Scaling Effect in Air Gap MOSFET

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Abstract

This abstract addresses the effect of scaling in air gap MOSFETs and determination of functional relationship between scaling parameter and sensitivity, frequency response. The modelling of the MOSFET and its simulations has been carried out using COMSOL Multiphysics. An air Gap MOSFET in its simplest form can be imagined to be one obtained by replacing the dielectric in a MOSFET with air. The air gap between the gate and the channel allows the gate to deflect when a load acts upon it. A MOSFET such as this would be the sensing element of a Hydrophone. To ensure that even under the extreme case of pull in, the gate does not get shorted to the channel, a very thin layer of silicon oxide is deposited on the channel. The thickness of the oxide is several orders less than the thickness of the air gap itself. Simulation has been carried out for air gaps in the range 0.5 to 10microns. Significant results have been obtained on the sensitivity of the membrane with respect to the dimensions, thickness (of the membrane) and the air gap between the membrane and channel based on the effect of scaling.