Abstracts

A 1-17-GHz InGaP-GaAs HBT MMIC analog multiplier and mixer with broad-band input-matching networks

Bosen Tzeng, Chun-Hsien Lien, Huei Wang, Yu-Chi Wang, Pane-Chane Chao and Chung-Hsu Chen. "A 1-17-GHz InGaP-GaAs HBT MMIC analog multiplier and mixer with broad-band input-matching networks." 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)): 2564-2568.

An InGaP-GaAs heterojunction bipolar transistor (HBT) analog multiplier/mixer monolithic microwave integrated circuit (MMIC) is developed that adopts a Gilbert-cell multiplier with broad-band input-matching networks to widen the bandwidth up to 17 GHz. This MMIC was fabricated using a commercially available 6-in InGaP-GaAs HBT MMIC process. It achieved a measured sensitivity of above 1100 V/W for an analog multiplier and a conversion gain of better than 9 dB for a mixer. It also demonstrated a lower corner frequency and noise than that of an InP HBT analog multiplier. The measured low-frequency noise was 10 nV/sqrt(Hz), which is about half of that of an InP HBT analog multiplier with a similar architecture. The corner frequency of the low-frequency noise was roughly estimated to be 15 kHz. The measured performance of this MMIC chip with gain-bandwidth-product (GBP) of 47 GHz rivals that of the reported GaAs-based analog multipliers and mixers. The high GBP result achieved by this chip is attributed to the HBT device performance and the broad-band input-matching network.

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