Agenda

- FlexPower CRPS background
- OCP Edge
- Power Supply Considerations for OCP Edge
CRPS Standard Family of Power Supplies for Server, Storage and Network Applications
FlexPower CRPS Solutions – Aligns with Intel roadmap

185mm x 73.5mm x 40mm

265mm x 73.5mm x 40mm
CRPS 5G Application
EDGE server project

For more details:
https://www.opencompute.org/projects/edge
OCP EDGE

- OCP EDGE is an open-source sub-group of OCP standardizing Edge Computing shelves with 2U and 3U rack-mount chassis options
- The system meets NEBS requirements
  - Earthquake, Airborne Contaminants, Humidity, EMC, Surge Levels
- 3U chassis uses two redundant 2000W power supplies
  - AC input 2000W (100-264 VAC)
  - DC input 2000W (40-72 VDC)
- 2U chassis uses two redundant 1200W power supplies
  - AC input 1200W (100-264 VAC)
  - DC input 1200W (40-72 VDC)

Figure 1 Open edge server chassis
Power Supply Considerations for OCP Edge
OpenEDGE power considerations

- Comply with openEDGE specifications
- Meet NEBS requirements
  - Earthquake, Airborne Contaminants, Humidity, EMC, Surge Levels
- Communicate with RMC via PMBus
- Power the compute processor – Purley x86 (Skylake or Cascade Lake)
- AC and DC input power supplies must be interoperable
  - Current share, Hot Swap, Protection Circuits
- Hold-Up Time differences between AC and DC input power supplies
Output Power derating over temperature

Thermal Hot Spots inside the DC and AC input power supplies are different based on the power stage physical differences in the primary.

Need to work closely with the customer to qualify both AC and DC input models for thermal management and overtemperature protection.
DC and AC timing differences

### Table 9 DC Holdup / Dropout

<table>
<thead>
<tr>
<th>Loading during DC dropout / holdup</th>
<th>12V Main Output Holdup time / Dropout duration</th>
<th>12V Standby Output Holdup time / Dropout duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>50% of max load</td>
<td>2ms</td>
<td>4ms</td>
</tr>
<tr>
<td>70% of max load</td>
<td>1.5ms</td>
<td>3ms</td>
</tr>
<tr>
<td>100% of max load</td>
<td>1ms</td>
<td>2ms</td>
</tr>
</tbody>
</table>

### Table 9.1 AC Holdup / Dropout

<table>
<thead>
<tr>
<th>Loading during AC dropout / holdup</th>
<th>Holdup time / Dropout duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>50% of max load</td>
<td>16msec/15ms</td>
</tr>
<tr>
<td>70% of max load</td>
<td>11msec/10ms</td>
</tr>
<tr>
<td>100% of max load</td>
<td>9msec/7ms</td>
</tr>
</tbody>
</table>

### Table 21 Timing Requirements

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Min</th>
<th>Nom</th>
<th>MAX</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tpwok_holdup</td>
<td>Delay from loss of DC to de-assertion of PWOK at 40VDC 100% load.</td>
<td>0.5</td>
<td>5</td>
<td></td>
<td>ms</td>
</tr>
<tr>
<td>Tpwok_holdup</td>
<td>Delay from loss of AC to de-assertion of PWOK at 230V 100% load.</td>
<td>7</td>
<td></td>
<td></td>
<td>ms</td>
</tr>
</tbody>
</table>

The PWOK signal can be used to initiate NV-DIMM memory backup. It is important to verify proper backup timing for AC and DC input power supplies.
**Flex PN Normal Airflow (Airflow Output to DC Inlet):**
FPS-S-2000DDU00-101

**Flex PN Reverse Airflow (Airflow DC Inlet to Output):**
FPS-S-2000DDU00-201

**Flex PN Normal Airflow (Airflow Output to DC Inlet):**
FPS-S-1200DDU00-101

**Flex PN Reverse Airflow (Airflow DC Inlet to Output):**
FPS-S-1200DDU00-201
Potential Future Power Considerations

- Power Distribution Board (PDB) connects to the Rack Management Controller (RMC)
  - Could use DC/DC converters with PMBus communication to enable more features such as sequencing

- Power supply hold-up time could be optimized to use non-volatile memory (NV-DIMM)
  - Additional hold-up required for NV-DIMM could be provided by battery backup

- Future Server sleds may upgrade Processor
  - Cooper Lake has different peak power requirements than Purley
  - 2100W model Cooper Lake compliant

The key is for the power supply company to anticipate changes based on a deep understanding of the customer’s requirements and road map
Summary

- AC/DC and DC/DC Power Supplies are a critical component of edge computing equipment
- Power Supplies have features that can be optimized for unique 5G requirements
- Many features can be changed quickly and easily with firmware
- Some other features are implemented in hardware and require longer leadtime to change or implement
- Working closely with the power supply vendor is the best way to meet the program requirements on time
For further information contact:

Power Supplies
- Jim Nelson, jim.nelson@flex.com
- Tom Gottwald, tom.gottwald@flex.com
Thank you.