CUHK Investment Research Society
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Overview | Semiconductor Industry

Competition to intensify, growth driven by 5G, IoT and AI development

Industry Summary

Semiconductors are an intermediate between a conductor and an insulator. After designing various electrical circuits, they would be applied to a wafer, a thin slice of semiconductor. Then, the manufacturer would form an IC on the wafers' surface and cut them into smaller blocks. After the assembling and packaging process, chips are finally produced. Semiconductors are the key components of all electronic products, and the primary client industries are in computing, taking a 30% position, 29% in wireless communications, 11% in consumer electronics, and 9% in automotive, etc. In short, it is the backbone of modern technology, providing core materials for quantum computing, autonomous vehicles, and many other emerging technologies.

Technology development leads to the exponential growth in the demand for semiconductors, resulting in a long-term cycle of 10 years in the industry, also known as the product cycle. In general, the industry has seen a robust correlation between GDP growth and the revenue from semiconductor companies. GDP growth brings expansion of production that leads to an increased demand for semiconductors, while GDP stagnation results in reduced investments from tech companies and consumer spending, deriving a demand-constrained semiconductor ecosystem.

Future prospect

Along with the technological advancement in downstream industries such as consumer electronics, EV, defense, etc, we see a positive correlation between the number of IC required per product and the semiconductor's technological complexity. Structural growth in cloud, big data, AI, IoT, 3D architecture, 5G push the demand for smaller chips. This trend has also driven the need for more powerful sensors, software, or microelectron-mechanical systems to sync and connect all devices, particularly consumer electronics, together. Therefore, we expect to see semiconductor manufacturing companies invest billions of CAPEX expenses to make a progressively smaller transistor in the market.

Total Addressable Market (TAM):

Combining with above-mentioned characteristics, demand for chips related to the rapidly growing use of AI, IoT and machine learning will contribute significantly to the industry’s overall growth. Besides the development of advanced technology, the rising utilization of consumer electronics goods and demand for integrated circuits in developing economics aid the market growth.

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Semiconductor

Industry View	Positive
CUIRS Foundry Team View:	
TSMC (2330. TW)	OW
UMC (2303. TW)	EW
SMIC (0981 HK)	EW
GlobalFoundries (GFS US)	OW

Source: Accenture, Deloitte, UniversityWafer, SIA

TSMC | Asia Pacific

Robust demand and N3e development higher than market expectation; initiate OW

Stock rating	Target Price
Over-weight	NT$ 692

Key Thesis

Development of N3e would maintain decisive position to match future technology innovation and market demands. TSMC's N3e is the enhanced version of its original 3nm process. It is likely to be used in next-generation high-performance computing (HPC), mobile, 5G, and AI chip designs, with a particularly robust growth and demand in HPC. We believe that the rise in demand of HPC would consequently result in an industry-wide upcycle for the logic semiconductors. Furthermore, TSMC, with the N3e and future technology secured and developing, can capitalize this upward trend. Currently, the N3e process has shown faster than expected development speed and is projected to start partial production by the end of this month, with the mass production date beginning in 2Q2023. This new perspective chip promises a better-than-expected return while consuming less EUV light sources. Leveraging the economies of scale, TSMC would be able to further increase its margins by making the n3e, producing more with less cost in terms of energy and spatial occupation.

Currently undervalued by the market, coupled with the market shock, TSMC presents a good opportunity to buy low. We have observed a persistent upward trend in sales, reaching the highest ever of the company in 2022 February. This is backed by the full capacity production happening: TSMC's capacity remains full almost till 2024. Significant order cutting had not yet happened and won't happen soon, due to the new technological progress. We believe that the current market shock, due to the Ukraine crisis and supply chain shortage, is unwarranted by the scope of our current analysis. And we believe that this is a good opportunity to invest against the tide.

Leading the semiconductor industry in research and development, TSMC's new N3e and succeeding products will not be impacted severely by the assumed 2023 rebalancing. Analysts believe the semiconductor shortage from automobile and industrial applications could normalize in 2023. However, the normalization refers more to the saturation in the lower-end semiconductors used by EVs. We are less worried about this situation as the current semiconductor chip cycle is mainly led by high-performance processors which are more dependent on advanced-node processes. Leading foundries such as TSMC are still likely to be benefited.

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TSMC (2330. TW)

Stock Rating	**Over-weight**
Target Price	**NT$692**
Shr price (08/04/22)	NT$567
Up/downside (%)	22.0%
52-Week Range	NT$518 – $688
Shares Out. (mn)	25,930
Mkt Cap (mn)	NT$15,273,811
EV (mn)	NT$14,843,783
Free Float (%)	93.6%

Fiscal year (31/12 End)

(NT$ bn)	2021A	2022E	2023E
Revenue	**1,587.4**	**2,055.5**	**2,488.3**
YoY (%)	19%	29%	21%
GP	**819.5**	**1,126.4**	**1,341.2**
GPM (%)	52%	55%	54%
EBIT	**649.8**	**903.4**	**1,065.0**
OPM (%)	41%	44%	43%
PBT	**663.1**	**927.0**	**1,088.2**
NPM (%)	38%	41%	39%
Basic EPS	**23**	**32**	**38**

Source: Bloomberg, TSMC Annual Report, TSMC Earning Calls

UMC | Asia Pacific

Strengthening foothold in 22/28nm chips; cautious in long-term profitability

Stock rating	Target Price
Equal-weight	TWD$ 51.00

Key Thesis

UMC enjoys tailwinds from the structural growth of mega trends, and benefits from anticipated expansion of applications manufactured from 12-inch wafers.
Ranking the second in terms of market share in pure foundries, UMC benefits from main key drivers of the industry, including increasing integration of technologies like IoT, AI and cloud computing in the 5G network. Expanding applications of WiFi 6, OLED driver ICs and IoT are expected to support the demand growth of 12-inch wafers and hence, UMC is expected to generate significant sales, especially in 28/40nm chips, for the upcoming year.

Being the second-largest supplier of 12-inch wafers, UMC continues to strengthen its foothold in more mature chips, especially in 22/28-nm chips space, building a well-balanced 8 -inch and well-diversified 12-inch offering.
The current capacity utilization rates of most of the fabs of UMC remain at 100% plus. The fab 12A in P5 site in Taiwan will contribute an extra 10000 monthly capacity of 12-inch wafers, shortening the gap between demand and supply. In order to further meet the rising demand, particularly in 22/28-nm chips, UMC plans to invest in building new fabs and R&D of special technology platforms. It plans to invest $94 million in technologies of 22-90-nm chips, like HV, CIS, eFlash, etc, which starts mass production in 2022, driving growth in sales of chips in higher performance and efficiency in the remaining quarters in 2022. By this means, it aims to achieve 40% gross margin, with nearly 50% of revenue generated from 22/28-nm chips in 2022. It also plans to invest $5 billion in a fab in Singapore, which will start mass production of 22/28-nm chips in Q424, promoting sustainable supply in this space with an estimated CAGR forwarded to 2025 (11%) and diversifying the supply portfolio of UMC.

While cyclicity correction of the semiconductor industry looms, UMC may secure its foothold in 22/28-nm chips during the downturn.
As the average lead time has been around 26 weeks for chips in February 2022, many customers have been placing lots of orders in order to combat against this supply chain insecurity. However, the consensus estimates downturn of semis may begin in 2023, leading to an oversupply of chips, particularly 22/28-nm chips in the industry. Fortunately, between LTA and single source, UMC has approximately 80% of coverage capacity of 22/28-nm chips, which is higher than the average of its rivals in the same space. Hence, helping UMC to secures its orders in the space which is expected to have the highest contribution to its revenue.

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UMC (2303. TW)

Stock Rating	**Equal-weight**
Target Price	**NT$51**
Shr price (08/04/22)	NT$50
Up/downside (%)	2.0%
52-Week Range	NT$43.05 - 72.00
Shares Out. (bn)	12.48
Mkt Cap (bn)	NT$680.28
EV (bn)	556.19
Free Float (%)	82.1

Fiscal year (31/12 End)

(NT$ bn)	2021A	2022E	2023E
Revenue	**213.0**	**254.5**	**263.4**
YoY (%)	20%	19%	4%
GP	**72.0**	**101.8**	**97.5**
GPM (%)	33.8%	40%	37%
EBIT	**51.5**	**73.8**	**68.5**
OPM (%)	24%	29%	26%
PBT	**61.8**	**73.8**	**68.4**
NPM (%)	26%	28%	25%
Basic EPS	**4.6**	**5.8**	**5.4**

Source: KPMG, SeekingAlpha, Capital, Stockfeel, UMC, Investopedia

SMIC | Asia Pacific

Aggressive capacity expansion; remains cautious on profitability

Stock rating	Target Price
Equal-weight	HK$ 18.41

Key Thesis

Wafer price hikes temporarily by SMIC

ASP rose 6.2 % qoq, mainly caused by sustained improvement in product matrix and further price hikes due to the global supply tightness. Gross margin reached 35.0 % in 4Q21, up1.9 pp qoq, in line with SMIC's previous guidance of 33%, and a record high in the past five years. But, this seems to be only temporary. As the global chain recovers, customers become less dependent on SMIC. The price will peak in 1H22 and then start to fall.

Handholding gains trust

In order to reduce the risk of US sanctions by reducing dependence on foreign customers, SMIC has begun to focus on expansion in the domestic market. SMIC's focus to build a closer relationship with customers in China on long-term commitment allows it to earn their trust. As the same time, with the rise of domestic system houses, SMIC prefers closer collaborations with local suppliers to secure silicon capacity support. This may offer them firmer order commitment to align with their respective tech roadmaps.

Capex to keep aggressive to ensure capacity expansion

Capex is strongly correlated with sales performance in the semiconductor industry. SMIC spent USD2.1bn in Capex in 4Q21 and guided a 2022 Capex budget of USD5.0bn. The company confirmed its aggressive 12" capacity expansion plan: 1) 40kwpm at the Shenzhen fab, 2) 100kwpm at the Beijing Jingchen project, and 3) 100kwpm at the Shanghai Lin gang project. SMIC stressed its ambitious target of doubling its capacity (621 kwpm 8"equiv. by 4Q21) in the next few years. This may reflect the company is on the right track to achieving this target in some ways. This will boost SMIC's supply self-sufficiency in the food chain, including equipment, IC design, packaging, EMS, and end demand.

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SMIC (0981 HK)

Stock Rating	**Equal-weight**
Target Price	**HK$18.41**
Shr price (08/04/22)	HK$17.08
Up/downside (%)	7.8%
52-Week Range	HK$14.96-30.80
Shares Out. (mn)	5965.6
Mkt Cap (mn)	HK$213661.9
EV (mn)	HK$179600
Free Float (%)	84.48%

Fiscal year (31/12 End)

(US$ mn)	2021E	2022E	2023E
Revenue	**5198.0**	**7183.3**	**8435.8**
YoY (%)	33.0%	38.2%	17.4%
GP	**1430.7**	**2414.2**	**2390.6**
GPM (%)	27.5%	33.6%	28.3%
EBIT	**966.8**	**1742.1**	**1466.3**
OPM (%)	18.6%	24.3%	17.4%
PBT	**1414.4**	**1955.8**	**1812.1**
NPM (%)	24.5%	25.1%	19.4%
Basic EPS	**0.16**	**0.22**	**0.20**

Source: Bloomberg, Online Research, SMIC Annual Report, Sell Side Research

GlobalFoundries | North America

Capacity expansion, better cost absorption and ASP drove up margin; initiate with OW

Stock rating	Target Price
Over-weight	USD$ 73.10

Key Thesis

Global Capacity Expansion Plans: Increase capacity by 450,000 by 2023 in Singapore, which means 42.9% increasement in total capacity.

The company has a 3-year average revenue growth rate of 4.34%, driven by its wafer shipments growing by an average of 8.9%. The company previously announced that it will spend $6 billion to expand capacity in Singapore, Germany and the US. From that figure, more than $4 billion is allocated for Singapore with the remainder $1 billion each for its other locations up to 2023. In its Q4 2021 earnings briefing, management confirmed that construction of Phase one expansion remains on track for its Singapore expansion where 40% of its chips are manufactured and will increase capacity by 450,000 wafers per year with production expected to commence in Q1 2023. This represents a capacity increase of 42.9% to 1.5 million wafers per year.

Margins drove by better fixed cost absorption, higher ASPs for expedited and premium pricing, and better mix. profitability continues to improve with operating of 8% in Q4, coming from rising gross margin and OPEX leverage.

The significant increase in gross margin to 21.5% driven by better fixed cost absorption, higher ASPs, and improved mix. The company's guide for Q1 gross margin to 22.3% implies a continuation of rising ASPs and higher utilization as tailwinds of a favourable pricing environment continue.

Low liquidity of the company could indeed result in share price declines due to selling pressure.

The company's average 100-day volume was 2.2 million compared to its shares outstanding of 531.85 million, for a ratio of 0.4%. This is much lower when compared to a Large Cap sample of 200 companies that has an Average Volume/ Shares Outstanding ratio of 2.0%.

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GFS (GFS US)

Stock Rating	**Over-weight**
Target Price	**US$ 73.10**
Shr price (08/04/22)	US$54.75
Up/downside (%)	33.5%
52-Week Range	US$43.59-79.49
Shares Out. (mn)	532
Mkt Cap (mn)	US$31,726
EV (mn)	US$30,800
Free Float (%)	10%

Fiscal year (31/12 End)

(USD$ mn)	2021A	2022E	2023E
Revenue	**6,585**	**8,144**	**9,230**
YoY (%)	36%	24%	13%
GP	**1,013**	**2,561**	**3,636**
GPM (%)	15%	31%	39%
EBIT	**(60)**	**1,282**	**2,086**
OPM (%)	-1%	16%	23%
PBT	**(176)**	**1,166**	**1,970**
NPM (%)	-3%	14%	21%
Basic EPS	**-0.5**	**2.1**	**3.4**

Source: Khaveen Investments,Aggressive Expansion Paves Path To Double-Digit Growth

For the full version of the report including financial forecast, valuation, company and industry summary, please comment on our LinkedIn post with your email address.

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