

Integrated Circuit Economics

2009 Edition

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IC*KNOWLEDGE LLC*

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IC Knowledge LLC was founded in the year 2000 by a group of wafer fabrication technologists and management specialists. IC Knowledge LLC is dedicated to offering the finest training and reference materials available to the semiconductor industry.

1.3. IC Knowledge LLC products

- Integrated Circuit Cost Model - a Microsoft Excel based cost model that uses dropdown menu selections to generate product costs for most integrated circuit products.
- Discrete and Power Products Model - a Microsoft Excel based cost model that uses dropdown menu selections to generate product costs for most discrete and power products.
- MEMS Cost Model - a Microsoft Excel based cost model that uses dropdown menu selections to generate product costs for most MEMS products.
- Integrated Circuit Economics - this report.
- Integrated Circuit Packaging - a report covering the packaging market, packaging technology, test, packaging technology trends, packaging foundry selection and pricing.
- Integrated Circuit Technology - an annual report covering the latest in IC technologies.
- 300mm Watch - a database of 300mm fabs and companion analysis.
- Solar Watch - a database of solar cell fabs and companion analysis.

- Cleanroom Reference Guide for Semiconductor and MEMS Applications - a concise reference guide containing all the information needed to design, build and operate a cleanroom.
- A Visual Guide to Semiconductor Process Equipment - a highly visual guide describing the theory, operation and usage of the major types of semiconductor process equipment.

1.4. Disclaimer

We believe the information presented in this publication to be accurate and representative of general integrated circuit industry practices. Much of the information in this report is compiled from technical journals and other secondary sources. IC Knowledge LLC does not warranty the accuracy of the information presented in this report in any way. It is up to the user to determine whether the information presented is applicable to the situation the user is interested in.

1.5. Report outline

This report is broken up into thirteen sections.

1. Welcome.
2. IC market status and trends - a general look at the IC market and market trends.
3. Capital and materials spending - an analysis of capital and materials spending and spending trends.
4. Economics trends - a high level analysis of IC economics.
5. 300mm and 450mm - a discussion of the impact of 300mm and 450mm wafer sizes on the industry.
6. Foundries - the impact and future of foundries.
7. Design - the impact of design complexity and cost.
8. Integrated circuit manufacturing overview - an overview of IC manufacturing and facility requirements.
9. Wafer fabrication costs - a detailed look at the costs of wafer fabrication.
10. Test and packaging costs - a detailed review of the costs to test and package integrated circuits.
11. Die yield and product costs - how to calculate die yield and die and product costs from the information presented in the previous two sections.
12. Cycle time and utilization - wafer fabrication facility utilization is one of the most important factors in determining costs, this section discusses factory management trade-offs.
13. Technology trends - trends in IC technology and a brief history of the IC.

1.6. What this report is not

This report is meant to give the reader an understanding of integrated circuit manufacturing costs and broad economic issues.

- We discuss general market trends, but this is not a market research firm and we are not in the business of forecasting the market. For market research and forecasts we recommend IC Insights at www.icinsights.com.
- This report is not intended to serve as a cookbook for calculating IC costs. To calculate costs for specific ICs, we recommend our IC Cost Model.

1.7. A word about technology focus

For many years the overall driver of IC technology was DRAMs, recently microprocessors have displaced DRAMs in many areas, although DRAMs still lead in areas such as high-k capacitor structures. For the purposes of technology analysis in this report, we discuss both microprocessors and DRAMs. Our microprocessor analysis is centered on Intel since they have the dominant market share in the microprocessor arena.

1.8. Acknowledgements

We would like to thank IC Insights for permission to reprint several tables from the 2009 edition of the McClean report. As we mentioned in the previous section we are not a market research firm - they are, and a good one. We strongly recommend the McClean report to anyone interested in understanding the semiconductor market in greater detail than presented here. We would also like to thank Linx Consulting for providing data for the section on Semiconductor Materials.