Status and Prospects for the Advanced Packaging Industry in China

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Introduction, Definitions & Methodology
The objectives of this report are to provide:

• China semiconductor market outlook
• Advanced packaging ecosystem in China
• Global & local players
• China wafer bumping capacity forecast data (2015-2020) by technology: Flip chip (Cu pillar/solder/Au bump) & WLCSP
• Chinese backend equipment & materials suppliers
• Chinese government IC policy
• Detailed analysis of China IC investment fund
• Strategy & outlook of local & global players
• Different scenarios of evolution of advanced packaging market
• Opportunities & Challenges of China advanced packaging market
REPORT METHODOLOGY

Market forecast methodology

APPLICATION

Forecast of system market volume (unit) → Definition of functions using devices, technical requirements at device level and device penetration rate and competitiveness with alternative technologies

Forecast of device market volume (unit) → Definition of ASP per application → Forecast of device market size ($) → Understanding and definition of market share

Definition of manufacturing flows for front-end and packaging at module and device level → Forecast of device manufacturing equipment and material markets (unit and $)

Definition of device die surface (mm²) and substrate die surface (mm²) and epiwafer volume (unit) → Forecast of device substrate markets (unit, wafers and $)

System Plus Consulting expertise in reverse costing / reverse engineering

Market segmentation methodology

USES → Variant → Quasi segments

Fonction and technological application matrices

APPLICATIONS → SEGMENTS

CLIENTS

Commercial key success factors behaviour and competitor behaviour matrices

BEHAVIOUR

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REPORT METHODOLOGY

Technology analysis methodology

- Define the key parameters
- Understand the requested specifications per parameter and application
- Define the competing technologies and the potential evolutions of the technologies
- Define the roadblocks and challenges to be overcome
- Establish the technology roadmaps and maps
- Experts discussions

Information collection

- Analysts’ processing to answer your needs and questionings on market size, positioning, technical challenges...
- Trade shows, conferences, events, web, academic publications, literature...
- Material makers
- Equipment makers
- Device makers
- System designers
- OSAT
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IC MARKET FORECAST: CHINA VS REST OF WORLD

China IC market to grow by 7% CAGR from 2015-2020 whereas rest of world grow by 2.5%
WIDE GAP BETWEEN CHINA IC MARKET & PRODUCTION

- Increasing Gap between China Demand and China Production
- In 2015, total gap between China IC product and consumption is ~$91B
- Chinese government target is to bridge the local gap between IC market & product in next 10 years by implementing National IC policy & providing huge financial support to local IC players
PLAYERS HAVING ADVANCED PACKAGING CAPABILITY

Non exhaustive list

Key players in China engaged in advanced packaging capability

Millenium Microtech (Shanghai) Co., Ltd. bought by Flip Chip international is now part of Huatian.
KEY FABLESS / DESIGN PLAYERS IN CHINA

Non exhaustive list

IC design ecosystem is well established in China
PLAYERS HAVING WAFER BUMPING CAPACITY

By wafer size (300mm, 200mm, 150mm)

- More than 90% advanced packaging players have 300mm wafer bumping capability
- Only 3 players viz. Chipbond (Chipmore), JCAP (JCET) and Unisem have XXmm wafer bumping facility
- SPIL and TI bumping facility is in construction and likely to start operation by end of 2016.
- Bumping technology includes Cu pillar and plated solder bump, ball drop (mainly for WLCSP) and Au bump.
- ChipMOS to start XXmm & XXmm Au & Cu bumping with COG/COF assembly in Shanghai in 2016.
Drivers of China advanced packaging industry:

1. Long-term growth in China IC industry
   - Driver of China AP market
2. Aggressive M&As
3. Investment by global OSATs
4. China government initiative

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By revenue (in $M)

- In 2015, AP market in China is estimated to be ~ $2.2B
- Flip-chip is the largest market (~$1.8B) followed by WLCSP (~$343M).
- Flip-chip market include bumping & assembly
- We see huge ramping of bumping capacity by Chinese players particularly in 12” Cu pillar
- Fan-out & 2.5D/3D packaging are at the infancy stage in China and will have <1% market share by 2020

China advanced packaging market forecast, 2015-2020 (in M$)
Bumping include flip-chip and WLCSP packaging

- FC bumping includes the CuP pillar bump, plated solder (Sn-Ag) and Au bump.
- FC bumping is expected to grow at CAGR of 19.7% to reach ~XXM wpy by 2020
- The growth mainly comes from ramping of 12” Cu pillar bumping by key China OSATs
- WLCSP includes the ball drop and paste printing, majority (> 2/3rd) being ball drop.
- Bumping capacity here doesn’t include STATSChipPAC (acquired by JCET) Shanghai facility that’ll be closed in 2016 & relocated to the JCET facility.
CHINA WAFER TOTAL BUMPING CAPACITY

Split by player market share (12”eq wpy)

Wafer bumping capacity by players, 12”eq wpy

2015
Total ~ XXM

2020
Total ~ XM

Wafer bumping capacity by players, 12”eq wpy

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CHINA CU PILLAR BUMPING CAPACITY: BREAKDOWN BY PLAYER

2015
Total ~ XXM

2020
Total ~ XXM

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China has only ~XX% market share in AP equipment market.

Leading regions remain the same years after years, following the investment of large OSATs and IDMs: Korea and Taiwan are leading, America and Europe following.

China is the place to follow with a very large potential of investment and strong government support:
- First important player being JCET, thanks to OSAT activities (STATS ChipPAC, JCAP) but more investment expected in the future.
Plating chemistry, dielectric materials & photoresist material together constitutes > 70% of China AP market.

- Plating chemistry constitutes >1/3\textsuperscript{rd} of AP material market followed by dielectric materials & photoresist
- TB/DB material is mainly used in memory stacking using TSV. We don’t see any commercial 3D activity in China before 2018.
Semiconductor supply chain in China is established and growing.

EDA | Fabless | Foundry | OSAT | EMS | OEM | Equipment suppliers

Materials suppliers

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Total fund including state & private players is > $100B

Funds for China IC sector

Total ~ $105B

Regional funds include investment from provincial governments:
Shanghai $XXbn, Beijing $XXbn, Wuhan $XXbn, Sichuan $XXbn, Shenzhen $XXbn, Wuxi $XXbn, Nanjing $XXmn

Total ~ $XXB
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• **LED Professional Symposium – LpS**  
  September 20-23, 2016 – Bregenz, Austria

• **SEMICON Europa**  
  October 25-27, 2016 – Grenoble, France

• **SEMICON Japan**  
  December 14-16, 2016 – Tokyo, Japan

*Non exhaustive list
EVEN MORE!

Who should be interested in this report?

• OSAT, IDMs, foundries companies:
  • To have a broad overview China advanced IC packaging market
  • To identify new markets
  • To monitor and benchmark potential competitors

• Financial & Strategic investors:
  • To understand the potential for China advanced IC packaging market
  • To know the latest M&A
  • To get a list of various investment funds and their activities

• R&D players:
  • To understand new technical challenges and opportunities in China advanced packaging space

• Equipment & Material suppliers:
  • To know the key players in China advanced IC packaging supply chain
  • To identify business opportunities and prospects

• OEMs & Integrators:
  • To understand the China advanced IC packaging ecosystem

Companies cited

• JCET, JCAP, HUATIAN TECHNOLOGY, NANTONG FUJITSU MICROELECTRONICS, SJSEMI, INTEL, UTAC, UNISEM, SPIL, ASE, AMKOR TECHNOLOGY, AMD, TEXAS INSTRUMENTS, STATSCHIPPAC, NEPES, NANYA, UNIMICRON, SPEED TECHNOLOGY, AMEC, AMC, NMC, SMEE, KINGSEMI, SILTECH, SMIC, CHINA WLCSP, TSINGHUA GROUP, RDA MICROELECTRONICS, SPREADTRUM, HISILICON, SPRD, ZTE MICRO, CEC, ALL WINNER, SILAN, GIGADEVICE, SUMMIT VIEW CAPITAL, NEPES, INFINEON, NCP, NXP, DIODES. SAMSUNG, SCC, SEVENSTAR, KINGSEMI, PIOTECH CO. LTD, HWATSING, AMEC, NMC, ACM RESEARCH INC, SMEE, SCC, FASTPRINT, EARLYSUN, WUXI CHUANDA ELECTRONIC, DANBOND TECHNOLOGY

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