

Performance analysis of parasitic effect on distributed spiral inductor for 0.15 μm GaAs pHEMT MMIC low noise amplifier

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ABSTRACT

This paper presents the effect of measured distributed spiral inductor in monolithic microwave integrated circuit (MMIC) low noise amplifier (LNA) performance. Using S-parameter simulation, the LNA performance between lump and distributed circuit are compared at 2.4 GHz. The utilized measured spiral inductors are 0.37 nH, 5.29 nH and 6.7 nH. Noise figure (NF) performance of the LNA is measured. It is shown that the NF is increased by 0.69 dB when lump components are replaced with distributed components. It is also found that the gain is decreased by 6.35 dB while input-output return loss has decreased by 0.01 dB and 0.28 dB, respectively. From the results obtained, the spiral inductor has a noticeable impact on the LNA performance especially on the gain and noise figure. The parasitic effects including self-resonance on spiral inductor of 5.29 nH is also discussed. This analysis is essential to ensure the simulation results yield realistic measured results for the fabricated LNA. Therefore the designer will have a good estimation on the performance of the LNA during the design stage prior to the testing stage.

KEYWORDS:

Amplifier; Inductor; Parasitic; Distributed; Lump

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