Abstracts

A scalable general-purpose model for microwave FETs including DC/AC dispersion effects

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This paper addresses the issue of scalability in equivalent circuit-based models for FETs, emphasizing for the first time the particularly difficult problems associated with the scalability of dc/ac dispersion phenomena. A study has been carried out on devices from both MESFET (L/sub G/=0.5 /spl mu/m) and pseudomorphic high electron-mobility transistor (PHEMT) (L/sub G/=0.2 /spl mu/m) foundry processes, with total gatewidths between 60-1200 /spl mu/m. Results are presented, showing that at least up to medium-size devices, dc characteristics, and most of the bias-dependent small-signal circuit elements scale in general, very well provided a reliable parameter extraction methodology is implemented. However, in the case of dispersion phenomena, while the differential dc/ac transconductance obeys straightforward scaling rules, the output conductance does not. The main features of a general-purpose scaleable microwave FET model-COBRA-are described. This includes an equivalent circuit-based solution to account for dispersion effects. The solution is compact, obeys the required conservation constraints, and can "absorb" the scaling inconsistencies observed in the output conductance. The corresponding modeling methodology is also described. Finally, a comprehensive set of measurement versus simulation scalability test results are presented, including dc, small-signal, and large-signal tests.

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