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.

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.

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.

Experimental Results

- 94.1% peak efficiency, 2,010 W/in³ power density.