Ministry of
Economic Affairs

TAIWAN NEW GENERATION AUTOMOTIVE INDUSTRY CHAIN

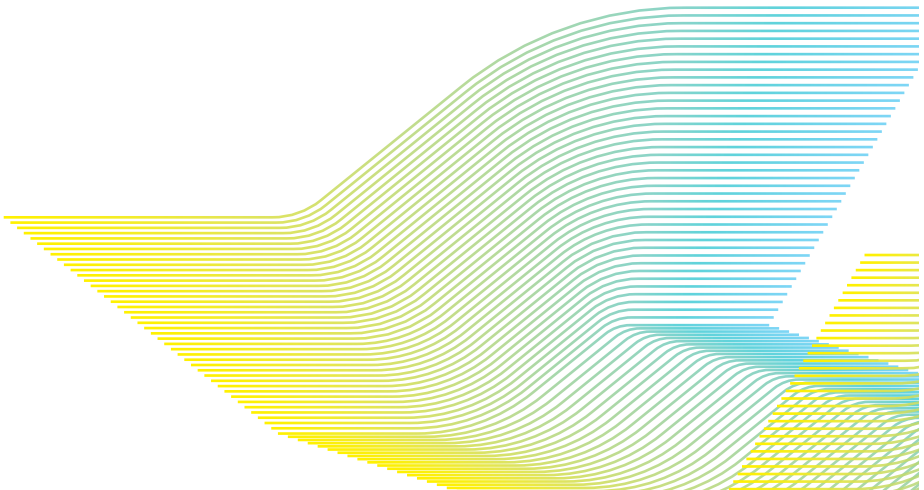
2023

Collaborating with Taiwan's ICT Industry to Seize Business Opportunities in the Development of New Generation Vehicles.

2023

Taiwan New Generation Automotive Industry Chain

※ NEW GENERATION VEHICLES IN THIS MANUAL REFER TO ELECTRIC VEHICLES (EVS)



01 Policy Guidelines

Taiwan is following in the footsteps of countries around the world working towards "Net-Zero Emissions by 2050," and is actively developing fields related to electric vehicles. According to Taiwan's Pathway to Net-Zero Emissions in 2050 announced by the National Development Council in March 2022, Taiwan plans to develop five net-zero technologies, including sustainable and innovative energy, low carbon & carbon reduction, carbon negative, circulation, and humanities & social sciences. Sustainable and innovative energy includes hydrogen energy applications, and low carbon includes low-carbon manufacturing processes and green transportation. The transportation sector will step up efforts to make all public buses electric in Taiwan by 2030 and ban sales of fossil fuel vehicles and motorcycles by 2040.

The Ministry of Economic Affairs (MOEA) has formulated implementation strategies for electric vehicles, including supporting local production, subsidizing key parts R&D, striving to enter international markets and driving EV domestic demand. The MOEA launched the Smart Electric Vehicle Key Parts Development Subsidies Program in 2022 to facilitate transition and upgrades for key systems and components companies with potential. These companies eventually become Tier 1 suppliers to automobile companies.

Taiwan has a complete EV supply chain and a world-leading semiconductor industry, so our capacity in the global EV market is projected to grow rapidly. Public charging infrastructure is an important condition for popularizing electric vehicles. So, the Ministry of Transportation and Communications (MOTC) has compiled various government measures in the action plan to improve supporting measures for the environment under "Carbon-Free & Electric Vehicles" of the Roadmap to Net Zero Emissions in 2050. The MOTC plans to increase the number of charging facilities, set relevant specifications, and establish support measures for electricity consumption, which are further divided into 19 action plans. Hardware improvements and the implementation of supporting environmental plans will create a friendly EV environment in Taiwan.

02 Industry Overview

Scale of Output Value

Taiwan is a global leader in semiconductors and has a complete upstream, midstream, and downstream industry chain. It is an important partner to high-end chips and automotive semiconductor companies around the world. Moreover, Taiwan has a highly developed automotive electronics industry, as well as other related industries, and leads the world in in-vehicle infotainment systems (IVI system), advanced driver assistance systems (ADAS), auto parking assist (APA), and EV parts manufacturing.

The output value of Taiwan's automotive parts and electronics industries reached NT$355 billion in 2022. Following the development of electric vehicles and autonomous driving technologies, the output value is expected to surpass NT$600 billion in 2025, with the compound annual growth rate reaching 14.02%.

The battery is the core component of an EV and accounts for a majority of the cost as well, approximately 40%. According to the Industrial Technology Research Institute (ITRI), the global output value of batteries was nearly US$95 billion in 2022, and it is expected to surpass US$100 billion in 2023. Taiwan has a certain advantage in downstream battery assembly, and its output value of battery modules accounts for approximately 40% of the global market (mainly in digital products). In the future, Taiwan is planning to develop upstream battery materials. We currently have companies working on the four main battery components: eJoule Technology and CoreMax for positive electrodes, CSCC and Long Time Technology for negative electrodes, BenQ Materials for separators, and Hopax Fine Chemicals electrolytes.

Taiwan is also part of the supply chain of international automobile companies for advanced driver-assistance systems (ADAS) and key parts of EVs, e.g., IVI systems, blind spot detection (BSD), lane departure warning systems (LDWS), auto parking assist (APA), and automotive LED products. Following the development of autonomous driving and connected vehicles, Taiwan's output value has also increased, and the EV industry may become the next trillion-dollar industry in Taiwan.

Industry Chain

Taiwan's automobile industry has accumulated strong manufacturing capabilities over several decades, forming a complete automobile industry chain through long-term collaborations with traditional automobile companies and their suppliers. In light of the development in recent years, Taiwan's automobile and parts manufacturers are actively preparing for EVs and gradually integrating with the supply chains of international automobile companies, leveraging their advantage to play an important role in the process.

At present, Taiwan's EV industry chain covers materials, parts and modules, systems and subsystems, system integration, and whole-vehicle manufacturing. Related companies play an important role to supply parts and modules. Furthermore, Taiwan has a complete automotive electronics industry chain, making us highly competitive in the EV industry.

Automotive electronics systems

- Internet of vehicles (IoV):Lite-On, Chunghwa, Telecom
- Panels:AUO, Innolux, Giantplus
- Automotive memories:Winbond, Macronix
- Navigation systems:Garmin, MiTAC
- In-vehicle computers:ASUS, Advantech
- Wireless communications:WNC, Alpha Networks, RealTek
- Head-up displays:E-lead, UniMax
- Automotive cameras:Asia Optical, Calin, H.P.B., Optoelectronics

Body System

- Automotive LEDs:Ta Yih Industrial, DEPO, TYC
- Fasteners:SUMEEKO, Boltun, San Shing Fastech, New Best
- Forged aluminum wheels:SuperAlloy
- Safety belt retractors:Getac
- Electronic curtains:Macauto
- Connectors:Hu Lane Associate, Alltop Technology, BizLink, Sinbon, Foxconn Interconnect Technology
- Cooling fans and modules:Jentech Precision, Sunon, Yen Sun, Amulaire
- Ball screws:HIWIN, PMI

Motor electrical system

- Motor magnetic steel sheets:CSC
- Decelerators:Hota
- Transmission shafts:Kian Shen
- Transmission components:Global PMX
- Motors:Fukuta, TECO, ADATA

Charging system

- Charging station relays:Lite-On
- Relay bases:China Fineblanking Technology
- Charging guns:K.S. Terminals, AcBel, Polytech
- Charging gun power cords:Cheng Uei, Well Shin
- Charging management services:xMight

Battery systems

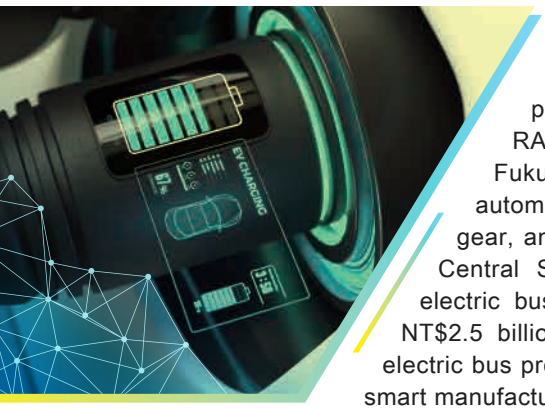
- Battery materials:Advanced Lithium Electrochemistry, CSCC, Chang Chun, BenQ
- Battery cells:Molicel,Delta Electronics, Amita Technologies, Foxconn (plant under construction)
- Battery harnesses:BizLink
- Battery module structural parts:ESON
- Battery cases:China Fineblanking Technology
- Lead frames:SDI
- Battery modules:SMP(Advanced Energy Solution), Gogoro, Mobiletron, China Motor, DynaPack, Celxpert Energy, DARFON

Source:Industrial Technology Research Institute (ITRI); Industry, Science and Technology International Strategy Center ; Automotive Research & Testing Center; and Metal Industries Research & Development Centre

Industry Clusters

Northern Cluster

The Northern Cluster is the main base of Taiwan's automobile industry and has a complete industry supply chain. It includes vehicle assembly companies and vehicle body manufacturers, such as GOGORO, SANYANG, Yulon, CMC, RAC, LioHo, and KuoZui. The Northern Cluster is gradually developing into an important R&D center for EVs. For example, SanYuan established an integrated services headquarters in the Taoyuan Hi-tech Industrial Park. Foxtronev is a joint venture of Foxconn and Yulon Group that focuses on the R&D and manufacturing of smart electric vehicles and is located in the Baogao Science and Intellectual Park.



Central Cluster

The Central Cluster has gathered key parts manufacturers, including WongDec and RAC for whole-vehicle and control systems, Fukuta Motor for motor systems, Calin for automotive optical lenses, Hota for deceleration gear, and HIWIN for ball screws. Furthermore, the Central Science Taiwan Park is focused on the electric bus industry. For example, Master invested NT$2.5 billion in the Erlin Park to establish the first electric bus production line, which is to be combined with smart manufacturing.

Southern Cluster

The Southern Cluster has many auto parts and accessories manufacturers. Examples include: Tong Yang (TYG), the world's largest aftermarket (AM) plastic parts and bumper manufacturer; DEPO and TYC, both major headlight manufacturers; and Whetron, major manufacturer of automotive electronics . The rise of EVs is driving demand for compound semiconductors, creating massive potential for the Southern Cluster, which is also an important center for Taiwan's semiconductor industry. For example, the Dutch company NXP established a global testing and R&D center in Kaohsiung for new automotive products. Furthermore, an automotive battery industry chain currently in development in southern Taiwan is very promising, as Foxconn invested NT$6 billion in Kaohsiung in June 2022 to establish a battery R&D and trial production center.

Northern Cluster

Motors and control modules:
Delta Electronics, TECO, Shihlin Electric, Taigene, EVT, Tatung Electric
Automotive accessories systems:
TECO, Taigene, Delta Electronics, Denso
Batteries:
Amita Technologies, SMP (Advanced Energy Solution), PSI, Delta Electronics, GUS Technology,Taiwan Yuasa Battery, Gogoro, Celxpert Energy, DynaPack, DARFON, ProLogium, Lite-On, XING Mobility
Other key EV technologies &system integration:
Delta Electronics, Chroma ATE, Lioho Machine Works, Foxtron
Niche EVs:
Broadcasting Corporation of China, Baojie, Foxtron

Central Cluster

Motors and control modules:
RHYMEBUS, Fukuta, Adlee Powertronic
EV accessories systems:RHYMEBUS
Batteries:
WongDec, Changs Ascending, Formosa Smart Energy
Other key EV technologies & system integration:
Taiwan Precision, Chiau Cheng
Niche EVs:Merida, Taiwan Helio, RAC
In-vehicle optical lens:Calin, Asia Optical

Southern Cluster

Motors and control modules:UCF, Rich Electric
Batteries:Molicel, C-LiFe, Foxconn
Other key EV technologies & system integration:Jui Li
Niche EVs:Kymco, Pillar Spoke, Master Transportation, Tang Eng Iron Works

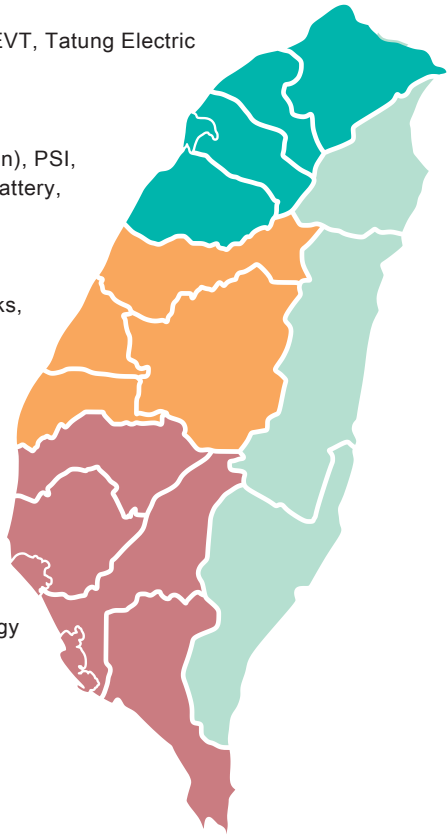


Figure 1
Taiwan's EV Industry Cluster

03 Investment Opportunities

Optimal R&D and Testing Base for EVs

Taiwan has a complex traffic environment with pedestrians, scooters, and cars on the road. Our citizens are also frequent users of digital products and services. Hence, compared to other countries, Taiwan is a more complex and suitable testing ground for developing self-driving cars. Through international collaborations, we can upgrade industries and become an EV demo site. This includes cross-sector collaboration in new business models and EV demonstrations. The Unmanned Vehicles Technology Innovative Experimentation Act will facilitate development of self-driving car sites as well as foreign companies that develop products and establish R&D centers in Taiwan.

Furthermore, the Automotive Research & Testing Center (ARTC) has Asia's most complete EMC laboratory conducting electromagnetic interference and susceptibility tests on electric buses, cars, scooters, and parts. The laboratory has obtained certifications from the American Association for Laboratory Accreditation (A2LA), GM, Ford, FCA, Fisker, Jaguar & Land Rover, and Harley-Davidson, and helps companies obtain international certifications and EMC test reports. In the future, Taiwan will have more efficient certification, testing, and modification processes.

Collaborate with the ICT Industry to Develop New Generation Vehicles

New generation vehicles cover an extensive field, including EVs and self-driving cars, and there are still considerable technical and R&D barriers. Conventional manufacturers are unable to develop new generation vehicles on their own, tech companies have trouble entering the automobile industry on their own, and new car companies need to work with partners in different industries and fields or even seek technology abroad to make breakthroughs in emerging technologies.

Taiwan has world-class R&D and manufacturing in automotive electronics, gaining the recognition of international automobile manufacturers for its capabilities after years of dedication to vehicle safety, assistance, communications multimedia, and automotive IC. Taiwan has gradually established a supply chain for new generation vehicle key parts, such as cameras, radars, and Internet of Vehicles (IoV) communication modules, among other sensor/positioning products. Taiwanese companies are also currently supplying international companies.

Demand for sensor technology has significantly increased due to the rise of new generation vehicles, and ICT companies are investing in LiDAR, HD map, and automotive ethernet IC design, while seizing system integration business opportunities.

Taiwan can manufacture whole-vehicles and components (complete production services)

Taiwan's automobile manufacturers have invested considerable resources to increase of overall manufacturing capacity, some companies can even manufacture EVs independently. With highly flexible production lines providing complete manufacturing services for small batches of special vehicle models, Taiwan companies are ideal partners for the early stages of trial production.

Furthermore, Taiwan has excellent auto parts manufacturing abilities and strong technical capabilities in EV lithium batteries, motors, deceleration gear, energy storage systems, electricity control modules, power control systems, and in-vehicle information and communication systems. Many Taiwanese companies are supplying EV parts to international automobile manufacturers, such as Tesla and BMW Mini-E, showing that Taiwanese parts suppliers have gained international recognition. Taiwan also has the ability to produce positive and negative electrode materials, copper foil, and electrolyte for lithium batteries. In the future, Taiwanese parts manufacturers will utilize their excellent R&D abilities to continue to provide products to international automobile manufacturers.

04 Investment Incentive Measures

Tax Measures

Besides setting the profit-seeking enterprise income tax rate at 20%, the following preferential tax measures are also applicable to foreign companies to encourage them to invest in Taiwan, support industry innovation, and facilitate industry-academia collaboration:

Items	Preferential Measures
Develop and Introduce Technologies or Machinery and Equipment	▪ Companies may deduct up to 15% of their R&D expenses from their profit-seeking enterprise income tax in the current year; or deduct up to 10% of expenses from their profit-seeking enterprise income tax over the course of 3 years. ▪ Royalty payments to foreign companies for imported new production technologies or products that use patents, copyrights, or other special rights owned by foreign companies is, with the approval of the Industrial Development Administration, MOEA, exempt from the corporate income tax. ▪ Import duties on machinery and equipment not manufactured in Taiwan are waived.
Investments in smart machinery /5G/information security	▪ Smart machinery:Use big data, AI, and IoT for new hardware, software, technologies, or technical services, such as automated scheduling and flexible or mixed production lines. ▪ 5G:Related investments include new hardware, software, technologies, or technical services of 5G communication systems. ▪ Information security:Include investments of companies in new hardware, software, technologies, or technical services for information security products or services into the scope of deductibles.

Items	Preferential Measures
Investments in smart machinery /5G/information security	▪ When the investment amount reaches NT$1 million and above but no more than NT$1 billion, there are two options for deductibles: “deduct 5% of the investment amount from the profit-seeking enterprise income tax in the current year” or “deduct 3% of the investment amount from the profit-seeking enterprise income tax over three years”; however, the deductible may not exceed 30% of the profit-seeking enterprise income tax payable each year. ▪ Applicable until December 31, 2024.
Employee stock awards	▪ Where company employees receive stock awards within NT$5 million, and hold the shares and continue to serve at the company for two years, they may be taxed at the price when the shares were acquired or transferred, whichever is lower.
Specific foreign professionals	▪ Half of the salary income exceeding NT$3 million of specific foreign professionals that meet the criteria is exempted from being included in gross consolidated income.
Companies in various industrial parks	▪ Companies in export processing zones, science parks, and free trade zones will enjoy import duty, commodity tax, and business tax exemptions for imported machinery and equipment, raw materials, fuel, supplies, and half-finished products.
Other	▪ Undistributed earnings invested by companies may be listed as deductibles and exempted from the profit-seeking enterprise income tax.

Subsidy Measures

1.Global Innovation Partnership Initiatives Program

Companies approved by the MOEA may receive subsidies of up to 50% of total R&D expenses. These incentives are designed to encourage foreign companies that complement and mutually benefit Taiwan's industries to engage in innovation and R&D activities in Taiwan. Activities include the development of advanced technologies surpassing current industry standards in Taiwan, as well as key technologies and integrated technologies needed by industries through collaborative R&D with Taiwanese companies. These endeavors are expected to have a significant positive impact on domestic industries, such as facilitating the establishment and development of an industrial technology R&D and supply chain, improving R&D efficiency, accelerating the timetable from R&D to industry application, and assisting in the active development of international markets.

2.Pioneers for Innovation Leadership on Technology Program

Companies approved by the MOEA may receive subsidies of up to 50% of their total R&D expenses, in order to develop Taiwan into a high-tech R&D center; attract major companies with technological leadership around the world to establish an advanced R&D base in Taiwan; develop prospective technologies and collaborate with domestic industry chains; develop a collaboration system for research, co-creation, and development to strengthen the technical competitiveness of leading industries in Taiwan; and accelerate the development of emerging industry clusters.

3.Industrial Upgrading Innovation Platform Guidance Program

The Industrial Development Administration implemented the Industrial Upgrading Innovation Platform Guidance Program to facilitate the development of industries with higher added value. The program encourages companies to develop high-end product applications market, ultimately raising the industry's value-added ratio. For companies that have a R&D team in Taiwan, 40% to 50% of project funding is subsidized for theme-based R&D projects, and up to 40% of project funding is subsidized for R&D projects proposed by companies.

05 Taiwan Representative Companies

Materials and Components

CHANG CHUN PETROCHEMICAL CO., LTD.

www.ccp.com.tw

Established in 1964, Chang Chun Petrochemical mainly supplies electro-deposited copper foil used in EV lithium batteries. The electro-deposited copper foil can reach 5 μm in thinness and significantly improves battery performance. Chang Chun caters to the world's top five lithium battery suppliers, and up to 60% of EVs produced by Tesla in its US plants use copper foil from Chang Chun in their lithium batteries. Chang Chun currently has an approximately 25% market share of the global EV lithium battery copper foil market.

Honley Auto. Parts Co., Ltd.

www.ceck.com.tw

Established in 2014, CECK's main products include hot stamping plates and structural parts (e.g., A/B-pillars, door beams, bumpers, vehicle roof bows, and side steps), as well as the assembly and manufacturing of application products. Hot stamping parts are thin, lightweight, and safe, meeting the lightweight and safety requirements of EVs.

ProLogium Technology Co., Ltd.

prologium.com

Established in 2006, ProLogium is a lithium battery cell manufacturer that uses lithium ceramic battery technology and focuses on the development of oxide-based solid-state batteries. ProLogium's products are safe and have high energy density, which have attracted strategic partnership with international automobile companies, who invest in the mass production and commercialization of solid-state lithium batteries.

Modules and Systems

Pegatron Corporation

www.pegatroncorp.com

Established in 2008, Pegatron supplies automotive electronics products to German companies, including IVI system application services, remote recording devices, and ADAS. The company has been actively expanding into EVs and provides automotive electric control systems and divisional or subsystem solutions. Its customers include Tesla, Audi, and Toyota, and it has become a Tier 1 supplier.

TungThih Electronic Co., Ltd

www.tungthih.com.tw

Established in 1979, TTE mainly develops ADAS. It is the third largest supplier of parking sensors in the world and integrates ultrasonic radar and automotive camera solutions. Customers include Tesla, Ford, GM, Volkswagen, and PSA.

DELTA ELECTRONICS, INC.

www.deltaww.com

Established in 1971, Delta mainly supplies EV transmission systems and charging equipment. Delta Electronics and GKN Automotive, a transmission system supplier in the United Kingdom, jointly developed a new generation eDrive system for EVs by combining the motor and gearbox of GKN with the motor driver of Delta Electronics. This reduced its weight, size, and simplified the assembly process, accounting for 10% of the global EV power system market. Delta Electronics also provides charging stations with two-way charging and discharging, including DC fast charging, AC chargers, and charging station management systems, and has obtained certifications for safety regulations and standards of the European Union, United States, Mainland China, and Taiwan.

XING MOBILITY INC.

www.xingmobility.com

Established in 2015, Xing Mobility obtained a patent for immersion cooled battery technology, using a high-power density modular design to achieve high efficiency cooling, while significantly reducing size and weight. The company currently targets the commercial and industrial EV market, and developed the patented “Immersion Cooled Modular Battery System” to change conventional combustion engines of vehicles in construction, agriculture, and mining, which mainly use diesel, into battery systems.

Whole Vehicles

RAC Electric Vehicles Inc.

www.racev.com

Established in 2005, RAC EVs is a manufacturer of commercial EVs; it launched the electric bus brand “RAC,” and has the ability to design electric buses and manufacture vehicles. The company has patents for three electric system technologies (battery, electric machinery, and electric control), including electric bus power control systems, electric bus battery abnormality detection, low chassis electric bus battery layout, electric bus motor transmission mechanisms, and electric bus air conditioner condensers.

Foxtron Vehicle Technologies Co., Ltd.

www.foxtronev.com

A joint venture of Foxconn Group and Yulon Group in 2020, Foxtron Vehicle Technologies integrates Yulon’s whole vehicle R&D platform with Foxconn’s supply chain system, parts manufacturing, mechanism design, and system integration abilities to provide new energy vehicle development and key subsystem development services, promoting the MIH EV platform and sharing model. At present, the independently developed electric bus Model T has been delivered to Kaohsiung Bus, and the company plans to mass produce the electric SUV Model C and electric coupe Model E, showing its EV manufacturing and technology development abilities.

TANGENG ADVANCED VEHICLES CO., LTD.

www.tangeng.com

Spun off in 2002, Tangeng was formerly part of the Vehicle Business Department of the state-owned Tang Eng Iron Works Co., Ltd. Main products include electric buses, electric multiple units, trucks, buses, and new energy devices. The company obtained the ISO 9001 certification from France’s BVQI and the United Kingdom’s UKAS in 2003. The company signed a technology licensing agreement with Sweden’s VOLVO Trucks and Buses to jointly produce VOLVO trucks and buses. It formed the CTP alliance with Aviation Industry Development Company (AIDC), the leader of Taiwan’s aerospace industry, in 2021 and announced that it will jointly develop a Taiwanese brand of electric buses.

Other Examples

Mobility In Harmony Open EV Platform

www.mih-ev.org/en/index

Foxconn Technology Group established the open EV platform in 2020 to break through the high development cost, long development times, and resource-intensive characteristics of the conventional automobile industry. Foxconn Technology Group has adopted MIH as a platform to create an open and shared ecosystem, and attracted companies to join the ecosystem and jointly drive technological innovations and development of the EV industry. As of February 2023, over 2,500 companies are part of the MIH platform.

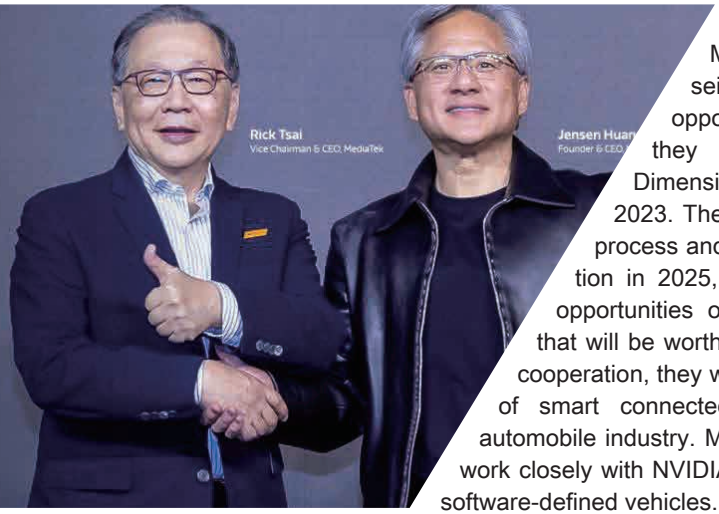
06 Examples of Foreign Investment

NXP and Pegatron Collaborates on Smart Cockpit Solution

NXP, a major Dutch automotive IC manufacturer, and Pegatron, a Taiwanese company, showcased their smart cockpit solution at the 2023 COMPUTEX (from May 30 to June 2, 2023). The solution uses NXP's MCU and MPU series. NXP Executive Vice President Rafael Sotomayor stressed that Taiwan is crucial to NXP's strategy in that it provides high quality talent and a complete supply chain. NXP not only built a global testing and R&D center in Kaohsiung for new automotive products, but will also collaborate with Taiwanese companies for future automobile development.

Figure 2. Concept Map of NXP's Smart Cockpit, NXP's Official Website

MediaTek and NVIDIA Collaborate on Automotive Business Opportunities



Major IC design house MediaTek and NVIDIA jointly seized automotive business opportunities, announcing that they will develop the platform Dimensity Auto together on April 29, 2023. The companies will use a 3 nm process and plan to begin mass production in 2025, in order to seize business opportunities of the smart cockpit market that will be worth US$10 billion. Through this cooperation, they will develop a new generation of smart connected vehicles for the global automobile industry. MediaTek indicated that it will work closely with NVIDIA to jointly create a future of software-defined vehicles.

Figure 3. MediaTek and NVIDIA Jointly Seize Automotive Business Opportunities, MediaTek's Official Website

2023

Taiwan New Generation Automotive Industry Chain

Department of Investment Promotion, MOEA
Address:3F, No. 82, Aiguo E. Rd., Zhongzheng District, Taipei City
Contact Number:+886-2-2389-2111
Fax:+886-2-2389-0497
Website:investtaiwan.nat.gov.tw
E-mail:dois@moea.gov.tw

InvesTaiwan
Address:8F, No. 1, Xiangyang Rd., Zhongzheng District, Taipei City
Contact Number:+886-2-2311-2031
Fax:+886-2-2311-1949
Website:investtaiwan.nat.gov.tw
E-mail:service@invest.org.tw

Publisher:Department of Investment Promotion, MOEA
Address:3F, No. 82, Aiguo E. Rd., Zhongzheng District, Taipei City
Contact Number:+886-2-2389-2111

2023

TAIWAN NEW GENERATION AUTOMOTIVE INDUSTRY CHAIN

AD by MOEA 2023.11