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# Transformerless High-Gain DC-DC Converter with SiC Cascode JFETs for High-Voltage Applications

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Wide bandgap (WBG) semiconductor devices bring numerous advantages to power converters due to their inherent superior characteristics and high performance under harsh operating conditions. Currently, traditional silicon switching devices are approaching their practical limits in terms of fast switching, high voltage, and high temperature operation. To overcome the limitations of the existing Si technologies, silicon carbide (SiC) power devices are chosen because they exhibit a higher energy bandgap with a lower on-state resistance and therefore are effectively able to improve the power density and increase efficiency of power conversion for high-temperature and high-switching environments. This paper presents an efficient transformer-less high-gain floating boost converter quipped with SiC cascode JFET for high-voltage applications. The switching behaviors of both Si and SiC cascode JEFT devices are evaluated using a double-pulse test (DPT) technique at different gate resistances, device currents, and junction temperatures. In addition, the efficiency of the converter design with SiC power devices is investigated and compared with the Si-based converter under different switching frequencies and load conditions. This work uniquely presents a characterization of the new generation SiC cascode JFET manufactured by USCi and then demonstrates the benefit of using SiC JEFETs in the high-gain DC-DC converter. The results show SiC power devices utilized in the converter can reduce the total semiconductor loss and improve overall converter efficiency.

**Author:** Mr ALHARBI, Saleh S. (University of Denver)

**Co-authors:** Mr ALHARBI, Salah S. (University of Denver); Prof. MATIN, Mohammad (University of Denver)

**Presenter:** Mr ALHARBI, Saleh S. (University of Denver)

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