CHIP DESIGN NL, THE NATIONAL CLUSTER

Our Dutch ambition: to strengthen the European semiconductor value chain.

Chip design as the second branch of the Dutch semiconductor industry

Strengthen chip design's position as enabler of the Dutch semiconductor industry with support from the Dutch Innovation Policy

Chip Design NL: our Dutch ambition for strengthening the European semiconductor value chain

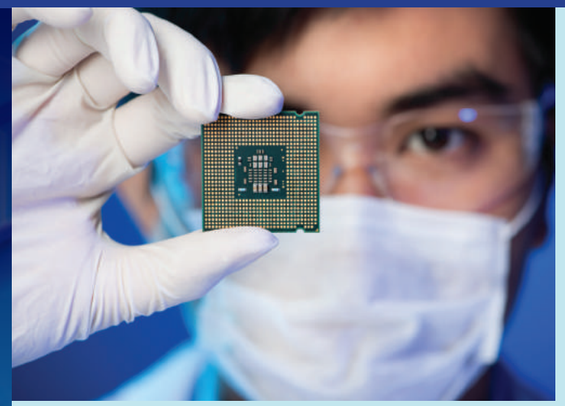
The Dutch semiconductor industry has a long and rich history. The innovative strength of Philips gave rise to several major businesses that have become essential to the global high-tech ecosystem. Over the years, many Dutch chip design companies have contributed to applications for major clients across Europe, Asia and the US. All these companies have one thing in common: the significant added value they offer as a reliable supplier. During the last several decades, an invaluable ecosystem of SMEs, knowledge institutions and universities has grown out of these corporate businesses. This ecosystem strengthens itself and maintains a national focus in the chain. It is a valuable system that is of major added value to the global semiconductor industry. The Netherlands has acquired a position of global leadership in the semiconductor equipment industry, which is something that makes us truly proud! We see opportunities to strengthen our country's position in the chip design industry as well, thereby giving the Dutch semiconductor industry a strong second branch.

Electronic chips are essential to our modern industry. Without chips, we have no way of communicating via our computer monitors or smartphones. Without chips, surgeons once again have to rely solely on what they can see with their naked eyes. Without chips, there can be no vehicles, transport or modern production processes. Likewise, innovative technologies such as artificial intelligence, integrated photonics and quantum computing depend on the computational power of electronic chips. If we are to have any hope of weathering the major societal transitions we are going through, it is primarily important to have access to an ample supply of the latest generation of chips to drive the electronic equipment we have come to depend on. Therein, unfortunately, lies the rub: the supply of chips is under pressure, in part because of the ever-accelerating digital transition and a geopolitical landscape that is more complex than ever. Secondly, these chips have to be designed by highly educated and well-trained technical staff of which there is currently a dire shortage. The Netherlands has an international leadership position when it comes to chip design.

You'd be hard-pressed to open up an electronic appliance without finding a piece of chip made by Dutch chip designers. Our country has long since been a forerunner with regard to various chip design specialisations. However, not being able to train and retain enough designers may jeopardise this position. Europe is preparing for this eventuality with the EU Chips Act, which - among other things - focuses on training fresh talent and launching first-of-a-kind industries. How can the Netherlands prepare for what the near future holds? What is our country's answer to the EU Chips Act? How can we facilitate international students and experienced expats? In other words, it is high time to take action. It is time to safeguard European and national resilience, autonomy, technological leadership in existing and new fields and the delivery reliability of chips. It is time for a national action plan to further strengthen the Netherlands' position and help Europe strike a better balance between the mutual dependencies on the geopolitical playing field.

Chip design as key role in the semiconductor value chain

Chip design plays a key role in the global semiconductor value chain. This is clear when looking at the global average added value of chip design: It is 50%, compared to manufacturing's 24% and the 12% that equipment brings to the table. However, we currently miss out on most of the added value of Dutch chip design because we are insufficiently capable of translating our designs into applications and products. Our country is home to the best chip designers in the world when it comes to RF, mixed signal and Edge AI, but we generally sell our "IC design services" at a low hourly rate without developing any IP of our own. As a result, the true earning capacity and ownership of Dutch chip design expertise rests in the hands of foreign parties. The Netherlands can capitalise on this enormous potential earning capacity by expanding our value chain and marketing the added value of chip design domestically.



Why is European strategic autonomy so important?

The semiconductor industry is important for our overall prosperity, but programming is essential. Below is an overview of the importance of autonomy and the role that chip design plays in the answer to this question.

1. **Shortage of semiconductor chips due to:**
- Accelerated digital transition;
- Increased demand for chips, one-billion euro market by 2030;
- Concentration of production in Asia (Taiwan, Korea, Japan, China).

2. **Supply risks in the EU due to:**
- Limited production capacity in Europe;
- Lack of experience with production at <20nm;
- High capital requirements for new foundries;
- Geopolitical tensions.

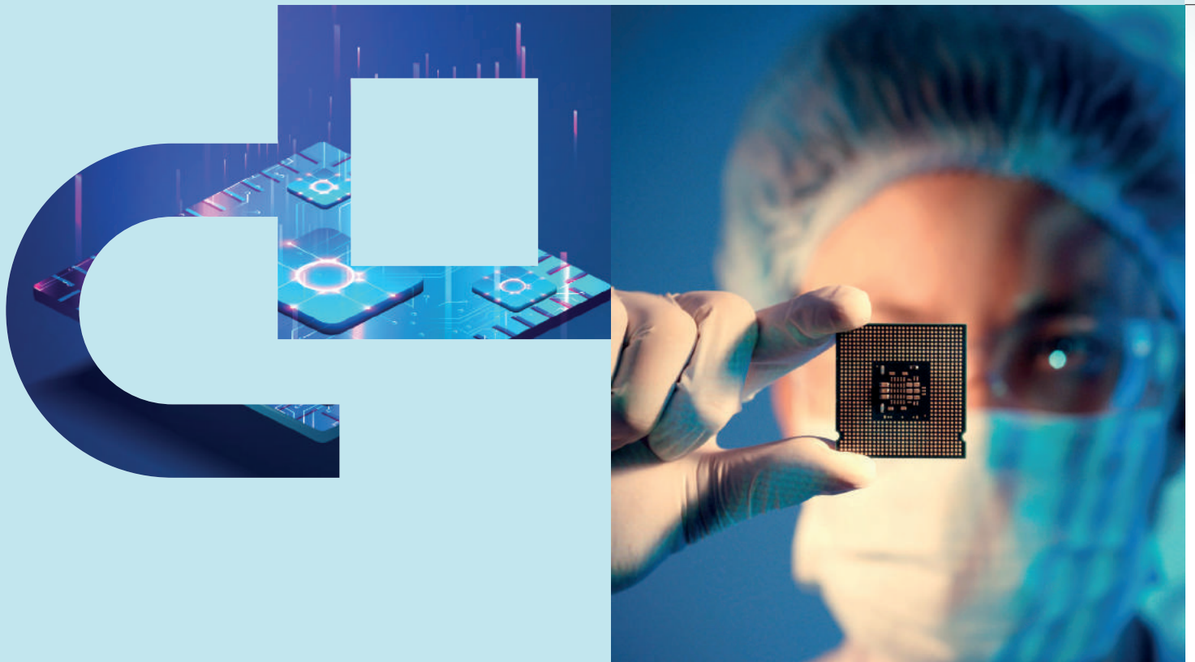
3. **Adverse effects in all sectors, leading semiconductor technology is key for:**
- Competitiveness;
- Security and data protection;
- Performances and innovations of digital systems;
- All technologies and markets that are important for the Netherlands;
- Societal transitions: energy, health care, mobility, data security, food and water.

4. The role of chip design within the value chain:
- High added value;
- Are the clients of pure play foundries and must fill these fabs;
- Innovation partnerships with application markets to realise new technological possibilities;
- Control points at businesses that have an application and strategic independence with regard to major societal themes;
- Heterogeneous integration requires innovative design technology that covers the entire production chain of the chips/systems in order to create a single system.

Dutch ambition for strengthening our country's position in chip design

At the global level, the United States - home to such fabless chip manufacturers as Qualcomm, Broadcom, Nvidia and AMD, as well as integrated device manufacturers (IDMs) like Intel and Texas Instruments - dominates the chip design sector of the semiconductor industry. In 2018, the United States had a 56% market share, making Europe's market share of 8% pale by comparison. Many of these fabless chip manufacturers have outsourced their production to Asia and foundries such as TSMC in Taiwan. Likewise, most packaging and testing activities take place in Asia.

Europe is home to four technology clusters: Dresden (Germany), the Benelux (the Netherlands and Belgium), Grenoble (France) and the region between Freiburg, Stuttgart and Munich (Germany). Among the major players in Europe are NXP, Infineon, STMicroelectronics and Bosch, all of whom are integrated device manufacturers. Most production, packaging and testing activities take place in-house. Although IDMs handle some of their chip design in-house (40%), a growing majority (now 60%) of all chips are designed by fabless companies. Dutch chip design companies play an important role within these European clusters, second only to those in the United Kingdom. The Dutch private chip design ecosystem consists of about seventy-five OEMs, design houses, IP block and design tool companies. These companies are concentrated around four hotspots in the Netherlands: Brainport Eindhoven, Twente and the regions around Nijmegen and Delft. Each of these regions has its own strengths. More importantly, the Dutch ecosystem (from universities of technology to businesses) is one of the best in the world and has a high degree of interconnectedness. We know each other, we know each other's strengths and that allows us to provide unprecedented added value around the world.



EINDHOVEN
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NIJMEGEN
DELFT

These Dutch regions are home to prominent players in the fields of: Analogue and RF Integrated Circuit Design, quantum, integrated photonics, high-volume chip production, application OEMs, Power 5G/6G, MEMS, heterogeneous integration and systems, microfluidics, nanotechnology, sensor interfaces, smart sensoring, Edge AI and Logic.

The national ambition

The Netherlands has a high-quality knowledge and business foundation with regard to chip design. However, our country's chip design capacity is in urgent need of strengthening. The first step in this process is to attract more and properly trained chip design talent. The global demand for chip design competences will increase rapidly in the future, so we will have to get a head start to avoid missing out. By expanding and strengthening the Dutch chip design sector, we will be able to retain our strategic position in the value chain. After all, chip design - together with equipment - forms a crucial link in the global value chain. An important point of attention in this regard is to secure our national earning capacity. For these reasons, we present our ambitions:

"Chip design as the second branch of the Dutch semiconductor industry"

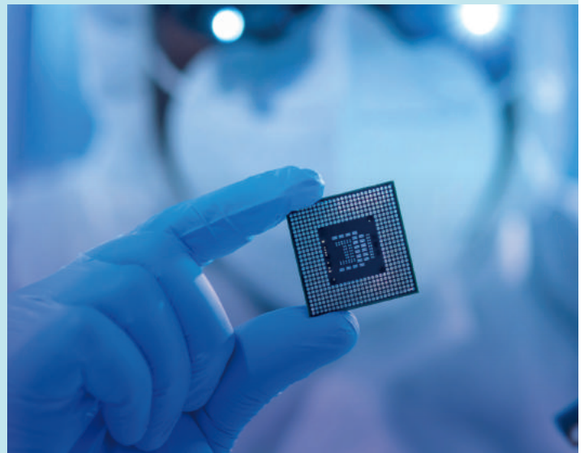
"Strengthen chip design's position as enabler of the Dutch semiconductor industry with support from the Dutch Innovation Policy"

We aim to realise this ambition by bringing together market parties, knowledge and research institutions in the Netherlands to form a powerful chip design ecosystem. This will allow us to influence and respond to future calls - such as those from the Chips Joint Undertaking and the National Growth Fund - quickly and in a structured manner. Together with businesses, knowledge institutions and collaboration partners, we have developed our national answer to the ongoing global developments in the semiconductor industry, which has resulted in four lines of action:

1. **Lab to Fab**
2. **Tech to Market**
3. **Human Capital**
4. **Venture Building**

To realise our ambition, we want to establish a national Competence Center for chip design on the short term.

From there, the aforementioned action lines will be translated into roadmaps that revolve around the key partners. Below is an initial description of each of the lines of action. Over the coming months, these lines will be further refined in close conference and collaboration with stakeholders before being translated into a multi-year strategy.



In the coming period, the following ambitions will be refined further in collaboration with various partners and businesses and translated into a national action programme.

LINE OF ACTION 1 - LAB TO FAB

In the semiconductor production chain, there are opportunities and threats with regard to the transition from lab to fab. To bridge this gap and establish large-scale, innovative design capacities for integrated semiconductor technologies, we will initiate activities as part of this line of action to translate technological developments to the application (technology push). Our focus will be on mixed signal, RF, hybrid photonics/electronics, Edge AI, microfluidics and MEMS/MOEMS chips. Among other things, we will focus on launching pilot lines in preparation of innovative production and test and experimentation facilities, access to infrastructure and academia, heterogeneous integration of the aforementioned platforms and providing access to state-of-the-art knowledge of materials, nodes, More (than) Moore, photonics, microfluidics and electronic developments.

LINE OF ACTION 2 - TECH TO MARKET

We have defined activities that make it possible to expand and strengthen our country's capacity to innovate with regard to the design of advanced chips and bring these in line with the needs of the market (market pull). In particular, we will look at things that are currently not going well and where there is consequently much room for improvement. Consider activities such as supporting the growth of chip design companies, facilitating startups, attracting foreign parties, cluster formation, joint calls and drawing up R&D roadmaps. Our focus will be on mobility, health, agro-food, industry and energy.

LINE OF ACTION 3 - HUMAN CAPITAL

The demand for technical talents who can help overcome the aforementioned challenges has never been higher. Reality check: the global semiconductor industry will need 100,000 new chip-skilled talents every year. That means one million new talents by 2030, which is double the current number. What do these vast numbers mean for Dutch educational institutes? How many new design talents will we have to train and what new skills will be required in the future? In other words, training new talent is essential in order to expand our chip design capacity and meet the aforementioned 20% market share for Europe. The EU Chips Act is designed to accommodate that urgency. In light of our ambitions, we recognise the following opportunities, among others: identifying the right competences, getting more tech students excited about chip design, offering Chips JU scholarships, more funds for doctoral candidates and professional doctorates, establishing talent learning centres and promoting and facilitating entrepreneurship.

LINE OF ACTION 4 - VENTURE BUILDING

Merely having a technologically competitive product offers no guarantees for success. A thriving startup requires the right marketing, management and funding. To support startups, scale-ups and innovative SMEs, we have identified the following opportunities to strengthen our innovation ecosystem: finding and connecting businesses to experienced mentors in the fields of internationalisation, business insights, team composition and co-foundership. Other important activities include connecting businesses to networks for attracting private and public funding, such as the Chips Fund and the National Growth Fund, and providing access to market information. In particular, we are exploring ways to join existing initiatives.

Training new design talent is essential to achieving a 20% market share for Europe.

”Together, we can make chip design a top priority of the Dutch innovation policy and, in doing so, contribute to the realisation of a full-scale European chip ecosystem. Let’s make it happen!”

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This action agenda is the result of the collaboration between the following organisations and knowledge institutions. The action agenda was reviewed by a delegation of businesses involved in the following cluster organisations.

BRAINPORT EINDHOVEN

CHIPTECH TWENTE

oost nl

High Tech NL Semiconductors

Twente Board

TU Delft

UNIVERSITY OF TWENTE.

TU/e EINDHOVEN UNIVERSITY OF TECHNOLOGY