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Mapping ASEAN's position in the global semiconductor industry

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Executive summary

Through a mix of industrial policies, targeted foreign investment, and pragmatic diplomacy, Southeast Asia is positioning itself to capture a larger share of the semiconductor value chain amid growing US-China competition.

The semiconductor industry is undergoing a profound global realignment, and the Association of Southeast Asian Nations (ASEAN) economies are emerging as increasingly essential nodes in this transformation. Through a mix of industrial policies, targeted foreign investment, and pragmatic diplomacy, Southeast Asia is positioning itself to capture a larger share of the semiconductor value chain amid growing US-China competition.

ASEAN's rise in the semiconductor ecosystem reflects its deep manufacturing base, competitive labor, and integration into global trade networks. The region's share of semiconductor export growth worldwide rose from around 20% in 2015 to nearly 30% by 2024, led by analog and optoelectronic, sensor, and discrete (OSD) components. Malaysia and Singapore dominate high-value production and testing, while Vietnam and Thailand are advancing rapidly through new assembly, packaging, and printed circuit board (PCB) facilities.

Governments are deploying a range of industrial policies and state capitalist efforts to move up the value chain. Malaysia and Vietnam have developed policies with similar structures and long-term objectives for the strategic development of their semiconductor industries. They combine fiscal incentives, workforce training, and technology transfer to strengthen local capabilities in integrated circuit (IC) design and advanced packaging. Singapore focuses on sustaining its global leadership in high-end research and development (R&D) and compound materials under the

Supply chain diversification efforts as a result of US-China strategic and trade frictions are reshaping opportunities and challenges in Southeast Asia.

Supply chain diversification efforts have made ASEAN a key balancing ground between competing technological blocs.

Research, Innovation and Enterprise (RIE) 2025 Plan, while Thailand has initiated a national semiconductor framework to integrate its electronics and electric vehicle (EV) industries.

Almost all strategies aim to indigenize the semiconductor industry, despite the presence of strong dependencies, as evidenced by the analysis of trade concentration which remains high. Singapore and Malaysia have highly concentrated imports of analog chips, while Thai and Vietnamese exports are bound primarily to the US, exposing these countries to potential tariff threats. Nevertheless, diversification is underway, as new trade and investment partners, such as India and Taiwan, are emerging, along with several new high-level Comprehensive Strategic Partnerships (CSPs) and industrial deals.

US-China strategic and trade frictions are reshaping opportunities and challenges in the region. While Southeast Asia's policymakers have managed to avoid semiconductor tariffs, data center issues have exposed risks and faultlines of geopolitical diversification. Supply chain diversification efforts, however, have redirected investment flows into the region. Major projects from the US, Taiwanese, and European firms are reshaping the ecosystems of Malaysia, Singapore, and Vietnam, while Chinese and Taiwanese investors are expanding in Thailand. These dynamics have made ASEAN a key balancing ground between competing technological blocs.

The report finds that ASEAN's emerging position is one of strategic interdependence — benefiting from global capital and technology inflows, remaining cautious about external policy shocks, yet still vulnerable to supply constraints. Demand for data centers and artificial intelligence (AI)-related chips, coupled with increasing localization requirements, presents both opportunities and risks to this trajectory. Sustaining momentum will require coordinated regional initiatives, such as the ASEAN Framework for Integrated Semiconductor Supply Chain (AFISS), as well as expanded R&D investment and continued skill development.

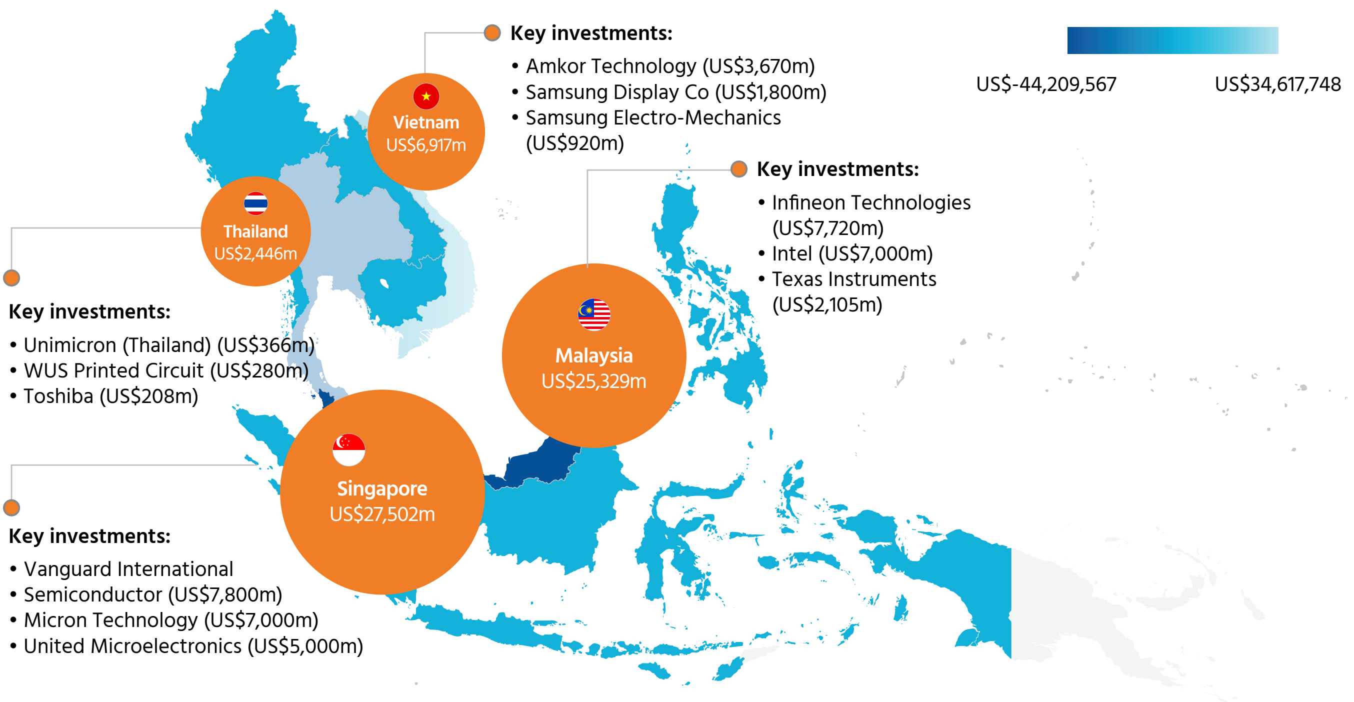
1. Introduction

Today, policymakers and industry leaders in ASEAN are working to establish more self-sufficient semiconductor ecosystems, anchored in domestic innovation and supported by interconnected regional supply chains.

The global semiconductor industry stands at a pivotal moment — a convergence of rapid expansion and intensifying geopolitical competition. Semiconductors are the backbone of modern technology, enabling advanced computing, communications, automotive systems, AI, and next-generation defense applications. Global sales are forecasted to reach US$697 billion in 2025 — an all-time high — and exceed US$1 trillion by 2030, underscoring the industry's centrality to digital and industrial transformation.[1]

Increasingly, ASEAN economies are becoming key players in this narrative. As some of the fastest-growing markets internationally, they boast robust manufacturing ecosystems, competitive labor, and deep integration into global trade networks. Building on their long-standing traditions of industrial policy and state intervention, ASEAN governments are pursuing new strategies to advance beyond assembly and testing into higher-value semiconductor segments. Until recently, these economies were viewed primarily as sites for foreign-owned manufacturing. Today, policymakers and industry leaders are working to establish more self-sufficient semiconductor ecosystems, anchored in domestic innovation and supported by interconnected regional supply chains.

Figure 1 – **Trade balance and foreign investments in semiconductors in Southeast Asia (2024)**



Source: Author's elaboration based on UN Comtrade data (Trade Map)

National efforts are unfolding within the broader context of US-China strategic competition, which is driving the fragmentation and realignment of global technology supply chains, while major players such as the EU, Taiwan, Japan, and South Korea are also deepening partnerships with Southeast Asia to strengthen supply chain resilience.

This report examines how ASEAN countries are leveraging state capitalism and industrial policies to capture greater value within the semiconductor industry. It focuses on four leading countries — Singapore, Malaysia, Vietnam, and Thailand — to analyze how trade, investment, and technology policies are reshaping their roles in the global value chain. The analysis situates these national efforts within the broader context of US-China strategic competition, which is driving the fragmentation and realignment of global technology supply chains. At the same time, major players such as the European Union (EU), Taiwan, Japan, and South Korea are also deepening partnerships with Southeast Asia to strengthen supply chain resilience.

Methodologically, the study combines trade data (Trade Map, based on UN Comtrade), investment intelligence (fDi Markets), and primary interviews with experts to identify trends in industrial policy and investment attraction. It employs a novel framework that categorizes integrated circuits (ICs) into five main chip types — logic, memory, analog, system-on-chip (SoC), and OSD — to capture differences in production specialization across the region.[2] OSD refers to a major class of chips used for sensing light. Due to limited data on SoCs, the analysis concentrates on the other four categories.

The report seeks to answer five key questions:

1. How are ASEAN states using industrial policy to climb up the semiconductor value chain?
2. How do they balance the interests of the US and China?
3. How are US trade and export controls influencing investment?
4. To what extent do US-China tensions create new opportunities or dependencies for ASEAN?
5. What are the implications of ASEAN's emerging position for global technology governance?

The remainder of this report comprises four main sections. Section Two examines ASEAN's role in the semiconductor supply chain through two analytical lenses: trade and foreign direct investment (FDI). The subsequent sections examine national industrial strategies (section Three), geopolitical positioning between Washington and Beijing (section Four), and finally, emerging risks and opportunities for regional coordination and resilience (section Five).

2. ASEAN's role in the semiconductor supply chain

Over the past decade, ASEAN economies contributed to half of the global growth in analog semiconductors (power chips), 40% in OSD exports, 25% in logic chips, and around 16%–19% in memory chips.

Trade: ASEAN's powering up to future industrial transformations

ASEAN's position in the global semiconductor trade has broadened across nearly all chip types, establishing the region as both a major production base and a leading consumer market. The bloc's share of global semiconductor export growth rose from around 20% in 2015 to nearly 30% in 2024, led by analog and OSD devices. These segments showcase ASEAN's expanding capabilities in power, sensor, and discrete components, while maintaining its stable base in logic chips that accounted for a quarter of global growth. Imports grew in tandem — from about 10% to nearly 20% — fueled mainly by the rising demand for logic and memory chips. The region's trade balance remains positive, underscoring ASEAN's net contribution to global semiconductor output.

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For analog chips, ASEAN's share of world imports and exports increased significantly — from 3% and 21% in 2015 to 23% and 36% in 2024, respectively.

Figure 2 – ASEAN share of global semiconductor growth, 2015–2024

Source: Author's elaboration based on UN Comtrade data (Trade Map)

Mature hubs such as Singapore and Malaysia dominate high-value segments, while emerging players like Vietnam and Thailand are moving up the value chain through assembly, testing, and component specialization.

This segment alone is responsible for half of the global growth in analog semiconductors, with a five-year compound annual growth rate (CAGR) of 31% for imports, around five times the global rate. Within ASEAN, Malaysia and Singapore together make up approximately 18% of global imports and 33% of exports, contributing more than 80% of the region's trade growth over the past decade. Meanwhile, Vietnam's and, to a lesser extent, Indonesia's import shares have expanded considerably, likely driven by the establishment of new EV manufacturing bases and demand for power semiconductors.

For logic chips, ASEAN's position has remained stable yet significant, accounting for approximately a quarter of global trade growth over the past decade. Imports have grown slightly faster than exports, a pattern possibly linked to the rapid development of data centers across the region. In this segment, Singapore, Malaysia, and Vietnam accounted for most of the trade value and growth, with the Philippines contributing modest but consistent export expansion. This stability underlines ASEAN's embeddedness in mature logic chip value chains that serve global computing and communications industries.

For memory chips, ASEAN's trade growth has been primarily underpinned by imports, which rose from 5% of global trade in 2015 to around 12% in 2024, while exports have remained relatively steady at about 8%. Malaysia and Singapore continue to play crucial roles in this segment, with their imports expanding four- to five-fold over the last decade. However, Vietnam's import growth — fifteen times since 2015 — stands out as exceptional, reflecting the country's expanding consumer electronics and data storage sectors. Imports in the Philippines, Thailand, and Indonesia have also accelerated since the COVID-19 period, signaling broader regional diversification in downstream semiconductor demand.

Finally, ASEAN's share of global OSD exports increased from 18% to 24% over the past decade, with Singapore, Malaysia, Vietnam, and Thailand accounting for the majority of this trade. Singapore, Malaysia, and Vietnam each represent roughly 5%–7% of global OSD exports, underscoring their established industrial bases. Meanwhile, Vietnam and Thailand have experienced the fastest growth — over 12-fold and five-fold, respectively — during the last decade. This growth reflects Vietnam's transformation into an assembly and testing hub, as well as Thailand's deepening specialization in automotive electronics and integrated manufacturing.

In sum, trade trends reveal a clear pattern of upgrading. Mature hubs such as Singapore and Malaysia dominate high-value segments, while emerging players like Vietnam and Thailand are moving up the value chain through assembly, testing, and component specialization. This trade dynamism, coupled with deep regional supply chain integration, has made ASEAN an increasingly attractive destination for global semiconductor investment.

FDI in Southeast Asia: New fabs, advanced technologies, and R&D centers

Global FDI in the semiconductor industry has surged over the last five years. The US remains the most significant source and destination, channeling over US$315 billion across 128 projects worldwide, while receiving US$206 billion as a result of the CHIPS and Science Act's luring incentives.[3]

Since 2021, several large-scale projects have emerged predominantly between Taiwan and the US. Notably, Taiwan Semiconductor Manufacturing Company (TSMC) made the single largest foreign investment in US history, expanding with three new fabs, two advanced packaging plants, and an R&D hub to supply major AI chip clients, including Apple, Nvidia, Advanced Micro Devices (AMD), Broadcom, and Qualcomm.[4] Of the total US$165 billion project, TSMC secured US$6.6 billion in direct funding and US$5 billion in low-cost loans through US incentives.

Table 1 – Top 10 global sources and 11 destinations of semiconductor FDI, US$ million

	Destination											
Sources	**US**	**Germany**	**Japan**	**India**	**Singapore**	**Israel**	**Malaysia**	**Italy**	**Ireland**	**China**	**Vietnam**	**Total**
Taiwan	162,713 (16)	11,000 (6)	22,691 (5)	13,156 (5)	13,478 (4)	0	1,918 (5)	1,610 (1)	0	3,273 (2)	167 (3)	**230,005 (47)**
US	83,499 (62)	37,699 (16)	13,829 (14)	5,321 (33)	7,286 (5)	25,055 (2)	10,854 (7)	5,085 (5)	14,450 (7)	2,800 (14)	4,897 (11)	**210,776 (176)**
South Korea	50,205 (15)	0.5 (1)	397 (4)	244 (4)	0	0	820 (4)	0	0	386 (2)	1,181 (5)	**53,232 (35)**
UAE	14,403 (5)	450 (1)	0	66 (2)	4,450 (2)	0	24 (1)	0	0	0	0	**19,393 (11)**
Germany	1,852 (5)	0	153 (3)	96 (2)	91 (2)	0	8,068 (3)	24 (1)	49 (2)	83 (1)	111 (2)	**10,526 (21)**
Switzerland	348 (3)	10 (3)	10 (2)	0	0	0	85 (1)	5,881 (5)	0	2400 (1)	N/A	**8,734 (15)**
Singapore	342 (2)	24 (1)	0	3,222 (1)	0	0	68 (2)	3,600 (1)	0	0	N/A	**7,256 (7)**
Japan	1,249 (13)	0	0	2,228 (13)	341 (2)	4 (1)	1,314 (8)	0	40 (1)	153 (2)	N/A	**5,329 (40)**
China	299 (4)	1,570 (8)	0	1,601 (1)	331 (3)	0	987 (7)	0	0	0	5 (1)	**4,793 (24)**
Israel	41 (2)	0.5 (1)	80 (3)	3,000 (2)	0	0	0	0	0	0	N/A	**3,122 (8)**
Total	**314,950 (127)**	**50,754 (37)**	**37,160 (31)**	**28,935 (63)**	**25,978 (18)**	**25,059 (3)**	**24,138 (38)**	**16,199 (13)**	**14,539 (10)**	**9,095 (22)**	**6,361 (22)**	

Note: Figures in brackets refer to number of investment projects.
Source: fDi markets

Singapore and Malaysia alone account for three-quarters of the total semiconductor FDI value, reflecting their consistent policies, high-quality infrastructure, and skilled talent pools.

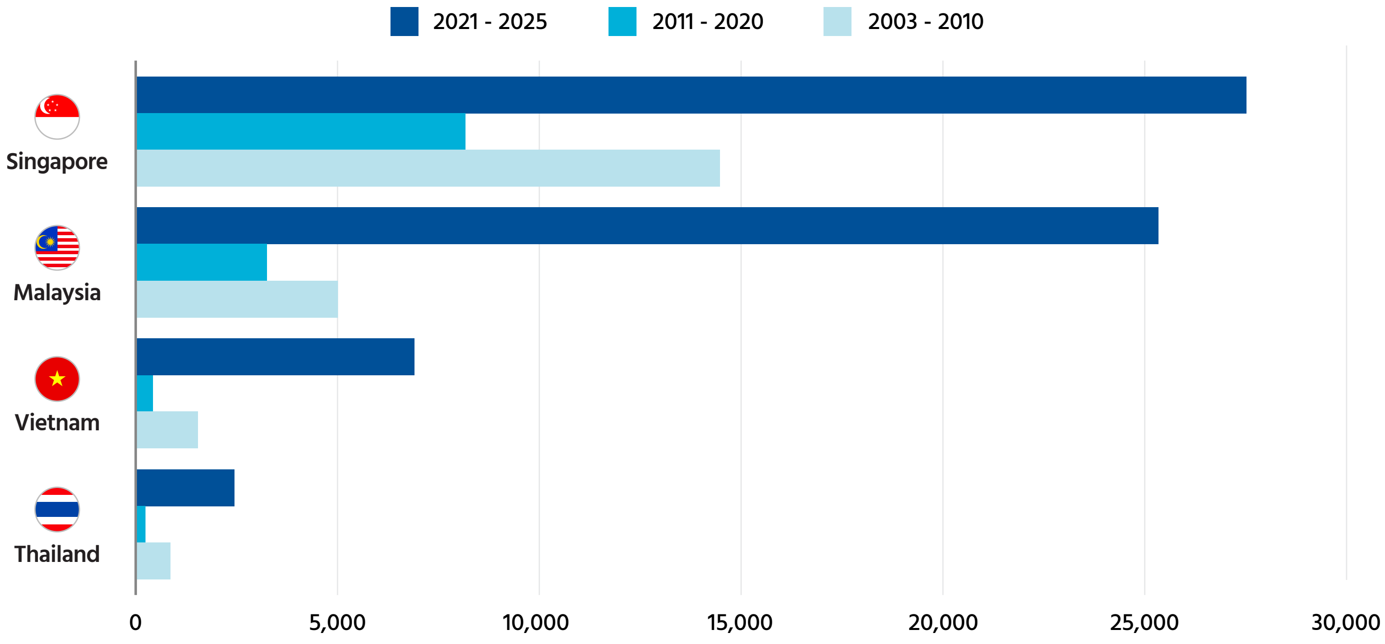
Among ASEAN economies, Singapore stands out as a source of outbound investment — most notably, IGSS Ventures' US$3.2 billion high-tech park in Tamil Nadu, India (2022)[5] and Silicon Box's €3.5 billion fab in Italy (2024), of which €1.3 billion was co-funded by the Italian government.[6]

While ASEAN's outbound FDI remains modest, inward investment has accelerated sharply. Since 2020, the region has attracted about US$60.8 billion in semiconductor FDI.[7] Almost 80% of this sum is concentrated in 12 investments in Singapore and Malaysia, and one in Vietnam. These investments support new fabs, the expansion of existing ones, and new bases for advanced packaging or advanced materials manufacturing bases.

Singapore and Malaysia alone account for three-quarters of the total FDI value, reflecting their consistent policies, high-quality infrastructure, and skilled talent pools. Investment levels in Singapore over the last five years are triple those of the previous decade, while those in Malaysia have risen eight-fold. Thailand has begun to attract smaller but strategically important projects, particularly in PCBs and EV electronics. Meanwhile, the Philippines and Indonesia show low or declining investor momentum in the pure semiconductor segment.

Overall, ASEAN's investment landscape mirrors its trade trajectory, with Singapore and Malaysia at the core, Vietnam on the rise, and Thailand expanding its role. This pattern highlights ASEAN's evolving competitiveness as a multi-hub region, integrating diverse specializations across the semiconductor value chain.

Figure 3 – **FDI in semiconductor industries, selected ASEAN countries, 2021–2025 (US$ million)**



Source: fDi Markets, PCB FDI added to Thailand's 2021–25 period

3. National differentiation across ASEAN

Together, the industrial strategies and institutional approaches of Singapore, Malaysia, Vietnam, and Thailand illustrate ASEAN's pragmatic diversity: a mix of policy experimentation, strategic alignment, and competition that collectively strengthens the region's semiconductor ecosystem.

While ASEAN economies share a common ambition to capture a greater share of the global semiconductor value chain, their industrial strategies and institutional approaches differ significantly. The four countries examined — Singapore, Malaysia, Vietnam, and Thailand — represent distinct yet complementary models of state-led semiconductor development. Each blends state capitalism, industrial incentives, and foreign partnerships in varying proportions to strike a balance between growth, autonomy, and global integration. Singapore drives the region's innovation and high-end manufacturing base; Malaysia leverages strategic state intervention to move up the value chain; Vietnam pursues rapid industrial upgrading through international partnerships; and Thailand focuses on integration between electronics, automotive, and semiconductor supply chains. Together, these cases illustrate ASEAN's pragmatic diversity: a mix of policy experimentation, strategic alignment, and competition that collectively strengthens the region's semiconductor ecosystem.

Among the selected Southeast Asian countries, Malaysia and Vietnam have developed the most comprehensive and targeted industrial policies for the semiconductor industry, with Thailand soon to follow. The Thai Prime Minister commissioned the Board of Investment (BOI) to draft a national roadmap.[8] Singapore, meanwhile, continues to attract major investments and support its domestic semiconductor base under the broader umbrella of the *RIE2025 Plan* and the *Manufacturing 2030 Vision*.

When comparing policy frameworks, Vietnam and Malaysia share the most similarities. Both have adopted long-term, phased strategies to strengthen advanced packaging and expand into the IC design segment. In Malaysia, experts note that the *National Semiconductor Strategy (NSS)* drew heavily on Taiwan's experience, targeting parts of the value chain that offer both higher value-added and strong employment potential. The focus on IC design and outsourced semiconductor assembly and testing (OSAT) was deliberate: the former promises high value with smaller, skilled teams, while the latter expands job creation, albeit at lower value-added levels.

Singapore, by contrast, commands the largest public budget for technology development — although not exclusively for semiconductors — through major R&D investments in compound materials [gallium nitride (GaN)/silicon carbide (SiC)] and new wafer fabrication capacity. Despite having a more modest fiscal base, Thailand has nevertheless set ambitious workforce targets and emerged as the region's key production base for PCBs, supported by BOI incentives that have successfully attracted foreign investors. Across all four economies, governments are actively courting FDI through tax breaks, talent programs, and investment facilitation measures to strengthen the semiconductor ecosystem.

Table 2 – Comparing industrial policies and targets for the semiconductor industry across four ASEAN countries

	Flagship policy/ Plan	Strategic focus	Structure/Phases	Public funding/ Financing (USD approx.)	Targets: Investment and trade	Talent targets	Key organizations
Malaysia	NSS (May 2024)	Move from OSAT/ backend to advanced packaging, IC design, power/trailing edge fabs, and front-end equipment	**Phase 1**: Modernize OSAT > advanced packaging; grow existing fabs (power/trailing edge); seed IC design champions **Phase 2**: Attract cutting-edge fab/test and integrate local champions **Phase 3**: Build world-class Malaysian firms; attract major chip buyers	≥US$5.93B (RM 25B) fiscal support; US$0.36B (RM 1.5B) from GLCs; US$0.14B (RM 600M) soft loans by Bank Negara	US$118.5B (RM 500B) total semiconductor investments by 2030 10 firms with US$200M–1.1B (RM 14.7B) revenue 100+ local champion >US$236 M (RM 1B)	60,000 engineers upskilled by 2030	MITI/MIDA; National Semiconductor Strategic Task Force (NSSTF); CREST; MIMOS
Vietnam	Decision No. 1018/ QĐTTg (21 September 2024) — Strategy for Development of Vietnam's Semiconductor Industry to 2030, Vision 2050	Build specialized chips (AI/IoT), upgrade electronics industry, attract FDI, develop human resources, strengthen sustainability ('C = SET + 1')	**Phase 1** (2024-2030): 100 design firms; 1 fab; 10 packaging/OSAT **Phase 2** (2030-2040): 200 design firms; 2 fabs; 15 OSAT **Phase 3** (2040-2050): 300 design firms; 3 fabs; 20 OSAT	≈US$380M (₫10T) financial support; US$670M for training (of US$1.05B plan)	2030: >US$25B; 2040: >US$50B; 2050: >US$100B semiconductor output with 10–15% value add	≥50,000 engineers by 2030; >100,000 by 2040	National Steering Committee for Semiconductor Development (Chair: PM); Expert Advisory Group
Singapore	RIE2025 Plan & Manufacturing 2030 Vision	Deepen high-value semiconductor manufacturing & R&D leadership: IC design, wafer fab specialties, advanced packaging, compound materials (GaN/SiC), equipment, AI/EV/5G applications	Ongoing ecosystem approach — continuous investment & cluster strengthening (not formally phased)	S$28B (≈US$21.6B) + S$3B top up (≈US$2.3B) for R&D & advanced manufacturing	~US$13.9B (S$18B) recent semiconductor R&D and manufacturing investments; 10% of global chip output; 20% of global equipment production	~35,000 semiconductor professionals; continuous training via SkillsFuture and EDB A*STAR programs	EDB; A*STAR; Singapore Semiconductor Industry Association (SSIA)
Thailand	National Semiconductor and Advanced Electronics Strategy (2024) — framework approved by National Semiconductor Board (NSB); ThailandBOI to finalize plan (by the end of year)	Expand into higher-end segments (IC design, fab, testing, packaging); position Thailand as ASEAN node for semiconductors & advanced electronics linked to EV/IoT	Framework approved; implementation plan under development (2025 onwards).	HR development: US$211M (THB6.9B) + US$153M (THB5B) program for Training 17,500 semiconductor workers; R&D funding: US$245M (THB8B); potential US$306 M (THB1 B) for 20 years to foster "local chips"	Foreign investment target: US$15.3B (THB500B) by 2029	Train 86,000 workers (incl. 1,400 MSc/PhD researchers)	NSB (chaired by PM); BOI; subcommittees for strategy and skills

Source: Malaysia - Ministry of Investment, Trade and Industry (MITI). (2024). National Semiconductor Strategy (NSS) 2024. Government of Malaysia. Retrieved from https://www.miti.gov.my/miti/resources/NSS_141024.pdf; Business Today Malaysia. (2025, 31 July). NSS targets RM500 billion investments to power semiconductor ambitions. Retrieved from https://www.businesstoday.com.my/2025/07/31/nss-targets-rm500-billion-investments-to-power-semiconductor-ambitions/; ASEAN Briefing. (2024, 17 June). Malaysia's semiconductor growth: Can it move up the value chain? Retrieved from https://www.aseanbriefing.com/news/malaysias-semiconductor-growth-can-it-move-up-the-value-chain/; Vietnam - Government of Vietnam. (2024, 21 September). Decision No. 1018/QĐ-TTg: Strategy for Development of Vietnam's Semiconductor Industry to 2030, Vision 2050. Hanoi: Office of the Prime Minister; Viettonkin Consulting. (2024, 1 October). Vietnam's semiconductor strategy: A vision for 2030 and beyond. Retrieved from https://viettonkinconsulting.com/industry-insights/vietnams-semiconductor-strategy-a-vision-for-2030-and-beyond/; Acclime Vietnam. (2024). Vietnam semiconductor industry brief. Retrieved from https://vietnam.acclime.com/guides/vietnam-semiconductor-brief/; The Investor (2024) Vietnam sets aside $1 bln to train semiconductor workforce. Available at: https://theinvestor.vn/vietnam-sets-aside-1-bln-to-train-semiconductor-workforce-d9757.html; Singapore - Singapore Economic Development Board (EDB). (2024, August). What makes Singapore a prime location for semiconductor companies driving innovation. Retrieved from https://www.edb.gov.sg/en/business-insights/insights/what-makes-singapore-a-prime-location-for-semiconductor-companies-driving-innovation.html; Agency for Science, Technology and Research (A*STAR) (2025, March). Singapore's semiconductor rise amid global AI chip wars. Retrieved from https://www.a-star.edu.sg/News/astarNews/news/features/singapore-semiconductor-rise-ai-chip-wars; OpenGov Asia. (2025, February). Singapore advances high-performance semiconductor innovation. Retrieved from https://opengovasia.com/singapore-advances-high-performance-semiconductor-innovation/; Singapore Budget 2024. (2024). Budget Statement: RIE2025 top-up and advanced manufacturing investments. Ministry of Finance Singapore. Retrieved from https://www.singaporebudget.gov.sg; Thailand - Thailand Board of Investment (OSOS/BOI). (2024, May). Thailand's new Semiconductor Board approves framework of National Strategy and skilled workforce development to prepare for THB500 billion expected foreign investment wave. Retrieved from https://osos.boi.go.th/EN/news/2136/Thailand%E2%80%99s-New-Semiconductor-Board-Approves-Framework-of-National-Strategy-and-Skilled-Workforce-Development-to-Prepare-for-500-Billion-Baht-Expected-Foreign-Investment-Wave/; Bangkok Post. (2024, 27 May). Chips set for latest hub push. Retrieved from https://www.bangkokpost.com/thailand/general/2890343/chips-set-for-latest-hub-push; Borneo Bulletin (2024) Thailand urged to act on chip strategy. Available at: https://borneobulletin.com.bn/thailand-urged-to-act-on-chip-strategy/; Ministry of Labor, Thailand (2024) Labor minister outlines THB6.9 billion budget to upskill Thai workforce for new industries: AI, semiconductors, electrical and electronic technologies, and digital skills; emphasizes work safety and gradual move toward THB400 minimum wage and THB30 billion social security loans for job retention. Available at: https://www.mol.go.th/en/news/labour-minister-outlines-thb-6-9-billion-budget-to-upskill-thai-workforce-for-new-industries-ai-semiconductors-electrical-and-electronic-technologies-and-digital-skills-emphasizes-work-safety-and-gradual-move-toward-thb-400-minimum-wage-and-thb-30-billion-social-security-loans-for-job-retention

Table 3 – Largest investments, industrial parks, and related semiconductor types in selected countries

	Singapore	Malaysia	Vietnam	Thailand
Top FDI in last five years	Vanguard-NXP (US$7B); Micron (US$7B); UMC (US$5B); Global Foundries (US$4B)	Infineon (US$7B), Siliconware Precision Industries (SPIL, US$2.1 B), AT&S (US$1B), Texas Instruments (US$3.1B)	Amkor (US$3.6B); Samsung US$2.7B)	Unimicron (US$366M); WUS Printed (US$280M), Toshiba (US$207M)
Semiconductor type	Analog (power semiconductors – VSMC); Memory (HBM – Micron); Logic (28nm/22nm – UMC); OSD (RF and image sensors – GlobalFoundries)	Analog (SiC power semiconductors – Infineon); Advanced packaging/OSAT (SPIL); Substrate & PCB materials (AT&S); Analog & mixed-signal – TI)	Advanced packaging & testing (Amkor – OSAT); OSD & display semiconductors (Samsung OLED); Logic & AI chip design collaborations emerging	PCB and substrate manufacturing (Unimicron, WUS); Power and discrete semiconductors (Toshiba – OSD/analog)
Main industrial hubs	Pasir Ris Wafer Fab Park, Tampines Wafer Fab Park, Ang Mo Kio	Kulim Hi-Tech Park, Bayan Lepas, Bandar Cassia Technology Park	Yen Phong Industrial Park & Yen Bihn Industrial Zone	Eastern Economic Corridor, TFD Industrial Estate; Phra Nakhon Si Industrial Park

Source: fDi markets and author's own elaboration

Nearly all ASEAN countries are pursuing indigenization strategies to develop "local chips."

Nearly all ASEAN countries are pursuing indigenization strategies to develop "local chips." Singapore, which already produces around 10% of the world's chips, continues to pioneer in advanced R&D.[9] Malaysia is moving forward with plans to produce its own chips and graphics processing units (GPUs) within the next decade,[10] supported by a US$250 million technology transfer from Arm Holdings.[11] Vietnam is experiencing some of the fastest growth in semiconductor trade and investment, with local firms such as FPT Semiconductor, Viettel High Tech, and CMC Corporation gearing up to supply the country's growing AI, automotive, telecommunications, and smart device industries.[12] Likewise, Thailand is promoting local chip initiatives linked to its growing data center and power-electronics sectors, which will stimulate demand for advanced modules.[13] These indigenization efforts are unfolding in parallel with national initiatives in Industry 4.0, 5G, and Internet of Things (IoT) infrastructure, all of which are increasing semiconductor demand across the region.

Singapore: New logic and power chips fabs set to position the city as a key manufacturing and R&D node

Singapore exemplifies the region's innovation-led semiconductor model, combining advanced manufacturing, strong state-backed R&D, and an open investment regime. Rather than a single semiconductor plan, Singapore embeds its strategy within two broader frameworks — the *RIE2025 Plan* and the

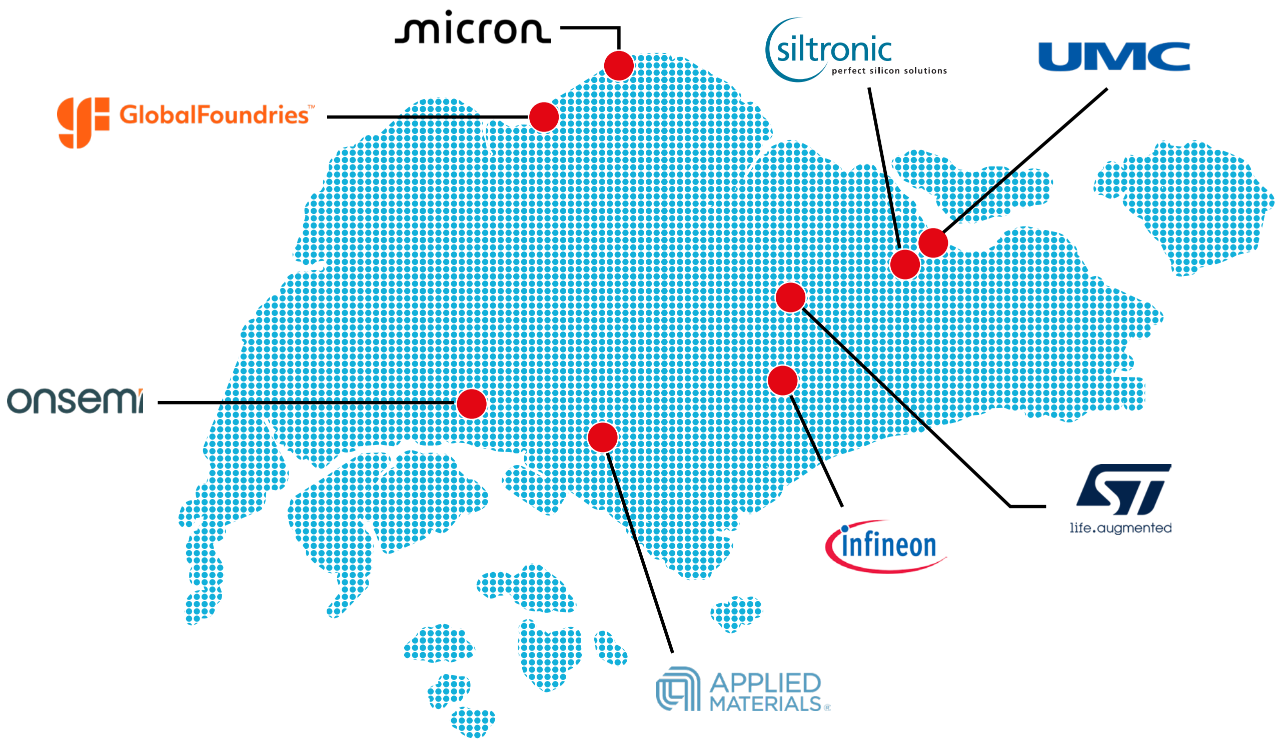
Singapore's policy approach focuses on deepening R&D capacity while maintaining competitiveness in core semiconductor segments, including IC design, compound semiconductors (GaN/SiC), advanced packaging, and equipment manufacturing.

Manufacturing 2030 Vision — which together aim to keep the city-state at the forefront of high-value manufacturing, digital integration, and technological innovation.

Backed by S$28 billion (≈ US$21.6 billion) in funding under the *RIE2025 Plan* and an additional S$3 billion top-up, Singapore's policy approach focuses on deepening R&D capacity while maintaining competitiveness in core semiconductor segments, including IC design, compound semiconductors (GaN/SiC), advanced packaging, and equipment manufacturing. The Economic Development Board (EDB) and the Agency for Science, Technology and Research (A*STAR) play central roles, coordinating research programs, facilitating skills development through initiatives like SkillsFuture, and fostering public-private partnerships between industry and universities.

Singapore's success in attracting large-scale FDI highlights its dual role as a manufacturing base and regional R&D center. Recent investments include the US$7.8 billion VisionPower Semiconductor Manufacturing Company (VSMC) joint venture between Vanguard International Semiconductor and NXP Semiconductors, which will build a new 300-millimeter wafer fab for power management and analog products expected to start production in 2027;[14] Global Foundries' US$4 billion Fab 7H expansion adding 450,000 wafers annually making

Figure 4 – Singapore semiconductor investment mapping



Source: Author's own elaboration

Singapore's continued investment in research translation, materials science, and system integration ensures that the city-state remains a critical innovation node linking global semiconductor leaders with Southeast Asia's expanding production networks.

OSD chips, including image and radio frequency sensors, which are critical components for smartphones and EVs;[15] Taiwanese United Microelectronics Corporation's (UMC) capacity expansion for its 22-nanometer and 28-nanometer processes in Pasir Ris Wafer Fab Park to produce power-efficient memory chips;[16] and Micron's US$7 billion advanced packaging facility for high-bandwidth memory (HBM) chips.[17] Collectively, these projects amount to nearly US$25 billion in new investment and the creation of 5,000 skilled jobs.

The government is steering the industry toward higher-value segments: wide-bandgap (SiC/GaN) semiconductors, advanced packaging, heterogeneous integration, sensors/actuators, and edge/AI chips. Meanwhile, infrastructure development to support large-scale semiconductor manufacturing includes hard infrastructure such as vibration-tested industrial land and utilities, as well as soft infrastructure in the form of a strong R&D ecosystem. Government-funded institutes like A*STAR and top universities like Nanyang Technology University (NTU) and the National University of Singapore collaborate with industry on leading innovation in advanced packaging, photonics, mmWave, and heterogeneous integration. One example is the National Semiconductor Translation and Innovation Centre for Gallium Nitride, the first national facility dedicated to GaN semiconductors, established as a partnership among A*STAR, DSO National Laboratories, and NTU.[18]

Singapore's policy mix — comprising stable governance, advanced infrastructure, and a deep R&D ecosystem — positions it as ASEAN's most mature semiconductor hub. Its continued investment in research translation, materials science, and system integration ensures that the city-state remains a critical innovation node linking global semiconductor leaders with Southeast Asia's expanding production networks.

Malaysia: From advancing OSAT in Penang and Kedah's industrial parks to new IC design ventures in Selangor and Sarawak

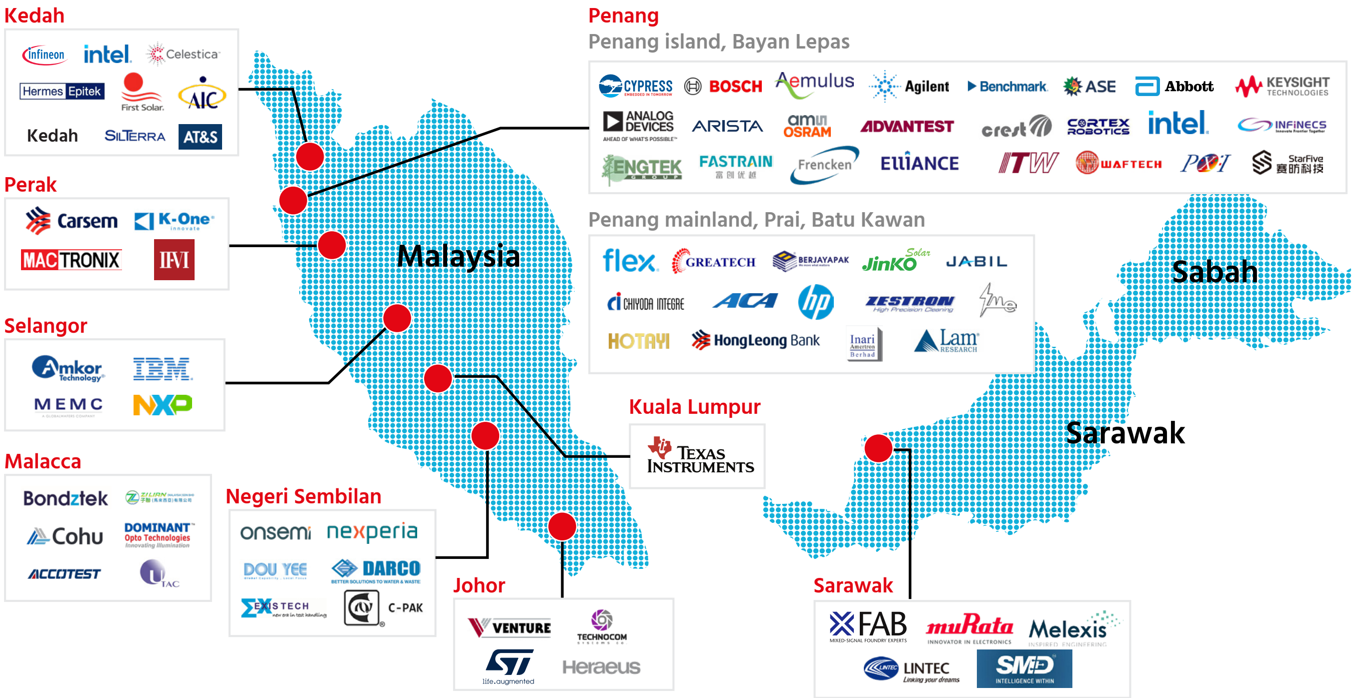
Malaysia follows closely behind Singapore as one of ASEAN's leading destinations for semiconductor investment. The country's approach blends state capitalism, industrial planning, and active investment promotion to transition from back-end assembly and testing toward advanced packaging, IC design, and power semiconductor fabrication. The government's NSS, launched in May 2024, sets out an ambitious roadmap to transform Malaysia into a regional hub for high-value chip manufacturing and design. The NSS adopts a three-phase roadmap: upgrading existing OSAT facilities and power-chip fabs; attracting cutting-edge fabrication and test operations; and ultimately building world-class Malaysian champions capable of supplying global chipmakers. The government has committed US$5.9 billion (RM25 billion) in fiscal support, complemented by funding from government-linked corporations and Bank Negara soft loans — a strong signal of Malaysia's enduring reliance on state capitalism as a development tool.

These state capitalism efforts are spearheaded by agencies such as the Malaysian Investment Development Authority (MIDA), Collaborative Research in Engineering, Science & Technology (CREST), and MIMOS Berhad, the National Semiconductor Task Force (NSSTF) under the Ministry of Investment, Trade and Industry (MITI). Together, they align investment incentives, talent programs, and infrastructure upgrades across Malaysia's industrial corridors, particularly Penang, Kulim, and Selangor.

Recent developments underscore Malaysia's growing momentum. Infineon's US$7 billion 200-millimeter SiC power-semiconductor fab in Kulim — set to become the world's largest of its kind — and Intel's planned advanced 3D packaging facility in Penang highlight the country's capacity to host cutting-edge processing and manufacturing. Intel's project was intended to be Malaysia's first 300-millimeter wafer fab and the first facility to use ASML's deep ultraviolet lithography system. However, according to recent news this year, this plan is being put on an indefinite hold due to the company's recent underperforming profits. An industry expert claimed this highlights both the financial fragility of this industry, which requires substantial capital investments, and the shortage of ready-to-hire talent in Malaysia. Intel, for example, had to send 600 engineers to New Mexico and Oregon for training. It also points to the potential need for the Malaysian government to consider injecting equity in these large-scale investments, as Singapore did with the Vanguard-NXP plant.[19]

Meanwhile, new sites for IC design and fabs are emerging. In Selangor, two new IC design parks have been established in Puchong and Cyberjaya. The first, located in Puchong, currently hosts 12 firms, comprising both local players and companies from China, Australia, the US, and France.[20] The deal with Arm, involving a blueprint and technology transfer in exchange for US$250 million over the next 10 years to

Figure 5 – Malaysia semiconductor investment mapping



Source: Malaysian Investment Development Authority

Mirroring Indonesia's approach, Malaysia has implemented measures to restrict raw mineral exports to encourage domestic processing and higher-value manufacturing.

produce Malaysia's own GPU chips, is part of a broader effort to move toward high value-added processes to meet domestic demand for AI and data centers.[21]

Beyond the peninsula, Sarawak is positioning itself as a strategic hub for the semiconductor industry. *The Semiconductor Roadmap 2030* targets RM30 billion (US$7.3 billion) in revenue, RM2 billion in investments, and 3,000 high-skilled jobs by 2030. Local and foreign firms, such as Sarawak Microelectronics Design (SMD), X-Fab, Compound Semiconductor Applications (CSA) Catapult, and Cambridge Microelectronics, are collaborating on the development of GaN-based chips and analog–mixed signal devices. X-Fab's RM3 billion fab expansion at the Sama Jaya High Tech Park aims to produce Sarawak's first homegrown GaN-based semiconductor chips and will double production capacity for 180-nanometer Bipolar-CMOS-DMOS (BCD)-on-Silicon-On-Insulator (SOI) technology chips.[22] The SMD Advanced Chip Integration Centre in Kuching further demonstrates Sarawak's ambition to anchor the state in global value chains through partnerships with the Welsh Government and CSA Catapult.[23]

Malaysia's state activism extends beyond industrial parks. In 2024, the government organized study tours in Penang and Kulim to better understand industry needs before finalizing the NSS, while MIDA began surveying the country's rare-earth deposits to assess potential feedstock for chip manufacturing. A preliminary study by the Department of Mineral and Geoscience in 2025 identified 16.2 million metric tons of rare-earth elements worth an estimated US$175 billion — a discovery that has already drawn interest from both Chinese and US partners. Mirroring Indonesia's approach, Malaysia has implemented measures to restrict raw mineral exports to encourage domestic processing and higher-value manufacturing.[24]

High-level political engagement has been crucial to this second take-off of the Malaysian semiconductor industry. Prime Minister Anwar Ibrahim and state leaders frequently promote Malaysia's semiconductor ambitions at international forums, including negotiations with Nvidia and YTL Power International to develop AI infrastructure powered by green energy.[25] The Prime Minister's presence at Infineon's plant inauguration, alongside Kedah's Chief Minister, reflects Malaysia's whole-of-government coordination in supporting the semiconductor industry.

Malaysia's approach illustrates a pragmatic model of state-capitalist industrial transformation: one that mobilizes public resources, coordinates across levels of government, and strategically engages global firms to generate spillovers in design, manufacturing, and talent. If effectively implemented, the NSS could consolidate Malaysia's position as Southeast Asia's second-largest semiconductor hub — a critical bridge between the region's manufacturing powerhouses and the world's leading technology firms.

Vietnam: Pursuing high growth by fostering local champions partnerships with international giants

Vietnam serves as a model of a fast-follower approach to semiconductor industrialization, leveraging foreign partnerships, state coordination, and rapid workforce expansion to build a domestic semiconductor ecosystem. The *National Strategy for the Development of Vietnam's Semiconductor Industry to 2030*, with a vision to 2050 sets out a long-term, three-phase roadmap that aims to cultivate local design capacity, attract major FDI, and expand packaging and testing capabilities.

Table 4 – Companies participating in chips design by region in Vietnam

Region	Companies
Hanoi	Samsung Electronics, Viettel, LG, Toshiba, Amkor Technology, FPT Semiconductor, and CoAsia SEMI Vietnam.
Da Nang	Renesas, Hitachi, Synopsys, Savarti, and FPT Semiconductor.
Ho Chi Minh City	VNChip Technology, Microchip, Panasonic, Renesas, Samsung Electronics, Intel, Savarti, Synopsys, FPT Semiconductor, and Uniquify.

Source: Vietnam Microchip Community, in Vietnam Briefing

Vietnam's growing appeal as an assembly and testing hub is complemented by a surge in IC design collaborations, linking domestic champions and global firms to advance the country's ambitious agendas in AI, EV, communication, and industrial automation.

Under this framework, Vietnam aims to develop 100 IC design firms, one fabrication plant, and 10 OSAT facilities by 2030, scaling up to 300 design firms, three fabs, and 20 OSAT plants by 2050. The plan includes approximately US$1.05 billion in total support, comprising US$380 million in direct financial assistance and US$670 million earmarked for training 50,000 engineers by 2030 and over 100,000 by 2040. The National Steering Committee for Semiconductor Development, chaired by the Prime Minister, and an Expert Advisory Group oversee coordination across ministries, education institutions, and private sector partners.

Vietnam is currently experiencing the fastest growth in semiconductor trade in Southeast Asia, fueled by a wave of FDI and joint ventures. Key milestones include Amkor's US$3.6 billion OSAT facility in Yen Phong Industrial Park, Samsung's cumulative US$22.4 billion investments across six plants and an R&D center,[26] and Samsung Display's new US$1.8 billion OLED (or organic light-emitting diode) plant for automotive and device applications. Vietnam's growing appeal as an assembly and testing hub is complemented by a surge in IC design collaborations, linking domestic champions and global firms to advance the country's ambitious agendas in AI, EV, communication, and industrial automation.

Meanwhile, alongside major OSAT and OSD investments, the country is developing IC design parks, enabling local companies such as Viettel, FTP, and VNPT to collaborate with leading industry players. One example is Samsung's collaboration with Vietnam's National Innovation Center (NIC), which serves as a key partnership to support the country's ambition to produce 50,000 semiconductor engineers by 2030.[27] The center has launched programs with Synopsys, Samsung, Intel, and Qualcomm to train chip designers and promote AI-related applications.[28] Intel's planned relocation of a plant from Costa Rica to Vietnam will make Vietnam one of Intel's largest global assembly and testing bases, using its most advanced 18A chip

Thailand's strength lies mainly in PCBs, semiconductor components, and manufacturing equipment, reflecting the proactive role of the Thailand BOI in offering incentives for foreign companies to establish operations.

line.[29] The company has been actively promoting AI workforce training programs for both the public and private sectors, and, to date, has trained approximately 8,000–10,000 engineers and technicians, while building a strong network of 600 local partners.

At the same time, local firms such as FPT Semiconductor, Viettel High Tech, and CMC Corporation are establishing a foothold in chip design and system integration for AI, automotive, telecom, and smart device applications. The FPT-Nvidia partnership to develop a US$200 million AI factory underscores Vietnam's efforts to establish itself as a key regional player in AI hardware and logic chips production.[30] This April, several memoranda of understandings (MOU) between Vietnamese and Japanese companies, universities, and institutes like Nippo and Restar were signed to support labor force development and tech transfer.[31]

Vietnam's progress illustrates how strategic foreign partnerships and human capital investment can accelerate industrial upgrading. The country's challenge now lies in scaling its domestic capabilities, improving infrastructure reliability, and deepening supply chain linkages with its ASEAN neighbors. Nonetheless, Vietnam's rapid advancement signals its potential to become Southeast Asia's most dynamic growth hub for semiconductor design and advanced packaging.

Thailand: New player in PCBs and OSD

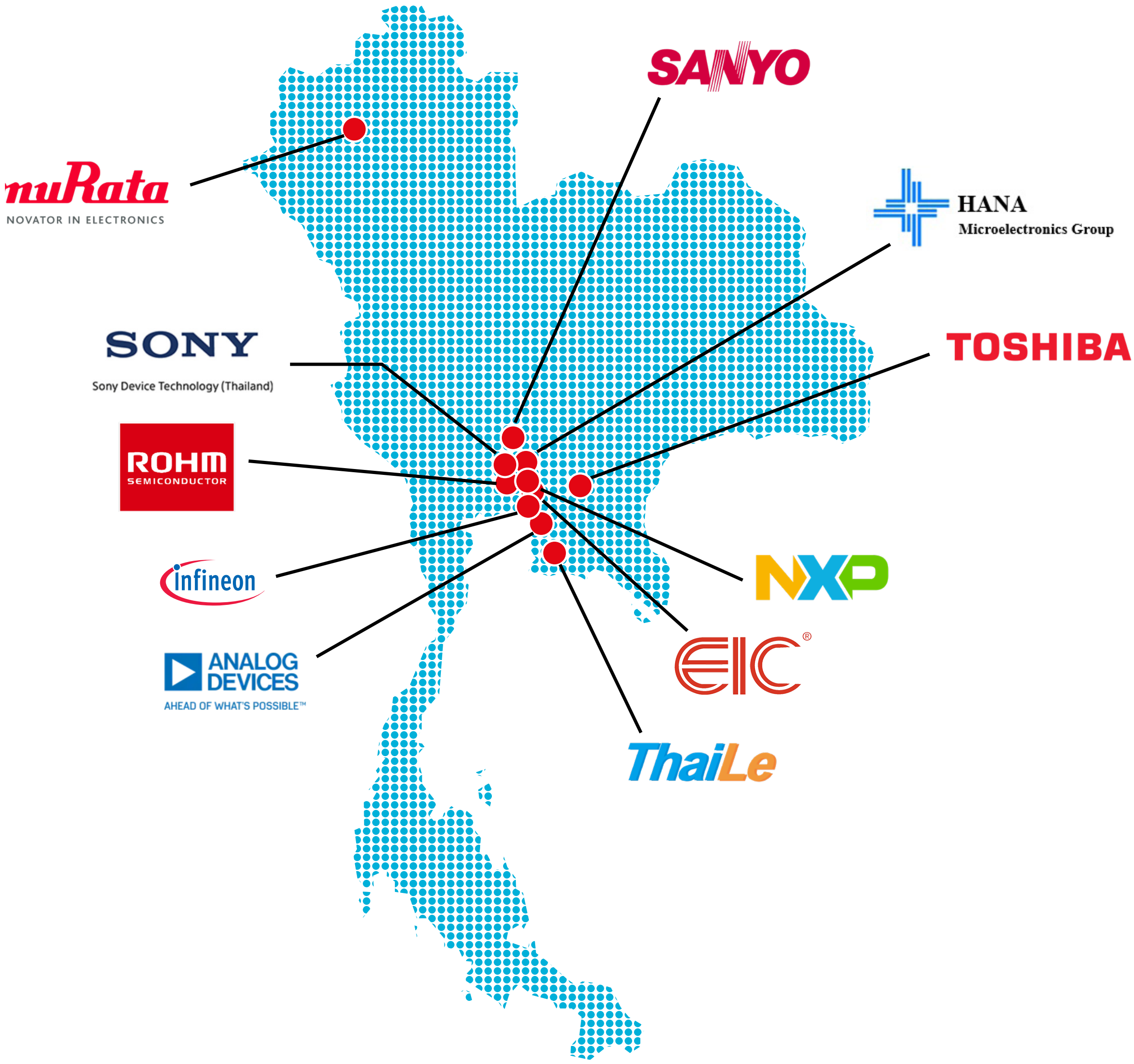
Thailand is fast emerging as a new player in Southeast Asia's semiconductor landscape. Although its investments remain more modest than those of Singapore or Malaysia, the country is strategically positioning itself as a regional base for PCBs , semiconductor components, and advanced electronics. This momentum reflects Thailand's proactive industrial policy, which is coordinated through the Thailand BOI and the newly established NSB, chaired by the Prime Minister.

In 2024, the NSB approved the framework for the *National Semiconductor and Advanced Electronics Strategy*, which will guide the country's transition toward higher-end manufacturing and technology integration. The BOI has been tasked with finalizing the implementation roadmap by 2025. The strategy's objectives are to expand into IC design, fabrication, testing, and packaging, while positioning Thailand as an ASEAN node for semiconductors and advanced electronics closely linked to the EV and IoT sectors.

Although Thailand is attracting smaller investments compared to Singapore or Malaysia, it is steadily carving out its place in Southeast Asia's growing semiconductor ecosystem. The country's strength lies mainly in PCBs, semiconductor components, and manufacturing equipment, reflecting the proactive role of the Thailand BOI in offering incentives for foreign companies to establish operations. As a result, the Eastern Economic Corridor provinces — Chachoengsao, Chonburi, and Rayong — have become thriving hubs for electronics and semiconductors. Firms from China, Taiwan, the US, and South Korea account for roughly 70% of recent investments, drawn by Thailand's robust industrial infrastructure and extensive export connectivity.

Concurrently, the Map Ta Phut industrial estates have developed into a center for chemical supply chains supporting semiconductor production, while Greater Bangkok is emerging as the country's design and innovation hub, hosting key players such as Silicon Craft Technology and the Thai Microelectronics Center

Figure 6 – Thailand semiconductor investment mapping



Source: Author's own elaboration

(TMEC), focusing on specific types of OSD chips.[32] Meanwhile, the Japanese Murata Group, a global supplier of high-end electronic components, is expanding in Lamphun province to produce multilayer ceramic capacitors (MLCCs), discrete components crucial for analog semiconductors.[33]

Policy momentum has accelerated in recent years. The Thailand BOI has commissioned the drafting of the National Semiconductor and Advanced Electronics Strategy, while the NSB, chaired by the Prime Minister, oversees

Thailand is well-positioned for remarkable growth in the near future, having established itself as a key China+1 alternative with strong connections to the region's growing and established electronics clusters in Vietnam and, most recently, Laos.

national policy direction. In parallel, the Ministry of Higher Education, Science, Research and Innovation (MHESI) has launched ambitious talent-development programs worth THB6.9 billion (≈ US$211 million) to train 17,500 semiconductor workers, alongside R&D funding of THB8 billion (≈ US$245 million) and THB5 billion (≈ US$153 million) for collaborative projects between government and industry. Separately, THB10 billion (≈ US$306 million) has been allocated to support "Local Chips" initiatives over 20 years. Together, these programs aim to cultivate 86,000 skilled workers, including 1,400 Masters and PhD researchers.[34]

The country's academic and industrial ecosystems are also expanding. The King Mongkut's Institute of Technology, Ladkrabang (KMITL) recently launched the KMITL Academy of Innovative Semiconductor Manufacturing (KAISEM), Thailand's first comprehensive R&D center for semiconductor technology. State-backed organizations such as TMEC and First Thailand Semiconductor Company (FT) — a joint venture with technology transfer from South Korea's Power Master Semiconductor — are spearheading projects in SiC power semiconductors for the EV sector. In addition, Infineon's new plant in Samut Prakan, south of Bangkok, will strengthen domestic capabilities in power semiconductors for EVs and data centers.[35]

In sum, Thailand is well-positioned for remarkable growth in the near future, having established itself as a key China+1 alternative with strong connections to the region's growing and established electronics clusters in Vietnam and, most recently, Laos.[36] The country is pursuing a pragmatic, integration-oriented approach that links its established electronics and automotive industries with emerging semiconductor capabilities. Investment patterns so far indicate that intra-ASEAN trade could grow considerably in the future, as equipment, materials, machinery, and chips continue to support regional growth and create new efficiencies. Through its combination of human capital investment, industrial incentives, and foreign partnerships, the country is laying the groundwork for a diversified semiconductor ecosystem capable of meeting the rising regional demand for power electronics and advanced modules.

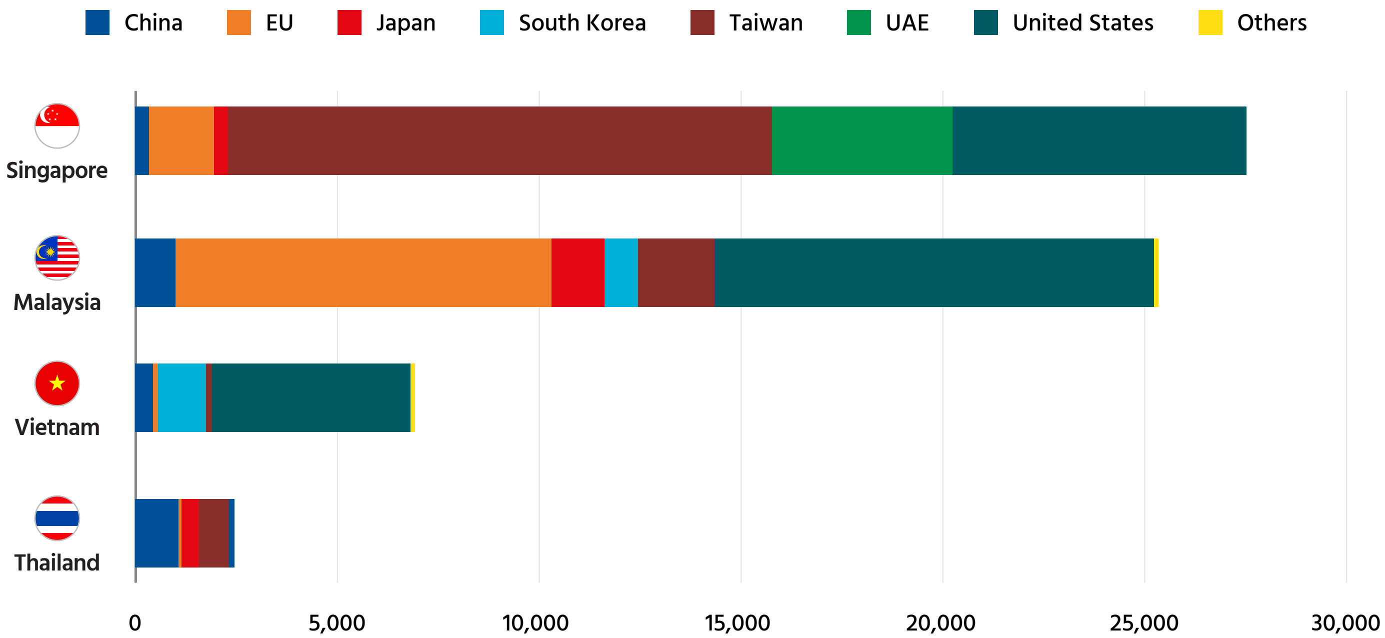
4. ASEAN tiptoes between Washington and Beijing

Over the last five years, the US has remained a significant source of semiconductor FDI in Southeast Asia, but its weight varies widely across countries.

Amid intensifying geopolitical competition, ASEAN countries are finding new opportunities to expand partnerships and diversify strategic alignments. The central dynamic shaping this environment is diversification, as governments pursue a web of bilateral agreements, MOUs, technology transfers, and R&D collaborations with both traditional and emerging partners, while maintaining engagement with the US and China.

Recent investment patterns underscore the need for this balancing act. Over the last five years, the US has remained a significant source of semiconductor FDI in Southeast Asia, but its weight varies widely across countries. In Vietnam, US investments make up a striking 70% of total semiconductor inflows, reflecting the country's centrality in Washington's "friend-shoring" efforts. In Malaysia, US investors account for over 40% of total value — though this falls to around 15% once Intel's large-scale project is excluded — while European investors represent roughly 37%. In Singapore, US investments comprise just over a quarter of total inflows, whereas Taiwanese firms have become the dominant new source of investment. Thailand, in contrast, is the only major ASEAN country where Chinese firms (44%) — followed by Taiwanese PCB manufacturers (30%) — lead investment activity.

Figure 7 – Sources of FDI in selected ASEAN countries, 2021-2025 (US$ million)



Source: fDi Markets

Following USTR Jamieson Greer's threat to impose 300% tariffs on semiconductor imports unless data-center security concerns were addressed and production moved to the US, Malaysia and Singapore have intensified engagement with US bodies including the Office of the USTR, the US Department of Commerce, and bilateral business chambers to ensure policy alignment and crisis management.

This diversification of trade, investment, and partnerships forms part of ASEAN's deliberate effort to mitigate external shocks and preserve autonomy. The urgency of this balancing became apparent in September 2025, when US Trade Representative (USTR) Jamieson Greer threatened to impose 300% tariffs on semiconductor imports unless national security concerns surrounding data centers were addressed and production relocated to the US.[37] The warning sent shockwaves throughout major exporters, including Malaysia, Thailand, and Vietnam.

In response, Malaysia and Singapore accelerated diplomatic and economic diversification. Malaysia's government has urged its domestic industry to explore alternative export markets in the Middle East, Africa, Latin America, and Europe, while conducting internal reviews to identify supply chain vulnerabilities in its electrical and electronics (E&E) and semiconductor sectors.[38]

Prior to this, Malaysia had already introduced export tracking for US-origin AI chips and committed US$150 billion in equipment purchases from American suppliers to maintain access to critical technology.[39] Singapore, meanwhile, sought to broaden its strategic partnerships, signing new CSPs with New Zealand and France in 2024 and 2025 respectively.[40] These agreements explicitly acknowledge the need to adapt to geopolitical tensions, protectionism, and technological disruption to preserve the city-state's status as a global hub. Both countries also intensified engagement with US bodies including the Office of the USTR, the US Department of Commerce, and bilateral business chambers to ensure policy alignment and crisis management.[41]

Southeast Asian governments are pursuing a web of bilateral agreements, MOUs, technology transfers, and R&D collaborations with both traditional and emerging partners.

Among ASEAN countries, Vietnam and Malaysia have been the most proactive in utilizing high-level partnerships to foster industrial collaboration.

A notable development arose at the 2025 ASEAN Forum, where President Trump's participation and conciliatory remarks helped ease tariff fears, at least in the short term. During the Forum, Malaysia became the second ASEAN country, after Vietnam, to sign a CSP with the US. In parallel, China's longstanding practice of offering CSPs as its highest form of partnership remains an attractive policy tool. In Beijing's diplomatic lexicon, CSPs denote long-term strategic vision alignment across economic and security domains.[42] By contrast, the US, a relatively new player in CSPs, has developed a model of CSPs that places stronger emphasis on technology cooperation, supply chain resilience, and economic security, often with specific reference to semiconductors.

At present, Malaysia, Vietnam, and Thailand have signed CSPs with China, with Malaysia's "deepened" and Thailand's "advanced" partnerships both referencing cooperation in the semiconductor industry. Yet, the most dynamic new player in ASEAN's semiconductor CSP diplomacy is India. France, South Korea, and Japan have also been actively brokering MOUs and cooperation agreements focused on talent development, R&D, and technology transfer. Among ASEAN countries, Vietnam and Malaysia have been the most proactive in utilizing high-level partnerships to foster industrial collaboration.

Thailand and Malaysia recently signed agreements on critical minerals and rare earths with the US to strengthen supply chain resilience.[43] While non-binding, these MOUs signal the importance of diversifying inputs essential

Table 5 – CSPs between selected ASEAN countries and major partners

	United States	China	Japan	South Korea	India	EU/UK	Others
Singapore	SP, 2024	ARHQFOP, 2023	JSEPA, 2002	SP, 2025	**2024***	France, 2025	NZ, 2025; AU, 2015 & 2025 (2.0)
Malaysia	**2025***	2013, **2024 (deep.)***	2023	SP, 2024	**2024***	**France, SBISP, 2025***	AU, 2021
Vietnam	**2023***	2008	**2023***	**2022***	2013, **2024 (stren.)***	Russia, 2012; France, 2024	AU, 2024; NZ, 2025
Thailand	N/a	2012, **2024 (adv.)***	2022	SP, 2021	SP, 2025	SP, 2024, UK	AU, SP, 2020
ASEAN	2022	2021	2023	2024	2022	DP, 2023 France	AU, 2023; NZ, 2025

Notes: If the date is boldened and followed by *, it indicates that the CSP specifically mentions the semiconductor industry (several related sectors, such as energy, digital, or AI, are mentioned, but in this case, they are not in bold). Where alternative partnership nomenclatures appear, they are mentioned as per the media source and abbreviated as follows: SP (Strategic Partnership), ARHQFOP (All-Round High-Quality Future-Oriented Partnership), JSEPA (Japan-Singapore Economic Partnership Agreement), SBISP (State-backed Industry Strategic Partnership), and DP (Development Partnership).

Source: Author's own elaboration

Beyond the government-to-government ties within ASEAN, Taiwan has emerged as one of the region's most consequential new semiconductor partners.

to semiconductor production. The latest magnet plant agreement between Australia's Lynas Rare Earths Ltd. and South Korea's JS Link in Malaysia may mark the beginning of a new wave of such ventures.[44] Yet, these initiatives also carry risk: mineral development projects in Southeast Asia and elsewhere have often triggered local environmental protests, highlighting the trade-offs between economic opportunity and social and environmental sustainability.[45]

Another key trend is the emergence of intra-ASEAN cooperation. Vietnam's CSPs with Thailand and Malaysia, while not explicitly focused on semiconductors, nonetheless point to growing regional synergy. Trade and investment flows suggest the formation of a potential growth triangle connecting all three countries. One example is Infineon's divestment of an older Thai plant to Malaysian Pacific Industries, signaling the rise of local champions and the potential for deeper regional supply chains. Cooperation between Malaysia and Vietnam on talent training and chip trade is also intensifying.[46]

Beyond these government-to-government ties, Taiwan has emerged as one of ASEAN's most consequential new semiconductor partners. Though unable to formalize CSPs, Taipei has pursued extensive industry and academic collaborations under its New Southbound Policy. Notable examples include agreements between the National Taipei University of Technology (Taipei Tech) and the Asian Institute of Technology (Thailand), as well as between Vietnam's NIC and the National Taiwan University of Science and Technology (NTUST), all of which focus on developing semiconductor talent.[47] Similar partnerships link TSMC with Singaporean firms and universities.

These initiatives are mutually reinforcing; ASEAN countries actively court Taiwanese semiconductor firms, viewing Taiwan's success as a model for their own industrial ascent, while Taiwanese investors see Southeast Asia as a crucial diversification base. Still, the risks of geopolitical entanglement persist. The recent termination of TSMC's collaboration with Singapore's PowerAIR over possible US export-control violations involving Huawei, and Malaysia's withdrawal from a Huawei-linked chip project,[48] illustrates how easily firms and governments in the region can be caught in the crossfire of US-China technological rivalry.[49]

5. What lies ahead: Risks and opportunities

Fueled by cloud expansion, AI workloads, edge computing, and new data-localization rules, data centers have become fault lines in US-China technological rivalry.

ASEAN countries are cautiously navigating an increasingly complex semiconductor landscape. Most governments are steering clear of technologies that could trigger intellectual property disputes or export control restrictions, instead focusing on next-generation materials such as GaN and SiC — segments that offer high growth potential with fewer geopolitical sensitivities. Many are also prioritizing mature-node technologies, which make up the bulk of global trade and allow for added-value production with lower risk.

Yet one area pulling ASEAN back into the geopolitical crossfire is the rapid rise of data center development. Fueled by cloud expansion, AI workloads, edge computing, and new data-localization rules, data centers have become fault lines in US-China technological rivalry. They likely explain the surge in semiconductor imports to Indonesia, Vietnam, and Thailand, where new data centers are proliferating. The most acute tensions, however, are in Malaysia and Singapore, the region's established data center hubs.

Earlier this year, Singapore became the focus of a US investigation into whether DeepSeek had bypassed US export controls on advanced Nvidia chips through indirect purchases. Soon after, servers from Dell and Super Micro Computer bound for Malaysia came under scrutiny, which led to arrests.[50] In response, Malaysia introduced new regulations in July 2025 to govern the export, trans-shipment, and transit of high-performance AI chips of US origin, aiming to prevent their diversion to Chinese data centers. Despite such measures, new "rebranding" practices[51] for restricted chips continue to emerge, forcing Malaysia and Singapore to walk a diplomatic tightrope between US compliance and Chinese market access. As regional demand for data centers grows, these tensions are likely to intensify, creating ongoing policy and compliance headaches for ASEAN governments.

A second challenge lies in fiscal sustainability. Interviews revealed growing concern that governments are devoting enormous resources to tax incentives and investment subsidies — a phenomenon described as "incentive shopping." Companies increasingly approach multiple ASEAN states to secure the most favorable terms. Without coordination, such competition risks eroding fiscal space and reducing investment quality. This is where a more unified ASEAN approach could make a difference. The proposed AFISS represents a first step toward regional standardization and coordination.[52]

A related concern is environmental sustainability. While all ASEAN members acknowledge the resource intensity of semiconductor production, investments in renewable energy, water harvesting, and treatment infrastructure continue to lag behind industry growth. Most national strategies include commitments to reduce carbon emissions, water usage, and improve environmental, social, and governance (ESG) standards, but data on local company compliance remains scarce. Comprehensive monitoring mechanisms are urgently needed to track environmental performance in what is one of the world's most resource- and

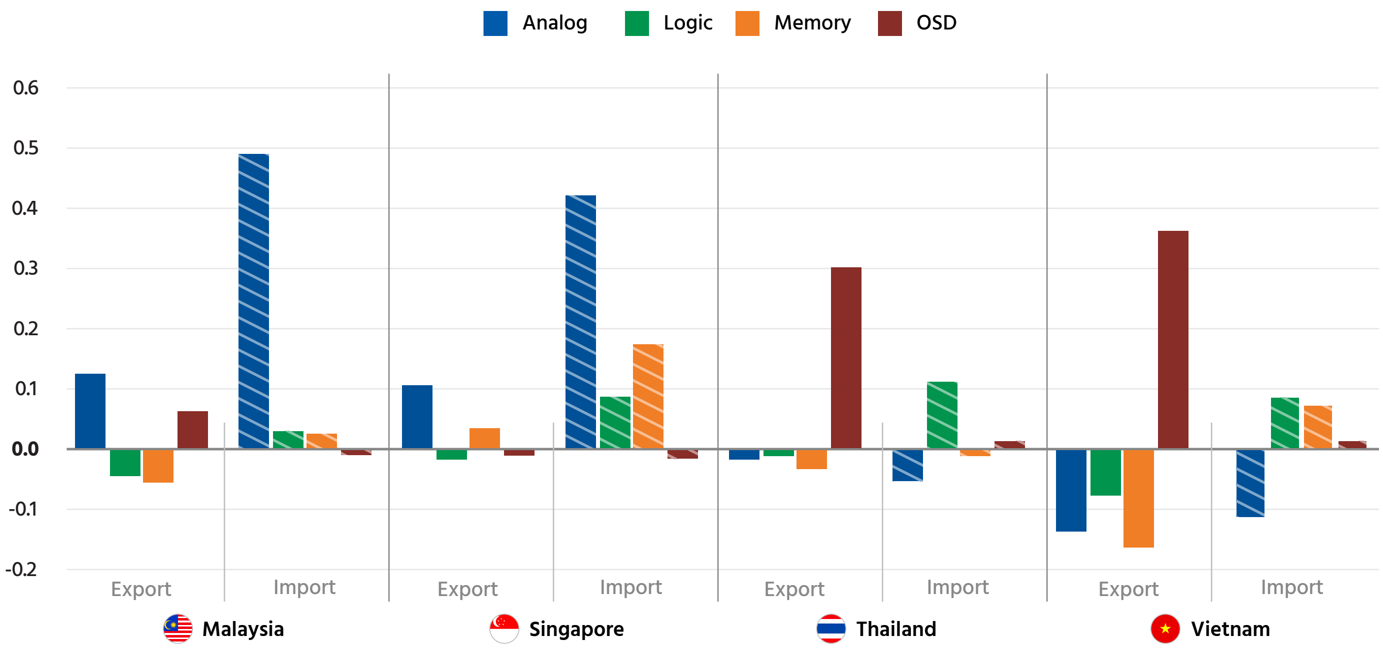
Encouragingly, intra-ASEAN trade is expanding — particularly in analog chips among Singapore, Thailand, and Vietnam — suggesting that regional interdependence is gradually deepening.

chemical-intensive industries.[53] If "incentive shopping" continues unchecked, large public subsidies for semiconductor infrastructure could divert funds away from decarbonization and climate-resilience efforts.

Another vulnerability stems from limited trade diversification in certain chip types. In Malaysia and Singapore, analog chip trade has become highly concentrated, with the top partners accounting for 70%–90% of total trade value. Singapore imports 72% of its analog chips from South Korea and over half of its memory chips from Taiwan, while Malaysia sources 86% of its analog imports from Singapore. In Thailand and Vietnam, export concentration is the most pronounced in OSD chips, over 70% of which go to the US, while Vietnam's imports of logic and memory chips rely heavily on China, South Korea, and Taiwan (together over 80%). Nonetheless, diversification is improving in other categories. India has entered the top export markets for Thai OSD and Vietnamese analog chips, while partnerships with Taiwanese and European companies are becoming more significant across most segments. Encouragingly, intra-ASEAN trade is also expanding — particularly in analog chips among Singapore, Thailand, and Vietnam — suggesting that regional interdependence is gradually deepening.

This growing connectivity is reinforced by significant investments from Intel, Infineon, STMicroelectronics, Micron, and NXP, whose multi-plant networks now span several ASEAN countries. Such cross-border linkages are expected to generate synergies across design, packaging, and materials manufacturing, while

Figure 8 – **Delta HHI of trade in the selected ASEAN countries**



Note: The Delta is between HHI in 2015 and 2024, but for Vietnam's OSD trade the year 2023 was used instead.
Source: Author's own elaboration based on UN Comtrade data

The pursuit of "ASEAN's semiconductor sovereignty" is a delicate balancing act: capitalizing on geopolitical opportunities created by global supply chain realignment, avoid dependency traps, and harmonizing regional standards to strengthen collective resilience.

also producing local spillovers in employment, training, and the development of start-up and local companies.

In sum, ASEAN is poised for significant semiconductor growth as new industrial strategies and indigenization efforts begin to mature. Yet sustaining this trajectory requires more than investment and policy momentum. Achieving stability in this industry hinges on the region's ability to effectively leverage and sustain the variety of partnerships being established. Doing so will not only require a new, enhanced level of diplomacy but also advanced research systems to guide technological, legal, and economic decisions in an increasingly complex world.

The pursuit of "ASEAN's semiconductor sovereignty" is a delicate balancing act: capitalizing on geopolitical opportunities created by global supply chain realignment, avoiding dependency traps, and harmonizing regional standards to strengthen collective resilience. A key distinction exists between Singapore and the rest of ASEAN. The Lion City has invested heavily in the fundamentals of innovation — robust capital markets, world-class universities, and sustained public R&D funding — while Malaysia, Vietnam, and Thailand are progressing primarily through supply chain integration and foreign capital attraction. Without greater investment in these underlying enablers of innovation, ASEAN risks becoming the world's next semiconductor factory — capable of producing chips, but not the ideas and innovations that design and revolutionize them.

ASEAN will need advanced research systems to guide technological, legal, and economic decisions in an increasingly complex world.

Author bio: Angela Tritto

Angela Tritto is an Honorary Fellow at the University College of London, European and International Social and Political Studies Centre. She was formerly with the Hong Kong University of Science and Technology, where her research focused on examining China's Belt and Road Initiative in Southeast Asia and beyond. In 2020, she served as the Fellow of the Global Future Council of Sustainable Tourism at the World Economic Forum and she's currently part of WEF's Impact Group on Digital Transformation of Industries. Her publications analyze the role of public, private, and third-sector organizations in affecting development outcomes and sustainability. She holds a PhD in Public Policy from the City University of Hong Kong.

Angela Tritto

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University College of London

Appendix

Methodology notes

To define semiconductor categories, I began with the four primary categories and their related subcategories as set out in the Congressional Research Service report "Semiconductors and the Semiconductor Industry."[54] I then cross-referenced these with classifications in the latest Organisation for Economic Co-operation and Development (OECD) report on the global semiconductor industry to match each category with its corresponding Harmonized System (HS) codes.[55] Through a further review of documentation, additional categories and subcategories were identified to capture industry nuances.

A simplified version of the table used for categorization is presented below.

Formulas used — ASEAN share of global growth (Figure 1)

For each semiconductor type *s* and flow *f*:

$$\text{ASEAN share of global growth}_{s,f} = (\text{ASEAN}_{2024} - \text{ASEAN}_{2015})/(\text{World}_{2024} - \text{World}_{2015}) \times 100$$

For each semiconductor type *s* and trade flow *f*:

Where:

- $ASEAN_t$ = ASEAN trade value in year *t*
- $World_t$ = World trade value in year *t*

Notes on data on Foreign Direct Investments

The main source for FDI data is fDi Markets (Financial Times). For the global FDI figure on semiconductor investments, the selection was limited to:

- Sector: Semiconductor
- Subsector: Semiconductors

During research, several relevant investments — particularly in Thailand — were found to be classified under a different subsector:

- Sector: Electronic Components
- Subsector: All Other Electronic Components.

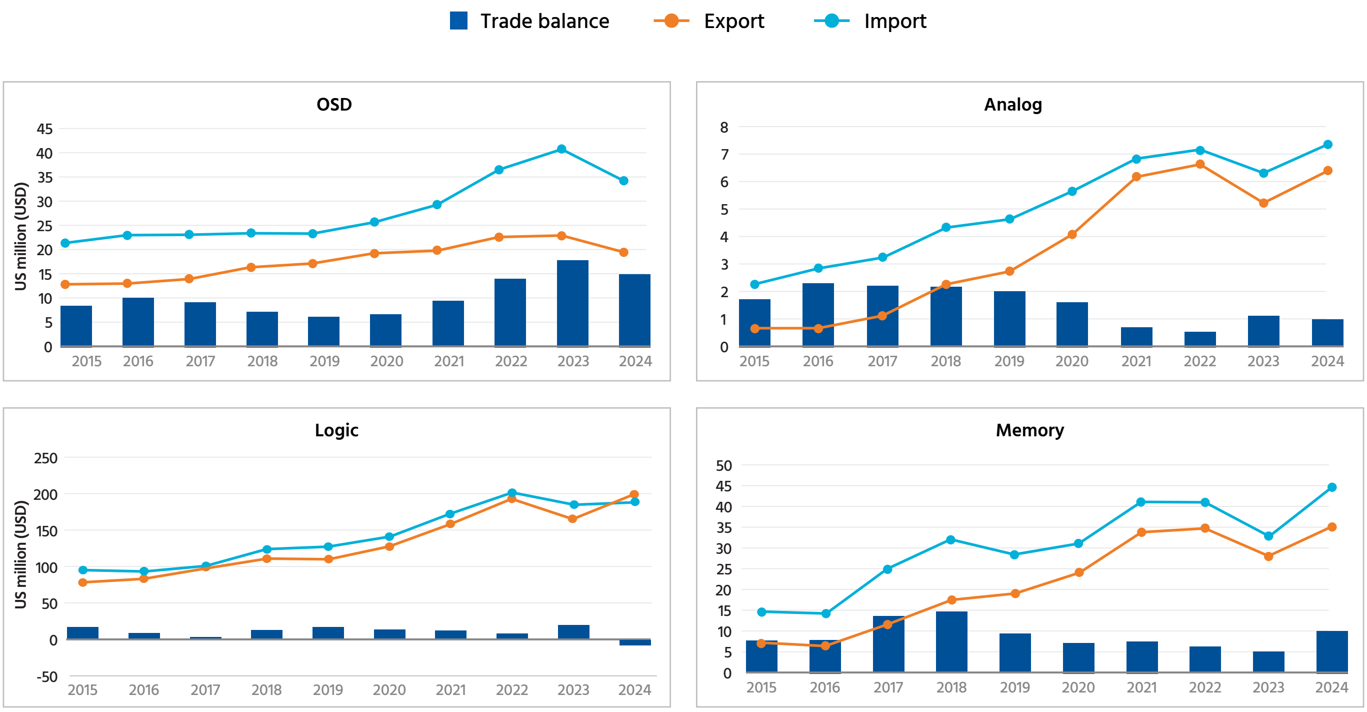
These entries were manually verified and subsequently added to the Thai dataset to ensure a more comprehensive coverage of semiconductor-related investments. Additional data points were obtained through manual cross-checking with company announcements, government releases, and media reports, and recorded in a supplementary investment database created by the author.

Semiconductor HS codes

HS code - 4 digit	HS Code - 6 digits	Description (HS 2017)	Types of chips
8541	854110	Diodes, other than photosensitive or light-emitting diodes (LED)	OSD - Discretes
	854121	Transistors with a dissipation rate of less than 1W	
	854129	Other transistors	
	854130	Thyristors, diacs, and triacs	
	854160	Mounted piezoelectric crystals	
	854190	Parts	
8542	854231	Processors and controllers, whether or not combined with memories, converters, logic circuits, amplifiers, clock and timing circuits, or other circuits	Logic
	854232	Memories	Memory
	854233	Amplifiers	Analog
	854239	Electronic integrated circuits; n.e.c. in heading no. 8542	Logic
8523	852351	Solid-state, non-volatile data storage devices for recording data from an external source [flash memory cards or flash electronic storage cards]	Memory
	852352	Cards incorporating one or more electronic integrated circuits "smart cards"	
	852359	Discs, tapes, solid-state non-volatile storage devices, smart cards and other media for the recording of sound or of other phenomena	

Source: Author's own elaboration based on OECD, 2025

Extra figures – ASEAN: Export, Import, and Trade Balance for different types of semiconductors



Source: Author's own elaboration based on UN Comtrade data

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2. A simplified reference table for this categorization is available in methodological notes. The rest will be in a forthcoming paper by Tritto and Amighini.
3. This number includes some intra-US FDI. However, the United States remains the largest, also after removing these. The time range is between January 2021 and July 2025. A note on the Chips Act and its direct link to these large Taiwanese investments can be found in this interview with Jimmy Goodrich.
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