

# Winbond's Story

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# Winbond's Story



**Proactive Innovation, Pioneering a Zero Carbon Future**  
Deliver low-carbon footprint future by innovation



“ Winbond is a technology innovative company that strives to improve the quality of human life and ensure the sustainability of the planet through technological advancements. ”

With the global goal and challenge of achieving net-zero emissions by 2050, Winbond continuously enhances relevant research, development, and manufacturing efforts. In addition, Winbond actively invests in the development of green products and technologies and have embarked on a digital transformation journey to create the "Carbon Emissions Information Platform." We aims to realize the goal of transitioning towards net-zero emissions by focusing on three key areas: designing innovatively for green products, implementing green and low-carbon production practices, and constructing a green information platform.

## Green Design: Innovation in Sustainable Product Design

Winbond understands that following the same path won't lead to new destinations. Starting from the concept of product life cycle, Winbond focuses on selecting low-carbon raw materials, continuously improving processes and design innovation, enhancing productivity, and reducing design time to achieve smaller chip sizes, fewer pins. With incorporating Design for Test (DFT) techniques, this results in smaller form factor, lower pin counts, shorter testing time, and finally significantly reducing carbon emissions generated during the manufacturing process. In addition, Winbond emphasizes the use of environmentally friendly materials for packaging, supports low-temperature soldering processes, and reduces PCB usage through smaller form factors. These efforts help downstream customers reduce overall raw material usage and energy consumption during PCBA production, further lowering carbon emissions. Moreover, Winbond commits to reduce power consumption and prolonging power usage time during the product usage phase. Besides continuously design the Flash memory with lower operating currents along with process evolution, Winbond has developed new processes and circuit architectures, and introduced the world's first NOR Flash that supports operating voltage of 1.2V. At every stage of the product life cycle, Winbond considers energy-saving and carbon reduction measures, striving towards net-zero emissions.

— Winbond integrates product performance with environmental protection, ensuring a sustainable approach throughout the product life cycle —



Conceive



Design



Manufacture



Deliver

## Green product innovation

In the era of portable electronic products and the Internet of Things, Winbond continues to focus on designing low-power-consumption products. For example, our value is demonstrated in the context of net-zero and environmental sustainability by offering the Known Good Die (KGD) sales model, where memory chips are packaged together with logic chips, creating energy-efficient and carbon-saving end products that prioritize low carbon emissions and green features.



### Known Good Die (KGD) quick fact

With the assistance of Winbond's expertise, many customers utilize the Known Good Die (KGD) of our flash memory products for System-in-Package (SiP) solutions. Flash memory chips are stacked with controller chips and placed in a single package or module to provide SiP solutions. KGD of other components can also be stacked with flash memory KGD, saving packaging materials, improving performance, and reducing power consumption and chip size.

## Winbond Group selected as one of the Top 100 Global Innovators from Clarivate

With "Aggressive Innovation" as one of our core values, Winbond was selected as one of Clarivate's Top 100 Global Innovators. The evaluation criteria for this award include not only the total number of patents, reaching 500, but also factors such as the industry influence, track record of success, globalization, and technology applications. Out of 3,200 candidate organizations worldwide, Winbond Group has been recognized, demonstrating our strength in innovative research and development, as well as the global impact of our patent portfolio. This recognition from an international evaluation institution proves that Winbond is a semiconductor company that values research and development investments, pursues growth driven by innovation, and is committed to environmental sustainability. From the product design stage, Winbond focuses on using low-carbon materials and developing green products that are high-performance, low-power, and require minimal resources. Our goal is to protect and minimize our impact on the environment.



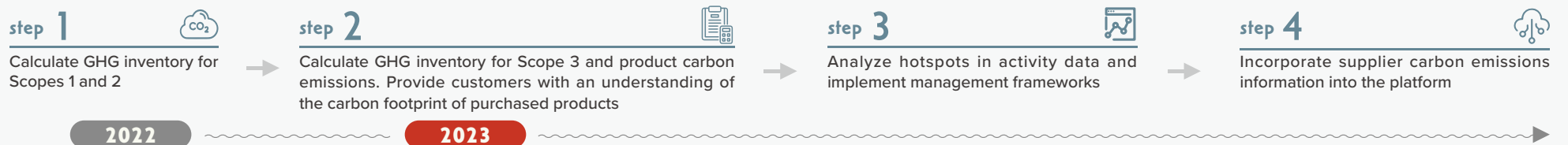
## Green Information Construction

Carbon management serves as an important indicator for mitigating climate change. In 2022, Winbond collaborated with consulting teams from Microsoft Taiwan and SoftwareOne Taiwan to develop the "Carbon Emissions Information Platform." By leveraging Microsoft's cloud services and Power Platform, Winbond has created an automated integration system for carbon emission data, enabling real-time data visualization and management.

The semiconductor manufacturing process is complex and diverse, presenting three major challenges in integrating carbon emission data: standardization, manual processing, and visualized management. The "Carbon Emissions Information Platform" addresses these challenges and provides solutions for various pain points. For example, it allows for inventorying historical data, monitoring dynamic reports, and simulating and predicting future carbon emissions based on future capacity growth. This enables the evaluation of relevant reduction measures, facilitating the construction and management of green information and supporting the goal of transitioning to a greener paradigm.

## 4 Steps to launch a digital zero-carbon new future

The "Carbon Emissions Information Platform" completed Step 1 calculations of GHG inventory for Scopes 1 and 2 in 2022. Winbond plans to achieve Step 4 by the end of 2023, calculating Scope 3 and product carbon emissions. Winbond will provide customers with carbon footprint data for purchased products and incorporate activity data analysis and supplier carbon emissions information. The goal is to integrate and provide real-time information and management for green products and green manufacturing through the Carbon Emissions Information Platform.



# Green Manufacture

Since the first day of constructing our Kaohsiung Fab, the balance of environment, talent, and manufacturing efficiency has been taken into account. The smart factory leverages automation technology, artificial intelligence, and big data to enhance production efficiency, enabling human resources to focus on high-value innovation. The Kaohsiung Fab has adopted high-energy-saving designs, resulting in significant reductions in energy consumption (as shown in the table below). This achievement aligns with the goals of environmental protection, carbon reduction, and the realization of green and low-carbon manufacturing.

## Achievements in Energy Saving and Carbon Reduction at the Kaohsiung Fab

Type	Name of energy-conservation/ carbon reduction project	Energy Savings		GHG Emission Reduction (tCO <sub>2</sub> e)
		(kWh)	(GJ)	
Energy-Efficient	Waste heat recovery from hot ultra-pure water heat pump	8,488,000	30,558	4,320
	Waste heat recovery from air compressor dryer	54,750	197	28
Design of the Fab	High-efficiency energy-saving boiler	9,855,000	35,478	3,230
	Increased outlet water temperature of chilled water system	10,444,110	37,599	5,316
	LED Energy-conserving lighting	1,656,000	5,962	843
	<b>Total</b>	<b>30,497,860</b>	<b>109,793</b>	<b>13,737</b>

**Note** 1.The energy-saving design of the new fab was based on the CTSP Fab as the reference. 2.The GHG reduction of the high-efficiency energy-saving boiler project was the comprehensive calculation result of electricity saving and natural gas usage.



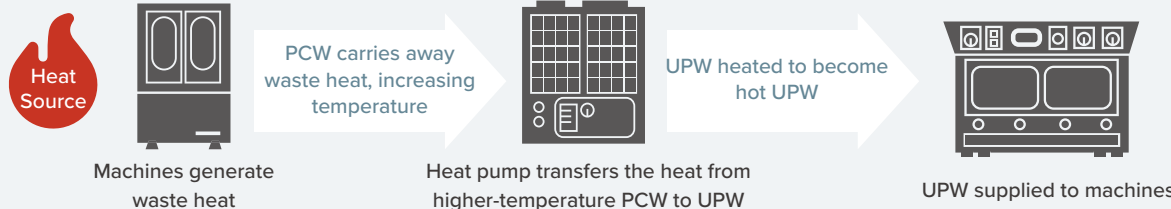
Pic. Kaohsiung Fab



### Energy-conserving Design of Kaohsiung Fab

With green production as the goal, Winbond's Kaohsiung Fab incorporated numerous energy-conserving designs in its initial design. The facility is able to conserve large amounts of energy through methods such as recycling waste heat, using low-power LED lights, and adopting energy-conserving chiller designs. Take waste heat recovery and energy-saving chiller design as examples:

**1 Waste heat recovery from hot ultra-pure water heat pump: Waste heat generated by the process cooling water (PCW) is recovered. A heat pump is used to heat the UPW, which is then supplied to the equipment.**



**2 Increased outlet water temperature of chilled water system: The outlet water temperature of the chiller is increased to 12°C, significantly reducing energy consumption compared to the previous 9°C chiller operation.**



The hot water system was switched from an electric boiler to a gas boiler to reduce carbon emissions



Energy recovery from UPW system for reuse



Energy-saving planning and design for the chilled water system



Energy-saving system for the chilled water system

## ISO 50001 Energy Management System Certification

In 2022, Winbond's CTSP Fab achieved ISO 50001 Energy Management System certification. This certification establishes management procedures, energy baselines, and energy performance indicators. Through the P-D-C-A cycle, continuous improvement is pursued, optimizing equipment related to major energy consumption. The goal is to achieve systematic energy management. By implementing the ISO 50001 management system, Winbond has achieved tangible benefits such as improved energy efficiency, reduced energy costs, and decreased greenhouse gas emissions. This includes effectively managing and optimizing the electricity efficiency of process and utility equipment, as well as implementing various carbon reduction measures, such as introducing perfluorocarbons (PFCs) emissions reduction projects, smart air conditioning, energy-saving chillers, waste heat recovery from hot ultra-pure water heat pumps, and high-efficiency energy-saving boilers, to reduce carbon emissions during the production process.

### Implement energy-saving measures

By implementing the ISO 50001 Energy Management System, Winbond has successfully completed 21 energy-saving measures in 2022, resulted in 35.9 million kWh of electricity saved and GHG emissions of 16,485 metric tons reduced

## PFCs emissions reduction projects

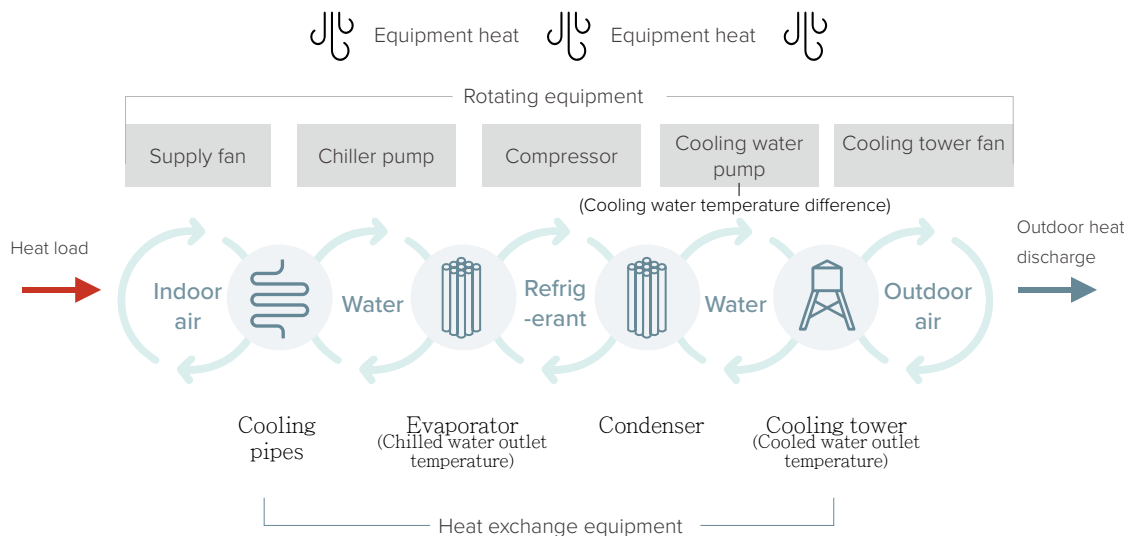
**PFCs emissions reduction projects: Over the past 15 years, a cumulative reduction of approximately 2.1 million metric tons has been achieved.**

Winbond has from 2006 onwards participated in the PFCs emissions reduction projects organized by the Taiwan Semiconductor Industry Association and the World Semiconductor Council. Over the past 15 years, a cumulative reduction of approximately 2.1 million metric tons has been achieved.

## Energy-saving chillers

In 2022, Winbond collaborated with National Taiwan University on an industry-academia partnership to implement group control settings for chillers. By establishing a kW/RT energy consumption model and combining it with weather forecast data from the Central Weather Bureau for the next six hours, optimal settings for chiller energy savings were derived, resulting in an energy-saving ratio of approximately 2.8%.

**Objective: Optimize chiller parameters setting → Improve power efficiency and reduce electricity consumption**



**AS-WAS**  
Consider current individual component temperature settings

**NOW**  
Predict future 6-hour air conditioning demand  
Integrate all components to achieve multi-point temperature optimization recommendations

Chillers		Smart chillers		Reduced energy consumption
Time	Energy consumption (kWh/RT)	Time	Energy consumption (kWh/RT)	
2022/1	0.71	2023/1	0.69	2.82%
2022/2	0.72	2023/2	0.70	2.78%
2022/3	0.72	2023/3	0.70	2.78%
2022/4	0.72	2023/4	0.70	2.78%

**Note** Due to the schedule of compiling the Corporate Sustainability Report, the energy consumption comparison table is disclosed up to April.



Climate change is the biggest global risk and a significant challenge for businesses. Winbond recognizes the trends and, by strengthening its core competencies, is gradually exploring green and sustainable business opportunities. In 2022, Winbond elevated the organizational level of the ESG Committee to be under the purview of the Board of Directors, with the chairman directly serving as the committee's chairman. Winbond has allocated resources to three main aspects: TCFD climate governance, green investment, and promoting a carbon reduction culture. Winbond aim to strengthen employees' awareness and behavior towards carbon reduction through the communication of principles and practical operations, thus exerting a positive impact on the environment and society, and fulfilling our commitment to sustainable development.

## The organizational level of the ESG Committee elevated to be under the purview of the Board of Directors

Winbond has restructured the current "Winbond Corporate Social Responsibility (CSR) Implementation Committee" into the ESG Committee in May 2022 (as shown in Figure 1). The level of committee is raised to be under the purview of the Board of Directors. It shall be composed of several directors and five to seven executive managers from relevant departments including the President. The term of the directors is the same as the term of the Board of Directors while the Chairman serves as the chairperson of the committee.

Under the ESG Committee, Winbond established the ESG office and five task forces, including Environmental Sustainability, Green Products, Human Rights and Social Inclusion, Sustainable Supply Chain, and Corporate Governance. Winbond has developed a sustainable strategy framework (as shown in Figure 2) and continue to promote sustainable actions. The committee reports its implementation achievements to the Board of Directors every fourth quarter to ensure the promotion and implementation of works related to corporate sustainability.

— ESG Committee —

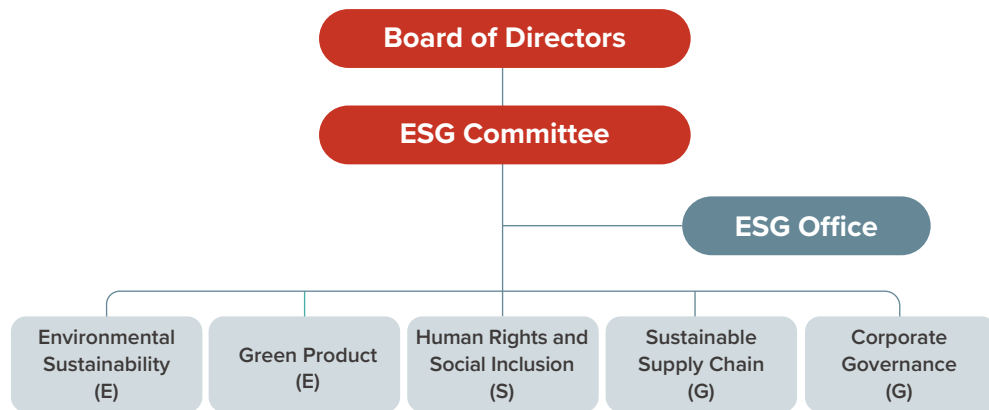


Figure 1

— Carbon footprint as an assessment indicator of innovative contributions —

<b>Vision</b>	<ul style="list-style-type: none"> <li><b>E</b> Measure innovative contributions with “carbon footprint”</li> <li><b>S</b> To be kind, righteous, proper, wise and trustworthy in everything we do. We would treat others as ourselves, and extend that to all people and even everything</li> <li><b>G</b> Conduct business with integrity and ethical behavior</li> </ul>				
<b>Strategy</b>	Green Product	Sustainable Supply Chain	Environmental Sustainability	Human Rights and Social Inclusion	Corporate Governance
<b>Talent</b>	<b>ESG</b> Awareness Building (Education and Training, Sustainable Education and Training Platform)		<b>ESG</b> Sustainability Capabilities Building		
<b>Processes</b>	<b>G</b> Risk Management Process	<b>G</b> Sustainable Governance Process	<b>G</b> Compliance Disclosure	<b>ESG</b> Sustainable Innovation Culture (ESG Award)	
<b>Technology</b>	<b>ESG</b> Digital Transformation		<b>ESG</b> Sustainable Data Establishment and Application		<b>E</b> Carbon Emissions Information Platform



Figure 2

## Enhancing TCFD climate change governance

To strengthen climate change governance, a TCFD has been established and the TCFD management framework has been introduced for us to identify climate-related risks and opportunities as the basis for reviewing Winbond's strategies in response to climate issues and establishing relevant management indicators. Winbond also publishes climate-related financial disclosure reports to continuously review and focus on enhancing Winbond's operational resilience towards climate change.

## Joining Taiwan Climate Partnership to exert social influence

In 2022, Winbond joined the Taiwan Climate Partnership, with Chairman Yu-Cheng Chiao serving as a board member of the Partnership. By joining the Taiwan Climate Partnership, Winbond aims to leverage its industry influence and take practical actions to realize carbon reduction goals in collaboration with the upstream and downstream supply chains. In addition to responding to the demands of international brand customers, this move also demonstrates Winbond's high level of concern for climate change issues.

## Initiating green investment

### Investing NT\$555 million in green energy development as a crucial first step towards achieving carbon neutrality

Upon conducting a comprehensive GHG inventory across the entire Company, Winbond discovered that indirect energy emissions accounted for approximately 89% of the total emissions. To meet carbon reduction and carbon neutrality targets, Winbond has been actively evaluating investments in renewable energy. In 2022, Winbond invested NT\$555 million in green energy development related business, marking a crucial first step in initiating green investment. Through green investment and continuous collaboration with green industry suppliers and alliances, Winbond aims to expand the scope and impact of its green investment.

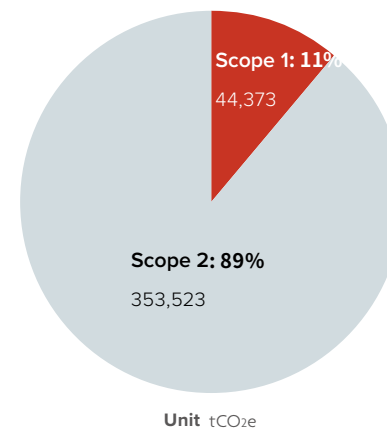


### Important Board agenda and reports related to climate in 2022

- Report on GHG inventory and verification schedule (including subsidiary companies)
- Passed the proposed increase budget for capital expenditure (for replacement with energy-efficient equipment)
- Passed the establishment of the ESG Committee and the formulation of organizational regulations
- Passed the investment in Chia-Ho Green Energy Corporation
- Report on the plan to achieve the 2030 renewable energy target
- Report on the 2022 carbon credit trading plan
- Regular reports on the progress of GHG inventory in 2022 (including subsidiary companies)
- Regular reports on the progress of sustainable development initiatives



Taiwan Climate Partnership Council



● Scope 1

● Scope 2

#### Scope 1

Refers to direct emissions from processes or facilities, such as emissions from factory chimneys, processes, ventilation equipment, and emissions from owned or controlled stationary combustion sources, process emissions, and emissions from transportation vehicles.

#### Scope 2

Represents indirect energy emissions, which are emissions resulting from the use of purchased electricity, heat, or steam.

## Winbond has acquired carbon credits from the world's largest blue carbon project, contributing to environmental protection and biodiversity conservation

In the face of the climate crisis, the next decade is crucial, and global resources and collective innovation are needed. Winbond has actively evaluated green investment and invested in the Pakistan Mangrove Conservation Project in 2022, which is currently the world's largest blue carbon project. Covering an area of over 350,000 hectares, the project encompasses habitats of several endangered species and brings significant climate adaptation benefits to the region's biodiversity, and contributes to climate change mitigation, biodiversity conservation, and job creation opportunities.



Winbond's investment in the world's largest blue carbon project has contributed to climate change mitigation, biodiversity conservation, and job creation efforts.

The Pakistan Mangrove Conservation Project is currently the world's largest blue carbon project, covering an area of over 350,000 hectares. It encompasses habitats of several endangered species and brings significant climate change adaptation benefits to the region's biodiversity. The project is expected to benefit around 42,000 local residents through various co-benefits, including the creation of over 21,000 full-time jobs, access to clean drinking water sources, conservation-focused education and training, public health improvements, and gender equality advocacy.



### Blue Carbon quick fact

Based on the sources and storage methods of "carbon", scientists classify carbon into different colors: gray carbon, black carbon, brown carbon, green carbon, and blue carbon. "Blue carbon" refers to all carbon absorbed and stored by marine organisms from the atmosphere within the ecosystem. Plant-based "blue carbon" in the ocean includes seagrasses, herbaceous plants in salt marshes, mangroves, and algae.

## Driving a carbon reduction culture: embracing sustainable thinking everywhere

Corporate sustainability and global sustainability are interconnected concepts, and it is not a new issue for Winbond. Winbond actively reduces waste and implement a carbon reduction culture in our daily operations. The "Zero Carbon Family Day" is an example of this. In a fun and educational way, Winbond encourages employees and their families to actively conserve energy and reduce carbon emissions in their daily lives, such as bringing their own eco-friendly food containers, using reusable cups, promoting carpooling, ethical purchasing, environmental awareness, waste reduction, and using electric vehicles, among other practices, to collectively contribute to mitigating climate change.

### Zero Carbon Family Day strengthens the carbon reduction awareness of all employees and extends influence to the next generation

Winbond's "Zero Carbon Family Day" focused on promoting net-zero emissions and green living, with nearly 7,000 employees and their families participating together, showing their concern for green sustainability issues and expanding their influence!



For the first time, the carbon emissions generated on Family Day were retired through the purchase of blue carbon credits, achieving a zero carbon family day.



The retirement certificate was issued by the Climate Impact X, a carbon credit exchange based in Singapore



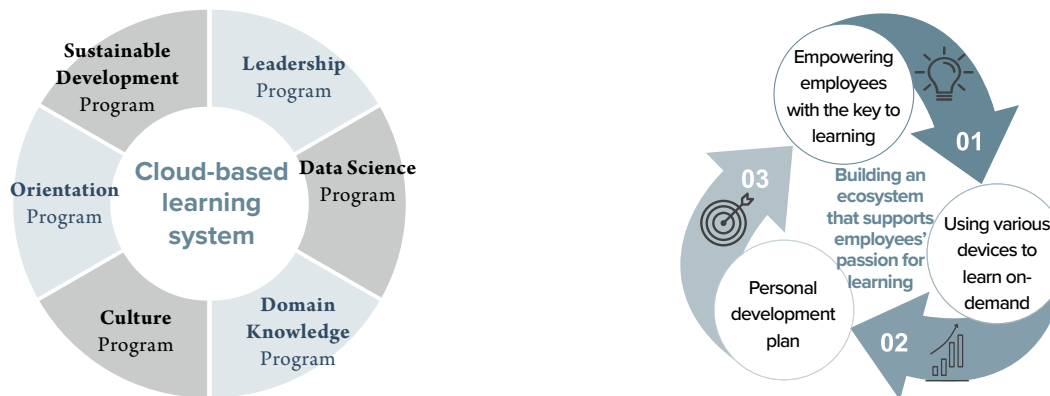


## In a rapidly changing world, talent is Winbond's ace in transforming the world

The cultural spirit, excellence in quality, research and development innovation, and sustainable development of a company all rely on "people" for inheritance and creation. With the impact of declining birth rates expanding, Taiwan's semiconductor industry will also face a shortage of talent. Therefore, Winbond not only values "talent cultivation" but also knows how to cherish talent. Winbond is committed to providing a good learning environment for potential talents and senior employees alike, initiating proactive actions to support them in terms of technology, resources, and life. Winbond hopes to cultivate a stronger semiconductor industry talent pool for Taiwan and even the world, through Winbond's professionalism, influence, and encouragement of a passion for learning.

### Establishing an ecosystem that supports employees' passion for learning

As a technology innovation enterprise, Winbond values talent development and has established a learning ecosystem to cultivate semiconductor talents through a culture of passionate learning. Winbond empowers employees with the key to learning, encouraging them to learn anytime, anywhere based on their own learning needs. Winbond's learning platform offers six major programs with over 3,200 courses, allowing employees to learn at their own pace. At the same time, Winbond provides diverse learning channels to assist employees in their personal career development.



### — Multiple learning platforms and channels are provided —

Winbond's learning platform	Overseas executive leadership courses	On-site training	Online learning platforms	On-the-job training	Overseas seminars	Overseas assignments and training	Job rotations
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### Driving digital transformation and continuously empowering employees

Innovations and the development of artificial intelligence technology are accelerating the transformation of our future work and life. As talent is the core of Winbond's sustainable development, Winbond places great emphasis on talent development and cultivation, aiming to assist employees in facing the future world with sufficient capabilities. Winbond continues to drive digital transformation and has established the Data Science Program to support lifelong learning for employees.

**Data science learning results**

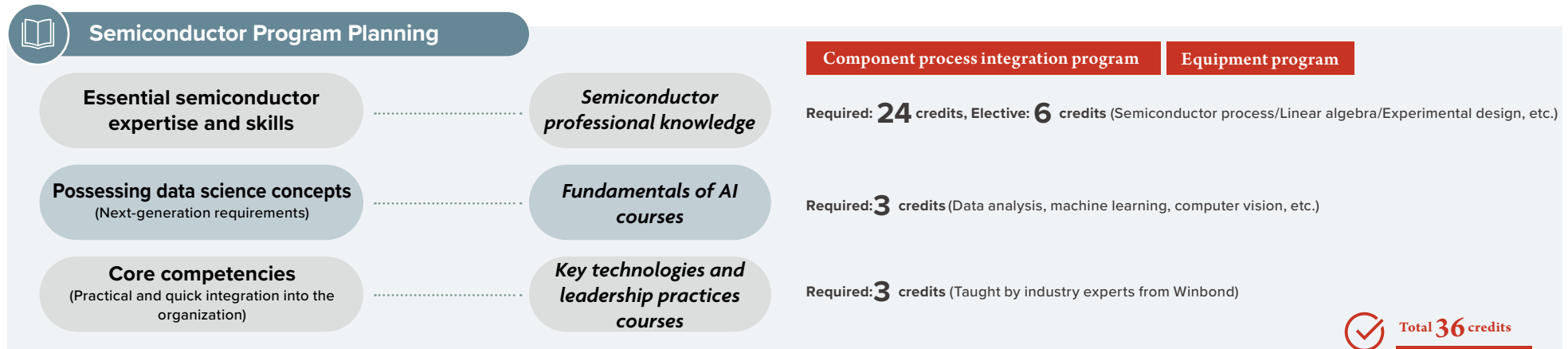
- Offering 804 online self-learning courses to employees
- Receiving nearly 7,608 views
- Total training time of 23,745 hours

## Jointly cultivating semiconductor talent in Taiwan through industry-academia collaboration

To enhance the quality of semiconductor talent in Taiwan, Winbond actively supports the collaboration between industry, government, and academia to foster talent. Through various means such as technology exchange, knowledge sharing, and teaching, Winbond actively participates in the cultivation of talent in society, aiming to enhance Taiwan's industrial competitiveness.

### Establishing Semiconductor Program to cultivate the next generation of talent

With a sense of responsibility for the development of Taiwan's semiconductor industry and talent cultivation, Winbond invested nearly NT\$10 million each year to assist in the establishment of the Academy of Innovative Semiconductor and Sustainable Manufacturing at National Cheng Kung University. In 2022, Winbond collaborated with the Academy to launch the "Semiconductor Program," which was planned by Winbond's senior executives. The program aims to help students lead the future semiconductor industry and develop a foundational understanding of artificial intelligence. Winbond also provides scholarships, internship/visit opportunities, guaranteed job interviews, and signing bonuses as part of its high-quality programs, encouraging the new generation of talent to join the semiconductor industry. As of 2022, over a hundred students have participated in Winbond's Semiconductor Program.



### Collaborative smart manufacturing project for joint research and innovation environment

From 2021 to 2022, Winbond cooperated with Professor Chia-Yen Lee of National Taiwan University on smart manufacturing project. The graduate students led by the professor and Winbond jointly conducted project development and research. The main contents included "Data Analytics Efficiency", "Quality Enhancement", "Yield Improvement", "Energy Saving Analysis" and other topics to help students connect with the industry in advance while at school.

### Research and development sponsorship for industry upgrading

Winbond sponsored the "Chair Professor Research Grant" project at National Yang Ming Chiao Tung University to assist the university in enhancing its academic standards. The sponsorship aimed to attract and retain outstanding domestic and international scholars, supporting professors in continuously improving their teaching and research capabilities, with a dedication to advancing academic research and fostering talent development in the field of information and communication technology. By combining resources with academia, Winbond strives to improve the environmental quality of the semiconductor industry.

## Not only do Winbond take care of our employees, but Winbond also take care of their families

Employees are long-term partners of Winbond, and as they enter the family stage of life, Winbond strives to become the most reliable ally for every employee who becomes a parent. We provide childcare allowances, flexible working hours, work-from-home options, and LOHAS Holiday, allowing our employees to balance their work and family life. Winbond is one of the few companies in the industry that extends group medical insurance coverage to employees' spouses and children.

## Creating a friendly work environment during the COVID-19 pandemic

During the COVID-19 pandemic, Winbond has implemented various employee welfare measures related to epidemic prevention based on the employee needs. These measures include paid vaccine leave, epidemic care leave, and group epidemic insurance, which covers employees, their spouses, and children. As work and lifestyle patterns have changed during the pandemic, Winbond provides systematic and professional psychological counseling services to support employees. Remote medical consultations and workplace resilience seminars are also conducted to provide employees with emotional and mental support during the epidemic. Winbond aims to create a friendly work environment during the epidemic, ensuring that employees can work in a healthy and secure manner.

## Industry-leading childcare allowance

Winbond believes in creating a supportive work environment that provides resources for childcare. This not only helps mitigate the risks associated with declining birth rates but also recognizes that every child has the right to receive proper care and development. Winbond offers a monthly "Childcare Allowance" of NT\$6,000 for employees' children in the hopes of easing the financial burden of childcare and providing support for employees' career development.



Since 2011, the Childcare Allowance has cumulatively reached **NT\$298,832,873**, benefiting a total of 1,122 employees and 1,667 children who have received this support!

### Father of five children

We have enjoyed the company's childcare allowance, and you can too!

During my 15 years at Winbond, I went from being single to getting married and having five sons.

I am extremely grateful for Winbond's supportive policies that help employees achieve a balance between work and family. The LOHAS Holiday and flexible working hours have provided me with more quality time to spend with my children. The flexible vacation and delegation system also allow us to focus on our children when we are at home.

But the most significant support has been the childbirth allowance. When we had our first child, we had to start from scratch, buying everything from diapers and cribs to baby clothes, car seats, strollers, and toys. They were all very expensive, and the quarterly childbirth allowance provided over four years felt like a regular dose of happiness. It greatly relieved the financial burden of raising children. Winbond's genuine commitment to its employees' families and personal lives is not just a slogan; it's something we can genuinely feel and experience.

