

## 基于SOI的硅微谐振式压力传感器芯片制作

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摘要:

采用SOI硅片, 基于MEMS技术, 设计并加工了一种新型三明治结构的硅微谐振式压力传感器, 根据传感器敏感单元的结构设计, 制定了相应的制备工艺步骤, 并且针对湿法深刻蚀过程中谐振子的刻蚀保护等问题, 提出了一种基于氮化硅、氧化硅和氮化硅三层薄膜的保护工艺, 实验表明, 在采用三层薄膜保护工艺下进行湿法刻蚀10小时后, 谐振子被完全释放, 三层薄膜保护工艺对要求采用湿法刻蚀镂空释放可动结构具有较高的实用价值。最后对加工完成的谐振式压力传感器进行了初步的性能测试, 结果表明, 在标准大气压力下谐振子的固有频率为9.932KHz, 品质因数为34。

关键词: 谐振式压力传感器, 三层薄膜保护工艺, 敏感膜片, MEMS, SOI

## Fabrication of a novel resonant pressure sensor based on SOI wafer

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**Abstract:**

Based on the silicon-on-insulator (SOI) wafer, a novel resonant pressure sensor for pressure detection is designed and fabricated. The resonator suspended by four beams at four points on the diaphragm is encapsulated between two glass lids. As the ambient gas pressure changes, the diaphragm shape changes, thereby changing the resonator's natural frequency. To prevent the A novel resonant pressure sensor for pressure detection is designed and fabricated based on the silicon-on-insulator (SOI) wafer. The resonator suspended by four beams at four points on the diaphragm is encapsulated between two glass lids. To prevent the undesired etching of resonator during the wet etching, a triple-layer protective process using silicon nitride and silicon oxide is adopted. Experiments show that after several hours wet etching in tetramethyl ammonium hydroxide (TMAH) solution, the resonator is successfully released. This protection technology proved to be highly effective for the release of a movable microstructure by wet silicon etchants. Initial performance test results of the device yield a natural frequency of 9.932 KHz under the standard atmospheric pressure and the Q factor of 34.

**Keywords:** resonant pressure sensor, triple-layer protective films, diaphragm, MEMS, SOI

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