SFF-TA-1014

Specification for

Fabric Attached Device Connector

Rev 1.0 March 29, 2019

SECRETARIAT: SFF TA TWG

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

ABSTRACT: This specification defines the mechanical requirements and general performance requirements for the Fabric Attached Device Connector, a high speed electrical connector system for Open Flex applications. This includes a right angle receptacle, press-fit, 160 position, 8 column, 2.0 mm column pitch, 6 signal pairs per column, and a mating header plug connector with an integrated guide pin.

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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.

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.

Revision History

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- First publication

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1. Scope

This specification defines the Fabric Attached Device right angle receptacle connector and a mating header plug connector. This includes a connector overview, mechanical descriptions, general performance testing requirements, and recommendations for PCB footprints and keep-out zones.

2. References and Conventions

2.1 Industry Documents

- ASME-Y14.5 Geometric Dimensioning and Tolerancing
- EIA-364-1000 Environmental Test Methodology for Assessing the Performance of Electrical Connectors and Sockets Used in Controlled Environment Applications
- SFF-TA-1013 Fabric Attached Device Form Factor
- SFF-TA-1015 Fabric Attached Device Connector Pinout

2.2 Sources

The complete list of SFF documents which have been completed, are currently being worked on, or that have been expired by the SFF Committee can be found at http://www.snia.org/sff/specifications. Suggestions for improvement of this specification will be welcomed. They should be submitted to http://www.snia.org/feedback.

Copies of ASME standards may be obtained from the American Society of Mechanical Engineers (https://www.asme.org).

Copies of Electronic Industries Alliance (EIA) standards may be obtained from the Electronic Components Industry Association (ECIA) (https://www.ecianow.org).

2.3 Conventions

The following conventions are used throughout this document:

DEFINITIONS
Certain words and terms used in this standard have a specific meaning beyond the normal English meaning. These words and terms are defined either in the definitions or in the text where they first appear.

ORDER OF PRECEDENCE
If a conflict arises between text, tables, or figures, the order of precedence to resolve the conflicts is text; then tables; and finally figures. Not all tables or figures are fully described in the text. Tables show data format and values.

LISTS
Lists sequenced by lowercase or uppercase letters show no ordering relationship between the listed items.

EXAMPLE 1 - The following list shows no relationship between the named items:

a. red (i.e., one of the following colors):
    A. crimson; or
    B. pink;
b. blue; or
c. green.

Lists sequenced by numbers show an ordering relationship between the listed items.

EXAMPLE 2 -The following list shows an ordered relationship between the named items:

1. top;
2. middle; and
3. bottom.

Lists are associated with an introductory paragraph or phrase, and are numbered relative to that paragraph or phrase (i.e., all lists begin with an a. or 1. entry).

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

NUMBERING 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

3. Keywords, Acronyms, and Definitions

For the purposes of this document, the following keywords, acronyms, and definitions apply.

3.1 Keywords

May / may not: Indicates flexibility of choice with no implied preference.

Shall: Indicates a mandatory requirement. Designers are required to implement all such mandatory requirements to ensure interoperability with other products that conform to this specification.

Should: Indicates flexibility of choice with a strongly preferred alternative.

3.2 Acronyms and Abbreviations

AOC: Active Optical Cable
EMLB: Early Mate Late Break
IDC: Insulation Displacement Contact
IDT: Insulation Displacement Termination
PCB: Printed Circuit Board
PF: Press Fit
PTH: Plated Through Hole
RA: Right Angle
RAH: Right Angle Header
RAR: Right Angle Receptacle
SMT: Surface Mount Technology

3.3 Definitions

Alignment guides: A term used to describe features that pre-align the two halves of a connector interface before electrical contact is established. Other common terms include: guide pins, guide posts, blind mating features, mating features, alignment features, and mating guides.

Connector: Each half of an interface that, when joined together, establish electrical contact and mechanical retention between two components. In this specification, the term connector does not apply to any specific gender; it is used to describe the receptacle, the plug or the card edge, or the union of receptacle to plug or card edge. Other common terms include: connector interface, mating interface, and separable interface.

Contact mating sequence: A term used to describe the order of electrical contact established/ terminated during mating/un-mating. Other terms include: contact sequencing, contact positioning, mate first/break last, EMLB (early mate late break) staggered contacts, and long pin/short pin.

Contacts: A term used to describe connector terminals that make electrical connections across a separable interface.

Module: In this specification, module may refer to a plug assembly at the end of a copper (electrical) cable (passive or active), an active optical cable (AOC), an optical transceiver, or a loopback.

Plug: A term used to describe the connector that contains the penetrating contacts of the connector interface as shown in Figure 3-1. Plugs typically contain stationary contacts. Other common terms include male, pin connector, and card edge.

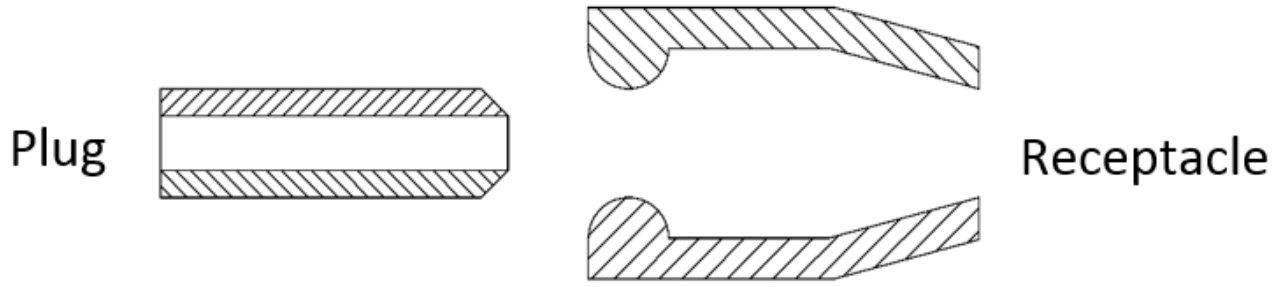


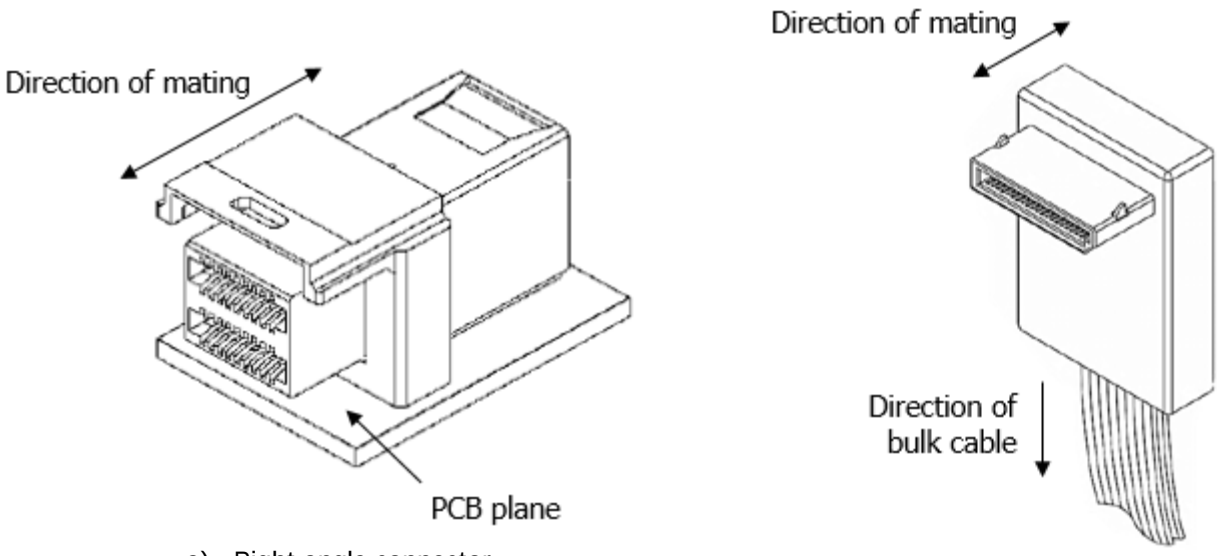
Figure 3-1 Plug and Receptacle Definition

Plated through hole termination: A term used to describe a termination style in which rigid pins extend into or through the PCB. Pins are soldered to keep the connector or cage in place. Other common terms are through hole or PTH.

Press fit: A term used to describe a termination style in which collapsible pins penetrate the surface of a PCB. Upon insertion, the pins collapse to fit inside the PCB's plated through holes. The connector or cage is held in place by the interference fit between the collapsed pins and the PCB.

Receptacle: A term used to describe the connector that contains the contacts that accept the plug contacts as shown in Figure 3-1. Receptacles typically contain spring contacts. Other common terms include female and socket connector.

Right Angle: A term used to describe either a connector design where the mating direction is parallel to the plane of the printed circuit board upon which the connector is mounted or a cable assembly design where the mating direction is perpendicular to the bulk cable. Examples are shown in Figure 3-2.



a) Right angle connector

b) Right angle cable assembly

Figure 3-2 Right Angle Connector and Cable Assembly

Straight: A term used to describe a connector design where the mating direction is parallel to the bulk cable.

Surface mount: A term used to describe a termination style in which pins sit on pads on the surface of a PCB and are then soldered to keep the connector or cage in place. Other common terms are surface mount technology or SMT.

Termination: A term used to describe a connector's non-separable attachment point such as a connector contact to a PCB. Common PCB terminations include: surface mount (SMT), plated through hole termination (PTH), and press fit (PF). Common cable terminations include insulation displacement contact (IDC), insulation displacement termination (IDT), wire slots, solder, welds, crimps, and brazes.

Wipe: The distance a contact travels on the surface of its mating contact during the mating cycle as shown in Figure 3-3.

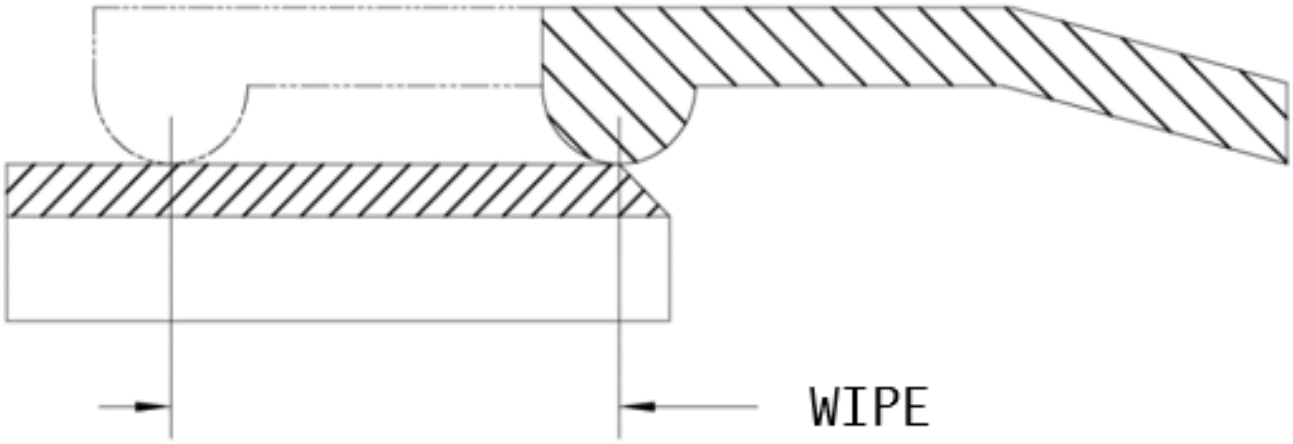


Figure 3-3 Wipe for a Continuous Contact

4. General Description

4.1 Configuration Overview/Descriptions

This specification details a connector system including a press-fit, right angle receptacle connector with 160 contact positions and an integrated guidance feature and a mating header/plug connector with an integrated guide pin.

4.1.1 Connector Configuration 1 (Right Angle Receptacle)

Configuration 1 is a press fit, right angle receptacle connector. A sample of this right angle receptacle, right guidance connector is shown in Figure 4-1 and it shall mate with a header/plug connector like the one shown in Figure 4-2.

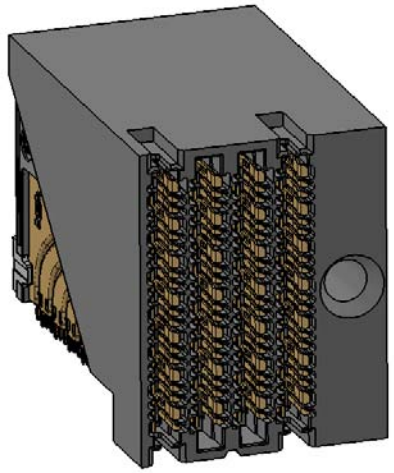


Figure 4-1 Right Angle Receptacle Right Guidance Connector

4.1.2 Connector Configuration 2 (Header/Plug)

Configuration 2 is a header right guidance connector that mates with Configuration 1. The header connector may be a right angle version header connector, as shown in Figure 4-2, but could also be a straight header connector or some other version in order to fit the needs of the particular application.

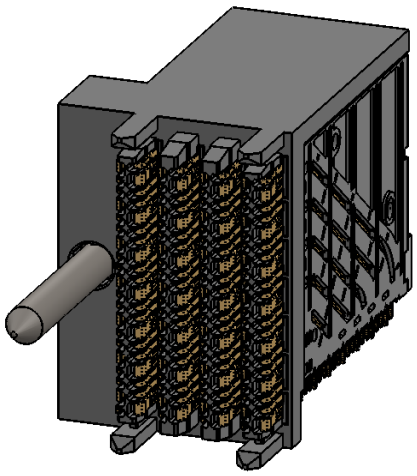


Figure 4-2 Example Mating Right Angle Header Right Guidance Connector

The right guidance feature means that the guide pin on the left side corresponds with the right guidance hole on

the right side of the mating receptacle connector.

4.2 Contact Numbering

The electrical contacts in this connector interface are arranged in 20 rows and 8 columns and are numbered as shown in Figure 4-3. Positions A1 and A7 are EMLB (Early Mate Late Break) contact locations.

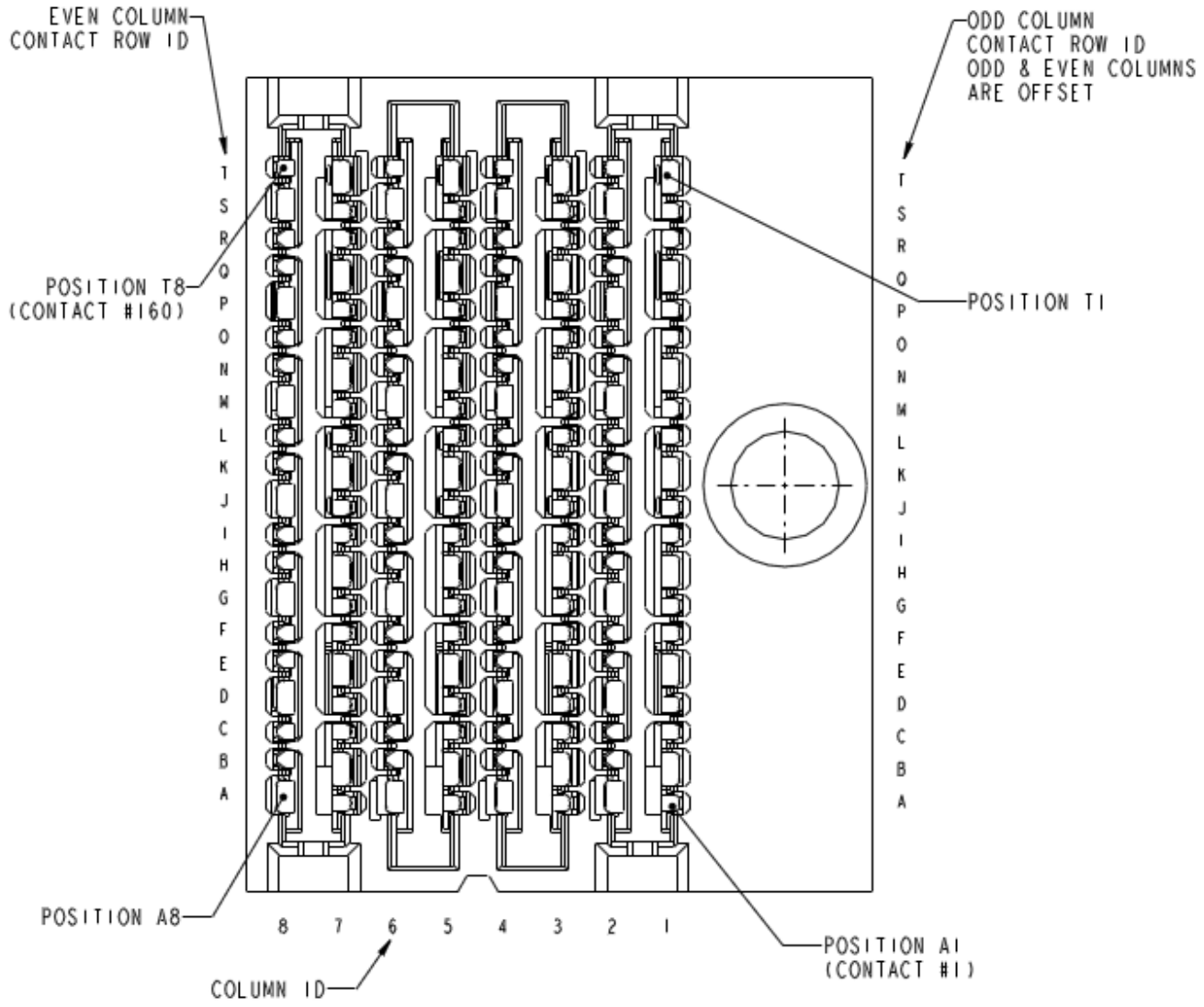
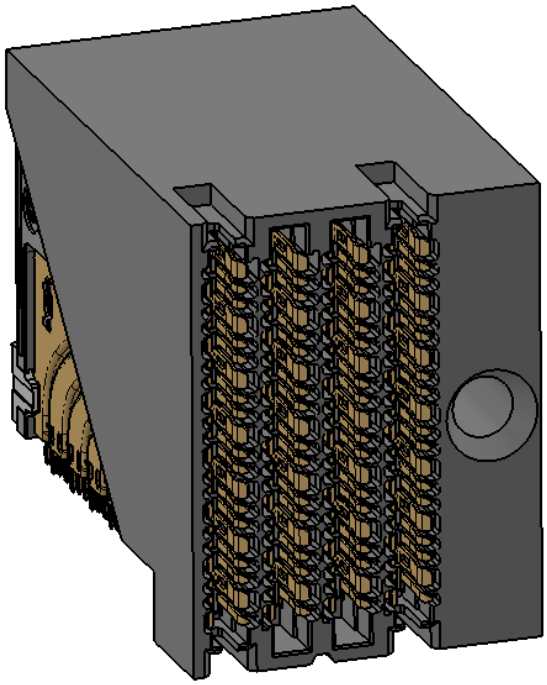


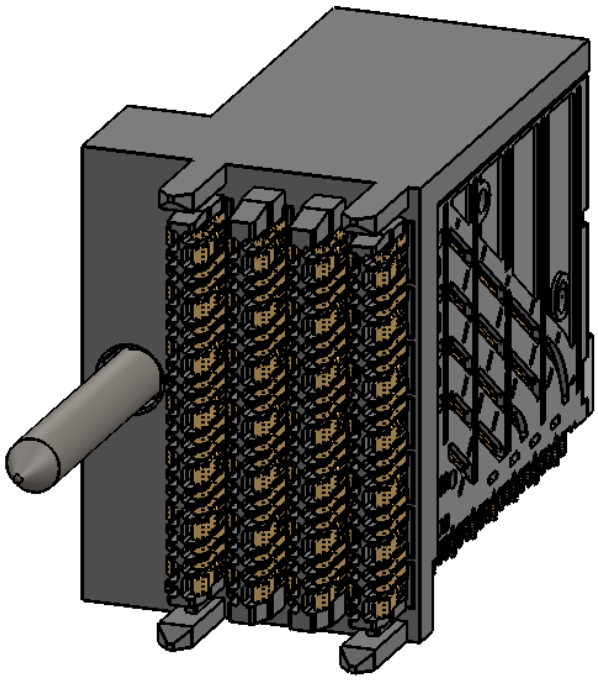
Figure 4-3 Contact Numbering (Right Angle Receptacle Right Guidance Connector)

5. Connector Mechanical Specification

5.1 Overview

The Fabric Attached Device connector is a high speed electrical connector system for backplane, coplanar, and orthogonal applications. The connector system utilizes a Right Angle Receptacle (RAR) and a mating header plug connector. The Fabric Attached Device connectors use compliant press-fit tails to provide a reliable electrical connection between the connector and the plated through holes (PTH) of the PCB. For signal terminals, the Fabric Attached Device connector product has a small press-fit section that uses Ø0.36mm finished through holes while the ground terminals use a larger standard press-fit section with Ø0.50mm finished through holes. In addition to the signal pairs and grounds, there is a single low speed signal contact at the end of each column that may be utilized for various low speed signals and/or low power requirements. These locations also have the small press-fit section and use Ø0.36mm finished through holes.





5.1.1 Datums

The datums defined in Figure 5-1 and Table 5-1 may be used throughout the rest of the document to describe the dimensional requirements of this connector.

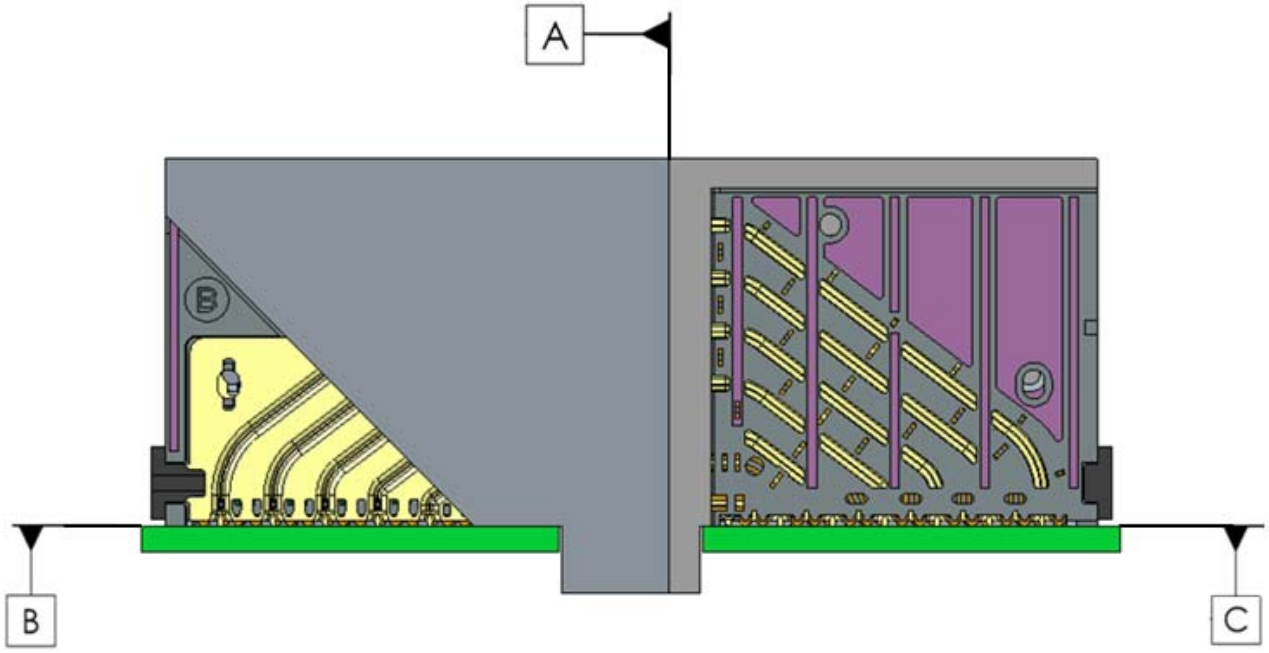


Figure 5-1 Datum Definitions

Table 5-1 Datum Descriptions

Datum	Descriptions
A	Mating surface
B	Fabric Attached Device pcb top surface
C	Coplanar RAH board top surface
U	Vertical centerline of RAH guide post slot distance on Datum A
X	Vertical centerline of RAR guide post distance on Datum A

5.2 Mechanical Description: Right Angle Receptacle Connector

5.2.1 Right Angle Receptacle Right Guidance Connector

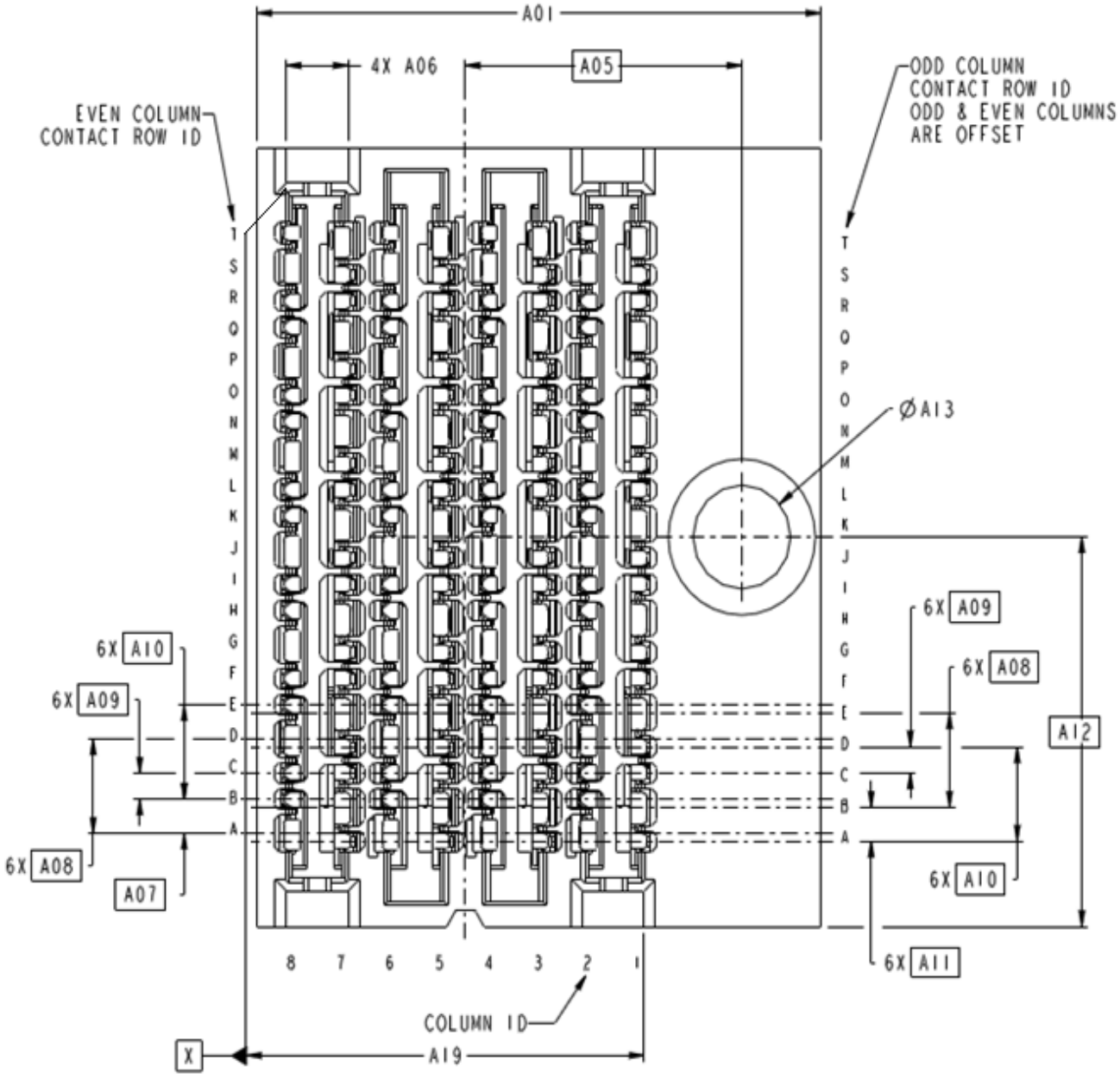


Figure 5-2 Right Angle Receptacle Right Guidance Connector Front View

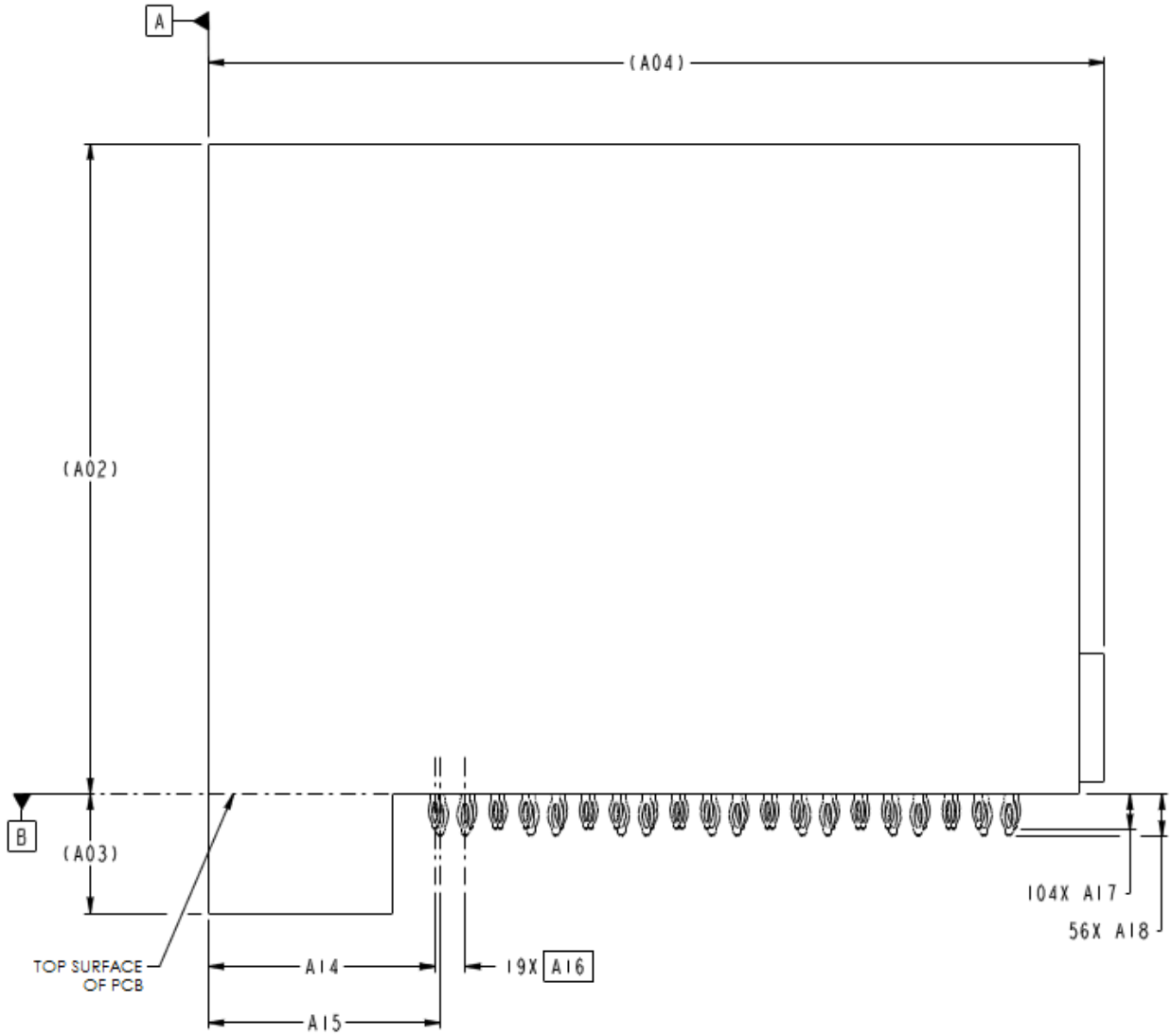


Figure 5-3 Right Angle Receptacle Right Guidance Connector Side View

Table 5-2 Right Angle Receptacle Right Guidance Connector Dimensions

Designator	Description	Dimension(mm)	Tolerance +/-
A01	RAR connector width	22.85	+/-0.10
A02	RAR connector height from Datum B	25.10	Ref
A03	Height from Datum B to RAR housing bottom	4.60	Ref
A04	RAR connector length from Datum A	35.60	Ref
A05	RAR hole center to Datum X	11.2	Basic
A06	RAR housing slot width	2.5	+/-0.05
A07	Even column row A centers to first signal centers	1.3	Basic
A08	Ground centers	3.6	Basic
A09	Signal pair centers	1.0	Basic
A10	Signal centers	3.6	Basic
A11	Odd column row A centers to first ground centers	1.3	Basic
A12	RAR guide hole center to housing bottom surface	14.85	Basic
A13	RAR guide hole diameter	3.95	+/-0.10
A14	Datum A to centers of odd columns	9.00	+/-0.15
A15	Datum A to centers of even columns	9.20	+/-0.15
A16	Pitch within each column	1.20	Basic
A17	Signals tail length	1.40	+/-0.20
A18	Grounds tail length	1.60	+/-0.20
A19	RAR housing guide post slot distance	14.50	+/-0.05

5.3 Mechanical Description: Right Angle Header Connector

5.3.1 Right Angle Header Right Guidance Connector

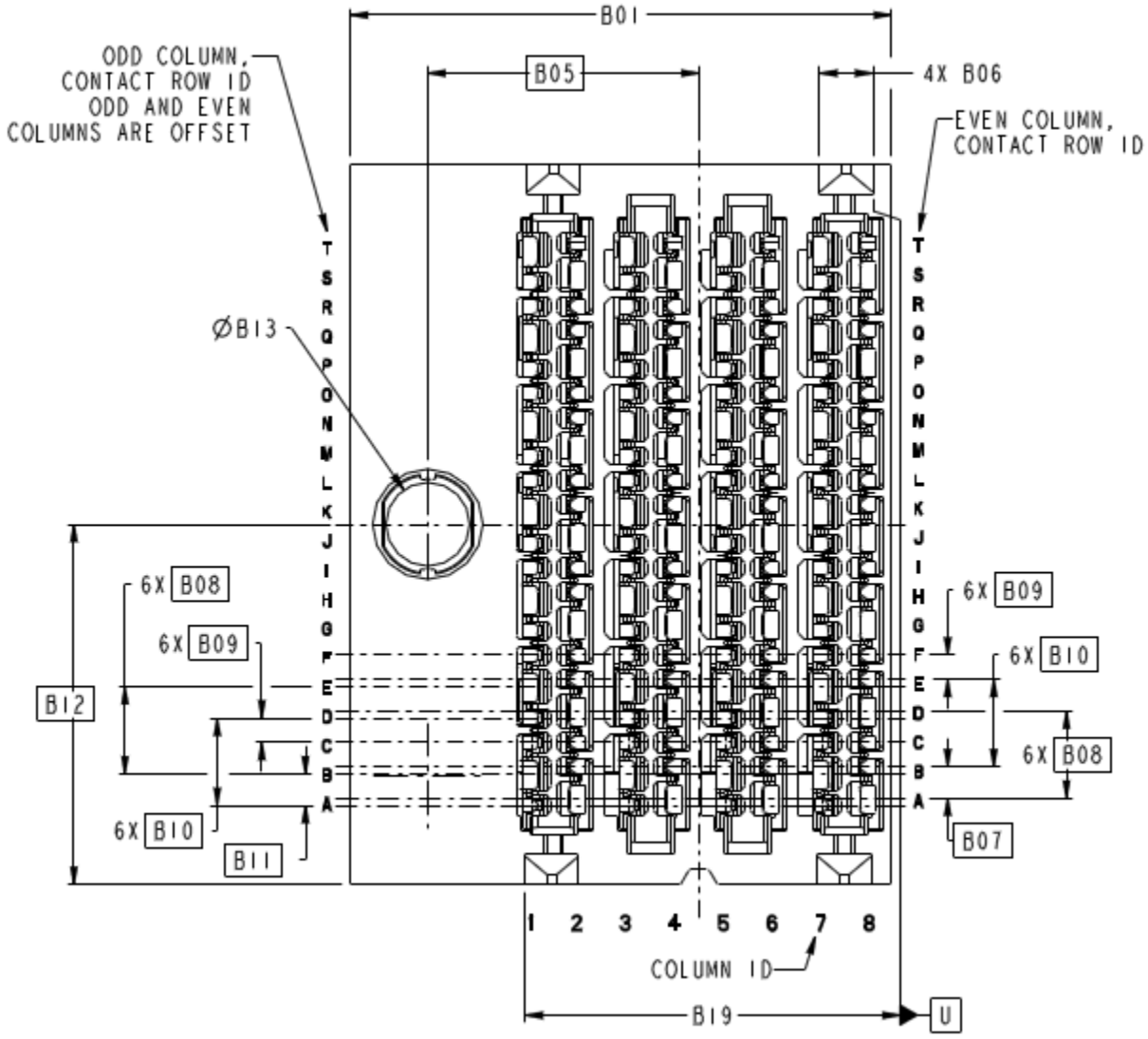


Figure 5-4 Right Angle Header Right Guidance Connector Front View

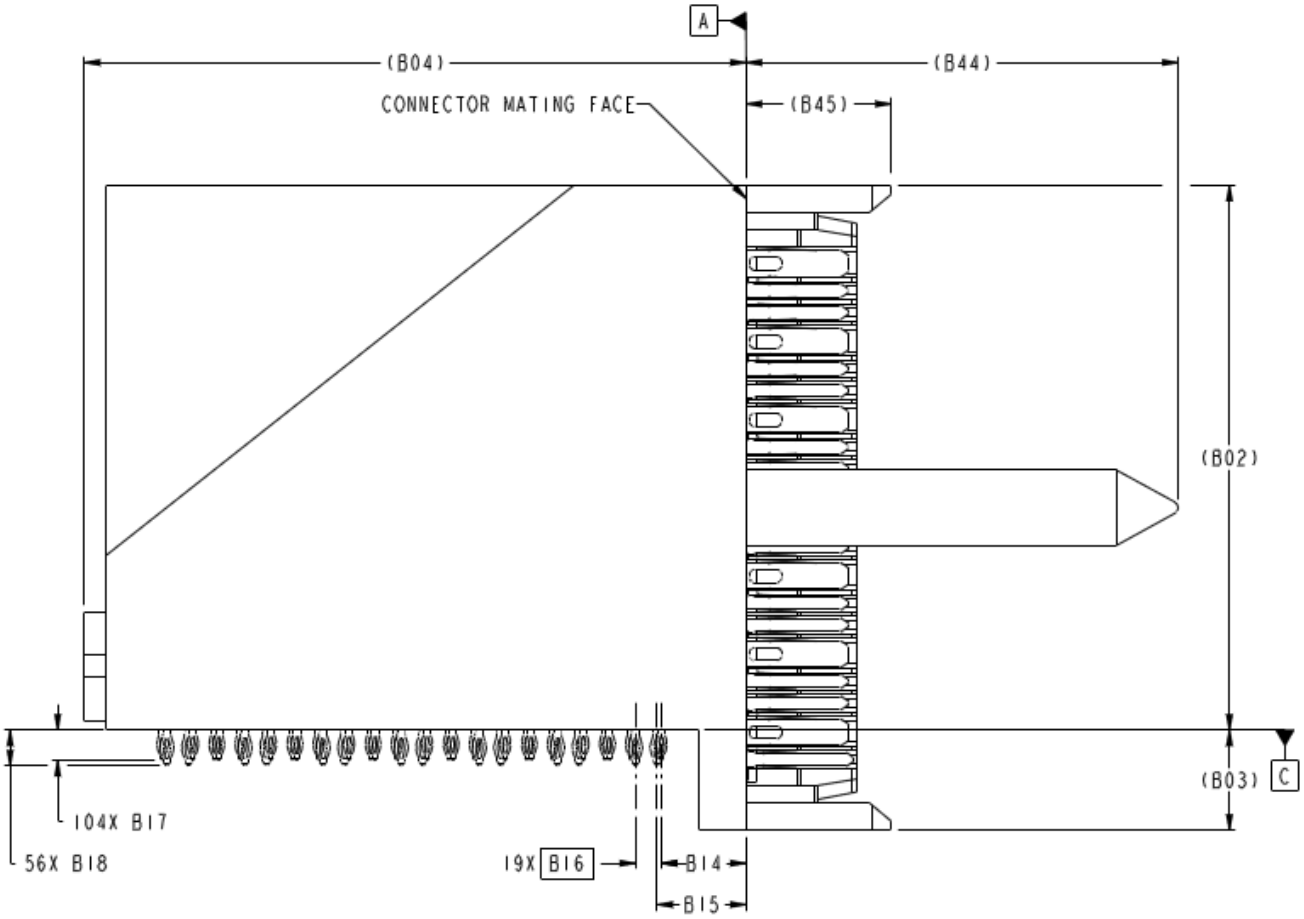


Figure 5-5 Right Angle Header Right Guidance Connector Side View

Table 5-3 Right Angle Header Right Guidance Connector Dimensions

Designator	Description	Dimension(mm)	Tolerance +/-
B01	RAH connector width	22.35	+/-0.10
B02	RAH connector height from Datum C	25.10	Ref
B03	Height from Datum C to RAH housing bottom	4.60	Ref
B04	RAH connector length from Datum A	30.50	Ref
B05	RAH guide pin center to Datum U	11.2	Basic
B06	RAH housing guide post width	2.2	+/-0.05
B07	Even column row A centers to first signal centers	1.3	Basic
B08	Ground centers	3.6	Basic
B09	Signal pair centers	1.0	Basic
B10	Signal centers	3.6	Basic
B11	Odd column row A centers to first ground centers	1.3	Basic
B12	RAH guide pin center to housing bottom surface	14.85	Basic
B13	RAH guide pin diameter	3.45	+/-0.05
B14	Datum A to centers of odd columns	3.90	+/-0.15
B15	Datum A to centers of even columns	4.10	+/-0.15
B16	Pitch within each column	1.20	Basic
B17	Signals tail length	1.40	+/-0.20
B18	Grounds tail length	1.60	+/-0.20
B19	RAH housing guide key distance	14.35	+/-0.05
B44	RAH guide pin length from Datum A	19.9	+/-0.20
B45	RAH guide post length from Datum A	6.7	+/-0.10

6. Performance Requirements

6.1 Performance Tables

EIA-364-1000 (TS-1000) shall be used to define the test sequences and procedures for evaluating the connector system described in this document. Where multiple test options are available, the manufacturer shall select the appropriate option where not previously specified. The selected procedure should be noted when reporting data. If there are conflicting requirements or test procedures between EIA-364 procedures and those contained within this document, this document shall be considered the prevailing authority.

Unless otherwise specified, procedures for sample size, data, and collection to be followed as specified in EIA-364-1000. See EIA-364-1000 Annex B for objectives of tests and test groups.

Table 6-1 summarizes the performance criteria that are to be satisfied by the connector described in this document. Most performance criteria are validated by EIA-364-1000 testing, but this test suite leaves some test details to be determined. To ensure that testing is repeatable, these details are identified in Table 6-2. Finally, testing procedures used to validate any performance criteria not included in EIA-364-1000 are provided in Table 6-3.

Table 6-1 Form Factor Performance Requirements

Performance Parameters	Description/ Details	Requirement
Mechanical/ Physical Requirements		
Plating Type	Plating type on mating end of connector contacts	Precious
Surface Treatment	Surface treatment on connector contacts	Non-lubricated
Wipe length	Designed distance a contact traverses over a mating contact surface during mating and resting at a final position	Greater than 0.127mm (3.7mm for contact A1 and A7. 2.5mm for all others.)
Rated Durability Cycles	The expected number of durability cycles a component is expected to encounter over the course of its life	Right angle connector and mating header connector: 200 cycles
Environmental Requirements		
Field Life	The expected service life for a component	10 years
Field Temperature	The expected service temperature for a component	85°C
Storage Temperature*	The expected storage temperature for a component when not in use	-55°C to +85°C
Storage Humidity*	The expected storage humidity for a component when not in use	10-75% Relative Humidity
Electrical Requirements		
Current*	Maximum current to which a contact is exposed in use	4A per contact MAX See Table 6-4
Operating Rating Voltage	Maximum voltage to which a contact is exposed in use	30V DC per contact MAX
NOTE: Performance criteria denoted with stars (*) are not validated by EIA-364-1000 testing. Refer to Table 6-3 for test procedures and pass/fail criteria.		

Table 6-2 describes the details necessary to perform the tests described in the EIA-364-1000 test sequences. Testing shall be done in accordance with EIA-364-1000 and the test procedures it identifies in such a way that the parameters/ requirements defined in Table 6-1 are met. Any information in this table supersedes EIA-364-1000.

Table 6-2 EIA-364-1000 Test Details

Test	Test Descriptions and Details	Pass/ Fail Criteria
Mechanical/ Physical Tests		
Durability (preconditioning)	EIA-364-09 To be tested with right angle connector and header connector only	No evidence of physical damage
Durability (see Note 1)	EIA-364-09 To be tested with right angle connector and header connector only	No visual damage to mating interface
Environmental Tests		
Mixed Flowing Gas (see Note 2)	EIA -364-65 Class IIA, 4-gas See Table 4.1 in EIA-364-1000 for exposure times Test option Per EIA-364-1000: 1B	No intermediate test criteria
Electrical Tests		
Low Level Contact Resistance (see Note 3)	EIA-364-23 20 mVDC MAX, 100 mA MAX To include wire termination or connector-to-board termination	10 mΩ MAX change from baseline
Dielectric Withstanding Voltage	EIA-364-20 Method B 500 VDC minimum for 1 minute Applied voltage may be product / application specific	No defect or breakdown between adjacent contacts within a single column -AND- 0.5 mA Max Leakage Current

NOTES:
1. If the durability requirement on the connector is greater than that of the module, modules may be replaced after their specified durability rating.
2. Test option, temperature, duration must be reported.
3. The first low level contact resistance reading in each test sequence is used to determine a baseline measurement. Subsequent measurements in each sequence are measured against this baseline.

Table 6-3 describes the testing procedures necessary to validate performance criteria not validated by EIA-364-1000 testing. The tests must be performed in such a way that the parameters/ requirements defined in Table 6-1 are met.

Table 6-3 Additional test Procedures

Test	Test Descriptions and Details	Pass/ Fail Criteria
Mechanical/ Physical Tests		
Mating Force	EIA-364-13 To be tested with connectors only, without any latching mechanism included	The force to mate a receptacle connector and a corresponding header shall not exceed 0.45 N per contact.
Unmating Force	EIA-364-13 To be tested with connectors only, without any latching mechanism included	The un-mating force shall not be less than 0.10 N per contact.
Environmental Tests		
Storage Temperature	EIA-364-32 Method A, Test Condition 1, Duration 4 Use min and max Field Temperatures listed in Table 6-1 for temperature range	Refer to Table 6-1
Storage Humidity	EIA-364-31	Refer to Table 6-1
Electrical Tests		
Current	EIA-364-70 Method 3, 30-degree temperature rise Contacts energized: See Table 6-4	Refer to Table 6-1 and Table 6-4

Table 6-4 Current Rating

Contacts Energized	Contact Current Rating (amperes)
Individual Signal Contact (centrally located in connector)	4
Single column, an insert molded leadframe assembly, or “wafer” (signal contacts carrying load, ground contacts carrying return)	17
Full adjacent columns, insert molded leadframe assemblies, or “wafers” (1 wafer carrying load, 2nd adjacent wafer carrying return)	25

Appendix A: Recommended Right Angle Receptacle Connector Footprint (Informative)

A.1 Overview

All material within this section, whether defined as normative or informative, is subject to IP disclosure and RAND terms by SNIA SFF TA TWG member companies

A.2 Recommended Right Angle Receptacle Right Guidance Connector PCB Layout

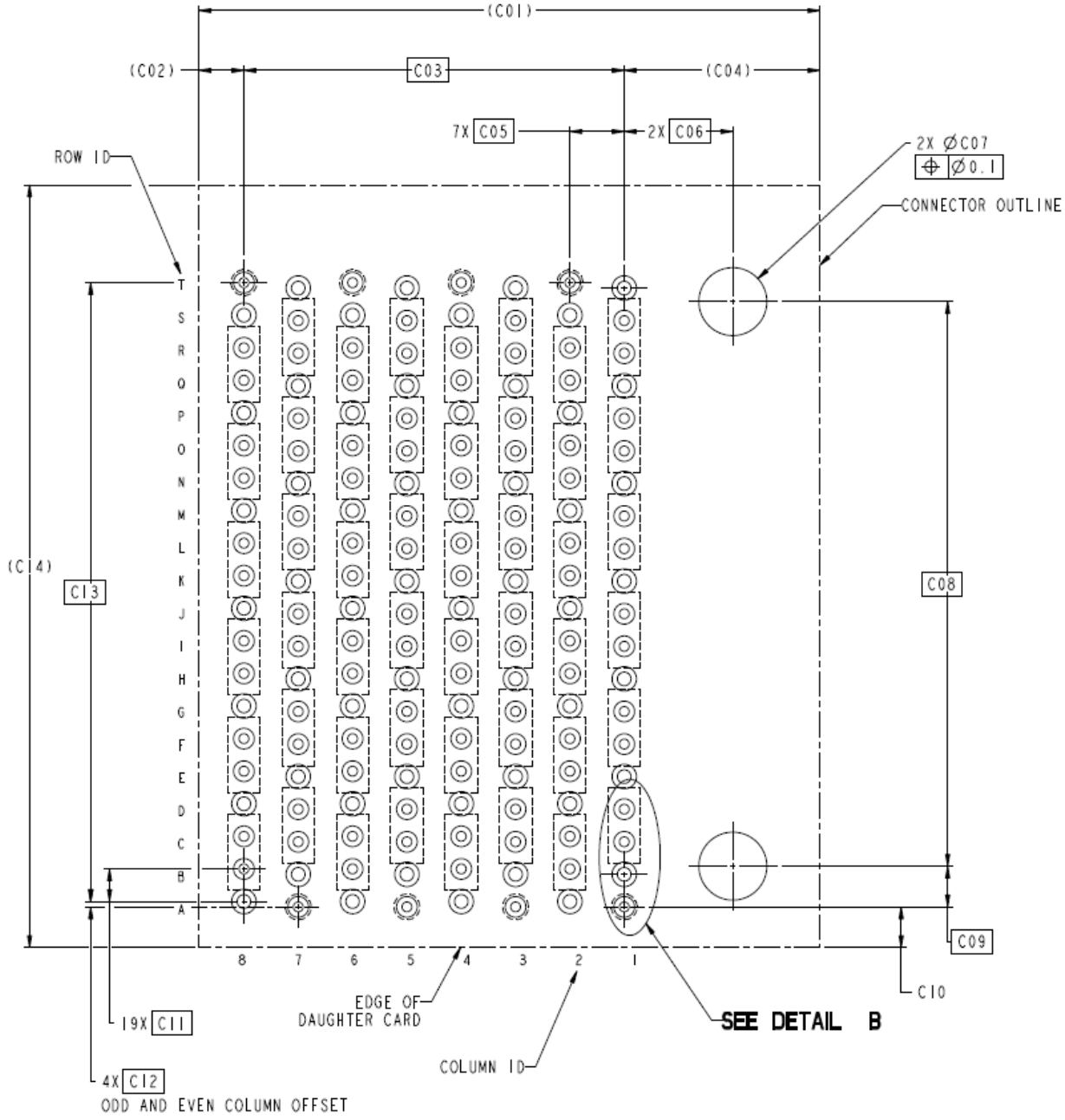


Figure: A-1 Right Angle Receptacle Right Guidance Footprint

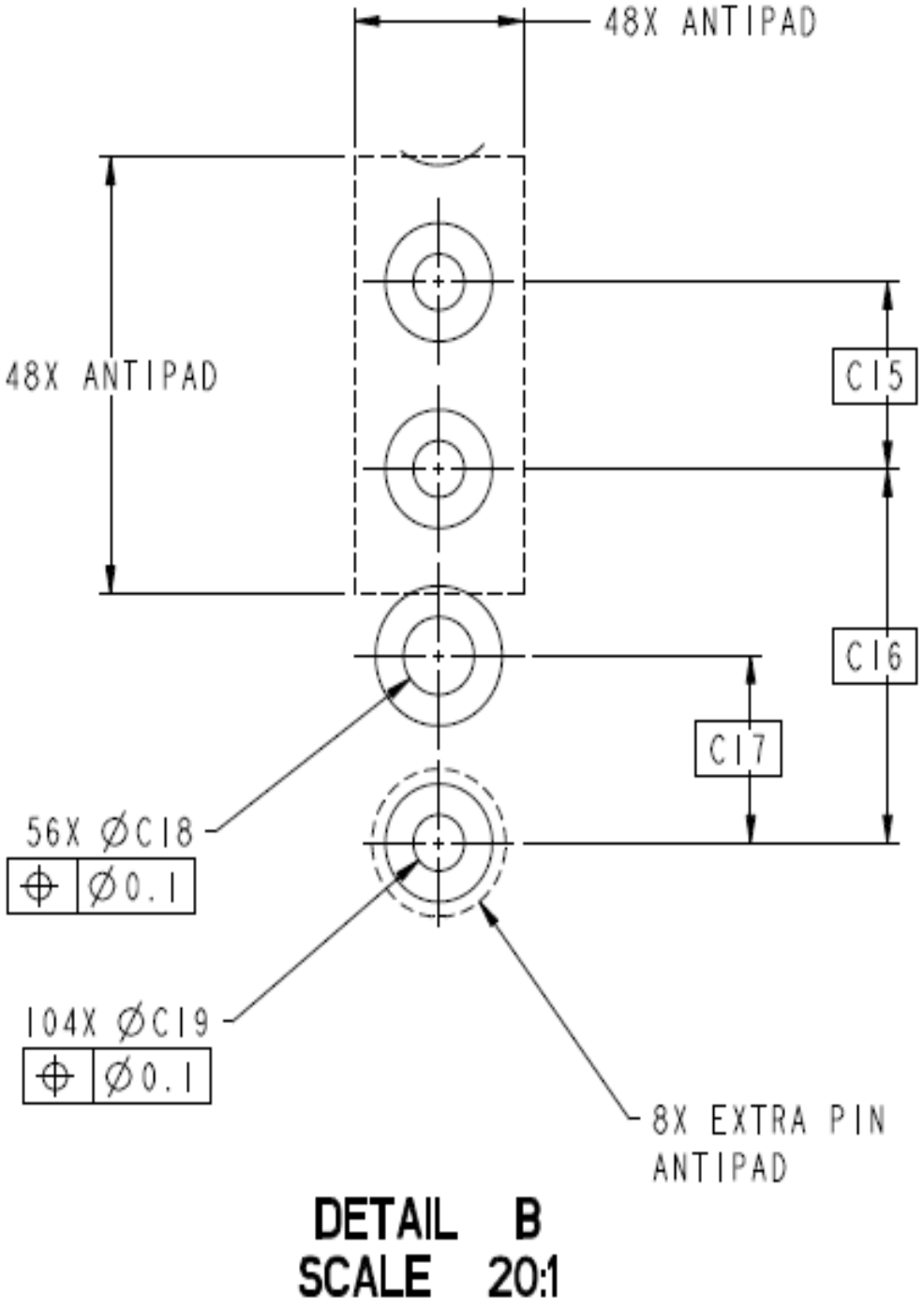


Figure: A-2 Right Angle Receptacle Right Guidance Connector Footprint - Detail View

Table: A-1 Right Angle Receptacle Right Guidance Connector Footprint Dimensions

Designator	Description	Dimension(mm)	Tolerance +/-
C01	RAR connector outline width	22.85	Ref
C02	Last row centers to connector edge	1.65	Ref
C03	Total column length	14.0	Basic
C04	First row via centers to connector edge	7.20	Ref
C05	Column to column pitch	2.00	Basic
C06	First row via centers to hold down locating hole centers	4.00	Basic
C07	Hold down locating hole diameter	2.50	+/-0.05
C08	Hold down locating hole distance	20.8	Basic
C09	A1 to hold down locating hole	1.50	Basic
C10	A1 to daughter card edge	1.50	Max.
C11	Pitch within each column	1.20	Basic
C12	Odd and even column offset	0.20	Basic
C13	Total pitch within each column	22.80	Basic
C14	RAR connector outline length	28.10	Ref
C15	Signal via pair pitch	1.20	Basic
C16	Signal via pitch	2.40	Basic
C17	Signal via to ground via	1.20	Basic
C18	Ground via finish hole diameter	0.500	+/-0.05
C19	Signal via finish hole diameter	0.360	+/-0.05

A.3 Right Angle Receptacle Right Guidance Connector Attachment Screws

It is recommended that two M2 pan head screws be used to attach integrated guide connectors to the PCB. In order to provide clearance for the fastener heads, it is important that no components or traces be within the cross hatched area shown. If the hold down or guide pin fastener hardware used has an outside diameter larger than 4.0mm then additional clearance will be required. See Figure: A-3.

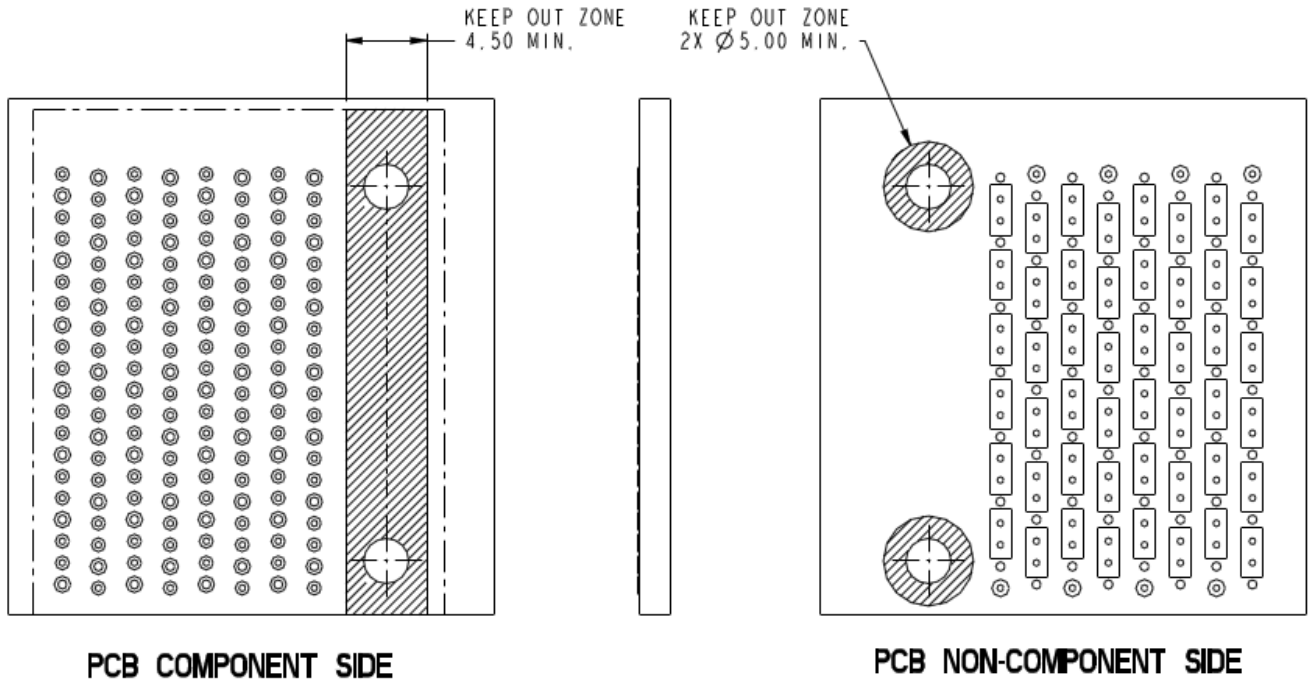


Figure: A-3 Keep Out Zone for Integrated Guide

Appendix B: Recommended Right Angle Header Right Guidance Connector Footprint (Informative)

B.1 Overview

All material within this section, whether defined as normative or informative, is subject to IP disclosure and RAND terms by SNIA SFF TA TWG member companies

B.2 Recommended Right Angle Header Right Guidance Connector PCB Layout

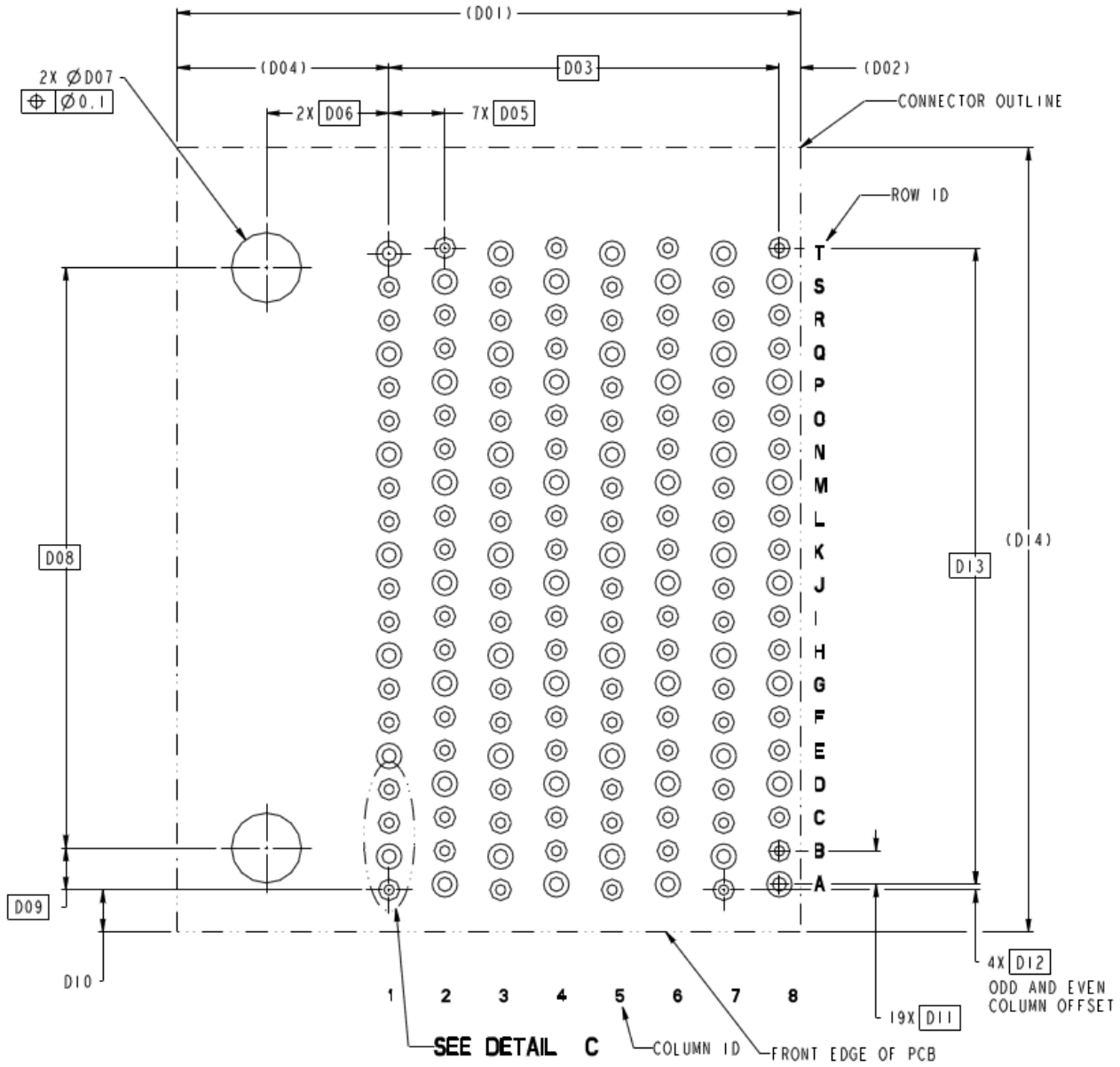
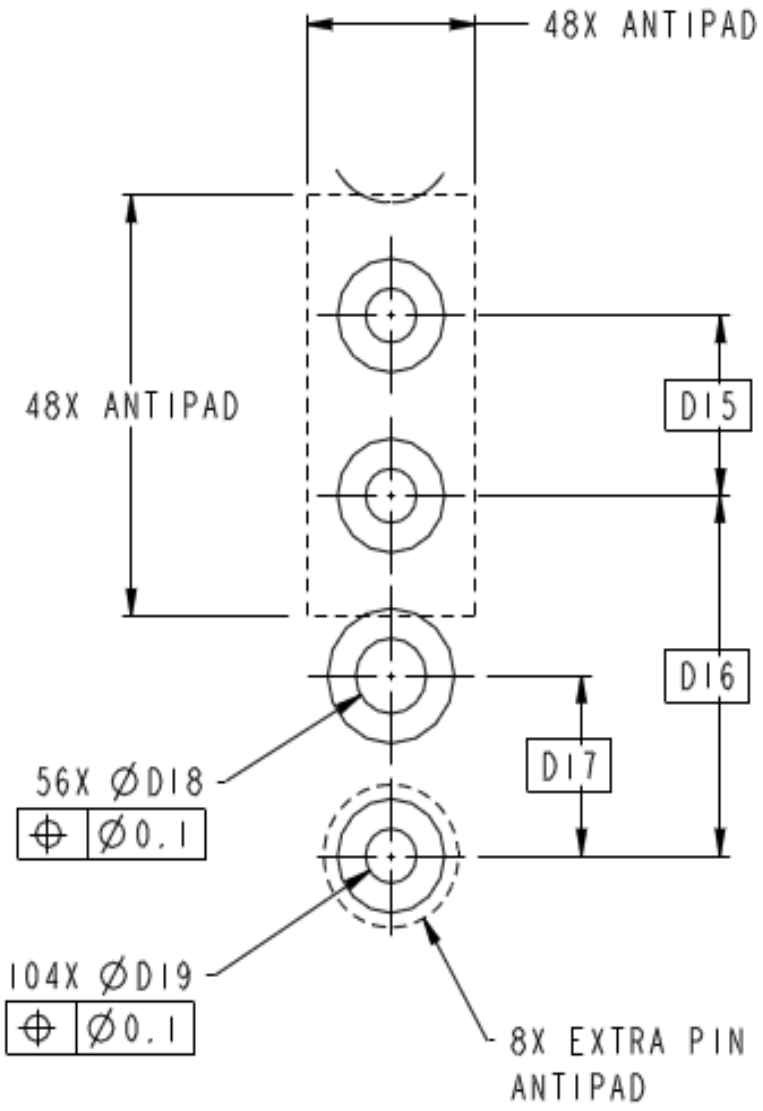


Figure: B-1 Right Angle Header Right Guidance Footprint



DETAIL C
SCALE 20:1

Figure: B-2 Right Angle Header Right Guidance Connector Footprint - Detail View

Table: B-1 Right Angle Header Right Guidance Connector Footprint Dimensions

Designator	Description	Dimension(mm)	Tolerance +/-
D01	RAH connector outline width	22.35	Ref
D02	Last row centers to connector edge	0.75	Ref
D03	Total column length	14.0	Basic
D04	First row via centers to connector edge	7.60	Ref
D05	Column to column pitch	2.00	Basic
D06	First row via centers to hold down locating hole centers	4.40	Basic
D07	Hold down locating hole diameter	2.50	+/-0.05
D08	Hold down locating hole distance	20.8	Basic
D09	A1 to hold down locating hole	1.50	Basic
D10	A1 to daughter card edge	1.50	Max.
D11	Pitch within each column	1.20	Basic
D12	Odd and even column offset	0.20	Basic
D13	Total pitch within each column	22.80	Basic
D14	RAR connector outline length	28.10	Ref
D15	Signal via pair pitch	1.20	Basic
D16	Signal via pitch	2.40	Basic
D17	Signal via to ground via	1.20	Basic
D18	Ground via finish hole diameter	0.500	+/-0.05
D19	Signal via finish hole diameter	0.360	+/-0.05

B.3 Right Angle Header Right Guidance Connector Attachment Screws

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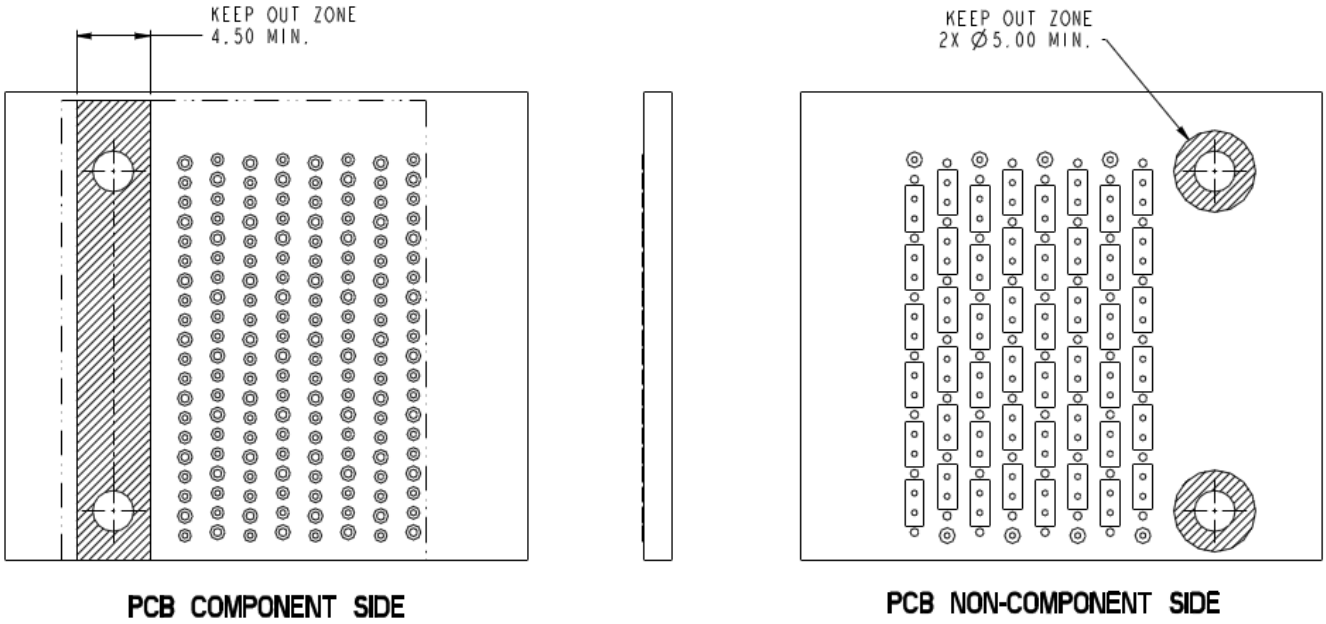

Figure: B-3 Keep Out Zone for Integrated Guide