

NL

Netherlands



Designing the future of
semiconductors in the
Netherlands

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The Netherlands as an international player

The Netherlands is a leading global player with regard to knowledge on and production of semiconductors. Among other things, we are home to the world's biggest machine builder for semicon manufacturing, ASML. Moreover, the semicon industry in the Netherlands is largely fed by small to medium-sized companies employing dozens of people. As a result, the Netherlands combines both the stability of large companies with comprehensive vertical integration and the versatility of independent operators. Inside the Netherlands, more than 300 semicon companies employ over 50,000 people and have an annual turnover of 30+ billion euros. Considering the Netherlands is internationally renowned with many companies active outside the country, the total turnover and number of employers is much higher.

The Dutch chip design community

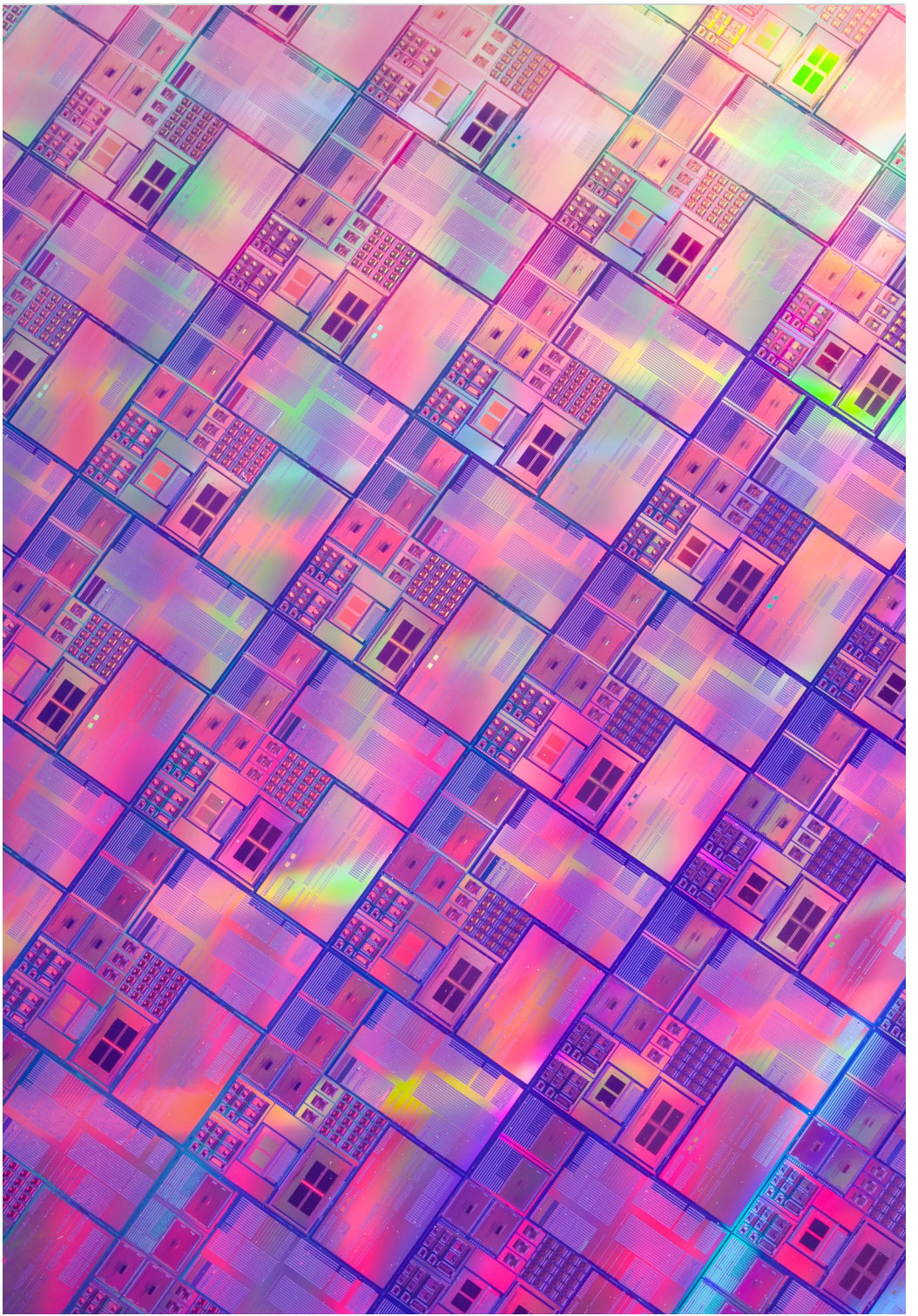
Chip design is an important part of our global IC ecosystem. It is a natural starting point for both semiconductors and integrated photonics IC's. The Netherlands is home to a thriving and ever growing community of chip design partners. There are almost 100 companies integrated into the Dutch Semiconductor top sector. Together with dedicated partners, [High Tech NL Semiconductors](#) along with partners is building a unique community Chip Design NL to add value to Dutch based chip design companies. These companies and institutions are operating in their own niches, and have proven track records in their areas of expertise. In the Netherlands, most production, packaging, and testing activities take place in-house. From innovating wireless data transmission and sensor data acquisition, to patented security technology, and core expertise on mixed-signal and IC design, the Netherlands offers a wealth of knowledge and established IP in the field of chip design.

Quadruple helix approach

Our quadruple helix approach ensures that knowledge institutions, industry, society and government all work together to solve global challenges. We pursue a common goal of a safer, healthier and more sustainable world through continuous innovation of semiconductor chips. Through the quadruple helix approach, the Netherlands has built a well-coordinated and successful public private innovation ecosystem. With our excellent digital and physical infrastructure, as well as innovation friendly policies, the Netherlands is an accessible and interconnected metropolis for sharing knowledge and innovations. The combination of a robust technological infrastructure, skilled workforce, supportive business environment, strategic location, and focus on future oriented solutions makes the Netherlands an attractive place for chip design companies. These factors contribute to the growth and success of such companies by fostering innovation and collaboration in the sector.

Knowledge institutions

The Netherlands knows how important it is to keep innovating, which is why various knowledge institutes and Universities across the Netherlands have focused investment on training the next generation of semiconductor innovators. The University of Twente, Delft University of Technology and the Eindhoven University of Technology all have programs which focus on IC chip design. The availability of highly educated and skilled workers in the Netherlands facilitates the development of a knowledgeable sector. Alongside training, these institutes engage in cutting-edge research, develop new chip design techniques, and file patents for innovative solutions.



University highlights

UNIVERSITY OF TWENTE.

University of Twente

Located in the Twente region, which has proven to have the right ingredients in house to develop the chip systems of the future. There are now nine chip design companies in the region that design (parts of) chips for various global manufacturers. Within the University of Twente, there is a burgeoning department dedicated to labs-on-a-chip. The University is also home to the MESA+ institute which is one of the world's largest nanotechnology research institutes, and boasts the state of the art MESA+ Nanolab. The focus of expertise in Twente is on Analogue and RF Integrated Circuit Design, MEMS, photonics, quantum, microfluidics, nanotechnology and integrating these (new) technologies into heterogeneous systems.

Prof.dr.ir. Bram Nauta is the chairman of the Integrated Circuit Design department at the University of Twente, and is a globally recognized expert in chip design. He is also the recipient of the 2023 Stevin Prize, one of the highest honours in Dutch sciences and accompanied by 1.5 million euros for research.

He recognizes that the quality of training students receive has resulted in the attraction of companies to the region. He has noticed that most of his students stay in the Twente region after graduation to work at companies in the region. These companies saw what was happening in Twente and didn't want to miss out on high quality, well trained future workers. The symbiotic relationship between industry, research, and education in Twente has led to the creation of an entire chip design ecosystem.

Delft University of Technology

At Delft University of Technology, the Department of Microelectronics is conducting cutting edge research and training the next generation of chip designers. With a staff of around 30 full time factory, and 180 full time scientific staff, the Department of Microelectronics combines the expertise of multiple research groups. Research at the Department of Microelectronics spans all major aspects of electronic engineering including the design and development of silicon-based devices, analogue and digital circuits for smart sensors, biomedical implants, wireless communication systems and much more.

Outside of research the department offers programs for masters students, many of whom come from bachelors programs in electrical engineering and computer science, also offered at Delft. Students can choose to study in one of three tracks: MSc Wireless Communication and Sensing, MSc Signals and Systems, and MSc Microelectronics. Among many other courses, students are able to take the courses Analog Circuit Design, Digital IC Design, and "Design a Chip" in which students make a VSLI design.



Eindhoven University of Technology

In 2021, the Eindhoven University of Technology (TU/e) launched the Eindhoven Hendrik Casimir Institute (EHCI) bringing together photonics, electronics and quantum technology. Based on decades of research in photonics and electronics, and bringing the emerging field of quantum technology together, EHCI focuses on exponential computing, communication and sensing technologies in order to enable a sustainable information society. The institute houses two centers, the Center for Integrated Photonics, and the Center for Quantum Technology.

The photonics center originates from a >30 year legacy in the field of photonics and has laid the foundation of the rich Brainport photonics ecosystem, with successful start-ups (e.g. EFFECT Photonics), scale-ups (e.g. SMART Photonics) and the ecosystem organization PhotonDelta, which recently acquired a National Growth Fund. The center itself regroups over 500 researchers active in the field of photonics, and has access to facilities such as Nanolab@TU/e, hosting state-of-the-art equipment and services for cutting edge photonics research and industrial collaborations, to innovative optical fiber labs. Recent longstanding partnership with ASML entered a new phase that includes jointly defined research programs, and the construction of a new cleanroom facility on TU/e campus, the largest of its kind in Europe.

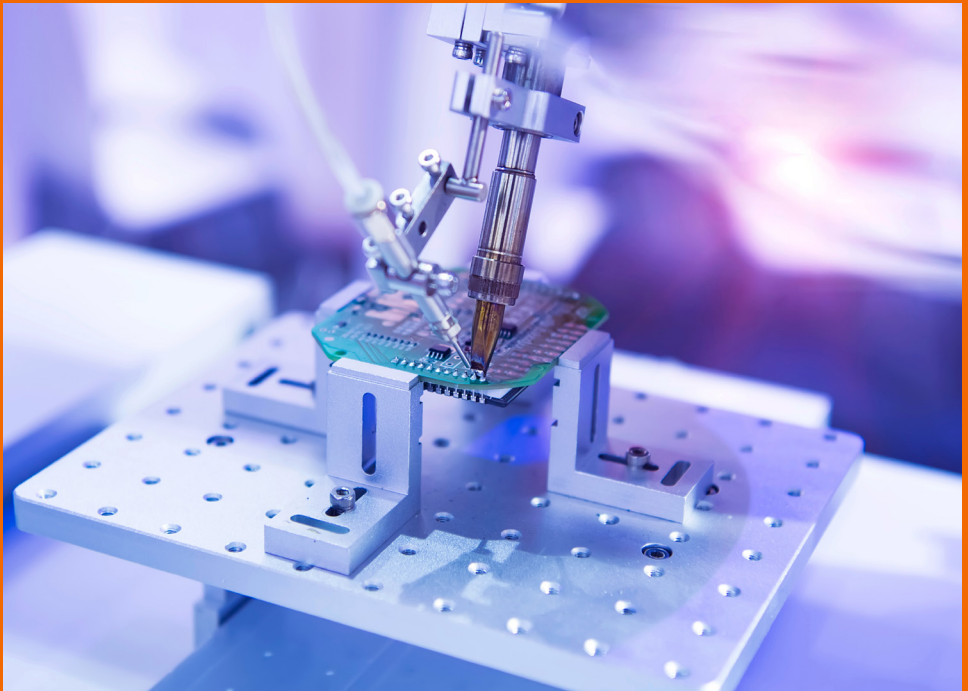
Eindhoven University of Technology is a core center for industrial cooperation. The collaboration with companies is seen through part-time positions for top engineers from neighboring companies (ASML, Signify, Philips), and involvement in pilot line projects with European partners. Taking all of the above into account, TU/e continues to attract top researchers and is a breeding ground for new talent in photonics, quantum and semiconductor technology.

The European Chips Act

The Netherlands has a thriving ecosystem of world players and SME's which supply to bigger companies and in turn scale up into larger companies themselves. On average 85% of the integrated circuits in all electronic devices worldwide, are made on machines designed in the Netherlands. The strong position of Dutch companies globally enables the country's ecosystem for the semiconductor manufacturing equipment industry to contribute significantly to Europe's digital sovereignty. And to the earning power of the Netherlands.

In 2023, the European Commission approved a sizeable investment into the semiconductor

industry. [The European Chips Act](#) aims to support and increase in semiconductor R&D and production across Europe in response to rising demand, to build on existing strengths and to increase European resilience. With the passage of the European Chip Act the Netherlands will be able to innovate in areas such as chip design, packaging and heterogeneous systems, which is supported by a strong and stable ecosystem. Because of its established importance in the semiconductor industry in Europe, the Netherlands will benefit greatly from this capital investment, setting the stage for new developments across the semiconductor value chain.



Company highlights



Axelera AI

Based in Eindhoven, Axelera AI has developed an AI hardware and software platform for edge computing. The company's hardware and software solution compresses the AI processing capabilities of an entire server into a single chip at a fraction of the power consumption and cost of existing AI technologies. This technology allows to run AI workloads inside autonomous vehicles, medical devices, security and safety systems, robots and drones.



NXP

NXP Semiconductors was founded and is headquartered in the Netherlands, with locations worldwide. In the Netherlands, NXP has activities in Eindhoven, Nijmegen and Delft. It contains a CTO Design Center, a center for state-of-the-art SoC integration methodologies and analogue mixed signal design. Furthermore there are also a number of Business Lines and a production facility at these locations. NXP creates purpose-built, rigorously tested technologies that enable devices to sense, think, connect and act intelligently to improve people's daily lives. This leads to new devices and complete solutions for automotive, industrial and communication applications and infrastructure.



Bruco IC

Bruco Integrated Circuits is a Twente based fabless design center focusing on RFIC, Analog/Mixed-signal IC design and RF Power application design. They provide design services and turn-key solutions from early system specification to qualified silicon and take care of the supply chain during product lifetime. Their designs can be found in many products close to home, like mobile phones, lighting, industry, cars, and personal entertainment. The team of highly skilled people consists of over thirty IC design and application engineers with Bachelor, Master and PhD degrees with various backgrounds. Bruco IC has a design office and RF measurement laboratory in Borne (HQ), the Netherlands, a design office in Nijmegen, the Netherlands and a design office in Berlin, Germany.

