



# **BGA/CSP DEVELOPMENT UPDATE SERVICE**

## **Second Quarter, 2001**

The second quarterly BGA/CSP update report for 2001 covers recent economic developments and their impact on BGA and CSP growth. The update features a special section on manufacturing in China and the potential growth for BGA and CSP production. Also included is special coverage of ten-year trends in BGA and CSP packages for key products using these technologies. Highlighted in the report are new package developments such as Motorola's flip chip BGA package, ShellCase's wafer level CSP package for optical applications, and Tessera's folded CSP. Among some of the new equipment introductions are Tru-Si's wafer handling systems for thin wafers and ball attach equipment market developments. There is also a discussion of the economic benefits of merging assembly and test, which have been clearly demonstrated by Amkor Technology's introduction of its larger format matrix strip and test strategy. The report also provides the latest developments in two-metal layer tape, featuring new announcements from International Flex Technologies and Compass Technology.

### **Table of Contents**

- 1 Economic Slowdown Implications
  - 1.1 Growth Prospects for CSPs and BGAs
  - 1.2 Manufacturing Growth in China
  - 1.3 BGA and CSP Trends
    - 1.3.1 Package and Board for Notebook Personal Computers
    - 1.3.2 Package and Board for Cellular Phones
- 2 New Package Developments
  - 2.1 Tessera's *Origami* CSP
  - 2.2 ShellOp Optical Package from ShellCase
  - 2.3 Motorola's Flip Chip PBGA Development
- 3 Equipment Developments
  - 3.1 NoTouch™ Wafer Handler from Tru-Si
  - 3.2 The Merger of Assembly and Test
  - 3.3 Ball Attach Equipment Market Developments
- 4 Material Developments
  - 4.1 IFT Announces Process Improvements for Two-Metal Layer Tape
  - 4.2 Compass Technology's Two-Metal Tape: A Flip Chip Substrate

### **List of Figures**

- 2.1 Tessera's folded stacked  $\mu$ BGA®
- 2.2 ShellOp package for Sanyo's CCD
- 2.3 ShellOp package cross-section and process
- 2.4 ShellOp package with one or two air cavities
- 2.5 ShellWAVE package for SAW filter
- 2.6 Motorola's FC-BGAs
- 3.1 Tru-Si's handheld wand
- 3.2 Amkor Technology's high density lead frame strip for MLF
- 3.3 MCT's test handler
- 3.4 Ball attach market installed base
- 4.1 Compass Technology's two-metal layer tape process

### **List of Tables**

- 1.1 UMC's Assembly Capabilities
- 1.2 High Pin Count Trends
- 1.3 Notebook PC Motherboard Requirements
- 1.4 Notebook PC Module Substrate Requirements
- 1.5 Cellular Technology PCB Trends
- 1.6 Cellular Phone Motherboard Requirements
- 1.7 Cellular Phone Module Substrate Requirements
- 1.8 Cellular Phone Module Electrical and Bend Radius Requirements
- 4.1 Two-Metal Layer Tape Suppliers
- 4.2 IFT's Wire Bond Test Data
- 4.3 Solder Ball Shear Results Post-PCT