Preface for Analog IC Design by D. Johns and K. Martin

For the past twenty years, numerous people have predicted there soon would be little need for analog circuitry because the world would rely on digital circuits. However, although many applications have indeed replaced much analog circuitry with their digital counterparts (such as digital audio), the need for good analog circuit design remains strong. For example, when digitizing physical signals, analog-to-digital and digital-to-analog converters are always needed, together with their associated antialiasing and reconstruction filters. In addition, new applications continue to appear in which speed and power-consumption requirements often demand the use of highspeed analog front ends, such as digital communications over copper wires or wireless communication channels. Also as integrated circuits become larger due to system integration, it is much more likely that at least some portion of a modern integrated circuit will include analog circuitry required to interface to the real world. Often this analog circuitry, although it constitutes only a small portion of the total chip area, may be the limiting factor on overall system performance and the most difficult part of the 1C to design. As a result, a strong industrial need for analog circuit designers continues. The purpose of this book is to help develop excellent analog circuit designers by presenting a concise treatment of the wide array of knowledge required by an integrated circuit designer.

Many refer to the designing and testing of high-performance analog circuits as a "mystical art". In other words, whereas digital design is relatively systematic, analog design appears to be much more confusing and based on gut feelings. In addition, analog testing may sometimes seem to depend more on the time of day and phase of the moon rather than on concrete electrical properties. These thoughts about analog circuits usually occur when one is not familiar with the many fundamentals required to create high-performance analog circuits. A major goal of this book is to help take the mystery out of analog integrated circuit design. The authors believe that most experienced electrical engineers are capable of good design if they are familiar with the most important design principles. We have attempted to highlight these principles throughout this text. Although many circuits and techniques are described, we have emphasized the most important and fundamental principles involved in realizing state-of-the-art analog circuits. Throughout this book, we give physical and intuitive explanations, and, although mathematical quantitative analyses of many circuits have necessarily been presented, we have attempted not to miss seeing the forest because of the trees. In other words, this book attempts to present the critical underlying concepts without becoming entangled in tedious and over complicated circuit analyses.

Intended Audience

This book is primarily intended for use as a graduate level textbook and as a reference for practicing engineers, although portions of this text are also useful for senior-level undergraduate courses. To appreciate the material in this book, it is expected that the reader has had at least one basic course in analog circuits. Specifically, the reader should be familiar with the concept of small signal analysis and have been exposed to basic transistor amplifier circuits. In addition, the reader should be comfortable working in the frequency domain (ie. Should be familiar with the Laplace transform) with possibly some knowledge of discrete-time signals.

Contents