

Status of GaN Power Transistor and MMICs in ETRI

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AlGaIn/GaN high electron mobility transistors (HEMTs) have been attracting considerable attention for high power applications due to their high saturation velocity and high breakdown field. Recently, the interests on their high frequency applications are increasing because millimeter-waves will possibly be used for the 5G mobile communication network [1]-[2]. GaN monolithic microwave integrated circuits (MMICs) are generally applied to high power and high frequency systems because MMICs not only miniaturize the system but also enhance the system performance. GaN monolithic microwave integrated circuits (MMICs) are generally applied to high power and high frequency systems because MMICs not only miniaturize the system but also enhance the system performance. In this study, we have fabricated and characterized 0.15 μm AlGaIn/GaN HEMTs for their millimeter-wave MMIC applications. We report the characterization of high power density 0.15 μm AlGaIn/GaN high electron mobility transistors (HEMTs) for their monolithic microwave integrated circuit (MMIC) applications. The passive devices such as resistors, capacitors, and inductors were fabricated with 0.15 μm AlGaIn/GaN HEMTs for the MMIC applications. The model parameters for the devices were extracted and the characterizations were done by the equivalent circuits after eliminating externally parasitic components (pads and interconnect lines) by open and short patterns [3]-[4]. This paper also described the development of 28GHz 7 W MMIC power amplifier using a 0.15 μm GaN-on-SiC HEMT technology. The fabricated MMIC is designed in two stages and eight transistors are connected in parallel at the final stage. Large signal modeling of GaN HEMT devices was extracted using Angelov model. EM simulation was performed for all parts of MMIC circuit. The 28GHz GaN MMIC power amplifier exhibited an output power of 7 W with a gain of 11 dB in a frequency range of 26-31 GHz. The chip size of the fabricated MMIC is 4mm x 4mm. This MMIC power amplifier is suitable for the next-generation communication systems and related applications in Ka-band [5].

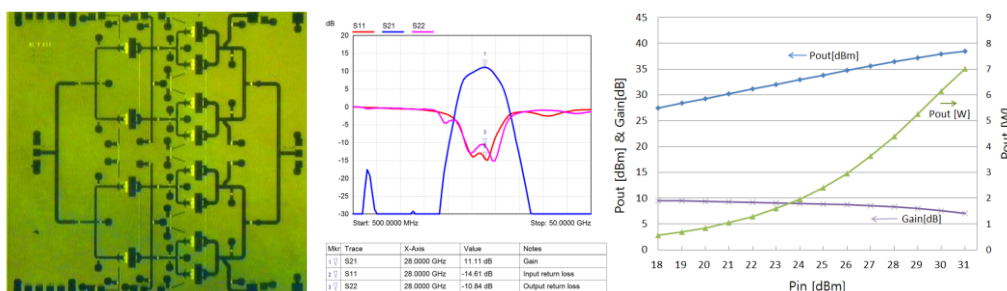


Fig 1. Fabricated MMIC photograph and measurement result.

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