Pulsewidth Modulated DC-to-DC Power Conversion. Circuits, Dynamics, and Control Designs

Description: This is the definitive reference for anyone involved in pulsewidth modulated DC-to-DC power conversion.

Pulsewidth Modulated DC-to-DC Power Conversion: Circuits, Dynamics, and Control Designs provides engineers, researchers, and students in the power electronics field with comprehensive and complete guidance to understanding pulsewidth modulated (PWM) DC-to-DC power converters. Presented in three parts, the book addresses the circuitry and operation of PWM DC-to-DC converters and their dynamic characteristics, along with in-depth discussions of control design of PWM DC-to-DC converters. Topics include:

- Basics of DC-to-DC power conversion
- DC-to-DC converter circuits
- Dynamic modeling
- Power stage dynamics
- Closed-loop performance
- Voltage mode control and feedback design
- Current mode control and compensation design
- Sampling effects of current mode control

Featuring fully tested problems and simulation examples as well as downloadable lecture slides and ready-to-run PSpice programs, Pulsewidth Modulated DC-to-DC Power Conversion is an ideal reference book for professional engineers as well as graduate and undergraduate students.

Contents:

Preface vii

PART I CIRCUITS FOR DC-TO-DC

POWER CONVERTERS

1 PWM Dc-to-dc Power Conversion 3

1.1 Description of PWM Dc-to-dc Power Conversion 4

1.2 Dc-to-dc Power Conversion System 7

1.3 Features and Issues of PWM Dc-to-dc Converter 8

1.4 Chapter Highlights 10

References 12

2 Power Stage Components 13

2.1 Semiconductor Switches 13

2.2 Energy Storage and Transfer Devices 17

2.3 Switching Circuits in Practice 38

2.4 Summary 50

References 51

Problems 51
3.5.2 Conditions for DCM Operation 90
3.5.3 Steady State Operation in DCM 92
3.6 Closed-loop Control of Buck Converter 97
3.6.1 Closed-loop Feedback Controller 98
3.6.2 Responses of Closed-loop Controlled Buck Converter 102
3.7 Summary 107
References 108
Problems 108
4 Dc-to-dc Power Converter Circuits 123
4.1 Boost Converter 124
4.1.1 Evolution to Boost Converter 124
4.1.2 Steady State Analysis in CCM 126
4.1.3 Steady State Analysis in DCM 130
4.1.4 Effects of Parasitic Resistance on Voltage Gain 132
4.2 Buck/Boost Converter 135
4.2.1 Evolution to Buck/Boost Converter 135
4.2.2 Steady-state Analysis in CCM 138
4.2.3 Steady-state Analysis in DCM 141
4.3 Structure and Voltage Gain of Three Basic Converters 144
4.4 Flyback Converter: Transformer Isolated Buck/Boost Converter 145
4.4.1 Evolution to Flyback Converter 146
4.4.2 Steady-state Analysis in CCM 147
4.4.3 Steady-state Analysis in DCM 151
4.5 Bridge-Type Buck Derived Isolated Dc-to-dc Converters 154
4.5.1 Switch Network and Multi Winding Transformer 155
4.5.2 Full-Bridge Converter 158
4.5.3 Half-Bridge Converter 163
4.5.4 Push-Pull Converter 167
4.6 Forward Converters 167
4.6.1 Basic Operational Principles 167
4.6.2 Tertiary-Winding Reset Forward Converter 173
9.2.4 Origin of Instability 448
9.2.5 Control Design with Source Impedance 450
9.2.6 Impacts of Source Impedance on Loop Gain and -output Impedance 450
9.3 Consideration for Non-Resistive Load 452
9.4 Summary 453
References 456
Problems 456

PART III CURRENT MODE CONTROL
10 Current Mode Control – Functional Basics and Classical Analysis 467
10.1 Current Mode Control Basics 469
10.1.1 Evolution to Peak Current Mode Control 469
10.1.2 Benefits and Issues of Peak Current Mode Control 476
10.1.3 Average Current Mode Control and Charge Control 478
10.2 Classical Analysis and Control Design Procedures 480
10.2.1 Small signal Model for Peak Current Mode Control 482
10.2.2 Loop Gain Analysis 488
10.2.3 Stability Analysis 491
10.2.4 Voltage Feedback Compensation 494
10.2.5 Control Design Procedures 499
10.2.6 Analysis of Converter Dynamics in DCM 508
10.3 Closed-loop Performance of Peak Current Mode Control 511
10.3.1 Audio-Susceptibility Analysis 512
10.3.2 -output Impedance Analysis 519
10.3.3 Step Load Response Analysis 523
10.4 Current Mode Control for Boost and Buck/Boost Converters 535
10.4.1 Stability Analysis and Control Design 535
10.4.2 Loop Gain Analysis 546
10.5 Summary 551
References 553
Problems 553

11 Current Mode Control – Sampling Effects and New Control Design Procedures 561
11.1 Sampling Effects of Current Mode Control 562
11.1.1 Origin and Consequence of Sampling Effects 562
11.1.2 Modeling Methodology for Sampling Effects 565
11.1.3 Feedforward Gains 566
11.1.4 Complete s-Domain Model for Current Mode Control 567
11.1.5 Two Prevalent s-Domain Models for Current Mode Control 567
11.2 Expressions for s-Domain Model for Current Mode Control 569
11.2.1 Modified Small signal Model 570
11.2.2 Modulator Gain F-m 571
11.2.3 He(s): s-Domain Representation of Sampling Effects 572
11.2.4 Feedforward Gains 582
11.3 New Control Design Procedures for Current Mode Control 586
11.3.1 New Power Stage Model 586
11.3.2 Control-to-output Transfer Function with Current-Loop Closed 588
11.3.3 Control Design Procedures 593
11.3.4 Correlation between New and Classical Design Procedures 609
11.4 Current Mode Control for Off-Line Flyback Converter with Optocoupler-Isolated Feedback 615
11.4.1 Off-Line Power Supplies 615
11.4.2 Current Mode Control for Flyback Converter with Optocoupler Feedback 616
11.5 Summary 630
References 633
Problems 633
Index 637
Fax Order Form
To place an order via fax simply print this form, fill in the information below and fax the completed form to 646-607-1907 (from USA) or +353-1-481-1716 (from Rest of World). If you have any questions please visit http://www.researchandmarkets.com/contact/

Order Information
Please verify that the product information is correct.

Product Name: Pulsewidth Modulated DC-to-DC Power Conversion. Circuits, Dynamics, and Control Designs
Web Address: http://www.researchandmarkets.com/reports/2176771/
Office Code: SCEJDYH9

Product Format
Please select the product format and quantity you require:

Quantity
Hard Copy (Hard Back): □ USD 147 + USD 28 Shipping/Handling

* Shipping/Handling is only charged once per order.

Contact Information
Please enter all the information below in BLOCK CAPITALS

Title: □ Mr □ Mrs □ Dr □ Miss □ Ms □ Prof □
First Name: ____________________________ Last Name: ____________________________
Email Address: * ____________________________
Job Title: ____________________________
Organisation: ____________________________
Address: ____________________________
City: ____________________________
Postal / Zip Code: ____________________________
Country: ____________________________
Phone Number: ____________________________
Fax Number: ____________________________

* Please refrain from using free email accounts when ordering (e.g. Yahoo, Hotmail, AOL)
Payment Information

Please indicate the payment method you would like to use by selecting the appropriate box.

☐ Pay by credit card: You will receive an email with a link to a secure webpage to enter your credit card details.

☐ Pay by check: Please post the check, accompanied by this form, to:
Research and Markets,
Guinness Center,
Taylors Lane,
Dublin 8,
Ireland.

☐ Pay by wire transfer: Please transfer funds to:

Account number: 833 130 83
Sort code: 98-53-30
Swift code: ULSBIE2D
IBAN number: IE78ULSB98533083313083
Bank Address: Ulster Bank,
27-35 Main Street,
Blackrock,
Co. Dublin,
Ireland.

If you have a Marketing Code please enter it below:

Marketing Code: 

Please note that by ordering from Research and Markets you are agreeing to our Terms and Conditions at http://www.researchandmarkets.com/info/terms.asp

Please fax this form to:
(646) 607-1907 or (646) 964-6609 - From USA
+353-1-481-1716 or +353-1-653-1571 - From Rest of World