[5C-89]

A MMIC SBM with InGaP/GaAs HBT Having the Low Pass Filter Type Output Matching Circuit for LNB Application

S. S. Choi, E. Nk, J. C. Lee, J. H. Kim, B. J. Lee, S. H. Jeon*, N. Y, Kim
Department of Electronics Engineering, Kwangwoon Universtiy
E-mail : ssinie@kw.ac.kr
***Knowledge*on Inc.**
E-mail : shjeon@knowlgdge-on.com

Abstract

In this paper, the single balanced mixer (SBM) is designed and fabricated with InGaP/GaAs heterojunction bipolar transistor (HBT) monolithic microwave intergrated circuit (MMIC) Technology. This mixer is designed for the Ku-band LNB application and implemented with the size of 940 × 800 μm^2. This mixer has a characteristics with conversion gain of 4.5 dB and IMD3 of 65.01 dBc with 3 V and 25 mA.

I Introduction

The demand of wireless environment is increasing with exponentially in this world. This trend can be seen in the wide range of world and very popular in the industry like a personal communication system or broadcasting system.

Especially, the broadcasting system using the satellite signal is very high and it goes up to the Ka-band for satisfying the increasing number of the subscribers. Satellite signal is very weak and in the high frequency range, signal from the satellite is changed the radio frequency (RF) signal to an intermediate frequency (IF) signal for set-top box. A low-noise downconverter block (LNB) is necessary for this case of weak and high frequency. It makes the weak signal to strong and suppresses the noise generating and changes the signal frequency range shift down. Mixer's major job is this frequency level shift down with conversion gain or loss.

II InGaP/GaAs HBT Characteristics

The HBT offers a more efficient approach in many front-end signal-processing functions than advanced Si homojunction bipolar transistors and III-V compound field-effect transistor (MESFET and HEMT) technology. Although the GaAs HBT has higher white noise than III-V FETs, advantages include faster speed with relaxed lithographic dimension, higher current per effective chip, better device matching, higher transconductance, lower output conductance, and reduced trapping effects accompanied by low 1/f and phase noise. As compared to advanced Si BJT technologies, the GaAs HBT is limited to integration complexity, but offers advantages of higher speeds with relaxed lithographic dimensions, lower output conductance, effectively no parasitic substrate capacitance, and greater radiation hardness.