Speaker name: Kimon Vivien
Organization: United Monolithic Semiconductor
Country: France
Speaker picture:

Presentation title: 150 nm Gallium Nitride on Silicon Carbide Technology for High-power 5G New Radio Applications

SHORT ABSTRACT OF PRESENTATION

In recent years, gallium nitride (GaN) transistors have become a key enabling technology for cellular communication networks, greatly contributing to the increase in energy efficiency and data rates of 5G new radio (5GNR) and future 6G. While LDMOS was the principal high power technology up until the 4G network, the very stringent constraints of modern telecommunications, as well as the opening to new frequency bands – mid-band (FR3) and millimeter waves (FR2) – are pushing operators to transition toward GaN.

As a company, United Monolithic Semiconductor (UMS) has been commercializing different GaN technologies on silicon carbide (SiC) substrates for the past decade, with gate lengths ranging from 500 down to 100 nm. With power densities reaching 4.5 W/mm at 30 GHz, associated with a drain efficiency above 50%, the 150 nm technological node GH15 is an optimal candidate for 5GNR, for all its frequency ranges.

Our presentation starts with discussing the main characteristics and options of GH15, along with some simulation and measurement data at key frequencies for 5GNR applications. The design and simulation results of a packaged 80 W Doherty power amplifier, offering more than 40% PAE at 9 dB back-off, is presented. This design was co-developed between UMS and STMicroelectronics within the SHIFT project. This design is currently under manufacturing – testing has been scheduled to start in September 2024. During the second part of our presentation, we focus on millimeter-wave FR2 power amplifiers. Some medium- and high-power UMS products compatible with 5G specifications are presented together with their challenges associated

for 5GNR design, including linearity simulations and measurements. Then we conclude with presenting the latest technologies developed by UMS as well as a roadmap for the upcoming years, paving the way for future 6G networks.

KEYWORDS

5GNR, 6G, Doherty power amplifier, gallium nitride, linearity, silicon carbide, SHIFT project, UMS.

ACKNOWLEDGMENTS

This work is supported by the Chips Joint Undertaking (Chips JU) under grant agreement number 101096256 (project SHIFT). The Chips JU receives support from the European Union's Horizon Europe research and innovation program and the National Authorities.

BIOGRAPHY

Kimon Vivien (IEEE Member) received the Ph.D. degree from the University of Marnes-la-Vallée in 2020. In 2019 and 2020, he worked at the RF Power and Analog Laboratory, University of Colorado Boulder, USA, as an exchange Ph.D. student, under the supervision of Pr. Taylor Barton. Today, he holds the position of Senior RF and Microwave Engineer at United Monolithic Semiconductor, which he joined in 2020.