ADVANCED IC PACKAGING TECHNOLOGIES, MATERIALS, AND MARKETS

2012 EDITION

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- Fabless Semiconductor Association (FSA, now GSA)
- IMAPS (International Microelectronics and Packaging Society)
- CIE/USA-SF Electronic Packaging and Manufacturing Committee (United States National Committee of the CIE) (International Commission on Illumination)

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CHAPTER 1
INTRODUCTION

1.1 BACKGROUND

The US economy appears to be on an upswing, although unemployment figures are still high. European markets are still in question, and there is still unrest in the Middle East. Nonetheless, demand for mobile connectivity is keeping the semiconductor industry alive and kicking, and the need for more bandwidth for social networks such as YouTube, Facebook, and the like keeps the overall demand for semiconductors and advanced IC packaging methods healthy. This report focuses on advanced IC packaging methods that are critical to success in maintaining technological leadership.

1.2 SCOPE

This report covers these basic topics:

- Stacked packages
- Through-silicon vias (TSVs), including 3-D and 2.5-D
- System in package (SiP)
- Fan-in QFN packages
- WLPs, including fan-out WLPs
- Interconnection, flip chip by device type, package, and I/O count, wire bonding, and wire bond material
- Substrates
- Rising markets for ICs and applications for IC devices

1.3 ORGANIZATION

This report is divided into ten chapters and two appendices. They are as follows:

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Chapter 1, Introduction: This chapter outlines the background, scope, organization, and methodology of the report.

Chapter 2, Executive Summary: This chapter provides summary forecasts and information.

Chapter 3, Stacked Packages: Stacked packages are covered, including discussions of the stacking technology and wafer thinning that enable this technology, applications, new product highlights, and forecasts of the technology. Forecasts of the different stacked package types include units, package assembly pricing, and packaging revenue, by stacked package style. The different stacked packaging styles include die stacks, PoP, or package stacks, PiP, TSOP stacks, QFN stacks, MCM stacks, and WLP stacks. These packages are also presented as a percentage of the total market for the package type in which they belong. Stacked package forecasts include device types (memory, logic, etc.), interconnection (wire bonding, flip chip, through-silicon vias), and applications. Forecasts of stacked packages with RF shielding are also included.

Chapter 4, Through-Silicon Vias, 3-D and 2.5-D Integration: Both 3-D and 2.5-D integration are covered in this chapter. Discussions include die-to-die, die-to-wafer, and wafer-to-wafer bonding; via first, middle, and last; etching and filling; specific upcoming applications, new product/technology highlights, and discussions. Forecasts include 2.5-D, 3-D, and the market potential for this technology.

Chapter 5, System in Package: Coverage of SiPs in this chapter includes discussions of technology trends, new product introductions, and forecasts. Forecasts include units, package assembly pricing, packaging revenue, device types (memory, logic, etc.), interconnection (wire bonding, flip chip, etc.), and applications.

Chapter 6, Fan-In QFN Packages: An overview of these leadframe-based packages is followed by new product introductions. Market forecasts include units, average I/O count, price per I/O, average assembly price, and revenue.

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Chapter 7, Wafer-Level Packages, Including Fan-Out WLPs: This chapter begins with a discussion of WLP technology. The distinction between WLPs and wafer bumping for flip chip devices is explained. New product introductions of WLPs are presented. A forecast of WLPs by I/O pitch and fan-out WLPs is included.

Chapter 8, Flip Chip and Wire Bonding Interconnection, and Wire Bond Materials: This chapter reviews the basics of first-level interconnection and bumping and discusses new product introductions. Forecasts of units and revenue are provided for flip chip interconnection by device type for each package category (PGA, BGA, FBGA, QFN) by I/O count, totaled by device type, presented again by total by package type and I/O count, by I/O count range, and compared with total I/O count range for the global IC package market. Forecasts continue for flip chip bare die units, wire bonded package units and revenue, and a forecast of the wire bond material by material type for both units and revenue.

Chapter 9, Substrates: A review of substrate options is followed by forecasts by pitch for PGA, BGA, and FBGA, and by substrate units, substrate area, and substrate revenue for various substrate types organized by PGA, BGA, and FBGA packages.

Chapter 10, Rising Chip Packaging Markets and Key Applications for IC Devices: This chapter provides a global forecast of IC units, IC revenue, and IC units by package families, plus an overview of the largest IC markets with their most popular package types and I/O counts. The chapter further explores the TSV market, and covers important electronic applications with forecasts for IC devices by product group, the total number of ICs for each product category, and total IC revenue.

Appendix A, Website Address Guide: This appendix contains the Internet addresses of the companies presented in this report.

Appendix B, Glossary: This appendix contains a general glossary of terms used in the IC packaging industry.

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1.4 METHODOLOGY

Information was obtained from both primary and secondary sources to complete this report. Information was gathered by telephone, facsimile, and e-mail, at trade shows, from speakers at seminars, conferences, luncheons, and dinners, and by visiting companies in the industry. Secondary sources of information included company literature, trade magazines, seminar proceedings, and the Internet, and often led to further primary contact.

Hundreds of individuals were contacted for information for this report. They included key people within all of the major semiconductor fabrication companies and IC package foundries around the globe. Information was obtained using standard surveys and is printed only in the aggregate. The survey questions were designed to determine the size of the market and likely growth patterns and to elicit responses about issues and developments in this particular area of the packaging industry. Discussions with those in the industry also played a key part in gathering information for this report.

A wide assortment of companies providing products and services for this market was contacted as well. Information was gathered in person when possible; company literature and white papers from seminars and proceedings were also heavily utilized.

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