
TAIWAN AND THE GLOBAL SEMICONDUCTOR SUPPLY CHAIN

- Analysis of Major Upstream, Midstream and Downstream Companies in the Taiwan Semiconductor Industry Value Chain

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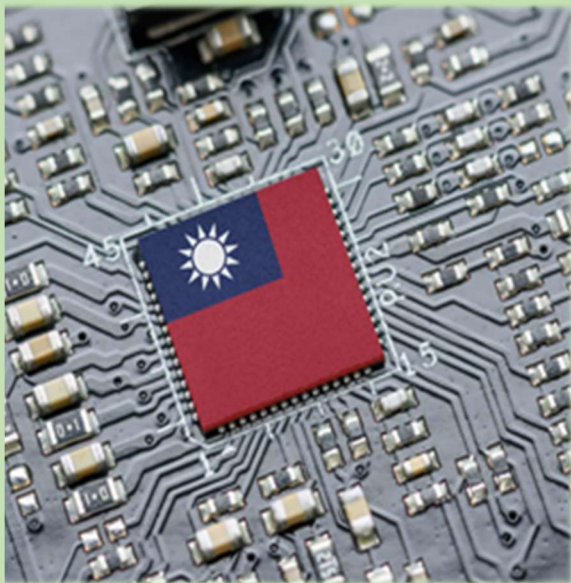
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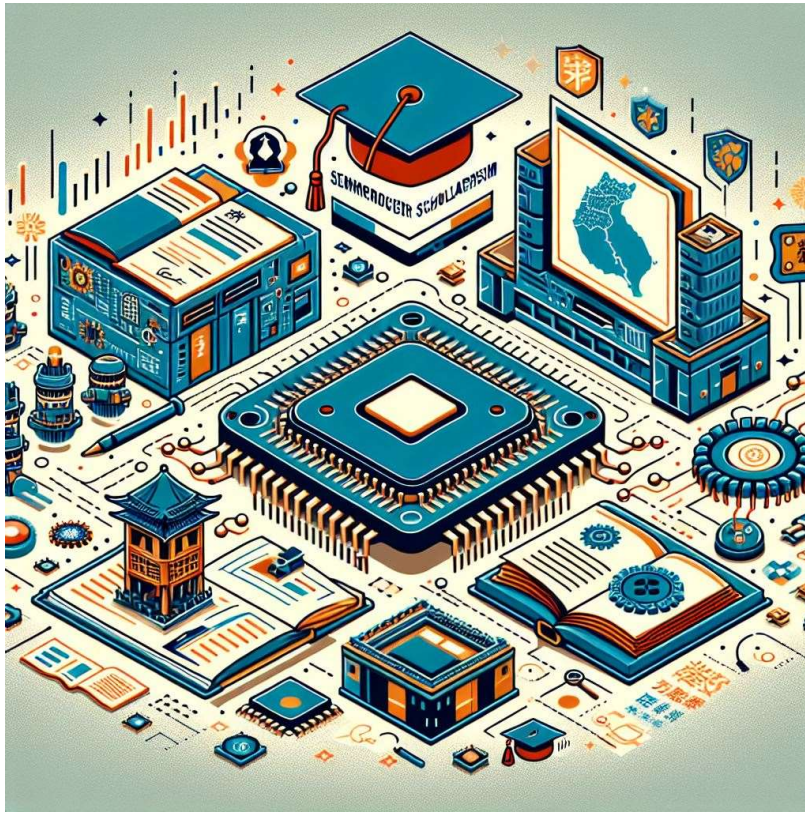
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Taiwan Semiconductor Scholarships



We warmly welcome our Singaporean friends to explore semiconductor studies in Taiwan, a country renowned for its cutting-edge semiconductor technology. Our semiconductor companies like the Taiwan Semiconductor Manufacturing Company (TSMC), United Microelectronics Corporation (UMC), MediaTek and ASE Technology are global leaders in the semiconductor industry.

Semiconductors play a critical role in various electronic devices, including smartphones, computers, and automobiles. The semiconductor industry has been instrumental in fostering bilateral trade and investment between Taiwan and Singapore. To enhance collaboration further—particularly in talent development—the Taipei Representative Office in Singapore proudly presents the latest guidebook titled 'Study Semiconductor in Taiwan.' This comprehensive resource covers application details for scholarships at nine Taiwanese universities. Download the full text of "Study Semiconductor in Taiwan" <https://shorturl.at/jNd5E>

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IN THE SPOTLIGHT

Article contributed by the Taiwan Stock Exchange Corporation:

Analysis of Major Upstream, Midstream and Downstream Companies in the Taiwan Semiconductor Industry Value Chain

Chapter I: Role of Taiwan's Semiconductor Industry in the Global Semiconductor Market

Semiconductors are the foundation of modern technology as well as critical components of electronic products. They power the development of high-tech products and services, and are the key force for powering global economic development, innovation, and applications. Artificial intelligence (AI), Internet of Things (IoT), 5G communications, cloud computing, electric vehicles (EV), autonomous vehicles, healthcare, military systems, transportation, clean energy, and countless other applications require cutting-edge advanced semiconductor technologies and products as the foundation.

In 2023, Taiwan manufactured 65% of the world's semiconductors, and its production of sub-7nm high-end ICs had a global market share of more than 70%. Taiwan's 2nm process technology is the most advanced in the world, and it remains the global leader in both technology and productivity. Taiwan's IC packaging and testing output value also ranked first in the global semiconductor market with a market share of 53%. Taiwan's IC design output value accounted for 16% of the global market with a market share second to only that of the United States. Thus, Taiwan plays a critical role in driving global economic growth and technological innovation.

Table 1: Output Value of Taiwan's IC Industry as a Percentage of the Global Industry Output Value: 2023

Unit: US\$ billion

2023	Taiwan Output Value	Global Output Value	Taiwan Percentage	Taiwan's Rank	Major Taiwanese Firms	Major Foreign Firms
IC Industry Total	124.6	526.9	24%	2	TSMC, MediaTek (MTK)	Intel (US), Samsung (Korea)
IC Design	33.3	213.5	16%	2	MediaTek (MTK), Novatek	Qualcomm (US), NVIDIA (US)
Foundry	70.0	110.1	65%	1	TSMC, UMC	Global Foundries (US), SMIC (China)
IDM (including Memory)	2.9	96.3	3%	5	Nanya (NTC), Winbond	Samsung (Korea), Micron (US)
IC Packaging and Testing	18.4	32.1	53%	1	ASE (ASEH), Powertech (PTI)	Amkor (US), JCET (China)

Source: Market Intelligence & Consulting Institute (MIC) of the Institute for Information Industry

- Taiwan's total IC output value ranks second in the world and trails only the United States.
- Taiwan's IC design output value ranks second in the world and trails only the United States.
- Taiwan boasts a foundry output value that ranks first in the world, 70% of the global advanced manufacturing capacity and 2nm and below process technologies.
- Taiwan's IDM output value ranks fifth in the world, trailing only the United States, South Korea, Europe, and Japan (its memory output value ranks fourth in the world, trailing only South Korea, the United States, and Japan).
- Taiwan's IC packaging and testing output value ranks first in the world.

Since the start of the trade war and technology war between the United States and China in 2018 and the COVID-19 pandemic in 2020, the governments of major economies have planned to set up semiconductor supply chains in areas outside China or in their home countries to mitigate geopolitical risks and excessive concentration of supply chains. They aim to increase their self-sufficiency in semiconductors and increase their control over the semiconductor

supply chain to ensure supply chain security. Thus, the reorganization of the global semiconductor supply chain began, shifting from a high degree of global collaboration to regional integration, which elevated Taiwan's importance to the global semiconductor industry.

Taiwan's semiconductor industry has received strong support in industrial development policies implemented by successive governments since the 1970s, and it has developed comprehensive and highly mature industry clusters. The creation of science and technology parks has provided Taiwan with advantages of a one-day supply ecosystem offering integrated advantages in IC design, manufacturing, packaging, and testing unmatched by the rest of the world.

Taiwan has established a highly efficient support system for the semiconductor industry, encompassing every stage from research and development to production and manufacturing. Its well-established niche ecosystem—characterized by top-tier talent, advanced technology, cost efficiency, rapid production, and flexible customization—has become a cornerstone of the global semiconductor landscape. As Taiwan's semiconductor industry has created a niche ecosystem with top-tier talent, advanced technology, cost efficiency, rapid production, and flexible customization, it enables the science and research communities of the United States, Europe, Japan, and its own institutions to collaborate seamlessly. This synergy allows for the swift resolution of challenges across semiconductor development, trial production, and mass production, thereby accelerating advancements in semiconductor process technologies.

Taiwan's current semiconductor manufacturing companies mainly manufacture products in Taiwan and sell them across the globe. More than 90% of the main production sites as well as high-end technologies, advanced processes, and forward-looking research and development remain in Taiwan. In addition, major international companies such as ASML, Lam Research, and Entegris continue to expand their investments in Taiwan, including establishing production sites or through direct investments in semiconductor companies in Taiwan. Applied Materials and Tokyo Electron have also set up training centers for advanced process equipment in Taiwan.

Leading international ICT and IC companies such as Apple, Broadcom, and Qualcomm have selected Taiwanese companies to provide contract wafer manufacturing and IC packaging and testing services. This demonstrates

Taiwan's role as a reliable and secure partner in the semiconductor supply chain. Although the United States, Japan, and Europe have invited TSMC, the top Taiwanese semiconductor company, to set up operations in their countries, the new plants will not change Taiwan's position in the global semiconductor industry. It is also difficult for other countries to take over Taiwan's production capacity, as well as its importance in the global semiconductor industry in the near and foreseeable future.

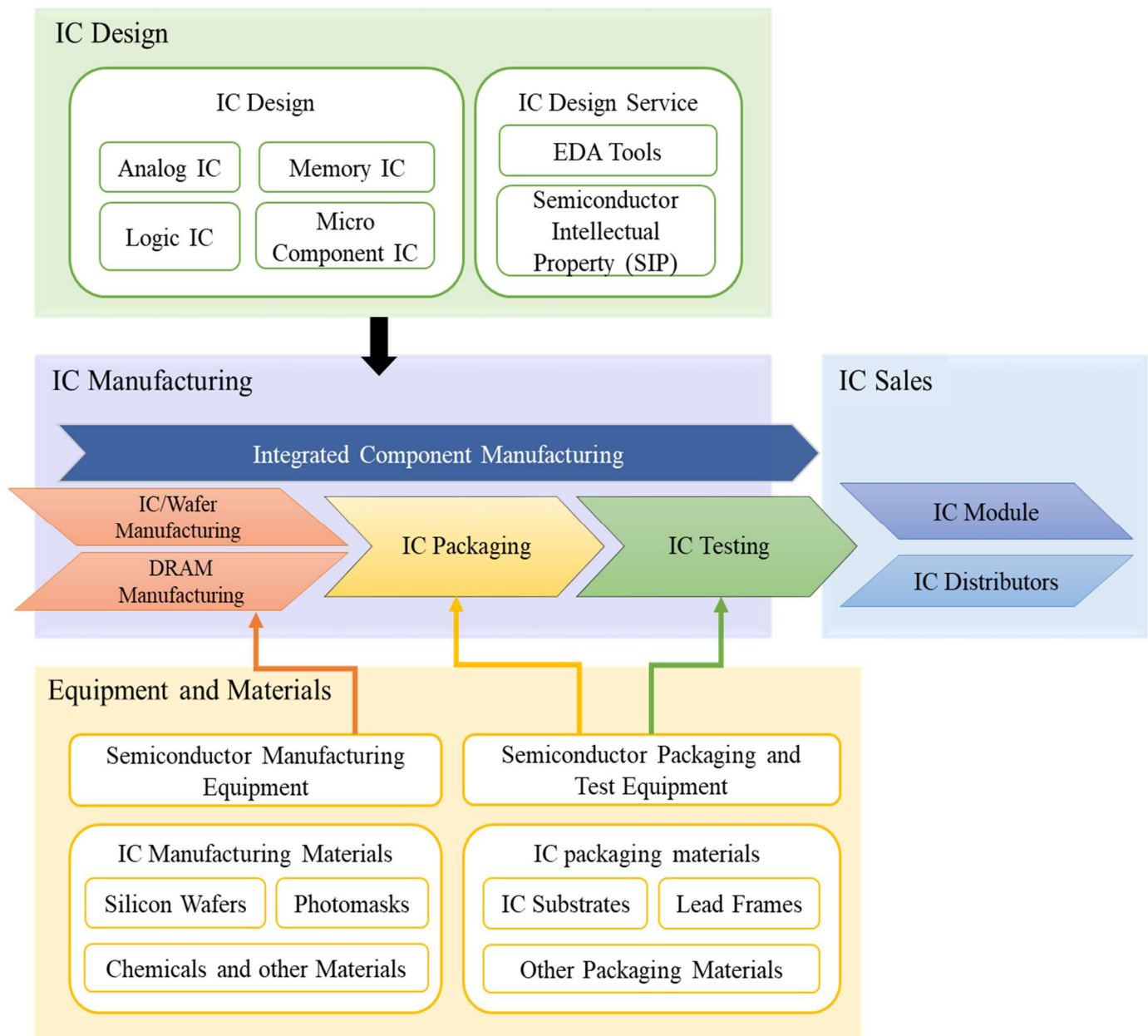
Chapter II: Division of Labor and Integration of Taiwan's Semiconductor Industry Chains

The semiconductor industry chains can be divided into upstream: IC design and IP design; midstream: IC manufacturing, wafer fabrication, related production process testing equipment, masks, and chemicals; and downstream: IC packaging and testing, related production process testing equipment, components (e.g., substrates and lead frames), IC modules, and IC channels.

Once IC design companies complete product designs, they contract a foundry or an IDM (Integrated Device Manufacturer, which provides end-to-end services from IC design to manufacturing, packaging, testing, and sales) to produce semi-finished wafer products. After preliminary tests, the products are sent to a packaging manufacturer for cutting and packaging. The IC testing manufacturer conducts final tests, and the finished products that pass tests are sold to system manufacturers through sales channels for assembly and production of system products.

Taiwan's semiconductor industry leverages the professional division of labor between upstream, midstream, and downstream suppliers in the supply chain to mitigate competition and create partnerships with other businesses. Taiwan has also developed the world's leading business model characterized by close cooperation and rapid mutual support (see Figure 1).

Figure 1: Upstream, Midstream, and Downstream Industry Chains in Taiwan's Semiconductor Industry



Source: Industry Value Chain Information Platform, compiled by Taiwan Stock Exchange Corporation

I. Upstream: IC Design:

It includes IC design, IC design services (IP supply, EDA, and design services), and other sub-industries. IC design serves as the foundation for all IC (chip) products. IC design companies use CAD and other IC design assistance tools developed by EDA companies to design the layout of transistors on the chip and the circuits that connect the transistors to create certain specifications and functions for chips. IC designers are broadly categorized into

Memory IC, Micro Component IC, Analog IC, and Logic IC designers based on their designing chip functions and signal transmission methods (see Figures 2 and 3).

Figure 2: Taiwan IC Design Main Product Output Value

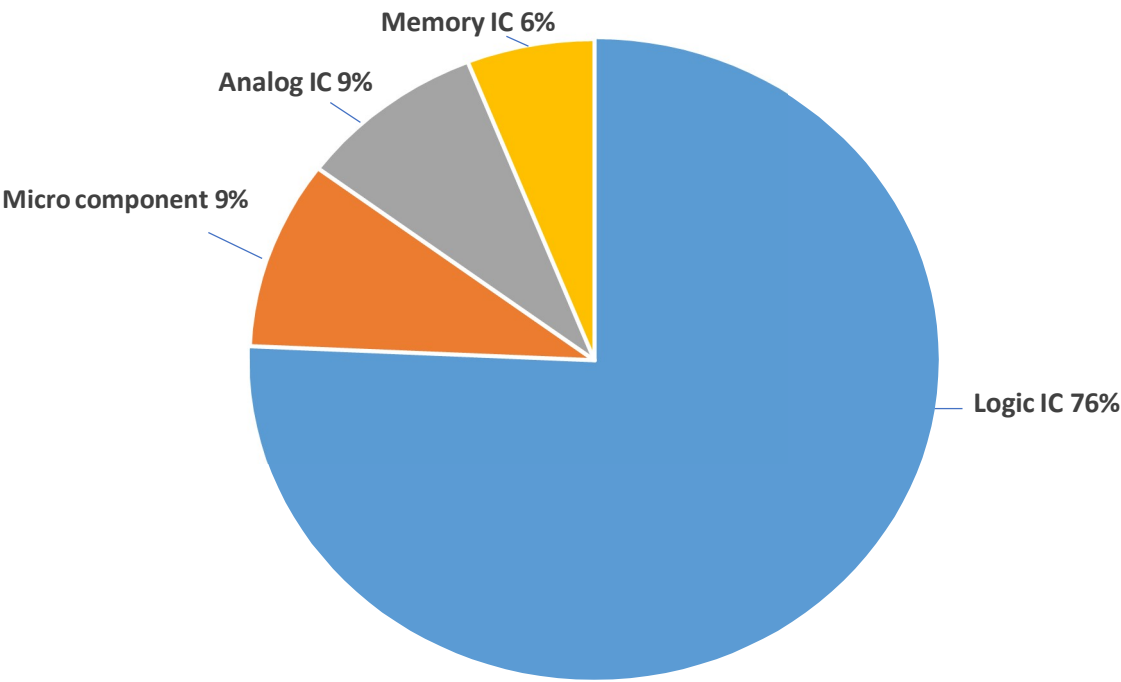
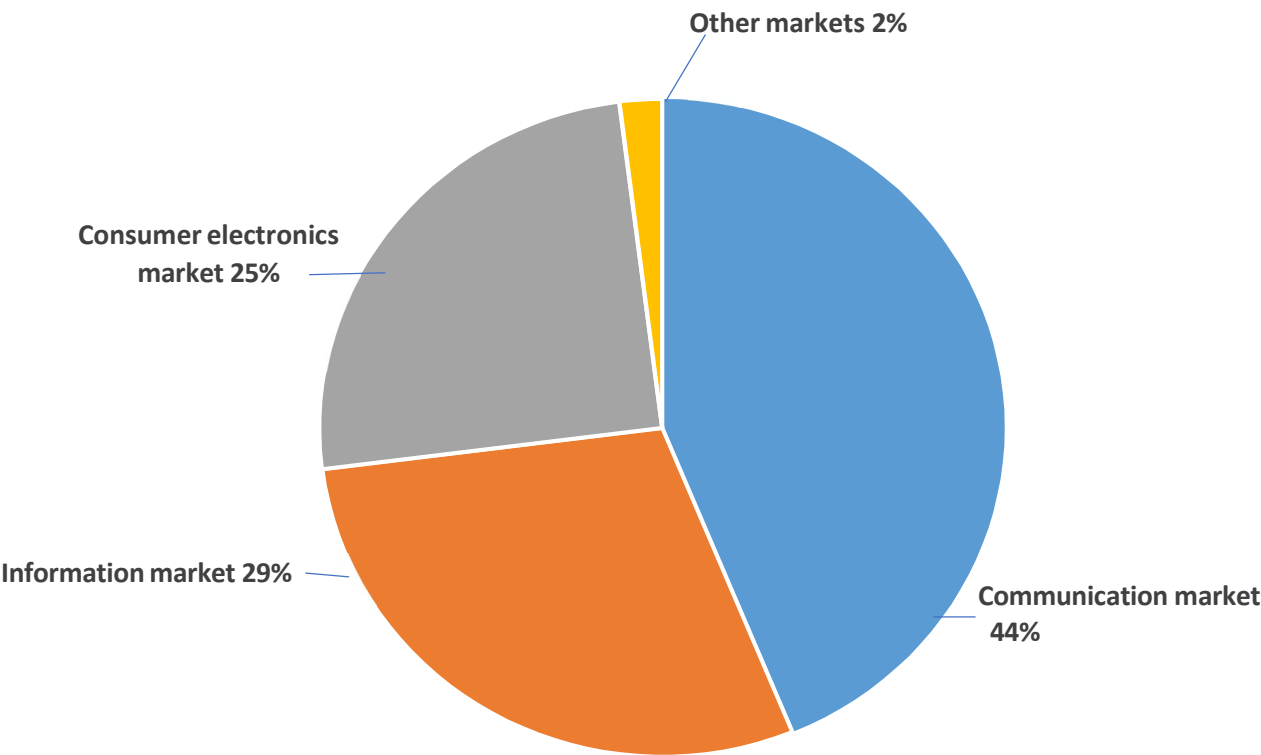


Figure 3: Main Application Fields of Taiwan IC Products



Source: Taiwan Industry Economics (TIE) Database, Taiwan Institute of Economic Research

Silicon Intellectual Property (SIP) is the intellectual property of IC design, and its development process includes IP design and IP verification. As IP core reuse can effectively shorten the product development cycle and reduce costs, especially in contemporary IC design for increasing the functionality of the chip, the design has become increasingly complex. In addition, existing IP components that have been verified are used to satisfy the need for shortening the time-to-market of ICs. Due to the differences in customer requirements for IC product functionality and production processes, IC design companies must develop a wide range of IPs in order to achieve economies of scale. IC design service companies specializing in IP design have emerged as a result.

In 2023, Taiwan's IC design industry was the second largest in the world in terms of output value, trailing only the United States. Three Taiwanese companies were among the global top ten IC design firms. MediaTek secured fifth place with an annual revenue of US\$13.9 billion, Novatek ranked seventh with US\$3.5 billion, and Realtek took eighth with US\$3.1 billion (see Table 2).

Table 2: 2023 Rankings of Main Global IC Design Companies by Revenue

Unit: US\$ billion

2023 Ranking	Company Name	Country/Market	2023 Revenue	2023 Market Share
1	Nvidia	US	55.3	26%
2	Qualcomm	US	30.9	14%
3	Broadcom	US	28.4	13%
4	AMD	US	22.7	11%
5	MediaTek (MTK)	TW	13.9	7%
6	Marvell	US	5.5	3%
7	Novatek	TW	3.5	2%
8	Realtek (RT)	TW	3.1	1%
9	Will Semiconductor	CN	2.5	1%
10	MPS	US	1.8	1%
Market share of the world's top ten companies				79%
Total market share of Taiwanese companies				10%

Source: Market Intelligence & Consulting Institute (MIC) of the Institute for Information Industry

Whilst MediaTek, Novatek, and Realtek are definitely the giants, other main players in the top ten list of main Taiwanese IC design companies in 2023 include Alchip, Himax, GUC, Raydium, SiliconMotion, Sitronix and FITIPOWER (see Table 3).

Table 3: Rankings of Main Taiwanese IC Design Companies: 2023

Unit: US\$ billion

2023 Ranking	Company Name	Securities Market	2023 Revenue	Main Products
1	MediaTek (MTK)	TWSE	13.9	Mobile phones, digital TV IC, IoT IC
2	Novatek	TWSE	3.5	Display driver IC
3	Realtek (RT)	TWSE	3.1	Communication IC, audio processor IC, monitor controller IC
4	Alchip	TWSE	1.0	ASIC, IP portfolio
5	Himax	NASDAQ	0.9	Display driver IC
6	GUC	TWSE	0.8	ASIC, IP portfolio
7	Raydium	TWSE	0.6	Display driver IC
8	SiliconMotion	NASDAQ	0.6	Memory card control IC
9	Sitronix	TWSE	0.5	Display driver IC
10	FITIPOWER	TWSE	0.5	Display driver IC

Source: Market Intelligence & Consulting Institute (MIC) of the Institute for Information Industry

IC design service companies that work closely with foundries tend to generate higher revenue. Taiwan's two largest foundries, TSMC and UMC, have established their own design service alliances. The main IC design service companies in Taiwan today are GUC and Alchip, which are part of the TSMC alliance, and Faraday, which is part of the UMC alliance. They occupy a larger share of the IC design service market in Taiwan.

II. Midstream: IC Manufacturing:

After the IC design company designs the IC circuit layout, it is transferred to the foundry for IC manufacturing. The manufacturing process requires the transfer of the circuit and circuit components onto the wafer with a photomask, and the wafer is manufactured through oxidization, diffusion, CVD, etching, and ion implantation. As IC circuit design has several layers, the process requires complex procedures, including the use of

several photomasks and pattern creation to form circuits and components, in order to produce a complete integrated circuit. Therefore, the technical and capital requirements are high.

IC manufacturing can be divided into foundries that specialize in producing data processing and computing IC, and memory manufacturers that produce memory IC. Taiwan's IC manufacturing industry focuses mainly on semiconductor foundries, which account for more than 90% of the output value of Taiwan's IC manufacturing industry.

Taiwan adopted a business model of specialized division of labor in upstream and downstream sections of the industry chain, and developed a unique foundry contract manufacturing business. In addition to mitigating the competition with other businesses, these companies have achieved superior yield performance with mature manufacturing processes due to their lead in technologies and cost efficiency in production. They also offer diverse manufacturing processes and capacity to satisfy market demand. Most companies are able to sign long-term contracts with customers to generate stable profits.

Taiwan's foundries also focus on the development of advanced processes. Companies such as TSMC have contributed to technological innovation and capital investment in Taiwan's overall IC manufacturing industry, further expanding Taiwan's advantages in advanced processes. In 2023, Taiwan maintained its lead across the board from 0.18 μ m to 20nm and sub-10nm processes in the global IC manufacturing industry (see Table 4).

Table 4: Overview of Global Capacity of Process Technologies: 2023

	Over 0.18 μ m	0.18 μ m to 40nm	40nm to 20nm	20nm to 10nm	Under 10nm	Total
Taiwan	16.8%	29.4%	29.5%	9.9%	62.6%	21.4%
South Korea	6.8%	9.6%	27.3%	29.3%	36.7%	20.4%
Japan	17.1%	13.5%	-	23.6%	-	15.8%
China	20.5%	15.6%	15.4%	14.8%	-	15.3%
North America	16.0%	12.5%	17.0%	11.6%	0.7%	12.6%
Europe	12.1%	7.2%	6.8%	1.7%	-	5.7%

Source: Taiwan Industry Economics (TIE) Database, Taiwan Institute of Economic Research, June 2023

TSMC announced in 2023 that mass production will begin for the 2 nm process by 2025. The market expects that customers, such as Apple, Nvidia, AMD, Qualcomm and MediaTek, will begin using TSMC's 2nm processes in the second half of 2025 (see Table 5).

Table 5: Global Foundry Advanced Process Mass Production Timeline

	2022	2023	2024	2025(F)	2026(F)	2027(F)	2030(F)
1nm, 10A							TSMC Samsung Intel
1.4nm, 14A					Intel	TSMC Samsung	
2nm, 2nmGAA, A16				TSMC Samsung	TSMC	Rapidus	
3nm, 3nmGAA	TSMC Samsung						
5nm+, Intel 18A			Intel				
5nm, Intel 20A			Intel SMIC				
7nm+, Intel3		Intel					
7nm, Intel4		Intel SMIC					

Source: Market Intelligence & Consulting Institute (MIC) of the Institute for Information Industry, June 2024

According to estimates, Taiwan's mature process capacity will account for 30% of the global capacity by 2030, and advanced process capacity will account for 58% of the global capacity. Taiwan's foundry industry is expected to maintain its lead in the medium to long-term development.

Table 6 presents the 2023 rankings of the top 10 global IC foundry companies by revenue. TSMC leads the market with a commanding 59% share and US\$ 69.4 billion in revenue, far ahead of its nearest competitors. Taiwanese companies, including TSMC, UMC, PSMC, and VIS, collectively hold an impressive 67% of the global market. Second-ranked Samsung accounted for 12% share and US\$13.3 billion in revenue followed by Global Foundries at 6% share and US\$ 7.4 billion in revenue. Chinese foundries such as SMIC and Hua Hong accounted for a combined 8% of market share.

Table 6: Rankings of Main Global Foundry by Revenue: 2023

Unit: US\$ billion

2023 Ranking	Company Name	Country/Market	2023 Revenue	2023 Market Share
1	TSMC	TW	69.4	59%
2	Samsung	US	13.3	12%
3	Global Foundries	US	7.4	6%
4	UMC	TW	7.1	6%
5	SMIC	CN	6.3	5%
6	Hua Hong	CN	3.8	3%
7	Tower Semiconductor	IL	1.4	1%
8	PSMC	TW	1.4	1%
9	VIS	TW	1.2	1%
10	Nexchip	CN	1.0	1%
Market share of the world's top ten companies				95%
Total market share of Taiwanese companies				67%

Note: Only revenue from the foundry business is included for Samsung Electronics.

Source: Market Intelligence & Consulting Institute (MIC) of the Institute for Information Industry, Trendforce

Table 7 demonstrates the global distribution of major players in the memory semiconductor market for 2023. South Korea dominated with Samsung and SK Hynix leading the pack, contributing a significant share of the market with revenues of US\$ 50.9 billion and US\$ 25.0 billion, respectively. The U.S. is represented strongly by Micron Technology at US\$ 16.7 billion and Western Digital at US\$ 5.9 billion.

In 2023, Taiwan's notable contributions came from Winbond (WEC), Nanya (NTC), and Macronix, highlighting its diversification within the

semiconductor industry. Together, these Taiwanese companies contribute around US\$ 3.1 billion in revenue. Meanwhile, Japan has representation through Kioxia, while China is represented by Yangtze Memory Technologies Corporation (YMTC), and ChangXin Memory Technologies (CXMT).

Table 7: Rankings of Main Global Memory Product Manufacturers by Revenue: 2003

Unit: US\$ billion

2023 Ranking	Company Name	Country/Market	2023 Revenue
1	Samsung	KR	50.9
2	SK Hynix	KR	25.0
3	Micron Technology	US	16.7
4	Kioxia	JP	6.7
5	Western Digital	US	5.9
6	YMTC	CN	1.6
7	Winbond (WEC)	TW	1.2
8	Nanya (NTC)	TW	1.0
9	Macronix	TW	0.9
10	CXMT	CN	0.6

Note: Only revenue from the memory business is included for Winbond; the revenue of CXMT is an estimate.

Source: Market Intelligence & Consulting Institute (MIC) of the Institute for Information Industry

Table 8 shows the 2023 rankings of the top 10 Taiwanese foundry companies by revenue. TSMC remains the industry leader with a staggering US\$ 69.4 billion revenue, focusing exclusively on foundry services. UMC follows as a strong second player in the foundry space, followed by PSMC, which is also engaging in DRAM production, to expand its portfolio.

Winbond and Nanya are prominent in the memory sector, specializing in DRAM and flash technologies. VIS, EPISIL, and Macromix showcase strength in niche markets, such as specialized foundry services, flash memory, and ROM. Nuvoton and MVI, operating as IDMs (Integrated Device Manufacturers), add versatility to Taiwan's semiconductor industry by combining design and production capabilities (see Table 8).

Table 8: Rankings of Main Taiwanese Foundry by Revenue: 2023

Unit: US\$ billion

2023 Ranking	Company Name	Securities Market	2023 Revenue	Main Products
1	TSMC	TWSE	69.4	Foundry
2	UMC	TWSE	7.1	Foundry
3	PSMC	TWSE	1.4	Foundry, DRAM
4	VIS	TPEX	1.2	Foundry
5	Winbond (WEC)	TWSE	1.2	DRAM, FLASH
6	Nuvoton (NTC)	TWSE	1.1	IDM, Foundry
7	Nanya (NTC)	TWSE	1.0	DRAM
8	Macromix	TWSE	0.9	Flash, ROM, Foundry
9	EPISIL	TPEX	0.1	Foundry
10	MVI	TWSE	0.0	IDM, Foundry

Note: Only revenue from the memory business is included for Winbond; only revenue from foundry is included for EPISIL.

Source: Market Intelligence & Consulting Institute (MIC) of the Institute for Information Industry

III. Downstream: IC packaging and testing:

IC packaging refers to the coverage of processed wafer with plastic, ceramic, or metal coating after the die is cut to protect the die from contamination, increase the ease of assembly, and enhance the electrical connection between the chip and the electronic system and heat dissipation. IC testing can be divided into two stages. The first is the wafer test before packaging to test the electrical properties. The second is the IC finished product test, which is mainly implemented to test whether the IC functions, electrical properties and heat dissipation are normal to ensure quality.

Taiwan's IC packaging and testing industry ranks first in the world. With the rise of IoT applications, Taiwan's IC packaging and testing companies have continued to develop high-end packaging and heterogeneous integration technologies, increasing their lead over competitors.

In 2023, five Taiwanese companies were ranked among the top ten global IC packaging and testing companies, including the world's largest packaging and testing company ASE (ASEH), with a market share more than 30%. Among other Taiwanese IC packaging and testing companies included in the ranking, their main products include computing IC and memory IC testing, which demonstrates the diversity and comprehensiveness of Taiwan's IC packaging and testing industry (see Table 9).

Table 9: Rankings of Main Global IC Packaging and Testing Companies by Revenue: 2023

Unit: US\$ billion

2023 Ranking	Company Name	Country/Market	2023 Revenue	2023 Market Share
1	ASE (ASEH)	TW	10.1	31%
2	Amkor	US	6.5	20%
3	JCET	CN	4.2	13%
4	TFMC	CN	3.1	10%
5	Powertech (PTI)	TW	2.3	7%
6	HUATIAN	CN	1.6	5%
7	KYEC	TW	1.1	3%
8	Hana Micron	KR	0.7	2%
9	Chipmos	TW	0.7	2%
10	Chipbond	TW	0.6	2%
Market share of the world's top ten companies				95%
Total market share of Taiwanese companies				45%

Note: Only revenue from packaging and testing is included for ASE (ASEH).

Source: Market Intelligence & Consulting Institute (MIC) of the Institute for Information Industry

Table 10 presents the top 10 rankings of Taiwan's major players in IC packaging and testing in terms of revenue for 2023. ASE (ASEH) leads the market with a remarkable revenue of US\$ 10.1 billion, primarily excelling in logic IC packaging and testing as well as mixed-signal IC services.

Powertech (PTI) stands out in memory and logic IC packaging and testing, contributing US\$ 2.3 billion, showcasing its focus on diverse services. Companies like KYEC, Chipmos, and Chipbond further highlight Taiwan's strength in specialized packaging, testing, and gold bumping for driver ICs and memory.

Table 10: Rankings of Main Taiwanese IC Packaging and Testing Companies by Revenue: 2023

Unit: US\$ billion

2023 Ranking	Company Name	Securities Market	2023 Revenue	Main Products
1	ASE (ASEH)	TWSE	10.1	Logic IC packaging and testing, mixed-signal IC packaging and testing
2	Powertech (PTI)	TWSE	2.3	Memory packaging and testing, logic IC packaging and testing
3	KYEC	TWSE	1.1	Wafer probing, IC product testing
4	Chipmos	TWSE	0.7	Driver IC packaging and testing, memory packaging and testing
5	Chipbond	TPEX	0.6	Driver IC packaging and testing, gold bumping
6	OSE	TWSE	0.5	Memory packaging and testing
7	Sigurd	TWSE	0.5	Mixed-signal IC, RF, power semiconductor packaging and testing
8	Ardentec	TPEX	0.5	Memory wafer testing, digital and mixed-signal IC testing
9	FATC	TWSE	0.2	Memory packaging and testing
10	WALTON	TWSE	0.2	Memory packaging and testing

Note: Only revenue from packaging and testing is included for ASE (ASEH).

Source: Market Intelligence & Consulting Institute (MIC) of the Institute for Information Industry

IV. IC Equipment and Other Supply Chains

According to the SEMI's report, Taiwan will continue to maintain its lead in expenditures on global foundry equipment between 2025 and 2027, with a total of US\$ 75 billion. However, nearly 80% of the

expenditures consist of purchases of foreign equipment, which shows that there is significant room for growth for domestic equipment manufacturers.

Taiwan's government has actively implemented a policy for domestic production of semiconductor equipment in recent years. It integrated national and industry resources, and encouraged companies to invest in semiconductor equipment development with the aim of attaining "local production of foreign company equipment, and domestic production of advanced packaging and testing equipment" to increase the use of domestic equipment by Taiwan's semiconductor companies.

The government also seeks to connect the entire industry to jointly support the upgrade of Taiwan's semiconductor equipment industry and increase the international competitiveness of Taiwan's semiconductor equipment industry. Its goal is to make Taiwan a "high-end manufacturing center in Asia" and "center of advanced semiconductor processes."

Table 11 shows that Taiwan's semiconductor midstream and downstream supply chains are supported by a network of listed companies specializing in key segments. In the midstream stage, companies like UIS and L&K lead in wafer plant construction and system integration, while MIC and Fiti supply advanced manufacturing equipment. Materials critical for wafer production, such as silicon wafers (FST), photomasks (TMC), and chemicals from Eternal, Topco, and Wahlee, form the foundation for IC manufacturing.

In the downstream segment, Chroma and Sciencetech provide critical testing and packaging equipment. Substrate suppliers like Unimicron, NanYa PCB, and Kinsus are essential for advanced packaging technologies, and lead frame manufacturers such as Chang Wah, SDI, and JihLin support wire-bond packaging needs.

Table 11: Main Listed Companies in Taiwan's IC Manufacturing, Packaging, and Testing Supply Chains

Supply Chain		Supply Chain Companies
Midstream	Wafer plant construction and system integration	UIS, L&K
	Wafer manufacturing equipment	MIC, Fiti
	Silicon wafer manufacturing	FST
	Photomasks	TMC
	Chemicals, photoresist	Eternal, Topco, Wahlee
Downstream	Packaging and testing equipment	Chroma, Scientech
	Substrates	Unimicron, NanYaPCB (N.P.C), Kinsus
	Lead frames	ChangWah, SDI, JihLin

Source: Compiled by the Taiwan Stock Exchange Corporation

V. IC distributors

IC distributors are only responsible for IC trading and sales, and are not involved in the production. Their business model mainly consists of procurement from upstream semiconductor design companies or manufacturers, and supply of key components or materials to downstream electronics industry manufacturers. They play the role of the intermediary in the entire semiconductor industry.

Distributors are indispensable for the success of Taiwan's semiconductor industry as they provide marketing channels and networks for upstream component suppliers. Due to the reach of distributors and high market sensitivity, they can quickly obtain market information and recommend new technologies to downstream manufacturers. They also leverage their integration and price negotiation capability for procurement from upstream suppliers to provide favorable prices for manufacturers. The most significant difference between semiconductor distributors and other distributors is that the former help original manufacturers with sales, technology, and warehousing management, resolve customer issues in design and mass production, and help customers shorten the time-to-market for new products.

In 2023, three Taiwanese companies were ranked among the top ten

global IC distributors. The IC distributor industry favors large companies, which tend to retain their lead. As 30% to 40% of IC industry products are sold through distributors, there is limited room for market growth and the intermediary service providers have margins of only 3% to 5%. As distributors generally rely on economies of scale, mergers and acquisitions become important means for distributors to expand their range of suppliers and customers.

In recent years, Taiwanese IC distributors such as WPG and WT have continuously expanded their businesses through mergers and acquisitions. They have also used horizontal partnerships to increase synergy in operations and were ranked among the top ten electronics distributors in the world. WT announced in 2023 the US\$ 3.8 billion acquisition of 100% of the shares Future Electronics, a Canadian IC distributor ranked seventh in the world. The settlement and consolidation was completed in 2024, and the acquisition is expected to make WT one of the top three IC distributors in the world and increase its competitiveness in future development (see Tables 12 and 12).

Table 12: Rankings of Main Global IC Distributors by Revenue: 2023

Unit: US\$ billion

2023 Ranking	Company Name	Country/Market	2023 Revenue	2023 Market Share
1	Arrow	US	21.7	11%
2	Avnet	US	19.9	10%
3	WPG	TW	19.2	10%
4	WT	TW	18.9	10%
5	Macnica	JP	6.7	4%
6	Toyota Tsusho	JP	4.6	2%
7	Supreme	TW	4.5	2%
8	CECport	CN	4.5	2%
9	Future Electronics	CA	4.3	2%
10	Digi-key	US	3.4	2%
Market share of the world's top ten companies				55%
Total market share of Taiwanese companies				22%

Source: Gartner

Table 13: Rankings of Main Taiwanese IC Distributors by Revenue and Products Distributed: 2023

Unit: US\$ billion

2023 Ranking	Company Name	Securities Market	2023 Revenue	Main Products
1	WPG	TWSE	19.2	Core components, memory components, discrete and logic components, analog and mixed-signal components, optical and sensor components; brands distributed include: AMD, Broadcom, Infineon, Intel, Kioxia, MediaTek, Micron, Nanya, Novatek, Nuvoton, NXP, Phison, Qualcomm, Realtek, Samsung, ST Micro, Willsemi, and Winbond
2	WT	TWSE	18.9	Analog IC, microcontrollers, memory IC, microprocessors, application specific IC; brands distributed include: Broadcom, ESMT, Intel, Marvell, MediaTek, Micron, Nanya, NXP, Nuvoton, Qualcomm, Realtek, and ST Micro
3	Supreme	TWSE	4.5	Memory components; brands distributed include: Samsung, MediaTek, Novatek, and CIRRUS LOGIC
4	Edom	TWSE	3.4	Integrated circuits, electronic components, memory

Source: Companies, Gartner

Chapter III: Taiwan Capital Market Support for the Semiconductor Industry

The Semiconductor Industry Association (SIA) of the United States stated in 2021 that if Taiwan was unable to produce chips for an entire year, the revenue of the global electronics industry would fall by nearly US\$ 500 billion. The robust international competitiveness of Taiwan's semiconductor companies is also an important engine of growth for Taiwan's capital market.

As of December 2024, the total market value of semiconductor companies listed on the Taiwan Stock Exchange Corporation (TWSE) accounts for approximately 47% of the market value of all listed companies in Taiwan. The semiconductor industry plus other ICT-related industry account for 70% of the total market value. Their operations include IC design, foundry, and packaging and testing. The upstream, midstream, and downstream sections of the industry form comprehensive semiconductor industry clusters.

Taiwan's stock market offers advantages in terms of low price-earnings ratio and high yields. Its transaction value and turnover rate are some of the highest among Asian markets, which demonstrate that Taiwanese stock prices are relatively reasonable and highly liquid, and investors can obtain stable cash dividends. More than 50% of foreign capital investments in Taiwan's capital market are invested in semiconductor stocks, which demonstrates the indispensable role of Taiwan's semiconductor industry in the global capital market.

In the future, the TWSE will continue to help Taiwan's semiconductor companies leverage the power of the capital market and national industry policies and resources to consolidate the key role of Taiwan's semiconductor industry in the global semiconductor industry chain and expand its lead.

Appendix : Basic Information of Main Listed Companies of Taiwan's IC Industry

Unit: Capital, revenue, market value: US\$ billion

Industry Chain	Stock Code	Short Name of the Company in English	Short Name of the Company in Chinese	Listing Date	Capital	2023 Revenue	Revenue in the First Three Quarters of 2024	Market Value	PB Ratio	PE Ratio	Dividend Yield	Company Website
IC design	2454	MTK	聯發科	2001/07/23	0.49	13.91	12.22	69.13	5.43	20.83	3.89%	www.mediatek.com
	3034	NOVATEK	聯詠	2002/08/26	0.19	3.55	2.41	9.32	4.81	14.64	6.37%	www.novatek.com.tw
	2379	RT	瑞昱	1998/10/26	0.16	3.06	2.71	8.89	6.07	20.70	2.73%	www.realtek.com
	3592	Raydium	瑞鼎	2022/01/07	0.02	0.59	0.58	0.91	2.56	14.28	3.86%	www.rad-ic.com
	8016	Sitronix	矽創	2003/12/25	0.04	0.54	0.41	0.78	2.27	13.67	5.65%	www.sitronix.com.tw
	4961	FITIPOWER	天鈺	2018/10/17	0.04	0.52	0.44	0.86	1.60	13.92	4.58%	www.fitipower.com
	3006	ESMT	晶豪科	2002/03/04	0.09	0.38	0.32	0.54	1.65	-	0.97%	www.esmt.com.tw
IC design service	3661	Alchip	世芯-KY	2014/10/28	0.02	0.98	1.21	8.30	7.43	45.73	0.68%	www.alchip.com
	3443	GUC	創意	2006/11/03	0.04	0.84	0.59	5.56	17.45	54.97	1.03%	www.guc-asic.com
	3035	Faraday	智原	2002/08/26	0.08	0.38	0.25	1.92	4.77	55.79	1.78%	www.faraday-tech.com
Foundry	2330	TSMC	台積電	1994/09/05	7.91	69.40	63.07	850.32	6.99	26.88	1.21%	www.tsmc.com
	2303	UMC	聯電	1985/07/16	3.83	7.14	5.35	16.49	1.46	10.40	6.97%	www.umc.com
	6770	PSMC	力積電	2021/12/06	1.27	1.41	1.05	2.01	0.74	-	-	www.powerchip.com
	4919	NTC	新唐	2010/09/27	0.13	1.13	0.77	1.14	2.32	37.71	3.37%	www.nuvoton.com
	2342	MVI	茂矽	1995/09/19	0.05	0.05	0.04	0.15	2.08	-	-	www.mosel.com.tw
Memory	2408	NTC	南亞科	2000/08/17	0.95	0.96	0.86	2.76	0.55	-	-	www.nanya.com
	2344	WEC	華邦電	1995/10/18	1.37	2.41	1.96	2.03	0.68	77.89	-	www.winbond.com
	2337	Macronix	旺宏	1995/03/15	0.57	0.89	0.62	1.12	0.81	-	2.53%	www.macronix.com
IC packaging and testing	3711	ASEH	日月光投控	2018/04/30	1.35	18.68	13.49	21.82	2.27	21.63	3.21%	www.aseglobal.com
	6239	PTI	力成	2004/11/08	0.23	2.26	1.75	2.82	1.65	9.88	5.74%	www.pti.com.tw
	2449	KYEC	京元電子	2001/05/09	0.37	1.06	0.61	4.16	3.27	18.65	2.87%	www.kyec.com.tw

Industry Chain	Stock Code	Short Name of the Company in English	Short Name of the Company in Chinese	Listing Date	Capital	2023 Revenue	Revenue in the First Three Quarters of 2024	Market Value	PB Ratio	PE Ratio	Dividend Yield	Company Website
	8150	ChipMOS	南茂	2014/04/11	0.22	0.69	0.54	0.70	0.92	13.63	5.74%	www.chipmos.com
	2329	OSE	華泰	1994/04/20	0.23	0.54	0.38	0.59	2.27	15.77	3.43%	www.ose.com.tw
	6257	SIGURD	矽格	2003/08/25	0.15	0.50	0.41	1.00	1.68	14.52	3.85%	www.sigurd.com.tw
	8131	FATC	福懋科	2007/11/29	0.13	0.25	0.21	0.38	1.10	16.02	3.19%	www.fatc.com.tw
	8110	WALTON	華東	2007/10/31	0.16	0.23	0.18	0.22	0.69	46.50	1.43%	www.walton.com.tw
Wafer plant construction and system integration	2404	UIS	漢唐	2000/03/14	0.06	2.21	1.08	2.80	7.16	17.48	4.36%	www.uisco.com.tw
	6139	L & K	亞翔	2003/08/25	0.07	1.83	1.69	1.60	3.94	12.66	4.00%	www.lkeng.com.tw
Wafer manufacturing equipment	6196	MIC	帆宣	2004/05/24	0.06	1.81	1.42	0.91	2.59	17.37	4.07%	www.micb2b.com
	3413	Fiti	京鼎	2015/07/28	0.03	0.42	0.36	1.06	2.24	13.64	3.72%	www.foxsemicon.com.tw
Wafers	3532	FST	台勝科	2007/12/10	0.12	0.48	0.29	1.16	1.56	24.62	5.10%	www.fstech.com.tw
Photomasks	2338	TMC	光罩	1995/04/17	0.08	0.23	0.18	0.39	2.08	28.63	3.05%	www.tmcnet.com.tw
Chemicals, photoresist	1717	ETERNAL	長興	1994/03/31	0.36	1.36	1.03	1.00	1.20	18.66	2.88%	www.eternal-group.com
	5434	TOPCO	崇越	2003/08/25	0.06	1.58	1.28	1.63	3.18	15.86	3.57%	www.topco-global.com
	3010	WAH LEE	華立	2002/07/22	0.08	2.14	1.86	0.97	1.43	14.84	4.02%	www.wahlee.com
Packaging and testing equipment	2360	CHROMA	致茂	1996/12/21	0.13	0.60	0.48	5.31	7.45	37.77	1.61%	www.chromaate.com
	3583	Scientech	辛耘	2013/03/12	0.02	0.22	0.22	0.97	6.73	36.96	1.01%	www.scientech.com.tw
Substrates	3037	UNIMICRON	欣興	2002/08/26	0.47	3.34	2.68	6.58	2.32	27.06	2.13%	www.unimicron.com
	8046	N.P.C	南電	2006/04/07	0.20	1.36	0.76	2.57	1.87	97.39	4.21%	www.nanyapcb.com.tw
	3189	KINSUS	景碩	2004/11/01	0.14	0.86	0.70	1.41	1.45	69.66	0.99%	www.kinsus.com.tw
Lead frames	8070	CHANGWAH	長華*	2007/12/31	0.02	0.53	0.40	1.01	1.74	23.33	5.49%	www.cwei.com.tw
	2351	SDI	順德	1996/04/25	0.06	0.35	0.25	0.52	2.49	26.44	2.75%	www.sdi.com.tw

Industry Chain	Stock Code	Short Name of the Company in English	Short Name of the Company in Chinese	Listing Date	Capital	2023 Revenue	Revenue in the First Three Quarters of 2024	Market Value	PB Ratio	PE Ratio	Dividend Yield	Company Website
	5285	JihLin	界霖	2014/02/25	0.03	0.16	0.12	0.16	1.72	26.46	4.00%	www.jihlin.com.tw
IC distributors	3702	WPG	大聯大	2005/11/09	0.51	21.57	20.20	3.50	1.48	14.07	5.12%	www.WPGholdings.com
	3036	WT	文曄	2002/08/26	0.38	19.09	21.72	3.75	1.49	18.06	1.64%	www.wtmec.com
	8112	Supreme	至上	2007/12/31	0.17	4.88	5.80	0.95	1.80	12.51	6.81%	www.supreme.com.tw
	3048	EDOM	益登	2002/10/01	0.08	3.44	2.49	0.28	1.85	-	3.25%	www.edomtech.com

Note 1: The market value, PB ratio, PE ratio, and dividend yield are based on the closing prices of the companies on December 31, 2024, and the financial reports for the nine months ended September 30, 2024.

Note 2: TWD to US\$ exchange rate: 2023 revenue: 31.15; revenue in the first three quarters of 2024: 32.12; capital, market value: 32.785

Source: Financial reports of companies on the Market Observation Post System (<https://mops.twse.com.tw/mops/web/index>) compiled by the Taiwan Stock Exchange Corporation, March 2025

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The U.S. is poised to tighten its chip restrictions on China once more. In one of his final acts as president, Joe Biden is set to announce new curbs on the export of advanced chips to China, particularly those used in AI. The U.S. will expand the scope of its manufacturing process controls from the current 7-nanometer advanced node to the 16-nanometer mature node. This move will pose significant challenges for foundries like TSMC as they face increased difficulties securing Chinese orders.

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Taiwan's startup ecosystem is gaining global attention as entrepreneurs look beyond Silicon Valley. With unique initiatives like the Taiwan Gold Card visa program and support from seasoned founders, the island is creating an environment that nurtures innovation. From tech pioneers like Steve Chen of YouTube and Kevin Lin of Twitch to local startups making waves, Taiwan's potential as a startup hub is undeniable. We look into the opportunities, challenges and cultural shifts shaping Taiwan's entrepreneurial landscape, with insights from industry leaders and ecosystem experts.

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