بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / سامية زكى يوسف

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد

AN INTEGRATED SIMULTANEOUS THERMAL AND RF ENERGY HARVESTING SYSTEM FOR WIRELESS SENSOR NETWORKS

By

Ahmed Abdulraouf Awad Ahmed Helaly

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Electronics and Communications Engineering

FACULTY OF ENGINEERING ,CAIRO UNIVERSITY
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Title of Thesis:

An Integrated Simultaneous Thermal and RF Energy Harvesting System for Wireless Sensor Networks

Key Words:
Energy Harvesting; charge pump; maximum power point tracking; power combining; wireless sensor networks

Summary:
This work presents an integrated simultaneous thermal/RF energy harvesting system that is suitable for low power wireless sensor networks. The system has the ability to combine harvested energy from both DC and AC sources at the same time and provide a regulated output voltage of 1.75V feeding a current load from 0.15 mA to 0.77 mA. A triple mode maximum power point tracking (MPPT) algorithm is implemented to achieve the best possible efficiency at different source and load conditions. The three reconfigurable parameters in the system are the number of stages of the DC path, the frequency driving the charge pump, and the capacitors of the matching network in the RF-path. The energy harvester also enables the storage of extra power by charging a supercapacitor in order to use it during power shortage periods. The supercapacitor is charged using a voltage doubler that has an output of 3.5V. The system is implemented in a 180 nm CMOS technology and utilizes a total on-chip capacitance of 2.4 nF. Simulations show that the overall end-to-end efficiency of the system reaches a maximum of 60.5% at input thermal voltage of 350mV and RF input power of -8 dBmW.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Ahmed Abdulraouf Awad Ahmed Helaly Date:

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