

Contents

Abstract (Chinese)	i
Abstract (English)	iii
Acknowledgement	v
Contents	vi
Table Captions	viii
Figure Captions	ix

Chapter 1

Introduction

1.1 Background	1
1.2 Organization	3
Fig. 1-1	4



Chapter 2

Small-Signal Model Parameter Extraction Method

2.1 Extraction of Extrinsic Elements	5
2.1.1 Extraction of pad inductances and series resistances	5
2.1.2 Extraction of Parasitic Capacitances	7
2.2 Extraction of Substrate Network Parameters	8
2.3 Extraction of Intrinsic Circuit Elements	11
2.3.1 Extraction of R_{bi} , C_{bci} , C_{π} , and C_{bcx}	12
2.3.2 Accuracy Improvement of R_{bi} , C_{bci} and C_{bcx}	14
2.3.3 Extraction of R_{π} , g_{m0} and τ	15
2.3.4 Discrepancy between measurement and simulation	16
Table 2-1	17
Figure 2-1 – 2-22	18

Chapter 3

Bias Dependences of Intrinsic Model Parameters

3.1 Cutoff Frequency and Maximum Oscillation Frequency	40
3.2 Intrinsic Transconductance and Excess Phase Delay	41
3.3 Intrinsic Base-Emitter Resistance and capacitance	43
3.4 Intrinsic Base-Collector capacitance	43
3.4 Intrinsic Base Resistance	44
Fig. 3-1 – 3-6	46

Chapter 4

Geometrical Effect on Model Parameters

4.1 Scaling Effect of Emitter Length	51
4.2 Scaling Effect of Emitter Width	52
4.3 Scaling Effect of Emitter Finger Number	53
4.4 Cell Number Effect	53
4.5 Geometrical Effect of Collector and Substrate	54
Table 4-1 – 4-4	56
Fig. 4-1 – 4-15	60

Chapter 5

Conclusion and Future Work

5.1 Conclusion	76
5.2 Future Work	77
References	78