SFF-TA-1040

Specification for

Internal Low-Profile High-Speed Cable Interconnect

Rev 0.0.1 April 2, 2025

SECRETARIAT: SFF 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 should comply with this specification to achieve interoperability between suppliers.

ABSTRACT: This specification defines a shielded board-to-board low-profile high-speed cable interconnect. The connector as shown has 74 contacts and is configurable for Vertical and Right-Angle applications. The cable-side connector is available in horizontal exit, angle exit, and vertical exit applications.

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FOREWORD

The development work on this specification was done by the SFF TWG, an industry group. Since its formation as the SFF Committee in August 1990, as well as since SFF's transition to SNIA in 2016, 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 https://www.snia.org/join.

REVISION HISTORY

Rev 0.0.1 *April 2, 2025*:
-Initial draft

CONTENTS

FIGURES

TABLES

1. Scope

This specification defines the general description of this form factor, the fixed-side connector mechanical specification, the free-side connector mechanical specification, performance requirements, and the electrical interface. Additional informative information such as PCB layout is included in an appendix.

2. References and Conventions

2.1 Industry Documents

The following documents are relevant to this specification:

- ASME Y14.5 Dimensioning and Tolerancing
- EIA-364-1000 Environmental Test Methodology for Assessing the Performance of Electrical Connectors and Sockets Used in Controlled Environment Applications
- PCIe5p0-6p0-7p0-CopprLink-Internal-Cable-Spec-v0p3-March-20-2025

2.2 Sources

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

Other standards may be obtained from the organizations listed below:

Standard	Organization	Website
ASME	American Society of Mechanical Engineers (ASME)	https://www.asme.org
Electronic Industries Alliance (EIA)	Electronic Components Industry Association (ECIA)	https://www.ecianow.org/eia-technical-standards
IEEE	Institute of Electrical and Electronics Engineers (IEEE)	https://ieeexplore.ieee.org/browse/standards/get-program/page/series?id=68
InfiniBand	InfiniBand Trade Association (IBTA)	https://www.infinibandta.org
JEDEC	Joint Electron Deice Engineering Council (JEDEC)	https://www.jedec.org
OIF	Optical Internetworking Forum (OIF)	https://www.oiforum.com/technical-work/implementation-agreements-ias/
PCIe	PCI-SIG	https://www.pcisig.com/specifications

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: Indicates flexibility of choice with no implied preference.

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

Obsolete: Indicates that an item was defined in prior specifications but has been removed from this specification.

Optional: 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.

Prohibited: Describes a feature, function, or coded value that is defined in a referenced specification to which this SFF specification makes a reference, where the use of said feature, function, or coded value is not allowed for implementations of this specification.

Reserved: Defines 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.

Restricted: Refers to features, bits, bytes, words, and fields that are set aside for other standardization purposes (e.g., entities). If the context of the specification applies the restricted designation, then the restricted bit, byte, word, or field shall be treated as a value whose definition is not in scope of this document, and is not interpreted by this specification.

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.

Vendor specific: Indicates something (e.g., a bit, field, code value) that is not defined by this specification. Specification of the referenced item is determined by the manufacturer and may be used differently in various implementations.

3.2 Acronyms and Abbreviations

IDC: Insulation Displacement Contact
IDT: Insulation Displacement Termination
PCB: Printed Circuit Board
PF: Press Fit
PTH: Plated Through Hole
RA: Right Angle
RAND: Reasonable and Non-Discriminatory
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, guideposts, blind mating features, mating features, alignment features, and mating guides.

Basic (dimension): The theoretical exact size, profile, orientation, or location of a feature. It is used as the basis from which permissible variations are established by tolerances in notes or in feature control frames (GD&T).

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.

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

Datum: A point, line, plane, etc. assumed to be exact for the purposes of computation or reference, as established from actual features, and from which the location or geometric relationship of either feature is established.

Frontshell / Backshell: A term used to describe the metallic part of a module that provides mechanical and shielding continuity between the plug and receptacle. Other terms commonly used are: housing, snout, and metal shroud.

Free-side connector: A term used to describe the connector that is terminated to a PCB. In this specification, the fixed-side connector contains the penetrating contacts of the connector interface as shown in Figure 3-1.

Figure 3-1 Plug and Receptacle Definition

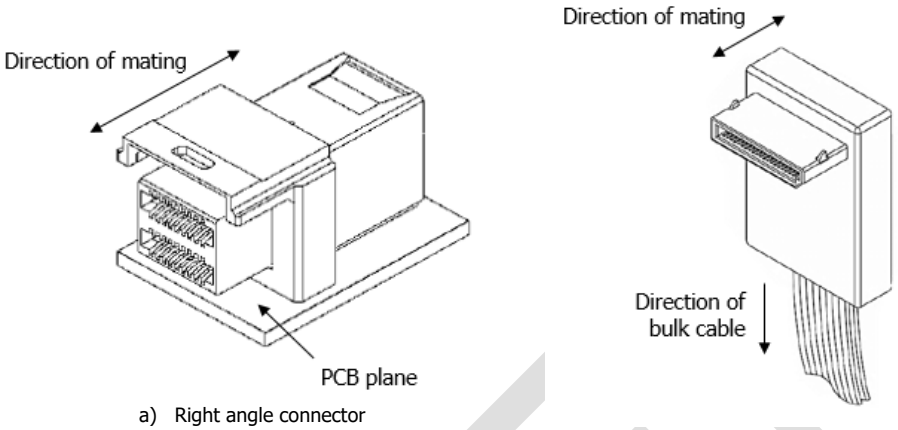
Fixed-side connector: A term used to describe a connector that is terminated to a bulk cable. In this specification, the free-side connector contains the contacts that accept the fixed-side contacts as shown in Figure 3-1.

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.

Reference (dimension): A dimension provided for information or convenience. It has no tolerance and is not to be used for inspection or conformance. It can be calculated from other tolerance dimensions or can be found elsewhere on the drawing with a tolerance. If removed, it would have no impact on the defined object or the ability or reproduce it.

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.



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 solder tails 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 bulk cable or a cage to PCB or solder tail to 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.

Vertical: A term used to describe a connector design where the mating direction is perpendicular to the printed circuit board upon which the connector is mounted.

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

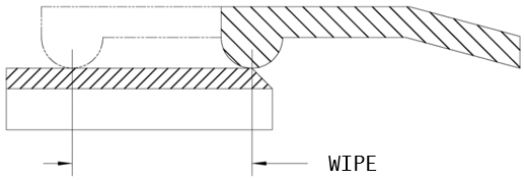


Figure 3-3 Wipe for a Continuous Contact

4. General Description

4.1 Configuration Overview/Descriptions

The connector system described in this document is made up of a fixed-side connector and a free-side connector. The free-side connector may have one of the three different cable exit directions (horizontal (0°), 60°, or vertical (90°)) and may or may not have a pull tab.

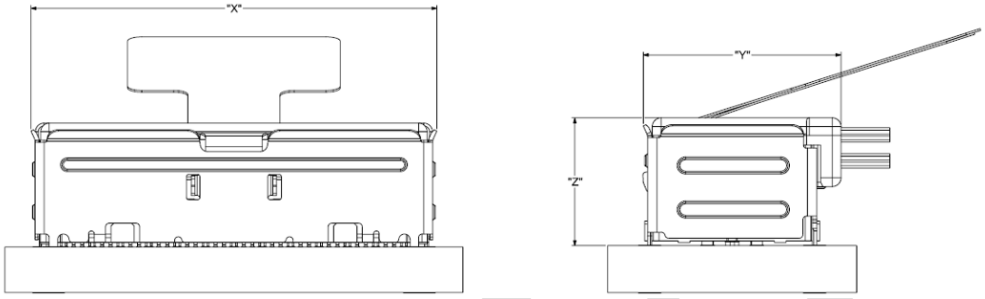


Figure 4-1: Overall dimensions for Connector/Cable Configurations

Table 4-1: Overall dimension values for Connector/Cable Configurations

Configuration	Description	Dim "X"	Dim "Y"	Dim "Z"
1	Free-Side Horizontal (0°) Cable Exit with Pull-Tab	28.63	13.50	8.70

4.1.1 Connector Configuration 1: With Right Angle Cable Exit with Pull Tab

This configuration has the cables exiting the connector perpendicular to the direction of mating and parallel to the PCB. It includes a pull tab for unmating of the connector.

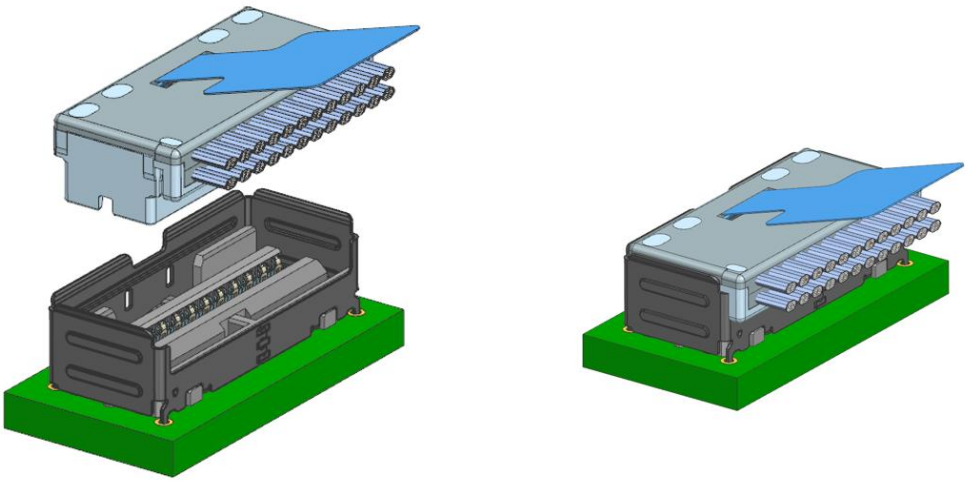


Figure 4-2: Configuration 1 - Unmated and Mated

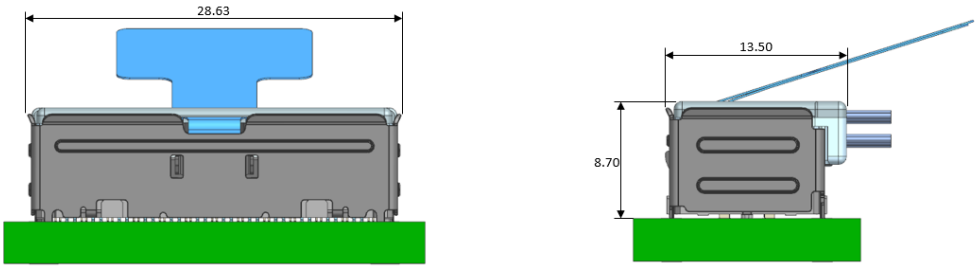


Figure 4-3: Configuration 1 - Mated Dimensions

4.2 Contact Numbering

The pins or electrical contacts in this connector are numbered as shown in Figure 4-4. Electrical assignments are captured in Table 4-2. Contacts labeled "S" denote signals that carry half of a high-speed differential pair. Ground contacts are labeled "GND".

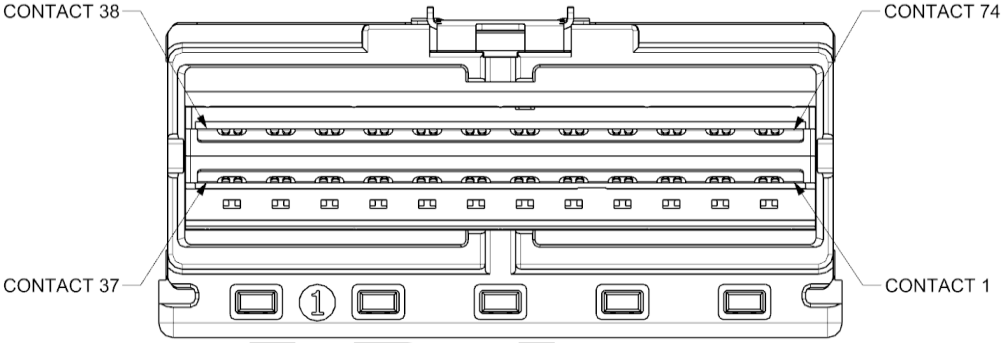


Figure 4-4: Free-Side Connector Contact Numbering

Table 4-2: Free-Side Connector Pinout

P1		P2	
CKT		CKT	
1	GND	38	GND
2	S	39	S
3	S	40	S
4	GND	41	GND
5	S	42	S
6	S	43	S
7	GND	44	GND
8	S	45	S
9	S	46	S
10	GND	47	GND
11	S	48	S
12	S	49	S
13	GND	50	GND
14	S	51	S
15	S	52	S
16	GND	53	GND
17	S	54	S
18	S	55	S
19	GND	56	GND
20	S	57	S
21	S	58	S
22	GND	59	GND
23	S	60	S
24	S	61	S
25	GND	62	GND
26	S	63	S
27	S	64	S
28	GND	65	GND
29	S	66	S
30	S	67	S
31	GND	68	GND
32	S	69	S
33	S	70	S
34	GND	71	GND
35	S	72	S
36	S	73	S
37	GND	74	GND

P1		P2	
CKT		CKT	
38	GND	1	GND
39	S	2	S
40	S	3	S
41	GND	4	GND
42	S	5	S
43	S	6	S
44	GND	7	GND
45	S	8	S
46	S	9	S
47	GND	10	GND
48	S	11	S
49	S	12	S
50	GND	13	GND
51	S	14	S
52	S	15	S
53	GND	16	GND
54	S	17	S
55	S	18	S
56	GND	19	GND
57	S	20	S
58	S	21	S
59	GND	22	GND
60	S	23	S
61	S	24	S
62	GND	25	GND
63	S	26	S
64	S	27	S
65	GND	28	GND
66	S	29	S
67	S	30	S
68	GND	31	GND
69	S	32	S
70	S	33	S
71	GND	34	GND
72	S	35	S
73	S	36	S
74	GND	37	GND

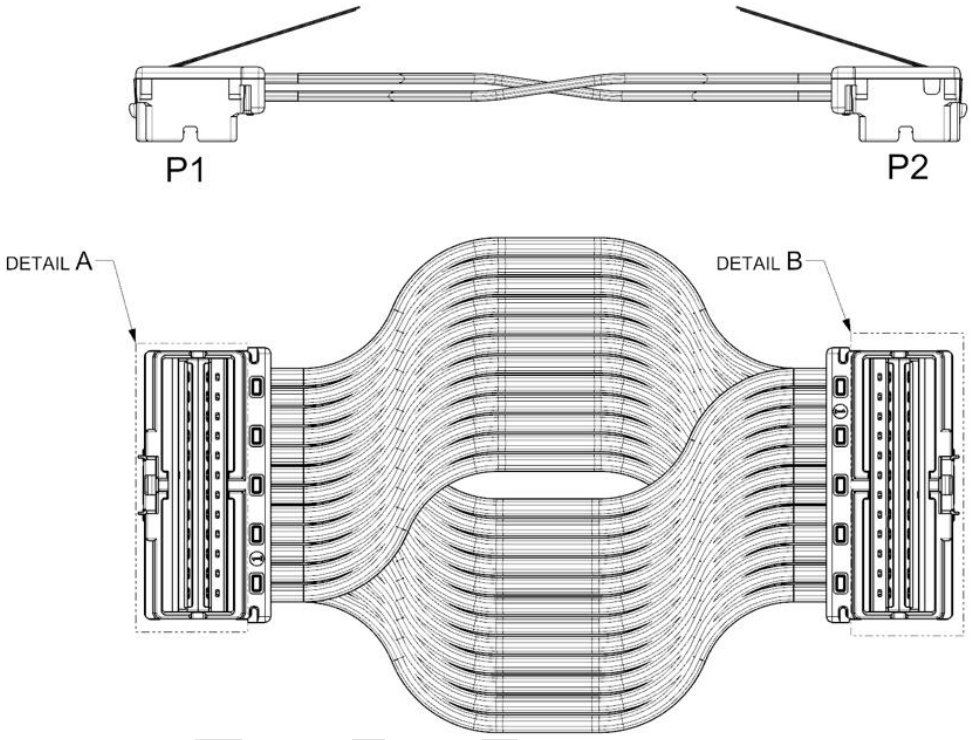


Figure 4-5: Cable Assembly Free-Side Connector Numbering

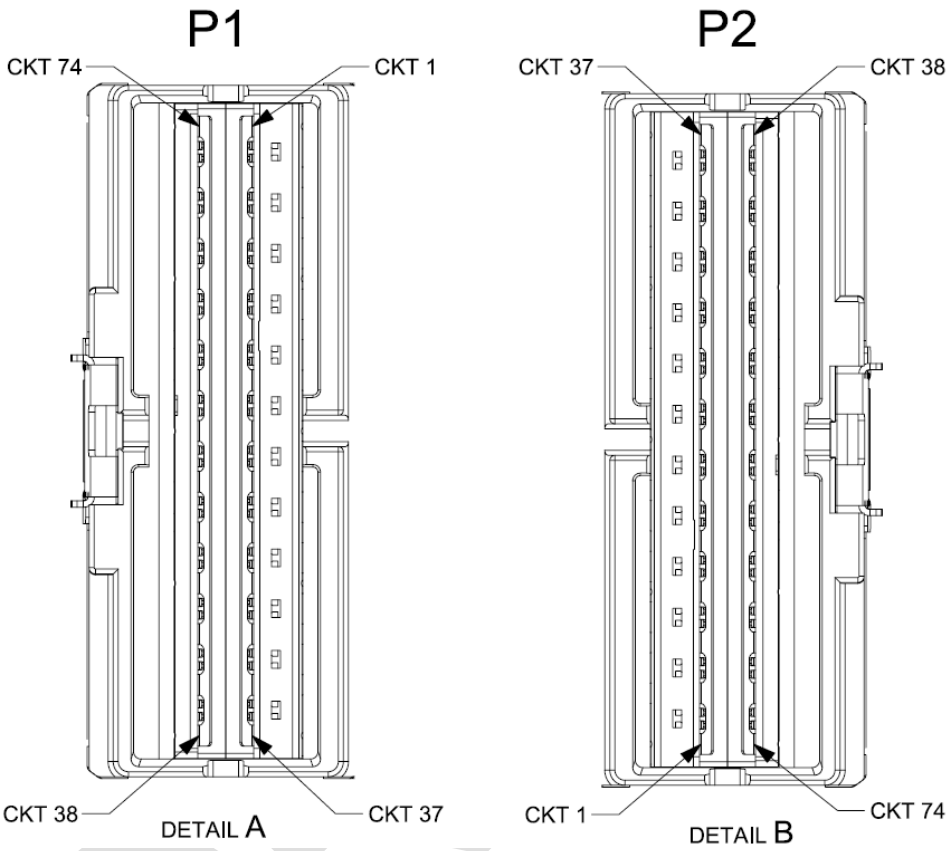


Figure 4-6: Cable Assembly Free-Side Connector Contact Numbering

5. Connector Mechanical Specification

5.1 Overview

5.1.1 Datums

The datums defined in Figure 5-1, and Figure 5-2 are used throughout the rest of the document to describe the dimensional requirements of the connector. Additional descriptions are provided in Table 5-1 and Table 5-2.

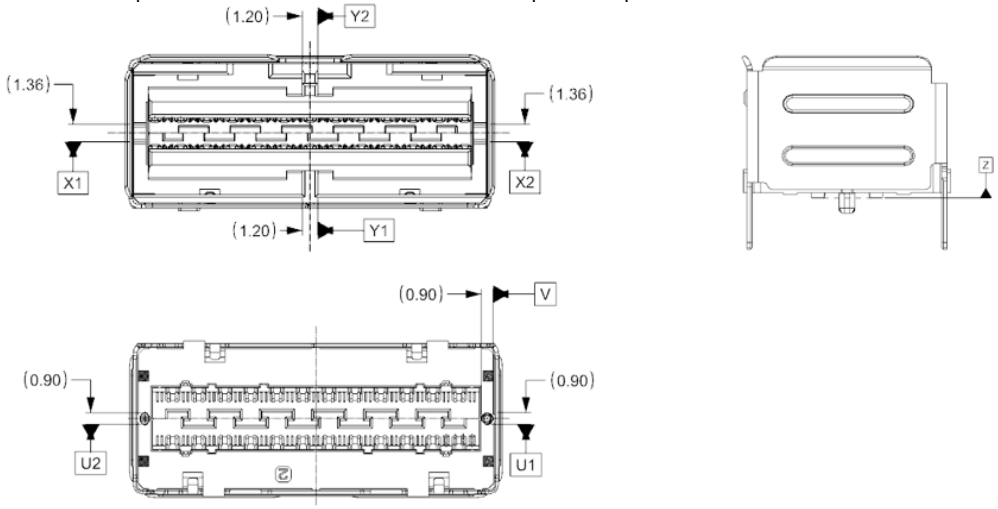


Figure 5-1 Fixed-side Connector Datums

Table 5-1 Fixed-side Connector Datum Descriptions

Datum	Description
X1-X2	Fixed-side centerline Y-direction mate side
Y1-Y2	Fixed-side centerline X-direction mate side
Z	Fixed-side housing (bottom)
U1-U2	Fixed-side centerline Y-direction PCB side
V	Fixed-side centerline X-direction PCB side

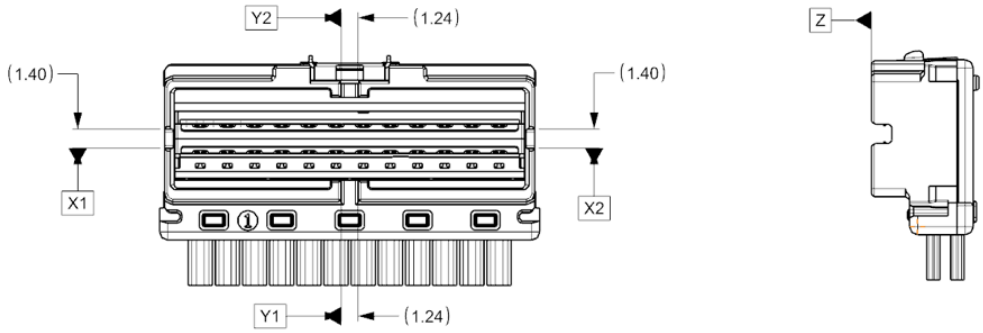


Figure 5-2: Free-side Connector Datums

Table 5-2: Free-side Connector Datums

Datum	Description
X1-X2	Fixed-side centerline Y-direction mate side
Y1-Y2	Fixed-side centerline X-direction mate side
Z	Fixed-side connector (bottom for staging)

5.2 Mechanical Description: Fixed-Side Connector

The fixed-side connector is comprised of insert molded terminals with plastic that are encased by a stainless steel cage with additional solder tails. The fixed-side connector is designed to mate to all free-side connector variants. The fixed-side connector cages are 0.25mm strip thickness which includes latch windows for the free-side cable connector and two passive latches on the sides. A vacuum cap is also included for pick-and-place equipment for placing the connector on the PCB and protecting the contacts during shipment and handling.

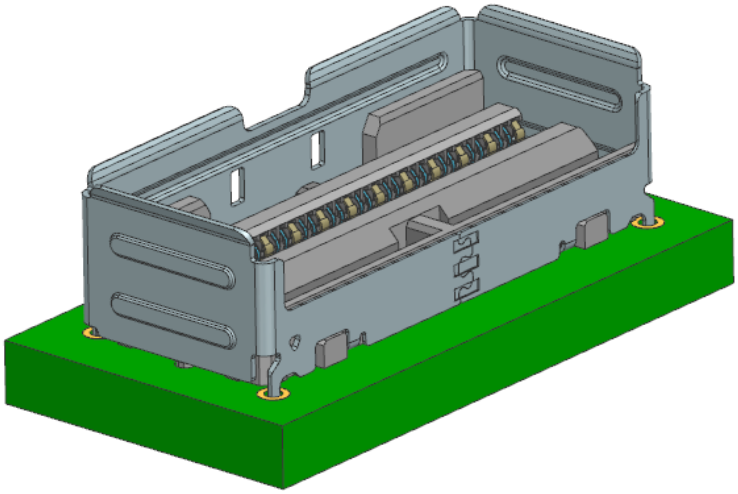


Figure 5-3: Fixed-side Connector without Vacuum cap

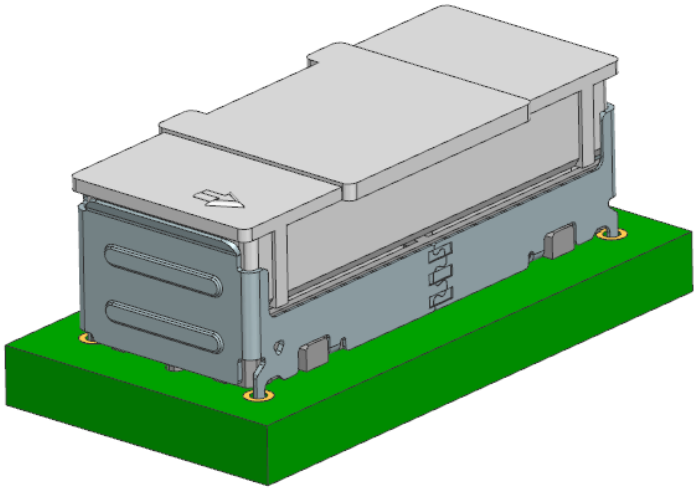


Figure 5-4: Fixed-side Connector with Vacuum Cap

The vacuum cap for the fixed-side connector is designed to fit only one way. It has an arrow on the top surface identifying the location of the contact 1 (refer to section 4.2 for contact numbering)

5.2.1 Mechanical Description: Fixed-Side Connector

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

a. Two & Three Place dimensions = +/- 0.05mm
b. Angular dimension = +/- 0.5°

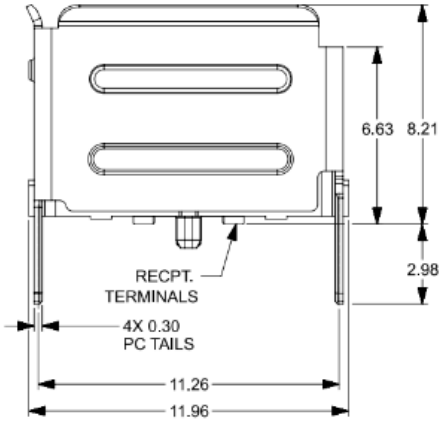


Figure 5-5: Profile View of Fixed-Side Connector Cage

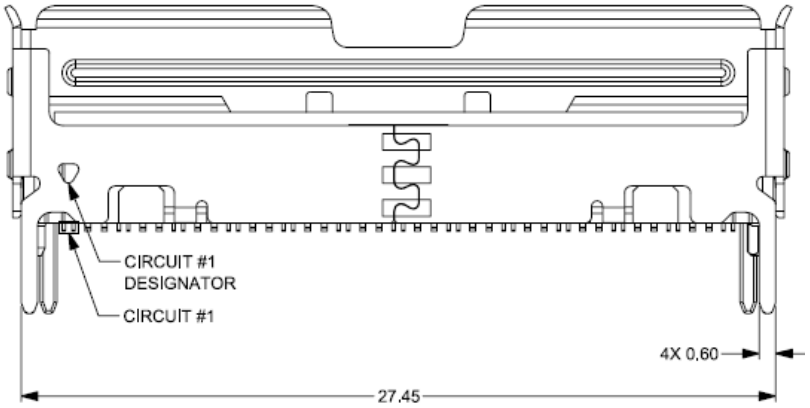


Figure 5-6: Front View of Fixed-Side Connector Cage

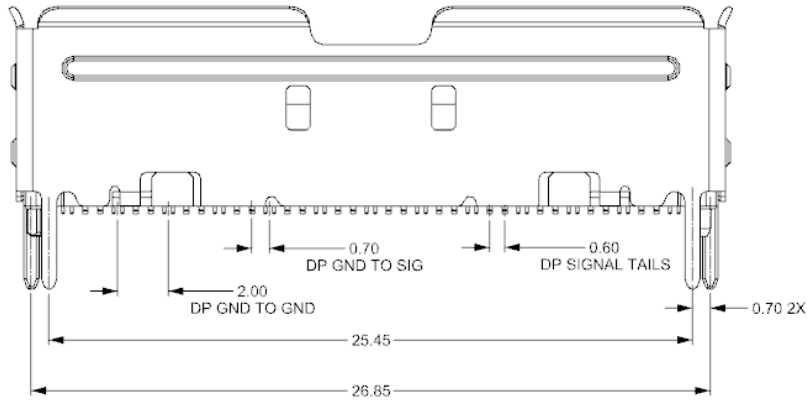


Figure 5-7: Back View of Fixed-Side Connector Cage

6. Free-Side Mechanical Specification

6.1 Overview

The free-side connector housing and cover are plastic. Twinax cable and single-ended ribbon cable is connector to the mating terminals inside the free-side connector.

6.2 Mechanical Description: Free-Side Connectors

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

a. Two & Three Place dimensions = +/- 0.05mm
b. Angular dimension = +/- 0.5º

6.2.1 Free-Side Variant 1: Horizontal (0º) Cable Exit with Pull-Tab

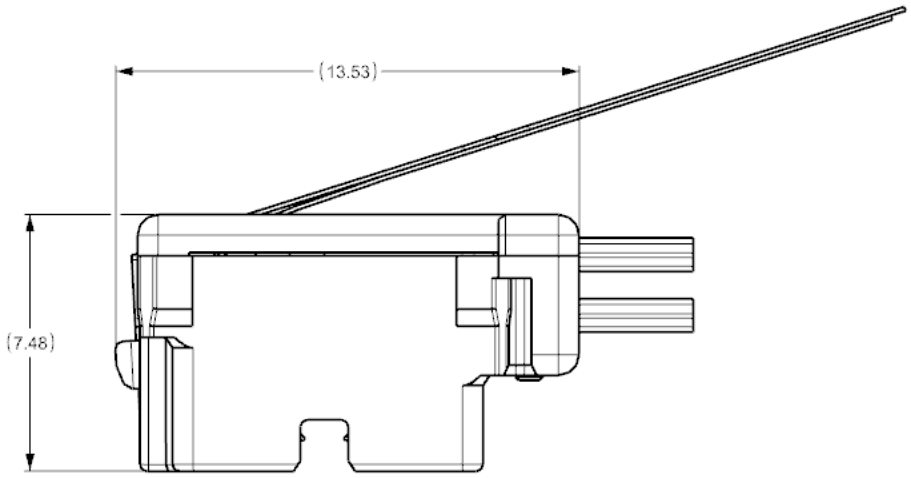


Figure 6-1: Profile View of Free-Side Connector with Right Angle Cable Exit & Pull Tab

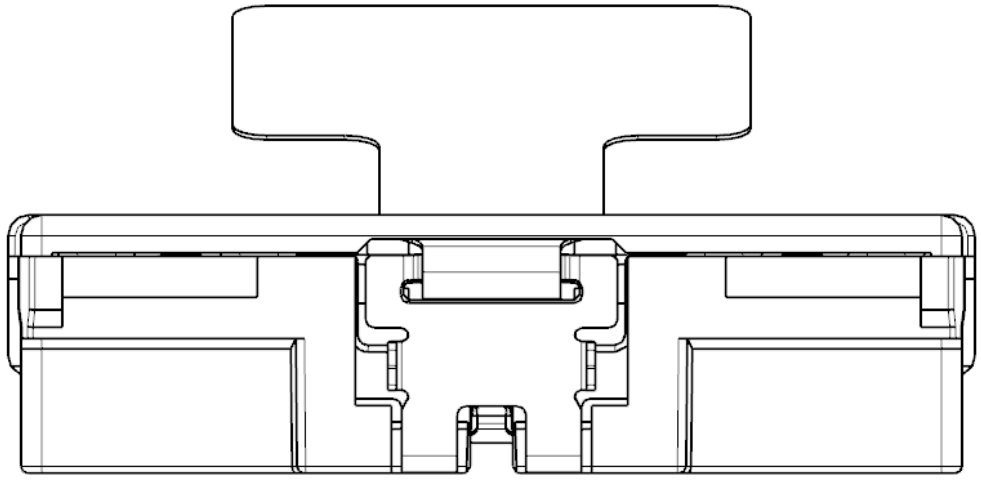


Figure 6-2: Right Angle Cable Exit & Pull-Tab

7. Dust Covers

7.1 Overview

The vacuum cap for the fixed-side connector is designed to fit only one way. It has an arrow on the top surface identifying the location of the contact 1 (refer to section 4.2 for contact numbering)

7.2 Dust Covers: Free-Side Connector

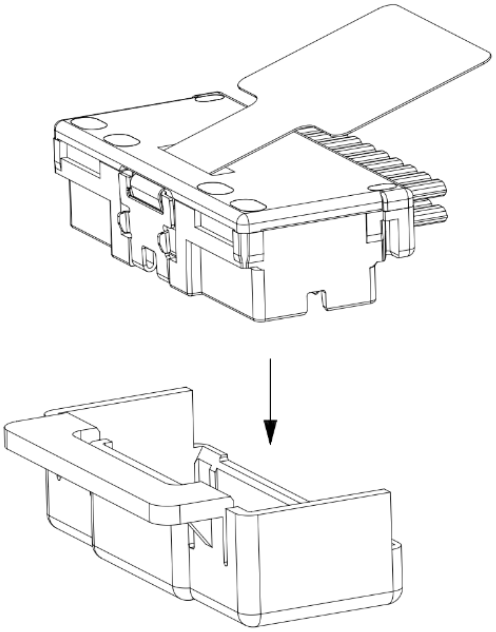


Figure 7-1: Free-Side Connector & Dust Cover Assembly Direction

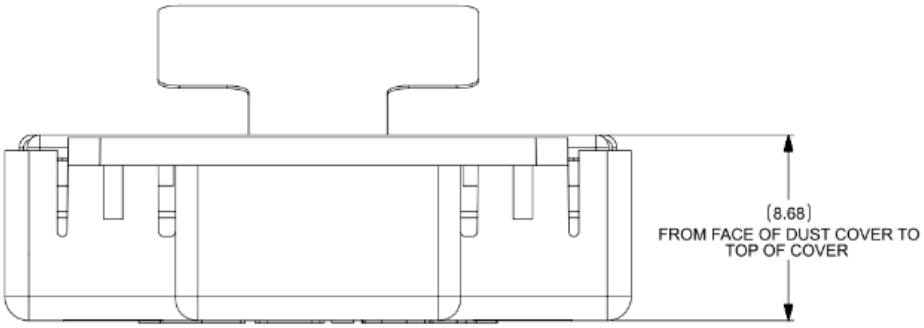


Figure 7-2: Top View of Free-Side Connector with Dust Cover Attached

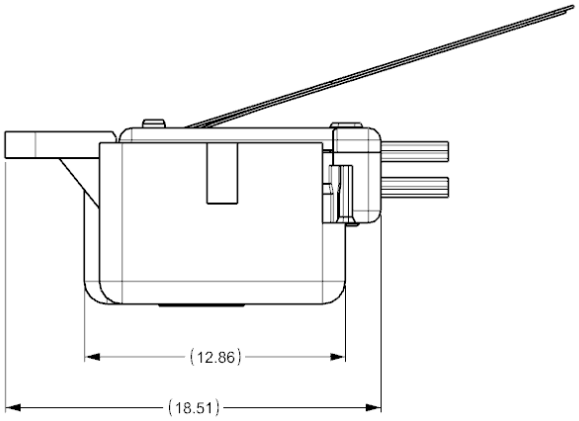


Figure 7-3: Profile View of Free-Side Connector with Dust Cover Attached

7.3 Dust Covers: Fixed-Side Connector

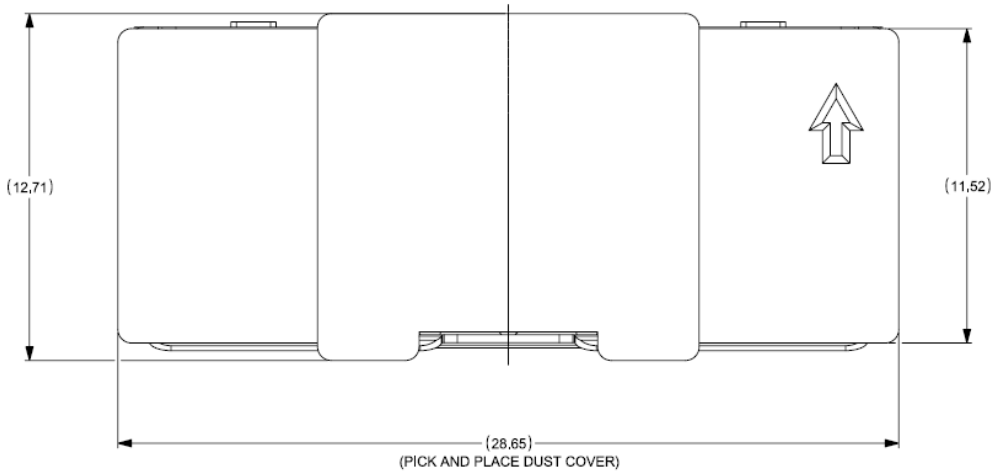


Figure 7-4: Top View of Fixed-Side Connector with Dust Cover

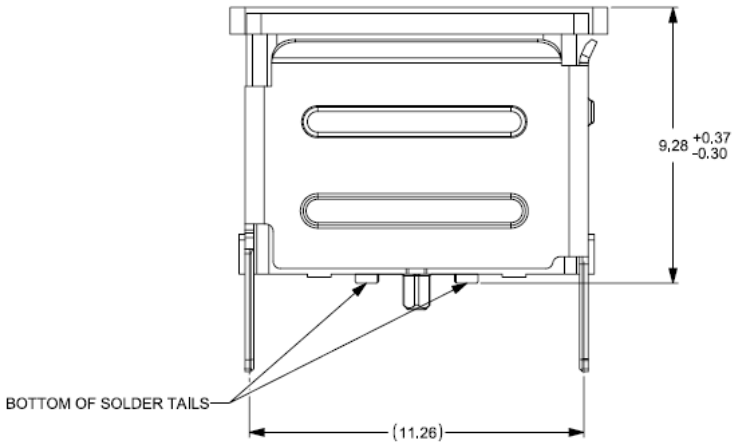


Figure 7-5: Profile View of Fixed-Side Connector with Dust Cover

8. Test Requirements and Methodologies (TS-1000, etc.)

8.1 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 8-1 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 8-2. Finally, testing procedures used to validate any performance criteria not included in EIA-364-1000 are provided in Table 8-3.

Table 8-1 Form Factor Performance Requirements

Performance Parameters	Description/ Details	Requirement
Mechanical/ Physical Requirements		
Plating Type	Plating type on 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
Rated Durability Cycles	The expected number of durability cycles a component is expected to encounter over the course of its life	Connector/ cage: 100 cycles
Latched Mating Force*	Amount of force needed to mate a module with a connector when latches are deactivated	45 N MAX
Latched Unmating Force*	Amount of forced needed to separate a module from a connector when latches are deactivated	45 N MAX
Latch Retention*	Amount of force the latching mechanism can withstand	65 N MIN

Table 8-1 Form Factor Performance Requirements (Continued)

Performance Parameters	Description/ Details	Requirement
Environmental Requirements		
Field Life	The expected service life for a component	10 years
Field Temperature	The expected service temperature for a component	0°C - 65°C
Storage Temperature*	The expected storage temperature for a component when not in use	-##°C to +##°C
Storage Humidity*	The expected storage humidity for a component when not in use	##% Relative Humidity
Environmental Requirements		
Current*	Maximum current to which a contact is exposed in use	0.25A per contact pair MAX
Operating Rating Voltage	Maximum voltage to which a contact is exposed in use	29.9V DC per contact MAX
NOTE: Performance criteria denoted with stars (*) are not validated by EIA-364-1000 testing. Refer to **Table 8-3** for test procedures and pass/fail criteria.		

Table 8-2 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 8-1 are met. Any information in this table supersedes EIA-364-1000.

Table 8-2 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 connector, cage, and module (Latches should not be locked)	No evidence of physical damage
Durability (see Note 1)	EIA-364-09 To be tested with connector, cage, and module (Latches should not be locked out per EIA-364-1000)	No visual damage to mating interface or latching mechanism
Environmental Tests		
Mixed Flowing Gas (see Note 2)	EIA-364-65 Class II See Table 4.1 in EIA-364-1000 for exposure times Test option Per EIA-364-1000: 4	No intermediate test criteria
Electrical Tests		
Low Level Contact Resistance (see Note 3)	EIA-364-23 20 mV DC 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 300 VAC minimum for 1 minute Applied voltage may be product / application specific	No defect or breakdown between adjacent contacts -AND- 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 8-3 describes the testing procedures necessary to validate performance criteria not validated by EIA-364-1000 testing. The tests are to be performed in such a way that the parameters/ requirements defined in Table 8-1 are met.

Table 8-3 Additional Test Procedures

Test	Test Descriptions and Details	Pass/ Fail Criteria
Mechanical/ Physical Tests		
Latched Mating Force	EIA-364-13 To be tested with cage, connector, and module without heat sinks Latching mechanism deactivated (locked out)	Refer to Table 8-1 -AND- No physical damage to any components
Latched Unmating Force	EIA-364-13 To be tested with cage, connector, and module without heat sinks Latching mechanism deactivated (locked out)	
Latch Retention	EIA-364-13 To be tested with cage, connector, and module without heat sinks Latching mechanism engaged (not locked out)	
Environmental Tests		
Storage Temperature	EIA-364-32 Method A, Test Condition 1, Duration 4 Use min and max Field Temperatures listed in Table 8-1 for temperature range	Refer to Table 8-1
Storage Humidity	EIA-364-31	Refer to Table 8-1
Electrical Tests		
Current	EIA-364-70 Method 1, 30-degree temperature rise Contacts energized: 8 adjacent signal contacts within a single wafer	Refer to Table 8-1 for current magnitude
NOTES: .		

Appendix A. System Mechanical Specification (Informative)

A.1. Overview

A.2. PCB Layout

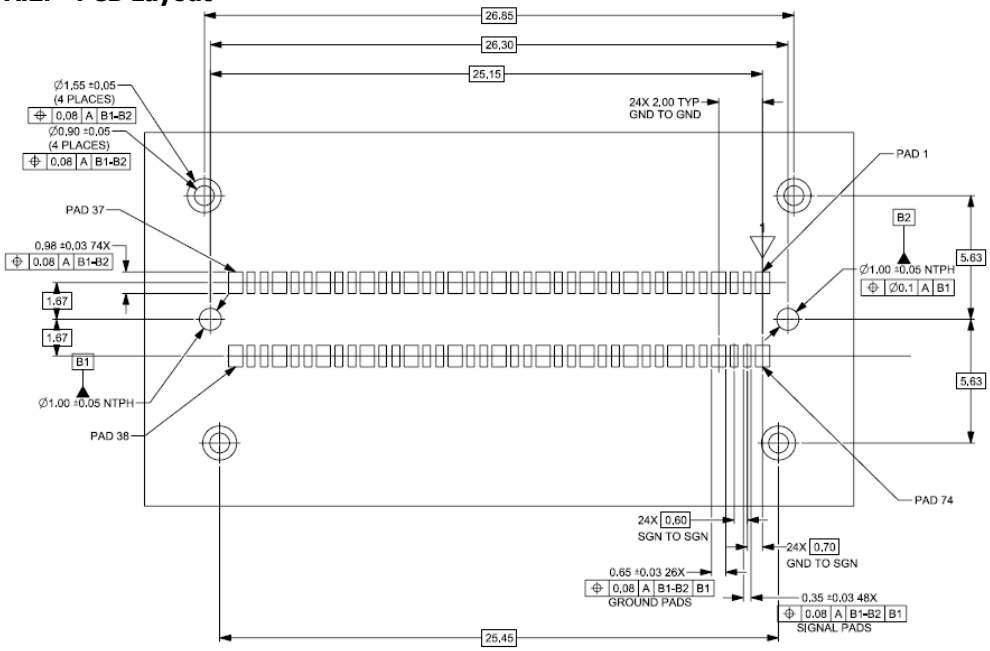


Figure A-1: PCB Layout