

Master 2012

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Electromechanical Analysis of a MEMS switches using Microwave Studio

ABSTRACT - Masterthesis

Communication technologies have been relied on RF MEMS switches from a very long time. The main aim of this thesis is to design and analyze the RF MEMS series switch. The focus of this thesis is the modeling of MEMS switches in MW CST Studio. The thesis deals with the modeling factors of RF MEMS series switch. This thesis is devoted to a thorough investigation on various phenomena's used to develop a RF MEMS switch. The research work mainly focuses on investigation of the mechanical and electrical properties of the switch. It covers the switch spring constant of fixed-fixed beam, and cantilever beam and also the electrostatic actuation of the switch.

The materials used to design the switch are aluminium, gold, stainless steel and copper. The basic mechanical and electrical principle acting behind the designing of the switch is discussed in detail and its relevant parameters are simulated using Matlab as software tool. In this thesis work the three different designs of a switch is simulated with a simulation software tool MW CST Studio. From the simulations the electrostatic field distribution around the switch is extracted from which the deformation of the switch is modeled. The s-parameters obtained from MW CST are imported to the MW AWR software tool for further analysis and designing. After getting results from MW AWR in the form of capacitance the actuation voltage of the switch is calculated with Matlab. Every switch design is carried out with same dimensions but four different materials. In the end of each design a comparison is taken out which describes the relation between voltage and gap height for different materials of a same switch.