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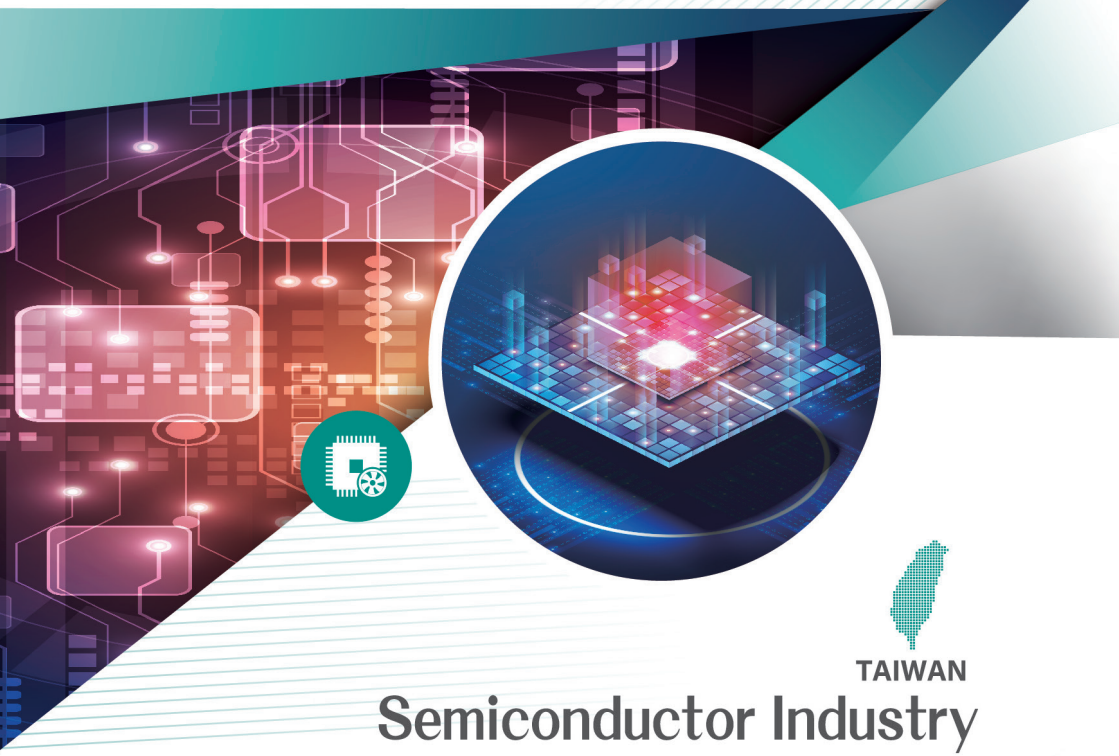

TAIWAN

Semiconductor Industry

Key Innovative Industries in Taiwan

Information Security	Next-Generation Vehicle	Communications Industry	Circular Economy	Green Energy
Biopharmacy Industry	Smart Machinery	**Semiconductor Industry**	Internet of Things	International Logistics and E-commerce

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Policy Initiatives —

Semiconductor Industry Development Program

The semiconductor industry cluster in Taiwan plays a leading international role as it is ranked first in the world by market share in both the wafer manufacturing industry and the packaging & testing industry. In the IC design industry, it is ranked second, while 92% of global leading-edge chip manufacturing capacity is concentrated in Taiwan. In particular, the US-China trade war and the COVID-19 pandemic have highlighted Taiwan's important position in the semiconductor industry. In response to changing global trends, the Taiwan government is promoting the establishment of an advanced semiconductor process ecology, and has adopted a target of achieving sub-nanometer process technology by 2030.

Taiwan's current semiconductor policy calls for the development of smart chips in combination with artificial intelligence (AI) applications to establish the critical technologies needed by industry for smart system applications. The government has already prioritized "IC design and pioneering semiconductor technologies" in its technology policy. Taiwan's strengths in the semiconductor industry will continue to be leveraged in support of the 5+2 Industrial Innovation Plan. In addition, Taiwan has a lot of outstanding semiconductor talent, and our government in 2020 adopted a goal of turning Taiwan into "a center for advanced semiconductor processes." The effort to achieve this goal entailed the following four main focal points:

1 Ensuring a Sufficient Supply of Semiconductor Talent

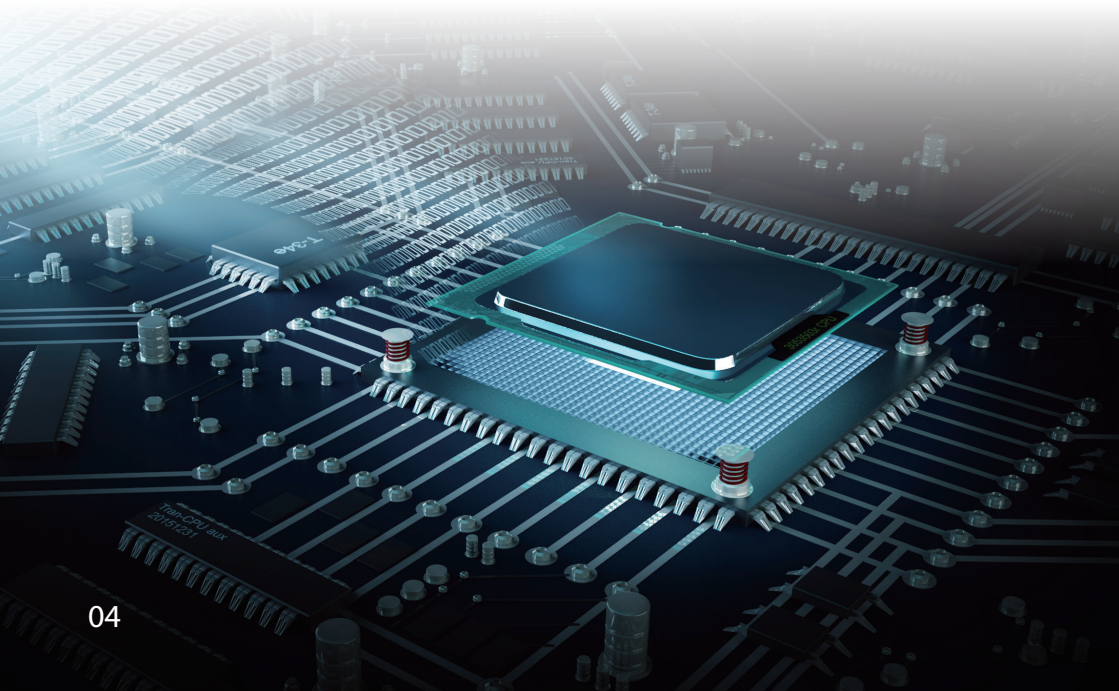
Passage earlier this year of the act governing "National Key Fields Industry-University Cooperation and Skilled Personnel Training," together with a number of deregulatory measures, has paved the way for closer cooperation between higher education and industry, and has empowered the competent authority to select specific national universities to set up research institutes to conduct research in particular key national fields so that universities and enterprises can work together to cultivate key industrial talent. At the same time, our government is pushing for companies and universities to jointly set up about three to five semiconductor R&D centers to strengthen cooperation between academia and industry. We expect these undertakings to train some 10,000 additional semiconductor professionals per year, thus helping the semiconductor industry to achieve sub-nanometer technology.

2 Strengthening Leading Edge Semiconductor R&D Efforts

Silicon-based semiconductors: Taiwan is pursuing the Angstrom Semiconductor Initiative (2021-2025) in order to explore the cutting-edge devices, circuits, processes, and testing technologies that will satisfy the needs of the semiconductor industry for the next decade. The program is expected to develop breakthrough solutions for the key challenges of sub-nanometer semiconductor technology that will be applied to mass production by 2030. To promote exploratory research on advanced semiconductor devices, materials, and process monitoring techniques, the program aims for innovative "out-of-box" solutions that could maintain the leading position of Taiwan in the semiconductor industry for the next decade. The program also seeks to accelerate efforts by domestic firms to obtain certification from name brand manufacturers of key front-end equipment for 12-inch wafers, 3D IC packaging equipment, and the like. At the same time, program grants are awarded to makers of processing elements that can independently produce regulated materials, are capable of rapid development, and are able to achieve low power consumption, so that their processing elements can find applications in computers, mobile devices, automobiles, etc.

Compound semiconductors: Taiwan is going to launch a Compound Semiconductor Project (2022-2025), which will involve the participation of firms in every part of the semiconductor value chain, from upstream to downstream. The objectives are to accelerate the development of key 8-inch wafer process equipment, and to pursue independent production of silicon carbide (SiC) powders (a type of third-generation semiconductor material) and 8-inch SiC wafers. In addition, firms are working to find applications for high-power devices in electric vehicles (motorcycles and automobiles) and green energy (wind power), as well as applications for high-frequency devices in communications (5G/6G) and low-orbit satellites.

Quantum technology: Taiwan has launched a Quantum Technology Program (2021-2025), under which some NT$8 billion will be spent over five years to establish a national quantum computer team so that Taiwan can remain a world leader in the field of quantum technology. The Quantum Technology Program will focus on quantum computing and quantum communications in order to develop silicon-based technologies to meet demand a decade from now for quantum computing. Accomplishing this will create more room for further development of Taiwan's semiconductor industry.



3 Promoting Semiconductor Material Clusters in Southern Taiwan

Kaohsiung's materials and petrochemicals cluster gives the city a big competitive edge, while it has strong circular technology and plans are in the works to build up Kaohsiung as a major high-value materials hub. These factors promise to generate a lot of jobs in the city's materials and petrochemicals industries and trigger an upgrading of related R&D capabilities. Also, the former site of the Kaohsiung Oil Refinery in Nanzi District has been converted into a semiconductor materials R&D center. This center -- along with local semiconductor plants operated by Taiwan Semiconductor Manufacturing, Advanced Semiconductor Engineering, Winbond Electronics, and WIN Semiconductors -- have formed a locally based strategic supply chain.

4 Further Industrial Development, More Incoming FDI

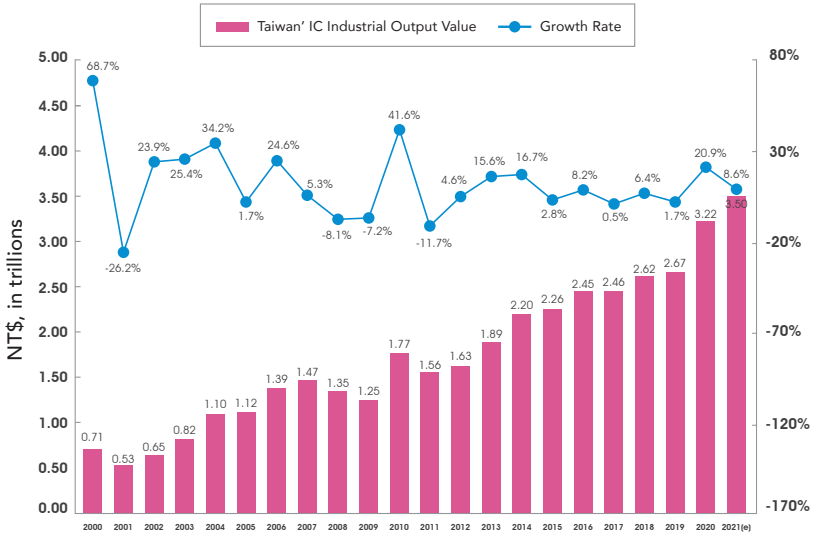
To help the semiconductor industry set down still deeper roots in Taiwan and spur further development of our AI, big data, cloud computing, and autonomous vehicle industries, government at both the central and local levels are making a concerted effort to optimize the investment environment. The government's upcoming renovation of phase 3 to phase 5 standard factory buildings at the Hsinchu Science Park is expected to enable companies in the Park to hire an additional 6,000 employees. At the same time, the government is taking all necessary steps to ensure that companies in the Park have dependable access to land, water, power, materials, and talent. In addition, the government plans to build three new science parks (in Kaohsiung's Qiaotou District, Chiayi, and Pingtung) and expand the Tainan Science Park. These undertakings will elevate Taiwanese industry to a higher level of critical mass.

Overview of Industrial Development

1 | Output Value |

The semiconductor industry is a key pillar of economic growth in Taiwan. It is one of Taiwan's most important industries in terms of output value, share of exports, and amount of investments. In 2020, Taiwan's semiconductor industry grew despite the pandemic, posting 20.9% year-on-year growth by achieving output value of NT$3.22 trillion (US$114.8 billion), making it the second largest in the world.

The semiconductor industry in Taiwan is characterized by vertical integration and industry clustering. A unique production model gives Taiwan production advantages such as flexibility, quickness, customized service, and low costs. In terms of industry structure, the IC design industry accounts for 26%, the IC manufacturing industry accounts for 57% (of which the foundry model accounts for 51% and the memory industry accounts for 6%), and the IC packaging & testing industry accounts for 17%. In terms of global market share, the foundry sector has been the most outstanding performer with a global market share of over 60%. Taiwan Semiconductor Manufacturing Company (TSMC) is Taiwan's best-known manufacturer and the undisputed world leader in the foundry sector with a global market share of more than 50% in 2020. Other key companies include MediaTek in the IC design sector, Advanced Semiconductor Engineering (ASE) in the IC packaging and testing sector, and Nanya Technology in the memory sector.



Source: Industry, Science and Technology International Strategy Center, ITRI (May 2021).

Figure 1 Output Value of Taiwan's Semiconductor Industry, 2000-2021

Looking ahead to 2021, demand for high-performance chips for use in such sectors as data centers, IoT, and AI will continue to drive growth in the semiconductor industry. On top of that, long-term expansion in 5G applications and continued growth of markets for equipment and materials in 2021 will help consolidate Taiwan's lead in semiconductor industry development, and will solidify Taiwan's position of key importance the global semiconductor market. The strong growth of 2020 is expected to continue, and business opportunities will be considerable. The pandemic also stimulated demand for working from home, tele-education, and servers. This has boosted shipments of epidemic prevention-related chips such as micro-controllers, temperature sensors, and ventilator chips. Market demand for semiconductor products is expected to post strong growth.

The output value of Taiwan's semiconductor industry is forecast to increase by 8.6% and reach NT$3.5 trillion in 2021 (see Fig. 1).

2 | Industry Value Chains |

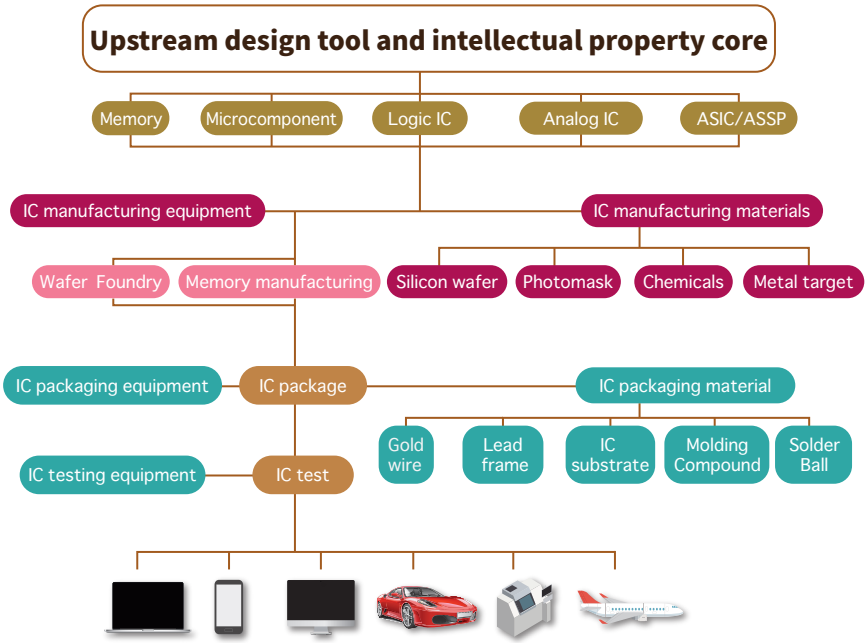
Taiwan is home to the most complete semiconductor industry clusters and specializations in the world, and has world-class companies in all the various sub-fields in the semiconductor industry. In the upstream segment, industry value chains include chip design and silicon intellectual property cores, and these industries can be further broken down, on the basis of differing functionality, into still narrower fields of specialty, such as memories, micro-components, logic chips, and analog chips. Leading chip design firms include MediaTek, Novatek Microelectronics, Realtek Semiconductor, Etron Technology, and Sunplus Technology. These companies are all well-known both in Taiwan and overseas. Leading firms in the area of silicon intellectual property cores include Andes Technology, eMemory Technology, Global Unichip, and Faraday Technology.

TSMC, the most prominent of Taiwan's midstream chipmakers, commands the No.1 share of the global foundry market and has highly advanced semiconductor processes, but in addition to TSMC there are also United Microelectronics, Vanguard International Semiconductor, and Powerchip Semiconductor, each of which possesses outstanding manufacturing capabilities with respect to certain processes and products. These companies maintain a very impressive device yield of above 95%. And other companies that produce silicon wafers, photomasks, chemicals, and metal target materials also link up with strong overseas partners. The above factors ensure that the Taiwan semiconductor industry's midstream supply chain is quite sound and comprehensive.

In the downstream packaging and testing segment, Taiwan has a host of home-grown packaging and testing firms with giant international reputations, including Advanced Semiconductor Engineering, Siliconware Precision, and Powertech Technology. With the development of advanced foundry processes, firms like these rely on their particular strengths to continually develop and improve corresponding packaging and testing technologies. In addition, there are also quite a few firms that supply the materials needed for packaging. Examples include Chang Wah Electromaterials (which produces gold wire and leadframes), Unimicron and Kinsus (IC carrier boards), Eternal Materials (molding, and filling materials), and Yeh-Chiang Technology and Shenmao

Technology (tin lead solder paste). These firms combine to support development of Taiwan's packaging and testing industry.

The core value of Taiwan's unique model of specialization lies in the very high degree of integration among the upstream, midstream, and downstream segments of industry. Each segment of industry contributes its own irreplaceable value to the semiconductor industry that arisen in Taiwan.

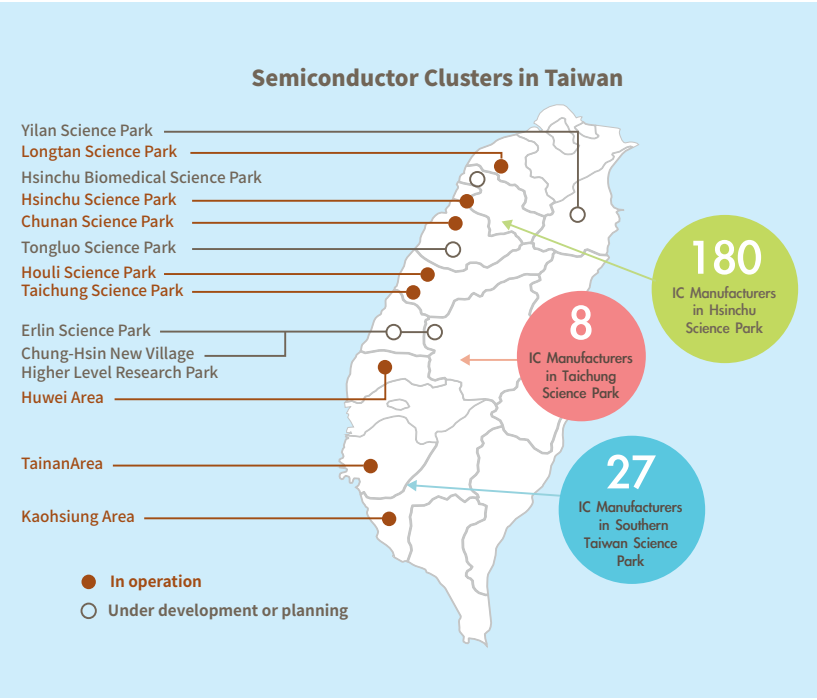


Source: 2020 Semiconductor Industry Yearbook, Department of Industrial Technology, Ministry of Economic Affairs.

Figure 2 The Overall Structure of Taiwan's Semiconductor Industry

3 | Industrial Clusters |

According to the 2020 Semiconductor Industry Yearbook, the 288 semiconductor firms currently operating in Taiwan employ some 250,000 persons. Most of these firms are concentrated in the Hsinchu Science Park and Taoyuan. However, in order to disperse risks associated with earthquakes and other natural disasters, a big share of more recently added production capacity has been built in science parks in central and southern Taiwan, while packaging and testing firms are mainly concentrated in Kaohsiung (see Fig. 3).



Note: Only the numbers of semiconductor manufacturers located in the three major science parks are shown.
Source: Compiled the data from the Science Park Administration.

Figure 3 Semiconductor Industry Clusters in Taiwan

Potential Investment and Collaboration Opportunities in Taiwan

1 Joining the Core Cluster of the Global Semiconductor Industry

The complete semiconductor industry chain, production clusters, and R&D capability in Taiwan will generate synergies for foreign businesses that set up R&D centers or production sites in Taiwan. The semiconductor industry is a cornerstone of Taiwan's industrial development in the digital age. Every effort will be made to support the development requirements of the semiconductor industry, including the taking of related measures.

In terms of human resources, more than 10,000 people graduate from IT-related faculties in Taiwan and join the workforce every year. OECD data shows that Taiwanese students are ranked 4th in the world in science education. The "Taiwan AI Academy" was also established in 2017 to cultivate talent for the AI industry. Taiwan has a big competitive advantage in edge computing and AI chips, and by tapping into the strengths of our country's very capable software/hardware vendors, Taiwan has succeeded in building up a very complete supply chain system.

The "AI on Chip Taiwan Alliance" (AITA) formed in July 2019 is composed of local and foreign semiconductor and ICT vendors, local universities, and national research institutions such as the ITRI. Four "key technology committees" in AITA focus on "AI system applications," "heterogeneous integration," "emerging architectures," and "AI system software." AITA will be building on Taiwan's existing advantages by moving from "horizontal division of labor" to "vertical integration." It will also help the industry reduce its R&D costs for AI chips by 90% and shorten their development time by over 6 months.

It is hoped that foreign companies can form technical partnerships with Taiwanese businesses to accelerate the development and application of semiconductor industries, and work together to build a new future for Taiwan's semiconductor industry.

2 Exploring the Growing Market for Semiconductor Equipment and Materials

IoT, AI, 5G, industrial and service robotics, smart city initiatives, smart lifestyle products, automotive electronics, and high-speed computing applications all require the support of the semiconductor industry, their future growth potential is considerable, and further growth in demand for semiconductor products is expected. Due to its large number of foundries and packaging plants, Taiwan has been the largest consumer of semiconductor materials in the world for 11 consecutive years. Total market value reached US$12.38 billion in 2020, which put Taiwan ahead of Korea and China. As the output value of Taiwan's IC industry continues to grow, the demand for new materials and equipment will continue to increase as well.

In the field of semiconductor materials, the high-performance photoresists, metal target materials, coating agents, and specialty reactive gases used in IC production processes as well as wire bonding, molding, and filling materials used in IC packaging are currently all imported from overseas. IC companies are hoping international vendors can produce those materials in Taiwan instead to reduce the supply risk. In addition, 5nm and 7nm IC production processes have now entered mass production in Taiwan while breakthroughs have been achieved in efforts to develop a 2nm process. There is strong demand for high-performance IC production and packaging materials, therefore greater cooperation with foreign vendors is needed. Among front-end wafer process materials, items in strong demand include metal sputtering deposition materials (target materials, parts/accessories), EUV photoresists, cleaning chemicals, and CMP slurry. As for back-end packaging and testing process materials, there is demand for high-end solid-state/liquid-state molding compounds, IC substrate materials with a low thermal expansion rate and a high heat dissipation rate, high-definition/low-stress buildup materials, die attach materials, flip chip underfill, and solder resist ink.

In terms of semiconductor equipment, Taiwan will remain the world's largest market due to investments by semiconductor vendors such as TSMC, Winbond, and Micron. By 2020, Taiwan boasted the second highest equipment expenditures in the world, and total financing demand was expected to exceed US$15 billion. In addition, Taiwanese vendors are capable of supplying

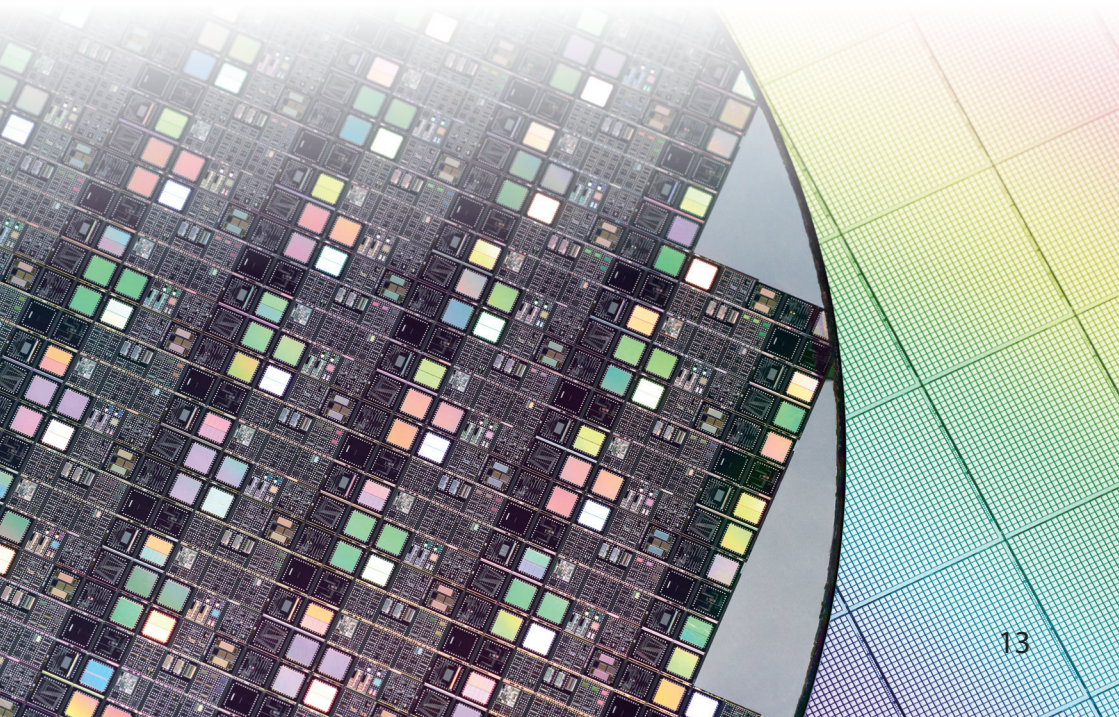
equipment for conventional packaging processes and components for wafer production equipment. They also hope to cooperate with international upstream equipment vendors on advanced packaging equipment and equipment for 12" wafer processes. Foreign vendors in the following areas are therefore welcome to invest in Taiwan:

1. Front-end wafer production equipment:

Deposition technology, dry etching technology, DUV and EUC exposure technology, photoresistor coating and developing technology, chemical-mechanical polishing technology.

2. Advanced packaging process equipment:

Exposure technology, copper-plating technology, deposition technology, and dry etching technology.



3 Tap into the Fast-growing Asia Market, Establish Operations Centers with Different Functions

The global semiconductor industry is moving in the direction of regionally defined development, with specific foundries in different regions turning out specific types of wafers. At the same time, this trend is generating demand from manufacturers for after-sales service. Korea, Taiwan, and China are the world's top three countries for equipment expenditures in 2021, and Taiwan can be expected to recover the top spot in 2022. And beyond that, the production aspect of the semiconductor industry is expected to take on a role of greater importance in Japan, and the countries of Southeast Asia will continue to develop stronger packaging and testing capabilities. In light of the trends described above, foreign firms can use Taiwan as a hub for servicing their Asia markets. They can set up equipment repair and refurbishment facilities in Taiwan, training facilities, and logistics centers for parts and modules. This approach is a good way for foreign firms to take advantage of opportunities afforded by the growth of the Asian semiconductor industry.

Investment Incentive Measures

1 | Tax Incentives |

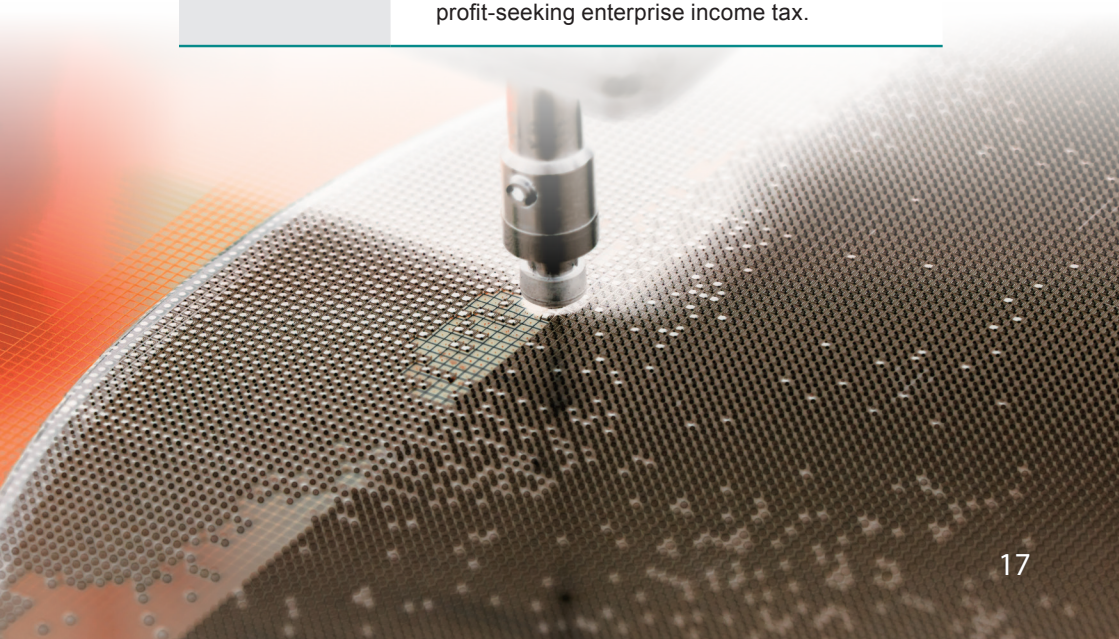
Taiwan's profit-seeking enterprise income tax rate is 20%. To encourage foreign companies to invest in Taiwan, support industrial innovation, and promote industry-academia collaboration, foreign companies are eligible for the following preferential taxes (Table 1):

Table 1 Preferential Taxes

Item	Preferential tax(es)
R&D and introduction of technology or mechanical equipment	• Up to 15% of the company's R&D expenditures may be deducted from its profit-seeking enterprise income tax for current year; or up to 10% of such expenditures may be credited over three years against the profit-seeking enterprise income tax payable by the company. • Royalty payments to foreign companies for imported new production technologies or products that use patents, copyrights, or other special rights owned by foreign companies is, with the approval of the Industrial Development Bureau, MOEA, exempt from the corporate income tax. • Imported machinery which local manufacturers cannot produce are eligible for duty-free treatment.

Item	Preferential tax(es)
Investment in smart machinery / 5G	• Smart machinery: Automatically scheduled, flexible, or mixed-model production lines that utilize big data, AI, and IoT. • 5G: Related investment projects include 5G communication systems, and new hardware, software, technology, or technical services. • For investments of no less than NT$1 million and no more than NT$1 billion, either "5% of investment spending deducted from profit-seeking enterprise income tax (current FY)" or "3% of investment spending deducted from profit-seeking enterprise income tax, if total spending spread over three years" may be selected, but the total amount deducted may not exceed 30% of corporate income tax that year. • The applicable periods are January 1, 2019 through December 31, 2021 (smart machinery) and January 1, 2019 through December 31, 2022 (5G).
Employee stock compensation	• A company employee who has obtained stock compensation worth a combined total of less than NT$5 million and continuously held the stock while remaining in the company's employ for at least two years may choose to be taxed on the market price of the stock at either the time the stock was obtained or the time the stock is sold, whichever is lower.

Item	Preferential tax(es)
Foreign special professionals	• Foreign special professionals who meet criteria are eligible for a 50% deduction of total income tax for amounts exceeding NT$3 million.
Setting up operations in industry parks	• Companies that set up operations in export processing zones, science industrial parks, or free trade ports are eligible for exemptions on import duties, commodity tax, and business tax for the import of machinery and equipment, ingredients, fuel, materials, and semi-finished products for their own use.
Others	• Companies that use undistributed earnings to engage in substantive investments may exclude the amount when calculating their profit-seeking enterprise income tax.



2 | Subsidies |

1. Global R&D Innovation Partner Program

Some foreign companies have a high degree of complementarity with Taiwan's industries, so we encourage them to come to Taiwan to plan and develop forward-looking technologies more advanced than those that Taiwanese firms currently possess, as well as key technologies or integrated technologies. By engaging in R&D work on such technologies in cooperation with Taiwanese firms, they could exert a key influence on Taiwanese industry by: (a) spurring R&D work on industrial technologies as well as the establishment and development of supply chains; (b) improving R&D efficiency; (c) accelerating the timetable from R&D to production; and (d) contributing actively to expansion of international markets. Foreign companies that achieve such things, after gaining approval from the MOEA, will be eligible for subsidies of up to 50% of total R&D expenditures.

2. Program for the Development of Pioneering Companies

The purpose of this program is to build Taiwan into a high-tech R&D center and encourage leading international manufacturers to establish cutting-edge R&D bases in Taiwan so that they can work here on forward-looking technologies and link up with the Taiwan supply chain, thereby creating a division of labor in the areas of research, co-creation, and development, with an eye to strengthening the technological competitiveness of Taiwan's leading industries and accelerating the formation of clusters in emerging industries. Program funding of up to 50% of total expenditures may be granted for any project that has been approved by the Ministry of Economic Affairs.

3. Taiwan Industry Innovation Platform Program

The Industrial Development Bureau and the Ministry of Science and Technology are jointly running the "Taiwan Industry Innovation Platform Program" to guide industries to develop towards greater value, and encourage companies to enter high-end product application markets to increase the industry's overall added value. The program provides companies with R&D teams in Taiwan with 40-50% of funding required for theme-based R&D projects, and up to 40% of funding for R&D projects proposed by companies.

Leading Taiwanese Companies

1 | IC Design |

Taiwan accounted for 3 of the world's 10 largest IC design firms in 2020: MediaTek, Novatek, Realtek.

1. MediaTek Inc. (MediaTek)

MediaTek is the 4th largest IC design firm in the world, and has also become the world's 8th largest semiconductor firm. MediaTek continues working to introduce products in new fields. In 2020 the company launched its Dimensity series of 5G chips. In addition, MediaTek's Wi-Fi 6 solutions had only been recently launched when they were migrated across platforms into high-end smartphones, high-end routers, Gigabit-capable passive optical networks (GPON), and high-end TV. MediaTek has also embarked upon applications in new fields, and its products go into the production of many different notebook computers as well Chromebooks.

2. Novatek Microelectronics Corp. (Novatek)

Novatek Microelectronics is the second largest supplier of LCD drivers in the world, and has long conducted R&D work on image display and digital AV multimedia technologies. Novatek's main products, in addition to flat panel display controllers, are digital AV and multimedia single-chip solutions for mobile devices and consumer electronics. In response to the accelerated adoption of 5G networks and smartphones in global markets, Novatek stole a beat on the competition by launching 120Hz AMOLED driver ICs and FTDI 120Hz driver ICs. As for automotive touch and display driver integration (TDDI) solutions, the company has successfully developed automotive TDDI chips that feature a high signal-to-noise ratio, low electromagnetic radiation, and EMI resistance.

3. Realtek Semiconductor Corp. (Realtek)

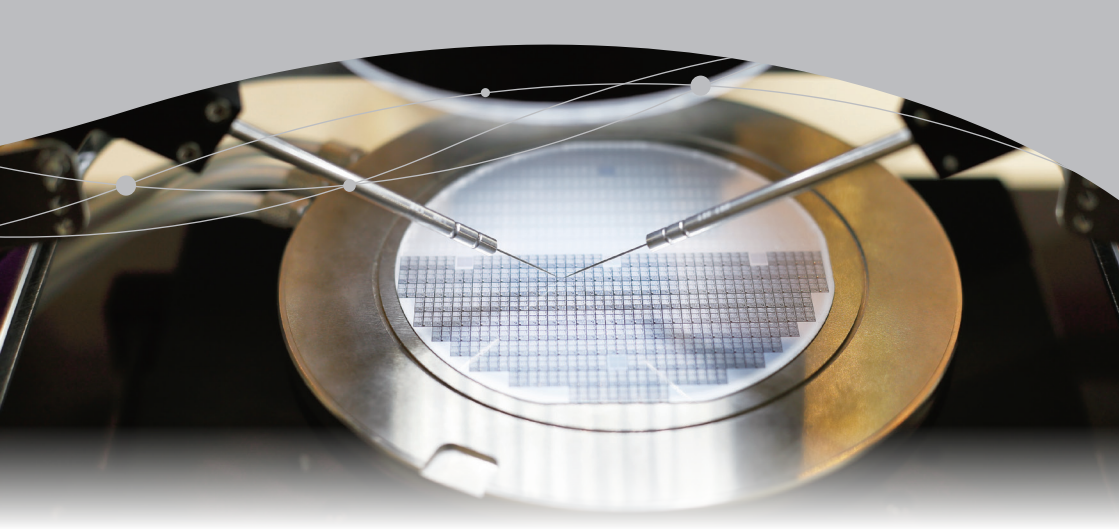
Realtek Semiconductor is one of the world's leading chip suppliers, and ranked globally among the top 10 IC design firms in 2020 for operating revenues. Realtek designs and develops IC products for wired and wireless communications networks, computer peripherals, consumer electronics, and multimedia applications. One of the company's competitive advantages derives from its advanced core technologies, and it is especially good at developing products with a high cost-benefit ratio that facilitate the production of high value-added systems integration solutions.

2 | IC Manufacturing |

In the wafer foundry field, Taiwanese firms command a global market share of greater than 60%. TSMC by itself controls more than a 90% share of the global market for sub-10nm high-end processes. In 2020, among the world's 10 biggest wafer foundries, four are based in Taiwan (TSMC, UMC, PSMC, and VIS).

1. Taiwan Semiconductor Manufacturing Co. (TSMC)

TSMC's operating revenues have hit all-time highs for the past 11 years in a row. In 2020, sales of advanced process wafers (16nm or below) accounted for 58% of the company's total wafer sales. In all, using 281 different processes, TSMC manufactured 11,617 different products for 510 customers. TSMC has successfully ramped up cutting-edge 5nm (N5) processes for mass production, thus facilitating its customers' efforts to introduce innovations in their smartphones and high-performance computing (HPC) applications. Moving forward, 3nm (N3) processes will replace N5 as the next full node process. TSMC's N3 process technology will offer the most advanced PPA and transistor technology. In addition, the company has also introduced TSMC 3DFabric, which integrates today's rapidly growing 3DIC solutions to achieve performance improvements at reduced power and smaller footprint than conventional two dimensional processes.



2. United Microelectronics Corp. (UMC)

UMC's advanced technology platforms including 14FFC (14nm FinFET Compact), 22nm ultra-low power (22ULP), 22nm ultra-low leakage (22ULL), and 28nm High Performance Compact (28HPC+) process technologies have already entered production. Other newly released processes include mmWave using 55nm, 40nm, and 28nm platforms to fulfill high-performance and low-power requirements for mobile devices, Internet of Things (IoT), 5G, automotive electronics, and industrial radar devices that use mmWave.

3. Powerchip Semiconductor Manufacturing Corp. (PSMC)

PSMC's main products are manufactured using 28nm and more mature processes, and include IoT products as well as industrial and automotive electronics applications. PSMC is planning to use memory and 3D Interchip technologies to develop OEM manufacturing platforms for a wide range of high-performance, low-power consumption, highly integrated products, and will also embark upon various new product lines, including ultra-low-power special memory applications, BSI image sensors, and GaN/SiGe power devices.

4. Vanguard International Semiconductor (VIS)

The world's leading-edge products are concentrated especially in such fields as power management, panel displays, automotive electronics, fingerprint recognition, IoT, and microelectromechanical systems (MEMS). Looking ahead to the age of IoT, VIS continues to invest resources in the development of embedded flash memory. The 0.18 micrometer process has been introduced to the production of general MCU and touch control IC products since 2017, whereas development of the 0.11 micrometer process continues.

3 | IC Packaging and Testing |

Taiwan is also the world's most important player in the field of IC packaging and testing. Taiwan accounted for 6 of the world's 10 largest packaging and testing firms in 2020. Most notable among them are ASE, SPIL, and PTI.

1. Advanced Semiconductor Engineering (ASE)

ASE continues to lead the semiconductor industry with its cutting edge IC packaging technologies to meet the requirements of high-performance electronics products. Services from front-end engineering testing, wafer probing, package design, substrate design and manufacturing, and finished product testing are fully integrated onto a single supply chain. ASE provides the very latest in advanced package processes, such as Cu wire bonding, wafer bumping, Cu pillar bump, flip chip, wafer level CSP, chip scale package (CSP), MEMS & sensor packaging, fan out, 2.5D/3D IC packaging, green packaging, and 300mm turnkey backend solutions.

2. Siliconware Precision Industries Co., Ltd. (SPIL)

SPIL focuses on IC packaging and testing services, including wafer bumping, wafter testing, IC packaging, IC testing, and direct delivery. In order to meet demand for packaging and testing many types of products, SPIL has a wide range of technologies and provides diverse packaging and testing services, including advanced leadframe and substrate packages.

3. Powertech Technology Inc. (PTI)

As a world leader in the field of IC packaging and testing, PTI provides such services as wafer bumping, wafer probing, IC packaging and testing, and burn-in, as well as packaging and worldwide shipments of finished products and solid-state hard drives. In the area of R&D, PTI has completed a test lab for Antenna in Package (AiP) and Radio Frequency (RF) to provide certification services for 5G products. As for CMOS image sensors (CIS), PTI has high-quality through-silicon via (TSV) technology, which features a high technical barrier to market entry, and applies it to wafer-level chip-scale packaging of medical, surveillance, and automotive chips. In the area of fan-out panel level packaging (FOPLP), PTI works closely with customers on related product development and certification.

4 | Semiconductor Equipment |

1. Grand Process Technology Corporation (GPTC)

GPTC is Taiwan's leading brand in the semiconductor wet processing equipment industry. Founded in 1993, the company's metal etching equipment, metal plating equipment, and cleaning equipment for 8- and 12-inch single wafers are highly prized by brand-name international high-tech manufacturers. GPTC's main products are wet processing equipment used for downstream packaging purposes. The company is currently developing 200mm to 300mm wet stations and single-wafer cleaning equipment. GPTC's wet processing equipment solutions represent the top of the line in the Taiwan semiconductor industry.

2. Sky-Tech Taiwan Electronics

Established in 2002, Sky-Tech started out as a maker of semiconductor equipment parts and components. In 2017, Sky-Tech designed its first complete semiconductor fabrication unit, the Nexda PVD. Then in 2019, working in collaboration with Taiwan Instrument Research Institute (TIRI), Sky-Tech designed a complete ALD process unit, the Atomila 300. It followed up in 2020 by developing a multi-dimension wafer bonder. Sky-Tech maintains long-term cooperative ties with leading wafer fabs and memory wafer makers throughout the world.

3. C Sun Manufacturing

C Sun Manufacturing was founded in 1966, and has successfully developed business based on light and heat to research the following five core technologies: UV processes, thermal processes, lamination & coating, wet processes, and plasma processes. The company serves various industries, including firms involved in printed circuit boards, touch panels, semiconductors, electronics assembly, printing, coating, and shoe making. Meanwhile, C Sun's main semiconductor equipment are concentrated in the areas of thermal processes, ion cleaning, and molding.

Examples of Successes Achieved by Foreign Companies

Due to the pandemic, global FDI slowed down in 2020, but foreign firms in the semiconductor industry continued to increase investments in Taiwan. This trend was due in part to our country's successful COVID control strategy, but also to the fact that the pandemic spurred a big increase in global demand for semiconductor products. Investments in Taiwan by foreign firms can be categorized into the following three types:

1 Expansion of Capacity to Meet Market Demand

Diodes Technologies (a semiconductor design firm from Luxembourg), KIOXIA Corporation (a memory manufacturer headquartered in Japan), Mitsubishi Chemical (a leading chemicals manufacturer), Tokuyama Corporation (a major international maker of isopropyl alcohol), and VALQUA (a Japanese maker of seal products) have all set up new factories in Taiwan.

Air Liquide (from France) has expanded its presence in Hsinchu, Taichung, Kaohsiung, and Tainan, while Merck (from Germany) continues to expand its chemical vapor deposition operations in Kaohsiung's Lujhu District. Micron Technology, a major American memory manufacturer, has decided to establish its global Center of Excellence for DRAM in Taiwan, and will continue to build up Taiwan as a vertically integrated production base for DRAM manufacturing, packaging, and testing. In addition, Micron Technology is also planning to set up an R&D facility in Taiwan for leading-edge memory production technologies.

Entegris, a leading American maker of semiconductor materials, in December 2020 announced plans to invest US$200 million in a plant in Kaohsiung to produce gas delivery systems, advanced materials, and other products and technologies for use in high-end semiconductor processes. SUSS MicroTec, a German maker of lithography equipment, in late 2020 formally opened its first manufacturing center in Asia at the Hsinchu Science Park. The new facility will focus especially on the manufacture of photoresist coaters/developers, scanners, photomask process equipment, and other such high-precision lithographic process equipment. These new investments will ensure that Taiwan's semiconductor supply chains continue to grow stronger.

2 | R&D and Technical Support Centers |

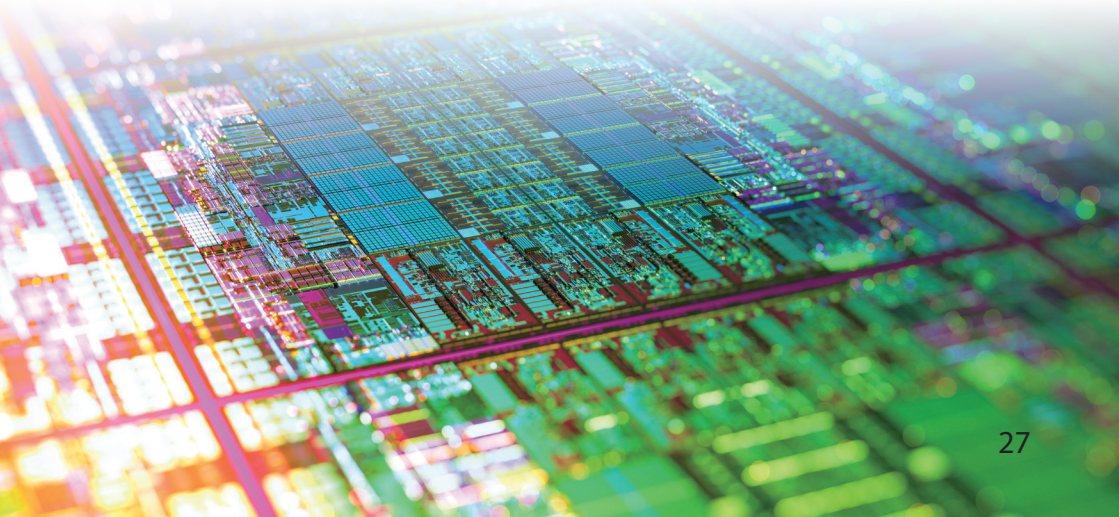
Because of Taiwan's key position in the semiconductor industry, ASML continues hiring more and more R&D talent in Taiwan. In preparation for the arrival of a new generation of multibeam inspection equipment, the company plans to hire more than 250 R&D personnel over the coming four years, bringing its total workforce in Taiwan to over 3,000. This will make Taiwan by far ASML's biggest facility in Asia.

Well-known companies like Apple, Microsoft, Google, IBM, Amazon, AMD, Merck, and Shin-Etsu Chemical have all established R&D centers or data centers in Taiwan, or have expanded factories here. In each case, they have done so because they are impressed by the success of Taiwan's semiconductor industry and its deep pool of outstanding talent.

3 Operations Centers with Different Functions

Foreign firms have increasing numbers of customers and devices in Taiwan and neighboring Asian countries, which means they have opportunities to establish equipment repair and refurbishment facilities in Taiwan as well as training facilities and logistics centers for parts and modules. ASML, a world leader in lithography technology, has set up an EUV Training Center in the Southern Taiwan Science Park. ASML's first such facility anywhere in the world outside the Netherlands, this training center will help Taiwan to train EUV equipment specialists, and it will continue to expand its customer support team in Taiwan. In addition, Applied Materials has established its newest global training center at the Hsinchu Science Park, and Lam Research has established semiconductor equipment refurbishment and new equipment production lines in Taiwan.

Also, in preparation for business opportunities likely to arise in connection with the high-end processes required for 5G and high-performance computing (HPC) applications, TRUMPF Laser, a world leader in the field of laser applications, is working with Taiwan's Industrial Technology Research Institute (ITRI) and the Taiwan Association of Machinery Industry (TAMI) to establish the Taiwan Semicon & Electronic Industries Laser Application Service Center. This new center will provide Taiwan's semiconductor equipment firms advanced technical services.



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