Abstracts

A Novel Monolithic HEMT LNA Integrating HBT-Tunable Active-Feedback Linearization by Selective MBE

K.W. Kobayashi, D.C. Streit, A.K. Oki, D.K. Umemoto and T.R. Block. "A Novel Monolithic HEMT LNA Integrating HBT-Tunable Active-Feedback Linearization by Selective MBE." 1996 Transactions on Microwave Theory and Techniques 44.12 (Dec. 1996, Part II [T-MTT] (1996 Symposium Issue)): 2384-2391.

For the first time, a novel heterojunction bipolar transistor (HBT) active-feedback circuit is employed with a high electron mobility transistor (HEMT) low noise amptifier (LNA) which improves the linearity or third-order intercept point (IP3) and gain-bandwidth performance without significantly impacting noise figure. The HEMT and HBT circuits are monolithically integrated using selective molecular beam epitaxy (MBE). The use of HBT active feedback provides several advantages over field-effect transistor (FET) active feedback such as smaller size, lower dc power consumption, active self-bias, and direct-coupled performance. Applied to a 1-11 GHz HEMT LNA design, the HBT active feedback has resulted in a 50 % improvement in gain-bandwidth performance and a 4-10 dB improvement in IP3 without degrading noise figure compared to an equivalent resistive-feedback design. In addition, the HBT active feedback consumes only 15% additional dc power and has provided as much as a 20-dB reduction in third-order (two-tone) intermodulation products (IM3's) over a narrow band. Thk HBT active-feedback linearization technique is a compact, cost-effective means of improving the linearity of HEMT-based LNA/receiver monolithic microwave/millimeter wave integrated circuits (MMIC's) for use in wireless multicarrier communications systems requiring a wide dynamic range.

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