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Simulation and Design Trade-Off Analysis of 15 kV SiC SGTO Thyristor during Extreme Pulsed Overcurrent Conditions

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Silicon carbide Super Gate Turn-OFF (SGTO) thyristors are an advanced technology for increasing the power density of high voltage pulsed power or power electronics. However, the transient characteristics and failure modes of these devices have to be further understood. This paper presents the Silvaco Atlas simulation of a 15 kV SiC SGTO thyristor during extreme pulsed overcurrent conditions. The device is simulated with various operating conditions that include pulsed current amplitude, pulse width, and temperature, and the simulation results are validated against experimental results for a 100 μ s, 2.0 kA pulse. In addition, tradeoff studies for the device structure region widths are performed. The simulation model developed in Silvaco Atlas is detailed, and the results for the various operating conditions and device region widths are presented.

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