MULTI-PHASE HYBRID POWER CONVERTER ARCHITECTURE WITH LARGE CONVERSION RATIOS

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PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20240146188	05/02/2024	2021-100

BRIEF DESCRIPTION

The power demands on data centers are large and increasing rapidly. This is straining data center economic and environment impacts, and in turn driving improvements in data center power efficiencies. Data centers have been widely adopting 48 V intermediate bus architectures due to higher efficiency, good flexibility, and reduced cost. However, a major challenge in such systems is the conversion from the 48 V bus to the extreme low voltage and high current operating levels of server CPUs and GPUs.

To address this challenge, UC Berkeley researchers developed a multi-phase hybrid power converter architecture. The Berkeley design uses hybrid converter topologies. A switched-capacitor network is smartly merged with a switched-inductor network, resulting in circuit component number reduction and soft-charging operation of the capacitors. Furthermore, the Berkeley architecture integrates a multi-phase control technique to achieve a higher conversion ratio of the switched-capacitor network, which can further improve the overall system efficiency without increasing the circuit size.

SUGGESTED USES

- Data center power delivery to support the increasing power demand
- All-electric and hybrid vehicle to bridge 400 V battery bus voltage and 48 V subsystems
- Portable electronics to enable more efficient and faster wired/wireless charging
- Solar photovoltaics to improve the conversion efficiency between panel and grid

ADVANTAGES

A prototype based on the Berkeley design with a 48 V to 2.5-1.0 V converter and 65 A output current achieved 95.1% peak efficiency (94.3% including gate drive loss) and 395 W/in3 power density, demonstrating one of the best in-class performances.

RELATED MATERIALS

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Thermal Test Vehicle For Electronics Cooling Solutions

CONTACT

Michael Cohen
mcohen@berkeley.edu
tel: 510-643-4218.

INVENTORS

- Pilawa-Podgurski, Robert C.N.

OTHER INFORMATION

KEYWORDS

Power Converter, Data Center Power

CATEGORIZED AS

- **Computer**
  - Other
- **Energy**
  - Other
- **Environment**
  - Other
- **Engineering**
  - Other

RELATED CASES

2021-100-0, 2022-034-1, 2021-051-1

University of California, Berkeley Office of Technology Licensing
2150 Shattuck Avenue, Suite 510, Berkeley,CA 94704
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