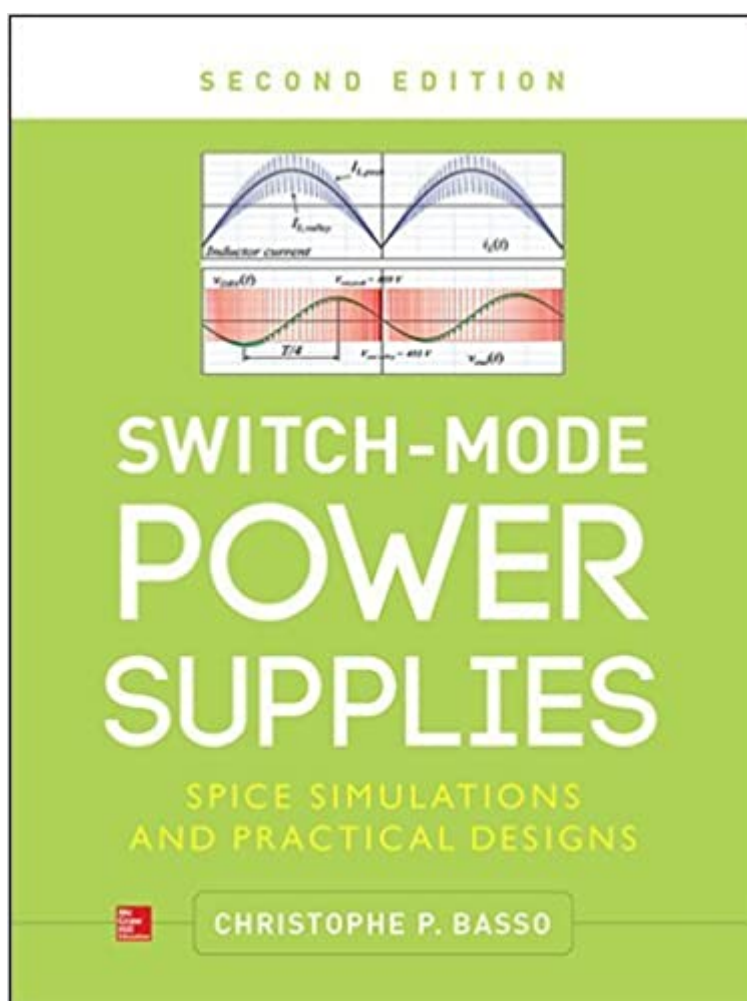


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# Switch-Mode Power Supplies, Second Edition: SPICE Simulations And Practical Designs (Electronics)



## Synopsis

THE LATEST SPICE SIMULATION AND DESIGN TOOLS FOR CREATING STATE-OF-THE-ART SWITCHING POWER SUPPLIES Fully updated to incorporate new SPICE features and capabilities, this practical guide explains, step by step, how to simulate, test, and improve switch-mode power supply designs. Detailed formulas with founding equations are included. Based on the author's continued research and in-depth, hands-on work in the field, this revised resource offers a collection of the latest SPICE solutions to the most difficult problem facing power supply designers: creating smaller, more heat-efficient power supplies in shorter design cycles. NEW to this edition: Complete analysis of rms currents for the three basic cells in CCM and DCM PWM switch at work in the small-signal analysis of the DCM boost and the QR flyback OTA-based compensators Complete transistor-level TL431 model Small-signal analysis of the borderline-operated boost PFC circuit operated in voltage or current mode All-over power phenomena in QR or fixed-frequency discontinuous/continuous flyback converters Small-signal model of a QR flyback converter Small-signal model of the active clamp forward converter operated in voltage mode control Electronic content--design templates and examples available online Switch-Mode Power Supplies: SPICE Simulations and Practical Designs, Second Edition, covers: Small-signal modeling \* Feedback and control loops \* Basic blocks and generic switched models \* Nonisolated converters \* Off-line converters \* Flyback converters \* Forward converters \* Power factor correction

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## Customer Reviews

This second edition capitalizes on comments and suggestions collected over 5 years from world-wide readers. A warm "merci" to all of you! There are several key additions such as a small-signal model of the active clamp forward converter or the ac-response analysis of the QR flyback converter. Small-signal transfer functions of BCM PFC stages are also there, in current mode or voltage mode. Another important addition is the derivation of all rms currents (with a step-by-step approach so that you can follow the flow) of the three basic cells when operated in CCM but also in DCM. Results are presented in a clear and ordered form, also available in dedicated Mathcad files for those of you who want to put these equations at work. This book is for engineers who believe, as I do, that SPICE or simulation in general, can be an excellent assistant in intermediate design steps before going to the bench. Understanding power conversion theory through equations further verified by simulations and practical results are ingredients for a success that I wish to all my readers! Please note that Chapter 1 download and models are now available on-line from the McGraw-Hill landing page at

[mhprofessional.com/product.php?isbn=0071823468](http://mhprofessional.com/product.php?isbn=0071823468) With best wishes from Christophe Basso, France July 2014

Christophe Basso is an Application Engineering Director at ON Semiconductor in Toulouse, France, where he leads an application team dedicated to developing new offline PWM controllers specifications. He has originated numerous integrated circuits among which the NCP120X series has set new standards for low standby power converters. Further to his 2008 book "Switch-Mode Power Supplies: SPICE Simulations and Practical Designs", published by McGraw-Hill, he released a new title in 2012 with Artech House, "Designing Control Loops for Linear and Switching Power Supplies: a Tutorial Guide". He holds 30 patents on power conversion and often publishes papers in conferences and trade magazines including How2Power and PET. He regularly teaches professional seminars at APEC conferences in the US. Christophe has over 20 years of power supply industry experience. Prior to joining ON Semiconductor in 1999, Christophe was an application engineer at Motorola Semiconductor in Toulouse. Before 1997, he worked as a power supply designer at the European Synchrotron Radiation Facility in Grenoble, France, for 10 years. He holds a BSEE equivalent from the Montpellier University (France) and a MSEE from the Institut National Polytechnique of Toulouse (France). He is an IEEE Senior member. The author can be

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Great book. It is the best book I have found on the subject. It has a good balance of theory and practical, real world examples. I purchased it a few months back and I was able to not only learn the theory, but also get simulations up and running quickly for a couple designs I was working on. It has helped me immensely. It is my go to book and I will be using it, and the knowledge I gained, for years to come. I would recommend this book for anyone in the SMPS field from beginner to expert. The book by itself is great but the kicker is there are files that can be downloaded that allow the reader to get up and running quickly. I can't say enough good things about it. It has exceeded my expectations.

This is my go-to reference book for power supply design. The new edition offers some nice improvements over the first. Most notable is the new layout, which makes it a little easier to use, however there is plenty of new content. It does a great job at bridging the gap between the simple fundamentals that many other books offer and practical real world applications, while offering intuitive ways to predict real world performance through simulation. It is nice to see a book that covers the design of the entire converter (input filter, clamps, snubbers, etc.) through real world application examples. For instance, a boost converter for a car audio amplifier starting with only the customer requirements and carrying the reader through the entire design process including component selection and thermal considerations. Although it only focuses on the basic topologies (boost, buck, buck-boost, flyback, forward), the approaches demonstrated for deriving their equations and models make it is easy to derive the equations and models for their derivative topologies (push-pull, SEPIC, Cuk, half/full-bridge, etc.). I recommend this book to all of my colleagues!

Very good book but it is not CMOS power supply. I hope I can apply many techniques in this textbook to my conference paper some day in the future.

A must have book!

each chapter has short explanation on the subject but plenty of formula. This book is a great reference for SMPS simulation.

I purchased the 1st edition of this book a while back and this second edition seems even better with a more equation derivations and larger pages. Mr. Basso is quite gifted at explaining things clearly and writes in an engaging and readable style. Mr. Basso derives all his equations from basic principles; this allows the reader to fully understand equations he presents as well as to clearly understand the assumptions behind them. This further allows the reader to apply these equations with confidence. He uses math to re-enforces his explanations, as opposed to the other way around. This is probably best translated as 'this is what's happening, and this is what it looks like mathematically.' I was recently posted overseas on secondment to work on a power supply design and this is one of the two books that I brought with me. Most recommended.

Well my heavily used first edition copy of this book has now been happily replaced by this wonderful state-of-the-art second edition update. The first edition book has served me so well as one of the most helpful reference collection books to allow me to bridge between theory and actual practice. Now arrives the second edition with corrections, updates and additions that seek to make this tool even more helpful. Has it delivered? Oh yes! The first big improvement is its size. It is slightly taller but significantly wider, which has allowed for a great improvement in formatting. The flow of reading the second edition is fantastic. Where needed mathematical details have been elaborated and are clearer and easier to understand. New additions to switching topologies have been added to the already vast collection. A subject of this complexity and variability is not easy to distill in a manner which can be easily understood, digested and made practical for the modern day student or established engineer who wishes to design and simulate power converters using SPICE. Mr. Basso very eloquently and most thoroughly covers a huge swath of switch-mode topologies that is easy to understand for both students entering into power conversion and practicing engineers who need a refresher. I have tried other books, either they are over the top theoretical with long drawn out mathematics that leave one hanging in limbo between theory and reality, or they are general and provide very few tools on how to "do it yourself". As a prerequisite to following this book you will need an understanding of algebra, calculus and basic SPICE simulation skills. The book provides you with a link to download many of the SPICE and MathCAD example files in the book as well as demo simulation software. Is the book perfect? Perfection is quite subjective and in the case of this complex subject, it is hard to please everyone, especially picky engineers. I think Mr. Basso has been able to present the concepts, design and practical steps of using SPICE to design power converters in a balanced middle ground fashion that the vast majority of student and engineers can greatly benefit from. It neither goes to deep into theory nor does it simply skim across the subjects,

but provides a hands-on practical mathematical and SPICE based approach to designing modern day power converters. Every topology that is covered in this book has at least one example design that goes step-by-step through the design process, from calculations of parameters and component values to average and transient SPICE simulations of the design. He goes into the minutia of what to look out for in the particular topology and what topology is correct for a given requirement. If you are a power conversion engineer, or want to be versed in that field, this book is invaluable. The practical examples covered in this book are of power converters in the low to medium power range. If you are looking for a book with examples to design and simulate very high power converters, this book may not be for you, but it will provide you with most of the building blocks and foundation needed for you to tackle that field. You will not be disappointed with the money and time you invest in this book. Get It.

As someone who has been involved in switch-mode power supply design for over 30 years, I highly recommend this book. Before Christophe Basso's first edition, I was constantly digging through multiple reference papers, seminar notes, and specific chapters of various text books to find the information I needed to design and simulate a power supply. His first edition captured all of the design information and simulation techniques in one well-written and useful book. My copy is worn as I have referred to it daily as a design reference. His second edition builds on this excellent work with additional small signal modeling and analysis, with more SPICE and MathCad examples. Christophe also maintains a website with tools and references. You will find him accessible and worth the read. The quality of print, larger page format, and better book construction of the latest edition are also appreciated.

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