بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
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تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

MONA MAGHRABY

LOW POWER DUAL MODE BLUETOOTH 5.1/BLUETOOTH LOW ENERGY RECEIVER DESIGN

By

Ahmed Magdy Afifi Azb

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:

LOW POWER DUAL MODE BLUETOOTH 5.1/BLUETOOTH LOW ENERGY RECEIVER DESIGN

Key Words:
Bluetooth; passive mixer-first; high-performance mode; low-power mode; current reuse

Summary:
This thesis presents, for the first time, single Bluetooth5.1 and Bluetooth low energy compliant receiver design compromises two operation modes – low-power mode, and high-performance mode – using fundamental and third harmonic LO down-conversion in passive mixer-first. Passive mixer analysis is presented as well. It brings up various techniques for low-power consumption at both system and circuit level. Low-IF mixer first architecture is utilized to optimize power consumption at system level. Furthermore, harmonic down-conversion in the low-power mode enables quadrature LO generation. Reduced supply voltage, passive mixers, and current reuse address power minimization at circuit level. It is implemented in 65 nm CMOS technology and occupies an active area of 0.551 $\boldsymbol{mm^2}$ consuming only 697 µW and 1250 µW when operating in low-power mode and high-performance mode respectively. Low-power mode RX achieves a noise figure of 12.82 dB and IIP3 of +5.58 dBm while provides image rejection by 81 dB. For high-performance mode, the RX front end achieves a 6.3 dB noise figure, +2.6 dBm IIP3, and 65 dB image rejection.

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: Date:

Signature:

Dedication

To

My Father,

My Mother,

My elder brother Alaa,

My little brother Hossam,

My sister in law Yasmeen

, and

My lovely nephew Adam

For their love and support

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