



Hidden Electronics IV

Ensuring Strategic Autonomy:
Microelectronics for Europe's Economic
and Security Interests

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Preface

In line with the position of the VDE as a neutral, technical-scientific association, the VDE position paper presents the joint findings of the task force members. The collective results were developed in a constructive dialogue from different perspectives. The contents of this document therefore do not necessarily reflect the opinion of the companies and institutions represented by their employees.

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1. The importance of microelectronics for innovations in Germany/Europe

Since the chip shortage, which severely affected large parts of the German economy during the coronavirus pandemic, it has become clear that Europe's industries need a crisis-proof supply of microchips in order to manufacture their products and systems. Integrated circuits, known as chips, are indispensable core elements of all electronic systems, enabling product innovations and thus finding use in everyday life. Integrated circuits can be found in almost all commercially available devices today, not only in data centers, smartphones, tablets, and laptops, but also in smart meters, medical devices, security systems, extended reality (XR) systems, sensors (such as video cameras, radar/lidar systems, and laser sensors), household appliances, weather stations, as well as in vehicles, drones, satellites, robots, and generally in mechanical and plant engineering products. The crisis-proof availability of chips is a key prerequisite for securing Germany's – and thus Europe's – long-term competitiveness. It forms the basis for driving innovation and competing internationally with both new and established products. Against this backdrop, the major European initiatives to strengthen microelectronics are the right move. However, they do not go far enough to achieve the stated goal of a 20% share of global semiconductor production. Europe currently has a share of just under 8%, and with the amounts currently being invested in Europe, this share will not increase but will remain the same at best.

An example: Since 2020, Chinese companies have been subject to the US embargo on devices in the field of information technology and telecommunications. This applies in particular to chips manufactured in "advanced technology nodes," i.e., semiconductor chips with the smallest structures that have the best parameters in terms of computing power and energy consumption. The US cannot completely eliminate China from the competition, but it can significantly slow it down. However, the US strategy is unlikely to have a lasting effect, as China is investing considerable sums in building up its own semiconductor industry. It is likely that China will succeed in developing its own manufacturing capacities for "advanced technology nodes" in order to counteract US efforts to cut China off from access to these chips. Innovative strength and technological progress – particularly in the development and manufacture of chips – are among China's top economic priorities.

It is unclear what would happen if geopolitical conditions changed in such a way that unforeseen new dependencies arose in the chip market and the supply of chips of the required specifications, quality, and quantity to European industry could no longer be guaranteed. Such scenarios are being discussed and played out in think tanks. As Europe has lost significant ground in microelectronics over the last twenty years, it would only play a marginal role without effective measures being taken at an early stage.

The complexity of both military and critical infrastructures requires access to a multitude of different system components, which are built based on the entire range of semiconductor devices. These infrastructures are therefore critically dependent on the availability of state-of-the-art microelectronics, and thus on chips fabricated in advanced technology nodes. The war in Ukraine has shown that defense capabilities require systems that combine artificial intelligence (AI) with state-of-the-art sensor technology and secure information and communication technology (ICT). Robotics and edge AI-based autonomous systems are becoming increasingly important in this context. Edge AI means that artificial intelligence works directly where the data is generated – for example, in a robot, a sensor, a drone, an emergency vehicle, another enabled end device, or even nearby local infrastructure nodes (such as a base station, a switch, or a router). Information is not first transferred to large data centers or into the cloud, but can be processed immediately onsite or very close by, "on the edge". Europe today has a strength in edge AI technologies.

Chips are the central backbone of data centers and cloud-based services. In order to maintain progress in the field of large language models (LLM) and thus generative AI, advanced technology is needed, especially in so-called "hyperscalers", the powerful data centers that represent the infrastructure of modern cloud AI. The main components for data centers are processors, memory and ICT. The latest semiconductor technologies, the "advanced technology nodes", are generally used to fabricate these, along with the associated 3D packaging and assembly and ICT systems. In particular, hyperscalers use custom-made chip architectures that are specifically tailored to the requirements and needs of data centers and, in

particular, AI applications, such as those developed and offered by Nvidia. The development of chips designed even more specifically for AI requirements was marked by Google's TPU (Tensor Processing Unit) architecture. In the meantime, however, companies such as Amazon and Microsoft have also built up their own expertise in chip design in order to equip their data centers with customized chips. Without access to state-of-the-art technology, products from Europe's core industries will no longer be competitive. The lack of key components due to sanctions could hinder

the establishment of successful start-ups. The specialized system and application expertise essential for chip design and development would be lost, severely impacting customer industries. As a result, their products would be relegated to mere "me-too" or a follower status, lacking competitive differentiation. Ultimately, this would also affect European consumers, the market, as well as the entire society and the attractiveness of Europe as a business location.

We use the terms “microelectronics,” “microchips,” and “semiconductors” in this position paper.

Microelectronics is a field of electronics that deals with the development, manufacture, and application of integrated circuits and electronic components at the microscopic level. It is characterized by key features such as miniaturization, high integration, and the integration of software, which enables complex functions to be implemented efficiently in compact devices.

Microchips consist of miniaturized electronic components integrated on a semiconductor chip. They are designed for a wide range of applications, including logic circuits, memory functions, analog processing, sensor technology, and power control. Due to their versatility, microchips are used in numerous devices and technologies, from smartphones to industrial control systems.

Semiconductors are materials that have electrical properties between those of conductors (e.g., metals) and insulators (e.g., glass). They can be modified by doping (inserting foreign atoms) to control their conductivity. Semiconductors are the basis for the fabrication of microelectronics and microchips, as with them electronic and optical signals can be engineered in a controlled manner.

2. The microelectronics ecosystem

Microelectronics depends on a complex, highly specialized ecosystem with extensive collaboration among stakeholders. Key aspects include:

- Application expertise, which is primarily incorporated into application-specific chips (the so-called Application-Specific Integrated Circuits (ASICs)). Germany and Europe have considerable application expertise, for example through their strong position in the automotive industry, mechanical engineering, robotics, and medical technology.
- Expertise in chip design is needed to design chips that can either be used in a variety of contexts (e.g., processors such as CPUs, GPUs, or microcontrollers, memory, power semiconductors, discrete microelectronic components in general) or are specialized for a specific task. In Europe, chip design expertise is mainly located at the large IDMs (Integrated Device Manufacturers), which design chips for their own use and then manufacture them themselves or have them manufactured by global contract manufacturers.
- Chip manufacturing comprises wafer production – known as front-end manufacturing – as well as the packaging of chips in housings – known as back-end manufacturing of chips – and testing to ensure functionality and reliability. Traditionally, wafer fabrication was considered highly demanding, yet it is characterized by a high degree of automation. In contrast, packaging and circuit testing were seen as labor-intensive and less technology-driven – classic tasks outsourced to low-wage locations. This has been changing for several years now. Packaging is becoming more technologically demanding, driven by chiplet concepts, for example, and the requirements for manufacturing testing are also increasing. In Europe, Dresden is the largest fabrication site, with major chip fabs located there. Other important sites in Europe are located in France, Italy, Ireland. All of these sites have limited testing capacities. Packaging in Europe, except in Portugal and Malta, is only carried out for special-themed chips.
- Last but not least, the supplier industries play an essential role in ensuring a smoothly functioning ecosystem. This includes, for example, the production of silicon wafers (e.g., Siltronic), materials and specialty chemicals for production (e.g., BASF, Merck), and equipment for semiconductor manufacturing (e.g., ASML)

in the Netherlands and its German suppliers Zeiss and Trumpf, e.g. Aixtron, Süss) as well as software tools ("EDA tools") for the highly complex task of chip design.

The capital markets rate microelectronics expertise extremely high as an essential industry of the future. Nvidia, a fabless company (without its own manufacturing facilities), based on expertise in chip design, is currently the most valuable company in the world, worth about 1.5 times as much as all companies in the DAX 40 combined. TSMC, the world's leading contract manufacturer (foundry), is worth about half as much as all DAX 40 companies combined. ASML from the Netherlands, a highly specialized lithography equipment company, is more valuable than the entire German automotive tier 1.

The semiconductor ecosystem is highly intertwined worldwide, with very large mutual dependencies. This dependency has arisen as a result of global division of labor and specialization. Striving for self-sufficiency is not possible, especially for Europe, but also for other major regions of the world, and would also be an economic step backward. On the other hand, unilateral dependencies in the development and manufacture of semiconductors or Europe's overall lack of importance in this area are extremely dangerous and can lead to blackmail or existential damage in the event of a crisis. Instead of self-sufficiency, the goal should be sovereignty and resilience of the local ecosystem. Sovereignty can be ensured by mastering all the essential skills required in the ecosystem, or by dominating a sufficient number of critical skills so that other regions of the world are at least as dependent on Europe as Europe is on other regions (concept of "mutual dependence").

Europe's strengths lie in EUV technology, semiconductors in the areas of edge AI, crypto chips, and power semiconductors, sensors and semiconductor components for analog functions, and optoelectronic semiconductor components. Europe plays a minor role in processors and no role at all in memory components. However, it is precisely these components that are also needed for modern applications such as artificial intelligence. It is in Europe's best interests to regain influence in the field of logic and memory production. Strategic technology partnerships as well as setting up manufacturing facilities of foreign companies in Europe will help to achieve this.

3. Examples of success

Example 1 – Construction of the Dresden chip factories: After the fall of the Iron Curtain, projects were sought that could help rebuild the economy of eastern Germany. The semiconductor industry was experiencing strong growth at the time, and Siemens was persuaded to build its new chip factory in Dresden, a location where semiconductors had been manufactured during the GDR era. The factory was planned, built, and went into operation in 1996, almost 30 years ago. Shortly thereafter, Siemens teamed up with Motorola to develop the world's first factory with 300 mm wafers for the memory chip sector. Developments continued at a rapid pace: the AMD/GlobalFoundries factory was built, Bosch joined later, and plans are currently underway to build a chip factory for the European joint venture between TSMC, Bosch, Infineon, and NXP. Over the past 30 years, Saxony has succeeded in establishing a strong European semiconductor ecosystem.

Example 2 – European funding for microelectronics is having an impact: In 2018, Europe approved the first IPCEI (Important Projects of Common European Interest) program for microelectronics, which allows the European Commission to grant aid to companies in member states for projects with a very high level of innovation. A total of 32 companies from five European countries received funding. Among other things, IPCEI-I funds were used to support Bosch's 300 mm factory in Dresden. In IPCEI-II, which was approved in 2023, a total of 68 projects from 14 European countries were funded, with a focus on communication (5G and 6G), autonomous driving,

artificial intelligence, quantum computing, energy generation, distribution, and use. As a further step, the European Chips Act enables targeted funding for research infrastructures, production facilities, and crisis management. Support for production facilities ultimately led to the positive decision to locate the ESMC semiconductor factory in Dresden, a joint venture involving Taiwanese chip manufacturer TSMC and European companies Bosch, Infineon, and NXP. Both the IPCEI programs and the European Chips Act are essential elements in strengthening European microelectronics and are of great strategic importance.

Example 3 – The path to becoming the global market leader for lithography machines: ASML began developing lithography equipment in the 1980s, the machines used to lithographically generate the finest structures onto semiconductor wafers. ASML and its Japanese competitors faced the challenge that fabrication structures that are much smaller than the wavelength of the light could only be optically imaged using many tricks. The reduction in the wavelength of the exposure machines stagnated at 193 nm due to numerous technical difficulties. ASML therefore researched a completely new generation of devices that use extreme ultraviolet (EUV) light with a wavelength of 13.5 nm to create the finest structures on the wafers and cooperated with its German partners Zeiss (for the optics) and Trumpf (for the generation and processing of EUV light). ASML is currently the only company in the world capable of building equipment for the manufacture of chips with structures smaller than 5 nm.

4. Status Quo

Reading through the above examples of success, one might get the impression that "everything is fine, Europe has a strong microelectronics industry" – unfortunately, this is only partially true. Indeed, it is important to highlight positive examples in order to demonstrate Europe's capabilities. At the same time, it must be clear that microelectronics, due to its position as a key industry, is strongly controlled and promoted by governments worldwide. The microelectronics market is not a

free market that functions solely according to the rules of competition.

From the very beginning, the semiconductor industry has been significantly supported and guided by government programs. Silicon Valley has benefited greatly from government assistance from large DARPA projects and other programs. Europe lacks an effective technology agency such as DARPA to initiate, develop, and imple-

ment groundbreaking, transformative, and disruptive technologies. In Japan, local companies were supported by the then powerful MITI (Ministry of International Trade and Industry), and in Taiwan, the ITRI research institute laid the foundation for the semiconductor manufacturer TSMC. In Korea, the development and manufacture of memory semiconductors began very early on and was supported by strong programs. In the 1980s, Europe launched the EUREKA program JESSI, which was intended to support the entire European semiconductor industry. In 2000, Europe had a share of approximately 20% of global semiconductor production, which has fallen steadily in subsequent years to just under 8% today. Today, Europe no longer has any memory manufacturers and plays almost no role in logic devices. Europe, on the other hand, has strengths in the areas of analog, power, and opto semiconductors, as well as sensors.

Another segmentation can be made along the value chain. This segmentation starts with basic materials and media and continues with manufacturing equipment, semiconductor production, design tools, chip design, testing, and packaging. The status of the European semiconductor industry also varies significantly along the value chain.

Most manufacturers of wafer base materials are now located in Asia. A major factor is that the production of wafer base materials requires a great deal of electrical energy. High energy prices in Europe make this very difficult economically. Exceptions are special materials, such as substrate materials for power semiconductors, composite materials, or special substrates with buried oxides.

Among European equipment manufacturers, ASML is particularly noteworthy as it is currently the only manufacturer of EUV lithography systems, which are needed to produce chips with structures smaller than 5 nm. There are several clusters in Europe where semiconductors are manufactured, but new semiconductor factories are (almost) only being built if they receive government support at their respective locations. Due to increasingly unfavorable competitive conditions, only a few new semiconductor factories have been built in Europe in recent years.

Furthermore, design tools are currently dominated by three large companies: Synopsys, Cadence, and Mentor Graphics, which was acquired by Siemens. Europe has only a few stand-alone chip

design companies, known as fabless companies, with most design activities taking place at large semiconductor manufacturers for their own use. Europe now plays almost no role in testing and packaging, except in niche areas.

In the recent past, microelectronics has been considered important for the German innovation ecosystem by government actors. The Federal Ministry for Economic Affairs and Energy has provided particular support to the industry, and the Federal Ministry of Research, Technology, and Space has continuously promoted research in microelectronics. Important milestones include the establishment of the Research Factory Microelectronics Germany (FMD), FORLAB, QNC, and – together with the EU Commission – the pilot line for heterogeneous integration APECS. The excellent research environment and well-developed ecosystem help that international companies are also expanding their development activities in Europe.

The efforts in Europe and its member states to promote the European semiconductor industry are considerable, but in this global market, it is also necessary to keep an eye on the programs of other regions of the world. From this perspective, support in Europe appears important, but not sufficient. Even with the current programs, the share of semiconductor production in Europe will continue to decline in percentage terms because other regions of the world have launched disproportionately large programs to expand their respective microelectronics activities. According to Semi, more than 100 semiconductor factories will be built worldwide by 2030, only a small proportion of which will be in Europe. In addition to semiconductor production, efforts in research and development are also essential for the innovation and competitiveness of European industry. Recent geopolitical developments in the technology dispute between the US and China have shown that technologies are only unrestrictedly and reliably available if they are based on sovereign intellectual property and can therefore also be controlled by Europe.

5. Misconceptions and false arguments

Misconception 1 – Semiconductor manufacturers earn enough; support is unnecessary:

The semiconductor business is a cyclical business with strong fluctuations both upwards and downwards. On average, revenues in the semiconductor industry fluctuate by an order of magnitude greater than gross domestic product. During the financial crisis, for example, there were declines of up to 60-70%, although these were quickly offset in subsequent quarters. When business is doing well, it is therefore necessary to earn above-average amounts in order to have sufficient reserves for the critical years. Investments in the semiconductor industry are extremely capital-intensive. The conditions for investments are therefore crucial in the selection of a location for manufacturing. A semiconductor manufacturer will compare and assess global location conditions when making major investment decisions. Government subsidies are not the only prerequisite for large-scale investments, but they are a necessary prerequisite for implementing the investment. The conclusion is clear: If Europe is willing to provide targeted support, the chances of attracting new companies will increase significantly. If such incentives are not forthcoming, companies will choose other regions.

Misconception 2 – Promoting the semiconductor industry is too expensive from an economic perspective:

When you look at the success story of Silicon Saxony, you immediately understand that every euro invested in this region has paid off. In the greater Dresden area, more than 400 companies are currently organized in the Silicon Saxony network, providing a total of more than 30,000 jobs. The two recently published studies by IIT, "Analysis and forecast of economic and regional growth effects of the semiconductor ecosystem in Saxony" and by ZVEI/PWC, "From chips to opportunities – the importance and profitability of microelectronics funding," show that government aid pays for itself within approximately 10 years. One job created in the semiconductor industry leads to five additional induced jobs in related industries and trades. In addition to being economically viable from a return perspective, semiconductor plants are indispensable from a technological sovereignty perspective.

Misconception 3 – Europe doesn't need 3 nm technology:

Logic technologies with 3 nm structure size are currently only manufactured by three companies worldwide: Intel, Samsung, and TSMC. The structures are so small that they cannot be manufactured with conventional lithography machines, requiring so-called extreme ultraviolet (EUV) technology. Since product development and mask sets for 3 nm technologies are very expensive, these factories can only manufacture extremely high-volume products: chips for mobile phones, PCs, and data center applications. No chips for these applications are manufactured in Europe, so one may question whether Europe needs a 3 nm factory. Several aspects must be considered here: (1) For technological sovereignty, it would be beneficial if 3 nm nodes were also manufactured in Europe – the end products containing these chips are not currently manufactured in Europe, but are sold. It is possible that chiplet technology will enable the manufacture of 3 nm chips based on the integration of chiplets into a single chip – chiplet technologies could be widely accepted in European user industries. (2) Spillover effects: It can be assumed that the establishment of a 3 nm factory in Germany would have a technological spillover effect on the entire semiconductor ecosystem. To the extent that corresponding customer industries establish themselves on the continent in the future, a 3 nm factory would be of outstanding interest to Europe. A balance between supply and demand is a crucial success factor. Even the fact that Intel canceled the construction of the 3 nm factory due to company-specific issues is not an argument against supporting a 3 nm factory.

Misconception 4 – If you support semiconductor factories, you also have to subsidize many other industries – there isn't enough money:

The authors of this position paper do not believe that economic success can only be achieved with government subsidies. On the contrary, the government should ensure favorable framework conditions and, wherever possible, allow the economy to function according to free market mechanisms. Problems and conflicts arise when there is a departure from free and fair competition, leading to market distortions – for example, through massive and disproportionate subsidies

for individual industries in other parts of the world. This is the case for the semiconductor industry and certainly also for some other critical sectors.

Semiconductors are a basic product of almost all modern technologies – from smartphones and industrial equipment to medical technology and vehicles. Innovations in the semiconductor sector therefore have a multiplicative effect: Advances in chips enable new functions, greater energy efficiency, and improved security in all industries. A high-performance, cost-effective, and trustworthy chip supply from Europe directly strengthens the competitiveness of European companies in sectors such as automotive, mechanical engineering, telecommunications, energy, and healthcare. Promoting microelectronics is therefore not only relevant for sector policy, but also a strategic lever for the entire European innovation landscape.

The consequence of not providing support would simply be that chips would no longer be developed and produced in Europe. The last 25 years have clearly demonstrated this. The big question is why we should support microelectronics and not other sectors, such as battery technology, electric cars, solar cells, etc. Solar cells also received massive government support in China, thus displacing European manufacturers. The difference between solar cells and semiconductors is that semiconductors are crucial to the innovative capacity of the European economy. Without semiconductors, there is a risk that Europe will be left behind; without semiconductors, Europe's technological sovereignty is at risk in a whole range of critical technology areas. While this argument may apply to other industries as well, it does not change its relevance for the semiconductor industry.

6. Fit for Future – recommendations for action

1. Strengthening the entire semiconductor ecosystem in Europe:

Europe needs a strong semiconductor ecosystem across the entire value chain. A special focus should be on manufacturing (including testing) and design. On manufacturing, because Europe needs a stronger presence in the supply of chips than it currently has – and on design, because design accounts for the highest share of value added, and Europe has a lot of catching up to do in this area. Design should not be neglected at the expense of promoting production, and vice versa – promoting design activities does not make supporting manufacturing superfluous.

2. Strengthening chip design:

Germany represents a strong, attractive location for chip design. This is demonstrated by the fact that non-European companies such as Apple and Texas Instruments conduct significant chip design activities here. However, the commercial EDA tools for chip design are overwhelmingly developed in the USA, which could pose a problem for Europe's technological sovereignty. The aim here is to stimulate and promote the development of a European EDA industry. Another possible approach could be to strengthen the development of open-source design tools, which are currently

gaining increasing attention in Europe. An initial encouraging example is provided in the field of processor design by RISC-V. RISC-V is an open and royalty-free instruction set architecture and enables players to develop and distribute their own processors. Open-source design tools will not be able to replace proprietary tools, but overall, there is certainly the potential for Europe to become less dependent on the US and gain technological sovereignty by building an open-source ecosystem in chip design. This would benefit the entire European supply chain and reduce market fragmentation and technological dependence on third countries. The ability to openly develop and share hardware architectures would also lower barriers to entry for new market entrants and strengthen competitiveness. Given the growing importance of edge AI and high-performance computing, it is crucial for Europe to play its own role in this area.

3. Strengthening strengths:

Funding must be channeled into European semiconductor locations and the expansion of infrastructure where Europe already has strengths. Fears of free-rider effects are misplaced, as semiconductor manufacturers think globally when expanding capacity and consider the overall framework. Funding alone is not

decisive; other important factors include (1) planning security, (2) a good energy supply and low energy prices, (3) a functioning administration without excessive bureaucracy, (4) the availability of skilled workers, (5) market access, and (6) the ecosystem.

4. Closing gaps:

Europe now has significant gaps in many areas of the semiconductor value chain that need to be closed. It is clear that this cannot be achieved completely, but a start must be made. In this sense, any company that establishes itself in areas where Europe has lost its expertise should be strongly supported.

5. Strengthening innovations:

The translation of excellent research into marketable innovations takes place in both established industrial companies and start-ups. Europe has a lot of catching up to do with the US, especially in the area of startups. Activities to promote startups (e.g., *UnternehmerTUM* in Munich or the nationwide incubators of the 6G hubs) must be further supported and developed. Improving the availability of venture capital is essential.

6. Identifying future markets:

Microelectronics regularly experiences new growth spurts through new markets (in the past, for example, PCs and mobile telephony; currently, AI and robotics). A systematic study (e.g., by acatech) of potential future markets for microelectronics that are attractive to Europe (e.g., robotics or personalized medical technology) would provide appropriate support for decision-making.

7. Benchmarking with other regions of the world:

In addition to the EU Chips Act, major funding programs have been launched in all regions relevant to the semiconductor industry. With the Chips Act, the US has initiated the construction of new factories by Intel, TSMC, and other companies. Furthermore, several global manufacturers have recently announced significant investments of their own in the US. China has strengthened its own manufacturers, such as SMIC and YMTC, through massive government support and reduced technological gaps. South Korea and Japan are pursuing industrial policy strategies that promote both national champions and international collaborations. For example, Japan has begun a large-scale program for the development and production of 2 nm nodes (Rapidus). To compete globally, Europe must therefore not only measure itself against its own progress, but also align itself with the speed and determination of other regions.

8. Strengthening research:

For the future viability of microelectronics in Germany and Europe, it is essential to maintain the current momentum in the long term and to strengthen it in individual areas. Areas where Europe already has proven strengths, such as sensor technology and power electronics, and those that are important for technological sovereignty, such as quantum technologies and IT security, are ideal. It will also be important to further advance capabilities and capacities in chip design. Likewise, the use of the research capabilities developed in Germany in semiconductor technology and hetero-integration should be intensified for future innovations.

9. Attracting skilled workers:

Especially in the current geopolitical situation, Europe can be very attractive for excellent skilled workers. Outstanding researchers often serve as focal points for both further skilled workers and the founding of startups. A program for Humboldt Professorships for microelectronics (such as the 2020-2024 program for AI) or ERC grants specifically for microelectronics can be helpful in this regard.

10. Strengthening international partnerships:

A self-sufficient semiconductor ecosystem in Europe would be a utopian ambition. Rather, Europe should intensify partnerships to ensure robust, transparent, and diversified supply chains while securing skilled workers, critical raw materials, and technological expertise. The focus should therefore be on like-minded partner countries in the APAC region (e.g., Japan, Taiwan, Singapore, India, Vietnam) that possess complementary strengths, growing markets, and technological competencies. Targeted diversification and regionalization reduce sectoral dependencies (friend-shoring), although the costs of de-risking must always be considered. Effective risk diversification requires a strategic, focused, and market-oriented approach. Not every region needs to cover all stages of the value chain – the key is to avoid one-sided, critical dependencies on individual players.

About the VDE/VDI-Society Microelectronics, Microsystems and Precision Engineering (VDE VDI GMM)

The VDE/VDI Society Microelectronics, Microsystems and Precision Engineering (VDE VDI GMM) is the comprehensive platform in microelectronic application areas. It is jointly supported by the VDE and VDI, and promotes the valuable transfer of interdisciplinary knowledge. Its spectrum ranges from basic technologies in the production of microelectronics and microsystem technology right through to mechatronics and fields of electromagnetic compatibility. The GMM stands for cooperation and international networking to foster innovation. It works with interdisciplinary research institutes, companies and universities at every stage, from basic research to applications, and offers its members all the advantages of being part of a progressive expert community. Thanks to its expertise, the GMM has an influence on technical standards and is involved in national and European research programs. Other important goals for the GMM include promoting young scientists as well as training and further education. The COSIMA competition (Competition of Students in Microsystems Applications), which is funded by the Federal Ministry of Education and Research, is essential in achieving this. For more information, visit www.vde.com/gmm

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The Information Technology Society within VDE (VDE ITG) is a community of experts working in the field of information and communication technology (ICT). Founded in 1954, this technical society aims to pave the way for innovative technology topics, bringing them from the scientific world into our economy and society. It combines theory and practice to promote the technology topics of tomorrow, which are crucial for the digital transformation of the economy and society. The ITG sees itself as a driving force in the ICT field and supports the VDE vision of a livable and e-digitalistic future.

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Shaping the e-digitalistic future.

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