Abstracts

Modeling and characterization of SiGe HBT low-frequency noise figures-of-merit for RFIC applications

Jin Tang, Guofu Niu, Zhenrong Jin, J.D. Cressler, Shiming Zhang, A.J. Joseph and D.L. Harame. "Modeling and characterization of SiGe HBT low-frequency noise figures-of-merit for RFIC applications." 2002 Transactions on Microwave Theory and Techniques 50.11 (Nov. 2002 [T-MTT] (Mini-Special Issue on the 2002 IEEE Radio Frequency Integrated Circuit (RFIC) Symposium)): 2467-2473.

We present the first systematic experimental and modeling results of noise corner frequency (f/sub C/) and noise corner frequency to cutoff frequency ratio (f/sub C//f/sub T/) for SiGe heterojunction bipolar transistors (HBTs) in a commercial SiGe RF technology. The f/sub C/ and f/sub C//f/sub T/ ratio are investigated as a function of operating collector current density, SiGe profile, breakdown voltage, and transistor geometry. We demonstrate that both the f/sub C/ and f/sub C//f/sub T/ ratio can be significantly reduced by careful SiGe profile optimization. A comparison of the f/sub C/ and f/sub C//f/sub T/ ratio for high breakdown and standard breakdown voltage devices is made. Geometrical scaling data show that the SiGe HBT with A/sub E/=0.5/spl times/2.5 /spl mu/m/sup 2/ has the lowest f/sub C/ and f/sub C//f/sub T/ ratio compared to other device geometries. An f/sub C/ reduction of nearly 50% can be achieved by choosing this device as the unit cell in RF integrated-circuit design.

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