

Preface

This book describes circuit engineering efforts for comparators. Comparators are key components for analog-digital converters and consequently for modern wireless and mobile communication. Electronic circuits for latest mass applications like WIFI or WLAN modems, mobile phones, and smart phones are realized as so-called systems on chip (SoC). Such SoCs are realized in nanometer CMOS technology and contain a lot of digital circuits for digital signal processing but they also contain analog circuits which often form the key devices for good overall performance. The importance of comparators nowadays is often underestimated. They are, however, important to obtain high-performance analog-digital converters and wireless receivers and transmitters. The improvement of analog-digital converters is the final issue in bringing the digital signal processing as close as possible to the antenna. Therefore, comparators need to be improved also. Sense-amplifier type comparators are also important for SRAMs and DRAMs as well as some optical receivers.

In fact, progress in CMOS technology and circuit design allows the revolution in modern wireless and mobile communication. UMTS, HSPA+, and LTE as well as Ultra Wide Band (UWB) and Software Defined Radio were important keywords in research of the last years for SoCs. All these applications require high-samplerate analog-digital converters, which rely on high-performance comparators. For application in mobile devices, low-voltage operation and low power consumption are important issues of comparators.

To make all this possible for a mass market, analog circuit design in nanometer CMOS technology is an important key factor. This book concentrates on one sub-topic of analog circuit design, i.e., comparators. This is especially justified since in the literature very often only analog-digital converters are described without characterizing the properties of the comparators being implemented in detail. Starting from the basics of comparators and the poor transistor characteristics in nanometer CMOS, seven high-performance comparators developed by the authors in 120 nm and 65 nm CMOS are described extensively. These comparators cover sample rates from 500 MHz to 7 GHz and supply voltages from 0.5 to 1.5 V. Their power consumption is in the milliwatt range down to 18 μ W. Detailed descriptions

of measurement methods for the characterization of advanced comparators are introduced in addition.

Although comparators are being used since several decades in many integrated circuits, it was still possible to develop new topologies or to modify and expand known comparator topologies to improve their performance. This book introduces newest results of development of comparators in deep-sub-micron and nanometer CMOS and describes methods for comparator design dealing successfully with the nanometer hell of physics. Numerous detailed circuit diagrams and plots of measured results allow a fast comprehension.

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