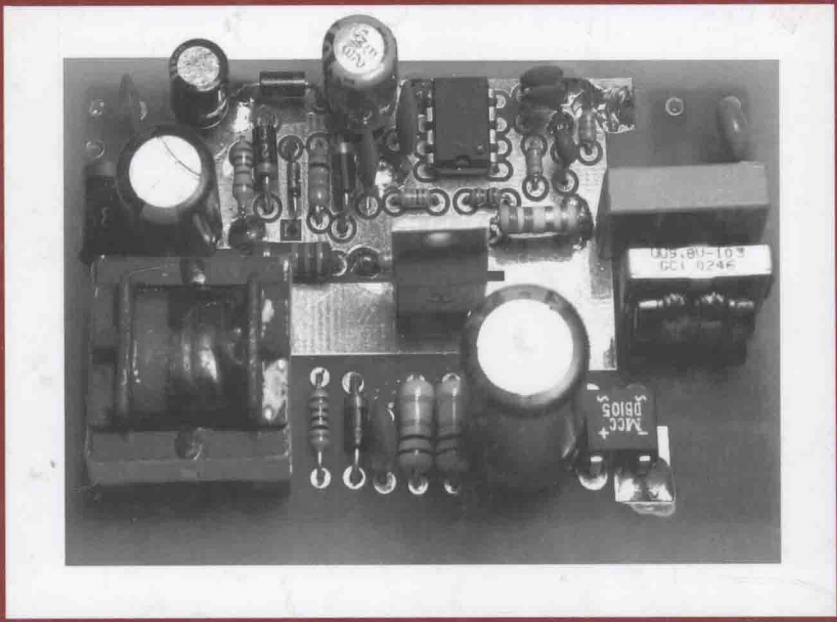

Power-Switching Converters

Second Edition

Simon Ang
Alejandro Oliva

POWER-SWITCHING CONVERTERS

Second Edition

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Preface to the Second Edition

In this second edition, Dr. Simon Ang welcomes co-author, Dr. Alejandro Oliva of the Universidad Nacional del Sur, Argentina. Much new material and many references have been added. Several chapters have been completely revised, and two new chapters on interleaved converters and switched capacitor converters have been added. The discrete-time modeling method has been included in the dynamic analysis of switching converters. Design case studies have been replaced with new cases.

This book is intended to be used as a textbook for a senior-level electrical engineering course on switching converters. The introductory course would cover the basic switching converter topologies described in Chapters 1 to 4, followed by an introduction to basic control techniques presented in Chapter 5. The instructor may choose to skip to Chapters 7 and 8 on interleaved converters and switching capacitor converters, respectively.

Chapter 6 covers the closed-loop control and stability considerations in the design of switching converters. It discusses the dynamic analysis of switching converters based on state–space averaging and linearization. This chapter is divided into two parts. The first part covers continuous-time

models and control techniques, while the second part introduces discrete-time models based on sampled-data modeling. Many of the topics presented in this chapter can be skipped and covered later in a more advanced level course.

Chapter 9 provides tools for the simulation of switching converters. It introduces both PSpice and MATLAB simulations of switching converters. This chapter may be partially taught after Chapter 2 and concurrently with Chapters 4 to 6. The discussion of switching converters is not complete until a switching converter is analyzed, designed, and finally prototyped. Chapter 10 contains complete design examples, including experimental designs, which may be used as technical reference or for a class project.

Supplementary information and material, updated periodically, are available on the download page at *http://www.crcpress.com*. These include class slides, selected PSpice examples, and MATLAB scripts. The PSpice examples are designed to run on the OrCAD 10.0 demo software.

Several individuals have contributed to this second edition of *Power-Switching Converters* by providing assistance, suggestions, and criticisms. We appreciate the collaboration of Dr. Juan Carlos Balda for his detailed and constructive criticism, which improve the accuracy and content of Chapter 6. We would like to thank Dr. Roberto M. Schupbach for his thorough reading and error detection in the MATLAB code. Graciela Rodríguez (Mrs. Oliva) gave up her vacations to offer invaluable help with the figures and equations. Several design case studies in Chapter 10 were adapted from the class projects of our former graduate students at the University of Arkansas, in particular, those of Kien Truong and Lan Phuong Bui Pham. We gratefully acknowledge Claudio Frate for preparing most of the figures in the text. Finally, we like to sincerely express our gratitude to our families for their support and love.

Simon S. Ang
Alejandro R. Oliva

Editors

SIMON S. ANG has been a professor of electrical engineering at the University of Arkansas at Fayetteville since 1988. He received his B.S.E.E. from the University of Arkansas at Fayetteville in 1980, his M.S.E.E. from Georgia Tech, Atlanta in 1981, and his Ph.D. in electrical engineering from Southern Methodist University, Dallas, Texas in 1985. He was with Texas Instruments, Dallas from 1981 to 1988. Dr. Ang has published in more than 200 journals and proceedings papers and holds four U.S. patents. His research interests are switching converters, bio-sensors, and MEMS.

ALEJANDRO R. OLIVA has been an assistant professor at the Universidad Nacional del Sur, Bahía Blanca, Argentina, since 1999. He received his B.S.E.E. from the Universidad Nacional del Sur in 1987, his M.S.E.E. in 1996, and his Ph.D. in electrical engineering from the University of Arkansas at Fayetteville in 2004. From 1987 to 1988 Dr. Oliva worked for Hidronor S.A., developing a database for modeling large hydraulic plants. He has been associated with the Universidad Nacional del Sur since 1988, and from 1994 to 1996, he worked for the University of Arkansas at Fayetteville on an EPRI/CSW power quality research project. He has published in more than 30 journals and proceedings. His main research interests are power electronics and DSP control.

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