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China's impact on the semiconductor industry: 2016 update

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Executive summary

Continuing its upward trend, China's impact on the semiconductor industry increased further in 2015. In fact, both China's semiconductor consumption and production revenues increased at a greater rate than worldwide revenues. As a result, China's share of the worldwide consumption market increased to 58.5% in 2015, while its share of the worldwide semiconductor industry increased to 16.2%. From 2005 through 2015 China's semiconductor industry grew at a ten-year compounded annual growth rate (CAGR) of 18.7% while its semiconductor consumption grew at a rate of 14.3% and the worldwide semiconductor market at a 4.0% CAGR.

A further sign of a maturing and stabilizing market, China reported a notable reversal of growth of its IC consumption/production gap in 2015. This difference between IC consumption and production revenues decreased for the first time since 2009, and only the second time since 1999. Although the decline was moderate, it is now forecast to continue decreasing for each of the following three years.

A look at industry segments reveals that China's IC design (fabless) industry continues to be the fastest growing segment of China's semiconductor industry. Its revenues exceeded US$20 billion for the first time in 2015 and have now grown to represent 25% of the worldwide fabless industry. Other segments also showed strong growth. During 2015 China's wafer fabrication plants in production increased to 169 and their share of worldwide capacity increased to 12.7%. Foundry production continues to constitute the largest share of China's wafer fab capacity. China's semiconductor packaging, assembly and test (SPA&T) capacity also increased in 2015, with IC unit production growing by more than 13% and O-S-D production by more than 7%. In both sectors China's increase in unit production was achieved at the expense of decreases in other regions as China's increase exceeded the worldwide increase.

In summary, 2015 proved to be another year of steady growth for China's semiconductor industry. It continues to play an increasingly influential role in the global industry and all signs point to continued moderate but sustainable growth over the next few years. Government incentives and market conditions should continue to benefit the now mature industry, allowing for the further reduction in the consumption/production gap and long-range moderate growth. We will continue to monitor this important market by providing yearly updates.

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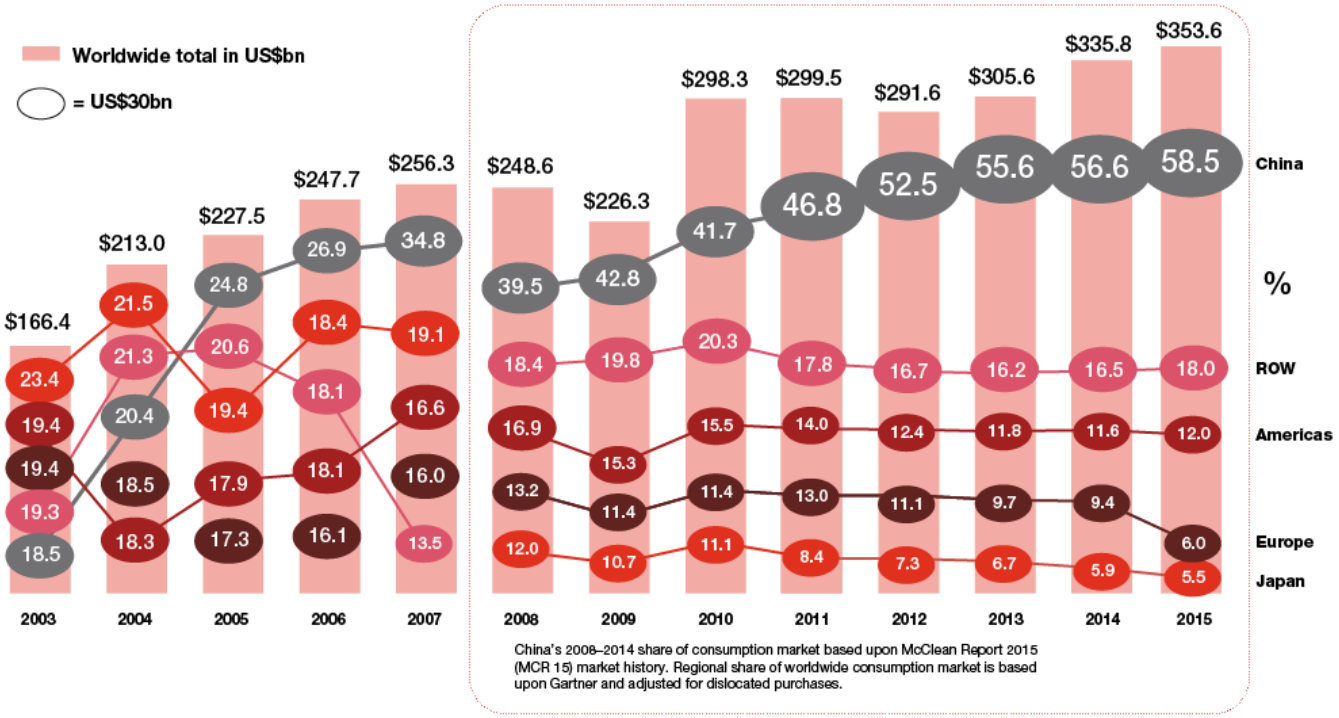
China's semiconductor market

China's semiconductor market

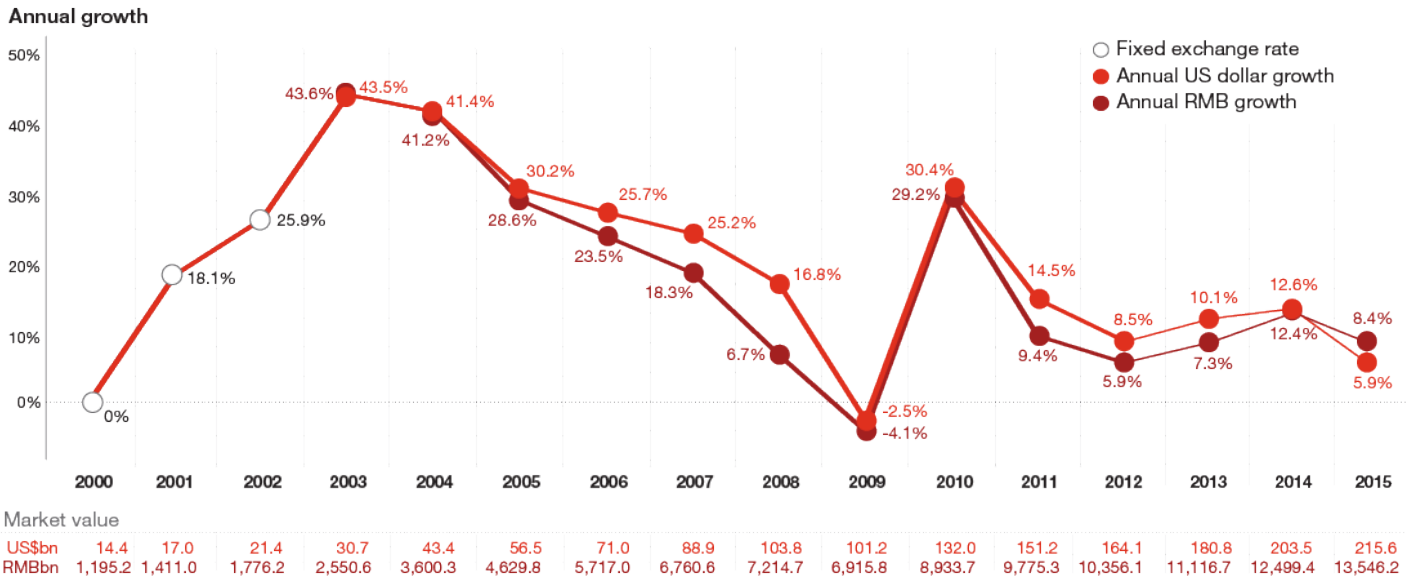
Worldwide semiconductor consumption market by region, 2003-2015



Source: Semiconductor Industry Association (SIA), McClean Report 2015 (MCR 15), Gartner Dataquest (GDQ), CCID Consulting (CCID)

China's semiconductor consumption growth continued to far exceed worldwide semiconductor market growth for the fifth consecutive year in 2015. China's semiconductor consumption market grew by 5.9% in 2015 to reach a new record of 58.5% of the global market while the worldwide semiconductor market decreased slightly in 2015. During the past ten years, China's semiconductor consumption has grown at a 14.3% compounded annual growth rate (CAGR), while total worldwide consumption has only grown at a 4.0% CAGR. The worldwide semiconductor market as reported by Worldwide Semiconductor Trade Statistics (WSTS) has grown by US$109bn from 2005 to 2015 while China's semiconductor consumption as reported by CSIA has grown by US$159bn.

China's semiconductor consumption market growth, 2000-2015



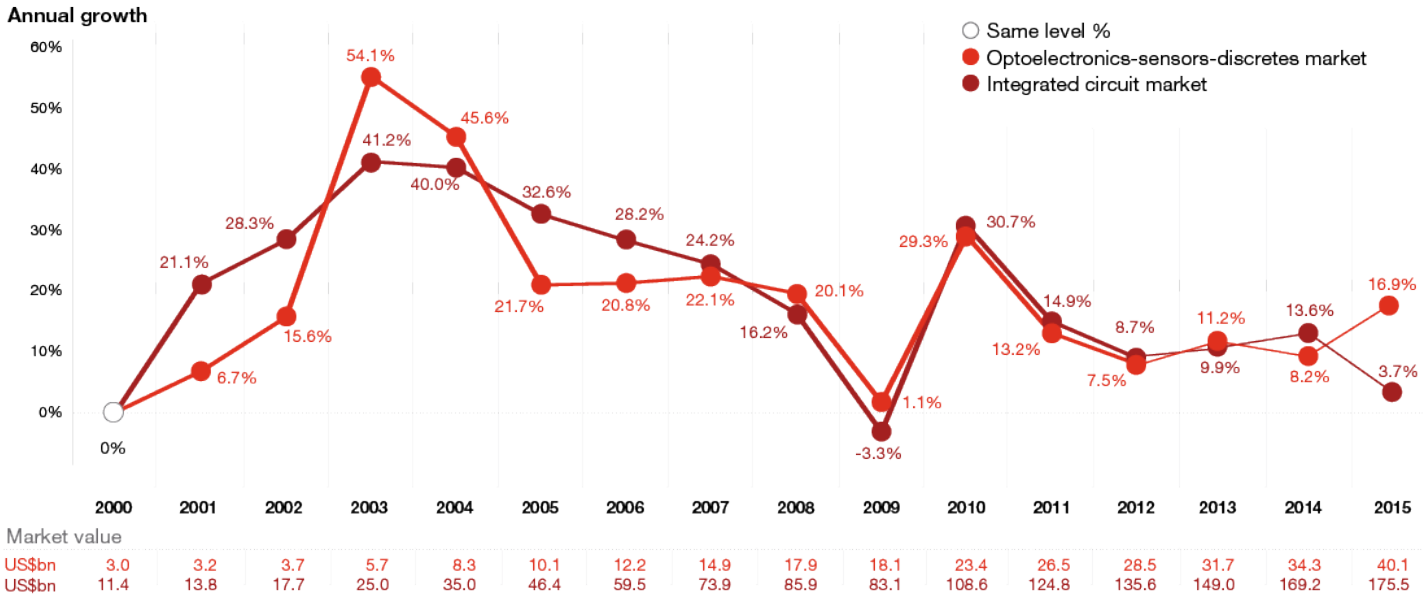
Note: Market reporting has changed since 2003 with sensors and optical semiconductors included as part of the optoelectronics-sensors-discrete (O-S-D) segment which along with integrated circuits make up the total semiconductor market.

Source: CCID, CSIA

China's semiconductor consumption market continues to grow many times faster than the worldwide market as a result of two driving factors—the continuing transfer of worldwide electronic equipment production to China and the above-average semiconductor content of that equipment. Many industry analysts predict that the trend of an increasing share of electronic equipment production in China will moderate but continue over the next several years.

According to Gartner, China's share of electronic equipment production is forecast to increase to more than 38% by 2017; the semiconductor content of that production to gradually increase to over 35%, while the worldwide average content increases to 25%; and China's share of worldwide semiconductor consumption is forecast to increase by a further 4%.

China's IC and O-S-D market growth, 2000-2015



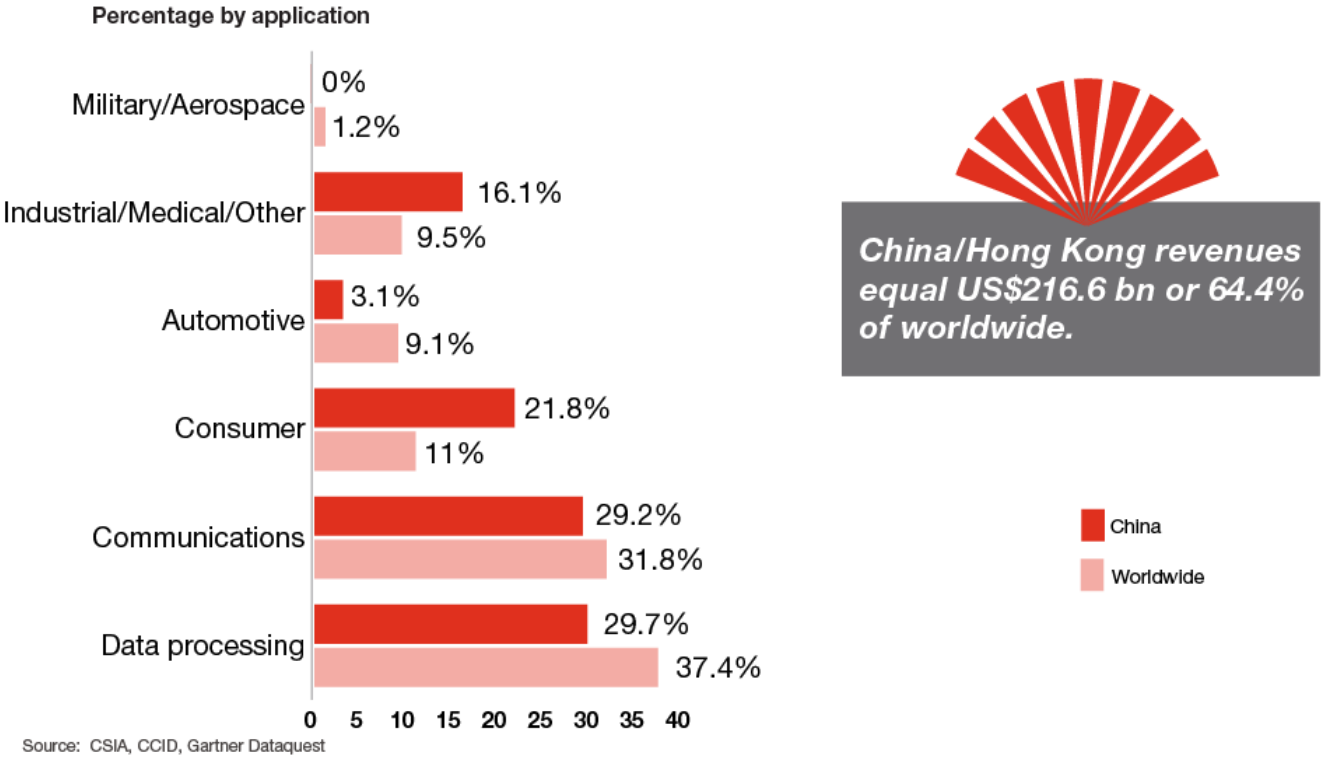
Note: Market reporting has changed since 2003 and the definition of O-S-D (optoelectronics-sensors-discretes) now includes sensors and optical semiconductors.

Source: CCID, CSIA

China's integrated circuit (IC) consumption market grew 3.7% to US$176bn in 2015 while the worldwide IC market saw a 0.9% decrease. As a result, China's IC consumption represented almost 64% of worldwide consumption in 2015. During 2015 China's IC consumption increased by more than US$6bn while the worldwide market decreased by US$2bn. Moreover, during the past ten years China's IC consumption has grown by US$129bn while the worldwide market increased by only US$83bn. China's IC consumption has grown at the expense of IC markets in other regions although China's rate of IC consumption market growth is gradually moving closer to the worldwide rate.

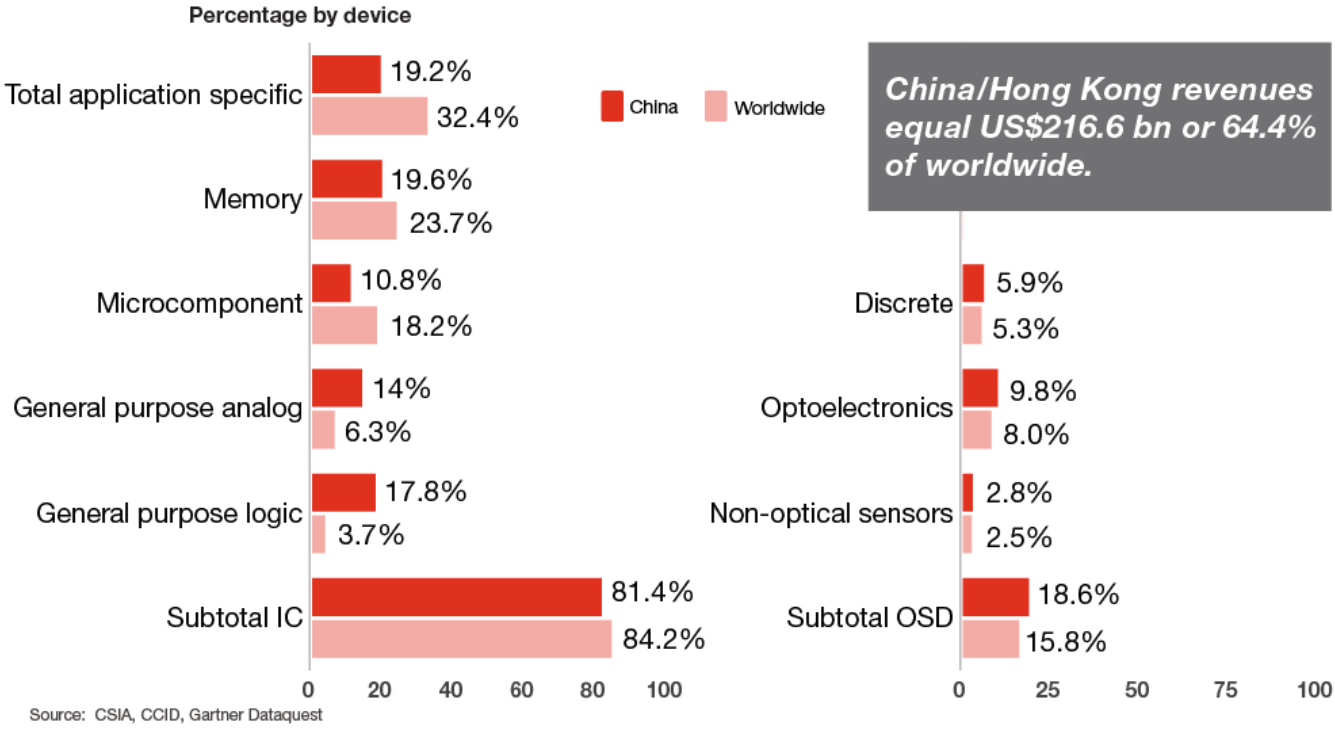
In 2015 China's O-S-D (optoelectronics-sensors-discretes) consumption market grew 17.1% to reach a new peak of US$40.1bn. For the fourth time in five years this increase was greater than the worldwide O-S-D market increase. During the past ten years China's O-S-D consumption has grown by US$30bn while the worldwide market has increased by only US$26bn. As a result, China's share of that market increased to 66% in 2015.

China compared with worldwide semiconductor market by application, 2015



During 2015 China's semiconductor consumption (as reported by the China Semiconductor Industry Association [CSIA]) continued to be more concentrated in the data processing, and communications applications sectors, less concentrated in the consumer and industrial/medical/other sectors and noticeably less concentrated in the automotive, and military/aerospace sectors. China's share of 2015 worldwide semiconductor consumption was largest for the consumer sector, where it increased along with China's share of the 2015 industrial/medical/other sector. China's share of the worldwide data processing, communications, and automotive sectors decreased somewhat during 2015.

China compared with worldwide semiconductor market by device, 2015



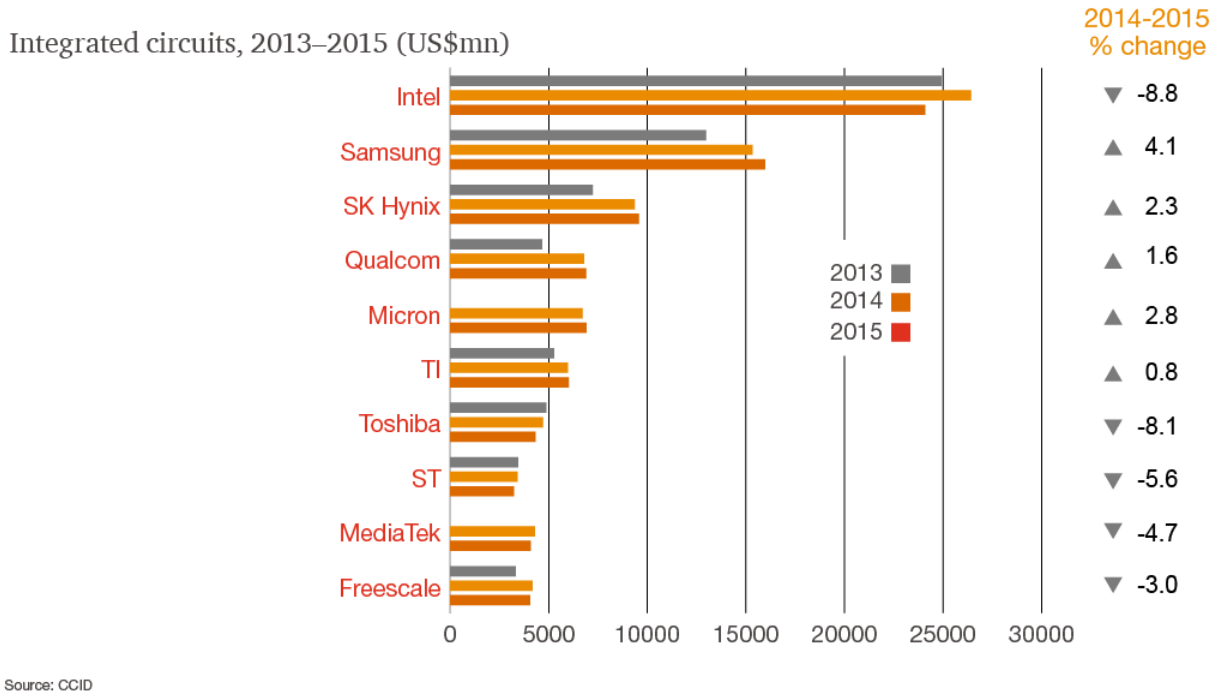
China's 2015 semiconductor consumption (measured by revenue) was largest for the memory and application-specific sectors, and slightly less for the general purpose logic and general purpose analog sectors. China's share of 2015 worldwide semiconductor consumption was largest for the O-S-D (optoelectronics-sensors-discretes) sectors, representing more than 70% of those sectors.

Semiconductor suppliers to the Chinese market Top 10 ranking, 2014-2015

Source: CCID

The major global semiconductor companies continue to dominate the Chinese market. There have only been 14 different companies among these top 10 suppliers over the past twelve years. Six companies have been among the top 10 suppliers to China for every year from 2003 through 2015: Intel, Samsung, TI, Toshiba, SK Hynix, and STMicroelectronics. Freescale has been among the top 10 for every year except 2014 when it was number eleven. AMD, which had joined the list in 2004, had been among the top 10 suppliers to China for the following eleven years through 2014. Micron, which joined the list in 2011, moved up to number five in 2014 and to number four in 2015. Similarly, Qualcomm joined the list in 2012 at number ten and moved up to number four by 2014 before dropping to number five in 2015.

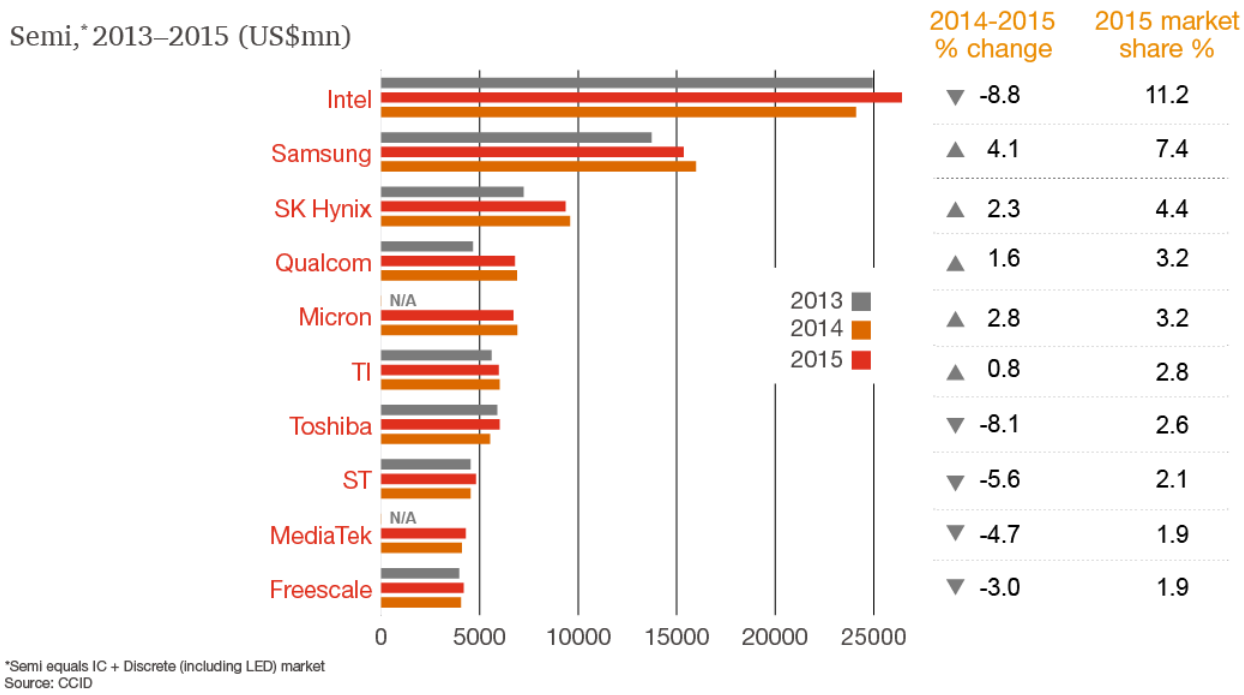
Semiconductor suppliers to the Chinese market
Integrated circuits, 2013-2015 (US$mn)



Source: CCID

During 2015 China's consumption of integrated circuit products from these ten largest suppliers decreased by slightly more than 4% while China's total consumption of integrated circuit products increased by almost 4%. As a result, their share of China's 2015 integrated circuit market fell to 48.5%, down from an average of more than 50% for the prior twelve years since 2003.

Semiconductor suppliers to the Chinese market Semi, 2013-2015 (US$mn)*

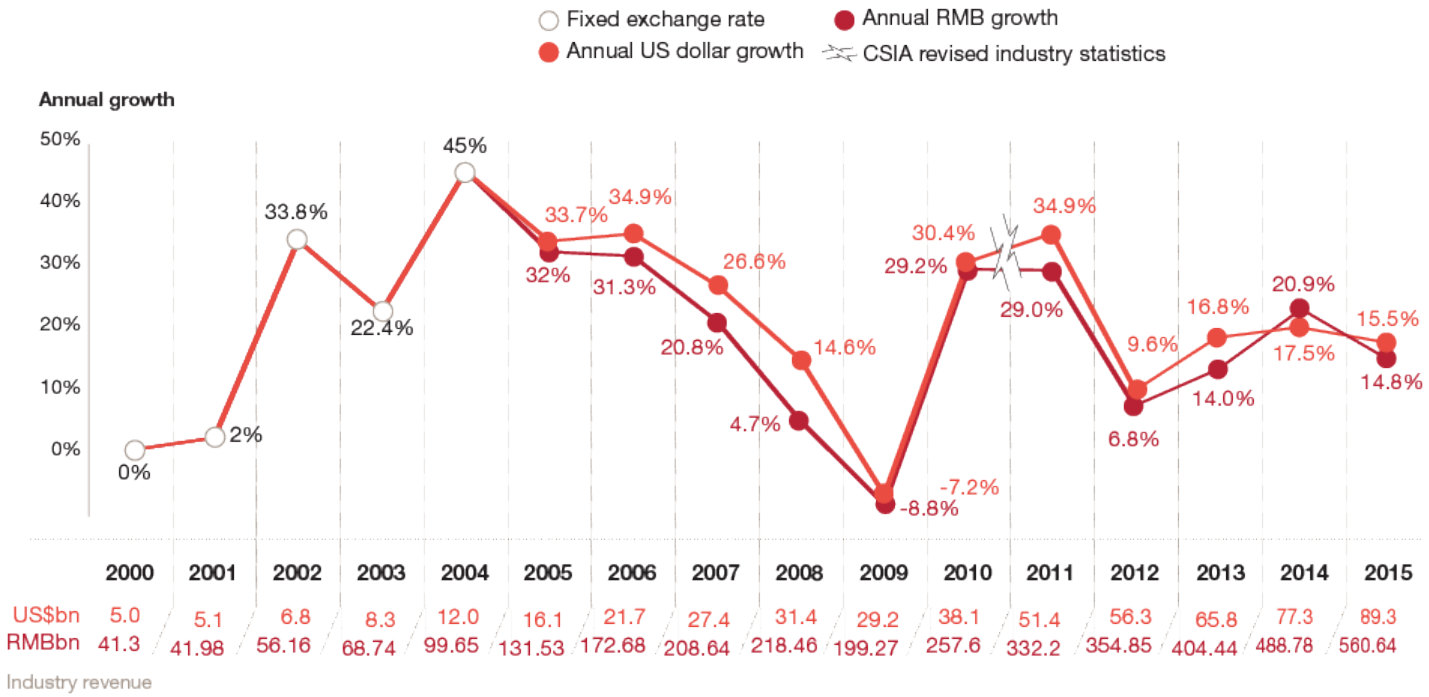


During 2015 China's consumption of total semiconductor products from these ten largest suppliers decreased by 4% while China's total consumption of semiconductor products increased by almost 6%. The Chinese semiconductor consumption market continued its trend of becoming less concentrated than the worldwide market as the top 10 suppliers' share of China's semiconductor consumption declined to 40.7% in 2015, down from 42.4% in 2014 and 45% in 2011. This is noticeably less than the top 10 suppliers' 53.3% share of the worldwide market.

China's semiconductor industry

China's semiconductor industry

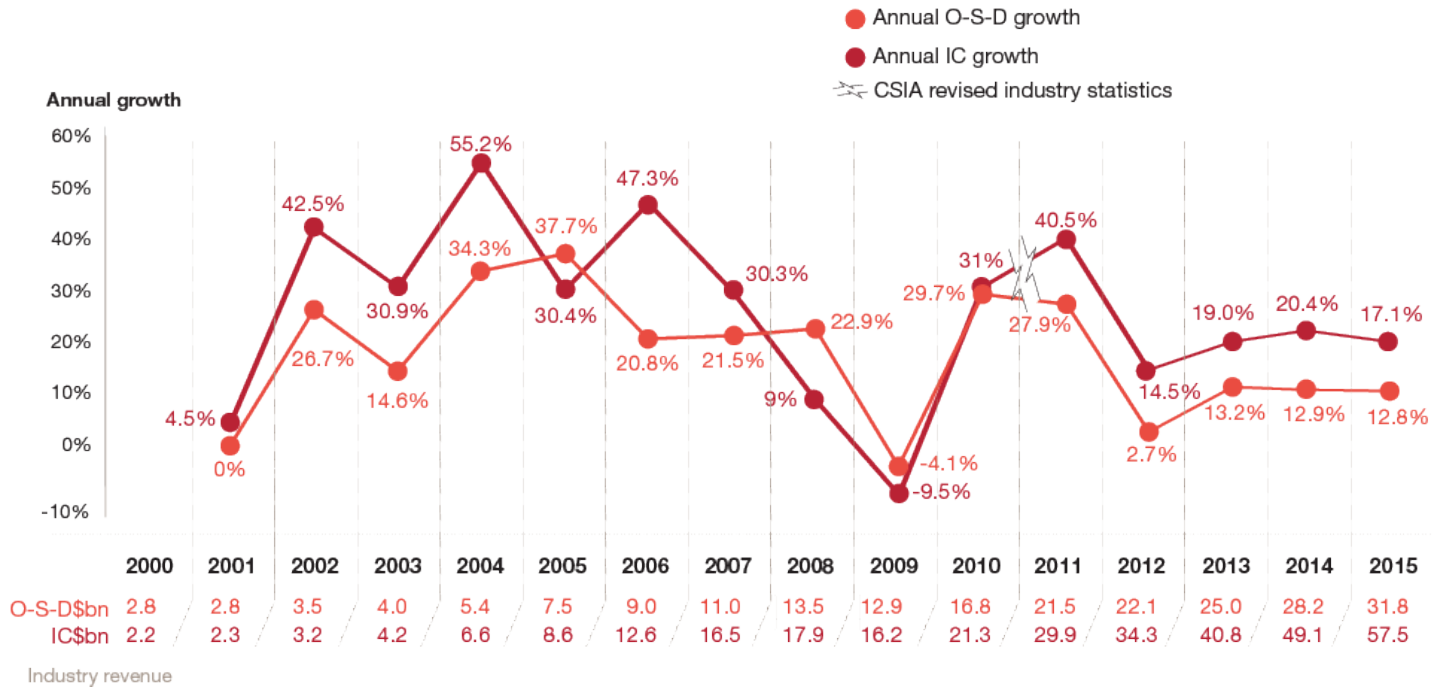
China's semiconductor industry revenue and growth, 2000-2015



Source: CCID, CSIA

China's reported 2015 semiconductor industry revenue growth continued to exceed both China's semiconductor consumption and the worldwide semiconductor market growth. China's semiconductor industry grew by 15.5% in 2015 to a record US$89.3bn. China's semiconductor industry has grown at an equal or greater rate than its semiconductor market consumption for eight of the past ten years. From 2005 through 2015 China's semiconductor industry grew at a ten-year CAGR of 18.7%, while its semiconductor consumption grew at 14.3% and the worldwide semiconductor market at a 4.0% CAGR. China's share of the worldwide semiconductor industry is continuing to grow and become significant. Compared to the sum of worldwide semiconductor device sales revenue, plus the value of all wafer fabrication and packaging, assembly and test production, China's 2015 semiconductor industry revenues accounted for 16.2% of the worldwide semiconductor industry, up from 13.4% in 2014, 12% in 2013 and 11.6% in 2012.

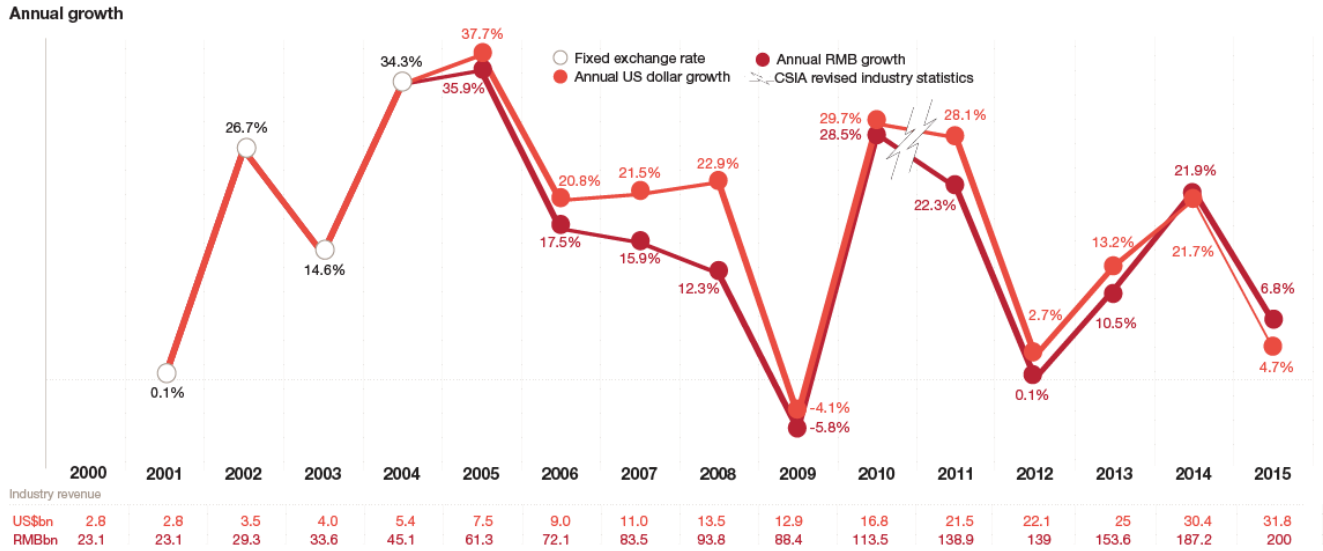
China's O-S-D and IC industry revenue and growth, 2000-2015



Source: CCID, CSIA

The overall performance of China's IC industry (the sum of IC design, IC wafer manufacturing, and IC packaging and testing) continued to be the major contributor to China's overall semiconductor industry growth in 2015. It grew by 17.1% in 2015 while China's O-S-D industry revenue only grew by 12.8%. Since 2010 China's IC industry revenues have more than doubled, growing 170%, while China's O-S-D industry revenues only increased by 90%. China's 2015 IC industry revenues of US$57.5bn were nearly twice their O-S-D revenues of US$31.8bn.

China's O-S-D industry revenue and growth, 2000-2015

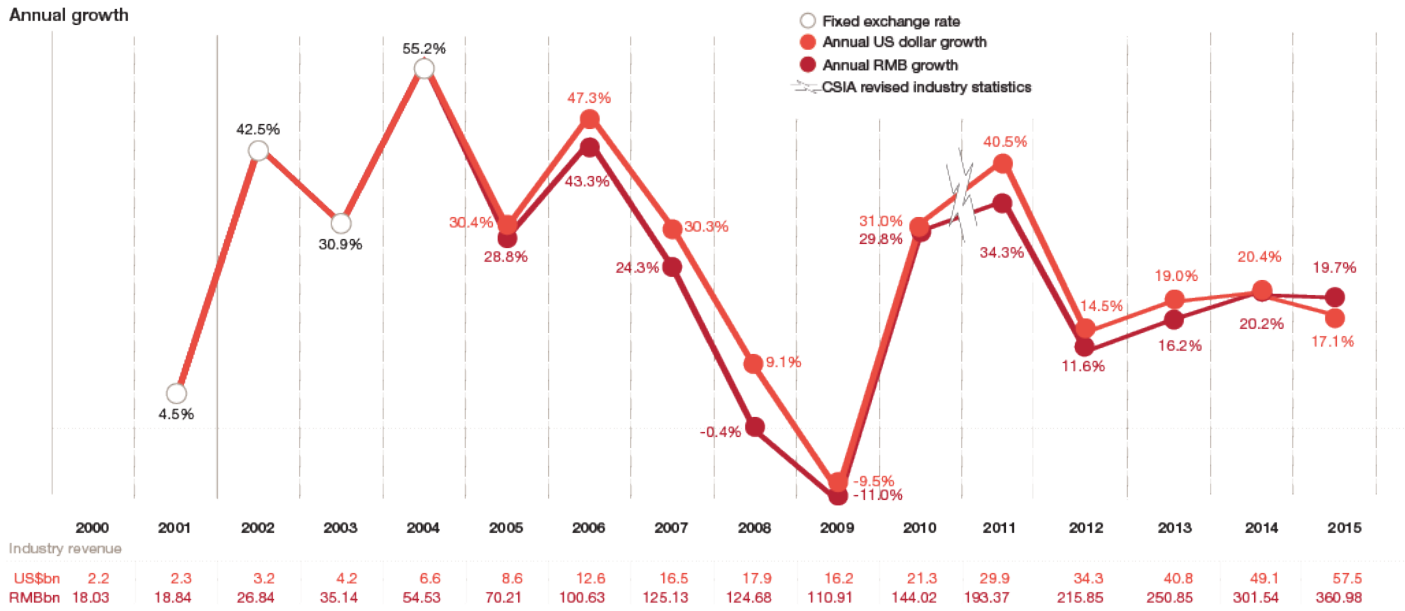


Source: CCID, CSIA

For the fifth year in a row China's O-S-D industry growth exceeded worldwide O-S-D industry growth**.** China's O-S-D industry revenues grew 4.7% in 2015 to US$32bn while worldwide O-S-D revenues only grew by 3.4% to US$67bn. Within the sector, China's LED revenues grew by 12.6% to US$13.4bn, while discrete device revenues decreased fractionally to US$18.4bn. China's reported O-S-D production unit output increased by 7.3%, while average selling prices decreased almost 0.5% during 2015.

Since 2010 China's O-S-D industry revenue has grown at the expense of worldwide industry revenues, growing by US$15.0bn while worldwide revenues only increased US$13.4bn. Based upon revenue values, China's reported O-S-D industry was just able to maintain self-sufficiency for the sixth consecutive year in 2015, with an overall self-sufficiency ratio of about 101% (ratio of production versus consumption values).

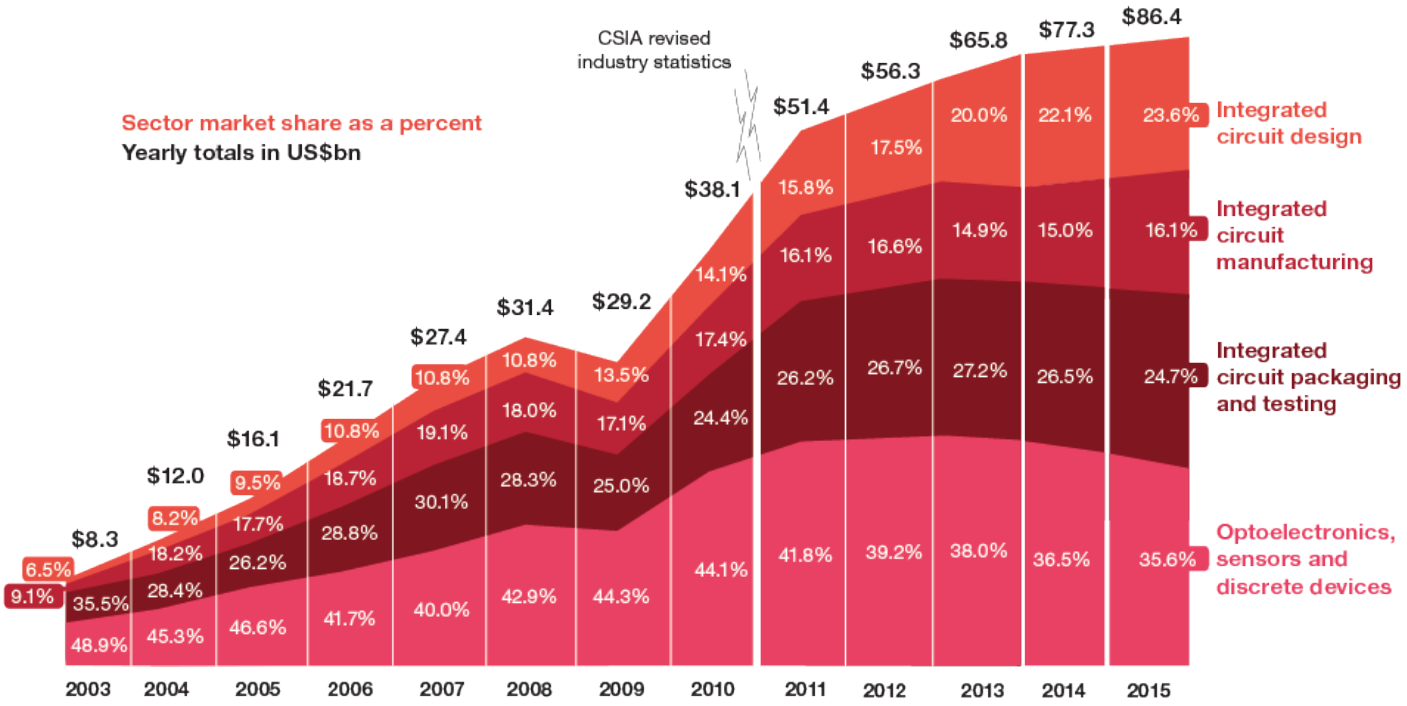
China's IC industry revenue and growth, 2000-2015



Source: CCID, CSIA

China's IC industry revenue growth continued in 2015 despite a decline in the global IC market. China's IC industry revenues increased 17.1% in 2015 to US$57.5bn, while worldwide IC revenues decreased by 1.4% to US$287.1bn. Starting from a very small US$2.2bn base in 2000, China's IC industry has grown much faster than the worldwide IC market for every subsequent year except 2010 (when it grew 30% versus a worldwide market recovery of 33%). During the fifteen-year period from 2000 through 2015, China's IC industry revenues have increased US$55.3bn or 2,500%, while the worldwide IC market increased US$97bn or 53%. Since 2000 China's IC industry growth has accounted for 57% of total worldwide IC market growth.

China's semiconductor industry by sector, 2003-2015



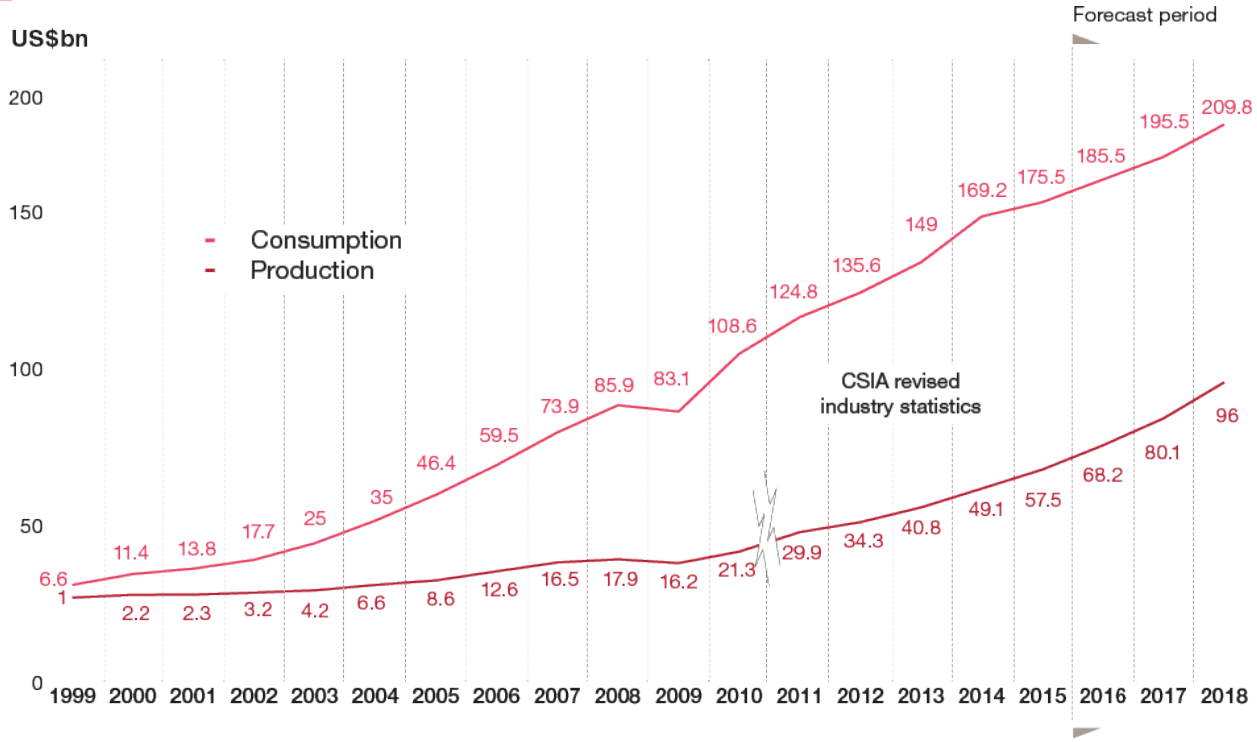
Source: CCID, CSIA

The distribution of China's semiconductor industry revenue continued its gradual increase in the IC sectors in 2015. Over the past ten years from 2005 through 2015 the once-small IC design sector has grown at a 30% CAGR, while the larger IC packaging and test sector grew at a 18%; the smaller IC manufacturing sector at a 17.6% and the much larger O-S-D sector has only grown at a 15.6% CAGR. As a result, China's three IC industry sectors have grown from 53.4% to 64.4% of China's total semiconductor industry.

During 2015 both IC design and IC manufacturing grew 24.1%, while IC packaging and test only grew 8.1%, and O-S-D 4.7%, slightly changing their relative share but not the order of their distribution which became:

O-S-D devices	35.6%
IC packaging & testing	24.7%
IC design	23.6%
IC manufacturing	16.1%

Comparison of China's integrated circuit consumption and production, 1999-2018



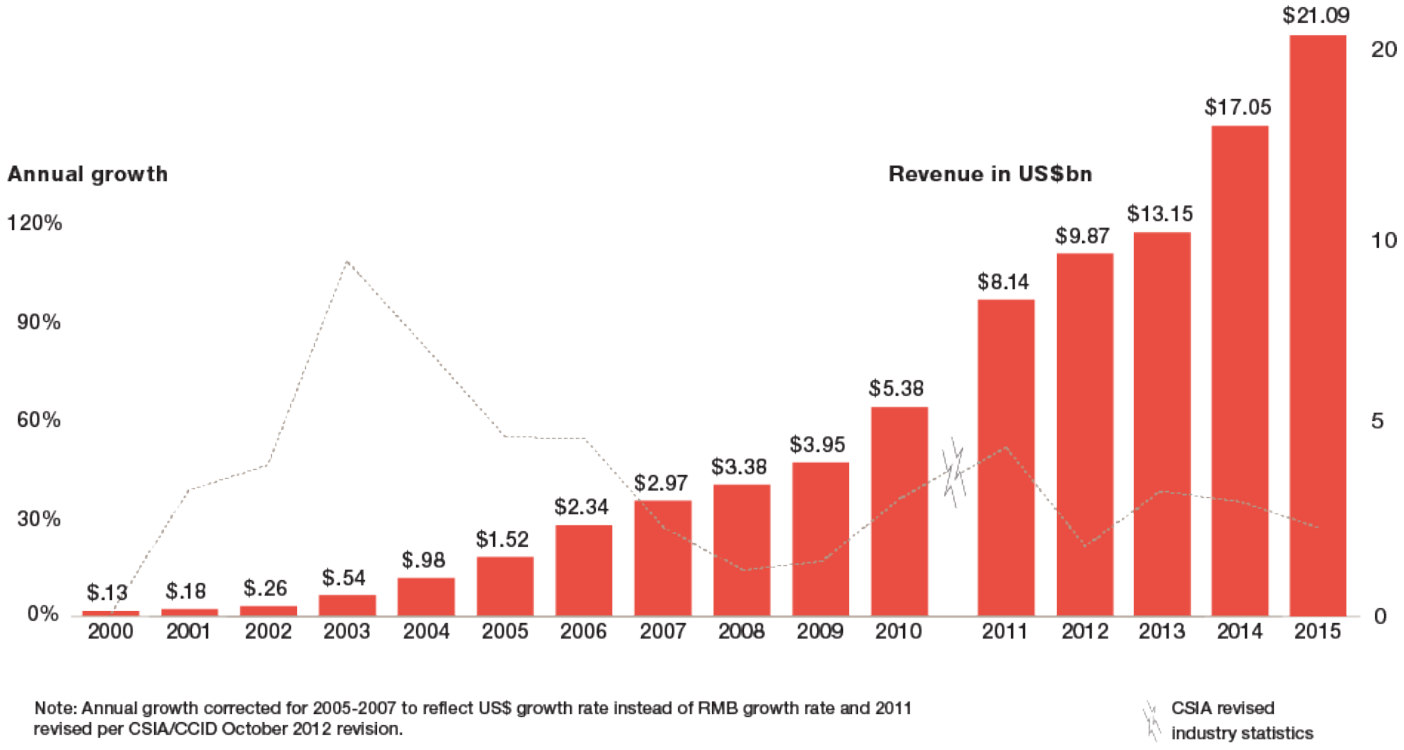
Source: CCID, CSIA, PwC, 2004-2016

China reported a notable reversal of growth in its IC consumption/production gap in 2015. For the first time since 2009 and for only the second time since 1999, China's IC consumption/production gap decreased modestly in 2015. Furthermore, it is now forecast to continue decreasing for each of the following three years. This gap is the yearly difference between IC consumption and IC industry revenues. Based upon CSIA industry statistics, this annual gap decreased by US$2.1bn (1.7%) in 2015 to US$118bn. The ratio of China's IC production revenue to IC consumption continues to show improvement. It has grown from 17% in 2001 to a peak of 33% in 2015 and is now expected to increase to 38% by 2018 (which is up from the 36% CSIA had forecast for 2017 a year ago).

China's design industry

China's design industry

China's IC design industry revenue and growth, 2000-2015

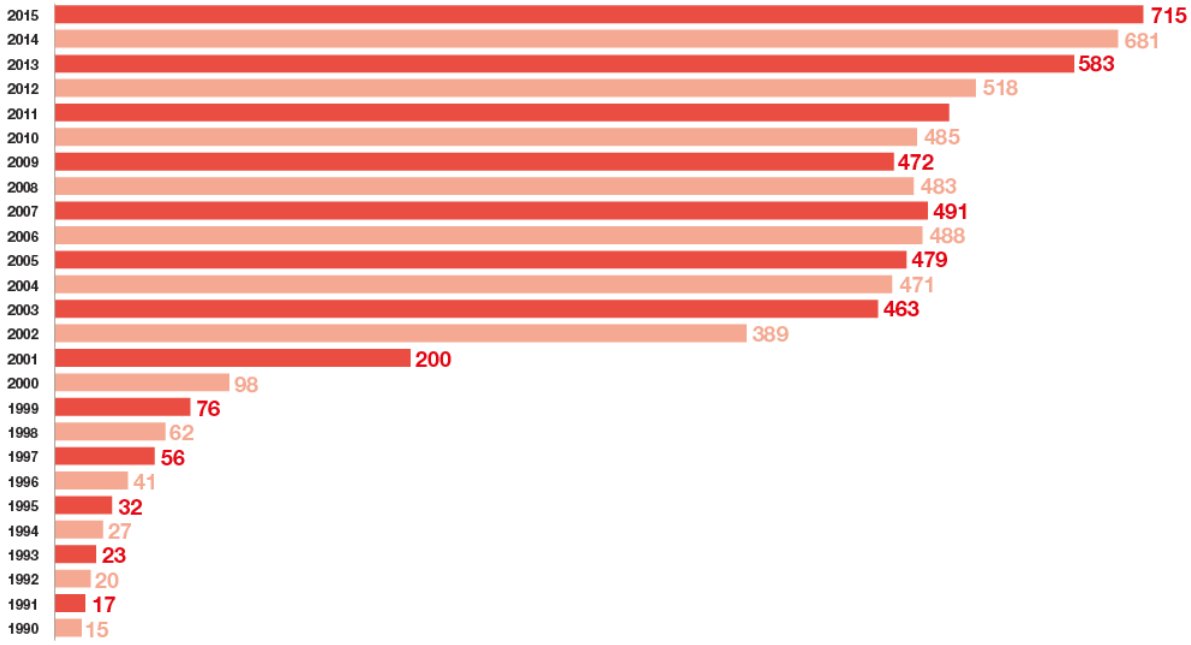


Source: CCID, CSIA

Integrated circuit (IC) design continues to be the fastest growing segment of China's semiconductor industry. It grew by 24% in 2015 to reach record revenues of US$21.1bn. During the ten years from 2005 through 2015 China's IC design (fabless) industry has grown at a 30.1% compound annual growth rate (CAGR) from US$1.52bn to just over US$21bn in 2015.

According to the China Center of Information Industry Development (CCID) and the China Semiconductor Industry Association (CSIA) IC design sector revenue contributed more than 38% to China's semiconductor industry revenue growth in 2015 and has grown from 9.5% in 2005 to represent almost 24% of China's total semiconductor industry. During the last ten years China's IC design industry has grown from representing just 0.4% of the worldwide IC market and 2.5% of the worldwide fabless IC industry in 2003 to representing almost 7.5% of the worldwide IC market and 25% of the worldwide fabless IC industry in 2015.

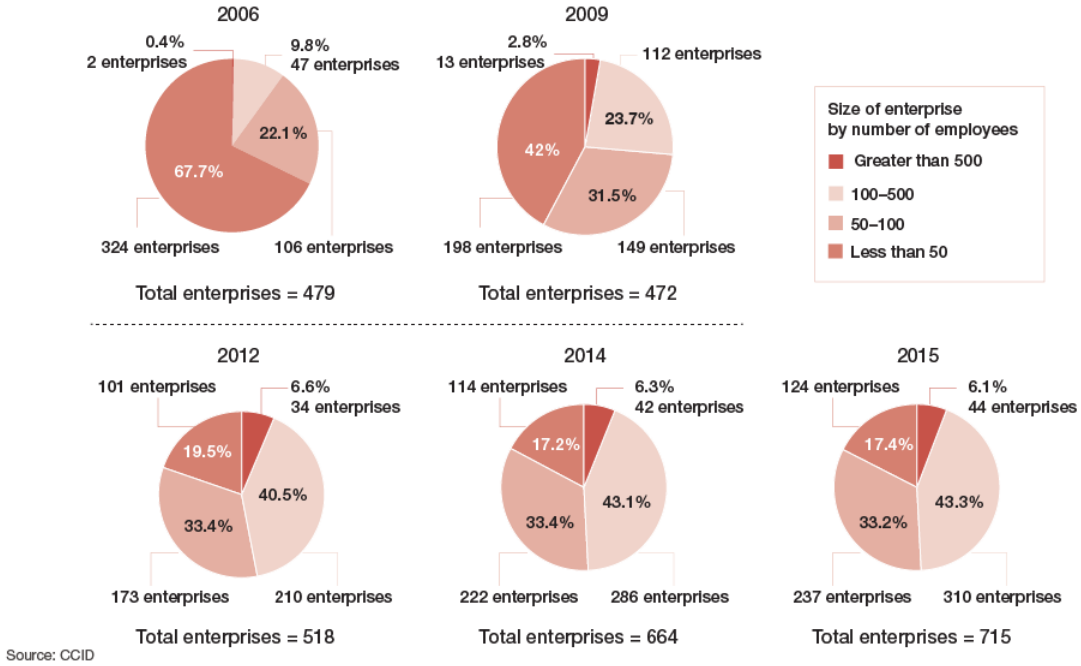
IC design enterprises in China, 1990-2015



Source: CCID

The China Center of Information Industry Development (CCID) reports that the number of China's IC design enterprises increased from 681 in 2014 to 715 by the end of 2015. That increase of 34 additional IC design enterprises during 2015 is the third largest increase in the past decade and comes after increases of 65 and 98 in 2013 and 2014, respectively. The number of reported IC design enterprises increased from less than 500 in 2010 to 715 in 2015. The Chinese government policy of offering tax incentives to promote the development of its semiconductor industry since the implementation of its 12th Five Year plan in 2011 seems to have played a key role in the growth of IC design enterprises in China. Nineteen percent (19.4%) had 2015 sales of between US$2.3bn and US$16mn; 23.0% between US$16mn and US$8mn; 27.7% between US$8mn and US$1.6mn and 29.9% less than $1.6mn. CCID also reports that the top ten IC design enterprises had a 2015 average gross margin of 40.3%, an increase of 3.2% compared with 2014, while the average gross margin of the top 100 was 29.6%, a decrease of 1.3% from 2014.

China's IC design enterprises by employee count, 2015



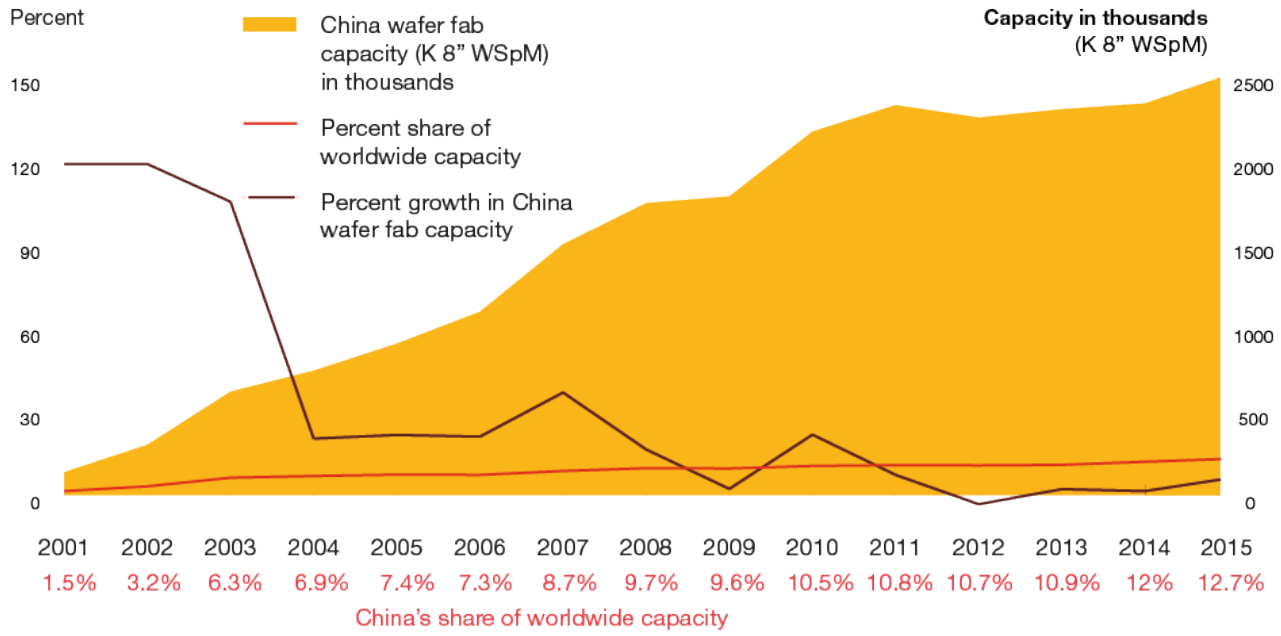
Source: CCID

During 2015 the total number of employees in China's IC design sector increased by only 5.5% to about 155,000 while the number of IC design enterprises increased by almost 5%. As a result, the average employee count for each IC design enterprise decreased to 217, the lowest level since 2012. Almost 60% of these design employees work in mid-sized companies with 100 to 500 employees. Since total IC design revenues increased by 24% in 2015, IC design productivity increased more than 17% to over US$135,000 average sales per employee.

China's semiconductor manufacturing

China's semiconductor manufacturing

China's wafer fabrication capacity and share of worldwide capacity, 2002-2015 1

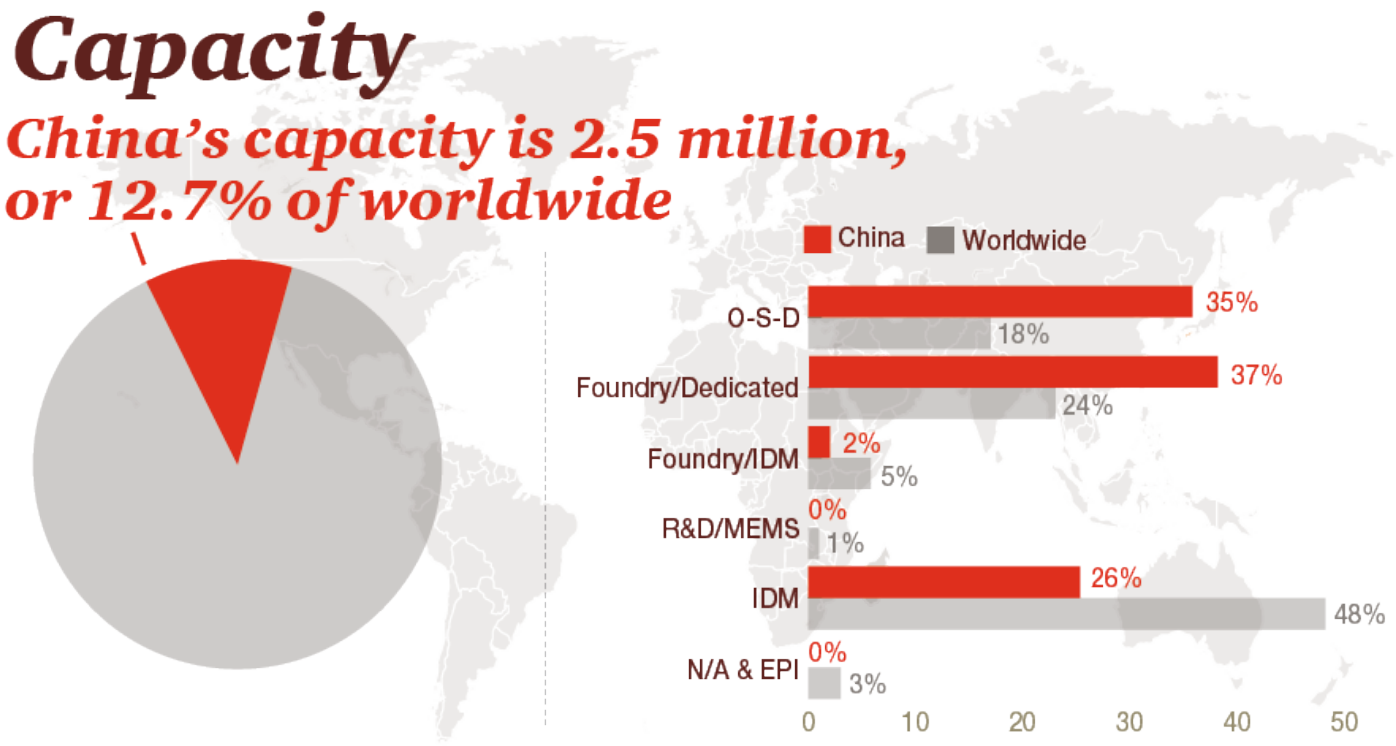


Note: Capacity is in thousands of 8-inch equivalent wafer starts per month/fully ramped. This is the maximum number of wafers per month that could be started if the fab were fully equipped as defined in the fab design specifications and if the equipment were fully utilized.

Source: World Fab Watch 2002-2016

After remaining relatively constant during the four years from 2011 through 2014, China's wafer fabrication capacity increased by 7% in 2015 to just over 2,500 8-inch equivalent wafer starts per month (WSpM) while its share of worldwide wafer fab capacity increased to 12.7%. During 2015 China's number of wafer fabs in production increased from165 to 169 with the addition of two discrete and one each Opto/LED and dedicated foundry fabs for a combined increase of 166K (7%) 8-inch equivalent wafer starts per month. Although total worldwide wafer fabs in production decreased from 1,040 to 1,031 during 2015, a moderate shift to larger size wafers yielded a one percent increase in combined capacity.

Current wafer fab capacity comparison China and Worldwide, 2015

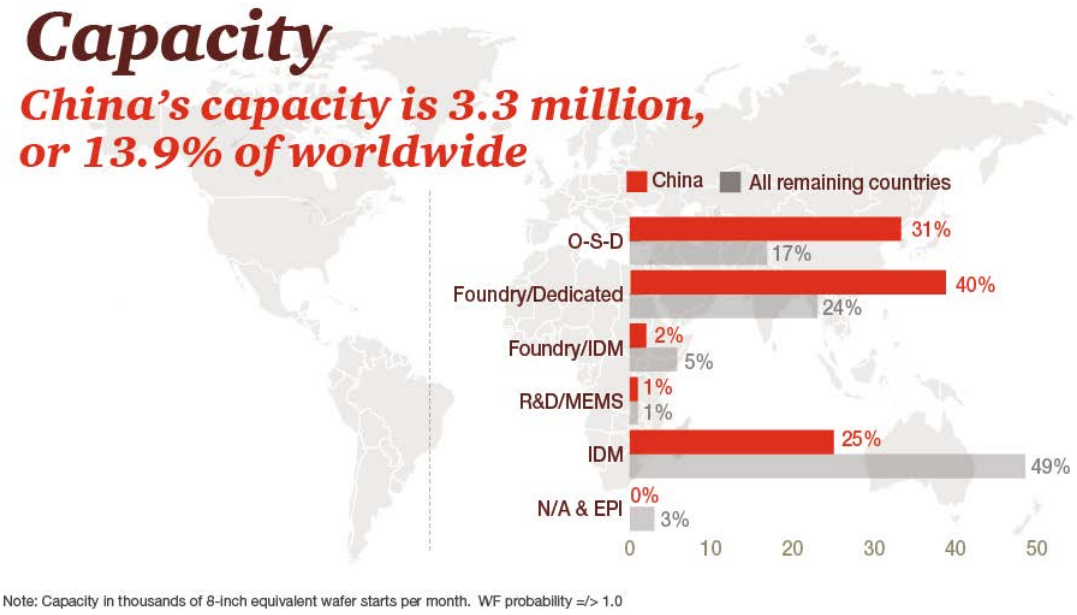


Note: Capacity in thousands of 8-inch equivalent wafer starts per month. WF probability =/> 1.0

Source: SEMI Wafer Fab Watch, Feb 2016

China's current wafer fab capacity continues to be notably different from worldwide in that 39% is devoted to foundry production versus 29% worldwide (Dedicated and IDM combined), 35% to O-S-D production versus 18% worldwide; and only 10 fabs are 300mm out of a total of 118 worldwide. Because China represents a disproportionately large share of worldwide LED (29%) and discrete (22%) fab capacity, it continues to have a much higher mix of smaller wafer size (150mm or less) and mature technology node (0.7µm or greater) fab capacity than worldwide. Its share of both worldwide mature and intermediate technology node (0.2 to 0.028µm) capacity increased by almost 2% each to 20% and 15%, respectively, while its share of advanced technology node (28nm or less) capacity decreased fractionally but remained at about 5%.

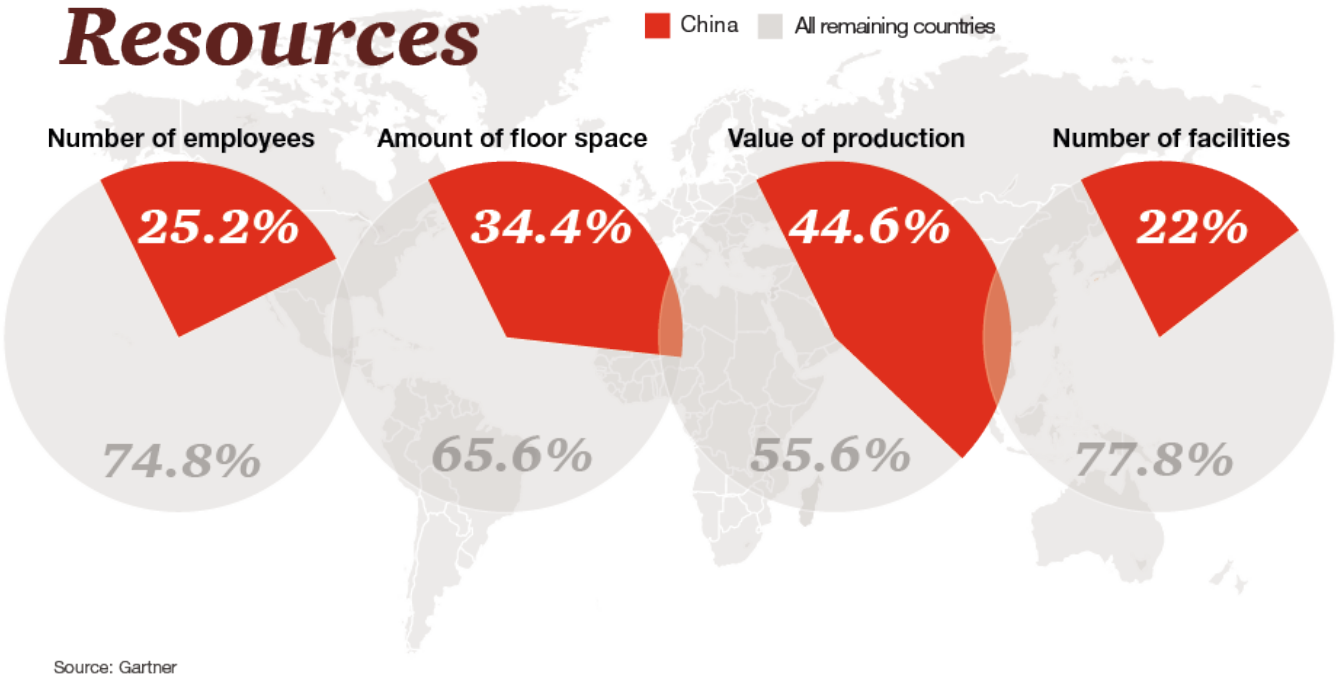
Current and committed planned wafer fab capacity comparison, China and worldwide, 2015



Source: SEMI Wafer Fab Watch, Feb 2016

Foundry production (Dedicated and IDM combined) continues to constitute the largest share of China's current and committed planned wafer fab capacity in 2015 at 42% of total compared to the worldwide average which increased from 28% in 2014 to 29% in 2015. China's committed planned IC IDM production capacity increased slightly in 2015 to constitute 25% of total wafer fab capacity, compared to 49% worldwide.

Comparison of China and all remaining countries' SPA&T resources, 2015

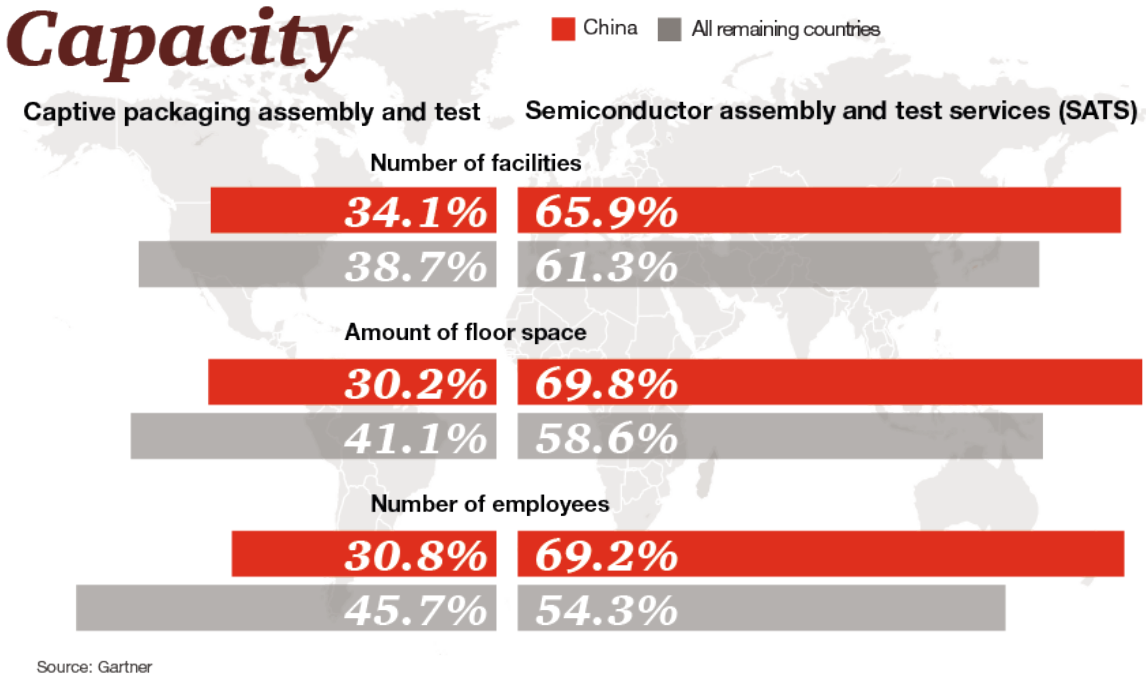


Source: Gartner

Semiconductor packaging, assembly and test (SPA&T) nominal capacity in China increased further during 2015, with IC unit production increasing by more than 13% and O-S-D production by more than 7%. In both sectors China's increase in unit production was achieved at the expense of decreases in other regions as China's increase exceeded the worldwide increase. During the year China reported a net increase of three additional SPA&T facilities and a 13.5% increase in SPA&T manufacturing floor space.

At the end of 2015 China had 123 SPA&T facilities in operation, an increase from the total of 120 at the end of 2014. These 123 facilities continue to represent 22% of the total number of worldwide SPA&T facilities; 34% of worldwide SPA&T manufacturing floor space; and 25% of reported worldwide SPA&T employees. As a result, China's SPA&T facilities continues to rank first in both number of facilities and share of SPA&T manufacturing floor space—a proxy for potential manufacturing capacity—for the seventh year, noticeably ahead of Taiwan (with 93 facilities for just more than 21% of worldwide SPA&T space) and Japan (113 facilities for 9% of SPA&T space). China's SPA&T facilities also ranked first in number of reported employees, with 25% of worldwide employees at the end of 2015, ahead of Taiwan with 19% and Malaysia with 18%.

Comparison of China and all remaining countries' SATS share of SPA&T resources, 2015



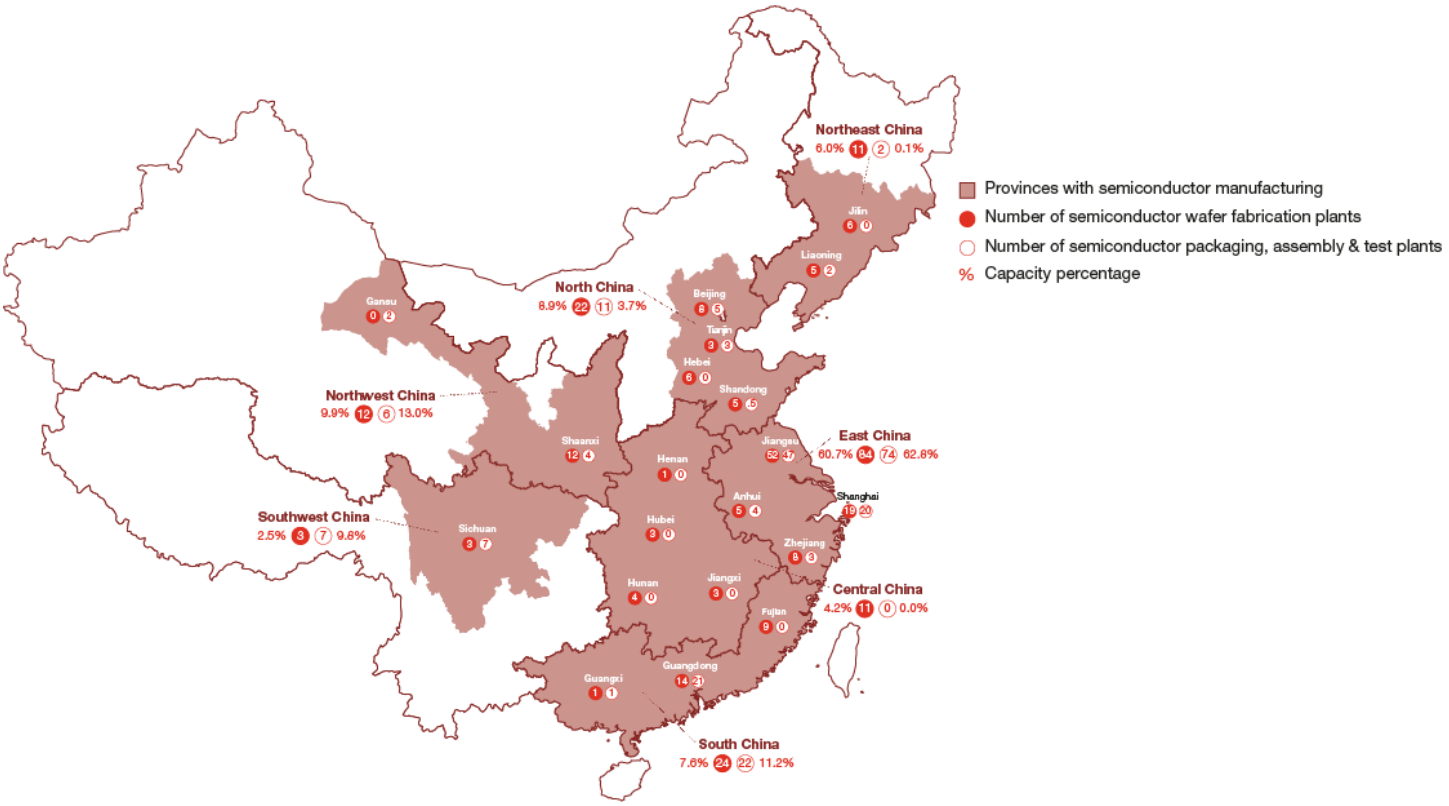
During 2015 China's SPA&T capacity became even more concentrated in the SATS sector than that of other regions. In fact, 70% of China's SPA&T manufacturing floor space and 69% of manufacturing employees were dedicated to the SATS sector versus 59% and 54% for all other countries. This is an increase from 66% of SPA&T manufacturing floor space in 2014. Nine of the ten largest worldwide SATS companies had one or more facilities in China for a total of 27 out of the 125 top ten SATS facilities worldwide. These 27 facilities accounted for 42% of the top ten SATS manufacturing floor space worldwide.

Jingsu Changjiang Electronics Technology (JCET), the largest of the Chinese SATS companies, grew by 71% to become the fourth largest worldwide SATS company in 2015, up from sixth in 2014. A second Chinese SATS company, Tianshui Huatian Microelectronics (TSHT), grew by 19% to become the ninth largest worldwide SATS company in 2015, up from twelfth in 2014. There was a third Chinese SATS company, Nantong Fujitsu Microelectronics (NFME), which was ranked fourteenth within the top twenty worldwide SATS companies in 2015.

In total there were 63 Chinese SATS companies with 81 existing facilities that accounted for 38% of worldwide SATS manufacturing floor space in 2015.

Packaging assembly and test remains the largest of China's semiconductor manufacturing activities when measured in terms of value added, production revenue, employees and manufacturing floor space, although this relationship is often missed because it is allocated between two separate industry sectors: the IC packaging and testing and O-S-D sectors. The composite weighted average of China's 2015 SPA&T production is now estimated to be about 60% of worldwide, up from a revised 58% in 2013.

China's 2015 semiconductor manufacturing capacity by province and region



Source: SEMI, Gartner, PwC

There are at least 289 semiconductor wafer fabrication or packaging and testing plants spread across 20 different provinces in China. They are spread from Jilin in the North to Guangdong in the South and from Zhejiang in the East to Sichuan in the West across an area of about 1,700,000 square miles.

To help put this map in perspective, China is about the same size as the US, 102% of area, has 4.3 times the population (1,336 mn/309 mn); but only 83% of arable land (1,479/1,780 sq km) and almost 13 times the rural population (708/55 mn). At the end of 2015 China had at least 289 semiconductor plants compared to 313 in the US.

East China (or the Yangtze River Delta) has the greatest concentration with more than 60% of both wafer fabrication and packaging and testing capacity, with the majority of plants located in Shanghai, Suzhou and Wuxi. It accounted for 50% of China's IC industry revenue in 2015.

China's semiconductor industry activity in the four regions of Central, Southwest, Northeast and Northwest China has increased by more the 500% in the last several years to account for 23% of China's capacity in 2015.

Top Chinese semiconductor companies and manufacturers

Top Chinese semiconductor companies and manufacturers

Top 10 semiconductor manufacturers, 2003-2015

	Rank											
Name of company	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
HiSilicon Technology				24	11	7	8	5	4	1	2	1
SMIC	2	1	1	2	3	3	3	3	3	3	3	2
Samsung		18	21	18	15	15	18	7	8	9	6	3
SK Hynix			11	4	1	2	2	2	2	2	1	4
Spreadtrum							15	8	12	8	7	5
Micron									6	6	4	6
Xinchao Group	7	5	7	7	8	6	6	6	5	5	8	7
Hangzhou Cree								12	10	11	9	8
Everlight Electronics								24	26	22	11	9
Intel	8	10	9	17	17	1	1	1	1	4	5	10
RFMD	4	4	4	5	7	5	5	16	11	10	10	11
Natong Huada Micro	9	12	13	12	13	13	9	13	14	13	13	12
Freescale	1	2	2	1	2	4	4	4	7	7	12	14
Renesas	5	6	10	9	5	9	10	15	18	15	17	16
China Resources Micro	13	15	16	6	6	8	7	11	15	14	14	19
ASE				20	18	16	14	10	13	12	16	21
Huahong Group	3	7	5	8	12	11	12	9	9	20	21	24
Panasonic	16	11	8	10	9	10	11	14	17	24	32	31
Leshan Radio	10	13	15	15	16	14	16					
STMicroelectornics	11	3	6	11	10	12	13	18			36	37
ASMC	12	19	17	25								
HeJian Technology	6	8	12	14	23	22	25				44	46
Infineon		9	3	3	4	17	17	22	23	25	28	27
China semiconductor industry revenue (US$mn)	12,006	16,053	21,660	27,431	31,434	29,171	38,053	51,402	56,325	65,758	77,303	89,300
Total Top 10 manufacturers (US$mn)	3,752	4,354	6,709	8,954	9,605	9,409	12,015	14,503	16,048	13,724	15,022	18,195
Top 10% China semiconductor industry	31.3%	27.1%	31.0%	32.6%	30.6%	32.3%	31.6%	28.2%	28.5%	20.9%	19.4%	20.4%

Note: Top 10 totals are based on each year's top 10 manufacturers. Lists only companies that have been within the top 10 manufacturers for one or more years 2004-2015. Rankings below 25 have been omitted. Each manufacturer is listed by its current or surviving group or company name.

Source: CCID, CSIA

This table shows the relative ranking history of China's top ten semiconductor manufacturers from 2003 through 2015. The composition of the top 10 manufacturers has been noticeably more dramatic than that of the top 10 suppliers.

There have been twenty-three different groups of companies that have been among China's top 10 manufacturers during one or more of the years from 2003 through 2015. Only two—SMIC and Xinchao Group—have been among the top 10 for every year during that period while two others—ASMC and ASE—have been among the top 10 for a single year.

During the period from 2003 through 2015 China's top 10 semiconductor manufacturers have accounted for an average 26% of China's total semiconductor industry revenues.

Major Chinese semiconductor manufacturers (including groups), 2015

	Rank		Sales revenue (RMB:100mn)				Sales revenue (US$mn)		
Name of company	2014	2015	2014	2015	Change	Sector	2014	2015	Change
HiSilicon Technologies Co., Ltd.	2	1	146.00	221.00	51.4%		2,378	3,518	47.9%
SMIC (Semiconductor Manufacturing International Corp.)	3	2	120.20	145.20	20.8%		1,958	2,311	18.1%
Samsung Electronics (Suzhou Semi & LED) Co., Ltd.	6	3	76.40	144.70	89.4%		1,244	2,303	85.1%
SK Hynix Semiconductor (China) (incl Hitech JV)	1	4	147.80	127.00	-14.1%		2,407	2,021	-16.0%
Unisplendor (Spreadtrum Communications Inc.)	7	5	72.00	109.90	52.6%		1,173	1,749	49.2%
Micron Semiconductor (Xi'an) Co., Ltd.	4	6	83.68	97.64	16.7%		1,363	1,554	14.0%
XINCHAO Group	8	7	69.10	92.20	33.4%		1,125	1,468	30.4%
Huizhou Cree	9	8	67.80	63.00	-7.1%		1,104	1,003	-9.2%
Everlight Electronics	11	9	59.50	63.80	7.2%		969	1,015	4.8%
Intel Products/Semiconductor (Chengdu/Dalian) Co., Ltd.	5	10	76.40	62.60	-18.1%		1,244	996	-19.9%
RFMD (RF Micro Devices (Beijing) Co., Ltd.	10	11	63.00	62.00	-1.6%		1,026	987	-3.8%
Nantong Huada Microelectronics Group Co., Ltd.	13	12	52.10	56.40	8.3%		849	898	5.8%
TianJIn ZhongHuan Semiconductor Co., Ltd.	15	13	47.68	55.63	16.7%		777	886	14.0%
Freescale Semiconductor (China) & (Tianjin) Co., Ltd.	12	14	53.90	54.20	0.6%		878	863	-1.7%
Shenzhen ZTE Microelectronics Technology Co., Ltd.	30	15	30.60	51.00	66.7%		498	812	62.9%
Renesas Semiconductor (Beijing & Suzhou) Co., Ltd.	17	16	43.30	50.52	16.7%		705	804	14.0%
Sanan Optoelectronics	18	17	42.10	43.60	3.6%		686	694	1.2%
Tianshui Huatian Technology Co., Ltd.	20	18	40.30	47.80	18.6%		656	761	15.9%
China Resources Microelectronics (Holdings) Ltd.	14	19	50.40	47.80	-5.2%		821	761	-7.3%
MLS Co., Ltd.	22	20	40.00	46.67	16.7%		651	743	14.0%
ASE Ass. & Test (Shanghai+ Khunshan+WeiHai +Suzhou) Ltd.	16	21	47.24	55.12	16.7%		769	710	-7.7%
Liteon Technology	24	22	38.15	33.70	-11.7%		621	536	-13.7%
TSMC (Shanghai) Co., Ltd.	23	23	39.30	43.60	10.9%		640	694	8.4%
Shanghai Huahong (Group) Company Ltd.	21	24	40.30	42.70	6.0%		656	680	3.5%
MLS Co., Ltd. (Forest Lighting)	22	25	40.00	41.70	4.3%		651	664	1.9%
China Huada Integrated Circuits Design (Group) Co., Ltd.	25	26	32.10	37.46	16.7%		523	596	14.0%
Hitech Semiconductor (Wuxi) Co., Ltd.		27	35.70	37.20	4.2%		581	592	1.8%
Infineon Technologies (Wuxi) Co., Ltd.	28	28	30.86	36.01	16.7%		503	573	14.0%
Huada Semiconductor Co.	26	29	32.10	33.80	5.3%		523	538	2.9%
Datang Semiconductor Design Co., Ltd.	27	30	31.30	31.00	-1.0%		510	493	-3.2%
Diodes Shanghai Co., Ltd.	19	31	41.03	30.10	-26.6%		668	479	-28.3%
Shangahi Panasonic Semiconductor Co., Ltd.	32	32	25.50	29.75	16.7%		415	474	14.0%

Name of company	Rank 2014	Rank 2015	Sales revenue (RMB:100mn) 2014	2015	Change	Sector	Sales revenue (US$mn) 2014	2015	Change
Amkor Technology China Ltd.	31	33	28.58	29.50	3.2%	◆	465	470	0.9%
Beijing Nari Smart Chip Microelectronics Co., Ltd.	33	34	24.80	29.20	17.7%	●	404	465	15.1%
No. 55 Research Institute of China Electronics Tech. Group Corp.	34	35	23.76	27.72	16.7%	■	387	441	14.0%
SanDisk Semiconductor (Shanghai) Co., Ltd.	29	36	30.86	27.60	-10.6%	◆	503	439	-12.6%
STATS ChipPAC	35	37	23.30	27.19	16.7%	◆	379	433	14.0%
ST Microelectronics	36	38	22.84	26.65	16.7%	◆	372	424	14.0%
RDA Microelectronics, Inc.	37	39	22.00	25.67	16.7%	●	358	409	14.0%
Siliconware Technology (Suzhou) Co., Ltd.	38	40	20.82	24.30	16.7%	◆	339	387	14.0%
Duntai Technology (Shenzhen) Co., Ltd. (aka FocalTech Systems)		41	9.40	24.20	157.4%	●	153	385	151.6%
Shenzhen National Holdings Co., Ltd.	41	42	19.37	22.61	16.7%	●	316	360	14.0%
Xi'an Microelectronics Technology Institute	42	43	19.00	22.00	15.8%	■	309	350	13.2%
Hangzhou Silan Microelectronics Co., Ltd.	40	44	19.60	20.10	2.6%	●▼⬢	319	320	0.2%
Beijing Vimicro Co., Ltd.	43	45	17.50	18.50	5.7%	●	285	294	3.3%
Shenzhen Netcom Electronics Co., Ltd.	45	46	15.79	18.42	16.7%	●	257	293	14.0%
HeJian Technology (Suzhou) Co., Ltd.	44	47	16.20	18.10	11.7%	⬢	264	288	9.2%
Galaxycore Inc.	39	48	20.40	17.90	-12.3%	●	332	285	-14.2%
Leshan Phoenix Semiconductor Co., Ltd. (ON Semi JV)	46	49	15.16	17.68	16.7%	◆	247	281	14.0%
Allwinner Technology	47	50	15.14	17.66	16.7%	●	247	281	14.0%

Source: MIIT, Gartner, Thomson Reuters, company reports

This table lists the 50 largest semiconductor manufacturers in China—those reporting 2015 revenues of US$281mn or more. This revenue threshold is up 37% from the US$205mn threshold in our 2015 update which reflects the growth in number and size of Chinese semiconductor manufacturers.

The combined revenues reported for these top 50 enterprises is US$39.9bn, representing 44.7% of China's total 2015 semiconductor industry revenue of US$89.3bn. This is a further increase in combined revenue, but a slight decrease in share from the prior year. During 2015 these top 50 enterprises accounted for 48% of China's IC chip manufacturing (foundry and IDM) revenues; 62% of IC packaging and testing revenues; 54% of IC design (fabless) revenues but only 25% of O-S-D revenues.

China's industry continues to be less concentrated than the worldwide industry, where the top 10 companies accounted for 53% of the total market.

Summary of listed major Chinese semiconductor companies by report/update, 2004-2016

Report/ Update date	Number of companies	Sales revenue (RMB:100mn)			Sales revenue (US$mn)			% China's semi industry
		Minimum	Average	Maximum	Minimum	Average	Maximum	
2004	11	0.52	3.21	6.23	6	37	75	
2005	26	1.21	3.21	7.67	15	39	93	8.4
2006	30	1.63	3.83	12.58	20	47	155	8.5
2007	27	2.09	5.66	13.46	26	71	169	8.3
2008	29	2.3	5.96	12.90	30	78	170	8.6
2009	33	2.15	6.07	30.94	31	87	445	8.8
2010	38	2.05	5.63	39.11	30	82	572	11.2
2011	43	2.25	7.29	44.10	33	107	652	12.2
2012	50	2.85	9.05	66.68	44	140	1,032	13.0
2013	50	3.12	9.69	74.19	50	154	1,178	13.7
2014	50	3.20	13.21	130.40	52	215	2,120	16.3
2015`	50	3.87	16.08	146.00	63	262	2,378	16.9
2016	50	4.90	21.27	221.00	78	338	3,518	19.0

Note: Sales revenue is for the preceeding year.

Source: CSIA, CCID, GSA, Gartner, PwC

During the past twelve years our listing of the top Chinese semiconductor companies has grown from 26 companies with an average revenue of US$39mn first listed in the 2005 Update to 50 companies with an average revenue of US$338mn listed in this 2016 Update. The combined revenues of this group of top companies increased 24% in 2015 to account for 19% of China's total semiconductor industry. Only one of the current top ten Chinese semiconductor companies, Datang Semiconductor Design, was among the top Chinese semiconductor companies listed in the 2005 Update. Ten other of the companies listed in the 2005 Update are among the companies in this current listing.

Major Chinese semiconductor companies by revenue, 2015

Name of company	Rank 2014	Rank 2015	Sales revenue (RMB:100mn) 2014	2015	Change	Sector	Sales revenue (US$mn) 2014	2015	Change
HiSilicon Technologies Co., Ltd.	1	1	146.00	221.00	51.4%	●	2378	3518	47.9%
Unisplendour (Spreadtrum Communications Inc.)	2	2	72.00	109.90	52.6%	●	1173	1749	49.2%
Shenzhen ZTE Microelectronics Technology Co., Ltd.	6	3	30.60	51.00	66.7%	▲	498	812	62.9%
MLS Co., Ltd.	4	4	40.00	46.67	16.7%	▲	651	743	14.0%
Sanan Optoelectronics	3	5	42.10	43.60	3.6%	●	686	694	1.2%
CEC Huada Semiconductor Co., Ltd. (HDSC)	19	6	22.29	33.80	51.6%	●	363	538	48.2%
Datang Semiconductor Design Co., Ltd.	5	7	31.30	31.00	-1.0%	●	510	493	-3.2%
Beijing Nari Smart Chip Microelectronics Co., Ltd.	7	8	24.80	29.20	17.7%	▼	404	465	15.1%
No. 55 Research Institute of China Electronics Technology Group Corporation	8	9	23.75	27.71	16.7%	●	387	441	14.0%
Duntai Technology (Shenzhen) Co., Ltd. (aka FocalTech Systems)		10	9.40	24.20	157.4%	●	153	385	151.6%
Elec-Tech International Co., Ltd.	18	11	12.40	22.60	82.2%	●	202	360	78.1%
Xi'an Microelectronics Technology Institute	12	12	19.00	22.00	15.8%	▼	309	350	13.2%
Hangzhou Silan Microelectronics Co., Ltd.	11	13	19.60	20.10	2.6%	●	319	320	0.2%
Beijing Vimicro Co., Ltd.	13	14	17.50	18.50	5.7%	▲	285	294	3.3%
Shenzhen Netcom Electronic Co., Ltd.	15	15	15.79	18.42	16.7%	●	257	293	14.0%
Beijing Zhongxing Microelectronics Co., Ltd.		16		18.10	N/A	●		288	N/A
Galaxycore Inc.	10	17	20.40	17.90	-12.3%	⬣	332	285	-14.2%
Geke Microelectronics		18		17.90	N/A	▲		285	N/A
Jiangsu Aucksun	14	19	15.90	16.20	1.9%	●	259	258	-0.4%
Fuzhou Rockchip Electronics Co., Ltd.	16	20	13.51	13.00	-3.8%	▼⬣	220	207	-5.9%
Wuxi China Resouces Huajian Microelectronics Co., Ltd.	20	21	11.09	12.94	16.7%	●	181	206	14.0%
Montage Techology Group Ltd.	22	22	10.25	12.57	22.6%	●	167	200	19.8%
Jilin Sino Microelectronics Co., Ltd.	17	23	12.60	12.38	-1.7%	●	205	197	-4.0%
Foshan Nationstar Optoelectronics	26	24	9.33	11.81	26.5%	●	152	188	23.7%
Shenzhen Jufei Optoelectronics Co., Ltd.	24	25	9.67	11.28	16.7%	▲	157	180	14.0%
GigaDevice Semiconductor	23	26	8.47	11.18	32.0%	▲	138	178	29.0%
Xiamen Hualian Electronics Co., Ltd.	25	27	9.41	10.98	16.7%	▲	153	175	14.0%
RDA Microelectronics, Inc.	9	28	22.00	10.68	-51.5%	▲	358	170	-52.6%

Continued next page

Name of company	Rank 2014	Rank 2015	Sales revenue (RMB:100mn) 2014	2015	Change	Sector	Sales revenue (US$mn) 2014	2015	Change
Shenzhen Refond Optoelectronics Co., Ltd.	29	29	8.79	10.26	16.7%	▲	143	163	14.0%
Allwinner Technology	21	30	10.32	9.74	-5.6%	▲	168	155	-7.7%
Guangzhou Hongli Opto-Electronics	45	31	4.48	9.74	117.3%	⬣	73	155	112.4%
Wuhan HC SemiTek Co., Ltd.	33	32	7.10	9.50	33.8%	●	116	151	30.8%
Shandong Inspur Huaguang Optoelectronics Co., Ltd.	28	33	8.80	9.40	6.8%	▲	143	150	4.4%
Shanghai Fudan Microelectronics Co., Ltd.	32	34	8.41	9.36	11.3%	●	137	149	8.8%
Shanghai Epilight Technology Co., Ltd.	30	35	7.99	9.32	16.7%	●	130	148	14.0%
Tongfang Opto Co., Ltd.	27	36	9.00	9.30	3.3%	●	147	148	1.0%
Silergy Semiconductor Technology (Hangzhou) Co., Ltd.	38	37	5.96	9.30	56.2%	⬣	97	148	52.6%
Fosham Blue Rocket Electronics Co., Ltd.	31	38	7.56	8.82	16.7%	●	123	140	14.0%
Shanghai Huahong IC Co., Ltd.	34	39	6.82	7.95	16.7%	●	111	127	14.0%
Beijing Huadazhibao Electronic Systems Co., Ltd.	36	40	6.73	7.85	16.7%	▲	110	125	14.0%
Suzhou Good-Ark Electronics Co., Ltd.	37	41	6.69	6.28	-6.2%	⬣	109	100	-8.3%
Wuxi China Resouces Semico Co., Ltd.	35	42	6.75	6.22	-7.9%	⬣	110	99	-10.0%
Tongfang Microelectronics Company	39	43	5.18	6.04	16.7%	●	84	96	14.0%
HuaLei Optoelectronic Co., Ltd.	40	44	5.00	5.83	16.7%	⬣	81	93	14.0%
Chengdu Yaguan Electronic Co., Ltd.	41	45	4.82	5.62	16.7%	▲	78	89	14.0%
Shantou Huashan Electronic Device Co., Ltd.	42	46	4.76	5.55	16.7%	●	78	88	14.0%
Beijing MXTronics Co., Ltd.	43	47	4.57	5.33	16.7%	▲	74	85	14.0%
China Electronics Science & Technology Group Company No. 58 Institute	44	48	4.55	5.30	16.7%	⬣	74	84	14.0%
Shenzhen State Micro Technology Co., Ltd. (SMIT)	46	49	4.30	5.02	16.7%	⬣	70	80	14.0%
Changelight Co., Ltd.	47	50	4.20	4.90	16.7%	⬣	68	78	14.0%

● Design (Fabless) ▲ Discrete (LED) ▼ IDM ⬣ Discrete

Source: CSIA, CCID, GSA, Gartner, PwC

The table above lists the largest indigenous Chinese companies that design, manufacture (or have manufactured) and sell semiconductor devices and therefore do not include foundries or packaging and testing companies. The threshold for inclusion in this 2015 list increased to US$78mn, up 24% from the US$63mn used for the 2014 listing. The combined revenues of the continuing 48 of these top 50 companies increased by 23.6% in 2015 which is higher than the 15.5% increase reported by China's total semiconductor industry. During 2015 these top 50 companies accounted for 19% of China's total semiconductor industry revenues; 55% of China's IC design (fabless) revenues, but only 14% of discrete revenues and 7% of IDM and foundry revenues.

About this report

This update assesses the current status of the semiconductor industry in China and how it has changed since our previous update. As with our previous reports on this issue, we conducted a second-order analysis for the 2015 update. To accomplish this, first we reconciled data from different, incomplete and often contradictory reports from various sources. These sources included industry associations and third-party research firms located in Asia and the West. Then we analyzed the reconciled data with an eye towards filling in gaps and revealing information that was not apparent in the original source material. We also interviewed industry executives to obtain current views from various parts of the value chain.

This year we found reasonable consistency between various sources about the direction and relative magnitude of the changes in China's semiconductor market and industry. However, there was still a noticeable variation between sources about absolute size of the market.

For our top level reporting of China's semiconductor consumption market and production industry, we have continued to utilize the values reported by CCID Consulting. They provide the most comprehensive detail about China's market and industry available and their reports are the principal source of information for Chinese policymakers.

For some of our detail analysis we have utilized alternate sources that provide information not available elsewhere and have, wherever possible, tried to base each such analysis on a homogeneous data source. As a consequence, the value of some metrics may vary slightly between different figures and tables. We acknowledge these differences and trust that they will not divert our readers' attention from the value and significance of the findings of the report.

Our intent with this method remained to construct a more comprehensive, meaningful, and yet quantitatively based, picture of the industry than is otherwise available. Using this method, we surfaced additional findings and considered the ramifications of those findings for multinational semiconductor industry companies.

A couple of further points we should note on the data sources, the metrics we use or developed had to be sufficiently comprehensive and consistent to be useful for the type of report we wanted to publish. For that reason, we elected to use the World Semiconductor Trade Statistics (WSTS) values for the worldwide semiconductor market wherever possible although several other market research firms have reported greater values. We have elected to convert the Renminbi (RMB) currency values from various Chinese data sources to US dollar values at the year-end foreign exchange rate for the year reported while recognizing that many of the semiconductor transactions in China are originally priced in dollars or other foreign currencies and converted to RMB on a contemporaneous basis for local reporting purposes.

Interpreting Chinese semiconductor statistics

Despite increasing international interest and press coverage, market reports and statistics of the Chinese semiconductor industry remain difficult to obtain and are often subject to misinterpretation or skepticism. Nonetheless, this report is based, in part, on data derived from Chinese sources. We use this data for two reasons. First, Western sources on the subject are incomplete and somewhat divergent and second, this is the same data used by the Chinese policymakers.

The two principal indigenous sources for most Chinese semiconductor industry and market reports, data and statistics are the China Center for Information Industry Development (CCID) Consulting and the China Semiconductor Industry Association (CSIA). Both are associated with the Ministry of Industry and Information Technology (MIIT) and share common data sources and industry analysts.

Definitional differences

According to CCID, CSIA, and MIIT usage, their reports on the Chinese semiconductor industry are based upon an industry structure organized into the following sectors:

IC design This sector includes IC design companies, institutes and laboratories, as well as all fabless IC semiconductor companies in China regardless of ownership structure. Most of the revenue and all of the unit production reported for this sector come from product sales by fabless semiconductor companies.

IC manufacture Sometimes identified as the chip manufacturing industry, this sector includes wafer foundries, wafer fabrication plants of foreign IC semiconductor companies and Chinese IC integrated device manufacturers (IDMs). As a result, the revenue and unit production reported for this sector is a heterogeneous mix of wafer and finished product unit sales.

IC packaging and testing This sector, which is sometimes identified as the encapsulation and testing industry, includes the IC semiconductor packaging, assembly and test (SPA&T) plants of foreign semiconductor companies, as well as all IC semiconductor assembly and test services (SATS) plants and companies in China.

Discrete device This sector includes all Chinese discrete IDMs and several Chinese SPA&T plants, as well as all discrete wafer fabrication and SPA&T plants of foreign semiconductor companies in China. It also includes LEDs which CSIA continues to include within the discrete industry sector. Because many of the SPA&T plants of foreign semiconductor companies use a consigned wafer/die business model rather than the fully-costed IDM business model, the revenue reported for this sector is not homogeneous and can be misleading. However, reported unit production is relatively consistent and reliable.

Data compilation methods

Both the CCID and CSIA compile their industry data from reports or survey responses filed by the various entities in each industry sector. These entities usually report their activities as separate stand-alone companies, and the CCID and CSIA consolidate the reports from each company in an industry sector without any eliminations or offsets. The results are often industry-sector totals that are aggregates of different inputs and therefore misleading. For example, the data might include foundry wafer revenues and wafer shipments combined with IDM finished-unit product sales revenues and unit shipments.

Probable double-counting

Because of the way the CCID and CSIA compile their data, without any eliminations or offsets, it is very probable that there will be instances of double-counting between sectors.

Implications of statistical disparities

Compared with the more conventional practices and standards of the World Semiconductor Trade Statistics (WSTS) and related industry associations and analysts, these differences in CCID and CSIA reporting practices and standards could lead to noticeable variability in reported Chinese semiconductor industry results. This variance would be greater or lower depending upon the mix of business models employed.

Furthermore, these differences could have a significant impact on China's ability to gauge the need for or to even manage the output of nationwide IC production (for example, to meet a greater share of its domestic consumption).

Statistics used in our report

Despite the evident disparities, we use the aggregate statistics as reported, while carefully noting that they represent China's semiconductor industry as reported in China—that is, the sales revenue of all semiconductor companies in China as reported to the Chinese authorities. We do so because we have no way to determine which business model is being used by every company, and because Chinese policymakers themselves rely upon these result. Although the tendency is for these sources to overstate the size of the industry, understatement is far less likely, we want to be careful not to understate the impact of China on the industry as a whole. Still, in cases where the Chinese have identified individual company revenues, we have been able to augment that data with information from other sources.

Identifying Chinese semiconductor companies

For a variety of translation and structural reasons, the English names of many of the Chinese semiconductor companies are often a source of confusion. Many companies have English names that are different from the literal translation of their Chinese names and often inconsistently incorporate location prefixes. As a result, the same company may be identified by a number of different English names in various reports and articles.

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