

Mems variable capacitor

What is a variable MEMS capacitor?

The variable MEMS capacitor is the best alternative to the solid-state varactors. The MEMS tunable capacitor has the advantage of lower loss, lower parasitic, low-voltage operation and potentially larger tuning range and higher linearity [1,5]. Also, the interconnection loss and noise can be less than off-chip solid-state RF components [8].

Can a variable MEMS capacitor be used in HMSIW structures?

To avoid the problems of integration and noise, a new variable MEMS capacitor is designed to use in the HMSIW structures, for the first time. Hence, two basic and specific designs are presented and the mechanical behaviour of them is analysed and simulated using the FEM.

What is the tuning range of a MEMS variable capacitor?

According to (10), the tuning range of the basic MEMS variable capacitor is 26% while this parameter for the proposed MEMS variable capacitor is 29%. Then, the proposed MEMS capacitor is placed on the HMSIW-CSRR resonator (see Figs. 2a and b).

What are MEMS based switches & capacitors?

The MEMS based switches (dc- and ac-modes) and capacitors are the most important components for RF applications. They have a mechanical structure that isolates the control circuit from the signal circuit, and a mechanical inertia that prevents modulation of the capacitance value by RF signal, and provides good linearity.

Do MEMS based digital variable capacitors with multi-cantilevers and double-clamped beams increase capacitance?

Conclusions MEMS based digital variable capacitors with multi-cantilevers and double-clamped beams were analyzed and designed. By applying the bias voltage between two electrodes, an increased electrostatic force pulls-in the cantilever beams one by one, realizing a digital increase in capacitance.

Can a variable MEMS capacitor provide tunable resonators and filters?

In this paper, an on-chip variable MEMS capacitor, with designing of new special arms that cause uniform movement, is presented for use on the HMSIW-CSRR (half mode substrate integrated waveguide-complementary split-ring resonator) to provide tunable resonators and filters.

Our study describes design of wide range variable capacitor controlled by electrostatic MEMS actuator. The capacitor consists of two 1000 μ m² doped polysilicon plates, which are aligned ...

Therefore, the study of MEMS variable capacitors that offer both high linearity and a large capacitance tuning ratio has attracted enormous interest over the past decade. One potential solution to overcome the high nonlinearity of parallel-plate capacitors is to develop capacitors with novel plate structures to replace

conventional variable capacitors. Seok et al. ...

MEMS Capacitor o MEMS (Microelectromechanical system) o Can be a variable capacitor by changing the distance between electrodes. o Use in sensing applications as well as in RF electronics. o Use in sensing applications as well ...

A MEMS variable capacitor owns a good capacitance ratio, high-quality factor, and linearity concerning the varactor diode (Rebeiz 2004). However, electrostatically actuated MEMS tunable capacitors need high voltages for actuation. Furthermore, the function of the electrostatic force between applied voltage and the gap is nonlinear, which ...

MEMS based digital variable capacitors with multi-cantilevers and double-clamped beams were analyzed and designed. By applying the bias voltage between two electrodes, an increased electrostatic force pulls-in the cantilever beams one by one, realizing a digital increase in capacitance. A four-mask process was developed to fabricate these ...

Electromechanical systems or MEMS represent a technological process to create integrated systems through combining electrical and mechanical components (Maluf and Williams 2004) tegration of switches and passive elements such as inductors with high Q, resistance and different types of capacitors, such as trench capacitors with a very high density, ...

This study presents the design and simulation of an RF MEMS variable capacitor with a high tuning ratio and high linearity factor of capacitance-voltage response. An electrostatic torsion actuator with planar and non-planar structures is presented to obtain the high tuning ratio by avoiding the occurrence of pull-in point. In the proposed ...

Micro-electro-mechanical system (MEMS) variable capacitors offer the possibility of making RF front-end modules reconfigurable, thus enabling them to meet space limitations by requiring fewer components and able to satisfy recent multi-band application requirements.

The gap-closing MEMS variable capacitor could be a good candidate for this purpose as it offers large capacitance variation if the actuation voltage is higher than the pull-in voltage . However, a mechanical contact is required in order to have a high capacitance variation. Consequently, this solution suffers from a high non-adiabatic loss, which is independent of the ...

Micro-electro-mechanical system (MEMS) variable capacitors offer the possibility of making RF front-end modules reconfigurable, thus enabling them to meet space limitations by requiring ...

Compared to semiconductor varactors, MEMS variable capacitors have the potential for an extended tuning range, higher linearity and lower loss, along with the reduction ...

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The proposed MEMS variable capacitor consists of a single suspended plate with 608 comb fingers to achieve 1.4 pF nominal capacitance as shown in figure 1. The tuning electrode is made on the glass substrate. A dc voltage applied to the tuning electrode causes an electrostatic force which moves the suspended plate closer to the glass substrate and the ...

In this paper, an on-chip variable MEMS capacitor, with designing of new special arms that cause uniform movement, is presented for use on the HMSIW-CSRR (half mode substrate integrated waveguide-complementary split-ring resonator) to ...

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Abstract: An innovative and simple method is proposed to achieve ultralinear behavior in a capacitance-versus-voltage response and to obtain a large capacitance tuning ratio in a parallel-plate microelectromechanical systems (MEMS) variable capacitor by moving the plate to an increasing-gap direction. By adopting a levering structure, the ...

In this paper, a special variable MEMS capacitor is offered to application in the telecommunication equipment especially SIW-based structures. The variable MEMS capacitor is designed with special serpentine arms around the membrane. By using these arms, the air damping and the stiffness of the capacitor are decreased. To evaluate the performance of the ...

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