

Semiconductor Intellectual Property: Continuing on the Path to Growth

January 2008
Study Number: SC108-07

© Copyright Semico Research, 2008. All rights reserved.

Reproduction in whole or part is prohibited without the express written permission of Semico.

The contents of this report represent the interpretation and analysis of statistics and information that is generally available to the public or released by responsible agencies or individuals, but is not guaranteed as to its accuracy or completeness.

Table of Contents

Table of Contents	i
List of Tables	ii
List of Figures	iii
Executive Overview	1
I. Semiconductor Intellectual Property: An Idea That's Time Has Come	4
The History of SIP	4
Where Does Intellectual Property Come From?	9
The Disaggregation of the Semiconductor Market	10
SIP Creates New Classes of Semiconductors	12
A New Twist in SoC Development Has Implications for the IP Market	14
Definition of SIP	19
II. Categories of SIP in the Market Today	19
Categories of SIP	23
Analog SIP	24
A Possible Breakthrough for Analog SIP	26
Types of SIP	29
Where Do Hard, Firm and Soft Cores Fit in the Market?	31
III. Different Business Models for 3 rd Party SIP Vendors	32
Creation of Standards Bodies for the SIP Market	35
Consolidation In the SIP Market	38
IV. Reuse of SIP	39
Design Productivity Gap Driving SIP Reuse	43
Cost for Developing SIP for Reuse	45
V. SIP Market Forecast	48
Total Worldwide SIP Market Forecast	49
SIP Market Forecast by Application	51
Commodity SIP Market Forecast	53
Star SIP Market Forecast	55
SIP Market Forecast for Hard, Firm and Soft SIP	56
SIP Market Forecast for Hard, Firm and Soft SIP by Application	59
Worldwide SIP Market by Device Type	72
Growth In The Number of SIP Blocks Per Design	76
Growth In The Complexity of SIP Blocks	80
Worldwide SIP Market Forecast by Region	83
Worldwide SIP Market Forecast by Function	89
VI. Future Directions in the SIP Market	94
VII. ASIC Market Trends in 2008 and Beyond	100

List of Tables

Table 1: Sixty Years of Semiconductor Innovation	7
Table 2: Segmentation of the SIP Market by Category	22
Table 3: Comparing Hard, Firm and Soft SIP Blocks	30
Table 4: Internal Factors Involved in a Design-For-Reuse Program	41
Table 5: Worldwide SIP Market Forecast by Application	52
Table 6: Worldwide Commodity SIP Market Forecast by Application 2007 - 2012	54
Table 7: Worldwide Star SIP Market Forecast by Application	56
Table 8: Total Hard, Firm & Soft SIP Market Revenue Forecast	57
Table 9: Total Hard, Firm & Soft Commodity SIP Market Revenue Forecast	58
Table 10: Total Hard, Firm & Soft Star SIP Market Revenue Forecast	59
Table 11: Total Hard, Firm & Soft Commodity SIP Market Forecast by Application	60
Table 12: Hard Commodity SIP Market Revenue Forecast by Application	61
Table 13: Firm Commodity SIP Market Revenue Forecast by Application	62
Table 14: Soft Commodity SIP Market Revenue Forecast by Application	63
Table 15: Total Hard, Firm & Soft Star SIP Market Revenue Forecast by Application	64
Table 16: Hard Star SIP Market Revenue Forecast by Application	65
Table 17: Firm Star SIP Market Revenue Forecast by Application	66
Table 18: Soft Star SIP Market Revenue Forecast by Application	67
Table 19: Total Hard, Firm & Soft SIP Market Revenue Forecast by Application	68
Table 20: Total Hard SIP Market Revenue Forecast by Application	69
Table 21: Total Firm SIP Market Revenue Forecast by Application	70
Table 22: Total Soft SIP Market Revenue Forecast by Application	71
Table 23: Worldwide SIP Market Revenue Forecast by Device Type	73
Table 24: Worldwide Commodity SIP Market Revenue Forecast by Device Type	75
Table 25: Worldwide Star SIP Market Revenue Forecast by Device Type	76
Table 26: Worldwide SIP Market Revenue Forecast by Region	85
Table 27: Worldwide Commodity SIP Market Revenue Forecast by Region	87
Table 28: Worldwide Star SIP Market Revenue Forecast by Region	89
Table 29: Worldwide IP Market Revenue Forecast by IP Type	90
Table 30: What does an SIP Company Look Like Today and in Five Years?	97
Table 31: What does the SIP Market Look Like Today and in Five Years?	98

List of Figures

Figure 1: Outsourcing Drives New Markets	11
Figure 2: Semiconductor Market Diversification Through Use of SIP	12
Figure 3: Simple System Level Integration.....	13
Figure 4: Example of Platform SoC.....	14
Figure 5: Yesterday's Typical SoC Design.....	16
Figure 6: Today's SoC: Systems-on-a-Chip.....	17
Figure 7: Trends Driving Semiconductor Market Towards SIP.....	18
Figure 8: SIP Market Evolution	21
Figure 9: Power Density Worsens at Every New Process Node	27
Figure 10: Potential Power Management Solution.....	28
Figure 11: Design Elements in Today's Market.....	31
Figure 12: Consolidation in the SIP Market.....	38
Figure 13: Design Productivity Gap.....	44
Figure 14: Learning Curve Drives Moore's Law	45
Figure 15: SIP as a Function of Silicon Cost	47
Figure 16: Total Worldwide SIP Market Forecast	49
Figure 17: Worldwide SIP Market Forecast by Category	50
Figure 18: Worldwide SIP Market Forecast by Application Percent of Total	51
Figure 19: Worldwide SIP Market Forecast Revenues by Application.....	52
Figure 20: Commodity SIP Market Forecast Revenues by Application	53
Figure 21: Star SIP Market Forecast Revenues by Application	55
Figure 22: Total Hard, Firm & Soft SIP Market Forecast Revenues	57
Figure 23: Total Hard, Firm & Soft Commodity SIP Market Forecast Revenues	58
Figure 24: Total Hard, Firm & Soft Star SIP Market Forecast Revenues	59
Figure 25: Total Hard, Firm & Soft Commodity SIP Market Forecast by Application	60
Figure 26: Hard Commodity SIP Market Forecast by Application.....	61
Figure 27: Firm Commodity SIP Market Forecast by Application.....	62
Figure 28: Soft Commodity SIP Market Forecast by Application	63
Figure 29: Total Hard, Firm & Soft Star SIP Market Forecast by Application.....	64
Figure 30: Hard Star SIP Market Forecast by Application.....	65
Figure 31: Firm Star SIP Market Forecast by Application.....	66
Figure 32: Soft Star SIP Market Forecast by Application.....	67
Figure 33: Total Hard, Firm & Soft SIP Market Forecast by Application	68
Figure 34: Total Hard SIP Market Forecast by Application.....	69
Figure 35: Total Firm SIP Market Forecast by Application.....	70
Figure 36: Total Soft SIP Market Forecast by Application.....	71
Figure 37: Worldwide SIP Market Forecast Revenues by Device Type.....	72
Figure 38: Worldwide Commodity SIP Market Forecast Revenues by Device Type.....	74
Figure 39: Worldwide Star SIP Market Forecast Revenues by Device Type	75
Figure 40: Growth In The Number of SIP Blocks Per Design.....	77
Figure 41: SIA / ITRS Roadmap for Die Area Partitioning 1999 - 2014.....	78
Figure 42: Semico Roadmap for Die Area Partitioning 1999 - 2017	79
Figure 43: ARM CPU Cores Grow in Complexity	80
Figure 44: USB Cores Grow in Complexity	81
Figure 45: PCI Cores Grow in Complexity	81
Figure 46: Projected Mask Set Costs for 130nm to 65nm.....	83
Figure 47: Worldwide SIP Market Forecast Revenues by Region.....	84
Figure 48: Worldwide Commodity SIP Market Forecast Revenues by Region.....	86
Figure 49: Worldwide Star SIP Market Forecast Revenues by Region	88
Figure 50: Worldwide IP Market Forecast Revenues IP Type.....	90
Figure 51: Worldwide SIP Market Revenues by Function for 2007	91
Figure 52: Worldwide SIP Market Revenues by Function for 2012.....	92