Preface

Signal Integrity is no longer an issue for microprocessor and radio frequency designers who designed high-end custom IC designs. As technology scales, clock frequencies rise, and the need for higher integration of analog and digital IP blocks increases, unwanted parasitic effects become more and more a gating factor to IC design project success. Many of these effects can be prevented or analyzed and fixed in isolation, but increasingly they are becoming highly dependent on each other. This all creates a lot of confusion and subjective opinion in the IC design world about how to deal with these new problems. The purpose of this book is to help clear these confusions, and offer a number of methods for IC designers and CAD engineers to model, and then solve, these problems.

This book has been structured to be useful to both new and advanced digital and mixed-signal IC engineers. To enable this, each part is carefully partitioned with one or two leading tutorial papers. Tutorial papers are followed by papers on issues such as analysis, extraction, and modeling techniques, as well as optimization/reduction and design methods. Finally, useful papers are presented from related topics.

The book begins with a paper presenting a Designer’s Perspective to Signal Integrity Effects in System-on-Chip Design. This paper has been authored by hardware and software engineers from companies worldwide, and provides a real-life overview of the design issues faced.

In Part 1, a series of papers covering Interconnect Crosstalk are presented. Issues such as noise-aware static timing analysis, and post-layout routing optimization are discussed.

In Part 2, Inductance Effects are discussed. Issues such as when inductance is important, inductance extraction, and design techniques are covered.

In Part 3, Power Grid and Distribution Noise is presented. Issues such as floorplanning methods and electromigration are covered. Mixed-signal supply noise issues are also presented.

Finally, in Part 4, Substrate Noise issues are discussed. Issues such as extraction and design techniques are covered, as well as general noise issues in mixed-signal IC design.

With such a broad range of topics involved in Signal Integrity in IC designs, this book cannot possibly cover every topic of interest, and there are without doubt other books that offer more details in very specific areas. However, it is my hope that this book will act as a sufficient central reference point for Signal Integrity issues (both now and going forward), helping the reader both understand the various issues and offering practical methods for integrating the effects in design flows.

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