

Now Available!

IC PACKAGE PITCH, LEADFRAME PLATING, AND SUBSTRATE MARKETS

2013 EDITION

**An Extension of the Most Comprehensive Report Available
On The Global IC Packaging Industry**

Report Highlights

- **Industry Overview**

- **The Economic State of the Industry**

- **Summary of Market Forecasts, 2012–2017**
 - ◆ **IC Package Pitch by Package Family and I/O Count**
 - ◆ **Leadframe Plating and Lead-free Issues**
 - ◆ **IC Packaging Substrates**

New Venture Research Corp.

337 Clay St., Suite 101

Nevada City, CA 95959

www.newventureresearch.com

A Technology Market Research Company

kwilliams@newventureresearch.com

Tel: (408) 244-1100

Fax: (530) 265-1998

Synopsis

Integrated circuits (ICs) are placed in a package, which gives the semiconductor die the mechanical and electrical interface to the printed circuit board (PCB). Once packaged, the IC transforms from a “die” into a “chip”.

This report, the **IC Package Pitch, Leadframe Plating, And Substrate Markets**, provides information which will help determine the size of a package, the test socket size, and the footprint of the device on a PCB, as well as provide information on material choices for leadframes, which affects the test companies, printed circuit board manufacturers, and others who delve into the interfaces with the package leadframe. The following paragraphs describe the topics of discussion within the report.

Package Pitch

One of the functions of an IC package is to provide the mechanical connection to the printed circuit board (PCB). Whether the connection is a lead, ball, land pad, or pin, each of these elements will be spaced at a certain distance to the next interconnection to the board. The distance between the center of one lead or ball to the next is referred to as the pitch.

Chapter 4 of this report covers the package pitch of all the IC package families available, including DIP, SOT, SO, TSOP, DFN, CC, QFP, QFN, PGA, BGA, FBGA, and WLP, by I/O count ranges of 3-18, 20-32, 34-100, 102-304, 308-999, and 1,000 and up.

Leadframe Plating Options

The leadframe is the skeleton of the IC package, providing the electrical and mechanical connection from the die to the PCB. Most leadframes are made out of copper, and it, and all materials used to create leadframes, do not solder to a PCB, so the leadframes must be plated with some type of solderable material to make the leadframe adhere to the PCB in a reflow oven. This material also protects the leadframe from oxidation, corrosion, and abrasion. Leadframes fall into

either preplate or postplate options.

Preplate leadframes are plated well before die attach and assembly, by the leadframe manufacturer. Postplate leadframes are plated after die attach, interconnection, and overmolding, as part of the package assembly operations.

Chapter 5 covers the leadframe plating options, and issues associated with these choices.

IC Package Substrates

Packages such as PGAs, BGAs, LGAs, and FBGAs all attach to a substrate, also known as an interposer. The substrate replaces the leadframe as the interposer between the die and the PCB. The substrate can be made from a variety of materials, including BT (bismaleimide triazine) resin, FR-4, FR-5, ceramic, and polyimide flex tape. The substrate generally has balls or pins on the underside that attach it to the PCB. The package is considered an LGA, or land grid array, if the substrate is placed on the PCB directly, without balls or pins.

Chapter 6 contains forecasts of the various substrate options by Package Family, Substrate Units, Substrate Area, and Substrate Revenue, from 2012-2017.

IC Package Pitch, Leadframe Plating, and Substrate Markets - 2013 Edition continues **NVR's** leadership position in assessing the status and future of IC packaging. This analysis is an effective and economical tool for any company associated in the semiconductor industry to aid in assessing their own markets and potential areas of growth. The report sells for \$995 and is delivered by email as a single-user PDF file. Extra single-user licenses sell for \$250 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 \$750 and a printed copy for \$250.

About the Author

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

Table of Contents and List of Tables and Figures

Chapter 1: Introduction

Chapter 2: Executive Summary

Chapter 3: State of the Industry

Economic Overview

Industry Overview

Chapter 4: Forecasts by IC Package Pitch, by Package

Family and by I/O count, 2012 - 2017.

<u>Package Types:</u>	<u>I/O Count:</u>	<u>Pitch:</u>
DIP	004-018	≥1.27 mm
SOT	020-032	1.0 mm
SO	034-100	0.8 mm
TSOP	104-304	0.65 mm
DFN	308-999	0.5 mm
CC	1,000 +	0.45 mm
QFP		0.4 mm
QFN		0.3 mm
PGA		
BGA		
FBGA		
WLP		

Chapter 5: IC Package Leadframe and Lead-free Issues

Preplate

Post plate

Lead-free Issues: Tin Whiskers

New Product Introductions

- Lockheed Martin Space Systems Company

Forecasts of the various plating options including Matte Tin, Tin Silver, Tin Copper, Tin Bismuth, Nickel Palladium, and Nickel Palladium Gold.

Chapter 6: IC Package Substrates

Ceramic

Laminate

HDIS

Coreless

Flex Tape

Embedded

Thermal Substrates

Forecasts by Pitch, Units, Area, and Revenue

New Product Introductions

Fujitsu Components America, Inc.

Intel Corporation

Shinko Electric Industries Co., Ltd.

Siliconware Precision Industries Co., Ltd.

Substrates are forecast by material type by package, and standardized for forecasting substrate area. The substrate revenue is also provided.

Appendix A: Web Address Guide

Appendix B: Glossary of Terms

List of Tables

Table 4-1	DIP 003-018 I/O Pitch Forecast
Table 4-2	DIP 020-032 I/O Pitch Forecast
Table 4-3	DIP 034-100 I/O Pitch Forecast
Table 4-4	Total DIP Pitch Forecast
Table 4-5	SOT Pitch Forecast
Table 4-6	SO 004-018 I/O Pitch Forecast
Table 4-7	SO 020-032 I/O Pitch Forecast
Table 4-8	SO 034-100 I/O Pitch Forecast
Table 4-9	Total SO Pitch Forecast
Table 4-10	TSOP 004-018 I/O Pitch Forecast
Table 4-11	TSOP 020-032 I/O Pitch Forecast
Table 4-12	TSOP 034-100 I/O Pitch Forecast
Table 4-13	Total TSOP Pitch Forecast
Table 4-14	DFN 004-018 I/O Pitch Forecast
Table 4-15	DFN 020-032 I/O Pitch Forecast
Table 4-16	Total DFN Pitch Forecast
Table 4-17	CC 020-032 I/O Pitch Forecast
Table 4-18	CC 034-100 I/O Pitch Forecast
Table 4-19	Total CC Pitch Forecast
Table 4-20	QFP 032-100 I/O Pitch Forecast
Table 4-21	QFP 104-304 I/O Pitch Forecast
Table 4-22	Total QFP Pitch Forecast
Table 4-23	QFN 004-018 I/O Pitch Forecast
Table 4-24	QFN 020-032 I/O Pitch Forecast
Table 4-25	QFN 034-100 I/O Pitch Forecast
Table 4-26	QFN 104-304 I/O Pitch Forecast
Table 4-27	Total QFN Pitch Forecast
Table 4-28	PGA 104-304 I/O Pitch Forecasts
Table 4-29	PGA 308-999 I/O Pitch Forecast
Table 4-30	Total PGA Pitch Forecast
Table 4-31	BGA 034-100 I/O Pitch Forecast
Table 4-32	BGA 1040304 I/O Pitch Forecast
Table 4-33	BGA 308-999 I/O Pitch Forecast
Table 4-34	BGA 1,000+ I/O Pitch Forecast
Table 4-35	Total BGA Pitch Forecast
Table 4-36	FBGA 004-018 I/O Pitch Forecast
Table 4-37	FBGA 020-032 I/O Pitch Forecast
Table 4-38	FBGA 034-100 I/O Pitch Forecast
Table 4-39	FBGA 104-304 I/O Pitch Forecast
Table 4-40	FBGA 308-999 I/O Pitch Forecast
Table 4-41	FBGA 1,000+ I/O Pitch Forecast
Table 4-42	Total FBGA Pitch Forecast
Table 4-43	WLP 004-018 I/O Pitch Forecast
Table 4-44	WLP 020-032 I/O Pitch Forecast
Table 4-45	WLP 034-100 I/O Pitch Forecast
Table 4-46	WLP 104-304 I/O Pitch Forecast
Table 4-47	Total WLP Pitch Forecast
Table 4-48	Total IC Package Pitch Forecast
Table 5-1	DIP Plating Forecast
Table 5-1	DIP Plating Forecast
Table 5-2	SOT Plating Forecast
Table 5-3	SO Plating Forecast
Table 5-4	TSOP Plating Forecast
Table 5-5	DFN Plating Forecast
Table 5-6	CC Plating Forecast
Table 5-7	QFP Plating Forecast
Table 5-8	QFN Plating Forecast
Table 5-9	Total IC Leadframe Plating Forecast
Table 6-1	PGA Units by I/O Pitch, 2012—2017
Table 6-2	BGA Pitch, 2012—2017
Table 6-3	FBGA Pitch, 2012—2017
Table 6-4	PGA Substrates, 2012—2017
Table 6-5	BGA Substrates, 2012—2017
Table 6-6	FBGA Substrates, 2012—2017
Table 6-7	Substrate Unit Summary, 2012—2017
Table 6-8	Average Substrate Area by Package Type, 2012—2017
Table 6-9	Substrate Area by Package Type, 2012—2017
Table 6-10	Substrate Area Summary, 2012—2017
Table 6-11	Average Substrate Price, 2012—2017
Table 6-12	Substrate Revenue by Package Type, 2012—2017
Table 6-13	Substrate Revenue Summary, 2012—2017

List of Tables and Figures (continued)

List of Figures

Figure 4-1 DIP 003-018 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-2 DIP 020-032 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-3 DIP 034-100 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-4 Total DIP Pitch Forecast, 2012 vs. 2017
 Figure 4-5 SOT Pitch Forecast, 2012 vs. 2017
 Figure 4-6 SO 004-018 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-7 SO 020-032 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-8 SO 034-100 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-9 Total SO Pitch Forecast, 2012 vs. 2017
 Figure 4-10 TSOP 004-018 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-11 TSOP 020-032 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-14 TSOP 034-100 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-13 Total TSOP Pitch Forecast, 2012 vs. 2017
 Figure 4-14 DFN 004-018 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-15 DFN 020-032 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-16 Total DFN Pitch Forecast, 2012 vs. 2017
 Figure 4-17 CC 020-032 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-18 CC 034-100 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-19 Total CC Pitch Forecast, 2012 vs. 2017
 Figure 4-20 QFP 032-100 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-21 QFP 104-304 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-22 Total QFP Pitch Forecast, 2012 vs. 2017
 Figure 4-23 QFN 004-018 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-22 QFN 020-032 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-25 QFN 034-100 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-26 QFN 104-304 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-27 Total QFN Pitch Forecast, 2012 vs. 2017
 Figure 4-28 PGA 104-304 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-29 PGA 308-999 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-30 Total PGA Pitch Forecast, 2012 vs. 2017
 Figure 4-31 BGA 034-100 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-32 BGA 104-304 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-33 BGA 308-999 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-34 BGA 1,000+ I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-35 Total BGA Pitch Forecast, 2012 vs. 2017
 Figure 4-36 FBGA 004-018 I/O Pitch Forecast, 2012 vs. 2017

Figure 4-37 FBGA 020-032 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-38 FBGA 034-100 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-39 FBGA 104-304 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-40 FBGA 308-999 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-41 FBGA 1,000+ I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-42 Total FBGA Pitch Forecast, 2012 vs. 2017
 Figure 4-43 WLP 004-018 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-44 WLP 020-032 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-43 WLP 034-100 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-46 WLP 104-304 I/O Pitch Forecast, 2012 vs. 2017
 Figure 4-47 Total WLP Pitch Forecast, 2012 vs. 2017
 Figure 4-48 Total IC Package Pitch Forecast, 2012 vs. 2017

Figure 5-1 Whisker Grain in Bright Tin on Copper
 Figure 5-2 Schematic—Whisker Grain Morphology
 Figure 5-3 Kirkendall Effect for Sn/Cu Couple
 Figure 5-4 Kirkendall Stress Effect for Sn/Cu Couple
 Figure 5-5 Compressive Stress Model
 Figure 5-7 DIP Plating, 2012—2017
 Figure 5-8 SOT Plating, 2012—2017
 Figure 5-9 SO Plating, 2012—2017
 Figure 5-10 TSOP Plating, 2012—2017
 Figure 5-11 DFN Plating, 2012—2017
 Figure 5-12 CC Plating, 2012—2017
 Figure 5-13 QFP Plating, 2012—2017
 Figure 5-14 QFN Plating, 2012—2017
 Figure 5-15 Total IC Leadframe Plating, 2012—2017

Figure 6-1 Cored vs. Coreless Substrate
 Figure 6-2 Pre-Molded Leadframe Process Flow
 Figure 6-3 Wire bond type rLBGA Package Structure
 Figure 6-4 Flip Chip type rLBGA Package Structure
 Figure 6-5 Routable Lead-frame Top view
 Figure 6-6 PGA Substrates, 2012 vs. 2017
 Figure 6-7 BGA Substrates, 2012 vs. 2017
 Figure 6-8 FBGA Substrates, 2012 vs. 2017
 Figure 6-9 Substrate Unit Summary, 2012 vs. 2017
 Figure 6-10 Substrate Area Summary, 2012 vs. 2017
 Figure 6-11 Substrate Revenue Summary, 2012 vs. 2017

Publish Date: August 2013 ~ 200 Pages

Order Form

Payment Method

Check in the amount of \$ _____ is enclosed.

Invoice per P.O. # _____

Please charge: Visa MasterCard American Express

Card # _____ Exp. _____

Name On Card _____

Signature _____ Date _____

Name _____

Title _____

Company _____

Address _____

City/State/Zip _____

Telephone _____

Fax _____

E-mail _____

IC Package Pitch, Leadframe Plating, and Substrate Markets, 2013 Edition (Single-User License - PDF file) \$995

Add Extra Single-User Licenses (\$250 each) or Corporate License (\$1,000)

Returns: No return privileges. **International Orders:** Must be prepaid, please contact us for payment arrangements.

New Venture Research Corp.

337 Clay St., Suite 101
 Nevada City, CA 95959
 Tel: (408) 244-1100 Fax: (530) 265-1998
 www.newventureresearch.com; kwilliams@newventureresearch.com

Subtotal

Add Excel Spreadsheet of all Tables: \$750

Add a printed copy of the report \$250

TOTAL