



◆ Data  
◆ Analysis  
◆ Knowledge

## **Polysilicon & Silicon Wafer Industry Study: Avoiding the Sun Burn**

**January 2008**

**Study Number: MA128-08**

Prepared Jointly by  
Semico Research and Semiconductor Partners, LLC

©Copyright Semico Research, 2008. All rights reserved.

Reproduction in whole or part is prohibited without 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

---

<b>List of Tables .....</b>	<b>v</b>
<b>Executive Summary.....</b>	<b>8</b>
Outlook for Silicon Wafers .....	8
<b>Study Methodology.....</b>	<b>9</b>
Assumptions .....	10
<b>Overview of the Silicon Wafer Industry.....</b>	<b>11</b>
Historical Perspective .....	11
Silicon Wafer Demand For Semiconductor Manufacturing .....	12
Wafer Demand by Product .....	14
Memory .....	15
Micro Logic .....	19
Wireless and Analog.....	22
200mm and 300mm Wafer Trends .....	24
Technology and Productivity Changes .....	25
Emerging Specialty Wafer Products.....	26
Productivity Improvements .....	28
450mm Wafer Introduction .....	29
<b>Risks and Upsides to the Silicon Wafer Industry .....</b>	<b>31</b>
Risks .....	31
Opportunities.....	32
<b>Pricing Information .....</b>	<b>35</b>
Market Dynamics .....	35
Trends in Polysilicon Supply.....	36
<b>Strategic Focus of Silicon Wafer Manufacturers .....</b>	<b>39</b>
Wafer Manufacturer Strategies.....	41
SEMI Wafer Specifications .....	43
Specialty Wafers.....	44
<b>Wafer Prices and Requirements .....</b>	<b>45</b>
<b>AXT, Inc .....</b>	<b>50</b>
<b>Epistone .....</b>	<b>51</b>
<b>LG Siltron .....</b>	<b>52</b>
Corporate Information .....	52
Sales .....	52
Products .....	52
<b>MEMC .....</b>	<b>54</b>
Corporate Information .....	54
Sales .....	55
Market Share .....	56

Region .....	56
Products .....	57
Wafer Size.....	57
Customer Type .....	57
Capital Expenditure .....	58
R&D .....	58
Current Focus/Investment Strategy Trends .....	59
SOI .....	59
300mm Wafers .....	59
450mm Wafers .....	60
Photovoltaic Market .....	60
Polysilicon Supply Chain.....	60
Industry Reputation.....	60
<b>Shin-Etsu Handotai (SEH) .....</b>	<b>62</b>
Corporate Information .....	62
Sales .....	62
Market Share .....	62
Region .....	63
Products .....	63
Customer Type.....	64
Wafer Size.....	64
300mm Wafers .....	64
450mm Wafers .....	64
Photovoltaic Market .....	64
Current Focus/Investment Strategy Trends .....	64
Capital Expenditures .....	65
R&D.....	65
SOI and Other Specialty Wafers .....	65
Polysilicon Supply Chain.....	66
Industry Reputation.....	67
<b>Siltronic AG .....</b>	<b>68</b>
Corporate Information .....	68
Sales .....	68
Market Share .....	69
Region .....	69
Products .....	69
Wafer Size.....	70
Customer Type .....	70
Capital Expenditure .....	70
R&D .....	71
Current Focus/Investment Strategy Trends .....	71
SOI .....	71
300mm Wafers .....	72
450mm Wafers .....	73
Polysilicon Supply.....	73
Photovoltaic Market .....	74
Industry Reputation.....	75
<b>SUMCO Corporation .....</b>	<b>76</b>
Corporate Information .....	76
Sales .....	76

Market Share .....	77
Region .....	78
Wafer Size.....	78
Customer Type .....	78
Capital Expenditure .....	79
SUMCO Group .....	79
SUMCO TECHXIV .....	79
Research and Development .....	79
Current Focus/Investment Strategy Trends .....	79
SOI .....	79
300mm Wafers .....	80
450mm Wafers .....	81
Photovoltaic Market .....	81
Polysilicon Supply Chain.....	82
Industry Reputation.....	82
<b>Soitec .....</b>	<b>83</b>
Corporate Information .....	83
Sales .....	84
Market Share .....	84
Region .....	85
Wafer Size.....	85
Customer Type .....	85
Capital Expenditure .....	86
R&D .....	86
Current Focus/Investment Strategy Trends .....	87
SOI .....	87
300mm Wafers .....	88
450mm Wafers .....	88
Photovoltaic Market .....	88
Polysilicon Supply Chain.....	88
Industry Reputation.....	89
<b>Other SOI Wafer Manufacturers .....</b>	<b>90</b>
<b>Joint Ventures .....</b>	<b>91</b>
<b>Summary and Conclusions .....</b>	<b>93</b>

## List of Tables

---

<b>Table 1. Semiconductor Revenue, Unit and Wafer Growth Rates.....</b>	<b>12</b>
<b>Table 2. Wafer Demand by Product .....</b>	<b>13</b>
<b>Table 3. CMOS Image Sensor and RFID Forecast.....</b>	<b>22</b>
<b>Table 4. 300mm Wafer Usage by Product and Company.....</b>	<b>23</b>
<b>Table 5. SOI Wafers by Product Category.....</b>	<b>25</b>
<b>Table 6. Silicon on Sapphire Dimensional Specifications .....</b>	<b>26</b>
<b>Table 7. Solar Manufacturers' Polysilicon Pre-purchases.....</b>	<b>35</b>
<b>Table 8. Top Polysilicon Supplier Capacity 2006, 2008 .....</b>	<b>36</b>
<b>Table 9. Polysilicon Suppliers in China .....</b>	<b>36</b>
<b>Table 10. Polysilicon Market Stats.....</b>	<b>37</b>
<b>Table 11. 300mm Wafer Specifications .....</b>	<b>42</b>
<b>Table 12. Metal Contamination Limits* .....</b>	<b>43</b>
<b>Table 13. Wafer Price Forecast in \$US.....</b>	<b>44</b>
<b>Table 14. GaAs Wafer Specs .....</b>	<b>46</b>
<b>Table 15. Specialty Wafer Prices .....</b>	<b>46</b>
<b>Table 16. AXT Product Offerings.....</b>	<b>49</b>
<b>Table 17. Epistone Product Offerings .....</b>	<b>50</b>
<b>Table 18. Siltron Corporate Information.....</b>	<b>51</b>
<b>Table 19. Siltron Sales 2004-2006.....</b>	<b>51</b>
<b>Table 20. MEMC Corporate Information.....</b>	<b>53</b>
<b>Table 21. MEMC Sales 2002-2006.....</b>	<b>54</b>
<b>Table 22. MEMC 2006 Market Share .....</b>	<b>55</b>
<b>Table 23. MEMC 2006 Regional Sales .....</b>	<b>55</b>
<b>Table 24. MEMC Capital Expenditures 2002-2006.....</b>	<b>57</b>
<b>Table 25. MEMC R&amp;D Expenditures.....</b>	<b>57</b>
<b>Table 26. SEH Corporate Information.....</b>	<b>61</b>
<b>Table 27. SEH Market Share .....</b>	<b>62</b>

<b>Table 28. SEH Regional Sales .....</b>	<b>62</b>
<b>Table 29. SEH Product Specifications .....</b>	<b>65</b>
<b>Table 30. Siltronic Corporate Information .....</b>	<b>67</b>
<b>Table 31. Siltronic Revenues, Net Investment &amp; R&amp;D.....</b>	<b>68</b>
<b>Table 32. Siltronic 2006 Market Share.....</b>	<b>68</b>
<b>Table 33. Siltronic Capital Expenditures .....</b>	<b>69</b>
<b>Table 34. Siltronic R&amp;D Expenditures .....</b>	<b>70</b>
<b>Table 35. Sumco Corporate Information.....</b>	<b>75</b>
<b>Table 36. Consolidated SUMCO Group Sales FY2005-FY2007 .....</b>	<b>75</b>
<b>Table 37. SUMCO TECHIV Sales .....</b>	<b>76</b>
<b>Table 38. SUMCO Market Share 2006 .....</b>	<b>76</b>
<b>Table 39. SUMCO Group Sales by Region FY2007 .....</b>	<b>77</b>
<b>Table 40. SUMCO TECHXIV Sales by Region FY2007 .....</b>	<b>77</b>
<b>Table 41. Soitec Corporate Information .....</b>	<b>82</b>
<b>Table 42. Soitec Sales Revenue FY2003-FY2007 .....</b>	<b>83</b>
<b>Table 43. Epistone Product Offerings .....</b>	<b>83</b>
<b>Table 44. Soitec Sales By Region .....</b>	<b>84</b>
<b>Table 45. Soitec Product Breakout .....</b>	<b>84</b>
<b>Table 46. Soitec R&amp;D Expenditures .....</b>	<b>85</b>

## **List of Figures**

---

<b>Figure 1. Semico Wafer Demand Methodology .....</b>	<b>9</b>
<b>Figure 2. Semiconductor Wafer Market .....</b>	<b>10</b>
<b>Figure 3. Semiconductor Revenue, Unit and Wafer Demand.....</b>	<b>12</b>
<b>Figure 4. Memory Revenue, Unit, and Wafer Demand 2007 .....</b>	<b>15</b>
<b>Figure 5. DRAM Revenues by Density (Millions \$US) .....</b>	<b>16</b>
<b>Figure 6. Non Volatile Revenues by Region .....</b>	<b>18</b>
<b>Figure 7. Micro Logic Revenues, Units and Wafer Demand 2007 .....</b>	<b>19</b>
<b>Figure 8. Analog Product Category Unit Growth .....</b>	<b>21</b>
<b>Figure 9. Wireless Product Category Unit Growth .....</b>	<b>22</b>
<b>Figure 10. Wafer Size Transition for Semiconductor Applications .....</b>	<b>24</b>
<b>Figure 11. Global Silicon Wafer Market 2000-2006 .....</b>	<b>38</b>
<b>Figure 12. Global Silicon Wafer Markets 2006 .....</b>	<b>39</b>
<b>Figure 13. Semiconductor Wafer Price Forecast .....</b>	<b>45</b>
<b>Figure 14. Siltronic Wafer Expansion Program .....</b>	<b>71</b>
<b>Figure 15. Siltronic Polysilicon Expansion Program .....</b>	<b>73</b>
<b>Figure 16. SUMCO Group Wafer Expansion Program .....</b>	<b>80</b>