Flex Power Modules furthers Direct Conversion Ecosystems

Bob Cantrell, Senior Field Engineer, Flex Power Modules
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
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)
Typical System Configurations

**Before Direct Conversion**

- **Supply**: +48 V
- **Intermediate Bus Power**: +12 V
- **High Power Isolated DC/DC**
- **Multi-Phase POL / VRM**
- **POL**
- **POL / LDO**
- **100-250+ A Loads (CPU/GPU)**
- **25-50 A Loads**
- **Non-core Loads**

**With Direct Conversion**

- **Supply**: +48 V
- **Intermediate Bus Power**: +48 V
- **Low Power Isolated DC/DC**
- **48:N**
- **48:N**
- **POL / LDO**
- **100-250+ A Loads (CPU/GPU)**
- **50-100 A Loads (NIC/Storage)**
- **Non-core Loads**

---

**RACK & POWER**

---

**Open. Together.**
System Architecture

- 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 → resonant topology with zero voltage & zero current switching
- Ripple cancellation by automatic phase interleaving

**Typical Buck PoL Solution**

**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


- More information about 48 V to Load Direct Conversion: 48V to Direct Load Brochure

- Contact information: pm.info@flex.com