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Evaluation of Long Term Reliability and Safe Operating Area of 15 kV SiC PiN Diodes during Ultra-High Current Pulsed Conditions

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Silicon Carbide (SiC) is a leading wide bandgap semiconductor for increasing the power density of high power applications. This paper overviews the long term reliability and safe operating area of 15 kV SiC PiN diodes during pulsed current conditions. An automated system is used to stress these devices with ultra-high current pulses and monitor degradation with in-system characterization. The system is capable of a 100 μs full-width half maximum pulse width up to 15 kA, with a repetition rate of 0.5 Hz. Periodic in-system characterization measures device forward conduction and reverse breakdown. The devices in this paper are pulsed at current levels from 1.5 kA to 3 kA. Over 100,000 pulses at 1.5 kA have been performed with no degradation. The long term reliability and failure mode results for the 15 kV PiN diodes will be reviewed.

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