SFF Committee documentation may be purchased in electronic form.
SFF specifications are available at ftp://ftp.seagate.com/sff

SFF Committee

SFF-8683

Specification for

QSFP+ Cage

Rev 1.2 November 4, 2014

Secretariat: SFF Committee

This specification defines the complete mechanical compatibility between this Cage and the QSFP+ connector and QSFP+ Pluggable Modules and Cable Plugs which have been implemented to SFF-8685. This individual cage-only specification is mechanically identical to the cage design described within the original 10Gb/s QSFP+ SFF-8436.

The EMI leakage for these cages is expected to be similar to that of SFF-8436 when QSFP+ modules and cages are mated.

This specification provides a common reference for systems manufacturers, system integrators, and suppliers, of module style interconnects. This is an internal working specification of the SFF Committee, an industry ad hoc group.

This specification is made available for public review, and written comments are solicited from readers. Comments received by the members will be considered for inclusion in future revisions of this specification.

The description in this specification does not assure that the specific component is actually available from suppliers. If such is supplied it shall comply with this specification to achieve interoperability between suppliers.

Support: This specification is supported by the identified member companies of the SFF Committee.

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EXPRESSION OF SUPPORT BY MANUFACTURERS

The following member companies of the SFF Committee voted in favor of this industry specification.

All Best
Amphenol
FCI
Finisar
Foxconn
Hewlett Packard
HGST
IBM
JDS Uniphase
Jess-Link
Lotes Tech
LSI
MGE
Molex
NetApp
Oclaro
QLogic
Seagate
Sumitomo
TE Connectivity
Volex

The following member companies of the SFF Committee voted to abstain on this industry specification.

AMI
Applied Micro
Avago
Broadcom
Dell Computer
EMC
Emulex
Luxshare-ICT
Pioneer
Sandisk
Shenzhen
Toshiba
Western Digital
Xyratex

The user's attention is called to the possibility that implementation to this Specification may require use of an invention covered by patent rights. By distribution of this Specification, no position is taken with respect to the validity of this claim or of any patent rights in connection therewith. Members of the SFF Committee which advise that a patent exists are required to provide a statement of willingness to grant a license under these rights on reasonable and non-discriminatory terms and conditions to applicants desiring to obtain such a license.

Change History:

April 2012
 - Split the cage component from the SFF-8436 spec to facilitate a QSFP+ documentation restructuring project.
 - Decreased the latch retention force from 180N to 125N
 - corrected oversight when size of the XFP style latch implemented for the QSFP single cage was decreased to accommodate side by side ganged as well as stacked and ganged solutions.

Rev 0.5 July 7, 2012
 - Figure 5-1 redrawn
    o Note 9 re higher wattage models added
- Figure 5-4 redrawn
    o Re-dimensioned thermal contact area to coincide with opening in top of cage

Rev 0.6 January 23, 2013 [made to retain consistency with SFF-8436]
- Removed Ref from upper left of Figure 17, valid for only one of the configurations
- Moved notes from body to below figure.

Rev 0.7 July 23, 2013
- Harmonized values of B20/B21 and C02/C03 with SFF-8682

Rev 0.9 March 4, 2014
- Harmonized figure 5-2 with 8663 format including the deletion of Figure 5-3. Figure 5-2 now points to the connector footprint in the connector spec (8682) now so the A22-27 were removed for Table 6-1.
Figure 5-3 is now 5-2, 5-4 is now 5-3.

Rev 1.0 May 23, 2014
- Revised Table 6-1 to clarify the test requirements by removing the connector from the cage test as it should not be included in the test.
- Added enlarged view of latch tip to Figure 5-1

Rev 1.1
- Speed removed from title and text as it is referenced by multiple variants

Rev 1.2
- Expanded the list of references in Section 1.1 and Section 1.2

Foreword

The development work on this specification was done by the SFF Committee, an industry group. The membership of the committee since its formation in August 1990 has included a mix of companies which are leaders across the industry.

When 2 1/2" diameter disk drives were introduced, there was no commonality on external dimensions e.g. physical size, mounting locations, connector type, connector location, between vendors.

The first use of these disk drives was in specific applications such as laptop portable computers and system integrators worked individually with vendors to develop the packaging. The result was wide diversity, and incompatibility.

The problems faced by integrators, device suppliers, and component suppliers led to the formation of the SFF Committee as an industry ad hoc group to address the marketing and engineering considerations of the emerging new technology.

During the development of the form factor definitions, other activities were suggested because participants in the SFF Committee faced more problems than the physical form factors of disk drives. In November 1992, the charter was expanded to address any issues of general interest and concern to the storage industry. The SFF Committee became a forum for resolving industry issues that are either not addressed by the standards process or need an immediate solution.

Those companies which have agreed to support a specification are identified in the first pages of each SFF Specification. Industry consensus is not an essential requirement to publish an SFF Specification because it is recognized that in an emerging product area, there is room for more than one approach. By making the documentation on competing proposals available, an integrator can examine the alternatives available and select the product that is felt to be most suitable.

SFF Committee meetings are held during T10 weeks (see www.t10.org), and Specific Subject Working Groups are held at the convenience of the participants. Material presented at SFF Committee meetings becomes public domain, and there are no restrictions on the open mailing of material presented at committee meetings.

Most of the specifications developed by the SFF Committee have either been incorporated into standards or adopted as standards by EIA (Electronic Industries Association), ANSI (American National Standards Institute) and IEC (International Electrotechnical Commission).

If you are interested in participating or wish to follow the activities of the SFF Committee, the signup for membership and/or documentation can be found at:
www.sffcommittee.com/ie/join.html

The complete list of SFF Specifications which have been completed or are currently being worked on by the SFF Committee can be found at:
ftp://ftp.seagate.com/sff/SFF-8000.TXT

If you wish to know more about the SFF Committee, the principles which guide the activities can be found at:
ftp://ftp.seagate.com/sff/SFF-8032.TXT

Suggestions for improvement of this specification will be welcome. They should be sent to the SFF Committee, 14426 Black Walnut Ct, Saratoga, CA 95070.

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SFF Committee --

QSFP+ Cage

1. Scope

This specification defines the terminology and mechanical requirements for a high speed pluggable module cage. This specification is also intended to facilitate the implementation of 1 x "n" ganged cages and the 2 x "n" stacked cage configurations.

The need for this specification became evident when it was realized that QSFP+ SFF-8436 cage designs may not meet the needs for higher data rates. This specification is of an improved transceiver style which has tight mechanical tolerances on the module and enhanced EMI characteristics when mated with a cage designed for higher speed modules.

1.1 Application Specific Criteria

This connector is capable of meeting the interface requirements for the operation of:

- Ethernet IEEE 802.3ba 40 GbE
- Ethernet IEEE 802.3bj 100GbE copper
- Ethernet IEEE 802.3bm 100GbE optical
- Infiniband IBTA EDR
- Infiniband IBTA FDR
- InfiniBand IBTA QDR
- T10 SAS 2.1

2. - T10 SAS 3 References

The SFF Committee activities support the requirements of the storage industry, and it is involved with several standards.

2.1 Industry Documents

The following interface standards and specifications are relevant to this Specification.

- Ethernet IEEE 802.3ba 40 GbE
- Ethernet IEEE 802.3bj 100GbE copper
- Ethernet IEEE 802.3bm 100GbE optical
- Infiniband IBTA EDR
- Infiniband IBTA FDR
- InfiniBand IBTA QDR
- T10 SAS 2.1
- T10 SAS 3
- SFF-8410 High Speed Serial Testing for Copper Links
- SFF-8661 QSFP+ 4X Pluggable Module
- SFF-8682 QSFP+ 4X Connector

2.2 SFF Specifications

There are several projects active within the SFF Committee. The complete list of specifications which have been completed or are still being worked on are listed in the specification at ftp://ftp.seagate.com/sff/SFF-8000.TXT

2.3 Sources

Those who join the SFF Committee as an Observer or Member receive electronic copies of the minutes and SFF specifications (http://www.sffcommittee.com/ie/join.html).

Copies of ANSI standards may be purchased from the InterNational Committee for Information Technology Standards (http://tinyurl.com/c4psg).

Copies of SFF, T10 (SCSI), T11 (Fibre Channel) and T13 (ATA) standards and standards still in development are available on the HPE version of CD_Access (http://tinyurl.com/85fts).

2.4 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.

American	French	ISO
0.6	0,6	0.6
1,000	1 000	1 000
1,323,462.9	1 323 462,9	1 323 462.9

2.5 Definitions

For the purpose of SFF Specifications, the following definitions apply:

Optional: This term 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. If there is a conflict between text and tables on a feature described as optional, the table shall be accepted as being correct.

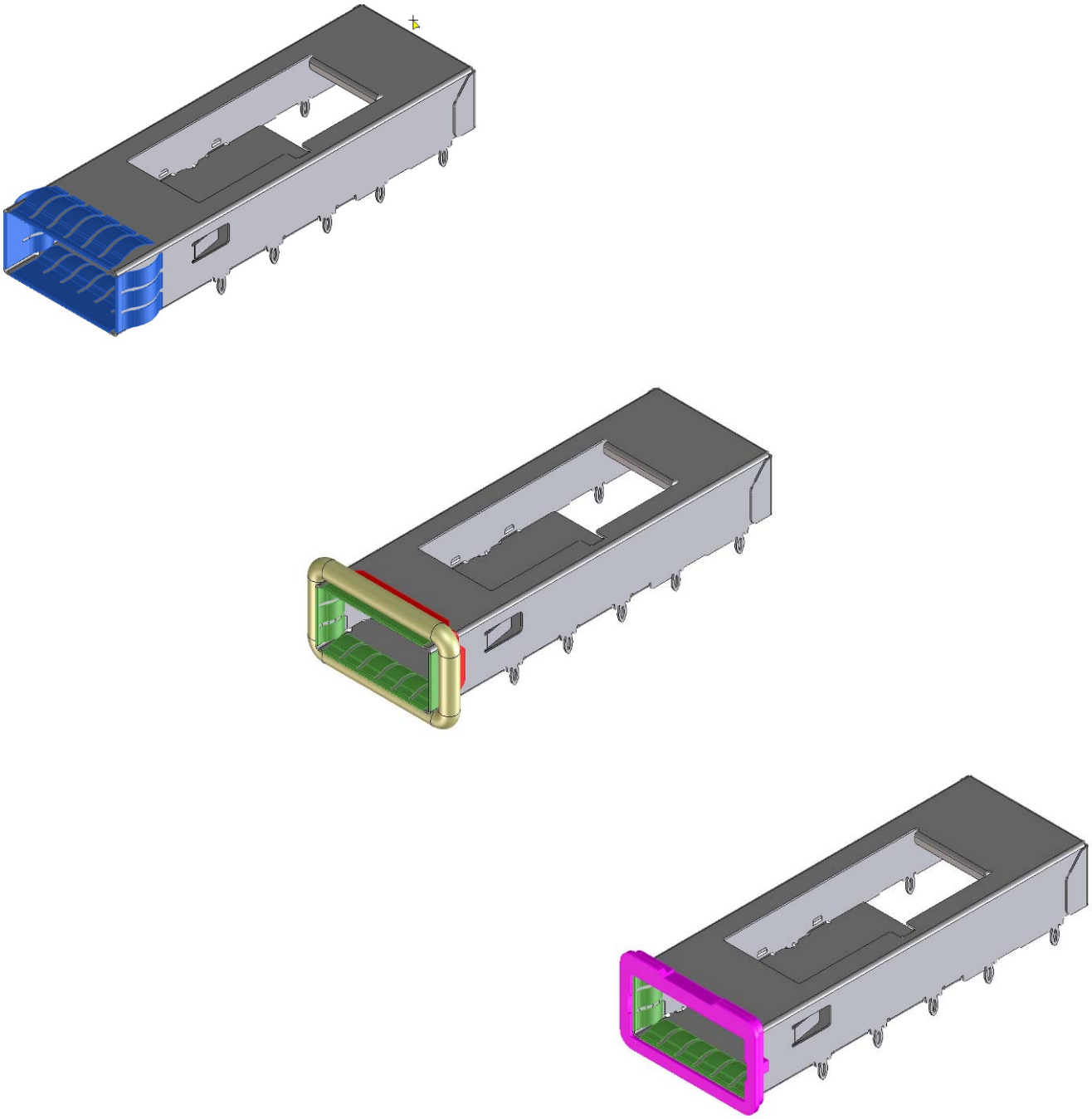
Reserved: Where this term is used for defining the signal on a connector pin its actual function is set aside for future standardization. It is not available for vendor specific use. Where this term is used for bits, bytes, fields and code values; the bits, bytes, fields and code values are set aside for future standardization. The default value shall be zero. The originator is required to define a reserved field or bit as zero, but the receiver should not check Reserved fields or bits for zero.

Dimension, Reference: A dimension used for information purposes only. A reference dimension is a repeat of a dimension or is derived from other values shown on the drawing or on related drawings. It is considered auxiliary information and does not govern production or inspection operations.

3. General Description

This specification defines the complete mechanical dimensions of the QSFP+ Pluggable module cage. This Pluggable module cage system provides several implementation alternatives in terms of interoperability and EMI control that provide the increased data rate capability required for high speed applications.

The dimensions for the module are normative.



Cages shown with optional opening in the top to accept a heat sink.

FIGURE 3-1 TYPICAL SPRING FINGER, ELASTOMERIC GASKET & BEHIND THE BEZEL CAGES

4. Datums

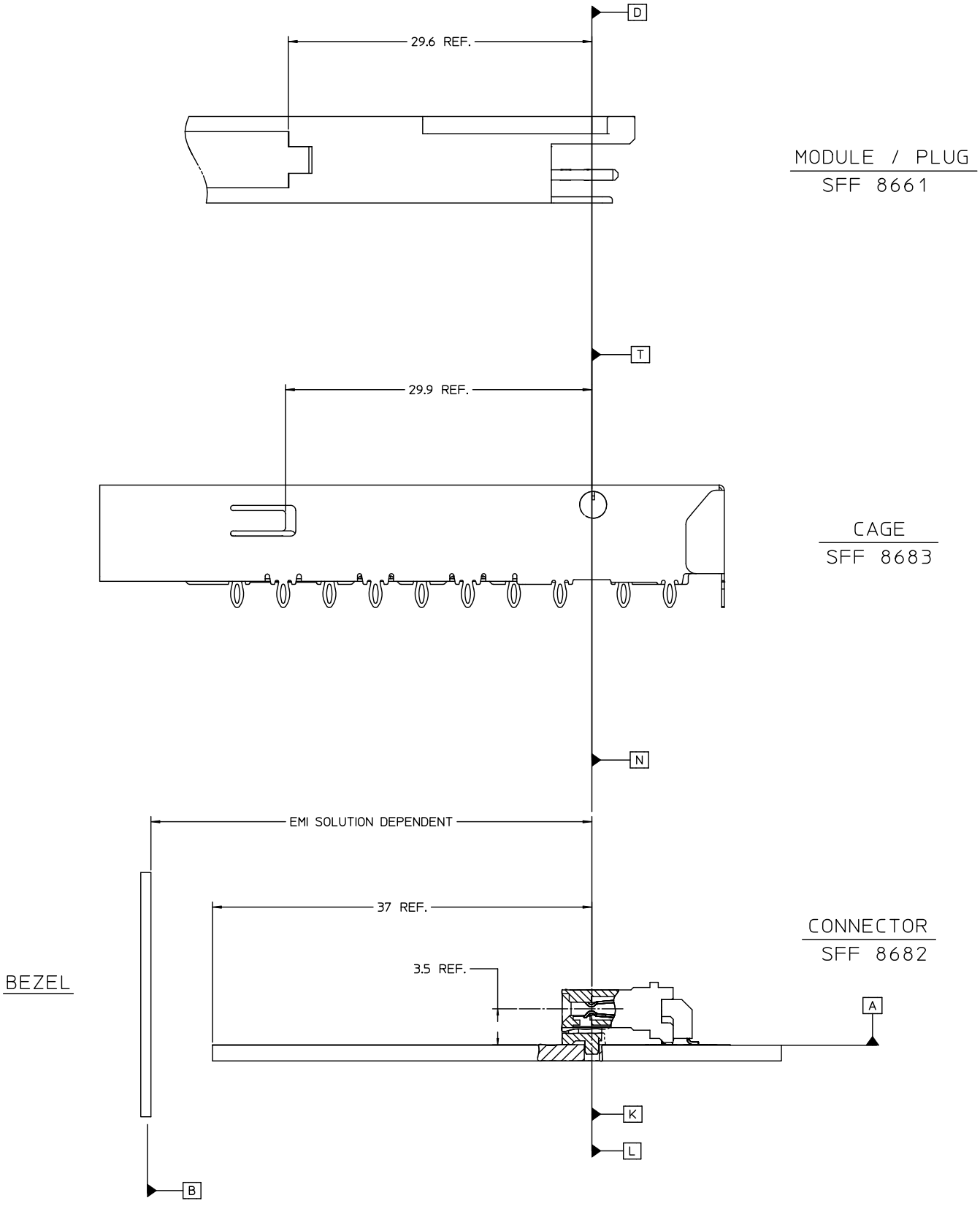


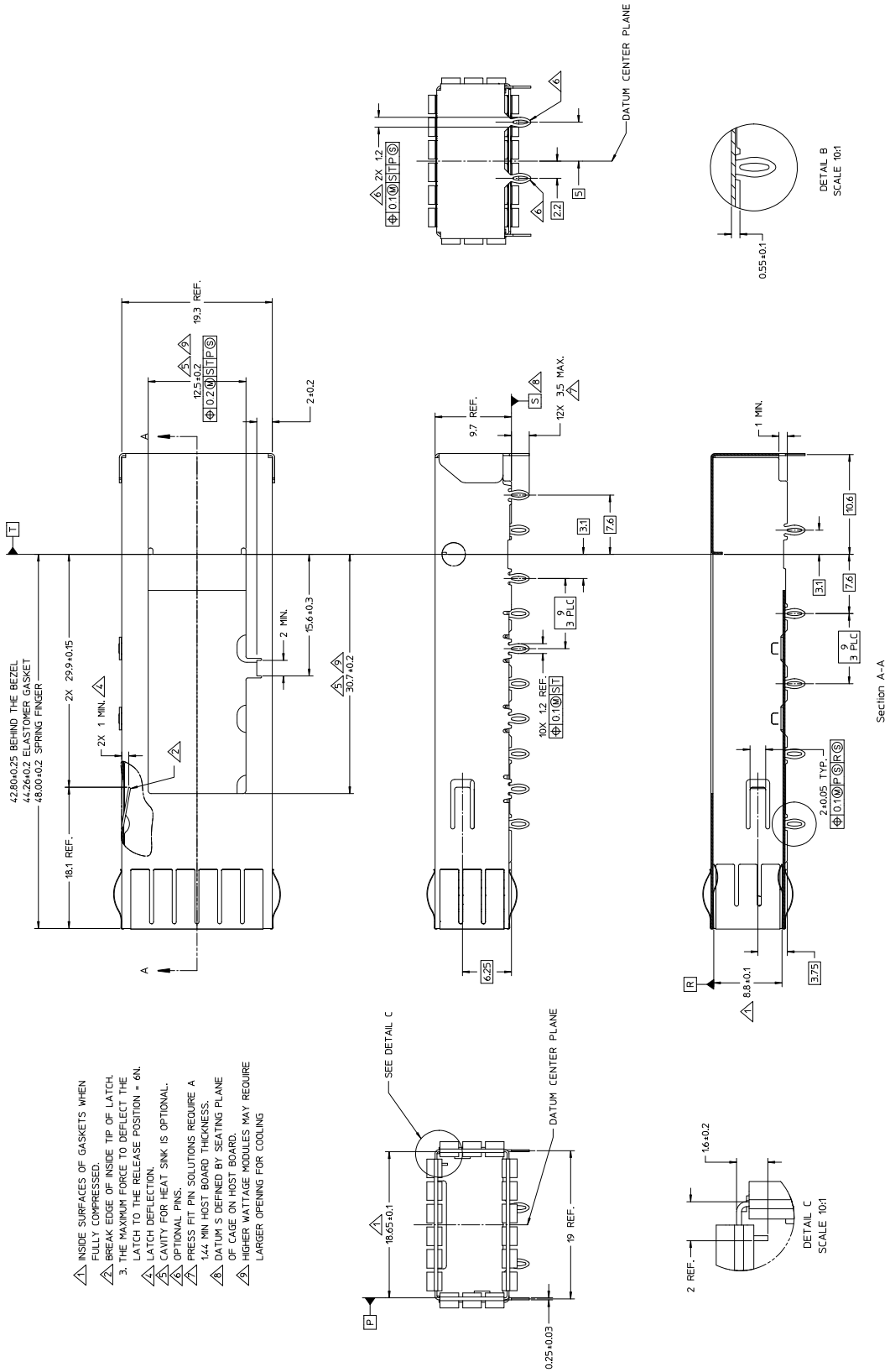
FIGURE 4-1 DATUM DEFINITIONS

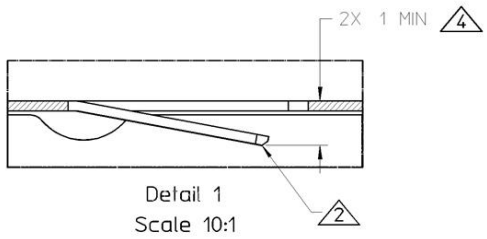
(Shown in conjunction with SFF-8661 & SFF-8682)

TABLE 4-1 DATUM DIMENSIONS

Datum	Description
A	Host Board Top Surface
B	Inside Surface of bezel
C	**Distance between Connector housing pegs on host board
D	*Hard stop on Module
K	*Host board thru hole #1 to accept connector guide post
L	*Host board thru hole #2 to accept connector guide post
M	**Width of bezel cut out
N	*Connector alignment pin
P	**Width of inside of cage at EMI gasket (when fully compressed)
R	Height of inside of cage at EMI gasket (when fully compressed)
S	Seating plane of cage on host board
T	*Hard stop on cage
W	Seating surface of the heat sink on the cage
X & Y	Host board horizontal and depth datums established by customer's fiducials
Z	**Width of heat sink surface that fits into clip
CC	Length of boss on heat sink that fits inside of the cage
* Datums D, K, L, N and T are aligned when assembled. ** Centerlines of datums C, M, P and Z are aligned on the same vertical axis. *** All dimensions shown are in millimeters.	

5. Pluggable Module Cage Dimensions





Notes:
1. Inside surfaces of gaskets when fully compressed.
2. Break edge of inside tip of latch.
3. The maximum force to deflect the latch to the release position = 6N.
4. Latch deflection.
5. Cavity for heat sink is optional.
6. Optional pins.
7. Press fit pin solutions require a 1.44 min host board thickness.
8. Datum defined by seating plane of cage on host board.
9. Higher wattage models may require larger opening for cooling

FIGURE 5-1 PLUGGABLE MODULE CAGE DIMENSIONS

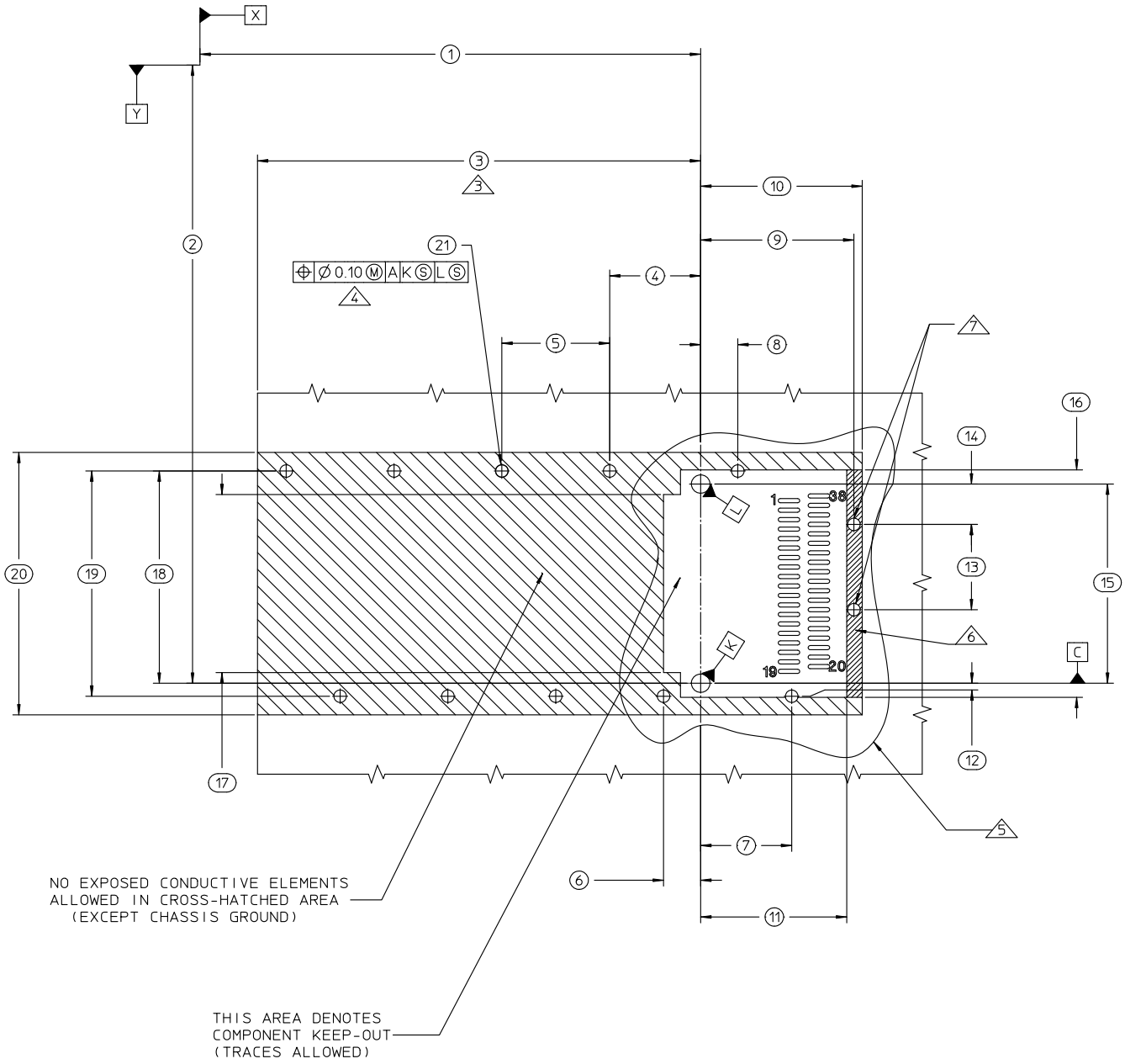


FIGURE 5-2 PLUGGABLE MODULE CAGE FOOTPRINT

Notes:
1. Datums X and Y are established by the customer's fiducial
2. Datum A is the top surface of the host board
3. Location of the edge of the PCB is application specific
4. Finished hole size
5. Refer to SFF-8682 for connector footprint dimensions
6. Surface traces permitted within this shaded area
7. Indicated holes are optional

TABLE 5-1 PLUGGABLE MODULE CAGE FOOTPRINT

Designator	Description	Dimension	Tolerance
A01	Fiducial to Datum L/K	System	Basic
A02	Fiducial to Datum C	System	Basic
A03	Datum L/K to Cage Pin PF Pin Hole Diameter	37.00	Max
A04	Datum L/K to Cage Pin PF Pin Hole Diameter	7.60	Basic
A05	Datum L/K to Cage Pin PF Pin Hole Diameter	9.00(6x)	Basic
A06	Datum L/K to Cage Pin PF Pin Hole Diameter	3.10	Basic
A07	Datum L/K to Cage Pin PF Pin Hole Diameter	7.60	Basic
A08	Datum L/K to Cage Pin PF Pin Hole Diameter	3.10	Basic
A09	Datum L/K to Cage Pin PF Pin Hole Diameter	10.60	Basic
A10	Datum L/K to Outside Edge of Shaded Area	11.30	Min
A11	Datum L/K to Inside Edge of Shaded Area	10.30	Max
A12	Datum C to Side of Component Free Area	1.10	Basic
A13	C/L to C/L between Rear Cage PF Pin Holes	7.20	Basic
A14	Datum L to rear Cage PF Pin Hole	3.40	Basic
A15	Distance between Datum L and Datum K	16.80	Ref
A16	Width of Component Free Area	19.20	Max
A17	Width of Component Free Area	15.02	Max
A18	Datum C to Row of Cage Pins	17.90	Ref
A19	Side to Side between Cage Pin Holes	19.00	Basic
A20	Cage Footprint Width	22.15	Min
A21	Diameter of Cage PF Pin Holes	1.05 (12x)	+/-0.05

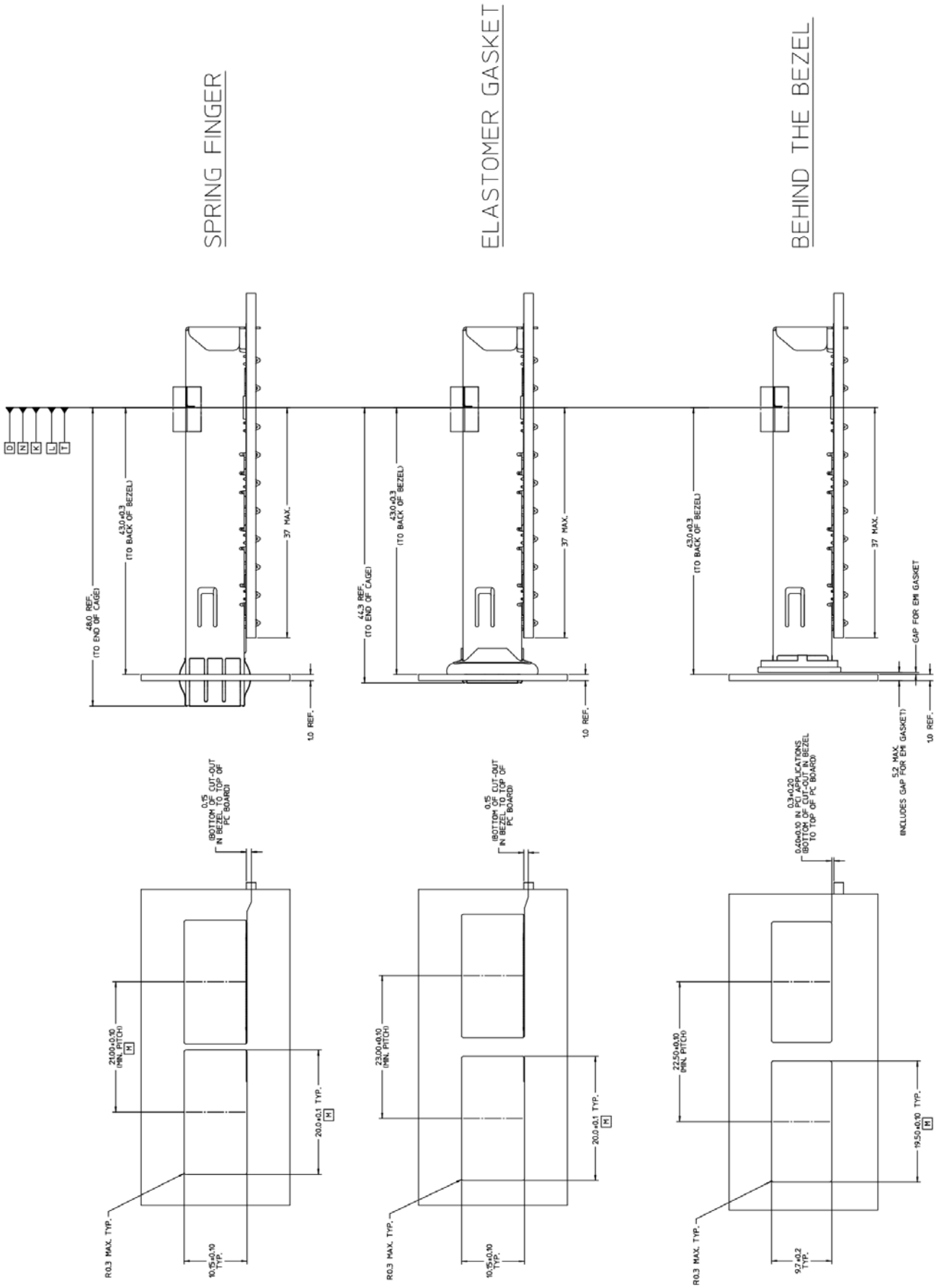
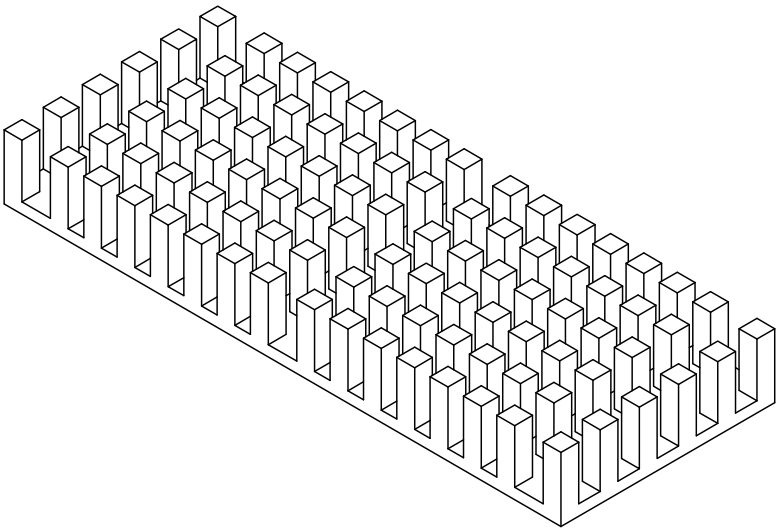
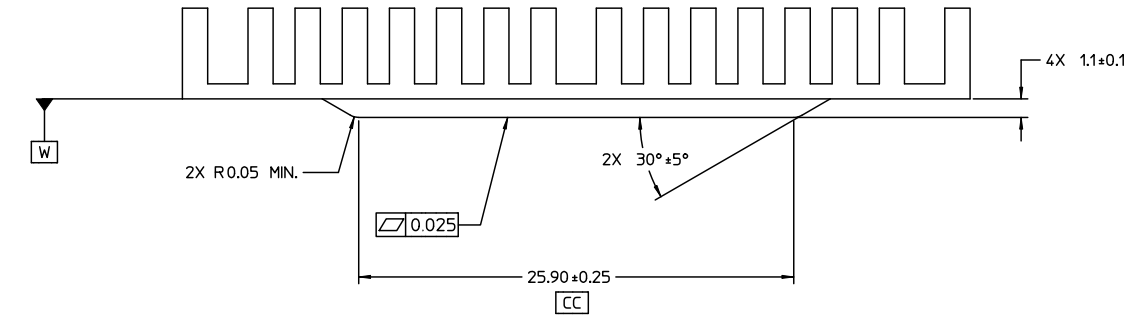
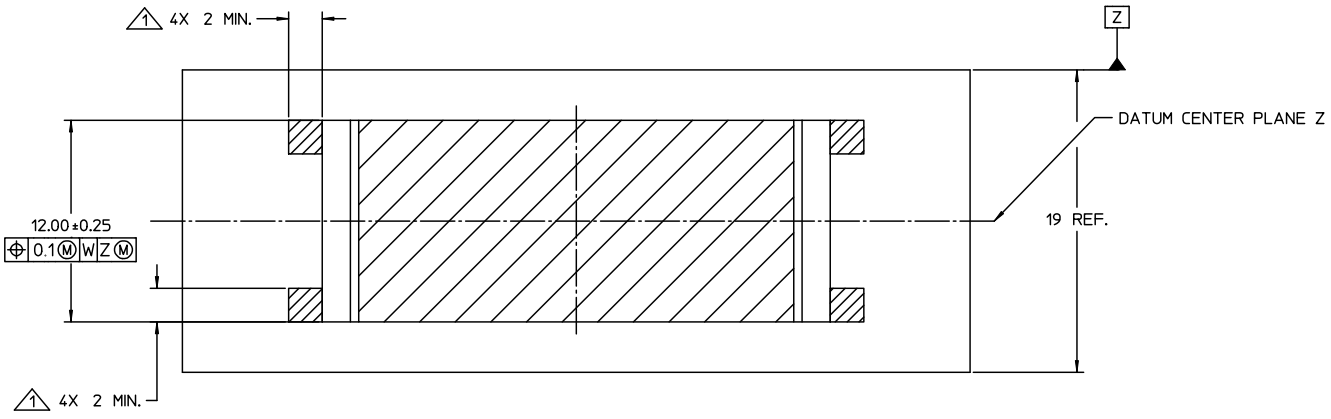


FIGURE 5-3 CAGE TO BEZEL DIMENSIONING AND BEZEL OPENINGS FOR SINGLE CAGES







1 PLANE FOR FLATNESS AND HEIGHT MEASUREMENTS ESTABLISHED AT FOUR INDICATED AREAS
2. ALL OTHER DIMENSIONS ARE PER MANUFACTURER DESIGN

FIGURE 5-4 TYPICAL HEAT SINK CONFIGURATION

6. Insertion, Extraction and Retention Forces

TABLE 6-1 INSERTION, EXTRACTION AND RETENTION FORCES FOR MODULE AND CAGE

Measurement	Min	Max	Units	Comments
QSFP+ Module Insertion	0	40	N	cage without connector
QSFP+ Module Extraction	0	30	N	cage without connector
QSFP+ Module retention	90	N/A	N	No damage to module below 90N
Cage retention (Latch strength)	125	N/A	N	No damage to cage latch below 125N
Cage retention in Host Board	114	N/A	N	Force to be applied in a vertical direction, no damage to cage
Insertion / removal cycles, connector / cage	100	N/A	Cycles	Number of cycles for the connector and cage with multiple modules/plugs
Insertion / removal cycles, QSFP+ Module	50	N/A	Cycles	Number of cycles for an individual module/plug into a cage and connector