

PLAYING A CATALYTIC ROLE IN MALAYSIA'S 'SILICON VISION'

IT has become increasingly critical for Malaysia to build local capabilities in chip design and reduce its reliance on imported chips due to tighter export controls on artificial intelligence chips, such as those imposed by the US under frameworks regulating the diffusion of advanced AI technologies, says Alvin Gan, head of management consulting at KPMG Malaysia.

But building AI chips is not an easy endeavour. These chips require substantial investments and a large, highly skilled engineering team that commands high salaries, says Nasiruddin Nasirin, senior silicon design engineer at Advanced Micro Devices. On top of that, there needs to be clear commercial demand for the chips or the effort will not be financially viable.

"If there is no customer, [there is] no point in designing a chip. We can design an AI chip but if no one is going to buy it, then it will be a waste of money," says Nasiruddin.

Manufacturing AI chips requires cutting-edge nodes, which the country's does not currently have, he adds. While existing local foundries might handle chips for lower compute applications, they are insufficient for high-performance AI workloads.

This technical limitation poses a challenge to Malaysia's "silicon vision", which envisages the production of the first Made in Malaysia AI chip. This chip will be designed, manufactured, tested and assembled here, and sold to the rest of the world within a 10-year time frame.

This is where Penang, with its well-established electrical and electronics (E&E) ecosystem, can step in to help Malaysia take control of its semiconductor future by focusing on upskilling local firms in integrated circuit (IC) design and expanding capabilities from



"Penang can also strengthen its position by forming strategic partnerships with other industrial hubs like Selangor, which is becoming an IC design centre."

Gan, KPMG

architecture to fabrication, says Gan.

The state's existing infrastructure makes it an ideal base for supporting Malaysia's vision of producing homegrown chips, especially as the demand for computing infrastructure grows.

The state's talent pool will be its most valuable contribution, say industry experts. Alongside this, homegrown companies like ViTrox Corp Bhd (KL:VITROX) and Greatech Technology Bhd (KL:GREATEC), which have traditionally focused on back-end assembly

and testing, are now expanding into front-end processes by developing automation solutions for advanced packaging.

To add to this, Penang is enhancing its infrastructure, such as a 275kV cross-sea transmission line, to ensure a stable power supply for semiconductor manufacturing.

MOVING UP THE VALUE CHAIN

Achieving the silicon vision requires a complete semiconductor ecosystem from IC design to fabrication, packaging and testing.

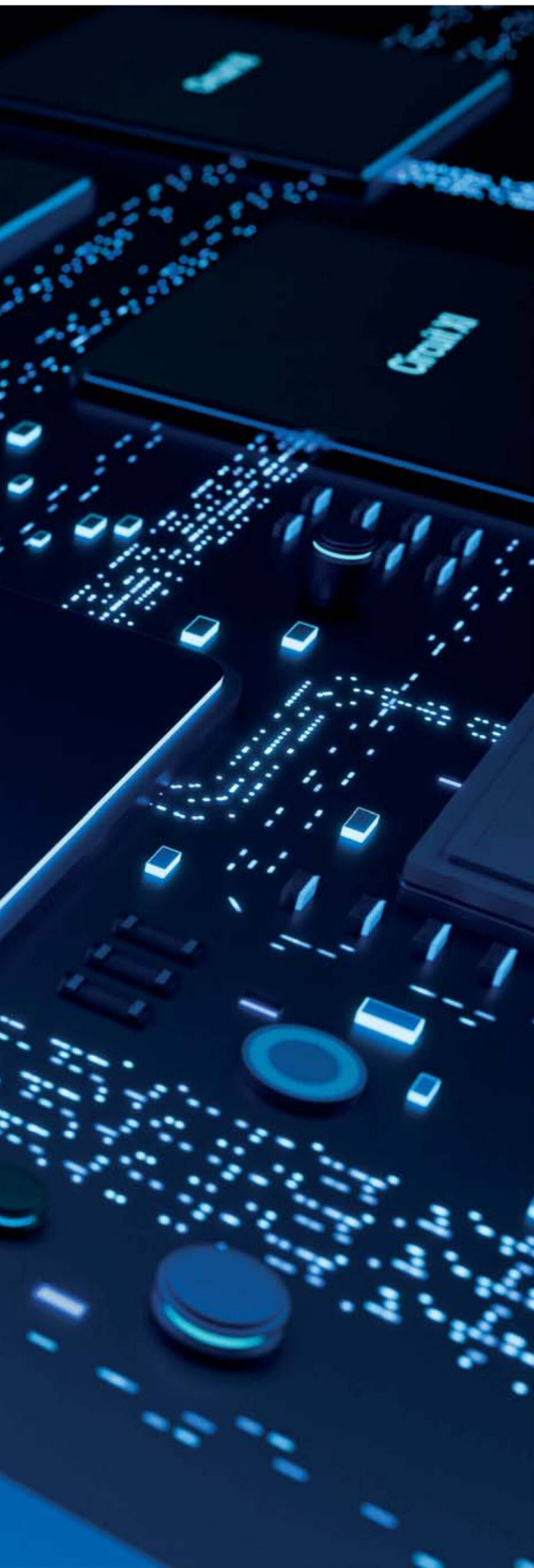
This means Penang, which is predominantly driven by the manufacturing and services sectors, must move beyond its back-end legacy to build a more complete ecosystem. This includes design tools, fabs, intellectual property (IP) developers and academic partnerships, says Asrulnizam Abdul Manaf, director of the Collaborative Microelectronic Design Excellence Centre (Cedec). Cedec is an established microelectronic research centre of Universiti Sains Malaysia.

This is if the state wants to replicate the success of the Hsinchu Science Park or attract strategic investments in advanced semiconductors, he says. The Hsinchu Science Park is home to chip-making giants like Taiwan Semiconductor Manufacturing Co Ltd (TSMC), United Microelectronics Corp and MediaTek.



"The state is well positioned to transition into advanced packaging, a higher-value back-end function that's critical for new chiplet architecture used in AI servers and high-performance computing."

Asrulnizam, Cedec



REUTERS

Penang's current semiconductor industry, however, is heavily post-silicon, which is in testing, packaging and back-end manufacturing after the wafer fabrication is completed elsewhere, notes Nasiruddin. Pre-silicon, which is in design and simulation, is far more limited and building that capability requires both investor appetite and supportive policy.

"Designing is not as easy as buying a machine. For manufacturing, the huge capital goes to the machine, for the foundry and everything ... But then for design, it requires highly trained engineers ... Penang could provide that," says Nasiruddin.

Penang already has the engineering depth and now needs a mechanism to channel that expertise into new ventures, he adds.

For instance, the state is well positioned to transition into advanced packaging, a higher-value back-end function that's critical for new chiplet architecture used in AI servers and high-performance computing, says Cedec's Asrulnizam. He notes that demand for advanced packaging is rising due to the complexity of modern chips and Penang should capitalise on this trend.

Advanced packaging requires closer integration with IC design, which provides a natural bridge to move further up the value chain. To support this shift, institutions like Cedec function both as a research and development (R&D) and training centre that offers postgraduate programmes in microelectronics and chip design. The goal is to cultivate industry-ready talent in areas like IC design and front-end development, says Asrulnizam.

Now, Penang must shift from being merely a hub for design services and back-end manufacturing to becoming a centre for local IP development, he adds. The state could mature into a dual hub, which supports both advanced packaging and fabless companies that move

beyond services into developing proprietary semiconductor IPs.

Additionally, local players are focused on design services and not IP development, says Asrulnizam. To elevate Malaysia's capabilities, there needs to be a transition from fabless design towards IP development.

More importantly, Malaysia must do more than simply manufacture chips, says Asrulnizam. Companies need to design and build them for their own products. One of the key reasons local companies struggle to create their own chips is the lack of domestic market access. Malaysia does not have dominant consumer tech brands that could absorb domestically made chips, unlike China, South Korea or Taiwan, which have their own local tech giants.

To overcome this, Malaysia must develop "anchor companies" that can catalyse local chip adoption, he says. Even the best-designed chips will struggle to find customers without anchor companies.

Penang can become a test bed for developing and implementing sustainable data centre technologies and practices that can be adopted nationwide, says Ong Wooi Leng, head of the socioeconomics and statistics programme at Penang Institute.

This is because Penang's established E&E sector can provide a competitive advantage in manufacturing and supplying components for data centres and high-performance computing facilities across Malaysia, she says. Penang can carve out a unique niche within Malaysia's data centre landscape by focusing on specialised and high-value compute infrastructure related to advanced packaging and AI.

For instance, Johor is rising as a regional hub for data centres and Penang could supply the AI chips required for these facilities by leveraging its semiconductor base, says KPMG's Gan. "This col-

laboration could help create a more self-sustaining and efficient tech ecosystem across the region. Penang can also strengthen its position by forming strategic partnerships with other industrial hubs like Selangor, which is becoming an IC design centre," he says.

PARTNERSHIP WITH ARM HOLDINGS

Ultimately, Malaysia has set a strategic goal of producing homegrown chips within the next five to 10 years along with a mandate to train 10,000 IC design engineers. On top of that, the aim is to enable the nation to develop its own AI chips and establish at least 10 local chip companies with annual revenue of US\$1.5 billion (RM6.4 billion) to US\$2 billion.

Malaysia is banking on achieving these goals with a US\$250 million technology partnership with Arm Holdings plc, which allows access to the leading semiconductor design firm's advanced chip blueprints and critical IP. A selection of local companies will be able to access Arm's extensive IP network.

"This will not only facilitate technology transfer but also open up opportunities for Malaysian players to integrate into the global semiconductor and software design ecosystem," says Gan.

The state government can further accelerate this by introducing targeted training programmes designed to upskill the current talent pool and prepare them for the advanced demands of IC chip design, he adds.

Penang Institute's Ong adds that other key initiatives should include developing specialised university and vocational training programmes focused on Arm architecture, establishing design centres and incubators through public-private partnerships, incentivising local IP creation and commercialisation, targeting niche application areas for Arm-based designs, attracting venture capital and fostering strategic collaborations.

Access to a major IP block like a graphics processing unit or GPU is just the beginning, says Nasiruddin. Companies must still know how to integrate various blocks to build a functioning AI chip.

He says that designing a chip is like assembling a custom structure using pre-built Lego blocks. These blocks are called IPs in semicon-



"Penang can become a test bed for developing and implementing sustainable data centre technologies and practices that can be adopted nationwide."

Ong, Penang Institute

ductor design. Creating all IPs from scratch is capital-intensive and talent-dependent, so most companies purchase third-party IPs like Arm's to accelerate development.

ALIGNING WITH THE NSS

The government launched the National Semiconductor Strategy (NSS) to position the country as a global leader in semiconductor R&D and manufacturing. The three-phase plan targets RM500 billion in investments, the development of 10 leading semiconductor companies and the cultivation of 60,000 skilled engineers by 2030.

Penang has made strides in aligning with the NSS but additional state-level policies and incentives are needed to attract high-value semiconductor investments, says Jaffri Ibrahim, CEO of Collaborative Research in Engineering, Science and Technology (CREST). These include enhanced fiscal and infrastructure support; strengthening talent development and retention; facilitating R&D collaborations; and improving regulatory and policy frameworks.

Jaffri says streamlining regulatory processes and ensuring a stable policy environment are crucial for attracting long-term investments. He suggests the establishment of a dedicated semiconductor task force to oversee policy implementation, align regulations to global standards and advocate for favourable trade policies and international collaborations.

On its part, CREST will play a coordinating role in supporting Malaysia's silicon vision. It

supports talent development through programmes like the Engineering Talent for Semiconductor Industry to ensure a steady pipeline of skilled engineers in AI, chip design and embedded systems. CREST also leads collaborative R&D projects by bringing together local companies such as Infineon Systems

Sdn Bhd and SkyeChip Sdn Bhd with universities and research institutions to foster innovation in advanced design technologies and prototyping. ●

By Kiran Jacob



"Streamlining regulatory processes and ensuring a stable policy environment are crucial for attracting long-term investments."

Jaffri, CREST



Scan/click
ASK EDGE
12 Things You Must
Know About Any Stock