Devices

**GaAs HEMT**
The main focus of this Research Group is to develop high performance submicron (≤0.25µm) gate-length HEMTs for MMIC applications. Both Pseudomorphic HEMT (PHEMT) and Metamorphic HEMT (MHEMT) are being developed for their attractive high power and high frequency properties.

The HEMT wafer processing is carried out in the 150m² Class10 and Class100 MDC Clean Room equips with a direct electron beam writing system for submicron gate fabrication. Complete front-end and back-end processes are available to fabricate MMICs on thinned GaAs substrates with via-holes. Currently, the fabrication process and clean room facilities can support wafer sizes of 3 and 4 inches.

**GaN HEMT**
Currently, the main focus of this Research Group is to develop high power GaN HEMTs on High-Resistivity (HR) Silicon substrates. The incentives for using HR Silicon substrates include the availability of larger substrate size, lower substrate cost and lower thermal resistivity.

In addition to the baseline GaN HEMT for MMIC applications, more advanced device technology development such as Metal-Insulator-Semiconductor HEMT (MISHEMT) is currently underway with the aim of improving the devices' performances. High-K dielectric films including Al₂O₃, Ta₂O₅ and HfO₂ are also being developed for gate dielectric using the Atomic-Layer-Deposition (ALD) system.

**GaAs RF MEMS**
The GaAs RF MEMS effort started in 2007 and had demonstrated the first locally
fabricated surface micro-machined capacitive RF MEMS by the end of that year. By the beginning of 2009, this Research Group had demonstrated the first locally fabricated MMIC with RF MEMS. This process allows full integration of surface micro-machined RF MEMS with active transistors, capacitors, inductors, resistors and transmission lines, thus permitting digital switching and digital varactor-tuning of microwave circuits, and facilitating circuit agility. Future work will include back-side processing needed for thermal dissipation in power amplifier type applications.

This Research Group has also started work on micro-fabrication manufacturing technology that will enable new integrated 3D RF architectures for microwave components and systems.

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