SFF-TA-1033

Specification for

Internal High-Speed Cable / Modular Connector System

Rev 2.0 March 28, 2025.

SECRETARIAT: SFF TWG

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The description of the connector in this specification does not ensure 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 the mechanical specifications and general performance requirements for an Internal High-Speed Cable / Modular Connector System that is designed to provide an internal cable and connector solution that supports both high-speed and power transmission and enables broad compatibility across future generations of host process modules.

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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 1.0 **September 07, 2023:**

- First Publication

Rev 2.0 **March 28, 2025:**

- Updated the Combo x16+55A High Power Plus sample application figures, Figure 4-23 through Figure 4-29, due to a dimensional change in the Vertical Combo x16+55A High Power Plus Connector.
- Updated Figure 4-35 and Figure 5-5 due to a dimensional change in the Vertical Combo x16+55A High Power Plus Connector.
- Updated Table 5-1 to include Datum R and modified the description of Datum C.
- Updated Figure 5-8, Figure 5-9, Figure 5-12, Figure 5-13, Figure 5-16, Figure 5-17, Figure 5-20, Figure 5-21, Figure 5-25, and Figure 5-26 to loosen the True Position location tolerance for certain metal pins on the underside of the connectors from within 0.10 mm to within 0.20 mm.
- Updated Figure 5-24, Figure 5-25, and Figure 5-28 due to lengthening the sideband and power end of the 55A connector by 1.0 mm to avoid accidental mating with 21A or 34A plugs.
- Updated Figure 5-33 and Figure 5-38 to accommodate the changes to the Vertical Combo x16+55A High Power Plus connector.
- Updated Figure 6-6 and Figure 6-7 to prevent accidental mating with 34A or 55A connectors.
- Updated Figure 6-14 and Figure 6-15 to accommodate the changes made to the x16+55A connectors.
- Updated Figure 6-16 and Figure 6-17 to widen the distance between the latch features to improve stability when mated and latched.
- Updated Figure 6-23 to accommodate the changes made to the mating x16+55A receptacle connector.
- In Section 6.3.10, added a caution statement about avoiding plugging in the 21A Power AIC into one of the 34A or 55A connectors.
- Updated Figure 6-27 to add a missing radius dimension and modify the location dimensions for the power pads.
- Updated Figure 6-29 to accommodate the changes made to the mating x16+55A High Power Plus connector.
- Updated Figure A-5 footprint to match the changes made to the x16+55A High Power Plus connector.
- Added missing list of Appendix Figures to the List of Figures on pages 6 and 7.
- Updated Figure 6-1.

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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 details such as the PCB layouts are 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
- EIA-364-04 Normal Force Test Procedure for Electrical Connectors
- EIA-364-13 Mating and Unmating Forces Test Procedure for Electrical Connectors
- EIA-364-20 Withstanding Voltage Test Procedure for Electrical Connectors
- EIA-364-21 Insulation Resistance Test Procedure for Electrical Connectors
- EIA-364-23 Low Level Contact Resistance Test Procedure for Electrical Connectors
- EIA-364-27 Mechanical Shock Test Procedure for Electrical Connectors
- EIA-364-28 Vibration Test Procedure for Electrical Connectors and Sockets
- EIA-364-98 Housing Locking Mechanism Strength Test Procedure for Electrical Connectors
- IPC-A-610 Acceptability of Electronic Assemblies
- SFF-TA-1016 Internal Unshielded High Speed Connector System

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.

Copies of PCIe standards may be obtained from PCI-SIG (https://pcisig.com).

Copies of SAS and other ANSI standards may be obtained from the International Committee for Information Technology Standards (INCITS) (https://www.incits.org).

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: Indicates flexibility of choice with no implied preference.

May/ 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 [when] 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 reserved bit, byte, word, or field (e.g., a restricted byte uses the same value as defined for a reserved byte).

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

AIC: Add-in-Card
DE: Dual Exit
GND: Ground
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
RRA: Reverse Right Angle
RSTR: Reverse Straight
SMT: Surface Mount Technology

STR: Straight
VT: Vertical

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.

Dual-exit: A term used to describe the ability of a board connector that could accept the insertion by multiple plug connector types, such as right angle, reverse right angle, etc. This type of board connector accommodates the latching of those plug types with latch slots located on both sides of the connector.

Module: In this specification, module may refer to a plug assembly at the end of a copper (electrical) cable (passive).

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.

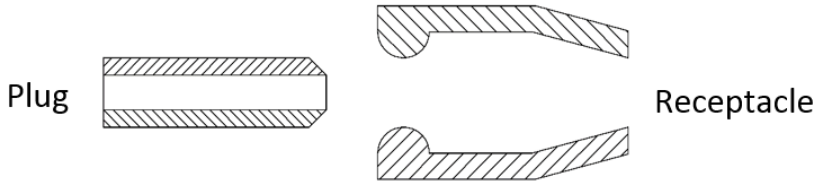


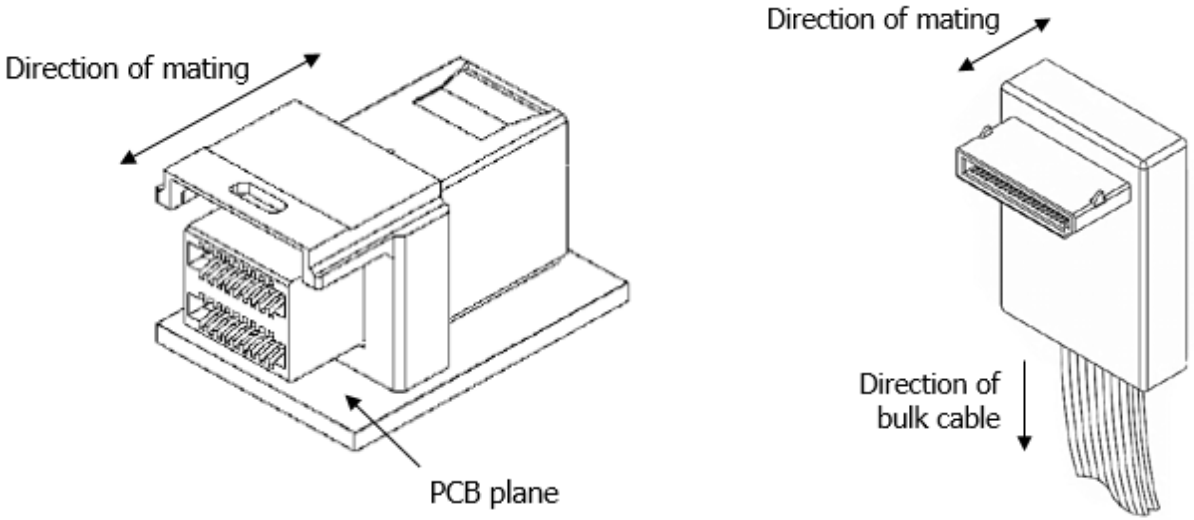
Figure 3-1 Plug and Receptacle Definition

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.



a) Right angle connector b) Right angle cable assembly

Figure 3-2 Representative Generic 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 connector solder tail 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.

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.

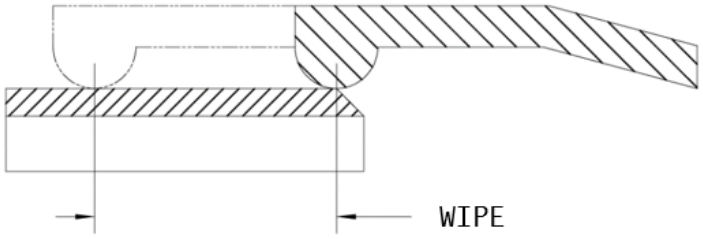


Figure 3-3 Wipe for a Continuous Contact

4. General Description

4.1 Configuration Overview/Descriptions

This specification details a connector system that includes key features such as flexible pin configurations that support dual-exit (DE) and blind mate applications across multiple cable plug types with optimized electrical performance and power delivery. This specification is intended to strictly be the mechanical specification for this connector system. It is not intended to include the various SI requirements that may be needed depending on the particular application where this connector system may be used.

4.1.1 Vertical Combo DE X16+21A Power Connector Configuration

This configuration can be used in three different ways.

1. A single add-in card (AIC) can plug into the Vertical Combo DE x16+21A Power connector as shown in Figure 4-1.
2. A single combo cable can plug into the Vertical Combo DE x16+21A Power connector as shown in Figure 4-2, Figure 4-3, or Figure 4-4.
3. Separate individual cables can plug into the Vertical Combo DE x16+21A Power connector where there are two cables with 74-pin plugs and a 21A Power cable used as shown in Figure 4-5 or Figure 4-6. In this third case, the Straight Plug with no side flanges for 74 Contacts listed in SFF-TA-1016, the equivalent Right Angle Plug (with no side flanges), or a Reverse Right Angle Plug (with no side flanges) can mate with these receptacle connectors. The standard SFF-TA-1016 Straight Plug for 74 Contacts or the Right Angle Plug for 74 Contacts that include the side flanges will not fit. For this same reason, the SFF-TA-1016 Straight Plug for 148 Contacts or the Right Angle Plug for 148 Contacts will not fit.

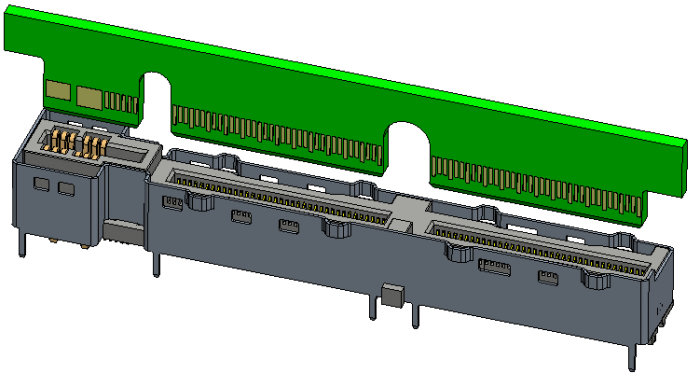


Figure 4-1 Combo x16+21A Power AIC Application

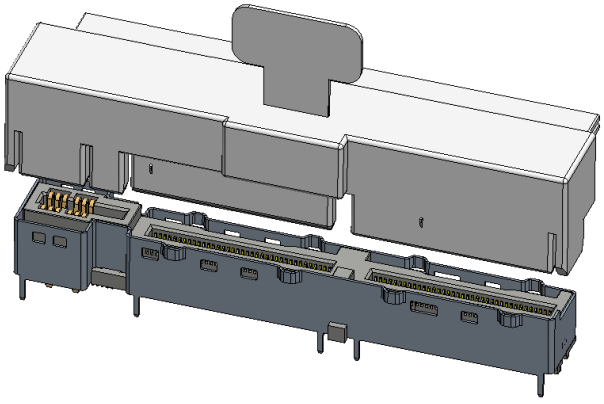


Figure 4-2 Combo x16+21A Power RA Cable Application

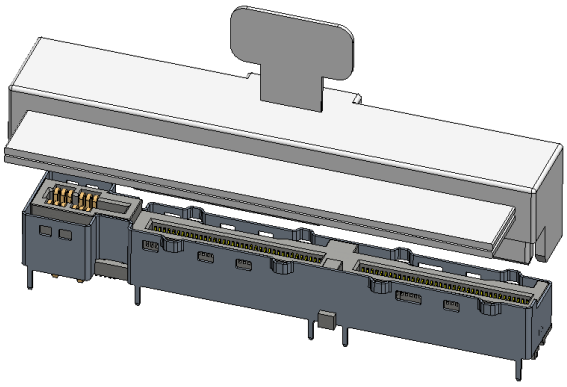


Figure 4-3 Combo x16+21A Power RRA Cable Application

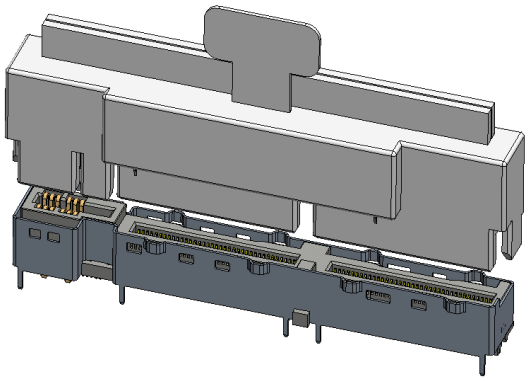


Figure 4-4 Combo x16+21A Power STR Cable Application

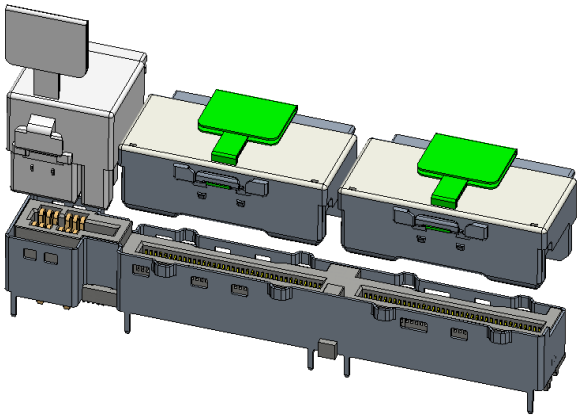


Figure 4-5 Separate RA 74 Pin Cables and a RA 21A Power Cable Application

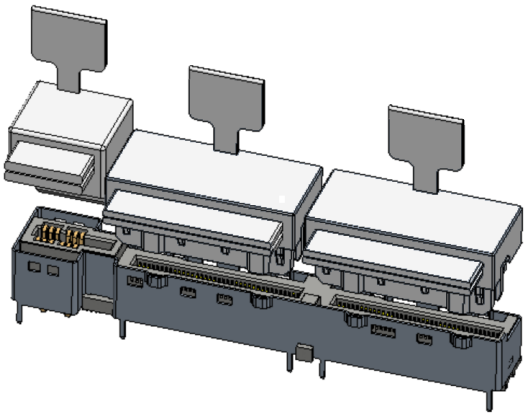


Figure 4-6 Separate RRA 74 Pin Cables and a RRA 21A Power Cable Application

4.1.2 Vertical Combo DE X8+21A Power Connector Configuration

This x8 configuration is much like the x16 configuration and can still be used in three ways.

1. A single add-in card (AIC) can plug into the Vertical Combo DE x8+21A Power connector as shown in Figure 4-7.
2. A single combo cable can plug into the Vertical Combo DE x8+21A Power connector as shown in Figure 4-8, Figure 4-9, or Figure 4-10.
3. Separate individual cables can plug into the Vertical Combo DE x8+21A Power connector where there is only one 74-pin cable and a 21A Power cable used as shown in Figure 4-11 or Figure 4-12. In this third case, the Straight Plug with no side flanges for 74 Contacts listed in SFF-TA-1016, the equivalent Right Angle Plug (with no side flanges), or a Reverse Right Angle Plug (with no side flanges) can mate with these receptacle connectors. The standard SFF-TA-1016 Straight Plug for 74 Contacts or the Right Angle Plug for 74 Contacts that include the side flanges will not fit.

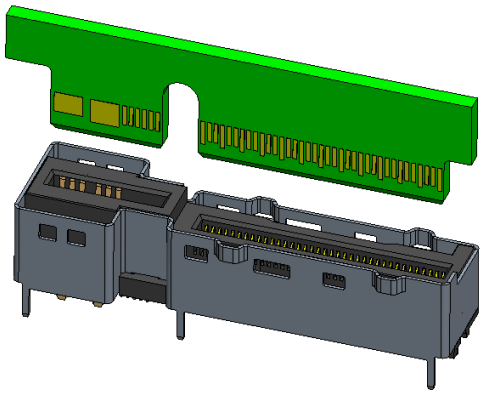


Figure 4-7 Combo x8+21A Power AIC Application

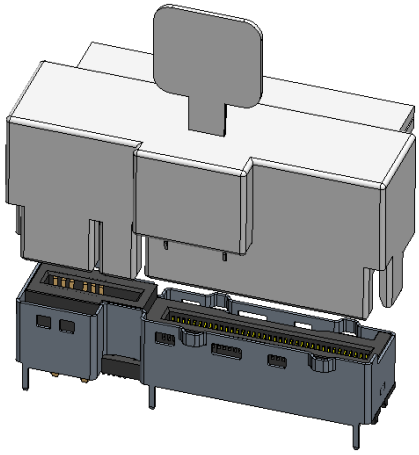


Figure 4-8 Combo x8+21A Power RA Cable Application

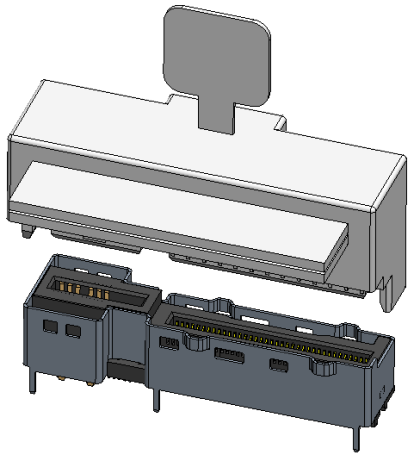


Figure 4-9 Combo x8+21A Power RRA Cable Application

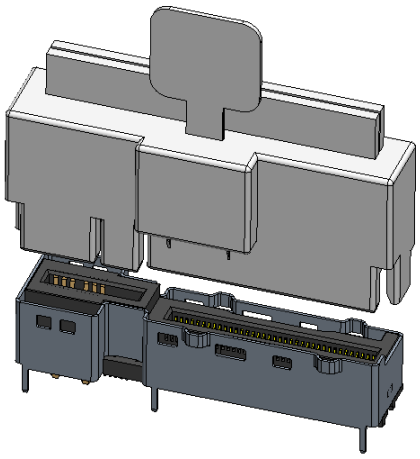


Figure 4-10 Combo x8+21A Power STR Cable Application

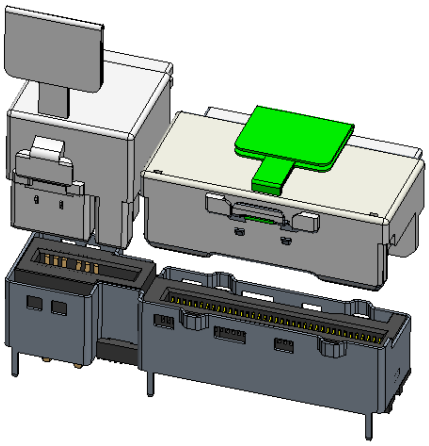


Figure 4-11 Separate RA 74 Pin Cable and a RA 21A Power Cable Application

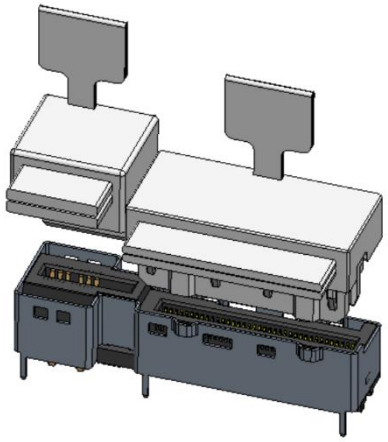


Figure 4-12 Separate RRA 74 Pin Cable and a RRA 21A Power Cable Application

4.1.3 Vertical DE 21A Power Connector Configuration

This configuration is much like the previous configurations except it only incorporates the 21A Power connector with 12 sidebands (6 per side). It can be used in two ways.

1. A single add-in card (AIC) can plug into the Vertical 21A Power connector as shown in Figure 4-13.
2. A single Power cable to plug into the Vertical 21A Power connector as shown in Figure 4-14 or Figure 4-15.

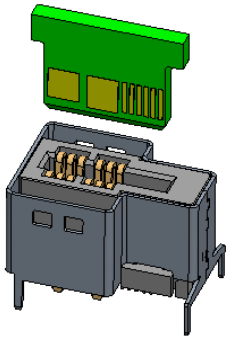


Figure 4-13 21A Power AIC Application

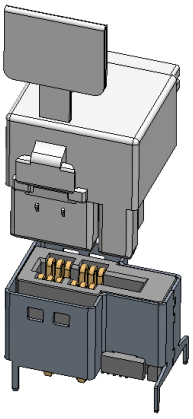


Figure 4-14 RA 21A Power Cable Application

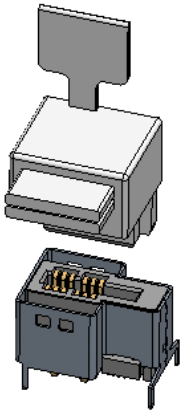


Figure 4-15 RRA 21A Power Cable Application

4.1.4 Vertical Combo DE X16+34A High Power Connector Configuration

This configuration is much like the configuration in section 4.1.1 except this configuration contains a double the number of power contacts. This configuration can be used in three different ways.

1. A single add-in card (AIC) can plug into the Vertical Combo DE x16+34A Power connector as shown in Figure 4-16.
2. A single combo high power cable can plug into the Vertical Combo DE x16+34A High Power connector as shown in Figure 4-17, Figure 4-18, Figure 4-19, or Figure 4-20.
3. Separate individual cables can plug into the Vertical Combo DE x16+34A High Power connector where there are two 74-pin cables and a 34A High Power cable used as shown in Figure 4-21 or Figure 4-22. In this third case, the Straight Plug with no side flanges for 74 Contacts listed in SFF-TA-1016, the equivalent Right Angle Plug (with no side flanges), or a Reverse Right Angle Plug (with no side flanges) can mate with these receptacle connectors. The standard SFF-TA-1016 Straight Plug for 74 Contacts or the Right Angle Plug for 74 Contacts that include the side flanges will not fit. For this same reason, the SFF-TA-1016 Straight Plug for 148 Contacts or the Right Angle Plug for 148 Contacts will not fit.

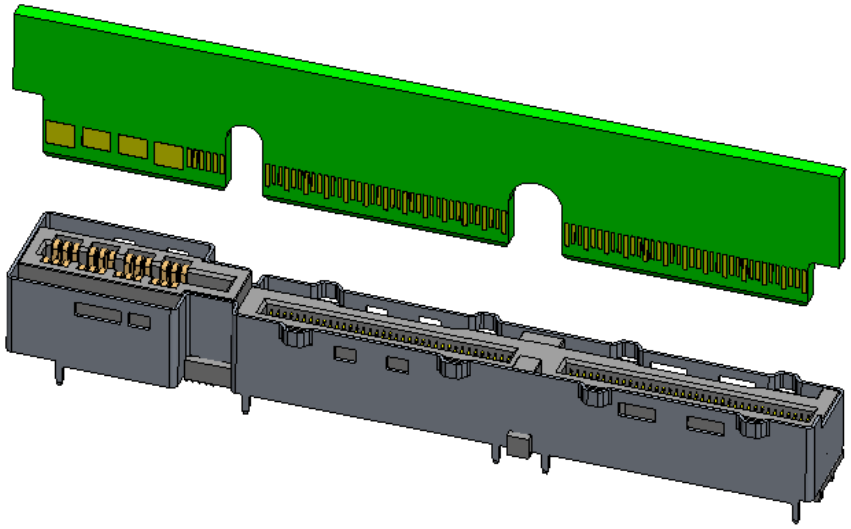


Figure 4-16 Combo x16+34A High Power AIC Application

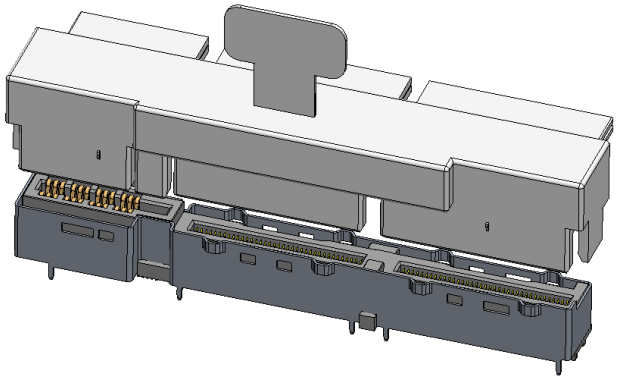


Figure 4-17 Combo x16+34A High Power RA Cable Application

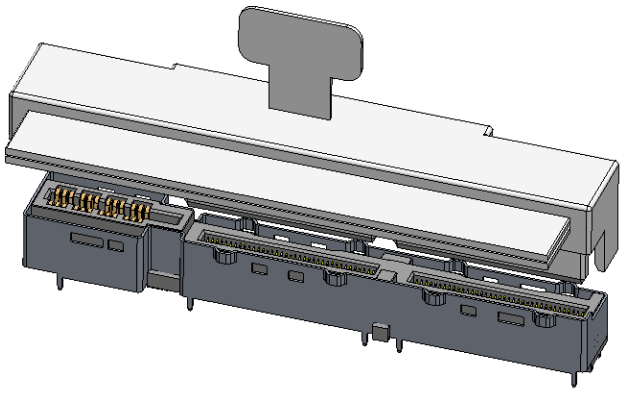


Figure 4-18 Combo x16+34A High Power RRA Cable Application

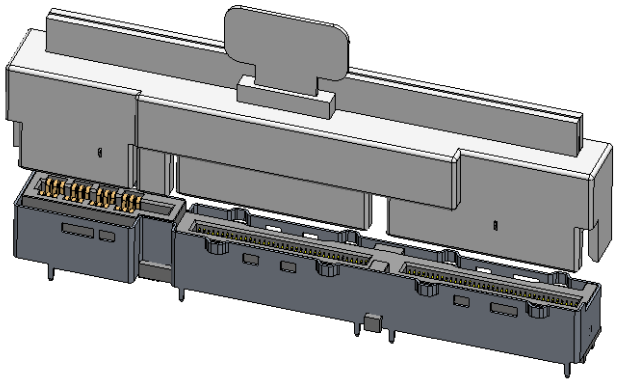


Figure 4-19 Combo x16+34A High Power STR Cable Application

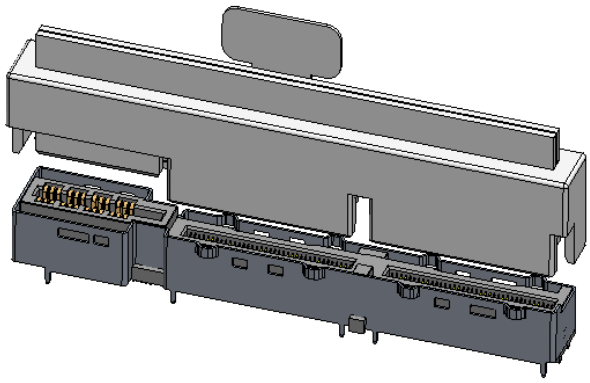


Figure 4-20 Combo x16+34A High Power RSTR Cable Application

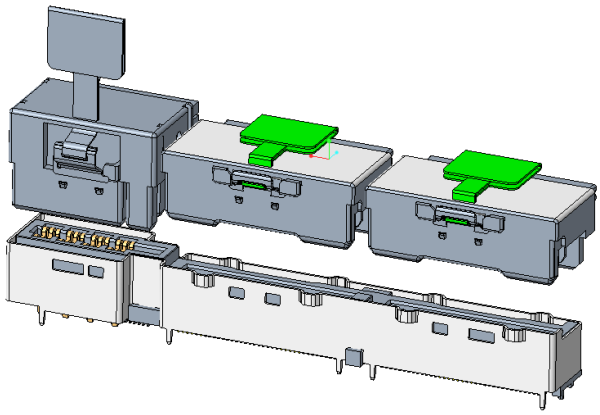


Figure 4-21 Separate RA 74 Pin Cables and a RA 34A High Power Cable Application

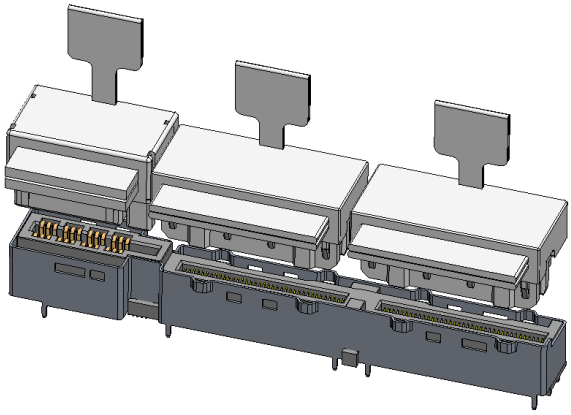


Figure 4-22 Separate RRA 74 Pin Cables and a RRA 34A High Power Cable Application

4.1.5 Vertical Combo DE 55A X16+55A High Power Plus Connector Configuration

This configuration is much like the configuration in section 4.1.4 except it contains four, but larger, higher power contact pads on the plug side and many more power contacts on the receptacle side (8 contacts per large power pad versus the normal 3 contacts per power pad). This configuration can be used in three different ways.

1. A single add-in card (AIC) can plug into the Vertical Combo DE x16+55A Power connector as shown in Figure 4-23.
2. A single combo high power cable can plug into the Vertical Combo DE x16+55A High Power Plus connector as shown in Figure 4-24, Figure 4-25, Figure 4-26, or Figure 4-27.
3. Separate individual cables to plug into the Vertical Combo DE x16+55A High Power Plus connector where there are two 74-pin cables and a 55A High Power Plus cable used as shown in Figure 4-28 or Figure 4-29. In this third case, the Straight Plug with no side flanges for 74 Contacts listed in SFF-TA-1016, the equivalent Right Angle Plug (with no side flanges), or a Reverse Right Angle Plug (with no side flanges) can mate with these receptacle connectors. The standard SFF-TA-1016 Straight Plug for 74 Contacts or the Right Angle Plug for 74 Contacts that include the side flanges will not fit. For this same reason, the SFF-TA-1016 Straight Plug for 148 Contacts or the Right Angle Plug for 148 Contacts will not fit.

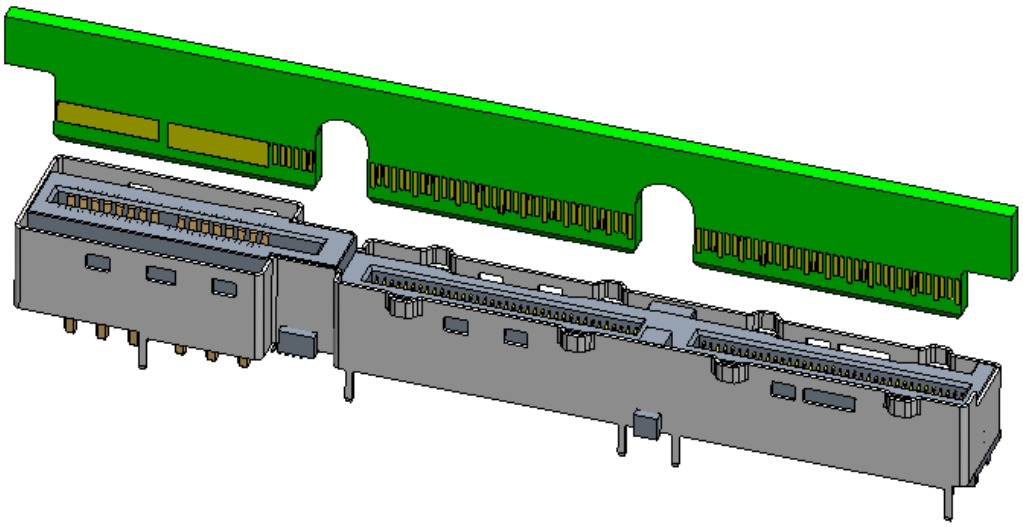


Figure 4-23 Combo x16+55A High Power Plus AIC Application

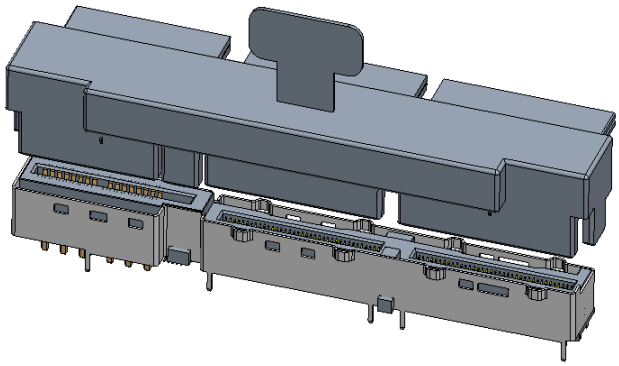


Figure 4-24 Combo x16+55A High Power Plus RA Cable Application

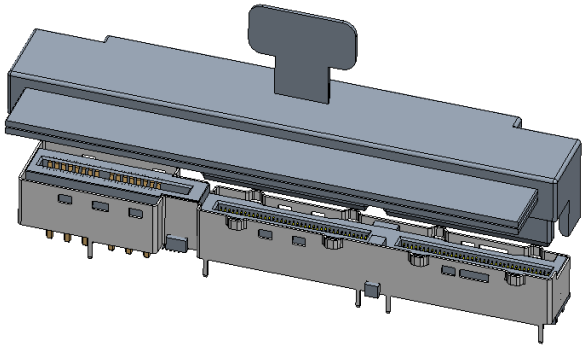


Figure 4-25 Combo x16+55A High Power Plus RRA Cable Application

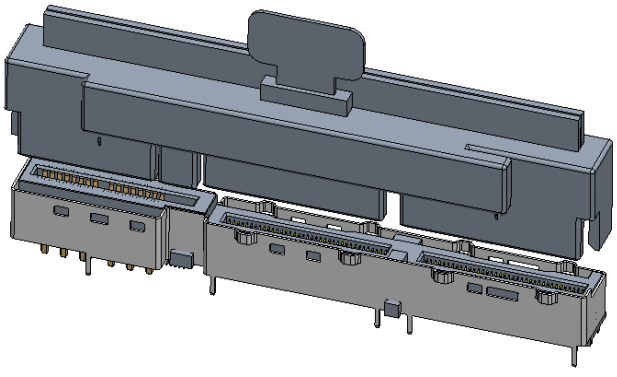


Figure 4-26 Combo x16+55A High Power Plus STR Cable Application

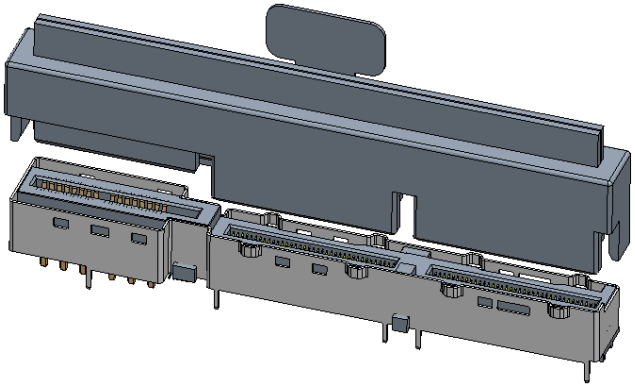


Figure 4-27 Combo x16+55A High Power Plus RSTR Cable Application

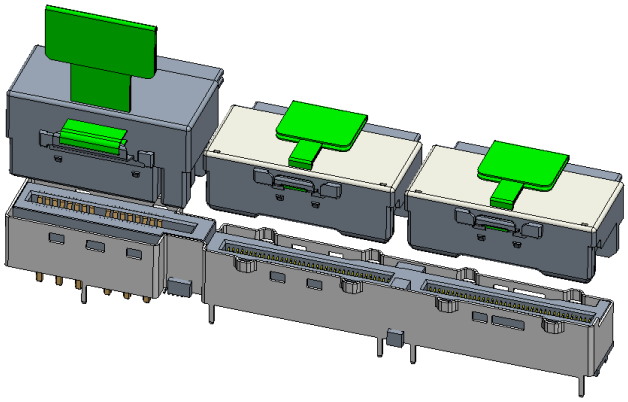


Figure 4-28 Separate RA 74 Pin Cables and a RA 55A High Power Plus Cable Application

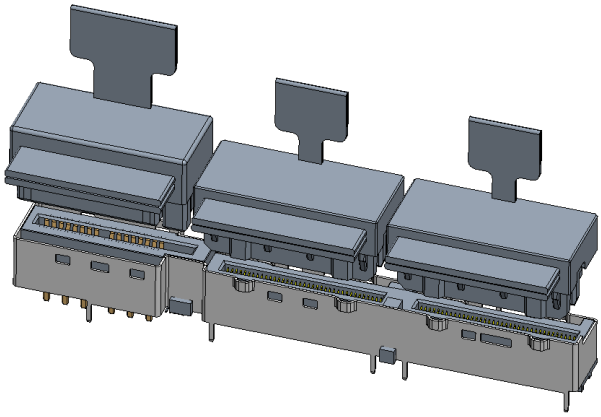


Figure 4-29 Separate RRA Cables and a RRA 55A High Power Plus Cable Application

4.2 Contact Numbering

The pins or electrical contacts in this connector are numbered as shown in Figure 4-30, Figure 4-31, Figure 4-32 and Figure 4-33.

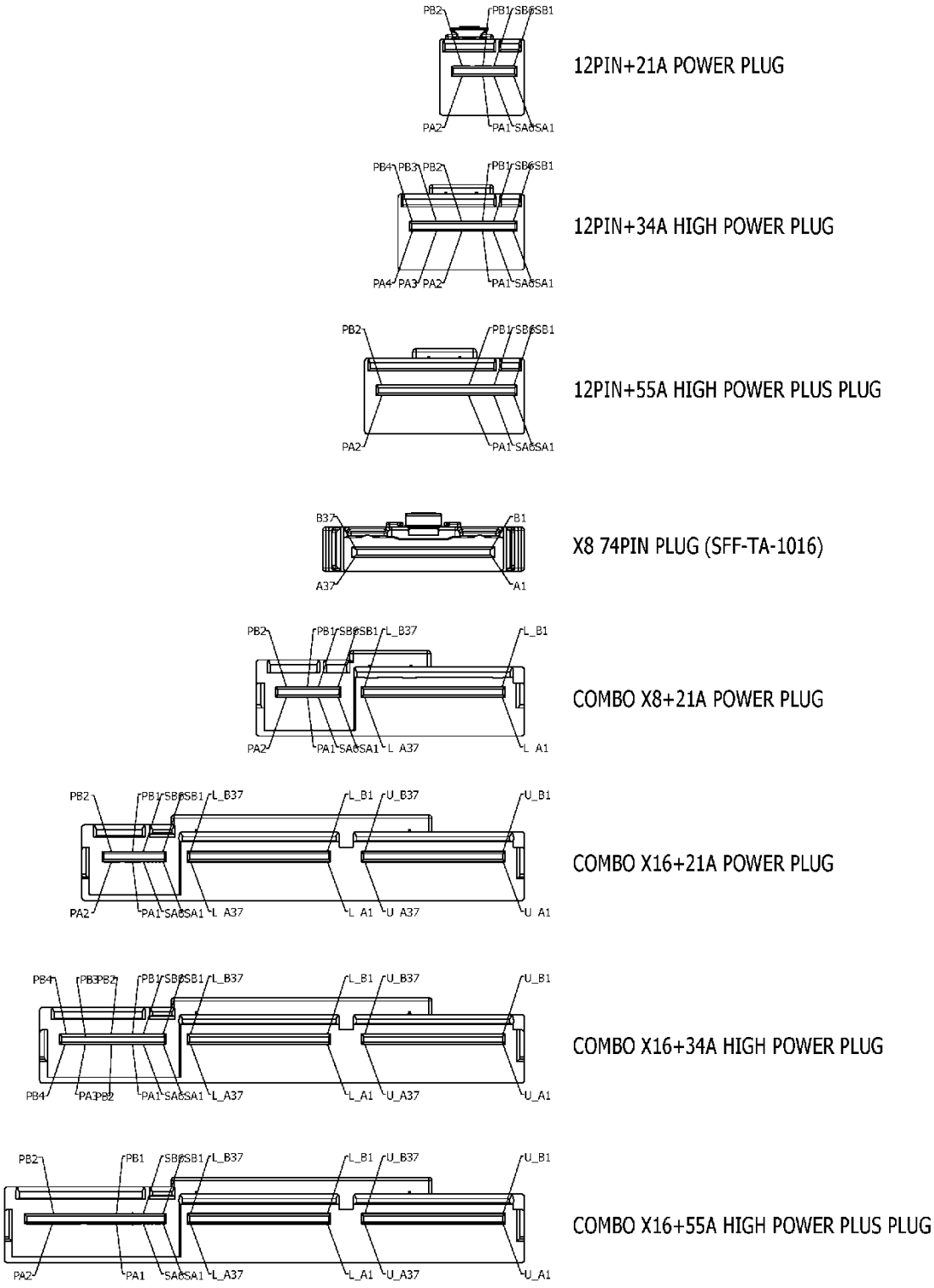


Figure 4-30 Plug Contact Numbering

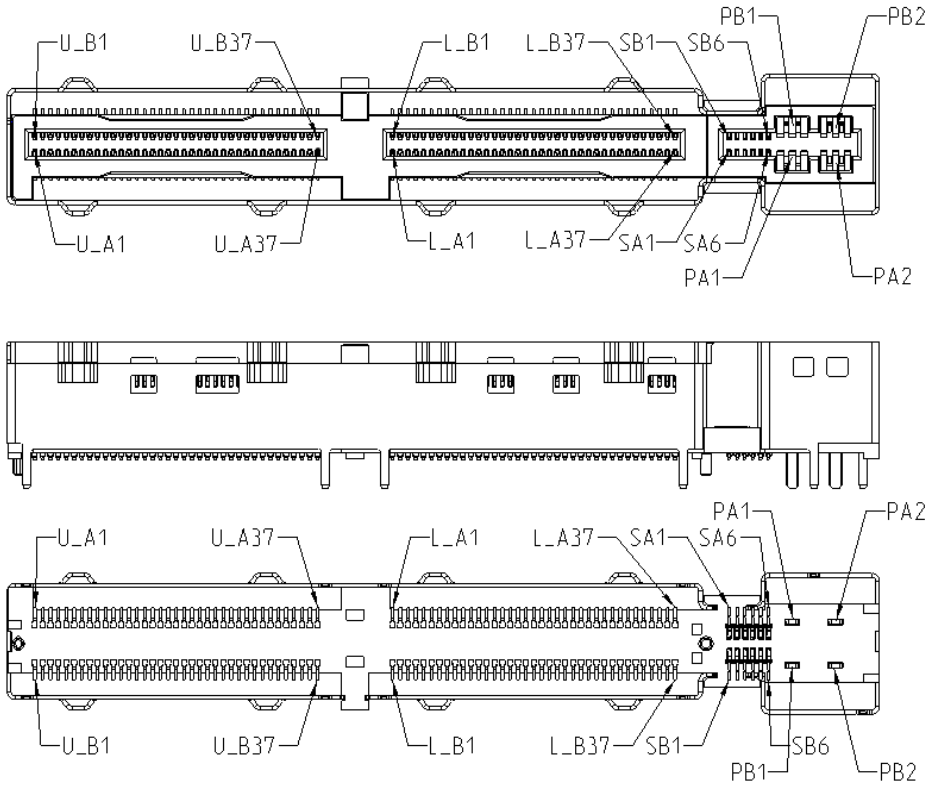


Figure 4-31 Vertical Combo x16+21A Power Receptacle Contact Numbering

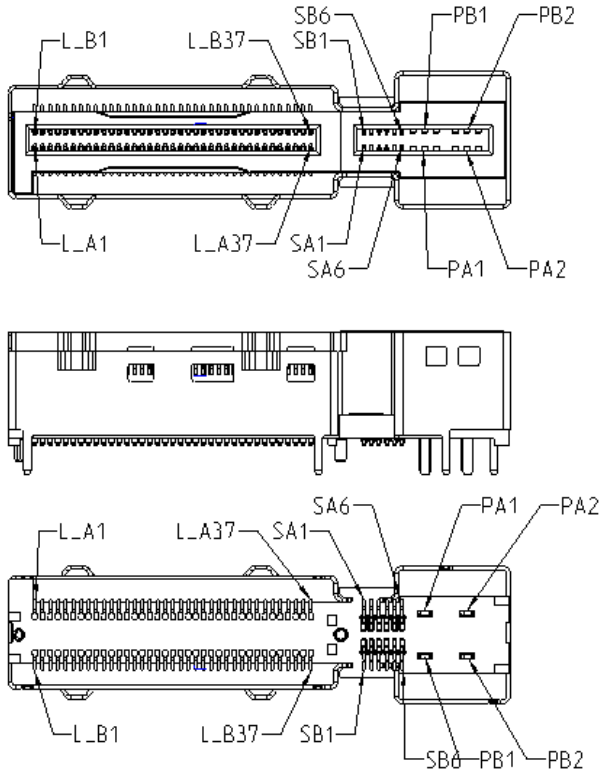


Figure 4-32 Vertical Combo x8+21A Power Receptacle Contact Numbering

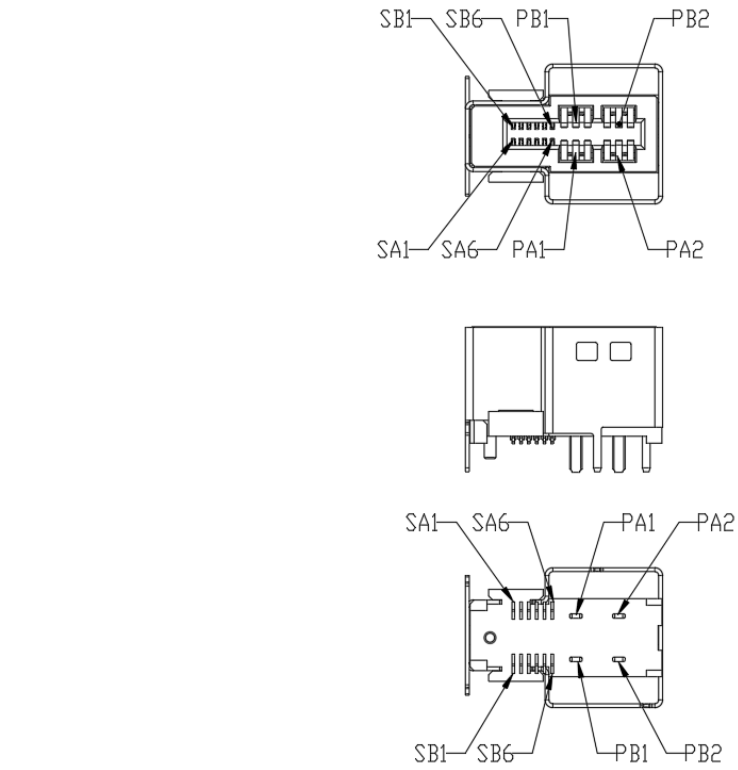


Figure 4-33 Vertical 21A Power Receptacle Contact Numbering

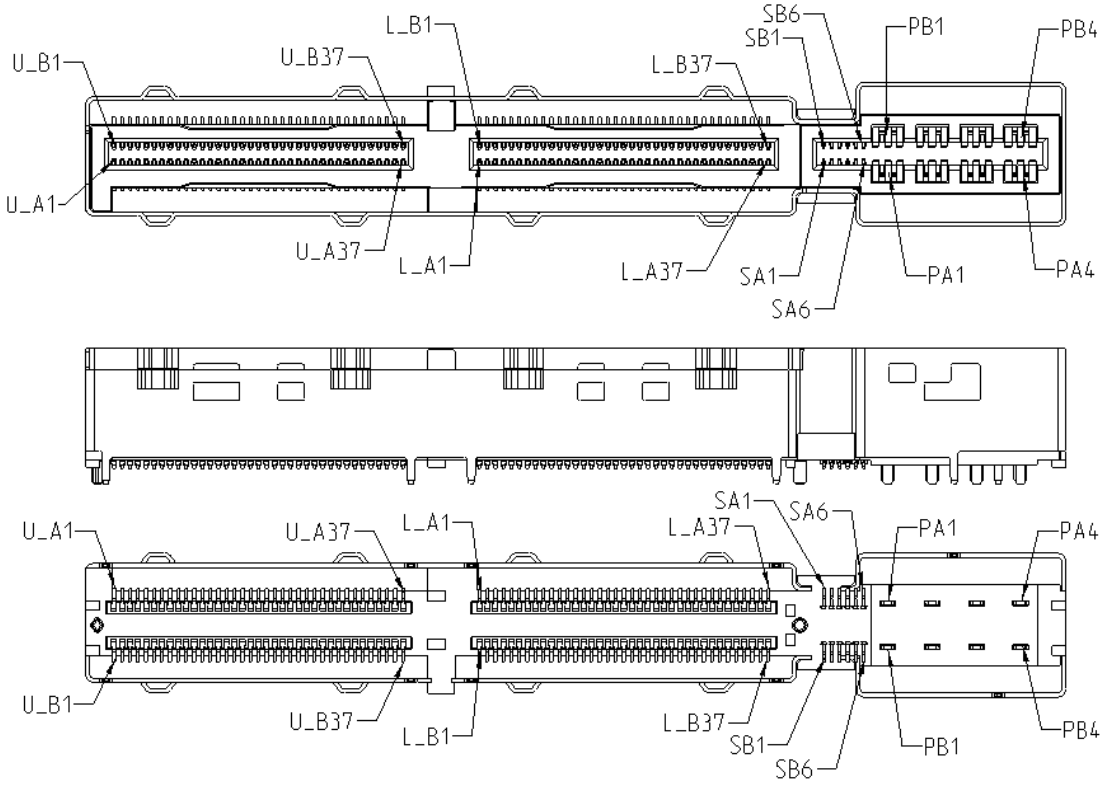


Figure 4-34 Vertical Combo x16+34A High Power Receptacle Contact Numbering

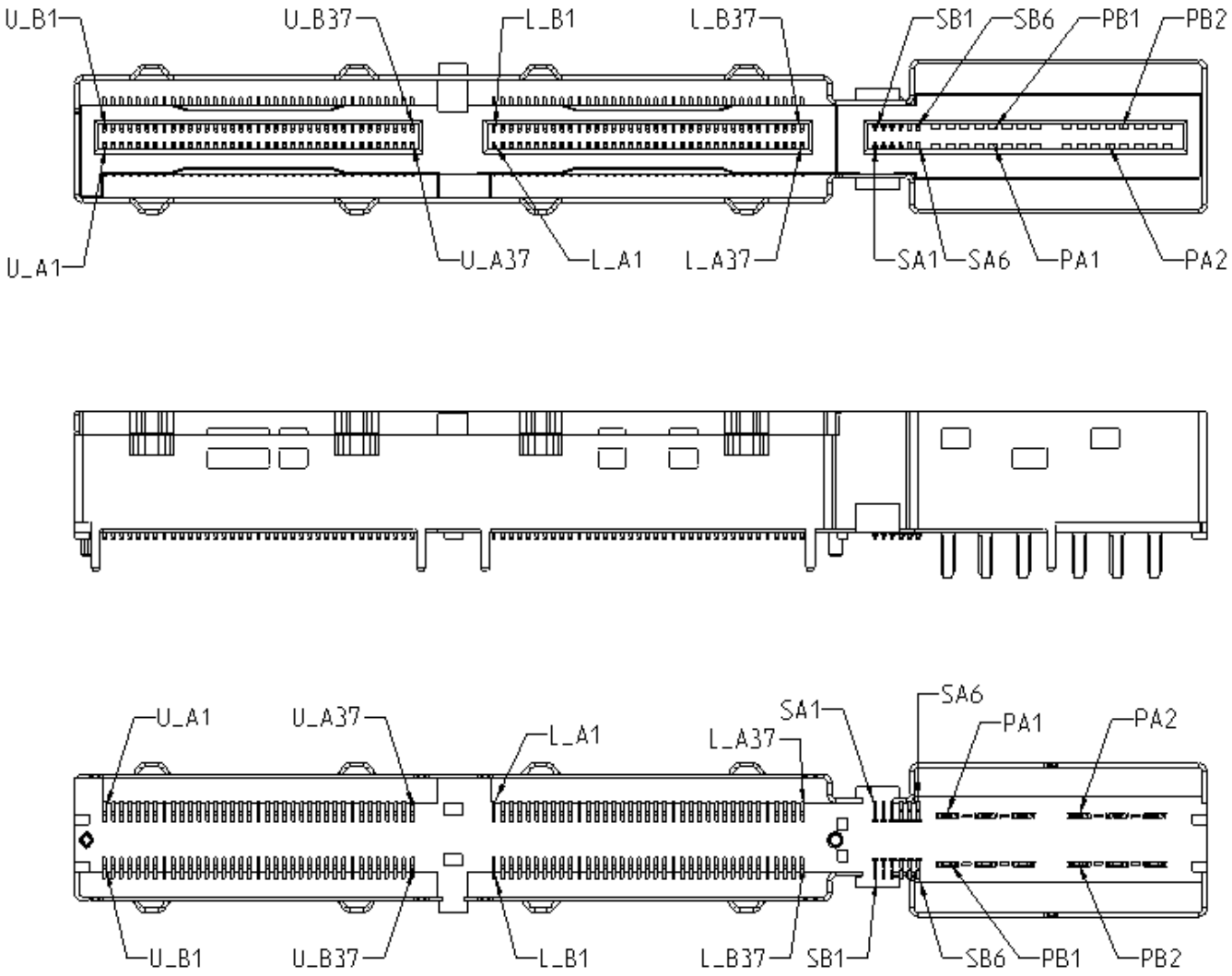


Figure 4-35 Vertical Combo x16+55A High Power Plus Receptacle Contact Numbering

5. Connector Mechanical Specification

5.1 Overview

5.1.1 Datums

The datums defined in Figure 5-1, Figure 5-2, Figure 5-3, Figure 5-4, Figure 5-5, and Figure 5-6, and in Table 5-1 are used throughout the rest of the document to describe the dimensional requirements of this connector.

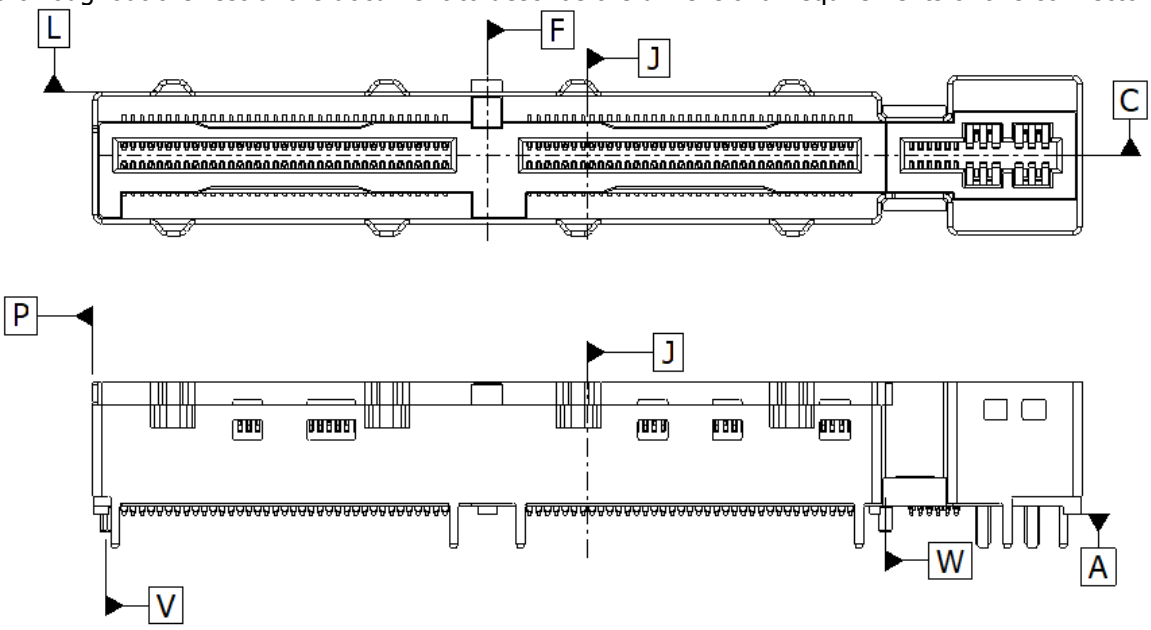


Figure 5-1 Vertical Combo DE X16+21A Power Receptacle Connector Datum Definitions

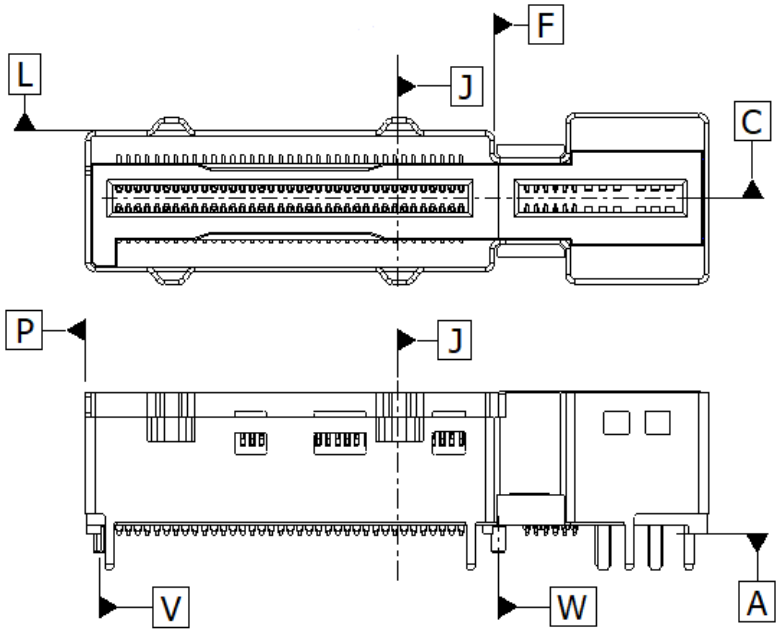


Figure 5-2 Vertical Combo DE X8+21A Power Receptacle Connector Datum Definitions

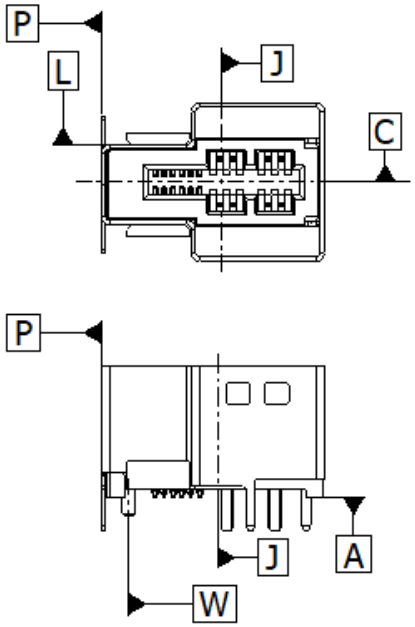


Figure 5-3 Vertical DE 21A Power Receptacle Connector Datum Definitions

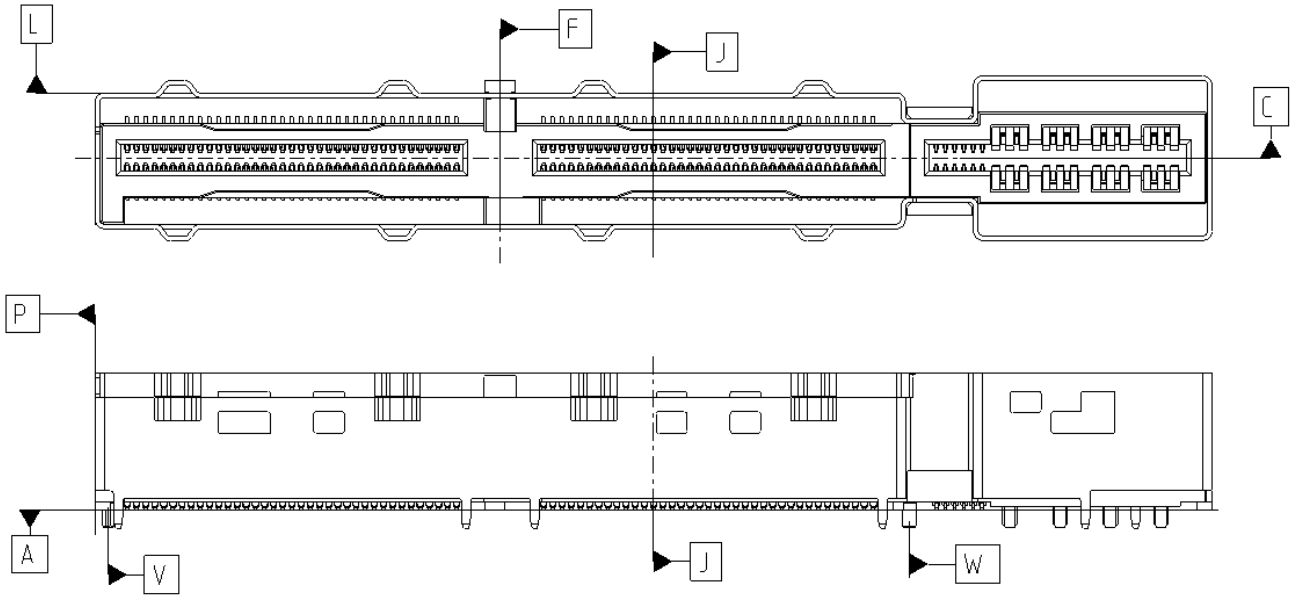


Figure 5-4 Vertical Combo DE X16+34A High Power Receptacle Connector Datum Definitions

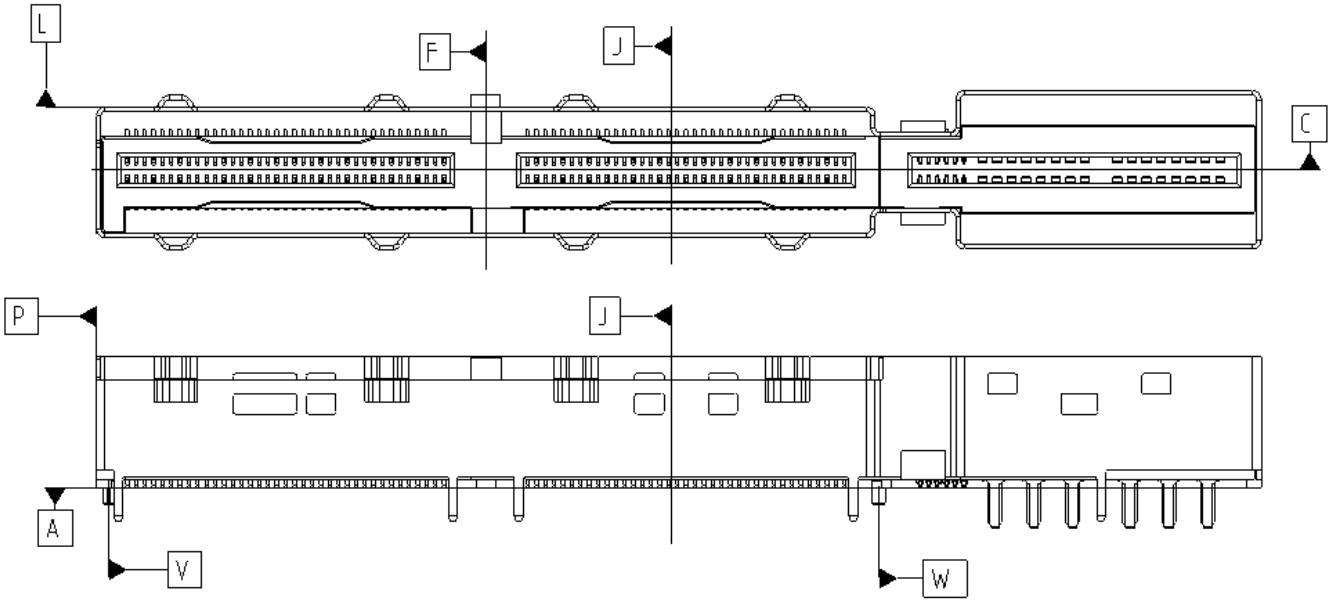


Figure 5-5 Vertical Combo DE X16+55A High Power Plus Receptacle Connector Datum Definitions

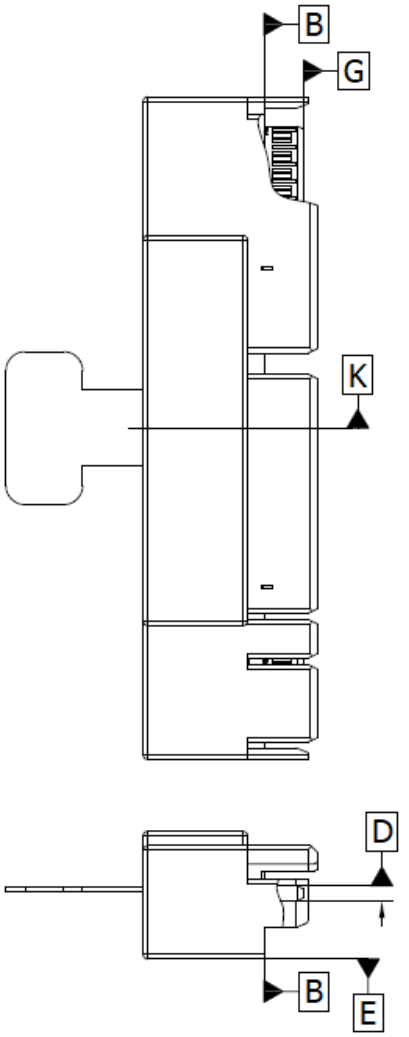


Figure 5-6 Plug Datum Definitions

Table 5-1 Datum Descriptions

Datum	Description
A	Mating Surfaces to the PCB or PCB Pads
B	Plug and Receptacle Mechanical Stop
C	Centerline of the Receptacle Paddle Card Slot Height / Mating Interface Centerline
D	Centerline of Paddle Card Thickness
E	Bottom Surface of Plug Body
F	Centerline of Key
G	Leading Edge of Paddle Card
J	Centerline of the Receptacle Width
K	Centerline of Plug Body
L	Receptacle Shell Surface
P	Receptacle Shell Surface
R	Power Paddle Card Interface Width Centerline
V	Centerline of the Receptacle's Locating Peg
W	Centerline of the Receptacle's Locating Peg

5.2 Mechanical Description: Vertical Combo Family of Connectors

This specification details a connector system consisting of five variations of board connectors.

1. The Vertical Combo 21A Power Dual-Exit (DE) in the x16+21A Power size.
2. The Vertical Combo 21A Power DE in the x8+21A Power size.
3. The Vertical 21A Power DE connector by itself.
4. The Vertical Combo 34A High Power DE in the x16 size. This 34A High Power variation is capable of providing 34A of current with the power contacts.
5. The Vertical Combo 55A High Power Plus DE in the x16 size. This 55A High Power Plus variation is capable of providing 55A of current with the power contacts.

5.2.1 Vertical Combo DE X16+21A Power Connectors

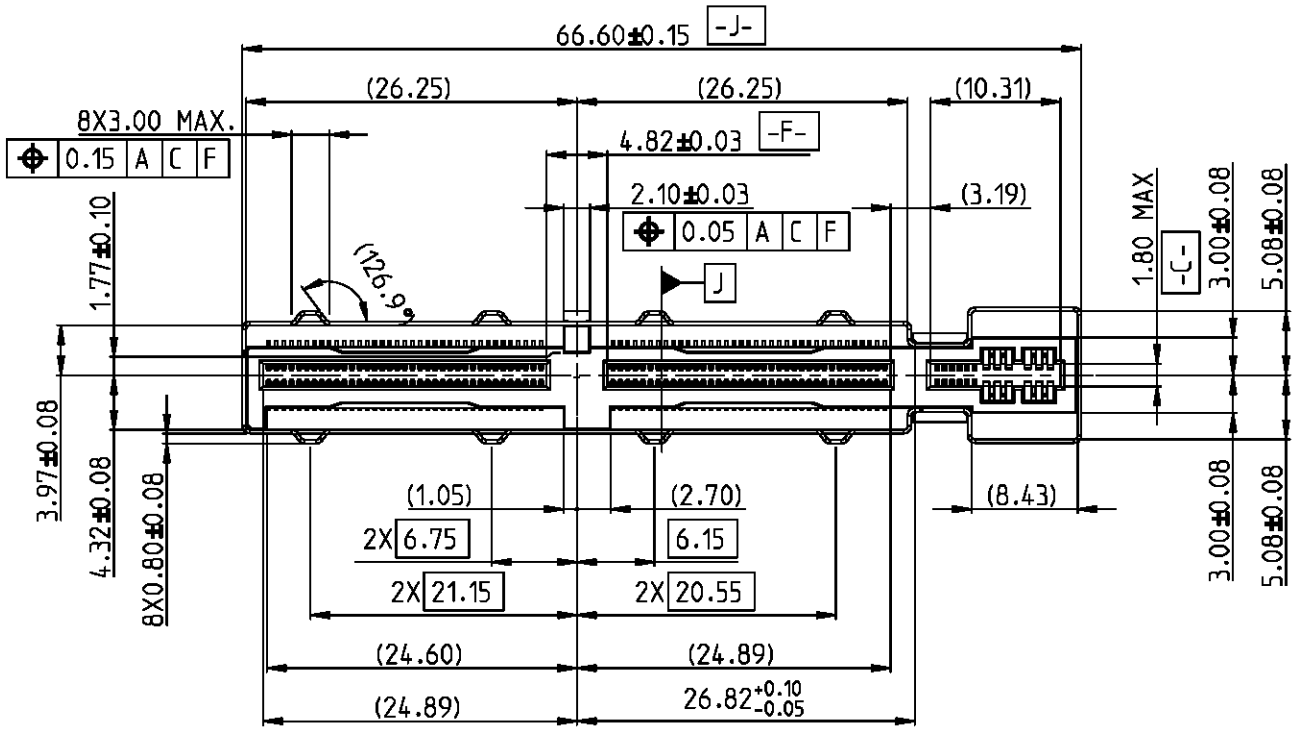


Figure 5-7 Vertical Combo DE X16+21A Power Connectors (Top View)

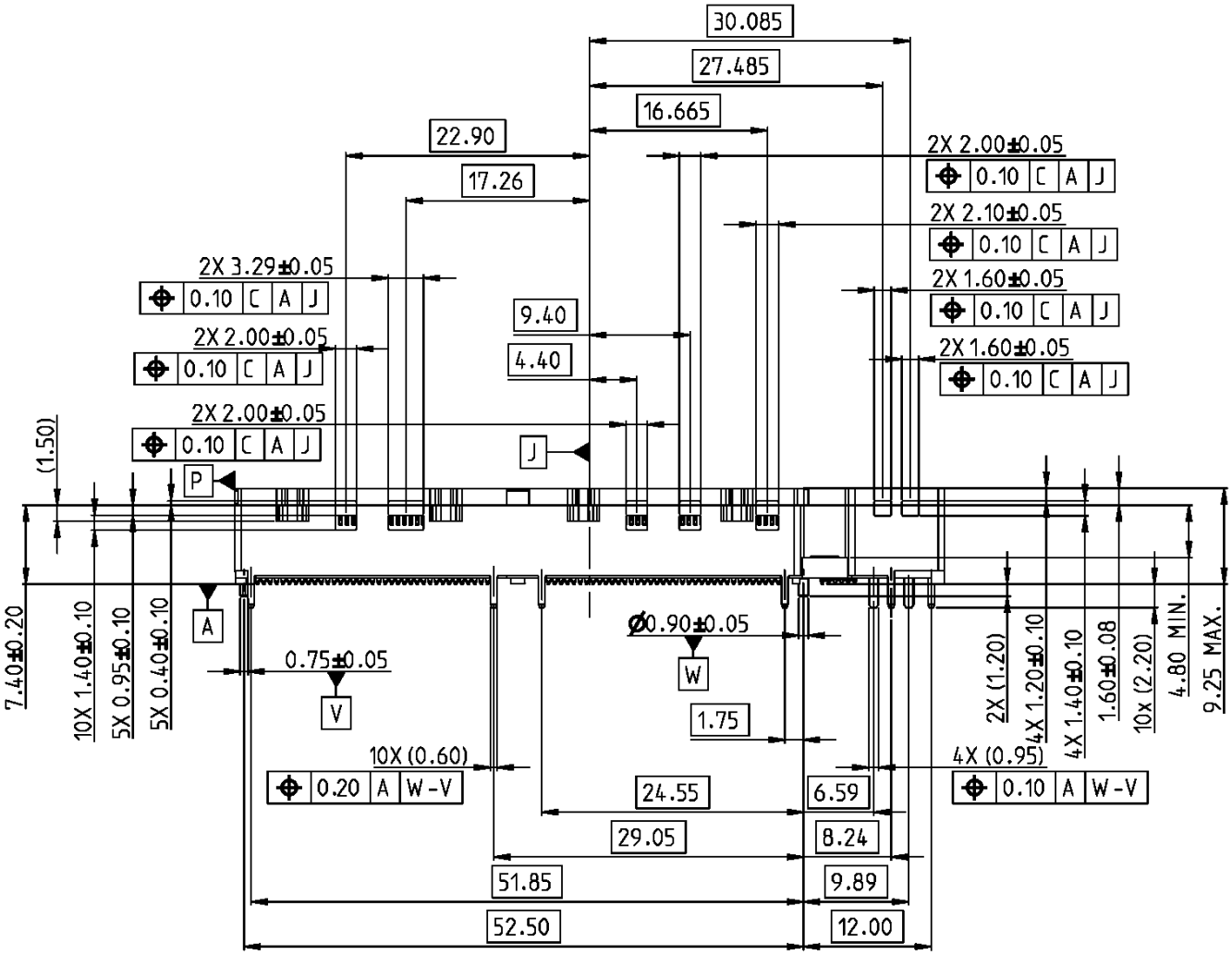


Figure 5-8 Vertical Combo DE X16+21A Power Connectors (Side View)

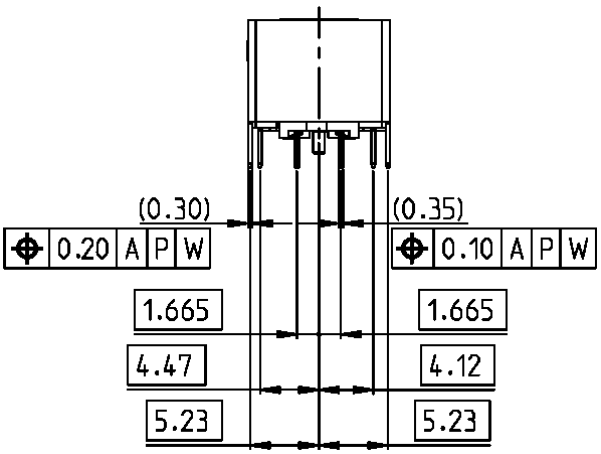


Figure 5-9 Vertical Combo DE X16+21A Power Connectors (End View)

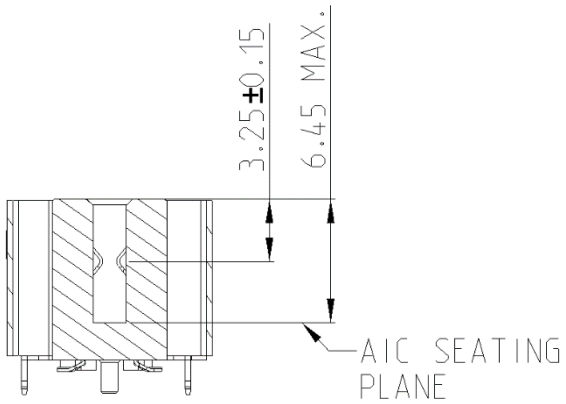


Figure 5-10 Vertical Combo DE X16+21A Power Connectors (Section View)

5.2.2 Vertical Combo DE X8+21A Power Connectors

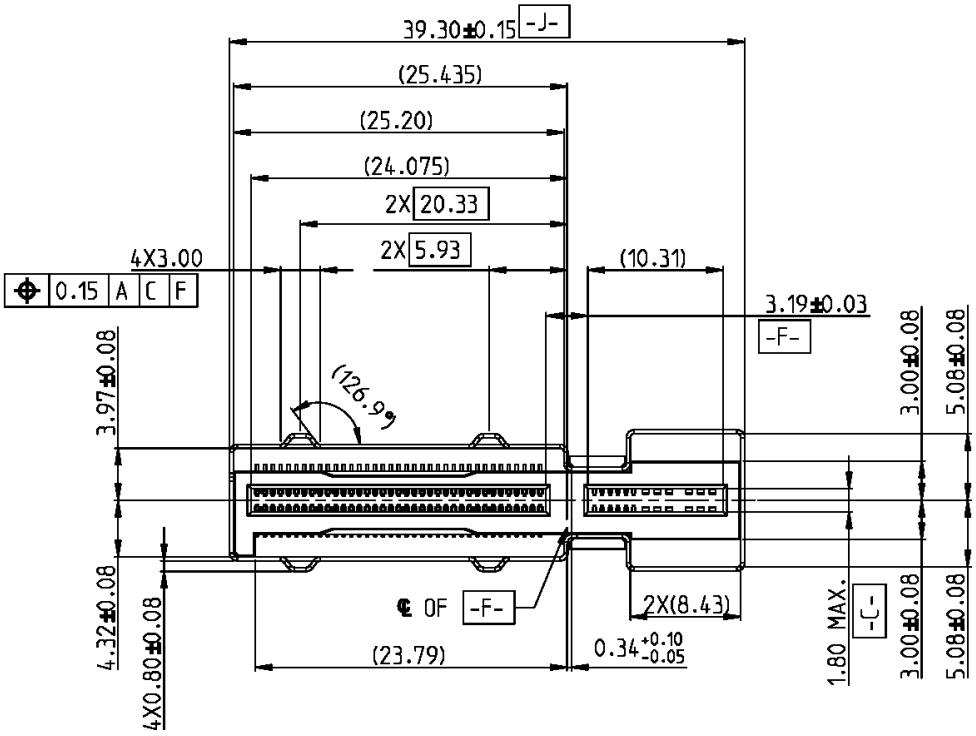


Figure 5-11 Vertical Combo DE X8+21A Power Connectors (Top View)

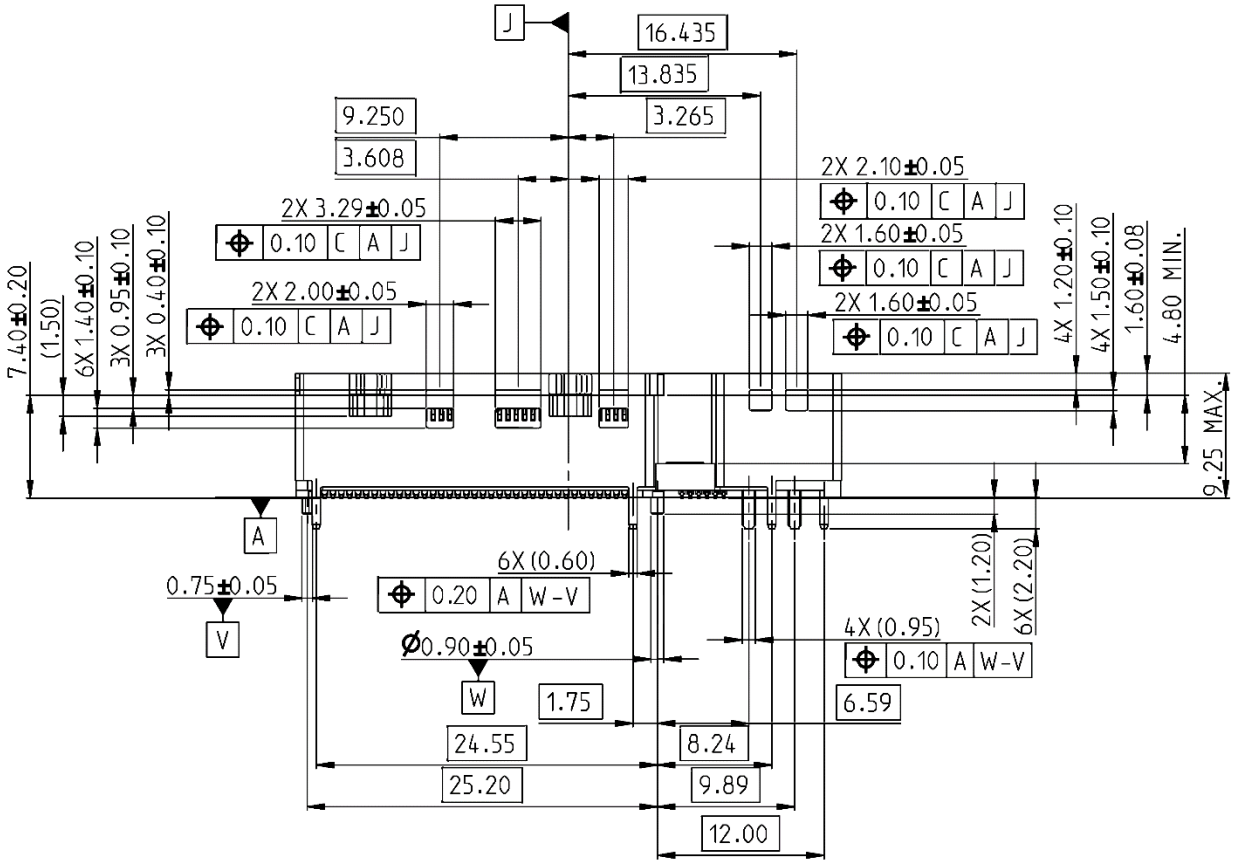


Figure 5-12 Vertical Combo DE X8+21A Power Connectors (Side View)

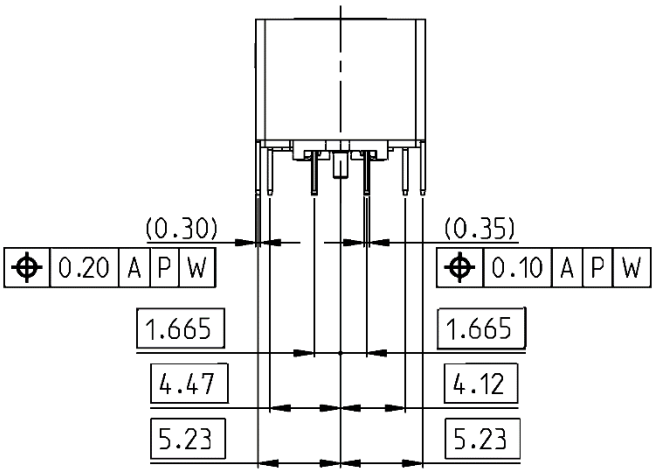


Figure 5-13 Vertical Combo DE X8+21A Power Connectors (End View)

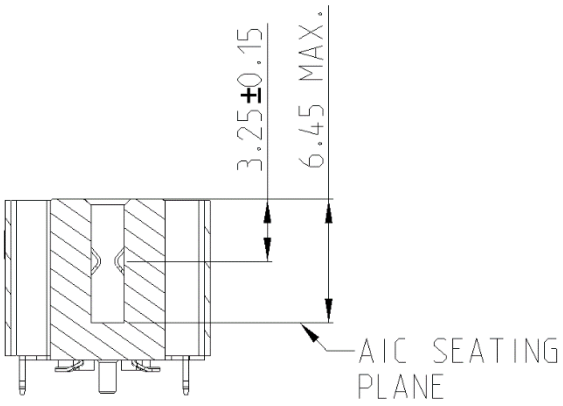


Figure 5-14 Vertical Combo DE X8+21A Power Connectors (Section View)

5.2.3 Vertical DE 21A Power Connectors

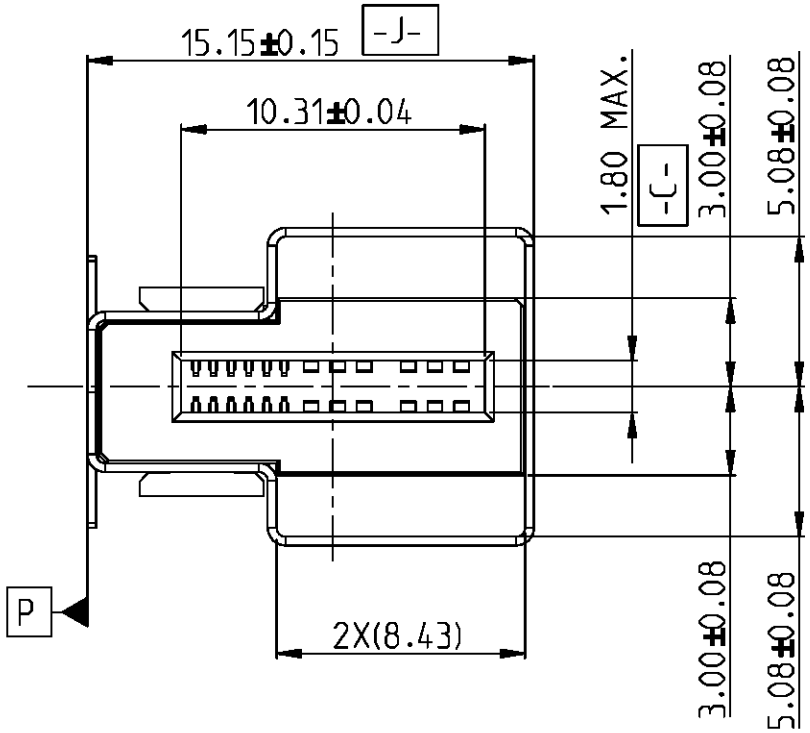


Figure 5-15 Vertical DE 21A Power Connectors (Top View)

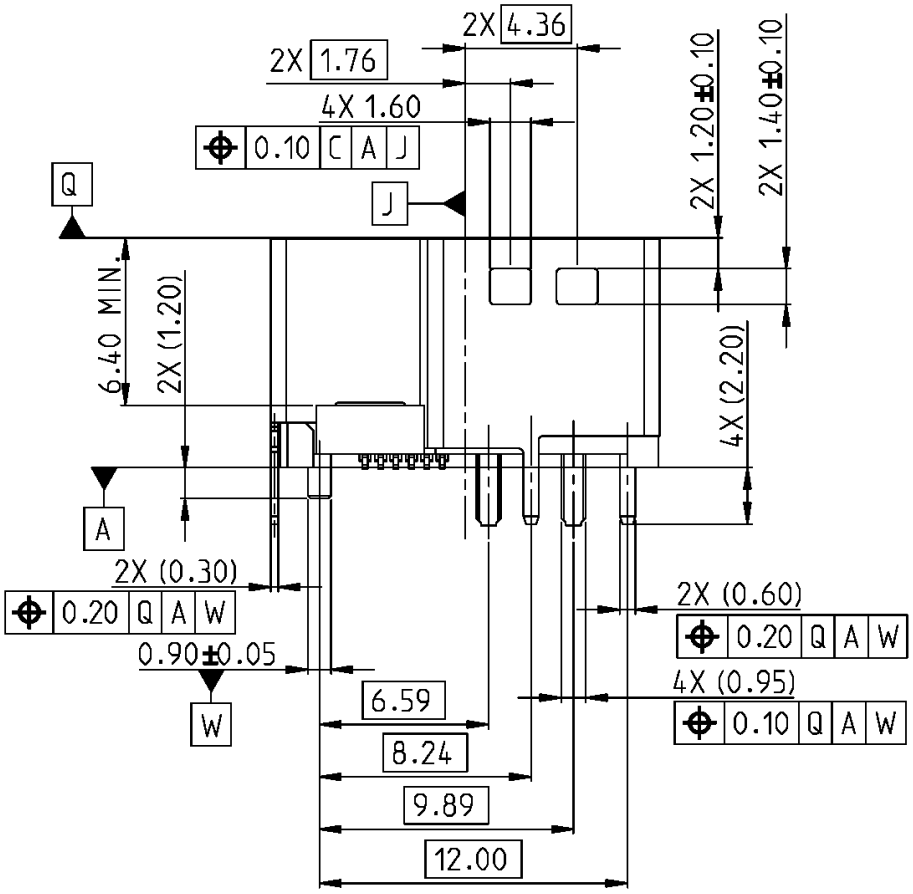


Figure 5-16 Vertical DE 21A Power Connectors (Side View)

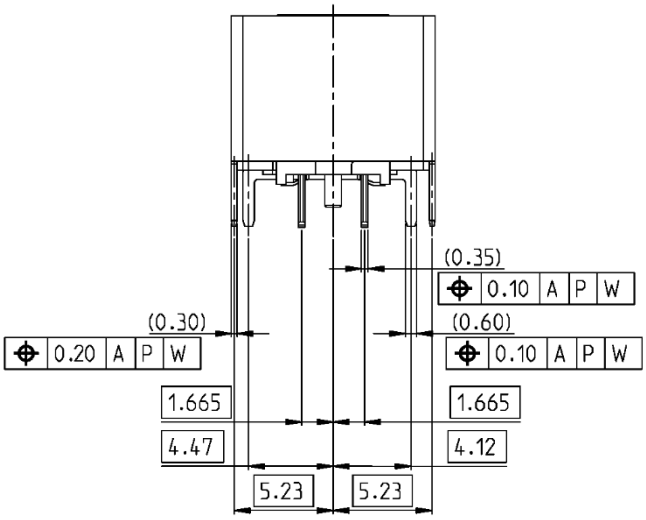


Figure 5-17 Vertical DE 21A Power Connectors (End View)

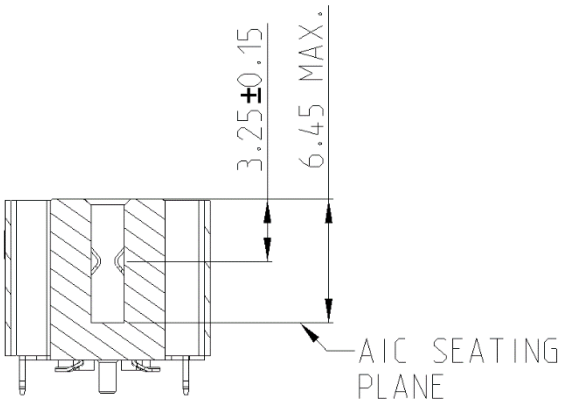


Figure 5-18 Vertical DE 21A Power Connectors (Section View)

5.2.4 Vertical Combo DE X16+34A High Power Connectors

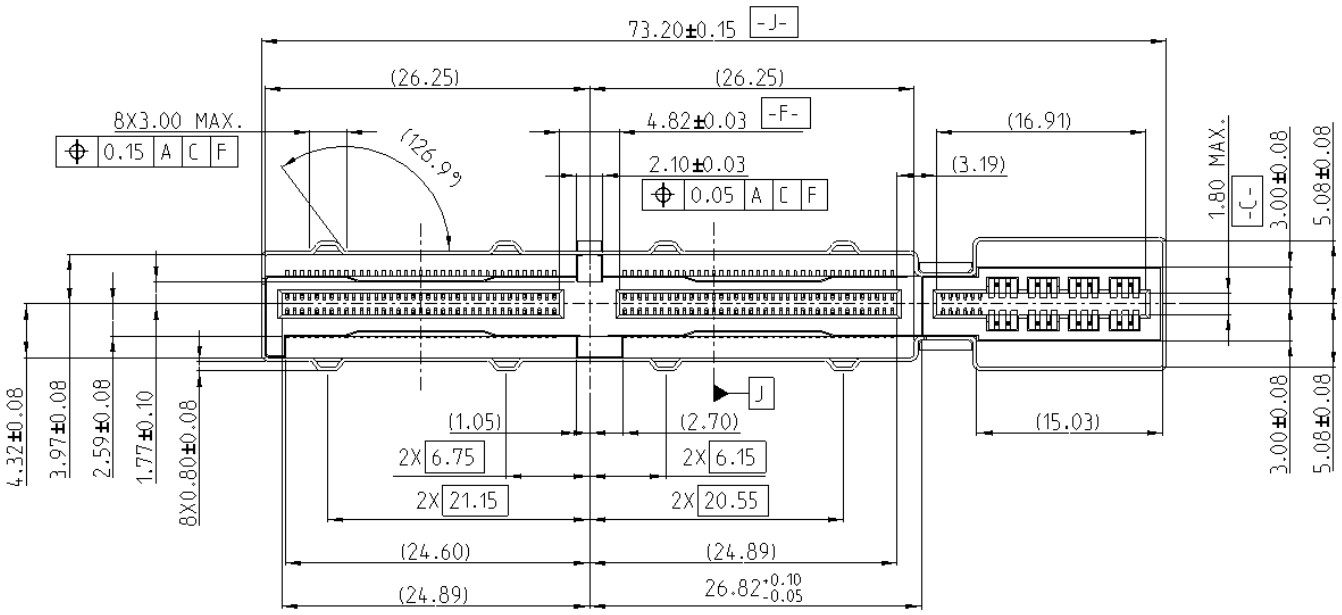


Figure 5-19 Vertical Combo DE X16+34A High Power Connectors (Top View)

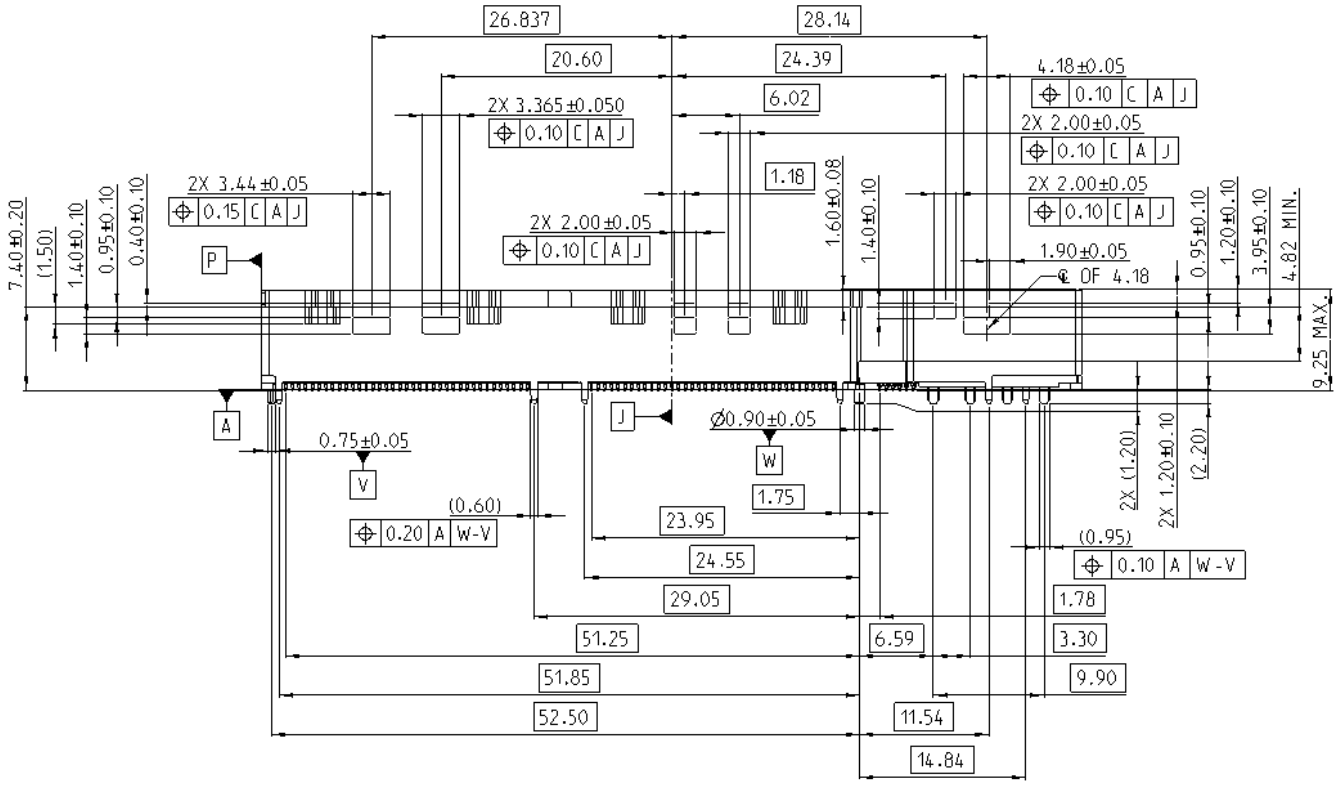


Figure 5-20 Vertical Combo DE X16+34A High Power Connectors (Side View)

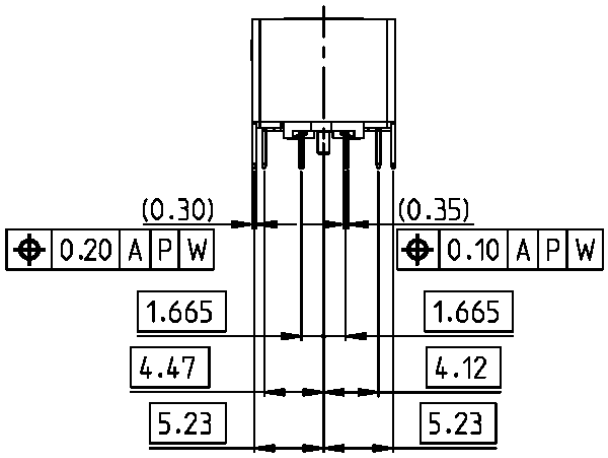


Figure 5-21 Vertical Combo DE X16+34A High Power Connectors (End View)

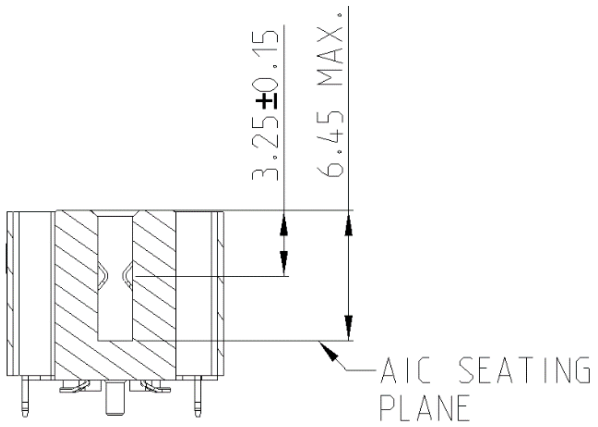


Figure 5-22 Vertical Combo DE X16+34A High Power Connectors (Section View)

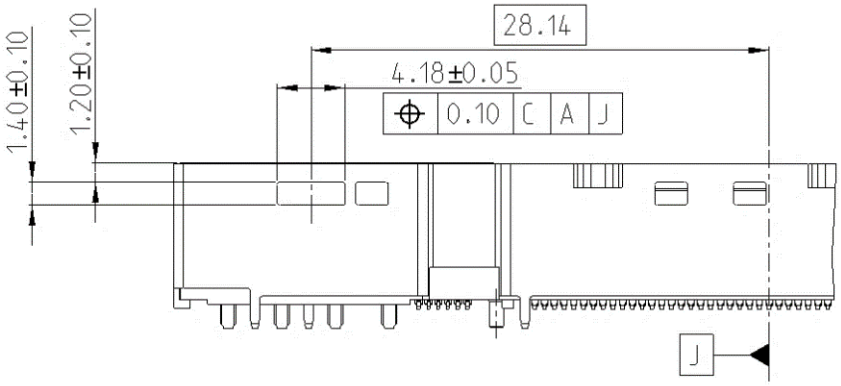


Figure 5-23 Vertical Combo DE X16+34A High Power Connectors (Aux View)

5.2.5 Vertical Combo Power DE Connectors for X16+55A High Power Plus

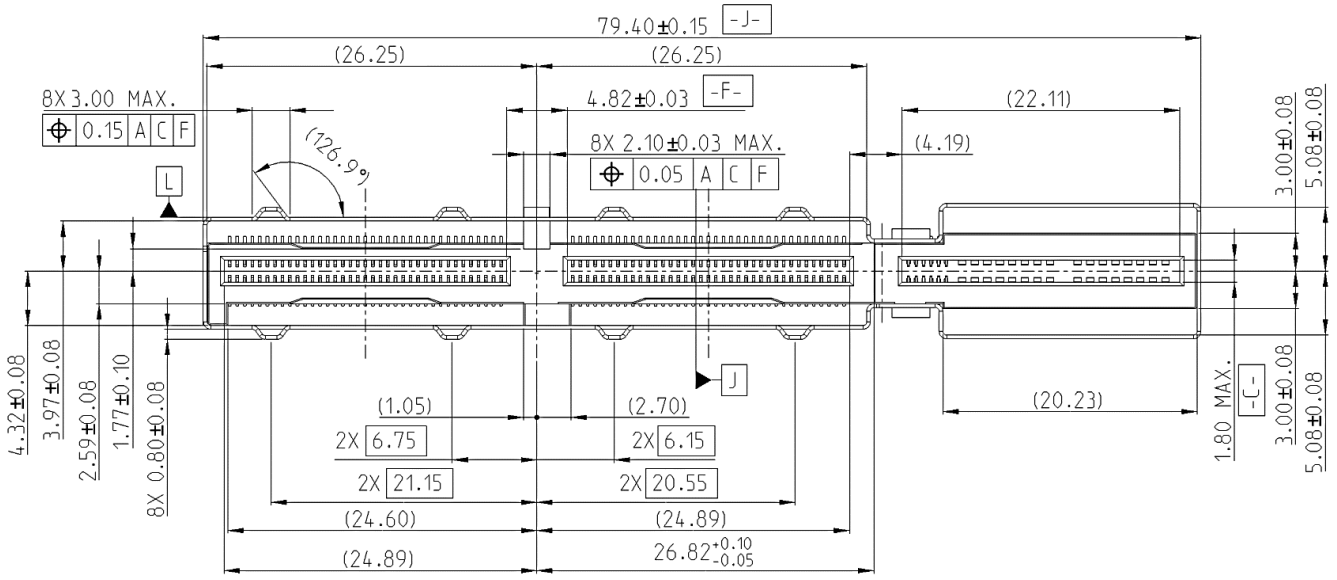


Figure 5-24 Vertical Combo Power DE Connectors for X16+55A High Power Plus (Top View)

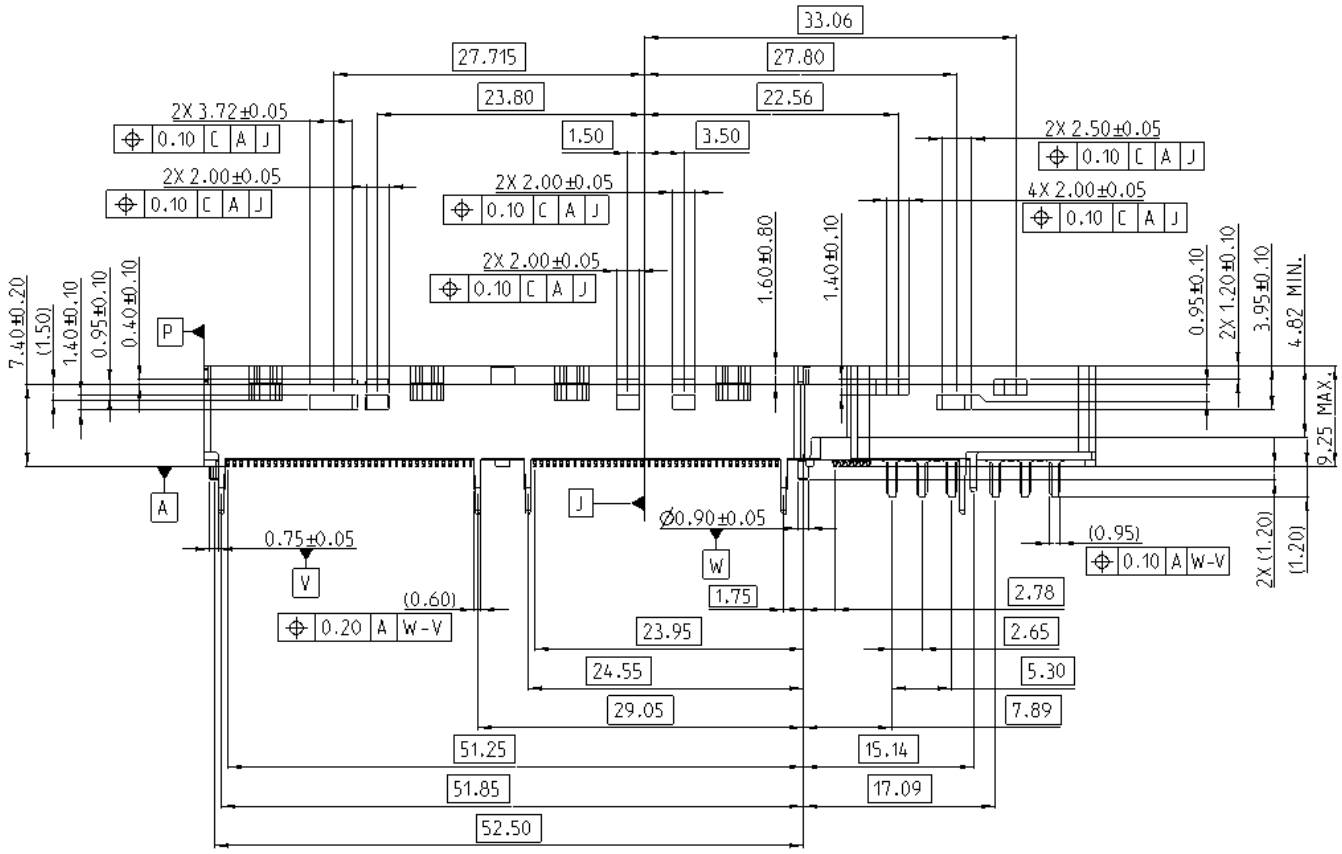


Figure 5-25 Vertical Combo Power DE Connectors for X16+55A High Power Plus (Side View)

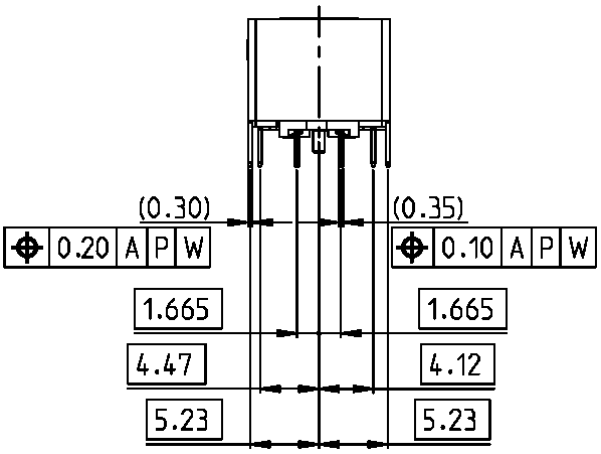


Figure 5-26 Vertical Combo DE X16+55A High Power Plus Connectors (End View)

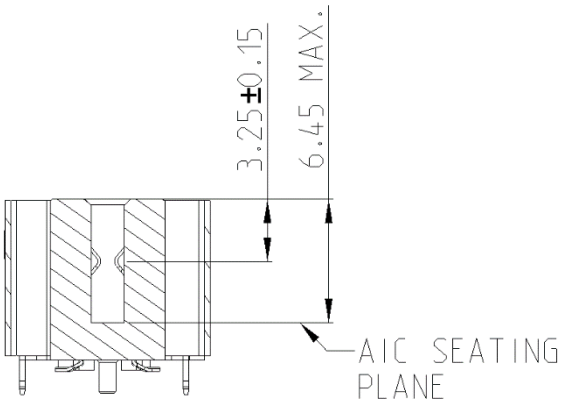


Figure 5-27 Vertical Combo DE X16+55A High Power Plus Connectors (Section View)

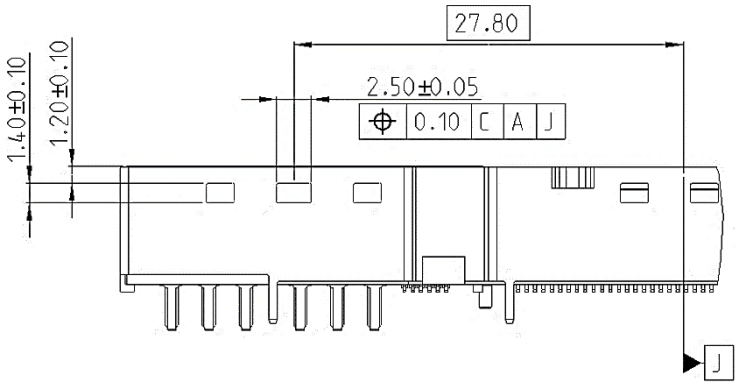


Figure 5-28 Vertical Combo DE X16+55A High Power Plus Connectors (Aux View)

5.3 Outer Locus of the Vertical Connector Mating Contacts

Figure 5-29 through Figure 5-33 show the outer locus of the connector contacts at the mating interface.

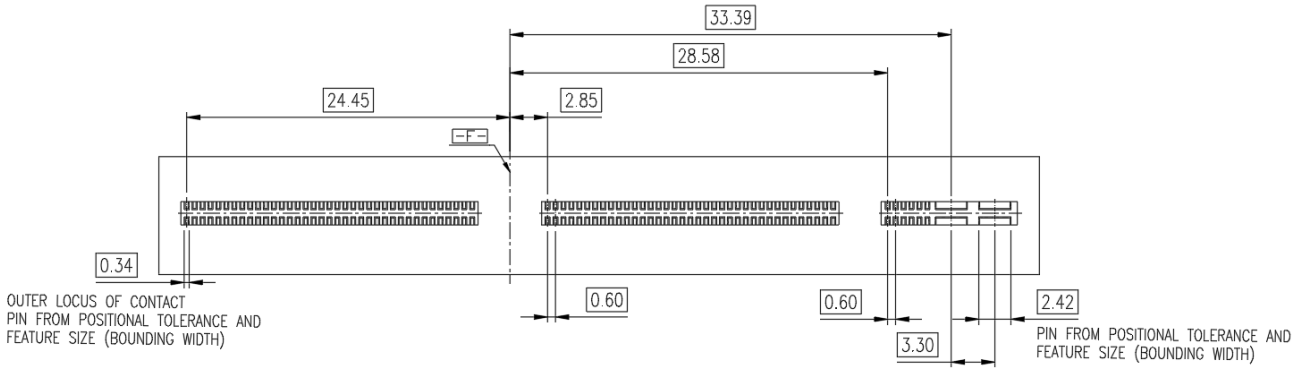


Figure 5-29 Outer Locus of Vertical Combo DE X16+21A Power Connector Mating Contact Pins

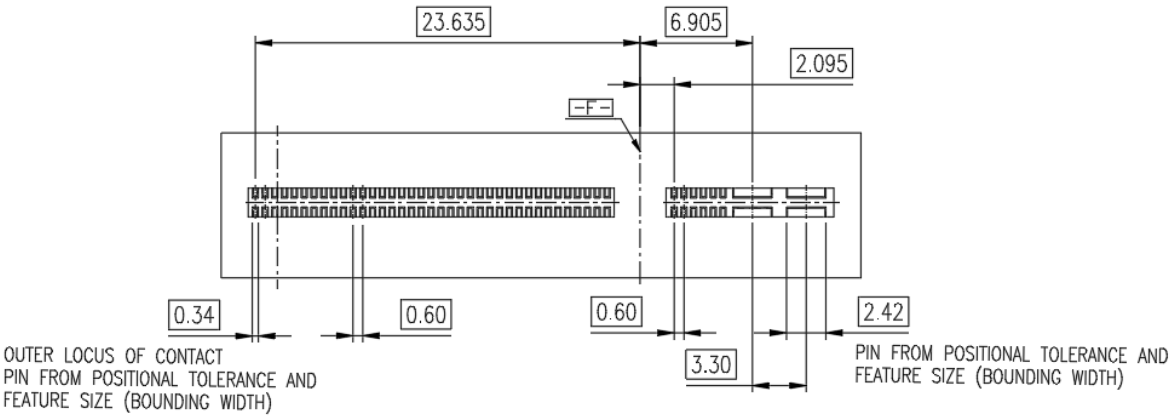


Figure 5-30 Outer Locus of Vertical Combo DE X8+21A Power Connector Mating Contact Pins

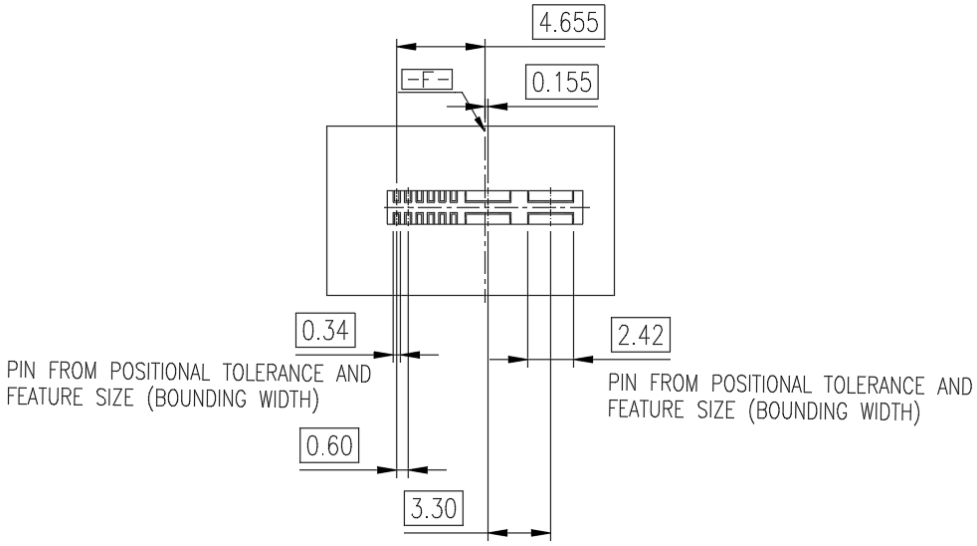


Figure 5-31 Outer Locus of Vertical DE 21A Power Connector Mating Contact Pins

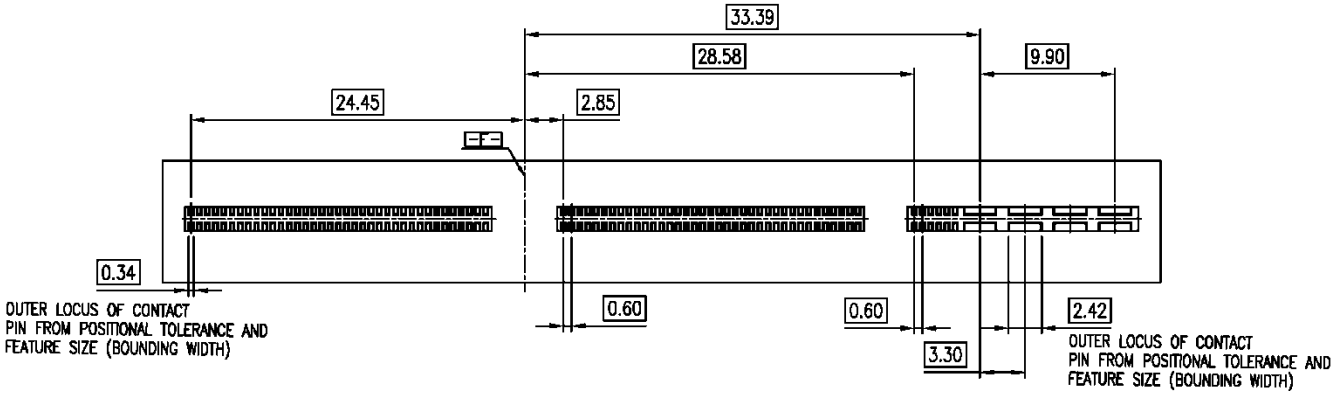


Figure 5-32 Outer Locus of Vertical Combo DE X16+34A High Power Connector Mating Contact Pins

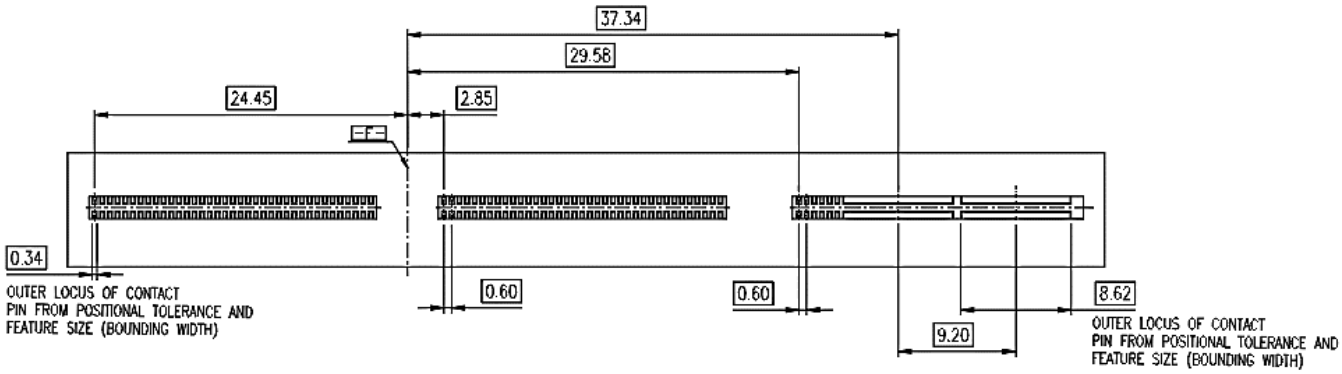


Figure 5-33 Outer Locus of Vertical Combo DE X16+55A High Power Plus Connector Mating Contact Pins

5.4 Outer Locus of the SMT Leads

Figure 5-34 through Figure 5-38 show the outer locus of the flat surfaces of the SMT leads that are intended to mate with the applicable PCB footprint pads for receptacle each connector type.

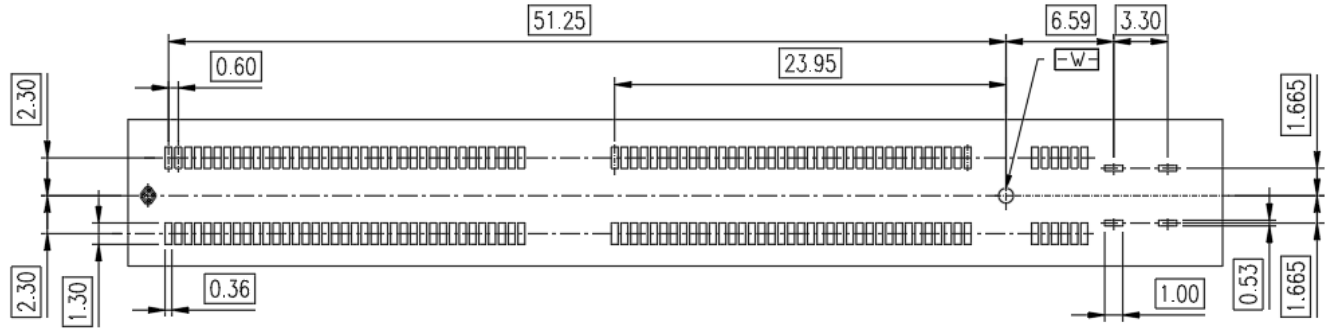


Figure 5-34 Outer Locus of Vertical Combo DE X16+21A Power Connector SMT Leads

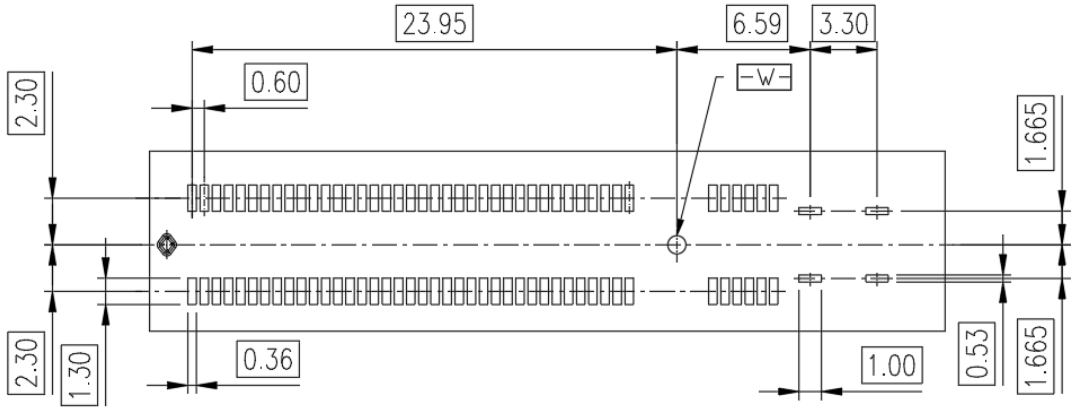


Figure 5-35 Outer Locus of Vertical Combo DE X8+21A Power Connector SMT Leads

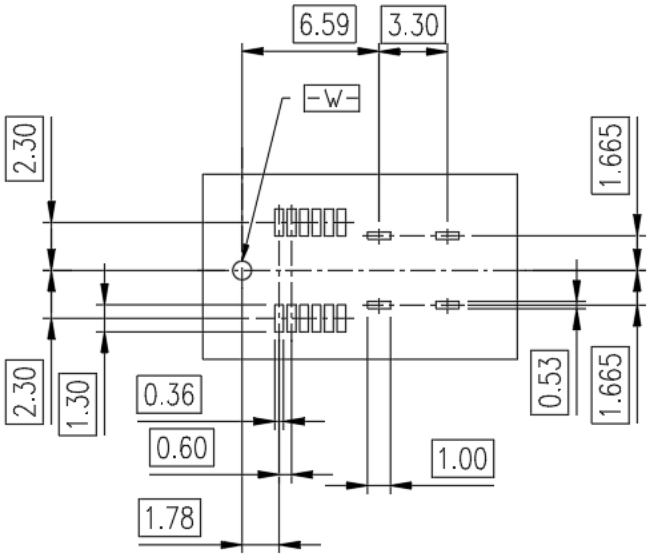


Figure 5-36 Outer Locus of Vertical DE 21A Power Connector SMT Leads

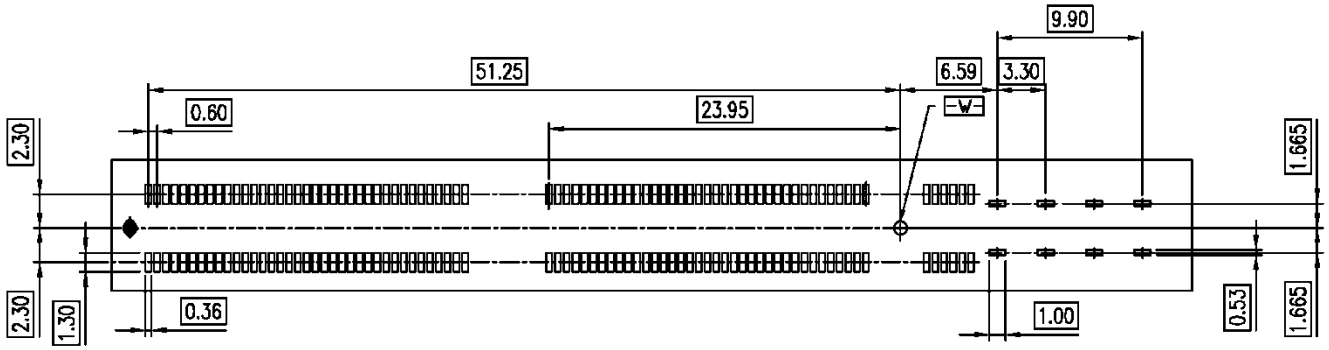


Figure 5-37 Outer Locus of Vertical Combo DE X16+34A High Power Connector SMT Leads

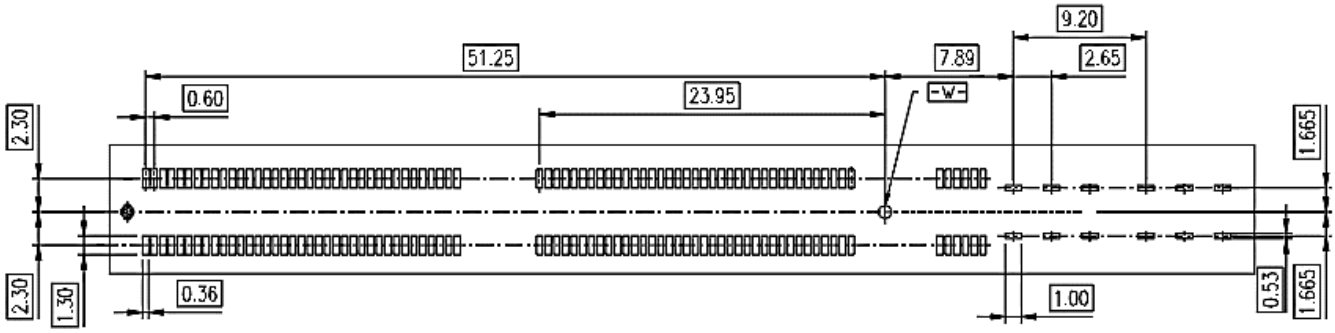


Figure 5-38 Outer Locus of Vertical Combo DE X16+55A High Power Plus Connector SMT Leads

6. Plug Mechanical Specification

6.1 Overview

Refer back to section 5.1.1 for definitions of datums used throughout the following sections.

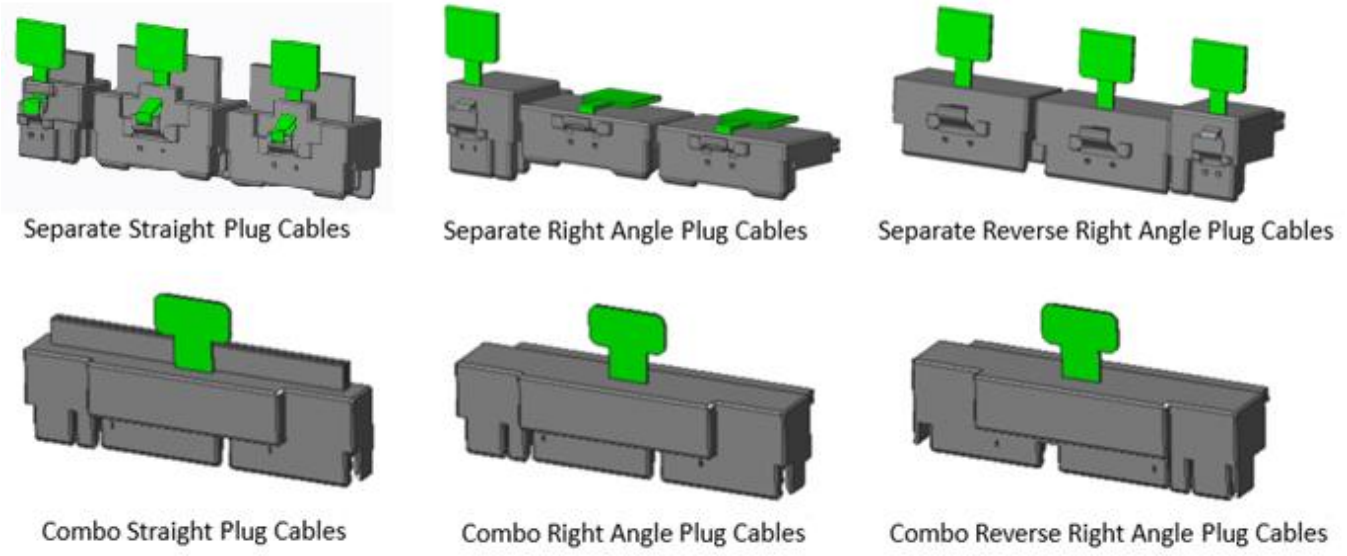


Figure 6-1 Example Images of Plug Variations

6.2 Mechanical Description: Combo Family of Plugs

These plugs include multiple variations.

1. There are the Combo x16+21A Power Straight (STR) plug, the Combo x16+21A Power Right Angle (RA) plug, the Combo x16+21A Power Reverse Straight (RSTR) plug, and the Combo x16+21A Power Reverse Right Angle (RRA) plug.
2. There are the Combo x8+21A Power Straight (STR) plug, the Combo x8+21A Power Right Angle (RA) plug, the Combo x8+21A Power Reverse Straight (RSTR) plug, and the Combo x8+21A Power Reverse Right Angle (RRA) plug.
3. There are the 21A Power Straight (STR) plug, the 21A Power Right Angle (RA) plug, the 21A Power Reverse Straight (RSTR) plug, and the 21A Power Reverse Right Angle (RRA) plug.
4. There are the Combo x16+21A Power Straight (STR) Panel Mount plug and the Combo x16+21A Power Reverse Straight (RSTR) Panel Mount plug.
5. There are the Combo x16+34A High Power Straight (STR) plug, the Combo x16+34A High Power Right Angle (RA) plug, the Combo x16+34A High Power Reverse Straight (RSTR) plug, the Combo x16+34A High Power Reverse Right Angle (RRA) plug.
6. There are the 34A High Power Straight (STR) plug, the 34A High Power Right Angle (RA) plug, the 34A High Power Reverse Straight (RSTR) plug, and the 34A High Power Reverse Right Angle (RRA) plug.
7. There are the Combo x16+55A High Power Plus Straight (STR) plug, the Combo x16+55A High Power Plus Right Angle (RA) plug, the Combo x16+55A High Power Plus Reverse Straight (RSTR) plug, and the Combo x16+55A High Power Plus Reverse Right Angle (RRA) plug.
8. There are the 55A High Power Plus Straight (STR) plug and the 55A High Power Plus Right Angle (RA) plug, the 55A High Power Plus Reverse Straight (RSTR) plug, and the 55A High Power Plus Reverse Right Angle (RRA) plug.
9. In addition, there are separate x8 74-pin STR plugs (see the No Flange version found in SFF-TA-1016), 74-pin RA plugs (see the No Flange version found in SFF-TA-1016), 74-pin RSTR plugs, and 74-pin RRA plugs that can be used with separate power cables can mate with the x16 portion of the family of Vertical Combo DE x16+Power connectors or the x8 portion of the family of Vertical Combo DE x8+Power connectors.

6.2.1 Combo x16+21A Power Straight (STR) Plug or Combo x16+21A Power Right Angle (RA) Plug

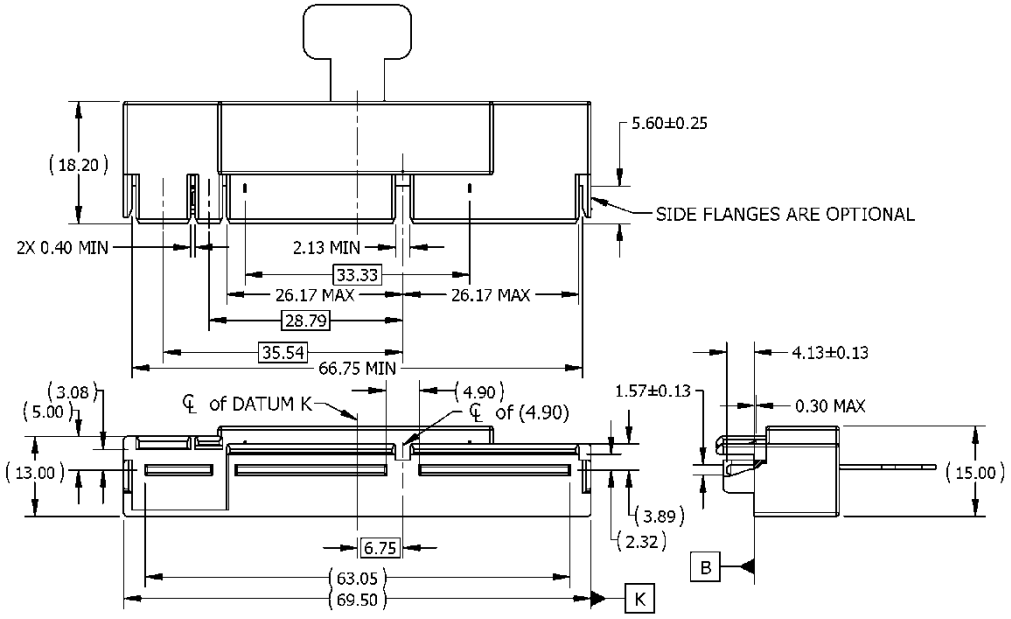


Figure 6-2 Combo x16+21A Power STR Plug or Combo x16+21A Power RA Plug

6.2.2 Combo x16+21A Power Reverse Straight (RSTR) Plug or Combo x16+21A Power Reverse Right Angle (RRA) Plug

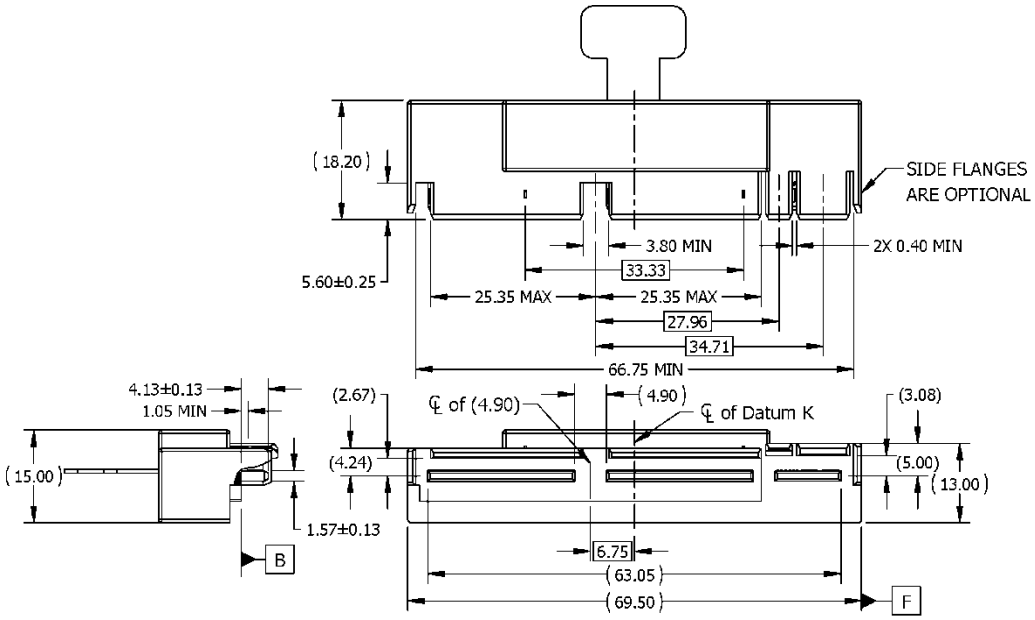


Figure 6-3 Combo x16+21A Power RSTR Plug or Combo x16+21A Power RRA Plug

6.2.3 Combo x8+21A Power Straight (STR) Plug or Combo x8+21A Power Right Angle (RA) Plug

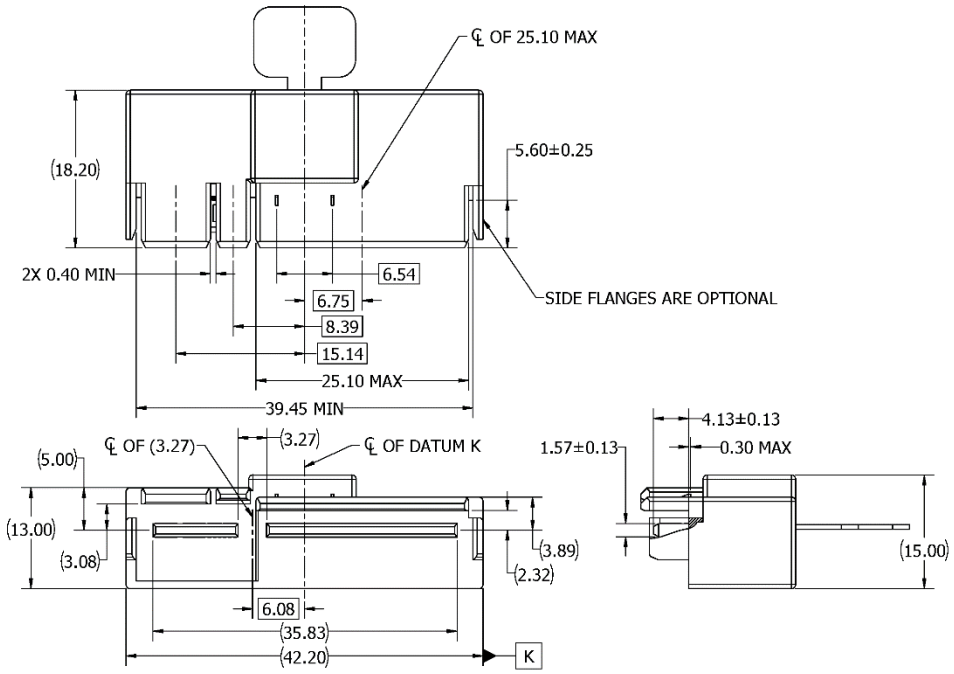


Figure 6-4 Combo x8+21A Power STR Plug or Combo x8+21A Power RA Plug

6.2.4 Combo x8+21A Power Reverse Straight (RSTR) Plug or Combo x8+21A Power Reverse Right Angle (RRA) Plug

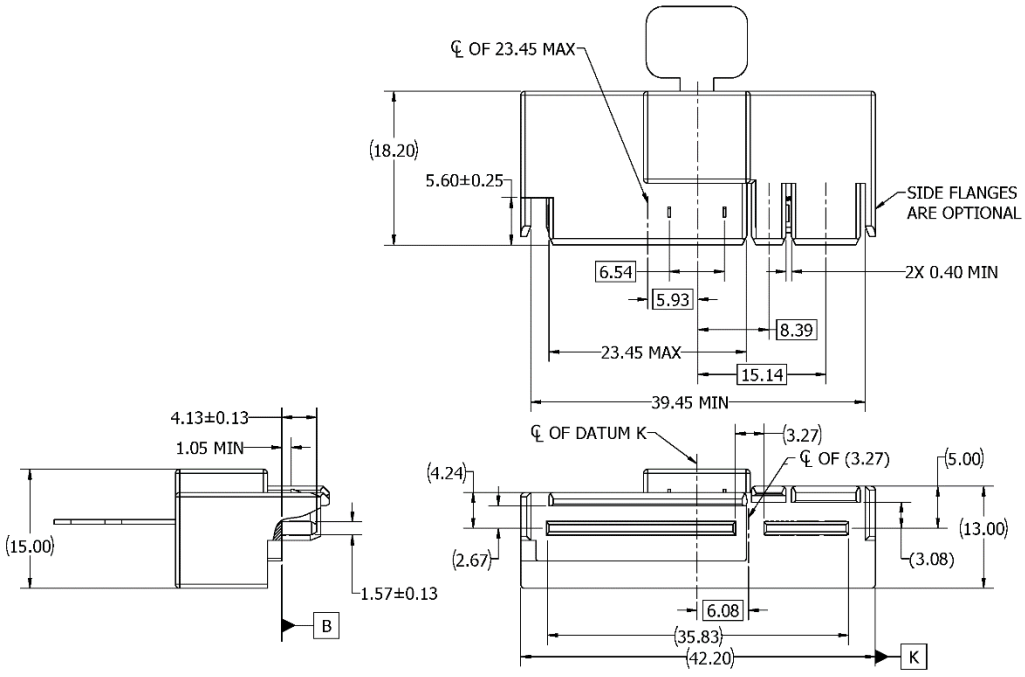


Figure 6-5 Combo x8+21A Power RSTR Plug or Combo x8+21A Power RRA Plug

6.2.5 Straight (STR) 21A Power Plug or Right Angle (RA) 21A Power Plug

These plugs include 12 sidebands and 4 power contacts.

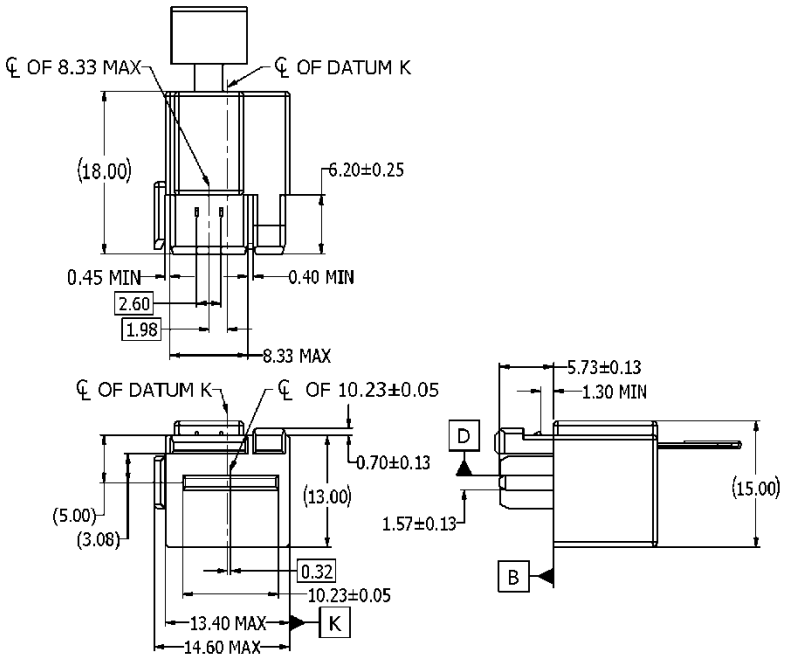


Figure 6-6 STR 21A Power Plug or RA 21A Power Plug

6.2.6 Reverse Straight (RSTR) 21A Power Plug or Reverse Right Angle (RRA) 21A Power Plug

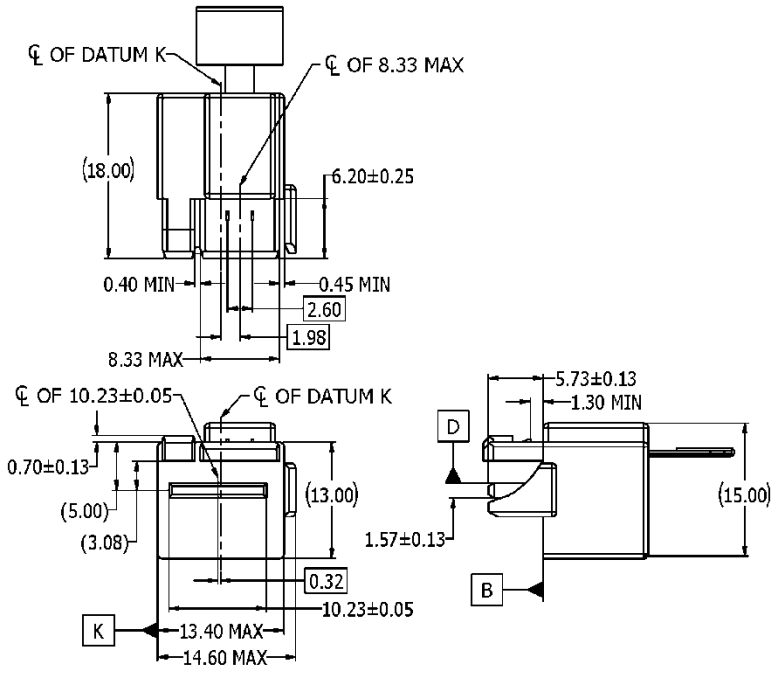


Figure 6-7 RSTR 21A Power Plug or RRA 21A Power Plug

6.2.7 Combo x16+21A Power Straight (STR) Panel Mount Plug

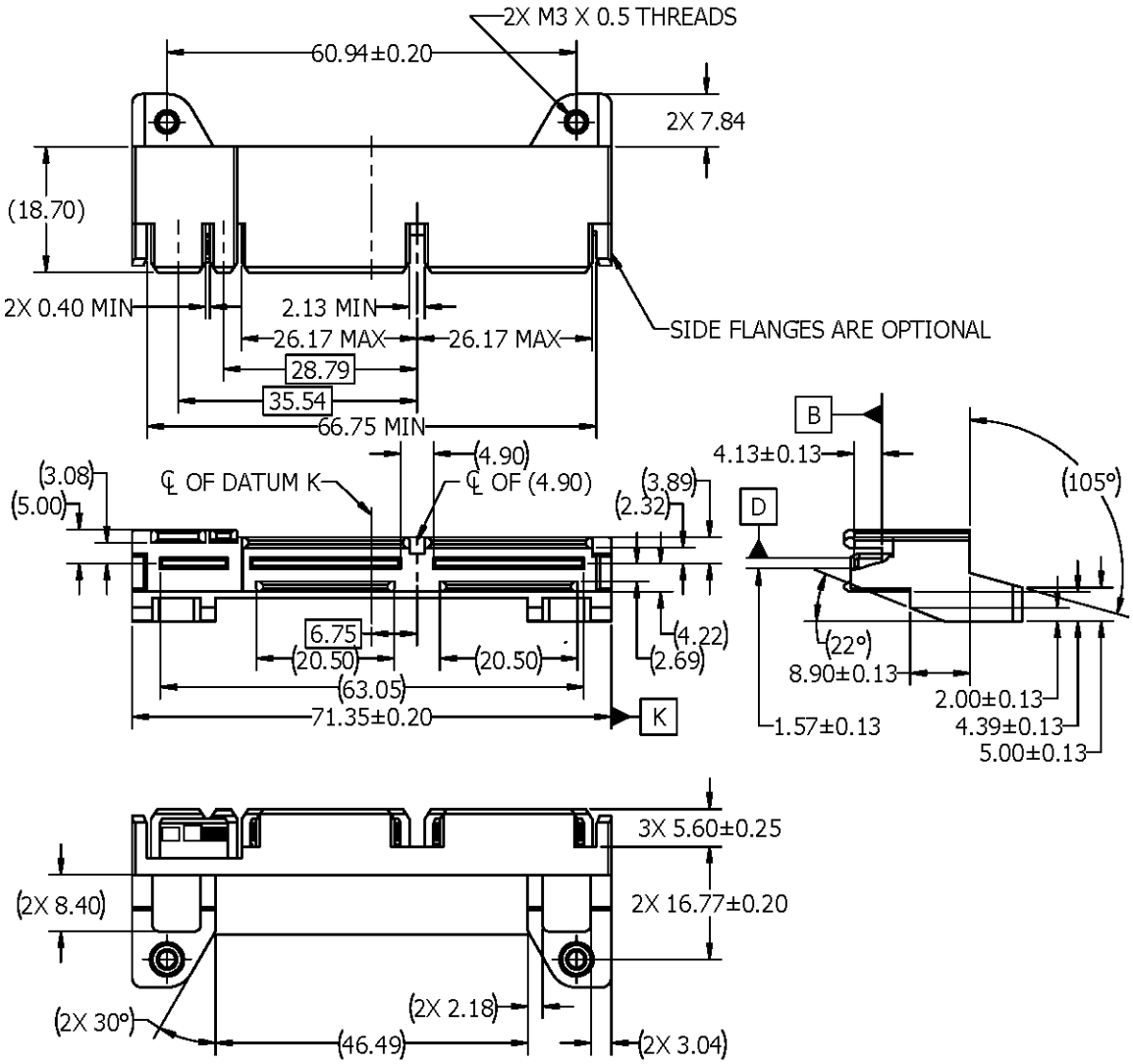


Figure 6-8 Combo x16+21A Power STR Panel Mount Plug

6.2.8 Combo x16+21A Power Reverse Straight (RSTR) Panel Mount Plug

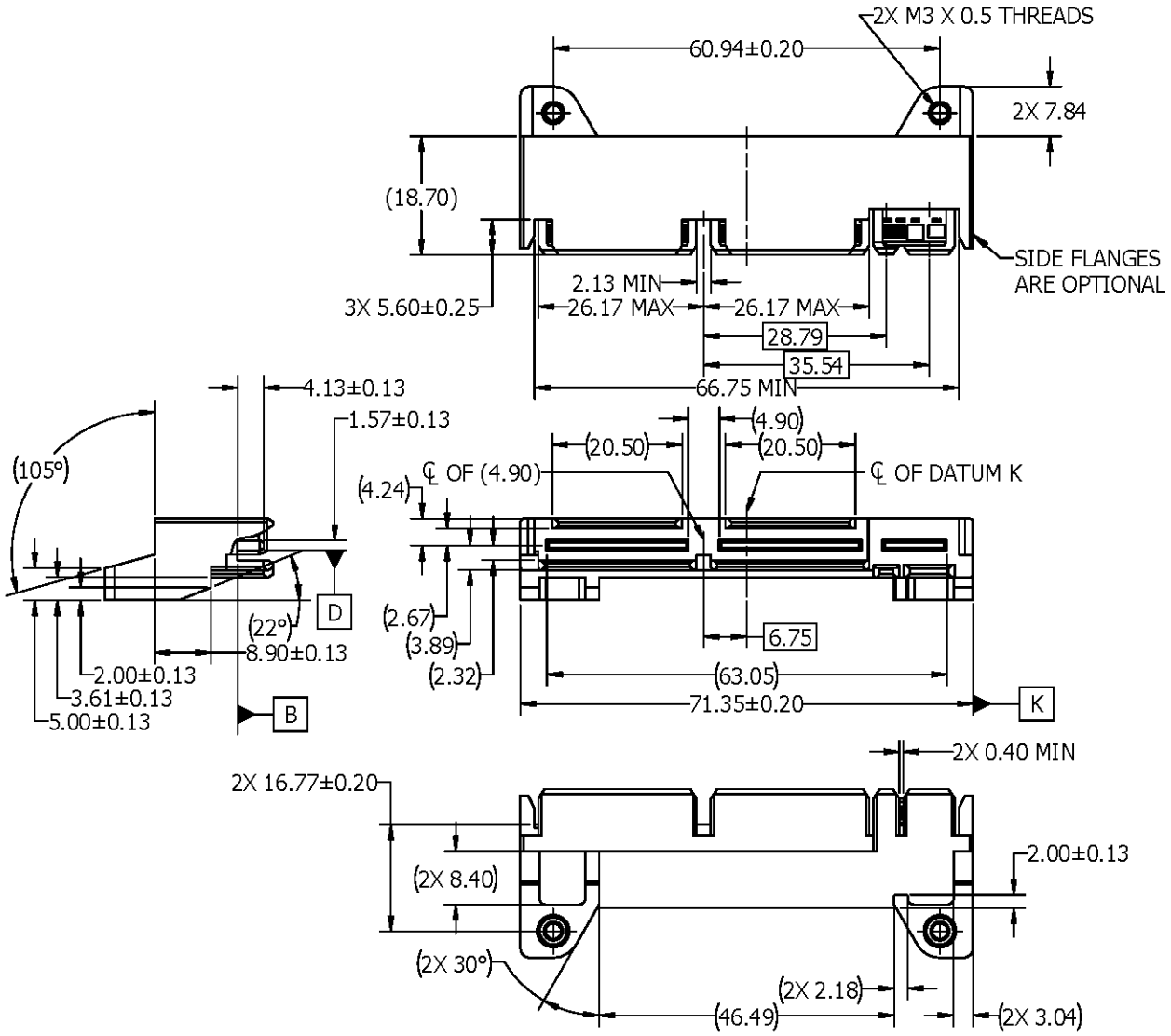


Figure 6-9 Combo x16+21A Power RSTR Panel Mount Plug

6.2.9 Combo x16+34A High Power Straight (STR) Plug or Combo x16+34A High Power Right Angle (RA) Plug

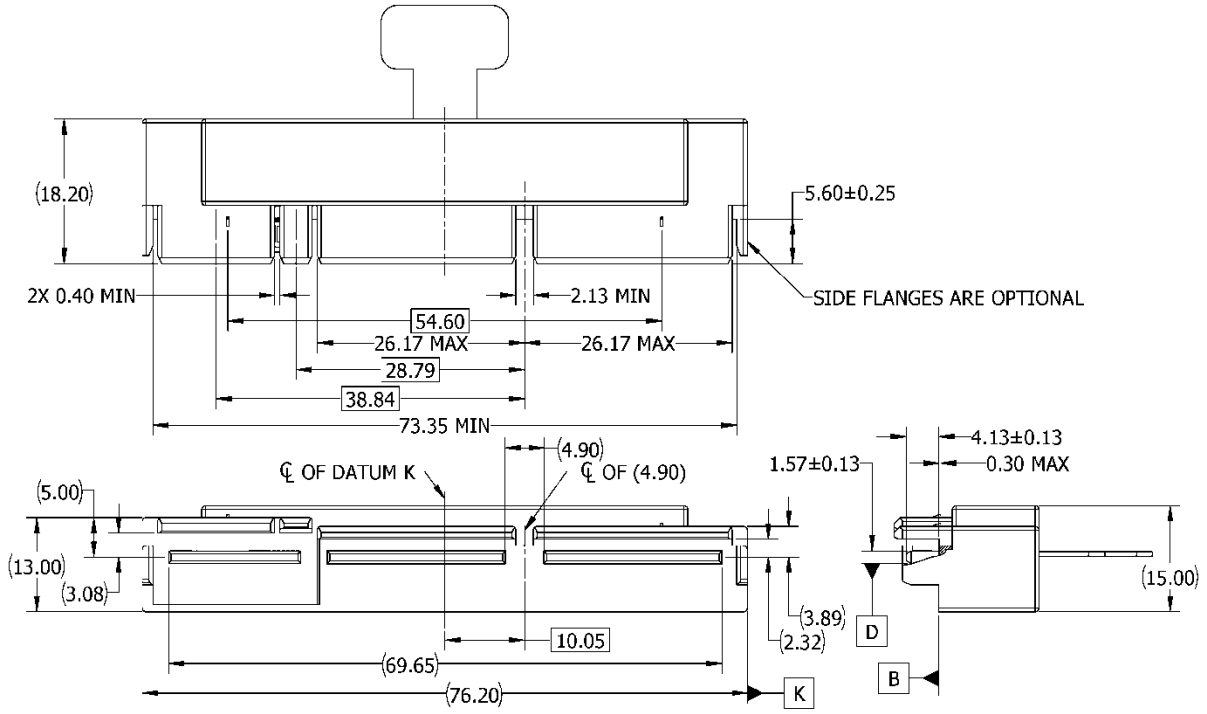


Figure 6-10 Combo x16+34A High Power STR Plug or Combo x16+34A High Power RA Plug

6.2.10 Combo x16+34A High Power Reverse Straight (RSTR) Plug or Combo x16+34A High Power Reverse Right Angle (RRA) Plug

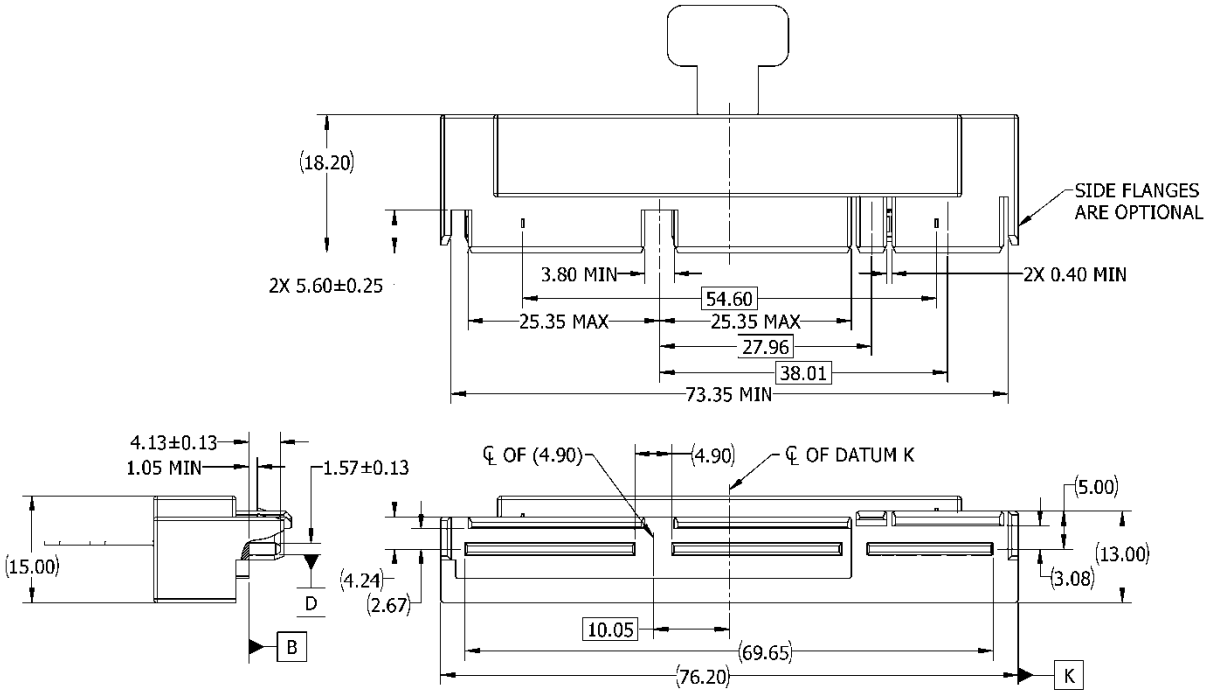


Figure 6-11 Combo x16+34A High Power RSTR Plug or Combo x16+34A High Power RRA Plug

6.2.11 Straight (STR) 34A High Power Plug or Right Angle (RA) 34A High Power Plug

These 34A High Power plugs include 12 sidebands and 8 power contacts.

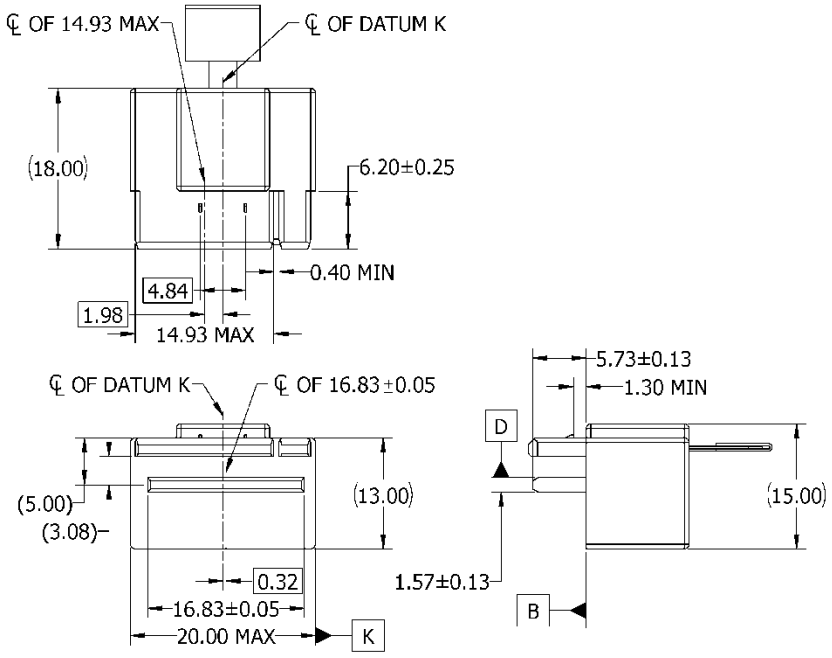


Figure 6-12 STR 34A High Power Plug or RA 34A High Power Plug

6.2.12 Reverse Straight (RSTR) 34A High Power Plug or Reverse Right Angle (RRA) 34A High Power Plug

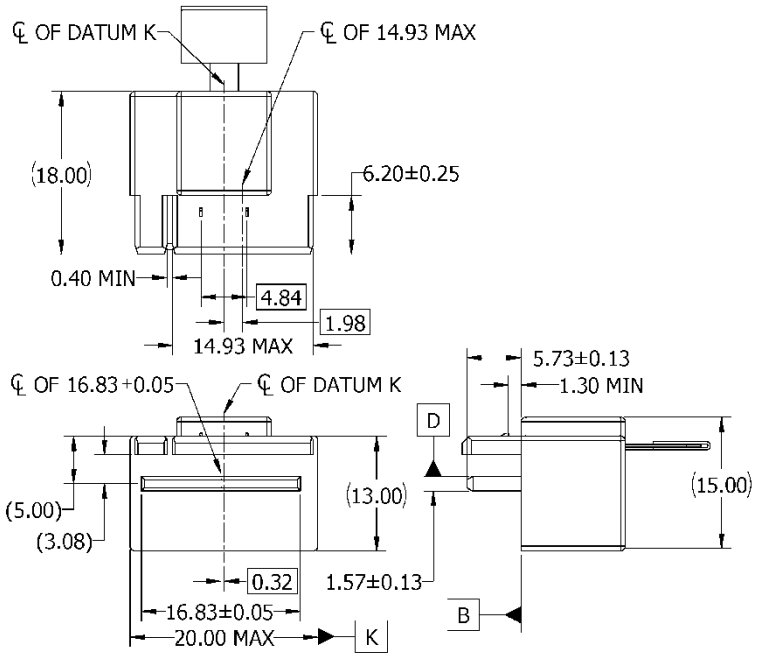


Figure 6-13 RSTR 34A High Power Plug or RRA 34A High Power Plug

6.2.13 Combo x16+55A High Power Plus Straight (STR) Plug or Combo x16+55A High Power Plus Right Angle (RA) Plug

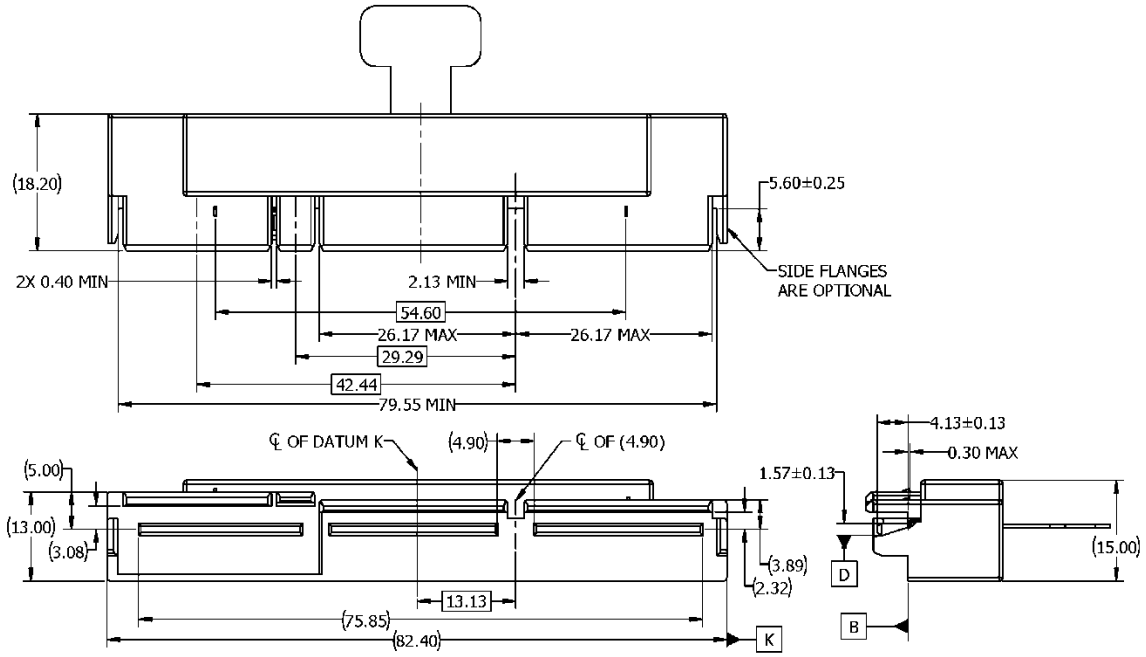


Figure 6-14 Combo x16+55A High Power Plus STR Plug or Combo x16+55A High Power Plus RA Plug

6.2.14 Combo x16+55A High Power Plus Reverse Straight (RSTR) Plug or Combo x16+55A High Power Plus Reverse Right Angle (RRA) Plug

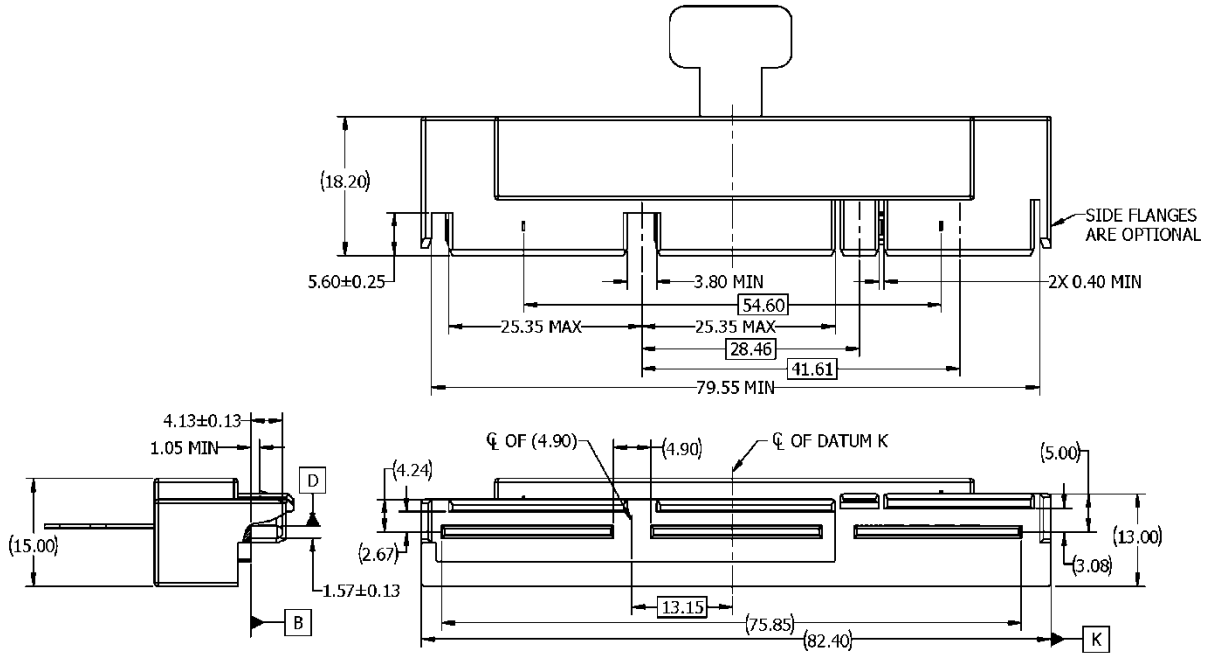


Figure 6-15 Combo x16+55A High Power Plus RSTR Plug or Combo x16+55A High Power Plus RRA Plug

6.2.15 Straight (STR) 55A High Power Plus Plug or Right Angle (RA) 55A High Power Plus Plug

These 55A High Power Plus plugs include 12 sidebands and 4 higher power contacts.

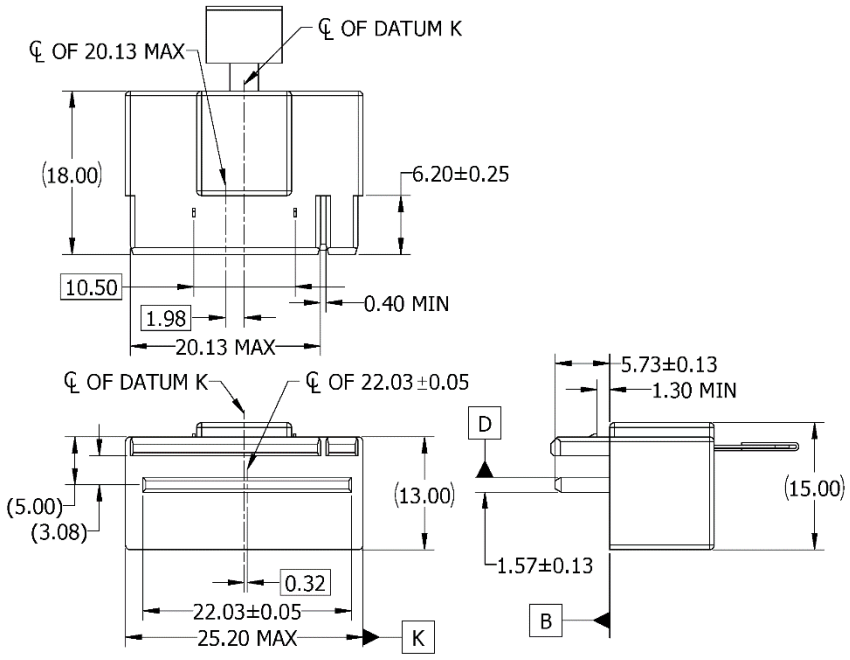


Figure 6-16 STR 55A High Power Plus Plug or RA 55A High Power Plus Plug

6.2.16 Reverse Straight (RSTR) 55A High Power Plus Plug or Reverse Right Angle (RRA) 55A High Power Plus Plug

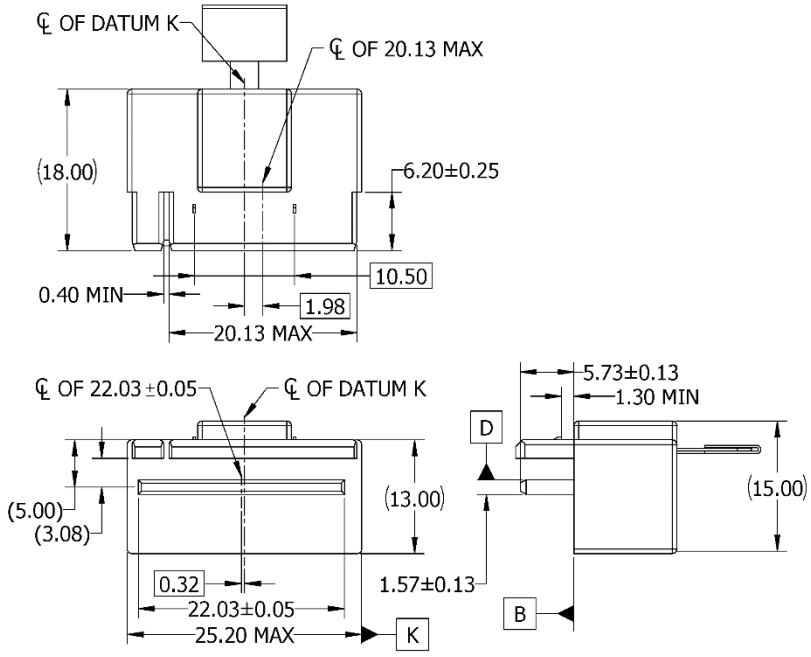


Figure 6-17 RSTR 55A High Power Plus Plug or RRA 55A High Power Plus Plug

6.3 Card Edge Description (Mechanical Interface)

The following figures detail the mating interface pads and paddle card dimensions applicable to the mating interface of the plug connectors within this specification. In addition, recommended card edge dimensions for related Add-in-Cards (AIC) follow. Unless otherwise specified, the General Tolerance for dimensions included in the AIC drawing figures are ±0.05mm.

6.3.1 Plug Paddle Card for Combo x16+21A Power Plugs

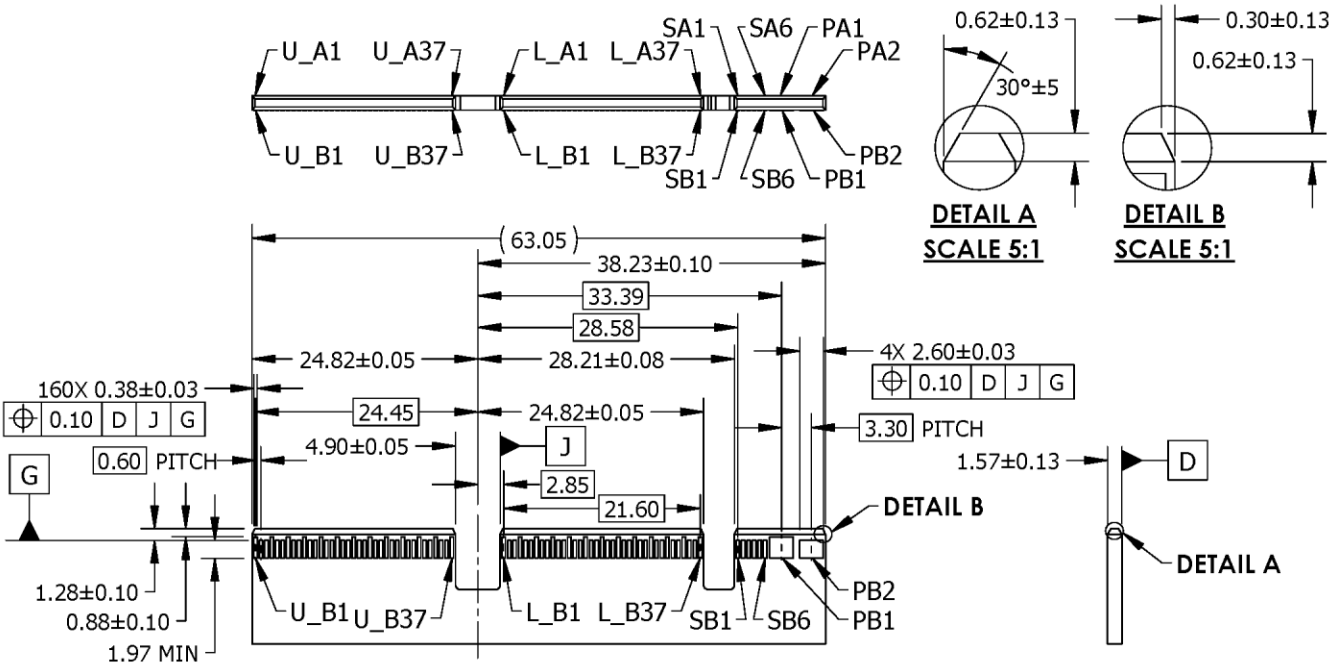


Figure 6-18 Plug Paddle Card for Combo x16+21A Power Plugs

6.3.2 Plug Paddle Card for Combo x8+21A Power Plugs

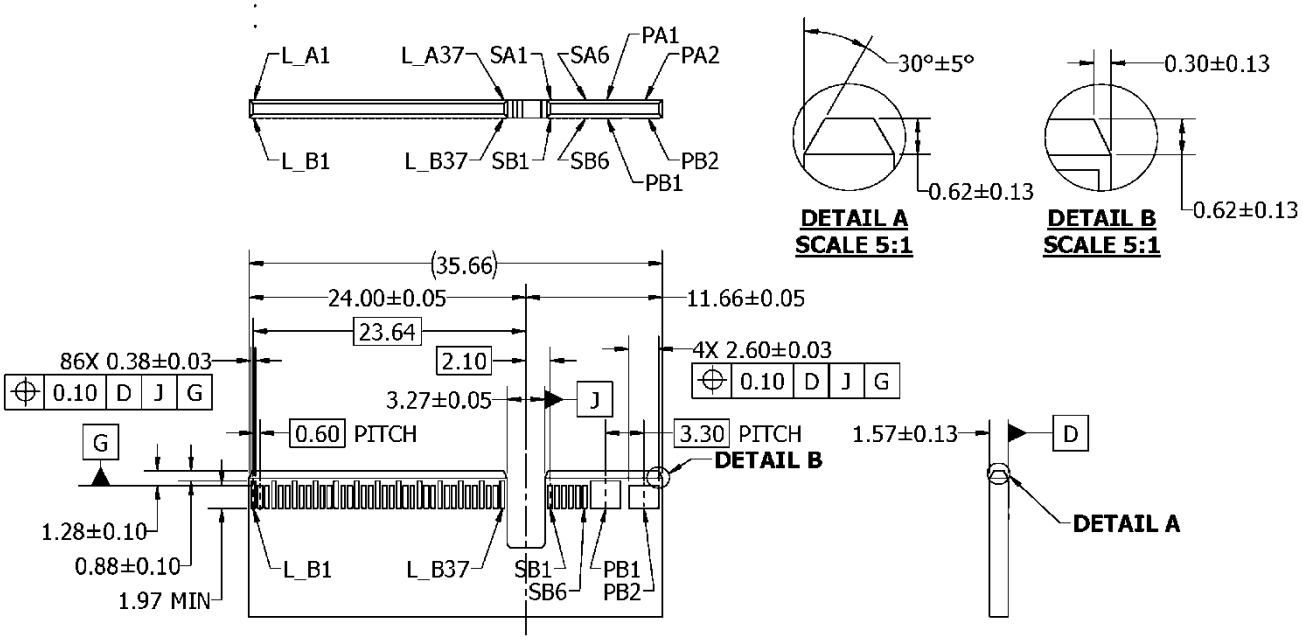


Figure 6-19 Plug Paddle Card for Combo x8+21A Power Plugs

6.3.3 Plug Paddle Card for 21A Power Plugs

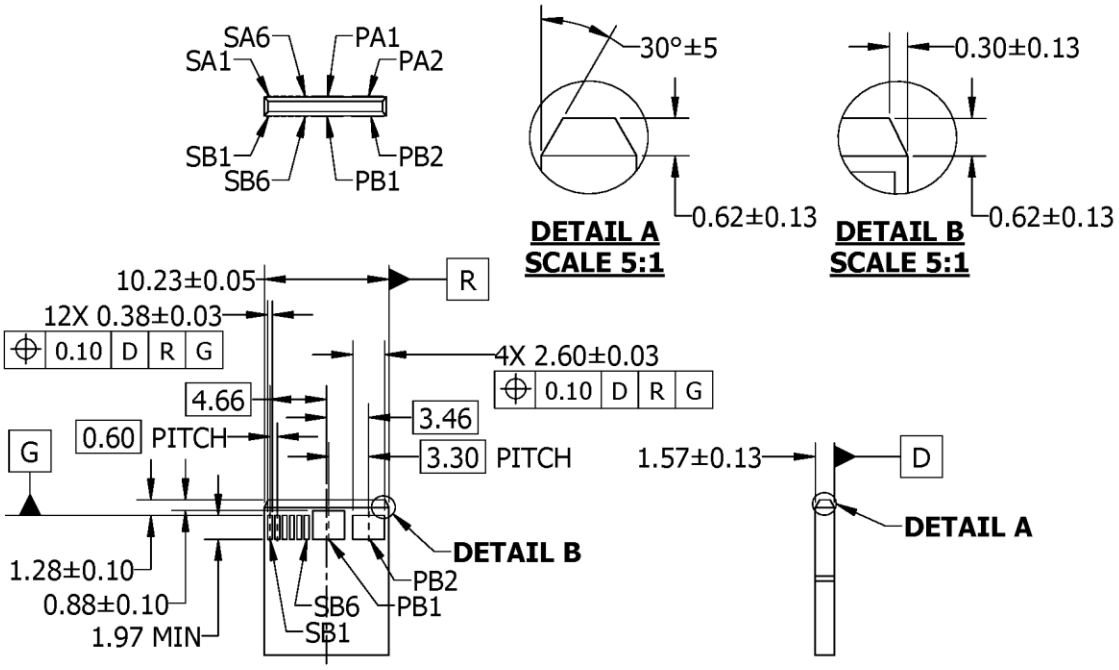


Figure 6-20 Plug Paddle Card for 21A Power Plugs

6.3.4 Plug Paddle Card for Combo x16+34A High Power Plugs

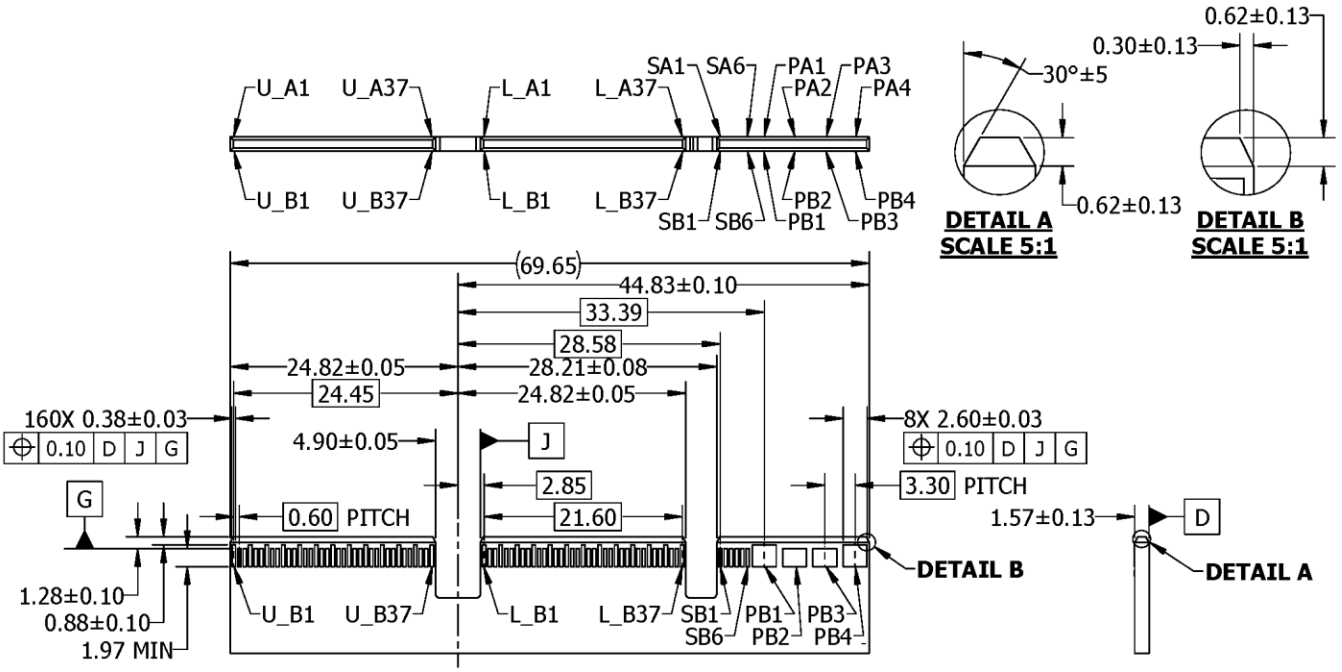


Figure 6-21 Plug Paddle Card for Combo x16+34A High Power Plugs

6.3.5 Plug Paddle Card for 34A High Power Plugs

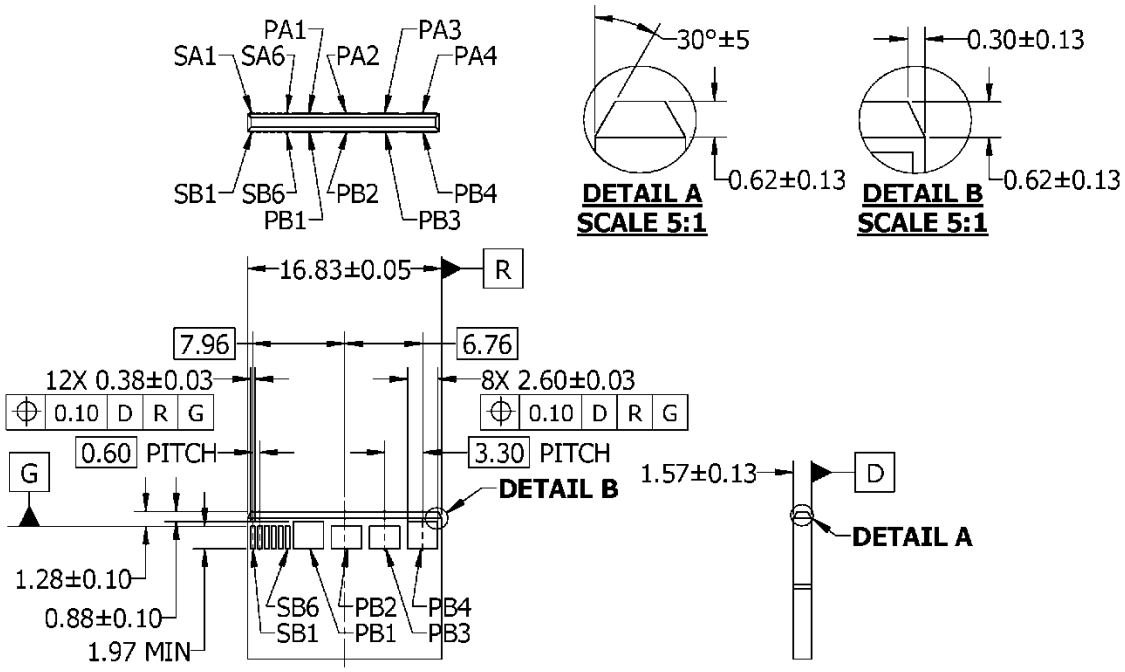


Figure 6-22 Plug Paddle Card for 34A High Power Plugs

6.3.6 Plug Paddle Card for Combo x16+55A High Power Plus Plugs

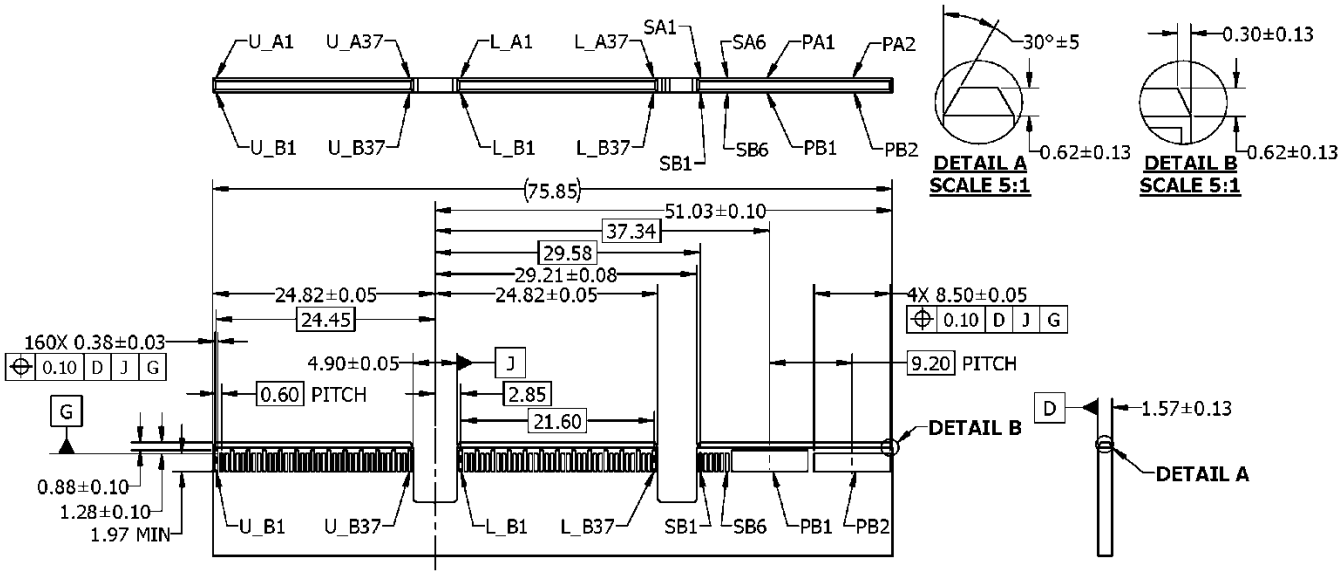


Figure 6-23 Plug Paddle Card for Combo x16+55A High Power Plus Plugs

6.3.7 Plug Paddle Card for 55A High Power Plus Plugs

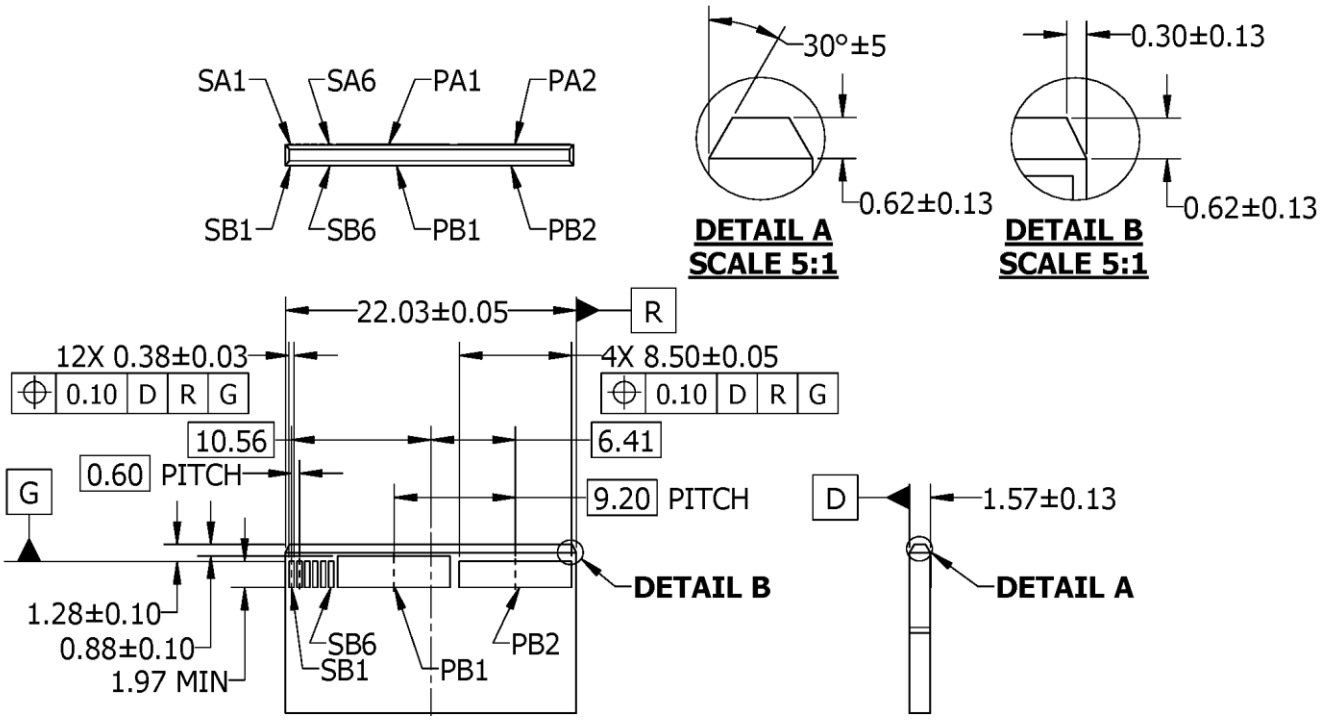


Figure 6-24 Plug Paddle Card for 55A High Power Plus Plugs

6.3.8 X16+21A Power Add-in-Card (AIC)

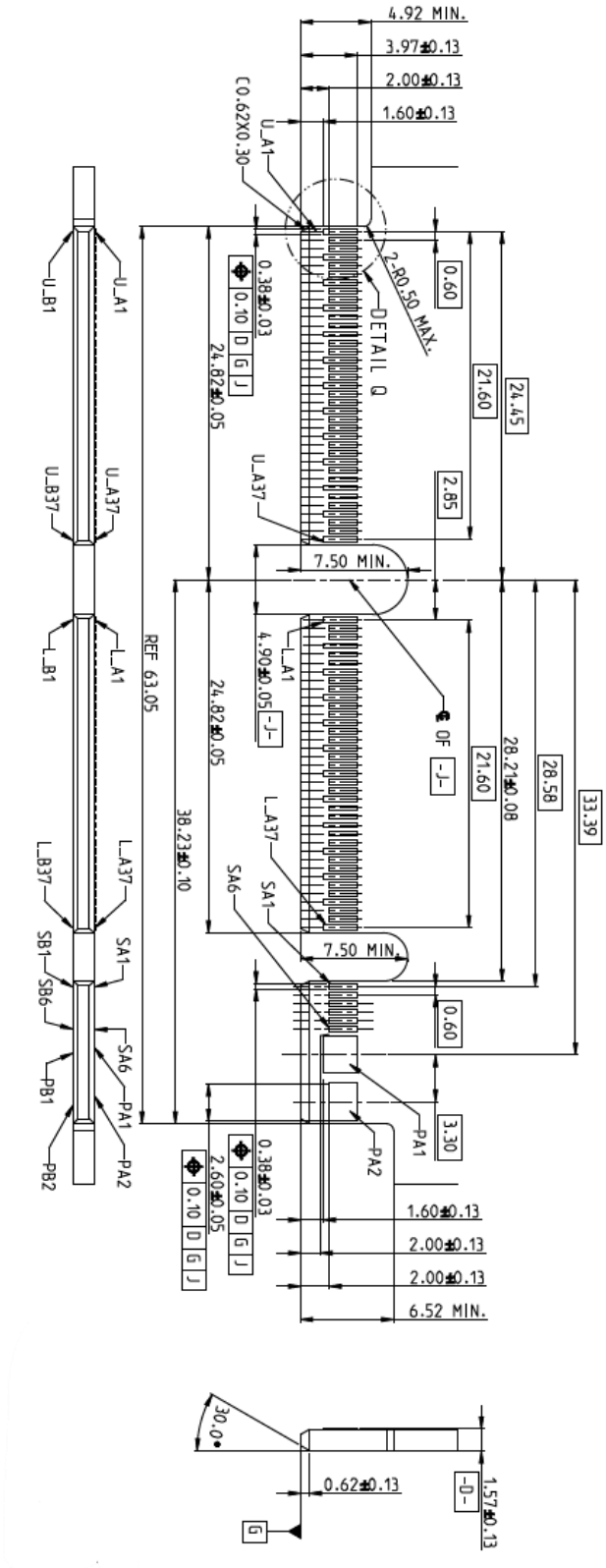


Figure 6-25 X16+21A Power Add-in-Card (AIC)

6.3.9 X8+21A Power Add-in-Card (AIC)

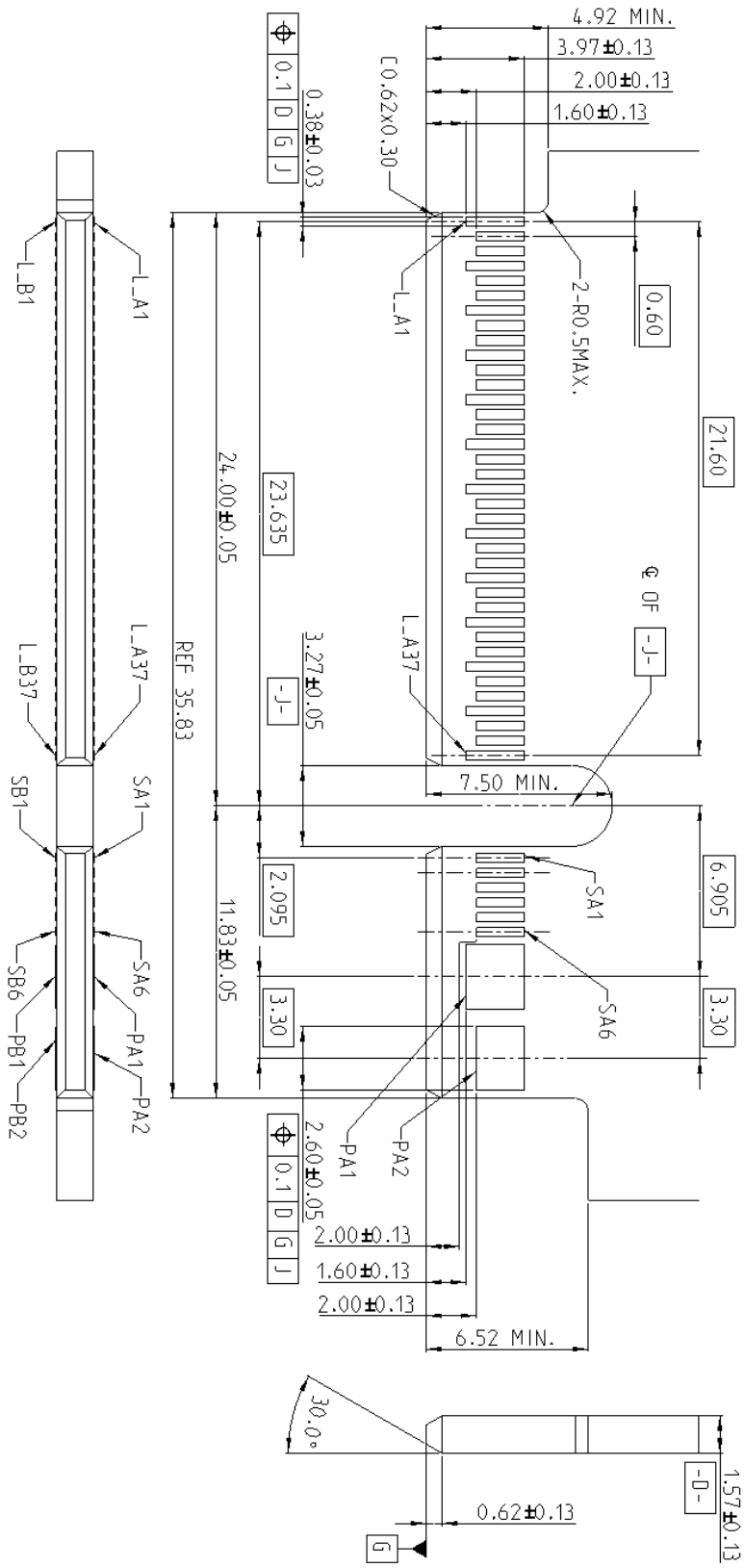


Figure 6-26 X8+21A Power Add-in-Card (AIC)

6.3.10 21A Power Add-in-Card (AIC)

Please Note: Care should be taken to avoid plugging in the 21A Power AIC into one of the 34A or 55A connectors. It is recommended that the user of the 21A Power AIC use some sort of method (outside the scope of the SFF-TA-1033 specification) to prevent the accidental pluggin in of the 21A Power AIC into any of the 34A or 55A connectors. Otherwise, bad things may happen such as electrical damage to the AIC device and/or to the mating device.

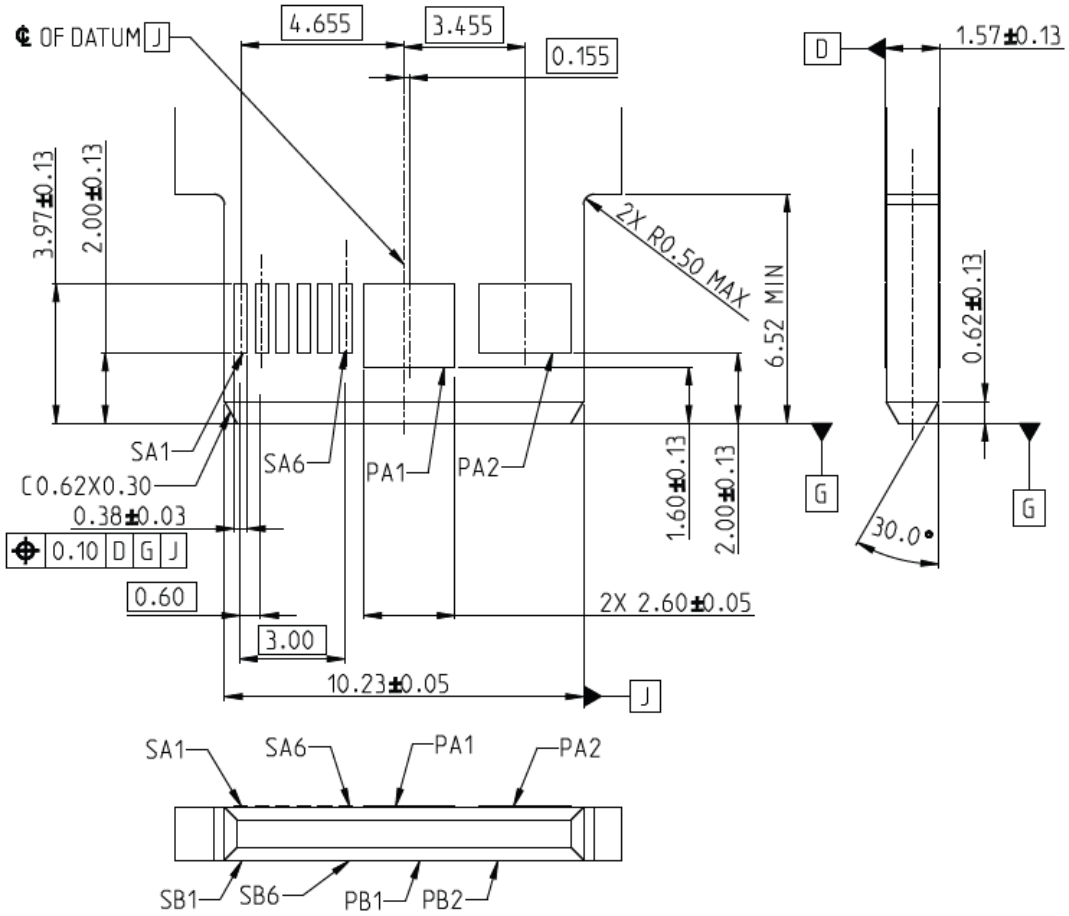


Figure 6-27 21A Power Add-in-Card (AIC)

6.3.11 X16+34A High Power Add-in-Card (AIC)

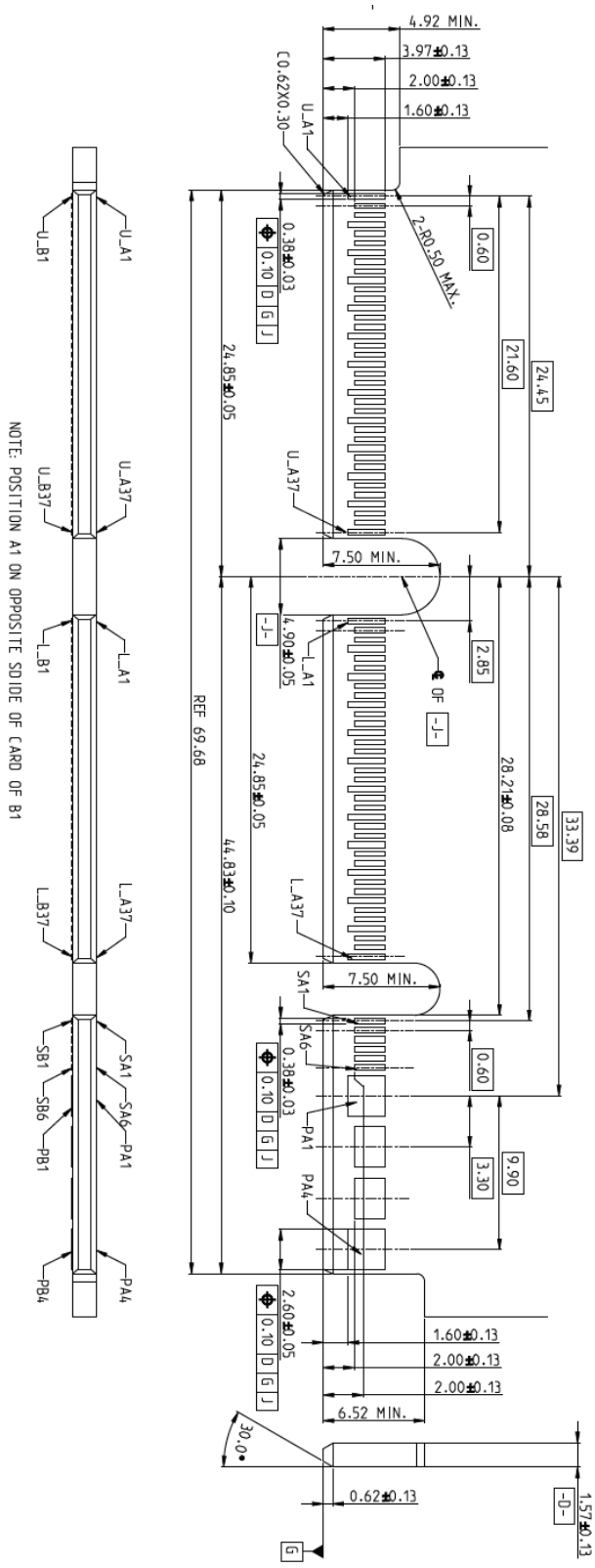


Figure 6-28 X16+34A High Power Add-in-Card (AIC)

6.3.12 X16+55A High Power Plus Add-in-Card (AIC)

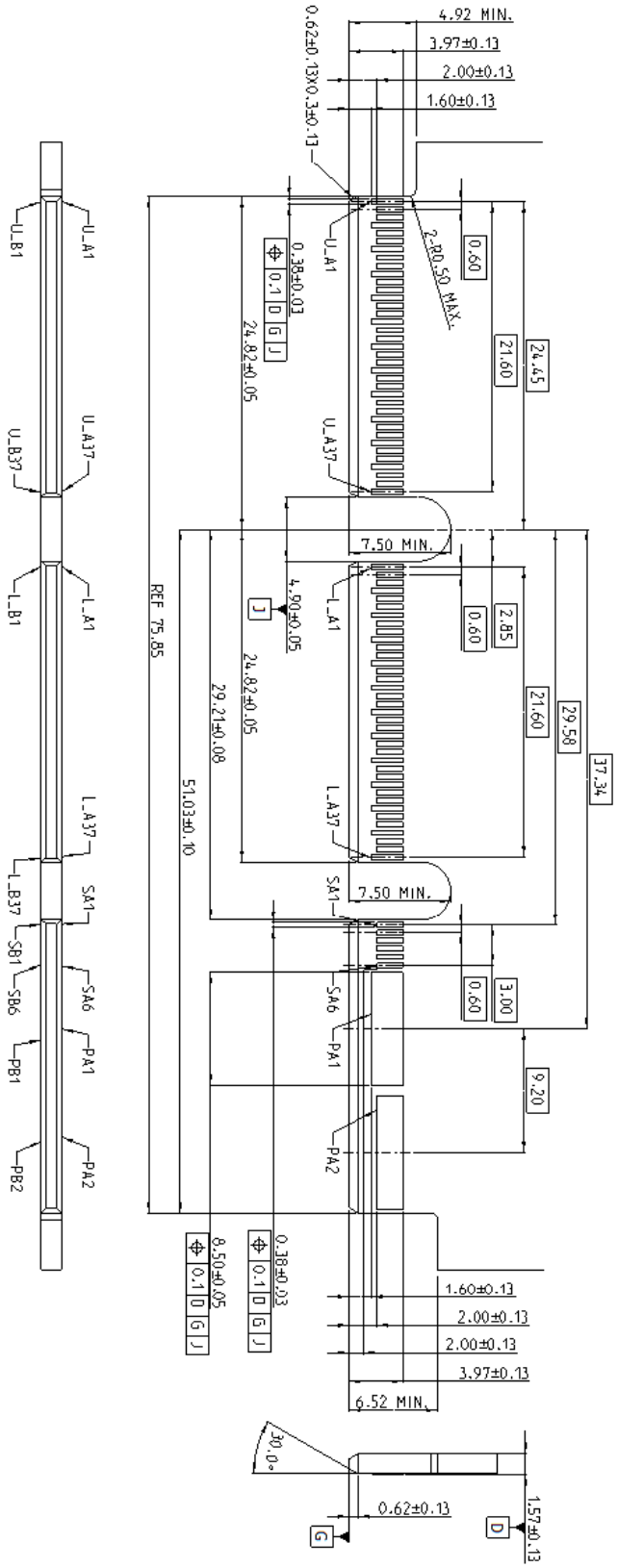


Figure 6-29 X16+55A High Power Plus Add-in-Card (AIC)

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 0.127mm
Rated Durability Cycles	The expected number of durability cycles a component is expected to encounter over the course of its life	Connector: 200 cycles Plug: 200 cycles
Latched Mating Force*	Amount of force needed to mate a plug with a connector when latches are deactivated	1.1 N/contact pair + 10 N MAX
Latched Unmating Force*	Amount of forced needed to separate a plug from a connector when latches are deactivated	0.1 N/contact pair MIN
Latch Retention*	Amount of force the latching mechanism can withstand	50 N MIN
Wrenching Strength*	Amount of force in various directions the product can withstand while mated	25 N MIN for each axis direction

Table 7-1 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 to +65°C
Storage Temperature*	The expected storage temperature for a component when not in use	-20°C to +80°C
Storage Humidity*	The expected storage humidity for a component when not in use	80% Relative Humidity
Electrical Requirements		
Current*	Maximum current to which a contact is exposed in use	21A Standard version: 10.5A MAX per power pin, 0.5A MAX per signal pin. 34A High Power version: 8.5A MAX per power pin, 0.5A MAX per signal pin. 55A High Power Plus version: 27.5A MAX per power pin, 0.5A MAX per signal pin.
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 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 and plug (Latches should be locked out)	No evidence of physical damage
Durability (see Note 1)	EIA-364-09 To be tested with connector and plug (Latches should 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 IIA Duration: 7 days 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- 0.5 mA Max Leakage Current

NOTES:
1. If the durability requirement on the connector is greater than that of the plug, plugs 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 (see Note 1)	Test Descriptions and Details	Pass/ Fail Criteria
Mechanical/ Physical Tests		
Latched Mating Force	EIA-364-13 To be tested with connector (with integrated latch shroud) and plug without any 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 connector (with integrated latch shroud) and plug without any heat sinks. Latching mechanism deactivated (locked out)	
Latch Retention	EIA-364-13 To be tested with connector (with integrated latch shroud) and plug without any heat sinks Latching mechanism engaged (not locked out)	
Wrenching Strength	Bend cable 90° at minimum bend radius. Pull 25 N Min in each of 4 axis directions for round cable. Pull 25 N Min in each of 2 axis directions for flat cable.	No damage to plug / cable assembly.
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	Refer to Table 7-1 for current magnitude
NOTES: 1. Requirements and tests specified that fall outside of EIA-364-1000 testing are listed in this table.		

Appendix A. System Mechanical Specification (Informative)

A.1 Appendix Overview

All material within this appendix, whether defined as normative or informative, is subject to IP disclosure and reasonable and non-discriminatory (RAND) terms by SNIA SFF TA TWG member companies.

A.2 Connector PCB Layouts

Unless otherwise specified, the General Tolerances for the following drawing figures are ±0.05 mm.

A.2.1 Recommended PCB layout for Vertical Combo DE X16+21A Power Connector Footprints

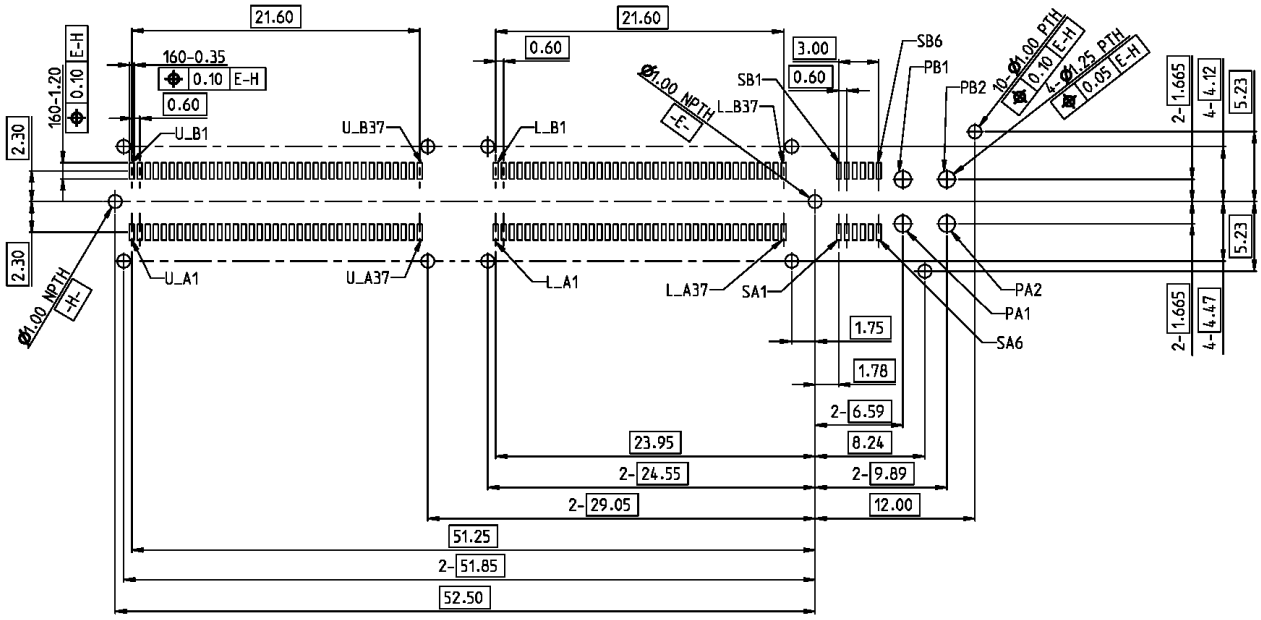


Figure A-1 Recommended Footprint for Vertical Combo DE X16+21A Power Connectors

A.2.2 Recommended PCB layout for Vertical Combo DE X8+21A Power Connector Footprints

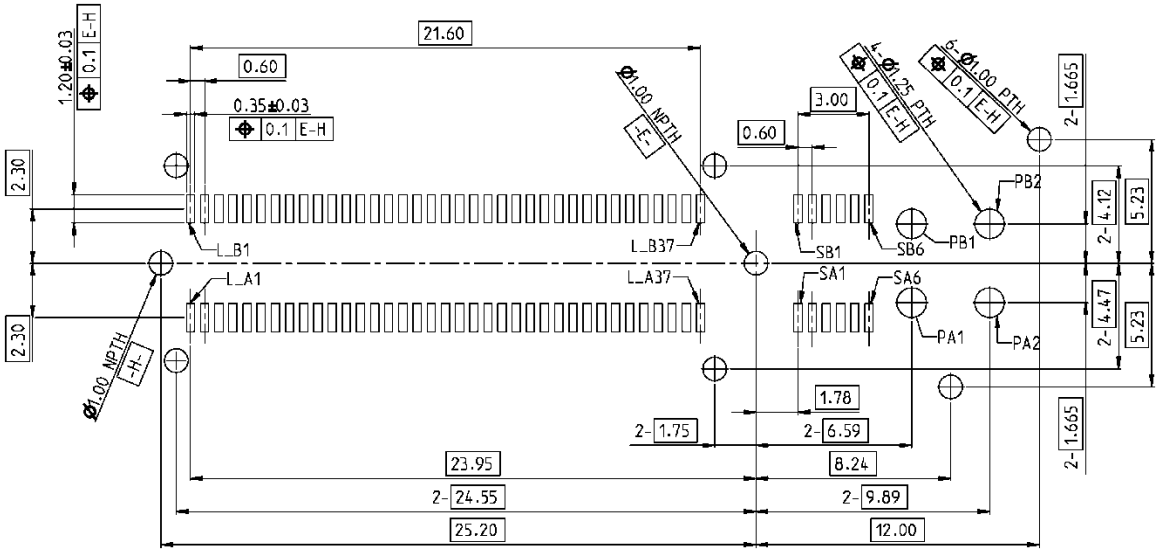


Figure A-2 Recommended Footprint for Vertical Combo DE X8+21A Power Connectors

A.2.3 Recommended PCB layout for Vertical Combo DE 21A Power Connector Footprints

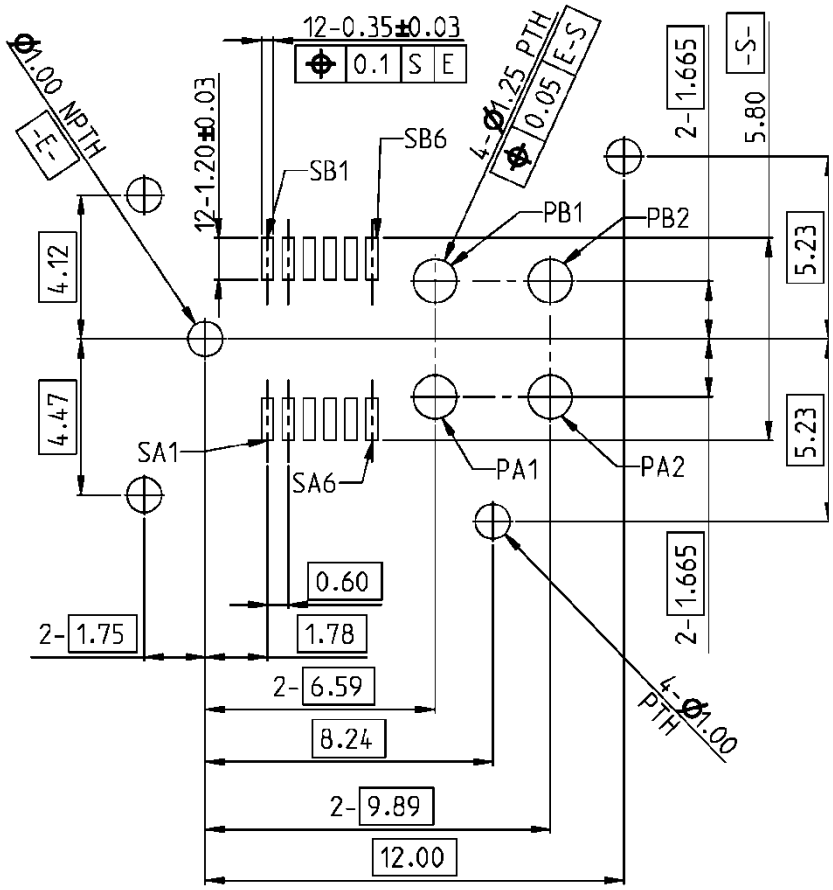


Figure A-3 Recommended Footprint for Vertical DE 21A Power Connectors

A.2.4 Recommended PCB layout for Vertical Combo DE X16+34A High Power Connector Footprints

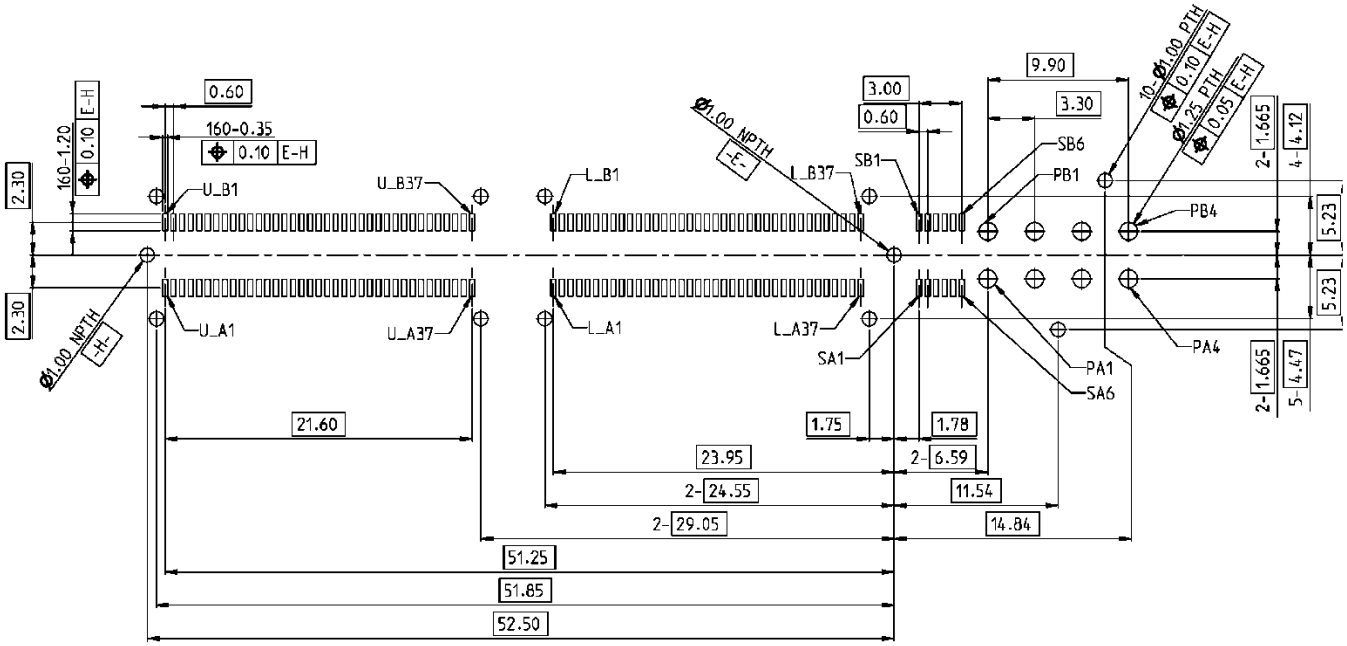


Figure A-4 Recommended Footprint for Vertical Combo DE X16+34A High Power Connectors

A.2.5 Recommended PCB layout for Vertical Combo DE X16+55A High Power Plus Connector Footprints

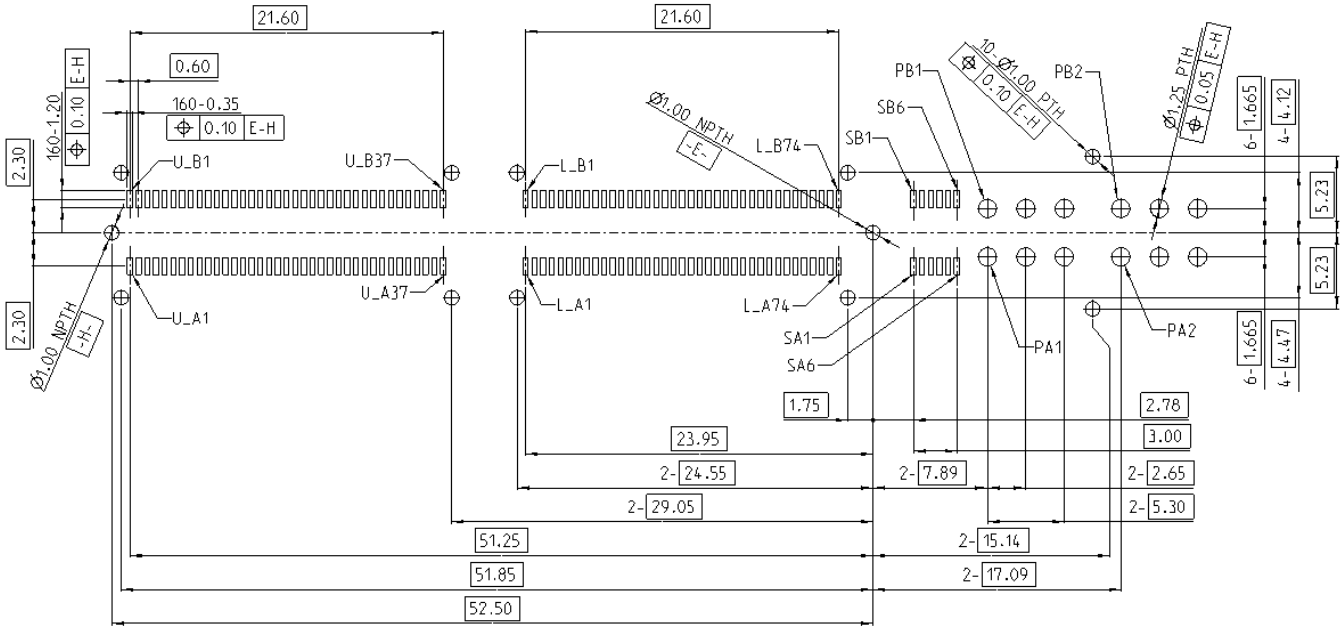


Figure A-5 Recommended Footprint for Vertical Combo DE X16+55A High Power Plus Connectors