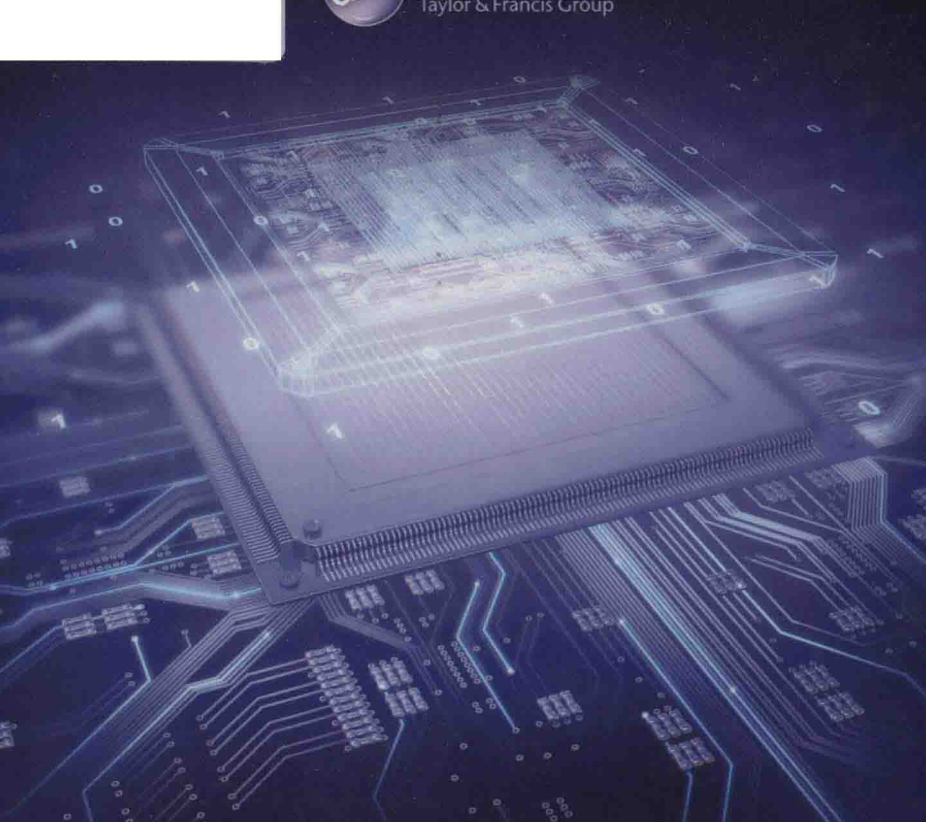




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A detailed illustration of a microchip mounted on a circuit board. The chip is shown in a perspective view, with its internal circuitry visible through a transparent layer. The circuit board below it is densely packed with various components and traces, all rendered in a blue and purple color scheme. The background is dark, with some faint binary code (0s and 1s) visible.

Mixed-Signal Circuits

EDITED BY
Thomas Noulis

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Preface

This book addresses mixed-signal integrated circuits using advanced design techniques to enable digital circuits and sensitive analog circuits to co-exist without any compromise. Different related topics are addressed, such as the advanced process technology to address the performance challenges associated with developing these complex mixed-signal circuits, the related blocking points in the industry design flow, and the general validation of the proposed solutions and implementations. Development and implementation of innovative methodologies to move analog into the digital domain quickly, minimizing and eliminating common trade-offs between performance, power consumption, simulation time, verification, size, and cost containment are also discussed.

Specifically, in this book, the state of the art in integrated circuit design in the context of mixed-signal applications is addressed. New, exciting opportunities in different areas like wireless communications, data networking, and simulation and verification techniques are presented. Design concepts for very low-power performance and approaches for high-speed interfaces, PLL, VCOs, ADC converters, and biomedical filters are described. Respective parts of a full system-on-chip (SoC), from the digital parts until the base-band blocks, the RF circuitries, the ESD structures and the built-in self-test architectures are provided.

Coverage includes advanced crucial topics like signal integrity, large-scale simulation, and verification and testing. Extremely hot modeling topics are also addressed such as reliability, variability, and crosstalk that define pre-silicon design methodology and trends and are the main research items for all industry leading companies involved in wireless applications.

The book is written by a mixture of top industrial experts and key academic professors and researchers. Practical enough to understand how these technologies work, but not a product manual and, at the same time, scientific enough but not pure academic theory.

This book is a must for anyone involved in mixed-signal circuit design for future technologies. The intended audience is engineers with advanced integrated circuit background working in the semiconductor industry. This book can also be used as a recommended reading and supplementary material in a graduate course curriculum and, in general, the intended audience is professionals working in the integrated circuit design field.

I hope you enjoy reading this book as much as we have enjoyed writing it!

Thomas Noulis

Editor

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Thomas Noulis is a staff RFMS engineer at Intel Corporation in the Mobile & Communications Group in Munich, Germany, specializing in circuit design, modeling–characterization, crosstalk, and SoC product active area minimization. Before joining Intel, from May 2008 to March 2012, Dr. Noulis was with HELIC Inc., initially as an analog/RF IC designer, and then as an R&D engineer specializing in substrate coupling, signal and noise integrity, and analog/RFIC design. Thomas Noulis earned a BSc in physics (2003), an MSc in electronics engineering (2005), and a PhD in the Design of Signal Processing Integrated Circuits (2009) from the Aristotle University of Thessaloniki, Greece, and in collaboration with LAAS (Laboratoire d'Analyse et d'Architectures des Systèmes), Toulouse, France. During 2004–2009, he participated as principal researcher in multiple European and national research projects related to space application and nuclear spectroscopy IC design, while between 2004 and 2010, he also collaborated as a visiting-adjunct professor with universities and technical institutes. Dr. Noulis is the author of more than 30 publications, journals, conferences, and scientific book chapters. He holds one French and World patent. His work has received more than 50 citations. He is an active reviewer of multiple international journals and has given multiple invited presentations at European research institutes and international conferences on crosstalk and radiation detection IC design. Dr. Noulis has received awards for his research at conferences and by research organizations and can be reached at t.noulis@gmail.com.

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