

NEXT

IN THE SPOTLIGHT: **MICROELECTRONICS**

STORIES, FACTS & FIGURES



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Dear Readers,

European microelectronics is booming, thanks in part to the European Chips Act, which came into force on September 21, 2023. Saxony in particular has had reason to rejoice since then, as it continues to maintain its exceptional position in Europe with the latest news from TSMC, Infineon, Bosch and GlobalFoundries. Today the microelectronics heart of the continent beats here and will continue to do so in the future. But what do we actually mean by microelectronics? Why is Europe pushing for more sovereignty? How is Germany currently positioned as a semiconductor location? Why is Saxony booming and what role do European and international cooperations play in this? Our booklet offers you a compact overview and, if you are interested, directs you to further online articles.

Enjoy the reading,
Yvonne Keil

*Sr. Director Global Supply Management,
GlobalFoundries Dresden,
Executive board member, Silicon Saxony*

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Microelectronics

A complex topic simply explained.



Microelectronics (sometimes synonymously semiconductors) describes the design and manufacture of thousands of tiny integrated circuits (ICs) within a single device, the “chip”. In most cases, the basic material of this chip is silicon, which is processed by semiconductor factories (fabs) on so called wafers, thin circular slices of the material. Here, insulating or conductive layers are applied in numerous complex process steps. This is how electronic components, for example transistors and capacitors, are realized, which can be combined depending on the desired function of the chip. The production process ends with packaging, in which in some cases several thousand chips are separated from one another and placed in a package, as well as an elaborate test procedure. Basically, it can be said that as the size of the transistors decreases, the performance of the chip increases, but the production also becomes more complex and expensive. Chips are used today in all technical devices - from alarm clocks and cell phones to industrial robots.

Top 5

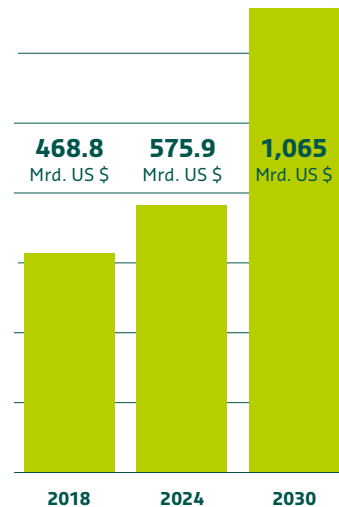
Leading semiconductor companies 2023 (worldwide)

1. Nvidia (1,078)
2. TSMC (467.34)
3. Broadcom (361.02)
4. Samsung (338.78)
5. ASML (236.6)

Market capitalization
(in billions of US dollars)
Source: Statista 2023

Forecast

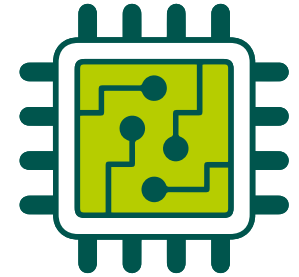
Sales of the semiconductor industry worldwide



Source: Statista, World Semiconductor Trade Statistics (WSRS), McKinsey

Comparison

Common figures of the Micro- and nanoelectronics



Micrometer

$$1\mu\text{m} = 1/1,000,000\text{ m}$$

A human hair has a diameter of 50 to 100 micrometers.

Nanometer

$$1\text{nm} = 1/1,000,000,000\text{ m}$$

One nanometer corresponds to the size of about ten water molecules arranged in a row.

Chips and transistors

$$50,000,000,000$$

Modern microprocessors can contain billions of transistors on a single chip. The record is over 50 billion transistors on a single chip.

Chips in the application

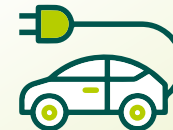


160 chips

are in a modern smartphone.

3,500 chips

is roughly what a hybrid car currently contains. In a luxury car, it's up to 5,000 chips.



Chips produced worldwide

140 microchips per person

In 2021, nearly 1.14 trillion semiconductor chips were sold worldwide. That's about 130 million chips produced per hour and 140 chips per person.

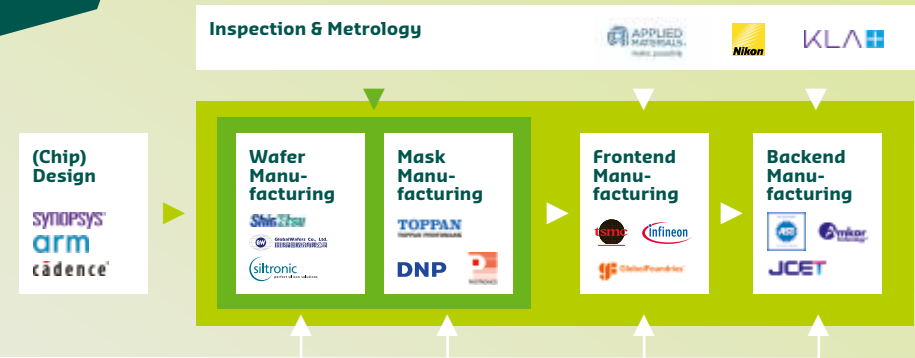
Value chain**More network than chain**

Complex. Worldwide. More of a value network than a value chain. Microchip production is demanding. We provide an overview of the work steps, interdependencies and top players.

The companies shown here are a selection of prominent examples of the respective value-added sectors.



What do the individual areas stand for? We explain it online.

Production process**No chips without masks**

Europe's leading mask center, the Advanced Mask Technology Center (AMTC), is located in Dresden. A clear commitment to Europe's most important semiconductor region, Silicon Saxony.

AMTC, Europe's leading center for the development and production of photolithography masks, was established in Dresden in 2002. It is a

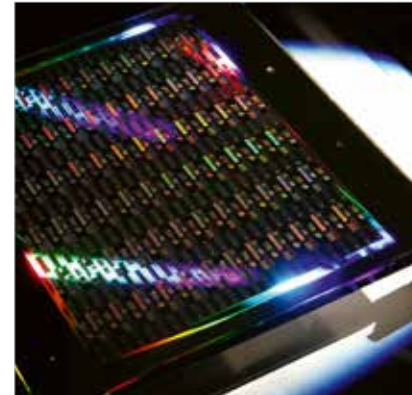
joint venture of GlobalFoundries and Toppan Photomask. AMTC Managing Director Thomas Schmidt explains why this cooperation was necessary, where the journey for photomasks is heading in the wake of the EU Chip Act and why photomasks are crucial for semiconductor production.



Thomas Schmidt,
Managing
Director AMTC



To the complete
interview

**Toppan Photomask – The world's market leader for merchant photomask**

Toppan Photomask Company provides micro imaging solutions worldwide. It develops and produces photomasks. Photomasks are high-purity glass substrates that contain precise images of integrated circuits (or semiconductor chips). Utilizing operations within the industry's most advanced and largest global network of manufacturing facilities, Toppan Photomasks offers a comprehensive range of photomask technologies and research and development capabilities.

**If you can IMAGINE it,
we can IMAGE it!**

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more!

Just scan it



European Chips Act

*Germany is leading the way.
Now it is up to Europe.*

On September 21, 2023, the European Chips Act came into force. With a funding volume of 43 billion euros, it is intended to bring Europe's microelectronics sector to the forefront internationally. With its help, the EU hopes to achieve a market share of 20 percent – in other words, double the actual figure. It is questionable whether this can be achieved against competition from Asia and North America, which are far more eager to invest. Germany, that much is certain, is experiencing a real investment boom these days and has already secured four major projects with a total value of 48 billion euros in recent months, including international semiconductor giants such as Intel and TSMC.

Would you rather read or listen?

Goals, status quo and potentials explained clearly and understandably can be found in our further text as well as the fourth episode of our German speaking podcast "Halo Zukunft" with Julia Hess (Stiftung Neue Verantwortung) and Frank Bösenberg (Silicon Saxony).



Read more
online



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info:
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Silicon Europe

The European Cluster
Alliance for innovative
electronics and software
technologies



Important Projects of

Common European Interest (IPCEI)

Funding for microelectronics



4 billion euros for 31 projects from eleven German states – Alongside the European Chips Act, IPCEI is the instrument for microelectronics in Europe. Find out who and what is being funded here.



EU Chips Act projects

Germany sets the pace

Wolfspeed

- **Investment project:** Silicon carbide chip plant
- **Funding amount:** approx. 750 million euros
- **Total investment:** 3 billion euros

Infineon

- **Investment project:** Expansion site with new plant
- **Funding amount:** approx. 1 billion euros
- **Total investment:** 5 billion euros

Intel

- **Investment project:** Giga-Fab
- **Funding amount:** approx. 10 billion euros
- **Total investment:** 30 billion euros

TSMC/ESMC

- **Investment project:** Joint venture with Infineon, Bosch & NXP (ESMC)
- **Funding amount:** approx. 5 billion euros
- **Total investment:** 10 billion euros

European Semiconductor Regions Alliance (ESRA)

Common platform

For more info:
Scan QR code



27 European regions from twelve EU member states founded a joint platform for cooperation, growth and investment in the European semiconductor industry in September 2023. An initial ten-point paper formulates ambitious goals.



"As a key technology, microelectronics plays a central role in climate protection, energy efficiency and economic growth. Independent access to microelectronics components is more important than ever for the transformation of the economy and for the security of supply of Germany and Europe."

Robert Habeck,
Federal Minister for Economic
Affairs and Climate Action



◀ Infineon's Smart Power Fab is scheduled for completion in the fall of 2026 and further creates 1,000 jobs.

A look into history

How Saxony became the microelectronics hotspot

Right decisions at the right time: What began in 1961 with the "Arbeitsstelle für Molekularelektronik" in Dresden became the success story of European microelectronics – the Silicon Saxony.



Read more here about a story marked by fortunate coincidences and typical Saxon perseverance.

Documentary

Exciting chip history

A story like a spy thriller: secret document transfer, technology smuggling, but also proud successes of own research up to the presentation of the 1MB chip in 1988, Made in GDR.



The background to the chip story is illuminated in the German documentary "Macht!Chips!"

Growth and no end in sight

76,100 employees. 3,650 companies. Saxony's hightech is the region's economic engine and is booming relentlessly.

Take a look into Europe's No. 1 semiconductor region



Saxony's hightech is soaring: No other microelectronics region in Europe is so excellently positioned. With Bosch, Infineon, GlobalFoundries, X-FAB and SAW Components, Saxony already has the highest density of semiconductor

manufacturers in the world. TSMC and Jenoptik are joining them these days. A huge high-tech ecosystem with 3,650 companies and institutions as well as an almost complete value chain – from research to user industries – makes Saxony almost unique not only in Germany and Europe, but even in the world. Good reasons for more and more companies to establish locations here or expand existing ones.

Overview

Saxony's semiconductor fabs

How do the managing directors and site managers view Saxony? We asked them.

Infineon Technologies

- ▶ **Opening:** 1994
 - ▶ **Fab size:** 300,000 m²
 - ▶ **Size of clean rooms:** 40,000 m²
 - ▶ **Structure sizes:** 90 nm and larger
 - ▶ **User industries:** Automotive, industrial electronics, consumer
 - ▶ **Employees:** 3,500
- Interview with: Raik Brettschneider, Vice President & Managing Director, Infineon Technologies Dresden



GlobalFoundries

- ▶ **Opening:** 20.10.1999
 - ▶ **Fab size:** 407,000 m²
 - ▶ **Size of clean rooms:** 52,000 m²
 - ▶ **Structure sizes:** 55 nm – 22 nm
 - ▶ **User industries:** Mobile communication, automotive, IoT
 - ▶ **Employees:** 3,000
- Interview with: Dr. Manfred Horstmann, Sr. Vice President & General Manager, GlobalFoundries Dresden



Robert Bosch Semiconductor Manufacturing

- ▶ **Opening:** June 7, 2021
 - ▶ **Fab size:** 100,000 m²
 - ▶ **Size of clean rooms:** 10,000 m²
 - ▶ **Equipment design:** 180 nm – 65 nm
 - ▶ **User industries:** Mobility, consumer goods
 - ▶ **Employees:** currently 500
- Interview with: Dr. Christian Koitzsch, Plant Manager, Robert Bosch Semiconductor Manufacturing



SAW COMPONENTS

- ▶ **Opening:** 1993
 - ▶ **Fab size:** 4,000 m²
 - ▶ **Size of clean rooms:** 1,800 m²
 - ▶ **Structure sizes:** 250 nm
 - ▶ **User industries:** Mobile industry, sensor technology, bioanalytics
 - ▶ **Employees:** 33
- Interview with: Steffen Zietzschmann, CEO, SAW COMPONENTS Dresden



Jenoptik

- ▶ **Opening:** end of 2024; Start of production from 2025
 - ▶ **Fab size:** 11,000 m²
 - ▶ **Size of clean rooms:** 2,000 m²
 - ▶ **Structure sizes:** Optically active structures up to 100 nm
 - ▶ **User industries:** Semiconductor Equipment Industry
 - ▶ **Employees:** > 120
- Interview with: Dr. Andreas Morak, Director Operations Microoptics



X-FAB

- ▶ **Opening:** 1981
 - ▶ **Fab size:** 81,000 m² (plot)
 - ▶ **Size of clean rooms:** 3,800 m²
 - ▶ **Structure sizes:** 600 nm und 350 nm
 - ▶ **User industries:** Automotive, industrial, medical
 - ▶ **Employees:** 575
- Interview with: Michael Woittennek, Managing Director, X-FAB Dresden



The site is growing at a rapid pace. We have an overview of current expansion plans. Simply scan the QR code.

Saxony's unique selling point

A complete value chain.

Materials, equipment, chip design, wafers, masks, front-end and back-end manufacturing – Saxony is completely positioned in the field of microelectronics. This is unique in Europe, perhaps even worldwide.

The companies shown here are a selection of prominent examples of the respective value-adding sectors. ►

Interview

Three questions for ... Minister President Michael Kretschmer

Silicon Saxony got to the heart of the Saxon Minister President. Michael Kretschmer commented on the importance of a new alliance of European microelectronics regions (ESRA), the current settlement policy, the advantages of the Free State of Saxony and the role of Saxony in Europe's ambitious goal of producing 20 percent of the microchips produced worldwide.



To the complete
Interview



Microelectronics
companies in
Silicon Saxony



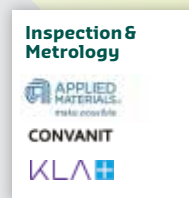
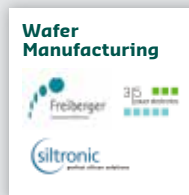
Leipzig



Chemicals



Chemnitz



Moritzburg

Kesselsdorf

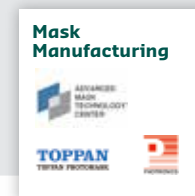
Freiberg



Ottendorf-Okrilla

Radeberg

Dresden



Find the
complete
overview online

Position Paper Microelectronics

Silicon Saxony demands clear strategic action

A national strategy with long-term financial planning (until 2040), the improvement of important framework conditions for the production location (e.g. energy, bureaucracy, chemical policy), high-performance research and development in

Europe as well as securing the next generation of skilled workers are the decisive factors for Silicon Saxony to support German and European microelectronics in a meaningful way. These are all suggestions for a German microelectronics strategy, which you can learn more about in the association's position paper.



On this and other
position papers

Saxony's chip industry strengthens its supply chains

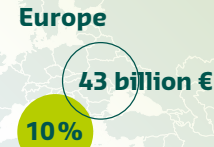
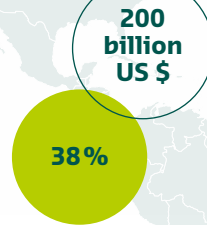
Microelectronics logistics must manage material flows around the globe.

Read our online article to find out which dependencies exist worldwide and how Saxony's chip manufacturers in particular are becoming increasingly independent.



The crises of recent years posed enormous challenges for the semiconductor industry. Geopolitical disputes followed and China, USA and Europe are now openly competing. No nation will operate completely independently in the field of semiconductors in the near future, that is certain.

○ Investments
● Market share



718.6 billion US \$

48%

Asia



Who invests how much worldwide?
Download our map

Book recommendation
How the battle over microchips will decide our future

Chris Miller's "Chip War" is the microelectronics read of our time, a bestseller and a real "nonfiction thriller," as the New York Times headlined it. An unconditional reading recommendation!



Comment

Is China pulling the plug on gallium exports?

Since August 2023, special licenses have been required to export gallium and germanium from China. What impact will this have on German and global microelectronics production? Where are these increasingly important raw materials still being mined? Are new semiconductor bottlenecks and an expansion of the global "chip war" now looming?



Frank Bösenberg, managing director of Silicon Saxony, answers these and other questions in a commentary.



New semiconductor materials

Journey through the periodic table

Join us for a look at exciting new materials, their potential applications, and advantages and disadvantages.



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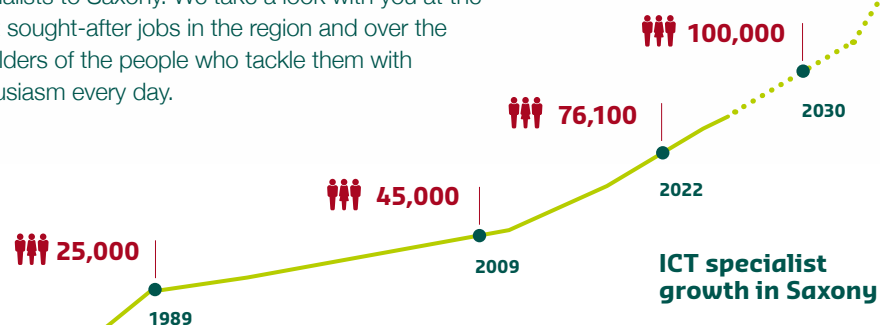
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Semicon booth B1221

Jobs with a future

*Growth needs skilled labor:
The top jobs in microelectronics at a glance.*

Europe's largest microelectronics location is growing. By 2030, 100,000 people in Saxony are expected to drive the microelectronics and ICT sector forward, around 24,000 more employees than today (2023). To achieve this, it is necessary to expand study and training opportunities, facilitate lateral entry and attract international specialists to Saxony. We take a look with you at the most sought-after jobs in the region and over the shoulders of the people who tackle them with enthusiasm every day.



METIS

Education and training for the industry

In the European METIS project, various educational institutions and companies have compiled training and continuing education offerings on the topic of microelectronics – from one-hour webinars to courses lasting several months that are conducted in presence.



For more info:
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Change the world

An exciting film about IC Design



Can Emma change the world of work in 2025? Here you can find the answer.

Top 5

The most relevant professions in microelectronics*

Software Engineer

"As a software engineer, I have the privilege of working with cutting-edge technology. This allows me to drive innovation and help shape the future of technology. It has a positive impact on the world."



Nour Rekik, Junior Software Engineer at PEER Group GmbH

Test engineer

"Some days I write code, some days I work in the lab. And when there's a problem in the lab, we have to find the cause. It's often like solving a puzzle."

Laura Hernández, Test Engineer at Racyics GmbH



Design Engineer / IC Designer

"The most exciting moment for me is when my layout is realized on a chip – when I see that what I have previously thought about actually works. This magic of technology fascinates me."



Dirk Schlebusch, System Design Engineer for micro displays and sensors at Fraunhofer FEP

European Chips Skills Academy

The further harmonization of the existing and emerging education and training offers in Europe on the subject of microelectronics are the goal of the METIS follow-up project.

More about the project and the participation possibilities



Maintenance Technician

"What I like about my job is the variety and the challenge of being confronted with new problems to solve every day. In addition, I find working together in a team very pleasant and productive."



Oliver Jendro, maintenance engineer in the lithography department at X-FAB

Process engineer

"We research and develop new technologies and materials, and I enjoy working on issues where the solution is not clear, and I have to find the root cause first."



Nadine Seifarth, Principal Engineer Integration Engineering at GlobalFoundries

* source: EU-Projekt „METIS“



Once a year, the European microelectronics community meets at Silicon Saxony Day.

Projects

ASCENT+: Promotion – Networking – Innovation

To this and further projects



The project sees itself as a European toolbox for microelectronics. Interested parties submit their technical requirements – the project partners the suitable partners!

“Thanks to Silicon Saxony, I had the great opportunity to discover the French microelectronics ecosystem and lay the foundation for new business partnerships.”



Dr. Michael Arnold,
Managing Director,
PEER Group GmbH

“The professional and informal exchange on peer level is one of the most used opportunities in Silicon Saxony.”



Stefan Uhlig, Head of
Department Microelectronics
& Smart Systems

Working group

Professional exchange on IC Design

The working group “IC Design” provides a forum for the exchange and networking of circuit designers from Saxony and beyond.



To the working
group: Scan QR code

Professionals

Lecture Series IC Design

Find out all about
our HR and skilled
worker activities



Content of the lecture series are requirements and methods for the design of integrated circuits from the point of view of industrial production.

“The fact that the lecture series emerged from our working group is a great success.”



Dr. Achim Graupner, Bosch Sensortec GmbH,
Head of the Silicon Saxony working group IC Design

Public affairs

Political committee work at all levels

For more info:
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Setting strategic priorities at regional, national and European level is just as much a part of our work as exchanging views with politicians and the press and communicating the challenges and needs of our industries in the form of position and strategy papers.



Be part of it.

Network

Become a member

500 members make Silicon Saxony the largest microelectronics network in Europe



Communication Technology to the ears



“Hallo Zukunft” –
Silicon Saxony’s
Podcast (German)

Industry insights directly in your inbox



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