Contents

Abstract (C	'hinese)	i
Abstract (E	nglish)	iv
Acknowled	Acknowledgements (Chinese)	
Contents		ix
Table Captions		xiv
Figure Cap	tions	XV
Chapter 1	Introduction	1
	1.1 Overview	1
	1.2 Selection of silicide	3
	1.3 Thesis Organization	7
	References	9
Chapter 2	Thermal stability of nickel silicide thin films on Si	12
	2.1 Introduction	12
	2.2 Experimental procedures	12
	2.3 Results and discussion	15
	2.3.1 NiSi/Si sample implanted with BF_2^+ ions followed by	15
	FA	
	2.3.1.1 Sheet resistance measurement	15

	2.3.1.2 Surface morphology of BF_2^+ implanted	17
	NiSi/Si samples	
	2.3.2 NiSi/Si sample implanted with BF_2^+ ions followed by	19
	RTA	
	2.3.2.1 Sheet resistance measurement	19
	2.3.2.2 Surface morphology of BF_2^+ implanted	20
	NiSi/Si samples	
	2.3.3 NiSi/Si sample implanted with P^+ ions followed by FA	21
	2.3.3.1 Sheet resistance measurement	21
	2.3.3.2 Surface morphology of P^+ and P^+/F^+ dual implanted NiSi/Si samples	22
	the second second	
	2.4 Conclusions	23
	References	25
Chapter 3	NiSi contacted p^+n shallow junction	43
	3.1 Introduction	43
	3.2 Experimental procedures	46
	3.2.1 Formation of NiSi/ p^+n shallow junctions and	46
	characterization techniques	
	3.2.2 Four-terminal Kelvin test structure for $NiSi/p^+n$	48

contact resistance measurement

3.3 TRIM simulation	
3.4 Results and discussion	
3.4.1 NiSi/p ⁺ n junctions formed by furnace annealing (FA)	52
[A] Material characterization	52
[B] Junction depth	52
[C] Electrical characteristics	53
(a) Forward ideality factor	54
(b) Reverse bias current	55
(c) Activation energy measurement	57
(d) Area and peripheral current	58
3.4.2 NiSi/ p^+ n junctions formed by RTA	
[A] Material characterization	60
[B] Junction depth	60
[C] Electrical characteristics	61
(a) Forward ideality factor	61
(b) Reverse bias current	61
(c) Activation energy measurement	63
(d) Area and peripheral current	64

	[D] Contact resistivity of NiSi/p ⁺ n shallow junction	65
	3.5 Conclusion	67
	References	69
Chapter 4	NiSi contacted n^+p shallow junction	95
	4.1 Introduction	95
	4.2 Experimental procedures	97
	4.3 Trim simulation	99
	4.4 Results and discussion	100
	[A] Material characterization	100
	[B] Junction depth	101
	[C] Electrical characteristics	102
	(a) Forward ideality factor	102
	(b) Reverse bias current	103
	(c) Area and peripheral current	104
	(d) Activation energy measurement	106
	4.5 Conclusion	107
	References	109
Chapter 5	Thermal stability of Cu/NiSi contacted p^+n shallow junction	118
	5.1 Introduction	118

	5.2 Experimental procedures	119
	5.3 Results and discussion	121
	5.3.1 Electrical measurement	121
	5.3.2 Sheet resistance measurement	122
	5.3.3 Surface morphology	122
	5.3.4 XRD analysis	123
	5.3.5 SIMS depth profiles	124
	5.4 Conclusion	124
	References	126
Chapter 6	Conclusion	134
	6.1 Main conclusions from the study of this dissertation	134
	6.1.1 Thermal stability of nickel silicide	134
	6.1.2 NiSi/p ⁺ n shallow junction	135
	6.1.3 NiSi/n ⁺ p shallow junction	137
	6.1.4 Thermal stability of TaN/Cu/NiSi/p ⁺ n junction diode	138
	6.2 Suggestion for future study	139
Vita (Chinese)		141
Publication List		142