薄膜体声波谐振器的**FDTD**数值分析

作　者：池志鹏1，赵正平1,2

单　位：（1. 河北工业大学信息工程学院，天津，300130; 2. 河北半导体研究所微米纳米中心，石家庄，050051）

摘　要：

提出了基于时域有限差分方法对薄膜体声波谐振器进行数值分析的新方法。利用时域有限差分法理论对压电材料的控制方程、牛顿方程和电学方程在空间和时间进行了离散化，通过得到的差分方程直接得出了声场传播的时域数值解。使用该数值方法对薄膜体声波谐振器的电学特性阻抗进行了分析，并将结果与一维Mason模型的解析解进行了比较验证。

关键词：压电材料；时域有限差分法；压电谐振器

Finite-difference Time-domain Method for the Numerical Analysis of Thin-film Bulk Acoustic Wave Resonators

Author's Name: CHI Zhi-peng1, ZHAO Zheng-Ping1,2

Institution: （1. School of Information Engineering, Hebei University of Technology, Tianjin 300130, China） （2 . Micro/Nano Technology Center, Hebei Semiconductor Research Institute, Shijiazhuang 050051，China)

Abstract:

This paper describes the new application of the finite-difference time-domain (FDTD) method for the numerical analysis of electromechanical phenomena of thin-film bulk acoustic wave resonators (FBAR). The piezoelectric governing equations 、Newton's equation and electrical equation are discretized in spatial and temporal domain by the FDTD theory, and the numerical solutions of the acoustic propagation in the time domain can be obtained directly by these difference equations. The impedance characteristics of a AlN FBAR are presented by the proposed numerical method, and the results are demonstrated to be according with the analytical solutions of the 1-D Mason model.

Keywords: piezoelectric material；FDTD method；FBAR

查看pdf文件