

2025 Oct. 17 (Fri) - AI & Semiconductor Strategic Innovation



Dr. Tzi-Dar Chiueh

PM 03:50 - 04:20

晶創臺灣方案: 奠基臺灣未來科技國力

Introduction to Taiwan's Chip-Based Industry Innovation Program

CEO, Taiwan Chip-Based Industry Innovation Office



Taiwan Cbi

Taiwan Chip-based Industrial
Innovation Program

Tzi-Dar Chiueh

October 17, 2025



Outline



1

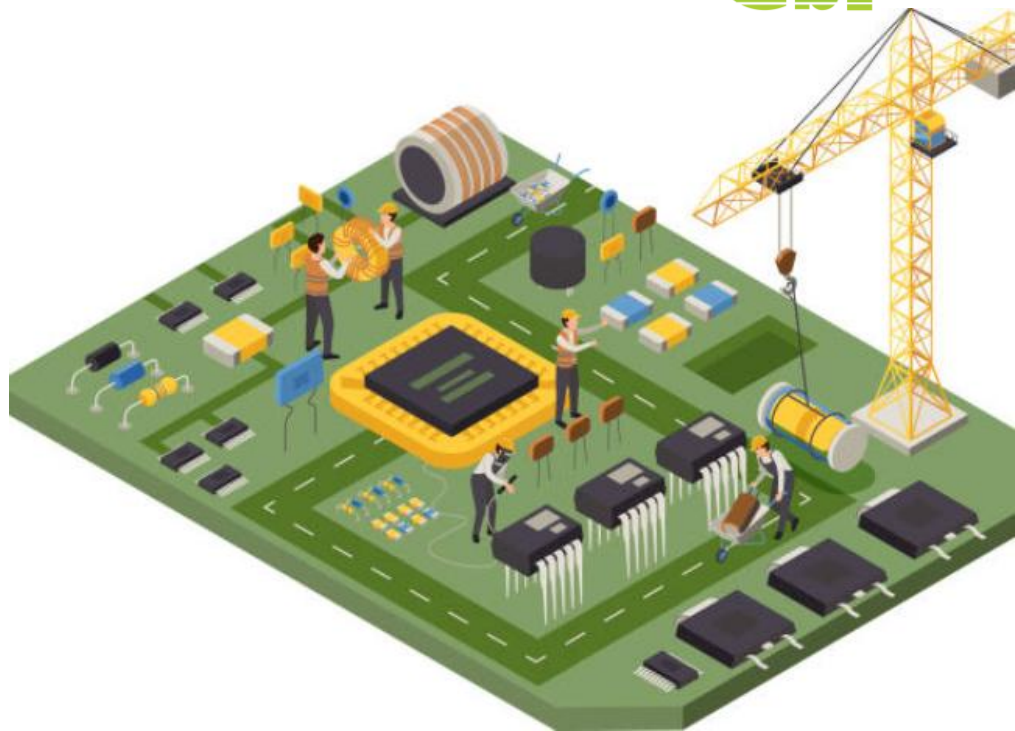
Megatrends and
Challenges

2

Goals and Themes

3

Major Accomplishments
and Impacts



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Global Trends and Challenges

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Forecast on Global Semiconductor Market



PRECEDENCE
RESEARCH

SEMICONDUCTOR MARKET SIZE 2023 TO 2033 (USD BILLION)

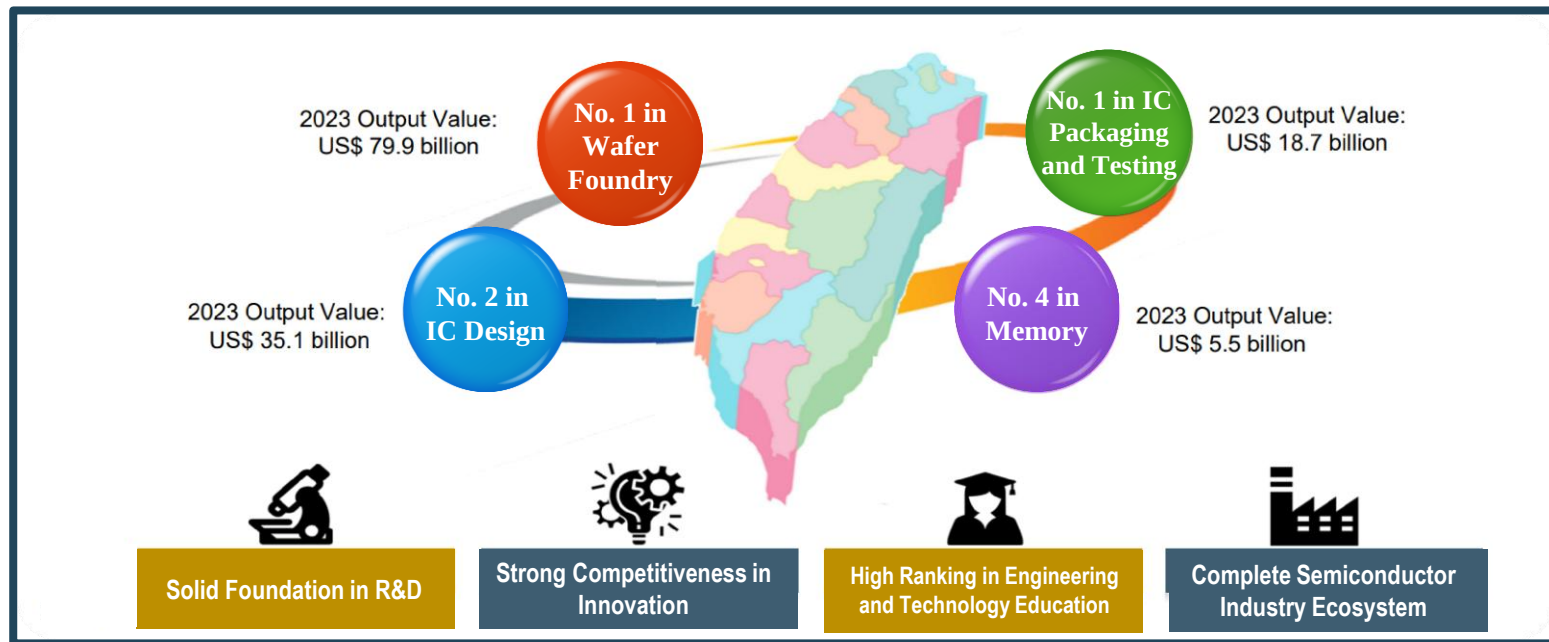


Source: <https://www.precedenceresearch.com/semiconductor-market>

Taiwan's Position in the Global Market



Taiwanese semiconductor industry includes three main sectors: IC design, IC manufacturing, and IC packaging and testing. In 2023, the value of Taiwan's semiconductor industry was approximately NT\$4.34 trillion, and it is more than NT\$5.1 trillion in 2024, representing 17.7% growth.

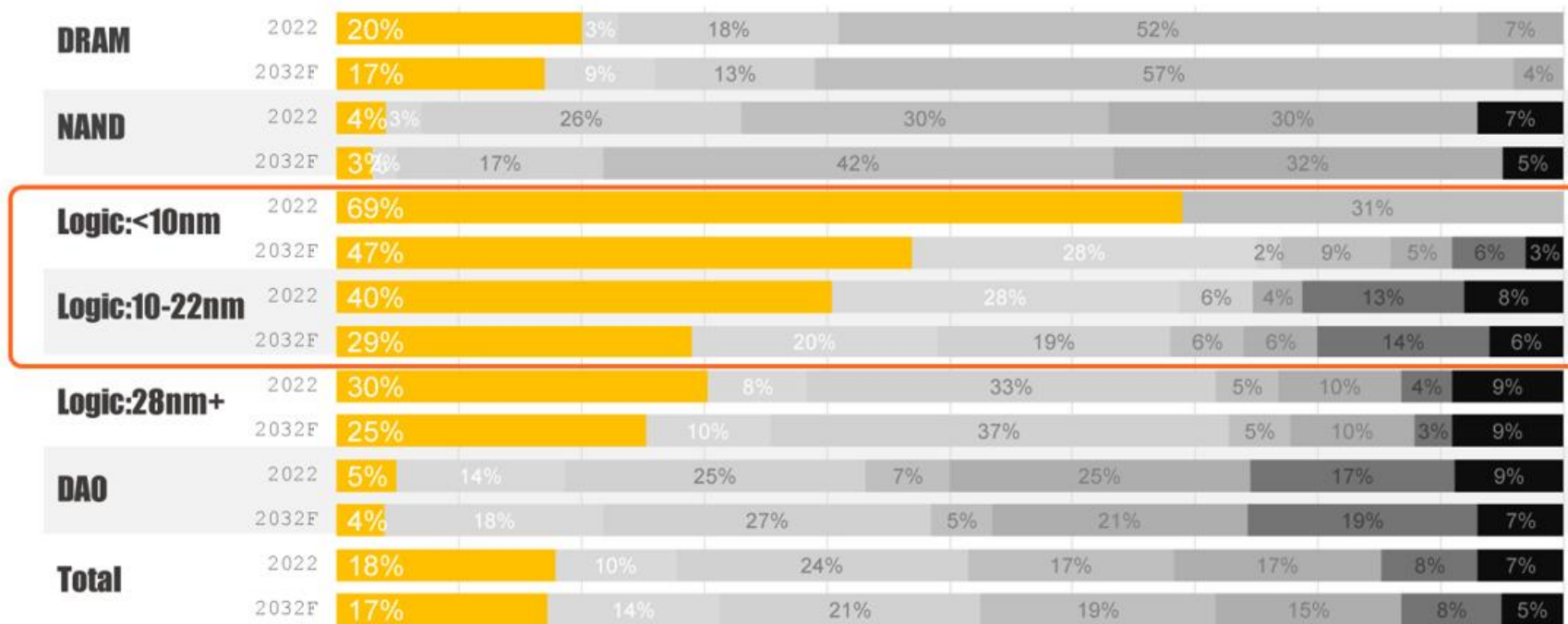


In 2023, Taiwan's GDP accounted for only 0.70% of Global GDP. Taiwanese semiconductors accounted for 20.8% of the global market share in IC, wafer foundry, and IC packaging and testing in 2023.

Fierce International Competition



- SIA and BCG predicted more diverse semiconductor manufacturing geography in 2032, Taiwan's market share will decline.



Market share comparison in 2022 vs. 2032

■ TW ■ US ■ CN ■ KR ■ JP ■ EU ■ 其他

Source: SIA/BCG (2024)

- Governments worldwide see semiconductors as vital for economic growth and security. Many are rolling out strategies to boost investment, manufacturing, and production autonomy.

CHIPS and Science Act 2022



- Revitalize domestic manufacturing, create high-paying jobs, and strengthen supply chains for AI leadership.
- **\$39 billions** in incentives to boost the manufacturing sector.

Semiconductor & Digital Strategy 2021



- Secure semiconductor capacity, support design for digitalization/green growth, and advance critical technologies.
- **¥5 trillions** public-private investment by 2030.

European Chips Act 2023



- Addresses semiconductor shortages, ensures supply security, and strengthens Europe's technological leadership.
- Public and private investment exceeds **€43 billions**.

K-Semiconductor Strategy 2021



- Building clusters and expanding advanced memory, foundry, packaging, and equipment hubs.
- **₩511 trillions** private investment targeted by 2030.

■ Trump Policy Highlights

- ✓ Rebuild U.S. semiconductor supply chain; promote domestic manufacturing
- ✓ Attract foreign investment in U.S. fabs (e.g., TSMC Arizona)
- ✓ Strengthen technology controls and export restrictions (e.g., block high-end chips to China)

■ Global Semiconductor Trends

- ✓ Intensifying competition in advanced nodes (~2nm)
- ✓ U.S., Japan, and Korea strengthening supply chain resilience
- ✓ Rising chip demand from AI, B5G, and autonomous vehicles

■ Taiwan's Current Situation

- ✓ Global leader in semiconductor manufacturing (TSMC)
- ✓ Highly dependent on global supply chains and markets
- ✓ Faces geopolitical risks and industry restructuring pressures (NTNC!)

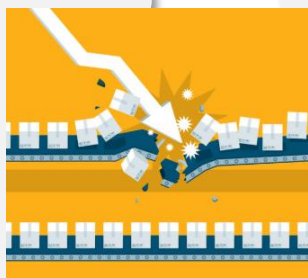


Summary: Trends and Challenges



Global Competition

Countries are making major investments in semicon. national programs.



Supply Chain Shift

Pandemic, geopolitics, and regional conflicts drive needs for autonomous semiconductor manufacturing.



Need for Innovation

Pushing Moore's law to support fast-growing emerging applications.



Net-Zero Trend

International net-zero standards are spreading across industries to fight global warming.



Semiconductor Labor Shortage

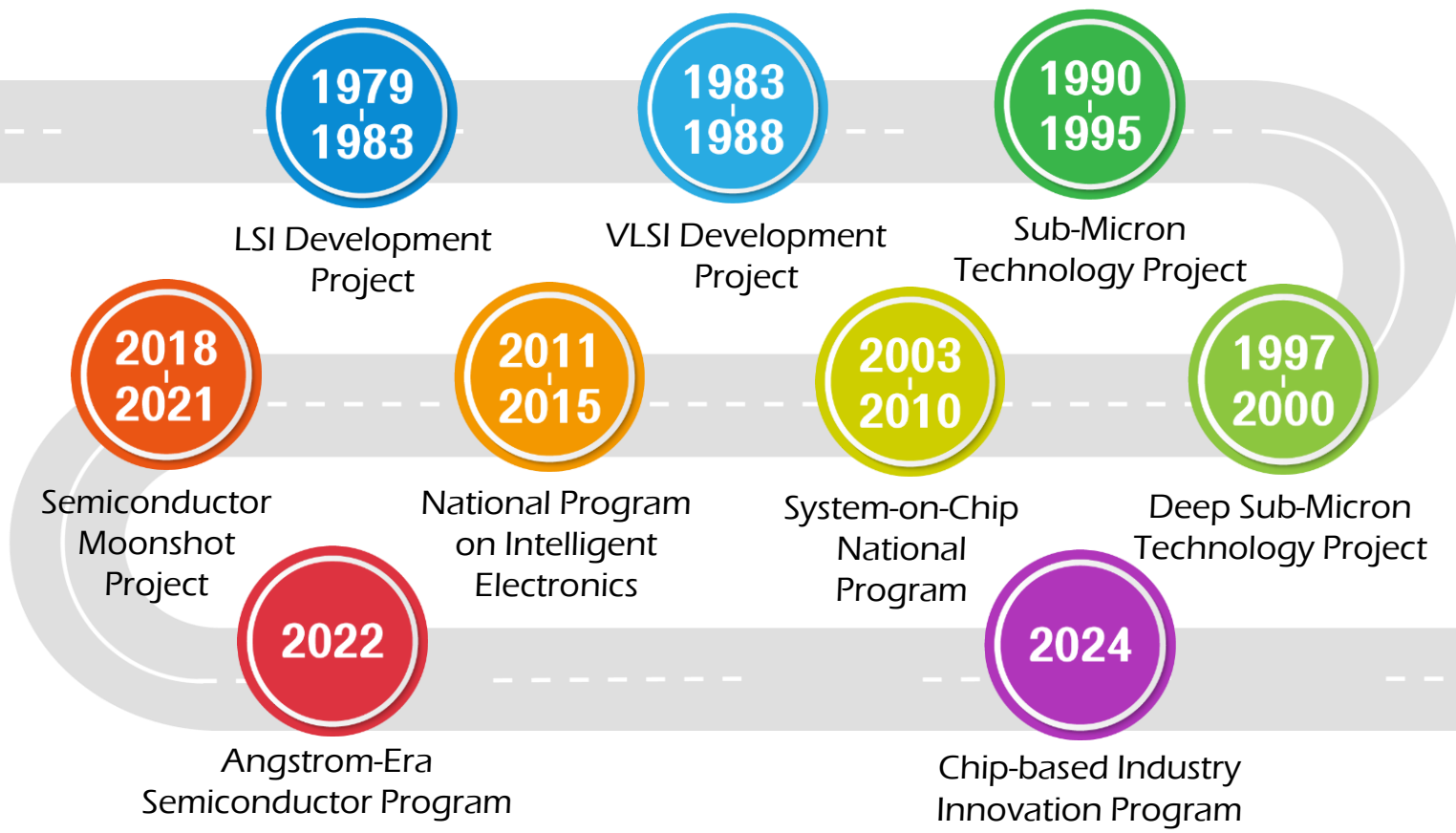
Semiconductor industry projected to require 1.5 million talents by 2032.

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Cbl Goals and Strategic Themes

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Government Commitment in Technology Development



Chip-based Industrial Innovation Program



Drive innovation and strengthen technology leadership through integration of **semiconductor and AI**. An **inter-ministry, inter-discipline** national initiative.

Theme 1

Leverage AI and Chips to Drive Industrial Innovation

Theme 2

Cultivate Global Multidisciplinary Talent

Theme 4

Position Taiwan as the Global Hub for IC Startups

Theme 3

Develop Enabling Technologies for a Sustainable Ecosystem



Strategy

Build a full IC-to-application ecosystem to support industries and boost competitiveness of traditional and SME sectors.



Method

- Build a **system design & integration platform** to support industry development.
- Expand **the machine-tool case's data-sharing and co-creation model** to other industries, enhancing SME involvement.
- Build a **280 PFLOPS** HPC facility to support industry-academia-research demands.
- Accelerate **Edge AI-chip integration** by developing multimodal models for key domestic SMEs and applying them in practice.
- **Develop top AI integrators and startups** to overcome digital and AI transformation challenges in traditional industries and SMEs.

Combine semiconductor investments with R&D and talent development for mutual benefit



- Align **overseas investments** with tech cooperation and talent development with like-minded nations.
- Develop **technical talent** capable of independently creating innovative application systems.
- Processing **infrastructure** for R&D.
- IC design environment with **EDA cloud**.
- **Pilot production lines** to facilitate prototyping and small-scale production.

Environment Building

Strategy

Advance IC design and heterogeneous integration, boost EDA toolchain autonomy, and upgrade the chip design industry

Topics include

- AI and HPC IC
- 3D IC stacking, silicon photonics, chiplets
- Compound semiconductor
- EDA toolchain



Method

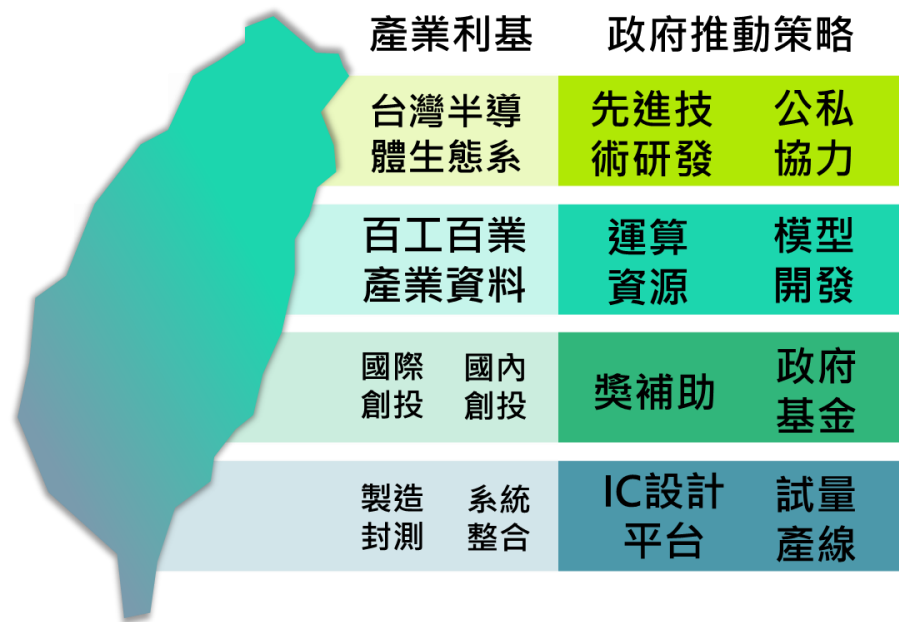
- Promote high-value products and diversified applications: **software, applications, IC design**
- Promote industry-academia-research. investment in **high-performance computing and advanced chip system R&D**.
- Develop **key IP, materials, and equipment for heterogeneous integration**.
- Develop key EDA technologies and build **an EDA toolchain for HI process service**.

Utilize the Strengths of Silicon Island to Attract International Startup Capital



Strategy

Establish an IC startup to foster teams in realization of innovative products.



Method

- Host a **global startup competition** to select promising chip startups worldwide for development in Taiwan, providing phased support and linking them with domestic industries to drive cross-sector growth.
- **Collaborate with system companies to define chip specs**, giving startups immediate market access upon design completion.
- A **system design and integration service platform**, where demand-side specifications drive growth for small and medium IC design firms.

Four Strategic Themes



1

Leverage AI and Chips to Drive Industrial Innovation

- Bio. and Agri. Innovation
- 6G Communications
- Resilient Security
- Non-Terrestrial Communications
- High-Performance Computing
- AI Benchmarking
- AI Applications for the Mass Market
- AI Large Language Models
- Key Chips and Modules for UAV

3

Develop Enabling Technologies for a Sustainable Ecosystem

- Design Software Technology
- Critical Chips and Heterogeneous Integration
- IC Design Industry Subsidies

2

Cultivate Global Multidisciplinary Talents

- International Cooperation
- IC Design Talent Incubation
- Hardware and Software Resources Sharing

4

Position Taiwan as the Global Hub for IC Startups

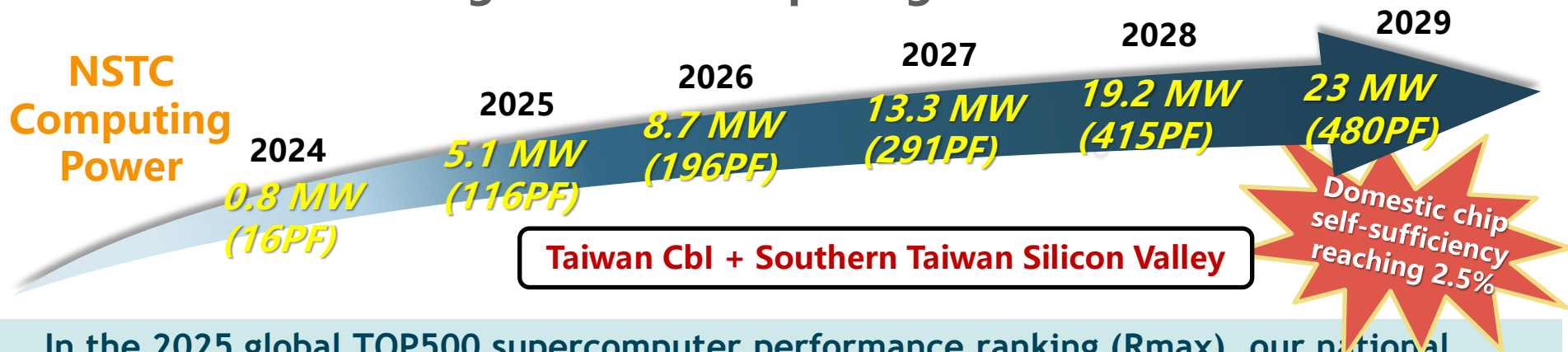
- Comprehensive IC Design Ecosystem
- IC Taiwan Grand Challenge Competition



Major Accomplishments and Impacts



Building AI Core Computing Infrastructure



In the 2025 global TOP500 supercomputer performance ranking (Rmax), our national overall computing power has reached **13th** place.

Building the Taiwan Computing Power Alliance

- AI infrastructure development
- Integration of public-private computing resources
- Advancing sovereign AI and trustworthy technologies, building a sustainable cross-domain ecosystem
- Strengthening Taiwan's international competitiveness and visibility in AI.

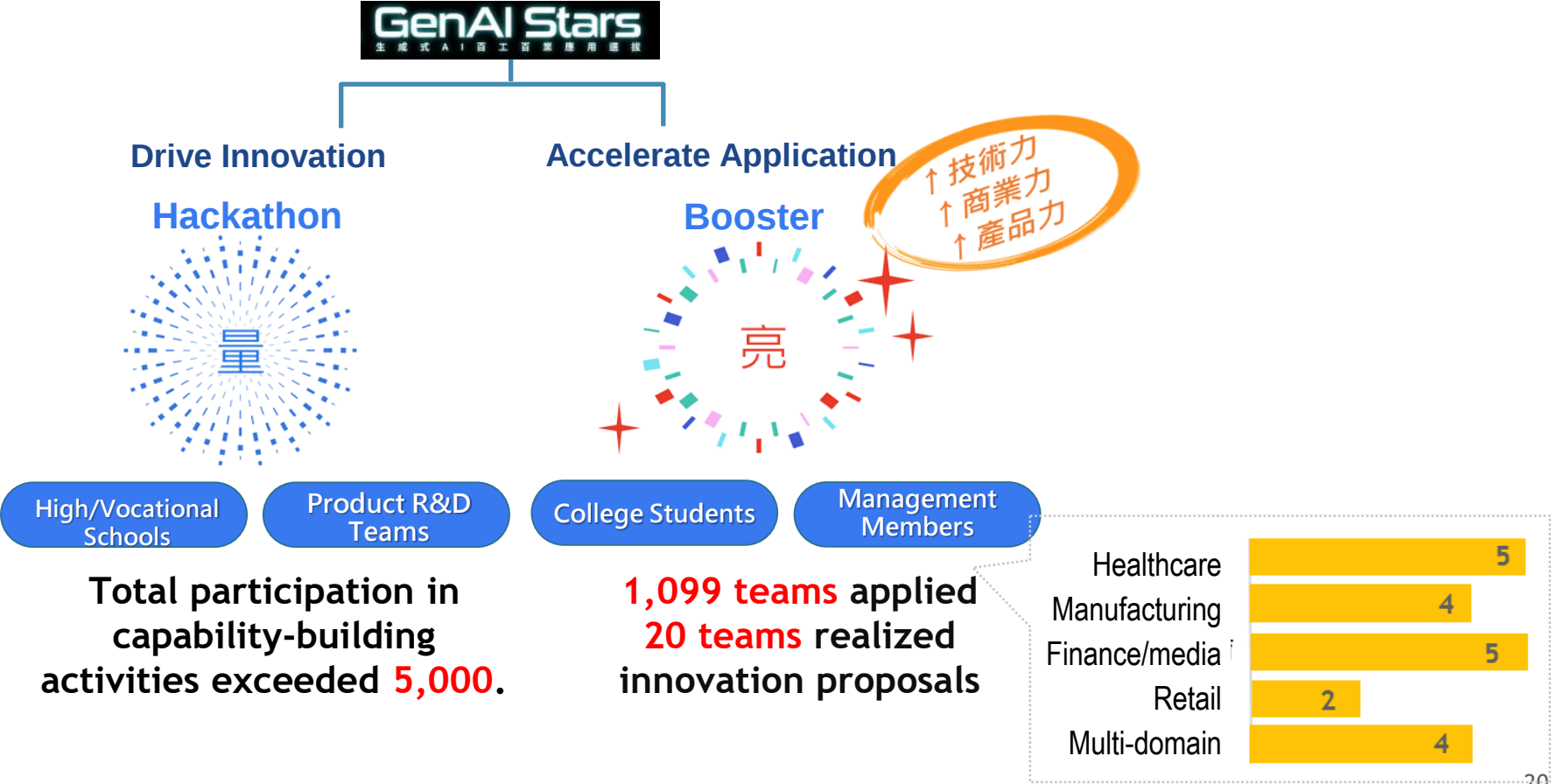


Taiwan AI RAP

- Providing one-stop LLM computing power and tools to help enterprises rapidly adopt generative AI.
- Reduce deployment costs, strengthen applications, and enhance efficiency.

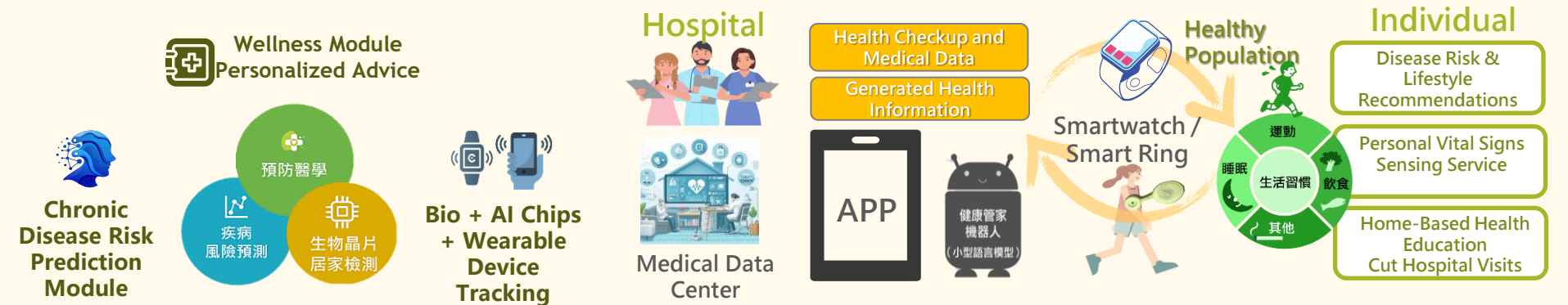


Promoting AI Adoption Across Industries



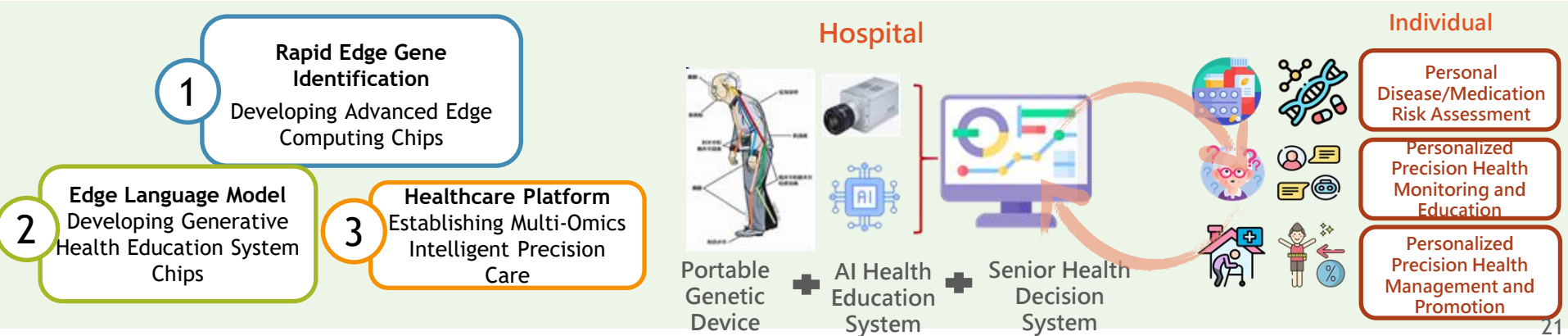
Hospital at home: Extend hospital services into daily life

NTU Hospital



Hospital without walls: Develop Personalized Healthcare Service

NCKU Hospital



Enhancing Advanced Chip System Design Environment



Establishing FinFET, AI,
and Advanced Packaging
Design Environments

- 7nm/16nm Design Guidelines and Reference Examples
- TSRI CoCoB Chiplet Design Flow



Upgrading Computing
Environment

- Expand computing and storage resources
- Evaluation of commercial cloud services



FinFET IC Design
Talent Incubation

- Provide courses and teaching materials
- Train teachers to offer classes and expand talent development.

EDA Cloud Computing Capacity
Expanded to **24,000 CPU Cores**

In-house Advanced Packaging
SoC Design Platform, Supporting
the Development of High-Level
System Integration Talent in AI



○ 2030

Domestic talent development: 2,200
person/year

Annual FinFET design talent: **600 persons**
IC design environment: **5nm / 7nm / 16nm**
+ AI-assisted

○ 2023

Domestic talent development: 1,200 person/year

Annual FinFET design talent: <20 people

IC design environment: 16nm

National Hub of Semiconductor Processing Research Facilities

Establish a Next-Generation R&D Environment on Par with International Benchmark Research Institutions

Modeled after **CEA-Leti (France) & Fraunhofer IPMS (Germany)**

- Advanced Transistor
- Silicon Photonics Technology
- Advanced Packaging Technology

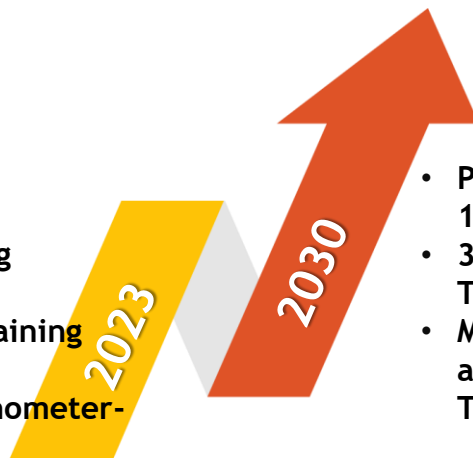
Atomic-Level Process Verification Line Establishment

- 1nm Device Research and Education Core Facilities
- Compatible with <12-inch/fragmented wafers and special substrates

Establishment of 2.5D/3D Chip-Level Heterogeneous Integration Advanced Packaging Line

Popularization of Heterogeneous Integration System Verification

- Planar Transistor Manufacturing Training Capacity: 1,000 person/year
- Advanced Manufacturing Technology Training Capacity: <100 person/year
- Device Manufacturing Environment: Nanometer-Scale



- Planar Transistor Manufacturing Training Capacity: 1,400 person/year
- 3D Transistor Advanced Manufacturing Technology Training Capacity: 600 person/year
- Manufacturing Environment: **Atomic-Level 1nm Device** and **16nm Circuit** Research, Education, and Hands-On Training Environment

Pilot Lines for Advanced Research and Specialty Chips

12-inch BEOL Process Platform

- 28nm back-end processing for front-end IC in Nx technology nodes.
- Verification and pilot production line.



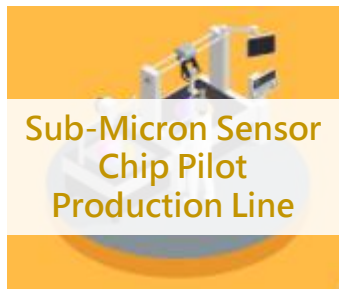
New 3D IC Packaging Platform

- BEOL process platform integration
- Target sub- μm pitch (at par with TSMC and imec).



Sensor Chip Technology Verification and Pilot Fabrication Platform

- Domestic production of advanced sensor chips
- Feature size: $0.35\ \mu\text{m}$, superior to Bosch ($0.8\ \mu\text{m}$) and ST Micro ($0.5\ \mu\text{m}$).



High-End Inspection Platform

- Supporting R&D of inspection technologies required for key process and packaging research and development.



Critical Chips and Heterogeneous Integration Technologies

EDA Tool

Advanced Packaging EDA Toolchain

- Medical-Grade Auditory System
 - ✓ Improves SNR by More Than **8-10dB**
- Advanced Packaging Routing Algorithm
 - ✓ Shortens Path Length by **32.9%**
 - ✓ Increases Speed by **5000x**

IC Design

High-Performance Chip

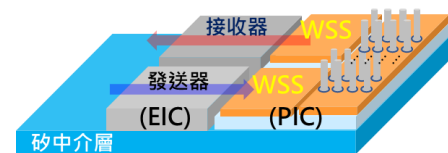
- AI Neural Network Acceleration Chip
 - ✓ Energy Efficiency: **157 TOPS/W (Up 1.6x)**
- AI Model Algorithm Lightweighting Technology
 - ✓ LiDAR Inference Accelerator Achieves **4500 FPS**, Power Consumption Reduced to **38.3 mW**
- Large-Scale AI Model Computing Technology
 - ✓ Simulation Speed Reaches **55.3M OP/s**

Process

Advanced Packaging

Silicon Photonics (CPO)

- Developed interposer optical waveguide technology
 - ✓ Conversion efficiency reaches **81.9%**



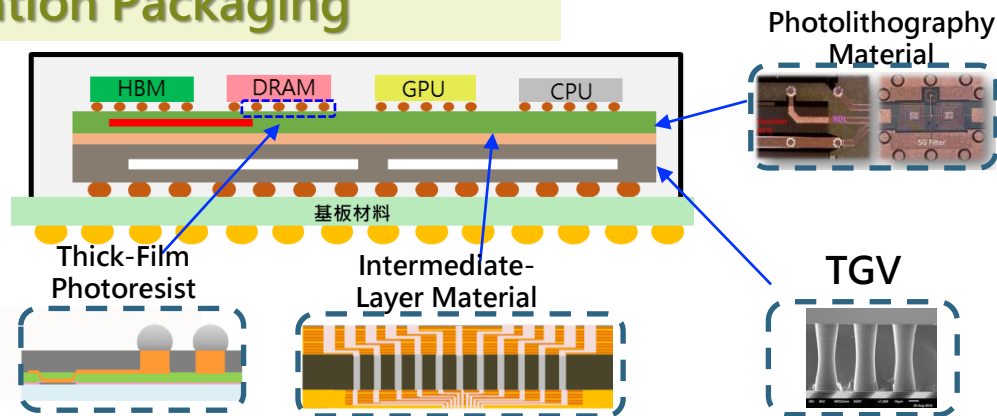
Heterogeneous Integration Packaging Equipment Technology

- Promote industrial development of equipment for 3D packaging and silicon photonics, with β -Site production line verification.
- Grant 6 equipment development projects with the expected revenue exceeding NT\$2 billion.



Materials for Heterogeneous Integration Packaging

- Materials for photolithography, interposer, thick-film photoresists for advanced packaging, and TGV via etching.
- Grant 4 development projects, with β -Site verification to accelerate commercialization.
- Expected additional investment NT\$1.04 billion.



Industry R&D Project Grants to Elevate IC Design Technology

In 2024, **38** projects approved for grant (22 SMEs), with funds totaling **NT\$1.27 billion**. In 2025, a total of 101 companies submitted **82** applications, requesting NT\$7.094 billion in subsidy funds (80 SMEs).



Invest in R&D of leading-edge chips and application systems

Promote small and medium IC design companies into advanced process nodes

Develop enabling technologies for UAV

Advanced Chips and Next-Generation Communications

- 2nm IC design flow
- B5G, 6G, and CPO
- AI processor design with hardware-software integration



800G DPU Chip

- Next-generation high-speed 800G DPU fabricated at 7nm, with integrated AI capabilities
- Supports enterprise and on-premises generative AI applications



DRAM 3D Stacking Tech

- 3D DRAM stacking technology, developed in collaboration with ITRI for Integrated SoC platform design



International Linkages for Chip Innovation and Entrepreneurship

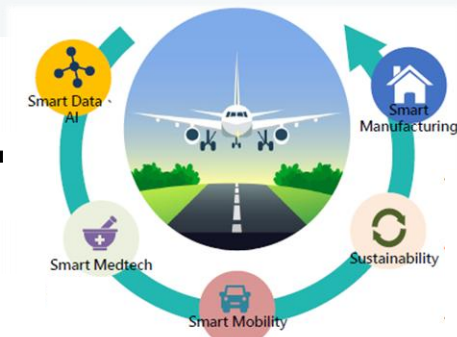
■ Build a global IC startup cluster to attract international teams and drive Taiwan's industrial innovation through chips

✓ IC Taiwan Grand Challenge

- 10 winners in 2 rounds (2024)

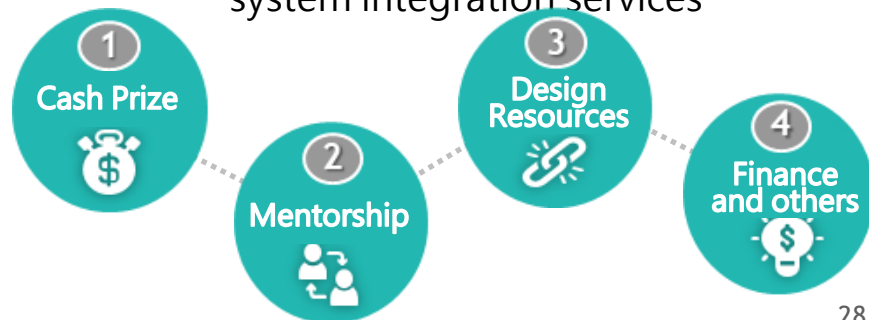


- Secured orders from ST Engineering, Singapore
- Established R&D sites in Nankang and Hsinchu
- received seed round investment by end of 2024



✓ Establish IC Startup Acceleration Platform

- One-stop service linking Taiwan semiconductor industry expertise and resources to shorten startup product development cycles
- Enlisted 13 domestic companies to provide chip design, manufacturing, packaging, and system integration services



Key Takeaways (懶人包)



Chip-based Industrial Innovation Program



Drive innovation and technology leadership through semiconductor advancement and the integration of AI.

01



Leverage AI and Chips to Drive Industrial Innovation

02



Cultivate Global Multidisciplinary Talent

03



Develop Enabling Technologies for a Sustainable Ecosystem

04



Position Taiwan as the Global Hub for IC Startups

01

Leverage **AI** and **Chips** to Drive Industrial Innovation



Industry Adoption

Identify sector-specific needs and provide entry points for AI and chip integration.



R&D Infrastructure

Upgrade facilities for advanced research and talent development, and expand IC design learning resources.



Tailored Solutions

Create industry-specific AI service models and solutions to drive digital transformation nationwide.

Cultivate Global Multidisciplinary **Talent**



Cross-Sector Collaboration

Develop AI and chip talent through practical training and industry-academia collaboration.

Advanced Learning Facilities

Upgrade teaching environments and build nationwide semiconductor labs with shared resources.

Global Access to Innovation

Provide pilot lines for innovative technologies and open services to students, researchers, and startups.

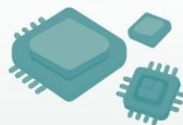
03

Develop Enabling Technologies for a Sustainable Ecosystem



Advanced Chip Design

Strengthen design capabilities and support the creation of innovative devices, circuits, and systems.



Heterogeneous Integration

Develop advanced packaging technology and enable new functions with shorter R&D cycles.



Atomic-Scale Processing

Establish facilities for next-generation semiconductor processes at the atomic scale.

Take advantage of the leading position and accelerate towards advanced processes

04

Position Taiwan as the Global Hub for **IC Startups**



Comprehensive Ecosystem

Taiwan's robust semiconductor value chain attracts international IC entrepreneurs.



One-Stop Services

The Cbi program offers IC design, fast prototyping, pilot production, and fundraising support.



Vibrant Startup Environment

By fostering innovation and accelerating growth, Taiwan is positioned as the leading hub for IC design startups worldwide.



Thank you for your attention



TECIF 2025

Taiwan-Europe Chip Innovation Forum



Time :
27th - 28th Nov, 2025

Place :
Dresden, Germany

Venue :
**Hotel Taschenbergpalais
Kempinski Dresden**

Sessions :

- Talent cultivation
- Advanced device and Emerging memory
- Smart sensing
- Advanced package
- Silicon photonics



Key speakers



ESMC President
Dr. Christian Koitzsch



TSMC Manager
Dr. Glavine Yeh



TUD Rector
Dr. Ursula M. Staudinger



imec Director
Romano Hoofman



TUM
Prof. Dr. Hussam Amrouch



NTU DIST
Prof. Chee-Wee Liu



NTHU VP
Prof. Po-Wen Chiu