



## Power Electronics: Topologies, Magnetics and Control: NEW (Volume 1)

By Slobodan Cuk

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**Power Electronics: Topologies, Magnetics and Control: NEW (Volume 1)** By Slobodan Cuk

Power Electronics: Topologies, Magnetics and Control (Volume 1) The first chapter entitled: Basics of Switched-Mode Power Conversion: Topologies, Magnetics and Control was written specifically to provide a comprehensive view of Power Electronics field and to introduce novice engineers to the three key areas of expertise: Topologies, Magnetics and Control. Its first section introduces buck, boost and flyback DC-DC converters. Its second section provides an overview of properties of ferromagnetic materials culminating in modelling and design of transformers and inductors. The third section describes the general method of PWM control and regulation. This Volume 1 also introduces the fourth basic non-isolated converter type, the Cuk converter, invented on April 1, 1975. Unlike the buck, the boost and the flyback converters, this converter introduces for the first time capacitive energy transfer which led Dr. Cuk to formulate his most general State-Space Averaging Method, using the missing state-space equations for capacitor voltages and respective charge balance in addition to state-space equations for inductor currents and corresponding original volt-second balance on inductors. This method results in the general analytical model for both steady-state (DC) as well as dynamic (AC) properties for not only the existing switching converters but for all DC-DC converters based on PWM control which were known at the time and those which have been invented at any time thereafter. The Cuk converter has also motivated formulation of a new general magnetic circuits methods named Coupled-Inductors and Integrated Magnetics and demonstrated their implementation in the non-isolated and isolated Cuk converters.

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## **Power Electronics: Topologies, Magnetics and Control: NEW (Volume 1) By Slobodan Cuk Bibliography**

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### **Editorial Review**

#### Review

This four-volume series is an updated version of the three-volume series by Dr. Slobodan Cuk, published originally by TESLACO in 1983 as a second hardcover edition with Volume 1 and Volume 2 printed in one hardcover and volume 3 in a second hardcover. The first paperback edition published in 1981 consisted of first two volumes only. This third edition now has an additional fourth volume. The objective of this updated and new 2015 series is to provide a fundamental introduction to this complex field to novice engineers as well as to serve as reference books to experienced practicing Power Electronics specialists. Technical papers in this series have a twofold objective: advance the field with new research results and educate the Power Electronics community at large. This material is now also crucial for the understanding of the new switching methods: Hybrid Switching Method and Storageless Switching Method and a number of related new converter topologies and the magnetics and control improvements that have been introduced in last several years. This four-volume set provides the four pillars on which the current Power Electronics system design relies. The first volume is:

#### **Volume 1. Power Electronics: Topologies, Magnetics, and Control**

- Provides a comprehensive view of Power Electronics and introduces novice engineers to the three key areas of expertise: Topologies, Magnetics, and Control.
- Describes buck, boost, and flyback dc-dc converters, forward and bridge converters.
- Presents properties of ferromagnetic materials leading to modeling and design of transformers and inductors.
- Provides general method of PWM control and regulation.
- Introduces the fourth basic non-isolated converter type, the Cuk converter. Unlike the buck, the boost, and the flyback converters, this converter introduces for the first time capacitive energy transfer to formulate the most general State-Space Averaging Method, using the missing state-space equations for capacitor currents and respective charge balance in addition to state-space equations for inductor currents and corresponding original volt-second balance on inductors. The Cuk converter also motivated formulation of new general magnetic circuits methods, Coupled-Inductors and Integrated Magnetics, and demonstrated their implementation in the non-isolated and isolated converters.

"Dr. Cuk's New Book", Ray Ridley:

When I started my very first job, back in 1981, my Romanian office mate decided to test me to decide whether I was a worthy colleague. He handed me Dr. Cuk's dissertation on state-space averaging, and asked me to learn how it worked in the next 2 days. It got me hooked on the intricacies of power supply analysis. Looking back on it now, I realize that perhaps he didn't understand the dissertation, and was hoping I would be able to explain it to him!

Dr. Cuk has just come out with this new volume. I recommend you all read everything he has ever written.

"I am a great admirer of Dr. Cuk's work", Jacobo Aguillon-Garcia:

During my studies I never imagined to be in touch with so big personalities that, in some way are a kind of heroes in the power electronics arena! The first time I heard about Dr. Cuk is when I got his three-volumes

borrowed from my professor in order to prepare a presentation of ĉuk converter architecture. I got so stunned from it, and all the development of soft switching theory from Prof. Middlebrook that I never returned those heavy volumes! I still have them in my home in Mexico! Anyhow, for sure I'll get those new 4 volumes (in particular the newer ones because I'm in love with magnetic devices).

"Dr. ĉuk, your methods of State-space Averaging have helped immensely...,Sreejakumar Nair:  
... in Designing Compensators for the power converters that we designed in both Analog and Digital domains. The methods propagated to me through various of your publications. Thanks for your contributions in my career. I would Strongly recommend this priceless treasure to all young power engineers and practicing engineers.

"I now have the book!", Anthony Wood:

It is looking like a very good reference material. PS I like the reference at the front from Dr. Middlebrook referring to your PhD thesis. For quite a while, I signed my emails at the bottom with one of his quotes "the math is your slave, not your master". And these books presentation shows that this is true. Here is a quote from Professor Middlebrook regarding Dr. Cuk's thesis on State-Space Averaging covered in Volume 4: "...If the models for all such converters are the same, it should be possible to derive this unique model without having to specify in advance any particular converter. This problem was solved in a very elegant manner by Slobodan Cuk. In his 1976 PhD thesis he introduced the analysis Method of *State-Space Averaging*, which in a single stroke eliminates the switching process from consideration and exposes the desired dynamic response. From this model came the same unique small signal equivalent circuit model, which is now called the *canonical* model."

From the Author

It is gratifying to know that the material covered in the four volumes generated 35 years ago has not only survived the test of the time but is also providing a solid foundation for ultimate POWER ELECTRONICS SYSTEM technology by extension of the State -Space Averaging to unique PWM/Resonant Switching Methods and the use of the ĉuk-type transformer in novel converter topologies!

From the Inside Flap

It is gratifying to know that the material covered in this fourth volume generated exactly 40 years ago has not only survived the test of the time but is also providing a solid foundation for ultimate POWER ELECTRONICS SYSTEM technology by extension of the State -Space Averaging to unique PWM/Resonant Switching Methods and the use of the ĉuk-type transformer in novel converter topologies!

## **Users Review**

**From reader reviews:**

**Raymond Childers:**

Do you have favorite book? Should you have, what is your favorite's book? Book is very important thing for us to understand everything in the world. Each e-book has different aim or goal; it means that e-book has different type. Some people really feel enjoy to spend their the perfect time to read a book. These are reading whatever they take because their hobby is actually reading a book. Consider the person who don't like reading a book? Sometime, particular person feel need book after they found difficult problem or perhaps exercise. Well, probably you'll have this Power Electronics: Topologies, Magnetics and Control: NEW (Volume 1).

**Olive Wilson:**

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**Ines Patterson:**

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**Wm Mills:**

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