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High-Power Converters and AC Drives Emerging Power Converters for Renewable Energy and Electric Vehicles High-Power Converters and AC Drives Phase Converters for Operation of Three-phase Motors from Single-phase Power Compact, Low-Profile Power Converters New Current Sensing Solutions for Low-cost High-power-density Digitally Controlled Power Converters Model Predictive Control of Wind Energy Conversion Systems Switch-Mode Power Converters Power Electronic Converters Modeling and Control Control of Power Electronic Converters with Microgrid Applications Design and Control of Power Converters 2020 Grid-Side Converters Control and Design Encyclopedia of Sustainable Technologies 100kW Energy Transfer Multiplexer Power Converter Prototype Development Project American Manufacturer and Trade of the West Advances in Manufacturing Technology and Management Modern DC-to-DC Switchmode Power Converter Circuits Advanced Multilevel Converters and Applications in Grid Integration Self-Commutating Converters for High Power Applications Electric Power Conversion North American Industry Classification System (NAICS) Reprint United States 2017 Edition Electrical

Manufacturing Large Scale Optimization in Supply Chains and Smart Manufacturing Power Converters and AC Electrical Drives with Linear Neural Networks Canadian Manufacturer On the perspectives of SiC MOSFETs in high-frequency and high-power isolated DC/DC converters Advancement in Materials, Manufacturing and Energy Engineering, Vol. I Model Predictive Control for Doubly-Fed Induction Generators and Three-Phase Power Converters Manufacturers' Record Power Electronic Converters for Microgrids Advancement in Materials, Manufacturing and Energy Engineering, Vol. II Farm Implement News Buyer's Guide ABC of Iron and Steel Power Converter Circuits Modeling and Control of Static Converters for Hybrid Storage Systems Hearings Advances in Battery Manufacturing, Service, and Management Systems Thomas Register of American Manufacturers Power Electronic Converter Harmonics Pulse Width Modulation for Power Converters

Switch-Mode Power Converters Jul 13 2022 Switch-Mode Power Converters introduces an innovative, highly analytical approach to symbolic, closed-form solutions for switched-mode power converter circuits. This is a highly relevant topic to power electronics students and professionals who are involved in the design and analysis of electrical power converters. The author uses extensive equations to explain how solid-state switches convert electrical voltages from one level to another, so that electronic devices (e.g., audio speakers, CD players, DVD players, etc.) can use different voltages more effectively to perform their various functions. Most existing

comparable books published as recently as 2002 do not discuss closed-loop operations, nor do they provide either DC closed-loop regulation equations or AC loop gain (stability) formulae. The author Wu, a leading engineer at Lockheed Martin, fills this gap and provides among the first descriptions of how error amplifiers are designed in conjunction with closed-loop bandwidth selection. BENEFIT TO THE READER: Readers will gain a mathematically rigorous introduction to numerous, closed-form solutions that are readily applicable to the design and development of various switch-mode power converters. Provides symbolic, closed-form solutions for DC and AC studies Provides techniques for expressing close-loop operation Gives readers the ability to perform closed-loop regulation and sensitivity studies Gives readers the ability to design error amplifiers with precision Employs the concept of the continuity of states in matrix form Gives accelerated time-domain, steady-state studies using Laplace transform Gives accelerated time-domain studies using state transition Extensive use of matrix, linear algebra, implicit functions, and Jacobian determinants Enables the determination of power stage gain that otherwise could not be obtained

High-Power Converters and AC Drives Feb 20 2023 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.

100kW Energy Transfer Multiplexer Power Converter Prototype Development Project Jan 07 2022 Project Final Report for "100kW Energy Transfer Multiplexer Power Converter Prototype Development Project" prepared under DOE grant number DE-FG36-03GO13138. This project relates to the further development and prototype construction/evaluation for the Energy Transfer Multiplexer (ETM) power converter topology concept. The ETM uses a series resonant link to transfer energy from any phase of a multiphase input to any phase of a multiphase output, converting any input voltage and frequency to any output voltage and frequency. The basic form of the ETM converter consists of an eight (8)-switch matrix (six phase power switches and two ground power switches) and a series L-C resonant circuit. Electronic control of the switches allows energy to be transferred in the proper amount from any phase to any other phase. Depending upon the final circuit application, the switches may be either SCRs or IGBTs. The inherent characteristics of the ETM converter include the following: Power processing in either direction (bidirectional); Large voltage gain without the need of low frequency magnetics; High efficiency independent of output load and frequency; Wide bandwidth with fast transient response and; Operation as a current source. The ETM is able to synthesize true sinusoidal waveforms with low harmonic distortions. For a low power PM wind generation system, the ETM has the following

characteristics and advantages: It provides voltage gain without the need of low frequency magnetics (DC inductors) and; It has constant high efficiency independent of the load. The ETM converter can be implemented into a PM wind power system with smaller size, reduced weight and lower cost. As a result of our analyses, the ETM offers wind power generation technology for the reduction of the cost and size as well as the increase in performance of low power, low wind speed power generation. This project is the further theoretical/analytical exploration of the ETM converter concept in relationship to PM wind power generator applications in the 100kW and under power range. The theoretical/analytical and bench scale work focuses on simplifying the basic ETM converter topology (in terms of parts count and complexity) for the specific application of the low power PM system. The project goals and objectives were for Spellman HV will develop a 100kW prototype ETM power converter based on paralleled lower ratings converters. The proposed configuration of this prototype is a 100kW rated converter comprised of four (4) 34kW rated modules connected in parallel (the fourth converter is included to demonstrate N+1 fault tolerance). This approach is more viable as there is lower technological risk involved in developing a 34kW-rated converter than a single 100kW unit. The modular system approach should have a lower deployment and service cost over a single unit system, because of the economics of scale (smaller units at a higher volume means lower manufacturing cost) and because of improved serviceability (a non-redundant power system with

one failed module will still operate at a lower power level). There is also the added benefit that greater commercial application and acceptance should be achieved by having a modular system available in which fault tolerance (N+1 or 2N) is a feature. This modular approach would allow the output power to be increased by adding more paralleled converters. Thus, the maximum output power of the overall power system is a function of the interconnection medium (the hot swap connection subsystem), rather than the ratings of a single module. The project was implemented with Spellman HV acting as the program management and production assembly and test facility; The Baker Company acting as a technical consultant and resource when required; and dtm Associates acting as the design/development resource for the hardware development of the 100kW ETM converter prototype.

Design and Control of Power Converters 2020 Apr 10 2022 In this book, nine papers focusing on different fields of power electronics are gathered, all of which are in line with the present trends in research and industry. Given the generality of the Special Issue, the covered topics range from electrothermal models and losses models in semiconductors and magnetics to converters used in high-power applications. In this last case, the papers address specific problems such as the distortion due to zero-current detection or fault investigation using the fast Fourier transform, all being focused on analyzing the topologies of high-power high-density applications, such as the dual active bridge or the H-bridge multilevel inverter. All the papers provide enough insight in the analyzed issues

to be used as the starting point of any research. Experimental or simulation results are presented to validate and help with the understanding of the proposed ideas. To summarize, this book will help the reader to solve specific problems in industrial equipment or to increase their knowledge in specific fields. High-Power Converters and AC Drives Dec 18 2022 A comprehensive reference of the latest developments in MV drive technology in the area of power converter topologies This new edition reflects the recent technological advancements in the MV drive industry, such as advanced multilevel converters and drive configurations. It includes three new chapters, Control of Synchronous Motor Drives, Transformerless MV Drives, and Matrix Converter Fed Drives. In addition, there are extensively revised chapters on Multilevel Voltage Source Inverters and Voltage Source Inverter-Fed Drives. This book includes a systematic analysis on a variety of high-power multilevel converters, illustrates important concepts with simulations and experiments, introduces various megawatt drives produced by world leading drive manufacturers, and addresses practical problems and their mitigations methods. This new edition: Provides an in-depth discussion and analysis of various control schemes for the MV synchronous motor drives Examines new technologies developed to eliminate the isolation transformer in the MV drives Discusses the operating principle and modulation schemes of matrix converter (MC) topology and multi-module cascaded matrix converters (CMCs) for MV drives, and their application in commercial MV drives Bin Wu is a Professor and Senior

NSERC/Rockwell Automation Industrial Research Chair in Power Electronics and Electric Drives at Ryerson University, Canada. He is a fellow of Institute of Electrical and Electronics Engineers (IEEE), Engineering Institute of Canada (EIC), and Canadian Academy of Engineering (CAE). Dr. Wu has published more than 400 papers and holds more than 30 granted/pending US/European patents. He co-authored several books including Power Conversion and Control of Wind Energy Systems and Model Predictive Control of Wind Energy Conversion Systems (both by Wiley-IEEE Press). Mehdi Narimani is a Postdoctoral Research Associate with the Department of Electrical and computer Engineering at Ryerson University, Canada, and Rockwell Automation Canada. He is a senior member of IEEE. Dr. Narimani is author/co-author of more than 50 technical papers and four US/European patents (issued/pending review). His current research interests include power conversion, high power converters, control of power electronics, and renewable energy systems.

Pulse Width Modulation for Power Converters Oct 12 2019 * The first single volume resource for researchers in the field who previously had to depend on separate papers and conference records to attain a working knowledge of the subject. * Brings together the field's diverse approaches into an integrated and comprehensive theory of PWM

Hearings Feb 14 2020

Grid-Side Converters Control and Design Mar 09 2022 This textbook is intended for engineering students taking courses in power electronics, renewable energy sources, smart grids or static

power converters. It is also appropriate for students preparing a capstone project where they need to understand, model, supply, control and specify the grid side power converters. The main goal of the book is developing in students the skills that are required to design, control and use static power converters that serve as an interface between the ac grid and renewable power sources. The same skills can be used to design, control and use the static power converters used within the micro-grids and nano-grids, as the converters that provide the interface between such grids and the external grid. The author's approach starts with basic functionality and the role of grid connected power converters in their typical applications, and their static and dynamic characteristics. Particular effort is dedicated to developing simple, concise, intuitive and easy-to-use mathematical models that summarize the essence of the grid side converter dynamics. Mathematics is reduced to a necessary minimum, solved examples are used extensively to introduce new concepts, and exercises are used to test mastery of new skills.

Self-Commutating Converters for High Power Applications Aug 02 2021 For very high voltage or very high current applications, the power industry still relies on thyristor-based Line Commutated Conversion (LCC), which limits the power controllability to two quadrant operation. However, the ratings of self-commutating switches such as the Insulated-Gate Bipolar Transistor (IGBT) and Integrated Gate-Commutated Thyristor (IGCT), are reaching levels that make the technology possible for very high power applications. This unique book reviews the present state and future

prospects of self-commutating static power converters for applications requiring either ultra high voltages (over 600 kV) or ultra high currents (in hundreds of kA). It is an important reference for electrical engineers working in the areas of power generation, transmission and distribution, utilities, manufacturing and consulting organizations. All topics in this area are held in this one complete volume. Within these pages, expect to find thorough coverage on: modelling and control of converter dynamics; multi-level Voltage Source Conversion (VSC) and Current Source Conversion (CSC); ultra high-voltage VSC and CSC DC transmission; low voltage high DC current AC-DC conversion; industrial high current applications; power conversion for high energy storage. This text has a host of helpful material that also makes it a useful source of knowledge for final year engineering students specializing in power engineering, and those involved in postgraduate research.

Canadian Manufacturer Jan 27 2021

Model Predictive Control of Wind Energy Conversion Systems Aug 14 2022 Model Predictive Control of Wind Energy Conversion Systems addresses the predicative control strategy that has emerged as a promising digital control tool within the field of power electronics, variable-speed motor drives, and energy conversion systems. The authors provide a comprehensive analysis on the model predictive control of power converters employed in a wide variety of variable-speed wind energy conversion systems (WECS). The contents of this book includes an overview of wind energy system configurations, power converters for variable-speed WECS, digital control techniques,

MPC, modeling of power converters and wind generators for MPC design. Other topics include the mapping of continuous-time models to discrete-time models by various exact, approximate, and quasi-exact discretization methods, modeling and control of wind turbine grid-side two-level and multilevel voltage source converters. The authors also focus on the MPC of several power converter configurations for full variable-speed permanent magnet synchronous generator based WECS, squirrel-cage induction generator based WECS, and semi-variable-speed doubly fed induction generator based WECS. Furthermore, this book: Analyzes a wide variety of practical WECS, illustrating important concepts with case studies, simulations, and experimental results Provides a step-by-step design procedure for the development of predictive control schemes for various WECS configurations Describes continuous- and discrete-time modeling of wind generators and power converters, weighting factor selection, discretization methods, and extrapolation techniques Presents useful material for other power electronic applications such as variable-speed motor drives, power quality conditioners, electric vehicles, photovoltaic energy systems, distributed generation, and high-voltage direct current transmission. Explores S-Function Builder programming in MATLAB environment to implement various MPC strategies through the companion website Reflecting the latest technologies in the field, Model Predictive Control of Wind Energy Conversion Systems is a valuable reference for academic researchers, practicing engineers, and

other professionals. It can also be used as a textbook for graduate-level and advanced undergraduate courses.

Emerging Power Converters for Renewable Energy and Electric Vehicles Jan 19 2023 This book covers advancements of power electronic converters and their control techniques for grid integration of large-scale renewable energy sources and electrical vehicles. Major emphasis are on transformer-less direct grid integration, bidirectional power transfer, compensation of grid power quality issues, DC system protection and grounding, interaction in mixed AC/DC system, AC and DC system stability, magnetic design for high-frequency high power density systems with advanced soft magnetic materials, modelling and simulation of mixed AC/DC system, switching strategies for enhanced efficiency, and protection and reliability for sustainable grid integration. This book is an invaluable resource for professionals active in the field of renewable energy and power conversion.

Compact, Low-Profile Power Converters Oct 16 2022 ADEPT Project: Georgia Tech is creating compact, low-profile power adapters and power bricks using materials and tools adapted from other industries and from grid-scale power applications. Adapters and bricks convert electrical energy into useable power for many types of electronic devices, including laptop computers and mobile phones. These converters are often called wall warts because they are big, bulky, and sometimes cover up an adjacent wall socket that could be used to power another electronic device. The magnetic components traditionally used to make adapters and bricks have reached their limits; they can't be made any

smaller without sacrificing performance. Georgia Tech is taking a cue from grid-scale power converters that use iron alloys as magnetic cores. These low-cost alloys can handle more power than other materials, but the iron must be stacked in insulated plates to maximize energy efficiency. In order to create compact, low-profile power adapters and bricks, these stacked iron plates must be extremely thin-only hundreds of nanometers in thickness, in fact. To make plates this thin, Georgia Tech is using manufacturing tools used in microelectromechanics and other small-scale industries.

Advances in Battery Manufacturing, Service, and Management Systems Jan 15 2020 Addresses the methodology and theoretical foundation of battery manufacturing, service and management systems (BM2S2), and discusses the issues and challenges in these areas This book brings together experts in the field to highlight the cutting edge research advances in BM2S2 and to promote an innovative integrated research framework responding to the challenges. There are three major parts included in this book: manufacturing, service, and management. The first part focuses on battery manufacturing systems, including modeling, analysis, design and control, as well as economic and risk analyses. The second part focuses on information technology's impact on service systems, such as data-driven reliability modeling, failure prognosis, and service decision making methodologies for battery services. The third part addresses battery management systems (BMS) for control and optimization of battery cells, operations, and hybrid storage

systems to ensure overall performance and safety, as well as EV management. The contributors consist of experts from universities, industry research centers, and government agency. In addition, this book: Provides comprehensive overviews of lithium-ion battery and battery electrical vehicle manufacturing, as well as economic returns and government support Introduces integrated models for quality propagation and productivity improvement, as well as indicators for bottleneck identification and mitigation in battery manufacturing Covers models and diagnosis algorithms for battery SOC and SOH estimation, data-driven prognosis algorithms for predicting the remaining useful life (RUL) of battery SOC and SOH Presents mathematical models and novel structure of battery equalizers in battery management systems (BMS) Reviews the state of the art of battery, supercapacitor, and battery-supercapacitor hybrid energy storage systems (HESSs) for advanced electric vehicle applications Advances in Battery Manufacturing, Services, and Management Systems is written for researchers and engineers working on battery manufacturing, service, operations, logistics, and management. It can also serve as a reference for senior undergraduate and graduate students interested in BM2S2.

Manufacturers' Record Sep 22 2020

Modern DC-to-DC Switchmode Power Converter Circuits Oct 04 2021 As each area of technology with a potential for significantly impacting any major segment of the electronics industry evolves, it often is accompanied by the development of a succession of new circuits. Each new circuit indeed

appears different, employing different components in differing configurations, and claims an assortment of distinct features of "improved performance. " Without a considerable investment of laboratory time to construct, evaluate, and compare each candidate circuit, it usually is difficult to realistically appraise the relative merits of one approach over another. It often is even more difficult to identify the underlying principles which point up basic similarities and differences. Such is the situation in the new and rapidly expanding area known as electronic power processing or switching mode power supplies. The area of switching power supplies has been spurred by the need for power sources of higher performance, smaller volume, and lighter weight in order to achieve compatibility with the shrinking size of all forms of communication and data handling systems, and particularly with the portable battery-operated equipment in everything from horne appliances and handtools to mobile com munication equipment. Static dc-to-dc converters and dc-to-ac inverters provide a natural interface with the new direct energy sources such as solar cells, fuel cells, thermoelectric generators, and the like, and form the central ingredient in most uninterruptable power sources.

Large Scale Optimization in Supply Chains and Smart Manufacturing Mar 29 2021 In this book, theory of large scale optimization is introduced with case studies of real-world problems and applications of structured mathematical modeling. The large scale optimization methods are represented by various theories such as Benders' decomposition, logic-based Benders' decomposition,

Lagrangian relaxation, Dantzig –Wolfe decomposition, multi-tree decomposition, Van Roy' cross decomposition and parallel decomposition for mathematical programs such as mixed integer nonlinear programming and stochastic programming. Case studies of large scale optimization in supply chain management, smart manufacturing, and Industry 4.0 are investigated with efficient implementation for real-time solutions. The features of case studies cover a wide range of fields including the Internet of things, advanced transportation systems, energy management, supply chain networks, service systems, operations management, risk management, and financial and sales management. Instructors, graduate students, researchers, and practitioners, would benefit from this book finding the applicability of large scale optimization in asynchronous parallel optimization, real-time distributed network, and optimizing the knowledge-based expert system for convex and non-convex problems.

Electrical Manufacturing Apr 29 2021

Power Electronic Converter Harmonics Nov 12 2019 Electrical Engineering/Power and Energy Engineering Power Electronic Converter Harmonics Multipulse Methods for Clean Power "An excellent treatment of the subject." --Allan Ludbrook, Ludbrook & Associates "Pulls all the material together and presents it from the viewpoint of a long-time practitioner in the field . will be much appreciated by designers, the utilities, and users." --Thomas Barton, University of Calgary Stay on the cutting edge of applied power electronics for energy-saving systems with this invaluable guide to multipulse

converters, power sources, and the IEEE Industry Standard 519. One of the foremost experts in the field and holder of 28 patents, Derek A. Paice brings you new circuit schematics and easy-to-follow methods for practical system analysis, using actual field test results. This book offers thorough coverage of: * Requirements, calculations, and standards for harmonics * Power source representation * Multipulse methods and transformers * Double-wound, auto-wound, interphase, and current-control transformers * Multiphase circuit performance * Practical applications * Useful formulas for analysis Power Electronic Converter Harmonics will be indispensable to anyone looking for optimum concepts for power electronics design, including applications engineers, consultants, and manufacturers. Also of Interest from IEEE Press. Printed Circuit Board Design Techniques for EMC Compliance Mark I. Montrose 1996 Hardcover 256 pp IEEE Order No. PC5595 ISBN 0-7803-1131-0 electromagnetic Compatibility in Power Electronics Laszlo Tihanyi 1995 Hardcover 416 pp IEEE Order No. PC3129 ISBN 0-7803-0416-0 Handbook of Electrical and Electronic Insulating Materials Second Edition W. Tillar Shugg, Shugg Enterprises, Inc. 1995 Hardcover 608 pp IEEE Order No. PC 3780 ISBN 0-7803-1030-6.

Farm Implement News Buyer's Guide Jun 19 2020

Advances in Manufacturing Technology and Management Nov 05 2021 This book presents the select peer-reviewed proceeding of the International Conference on Advanced Production and Industrial Engineering (ICAPIE) – 2021 held at Delhi Technological University. It covers

recent trends in various fields of mechanical engineering. The broad range of topics and issues covered include mechanical system engineering, materials engineering, micro-machining, renewable energy, industrial engineering and additive manufacturing. This book will be useful for students, researchers and professionals working in the area of mechanical and allied engineering discipline.

American Manufacturer and Trade of the West Dec 06 2021

Control of Power Electronic Converters with Microgrid Applications May 11 2022 Control of Power Electronic Converters with Microgrid Applications Discover a systematic approach to design controllers for power electronic converters and circuits In Control of Power Electronic Converters with Microgrid Applications, distinguished academics and authors Drs. Arindam Ghosh and Firuz Zare deliver a systematic exploration of design controllers for power electronic converters and circuits. The book offers readers the knowledge necessary to effectively design intelligent control mechanisms. It covers the theoretical requirements, like advanced control theories and the analysis and conditioning of AC signals as well as controller development and control. The authors provide readers with discussions of custom power devices, as well as both DC and AC microgrids. They also discuss the harmonic issues that are crucial in this area, as well as harmonic standardization. The book addresses a widespread lack of understanding in the control philosophy that can lead to a stable operation of converters, with a focus on the application of

power electronics to power distribution systems. Readers will also benefit from the inclusion of: A thorough introduction to controller design for different power electronic converter configurations in microgrid systems (both AC and DC) A presentation of emerging technology in power distribution systems to integrate different renewable energy sources Chapters on DC-DC converters and DC microgrids, as well as DC-AC converter modulation techniques and custom power devices, predictive control, and AC microgrids Perfect for manufacturers of power converters, microgrid developers and installers, as well as consultants who work in this area, Control of Power Electronic Converters with Microgrid Applications is also an indispensable reference for graduate students, senior undergraduate students, and researchers seeking a one-stop resource for the design of controllers for power electronic converters and circuits.

Modeling and Control of Static Converters for Hybrid Storage Systems Mar 17 2020 The energy transition initiated in recent years has enabled the growing integration of renewable production into the energy mix. Microgrids make it possible to maximize the efficiency of energy transmission from source to consumer by bringing the latter together geographically and by reducing losses linked to transport. However, the lack of inertia and the micro-grid support system makes it weak, and energy storage is necessary to ensure its proper functioning. Current storage technologies do not make it possible to provide both a large capacity of energy and power at the same time. Hybrid storage is a solution that combines the advantages of several

technologies and reduces their disadvantages. Modeling and Control of Static Converters for Hybrid Storage Systems covers the modeling, control theorems, and optimization techniques that solve many scientific problems for researchers in the field of power converter control for renewable energy hybrid storage and places particular emphasis on the modeling and control of static converters for hybrid storage systems. Covering topics ranging from energy storage to power generation, this book is ideal for automation engineers, electrical engineers, mechanical engineers, professionals, scientists, academicians, master's and doctoral students, and researchers in the disciplines of electrical and mechanical engineering.

Advancement in Materials, Manufacturing and Energy Engineering, Vol. II Jul 21 2020 This book (Vol. II) presents select proceedings of the conference on "Advancement in Materials, Manufacturing, and Energy Engineering (ICAMME 2021)." It discusses the latest materials, manufacturing processes, evaluation of materials properties for the application in automotive, aerospace, marine, locomotive, and energy sectors. The topics covered include advanced metal forming, bending, welding and casting techniques, recycling and re-manufacturing of materials and components, materials processing, characterization and applications, materials, composites and polymer manufacturing, powder metallurgy and ceramic forming, numerical modeling and simulation, advanced machining processes, functionally graded materials, non-destructive

examination, optimization techniques, engineering materials, heat treatment, material testing, MEMS integration, energy materials, bio-materials, metamaterials, metallography, nanomaterial, SMART materials, bioenergy, fuel cell, and superalloys. The book will be useful for students, researchers, and professionals interested in interdisciplinary topics in the areas of materials, manufacturing, and energy sectors.

New Current Sensing Solutions for Low-cost High-power-density Digitally Controlled Power Converters

Sep 15 2022

[Truncated abstract] This thesis studies current sensing techniques that are designed to meet the requirements for the next generation of power converters. Power converters are often standardised, so that they can be replaced with a model from another manufacturer without an expensive system redesign. For this reason, the power converter market is highly competitive and relies on cutting-edge technology, which increases power conversion efficiency and power density. High power density and conversion efficiency reduce the system cost, and thus make the power converter more attractive to the customer. Current sensing is a vital task in power converters, where the current information is required for monitoring and control purposes. In order to achieve the above-mentioned goals, existing current sensing techniques have to be improved in terms of cost, power loss and size. Simultaneously, current information needs to be increasingly available in digital form to enable digital control, and to allow the digital transmission of the current information to a centralised monitoring and control unit. All this requires the output signal of a particular current

sensing technique to be acquired by an analogue-to-digital converter, and thus the output voltage of the current sensor has to be sufficiently large. This thesis thoroughly reviews contemporary current sensing techniques and identifies suitable techniques that have the potential to meet the performance requirements of the next-generation of power converters. After the review chapter, three novel current sensing techniques are proposed and investigated: 1) The usefulness of the resistive voltage drop across a copper trace, which carries the current to be measured, to detect electrical current is evaluated. Simulations and experiments confirm that this inherently lossless technique can measure high currents at reasonable measurement bandwidth, good accuracy and low cost if the sense wires are connected properly. 2) Based on the mutual inductance theory found during the investigation of the copper trace current sense method, a modification of the well-known lossless inductor current sense method is proposed and analysed. This modification involves the use of a coupled sense winding that significantly improves the frequency response. Hence, it becomes possible to accurately monitor the output current of a power converter with the benefits of being lossless, exhibiting good sensitivity and having small size. 3) A transformer based DC current sense method is developed especially for digitally controlled power converters. This method provides high accuracy, large bandwidth, electrical isolation and very low thermal drift. Overall, it achieves better performance than many contemporary available Hall Effect sensors. At the same time, the cost of this current

sensor is significantly lower than that of Hall Effect current sensors. A patent application has been submitted. .... The current sensing techniques have been studied by theory, hardware experiments and simulations. In addition, the suitability of the detection techniques for mass production has been considered in order to access the ability to provide systems at low-cost. *Model Predictive Control for Doubly-Fed Induction Generators and Three-Phase Power Converters* Oct 24 2020 Model Predictive Control for Doubly-Fed Induction Generators and Three-Phase Power Converters describes the application of model predictive control techniques with modulator and finite control sets to squirrel cage induction motor and in doubly-fed induction generators using field orientation control techniques as both current control and direct power control. Sections discuss induction machines, their key modulation techniques, introduce the utility of model predictive control, review core concepts of vector control, direct torque control, and direct power control alongside novel approaches of MPC. Mathematical modeling of cited systems, MPC theory, their applications, MPC design and simulation in MATLAB are also considered in-depth. The work concludes by addressing implementation considerations, including generator operation under voltage sags or distorted voltage and inverters connected to the grid operating under distorted voltage. Experimental results are presented in full. Adopts model predictive control design for optimized induction machines geared for complex grid dynamics Demonstrates how to simulate model predictive control using MATLAB and

Simulink Presents information about hardware implementation to obtain experimental results Covers generator operation under voltage sags or distorted voltage

Electric Power Conversion Jul 01 2021 The introductory chapter to this book is like traveling in a time machine into past, present, and future of electric power conversion. Archeological discoveries are being transformed into the discoveries of the future. The book is an incursion to electric power conversion through electromechanical power conversion, static power conversion, and applications in the field. Each of the above-mentioned sections analyzes the knowledge gained using the experimental results of valuable research projects. Novice readers will learn how energy is converted adequately and adapted to different consumers. Advanced readers will discover different kinds of modern solutions and tendencies in the field of electric power conversion.

Thomas Register of American Manufacturers Dec 14 2019 This basic source for identification of U.S. manufacturers is arranged by product in a large multi-volume set. Includes: Products & services, Company profiles and Catalog file.

Phase Converters for Operation of Three-phase Motors from Single-phase Power Nov 17 2022

Power Electronic Converters Modeling and Control Jun 12 2022 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 Converter Circuits Apr 17 2020 This text reveals all key components of rectification, inversion, cycloconversion, and conversion circuits. It authoritatively describes switching, voltage and current relationships, and converter properties, operation, control, and performance as utilized in most practical

applications. Authored jointly by a veteran scholar and an accomplished researcher in the field Power Converter Circuits highlights methods grounded in classical mathematics and includes an abundance of numerical worked examples. Features hundreds of chapter-specific problems, with solutions provided separately at the end of the book

Advancement in Materials, Manufacturing and Energy Engineering, Vol. I Nov 24 2020 This book (Vol. I) presents select proceedings of the conference on "Advancement in Materials, Manufacturing, and Energy Engineering (ICAMME 2021)." It discusses the latest materials, manufacturing processes, evaluation of materials properties for the application in automotive, aerospace, marine, locomotive, and energy sectors. The topics covered include advanced metal forming, bending, welding and casting techniques, recycling and re-manufacturing of materials and components, materials processing, characterization and applications, materials, composites and polymer manufacturing, powder metallurgy and ceramic forming, numerical modeling and simulation, advanced machining processes, functionally graded materials, non-destructive examination, optimization techniques, engineering materials, heat treatment, material testing, MEMS integration, energy materials, bio-materials, metamaterials, metallography, nanomaterial, SMART materials, bioenergy, fuel cell, and superalloys. The book will be useful for students, researchers, and professionals interested in interdisciplinary topics in the areas of materials,

manufacturing, and energy sectors.

Power Electronic Converters for Microgrids Aug 22 2020 As concerns about climate change, energy prices, and energy security loom, regulatory and research communities have shown growing interest in alternative energy sources and their integration into distributed energy systems. However, many of the candidate microgeneration and associated storage systems cannot be readily interfaced to the 50/60 Hz grid. In Power Electronic Converters for Microgrids, Sharkh and Abu-Sara introduce the basics and practical concerns of analyzing and designing such micro-generation grid interface systems. Readers will become familiar with methods for stably feeding the larger grid, importing from the grid to charge on-site storage, disconnecting from the grid in case of grid failure, as well as connect multiple microgrids while sharing their loads appropriately. Sharkh and Abu-Sara introduce not only the larger context of the technology, but also present potential future applications, along with detailed case studies and tutorials to help the reader effectively engineer microgrid systems.

Power Converters and AC Electrical Drives with Linear Neural Networks Feb 25 2021 The first book of its kind, Power Converters and AC Electrical Drives with Linear Neural Networks systematically explores the application of neural networks in the field of power electronics, with particular emphasis on the sensorless control of AC drives. It presents the classical theory based on space-vectors in identification, discusses control of electrical drives and power converters, and examines improvements that can be attained when using linear neural networks.

The book integrates power electronics and electrical drives with artificial neural networks (ANN). Organized into four parts, it first deals with voltage source inverters and their control. It then covers AC electrical drive control, focusing on induction and permanent magnet synchronous motor drives. The third part examines theoretical aspects of linear neural networks, particularly the neural EXIN family. The fourth part highlights original applications in electrical drives and power quality, ranging from neural-based parameter estimation and sensorless control to distributed generation systems from renewable sources and active power filters. Simulation and experimental results are provided to validate the theories. Written by experts in the field, this state-of-the-art book requires basic knowledge of electrical machines and power electronics, as well as some familiarity with control systems, signal processing, linear algebra, and numerical analysis. Offering multiple paths through the material, the text is suitable for undergraduate and postgraduate students, theoreticians, practicing engineers, and researchers involved in applications of ANNs.

Advanced Multilevel Converters and Applications in Grid Integration Sep 03 2021 A comprehensive survey of advanced multilevel converter design, control, operation and grid-connected applications Advanced Multilevel Converters and Applications in Grid Integration presents a comprehensive review of the core principles of advanced multilevel converters, which require fewer components and provide higher power conversion efficiency and output power quality. The authors

– noted experts in the field – explain in detail the operation principles and control strategies and present the mathematical expressions and design procedures of their components. The text examines the advantages and disadvantages compared to the classical multilevel and two level power converters. The authors also include examples of the industrial applications of the advanced multilevel converters and offer thoughtful explanations on their control strategies. Advanced Multilevel Converters and Applications in Grid Integration provides a clear understanding of the gap difference between research conducted and the current industrial needs. This important guide: Puts the focus on the new challenges and topics in related areas such as modulation methods, harmonic analysis, voltage balancing and balanced current injection Makes a strong link between the fundamental concepts of power converters and advances multilevel converter topologies and examines their control strategies, together with practical engineering considerations Provides a valid reference for further developments in the multilevel converters design issue Contains simulations files for further study Written for university students in electrical engineering, researchers in areas of multilevel converters, high-power converters and engineers and operators in power industry, Advanced Multilevel Converters and Applications in Grid Integration offers a comprehensive review of the core principles of advanced multilevel converters, with contributions from noted experts in the field.

Encyclopedia of Sustainable Technologies Feb 08 2022 Encyclopedia of Sustainable

Technologies provides an authoritative assessment of the sustainable technologies that are currently available or in development. Sustainable technology includes the scientific understanding, development and application of a wide range of technologies and processes and their environmental implications. Systems and lifecycle analyses of energy systems, environmental management, agriculture, manufacturing and digital technologies provide a comprehensive method for understanding the full sustainability of processes. In addition, the development of clean processes through green chemistry and engineering techniques are also described. The book is the first multi-volume reference work to employ both Life Cycle Analysis (LCA) and Triple Bottom Line (TBL) approaches to assessing the wide range of technologies available and their impact upon the world. Both approaches are long established and widely recognized, playing a key role in the organizing principles of this valuable work. Provides readers with a one-stop guide to the most current research in the field Presents a grounding of the fundamentals of the field of sustainable technologies Written by international leaders in the field, offering comprehensive coverage of the field and a consistent, high-quality scientific standard Includes the Life Cycle Analysis and Triple Bottom Line approaches to help users understand and assess sustainable technologies

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

Dec 26 2020

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 eistungsbauteile an einige inhärente Materialgrenzen, die unter anderem mit der Temperaturbelastung, der Schaltfrequenz und der Blockierspannung in Zusammenhang stehen. In jüngster Zeit sind SiC-basierte Leistungsbauelemente vielversprechende Kandidaten für Hochleistungs- und Hochfrequenzanwendungen. Aktuell sind SiC-MOSFETs von mehreren Herstellern im Handel erhältlich. 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 Planarund Doubletrench SiC-MOSFETs verschiedener Hersteller. Die Auswirkungen unterschiedlicher Gatespannungen, Zwischenkreisspannungen und Temperaturen werden analysiert. Die Ergebnisse der Charakterisierung zeigen, dass die Bauteile überlegene Schaltleistungen unter verschiedenen Betriebsbedingungen aufweisen. Darüber 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 Berücksichtigung der Gehäusetemperatur, der Schaltgeschwindigkeit, des Durchlassstroms und der angelegten Spannung bewertet. Anhand der Messergebnisse wird die Sperrschichttemperatur geschätzt, damit ein sicherer Betrieb gewährleistet ist. Ein einfaches elektrothermisches Modell wird vorgestellt, um die maximal zulässige Schaltfrequenz auf der Grundlage des thermischen Designs der SiC-Bauteile abzuschätzen. 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. Außerdem wird die Parallelisierung von SiC-MOSFETs untersucht, bevor die Parallelschaltung der verschiedenen Bauelemente ebenso im kontinuierlichen Konverterbetrieb verglichen wird. Es wird der Einfluss der häufigsten Parametervariationen auf die statische und dynamische Stromaufteilung der Transistoren analysiert, was zeigt, dass eine Parallelisierung von SiC-MOSFETs möglich ist. Anschließend wird ein analytisches Modell der SiC-MOSFETs zur Schaltverlustoptimierung vorgeschlagen. Das analytische Modell zeigt eine relativ enge Übereinstimmung 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 Berücksichtigung der wichtigsten parasitären 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-Widerstände werden ausgewertet. Zusätzlich wird die temperaturabhängige Kurzschlussfähigkeit ausgewertet und die zugehörigen Fehlerfälle werden analysiert. Anschließend wird die Auslegung und Prüfung von zwei verschiedenen Verfahren zum Überstromschutz evaluiert. Die „Desaturation“-Technik wird auf SiC-MOSFETs angewendet und mit einer zweiten Methode

verglichen, welche die parasitäre Induktivität der Bauelemente nutzt. Schließlich 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, Leiterausführungen und Wicklungsanordnungen wird bewertet. Es wird ein unidirektionaler ZVZCS Vollbrücken-DC/DC-Wandler vorgestellt, der nur die parasitäre Streuinduktivität des Transformators verwendet. Experimentelle Ergebnisse für einen 10 kW, (100-250) kHz Prototyp zeigen einenWirkungsgrad von bis zu 98,1% für den gesamten Umrichter. Abschließend wird ein optimiertes Regelverfahren verwendet, welches auf einem modifizierten Dual-Phase-Shift-Regelverfahren basiert, um den Kreisstrom im isolierten bidirektionalen Dual-Aktiv-Brücken-DC/DC-Wandler zu minimieren. Diese Regelmethode wird experimentell mit der herkömmlichen Single-Phase-Shift-Regelung verglichen. Hierbei zeigt sich eine deutliche Effizienzsteigerung durch die neue Regelmethode. Die experimentellen Ergebnisse bestätigen die theoretische Analyse und zeigen, dass die vorgeschlagene Regelung den Gesamtwirkungsgrad des Umrichters erhöhen und den ZVZCS-Bereich erweitern kann.

North American Industry Classification System (NAICS) Reprint United States 2017 Edition May 31 2021 The North American Industry Classification System (NAICS) is the standard used by Federal statistical agencies in classifying

business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. It is a joint work between the Untied States, Canada, and Mexico that allows a high level of comparability between the countries. The NAICS officially replaced the SIC (Standard Industrial Classification) system in 1997. The publisher has included the SBA Size Standards Table as an appendix at the back of this book to assist users of the data. Should you have suggestions or feedback on ways to improve this book please send email to Books@OcotilloPress.com If you would like to order a copy of this book as a 3 ring punched looseleaf print please contact Books@OcotilloPress.com

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