Design and Performance Analysis of Low Pull – in Voltage RF MEMS Shunt Switch for Millimeterwave Therapy, IoT and 5G Applications

Srinivasa rao k (✉ srinivasakarumuri@gmail.com)

Koneru Lakshmaiah University

P. Ashok Kumar

Koneru Lakshmaiah Education Foundation

Girija Sravani

National Institute of Technology Silchar

Koushik Guha

National Institute of Technology Silchar

Research Article

Keywords: Iterative Meander, Millimeterwave, 5G Applications, High Isolation, Low Insertion loss, Low Pull-in-Voltage.

Posted Date: April 28th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-434735/v1>

License: This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Recent Advancements in the wireless communication systems utilizes miniaturized devices based on Micro – Electro – Mechanical System technology for present and future 5G wireless applications. Now a days, RF devices are utilizing the frequencies upto 30 GHz and a huge traffic in signal propagation occurs which leads to the slow data rate. In other hand, there is a huge spectrum available in the millimetre wave frequency range of 30 – 300 GHz. The millimetre wave spectrum is attractive for development of smart systems based on 5G technology. In this paper, A low pull – in voltage capacitive type RF MEMS switch is proposed to operate at the frequencies above 30 GHz. The switch is proposed with new iterative meandering technique where span length of each section in meanders differs and dependable with first section. A low pull – in voltage of 1.8V is achieved with large capacitance ratio of 63. The switch exhibits low insertion loss of -0.24 dB at 41 GHz and possess high isolation of -46.7 dB at 38 GHz. The design is validated by comparing the theoretical and simulated results and the switch can be efficiently utilized for millimeterwave applications.

Full Text

This preprint is available for [download as a PDF](#).

Figures

Figure 1

2D schematic of proposed switch.

Figure 2

3D Model of proposed switch.

Figure 3

Proposed Fabrication Methodology.

Figure 4

Mechanical model of switch.

Figure 5

Single Iterative Meander.

Figure 6

Simulation of Proposed switch at 1.8V

Figure 7

Displacement analysis of perforated beam for different voltages

Figure 8

Upstate Cpacitance of switch.

Figure 9

Downstate Capacitance of switch.

Figure 10

Capacitance variation during switch actuation.

Figure 11

Transmission Losses of switch in ON and OFF states.