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Analysis of Commercial GaN HEMT in Overcurrent Operations under Higher Ambient Temperature

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As Silicon reaches its theoretical limit in power density capabilities, Gallium Nitride (GaN) High Electron Mobility Transistors (HEMTs) are an ideal option in applications of power electronics due to its wide-bandgap, similar to another proven technology is Silicon Carbide, and high electron mobility due to its special channel. Because of GaN being state of the art technology in power electronics applications, there is a high demand to see if the HEMT semiconductors are reliable in a long-term operation in high power switch-mode conditions. Information on overcurrent capability about GaN HEMTs is not well established thus a demand to investigate the devices exists. The high voltage offering from GaN Systems', the GaN HEMT GS66508P, was tested in pulsed overcurrent operations in higher ambient temperatures to establish the performance and to observe any operational changes. The device rated at 650 V and 30 A continuous. The goal of this research is to see if the device characteristics change under accelerated reliability testing in different ambient temperatures and to analyze the device degradation that occurs. The device was tested in a RLC ring circuit to minimize series inductance for fast risetime current pulses, and after every pulse set was characterized on an Agilent B1500A semiconductor parameter analyzer.

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