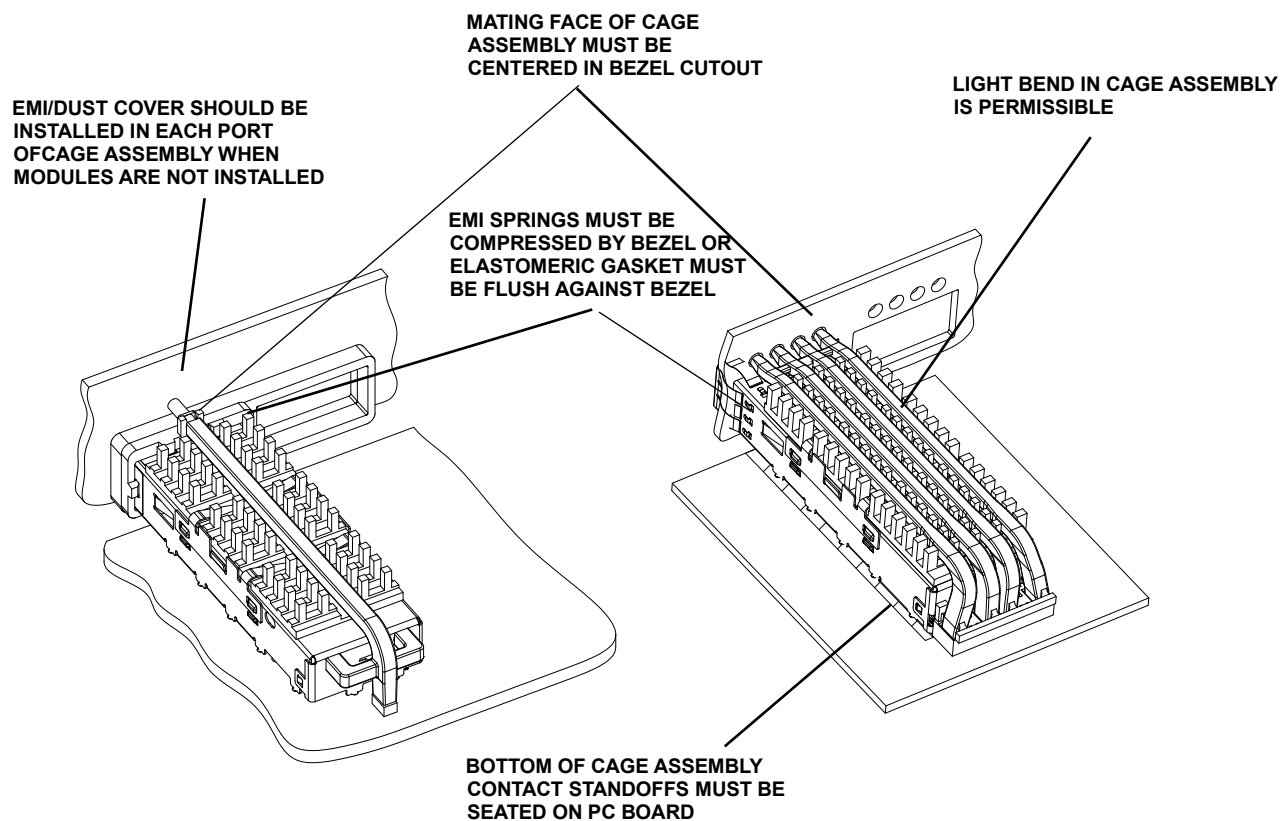


**Figure 9**

Seating Tool BASE PN	Extraction Tool BASE PN	Product Desc
2215049	2215056	1XN cage assembly
2215048		1XN Cage Assembly with Heatsink, W/O Light pipe, W/ 1 Light pipe and W/2 Light pipe
2215047		1XN Cage Assembly with Heatsink and 4 Light pipe

## 6. VISUAL AID

The illustration below shows a typical application of zQSFP+/QSFP28 behind/ through bezel cage assembly (with or without light pipes). This illustration should be used by production personnel to ensure a correctly applied product. Applications which DO NOT appear correct should be inspected using the information in the preceding pages of this specification and in the instructional material shipped with the product or tooling.



**FIGURE 8. VISUAL AID**



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