



SFF-TA-1044

Specification for

Hybrid Orthogonal EDSFF Connector System

Rev 1.0

March 27, 2026

SECRETARIAT: SFF TWG

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ABSTRACT: This specification defines the hybrid orthogonal interconnect system: a PCB mount connector with a standard EDSFF interface and a cable plug interface, a cable assembly that passes the high-speed signals from the connector to a host board, and a connection to a separate board for low-speed signals. The connector may accept 1C, 2C, or 4C EDSFF devices.

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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, 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

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| Rev 1.0 | March 27, 2026 First Publication |
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1. Scope

This specification defines the general description of this form factor, the connector and mating plug mechanical specification, some 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
- SNIA-SFF-TA-1002 Protocol Agnostic Multi-Lane High Speed Connector
- SNIA-SFF-TA-1005 Universal Backplane Management (UBM)
- SNIA-SFF-TA-1008 Enterprise and Datacenter Standard Form Factor (E3)
- SNIA-SFF-TA-1009 Enterprise and Datacenter Standard Form Factor Pin and Signal Specification
- SNIA-SFF-TA-1045 Pin and Signal Definition for the Hybrid Orthogonal EDSFF Connector Specification

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 |

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 implemented as defined by the specification. Describing a feature as optional in the text is an informational callout 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: Where the term is used for a signal on a connector contact, the 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. If the context of the specification applies to 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

EMLB: Early Mate Late Break

PCB: Printed Circuit Board

PF: Press Fit

PTH: Plated Through Hole

RA: Right Angle

RAND: Reasonable and Non-Discriminatory

RS: Returned Sidebands

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.

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.

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.

Fixed-side connector: A term used to describe a connector that is terminated to a PCB. An example is shown in Figure 3-1.

Free-side connector: A term used to describe connector terminals that make electrical connections across a separable interface (e.g., the cable end). An example is shown in Figure 3-1.

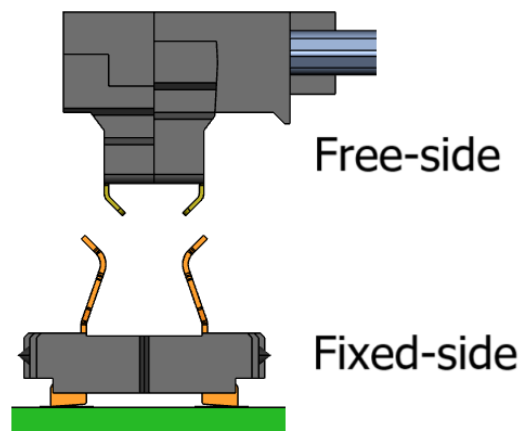


Figure 3-1 Fixed-side and Free-side Connector Definition

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 common terms include housing, snout, and metal shroud.

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 assembly, 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 3-2. Plugs typically contain stationary contacts. Other common terms include male connector, pin connector, and card edge.

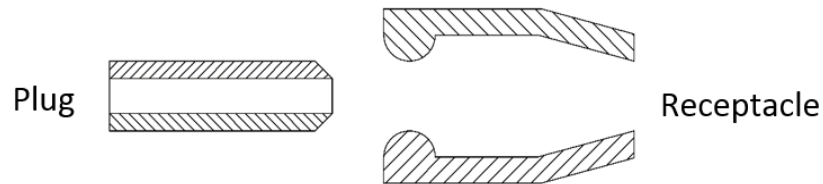


Figure 3-2 Plug and Receptacle Definition

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 include plated through hole (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 3-2. Receptacles typically contain spring contacts. Other common terms include female connector and socket connector.

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 to 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.

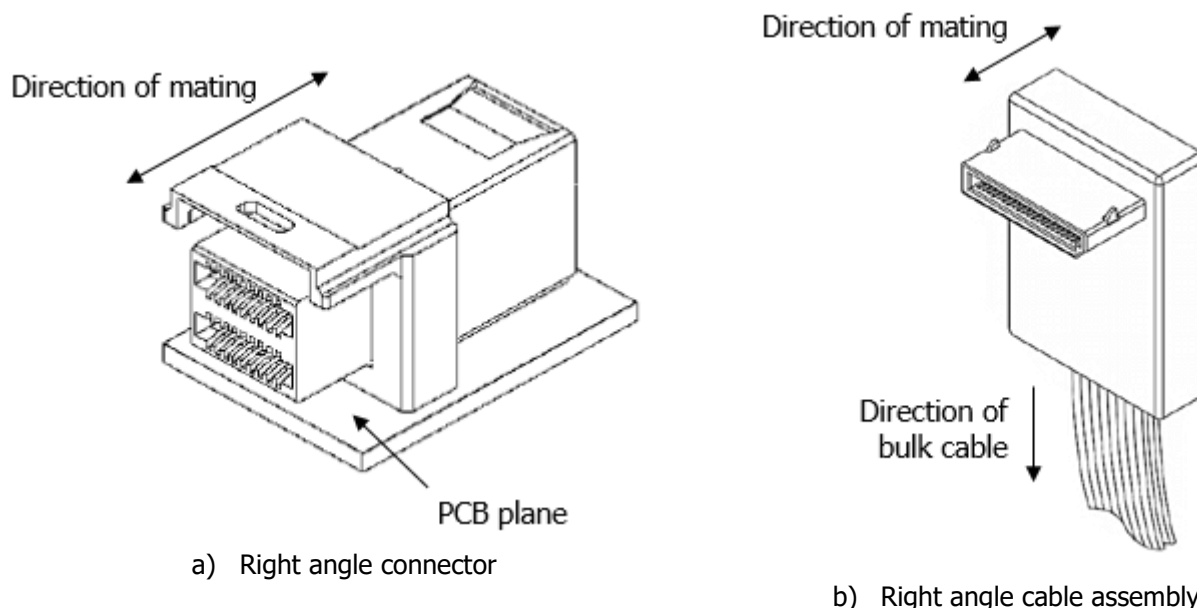


Figure 3-3 Right Angle Connector and Cable Assembly

Straddle mount: A term used to describe a termination style that uses surface mount termination points on both sides of a PCB.

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 include surface mount technology (SMT).

Termination: A term used to describe a connector's non-separable attachment point such as a connector contact to a bulk cable/ a cage to a PCB or flex circuit/ bulk cable to a PCB or flex circuit/ solder tail to PCB. Common PCB terminations include surface mount technology (SMT), plated through hole (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 3-4.

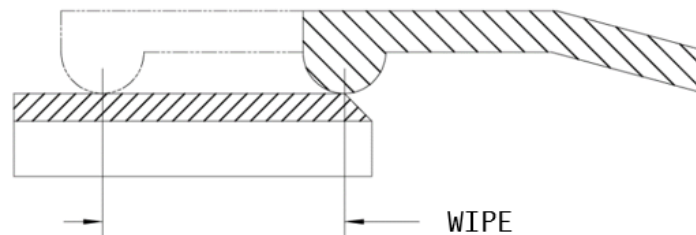


Figure 3-4 Wipe for a Continuous Contact

4. General Description

4.1 Configuration Overview/Descriptions

This document describes an interconnect system that includes a PCB mount receptacle connector and a cable plug. Figure 4-1 illustrates an overview of the interconnect system. The orthogonal receptacle connector accepts EDSFF devices on the left side and a cable plug on the right side. The connector directly passes through high-speed signals and some sidebands between the device and the cable plug. The connector routes power and some sidebands to a midplane. The sidebands may or may not be processed and returned to the connector. The connector then passes the sidebands to the cable plug. The other end of cable may be attached a SNIA SFF-TA-1016 connector to a host board.

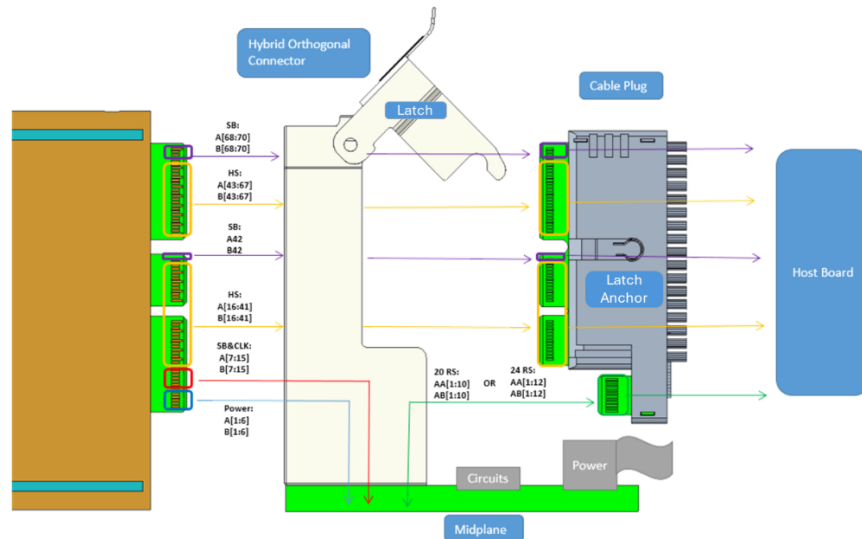


Figure 4-1 Hybrid Orthogonal EDSFF Connector System Overview

The hybrid orthogonal connector has 1C, 2C and 4C configurations. Each configuration may have cable plugs with 20 or 24 sideband pins returned from the midplane. Those pins are referred to RS (returned sidebands) in this document. 1C and 2C connectors have both standalone and ganged versions. Figure 4-2 shows configuration overview.

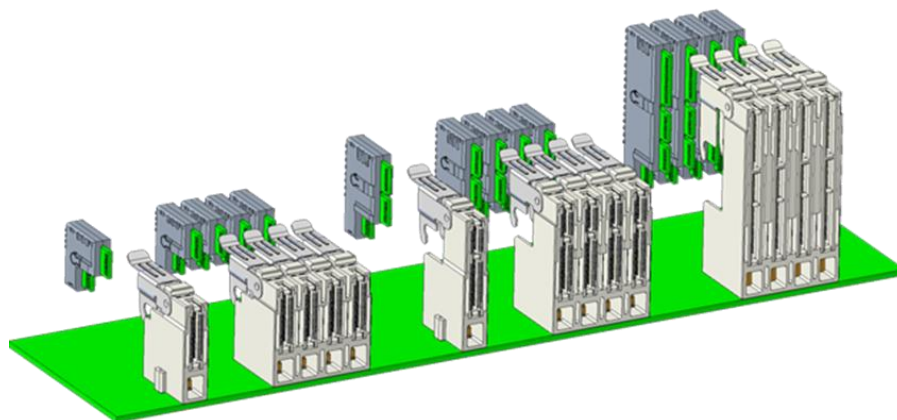


Figure 4-2 Connector Configuration Overview

The orthogonal connector defined in this specification has all high-speed ground pins joined together within the connector body. Using the same connector type definition in SNIA SFF-TA-1002, the connector in this specification is called "Type 2". The connector shall be clearly labeled. The location of the label is recommended in Appendix B.

4.1.1 Connector Configuration 1 – 1C-RS20

This configuration has 1C connector height and 20 sidebands returned from midplane.

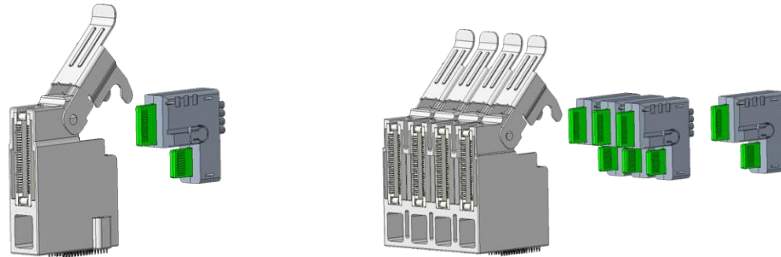


Figure 4-3 1C Hybrid Orthogonal Connector Receptacle and Plug with RS20

4.1.2 Connector Configuration 2 – 1C-RS24

This configuration has 1C connector height and 24 sidebands returned from midplane.

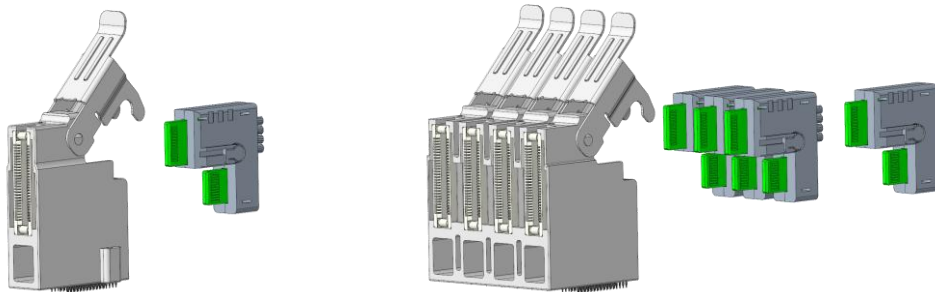


Figure 4-4 1C Hybrid Orthogonal Connector Receptacle and Plug with RS24

4.1.3 Connector Configuration 3 – 2C-RS20

This configuration has 2C connector height and 20 sidebands returned from midplane.

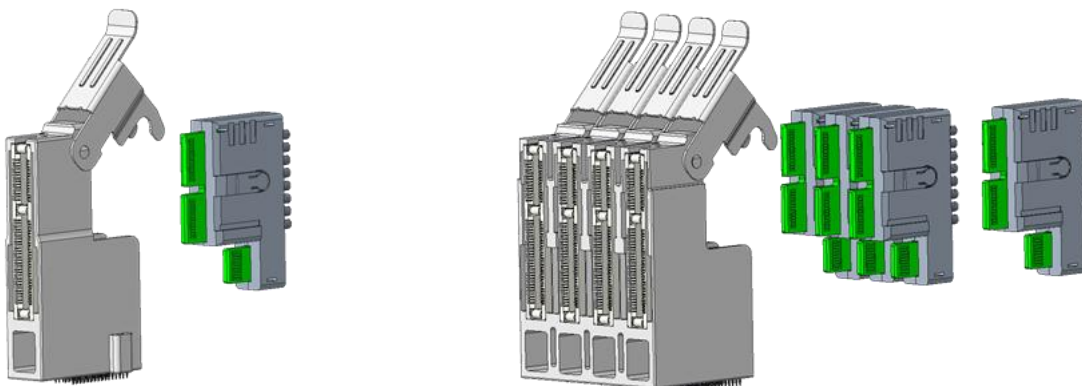


Figure 4-5 2C Hybrid Orthogonal Connector Receptacle and Plug with RS20

4.1.4 Connector Configuration 4 – 2C-RS24

This configuration has 2C connector height and 24 sidebands returned from midplane.

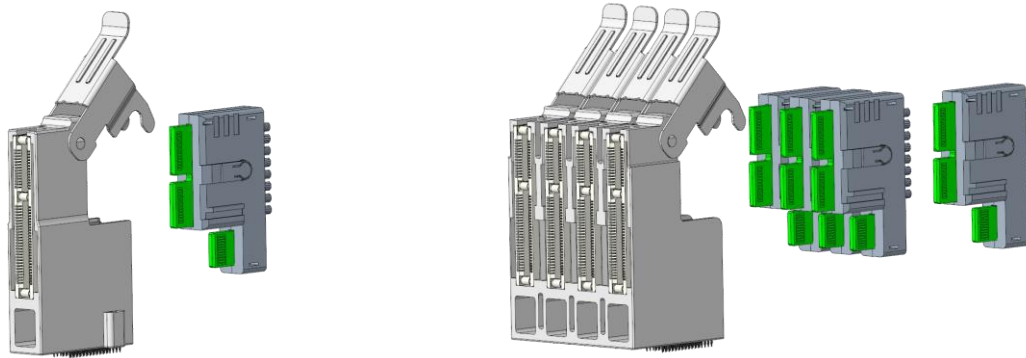


Figure 4-6 2C Hybrid Orthogonal Connector Receptacle and Plug with RS24

4.1.5 Connector Configuration 5 – 4C-RS20

This configuration has 4C connector height and 20 sidebands returned from midplane.

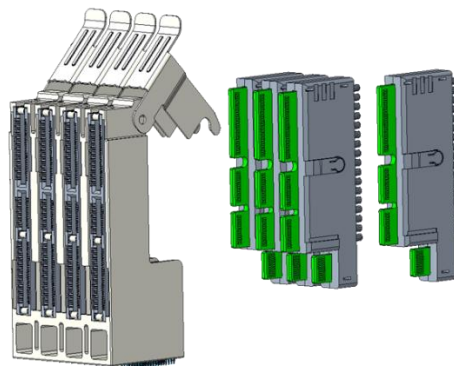


Figure 4-7 4C Hybrid Orthogonal Connector Receptacle and Plug with RS20

4.1.6 Connector Configuration 6 – 4C-RS24

This configuration has 4C connector height and 24 sidebands returned from midplane.

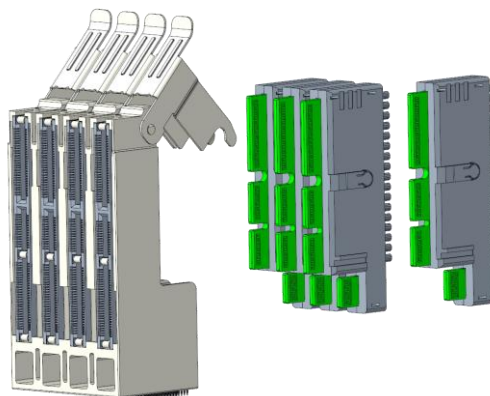


Figure 4-8 4C Hybrid Orthogonal Connector Receptacle and Plug with RS24

4.2 Contact Numbering

The pins or electrical contacts in the receptacle connectors are numbered as shown in Figure 4-9 and Figure 4-10. The pins or electrical contacts in the plug module are numbered as shown in Figure 4-11 and Figure 4-12. 1C, 2C and 4C connectors share the same footprint. The footprint pins are numbered as shown in Figure 4-13 and Figure 4-14.

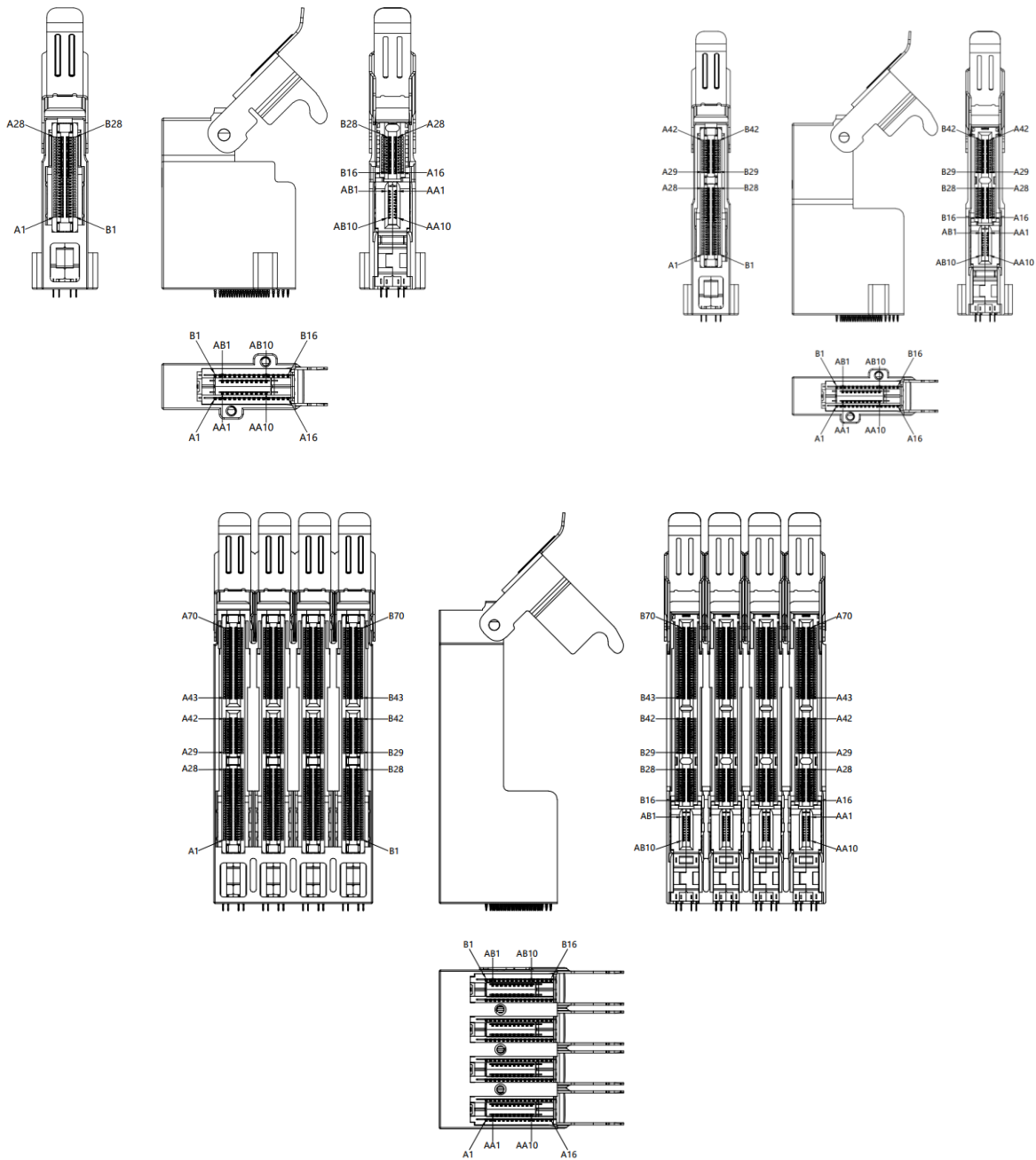


Figure 4-9 Contact Numbering of Receptacle Connectors with RS20

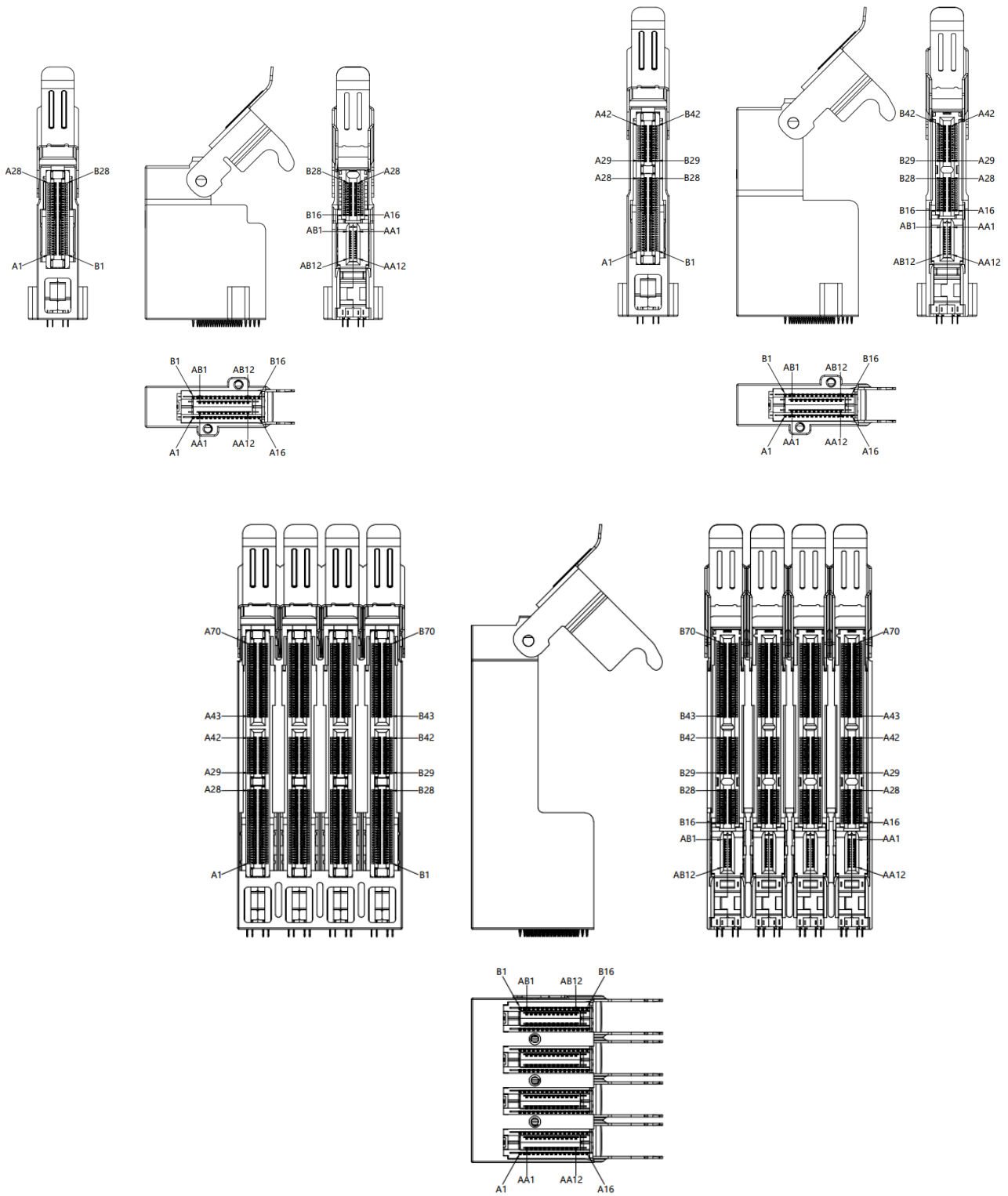


Figure 4-10 Contact Numbering of Receptacle Connectors with RS24

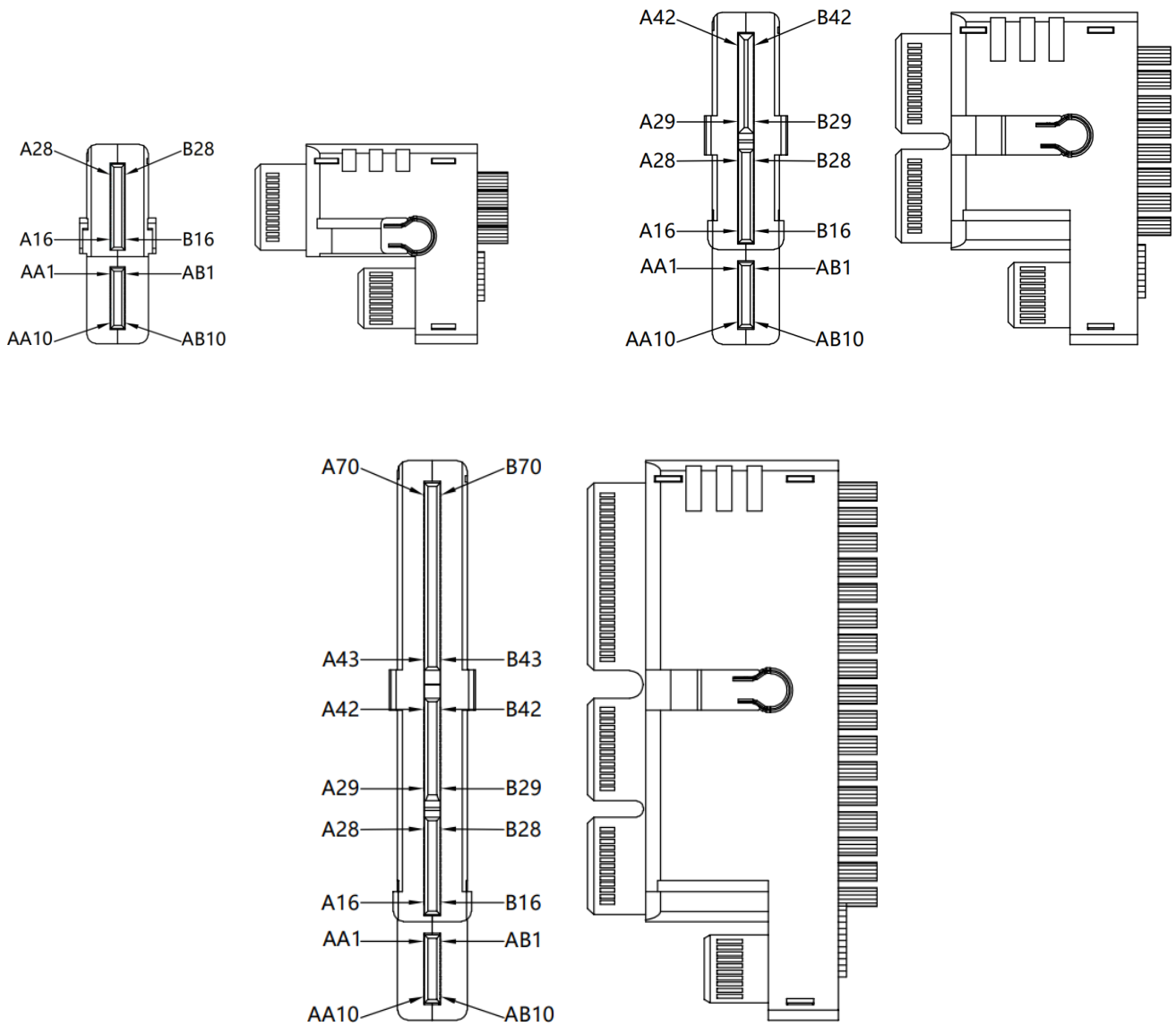


Figure 4-11 Contact Numbering of Plugs with RS20

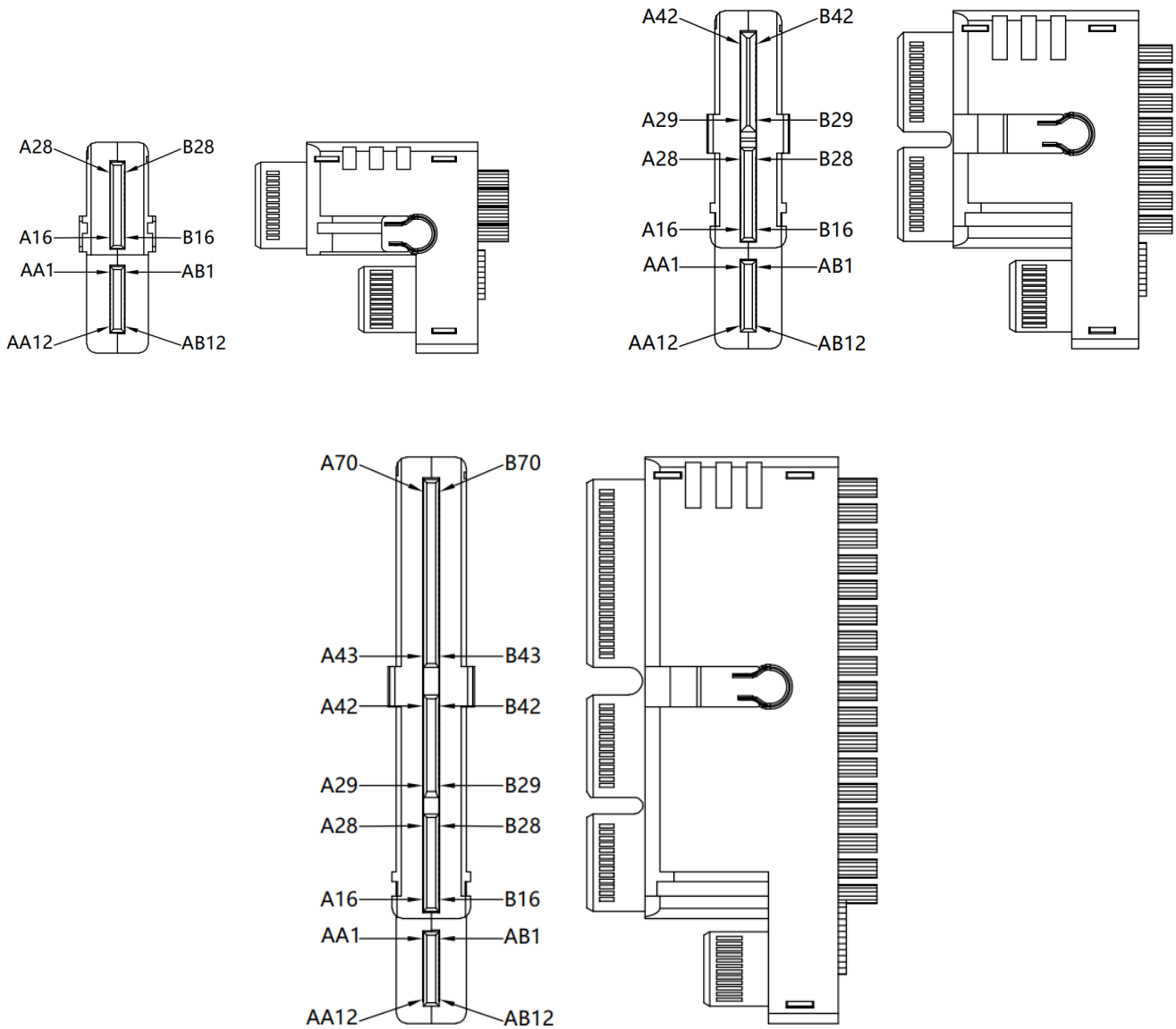


Figure 4-12 Contact Numbering of Plugs with RS24

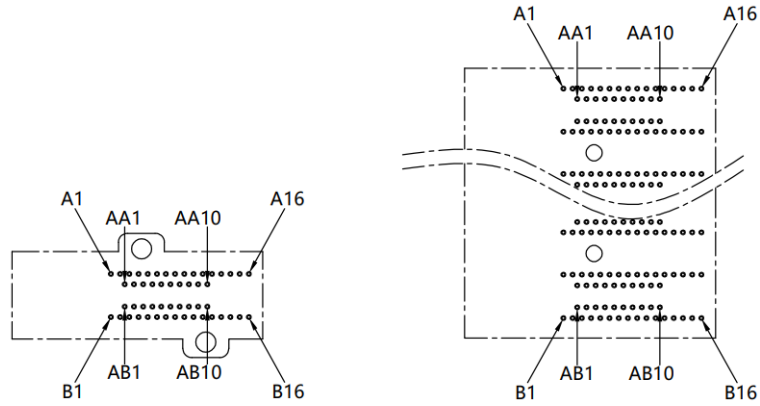


Figure 4-13 Pin Numbering of PCB Footprint with RS20

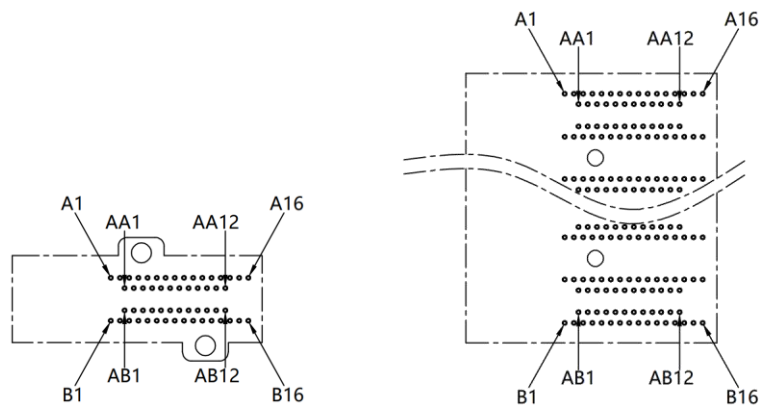


Figure 4-14 Pin Numbering of PCB Footprint with RS24

5. Connector Mechanical Specification

5.1 Overview

The mechanical drawings of all receptacle connector configurations are shown in this section. For ganged version, only a group of 4 connectors is shown in the drawing. It is easy to extrapolate it to other numbers of connectors in a group with the same pitch between connector to connector. 1x2, 1x3 and 1x4 are typical ganged usage cases.

Unless otherwise specified in the drawing, the following tolerances shall apply by default:

- a. Dimension with one decimal place, default tolerance +/- 0.25 mm
- b. Dimension with two decimal places, default tolerance +/- 0.20 mm
- c. Dimension with three decimal places, default tolerance +/- 0.10 mm
- d. Angular dimension, default tolerance +/- 0.5°

5.2 Mechanical Description: Hybrid Orthogonal 1C Connector

5.2.1 Hybrid Orthogonal 1C-RS20 Connector

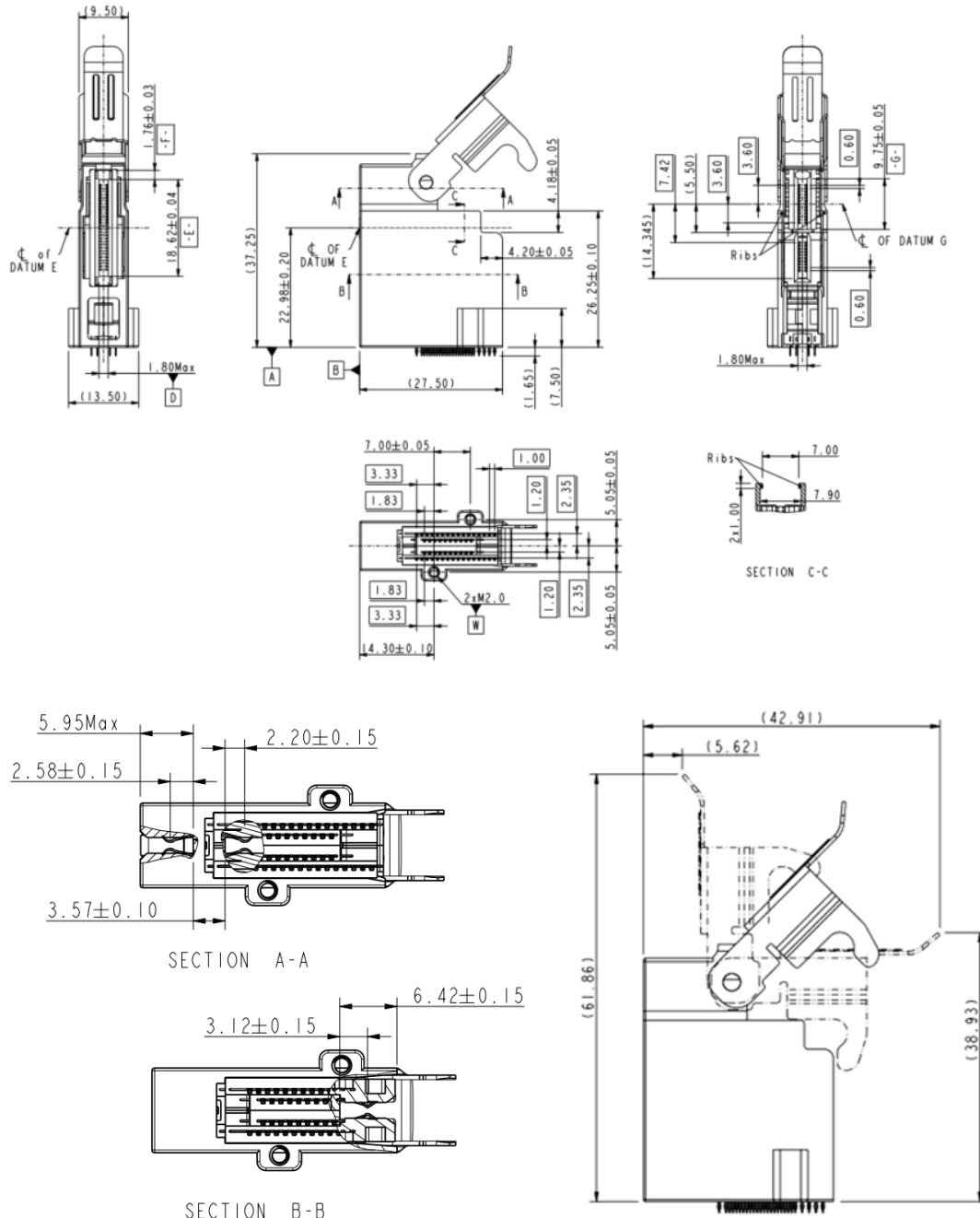


Figure 5-1 Standalone 1C-RS20 Connector

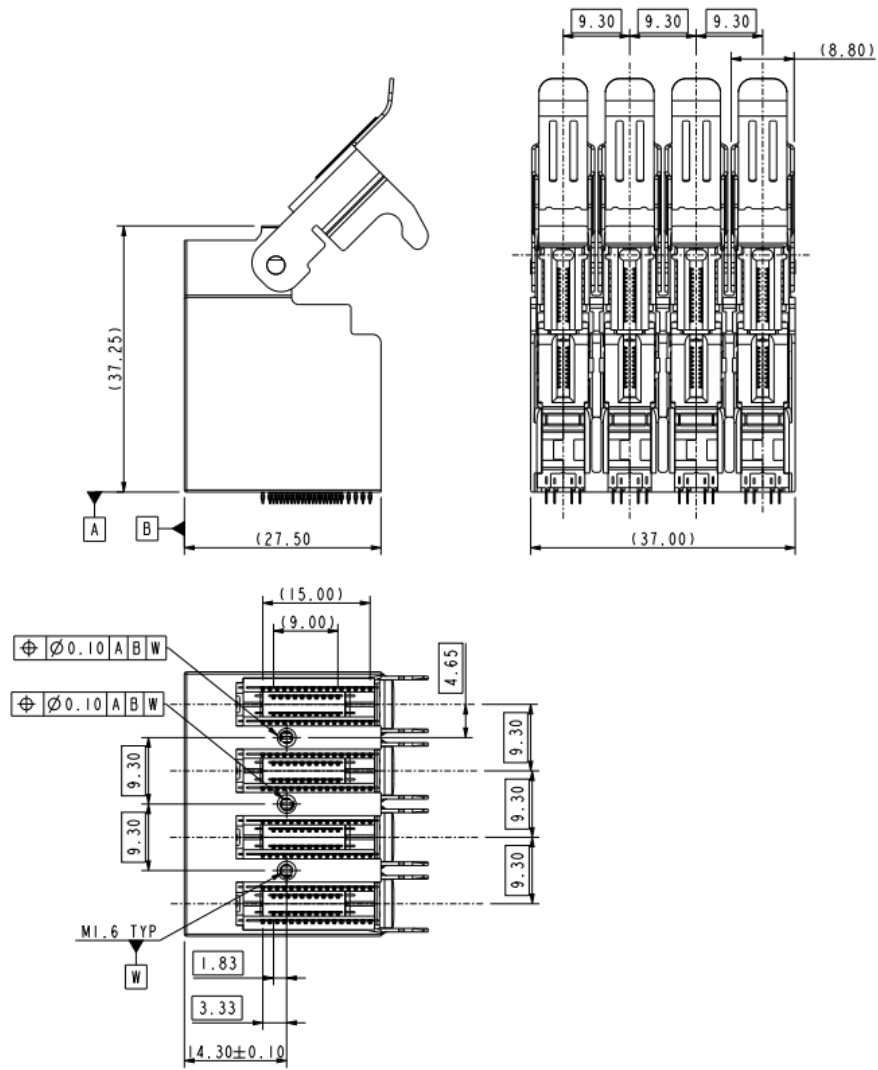


Figure 5-2 Ganged 1C-RS20 Connector

5.2.2 Hybrid Orthogonal 1C-RS24 Connector

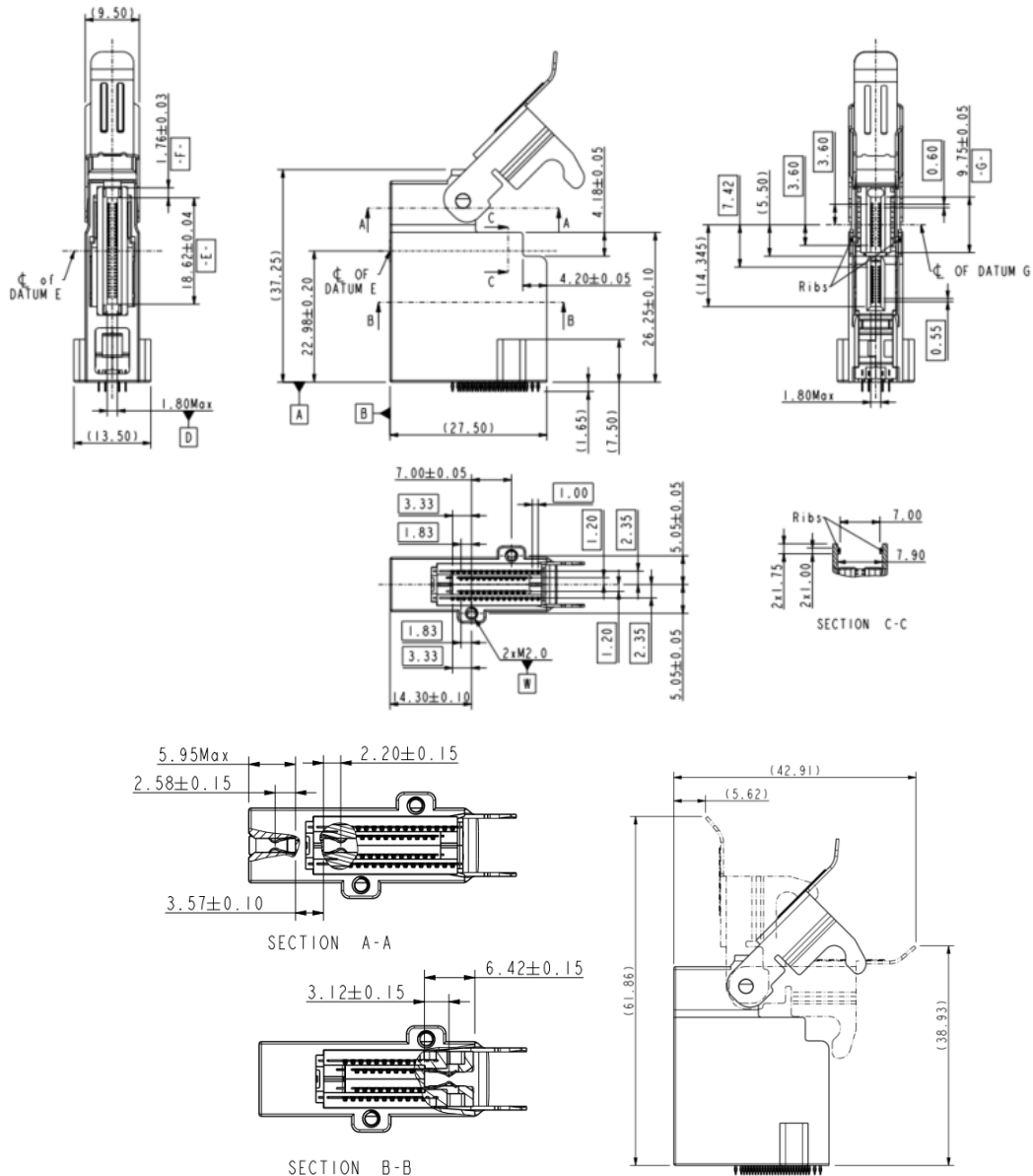


Figure 5-3 1C-RS24 Connector

5.3 Mechanical Description: Hybrid Orthogonal 2C Connector

5.3.1 Hybrid Orthogonal 2C-RS20 Connector

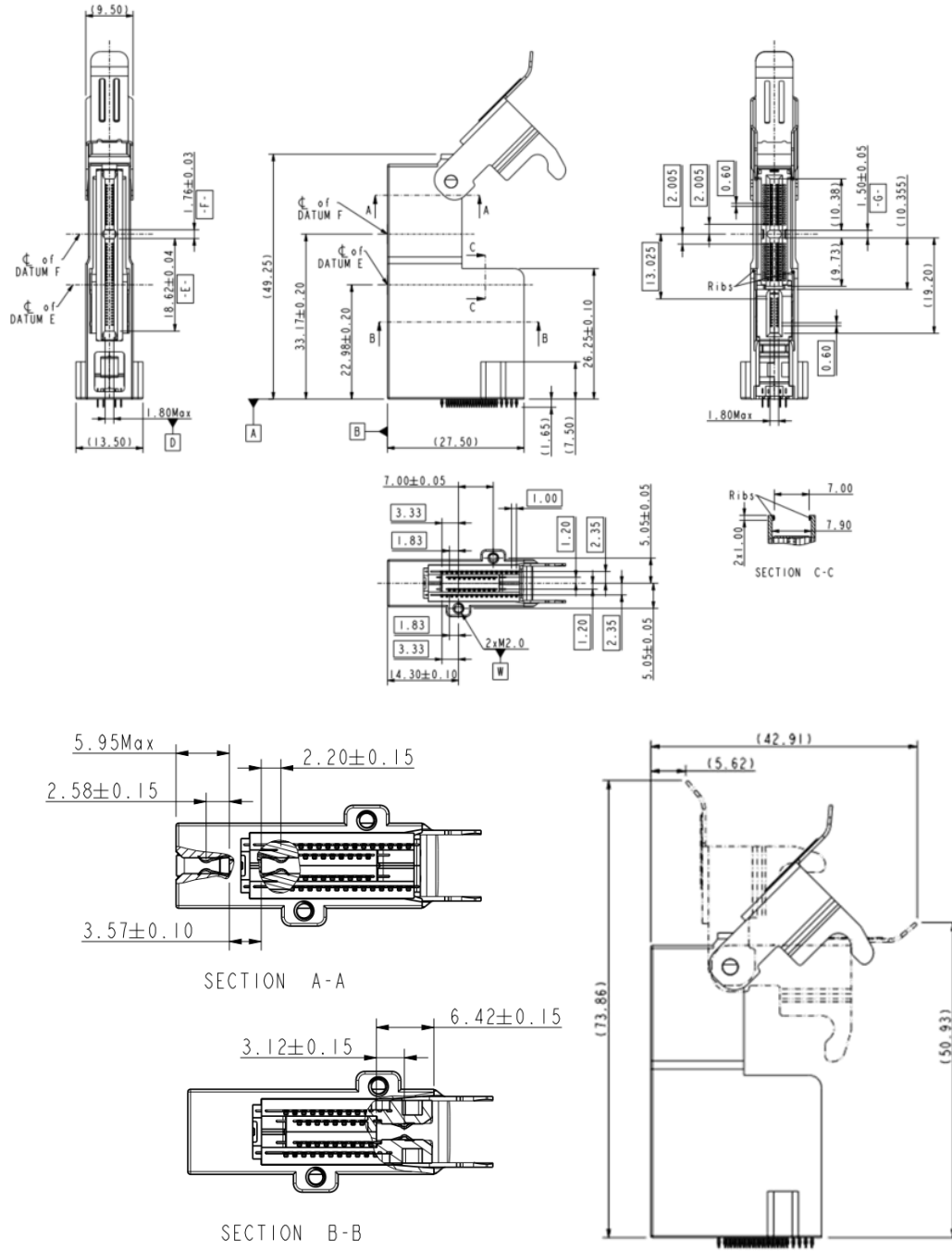


Figure 5-5 2C-RS20 Connector

5.3.2 Hybrid Orthogonal 2C-RS24 Connector

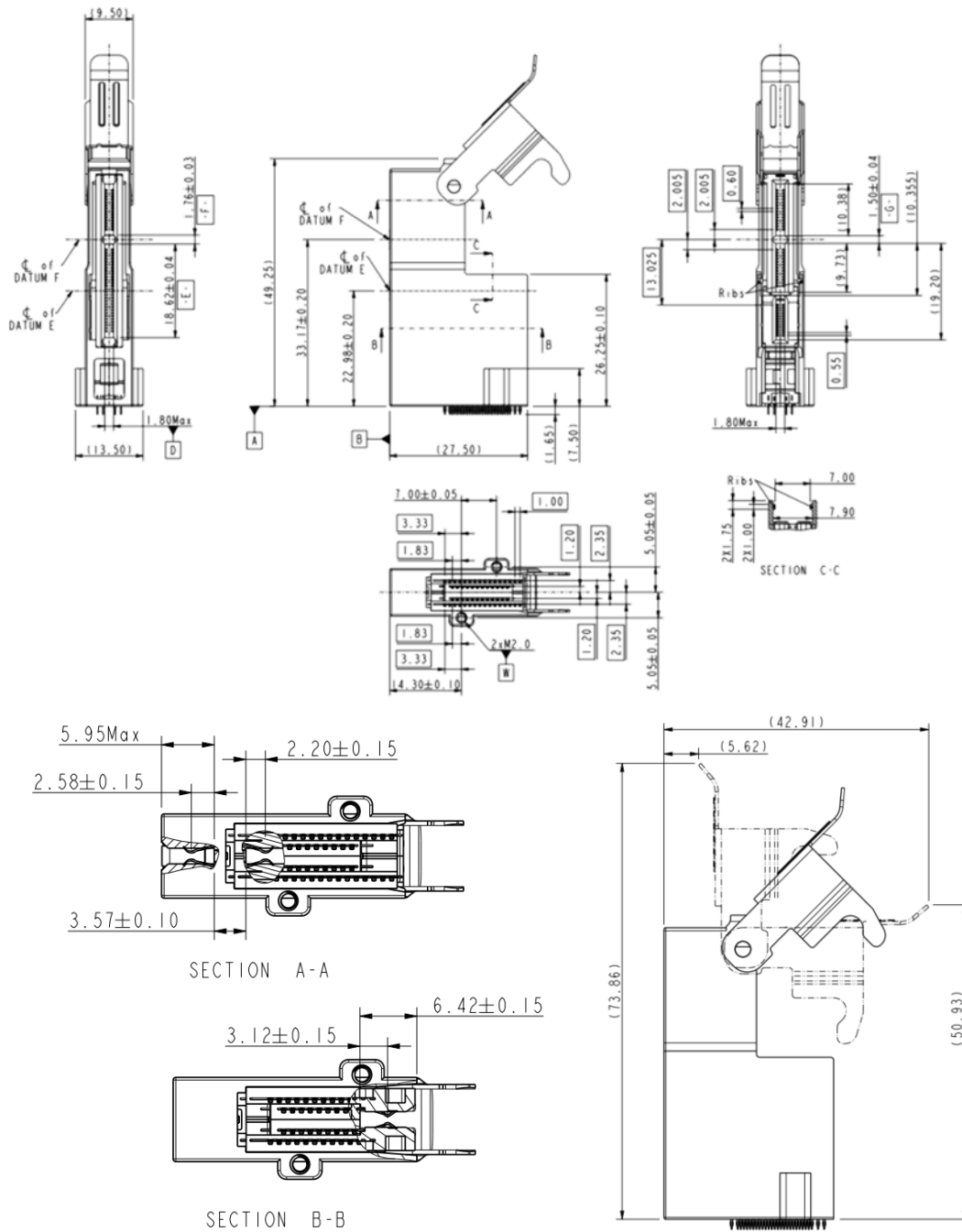


Figure 5-7 2C-RS24 Connector

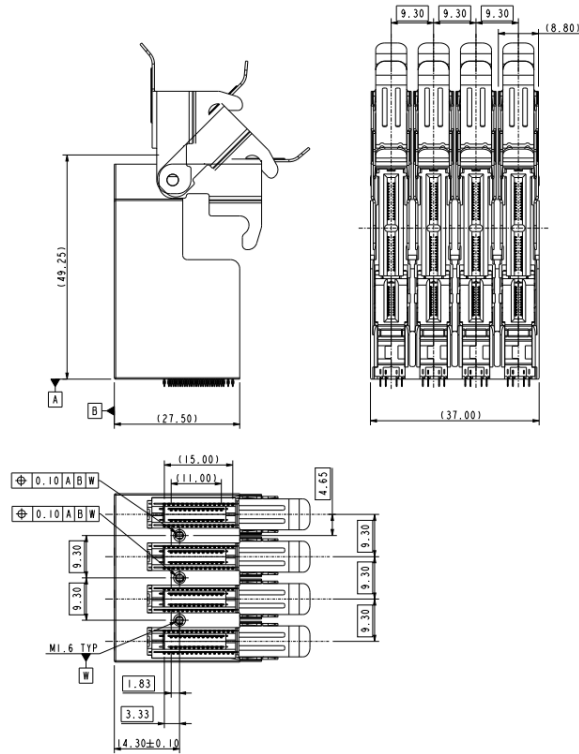


Figure 5-8 2C-RS24 Connector

5.4 Mechanical Description: Hybrid Orthogonal 4C Connector

5.4.1 Hybrid Orthogonal 4C-RS20 Connector

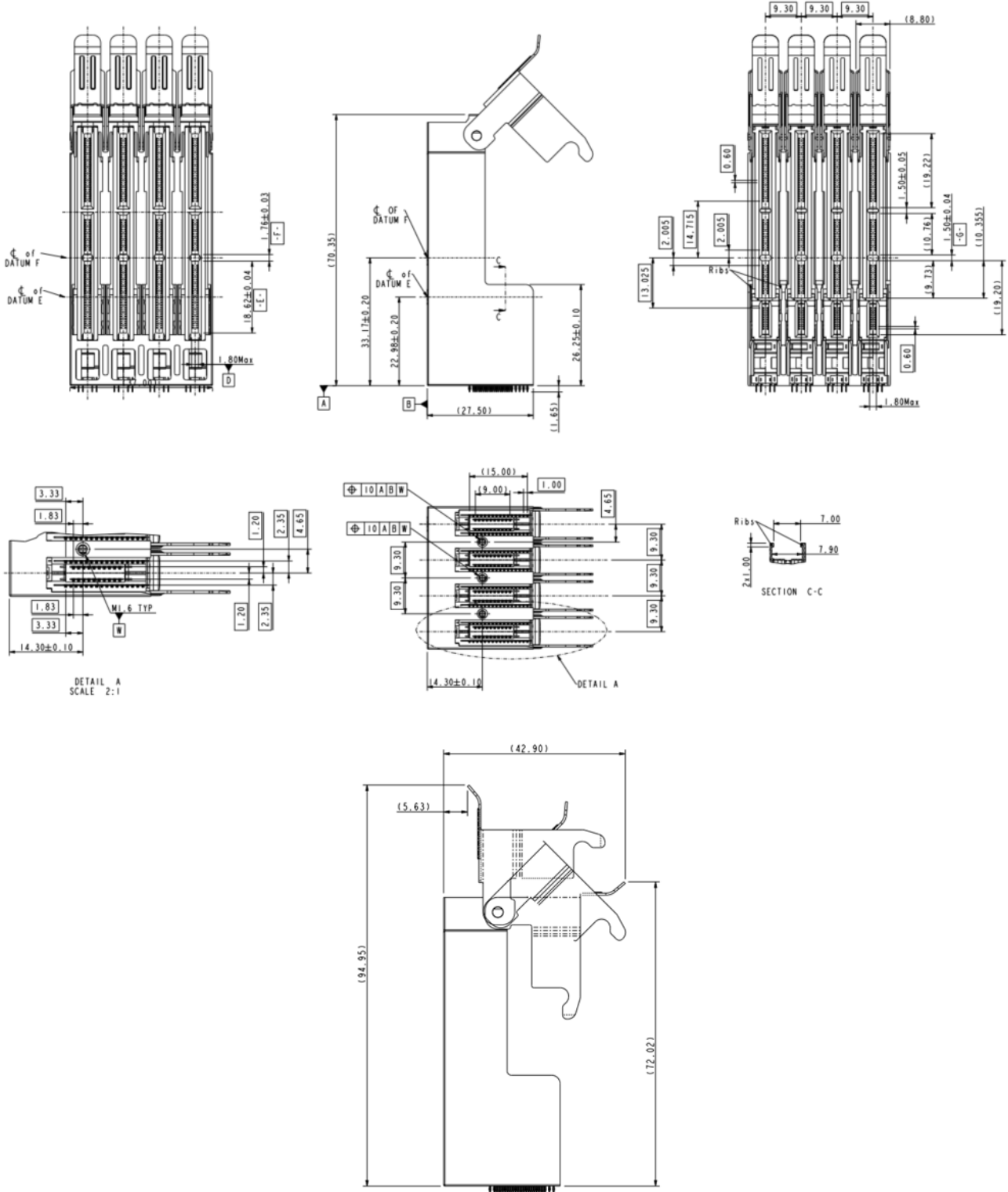


Figure 5-9 Ganged 4C-RS20 Connector

5.4.2 Hybrid Orthogonal 4C-RS24 Connector

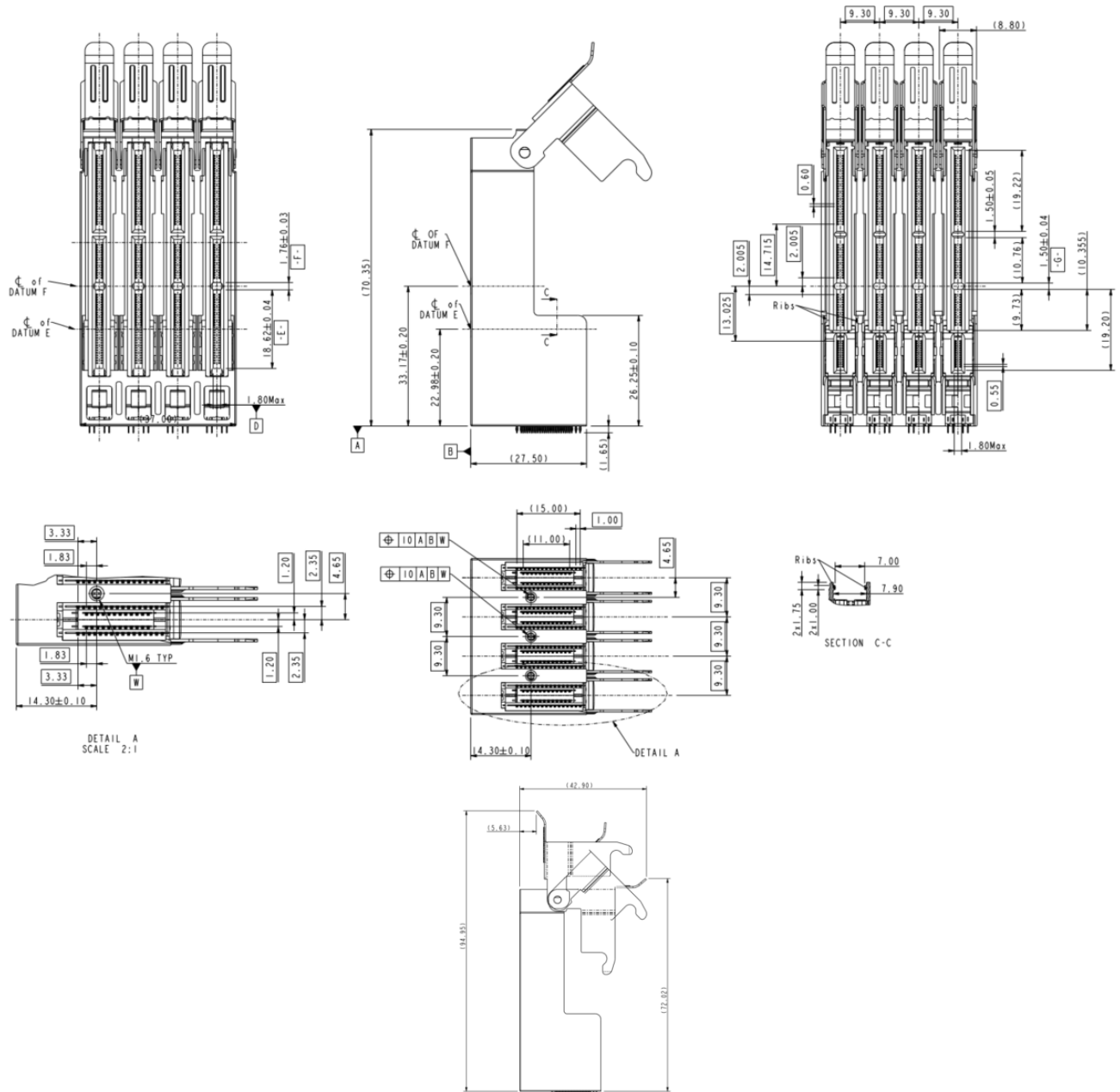


Figure 5-10 Ganged 4C-RS24 Connector

6. Module Mechanical Specification

6.1 Overview

The mechanical drawings of all plug module connector configurations are shown in this section.

Unless otherwise specified in the drawing, the following tolerances shall apply by default:

- Dimension with one decimal place, default tolerance +/- 0.25 mm
- Dimension with two decimal places, default tolerance +/- 0.20 mm
- Dimension with three decimal places, default tolerance +/- 0.10 mm
- Angular dimension, default tolerance +/- 0.5°

6.2 Mechanical Description: 1C Plug Modules

6.2.1 1C-RS20 Plug Module

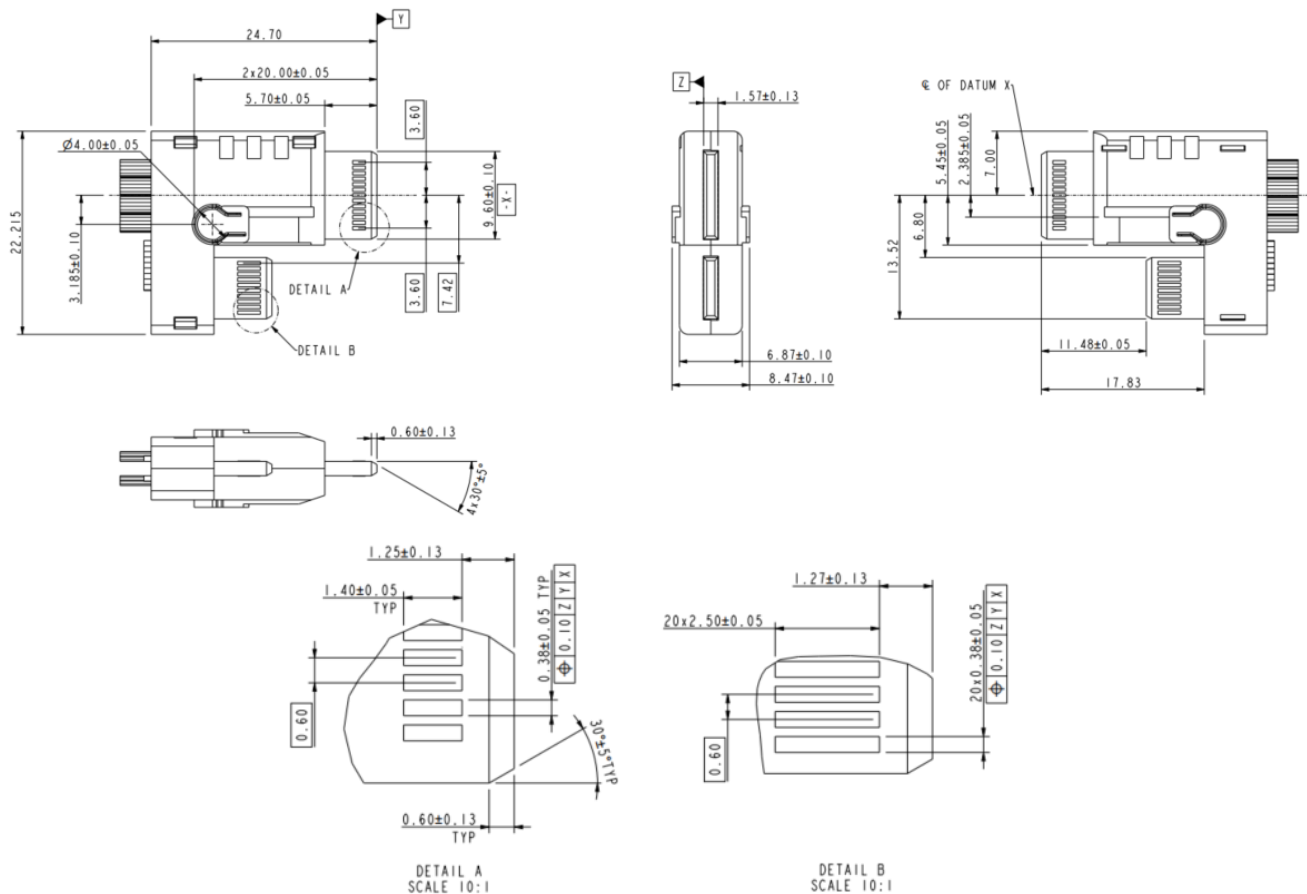


Figure 6-1 1C-RS20 Plug Module

6.2.2 1C-RS24 Plug Module

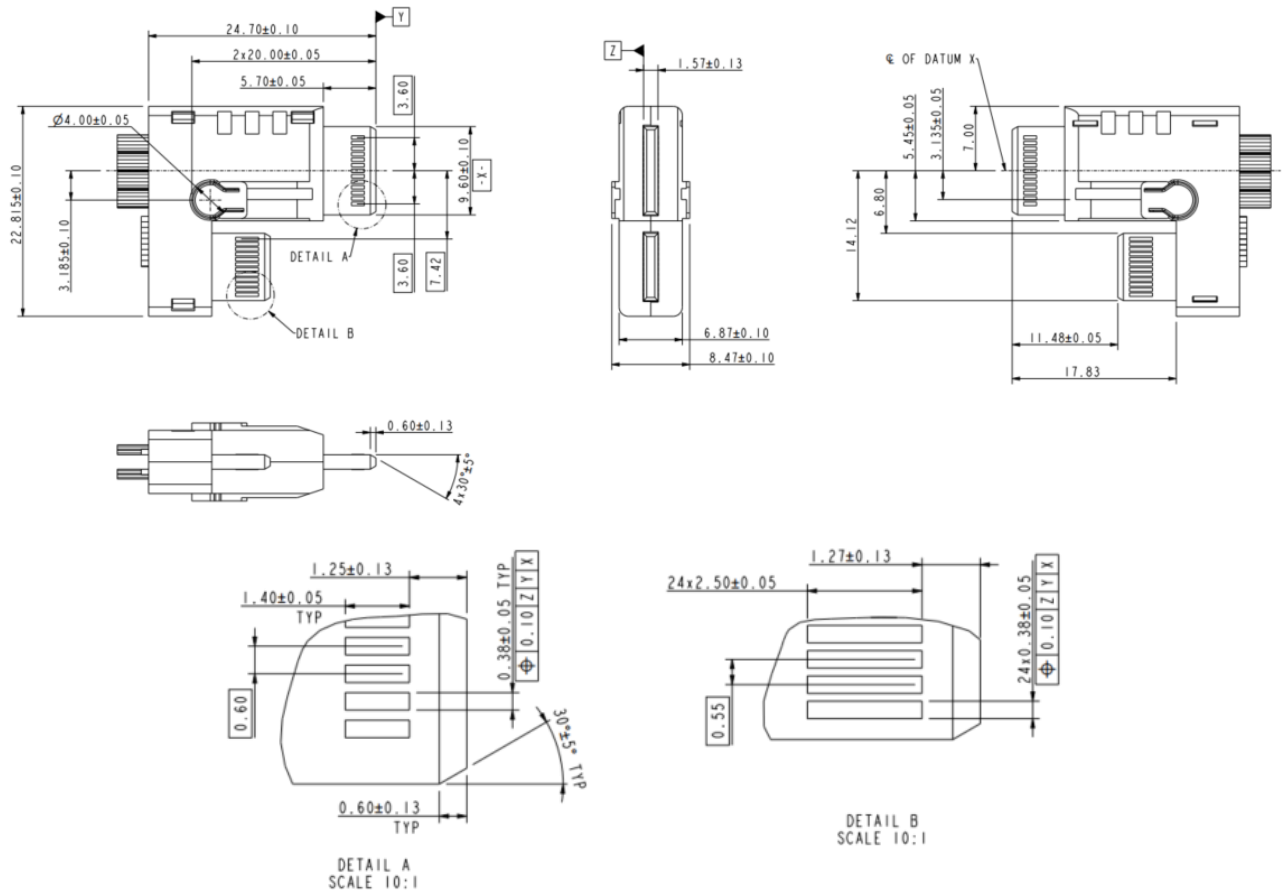


Figure 6-2 1C-RS24 Plug Module

6.3 Mechanical Description: 2C Plug Modules

6.3.1 2C-RS20 Plug Module

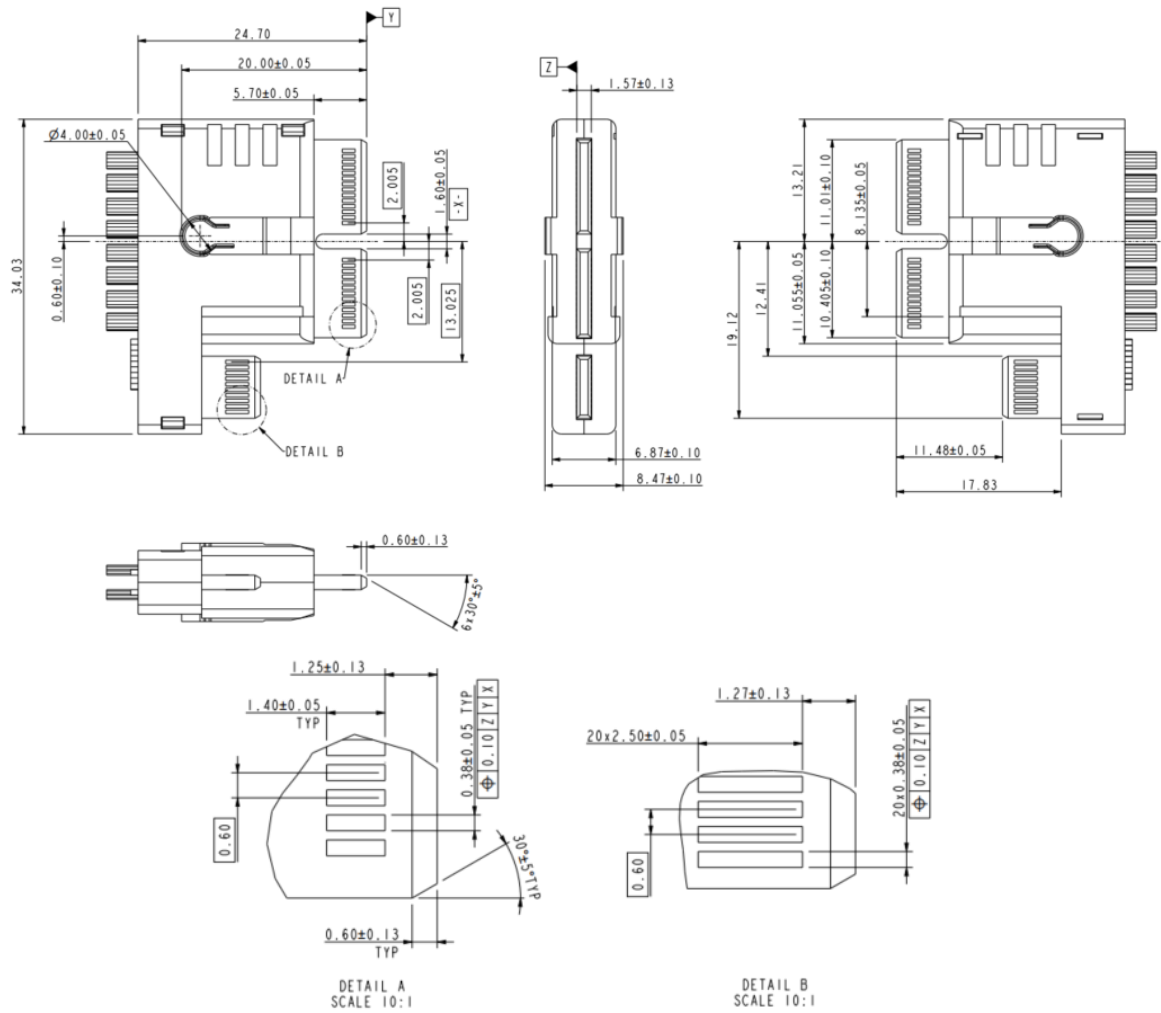


Figure 6-3 2C-RS20 Plug Module

6.3.2 2C-RS24 Plug Module

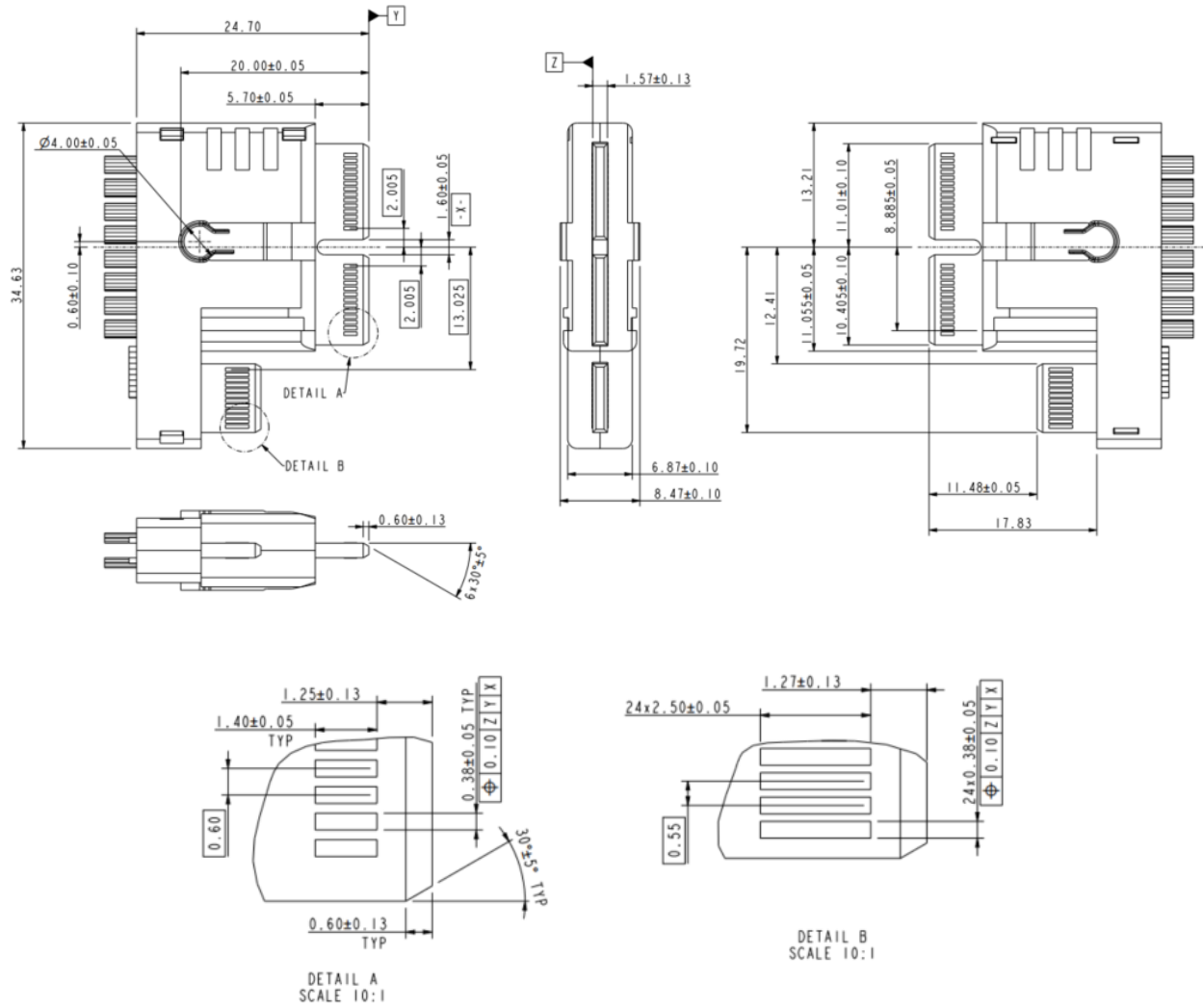


Figure 6-4 2C-RS24 Plug Module

6.4 Mechanical Description: 4C Plug Modules

6.4.1 4C-RS20 Plug Module

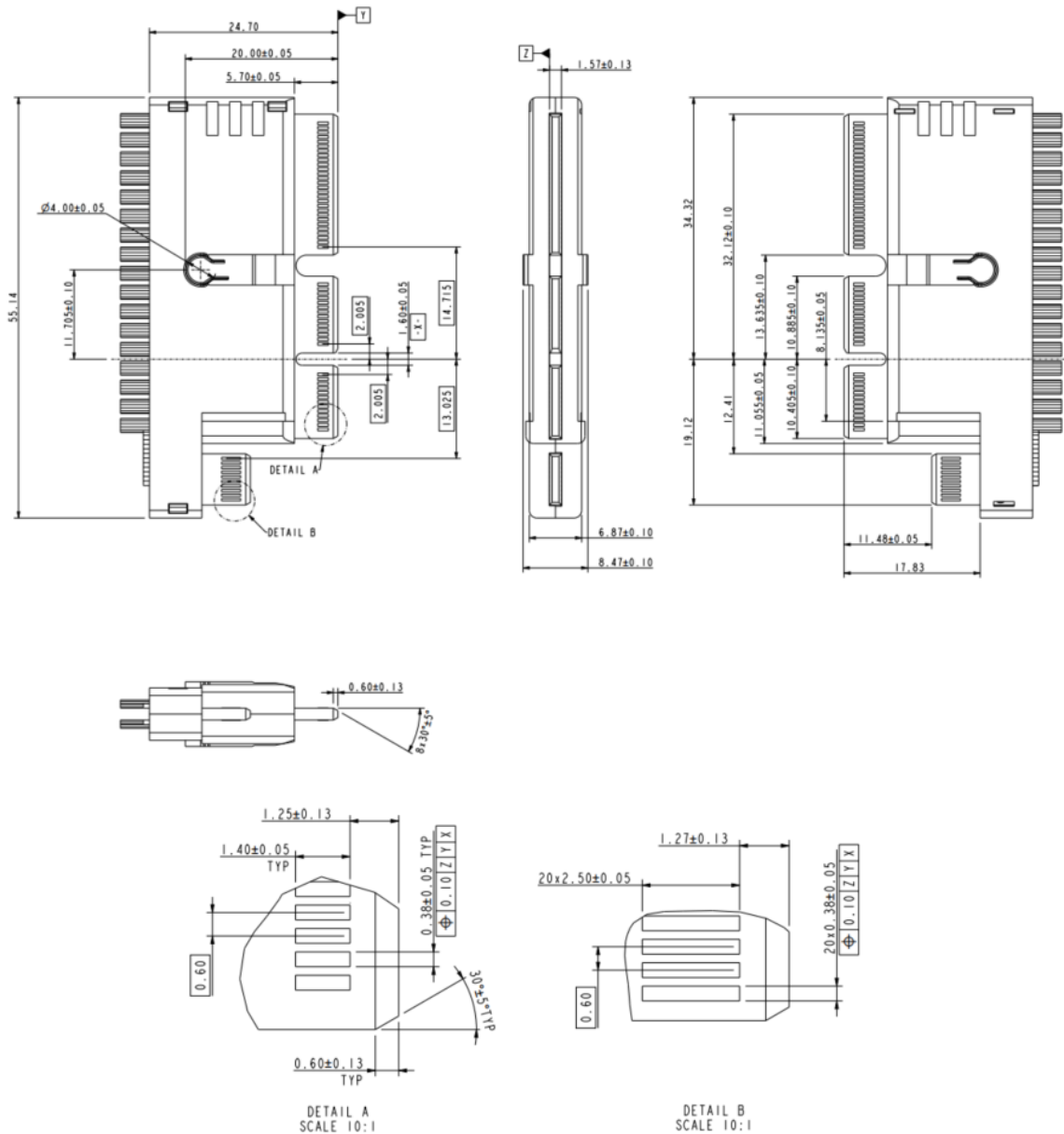


Figure 6-5 4C-RS20 Plug Module

6.4.2 4C-RS24 Plug Module

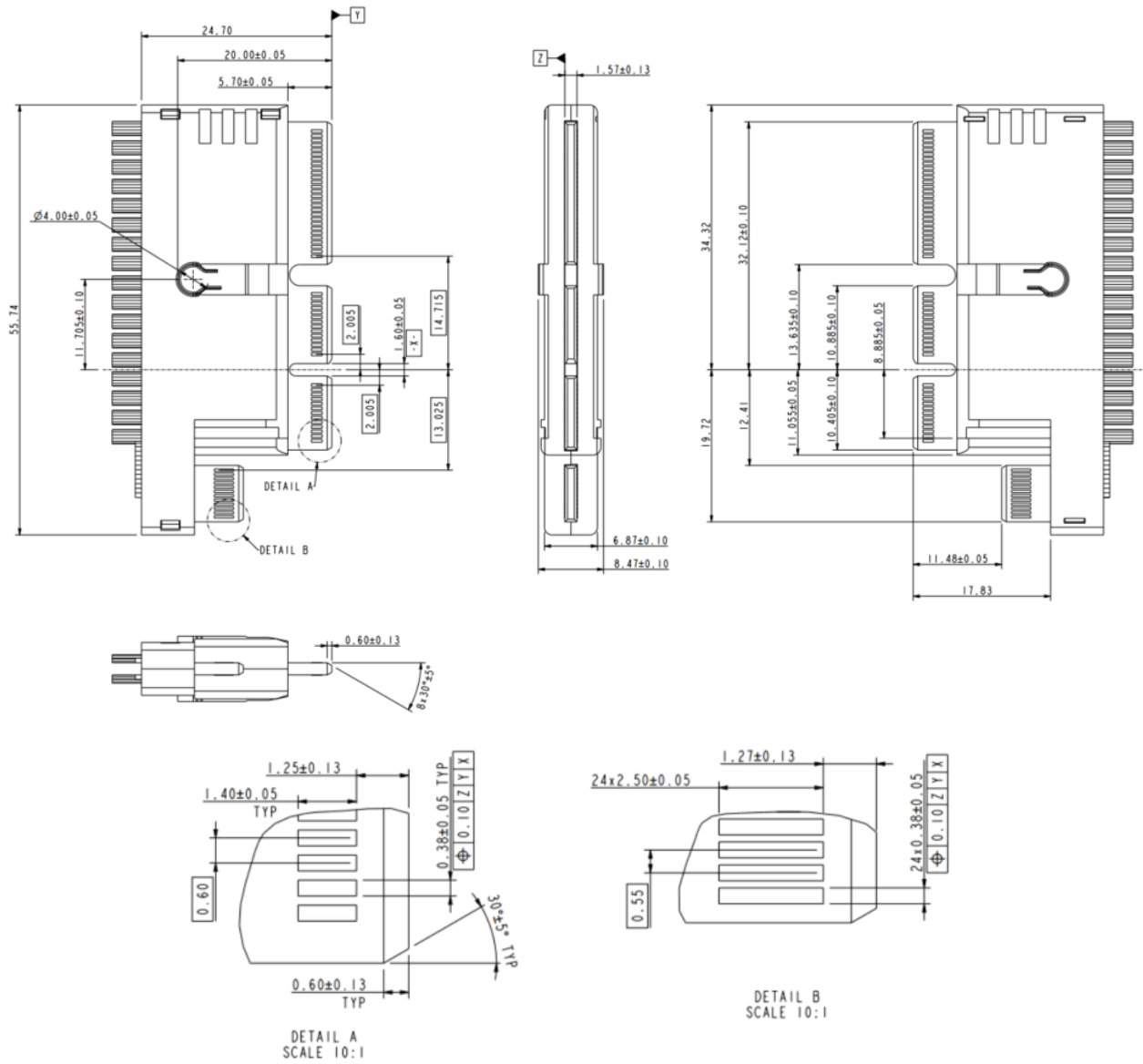


Figure 6-6 4C-RS24 Plug Module

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

7.1 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 7-1 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 7-2. Finally, testing procedures used to validate any performance criteria not included in EIA-364-1000 are provided in Table 7-3.

Table 7-1 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 0.127 mm |
| Rated Durability Cycles | The expected number of durability cycles a component is expected to encounter over the course of its life | Connector/ cage: 200 cycles |
| Latched Mating Force* | Amount of force needed to mate a module with a connector when latches are deactivated | 1.1 N Max/contact pair |
| Unlatched Unmating Force* | Amount of force needed to separate a module from a connector when latches are deactivated | 0.1 N Min/contact pair |
| Latch Retention* | Amount of force the latching mechanism can withstand | 100 N min |
| Wrenching Strength* | Amount of force in various directions the product can withstand while mated | 25 N MIN for each axis direction |
| Environmental Requirements | | |
| Field Life | The expected service life for a component | 10 years |
| Field Temperature | The expected service temperature for a component | 0°C to +65°C |
| Storage Temperature* | The expected storage temperature for a component when not in use | -20°C to +80°C |
| Storage Humidity* | The maximum expected storage humidity for a component when not in use | 80% Relative Humidity |
| Electrical Requirements | | |

Table 7-1 Form Factor Performance Requirements

| Performance Parameters | Description/ Details | Requirement |
|--|--|--|
| Current* | Maximum current to which a contact is exposed in use | 0.5 A per contact max 1.1 A per power contact max |
| Operating Rating Voltage | Maximum voltage to which a contact is exposed in use | 29 V DC per contact max |
| NOTE: Performance criteria denoted with stars (*) are not validated by EIA-364-1000 testing. Refer to Table 7-3 for test procedures and pass/fail criteria. | | |

Table 7-2 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 7-1 are met. Any information in this table supersedes EIA-364-1000.

Table 7-2 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 | 20 mΩ max change from baseline |
| Dielectric Withstanding Voltage | EIA-364-20 Method B 300 VDC minimum for 1 minute Applied voltage may be product / application specific | No defect or breakdown between adjacent contacts -AND- 1 mA max Leakage Current |
| NOTES: | | |
| <ol style="list-style-type: none"> 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 7-3 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 7-1 are met.

Table 7-3 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 7-1 -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 7-1 for temperature range | Refer to Table 7-1 |
| Storage Humidity | EIA-364-31 | Refer to Table 7-1 |
| Electrical Tests | | |
| Current | EIA-364-70 Method 3, 30-degree temperature rise Contacts energized: Up to a maximum of 6 adjacent contacts per side, 12 contacts total | Refer to Table 7-1 for current magnitude |

Appendix A. System Mechanical Specification (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 TWG member companies.

A.2. PCB Layout

A.2.1 Standalone Connector Footprint

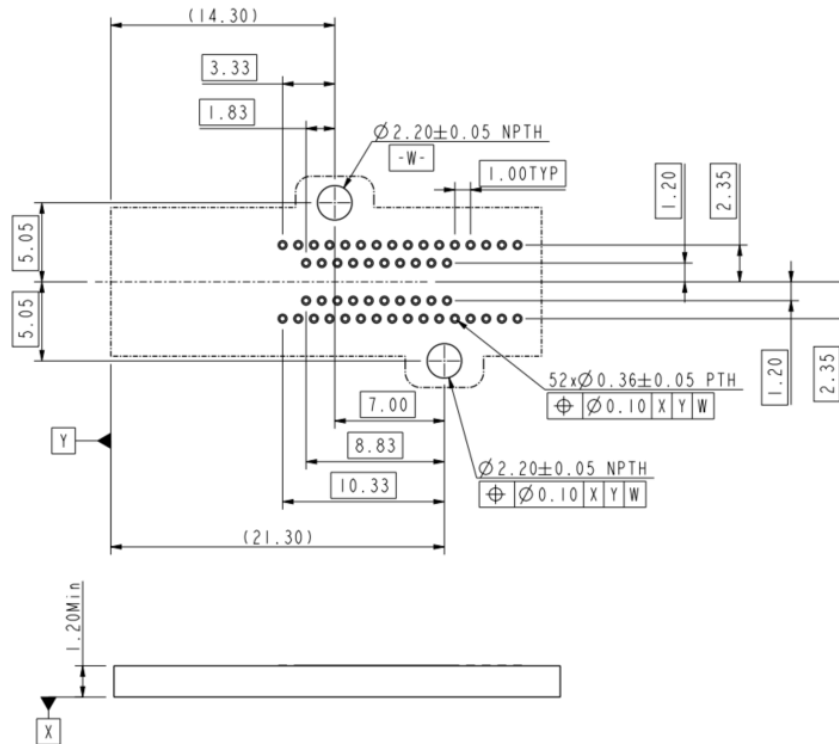


Figure A-1 Recommended Standalone Connector Footprint with RS20

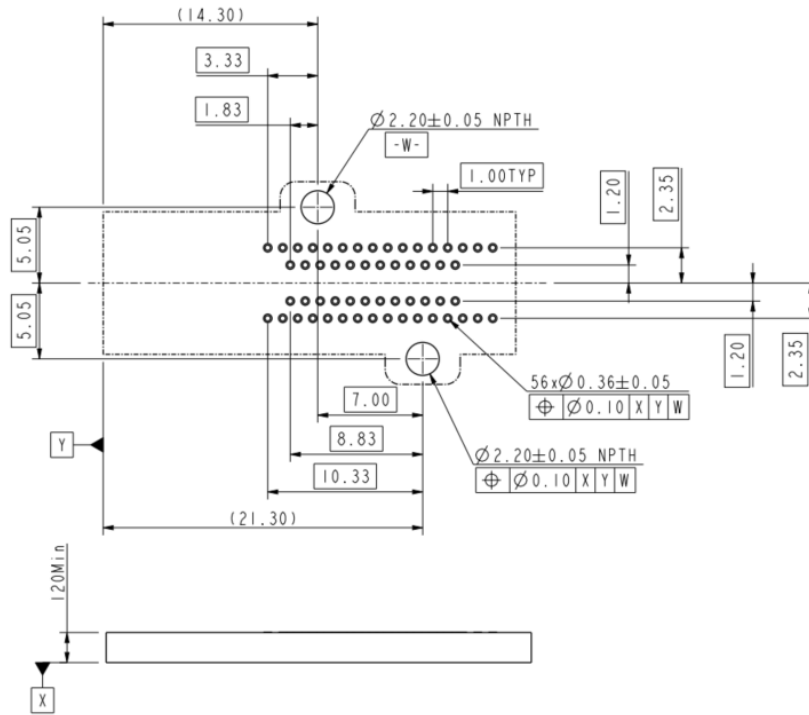


Figure A-2 Recommended Standalone Connector Footprint with RS24

A.2.2 Ganged Connector Footprint

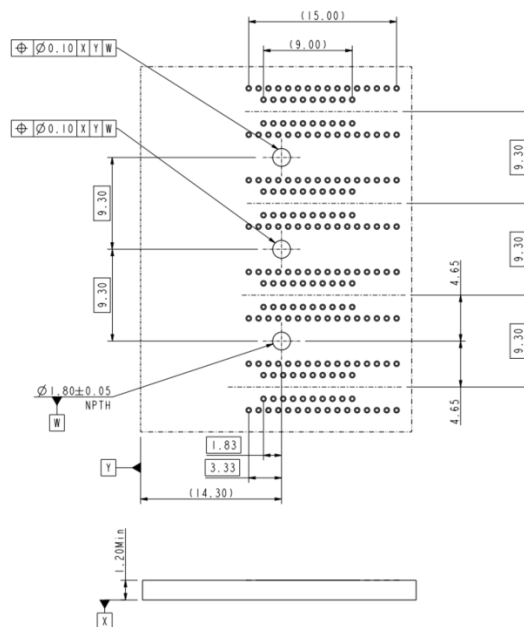


Figure A-3 Recommended Ganged Connector Footprint with RS20

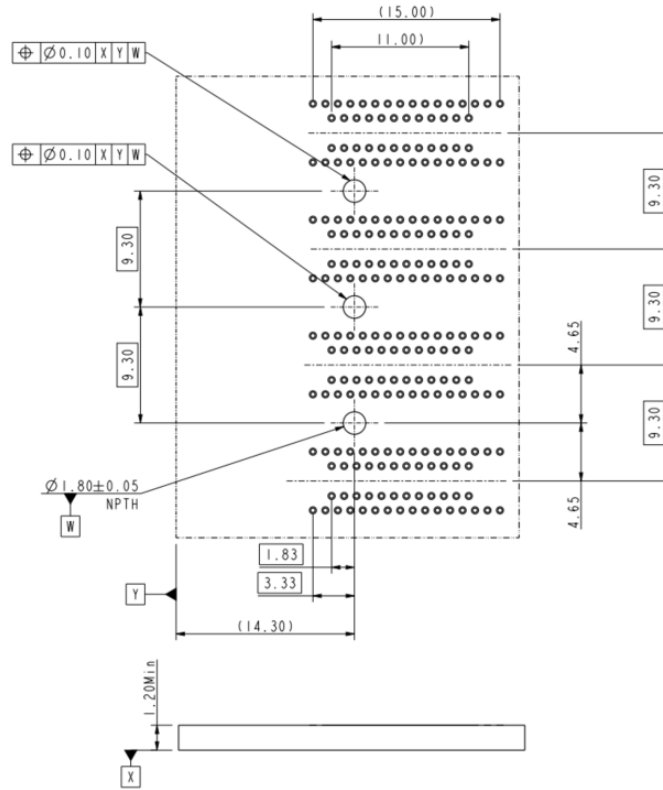


Figure A-4 Recommended Ganged Connector Footprint with RS24

Appendix B. Labeling Connector Type (Informative)

A human legible label indicating connector type ("Type 2" or "T2") shall be placed anywhere on the viewing side of the connectors shown below. Figure B-1 shows the face of the 1C connector. Figure B-2 shows the face of the 2C connector. Figure B-3 shows the face of the 4C connector.

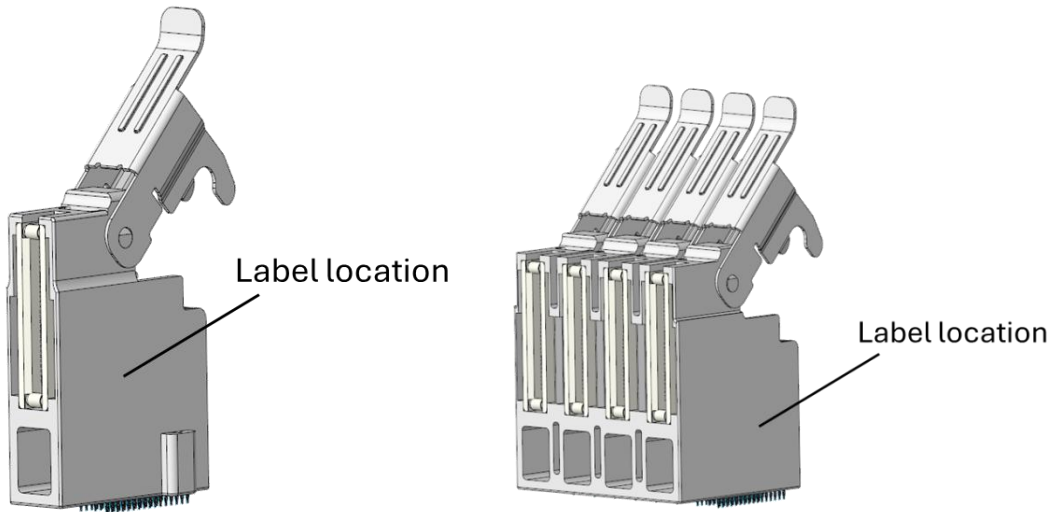


Figure B-1 1C Connector Label Location

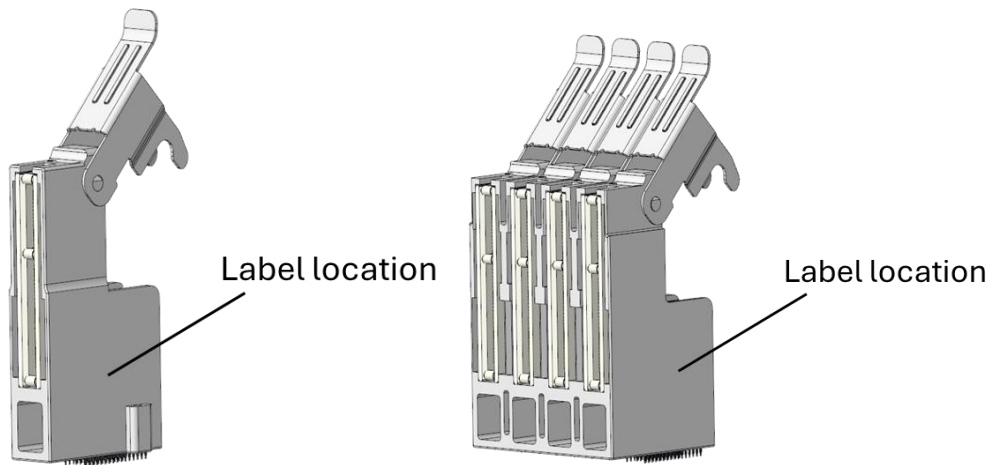


Figure B-2 2C Connector Label Location

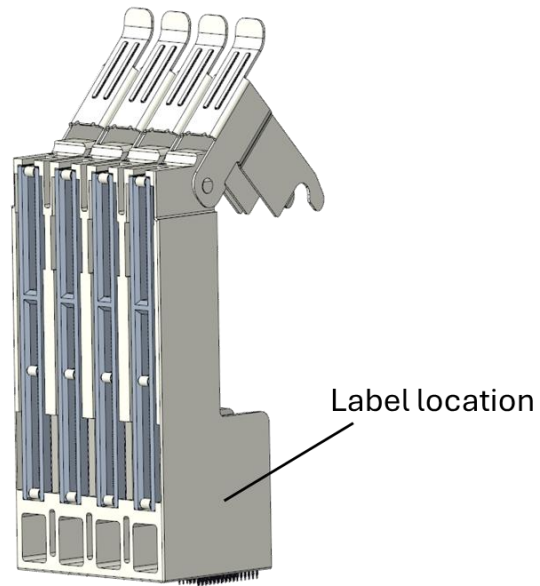


Figure B-3 4C Connector Label Location