Sensors and Actuators A: Physical

Volume 115, Issues 2â€“3, 21 September 2004, Pages 523-529

MEMS electrostatic micropower generator for low frequency operation

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https://doi.org/10.1016/j.sna.2004.04.026

Abstract

This paper describes the analysis, simulation and testing of a microengineered motion-driven power generator, suitable for application in sensors within or worn on the human body. Micro-generators capable of powering sensors have previously been reported, but these have required high frequency mechanical vibrations to excite a resonant structure. However, body-driven movements are slow and irregular, with large displacements, and hence do not effectively couple energy into such generators. The device presented here uses an alternative, non-resonant operating mode. Analysis of this generator shows its potential for the application considered, and shows the possibility to optimise the design for particular conditions. An experimental prototype based on a variable parallel-plate capacitor operating in constant charge mode is described which confirms the analysis and simulation models. This prototype, when precharged to 30Â V, develops an output voltage of 250Â V, corresponding to 0.3Â Î¼J per cycle. The experimental test

procedure and the instrumentation are also described.

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Keywords

Micro-generator; Self-powered sensors; Motion-to-electric energy conversion; Micropower generator

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