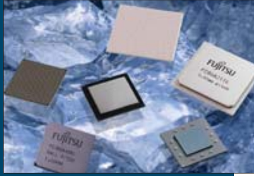
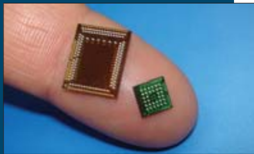
Flip Chip and WLP: 2006 Market Update and Technology Developments





Driven by the need for increased performance and form factor requirements, demand for flip chip bumping and wafer level packaging is growing rapidly. Issues include the use of flip chip for silicon with low-k dielectrics, availability of low-cost organic substrates, and the adoption of Pb-free bumping. Highlighted are trends in 300mm bumping, wafer bumping processes, and new underfill materials. New applications are described with examples of device type, die size, and package. This analysis provides an updated forecast of the flip chip wafer bumping market by product application, device type, bump type, number of wafers, and number of die. Merchant and captive capacity is projected by number of wafers and bump type. WLPs are also growing in volume with shipments of integrated passives, analog devices, image sensors, RF, memory, and power MOSFETs. Projections for WLPs are provided in both units and number of wafers.

1 Technology Developments
- 1.1 New Bumping Technologies
  - 1.1.1 Copper Pillar Bump (Intel, APS)
- 1.2 Pb-Free Bumping
  - 1.2.1 C4NP
  - 1.2.2 Ultra Fine Pitch Solder Bumping
  - 1.2.3 New Electrodeposition Process
- 1.3 Issues with Low-k Dielectrics
- 1.4 Electromigration Issues
- 1.5 300mm Wafer Bumping
- 1.6 Bumping Price Trends
- 1.7 Bump Pitch Trends
- 1.8 Flip Chip Substrate Trends
- 1.9 Underfill Material Trends

2 Flip Chip Market Projections
- 2.1 Wafer Bump Capacity (solder and gold)
- 2.2 Flip Chip Demand
  - 2.2.1 Solder Bumping Market Projections
  - 2.2.2 Gold Bumping Market Projections
  - 2.2.3 Gold Stud Bump
- 2.3 Flip Chip Application by Device Type
  - 2.3.1 Computers and Communications
  - 2.3.2 Personal Computer CPUs
  - 2.3.3 Game CPUs and Graphics Processors
  - 2.3.4 Digital Signal Processors
  - 2.3.5 ASIC, FPGA, and Switches
  - 2.3.6 Chipsets
  - 2.3.7 Set Top Boxes
  - 2.3.8 Wireless
  - 2.3.9 Camera Modules
  - 2.3.10 Preamps for Disk Drives
  - 2.3.11 Consumer Products
  - 2.3.12 Medical
  - 2.3.13 Automotive Electronics
  - 2.3.14 Military and Aerospace
  - 2.3.15 Memory Modules
  - 2.3.16 Display Drivers
  - 2.3.17 RFID Tags
  - 2.3.18 High Brightness LEDs

3 Wafer Level Package Projections
- 3.1 Wafer Level Package Capacity
- 3.2 Wafer Level Package Demand
- 3.2.1 Demand by Device Type
- 3.3 Wafer Level Packaging Applications
- 3.4 RF Applications

4 Wafer Bumping and WLP Providers
- 4.1 Bumping Options
- 4.2 Wafer Level Packaging Options
- 4.3 Wafer Bumping and WLP Providers
  ASE, APS, Amkor, Casio Micronics, Chipbond, EM Microelectronics – Marin, FlipChip International, Fujikura, Fujitsu Microelectronics, FuPo, IC Interconnect, International Micro Industries, LB Semicon, Nepes, Pac Tech Packaging Technologies, Samsung Techwin, SCHOTT, SMIC, Tessera, SPIL, STATSChipPAC, Unisem

5 Contract Assembly Services
- 5.1 IC Package Assembly Services
  AIT, ASE, Amkor, ASAT, Carsem, Casio Micronics, Chipbond Corporation, ChipMOS, Corwil, Fujitsu, Kyocera, Misuzu Industries, Namtai, Nepes, Shinko Electric, SPIL, STATSChipPAC, Unisem, UTAC, Valtronic, White Electronic Designs

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5.2 Board-Level Assembly Services
Belton Technology, Binder Elektronik, Celestica, Endicott Interconnect, Fabrinet, Flextronics, HEI, IMI, Jabil, Maxtek, Nextek, Pemstar, Plexus, Promex, Sanmina-SCI, Solectron, Texas Prototypes

Appendices – Vendors and Suppliers

Partial List of Figures and Tables

- Intel's Cu pillar bumps.
- C4NP bumping process flow.
- Tamura's 80µm pitch process.
- Low-k wafer shipments.
- 300mm wafer-bump capacity.
- Bumping process cost of ownership comparison.
- Solder bump pitch trends.
- Merchant and captive solder bump capacity.
- Dedicated copper pillar capacity.
- Solder bump capacity by geographic region.
- Gold bump capacity by geographic region.
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- IBM's Z9 server module with flip chip.
- Cell processor.
- ATI's RADON™ graphics processor with flip chip.
- Fujitsu's flip chip ASIC.
- IBM's CuCGA and CCGA.
- Stratix II EP2S180.
- Intel's E7520 and E7320 MCH chips (Northbridge).
- Intel's flip chip package for LAN product.
- Infineon E-GOLDlite baseband IC for mobile phones.
- Philips Sb-SiP with flip chip.
- Transceiver RF ASIC on IPAD.
- SyChip's Wireless LAN module.
- CMOS image sensor with NiAu bump.
- Hearing aid module.
- NEC's Pb-free AMB.
- TI's gold bumped Gen2 RFID chip.
- Hitachi µChip.
- LUXEON Flash package.
- NEC's COC package.
- WLP shipments by device type.
- NTT DoCoMo NM850iG.
- Oki's WLP in Panasonics Mini SD card.
- CMOS image sensor.
- National Semiconductor's micro SMDxt.
- Samsung's WFP process.
- Micron's DDR2 in WLCSP.
- CSR's Bluetooth™.
- Merchant and captive solder bumping capacity
- WLP wafer shipments by bump fabrication method.
- Casio EWLP Digital TV Tuner Prototype.
- Fujikura's WLP.
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- WLP Capacity and Demand Projections
- Wafer Level Package Demand
- Mobile Phone Examples containing WLPs
- Flip Chip Package Assembly Suppliers
- Flip Chip Board Level Assembly Suppliers

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