Ac To Dc Converter

SAUL FIELDS

Investigation of Power Factor Correction in Single Phase AC-DC Converters John Wiley & Sons
This book presents novel contributions in the development of solid-state-transformer (SST) technology both for medium-voltage (MV) and low-voltage (LV) utility grid interfaces, which can potentially augment the grid modernization process in the evolving power system paradigm. For the MV interface, a single-stage AC-DC SST submodule topology has been proposed, and its modulation and soft-switching possibilities are analysed, experimentally validated and adequately benchmarked. A control scheme with power balance capability among submodules is developed for MV grid-connected single-stage AC-DC SST for smooth operation under inevitable parameter drift scenario, and experimental validation shows excellent performance under drastic load change conditions. A novel machine learning-aided multi-objective design optimization framework for grid-connected SST is developed and experimentally validated, which equips a power electronics design engineer with meagre computational resources to find out the most optimal SST design in a convenient time-frame. This book has also contributed towards the development of dual-active-bridge (DAB)-type and non-DAB-type LV grid-interfaced isolated AC-DC converters by providing solutions to specific topology and modulation-related shortcomings in these two types of topologies. A comprehensive comparison of the DAB and non-DAB-type LVAC-LVDC converters reveals the superiority of DAB-type conversion strategy.
A POWERFUL AC-DC CONVERTER. Power Electronic Converters
This book is the third in a series of four devoted to POWER ELECTRONIC CONVERTERS: The first of these concerns AC to DC conversion. The second concerns AC to AC conversion. This volume examines DC to DC conversion. The fourth is devoted to DC to AC conversion. Converters which carry out the DC-DC conversion operate by chopping the input voltage or current: they are called choppers or switch-mode power converters. Their operating frequency is not imposed by either the input or the output, both of which are at zero frequency. A frequency which is much greater than that of the industrial network can be chosen, provided that suitable configurations and semiconductor devices are used. This is the first difference compared to the rectifiers and AC-AC converters, analyzed in the previous volumes and which often operate at the industrial network frequency. The second difference concerns the commutation mode. Choppers operate in forced commutation. The beginning of an operating phase does not auto matically turn off the semiconductor devices which were conducting during the previous phase and which have to be brought to the blocking state. This turn-off must be carried out autonomously. These two differences - the higher frequency of commutations and, espe cially, the different mode of commutation -justify the first two chapters in this work: - Chapter 1 examines general notions concerning converters, supplies and loads, and more especially, how they can be characterized with regard to commutations.
AC to AC Converters John Wiley & Sons
For the first time in power electronics, this comprehensive treatment of switch-mode DC/DC converter designs addresses many analytical closed form equations such as duty cycle prediction, output regulation, output ripple, control loop-gain, and steady state time-domain waveform. Each of these equations are given various topologists and configurations, including forward, flyback, and boost converters. Pulse Width Modulated DC/DC Converters begins with a detailed approach to the quiescent operating locus of a power plant under open-loop. The reader is then led through other

supporting circuits once again in the quiescent condition. These exercises result in the close-loop formulations of the subject system, providing designers with the ability to study the sensitivities of a system against disturbances. With the quiescent conditions well established, the book then guides the reader further into the territories of system stability where small signal behaviors are explored. Finally, some important large signal time-domain studies cap the treatment. Some distinctive features of this book include: *detailed coverage of dynamic close-loop converter simulations using only personal computer and modern mathematical software *Steady-state, time-domain analysis based on the concept of continuity of states Voltage-mode and current-mode control techniques and their differences of merits A detailed description on setting up different equations for DC/DC converters'simulation using only PC

A Development of AC/DC Converter with Bi-directional Power Flow CRC Press

Power Electronics is a large size technology, mainly covering four categories: the AC/DC rectifiers, DC/DC converters, DC/AC inverters, and AC/AC converters. This book offers approximately 100 novel topologies of all four. The applications are used in sustainable energy generation areas, such as distributed generation (DG), micro-grid (MG), smart grid (SG) systems, and electrical vehicles (EV). With case studies from GE, AEG, Simplatroll Ltd, and Chinese Power Manufacturing Co., the reader will be exposed to practical applications in industry and real-world settings. This new edition features an entirely new chapter on best switching angles to obtain lowest THD for multilevel DC/AC inverters. Additionally, all chapters have been updated and include homework problems throughout.

Advanced Power Electronics Converters Springer Science & Business Media

The difficulties in creating powerful rectifiers are mainly due to the fact that high voltage accumulates in the discharge gaps which undergo preliminary ionization; this decreases their electrical and rectifying strength. In the examined converter the air gaps (at a pressure of 5-10 abs atm) are not ionized, since with air pressure greater than 3 abs atm and voltages less than discharge voltages, there is no corona discharge. The converter consists of a transformer unit which creates a multiphase closed winding, a switching device, and rectifiers. (Author).

Power Electronics John Wiley & Sons

The UHV transmission has many advantages for new power networks due to its capacity, long distance potential, high efficiency, and low loss. Development of UHV transmission technology is led by infrastructure development and renewal, as well as smart grid developments, which can use UHV power networks as the transmission backbone for hydropower, coal, nuclear power and large renewable energy bases. Over the years, State Grid Corporation of China has developed a leading position in UHV core technology R&D, equipment development, plus construction experience, standards development and operational management. SGCC built the most advanced technology 'two AC and two DC' UHV projects with the highest voltage-class and largest transmission capacity in the world, with a cumulative power transmission of 10TWh. This book comprehensively summarizes the research achievement, theoretical innovation and engineering practice in UHV power grid construction in China since 2005. It covers the key technology and parameters used in the design of the UHV transmission network, shows readers the technical problems State Grid encountered during the construction, and the solution they come up with. It also introduces key technology like UHV series compensation, DC converter valve, and the systematic standards and norms. Discusses technical characteristics and advantages of using of AC/DC transmission system Includes applications and technical standards of UHV technologies Provides insight and case studies into a technology area that is developing worldwide Introduces the technical difficulties encountered in design and construction phase and provides solutions

Novel Hybrid Unidirectional Three-phase AC-DC Converter Systems CRC Press

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

Power Electronic Converters CRC Press

DC/DC conversion techniques have undergone rapid development in recent decades. With the pioneering work of authors Fang Lin Luo and Hong Ye, DC/DC converters have now been sorted into their six generations, and by a rough count, over 800 different topologies currently exist, with more being developed each year. Advanced DC/DC Converters, Second Edition offers a concise, practical presentation of DC/DC converters, summarizes the spectrum of conversion technologies, and presents new ideas and more than 200 new topologies. Beginning with background material on DC/DC conversion, the book later discusses both voltage lift and super-lift converters. It then proceeds through each generation, including the groundbreaking sixth generation—converters developed by the authors that can be cascaded for high voltage transfer gain. This new edition updates every chapter and offers three new chapters. The introduction of the super-lift technique is an outstanding achievement in DC/DC conversion technology, and the ultra-lift technique and hybrid split-capacitor/inductor applied in Super-Lift Luo-Converters are introduced in Chapters 7 and 8. In Chapter 9, the authors have theoretically defined a new concept, Energy Factor (EF), researched the relations between EF and the mathematical modelling for power DC/DC converters, and demonstrated the modeling method for two converters. More than 320 figures, 60 tables, and 500 formulae allow the reader to more easily grasp the overall structure of advanced DC/DC converters, provide fast access to precise data, and help them to quickly determine the values of their own circuit components.

Switching Power Supply Design and Optimization, Second Edition Springer Science & Business Media

Power Electronic ConvertersSpringer Science & Business Media

A New Bidirectional AC-DC Converter with Low Harmonic Input Currents and an Adjustable Power Factor Springer Nature

The book provides a comprehensive overview of Single-Inductor Multiple-Output Converters from both theoretical and practical perspectives. Based on the authors' in-depth research, the volume covers not only conventional SIMO DC-DC converters but also the new generations of SIMO such as SIMO AC-DC converters, SIMO DC-AC converters (or SIMO inverters), and the latest SIMO hybrid converters. This book offers a holistic and systematic presentation of all types of SIMO converters, encompassing the derivation of the circuit topologies, the definition of key concepts, detailed discussion of theoretical underpinnings, design methodology and control schemes, as well as design considerations and techniques that enable practical implementation. Specific examples of real-world applications of SIMO converters are also provided. The volume offers a comprehensive overview and systematic classification of the traditional and modern topologies of SIMO converters in terms of system architecture, circuit analysis, operating principles, control methods, design considerations and practical implementation. Specifically, the book presents the mathematical models and design principles necessary for analyzing the behavior of each kind of SIMO converter, and building upon that, introduces and imparts new approaches and techniques when designing such converters, guiding engineering students and power engineers towards achieving low-cost, compact and energy efficient SIMO converters. offers the design considerations and optimization as well as describing the key applications of SIMO converters. The book fills a significant niche in the power electronics literature and provides a complete perspective on SIMO converters that hopefully can inspire appreciation and better understanding of the subject matter. It can be directly adopted in undergraduate or graduate coursework as well as postgraduate research programs.

Power Electronic Converters CRC Press

Power electronic converters can be broadly classified as AC to DC, DC to AC, DC to DC and AC to AC converters. AC to AC converters can be further classified as AC Controllers or AC regulators, Cycloconverters and Matrix converters. AC controllers and cycloconverters are fabricated using Silicon Controlled Rectifiers (SCR) whereas matrix converters are built using semiconductor bidirectional switches. This text book provides a summary of AC to AC Converter modelling excluding AC controllers. The software Simulink® by Mathworks Inc., USA is used to develop the models of AC to AC Converters presented in this text book. The term model in this text book refers to SIMULINK model. This text book is mostly suitable for researchers and practising professional engineers in the industry working in the area of AC to AC converters. Features Provides a summary of AC to AC Converter modelling excluding AC controllers Includes models for three phase AC to three phase AC matrix converters using direct and indirect space vector modulation algorithm Presents new applications such as single and dual programmable AC to DC rectifier with derivations for output voltage Displays Hardware-in-the Loop simulation of a three phase AC to single phase AC matrix converter Provides models for three phase multilevel matrix converters, Z-source Direct and Quasi Z-source Indirect matrix converters; a model for speed control and brake by plugging of three phase induction motor and separately excited DC motors using matrix converter; a model for a new single phase and three phase sine wave direct AC to AC Converter without a DC link using three winding transformers and that for a square wave AC to square wave AC converter using a DC link; models for variable frequency, variable voltage AC to AC power supply; models for Solid State Transformers using Dual Active Bridge topology and a new direct AC to AC Converter topology; and models for cycloconverters and indirect matrix converters

Power Electronic Converters: AC-DC conversion Springer Nature

The latest techniques for designing state-of-the-art power supplies, including resonant (LLC) converters Extensively revised throughout, Switching Power Supply Design & Optimization, Second Edition, explains how to design reliable, high-performance switching power supplies for today's cutting-edge electronics. The book covers modern topologies and converters and features new information on designing or selecting bandgap references, transformer design using detailed new design charts for proximity effects, Buck efficiency loss teardown diagrams, active reset techniques, topology morphology, and a meticulous AC-DC front-end design procedure. This updated resource contains design charts and numerical examples for comprehensive feedback loop design, including TL431, plus the world's first top-down simplified design methodology for wide-input resonant (LLC) converters. A step-by-step comparative design procedure for Forward and Flyback converters is also included in this practical guide. The new edition covers: Voltage references DC-DC converters: topologies to configurations Contemporary converters, composites, and related techniques Discontinuous conduction mode Comprehensive front-end design in AC-DC power conversion Topologies for AC-DC applications Tapped-inductor (autotransformer-based) converters Selecting inductors for DC-DC converters Flyback and Forward converter transformer design Forward and Flyback converters: step-by-step design and comparison PCBs and thermal management Closing the loop: feedback and stability, including TL431 Practical EMI filter design Reset techniques in Flyback and Forward converters Reliability, testing, and safety issues Unraveling and optimizing Buck converter efficiency Introduction to soft-switching and detailed LLC converter design methodology with PSpice simulations Practical circuits, design ideas, and component FAQs

The Designs of Low Power AC-DC Converter for Power Electronics System Applications University-Press.org

Conventional three-phase AC-DC converters have two converter stages. They have a front-end converter that converts the input AC voltage into an intermediate DC bus voltage and a second, back-end converter that converts this DC bus voltage into the desired isolated DC output voltage. The front-end converter also performs power factor correction (PFC) and shapes the three-phase input currents so that they are nearly sinusoidal and in phase with the three-phase input voltages. This allows the AC power source to be used in the most efficient manner. The front-end AC-DC converter is typically implemented with six switches while the back-end DC-DC converter is typically implemented with a four switch DC-DC full-bridge topology. Power electronic researchers have been motivated to try to reduce the number of switches that are used in the conventional two-stage approach in order to reduce cost and simplify the overall AC-DC converter. There are two general approaches to doing this: This first approach is to reduce the number of switches in the front-end AC-DC converter. The second approach is to combine the AC-DC converter and the DC-DC converter in a single converter so that the overall AC-DC converter can be implemented in a single converter stage that can simultaneously perform AC-DC power conversion with PFC and DC-DC power conversion. The main focus of this thesis is on new power converter topologies that convert a three-phase AC input voltage into an isolated DC output voltage with a reduced number of switches. In the thesis, a new family of reduced switch front-end converter topologies is proposed, an example converter from this new family is selected for further study and a modified version of this topology is studied as well. In addition to these front-end converters, two new three-phase AC-DC single-stage converters are proposed and their properties and characteristics are compared. For each new converter that is investigated in detail, its modes of operation are explained, its steady-state characteristics are determined by mathematical analysis, and the results of the analysis are used to develop a design procedure that can be used to select key components. The design procedure of each new converter is demonstrated with an example that was used in the implementation of an experimental prototype that confirmed the feasibility of the converter. The thesis concludes by presenting that have been reached as a result of the work that was performed, stating its main contributions to the power electronics literature and suggesting future research that can be done based on the thesis work.

Pulse Width Modulated DC-DC Converters Springer Science & Business Media

Please note that the content of this book primarily consists of articles available from Wikipedia or

other free sources online. Pages: 62. Chapters: AC/AC converter, Adjacent channel power ratio, Commutation cell, DC-to-DC converter, Differential capacitance, Electronic speed control, Gate Drivers, Insulated-gate bipolar transistor, Load dump, Magnetic amplifier, Mechanical rectifier, MOS Controlled Thyristor, Motor soft starter, Multi-port power electronic interface, PIN diode, PLECS, Power electronic substrate, Power module, Power MOSFET, Power semiconductor device, Safe operating area, Shorepower, Silicon-controlled rectifier, Static induction thyristor, Static induction transistor, Switched-mode power supply, Switched-mode power supply applications, Thyristor drive, TRIAC, Vienna rectifier, Voltage spike, Voltech Instruments. Excerpt: Power electronics is the application of solid-state electronics for the control and conversion of electric power. It also refers to a subject of research in electronic and electrical engineering which deals with design, control, computation and integration of nonlinear, time varying energy processing electronic systems with fast dynamics. The first high power electronic devices were mercury-arc valves. In modern systems the conversion is performed with semiconductor switching devices such as diodes, thyristors and transistors, as pioneered by R. D. Middlebrook and others beginning in the 1950s. In contrast to electronic systems concerned with transmission and processing of signals and data, in power electronics substantial amounts of electrical energy are processed. An AC/DC converter (rectifier) is the most typical power electronics device found in many consumer electronic devices, e.g. television sets, personal computers, battery chargers, etc. The power range is typically from tens of watts to several hundred watts. In industry a common application is the variable speed drive (VSD) that is used to control an induction...

A Single Stage Full Bridge Power Factor Corrected AC/DC Converter Academic Press

An all-in-one guide to high-voltage, multi-terminal converters, this book brings together the state of the art and cutting-edge techniques in the various stages of designing and constructing a high-voltage converter. The book includes 9 chapters, and can be classified into three aspects. First, all existing high-voltage converters are introduced, including the conventional two-level converter, and the multi-level converters, such as the modular multi-level converter (MMC). Second, different kinds of multi-terminal high-voltage converters are presented in detail, including the topology, operation principle, control scheme and simulation verification. Third, some common issues of the proposed multi-terminal high-voltage converters are discussed, and different industrial applications of the proposed multi-terminal high-voltage converters are provided. Systematically proposes, for the first time, the design methodology for high-voltage converters in use of MTDC grids; also applicable to constructing novel power electronics converters, and driving the development of HVDC, which is one of the most important technology areas Presents the latest research on multi-terminal high-voltage converters and its application in MTDC transmission systems and other industrially important applications Offers an overview of existing technology and future trends of the high-voltage converter, with extensive discussion and analysis of different types of high-voltage converters and relevant control techniques (including DC-AC, AC-DC, DC-DC, and AC-AC converters) Provides readers with sufficient context to delve into the more specialized topics covered in the book Featuring a series of novel multi-terminal high-voltage converters proposed and patented by the authors, Multi-terminal High Voltage Converters is written for researchers, engineers, and advanced students specializing in power electronics, power system engineering and electrical engineering.

A Direct AC-to-DC Converter Topology with High-frequency Isolation Elsevier

AC voltage frequency changes is one of the most important functions of solid state power converters. The most desirable features in frequency converters are the ability to generate load voltages with arbitrary amplitude and frequency, sinusoidal currents and voltages waveforms; the possibility of providing unity power factor for any load; and, finally, a simple and compact power circuit. Over the past decades, a number of different frequency converter topologies have appeared in the literature, but only the converters with either a voltage or current DC link are commonly used in industrial applications. Improvements in power semiconductor switches over recent years have resulted in the development of many structures of AC-AC converters without DC electric energy storage. Such converters are an alternative solution for frequently recommended systems with DC energy storage and are characterized by a lower price, smaller size and longer lifetime. Most of the these topologies are based on the structure of the matrix converter. Three-Phase AC-AC Power Converters Based On Matrix Converter Topology: Matrix-reactance frequency converters concept presents a review of power frequency converters, with special attention paid to converters without DC energy storage. Particular attention is paid to nine new converters named matrix-reactance frequency converters which have been developed by the author and the team of researchers from Institute of Electrical Engineering at the University of Zielona Góra. The topologies of the presented matrix-reactance frequency converters are based on a three-phase unipolar buck-boost matrix-reactance chopper with source or load switches arranged as in a matrix converter. This kind of approach makes it possible to obtain an output voltage greater than the input one (similar to that in a matrix-reactance chopper) and a frequency conversion (similar to that in a matrix converter). Written for researchers and Ph.D. students working in the field of power electronics converters and drive systems, Three-Phase AC-AC Power Converters Based On Matrix Converter Topology: Matrix-reactance frequency converters concept will also be valuable to power electronics converter designers and users; R&D centers; and readers needing industry solutions in variable speed drive systems, such as automation and aviation.

A Single Stage Power Factor Corrected AC/DC Converter Springer Nature

Two-stage single-phase converters, including two-stage single-phase dc-ac inverters and two-stage single-phase PFC converters, are interfacing power converters between dc and ac voltage/current sources, which have been widely applied for dc-ac and ac-dc power conversion. For the two-stage single-phase converter, the ac-side power pulsates at twice the ac voltage frequency, resulting in second harmonic current (SHC) which might flow into the dc-dc converter, the dc voltage source, and dc load. This book clarifies the generation, propagation, and side-effects of this SHC and proposes the SHC reduction control schemes for the dc-dc converter, with different topologies and/or different operating modes, in the single-phase converter. On this basis, the second harmonic current compensator (SHCC) is proposed to compensate the SHC, significantly reducing the dc bus capacitance. In doing so, the electrolytic capacitors, with short lifetimes, are removed from the two-stage single-phase converter, leading to extended system lifetime and enhanced system stability. For having flawless SHC compensation performance, the port-current control schemes are proposed for the SHCC. Additionally, the stability analysis is carried out for the two-stage single-phase converter with the addition of SHCC. This book is a monograph combining theoretical analysis and engineering design, which could not only be a reference book for master students, Ph.D. students, and teachers majoring in power electronics but also be a handbook for the electrical engineers working on the research and development of LED drivers, EV on-board chargers, railway auxiliary power supplies, aviation power supplies, renewable energy generation systems, etc.

Analysis, Optimization and Control of Grid-Interfaced Matrix-Based Isolated AC-DC Converters McGraw Hill Professional

An ac to dc converter is an integral part of any power supply unit used in the all electronic equipments. These electronic equipments form a major part of load on the utility. Generally, to convert line frequency ac to dc, a line frequency diode bridge rectifier is used. To reduce the ripple in the dc output voltage, a large capacitor is used at the rectifier output. But due to this large capacitor, the current drawn by this converter is peaky in nature. This input current is rich in low order harmonics. Also, as power electronics equipments are increasingly being used in power conversion, they inject low order harmonics into the utility. Due to the presence of these harmonics, the total harmonic distortion is high and the input power factor is poor. Because of the problems associated with low power factor and harmonics, utilities will enforce harmonic standards and guidelines, which will limit the amount of current distortion allowed into the utility, and thus the simple diode rectifier may not be in use. So, there is a need to achieve rectification at close to unity power factor and low input current distortion. Initially, power factor correction schemes have been implemented mainly for heavy industrial loads like induction motors, induction heating furnaces etc., which forms a major part of lagging power factor load. Hence, PFC is becoming an important aspect even for low power application electronic equipments. There are two types of PFC"s. 1) Passive PFC, 2) Active PFC. The active PFC is further classified into low-frequency and high-frequency active PFC depending on the switching frequency. Different techniques in passive PFC and active PFC are presented here. Among these PFC"s, we will get better power factor by using high-frequency active PFC circuit. Any DC-DC converters can be used for this purpose, if a suitable control method is used to shape its input current or if it has inherent PFC properties. The DC-DC converters can operate in Continuous Inductor C

AC to DC Converter for Cabless Power Transmission McGraw-Hill Companies

The purpose of this book is to describe the theory of Digital Power Electronics and its applications. The authors apply digital control theory to power electronics in a manner thoroughly different from the traditional, analog control scheme. In order to apply digital control theory to power electronics, the authors define a number of new parameters, including the energy factor, pumping energy, stored energy, time constant, and damping time constant. These parameters differ from traditional parameters such as the power factor, power transfer efficiency, ripple factor, and total harmonic distortion. These new parameters result in the definition of new mathematical modeling: • A zero-order-hold (ZOH) is used to simulate all AC/DC rectifiers. • A first-order-hold (FOH) is used to simulate all DC/AC inverters. • A second-order-hold (SOH) is used to simulate all DC/DC converters. • A first-order-hold (FOH) is used to simulate all AC/AC (AC/DC/AC) converters. * Presents most up-to-date methods of analysis and control algorithms for developing power electronic converters and power switching circuits * Provides an invaluable reference for engineers designing power converters, commercial power supplies, control systems for motor drives, active filters, etc. * Presents methods of analysis not available in other books.

A power converter is a device used in electrical engineering, power engineering, and the electric power sector to convert electric energy from one form to another, such as converting between AC and DC, changing voltage or frequency, or a combination of these. It is used in a variety of applications, such as industrial drives, power supply, energy generating equipment, consumer goods, electrical vehicles/aeroplanes/ships, smart grids and more.This book will open a door for engineers to design the power converters via the artificial intelligence (AI) method. It begins by reviewing current AI technology in power converters. The book then introduces customized AI algorithms for power converters that take into account the particular characteristics of power converters. The book then presents a set of AI-based design methodologies for power devices, including DC/DC converters, resonant DC/DC converters, bidirectional DC/DC converters, DC/AC inverters, and AC/DC rectifiers. This is the first book to cover all you need to know about using AI to create power converters, including a literature review, algorithm, and circuit design.