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CMOS-MEMS accelerometer with gold proof-mass and its application in diagnosis of Parkinson's Disease

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This paper presents our recent progress of a high sensitivity complementary metal-oxide semiconductor-microelectromechanical systems (CMOS-MEMS) accelerometer with gold proof-mass and its application in diagnosis of Parkinson's disease. The feature of the CMOS-MEMS accelerometer is the use of gold proof-mass. High density of gold enables us to increase the sensitivity by reducing thermo-mechanical noise that is inversely proportional to the proof mass. We then show the developed CMOS-MEMS multi-physics design environment. An equivalent circuit of a MEMS accelerometer has been designed to simultaneously understand both the mechanical and the electrical behaviors. One of the potential applications of the high sensitivity accelerometer is also discussed by focusing on early-stage diagnosis of Parkinson's disease.

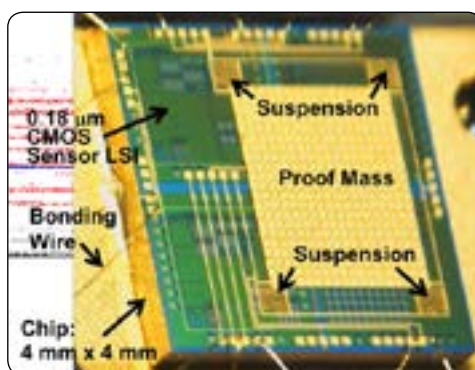


Figure 1: Chip photo of CMOS-MEMS accelerometer with gold proof-mass.

Recent Publications

1. K Machida et al. (2014) Integrated CMOS-MEMS technology and its applications. ECS Trans. 61(6):21-39.
2. D Yamane et al. (2014) Design of sub-1g microelectromechanical systems accelerometers. Appl. Phys. Lett. 104(7):074102.
3. T Konishi et al. (2014) A capacitive CMOS-MEMS sensor designed by multi-physics simulation for integrated CMOS-MEMS technology. Jpn. J. Appl. Phys. 53(4S):04EE15.
4. C Y Chen et al. (2016) Pulse electroplating of ultra-fine grained Au films with high compressive strength. Electrochemistry Communication. 67(C):51-54.

Biography

Kazuya Masu obtained his BE, ME and PhD Degrees in Electronics Engineering from Tokyo Institute of Technology (Tokyo Tech), Japan. He was an Assistant Professor and an Associate Professor with Tohoku University from 1982. In 2000, he moved to Tokyo Tech. He is currently a Professor and Director General of Institute of Innovative Research at the same university. He was a Visiting Professor in Georgia Institute of Technology in 2002 and 2005 respectively. He received IEICE Electronics Society Award in 2004, IEICE Achievement Award in 2013 and IEEEJ Outstanding Achievement Award in 2014. He served as Vice President of JSAP in 2014-2015. He is JSAP Fellow, IEEEJ Fellow, and IEICE Fellow.

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