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

SFF Committee

SFF-8663

Specification for

QSFP+ 28 Gb/s Cage (Style A)

Rev 1.6 May 23, 2014

Secretariat: SFF Committee

This specification provides mechanical compatibility between this new Cage Formfactor and QSFP+ Pluggable Modules and Cable Plugs which have been implemented to SFF-8436. The EMI leakage for them is expected to be similar to that when QSFP+ modules and cages are mated.

Superior EMI performance can only be expected with mated combinations of 28 Gb/s Pluggable modules/Cable plugs and cages.

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
Avago
Broadcom
EMC
ETRI
FCI
Finisar
Foxconn
Hewlett Packard
HGST
JDS Uniphase
Lotes Tech
LSI
Molex
NetApp
Oclaro
Panduit
QLogic
Shenzhen
Sumitomo
Sun Microsystems
TE Connectivity
Volex

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

Applied Micro
Cinch
Dell Computer
Emulex
Intel
Luxshare-ICT
Sandisk
Seagate
Siemon
Toshiba
Xyratex
Yamaichi

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:

June 11, 2011:
Global
  Removed redundant use of 25G throughout body
  All references to 25G were replaced by 32 Gb/s
  Specification Titles updated to current usage
Section 4:
  Added "Datum Definitions" table
  Updated Figure 4-1 with the following changes:
    Added "Module/Plug" description to top view
    Added appropriate SFF document reference to each view
    Extended datum line through all 3 views
    Replaced "SEE FIGURES 12A AND 12B" WITH "EMI SOLUTION DEPENDENT"
Section 5:
  Updated Figure 5-1 with the following changes:
    Rotated entire figure 90 degrees to show views that were cut off the page
    18.65 +/- 0.1 dimension was 18.75 +/- 0.1
  Updated Figure 5-2 with the following changes:
    Rotated entire figure 90 degrees to show Detail 1 that was cut off the page
    Added Note 5 referencing SFF-8662 spec
    Added reference to SFF-8662 in figure title
  Updated Figure 5-3 with the following changes:
    Rotated entire figure 90 degrees
    Extended datum line through all 3 views
Section 6:
  Updated title (previously was Section 7)
  Replaced Table 7-1 AND 7-2 (SFP+ requirements) with Table 6-1
    Added text to clarify that connector is included in module insertion/extraction

June 29, 2011
  Added Table of Contents
  Added references to figures in Table 4-1

January 30, 2012
  All references to 32 Gb/s were replaced by 28 Gb/s

Rev 1.0 May 21, 2012
  Expanded list of Industry Documents

Rev 1.1 July 7, 2012
  Figure 5-1 redrawn
  - Note 9 re higher wattage models added
  Figure 5-4 redrawn
  - Re-dimensioned thermal contact area to coincide with opening in top of cage

Rev 1.2 July 27, 2013
  Harmonized values of B20/B21 and C02/C03 with SFF-8662
  Identified dimension 10.6 on Figure 5-1 as should be 12.79

Rev 1.3 November 18, 2013
  Replaced Figure 5-1
  Replaced Figure 5-2 and renamed dimension 3
  Deleted Figure 5-3 and associated dimensions
  Changed Table 6-1 Cage retention (Latch strength) to 125N

Rev 1.4 February 27, 2014
- Replaced Figures 4-1, 5-1, 5-2, to improve legibility(highlighted in markup)
- Figure 5-1: revised the original 2 pin rear view, added new 1 pin rear view and a new zero pin rear view to show the pin locations of the pins
- Added dimensions for the rear wall pin locations to figure 5-2 cage footprint with table of dimensions.
- Table 5-1: Added dimension for the single pin version and revised the way the two pin version was dimensioned (the pins were not relocated)
- Removed Fibre Channel PI-5 from section 2-1; QSFP added in PI-6

Rev 1.5 April 3, 2014
- Changed Dimension 21 in Figure 5-1 to include 10X and 11X as well as 12X

Rev 1.6 May 23, 2014
- Added Detail to clarify the tip of latch to Figure 5-1
- Replaced Figure 5-5 with better quality copy – no changes to the figure itself
- 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.

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+ 28 Gb/s Cage (Style A)

1. Scope

This specification defines the terminology and mechanical requirements for a 28 Gb/s 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+ cage designs do not meet the needs for the higher data rates. The 28 Gb/s QSFP+ is an improved transceiver style which has tight mechanical tolerances on the module and enhanced EMI characteristics when mated with a cage designed for the 28 Gb/s module. Please note that there are new cage dimensional requirements specified in this document to enable assembly with the 28 Gb/s Mini Multilane connector specified in SFF-8662. These new requirements do not affect the mating compatibility of QSFP+ pluggable modules/plugs with the new 28 Gb/s cage.

2. Reference

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

2.1 Industry Documents

The following documents are relevant.

- Ethernet IEEE 802.3ba 40G
- Ethernet IEEE 802.3bj 100G
- InfiniBand IBTA QDR/FDR/EDR
- T10 SAS 2-1 (Serial Attached SCSI)
- T10 SAS-3
- T11 FC-PI-6 (Fibre Channel Physical Interface)
- SFF-8024 SFF Committee Cross Reference to Industry Product Names
- SFF-8410 High Speed Serial Testing for Copper Links
- SFF-8661 QSFP+ 28 Gb/s 4X Pluggable Module (Style A)
- SFF-8662 QSFP+ 28 Gb/s 4X Connector (Style A)
- SFF-8665 QSFP+ 28 Gb/s 4X Pluggable Transceiver Solution (QSFP28)

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).

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.

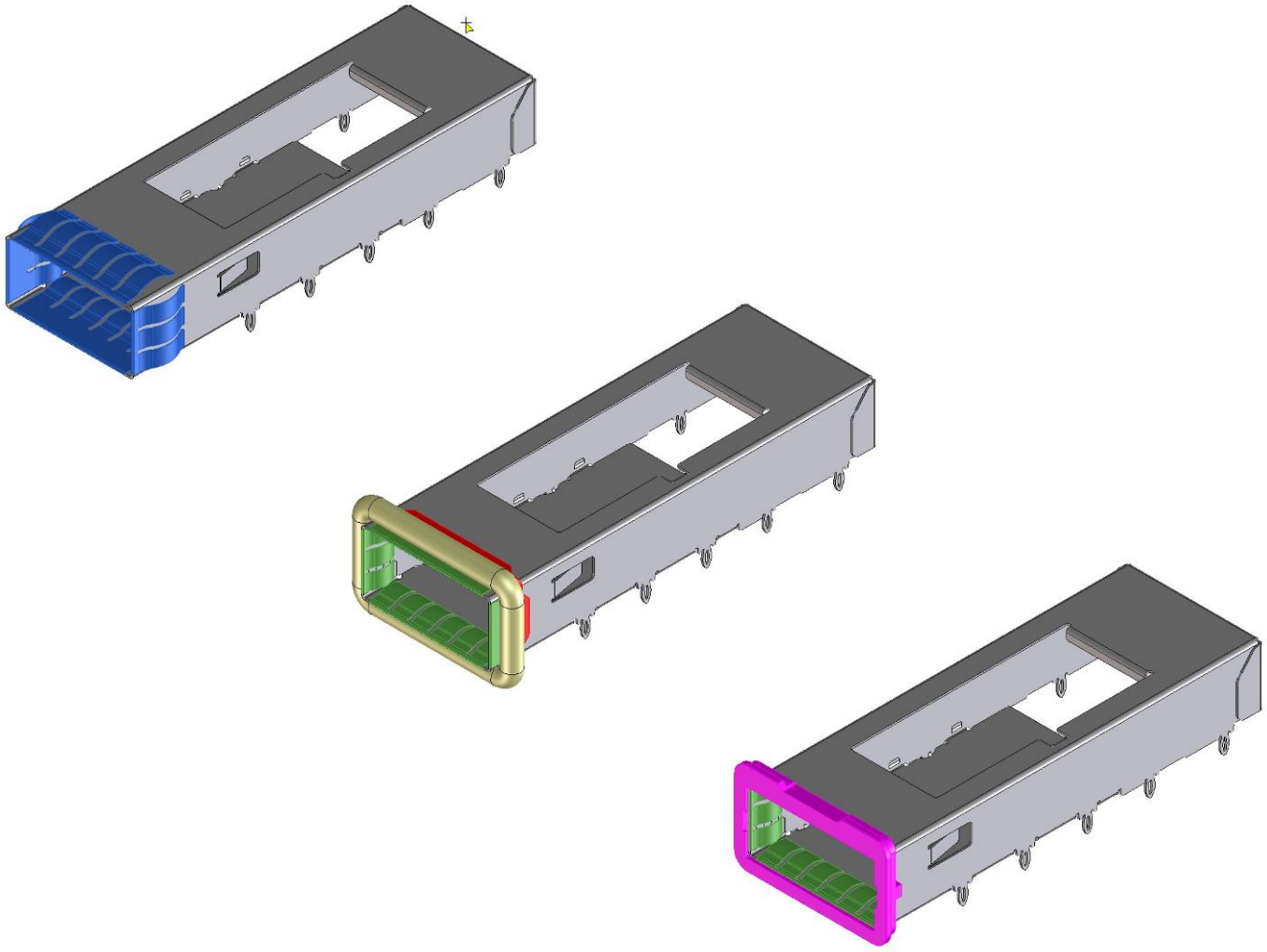
Reserved: Where this term is used for defining the signal on a connector pin its actual function is set aside for future standardization. It is not available for vendor specific use. Where this term is used for bits, bytes, fields and code values; the bits, bytes, fields and code values are set aside 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 28 Gb/s 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 28 Gb/s 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

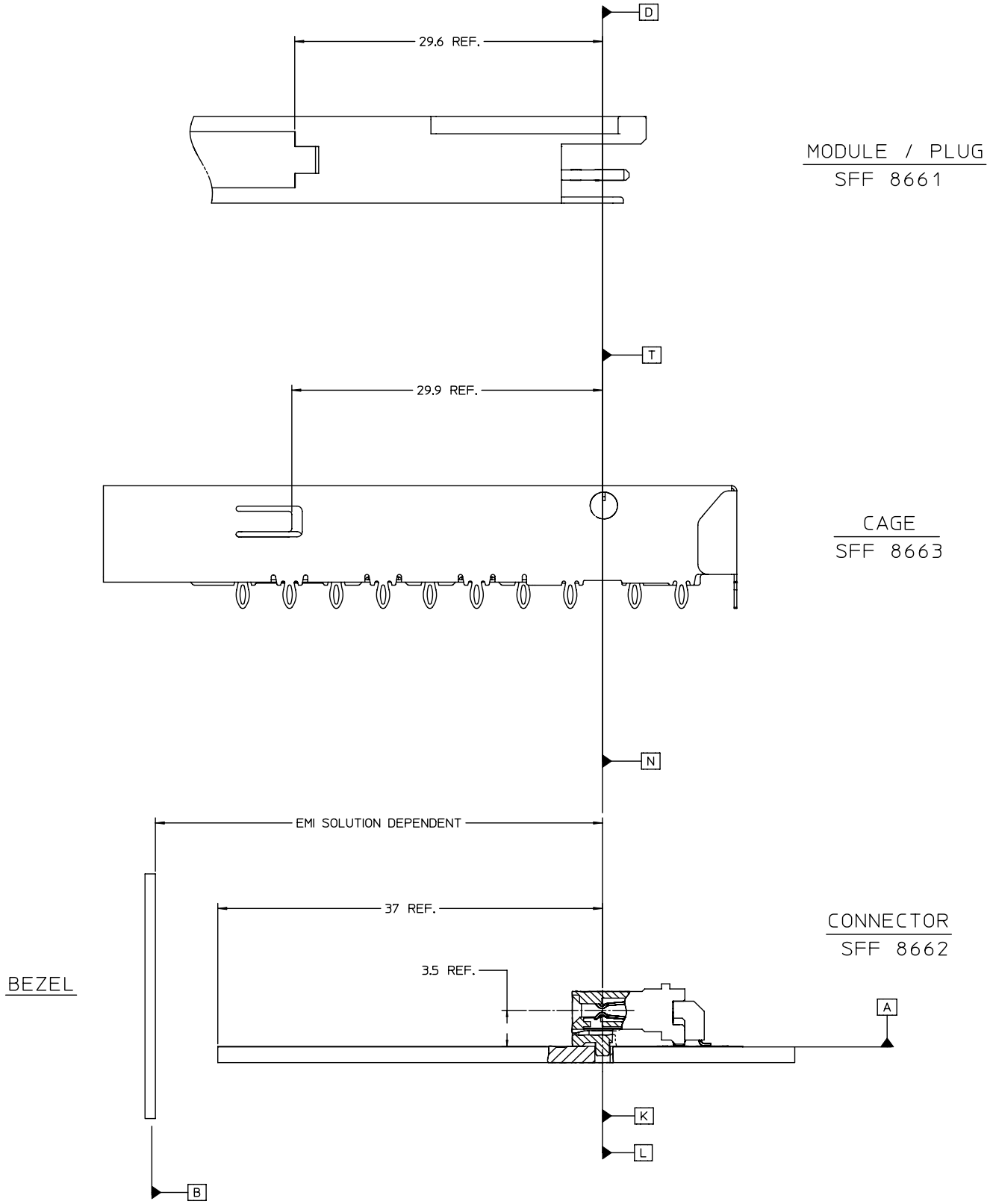


FIGURE 4-1 DATUM DEFINITIONS

(Shown in conjunction with SFF-8661 & SFF-8662)

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
All dimensions shown are in millimeters. *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.	

5. Pluggable Module Cage Dimensions

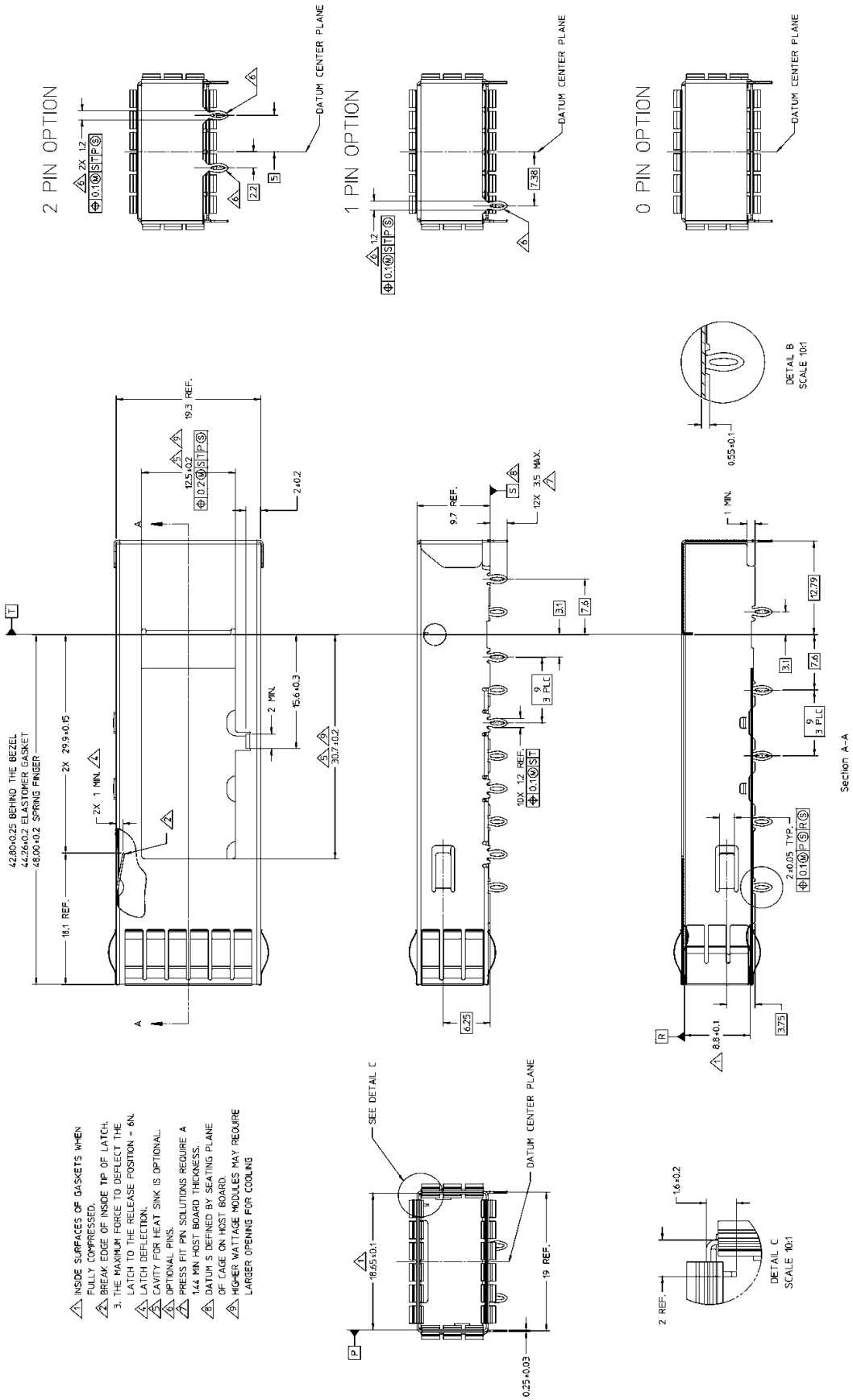


FIGURE 5-1 PLUGGABLE MODULE CAGE DIMENSIONS (1 OF 2)

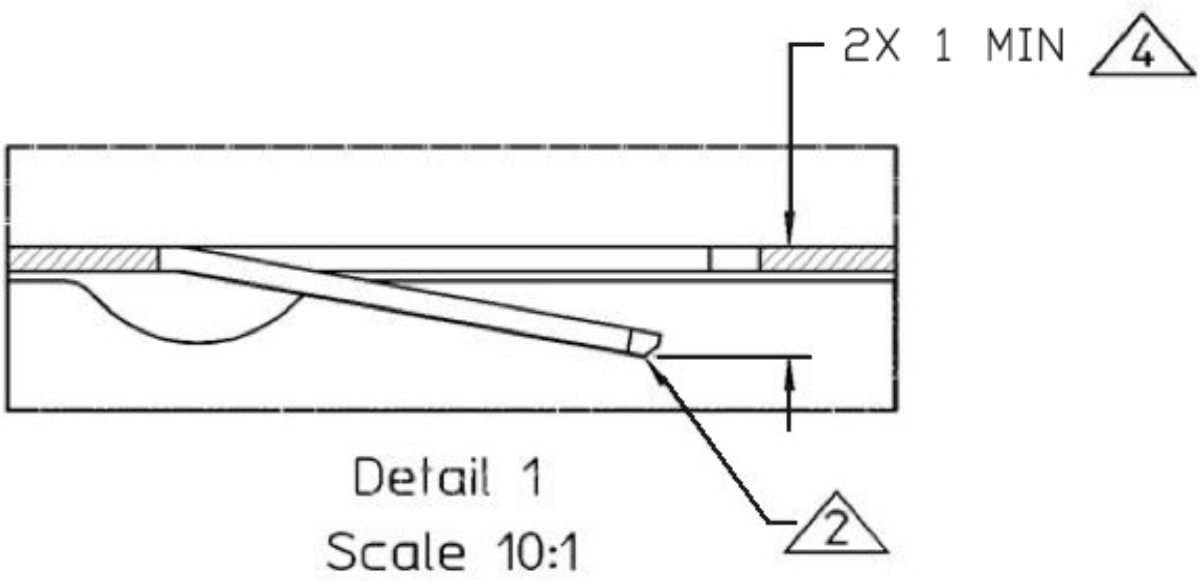
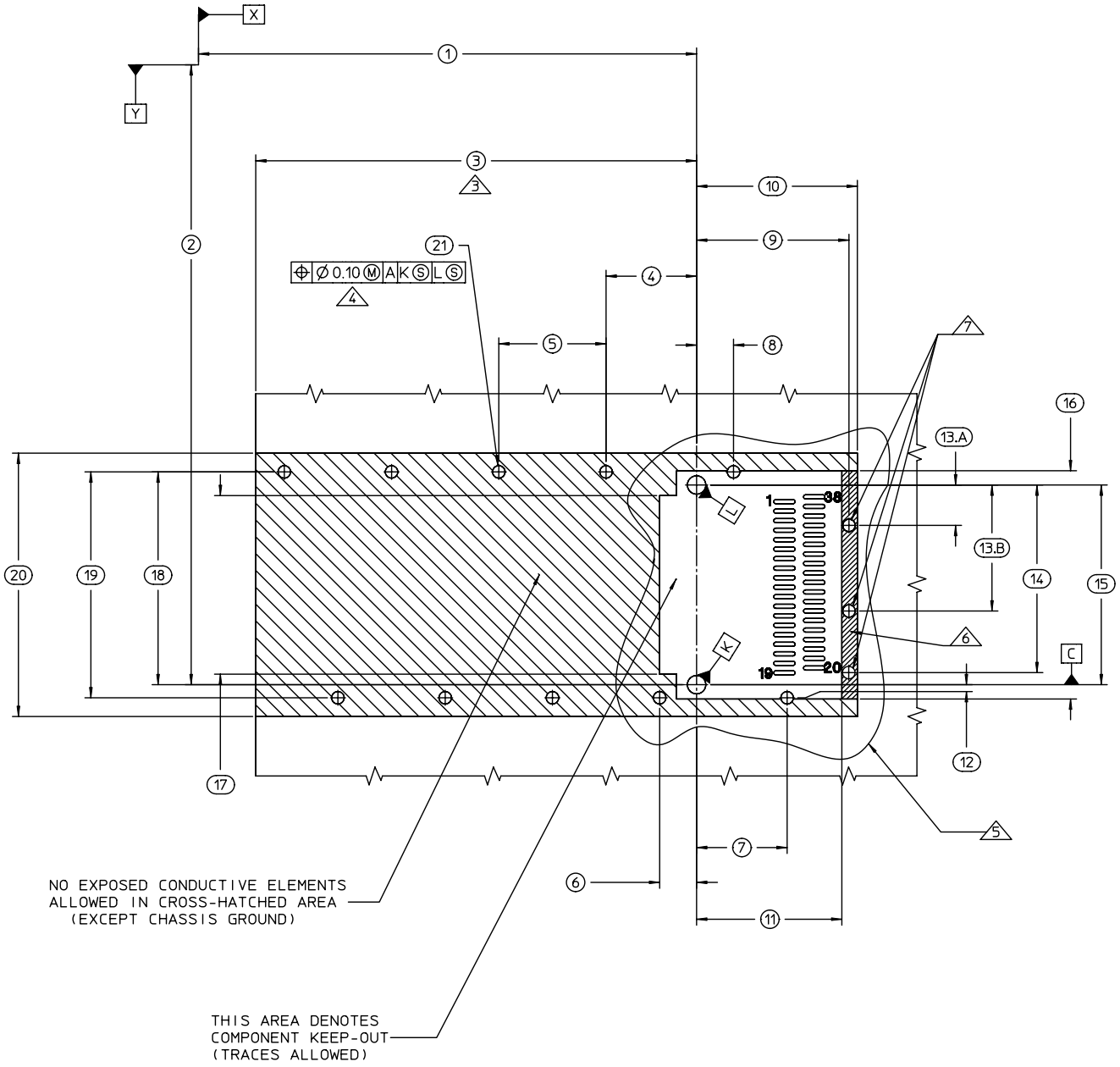


FIGURE 5-2 PLUGGABLE MODULE CAGE DIMENSIONS (2 OF 2)



NOTES
1. DATUM X & Y ARE ESTABLISHED BY THE CUSTOMER'S FIDUCIAL
2. DATUM A IS THE TOP SURFACE OF THE HOST BOARD
3. LOCATION OFTHE EDGE OF PCB IS APPLICATION SPECIFIC
4. FINISHED HOLE SIZE
5. REFER TO SFF8662 FOR CONNECTOR FOOTPRINT DIMENSIONS
6. SURFACE TRACES PERMITTED WITHIN THIS SHADED AREA
7. INDICATED HOLES ARE OPTIONAL (SEE TABLE FOR COMPLIANT PIN CONFIGURATION)

	# OF REAR PINS			
OPTION 1	2	13.A	13.B	N/A
OPTION 2	1	N/A	N/A	14
OPTION 3	0	N/A	N/A	N/A

FIGURE 5-3 PLUGGABLE MODULE CAGE FOOTPRINT

TABLE 5-1 PLUGGABLE MODULE CAGE FOOTPRINT

Designator	Description	Dimension	Tolerance
1	Fiducial to Datum L/K	System	Basic
2	Fiducial to Datum C	System	Basic
3	Datum L/K to End of the Host PCB	37.00	Max
4	Datum L/K to Cage Pin PF Pin Hole Diameter	7.60	Basic
5	Datum L/K to Cage Pin PF Pin Hole Diameter	9.00(6x)	Basic
6	Datum L/K to Cage Pin PF Pin Hole Diameter	3.10	Basic
7	Datum L/K to Cage Pin PF Pin Hole Diameter	7.60	Basic
8	Datum L/K to Cage Pin PF Pin Hole Diameter	3.10	Basic
9	Datum L/K to Cage Pin PF Pin Hole Diameter	12.79	Basic
10	Datum L/K to Outside Edge of Shaded Area	13.49	Min
11	Datum L/K to Inside Edge of Shaded Area	12.49	Max
12	Datum C to Side of Component Free Area	1.10	Basic
13.A	Datum L to rear Cage PF Pin Hole (2 Pin Option)	3.40	Basic
13.B	Datum L to rear Cage PF Pin Hole (2 Pin Option)	10.60	Basic
14	Datum L to rear Cage PF Pin Hole (1 Pin Option)	15.78	Basic
15	Distance between Datum L and Datum K	16.80	Ref
16	Width of Component Free Area	19.20	Max
17	Width of Component Free Area	15.02	Max
18	Datum C to Row of Cage Pins	17.90	Ref
19	Side to Side between Cage Pin Holes	19.00	Basic
20	Cage Footprint Width	22.15	Min
21	Diameter of Cage PF Pin Holes (10X, 11X, 12X)	1.05	+\-0.05

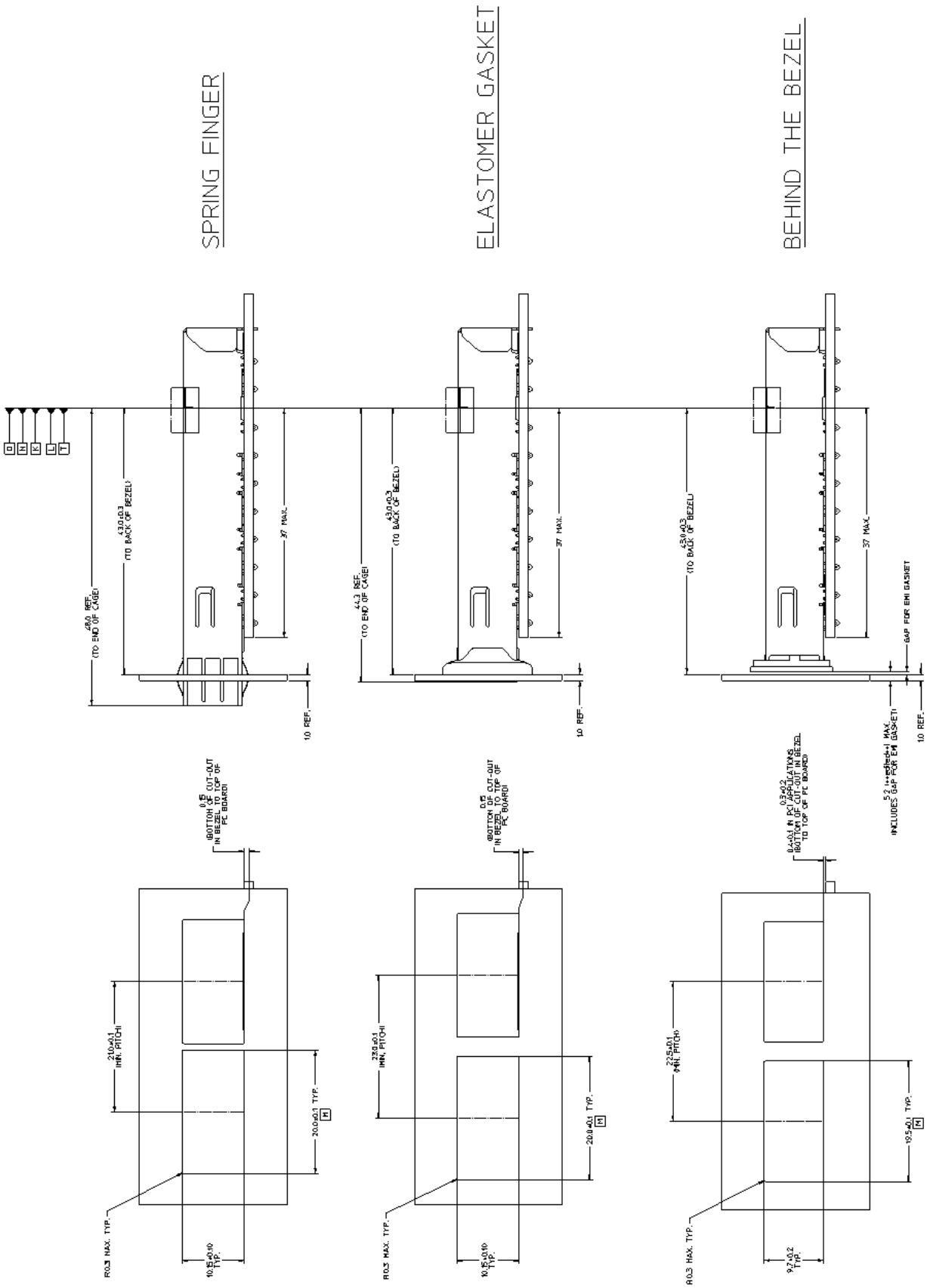
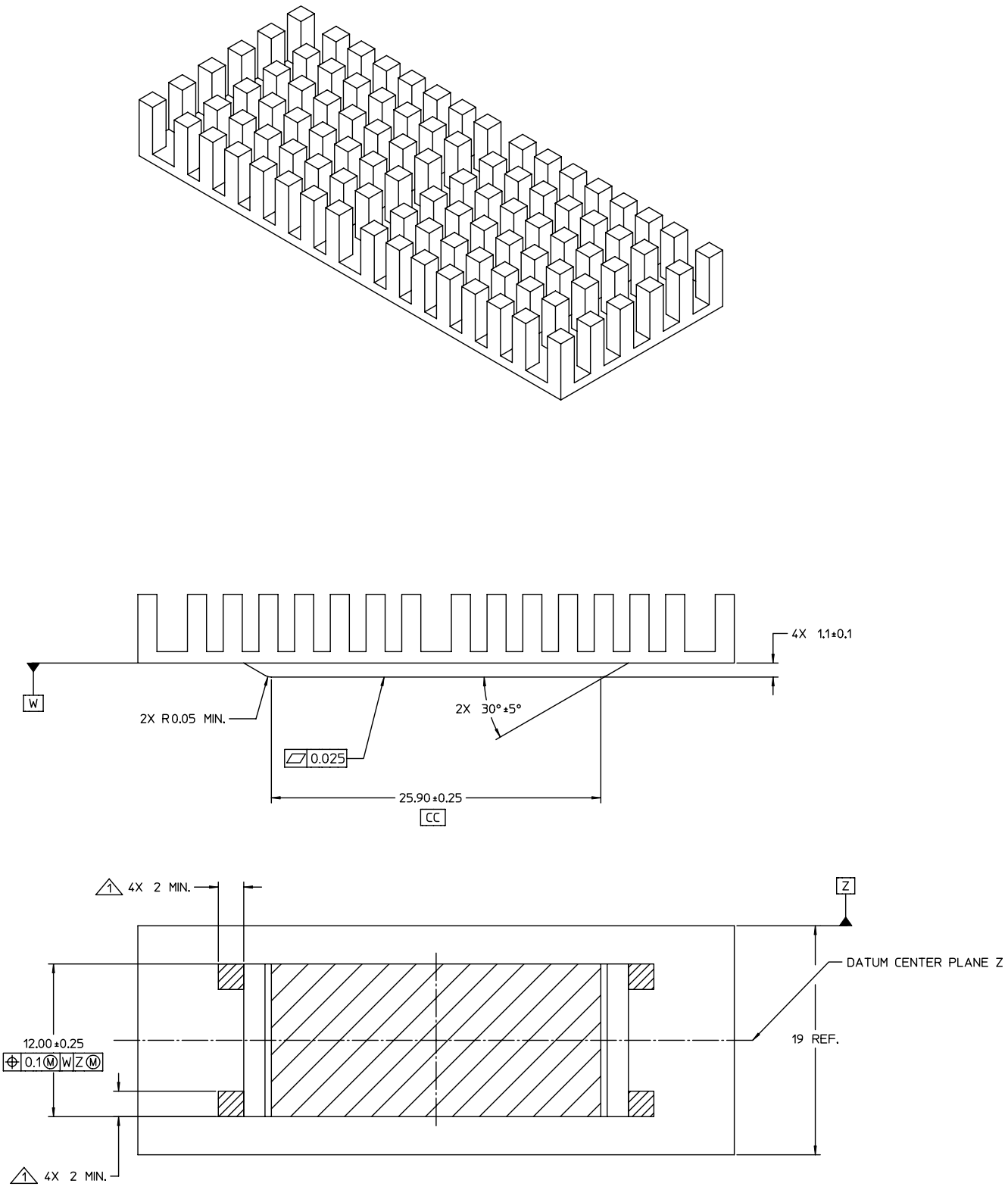


FIGURE 5-4 CAGE TO BEZEL DIMENSIONING AND BEZEL OPENINGS FOR SINGLE CAGES



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

FIGURE 5-5 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
Insertion / removal cycles, QSFP+ Module	50	N/A	Cycles	Number of cycles for an individual module into a cage and connector