Abstracts

Micromachined microwave planar spiral inductors and transformers

R.P. Ribas, J. Lescot, J.-L. Leclercq, J.M. Karam and F. Ndagijimana. "Micromachined microwave planar spiral inductors and transformers." 2000 Transactions on Microwave Theory and Techniques 48.8 (Aug. 2000 [T-MTT]): 1326-1335.

A new micromachined planar spiral inductor, with the strips suspended individually, has been fabricated in standard GaAs high electron-mobility transistor monolithic-microwave integrated-circuit technology through maskless front-side bulk micromachining. The electronic compatibility, the use of industrial integrated-circuit production lines, the straightforward and low-cost additional procedure for structure releasing, and the very short etching time required are the principal features related to such a novel inductor structure. Moreover, the air-gap layer created underneath the device and between the strips significantly reduces shunt and fringing parasitic capacitances, consequently increasing the performance and operating frequency range. Experimental measurements, carried out up to 15 GHz, before and after micromachining, showed for a 12-nH inductor an increase of the maximum Q factor from 5 (at 3 GHz) to about 20 (at 7 GHz), while the self-resonant frequency was shifted from 5 to 13 GHz. Furthermore, a structure with two interleaved spiral inductors, in a 1:1 transformer-like configuration, was also fabricated, and its performance verified in order to demonstrate the promising performance improvements provided by the proposed device. Finally, heating and mechanical characteristics associated with freestanding microstructures are briefly evaluated using finite-element method simulations.

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