
FLASH MEMORIES

Edited by **Igor S. Stievano**

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Preface

In recent years, the ICT market has quickly moved toward the integration of a large variety of functions into a single portable electronic equipment. The boundaries among different devices like music players, digital cameras or mobile phones are going to vanish. In this trend, one of the key factors is played by data storage, since all these devices require a large amount of memory to store either audio or visual data. Also, the energy consumption needs to be reduced to further extend battery duration and the functionality of the devices.

In this setting, Flash memories provide an effective solution, as they offer impressive features, including low noise, reliability, low energy consumption, small size and weight, and robustness to mechanical stresses. Flash memories are thus actively contributing to a new generation of devices. The technology is mature and this class of devices is massively used in a wide range of applications. The performances of Flash memories also contribute to the growing interest in solid-state disks, that are currently replacing traditional hard drives in ubiquitous notebook PCs, netbooks and PC tablets. The research on memories and their applications, therefore, will be of paramount importance for the development of future electronic products.

This book is aimed at presenting the state-of-the-art technologies and the research studies related, but not limited, to flash memories. The book consists of fourteen Chapters organized into three Parts, which guide the reader through the different aspects of the subject.

Part 1 focuses on the contributions related to modeling, algorithms and programming techniques. The first Chapter provides a comprehensive overview of file management with specific interest on native flash file systems. The second and third chapters address the important problem of error correction and coding. The fourth Chapter discusses the features and performances of both the automatic and the semi-automatic block cleaning processes. Finally, the last Chapter provides an overview of the state-of-the-art methods to build behavioral models of Flash memories for signal and power integrity simulations.

Part 2 is mainly dedicated to contributions with emphasis on applications. The first Chapter addresses the problem of storage in battery-powered devices operating in a

distributed wireless sensor network, thus highlighting the importance of flash memory chips in a sensor node. The second Chapter presents the design of a peripheral controller reconfigurable system based on the FPGA Dynamic Partial Reconfiguration technology, which enables more efficient run-time resource management. The last Chapter focuses on practical examples of in-circuit programming of commercial flash memory devices.

Part 3 collects results on the technology, materials and design topics. The first three Chapters deal with alternative improved technologies and innovative materials for enhancing the performance of memories along with a detailed discussion of features, strengths and limitations of the proposed solutions. The last Chapter concludes the book by discussing a method for molecular dynamic simulations. This simulation is aimed at assessing the strengths of these new materials and their possible application to the future technology of Flash memories.

Enjoy the book!

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