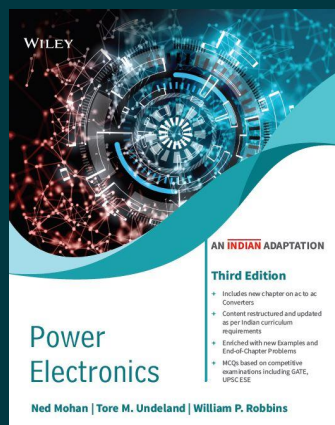




Power Electronics, 3ed: Converters, Applications and Design (An Indian Adaptation)

By Ned Mohan , Tore M. Undeland , William P. Robbins

Paperback

9789354640278

₹1,139.00

Pages: 740

Description

Power Electronics offers cohesive and in-depth presentation of power electronics fundamentals for applications and design in an easy-to-follow step-by-step manner. A detailed coverage of practical and emerging power electronic converters based on new generation of power semiconductor devices is also included. This Indian Adaptation of the third edition of the book builds on the conceptual strength of the previous editions, reorganizes topic coverage at places and offers new content.

About the Author

Ned Mohan , Tore M. Undeland , William P. Robbins

Ned Mohan is the Oscar A. Schott Professor of Power Electronics at the University of Minnesota, He has numerous patents and publications in this field. He is a Fellow of the IEEE.

Tore M. Undeland is a professor in Power Electronics in the Faculty of Information Technology, Mathematics and Electrical Engineering at the Norwegian University of Science and Technology, NTNU, Trondheim, Norway. He is also a scientific advisor to the SINTEF Energy Research.

William P. Robbins is a professor in the Department of Electrical and Computer Engineering at the University of Minnesota. Prior to joining the University of Minnesota

Table of Contents

Part 1 Introduction

Chapter 1 Power Electronic Systems

1-1 Introduction

1-2 Power Electronics versus Linear Electronics

1-3 Scope and Applications

1-4 Classification of Power Processors and Converters

1-5 Interdisciplinary Nature of Power Electronics

1-6 Convention of Symbols Used

1-7 About the Text

Chapter 2 Overview of Power Semiconductor Switches

2-1 Introduction

2-2 Diodes

- 2-3 Thyristors
- 2-4 Desired Characteristics in Controllable Switches
- 2-5 Bipolar Junction Transistors and Monolithic Darlington
- 2-6 Metal-Oxide-Semiconductor Field Effect Transistors
- 2-7 Gate-Turn-Off Thyristors
- 2-8 Insulated Gate Bipolar Transistors
- 2-9 MOS-Controlled Thyristors
- 2-10 Comparison of Controllable Switches
- 2-11 Drive and Snubber Circuits
- 2-12 Justification for Using Idealized Device Characteristics
- Chapter 3 Review of Basic Electrical and Magnetic Circuit Concepts
- 3-1 Introduction
- 3-2 Electrical Circuits
- 3-3 Magnetic Circuits
- Part 2 Semiconductor Devices
- Chapter 4 Basic Semiconductor Physics
- 4-1 Introduction
- 4-2 Conduction Processes in Semiconductors
- 4-3 pn Junctions
- 4-4 Charge Control Description of pn-Junction Operation
- 4-5 Avalanche Breakdown
- Chapter 5 Power Diodes
- 5-1 Introduction
- 5-2 Basic Structure and I-V Characteristics
- 5-3 Breakdown Voltage Considerations
- 5-4 On-State Losses
- 5-5 Switching Characteristics
- 5-6 Schottky Diodes
- Chapter 6 Bipolar Junction Transistors
- 6-1 Introduction
- 6-2 Vertical Power Transistor Structures
- 6-3 I-V Characteristics
- 6-4 Physics of BJT Operation
- 6-5 Switching Characteristics
- 6-6 Breakdown Voltages
- 6-7 Second Breakdown
- 6-8 On-State Losses
- 6-9 Safe Operating Areas

Chapter 7 Power MOSFETs

7-1 Introduction

7-2 Basic Structure

7-3 I-V Characteristics

7-4 Physics of Device Operation

7-5 Switching Characteristics

7-6 Operating Limitations and Safe Operating Areas

7-7 Comparison Between Power BJT and MOSFET

Chapter 8 Thyristors

8-1 Introduction

8-2 Basic Structure

8-3 I-V Characteristics

8-4 Physics of Device Operation

8-5 Switching Characteristics

8-6 Methods of Improving di/dt and dv/dt Ratings

Chapter 9 Gate Turn-Off Thyristors

9-1 Introduction

9-2 Basic Structure and I-V Characteristics

9-3 Physics of Turn-Off Operation

9-4 GTO Switching Characteristics

9-5 Overcurrent Protection of GTOs

Chapter 10 Insulated Gate Bipolar Transistors

10-1 Introduction

10-2 Basic Structure

10-3 I-V Characteristics

10-4 Physics of Device Operation

10-5 Latchup in IGBTs

10-6 Switching Characteristics

10-7 Device Limits and SOAs

Chapter 11 Emerging Devices and Circuits

11-1 Introduction

11-2 Power Junction Field Effect Transistors

11-3 Field-Controlled Thyristor

11-4 JFET-Based Devices versus Other Power Devices

11-5 MOS-Controlled Thyristors

11-6 Power Integrated Circuits

11-7 New Semiconductor Materials for Power Devices

11-8 Wide-Bandgap Semiconductors

Part 3 Power Electronic Circuits

Chapter 12 Diode Rectifiers: ac → Uncontrolled dc

12-1 Introduction

12-2 Basic Rectifier Concepts

12-3 Single-Phase Diode Bridge Rectifiers

12-4 Voltage Doubler (Single-Phase) Rectifiers

12-5 Effect of Single-Phase Rectifiers on Neutral Currents in Three-Phase, Four-Wire Systems

12-6 Three-Phase, Full-Bridge Rectifiers

12-7 Comparison of Single-Phase and Three-Phase Rectifiers

12-8 Inrush Current and Overvoltages at Turn-On

12-9 Concerns and Remedies for Line-Current Harmonics and Low Power Factor

Chapter 13 Phase-Controlled Rectifiers and Inverters: Line Frequency

ac ↔ Controlled dc

13-1 Introduction

13-2 Thyristor Circuits and their Control

13-3 Single-Phase Converters

13-4 Three-Phase Converters

13-5 Other Three-Phase Converters

Chapter 14 dc-dc Converters

14-1 Introduction

14-2 Control of dc-dc Converters

14-3 Step-Down (Buck) Converter

14-4 Step-Up (Boost) Converter

14-5 Buck-Boost Converter

14-6 Cúk dc-dc Converter

14-7 Full-Bridge dc-dc Converter

14-8 dc-dc Converter Comparison

Chapter 15 dc-ac Inverters

15-1 Introduction

15-2 Basic Concepts of Switch-Mode Inverters

15-3 Single-Phase Inverters

15-4 Three-Phase Inverters

15-5 Effect of Blanking Time on Voltage in PWM Inverters

15-6 Other Inverter Switching Schemes

15-7 Rectifier Mode of Operation

Chapter 16 Resonant Converters

16-1 Introduction

16-2 Classification of Resonant Converters

16-3 Basic Resonant Circuit Concepts

16-4 Load-Resonant Converters

16-5 Resonant-Switch Converters

16-6 Zero-Voltage-Switching, Clamped-Voltage Topologies

16-7 Resonant-dc-Link Inverters with Zero-Voltage Switchings

16-8 High-Frequency-Link Integral-Half-Cycle Converters

Chapter 17 ac-ac Converters

17-1 Introduction

17-2 Principle of Converter Control

17-3 Single-Phase Full Wave ac Voltage Controller

17-4 Three-Phase Full Wave Voltage Controller

17-5 Cycloconverter

Part 4 Power Supply Applications

Chapter 18 Switching dc Power Supplies

18-1 Introduction

18-2 Linear Power Supplies

18-3 Overview of Switching Power Supplies

18-4 dc-dc Converters with Electrical Isolation

18-5 Control of Switch-Mode dc Power Supplies

18-6 Power Supply Protection

18-7 Electrical Isolation in the Feedback Loop

18-8 Designing to Meet the Power Supply Specifications

Chapter 19 Power Conditioners and Uninterruptible Power Supplies

19-1 Introduction

19-2 Power Line Disturbances

19-3 Power Conditioners

19-4 Uninterruptible Power Supplies (UPSs)

Part 5 Other Applications

Chapter 20 Residential and Industrial Applications

20-1 Introduction

20-2 Residential Applications

20-3 Industrial Applications

20-4 Interconnection of Renewable Energy Sources to Utility

20-5 Grid-Connected Electric Vehicle Charging Stations

Chapter 21 Optimizing the Utility Interface with Power Electronic Systems

21-1 Introduction

21-2 Generation of Current Harmonics

21-3 Current Harmonics and Power Factor

21-4 Harmonic Standards and Recommended Practices

21-5 Need for Improved Utility Interface

21-6 Improved Single-Phase Utility Interface

21-7 Improved Three-Phase Utility Interface

21-8 Electromagnetic Interference

Part 6 Practical Converter Design Considerations

Chapter 22 Snubber Circuits

22-1 Function and Types of Snubber Circuits

22-2 Diode Snubbers

22-3 Snubber Circuits for Thyristors

22-4 Need for Snubbers with Transistors

22-5 Turn-Off Snubber

22-6 Overvoltage Snubber

22-7 Turn-On Snubber

22-8 Snubbers for Bridge Circuit Configurations

22-9 GTO Snubber Considerations

Chapter 23 Gate and Base Drive Circuits

23-1 Preliminary Design Considerations

23-2 dc-Coupled Drive Circuits

23-3 Electrically Isolated Drive Circuits

23-4 Cascode-Connected Drive Circuits

23-5 Thyristor Drive Circuits

23-6 Power Device Protection in Drive Circuits

23-7 Circuit Layout Considerations

Chapter 24 Component Temperature Control and Heat Sinks

24-1 Control of Semiconductor Device Temperatures

24-2 Heat Transfer by Conduction

24-3 Heat Sinks

24-4 Heat Transfer by Radiation and Convection

Chapter 25 Design of Magnetic Components

25-1 Magnetic Materials and Cores

25-2 Copper Windings

25-3 Thermal Considerations

25-4 Analysis of a Specific Inductor Design

25-5 Inductor Design Procedures

25-6 Analysis of a Specific Transformer Design

25-7 Eddy Currents

25-8 Transformer Leakage Inductance

25-9 Transformer Design Procedure

25-10 Comparison of Transformer and Inductor Sizes

Part 7 Motor Drive Applications

Chapter 26 Introduction to Motor Drives

26-1 Introduction

26-2 Criteria for Selecting Drive Components

Chapter 27 dc Motor Drives

27-1 Introduction

27-2 Equivalent Circuit of dc Motors

27-3 Permanent-Magnet dc Motors

27-4 dc Motors with a Separately Excited Field Winding

27-5 Effect of Armature Current Waveform

27-6 dc Servo Drives

27-7 Adjustable-Speed dc Drives

Chapter 28 Induction Motor Drives

28-1 Introduction

28-2 Basic Principles of Induction Motor Operation

28-3 Induction Motor Characteristics at Rated (Line) Frequency and Rated Voltage

28-4 Speed Control by Varying Stator Frequency and Voltage

28-5 Impact of Nonsinusoidal Excitation on Induction Motors

28-6 Variable-Frequency Converter Classifications

28-7 Variable-Frequency PWM-VSI Drives

28-8 Variable-Frequency Square-Wave VSI Drives

28-9 Variable-Frequency CSI Drives

28-10 Comparison of Variable-Frequency Drives

28-11 Line-Frequency Variable-Voltage Drives

28-12 Reduced Voltage Starting ("Soft Start") of Induction Motors

28-13 Speed Control by Static Slip Power Recovery

Chapter 29 Synchronous Motor Drives

29-1 Introduction

29-2 Basic Principles of Synchronous Motor Operation

29-3 Synchronous Servomotor Drives with Sinusoidal Waveforms

29-4 Synchronous Servomotor Drives with Trapezoidal Waveforms

29-5 Load-Commutated Inverter Drives

29-6 Cycloconverters

Appendix Computer Simulation of Power Electronic Converters and Systems A

A-1 Introduction

A-2 Challenges in Computer Simulation

A-3 Simulation Process

A-4 Mechanics of Simulation [1]

A-5 Solution Techniques for Time-Domain Analysis

A-6 Widely Used, Circuit-Oriented Simulators

A-7 Equation Solvers

Summary

Problems

References

To purchase this product, please visit:

<https://www.wileyindia.com/power-electronics-3ed-an-indian-adaptation-converters-applications-and-design.html>



Scan to buy