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Performance Comparison of Commercial GaN HEMT under Repetitive Overcurrent Operations

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Gallium nitride (GaN) high-electron-mobility transistors (HEMT) are of great interest for pulsed power applications due to the proven capabilities of wide band gap semiconductors, such as silicon carbide (SiC) transistors. With further advances in GaN power semiconductors, there's an interest in the evaluation of their performance under repetitive overcurrent operation in power electronics applications beyond the manufacturer's prescribed operating parameters. The 650V/30A GS66508T-E02-MR from GaN System and the 600V/31A IGT60R070D1ATMA1 from Infineon were evaluated in a pulsed ring down testbed at 475 V with a peak current above 80 A over a switching frequency range from 138 to 277 Hz. The testbed employed a temperature chamber to maintain the case temperature of the device at 25 ˚C during testing. The devices'electrical characteristics, such as transconductance, forward I-V curve and breakdown voltage were measured throughout testing and have not shown significant degradation. The collected data from these measurements allowed a comparison of the devices'performance and shows their ability to handle transient overcurrent conditions commonly found in power semiconductor device applications.

Keywords –gallium nitride; GaN; HEMT; power electronics; pulsed power; reliability testing; performance evaluation

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