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Design and Simulation of Step Structure RF MEMS Switch for K Band Applications

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Abstract : MEMS plays an important role in wide range of applications like biological, automobiles, military and communication engineering. This paper mainly investigates on capacitive shunt RF MEMS switch with low actuation voltage and low insertion losses. To trim the pull-in voltage, a step structure has introduced to trim air gap between the beam and the dielectric layer with that pull in voltage is trim to 2.9 V. The switching time of the proposed switch is 39.1μs, and capacitance ratio is 67. To get more isolation, we have used aluminum nitride as dielectric material instead of silicon nitride (Si_3N_4) and silicon dioxide (SiO_2) because aluminum nitride has high dielectric constant (ε_r = 9.5) increases the OFF capacitance and eventually increases the isolation of the switch. The results show that the switch is ON state involves return loss (S_{11}) less than -25 dB up to 40 GHz and insertion loss (S_{21}) is more than -1 dB up to 35 GHz. In OFF state switch shows maximum isolation (S_{21}) of -38 dB occurs at a frequency of 25-27 GHz for K band applications.

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