

Malaysia Technology

Thematic: The future of the global semiconductor industry

Differing prospects for semicon front vs. back-end

MIBG collaborated with Bloomberg Intelligence (BI) on 14 June for an update on the future of the global semiconductor industry. While the backend is expected to face challenges, we are positive on front-end prospects - driven by growth in leading edge nodes (<10nm) and advanced packaging. We maintain NEUTRAL on Malaysia semicon sector but have selective BUYs on front-end auxiliary players SAM Engineering and Frontken.

Secular growth in SPEs and 3D Advanced Packaging

BI posits that global semiconductor manufacturing sales will grow faster (+32%) than overall semicon sector sales (+28%) by 2027E (from 2024E). The largest share of spending in semicon manufacturing is equipment, which contributed c.36% to total manufacturing sales in 2023. Potential beneficiaries of this growth are established SPE players (ASML, Applied Materials, KLA Corp, LAM Research). Developing nodes smaller than 2nm is also reaching physical limitations. Advanced packaging allows for the integration of different chip types within a single package, offering a way to increase performance by combining existing processes at lower cost.

Al and automotive sectors to spearhead sector growth

While BI thinks that total semiconductor sales will continue to be dominated by consumer electronics (PC and smartphones), sector sales will be increasingly driven by emerging sectors like AI/HPC/DC and EVs, which are projected to grow at a CAGR of 8.9% and 7.5% respectively (over 2022-2027E). Total semiconductor sales is projected to reach >USD800b by 2027E, implying a robust 53% growth from USD525b in 2023.

China's market share in mature nodes to increase

China's market share in mature node (>28nm) capacity is forecasted to increase substantially to 34% in 2032E (from 27% in 2022), as the nation is building up its domestic supply to become less reliant on foreign chip imports after facing export restrictions from the US. Over the next decade, a significant influx of Chinese mature node chips could lead to price wars in the mature node sub-segment.

NEUTRAL

Unchanged

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Abbreviations

AI = Artificial Intelligence

DC = Data Centre

EV = electric vehicles

HPC = high-performance computing

IC = integrated circuits

nm = nanometre

OSAT = outsourced assembly & test

PC = personal computing

PLC = public-listed company

SiP = system-in-package

SPE = semiconductor production equipment

Stock	Bloomberg	Mkt cap	Rating	Price	TP	Upside	oside P/E (x		P/B (x)		Div yld (%)	
	code	(USD'm)		(LC)	(LC)	(%)	24E	25E	24E	25E	24E	25E
Inari Amertron	INRI MK	3,044	Hold	3.84	3.40	(9)	43.7	36.5	5.5	5.4	1.9	2.3
ViTrox Corp	VITRO MK	1,671	Sell	4.16	3.40	(18)	49.3	41.3	7.1	6.3	0.5	0.6
Frontken Corp	FRCB MK	1,537	Buy	4.58	4.75	5	42.8	37.5	12.2	11.8	0.7	0.8
Greatech Tech	GREATEC MK	1,470	Buy	5.53	6.50	18	35.8	29.3	7.4	5.9	0.0	0.0
SAM E&E	SEQB MK	924	Buy	6.43	6.85	8	31.1	37.0	2.4	2.9	0.7	0.7
Globetronics	GTB MK	206	Hold	1.44	1.65	17	30.5	22.7	3.1	2.9	2.6	3.1



1. Semiconductor manufacturing sector to grow at a faster pace than overall sector sales

1.1 Equipment spending is the largest contributor to semiconductor manufacturing sales

Bloomberg Intelligence (BI) forecasts global semicon manufacturing sales to grow at a faster rate than overall global semicon sales. BI projects global semicon manufacturing sales to grow 32% from USD386b in 2024E to USD510b in 2027E vs. its global semicon sales growth projection of 28% over the same period.

In 2023, semicon equipment spending alone totalled USD127.6b, accounting for 36% (largest contributor) of total semiconductor manufacturing sales.

Prime beneficiaries of this growth trend are existing semiconductor production equipment (SPE) market leaders like Netherlands-based ASML, as well as US-based Applied Materials, KLA Corp and LAM Research.

Apart from LAM Research with its largest global manufacturing base in Batu Kawan (Penang), Malaysia's exposure to SPE is limited, especially amongst PLCs. Malaysian PLC exposure to SPEs is primarily in the precision engineering and metal fabrication stages of the assembly process. Within this space, we note that SAM Engineering (SEQB MK, BUY, TP: MYR6.85) counts two of the top global SPEs (Customer X/Y) as its key customers.

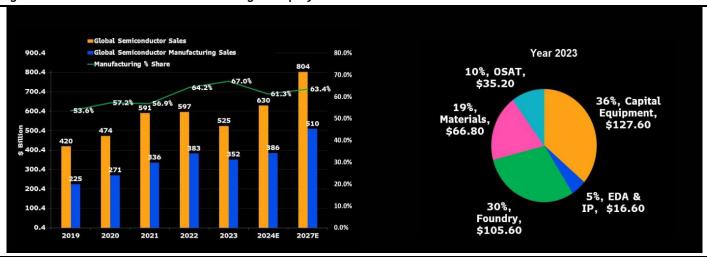


Fig 1: Global Semiconductor & Manufacturing Sales projection till 2027E

Source: Bloomberg Intelligence

1.2 3D Advanced Packaging: A Secular Growth Subsector

With the advent of artificial intelligence (AI), advanced packaging is becoming increasingly important in back-end assembly, test & packaging (ATP). While Moore's Law postulates that the number of transistors on integrated circuits (IC) would double every 2 years, the relentless scaling down of transistor size (especially beyond 2nm) is fast approaching the boundaries of physical limitations as it becomes harder and more expensive to miniaturise nodes.



Advanced packaging allows for the physical integration of varying ICs within a single package to achieve greater functionality and performance. This is imperative for applications like AI and high-performance computing (HPC) that demands high levels of processing power. In essence, advanced packaging technologies like flip chip, 2.5D/3D, SiP, and Fan-in/Fan-out offer a cost-efficient approach to achieving greater performance.

BI posits that chipmakers who excel in power consumption, performance, cost and time-to-market are poised to dominate the competition. The advanced packaging subsegment is primarily led by foundries TSMC, Intel and Samsung, as well as pure-play Outsourced Semiconductor Assembly and Test (OSAT) players like ASE and Amkor.

The advances made in advanced packaging by leading industry players have implications for OSATs lower down the value-add chain. OSAT companies with lagging capabilities are likely to struggle keeping up with rapid technological advancements and demands to execute more sophisticated packaging solutions. Leading OSAT companies like Amkor and ASE are investing heavily in advanced packaging and as such, the smaller OSATs may be forced to increase R&D spend to develop advanced packaging capabilities and alternatives of their own to maintain market share.

The advanced packaging subsector is expected to grow at a 3-year 2022-2025E CAGR of 10%, roughly 10x faster than conventional packaging (per Figure 2). Amongst Malaysian PLCs, there are no direct proxies to the growth of the advanced packaging subsector at present.

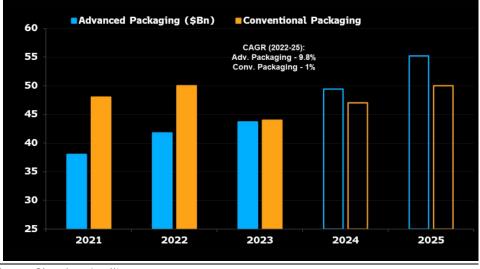


Fig 2: Advanced Packaging vs Conventional Packaging growth forecasts

Source: Bloomberg Intelligence

Malaysian OSAT PLCs may face structural headwinds moving forward if they are not quick to adapt to advanced packaging trends. We note that of the four primary Malaysian OSAT PLCs - Inari (INRI MK, HOLD, TP: MYR3,40), MPI (MPI MK, Not Rated), Unisem (UNI MK, Not Rated) and Globetronics (GTB MK, HOLD, TP: MYR1.65) - none currently have full-fledged advanced packaging capabilities at mass production level. However, we note efforts made by Inari to move up the value chain in this regard, particularly in multi-stack die technology for memory applications.



- 2. Total global semiconductor sales to reach >USD800b by 2027E (53% growth from 2023)
- 2.1 Artificial Intelligence (AI) and Electric Vehicles (EV) to spearhead semiconductor sales growth till 2027E

While BI thinks that total semiconductor sales will continue to be dominated by consumer electronics (PCs and smartphones), sales are expected to be increasingly driven by EVs and emerging AI sectors like high-performance computing (HPC) and data centres (DC). These segments are projected to grow at a CAGR of 7.5% and 8.9% respectively from 2022-2027E.

Among Malaysian PLCs, we highlight that PIE Industrial (PIE MK, Not Rated) and VSTECS (VST MK, Not Rated) are poised to be potential beneficiaries to ride on the AI/DC growth trend.

PIE is currently expanding production floor space to cater for the AI server assembly business. We believe that its parent company, Foxconn, intends to collaborate with PIE via a technology transfer agreement to assemble its AI servers in Malaysia, enabling it to ride on DC growth trends in the country. Foxconn, being the world's largest AI server manufacturer, will be able to help shorten PIE's learning curve in this high-tech assembly process.

Meanwhile, VSTECS, Malaysia's leading IT hardware and software solutions distributor and provider, is well positioned to tap on Malaysia's exponential DC server demand growth. This is especially evident from domestic DC colocation activities as the DC tenants often source their server, storage and networking equipment from local distributors.

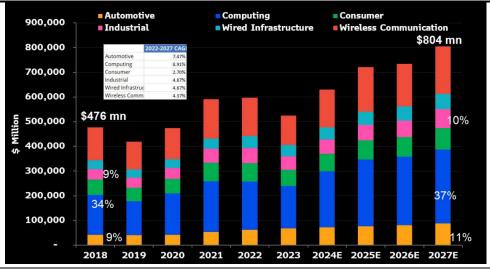


Fig 3: Global Semiconductor Sales Projection Breakdown by Sectors till 2027E

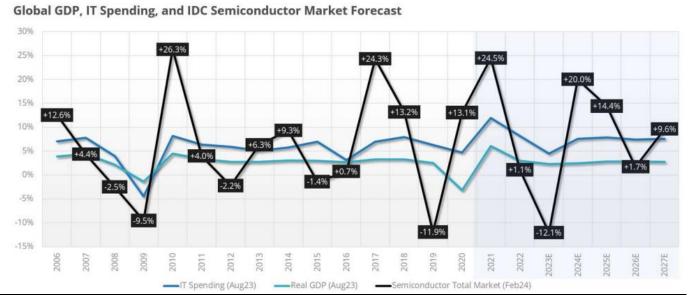
Source: Bloomberg Intelligence



2.2 Semiconductor sales projected to grow every year until 2027E, albeit at different rates annually

International Data Corporation (IDC), a global market intelligence firm, forecasts total global semiconductor spending to continue increasing YoY, albeit at varying growth rates of 20% in 2024E, 14% in 2025E, 2% in 2026E and 10% in 2027E respectively (per Figure 4).

Fig 4: Semiconductor and Global Growth Forecast



Source: Bloomberg Intelligence, IDC



3. Inventory levels & foundry utilisation rates

3.1 Inventory levels indicate that the worst is over, but uncertainties remain over growth prospects

According to BI, inventory levels in the consumer electronics (PC and smartphone) segments are seeing signs of normalisation but remain elevated due to sluggishness in end-demand recovery. Similarly, BI believes that the automotive semiconductor segment's return to normalcy will likely be delayed to 2025E due to lower-than-expected global EV demand and slow inventory turnover amongst leading marques.

Premised on lethargic near-term end-demand, BI forecasts that inventory levels will continue to normalise in upcoming quarters for all three segments - personal computing, smartphones and automotive (per Fig. 5).

Fig 5: Chip inventory levels

Source: Bloomberg Intelligence, IDC

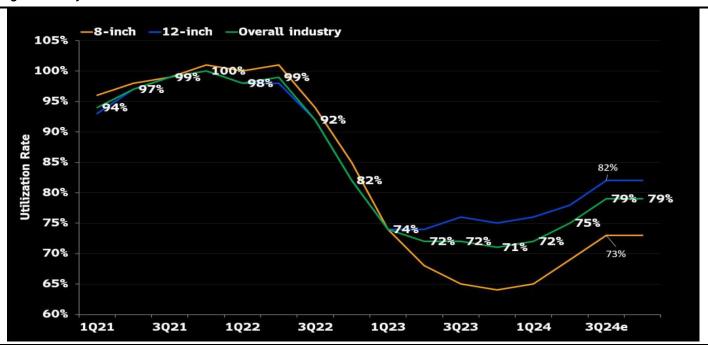
3.2 Wafer fab/foundry utilisation rate

BI research shows that the average foundry utilisation rate has bottomed in 2HCY23 and is on track to recover above >75% utilisation in 2H24, buoyed by robust demand for AI chips and a shift in orders from non-Chinese chipmakers to foundries outside of China. According to BI, this trend has materialised despite softness in the consumer electronics market (PC, smartphones and automotive). BI also notes that Chinese foundries are sacrificing profit margins for increased utilisation rates.

Amongst Malaysian PLCs, we believe the key beneficiary of increased wafer fab utilisation is **Frontken (FRCB MK, BUY, TP: MYR4.75)**, an auxiliary front-end player specialising in ultrahigh-purity precision cleaning and coating for SPE in wafer fabs. We believe that the world's leading Taiwan-based wafer fab (currently at the forefront of the global AI revolution) is its key customer and accounts for roughly a third of its group turnover. It has negligible exposure to Chinese foundries but serves nearly all other foundry players present in Taiwan, Singapore and Malaysia.

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Fig 6: Foundry utilisation rates



Source: Bloomberg Intelligence



- 4. More than 70% of new capex will focus on leading-edge nodes and advanced packaging
- 4.1 Taiwan's leadership in sub-5 nanometre semiconductor manufacturing will likely decline over the next decade

Leading chip manufacturers TSMC, Samsung and Intel are collectively looking to increase their strategic presence in the US and Europe for multiple reasons:

- i) Geopolitical tensions between the US and China;
- ii) Closer proximity to their US customer base;
- iii) To capitalise on the US government incentives: (a) Chips and Science Act funding (USD52.7b); and (b) 25% investment tax credits.

This shift is expected to reduce Taiwan's leadership in sub-5 nm semicon manufacturing over the next decade amidst rising geopolitical tensions and supply chain diversification. Consequently, BI posits that US and European chip designers are expected to prefer suppliers with production facilities closer to home, especially for advanced computing applications.

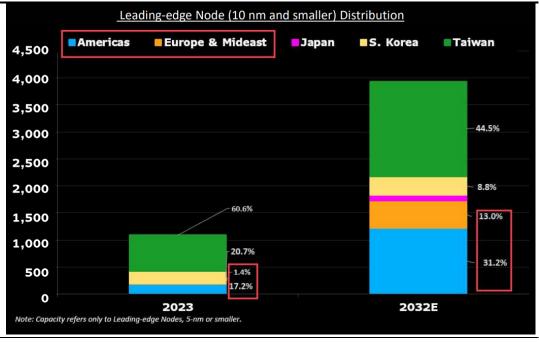


Fig 7: Leading-edge node (<10nm) capacities by region by 2032E

Source: Bloomberg Intelligence

4.2 China to lead mature-node capacity expansion

China's market share in mature node (>22nm) capacity is forecasted to increase substantially to 34% in 2032E (from 27% in 2022), as the Chinese government continues its relentless drive towards technological self-sufficiency by focusing on building a strong domestic supply chain. Over the next decade, a significant influx of Chinese mature node chips could lead to price wars in the mature node sub-segment.



As such, we believe that Silterra, 60%-owned by **DNeX (DNEX MK, Not Rated)**, could face headwinds. Unless measures are taken to address this issue, the unit could face stiff competition over the medium-to-long term from Chinese mature node manufacturers who are aggressively increasing capacity.

4.3 Advanced and mature node capacities expected to grow by 140% and 37% respectively by 2032E (from 2023 base)

Based on all greenfield and brownfield projects announced, BI expects production capacities of mature nodes in Taiwan to increase c.3x their current levels by 2032. This translates to a 140% growth in global advanced-node (<10nm) capacity. AI, autonomous driving and HPC chips are likely to account for <25% of advanced semicon shipments in the next 10 years.

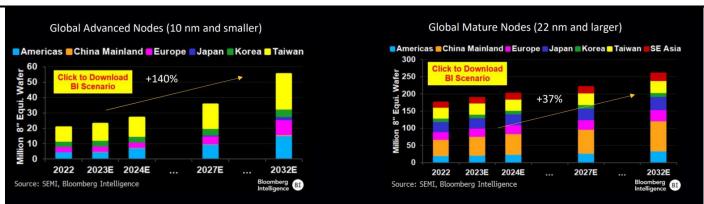


Fig 8: Growth rates of Advanced Nodes vs Mature Nodes

Source: Bloomberg Intelligence



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