THE WORLDWIDE IC PACKAGING MARKET, 2014 EDITION

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The backbone of each report is based upon primary market research information. Our market information originates from direct interviews with vendors, users, and other industry participants. We use secondary research to test for reasonableness, technical backgrounds, and, in some cases, for top-level forecasts. We distill the research into coherent forecasts and recommendations.

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Chapter 1
Introduction

1.1 Objectives of the Report

This report, *The Worldwide IC Packaging Market, 2014 Edition*, provides a comprehensive analysis of the global integrated circuit packaging marketplace. The report examines the two most current years (2012 and 2013) in terms of market size and trends in the major package types, or families, and provides forecasts of each from 2014 to 2018. The IC packaging marketplace is also examined from the point of view of the semiconductor device types that are being packaged (e.g., MPUs, MCUs, memory, logic, etc.). The report provides a particular focus on the OSAT market, the "outsourced semiconductor assembly and test" vendors who sell packaging services to other companies, as opposed to the captive, or in-house, assembly operations of large integrated device manufacturers (IDMs). In the final chapter, we provide profiles of many of these OSAT competitors.

For the large number of companies involved in this industry, *The Worldwide IC Packaging Market* is designed to aid executives in senior management, as well as marketing and sales managers, to clarify market potential for current packaging products as well as to make critical strategic decisions about which new market segments to enter. The report will be beneficial to:

- Foundries and other companies directly involved in chip packaging, as an aid to determining the demand for their own products
- Semiconductor manufacturers interested in how changes in packaging technology will impact (and be impacted by) advancements in IC manufacturing techniques
- Companies interested in how the evolving IC packaging market is keeping pace with other changing markets, and ultimately how performance expectations of ICs will impact products purchased at the consumer level.

1.2 Scope of the Report

The IC packaging marketplace is extremely diverse, encompassing a seemingly infinite number of possible package types, ranging from simple 3- or 4-lead packages, to common ceramic dual in-line memory chips, to complex stacked devices capable of hundreds of I/O

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connections, and ranging in size from devices 50 mm or more on a side down to chip-scale packages barely larger than the bare die that they encase. (It also encompasses the bare die that are not "packaged" at all in the traditional sense.) In this report, we categorize this hugely complex market into the following thirteen major package families:

- Dual in-line package (DIP)
- Small outline transistor (SOT)
- Small outline (SO)
- Thin small outline package (TSOP)
- Dual flat pack no lead (DFN)
- Chip carrier (CC)
- Quad flat pack (QFP)
- Quad flat pack no lead (QFN)
- Pin grid array (PGA)
- Ball grid array (BGA)
- Fine-pitched ball grid array (FBGA)
- Wafer-level package (WLP)
- Direct chip attach (DCA)

In addition, we analyze each of the packaging families in terms of the types of semiconductors that are packaged using one or another of the packaging techniques. Device types that are discussed include:

- Microprocessors (MPUs)
- Microcontrollers (MCUs)
- Digital signal processors (DSPs)
- Memory: DRAM, flash, ROM, and EPROM
- Logic: digital bipolar, gate array, display drivers
- Special-purpose logic: consumer, computer, communications, automotive and multipurpose/other
- Analog devices: amplifiers and comparators, interfaces, data converters
- Application-specific analog: consumer, computer, communications, automotive, industrial/other

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The discussions provided throughout this report include analyses of unit shipments, packaging-related revenues, and average assembly pricing. Most data tables cover the historical years 2012 and 2013, with forecasts provided from 2014 through 2018. We explore both the total worldwide IC market and the OSAT market, the latter comprising a subset of the worldwide IC packaging market. Forecasts or package types are further broken down by I/O-count range.

1.3 Report Organization

1.3.1 Methodology

The information presented in this report was gathered from a variety of primary and secondary sources. The primary sources were engineering, marketing, and business development managers at semiconductor manufacturers (primarily OSATs) as well as fabless companies, who were contacted directly. These individuals were asked to respond to a survey. In most cases, the answers to the survey were delivered as written responses. In other cases, the information was conveyed via telephone interviews. Historical data presented in Chapters 4, 5, and 6 were based, in part, on the SIA's World Semiconductor Trade Statistics (WSTS) reports. All packaging data and forecasts, however, were developed by New Venture Research using a proprietary methodology.

The secondary sources included company literature, such as press releases, investment reports (e.g., annual reports and SEC filings), white papers, and information published on Web sites, both by the companies involved and by other organizations. We also obtained data from online databases and trade publications.

1.3.2 Chapter Outline

This report is organized into eight chapters, plus one appendix:

- Chapter 1. Introduction - Outlines the scope and organization of the report.
- Chapter 2. Executive Summary - Provides an overview of the market and highlights of the top-level market segments.
- Chapter 3. The Global Electronics Industry Outlook - Focuses on the global economy and its impact on the worldwide semiconductor markets.

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- Chapter 4. Worldwide IC Packaging Total Market Analysis - Provides an overview of the entire IC packaging market, with total market forecasts in terms of the IC packaging families as well as the semiconductor devices being packaged.
- Chapter 5. IC Package Market Analysis by Semiconductor Device - Presents historical and forecast data of IC packaging markets in terms of the type of semiconductor device.
- Chapter 6. IC Package Market Analysis by Package Family - Presents the 13 major packaging families with segmentation by the range of I/O for each package type.
- Chapter 7. OSAT Market and Strategy Analysis - Presents an overview of the outsourced semiconductor assembly and test market-a subset of the total IC packaging market-as well as forecasts and market trends.
- Chapter 8. OSAT Company Profiles - Short profiles of selected OSAT vendors. Each includes a brief company overview and a description of the company's IC packaging product lines.
- Appendix. Glossary of Packaging Terms - Expanded names of industry acronyms and definitions of many terms used in the semiconductor assembly and test industry.

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