

**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  $\pm 0.13$  mm 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 QSFP 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, QSFP 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 pass through the bezel. The cage assembly transceiver locking latches hold the transceiver in place, and the hard stop controls the insertion depth of the transceiver.

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

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.

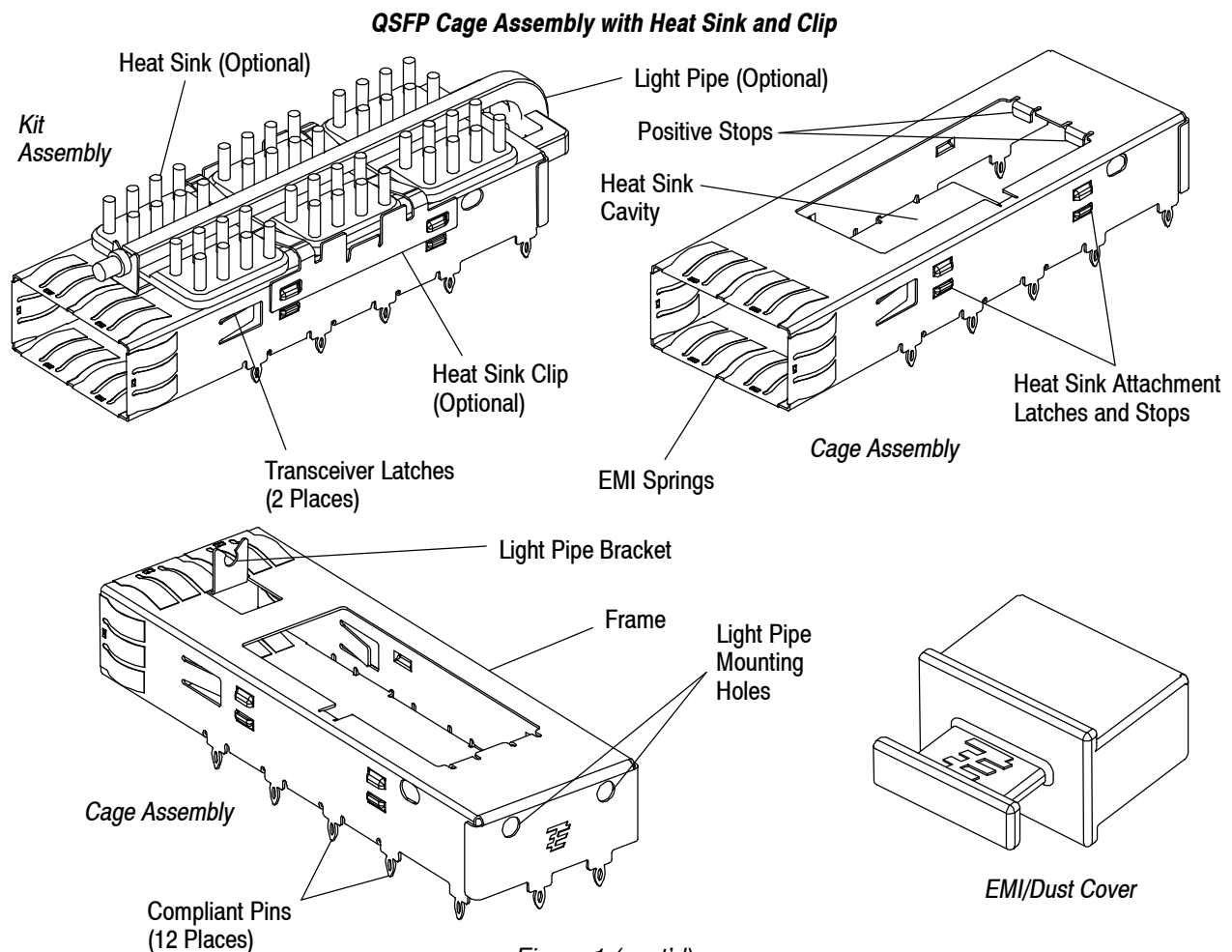


Figure 1 (cont'd)

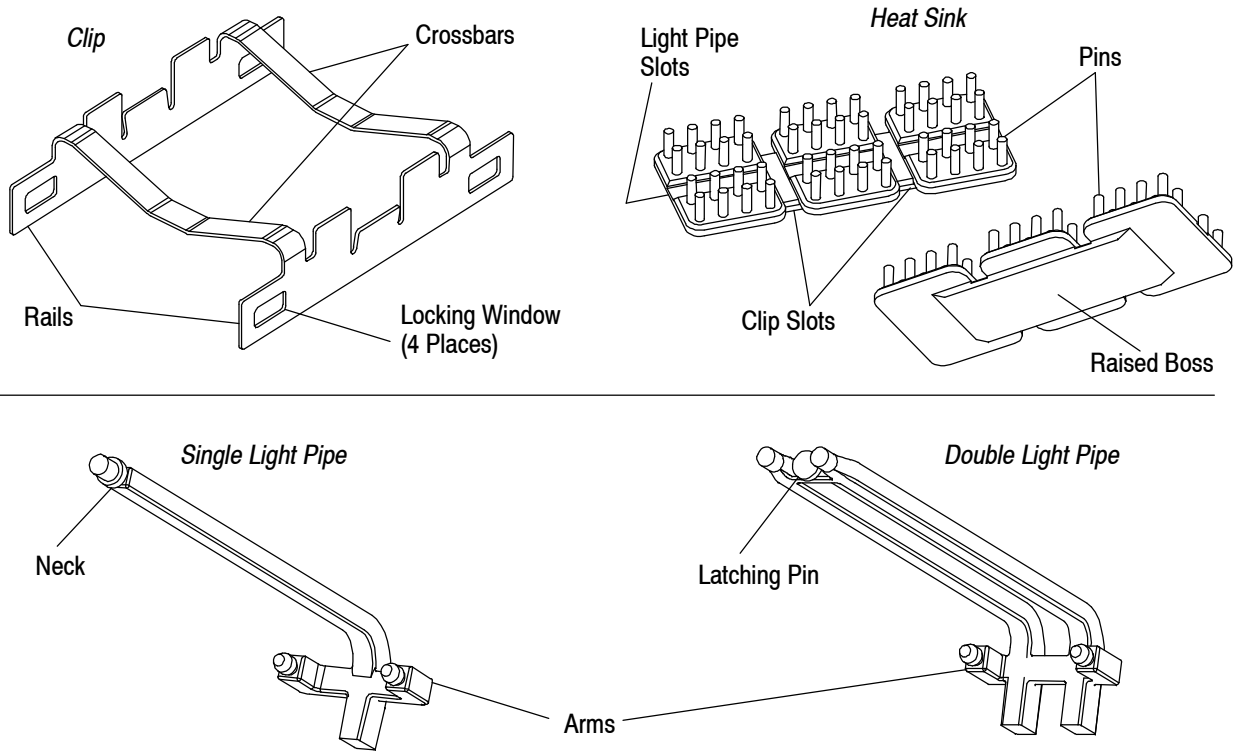


Figure 1 (end)

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. For sample part numbers on heat sinks, refer to Instruction Sheet 408-10187 or contact PRODUCT INFORMATION at the number at the bottom of page 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. Single or double light pipes are available. See Figure 1 for an illustration of these components and their features.

## 2. REFERENCE MATERIAL

### 2.1. Revision Summary

- Added new tooling information in Section 5, TOOLING

### 2.2. Customer Assistance

Reference Product Base Part Numbers 1888617 and 1888674 and Product Code G570 are representative of QSFP Thru Bezel 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.

### 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 108-2286 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:

<u>Document Number</u>	<u>Document Title</u>
408-10187	QSFP Thru Bezel Cage Assembly, Heat Sink, and Light Pipe

## 3. REQUIREMENTS

### 3.1. Safety

Do not stack component packages so high that the shipping 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.



*It is strongly recommended that this bezel configuration NOT be used for peripheral component interconnect (PCI) applications.*

### 3.3. Material

The cage assembly frame is made of nickel silver alloy, and the EMI springs are made from copper alloy, tin-plated. The EMI/dust cover is made of zinc plated with tin over nickel. The heat sinks are made of 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 connectors should be used on a first in, first out basis to avoid storage contamination that could adversely affect performance.

### 3.5. Chemical Exposure

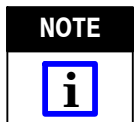
Do not store cage assemblies or accessories near any chemical listed below as they may cause stress corrosion cracking in the contacts or compliant pins.

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.



*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.

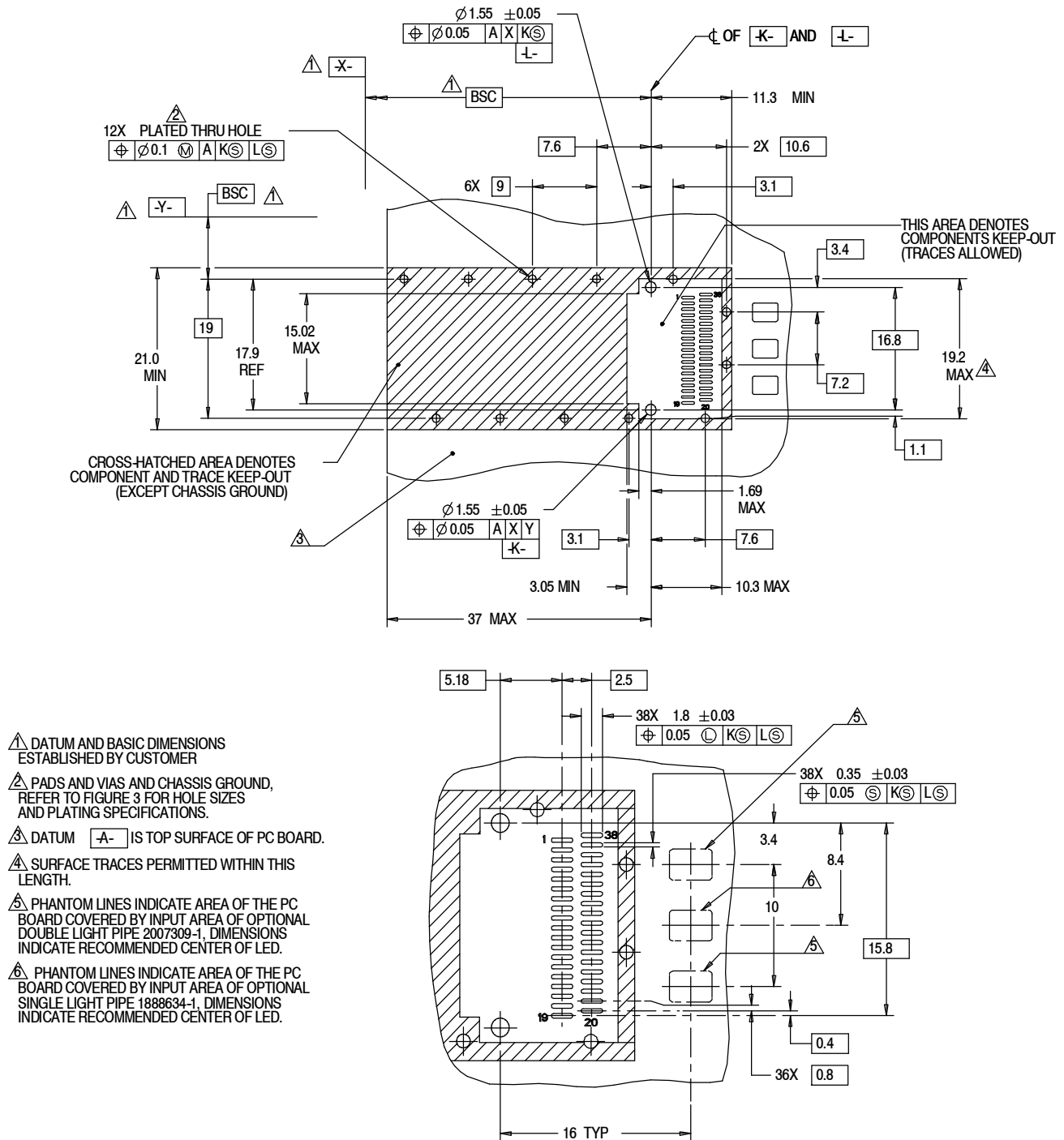
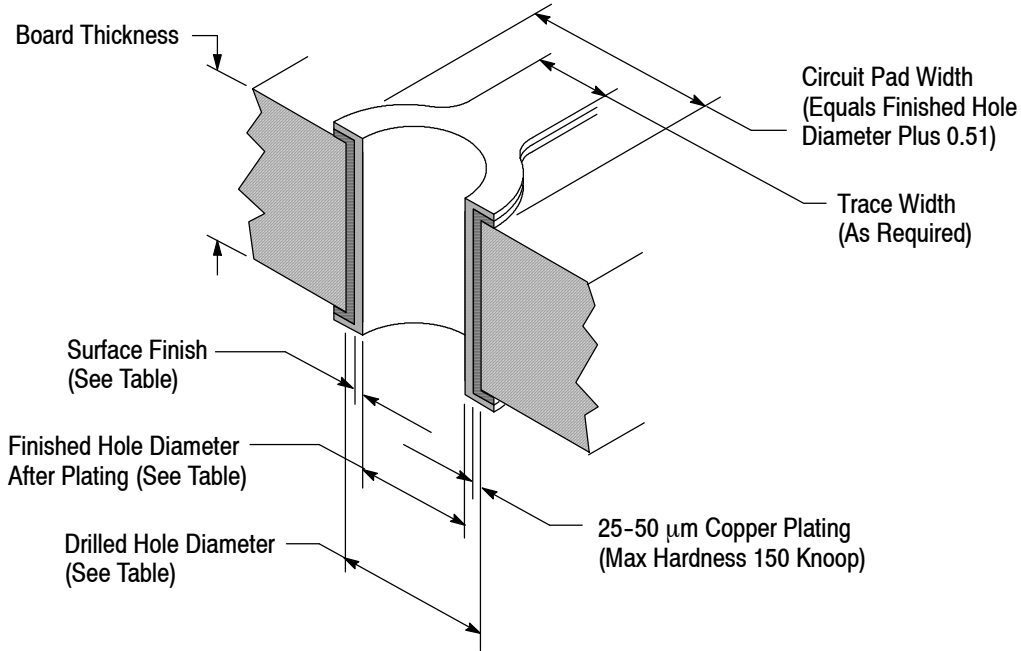


Figure 2

### 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.



SURFACE FINISH	DRILLED HOLE DIAMETER	FINISHED HOLE DIAMETER	SURFACE FINISH THICKNESS
HASL SnPb	1.15 ±0.02	1.05 Ref	0.004-0.010
Immersion Sn	1.15 ±0.02	1.05 Ref	0.0005 Min.
OSP	1.15 ±0.02	1.05 Ref	0.0002-0.0005
Immersion Au/Ni	1.15 ±0.02	1.05 Ref	0.004-0.0076 (Ni) 0.0001-0.0005 (Au)

Figure 3

### 3.7. Bezel



*It is strongly recommended that this bezel configuration NOT be used for PCI applications. The following requirements were intended to be used in the communications industry only.*

#### A. Thickness

The bezel thickness range shall be 0.8 mm through 2.6 mm.

#### B. Cutout

The bezel must provide a cutout that allows proper mounting of the cage assembly. The cage assembly panel ground springs must be compressed by the bezel in order to provide an electrical ground between the cage assembly and bezel for EMI suppression. Care must be used to avoid interference between adjacent cage assemblies and other components. The minimum allowable distance between cage assemblies must be considered to ensure proper assembly. Dimensions for bezel cutout and minimum allowable distance between cutouts are shown in Figure 4.

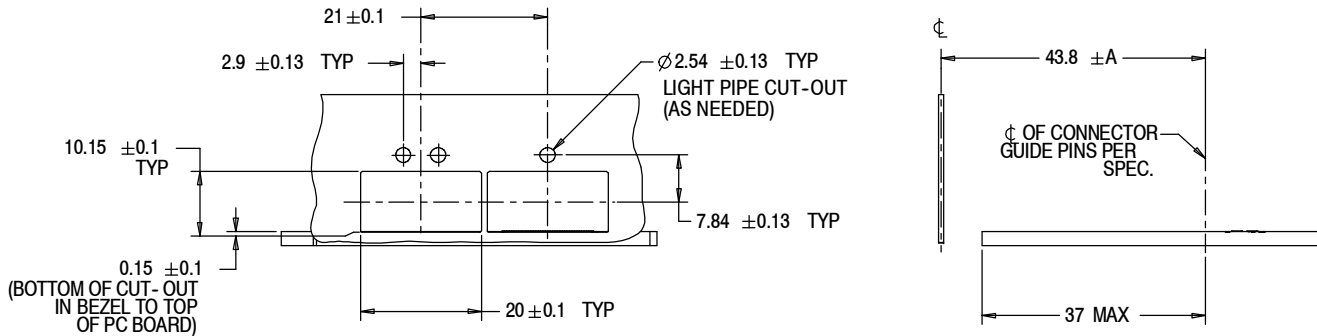


Figure 4

**C. Bezel Position**

The clearance between the bezel and host pc board, and the bezel thickness may be set by the customer, as long as the conditions in Figure 4 are met. The tolerance “A” on the bezel centerline position must be calculated as follows:

$$A = 0.3 \text{ mm} + \frac{(\text{Bezel Thickness})}{2}$$

**3.8. 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 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.

**NOTE:** Single Port Cage Assembly Shown, Cage Shown without Heat Sink and Clip

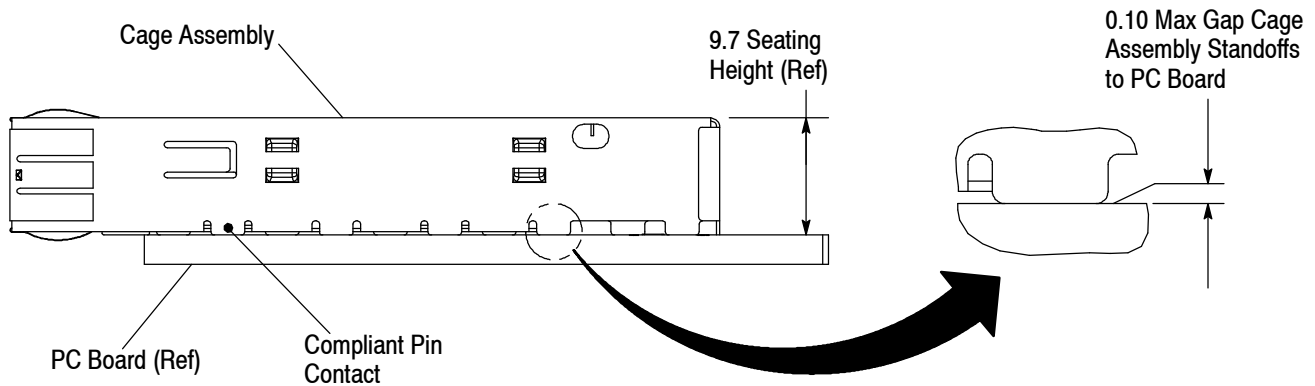


Figure 5

### 3.9. Checking Installed Cage Assembly

After installation, the cage assembly panel ground springs must be compressed by the bezel and the lenses of any light pipes used must be visible thru 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.

**NOTE:** Single Port Cage Assembly Shown, Cage Shown with Light Pipes

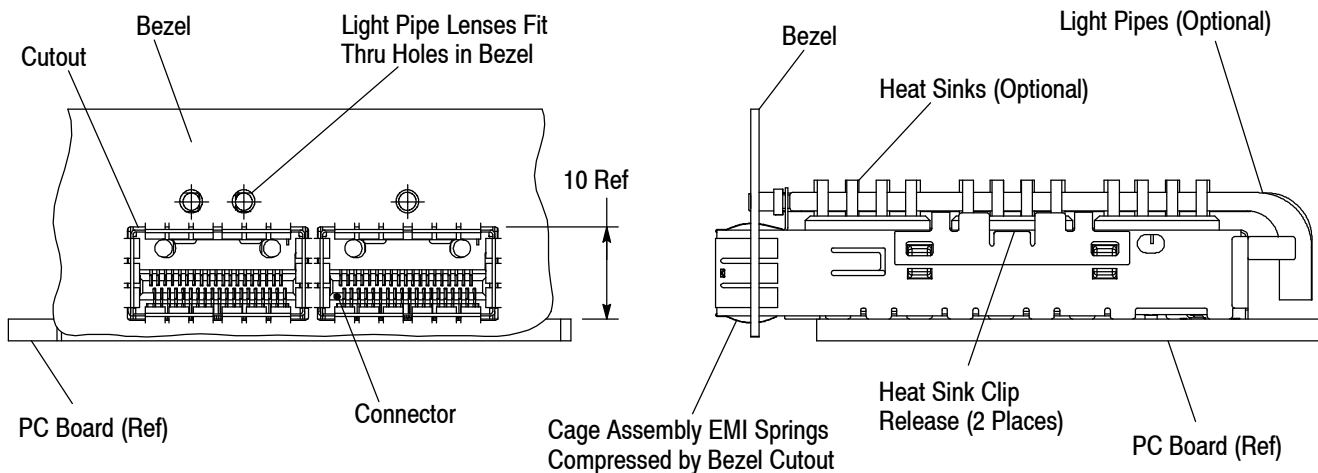


Figure 6

### 3.10. 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

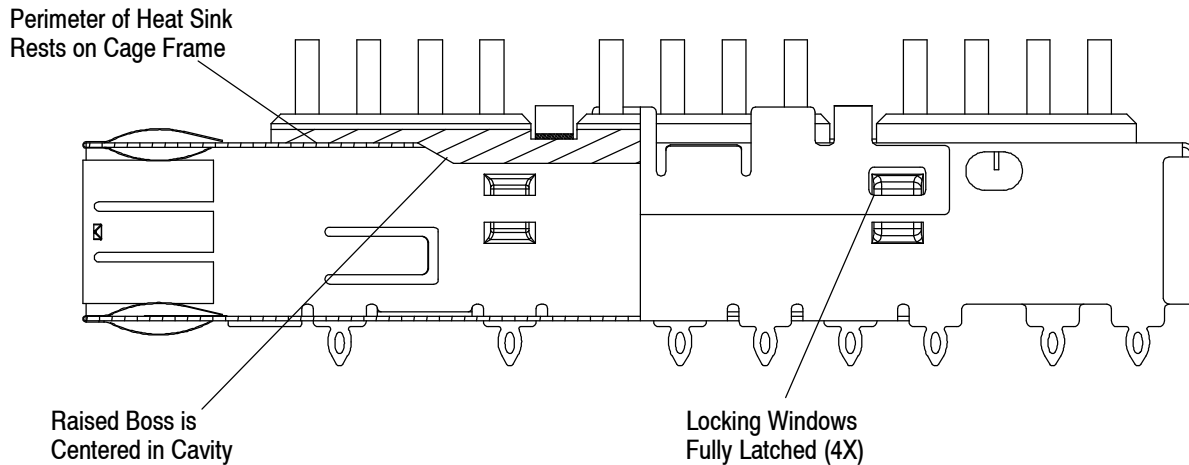


Figure 7

**3.11. Dust Cover**

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

**3.12. Light Pipe**

A light pipe may be installed on various QSFP cage assemblies. They can be used either with or without the appropriate heat sink, but must be installed after the heat sink and heat 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. See Figure 4 for placement of these cut-outs. The appropriate location of the LED's on the host pc board is provided in Figure 2.

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. See Figure 8.

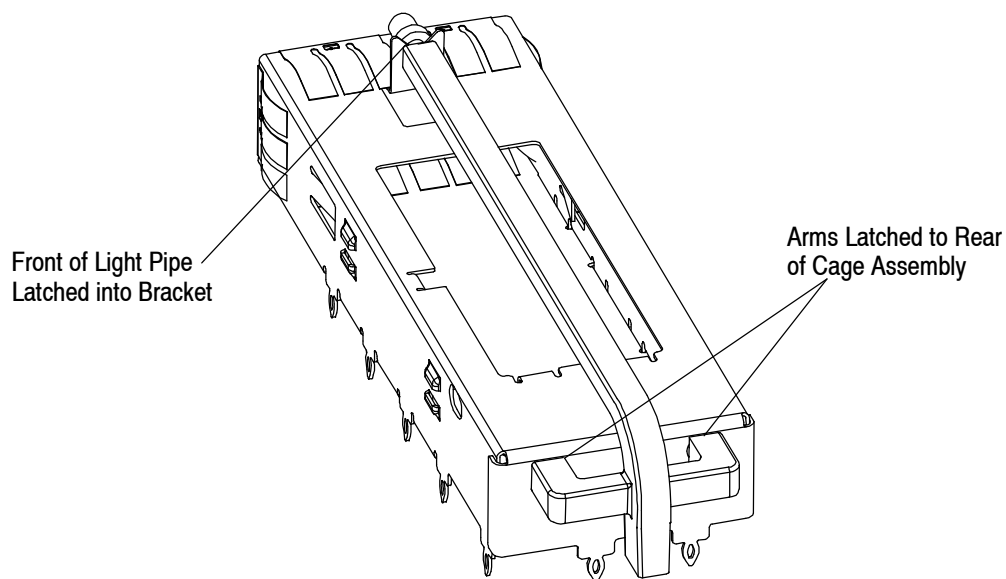


Figure 8




### 3.13. 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 thru bezel cage assembly that has a light pipe bracket.

Before removing the optional heat sink, the heat sink clip 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, VISUAL AID.
2. Lift the clip and heat sink from the cage assembly.

The heat sink clip and heat sink can be re-used after removal. The performance of the heat sink clip is improved if it is used on the same heat sink and cage assembly on which it was originally used.

**CAUTION**  The heat sink must be removed from the cage assembly before removing the cage assembly from the host pc board. The dust cover or 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.


**CAUTION**  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.

### 4. QUALIFICATIONS

QSFP Connectors have not yet been sent for agency evaluation.

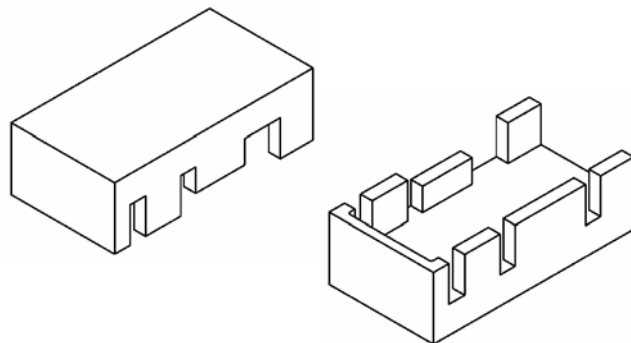
### 5. TOOLING

The seating tool (part no. 2170547) shown in Figure 9A is used to seat the cage assembly onto the pc board.

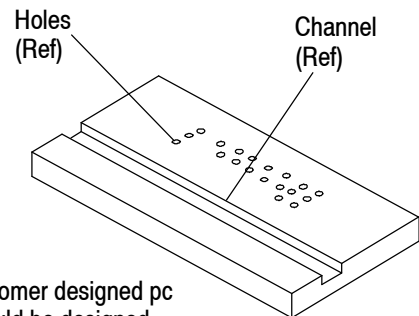
**CAUTION**  Extreme caution must be used not to touch or damage the EMI springs during seating.

A 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 its adjacent components during seating of the cage assembly. It must have a flat surface with holes or a channel wide and deep enough to receive any protruding components during seating of the cage assembly on the host pc board. See Figure 9B.

9A Seating Tool 2170547



9B PC Board Support Fixture (Application Specific, Customer Supplied)

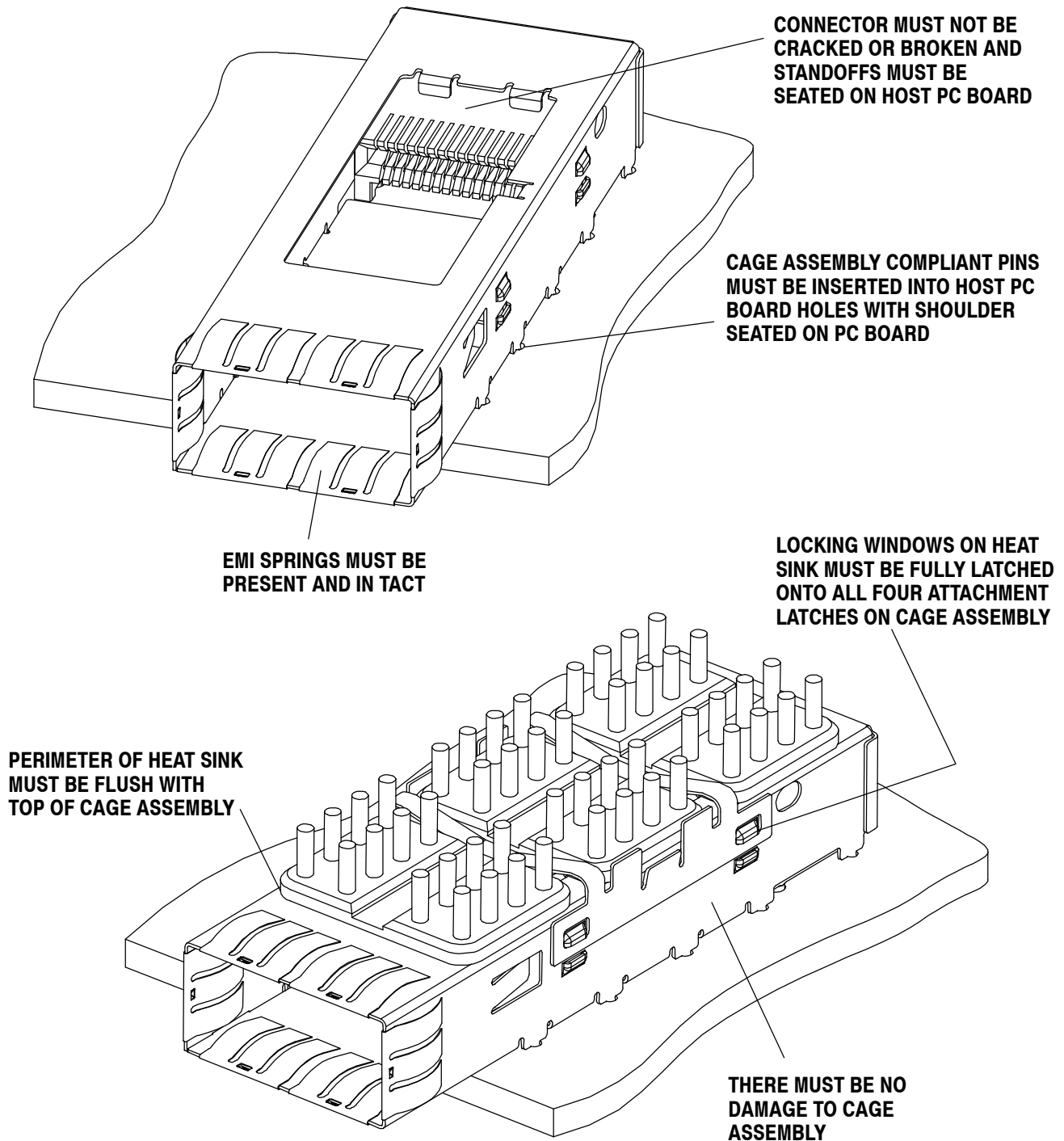


**NOTE:** The customer designed pc board support should be designed using the pc board layout from the specific customer print.

Figure 9

**6. VISUAL AID**

Figure 10 shows a typical application of a QSFP Connector and Cage Assembly. 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 10. VISUAL AID**