

Preface

The future is the Internet of Things (IoT) and it is already here, e.g., in the environmental monitoring, in the manufacturing, and in the building and home automation. By the technology of IoT, there have been millions of mobile devices that are collecting data and exchanging it across the Internet. Typically, that is implemented by three main steps: the data input, the data processing, and the data transfer. Since powerful processors and high-speed network access are available, the data input becomes one of the bottlenecks for the whole system. Not only is the high-resolution and high-rate data input required but also the high power efficiency is expected by the low-power mobile applications.

The data is provided by the analog-to-digital (AD) converter, which bridges the physical world and the computational system. Extreme requirements have been imposed on the AD converter by the rapid growth of the IoT. The low power, the high resolution (not less than 12 bit), and the high speed (not less than 100 MSps) are of crucial importance for contemporary AD converter. To realize that, the CMOS integrated AD conversion is one of the technologies used widely, which has the benefits of both the high performance and the low cost. However, to implement the power-efficient, high-resolution, and high-speed AD converter, some particular design techniques are needed, i.e., the architecture and the circuit optimization, such that the AD converter can meet the requirements provoked by the applications. While many researches have focused on it, the lack of the systematic and comprehensive tutorial results in the inefficiency of the learning and designing.

This book deals with design techniques to realize the integrated AD converter with the unprecedented combination of the power efficiency, the resolution, and the speed in advanced CMOS technology. It consists of eight chapters and is prepared for readers having a solid understanding of the analog IC circuit and data conversion. The contents and orders are organized carefully to provide readers with a step-by-step tutorial. Two aspects, from the system level to the circuit block level,

are both covered. Three types of improved architectures, three circuit blocks, and the calibration for different architectures are all discussed in detail. In addition, a design case is included as an example.

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Weitao Li
Fule Li
Zhihua Wang

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Li, W.; Li, F.; Wang, Z.

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