Abstracts

Mechanisms Determining Third Order Intermodulation Distortion in AlGaAs/GaAs Heterojunction Bipolar Transistors

A. Samelis and D. Pavlidis. "Mechanisms Determining Third Order Intermodulation Distortion in AlGaAs/GaAs Heterojunction Bipolar Transistors." 1992 Transactions on Microwave Theory and Techniques 40.12 (Dec. 1992 [T-MTT] (1992 Symposium Issue)): 2374-2380.

The third order intermodulation distortion (IMD3) mechanisms of HBT's are analyzed using Volterra Series theory. A T-equivalent circuit is used for the large-signal model of the HBT. The third order nonlinear currents generated by the device nonlinearities are evaluated for this purpose and current cancellation is discussed. It is found that, even though the C/sub je/ and g/sub je/ related currents do not show pronounced cancellation, the total base-emitter current and the total base-collector current cancel partially. Second harmonic loading is addressed in view of IMD3 optimization while, at the same time, maintaining high gain through conjugate matching at the fundamental frequency. IMD3 is very sensitive to the nonlinear currents generated by g/sub je/ and a. Optimum IMD3 occurs at high second harmonic reflection coefficients corresponding to open load conditions. Finally, minimum and maximum IMD3 occurs for second harmonic load reflection coefficient phases close to analogous extremes of the dominant nonlinear current of the device.

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