Book review: Fundamentals of Power Supply Design

Steve Taranovich - March 22, 2017

Editor's note: I hope to see many of my EDN and Planet Analog audience at APEC in Tampa, FL this year. Texas Instruments will have Bob Mammano at their booth at APEC where you can meet him and enter and win an autographed copy of his book.

Who better to write such a tutorial reference book as this than Bob Mammano, founder of Unitrode Semiconductor Corporation, creator of the first switching power supply controller IC (Silicon General SG1524), and TI Fellow (retired). Mammano’s career has spanned decades from the days of discrete switching power designs all the way through to the creation of Digital Power. Unitrode’s power seminars are still remembered by so many power designers as the prime source of technical education for engineers who need to develop power supplies. Texas Instrument’s 1999 acquisition of Unitrode bolstered both TI’s power offering and Unitrode’s strength as a power company under the TI umbrella. These seminars continue even today by TI and are just as good as the early Unitrode ones that brought design expertise to power designers over 40 years ago (I attended these seminars as a design engineer).

This book is an organized and well-written technical compendium of those many years of Unitrode educational seminars which were created and presented by renowned Unitrode and Texas Instruments experts.

I am very familiar with the litany of names of those who helped make this book one for designer’s bookshelves. I personally know both Robert Kollman as a former colleague, power supply expert and mentor at TI as well as Bill Schweber, another former colleague and mentor from EDN and Planet Analog, who knows how to clearly and eloquently put words on a page and fully understands the tenets of electronics engineering.
The basics, design compromises, and the right choices

Mammano builds his tutorial from a good, solid foundation in the basics of Power Electronics during the first three chapters. Now a designer would need to see which of the hundreds of power circuit topologies they should choose to meet their system requirements—that’s Chapter 4. In this section the designer can begin thinking about the cost, size and efficiency of the power supply and how to best make design choices, trade-offs, and compromises to meet the system specifications while creating a robust design.

Chapter 5 outlines the advantages of different methods of the best way to control the switching in a power design architecture using algorithms. This is critical to the power designer who may not be very familiar or comfortable with algorithms.

Chapter 6 brings in the all-important stability of the power supply under all conditions of time,
temperature and other external disturbances. This will draw the line between designing a stable
power supply or an oscillator. Feedback, isolation, modeling, and compensation choices are
introduced in depth here.

**Magnetic component design and selection**

This is the next step to becoming an expert power designer. Many designers will just select
magnetics by consulting magnetics suppliers and their manuals for the closest fit to their design, or
they may use a reference design. Here is where the expert power designer departs from the casual
power designer. Mammano starts gently with the basics and works his way deeply into this “art”
which will determine a good vs. a great power supply design.

**Looking at a “real-world” power supply beyond the fundamentals**

Many reference schematics, application notes and white papers on power supply design are
relatively simplified and/or very specific in their treatment of the power supply due to time and
space constraints.

In Chapter 8 we enter the missing and seemingly generic components world with capacitors on the
input and output where many designers can get away with a set of typical capacitor value selections
that may fit most of their designs under most conditions----but not all conditions. This is where the
power supply design departs from the adequate to the fully reliable design under any and all
conditions.

Power Factor is discussed in depth along with Continuous-Conduction Mode (CCM), Transitional or
Critical Conduction Mode (CRM) control are outlined. Does anyone know what Interleaved Power
Factor is? Well, Chapter 8 will enlighten you.

The definition and advantages of Bridgeless PFC are also explained in detail if you want to squeeze
the maximum efficiency out of your design. Power supply start-up, Snubber Circuit design, switching
without the use of inductors (The charge pump is introduced).

All of these essential and seemingly small details will make the power supply a very robust design.

I saved all my Unitrode and TI power supply seminar manuals over the years in my bookshelf when I
was a designer, but I really wish that back then I had such a comprehensive source, that
summarized all of this essential design knowledge, when I sat down to design a power supply. Bob
Mammano and Texas Instruments has just given designers a very valuable book that will accelerate
their time-to-market with a robust and optimum system power design architecture.

*There will be a 20% off promo code “BOBSBOOK” valid through the month of April when purchased
through Amazon.com. Books should be available on Amazon some time during the week of March 27.*

**Also see:**

- Isolated power conversion: making the case for secondary-side control
- Book Review: Power Integrity