

## Power Electronics 3rd Edition Mohan

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*On the perspectives of SiC MOSFETs in high-frequency and high-power isolated DC/DC converters* CRC Press

Initially, the only electric loads encountered in an automobile were for lighting and the starter motor. Today, demands on performance, safety, emissions, comfort, convenience, entertainment, and communications have seen the working-in of seemingly innumerable advanced electronic devices. Consequently, vehicle electric systems require larger capacities and more complex configurations to deal with these demands. Covering applications in conventional, hybrid-electric, and electric vehicles, the Handbook of Automotive Power Electronics and Motor Drives provides a comprehensive reference for automotive electrical systems. This authoritative handbook features contributions from an outstanding international panel of experts from industry and academia, highlighting existing and emerging technologies. Divided into five parts, the Handbook of Automotive Power Electronics and Motor Drives offers an overview of automotive power systems, discusses semiconductor devices, sensors, and other components, explains different power electronic converters, examines electric machines and associated drives, and details various advanced electrical loads as well as battery technology for automobile applications. As we seek to answer the call for safer, more efficient, and lower-emission vehicles from regulators and consumer insistence on better performance, comfort, and entertainment, the technologies outlined in this book are vital for engineering advanced vehicles that will satisfy these criteria.

*Advanced Conversion Technologies, Second Edition* CRC Press

Fundamentals of Power Electronics, Third Edition, is an up-to-date and authoritative text and reference book on power electronics. This new edition retains the original objective and philosophy of focusing on the fundamental principles, models, and technical requirements needed for designing practical power electronic systems while adding a wealth of new material. Improved features of this new edition include: new material on switching loss mechanisms and their modeling; wide bandgap semiconductor devices; a more rigorous treatment of averaging; explanation of the Nyquist stability criterion;

incorporation of the Tan and Middlebrook model for current programmed control; a new chapter on digital control of switching converters; major new chapters on advanced techniques of design-oriented analysis including feedback and extra-element theorems; average current control; new material on input filter design; new treatment of averaged switch modeling, simulation, and indirect power; and sampling effects in DCM, CPM, and digital control. Fundamentals of Power Electronics, Third Edition, is intended for use in introductory power electronics courses and related fields for both senior undergraduates and first-year graduate students interested in converter circuits and electronics, control systems, and magnetic and power systems. It will also be an invaluable reference for professionals working in power electronics, power conversion, and analog and digital electronics. Includes an increased number of end of chapter problems; Updated and reorganized, including three completely new chapters; Includes key principles and a rigorous treatment of topics.

Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles CRC Press

Electronics: Basic, Analog, and Digital with PSpice does more than just make unsubstantiated assertions about electronics. Compared to most current textbooks on the subject, it pays significantly more attention to essential basic electronics and the underlying theory of semiconductors. In discussing electrical conduction in semiconductors, the author addresses the important but often ignored fundamental and unifying concept of electrochemical potential of current carriers, which is also an instructive link between semiconductor and ionic systems at a time when electrical engineering students are increasingly being exposed to biological systems. The text presents the background and tools necessary for at least a qualitative understanding of new and projected advances in microelectronics. The author provides helpful PSpice simulations and associated procedures (based on schematic capture, and using OrCAD® 16.0 Demo software), which are available for download. These simulations are explained in considerable detail and integrated throughout the book. The book also includes practical, real-world examples, problems, and other supplementary material, which helps to demystify concepts and relations that many books usually state as facts without offering at least some plausible explanation. With its focus on fundamental physical concepts and thorough exploration of the behavior of semiconductors, this book enables readers to better understand how electronic devices function and how they are used. The book's foreword briefly reviews the history of electronics and its impact in today's world. \*\*\*Classroom Presentations are provided on the CRC Press

website. Their inclusion eliminates the need for instructors to prepare lecture notes. The files can be modified as may be desired, projected in the classroom or lecture hall, and used as a basis for discussing the course material.\*\*\*

Handbook of Automotive Power Electronics and Motor Drives CRC Press

Designed for polytechnic and undergraduate students of electrical/electronics, this book offers short questions and answers at the end of chapters. It is also suitable for those preparing for professional courses like AMIE and AMITE.

Principles of Power Electronics Springer Science & Business Media

The subject of power electronics is concerned with solid state devices for the control and conversion of electrical power. These silicon devices are designed mainly for switching the transfer current from one part of an electrical circuit to another. Power electronics has a wide range of applications from the small systems used in electrical appliances to very large systems for the supply and distribution of electricity. Although it can be difficult to completely define where the boundary lies between electronics and power electronics, this resource succeeds at breaking down the discipline. Containing the useful concepts and building blocks that go into making a power converter operate successfully, this book provides a description of the characteristics of different types of power semiconductor devices and their application to power converter circuits. Applications to power transmission, electric drives, and medical equipment are included to illustrate the wide range of power electronics in both small and high power circuits.

Control in Power Electronics Pearson Education India

**STUDENT COMPANION SITE** Every new copy of Stuart Wentworth's Applied Electromagnetics comes with a registration code which allows access to the Student's Book Companion Site. On the BCS the student will find: \* Detailed Solutions to Odd-Numbered Problems in the text \* Detailed Solutions to all Drill Problems from the text \* MATLAB code for all the MATLAB examples in the text \* Additional MATLAB demonstrations with code. This includes a Transmission Lines simulator created by the author. \* Weblinks to a vast array of resources for the engineering student. Go to

[www.wiley.com/college/wentworth](http://www.wiley.com/college/wentworth) to link to Applied Electromagnetics and the Student Companion Site.

**ABOUT THE PHOTO** Passive RFID systems, consisting of readers and tags, are expected to replace bar codes as the primary means of identification, inventory and billing of everyday items. The tags typically consist of an RFID chip placed on a flexible film containing a planar antenna. The antenna captures radiation from the reader's signal to power the tag electronics, which then responds to the reader's query. The PENI Tag (Product Emitting Numbering Identification Tag) shown, developed by the University of Pittsburgh in a team led by Professor Marlin H. Mickle, integrates the antenna with the rest of the tag electronics. RFID systems involve many electromagnetics concepts, including antennas, radiation, transmission lines, and microwave circuit components. (Photo courtesy of Marlin H. Mickle.)

with Case Studies John Wiley & Sons

This original contributed volume combines the individual expertise of eleven world-renowned professionals to provide comprehensive, authoritative coverage of state-of-the-art power electronics and AC drive technology. Featuring an extensive introductory chapter by power-electronics expert Bimal K. Bose and more than 400 figures, **POWER ELECTRONICS AND VARIABLE FREQUENCY DRIVES** covers each of the field's component disciplines and drives--all in one complete resource. Broad in scope and unique in its presentation, this volume belongs on the bookshelf of every industry engineer, professor, graduate student, and researcher involved in this fast-growing multidisciplinary field. It is an essential for teaching, research, development, and design.

Power Electronics John Wiley & Sons

To be accredited, a power electronics course should cover a significant amount of design content and include

extensive use of computer-aided analysis with simulation tools such as SPICE. Based upon the authors' experience in designing such courses, **SPICE for Power Electronics and Electric Power**, Second Edition integrates a SPICE simulator with a po

converters, applications, and design Springer

This book serves as a tool for any engineer who wants to learn about circuits, electrical machines and drives, power electronics, and power systems basics. From time to time, engineers find they need to brush up on certain fundamentals within electrical engineering. This clear and concise book is the ideal learning tool for them to quickly learn the basics or develop an understanding of newer topics. **Fundamentals of Electric Power Engineering: From Electromagnetics to Power Systems** helps non-electrical engineers amass power system information quickly by imparting tools and trade tricks for remembering basic concepts and grasping new developments. Created to provide more in-depth knowledge of fundamentals—rather than a broad range of applications only—this comprehensive and up-to-date book: Covers topics such as circuits, electrical machines and drives, power electronics, and power system basics as well as new generation technologies. Allows non-electrical engineers to build their electrical knowledge quickly. Includes exercises with worked solutions to assist readers in grasping concepts found in the book. Contains “in-depth” side bars throughout which pique the reader's curiosity.

**Fundamentals of Electric Power Engineering** is an ideal refresher course for those involved in this interdisciplinary branch. For supplementary files for this book, please visit

<http://booksupport.wiley.com/>

Circuit Analysis and Design John Wiley & Sons

This book covers power electronics, in depth, by presenting the basic principles and application details, which can be used both as a textbook and reference book. Introduces a new method to present power electronics converters called Power Blocks Geometry (PBG). Applicable for courses focusing on power electronics, power electronics converters, and advanced power converters. Offers a comprehensive set of simulation results to help understand the circuits presented throughout the book.

PWM Converters Processing AC Voltages Institute of Electrical & Electronics Engineers (IEEE)

This book develops some methods and structures to improve the power inverters for different applications in a single-phase or three-phase output in recent years. The reduction of the switching devices and multilevel inverters as changing structure for the power inverters and PDM and PWM methods as changing control methods for the power inverter are studied in this book. Moreover, power inverters are developed to supply open-ended loads. Furthermore, the basic and advanced aspects of the electric drives that are control based are taught for induction motor (IM) based on power inverters suitable for both undergraduate and postgraduate levels. The main objective of this book is to provide the necessary background to improve and implement the high-performance inverters. Once the material in this book has been mastered, the reader will be able to apply these improvements in the power inverters to his or her problems for high-performance power inverters.

Power Electronics John Wiley & Sons

**Fundamentals of Power Electronics**, Second Edition, is an up-to-date and authoritative text and reference book on power electronics. This new edition retains the original objective and philosophy of focusing on the fundamental principles, models, and technical requirements needed for designing practical power electronic systems while adding a wealth of new material.

Improved features of this new edition include: A new chapter on input filters, showing how to design single and multiple section filters; Major revisions of material on averaged switch modeling, low-harmonic rectifiers, and the chapter on AC modeling of the discontinuous conduction mode; New material on soft switching, active-clamp snubbers, zero-voltage transition full-bridge converter, and auxiliary resonant commutated pole. Also, new sections on design of multiple-winding magnetic and resonant inverter design; Additional appendices on Computer Simulation of Converters using averaged switch modeling, and Middlebrook's Extra Element Theorem, including four tutorial examples; and Expanded treatment of current programmed control with complete results for basic converters, and much more. This edition includes many new examples, illustrations, and exercises to guide students and professionals through the intricacies of power electronics design. *Fundamentals of Power Electronics, Second Edition*, is intended for use in introductory power electronics courses and related fields for both senior undergraduates and first-year graduate students interested in converter circuits and electronics, control systems, and magnetic and power systems. It will also be an invaluable reference for professionals working in power electronics, power conversion, and analogue and digital electronics.

**Power Electronics** John Wiley & Sons

This book presents the latest cutting-edge technology in high-power converters and medium voltage drives, and provides a complete analysis of various converter topologies, modulation techniques, practical drive configurations, and advanced control schemes. Supplemented with more than 250 illustrations, the author illustrates key concepts with simulations and experiments. Practical problems, along with accompanying solutions, are presented to help you tackle real-world issues.

**Power Electronics and Energy Conversion Systems, Fundamentals and Hard-switching Converters** Wiley-IEEE Press

This textbook, designed for undergraduate students of electrical engineering, offers a comprehensive and accessible introduction to state-of-the-art power semiconductor devices and power electronic converters with an emphasis on design, analysis and realization of numerous types of systems. Each topic is discussed in sufficient depth to expose the fundamental principles, concepts, techniques, methods and circuits, necessary to thoroughly understand power electronic systems.

**Electric Powertrain** Springer Science & Business Media

The authors were originally brought together to share research and applications through the international Danfoss Professor Programme at Aalborg University in Denmark. Personal computers would be unwieldy and inefficient without power electronic dc supplies. Portable communication devices and computers would also be impractical. High-performance lighting systems, motor controls, and a wide range of industrial controls depend on power electronics. In the near future we can expect strong growth in automotive applications, dc power supplies for communication systems, portable applications, and high-end converters. We are approaching a time when all electrical energy will be processed and controlled through power electronics somewhere in the path from generation to end use. The most up-to-date information available is presented in the text Written by a world renowned leader in the field

**Power Electronics** BoD – Books on Demand

Author Ned Mohan has been a leader in EES education and research for decades. His three-book series on Power Electronics focuses on three essential topics in the power sequence based on applications relevant to this age of sustainable energy such as wind turbines and hybrid electric vehicles. The three topics include power electronics, power systems and electric machines. Key features in the first Edition build on Mohan's successful MNPERE texts; his systems approach which puts dry technical detail in the context of applications; and substantial pedagogical support including PPT's, video clips, animations, clicker questions and a lab manual. It follows a top-down systems-level approach to power electronics to highlight interrelationships between these sub-fields. It's intended to cover fundamental and practical design. This book also follows a building-block approach to power electronics that allows an in-depth discussion of several important topics that are usually left. Topics are carefully sequenced to maintain continuity and interest.

**Fundamentals of Electric Power Engineering** Universit ä tsverlag der TU Berlin

Modern power electronic converters are involved in a very broad spectrum of applications: switched-mode power supplies, electrical-machine-motion-control, active power filters, distributed power generation, flexible AC transmission systems, renewable energy conversion systems and vehicular technology, among them. *Power Electronics Converters Modeling and Control* teaches the reader how to analyze and model the behavior of converters and so to improve their design and control. Dealing with a set of confirmed algorithms specifically developed for use with power converters, this text is in two parts: models and control methods. The first is a detailed exposition of the most usual power converter models: · switched and averaged models; · small/large-signal models; and · time/frequency models. The second focuses on three groups of control methods: · linear control approaches normally associated with power converters; · resonant controllers because of their significance in grid-connected applications; and · nonlinear control methods including feedback linearization, stabilizing, passivity-based, and variable-structure control. Extensive case-study illustration and end-of-chapter exercises reinforce the study material. *Power Electronics Converters Modeling and Control* addresses the needs of graduate students interested in power electronics, providing a balanced understanding of theoretical ideas coupled with pragmatic tools based on control engineering practice in the field. Academics teaching power electronics will find this an attractive course text and the practical points make the book useful for self tuition by engineers and other practitioners wishing to bring their knowledge up to date.

**Power Electronics** Artech House

Market\_Desc: · Electrical Engineering Students · Electrical Engineering Instructors · Power Electronics Engineers Special Features: · Easy to follow step-by-step in depth treatment of all the theory. · Computer simulation chapter describes the role of computer simulations in power electronics. Examples and problems based on Pspice and MATLAB are included. · Introductory chapter offers a review of basic electrical and magnetic circuit concepts. · A new CD-ROM contains the following: · Over 100 of new problems of varying degrees of difficulty for homework assignments and self-learning. · PSpice-based simulation examples, which illustrate basic concepts and help in design of converters. · A newly-developed magnetic component

design program that demonstrates design trade-offs. • PowerPoint-based slides, which will improve the learning experience and the ease of using the book About The Book: The text includes cohesive presentation of power electronics fundamentals for applications and design in the power range of 500 kW or less. It describes a variety of practical and emerging power electronic converters made feasible by the new generation of power semiconductor devices. Topics included in this book are an expanded discussion of diode rectifiers and thyristor converters as well as chapters on heat sinks, magnetic components which present a step-by-step design approach and a computer simulation of power electronics which introduces numerical techniques and commonly used simulation packages such as PSpice, MATLAB and EMTP.

A Tutorial Guide John Wiley & Sons

The why, what and how of the electric vehicle powertrain Empowers engineering professionals and students with the knowledge and skills required to engineer electric vehicle powertrain architectures, energy storage systems, power electronics converters and electric drives. The modern electric powertrain is relatively new for the automotive industry, and engineers are challenged with designing affordable, efficient and high-performance electric powertrains as the industry undergoes a technological evolution. Co-authored by two electric vehicle (EV) engineers with decades of experience designing and putting into production all of the powertrain technologies presented, this book provides readers with the hands-on knowledge, skills and expertise they need to rise to that challenge. This four-part practical guide provides a comprehensive review of battery, hybrid and fuel cell EV systems and the associated energy sources, power electronics, machines, and drives. The first part of the book begins with a historical overview of electromobility and the related environmental impacts motivating the development of the electric powertrain. Vehicular requirements for electromechanical propulsion are then presented. Battery electric vehicles (BEV), fuel cell electric vehicles (FCEV), and conventional and hybrid electric vehicles (HEV) are then described, contrasted and compared for vehicle propulsion. The second part of the book features in-depth analysis of the electric powertrain traction machines, with a particular focus on the induction machine and the surface- and interior-permanent magnet ac machines. The brushed dc machine is also considered due to its ease of operation and understanding, and its historical place, especially as the traction machine on NASA's Mars rovers. The third part of the book features the theory and applications for the propulsion, charging, accessory, and auxiliary power electronics converters. Chapters are presented on isolated and non-isolated dc-dc converters, traction inverters, and battery charging. The fourth part presents the introductory and applied electromagnetism required as a foundation throughout the book.

- Introduces and holistically integrates the key EV powertrain technologies.
- Provides a comprehensive overview of existing and emerging automotive solutions.
- Provides experience-based expertise for vehicular and powertrain system and sub-system level study, design, and optimization.
- Presents many examples of powertrain technologies from leading manufacturers.
- Discusses the dc traction machines of the Mars rovers, the ultimate EVs from NASA.
- Investigates the environmental motivating factors and impacts of electromobility.
- Presents a structured university teaching stream from introductory undergraduate to postgraduate.
- Includes real-world problems and assignments of use to design engineers, researchers, and students alike.
- Features a companion website with numerous references, problems, solutions, and practical assignments.
- Includes introductory material throughout the book for the general scientific reader.
- Contains essential reading for government regulators and policy makers.

Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles is an important professional resource for practitioners and researchers in the battery, hybrid, and fuel cell EV transportation industry. The book is a structured holistic textbook for the teaching of the fundamental theories and applications

of energy sources, power electronics, and electric machines and drives to engineering undergraduate and postgraduate students. Textbook Structure and Suggested Teaching Curriculum This is primarily an engineering textbook covering the automotive Emerging Capabilities and Applications of Wireless Power Transfer Artech House

Increasing demand for efficiency and power density pushes Si-based devices to some of their inherent material limits, including those related to temperature operation, switching frequency, and blocking voltage. Recently, SiC-based power devices are promising candidates for high-power and high-frequency switching applications. Today, SiC MOSFETs are commercially available from several manufacturers. Although technology affiliated with SiC MOSFETs is improving rapidly, many challenges remain, and some of them are investigated in this work. The research work in this dissertation is divided into the three following parts. Firstly, the static and switching characteristics of the state-of-the-art 1.2 kV planar and double-trench SiC MOSFETs from two different manufacturers are evaluated. The effects of different biasing voltages, DC link voltages, and temperatures are analysed. The characterisation results show that the devices exhibit superior switching performances under different operating conditions. Moreover, several aspects of using the SiC MOSFET's body diode in a DC/DC converter are investigated, comparing the body-diodes of planar and double-trench devices. Reverse recovery is evaluated in switching tests considering the case temperature, switching rate, forward current, and applied voltage. Based on the measurement results, the junction temperature is estimated to guarantee safe operation. A simple electro-thermal model is proposed in order to estimate the maximum allowed switching frequency based on the thermal design of the SiC devices. Using these results, hard- and soft-switching converters are designed, and devices are characterised as being in continuous operation at a very high switching frequency of 1 MHz. Thereafter, the SiC MOSFETs are operated in a continuous mode in a 10 kW / 100-250 kHz buck converter, comparing synchronous rectification, the use of the body diode, and the use of an external Schottky diode. Further, the parallel operation of the planar devices is considered. Thus, the paralleling of SiC MOSFETs is investigated before comparing the devices in continuous converter operation. In this regard, the impact of the most common mismatch parameters on the static and dynamic current sharing of the transistors is evaluated, showing that paralleling of SiC MOSFETs is feasible. Subsequently, an analytical model of SiC MOSFETs for switching loss optimisation is proposed. The analytical model exhibits relatively close agreement with measurement results under different test conditions. The proposed model tracks the oscillation effectively during both turn-on and – off transitions. This has been achieved by considering the influence of the most crucial parasitic elements in both power and gate loops. In the second part, a comprehensive short-circuit ruggedness evaluation focusing on different failure modes of the planar and double-trench SiC devices is presented. The effects of different biasing voltages, DC link voltages, and gate resistances are evaluated. Additionally, the temperature-dependence of the short-circuit capability is evaluated, and the associated failure modes are analysed. Subsequently, the design and test of two different methods for overcurrent protection are proposed. The desaturation technique is applied to the SiC MOSFETs and compared to a second method that depends on the stray inductance of the devices. Finally, the benefits of using SiC devices in continuous high-frequency, high-power DC/DC converters is experimentally evaluated. In this

regard, a design optimisation of a high-frequency transformer is introduced, and the impact of different core materials, conductor designs, and winding arrangements are evaluated. A ZVZCS Phase-Shift Full-Bridge unidirectional DC/DC converter is proposed, using only the parasitic leakage inductance of the transformer. Experimental results for a 10 kW, (100-250) kHz prototype indicate an efficiency of up to 98.1% for the whole converter. Furthermore, an optimized control method is proposed to minimise the circulation current in the isolated bidirectional dual active bridge DC/DC converter, based on a modified dual-phase-shift control method. This control method is also experimentally compared with traditional single-phase shift control, yielding a significant improvement in efficiency. The experimental results confirm the theoretical analysis and show that the proposed control can enhance the overall converter efficiency and expand the ZVZCS range. Die steigende Nachfrage nach Effizienz und Leistungsdichte bringt Si-basierte Leistungsbaueteile an einige inh ä rente Materialgrenzen, die unter anderem mit der Temperaturbelastung, der Schaltfrequenz und der Blockierspannung in Zusammenhang stehen. In j ü ngster Zeit sind SiC-basierte Leistungsbaueteile vielversprechende Kandidaten f ü r Hochleistungs- und Hochfrequenzanwendungen. Aktuell sind SiC-MOSFETs von mehreren Herstellern im Handel erh ä ltlich. Obwohl sich die Technologie der SiC-MOSFETs rasch verbessert, werden viele Herausforderungen bestehen bleiben. Einige dieser Herausforderungen werden in dieser Arbeit untersucht. Die Untersuchungen in dieser Dissertation gliedern sich in die drei folgenden Teile: Im ersten Teil erfolgt, die statische und die transiente Charakterisierung der aktuellen 1,2 kV Planar und Doubletrench SiC-MOSFETs verschiedener Hersteller. Die Auswirkungen unterschiedlicher Gatespannungen, Zwischenkreisspannungen und Temperaturen werden analysiert. Die Ergebnisse der Charakterisierung zeigen, dass die Bauteile ü berlegene Schaltleistungen unter verschiedenen Betriebsbedingungen aufweisen. Dar ü ber hinaus wird der Einsatz der internen SiC-Bodydioden in einem DC/DC-Wandler untersucht, wobei die Unterschiede zwischen Planar- und Doppeltrench-Bauteilen aufgezeigt werden. Das Reverse-Recovery-Verhalten wird unter Ber ü cksichtigung der Geh ä usetemperatur, der Schaltgeschwindigkeit, des Durchlassstroms und der angelegten Spannung bewertet. Anhand der Messergebnisse wird die Sperrschichttemperatur gesch ä tzt, damit ein sicherer Betrieb gew ä hrleistet ist. Ein einfaches elektrothermisches Modell wird vorgestellt, um die maximal zul ä ssige Schaltfrequenz auf der Grundlage des thermischen Designs der SiC-Bauteile abzusch ä tzen. Anhand dieser Ergebnisse werden hart- und weichschaltende Umrichter konzipiert und die Bauteile werden im Dauerbetrieb mit einer sehr hohen Schaltfrequenz von 1 MHz untersucht. Danach werden die SiC-MOSFETs im Dauerbetrieb in einem 10 kW / 100-250 kHz-Tiefsetzsteller betrieben. Dabei wird die Synchrongleichrichtung, die Verwendung der internen Diode und die Verwendung einer externen Schottky-Diode verglichen. Au ß erdem wird die Parallelisierung von SiC-MOSFETs untersucht, bevor die Parallelschaltung der verschiedenen Bauelemente ebenso im kontinuierlichen Konverterbetrieb verglichen wird. Es wird der Einfluss der h ä ufigsten Parametervariationen auf die statische und dynamische Stromaufteilung der Transistoren analysiert, was zeigt, dass eine Parallelisierung von SiC-MOSFETs m ö glich ist. Anschlie ß end wird ein analytisches Modell der SiC-MOSFETs zur Schaltverlustoptimierung vorgeschlagen. Das analytische Modell zeigt eine relativ enge Ü bereinstimmung mit den Messergebnissen unter verschiedenen Testbedingungen. Das

vorgeschlagene Modell bildet die Schwingungen sowohl beim Ein- als auch beim Ausschalten effektiv nach. Dies wurde durch die Ber ü cksichtigung der wichtigsten parasit ä ren Elemente in Strom- und Gatekreisen erreicht. Im zweiten Teil wird eine umfassende Bewertung der Kurzschlussfestigkeit mit Fokus auf verschiedene Ausfallmodi der planaren und double-trench SiC-Bauelemente vorgestellt. Die Auswirkungen unterschiedlicher Gatespannungen, Zwischenkreisspannungen und Gate-Widerst ä nde werden ausgewertet. Zus ä tzlich wird die temperaturabh ä ngige Kurzschlussf ä higkeit ausgewertet und die zugeh ö rigen Fehlerf ä lle werden analysiert. Anschlie ß end wird die Auslegung und Pr ü fung von zwei verschiedenen Verfahren zum Überstromschutz evaluiert. Die „ Desaturation “ -Technik wird auf SiC-MOSFETs angewendet und mit einer zweiten Methode verglichen, welche die parasit ä re Induktivit ä t der Bauelemente nutzt. Schlie ß lich wird der Nutzen des Einsatzes von SiC-Bauteilen in kontinuierlichen Hochfrequenz-Hochleistungs-DC/DC-Wandlern experimentell untersucht. In diesem Zusammenhang wird eine Designoptimierung eines Hochfrequenztransformators vorgestellt und der Einfluss verschiedener Kernmaterialien, Leiterausf ü hrungen und Wicklungsanordnungen wird bewertet. Es wird ein unidirektionaler ZVZCS Vollbr ü cken-DC/DC-Wandler vorgestellt, der nur die parasit ä re Streuinduktivit ä t des Transformators verwendet. Experimentelle Ergebnisse f ü r einen 10 kW, (100-250) kHz Prototyp zeigen einen Wirkungsgrad von bis zu 98,1% f ü r den gesamten Umrichter. Abschlie ß end wird ein optimiertes Regelverfahren verwendet, welches auf einem modifizierten Dual-Phase-Shift-Regelverfahren basiert, um den Kreisstrom im isolierten bidirektionalen Dual-Aktiv-Br ü cken-DC/DC-Wandler zu minimieren. Diese Regelmethode wird experimentell mit der herk ö mmlichen Single-Phase-Shift-Regelung verglichen. Hierbei zeigt sich eine deutliche Effizienzsteigerung durch die neue Regelmethode. Die experimentellen Ergebnisse best ä tigen die theoretische Analyse und zeigen, dass die vorgeschlagene Regelung den Gesamtwirkungsgrad des Umrichters erh ö hen und den ZVZCS-Bereich erweitern kann.