

# **High-Linearity CMOS RF Front-End Circuits**

# High Linearity Cmos Rf Front End Circuits

**Steve Hung-Lung Tu, Ding-Lan  
Shen, Rong-Jyi Yang**



### **High Linearity Cmos Rf Front End Circuits:**

High-Linearity CMOS RF Front-End Circuits Yongwang Ding, Ramesh Harjani, 2006-02-08 This book focuses on high performance radio frequency integrated circuits RF IC design in CMOS 1 Development of radio frequency ICs Wireless communications has been advancing rapidly in the past two decades Many high performance systems have been developed such as cellular systems AMPS GSM TDMA CDMA W CDMA etc GPS system global positioning system and WLAN wireless local area network systems The rapid growth of VLSI technology in both digital circuits and analog circuits provides benefits for wireless communication systems Twenty years ago not many people could imagine millions of transistors in a single chip or a complete radio for size of a penny Now not only complete radios have been put in a single chip but also more and more functions have been realized by a single chip and at a much lower price A radio transmits and receives electromagnetic signals through the air The signals are usually transmitted on high frequency carriers For example a typical voice signal requires only 30 Kilohertz bandwidth When it is transmitted by a FM radio station it is often carried by a frequency in the range of tens of megahertz to hundreds of megahertz Usually a radio is categorized by its carrier frequency such as 900 MHz radio or 5 GHz radio In general the higher the carrier frequency the better the directivity but the more difficult the radio design

Linear CMOS RF Power Amplifiers Hector Solar Ruiz, Roc Berenguer Pérez, 2013-09-14 The work establishes the design flow for the optimization of linear CMOS power amplifiers from the first steps of the design to the final IC implementation and tests The authors also focus on design guidelines of the inductor's geometrical characteristics for power applications and covers their measurement and characterization Additionally a model is proposed which would facilitate designs in terms of transistor sizing required inductor quality factors or minimum supply voltage The model considers limitations that CMOS processes can impose on implementation The book also provides different techniques and architectures that allow for optimization

International Conference on Communication, Computing and Electronics Systems V. Bindhu, Joy Chen, João Manuel R. S. Tavares, 2020-03-04 This book includes high impact papers presented at the International Conference on Communication Computing and Electronics Systems 2019 held at the PPG Institute of Technology Coimbatore India on 15-16 November 2019 Discussing recent trends in cloud computing mobile computing and advancements of electronics systems the book covers topics such as automation VLSI embedded systems integrated device technology satellite communication optical communication RF communication microwave engineering artificial intelligence deep learning pattern recognition Internet of Things precision models bioinformatics and healthcare informatics

**Handbook of Research on Students' Research Competence in Modern Educational Contexts** Mkrttchian, Vardan, Belyanina, Lubov, 2018-01-19 While there are many ways to collect information students have trouble understanding how to employ various research methods effectively since everyone learns and processes information differently Instructing students on successfully using research methods is a continual challenge in education The Handbook of Research on

Students Research Competence in Modern Educational Contexts is a scholarly resource that examines the critical analysis of the development of research competence in students Featuring coverage on a broad range of topics such as educational technologies cognitive interest and research capacity this book is geared towards academicians researchers and students seeking current research on the development of research competence

**Nanometer CMOS RFICs for Mobile TV Applications** Ahmed A. Youssef, James Haslett, 2010-06-17 Nanometer CMOS RFICs for Mobile TV Applications focuses on how to break the trade off between power consumption and performance linearity and noise figure by optimizing the mobile TV front end dynamic range in three hierarchical levels the intrinsic MOSFET level the circuit level and the architectural level It begins by discussing the fundamental concepts of MOSFET dynamic range including nonlinearity and noise It then moves to the circuit level introducing the challenges associated with designing wide dynamic range variable gain broadband low noise amplifiers LNAs The book gives a detailed analysis of a new noise canceling technique that helps CMOS LNAs achieve a sub 2 dB wideband noise figure Lastly the book deals with the front end dynamic range optimization process from the systems perspective by introducing the active and passive automatic gain control AGC mechanism

**Tunable RF Components and Circuits** Jeffrey L. Hilbert, 2018-09-03 An Industry Perspective on Key Tunable Technologies and Applications Tunable RF Components and Circuits Applications in Mobile Handsets provides a technical introduction to the state of the art in tunable radio frequency RF components circuits and applications and discusses the foundational work that has been done to date Leading practitioners in the field share their expertise on tunable devices in mobile handset applications Through these practical viewpoints readers discover how to use tunable RF techniques and devices to develop successful product designs A substantial portion of the book focuses on antennas and antenna tuning reflecting the dominance of the antenna tuning application in today s commercial market for tunable RF The book explains how RF microelectromechanical systems RF MEMS barium strontium titanate BST silicon on insulator SOI field effect transistors FETs and high performance complementary metal oxide semiconductors CMOS are used as enabling technologies for tunable functions in current and next generation radio architectures The book also describes power amplifier envelope tracking an emerging and important technique for improving efficiency presents a network operator s perspective on the evolution of the handset front end and explores emerging approaches to production testing of wireless devices

*Direct Conversion Receivers in Wide-Band Systems* Aarno Pärssinen, 2006-04-18 This book is based on my doctoral thesis at the Helsinki University of Technology Several different projects during five years guided me from the basics of the RF IC design to the implementations of highly integrated radio receiver chips Sharing time and effort between IC and system issues is not always straightforward I have been lucky to follow both topics and share experiences with diligent and enthusiastic people having different specialities As a result this book will cover a wide range of different topics needed in the design of highly integrated radio receivers Experiences from the first receiver prototypes for the third generation cellular systems form the basis of this

book Most of the issues are directly related to the early proposals of European and Japanese standardization organizations For example the chip rate was originally set to 4 096 Mcps in a wide band CDMA channel I have kept that number in the book in most of the examples although it has been later changed to 3 84 Mcps I hope that the readers will accept that and the possible other incompatibilities to the latest specifications At least in the research phase the changes even in the most essential requirements are definitely not a rare incident and IC designers should be able to react and modify their designs as soon as they can

**Ultra-Wideband and 60 GHz Communications for Biomedical Applications** Mehmet R. Yuce, 2013-10-16 This book investigates the design of devices systems and circuits for medical applications using the two recently established frequency bands ultra wideband 3 1 10 6 GHz and 60 GHz ISM band These two bands provide the largest bandwidths available for communication technologies and present many attractive opportunities for medical applications The applications of these bands in healthcare are wireless body area network WBAN medical imaging biomedical sensing wearable and implantable devices fast medical device connectivity video data transmission and vital signs monitoring The recent technological advances and developments proposed or used in medicine based on these two bands are covered The book introduces possible solutions and design techniques to efficiently implement these systems in medical environment All individual chapters are written by leading experts in their fields Contributions by authors are on various applications of ultra wideband and the 60 GHz ISM band including circuit implementation UWB and 60 GHz signal transmission around and in body antenna design solution hardware implementation of body sensors UWB transceiver design 60 GHz transceiver design UWB radar for contactless respiratory monitoring and ultra wideband based medical Imaging The book will be a key resource for medical professionals bio medical engineers and graduate and senior undergraduate students in computer electrical electronic and biomedical engineering disciplines

**Linear CMOS RF Power Amplifiers for Wireless Applications** Paulo Augusto Dal Fabbro, Maher Kayal, 2010-06-22 Advances in electronics have pushed mankind to create devices ranging from credible gadgets to medical equipment to spacecraft instruments More than that modern society is getting used to if not dependent on the comfort solutions and astonishing amount of information brought by these devices One eld that has continuously bene tted from those advances is the radio frequency integrated c cuit RFIC design which in its turn has promoted countless bene ts to the mankind as a payback Wireless communications is one prominent example of what the vances in electronics have enabled and their consequences to our daily life How could anyone back in the eighties think of the possibilities opened by the wireless local area networks WLANs that can be found today in a host of places such as public libraries coffee shops trains to name just a few How can a youngster who lives this true WLAN experience nowadays imagine a world without it This book dealswith the design oflinearCMOS RF PowerAmplifiers PAs The RF PA is a very important part of the RF transceiver the device that enables wireless communications Two important aspects that are key to keep the advances in RF PA design at an accelerate pace are treated ef ciency enhancement and frequen tunable

capability For this purpose the design of two different integrated circuits realized in a 0.11  $\mu\text{m}$  technology is presented each one addressing a different aspect With respect to efficiency enhancement the design of a dynamic supply RF power amplifier is treated making up the material of Chaps 2 to 4

**Analog Circuits and Devices** Wai-Kai Chen, 2003-03-26 The Principles and Application in Engineering Series is a new series of convenient economical references sharply focused on particular engineering topics and subspecialties Each volume in this series comprises chapters carefully selected from CRC's bestselling handbooks logically organized for optimum convenience and thoughtfully priced to fit

*Information and Management Engineering* Min Zhu, 2011-09-06 This six volume set CCIS 231 232 233 234 235 236 constitutes the refereed proceedings of the International Conference on Computing Information and Control ICCIC 2011 held in Wuhan China in September 2011 The papers are organized in two volumes on Innovative Computing and Information CCIS 231 and 232 two volumes on Computing and Intelligent Systems CCIS 233 and 234 and in two volumes on Information and Management Engineering CCIS 235 and 236

**Low Power RF Circuit Design in Standard CMOS Technology** Unai Alvarado, Guillermo Bistué, Iñigo Adín, 2011-10-18 Low Power Consumption is one of the critical issues in the performance of small battery powered handheld devices Mobile terminals feature an ever increasing number of wireless communication alternatives including GPS Bluetooth GSM 3G WiFi or DVB H Considering that the total power available for each terminal is limited by the relatively slow increase in battery performance expected in the near future the need for efficient circuits is now critical This book presents the basic techniques available to design low power RF CMOS analogue circuits It gives circuit designers a complete guide of alternatives to optimize power consumption and explains the application of these rules in the most common RF building blocks LNA mixers and PLLs It is set out using practical examples and offers a unique perspective as it targets designers working within the standard CMOS process and all the limitations inherent in these technologies

**UMTS** Andreas Springer, Robert Weigel, 2013-04-17 It took more than 15 years of research standardization work and development with an enormous effort of manpower to bring third generation 3G wireless communication systems to life The first research work on 3G systems started around 1988 At this time the striking success of second generation 2G systems especially of GSM Global System for Mobile Communications was not yet evident A substantial part of these early research activities took place in Europe and was sponsored by the European Commission in the course of research programs such as Research and Development of Advanced Communications Technologies in Europe RACE I RACE 2 and Advanced Communications Technology and Services ACTS 2 Even before these activities 3G systems were considered in 1992 at the WARC World Administrative Radio Conference where 230 MHz of spectrum around 2 GHz was identified for 3G and in standardization bodies like the ITU International Telecommunications Union from a global perspective and ETSI European Telecommunications Standards Institute in Europe At the present time 3G networks are deployed or are already operating e.g. in Japan the first commercial 3G system started its service in October 2001 Unfortunately the initial idea to

create one single 3G standard to allow for seam less world wide roaming could not be realized However three of the five members of the so called IMT 2000 International Mobile Telecommunica tions the official acronym for 3G systems family of standards are based on Wideband CDMA Code Division Multiple Access

**Optoelectronics Engineering and Information Technologies in Industry** D.A. Li,W.H. Zhou,2013-09-18 Selected peer reviewed papers from the 2013 2nd International Conference on Opto Electronics Engineering and Materials Research OEMR 2013 October 19 20 2013

Zhengzhou Henan China **Circuit Design for RF Transceivers** Domine Leenaerts,J. van der Tang,Cicero S.

Vaucher,2007-05-08 Circuit Design for RF Transceivers covers key building blocks which are needed to make an integrated transceiver for wireless and cellular applications that is low noise amplifiers mixers voltage controlled oscillators RF power amplifiers and phase locked loop systems Starting from detailed RF concepts and specifications the authors discuss the circuits in detail and provide solutions to many design problems The circuits are implemented in a wide range of modern technology processes Production requirements are taken into account and measurement results are presented and discussed Several of the presented circuits are used in IC products The text also includes several RF technologies for example double poly Silicon on Anything SiGe bipolar RF CMOS etc and microwave design techniques such as transmission line concepts In addition the problem of connecting the RF signals on chip to the PCB and to the antenna will be discussed including the influence of the package ESD and bond pads The contents of Circuit Design for RF Transceivers 2nd edition are based on research activities carried out at Philips Research Many internal and external publications contributed to make the presented material state of the art The book is written for people who have a basic knowledge of analogue IC design The second edition of this successful 2001 RF Circuit Design book has been updated latest technology reviews have been added as well as several actual case studies Due to the authors being active in industry as well as academia this should prove to be an essential guide on RF Transceiver Design for students and engineers

**Analog Circuit Design for Communication SOC** Steve Hung-Lung Tu,Ding-Lan Shen,Rong-Jyi Yang,2012 This e book provides several state of the art analog circuit design techniques It presents both empirical and theoretical materials for system on a chip SOC circuit design Fundamental communication concepts are used to explain a variety of topics including data conversion ADC DAC S oversampling data converters clock data recovery phase locked loops for system timing synthesis supply voltage regulation power amplifier design and mixer design This is an excellent reference book for both circuit designers and researchers who are interested in the field of design of analog communic

Dissertation Abstracts International ,2009 **The Customer Satisfaction**

**towards Service Quality of Electrical Equipments** E. Sankaran, Dr. K S Meenakshi Sundaram, Dr. D Kirubakaran,

**Handbook of Research on Software-Defined and Cognitive Radio Technologies for Dynamic Spectrum Management** Kaabouch, Naima,Hu, Wen-Chen,2014-10-31 The inadequate use of wireless spectrum resources has recently motivated researchers and practitioners to look for new ways to improve resource efficiency As a result new cognitive radio

technologies have been proposed as an effective solution The Handbook of Research on Software Defined and Cognitive Radio Technologies for Dynamic Spectrum Management examines the emerging technologies being used to overcome radio spectrum scarcity Providing timely and comprehensive coverage on topics pertaining to channel estimation spectrum sensing communication security frequency hopping and smart antennas this research work is essential for use by educators industrialists and graduate students as well as academicians researching in the field

**Microwave Circuits for 24 GHz Automotive Radar in Silicon-based Technologies** Vadim Issakov, 2010-08-05 There are continuous efforts focussed on improving road traffic safety worldwide Numerous vehicle safety features have been invented and standardized over the past decades Particularly interesting are the driver assistance systems since these can considerably reduce the number of accidents by supporting drivers perception of their surroundings Many driver assistance features rely on radar based sensors Nowadays the commercially available automotive front end sensors are comprised of discrete components thus making the radar modules highly priced and suitable for integration only in premium class vehicles Realization of low cost radar front end circuits would enable their implementation in inexpensive economy cars considerably contributing to traffic safety Cost reduction requires high level integration of the microwave front end circuitry specifically analog and digital circuit blocks co located on a single chip Recent developments of silicon based technologies e.g CMOS and SiGe C bipolar make them suitable for realization of microwave sensors Additionally these technologies offer the necessary integration capability However the required output power and temperature stability necessary for automotive radar sensor products have not yet been achieved in standard digital CMOS technologies On the other hand SiGe bipolar technology offers excellent high frequency characteristics and necessary output power for automotive applications but has lower potential for realization of digital blocks than CMOS



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