AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

Electronics and Communications Engineering Department

Design of Low Power / Low Sensitivity to Process Variations Integrated RF Receivers in Deep Sub-micron CMOS Technology

A Thesis

Submitted in partial fulfillment of the requirements of the degree of

Master of Science in Electrical Engineering

Submitted by

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B.Sc. of Electrical Engineering

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STATEMENT

This dissertation is submitted to Ain Shams University for the degree of Master of Science in Electrical Engineering (Electronics and Communications Engineering).

The work included in this thesis was carried out by the author at the Electronics and Communications Engineering Department, Faculty of Engineering, Ain Shams University, Cairo, Egypt.

No part of this thesis was submitted for a degree or a qualification at any other university or institution.

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ABSTRACT

Sameh Ahmed Assem Mostafa Ibrahim, Design of Low Power / Low Sensitivity to Process Variations Integrated RF Receivers in Deep Sub-micron CMOS Technology, Master of Science dissertation, Ain Shams University, 2005.

This dissertation demonstrates the design of a fully integrated 2.4 GHz CMOS receiver in accordance with the Bluetooth standard. The receiver integrates a low noise amplifier, a passive polyphase quadrature generator, four Gilbert cell mixers, an active polyphase intermediate frequency filter and a zero-crossing demodulator.

The dissertation also includes detailed system engineering of the proposed receiver. Three main constraints were regarded through the whole work; full integration in CMOS, low sensitivity to process variations and low power. These constraints have been considered in three aspects; system level, circuit level and layout (mask) level.

AMS 0.35 μm CMOS technology was used. Simulation results show that the front-end has a 23 dB voltage conversion gain, an 11 dB noise figure and a -9 dBm IIP3. It consume 6.79 mA from a 3.3 V supply. A minimum image rejection ratio of 37 dB was achieved.

Key words: low-if receiver, Bluetooth, polyphase, image rejection ratio, CMOS, zero-crossing detector, low noise amplifier, double quadrature.

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