Leibniz Ferdinand Braun Institut

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Digital GaN-based Transceiver Module for Future Green 5G Networks

The Ferdinand-Braun-Institut develops a novel GaN-based digital transceiver module for 5G mobile communication infrastructure. This module combines for the first time a true digital GaN class-E PA chip with an LNA with integrated switching capability on one single chip exhibiting an area of 4.5 x 2.3 mm². Due to the T/R switch integrated in the LNA a usual antenna switch can be omitted, reducing module complexity and required chip size. The very compact and flexible digital class-E PA achieves peak output powers in the 2 W range. The digital transceiver operates at 4.7 GHz and is a true candidate to realize a greener ICT in future 5G networks.

Components

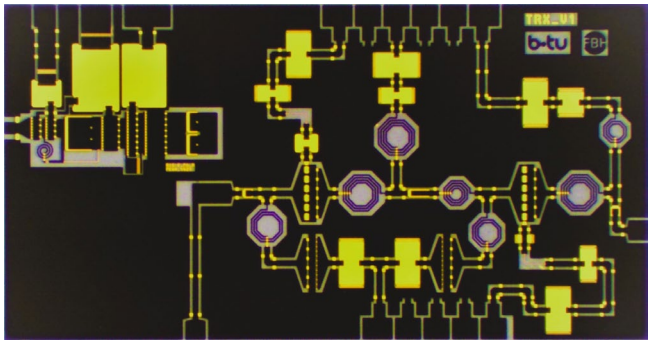
- Software-based digital modulator including lossless correction feature (FBH patent)
- GaN digital class-E PA stage including output filter network
- LNA with integrated T/R switch

Specifications @ 4.7 GHz for LNA with integrated switch

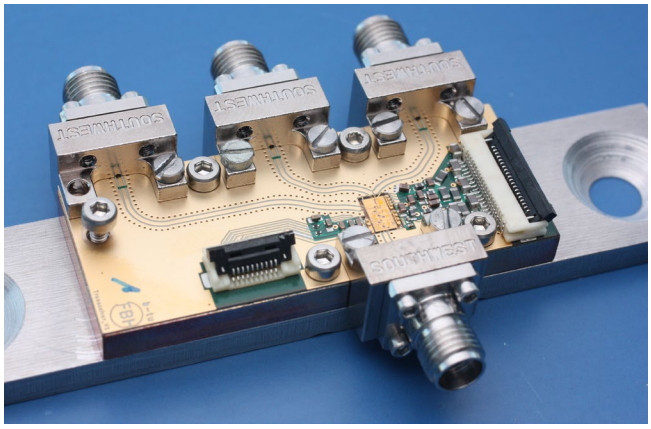
- gain: 12.7 dB
- noise figure (NF): 3 dB
- isolation > 20 dB in OFF state

Specifications @ 4.7 GHz for digital class-E PA

- Single-tone:
  - peak output power: 2 W
  - peak drain efficiency: 57%
- Final-stage drain efficiency for modulated signals:
  - 46% (20 MHz 6.5 dB LTE signal)
  - 23% (20 MHz 9 dB OFDM signal)
  - 22% (240 MHz 10 dB OFDM signal)



Fabricated compact digital TRx MMIC including LNA with integrated switch and digital PA; size: 4.5×2.34mm².



Realized transceiver module; size: 20×50 mm².

Applications

- mobile communication infrastructure
- base stations
- 5G massive MIMO systems

Profile

The Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (FBH) researches electronic and optical components, modules and systems based on compound semiconductors. In the field of III-V electronics, it manufactures high-frequency devices and circuits for communications, power electronics, and sensor technology. Moreover, FBH develops light sources from the visible to the UV spectral range: high-power diode lasers, UV light sources, and hybrid laser systems. Applications range from medical technology, materials processing and sensors to optical communications in space and integrated quantum technology. In close cooperation with industry, its research results lead to cutting-edge products.

The institute is a member of the Leibniz Association and part of Research Fab Microelectronics Germany (FMD).