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Simulation of Nanoscale AlGaN/GaN High -Electron Mobility Transistors Employing Field-Plate Technology

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The excellent microwave power performance demonstrated in AlGaN/GaN HEMTs (high-electron mobility transistors) results from the combination of high current density with high voltage operation[1], which benefits from the high sheet charge density in these hetero-structures (10^{13} cm^{-2}), the high carrier mobility (1500 cm^2/Vs) and saturation velocity (1.5×10^7 cm/s) in the channel and the high breakdown voltage inherent in the GaN material. However, their reliability still limits their applications in today's electronic systems. The newly developed field-plated AlGaN/GaN high electron mobility transistors show improved performance dueto the electricfield reduction in the device channel and surface modification[2]. We report on two dimensional numerical simulations of gate-recessed and field-plated AlGaN/GaN HEMTs where all the important device parameters have been defined, the insulator thickness under the field plate is also an important design parameter to attain higher breakdown voltage, thus an improvement of the performances of HEMT devices.

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