

Fei Yuan

ACSP  
ANALOG CIRCUITS AND SIGNAL PROCESSING

# CMOS Current-Mode Circuits for Data Communications

# Cmos Current Mode Circuits For Data Communications

**Mike Jess**



## **Cmos Current Mode Circuits For Data Communications:**

CMOS Current-Mode Circuits for Data Communications Fei Yuan, 2007-04-26 Current mode circuits where information is represented by the branch currents of the circuits rather than the nodal voltages as of voltage mode circuits possess many unique and attractive characteristics over their voltage mode counterparts including a small nodal time constant high current swing in the presence of a low supply voltage reduced distortion a low input impedance a high output impedance less sensitive to switching noise and better ESD immunity CMOS current mode circuits have found increasing applications in telecommunication systems instrumentation analog signal processing multiprocessors high speed computer interfaces and the backplane of complex electronic systems This book deals with the analysis and design of continuous time CMOS current mode circuits for data communications over wire channels CMOS current mode sampled data networks such as switch current circuits and current mode logic circuits are excluded The book is organized as follows Chapter 1 examines the distinct characteristics of ideal voltage mode and current mode circuits The topology duality of these two classes of circuits is investigated using the concept of interreciprocity and adjoint network A critical comparison of the input and output impedances bandwidth slew rate propagation delay signal swing supply voltage sensitivity and ESD sensitivity of voltage mode and current mode circuits is provided Chapter 2 investigates design techniques that improve the performance of low voltage current mode circuits including input impedance reduction output impedance boosting bandwidth enhancement mismatch compensation power consumption reduction and swing improvement Chapter 3 investigates the modeling of wire channels

*Model and Design of Improved Current Mode Logic Gates* Kirti Gupta, Neeta Pandey, Maneesha Gupta, 2019-11-22 This book presents MOSFET based current mode logic CML topologies which increase the speed and lower the transistor count supply voltage and power consumption The improved topologies modify the conventional PDN load and the current source sections of the basic CML gates Electronic system implementation involves embedding digital and analog circuits on a single die shifting towards mixed mode circuit design The high resolution low power and low voltage analog circuits are combined with high frequency complex digital circuits and the conventional static CMOS logic generates large current spikes during the switching also referred to as digital switching noise which degrades the resolution of the sensitive analog circuits via supply line and substrate coupling This problem is exacerbated further with scaling down of CMOS technology due to higher integration levels and operating frequencies In the literature several methods are described to reduce the propagation of the digital switching noise However in high resolution applications these methods are not sufficient The conventional CMOS static logic is no longer an effective solution and therefore an alternative with reduced current spikes or that draws a constant supply current must be selected The current mode logic CML topology with its unique property of requiring constant supply current is a promising alternative to the conventional CMOS static logic

Circuit and Interconnect Design for RF and High Bit-rate Applications Hugo Veenstra, John R. Long, 2008-06-04 Realizing

maximum performance from high bit rate and RF circuits requires close attention to IC technology circuit to circuit interconnections i e the interconnect and circuit design This detailed book covers each of these topics from theory to practice with sufficient detail to help you produce circuits that are first time right Many practical circuit examples are included to demonstrate the interplay between technology interconnect and circuit design *Injection-Locking in Mixed-Mode Signal Processing* Fei Yuan,2019-05-17 This book provides readers with a comprehensive treatment of the principles circuit design techniques and applications of injection locking in mixed mode signal processing with an emphasis on CMOS implementation Major topics include An overview of injection locking the principle of injection locking in harmonic and non harmonic oscillators lock range enhancement techniques for harmonic oscillators lock range enhancement techniques for non harmonic oscillators and the emerging applications of injection locking in mixed mode signal processing Provides a single source reference to the principles circuit design techniques and applications of injection locking in mixed mode signal processing Includes a rich collection of design techniques for increasing the lock range of oscillators under injection along with in depth examination of the pros and cons of these methods Enables a broad range of applications such as passive wireless microsystems forwarded clock parallel data links frequency synthesizers for wireless and wireline communications and low phase noise phase locked loops **IEEE Transactions on Circuits and Systems** ,2006 **Full-Chip Nanometer Routing Techniques** Tsung-Yi Ho,Yao-Wen Chang,Sao-Jie Chen,2007-08-30 At 90 nm wires account for nearly 75% of the total delay in a circuit Even more insidious however is that among nearly 40% of these nets more than 50% of their total net capacitance are attributed to the cross coupling capacitance between neighboring signals At this point a new design and optimization paradigm based on real wires is required Nanometer routers must prevent and correct these effects on the fly in order to reach timing closure From a manufacturability standpoint nanometer routers must explicitly deal with the ever increasing design complexity and be capable of adapting to the constraint requirements of timing signal integrity process antenna effect and new interconnect architecture such as X architecture In the nanometer era we must look into new generation routing technologies that combine high performance and capacity with the integration of congestion timing SI prevention and DFM algorithms as the best means of getting to design closure quickly In this book we present a novel multilevel full chip router namely mSIGMA for SIGNAL integrity and MANufacturability optimization And these routing technologies will ensure faster time to market and time to profitability *Advances in Power Systems and Energy Management* Amik Garg,Akash Kumar Bhoi,Padmanaban Sanjeevikumar,K. K. Kamani,2017-11-28 This book is a collection of research articles and critical review articles describing the overall approach to energy management The book emphasizes the technical issues that drive energy efficiency in context of power systems This book contains case studies with and without solutions on modelling simulation and optimization techniques It covers some innovative topics such as medium voltage MV back to back BTB system cost optimization of a ring frame unit in textile industry rectenna for radio frequency RF energy

harvesting ecology and energy dimension in infrastructural designs 2 4 kW three phase inverter for aircraft application study of automatic generation control AGC in a two area hydrothermal power system energy efficient and reliable depth based routing protocol for underwater wireless sensor network and power line communication using LabVIEW This book is primarily targeted at researchers and senior graduate students but is also highly useful for the industry professional and scientists

**Adaptive Multi-Standard RF Front-Ends** Vojkan Vidojkovic, J. van der Tang, Arjan Leeuwenburgh, Arthur H.M. van Roermund, 2008-02-07

N this information era people are living in a society in which processing and exchange of information are vital for their existence Two major issues in such society which are related to flow and exchange of information are connectivity and mobility On one hand computers and Internet provide connectivity and allow communication as well as fast access to large amounts of information On the other hand wireless technologies bring mobility People can move and still be able to communicate and have access to various kind of information Therefore the functioning of an information society is unthinkable without the use of computers Internet and wireless technologies The expectations are that in the future they will merge into a unique system for communication access to information as well as their exchange and processing The era of wireless communications started in 1901 when Guglielmo Marconi successfully transmitted radio signals across the Atlantic Ocean From that moment up to now wireless communications experienced explosive growth and became the fastest growing field in the engineering world Pushed by customer requirements new wireless technologies have been emerging very fast Each new generation of wireless technologies have brought new features and more complexity Pushed by market forces to reduce costs the semiconductor industry has provided new technologies for solid state circuits implementation Fortunately at the same time with the cost reduction performance of new technologies has been improving

**Switched-Capacitor Techniques for High-Accuracy Filter and ADC Design** Patrick J. Quinn, Arthur H.M. van Roermund, 2007-07-20

This book proposes alternative switched capacitor techniques which allow the achievement of higher intrinsic analogue functional accuracy than previously possible in such application areas as analogue filter and ADC design The validity of the concepts developed and analyzed in Switched Capacitor Techniques for High Accuracy Filter and ADC Design has been demonstrated in practice with the design of CMOS SC bandpass filters and algorithmic ADC stages

**High-Level Modeling and Synthesis of Analog Integrated Systems** Ewout S. J. Martens, Georges Gielen, 2008-01-03

As the miniaturization of semiconductor technology continues electronic systems on chips offer a more extensive and more complex functionality with better performance higher frequencies and less power consumption Whereas digital designers can take full advantage of the availability of design automation tools to build huge systems the lack of support by computer programs for different abstraction levels makes analog design a time consuming handcraft which limits the possibilities to implement large systems Various approaches for finding optimal values for the parameters of analog cells like opamps have been investigated since the mid 1980s and they have made their entrance in commercial applications However a larger impact on the performance is expected if tools are developed

which operate on a higher abstraction level and consider multiple architectural choices to realize a particular functionality In this book the opportunities conditions problems solutions and systematic methodologies for this new generation of analog CAD tools are examined The outline of this book is as follows In the first part the characteristics of the analog design process are systematically analyzed and several approaches for automated analog synthesis are summarized Comparison of their properties with the requirements for high level synthesis of analog and mixed signal systems results in a new design paradigm the high level design now based on generic behavior This design approach involves a modeling strategy using generic behavioral models and a synthesis strategy leading to the exploration of a heterogeneous design space containing different architectures The modeling strategy is further elaborated in Part II

**Intelligent Computing and Applications** Durbadal Mandal, Rajib Kar, Swagatam Das, Bijaya Ketan Panigrahi, 2015-02-23 The idea of the 1st International Conference on Intelligent Computing and Applications ICICA 2014 is to bring the Research Engineers Scientists Industrialists Scholars and Students together from in and around the globe to present the on going research activities and hence to encourage research interactions between universities and industries The conference provides opportunities for the delegates to exchange new ideas applications and experiences to establish research relations and to find global partners for future collaboration The proceedings covers latest progresses in the cutting edge research on various research areas of Image Language Processing Computer Vision and Pattern Recognition Machine Learning Data Mining and Computational Life Sciences Management of Data including Big Data and Analytics Distributed and Mobile Systems including Grid and Cloud infrastructure Information Security and Privacy VLSI Electronic Circuits Power Systems Antenna Computational fluid dynamics Heat transfer Intelligent Manufacturing Signal Processing Intelligent Computing Soft Computing Bio informatics Bio Computing Web Security Privacy and E Commerce E governance Service Orient Architecture Data Engineering Open Systems Optimization Communications Smart wireless and sensor Networks Smart Antennae Networking and Information security Machine Learning Mobile Computing and Applications Industrial Automation and MES Cloud Computing Green IT IT for Rural Engineering Business Computing Business Intelligence ICT for Education for solving hard problems and finally to create awareness about these domains to a wider audience of practitioners

*Low-Frequency Noise in Advanced MOS Devices* Martin Haartman, Mikael Östling, 2007-08-23 Low Frequency Noise in Advanced CMOS Devices begins with an introduction to noise describing the fundamental noise sources and basic circuit analysis The characterization of low frequency noise is discussed in detail and useful practical advice is given The various theoretical and compact low frequency 1/f noise models in MOS transistors are treated extensively providing an in depth understanding of the low frequency noise mechanisms and the potential sources of the noise in MOS transistors Advanced CMOS technology including nanometer scaled devices strained Si SiGe SOI high k gate dielectrics multiple gates and metal gates are discussed from a low frequency noise point of view Some of the most recent publications and conference presentations are included in order to give the very latest view on the topics The book

ends with an introduction to noise in analog RF circuits and describes how the low frequency noise can affect these circuits

**CMOS Data Converters for Communications** Mikael Gustavsson, J. Jacob Wikner, Nianxiong Tan, 2000-01-31 CMOS Data Converters for Communications distinguishes itself from other data converter books by emphasizing system related aspects of the design and frequency domain measures. It explains in detail how to derive data converter requirements for a given communication system baseband passband and multi carrier systems. The authors also review CMOS data converter architectures and discuss their suitability for communications. The rest of the book is dedicated to high performance CMOS data converter architecture and circuit design. Pipelined ADCs, parallel ADCs with an improved passive sampling technique and oversampling ADCs are the focus for ADC architectures, while current steering DAC modeling and implementation are the focus for DAC architectures. The principles of the switched current and the switched capacitor techniques are reviewed and their applications to crucial functional blocks such as multiplying DACs and integrators are detailed. The book outlines the design of the basic building blocks such as operational amplifiers, comparators and reference generators with emphasis on the practical aspects. To operate analog circuits at a reduced supply voltage, special circuit techniques are needed. Low voltage techniques are also discussed in this book. CMOS Data Converters for Communications can be used as a reference book by analog circuit designers to understand the data converter requirements for communication applications. It can also be used by telecommunication system designers to understand the difficulties of certain performance requirements on data converters. It is also an excellent resource to prepare analog students for the new challenges ahead.

**The Circuits and Filters Handbook** Wai-Kai Chen, 1995-06-29 This invaluable reference book features the most comprehensive coverage ever of circuits and filters from classical to state of the art designs. It begins with a discussion of basic mathematics for signal processing and circuit and filter design, then goes on to investigate the underlying theory and applications, including a thorough analysis of both analog and digital circuits and filters.

**CMOS Circuits for Passive Wireless Microsystems** Fei Yuan, 2010-10-28 This book provides a comprehensive treatment of CMOS circuits for passive wireless microsystems. Major topics include an overview of passive wireless microsystems, design challenges of passive wireless microsystems, fundamental issues of ultra low power wireless communications, radio frequency power harvesting, ultra low power modulators and demodulators, ultra low power temperature compensated current and voltage references, clock generation and remote calibration, and advanced design techniques for ultra low power analog signal processing.

**The Journal of the Acoustical Society of Japan (E)**, 1998 Contains English abstracts of original papers and letters to the editor that appear in the Japanese edition.

*Proceedings of the IEEE 1999 Custom Integrated Circuits Conference*, 1999

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**Low-voltage Bipolar Circuit Topologies for High-speed Data Communication--a Unified Design Approach with Reduced Device Stacking** Daniel Kucharski, 2005

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