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Narrow Pulse Evaluation of 15 kV SiC MOSFETs and IGBTs

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With the progression of silicon carbide (SiC) technologies, single semiconductor switches with higher voltage and current capabilities are emerging. Evaluating the pulsed current capability of SiC semiconductor devices for pulsed power and power electronics applications is required to understand their performance and reliability. This paper presents the narrow pulse evaluation of 15 kV SiC MOSFETs (0.25 cm^2 active area) and IGBTs (0.32 cm^2 active area) with pulse widths in the range of 500 ns to 2 µs. Testing results are presented with an 8 kV charge voltage and 50 A or 90 A peak conduction current for the MOSFET and IGBT, respectively. A low inductance RLC circuit was used to generate the pulses and the device under test (DUT) was switched off during the pulse to create a square-wave type current waveform through the device. Transient characteristics, such as turn-on and turn-off times and energy, were measured to benchmark the devices'narrow pulse characteristics. The long term reliability of each device was evaluated by pulsing the device for tens of thousands of cycles with periodic measurement of the static characteristics. Testing has revealed that the 15 kV SiC IGBTs withstood tens of thousands of pulses in the range of 60 A to 95 A. The results presented in this paper demonstrate the reliability of these devices for narrow pulse applications.

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