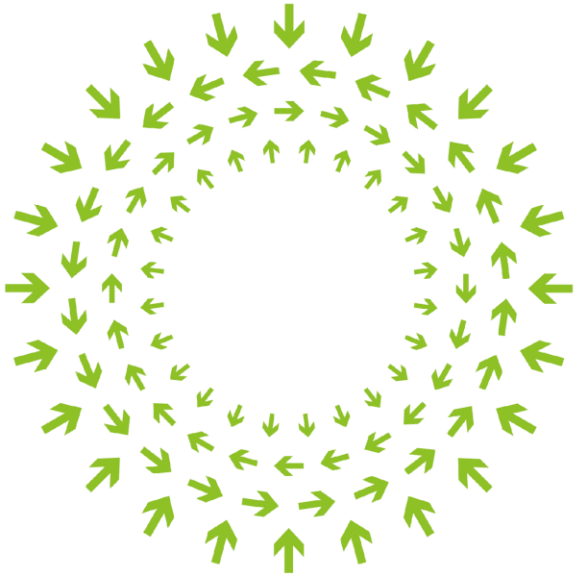


OPEN

Compute Project

48V PICPWR and Dedicated Supply Product Specification

Revision 1.1

Sep 9th, 2025

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Table of Contents

1. License 4
1.1. Acknowledgements 4
2. Compliance with OCP Tenets 5
2.1. Openness 5
2.2. Efficiency 5
2.3. Impact 5
2.4. Scale 5
2.5. Sustainability 5
3. Change Log 6
4. Scope 7
5. Overview 7
6. Environmental / Regulatory / Test Requirements 9
6.1. Temperature Life 9
6.2. Thermal Shock 9
6.3. Low Level Contact Resistivity 9
6.4. Insulation Resistance 9
6.5. Dielectric Withstanding Voltage 9
6.6. Temperature Rise vs Current 10
6.7. Random Vibration 10
6.8. Mechanical Shock 11
6.9. Durability 11
6.10. Retention Force 11
6.11. Humidity 11
6.12. Solderability 11
6.13. Flammability 11
7. Physical Specifications 12
7.1. Board Connector Physical Specifications 12
7.2. Cable Connector Physical Specifications 15
7.3. Mechanical Dimensions 17
8. Electrical Requirements 24
8.1. 48 Volt PICPWR 24

8.2. 48 Volt Dedicated Supply 24

Appendix A - Checklist for IC approval of this Specification (to be completed by contributor(s) of this Spec) 26

1. License

The information in the Appendix or Appendices is for reference only and non-normative in nature.

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1.1. Acknowledgements

The Contributors of this Specification would like to acknowledge the following companies for their feedback:

TE Connectivity
Intel

2. Compliance with OCP Tenets

2.1. Openness

The subsequent TE Connectivity mechanical and electrical specifications provide Hyperscalers and suppliers guidelines to design and source 48V power solutions intelligently.

2.2. Efficiency

This standard makes designing, sourcing, and maintaining 48V systems more efficient. Having multiple vendors produce and multiple customers consume, yields benefits for the whole market. Joule heating efficiency gains are also intrinsic to a 48V PDN (Power Distribution Network) instead of a 12V PDN.

2.3. Impact

This standard encourages more of the industry to change from the 12V architecture to the 48V architecture for their next generation systems. By increasing the voltage instead of the current there are improvements regarding heat generation, energy efficiency, and board space.

2.4. Scale

Defining mechanical, electrical, and test requirements opens manufacturing and design-in opportunities for the 48V PICPWR and Dedicated 48V Supply connectors. This is seen as advantageous for both customers and vendors as multiple vendors can provide sourcing solutions, and many customers can provide design-in opportunities. Serviceability will be positively impacted by the standardization of this 48V connector.

2.5. Sustainability

Standardizing the 48V PICPWR connections will reduce scrap and component replacement during system upgrades. With a standardized interface the chances of reusing components instead of scraping components increases. This effort also reduces the effort and design time of qualifying multiple similarly functioning interconnects. Overall, the 48V system moves 4x the power of the 12v system while generating less heat leading to a more energy efficient system.

3. Change Log

Date	Version #	Author	Description
16th Dec 2024	0.1	Michael Menkhaus	Initial Proposal
17th March 2025	0.2	Michael Menkhaus	Align wording with M-PIC standard. Additional dimensional information provided in additional figures.
21st April 2025	0.3	Michael Menkhaus	Add current carrying capacity board design. Adjust figure numbers. Add additional dimensions to figures 10-14. Minor wording updates.
29th April 2025	0.4	Michael Menkhaus	6.3: update to “sideband/sense” 6.5: update to “sideband/sense” 6.6: Add “… not double back…”
14th July 2025	1.0	Michael Menkhaus	Update to rev 1.0 for public release.
9th Sep 2025	1.1	Michael Menkhaus	“Fig X” to “Figure X” all locations. “Below” to “ in Figure X” all locations. 6.6: Delete “30°C maximum… current.”

4. Scope

This document contains technical requirements for flexible power/signal solutions used in a variety of system architectures utilizing a 48V busbar, 48V HPMs/PDBs, and 48V peripherals. This document defines the various position counts, orientations, and keying features allowing for scalability of this cable to board solution. The subsequently defined connectors are purposefully incompatible with the 12V PICPWR and PCIe power connectors to provide error-proofing between the different potentials. The subsequently defined connectors are also purposefully color coded to avoid confusion with the 12V PICPWR and PCIe power connectors. The 48V PICPWR connectors shall be natural colored. The Dedicated 48V Supply connector shall be grey in color. Regarding overall dimensions, this 48V solution shall be the same size or smaller than the 12V solution allowing for easier future design-ins.

Any supplier seeking OCP recognition for a hardware product based on this specification shall be compliant with 100% of the features and requirements defined in this document.

5. Overview

This specification standardizes a family of connectors carrying both power and signal in OCP servers. There are defined “48V PICPWR” connection interfaces. There is a defined “Dedicated 48V Supply” connection interface. The 48V PICPWR solution includes vertical and right-angle board options with mating cables. The 48V PICPWR solution includes a 48V 2x3+6SB PICPWR and a 48V 2x6+12SB PICPWR option. The vertical and right-angle headers shall share the same footprint for ease of footprint design and architecture. The Dedicated 48V Supply connection is a vertical board connector with mating cable. The contact designs are advantageous for reduced resistance, increased stability, and endured vibrations. The terminal and contact interface design also accounts for proper mating order. Considerations have been taken to control the mating sequence for supply currents, return currents, and sideband/sense currents. Definitions of what are considered supply, return, and sideband/sense currents are present in the electrical specification section of this standard. Multiple cable gauge options accommodate for customers needing more power or for customers needing more flexible cable routings.

An example of where the 48V PICPWR connectors and where the Dedicated 48V Supply connector could be used is shown in Figure 1. This example is lifted from the M-PIC Base Specification where other examples of 48V PICPWR are also present.

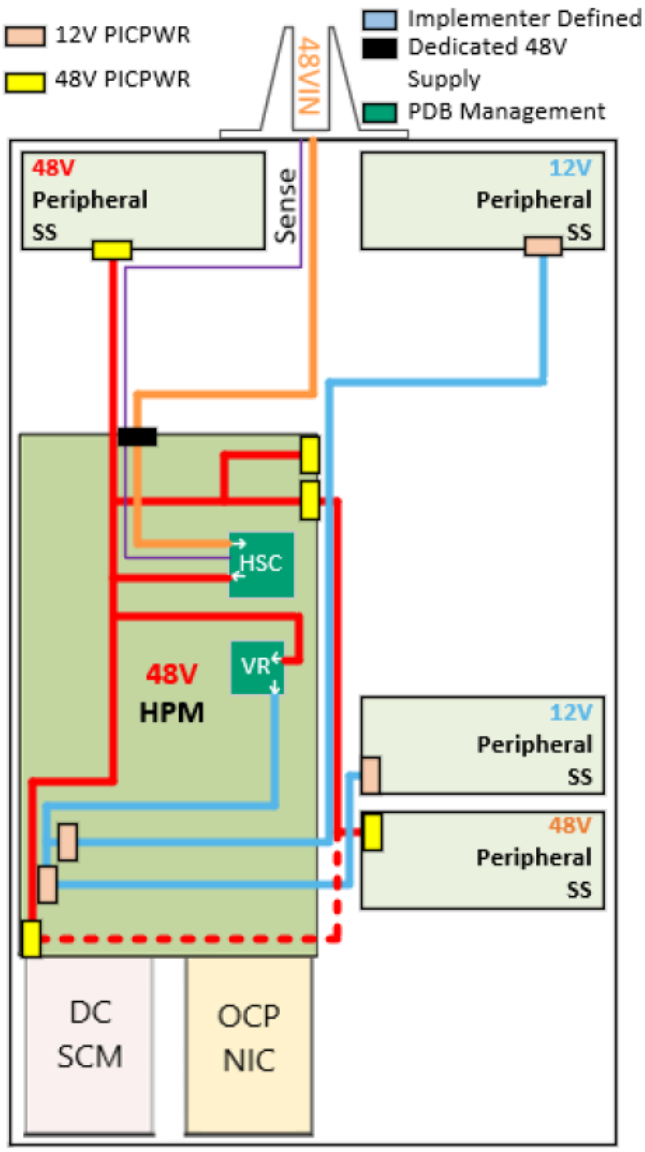


Figure 1: 48V OCP architecture example.

6. Environmental / Regulatory / Test Requirements

6.1. Temperature Life

Measured in accordance with EIA-364-17, method A, test condition 4. Subject the mated connectors to 105°C for 240 hours.

6.2. Thermal Shock

Measured in accordance with EIA-364-32, test condition VIII, test duration A. Subject mated connectors to 5 cycles between -40°C and 105°C.

6.3. Low Level Contact Resistivity

Measured in accordance with EIA-364-23. Subject connectors to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage.

Supply/Return:

5 milliohms maximum initial

6 milliohms maximum final

Sideband/Sense

50 milliohms maximum initial

80 milliohms maximum final

6.4. Insulation Resistance

Measured in accordance with EIA-364-21. 500 volts DC, 2 minute hold. Tested between adjacent contacts of unmated connectors.

1000 Megaohms minimum.

6.5. Dielectric Withstanding Voltage

Measured in accordance with EIA-364-20, condition I. 1,000 volts DC/AC at sea level for supply/return pins. 300 volts DC/AC at sea level for sideband/sense pins. Tested between adjacent pins of unmated connectors.

One minute hold with no breakdown or flashover.

6.6. Temperature Rise vs Current

Measured in accordance with EIA-364-70, method 2. The current is considered stabilized when 3 readings at 5 minute intervals are within 1°C. This is tested with a single energized contact and tested with all contacts energized. Cables shall be bundled together during this testing and not splayed apart as to test the worst case-scenario. The cables shall be oriented straight and not double back on themselves during testing. Footprint and copper distribution for all contacts energized testing is shown in Figure 2.

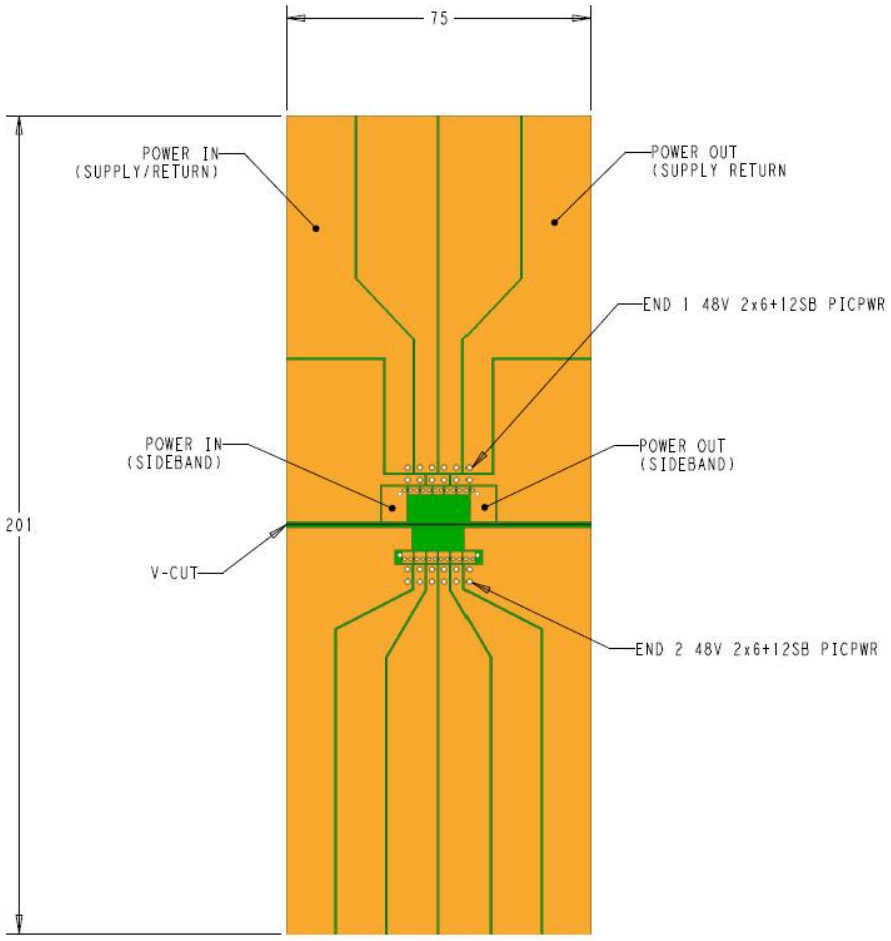


Figure 2: Copper distribution for temperature rise vs current testing for 48V 2x6+12SB PICPWR for all contacts energized. The top layer of copper is shown. In total there shall be 6 layers of 5oz copper. Layers are bussed together with Ø1.02mm plated thru holes.

6.7. Random Vibration

Measured in accordance with EIA-364-28, Test Condition VII, Condition D. Subject mated connectors to 3.10 G's rms. Fifteen minutes in each of 3 mutually perpendicular planes.

No discontinuities of 1 microsecond or longer duration.

6.8. Mechanical Shock

Measured in accordance with EIA-364-27, Method A. Subject mated connectors to 50G's half-sine shock pulses of 11 milliseconds duration. Three shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks.

No discontinuities of 1 microsecond or longer duration.

6.9. Durability

Measured in accordance with EIA-364-09.

The connector interface needs to withstand 30 cycles or more while still meeting visual requirements, showing no physical damage, and meeting the requirements of the additional tests defined in this standard.

6.10. Retention Force

Measured in accordance with EIA-364-38.

The latching mechanism shall withstand 45 Newtons minimum.

Cable connector supply and return pins shall individually withstand 24.5N minimum.

Cable connector sideband/sense pins shall individually withstand 9N minimum.

6.11. Humidity

Measured in accordance with EIA-364-31. Subject mated connectors to 96 hours at 40°C±2°C with a relative humidity of 90-95%.

The connector shall meet visual requirements, show no physical damage, and meeting the requirements of the additional tests defined in this standard.

6.12. Solderability

Measured in accordance with EIA-364-52, method 1, dip and look. Soldered at a temperature 245°C ± 5°C for an immersion duration of 5s.

All leads shall exhibit a continuous solder coating free from defects for a minimum of 95% of the critical area of any individual lead. The critical area of the lead is defined as the end of the tail to 0.5mm above the PCB level on the thru hole soldered tails.

6.13. Flammability

Materials shall be UL 94V-0 rated and low halogen composition (<1500ppm total halogen content).

7. Physical Specifications

7.1. Board Connector Physical Specifications

48V M-PIC connectors are composed of 3 distinct contact types: supply contacts, return contacts, and sideband contacts. Supply contacts shall be in the row closest to the latching side. Return contacts shall be in the center row. Sideband contacts shall be in the row furthest from the latching side. Figure 3 displays these contact type locations.

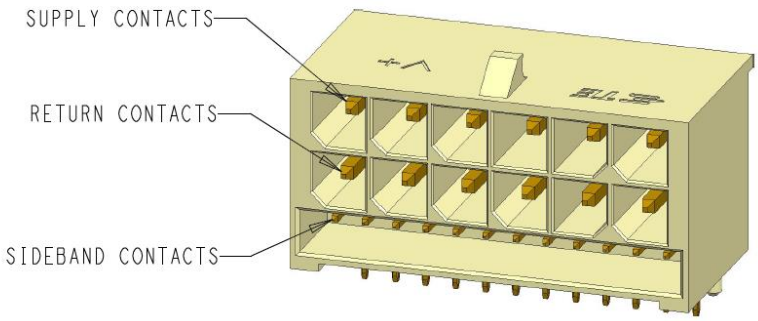


Figure 3: Right angle 48V 2x6+12SB PICPWR shown.

The Dedicated 48V Supply connector is composed of 3 distinct contact types: supply contacts, return contacts, and sense contacts. Supply contacts shall be in the row closest to the latching side. Return contacts shall be in the center row. Sense contacts shall be in the row furthest from the latching side. Figure 4 displays these contact type locations.

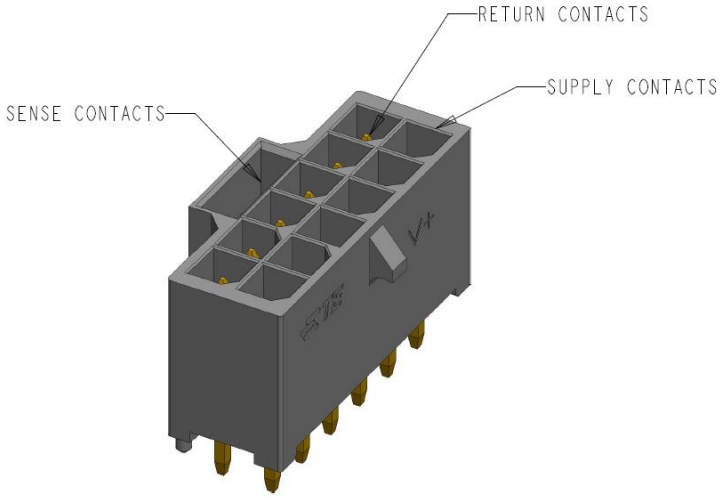


Figure 4: Dedicated 48V Supply shown.

Terminal and contact engagement lengths shall be intentionally staggered to control the mating sequence. The return contacts shall be 1st-to-mate/last-to-break in all instances. The sideband/sense contacts shall be last-to-mate/1st-to-break in all instances. The sideband/sense mating interface is staggered in the socket cable interface.

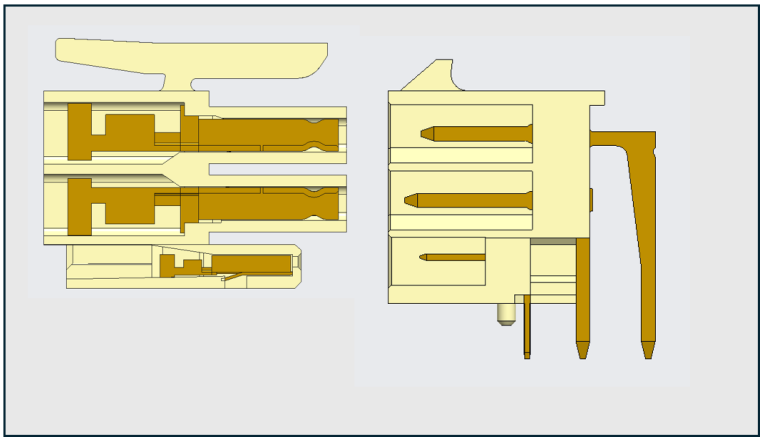
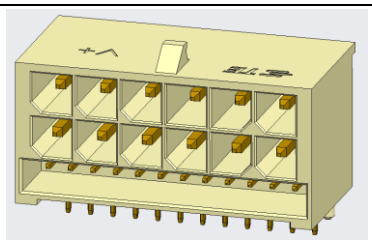
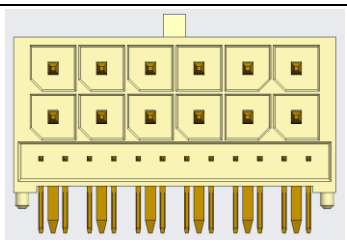
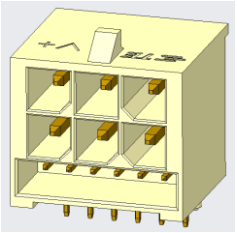
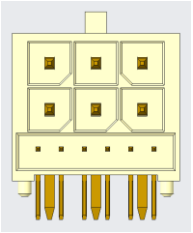
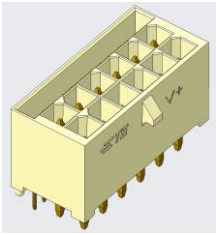
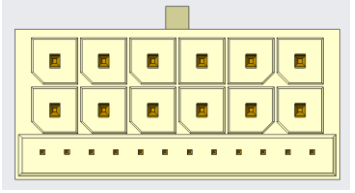
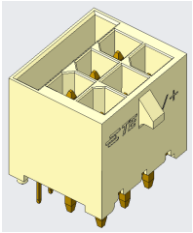
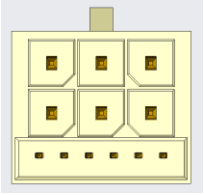
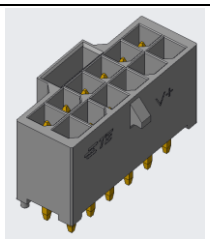
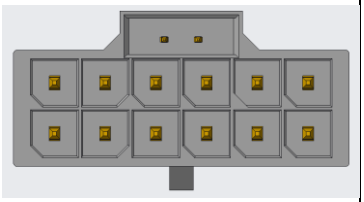


Figure 5: Cross section with terminal staggering shown.

The Dedicated 48V Supply and the 48V PICPWR configurations are shown below.

Callout	Form	Supply, Return, Sideband/Sense	Isometric View	Mating View
48V 2x6+12SB PICPWR	RA	6 / 6 / 12		
48V 2x3+6SB PICPWR	RA	3 / 3 / 6		
48V 2x6+12SB PICPWR	VT	6 / 6 / 12		
48V 2x3+6SB PICPWR	VT	3 / 3 / 6		
Dedicated 48V Supply Connector	VT	6 / 6 / 2		

Keying shall be present through selectively chamfered cores. The right angle and vertical options of each 48V PICPWR plug share the same keying features as they accept the same cable mate. The 2x6+12SB and 2x3+6SB options shall not share the same keying features and shall not accept the same cable mate. A reference of the keying chamfer is shown in Figure 6 and shall prevent partial or full cross-mating with all other M-PIC and PCIe power connectors.

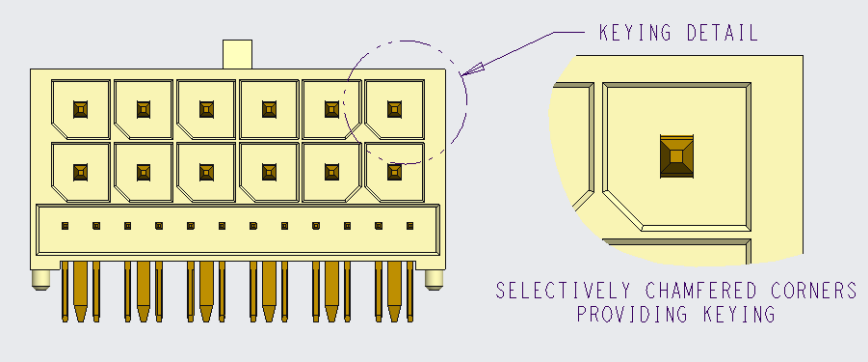


Figure 6: Select positions shall be chamfered to provide a poka-yoke solution.

7.2. Cable Connector Physical Specifications

Latching shall be required for every configuration. Tactile feedback when the latch engages is necessary. The latch should be fully shrouded to prevent unintended disconnects.

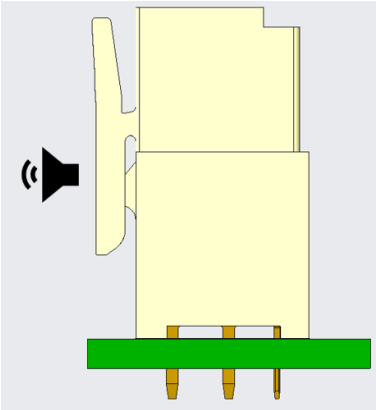
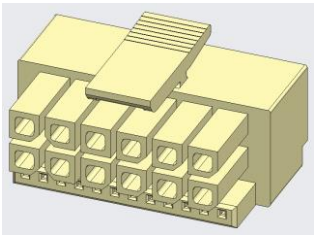
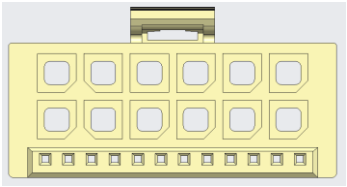
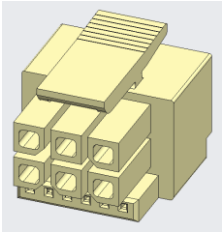
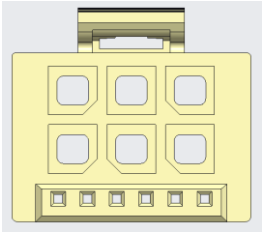
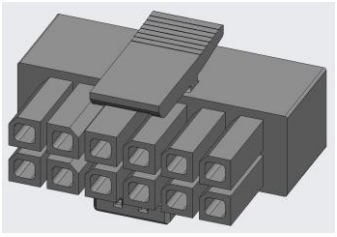
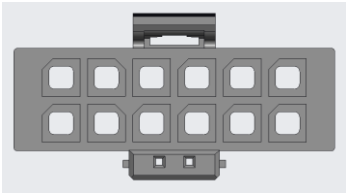


Figure 7: An audible and fully shrouded latching mechanism.

The 48V PICPWR and the Dedicated 48V Supply cable configurations are shown below.

Callout	Form	Supply, Return, Sideband/Sense	Isometric View	Mating View
48V 2x6+12SB PICPWR	VT	6 / 6 / 12		
48V 2x3+6SB PICPWR	VT	3 / 3 / 6		
Dedicated 48V Supply Connector	VT	6 / 6 / 2		

For all three cable assemblies the power and return paths shall utilize 14awg or 16awg wire. The 48V PICPWR sideband positions shall utilize 28awg wire. The Dedicated 48V Supply sense positions shall utilize 24awg wire.

Keying shall be present on the cable connectors to correspond with the appropriate board connector mate. A reference of the keying chamfer is shown in Figure 8.

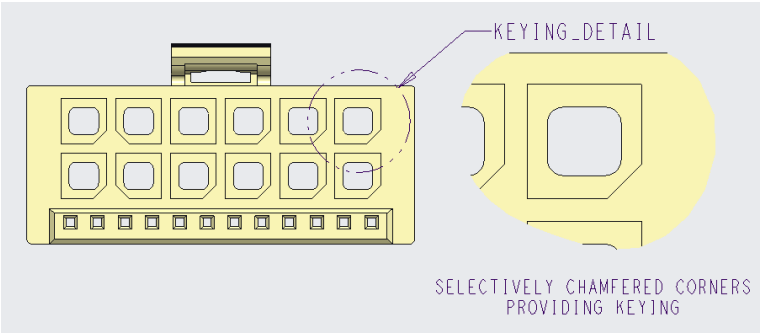


Figure 8: Select positions shall be chamfered to provide a poka-yoke solution.

Four points of contact shall be required for each supply and return terminal. The cable side contact for the supply and return positions needs a 4 beam geometry ensuring contact is made with all four sides of the mating terminal pin.

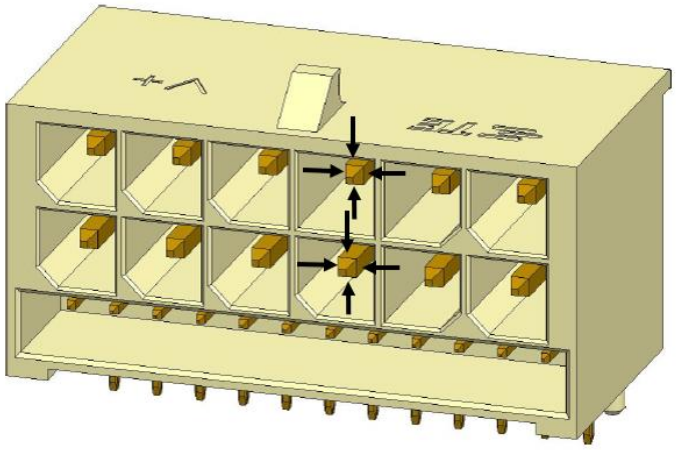


Figure 9: All four sides of each supply and return terminal shall have a contact point with the cable side contact.

7.3. Mechanical Dimensions

Figures in section 7.3 define overall sizes and critical to function datums and dimensions. Connectors shall be confined to the dimensions in Figures 10 through 17. This ensures the 48V solutions fit within the pre-existing12V footprint. This also ensures 48V solutions from multiple sources can be mated.

The 48V 2x6+12SB PICPWR right angle board connector is defined in figure 10.

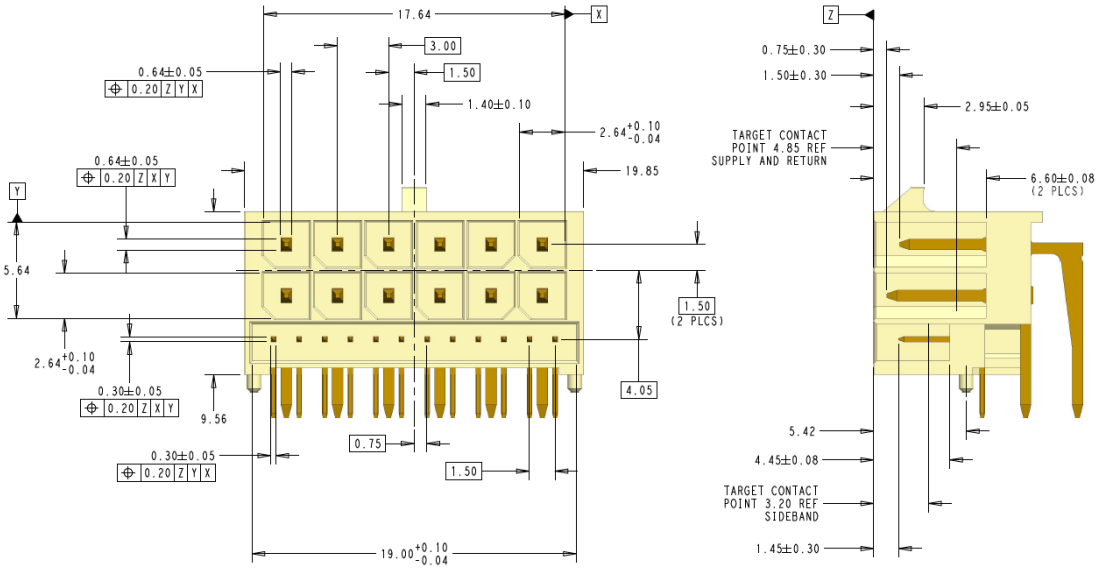


Figure 10: Datums and key dimensions of the 48V 2x6+12SB PICPWR right angle.

The 48V 2x3+6SB PICPWR right angle board connector is defined in Figure 11.

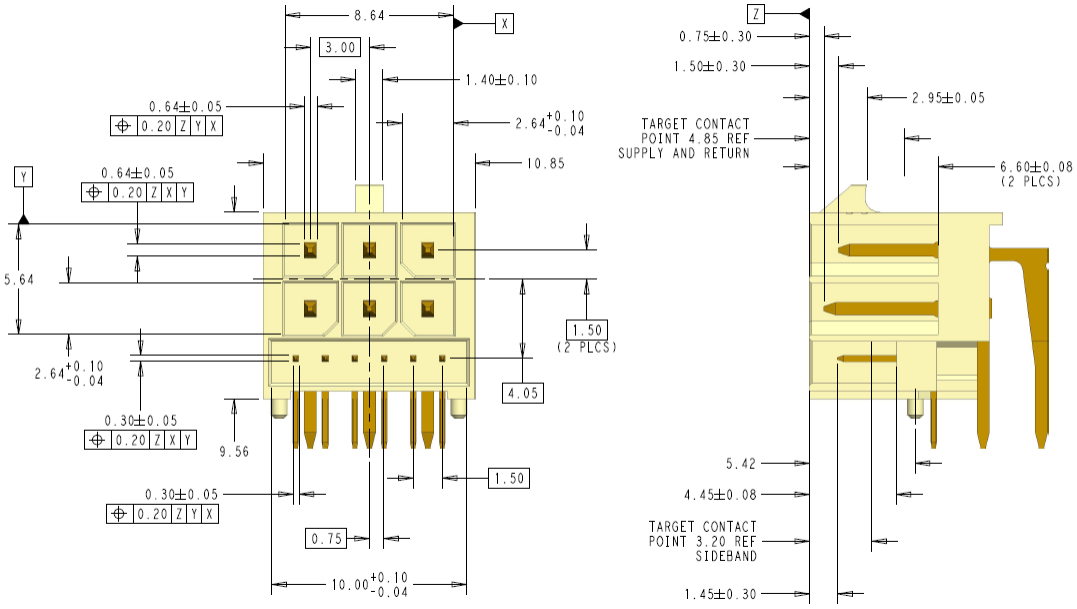


Figure 11: Datums and key dimension of the 48V 2x3+6SB PICPWR right angle.

The 48V 2x6+12SB PICPWR vertical board connector is defined in Figure 12.

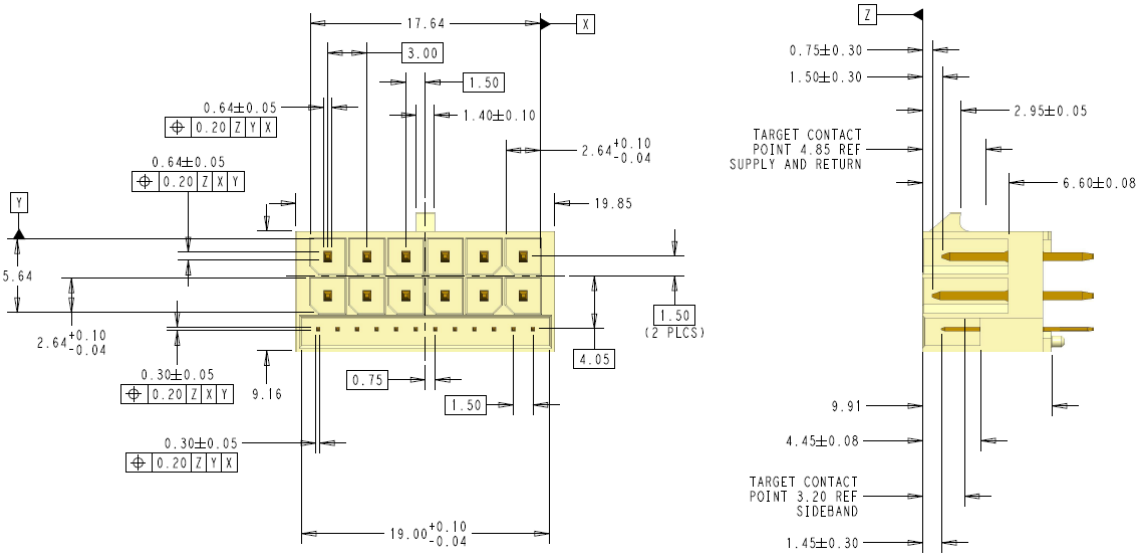


Figure 12: Datums and key dimensions of the 48V 2x6+12SB PICPW vertical.

The 48V 2x3+6SB PICPWR vertical board connector is defined in Figure 13.

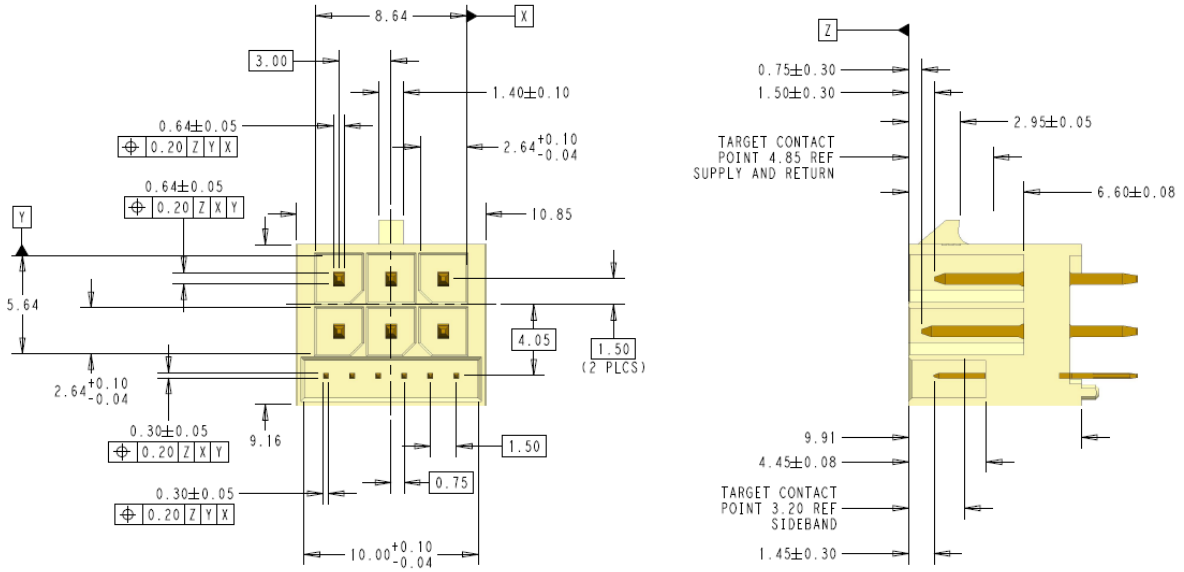


Figure 13: Datums and key dimensions of the 48V 2x3+6SB PICPWR vertical.

The Dedicated 48V Supply board connector is defined in Figure 14.

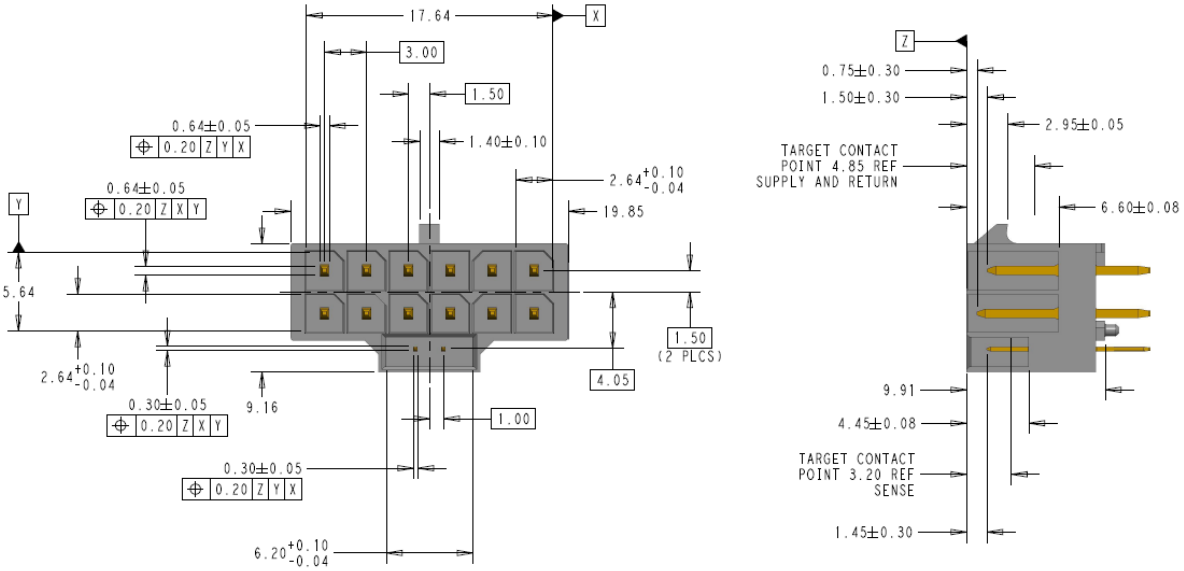


Figure 14: Datums and key dimensions of Dedicated 48V Supply.

The 48V 2x6+12SB PICPWR cable connector is defined in Figure 15.

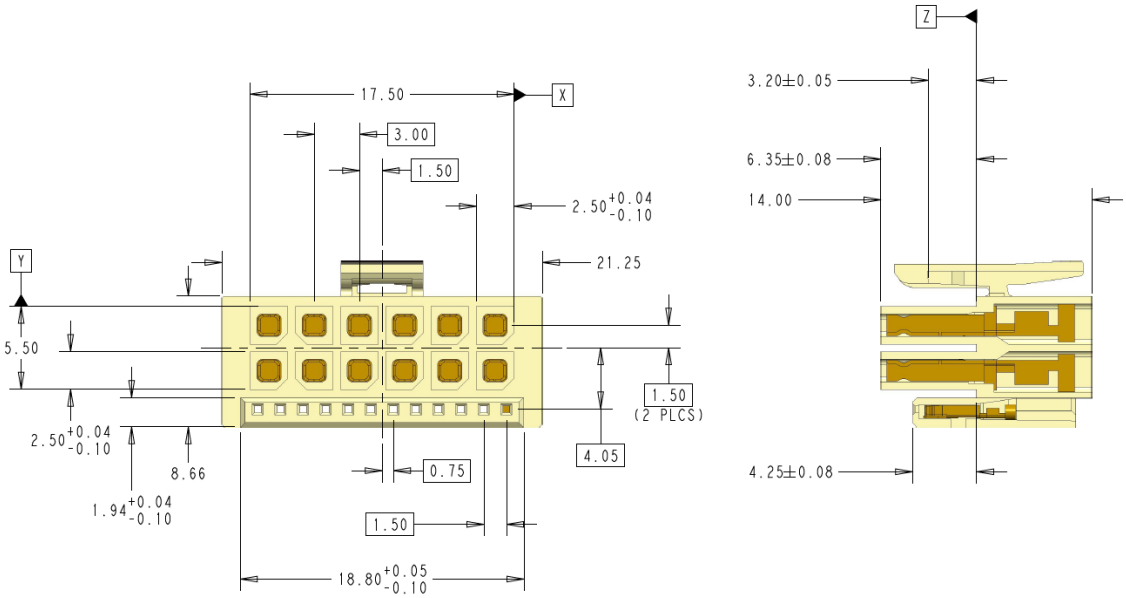


Figure 15: Datums and key dimensions of 48V 2x6+12SB PICPWR cable.

The 48V 2x3+6SB PICPWR cable connector is defined in Figure 16.

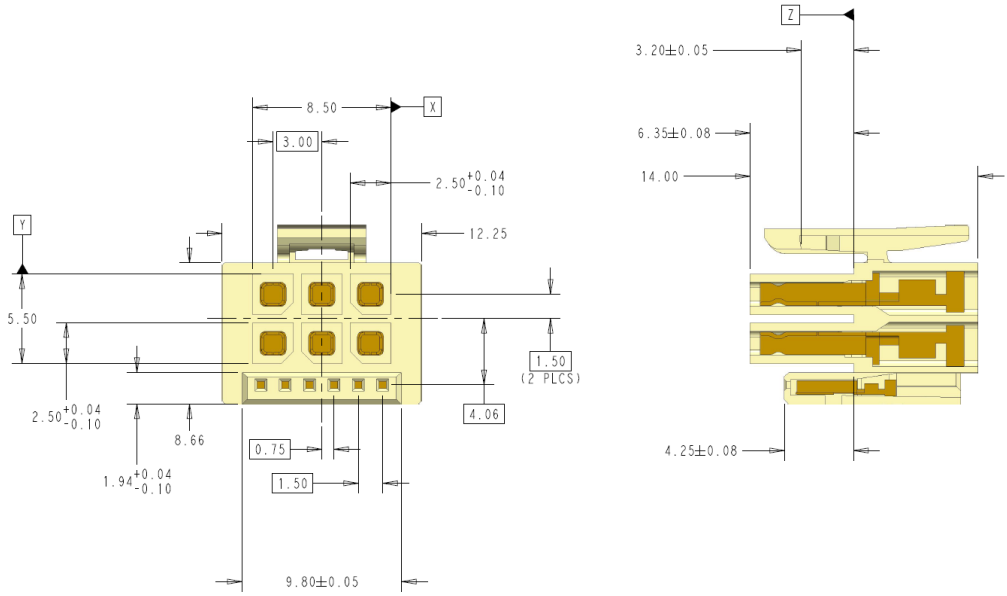


Figure 16: Datums and key dimensions of 48V 2x3+6SB PICPWR cable.

The Dedicated 48V Supply cable connector is defined in Figure 17.

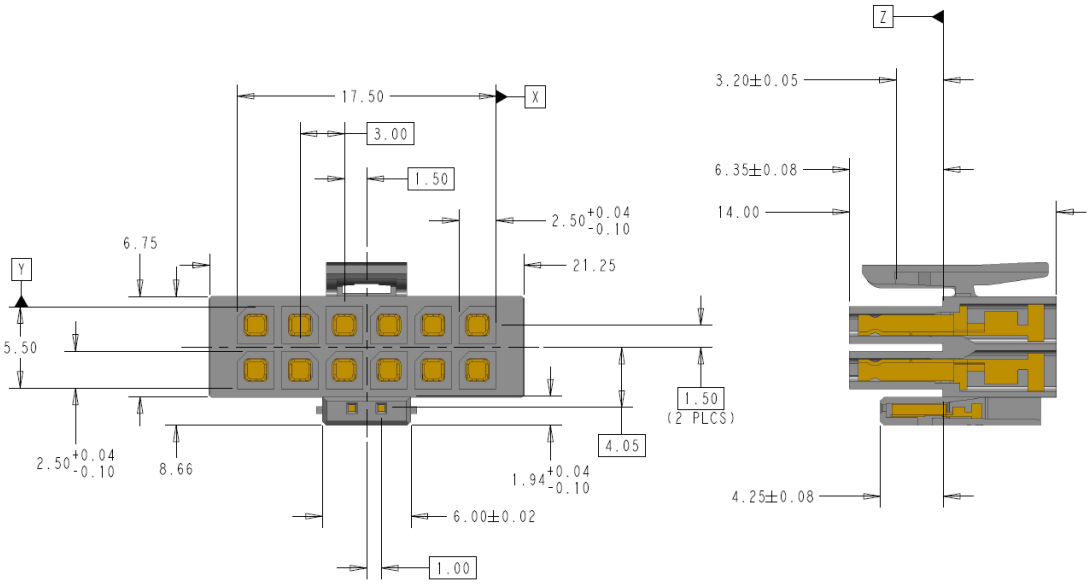


Figure 17: Datums and key dimensions of the Dedicated 48V Supply cable.

Right angle and vertical connector variants utilize the same printed circuit board footprint but have different connector outlines. The right angle and vertical footprints in Figure 18 have the same drilled and plated holes. The only difference is the connector keep out zone as illustrated.

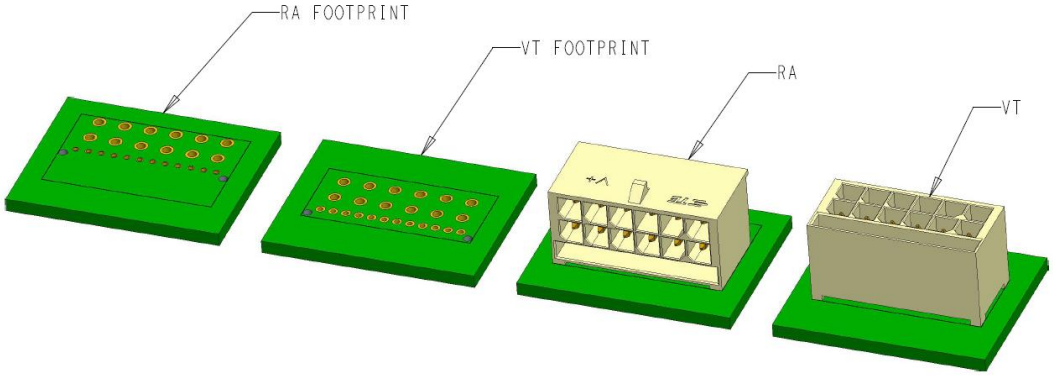


Figure 18: Display of both RA and VT options utilizing the same footprint.

The 48V 2x6+12SB PICPWR connector footprints are shown in Figures 19 and 20 and define the 48V 2x6+12SB PICPWR board requirements.

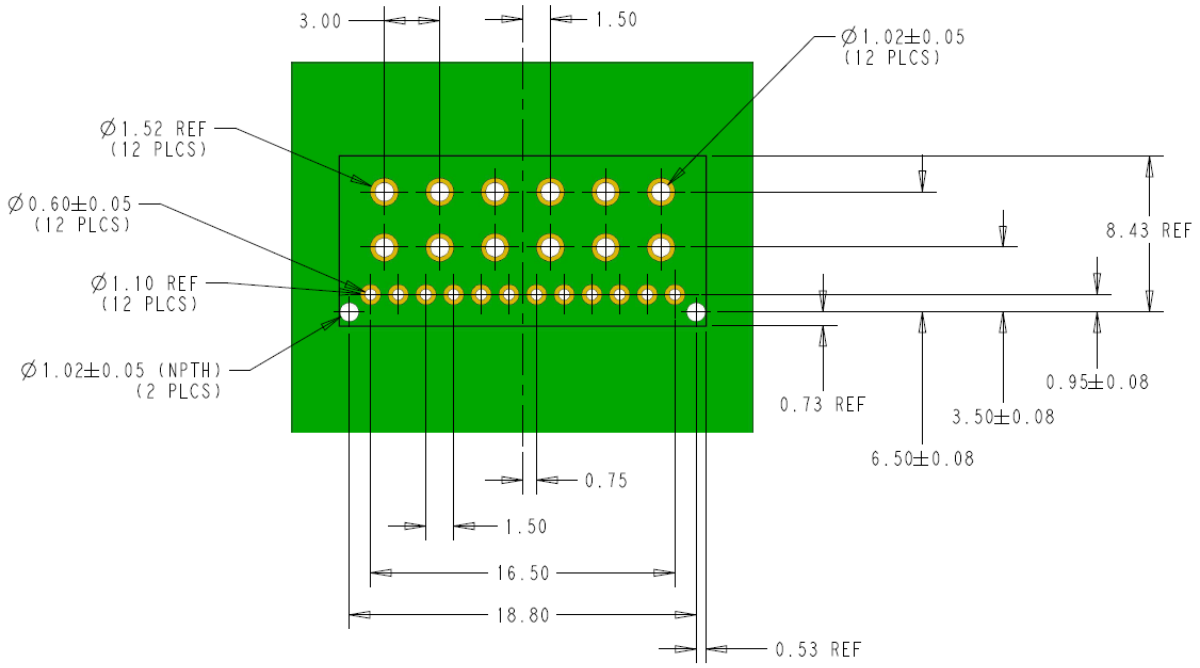


Figure 19: Footprint for vertical 48V 2x6+12SB PICPWR connector.

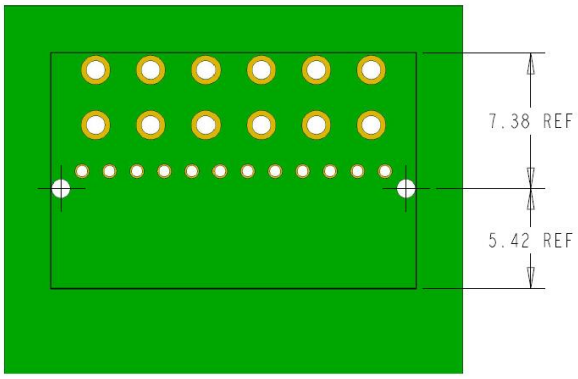


Figure 20: Footprint for right angle 48V 2x6+12SB PICPWR connector. Same as Figure 19 except as shown.

The 48V 2x3+6SB PICPWR connector footprints are shown in Figures 21 and 22 and define the 48V 2x3+6SB PICPWR board requirements.

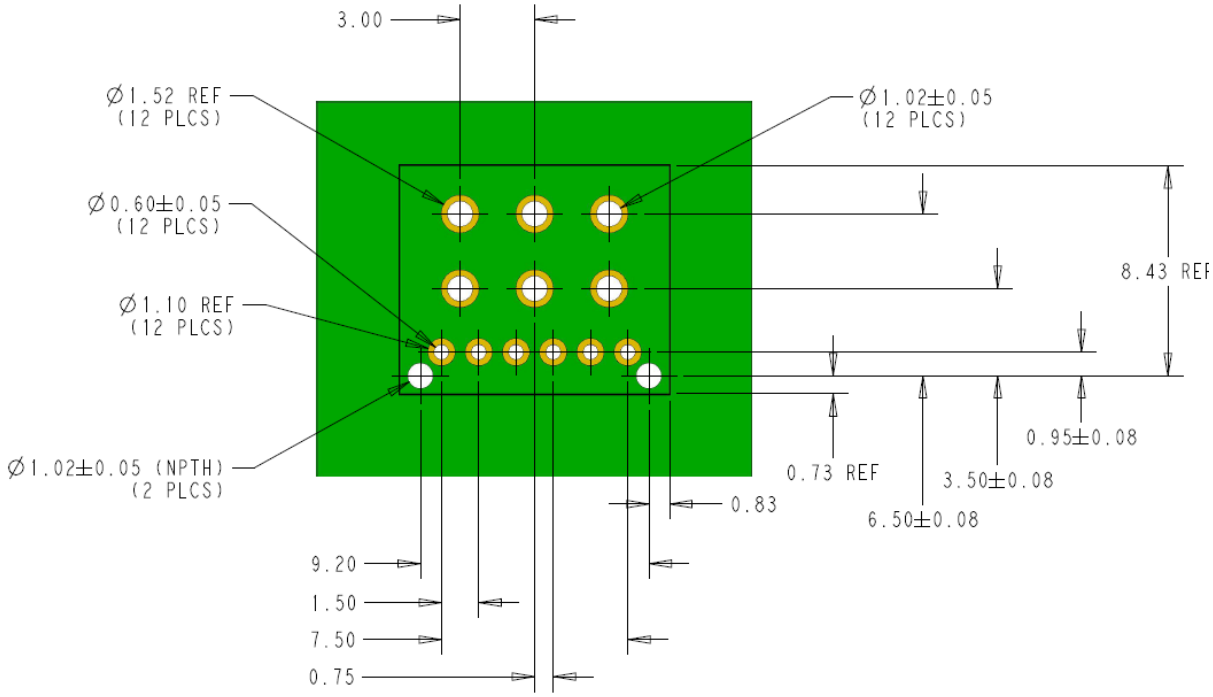


Figure 21: Footprint for vertical 48V 2x3+6SB PICPWR connector.

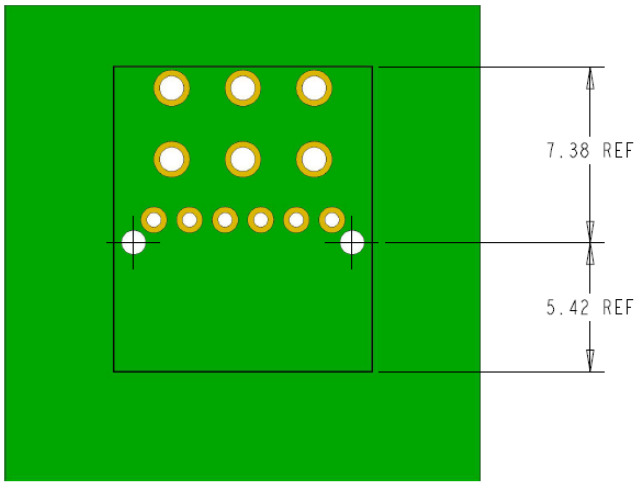


Figure 22: Footprint for right angle 48V 2x3+6SB PICPWR connector. Same as Figure 21 except as shown.

The Dedicated 48V Supply connector footprint is shown in Figure 23 and defines the Dedicated 48V Supply board requirements.

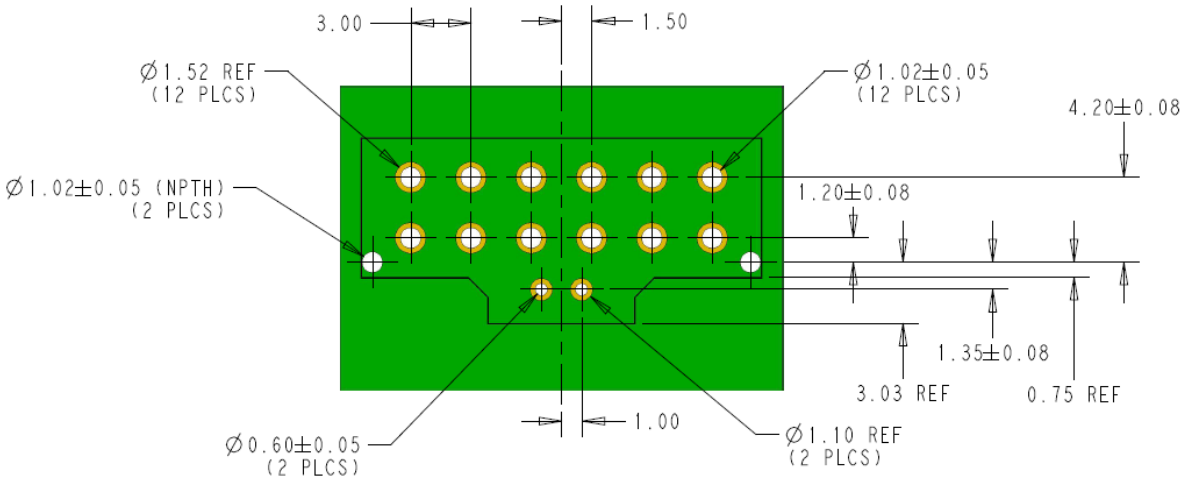


Figure 23: Footprint for Dedicated 48V Supply connector.

8. Electrical Requirements

8.1. 48 Volt PICPWR

Supply and return positions of the 48V 2x3+6SB PICPWR configuration shall handle 40.5 total Amps of supply and 40.5 total Amps of return. This yields 1863W at 46 volts. The normal operating voltage shall be up to 60V. The connector shall support current excursions shorter than 1 second where the maximum currents for all excursion windows are less than 5 times the nominal connector current rating, provided the RMS current over all periods of 1 second or more do not exceed the nominal current rating.

Supply and return positions of the 48V 2x6+12SB PICPWR configuration shall handle 72 total Amps of power and 72 total Amps of return. This yields 3312W at 46 volts. The normal operating voltage shall be up to 60V. The connector shall support current excursions shorter than 1 second where the maximum currents for all excursion windows are less than 5 times the nominal connector current rating, provided the RMS current over all periods of 1 second or more do not exceed the nominal current rating.

The sideband positions of the 48V PICPWR connectors shall individually carry 1 Amp minimum.

Pinout information for the 48V PICPWR connectors can be found in section 10.2.13 of the M-PIC Base Specification.

8.2. 48 Volt Dedicated Supply

Supply and return positions of the 48V Dedicated Supply shall handle 72 total Amps of supply and 72 total Amps of return. This yields 3312W at 46 volts. The normal operating voltage shall be up to 60V.

The connector shall support current excursions shorter than 1 second where the maximum currents for all excursion windows are less than 5 times the nominal connector current rating, provided the RMS current over all periods of 1 second or more do not exceed the nominal current rating.

The sense positions of the 48V Dedicated Supply connector shall individually carry 1.5 Amps minimum.

Pinout information for the Dedicated 48V Supply connectors can be found in section 10.2.12 of the M-PIC Base Specification.

Appendix A - Checklist for IC approval of this Specification (to be completed by contributor(s) of this Spec)

Complete all the checklist items in the table with links to the section where it is described in this spec or an external document .

Item	Status	Link to detailed explanation
Has this contribution been presented to an OCP Project group during a project call or engineering workshop?	Yes	Presented on 6/25/2025 OCP Project Call
Approval by Project Leads	Yes	
Is this contribution entered into the OCP Contribution Portal?	Yes	Revision 1.1 will be submitted for review.
Was it approved in the OCP Contribution Portal?	Not Yet	Revision 1.1 is being submitted for review.