

Power Semiconductor Devices Theory And Applications

Semiconductor power devices are the heart of power electronics. They determine the performance of power converters and allow topologies with high efficiency. Semiconductor properties, pn-junctions and the physical phenomena for understanding power devices are discussed in depth. Working principles of state-of-the-art power diodes, thyristors, MOSFETs and IGBTs are explained in detail, as well as key aspects of semiconductor device production technology. In practice, not only the semiconductor, but also the thermal and mechanical properties of packaging and interconnection technologies are essential to predict device behavior in circuits. Wear and aging mechanisms are identified and reliability analyses principles are developed. Unique information on destructive mechanisms, including typical failure pictures, allows assessment of the ruggedness of power devices. Also parasitic effects, such as device induced electromagnetic interference problems, are addressed. The book concludes with modern power electronic system integration techniques and trends.

Power Electronics and Motor Drive Systems is designed to aid electrical engineers, researchers, and students to analyze and address common problems in state-of-the-art power electronics technologies. Author Stefanos Manias supplies a detailed discussion of the theory of power electronics circuits and electronic power conversion technology systems, with common problems and methods of analysis to critically evaluate results. These theories are reinforced by simulation examples using well-known and widely available software programs, including SPICE, PSIM, and MATLAB/SIMULINK. Manias expertly analyzes power electronic circuits with basic power semiconductor devices, as well as the new power electronic converters. He also clearly and comprehensively provides an analysis of modulation and output voltage, current control techniques, passive and active filtering, and the characteristics and gating circuits of different power semiconductor switches, such as BJTs, IGBTs, MOSFETs, IGCTs, MCTs and GTOs. Includes step-by-step analysis of power electronic systems Reinforced by simulation examples using SPICE, PSIM, and MATLAB/SIMULINK Provides 110 common problems and solutions in power electronics technologies

Entrepreneurship in Power Semiconductor Devices, Power Electronics, and Electric Machines and Drive Systems introduces the basics of entrepreneurship and a methodology for the study of entrepreneurship in electrical engineering and other engineering fields. Entrepreneurship is considered here in three fields of electrical engineering, viz. power semiconductor devices, power electronics and electric machines and drive systems, and their current practice. It prepares the reader by providing a review of the subject matter in the three fields, their current status in research and development with analysis aspect as needed, thus allowing readers to gain self-sufficiency while reading the book. Each field's emerging applications, current market and future market forecasts are introduced to understand the basis and need for emerging startups. Practical learning is introduced in: (i) power semiconductor devices entrepreneurship through the prism of 20 startups in detail, (ii) power electronics entrepreneurship through 28 startup companies arranged under various application fields and (iii) electric machines and drive systems entrepreneurship through 15 startups in electromagnetic and 1 in electrostatic machines and drive systems. The book: (i) demystifies entrepreneurship in a practical way to equip engineers and students with entrepreneurship as an option for their professional growth, pursuit and success; (ii) provides engineering managers and corporate-level executives a detailed view of entrepreneurship activities in the considered three fields that may potentially impact their businesses, (iii) provides entrepreneurship education in an electrical engineering environment and with direct connection and correlation to their fields of study and (iv) endows a methodology that can be effectively employed not only in the three illustrated fields of electrical engineering but in other fields as well. This book is for electrical engineering students and professionals. For use in undergraduate and graduate courses in electrical engineering, the book contains discussion questions, exercise problems, team and class projects, all from a practical point of view, to train students and assist professionals for future entrepreneurship endeavors.

Only by understanding both semiconductor device theory and high-power application can the designer be sure of selecting the correct power device for a given application. This book covers both the switches themselves and the circuitry required to make them work effectively.

Power Electronics Basics: Operating Principles, Design, Formulas, and Applications provides fundamental knowledge for the analysis and design of modern power electronic devices. This concise and user-friendly resource: Explains the basic concepts and most important terms of power electronics Describes the power assemblies, control, and passive components of semiconductor power switches Covers the control of power electronic devices, from mathematical modeling to the analysis of the electrical processes Addresses pulse-width modulation, power quality control, and multilevel, modular, and multicell power converter topologies Discusses line-commutated and resonant converters, as well as inverters and AC converters based on completely controllable switches Explores cutting-edge applications of power electronics, including renewable energy production and storage, fuel cells, and electric drives Power Electronics Basics: Operating Principles, Design, Formulas, and Applications supplies graduate students, industry professionals, researchers, and academics with a solid understanding of the underlying theory, while offering an overview of the latest achievements and development prospects in the power electronics industry.

Power Electronics: Devices, Circuits and Industrial Applications would serve as an invaluable text for undergraduate and postgraduate courses on power electronics. It would also be a useful reference for practicing design engineers. The book provides an exhaustive coverage of various power electronic devices with emphasis on the thyristor. The characteristics of modern power semiconductor devices like the power transistor, MOSFET and the IGBT are also discussed. Other relevant topics like cycloconverters, brushless DC motors, microprocessor fundamentals, microprocessor control of industrial equipment, and field-oriented control of AC motors, are dealt with in detail. With its in-depth presentation of topics, detailed and easy-to-understand derivations, the emphasis of the book is on the understanding of fundamental concepts. The theory is well-supported by a large number of solved and unsolved problems and multiple choice questions. The lucid treatment in the book encourages self-study and motivates the student towards independent problem solving.

Concern for reliable power supply and energy-efficient system design has led to usage of power electronics-based systems, including efficient electric power conversion and power semiconductor devices. This book provides integration of complete fundamental theory, design, simulation and application of power electronics, and drives covering up-to-date subject components. It contains twenty-one chapters arranged in four sections on power semiconductor devices, basic power electronic converters, advanced power electronics converters, power supplies, electrical drives and advanced applications. Aimed at senior undergraduate and graduate students in electrical engineering and power electronics including related professionals, this book • Includes electrical drives such as DC motor, AC motor, special motor, high performance motor drives, solar, electrical/hybrid vehicle and fuel cell drives • Reviews advances in renewable energy technologies (wind, PV, hybrid power systems) and their integration • Explores topics like distributed generation, microgrid, and wireless power transfer system • Includes simulation examples using MATLAB®/Simulink and over four hundred solved, unsolved and review problems In chapter 4, we also investigate the device physics behind a superjunction MOSFET structure for improved robustness. The biggest issue with a completely charge balanced MOSFET is decreased robustness in an Unclamped Inductive Switching (UIS) Circuit. The equally charged P and N pillars result in a flat electric field profile, with the peak carrier density closer to the P-N junction at the surface. This

results in an almost negligible positive dynamic R_{ds-on} effect in the MOSFET. By changing the charge profile of the P-column, either by increasing it completely or by implementing a graded profile with the heavier P on top, we can change the field profile and shift the carrier density deeper into silicon, increasing the positive dynamic R_{ds-on} effect. Simulation and experimental results are presented to support the theory and understanding. Chapter 5 summarizes all the theories presented and the contributions made by them in the field. It also seeks to highlight future work to be done in these areas.

At the heart of modern power electronics converters are power semiconductor switching devices. The emergence of wide bandgap (WBG) semiconductor devices, including silicon carbide and gallium nitride, promises power electronics converters with higher efficiency, smaller size, lighter weight, and lower cost than converters using the established silicon-based devices. However, WBG devices pose new challenges for converter design and require more careful characterization, in particular due to their fast switching speed and more stringent need for protection. *Characterization of Wide Bandgap Power Semiconductor Devices* presents comprehensive methods with examples for the characterization of this important class of power devices. After an introduction, the book covers pulsed static characterization; junction capacitance characterization; fundamentals of dynamic characterization; gate drive for dynamic characterization; layout design and parasitic management; protection design for double pulse test; measurement and data processing for dynamic characterization; cross-talk consideration; impact of three-phase system; and topology considerations.

Power electronics, which is a rapidly growing area in terms of research and applications, uses modern electronics technology to convert electric power from one form to another, such as ac-dc, dc-dc, dc-ac, and ac-ac with a variable output magnitude and frequency. Power electronics has many applications in our every day life such as air-conditioners, electric cars, sub-way trains, motor drives, renewable energy sources and power supplies for computers. This book covers all aspects of switching devices, converter circuit topologies, control techniques, analytical methods and some examples of their applications. * 25% new content * Reorganized and revised into 8 sections comprising 43 chapters * Coverage of numerous applications, including uninterruptable power supplies and automotive electrical systems * New content in power generation and distribution, including solar power, fuel cells, wind turbines, and flexible transmission

In two editions spanning more than a decade, *The Electrical Engineering Handbook* stands as the definitive reference to the multidisciplinary field of electrical engineering. Our knowledge continues to grow, and so does the Handbook. For the third edition, it has expanded into a set of six books carefully focused on a specialized area or field of study. *Electronics, Power Electronics, Optoelectronics, Microwaves, Electromagnetics, and Radar* represents a concise yet definitive collection of key concepts, models, and equations in these areas, thoughtfully gathered for convenient access. *Electronics, Power Electronics, Optoelectronics, Microwaves, Electromagnetics, and Radar* delves into the fields of electronics, integrated circuits, power electronics, optoelectronics, electromagnetics, light waves, and radar, supplying all of the basic information required for a deep understanding of each area. It also devotes a section to electrical effects and devices and explores the emerging fields of microlithography and power electronics. Articles include defining terms, references, and sources of further information. Encompassing the work of the world's foremost experts in their respective specialties, *Electronics, Power Electronics, Optoelectronics, Microwaves, Electromagnetics, and Radar* features the latest developments, the broadest scope of coverage, and new material in emerging areas. This book relates the recent developments in several key electrical engineering R&D labs, concentrating on power electronics switches and their use. The first sections deal with key power electronics technologies, MOSFETs and IGBTs, including series and parallel associations. The next section examines silicon carbide and its potentiality for power electronics applications and its present limitations. Then, a dedicated section presents the capacitors, key passive components in power electronics, followed by a modeling method allowing the stray inductances computation, necessary for the precise simulation of switching waveforms. Thermal behavior associated with power switches follows, and the last part proposes some interesting prospectives associated to Power Electronics integration.

"Power Electronics in Smart Electrical Energy Networks" introduces a new viewpoint on power electronics, re-thinking the basic philosophy governing electricity distribution systems. The proposed concept fully exploits the potential advantages of renewable energy sources and distributed generation (DG), which should not only be connected but also fully integrated into the distribution system in order to increase the efficiency, flexibility, safety, reliability and quality of the electricity and the networks. The transformation of current electricity grids into smart (resilient and interactive) networks necessitates the development, propagation and demonstration of key enabling cost-competitive technologies. A must-read for professionals in power engineering and utility industries, and researchers and postgraduates in distributed electrical power systems, the book presents the features, solutions and applications of the power electronics arrangements useful for future smart electrical energy networks.

Electrical Engineering Advanced Theory of Semiconductor Devices Semiconductor devices are ubiquitous in today's world and are found increasingly in cars, kitchens and electronic door locks, attesting to their presence in our daily lives. This comprehensive book provides the fundamentals of semiconductor device theory from basic quantum physics to computer-aided design. *Advanced Theory of Semiconductor Devices* will improve your understanding of computer simulation of devices through a thorough discussion of basic equations, their validity, and numerical solutions as they are contained in current simulation tools. You will gain state-of-the-art knowledge of devices used in both III-V compounds and silicon technology. Specially featured are novel approaches and explanations of electronic transport, particularly in p-n junction diodes. Close attention is also given to innovative treatments of quantum-well laser diodes and hot electron effects in silicon technology. This in-depth book is written for engineers, graduate students, and research scientists in solid-state electronics who want to gain a better understanding of the principles underlying semiconductor devices.

Power Electronic Semiconductor Switches is the successor to Professor Ramshaw's widely-used *Power Electronics*. The text has been completely re-written and expanded to

focus on semiconductor switches, and to take into account advances in the field since the publication of Power Electronics and changes in electrical and electronic engineering syllabuses.

This symposium was the scientific-technical event of the centennial celebration of the Asea Brown Boveri Switzerland. The purpose was to assess the present state of the art as well as shaping the basis for future progress in the area of power devices and related power circuits. The merger of Brown Boveri (BBC) with Asea to Asea Brown Boveri (ABB) three years ago gave new stimulus and enriched the technical substance of the symposium. By 1991, 100 years after the formation of BBC in Switzerland as a single company, this organization has been decentralized, forming 35 independent ABB companies. One of them - ABB Semiconductors Ltd. - directly deals with the power semiconductor business. These significant changes reflect the changes in the market place: increased competition and higher customer expectations have to be fulfilled. In line with the core business activities of ABB and with the concept of sustainable development, it is natural for ABB to be active in the area of power devices and circuits. Increased awareness towards energy conservation is one of the main drives for these activities. User friendliness is another drive: integration of intelligent functions, e.g. protection and/or increased direct computer interfacing of the power circuits. Therefore, also the R&D activities related to the subject of this symposium will in the future be characterized by an even stronger coupling with the market needs. For the members of the R&D Laboratories this means improved customer partnership beyond operational excellence.

The book addresses the need to investigate new approaches to lower energy requirement in multiple application areas and serves as a guide into emerging circuit technologies. It explores revolutionary device concepts, sensors, and associated circuits and architectures that will greatly extend the practical engineering limits of energy-efficient computation. The book responds to the need to develop disruptive new system architectures and semiconductor processes aimed at achieving the highest level of computational energy efficiency for general purpose computing systems. Discusses unique technologies and material only available in specialized journal and conferences. Covers emerging materials and device structures, such as ultra-low power technologies, nanoelectronics, and microsystem manufacturing. Explores semiconductor processing and manufacturing, device design, and performance. Contains practical applications in the engineering field, as well as graduate studies. Written by international experts from both academia and industry.

The aim of this book is to provide an overview of the various types of power semiconductor devices, to give an insight into how they function, and to explain and analyze the characteristics of the various components. All the important classes of power semiconductors are covered. Of particular interest, the author takes into account the role of plasma formation in the operation of highpower semiconductor devices.

This book covers the fundamentals and significance of 2-D materials and related semiconductor transistor technologies for the next-generation ultra low power applications. It provides comprehensive coverage on advanced low power transistors such as NCFETs, FinFETs, TFETs, and flexible transistors for future ultra low power applications owing to their better subthreshold swing and scalability. In addition, the text examines the use of field-effect transistors for biosensing applications and covers design considerations and compact modeling of advanced low power transistors such as NCFETs, FinFETs, and TFETs. TCAD simulation examples are also provided. FEATURES Discusses the latest updates in the field of ultra low power semiconductor transistors Provides both experimental and analytical solutions for TFETs and NCFETs Presents synthesis and fabrication processes for FinFETs Reviews details on 2-D materials and 2-D transistors Explores the application of FETs for biosensing in the healthcare field This book is aimed at researchers, professionals, and graduate students in electrical engineering, electronics and communication engineering, electron devices, nanoelectronics and nanotechnology, microelectronics, and solid-state circuits.

Detailed explanations suitable for self-instruction are given for the design and operation of a large variety of power supplies and converters. Provides a sound basis of theoretical knowledge while stressing practical methods, allowing the reader to apply the ideas in the text to all types of circuits. Discusses transient circuit analysis, Fourier analysis, electric machine theory, and elementary control system theory, and goes on to discuss various types of systems and their physical appearance, circuits including thyristors and the method of rating and classifying them. Individual classes of converter are examined in succeeding chapters. Numerical examples based on practical experience are included. From power electronics to power integrated circuits (PICs), smart power technologies, devices, and beyond, Integrated Power Devices and TCAD Simulation provides a complete picture of the power management and semiconductor industry. An essential reference for power device engineering students and professionals, the book not only describes the physics inside integrated power semiconductor devices such as lateral double-diffused metal oxide semiconductor field-effect transistors (LDMOSFETs), lateral insulated-gate bipolar transistors (IGBTs), and super junction LDMOSFETs but also delivers a simple introduction to power management systems. Instead of abstract theoretical treatments and daunting equations, the text uses technology computer-aided design (TCAD) simulation examples to explain the design of integrated power semiconductor devices. It also explores next generation power devices such as gallium nitride power high electron mobility transistors (GaN power HEMTs). Including a virtual process flow for smart PIC technology as well as a hard-to-find technology development organization chart, Integrated Power Devices and TCAD Simulation gives students and junior engineers a head start in the field of power semiconductor devices while helping to fill the gap between power device engineering and power management systems.

Power Electronics Device Applications of Diamond Semiconductors presents state-of-the-art research on diamond growth, doping, device processing, theoretical modeling and device performance. The book begins with a comprehensive and close examination of diamond crystal growth from the vapor phase for epitaxial diamond and wafer preparation.

It looks at single crystal vapor deposition (CVD) growth sectors and defect control, ultra high purity SC-CVD, SC diamond wafer CVD, heteroepitaxy on Ir/MqO and needle-induced large area growth, also discussing the latest doping and semiconductor characterization methods, fundamental material properties and device physics. The book concludes with a discussion of circuits and applications, featuring the switching behavior of diamond devices and applications, high frequency and high temperature operation, and potential applications of diamond semiconductors for high voltage devices. Includes contributions from today's most respected researchers who present the latest results for diamond growth, doping, device fabrication, theoretical modeling and device performance Examines why diamond semiconductors could lead to superior power electronics Discusses the main challenges to device realization and the best opportunities for the next generation of power electronics

This descriptive textbook provides a clear look at the theories and process technologies necessary for understanding the modern power semiconductor devices, i.e. from the fundamentals of p-n junction electrostatics, unipolar MOSFET and superjunction structures, bipolar IGBT, to the most recent wide bandgap SiC and GaN devices. It also covers their associated semiconductor process technologies. Real examples based on actual fabricated devices, with the process steps described in clear detail are especially useful. This book is suitable for university courses on power semiconductor or power electronic devices. Device designers and researchers will also find this book a good reference in their work, especially for those focusing on the advanced device development and design aspects.

Fundamentals of Power Semiconductor Devices provides an in-depth treatment of the physics of operation of power semiconductor devices that are commonly used by the power electronics industry. Analytical models for explaining the operation of all power semiconductor devices are shown. The treatment here focuses on silicon devices but includes the unique attributes and design requirements for emerging silicon carbide devices. The book will appeal to practicing engineers in the power semiconductor device community.

Across 15 chapters, Semiconductor Devices covers the theory and application of discrete semiconductor devices including various types of diodes, bipolar junction transistors, JFETs, MOSFETs and IGBTs. Applications include rectifying, clipping, clamping, switching, small signal amplifiers and followers, and class A, B and D power amplifiers.

Focusing on practical aspects of analysis and design, interpretations of device data sheets are integrated throughout the chapters. Computer simulations of circuit responses are included as well. Each chapter features a set of learning objectives, numerous sample problems, and a variety of exercises designed to hone and test circuit design and analysis skills. A companion laboratory manual is available. This is the print version of the on-line OER.

Power Semiconductor Devices Theory and Applications Vít???zslav Benda Czech Technical University, Prague, Czech Republic John Gowar Duncan A. Grant University of Bristol, UK Recent advances in robotics, automatic control and power conditioning systems have prompted research into increasingly sophisticated power semiconductor devices. This cutting-edge text explores the design, physical processes and applications performance of current power semiconductor devices. The extensive scope covers the complete range of discrete and integrated devices now available. Features include: * Use of physical models to explain the device structures and functions without complicated mathematical techniques * Explanation of the structure, function, characteristics and features of the most important discrete and integrated power devices * Demonstration of the influence of construction and technological parameters on important device characteristics * Sections on power modules and conditions for reliable operation plus a look at future materials and devices This valuable reference encompassing the structure, operation and application of power semiconductor devices will benefit both practising electronics engineers and students of power electronics.

This book addresses material growth, device fabrication, device application, and commercialization of energy-efficient white light-emitting diodes (LEDs), laser diodes, and power electronics devices. It begins with an overview on basics of semiconductor materials, physics, growth and characterization techniques, followed by detailed discussion of advantages, drawbacks, design issues, processing, applications, and key challenges for state of the art GaN-based devices. It includes state of the art material synthesis techniques with an overview on growth technologies for emerging bulk or free standing GaN and AlN substrates and their applications in electronics, detection, sensing, optoelectronics and photonics. Wengang (Wayne) Bi is Distinguished Chair Professor and Associate Dean in the College of Information and Electrical Engineering at Hebei University of Technology in Tianjin, China. Hao-chung (Henry) Kuo is Distinguished Professor and Associate Director of the Photonics Center at National Chiao-Tung University, Hsin-Tsu, Taiwan, China. Pei-Cheng Ku is an associate professor in the Department of Electrical Engineering & Computer Science at the University of Michigan, Ann Arbor, USA. Bo Shen is the Cheung Kong Professor at Peking University in China.

The growth of power electronics, centering on inverters and converters as its key system topology, has accelerated recently due to the demand for efficient power conversion. This growth has also been backed up by several evolutionary changes and breakthroughs achieved in the areas of power semiconductor device physics, process technology, and design. However, as power semiconductor technology remains a highly specialized subject, the literature on further research, development, and design in related fields is not adequate. With this in view, two specialists of power semiconductors, well known for their research and contributions to the field, compiled this book as a review volume focusing on power chip and module technologies. The prime purpose is to help researchers, academia, and engineers, engaged in areas related to power devices and power electronics, better understand the evolutionary growth of major power device components, their operating principles, design aspects, application features, and trends. The book is filled with unique topics related to power semiconductors, including tips on state-of-the-art and futuristic-oriented applications. Numerous diagrams, illustrations, and graphics are included

to adequately support the content and to make the book extremely attractive as a practical and user-friendly reference book for researchers, technologists, and engineers, as well as a textbook for advanced graduate-level and postgraduate students.

Provides a wide range of indepth coverage of both semiconductor device theory and device application in power electronics. Material covered gives the reader a sound appreciation of the device types, their operating mechanisms and limitations -- all of which is required for correct device selection. Focusing on high-power devices, the book considers how device structure and construction are related to its terminal electrical and thermal construction. Also covered are the circuitry required to use power devices, interfacing and control requirements, and the structure and electrical characteristics of a device as they relate to its drive and protection. Features numerous diagrams and problems with numerical answers.

Written in a tutorial form, the text supplies in-depth the physics, design, and fabrication technology for power devices. Each chapter includes a discussion of the basic concepts of device operation and their electrical characteristics, a detailed analysis of the device physics, and the technology of fabrication. Extensive analytical solutions are used to enable the reader to obtain an understanding of the physics.

Power semiconductor devices are widely used for the control and management of electrical energy. The improving performance of power devices has enabled cost reductions and efficiency increases resulting in lower fossil fuel usage and less environmental pollution. This book provides the first cohesive treatment of the physics and design of silicon carbide power devices with an emphasis on unipolar structures. It uses the results of extensive numerical simulations to elucidate the operating principles of these important devices.

Halbleiter-Leistungsbaulemente sind das Kernstück der Leistungselektronik. Sie bestimmen die Leistungsfähigkeit und machen neuartige und verlustarme Schaltungen erst möglich. In dem Band wird neben den Halbleiter-Leistungsbaulementen selbst auch die Aufbau- und Verbindungstechnik behandelt: von den physikalischen Grundlagen und der Herstellungstechnologie über einzelne Bauelemente bis zu thermomechanischen Problemen, Zerstörungsmechanismen und Störungseffekten. Die 2., überarbeitete Auflage berücksichtigt technische Neuerungen und Entwicklungen.

Power Electronics: Switches and Converters explains the principles and practices of power electronics, electronic switches and converters with the support of illustration and worked examples, guiding the reader from theory to real-life application. Covering insights on industrial applications and practical aspects of power electronic devices and power converter systems, the book is intended for engineers, researchers and students in the field of power electronics who are interested in advanced control of power converters and the exploration of new applications of control theory. Includes illustrated diagrams to cover up-to-date industry applications Provides in-depth, worked examples that support the understanding of discussed power electronics theory and applications Includes end-of-chapter evaluations to reinforce the acquired knowledge

'This is an excellent reference book for graduates or undergraduates studying semiconductor technology, or for working professionals who need a reference for detailed theory and working knowledge of processes in the field of power semiconductor devices.'IEEE Electrical Insulation MagazineThis descriptive textbook provides a clear look at the theories and process technologies necessary for understanding the modern power semiconductor devices, i.e. from the fundamentals of p-n junction electrostatics, unipolar MOSFET and superjunction structures, bipolar IGBT, to the most recent wide bandgap SiC and GaN devices. It also covers their associated semiconductor process technologies. Real examples based on actual fabricated devices, with the process steps described in clear detail are especially useful. This book is suitable for university courses on power semiconductor or power electronic devices. Device designers and researchers will also find this book a good reference in their work, especially for those focusing on the advanced device development and design aspects.

CD-ROM contains: "Win32 version of SGFramework and the simulations contains in the book."

Entrepreneurship in Power Semiconductor Devices, Power Electronics, and Electric Machines and Drive Systems introduces the basics of entrepreneurship and a methodology for the study of entrepreneurship in electrical engineering and other engineering fields. Entrepreneurship is considered here in three fields of electrical engineering, viz. power semiconductor devices, power electronics and electric machines and drive systems, and their current practice. It prepares the reader by providing a review of the subject matter in the three fields, their current status in research and development with analysis aspect as needed, thus allowing readers to gain self-sufficiency while reading the book. Each field's emerging applications, current market and future market forecasts are introduced to understand the basis and need for emerging startups. Practical learning is introduced in: (i) power semiconductor devices entrepreneurship through the prism of 20 startups in detail, (ii) power electronics entrepreneurship through 28 startup companies arranged under various application fields and (iii) electric machines and drive systems entrepreneurship through 15 startups in electromagnetic and 1 in electrostatic machines and drive systems. The book: (i) demystifies entrepreneurship in a practical way to equip engineers and students with entrepreneurship as an option for their professional growth, pursuit and success; (ii) provides engineering managers and corporate-level executives a detailed view of entrepreneurship activities in the considered three fields that may potentially impact their businesses, (iii) provides entrepreneurship education in an electrical engineering environment and with direct connection and correlation to their fields of study and (iv) endows a methodology that can be effectively employed not only in the three illustrated fields of electrical engineering but in other fields as well. This book is for electrical engineering students and professionals. For use in undergraduate and graduate courses in electrical engineering, the book contains discussion questions, exercise problems,

team and class projects, all from a practical point of view, to train students and assist professionals for future entrepreneurship endeavors.

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