

Trade-Offs in Analog Circuit Design

The Designer's Companion

Edited by

Chris Toumazou, George Moschytz
and Barrie Gilbert



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Kluwer Academic Publishers

Trade Offs In Analog Circuit Design The Designers Companion

Peter Wilson



Trade Offs In Analog Circuit Design The Designers Companion:

Trade-Offs in Analog Circuit Design Chris Toumazou, 2004-08-03 As the frequency of communication systems increases and the dimensions of transistors are reduced more and more stringent performance requirements are placed on analog circuits This is a trend that is bound to continue for the foreseeable future and while it does understanding performance trade offs will constitute a vital part of the analog design process It is the insight and intuition obtained from a fundamental understanding of performance conflicts and trade offs that ultimately provides the designer with the basic tools necessary for effective and creative analog design Trade offs in Analog Circuit Design which is devoted to the understanding of trade offs in analog design is quite unique in that it draws together fundamental material from and identifies interrelationships within a number of key analog circuits The book covers ten subject areas Design methodology Technology General Performance Filters Switched Circuits Oscillators Data Converters Transceivers Neural Processing and Analog CAD Within these subject areas it deals with a wide diversity of trade offs ranging from frequency dynamic range and power gain bandwidth speed dynamic range and phase noise to tradeoffs in design for manufacture and IC layout The book has by far transcended its original scope and has become both a designer s companion as well as a graduate textbook An important feature of this book is that it promotes an intuitive approach to understanding analog circuits by explaining fundamental relationships and in many cases providing practical illustrative examples to demonstrate the inherent basic interrelationships and trade offs Trade offs in Analog Circuit Design draws together 34 contributions from some of the world s most eminent analog circuits and systems designers to provide for the first time a comprehensive text devoted to a very important and timely approach to analog circuit design *Trade-offs in analog circuit design : the designer's companion. 1* Chris

Toumazou, 2002 **Trade-Offs in Analog Circuit Design** Chris Toumazou, George S. Moschytz, Barrie Gilbert, 2007-05-08 As the frequency of communication systems increases and the dimensions of transistors are reduced more and more stringent performance requirements are placed on analog circuits This is a trend that is bound to continue for the foreseeable future and while it does understanding performance trade offs will constitute a vital part of the analog design process It is the insight and intuition obtained from a fundamental understanding of performance conflicts and trade offs that ultimately provides the designer with the basic tools necessary for effective and creative analog design Trade offs in Analog Circuit Design which is devoted to the understanding of trade offs in analog design is quite unique in that it draws together fundamental material from and identifies interrelationships within a number of key analog circuits The book covers ten subject areas Design methodology Technology General Performance Filters Switched Circuits Oscillators Data Converters Transceivers Neural Processing and Analog CAD Within these subject areas it deals with a wide diversity of trade offs ranging from frequency dynamic range and power gain bandwidth speed dynamic range and phase noise to tradeoffs in design for manufacture and IC layout The book has by far transcended its original scope and has become both a designer s

companion as well as a graduate textbook An important feature of this book is that it promotes an intuitive approach to understanding analog circuits by explaining fundamental relationships and in many cases providing practical illustrative examples to demonstrate the inherent basic interrelationships and trade offs Trade offs in Analog Circuit Design draws together 34 contributions from some of the world's most eminent analog circuits and systems designers to provide for the first time a comprehensive text devoted to a very important and timely approach to analog circuit design Tradeoffs and Optimization in Analog CMOS Design David Binkley, 2008-09-15 Analog CMOS integrated circuits are in widespread use for communications entertainment multimedia biomedical and many other applications that interface with the physical world Although analog CMOS design is greatly complicated by the design choices of drain current channel width and channel length present for every MOS device in a circuit these design choices afford significant opportunities for optimizing circuit performance This book addresses tradeoffs and optimization of device and circuit performance for selections of the drain current inversion coefficient and channel length where channel width is implicitly considered The inversion coefficient is used as a technology independent measure of MOS inversion that permits design freely in weak moderate and strong inversion This book details the significant performance tradeoffs available in analog CMOS design and guides the designer towards optimum design by describing An interpretation of MOS modeling for the analog designer motivated by the EKV MOS model using tabulated hand expressions and figures that give performance and tradeoffs for the design choices of drain current inversion coefficient and channel length performance includes effective gate source bias and drain source saturation voltages transconductance efficiency transconductance distortion normalized drain source conductance capacitances gain and bandwidth measures thermal and flicker noise mismatch and gate and drain leakage current Measured data that validates the inclusion of important small geometry effects like velocity saturation vertical field mobility reduction drain induced barrier lowering and inversion level increases in gate referred flicker noise voltage In depth treatment of moderate inversion which offers low bias compliance voltages high transconductance efficiency and good immunity to velocity saturation effects for circuits designed in modern low voltage processes Fabricated design examples that include operational transconductance amplifiers optimized for various tradeoffs in DC and AC performance and micropower low noise preamplifiers optimized for minimum thermal and flicker noise A design spreadsheet available at the book web site that facilitates rapid optimum design of MOS devices and circuits Tradeoffs and Optimization in Analog CMOS Design is the first book dedicated to this important topic It will help practicing analog circuit designers and advanced students of electrical engineering build design intuition rapidly optimize circuit performance during initial design and minimize trial and error circuit simulations

Performance Optimization Techniques in Analog, Mixed-Signal, and Radio-Frequency Circuit Design Fakhfakh, Mourad, Tlelo-Cuautle, Esteban, Fino, Maria Helena, 2014-10-31 Improving the performance of existing technologies has always been a focal practice in the development of computational systems However as circuitry is becoming

more complex conventional techniques are becoming outdated and new research methodologies are being implemented by designers Performance Optimization Techniques in Analog Mixed Signal and Radio Frequency Circuit Design features recent advances in the engineering of integrated systems with prominence placed on methods for maximizing the functionality of these systems This book emphasizes prospective trends in the field and is an essential reference source for researchers practitioners engineers and technology designers interested in emerging research and techniques in the performance optimization of different circuit designs *Extreme Statistics in Nanoscale Memory Design* Amith Singhee,Rob A.

Rutenbar,2010-09-09 Knowledge exists you only have to find it VLSI design has come to an important inflection point with the appearance of large manufacturing variations as semiconductor technology has moved to 45 nm feature sizes and below If we ignore the random variations in the manufacturing process simulation based design essentially becomes useless since its predictions will be far from the reality of manufactured ICs On the other hand using design margins based on some traditional notion of worst case scenarios can force us to sacrifice too much in terms of power consumption or manufacturing cost to the extent of making the design goals even infeasible We absolutely need to explicitly account for the statistics of this random variability to have design margins that are accurate so that we can find the optimum balance between yield loss and design cost This discontinuity in design processes has led many researchers to develop effective methods of statistical design where the designer can simulate not just the behavior of the nominal design but the expected statistics of the behavior in manufactured ICs Memory circuits tend to be the hardest hit by the problem of these random variations because of their high replication count on any single chip which demands a very high statistical quality from the product Requirements of 5 6s 0

CMOS Analog Design Using All-Region MOSFET Modeling Márcio Cherem Schneider,Carlos

Galup-Montoro,2010-01-28 The essentials of analog circuit design with a unique all region MOSFET modeling approach

Reuse-Based Methodologies and Tools in the Design of Analog and Mixed-Signal Integrated Circuits Rafael

Castro López,Francisco V. Fernández,Óscar Guerra-Vinuesa,Ángel Rodríguez-Vázquez,2007-09-17 Aiming at the core of the problem Reuse Based Methodologies and Tools in the Design of Analog and Mixed Signal Integrated Circuits presents a framework for the reuse based design of AMS circuits The framework is founded on three key elements 1 a CAD supported hierarchical design flow that facilitates the incorporation of AMS reusable blocks reduces the overall design time and expedites the management of increasing AMS design complexity 2 a complete clear definition of the AMS reusable block structured into three separate facets or views the behavioral structural and layout facets the first two for top down electrical synthesis and bottom up verification the latter used during bottom up physical synthesis 3 the design for reusability set of tools methods and guidelines that relying on intensive parameterization as well as on design knowledge capture and encapsulation allows to produce fully reusable AMS blocks Reuse Based Methodologies and Tools in the Design of Analog and Mixed Signal Integrated Circuits features a very detailed tutorial and in depth coverage of all issues and must have

properties of reusable AMS blocks as well as a thorough description of the methods and tools necessary to implement them For the first time this has been done hierarchically covering one by one the different stages of the design flow allowing us to examine how the reusable block yields its benefits both in design time and correct performance **The Circuit Designer's Companion** Peter Wilson,2012-01-12 Grounding and Wiring Printed Circuits Passive Components Active Components Analog Integrated Circuits Digital Circuits Power Supplies Electromagnetic Compatibility General Product Design Appendices

Big Data and Visual Analytics Sang C. Suh,Thomas Anthony,2018-01-15 This book provides users with cutting edge methods and technologies in the area of big data and visual analytics as well as an insight to the big data and data analytics research conducted by world renowned researchers in this field The authors present comprehensive educational resources on big data and visual analytics covering state of the art techniques on data analytics data and information visualization and visual analytics Each chapter covers specific topics related to big data and data analytics as virtual data machine security of big data big data applications high performance computing cluster and big data implementation techniques Every chapter includes a description of an unique contribution to the area of big data and visual analytics This book is a valuable resource for researchers and professionals working in the area of big data data analytics and information visualization Advanced level students studying computer science will also find this book helpful as a secondary textbook or reference

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