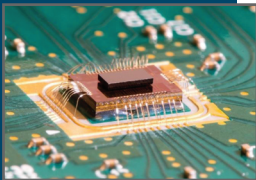
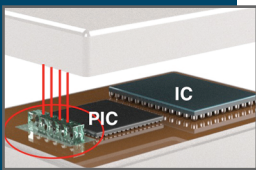
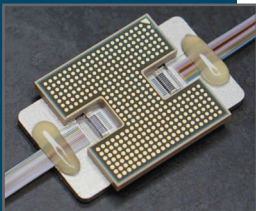
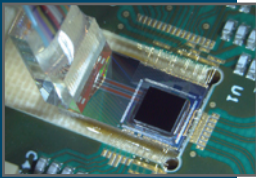
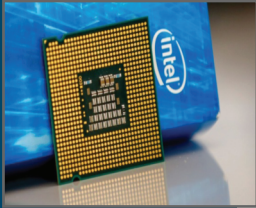


# Advanced Packaging Update: Market and Technology Trends

Vol. 2-0820



This second volume of the Advanced Packaging Update features a new forecast for fan-out wafer level packages. The forecast is broken out into standard density and high-density and is provided in both number of packages and wafers. Alternatives are discussed such as silicon interposer and bridge options. Advanced packaging substrates are discussed and a forecast for build-up material in high-performance applications is provided. Sections covering recent trends and drivers for integrated passives and packaging for integrated photonics are included. OSAT financials are presented.

## Table of Contents

### 1 Industry and Economic Trends

- 1.1 Economic Trends
  - 1.1.1 U.S. Macroeconomic Trends
- 1.2 Semiconductor Industry Growth
  - 1.2.1 TSMC's Outlook
- 1.3 Trade Agreements and Trade Friction
- 1.4 Growth Areas
  - 1.4.1 Smartphones and 5G Adoption
  - 1.4.2 5G Infrastructure
  - 1.4.3 Datacenters and Servers
  - 1.4.4 Automotive Electronics

### 2 OSAT Market Sector

### 3 Fan-out WLP Outlook

- 3.1 Standard-Density
- 3.2 High-Density FO-WLP
  - 3.2.1 TSMC's InFO
  - 3.2.2 Samsung's FOPLP
  - 3.2.3 Fan-out on Substrate
    - Amkor, ASE, SPIL, TSMC, TFME
- 3.3 FO-WLP Market Forecast

### 4 Substrate Trends

- 4.1 Larger Body Sizes
- 4.2 Finer Features
- 4.3 Higher Layer Counts
- 4.4 Substrate Panel Requirements
- 4.5 Increased Substrate Capacity

### 5 Integrated Passive Developments

- 5.1 Technology Overview
  - Intel Corporation, Samsung, A\*STAR, TSMC

### 6 Integrated Photonics Packaging

- 6.1 Packaging for Integrated Photonics
- 6.2 Industry Activities
  - Cisco, GLOBALFOUNDRIES, HPE, Infinera, Intel, Juniper Networks, Microsoft, POET, Ranovus, Rockley Photonics, SCINTIL Photonics
- 6.3 Research Organizations
  - CEA Leti, Fraunhofer IZM, IBM Watson

Research Center, IMEC Transfer Printing for Silicon Photonics, iNEMI's Optoelectronics Roadmap, Microsoft/Facebook Co-Packaged Optics, PETRA, Tyndall National Institute

### 6.4 EDA Tools

Ansys, Cadence, Mentor Graphics, Synopsys

### 6.5 OSAT Activities

AIM Photonics, Amkor, ASE, Argotech, IBM Assembly and Test Services, Integra, PHIX Photonics Assembly, Technobis Group

### 6.6 Market for Integrated Photonics

## Partial List of Figures

- 3.1. Substrate-SWIFT®.
- 3.2. FOEB package with bridge die.
- 3.3. TFME FOPoS.
- 5.2. Intel's MIA inductors.
- 5.3. Samsung's 3D wafer stacking ISC.
- 6.1. Transition from Cu wiring to photonics.
- 6.3. ASIC/transceiver integration concept.
- 6.4. HPE's fiber-to-chip connector.
- 6.5. Intel co-packaged optics Ethernet switch.
- 6.7. 3D router optoelectronic chip on optical PCB.
- 6.8. IBM 8x8 photonic switch module.
- 6.9. Fiber-last assembly process.
- 6.11. Mentor Graphics' integrated photonics design.

## Partial List of Tables

- 2.1. Revenue of Top 20 Publicly Traded OSATs
- 3.1. Fan-Out Suppliers
- 3.2. Fan-out WLP Examples
- 3.3. Apple's Application Processors in TSMC's InFO
- 3.4. InFO-R versus InFO-L
- 3.5. FO-WLP Market Projections in Units
- 3.6. FO-WLP Market Projections in Wafers
- 4.1. High-Performance Substrate Build-up Material
- 6.3. Hybrid and Monolithic Integration

Annual subscription – \$5,100 (4 issues)  
Single issue – \$2,500  
Corporate license – \$8,750

  
**TechSearch**  
INTERNATIONAL

4801 Spicewood Springs Road • Suite 150  
Austin, Texas 78759  
Tel: 512-372-8887 • Fax: 512-372-8889  
tsi@techsearchinc.com • www.techsearchinc.com