Three-dimensional finite element analysis of GaPO4/Pt surface acoustic wave resonator based on cell model.

ABSTRACT

This paper present a three-dimensional finite element method for the one-port surface acoustic wave resonator base on GaPO4 with 5° cut for high frequency application. Interdigital transducer is assumed a thin film platinum with chromium as an under-layer material. The simulated frequency response and wave propagation are obtained under base cell model at 433.92 MHz centre frequency under ISM band. Frequency responses versus impedance are compared and verify with the known result in literature. The results show that the total displacements are vanished at a distance of about 2 to 3 wavelength from the surface. As expected, the X and Y displacement are 90°out-of-phase with each other. It is observed that the mass loading effect is suitable for prediction of resonant frequency. It is Q found that the factor value is larger than 1000 and the mode shapes for resonant and anti-resonant condition are different at two edges of stop-band

Keyword: Three-dimensional FEM; SAW; Wave propagation; Mass loading effect; Frequency response; Gallium orthophosphate; Resonator.