Open Rack V3 Power Shelf 48V Output Connector

Rev: 0.33

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1. **Scope**

This document defines the technical specifications for an Open Rack V3 Power Shelf 48V Output Connector used in the Open Compute Project.

2. **Overview**

This interconnection will allow for the installation of an Open Rack V3 power shelf in any location within an Open Rack by replacing the current bolted interface from Open Rack V2 that requires a pre-defined hole location.

3. **Electrical**

- Voltage range: 40V – 59.5V dc
- Max current continuous: 500A dc
- Max temperature rise: 30C (with busbar connected, as specified on ORv3 busbar Spec)
- Max voltage drop: 12mV @ max rated current
4. **Mechanical**

4.1 **Geometry**

The connector shall fit within the maximum height of a 1U EIA chassis (44.45mm).

The connector shall support a panel thickness of 0.72 – 1.32 mm.

The connector MAY use tools to attach the connector to the power shelf. [Details of hardware, torque, latching forces]

{Hole details for chassis to be here}

Wires shall resist pullout from the connector of XXX N.

4.2 **Mating to the Busbar**

The connector shall support blind-mate installation of the power shelf onto the 48V busbar as defined in the Open Compute Specification Revision 2.1.

Connector shall support +/-2mm float horizontally and vertically.

Connector shall support 6mm of wipe minimum.

Busbar to be copper stock 3.0 +/- 0.13mm thick with silver plating 11 micron thick minimum over nickel 5 micron thick minimum. Surface roughness Ra <1.0.

The max rate of the power shelf insertion into the rack will be 1 m/s.

The insertion force of the connector onto the busbar shall be less than 50N.

All of the input power cords shall be disconnected prior to disconnecting the shelf from the busbar under normal conditions. However, the rack may have more than one power shelf installed into a power zone, so the rack busbar may be energized when the power shelf is installed or removed from a live rack. So, the connector must survive 2 cycles in this condition.

The power shelf will ship within the rack while connected to the rack busbar. The connector solution shall prevent damage of the power shelf and the rack busbar during the following packaged, rack-level tests (ASTM 4169 details below) while meeting the voltage drop requirements per section 6.0 and show no exposed copper of either the power shelf connector or rack busbar under SEM analysis of the interfaces.

The rack is tested in the shipping packaging for transportation Shock and Vibration per ASTM 4169-16 Schedule E - Vehicle Vibration for 2hrs on vertical axis only for 80 minutes low level, 30 minutes medium level and 10 minutes high level.

**Airflow**

The Power shelf shall always provide airflow across the interconnect while the power shelf is under load.
Max Temperature: 45°C
Minimum pressure: XXX Pa
Minimum flow speed: XXX m/s

5. Environmental Requirements:

- Operating Ambient Temperature at connector location: 10°C – 45°C
- Long-term Storage: -40°C to 50°C and 5-95% RH [XXX timeframe]
- Short-term Storage: -20°C to 65°C and 10-80% RH
- Operating Humidity: 20-90%, 5°C dew point minimum
- Lifetime: 5 years
6. Quality

The following tests will be conducted with three samples each per Table 1.

<table>
<thead>
<tr>
<th>Test</th>
<th>Test Standard</th>
<th>Test Condition/ Method</th>
<th>Pass/Fail Criteria</th>
<th>Additional Data to Collect for Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>Durability</td>
<td>EIA-364-09</td>
<td>25 mating/un-mating cycles 30~60mm per second travel speed</td>
<td>contact resistance before and after post test surface wear examination: no exposed nickel or copper</td>
<td>N/A</td>
</tr>
<tr>
<td>Contact Retention</td>
<td>EIA-364-29</td>
<td>Method A 15kgf pull force, both axial and at 45degrees, for a minimum of 6 seconds</td>
<td>no visible contact to housing displacement</td>
<td>N/A</td>
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<tr>
<td>Vibration</td>
<td>EIA-364-28</td>
<td>Test condition VII Test condition letter E 15 minutes duration in each of the three mutually perpendicular direction</td>
<td>per standard in addition: contact resistance before and after post test contact wear optical examination, SEM/EDX optional</td>
<td></td>
</tr>
<tr>
<td>Shock</td>
<td>EIA-364-27</td>
<td>half-sine pulse test condition A 3 shocks * 3 perpendicular planes * 2 directions = 18 shocks</td>
<td>per standard in addition: contact resistance before and after post test contact wear optical examination, SEM/EDX optional</td>
<td></td>
</tr>
<tr>
<td>Temperature Life</td>
<td>EIA-364-17</td>
<td>Method C Test condition 1: 125+/−2C Test duration: 168hrs Load current: 500A</td>
<td>per standard, section 4.4 in addition: contact resistance before and after monitor contact voltage drop during test</td>
<td></td>
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<tr>
<td>Thermal Shock</td>
<td>EIA-364-32</td>
<td>Method A Test condition VII: -55C to 105C Test duration: 10cycles</td>
<td>per standard, section 4.6</td>
<td>N/A</td>
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<tr>
<td>Humidity</td>
<td>EIA-364-31</td>
<td>Method IV</td>
<td>contact resistance before and after dielectric withstand voltage before and after insulation resistance before and after</td>
<td>N/A</td>
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<tr>
<td>Salt Spray</td>
<td>EIA-364-26C</td>
<td>5% solution @ 35C+/−2C, 72hrs</td>
<td>contact resistance before and after</td>
<td>N/A</td>
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<tr>
<td>Temperature rise</td>
<td>TBD</td>
<td>Run 500Adc through connector, connected to busbar</td>
<td>Lower than 30C</td>
<td>N/A</td>
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<tr>
<td>Voltage drop</td>
<td>TBD</td>
<td>Run 500Adc through connector</td>
<td>Lower than 12mV</td>
<td>N/A</td>
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</table>
7. Regulatory

The connector shall comply with the latest edition, revision, and amendment of the following Standards:

- [USA] UL 60950-1, Information Technology Equipment - Safety - Part 1: General Requirements
- [INT’L] IEC 60950-1, Information Technology Equipment - Safety - Part 1: General Requirements, including all national deviations as specified in the most current CB Bulletin; CB Certificate and report MUST include all countries participating in the CB Scheme; US and Canada national deviations may be excluded since the power supply will have third party certifications for these 2 countries
- [EU] EN 60950-1, Information Technology Equipment - Safety - Part 1: General Requirements
- IEC 62368-1, Audio/video, information and communication technology equipment – Part 1: Safety requirements (applicable to meet anticipated effective date of December 20, 2020 for North America and Europe.)
  - Halogen Free per [XXX]
  - ROHS [XXX]
- Material flammability: All materials shall be UL94 V-0 rated.
- Connectors shall be UL1977 recognized.

8. Revisions

<table>
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<tr>
<th>Rev</th>
<th>Date</th>
<th>Author</th>
<th>Changes</th>
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<tr>
<td>0.31</td>
<td>5 May 19</td>
<td>Steve Mills</td>
<td>Converted to 48V</td>
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<tr>
<td>0.32</td>
<td>5 JUL 19</td>
<td>SM and HK</td>
<td>Extensive updates</td>
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<tr>
<td>0.33</td>
<td>12 JUL 19</td>
<td>Steve Mills</td>
<td>Extensive Changes from the JUL19 OCP Workshop</td>
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