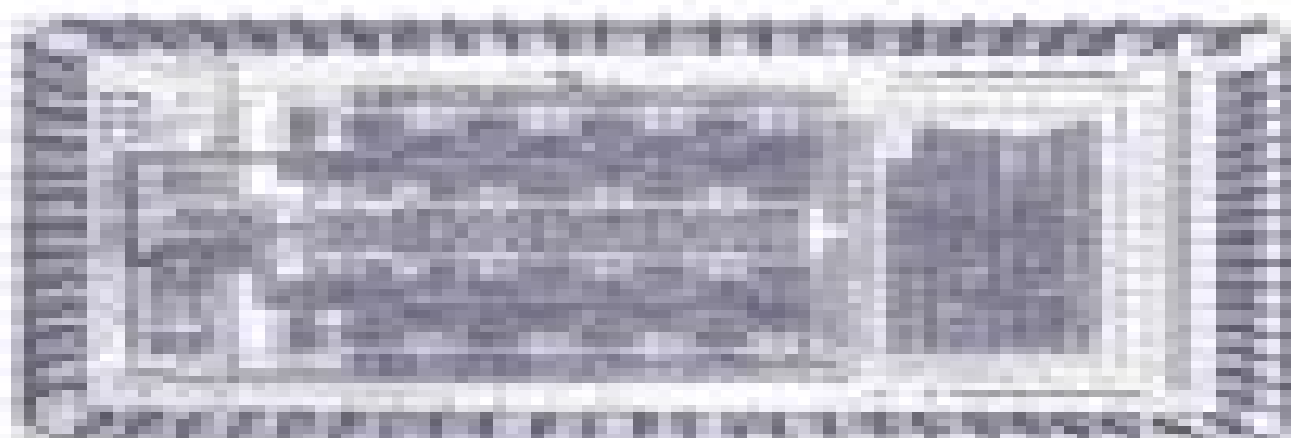


I-TECHNIQUES FOR POWER AND HIGH-SPEED A/D CONVERTERS

PDF

William E. Wolkoff and Kurt A. L. Halonen



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Circuit Techniques For Lowvoltage And Highspeed Ad Converters

Volkan Kursun, Eby G. Friedman



Circuit Techniques For Lowvoltage And Highspeed Ad Converters:

Circuit Techniques for Low-Voltage and High-Speed A/D Converters Mikko E. Waltari, Kari A.I.

Halonen, 2005-12-30 For four decades the evolution of integrated circuits has followed Moore's law according to which the number of transistors per square millimeter of silicon doubles every 18 months. At the same time transistors have become faster making possible ever increasing clock rates in digital circuits. This trend seems set to continue for at least another decade without slowing down. Thus in the near future the processing power of digital circuits will continue to increase at an accelerating pace. For analog circuits the evolution of technology is not as beneficial. Thus there is a trend to move signal processing functions from the analog domain to the digital one which besides allowing for a higher level of accuracy provides savings in power consumption and silicon area. Increases in robustness speed up the design process, brings flexibility and programmability and increases the possibilities for design reuse. In many applications the input and output signals of the system are inherently analog preventing all digital realizations. At the very least a conversion between analog and digital is needed at the interfaces. Typically moving the analog/digital boundary closer to the outside world increases the bit rate across it. In telecommunications systems the trend to boost bit rates is based on playing wider bandwidths and a higher signal to noise ratio. At the same time radio architectures in many applications are evolving toward software defined radio one of the main characteristics of which is the shifting of the analog/digital boundary closer to the antenna.

Circuit Techniques for Low-voltage and High-speed A/D Converters Mikko Waltari, 2002

Generalized Low-Voltage Circuit Techniques for Very High-Speed Time-Interleaved Analog-to-Digital Converters Sai-Weng Sin, Seng-Pan U, Rui Paulo

Martins, 2010-09-29 Analog to Digital Converters ADCs play an important role in most modern signal processing and wireless communication systems where extensive signal manipulation is necessary to be performed by complicated digital signal processing DSP circuitry. This trend also creates the possibility of fabricating all functional blocks of a system in a single chip System On Chip SoC with great reductions in cost, chip area and power consumption. However this tendency places an increasing challenge in terms of speed, resolution, power consumption and noise performance in the design of the front end ADC which is usually the bottleneck of the whole system especially under the unavoidable low supply voltage imposed by technology scaling as well as the requirement of battery operated portable devices. Generalized Low Voltage Circuit Techniques for Very High Speed Time Interleaved Analog to Digital Converters will present new techniques tailored for low voltage and high speed Switched Capacitor SC ADC with various design specific considerations.

Modular Low-Power, High-Speed CMOS Analog-to-Digital Converter of Embedded Systems Keh-La Lin, Armin Kemna, Bedrich J.

Hosticka, 2006-01-14 One of the main trends of microelectronics is toward design for integrated systems i.e. system on a chip SoC or system on silicon SoS. Due to this development design techniques for mixed signal circuits become more important than before. Among other devices analog to digital and digital to analog converters are the two bridges between the analog

and the digital worlds Besides low power design technique is one of the main issues for embedded systems especially for hand held applications Modular Low Power High Speed CMOS Analog to Digital Converter for Embedded Systems aims at design techniques for low power high speed analog to digital converter processed by the standard CMOS technology Additionally this book covers physical integration issues of A/D converter integrated in SoC i.e. substrate crosstalk and reference voltage network design *High-Performance AD and DA Converters, IC Design in Scaled Technologies, and Time-Domain Signal Processing* Pieter Harpe, Andrea Baschiroto, Kofi A. A. Makinwa, 2014-07-23 This book is based on the 18 tutorials presented during the 23rd workshop on Advances in Analog Circuit Design Expert designers present readers with information about a variety of topics at the frontier of analog circuit design serving as a valuable reference to the state of the art for anyone involved in analog circuit research and development *Analog Circuit Design* Johan Huijsing, Rudy J. van de Plassche, Willy M.C. Sansen, 2013-03-14 Johan H Huijsing This book contains 18 tutorial papers concentrated on 3 topics each topic being covered by 6 papers The topics are Low Noise Low Power Low Voltage Mixed Mode Design with CAD Tools Voltage Current and Time References The papers of this book were written by top experts in the field currently working at leading European and American universities and companies These papers are the reviewed versions of the papers presented at the Workshop on Advances in Analog Circuit Design which was held in Villach Austria 26-28 April 1995 The chairman of the Workshop was Dr Franz Dielacher from Siemens Austria The program committee consisted of Johan H Huijsing from the Delft University of Technology Prof Willy Sansen from the Catholic University of Leuven and Dr Rudy J van der Plassche from Philips Eindhoven This book is the fourth of a series dedicated to the design of analog circuits The topics which were covered earlier were Operational Amplifiers Analog to Digital Converters Analog Computer Aided Design Mixed A/D Circuit Design Sensor Interface Circuits Communication Circuits Low Power Low Voltage Integrated Filters Smart Power As the Workshop will be continued year by year a valuable series of topics will be built up from all the important areas of analog circuit design I hope that this book will help designers of analog circuits to improve their work and to speed it up Design of Low-Voltage Low-Power CMOS Delta-Sigma A/D Converters Vincenzo Peluso, Michiel Steyaert, Willy M.C. Sansen, 2013-03-09 Design of Low Voltage Low Power CMOS Delta Sigma A/D Converters investigates the feasibility of designing Delta Sigma Analog to Digital Converters for very low supply voltage lower than 1.5V and low power operation in standard CMOS processes The chosen technique of implementation is the Switched Opamp Technique which provides Switched Capacitor operation at low supply voltage without the need to apply voltage multipliers or low V_t MOST devices A method of implementing the classic single loop and cascaded Delta Sigma modulator topologies with half delay integrators is presented Those topologies are studied in order to find the parameters that maximise the performance in terms of peak SNR Based on a linear model the performance degradations of higher order single loop and cascaded modulators compared to a hypothetical ideal modulator are quantified An overview of low voltage Switched Capacitor design techniques such as the use of voltage

multipliers low VtMOST devices and the Switched Opamp Technique is given An in depth discussion of the present status of the Switched Opamp Technique covers the single ended Original Switched Opamp Technique the Modified Switched Opamp Technique which allows lower supply voltage operation and differential implementation including common mode control techniques The restrictions imposed on the analog circuits by low supply voltage operation are investigated Several low voltage circuit building blocks some of which are new are discussed A new low voltage class AB OTA especially suited for differential Switched Opamp applications together with a common mode feedback amplifier and a comparator are presented and analyzed As part of a systematic top down design approach the non ideal charge transfer of the Switched Opamp integrator cell is modeled based upon several models of the main opamp non ideal characteristics Behavioral simulations carried out with these models yield the required opamp specifications that ensure that the intended performance is met in an implementation A power consumption analysis is performed The influence of all design parameters especially the low power supply voltage is highlighted Design guidelines towards low power operation are distilled Two implementations are presented together with measurement results The first one is a single ended implementation of a Delta Sigma ADC operating with 1.5V supply voltage and consuming 100 W for a 74 dB dynamic range in a 3.4 kHz bandwidth The second implementation is differential and operates with 900 mV It achieves 77 dB dynamic range in 16 kHz bandwidth and consumes 40 W Design of Low Voltage Low Power CMOS Delta Sigma A/D Converters is essential reading for analog design engineers and researchers

Switched-Current Signal Processing and A/D Conversion Circuits Bengt E. Jonsson, 2013-04-18 Switched Current Signal Processing and A/D Conversion Circuits Design and Implementation describes the design and implementation of switched current SI circuits with emphasis on signal processing and data conversion applications The work includes theoretical analysis high level and circuit level simulation results as well as measurement results from a few of the author's circuit implementations An extensive overview of the SI field of research is also given The book contains an extensive overview of the switched current field of research and can therefore be used as a quick reference to the field The description of each design example has been organized to describe the entire design flow from system level design and simulation to circuit simulation layout and measurement as accurately as possible Thus it is possible to follow each step in the design process Switched Current Signal Processing and A/D Conversion Circuits Design and Implementation is an invaluable reference for researchers and circuit designers working with one chip mixed signal system solutions and low voltage analog CMOS design It will also be appreciated by anyone requiring a quick overview of what has been done in the SI field

Operational Amplifier Speed and Accuracy Improvement Vadim V. Ivanov, Igor M. Filanovsky, 2005-12-30 Operational Amplifier Speed and Accuracy Improvement proposes a new methodology for the design of analog integrated circuits The usefulness of this methodology is demonstrated through the design of an operational amplifier This methodology consists of the following iterative steps description of the circuit functionality at a high level of abstraction using signal flow graphs

equivalent transformations and modifications of the graph to the form where all important parameters are controlled by dedicated feedback loops and implementation of the structure using a library of elementary cells

Operational Amplifier Speed and Accuracy Improvement shows how to choose structures and design circuits which improve an operational amplifier's important parameters such as speed to power ratio open loop gain common mode voltage rejection ratio and power supply rejection ratio The same approach is used to design clamps and limiting circuits which improve the performance of the amplifier outside of its linear operating region such as slew rate enhancement output short circuit current limitation and input overload recovery

Static and Dynamic Performance Limitations for High Speed D/A Converters Anne van den Bosch, Michiel Steyaert, Willy M.C. Sansen, 2013-06-29

Static and Dynamic Performance Limitations for High Speed D A Converters discusses the design and implementation of high speed current steering CMOS digital to analog converters Starting from the definition of the basic specifications for a D A converter the elements determining the static and dynamic performance are identified Different guidelines based on scientific derivations are suggested to optimize this performance Furthermore a new closed formula has been derived to account for the influence of the transistor mismatch on the achievable resolution of the current steering D A converter To allow a thorough understanding of the dynamic behavior a new factor has been introduced Moreover the frequency dependency of the output impedance introduces harmonic distortion components which can limit the maximum attainable spurious free dynamic range Finally the last part of the book gives an overview on different existing transistor mismatch models and the link with the static performance of the D A converter

Systematic Design of Sigma-Delta Analog-to-Digital Converters Ovidiu Bajdechi, Johan Huijsing, 2004-06-01

Systematic Design of Sigma Delta Analog to Digital Converters describes the issues related to the sigma delta analog to digital converters ADCs design in a systematic manner from the top level of abstraction represented by the filters defining signal and noise transfer functions STF NTF passing through the architecture level where topology related performance is calculated and simulated and finally down to parameters of circuit elements like resistors capacitors and amplifier transconductances used in individual integrators The systematic approach allows the evaluation of different loop filters order aggressiveness discrete time or continuous time implementation with quantizers varying in resolution Topologies explored range from simple single loops to multiple cascaded loops with complex structures including more feedbacks and feedforwards For differential circuits with switched capacitor integrators for discrete time DT loop filters and active RC for continuous time CT ones the passive integrator components are calculated and the power consumption is estimated based on top level requirements like harmonic distortion and noise budget This unified systematic approach to choosing the best sigma delta ADC implementation for a given design target yields an interesting solution for a high resolution broadband DSL like ADC operated at low oversampling ratio which is detailed down to transistor level schematics The target audience of Systematic Design of Sigma Delta Analog to Digital Converters are engineers designing sigma delta ADCs and or switched capacitor and continuous time filters both

beginners and experienced It is also intended for students academics involved in sigma delta and analog CAD research

Compact Low-Voltage and High-Speed CMOS, BiCMOS and Bipolar Operational Amplifiers Klaas-Jan de Langen, Johan Huijsing, 2013-03-14 Compact Low Voltage and High Speed CMOS BiCMOS and Bipolar Operational Amplifiers discusses the design of integrated operational amplifiers that approach the limits of low supply voltage or very high bandwidth The resulting realizations span the whole field of applications from micro power CMOS VLSI amplifiers to 1 GHz bipolar amplifiers The book presents efficient circuit topologies in order to combine high performance with simple solutions In total twelve amplifier realizations are discussed Two bipolar amplifiers are discussed a 1 GHz operational amplifier and an amplifier with a high ratio between the maximum output current and the quiescent current Five amplifiers have been designed in CMOS technology extremely compact circuits that can operate on supply voltages down to one gate source voltage and two saturation voltages which equals about 1.4 V and ultimate low voltage amplifiers that can operate on supply voltages down to one gate source voltage and one saturation voltage which amounts to about 1.2 V In BiCMOS technology five amplifiers have been designed The first two amplifiers are based on a compact topology Two other amplifiers are designed to operate on low supply voltages down to 1.3 V The final amplifier has a unity gain frequency of 200 MHz and can operate down to 2.5 V Compact Low Voltage and High Speed CMOS BiCMOS and Bipolar Operational Amplifiers is intended for the professional analog designer Also it is suitable as a text book for advanced courses in amplifier design

Low-Power High-Resolution Analog to Digital Converters Amir Zjajo, José Pineda de Gyvez, 2010-10-29 With the fast advancement of CMOS fabrication technology more and more signal processing functions are implemented in the digital domain for a lower cost lower power consumption higher yield and higher re configurability This has recently generated a great demand for low power low voltage A/D converters that can be realized in a mainstream deep submicron CMOS technology However the discrepancies between lithography wavelengths and circuit feature sizes are increasing Lower power supply voltages significantly reduce noise margins and increase variations in process device and design parameters Consequently it is steadily more difficult to control the fabrication process precisely enough to maintain uniformity The inherent randomness of materials used in fabrication at nanoscopic scales means that performance will be increasingly variable not only from die to die but also within each individual die Parametric variability will be compounded by degradation in nanoscale integrated circuits resulting in instability of parameters over time eventually leading to the development of faults Process variation cannot be solved by improving manufacturing tolerances variability must be reduced by new device technology or managed by design in order for scaling to continue Similarly within die performance variation also imposes new challenges for test methods In an attempt to address these issues Low Power High Resolution Analog to Digital Converters specifically focus on i improving the power efficiency for the high speed and low spurious spectral A/D conversion performance by exploring the potential of low voltage analog design and calibration techniques respectively and ii development of circuit techniques and

algorithms to enhance testing and debugging potential to detect errors dynamically to isolate and confine faults and to recover errors continuously The feasibility of the described methods has been verified by measurements from the silicon prototypes fabricated in standard 180nm 90nm and 65nm CMOS technology

Continuous-Time Delta-Sigma Modulators for High-Speed A/D Conversion James A. Cherry, W. Martin Snelgrove, 2006-04-18 Among analog to digital converters the delta sigma modulator has cornered the market on high to very high resolution converters at moderate speeds with typical applications such as digital audio and instrumentation Interest has recently increased in delta sigma circuits built with a continuous time loop filter rather than the more common switched capacitor approach Continuous time delta sigma modulators offer less noisy virtual ground nodes at the input inherent protection against signal aliasing and the potential to use a physical rather than an electrical integrator in the first stage for novel applications like accelerometers and magnetic flux sensors More significantly they relax settling time restrictions so that modulator clock rates can be raised This opens the possibility of wideband 1 MHz or more converters possibly for use in radio applications at an intermediate frequency so that one or more stages of mixing might be done in the digital domain Continuous Time Delta Sigma Modulators for High Speed A D Conversion Theory Practice and Fundamental Performance Limits covers all aspects of continuous time delta sigma modulator design with particular emphasis on design for high clock speeds The authors explain the ideal design of such modulators in terms of the well understood discrete time modulator design problem and provide design examples in Matlab They also cover commonly encountered non idealities in continuous time modulators and how they degrade performance plus a wealth of material on the main problems feedback path delays clock jitter and quantizer metastability in very high speed designs and how to avoid them They also give a concrete design procedure for a real high speed circuit which illustrates the tradeoffs in the selection of key parameters Detailed circuit diagrams simulation results and test results for an integrated continuous time 4 GHz band pass modulator for A D conversion of 1 GHz analog signals are also presented Continuous Time Delta Sigma Modulators for High Speed A D Conversion Theory Practice and Fundamental Performance Limits concludes with some promising modulator architectures and a list of the challenges that remain in this exciting field

Multi-voltage CMOS Circuit Design Volkan Kursun, Eby G. Friedman, 2006-08-30 This book presents an in depth treatment of various power reduction and speed enhancement techniques based on multiple supply and threshold voltages A detailed discussion of the sources of power consumption in CMOS circuits will be provided whilst focusing primarily on identifying the mechanisms by which sub threshold and gate oxide leakage currents are generated The authors present a comprehensive review of state of the art dynamic static supply and threshold voltage scaling techniques and discuss the pros and cons of supply and threshold voltage scaling techniques

High Performance Embedded Computing Handbook David R. Martinez, Robert A. Bond, M. Michael Vai, 2018-10-03 Over the past several decades applications permeated by advances in digital signal processing have undergone unprecedented growth in capabilities The editors and authors of High

Performance Embedded Computing Handbook A Systems Perspective have been significant contributors to this field and the principles and techniques presented in the handbook are reinforced by examples drawn from their work The chapters cover system components found in today's HPEC systems by addressing design trade offs implementation options and techniques of the trade then solidifying the concepts with specific HPEC system examples This approach provides a more valuable learning tool Because readers learn about these subject areas through factual implementation cases drawn from the contributing authors own experiences Discussions include Key subsystems and components Computational characteristics of high performance embedded algorithms and applications Front end real time processor technologies such as analog to digital conversion application specific integrated circuits field programmable gate arrays and intellectual property based design Programmable HPEC systems technology including interconnection fabrics parallel and distributed processing performance metrics and software architecture and automatic code parallelization and optimization Examples of complex HPEC systems representative of actual prototype developments Application examples including radar communications electro optical and sonar applications The handbook is organized around a canonical framework that helps readers navigate through the chapters and it concludes with a discussion of future trends in HPEC systems The material is covered at a level suitable for practicing engineers and HPEC computational practitioners and is easily adaptable to their own implementation requirements

Wideband Low Noise Amplifiers Exploiting Thermal Noise Cancellation Federico Bruccoleri, Eric Klumperink, Bram Nauta, 2006-03-30 Low Noise Amplifiers LNAs are commonly used to amplify signals that are too weak for direct processing for example in radio or cable receivers Traditionally low noise amplifiers are implemented via tuned amplifiers exploiting inductors and capacitors in resonating LC circuits This can render very low noise but only in a relatively narrow frequency band close to resonance There is a clear trend to use more bandwidth for communication both via cables e g cable TV internet and wireless links e g satellite links and Ultra Wideband Band Hence wideband low noise amplifier techniques are very much needed Wideband Low Noise Amplifiers Exploiting Thermal Noise Cancellation explores techniques to realize wideband amplifiers capable of impedance matching and still achieving a low noise figure well below 3dB This can be achieved with a new noise cancelling technique as described in this book By using this technique the thermal noise of the input transistor of the LNA can be cancelled while the wanted signal is amplified The book gives a detailed analysis of this technique and presents several new amplifier circuits This book is directly relevant for IC designers and researchers working on integrated transceivers Although the focus is on CMOS circuits the techniques can just as well be applied to other IC technologies e g bipolar and GaAs and even in discrete component technologies

Proceedings of International Conference on Advances in Computing Aswatha Kumar M., Selvarani R., T V Suresh Kumar, 2012-09-03 This is the first International Conference on Advances in Computing ICAdC 2012 The scope of the conference includes all the areas of New Theoretical Computer Science Systems and Software and Intelligent systems Conference Proceedings is a

culmination of research results papers and the theory related to all the three major areas of computing mentioned above Helps budding researchers graduates in the areas of Computer Science Information Science Electronics Telecommunication Instrumentation Networking to take forward their research work based on the reviewed results in the paper by mutual interaction through e mail contacts in the proceedings

Analogue-digital ASICs Randeep Singh Soin, Franco Maloberti, José Franca, 1991 For many applications circuits that combine analog and digital signals can provide superior solutions to those produced with digital signals alone Eighteen contributions in four sections processing technology circuit techniques and building blocks design and applications and CAD and supporting tools detail and support this new approach Annotation copyrighted by Book News Inc Portland OR

Introduction to Avionics Systems R.P.G. Collinson, 2002-12-31 Evaluation copies are available Please contact textbooks wkap com Provide the course number number of students and present textbook used Introduction to Avionics Systems Second Edition explains the basic principles and underlying theory of modern avionic systems and how they are implemented with current technology for both civil and military aircraft in a clear and easy to read manner All systems are explained so that their design and performance can be understood and analysed Worked examples are included to illustrate the application of the theory and principles covered The latest developments and directions of research for future systems are included This new second edition has approximately 25% new material and takes into account the technology developments which have taken place since the first edition was published in January 1996 The book is well illustrated with line drawings and photos with some in colour where appropriate Readership Graduates or equivalent from a range of disciplines entering the avionics and aerospace industries Engineers at all levels engaged in the design and development of avionic systems and equipment in the avionic and aerospace industries Students and post graduate students taking avionics and aeronautical engineering courses Staff in the armed services and civil airlines engaged in the support or operation of aircraft who wish to acquire a deeper understanding of the design and implementation of avionic systems and equipment

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