

P rinciples and E lements

of

POWER ELECTRONICS

Devices, Drivers, Applications, and Passive Components

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PREFACE

The book is in five parts.

Part 1 covers power semiconductor switching devices, their static and dynamic electrical and thermal characteristics and properties. Part 2 describes device driving and protection, while Part 3 presents a number of generic applications. Part 4 covers systems and energy sources. The final part, Part 5, introduces capacitors, magnetic components, resistors, and dc relays and their characteristics relevant to power electronic applications.

- 1 Basic Semiconductor Physics and Technology
- 2 The pn Junction
- 3 Power Switching Devices and their Static Electrical Characteristics
- 4 Electrical Ratings and Characteristics of Power Semiconductor Switching Devices
- 5 Cooling of Power Switching Semiconductor Devices
- 6 High-Performance Cooling for Power Electronics

- 7 Load, Switch, and Commutation Considerations
- 8 Driving Transistors and Thyristors
- 9 Protecting Diodes, Transistors, and Thyristors
- 10 Switching-aid Circuits with Energy Recovery
- 11 Series and Parallel Device Operation, Interference, and Grounding
- 12 Device Protection

- 13 Naturally Commutating AC to DC Converters – Uncontrolled Rectifiers
- 14 Naturally Commutating AC to DC Converters – Controlled Rectifiers
- 15 AC Voltage Regulators
- 16 DC Choppers
- 17 DC to AC Inverters – Switched Mode
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- 19 DC to DC Converters - Switched-mode
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- 22 50/60Hz Transformers: Single and Three Phase

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- 24 HVDC Transmission Modelling
- 25 FACTS Devices and Custom Controllers
- 26 Inverter Grid Connection for Embedded Generation
- 27 Energy Sources and Storage: Primary Sources
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- 29 Capacitors
- 30 Resistors
- 31 Soft Magnetic Materials: Inductors and Transformers
- 32 Hard Magnetic Materials: Permanent Magnets
- 33 Contactors and Relays
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The 174 non-trivial worked examples cover the key issues in power electronics.