Abstracts

High-Q factor three-dimensional inductors

B. Piernas, K. Nishikawa, K. Kamogawa, T. Nakagawa and K. Araki. "High-Q factor three-dimensional inductors." 2002 Transactions on Microwave Theory and Techniques 50.8 (Aug. 2002 [T-MTT]): 1942-1949.

In this paper, the great flexibility of three-dimensional (3-D) monolithic-microwave integrated-circuit technology is used to improve the performance of on-chip inductors. A novel topology for high-Q factor spiral inductor that can be implemented in a single or multilevel configuration is proposed. Several inductors were fabricated on either silicon substrate (/spl rho/ = 30 /spl Omega/ /spl middot/ cm) or semi-insulating gallium-arsenide substrate demonstrating, more particularly, for GaAs technology, the interest of the multilevel configuration. A 1.38-nH double-level 3-D inductor formed on an Si substrate exhibits a very high peak Q factor of 52.8 at 13.6 GHz and a self-resonant frequency as high as 24.7 GHz. Our 4.9-nH double-level GaAs 3-D inductor achieves a peak Q factor of 35.9 at 4.7 GHz and a self-resonant frequency of 8 GHz. For each technology, the performance limits of the proposed inductors in terms of quality factor are discussed. Guidelines for the optimum design of 3-D inductors are provided for Si and GaAs technologies.

❑ Return to main document.