Thermal Bridge to Cage Assembly Configurations

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 ±0.13 and angles have a tolerance of ±2°. Figures are not drawn to scale.

1. INTRODUCTION

This specification covers the requirements for application of cage assembly configurations with Thermal bridge; used in conjunction with right-angle surface mount and press-fit connectors utilized in the communications industry. The cage assembly serves as a housing for the connector and mating transceiver. Thermal bridge is a device capable of transferring heat efficiently from the mated transceiver (Optical / High Power) to a cold plate / fixed heatsink which dissipates the heat. Thermal bridge is welded to the cage top thereby permanently fixturing the thermal bridge to the cage assembly. 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. The front flange provides a flat surface to contact the EMI gasket attached to the perimeter of the bezel cutout. The cage assembly locking latches hold the transceiver in place upon insertion into the cage, and the hard stop controls the insertion depth of the transceiver.

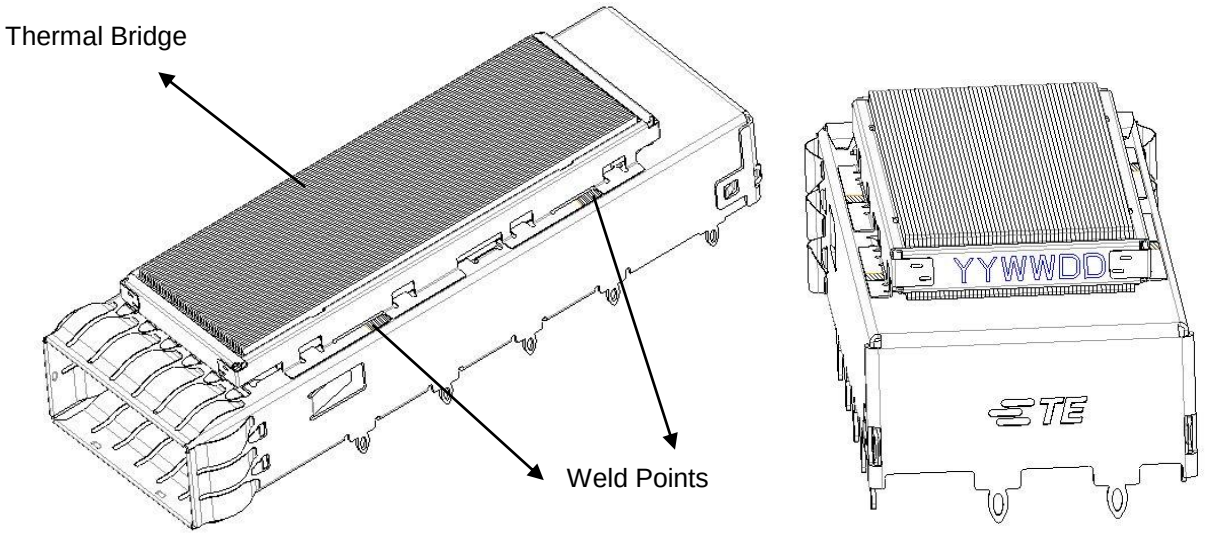

Figure 1: ZQSFP+ Cage Assembly with Thermal Bridge

In applications that use optics module / high power modules that generate high temperature, it is important to dissipate heat and keep the T_{rise} between the module and the ambient temperature as low as possible. The cold plate / fixed heat sink is mounted over the thermal bridge at a specified height from the PCB as shown in Figure 2. Compression from the cold plate and module ensure proper contact and force against the thermal bridge that maximizes heat transfer.

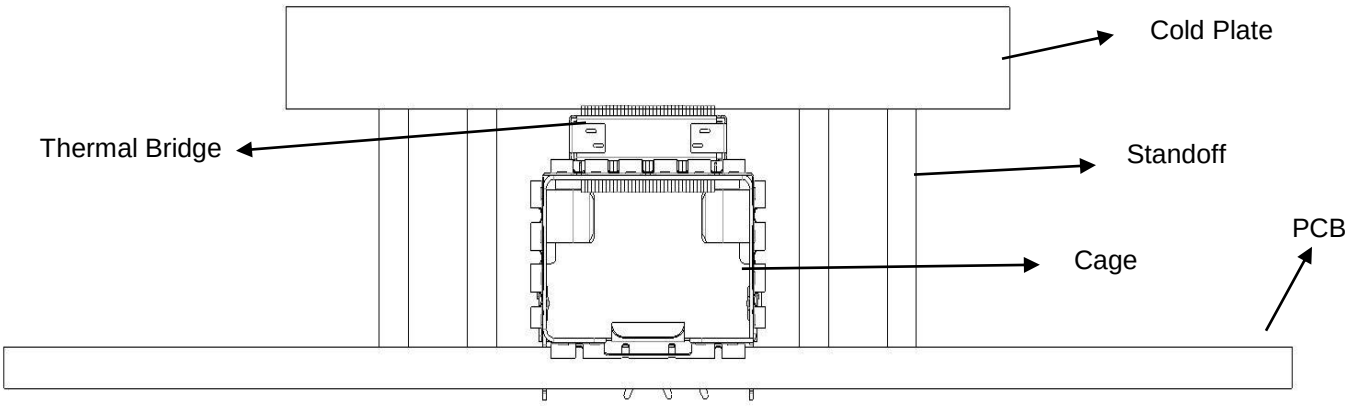

Figure 2: Thermal Bridge on Cage Installation Setup

The cage configurations that accommodates thermal bridge include both single, ganged, and stacked cages. This application specification covers the thermal bridge on cage assembly configurations only. For information on cage assemblies using heatsink and clips, please refer to www.te.com.

2. REFERENCE MATERIAL

2.1. Revision Summary

Revisions to this application specification include:

- Initial release

2.2. Customer Assistance

Reference product base part numbers included as a part of cage assemblies with thermal bridge:

- ZQSFP+ 1X1 – 2359309
- ZQSFP+ 1X4 – 2354935
- ZQSFP+ 1X6 – 2355519
- QSFP-DD 1X1 – 2354751
- QSFP-DD 2X1 – 2354345
- SFP+ 1X1 – 2358986
- SFP-DD 1X1 – 2359292

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. Customer Drawings

Customer drawings for product part numbers are available from www.te.com. Information contained in the customer drawing takes priority.

2.4. Specifications

For information regarding product related performance, reference product specification 108-130042.

2.5. Instructional Material

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

Product P/N	Instruction Sheets	
	Seating Tool	Extraction Tool
2359309-1	408-35105	408-32157
2355519-1	408-35105	408-32239
2354935-1	408-35105	408-32239
2358986-1	408-35112	408-32163
2359292-1	408-35107	408-32238
2354751-1	408-35106	408-32157

3. REQUIREMENTS

3.1. Safety

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

3.2. Operating Temperature

The operating temperature range for cage and thermal bridge is between -40° to 85°C [-40° to 185°F].

3.3. Limitations

A. Transceiver Module

Module must meet MSA requirements for roughness and flatness. The width of the mating QSFP28/ QSFP-DD transceiver module (outside of the cage assembly) cannot exceed 19 mm to prevent interference between transceivers inserted into adjacent ports. The width of the mating SFP+/ SFP-DD transceiver modules (extending outside of cage) must not exceed 14mm.

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.

3.4. Material

Thermal bridge comprises the laminates that are held together by a frame. The laminates are made of copper plated with Nickel and the frame is made of stainless steel. For material specifications regarding cage configurations please refer to the customer drawing.

3.5. 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.

3.6. 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.

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

3.7. PC Board

A. Material and Thickness

The host pc board material shall be glass epoxy (FR-4 or G-10). The recommended minimum pc board thickness for mounting the cage assembly to one side of the pc board as well as both sides of the pc board are specified in the customer drawing.

NOTE
Call the number at the bottom of page 1 for suitability of other pc board materials.

B. Tolerance

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

C. Circuit Pads

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

D. Hole Dimensions

Finished Hole Dimensions can be noted from Connector Customer Drawing.

E. Layout

All holes and circuit pads must be precisely located on the pc board. The pc board layout for all thermal bridge cage assemblies must be designed using the dimensions provided on the customer drawing for the specific connector. Reference customer drawings for each cage configuration for detailed layout for cage and connector.

F. 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. For detailed information on hole dimensions and plating recommendations pertaining to each cage configuration, please refer to the following application specs (cage assemblies without thermal bridge):

QSFP-DD 1X1 – **114-60025**

SFP28 1X1 – **114-13120**

SFP-DD 1X1 – **114-13120**

QSFP28 1X1, 1X4 & 1x6 – **114-32023**

3.8. Bezel

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. 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 have been referenced in the customer drawing.

C. 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 specified in the customer drawings pertaining to each cage configuration.

3.9. Cage Assembly Placement

SMT connectors must be soldered to the pcb before seating the cage.

A. Registration

The compliant pins 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

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

A seating tool is required to insert the cage assembly into the pc board. 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)

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.

For further details, reference the following application specs:

QSFP28 (Single and Ganged) – 114-13023

SFP28 – 114-13120

QSFP-DD – 114-60025

3.10. Checking Installed Cage Assembly

After seating the thermal bridge cage assembly on the PC board, the cold plate / fixed heat sink must be mounted on top of the thermal bridge cage assembly at a specified height from the host board. Standoffs can be used to position the cold plate at a fixed height from the PCB as shown in Fig 2. The mounting height of cold plate / fixed heat sink is specified in the customer drawing pertaining to each cage configuration. Application of thermal grease improves heat transfer efficiency, although thermal grease must be applied to the bottom surface of cold plate that would contact the thermal bridge. With use of thermal grease, cold plate fixture height must be modified based on thickness of thermal grease applied. These details are provided in the customer drawing.

Note: *Thermal Grease Migration Testing (Elevated Temp. Shock and Vibration as well as Elevated Temp Durability Cycling), performed using ShinEtsu X23-7921-5 and Laird Tgrease 2500, successfully demonstrated lack of grease migration across the thermal bridge. This test is specific to the above-mentioned thermal greases.*

3.11. Removal and Repair

For cage applications using thermal bridge, the complete cage assembly must be replaced. The thermal bridge must not be removed separately from the cage (This could damage the thermal bridge). For cage replacement, the entire cage assembly including thermal bridge has to be removed and replaced with a new cage assembly with thermal bridge. Extraction tools (details specified in Section 5) will be required to remove the cage assembly from the PC board.

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 reused.

4. QUALIFICATION

No outside agency approvals for cage assembly configurations (QSFP28 (1X1, 1X4 and 1X6), QSFP-DD 1X1, SFP28 1X1, SFP-DD 1X1) was defined at the time of publication of this document.

5. TOOLING

Tooling will be available for all thermal bridge – cage configurations specified in this document. Instruction Sheet (408-) provides details on how the seating and extraction tooling needs to be used to fit the cage assembly on the PC Board. Table I provides the seating and extraction tool P/N for each cage assembly configuration.

5.1. Seating & Extraction Tool

Table I: Seating Tool and Extraction Tool P/Ns

Cage Configurations	Product P/N	Seating Tool P/N	Extraction Tool P/N
QSFP28 1X1	2359309-1	2372134-2	3-2215056-8
QSFP28 1X4	2354935-1	2372134-1	1-2215041-1
QSFP28 1X6	2355519-1	2372134-3	1-2215041-2
SFP28 1X1	2358986-1	2367090-1	2215058-7
SFP-DD 1X1	2359292-1	2372146-1	2215024-5

QSFP-DD 1X1	2354751-1	2372142-1	3-2215056-9

6. VISUAL AID

The illustration below shows a typical application of QSFP28 1X1 Cage Assembly with Thermal Bridge. 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.

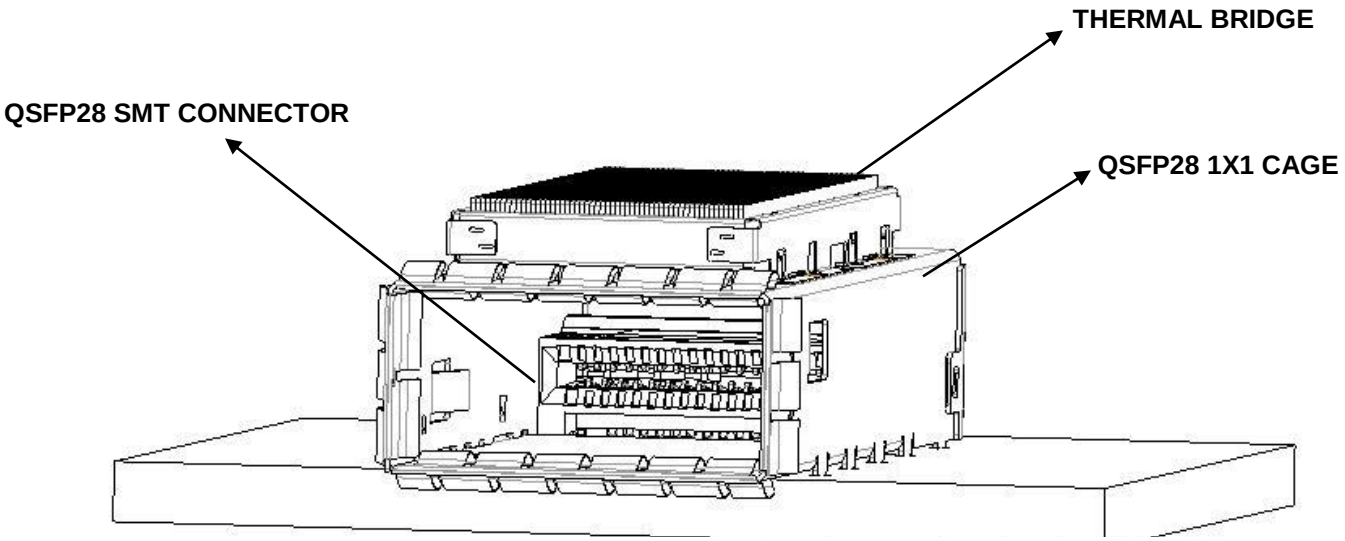

Figure 3: Visual Aid