THE WORLDWIDE IC PACKAGING MARKET – 2013 EDITION

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New Venture Research Corp.
337 Clay Street, Suite 101
Nevada City, CA 95959
(Tel) 530-265-2004
(Fax) 530-265-1998

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ABOUT THE AUTHOR

Sandra L Winkler has been an industry analyst beginning in 1988, and since 1995, a staff member of Electronic Trend Publications, currently New Venture Research. She has produced numerous off-the-shelf and custom reports. Ms. Winkler began her analyst career in the telecommunications industry, with Frost and Sullivan. Since 1995, she has focused on the semiconductor packaging industry, and has authored more than 30 widely cited reports on the topic, including The Worldwide IC Packaging Market, Advanced IC Packaging Markets and Trends, and IC Packaging Materials. She also writes for Chip Scale Review magazine, Global SMT & Packaging News, and contributes to the IEEE/CPMT newsletter and other media. Ms. Winkler has an MBA from Santa Clara University. She is on the executive planning committee of the IEEE/CPMT Santa Clara Valley chapter, and serves as Luncheon Program Chair.

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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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337 Clay Street, Suite 101
Nevada City, California 95959

Tel: (530) 265-2004 • Fax: (530) 265-1998
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THE WORLDWIDE IC PACKAGING MARKET - 2013 EDITION

TABLE OF CONTENTS

Chapter One – Introduction **1**

1.1 Scope 1

1.2 Organization 2

1.3 Methodology 4

Chapter 2 - Executive Summary **6**

2.1 Overview 6

2.2 IC Units and Revenue 6

2.3 Units by Package Family 8

2.4 Price per I/O 10

2.5 Revenue by Package 11

2.6 OSAT Company Units 14

2.7 OSAT Company Revenue 17

2.8 Industry Cycles 20

Chapter 3 – Economic Outlook and Worldwide Electronics Industry Forecast **30**

3.1 World and Semiconductor Overview 30

3.2 Not All Economies Recovering Equally; Unrest Remains 30

3.3 World GDP 31

3.4 Global Electronics Market 36

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3.5 Electronics Industry Summary Forecast 38
3.5.1 Communications 39
3.5.1.1 Cellular Handsets 41
3.5.1.2 Cellular Infrastructure 42
3.5.1.3 Other Phones 43
3.5.1.4 Enterprise LANs 43
3.5.1.5 Wireless LANs 43
3.5.1.6 DSL and Cable Modems 44
3.5.1.7 PBX/Other CPE 45
3.5.1.8 Carrier-Class Equipment 45
3.5.2 Computers 46
3.5.2.1 Personal Computers 49
3.5.2.2 Tablets 49
3.5.2.3 Servers 49
3.5.2.4 Workstations 50
3.5.2.5 Enterprise Storage Systems 50
3.5.2.6 Flash Drives 51
3.5.2.7 Monitors 51
3.5.2.8 Printers 51
3.5.2.9 E-Readers 52
3.5.3 Consumer 52
3.5.3.1 Televisions 55

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3.5.3.2 Set-Top Boxes 55
3.5.3.3 DVD Players/Recorders 56
3.5.3.4 Digital Cameras 56
3.5.3.5 Console Video Games 57
3.5.3.6 MP3 Players 57
3.5.3.7 Personal Navigation Devices 57
3.5.3.8 Memory Cards 57
3.5.4 Industrial 58
3.5.5 Medical 60
3.5.6 Automotive 61
3.5.7 Commercial Aviation, Defense, and Other Transportation 63
Chapter 4 - IC Package Forecast by Product 65
4.1 Overview 65
4.2 MPUs 72
4.3 MCUs 76
4.3.1 4-Bit 77
4.3.2 8-Bit 79
4.3.3 16-Bit 82
4.3.4 32-Bit and Up 85
4.4 DSPs 87
4.5 DRAM 90
4.6 Flash 96

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4.7 Other Memory 102

4.7.1 SRAM 102

4.7.2 ROM and EPROM 106

4.7.3 EEPROM/Other Memory 108

4.8 Logic 111

4.8.1 Digital Bipolar 111

4.8.2 Standard Logic 113

4.8.3 Gate Array 116

4.8.4 Standard Cell and PLD 118

4.8.5 Display Drivers 123

4.8.6 Special-Purpose Logic—Consumer 125

4.8.7 Special-Purpose Logic—Computer and Peripherals 128

4.8.8 Special-Purpose Logic—Communications 132

4.8.9 Special-Purpose Logic—Automotive 136

4.8.10 Special-Purpose Logic—Multipurpose and Other 139

4.9 Analog 142

4.9.1 Amplifiers and Comparators 143

4.9.2 Interfaces 146

4.9.3 Voltage Regulators and References 150

4.9.4 Data Converters 154

4.9.5 Consumer Analog 158

4.9.6 Computer and Peripherals Analog 161

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4.9.7 Communications Analog 164

4.9.8 Automotive Analog 167

4.9.9 Industrial and Other Analog 171

4.10 Industry Totals by Product 174

Chapter 5 - IC Package Forecast by Package Family 178

5.1 Overview 178

5.2 DIP 178

5.3 SOT 187

5.4 SO 189

5.5 TSOP 199

5.6 DFN 208

5.7 CC 214

5.8 QFP 221

5.9 QFN 228

5.10 PGA 238

5.11 BGA 240

5.12 FBGA 250

5.13 WLP 261

5.14 DCA 271

5.15 Industry Totals by Package Family 276

5.16 Analysis of I/O Count 285

Chapter 6 - Outsourced IC Package Assembly Market Forecasts 287

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6.1 Total Market Overview 287

6.2 DIP 297

6.3 SOT 300

6.4 SO 302

6.5 TSOP 305

6.6 DFN 308

6.7 CC 311

6.8 QFP 314

6.9 QFN 317

6.10 PGA 321

6.11 BGA 324

6.12 FBGA 328

6.13 WLP 332

6.14 OSAT Rankings 335

Chapter 7 - OSAT Profiles 340

Amkor Technology, Inc. 341

Anst China Resource Micro-Assembly Technology, Ltd. 347

ASE, Inc. 349

Azimuth Semiconductor Assembly 353

Carsem 354

ChipMOS Technologies (Bermuda), LTD. 357

Cirtek Electronics Corporation 359

© 2013 New Venture Research Corp.

CORWIL Technology Corporation 361
Deca Technologies 366
FlipChip International, LLC 367
Hana Microelectronics Public Company, Ltd. 369
Hana Micron Co., Ltd. 371
i2a Technologies 373
J-Devices Corporation 376
Jiangsu Changjiang Electronics Technology Co., Ltd. 377
Lingsen Precision Industries, Ltd. 380
Millennium Microtech 383
NANIUM S.A. 385
Nantong Fujitsu Microelectronics Co., Ltd. 387
Orient Semiconductor Electronics 390
Powertech Technology, Inc. 392
Shinko Electric Industries Co., Ltd. 394
Signetics Corporation 395
Sigurd Corporation 398
Siliconware Precision Industries Co., Ltd. 400
SPEL Semiconductor, Limited 404
STATS ChipPAC, Ltd. 406
Teramikros, Inc. 411
Tianshui Huatian Technology Co., Ltd. 412

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Unisem Group 415

United Test and Assembly Center, Ltd. 418

Vigilant Technology Co., Ltd. 421

Xintec 423

Appendix A OSAT Packages 424

Appendix B OSAT Website Guide 455

Appendix C Glossary 462

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CHAPTER ONE – INTRODUCTION

1.1 SCOPE

This report offers an in-depth look at the worldwide integrated circuit (IC) packaging market. Extensive interviewing yielded the information upon which to base forecasts of the following 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)

Forecasts include data on:

- Units assembled
- Average assembly price, broken down by price per I/O and average I/O count
- Packaging revenue

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Additionally, unit forecasts for die mounted using direct chip attach (DCA) methods were developed. DCA methods include chip on board (COB), flip chip on board (FCOB), chip on glass (COG), flip chip on glass (FCOG), and tape automated bonding (TAB)/tape carrier package (TCP). No packaging prices or revenue were developed for DCA methods.

Forecasts provided start with a base year of 2012, and forecast to 2017. The compound annual growth rate (CAGR) is formulated on those years. A historical year of 2011 is also provided for additional insight.

Both the total worldwide IC market and the OSAT (outsourced semiconductor assembly and test) market are explored. The OSAT market is a subset of the worldwide IC market. Forecasts are broken down by I/O-count range for the package types described previously for the world market.

The purpose of the report is to aid companies associated with the IC packaging market in forecasting demand for their own products. The IC packaging market is evolving to keep pace with other changing markets. IC packaging demand is affected by changes in the die contained in the packages, and by performance expectations of the final product purchased at the consumer level. Through extensive primary and secondary research, this report presents an objective look at the world of IC packaging.

1.2 ORGANIZATION

This report is organized into seven chapters and three appendices. Chapter 1, “Introduction,” outlines the scope, organization, and methodology of the report. Chapter 2, “Executive Summary,” is a worldwide forecast of the overall packaging market by package type. Units and revenue are presented for both the world market and the OSAT market.

Chapter 3 is an overview of the state of the overall economy and semiconductor industry. Chapter 4 analyzes the total worldwide IC packaging market by units and packaging revenue. The analysis in this

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chapter is presented by IC device type, defining each device market by the percentage of each package type utilized, and by I/O range. Chapter 5 then rearranges the data for presentation by package family. Unit analysis is further broken down by I/O-count segments. Packaging revenue is generated by multiplying worldwide units with pricing information supplied by the OSAT IC package assemblers.

Chapter 6 forecasts growth in the OSAT market. Units and revenue are analyzed by package family. Forecasts are computed by compiling information obtained from each individual contract assembly company. Pricing information is provided by I/O count and price per I/O, and when multiplied by units, yields revenue. OSAT revenue from test, shipping, and so forth is not within the scope of this report, nor is the packaging of discrete devices.

The package family pricing provided in this report is a broad average across all situations within the package family: high and low volumes, wire bonding and flip chip interconnections, plastic and ceramic substrates, and so on. Pricing data per I/O is applied to the worldwide market in Chapter 4 to obtain revenue figures in that chapter.

Profiles of OSAT companies are presented in Chapter 7. These profiles give a look at the companies that provide outsourced semiconductor assembly services, and their package offerings. When provided by the company, accompanying statistics appear with each package offering. The extent of each profile depends on the amount of information provided by that company.

Appendix A lists the OSAT companies' offerings by package family, to be used as a reference guide. Appendix B gives the website addresses for the OSAT companies. Appendix C is a small glossary of acronyms and terms used in the semiconductor packaging industry.

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1.3 METHODOLOGY

In obtaining information for this report, both primary and secondary sources were utilized. Gathering information for Chapter 4 consisted of contacting a wide spectrum of semiconductor manufacturers and fabless companies. Each group was contacted to obtain specific information on a given segment of the industry. The information was gathered via e-mail and face-to-face interviews, and through secondary sources.

The base year (2012) IC units for each product segment in Chapter 4 have been formulated by New Venture Research, based upon data published by World Semiconductor Trade Statistics (WSTS), and are for the merchant IC industry as defined by WSTS. All forecasts were created by NVR using its proprietary methods.

The OSAT pricing developed for Chapter 6 was used to calculate the worldwide IC packaging "revenue" provided in Chapter 4. That is, the price per I/O for IC package assembly gathered from the OSAT market (Chapter 6) is applied to the worldwide IC packaging market in Chapter 4 to arrive at worldwide package revenue figures. OSAT pricing embodies all costs associated with package assembly, including materials, labor, equipment amortization, and overhead.

To gather information for Chapter 6, every OSAT in the IC packaging marketplace was contacted and asked a standardized series of questions. The goal of the questions was to get a "fix" on the marketplace—where it is now and the direction it is heading. As with Chapter 4, the responses were obtained by e-mail. Chapter 6 forecast information then is built "from the bottom up," as information is added up company by company to reach the total market figures.

The OSAT companies were queried on their total units and revenue, and the percentage of their units that each package family represented. For each package family, the OSATs were asked to provide information on the

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number of units, average number of I/Os, and price per I/O. A model was then used to produce the results given in this chapter.

For both Chapters 4 and 6, the responses to these questions were used to reveal the path or direction NVR may reasonably predict that the industry will follow. The answers to these questions were considered anonymous, and are not printed as being associated with any specific company. Multiple companies were queried per segment, thus revealing "aggregate" trends in the market.

An array of secondary sources was also consulted. The Internet, technical magazines, newspapers, and proceedings from technical programs were utilized to gain information for the body of the report. The author also attended numerous trade functions and met informally with IC packaging industry participants to ascertain the direction of the industry.

IC package OSAT profiles in Chapter 7 were updated with information from company websites and sent to the appropriate person within each company with a request for updated information, and changes were made if necessary. If no corrections or additions were made to the profile, all information was assumed to be correct and current, and published as such.

All prices and revenue given in the figures and tables within the market analysis chapters of this report are stated in current US dollars.

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