Abstracts

An Accurate Physics-Based Broadband Heterojunction Bipolar Transistor Model for SPICE-Assisted Microwave Circuit Design

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A physics-based model, which is suitable for CAD implementation, of a heterojunction bipolar transistor (HBT) was developed. This model offers features not found in previous analytical or physics-based HBT models, such as consideration of a cylindrical emitter-base geometry and direct implementation into SPICE. The HBT model is developed by using semiconductor physics to calculate modified parameters for the existing SPICE BJT model. The model predicted the device's performance over its entire dc range of operation and from 1 to 50 GHz to within ± 5%. Although a few of the model parameters were determined empirically, the physical nature of the model provides insight into new device designs by directly relating the material, geometry, and process specifications to the model parameters.

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