Abstracts

Characterization and modeling of bias dependent breakdown and self-heating in GaInP/GaAs power HBT to improve high power amplifier design

S. Heckmann, R. Sommet, J.-M. Nebus, J.-C. Jacquet, D. Floriot, P. Auxemery and R. Quere. "Characterization and modeling of bias dependent breakdown and self-heating in GaInP/GaAs power HBT to improve high power amplifier design." 2002 Transactions on Microwave Theory and Techniques 50.12 (Dec. 2002 [T-MTT] (Special Issue on 2002 International Microwave Symposium)): 2811-2819.

It is usual to say that power GaInP/GaAs heterojunction bipolar transistors (HBTs) have many advantages for power amplification at microwave frequencies, because of their high gain and high power density. Furthermore, the possibility of controling the base biasing conditions (voltage, current, self-bias control) compared to a field-effect transistor offers additive degrees of freedom to make a tradeoff between linearity and power-added efficiency. Nevertheless existing devices are limited because of the relatively low breakdown voltage whereas high collector voltage swings are required to achieve high power. This drawback makes them not appropriate for use in the next generation of mobile communication base station or radar systems. Silicon technologies such as LDMOS and III-V devices (MESFET and HFET) present competitive performances in term of high power level but for medium power added efficiency. Important improvements have been made in recent years which make possible large breakdown voltages for GaInP/GaAs HBTs. Breakdown value close to 67 V has been achieved. The aim of this work is to significantly improve the modeling of the breakdown voltage on this type of transistor. Furthermore, the in depth characterization and modeling of self-heating effects have been greatly improved in order to improve thermal management solutions which enable us to enhanced design solutions of HBT high power amplifiers.

❑ Return to main document.

Click on title for a complete paper.