Tunable MEMS Capacitor for Mm and µm Wave Generation

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Abstract

Micro-Electro-Mechanical Systems, or MEMS, is a technology that in its most general form can be defined as miniaturized mechanical and electro-mechanical elements (i.e., devices and structures) that are made using the techniques of micro fabrication. A variable capacitor is a capacitor whose capacitance may be intentionally and repeatedly changed mechanically or electronically. Tunable parallel-plate capacitors are wide used in RF MEMS . They are used in microrelays, micromirrors, micro actuators, micro switches, micro position sensors, voltage controlled oscillators (VCO), resonators, tunable filters and so on. In this paper design of a Tunable MEMS capacitor with two plates (one movable plate and one fixed plate) has been demonstrated. The response time obtained is 5µs.

The tunable capacitor plays an important role in RF circuits used in or as on-chip matching networks, passive filters, voltage-controlled oscillators, power amplifiers, radio transmitters and other tuning circuits for electrostatic actuation and sensing. In this paper we focus on tunable capacitor based on MEMS simulated using COMSOL Multiphysics®.
In an electrostatically tunable parallel plate capacitor you can modify the distance between the two plates when the applied voltage changes. For tuning of the distance between the plates the capacitor includes a spring that attaches to one of the plates. If you know the characteristics of the spring and the voltage between the plates, you can compute the distance between the plates. This model includes an electrostatic simulation for a given distance.
The tunable capacitor is a typical component in various microelectromechanical systems (MEMS) for electromagnetic fields in the radio frequency range 300 MHz to 300 GHz. By combining an variable inductor with tunable the frequency ratio is about of thousands

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