1. SFF specifications are available at http://www.snia.org/sff/specifications

SFF-8683

Specification for

QSFP+ Cage

Rev 1.3 October 19, 2017

Secretariat: SFF TA TWG

Abstract: This specification defines the complete mechanical compatibility between this Cage and the QSFP+ connector and QSFP+ modules 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.

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 of a connector in this specification does not assure that the specific component is actually available from connector suppliers. If such a connector is supplied it must comply with this specification to achieve interoperability between suppliers.

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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
  - 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 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

Rev 1.3:
- Updated to SNIA format
- Revised abstract
- Reformatted Change History
- Fixed broken links in Foreword
- Added EIA document references
- All reference to “pluggable modules,” “plugs,” or “modules” changed to “module;” added definition for “module”
- Minor editorial issues resolved
- Updated Section 6 (Insertion, Extraction, and Retention Forces) to agree with other SFF documents for QSFP

Foreword

The development work on this specification was done by the SNIA SFF TWG, an industry group. Since its formation as the SFF Committee in August 1990, the membership 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 SFF Committee provided a forum for system integrators and vendors to define the form factor of disk drives.

During their definition, other activities were suggested because participants in SFF faced more challenges than the form factors. 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.

In July 2016, the SFF Committee transitioned to SNIA (Storage Networking Industry Association), as a TA (Technology Affiliate) TWG (Technical Work Group).

Industry consensus is not a requirement to publish a 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 meets during the T10 (see www.t10.org) and T11 (see www.t11.org) weeks, and SSWGs (Specific Subject Working Groups) are held at the convenience of the participants. Material presented to SFF becomes public domain, and there are no restrictions on the open mailing of the presented material by Members.

Many of the specifications developed by SFF have either been incorporated into standards or adopted as standards by ANSI, EIA, JEDEC and SAE.

For those who wish to participate in the activities of the SFF TWG, the signup for membership can be found at:
http://www.snia.org/sff/join

The complete list of SFF Specifications which have been completed or are currently being worked on by the SFF Committee can be found at:
https://ta.snia.org/higherlogic/ws/public/download/1211/SFF-8000.xlsx/latest

If you wish to know more about the SFF TWG, the principles which guide the activities can be found at:
https://ta.snia.org/higherlogic/ws/public/download/144/8032_028.PDF

Suggestions for improvement of this specification will be welcome, they should be submitted to:
http://www.snia.org/feedback

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2. Scope

This specification defines the terminology and mechanical requirements for a high speed 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.

2.1 Application Specific Criteria

SAS, InfiniBand, IEEE, and Fibre Channel define respective electrical performance requirements for the transmission of multi-gigabit signals through this interface. When this connector is used for any of these applications, its performance shall meet the requirements of the appropriate standard. This connector shall intermate with previous generations of lower speed QSFP connectors.

2.2 Copyright

2.3 Disclaimer

The information contained in this publication is subject to change without notice. The SNIA makes no warranty of any kind with regard to this specification, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. The SNIA shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this specification.

Suggestions for revisions should be directed to http://www.snia.org/feedback/

3. References

3.1 Industry Documents

- 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
- EIA-364-1000 Environmental Test Methodology for Assessing the Performance of Electrical Connectors and Sockets Used in Controlled Environment Applications
- EIA-364-13 Mating and Unmating Forces Test Procedure for Electrical Connectors

3.2 Sources

There are several projects active within the SFF TWG. The complete list of specifications which have been completed or are still being worked on are listed in https://ta.snia.org/higherlogic/ws/public/download/1211/SFF-8000.xlsx/latest.

Copies of ANSI standards may be purchased from the InterNational Committee for Information Technology Standards (http://www.techstreet.com/incitsgate.tmpl).

3.3 Conventions

The dimensioning conventions are described in ANSI-Y14.5M, Geometric Dimensioning and Tolerancing. All dimensions are in millimeters, which are the controlling dimensional units (if inches are supplied, they are for guidance only).

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

3.4 Definitions

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

Alignment guides: Connector features that preposition insulators prior to electrical contact. Other terms sometimes used to describe these features are: guide pins, guide posts, blind mating features, mating features, alignment features, and mating guides

Frontshell: That metallic part of a connector body that directly contacts the backshell or other shielding material that provides mechanical and shielding continuity between the connector and the cable media. Other terms sometimes used to describe this part of a cable assembly are: housing, nosepiece, cowling, and metal shroud.

Module: In this specification, refers to direct attach copper (DAC), direct attach optics, and pluggable optics.

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 contact 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.

Through hole: A connector design and a printed circuit board design style where the connector termination points penetrates the printed circuit board and are subsequently soldered to the printed circuit board.

4. General Description

This specification defines the complete mechanical dimensions of the QSFP+ cage. This 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.

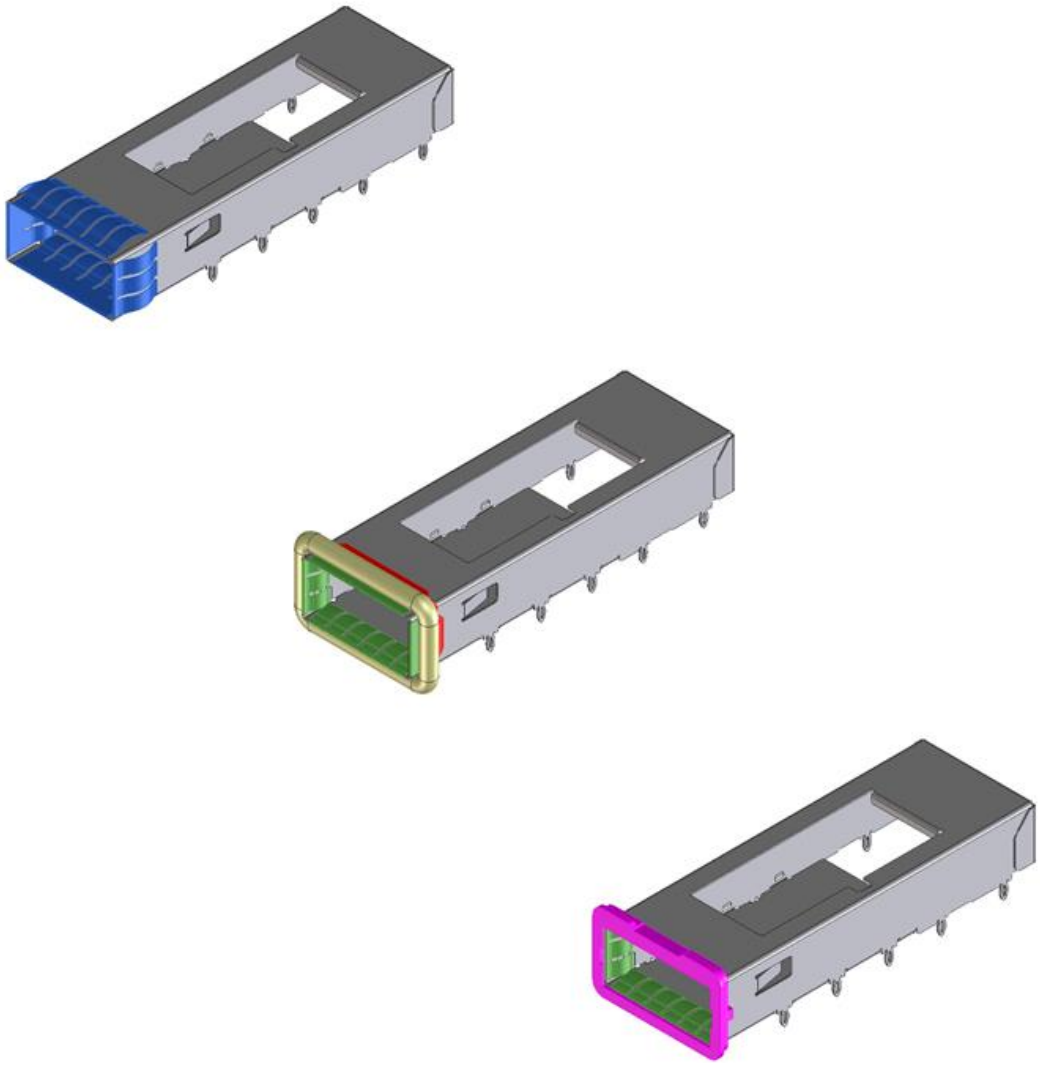


FIGURE 4-1 TYPICAL SPRING FINGER, ELASTOMERIC GASKET & BEHIND THE BEZEL CAGES

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

5. Datums

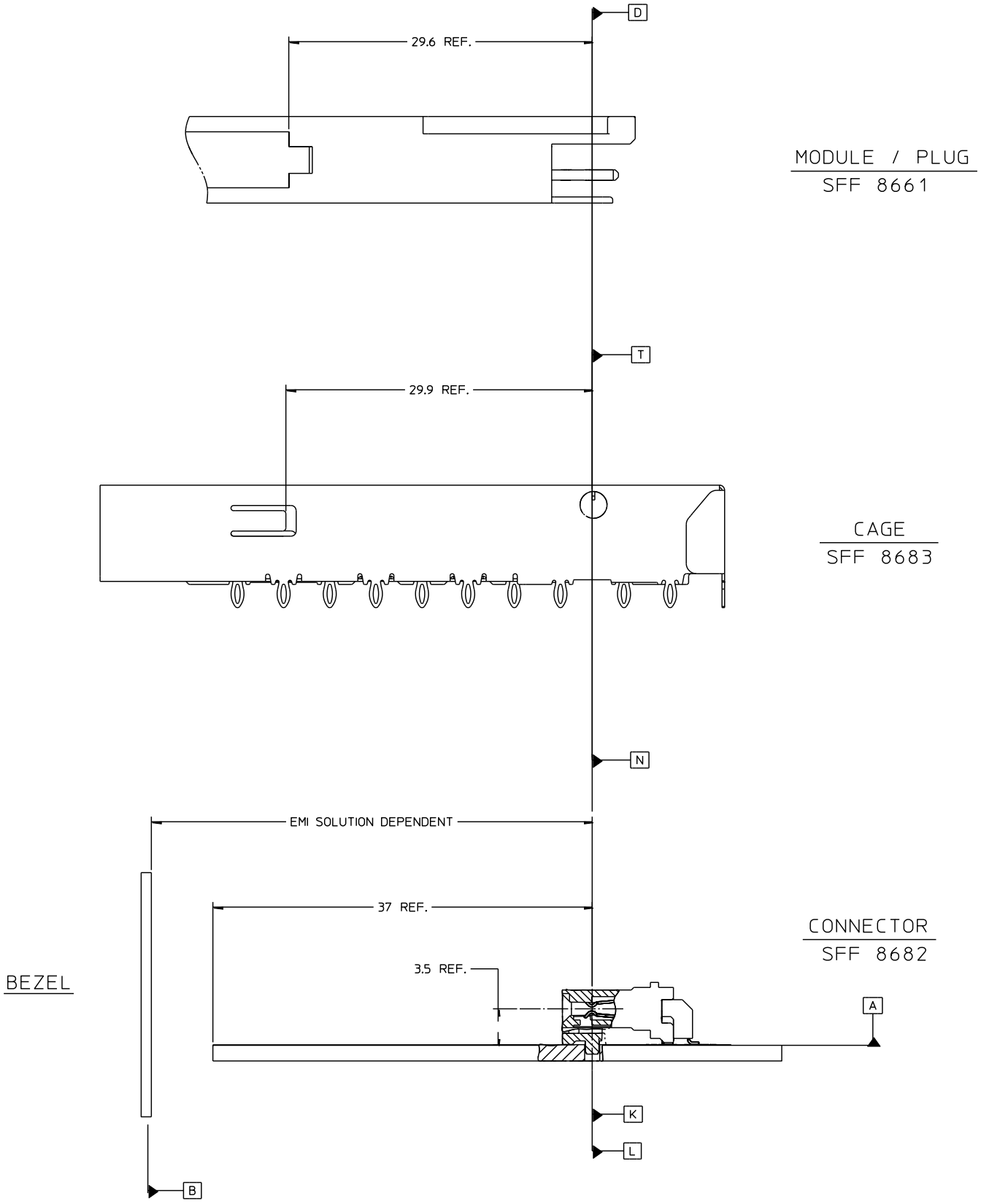


FIGURE 5-1 DATUM DEFINTIONS

TABLE 5-1 DATUM DESCRIPTIONS

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.	

6. Cage Dimensions

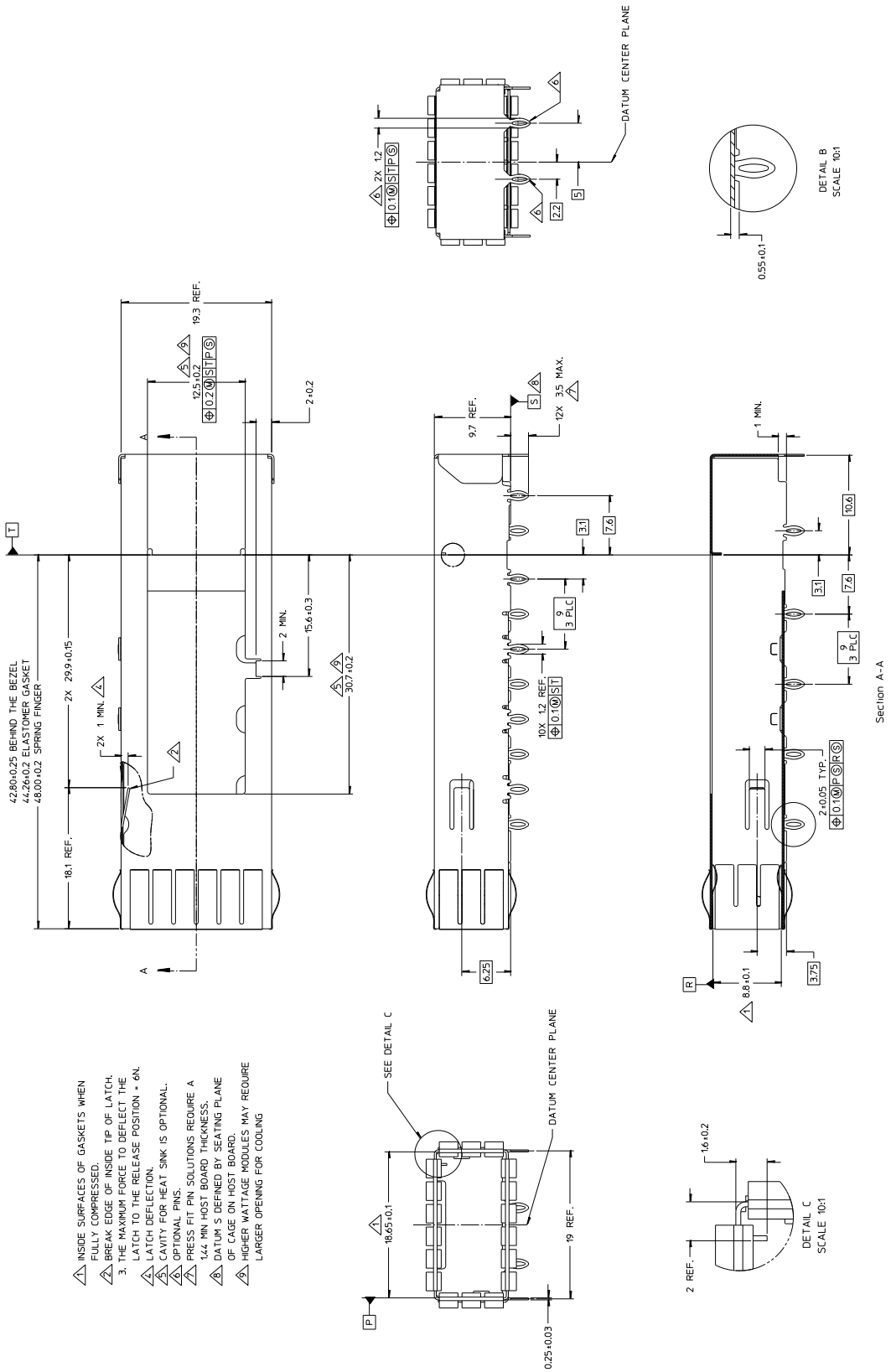


FIGURE 6-1 CAGE DIMENSIONS (1 OF 2)

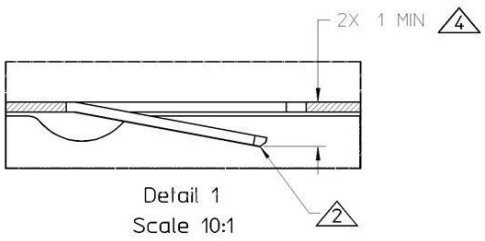


FIGURE 6-2 CAGE DIMENSIONS (2 OF 2)

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

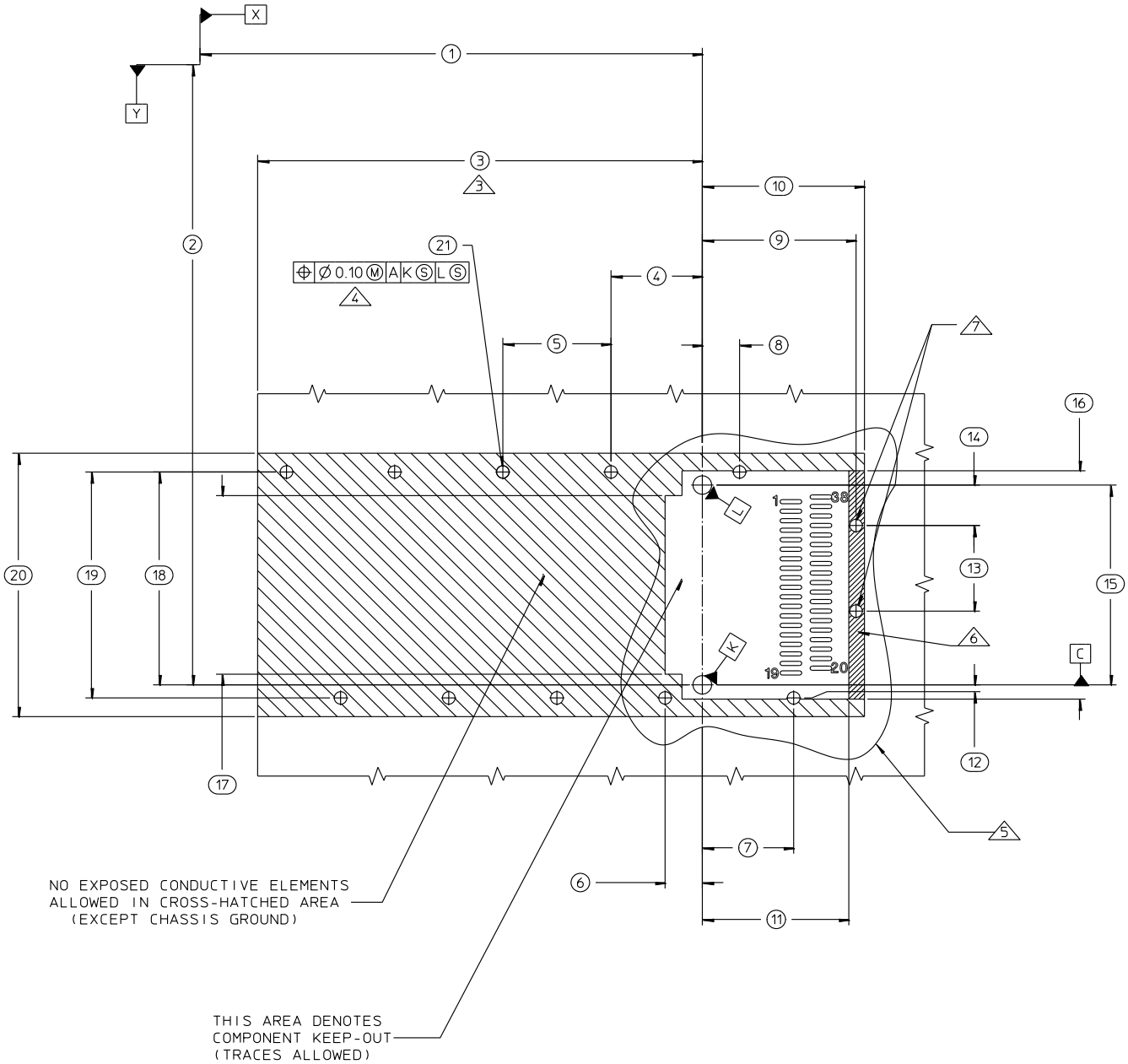


FIGURE 6-3 CAGE FOOTPRINT

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 6-1 CAGE FOOTPRINT DIMENSIONS

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

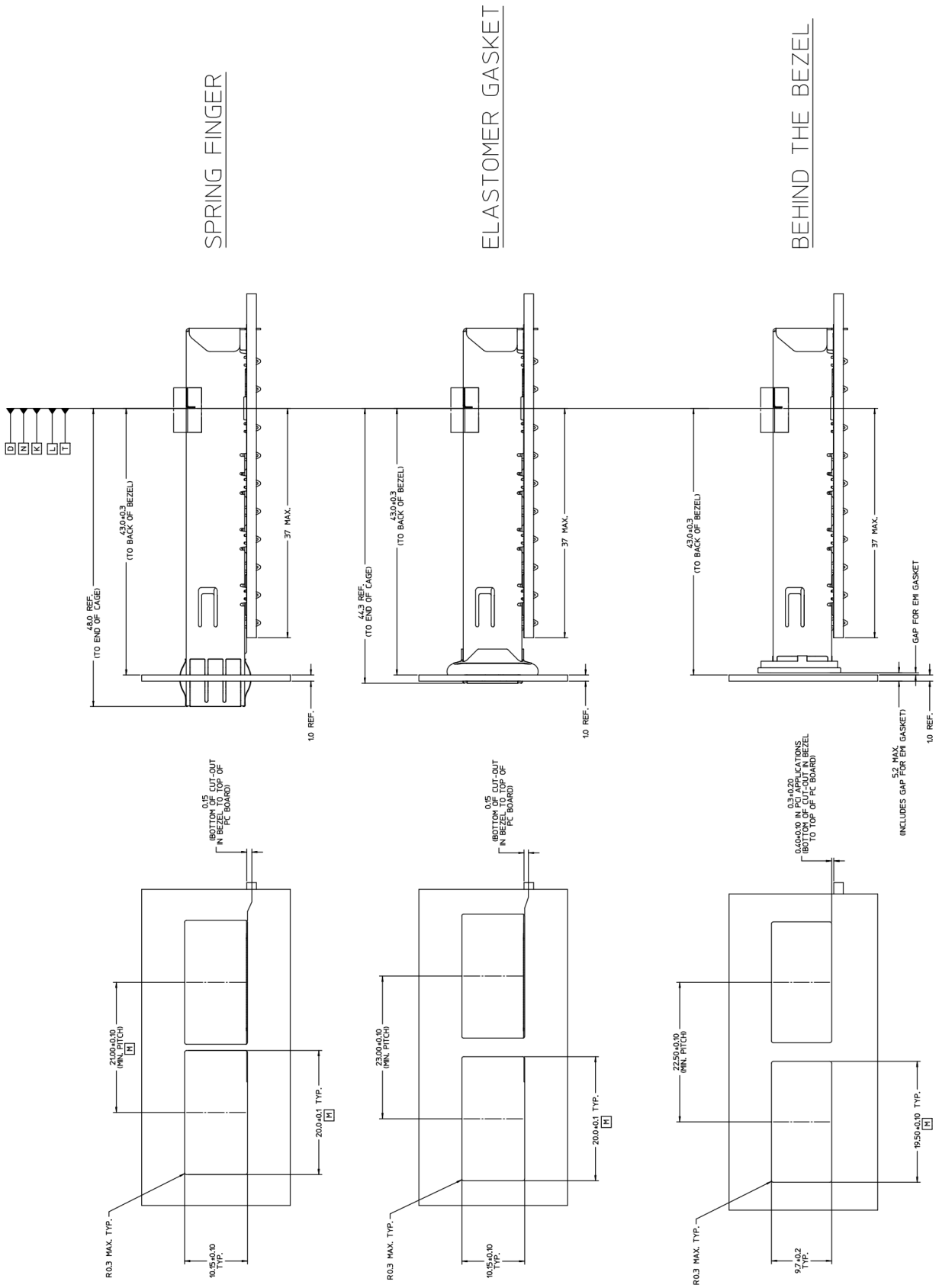
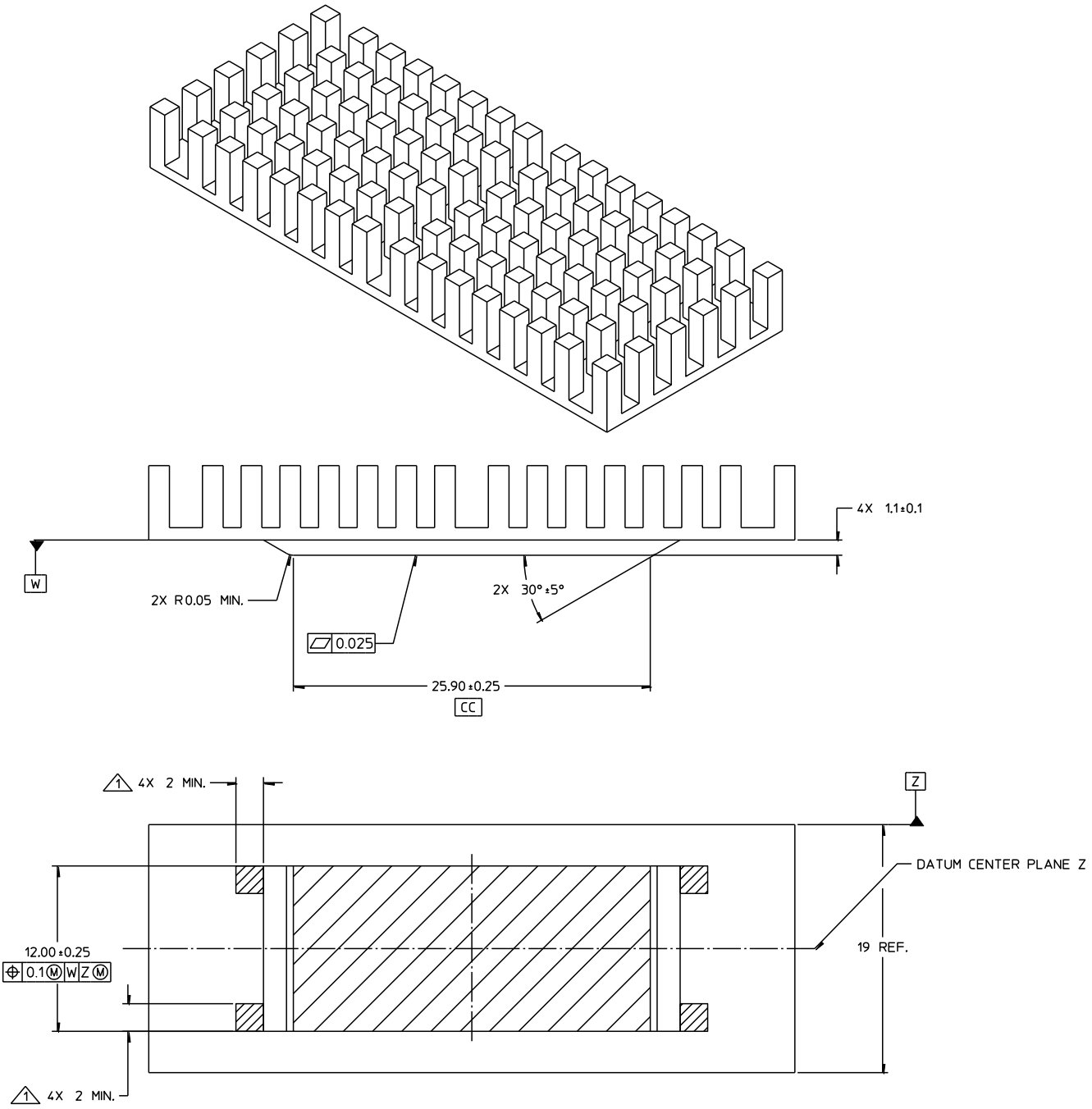


FIGURE 6-4 CAGE TO BEXEL DIMENSIONING AND BEZEL OPENINGS FOR SINGLE CAGES



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

FIGURE 6-5 TYPICAL HEAT SINK CONFIGURATIONS

7. Insertion, Extraction, and Retention Forces

TABLE 7-1 INSERTION, EXTRACTION, AND RETENTION FORCES

Parameter	Procedure	Requirement[1]
Insertion force	EIA 364-13 Test with connector, cage & module (latch disengaged, without heatsink)	60N MAX
Extraction force	EIA 364-13 Test with connector, cage & module (latch disengaged, without heatsink)	30N MAX
Latch strength	Pull to separate module from cage Test with connector, cage & module (latch engaged)	125N MIN
Cage retention in host board	Manufacturer specified test to vertically pull cage off board	114N MIN
Module durability	Test with connector, cage & module as part of TS-1000[2]	100 cycles MIN

NOTES:
1. In addition to the requirements listed, all parts must be free of visible damage after testing.
2. Modules may be replaced every 50 cycles.