

## Belt and Road Initiative A DECADE AND BEYOND

UOB China supported by Mida Guangzhou, organised a C-Suite roundtable meeting in March this year between the Johor chief minister and potential investors

# Supporting Malaysia's ambition to move up semiconductor value chain

The talent pool and developed ecosystem of Malaysia's semiconductor industry, along with China's move to diversify its operations because of the US-China chip war, have translated into an increase in Chinese investments in Malaysia's electrical and electronics industry. With the Belt and Road Initiative, there may be opportunities for greater collaboration and technology transfer that could benefit the industry.

When Shanghai-based StarFive Technology International Sdn Bhd weighed the list of potential locations outside of China, Malaysia — specifically Penang — was a natural choice, thanks to the availability of talent and the existing electrical and electronics (E&E) ecosystem developed over the last five decades. From the start of its Penang operations in May 2021, the semiconductor company has grown from a staff strength of about 30 to more than 100 R&D engineers currently. "As a fully fabless company, more than 90% of our employees are design and development people," says StarFive vice-president and general manager Ong Chin Hu.

Founded in 2018, StarFive is a leader in the RISC-V software and hardware ecosystem in China, from System-on-Chip or SoC (which is a type of integrated circuit [IC] design) to RISC-V CPU IP, NOC IP (Network-on-Chip) and development boards.

Ong, who leads the overall SoC development for the group, says its JH7110 is one of the world's first RISC-V-based SoC that has been mass produced and used in several industrial applications. "StarFive's JH7110 SoC also powered the world's first RISC-V laptop Roma, which is designed to provide developers with a powerful native RISC-V development software environment and toolchains," he adds.

(RISC-V architecture is an open-source instruction set architecture [ISA], which has garnered significant attention in recent years because chip design teams can access and implement the open-source RISC-V standard to design chips of varying complexity, from simple microcontrollers to complex SoCs. As an open-source ISA, RISC-V allows for a wide range of customisation options, enabling developers to create processors tailored to specific applications and use cases. This has led to its adoption in various industries, from embedded systems and Internet of Things devices to high-performance computing and artificial intelligence [AI].)

StarFive is one of several China-based semiconductor companies that are investing in Malaysia. According to the Malaysian Investment



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MIDA

result of the ongoing US-China chip war, Malaysia has emerged as an investment destination for Chinese semiconductor firms. Mida CEO Sikh Shamsul Ibrahim Sikh Abdul Majid says many chip manufacturers, particularly those located in China, are "looking to mitigate their risks in case the US imposes further sanctions on China's chip industry".

"The US has not only prohibited China's access to high-end chips, but also to essential resources such as AI chip design, semiconductor manufacturing equipment and design automation software," he continues.

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ductor Development Authority (Mida), from 2014 to 2023, Malaysia — specifically Kedah, Penang and Johor — attracted RM1.1 billion in foreign investments from China, which were approved for 19 manufacturing projects in the semiconductor industry, creating approximately 1,600 job opportunities. Recently, Penang Chief Minister Chow Kon Yeow said three Chinese semiconductor companies are keen to invest in Penang with total investments of US\$100 million, bolstering the state's growing IC design and advanced packaging ecosystem.

Currently, Penang houses more than 50 companies from China. They are in assembly and test, manufacturing of automation equipment, manufacturing of precision components, electronic manufacturing services, software development and design centre, says InvestPenang CEO Datuk Loo Lee Lian.

Besides foreign direct investments (FDIs), there have also been several joint ventures and collaborations between Malaysian and Chinese companies. Malaysia Semiconductor Industry Association (MSIA) president Datuk Seri Wong Siew Hai says these include the joint venture between AMD and Nantong Fujitsu Microelectronics Co Ltd, Dagang NeXchange Bhd's (KL:DNEX) strategic partnership with Beijing Integrated Circuit Advanced Manufacturing and High-End Equipment Equity Investment Fund Center (Limited Partnership) to acquire Khazanah Nasional Bhd's SilTerra Malaysia

Sdn Bhd, a semiconductor wafer foundry based in Kedah, and the joint venture between JF Technology Bhd (KL:JFTECH) and Shenzhen HFC Co Ltd to design and manufacture electromagnetic interference shielding materials, thermal interface materials and absorbing materials.

"Huawei Technologies has also established a presence in Malaysia with various investments, including R&D centres focusing on semiconductor technologies and telecommunications," he adds.

In recent years, as a result of the ongoing US-China chip war, Malaysia has emerged as an investment destination for Chinese semiconductor firms. Mida CEO Sikh Shamsul Ibrahim Sikh Abdul Majid says many chip manufacturers, particularly those located in China, are "looking to mitigate their risks in case the US imposes further sanctions on China's chip industry".

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He adds that the restriction imposed by the US and Europe on China's semiconductor industry has significantly impacted investment in the front-end semicon-

ductor sector. Mida, which has established three offices in China, beginning with Shanghai in 2002, followed by Guangzhou (2008) and Beijing (2015), is "currently engaged in active negotiations with several promising Chinese companies operating in the front-end semiconductor" segment to invest in Malaysia.

The chip war has also seen other foreign multinational corporations (MNCs) shift their manufacturing operations and diversify their businesses outside of China. Malaysia is said to be in the middle of the global chip making supply chain, with 7% of global market share and contributing to 23% of US semiconductor trade in 2022.

"The global supply chain for semiconductors is evolving from just-in-time to just-in-case, with 'resilient and secure supply chain' being a recurring theme in many investment decisions. The geopolitical tensions and regional conflicts around the world have resulted in semiconductor companies looking at risk mitigation solutions like China+1, Taiwan+1, US+1 and Europe+1," says MSIA's Wong.

### 'A confluence of factors'

Mida's Shamsul says prior to the US-China chip war, China's investments in Malaysia's semiconductor industry were driven by a confluence of factors that positioned Malaysia as an attractive destination for semiconductor manufacturing and investment. These include the country's stance of geopolitical neutrality, coupled with favourable bilateral relations with major countries. "The country's robust industrial ecosystems and diverse, multilingual workforce further bolstered its attractiveness to investors seeking efficient and dynamic production environments.

"Malaysia also had established expertise in semiconductor back-end processes, which became increasingly crucial as the demand for high-powered chips surged. This expertise, combined with Malaysia's reputation for quality and efficiency in semiconductor assembly, testing and packaging, attracted investments from China seeking to leverage these capabilities," he adds.

The country's semiconductor industry has also been able to mitigate challenges arising from a surge in demand across sectors such as consumer electronics, automotive and data centres, which created significant disruptions and delays in semiconductor production globally.

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dress these challenges by diversifying supply chains, reducing dependence on limited manufacturing hubs, and enhancing domestic production capabilities through collaboration and innovation. Driven by Moore's Law, the industry has also been focused on miniaturisation and innovation in design, manufacturing processes and materials," he says, pointing to the semiconductor ecosystem's exploration of alternatives to silicon, such as graphene and gallium nitride, and integrating experimental 3D technologies.

(Almost every facet of a high-tech society benefits from Moore's Law in action, from more efficient and faster computers to the advent of mobile devices, such as smartphones which would not work without tiny processors. It's named after Gordon Moore — an engineer who co-founded Intel — who, in 1965, predicted that the number of transistors in an IC would double approximately every two years while costs stayed the same or decreased. This theory has held true for almost 50 years, but now, as the state-of-the-art ICs reach 7-5 nanometres [one nanometre is one billionth of a metre], the theory appears to be approaching its natural end.)

The government's promotion of semiconductor manufacturing through various incentives and policies has also been a plus. Added to that is its commitment to continuously develop and upgrade the infrastructure to meet global standards. "This has resulted in more than 500 dedicated industrial parks, specialised industrial parks and free industrial zones, expanding telecommunication technologies, growing network of highways, efficient seaports, well-recognised international airports as well as digital infrastructure through our future forward policy," says Shamsul.

### Moving up the value chain

The E&E industry sector makes up about 7% of Malaysia's GDP, with semiconductor devices and electronic ICs alone constituting a quarter of total exports, totalling RM387 billion in export value in 2023. Through the New Industrial Master Plan (NIMP) 2030, the country aspires to see more front-end activities such as IC design, wafer fabrication, semiconductor machinery and equipment manufacturing in Malaysia.

Cognisant of Malaysia's aspirations to move up the semiconductor value chain, Ong believes that IC design companies like StarFive have an important role to play. "Having more design companies will allow the country to develop in this part of the value chain," he adds.

The company, for example, is collaborating with local universities such as Universiti Sains Malaysia and Universiti Teknologi Petronas to enhance research activities in RISC-V open architecture. These include the setting up of joint embedded research labs, the provision of RISC-V teaching kits as well as opportunities for undergraduate and postgraduate students to work on the RISC-V open architecture research activities. "We're also providing some incentives for students to undertake their final year or postgraduate project based on RISC-V. That way, we can train them to be future job-ready," he says, adding that this is one approach to ensuring a supply of talent for the industry.

The Belt and Road Initiative (BRI) also presents opportunities that could help to support Malaysia's ambition to move up the semiconductor value chain. "The combination of the BRI and the China+1 strategy offers a strategic boost to Malaysia's semiconductor industry, particularly in advancing its capabilities in high-end semiconductor production such as IC design, silicon carbide substrate materials, wafer bumping, wafer probing, wafer fabrication, wafer fab equipment



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and advanced packaging activities. These activities will fill the gaps in Malaysia's semiconductor ecosystem to [help the country move] up the high-technology value chain," says Shamsul.

InvestPenang's Loo concurs, pointing out that opportunities for technology transfer and collaboration in the semiconductor industry could lead to investments in R&D and adoption of advanced manufacturing technology. "As the BRI encourages cross-border cooperation and integration of supply chains, semiconductor companies that are based in Malaysia could benefit from other BRI countries, especially the Southeast Asian region, leading to more efficient production processes and access to a wider range of resources," she adds.

Given the BRI's goals to enhance trade connectivity between countries along the route, she says this could result in increased demand for Malaysian semiconductor products and open new markets and opportunities for growth. Shamsul adds that Malaysian companies can gain easier access to large and diverse markets within the BRI network. "This expanded market reach is vital for businesses looking to scale operations and enhance their global footprint in the semiconductor industry," he says.

In the case of StarFive, Ong reckons that as the region's semiconductor consumption grows and with Asean's increasing focus on the E&E industry, its footprint in Malaysia will give it access to other markets.

The BRI's infrastructure projects will also be a plus for not just the semiconductor industry but also the overall manufacturing sector, from transport projects such as the East Coast Rail Link to industrial parks such as the Malaysia-China

Kuantan Industrial Park.

Shamsul says the BRI's emphasis on digital connectivity and innovation also aligns with Malaysia's push towards Industry 4.0. "Participation in the BRI could help Malaysian firms integrate automation, smart manufacturing and digitalisation into their operations, positioning them as competitive players in high-value semiconductor manufacturing."

What's more, the BRI's support for green development could also assist Malaysia in aligning its semiconductor production processes with environmental standards, enhancing its attractiveness as a green technology partner.

"By leveraging the BRI's infrastructure, economic cooperation, digital connectivity and sustainability initiatives, Malaysia can position itself as a hub for high-value semiconductor activities, fostering innovation, competitiveness and sustainable growth in the global semiconductor value chain," adds Shamsul.

Although there are certainly opportunities stemming from the US-China chip war and the BRI, he stresses that the government remains selective in its investment promotion approach. "The investment promotion is based on the ecosystem approach where we target investors to [close] the gaps in the value chain of each industry. Malaysia is focusing on targeting quality investments in line with its current policies and strategies to attract FDI which are high technology, high value-added, knowledge and capital intensive," he says, adding that this is also in line with NIMP 2030.

"In the semiconductor industry, the government, through Miti (Ministry of Investment, Trade and Industry) and Mida, targets opportunities in the wafer fabrication and IC design activities which create the highest value added in the semiconductor sub-sector. Our focus will be on leveraging the development of mega trends to target products with technological advancements and new product applications, including Industry 4.0." —

By Sreerema Bano



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Ong, StarFive  
STARFIVE

## Once-in-a-generation opportunity

► The semiconductor industry is moving at a rapid pace in terms of technology and innovation. "The applications for semiconductors continue to increase in all areas. Currently, the strongest demand is in AI (artificial intelligence) chips," says Malaysia Semiconductor Industry Association (MSIA) president Datuk Seri Wong Siew Hai, adding that the global semiconductor revenue is expected to reach US\$1 trillion by 2030. In 2024, the World Semiconductor Trade Statistics expects global semiconductor sales to grow by 11.4%.

"Therefore, semiconductor companies will continue to invest in new technologies and increase capacity to capture the US\$1 trillion semiconductor market. Chinese semiconductor companies are similarly looking to locate their facilities, both manufacturing and R&D facilities, in countries like Malaysia."

Malaysian Investment Development Authority (Mida) CEO Sikh Shamsul Ibrahim Sikh Abdul Majid agrees, adding that Malaysia's well-established semiconductor manufacturing and assembly industry, "renowned for its quality and efficiency, presents opportunities for China companies to establish production of semiconductor or related ecosystem operations in Malaysia, such as specialised materials and wafer fab equipment".

Although the ongoing US-China trade war has been a boon to Malaysia, a bigger imperative for the country is how it can capitalise on the resulting opportunities. Speaking at the launch of Lam Research Corp's automated storage and retrieval system warehouse in Batu Kawan recently, Deputy Minister of Investment, Trade and Industry Liew Chin Tong said the geopolitical competition between the US and China has resulted in massive investments coming to Malaysia and the region as part of the reorganisation of the global supply chain.

"This is a once-in-a-generation opportunity for Malaysia to see a second economic take-off. The first one being the boom between 1988 and 1997. The lesson of the first economic take-off did not happen incrementally. It happened very quickly, exponentially. Yet once the party was over, Malaysia was stagnant for the next 25 years," he said. He urged leaders of both the industry and government to "make the semiconductor supply chain in Malaysia the most secure and resilient, ensure we have the most dynamic and well-paid workforce, and be massively involved in R&D to acquire technologies".

He added that Penang and generally Malaysia have no shortage of talent. "The problem is the pay is too low, and therefore our people ended up working in Singapore. The role of the government is not to find cheap labour and cheap engineers for industry. It must ensure the industries would get all the help to acquire technology and to be resilient while ensuring the workers have better jobs with better pay."

Liew highlighted the latter point last year in an article for the East Asia Forum, where he said that rather than a talent problem, the country had a "salary problem". He pointed out that more than one-third of engineering graduates had a starting salary of less than RM2,000 per month while 90% of engineering graduates earned less than RM3,000 per month, leading many to work in Singapore where an entry-level engineer can expect to make S\$2,800 (RM9,700) to S\$3,400 a month. At the same time, the low wage also discourages students from pursuing engineering and other STEM-related careers, further exacerbating the issue.