
Steve Taranovich - July 24, 2015

There are many good books and papers regarding wireless power out there in this fast-growing, relatively new industry (As a caffeine and smart phone addict, I am happy to say that Starbucks is already deploying Wireless Power in their coffee shops on all the tables).

What makes author Michael de Rooij’s technical handbook different than the others is that it is a treatment of one of the biggest challenges in this industry---Creating the optimal amplifier design for this architecture using the superior performance of gallium nitride power transistors and their power and frequency capabilities unlike any other single power element in the industry.

Although Efficient Power Conversion Corporation published this book only a few months ago, when I finally got around to reading it, I found it a must-read for anyone who is considering doing a wireless power design or even if you only want to add this knowledge to enhance your engineering expertise and capability.
As an added plus to the design architecture and theory, GaN Power elements are used in the designs because of their unique capability in both power and speed; both are needed in the design of a proper Wireless Power Transfer (WPT) system. This book will provide the guidance for designing an efficient amplifier for a wireless power transfer system so that a designer will have a most robust architectural design as well as an optimally performing system.

The author, Michael DeRooij, certainly has stellar credentials as well as excellent hands-on knowledge of this relatively new subject and architecture in electronics. DeRooij is Executive Director of Applications Engineering at Efficient Power Conversion Corporation (EPC). Prior to joining EPC, he worked at Windspire Energy and the GE Global Research Center. Dr. de Rooij received his Ph.D. from the Rand Afrikaans University and conducted postdoctoral studies on power electronic integration, packaging and a high frequency MOSFET Gate-driver at the Center for Power Electronic Systems (CPES) at Virginia Tech. He is a Senior Member of the IEEE and has authored over 25 publications, most recently co-authoring *GaN Transistors for Efficient Power Conversion*, of which this book is a supplement. He has been granted 21 US and International patents and 19 US and International pending patent applications.

I have witnessed many different wireless power designs in operation with many different types of architectures. Designing with highly resonant wireless power transfer using eGaN FETs, in my experience, will lead to efficient, convenient wireless power.

Designing a system with this technology poses many challenges to engineers. At the heart of highly resonant wireless power is the amplifier, which drives the coils that generate the magnetic field. The challenges a designer will face are design issues such as effects of changing load conditions and compliance with the many standards like radiated EMI regulations.

**Design aspects to develop a wireless power system**

DeRooij brings the reader the many design aspects needed to develop a well performing and robust wireless power transfer system. The topics he covers in this book include how to effectively compare component devices, such as eGaN FETs and MOSFETs, when used in an amplifier design. This comparison, complete with experimental verification, illustrates the superiority of eGaN FETs over MOSFETs.

The designer will need to wade through the alphabet-soup of three standards that have emerged in this industry which include: The Wireless Power Consortium’s (WPC) Qi standard; the Power Matters Alliance (PMA) and Alliance for Wireless Power (A4WP), also called Rezence®.
The Rezence standard is comprised of a highly-resonant approach which allows loosely-coupled transmission and reception between the source and the receiving coils. I like this technique because it fosters the capability to drive many amplifier topologies such as Class E, the well-known traditional Class D as well as current-mode Class D and also ZVS Class D. These are all designed, built, tested and compared in this book as a further aid to the designer in selecting the best amplifier topology for their system design.

De Rooij masterfully handles the “Convenience of use factor” regarding the wireless coil set. Challenges such as changes in distance between source and the device; alignment and position of the device on the source coil; multiple devices on a single coil and the all-important introduction of foreign objects of metal or magnetic composition into the field. Chapter 6 addresses these important criteria in great detail.

I especially like Chapter 7 which gives the designer the final practical touches that will get a viable and robust design to market. Such issues as radiated EMI, multi-mode systems and a method that will improve the ZVS Class D amplifier efficiency are discussed in detail.

Alex Lidow, Efficient Power Conversion CEO comments:

*Magnetic field technology may have caught up with the concept of wireless power, but the implementation poses many challenges to power system designers. Based upon experimental results, this handbook shows that the ZVS Class D topology, fitted with eGaN FETs, exhibited superior performance as compared to the other amplifiers.*

*Wireless Power Handbook: a Supplement to GaN Transistors for Efficient Power Conversion* is available for $39.95 and can be purchased from Digi-Key under the Publications tab.

So, if you are designing a Wireless Power Transfer System, or will be in the future, or even if you just want to gain this knowledge to enhance your design capabilities, I highly recommend this book for you to keep handy on your design shelf.

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