Abstracts

High-Frequency Time-Domain Modeling of GaAs FETs Using Hydrodynamic Model Coupled with Maxwell's Equations

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A high frequency full wave model for microwave and millimeter wave GaAs Field Effect Transistors (FET) is presented. The model consists of two coupled models for the solid-state and electromagnetic parts of the problem. In the solid-state part, a hydrodynamic model consisting of the conservation equations for carrier density, energy, and momentum is utilized, All the conservation equations are solved with minimum simplifications. On the electromagnetic side, a 3D model consisting of Maxwell's equations is used. The time domain simulation of the device is performed using finite difference method. Numerical results of the presented model for a 0.5 µm MESFET show that wave effect plays a crucial role in modulating fields and electron velocities inside the active device. The wave propagation is detected and found to cause considerable variations in field distribution and electron velocities.

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