

Flex Power Modules furthers **Direct Conversion Ecosystems**

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[Rack & Power]









Why did Flex Power Modules start with 48V Direct **Conversion**?

- **2016**: "There's an opportunity to define a 48V [direct conversion] standard in a way that let's the industry supply the components to its vendors and integrate those components... and let everyone come from the same supply chain. There isn't a good reason to have multiple versions of 48V racks which is why we're trying to develop a common standard so the entire industry can move to it faster." Urs Hölzle, Sn VP Technology, Google
- **2016** : Flex Power Modules reacted to this request and has invested in R&D for 48V direct conversion technology
- Multi-vendor approach demanded by the market



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What is driving the need for 48V Direct Conversion?

- Next generation Data Center applications require higher power
- 3-4kW boards testing limits of Intermediate Bus Converter (IBC) / Point of Load (PoL) Power Architecture
- Challenge for Next Generation Data Centers to distribute the current, especially at 12V
- The solution: converters capable of operating directly from the system bus voltage (48V or 54V) to PoL Voltage (< 2V)



uire higher power us Converter (IBC) /



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System Architecture

V







- Scalable solution for modularity
- Up to 6 phases in • parallel
- Increased board level efficiency



Scalable Efficiency Optimization







- Dynamic phase management
- Optimize efficiency across the load range
- Enhance load transient response
- 92% peak efficiency
- Active current balancing between phases improves thermal performance





Ripple and noise

- Extremely low noise floor \rightarrow resonant topology with zero voltage & zero current switching
- Ripple cancellation by automatic phase interleaving



Direct Conversion







Switch node waveform





System Benefits

- Reduced need for 2-Stage conversion in 48V systems
- 48V Direct Conversion to <2V for High Current Rails
- Up to 50% reduction in board area for power conversion
- Increased board level efficiencies typically 2-3% higher than a leading-edge **IBA** solution
- Better dynamic performance/less capacitance required
- Scalable solution for modularity
- Programmable via Digital Interface (PMBus)







Our conclusion

We are open and work together with the power community in order to facilitate a multivendor solution with compatible products









Additional resources

- https://www.opencompute.org/files/External-2018-OCP-Summit-<u>Google-48V-Update-Flatbed-and-STC-20180321.pdf</u>
- https://2019ocpglobalsummit.sched.com/event/Jinc/google-48v-rack-adaptation-and-onboard-power-technology-update.
- More information about 48 V to Load Direct Conversion: 48V to Direct Load Brochure
- Contact information: <u>pm.info@flex.com</u>









Open. Together.



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