1. Title: Thermal Reliability Behavior of GaN HEMTs

2. Individual Sponsor:
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3. Academic Area/Field and Education Level: Type of Research: GaN HEMTs, Modeling and simulation, test and characterization, thermal characterization, reliability (MS or PhD)

4. Objective: The objective is to understand the complex thermal behavior of wide bandgap (WBG) GaN HEMT devices under stress. This involves investigating thermal conductivity vs. age, how defects affect thermal properties, and modeling GaN HEMTs thermal characteristics under large signal RF stimulus and class of operation.

5. Description: GaN HEMT devices are tested for reliability using different methods including those under thermal and RF stresses where the device is subject to increases in the junction temperature. To conduct these tests the devices are often modeled or measured to determine thermal resistances of the working device, connections, and the test fixture. These may then be used to optimize the life testing to set the junction temperature to accurately determine the reliability of the device. The tests currently, however, neglect the possibility that the thermal resistances themselves are changing as a result of the life testing/aging of the device under test. Under this topic a student would determine and utilize appropriate thermal resistance measurement methods to analyze this feedback loop and/or model the potential effects that this type of thermal resistance change would have on semiconductor reliability testing. Techniques for reliability testing, RF testing, and thermal characterization would all be developed, adapted, or utilized to attempt to quantify the impacts of changes in the thermal resistance during life-time tests to the conduction of the test and the results of the tests for device reliability. Impacts would be made in the area of device reliability, mission life-times, and reliability testing.

6: Research Classification/Restriction: Unclassified/No Restriction

7. Eligible Research Institutions: All

Keyword: GaN HEMT, Reliability, Thermal Resistance