

Contents

Preface	xiii
Foreword	xv
Acknowledgments	xix
Chapter 1: Libraries	1
1.1 Standard Cells	2
1.2 Transistor Sizing	12
1.3 Input-Output Pads	16
1.4 Library Characterization	25
1.5 Summary	34
Chapter 2: Floorplanning	37
2.1 Technology File	38
2.2 Circuit Description	40
2.3 Design Constraints	45
2.4 Design Planning	47
2.5 Pad Placement	51

2.6	Power Planning	54
2.7	Macro Placement	58
2.8	Clock Planning	64
2.9	Summary	66
Chapter 3: Placement		71
3.1	Global Placement	72
3.2	Detail Placement	81
3.3	Clock Tree Synthesis	89
3.4	Power Analysis	99
3.5	Summary	102
Chapter 4: Routing		105
4.1	Special Routing	106
4.2	Global Routing	108
4.3	Detail Routing	115
4.4	Extraction	123
4.5	Summary	141
Chapter 5: Verification		145
5.1	Functional Verification	146
5.2	Timing Verification	149
5.3	Physical Verification	171
5.4	Summary	175
Chapter 6: Testing		179
6.1	Functional Test	181
6.2	Scan Test	185
6.3	Boundary Scan Test	188
6.4	Fault Detection	190
6.5	Parametric Test	192
6.6	Current and Very Low-level Voltage Test	194
6.7	Wafer Acceptance Test	196
6.8	Memory Test	199

<i>Contents</i>	xi
6.9 Parallel Module Test	202
6.10 Summary	201
Index	205