Asia Semiconductor Sector

COMMENT

IC China 2015: Building or buying to develop the local ecosystem

Figure 1: China semiconductor shifting to IC design and manufacturing

Source: SEMI, Credit Suisse research

We highlight takeaways from IC China 2015 held during 11-13 November, featuring presentations from China's National IC Fund, President of the MIIT, SMIC Chairman and companies across the foundry (SMIC) and back-end (JCET and Tianshui Huatian), to provide a look at China's push to support its IC ecosystem.

- **Reiterating long-term targets on semiconductor development.** Semiconductor revenue in China is on track to grow 19% to Rmb350 bn in 2015, meeting its first growth target—well above global industry sales which are flat. The government stays positive supporting the local ecosystem and targets maintaining a 20% growth CAGR through 2020.

- **China further expands its opportunities in the semiconductor industry.** China has increased its investment in the national IC fund from Rmb120 bn to Rmb139 bn; private equity funds remain aggressive on the development with focus on leaders in IC design (SPRD and Hi-Silicon) and manufacturing (SMIC).

- **Acquisition and collaboration with foreign companies as a key focus.** The Chinese government encourages local companies to collaborate with foreign companies through acquisitions and partnerships. A recent case includes Tsinghua Unigroup's acquisitions in memory chain with a focus on NAND.

- **Stock beneficiaries—SMIC and Hua Hong.** We recently upgraded SMIC with an upside from government support and better execution filling its capacity profitably. We also stay positive on China's 8" pure play foundry Hua Hong despite the recent sales setback with good specialty technology and trading at a discount. We stay conservative on Mediatek as Chinese competition looks to stay fierce from Spreadtrum, Leadcore and Hi-Silicon and Qualcomm stays aggressive to defend its position on 4G.
Focus charts

Figure 2: Revenue target of the semiconductor guideline

$ Billion

Notes:
1. The Revenue number is the sum of China IC companies' sales, including IC Fabless, Foundry, IDM & CSAT.
2. Revenue Target (2015): ~$57.5 Billion (RMB 350 Billion)
3. Y2015-Y2020 CAGR Target: >20%

Annual Growth Rate (2003-2013): 26.5%

Source: CSIA, SEMI

Figure 3: ~40% of semiconductors are shipped to China

Semiconductor shipment (US$bn)

Source: CSIA, SEMI, SMIC, Credit Suisse

Figure 4: China automotive semis to reach US$6 bn by 2016

Source: IHS, Datang NXP, Credit Suisse research

Figure 5: SMIC is offering a wide range of technologies

Source: SMIC

Figure 6: China semiconductor growth shifting to IC design and manufacturing

Source: SEMI, Credit Suisse research

Figure 7: JCET and STATS position in the back-end

Source: Company data, Credit Suisse estimates

Figure 8: JCET provides WLCSP packaging technology

Source: JCET

Figure 9: Tianshui showcased the wafer used in WLCSP

Source: Tianshui Huatian
IC China 2015: Building or buying to develop the local ecosystem

We attended IC China 2015 in Shanghai from 11-13 November hosted by CSIA (China Semiconductor Industry Association), featuring keynote speeches from management of the leading Chinese back-end and foundry suppliers, and financial managers of the Chinese private and government backed IC funds. The event provided another close look at the Chinese semiconductor market, a key rising sector as China accounts for over half of the global semiconductor consumption and a growing production base as Chinese entities provide more funding and policy support to develop its IC industry and local semiconductor ecosystem.

IC China 2015 featured keynotes by China policy makers, senior Chinese and international executives, including the CEO of SMIC TY Chiu, CEO of Datang-NXP Pong-Gang Chang and key back-end manufacturers JCET, Tianshui Huatian and Nantong Fujitsu. The event also featured a presentation from the President of the China IC Fund Wenwu Ding and President of China’s MIIT Jing Shi.

Key themes from IC China 2015

We highlight some of the key themes and takeaways from the conference:

- **China remains focused on growing its semiconductor industry.** Following the release of National Guidelines for the Development and Promotion of the IC Industry in 2014, the Chinese government established a Rmb120 bn (US$19 bn) national IC fund to support the local semiconductor ecosystem; that amount has now been increased to Rmb139 bn. The fund will be spent in five years through 2020 with 60% tied to manufacturing as a hub for the local ecosystem of foundries, back-end, suppliers and design companies. The Chinese government believes that the policy and national fund on the semiconductor industry can attract an even greater amount of investment from private sectors, financial institutions and overseas:

  1) **Local funds.** The Chinese government believes that there will be 5x more investments through local funds in addition to the national fund, where fund investments were increased from Rmb120 bn to Rmb139 bn. Shanghai’s government has been aggressive on semiconductor industry development as it already has a relatively sound ecosystem of international manufacturers, local and overseas foundries, back-end and IC design. The IC fund that it established last year made its first acquisition target of ISSI in March to bring more memory IP into China. The Beijing IC Fund also has Rmb30 bn and has launched a bid for Omnivision and has partnered with SMIC for its 28nm 12” JV fab now ramping up to 15k WPM by the end of 2016 with an eventual target for 35K in the first of the three phases.

  2) **Private VCs.** Local private VCs are also working in conjunction with the government and national IC fund. Tsinghua Unigroup has been aggressive in acquisitions, having invested in RDA/Spreadtrum, attracting Intel’s investment in 2014 and expanding its acquisition targets into memory with plans to invest in Western Digital (which is targeting to acquire SanDisk) and Powertech. Shanghai PDSTI also acquired set-top supplier Montage and continues to look for attractive targets overseas.

- **Reiterating growth targets set for China’s long-term semiconductor growth despite the market slowdown.** The Chinese government believes that its first phase target of Rmb350 bn revenue (+19% YoY) from the Chinese semiconductor supply chain in 2015 will be achieved despite the global slowdown. China still targets growing its industry at a 20% sales CAGR through 2020, with key China IC companies becoming tier-one global players by 2030.
China looking to consolidate resources on the leaders. Though the government and private sector have committed to invest in their local semiconductor ecosystem, the government acknowledges that many smaller companies lack core technology capability. Therefore, the Chinese government is encouraging industry consolidation and acquisitions to consolidate resource allocation and develop core technologies. China’s domestic foundry leader SMIC has committed to continued investment in the advanced nodes and specialty technologies on mature nodes to drive the local ecosystem with support from the local government.

Acquisition and collaboration with foreign companies a key focus. In addition to developing technologies on its own, the government and VC firms encourage local companies to collaborate with foreign companies to build the core technology portfolio more efficiently through acquisitions and partnerships. The recent examples of these actions include attracting Intel's investment in Tsinghua Unigroup’s subsidiary owning Spreadtrum and RDA to develop a competitive Chinese IC rival in the mobile communications chipset market. Datang Telecom also partnered with NXP to co-develop automotive semiconductors through a JV after three years of discussion.

Stock implications from China's development push

SMIC: Foundry leader supported as the building block for the ecosystem

We recently upgraded SMIC from Neutral to OUTPERFORM, raising our target price from HK$0.80 to HK$0.97 due to improving execution and leverage to China’s semiconductor industry expansion and being the focal point for China’s semiconductor development. We see potential catalysts over the next year as Chinese investments in its ecosystem improve capabilities and growth expands organically with emerging IC design companies, and overseas acquisitions of established fabless. The risk to our call is slower process improvement on 28nm, although the company has lifted its mature 12” and kept 8” full at good margins during the interim and is at least now into volume production and is targeting 10% of sales on 28nm by the end of 2016.

Hua Hong: 8” foundries having continued growth from smart cards, analog, and MCUs used in IoT applications

Hua Hong invested early in embedded non-volatile memory (eNVM), making it a reliable low-cost foundry for a number of Internet of Things (IoT) applications, including smart cards (for five of six qualified Chinese suppliers), microcontrollers (supplies and licences from Cypress and Microchip), RF and analog/discretes. The company recently guided a slowdown in 4Q15 after over-shipping early into the slowdown and is now seeing a pause across end markets—we still believe it can recover. The company has good specialised technology on 8” and a broad base of emerging Chinese customers, and some International IDMs that should enable good growth and positive FCF operating 8” capacity.

China targets growing its IC market at a 20% CAGR

SMIC and Hua Hong could benefit from some of the developments in China, while Mediatek would see more competition from local players
Mediatek: Rising Chinese competition from Spreadtrum, Leadcore and Hi-Silicon should persist

Mediatek is facing more competition from Spreadtrum, which recently noted (at the Fabless Semiconductor Association event in Taiwan) that it expects to grow shipments over 10% to 500 mn units in 2015 (about 50% smartphone) with revenue of US$1.45 bn, +25% YoY. Spreadtrum has improved its 3G quad core platform to take more low-mid end share in the sub-US$50 factory price 3G smartphones, and will benefit from the continued government R&D and wafer subsidy support. Spreadtrum is targeting catching up on its roadmap with Chinese manufacturers expecting to introduce entry level 4G platforms using Spreadtrum in early 2016. Spreadtrum also plans to introduce Whale 2, an octa-core built on TSMC’s 16nm, in 2Q16 to compete with Mediatek’s Helio series chips.

Hi-Silicon, an IC design company owned by Huawei Group targets giving Huawei a competitive advantage through differentiated silicon. The company introduced Kirin 950, an octa core A72+A53 4G SoC this month that will be in Huawei’s Flagship smartphone Mate 8. We expect Huawei to use its in-house SoC for its high-end models, keeping a smaller portion of the business split between Qualcomm and Mediatek. We maintain NEUTRAL on Mediatek with target price of NT$250 as the company continues its push for share at the expense of margin as Qualcomm defends 4G, Spreadtrum penetrates 3G and Huawei and Xiaomi use more internal sources.

Chinese policy makers remain committed to developing the Chinese IC industry

We attended several presentations by Chinese policy makers for an updated look at China’s policy development for its local industry, building on the report that we published this past spring after Semicon China. We highlight key points from the President of the MIIT (Ministry of Industry and Information Technology) and the Director of the BDA Administrative Commission, a Beijing Economic Technological Development Area influential in the local semiconductor industry.

China semiconductor outlook and Made-in-China 2025

Presenter: Jing Shi, President of China’s MIIT

- **China semiconductor’s focus remains committed across front-end, back-end and IC design.** China’s IC design market has grown from Rmb1.5 bn to Rmb104.7 bn at a CAGR of 38.6% from 2001-14 and now accounts for 35% of the Chinese semiconductor market, outpacing manufacturing growing at a still robust CAGR of 28.6%. Until now, back-end has lagged, growing at a high-teens rate. The Chinese government believes that the trend will continue and is focusing on developing IC design, manufacturing and back-end capabilities.

- **China’s semiconductor growth will continue to outpace the global market.** Though overall semiconductor demand has slowed down to flat growth due to weaker global growth and slowing smartphones, tablets, and computing, the Chinese semiconductor industry still achieved 19% YoY growth in 1H15 and sales of Rmb159.2 bn. The first phase target of the national semiconductor development guideline for 2015 revenue at Rmb350 bn (+19% YoY) may still be achieved. The government expects to maintain this robust pace through support from the Chinese government, national IC funds and cooperation with the private sector.
- **Semiconductor M&A trend will continue.** Based on the estimates from the Chinese government, the value of M&A in the global semiconductor industry was only US$10 bn/US$17 bn in 2013/2014, but increased meaningfully in 2015 to US$100 bn YTD as the global slowdown offers companies a good opportunity to consolidate at a lower valuation. The Chinese government believes that the consolidation trend will continue as the global semiconductor industry will only grow modestly in the next few years and Chinese companies will be more aggressive to use resources from the government and cheap capital in China to improve their competitiveness through the acquisition of their global and domestic peers.

- **Challenges for China’s semiconductor development.** Though the Chinese government and local VCs have set up funds and will continue to invest in the semiconductor industry, the resource allocation is not efficient as there are too many small companies without core technology capability asking for support, thereby diluting the effort. In addition, the lack of semiconductor engineering talent in China could also limit R&D progress. Therefore, the Chinese government is encouraging local semiconductor supply chain consolidation to consolidate resources on leaders and foreign semiconductor companies to work with local firms on technology development and expand market opportunities.

### China semiconductor policy development

**Presenter:** Sheng Liang, Director of BDA Administrative Commission

- **Multiple programmes to support the semiconductor development.** The Chinese government started 01, 02 and 03 projects to support the development of the local semiconductor industry since 2008, helping foster an acceleration of technology progress that is now bearing fruit. The administration cited a few examples: (1) SMIC has now ramped 28nm and continued investment on advanced nodes including forming a partnership for 14nm FinFet development by 2020, (2) Spreadtrum/RDA and Hi-Silicon are now becoming more competitive with 4G chipsets manufactured on the advanced nodes in the smartphone markets and (3) JCET acquired STATS ChipPAC to establish world class back-end test and assembly capability.

- **Memory IC development a priority.** Currently China still imports most of the ICs due to the lack of high-end technology with memory accounting for 21% of total imported ICs followed by CPU at 19% and RF ICs at 7%. The Chinese government sees
memory IC development as a key battlefield as cloud computing, big data and IoT will drive demand, and memory IP is also related to national security. The commission representative believes that Tsinghua Unigroup’s recent acquisitions in the memory supply chain and partnerships with foreign companies are a good start in building up the IDM ecosystem with core technologies in China spanning from upstream supply down to end-market demand. However, the commission implied that local supply chain development in memory should be more focused on NAND which offers more long-term growth potential, whereas DRAM would need to compete against players operating depreciated fabs and significantly more IP.

- **Setting up localised standards to support industry development.** The Chinese government also believes that the large domestic demand from the local market gives it a great opportunity to support the local semiconductor industry by setting up localised industry standards. The government successfully promoted TD-LTE in the communications segment and now believes that they are in a leading position to drive standards in 5G development. They also set up a new standard in the financial cards market to support the local smartcard fabless in 2014.

Figure 13: **China IC industry policies progress since 2000**

Source: SEMI

### Chips in automotive, a growing opportunity for China

**Presenter:** Pong-Gang Chang, GM of Datang NXP

- **Auto semis to remain a fast growing market.** Datang NXP indicated that the semiconductor content in hybrid automotive and Electric Vehicles has reached US$664 and US$673, respectively, and expects the semiconductor content in automotive to continue to rise as cars build in more advanced infotainment, communications and automated driving assistance. The company expects the Chinese automotive semiconductor market to grow from US$5.5 bn in 2015 to US$10 bn+ by 2025.

- **Made-in-China campaign could support the local supply chain.** The Chinese government introduced a Made-in-China 2025 campaign this May. For automotive, it targets to produce 80%+ key components in commercial automobiles locally by 2025, including semiconductor content, providing the China supply chain a good market opportunity to increase its capability.

- **Datang NXP provides the leading automotive IC solutions.** As China’s semiconductor ecosystem lacks the technology capability in automotive ICs in every aspect (e.g. sensor, auto electronic system and ECU), Datang Telecom and NXP set up a JV with three main product lines including car light adjustment control IC, power management IC and gate driver IC. Currently the company has become the leader of automotive IC solutions locally and continues its effort to expand its technology portfolio with technical support from NXP to address growing demand in the Chinese market.
Recent progress on government investment in the semiconductor industry

Presenter: Wen-Wu Ding, President of China IC Fund

- **Investment principles.** Currently, the IC fund size has increased to Rmb139 bn from Rmb120 bn. The key focus would be to concentrate on industry leaders to help them become global first-tier companies. The government hopes to leverage its own investment in the semiconductor industry with support from the private sector, local governments, financial institutions and capital from overseas.

- **Government encourages collaborations with foreign companies.** The Chinese government has observed the recent industry consolidation trend in both China and overseas, and has encouraged collaboration through acquisitions and partnerships. It has cited recent cases including Tsinghua Unigroup's recent acquisition in the memory supply chain, Nantong Fujitsu's investment in AMD's two bumping fabs and JCET's acquisition of STATS ChipPAC.

- **Priorities for industry development.** The fund laid out four top priorities behind the fund use. (1) Play the role as a capital stream that links the supply chain from IC design, IC manufacturing, packaging, equipment, material, and applications. (2) Encourage industry consolidation and improve corporate governance. (3) Assign geographic specialties. (4) Collaborate with national finance policies on loan supply, taxes, high tech projects, talent retention plans and marketing promotion.

- **Goals to achieve 20% growth for the China IC industry to be leaders by 2030.** With the support of the national IC policy, IC industry revenue may reach Rmb350 bn in 2015. The fund targets to minimise the technology gap between Chinese companies and foreign IC companies to deliver 20% sales CAGR. By 2030, key China IC companies will aim to become tier-one global players. The China IC Fund did cite several recent breakthroughs, citing SMIC's collaboration with Qualcomm on 28nm and the company's continued development of 14nm R&D, Spreadtrum's quad core LTE chipset 8735S, and Hi-Silicon's volume production of an advanced TV SoC.
Using capital efficiently to drive semiconductor industry growth

**Presenter:** Yu-Wang Sun, President of SMIC Capital

- The growth of China’s semiconductor industry is expected to continue. SMIC estimates that China’s semiconductor industry has grown at a CAGR of 18.1%, much higher than the global semiconductor market’s +4% CAGR and expects growth to continue in the next three years driven by the strong Chinese domestic tech demand and Internet of Things development. In addition, SMIC believes China’s semiconductor growth momentum could be further fuelled by the Made-in-China plan, which targets strengthening the industrial base to enhance the quantity and quality of the manufacturing, foster Chinese brands and improve manufacturing innovation.

- Investment focus on the IC design ecosystem. SMIC Capital expects that 70% of the fund invested will be directly related to the semiconductor industry, especially IC design houses which will drive SMIC’s growth in the future. Analog and mixed signal ICs (WiFi, GPS, AM/FM transceiver, Bluetooth and MCU) are a key focus due to the strong IoT demand in the future. In addition, SMIC Capital also invests in fabless with focus on MEMS sensor, RF-ICs, low power consumption processors, power discretes, FPGAs and low power flash to fill its capacity in the legacy and mature nodes with its specialty technology offerings.

Bringing overseas resources back to China

**Presenter:** Ya-Jun Lee, Managing director of PDSTI

- Aggressively looking for good foreign acquisition targets. PDSTI is working with the Shanghai Lin Xin management committee to set up a semiconductor fund worth Rmb10 bn and in some cases pool resources with Shanghai government’s Rmb30 bn fund and SummitView Capital in China with an Rmb10 bn fund. The fund will be a semiconductor investment platform for acquisitions of leading foreign companies to use their industry leading technologies to expand markets in China.

- Investment methodologies. PDSTI will acquire foreign assets by (1) acquiring the assets of unlisted companies, (2) privatising listed companies and (3) acquiring 10-20% of the foreign companies’ stake to become the most powerful shareholders to
influence decision making. PDSTI will further restructure the assets that it acquires into listed companies in China to make the financials better and get cheaper capital for further investments/acquisitions.

Company presentation takeaways

We also profile the key takeaways from the corporate presentations and keynotes that we attended:

SMIC: The challenges and opportunities in China semiconductor manufacturing

**Presenter:** Tzu-Yin Chiu, CEO of SMIC

- **China is becoming important in the global semiconductor ecosystem.** China currently accounts for 41% of the global semiconductor shipments, which is rising further with more semiconductor content made in China and supporting Chinese brands gaining share in end applications.

- **SMIC—a key partner for the China IC ecosystem.** SMIC provides strong support to its fabless customers across design, manufacturing and IP support with ARM, Cadence, Synopsys, and in-house on mask, front-end production and wafer probe services. In addition, the company set up a JV with JCET to provide bumping service, established an R&D centre for 3D IC development and will partner with SPIL, ASE, Amkor, and STATS on assembly and test. SMIC partnered with 116 local suppliers across the mid-end, back-end, R&D, IP & EDA, and design services. To support local development of the semiconductor supply chain, the company also purchased Rmb1 bn+ in semiconductor equipment and materials from local suppliers. With these efforts, SMIC saw revenue contribution from its local customers grow at a CAGR of 30% from 2004-15. The company has also improved execution to attract business back from overseas foundries, citing that 70% of fabless companies in China would like to work with them, up from 59% in 2011.

**Figure 17: Growing collaborations in the China semiconductor ecosystem**

- **28nm ramping up and advanced node technologies in development.** SMIC’s 28nm is ramping with small revenue contribution by the year end and the company expects to reach 10% of sales by 4Q16 with reasonable yields. The company will skip 20nm and move to 14nm directly with a goal to reach production by 2020 through its partnership with Huawei, Qualcomm and imec. As the company knows that advanced
technologies require huge investments and usually take 7-10 years for the invested capital to recover, the company is working on R&D with global and local IC design and R&D teams, and hopes to facilitate the time to market and believes that more partners will join to share the R&D expense and limit the company's P&L impact.

- **Continued specialty technology development to keep the capacity tight.** SMIC is committed to developing derivative technologies that cover a wide domain that are compatible with the core logic technology.  
  
  1. **55nm based embedded flash.** SMIC started mass production in mid-2014 compatible with 65nm logic so IPs can be extended to reduce mask cost.  
  2. **38nm NAND:** SMIC's 38nm NAND Flash process making it the only foundry to manufacture NAND products for its customers and the technology targets on the specialty applications (e.g. embedded products, STB and IoT related applications),  
  3. **SPOCULL 95:** The technology could shrink the die size of the same chip by 45% vs the traditional 130nm and is mainly used in DDIC for HD resolution and low power consumption MCU for IoT.

**Figure 18:** SMIC's specialty technologies

**Figure 19:** SMIC is offering a wide range of technologies

**JCET: Technology development in back-end packaging**

**Presenter:** Xin-Fu Liang, Vice President of JCET

JCET's Vice President Xin-Fu Liang discussed the technology development and the company's strategy after the acquisition of #4 back-end supplier Stats ChipPAC.

**Figure 20:** JCET and STATS position in the back-end

**Figure 21:** 2014 OSAT market share by revenue

**Stats ChipPAC acquisition expands its opportunities in high-end.** Management noted that the acquisition of STAs ChipPAC enables JCET to move up its technology offerings to high-end packaging and helps it accelerate technology development and international recognition and customer relationships. Currently the combined entity has...
1,000+ patents in the US, significantly higher than ASE's ~800 and SPIL's ~500 patents; 66% of the patents relate to advanced wafer level and flip chip technologies.

- **Targeting to be #3 back-end packaging supplier in the next six years.** After acquiring STATS ChipPAC, JCET has moved up to #4 in the global back-end packaging market and management believes the fast growing local semiconductor ecosystem with strong support from the government could allow it to gain more market share in the mid- to low-end wirebonding packaging markets, while moving up its capability into more advanced package and test.

- **Is positive on its leadership in the WLCSP market.** JCET is also working closely with its international customers on the high-end bumping and wafer level packaging qualification. Though there is potential competition from TSMC, management maintains its positive view on the leading position in the WLCSP market with the eWLB technology licensed from Infineon as STATS ChipPAC has proven its technological capability, good cost structure and adequate capacity with over 50% share in the market. The company is also aggressively developing panel packaging technology to further improve the cost structure.

**Figure 22: JCET provides WLCSP packaging technology**

**Figure 23: JCET’s packaging roadmap extending to SiP**

- **Turnkey solutions and collaboration drive success.** JCET believes that the back-end packaging and testing services that it could provide is 80-90% similar compared with its competitors and sees the opportunities in which it could differentiate are opportunities in the growing local supply chain and its strong co-operation with its customers and supply chain. It expects the partnership with SMIC to allow it to provide a full turnkey solution for its customers. We believe that in in the near term, JCET lost some STATs customers as customers are still observing the output of a Chinese-run STATS, but longer term could allow the combined company to create a larger and more competitive force in the back-end.

**Tianshui Huatian: The challenges and opportunities for packaging**

**Presenter:** Dai-Lie Lu, R&D Director of Tianshui Huatian

- **China semiconductor focus shifted to manufacturing and IC design.** Tianshui Huatian estimates that China’s back-end assembly output in 2015 could reach Rmb145 bn. Though China's back-end packaging and testing industry still outgrew global peers at a CAGR of 17% from 2001-14, the organic growth in the past few years has been weaker as innovation in back-end is slower. In addition, the key focus of the guideline for semiconductor development and national fund also focuses more support on front-end semiconductor manufacturing (e.g. SMIC) and IC design (e.g. Hi-
Silicon and Spreadtrum) as the back-end segment is more mature. The government targets to lower revenue from back-end from 40% to 30% in the next few years.

- **Growing opportunities in China.** Though the key investment focus is shifting, Tianshui Huatian believes that its domestic customers could develop more advanced applications to capture the growing semiconductor demand in China. In addition, the company believes that its addressable market is also expanding into cloud computing, big data and automotive semiconductors as the local chain develops more capabilities.

- **Adding advanced technology capability through the acquisition of FlipChip.** Tianshui Huatian completed the acquisition of FlipChip, a flip chip bumping and wafer level packaging provider, in April to serve low/mid volume production for its US customers. With the acquisition, the company gained advanced packaging technologies and plans to further expand its WLCSP capacity in Kunshan China and high-end assembly in Xian. The company is now also working on TSV technology with its customers.

Figure 24: Tianshui Huatian’s facility across US and China

Figure 25: Tianshui Huatian showcased the wafer used its WLCSP

Source: Tianshui Huatian

Source: Tianshui Huatian
Companies Mentioned (Price as of 16-Nov-2015)

Advanced Semicon. Engr. (2311.TW, NT$35.3)
Amkor Technology Inc. (AMKR.OQ, $6.22)
Chipbond (6147.TWO, NT$50.0)
Datang Telecom (600198.SS, Rmb23.59)
Hi Silicon (Unlisted)
Hua Hong Semiconductor Limited (1347.HK, HK$7.22, OUTPERFORM, TP HK$11.0)
Hua Tian (002185.SZ, Rmb18.0)
Intel Corp. (INTC.OQ, $32.11)
JCET (600584.SS, Rmb18.93)
KYEC (2449.TW, NT$20.5)
Leadcore (Unlisted)
MediaTek Inc. (2454.TW, NT$270.5, NEUTRAL, TP NT$250.0)
NXP Semiconductors N.V. (NXPI.OQ, $77.82)
OmniVision Tech (OVTI.OQ, $28.67)
Powertech Technology (6239.TW, NT$69.4)
QUALCOMM Inc. (QCOM.OQ, $51.94)
Semiconductor Manufacturing International Corp. (0981.HK, HK$0.84, OUTPERFORM, TP HK$0.97)
Siliconware Precision (2325.TW, NT$43.2)
Taiwan Semiconductor Manufacturing (2330.TW, NT$135.0)
Tsinghua Unigroup (Unlisted)
United Microelectronics (2303.TW, NT$11.55)
Vanguard International Semiconductor (5347.TWO, NT$38.35)
Western Digital Corp. (WDC.OQ, $60.23)
Xiaomi (Unlisted)

Disclosure Appendix

Important Global Disclosures

I, Randy Abrams, CFA, certify that (1) the views expressed in this report accurately reflect my personal views about all of the subject companies and securities and (2) no part of my compensation was, is or will be directly or indirectly related to the specific recommendations or views expressed in this report.

3-Year Price and Rating History for Hua Hong Semiconductor Limited (1347.HK)

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* Asterisk signifies initiation or assumption of coverage.
3-Year Price and Rating History for MediaTek Inc. (2454.TW)

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<td>270.00</td>
<td>250.00</td>
<td>O</td>
</tr>
</tbody>
</table>

* Asterisk signifies initiation or assumption of coverage.

3-Year Price and Rating History for Semiconductor Manufacturing International Corp. (0981.HK)

<table>
<thead>
<tr>
<th>Date</th>
<th>Closing Price</th>
<th>Target Price</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>07-Jan-13</td>
<td>0.42</td>
<td>0.57</td>
<td>O</td>
</tr>
<tr>
<td>25-Apr-13</td>
<td>0.54</td>
<td>0.68</td>
<td>O</td>
</tr>
<tr>
<td>10-Jun-13</td>
<td>0.62</td>
<td>0.68</td>
<td>O</td>
</tr>
<tr>
<td>30-Apr-14</td>
<td>0.63</td>
<td>0.73</td>
<td>O</td>
</tr>
<tr>
<td>21-Jul-14</td>
<td>0.77</td>
<td>0.80</td>
<td>O</td>
</tr>
<tr>
<td>23-Mar-15</td>
<td>0.68</td>
<td>0.86</td>
<td>O</td>
</tr>
<tr>
<td>16-Apr-15</td>
<td>0.85</td>
<td>1.00</td>
<td>O</td>
</tr>
<tr>
<td>08-May-15</td>
<td>0.84</td>
<td>0.90</td>
<td>N</td>
</tr>
<tr>
<td>12-Aug-15</td>
<td>0.74</td>
<td>0.80</td>
<td>O</td>
</tr>
<tr>
<td>12-Nov-15</td>
<td>0.88</td>
<td>0.97</td>
<td>O</td>
</tr>
</tbody>
</table>

* Asterisk signifies initiation or assumption of coverage.

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*Relevant benchmark by region: As of 10th December 2012, Japanese ratings are based on a stock’s total return relative to the analyst’s coverage universe which consists of all companies covered by the analyst within the relevant sector, with Outperforms representing the most attractive, Neutrals the less attractive, and Underperforms the least attractive investment opportunities. As of 2nd October 2012, U.S. and Canadian as well as European ratings are based on a stock’s total return relative to the analyst’s coverage universe which consists of all companies covered by the analyst within the relevant sector, with Outperforms representing the most attractive, Neutrals the less attractive, and Underperforms the least attractive investment opportunities. For Latin American and non-Japan Asia stocks, ratings are based on a stock’s total return relative to the average total return of the relevant country or regional benchmark; prior to 2nd October 2012 U.S. and Canadian ratings were based on (1) a stock’s absolute total return potential to its current share price and (2) the relative attractiveness of a stock’s total return potential within an analyst’s coverage universe. For Australian and New Zealand stocks, the expected total return (ETR) calculation includes 12-month rolling dividend yield. An Outperform rating is assigned where an ETR is greater than or equal to 7.5%; Underperform where an ETR less than or equal to 5%. A Neutral may be assigned where the ETR is between -5% and 15%. The overlapping rating range allows analysts to assign a rating that puts ETR in the context of associated risks. Prior to 18 May 2015, ETR ranges for Outperform and Underperform ratings did not overlap with Neutral thresholds between 15% and 7.5%, which was in operation from 7 July 2011.

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Market Weight: The analyst’s expectation for the sector’s fundamentals and/or valuation is neutral over the next 12 months.

Underweight: The analyst’s expectation for the sector’s fundamentals and/or valuation is cautious over the next 12 months.

*An analyst’s coverage sector consists of all companies covered by the analyst within the relevant sector. An analyst may cover multiple sectors.

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<table>
<thead>
<tr>
<th>Rating</th>
<th>Versus universe (%)</th>
<th>Of which banking clients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outperform/Buy*</td>
<td>59%</td>
<td>(34% banking clients)</td>
</tr>
<tr>
<td>Neutral/Hold*</td>
<td>27%</td>
<td>(33% banking clients)</td>
</tr>
<tr>
<td>Underperform/Sell*</td>
<td>13%</td>
<td>(23% banking clients)</td>
</tr>
<tr>
<td>Restricted</td>
<td>1%</td>
<td></td>
</tr>
</tbody>
</table>

*For purposes of the NYSE and NASD ratings distribution disclosure requirements, our stock ratings of Outperform, Neutral, and Underperform most closely correspond to Buy, Hold, and Sell, respectively; however, the meanings are not the same, as our stock ratings are determined on a relative basis. (Please refer to definitions above.) An investor’s decision to buy or sell a security should be based on investment objectives, current holdings, and other individual factors.

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Price Target: (12 months) for Hua Hong Semiconductor Limited (1347.HK)

**Method:** Our target price of HK$11 for Hua Hong Semiconductor Limited is based on 0.9x P/B (price-to-book). Hua Hong offers stable and profitable low teens growth, mid-teens pretax margins and positive FCF as an 8” China foundry targeting specialty semiconductors using legacy capacity and also receiving China govt's support on R&D and Manufacturing.

**Risk:** Hua Hong has several risks that could impact the business outlook and our HK$11 target price: (1) 8” applications could migrate to 12”. (2) Hua Hong's access to the Huali 12” fab is not assured. (3) China support could wane – private forces sometimes prevail. (4) The company will stay closely held and government backed post the IPO.

Price Target: (12 months) for MediaTek Inc. (2454.TW)

**Method:** Our target price of NT$250 for Mediatek is based on 16x 2016E EPS, in-line with global peers.

**Risk:** Risks that could cause the share price to diverge from our NT$250 target price for Mediatek include the impact of competitive products and pricing, timely design acceptance by its customers, timely introduction of new technologies, ability to ramp new products into volume, industry-wide shifts in supply and demand for semiconductor products, industry overcapacity, availability of manufacturing capacity, and financial stability in end markets.

Price Target: (12 months) for Semiconductor Manufacturing International Corp. (0981.HK)

**Method:** Our HK$0.97 target is based on 1.4x P/B, high-end of its 1-1.4x past 3 year range giving it a premium to book for its opportunity to benefit from China’s push to support its local manufacturing and better execution filling its fabs to drive improving growth at good margins.

**Risk:** Risks that could impede achievement of our HK$0.97 target price for SMIC include: (1) the global semiconductor up-cycle is not as strong as market expected, being an upstream company, SMIC tends to be more cyclical than other tech plays. (2) Price competition from peers are more severe than expected. (3) SMIC, like its peers will be affected by unexpected slowdown of global economy. (4) The advanced technology products do not come out as the company scheduled to.
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See the Companies Mentioned section for full company names

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