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SFF-8631

Specification for

Serial Attachment X8/X16 Unshielded Device Connector

Rev 1.4 June 5, 2018

Secretariat: SFF TA TWG

Abstract: This specification defines the unshielded Input/Output connector with eight or sixteen ports, each of which is capable of operation up to 16.875 Ghz. The connector has a total of 92 positions (X8 ports) or 166 positions (X16 ports).

This connector is designed for use with serial interface unshielded devices and has been designed with versions to fit the 2.5 and/or 3.5 inch Drive Form Factor.

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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Intellectual Property

The user's attention is called to the possibility that implementation of this Specification may require the use of an invention covered by patent rights. By distribution of this specification, no position is taken with respect to the validity of a claim or claims or of any patent rights in connection therewith.
This specification is considered SNIA Architecture and is covered by the SNIA IP Policy and as a result goes through a request for disclosure when it is published. Additional information can be found at the following locations:

- Results of IP Disclosures: http://www.snia.org/sffdisclosures
- SNIA IP Policy: http://www.snia.org/ippolicy

Change History

Revision 1.0
-Major changes/differences due to connector repurposing.

Revision 1.1
-Removed signal names
-Page 1 Para 2 Added “with versions” and “and/or”
-Added SFF-8351 and SFF-8667 references
-Moved board layouts to Appendix B
-Changed 12GHz to 16.875GHz in the abstract, Section 1.1, and Section 3
-Made the callouts consistent e.g. Free (Plug) X8
-Changed “recommended” to ‘Example” when referencing board layouts.
-Removed the speed reference from title
-Changed plug contact leg design
-Added X8 and X16 inverted plug connector drawings and board layouts.
-Corrected table entries for Figures, Tables and Pages

Revision 1.2
-Changed Title removing ‘for PCIe Gen4/SAS-4 and Beyond”
-Removed ‘and Pinouts” from Appendix A Title
-Changed pin numbering in Table 6-2 Temperature Rise to reflect actual numbering and corrected the current to 7.5A (was 6A)
-Changed contact gap dimension (A22 and C25) to housing slot dimensions in Figs 5-1 and 5-3
-Changed A22 and C25 from 0.98 to 1.86 in Tables 5-1 and 5-3.
-Changed Mating/Unmating forces in Table 6-3 from 56N/10.5N to: X8 56N/7N and X16 100N/12.5N

Revision 1.3
-Transition to a Published Document as a result of the Approval Ballot that closed on 3/1/17.
-Changed Development to Published in Header
-Changed Revision from 1.2 to 1.3

Revision 1.4 (June 5, 2018)
-Updated to latest template
-Removed some unneeded definitions
-Removed reference to old ftp site.
-Added Copyright note to footer.
-Added note to plug Figures 5-2, 5-4, 5-5, and 5-6 making the mounting height dimensions informative.
-Flagged dimensions in Tables 5-2, 5-4, 5-5, and 5-6 as informative.
-Corrected Table title 6-6 to 5-6.
-Corrected various references to ANSI/ASME tolerancing specs making them all ASME Y14.5-2009

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, and 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).

The Members' support of a specification is identified on the second page of each specification. 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 is contained in the document SFF-8000 which can be found at:
http://www.snia.org/sff/specifications

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

CONTENTS

FIGURES

TABLES

1. Scope

This specification defines the mechanical and connector contact performance requirements for a composite connector system. This composite system is designed to support high speed serial signals and power on different contacts within the same housing.

1.1 Application Specific Criteria

This connector shall meet the electrical performance limits defined by HDSFF multi-source agreement committee and the Serial Attached SCSI-4 (SAS-4) at 16.875GHz.

1.2 Copyright

1.3 Disclaimer

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

2. References

2.1 Industry Documents

- ASME Y14.5-2009 Dimensioning and Tolerancing
- EIA-364-D Electrical Connector/Socket Test Procedures Including Environmental Classifications
- SAS-4 Serial Attached SCSI-4
- HDSFF TBD
- SFF-8351 3.5” Form Factor Drive with High Density Connector
- SFF-8667 High Density Connector Signals for Enclosure Applications

2.2 Sources

There are several projects active within the SFF TWG. The complete list of SFF Specifications which have been completed or are currently being worked on by the SFF Committee is contained in the document SFF-8000 which can be found at:http://www.snia.org/sff/specifications.

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

2.3 Conventions

The dimensioning conventions are described in ASME-Y14.5-2009, 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

2.4 Definitions

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

Contact mating sequence: Order of electrical contact during mating/unmating process. Other terms sometimes used to describe this feature are: contact sequencing, contact positioning, make first/break last, EMLB (early make late break) staggered contacts, and long pin / short pin.

Fixed: Used to describe the gender of the mating side of the connector that accepts its mate upon mating. This gender is frequently, but not always, associated with the common terminology.
Other terms commonly used are "female" and "socket connector". The term "fixed" is adopted from EIA standard terminology as the gender that most commonly exists on the fixed end of a connection, for example, on the board or bulkhead side. In this specification "fixed" is specifically used to describe the mating side gender illustrated in Figure 2-1.

Free: Used to describe the gender of the mating side of the connector that penetrates its mate upon mating. This gender is frequently, but not always, associated with the common terminology "plug". Other terms commonly used are "male" and "pin connector". The term "free" is adopted from EIA standard terminology as the gender that most commonly exists on the free end of a connection, for example, on the cable side. In this specification "free" is specifically used to describe the mating side gender illustrated in Figure 2-1.

Mating side: The side of the connector that joins and separates from the mating side of a connector of opposite gender. Other terms commonly used in the industry are mating interface, separable interface and mating face.

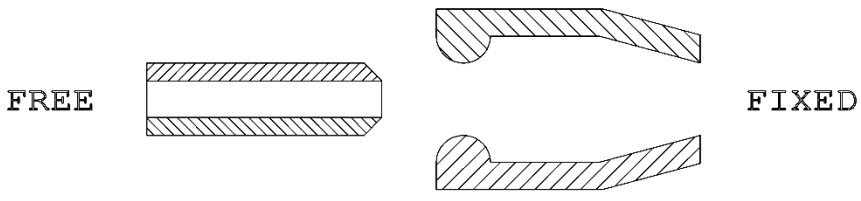


FIGURE 2-1 MATING SIDE GENDER DEFINITION

Offset: An alignment shift from the center line of the connector

Right Angle: A connector design for use with printed circuit board assembly technology where the mating direction is parallel to the plane of the printed circuit board

Single row: A connector design for use with surface mount printed circuit board assembly technology where the termination side points are arranged in one line

Straight: A connector design for use with printed circuit board assembly technology where the mating direction is perpendicular to the plane of the printed circuit board

Surface mount: A connector design and a printed circuit board design style where the connector termination points do not penetrate the printed circuit board and are subsequently soldered to the printed circuit board

Termination side: The side of the connector opposite the mating side that is used for permanently attaching conductors to the connector. Due to pin numbering differences between mating side genders the termination side shall always be specified in conjunction with a mating side of a specific gender. Other terms commonly used in the industry are: back end, non-mating side, footprint, pc board side, and post side

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.

Wipe (Contact Location): The contact location has two components: direction of mating and direction of contact pitch. In the direction of mating, the Free contact location shall be a minimum of 0.05 mm from either end of the Fixed contact mating interface after mating and latching.

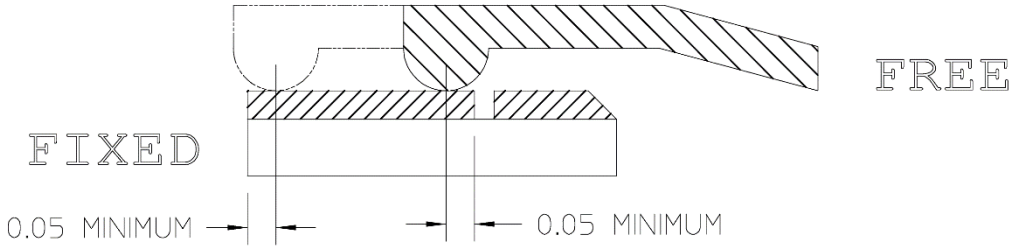


FIGURE 2-2 DIRECTION OF MATING

In the direction of contact pitch, the Free contact shall have no less than 50% of the available mating width in contact with the Fixed contact and there is be a minimum clearance to the adjacent Fixed contact. The minimum clearance to the adjacent Fixed contact shall be 0.075 mm for interfaces with a pitch of at least 0.70 mm. For pitches less than 0.70 mm, the minimum clearance should be reviewed on a case by case basis to insure that a shorting condition does not exist.

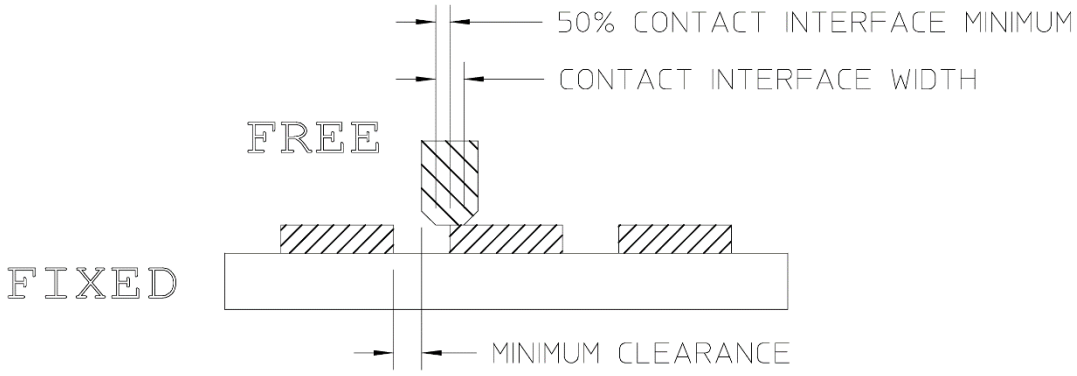


FIGURE 2-3 DIRECTION OF CONTACT

Wipe (Minimum Effective Contact): The distance that the Free contact moves along the Fixed contact without losing electrical connection.

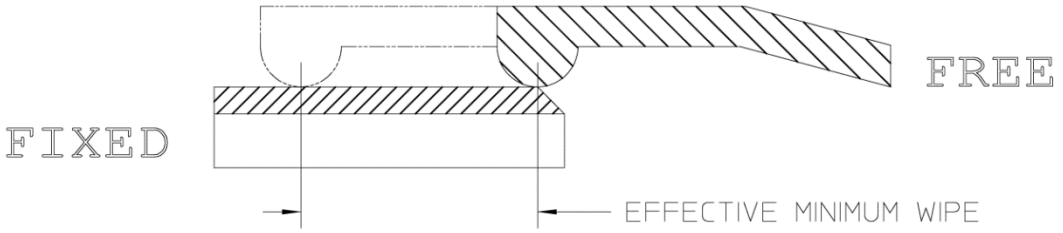


FIGURE 2-4 CONTINUOUS CONTACT

A split or interrupted contact surface (i.e. a contact interface with a pre-pad) is allowable so long as the gap does not allow for the Free contact to make contact with a non-conductive surface.

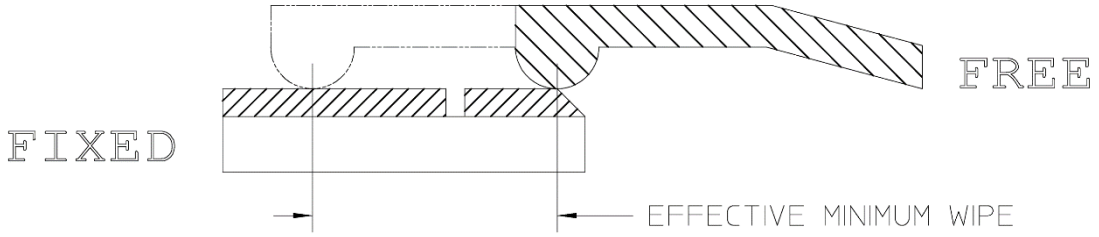


FIGURE 2-5 SPLIT CONTACT

The minimum effective wipe is dependent on the finish of the contact interface. Tin-Tin interfaces shall have a minimum effective wipe of 2.00 mm. Gold-Gold interfaces shall have a minimum effective wipe of 0.40 mm.

Note: Subscripts and superscripts are shown in such a small font by some word processors that they are virtually unreadable in PDFs. Symbols are not always represented correctly in PDFs. The SFF Committee avoids legibility issues by using abbreviations instead of symbols and not using subscript/superscript representation e.g. the caret is used for exponentiation, as in b^n for b raised to the nth power.

3. General Description

This specification defines the plug, alignment features, mating interface, footprint, and receptacle requirements for a 16.875 GHz 8/16 Port Unshielded Connector System.

This connector system is designed to suit the 2.5 and 3.5 inch drive form factors, amongst others. It has two separate interfaces each comprised of multiple sets (a set being Tx and Rx pairs surrounded by their grounds in a GSSGGSSG configuration) of differential pair signals. The two interfaces are uniquely polarized to prevent cross mating and/or reverse mating, thus avoiding shorts or improper mating.

This specification defines the contact range that the retention scheme has to provide to assure acceptable connector performance.

The use of this connector has no effect on the wiring rules, firmware, or system configuration rules for interfaces such as Fibre Channel, Gigabit Ethernet, Serial Attach SCSI and other high speed interconnects.

Figure 3-1 represents a typical mating configuration of this connector.

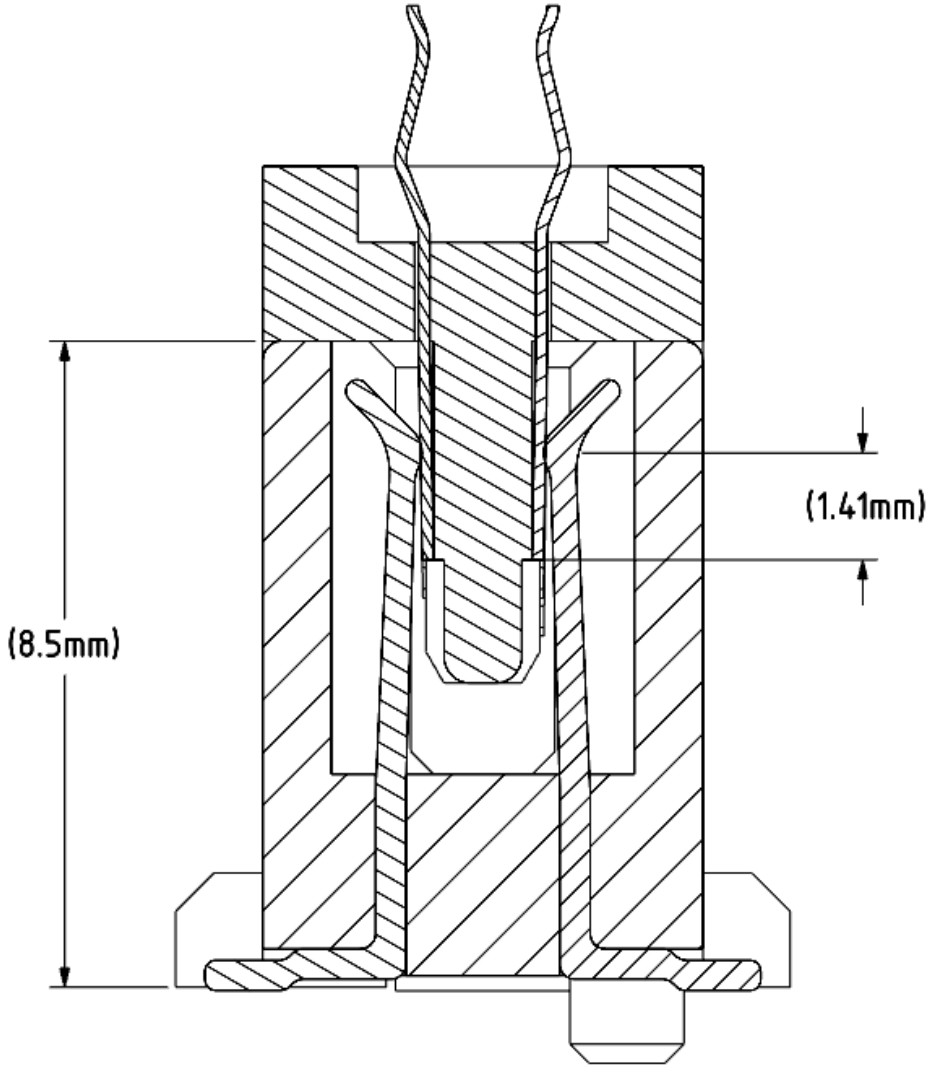


FIGURE 3-1 MATED CONNECTOR DIMENSION AND NOMINAL WIPE

4. Dimensional Requirements

4.1 Connector Interface

All dimensional requirements for the connector within this specification must be met in order to provide intermateability between plug and receptacle and to fit within the physical boundaries required by the media and backplane.

4.2 Printed Circuit Board Layouts

Included PCB layouts are examples to provide a common connector mounting interface to the host board to enable multi-sourcing of the connector while ensuring electrical performance.

This specification is not intended to address the electrical performance characteristics of the host Printed Circuit Board (PCB) material and construction used in these applications. The PCB thickness, number of layers, layer stack up, trace layer location(s), copper plane anti-pads, etc., are all major contributors to the final electrical characteristics of each unique application of the connector.

4.3 General Tolerances

Unless otherwise shown, the following tolerances shall apply to the figures:

2-Place dimension = +/- 0.20mm
Angular dimension = +/- 3 degrees

5. Dimensions

The dimensioning conventions are described in ASME-Y14.5-2009, Dimensioning and Tolerancing. All dimensions are in millimeters.

5.1 Fixed (Receptacle) X8 Connector

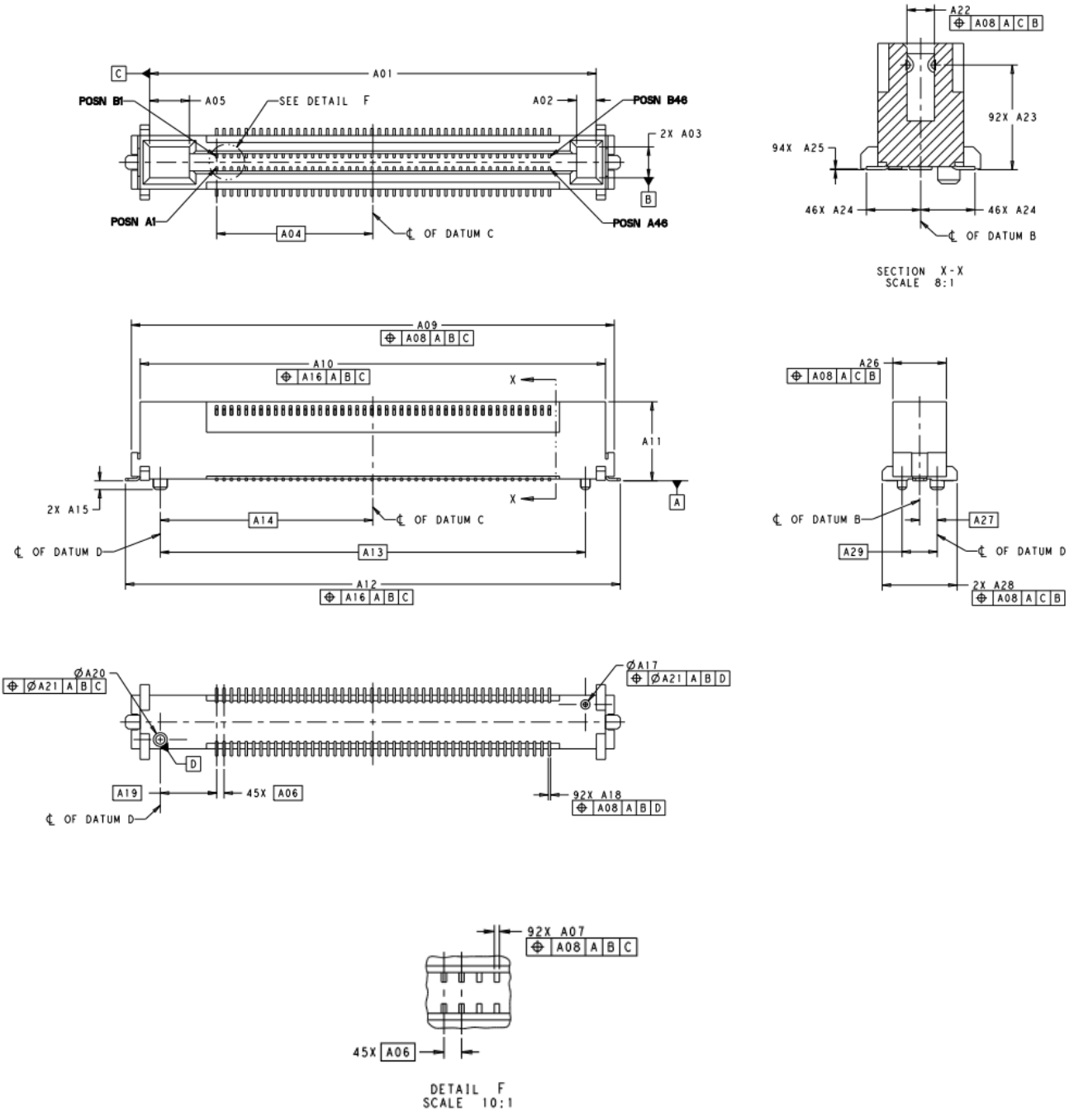


FIGURE 5-1 FIXED (RECEPTACLE) X8 CONNECTOR

TABLE 5-1 DIMENSIONS FOR X8 RECEPTACLE

Reference	Dimension (mm)	+/- TOL
A01	48.3	0.05
A02	2.1	0.1
A03	3.35	0.05
A04	16.9	BSC
A05	4.3	0.1
A06	0.8	BSC
A07	0.23	0.03
A08	0.1	N/A
A09	52.25	0.1
A10	50.35	0.05
A11	8.55	0.04
A12	53.55	0.1
A13	46	BSC
A14	23	BSC
A15	0.95	0.1
A16	0.2	N/A
A17	1	0.05
A18	0.25	0.03
A19	6.1	BSC
A20	1.5	0.05
A21	0.05	N/A
A22	1.86	0.13
A23	7.08	0.13
A24	3.61	0.1
A25	0.05	0.05
A26	5.8	0.1
A27	1.9	BSC
A28	8.1	0.1
A29	3.8	BSC
A30	0.35	0.03
A31	2.4	0.05
A32	2.28	0.03
A33	2	0.05
A34	1.1	0.05
A35	1.8	0.023
A36	3	BSC
A37	1.9	BSC
A38	5.04	BSC
A39	1.24	BSC
A40	1.6	0.05

5.2 Free (Plug) X8 Connector

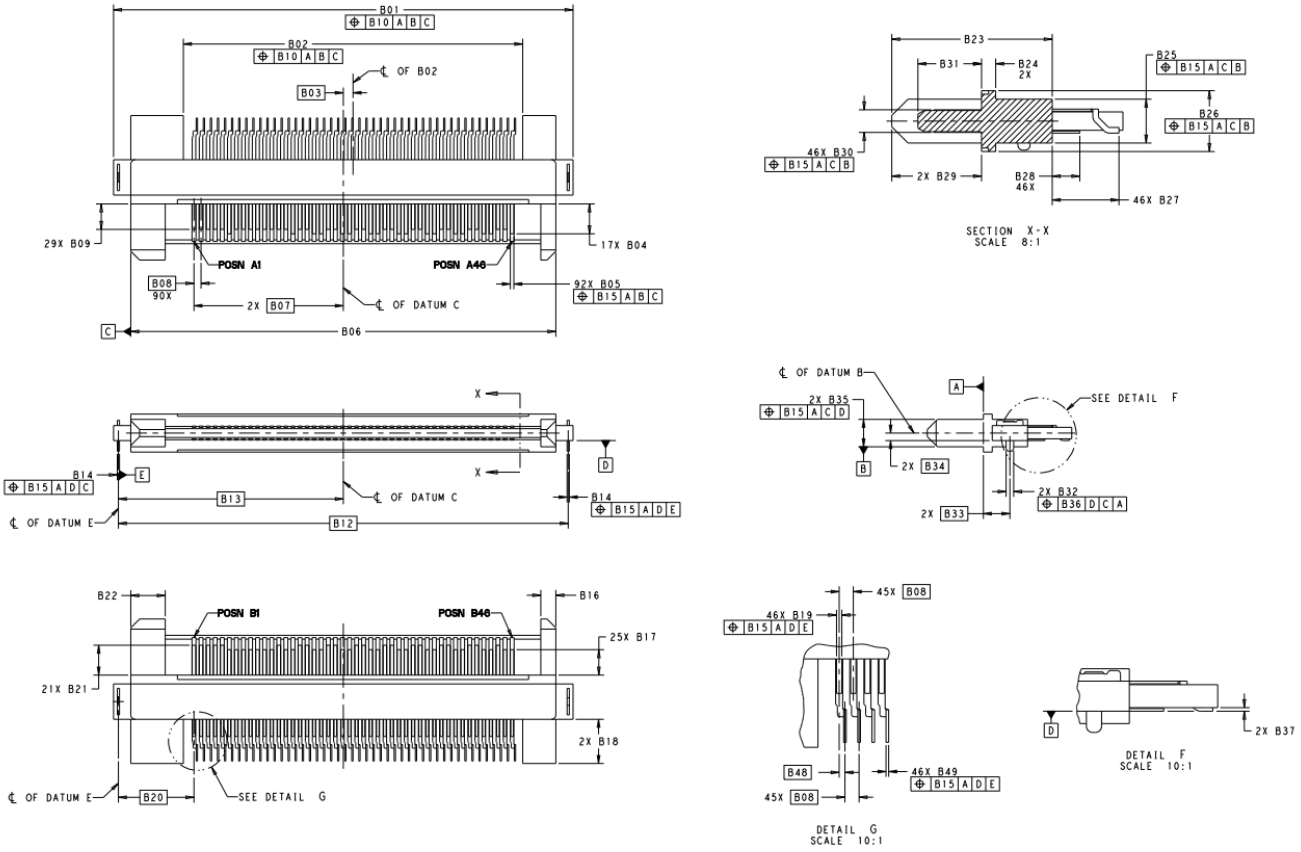


FIGURE 5-2 FREE (PLUG) X8 CONNECTOR

NOTE: Dimensions that define the mounting elevation and solder tail location are informative.

TABLE 5-2 DIMENSIONS FOR X8 PLUG

Reference	Dimension (mm)	+/- TOL
B01	52	0.1
B02	38.4	0.1
B03	1.1	BSC
B04	3.38	0.2
B05	0.4	0.3
B06	48.1	0.05
B07	16.9	BSC
B08	0.8	BSC
B09	2.88	0.2
B10	0.2	N/A
B11	UNUSED	UNUSED
B12	50.9	BSC
B13	25.45	BSC
B14	0.25	0.01
B15	0.1	N/A
B16	1.7	0.1
B17	2.88	0.2
B18	5	0.1
B19	0.3	0.03
B20	8.55	BSC
B21	338	0.2
B22	3.9	0.1
B23	11.35	0.1
B24	1	0.1
B25	3.1	0.1
B26	4.3	0.1
B27	4.75	0.1
B28	1.95	0.1
B29	6.35	0.1
B30	1.6	0.05
B31	4.5	0.1
B32	0.86	0.03
B33	3	BSC
B34*	0.8	BSC
B35	3.1	0.05
B36	0.05	N/A
B37*	0.2	0.05
B38	0.4	0.03
B39	2.28	0.03
B40	1.8	0.03
B41	2.2	0.1
B42	1.05	0.05
B43	48.5	0.1
B44	2.1	BSC
B45	6.29	BSC
B46	3.25	BSC
B47	R0.5	0.1
B48	0.325	BSC
B49	0.15	0.01

*Informative Dimension

5.3 Fixed (Receptacle) X16 Connector

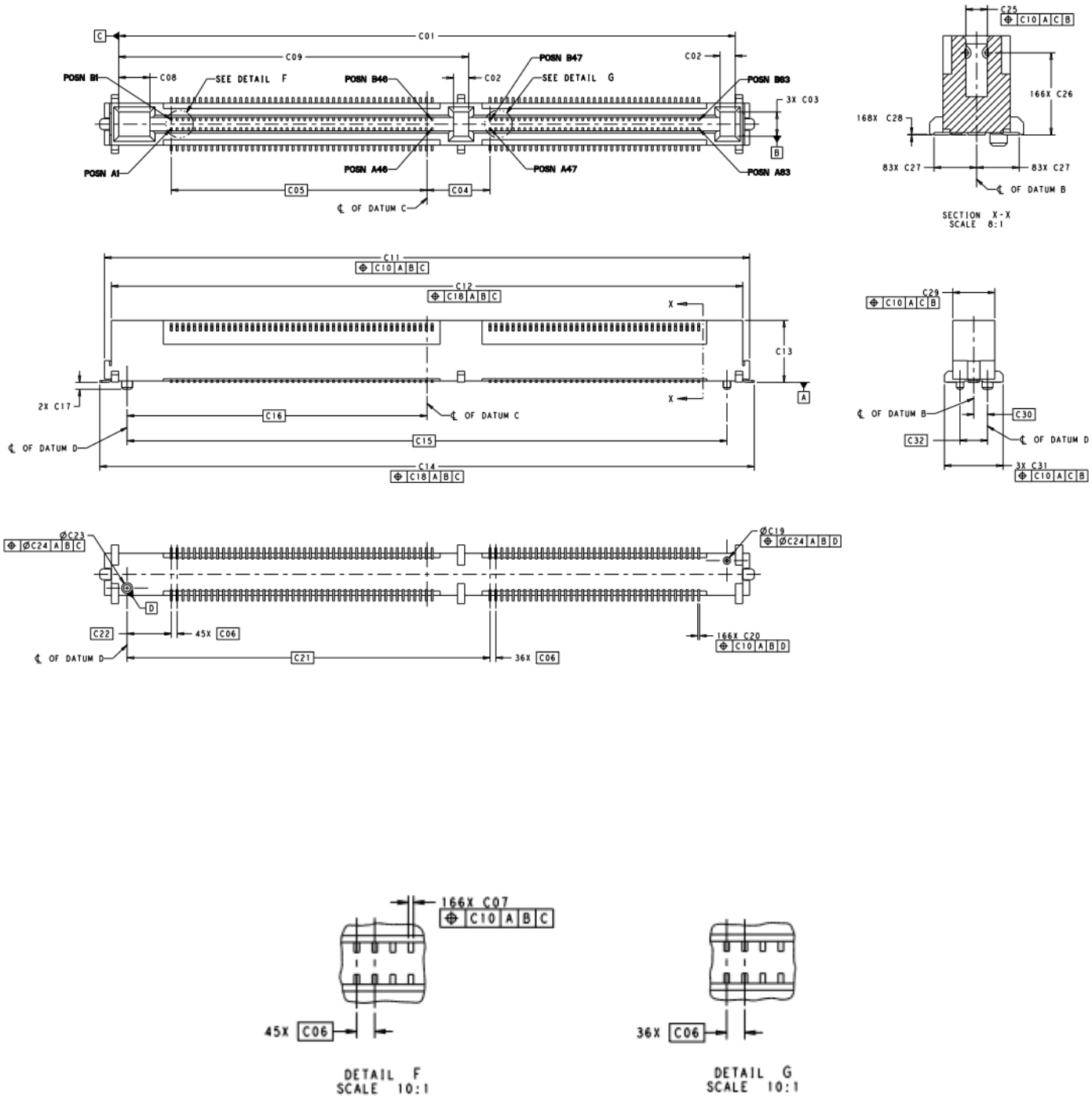


FIGURE 5-3 FIXED (RECEPTACLE) X16 CONNECTOR

TABLE 5-3 DIMENSIONS FOR X16 RECEPTACLE

Reference	Dimension (mm)	+/- TOL
C01	85.1	0.05
C02	2.1	0.1
C03	3.35	0.05
C04	8.7	BSC
C05	35.3	BSC
C06	0.8	BSC
C07	0.23	0.03
C08	4.3	0.1
C09	48.3	0.05
C10	0.1	N/A
C11	89.05	0.1
C12	87.15	0.05
C13	8.55	0.04
C14	90.35	0.1
C15	82.8	BSC
C16	41.4	BSC
C17	0.95	0.1
C18	0.2	N/A
C19	1	0.05
C20	0.25	0.03
C21	50.1	BSC
C22	6.1	BSC
C23	1.5	0.05
C24	0.05	N/A
C25	1.86	0.13
C26	7.08	0.03
C27	3.67	0.1
C28	0.05	0.05
C29	5.8	0.1
C30	1.9	BSC
C31	8.1	0.1
C32	3.8	BSC
C33	0.35	0.03
C34	2.4	0.05
C35	2.28	0.03
C36	2	0.05
C37	1.1	0.05
C38	1.8	0.03
C39	3	BSC
C40	1.9	BSC
C41	5.04	BSC
C42	1.24	BSC
C43	1.6	0.05

5.4 Free (Plug) X16 Connector

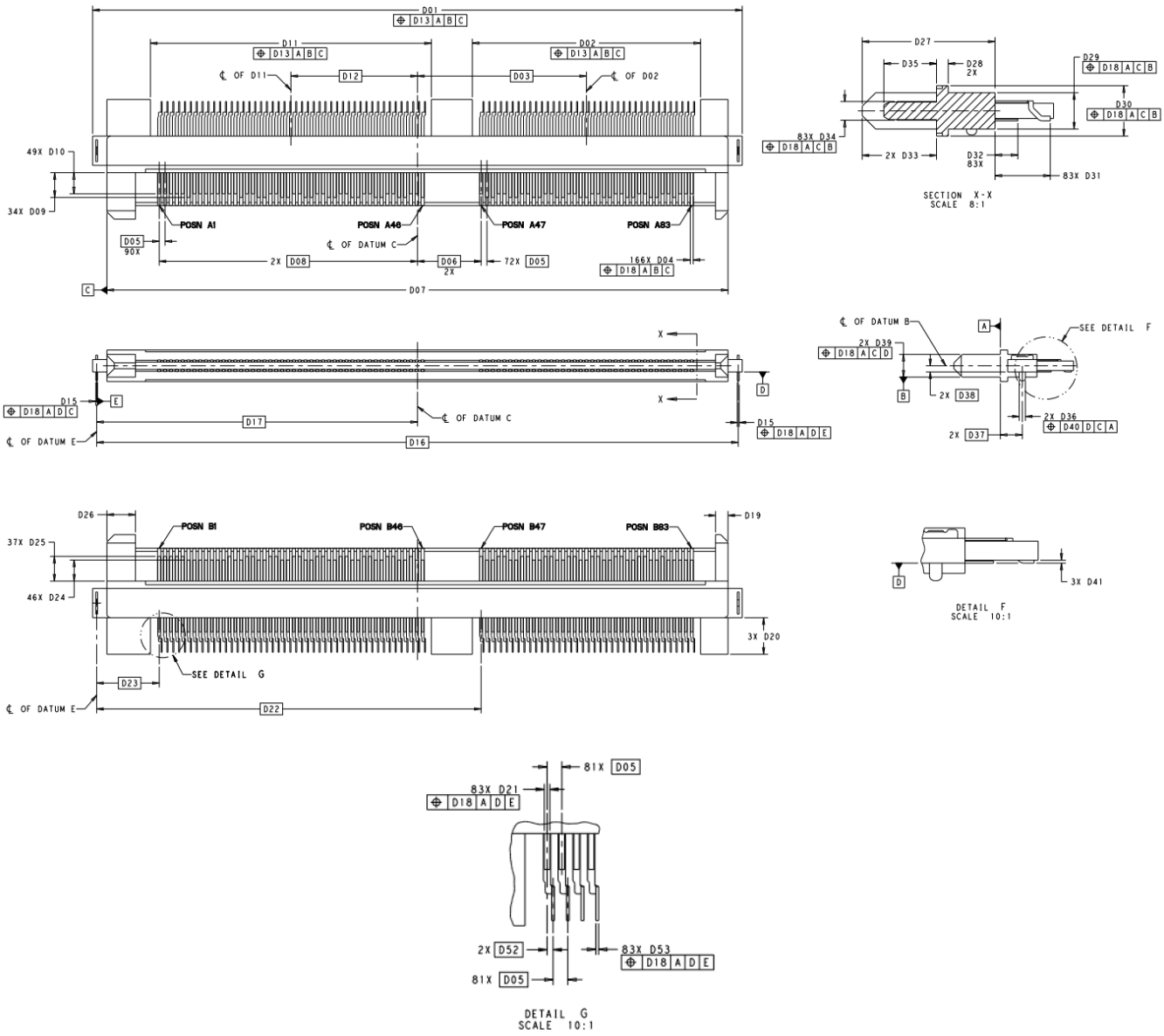


FIGURE 5-4 FREE (PLUG) X16 CONNECTOR

NOTE: Dimensions that define the mounting elevation and solder tail location are informative.

TABLE 5-4 DIMENSIONS FOR X16 PLUG

Reference	Dimension (mm)	+/- TOL
D01	88.8	0.1
D02	31.2	0.1
D03	23.1	BSC
D04	0.4	0.03
D05	0.8	BSC
D06	8.7	BSC
D07	84.9	0.05
D08	35.3	BSC
D09	3.38	0.2
D10	2.88	0.2
D11	38.4	0.1
D12	17.3	BSC
D13	0.2	N/A
D14	UNUSED	UNUSED
D15	0.25	0.01
D16	87.7	BSC
D17	43.85	BSC
D18	0.1	N/A
D19	1.7	0.1
D20	5	0.1
D21	0.3	0.03
D22	52.55	BSC
D23	8.55	BSC
D24	2.88	0.2
D25	3.38	0.2
D26	3.9	0.1
D27	11.35	0.1
D28	1	0.1
D29	3.1	0.1
D30	4.3	0.1
D31	4.75	0.1
D32	1.95	0.1
D33	6.35	0.1
D34	1.6	0.05
D35	4.5	0.1
D36	0.86	0.03
D37	3	BSC
D38*	0.8	BSC
D39	31	0.05
D40	0.05	N/A
D41*	0.2	0.05
D42	0.4	0.03
D43	2.28	0.03
D44	1.8	0.03
D45	2.2	0.1
D46	1.05	0.05
D47	85.3	0.1
D48	2.1	BSC
D49	6.29	BSC
D50	3.25	BSC
D51	R0.5	0.1
D52	0.325	BSC
D53	0.15	0.01

*Informative Dimension

5.5 Free (Plug) X8 Connector – Inverted

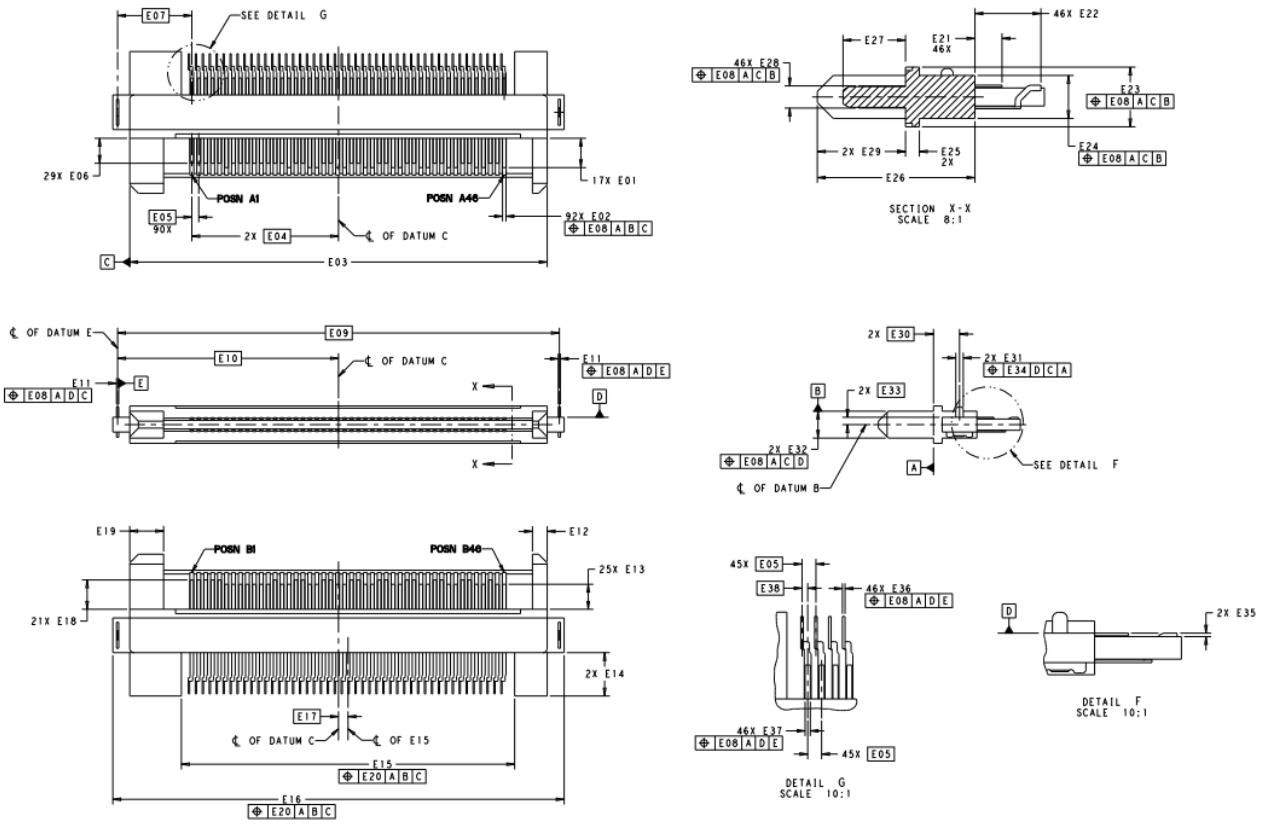


FIGURE 5-5 FREE (PLUG) X8 CONNECTOR – INVERTED

NOTE: Dimensions that define the mounting elevation and solder tail location are informative.

TABLE 5-5 DIMENSIONS FOR X8 PLUG - INVERTED

Reference	Dimension	+/- Tol
E01	3.38	0.2
E02	0.4	0.03
E03	48.1	0.05
E04	16.9	BSC
E05	0.8	BSC
E06	2.88	0.2
E07	8.55	BSC
E08	0.1	N/A
E09	50.9	BSC
E10	24.45	BSC
E11	0.25	0.01
E12	1.7	0.1
E13	2.88	0.2
E14	5	0.1
E15	38.4	0.1
E16	52	0.1
E17	1.1	BSC
E18	3.38	0.2
E19	3.9	0.1
E20	0.2	N/A
E21	1.95	0.1
E22	4.75	0.1
E23	4.3	0.1
E24	3.1	0.1
E25	1	0.1
E26	11.35	0.1
E27	4.5	0.1
E28	1.6	0.05
E29	6.35	0.1
E30	3	BSC
E31	0.86	0.03
E32	3.1	0.05
E33*	0.85	BSC
E34	0.05	N/A
E35*	0.2	0.05
E36	0.15	0.01
E37	0.3	0.03
E38	0.325	BSC
E39	1.8	0.03
E40	1.05	0.05
E41	2.2	0.1
E42	2.28	0.03
E43	0.4	0.03
E44	48.5	0.1
E45	R 0.5	0.1
E46	3.25	BSC
E47	6.29	BSC
E48	2.1	BSC

*Informative Dimension

5.6 Free (Plug) X16 Connector – Inverted

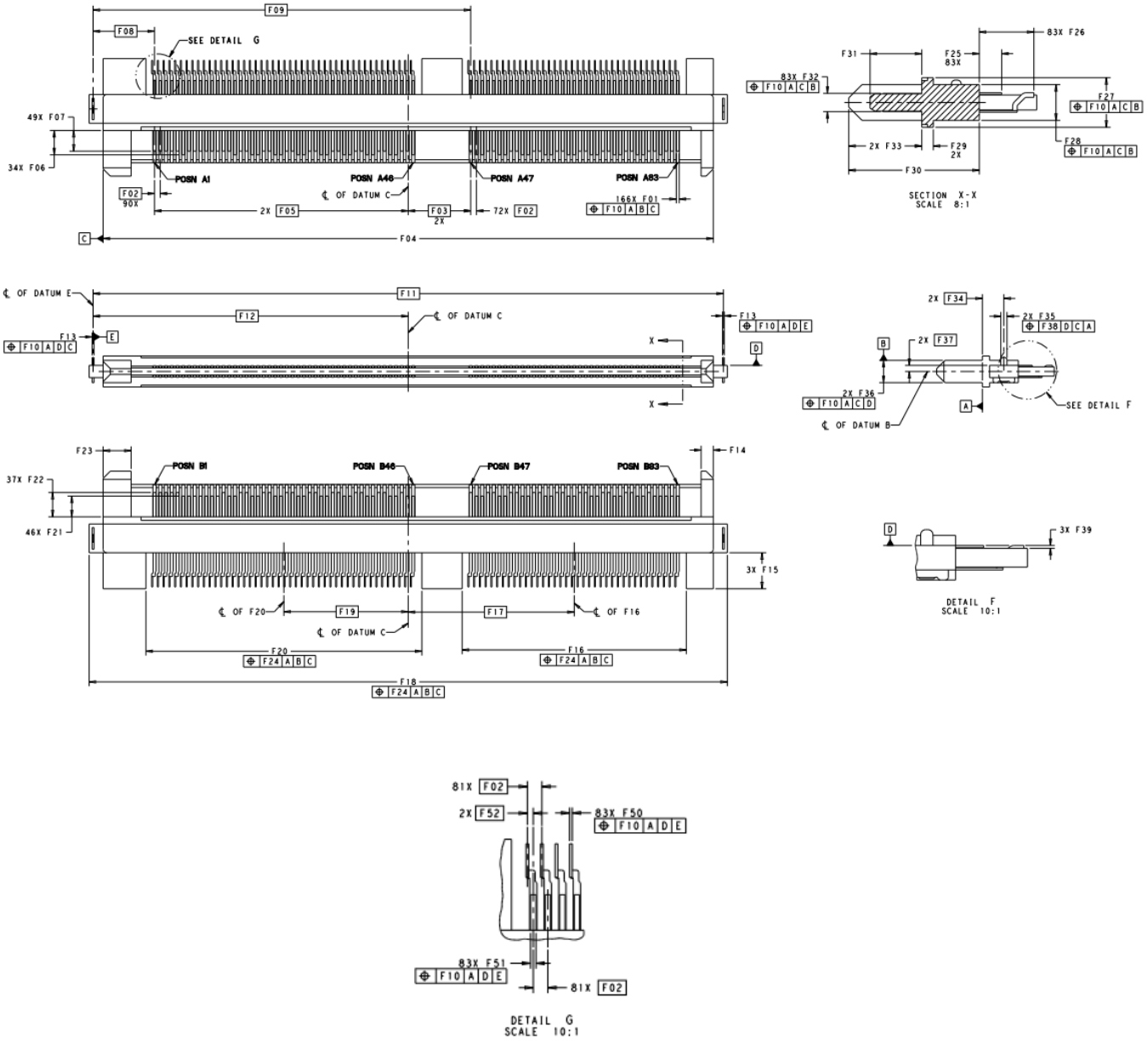


FIGURE 5-6 FREE (PLUG) X16 CONNECTOR - INVERTED

NOTE: Dimensions that define the mounting elevation and solder tail location are informative.

TABLE 5-6 DIMENSIONS FOR X16 PLUG - INVERTED

Reference	Dimension	+/- Tol
F01	0.4	0.03
F02	0.8	BSC
F03	8.7	BSC
F04	84.9	0.05
F05	35.3	BSC
F06	3.38	0.2
F07	2.88	0.2
F08	8.55	BSC
F09	52.55	BSC
F10	0.1	N/A
F11	87.7	BSC
F12	43.85	BSC
F13	0.25	0.01
F14	1.7	0.1
F15	5	0.1
F16	31.2	0.1
F17	23.1	BSC
F18	88.8	0.1
F19	17.3	BSC
F20	38.4	0.1
F21	2.88	0.2
F22	3.38	0.2
F23	3.9	0.1
F24	0.2	N/A
F25	1.95	0.1
F26	4.75	0.1
F27	4.3	0.1
F28	3.1	0.1
F29	1	0.1
F30	11.35	0.1
F31	4.5	0.1
F32	1.6	0.05
F33	6.35	0.1
F34	3	BSC
F35	0.86	0.03
F36	3.1	0.05
F37*	0.85	BSC
F38	0.05	N/A
F39*	0.2	0.05
F40	1.8	0.03
F41	1.05	0.05
F42	2.2	0.1
F43	2.28	0.03
F44	0.4	0.03
F45	85.3	0.10.1
F46	R 0.5	BSC0.1
F47	3.25	BSC
F48	6.29	BSC
F49	2.1	BSC
F50	0.15	0.01
F51	0.3	0.03
F52	0.325	BSC

*Informative Dimension

6. Performance Requirements

The general Electrical, Mechanical, and Environmental requirements for mating connectors are listed in the table. See section 1.2 for the Electrical Performance requirements for this connector solution.

TABLE 6-1 RATINGS

Current (per pin)	Continuous	1.5A
	Peak	2.5A for 1.5 seconds
	Peak Pre-Charge	6.0A for 1 millisecond
Temperature	Operating	minus 55C to plus 85C degrees

TABLE 6-2 ELECTRICAL REQUIREMENTS

Description	Requirement	Procedure
Low Level Contact Resistance	30 milliohms maximum for signal contacts (initial)	EIA-364-23: Mate connectors and apply a maximum voltage of 20 mV and a current of 100 mA
Insulation Resistance	1000 Mega ohms minimum	EIA 364-21: Apply a voltage of 500 VDC for 1 minute between adjacent terminals
Dielectric Withstanding Voltage	No breakdown or flashover	EIA 364-20, method B: Apply a voltage of 500 VAC for 1 minute between adjacent terminals
Temperature Rise (via current cycling)	Temperature rise shall not exceed 30C degrees	EIA 364-70B Wire contact pins B1 through B5 in parallel for power Wire contact pins A1 through A5 in parallel for return Supply 7.5 Amp total DC current to the power pins in parallel, returning from the parallel ground pins Measure and record the temperature after 96 hours (45 minutes ON and 15 minutes OFF per hour) in ambient condition of 25C still air

TABLE 6-3 MECHANICAL REQUIREMENTS

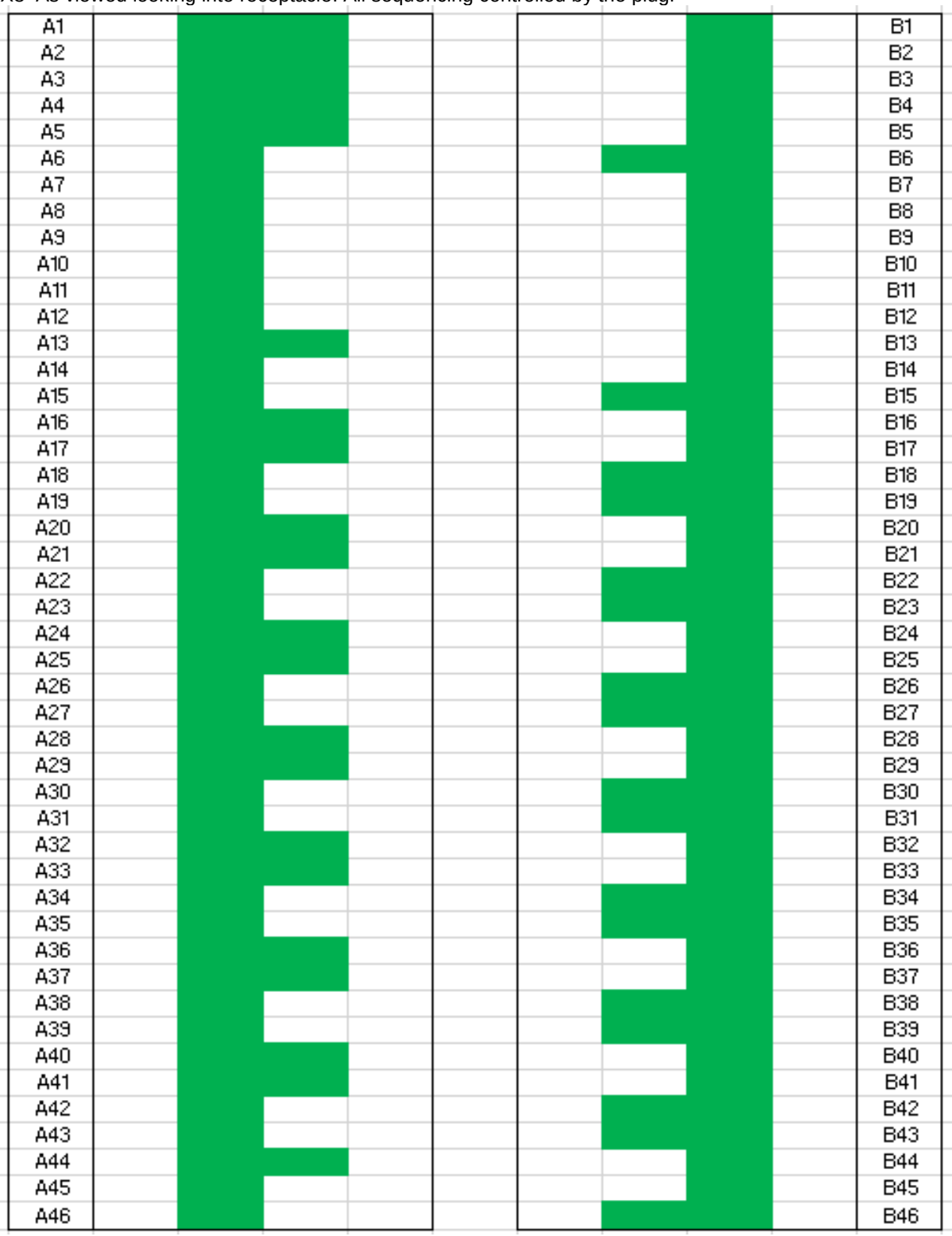
Description	Requirement	Procedure
Mechanical Shock	Discontinuity <1 microsecond 15 milliohm maximum change from initial Contact Resistance	EIA-364-27 Subject mated connectors to 50G's half-sine shock pulses of 11 milliseconds duration in each X,Y and Z axis (18 shocks total)
Random Vibration	Discontinuity <1 microsecond 15 milliohm maximum change from initial Contact Resistance	EIA-364-28, Test Condition VII Subject mated connectors to 3.10G's RMS between 20-500 Hz for 15 minutes in each of 3 mutually perpendicular planes
Durability	No damage 15 milliohm maximum change from initial Contact Resistance	EIA 364-09: Mate and unmate connectors at a maximum rate of 200 cycles per hour Backplane - 250 Cycles
Connector Mate and Unmate Forces	Backplane Mate X8 - 56.0N max Mate X16 – 100N max Unmate X8 – 7.0N min Unmate X16 – 12.5 min Initial and after durability	EIA 364-13: Mate and unmate connectors at a rate of 25mm per minute

TABLE 6-4 ENVIRONMENTAL REQUIREMENTS

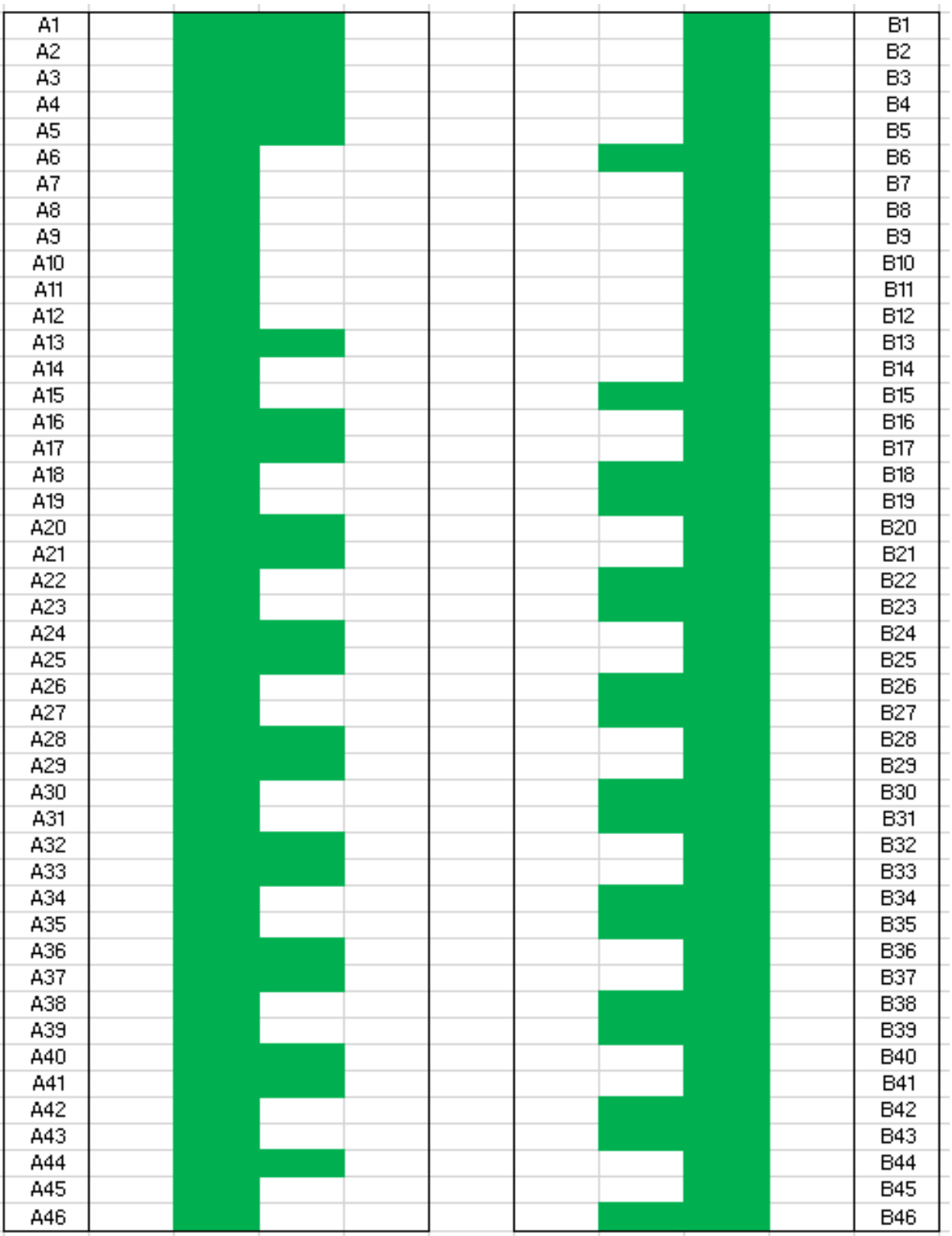
Description	Requirement	Procedure
Thermal Shock	No damage 15 milliohm maximum change from initial Contact Resistance	EIA 364-32, Test Condition I: Subject mated connectors to 10 cycles between minus 55C and plus 85C degrees
Temperature Life	No damage 15 milliohm maximum change from initial Contact Resistance	EIA 364-17, Test Condition III, Method A, Test Time Condition C: Subject mated connectors to 85C for 500 hours
Mixed Flowing Gas	No damage 15 milliohm maximum change from initial Contact Resistance	EIA 364-65, Class IIA: (4 Gas) Expose half of samples unmated for 7 days and then mated for 7 days. The other half are exposed mated for full 14 day test period.
Humidity	No damage 15 milliohm maximum change from initial Contact Resistance	EIA 364-31, Method II, Test Condition A: Subject mated connectors to 96 hours at 40C degrees with 90-95% relative humidity per

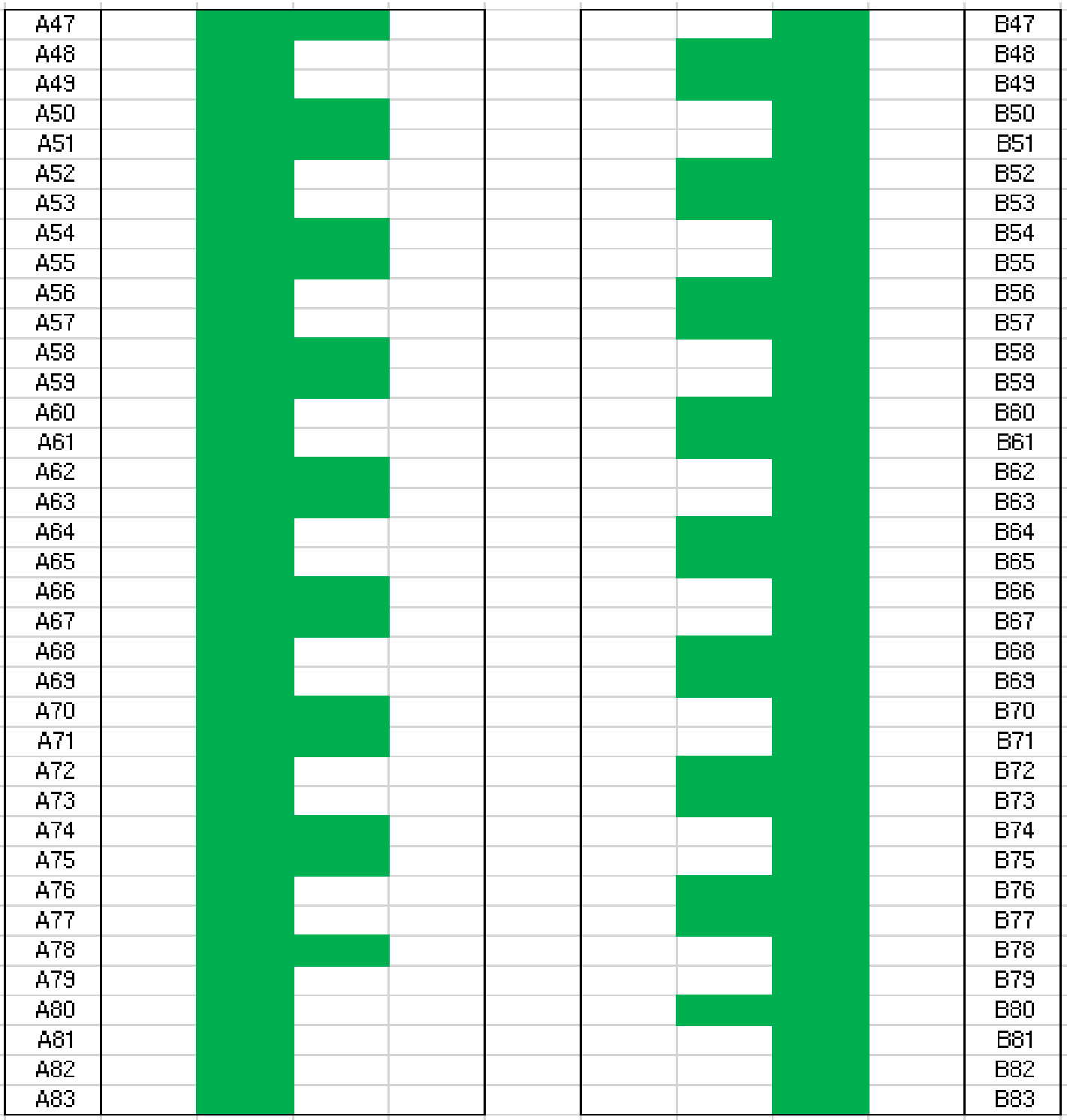
A. Appendix: Mating Sequences

X8 As viewed looking into receptacle. All sequencing controlled by the plug.



X16 as viewed looking into receptacle. All sequencing controlled by the plug.





B. Example Board Layouts

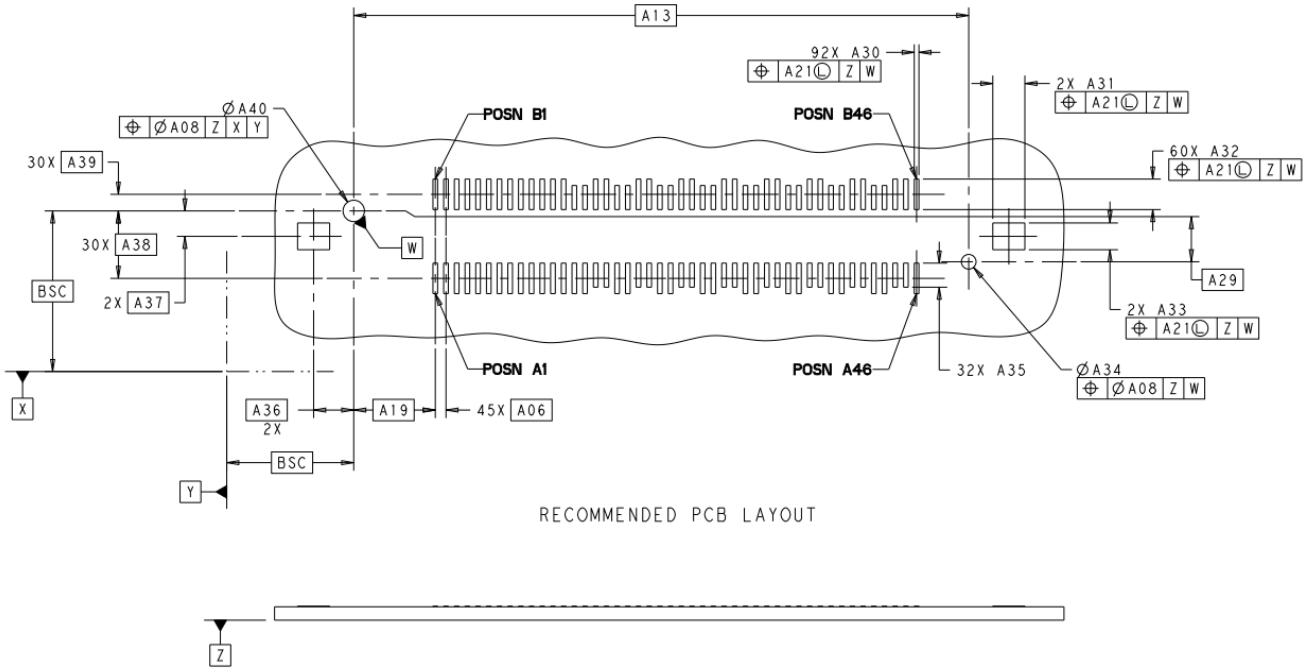


FIGURE B-1 FIXED (RECEPTACLE) X8 CONNECTOR BOARD LAYOUT

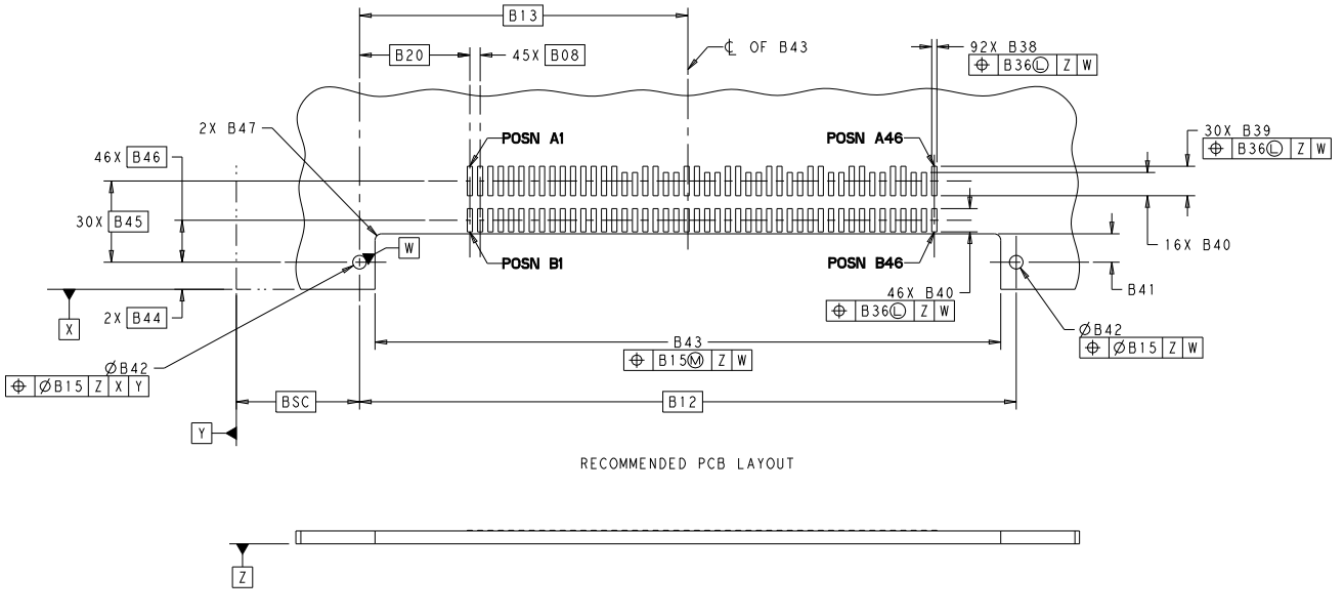


FIGURE B-2 FREE (PLUG) X8 CONNECTOR BOARD LAYOUT

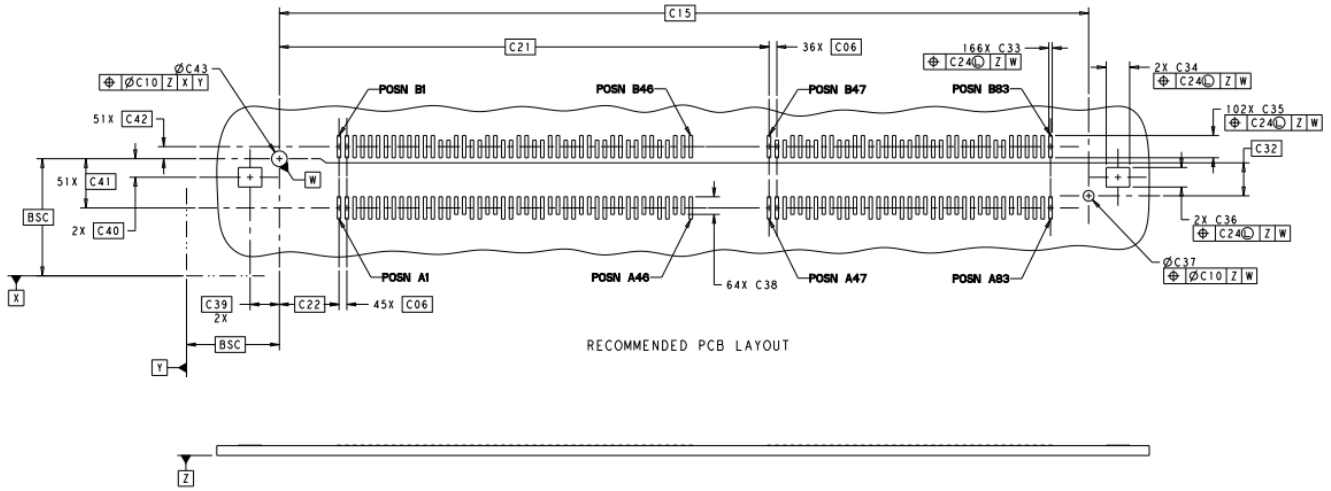


FIGURE B-3 FIXED (RECEPTACLE) X16 CONNECTOR BOARD LAYOUT

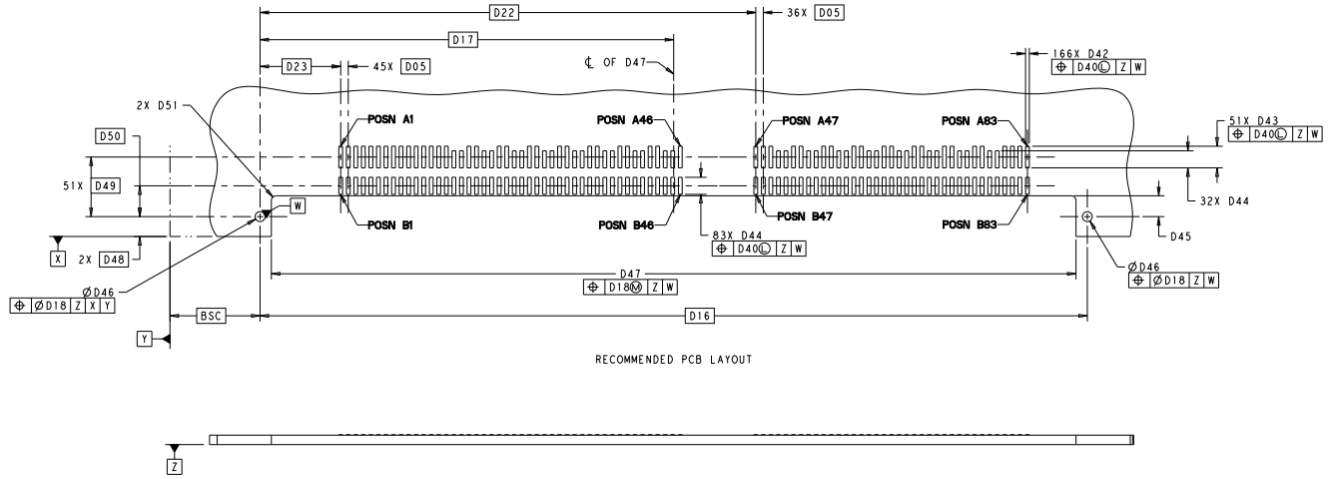


FIGURE B-4 FREE (PLUG) X16 CONNECTOR BOARD LAYOUT

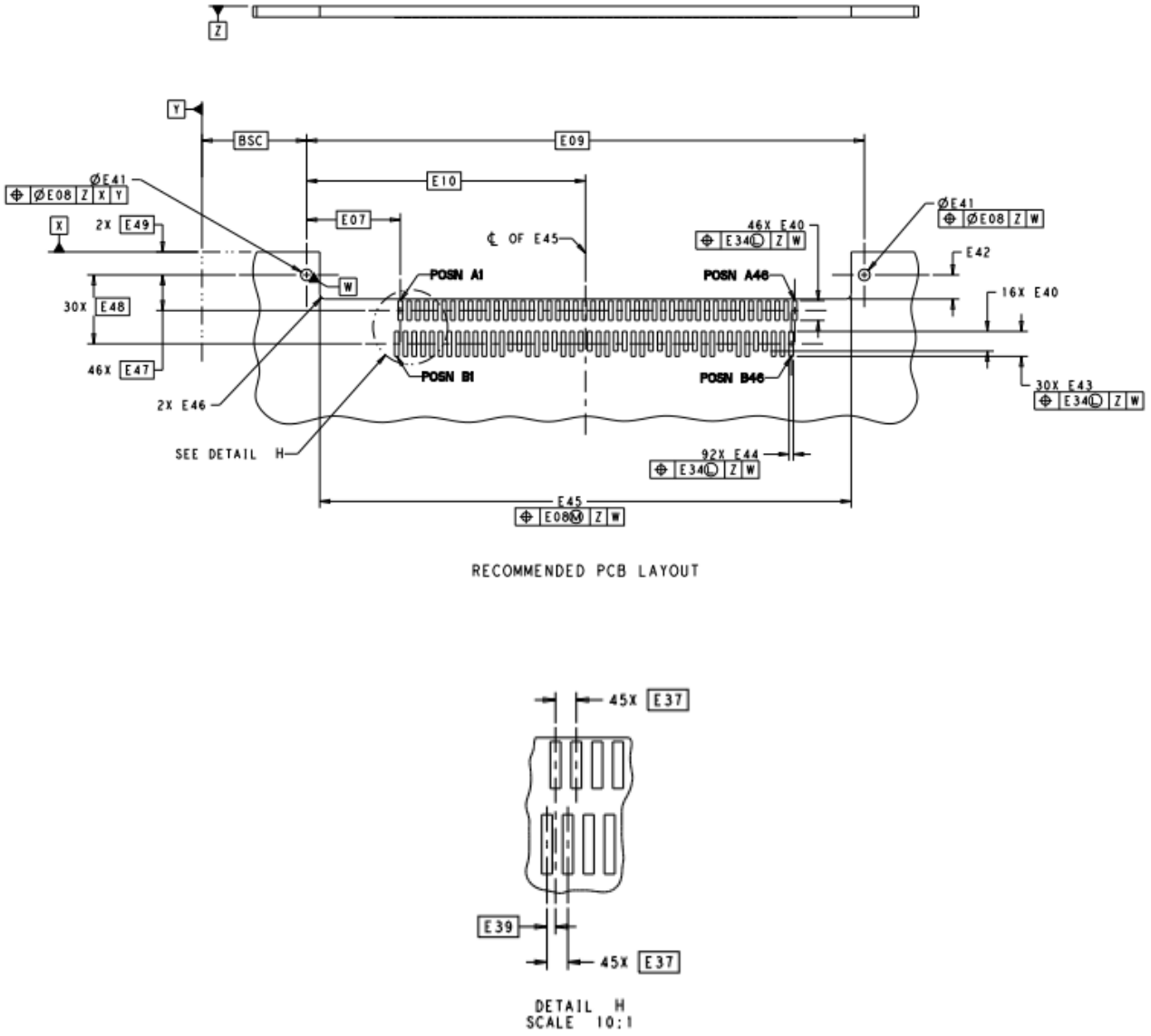


FIGURE B-5 FREE (PLUG) X8 CONNECTOR LAYOUT - INVERTED

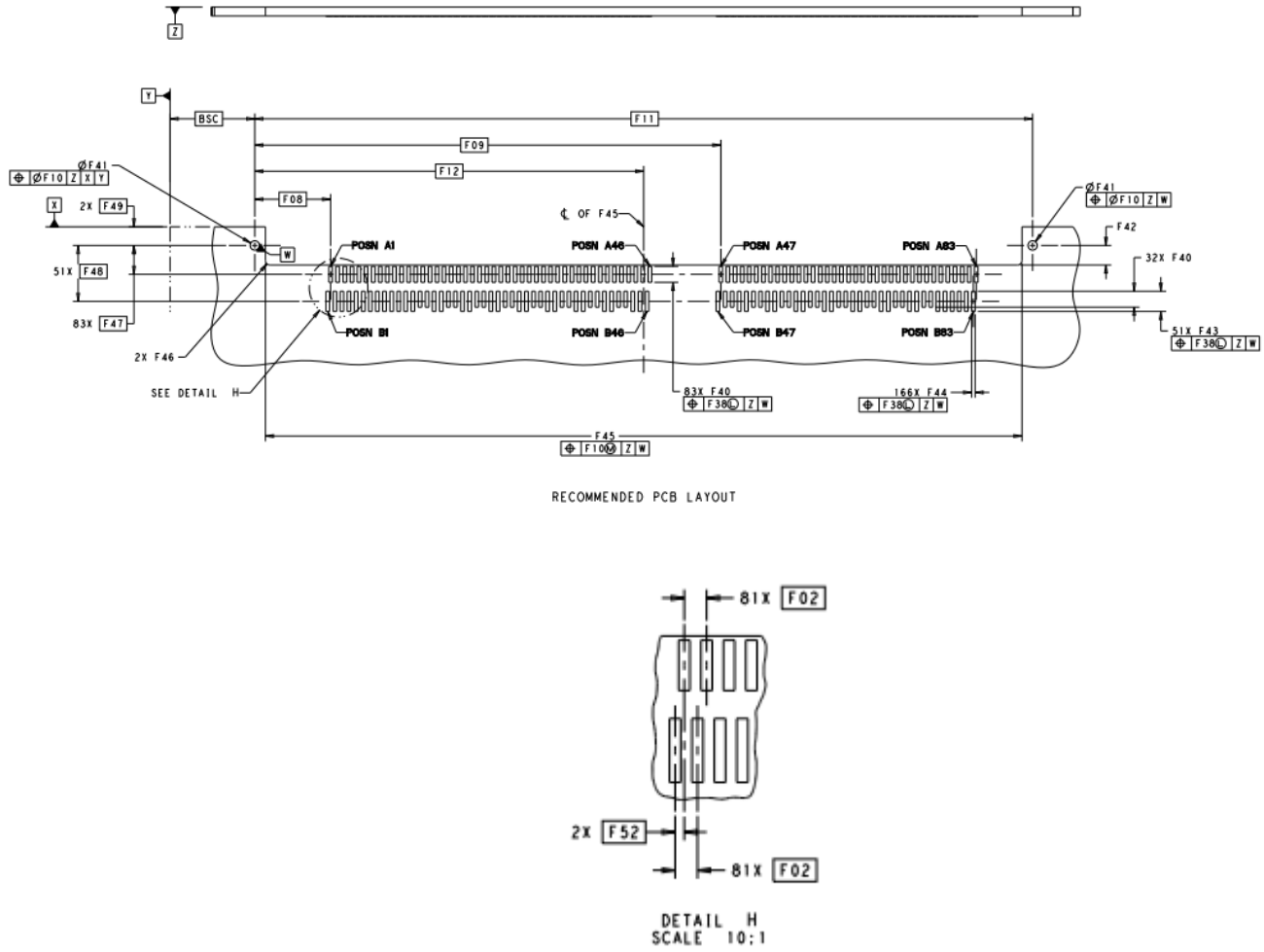


FIGURE B-6 FREE (PLUG) X16 CONNECTOR LAYOUT - INVERTED