SSIA
Singapore Semiconductor Industry Association

SINGAPORE SEMICONDUCTOR VOICE

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SSIA
Singapore Semiconductor Industry Association

Innovation - Digitalisation and Automation

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FOREWORD BY Executive Director

This year, SSIA has experienced remarkable success. We have implemented an unprecedented number of student outreach initiatives to significantly raise awareness about our industry. Through the Career Conversion Programme (CCP), we have successfully placed a record number of job seekers in our industry. Additionally, we have been instrumental in supporting companies on their transformation journey by facilitating the adoption of the Redeployment and Job Redesign (JR) Reskilling with support from WSG. Our industry has made great strides in promoting diversity and inclusion. A prime example of this progress is the growing engagement and endorsement we received for our annual Women's Forum, held in March this year. Even on the business side, we have witnessed increased involvement from SMEs in our Business Connect platform. We are also seeing more SMEs joining our network year on year. Our flagship event, SSIA Summit was graced by the presence of government representatives from various countries. The horizon holds a plethora of thrilling opportunities and potential collaborations that we eagerly anticipate exploring together.

Considering everything that has happened, the past year has been truly remarkable. Notably, it marks the 55th anniversary of Singapore's semiconductor industry, a milestone we joyously celebrated. In these 55 years, our Singapore semiconductor industry has not just grown; it has thrived. We have witnessed ground-breaking advancements, embraced transformative technologies, and forged invaluable partnerships. This milestone is a testament to our collective dedication and unwavering commitment to excellence. Although our industry has experienced a slowdown over the past year, and this trend may continue into the next year, we maintain a positive outlook. As we move forward into 2024, we continue to uphold our commitment to nurturing a vibrant and resilient semiconductor industry in Singapore. In this message, I would like to highlight the three focus areas of the many others that SSIA will continue to pursue into 2024.

SSIA will continue to work with companies to develop and grow our talent pool. Now is the opportune moment for us to invest in cultivating future talents and enlightening them about the dynamic nature of our industry. The upcoming Electronics Industry Day in January 2024 will be our industry's largest platform to serve this purpose. The primary objective of this platform is to raise awareness about our industry. By fostering greater collaboration among companies, we can effectively communicate this awareness to students. I hope that companies, regardless of whether they are MNCs or SMEs, and regardless of their current hiring plans, will unite on this platform to play a significant role in raising awareness and attracting more talent to our industry.

One of our main objectives for SSIA is to assist companies, particularly SMEs, in enhancing their international footprint and expanding their global presence on the business front. We have engaged in discussions with multiple nations, each displaying a keen enthusiasm to enhance their electronics sector. Through our global partnerships, we can facilitate connections between businesses and the ideal opportunities for expansion and progress beyond the shores of Singapore. We will provide additional insights on this topic in the upcoming months. Stay tuned for more information.

The topic of sustainability takes centre stage in SSIA's focus, occupying a prominent position in our agenda for next year. Our industry is constantly striving towards reducing our environmental impact while maximizing the use of resources. We are actively promoting sustainable manufacturing practices and implementing green initiatives across all levels of the supply chain. By prioritizing sustainability, businesses not only reap long-term benefits for themselves and the environment but also underscore Singapore's dedication to the global environment and our industry's pivotal role in upholding that commitment.

I would like to express my sincere gratitude to every member, partner, and stakeholder who has collaborated with us in nurturing the growth of our industry and fostering resilience within our industry's supply chain. I would also like to take this opportunity to thank the Secretariat team for their unwavering commitment and tireless efforts in driving SSIA's agenda. As we move forward into the new year, let us continue to work together towards a stronger, more sustainable, and more prosperous future for our industry. Let us stay united and resilient in the face of challenges and seize every opportunity that comes our way. Let us look forward to another year of growth, innovation, and success!

ANG WEE SENG
Executive Director
Singapore Semiconductor Industry Association (SSIA)

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Scan the QR code or email **secretariat@ssia.org.sg** to find out more.

Nurturing Brilliance in the Semiconductor Universe

At the heart of every semiconductor innovation lies the brilliance of the people who envision, create, and collaborate. Our theme, "Nurturing Brilliance in the Semiconductor Universe," shines a spotlight on the industry's most valuable asset: its people. With unwavering dedication and boundless creativity, individuals from diverse backgrounds propel the semiconductor industry forward. This theme underscores the pivotal role of people in every circuit, every breakthrough, and every stride toward a future defined by technological excellence and global impact. Special highlight only on Work Study Programmes. The event will examine how initiatives to prepare students for the industry have evolved over the decades. It will highlight the Work Study Programmes as a prominent aspect of this evolution, with the Semiconductor industry embracing it.

MARCH 2024

SEMICONDUCTOR WOMEN'S FORUM

Count Her In: Accelerating Gender Equality Through Economic Empowerment

In line with the industry's push towards gender equality in the workforce, this month's theme aims to promote and accelerate gender diversity in the semiconductor industry. We believe that empowering women through economic opportunities is essential for achieving a more inclusive and diverse industry. This month will feature SSIA Women's Forum, a platform that highlights women's achievements in the semiconductor field and to attract young female leaders to the industry since the inception of this podium in 2021.

End APRIL Early MAY 2024

SINGAPORE BUSINESS CONNECT

Catalysing Collaboration, Fuelling Innovation

Collaborative industry-wide participation in SSIA Business Connect is more than just a network, it is an ecosystem, a dynamic hub where ideas converge, partnerships are forged, and innovation finds its wings.

SSIA Updates

Strengthening Semiconductor Supply Chains at

SSIA Summit 2023

The SSIA Summit 2023 was held on 19 September and is a highly anticipated event within the Singapore and regional Semiconductor industry. This conference is renowned for bringing together industry leaders, experts, and enthusiasts to discuss the most recent mega trends and critical topics affecting the semiconductor landscape.

Under the theme **"Forging Resilience: Navigating Supply Chain Disruptions,"** the semiconductor industry, foundational to the digital world, has faced considerable challenges recently due to supply chain disruptions. These disruptions, exacerbated by recent global events, have revealed the vulnerabilities within our current supply chain models. Hence, this year's theme examines how we can strengthen and future-proof the semiconductor supply chains collectively.

THREE CORE PILLARS

Singapore's semiconductor industry has evolved significantly over the last five decades guided by three core pillars: ***Growing & Developing Workforce, Strengthening and Growing the Local Ecosystem, and Towards Sustainability.*** Its semiconductor workforce has shifted from precision skills to adaptable expertise, emphasising upskilling and preparing for opportunities in the Industry 4.0 era.

The Summit was graced by H.E. Kara Owen, British High Commissioner to Singapore, H.E. Judit Pach, Hungarian Ambassador to Singapore, alongside other distinguished figures both locally and globally.

Apart from keynote speaker sessions by a diverse group of industry leaders from consultancy to global semiconductor companies, the Summit also featured a panel discussion which delved into the realm of semiconductor supply chain resiliency, shedding light on the current challenges and exploring potential solutions within the industry. One of the key highlights of the panel discussion was the exploration of how the semiconductor industry could draw inspiration from other sectors and leverage cutting-edge technology to enhance its supply chain resiliency. This discussion was led by a group of panelists which included Michael Ciatto, Senior Vice President - Supply Chain Service Line CEO of Genpact, Peter Dressler, Vice President Corporate Supply Chain Logistics of Infineon Technologies, Khoo Kah Leng, Managing Director, Global Supply Chain of Applied Materials, and Siew Pai Oak, Head of Business Development, Siemens. They further engaged in a discourse about the strategic use of digital tools, advanced analytics, and automation, underscoring how these innovations can be harnessed to fortify the industry against disruptions.

Over the past 55 years, Singapore has undergone a remarkable transformation, evolving from a labour-intensive assembly hub to a R&D base. In today's world of economic uncertainties and frequent supply chain disruptions, the need for countries to collaborate collectively has never been more pressing. Fostering global collaborations will fortify the semiconductor supply chain, boosting its resilience to adapt to the dynamic shifts in the global landscape for the future

Ang Wee Seng, *Executive Director of SSIA*

Marking 55 Years of Semiconductor Advancements in Singapore, SSIA Looks to Cementing Singapore's Role as a Global Player in the Semiconductor Industry at the

Semiconductor 55 Dinner

The Singapore Semiconductor Industry Association (SSIA) commemorated a significant milestone in the form of a gala dinner to celebrate the 55th anniversary of the semiconductor industry on 19 September 2023. This prestigious event followed the annual SSIA Summit 2023 and was held at Resorts World Sentosa. This celebration not only honoured the country's semiconductor industry's remarkable journey since its inception in 1968 but also underscored its importance and contributions to Singapore's economic growth and the global semiconductor industry over the last 55 years.

The past five years has seen transformative strides for the industry, from pioneering advancements in microelectronics to the development of cutting-edge technologies like Artificial Intelligence, Photonics, Power Electronics, and MEMs.

Graced by Mr Gan Kim Yong, Minister for Trade and Industry as the Guest-of-Honor, the Semiconductor 55 dinner is the largest dinner to date, comprising prominent figures from government leaders, agencies as well as distinguished leaders within the semiconductor industry. The strong show underpins Singapore's integral role as a hub for the global semiconductor industry.

Additionally, in collaboration with North East Community Development Council (CDC), SSIA hosted a **Charity Art Auction with Shaping Hearts** at the dinner. The auction featured five meticulously selected art pieces done by artists with special needs. These proceeds will be used to support the various assistance schemes administered by North East CDC to uplift the lives of the needy and vulnerable within the district.

As we reflect on our remarkable journey in Singapore's semiconductor industry, marked by growth and transformation amidst challenges, we stand resilient. Recent years have tested our determination in navigating volatile economic landscapes and supply chain disruptions, showcasing our adaptability. We are excited about the future and remain committed to our legacy of excellence

Jennifer Teong, *Chairman of SSIA*

SINGAPORE SEMICONDUCTOR 1968–2023 55TH ANNIVERSARY

SSIA Singapore Semiconductor Industry Association

CONGRATULATORY MESSAGES

CONGRATULATORY MESSAGES

SINGAPORE SEMICONDUCTOR 55TH ANNIVERSARY 1968–2023

SSIA Singapore Semiconductor Industry Association

SINGAPORE SEMICONDUCTOR 55TH ANNIVERSARY 1968–2023

CONGRATULATORY MESSAGES

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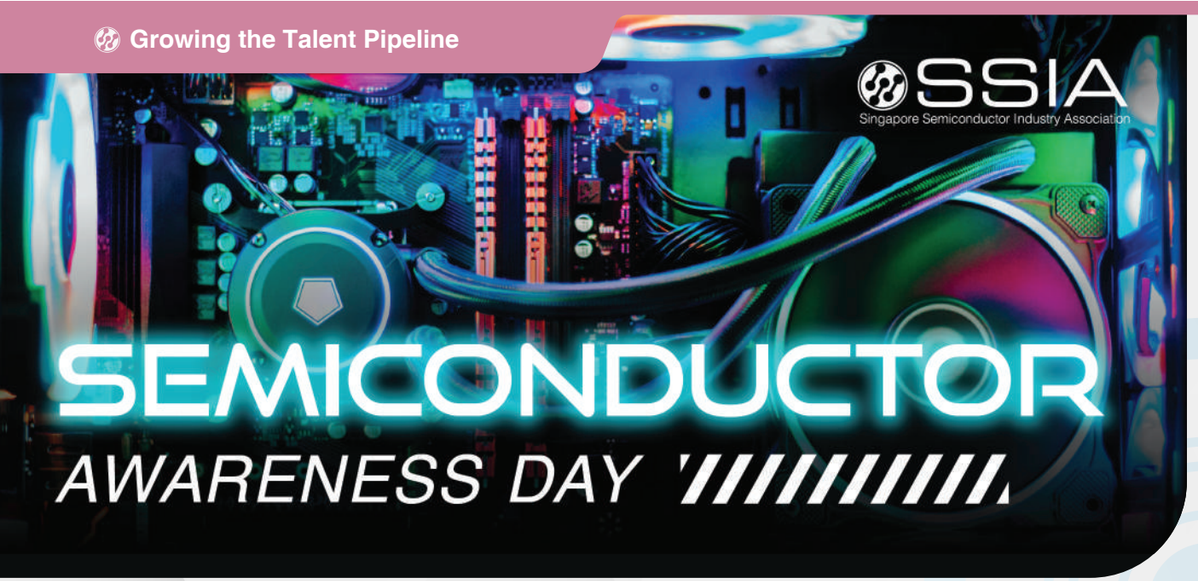


Shining a Spotlight on Cultivating Young Talent At the Semiconductor Awareness Week

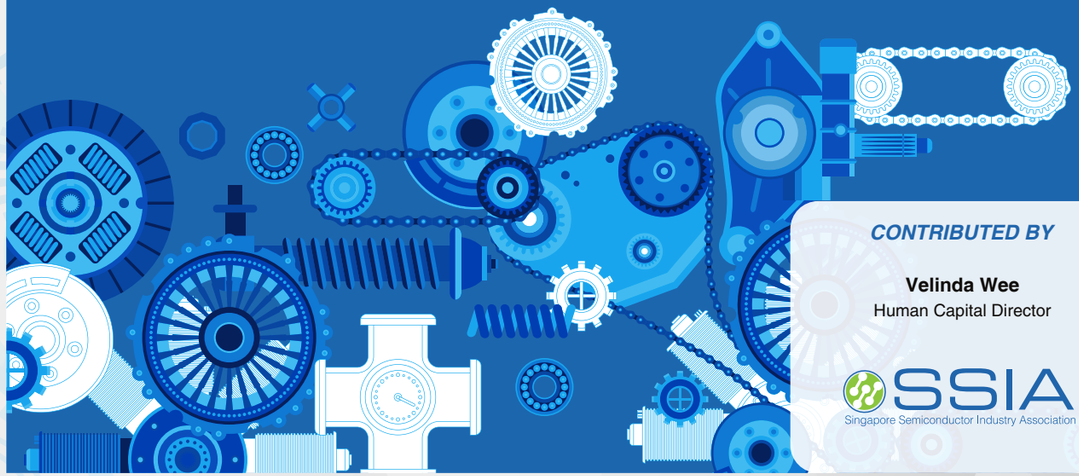
This Semiconductor Awareness Day is a joint student outreach initiative organised by SSIA with the support of Economic Development Board (EDB) and member companies from the full value chain of the semiconductor industry. This initiative attracted a total of 22 member companies that jointly organised career fairs and Industry awareness talks with NUS, NTU, Singapore Polytechnic, Republic Polytechnic and Ngee Ann Polytechnic during the months of August to November 2023.

At the career fairs, companies actively promoted internships, work study programmes and job opportunities to the students. The event had attracted more than 2000 students who visited the booths at the various Polytechnics and universities during three months.

In order to create greater semiconductor awareness among our youths, SSIA Executive Director, Ang Wee Seng and a representative from EDB also shared about the Semiconductor landscape and job opportunities in this sector. Young engineers and industry experts were also invited to share their experiences working in the semiconductor industry so as to give the students a better glimpse and perspective of the industry if they joined.

"The Semiconductor Awareness Day at NUS saw strong participation from 13 companies, which had in turn attracted a huge student turnout with more than 1500 visitors at the company booths, and 250 attendees at the talks. At NUS Electrical and Computer Engineering (ECE) Department, we have been organising industry visits for our students to raise their awareness of the opportunities in the industry. Having an event such as the Semiconductor Awareness Day certainly generated much greater impact to fulfil this objective. At NUS ECE, we now have a Specialisation in Advanced Electronics, which introduces students to industry practices related to semiconductor fabrication, chip manufacturing, IC design and prototyping. This is especially relevant to students who aspire to have a career in Singapore's semiconductor industry, which forms a vital node in the global electronics network. We look forward to further collaboration with the SSIA to attract talented and passionate students to the exciting semiconductor industry."

Associate Professor
Soh Wee Seng
Deputy Head (Undergraduate Programmes & Student Life), Department of Electrical & Computer Engineering, NUS



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Velinda Wee
Human Capital Director

SSIA
Singapore Semiconductor Industry Association

Micron Cultivates Engineering and Technician Talent Pipeline in Singapore

Micron Technology, Inc., today announced it is the first semiconductor company to sign a memorandum of understanding (MoU) with five polytechnics in Singapore to strengthen and scale the engineering talent pipeline for the technology industry.

Under the agreement, Micron will collaborate with Nanyang Polytechnic, Ngee Ann Polytechnic, Republic Polytechnic, Singapore Polytechnic and Temasek Polytechnic to provide students with a holistic and structured program throughout their education and National Service (if applicable).

The MoU was signed by Ms. Sim Cher Whee, vice president of Global Talent Acquisition, Mobility and Immigration at Micron Technology; Ms. Esther Ho, deputy principal of organizational excellence at Nanyang Polytechnic; Mr. Lim Kok Kiang, principal and chief executive officer (PCEO) at Ngee Ann Polytechnic; Ms. Jeanne Liew, principal and chief executive officer (PCEO) for Republic Polytechnic; Mr. Henry Tan, deputy principal of administration at Singapore Polytechnic; and Mr. Peter Lam, PCEO at Temasek Polytechnic. Singapore's Minister for Education, Mr. Chan Chun Sing and Micron's corporate vice president and Singapore country manager, Mr. Chen Kok Sing witnessed the MoU signing ceremony.

Minister Chan expressed his support for the collaboration: "I am glad to see companies like Micron working together with the polytechnics to nurture local talent. Strong industry partnerships are crucial for our institutes of higher learning to continue equipping students with the latest skills and knowledge, and contribute meaningfully to industry once they graduate. I look forward to Micron's efforts to inspire students and train the next generation of tech leaders. This partnership also enables the development of a skilled and nimble workforce that contributes to Singapore's technological success and global competitiveness."

Building The Workforce Of The Future - The collaboration between Micron and the polytechnics, as outlined in the MoU, includes a series of student engagement activities and opportunities:

Internship Program - Micron plans to offer internships to students identified by the polytechnics and issue letters of intent to hire exemplary interns upon satisfactory completion of the program.

Full-time Employment Before National Service (NS) - Micron will provide full-time employment opportunities for selected students upon their graduation before they enlist in NS.

Industry Sharing And Career Talks - Micron and the polytechnics will co-organize learning journeys and career talks, a conducive platform for interacting with industry leaders, professionals and engineers, to prepare students for careers in the semiconductor industry.

Staff Development - Micron and the polytechnics are committed to providing relevant professional training to staff as part of upskilling and reprofiling training.

Continuing Education And Training - Micron and the polytechnics will collaborate on continuing education and training (CET) programs, and individual career development opportunities. Micron will also participate in and help establish work-study programs.

"The collaboration between Micron and Singapore's polytechnics represents a significant milestone in the convergence of educational excellence and industry knowledge," said Mr. Chen corporate vice president at Micron. "These partnerships enable Micron to nurture diverse talent and offer potential employment opportunities within the company upon graduation. Micron is committed to promoting STEM education and increasing the pipeline of students studying a semiconductor curriculum in Singapore.

QUOTES FROM POLYTECHNICS

Micron is providing real-world learning and practical training opportunities. This collaboration will certainly be valuable in deepening students' interests and skill sets. As an industry-centric polytechnic, we are glad to work closely with Micron to co-develop and co-train our learners to prepare them to excel in their engineering roles

Mr. Russell Chan
PCEO, Nanyang Polytechnic

Temasek Polytechnic is proud to facilitate this collaborative journey with Micron and the other polytechnics. Through this partnership, polytechnic students can have valuable opportunities to participate in internships, mentoring sessions and hackathons with a leading company in semiconductor and advanced manufacturing. Such exposure will prepare our students well for the industry and enable them to seize the growing opportunities in the sector. We look forward to this partnership with Micron to nurture talents who will shape the future of Singapore's manufacturing sector

Mr. Peter Lam
PCEO, Temasek Polytechnic

Republic Polytechnic is pleased to collaborate with Micron to strengthen Singapore's competitiveness as a critical global node in the semiconductor industry. The partnership will further support the development of a strong talent pipeline through meaningful career opportunities in this vibrant sector. Staff and lifelong learners will stay up-to-date with the latest sectoral developments through various upskilling opportunities

Ms. Jeanne Liew
Principal & CEO,
Republic Polytechnic

Ngee Ann Polytechnic's strategic tie-up with Micron is timely amid the exciting growth prospects of the semiconductor sector. Besides facilitating knowledge exchange between industry and academia, this collaboration also offers students and adult learners industry-relevant training so they can have relevant skill sets to support Singapore's Manufacturing 2030 vision

Mr. Lim Kok Kiang
Principal & CEO,
Ngee Ann Polytechnic

Education and innovation are the twin pillars upon which the future is built. As we embark on this collaborative journey with Micron, we do not just forge connections; we create pathways to progress. Together, we ignite intellect, empower possibilities, and engineer a future harmonizing knowledge with industry and academia with innovation. This partnership is a testament to the boundless potential that arises when education and industry unite, transcending borders to sculpt a world of excellence, discovery, and profound impact. It nurtures a talent pool for the industry, cultivating a dynamic and skilled workforce that drives transformative change

Mr. Soh Wai Wah
Principal & CEO,
Singapore Polytechnic

Applied Materials: Investing in our Workforce Development

SINGAPORE 2030 PLAN

Amidst the complexities of the geopolitical and economic climate, the semiconductor industry persists as a growing market that is changing our world - driven by the demand for innovative technology such as Artificial Intelligence (AI), Internet of things (IoT), electric cars, smartphones and 5G/6G networks.

"One of the key differentiators that will allow us to attract investments in an industry that has become the focus of an intensifying global competition is Singapore's growing talent pool," said Minister of Trade and Industry, Gan Kim Yong.

Applied Materials aims to support the global semiconductor industry on its path to becoming a US$1 trillion market by the end of the decade. As announced in the Singapore 2030 plan, Applied will invest in global manufacturing and R&D capabilities, deepen technology ecosystem partnerships in Singapore and invest in a future-ready workforce empowered to excel in the fast-paced and complex world of semiconductors.

To ensure that the workforce is equipped to be future-ready, some of the initiatives that Applied Materials have spearheaded include partnerships with higher education institutions. Through these partnerships, Applied will develop and implement continuing education and training (CET) programs customized for employees, continuing to upskill its workforce and make digital skills and data part of its business language and DNA.

MOU WITH SINGAPORE INSTITUTE OF TECHNOLOGY (SIT) TO SUPPORT A FUTURE-READY SEMICONDUCTOR WORKFORCE

In just over a year since the program kicked off from the signing of the Memorandum of Understanding with SIT, the tailored learning programs on concepts related to Industry 4.0, AI, data engineering, IoT, machine learning and smart factories have already made a significant impact in employees who have participated in the programs.

Beyond the development of skill sets, we have also observed a trend indicating a change in perceptions towards the semiconductor industry - from a 'male-dominated' field to an increasingly inclusive field that has equal opportunities for all. The workforce for the near future is also in need of:

- **Multi-disciplinary Engineers**
  Engineers with diverse skill sets, spanning areas like electronics, material science, and computer science, to collaborate on complex projects and meet the shifting demands of digital transformation.
- **Skills in AI and Machine Learning**
  With the increasing integration of this emerging technology in design and manufacturing processes, there is a growing demand for professionals skilled in these areas.
- **Diversity and Inclusion**
  Building increasingly inclusive and diverse teams, placing values on the varied perspectives and values brought by individuals across gender and race to foster innovation.

VOICES FROM OUR TEAM

Meet Joseph and Sarah who took up the Upskill30 program, and their thoughts on how the program has benefitted them in their career:

Joseph Liyaw
Manufacturing Engineer

As a manufacturing engineer, I utilize digital tools to reduce production churn and to enhance productivity. I saw the opportunity to broaden my skill set and enrolled in a post-graduate certification program covering IoT, data engineering, AI for Smart Factory, and Robotics. With the support of my manager, I was able to balance my work and studies, and by making some personal sacrifices along the way. This learning experience proved highly valuable!

Sarah Chia
Process Engineer

I attended the Applied Python Fundamentals Course with my friend and approximately 20 other Applied employees. The course equipped me with the knowledge and skills necessary to complete coding tasks in my job. The skills I have learned are also applicable in real-life scenarios, providing me with valuable insights on how to reduce repetitive work and simplify processes to enhance overall productivity.

The semiconductor industry requires constant innovation, and investing in the development of our workforce is critical to maintaining our leadership as the world's leading semiconductor equipment company. We are committed to supporting the career growth of our employees, and I am pleased to see that many of our employees have participated in the SIT learning programs to equip themselves with knowledge of the latest technology

Tan Lee Sar
Managing Director,
Human Resources
Applied Materials South East Asia

Our collaboration with Applied Materials offers valuable opportunities for the company's employees to equip themselves with knowledge of in-demand skills in areas such as artificial intelligence and the Internet of Things. The programs will tap on SIT's strengths in applied learning and research and will contribute towards capability building in the local semiconductor industry and across its ecosystem. SIT is delighted to support Applied Materials in this important workforce initiative

Professor Chua Kee Chaing
SIT President

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ELECTRONICS INDUSTRY DAY 2024

Nurturing Brilliance in the Semiconductor Universe

24 JAN

DIGITAL INDUSTRIES

Technology that **transforms the everyday**

Investing in the Future Workforce for Sustainable Semiconductors

In semiconductors, every detail matters. That's why Siemens is using technology to revolutionize semiconductor manufacturing, and investing in the future workforce.

Our initiative includes:

- Program that brings students into Siemens early, giving them hands-on experience and real-world learning opportunities.
- QueenBee program that reskills and upskills semiconductor workers, helping them stay ahead of the curve and meet future demands.
- School competitions and events that introduce students to cutting-edge technologies and spark their interest in semiconductor manufacturing.

Our international team of experts is setting the work in motion, and we believe that technology with purpose has the potential to solve the greatest challenges of our time.

If you are interested in learning more about how your skills can transform the future of semiconductor production, visit our website at **jobs.siemens.com/careers**.

SIEMENS

INDUSTRIAL TRANSFORMATION ASIA-PACIFIC 2023

Embracing Industry 4.0 For A Future-ready World

The sixth edition of Industrial Transformation ASIA-PACIFIC (ITAP), the region's leading advanced manufacturing platform, returned from 18 - 20 October 2023 at Singapore EXPO.

Adaptability, resilience and transformation have become essential in a world that appears to navigate from one crisis to the next. Industry 4.0 (I4.0) adoption allows companies to disrupt traditional operations and set a course for future success. Against this backdrop, the sixth edition of Industrial Transformation Asia-Pacific (ITAP) served as a dynamic platform for businesses looking to start, scale and sustain their I4.0 adoption in an ever-evolving world.

With over 18,000 global I4.0 leaders and solution providers converging at Singapore EXPO in October, the event hall hummed with discussions on sustainability, innovative technologies and a collective vision for a resilient industrial future. The exhibition floor featured comprehensive learning opportunities and bustling thematic zones, including 11 industry-led and dedicated country pavilions.

Constellar, in collaboration with international partner Deutsche Messe, organised the event, which was inaugurated by Singapore's Deputy Prime Minister and Coordinating Minister for Economic Policies, Mr Heng Swee Keat. During his opening address, DPM Heng highlighted that this year's ITAP aims to facilitate over 1,200 business matchings, marking a 40% increase from pre-pandemic levels in 2019.

A COLLABORATIVE JOURNEY

Given the challenges and disruptive trends that organisations must confront, DPM Heng emphasised the critical importance of innovation and cross-border collaboration in building resilience. He drew attention to a recent partnership between Singapore's Agency for Science, Technology, and Research (A*Star) and institutes of higher learning. This collaboration has led to the creation of a distributed smart value chain program, allowing manufacturers to unite in responding swiftly to shifts in demand and supply. This initiative promotes data sharing and collaborative decision-making.

Alexander Feldman, President of Boeing Southeast Asia, underscored the importance of teamwork and partnerships during ITAP's Industry Transformation Forum. He stressed that Boeing's commitment to safe and efficient travel is a collaborative endeavour involving numerous stakeholders, such as academia, pharmaceutical companies, tourism boards, and government entities. Feldman also highlighted Boeing's ongoing dedication to innovation, which encompasses harnessing renewable energy and advanced technology while optimising operational efficiency.

Over the past five years, ITAP has served as a platform to promote collaboration and co-innovation between diverse stakeholders and industry verticals. At this year's edition, several significant Memorandums of Understanding (MoU) were inked, including the partnership between Singapore Polytechnic and the Malaysian Research Accelerator for Technology and Innovation, witnessed by Deputy Prime Minster Heng Swee Keat at the event's opening ceremony.

Minister of State for Trade and Industry Alvin Tan presided over two more MoUs on the second day of ITAP: one for the Circular Manufacturing Industry Alliance Partnership among five companies and another between the Singapore Precision Engineering and Technology Association (SPETA) and the Institute for HR Professionals (IHRP) to further develop talent and the human resources (HR) community in the manufacturing sector.

TRAILBLAZING INNOVATIONS TAKE CENTERSTAGE

At the ITAP showcase, emerging technologies such as AI, digital twins, and the metaverse claimed the spotlight. Siemens, the founding partner of ITAP, introduced their cutting-edge solutions, including Industrial Operations X, designed to enhance the efficiency of industrial processes in the realm of IT/OT (information technology/operational technology) convergence. One notable feature of their exhibition was a live demonstration showcasing how industrial automation and digitalisation were practically applied in the local start-up Artisan Green's vertical farm, resulting in increased operational efficiency, productivity and the promotion of sustainable food production.

Extended Reality (XR), an umbrella term for all immersive technologies like Augmented Reality (AR) and Virtual Reality (VR), played a prominent role in the exhibits. VIRNECT, a company specialising in intuitive communication and enhanced industrial workflows through AR technology, presented their immersive XR learning solutions, contributing to smoother operations through digital manufacturing.

At this year's ITAP, we saw the introduction of 50 new products, as well as trailblazers pushing the boundaries of automation.

Find out more about Industrial Transformation ASIA-PACIFIC, visit:
www.industrial-transformation.com

STEERING IMPACTFUL DIALOGUES

At the Industrial Innovation Stage, discussions ranged from sustainability and cybersecurity in semiconductor manufacturing, to modularisation and digitisation in the process industry, and collaborative AI that makes robots safe for working with humans. In the panel on Generative AI in Manufacturing, panellists delved into the hurdles posed by a transitioning workforce and the necessity to achieve more with fewer resources through automation, highlighting a pivotal shift towards sustainable and efficient manufacturing practices.

CREATING A BETTER WORLD FOR FUTURE GENERATIONS

As ITAP progresses, its sixth edition served as a remarkable testament to global leaders' and stakeholders' enduring and collaborative determination in charting a sustainable course ahead. Centred on the principles of innovation for robust value chains, addressing climate change, and fostering a skilled workforce, ITAP continues to strengthen the foundation for a future where technology and sustainability intersect to shape a brighter tomorrow.

CONTRIBUTED BY

constellar

Driving Research, Enabling Innovation:

Amid volatile times of conflict, trade disputes and climate change, the world's demand for semiconductor chips has been steadily increasing. Singapore plays a role in meeting part of this increasing demand. Up to 5% of specialty chips are produced in Singapore and more is expected with the US$4 billion investment by GlobalFoundries earlier this year. It is not surprising that much research and development is being carried out to push the performance envelope for semiconductor devices. However, due to the nature of the industry, there is a huge barrier to entry for firms trying to innovate and develop new devices or techniques. The infrastructure requirements as well as the high cost of equipment means that only large semiconductor companies or universities are able to conduct research and development. Small and medium sized enterprises (SMEs) are left out, potentially restricting the amount of innovation in this space.

> ***Our objective is to provide Singapore with state-of-the-art facilities, outstanding customer service in order to support companies to take their technology to the next level***
>
> **Prof. Antonio Castro Neto**

The Centre of Advanced 2D Materials (CA2DM) bridges this gap. Established in 2010, CA2DM has been enabling and driving research in 2 dimensional materials and the various applications. With a H-Index of 100+ and a m-quotient of 11, more than 1000 papers have been published since its establishment. CA2DM has 800m^2 of class 1000 and class 100 cleanrooms. It also houses a wide range of analytic, characterisation and fabrication tools for material research and device fabrication. Open 24/7, CA2DM is conveniently located in the campus of the National University of Singapore.

Companies can choose to enrol their staff to be users at the centre and utilise the equipment for a fee. CA2DM also provide services such as lithography, X-Ray Photoelectron Spectroscopy, etc… For SMEs and researchers, they can choose to take up a collaborative laboratory space in our centre. Collaborative lab spaces are private lab spaces for SMEs and researchers, enabling them to carry out research or proof of concept experiments.

Interested parties can find out more at:
https://graphene.nus.edu.sg/our-solutions/

CONTRIBUTED BY

Prof Antonio Castro Neto
Director of CA2DM

NUS National University of Singapore | Centre for Advanced 2D Materials

Biden-Harris Administration Announces Updates in CHIPS Act

> ***Opportunity is now open to smaller projects under US$300million***

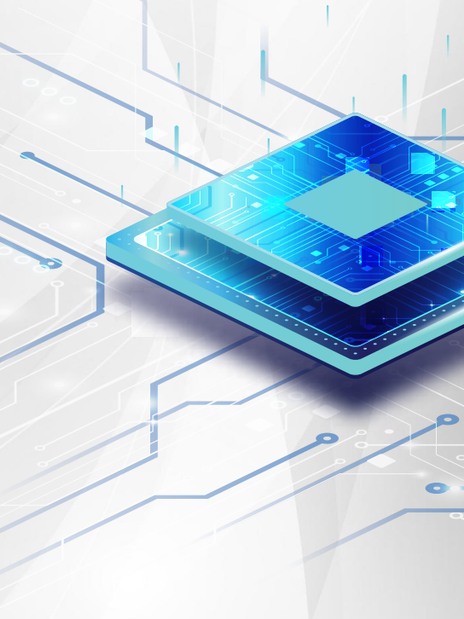
As of 29 September 2023, the U.S. Department of Commerce announced a funding opportunity for smaller supply chain projects and businesses to access CHIPS for America funds. As part of President Biden's Investing in America agenda, the bipartisan CHIPS and Science Act includes incentives to strengthen supply chains, support smaller projects and businesses, and create good-paying jobs in local communities across the country.

The new funding opportunity is open to projects with capital investment below USD$300 million involving the construction, expansion, or modernization of commercial facilities in the United States for semiconductor materials and manufacturing equipment. These projects will produce the equipment, chemicals, gases, and other materials that are critical to manufacturing semiconductors in America. Suppliers are also strongly encouraged to apply for CHIPS incentives alongside other institutions from their regions to expand economic opportunity and competitiveness. Supply chain investments can help regions increase economic resilience, create new pathways to good jobs, and bring emerging technology innovation home to their communities. The funding opportunity builds upon the Department's announcement in June to expand funding to larger supply chain projects, and the Biden-Harris Administration's strategic vision to ***strengthen the semiconductor supply chain*** through CHIPS for America investments.

The investments made as part of this new funding opportunity will support three strategic objectives as outlined in our "Vision for Success":

1. Strengthen supply chain resilience
2. Advance U.S. technology leadership
3. Support vibrant U.S. fab clusters with a reliable ecosystem of suppliers.

This funding opportunity follows through on the CHIPS and Science Act's requirement that the Department establish a program to incentivize investment in the construction, expansion, or modernization of commercial facilities in the U.S. for the semiconductor supply chain, including materials and manufacturing equipment.



*For more **funding opportunity information** and the **application process**:*
https://www.nist.gov/chips/chips-america-webinars

*About **CHIPS for America**, visit :*
https://www.chips.gov

CONTRIBUTED BY

NIST National Institute of Standards and Technology U.S. Department of Commerce

Executive Spotlight

Q: Can you provide an overview of your background and experience in the semiconductor industry? What led you to pursue a career in this field?

I started working with Henkel about five years ago but have been in the material science industry for some time, first with a large global consulting group and then with polymer supplier Covestro. As for my career in the semiconductor segment, I actually think the work found me! My passion is driving change – both cultural and on the innovation front – to deliver growth with purpose. This aspiration has seen me take on many different roles, ultimately leading me to Henkel and an incredible opportunity to lead a vibrant region in a challenging and exciting market.

Q: What are the current trends and advancements in the semiconductor industry that you find most exciting or promising?

There are many semiconductor trends that I find exciting and promising and where Henkel is making significant contributions. Automotive electrification, 5G connectivity, IoT, and emerging AI developments are top contenders. Semiconductor devices for applications in each of these spaces are seeing major transformation. For example, new wide bandgap semiconductors like gallium nitride and silicon carbide are enabling devices to operate at much higher temperatures and power levels. These compounds have the potential to surpass traditional silicon performance for certain devices. This impacts materials, and Henkel's die attach portfolio has several high thermal, high-reliability solutions. Advanced packaging and heterogeneous integration are also seeing advances occur at a remarkable pace. Large package bodies, large die, 2.5D and 3D stacking, and device complexity present numerous processing, thermal, and reliability challenges, and are areas where materials are enabling factors for new designs.

Q: From your perspective, what are the key factors driving innovation in the semiconductor industry today?

Sustainability across the value chain is a top priority for Henkel, our partners, and our customers. Environmental responsibility is core to our overall strategy – in electronics and for Henkel Corporation globally. Secondly, digitalization and advanced analytics are areas where Henkel has made significant investments and where substantive improvements can be realized in the semiconductor market. For example, modelling made possible by advanced combinatorial learning has the potential to augment or even replace traditional physical testing of chips. If proven successful, this could significantly reduce costs and speed time to market.

Q: Can you share some insights into the research and development efforts within the organisation?

Sustainable materials are top among the efforts. Developing PFAS-free products and adhesive formulations that allow debonding and re-bonding to facilitate repair and/or recyclability are areas where Henkel is innovating. And for the last three years, our electronics team has delivered tremendous success for die attach material capability, resulted in several new conductive die attach pastes that meet next-generation automotive-grade standards and deliver the high thermal requirements necessary for high-reliability packages.

CONTRIBUTED BY

Jing Yao
Head of Henkel Southeast Asia

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 60 years

Tokyo Electron will celebrate its 60th anniversary on November 11, 2023.

Manufacturing 101:
The Gemba Walk Experience

The word “Gemba” may sound foreign, but it is actually a useful concept. “Gemba” came from the Japanese word meaning “the real place”. It refers to an actual location of where a process or activity is completed. Thus, the ‘Gemba Walk’ allows employees at the Skyworks Singapore facility to be on the production line and observe manufacturing processes to identify potential areas for improvement.

Having the advantages of Gemba Walk in mind, our management decided to schedule our non-manufacturing employees to work on the production line for three consecutive days from 8 a.m. to 8 p.m. daily starting in August 2023. In the first phase of our Gemba Walk, managers and engineers were assigned to work in the different processes, including lithography, plating, and dicing. This exercise fosters hands-on mentality and promotes better communication between the line operators and our executives. Further to that, this creates awareness and understanding for the employees on the production line.

We have currently completed phase one of the Gemba Walk at the Skyworks Singapore facility with 180 employees being awarded with a gold, silver, or bronze star for their effort! A total of 248 observations and improvements have been generated after the Gemba Walk, including ideas for better efficiencies and communications strategies. Through our post-Gemba survey, 99% of the participants find the Gemba Walk very useful, beneficial, and also created awareness of the job of the members working in the production line.

The Gemba Walk has allowed our managers to collect direct feedback which helps the company to stay competitive through fostering a culture of continuous improvement. Both leaders and employees will be able to take ownership over their jobs and create a conducive working environment with trust and collaboration.

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SKYWORKS

ROKKO Singapore Celebrates
30 Years of an Exciting Journey

Established in 1992, ROKKO Singapore has embarked on a thrilling journey in the semiconductor industry, spanning three decades.

Initially concentrating on Precision Engineering, the company specialised in Trim and Form Dieset, supplying a wide array of materials and spare parts to the semiconductor back-end sector. As time progressed, Rokko strategically diversified, venturing into the design, development, and manufacturing of cutting-edge Semiconductor Equipment. Additionally, the company supplied Semiconductor Leadframe materials for applications in both the automotive and medical sectors.

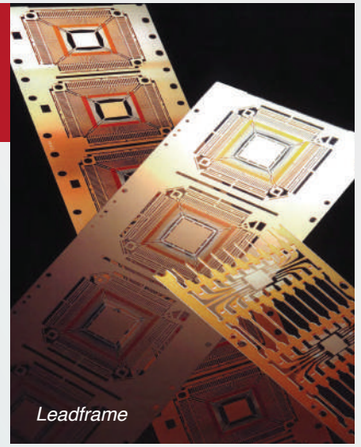
The success of Rokko is attributed to its dedicated team of over 250 employees, who have diligently served their customers for more than 30 years.

The company is also profoundly grateful for its loyal customer base, which has been a pillar of support, ensuring resilience and consistent growth throughout the years.

Revitalising a company with three decades of history demanded innovation, boundless passion, and unwavering dedication. In the ever-changing semiconductor industry, automation has become critical due to a shortage of skilled labour and escalating operational costs. The global pandemic further intensified these challenges, disrupting supply chains even more.

In this challenging post-pandemic landscape, decision-making grounded in pragmatism and enriched by experience is crucial while lasting relationships with our devoted customers underscore Rokko's steadfast commitment to excellence and its ability to add substantial value to their operations. This ensures our alignment with customers' objectives, helping them maintain a competitive edge in the foreseeable future.

Ultimately, Rokko offers unwavering and predictable support, empowering companies to focus on their core activities and enhance their competitiveness in the rapidly evolving semiconductor industry.


Leadframe


Auto Jig Saw

For more information, please visit:
www.rokkogroup.com or contact sales@rokko.net

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ROKKO

AMD RYZEN AI

AMD RYZEN™ AI

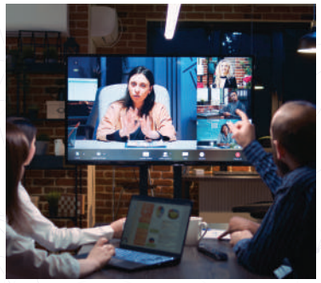
FOR WINDOWS LAPTOPS WITH AI TECHNOLOGY BUILT IN. PIONEERING A NEW ERA OF AI PC.

AMD has unveiled the world's first dedicated artificial intelligence (AI) engine to be integrated in an x86 processor. Introducing AMD Ryzen™ AI, this built-in hardware acceleration allows a laptop to run different AI models and workloads with its innovative inference technology. It is available on selected models of the latest AMD Ryzen™ PRO 7040 Series Processors. Lenovo and HP commercial PCs are available in market for businesses with AMD Ryzen™ PRO 7040 Series Processors, featuring Ryzen™ AI.

AMD RYZEN™ AI ENABLES THE FUTURE OF WINDOWS LAPTOPS BY:

Keeping data private and local to your computer and helping it run faster with selected AI based apps.

Providing AI technology ready for new apps and experiences coming soon in partnership with Microsoft and leading ISVs.



Enabling advanced video collaboration today, with Windows Studio effects, on new laptops powered by selected AMD Ryzen™ PRO 7040 Series Processors.

SCAN TO DISCOVER HOW AMD CAN EMPOWER YOUR AI JOURNEY.

WWW.AMD.COM

Realtek Opening Up a New Era of Exciting and Innovative Home Entertainment

Realtek has advanced comprehensive multimedia and communication network solutions. With an eye towards the future, Realtek has focused on advanced development of energy efficient products that meet customer needs. New release:

Next-Gen Android and RDK STB SoC

Wi-Fi 7, Wi-Fi 6E and BT Auracast Combo Solutions

Multi-Protocol Smart BT Dongle Solutions

Next-Gen Android and RDK STB SoC

In this advanced era, where speed and energy matter most, Multiple System Operators (MSOs) require Set-Top Box (STB) SoC platforms that offer high performance combined with power efficiency. Realtek's Next-Gen STB SoC designs feature an advanced 12nm process and CPU/GPU/NPU computing for a complete 4K HDR experience. This reflects Realtek's unwavering commitment to intertwining cutting-edge technology with prudent energy use, striving to improve a new benchmark in the entertainment domain.

With HDMI 2.1a functions, Edge AI for resolution/picture quality upscaling, and a built-in VVC/H.266 codec, Realtek's Android TV, Google TV, and RDK (Reference Design Kit) STB platforms continue to support immersive AV technology for OTT and hybrid products, shortening the time to market.

Wi-Fi 7, Wi-Fi 6E and BT Auracast Combo Solutions

(RTL8922A/RTL8852C Series)

Realtek Wi-Fi 7, Wi-Fi 6E, and BT Auracast Combo solutions support the latest Wi-Fi 7 and BT5.4 technology. The advent of Wi-Fi 7 and Wi-Fi 6E ushers in an additional 6GHz channel, augmenting the previous generation's 2.4GHz/5GHz channels, thereby broadening the bandwidth and alleviating congestion. This innovation translates to a superior Wi-Fi experience characterized by expedited internet speeds, diminished latency, and a markedly more reliable connection. Realtek's RTL8922A/RTL8852C series offer a high-quality Wi-Fi experience, providing faster internet speeds, lower latency, and a more reliable connection.

The embedded Auracast Combo solutions allow the RTL8922A/RTL8852C series to connect to an unlimited number of BT devices such as speakers and headsets. This, while concurrently mitigating interference, facilitates high-quality audio streaming to multiple devices simultaneously. The meticulous engineering behind this series not only amplifies the audio streaming quality but also fosters a seamless, interference-free connectivity environment.

Multi-Protocol Smart BT Dongle Solutions

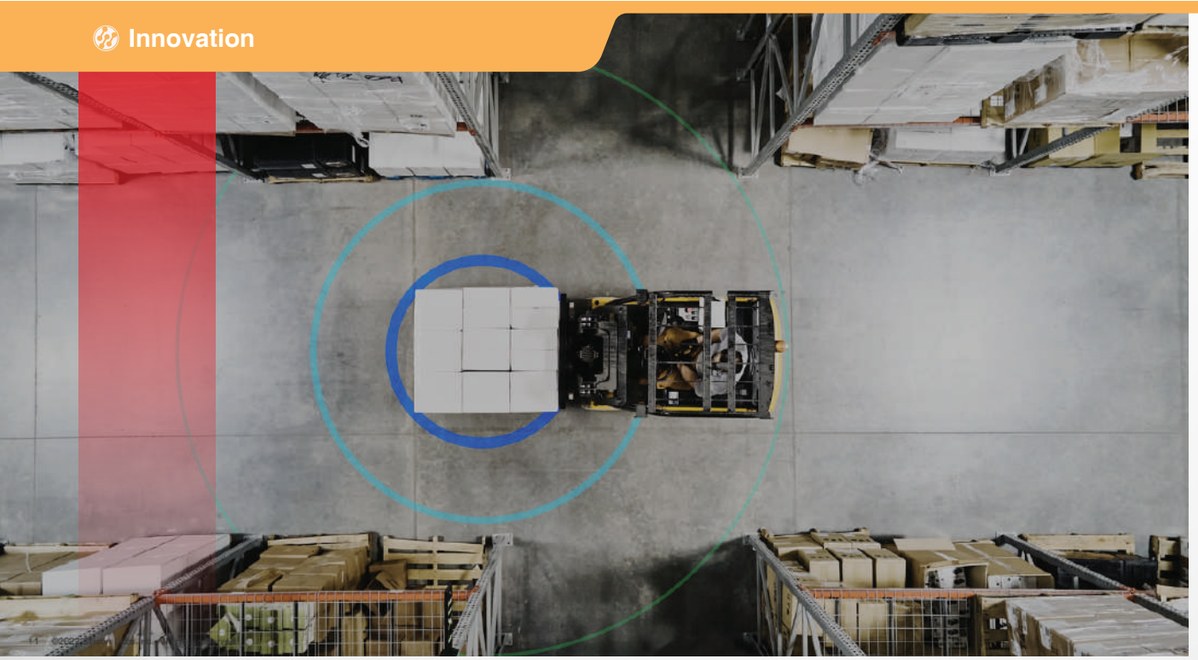
(RTL8763EAU/RTL8771G/RTL8761CUV)

Realtek has launched a series of Multi-Protocol Smart BT Dongle solutions that allow Host Devices to control various smart devices in the home, enabling TV/OTT devices to act as central control hubs.

- The RTL8763EAU provides a driver-free USB audio dongle with Auracast.
- The RTL8771G is a solution that supports Matter Thread Dongle.
- The RTL8761CUV provides dual-mode Bluetooth and supports the Bluetooth Auracast protocol.

Realtek's Edge AI USB camera controller, Wi-Fi 7, Wi-Fi 6E, BT Auracast Combo solutions, and Multi-Protocol Smart BT Dongle solutions enable TV/OTT devices to act as central control hubs, opening up a new era of exciting and innovative home entertainment.

Contact Us



Four Pillars to Take IoT to the Next Level

The IoT is growing to unthinkable heights. From life-saving medical devices to factory equipment making our everyday goods, the IoT is present just about everywhere. It is so prevalent that IDC predicts that we're only 2 years away from 50 billion connected devices. To keep this growth going, we as an industry need to do four things to usher in the next level of IoT.

Embedded computing is the largest, most constrained computing platform on the planet. By adding wireless connectivity, these devices take on an entirely different paradigm as data continuously flows both ways from device to cloud and cloud to device.

The link to the cloud is the final piece of the puzzle for this class of devices. By adding wireless connectivity, the cloud comes down. The product now adds compute, sensing, and transducing. For devices like shelf labels, the cloud connection is the first piece of the puzzle.

In all instances, connectivity is the key, unlocking value such as safety, efficiency, security, productivity, and more. For example, a tool manufacturer that has installed connectivity throughout their portfolio can optimize the performance of each tool, to the specifications needed for that day and job, improving speed, efficiency, and safety for the workers onsite. Other applications include equipment tracking to reduce theft and tool locating, remote alerts when maintenance is required, and logging capabilities for proof of work. The bottom line: connected products are simply better.

Today, no business can survive without a significant internet presence for things like sales, marketing, customer support, business development, and communication. The first wave of internet was about connecting people to businesses, but for IoT, we are connecting devices to cloud applications. There are 100x more IoT devices than people on this planet. The IoT has segments with volumes in the 1-10 billion annual volume range.

In other words, the IoT is everywhere. But we are not done. Across dozens of conversations with industry leaders and hours of research, four things bubbled to the top to bring in the next level of the IoT: accelerating software, securing products, connecting cloud and device teams, and empowering data governance.

1 ACCELERATING SOFTWARE

It's time to embrace real-time operating systems (RTOSs) as the foundation for software development in embedded devices. RTOSs make products scalable, maintainable, more secure, and portable. RTOSs provide an underlying framework that enables consistent connection to the cloud. It also includes features, such as over-the-air (OTA) firmware updates, that enable products in the field to function for 25 years or longer.

2 SECURING PRODUCTS

Cybercriminals are becoming increasingly more sophisticated and the IoT is a prime target. As the IoT becomes more pervasive, the attack surface also grows, giving bad actors more opportunities to deepen their attacks with AI and automation. Security starts from the silicon. Chips must be secure and its data must be protected. Devices also need a way to securely connect to the cloud, using technologies like key exchange authentication and encryption and using protocols that have been vetted.

3 CONNECTING CLOUD AND DEVICE TEAMS

The way we manage the teams of people we work with matters. Device teams building the physical products and cloud software teams working to manage that device over its lifetime must be connected, as these end nodes are getting more sophisticated. As we are able to do more at the edge, and the cloud is adapting to more embedded capabilities, each part of the IoT needs to work more efficiently and seamlessly, so it only makes sense to bring these teams together to accelerate time to market and maximize the benefits of the IoT.

4 EMPOWERING DATA GOVERNANCE

The IoT generate massive amounts of data, so it is important to ask how we are managing that data. We need to make sure bad things aren't happening with that data. Data governance makes sure that organizations deal with compliance and regulations effectively so data never falls into the wrong hands and is misused. Good data governance will help organizations get the most out of their data and safeguard that information.

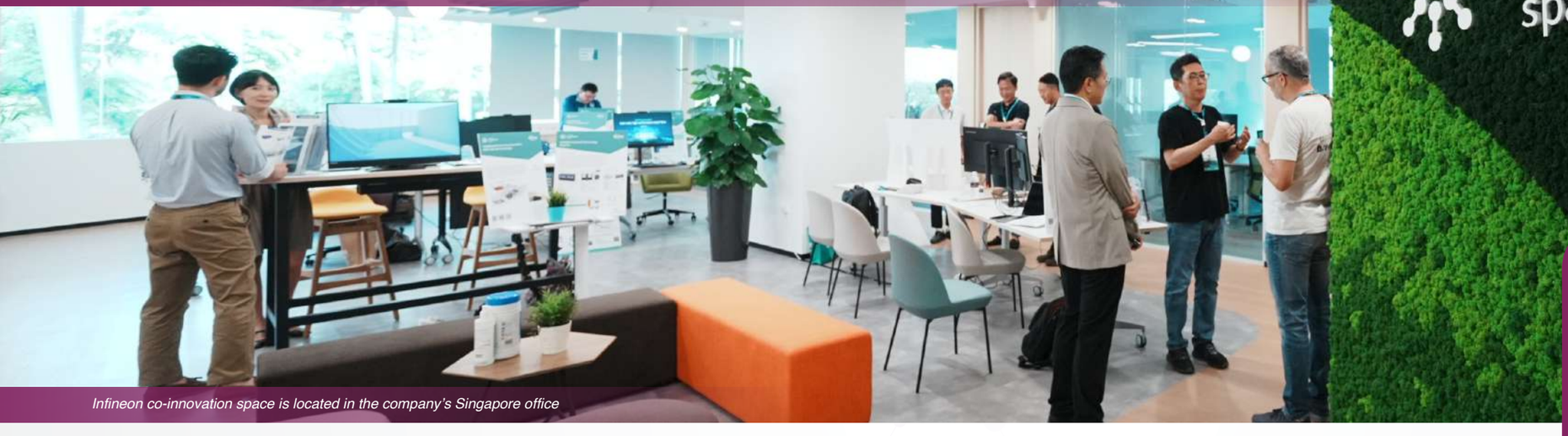
With these four pillars, we will take the IoT to the next level.

CONTRIBUTED BY

Daniel Cooley
Chief Technology Officer

SILICON LABS

Infineon Co-Innovation Space a Hallmark for Collaboration with Startups



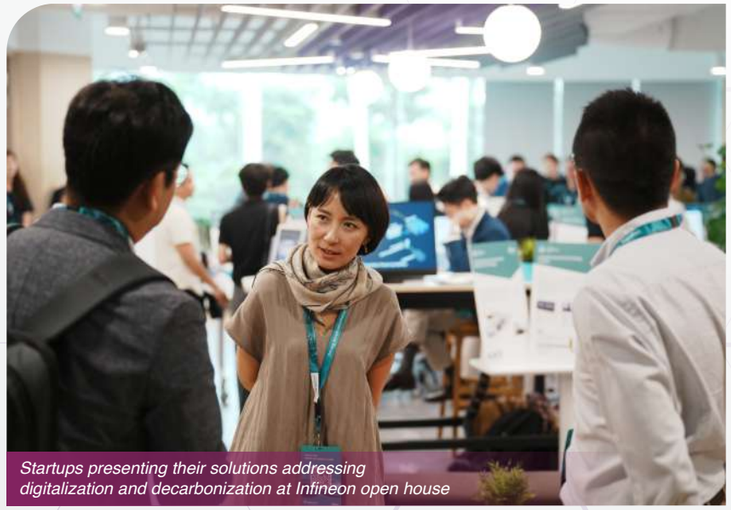
Infineon co-innovation space is located in the company's Singapore office

For start-ups, the most difficult stage of their business journey is often the beginning – getting extra funds beyond angel investing. To attract investors, companies need a market-ready product, and not everyone has resources to turn ideas into reality.

The Infineon co-innovation space is the perfect collaboration between startups and Infineon. Startups get access to Infineon's extensive resources – equipment, manpower, and knowledge – and its reputation as a trusted name. In exchange, Infineon learns about future market-changing applications from these startups.

"Infineon wants to create future businesses together with innovative startups. We look forward to supporting promising startups that want to grow together based on Infineon's technology and global network," Jerry Park, Director, Strategy and Market Development at Infineon Technologies Asia Pacific.

Startups often lack resources to bring ideas into reality. With Infineon's cutting-edge offerings, they can focus on developing innovations. The founder of PAGOPACE, a German electronics manufacturer and a partner of co-innovation space, stated that Infineon is the best support a startup can get: technology knowledge, competencies, and products to help them kickstart their journey.



Startups presenting their solutions addressing digitalization and decarbonization at Infineon open house

Infineon will remain a trusted customer, supplier, and development or go-to-market partner. The teamwork does not end at the year-long collaboration. By partnering with an established global brand, startups can build their network and broaden their portfolio by connecting with important decision makers and other innovators through Infineon-affiliated customer events. Infineon will purchase solutions or use global marketing and sales channels to generate business together.

Tack One in co-innovation space

Tack One, a Singapore-based global location intelligence startup, is a co-innovation space partner which has just launched the world's first palm-sized, autonomous flood monitoring device.

"With Infineon Technologies as our partner, our Tack EVO FloodFinder™ is a testament to how location intelligence has massive room for various applications to transform the way we live, protect human lives and safeguard the communities we care about."

Justin Zhang
CEO of Tack One

Website link: https://www.infineon.com/cms/en/partner-network/startups/

QR code for website

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Innovation

Leading The Semiconductor Industry With The Power Of Innovation

From business and healthcare to entertainment and education, almost every sphere of human activity is feeling the impact of the ongoing digital transformation. As a key innovator in the semiconductor space, ASM is proud to provide the cutting-edge equipment that delivers crucial technologies for the chips needed to develop and create the electronics products that consumers and businesses use everywhere. In the coming years, the company expects the power of innovation to be the driving force behind new growth throughout the industry.

Estimates project that the semiconductor market will be worth more than US$1 trillion by 2030. For ASM and other companies in the chip-making industry, new and expanding applications like artificial intelligence (AI), 5G smartphones, big-data analysis, autonomous and electric vehicles, edge and cloud computing, and the Internet of Things (IoT) will continue to drive demand for more powerful semiconductors. And as a crucial supplier of wafer-processing equipment and process solutions to the leading semiconductor manufacturers, ASM is building on in its legacy of more than 50 years by further developing its state-of-the-art deposition products, which include wafer-processing systems for atomic layer deposition (ALD), epitaxy (Epi), silicon carbide epitaxy, plasma enhanced chemical vapour deposition (PECVD) and vertical furnace equipment.

PEOPLE ARE THE INNOVATION ENGINE

While it is mostly seen as a tech company, ASM views its talented people as the driving force behind its success. The company's global workforce is made up of over 4,400 people, from 66 nationalities, working across 15 countries. Embracing the power of diversity, ASM strives to create an inclusive, inspiring, and motivating workplace where all employees are able to use their talents, excel at what they do, and develop their potential as all teams work together to deliver the cutting-edge technologies of tomorrow. ASM's core values – We Care, We Innovate, We Deliver – help them shape an even more diverse and inclusive culture.

GROWTH THROUGH INNOVATION

With R&D centers in seven countries and over 2,600 patents in force, ASM has helped to shape today's advanced semiconductor products. Working from its successful Growth through Innovation strategy, the company focuses its R&D efforts on developing new materials and process solutions that open up new applications for customers worldwide.

ASM continuously drives innovation of its products and services to address the technology needs of its customers: building faster, cheaper, and increasingly powerful semiconductors with reduced power consumption for each new technology node. That is why ASM's product development programs aim to increase throughput, equipment reliability, and yield, while at the same time lowering the energy and resource intensity and the cost of ownership.

The company is also growing and deepening its strategic collaborations with key partners such as customers, suppliers, chemical manufacturers, and research institutes. For example, the company maintains strong customer relationships with the top semiconductor manufacturers, working closely together with them in the early stages of their device roadmaps.

AHEAD OF WHAT'S NEXT:

GETTING READY FOR NEW TECHNOLOGY NODES

ASM believes that as long as there is growing demand for semiconductors, Moore's Law will continue. This will be driven by device and transistor innovations enabled by new materials and full use of the third dimension (3D chip design). Specifically, technology trends towards new materials and 3D scaling will accelerate further adoption of one of ASM's key technologies: ALD. This is because the self-limiting nature of the ALD process allows for the development of new materials with a precise and repeatable composition.

As the market leader in ALD, ASM's products and R&D portfolio are well-positioned to address the challenges presented by next-generation technology nodes. Working from its R&D centers in the US and Asia, the company has established a deep expertise in precursor chemistry, materials, and plasma, as well as long-term strategic R&D partnerships with leading research institutes like IMEC. ASM's strength is also reflected by its impactful intellectual property (IP) and product portfolio.

> ***With this cutting-edge technology, ASM always stays ahead of what's next and helps to move the industry roadmap forward, unlock new potential, drive innovation in the electronics market, and improve people's lives in fields from business and healthcare to entertainment and education – and beyond.***

CONTRIBUTED BY

ASM

Accelerating Innovation In An Evolving Semiconductor Landscape

Semiconductor technology is constantly evolving. The soaring demand for new technologies such as artificial intelligence, machine learning, 5G, the Internet of Things (IoT), and autonomous vehicles has propelled the industry's growth significantly. This surge in demand has also sparked innovations in chip design and packaging. Advanced techniques like 3D packaging, wafer-level packaging, and chiplets have enhanced performance, power efficiency, and reduced the overall form factor of semiconductor devices.

Test and measurement has undergone a revolution of its own, capitalizing on connected software, analytics, and artificial intelligence to enable more efficient design, test, and characterization of semiconductors. These recent advances have created significant, untapped opportunity to leverage test as a competitive advantage.

At the heart of this opportunity is inefficiency caused by disjointed design and test stages throughout a semiconductor product's development lifecycle. As product complexity drives the need for multiple development phases, inadequate communication and coordination exacerbates inefficiencies, especially in large organizations. Standardizing test and measurement tools and connecting engineering functions through shared software can significantly streamline operations, reducing time to market and improving engineering efficiency. Furthermore, as technology continues to rapidly evolve, developing flexible and efficient test strategies will be critical to quickly adapt to new requirements. It is these strategies that will enable semiconductor companies to scale effectively and win in the race to market.

For semiconductor companies to continue driving innovation, they must rethink their approach to test and take a closer look at the individual stages in their product development process. Leveraging a test vendor's specialized expertise, advanced testing solutions, and connected software is key. At NI, our goal is to help test organizations boost their engineering productivity with intuitive automation tools and adaptable test systems that allow engineering teams to focus their time in critical areas and become product experts.

In navigating the evolving semiconductor landscape, embracing collaboration is vital to innovation. The journey towards a connected and intelligent world is a collective endeavor, and together, we can unleash the power of semiconductor technology to shape a brighter, smarter, and more sustainable future.

CONTRIBUTED BY

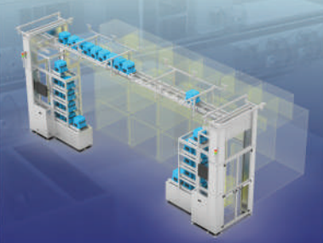
Robert Manion
Vice President and General Manager,
Semiconductor & Electronics
Test & Measurement Business Group,
Emerson

HiTec

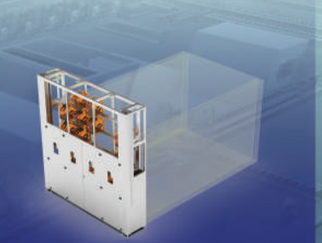
HITEC INNOVATIVE TECHNOLOGIES PTE. LTD.

Established in Singapore by a group of innovative engineers with more than 30 years of experience in design and manufacturing for clean room automation, process handling equipment, and factory bulk handling clean conveyor systems for the hard disk, semiconductor, and FPD industries.

SMIF NTB AUTOLOADER



SMIF WETBENCH AUTOLOADER



FOUP NTB AUTOLOADER

39, Woodlands Close #06-48
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sales@hitec.com.sg

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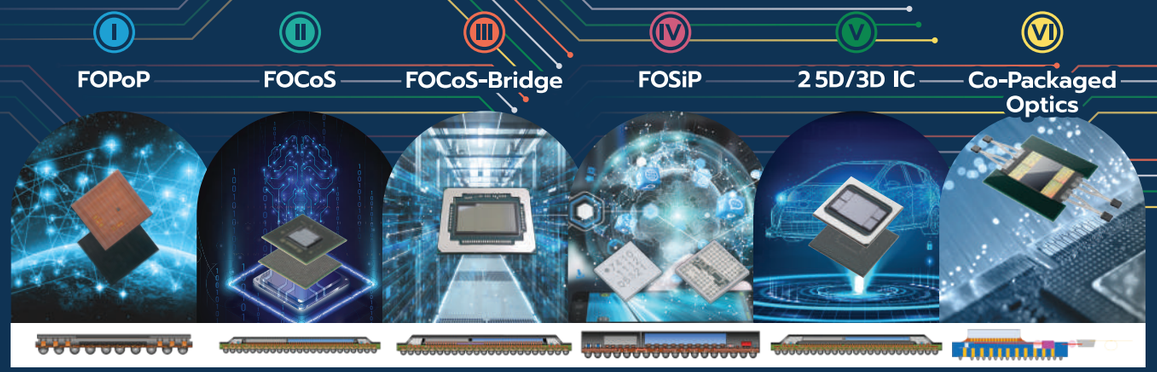

INTEGRATED DESIGN ECOSYSTEM

ASE's integration and miniaturization technologies are enabling transformative solutions that are literally changing lives, from Health to Transportation, from Robotics to AI, and from IoT to 5G.

ASE's VIPack™ is comprised of six core packaging technology pillars supported by an integrated design ecosystem. Please ask the ASE technologists about how we can innovate, collaborate and work together.

ASE Website **ASE** LinkedIn

ASE

Helping You Navigate
Sudden Changes in the Market

The semiconductor industry is famously cyclical in nature, often due to macroeconomic factors out of one's control. How does one decide when will be the right time to set up new facilities, or to acquire new machines in order to expand production capability? Will the newly acquired machines become white elephants in times of a sudden downturn?

At DISCO, we believe that what our customers really want is not just the product itself, but the processing results that are derived from using our products as a means. With this in mind, we provide our customers with the best processing results through our cumulated knowledge of Kiru (cutting), Kezuru (grinding) and Migaku (polishing) technologies.

DISCO is also acutely aware of all semiconductor players' processing requirements and concerns with regards to market changes. This is why DISCO offers our in-house dicing and grinding service as a means for our customers to cope with unexpected market trends. Our service, termed as "KKM Service", can be utilised for product development and small lot productions.

For new and difficult devices, it is important to ensure proof of mass production feasibility and quality before committing to any huge capital expenditure. DISCO is able to optimise the entire dicing and grinding process flow, which can be adopted full-scale once facilities are in place.

Another scenario would be if a new customer's order is received, but time is required for facilities and production capacity expansion. By engaging DISCO's KKM Service, a customer's order can still be fulfilled while expansion is underway.

Likewise, if you are a start-up company, DISCO can assist in achieving production stability, ensuring actualisation of economies of scale before the process is transferred for mass production.

DISCO Hi-Tec Singapore's dedicated Class 1K cleanrooms are equipped with the latest DISCO machines and technologies. DISCO's global network also ensures that our KKM Service can be performed in a DISCO office that makes the most sense strategically and logistically.

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

Please contact any DISCO office for more information on our KKM Service.

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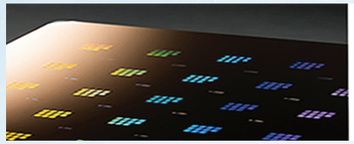
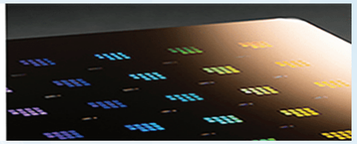


TOPPAN

TOPPAN PHOTOMASK



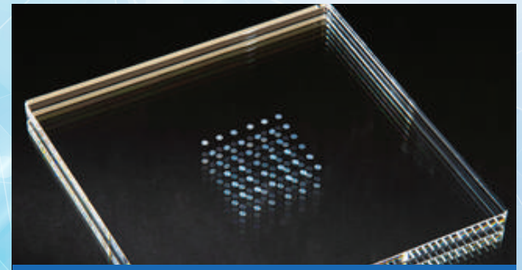
THE WORLD'S PREMIER PHOTOMASK PROVIDER

Toppan Photomask is a company that specializes in the production and supply of photomasks, which are essential components in semiconductor manufacturing. As a premier photomask provider, Toppan Photomask operates a vast network of advanced manufacturing facilities worldwide. The company offers a range of photomask technologies and services to meet the diverse needs of the global semiconductor industry.

Product outline

Photomasks for Semiconductors

Toppan Printing develops next-generation EUV photomask for leading-edge semiconductors



Silicon stencil masks / Molds for nanoimprint

In addition to our global manufacturing network, Toppan Photomask has a Singapore based customer support team. This team is headed by Song Heng Vince Teo, Head of Southeast Asia Sales for Toppan Photomasks.
Vince can be reached at vince.teo@photomask.com.

TURNING CHALLENGES INTO SOLUTIONS

Silicon Connection

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

Today, we have evolved into an effective solution provider with 4 areas of expertise:

Micro-Electronics Packaging
Facilities Components & Equipment
Wafers & Specialty Materials
Lighting & Imaging Products

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

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

- Singapore (HQ)
- Malaysia
- Thailand
- Philippines

Scan here to learn more about us

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7 Kallang Place, #05-05, Singapore 339153
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Driving Success:

Integrating Open Market Purchasing, Quality Assurance, and Innovation in the Dynamic Electronics Industry

Successful companies in our dynamic electronics industry have gained a competitive advantage by implementing an open market purchase strategy for electronic components. This strategy enables businesses to navigate through uncertainties and balance inventory risk, cost optimization, customer satisfaction, and operational efficiency by integrating Just-In-Case and Just-In-Time principles. Therefore, ensuring the authenticity, reliability, and compliance of electronic components procured from the open market becomes extremely important.

To accomplish this, it is essential to establish robust quality assurance measures, including collaborating with trusted suppliers, conducting rigorous inspections, and testing, and implementing effective traceability processes. By adhering to these practices, companies can guarantee the quality and reliability of their products while taking advantage of the open market purchase.

As a world-class testing laboratory, Prosemi has built a reputation among the largest CMs and OEMs for authenticating electronic components and providing additional services such as IC programming, tape and reel, and baking. Over the years, we've seen chip shortages, trade disputes, and black-swan events affecting the global supply chain. To tackle this complexity, Prosemi has focused on unique value propositions, investing in advanced electrical testing capabilities, and becoming pioneers in research, development, and innovation for better screening

As part of this initiative, Prosemi has developed proprietary electrical testing boards and screening solutions that allow our engineers to effectively measure the electrical properties of components with reduced signal loss, increased reproducibility, and minimized electrical noise during testing. Consequently, the testing results are more precise and consistent. Our developed advanced testing capabilities also lead to reduced testing time, including the ability to test products under extreme temperature conditions.

Our solutions have received an overwhelming response from industry stakeholders, including major players in the aerospace, automotive, energy, and medical sectors, as these testing solutions can help customers ensuring the quality and reliability of their products while sourcing from the open market.

Furthermore, in recognition of our outstanding accomplishments, we proudly received the prestigious 2023 National Business Award, further highlighting our commitment to excellence and success in our industry.

CONTRIBUTED BY

SC Lee
Quality Director

PROSEMI

HOYA dominates mask blank market, expands production to meet growing demand

Geoffrey Akiki talks about optical and extreme ultraviolet (EUV) lithography as well as mask blanks.

Geoffrey Akiki receiving the SBR International Business Awards trophy

In 2021, the electronics market experienced an increase in shipment of personal computers, smartphones, servers and other major finished products. This led to higher demand for logic devices, memory, analogue semiconductors, etc., translating into 26% growth in the semiconductor market overall.

Going forward, the growth of the market for mask blanks is expected to continue, given that semiconductor manufacturers and foundries are briskly conducting research and development activities aimed at the further miniaturisation of electronic circuits using extreme ultraviolet (EUV) lithography—a cutting-edge manufacturing technology—and that customers' research and development demand is the key driving force for the demand for mask blanks.

HOYA Position and Market Share

The company has maintained a large share of the market over the long term by leveraging their strengths in technology and manufacturing as a leader in boosting semiconductor performance. HOYA has conducted EUV blanks research for nearly 20 years, and have demonstrated a firm presence in this field which has exceptionally high hurdles to clear for entry.HOYA is the only manufacturer that has rolled out both EUV and optical (existing non-EUV lithography technology) mask blanks.

HOYA Outlook

HOYA expects that demand for mask blanks for EUV lithography will continue to be strong in the future as the miniaturization in semiconductors continues.

Mask blank sales are difficult to accurately predict due to the dramatic fluctuations that occur with customers' development speeds, and also because they are not consumables and are not necessarily linked to movements in the semiconductor industry as a whole. However, in regard to products for EUV applications, the cumulative number of EUV lithography machines installed is deemed as one of the indicators of growth of the EUV market.

HOYA has and will continue to expand its manufacturing line as appropriate to meet customer demand. HOYA added a manufacturing line for mask blanks for EUV lithography in 2020 and plan to further expand their production capacity by making additional investments in 2022 and subsequent years.

Overcoming Challenges in High-NA EUV Scanners

In the field of High-NA EUV scanners (next-generation EUV scanners), which are slated to be used in production from 2025 onwards in pursuit of further miniaturisation, the challenge is to tackle the 3D mask effect, by which the circuit pattern transferred to a semiconductor wafer is deformed as a result of diagonally-incoming light being blocked by the photomask's absorber. To resolve this, HOYA is carrying out developments to make the absorber thinner with their partners in the supply chain of semiconductor production.

"HOYA has been positioned as the leader in mask blanks for a long time. HOYA are a critical part of the general photomask industry. The blank HOYA produce is really a substrate upon which their customers imprint the patterns that produce semiconductors. Optical blanks can be transmissive or refractive which can produce binary or phase-shift properties. In contrast, EUV masks are mirrors for X-rays. Both types are used to help put patterns on silicon wafers, which eventually become the circuits," said Geoffrey Akiki, President, HOYA IT Segment Company (LSI, FPD, MD, Optics).

HOYA's Journey to Leadership in EUV Blanks and Future Technological Advancements

Mask blanks are a critical part of the supply chain. Optical blanks have been around for a long time and are therefore a mature, well-understood technology. Since masks have to be ready to do development in the semiconductor fab, HOYA must develop the new products well before they are used in the production of chips.

"I joined HOYA almost five years ago. At that time, no one was producing EUV blanks in volume. Very quickly, people wanted to go into high gear. Despite the difficulties, HOYA successfully ramped up. There were many challenges in terms of defects, yield and control which HOYA learned our way through and overcame," Mr Akiki adds. "HOYA are investing in more tools as well as technical and manufacturing resources. Just as HOYA did in becoming the leader in EUV technology at the beginning, HOYA will continue to be pre-eminent in new technologies and products. The past few years have been exciting but it is only the beginning!"

HOYA awarded at the SBR Technology Excellence Awards

Just as HOYA did in becoming the leader in EUV technology at the beginning, HOYA will continue to be preeminent in new technologies and products

Paving the Way to Inclusion in the Semiconductor Industry

For AEM, its diversity, equality and inclusion efforts reflect the company's commitment to empowering its employees to be the best version of themselves. Hear from three of AEM's team members – Yasminbee Sheikh, Liew Zhi Qing, and Pravina A/P Sunmogum – about their experiences working in the semiconductor industry!

Q: WHAT ARE SOME OF THE CHALLENGES YOU FACE IN YOUR ROLE? HOW DO YOU OVERCOME THEM?

Yasmin: The few challenges I face include getting plugged in earlier in project discussions and being part of the strategy discussion, not just tactical. But with any challenges, I adopt the following values to overcome them: advocacy, tenacity, innovation and resilience.

Zhi Qing: As a Software Engineer, I work on multiple projects simultaneously, so I often face competing priorities and deadlines. I try to prioritize my work based on the most pressing needs, and communicate regularly with my teams to ensure that we're all on the same page.

Q: WHAT ADVICE WOULD YOU GIVE TO WOMEN JOINING THE SEMICONDUCTOR INDUSTRY?

Yasmin: There are many opportunities for women in the semiconductor industry to become leaders in our field. I say, surround yourself with good leaders who create visibility for you to grow and excel. I've gotten strong support from my colleagues, especially male colleagues and leaders, who paved the way for me to grow.

Pravina: I encourage women to be open-minded in learning new things, and to take the leap in joining the industry because it isn't as daunting as it seems!

Zhi Qing: Believe in yourself, and reach out to others for support. You can even connect with other women in the industry. By bringing your experience to the table, you can make a difference.

Q: WHAT ARE YOUR HOPES FOR THE SEMICONDUCTOR INDUSTRY IN THE FUTURE?

Yasmin: I hope that it can foster a culture combining technological advancements with ethical practices, collaboration, and community engagement. Having this balance will allow the industry to drive innovation and progress.

Pravina: I'm looking forward to the continued growth of the semiconductor industry. In particular, I'm excited about the potential of AI and its impact within the industry.

CONTRIBUTED BY

AEM Testing Innovation

www.aem.com.sg

NXP

OUR PURPOSE

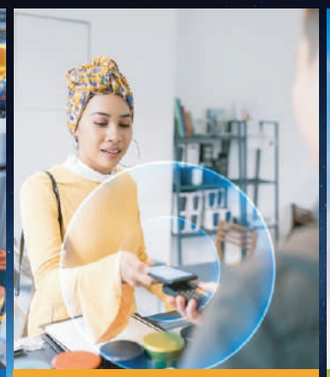
Bringing together bright minds to create breakthrough technologies that make the connected world better, safer and more secure.

OUR TARGET MARKETS

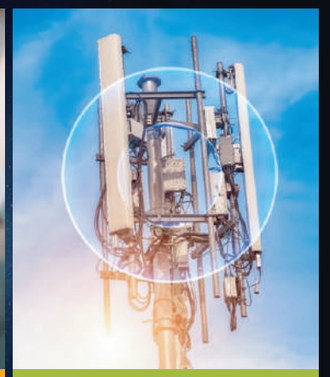
AUTOMOTIVE

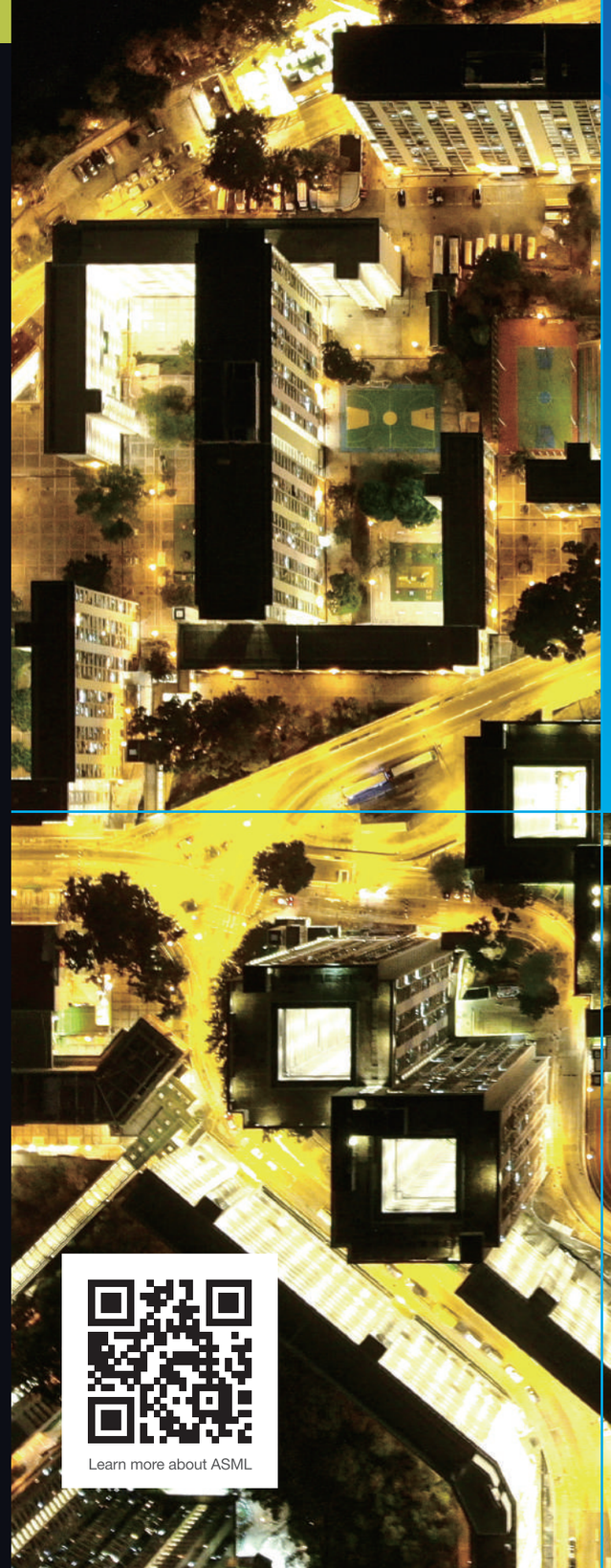
INDUSTRIAL & IOT

MOBILE



COMMUNICATION INFRASTRUCTURE





ASML

Changing the world, one nanometer at a time

Learn more about ASML

Beyond the Technology Horizon

The digital transformation of society is driving growth and innovation in the semiconductor industry, and the evolution of semiconductors has enhanced the role of semiconductor test. Founded in Tokyo in 1954, Advantest is the leading manufacturer of automatic test and measurement equipment, enabling leading-edge technologies. Advantest's test solutions are contributing to the development of advanced semiconductors used in the latest applications, including 5G communications, autonomous vehicles, high-performance computing (HPC), artificial intelligence (AI), machine learning and more.

With facilities around the world, Advantest offers a broad product portfolio and test solutions for a wide variety of semiconductors. In addition to our main product line, test equipment for SoC and memory semiconductors, we conduct R&D to address emerging testing challenges and applications; develop advanced test-interface solutions for wafer sort and final test; produce scanning electron microscopes essential to photomask manufacturing; and offer system-level test solutions and other test-related accessories.

Figure 1. Advantest's Broad Product Portfolio

Since FY2018, Advantest has been working to grow corporate value under our 10-year mid/long-term management policy, "Grand Design," which defines the commitments and strategies needed for Advantest to embody its corporate purpose and mission of "enabling leading-edge technologies." In addition, our corporate vision, "adding customer value to an evolving semiconductor value chain," and our core value, "INTEGRITY," motivate all our employees around the world to work and grow together with colleagues, customers and suppliers and contribute to global sustainability.

Advantest believes that semiconductors play an important role not only in the "Data Explosion" and growth of generative AI but also in combating climate change.

Smaller, higher-performance semiconductors make a great contribution to energy-efficient final products. Advantest also maintains an international commitment to sustainable practices and social responsibility. We have laid out "sustainability through the promotion of ESG" at the foundation of our corporate philosophical system, The Advantest Way, driving the company's sustainability practices. Our ESG Action Plan sets multiple goals to create a sustainable future for our business, including reducing CO2 emissions in our manufacturing and developing products free of polluting substances. We remain dedicated to furthering our ESG initiatives with the ultimate goal of creating a sustainable society for future generations.

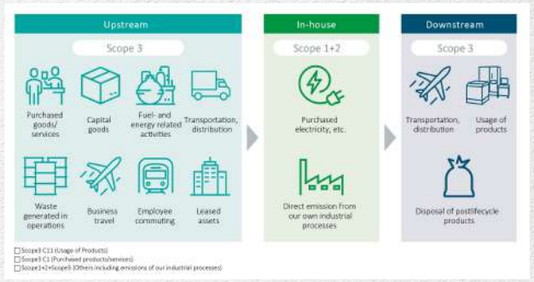


Figure 2. CO2 Emissions in Advantest's Supply Chain

CONTRIBUTED BY: ADVANTEST

Revolutionizing Manufacturing with Autonomous Mobile Robots (AMRs)

In the era of Industry 4.0, where automation and digitalization have become key drivers of manufacturing efficiency, SCS has embraced innovation by deploying cutting-edge AMRs. This marks a significant step towards a smart factory, revolutionizing manufacturing, and elevating competitiveness. Unlike traditional Automated Guided Vehicles (AGVs), these AMRs offer unique capabilities such as "load and go feature" and Lights-Out Operations, making SCS one of the forerunners in this transformative technology.

AMRs versus AGVs: A PARADIGM SHIFT

While AGVs have been utilized in the manufacturing sector for years, AMRs represent a major leap forward. Going far beyond the transportation function of AGVs, the AMRs possess extended capabilities with its robotic arm for lot movement which replicate those of a human operator's daily activities. AMRs play an integral role in our smart factory operations, for instance it interfaces with various systems to enable production real time scheduling of lots, which is a huge plus to improve cycle time. On top of that, AMRs perform automatic staging and retrieval on the e-racks, as well as seamless interfacing with equipment. As an illustration, in Lights-Out Operations, AMRs are well equipped with LIDAR to function optimally with other equipment in low-light or dark environments, further enhancing operational efficiency and reducing energy consumption in the production area. AMRs come with Auto Battery Changing Station which highly improve its utilization.

Francis Chang is the Director for WLD-CIS, overseeing the bulk of the deployment of the AMRs. He views that "the deployment of AMRs represents a transformative step towards smart manufacturing, allowing our company to integrate new technology and embrace innovation, and become one of the forerunners in this ever-evolving industrial 4.0 landscape."

The project team driving this initiative is led by Ms Ong Li Xuan, an engineer under Francis Chang's group. She opined that "AMRs offer us a competitive advantage as they improve operational efficiency, enhance production safety and eliminate human error in lot movement, and extend greater flexibility to adapt to changing production demands swiftly. This strategic investment reinforces STATS ChipPAC's commitment to deliver high quality service to our customers efficiently and cost-effectively."

In line with our roadmap to become a smart factory, our company is fully on track in the implementation of AMRs in WLCSP and CIS line. We will continue to fan out AMR deployment to other production areas such as EWLB/Bumping line.

CONTRIBUTED BY

JCET

STATS ChipPAC Pte Ltd

Energy Efficiency National Partnership Award 2023

'Best Practice' Has Been Awarded to SSMC

CEO of SSMC, Lim Soon spoke to The Business Times on their roadmap to Sustainability. Here is an extract of the interview.

Q: INNOVATIVE APPROACH

You've been the first in Singapore to introduce plasma scrubber technology in a semiconductor manufacturing plant. Can briefly describe the decision-making process that led to the adoption of this relatively novel approach, particularly in terms of its potential for high Global Warming Potential (GWP) abatement.

In SSMC, being innovative is a core value and we also apply that to our journey towards sustainable manufacturing & carbon neutrality. The plasma-scrubber that we use for PFC gas abatement is an example of how we applied innovation to achieve even better results. We leveraged on the existing technology provided by suppliers but at the same time improved the machine design. In so doing, this further improved the abatement efficiency of the PFC gases and also helped to raise the scrubber's operational uptime. The improved system performance helps to remove a staggering 87K tonnes of CO2 equivalent emission from our wafer fabrication operation annually.

Q: TECHNICAL CHALLENGES

Your project faced unique obstacles, including the issue of "high powder deposition" waste gas that initially compromised the system's efficiency. Could you elaborate on the collaboration with the scrubber supplier team to overcome these challenges and achieve a stable process?

SSMC proposal is unique and first of its kind. We dare to be different to implement plasma scrubbers in process tools involving gases which will cause serious powder deposition and choking to the scrubber inner waste gas pipeline. We worked with our supplier to improve the scrubber design, made changes to size and entry of the inlet pipe and installed a wet scrubber to remove the powder deposition before entry into the reactor wall. We also came up with a design to extend the life of the plasma torch head. The knowledge of the supplier in plasma technology, coupled with our knowledge in the process technology of our tools made us complementary partners to improve the overall design to improve the process and efficiency of the system.

Q: SUSTAINABILITY ROADMAP

SSMC has set an ambitious target to achieve net-zero carbon emissions by 2035. How does the success of this Plasma Gas Abatement project align with or expedite the trajectory toward that goal?

The plasma gas abatement project is a necessary first step in our goal to achieve net-zero carbon emission by 2035. Implementing a successful plasma technology in our most challenging tools gave us the confidence to extend the implementation to other tools in our factory. Most importantly, this project allows us the opportunity to partner with governmental agencies like NEA and EDB to collaborate to unlock more innovation to help expedite the trajectory towards our net-zero carbon goal by 2035.

Q: CONTINUOUS IMPROVEMENT

Given that the technology has successfully abated up to 95% of Perfluorinated Compound (PFC) waste gas, are there plans to further optimize the system or to incorporate other technologies to continue reducing your carbon footprint?

We have plans to further optimize our plasma system and to deploy to more tools in the factory. We are also considering the possible use of PFC gas concentrator technology in order to enhance plasma efficiency.

CONTRIBUTED BY

ssmc
(A Joint Venture of NXP and TSMC)

Don't Let Lessons Learned From COVID Go To Waste

It's fair to argue that semiconductor firms face a mini crisis in supply and demand every 18-36 months because of the cyclical nature of the industry. So what lessons did we learn from COVID that can help mitigate the next crisis?

Semiconductor supply chain leaders took three main lessons from the COVID disruption:

1. **The failure to diversify suppliers led to a lot of chokepoints in supply and also made it hard to find secondary and tertiary sources of supply**
2. **Geopolitical risks hadn't been factored into the manufacturing network design**
3. **More investment is needed in the tools and technologies that enable process visibility and the operating model required to act with agility**

Now we're about to step into the next crisis. This time it's a crisis of unprecedented growth driven by the rapid adoption of green energy, electric vehicles, AI solutions, and digital communications – all of which rely on semiconductors.

Investment will be mission critical to the sustainability of the industry, but if we do not change the way we work across the enterprise and with the extended network, this investment is not going to materialize in the ability to better respond to the next crisis.

To avoid this happening, there are three strategic business imperatives every semiconductor organization should consider.

1. **Build resilience in the local ecosystem. Proactively take charge of supply chain visibility and supply base control**
2. **Design and drive sustainable operations. Not just from an ESG standpoint, but sustainability of supply and coordination which means integrating business planning and orchestration across the enterprise**
3. **Invest in staffing and talent planning, but with a change in mindset. The reality is you're not going to find enough qualified people for your vacancies so think about who you need to partner with to augment your workforce and the technological and analytical skills you need to support new ways of working**

These three transformation initiatives are not easy tasks. You need a leadership team with the vision and stamina drive it to completion, a workforce that is technologically and analytically capable of running what if scenarios and proactive planning, and change management expertise to make it a reality.

CONTRIBUTED BY

Michael Ciatto
Supply Chain Service Line CEO

genpact

Join Forces for Sustainability - Transformation by Collaboration

The Singapore Semiconductor Sustainability Committee was formed in Feb 2023, led by a team of semiconductor industry leaders and experts with the objective to drive Sustainability goals towards Net Zero.

The Sustainability Committee focuses on Creating Awareness on sustainability, Benchmarking sustainability indexes across the semiconductor industry in Singapore, and in so doing, help companies, including SMEs transform and move towards a viable business model that embraces sustainability.

Transformation by Collaboration

Companies have provided problem statements that need to be addressed by the industry for sustainability goals and have been published since June 2023, calling for innovative ideas and solutions. Numerous companies have come forward with potential solutions to be explored with collaborators.

Some problem statements by the Industry which require attention:

EMISSION

- Near 100% Abatement Destruction and Removal
- Efficiency (DRE) of HFCs/GHGs/PFC
- Hard-to-abate gases reuse technology
- Near-zero Global Warning Potential (GWP) Heat Transfer Fluid (HTFs)
- Real-time In-situ Destruction and Removal Efficiency (DRE) measurement

ENERGY

- End-to-end wasted energy diagnostic
- Energy recapture technologies

WATER

- UPW-grace water treatment technology with low energy requirement
- Cooling tower vapor recapture with low energy requirement

WASTE

- Non-RRR waste concentration/treatment technology with low energy requirement
- Recycle/Reuse/Repurpose chemical waste (e.g. H3PO4, H2SO4, CHF to fluorspar)

Some representative companies (non-exhaustive) that have come forward as innovators:

- Cleantech Services on emission abatement system
- Meridionale Impianti on real-time in-situ Destruction Removal Efficiency (DRE) monitoring
- Nagase on VOC gas recovery system
- bbp on energy efficiency solution
- CES_Salcon on Passive Displacement Cooling (PDC) system for energy efficiency
- Engie on energy optimization, Utilities-as-a-service
- Sembcorp on Solar energy solution and RECs
- Siemens on digitalization solutions
- Evoqua on water technology
- Veolia on water recycling and waste treatment technology
- Seppure Technologies on filter membrane technology for organic solvent separation
- Vintage Venture on biodegradable packaging

We hope more companies will come forward with innovative ideas as this is an area with great potential and the solutions could be utilized across industries, to support the net zero journey.

Incentives and Schemes available in Singapore to support businesses in the green transition

Singapore is committed to achieve our long-term net zero emissions aspiration by 2050. Below references of incentives and schemes that have integrated sustainability into our business to accelerate new innovations in the green economy:

- Green Economy Regulatory Initiative (GERI) by MTI
- Resource Efficiency Grant for Emissions (REG(E)) by EDB
- Enterprise Sustainability Programme (ESP) by ESG
- Sustainability Open Innovation Challenge by ESG
- Energy Efficiency Funds (E2F) by NEA
- Water Efficiency Fund by PUB
- Industrial Water Solutions Demonstration Fund (IWSDF) by PUB

All companies are encouraged to tap on these schemes to increase their energy and water efficiency, to reduce emissions and waste.

The journey to net zero is one that requires collective effort. The committee highly encourages companies to come together to jointly develop, innovate and implement decarbonization solutions for the industry collectively.

List of organisations in the Singapore Semiconductor Sustainability Committee:

- **bbp**
- **Carbon Trust**
- **GlobalFoundries**
- **Infineon**
- **Micron Technology**
- **Soitec**
- **STMicroelectronics**
- **Singapore Semiconductor Industry Association**

CONTRIBUTED BY

Julie Koh
Strategic Programs

SSIA
Singapore Semiconductor Industry Association

Innovating for Sustainability:
Raising the Bar for Zero Carbon at the GlobalFoundries Singapore Expansion Facility

Measuring the performance of a semiconductor facility involves not only looking at wafer output and yields, but also how efficiently and sustainably it uses natural resources while minimising the impact of manufacturing on the environment.

These considerations are especially important for Singapore, which is one of the most densely populated nations and has a limited supply of water and other natural resources. GlobalFoundries (GF) has long operated in Singapore, benefitting from the nation's skilled and dedicated workforce, forward-thinking policies, outstanding universities, and strategic location. Since setting up operations here, we have collaborated with the local ecosystem on innovative ways to maximise resource efficiency across our operations and ultimately, play our part in driving forward the Singapore Green Plan 2030.

In fact, our newly opened Singapore Expansion facility was designed with state-of-the-art environmental performance from the start. Both the Administration and Manufacturing buildings have earned Green Mark Gold status from Singapore's Building and Construction Authority. Through innovation, the facility is outfitted with the latest technologies and solutions that are designed to increase overall energy efficiency.

REUSING AND RECYCLING WATER

The Singapore Expansion facility is GF's most water-efficient fab to date, leveraging advanced reclaim methodologies and waste-water treatment solutions such as reverse osmosis and ceramic filters. These are also used in the production of NEWater, which is highly treated reclaimed wastewater produced by Singapore's Public Utilities Board (PUB). To circumvent the constraints of space availability and implementation, the new expansion fab is also equipped with rainwater-catchment systems that allow us to capture rainwater for general use. With such technologies, the Singapore Expansion facility is capable of recycling more than 55% (above the regulated requirement of 50% for new semiconductor manufacturing sites in Singapore) of its water use at full ramp. This is equivalent to saving 17 Olympic size pools of water each day.

Closed-Circuit Reverse Osmosis system installed in the GF Singapore Expansion facility

TREATING THE AIR FOR LOWER GREENHOUSE GASES

We have installed advanced abatement systems on manufacturing tools within the Singapore Expansion facility, including a thermal oxidizer system designed to treat volatile organic compounds (VOCs) in the exhaust. This system is expected to reduce the concentration of VOCs by a significant margin, ranging from 90% to 99.5%.

ELECTRIFICATION AND PHASING OUT FOSSIL FUELS

In the new Singapore Expansion, we have also replaced fossil fuel-burning combustion boilers with electricity-driven heat pumps for heating water. This transition eliminates exhaust emissions and decreases overall energy demand, contributing to a cleaner and more sustainable production process. Local on-demand water heaters for other needs are also being integrated into the facility, further optimising energy use. Throughout the GlobalFoundries Singapore site, solar panels have been installed to reduce our dependence on fossil fuels as we move towards renewable energy sources.

LEVERAGING ADVANCED TECHNOLOGIES FOR SUSTAINABILITY

There is no doubt technology is an integral part of any manufacturing facility. At GF Singapore, we ensure that the innovative technologies deployed also support our sustainability goals. For example, the Singapore Expansion facility employs an IT-controlled, automated system that intelligently manages our production. This system matches optimised recipes with manufacturing equipment on a real-time basis for our product lines. What this means is that our products are delivered with the most efficient use of energy, gases, chemicals, and other materials.

TAKING A COLLECTIVE APPROACH

Sustainability is not, and cannot be, an effort done in silos. At GF, we encourage our employees to partake in environmentally-friendly practices through the provision of facilities like bicycle parking lots and green spaces, as well as implementation of campaigns to encourage employees to reduce, reuse and recycle.

GF also works closely with the wider Singapore semiconductor industry to push forward sustainability collectively. For example, we partnered with Enterprise Singapore for their Sustainability

Solar panels installed at the GF Singapore Campus

Open Innovation Challenge, bringing together local universities, think tanks and entrepreneurial businesses to innovate on actionable solutions for key environmental issues in the sector.

Ultimately, achieving a net-zero emissions status for the semiconductor industry in Singapore requires a dedicated and sustained effort. Beyond what we are doing at GF's new expansion facility, we also need to move towards the use of clean energy sources, and work together with stakeholders across the supply chain - from suppliers to universities, governments and industry associations - to solve key environmental challenges. Tapping into the power of the ecosystem will be key to unlocking further innovation, and drive the industry forward into a more sustainable future.

CONTRIBUTED BY

Dan Steele
Senior Director Global Environmental Health Safety and Security Operations

GlobalFoundries™

Semiconductor Tradewinds – Autumn 2023

As we approach the end of 2023, it hasn't quite turned out to be the year that was hoped as the recovery predicted for the 2nd half of the year didn't materialize. Instead, we seemed to hit the bottom around Q2 and then have bounced around that level for the rest of the year. Overall, global semiconductor sales in 2023 are now expected to shrink about -10% compared to 2022, due to the weak macroeconomic environment, and weak recovery of the Chinese market. Looking forward to 2024, most analysts are predicting the market to recover, but the speed and size of the recovery is not fully apparent yet.

GOVERNMENT INCENTIVES AND GEOPOLITICAL UPDATE

Governments around the world are all looking to take advantage of the semiconductor economic growth forecast and become less dependent on overseas semiconductor production by providing incentives and subsidies to companies to build new semiconductor manufacturing sites in their region. In September the European Chips Act officially became law and offers around US$48billion in incentives and subsidies to build new semiconductor facilities and expand production in Europe. The act is Europe's equivalent to similar schemes in the United States and Japan. In the United States, in September the US government released the final guidelines for funding claims of the US CHIPS and Science Act which was passed in Aug 2022, opening the way for companies to claim the US$52billion funds on offer. In Japan the government has indicated that it will subsidize up to a third of the capital costs for domestic and foreign manufacturers to build Fabs for designated semiconductors as long as there is 10 years of domestic production.

In October we reached the 1 year anniversary of the sweeping set of export controls implemented by the US and subsequently adopted by Japan and Netherlands. The export controls limit the export of advanced semiconductor equipment and advanced chips to China and are shaping the future of semiconductor supply chains. In October this year the US further amended the rules to close loopholes in the original rules to further limit the export of AI chips and semiconductor equipment, with Nvidia and ASML both saying they are impacted by the new controls.

SOUTHEAST ASIA CAPACITY EXPANSION UPDATE

Here in SouthEast Asia there have also been a lot of activity in recent months. Singapore Semiconductor Industry celebrated its 55th anniversary. GlobalFoundries officially opened its latest US$4billion 300mm Fab in Woodlands, and Silicon Box launched its US$2billion chiplet manufacturing factory in Tampines.

In Malaysia Infineon announced it would significantly expand its existing Kulim Fab and spend up 5billion Euro over the next 5 years to build the world's largest 200mm silicon carbide Power Fab. Whilst Bosch opened its new backend test and assembly in Penang, and Micron opened its new US$1billion assembly and test facility in Batu Kawan, Penang. OSAT ASE announced it would expand operations in Penang, with the first building to start operation next year and the construction of the 2nd building would begin in 2025.

OTHER INDUSTRY NEWS

TSMC continues its plans to expand globally. In Aug, TSMC announced its plans to build a new Fab in Europe having selected Dresden, Germany to build a new Fab for automotive and industrial products using 12/16/22/28nm technology in partnership with NXP, Infineon and Bosch. This Fab is the 3rd overseas location that TSMC has announced it will build new Fabs in after USA and Japan. In Arizona, USA TSMC has announced that it will build 2 Fabs, the first Fab, targeted at 5nm technology, was originally expected to open in late 2024 but it was recently announced that this will be pushed to 2025 due to delays in construction. The 2nd Fab is targeted for 3nm technology to come online in 2026. In Japan plans are on track to open the new 22/28 Fab in Kumamoto by the end of 2024 in partnership with Sony and Denso to make image sensor and automotive products. There are strong rumours that TSMC will announce a 2nd Fab in Japan to build 6nm chips and is believed to be in talks with the Japanese government for funding.

Intel called off its planned US$4.5billion acquisition of Tower Semiconductor due to lack of regulatory approval. Intel also made several changes to its corporate structure. It restructured its Technology Development and manufacturing group as a separate BU with its own profit and loss centre, acting like a foundry charging the other BU's for its services. In addition, Intel announced it will be spinning off its Programmable Solutions Group (PSG) to act as a standalone business with the long-term view of an IPO in 2 to 3 years' time.

Semiconductor IP company Arm Holding announced its IPO, and successfully launched on the New York Stock Exchange valuing the company at US$55billion. Major technology companies like Nvidia, Intel, Apple, Alphabet, Samsung, AMD and TSMC were all listed as planned cornerstone investors. Softbank retained a 90% share in Arm following the IPO.

Bosch completed its acquisition of the former TSI Fab in California, USA and it plans to invest US$1.5billion to transform the facility into a SiC Fab for electronic vehicles, and is looking to federal funding under the CHIPS act to support these activities.

As we look forward there is hope that in 2024 the semiconductor industry will start its long-awaited recovery, though it maybe not be until the 2nd half that a significant recovery is observed. Although the timing of the recovery is a little unclear, the medium-term future looks bright with much new capacity coming online around the world to support the long-term growth in HPC, 5G and EV demand, and Singapore is well positioned to benefit from this growth.

Despite the uncertain short-term outlook, the overall view for the semiconductor industry is bright with good year on year growth predicted out to 2028 driven by demand from 5G, electric vehicles and high performance computing including AI.

CONTRIBUTED BY

Mark Dyson
Foundry Account Director

ams OSRAM

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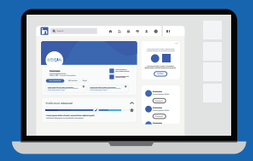

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