

SINGAPORE SEMICONDUCTOR VOICE

 **SSIA**
Singapore Semiconductor Industry Association

Volume 34 • T05SS0291A

A large, stylized graphic of the letters 'AI' in white, set against a background of green, glowing, concentric circles and lines, suggesting a digital or networked environment.

AI

SSIA Summit & Semiconductor Dinner 2024: The largest industry flagship event of the year has landed.

We're particularly excited because it is in unity we find strength;
in collaboration, we discover endless possibilities.

What makes Singapore a prime location for semi- conductor companies driving innovation?

Global semiconductor players are expanding operations in Singapore, leveraging advanced technologies like AI and sustainability initiatives to stay competitive.

Leadership in Engineering: Back by Popular Demand!

Oversubscribed in 2024, SSIA's Leadership in Engineering programme equips industry professionals with vital leadership skills. Read all about the two successful runs this July/August, and September!

Unity Through Art

Interviews with the Shaping Hearts Artists: An initiative by the Northeast Community Development Council.

FOREWORD

BY THE EXECUTIVE DIRECTOR

Welcome to the SSIA Summit and Semiconductor Dinner 2024. This event symbolizes far more than just a gathering; it embodies the unity and collaborative spirit that drives growth and innovation within the semiconductor industry. Today, we are joined by some of the brightest minds and most influential leaders, all here to share insights, explore emerging trends, and shape the future of our industry together. The Semiconductor Dinner celebrates the milestones we have achieved over the past year. Unity has always been our strength, and through collaboration, we unlock endless possibilities. Our shared accomplishments highlight the importance of community in pushing the boundaries of progress.

This year, our focus on workforce development has reached unprecedented levels. The Semiconductor Awareness Days initiative, held across eight Institutes of Higher Learning (IHLs), will engage over 3,500 STEM students, with the support of 31 companies in 2024. Additionally, the IC Design Summer Camp attracted 70 students, half of whom were Semiconductor Youth Ambassadors (SAY), supported by 12 industry experts and eight sponsoring companies. The SAY Ambassador Programme brought together 33 students, mentored by 28 top semiconductor professionals.

Leadership development within the semiconductor industry has also taken a significant step forward. This year, the Leadership in Engineering programme involved 70 industry leaders from 22 semiconductor companies. Across four sessions, 55 professionals participated, with the first in-person session in July exceeding capacity. The cohort reflected a balanced mix of 23% female and 77% male participants, representing a diverse cross-section of the industry, from fabs and equipment manufacturers to fabless companies and research institutes. These leaders engaged in cross-industry collaboration, expanding their networks, and exchanging ideas vital to the industry's future success. The programme's continued oversubscription highlights the growing demand for professional development and upskilling in an ever-evolving landscape.

As we reflect on our achievements, we are also looking to the future. SSIA's recent signing of an MOU with the India Electronics and Semiconductor Association (IESA) marks the beginning of a strategic partnership designed to enhance workforce capabilities through joint trade missions and collaborative initiatives. This partnership holds great promise and will undoubtedly bring value to our members and the broader workforce.

The coming year promises to be one of extraordinary momentum, with key events such as SEMICON Southeast Asia and APE returning to Singapore. We encourage all industry players to participate, showcasing the vibrancy and innovation within Singapore's ecosystem on a global stage.

Moving forward, SSIA remains steadfast in our commitment to our three guiding pillars: Growing and Developing the Workforce, Strengthening and Expanding the Local Ecosystem, and Promoting Sustainability. We invite you to join us on this exciting journey as we continue building a stronger, more dynamic semiconductor industry.



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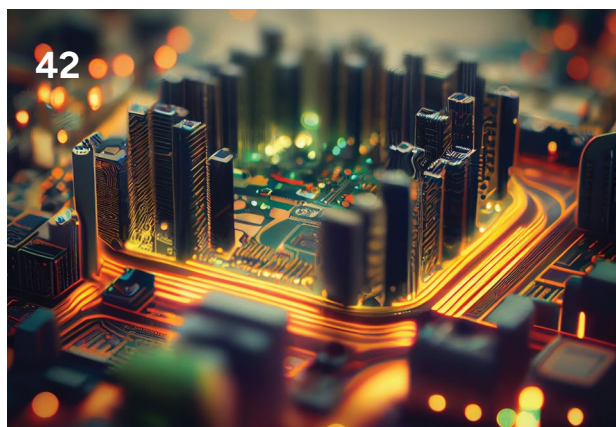
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Electronics Industry Day

January 2024

The annual Semiconductor Electronics Industry Day has quickly become Singapore's leading student outreach event in the semiconductor sector, backed by nearly every major company in the field. This event aims to unite semiconductor companies in a collaborative effort to increase industry awareness among young people. 2024 marked our second year at ITE, and the event saw significant growth, with increased participation from more companies and Institutes of Higher Learning (IHLs). This year, in partnership with the Ministry of Education, secondary school and junior college students were also invited, expanding the event's influence.

For companies, the event serves as a platform to showcase career opportunities and the cutting-edge technologies they develop. It allows them to connect directly with the future workforce, sparking interest in the diverse roles available within the industry. For students, the day offers a unique glimpse into the many career paths the semiconductor industry offers, empowering them to make informed decisions about their futures.

As Singapore strengthens its position as a global leader in the semiconductor industry, events like this are crucial for ensuring a continuous pipeline of skilled talent. The Semiconductor Electronics Industry Day not only highlights the exciting opportunities within the sector but also reinforces the industry's commitment to cultivating a future-ready workforce.



Semiconductor Women's Forum

March 2024

The Semiconductor Women's Forum 2024, held on 26 March 2024 at the Mandarin Oriental Hotel, continues to set the standard for celebrating and advancing gender diversity within the semiconductor industry. This annual event, a key fixture in the industry's calendar, was graced by Guest of Honour Gan Siow Huang, Minister of State for Education and Manpower. Her address emphasized the ongoing commitment to fostering an inclusive environment, one that not only recognizes but also actively supports the contributions of women in the field.

As with previous years, the forum focused on critical issues such as flexible work arrangements, mentorship programs, and bias-awareness training, all of which are essential for empowering women in their professional journeys. The discussions and workshops provided invaluable insights, particularly for mid-career professionals navigating career transitions and upskilling opportunities in an ever-evolving industry.

This forum is more than just a one-time event; it is part of a sustained effort to inspire and empower women in technology. Each year, the forum not only celebrates the achievements of female pioneers but also looks ahead to emerging trends like AI, IoT, and sustainable manufacturing, encouraging women to take on leadership roles in these areas.

The success of the 2024 forum is a testament to the ongoing dedication to gender diversity in the semiconductor industry. As this event becomes an annual tradition, participants can look forward to continued opportunities for learning, networking, and collaboration. The commitment to making the Semiconductor Women's Forum a yearly event underscores the industry's recognition of the vital role women play in driving innovation and shaping the future of technology.



Semiconductor Business Connect

July 2024

Held on 23 July 2024 at Singapore Expo, the Semiconductor Business Connect 2024 marked a significant milestone in the semiconductor industry, reinforcing Singapore's leadership in driving innovation and collaboration. The event, themed "Empowering SMEs through Collaboration and Innovation," brought together industry giants and innovators in a powerful convergence aimed at shaping the future of the semiconductor landscape.

The event was a strategic platform designed to strengthen Singapore's semiconductor ecosystem by fostering deep collaborations between multinational corporations (MNCs) and small and medium-sized enterprises (SMEs). The focus areas of Automation, AI, Sustainability, Cybersecurity, and Additive Manufacturing were at the forefront of discussions, reflecting the industry's critical advancements and future directions.

Throughout the day, attendees engaged in insightful break-out sessions that explored these key areas, fostering a dynamic exchange of ideas. The event also featured an exhibition space where SMEs showcased their cutting-edge products, while MNCs highlighted collaborative projects that emphasized the power of partnerships in driving industry innovation.

Semiconductor Business Connect 2024 underscored SSIA's commitment to supporting Singapore's vision of Advanced Manufacturing 2030. By facilitating meaningful interactions and collaborations, the event positioned Singapore's semiconductor industry on the global stage, paving the way for SMEs to achieve greater international competitiveness.

As a landmark event, Semiconductor Business Connect 2024 not only celebrated the industry's achievements but also laid the foundation for future growth, ensuring that Singapore remains at the forefront of global semiconductor innovation. This annual gathering continues to be a catalyst for change, driving the industry towards a future of endless possibilities.



SSIA Summit

September 2024

The SSIA Summit & Semiconductor Dinner on 18 September 2024 is poised to be the largest flagship event in the industry's annual calendar, further solidifying its status as a cornerstone of innovation and collaboration. Held at Resorts World Sentosa, this premier event consistently attracts the brightest minds and most influential leaders in the semiconductor sector, both locally and globally, to explore and shape the future of the industry.

The theme for this year, "Synergizing Silicon: Pioneering the Future with AI and Quantum Technologies," underscores SSIA's unwavering commitment to driving new industry frontiers. This focus not only highlights the critical role of semiconductors in enabling transformative technologies but also aligns with Singapore's broader vision of Advanced Manufacturing 2030. Through this event, SSIA reinforces its dedication to supporting Singapore's ambition to be a global leader in advanced manufacturing and innovation.

As with past events, the SSIA Summit & Semiconductor Dinner is more than just a gathering—it is a strategic platform for industry leaders to engage in high-level discussions, exchange cutting-edge insights, and forge meaningful collaborations. The dynamic program, filled with keynote speeches, panel discussions, and networking opportunities, sets the stage for the industry to continue pushing the boundaries of what's possible.

This recurring event underscores SSIA's role in fostering a vibrant and forward-looking semiconductor ecosystem. By participating, attendees are not just witnessing the future unfold—they are actively shaping it. This annual convergence serves as a catalyst for change, ensuring that Singapore remains at the forefront of global semiconductor innovation year after year. Mark your calendars and be part of this transformative experience that will continue to drive the industry towards a future of endless possibilities.

IVAH SUGIARTI:

LEADING WITH PURPOSE AND PASSION IN THE SEMICONDUCTOR INDUSTRY



Before joining SSIA, I spent 12 years as an HR professional in the financial industry, specializing in HR Operations, Program Management, and Business Advisory. My journey took me through regional roles at several prominent financial institutions, where I managed large-scale projects that drove significant organizational improvements. One of the most memorable experiences was leading the Marketing and Communications workstream for a women-focused Business Resource Group (BRG). This role allowed me to connect with accomplished women and gain invaluable insights into achieving success both professionally and personally.

After more than a decade in the corporate world, I decided to take a career break to focus on my personal well-being and family. This was one of the best decisions I've ever made—it gave me the chance to prioritize my health, reconnect with friends, and spend quality time with my family. I even took the opportunity to complete a professional makeup course and volunteer extensively at my daughter's school. This period of reflection led me to a renewed sense of purpose and a strong desire to make a positive impact on a broader audience.

When I felt ready to return to the workforce, I wanted to do something different, something meaningful. That's when I discovered SSIA's job advertisement on LinkedIn. I was immediately intrigued by the role and impressed by the organization's mission and how it stood out among trade associations. I knew SSIA was something special, and I decided to apply. A few days later, I received a call for an interview, and now here I am, acting as the Head of Human Capital Development at SSIA.

In my role at SSIA, I've had the privilege of leading several key initiatives, including the SSIA Semiconductor Awareness Day at Institutes of Higher Learning and the Leadership in Engineering Programme. I'm also managing the Semiconductor Active Youth (SAY) Ambassador Programme, which focuses on nurturing and developing young talents who are passionate about the semiconductor industry. Each of these programs holds unique value for the industry, making it hard to single out just one as the most impactful.

What I find most engaging about my role is the ability to influence the future of the semiconductor industry through these impactful programs. Whether it's developing strong leaders through the Leadership in Engineering Programme

or engaging with young talent through the Semiconductor Awareness Day and SAY Ambassador Programme, I'm passionate about making a tangible difference. The blend of leadership development and youth engagement is both rewarding and energizing, as I can see the positive impact we're making across different levels of the industry.

One of the most rewarding challenges I've faced at SSIA was organizing the Semiconductor Awareness Day, especially as someone still relatively new to the semiconductor industry. Designing an event that effectively engaged students and conveyed the industry's significance was no small feat. It required careful planning, coordination with multiple stakeholders, and the ability to balance technical content with accessible messaging. Seeing the enthusiastic response from students and their newfound interest in the industry was incredibly fulfilling and reinforced the importance of outreach and education in shaping future talent.

Outside of work, I'm all about keeping my energy levels high. I make sure to squeeze in my workouts over the weekend—think sweat-dripping cardio, core-blasting Tabata, and some good old weight lifting. When I'm not hitting the gym, you'll find me soaking up the sun with my family, whether it's cycling along the beach, splashing around in the pool, or strolling through the park. I'm also a travel enthusiast, always on the lookout for new places to explore and cuisines to try. And nothing beats hosting a get-together with friends, where we indulge in great food and even better conversations. This mix of fitness, outdoor fun, travel, and socializing keeps me feeling alive and kicking!

Looking ahead, my professional aspirations at SSIA include continuing to drive impactful programs that contribute to the growth and development of the semiconductor industry. I also aspire to take on more leadership responsibilities, where I can mentor and guide new team members, fostering a collaborative and innovative environment. I'm committed to enhancing my industry knowledge and skills to better support SSIA's strategic objectives and to stay at the forefront of industry trends. Ultimately, I hope to contribute to SSIA's mission in a meaningful way, helping to shape the future of the industry while achieving personal and professional growth.



WHAT MAKES SINGAPORE A PRIME LOCATION FOR SEMICONDUCTOR COMPANIES DRIVING INNOVATION?

Global players - supported by a robust network of local suppliers and partners - are expanding operations here and deploying advanced technologies such as AI and sustainability initiatives to stay competitive.

Global demand for semiconductors continues to grow – and the market is expected to reach US\$1 trillion between 2030 – 2032. The rise of artificial intelligence (AI) and electrification of vehicles are among the trends fueling the sector's growth.

Singapore is already an integral part of the global semiconductor supply chain. We account for 10 per cent of all chips produced worldwide and approximately 20 per cent of global semiconductor manufacturing equipment production. We are also home to a diverse semiconductor ecosystem with research and development (R&D) and manufacturing activities across the semiconductor value chain – from integrated circuits design, and wafer fabrication to packaging and testing.

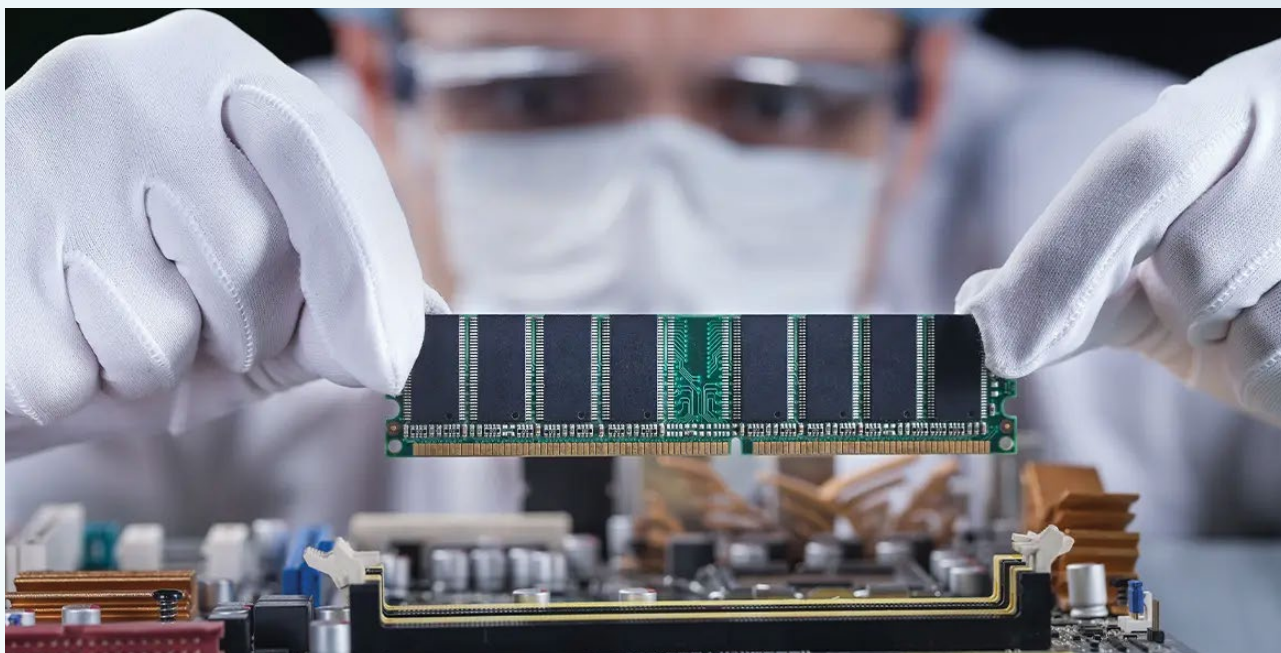
In Singapore, STMicroelectronics manufactures silicon carbide (SiC) chips – or third-generation semiconductors – for powering applications such as electric vehicles (EVs) and data centres. As AI adoption grows, data centres will need to cater to the power-hungry requirements of AI technology, further necessitating efficient power supply enabled by SiC chips. GlobalFoundries' Fab 7H, which opened in Singapore in September 2023, will produce image sensors and radio frequency chips integral to the next generation of smartphones and EVs.

Global semiconductor players can count on a robust ecosystem of semiconductor equipment companies and material suppliers, such as substrates companies that also perform R&D and manufacturing activities in Singapore.

Advanced Substrate Technologies (AST), a subsidiary of Japan's TOPPAN Holdings, is constructing a facility – the first in Singapore – to produce high-end flip-chip ball grid array (FCBGA) substrates used in chips vital to AI applications such as custom processors and networking chips. US chip manufacturer Broadcom is supporting the establishment of the facility.

Singapore's stability, efficient supply chain ecosystem and trusted intellectual property protection regime are among the factors that have attracted semiconductor investments here. Over the past 55 years, we have evolved from a hub for assembly and testing to a thriving semiconductor ecosystem encompassing chip design and wafer fabrication.

From investing in infrastructure and R&D to developing a highly skilled workforce to drive innovation and industry growth, here's a look at how Singapore continues to grow its semiconductor industry.



1. Ensuring infrastructure readiness

Singapore invests in advance to build the required infrastructure, a strong public research ecosystem and a skilled workforce. For example, we have set aside vibration-tested industrial land required to support large-scale semiconductor manufacturing projects and invest in utilities infrastructure ahead of demand to ensure redundancies.

2. Commitment to talent development

Singapore's semiconductor workforce numbers around 35,000. There are close partnerships between EDB, our Institutes of Higher Learning (IHLs), the Singapore Semiconductor Industry Association (SSIA) and industry partners to train a strong pipeline of relevant talent. Initiatives include:

- The Singapore Industry Scholarships (SgIS) and Industry Postgraduate Programme (IPP) to attract more youths to join the sector and to enable more technical experts to gain job engagements in the industry respectively. Specific to Integrated Circuit (IC) design, EDB is partnering SSIA to generate more interest amongst students via the IC Design Summer Camp, and to bridge capabilities between academia and industry needs by a six month IC design training programme co-developed by the National Technological University (NTU) and the industry.

- There are pre-employment training and career conversion programmes targeting mid-career workers, conducted in partnership with SSIA, industry players and IHLs.

- Industry players anchored in Singapore continue to partner with IHLs to train and prepare youth for semiconductor careers. In 2023, Micron signed a MoU with five local polytechnics in Singapore for a wide ranging partnership, which includes provisions of more internships, scholarships and bursaries to students, and also assistance to train and expose teaching staff to advanced semiconductor manufacturing. In 2024, ITE signed MoUs with Globalfoundries, Micron, STMicroelectronics and Agency for Science, Technology and Research (A*STAR)'s Institute of Microelectronics (IME) for student internships, staff attachments and joint projects.

3. Continuous investments in R&D and innovation

Semiconductors is a highly innovative sector and continuous investment in R&D is critical. The Singapore government has made sustained investments over the past decades in our Research, Innovation and Enterprise (RIE) 2025 plan. In Budget 2024, Singapore announced a S\$3 billion top-up to RIE 2025. In total, about S\$28 billion over five years will go towards growing the overall R&D ecosystem in Singapore. The funds will support both the public and private sector, including collaborative R&D projects between the two sectors.

Semiconductor R&D, the development of new chip designs, manufacturing processes and equipment, is a key focus area. Here are the microelectronics research pillars for Singapore in the medium to long term are:

- Heterogenous integration (e.g. Applied Materials and A*STAR's IME Centre of Excellence in Advanced Packaging; NUS' Singapore Hybrid-Integrated Next-Generation μ -Electronics Centre (SHINE)), which looks at packaging chips to enable faster performance and smaller form factors.
- Wide bandgap semiconductors (e.g. 200mm SiC Pilot Line and National GaN Technology Centre), devices that will enable applications such as EVs.
- Sensors and actuators (e.g. STMicroelectronics and IME's MEMS Lab-in-Fab), devices in our daily life which monitor conditions, signals before triggering responses.
- Other areas including mmWave and beyond, edge AI, and advanced photonics (e.g. National Semiconductor Translation and Innovation Centre).

4. Building a reliable and resilient ecosystem of partners and suppliers

In Singapore's semiconductor industry, local enterprises work with global companies as solution providers or co-development partners, particularly in the areas of spares, facilities and sustainability solutions. These partnerships allow local enterprises to accelerate capability building, which in turn strengthens the resilience of the ecosystem.

To facilitate more collaborations, the government has enhanced the Partnerships for Capability Transformation (PACT) scheme, to support additional partnership modalities between multinational corporations (MNCs) and local enterprises in capability training, internationalisation and corporate venturing, in addition to existing support for supplier development and co-innovation. Global Foundries, the world's third-largest chipmaker has partnered with local additive manufacturing enterprise – Forefront AM – for timely and efficient equipment repairs. Local precision engineering ELH Additive Manufacturing, also successfully ventured into additive manufacturing for metal and polymer materials, and works with MNCs across industries such as aerospace, defence and semiconductor manufacturing.

Semiconductor companies are among the enterprises that have pioneered and used advanced technologies like AI

and automation to be more efficient and competitive in their manufacturing operations. For example, GlobalFoundries and STMicroelectronics are using AI predictive maintenance, aiming to substantially reduce production tool downtime. Micron and Infineon are also part of the coveted World Economic Forum's Global Lighthouse Network, in recognition of efforts undertaken within their Singapore operations to scale Fourth Industrial Revolution technologies. Singapore is further catalysing AI activities here through an investment of more than S\$1 billion over the next five years into AI compute, talent and industry development. This includes putting in place enablers to support companies seeking to use GenAI to unlock productivity gains or to implement customised GenAI applications with tech partners to meet their business needs.

5. Supporting manufacturers to operate more sustainably

Singapore is already partnering with manufacturers to implement best-in-class greenhouse gas abatement and energy efficient systems. Beyond such efforts, companies are piloting novel emission abatement solutions to achieve further decarbonisation. STMicroelectronics for instance is working with SP Group on Singapore's largest industrial District Cooling System, to cool one of STMicroelectronics' manufacturing plants and its office areas. When ready in 2025, it will help STMicroelectronics achieve 20 per cent savings in annual cooling-related electricity consumption, and reduce ST's carbon emissions by up to 120,000 tonnes per year. Singapore is also improving access to cleaner energy – through regional power grids that will facilitate the import of low-carbon electricity and exploring low-carbon alternatives such as hydrogen, geothermal and carbon capture, utilisation and storage.

¹Quinn, Stephanie. "SEMICON West: Stronger Together". In Business, 30 Jul 2024.



Read about the latest semiconductor investments in Singapore

Jul 2023: Semiconductor heterogenous integration startup Silicon Box unveiled its S\$2 billion advanced semiconductor manufacturing foundry.

Sep 2023: GlobalFoundries officially opened its new ~US\$4 billion (S\$5 billion) wafer fab facility in Singapore focused on end-markets such as automotive, 5G mobility and secure devices.

Mar 2024: AST, a Singapore-based subsidiary of TOPPAN Holdings Inc., broke ground on a Singapore facility to produce high end substrates and develop advanced technologies to meet global demand.

Jun 2024: VisionPower Semiconductor Manufacturing Company, a joint-venture between Vanguard International Semiconductor Corporation and NXP Semiconductor, announced that it will build a ~US\$7.8 billion (S\$10.5 billion) wafer manufacturing plant in Singapore for automotive, industrial, consumer and mobile device markets.

Siltronic opened its new S\$2.9 billion production facility for 300mm wafers, making Singapore its largest production site globally. Hear from CEO Dr Michael Heckmeier on what makes Singapore a strategic partner for Siltronic.

Pall Corporation, opened a new US\$150 million (S\$202 million) state-of-the-art facility in Singapore to produce microelectronics filters for advanced node semiconductor manufacturing.

MediaTek has committed to investing S\$500 million in Singapore over the next five years. This will go towards furthering R&D capabilities in next-generation system on chip (SoC) technologies.

EDB:
SINGAPORE

This article was first published by the Singapore Economic Development Board (EDB). The Singapore Economic Development Board (EDB), a government agency under the Ministry of Trade and Industry, is responsible for strategies that enhance Singapore's position as a global centre for business, innovation, and talent.

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Leadership in Engineering

The SSIA Leadership in Engineering programme stands out for bringing together leaders from across the semiconductor value chain, offering participants a unique opportunity to learn from diverse industry perspectives.

The programme focuses on practical leadership and networking skills, with activities such as breaking wood-blocks and team challenges that help participants develop crucial competencies in self-leadership, teamwork, and peer management—skills vital for success in the semiconductor industry.

The first in-person run, held from 30-31 July to 1 August 2024, included a Q&A session with CS Chua, SSIA Board Member and President & Managing Director of Infineon Technologies, who provided practical insights into industry trends and leadership challenges.

Due to strong demand, SSIA added a second session from 2-4 September 2024, where Isabel Chong, Siemens SVP ASEAN Digital Industries, led a session on corporate management, leadership, and the importance of Diversity, Equity, and Inclusion (DEI). Her insights highlighted the growing significance of inclusive leadership in the modern workplace.

If you're interested in enhancing your leadership skills, you can pre-register for future sessions of the Leadership in Engineering programme by emailing secretariat@ssia.org.sg. Don't miss this opportunity to build critical leadership and team management capabilities!



LEADING WITH LIGHT:

HOW AMS OSRAM'S CEO, MR. ALDO KAMPER, IS SHAPING THE FUTURE OF THE SEMICONDUCTOR INDUSTRY



Can you share a bit about your company's vision for the future of the semiconductor industry?

Generally, the semiconductor industry is a key to digitalization. Specifically, optical semiconductors are increasingly replacing electronic components. Miniaturized light and sensor technology enables numerous applications in a multitude of sectors that were impossible to imagine just a few years ago. In cars, smart lighting and sensing technology allows vehicles to respond to the environment, monitor passengers and drivers and even drive autonomously, making driving smarter and safer than ever. In production, optical semiconductors power machine vision and robotics bringing the fully automated smart factory within reach. And in the medical field, high-precision LEDs and sensors are transforming imaging and diagnostics, enabling affordable and smart new use cases.

As a leading global provider of intelligent optical emitters and sensors, ams OSRAM focuses its business, product and innovation strategy on key societal megatrends. These trends include digitalization, smart living and the Internet of Things, as well as energy efficiency and sustainability, each one creating a broad spectrum of opportunities across the different end-markets.

Automotive market growth will be driven, according to our expectations, by applications such as dynamic forward and signal lighting, laser-diodes for lidar that is needed for assisted and autonomous driving, LED ambient lighting and in-cabin sensing, among others. In the industrial and medical segments, we anticipate that the growth vectors will be efficient horticulture lighting systems, UV-C disinfection, LED and laser projection, medical imaging applications including x-ray photon counting and customers specific sensors and sensor interfaces. Not to forget consumer applications, where we expect growth to come mainly from 3D sensing and camera enhancement applications across various devices and display management solutions including ambient light.

How do you cultivate a culture of innovation within your organization, particularly in semiconductor R&D?

Our slogan of 'Sense the power of light' is strongly rooted in our culture and makes it very clear: Our success is based on our deep understanding of the potential of light. We use the entire spectrum of visible and invisible light to illuminate our surroundings and gather information from them. We combine light with intelligence, enabling our customers to develop innovative applications. Our deep engineering expertise is our most valuable asset and is based on our dedicated R&D teams around the globe. We have a long

history in developing chips and packages for emitters and sensors, as well as full lamps and systems. Because we control the key technology steps, we can innovate at each step to sustainably improve the overall system.

To maintain our leadership position, we dedicate considerable resources to R&D activities and invest in our global presence, in highly motivated employees and in joint development activities with external partners. We invest around 500 million euros annually in our research and development activities, which also shows that our markets and technologies continue to have great potential.

What also sets us apart is our deep understanding of our customers' applications. We maintain long-standing relationships with our customers. In close collaboration with the customers our design centers around the world develop advanced solutions that make a real difference.

Can you share specific examples of how these innovations are already influencing the market or product development?

First, I would like to emphasize our blockbuster product EVIYOS for adaptive headlights in cars. The 25,000-pixel LED solution has been extremely well received by our customers and end customers alike. In only a few quarters, we were able to win contracts with a volume of more than 450 million euros lifetime value. After our pilot customer VW, we are now part of many other future car models, especially in Europe and China. The latest estimates predict that the global market for advanced, highly pixelated LED solutions will grow to roughly one billion euros annually by 2028.

Or take healthcare, Photon counting is revolutionizing computer tomography. Over the last few years, the clear objective of every scientist and expert in the field has been to reduce the radiation dose and to enhance early diagnosis with the aid of additional information. The step to photon counting is considered as significant as the transition from black-and-white to color television in terms of the extra information it delivers, in this case for better diagnoses. It also allows higher resolutions at significantly lower radiation dosages. Essentially, we make people's lives safer, smarter and more sustainable.

How is your company addressing the growing emphasis on sustainability in semiconductor manufacturing?

We see sustainability not only as an important pillar of our 'licence to operate,' but above all as an essential prerequisite for long-term success. Sustainability is a key compo-

nent of our corporate strategy. To live up to our responsibility, we have set the goal of achieving CO₂-neutral production by 2030. We have already achieved a 24% reduction by last year. In addition, we launched our Operations Sustainability Program for our semiconductor manufacturing sites in 2023, with the goal of reducing energy consumption and emissions at our own semiconductor sites by 20% each year by 2028 through efficiency measures and converting 100 % of our power supply to renewable energy.

Are there particular challenges in areas such as supply chain, materials, or innovation that you find most pressing, and how are you addressing them?

The biggest challenge at the moment is the hampered demand in many areas due to the weak global economic development. Like many competitors in the industry, we are currently experiencing some headwinds. But overall, we are confident that success is in our own hands.

ams OSRAM is a fantastic company with immense technical expertise, many long-standing customer relationships – and a lot of great people. ams OSRAM is globally positioned, in research and development, production, sales and with customers.

In particular, the combination of light and sensor capabilities of our business units presents a wealth of opportunities. We are active in a range of business areas that are benefitting from the megatrend towards increasingly digitalized, smart and energy-efficient applications. In the automotive area, electrification, autonomous driving and even – as sometimes required by regulators – driver monitoring have resulted in increased demand per vehicle for our products. In healthcare, we benefit from the demand of an aging population for affordable digital solutions. In addition, the trend towards increasingly autonomous machines, whether factory robots or robot vacuum cleaners, means the demand for efficient LED and sensor solutions is constantly growing. Our lighting and sensors make people's lives better, safer and more comfortable. There are exciting products and forward-looking ideas, as well as an increased demand for them.

PIONEERING THE DIGITAL
FRONTIER:

A Q&A WITH ROBIN NG, GROUP CEO OF ASMPT

What is ASMPT's vision for the future of the semiconductor industry, and how do you plan to drive advancements within the sector?

Our vision, encapsulated in the ASMPT brand, is simple yet powerful: “enabling the digital world.” The modern world, and even more so for future generations, is built on the tiny electronic miracles—microchips—that power every aspect of our lives. As a global leader in integrated solutions for semiconductor and electronics manufacturing, we play a pivotal role in enabling this digital world. We help a diverse range of innovative customers, from OEMs to foundries, overcome their greatest technological and process challenges.



Our strength lies in being a trusted partner, offering an unmatched portfolio of solutions for every major step in electronics manufacturing. No other company can match the breadth and depth of ASMPT's process expertise, which, combined with our reputation for customer-centricity, positions us to help advance the industry by ensuring our customers succeed.

What are the key innovations ASMPT is currently focusing on, and how do these address the industry's current needs and future demands?

Our customers face numerous challenges, from competition and cost pressures to the demand for ever-greater precision and quality in manufacturing. As technology advances and devices become more complex, ASMPT stands out as the only company providing integrated SEMI and SMT solutions to enable the intelligent factories of the future.

Our SEMI segment covers a wide range of processes, from bonding to molding, with high precision and quality being essential. In the SMT segment, we handle everything from the tiniest wearables to large industrial equipment, with a focus on speed and efficiency. What truly sets us apart is our ability to integrate equipment and software, offering high-quality, end-to-end solutions for semiconductor and electronics manufacturing. This is where we truly differentiate ourselves in the market.

As a leader, what strategies do you prioritize to keep ASMPT at the forefront of technological advancements, and how do you foster a culture of innovation?

Prioritizing R&D is key to helping our customers succeed. We work closely with them to understand their needs and develop solutions that bring their product ideas to life. This deep customer partnership drives our continuous investment in R&D, enabling us to provide industry-shaping solutions that enhance productivity, reliability, and quality.

Our strategy also involves increasing software integration into our solutions, which directly benefits customers by improving efficiency, flexibility, and innovation. This approach helps drive the transition to the Intelligent Factory of the future, where seamless data flow across machines, lines, factories, and enterprises enhances efficiency and resilience.

How has your leadership approach adapted to the unique challenges in the semiconductor industry, and what qualities do you believe are essential for leadership?

My leadership approach is guided by the principles of Collaboration, Consultation, and open Communication—what I call the ‘3 Cs’. These principles were particularly crucial when I took on the role of Group CEO in 2020, right at the onset of the COVID-19 pandemic. Leading ASMPT through such a challenging time required tapping into the collective expertise of our talented team and shaping a clear Group Strategy.

I also emphasize the importance of adopting a ‘Beginner’s Mind,’ which means being humble, open, and willing to learn from every encounter. This mindset helps us work together as a team to make ASMPT a company where the whole is greater than the sum of its parts.

How is ASMPT addressing the growing emphasis on sustainability in semiconductor manufacturing?

ASMPT is committed to being a sustainable business that actively manages its environmental and societal impacts while adhering to strong governance practices. As an ESG leader in our industry and a founding member of the global Semiconductor Climate Consortium, we aim to achieve zero carbon emissions for Scope 1 & 2 by 2035 and are actively working on a Scope 3 roadmap.

Our continuous investment in R&D is crucial for providing cost-effective, high-productivity solutions that also contribute to a sustainable future. We believe that by helping our customers succeed, we are also shaping a brighter, more sustainable future for everyone.

What role does innovation play in ensuring the delivery of reliable, high-performance tools across the semiconductor manufacturing spectrum?

Innovation is at the heart of delivering reliable, high-performance tools. Our innovation is customer-centric, driven by close collaboration with our clients to develop tailored solutions that address specific challenges and deliver consistent, high-quality results. We also lead in pioneering new technologies, integrating AI, machine learning, and smart automation into our tools to enhance performance, reliability, and efficiency.

Significant investment in R&D ensures that our tools remain at the cutting edge of technology, meeting the evolving demands of the semiconductor industry. Our commitment to innovation is matched by rigorous testing and quality assurance, ensuring that every tool we deliver is reliable, durable, and capable of high-performance operation under demanding conditions.

How does ASMPT collaborate with other stakeholders in the semiconductor ecosystem, and why are partnerships essential?

Collaboration is vital for sustaining our market leadership and driving innovation. A recent example is our extended collaboration with IBM to develop the next generation of chiplet packaging technologies. By advancing thermocompression and hybrid bonding technology, we are helping to move chiplets from research to mass production more efficiently.

Partnerships like this are catalysts for innovation and growth, enabling us to stay competitive and broaden our global footprint. They also amplify our industry influence, allowing us to help shape industry standards and policies. Through collaboration, we continue to push the boundaries of what’s possible in semiconductor manufacturing.

What advice would you give to emerging companies in the semiconductor space looking to innovate and make an impact?

My advice is to actively tap into the collective expertise of your team and always be willing to listen. Surround yourself with capable people who know more than you in many areas and who aren’t afraid to challenge you. Adopt a beginner’s mind, seeing every encounter as an opportunity to learn, and be ready to recognize and seize opportunities before anyone else does.

ASMPT enabling the digital world

SHAPING TOMORROW:

DAVID FERGUSON'S BLUEPRINT FOR AMD'S SEMICONDUCTOR LEADERSHIP



David Ferguson, Corporate Vice President and Country Lead for Singapore, AMD

Can you share a bit about your company's vision for the future of the semiconductor industry?

At AMD, we are here to push the limits of innovation as the leader in high-performance and adaptive computing. As AI transforms every aspect of our lives, AMD is uniquely positioned to deliver leadership computing solutions to enable that transformation and tackle some of the world's toughest challenges with our partners.

What are the key innovations your company is currently focusing on in semiconductor technology?

We see AI as more than just an interesting and powerful new technology; it is the single most important innovation of the last 50 years. In response, we have built strong multi-year hardware and software roadmaps – including our Instinct™ accelerators, and Ryzen™ AI processors – as we deliver leadership AI solutions across our portfolio.

As a leader in the semiconductor industry, what strategies do you prioritize to ensure your company remains at the forefront of technological advancements?

We have a mindset of continuous improvement and challenging the status quo, encouraging rapid-prototyping and refining. When challenges or opportunities present themselves, people are encouraged to use novel approaches and see if the method is patentable. We incentivize new approaches and ideas with invention awards and technical showcases.

Can you describe how your leadership approach has adapted to the unique challenges and opportunities within the semiconductor industry?

As kids when going skiing, my father used to say that if you do not fall at least once a day, you are not trying hard enough. I take a similar approach in our industry, it is moving so quickly that we need to be appropriately aggressive, take calculated risks and trust our colleagues and partners will jump in to help when needed.

What recent technological advancements or innovations has your company developed that you believe will significantly impact the semiconductor industry?

Our latest Ryzen™ AI 300 Series mobile processors redefined laptop computing at launch during Computex. With a dedicated AI engine built on new AMD XDNA 2 architecture, the Ryzen AI series offers 50 TOPS of AI processing power, surpassing Copilot+ AI PC requirements, with three times the AI engine performance of the second generation of AMD Ryzen AI.

How is your company addressing the growing emphasis on sustainability in semiconductor manufacturing?

In 2021, we announced our vision to deliver a 30x energy efficiency improvement by 2025 from a 2020 baseline for accelerated data center compute nodes. Built with AMD EPYC™ CPUs and AMD Instinct™ accelerators, these nodes are designed for some of the world's fastest-growing computing needs in AI training and high-performance computing (HPC) applications. With the latest performance data, we have achieved a 13.5x improvement from the 2020 baseline.

What do you see as the biggest challenges facing the semiconductor industry today, and how is your company positioned to tackle them?

As with many new emerging technologies, AI presents risks and challenges pertaining to its adoption and regulation due to external factors during nascency that we are naturally subjected to. However, we are making the benefits of AI pervasive by enabling customers to tackle AI deployment with ease, as well as delivering solutions that scale across a wide range of applications.

How do you foresee the semiconductor industry evolving over the next 5 to 10 years?

With the explosion of AI technology and its adoption, we can expect companies to start massive investments in computing infrastructure to enable the widespread deployment of training and inference capabilities. However, to accommodate these burgeoning needs, we can expect to see greater customisation and tailoring for individual use cases.

In what ways is your company collaborating with other stakeholders in the semiconductor ecosystem?

AMD actively collaborates with a wide range of software and hardware partners to build a robust ecosystem designed for our solutions. These include:

Hardware Manufacturers, including Cisco, Dell Technologies, Hewlett Packard Enterprise, Lenovo and Supermicro, that are continually integrating the latest AMD technologies to drive ever-better system performance and efficiency.

More than 150 leading-edge software vendors to optimise application performance, enabling outstanding customer experiences. (e.g. Hugging Face, VMware, Splunk)

Operating System Vendors such as Microsoft, Red Hat and Nutanix, that develop fully optimised, compatible solutions that empower customers to take advantage of AMD processors.

Can you highlight any recent partnerships or collaborations that have been particularly successful?

Following our acquisition of Xilinx in 2022, we recently

launched AMD Embedded+, a new architectural solution that combines AMD Ryzen™ Embedded processors with Versal™ adaptive SoCs onto a single integrated board to deliver scalable and power-efficient solutions that accelerate time-to-market for original design manufacturer partners

What exciting projects or initiatives is your company currently working on that you believe will shape the future of the semiconductor industry?

Semiconductors are going to be pervasively used in all categories of AI applications, and AMD has been participating in many of these applications for more than 10 years. For example, when your car gives a warning, it is an advanced driver assist system (ADAS) that is possibly an AMD chip. These applications are only going to continue to become more advanced, more pervasive and we have many products in development that will be very involved in this very exciting future.

As we look to the future, what are the key milestones or achievements you hope your company will reach in the next few years?

AMD is continuing to lead the fab-less model in being a highly collaborative manufacturing partner. This proven successful model will continue as we invest in delivering full solutions to our end customers and working very closely with our suppliers and manufacturing partners to deliver the highest quality solutions with the most advanced technologies.

What advice would you give to emerging companies in the semiconductor space looking to innovate and make an impact?

I'd like to quote a leader who was very impactful in the industry when we had some modest success, and the business was growing, they said "now more than ever, we need to stay focused, stay hungry and stay humble."

Is there anything else you would like to share about your company's journey, innovations, or vision for the future of the semiconductor industry?

AMD, together with our suppliers and partners, drives the most advanced process and packaging technologies and this will continue for many years to come. We also work to provide better thermal solutions, lower cost, higher performance while driving down total power per TOPS and continuing to innovate while solving the world's most important challenges.



SHAPING THE FUTURE:

A VISIONARY CONVERSATION WITH TAN YEW KONG

SENIOR VICE PRESIDENT AND GENERAL
MANAGER, GLOBALFOUNDRIES SINGAPORE



Can you share a bit about your company's vision for the future of the semiconductor industry?

GlobalFoundries (GF) produces essential, feature-rich semiconductor chips for billions of devices across various end-markets, including mobile devices, automotive, and IoT. Our essential chips meet 80% of market demand. We shape what's essential.

We're witnessing a confluence of megatrends—5G, IoT, AI, and the rise of EVs—driving unprecedented demand for semiconductors. GF's global manufacturing footprint across three continents, together with our dedication and innovation in delivering differentiated technologies, allows us to meet our customers' evolving demands for chips in a high-volume-high-mix environment.

What are the key innovations your company is currently focusing on, and how do they address the current needs and future demands of the industry?

GF's fabrication plants leverage advanced manufacturing processes, delivering feature-rich technologies on time and at competitive costs. We're focusing on Digital Manufacturing, using Industry 4.0 solutions such as AI and Machine Learning to enhance production efficiency and reduce tool downtime. We are also expanding the use of additive manufacturing solutions to reduce particle generation and extend our tool lifetimes with 3D printed parts that meet our stringent quality requirements.

Sustainability is crucial. Our R&D focuses on process innovation to reduce power consumption and improve energy efficiency, contributing to lower greenhouse gas emissions across various markets. We're also committed to reducing our carbon footprint as we grow our business.

Ultimately, innovation in our industry is no longer about just shrinking transistor size. GF remains focused on how we can add more features and capabilities on the essential chips we make for our customers at the best economics.

As a leader in the semiconductor industry, what strategies do you prioritize to ensure your company remains at the forefront of technological advancements?

Building a culture of continuous learning is essential. As our customers' needs evolve in tandem with advancements in key megatrends such as AI, IoT, 5G and EVs, we need to prioritize upskilling and reskilling for our teams to stay ahead of the curve. Modernizing job roles with I4.0 solutions is now a necessity to attract young talents.

GF collaborates with multiple industry and research players like EDB, IME and local educational institutions. With a rigorous talent development framework, we offer scholarships, work-study programs, internships and learning opportunities to grow our talent pipeline. We also emphasize developing soft skills, such as unconscious bias training, to empower our workforce to drive innovation.

How has your leadership approach adapted to the unique challenges and opportunities within the semiconductor industry?

With nearly three decades in the industry, my approach is anchored on continuous learning, forward thinking, and adaptability. In a fast-moving sector, comfort with uncertainty and bold decision-making are vital. For example, GF chose to expand our operations during the pandemic when others hesitated, this had allowed us to continue providing our customers with supply chain resiliency.

Leaders must lead by example—lifelong learning and embracing new challenges keep us ahead in this dynamic industry.

How is your company addressing the growing emphasis on sustainability in semiconductor manufacturing?

GF is committed to achieving zero carbon across our global footprint, aligned with Singapore's Green Plan 2030. Our Singapore Expansion facility earned Green Mark Gold certification, equipped with advanced technologies to boost energy efficiency. This includes water recycling systems where we will achieve a 55% recycling rate when fully ramped up, next-generation abatement systems, and increased electrification. We believe that investing in the necessary infrastructure now will deliver long-term returns on environmental performance.

What do you see as the biggest challenges facing the semiconductor industry today, and how is your company positioned to tackle them?

Global macroeconomic and geopolitical developments challenge our industry. Ensuring supply chain resilience is crucial. GF's strong global manufacturing footprint and dual-qualified products across multiple locations provide the geographic diversification and supply chain security our customers need.

How do you foresee the semiconductor industry evolving over the next 5 to 10 years? What role do you envision your company playing in shaping the future of the industry?

The semiconductor industry is on a trajectory to double in revenue to US\$1 trillion in the next decade. GF plays a critical role in producing the essential chips needed for smarter devices, AI at the edge, and the electrification of vehicles which are key factors catalyzing our industry's growth.

With few pure-play semiconductor foundries like GF in the market today, we're uniquely positioned to offer supply chain resiliency and meet stringent production standards, especially in the automotive sector.

In what ways is your company collaborating with other stakeholders in the semiconductor ecosystem?

Partnerships are essential for innovation. GF collaborates with EDB, SSIA, and local SMEs to nurture talent and drive industry advancements. Our partnerships with local research institutions and universities ensure we remain at the forefront of R&D and talent development.

Our efforts also extend to inspiring future semiconductor talent through outreach programs, building a strong talent pipeline to fuel the growth of our ecosystem.





A Conversation on Innovation, Sustainability, and Strategic Leadership with Ng How Hua, Vice President of Operations at STATS ChipPAC

I'm Ng How Hua, Vice President of Operation, at STATS ChipPAC. This is one of the largest OSAT company in the world offering advanced packaging. My key focus is on providing high-quality services and solution to customers' needs, in Wafer Level Bumping, Advanced Packaging & Assembly via Lean manufacturing.

My professional journey began in the foundry industry with Chartered Semiconductor Manufacturing, where I built my core on Lithography operation, Metrology and Fab Automation. I had spent more than 25 years in the wafer fabrication field, with Chartered Semiconductor (onward to GlobalFoundries in 2009) and later Skyworks Filter Solutions. In Skyworks, I was the Quality Director overseeing both Japan and Singapore production quality standards. Throughout my career, I have keenly undertaken many new challenges and opportunities for growth.

My Take on Innovation Drivers

STATS ChipPAC Singapore (SCS) is undergoing smart factory transformation encompassing digitalization, factory automation and Lean manufacturing. A case in point is our constant drive to streamline and automate existing workflows to enhance efficiency and utilization, leading to reduced costs. Implementation of the AMR (Autonomous Mobile Robot) and customized wafer handling system has significantly reduced human intervention during the entire manufacturing process, synchronized with RMS (Recipe Management System) and higher execution in our manufacturing systems. We also capitalize on data analytics to drive decision-making and gain insights into material, equipment and process behaviours.

Our primary purpose in innovation is to exceed customer requirements and expectations. Collaboration with local and international partners allows us to provide better solutions to our customers. Such partnerships help develop innovative and tailored approaches that address specific customer needs, in tangent with our motto to offer a one-stop solution for a seamless customer experience.

Advanced packaging has become synonymous to Artificial Intelligence (AI), which has started to gain traction in most markets. A key area SCS is working on is on Heterogenous Integration (HI) - interconnection and assembly of chiplets, dies or components with specific functions (IP) using our FOWLP (Fan-out Wafer Level Package) architecture. We are also working with major customers on SiPho (Si Photonic Packaging) and OE (Optical Engine) for Network and Data Centers.

My Leadership Perspective: Creating a Thriving Environment

To excel, we must create a safe and nurturing environment for our staff to speak out, challenge the status quo, think out-of-the-box, and engage in diverse interactions and 2-way communication. I actively promote cross-functional teamwork, collaboration, and encourage my people to leverage on diverse skillsets to not only resolve issues, but to predict before they happen.

The semiconductor industry is very dynamic, and as leaders we must adapt and evolve. Collaboration and innovation are crucial success factors. We must have a deep understanding of both the technical landscape and emerging trends to move our people forward. Additionally, the ability to inspire and motivate teams will be key to achieving goals. Ultimately, the most effective leaders will be those who can navigate complexity while empowering others to drive impactful change.

Sustainability in Semiconductor Manufacturing

We are deeply committed to minimizing our carbon footprint. Our team continuously explores innovative solutions to go green, reduce waste and conserve resources. We strive to implement energy-efficient technologies throughout our operations. Sustainability is a core value that guides our advancements in semiconductor technology. Together, we are building a future where technological progress move hand in hand with environmental responsi-

bility. Our efforts include recycling, energy saving and chemical usage/wastage reduction. It is also economically viable, by driving usage reduction projects which seek to further lower our cost of operations.

Key Challenges & Opportunities

The current geopolitical situation has presented both challenges and opportunities in the industry. We have long realised the need for a supply chain solution to minimize the impact of any disruption. As a leading OSAT offering comprehensive Turnkey solutions for our core offerings - eWLB/Bump/WLCSP/FCQFN/Test, it is vital to develop strong partnerships not only with our customers, but also with OEMs and material suppliers, and diversify where feasible.

The strong growth in AI and cloud-based storage has imposed high demands for OSATs to be ready with advanced packaging solutions. To be at the forefront, STATS ChipPAC is working closely with our stakeholders to develop 2.5D and 3D packaging solutions for AI, Silicon Photonics, HPC and Vehicle electrification applications to support the growing market. With our strong manufacturing experience and backed by solid support from our stakeholders, I have the highest confidence that we can make this new technology a reality.

In the semiconductor ecosystem, we foresee that within the next 5 to 10 years many companies will be diversifying supply chains and increasing domestic production capabilities in response to recent disruptions. There will be high investment in semiconductor fabs and related infrastructure to reduce reliance on geopolitical hotspots. There is a growing pressure and effort to minimize energy consumption, use of eco-friendly materials, and develop recycling processes for all forms of waste, emphasis on sustainability, and a focus on reducing the environmental impact of semiconductor manufacturing.

We will continue investing in R&D, capitalizing on Singapore's semiconductor ecosystem, developing local talents through tertiary institutions and partnering with stakeholders to acquire new skill sets in advanced packaging, and continue driving innovation and growth. Together with our partners, we will continue to provide and exceed customer satisfaction.

Closing Thoughts on the Semiconductor Landscape

Today's semiconductor landscape is rapidly evolving, driven mainly by technological advances, geopolitical factors, and shifting market dynamics. Shaping of the landscape depends on these factors:

- 1. Supply Chain Resilience:** there are significant implications for semiconductor supply chain disruptions. Countries are increasingly prioritizing domestic chip manufacturing capabilities to improve their supply chain resilience. Singapore offers the ideal geographical position and STATS ChipPAC is well positioned to serve our customers' needs.
- 2. AI and High-Performance Computing (HPC):** The explosion of AI, particularly generative AI models, is driving demand for specialized chips like GPUs, TPUs, and custom AI accelerators. The ongoing race for AI leadership is pushing semiconductor companies to innovate faster, focusing on performance, efficiency, and energy consumption. SCS is focused to capitalize on such opportunities with our 2.5D development.
- 3. Automotive and IoT Growth:** The automotive sector's shift towards electric and autonomous vehicles, combined with the growth of the Internet of Things (IoT), presents a significant market for semiconductors. Automotive chips are in high demand, pushing the need for reliability and safety standards.
- 4. Emerging Technologies and Quantum Computing:** Quantum computing, while still in its early stages, holds promise for solving problems beyond classical computing's reach. Similarly, neuromorphic computing and other non-traditional architectures are being explored for specialized applications. SCS is keenly monitoring developments in this exciting field.

STATS ChipPAC's future in the semiconductor industry lies in a combination of technological advancement, supply chain resilience, and strategic market alignment. By focusing on advanced packaging, expanding automation, targeting high-growth sectors and remaining agile, we will continue to play a vital role in the semiconductor ecosystem amidst the evolving industry dynamics.

STATSChipPAC

CELEBRATING SILICON LABS INTERNATIONAL'S 20TH ANNIVERSARY IN A Q&A WITH JENNIFER TEONG

Silicon Labs International (SLI) is celebrating its 20th anniversary this year, please tell us more background and history of SLI. What are/were the key milestones of SLI?

SLI was founded as an international headquarters in 2004 that would centralize our manufacturing activities and build partnerships with manufacturers in the APAC region. In 2007, we added a research and development (R&D) function and continued to expand key operations from our headquarters. Today, we have over 200 employees. Key achievements include:

- Expanding of our capabilities to include Failure Analysis and Reliability Lab
- Implementing advanced manufacturing systems to improve forecasting, analysis, and reporting
- Forming the best-in-class engineering teams for both R&D and manufacturing

Please describe the current company culture and how the company culture has evolved over the years.

Over the years, our company has grown to embody strong values, with integrity at the core. We prioritize transparency, accountability, and long-term sustainability. We have fostered a welcoming environment of mutual respect and inclusivity, valuing everyone's contributions. As a leader, I emphasize listening to feedback, keeping an open-door policy to encourage honest communication and continuous improvement.

What are the roles in SLI? As the overseas headquarter, how do you manage the cultural differences of various offices from the world?

Managing cultural differences across countries is challenging and requires time, understanding, and respect for each country's business practices, communication styles, and norms. We have faced obstacles, but we are committed to learning and positively engaging with our regional partners.

Cross-country collaborations are now common, with employees working with overseas colleagues and sharing valuable insights upon returning. We also host senior leaders annually (excluding pandemic years) to align teams with our mission and reinforce our CEO's emphasis on unity.





Even after 20 years, we continue to evolve our cultural understanding, supported by global DEI initiatives that offer cultural awareness training.

Please tell us the current employee status of SLI – which business functions does SLI have in Singapore? Also, what's the growth plan in SLI in Singapore?

We now have over 200 employees. Our Singapore office covers Design, Validation, Production Planning, Product Development and Testing, Foundry Operations, Supply Chain Management, Logistics Management, Manufacturing Systems Management, and Sales, as well as IT, Finance, and HR.

We aim to increase our headcount each year through organic growth. Additionally, we collaborate with local universities to offer internships and develop the next generation of talent.

Some technologies like AI and IoT are reshaping our economies, so what are the mega changes happening in Asian semiconductor industry? How do you see the company adapting to industry changes and trends?

AI and IoT are transforming economies by boosting productivity and decision-making, driving demand for smaller, high-performance chips in Asia's semiconductor hub. Manufacturers are upgrading technologies and capacities to meet this demand.

With IoT devices projected to reach nearly 30 billion by 2030, there's a growing need for advanced chips that support various protocols, offer high computational power, more memory, better security, and lower energy consumption. This will drive development at smaller process nodes. Sustainability is also influencing product design and manufacturing, pushing factories toward eco-friendly methods and greener supply chains.

Asia's semiconductor industry is rapidly advancing due to AI, IoT, and sustainability trends. To adapt, our key focus includes:

- Supply Chain Diversification: Maintaining a flexible supply chain to adapt to geopolitical changes and disruptions.
- Talent Retention and Development: Attracting and investing in top talent locally and globally, while collaborating with the government to support career development in semiconductors.
- Digital Transformation: Leveraging software platforms and requiring us to re-engineer operations and strengthen partnerships across the value chain.



NAVIGATING THE FUTURE OF
SEMICONDUCTORS:

INSIGHTS FROM KAH HEONG, DIRECTOR OF OPERATIONS AT SKYWORKS SINGAPORE



Can you share a bit about your company's vision for the future of the semiconductor industry?

At Skyworks, our vision is to "Connect Everyone and Everything, All the Time." We are dedicated to leading this transformation by enhancing the way people and devices interact in an increasingly connected world. Our focus is on laying the groundwork for smart cities, connected vehicles, and next-generation consumer devices.

What are the key innovations your company is currently focusing on in semiconductor technology?

We are currently concentrating on state-of-the-art RF front-end modules and high-efficiency power amplifiers. These innovations are essential for meeting the rising demand for faster, more reliable communication, especially as they amplify signals for broader broadcasting in applications like radio and television.

What strategies do you prioritize to ensure your company remains at the forefront of technological advancements?

To stay ahead, we emphasize strategies that foster both technological innovation and organizational excellence. By referencing Patrick Lencioni's model of organizational health, we focus on building a cohesive team where trust, accountability, and open communication are key.

How has your leadership approach adapted to the unique challenges and opportunities within the semiconductor industry?

Our leadership has evolved to meet the industry's challenges through customization and proactive problem-solving. We stay ahead of trends by adopting agile methodologies and maintaining strategic foresight, which allows us to respond effectively to emerging opportunities.

What recent technological advancements or innovations has your company developed that you believe will significantly impact the semiconductor industry?

Our recent developments, such as high-performance RF front-end modules, are enhancing 5G networks by providing faster data speeds and improved reliability. These modules are integral to ensuring uninterrupted and

high-quality communication – in fact, our RF solutions are being used in next-generation smartphones and other devices, improving their performance, and enabling consistent connectivity.

How is your company addressing the growing emphasis on sustainability in semiconductor manufacturing?

Skyworks is committed to sustainability by implementing environmental practices aimed at minimizing our impact. We are part of the Responsible Business Alliance (RBA®), working closely with customers, suppliers, and competitors to ensure industry-wide sustainability.

What are the biggest challenges facing the semiconductor industry today, and how is your company positioned to tackle them?

The industry faces challenges such as supply chain disruptions, rising material costs, and the need for continuous innovation. We address these by diversifying our supplier base, investing in supply chain resilience, and exploring alternative materials and processes to maintain consistent product quality and availability.

How do you foresee the semiconductor industry evolving over the next 5 to 10 years?

Over the next decade, we expect the industry to integrate advanced technologies like AI and IoT while increasing its focus on sustainability. Skyworks aims to be at the forefront of these developments, driving progress and supporting more efficient manufacturing practices.

What exciting projects or initiatives is your company currently working on that will shape the future of the semiconductor industry?

One key initiative is the development of advanced semiconductor solutions for automotive applications, particularly in electrification and connected vehicle technologies. These efforts align with our long-term goal of leading in high-performance semiconductor solutions across various markets.

As we look to the future, what are the key milestones or achievements you hope your company will reach in the next few years?

In the coming years, we aim to achieve key milestones, such as the successful deployment of our new RF solutions and the expansion of our product offerings into emerging markets. Our efforts are set to drive always-on connectivity. We are dedicated to shaping the future of the semiconductor sector and meeting the demands of a connected world.

In what ways is your company collaborating with other stakeholders in the semiconductor ecosystem?

Skyworks thrives on collaboration, working closely with technology companies, research institutions, and industry organizations. These partnerships are vital for fostering innovation and addressing industry challenges.

Can you highlight any recent partnerships or collaborations that have been particularly successful?

A standout collaboration is our work with major technology firms to enhance 5G infrastructure. By integrating our advanced RF components, we have significantly boosted network performance and connectivity.

What advice would you give to emerging companies in the semiconductor space looking to innovate and make an impact?

My advice is to focus on innovation, form strategic partnerships, and deeply understand market needs. Success in the semiconductor industry requires a blend of technical expertise, strategic vision, and a commitment to continuous learning.

Skyworks is committed to advancing the semiconductor industry through technological excellence, strategic growth, and a forward-thinking mindset. Our journey reflects a dedication to innovation that will continue to shape the future of connectivity and performance in the years to come.



INTERVIEW WITH

HIDEKI ITO

Executive Management,
President, Tokyo Electron Singapore Pte. Ltd.

Can you share a bit about your company's vision for the future of the semiconductor industry? How do you see your company driving advancements and growth within the sector?

Our vision is to be "a company filled with dreams and vitality that contributes to technological innovation in semiconductors." We are dedicated to contributing to the development of a dream-inspiring society through our leading-edge technologies, as well as our reliable service and support. This mission is deeply embedded in the DNA of Tokyo Electron and all our employees. We continuously challenge ourselves to improve our products, enhance our customer support, and ultimately make a positive impact on the world.

At Tokyo Electron Singapore, we also firmly believe in a 'Digital x Green' world, which represents the synergistic coexistence of digitalization and decarbonization to preserve our global environment. Our goal is not only to increase the capacity, speed, and reliability of semiconductors but also to minimize their environmental impact by reducing power consumption.



What are the key innovations your company is currently focusing on in semiconductor technology? How do these innovations address the current needs and future demands of the industry?

Tokyo Electron (TEL) is unique as the only semiconductor production equipment manufacturer with a product lineup that covers four sequential patterning processes: deposition, coater/developer, etch, and cleaning. We also lead the market in several product categories, including coater/developer, furnaces, batch deposition, cleaning, and plasma etch. This comprehensive product lineup provides us with valuable insights into optimizing upstream and downstream processes, leading to significant defect and yield improvements for our customers.

We have consistently invested heavily in R&D and will continue to do so. TEL currently holds the most patents in the semiconductor equipment industry for fiscal 2024, and we plan to invest over 1.5 trillion yen from FY2025 to FY2029. Future semiconductors will require even larger capacity, higher speed, greater reliability, and lower power consumption, making it critical for us to develop advanced next-generation R&D capabilities to deliver production equipment with higher added value and competitiveness in a timely manner.

As a leader in the semiconductor industry, what strategies do you prioritize to ensure your company remains at the forefront of technological advancements? How do you cultivate a culture of innovation within your organization, particularly in semiconductor R&D?

Given the broad spectrum and rapid pace of technological advancements, we strongly believe in the importance of leading-edge R&D through collaboration. Focusing on our main development sites in Japan, we foster innovations through close partnerships with consortiums, academia, and partners across various international locations, including the US, Europe, and Asia. Additionally, TEL Venture Capital invests in innovative technologies that align with Tokyo Electron's goals, supporting portfolio companies in developing new technologies and creating new business paradigms for both companies.

Can you describe how your leadership approach has adapted to the unique challenges and opportunities within the semiconductor industry? What leadership qualities do you believe are most essential for driving technological breakthroughs in this sector?

The semiconductor industry has transitioned from a cyclical boom/bust trend to a more stable growth trajectory, driven largely by the irreversible shift toward digitalization. Despite geopolitical factors, one constant remains: the effective harnessing, attraction, and retention of talent. Our employees are our most important asset at Tokyo Electron, and we prioritize their well-being and development.

Our approach is three-pronged:

Adherence to first principles – Safety, employee well-being, and quality are non-negotiable. We ensure that all work is performed with safety and quality taking precedence over cost and time considerations. Our employees know they can pause and seek clarification if these elements might be compromised.

Flexibility and Inclusivity – We promote an environment where ideas and diverse viewpoints can flow freely. This not only facilitates innovation but also empowers employees to know their feedback is taken seriously. For example, we were among the first in the industry in Singapore/SEA to adopt a hybrid on-site/remote working model during the early days of the COVID pandemic, and we've maintained this model based on employee feedback.

Unity – By adhering to these principles and fostering an inclusive and vibrant environment, we enable our team to confidently and effectively tackle unique and difficult challenges together.

How is your company addressing the growing emphasis on sustainability in semiconductor manufacturing? What initiatives or technologies are you implementing to reduce environmental impact while advancing semiconductor technology?

We are fully committed to achieving net zero emissions for scope 1, 2, and 3 by 2040. We've formed specialized

committees to promote, coordinate, and track our various sustainability initiatives. These include regular workshops where employees from different fields come together to discuss and align on achieving the Sustainable Development Goals (SDGs) adopted by the United Nations.

We also participate in global initiatives like the United Nations Global Compact (UNGC) and the Responsible Business Alliance (RBA), working with our suppliers to ensure compliance with the RBA code of conduct. Our commitment to sustainability has been recognized through inclusion in leading global ESG indices, such as the DJSI Asia/Pacific Index, FTSE4Good Index, MSCI ESG Leaders Indexes, Euronext Vigeo World 120 Index, and STOXX Global ESG Leaders indices. In FY23, we were also selected for the Bloomberg Gender-Equality Index (GEI) and evaluated as a low-risk company in Sustainalytics' ESG Risk Ratings. Additionally, we were recognized as an 'All Star' under the 2023 All-Japan Executive Team.

How do you foresee the semiconductor industry evolving over the next 5 to 10 years? What role do you envision your company playing in shaping the future of the industry?

The semiconductor industry's growth story in the coming years cannot be overstated, especially with the evolution of generative AI. Semiconductors are becoming increasingly integral components in our future, and the market is expected to reach US\$1 trillion by 2030, with continued growth in the decades to follow.

As the industry evolves, it is imperative for us to accelerate technological innovation and enhance TEL's product offerings to achieve sustainable and market-leading positions. We will continue to collaborate with our partners to develop differentiated solutions, ensuring that TEL remains a key player in shaping the future of the semiconductor industry.



Q&A WITH

RENÉ JONKER

EVP & GM, Edge and Cloud AI Division, Soitec



Can you explain how Edge AI and Cloud AI influence the demand for Soitec's products?

Both Edge AI and Cloud AI significantly drive demand for Soitec's products. Edge AI, in particular, requires highly efficient, low-power semiconductor solutions capable of performing complex computations locally. On the other hand, Cloud AI focuses on high-speed, scalable solutions for large data centers that also prioritize low power consumption. Soitec addresses these distinct needs through our innovations in semiconductor materials, offering substrates that enhance performance, reduce power consumption, and enable the creation of advanced semiconductor devices.

How is Soitec adapting its semiconductor technology to support the rise of Edge AI?

Soitec is continually enhancing its semiconductor materials, with a strong focus on innovations in Fully-Depleted Silicon-On-Insulator (FD-SOI) technology. FD-SOI substrates are crucial for Edge AI applications because they deliver superior performance and power efficiency. This is particularly important for edge devices, which require substantial processing power while being limited by size and battery life. By advancing our SOI wafers, Soitec ensures that the chips used in Edge AI applications can operate more efficiently, resulting in faster processing and reduced energy consumption.

What role does Cloud AI play in Soitec's strategic plans?

Cloud AI is a major driver of demand, especially for high-speed data center interconnect (DCI) solutions. Soitec is focusing on developing Photonics-SOI technology to meet the specific needs of DCI, which is integral to Cloud AI.

High-speed DCI demands robust thermal management and efficient power usage, and Soitec's Photonics-SOI substrates are designed to meet these requirements. By aligning our technology with the needs of Cloud AI, we aim to support the expansion of cloud infrastructure and address the growing demands for AI-driven DCI solutions.

What are the key technological advancements Soitec is making to support AI applications?

Soitec is investing in several key technological advancements, including the development of Photonics Lithium Niobate On-Insulator (LNOI) substrates that can achieve very high-speed modulation of optical signals, making them ideal for Cloud AI and data center applications. Additionally, we are exploring new generations of FD-SOI to support higher frequencies and lower power consumption, which are critical for Edge AI, 6G and wifi applications.

What are the strategic advantages Soitec enjoys with its footprint in Singapore?

Soitec established its first plant in Pasir Ris, Singapore, in 2008, and we are now expanding our facility in Pasir Ris Wafer Fab Park, which will double our wafer production capacity in Singapore to 2 million units per year. This expansion reflects our strong confidence in Singapore and our long-term commitment to building our presence here and across the region. Singapore's proximity to key Asian markets, its robust infrastructure, vibrant research and development ecosystem, and access to a highly skilled talent pool are all strategic advantages that have contributed to our success. Currently, we produce FD-SOI, among other products, in our Pasir Ris fab, and we are also preparing to begin production of Photonics-SOI at the same facility.



MICRON'S VISION FOR INNOVATION AND GROWTH IN SINGAPORE'S SEMICONDUCTOR INDUSTRY



Chen Kok Sing, Corporate Vice President and Singapore Country Manager at Micron

In an ever-evolving semiconductor landscape, Chen Kok Sing, Corporate Vice President and Singapore Country Manager at Micron, provides insight into the industry's future. He also discusses how Micron is shaping the future through innovation, sustainability, and strategic partnerships.

Can you share a bit about your company's vision for the future of the semiconductor industry and the key innovations?

Micron is a global leader in innovative memory solutions that transform how the world uses information. For over 45 years, Micron has been instrumental to the world's most significant technology advancements, delivering optimal memory and storage systems for a broad range of applications. Our NAND Center of Excellence in Singapore produces the world's first 232-layer 3D NAND and ninth-generation (G9) NAND, ideal for data-intensive and demanding storage applications including client, mobile, intelligent edge and data center. With the rapid adoption of AI, the demand for advanced memory storage solutions is growing and Micron is ready to take advantage of this growing market. Beyond technology innovation, Micron as one of the biggest employers in Singapore with a 9,000 workforce, is committed to bringing positive changes in Singapore together with our ecosystem partners, and implementing initiatives centered on technology advancement, environmental sustainability, talent development and community engagement.

In your view, how important is diversity, equality, and inclusion (DEI) in driving innovation and growth within the semiconductor industry?

At Micron, we believe that fostering an inclusive environment where everyone feels valued and respected enables our employees to reach their full potential and contribute to groundbreaking advancements. By embracing diverse perspectives from our team members, we develop more innovative ideas and solutions, giving us a competitive edge in the market. Our commitment to DEI also helps us attract and retain top talent, ensuring that we have a workforce that reflects the diversity of the communities we serve. Overall, I believe DEI is not just a moral imperative but a strategic advantage that fuels our success in the semiconductor industry.

How is your company addressing the growing emphasis on sustainability in semiconductor manufacturing?

Micron has always been committed to sustainability long before it became a buzzword. As a responsible semiconductor company, we are mindful of our use of resources and strive to reduce our energy, water, waste and material usage. At Micron Singapore, our dedication to sustainability has earned us the recognition as an Advanced Fourth Industrial Revolution and Sustainability Lighthouse by the World Economic Forum. We are the first front-end semiconductor fab in the world to have received these recognitions, testifying our leadership in using artificial intelligence (AI) to drive sustainable manufacturing and in proactively adopting

eco-efficient operations. It has grown sustainably by reducing the resources used per gigabyte produced by 45% from 2018 to 2021. Over 36,000 solar panels have been installed or being installed at Micron Singapore, generating energy sufficient to power 6,000 homes upon completion. Micron Singapore has also piloted a central abatement system to process greenhouse gases generated from the semiconductor etching processes. The system can bring 40 percent cost savings and 90 percent fuel consumption savings compared to conventional point-of-use abatement technology. Our Woodlands facility features many sustainability firsts for Micron, including rainwater collection for sanitary and irrigation purposes and smart glass for heat reduction inside the building.

Moreover, Micron donated SG\$1 million to support the Water Lily Gardens' sustainability efforts through the implementation of a smart water management system in 2021 which will help clean and restore the water in the Water Lily Garden and the larger Japanese Garden while reminding visitors, including children and tourists, of the importance of sustainability.

In what ways is your company collaborating with other stakeholders in the semiconductor ecosystem in Singapore?

Our assembly and test facility in Bendemeer was one of Singapore's first semiconductor manufacturing sites. The country's robust infrastructure, connectivity, supply chain, and talented workforce have been crucial to Micron's success. Singapore has been a great home to Micron. The Singapore government has also been highly supportive, strengthening the local semiconductor ecosystem.

We have a long-standing partnership with the Singapore government for our NAND operations, deploying leading technology and expanding our manufacturing footprint. We have established a strong partnership with the local semiconductor ecosystem, supported by the industry-leading equipment and material suppliers, facility, engineering and design ecosystem, generating 25,000 indirect jobs.

What do you see as the biggest challenges facing the semiconductor industry today, and how is your company positioned to tackle them?

We see the memory and storage industry growing exponentially with all the demand for AI and data, and our need for highly skilled talents will continue to expand rapidly. At Micron, our culture of innovation fuels the pursuit of technological excellence, creating opportunities to enhance digital and automation skills while also cultivating leadership, adaptability, and creativity.

Micron Singapore is also committed to nurturing the semiconductor talent pool by inspiring students to study STEM, attracting graduates to join the industry, and engaging and developing talent to their fullest potential. We continue to deepen our partnerships with local educational institutions and training partners. Notable examples include the signing of MoUs with Yayasan MENDAKI and all five local polytechnics in Singapore in 2023, as well as the MoU renewal with the Institute of Technical Education (ITE) on talent development in 2024. Micron hosted its first Chip Camp with Yayasan MENDAKI and Science Centre last year and successfully completed the second edition in June 2024, aiming to spark female students' interest in STEM.

How do you foresee the semiconductor industry evolving over the next 5 to 10 years?

The semiconductor industry is poised for significant advancements, driven by the increasing demand for high-performance computing, AI, and the Internet of Things (IoT). There will be a continued push towards smaller, more efficient, and powerful chips enabling new innovations across various sectors. I believe Micron's cutting-edge memory and storage solutions, such as the latest ninth-generation (G9) NAND flash technology, will play a crucial role in this evolution by providing the necessary speed, capacity, and reliability for data-intensive applications.

Furthermore, we foresee a greater emphasis on sustainability and energy efficiency as companies strive to reduce their environmental impact. Micron is dedicated to initiatives centered on technological advancement, environmental sustainability, talent development, and community engagement.

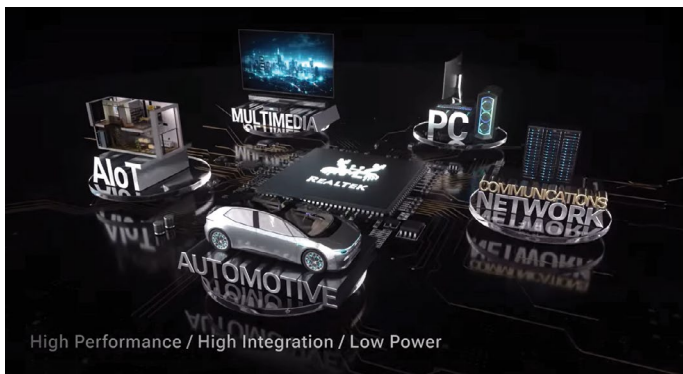


Realtek AI Changing the Future



REALTEK'S VISION:

PIONEERING THE FUTURE OF SEMICONDUCTORS



The semiconductor industry stands at the forefront of technological progress, playing an essential role in driving innovation across the global economy. As we move into the future, the industry is expected to continue its trajectory of rapid advancement, with several key trends shaping its evolution. These include the ongoing drive to shrink transistor sizes, the adoption of 3D chip stacking and chiplets, and the exploration of materials beyond silicon to achieve superior electrical properties. Innovations such as neuromorphic and photonic chips will push the boundaries of AI, machine learning, and data center efficiency, while edge computing will demand semiconductors capable of local AI processing. The industry's focus on sustainability will intensify, with efforts to minimize environmental impact through greener production methods and energy-efficient facilities. In this dynamic environment, securing and diversifying supply chains will be critical to mitigating risks from geopolitical and natural disruptions. The future of semiconductors will also be shaped by strategic partnerships among corporations, governments, and academic institutions, particularly in emerging fields like quantum computing and advanced wireless networks.



At Realtek, our vision aligns closely with these industry trends. We are committed to driving innovation across several key domains, positioning ourselves as leaders in the semiconductor industry's next phase of growth. Our focus on advanced multimedia solutions and network connectivity, including the development of Wi-Fi 7, exemplifies our dedication to enhancing user experiences and pioneering new frontiers in wireless technology. Additionally, Realtek is playing a pivotal role in the AIoT ecosystem, fostering innovation that leads to smarter, more effective devices. Our expansion into the automotive sector underscores our commitment to the future of smart, connected, and autonomous vehicles. By integrating AI and machine learning into our product offerings, we are developing more intelligent and intuitive features that cater to the evolving needs of our customers. Sustainability is also a core component of our strategy, as we innovate eco-friendly technologies, such as energy-saving chips and the use of recyclable materials in our manufacturing processes.

Realtek's approach to leadership in the semiconductor industry is grounded in our culture of innovation, collaboration, and continuous learning. We invest heavily in research and development, fostering an environment where cross-functional teams work together on pioneering projects that drive advancements in semiconductor technology. Our commitment to creativity and knowledge-sharing within our organization ensures that we remain at the cutting edge of industry innovation. At the heart of our culture is a belief in "Self-confidence and trust in people." We encourage our employees to explore new ideas, take calculated risks, and work together to achieve both individual and collective growth.

The semiconductor industry faces several challenges, including supply chain disruptions, technological complexity, environmental impact, and a talent shortage. Realtek addresses these challenges through strategic initiatives that focus on R&D investment, supply chain resilience, sustainable manufacturing practices, and talent development. By tackling these issues head-on, we position ourselves to remain competitive while advancing sustainable semiconductor technology.

Looking ahead, the semiconductor industry is poised for significant evolution over the next 5 to 10 years. Advancements in process nodes, 3D integration, AI, and machine learning will drive demand for specialized hardware and push the boundaries of what is possible in semiconductor technology. The industry will also see a greater emphasis on heterogeneous computing, supply chain diversification, quantum computing, and energy efficiency. Emerging applications in IoT, autonomous vehicles, and advanced wireless networks will further fuel innovation, leading to new chip designs and functionalities. Realtek is well-positioned to play a central role in this evolving landscape, driving innovation that will shape the future of the semiconductor industry and contribute to technological advancements across the global economy.

In conclusion, Realtek's vision for the future of semiconductors is rooted in a commitment to innovation, sustainability, and leadership. We are dedicated to advancing the industry through cutting-edge technologies, strategic partnerships, and a culture of continuous improvement. As we look to the future, Realtek will continue to be a driving force in shaping the semiconductor industry's trajectory, ensuring that we meet the demands of an increasingly digital and interconnected world.



Written by, **Shieh Ping Lung**
Senior Director, Realtek Singapore Pte Ltd



SEEKING SUSTAINABILITY IN THE SMART WORLD

We live in a SMART world, rapidly advancing with AI and quantum technology. These developments present significant opportunities for the semiconductor industry, which plays a critical role in powering AI. As a service provider within the semiconductor industry, SANCODA is also making strides in this evolving landscape. We spoke with Randy Liew, CEO of SANCODA, to learn how the company positions itself in the development of AI and quantum technology.

SANCODA recently entered the Singapore market. Could you briefly introduce your business?

Randy: SANCODA, established in Singapore, serves as the overseas headquarters of Shanghai Shengjian Technology Co., LTD. Our business focuses on three main areas: Green High-Tech Facility System Solutions, Semiconductor Supporting Equipment and Core Components, and Wet Chemicals.

Our Green High-Tech Facility System Solutions primarily involve semiconductor process exhaust system solutions, which are essential to our clients' production processes. These systems help maintain production capacity, ensure product yields, secure occupational health, and preserve the ecological environment.

In the Semiconductor Supporting Equipment sector, we offer products such as local scrubbers, LOC-VOC, vacuum pumps, and chillers. These pieces of equipment, designed with a focus on improving energy efficiency smartly, play a significant role in the auxiliary control of the reaction chamber of semiconductor process equipment, ensuring the necessary working conditions for etching, ion implantation, diffusion, and thin film deposition. Additionally, we supply electronic chemicals like strippers, etchants, and cleaners,

along with Chemical Dispensing and Recycling Systems to further enhance value for our customers.

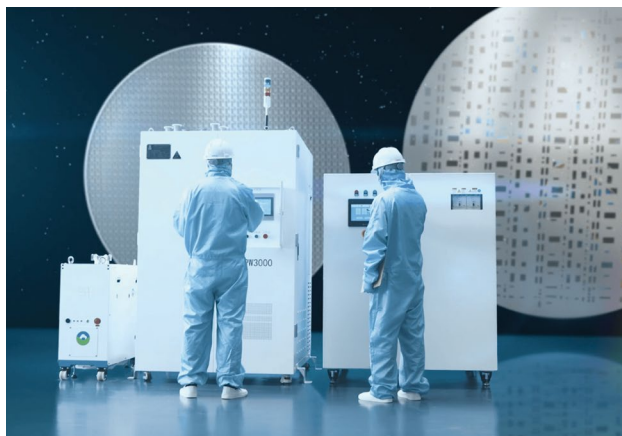
Front-end service providers in the semiconductor industry often seem to have a more direct and significant impact on industry development. How do you view SANCODA's role in this context? Does SANCODA contribute to AI development in any way?

Randy: We see ourselves more as 'supporters.' While SANCODA may not directly influence AI and quantum development by, for example, providing chips, we play a crucial role as a back-end service provider. Our expertise lies in exhaust treatment solutions and equipment, which adjust intelligently based on operational data. This not only ensures compliance with emission standards but also supports a greener future. We aim to make our systems even smarter by integrating AI and quantum technology in the future. Smarter operations will lead to greater efficiency and energy savings, indirectly contributing to the sustainability of AI development.

The concept of sustainability is increasingly emphasized, especially as we move towards the 2030 Agenda for Sustainable Development. How does SANCODA's technology support sustainability? How does it relate to the sustainability of AI and quantum technology?

Randy: AI and quantum technology place a premium on energy-saving and sustainability, creating opportunities for the semiconductor industry while demanding high-quality production. Decarbonization and sustainability are key indicators of this 'high quality.'

Our equipment operates smartly, such as our local scrubbers that collect data and automatically issue notifications



or warnings. This can be seen as a fundamental application of AI. We aim to further explore how AI can make our equipment even smarter. For example, our sustainable technology ensures that the MTBF for our local scrubbers is ≥ 180 days, with the service life of plasma types exceeding 6 months. This reduces energy consumption by up to 10%, supporting sustainable production in the semiconductor industry and, by extension, the sustainable development of AI technology.

How do you see AI and quantum technology affecting SANCODA's future development?

Randy: Currently, our smart operations are implemented on the premise that our systems are safe and stable, which sometimes requires certain trade-offs. We're exploring what could be possible with even smarter systems. For instance, imagine a trouble-reporting system that not only detects issues but also resolves them automatically, returning the system to normal and even carrying out maintenance on its own.

Achieving such advancements will require extensive data collection from semiconductor factories to enable deep machine learning. With our commitment to sustainable development, SANCODA is focused on making our products smarter to deliver even more value to our customers.



ASM FUELING AI GROWTH THROUGH ADVANCED MANUFACTURING AND DEPOSITION TECHNOLOGIES



As AI continues to revolutionize our world, the demand for computing power is soaring, driving the need for increasingly powerful and complex chips. Wafer fab equipment (WFE) is crucial in meeting this demand, with the market expected to reach S\$140 billion by 2027. ASM, a leader in deposition technology, is at the forefront of the AI revolution, pushing boundaries with its groundbreaking innovations.

ALD: The Engine Behind AI Innovation

Central to AI's advancement is Atomic Layer Deposition (ALD), a critical process for the 2nm gate-all-around (GAA) node. ALD enables the creation of ultra-thin films on silicon wafers, essential for high-performance, energy-efficient chips. With a dominant 55% global market share in ALD, ASM isn't just participating in AI's evolution – it's leading it.

Digital Transformation at the Core

ASM isn't just driving AI innovation; it's also leveraging AI to enhance its manufacturing and operations. With its Singapore site producing over 85% of the company's output, ASM is fast-tracking its digital transformation across smart manufacturing, digital supply chain management, and team collaboration.

By minimizing manual processes and integrating AI-driven tools, ASM is advancing toward smart, precision manufacturing, accelerating time to market, and reducing cycle times. This transformation is not limited to technology; it also includes a focus on people.

"We're continuing to upskill our people to help them navigate and excel in this new AI-powered landscape," said Yvonne Lee, Vice President of Global Product Delivery and Singapore Site Leader. "This strategic investment in both technology and people keeps our manufacturing and operations ahead."

Singapore: A Hub for Advanced Manufacturing and AI

"Singapore has proven to be a significant player in the global manufacturing ecosystem," noted Kent Rossman, Senior Vice President of Global Operations. "We are excited to grow with the brilliant talents and ecosystem partners here to foster innovation in advanced manufacturing and shape the future of AI."

In Singapore, ASM's cutting-edge products come to life, driving advancements in AI, electric vehicles, cloud computing, and more. Join us in the AI revolution and help build the technology that will shape tomorrow.



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THREE LESSONS IN GEN AI FOR SEMICONDUCTOR ENTERPRISES



Looking back from those early days of generative AI (gen AI), what's been interesting is to see the discussion evolve from – what we could do with gen AI – to – what we should do with it. Especially, in the semiconductor industry.

After a year of experimentation, incubation, proofs of concept, and pilots, the discussion has changed to – where are we going to reliably get a return on capital? And what have we learned from the bumps on the road along the way? There are three areas we are the wiser for, today.

1. Build the right data foundation

The foundation of successful AI projects lies in high-quality, well-governed data. Many companies struggle with data quality despite advances in technology. Data engineering involves managing data governance, ontologies, and quality.

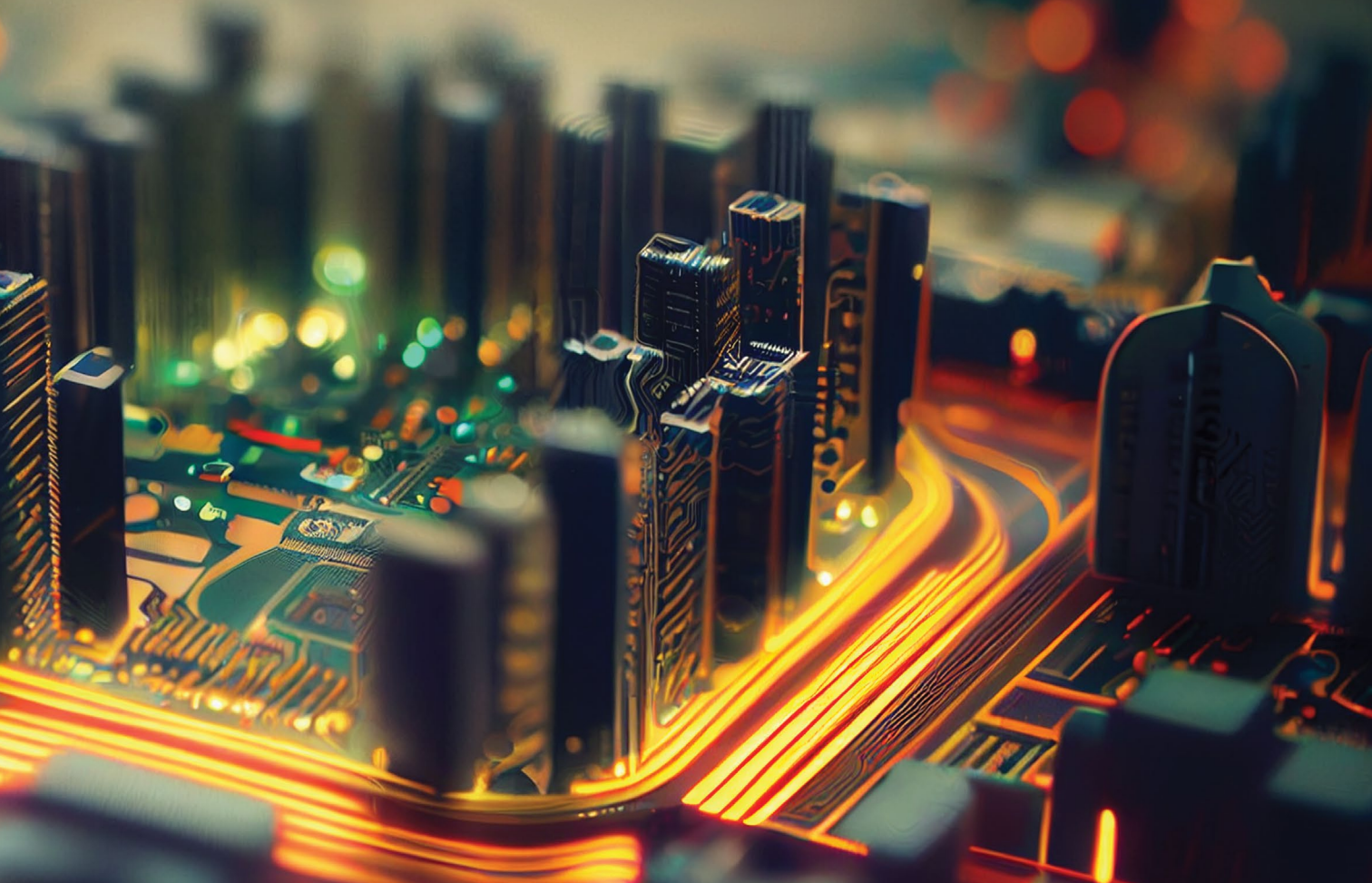
Effective strategies include shifting operating reviews into

core applications to ensure data accuracy and assigning data officers within each business unit to maintain accountability. Leading organizations prioritize cleaning current data sets and designing new data builds to be first-time-right.

2. Reimagine business processes and manage change

Gen AI demands a fundamental redesign of business processes. Unlike traditional automation, which speeds up existing processes, AI transforms end-to-end workflows. This transformation requires new skills and comprehensive change management. Success hinges on collaboration between business and IT teams, selecting the right problems to address, and balancing investments in new technologies while reducing legacy costs.

Gen AI projects benefit from crowdsourcing inputs closest to the business and starting with questions, not predefined answers. Effective change management and reskilling are crucial for maximizing returns on AI investments, as talent, skills, and culture become the critical factors for success.



3. The right tech stack and governance framework

Strategic capital allocation is vital in choosing between publicly available tools, custom AI stacks, or embedded AI solutions. Enterprises often adopt multiple large language models (LLMs) to mitigate rapid technology changes, necessitating a flexible back-end framework with a consistent user experience.

The increasing concentration of power among AI providers, from LLM to graphics processing units, raises concerns about vendor lock-in and associated risks. Organizations must navigate evolving regulatory frameworks related to critical infrastructure, privacy, and security, particularly in sectors like financial services. Implementing AI fairly, equitably, and inclusively will help companies stay ahead of regulatory changes while maintaining speed and innovation.

The best is yet to come

As the gen AI landscape evolves, the future promises even greater advancements and challenges. Building robust data foundations, reimagining business processes, and selecting the right technological and governance frameworks are key to unlocking the full potential of the technology in the semiconductor industry.

One thing is for sure though, we are only getting started and what we do going forward will dwarf what we have done so far with gen AI.



By, **Sanjay Srivastava**
Chief Digital Strategist, Genpact

ADVANCED PACKAGING FOR AI

Insights from
Henkel's Dr. Kefan Ni

Henkel is a leading semiconductor materials supplier at the forefront of the AI and computing revolution, enabling advanced packaging progress with novel adhesive and encapsulant formulations. Ahead of the SSIA Summit, the Singapore Semiconductor VOICE sat down with Henkel's Dr. Kefan Ni, APAC Head of Application Engineering for Henkel Adhesive Technologies' Electronics business, to discuss trends in AI package development, Henkel's view on future technology, and the material innovations required to deliver exceptional performance and reliability.

The focus of this year's SSIA Summit is Synergizing Silicon: Pioneering the Future with AI and Quantum Technologies. In your view, why is semiconductor technology a key—the key—enabler of AI and HPC advancement?

KN: The drive to intensify computing power and the resulting rise of AI technology is 100% enabled by advanced semiconductor capability. AI and high-performance computing (HPC) require massive parameter calculations for transmission speed, expansive memory, and computing sophistication. The industry continues to develop increasingly advanced silicon nodes with smaller transistor feature sizes and higher densities that are faster and more power efficient. Simultaneously, advanced packaging is providing innovative integration techniques. Meeting today's computing power requirements is absolutely dependent on semiconductor development progress.

You referenced advanced packaging capability. Please describe some of the package design innovations that have made AI and HPC devices possible.

KN: In recent years, advanced packaging technology has been integral to meeting AI/HPC performance requirements. This is especially true of the heterogeneous integration platform, which enables high-density, low-latency, wide-bandwidth performance, while also delivering high-yield economies of scale and time-saving design flexibility. Current advanced packaging technology integrates advanced node logic, memory, and substrates in compact 2.5D, interposer package form factors for HPC and AI/5G. We are also seeing emerging bumpless 3D IC stacking technology, which can further integrate high-density chiplets and achieve the highest I/O-to-I/O interconnect density for the shortest electrical distance. This significantly boosts bandwidth, reduces latency, and improves energy efficiency. And, of course, it's all thanks to advanced packaging innovation.

Why do you think AI has really just come into its own in the GPU space in the last five years or so? Some of the market leaders have been around since the early '90s. Why now? What has changed from a technology point of view?

KN: While GPU technology and advanced packaging have been in existence for many years, it's the recent breakthroughs in semiconductor scaling, processing capabilities, resolution, material innovation, and design methodologies that have propelled us into the era of powerful AI.

Henkel's expertise for AI is in electronic materials, specifically encapsulants and adhesives for advanced packaging. You are working with some AI package innovators who are designing these innovative 2.5D and 3D integrated packages. What are their biggest challenges when it comes to material capabilities?

KN: AI and HPC modules in data centers integrate packages with very large die and big package body sizes. Historically, these dimensions have led to reliability challenges due to thermal dissipation demands and their propensity for warpage. Advanced packaging semiconductor materials must provide balanced formulations that mitigate these issues to ensure the high reliability of these high-value, high-performance devices.

Let's explore that topic a bit more. What materials enable new AI package designs, and what attributes must the materials deliver?

KN: Certainly. There are a few categories of materials for advanced packaging that are crucial for the reliability of today's complex designs. These include underfill encapsu-

lants, liquid compression molding, thermal interface materials, and lid/stiffener attach adhesives. Their material properties and performance requirements are as follows:

▪ **Capillary Underfill :** With advancements in ultra-fine-pitch, narrow gap flip chip interconnects, capillary underfills require fine filler technology and fast flow rheology to ensure no voids. The flow rate is critical due to the large surface area; you don't want material gelation before all bumps are encapsulated. Additionally, underfills need strong adhesion to various surfaces (PI, SiN, Cu, Si, solder mask, etc.) for reliability and to accommodate design flexibility. Lastly, for bump protection and robust mechanical support, cured properties like the coefficient of thermal expansion (CTE), glass transition temperature (Tg), and modulus must be balanced.

▪ **Liquid Compression Molding (LCM) :** These materials are applied at the wafer level and used for heterogeneous integration—both fan-in wafer-level packaging (FI-WLP) and fan-out wafer-level packaging (FO-WLP). In AI, we see very high-density 2.5D integration, where warpage control is essential for processing, which LCM provides. Like capillary underfills, LCM materials need good adhesion to various surfaces (PI, SiN, Cu, Si) and, for mechanical support, must have balanced properties of toughness, CTE, and modulus.

▪ **Thermal Interface Materials :** For AI packages, there are many approaches to heat dissipation. Commonly, films and sheets that integrate novel fillers are placed between the package and the lid to help efficiently move heat away from the device. Henkel is a leader in thermal interface materials at the board level, and we are leveraging this expertise to drive innovation at the package level.

▪ **Lid/Stiffener Attach :** Finally, lid and stiffener attach adhesives are vital enablers for large package body devices. As I mentioned, these sizeable architectures are highly susceptible to warpage. Lid and stiffener adhesives help keep these packages flat, protecting them against mechanical damage. Henkel's materials deliver excellent adhesion, balanced cured properties, and improved package reliability performance.

Where do you think this AI train slows down—or does it—over the next 5 to 10 years?

KN: I certainly don't see AI growth slowing down much, if at all, in the next five to ten years. However, like most disruptive technologies, there will be incremental shifts in the

market. There are a few dominant players right now, but I foresee more competitors entering the field, further process advancements to drive down module costs, and new materials enabling much of this progress.

We agree! And AI is being integrated in other areas, too—outside of the data center. What does AI mean for devices at the edge—computers, mobile, automotive, etc.? What do mobile processor designs in those products demand from a materials point of view?

KN: On-device AI will be a huge market trend. We are already seeing it with major PC and smartphone brands announcing AI devices, and technologies like XR and automotive also integrating AI capabilities. Mobile processors that integrate AI functionality are driving the evolution of advanced packaging in the processor area. Here, too, materials like advanced Si-node underfills will be required, albeit for smaller package and die sizes.

Last question: What's next for Henkel in terms of development for advanced packaging? What will AI need in the coming years and how is Henkel planning for future innovation?

KN: Henkel has a strong foundation and is providing advanced solutions for AI today in the form of next-gen capillary underfills, molded underfills, liquid compression molding with fine feature capability and very low warpage, lid and stiffener attach, and we are working on a break-through solution for thermal interface materials (TIM). Our platforms in these areas are exceptional, and we continue to innovate ahead of the curve to enable the incremental changes we see coming for AI and other advanced packaging applications.

Thank you, Dr. Ni, for your insights! For more information about Henkel's advanced packaging materials solutions, please visit www.henkel-adhesives.com.



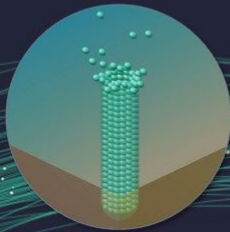
Dr. Kefan Ni

Head of Application Engineering – APAC
Henkel Adhesive Technologies - Electronics

THE PATH TO 1,000 LAYERS WILL BE ETCHED

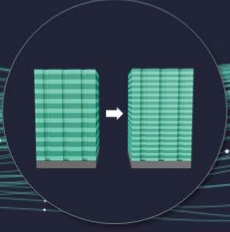


Enabling technologies to address 1000-layer scaling



Cryogenic high aspect ratio etching

Uniform deep etch enables more bits per cell



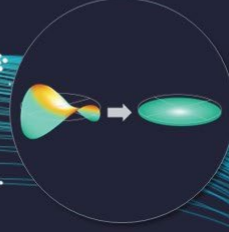
Wordline pitch scaling

Thinner oxide/nitride deposition layers enable more bits per device



Advanced wordline metallization

Lower resistance metal enables thinner connections and faster device



Wafer stress management

Backside deposition controls wafer bow and enables taller device



As we stand on the brink of a new era in technology, marked by the rise of artificial intelligence (AI), the demand for more advanced computational capabilities is skyrocketing. Data-intensive AI applications require significant advancements in memory technology—particularly in NAND flash memory, including faster data transfer speeds.

A side effect in the surge in compute demand is an increase in power consumption to handle data transfers within memory systems. In other words, the escalation contributes to heightened energy use in data centers because compute for AI training consumes a significant amount of energy (and space on the chip). Deploying high-density and more power-efficient NAND storage, which is used in more energy-efficient solid-state drives (SSDs), addresses the performance, space, and power requirements while reducing the operating costs and environmental impact of the AI revolution.

At Lam Research, we are at the forefront of driving these innovations, including those needed to scale 3D NAND to 1,000 layers by the end of the decade.

The path to 1,000-layer 3D NAND is more than a visionary


milestone—it's a necessity driven by the burgeoning demands of AI and machine learning technologies. These applications rely heavily on vast amounts of data to train algorithms and process information efficiently and effectively.

3D NAND chips with 1,000 layers will boost data storage capacity and throughput—crucial for AI applications that require rapid data retrieval and processing. As such, the semiconductor industry is pushing physics and chemistry to their limits, striving for higher data storage capacities and faster processing speeds.

Unfathomable Complexity

3D NAND flash is a type of memory that stacks multiple layers of cells vertically, increasing the density and capacity of data storage. The architecture involves complex and precise processes that require breakthrough innovations in etch and deposition technologies.

Etching is the process of removing material from the surface of a wafer to create the desired patterns and structures for memory cells. Etching is a critical process step to enhance 3D NAND device performance, reliability, and yield.



Scaling 3D NAND to higher layer counts is no trivial task. We're talking about manufacturing at an atomic scale—1,000x smaller than the width of a human hair. The technologies and processes that got us from 2D to 3D, and from 64- to 232-layer 3D NAND are not capable of getting us to 1,000 layers without new breakthroughs. That's why we must continue to innovate our precision high aspect ratio etch capability to enable our customer's roadmap.

"Memory hole precision" refers to the accuracy in creating vertical pathways in the memory stack that connect the cells, which is crucial for scaling 3D NAND devices to higher layer counts without compromising quality. "Logic scaling" requires reducing the deviation in critical dimensions from the top to the bottom of the channels, which is essential for the performance and capacity of flash memory as it scales to more layers and correspondingly taller stacks. The goal is to maintain the critical dimensions of the channels from top to bottom without deviation, which is essential for the performance and capacity of flash memory as it scales to more layers.

Just because you can technically scale the number of layers doesn't mean you can move to high-volume production. To scale, flash manufacturers must increase performance and capacity while decreasing the cost per bit.

The combined operational and technical complexity approaches the unfathomable.

Trend Setter

At Lam Research, we don't follow trends—we set them. Lam's pioneering efforts in etch and deposition technology over the decades have led to significant breakthroughs in NAND flash manufacturing. We have a proven track record of delivering solutions that enable 3D NAND scaling, such as cryogenic memory hole etch, which is the process of creating vertical pathways in the memory stack that connect the cells. This process is essential for enabling 3D NAND devices to scale to higher layer counts, as it determines the quality and uniformity of the memory cells.

Lam has improved memory hole etching processes over time, using our unique and proprietary technologies, such as:

- **Cryogenic high aspect ratio etching with novel chemistries**, a uniform deep etch that lowers wafer temperature during manufacturing to enable innovative new process chemistries that allows for more bits per cell.
- **Scalable high-power confined plasma reactors**, which generate high-energy plasmas that can etch deep and narrow holes with high aspect ratios.
- **Unique pulsed plasma technology**, which modulates plasma species to control the etch profile and selectivity, resulting in more uniform and consistent holes.

With these technologies, Lam has enabled our customers to achieve near-perfect memory hole etch profiles with high throughput and, because of greater efficiency, low environmental impact.

NAND Scaling

Lam has also enabled our customers to scale 3D NAND laterally, vertically, and logically with our leadership in high aspect ratio (HAR) etch. A differentiated high aspect ratio etch capability enables our customers to scale multiple vectors:

- **Lateral scaling**, which involves reducing the dimensions of individual memory cells and the distances between them in the same area, increasing the bit density and capacity.
- **Vertical scaling**, which involves increasing the number of layers in the memory stack to achieve higher storage capacity, performance, and energy efficiency.
- **Logic scaling**, which means increasing the number of bits per storage cell—from single-level cell (SLC) to multi-level cell (MLC), triple-level cell (TLC), and even quad-level cell (QLC)—allowing for more data to be stored in the same physical space.

Lam's high aspect ratio etch solutions, such as Flex® and Vantex®, use advanced hardware and software technolo-

gies to deliver precise dielectric etching with exceptional uniformity, repeatability, and low defectivity to create the most critical HAR device features.

In sum, our solutions enable our customers to reduce costs by packing more cells per layer, which increases the number of layers, and get more bits per cell, thereby improving energy efficiency and optimizing performance and reliability—necessary features that enable the AI era.

Defining Tomorrow

As we navigate the complexities of the AI age, the path to 1,000-layer 3D NAND represents more than just a technological aspiration; it symbolizes a leap toward meeting the future demands of global data processing and storage. Lam Research is committed to leading this charge, providing solutions that address the critical challenges of today and paving the way for innovations that will define tomorrow.



Harmeet Singh

GVP and GM, Etch Product Group



Technology Enabling Life



**Technology for creating
semiconductors
is technology that makes
dream products real**

Shockingly groundbreaking products –
this is what semiconductor advancements bring.
Our technology produces equipment to
manufacture semiconductors,
and it makes wonders real.

TEL TOKYO ELECTRON

THE CRUCIAL ROLE OF FD-SOI IN POWERING AI-DRIVEN IOT APPLICATIONS

The convergence of Artificial Intelligence (AI) and the Internet of Things (IoT) is revolutionizing the technology landscape. Fully Depleted Silicon On Insulator (FD-SOI) technology is emerging as a key enabler

for AI-driven IoT applications due to its unique advantages in power efficiency, performance, thermal management, and reliability.

In smart home environments, FD-SOI technology powers devices like smart thermostats, security systems, and home assistants. These devices benefit from FD-SOI's power efficiency and high performance, ensuring they can operate reliably and efficiently. Wearable devices, such as fitness trackers and smart watches, require extended battery life and reliable performance. FD-SOI's power efficiency and thermal management capabilities make it an ideal choice for these applications, allowing wearables to operate longer and provide more features.

In industrial settings, FD-SOI-powered IoT devices can monitor and manage machinery, optimize manufacturing processes, and enhance safety. The technology's reliability and performance are crucial for these demanding environments, ensuring that industrial operations run smoothly and efficiently. Medical IoT devices, such as remote patient monitors and diagnostic tools, benefit from FD-SOI's low power consumption, high reliability, and accurate data processing capabilities. These devices must operate consistently and accurately to ensure patient safety and





effective treatment. FD-SOI technology supports the development of AI-powered systems for autonomous driving, vehicle-to-everything (V2X) communication, and advanced driver-assistance systems (ADAS). The technology's robustness, power efficiency, and performance are essential for these safety-critical applications, ensuring the reliable operation of automotive systems.

One of the most significant benefits of FD-SOI technology is its ability to reduce power consumption substantially. This is achieved through a thin insulating layer that minimizes leakage currents, making FD-SOI particularly suitable for IoT devices that often rely on battery power or energy harvesting.

Additionally, FD-SOI supports Dynamic Voltage and Frequency Scaling (DVFS), which allows AI IoT devices to dynamically adjust their power usage based on the workload. This capability ensures that devices can operate efficiently under varying conditions, conserving energy during low-demand periods and ramping up performance when needed.

The reduced parasitic capacitance in FD-SOI technology leads to faster transistor switching speeds, which is essential for the high computational demands of AI algorithms. This capability is particularly beneficial for real-time processing in IoT devices, such as smart cameras and voice assistants, where quick data processing is crucial.

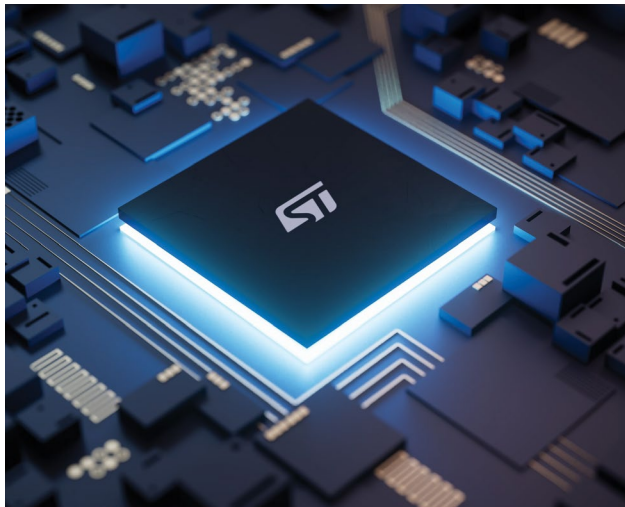
FD-SOI enables best in class low leakage SRAM, contributing to the highest efficiency when it comes to In-Memory Computing – an essential building block for Edge NPU (Neural Processing Unit) in modern AI/ML.

Soitec's FD-SOI technology offering is a crucial enabler for AI-driven IoT applications, offering significant advantages in power efficiency, performance, thermal management, and reliability. By addressing the unique demands of AI IoT systems, Soitec's Edge and Cloud AI Division is set to play a pivotal role in the future of connected and intelligent devices.

soitec

STMicroelectronics:

A PIONEER AND LEADING SEMICONDUCTOR COMPANY IN SINGAPORE



STMicroelectronics (ST) stands as a beacon of innovation and leadership in Singapore's semiconductor industry. Celebrating its 55th anniversary in Singapore this year, ST has been instrumental in shaping the landscape of the semiconductor sector in the region. From establishing the first front-end and back-end plants to driving technological advancements through strategic collaborations, STMicroelectronics is one of few global integrated device manufacturers in Singapore that masters the complete semiconductor value chain.

A Legacy of Firsts

STMicroelectronics' journey in Singapore began in 1969 when it became the first semiconductor company to establish a back-end plant in the country. This milestone marked the inception of the first such facility in Asia, setting the stage for Singapore's emergence as a semiconductor hub. In 1984, ST further solidified its pioneering status by establishing the first semiconductor wafer plant in Ang Mo Kio, which also served as the first wafer fab in Southeast Asia.

Today, STMicroelectronics operations in Singapore boasts the largest integrated presence of the company's manufacturing operations outside of Europe. Singapore serves as the sales and marketing headquarters for ST's operations in APeC (Asia Pacific excluding China), encompassing front-end manufacturing, back-end manufacturing and testing (BEM&T), packaging R&D, logistics, advanced IC design, application support, sales and marketing, and supply-chain management. With a workforce of more than 5,000 employees, STMicroelectronics continues to drive innovation and excellence in the semiconductor industry.

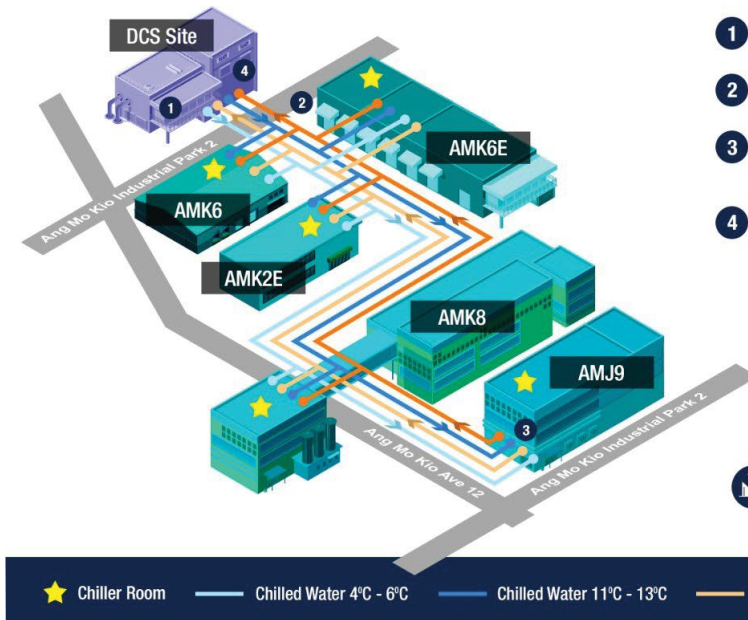
Technological Innovation Through Collaborations

STMicroelectronics' commitment to technological advancement is exemplified by its collaborative projects with local partners. One such initiative is the "Lab-in-Fab" project, supported by the Economic Development Board (EDB) through the Research & Innovation (RIS(C)) incentive scheme. Launched in 2021, this project involves a partnership between ST, the Institute of Microelectronics (IME), and ULVAC. Together, they established an 8" MEMS R&D line at ST's Ang Mo Kio campus, aimed at developing leading-edge Piezo MEMS materials, technologies, and products. The R&D line also facilitates prototyping activities for other MEMS, providing a unique ecosystem for customers and researchers to address their challenges.

Another significant project is ST's R&D in Silicon Carbide (SiC), also supported by EDB. Singapore plays a pivotal role in ST's global SiC program, with a strong base of existing 6" production and plans to continue as a second source for







STMicroelectronics AMK Industrial Park District Cooling System Network



- 1 Chilled water is generated in a central cooling plant.
- 2 A closed loop network of insulated pipes distributes the chilled water to each building.
- 3 When the chilled water reaches the building, energy transfer stations within each building circulate the cold energy from the network into the building's air-conditioning system, which dehumidifies and cools the air.
- 4 The warmer water is then circulated to the cooling plant, via the return pipes, to be chilled again. The whole process repeats itself.

Key benefits of STMicroelectronics Industrial District Cooling System:

-  Singapore's largest with a cooling capacity up to **36,000** refrigerant tonnes (RT)
-  Equivalent to taking **109,090** cars off the road
-  Reduce up to **120,000** tonnes of carbon emissions from the environment per year
-  Repurposing more than **4,000 sqm** of chiller plant space

more advanced 8" SiC technology. While most companies in the SiC industry are still producing 6" wafers, ST's commitment to innovation positions it to lead the industrialization of 8" SiC technology.

In May 2022, STMicroelectronics and SP Group (SP) announced a partnership to install a district cooling system at ST's Ang Mo Kio TechnoPark. With an estimated project value of SGD\$500 million over 20 years, this will be Singapore's largest district cooling system for an industrial development when operational in 2025. The system is designed to cut the industrial development's annual electricity consumption by 20% and reduce up to 120,000 tonnes of carbon emissions per year, showcasing ST's commitment to sustainability.

The Evolution of Singapore's Semiconductor Industry

The semiconductor industry in Singapore has evolved significantly since the 1960s, starting with foreign investments in assembly and testing. STMicroelectronics' establishment of a back-end plant in Boon Keng in 1969 marked the beginning of this journey. Over the years, the industry has moved up the value chain to wafer fabrication, developing into a major global hub for semiconductor manufacturing and R&D.

ST's decision to expand into Singapore in the 1960s was driven by factors such as the use of English as the business

language, attractive labor costs, and government incentives. While labor costs have increased over the years, the other factors remain, making Singapore an ideal location for semiconductor manufacturing and innovation.

In the 1980s, the strategy shifted to focus on the economic growth potential of the Asia market, with the rise of the electronics industry in the region. STMicroelectronics' establishment of the first semiconductor wafer plant in Ang Mo Kio in 1984 further solidified Singapore's position as a semiconductor hub. By integrating design centers, wafer fabrication, and assembly and testing in one region, ST was able to respond to customer needs faster than competitors, creating a fully integrated presence in Singapore.

STMicroelectronics' legacy of innovation, collaboration, and commitment to talent development has positioned it as a pioneer and leading semiconductor company in Singapore. As the industry continues to evolve, ST remains at the forefront, driving technological advancements and contributing to the growth and development of Singapore's semiconductor industry. With a strong foundation and a forward-looking approach, STMicroelectronics is poised to lead the industry into the future.



DESIGNING ADVANCED PACKAGING FOR AI APPLICATIONS

As the demand for Artificial Intelligence (AI) applications continues to grow, the focus on high-performance computing has intensified. At STATS ChipPAC Singapore (SCS), we have been at the forefront of advancing packaging technologies, particularly in the integration, interconnection, and assembly of chiplets with specific functions within the Fan-Out Wafer-Level Packaging (FOWLP) architecture. Our approach to heterogeneous integration is highly customized, with a strong emphasis on optimizing materials, processes, and designs to deliver cost-effective solutions. Our commitment to structural integrity and manufacturing robustness is exemplified through our in-house advanced simulation capabilities, which cover a wide range of applications, including warpage evaluation, stress analysis, and board-level reliability prediction.

Wafer Warpage Evaluation

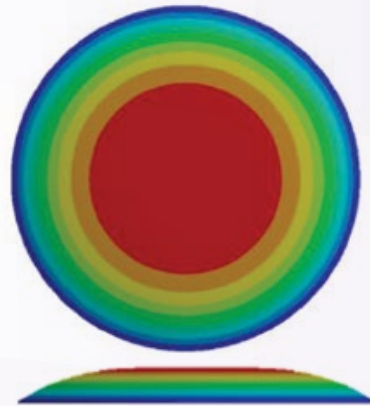
Controlling wafer-level (WL) warpage is crucial for the successful manufacturing of Fan-Out and Fan-In Wafer-Level Packaging technologies. At SCS, we utilize comprehensive simulation tools to accurately predict and mitigate wafer warpage. By conducting geometry optimization and material selection early in the package development process, we ensure manufacturing robustness, leading to higher yields and reliable products.

Chip Package Interaction (CPI) Stress Evaluation

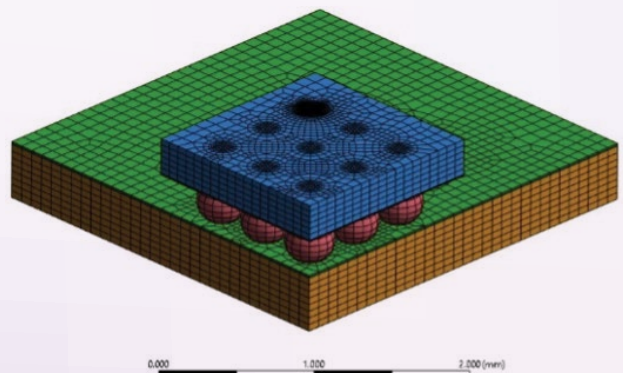
The interaction between the chip and its package is a key factor in determining the reliability of the final product. Our CPI stress evaluations provide detailed insights into chip-package interconnects, guiding design optimizations that ensure our products meet the highest standards of reliability. This rigorous approach helps us deliver semiconductor packages that are both robust and dependable.

Board-Level Reliability Prediction

Long-term reliability is a critical requirement for semiconductor packages, especially in AI applications. To address this, we have developed predictive models for board-level reliability tests. This proactive approach allows us to deliver solutions with both efficiency and precision, ensuring that our packages perform reliably over extended periods.



StatsCP-WaferWarpageSimulation

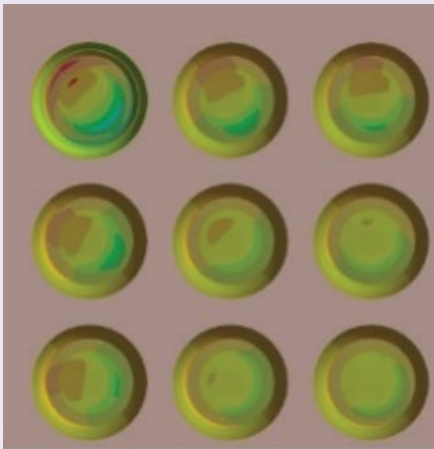


StatsCP-SolderJointStress Analysis

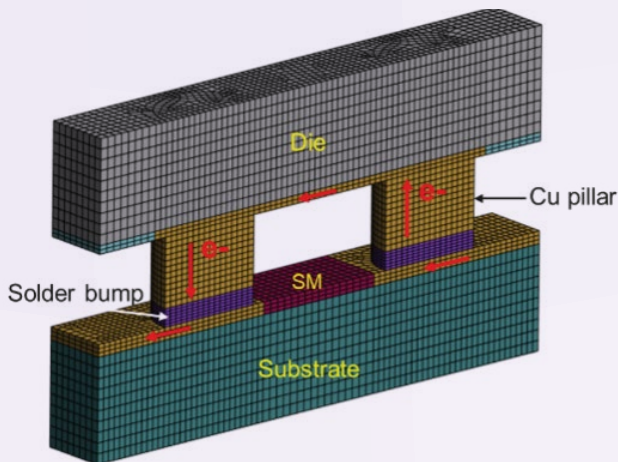
Driving Innovation in Semiconductor Packaging

Our success in these areas is driven by our continuous development of advanced modeling and simulation techniques. These analyses are integral to our research, design, and manufacturing processes, enabling us to deliver innovative packaging solutions that are not only reliable and cost-effective but also tailored to meet the specific needs of our customers.

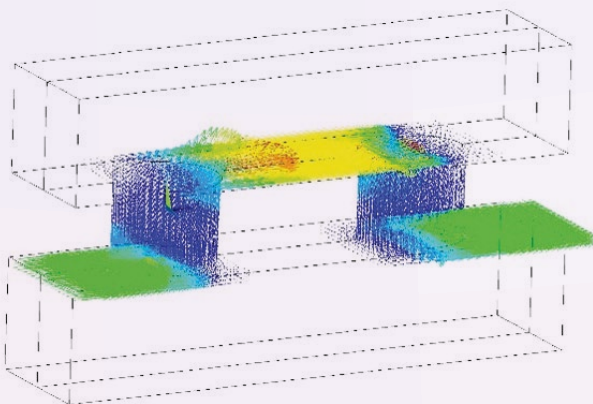
At STATS ChipPAC, we are committed to pushing the boundaries of what's possible in semiconductor packaging. Our advanced simulation capabilities are just one of the many ways we are leading the industry in providing cutting-edge solutions for today's most demanding applications.



StatsCP-SolderJointStress Analysis



StatsCP-Electro-migration simulation



StatsCP-CurrentDensityResult

STATSChipPAC

By:

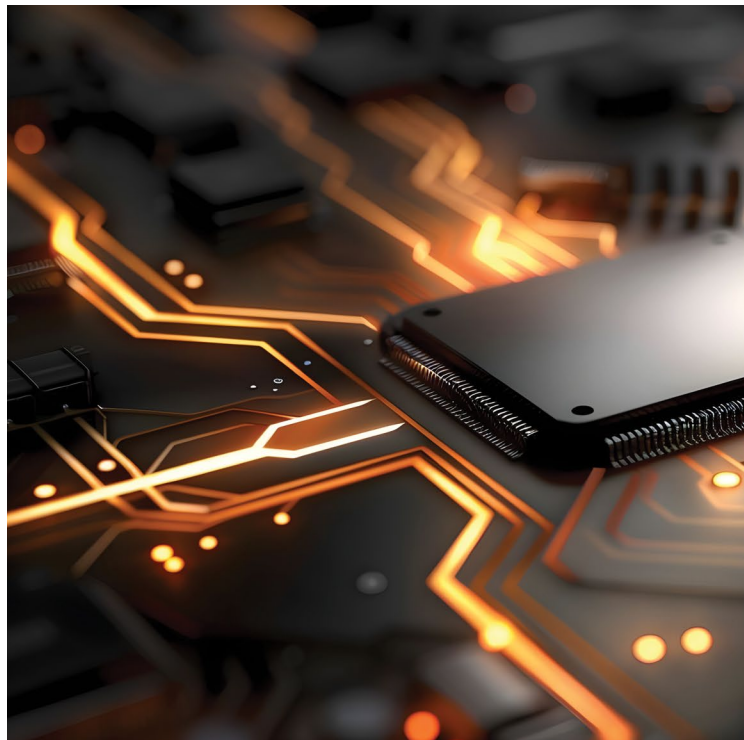


Dr. Alfred Yeo



Dr. Zhao Fa Cheng

PIONEERING ADVANCEMENTS AND INTELLIGENT TRANSFORMA- TION AT VIS



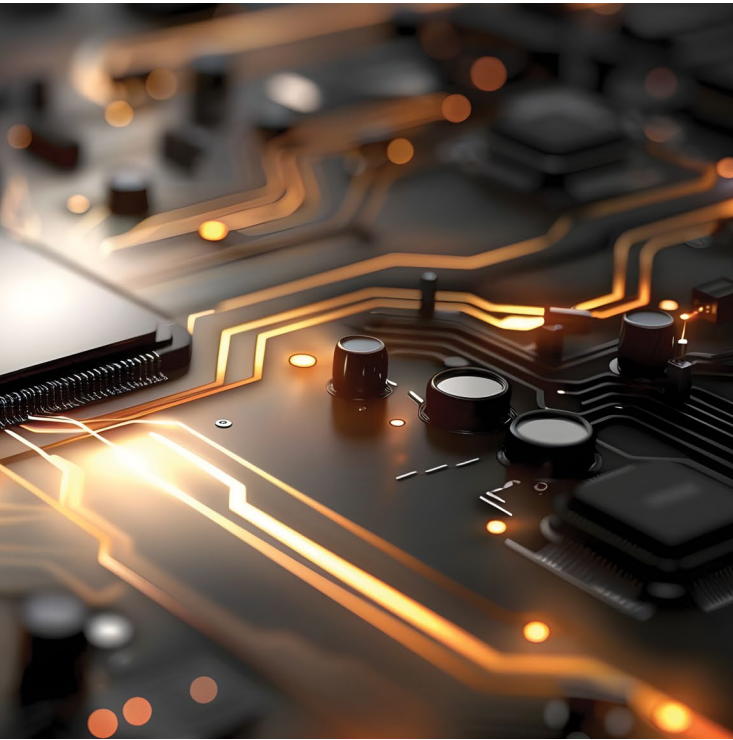
Competitive Technology

To provide customers with more competitive technology and services, VIS has not only expanded its core technologies into a range of specialty and next-generation technology platforms but has also introduced a variety of process and design service offerings. These efforts are aimed at meeting customer needs, enhancing the value of customer service, and strengthening partnerships.

In the field of display driver IC technology development, VIS has successfully entered volume production for high-voltage processes, including 0.2/0.18/0.15/0.11 micrometers. These advancements enable smaller component sizes and fewer masks while maintaining component characteristics, ultimately reducing costs. VIS has also led the development of high-specification processes tailored to custom needs, bolstering the competitiveness of customers' products. These processes are applied in high-end products such as ultra-high resolution TVs, mobile phones, laptops, and various consumer electronics. Moreover, VIS is venturing into new display sectors and advanced technologies, such as Electronic Shelf Label (ESL) driver ICs, color e-reader driver ICs, and next-gener-

ation microLED display technology driver ICs, meeting customer demands for new modules and mass transfer applications.

VIS has also made significant progress in the research and development of gallium nitride (GaN) power components within wide bandgap semiconductors. The mid-to-low voltage (less than 200V) GaN, developed in collaboration with customers, is slated for volume production in the first quarter of 2024, with initial applications in high-performance computing chip power components. In 2023, VIS introduced the first-generation 650V high-voltage GaN-on-QST process for quick charging applications in handheld devices. The second-generation 650V GaN process is expected to enter volume production in the second half of 2024, targeting high-power and high-density power applications in industrial and electric vehicle markets. VIS is also pioneering the development of 1200V GaN components for future electric vehicle fast-charging systems and On-Board chargers, with full volume production anticipated by 2025.



Intelligent Manufacturing and Management

VIS is accelerating its intelligent transformation through innovative manufacturing and management models, optimizing manufacturing efficiency, product yield, digital supply chain, digital customer service, and operational planning. In 2023, VIS implemented an intelligent dispatch system using genetic algorithms to enhance bottleneck machinery efficiency and improve production cycles through multi-objective scheduling adjustments. The company also reengineered processes and systems to enhance the efficiency of the product pricing process.

In response to the global trend of Artificial Intelligence (AI), VIS is focused on enhancing employees' knowledge and practical AI skills. The company has organized AI and big data workshops, enabling non-IT staff to apply data analysis in their work through training and low-code development tools. Additionally, the board of directors has received training on AI trends to provide strategic insights for navigating the AI landscape. Moving forward, VIS will continue to strengthen its competitive edge by adopting innovative digital systems, enhancing employees' digital leadership, and utilizing a comprehensive digital operational decision-making system.



We Are
HIRING



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careere@vis-sgp.com



**Vanguard International
Semiconductor Company**

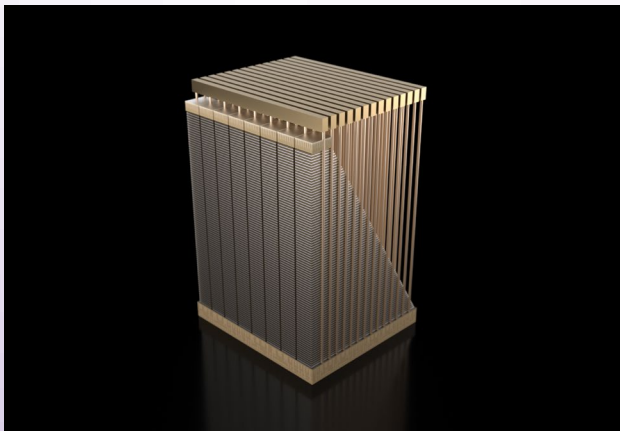


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MICRON ANNOUNCES VOLUME PRODUCTION OF NINTH - GENERATION NAND FLASH TECHNOLOGY

Industry-leading Micron 2650 NVMe SSD, based on ninth-generation NAND, begins volume shipment



Micron Technology has announced that it is shipping ninth-generation (G9) TLC NAND in SSDs, making it the first in the industry to achieve this milestone. Micron G9 NAND features the industry's highest transfer speed of 3.6 GB/s, delivering unsurpassed bandwidth for reading and writing data. The new NAND enables best-in-class performance for artificial intelligence (AI) and other data-intensive use cases from personal devices and edge servers to enterprise and cloud data centers.

"The shipment of Micron G9 NAND is a testament to Micron's prowess in process technology and design innovations," said Scott DeBoer, executive vice president of Technology and Products at Micron. "Micron G9 NAND is up to 73% denser than competitive technologies in the market today, allowing for more compact and efficient storage solutions that benefit both consumers and businesses."

Leading-edge technology delivers unrivaled performance

Micron G9 NAND leverages the industry's fastest NAND I/O speed to meet the high-throughput needs of data-centric workloads, delivering 50% faster data transfer than any NAND currently shipping in an SSD. Micron G9 NAND also delivers up to 99% higher write bandwidth and 88% better read bandwidth per die than currently available competitive NAND solutions. These per-die benefits translate to performance and energy efficiency gains in SSDs and embedded NAND solutions.

Like its previous-generation NAND, Micron G9 NAND fits in a compact 11.5mm x 13.5mm package, using 28% less space than competing products, making it the smallest high-density NAND available. Higher density in a smaller footprint maximizes design options for a diverse set of use cases.

"For the third generation in a row, Micron has led the industry in introducing innovative, leading-edge NAND technology. Products integrating Micron G9 NAND will provide demonstrable performance benefits over competitive offerings," said Sumit Sadana, executive vice president and chief business officer at Micron. "Micron G9 NAND will serve as a foundation for storage innovations, delivering value for customers across all end markets."



Micron G9 NAND enables class-leading performance in the Micron 2650 SSD

The Micron 2650 NVMe SSD integrates the cutting-edge G9 TLC NAND to deliver a best-in-class user experience for everyday computing that surpasses competitors in PCMark® 10 testing.

“Nearing theoretical saturation levels for PCIe Gen4, the Micron 2650 SSD uses our new G9 NAND to push the boundaries of what a value TLC client SSD can achieve,” said Prasad Alluri, Micron’s vice president and general manager of Client Storage. “Delivering up to 38% higher PCMark 10 benchmark scores than competitive solutions, this drive is set to redefine the user experience for this class of SSD.”

“AI advancements are increasing the data generated and driving the need for more storage, leading customers to require better performance to keep pace with AI,” said Jeff Janukowicz, research vice president of IDC’s Solid State Drives and Enabling Technologies. “SSDs like the Micron 2650, which benefit from the latest generation NAND innovations, will be essential to a broad range of users from

businesses to individual consumers.”

The Micron 2650 NVMe SSD offers class-leading reliability and features performance-enhancing accelerated caching for faster write performance, courtesy of its Dynamic SLC Cache. The Micron 2650 NVMe SSD provides real-world saturation performance for PCIe Gen4, with up to 7,000 MB/s sequential read. When compared to the competition, it delivers best-in-class performance with up to 70% better sequential read, up to 103% better sequential write, up to 156% better random read, and up to 85% better random write. These impressive figures underscore Micron’s commitment to pushing the boundaries of technology and delivering unparalleled performance to our customers.

Available in the Micron 2650 SSD for client OEMs, G9 NAND is also in qualification with customers in component form and in a consumer-based Crucial SSD. Visit micron.com to learn more about them.



DEVELOPING AI-ACCELERATED INFRASTRUCTURE

Al has the potential to transform the way we live. However, for AI to become sustainable and pervasive, we must revolutionize the computing platforms that analyze, secure, store, and transmit the data and algorithms powering AI.

Consider the optical interconnects that link AI clusters together. Twenty-five years ago, interconnects could transmit 100 megabits of data per second. Today, they can deliver over 1 terabit per second—more than 1,000 times faster than the cutting-edge speeds of two decades ago. While the power consumed per bit has declined by over 100x during this period, the cumulative power consumed by modules has increased, and future large-scale clusters will contain millions of interconnects.

Marvell is developing a comprehensive portfolio of silicon designed to accelerate infrastructure for AI and other workloads. These chips will serve as the foundation for switches, servers, and ultimately, the data systems that will deliver on AI's promise.

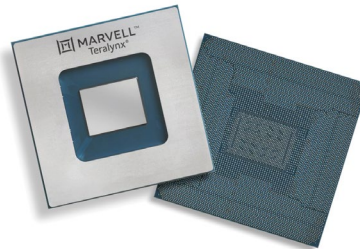
Customized processors, optimized for specific applications or software environments, will increasingly displace standard GPUs and CPUs in many data centers. This shift will boost productivity while reducing power consumption, heat, rack space, and cost. Some analysts estimate that customized chips can reduce processing power consumption by 20% or more. Similarly, optical modules will increasingly be designed around silicon photonic components, which can reduce the complexity, component count, and power consumption of interconnects.

New classes of semiconductors are also emerging. CXL devices will enable server designers to add memory and computing cores with precision, boosting performance per watt or running functions like deep learning recommendation models on behalf of main processors. Marvell's recent-

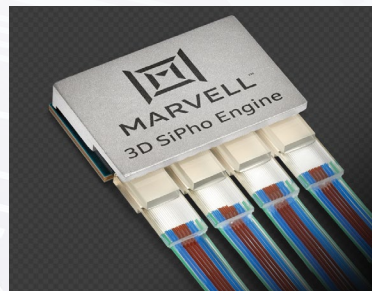
ly unveiled Structera™ X will allow system designers to reuse decommissioned DRAM, reducing e-waste and costs simultaneously. Two other relatively new device families from Marvell—PCI accelerators and Active Electrical Cable DSPs—will extend the life of copper for connecting components within systems and racks.

Developing semiconductors for accelerated infrastructure will require innovations in advanced packaging, materials, die-to-die interconnects, and other aspects of chip design. To this end, Marvell is expanding its relationships with partners and research institutions in Southeast Asia and other regions to cultivate the talent needed for these breakthroughs.

AI is coming, and we at Marvell are excited to create the building blocks that will power it.



Teralynx® 10, a 51.2T switch supports an industry-leading 512 connections. As a result, large (64K GPU) clusters built with it can include up to 44% fewer connections and 40% fewer switches.



Marvell 3D SiPho engine combines hundreds of discrete components that is designed to deliver up to 6.4TB of bandwidth.



By, **Michael Kanellos**
Editor-in-Chief at Marvell

The background of the entire image is a vibrant sunburst or starburst pattern. It consists of numerous triangular rays emanating from a central point at the top. The colors of the rays transition from bright yellow and orange in the center, through green and light blue, to a deep blue at the outer edges. The NXP logo is centered in the upper half of the image, with the 'X' and 'P' partially overlapping the rays.

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Silicon Connection started out in the year 2000, primarily as a distributor of products and services for semiconductor and other high-tech industries.

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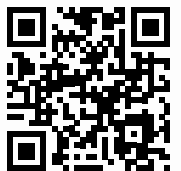
Wafers & Specialty Materials

Lighting & Imaging Products

As Silicon Connectors, our sense of purpose derives from listening and doing our utmost to welcome challenges faces by customers.

Our tagline “**Turning Challenges Into Solutions**” reflects this devotion of ours to serve.

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• Philippines

SILTRONIC: A LEADING MANUFACTURER OF HYPERPURE SILICON WAFERS



Siltronic Singapore is a leading manufacturer of hyperpure silicon wafers for the global semiconductor industry, producing high quality wafers for various electronic products.

On June 12, 2024, Siltronic celebrated the Grand Opening of its highly anticipated new 300 mm fab in Singapore. This event marked a significant milestone in the company's journey, showcasing its unwavering commitment to innovation and excellence. The 150,000 sqm factory, located in Tampines, is expected to produce roughly 100,000 wafers a month by the end of 2024. For the first time, Siltronic will produce 300 mm epitaxial wafers in Singapore. These are essential for the manufacturing of highly integrated semiconductor Elements (ICs), image sensors (CIS), and certain power semiconductors such as high electron mobility transistors (HEMT).



The new state-of-the-art facility is equipped with leading-edge technology and a highly automated production line, highlighting Siltronic's dedication to meeting the growing demands of the global semiconductor market.

Over the last 25 years, Siltronic Singapore continues to grow and has grown significantly, expanding from one fab in 1999 to three fabs today. Singapore has become the largest production site of Siltronic, offering hyperpure silicon wafers of various diameters and product capabilities.

Beyond technological advancements, Siltronic is fully committed to various sustainability initiatives and is working diligently to achieve its ambitious climate goals. One of these initiatives is Siltronic's membership with the Responsible Business Alliance (RBA), dedicated to responsible business conduct in global supply chains.

In addition, Siltronic Singapore is deeply involved in community service. It has partnered extensively with the Southwest Community Development Council (SWCDC) in the "Food Connect" and "My Schooling Needs" programs to support the underprivileged families in the district.

Siltronic is fully convinced that the semiconductor industry will continue to grow in the mid-and long-term driven by megatrends such as Artificial Intelligence, Digitalization and Electromobility. With its new capacity, Siltronic is well positioned to meet the growing demand.



ADVANCING SEMICONDUCTOR
LOGISTICS:

HOW SIN CHEW WOODPAQ OVERCOMES INDUSTRY CHALLENGES



Engineering Packing



Hoisting

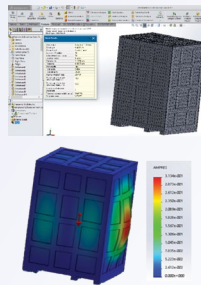
The semiconductor industry is the backbone of modern technology, powering everything from smartphones to advanced medical equipment. However, the complexity and sensitivity of semiconductor machinery present unique logistical challenges. Sin Chew Woodpaq, a comprehensive logistics solution provider, offers specialized services designed to give you peace of mind.

With decades of experience, we are a leading provider in the logistics sector, offering customized wooden crating, design and engineering capabilities, sensitive and heavy machinery moving and packing, heavy lifting, jacking and skidding, air-ride transportation, warehousing, and material treatment.

Trusted by industries ranging from aerospace to marine and offshore, we excel in serving the semiconductor sector.

We offer a comprehensive suite of logistics services tailored specifically to the semiconductor industry's needs. This includes reusable, secure-fit engineering cases for sensitive and heavy semiconductor machinery, along with cleanroom moving services. Recognizing the critical nature of semiconductor equipment, we uphold the highest standards of safety and efficiency.

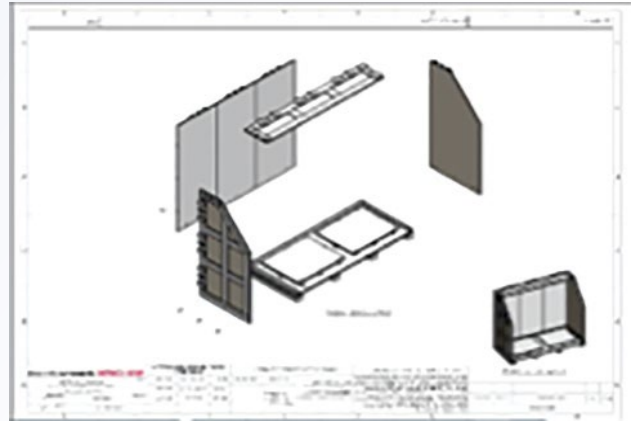
Specialized Packing Solutions for Sensitive Semiconductor Machinery



Finite Element Analysis (FEA)



Engineering Case



CAD Drawing

Sin Chew Woodpaq provides specialized crating and packing solutions to protect delicate semiconductor machinery. Utilizing CAD drawings, our engineers create precise and detailed designs of wooden cases, ensuring accurate representation of every dimension and feature. We employ Finite Element Analysis (FEA) to simulate and analyze the structural integrity of these cases under various stress conditions, ensuring they can withstand the rigors of transportation. Vibration recording allows us to understand the vibrational environment during transit,

enabling us to incorporate vibration-dampening materials and shock-absorbing features to safeguard delicate machinery.

Our reusable engineering cases are designed with hinges for easy assembly and disassembly, eliminating the need for nails. This design not only provides maximum protection and convenience but also uses high-quality, durable materials to ensure sustainability and long-term use.

Specialized Moving Solutions for Semiconductor Machinery



Battery Motorized Rollers



Hydraulic Air Float Systems

Sin Chew Woodpaq specializes in moving semiconductor machinery, utilizing advanced equipment such as hydraulic air float systems and battery motorized rollers to minimize manual handling. This approach enhances efficiency and ensures safety throughout the moving process. We are highly experienced in cleanroom relocation and strictly adhere to cleanroom protocols, including the use of appropriate cleanroom attire and equipment to prevent contamination. Our personnel are extensively trained in cleanroom procedures to ensure compliance with the highest standards.

Ensuring Timely and Reliable Logistics

Delays in semiconductor equipment delivery can disrupt production schedules, leading to costly downtime. Sin Chew Woodpaq's efficient logistics solutions ensure timely delivery of semiconductor machinery. We leverage advanced tracking systems, such as GPS-enabled transport units and real-time logistics software, to meticulously plan our transport operations. Additionally, air-ride transportation is employed to significantly reduce impact levels



GPS-Enabled Transport Units and Real-Time Logistics Software



Air-Ride Transportation

during transit, ensuring smoother rides and better protection for sensitive equipment. Strategic planning, including route optimization and contingency measures, helps prevent delays and maintains seamless operations.

Sin Chew Woodpaq understands the unique logistical challenges faced by the semiconductor industry. By offering specialized solutions in precision handling, cleanroom moving, and timely deliveries, we help you overcome these obstacles effectively. We are also committed to sustainability, using FSC-certified wooden materials for crates, employing hybrid forklifts to reduce emissions, and continually seeking eco-friendly solutions.

Experience the difference in quality, reliability, and sustainability with Sin Chew Woodpaq—your one-stop logistics solution. For more information, visit our website at www.sin-chew.com.sg.

Email: enquiry@sin-chew.com.sg

Phone: +65 6288 8555



SIN CHEW
Sin Chew Woodpaq Pte Ltd
Protecting & Positioning Businesses



#WeAreHOYAElectronics

Empowered to make a difference

We're more than just a company; we're a community of forward-thinkers, innovators, and dreamers driven by a shared vision of *innovating for a better tomorrow*.

We understand that innovation is the cornerstone of progress. At HOYA Electronics, you're empowered to bring your ideas to life and shape a brighter future.

With our supportive and inclusive workplace, you'll experience a culture that fosters your growth and development, providing you with abundant opportunities for skill-building and career advancement.

We recognize that your contributions are a vital part of our collective journey toward a better tomorrow, and we demonstrate our care by ensuring that your rewards are fair and competitive. Your unique contributions are valued, and together, we celebrate excellence.

You've come to the right place if you're looking for a workplace that empowers you to innovate, develop, and grow while prioritizing your well-being.

Unleashing Machine Learning Capabilities with Gantner Instruments in the Semiconductor Industry

Gantner Instruments: The Backbone of Machine Learning in Semiconductor Manufacturing

For machine learning to be effective, it requires high-quality, reliable data. This is where Gantner Instruments excels. Gantner provides advanced data acquisition systems that capture precise, real-time data from various points in the semiconductor manufacturing process. This data is critical for training and deploying ML models that can drive significant improvements in production efficiency and quality.

Real-Time, High-Resolution Data Acquisition

Gantner Instruments' data acquisition systems are designed to provide high-resolution, real-time data on critical process parameters such as temperature, pressure, voltage, and current. This level of detail is essential for ML models, which rely on accurate data to make predictions and optimizations.

In semiconductor manufacturing, where even small deviations can lead to significant defects, the ability to monitor and respond to process variations in real time is crucial. Gantner Instruments ensure that the data fed into ML algorithms is both accurate and timely, enabling more effective process control and optimization.

Seamless Integration with Machine Learning Platforms

Gantner Instruments' solutions are designed to integrate seamlessly with existing ML platforms and data analytics tools used in the semiconductor industry. This integration allows for the smooth flow of data from sensors and measurement devices into ML models, facilitating real-time analysis and decision-making.

By providing a robust and flexible data acquisition infrastructure, Gantner ensures that semiconductor manufacturers can fully leverage the power of machine learning without the need for extensive reconfiguration or additional investment in new systems.

scan & find out more



ENSURING PRODUCTION CONTINUITY IN AN UNPREDICTABLE MARKET



The semiconductor industry is well-known for its cyclical nature, often driven by macroeconomic factors beyond anyone's control. So, how does one determine the right time to set up new facilities or acquire new machinery to expand production capabilities? What happens if those newly acquired machines become obsolete during an unexpected market downturn?

At DISCO, we believe that our customers seek more than just our products—they desire the processing results that our products enable. With this in mind, we deliver the best processing outcomes through our extensive expertise in Kiru (cutting), Kezuru (grinding), and Migaku (polishing) technologies.

DISCO is keenly aware of the processing needs and concerns of all semiconductor players, especially in light of market fluctuations. That's why we offer our in-house dicing and grinding service, known as the "KKM Service," to help our customers navigate unexpected market trends. The KKM Service is particularly useful for product development and small-lot productions.

For new and challenging devices, it is crucial to validate the feasibility and quality of mass production before committing to significant capital expenditures. DISCO optimizes the entire dicing and grinding process flow, allowing it to be fully adopted when facilities are ready.

Consider another scenario: a new customer order is received, but additional time is needed for facility expansion and increased production capacity. By utilizing DISCO's KKM Service, you can fulfil customer orders while your expansion is in progress.

For start-up companies, DISCO provides support in achieving production stability, ensuring economies of scale are realized before transitioning to mass production.

DISCO Hi-Tec Singapore features dedicated Class 1K cleanrooms, equipped with the latest DISCO machines and technologies. Thanks to DISCO's global network, our KKM Service can be performed at the DISCO office that is strategically and logistically most advantageous.



Class 1K cleanroom (size: 276.8m²) at DISCO Hi-Tec Singapore



For more information on our KKM Service, please contact any DISCO office at www.disco.co.jp/eg/contact/general/contact



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thrives

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EDWARDS



THE BACKBONE OF TECHNOLOGY:

STRENGTHENING SEMICONDUCTOR SUPPLY CHAINS

As the world becomes increasingly reliant on semiconductors, addressing the complexities within their supply chain is vital to sustaining a robust and innovative global economy. Recently, the semiconductor industry has faced significant disruptions due to the Covid-19 pandemic, fluctuating macroeconomic conditions, and major trade disputes. This industry depends on a vast and intricate network of suppliers for raw materials, silicon wafers, and assembly and packaging services. Any disruption in this network can trigger a ripple effect, drastically impacting semiconductor supply and, in turn, affecting manufacturers, their customers, and end

users alike. DSV offers flexible solutions designed to enhance semiconductor supply chains, mitigate risks, and provide customers with a competitive edge in this rapidly evolving industry.

Precision in Motion: DSV's Capital Equipment Logistics

DSV's Capital Equipment Logistics division is dedicated to the meticulous transportation of delicate capital equipment. With white-glove services, DSV ensures that high-value equipment receives the highest level of care. From specialized tarmac loading and unloading to shock and tilt monitoring throughout transit, DSV protects assets every step of the way. Temperature-controlled shipments preserve optimal conditions for sensitive equipment, while a 24/7 end-to-end Monitoring Control Tower offers real-time visibility and complete peace of mind.

Infrastructure & Capabilities: A Network Engineered for Excellence

DSV's infrastructure is robust and reliable, tailored to meet the specific needs of the semiconductor industry. A central Control Tower meticulously oversees each shipment's journey from origin to destination. By controlling capacity through either charter or commercially available air freight, DSV ensures timely delivery. In-house teams manage flight

planning, load planning, and Build-Up Plans (BUP), optimizing logistics for maximum efficiency and operational excellence.

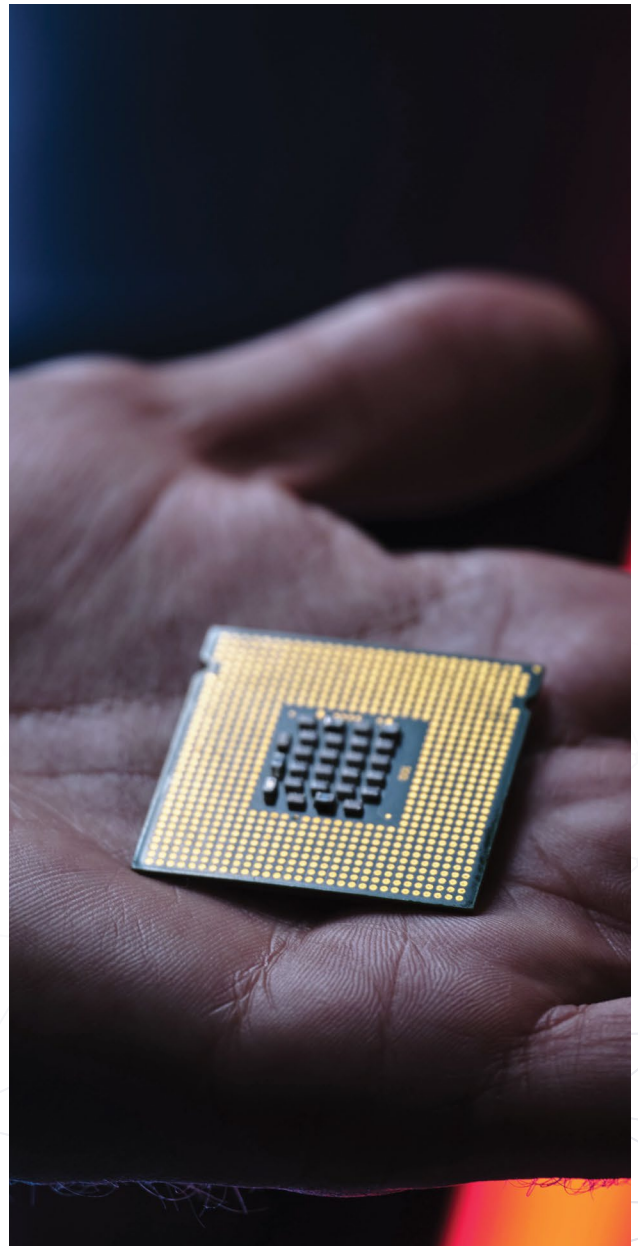
Understanding the necessity for flexible export gateways, DSV offers multiple options to provide the most cost-effective and time-sensitive routes for each shipment. With dedicated airport warehouse space within the Changi Airport Cargo Complex (FTZ), DSV ensures ample storage for in-transit cargo. A temperature-controlled warehouse maintains sensitive components in optimal conditions. Additionally, DSV's seamless transshipment capabilities via both air and sea freight ensure smooth and efficient transportation across long distances.

Seamless Execution: Distribution and Last-Mile Delivery

DSV's commitment doesn't end with international transportation. The company provides comprehensive distribution and last-mile delivery solutions to ensure products reach their final destination on time and in perfect condition. A charter flight service offers an express option for urgent shipments, while Flash Service guarantees swift and reliable delivery. With 24/7 freight operation support, any concerns are addressed promptly, and a dedicated fleet of air-ride trucks ensures a smooth and secure ride for valuable cargo. Moreover, reefer containers provide temperature-controlled storage, safeguarding the integrity of products throughout the final leg of their journey.

Recognizing the critical role of a resilient supply chain in the semiconductor industry, DSV empowers businesses with its expertise and unwavering commitment to excellence.

Contact DSV Semiconductor Supply Chain Solutions today to experience the difference a true partner can make. For more information, visit www.dsv.com/semiconductor.



DSV

Global Transport and Logistics

FUTURE OF POWER ELECTRONICS, COPPER INTERCONNECTS -

ENABLING THE NEXT LEAP

Power electronics are at the forefront of driving innovation in renewable energy systems and electric vehicles and have seen a significant growth in recent years. The trends in power electronics toward minimization, SiC devices and higher operation temperature drive the transition from traditional Aluminum (Al) wire interconnects to Copper (Cu) interconnects. Replacing Al wire with Cu wire addresses reliability bottlenecks and meet the rising demands for high-performance applications. Copper's superior mechanical strength, higher thermal and electrical conductivities and high current capacity make it a better material than Aluminum in advancing power electronics. Wire bonding with heavy Cu wire imposes more challenges to equipment and process. New innovations in equipment, tools and process help the acceleration of Cu wire bonding transition in power electronics.

Challenges in Integrating Copper Interconnects

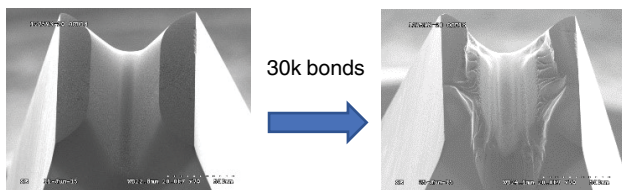


Figure 1: A standard wire bond tool and bonds comparison before and after 30,000 bonds of 20 mil Cu wire.

Implementing copper wire bonding introduces several technical challenges. Cu wire has a layer of oxide that is harder to remove than Al oxide and requires more sophisticated bonding process and higher power ultrasonic bonding system. The durability of bonding consumables including bonding and cutting tools is another critical considerations, as evidenced by Figures 1 and 2. Figure 3 further highlights the issues of stiction forces and surface metallization delamination.

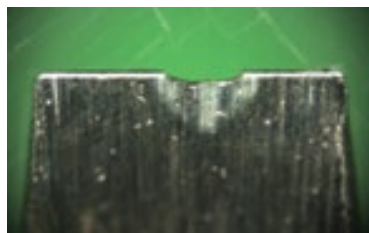


Figure 2: The view of a cutter blade after 5,000 cuts on a 16 mil Cu wire.

Wire termination for Cu wire is more challenging than Al wire; the elevated cutting force required for harder Cu wires and ribbons amplifies the risk of substrate damage and accelerates wear on the cutter blade. Figure 2 shows the visual depiction of the indentation formed in a conventional wire cutter blade after 5,000 cuts on a 16-mil copper wire.



Figure 3: Due to a high stiction force, the bond tool ripped off delaminated surface metallization after the bond tool lifted off from the surface.

The copper interconnect would also face process challenges with a unbonded region in the middle and significant stiction force between the bond tool and wire. Figure 3 illustrates the peeling of bond surface metallization after the bond tool was lifted.

Innovation as a Response to Industry Challenges

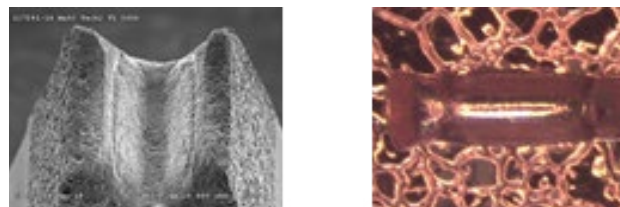


Figure 4: Bond tool and bond produced after 500,000 bonds of 16 mil Cu wire.

Kulicke & Soffa's (K&S) CuEx® bond tool, new wire cutter technology and the latest ultrasonic system represent significant strides in overcoming these hurdles. The extended lifespan and improved performance of these tools, illustrated in Figures 4 and 5, show a more stable and reliable bonding process.

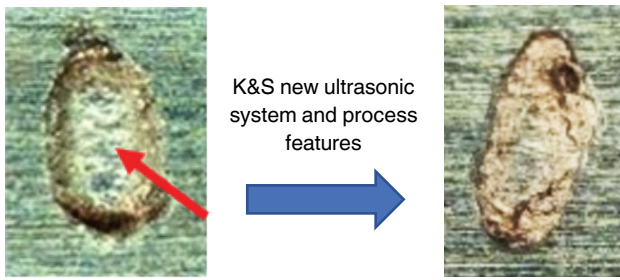


Figure 5: Improvement on central unbonded region

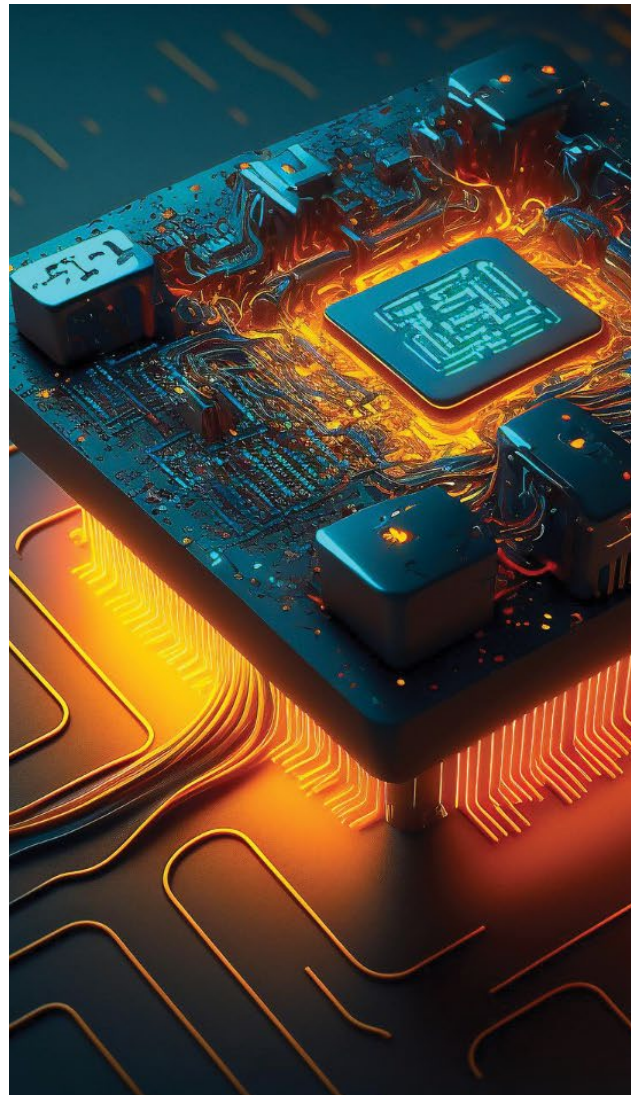
As the mechanical properties of a large copper wire and ribbon demand substantial bond power and force, K&S has developed an innovative ultrasonic system designed to meet these requirements for bonding large copper wire and ribbon. To tackle the challenge of high stiction force, a comprehensive set of process tools have been developed to enable the copper interconnect, facilitating mass production. Figure 5 illustrates the notable improvement of the bonded region after the implementation of K&S's latest Cu process solutions.

Positioning Within the Larger Industry Narrative

The shift towards copper interconnects in power electronics is more than a technical evolution; it's reflective of the industry's broader trajectory towards sustainability and performance. As renewable energy sources and electric vehicles become increasingly prevalent, the need for more reliable and efficient power electronics escalates. Copper interconnects facilitate this transition by enabling devices that can handle higher power densities and improved thermal management — key factors in the long-term viability and integration of these technologies.

K&S's solutions in equipment, process, bonding tools and consumables have demonstrated significant improvement in copper bonding and have met multiple manufacturing challenges. These advanced solutions have shown high yield and good cost of ownership in high volume manufacturing (HVM) recently.

In a larger context, by innovating and continuously collaborating with partners to advance the copper interconnect technology, K&S is working hard to contribute to the industry-wide push towards a cleaner, more sustainable future.



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COSIRI:

ELEVATING CORPORATE SUSTAINABILITY READINESS



Why COSIRI Exists

The purpose of COSIRI is to help companies assess their current state of sustainability readiness. Essentially, it enables organizations to understand where they currently stand in terms of their sustainability practices. This is achieved through an evaluation across 24 dimensions, categorized into four key building blocks: Strategy and Risk Management; Sustainable Business Processes; Technology; and Organization and Governance.

Sustainability is not confined to a single department—it permeates every facet of an organization, from R&D and production to supply chain, logistics, finance, training, and marketing. COSIRI's role is to evaluate the performance of these areas, determining how effectively each contributes to the company's sustainability goals.

The goal of COSIRI is to identify underperforming areas within the organization. Much like a personal health check, it highlights neglected or suboptimal aspects. Uncovering these weak points is crucial, as it guides the company on what needs improvement, how to enhance these areas, and where to seek assistance if necessary. All these efforts are aimed at helping companies achieve their net-zero goals, uphold social responsibility, and maintain strong governance practices.

How COSIRI Achieves Its Goals

Once a client commits to an assessment, the process begins with a pre-assessment briefing at least two weeks prior to the actual assessment. During this time, the client gathers department heads together, and the assessor requests the collection of relevant documents—such as certificates, policies, and photos—before the onsite assessment. These documents are used by the assessor for verification purposes. Additionally, the assessor may request to visit certain facilities, such as the water recycling plant, during the onsite assessment.

Two weeks following the pre-briefing, the plant manager and some department heads are expected to be on the shop floor to participate in the assessment. Depending on the size of the facility, this assessment can take between 2 to 3 days.

After the onsite evaluation, the assessor inputs the scores and notes into the COSIRI Platform, which automatically generates a Prioritization Matrix. This matrix identifies five key dimensions the client should focus on immediately, with one priority dimension selected from each building block, and an additional one from the Sustainable Business Processes block. Addressing these dimensions will yield the most significant improvements for the company.

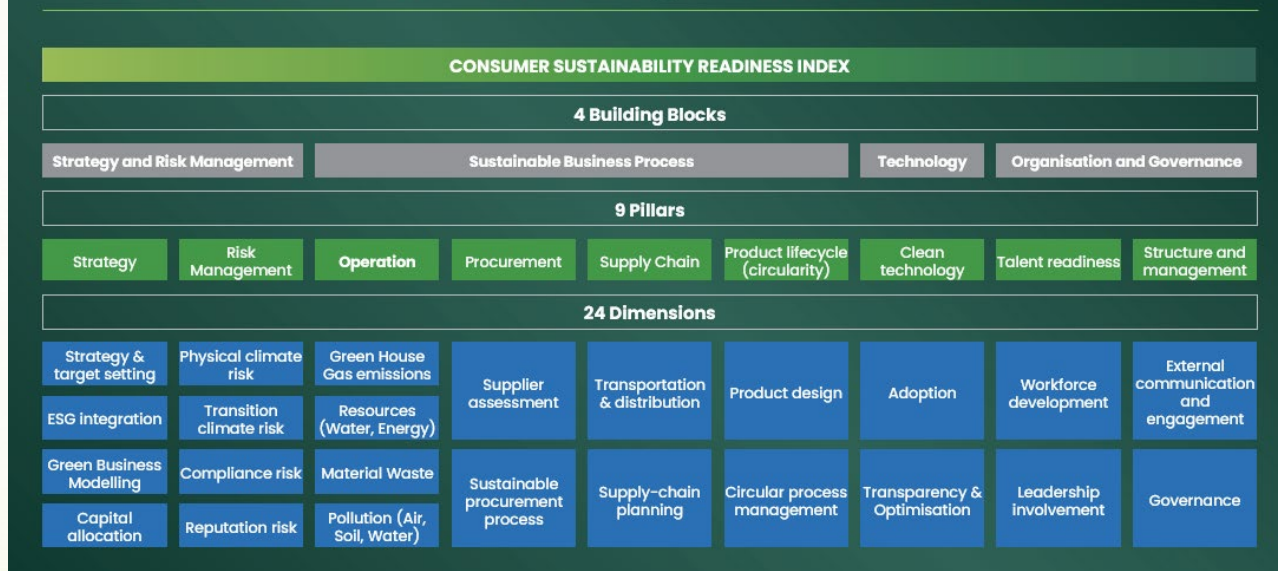
Following the assessment, clients receive a comprehensive 30-page report, which includes a certificate, and a star rating based on the evaluation.

What COSIRI Offers

The COSIRI assessment framework is comprised of four building blocks, encompassing 24 dimensions for evaluation.

During the assessment, the assessor engages with the client through a series of questions for each dimension. Based on the responses, the assessor may request

Dimension overview – 4 building blocks and 24 dimensions



supporting documents to verify and ensure alignment of understanding and expectations. Where discrepancies arise, additional information may be requested to ensure a fair assessment.

COSIRI employs a structured band score ranging from 0 to 5, with 0 being the lowest and 5 the highest. The assessor assigns an appropriate band score for each dimension based on the provided answers and supporting documents. This process is repeated across all 24 dimensions to complete the COSIRI assessment.

A standout feature of the report is the Best-in-Class comparison radar diagram, which provides an at-a-glance view of the performance across all 24 dimensions. None of these dimensions operate in isolation—they are interconnected. Therefore, poor performance in just 3 or 4 dimensions can have a significant impact on the company. For instance, low scores in Physical Climate Risk, Compliance Risk, Supply Chain, and Procurement suggest that the supply chain is not as resilient as it should be. Given the increasing regulations and climate changes, the client should prioritize implementing a Sustainable Supply Chain policy, conduct due diligence, and diversify sources of supply to mitigate against Physical Climate Risk.

The report also highlights the five dimensions that the client should address immediately, which will provide the greatest

improvement over the next two years. A transformation roadmap is provided, detailing the necessary steps to enhance performance. COSIRI may also recommend solution providers to assist in this transformation.



QUESTIONS

FOR MICHAEL TAY

Can you tell us a bit about yourself and your background?

I started my career in marketing. In 2014, I saw the movie, *An Inconvenient Truth*, and was sold by it. In 2016, I switched my career to sustainability. I became the General Manager for CSR at Bridgestone where I drove sustainability with over 100 natural rubber suppliers worldwide – that is from our Tier 1 supplier all the way up to the Point of Origin. I also built a traceability system to trace the journey of the raw materials and know who our Tier 2, Tier 3, and point of origin suppliers are. This enables us to drive sustainability to them. You cannot drive sustainability in your supply chain if you do not know who they are.

What inspired you to get into the field of sustainability?

The *Inconvenient Truth* made a tremendous impact on me. In 2015, a head-hunter approached me, and asked if I would like to do something that could help the world. I

thought about that seriously, and considered the existential threat my children and generations after have to deal with. I thought I could do my part, however small. Being able to integrate sustainability (do good) into business was what attracted me a lot. Since then, it has become my passion and mission to share my knowledge, and experience to help companies become more resilient, be more sustainable, in light of climate change.

How did the idea for COSIRI come about?

INCIT developed COSIRI together with McKinsey Consultants. This came about as sustainability is becoming mainstream around the world. Yet, many companies, do not know what they do not know. COSIRI helps companies to assess their sustainability state-of-readiness, uncover areas that were hidden, and develop a transformation roadmap for improvement.

What makes COSIRI different from other sustainability frameworks?

First, COSIRI is assessed by our Certified COSIRI Assessor, CCA. Our CCAs undergo a rigorous 5-days training and examination to be certified. It is not easy to be certified. I ensure a high standard of competency before certifying them. Secondly, all assessments are done onsite, at the client's premises, unlike many who had their assessments done online via an online survey form. Thirdly, all assessments are carried out together with senior members of the client. This interaction enables the client to be in the assessment process so that they can learn as well.

Can you explain the COSIRI 10 vs 24 index and how it benefits companies?

COSIRI-10 is a lite version of COSIRI-24. It assesses only the 10 dimensions within the Sustainable Business Process building block. SMEs, and bigger companies who want to have a mid-point check on their net-zero progress, are most suited for COSIRI-10. COSIRI-24 assesses 24 dimensions across 4 building blocks: Strategy and Risk Management; Sustainable Business Processes; Technology; and Organization and Governance. This is comprehensive, most suited for MNCs and those seeking financing.

What challenges have you faced in developing and implementing COSIRI?

To many companies, sustainability is still relatively new. Early this year, the Singapore Business Federation's (SBF) reported that 41 per cent of businesses here do not know where or how to start to become more sustainable. A lot of them are focused on reporting. The core of COSIRI is about improving. It is about transforming the whole organization to become more sustainable. This is what stakeholders and regulators are looking at. And this is where COSIRI is most helpful.

Can you share a success story or case study where COSIRI made a significant impact?

We had a situation where the client set aside strong budget for compliance and training, but did not do so for risk management, supply chain, procurement, and the adoption of technology. COSIRI uncovered these areas that were left out. They did not take Physical Climate Risk Management seriously. This can have a significant impact on supply resilience in the future. By working on that, along with driving sustainability with suppliers and adopting new

technology, they are able to reduce their environmental impacts significantly.

What are your future plans for COSIRI and INCIT?

We will continue to train and certify more assessors. We want to penetrate deeper into the US. With many changes on the regulatory front, we will continue to update COSIRI and keep it up-to-date. We want to work with solution providers that will be an extension of COSIRI, providing solutions to companies to turn their weaknesses into strengths.

How do you see the role of sustainability evolving in the next 5-10 years?

Sustainability will become mainstream, and reporting will become mandatory, just like accounting. Big companies will be subjected to regulatory demands, and they will drive that demand to their supply chains. Due diligence on supply chain will be a new requirement. The upcoming EU CSDDD (Corporate Sustainability Due Diligence Directive) will be quite a game changer, putting the onus on companies to drive sustainability up their supply chains. The penalty for violations is quite high. so, soon there will be consequences for non-compliance.

What advice would you give to companies just starting their sustainability journey?

Start now. Sustainability will become imperative for businesses. It will become a function within an organization. For companies that have not started their sustainability journey, I would encourage them to start now with a COSIRI-10 assessment. Besides discovering what areas to improve, clients will get to learn how to improve. This is a great way to get started.





Smart Manufacturing

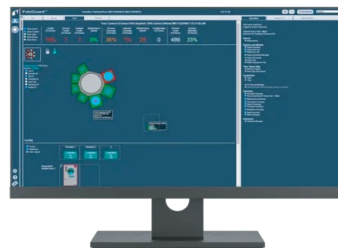
Unlock the Future of Autonomous Manufacturing with AI-Driven Smart Solutions

Enhance your factory's competitiveness by leveraging AI and machine learning. Gain unparalleled real-time data insights and automate decision-making to optimize your operations. Achieve operational excellence with Digital Twins, offering comprehensive data visibility, reduced cycle times, and optimized resource allocation.

- Transparent operations with complete data visibility
- Smart Sensors offer detailed process insights
- Real-time analytics enable confident decisions
- Higher profits through faster cycles and optimized resources
- Sustainable data governance with a single truth source
- User-friendly interface for all management levels

Elevate your factory to new heights with INFICON.

Discover more at ims.inficon.com



FabGuard®

FabGuard FDC System provides unparalleled capability to connect, collect, and translate data into meaningful information. Engineers use this information to develop deep insights into tool capability and process optimization. In addition to working alongside proven FDC techniques, powerful unsupervised Machine Learning with SmartFDC® enables FabGuard to automatically detect when changes occur.



FPS and FabTime®

FPS Digital Twin is the most critical building block for developing a Smart factory. It collects all the real-time operations events to compute cycle time and throughput data to drive powerful applications. FabTime's flexible reporting has been instrumental in empowering fabs with clear and immediate visibility into factory performance, leading to marked improvements in cycle time, capacity, productivity, and profitability.



Smart Sensors

INFICON Smart Sensors accurately measure real-time process conditions including, trace gas concentrations, impurities, and process byproducts. INFICON empowers manufacturers to control processes with greater precision, leading to higher yield, better process control and reduced defects.

Driving Energy Transition

Sembcorp is a leading Asian energy player and established urban developer. We play a key role in the transition towards a sustainable and low-carbon future.

Our 2028 goal

25GW

Gross Installed Renewables Capacity

Learn about
our solutions:



EMPOWERING THE SEMICONDUCTOR INDUSTRY ON THE PATH TO A NET-ZERO FUTURE



Sembcorp's Wind Energy Asset in Henan, China

The semiconductor industry is a critical pillar of the global economy, particularly in Asia, where it was valued at USD 544.78 billion¹ in 2022 and is projected to grow significantly, reaching a market volume of USD 624.80 billion by 2029². However, the industry faces significant challenges, including geopolitical uncertainties, rapid technological shifts, and labour shortages. Compounding these issues is the urgent need to decarbonise energy-intensive operations: the industry emitted approximately 41 million tonnes of CO₂ in 2020. As the industry navigates the complexities of managing cyclical demand and enhancing chip processing power – an effort that tends to increase carbon intensity – it must also contend with growing regulatory pressures and heightened expectations to decarbonise.

Staying on course to net-zero

To remain competitive and compliant, semiconductor companies are increasingly establishing bold sustainability goals, including commitments to achieve net-zero emissions, in alignment with the Paris Agreement. While

progress has been made, significant challenges remain. Current projections indicate that semiconductor emissions are expected to exceed the carbon budget for the 1.5°C pathway by 3.5 times based on existing commitments and the current trajectory, ultimately falling short of achieving net-zero emissions by 2050³. To stay on the net-zero pathway, the industry must increase efforts and investment in decarbonisation, including adopting innovative technologies, enhancing energy efficiency, and expanding renewable energy use.

Unlocking the potential of low-carbon technologies

Today, emerging low-carbon technologies such as ammonia, hydrogen and carbon capture storage solutions play a highly potential role in the next wave of the energy transition. They remain a topic of interest in the energy sector as they are crucial for ensuring energy security while transitioning to greener power.

Hydrogen, when generated through renewable methods, offers a clean alternative for power generation and industrial processes, significantly reducing carbon emissions. The Energy Market Authority of Singapore (EMA) has recently called for a study to develop a framework of laws and policies, which could cover areas such as hydrogen imports, the ownership and operation of hydrogen specific infrastructure, as well as incentive and financing schemes. This is so that the groundwork to tap low-carbon hydrogen as a cleaner fuel source will progress swiftly when it becomes viable. To that end, EMA has also launched a second Request for Proposal inviting the private sector to build, own, and operate two new hydrogen-ready Combined Cycle Gas Turbine generating units to be ready in 2029 and 2030 respectively. Ammonia, especially when

produced from renewable sources, serves as a low-carbon fuel and an effective energy carrier, facilitating the storage and transport of clean energy. Carbon capture, utilisation and storage technologies capture and either utilise or securely store carbon dioxide emissions from power plants and industrial sources, preventing their release into the atmosphere.

While some of these technologies are in its infancy stage or hold more potential compared to others – together they not only support the transition to sustainable energy but also enhance the efficiency and flexibility of our energy ecosystem.

Strategic partnerships to foster innovation and development of decarbonisation solutions

Sembcorp Industries, as a prominent Asian energy player with the right assets and infrastructure, is well underway to exploring the use and investing in such technologies for the energy and industrial sectors, working closely alongside several partners.

Given our growing renewables presence in India and China, Asia's top renewable energy markets and being the only renewables player in Singapore with a full suite of competitive green energy solutions, we are well placed to deliver across multiple sectors, including the semiconductor industry, and across multiple markets in the region. Our positioning as a leading gas player in Singapore also allows us to offer decarbonisation solutions to our customers through low-carbon feedstock, either as an alternative fuel to, or blend with natural gas, as well as long-term contracts to



Sembcorp's Gangavathi Solar Project in Karnataka, India

customers. This ensures that we can offer consistent power generation to our customers through a diversified range of energy sources, crucial for maintaining energy security.

Sembcorp has already signed agreements with strategic partners to pursue opportunities in this field. We have a joint development study agreement with PT PLN (Persero) to assess the feasibility of green hydrogen production in Indonesia for export to Singapore. Closer to home, we have partnered with IHI Corporation and GE Vernova's Gas Power business to explore the potential retrofitting of Sembcorp's Sakra power plant on Jurong Island with ammonia-firing capabilities. We have also been shortlisted by the Energy Market Authority in Singapore and the Maritime and Port Authority of Singapore to further study the viability to provide a low- or zero-carbon ammonia solution on Jurong Island for power generation and bunkering. This is in addition to our new multi-utilities centre on Jurong Island which will include a 600-megawatt hydrogen-ready power plant using J Class gas turbine supplied by Mitsubishi Heavy Industries, ready to be fully operational by 2026. We will continue to leverage our energy and renewables expertise to collaborate in opportunities across the green hydrogen and ammonia value chain.



Signing Ceremony of a joint development study agreement between Sembcorp and Indonesian state-owned utility company, PT PLN, to explore the feasibility of green hydrogen production Indonesia for export to Singapore

¹ <https://www.precedenceresearch.com/semiconductor-market>

² <https://www.statista.com/outlook/tmo/semiconductors/asia>

³ <https://www.bcg.com/publications/2023/a-plan-to-reduce-semiconductor-emissions>

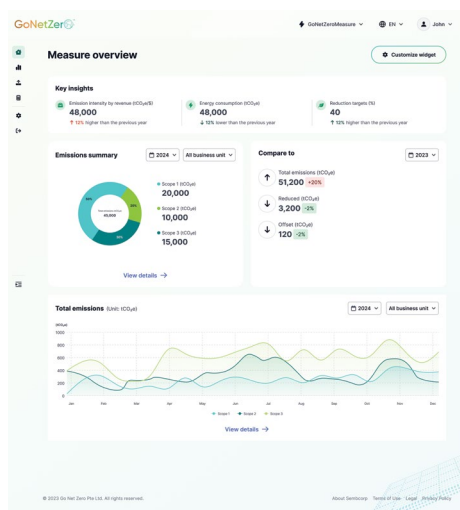
Making decarbonisation accessible with GoNetZero™

As part of Sembcorp's carbon management business, GoNetZero™ is a decarbonisation solution provider that empowers wide-ranging industries globally in their decarbonisation efforts by offering the essential tools and expertise required to meet emissions reduction targets.

a. Measure: The Foundation of effective decarbonisation

Effective decarbonisation strategies begin with a precise understanding of carbon emissions. GoNetZero™'s *Measure* platform provides semiconductor companies with a powerful tool to track, manage, and report their emissions. Powered by machine learning, *Measure* automates and streamlines the emissions data collection process, ensuring more accurate and efficient data handling.

- **Do away with manual uploads:** *Measure* effortlessly extracts information from various document formats and across multiple languages.
- **Expedite inter-team data submission:** *Measure*'s delegated data submission feature enables quicker and more efficient data collection by allowing different departments to submit data directly.
- **Pinpoint emissions hotspots:** *Measure* provides valuable insights across Scope 1, 2, and 3 emissions, identifying significant emissions contributors. It also allows for customised analysis at the desired level of granularity needed.



GoNetZero™'s *Measure* platform, powered by machine learning, automates emissions tracking and reporting, enabling accurate and efficient data management for semiconductor companies.

These features empower semiconductor firms to gain detailed insights into their energy consumption and associated emissions, allowing them to identify key areas for reducing their carbon footprints and setting achievable decarbonisation goals.

b. Maximising renewable energy output with SolarOS

With the majority of semiconductor industry emissions stemming from Scope 2 emissions, a key industry decarbonisation lever involves transitioning to renewable energy sources. Typically, this transition includes strategies such as entering into Power Purchase Agreements (PPAs) with renewable energy providers, or self-generation of renewable energy onsite.

In this context, innovative solutions such as GoNetZero™'s SolarOS platform play a crucial role in enabling companies to maximise their renewable energy generation.

- **Granular data analysis:** With SolarOS identifying shading and soiling losses, companies can enhance panel efficiency and minimise financial losses related to decreased efficiency.
- **Forecasting tools:** Leveraging advanced modeling data, SolarOS predicts energy generation and potential inefficiencies, enabling informed decision-making for resource management.
- **Predictive maintenance:** SolarOS streamlines maintenance operations by delivering prompt notifications to the operations and maintenance team. This proactive approach eliminates the need for routine panel cleaning schedules, resulting in labour cost savings and reduced downtime.



GoNetZero™'s SolarOS enhances solar panel efficiency with granular data analysis, forecasting, and predictive maintenance

▪ **Efficient troubleshooting:** For companies managing many solar panels, SolarOS provides string-level data, allowing for efficient troubleshooting at the individual panel level, enabling rapid repairs and uninterrupted energy generation.

By integrating SolarOS into their operations, semiconductor companies can achieve cost savings and increased yield, making substantial progress in reducing Scope 2 emissions. This ensures that solar investments deliver maximum returns, aligning energy use with global decarbonisation goals.

c. Leveraging RECs: Bridging the gap to 100% renewable energy

Transitioning to renewable energy sources is crucial, but semiconductor companies often face renewable energy shortfalls or limitations in onsite renewable energy generation. For those committed to RE100 – a global initiative encouraging companies to source 100% of their electricity from renewable energy – there lies an additional imperative to ensure these shortfalls are met. This is where RECs play a crucial role, with RECs representing the environmental attributes of one megawatt-hour of electricity generated from renewable sources.

GoNetZero™ offers flexibility and scalability with its RECs, providing a practical solution for businesses that cannot install onsite renewable energy infrastructure due to cost, space, or other limitations. GoNetZero™'s RECs are issued from Sembcorp's portfolio of renewable energy projects in Singapore and the region. Furthermore, GoNetZero™ sources a variety of certificates from its trusted network of partners, according to clients' needs. These include certificates for different technologies, vintages, countries of origin, and registries.

While RECs offer significant benefits, managing and retiring RECs can be a complex process. It involves registering RECs with a recognised registry, maintaining an active registry account, and ensuring that RECs are properly retired to claim environmental benefits. GoNetZero™'s *Manage* platform simplifies this by allowing companies to seamlessly view, manage, and retire their portfolio of environmental attributes on a single, user-friendly dashboard.

Towards a successful net-zero future

The energy transition is a complex process and every industry's path to a sustainable future is inextricably linked to its ability to decarbonise. As we explore the transforma-

tive potential of these new technologies and solutions, no single organisation, government, or entity can navigate them alone. It is through collective actions and decisions that will critically influence the pace and potential of the energy transition and chart the course of our energy landscape in the years to come.

Sembcorp's extensive network, coupled with our strong investment in decarbonisation solutions, positions us uniquely to guide the semiconductor industry through the complexities of its energy transition. Our robust global partnerships further enhance our capability to deliver innovative solutions and support. By leveraging these strengths, Sembcorp is well-equipped to drive the semiconductor sector towards a successful and sustainable energy transition.

Kickstart your decarbonisation journey with



GoNetZero™ empowers clients worldwide to achieve their net-zero goals. As a global decarbonisation solution provider, we offer comprehensive end-to-end solutions through our digital platform and verified environmental attributes.



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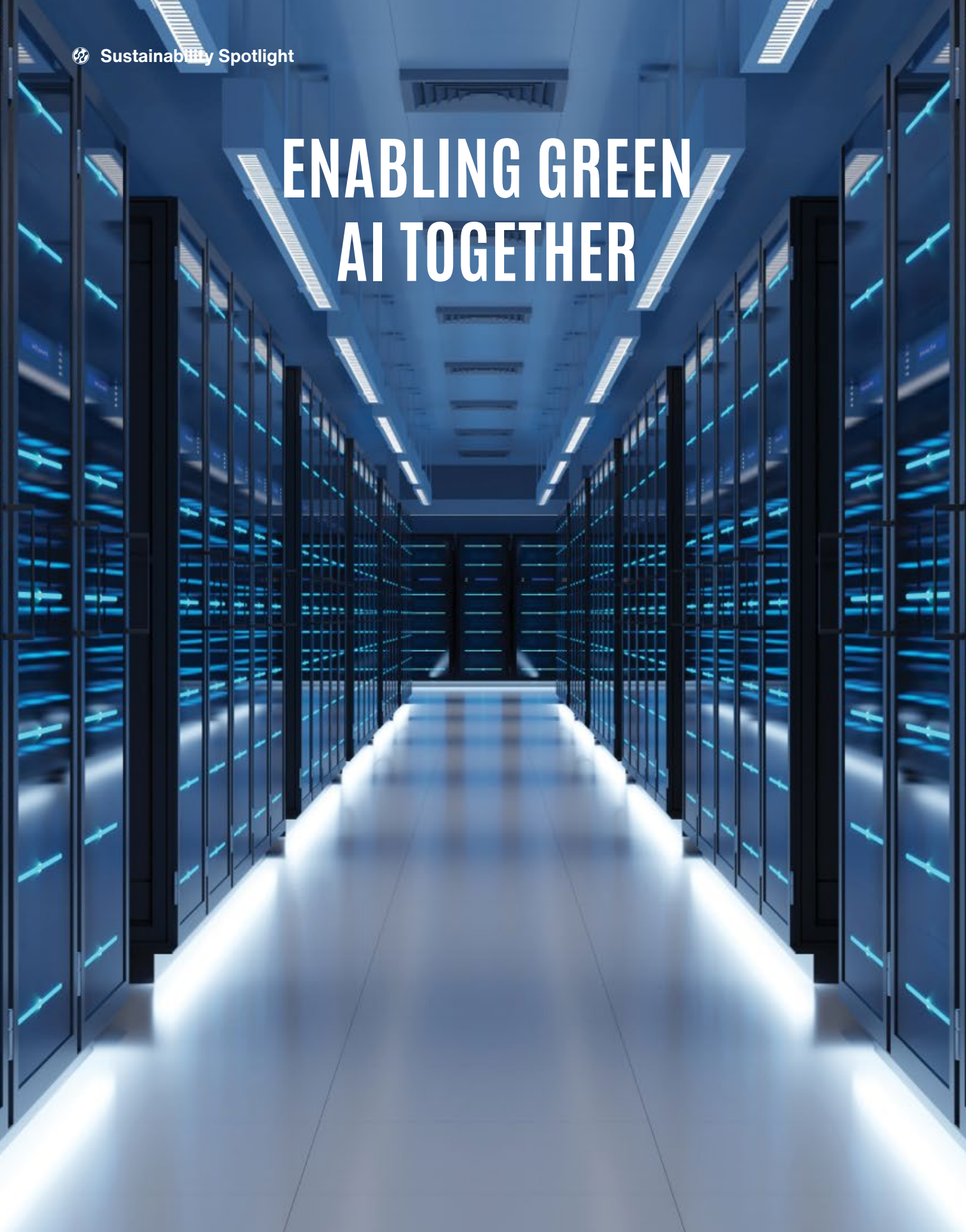
*12-Month and 24-Month fixed electricity rates are only applicable to businesses with a monthly consumption of ≤400MWh. Electricity plans are applicable to low tension customers only. Monthly Energy Uplift Charges (MEUC) excluded from above pricing and is on passthrough basis to customer. Other third-party costs and GST included. Prices are subject to change without prior notice. An initial security deposit determined based on your last 3 months' bill size average is applicable for each new sign-up. Early termination and/or recovery fees will apply for every termination within the contractual period or before the Start Date of the Agreement. Other terms and conditions apply. For full terms and conditions, please visit <https://www.sembcorppower.com>

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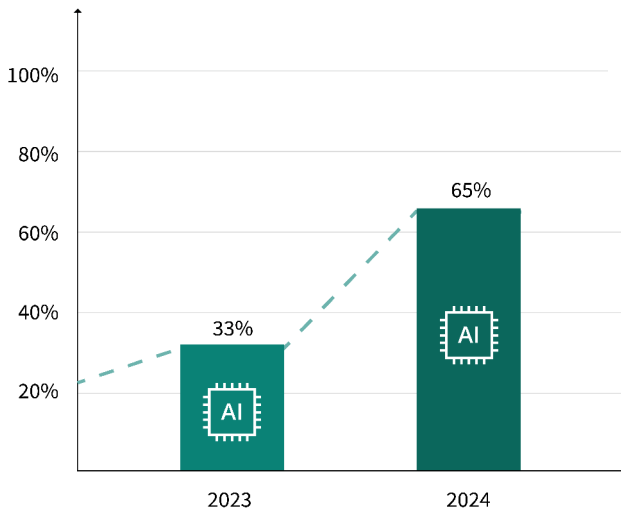


ENABLING GREEN AI TOGETHER



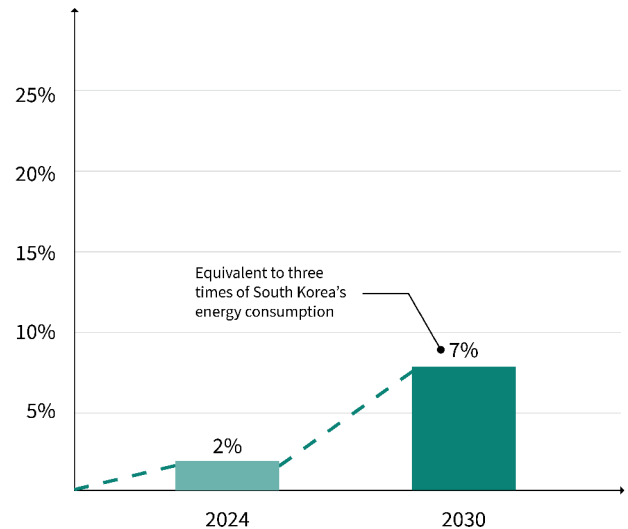
Artificial intelligence (AI) is becoming a part of our lives, from assisting us with our daily activities, to solving complex problems quickly, it is evolving from an experimental novelty and seeding into an explosive array of applications. According to a McKinsey survey, AI is becoming more integrated, with 65 percent of respondents mentioning that gen AI is being frequently used in at least one business function in their organizations - from just one-third of respondents a year before. The rapid growth of AI applications is driving demand for more data centers and more power to operate these centers.

Percentage of usage of gen AI in at least one business function in their organizations



Currently, data centers' energy consumption is just over 2 percent of the global energy supply. By 2030, it is projected to substantially increase to 7 percent which would be equivalent to three times the energy consumption of an industrialized country like South Korea. Energy is required not only for power hungry computations, but also to maintain these data centers in optimal performance conditions. The more intense the computations, the greater the need to cool the servers, thereby increasing total energy demand. Unfortunately, markets today are mainly concerned about data center shortage and the inability to ramp up; and are not paying enough attention to its impact on our energy infrastructure and sustainability going forward.

Data centers' energy consumption



At Infineon, we are doing our part to reduce energy loss by developing wide bandgap (WBG) technology-based power semiconductors. They help to make highly efficient power supply units (PSUs) enabling data centers to reduce their ecological footprint and lower lifetime operating cost. They also make energy conversions and transmissions more efficient. But the fact remains that total energy consumption will rise even faster and we have to meet these demands with alternate, green energy sources.

As AI is poised to take off, we are once again at the crossroads. It is high time for us to own the responsibility to advance as humankind in a sustainable way. Can we realize the full potential of AI and a greener world for our future generations that is worth living for? Perhaps if we commit unequivocally to drive decarbonization and digitalization together, in a sustainable way, we have a chance.

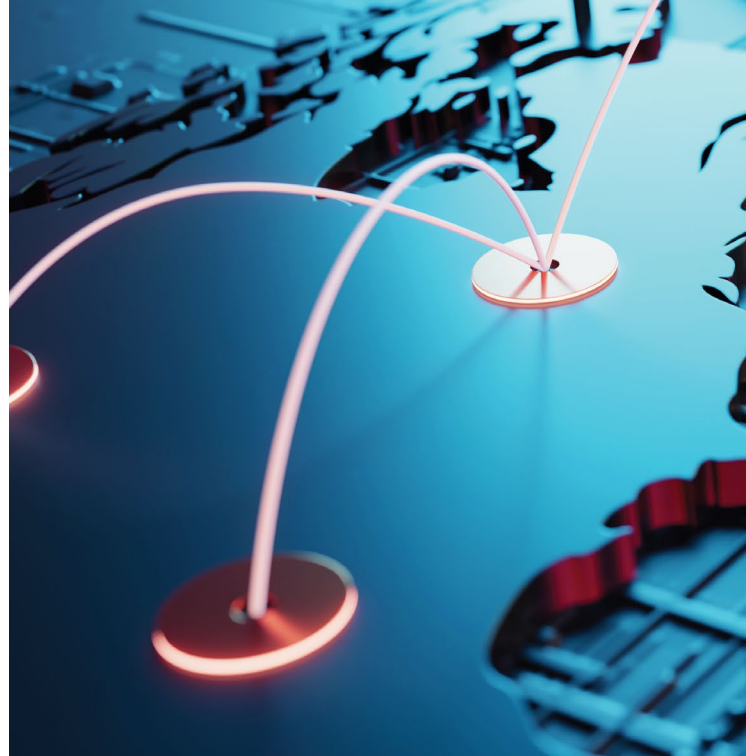


MAPPING GROWTH FOR SOUTHEAST ASIAN BUSINESSES

Innovation has long been the engine of progress, propelling industries forward and driving economic growth. Today, on the rise is a growing emphasis on ensuring this progress is sustainable so that the impact of innovation can exist in the long run. As the world grapples with environmental challenges, businesses are increasingly recognizing the need to integrate sustainability throughout their operations, including their innovation strategies. This is not only to protect the environment, but also to meet growing customer demand for greener products and services.

Sustainable innovation – Playing the long game through strategic investments

Sustainable innovation goes beyond simply developing “green” technologies. It is creating solutions that meet the current needs without compromising the ability of future generations to meet their own. Practicing sustainability in innovation can be as simple as reducing resource consumption and improving operational efficiency, eventually helping businesses achieve long-term success and significant cost savings. What this means is that businesses will have to invest in the development of energy efficient technology, solutions, and products to facilitate long-term transition. It is not a short-term expense, but rather a strategic investment. In fact, the addressable



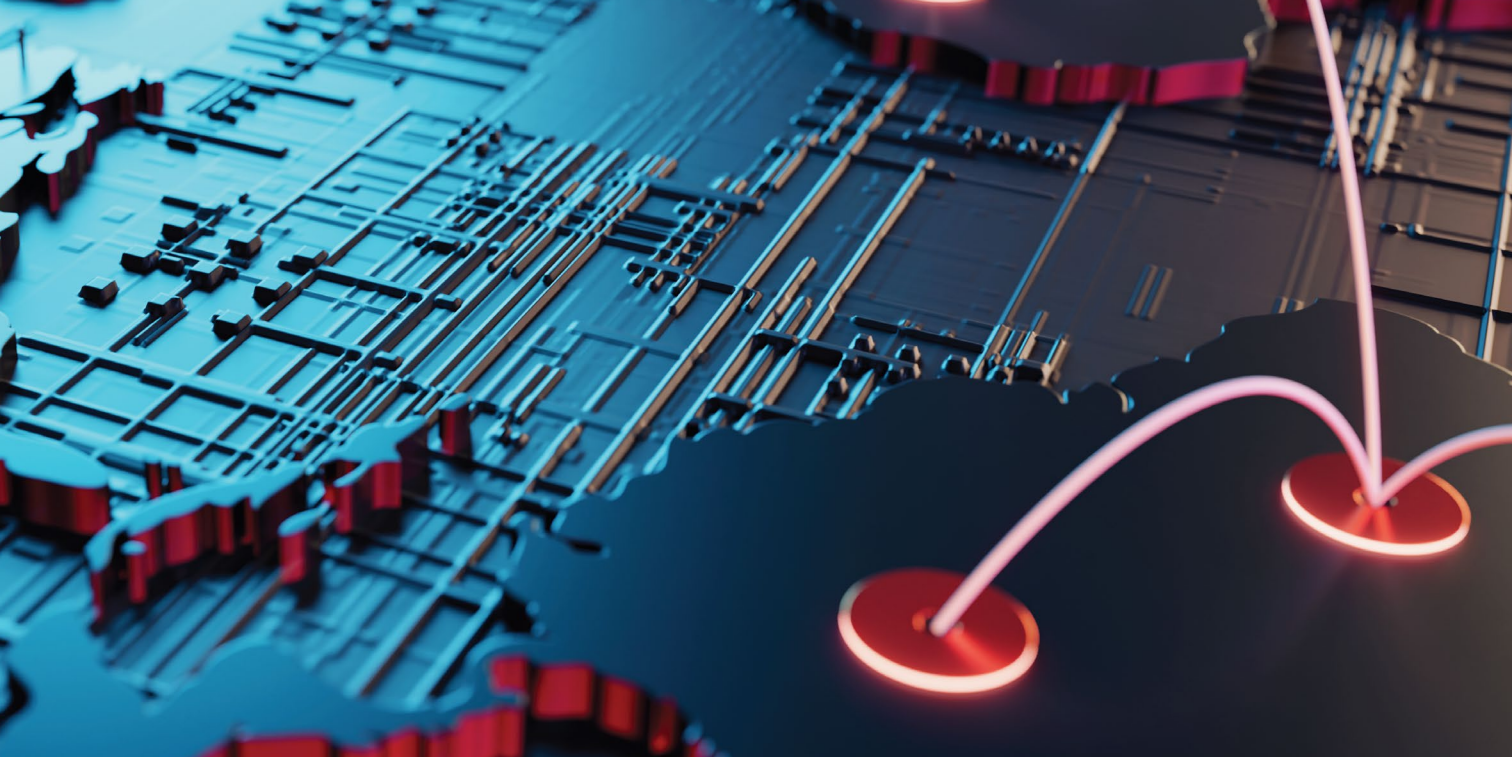
market size for green businesses in Asia is expected to reach between USD\$4 trillion and USD\$5 trillion by 2030.

According to McKinsey & Company, recent years have seen increased capital deployment into both mature businesses and startups that are paying attention to environmental, social, and governance (ESG) considerations. As such, by prioritising sustainability, businesses will be able to gain a competitive edge by resonating with environmentally conscious consumers and investors.

Innovation motivated by greener cause beyond human-centric focus for a greener cause

Innovation of today should not only address the world's and people's needs but also embrace a sustainable approach that respects and protects "Mother Nature" for a sustainable future. While traditional human-centered design focuses on user needs and satisfaction, it has evolved with societal and technological advancements to encompass the well-being of users and the broader community.

As businesses innovate, they should consider the long-term environmental benefits and aim to drive positive change in the world. For example, in Asia and the Pacific region, around 80% of wastewater could be discharged without treatment, leading to issues such as open defecation, insufficient improved sanitation, and inadequate wastewater management systems.



As such, 300 million people in Asia alone do not have access to water, and 1.5 billion lack basic sanitation, highlighting a critical gap in essential services. This significant challenge not only underscores the urgent need for improved water infrastructure and management but also signals an opportunity for businesses to innovate and address this pressing issue. Businesses can practice sustainable innovation by creating tools such as a remote water quality monitoring and metering system to effectively and efficiently measure and control important water quality indicators such as pH levels.

Ultimately, through sustainable innovation, businesses can create tools and solutions that not only meet current needs but also contribute to a more sustainable future.

Embracing the bumpy road in the journey of sustainable innovation

Implementing sustainable innovation poses challenges, particularly as businesses often feel pressured to prioritise immediate profits and shareholder returns. Investing in sustainable practices can involve upfront costs or require sacrificing short-term gains for long-term benefits like environmental impact reduction or resource efficiency.

To strike a balance between sustainable innovation and profitability, it is imminent for stakeholders to collaborate and address these challenges effectively. For instance, the government can set clear and consistent environmental

regulations, implement tax, subsidies or grants to encourage R&D (Research and development) of sustainable technologies and practices. In Southeast Asia, Singapore has recently increased the carbon tax to USD\$18.60/t-CO₂e, demonstrating a commitment to drive environmental sustainability. Similarly, in Thailand, the Finance Ministry is preparing to release an incentives package to encourage private investment in ESG projects.

Meanwhile, businesses can invest in R&D for sustainable solutions within their respective industries, implement sustainable practices throughout their operations, and set goals, such as achieving carbon neutrality or net-zero carbon emissions by 2030, in line with national objectives.

To conclude, innovation remains the key to the progression of the world and industries. That said, this progress must be sustainable. It is through embracing sustainable practices businesses can not only enjoy longevity in success but also contribute to a thriving future for generations to come.



Attributed by, **George Chia**, Regional Business Director, ASEAN, Analog Devices (ADI)

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About ASMPT Limited ("ASMPT")

ASMPT Limited is a leading global supplier of hardware and software solutions for the manufacture of semiconductors and electronics. Headquartered in Singapore, ASMPT's offerings encompass the semiconductor assembly & packaging, and SMT (surface mount technology) industries, ranging from wafer deposition to the various solutions that organise, assemble and package delicate electronic components into a vast range of end-user devices, which include electronics, mobile communications, computing, automotive, industrial and LED (displays). ASMPT partners with customers very closely, with continuous investment in R&D helping to provide cost-effective, industry-shaping solutions that achieve higher productivity, greater reliability, and enhanced quality.

ASMP enabling the digital world

AI-DRIVEN: A NEW ERA OF ADVANCED PACKAGING



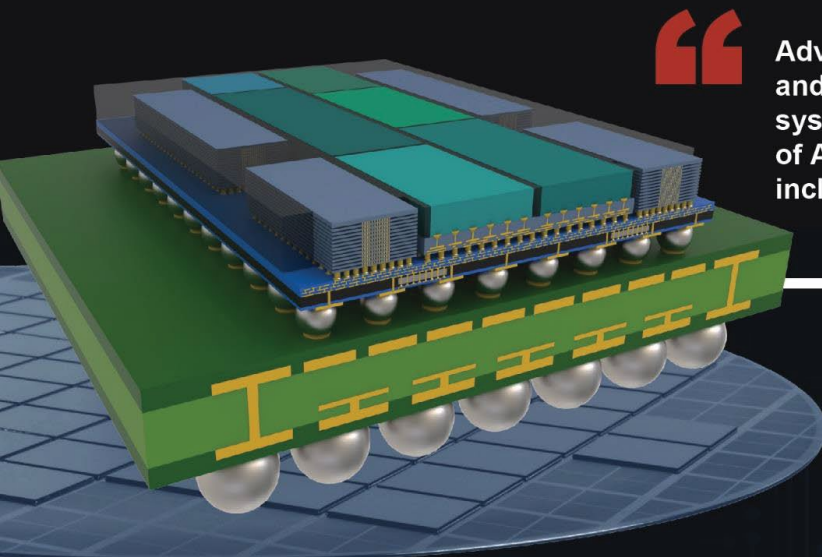
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Advanced packaging technologies, such as 2.5D and 3D hybrid bonding, are critical in optimizing system performance and fostering the new wave of AI chip innovation for a variety of applications, including mobile devices, automotive computing, smart manufacturing, and generative AI.



Advanced Packaging

ELH TECH'S LEAP INTO
ADDITIVE MANUFACTURING:

HOW STRATEGIC PARTNERSHIPS EMPOWERED A LOCAL SME TO BREAK INTO AEROSPACE, DEFENSE, AND SEMICONDUCTOR SECTORS

The Challenge:

ELH Tech, a local SME founded in 2009 as a precision engineering company, aimed to expand into the Additive Manufacturing space, with a focus on metal and polymer materials. However, breaking into industries like aerospace, defense, and semiconductors proved challenging. The company needed partnerships with larger industry players for testing and evaluation to establish credibility and market presence.

The Solution:

Through the Enterprise Singapore (ESG) initiative, SSIA connected ELH Tech with at least five multinational corporations (MNCs). These introductions enabled ELH Tech to conduct testing and evaluation of their 3D-printed parts, providing a platform to demonstrate their additive manufacturing capabilities to potential industry partners.

The Outcome:

Thanks to SSIA's support, ELH Tech achieved significant progress in the evaluation and testing of their 3D parts. This has positioned them as a key player in the aerospace, defense, and semiconductor sectors.



Read more about this
SME success story here.



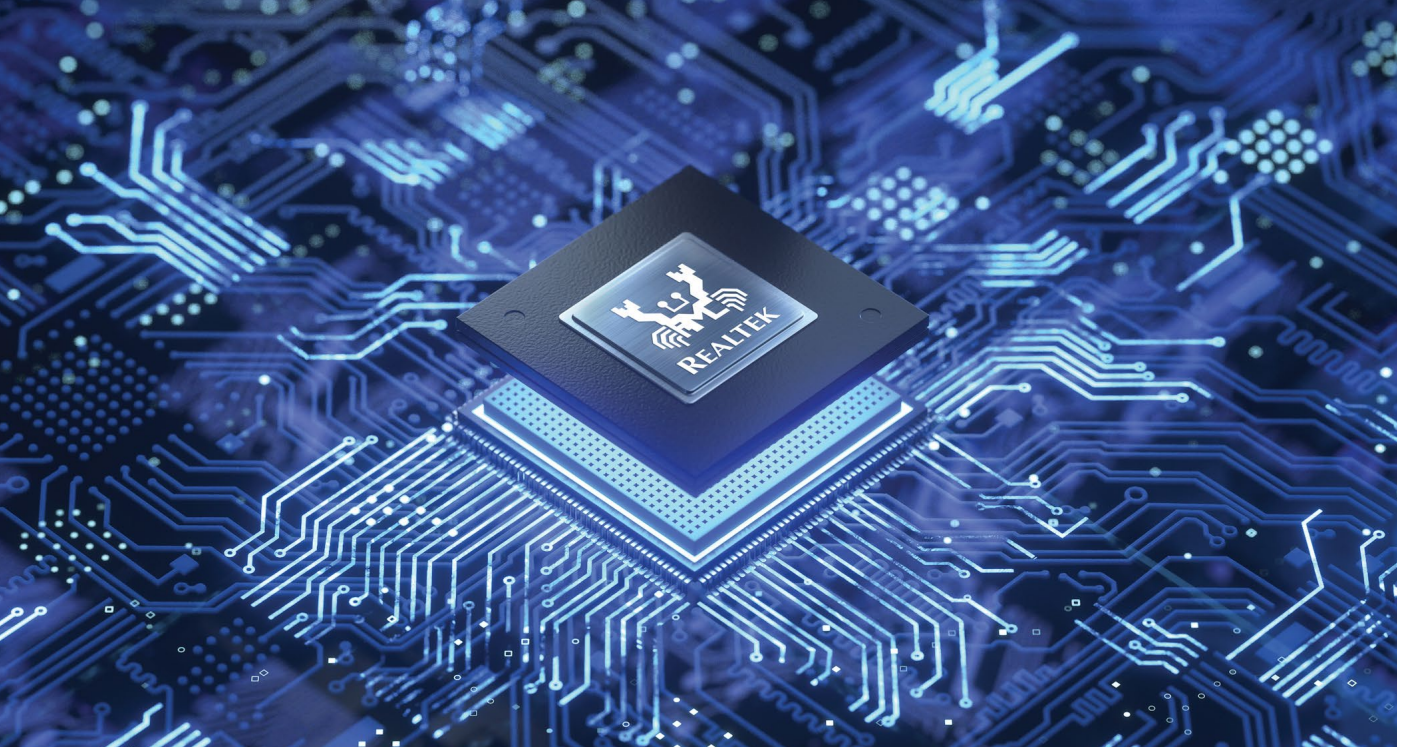
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REALTEK IMPLEMENTS SUSTAINABLE DEVELOPMENT AND SUPPORTS THE GLOBAL COMMON GOOD PHILOSOPHY

Realtek Semiconductor Corporation, founded in 1987, is a world-leading Integrated Circuit (IC) design house. With a corporate focus on IC research, development, and design, Realtek adheres to the principles of business excellence, innovation, and service across all stages of product development—from R&D and testing to production and sales. Realtek's product portfolio spans a wide array of applications, including connected media, communications networks, PC peripherals, multimedia, smart interconnects, and more. Their offerings include Ethernet controller ICs, automotive Ethernet solutions, wireless LAN controller ICs, IoT solutions, high-definition audio codecs, USB Type-C controllers, TV SoCs, and digital home center system solutions. Realtek is dedicated to providing customers with efficient, high-quality, and competitive products and solutions.

Commitment to Sustainable Operations

Realtek recognizes that the sustainable success of a business is intrinsically linked to the steady and diverse development of the world. In line with this understanding, Realtek has established and continues to develop a range of sustainable operation management policies aligned with international standards. These policies emphasize ethical management, environmental sustainability, talent development, social inclusion, and a commitment to the global common good.

Practicing Ethical Management

Realtek places a strong emphasis on ethical management as a cornerstone of its operations. The company has established internal independent audit units, risk management guidelines, information security management systems, customer privacy protection mechanisms, and comprehensive information security education and training programs. Realtek believes that strict adherence to business integrity and ethics is essential for sustainable operations and building strong, trustworthy relationships with customers.

Implementing Environmental Sustainability



Realtek is committed to achieving net-zero carbon emissions by 2050. The company plans to progressively reduce its total carbon footprint by developing low-carbon products, improving equipment energy efficiency, constructing and certifying office buildings to green building standards, increasing the use of renewable energy, and managing carbon reduction targets within its supply chain. By collaborating with global supply chain partners, Realtek is actively contributing to global sustainable development.

Developing and Cultivating Talent

Realtek views professional talent as its most vital core asset for sustainable operations. The company strategically places talent in roles that align with their skills while fostering a continuous learning environment. This approach ensures the development of professional knowledge and technical expertise, enabling employees to effectively contribute to Realtek's growth. To further enhance talent cultivation, Realtek has established the 'Realtek Corporate University,' which promotes campus



research and educational collaboration, develops a diverse range of courses, and integrates organizational competitiveness.

Promoting Social Inclusion

The principle of 'Shared Prosperity' underscores Realtek's commitment to social responsibility. Since 2008, Realtek has been actively engaged in social welfare through its 'Realtek Supports Charity with a Smile' program. This initiative encompasses a broad spectrum of activities, including youth development, women's and children's safety, rural community care, educational assistance, social mutual aid actions, academic research sponsorship, and charity projects. These efforts reflect Realtek's dedication to promoting social harmony and development.



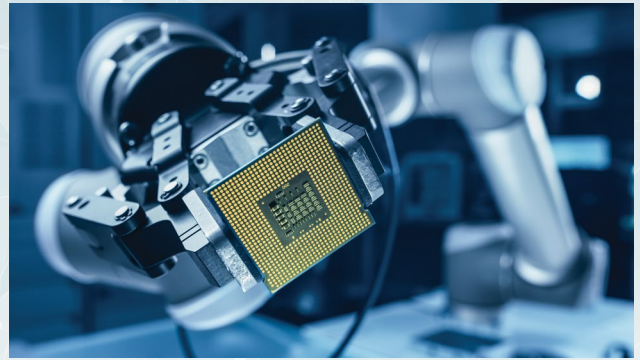
SIEMENS

TOWARDS A SMARTER, MORE SUSTAINABLE SEMICONDUCTOR INDUSTRY

Semiconductors are the backbone of today's technology, powering the performance of the electronic devices and systems we use daily, from smartphones to smart watches to smart grids, AI and cutting-edge manufacturing. Today's unprecedented market demand for higher performance in increasingly more compact devices requires both design innovation, smart and sustainable manufacturing.

Innovative approaches such as 3D IC Design, which stacks multiple active semiconductor devices, and the integration of modular semiconductor components such as chiplets, have emerged to meet the demand for higher performance with advance features. Other innovations such as high-performance GPUs that enable AI capabilities are driving new levels of market demand, with McKinsey forecasting an annual growth rate of 18% for AI-related semiconductors over the coming years. [1] But it is the growth of the entire Industry, with projections for total chip production nearly doubling by 2030, that is causing a looming environmental challenge.

Meeting today's complex market and technology challenges, while pursuing the need for more sustainable design-to-production solutions, calls for a new approach. This can only be achieved through intelligent chip design and the sustainable production practices of smart manufacturing for semiconductors, working in collaboration with semiconductor equipment engineering and machine



builders to evolve one cohesive system that minimizes the environmental footprint while maximizing productivity.

Smart manufacturing can optimize for a more sustainable design-to-production process

Smart manufacturing enables sustainability. Digitalization is essential, and smart manufacturing is more comprehensive digital than the legacy systems the industry has relied on since its inception. Fragmented legacy systems, many of which are unconnected without a common data platform or common language across, limit the secure collaboration and traceability needed for today's ecosystem. Key design, engineering and manufacturing functions too often exist in silos where sharing information is difficult, which inhibits innovation, continuous improvement and impacts quality.

Siemens' end-to-end sustainability solutions empowered by smart manufacturing, with a secure and sustainable design-to-production process can reduce carbon footprints and optimize the use of water, energy, and chemicals, ensuring safer handling of hazardous materials. They support responsible sourcing and utilization of materials for a more sustainable manufacturing process.



[1] <https://www.mckinsey.com/featured-insights/sustainable-inclusive-growth/chart-of-the-day/whats-driving-the-semiconductor-market>

Evolve from the inefficiency of being reactive to the efficiency of being predictive

Many traditional IC foundries are reactive, relying on post-incident analysis and corrective steps that often lead to production delays. But the adoption of smart manufacturing, with the digital twin collecting comprehensive real-time data, simulating next-generation processes, and informing smarter and more timely decisions, is the key to digital transformation. The evolution is on from the slow pace of reactive problem-solving to the rapid evolution of continuous learning, proactive quality management and predictive methodologies that prevent defects to deliver a higher level of semiconductor quality and higher yields.

The evolution of both lean and smart manufacturing is key to your company's success and sustainability.

The Move Towards A Digital Enterprise

This evolves into a complete Digital Enterprise (DE), Integrating digital tools and technologies across operations to offer numerous benefits:

- **Accelerated Development:** Utilizing Digital Twins and data-driven insights, we facilitate enhanced innovation and sustainability practices, speeding up the development and introduction of semiconductors.
- **Process Optimization and Quality Improvement:** An end-to-end semiconductor process solution, from design to production, leads to increased yield, reduced defects, and higher chip quality.
- **Efficiency and Cost Reduction:** Predictive maintenance and optimized resource allocation significantly reduce costs and downtime, minimizing production interruptions.
- **Flexibility and Market Responsiveness:** Improved resilience and adaptability through faster production cycles and flexible manufacturing processes enable rapid adaptation to market changes.
- **Environmental Sustainability:** Sustainable practices, such as optimized energy use and resource management, foster an eco-friendly production process.

Accelerate Your Digitalization Journey

With the Siemens Xcelerator digital platform, semiconductor companies can begin a comprehensive roadmap to achieving a smart, secure, and sustainable design-to-production process for semiconductors. Seamlessly integrating with existing infrastructure, with a unified environment for data management, analytics, and collaboration, Siemens Xcelerator enables semiconductor companies to

scale up while reducing environmental impact. Its adaptive, people-centric, and sustainable production ecosystem provides the agility and intelligent decision-making needed to respond and compete in today's rapidly evolving market.

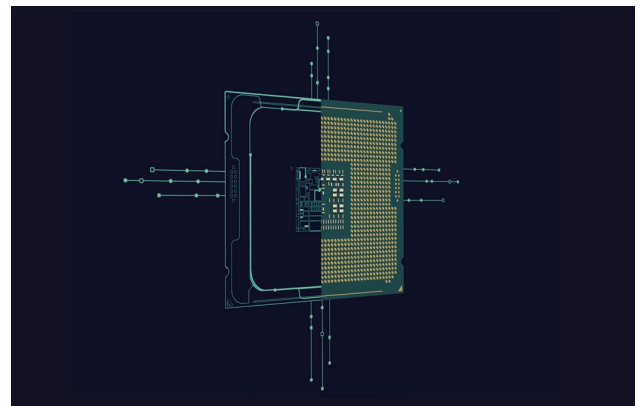
Siemens embodies a commitment to people and the semiconductor industry. Siemens virtual training solutions combined with our Digital Twins enable efficient and trackable workforce training. Our Industrial Copilots leverage generative AI to simplify tasks. Simultaneously, Siemens invests in software and automation training programs to reskill and upskill the workforce in the semiconductor industry's rapid evolution. We provide continuous learning opportunities online, onsite, hybrid and virtual simulation. Our training programs equip the semiconductor workforce with the skills necessary to drive chip 'design-to-production' innovation and lead the semiconductor industry forward.

Go Digital Become Smart, Sustainable Digital Enterprise

With smart manufacturing, chipmakers and machine builders can design and build future-proof semiconductor fabs by implementing a wide range of digitally integrated automation solutions, reducing energy consumption, enhancing efficiency and productivity, choosing less regulated materials, reducing water consumption, and providing people-centric workspaces in plant operations. Sustainable chip design and production practices reduce carbon through smart manufacturing capabilities that incorporate energy-efficient equipment, renewable energy sources, automation and AI for energy savings, enhanced efficiency, yield, and quality control.

Our experts are ready to provide you with the support you need in creating powerful semiconductors:

industrymarketing.sg@siemens.com



SIEMENS

TRAILBLAZING WOMEN IN TECH:

EVELYN WONG & DEWI SURYANA'S JOURNEY IN THE SEMICONDUCTOR INDUSTRY

In this insightful Q&A article, we feature two remarkable women from Lam Research SEA, **Evelyn Wong** and **Dewi Suryana**, who share their experiences and journeys in the semiconductor industry. They discuss the challenges and opportunities they've encountered, the support they've received, and the impact of inclusion and diversity in their workplace. Their stories are not only inspiring but also serve as a testament to the evolving landscape of the semiconductor industry and the significant contributions of women in STEM.



Evelyn Wong

Tell us about yourself.

I am Evelyn Wong, the Quality Program Lead at Lam Research SEA. I am part of a small but dynamic team focused on resolving quality issues from the field and our valued customers in SEA. I have been with Lam for two years and have prior experience in the medical device industry.

What made you work in the Semiconductor industry?

Semiconductors are crucial components in our daily lives, from smartphones to electric vehicles and artificial intelligence. In the semiconductor industry, I've found not just a job, but a fulfilling journey where I contribute to shaping the future of technology.

Can you share the challenges and opportunities you faced as a woman working in the semiconductor industry?

Certainly! Being a woman in the industry presents both challenges and opportunities. Historically, the semiconductor industry is male dominated, which can lead to unconscious biases and barriers for women in career advancement. However, I am happy to say that Lam Research is very inclusive, and the employees are supportive of each other regardless of gender, race, or other differences. I hope to serve as a role model and mentor for future generations, inspiring more young women to pursue careers in the semiconductor industry.

How did you navigate through the challenges and opportunities?

Despite being one of the few female Quality Program Leads in the team, I am not deterred from voicing my thoughts and contributing fully at work, as we have a very open culture where everyone is encouraged to share their opinions while exercising mutual trust and respect. My goal is to transform every challenge into an opportunity to grow, gain experience, and acquire wisdom. Staying positive and resilient in the face of challenges keeps me going towards my goals.

How does Lam foster Inclusion and Diversity?

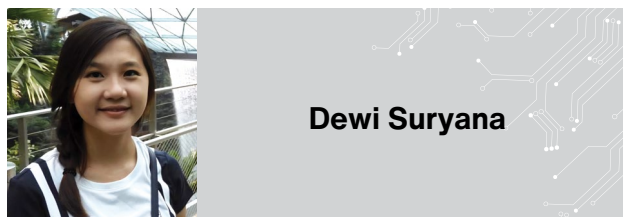
At Lam, we strive to ensure every individual feels valued, included, and empowered to achieve their full potential and extraordinary results. People managers have inclusion



development as part of their goals, and we have a wide range of programs aligned with our Inclusion and Diversity objectives.

Can you share helpful messages for the following female talent in the STEM field?

Do not be afraid to fail. Failure is another steppingstone to greatness and success.



Tell us about yourself.

Hello, my name is Dewi Suryana. I am a field process engineer at Lam Research SEA. It has been eight years since I embarked on my first role at Lam Research. I work closely with customers, from developing recipes to troubleshooting process issues, and my main area of expertise is the dry etch process.

What made you work in the Semiconductor industry?

While I was in university, I learned about the semiconductor industry and was fascinated by Moore's Law, which predicted the exponential growth in technology innovation. Another pivotal moment was attending Lam Research's career talk at my university, where I was profoundly impressed to learn that virtually every smart device has been processed with Lam's equipment. That's how impactful Lam Research is to the world, and I wanted to be part of that.

Can you share the challenges and opportunities you faced as a woman working in the semiconductor industry?

Throughout my eight-year career, I have faced various challenges. In the earlier years, I had to rapidly develop my technical capabilities to keep up with the pace of innovation. As I gained more experience, my manager empowered me with opportunities to take on various projects across etch applications and more recently, a technical lead role within my team. I feel valued and recognized at Lam for my contributions and performance. On a personal front, I became a mother last year. Balancing my professional responsibilities with personal commitments has been challenging, but I am glad to be growing my career in this industry and taking on opportunities that allow me to thrive.



How did you navigate through the challenges and opportunities?

At Lam Research, I am supported by a collaborative and diverse team in an environment that leverages our collective expertise in solving complex problems. Throughout my career, I have received invaluable guidance from my manager and mentors, who have been constant sources of support, especially during challenging times. Additionally, the unwavering support from my family has been instrumental in balancing my career and motherhood journey.

How does Lam foster Inclusion and Diversity?

Lam Research believes in fostering inclusion and increasing diversity, which is one of our core values. I have seen an increasing representation of female engineers across the process and service teams. We also have employee resource groups that support and empower women through workshops, talks, and activities. Lam goes above and beyond in supporting working parents, and I benefited from extended parental bonding leave on top of government maternity leave, which enabled me to fully recover and bond with my child before returning to work.

Can you share helpful messages for the following female talent in the STEM field?

The STEM field offers many opportunities for female talent, where your ideas and contributions are valued. Trust in your abilities, embrace challenges, and never doubt your potential to make a difference.





About the Artwork

A majestic eagle descends from the heavens, its wings stretching wide against a cerulean sky. With talons extended and legs thrust forward, the bird is poised for a powerful strike, capturing the raw and untamed essence of nature's hunt. The fierce determination in its eyes reflects an unyielding focus on its unseen prey below. Each feather is rendered with meticulous detail, showcasing the eagle's strength and agility. The air is thick with tension as this apex predator approaches its target with unwavering precision, freezing a moment of sheer beauty and primal intensity in time.

About the Artist

Bobby, an artist with Cerebral Palsy, discovered his passion for painting in 2022. Despite the challenges of his condition, painting brings him immense joy and fulfillment. Bobby skillfully uses color to tell stories, recognizing its power to evoke emotions and convey narratives. Through his artwork, he transcends physical limitations, demonstrating the profound ability of art to connect people on a deep, emotional level.

CELEBRATING UNITY AND
CREATIVITY THROUGH ART:

BOBBY'S VISION FOR SINGAPORE



In Singapore, art serves as a powerful medium for unity, and local artist Bobby is a testament to this. Known for his vibrant and lively paintings, Bobby captures the essence of collaboration and togetherness, reflecting the hopeful spirit of the nation. His artwork is part of a programme by Friends of the Disabled Society, where members with disabilities can develop their artistic talents, empowering them to share their creativity and unique perspectives with a broader audience.

Bobby's artwork often depicts scenes from various festivals where people from all backgrounds come together. "My art shows people in Singapore working together by painting scenes of different festivals where everyone celebrates together," Bobby explains. His work highlights the joy and camaraderie that these cultural events foster, showcasing a united community.

Innovation is central to Bobby's creative process. Recently, he has experimented with acrylic paint on canvas, bringing his ideas to life with bright, fresh colors. "It's a new technique for me, and I love how it brings my ideas to life in a fresh way," he shares.

The spirit of Singapore is a major inspiration for Bobby. He captures this through scenes of people enjoying life

together—chatting, playing, and celebrating in vibrant settings. "I love the hopeful and happy spirit in Singapore," he says. His art reflects the positivity and unity that are characteristic of the nation.

Bobby believes that art can connect people by reminding them of qualities like grace, courage, and determination. "I believe my art can bring people closer by inspiring these feelings in others," he says. His use of bright colors and innovative techniques makes his work accessible and engaging, emphasizing that life is full of possibilities for everyone.

Being part of Singapore's art community has been vital for Bobby. Collaborating with other artists brings new ideas and joy to his work. "Working with others is important because it brings new ideas and more fun to the process," he says, appreciating the support and growth that come from being part of an inclusive group of painters.

Looking forward, Bobby hopes his art will inspire others to embrace creativity and collaboration. He envisions a project where artists of all abilities work together on a large painting, symbolizing unity and the power of collective creativity.



About the Artwork

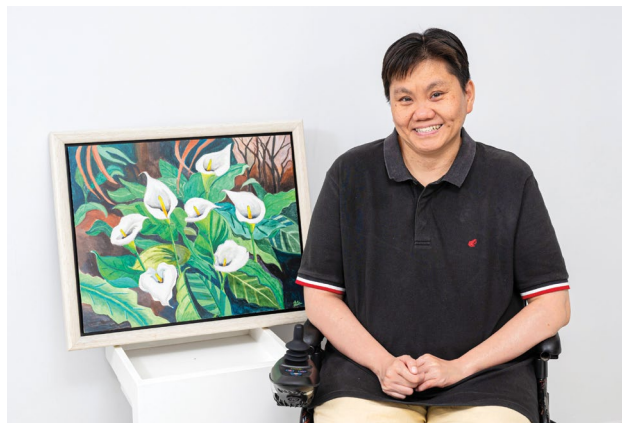
"Goldfinch" features a bird with striking yellow and black feathers resting gracefully on a plant. The vibrant colors of the bird contrast beautifully with the lush green foliage, creating a captivating and serene scene. The artist's attention to detail highlights the delicate nature of the bird and the harmonious connection between the creature and its natural surroundings.

About the Artist

Christina was a Prison Officer before a vehicular accident resulted in a major spinal cord injury, leaving her paralyzed from the chest down. Always one to see the glass half full, Christina did not give up on herself and discovered mouth painting through a group of friends. Initially apprehensive, she has since grown to enjoy the activity and is proficient with both watercolour and acrylic. Her favourite subjects to paint are flora and fauna. With ART:DIS Singapore, a non-profit organisation that advocates learning & livelihood opportunities for persons with disabilities, Christina has multiple opportunities to showcase her artistry at exhibitions. Besides being an artist Christina is also an award-winning table tennis player, representing Singapore at the recent 11th ASEAN Para Games.

THE GOLDFINCH:

CHRISTINA'S DIALOGUE WITH NATURE



Christina's latest work, *The Goldfinch*, is a testament to her profound connection with nature and her ability to channel its essence into her art. For Christina, nature is not merely a subject; it is an ever-present muse that infuses her work with a depth of emotion and a sense of universal understanding. She describes this connection as a visceral dialogue, where nature speaks to her, guiding her brush and inspiring her vision.

Her creative process is deeply rooted in the simplicity of natural experiences—moments that might seem fleeting to others but are rich with inspiration for her. A solitary walk along a windswept beach or the quietude found in a secluded garden offers her not just peace, but a clarity that allows new ideas to take form. It is in these moments of solitude that the seeds of her most compelling works are sown.

A pivotal experience in her artistic journey occurred while she was painting a lakeside scene. The interplay of light, color, and reflection at that moment struck a chord within her, encapsulating feelings of joy, freedom, and an almost

transcendent happiness. These emotions became the driving force behind her work, as she sought to capture the fleeting beauty of that scene and the emotions it evoked.

Christina's mastery of color and light is evident in *The Goldfinch*. She employs a sophisticated understanding of 'ColourTones' and lighting techniques to evoke specific moods and atmospheres. Each brushstroke is intentional, aimed at not just depicting the scene, but at bringing it to life—inviting the viewer to step into the world she has created.

Her work is more than just a visual experience; it is an emotional one. Christina's paintings aim to evoke a sense of awe, wonder, and peace, drawing the viewer into a contemplative space where they can reconnect with the natural world. In her future work, Christina aspires to deepen this connection, using her art as a reminder of nature's fragile beauty and the urgent need to protect it. Her vision is to inspire action through art, reminding us that the preservation of nature is not just a necessity, but a sacred duty.

UNITING THROUGH ART:

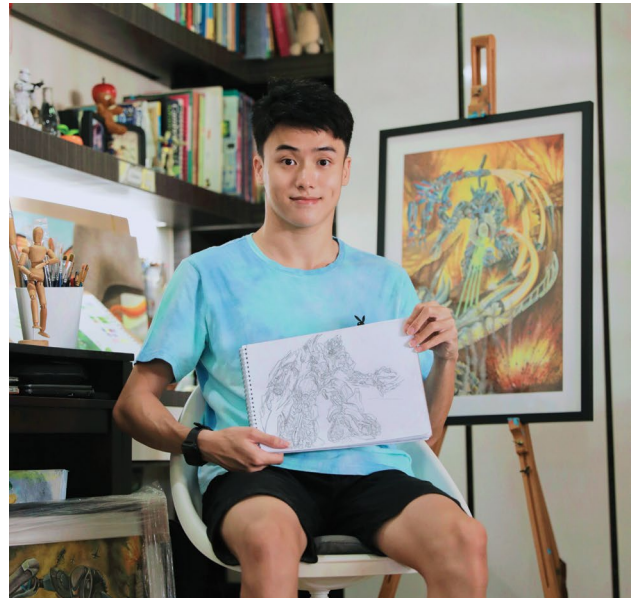
A CONVERSATION WITH SIMEON TAN ON CREATIVITY, INCLUSION, AND SINGAPORE'S VIBRANT ART SCENE

How does your art reflect the ideas of unity and collaboration in Singapore?

My art aims to raise awareness about the community of talented special needs artists who are eager to share their passion. By showcasing my work, I hope to encourage broader recognition of diversity and inclusion. I want to inspire people to support this community and work together to ensure everyone has the opportunity to be seen and valued. Art has an incredible ability to shine a light on important causes and bring about change, promoting unity and collaboration within our community.

Can you share a new technique or concept you've explored in your art?

I participated in a multidisciplinary, inclusive arts exhibition during the COVID-19 pandemic, which focused on hostile architecture and social inclusion in Singapore. This project allowed me to explore new techniques such as sewing, spray painting, and designing wearable art. Collaborating



with other artists and special needs participants, we created wearable designs using upcycled materials, which we showcased in a mini fashion show. It was a memorable experience that pushed me to experiment with new art forms.

What aspects of Singapore inspire your artwork, and how do you convey this inspiration?

My artwork often draws inspiration from various sources like robots, mythology, and manga. However, I also explore Singapore-related themes, such as in my piece "Transformation," which was inspired by the iconic painting "Drying Salted Fish" by Cheong Soo Pieng. By incorporating elements like Transformers, I playfully depicted Singapore's transformation from past to present, blending tradition with modernity.

How does your art bring people together, and what message of unity do you want to convey?

My art reflects the shared emotions and experiences that connect us all, despite our differences. The message of unity I aim to convey is that we are all part of the same human story, connected by our feelings, struggles, and joys. Through my art, I want to create a sense of belonging, reminding people that they are not alone and that we are all united by our shared experiences.

How can creativity in art contribute to a more inclusive and resilient society?

Creating art brings people together and helps us share our

stories, fostering personal connections that break down barriers. By celebrating our uniqueness and working together, we can build a stronger, more inclusive community where everyone feels valued and understood.

How has being part of Singapore's art community influenced your work, and how do you contribute to its growth?

Singapore's vibrant art community enriches my work through collaboration, feedback, and exposure to diverse perspectives. I contribute to this community by sharing my skills, and participating in exhibitions and festivals. These efforts not only help my personal growth but also contribute to the development of the broader art community.

How has collaboration shaped your artistic journey?

Collaborating with others has taught me that everyone's artistic process is unique, and there's no right or wrong in art. Learning from others' skills and ideas, while embracing my own uniqueness, has helped me enjoy the creative process even more.

Can you describe a project where you felt a strong connection to Singapore, and how it influenced your art?

During the pandemic, I worked on projects focused on iconic Singaporean themes, such as the Merlion and local food. These artworks, which were printed on various merchandise, exposed me to the commercial side of art and made me more open to exploring different ideas and mediums. Above all, it gave me a deep sense of pride in being Singaporean.

How do you hope your art inspires others in Singapore to embrace creativity and unity?

I hope my art inspires people in Singapore to connect and be creative by encouraging kindness, friendliness, and helpfulness. By sharing our stories and working together, we can build a warm and united community that celebrates our differences.

What are your future goals for contributing to Singapore's art scene, particularly in promoting unity and innovation?

My goal is to see Singapore's art scene flourish with creativity and unity. I envision a vibrant community where innovative ideas flow freely, and artists from all walks of life come together to inspire one another. By collaboration and making art accessible, I hope to help shape a future where our collective creativity drives us forward.



About the Artwork

"Fishes Out of Water" portrays the captivating reflection on the sea's surface, where reality and beauty intertwine. A group of goldfish, content in their fishbowl, mistake the reflection for the real world and drawn by its allure, leap into the sea—unaware they are like fishes out of water. This piece symbolizes how we can become so absorbed in our own perspectives that we overlook greater opportunities beyond our comfort zones. It encourages us to embrace change, explore new paths, and recognize the hidden beauty in life's reflections.

About the Artist

Simeon, an artist with Autism, passionately explores various artistic mediums. Whether wielding a paintbrush or moulding clay, he brings fantastical worlds to life with vibrant colours and dynamic line work, often featuring robots, sci-fi characters, and mythical creatures. Clay offers him solace and balance. Through exhibitions and programs at Pathlight and ARTDIS, Simeon has gained invaluable experience, culminating in a distinction in Visual Arts from NAFA CLE in 2021. Simeon was presented with the North East Shining Award in 2024, and is also a winner of the 2024 edition of the Liberty Art Awards.

THE ART OF KAINI:

REDEFINING UNITY AND INNOVATION THROUGH SINGAPORE'S CULTURAL LANDSCAPE

Kaini's artwork serves as a vivid portrayal of unity and collaboration within Singapore's diverse cultural tapestry. Her work draws inspiration from the nation's multicultural identity, blending elements from different traditions and festivals to highlight the values of togetherness that are at the heart of Singaporean life. Through her pieces, Kaini seeks to celebrate the rich diversity that shapes the city-state, while also exploring the interconnectedness that binds the community together.

As an artist, Kaini is driven by the dynamic and forward-thinking spirit of Singapore. This sense of constant reinvention inspires her to continually push the boundaries of her craft, experimenting with innovative techniques and unconventional materials. She often incorporates non-traditional



ditional elements such as cling wrap, sponge, tissue paper, and masking tape into her work, using them to create rich textures and abstract forms. By blending traditional techniques with modern methods, Kaini expands the possibilities of her art, creating pieces that are both visually striking and conceptually deep.

A key theme in Kaini's work is the Singapore spirit—a vibrant, forward-looking ethos that drives her creative process. This spirit is reflected not only in her exploration of different mediums and techniques but also in her focus on community. Her work highlights Singapore's scenery and culture, showcasing the interconnectedness and unity of its people. Whether through impressionism, abstract forms, or the use of negative space, Kaini's art speaks to the essence of Singapore's collective identity.

One of Kaini's core beliefs is that art has the power to transcend language and cultural barriers. By focusing on universal themes such as love, resilience, and hope, she seeks to connect with diverse audiences, fostering a sense of shared understanding. Her art frequently brings together people from all walks of life, offering them an opportunity to engage with her work on a deeply emotional level. For Kaini, art is not just a means of personal expression but a platform for fostering unity and inclusion.

Innovation, for Kaini, is not only about technique but also about the impact art can have on society. She believes that by challenging traditional norms and amplifying diverse voices, art can play a crucial role in fostering a more

inclusive and resilient society. The rise of social media has allowed artists like Kaini to share their work with global audiences, breaking down barriers and promoting a more inclusive art world. Her abstract pieces often encourage viewers to see the world from different perspectives, fostering empathy and understanding—qualities that Kaini believes are essential for building a stronger, more connected society.

As a member of the Mouth and Foot Painting Artists (MFPA) association and ART:DIS, Kaini is deeply involved in Singapore's art community. She draws inspiration from the dynamic, multicultural environment in which she works, often collaborating with fellow artists to conduct workshops. Through her involvement in these organizations, Kaini seeks to bring greater exposure to the disabled artist community in Singapore, helping to create more opportunities for artists of all abilities to showcase their work.

Collaboration has been a cornerstone of Kaini's artistic journey, allowing her to blend different perspectives, skills, and techniques into her work. One particularly meaningful project for her was her participation in the 2022 Shaping Hearts exhibition, which centered around themes of resilience and unity during the COVID-19 pandemic. This experience allowed Kaini to reflect on how her own personal journey mirrored the resilience and determination of Singapore's spirit, and her artwork became an embodiment of these values.

Looking ahead, Kaini is committed to contributing to Singapore's vibrant art scene by advocating for more accessible art spaces and events. She is passionate about creating inclusive environments where people of all abilities can participate in and enjoy the arts. Through her work, Kaini aims to raise awareness about issues related to disability, accessibility, and inclusion, using her art as a tool for social change. Ultimately, her goal is to bridge gaps in understanding and promote a more inclusive society, where unity is achieved through empathy, creativity, and mutual respect.



About the Artwork

Amongst the duller greenery, the vibrant lotus flower rises from the mud unstained, standing out as a symbol of resilience and strength.

About the Artist

Zhang Kaini was a Mandarin teacher in Singapore before a fatal car accident led to her spinal cord injury. She became paralysed from shoulders down. Inspired by Joni Eareckson, a fellow quadriplegic turned artist and author, Kaini taught herself to paint with her mouth. With her enormous strength, precision and concentration, she made rapid progress and started to make a living out of mouth painting. Today, her stunning paintings of the natural world are in great demand among corporate clients for their intricacy, depth and beauty. As a full-time artist who has overcome tremendous odds, Kaini hopes to inspire, encourage and touch the hearts of fellow persons with disabilities.

FOSTERING UNITY AND CREATIVITY:

AN ARTISTIC JOURNEY IN SINGAPORE'S VIBRANT ART SCENE

In an increasingly interconnected world, art continues to serve as a universal language, transcending boundaries and fostering a sense of unity and collaboration. For Saw Han, a visually impaired artist in Singapore, this belief is at the heart of her work. Her art is not just a creative expression but a powerful tool for bringing people together, celebrating diversity, and inspiring a resilient, inclusive society.

Celebrating Unity and Collaboration

Saw Han's artwork is a reflection of the rich cultural tapestry that defines Singapore. Drawing on the multiculturalism that is deeply embedded in the nation's identity, her pieces often incorporate traditional motifs from Malay, Chinese, Indian, and Eurasian communities. These symbols serve as a tribute to the harmonious coexistence of diverse cultures within the city-state. In her depiction of shared spaces—iconic Singapore landmarks such as hawker centres, HDB public housing, or parks—she illustrates the everyday interactions that unite people from all walks of life.

Moreover, her work often features scenes of togetherness, where individuals from various ethnicities engage in communal activities. These visuals are more than just artistic expressions; they are a celebration of collaboration and the spirit of togetherness that binds the Singaporean community.

Innovative Techniques in Art

Innovation plays a crucial role in Saw Han's artistic journey. She challenges traditional techniques by painting with her fingers, using acrylic paint and moulding material to create

textured, dimensional artwork. Her piece, "Let Our Light Shine!" is a testament to this innovative approach, combining tactile elements with vibrant colors to convey a sense of energy and optimism. This technique not only brings her art to life but also makes it accessible to a wider audience, allowing people to experience her work in a more immersive way.

Inspiration from the Singapore Spirit

The Singapore spirit, characterized by resilience, innovation, multiculturalism, and a strong sense of community, is a constant source of inspiration for Saw Han. She captures these qualities in her art, using dynamic compositions to symbolize growth and adaptability, and abstract designs to reflect the nation's forward-looking vision. By incorporating diverse color schemes and patterns, she highlights the unity and harmony in Singapore's diversity, reminding viewers of the common threads that bind the community together.

Art as a Unifying Force

Saw Han firmly believes that art has the power to bridge divides, connect people on multiple levels, and foster a sense of belonging. Through her work, she seeks to create shared experiences that resonate with universal themes such as love, resilience, and hope. By using symbols, colors, and storytelling that evoke shared human emotions, she invites viewers to see the world through each other's eyes, promoting a deeper understanding and appreciation of one another.

Her message is clear: unity is not about uniformity, but about embracing diversity while standing together. Through her art, she encourages people to find common ground, build connections, and work towards a more compassionate and connected society.

The Role of Innovation in Building an Inclusive Society

Innovation in art, according to Saw Han, is vital for building a more inclusive and resilient society. By challenging norms and amplifying diverse voices, art can shed light on marginalized communities and tell stories that are often overlooked. New mediums such as digital art and virtual reality open up possibilities for more participatory experiences, making art more accessible and breaking down barriers between artists and audiences.

Saw Han's innovative approach to art also fosters critical thinking and dialogue around complex social issues, encouraging a society that values diverse perspectives and is willing to embrace change. Her work demonstrates how creative problem-solving and adaptability—key aspects of innovation—can inspire others to approach challenges with resilience and a positive outlook.

Contributing to Singapore's Art Community

As a member of the disabled art community in Singapore, Saw Han is deeply influenced by her involvement in events like the North East Community Development Council's Shaping Hearts

annual art festival. This inclusive festival provides a platform for artists with disabilities to showcase their talents, contributing to a vibrant and diverse art scene. Through her participation, Saw Han not only shares her own creative expressions but also encourages broader participation in the arts, demonstrating that art is for everyone, regardless of physical limitations.

The Impact of Collaboration

While Saw Han's journey in the art world is relatively new, she acknowledges the potential for collaboration to further shape her work. Although she currently creates her pieces independently, she remains open to future opportunities that could expand her creative horizons and foster deeper connections within the art community.

Embracing the Singapore Spirit in Art

One of the most significant projects that reflect Saw Han's connection to the Singapore spirit is her participation in the Shaping Hearts festival. This inclusive arts event embodies resilience, innovation, multiculturalism, and community—values that are central to the Singaporean identity. For Saw Han, being part of this project is both a privilege and a responsibility, as it allows her to contribute to a celebration of the diverse talents within the special needs community.

Inspiring Unity and Creativity

Looking ahead, Saw Han aspires to continue contributing to Singapore's vibrant art scene by promoting unity and innovation. She hopes that her art will inspire viewers to embrace creativity and recognize the beauty in diversity. Through her use of exuberant colors, themes of love, hope, and life, and the poems that accompany each of her paintings, she aims to create a peaceful atmosphere that encourages positive interactions and reduces animosity.

Ultimately, Saw Han's art is more than just a visual experience; it is a call to action for unity, empathy, and collaboration. By fostering a spirit of inclusivity and understanding, she hopes to build a society that is not only resilient but also deeply connected through shared values and creative expression.

These elements would be combined to represent how unity and collaboration are deeply ingrained within the Singapore community such as the artwork below entitled "Me2".



About the Artwork

"Let Our Light Shine!" depicts a landscape acrylic painting of a winter starry night. Lift up your eyes to see the beauty of this starry night. Twinkle, twinkle, beautiful stars illuminate the cold, wintry sky. In the midst of darkness and cold, let our inner light shine forth, guiding and bringing cheer to those seeking solace.



About the Artist

Saw Han lost most of her vision in 2018 due to glaucoma, leaving her with only 15% tunnel vision in her left eye and completely blind in her right eye. In March 2023, she enrolled in the Touch Art program by SAVH and has since immersed herself in various forms of creative expression. Saw Han has a profound passion for creating with her hands, including painting, handicrafts, poetry writing, baking, massage, and playing melodies on the harp, tambourine, and autoharp. Through her paintings, she aims to evoke themes of life, hope, and exuberance.

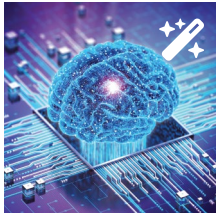
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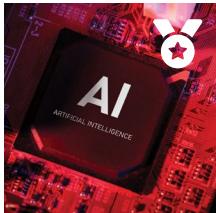
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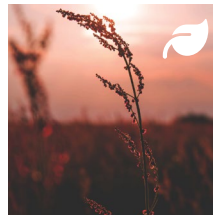
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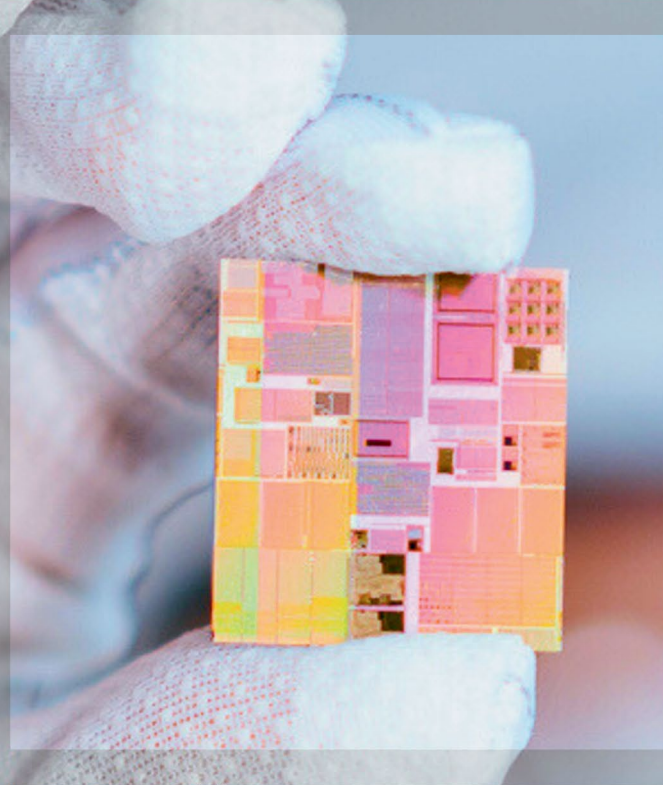
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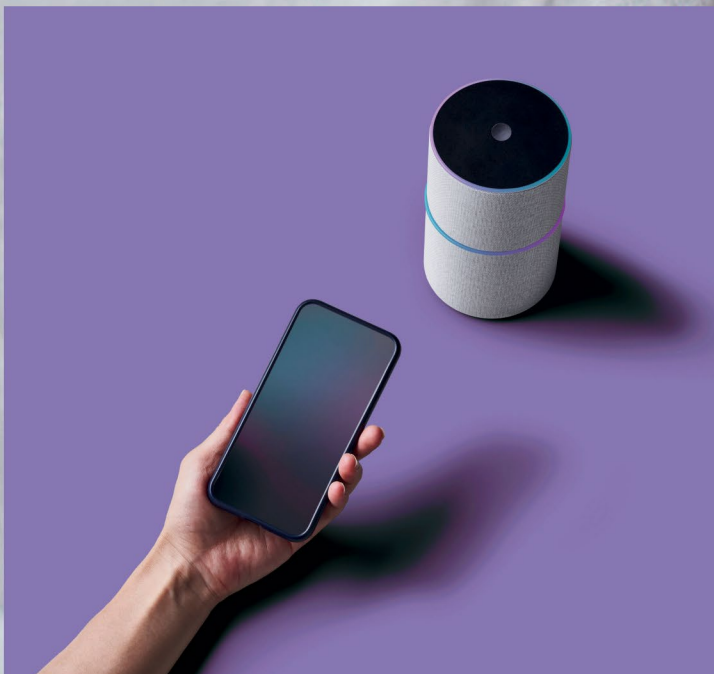
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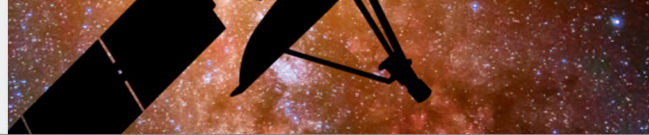
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