Evaluation for diaphragm's deflection for touch mode MEMS pressure sensors

ABSTRACT

In this paper, an analytical and simulation solution for touch mode Micro-electromechanical systems pressure sensor operating in harsh environment is proposed. The principle of the paper is to design, obtain analytical solution and compare the results with the simulation using finite elements analysis for a circular diaphragm deflection before and after touch point. By looking at MEMS devices, when the diaphragm starts touching the fixed electrode by applying loads, it will have a major effect on the overall performance of the device. Therefore, one should consider the effect of touch mode in the system to achieve good linearity, large operating pressure range and large overload protection at output. As of so far the effect of touch mode has not been evaluated efficiently in the literatures. The proposed touch mode MEMS capacitive pressure sensor demonstrated diaphragm with radius of 180 ε m , the gap depth of 0.5 ε m and the sensor exhibit a linear response with pressure from 0.05 Mpa to 2 Mpa.

Keyword: Capacitive pressure sensor; Circular diaphragm; FEA; Harsh environment; MEMS; Touch mode