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# ADVANCED IC PACKAGING TECHNOLOGIES, MATERIALS AND MARKETS

***2016 EDITION***

**A Strategic Report Covering the Latest  
Technologies in IC Packaging, Enabling Portable and  
Other Electronics**

## Report Coverage

- Stacked Packages
- System-in-Packages
- Interconnection Technologies
- Through-Silicon-Vias (TSV)
- 2.5D and 3D Integration
- Multi-row QFNs
- Fan-out WLPs

## Report Highlights

- Industry Outlook
- Market Analysis and Forecasts,  
2014–2020
- Multichip Packaging  
Technology Trends
- Key Application Forecasts
- Company Profiles

### **New Venture Research**

337 Clay St., Suite 101  
Nevada City, CA 95959  
Tel: (530) 265-2004

### ***A Technology Market Research Company***

info@newventureresearch.com/  
www.newventureresearch.com/  
Fax: (530) 265-1998

## Synopsis

The demand for consumer electronics and mobile communications devices that keep us connected is driving electronics manufacturers to deliver ever-more compact and portable products. Today's users ask for solutions that deliver more functionality, added performance, higher speed, and smaller form factors. Software systems and billions of networked devices are rapidly coalescing into a vast Internet of Things.

All of these forces are driving semiconductor companies to develop new advanced IC packaging technologies to provide greater silicon integration in increasingly miniaturized packages. The last decade has seen an explosion of new products including fan-out wafer-level packaging (FOWLPs), stacked IC packages and complex system-in-packages (SiPs), as well as advances in package substrates, flip chip interconnection and through-silicon vias. All these advances are enabling significant improvements in packaging density and opening new market opportunities for manufacturers.

This latest report from **New Venture Research (NVR)**, *Advanced IC Packaging Technologies, Materials and Markets, 2016 Edition*, reveals the latest technology and market trends in the IC packaging industry by focusing on the most advanced packaging products and solutions—those critical to success in developing cutting-edge products and in maintaining technological leadership. Every market or application segment discussed in the report includes quantitative analysis based on the most current historical years, 2014 and 2015, as well as forecasts from 2016 through 2020. Each of the eight chapters covers a different topic and market segment.

**Chapter 3: Overview of Worldwide IC Packaging Markets**, outlines the major IC packaging families and the latest market and application trends. Total market forecasts include units, prices, packaging revenue, package types and device types.

**Chapter 4: Advanced Single Chip IC Packaging**, provides an in-depth discussion of the two leading advanced packages: Fan-Out Wafer Level and Multi-Row QFN packages in terms of market overview, market trends and forecasts.

**Chapter 5: Multichip Packaging Markets** analyzes multichip packages from a number of points of view—their characteristics, applications, functions, and interconnection trends. This chapter then digs deeper into the stacked packages category, comprised of vertically stacked TSOPs, QFNs, FBGAs, and WLPs. Tables and figures provide market data and forecasts for unit shipments, revenues, prices, I/O-count and die usage.

**Chapter 6: System-in-Package Solutions and Substrate Materials** continues the data and forecast analysis of multichip packages, focusing on system-in-package (SiP) market segments, specifically package-on-packages, package-in-packages, multichip modules and a subgroup of stacked WLPs used as components in SiPs. This chapter also examines the substrate materials and embedded components used in SiP assembly. Forecasts include package units and material area shipped, as well as revenue impact of substrate material trends.

**Chapter 7: Interconnection Technologies and Solutions**, provides an in-depth explanation of wire bonding and flip chip markets, as well as leading-edge technologies, such as 2.5D and 3D packaging using through silicon vias (TSVs). Units and revenue forecasts are provided.

**Chapter 8: Company Profiles** leads off with an overview of recent competitor trends, specifically the recent surge in mergers and acquisitions. It then presents profiles of twenty advanced packaging companies from across the IC packaging spectrum, including large and small competitors from among OSATs and IDMs. Each profile gives a short company background and presents examples of their advanced packaging products.

*Advanced IC Packaging Technologies, Materials and Markets, 2016 Edition* is an effective tool for companies determined to stay informed about the latest advances in IC packaging technologies, and in assessing the future of this important segment of the semiconductor manufacturing industry. The report sells for \$3995 and is delivered by email as a single-user license PDF file. Additional single-user licenses are available for \$350 each and a corporate license is \$1000. With the purchase of the report, an Excel spreadsheet of all tables may be obtained for an additional \$1000, or a printed copy may be purchased for \$250.

## About the Author

**Jerry Watkins** is an independent senior analyst with more than 25 years of experience in the field of market research and consulting. He has worked for leading research companies such as **Frost & Sullivan**, **Lucid Information Services**, and **NSI Research** both in management and as a writer. Mr. Watkins has authored many syndicated reports, previously in the telecommunications sector and more recently in the computing and merchant embedded computing industry. He holds three university degrees, including a B.A. in History, as well as a M.A. in International Studies.

### Chapter 1: Introduction

### Chapter 2: Executive Summary

### Chapter 3: Overview of Worldwide IC Packaging Markets

#### 3.1 IC Package Families

#### 3.2 IC Packaging Market and Unit and Revenue Forecasts

*Covers: Worldwide IC Packaging by I/O Count and by Device Type*

#### 3.3 Key Applications Market for IC Devices

*Includes: Cellular Handsets, Tablets, PCs, Servers, Workstations, Set-Top Boxes, and others*

### Chapter 4: Advanced Single Chip IC Packaging

#### 4.1 Overview of Advanced IC Packaging

*Covers: Product and Competitor Trends, Internet of Things and Global Economic Trends*

#### 4.2 Fan-Out Wafer Level Packages

*Covers: Market Overview, Trends and Forecasts*

#### 4.3 Multi-Row QFN Packages

*Covers: Market Overview, Trends and Forecasts*

### Chapter 5: Multichip Packaging Markets

#### 5.1 Overview of Multichip Packaging Technology

##### 5.1.1 Types of Multichip Packages

##### 5.1.2 Benefits and Shortcoming of Stacked Packages

##### 5.1.3 Multichip Packages Challenges and Solutions

##### 5.1.4 Wafer Thinning - Dice Before Grinding Process

#### 5.2 MCP Market Trends and Forecasts

*Covers: Market Overview, Trends and Forecasts by MCP Type, Application, Device Function and Interconnection Trends*

#### 5.3 Stacked Multichip Packaging Market Segments

##### 5.3.1 Stacked TSOP Market Trends and Forecasts

##### 5.3.2 Stacked QFN Packaging Market Trends and Forecasts

##### 5.3.3 FBGA Packaging Market Trends and Forecasts

##### 5.3.4 Stacked WLP Market Trends and Forecasts

### Chapter 6: System-in-Package Solutions & Substrate Materials

#### 6.1 System-in-Packaging Market Overview

##### 6.1.1 Types of System-in-Packages

##### 6.1.2 Key Features of System-in-Packages

##### 6.1.3 System-in-Packages versus System-on-Chip Solutions

##### 6.1.4 Challenges for System-in-Packages

#### 6.2 System-in-Packages Market Trends and Forecasts

#### 6.3 Substrates

*Includes: Ceramic, Laminate, High-Density Interconnect, Polyimide Flex Tape, Embedded Components*

### Chapter 7: Interconnection Technologies and Solutions

#### 7.1 Interconnection Techniques Overview

#### 7.2 Wire Bonding

##### 7.2.1 The Benefit and Problem with Wire Bonding

##### 7.2.2 Wire Bonding Methods

*Includes: Ball Bonding, Reverse Wire Bonding, Wedge Bonding, and others*

#### 7.3 Tape Automated Bonding

#### 7.4 Flip Chip

*Covers: Total Market by Packaging Form Factors, Pricing, and includes Device Types*

#### 7.5 Through-Silicon Vias

*Covers: Characteristics, Interposers, Challenges and Forecasts*

#### 7.6 Quilt Packaging

#### 7.7 Panel Level Packaging

### Chapter 8: Advanced IC Packaging Company Profiles

#### 8.1 Chapter Overview

#### 8.2 Changing Competitive Landscape

#### 8.3 3D Plus, Inc.

#### 8.4 Advanced Semiconductor Engineering, Inc.

#### 8.5 Amkor Technology, Inc.

#### 8.6 Carsem, Inc.

#### 8.7 ChipMOS Technologies (Bermuda), Ltd.

#### 8.8 CONNECTEC Japan Corporation

#### 8.9 Deca Technologies

#### 8.10 FlipChip International, LLC

#### 8.11 HANA Micron Co., Ltd.

#### 8.12 Interconnect Systems Inc. (ISI)

#### 8.13 NANIUM, S.A.

#### 8.15 Palomar Technologies

#### 8.15 Powertech Technology, Inc.

#### 8.17 Shinko Electric Industries Co, Ltd

#### 8.18 Signetics Corporation

#### 8.19 Siliconware Precision Industries Co.

#### 8.20 SPEL Semiconductor, Ltd.

#### 8.21 STATS ChipPAC, Ltd

#### 8.22 United Test and Assembly Center, Ltd.

#### 8.23 Xintec, Inc.

### Glossary of Terms

# Advanced IC Packaging Technologies, Materials and Markets, 2016 Edition

## Partial List of Tables (all tables provide data for 2014 through 2020)

### Chapter 3 Tables: Worldwide IC Packaging Overview

Worldwide IC Packaging Unit Shipments by Market Segment  
 Worldwide IC Packaging Annual Revenue by Market Segment  
 Average IC Packaging Prices by Market Segment  
 IC Units, Revenue & Price of various application markets, including: Cellular phones, Tablets, PCs, Set-Top Boxes, Digital Cameras and Camcorders, and GPS Devices

### Chapter 4 Tables: Advanced Single Chip IC Packaging

Wafer-Level Packages Unit Shipments by I/O Count  
 Wafer-Level Packages Unit Shipments by Pitch  
 Fan-Out WLPs by Units, Price, and Revenue  
 Multi-Row QFNs by Units, Price, and Revenue

### Chapter 5 Tables: Multichip Packaging Markets

MCP Market by Unit Shipments, IC Shipments, and Revenue  
 Total MCP Unit Shipments by Market Segment  
 Total MCP Revenue by Market Segment  
 Total Die in MCPs by Market Segment  
 MCP Unit Shipments by Application  
 MCP Units by Device Function  
 MCP Units by Interconnection Method

### Chapter 5 Tables (continued):

Stacked TSOP Market by Unit Shipments, Price, and Revenue  
 Stacked FBGA Market by Unit Shipments, Price, and Revenue  
 Stacked QFN Market by Unit Shipments, Price, and Revenue  
 Stacked WLP Market by Unit Shipments, Price, and Revenue

### Chapter 6 Tables: SiP Solutions and Substrate Materials

System-in-package Market by Units, Price, Revenue, and Total ICs  
 System-in-package Market Units, ICs, and Revenue by Market Segment  
 Package-on-Packages by Units, Price, Revenue and Total ICs  
 Package-in-Packages by Units, Price, Revenue and Total ICs  
 Multichip Modules by Units, Price, Revenue and Total ICs  
 Stacked WLPs Used in SiPs by Units, Price, and Revenue  
 Total Substrate Package Units and Revenue by Type of Substrate  
 Embedded Components in SiPs by Type of Device

### Chapter 7 Tables: Interconnection Technologies and Solutions

Wire Bonded Units by Device Type and I/O Count  
 Flip Chip Package Units and Revenue by Packaging Type and I/O Count

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### New Venture Research

337 Clay St., Suite 101  
 Nevada City, CA 95959  
 Tel: (530) 265-2004 Fax: (530) 265-1998  
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