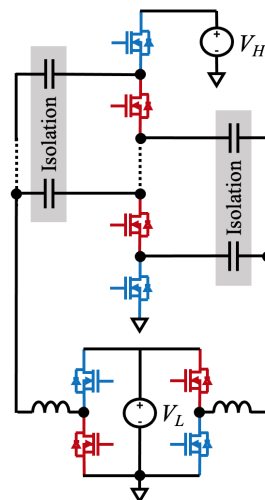


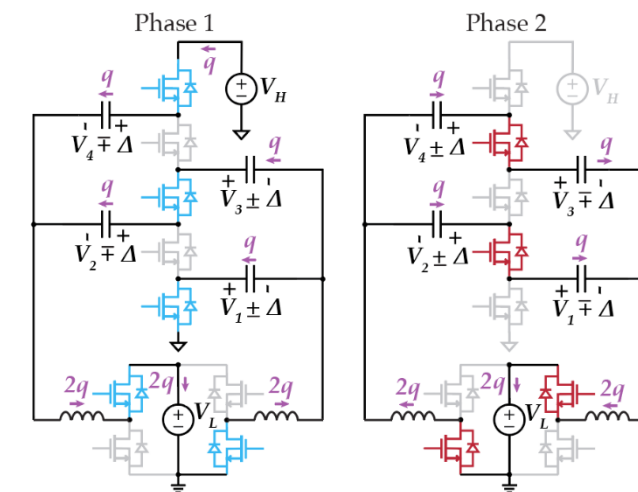
## Motivation and Applications

- Hybrid switched-capacitor converters offer high power density but have been restricted to non-isolated applications
- Traditional isolation methods require bulky and heavy transformers
- Capacitive isolation presents a power-dense alternative to magnetic isolation
- Flying capacitors with high voltage rating act as isolation capacitors



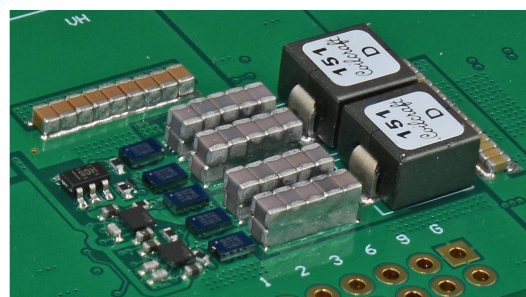
## Theory of Operation

- Capacitively isolated hybrid switched-capacitor converter based on [1], [2]
- Complete soft-charging of capacitors eliminates loss from transient inrush currents
- 50% duty cycle and two-phase operation
- Switch voltage stress independent of load



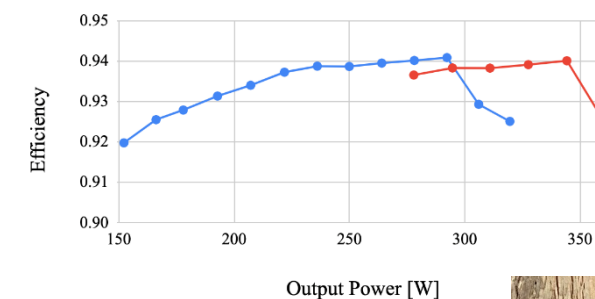
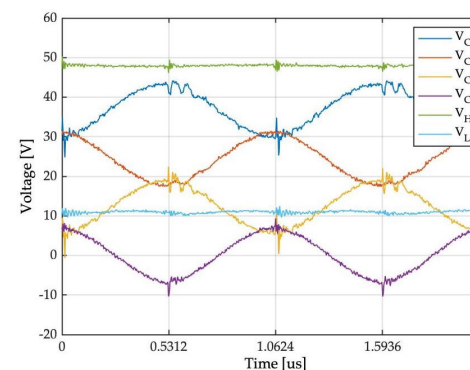
## Challenges and Solutions

- ZVS theoretically possible, but not successful at higher input voltages
  - Ongoing issue; we'll spend more time investigating timing
- Light-load oscillations that damage converter at higher voltages
  - Current solution: avoid light load



## Experimental Results

- 94.1% peak efficiency, 2,010 W/in<sup>3</sup> power density



[1] Y. Li, L. Gu, A. Hariya, Y. Ishizuka, J. Rivas-Davila, and S. Sanders, "A wide input range isolated stacked resonant switched-capacitor dc-dc converter for high conversion ratios," in *2018 IEEE 19th Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2018, pp. 1–7.

[2] N. M. Ellis and R. Amiratharajah, "A resonant dual extended lc-tank dickson converter with 502021 *IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2021, pp. 1282–1287.

