A Family Of Two-Switch Boosting Switched-Capacitor Converters (TBSC)

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INVENTORS

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OTHER INFORMATION

CATEGORIZED AS

» **Energy**
  » Solar
  » Storage/Battery
  » Transmission
» **Engineering**
  » Other

RELATED CASES

2014-674-0

BRIEF DESCRIPTION

Switched capacitor converters, which provide high-gain voltage conversion, have drawbacks that have limited their use to specific applications. UCI researchers have developed a family of two-switch boosting switched-capacitor converters (TBSC) that enables the use of switched-capacitor converters in low cost and small-size applications as well as on-chip integration.

SUGGESTED USES

• Power electronics – high-gain DC-DC voltage converters

FEATURES/BENEFITS

·Simple Circuit: Low-component count and simple control scheme reduce cost and failure points

·High Gain: The TBSC family provides high gain while providing continuous current and maintaining high efficiency

·Extensions: Possible to operate in bidirectional flow or voltage step-down modes

FULL DESCRIPTION

Switched-capacitor (SC) converters use capacitors and switches to convert from one electrical voltage to another. Such converters are ubiquitous in everyday life, like being used to convert the properties of electricity as it exists in power lines to a form that can be used by products such as appliances or personal electronics. SC converters have distinct advantages in being higher-gain, low-weight, and low-cost compared to traditional inductor-based designs. However, switched-capacitor converters have reduced stability, low efficiency, and high stress on components.

UCI researchers have developed a family of two-switch boosting switched-capacitor converters (TBSC) that, in eliminating key drawbacks, allow for their adoption into new industries and applications. Each TBSC component is comprised of only three types of small-footprint components: switches, diodes, and capacitors. The voltage rating for most of the components is decided by the low-side voltage, allowing for the use of less expensive components. Low component count, continuous current and high gain allow TBSCs to be implemented in new markets that are typically dominated by inductor-based converters.

STATE OF DEVELOPMENT

The family of two-switch boosting switched-capacitor converters has been fabricated and characterized.

RELATED MATERIALS

» Wu, Bin, et al. “A Family of Two-Switch Boosting Switched-Capacitor Converters.” IEEE Transactions on Power Electronics, vol. 30, no. 10, 2015, pp. 5413–5424., doi:10.1109/tpel.2014.2375311. - 12/02/2014

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,075,067	09/11/2018	2014-674

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Floating-Non Contact Wireless Voltage Sensor For High-Voltage Transmission Lines
- Cost-Effective Micro-Inverter For Solar Power Generation
- New Bootstrap Gate Drivers For Multilevel Converters
- A Family Of Hybrid Boosting Voltage Converters

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