射频识别：应用中的MIFARE和非接触式智能卡

（影印版）

RFID:
MIFARE and Contactless Smartcards in Application

Gerhard H. Schalk , Renke Bienert 著

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Preface

Dr. Thomas Wille

RFID technology, which uses radio frequency to identify people or objects, opens up pathways to newer and more expansive applications. From easier access control using contactless (RFID) cards to public transport fare tickets to bank cards to use in passports as well as in the new German identity cards, the applications are becoming more complex and require ever more computing power.

One of the reasons for contactless technology's success is the cards' ease of use and convenience. Simply placing an RFID device, without any special orientation, within a few centimeters of the reader suffices, and a transaction is completed in a fraction of a second.

Another advantage of this technology is its robustness. RFID devices are now highly integrated and measure just a few square millimeters in area. The coupling antennas are connected directly to the ICs' antenna terminals, resulting in minimal anisotropic connections. The antenna and IC may then be housed very stably within a card enclosure. By minimizing the required electrical connections in this manner, there are no further mechanical-electrical connections that, from a quality perspective, could present weaknesses. It is only possible by means of this robust construction, to achieve life spans of over ten years, and to use the technology in extreme environments.

All of these advantages are enabled with the design of more complex contactless interfaces on the cards and readers. In contrast with serial contact card interfaces with their 8 contacts, data coding for RFID carriers is more complex and the high positioning tolerance in regard to the reader device is made possible by complex and robust analog interface circuitry design. Optimization of the reader–card system is also crucial for optimal implementation and robust dimensioning of RFID technology.

This book gives the reader a simple and understandable introduction to the fundamentals of RFID technology and explains the relevant international standards. Then, in a separate chapter, the security aspects of the technology are discussed. Further, all RFID system components are systematically presented and explained in detail, from RFID antenna design to the different card and tag types to the design of an RFID reader, including the antenna design.

The design of a reader, particularly the Elektor RFID Reader, is very carefully described to the user, from software/firmware to user interface. However, for the user, practical application and associated problems are the key. This is where extensive description of some Elektor RFID Reader use cases and useful tips, tricks and solutions for problem

situations comes in. The chapters that follow fully describe the included reader software for an access control system functionally. The book also explains the user interface standards.

This book is thus a systematic introduction to the RFID arena that leads the user through the design of a practical card–reader system. In addition, the book is an indispensible guide for any user who wants to conceptualize, design and optimize RFID systems, and offers the crucial assistance required for the often complex problems inherent in RFID system design.

With this book, the authors have closed the loop for users, hopefully aiding the continuous march of RFID technology to further, unimagined extents. For this, we owe the authors a large debt of gratitude.

Hamburg, January 2011

Dr. Thomas Wille
Senior Director Architecture & Technology

Business Unit Identification, NXP Semiconductors

About the authors

Gerhard Schalk has been an application engineer at NXP Semiconductors (formerly Philips Semiconductors) since 2001. In this role, he supports global clients in developing smartcard operating systems. He is also a freelance lecturer at the FH-Hagenberg and FH-Campus 02 (Graz) technical colleges.

Renke Bienert has also been an application engineer at NXP Semiconductors since 2001. He supports global clients in developing readers and systems that use contactless smartcards. He was involved, among other things, with the introduction of electronic tickets for the 2006 FIFA World Cup, as well as electronic travel passes.

Acknowledgments

When we began this project, we had no idea how much blood, sweat and tears would be required to physically nail down all of these concepts in writing. It's perhaps good that we didn't know that in advance.

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February 2011, Gerhard H. Schalk and Renke Bienert

My special thanks go to my dear wife, Annemarie Brunner, and my two sons, Maximilian and Simon. Without the patience and support of my family, my contribution to this book would not have been possible.

February 2011, Gerhard H. Schalk

My sincere thanks go to all who have tolerated and supported me during the writing of this book, especially my wife, Ute Merkel.

February 2011, Renke Bienert

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