

Preface

Modern analog circuits and systems of mixed-signal very large scale integrated (VLSI) chips for multimedia, perception, control, instrumentation, and telecommunications operate with much smaller supply voltages than the discrete circuits and integrated circuits of the last decade. This new environment and needs have forced designers to develop new design approaches more amenable to low-voltage and low-power integrated circuits. In this book, we are the first to attempt to bring together these new design methodologies together with a number of applications in an understandable manner. Furthermore, since the design of analog and mixed-signal circuits with low voltage requires suitable system architectures, we discuss proper circuit models, optimization, and innovative circuit design. In the past, a circuit designer required little or no knowledge of the overall system and where the circuit was going to be used; these days a complete notion of the system, applications, requirements, and limitations is essential for a circuit designer to optimize a sound circuit design.

This book deals with analog and digital circuit design. When combined, these circuits are known as *mixed-signal circuits*. A particular emphasis of this book is on low-power supply voltages and low-power consumption. The revival of analog circuits in the last few years has been significant. The optimal use of analog circuits versus digital circuits has been a controversial issue, which is application dependent. There is a trend to combine analog and digital circuits in an optimal way. In current applications, high-speed analog front ends impose high speed and power consumption requirements. This book has developed from the need to fill a vacuum of information about low-power and low-voltage integrated circuits. We cover fundamental aspects of metal-oxide-semiconductor (MOS) device modeling, analog and

