Abstracts

A highly linear single balanced mixer based on heterojunction interband tunneling diode (Dec. 2001 [T-MTT])

A. Cidronali, G. Collodi, M.R. Deshpande, N. El-Zein, V. Nair, G. Manes and H. Goronkin. "A highly linear single balanced mixer based on heterojunction interband tunneling diode (Dec. 2001 [T-MTT])." 2001 Transactions on Microwave Theory and Techniques 49.12 (Dec. 2001 [T-MTT] (Special Issue on 2001 International Microwave Symposium)): 2437-2445.

In this paper, a compact and highly linear monolithic-microwave integrated circuit (MMIC) single balanced mixer based on heterojunction interband tunnel diode (HITD) technology working at 1.8 GHz is described. The prototype consists of a pair of HITDs biased at 0 V and a lumped-element directional coupler with arbitrary impedance terminations. The HITDs are in the InGaAs/InAlAs material system lattice matched to InP. The relevant feature of the mixer is the linearity due to the quasi-square-law dc current-voltage (IV) characteristics exhibited by the device around zero voltage. A qualitative treatment of the third-order intermodulation product and the conversion loss as a function of the HITDs IV characteristic and the embedding impedance is provided. The design techniques along with a detailed experimental validation are also provided. The prototype working in down-conversion mode, exhibited an third-order intercept point power level of +17.5 dBm, a conversion loss of 11 dB and a 1-dB compression point of +7 dBm at the operative frequency of 1.8 GHz with a +5-dBm local-oscillator drive level.

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