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Versatility, bandwidth & efficiency - the digital transmitter

The Ferdinand-Braun-Institute has developed a fully digital GaN-based transmitter module for 5G mobile communication infrastructure. This module applies for the first time a novel robust and compact digital GaN PA chip with greatly reduced complexity compared to earlier designs. Operation is very stable and insensitive to supply voltages. The chip with a size of 1.8 x 1.8 mm^2 requires three power sources and an input amplitude of 700 mVpp only. The amplified signal at the chip output pin is then fed into a simple lumped element bandpass filter tuned for 900 MHz signal frequency. The transmitter chain is completed with a SPDT T/R switch using 8 x 125 µm GaN-HEMTs. The switch shows an insertion loss of 0.6 dB in the transmit path.

Components

- software-based digital modulator including lossless correction feature (FBH patent)
- GaN digital PA stage, output bandpass filter, GaN T/R switch

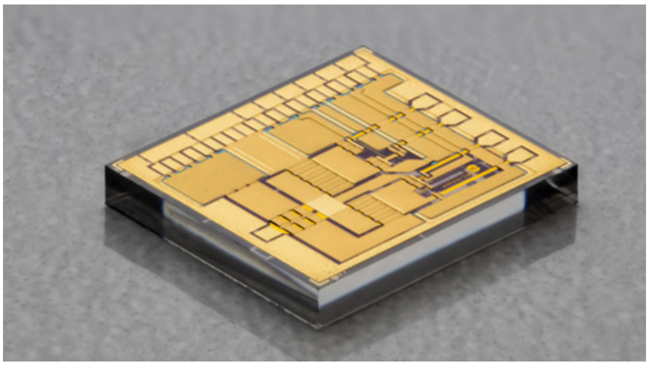
Specifications

for 6.5 dB 20 MHz WCDMA signal
- highest linearity: > 52 dBc ACLR
- high efficiency: up to 47%

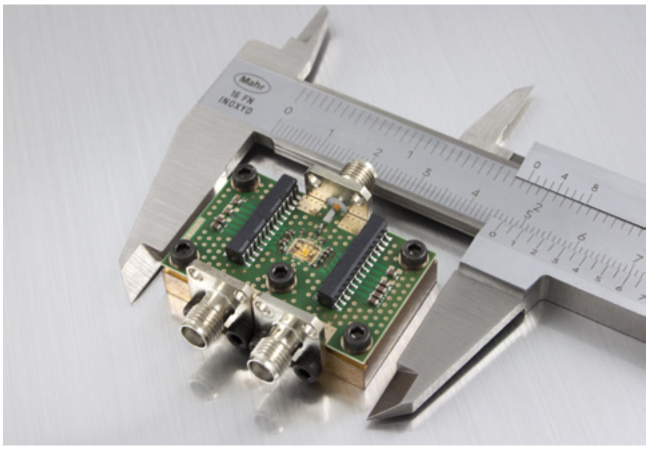
for single-tone signal
- peak output power: 5 W
- peak drain efficiency: 80%

Applications

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



Highly efficient, versatile and compact: novel GaN-based digital power amplifier MMIC (3 stages).



Highest linearity reached: digital transmitter module including digital PA chip, output bandpass filter and T/R switch.

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Profile

The Ferdinand-Braun-Institut, Leibniz-Institut fuer Hoechstfrequenztechnik (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 has a staff of 340 employees, is a member of the Leibniz Association and part of Research Fab Microelectronics Germany (FMD).