

Selective Metal Parallel Shunting Inductor and Its VCO Application

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Abstract

In this paper, a method called selective metal parallel shunting (SMPS) is proposed to move f_{Qmax} onto the desired frequency without additional processing steps. For a given planar inductor, a customized program is developed to find all the possible SMPS inductors and predict their Q_{max} and f_{Qmax} . Three sets of planar, all metal parallel shunting (AMPS), and SMPS inductors have been implemented in a 1P4M 0.35 μ m CMOS process to verify the proposed method. The prediction errors of Q_{max} and f_{Qmax} are less than 13% and 10%, respectively, between the simulated and measured ones. Moreover, three 2.3-2.4GHz VCOs using planar, AMPS, and SMPS inductors, respectively, have also been realized. The phase noise of the VCO using SMPS inductors can be improved by 9.3dB and 6dB, compared to the VCOs using planar and AMPS inductors, respectively, at 100KHz offset frequency. The figure-of-merit (FOM) performance of the VCO using SMPS inductors can be comparable to the state-of-the-art publications.