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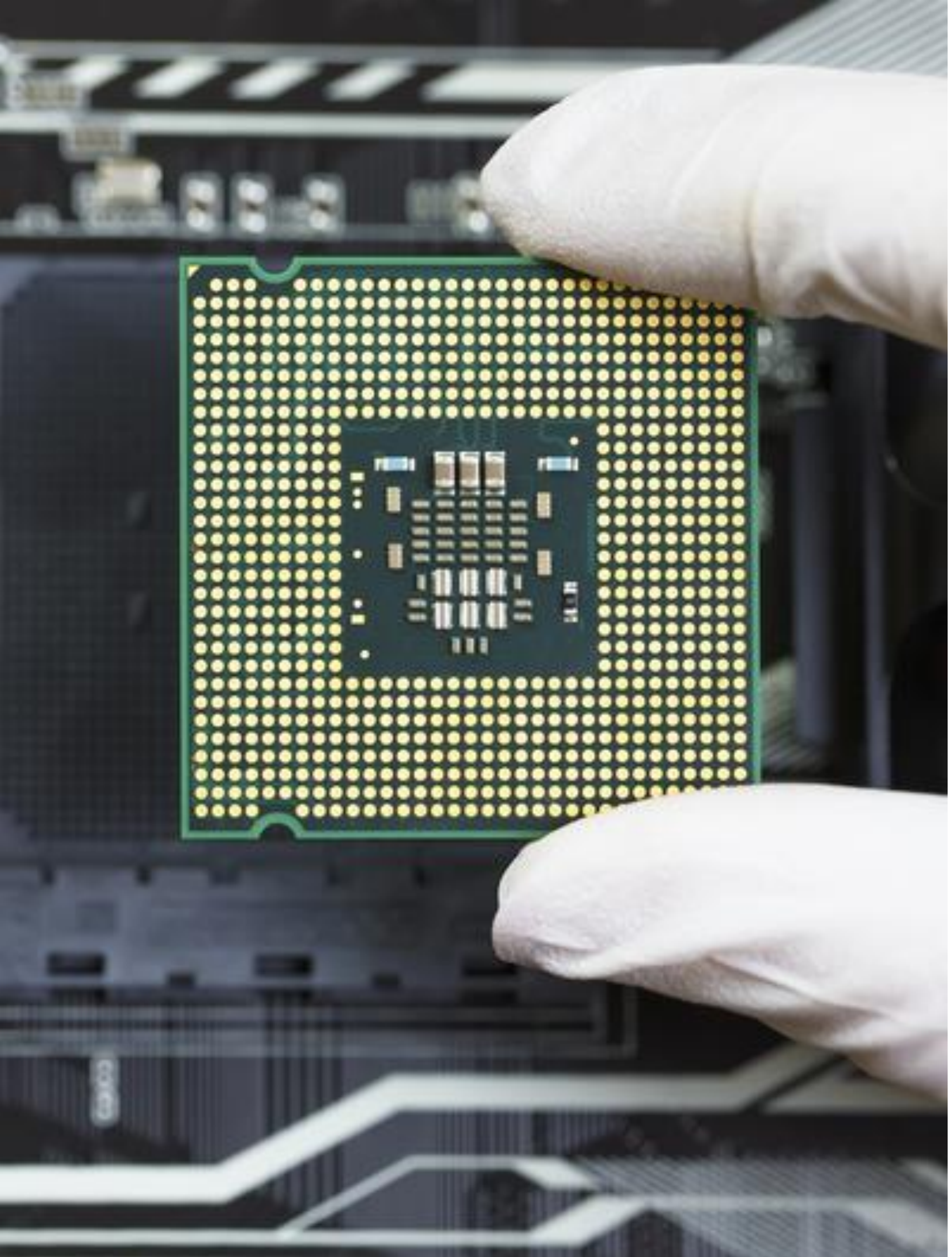
INSTITUT AUTOMOTIF ROBOTIK DAN IoT MALAYSIA
MALAYSIA AUTOMOTIVE ROBOTICS AND IoT INSTITUTE

Semiconductor-powered future of the automotive industry in Malaysia: A need for integration

April 2026



Content

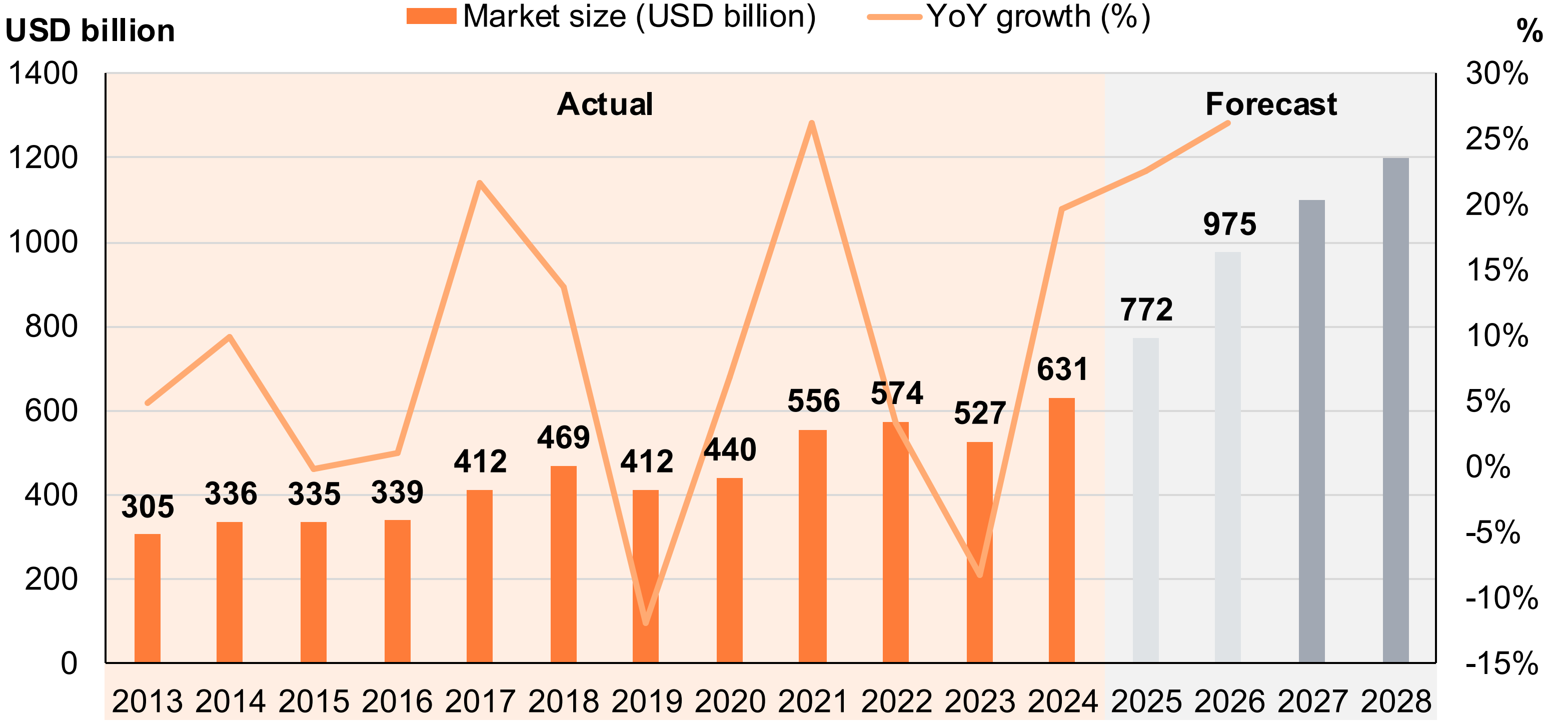
1

Global shifts:
No chips, no cars

By 2027, the global semiconductor market is projected to surpass USD1 trillion, with automotive electronics emerging as a key segment

The automotive industry is undergoing a profound transformation driven by electrification, autonomous driving, and software-defined vehicles (SDVs). Semiconductors are key to this development. The growing number of electronic components in modern vehicles, from silicon carbide power chips to cutting-edge graphics processors, highlights the growing importance of automotive-semiconductor industry integration.

Semiconductor market size (USD billion)



Source: Journal of Management Engineering and Information Technology, OMDIA 2024, Semicon Europa, CREST, World Semiconductor Trade Statistics

The automotive semiconductor segment is poised for sustained growth, underpinned by resilient historical demand and increasingly amplified by the electrification of the modern vehicle

- The automotive sector's historical concentration in mature process nodes (28nm–90nm) represent an estimated 60–65% of unit volume
- The software-defined vehicle has increased the demand for leading-edge nodes at 5nm–16nm essential for Advanced Driver Assistance Systems (ADAS) and centralised compute platforms

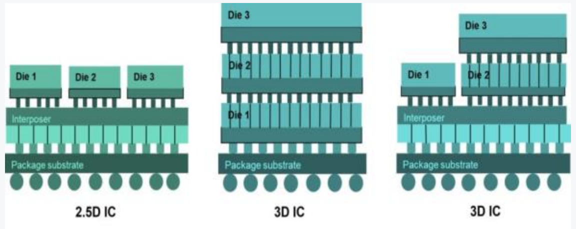
Many modern vehicle features and functions rely on key semiconductor-based components such as:

- Logic chips (5nm – 90nm)
- Memory chips (10nm – 180nm)
- Microprocessors (5nm – 180nm)
- Analog chips (28nm – 350nm+)
- Optoelectronic devices (28nm – 350nm)
- Sensors 22nm – 2µm+ (MEMS)

Three fundamental forces are reshaping the automotive semiconductor landscape. Surging demand, supply constraints and supply-chain resilience, and geopolitical realignment will have profound implications to the industry

Demand dynamics

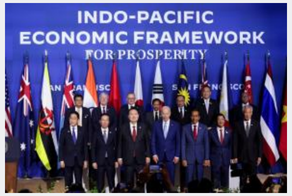
1 Growing opportunities in packaging, power semiconductors, and automotive manufacturing



- The advanced packaging market is projected to reach over USD80 billion by 2033 and offers a lower capital barrier than front-end fabrication
- Silicon carbide (SiC) and gallium nitride (GaN) power semiconductors are growing significantly, driven by EV electrification, making this an accessible segment for new entrants
- Countries that offer subsidies, skilled labour, and political alignment with major blocs are successfully attracting semiconductor investment

Supply constraints and supply-chain resilience

2 Rising interest in supply chain diversification, regionalisation, and friend-shoring



- The U.S. and its allies are actively relocating production to trusted nations through frameworks like the Indo-Pacific Economic Framework for Prosperity
- Over USD540 billion in semiconductor investments have been announced in the U.S. alone, with the CHIPS Act deploying more than USD50 billion for domestic manufacturing
- India, Malaysia, Vietnam, and Saudi Arabia are positioning themselves as alternatives to Taiwan, Province of China concentration

Geopolitical realignment and national response

3 Pressures on export controls, rare-earth dependencies and geopolitical ecosystems

How the US exerts controls over foreign chipmakers in China

A Ban Won't Stop Huawei's Technological Evolution.

MONEY

Chip wars intensify: Analysts warn US policies and restrictions could hand semiconductor market to China

US-China tech war Tech / Tech War

China's top chipmakers see shares plunge amid tariff uncertainty, despite revenue growth

SMIC and Hua Hong both warned of challenges in the second half of 2025, but reported strong revenue growth for the first quarter

- The U.S. has imposed sweeping export controls on advanced chips and equipment to China, while China has retaliated with rare earth restrictions affecting over 90% of global supply
- Rare earth dependencies have created critical chokepoints, and building alternative supply chains will take years
- The industry is becoming more fragmented across geopolitical blocs, where national policies are critical to enable the integration between Malaysia's semiconductor and automotive industries

Note: References to China refer specifically to the Chinese mainland. References to other regions, including Hong Kong SAR, Taiwan, Province of China and Macau SAR, are made separately where relevant.

Source: Malay Mail, Huawei, CNN, IThome, Economics Observatory, EEWorld, SEMI, South China Morning Post, Hinrich Foundation, Sustainability 2025 17(4), Center for Strategic and International Studies, International Data Corporation, Gulf News, Bloomberg, IDTechEx, IFRI Memos

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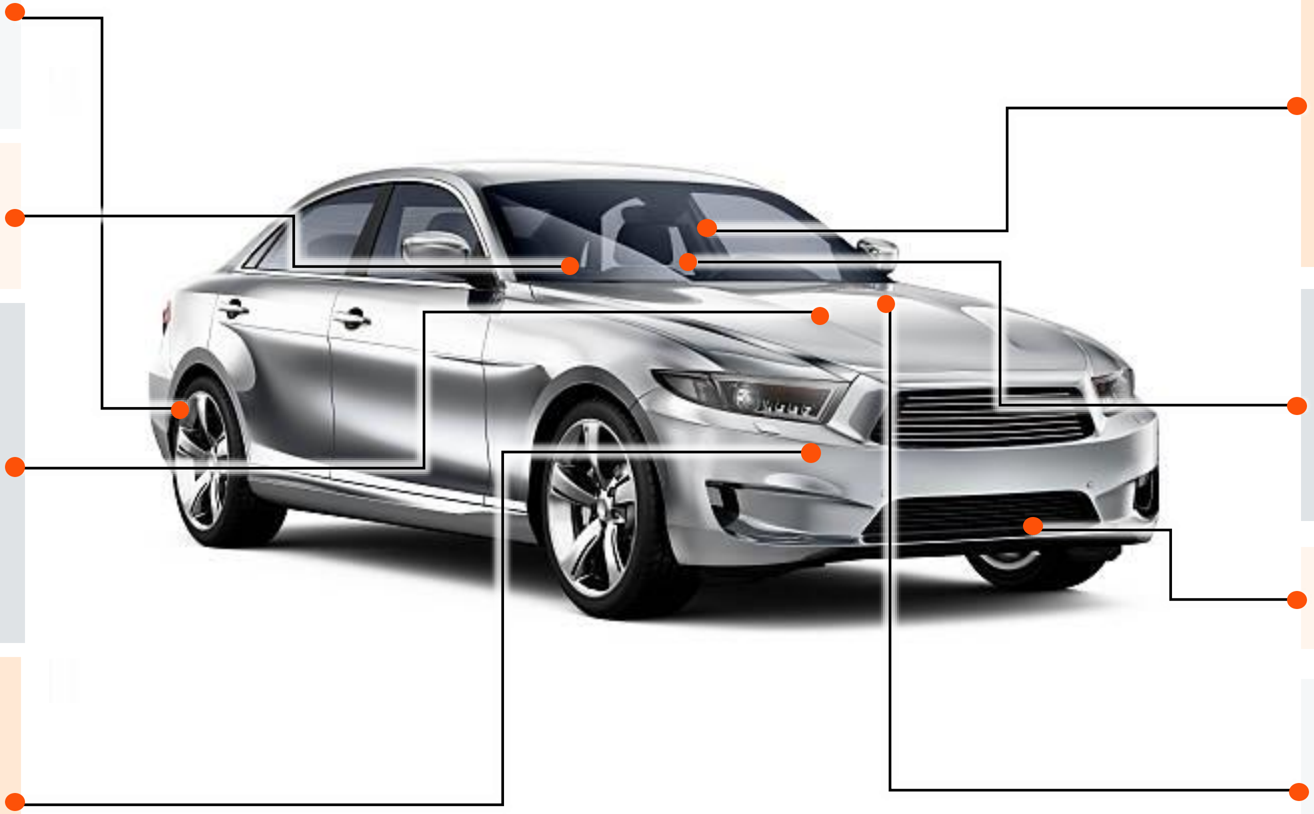
Current state:

Malaysia’s semiconductor and automotive sectors are strong but operating in parallel, leaving strategic value untapped

Chips are critical in many electronic control systems in today’s modern cars with approximately 1,000 to 3,000 semiconductors in a vehicle



Braking system

- Electronic Parking Brake
- Anti-locking Brake System/Traction Control Unit/Electronic Stability Control

Steering system

- Electronic Power Assisted Steering
- Active Steering Control

Engine, fuel/charging, and transmission

- Transmission Control Module
- Fuel Injection control Module
- Four-wheel Drive (4WD) Controller
- Automated Manual Transmission (AMT)/Continuously Variable Transmission (CVT)

Advanced Driver Assistance Systems (ADAS)

- Sensor Fusion Unit
- Driver Monitoring System
- Camera Monitoring System
- Vehicle-to-Everything (V2X) Communication Unit

Comfort, convenience and connectivity

- Telematics Control Unit
- Climate Control Module
- Car Navigation Unit
- Infotainment (Silver Box)
- Display Systems

Body controls

- Body Control Module
- Power Seat Control Unit
- Sunroof Control module
- Lighting Control Unit

Suspension system

- Active Suspension Control Unit

Safety and security systems

- Airbag Control Module
- Passive Entry System
- Tyre Pressure Control Module

Note: Electronic control systems listed are non-exhaustive.
Source: Journal of Management Engineering and Information Technology, OMDIA 2024, Semicon Europa, CREST, German Electro and Digital Industry Association (ZVEI e.V.), Strategy& Germany Analysis

Demand for semiconductors in automotives continue to rise as cars focus on software features

The future of mobility is increasingly Connected, Autonomous, Shared & Electric (CASE). Supporting services and adjacent industries need to adapt to the increasing exposure and use of electronic components in the design and manufacture of vehicles.

Rising demand for semiconductor products driven by the shift towards not only software-defined vehicles but also the latest development of AI-defined vehicles

1 Electrification

The value share of semiconductor parts in traditional internal combustion engine vehicles typically ranged from USD500 to USD600 per vehicle.

The demand for EV has increased the value of high-tech components to approximately USD1,500 in value share in 2025, and up to USD2,000 by 2030.

By 2030, 50% of global automotive sales are expected to be xEVs

2 Smart mobility technologies (ADAS, V2X, Cloud)

The advancement of autonomous vehicles and the addition of V2X technologies into vehicles further increase the value of semiconductors that are integrated into these vehicles.

For instance, the Tesla Model 3 contains over USD1,500 worth of semiconductor components, which is 3.6 times the average found in cars from 2017.

The increasing **adoption of smart mobility technologies,** along with the requirement for more chips to power them even in internal combustion engine (ICE) vehicles, has meant:

average ICE vehicles now contain
300 to 1,000 chips

Newer vehicles and xEVs may feature up to
1,000 to 3,000 chips

Note: Electrified vehicles (xEVs)
Source: Polar Semiconductor, Malaysian Investment Development Authority (MIDA), New Industrial Master Plan 2030 (NIMP 2030), Semicon Europa, BloombergNEF, Statifacts

Core technology segments for rising demand are driven by key advancements in driving assistance, digital cockpit, body and chassis and powertrain

The integration of infotainment and autonomous driving are increasing demand for processing power. This means stronger chips that can offer efficient control of power in automotives.

Snapshot of Automotive applications (non-exhaustive)

Driving assistance	Digital cockpit	Body and chassis	Powertrain	Others
ADAS/AD Sensors and connectivity	Infotainment Automotive High-Performance Computing (HPC)	Body Chassis	Electrification	Passive safety
Critical components that enable high performance computing for Advanced Driver Assistance Systems (ADAS) and Autonomous Driving (AD), sensors, and connectivity applications in modern vehicles. Development in this space increases the flexibility, performance, and reliability of these functions.	Critical in addressing the growing computational power demands of software-defined vehicles with rich new experiences provided by infotainment systems and other high performance computing applications in vehicles.	As software-defined vehicles become more prominent, SoC, System in Package (SiP) and system integrations are becoming more important for development and manufacturing.	Power electronics make up to 45% of the cost of an EV's traction system.	Passive safety systems such as airbags rely on power semiconductors, ICs, MEMS-based sensors, and microcontrollers within their triggering and deployment mechanisms to ensure reliability across a wide range of extreme operating conditions.
Automotive-grade integrated circuits (IC) and custom system on chips (SoC) provide reliable dedicated vision processing, radar signal processing, connectivity and sensor fusion capabilities for emerging software-defined vehicles.	Vital for delivering high-performance graphics, multi-display support, and multimedia processing. Custom SoCs integrate Graphics Processing Units (GPU), Digital Signal Processors (DSP) and Central Processing Unit (CPU) cores for rich user experiences, and the consolidation of multiple electronic control unit (ECU) functions.		Critical in providing computational intelligence and reliability when controlling traction systems.	
			Critical for EV/hybrid electric vehicles (HEV) to drive traction systems and manage power modules.	

Source: IEEE Access, Bosch, Infineon, Renesas, Qualcomm, Semiconductor Engineering, Monolithic Power, Toshiba, NXP Semiconductors, ISO, PwC Semiconductors & Beyond

The semiconductor industry's pursuit of greater performance is driving a fundamental shift in the value chain

Semiconductor design is receiving heightened attention for its role in product value and differentiation, and the need for higher processing power is increasing demand for more powerful chip materials.

Key stages of semiconductor manufacturing

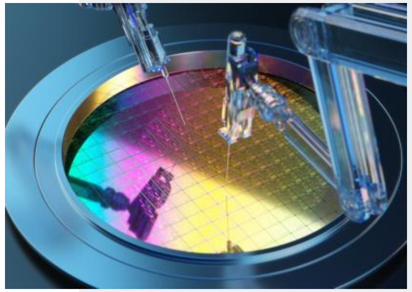
1 Design

- A shift towards Application Specific Integrated Circuits (ASIC) designs to improve performance and efficiency for specific tasks
- Electronic Design Automation (EDA) tools allow engineers to model, verify and optimise designs before fabrication, reducing costly re-spins
- AI and machine learning (ML) integration is transforming chip design, enabling prediction of design outcomes and reducing design iteration cycles

There are opportunities to leverage new technologies and developments to participate in the IC design industry.

2 Materials

- Silicon wafers remain the fundamental starting material for nearly all semiconductor fabrication, with ultra-pure silicon being a critical input
- Wide bandgap (WBG) semiconductors such as silicon carbide (SiC) and gallium nitride (GaN) are enabling high-power and high-frequency applications in EVs, 5G, and renewable energy, offering superior efficiency and thermal performance over traditional silicon



The industry must enhance its capabilities to capitalise on the shift towards wide bandgap semiconductors.

Source: PwC Semiconductors & Beyond 2026, State of the Semiconductor Industry, Semiconductor Engineering, Yole Group, Global Value Chain Development Report 2023, Interface EU, Bloomberg

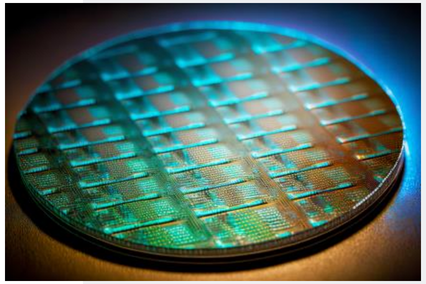
The semiconductor industry's pursuit of greater performance is driving a fundamental shift in the value chain (cont'd)

Fabs that can run several technology nodes in parallel will likely be essential for keeping production on pace and sustaining the industry’s next wave of growth. Advanced packaging has become a prime lever for system performance.

Key stages of semiconductor manufacturing

3 Wafer fabrication

- Taiwan, Province of China, South Korea, China, Japan, and Singapore together account for approximately 80% of global wafer fabrication capacity
- Costs have soared exponentially from ~USD200 million in 1983 to over USD20 billion for a bleeding-edge semiconductor fabrication plant (fab) in the early 2020s
- This is leading to continued growth in fabless chip design firms that outsource fabrication activities to large fabs with economies of scale

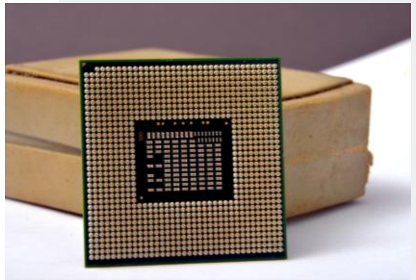


For bleeding-edge nodes, building fabs remain prohibitively expensive, making fabless models more economical for most players.

4 Packaging

Traditional packaging remain a critical lever for system performance, with key developments for advanced approaches.

- **Traditional** including power modules, remains foundational to modern electronics and accounts for the vast majority of packages in automotive applications, enabling EV powertrains, inverters, and onboard charging systems.
- **Advanced** driven by chiplets and heterogeneous integration through 2.5D and 3D architectures is increasingly adopted to meet the demands of AI, HPC, and automotive applications. This segment reached USD10 billion in 2023 and is projected to exceed USD 80 billion by 2033



As advanced packaging becomes more important to the creation of cutting-edge chips, Malaysia's Outsourced Semiconductor Assembly and Test (OSAT) industry will need to enhance its already established capabilities.

Source: PwC Semiconductors & Beyond 2026, State of the Semiconductor Industry, Semiconductor Engineering, Yole Group, Global Value Chain Development Report 2023, Interface EU, Bloomberg

The semiconductor and automotive industries are deeply interlinked—strategic partnerships and long-term agreements are critical as semiconductors are no longer just another commodity supplier, with geopolitical pressures and export controls adding further complexity to supply chain resilience

Interlinkage and strategic dependency

- Modern vehicles contain **1,000 to 3,000+ semiconductors** — a figure set to double with full electrification and autonomous driving
- Global semiconductor market valued at **USD975 billion in 2026**, projected to surpass **USD1 trillion in 2027** with automotive sector being one of the biggest contributors
- Newer vehicles and xEVs may feature up to 1,000 to 3,000 chips, which means semiconductors now represent **up to 35% of a vehicle's total bill of materials** in premium EVs

Geopolitical complexity and export control pressures

- US-China trade tensions have elevated semiconductors to a **national security asset**—no longer treated as a commercial commodity
- US CHIPS Act (**USD 52 billion**) and EU Chips Act (**€43 billion**) are actively reshaping global semiconductor investment flows and **ally-shoring** strategies
- Export controls on advanced chips and equipment—particularly targeting ASML, NVIDIA and TSMC—are fragmenting the global supply chain

Strategic imperative — partnerships and long-term agreements

- The 2021-2022 semiconductor shortage cost the automotive industry an estimated **USD210 billion in lost revenue** — exposing the risk of transactional supplier relationships
- OEMs including **Toyota, GM, Ford and Stellantis** have since moved to direct long-term supply agreements and **co-investment models** with semiconductor manufacturers
- Strategic alignment across **design, capacity reservation and technology roadmaps** is now a prerequisite for supply chain resilience, not an option

Sources: Goldman Sachs (2023), US CHIPS and Science Act (2022), European Commission (2023), US Bureau of Industry and Security (2023), AlixPartners (2022), Reuters (2023)

National policies are enabling the integration between Malaysia's semiconductor and automotive industries

The Malaysia Automotive, Robotics & IoT Institute (MARii), an agency under the Ministry of Investment, Trade & Industry (MITI), is committed to driving synergy between the semiconductor and automotive industries.

Cross-sector integration strategy anchored by three key national policies

1 New Industry Master Plan 2030

- Under NIMP 2030, the Electrical and **Electronics (E&E) industry is identified as a priority sector**, while the Automotive industry is designated as a focus sector for Malaysia's industrial development.
- The integration is directly tied to mission and strategy under the NIMP 2030
- **Mission 1 - Advanced Economic Complexity:** Focuses on encouraging the expansion to high value-added activities in the value chain through efforts to create global IC design champions from Malaysia

2 National Automotive Policy 2020

The Electrical and Electronics (E&E) sectors need to be integrated into the automotive industry to continue the development of the automotive industry towards the mobility industry.

Key elements in NAP 2020:

- **Next Generation Vehicle (NxGV)**: Energy efficient powertrains, advanced driving capabilities, connected vehicles
- **Mobility as a Service (MaaS)**: Transportation that is consumed as a service, preparing for new ownership models
- **Industrial Revolution 4.0 (IR4.0)**: Smarter and leaner manufacturing

3 National Semiconductor Strategy

- **Malaysia is targeting at least RM500 billion in semiconductor investments**. This reflects the government's ambition to position the country as a major global chip manufacturing and design hub.
- **Strategic neutrality and resilient supply chain positioning.** This highlights Malaysia's role in strengthening a secure and resilient global semiconductor supply chain.

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- **Mature ecosystem and workforce readiness**. Malaysia offers "a mature manufacturing base, robust R&D capabilities and an industry-ready workforce" for semiconductor investors

> To realise the aspirations of the National Automotive Policy, Malaysia must deepen its semiconductor capabilities to support advanced vehicle technologies, including ADAS, V2X and electrification systems.
>
> **Azrul Reza Aziz**
> **Chief Executive Officer,**
> **Malaysia Automotive,**
> **Robotics & IoT Institute (MARii)**

Source: Malaysia Automotive, Robotics & IoT Institute (MARii)

To build on its established semiconductor industry, Malaysia should actively develop its semiconductor ecosystem to uplift its competitiveness

Malaysia is the world's sixth-largest semiconductor exporter, accounting for approximately 13% of global exports. Despite significant achievements, Malaysia remains heavily concentrated in back-end processes, specifically outsourced semiconductor assembly and testing (OSAT).

National Semiconductor Strategy overview

Phase 1

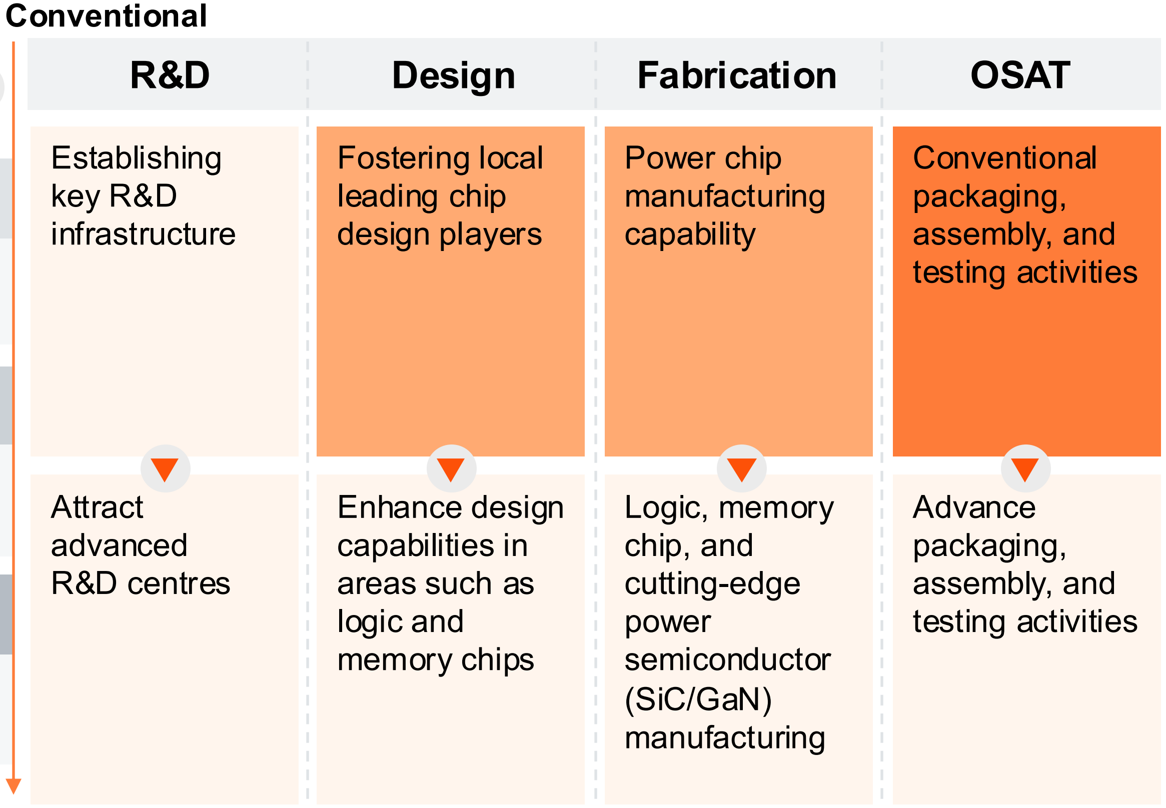
Securing core capabilities for each value chain segment

Phase 2

Transition to advanced technology

Phase 3

Achieving global semiconductor competitiveness



Conventional

	R&D	Design	Fabrication	OSAT
Conventional	Establishing key R&D infrastructure	Fostering local leading chip design players	Power chip manufacturing capability	Conventional packaging, assembly, and testing activities
Advanced	Attract advanced R&D centres	Enhance design capabilities in areas such as logic and memory chips	Logic, memory chip, and cutting-edge power semiconductor (SiC/GaN) manufacturing	Advance packaging, assembly, and testing activities

Advanced

Note: Enhancement in materials are key to advancing fabrication and OSAT

▨	Low presence
▨	Medium presence
■	High presence

Where do we go from here?

Malaysia should not only advance towards **high-end manufacturing, semiconductor design, and sophisticated semiconductor manufacturing equipment but also build upon its position in OSAT capabilities** and advanced packaging.

This is important because in an era of supply chain realignment and AI-driven chip demand, **owning a greater share of the semiconductor value chain is Malaysia's most strategic lever** to move from a low-cost assembly hub to a high-value technology nation.

Source: National Semiconductor Strategy, PwC Semiconductor Centre of Excellence, New Industrial Master Plan 2030 (NIMP 2030), Channel News Asia

3

What’s next?

The right to win and the race to position Malaysia as the regional hub for high value components

Advancing Malaysia’s automotive and semiconductor sectors

Looking ahead, three overarching strategies could serve as catalysts to grow Malaysia's automotive and semiconductor sectors, whilst strengthening the synergies between them. We also put forward some nascent initiative concepts that could help bring these strategies to fruition.

1 Technology advancement

Malaysia’s semiconductor sector is still **heavily dominated** by **traditional OSAT operations**. It will have to shift towards newer and more advanced activities to remain competitive and relevant

2 Knowledge and IP creation

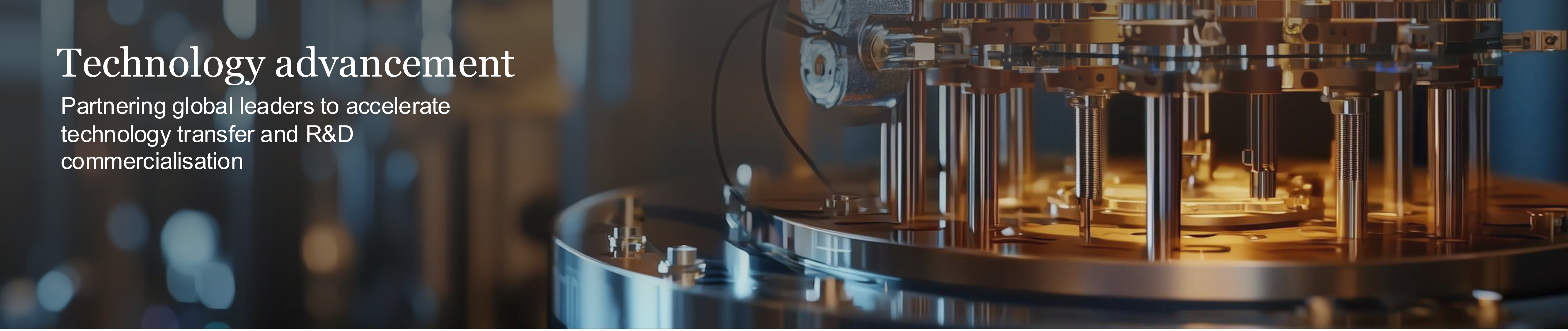
Knowledge and IP creation in Malaysia remain **limited** across the automotive and semiconductor industries. The linkage between the two sectors should be increased, attracting and developing Tier 1 system integrators

3 Talent

Malaysia needs **50,000 additional skilled semiconductor engineers** but universities **produce only about 5,000 graduates p.a.** Cross-border talent programmes, global talent attraction and industry collaboration is required to close this gap

Technology advancement

Partnering global leaders to accelerate technology transfer and R&D commercialisation



Fostering international partnerships

Malaysia has a compelling but time-bound opportunity to secure its place as a key node in the global automotive semiconductor and high-value electronics supply chain. Achieving this will require establishing strategic collaborations with global semiconductor leaders and automotive Tier 1 companies as well as automotive OEMs to accelerate technology transfer, gain access to advanced intellectual property, and build capabilities to move beyond OSAT operations.

In practice, this means pursuing two complementary initiatives.

Co-invest with leading semiconductor firms to bring key semiconductor expertise and capabilities in key segments such as wide bandgap (WBG) power semiconductors and advanced packaging technologies.

Incentivise the establishment of international R&D centres for automotive integrated circuits in Malaysia with a focus on ensuring smooth transition from R&D activities to commercialisation.

Co-invest with leading semiconductor firms on 3 high-value technology segments for Malaysia in the automotive-semiconductor industry

	Technology segments	Automotive applications*	Current status in Malaysia
1	**Power semiconductors (SiC/GaN)** WBG power semiconductors include materials like SiC and GaN that have a larger energy bandgap than traditional silicon. Devices can operate at higher voltages, temperatures, and switching frequencies with greater efficiency and reduced energy losses.	• Electric Vehicle Traction Inverters (electric motors) • On-Board Chargers • DC converters • Battery Management Systems	• WBG adoption is increasing globally • Local and foreign firms currently operate in Malaysia, developing and manufacturing WBG components, with the sector expected to grow
2	**Advanced packaging and system integration (Chiplets/SoC/SiP)** Combining multiple smaller chiplets or dies into a single package (SoC/SiP), enabling higher performance, design flexibility, and cost efficiency with the aim to increase yield, performance, and reliability.	• ADAS & Autonomous Driving SoCs • Infotainment Systems • Centralised Vehicle Computers (Zonal Architecture) • V2X Communication Modules • LiDAR & Radar Sensor Modules • EV Battery Management ICs • In-Cabin Monitoring Systems	• This category includes a wide variety of products across multiple technology segments, including logic chips, memory modules, and other ASICs, with varying levels of manufacturing and development in Malaysia • As demand for processing power increases in the automotive industry, chips for automotive applications will have to meet stringent reliability, safety, and quality standards • Malaysia is well positioned to capitalise on this growth by developing services such as testing, validation, and electronic design automation (EDA)
3	**Automotive-grade IC design and ASICs** Focus initially on 90nm–65nm nodes, which represent ~85% of ASEAN's total industry volume, powering body ECUs, sensors, instrument clusters, and basic infotainment. Expand into 40nm–28nm nodes to capture higher-value EV and ADAS opportunities critical for next-generation local EV development. Design of integrated circuits meeting stringent automotive standards (AEC-Q100, ISO 26262) for ADAS, electrification, and in-vehicle computing applications requiring reliability in harsh operating conditions.		

*Non-exhaustive

Source: PwC Semiconductors & Beyond, Journal of Management Engineering and Information Technology, OMDIA 2024, Semicon Europa, CREST

Exhibit A:
Proof-of-concept for Malaysian-made integrated circuits in mobility applications

MARii is partnering with automotive OEMs, Tier 1 suppliers and an IC design firm to develop a locally produced automotive component as a proof-of-concept for broader integration. The pilot engages local suppliers including Multi-Code Electronics Industries, Betamek Electronics, Delloyd Industries to strengthen localisation and accelerate adoption of Malaysian-made ICs in mobility applications.

Tier's objectives	Products (non-exhaustive)	
1 Immediate actions **Leverage current products**	Parking Sensor ECU Switches	Instrument cluster Automotive lamps
2 Strategic enhancements **Build depth and strategic capabilities**	Radars Cameras	Sensors
3 Critical transformations **Transform Malaysia into a high-tech semiconductor nation**	System on Chip (SOC)	

Source: Malaysia Automotive, Robotics & IoT Institute (MARii)

Knowledge and IP creation

Building an integration hub, attracting Tier 1s, and fast-tracking design to manufacturing

Attract and develop Tier 1 system integrators

Despite Malaysia's strength as the world's sixth-largest semiconductor exporter, its industry remains in back-end processes. To move decisively up the value chain, Malaysia must position itself as a regional hub for automotive systems integration by attracting and nurturing companies capable of delivering complete automotive subsystems from ADAS and infotainment to centralised vehicle computers driving higher value-add activities beyond traditional OSAT.

Realising this ambition calls for three paths of action.

Automotive Systems Integration Hub
A dedicated industrial zone with shared infrastructure for automotive SoC development, testing, and validation to automotive IC standards (AEC-Q100).

Incentivise the establishment of Tier 1 system integrators
by exploring joint ventures, incentives, and other mechanisms to bring Tier 1 system integrators to Malaysia.

Fast track design to manufacturing
by streamlining regulatory pathways and providing grants for companies transitioning from chip design to local manufacturing and packaging.

Talent

Closing the talent gap by attracting global talent and industry-academia partnerships

Attract and develop top talent

Malaysia's semiconductor ecosystem offers mature manufacturing, robust R&D, and strong government-industry-university talent collaboration.

However, a critical gap of 50,000 skilled engineers, coupled with increasingly sophisticated skill demands, requires urgent transformation to avoid constraining sector growth.

Closing this gap requires action across two paths.

Cross-border talent programmes and global talent attraction through exchange programmes with semiconductor hubs (Taiwan, Province of China, South Korea, Japan) to upskill Malaysian engineers in advanced technologies, as well as to fast-track visas with competitive tax incentives to bring top expertise to Malaysia.

Fostering partnerships with industry players and education and training institutions to increase the output of skilled graduates to support industry development.

Contact us

Patrick Ziechmann
Partner, Automotive ASEAN Leader
PwC Malaysia
patrick.oliver.ziechmann@pwc.com

Patrick Tay
Partner, Economics & Policy
PwC Malaysia
patrick.se.tay@pwc.com

Annafi Zulkifli
Director, Economics & Policy
PwC Malaysia
annafi.zulkifli.my@pwc.com

Annuura Rasul
Senior Manager, Economics & Policy
PwC Malaysia
annuura.rasul@pwc.com

Chee Kin Beh
Senior Associate, Economics & Policy
PwC Malaysia
chee.b.beh@pwc.com

Azrul Reza Aziz
Chief Executive Officer
Malaysia Automotive, Robotics &
IoT Institute (MARii)

Ts. Harizah Hashim
Head of Emerging Mobility &
Ecosystem Catalyst
Malaysia Automotive, Robotics &
IoT Institute (MARii)

Dr Luqman Yunos
Senior Researcher
Malaysia Automotive, Robotics &
IoT Institute (MARii)
luqman@marii.my

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