Design and simulation of high Q MEMS LC-tank for oscillators

ABSTRACT

This research focuses on the design of a high-performance MEMS LC-tank using a high Q MEMS inductor and capacitor. A two different gap varactor has been used to avoid pull-in voltage at 2.4 GHz. The layout has been done by CoventorWare software. The DC voltage is 2.5 v, which is applied to the plates and results of 2.04 pF could be gained. The Q factor of the varactor is computed at about 557.27, which is good enough to make a low-phase noise VCO. A hollow spiral inductor with a silicon base substrate for compatibility with CMOS technology has been designed. The Greenhouse equation has been used to obtain the dimensions of the inductor. A suspended inductor has been implemented to avoid substrate coupling. The simulation has been done by CoventorWare. The Q factor of the inductor has been calculated using Yue's model. The resultant values of inductance and the Q factor at 2.4 GHz, are 2.89 nH and 27, respectively, which are in good agreement with the results of theoretical computation. The results were verified with the well-documented literature.

Keyword: LC-tank; MEMS; Quality factor; Inductor and varactor