Abstracts

A unified model for single/multifinger HBTs including self-heating effects

This paper presents a unified analytical large-signal model that includes self-heating effects. The model is applied to a single-finger AlGaAs/GaAs heterojunction bipolar transistor (HBT) and a multifinger InGaAs/GaAs HBT. The self-heating effect in the HBT is simulated as a feedback from the collector current to the base-emitter voltage. The main advantage of the circuit presented here is that additional analysis of coupling between electrical and thermal circuits is not required, as is the case with the existing models. The small-signal HBT model is implemented based on the S-parameters at multiple frequencies measured at multiple bias points. This model is verified by comparing the measured and simulated S-parameters. The large-signal model is based on the forward Gummel plot and is built over the small-signal model. This model is verified by comparing the simulated and measured dc I-V characteristics.

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