

Thailand's Semiconductor and Electronics Industry



山田コンサルティンググループ株式会社




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I. Understanding the global semiconductor supply chain

- The global semiconductor supply chain consists of three distinct stages – IC design, wafer fabrication, and assembly, testing, and packaging (ATP), which is highly complex and diversified geographically.
- Thailand is the manufacturing base of ATP, representing 2% of the global capacity.

Global Semiconductor Supply Chain

	Front-end process		Back-end process
	 IC design	 Wafer fabrication	 Assembly, Testing and Packaging (ATP)
Process Overview	The process begins with integrated circuit (IC) design, where engineers use specialized electronic design automation (EDA) software to create the blueprints for chips.	The fabrication process transforms bare silicon wafers into functional IC involves an intricate fabrication process with hundreds of precise steps, including photolithography, etching, doping, and deposition.	This process involves cutting the wafer into individual dies, packaging them to protect from physical damage. After packaging, chips undergo final testing for functionality, performance, and reliability.
Industry Characteristics	<ul style="list-style-type: none"> • IC design is highly knowledge-intensive and value-added, accounting for roughly 53% of total R&D expenditure and contributing over 50% of the industry's overall value added. • Chip design is carried out by two main types of companies: IDMs and fabless firms. 	<ul style="list-style-type: none"> • Wafer fabrication is the most critical segment in the semiconductor value chain and is currently a major focus of national policy. • The market is highly concentrated due to its extreme capital intensity, which requires an upfront investment of tens of billions of USD. 	<ul style="list-style-type: none"> • ATP can be performed in-house by IDMs or it can be outsourced to OSAT firms. • ATP is less-capital intensive and employs vastly more labor than front-end manufacturing.
Geographical concentration	<ul style="list-style-type: none"> • Concentrated in US (68%*), Taiwan (21%), (China 9%) 	<ul style="list-style-type: none"> • Concentrated in East Asia: Taiwan, China, Japan, and S. Korea 	<ul style="list-style-type: none"> • Concentrated in Taiwan (>50%), China (>20%), and other countries in SE Asia
Key players	<ul style="list-style-type: none"> • Fabless: Apple, Nvidia, Qualcomm, AMD 	<ul style="list-style-type: none"> • TSMC, SMIC, UMC 	<ul style="list-style-type: none"> • OSATs: Amkor, ASE, Foxconn, JCET
	<ul style="list-style-type: none"> • IDMs: Intel, Samsung, Infineon, Sony, Texas Instrument, Micron, SK Hynix, NXP, Murata, STMicroelectronics, TI 		

IDM or Integrated Device Manufacturer is a semiconductor company that handle all aspects of semiconductor production starting from designs, manufacturing to sales.

Fabless firm refer to a company that designs and markets semiconductors, while outsourcing that hardware's fabrication (or fab) to a third-party partner.

OSAT or Outsourced Semiconductor Assembly and Test companies provide the ATP services for fabless firms and IDMs.



Thailand's Role in the global supply chain

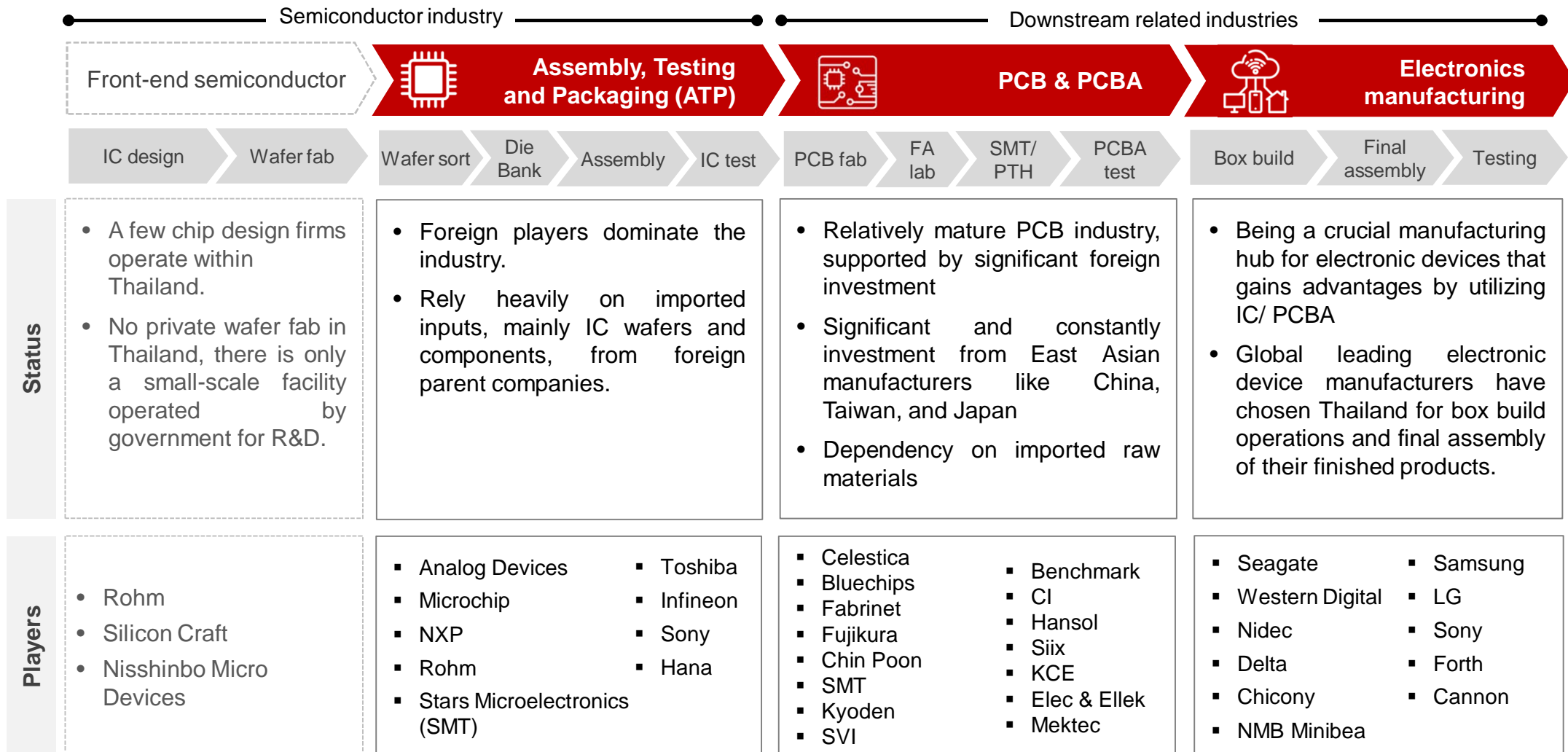
Among ASEAN countries, Thailand is a prominent hub for semiconductor back-end processing. Several IDMs and OSAT firms have established their APT facilities in the country. According to SIA, Thailand accounted for 2% of the global ATP capacity in 2022.

Note: * market share of fabless IC design

II. Thailand's semiconductor and electronics industry landscape: Industry supply chain

- Thailand's capabilities in the front-end semiconductor industry are limited.
- Conversely, it serves as a production hub for back-end semiconductor and downstream industries, including PCB, PCBA, and electronic products, with significant investments from leading global firms.

Thailand's semiconductor and electronics industry supply chain



II. Thailand's semiconductor and electronics industry landscape: Semiconductor & ICs industry (1/5)

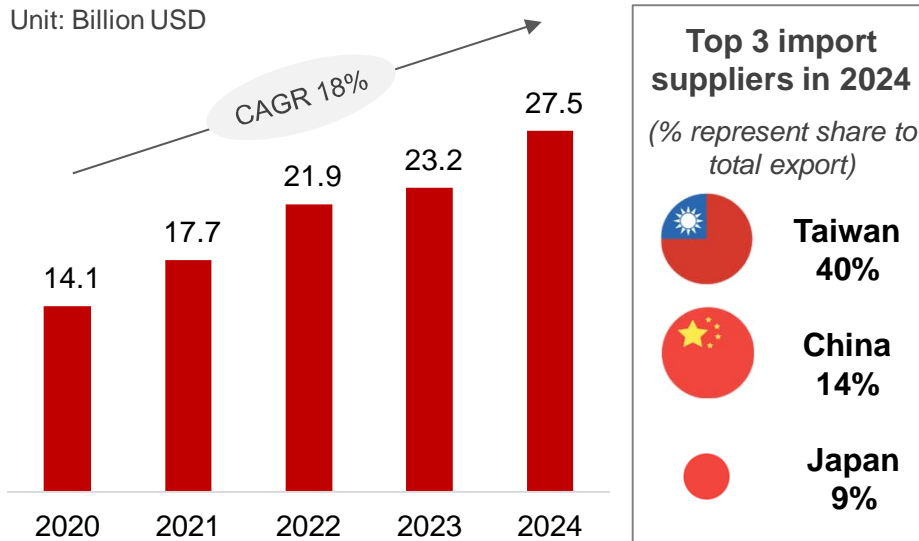
- The semiconductor industry is dominated by foreign IDMs and OSAT providers operating assembly, test, and packaging facilities that depend on imported IC wafers and components.

No. of semiconductor manufacturing by business (1)

Business activities / products	No. of factory
• IC design	3
• Semiconductor devices/ICs and parts manufacturer	7
• IC assembly, test, and packaging	25
Total	35

Thailand's import of semiconductor devices and ICs

Unit: Billion USD



IC Design company

- There is limited domestic design houses in the country with only one local company named Silicon Craft Technology Pcl., who specialized in RFID and NFC microchips.

Semiconductor devices and parts manufacture

- In Thailand, semiconductor manufacturing focuses on discrete components like transistors, diodes, and LEDs, and items such as lead frames used in integrated circuit packaging.
- Due to the limited number of local manufacturers, the country relies significantly on imported semiconductor devices and components.
- Over the past five years, imports of semiconductor devices have grown at a compound annual growth rate (CAGR) of 18%, spurred by rising demand in both the semiconductor market and related downstream sectors like PCBA.

IC assembly, test, and packaging (ATP)

- ATP facilities in Thailand are primarily run by both Integrated Device Manufacturers (IDMs) and Outsourced Semiconductor Assembly and Test (OSAT) providers, many of which are foreign subsidiaries that have shifted production locally.
- They heavily depend on imported inputs, mainly IC wafers and components from their parent companies, while assembling finished integrated circuits for export back to those companies.
- Notable IDMs with in-house assembly and testing in Thailand include Infineon, NXP, Microchip, Analog Devices, and Rohm, meanwhile, the significant EMS players that offering IC assembly and test services include UTAC, Hana, and Star Microelectronics.

Note: (1) According to "Thailand's Integrated Circuits and Parts Industry Report, published in 2021.

II. Thailand's semiconductor and electronics industry landscape: Semiconductor & ICs industry (2/5)

- Thailand hosts a diverse ecosystem of major semiconductor players, including leading IDMs alongside prominent EMS providers that deliver comprehensive IC packaging and manufacturing services.
- Especially, EMS companies have capabilities from back-end semiconductor to final assembly process.

Major players and their semiconductor operation in Thailand

Integrated Device Manufacturers (IDMs)		Electronic Manufacturing Service (EMS) companies*	
Analog Devices	<ul style="list-style-type: none"> Thailand facility serves as a key manufacturing and testing hub for high-volume production with "Sort & Final Test and Tape & Reels Packaging operation". 	Hana Microelectronics	<ul style="list-style-type: none"> Hana facility in Thailand specializes in the IC assembly and test of low to medium pin count IC's. The company offers state of the art assembly processes (including Copper Wire, Chip on Lead, Multi-Die, Stacked Die, Clear Molding, System In Package etc.) and test solutions. IC packaging capacity: 20 million units/ day Key segments: automotive, medical, IoT
Infineon	<ul style="list-style-type: none"> Infineon (Thailand) operates assembly, testing, and finishing facilities focused on automotive, industrial, and power electronics semiconductors. 		Stars Microelectronics
NXP	<ul style="list-style-type: none"> NXP Thailand operates assembly and testing of standard products, microcontrollers, and mixed signal ICs, which serve diverse markets including automotive, secure banking, mobile audio, and interface/ power solutions. 	UTAC Thai	
ROHM	<ul style="list-style-type: none"> Rohm Integrated Systems (Thailand), which is the main manufacturing site outside of Japan, operates assembly and testing ICs facility. Other primary products include ICs, transistors, diodes, SiC, IGBT, IPM, optical sensors, resistors, wireless modules. 		
Sony	<ul style="list-style-type: none"> Sony Device Technology (Thailand) operates assembly of image sensors for automotive applications, display devices, and laser diodes for data center application. 		
Toshiba	<ul style="list-style-type: none"> Toshiba Semiconductor (Thailand) carries out back-end processes—assembly and packaging—for small signal devices and photocouplers. 		

Note: *EMS companies offer a wide range of services, including prototype design, PCBA, box build, final assembly, testing service for electronic devices, etc. Some EMS companies in Thailand also offer outsourced semiconductor assembly and test (OSAT) service.

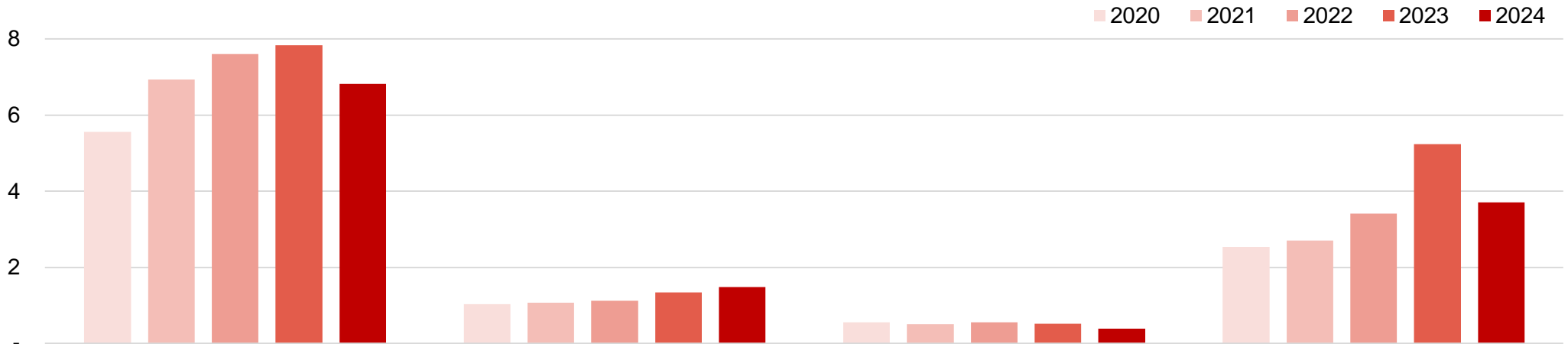
Abbreviations: SiC (Silicon Carbide), IGBT (Insulated Gate Bipolar Transistor), IPM (Intelligent Power Module), MEMS (Micro Electro-Mechanical Systems)

II. Thailand's semiconductor and electronics industry landscape: Semiconductor & ICs industry (3/5)

- Thailand's semiconductor exports demonstrate a diversified portfolio across DAO, logic, memory, and semiconductor devices.
- DAO chips representing the largest export value at approximately USD 6-8 billion, while semiconductor devices show strong growth potential with a 10% CAGR.

Thailand's export of semiconductor devices and ICs

Unit: Billion USD



Integrated Circuits (ICs)/ Chip

DAO

DAO stands for discrete, analog, and others, which include optoelectronics and sensors.

Logic

Logic chips perform complex calculations and operations, acting as the "brains" of electronic devices, e.g. CPU, GPU

Memory

Memory chips serve as a fundamental component in data storage and processing across countless applications, e.g. RAM, ROM.

Semiconductor devices

Diodes, transistors, similar semiconductor devices; including photovoltaic cells assembled or not in modules or panels, light-emitting diodes (LED), mounted piezo-electric crystals.

Product definition & coverage

Key markets & growth

- **Top 5 markets:** Hong Kong, Singapore, Germany, Philippines, US
- **CAGR (2020-2024):** 5.2%

- **Top 5 markets:** Japan, Hong Kong, China, Taiwan, Mexico
- **CAGR (2020-2024):** 9.5%

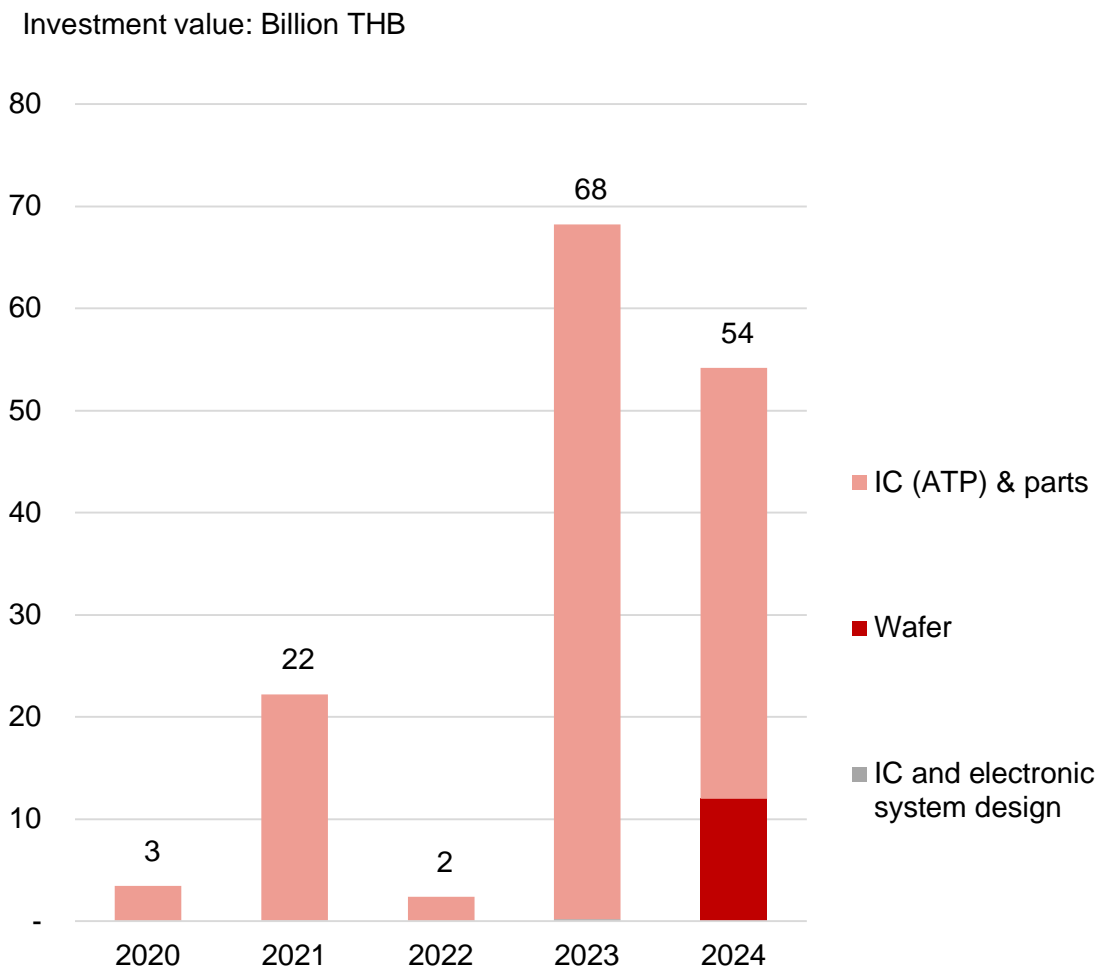
- **Top 5 markets:** Singapore, Taiwan, Hong Kong, China, Malaysia
- **CAGR (2020-2024):** -9%

- **Top 5 markets:** US, Hong Kong, Japan, India, China
- **CAGR (2020-2024):** 10%

II. Thailand's semiconductor and electronics industry landscape: Semiconductor & ICs industry (4/5)

- Thailand experienced a dramatic surge in semiconductor investment, reaching THB 68 billion in 2023, driven by US-China trade tensions and comprehensive BOI incentive reforms starting in 2021.

BOI approval projects for semiconductor investment



Great acceleration in semiconductor in Thailand

- There is the great acceleration in the investment in semiconductor industry in 2023 with the investment value of approximately THB 68 billion and sustained momentum in 2024.
- The surge in investment is driven by several factors, including stricter U.S. restrictions on China's semiconductor access, which have spurred the adoption of a China Plus One strategy, the enhancement of BOI incentives, and the country's robust infrastructure readiness coupled with strong back-end operations.




A comprehensive incentive framework for the entire value chain

- Starting in 2021, BOI introduced an updated investment policy that includes a new category for investment promotion covering front-end semiconductor operations, while also enhancing benefits for significant investments in IC assembly operations and parts manufacturing.
- **Design:** 8-year corporate income tax exemption for IC and electronic design.
- **Wafer:** 13-year corporate income tax exemption for wafer manufacturing
- **IC assembly and test:** Extend the corporate income tax exemption period for significant investments in IC and parts manufacturing from 5 years to 8 years.

II. Thailand's semiconductor and electronics industry landscape: Semiconductor & ICs industry (5/5)

- Thailand is experiencing unprecedented momentum in high-tech semiconductor manufacturing, with three major international companies making substantial investments totaling over THB 80 billion.

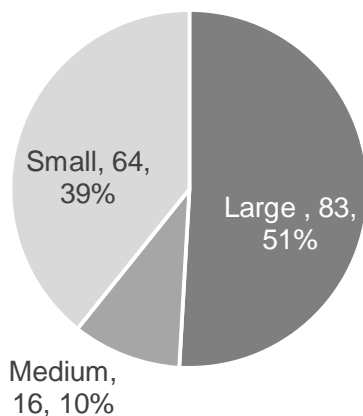
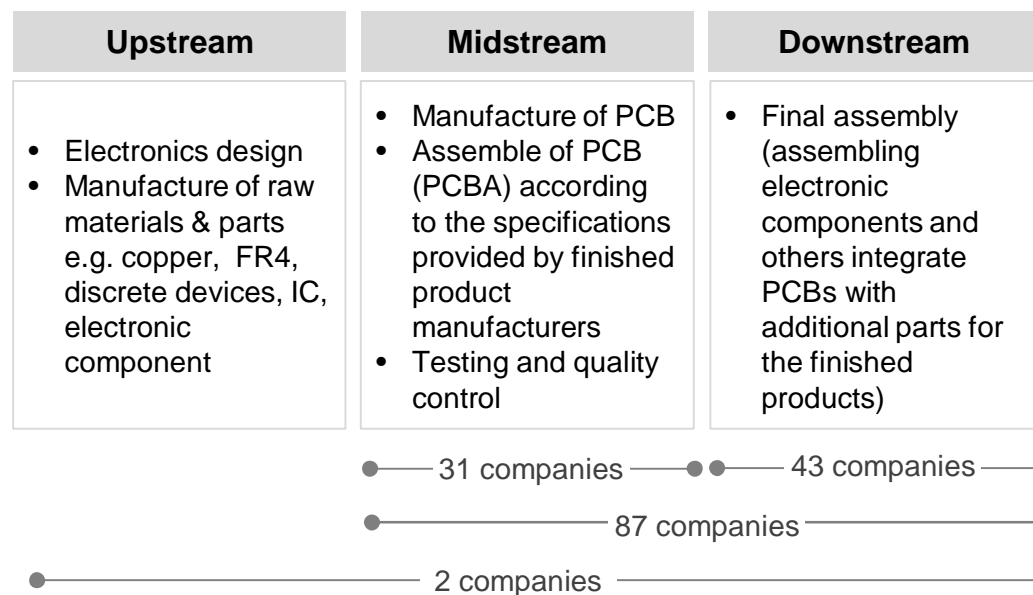
Recent mega investment in front-end semiconductor and advanced electronics

 <p>To produce high-precision machinery parts used in wafer fab</p>	<ul style="list-style-type: none"> • UNIQUE Integrated Technology Co., Ltd. (a subsidiary of Foxsemicon Integrated Technology Inc. of Taiwan) has invested approximately THB 10,500 million to build two plants in EEC (Chonburi and Rayong province) • The plants are dedicated to manufacturing critical components for semiconductor equipment, such as high-vacuum and high-purity parts and important modules which tailored made for Etching, Thin Film and CMP process, all essential elements in the manufacturing of the machinery used in wafer fabrication.
 <p>SiC wafer fabrication</p>	<ul style="list-style-type: none"> • Hana Microelectronics and PTT Group established a JV named FT1 Corporation Ltd., which is set to operate silicon carbide (SiC) wafer fabrication facility. • The company is expected to invest approximately THB 11,500 million in the first phase of its operations. During this phase, it will establish a semiconductor foundry that specializes in manufacturing wafers in both 6-inch and 8-inch sizes. The factory is expected to start operation by mid-2027. • The outstanding feature of SiC wafers, particularly the ability to tolerate high electric currents and resist heat making it suitable for power electronics applications such as data center servers, EV charging devices, and electrical conversion devices within energy storage systems.
 <p>To produce power module</p>	<ul style="list-style-type: none"> • Infineon Technologies (Germany) will invest around Euro 1.6 billion (approximately THB 59 billion) to the new facility to operate back-end fabrication, which is advanced packaging for power module, which is the key components for electric vehicles, renewable energy systems, and industrial applications. • This funding will be used to build cutting-edge cleanrooms and production lines, implement advanced technologies for power module production, support workforce training and development initiatives, and strengthen supply chain integration along with local partnerships. • The factory is expected to start operation by 2027.

II. Thailand's semiconductor and electronics industry landscape: PCB/ PCBA industry (1/5)

- With over five decades of evolution and global investment, the PCB/PCBA industry in Thailand is mature with advanced technology.

Thailand's PCB/PCBA Industry Supply Chain



Relatively mature PCB industry, supported by significant foreign investment

- The industry has been developing continuously for over 50 years.
- There is sustained interest from foreign investors and entrepreneurs in Thailand's printed circuit board industry.
- Most manufacturers are backed by foreign investments or operate as joint ventures with partners from East Asian countries, as Taiwan, China, Japan, and Hong Kong. In these joint ventures, foreign shareholders typically hold executive positions to oversee production and management.
- As of 2023, Thailand accounts for 4% of the global PCB production capacity and expected to increase to 10% within the next few years as global PCB manufacturers continue expanding their investments in the country.

Concentrating on midstream to downstream activities, requires import reliance

- According to ThaiEEI, as of 2023, there are 163 PCB/PCBA manufacturers in Thailand, half of which are large-sized manufactures.
- Almost all of these companies operate primarily in the midstream and downstream phases of production, with only two companies functioning as integrated manufacturers that cover the full range of activities from upstream to downstream.
- The major raw materials, such as application-specific integrated circuits (ASICs), which are custom-designed for a particular task or application, PCBs, copper-clad laminates, resins, and specialty chemicals, electronic components, need to be imported from abroad, especially from the customer's parent companies.

II. Thailand's semiconductor and electronics industry landscape: PCB/ PCBA industry (2/5)

- Thailand's printed circuit industry primarily operates in the downstream production, focusing on multi-layer and high-density boards manufacturing.

Examples of PCB/PCBA manufacturers and their operation in Thailand

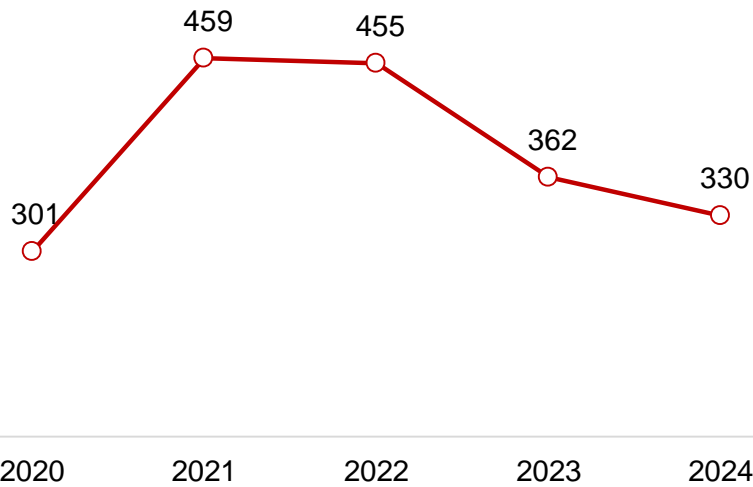
	Company	Main products/ services in Thailand
PCB manufacturers	KCE Electronics	Key parts: Laminate, Prepreg, chemical products (alkaline etching chemical and tin stripper chemical) PCBs: Double-sided PCBs, Multi-layer PCBs, HDI PCBs, Semi-flex PCBs
	Kingboard Laminate Manufacturing	Parts: Laminate, Prepreg, Copper Clad Laminate (CCL)
	Chin Poon Electronics	PCBs: Single-sided PCBs, Double-sided PCBs, Multi-layer PCBs (~26L), HDI & IVH, flexible PCBs, Heavy Copper (~14oz)
Electronic Manufacturing Service (EMS) companies	Hana Microelectronics	COB PCB assembly for electric appliances and other electronic devices
	Celestica (Thailand)	PCBA, Optical Transceivers Signal Multi-Chip Module, On Board Optics Module, High Speed Optical Transceiver
	Fabrinet	Optical Modulator, Optical Laser Source, Optical Transmitter Module, Optical Receiver Module, Optical Amplifier and Optical Automotive Module
	Stars Microelectronics	PCB and FPC assembly with several method including COB, COF, FOG, FOB mainly for audio and video device, IoT device, and industrial module
	Elec & Eltek (Thailand)	Multi-layer PCB, PCB for HDD, PCBA for automotive parts
	Kyoden (Thailand)	Single-sided PCBs, Double-sided PCBs, Multi-layer PCBs (up to 14 layers)
	Hansol Technics	SMT PCB assembly for automotive (gear box, LED lamp) and home appliances (refrigerator, air con)

II. Thailand's semiconductor and electronics industry landscape: PCB/ PCBA industry (3/5)

- PCB manufacturers in Thailand primarily produce for export (more than 70% of the sales volume).
- The remaining 28% is distributed domestically to serve the demand for several manufacturing products, such as automotive equipment, electrical appliances, etc.

Thailand's production of PCBA

Unit: Million pieces

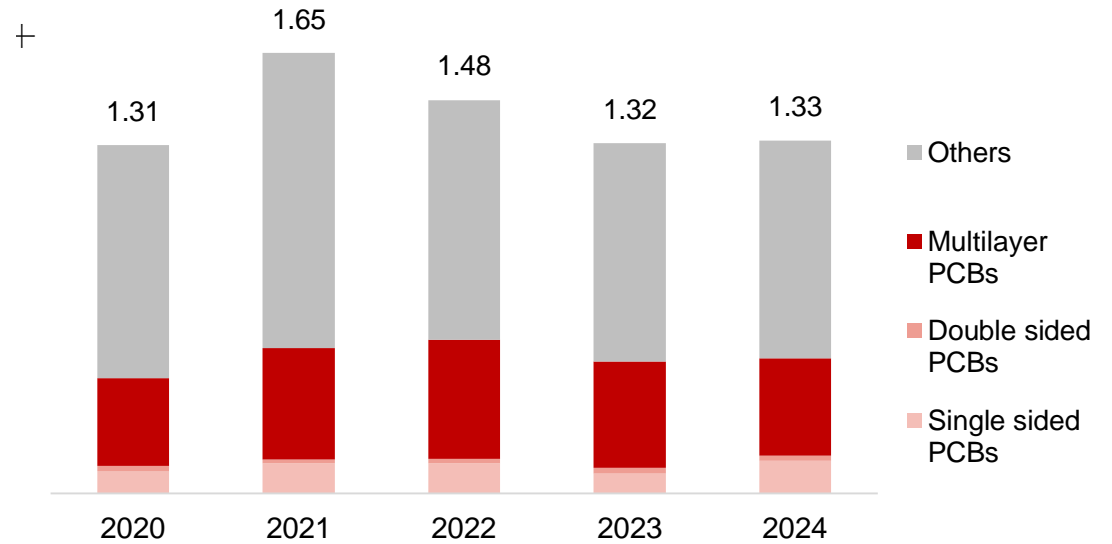


Share by sales channel in 2024



Thailand's export of PCBs

Unit: Billion USD



2.7%

2.7%

2.5%

2.6%

2.5%

% to World export

Top 3 export destinations in 2024



1. China
15%



2. Japan
15%



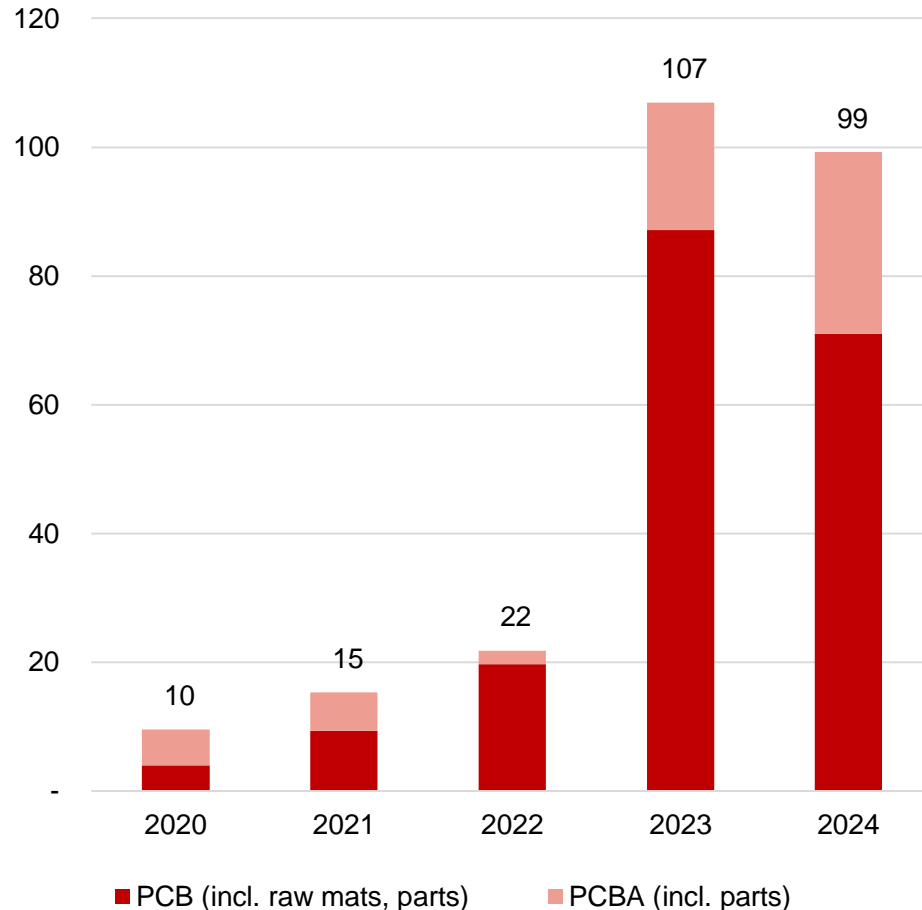
3. US
13%

II. Thailand's semiconductor and electronics industry landscape: PCB/ PCBA industry (4/5)

- Thailand's PCB industry has experienced a significant surge in upstream investment, addressing critical gaps in the supply chain while expanding into advanced manufacturing capabilities.

BOI approval projects for PCB/ PCBA investment

Value: Billion THB



Strategic investment trends in Thailand's PCB industry: From supply chain localization to advanced manufacturing

- According to BOI investment approval data, the combined investment in PCB and PCBA exceeded THB 100 billion in 2023 and sustain in 2024, which is a clear parallel emerging with the semiconductor industry.
- The Thai Government has strategically positioned the country to become the regional production hub for PCBs and assembled PCBs, implementing attractive investment incentives including an 8-year corporate income tax exemption for substantial capital investment.
- Recent investments have focused on establishing domestic production of essential components such as prepreg and copper clad laminate (CCL), which are fundamental materials for PCB manufacturing that have historically been imported.
- This strategic shift toward localizing key components represents a crucial step in reducing supply chain dependencies and strengthening Thailand's position as a regional PCB hub.
- Simultaneously, the industry has witnessed substantial investments in advanced PCB technologies, including flexible printed circuits (FPC) and high-density interconnect (HDI) multi-layer boards. These sophisticated PCB solutions are specifically designed to meet the demanding requirements of emerging sectors such as electric vehicles, AI servers, telecommunications infrastructure, and high-efficiency electronic devices.

II. Thailand's semiconductor and electronics industry landscape: PCB/ PCBA industry (5/5)

- The substantial investment in PCB industry in Thailand during the last 2 years were led by the global leading manufacturers from China, Taiwan, and Japan.

Mega investment projects in PCB Industry in Thailand

Key components

- **Unimicron**, a leader in high-end chip substrates and PCBs for AI data centers, announced a THB 1.26 billion investment to establish a subsidiary in Thailand in 2023. The factory, set to begin mass production in the second half of 2025, will initially produce **PCBs for game consoles and satellites, and chip substrates**. Additionally, Unimicron has secured land for up to five plants, underscoring its long-term commitment to Thailand's role in the global PCB supply chain.
- **Cheng Yi Technology (Thailand) Co., Ltd.** has invested around THB 6.15 billion to produce **prepreg and copper clad laminate (CCL)**, important components used in the production of printed circuit boards (PCB).
- **Taiflex Scientific Co., Ltd.**, a global leader in advanced flexible printed circuit (FPC) materials with a headquarter in Taiwan, has Invested US\$35 million to manufacture **adhesive-less FCCL**, with mass production scheduled to begin in mid-2024. The project is targeting the significant potential in the Southeast Asian automotive market.

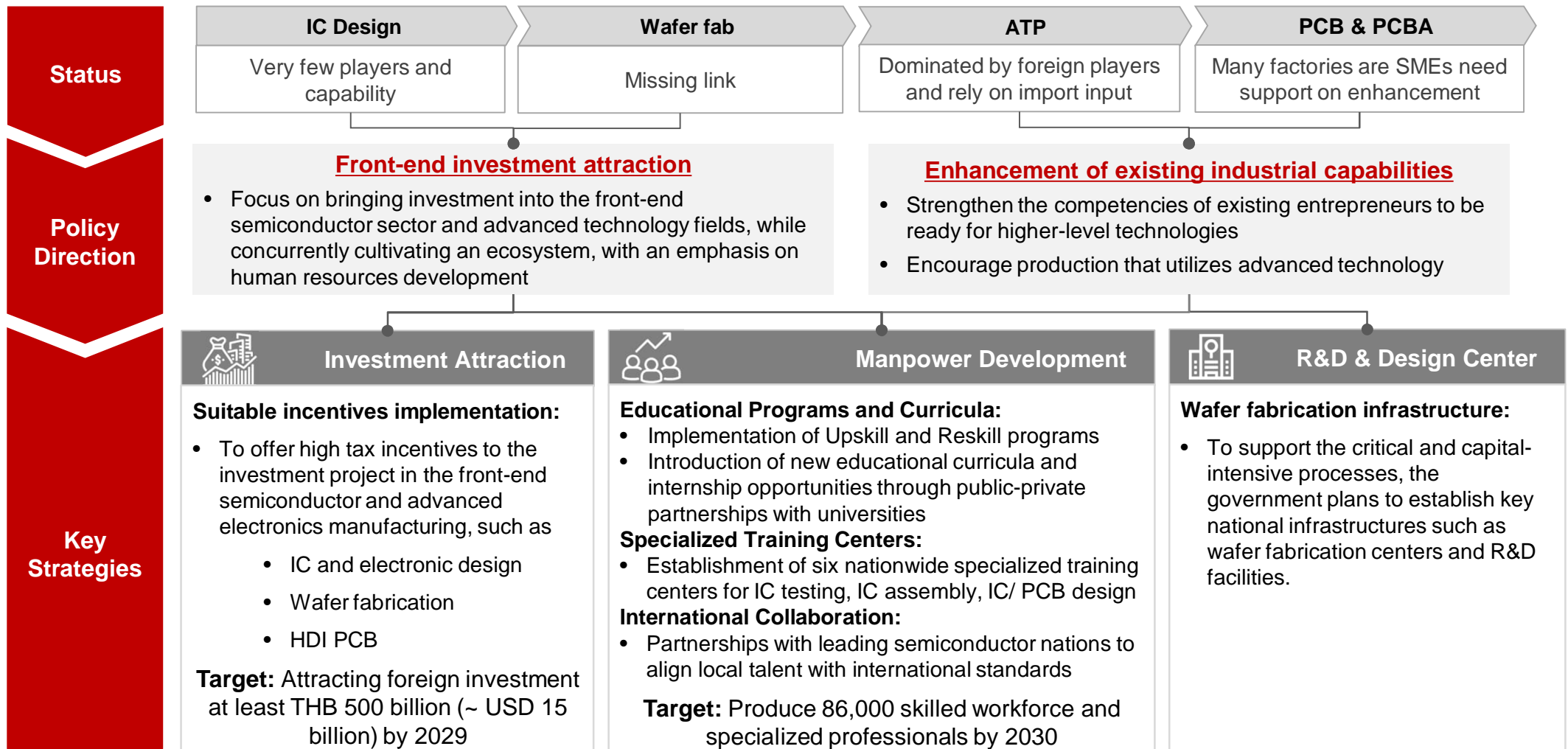
Advanced PCBs

- **Mektec Manufacturing Corporation (Thailand) Co., Ltd.**, a subsidiary of NOK Corporation - Japan's leading PCB manufacturer, is investing THB 920 million in advanced technology to enhance their production of flexible PCBs. This investment aims to expand **FPCB and FPCBA production** to support the increasing orders in the electric vehicle group.
- **Well Tek Electronics**, a subsidiary of Welgao Electronics - a Chinese circuit board manufacturer, has invested THB 2.5 billion in the first phase to produce a **multi-layer high-density interconnected PCBs**, which can reach up to 30 layers of stacked circuits. In addition, the company is preparing to expand with a second phase aiming to increase PCB production capability to 50 layers.
- **Peng Shen Technology (Thailand) Co., Ltd.**, a Joint Venture of Zhen Ding Technology Group (ZDT) and Saha Group, expects to invest around THB 10 billion to construct a factory equipped with production lines **for SLP, thick HDI, and RPCB**, targeting PCB needs for the AI server, communications, and optical module markets. Additional investment of over 50 billion baht (approximately \$1.4 billion) is planned by 2030.
- **Compeq**, the world's fifth-largest PCB manufacturer based in Taiwan, has invested around THB 10.4 billion to produce **multi-layer PCBs**, which can create **up to 34 layers** of electronic circuits on a single circuit board.

III. Government policy and initiatives: Policy direction

- The policy for developing Thailand's semiconductor industry aims to transition towards front-end process and embrace advanced technologies.
- Three main pillars, consisting of investment attraction, manpower development, and R&D – will be developed simultaneously to create a strong ecosystem.

Policy direction: Strategic shift towards front-end process and advanced technology



Note: The policy direction presented in this slide is based on the published information from the Semiconductor and Advanced Electronics Strategic Framework and related plans as of May 2025, with detailed strategies currently under development.

III. Government support and initiatives: Investment incentives

- Generous tax incentives, up to 13 years exemption, are offered to attract the investment in the whole supply chain of semiconductor and PCB industry.

BOI – investment incentives for semiconductor & electronic components industry

Products/ Activities

Corporate Income Tax (CIT) exemption period ⁽¹⁾

Semiconductor & IC	Front-end	▪ Electronics design e.g. microelectronics, optoelectronics or embedded system	▪ 8 years
		▪ Wafer	▪ 13 years
	Back-end	▪ Wafer sort, grinding, sawed dice, testing ▪ IC testing, IC module	▪ 5 years for the project with machinery investment of less than THB 1.5 billion ▪ 8 years for the project with machinery investment of at least THB 1.5 billion
Electronic passive components ⁽²⁾	▪ Surface-mount devices		▪ 5 years for the project with machinery investment of less than THB 1.5 billion ▪ 8 years for the project with machinery investment of at least THB 1.5 billion
	▪ Through hole devices		▪ 3 years
PCB	▪ High-Density Interconnect (HDI) PCB ▪ Flexible PCB or multi-layer PCB		▪ 5 years for the project with machinery investment of less than THB 1.5 billion ▪ 8 years for the project with machinery investment of at least THB 1.5 billion
	▪ Services in key processes to support manufacture of PCB e.g. Lamination, Drilling, Plating, Routing		▪ 3 years for the project with machinery investment of less than THB 1.0 billion
	▪ PCB raw materials: Copper Clad Lamination (CCL), Flexible Copper Clad Laminate (FCCL), and Prepregs		▪ 5 years for the project with machinery investment of less than THB 1.5 billion ▪ 8 years for the project with machinery investment of at least THB 1.5 billion
PCBA	▪ PCBA, which uses the surface mount technology (SMT) to the whole production line		▪ 3 years for the project with machinery investment of less than THB 0.5 billion ▪ 5 years for the project with machinery investment of at least THB 0.5 billion

Note: (1) Excluding manufacturing of wafer, the projects with further investment in R&D will be eligible to additional CIT exemption for up to 5 years. The number of additional years of tax incentives depends on the amount of R&D investment.

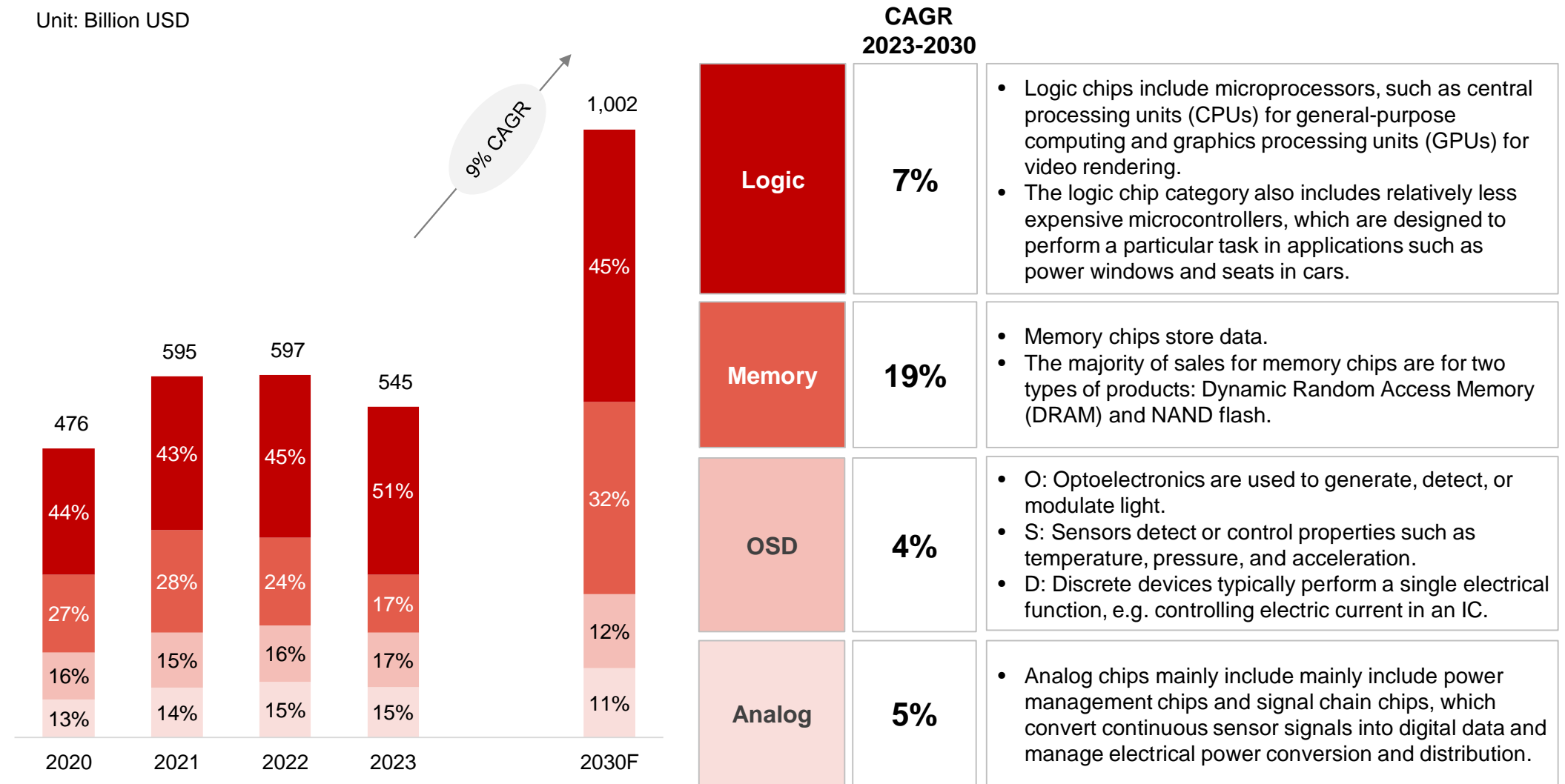
(2) e.g. resistors, capacitors, inductors

IV. Future outlook: Global semiconductor market trend

- Global semiconductor market are projected to reach USD 1 trillion by 2030 with 9% CAGR (2023-2030).
- Logic will remain to dominate the semiconductor market with the remarkable growth of memory chips, which will be driven by several factors include the growth of AI, IoT, data storage, cloud computing, etc.

Global semiconductor market by component type






Unit: Billion USD



IV. Future outlook: Emerging chip demand and PCB requirements

- By 2030, computing, telecommunications, and automotive sector will account for 85% of global semiconductor demand, driving requirements for advanced logic, memory, and analog chips that require specialized PCB technologies.

2030 Semiconductor: From application and tech-driven demand to chip and PCB requirements

Share by application (2030)	Key Technology Drivers	Major chip categories	Required PCB types
 Computing 41%	<ul style="list-style-type: none"> • AI/ ML: Driving demand for high-performance GPUs and specialized AI chips • Data Center/ Cloud: Fueling server processor and memory chip demand 	Logic & Memory: MCUs, HBM, GPUs, FPGAs, AI ASICs	Multi-layer PCB, HDI PCB, Substrate PCB
 Telecommunications 31%	<ul style="list-style-type: none"> • Implementation of 5G & 6G networks 	Analog: RF ICs, ASICs, Analog ICs	HDI PCB, Multi-layer PCB
 Automotive sector 13%	<ul style="list-style-type: none"> • A shift towards EVs: Requiring 3,000+ chips and 100+ MEM sensors per vehicle, power electronics 	OSD & Logic: Power ICs, Sensor ICs, MCUs	Metal Core PCB, Rigid PCB (thermal management substrates, high current-carrying capacity)
 Industrial sector 9%	<ul style="list-style-type: none"> • Increased adoption of IoT technologies (factory automation, smart factory) 	OSD, Analog, Logic: MCUs, Sensor ICs, Analog ICs	Multi-layer PCB, Rigid PCB
 Consumer electronics 6%	<ul style="list-style-type: none"> • Rising demand for advanced semiconductors in smartphones, wearables 	Memory, Logic, OSD: DRAM, NAND, MCUs, Display Drivers	HDI PCB, Multi-layer PCB, Flexible PCB

Abbreviations: MEM (Microelectromechanical System), HBM (High-Bandwidth Memory), MCUs (Microcontroller Units), GPUs (Graphics processing units), FPGAs (Field Programmable Gate Arrays), ASICs (Application-specific Integrated Circuits), RFIC (Radio Frequency Integrated Circuit)

IV. Future outlook: Trend towards supply chain diversification

- Escalating US-China semiconductor trade conflicts have driven multinational corporations to adopt “China Plus One” strategies, simultaneously boosting Southeast Asian manufacturing growth.

Supply chain diversification amid US-China tech tensions

Geopolitical Trade Tensions

- The escalation of US-China trade conflicts, which began in 2018 and intensified with ongoing American sanctions targeting Chinese technology companies, has fundamentally altered global supply chain strategies.
- The United States has deployed export controls and sanctions to restrict China's access to advanced semiconductor manufacturing equipment, aiming to slow China's development of cutting-edge chip technology.
- China has countered by boosting domestic investment in chip manufacturing to decrease dependence on international suppliers.
- The tension are likely to persist and potentially escalate further with both nations viewing semiconductor capabilities as critical to national security, technological leadership, and economic prosperity.

“China Plus One” Strategy Emergence

- The sustained trade tensions and US sanctions on Chinese tech firms have prompted multinational corporations to adopt “China Plus One” diversification strategies.
- This approach involves maintaining operations in China while simultaneously establishing alternative manufacturing bases to reduce risk exposure.

Southeast Asian Manufacturing Growth

- The friend-shoring movement has gained significant momentum in Southeast Asia, particularly in semiconductor and electronics manufacturing services (EMS) companies.
- The semiconductor trade decoupling has produced measurable positive effects for ASEAN nations.
- According to Trade Map data, US semiconductor imports from ASEAN sources showed dramatic increases with CAGR 18% (2020-2024). Conversely, US imports from China declined by approximately 12% during the same period.

United States import of semiconductor devices*

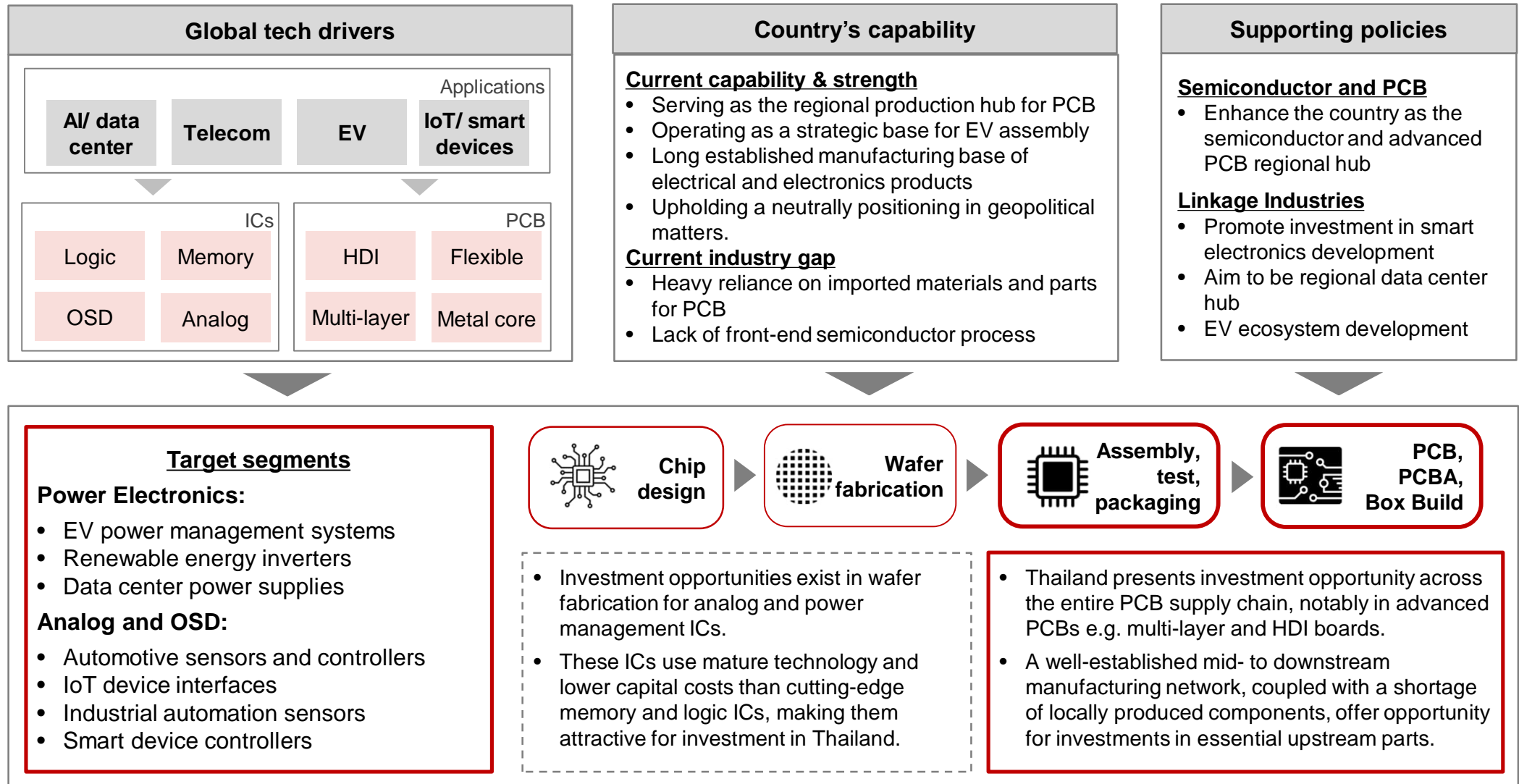
	2020		2024		CAGR 2020-2024
	Mil. USD	Mkt Share	Mil. USD	Mkt Share	
Viet Nam	2,539	19%	5,846	25%	23%
Thailand	1,546	12%	3,604	15%	24%
Malaysia	3,169	24%	3,401	15%	2%
Cambodia	133	1%	1,411	6%	80%
Others	501	4%	1,274	5%	26%
ASEAN	7,889	59%	15,536	67%	18%
China	1,088	8%	642	3%	-12%
Total	13,263	100%	23,320	100%	15%

Note: *HS Code 8541: Semiconductor devices, including diodes, transistors, and similar devices, as well as photosensitive semiconductors, including photovoltaic cells, and light-emitting diodes (LEDs)

V. Business Opportunities in Thailand

- The global market growth and the country's capability create strong investment opportunities in back-end semiconductors and the whole supply chain of advanced PCB.

Potential investment areas in Thailand's semiconductor and electronics industry



VI. Conclusion

Although Thailand's share in the global semiconductor market is small; it plays a vital role in the international supply chain. The country specializes in back-end operations and downstream production, notably in sectors such as PCB and PCBA manufacturing.

Although its capabilities in front-end processes remain limited, the country has emerged as an essential manufacturing hub, hosting a diverse ecosystem of foreign IDMs, EMS providers, and OSAT facilities. This robust production base supports a wide array of semiconductor products, with PCB manufacturers predominantly focused on advanced multi-layer and high-density technologies for export markets. Significant investments from leading global firms, particularly driven by the surge in semiconductor demand and external pressures like US-China trade tensions, underscore Thailand's strategic importance in the regional supply chain.

Government policies have further bolstered this momentum by offering generous tax incentives and comprehensive reforms, such as those initiated by the BOI, to attract investment across the entire semiconductor value chain. These measures, centered on investment attraction, manpower development, and R&D, aim to transition Thailand towards more advanced front-end processes while reinforcing its strong presence in back-end manufacturing.

With the global semiconductor market projected to reach USD 1 trillion by 2030, alongside rapid growth in sectors like computing, telecommunications, and automotive, Thailand is well-positioned to capitalize on emerging opportunities and drive further advancements in the semiconductor and PCB industries.

Thailand presents significant investment opportunities in the power electronics and analog semiconductor sectors. By leveraging the country's production capacity as a key regional hub, investors can mitigate geopolitical risks while effectively meeting the strong demand in the Asia Pacific market.

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