

CH2

Green Products

- 2.1 Innovation in Research & Development
 - 2.1.1 Strategy for Innovation in Research & Development
 - 2.1.2 Achievements in Research & Development by the Business Group
- 2.2 Green Manufacturing
- 2.3 Quality and Responsibility
 - 2.3.1 Product Quality Management
 - 2.3.2 Management of Hazardous Substances in Products
- 2.4 Intellectual Property Rights

Introduction

CH1
Sustainability
Communication

CH2
Green
Products

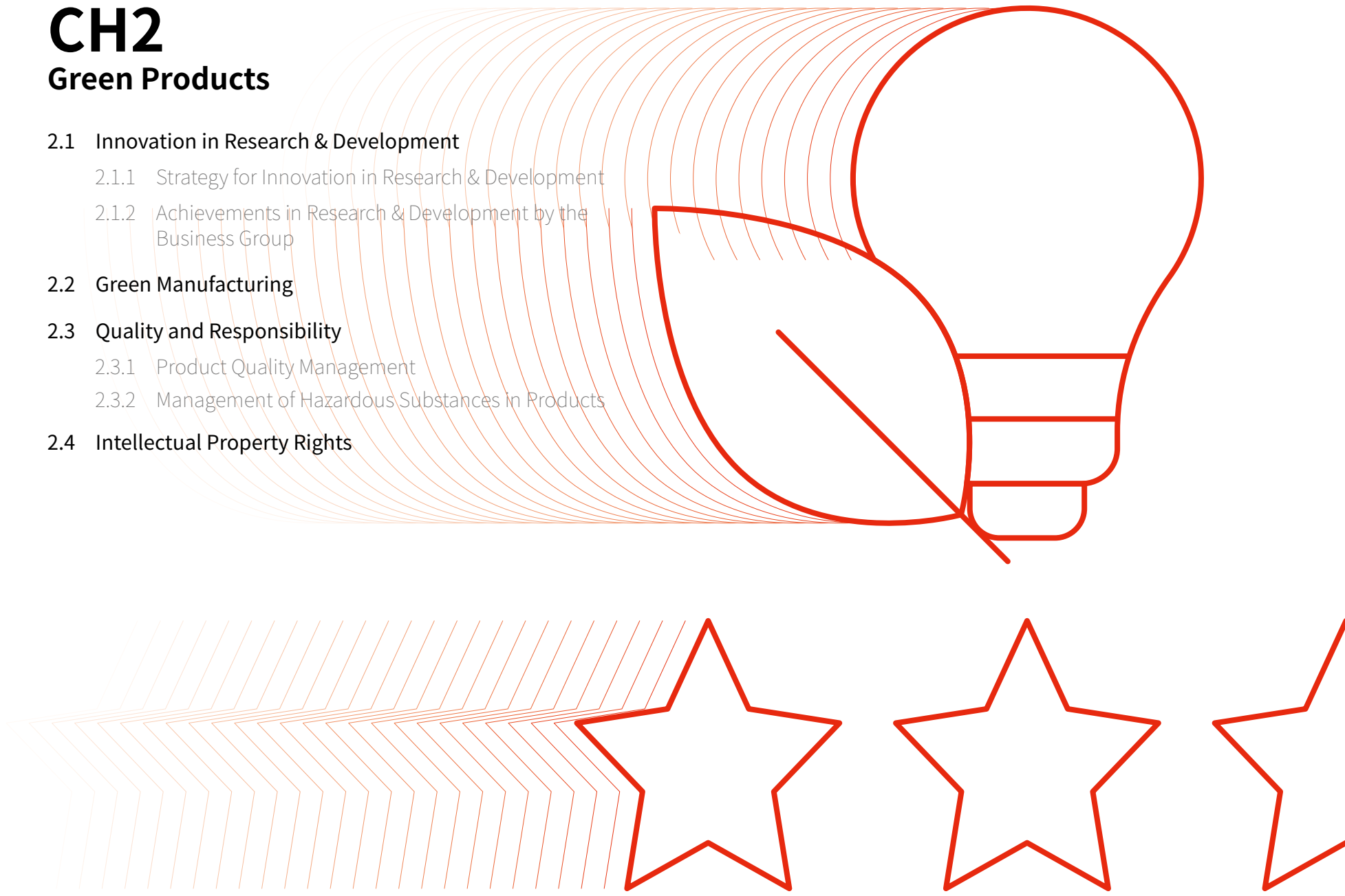
CH3
Excellence in
Governance

CH4
Environmental
Sustainability

CH5
Safe
Workplace

CH6
Social
Prosperity

Appendix



Material Topic: Innovation and R&D Management

Policies and Commitments	2023 Goals		Future Goals			Specific Actions
	Description of Goal	Achievements	Short-term (2024)	Mid-term (2025)	Long-term (2030)	
<ul style="list-style-type: none"> Regularly disclose R&D expenditures and newly acquired patent counts Through the implementation of innovation and R&D management, maintain the company's leading position in the industry and continue to provide customers with cutting-edge technology products 	<p>Nuvoton Taiwan</p> <ul style="list-style-type: none"> Total carbon footprint reduction of 38% (1.18 → 0.73) (kg CO₂/die) for energy-saving and carbon reduction products* 143 new patent applications in 2023 Develop innovative product R&D 	<p>Nuvoton Taiwan</p> <p>All goals achieved</p>	<p>Nuvoton Taiwan</p> <ul style="list-style-type: none"> The number of products using advanced processes in 2024 will grow by more than 50% compared to 2023 Maintain patent scale, with 141 new patent applications Enhance product environmental benefits, set a target of more than 38% total carbon footprint reduction for energy-saving and carbon reduction products 	<p>Nuvoton Taiwan</p> <ul style="list-style-type: none"> The number of products using advanced processes in 2025 will grow by more than 60% compared to 2023 	<p>Nuvoton Taiwan</p> <ul style="list-style-type: none"> Set an additional target of more than 90% growth in the number of products using advanced processes in 2025 compared to 2030 <p>Nuvoton</p> <ul style="list-style-type: none"> Continue to develop innovative product R&D, develop eco-friendly products; through advanced technology R&D, use technology to enrich human life, improve product execution efficiency and reduce power consumption during execution, and assist the world in moving towards sustainability 	<ul style="list-style-type: none"> Continue to invest in R&D funds and recruit R&D talents to expand innovation and R&D capabilities Provide incentives for new inventors, approved proposals, patent applications, and patent certifications
	<p>Nuvoton Japan</p> <ul style="list-style-type: none"> Develop miniaturized, low-power, and high-efficiency eco-friendly products New products' power consumption in 2025 to be 15% lower than in 2021 	<p>Nuvoton Japan</p> <p>All goals achieved</p> <p>A new green product certification standard has been established, aiming for a 15% reduction in power consumption of new products in 2025 compared to 2021. Relevant achievements in 2023 are as follows:</p> <ul style="list-style-type: none"> Chip area/PKG capacity reduced for 5 products (more than 5% reduction compared to previous models) TMOS on-resistance reduced for 5 products (more than 15% reduction compared to previous models) LSI power consumption reduced for 4 products (more than 15% reduction compared to previous models) Luminous efficiency of laser components increased for 2 products (more than 10% increase compared to previous models) 	<p>Nuvoton Japan</p> <ul style="list-style-type: none"> To maintain the leading position in the existing market and industry, will continue to introduce advanced low-Ron TMOS technology for lithium-ion batteries in smartphones 	<p>Nuvoton Japan</p> <ul style="list-style-type: none"> Along with the growth of the electric vehicle market, continue to develop and increase sales of vehicle-mounted BMS products 		

* The product carbon footprint calculation involves collecting the carbon footprint data for each IC manufacturing process and packaging type from suppliers. This data is used to calculate the difference in carbon footprints between the new generation and the previous generation of green products.

Nuvoton sees “research and innovation” as the driving force for the sustainable transformation of semiconductor IC design products. We are committed to developing the latest technologies in the industry, while continuously reducing the environmental impact throughout the process of design, production, packaging, and logistics. We introduce new technologies, high computational efficiency, and safer green products to meet energy-saving and carbon reduction goals. In addition to environmental benefits, Nuvoton also pursues social contributions through product innovation, including medical equipment, IoT devices, and smart city solutions that bring added convenience to society. Nuvoton rigorously controls product quality through quality management systems and conducts systematic hazardous substance management.

01 Enhancing Product Performance

- Improving power consumption
- Achieving faster computational efficiency
- Higher performance computing core units

02 Improving Quality

Continuously improving product quality in three major aspects: quality control, reliability assurance, and failure analysis.

03 Controlling Pollution

- Reducing consumables generated during the manufacturing process, lowering carbon footprint emissions.
- Establishing a system for managing hazardous substances in products, reducing or eliminating harmful substances included in products in a "process-oriented" manner.

04 Layout of Patents and Intellectual Property Protection

- Adopting international standards in the internal proposal stage of patent applications to enhance patent quality and application success rates.
- Improving the protection of intellectual property rights through internal education and training, signing confidentiality agreements, etc.

07 Reducing Production Energy Consumption

- By reducing wafer chip area and shortening production time, more products are produced with the same process, reducing energy consumption per wafer.
- Selecting low power and low leakage processes.

06 Achieving Smaller Size

EdgeBMC Continuously developing technologies to shrink wafer chip area compared to the previous generation of products, including ultra-low-power next-generation microcontroller MG51 chip, voice synthesis playback chip, edge computing management control chip EdgeBMC.

05 Ensuring Information Security and Confidentiality

Strengthening information security technologies, continuously providing advanced security function designs in products.





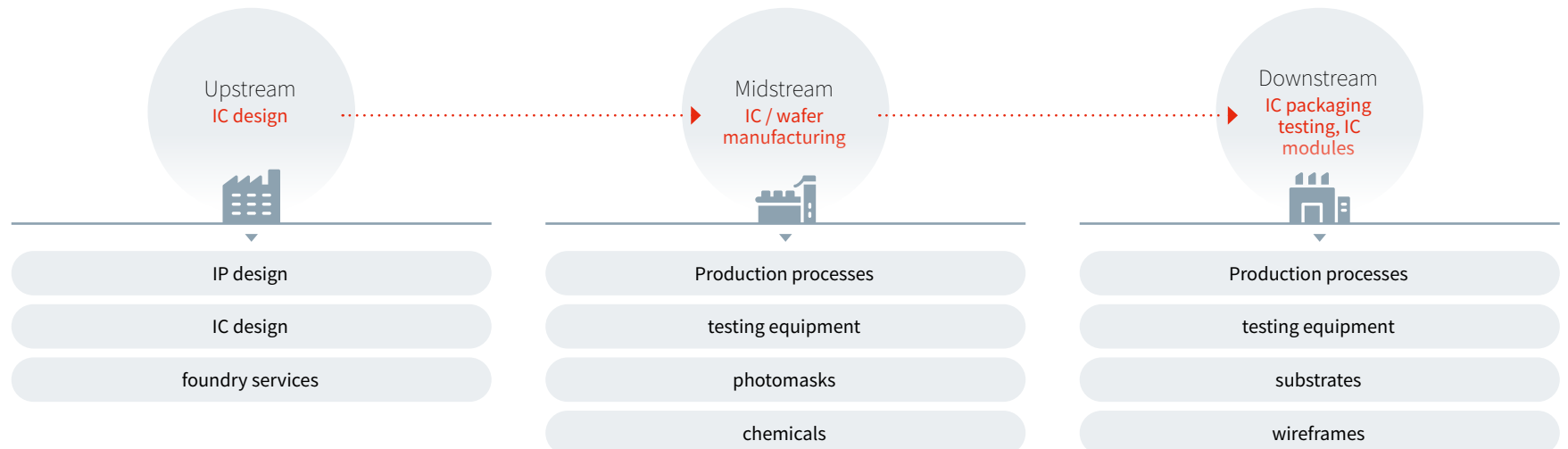
2.1 Innovation in Research & Development

The development of green semiconductor technology can have a positive impact on the future for humankind and our environment. Nuvoton envisions itself as the “invisible champion enriching human life with green semiconductor technology.” It regards “research and innovation” as the driving force for the sustainable transformation of semiconductor IC design products, and aspires for its products to continue expanding their footprint in overseas applications. At the same time, in response to new trends in the international market, Nuvoton is expanding resources to pursue product optimization in major areas of development, such as microcontrollers, cloud computing, and automotive industrial control networks. Products are designed and applied at terminals to achieve energy-saving and carbon reduction goals, continuously providing customers with high-quality products and new solutions, thus maintaining Nuvoton’s leading position in the IC Design House market.

2.1.1 Strategy for Innovation in Research & Development

Semiconductor Industry Chain Positioning

Nuvoton is an IC design company positioned upstream in the semiconductor industry chain, facing the front line impact of changes in market demand. Our technical research and development requires flexibility, advancement, and integration. From the perspective of the supply chain, Nuvoton’s products serve as the control and computing core of end products. In the field of cloud computing ICs, Nuvoton provides downstream customers with development of microcontrollers, microprocessors, smart home solutions, cloud security, battery monitoring, image sensing, IoT, and other related application ICs and semiconductor components, with deep expertise cultivated over many years. Additionally, Nuvoton is one of the few domestic IC design companies with wafer fabrication capabilities, owning a 6-inch wafer fab in Taiwan. It manufactures its own IC products and provides specialized wafer foundry services, establishing long-term and stable cooperation models with upstream players (raw material and equipment suppliers).





Based on the four innovation missions, Nuvoton has formulated management policies for its product development-related business groups to ensure consistency in product planning and design across different periods. It is committed to launching new technologies, high computational efficiency, and safer green products to meet energy-saving and carbon reduction goals.



Introduction

CH1
Sustainability
Communication

CH2
Green
Products

CH3
Excellence in
Governance

CH4
Environmental
Sustainability

CH5
Safe
Workplace

CH6
Social
Prosperity

Appendix



Business Group Names

The Microcontroller Application Business Group focuses on MCU/MPU products and audio products. MCU/MPU products prioritize user product safety and information security as the fundamental requirements. They incorporate energy-saving improvements and endpoint AI trends, exploring and defining key IPs or architectures in line with customer, market, and environmental trends for technical and product development. Audio products are application-oriented, introducing technologies to save battery consumption, reduce power consumption, achieve lighter and thinner packaging, minimize peripheral component and board material consumption, and gradually invest in high-end AI intelligent interaction research to develop comprehensive management strategies.



Microcontroller Application Business Group

In the global trend towards energy-saving efficiency, the Manufacturing Business Group continues to cultivate high-voltage process platforms for various application areas, providing customers with green semiconductors. In the HVIC process, development and implementation for customer products were completed in 2022, advancing to 600V application voltage by 2023, demonstrating technological innovation capabilities. In the future, close cooperation with customers will be established to invest in developing customized technologies, enabling customers' products to firmly establish a foothold in market demand and create value together. Additionally, resources will be invested in promoting smart manufacturing operations, executing innovative projects, monitoring carbon emissions automatically, improving operational efficiency, and reducing environmental consumption to achieve sustainable production goals.



Cloud Security Business Group

The Cloud Security Business Group's application areas include data centers, cloud servers, edge computing, and end-device-related computing device ecosystems, covering applications, such as security architecture, interface processing, and energy management. In response to the trends of remote work and education, the business group is dedicated to developing low-power, high-computing performance products. Additionally, for rapidly evolving cloud data centers, a highly secure remote control module is being constructed to meet the security environment requirements for personal and corporate cloud data processing. The business group focuses on two main directions for developing green products:

1. Energy-saving and carbon reduction in manufacturing processes: reducing wafer chip area, shortening production time, and producing more products per unit wafer energy consumption in the same process.
2. Energy-saving and carbon reduction in product functionality: products feature faster computational efficiency, integration of more interfaces, higher-performance computing core units, and system integration from multiple chips into one chip, overall improving customer system efficiency and reducing unit time energy consumption.



In 2023, Nuvoton continued to expand its R&D scale, with R&D expenses exceeding NT\$9.1 billion for the year, accounting for approximately 26% of total revenue. With more than 1,200 R&D personnel from Nuvoton Japan participating in improving product design, technology development, testing, and production efficiency, Nuvoton demonstrates its determination and commitment to product and technological innovation.






with R&D expenses
exceeding
NT\$9.1

accounting for
approximately
26%

With more than
1,200
R&D personnel from

2.1.2 Achievements in Research & Development by the Business Groups

Nuvoton’s three major product-related business groups continue to develop key technologies and have released notable products in recent years, spanning multiple application areas, showcasing Nuvoton’s abundant capabilities in IC design. Since its acquisition in 2020, Nuvoton Japan, the subsidiary of Nuvoton, has further supplemented research and development capabilities in the automotive electronics field, enhancing Nuvoton’s overall competitiveness in the international semiconductor and automotive markets.

	Key Technology	Highlighted Product	Areas of Application
 <p>Nuvoton - Microcontroller Application Business Group</p>	Efficient and energy-saving Cortex-A35 dual-core 64/32-bit MA35H0 microprocessor, with built-in DDR memory, H.264 video decoder, and operating temperature range of -40° C to 125° C (Tj)	NuMicro® MA35H0 series microprocessor for industrial human-machine interface (HMI) applications	Industrial automation, industrial HMI, new energy, smart buildings, smart homes, smart appliances, smart healthcare, etc.
	Wide temperature operating range, up to 125° C, complete Controller Area Network (CAN) solution	NuMicro® M463 series microcontroller	Sensors and control data for gaming, automotive electronics, and industrial applications
	Network communication and strong hardware encryption capabilities, combined with software optimization using Skymizer neural network technology, providing leading inference performance for machine learning in high-efficiency embedded systems. Winner of the EE Awards Asia 2023 - Best MCU/Driver IC Product Award	NuMicro® M467 series microcontroller	Smart home automation, smart cities and infrastructure, lightweight edge AI in IoT, smart manufacturing, etc.
	High precision, high integration, high output rate	NADC24 series 24-bit Delta-sigma analog-to-digital converter	Industrial control and measurement
	Exclusive LLSI (LED Light Strip Interface) patented technology supporting LED control, supports up to 2 sets of I3C functions	NuMicro® NUC1263 series microcontroller	Industrial sensors, lighting control, gaming lighting control, smart home-related applications
	Low voltage application 1-Battery boost control chip, with built-in Nuvoton patented low voltage boost circuit and overload protection circuit	N566LP boost control chip	Market for smart toy applications
 <p>Nuvoton - Manufacturing Business Group</p>	600V device technology	High-voltage integrated circuit (HVIC) process platform	Motor drive, power tools, electric bicycles, white goods, etc.
	120V BCD technology	BCD (Bipolar CMOS DMOS) process platform	DC/DC transformers, driver chips, automotive electronics, etc.
 <p>Nuvoton - Cloud Security Business Group</p>	computer security computer manageability	EdgeBMC Edge computing management control chip EdgeBMC	Edge computing computers, industrial computers, embedded Internet of Things (IoT), embedded computers, cloud servers, and data centers.
	Low-power, high-performance cores, providing personal computer peripheral input/output interfaces, power management functions, plus Nuvoton’s hardware root of trust (RoT) technology	Embedded controller NPCK397mNX for high-integration, mobile-specific solutions	Portable products such as tablets, detachable convertible laptops, and traditional laptops

Introduction

CH1
Sustainability
Communication

CH2
Green
Products

CH3
Excellence in
Governance

CH4
Environmental
Sustainability

CH5
Safe
Workplace

CH6
Social
Prosperity

Appendix

Nuvoton Japan strengthens its competitive advantage in the automotive market



Electric vehicles represent the long-term trend of green energy technology, and Nuvoton Japan has shown remarkable performance in automotive-related components such as MCU, BMIC, and HMI-IC. For example, in BMIC products, Nuvoton Japan began mass production of the third-generation electric vehicle battery management chip (BMIC) in 2023, responding to the extensive demand in the Chinese electric vehicle market. In the future, Nuvoton Japan will release the fourth-generation electric vehicle BMIC, capable of high-precision measurement of the voltage, temperature, and current of battery cells.

Introduction

CH1
Sustainability
Communication

CH2
Green
Products

CH3
Excellence in
Governance

CH4
Environmental
Sustainability

CH5
Safe
Workplace

CH6
Social
Prosperity

Appendix

Highlighted Products

HMI-IC

Human-Machine Interface Chip (HMI-IC)

Utilizes ISP/DSP as key technology; adopted by a major Chinese automotive manufacturer as a component for Head-Up Display (HUD)
A Japanese automotive manufacturer launched a model equipped with digital rearview mirrors using Nuvoton Japan's HMI-IC.



BMIC

Battery Management Chip

The third-generation electric vehicle BMIC is in mass production
The fourth-generation electric vehicle BMIC will be released, capable of high-precision measurement of the voltage, temperature, and current of battery cells.



MCU

Microcontroller

Newly developed Arm® Cortex®-M4F core motor control MCU has commenced mass production.



2.2 Green Manufacturing

Developing green products

Nuvoton's main products are IC chips, which are widely and diversely used in terminal markets and devices. Therefore, Nuvoton is committed to considering the environment during the chip design phase. Through technological innovation, Nuvoton continues to develop chips with lower power consumption and smaller sizes. Nuvoton's principles and actions for producing green products are evident in the four aspects of design, process, packaging, and logistics:



Introduction
CH1 Sustainability Communication

CH2 Green Products

CH3 Excellence in Governance

CH4 Environmental Sustainability

CH5 Safe Workplace

CH6 Social Prosperity

Appendix



Design
Nuvoton focuses on minimizing product chip size to reduce raw material usage and waste. Additionally, efforts are made to improve product efficiency and reduce power consumption to minimize environmental impact.



Process
Nuvoton's Cloud Security Business Group prioritizes the use of advanced processes for new products to achieve higher computing performance, lower energy consumption, smaller chip sizes and packaging, and to establish a healthier and more durable production supply chain. Representative products in 2023, such as the EdgeBMC edge computing management control chip and the Embedded Controller for commercial notebooks, optimize chip processes and performance. In the Manufacturing Business Group, the 600V HVIC process platform introduced in 2023 reduces overall power consumption by 40% compared to the 120-250V process developed in 2022. The 120V BCD process platform reduces power consumption by 25% compared to the 80V process, with four fewer photomask layers.



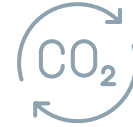
Packaging
Nuvoton adopts the circular economy concept for packaging materials, allowing them to be reused multiple times throughout their lifecycle to reduce environmental impact.



Logistics
Nuvoton focuses on consolidating shipments, increasing carrying capacity, optimizing delivery routes, and supporting green logistics networks.



Nuvoton’s commitment to energy efficiency and high performance is integrated into product design from the early development stage. Precise control designs are implemented based on user scenarios to minimize unnecessary circuit designs and increase logic gates in each function to ensure that each microcontroller consumes less power in different usage scenarios, reducing overall microcontroller power consumption.



Nuvoton Japan plans to obtain ISO 14067 certification for products with high customer demand by 2025. To understand resource consumption during the product lifecycle, Nuvoton develops products with green design to reduce resource consumption during production. The company has identified product emissions during the raw material and production stages and developed low-energy products to reduce emissions during the usage stage.

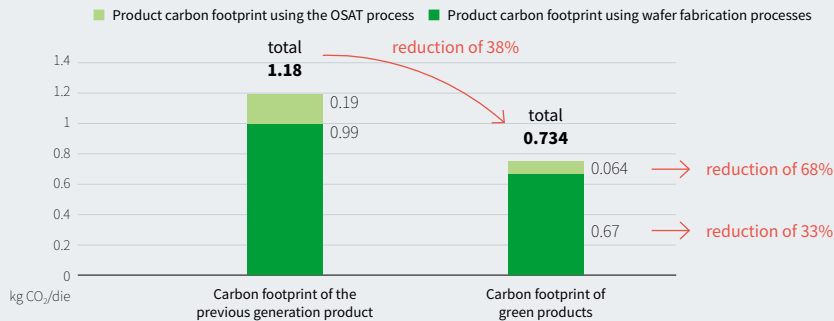
nuvoTon

In addition to outsourced production, Nuvoton also has in-house process platforms. Products manufactured sustainably outside the wafer fab service gradually account for a significant proportion. Key results in the development of three key components focusing on “high efficiency, high integration, and low power consumption” were achieved. Products produced by Nuvoton Taiwan are based on 6-inch wafers. In 2022, Nuvoton completed a carbon footprint assessment of 6-inch wafers according to ISO 14067:2018 and underwent third-party verification.



These innovative products not only benefit the environment but also bring a positive impact on society. The low-power characteristics of the new generation of microcontrollers mean more compact, lightweight products, which are helpful in various applications such as medical devices, IoT devices, and smart city solutions. The introduction of these products not only improves efficiency and performance but also brings more convenience and accessibility to society.

In 2023, the carbon footprint target for green products is 0.73 kg CO₂/die, achieving a reduction of -38%.



green revenue generated reached approximately **8.62** billion NT dollars



In 2023, Nuvoton’s products were widely used in various sustainability-related fields, such as automotive (e.g., autonomous driving systems/power management systems, charging piles/batteries), consumer electronics (home appliances/smart homes), industrial control (environmental monitoring sensors/energy management and distribution), and security management. The **green revenue generated reached approximately 8.62 billion NT dollars**. The total carbon footprint reduction achieved by energy-saving and carbon-reducing products compared to the previous generation was calculated to be 38%.

Reduced Power Consumption

- **General-purpose 32-bit Microcontroller M2003C** Compared to the previous-generation M051 microcontroller, both execution and standby power consumption are reduced by up to 50%.
- **Ultra-low-power Next-generation Microcontroller MG51** By improving product power consumption and selecting low-power, low-leakage processes, execution power consumption is reduced by 35% to 40% compared to the previous-generation low-power microcontroller N76E003, extending battery life.
- **HMI \ Motor Driver IC** Power consumption is reduced by over 15% compared to previous models.

Saved Chip Size

- **General-purpose 32-bit Microcontroller M2003C** Chip size is reduced by 40% compared to the previous-generation M051 microcontroller, decreasing material usage during manufacturing and lowering carbon footprint emissions.
- **Ultra-low-power Next-generation Microcontroller MG51** Chip size is reduced by 29% compared to the previous-generation low-power microcontroller N76E003, contributing to reduced material usage during manufacturing and lower carbon footprint emissions.
- **Smart Audio Amplifier** Chip size is reduced by 30% compared to the previous-generation smart audio amplifier.
- **Audio Optimization Chip** Chip size is reduced by 30% compared to the previous-generation audio optimization chip.
- **Speech Synthesis Playback Chip** Chip size is reduced by 70% compared to the previous-generation speech synthesis playback chip.
- **N589 Voice Chip (New Product)** Utilizes smaller flash memory units, reducing flash memory size by 45% compared to the previous-generation chip, and transitioned from 8" to 12" process, adopting a more environmentally friendly process to reduce environmental impact.
- **N55T24 Touch Sensing Chip** A single chip with 24 touchpoints replaces the previous solution of two chips with 16 touchpoints, resulting in a 32% reduction in chip size.
- **System Speech Processing Chip** Chip size is reduced by 50% compared to the previous-generation system speech processing chip.
- **EdgeBMC (Edge Computing Management Control Chip)** Introduced as a new product in 2023, it utilizes a more efficient chip package, reducing chip package size by 67% compared to the previous generation. This reduces the demand for silicon raw materials during chip manufacturing and saves space on terminal system application circuit boards.

Lower On-resistance

- **TMOS** On-resistance is reduced by over 15% compared to previous models.
- **Motor Driver IC Brushless DC Motor** High efficiency brushless DC motor conducive to energy savings. With its high design flexibility, it is used in various markets and offers multiple voltage, speed, and load options.
- **8bit KM101 MCU** Developed by Nuvoton Japan, equipped with an 8-bit original CPU microcontroller series. Low power consumption, high code efficiency, and performance comparable to other companies' 16-bit microcontrollers.
- **Arm® Cortex®-M7 MCU** KM1M7 series is a 32-bit flash memory microcontroller equipped with Arm® Cortex®-M7. It features high processing capability and low power consumption, with high-performance PWM, high-speed, high-precision AD converter, and feedback control auxiliary functions suitable for motor control/digital power control applications, making it an ideal choice for power electronic control.
- **LD** Luminous efficiency is increased by over 10% compared to previous models.+++

Increased Operational Efficiency

In our planning for the future, Nuvoton will continue to develop products that can reduce energy consumption and minimize size to save resources. We will also strive to improve processes, reducing environmental impact while meeting market demands and operational strategies. Nuvoton will integrate our expertise in servers and personal computers, actively cultivating the three layers of cloud, edge, and terminal. We will develop high-efficiency, low-power computer chip products that meet the latest security standards, offer zero-compromise security, and incorporate artificial intelligence based on enterprise and market needs. At the same time, we will continue to improve our TMOS, HMI, motor drivers, microcontrollers, and LD products. In the short term, Nuvoton will launch new products with market-leading security features, high performance and low power consumption, as well as the ability to be applied across multiple domains.

Digital Transformation and Smart Manufacturing

voton is fully promoting digital transformation, integrating digital technology into all areas of the enterprise to create organizational competitive advantages. Both Nuvoton Taiwan and Nuvoton Japan have established digital transformation committees, with members from production, sales, human resources, R&D, finance, and other units. We strive to introduce digital tools to assist in optimizing internal management and improving corporate productivity. The short-term goal is to raise awareness of the importance of digital transformation across the company. In 2023, Nuvoton Taiwan held 12 digital transformation sharing sessions, while Nuvoton Japan conducted digital transformation education and training, with 1,631 participants.

In addition to organizational upgrades through the use of digital tools, Nuvoton also places a heavy importance on smart manufacturing at the factory level. We began promoting smart manufacturing in 2010, referring to concepts such as Industry 4.0 and Industry 3.5 during this period to plan a smart manufacturing blueprint for our 6-inch wafer foundry. The factory launched its smart manufacturing infrastructure in 2010, and from 2012 to 2019, it started the digitization of production information. In 2020, a smart manufacturing management team was established, incorporating relevant projects into KPIs for regular progress reviews to ensure the implementation of relevant strategies. Currently, the smart manufacturing initiative has progressed to the software upgrade stage, where we continue to introduce software development and AI technologies to reduce repetitive operations and labor-intensive tasks. The team is continuously driving various innovative projects with the hope of creating an energy-efficient, environmentally friendly, and highly productive smart manufacturing factory, fulfilling the company’s vision of being an “Invisible Champion Enriching Human Life with Green Semiconductor Technology.”

2023 Smart Manufacturing and Industrial AI Project Achievements

Project Name	Linear Dispatching System	Real-time dispatching operations achieved through tablet and inventory management system	Intelligent Wafer Test Yield Analysis Management	Automatic Optical Defect Inspection AI Classification System	Optimized Wastewater Dosing System	Wafer Test Pattern Search Engine
Project Description	By setting output targets for micro-lithography process nodes, achieve stable throughput of work-in-progress to maximize output	Established a Wi-Fi environment in the semiconductor manufacturing plant, allowing operators to check production dispatch orders and product inventory locations anytime through portable devices	Established an automatic wafer test data acquisition and automatic fault analysis system to replace manual operations	Utilizes AI algorithms and image recognition technology for defect classification, reducing the workload of inspection personnel and providing faster analysis results	Established a dosing equipment system to automatically adjust valves based on pH value changes	Utilizes AI algorithms and image recognition technology to search for similar wafer test patterns to determine the root cause of product quality anomalies
Project Effectiveness	2% increase in productivity	3% reduction in engineering assistant operation time	83% reduction in fault analysis time	97% increase in defect (anomaly) classification speed	100% reduction in operation time	98% reduction in query time

Introduction

CH1 Sustainability Communication

CH2 Green Products

CH3 Excellence in Governance

CH4 Environmental Sustainability

CH5 Safe Workplace

CH6 Social Prosperity

Appendix

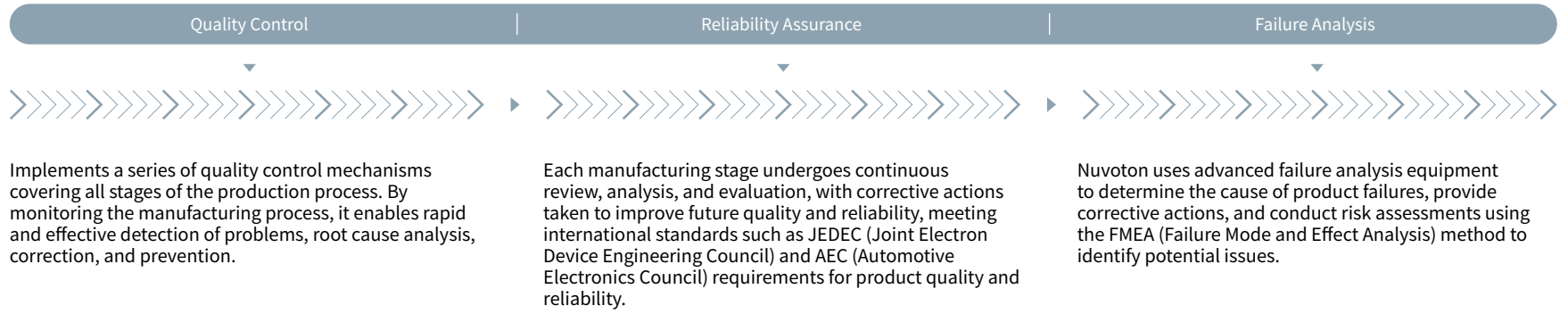
2.3 Quality and Responsibility

2.3.1 Product Quality Management

Nuvoton’s philosophy on quality management is to use a spirit of continuous innovation to provide excellent product and service quality, and become an irreplaceable partner for customers. Nuvoton establishes, implements, maintains, and continually improves its quality management system based on the IATF 16949 international standard management principles, including necessary processes and their interactions, to enhance the organization’s quality performance. Internally, the company continuously improves product quality and meets customer requirements through three aspects: quality control, reliability assurance, and failure analysis.



Quality Management Systems and Processes



In chip packaging, Nuvoton continuously monitors the manufacturing process at every stage, collecting feedback and information on various aspects, and rapidly and effectively detects, evaluates and analyzes issues to implement corrective measures, thereby constructing a product line with high quality and reliability. In terms of packaging technology and outsourcing management, Nuvoton closely cooperates with packaging companies to provide packaging forms that allow components to perform at their fullest potential, while meeting customers’ special requirements. Nuvoton also strictly screens outsourcing companies to ensure they can deliver high-quality products.

To ensure that all employees possess the knowledge, skills, abilities, and attitudes necessary to perform their duties, Nuvoton continuously conducts internal and external quality management education and training annually. The types include new employee training, on-the-job education, and professional staff training, comprehensively strengthening employees’ quality awareness and application of quality control methods, including quality circle activities, seven quality control tools, statistical analysis methods, FMEA, and other quality-related training. The following is the implementation of quality management education and training courses in 2023:

Course Name	Course Hours	Cumulative Attendees
QC080000 Hazardous Substance Process Management System	1	944
Basic FMEA Concepts	2	1,125
FMEA	6	302
SPC	3	276
QIT	3	538
7 QC Tools	3	263
General Education on ISO9001/ISO14001/ISO45001	1	1,841

Introduction

CH1 Sustainability Communication

CH2 Green Products

CH3 Excellence in Governance

CH4 Environmental Sustainability

CH5 Safe Workplace

CH6 Social Prosperity

Appendix

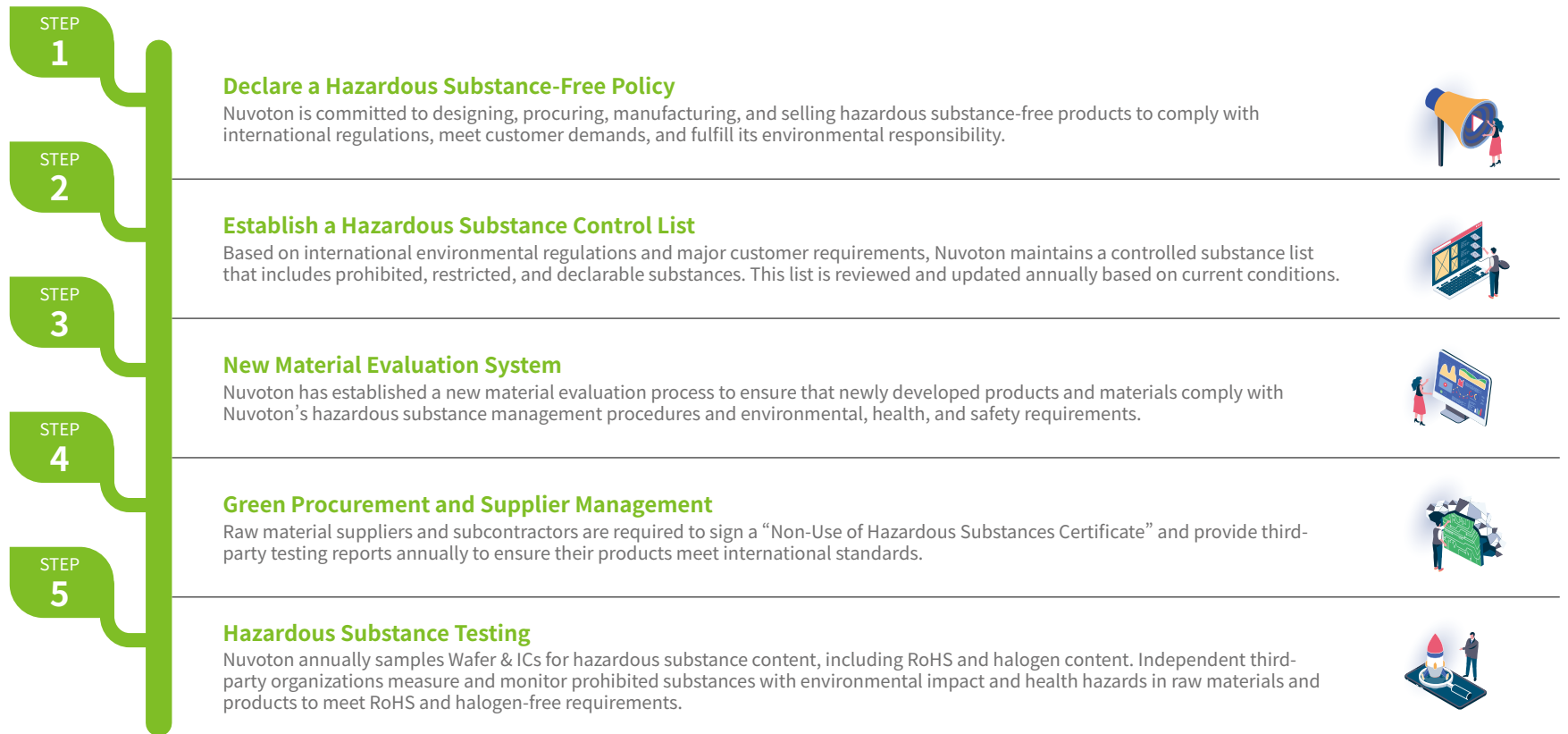
Nuvoton bases its management systems on various international standards, such as ISO 9001, IATF 16949, IECQ QC080000, ISO 14001, and ISO 45001, covering aspects like product quality, green products, environmental protection, and occupational health and safety. This helps improve operational efficiency and effectiveness, enhance product and service quality, and ensure the fulfillment of sustainability responsibilities. Meanwhile, Nuvoton Japan has established an ISO 9001 quality management system and obtained ISO 9001:2015 quality certification, as well as certifications for ISO 9001, ISO 14001, ISO 45001, ISO 27001, and ISO 21434 international standards.



Nuvoton's
International
Standard
Certifications

2.3.2 Management of Hazardous Substances in Products

Nuvoton implements a rigorous five-step process to manage hazardous substances in all its products. This stringent self-imposed regulatory framework has been recognized by customers, including Sony Green Partner certification since 2009 and regular Sony Green Partner audits. Building on ISO 9001 and IATF 16949 management systems, Nuvoton achieved IECQ QC 080000, the International Electrotechnical Commission's (IEC) Hazardous Substance Process Management Standard, in 2008. This "process-oriented" approach minimizes or eliminates hazardous substances in products, enabling systematic hazardous substance management that meets RoHS, REACH, WEEE, and other customer-specific requirements, effectively operating a robust hazardous substance management system.



2.4 Intellectual Property Rights

Nuvoton recognizes research and development (R&D) and innovation as essential competitive strengths for sustainable business operations and survival. Intellectual property (IP) protection is a crucial factor in safeguarding brand value. To reinforce its industry leadership and protect its hard-earned advanced technological achievements, the company has formulated an IP strategy that aligns with its business objectives and R&D resources. This strategy establishes an operational model for protecting the company’s R&D and technological innovations, thereby enhancing its competitive edge and solidifying the foundation for its development. The company’s patent management strategy primarily encompasses patent portfolio deployment strategies, mechanisms for identifying and cultivating key patents, and expanding patent application portfolios. Through the implementation of application and review mechanisms, incentive systems, education and promotion, and talent training at the execution level, the company protects its R&D outcomes and technological leadership, continuously accumulating IP strength. Nuvoton has established an IP department and a patent review committee to strengthen its IP management strategy work, including patent evaluation and review, awards and incentives for innovative results, creativity-stimulating activities, and strategic utilization of IP.

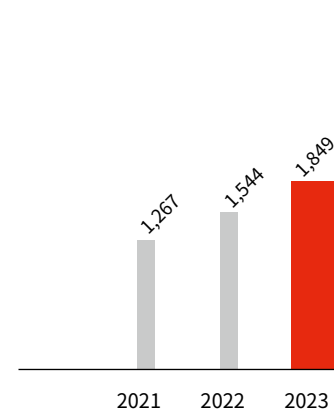
To improve the number of patent applications and approvals, the company adopts international standards in the internal proposal stage of patent applications, following patent laws, examination guidelines, and commercial potential of various countries to review each proposal. This approach aims to improve the quality of patents and the probability of successful approval, ensuring that the company’s R&D innovations can receive adequate legal protection. In addition, the company sets patent application targets at the beginning of each year and designs a variety of innovation incentive mechanisms to continuously encourage employees to submit invention applications. It also establishes a systematic IP management system, utilizes digital transformation tools to establish a patent knowledge platform to share patent information, and holds multiple creative brainstorming activities to assist colleagues in generating

patent proposals more efficiently. In 2023, Nuvoton filed 283 patents in Taiwan and over 2,500 patents globally. The number of patents granted in 2023 reached 305, with over 1,800 patents granted globally, ranking 23rd among domestic corporations in patent applications in 2023. Nuvoton filed 204 patents in Japan and over 4,300 patents globally. The number of patents granted in Japan was 125, with over 3,100 patents granted globally.

tection and management of trade secrets for comprehensive IP protection. The company’s new employee training programs include a theme to remind new employees to safeguard the company’s trade secrets. In 2023, the new employee training course, “Legal Issues that Knowledge Workers Should Pay Attention” was conducted, with a total of 129 trainees. In addition, Nuvoton signs confidentiality agreements with long-term cooperating suppliers or customers at the initial stage of contact to protect Nuvoton’s confidential information and trade secrets. In 2023, Nuvoton did not encounter any disputes involving breach of confidentiality agreements or infringement of trade secrets.



Number of Nuvoton Taiwan patents granted



Number of Nuvoton Japan patents granted

