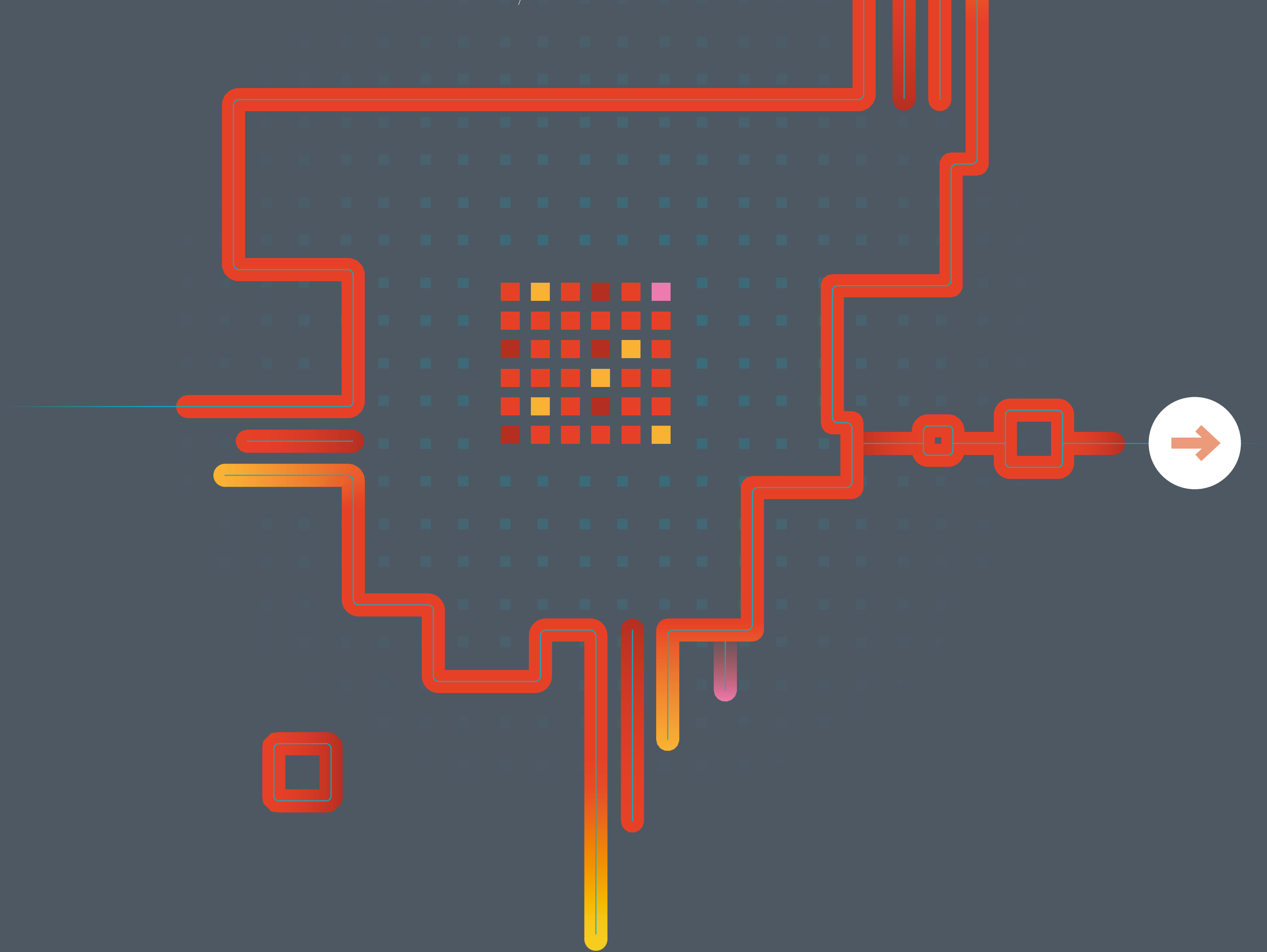
Mapping of the Spanish Microelectronics Ecosystem

October 2023

EXECUTIVE SUMMARY

ICEX
Ametic LA VOZ DE LA INDUSTRIA DIGITAL
50 aniversario 1973 - 2023



AEI CLUSTER Agrupaciones Empresariales Innovadoras

GOBIERNO DE ESPAÑA
MINISTERIO DE ECONOMÍA, COMERCIO Y EMPRESA
ICEX España Exportación e Inversiones

UNIÓN EUROPEA
PROYECTO COFINANCIADO POR EL FONDO EUROPEO DE DESARROLLO REGIONAL (FEDER)
Una manera de hacer Europa

Contents

Introduction

Many industrial sectors have recently experienced a severe shortage of semiconductors in the market, causing delays in the manufacture of many basic products in the capital and consumer goods industries. Via the European Parliament and the European Commission, the EU has proposed a series of measures aimed at alleviating these problems in the future by promoting technological sovereignty, some of which are included in the Chips Act (European Chips Act | European Commission (europa.eu)).

One of the key goals is for Europe to increase production of the world's microelectronics from 10% to 20% by 2030 in order to decrease dependence, especially in terms of advanced semiconductors, on Asian countries (especially Taiwan and South Korea).

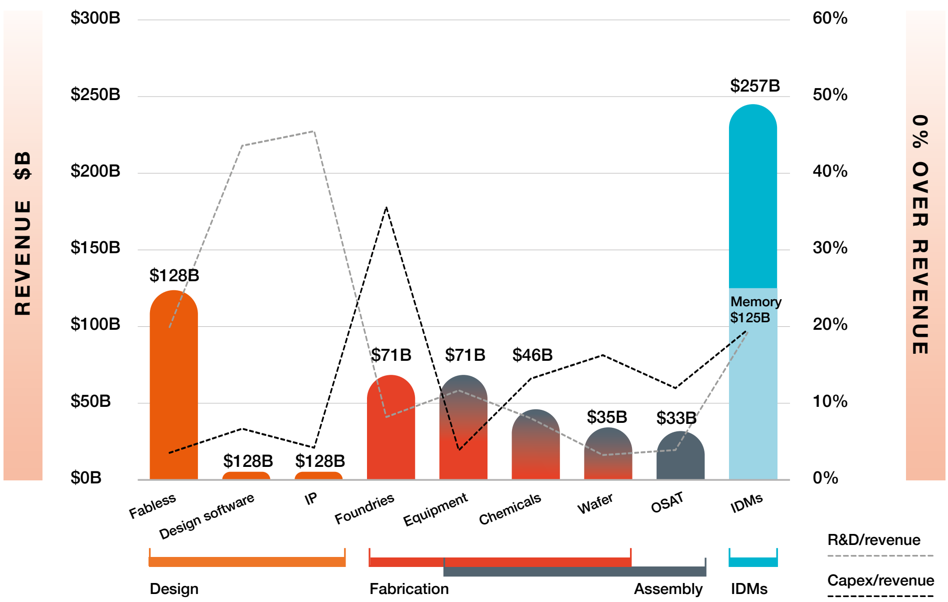
In Europe, investments in semiconductors have indeed focused on compound semiconductors, which are very important for power electronics, RF and analogue for specific applications and can be generically referred to as "Beyond CMOS", i.e. technologies that go beyond mainstream digital technologies, and which are currently centred on CMOS technology nodes of less than 5 nm.

New processors and associated memories are designed and manufactured on advanced nodes below 10 nm; Europe does therefore need to establish and invest in an infrastructure to develop knowledge and expertise in creating emerging technologies, such as AI, neuromorphic processors, quantum processors, etc.

Europe also needs new modes of semiconductor production below 10nm to meet the emerging market needs that are expected to grow in the coming years. Building these capabilities and competences in Europe at an industrial level is essential to place Europe among the leaders in technological innovation.

Revenues in $B for the different segments of the semiconductor value chain (left axis) and percentage of sales (right axis) for R&D and Capex.

Source: "Harnessing the power of the semiconductor value chain". Accenture. 2022.



Value chain

Based on their roles in the value chain and their business models, we can distinguish between the following:

IP (Intellectual Property) block provider companies: Design groups that produce Intellectual Property (IP) blocks consisting of reusable modular parts of chip designs that can be incorporated into complete chip designs.

Fabless companies: They design and sell chips, but buy chip fabrication services from foundries (companies offering chip manufacturing services in various technological processes) and assembly, test and packaging services from outsourced semiconductor assembly and test companies (OSATs).

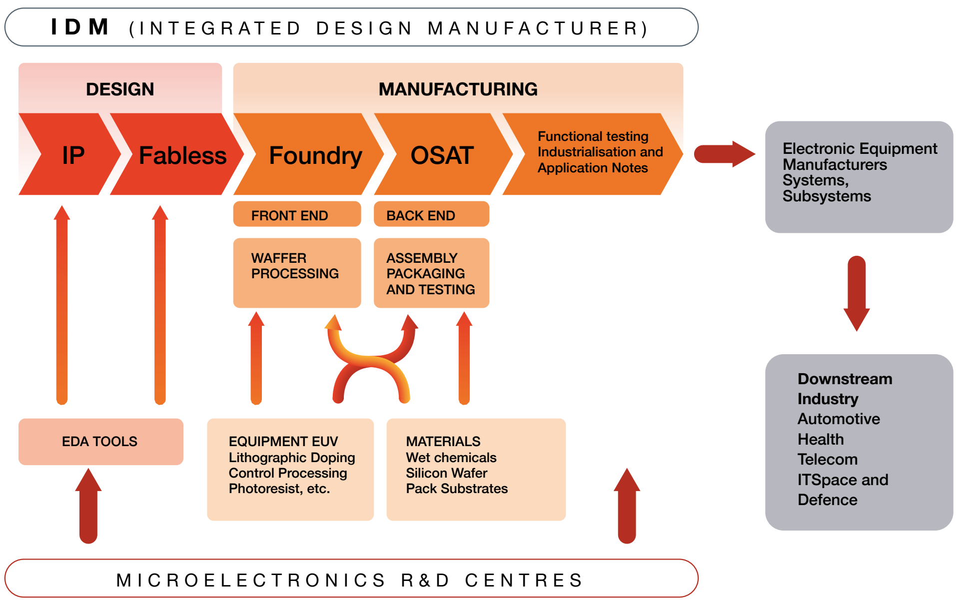
Foundry companies: Semiconductor manufacturing facilities that manufacture chips for fabless and third-party customers.

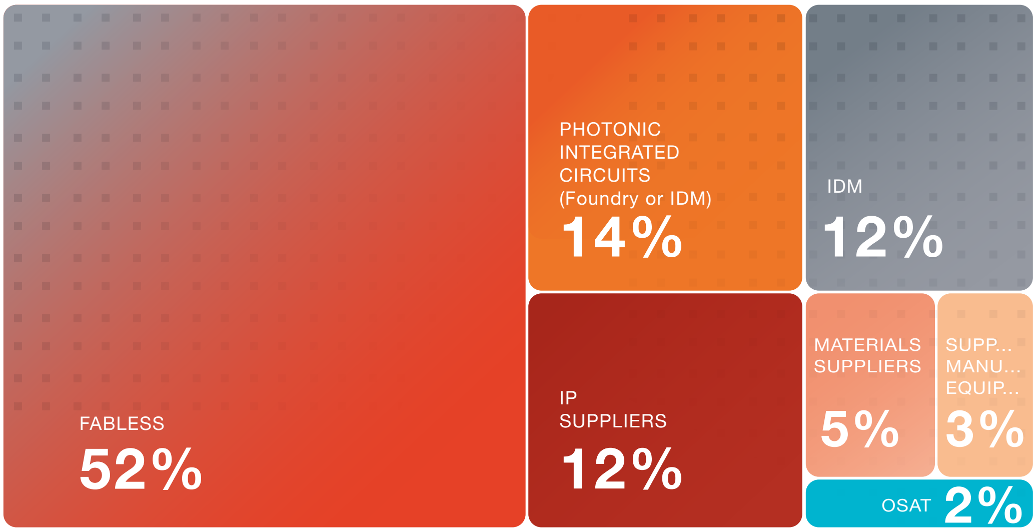
Chip manufacturing: The manufacturing process converts designs into chips, relying on a variety of semiconductor manufacturing equipment (lithography equipment, ion implanters, diffusion furnaces, etc.) and manufacturing materials (photoresists, high-purity chemicals, gases, etc.) in environments with extreme air purity (clean rooms).

Electronic equipment manufacturers: companies that design and assemble systems and sub-systems, using semiconductor electronic components provided by Fabless and/or IDM companies (processors, memories, communications SoCs, etc.), passive electronic components and mechanical components.

Downstream Industry: The manufacturers of end systems and products into which the electronic equipment, systems and sub-systems are inserted, usually provided by "electronic equipment manufacturers", often to the specification of these final system manufacturers.

Microelectronics R&D Centre: Includes public and private universities (departments or groups) and technology centres that systematically carry out R&D activities in one or more of the links in the semiconductor value chain, although strictly speaking they are not part of it.





Overview of the value chain, with weighting for the distribution of each type of stakeholder.

Spanish microelectronics ecosystem map

SPANISH CONTEXT

In a European ecosystem whose dynamics entails dependencies resulting from globalisation, and which legitimise and encourage a political and economic framework in which a country's macroeconomic and strategic actions and decisions must be aligned with these large-scale movements, it is essential to understand the domestic internal ecosystem and identify the stakeholders in the value chain in order to propose an appropriate long-term structural relationship.

In order to conduct a study that allows for decision-making and action that will lead the value chain in the direction that Spanish industry needs and to help it converge towards strategies related to supranational dominance, AMETIC has produced a survey of the ecosystem, together with an underlying matrix for designing the questions, based on knowledge of the microchip and semiconductor value chain.

This empirical framework and methodology, the result of which predisposes the starting point for precisely and rigorously obtaining answers to ensure a more accurate and complete final result of the value chain, allows stakeholders to be identified and helps to predict the movements and synergies that may occur in the value chain in a relatively short period of time.

The figure shows an overview of the value chain, with weighting for the distribution of each type of stakeholder.

As can be seen, the design activity considered strictly as such[1] (which includes Fabless, IP Providers and IDM) accounts for 76% of the value chain, according to the responses received.

Although the survey indicates that 14% of the respondents consider themselves to be foundries, looking at the value chain strictly speaking, there are currently no foundries in Spain as such, i.e. companies that offer their services of manufacturing chips designed by Fabless companies. The companies that describe themselves as foundries are small laboratories manufacturing photonic integrated circuits, which is of great interest for future trends, and the larger ones are manufacturers of discrete semiconductor components (diodes, thyristors, etc.).

1 The broader definition would include microelectronics R&D centres and SoC users.

3/ Spanish microelectronics ecosystem map

DESIGN ENTITIES PER REGION

+

-

LEGEND

- Design (*Fabless*)
- Design (*IP Provider*)
- Design (*Photonics*)
- Electronic equipment manufacturers
- Means photonics specific
- Design (*IDM manufacturing outside Spain*)

VALUE CHAIN: DESIGN SEGMENT

Distribution in Spain of value chain companies whose primary role could be classified as: IDMs, Fabless and IP providers.

MADRID
- Alcyon Photonics
- Alma Technologies
- Arquimea Aerospace Defence and Security
- Knowledge Development for POF
- Nvidia
- Ommatidia Lidar
- Qualcomm
- Thales
- Vodafone España
- Wave and Particle Engineering Solutions
- Wiyo
- Luz Wavelabs
- Medlumics
- Arxitec
- Infineon Technologies
- NXP Semiconductor
- Renesas
- Vishay

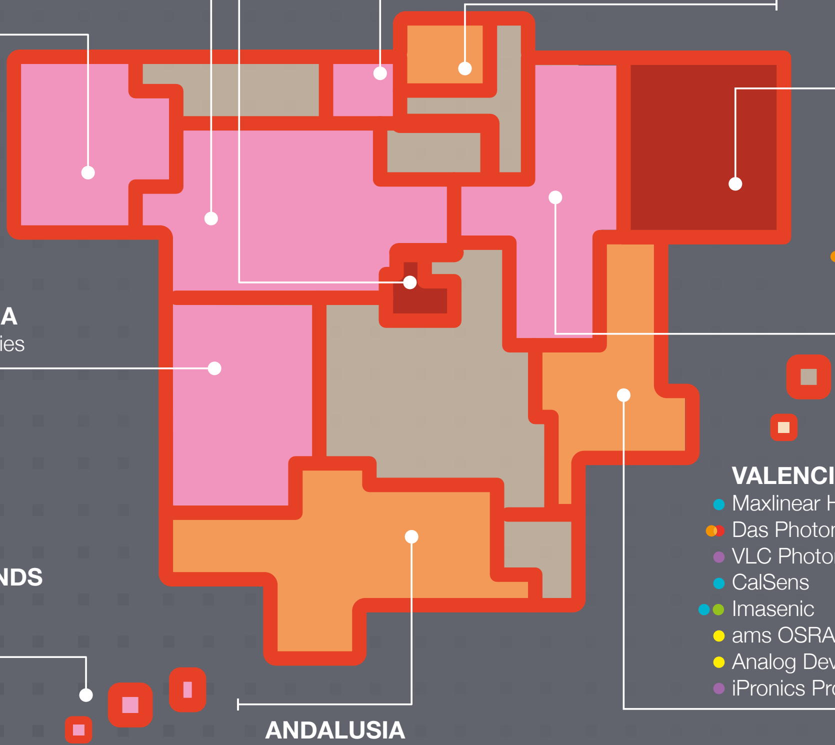
CATALONIA
- SiPearl, S.L.
- Qurv
- Sener
- ST Microelectronics
- Amper-Sensing & Contorl
- Indra Sistemas
- Semidynamics
- EMEA Electro Solutions
- Ignion
- MonoCrom
- Esperanto
- Marvell Technology
- Monolithic Power System
- Nanusens
- Open Chip
- Quilimanjaro Quantum Tech
- Quside Technologies
- Emea Electro Solutions

BASQUE COUNTRY
- Fagor Electrónica EMS
- Hybtronics
- Peta Optik
- Semi Zabala
- SoCe System on Chip
- Acceleration Robotics

CASTILE AND LEON
- Grupo Antolín-Irausa

CANTABRIA
- Acorde Technologies

GALICIA
- Maxwell Applied Technologies Arteixo



ARAGON
- Aragón photonics
- Microchip Technology Incorporated

EXTREMADURA
- BioBee Technologies

VALENCIAN COMMUNITY
- Maxlinear Hispania
- Das Photonics
- VLC Photonics
- CalSens
- Imasenic
- ams OSRAM
- Analog Devices
- iPronics Programmable Photonics

CANARY ISLANDS
- Solar MEMS
- WIMMIC

ANDALUSIA
- 2se-Space Submicron Electronic
- Innova IRV microelectronics
- Instituto de Microelectrónica de Sevilla
- Integrated Circuits Málaga
- Ontech Security
- Teledyne Innovaciones Microelectrónicas
- Alter Technologu Tüv Nord
- Premo
- Smart Health TV Solutions

MANUFACTURERS PER REGION

+

-

LEGEND

- **Manufacturing (*Chips*)**
- **Manufacturing (*OSAT*)**
- **IDM. Manufacturing outside of Spain**
- **Electronic equipment manufacturers**
- **Means photonics specific**

VALUE CHAIN: MANUFACTURING SEGMENT

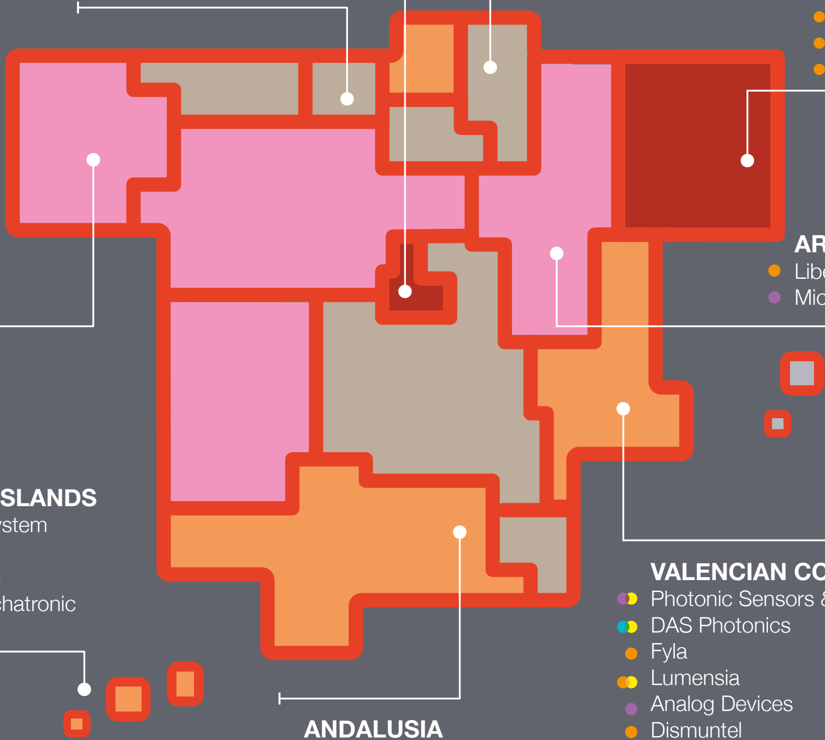
Distribution in Spain of value chain organizations whose primary role could be classified as Foundries and OSAT (Outsourced Semiconductor Assembly and Test). Although they do not fall under the strict definition of manufacturing, this map also includes manufacturers of electronic equipment using SoCs.

MADRID
- Arxitec
- Bosch Security Systems
- Cisco Systems España
- Inelcom
- Insyte Instalaciones
- Sapec
- Siemens
- Teydisa
- ams OSRAM
- Infineon
- NXP Semiconductor
- Renesas
- Vishay

CATALONIA
- Ficosa
- Lear
- LuxQuanta
- Ideaded
- D+T Microelectrónica A.I.E (CNM-INM-CSIC)
- ST Microelectronics
- Alternative Energy Innovations (AEInnova)
- Beamagine.
- Cinergia Power
- Circutor
- Cirsa
- Commtia Systems

BASQUE COUNTRY
- P4Q Professionals for Quality
- Triax
- LittleFuse
- Fagor SCOOP
- Graphenea Semiconductor
- Falcon Electronics

CANTABRIA
- Tst Sistemas



GALICIA
- Sparc Foundry
- Televés

ARAGÓN
- Libelium
- Microchip Technology Incorporated

CANARY ISLANDS
- Aerolaser System
- Sensorlab
- Solar MEMS
- Subsea Mechatronic
- Agnos PCB

VALENCIAN COMMUNITY
- Photonic Sensors & Algorithms (PhotonicSENS)
- DAS Photonics
- Fyla
- Lumensia
- Analog Devices
- Dismuntel
- Fermax

ANDALUSIA
- Clue Technologies

3/ Spanish microelectronics ecosystem map

OTHER AGENTS PER REGION

+

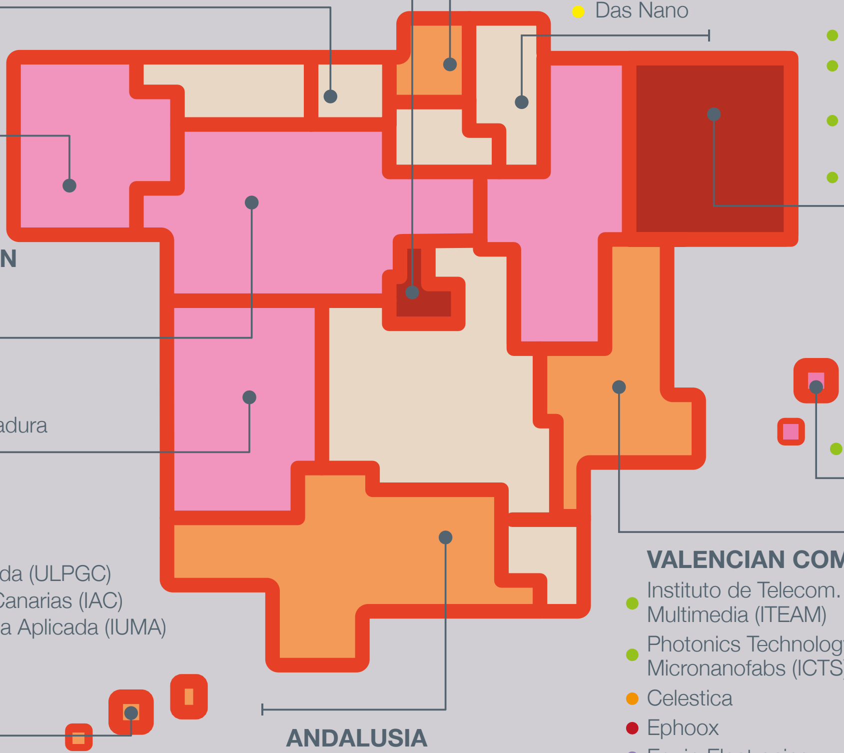
-

LEGEND

- Clusters & Associations
- Microelectronics R+D Center
- Téchnical Consulting
- Service Provider
- Equipment Supplier
- Materials Supplier
- Distribuitors
- Manufacturing Equipment Supplier

VALUE CHAIN: OTHER STAKEHOLDERS SEGMENT

The distribution in Spain of value chain organizations whose primary role could be classified as: RD&I centres; associations/ clusters; technical consultancy; service providers; equipment suppliers; material suppliers; equipment suppliers with manufacturing activity; distributors.



MADRID

- Fundación IMDEA Nanociencia
- IMDEA Nanoscience
- Univ. Politécnica de Madrid
- Inst. de Micro y Nanotecnología (IMN-CNM-CSIC)
- Instituto de Óptica (IO-CSIC)
- Universidad Carlos III
- AESEMI
- AEMETIC
- Cluster Inn. Tec. y Talento en Semiconductores
- Inetum España
- Sensia Solutions
- Arrow Electrónica
- Avnet Iberia
- Metalor Technologies
- Nippon Gases España
- Accenture
- Azure
- LeapWave Technologies

CATALONIA

- Univ. Autònoma de Barcelona
- Univ. Politècnica de Catalunya
- Institut Català de Nanociència i Nanotecnologia (ICN2)
- Universitat La Salle
- Secpho
- Ingenia Cat
- UniSCool
- JBC
- Atos
- Barcelona Supercomputing Center (BSC-CNS)
- Escuelas Profesionales Salesianos Sarriá
- Eurecat
- Instituto de Microelectrónica de BCN, IMB-CNM-CSIC
- Institut de Ciències Fotòniques (ICFO)
- T-Systems

CANTABRIA

- Universidad de Cantabria
- TST Sistemas
- Derivados del Flúor (DDF)

BASQUE COUNTRY

- Teknalia
- Ikerlan

NAVARRE

- Das Nano

GALICIA

- Gradiant
- Universidad de Vigo

CASTILE AND LEON

- Instituo Tecnológico de Castilla y León (ITCL)

EXTREMADURA

- Universidad de Extremadura

BALEARIC ISLANDS

- Universitat Illes Balears

CANARY ISLANDS

- IDeTic Fotónica Integrada (ULPGC)
- Inst. de Astrofísica de Canarias (IAC)
- Inst. de Microelectrónica Aplicada (IUMA)
- Clúster Chip Canarias
- e-Signus
- Wooptix

VALENCIAN COMMUNITY

- Instituto de Telecom. y Aplicaciones Multimedia (ITEAM)
- Photonics Technology Center Micronanofabs (ICTS)
- Celestica
- Ephoox
- Equip Electronics
- Uvax
- Valencia Silicon Clúster
- Universitat Politècnica de València (UPV Fab)

ANDALUSIA

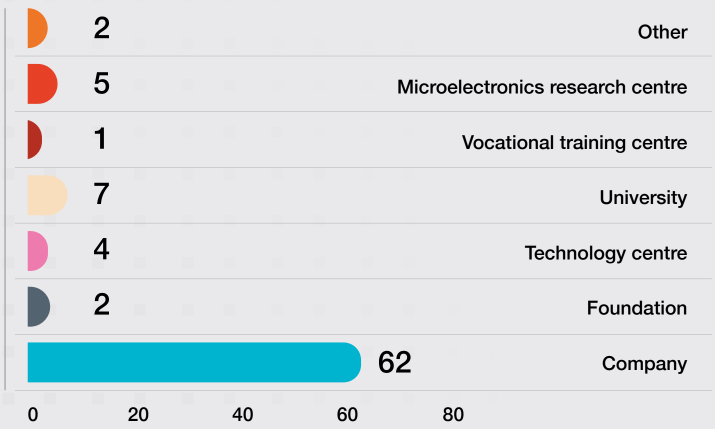
- Instituto de Microelectrónica de Sevilla (IMSE-CNM)
- Universidad de Sevilla
- Universidad de Málaga

Survey results

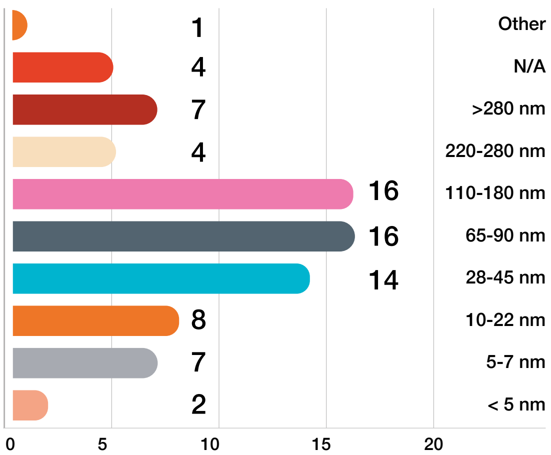
The following is a description of the results of the survey, arranged in order according to where they belong in the value chain in a first block, and followed by 3 more blocks that are considered to be of great importance after analysing the data: innovation, aid and the need for a training plan for innovation, research and the continuance of the of the microelectronics industry in Spain.

The sample of the population that has been surveyed is distributed by types as follows:

Organisations within the Spanish microelectronics ecosystem (that have answered the "map" survey")



Technology nodes used in the Spanish microelectronics ecosystem.



ABOUT THE DESIGN SEGMENT

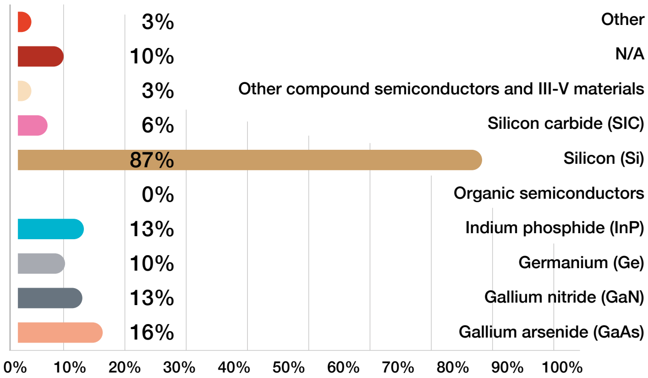
The design segment of the value chain is the most representative segment of the Spanish microelectronics industry.

The survey results reflected in the figure show the technology nodes used in the Spanish microelectronics ecosystem as a percentage of the total number of technology nodes considered.

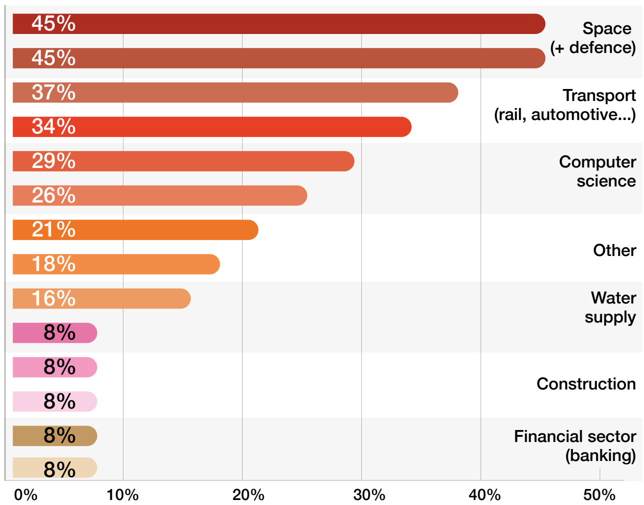
Nodes in the 65–90 nm and 110–180 nm ranges are used by 51.6% of those involved in the ecosystem, followed by the 28–45 nm range, which is used by 45.16%, and the 10–22 nm range, which is in third place, used by 25.81%.

It is worth noting that nodes in the 5–7 nm range are used by 22.58% of the ecosystem, including companies that design chips with RISC-V architecture and Machine Learning support for the Telecommunications market and Edge Computing processing, and also IP providers that implement them in FPGAs using these technological nodes.

4/ Survey results



Distribution of the use of semiconductor materials in the Spanish microelectronics ecosystem as a percentage according to the type of semiconductor material.



According to the opinions of the surveyed organisations (Fabless, IP Providers and IDM), the industry sectors they work with the most are:

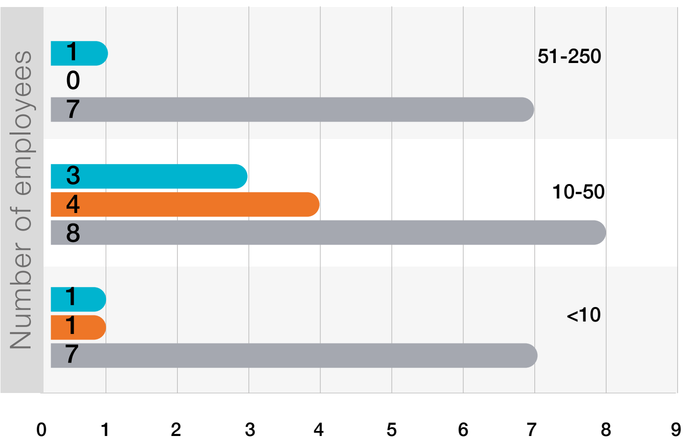
1/ Aerospace (+Defence) and Industry 4.0 (Robotics), followed by

2) Digital Infrastructure (wireless and wired (optical) communications networks, data centres),

3) Transport (including automotive, rail, aviation and maritime sectors and

4) Health.

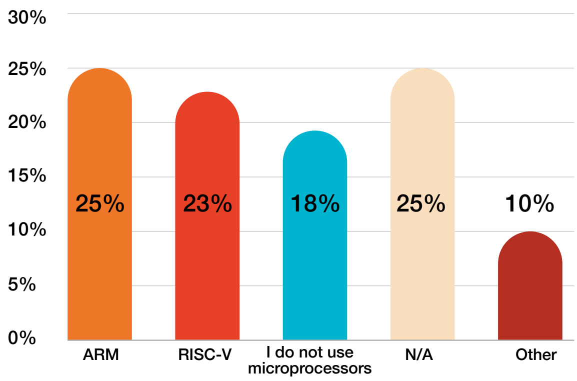
Distribution of industrial sectors to which the companies surveyed sell their chips.



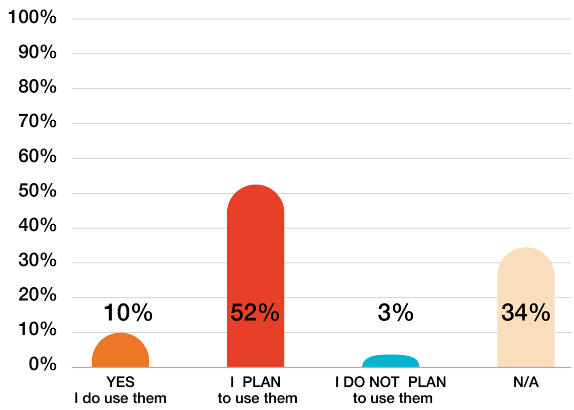
As can be seen, the design activity considered strictly as such[2] (which includes Fabless, IP Providers and IDM), accounts for 76% of the value chain and groups together organisations of different sizes, according to the responses received, as can be seen in the graph.

2 The broader definition would include microelectronics R&D centres and SoC users.

The following is a summary of the types of microprocessors used by SoC design companies in the ecosystem.



Distribution of the heteogeneus integration usage.



It is interesting to note that the design companies in the "other" field (Fabless, IP Providers and IDM) have specified the following types of microprocessors: ARC, Tensilica, Propio and Power Architecture.

New applications for semiconductor chips are driven by wireless communications systems, such as 5G, and soon 6G, as well as by the processing of massive amounts of data using AI. These systems are generally multi-chip systems, since in order to improve efficiency in terms of performance, consumption and price it is often necessary to combine chips from different technologies, which cannot be integrated into a single chip with a specific technology node.

Heterogeneous integration refers to the integration of separately manufactured components (typically chips) into a higher-level assembly (System-in-Package, SiP), which, when combined, provide enhanced functionality and improved operational characteristics. In this definition, components are understood as any unit, be it an individual chip, a MEMS device, a passive component or a combined assembly or subsystem that is integrated into a single package. Operational characteristics should also be understood according to their broader meaning, including characteristics such as system-level performance and cost.

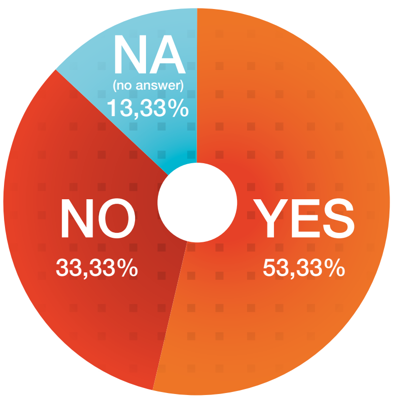
As shown above out of 29 companies that answered the question on heterogeneous integration, the majority of companies plan to use it (51.72%), while only three (10.34%) are currently using it. It is an evolving technology and makes sense for complex systems or for those using chips with different technologies to optimise their behaviour (power consumption, latency, etc.).

ON THE "MANUFACTURING" SEGMENT

Although the survey indicates that 14% of the respondents consider themselves to be foundries, looking at the value chain strictly speaking, there are currently no foundries in Spain as such, i.e. companies that offer their services of manufacturing chips designed by Fabless companies. The companies that describe themselves as foundries are small laboratories manufacturing photonic integrated circuits, which is of great interest for future trends, and the larger ones are manufacturers of discrete semiconductor components (diodes, thyristors, etc.).

ON THE "ELECTRONICS MANUFACTURERS USING SOCS" SEGMENT

Electronic equipment is increasingly influencing SoCs and SiPs. Manufacturers will therefore have to make their own SoCs if they want to stand out: either by commissioning them to design centres or by developing their own SoCs.



Percentage of companies surveyed as electronic equipment manufacturers considering a move to fabless in the near future.

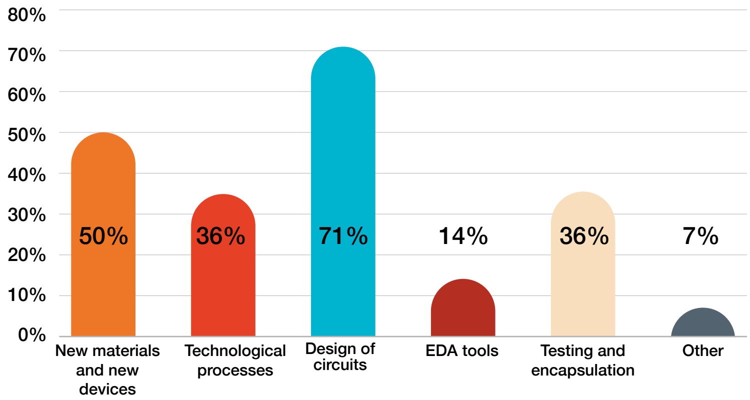
ON MICROELECTRONICS R&D TECHNOLOGY CENTRES

Collaboration between R&D centres and companies in the ecosystem is key. When companies were asked about their experience in working with these types of centres, 80% of the companies showed much interest in collaboration with Technology Centres and Universities.

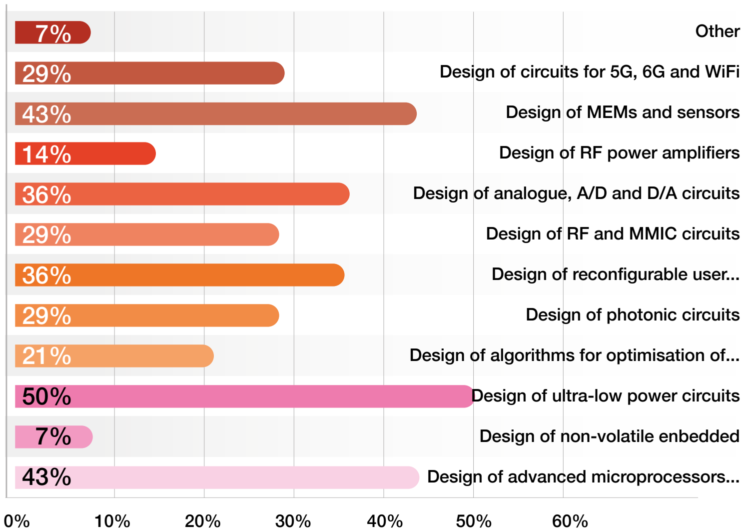
As can be seen in the following graphic on the distribution of the priority research areas pursued by the 14 microelectronics R&D centres in the Spanish microelectronics ecosystem, the main area of research in the different segments of the value chain focuses on circuit design.

The following figure shows the distribution of the R&D objectives in the "Circuit Design" priority research area pursued by the microelectronics R&D centres in the Spanish microelectronics ecosystem.

Main lines of research at R&D Centres.



Distribution of R&D objectives in the priority line of research "Circuit Design".



ON PUBLIC R&D&I GRANTS TO COMPANIES IN THE SEMICONDUCTOR VALUE CHAIN AND TO ELECTRONIC EQUIPMENT MANUFACTURERS

According to the evaluations of the RD&I instruments, the factor with the highest score is "economic conditions" with 5.2, followed by "field" (4.7), with "interest of the consortium" (4.4) in third place, followed by "ease of programme management" and "prestige of the programme" in fourth and fifth place respectively. In last place are rolling applications and other unspecified factors.

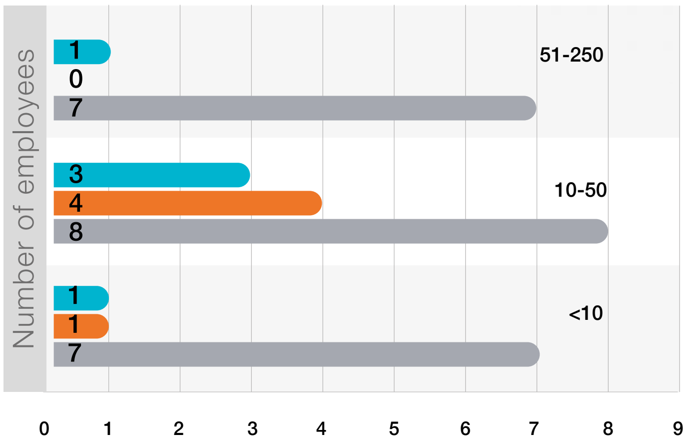
It is interesting to note that, apart from the economic conditions, which is obviously the factor that has the most "weight" (loan or grant, with or without guarantees, percentage of aid to the project, whether or not there is a clawback mechanism, etc.), the other most important factors are the "field", i.e. that it is clearly adapted to the strategic and commercial interests of the company, i.e. that it has a certain "direction", and the "interest of the consortium", which is a veiled commitment to start innovation and the commercial relations that may follow.

ON TRAINING PLANS IN MICROELECTRONICS AND TECHNOLOGICAL INNOVATIONS INTRODUCED BY THE COMPANY

Most companies concur that one of the greatest needs is skilled personnel to further the development of their R&D centres or departments. To benefit from the PERTE (Strategic Plan for Economic Recovery and Transformation), it is necessary to recruit staff with different profiles.

Conclusions from the survey results

Number of companies of each type in the design segment distributed according to employee size range (y-axis).



An analysis based on the data collected through the survey and supplementary interviews tracks the semiconductor industry's value chain to identify the strengths and weaknesses in each segment, and so consider possible strategies that could boost existing strengths and address weaknesses.

Three business models can be distinguished by analysing the design segment of the value chain (IP supplier, fabless and IDM). However, from an engineering point of view, a very high percentage of their activities in the design phase overlap.

According to the survey data, there are 31 companies that classify themselves as IP providers, fabless or IDMs.

In general, IDM companies cover both the design and the manufacturing stages. Nevertheless, the companies in Spain that have classified themselves as IDMs only cover the design phase, which is why we include them in the fabless category.

Overall, 32% of the 22 companies self-classified as fabless are micro-enterprises, i.e. they have less than 10 employees, 36% are companies with between 10 and 50 employees, and a further 32% are companies with between 51 and 250 employees.

With regard to size, it can be said that approximately one third are micro-enterprises, one third are small enterprises and one third are medium-sized enterprises.

Fifty percent of the medium-sized enterprises are companies belonging to powerful foreign multinationals. Of the medium-sized Spanish enterprises, one is public, one is an integrated photonics company and one is active in the defence/aerospace sector, so it can be said that there are no privately owned Spanish fabless companies, with the exception of one integrated photonics company that employs more than 50 people. Of the fabless companies with between 10 and 50 employees, 25% are active in integrated photonics.

Regarding the IDM companies, 20% have fewer than 10 employees, 60% have between 10 and 50, and a further 20% have between 51 and 250. These companies in Spain are effectively fabless, or rather, they act as design centres for their chip factories.

In terms of IP providers, 20% have fewer than 10 employees, and 80% are small companies with between 10 and 50 employees. These companies have strong growth potential and could become fabless if given the necessary support.

CONCLUSIONS ON THE "DESIGN" SEGMENT OF THE VALUE CHAIN

Firstly, fabless companies and IP providers are too small to be able to tackle the global market with any guarantees. Likewise, the majority of companies with more than 50 employees are fabless or IDM companies that are dependent on American multinationals. This is not a problem, in fact quite the opposite, as long as the conditions are maintained to ensure that they stay committed to remaining in Spain.

Innovation

Some of these fabless companies are very innovative when it comes to integrated photonics, so a strategy of stimulating and investing in photonics technologies will boost these businesses in the global market.

Companies in the "design" segment of the semiconductor sector engage in technological innovation by following the principles of open innovation. In fact, 96.77% say that they have collaborated with universities and R&D technology centres on R&D&I projects in the field of microelectronics, and 92.86% report that they have cooperated with other companies on R&D&I. Most of the companies state that their collaboration with universities and technology centres has generally been "quite smooth and very interesting".

In order for the R&D carried out in universities and microelectronics R&D centres to be translated into further innovation for companies in the "design" segment and encourage the creation of spin-offs, more "industrialisable" R&D is required, with companies being involved in the projects.

Industry

A wide range of technology nodes is used. Nodes in the 65-90 nm and 110-180 nm range are used by 51.6% of those involved in the ecosystem, with the 28-45 nm range being used by 45.16%, and the 10-22 nm range by 25.81%. Advanced technology nodes (<10 nm) are used by 9% of fabless companies.

Most companies in the design segment use Asian foundries, mainly TSMC (65%).

In terms of the semiconductor materials used, 54% use silicon and 46% are mainly III-V compound semiconductors.

The industrial sectors in which companies in the "design" segment of the semiconductor value chain are most active are, in order of importance:

1/ Aerospace (+Defence) and Industry 4.0 (Robotics), followed by
2/ Digital infrastructure (wireless and wired (optics) communications networks, data centres),
3/ Transport (including automotive, rail, air and maritime sectors),
4/ Health,
5/ Sensorics, IoT.

Talent

Staff with the necessary skills to enable companies in the design sector to meet their objectives: taking into account the forecast for 2024, overall, the need for additional design engineers specialised in the microelectronic design flow is between 444 and 1,320.

- Taking into account the forecast for 2024, the overall need for additional design engineers specialised in the microelectronic design flow is between 444 and 1,320.
- Taking into account the forecast for 2024, overall, the need for additional engineers with knowledge of system-on-chip, system specifiers and system architects is between 281 and 815.
- High demand for 2024: Additional software engineers (minimum 82/maximum 220).

Systems engineers with expertise in optical communications and photonic systems (minimum 51/ maximum 125).

Strategy

The creation and collaboration with an institute that would perform functions similar to those carried out by Fraunhofer or IMEC, fundamentally in the areas of design, IPs and back-end, would be viewed very positively.

Most of the companies in the "design" segment are in favour of attracting high-level fabless companies to the Spanish microelectronics ecosystem, although they recognise that this could lead to distortions in terms of the availability of skilled staff.

The majority of the companies in the sector, especially those interviewed, favour a "supply driven" strategy over a "demand driven" one, although some admit that both models could be appropriate, depending on specific market scenarios.

CONCLUSIONS ON THE “MANUFACTURING” SEGMENT OF THE VALUE CHAIN

There are no foundries or industrial IDMs for semiconductor chips in Spain, either for front-end (manufacturing of chips on wafers) or back-end (assembly, encapsulation and testing), which means that there are few suppliers of equipment and materials.

The only existing foundries are for integrated photonics, and the only self-classified back-end foundry also produces components for photonics.

The only facilities for producing very specific types of semiconductor devices are those housed by the technology centres, in particular CNM in Bellaterra. As for other types of device that cannot be considered as falling into the mainstream chips category, there are certain facilities that could be used for testing and future pilot lines, if suitably upgraded.

The IDM companies or foundries that responded to the survey were asked whether they would set up a CMO chip manufacturing plant in Spain in the near future. None answered in the affirmative; 36.36 % said no, not under any circumstances; 27.27 % said that it depended on the Chip PERTE support conditions; another 27.27 % said that they did not know what they would do; and, finally, 9.1 % said that it depended on how the Spanish microelectronics ecosystem evolved.

CONCLUSIONS ON THE “SOC USER ELECTRONIC EQUIPMENT” SEGMENT OF THE VALUE CHAIN

As buyers of semiconductor components and SoCs, “electronic equipment manufacturers” are part of the last link in the semiconductor value chain. Fabless companies and IDMs are interested in supplying these manufacturers with products that will solve problems for their customers. However, as today’s chips are complex electronic systems, the boundary between the two is becoming blurred, as some equipment manufacturers can claim to make their own SoCs (e.g. Apple, Cisco, etc.) without being “pure fabless companies”, and some “fabless companies” may manufacture their own electronic equipment (e.g. NVIDIA).

The main barriers to in-house chip design perceived by the electronic equipment manufacturers surveyed when deciding whether or not to design their own SoCs were:

- Low production volume (60%).
- High level of investment in EDA tools (60%).
- NRE costs (making prototypes in a foundry), strongly related to low production volume.
- Lack of technical staff (design engineers) in the country (53.33%).

There was not one single electronics manufacturer among those who responded to the survey who immediately rejected the idea of developing their own SoCs. In this sense, only 13.33% of respondents said they did not know, while the remaining 86.67% would indeed be willing to develop their own SoCs, provided they received sufficient state support.

CONCLUSIONS ON MICROELECTRONICS R&D TECHNOLOGY CENTRES

Virtually all microelectronics R&D centres are willing to open up their microelectronics facilities and laboratories to train professionals from companies in the value chain, within the framework of the Chip PERTE.

When asked whether the infrastructure could be used by a company if needed – always through a contract detailing the costs and conditions of service use – 84.62% of respondents said yes, and 15.38% said they did not know, but no centre has refused to open the infrastructures for use by companies.

The survey asked the microelectronics technology centres and university R&D groups what their priority research areas were.

The results show that the first priority line is “circuit design” (9%), followed by “new materials and devices”, %, and “technological processes” and “testing and encapsulation” in third place.

CONCLUSIONS ON STATE R&D&I AID TO COMPANIES IN THE SEMICONDUCTOR VALUE CHAIN AND TO ELECTRONIC EQUIPMENT MANUFACTURERS

The R&D&I support mechanisms are evaluated firstly on the basis of the "economic conditions" attached to the subsidy, secondly in terms of the "theme", i.e. do the calls for proposals have a certain "direction", and thirdly on the "interest of the consortium", meaning that there is increasing commitment to open innovation.

The results of technological innovation at companies have been key, as they have made it possible to increase efforts focused on innovation. State aid has made it possible to improve technological processes and bring new products to market; the average score of companies in the Spanish microelectronics ecosystem was 5.06/6, indicating the impact of such aid on innovation effort.
A very high score.

The responses received indicate that the financing mechanisms used by the companies surveyed, excluding state aid, to provide additional funding for their R&D&I projects were as follows: Only 50% had used one of the most common external financing systems. In fact, 31.25% turned to traditional bank loans, 22.92% to business angels/ risk capital, and 16.67% to loans from private investment funds. The remaining 50% had looked primarily to their own funds, through capital increases or reserves. A significant percentage had also sought financing from customers or through specific R&D&I contracts.

The five main barriers to innovation perceived by companies in the Spanish microelectronics ecosystem are:

- Difficulty in recruiting professionals with the required background and skills (65.91%).
- Uncertainty as to the timeframe for return on investment (59.65%).
- Difficulty in obtaining public aid or private funding (57.89%).
- The small size of the company (42.11%).
- Lack of trust or inability to collaborate with other companies or organisations (15.79%).
- Lack of employee training (15.79%).

CONCLUSIONS ON TRAINING PLANS FOR MICROELECTRONICS AND FOR THE TECHNOLOGICAL INNOVATIONS INTRODUCED BY THE COMPANY

The responses provided indicate that only 12.5% do not have a training plan. Those who said that they did have a training plan said that their plans:

- Included knowledge and skills to assimilate innovations (65.63%).
- Included the development of a skills for innovation mindset (64.06%).
- Were designed with the employee's future employability in mind (43.75%).

The companies surveyed were asked how they implement knowledge management and its dissemination within the company. Of the options given (respondents could select as many as they wished), the most frequently cited, from most to least frequent, were:

- Through teamwork and exchange of experiences (70.31%).
- Through the company's ongoing training plan related to new processes, products and other innovations (39.06%).
- There is a digital system providing access to all knowledge regarding production and management processes, clients, proposal and project history, etc. (37.5%).

The opinion on the promotion of dual vocational training and industrial doctorates was extremely favourable, which indicates a strong commitment to in-company training, as well as to that provided by the corresponding academic institution.

NB: See the Training Strategy Proposal for the Microelectronics and Semiconductor PERTE document. AMETIC-ACADEMIA.

Based on the conclusions drawn from the Spanish Microelectronics Ecosystem Map (briefly summarised here), AMETIC's Microelectronics Working Group will be aligning these conclusions with the Chip PERTE and other ecosystem-related areas, with the aim of setting out proposals to establish strategies that will mitigate weaknesses identified, further develop existing strengths, take advantage of opportunities and take action to protect against threats.

Proposed strategic areas for the Spanish Microelectronics Ecosystem

1 CHIP PERTE. AMETIC PROPOSALS

With regard to the Chip PERTE, backing has been given to the AMETIC document introducing the suggestions made by the companies in the Microelectronics Working Group.

2 STIMULATING THE GROWTH OF THE SPANISH MICROELECTRONICS ECOSYSTEM

With the aim of establishing a robust and competitive Spanish microelectronics ecosystem within 5-6 years, we propose the following actions:

Create

The aim is to encourage the creation of new companies that can start out as suppliers of IPs or other innovations relating to new devices, design techniques, EDA tools, etc., generally originating from university groups or technology centres, and to create spin-offs, supported by public authorities or capital markets, such as the Centre for the Development of Industrial Technology's NEOTEC programme. Possible actions:

- An investment pool backed by public-private funds for projects that have demonstrated strong potential in terms of innovation and market penetration.
- AMETIC-ACADEMIA training plan proposed for the Chip PERTE.

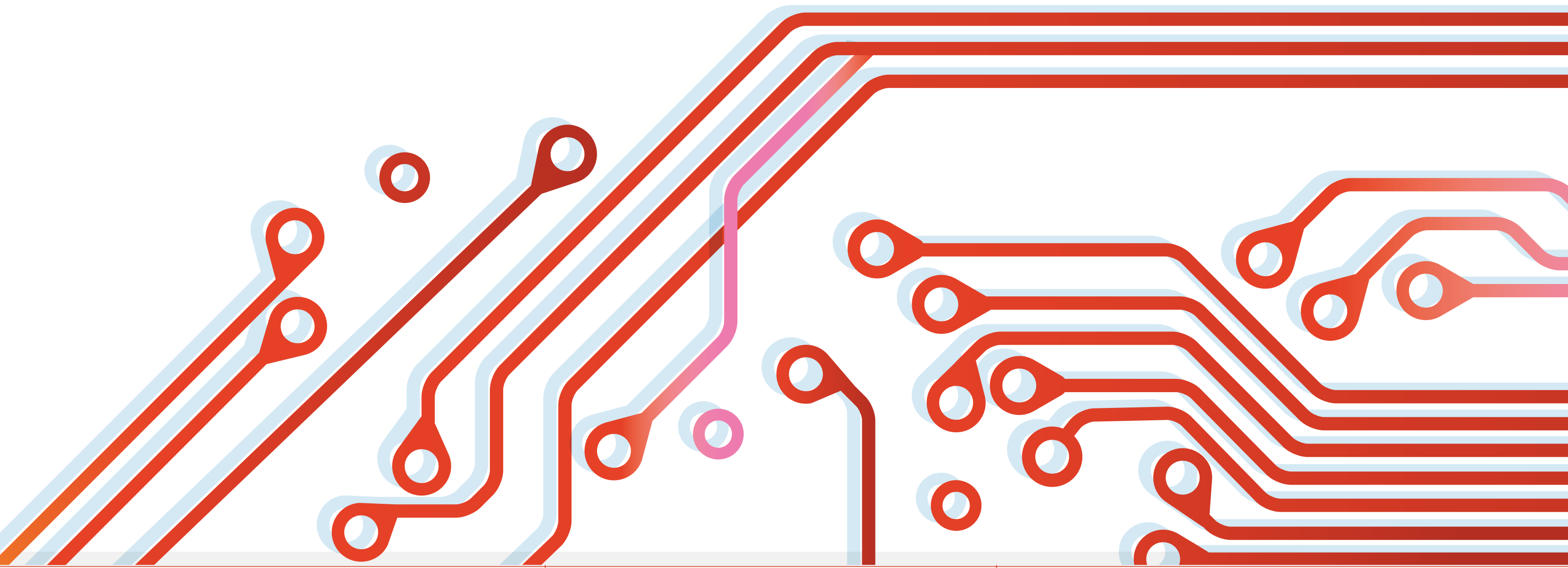
Grow

This is about growing existing companies in the ecosystem, ideally reaching a point where they will be employing 200-300 staff, through two initiatives:

- Innovation projects related to IPs, SoC, SiP, etc., with state aid for innovation and industrialisation.
- AMETIC-ACADEMIA training plan proposed for the Chip PERTE.

Attract

The aim is to attract fabless or other segments of the semiconductor value chain to help the ecosystem grow and reach critical mass. In this sense, the aim is to manage the Chip PERTE subsidies in such a way that these companies will find Spain an attractive place to set up business. With regard to factories, we believe that it is necessary to encourage those that boost the ecosystem and are aligned with the Chip Act and other EU initiatives.



3 ENCOURAGING THE FORMATION OF CLUSTERS

4 ALIGNMENT WITH EUROPE: IPCEI AND CHIP ACT

The survey asked respondents which Chips Act pilot lines were of interest to them, and the response from both industry and R&D and technology centres focused on microelectronics MEMs and sensors, heterogeneous integration and integrated photonics.

5 PROMOTING QUALITY R&D WITH A FOCUS ON THE ECOSYSTEM AND THE BIG CHALLENGES, SUCH AS THE EURODARPA PROPOSAL[4]

The EuroDARPA proposal puts forward challenges that should be taken up by the EU, with a view to boosting the European and Spanish semiconductor ecosystem: a) RISC-V challenge; b) satellite receiver challenge; 5G standard challenge; and d) "2035" standards challenge.

4 See: "Proposal for a Spanish initiative on semiconductors", Federico Ruiz. The section on "Proposals for the Spanish presidency of the EU" suggests "using a concept of technological competence, similar to that used by the United States and China. We can use the PERTE to explore and pinpoint areas of the global semiconductor chain where we want to gain competitive advantage, set a target and have different consortia compete against each other to reach or surpass it".

6 TRAINING AND TALENT ATTRACTION PLAN

See the AMETIC-ACADEMIA Training Strategy Proposal for the Chip PERTE.

7 TECHNOLOGY CENTRES AT THE SERVICE OF THE INDUSTRY AND THE ECOSYSTEM

Support existing R&D centres, based on their performance in supporting industry.

Encourage the creation of technology centres focused on providing support to industry, and in particular, on helping micro-enterprises and SMEs to grow and acquire critical mass.

8 PROMOTING ADVANCED BACK-END CENTRES IN SOUTHERN EUROPE

The survey showed that companies in the ecosystem supported the installation of OSAT in Spain to implement advanced 2.5D and 3D encapsulation techniques, as well as heterogeneous integration. Projects have been requested from IPCEI-ME in this area, given the need to make progress in these technologies (chiplet methodology); if successful, Spain could become the "advanced back-end" centre of Southern Europe.

In the Spanish context it is essential to understand the internal ecosystem and identify the stakeholders in the value chain in order to propose an appropriate long-term structural relationship.

Financing and support mechanisms

Subsidies consistent with the strategy		
EUROPE		
	CHIPS ACT HORIZON EUROPE • Key Digital Technologies EUREKA PROGRAMME • Eureka Clusters	IPCEI – IMPORTANT PROJECTS OF COMMON EUROPEAN INTEREST • IPCEI - Microelectronics and communication technologies DIGITAL EUROPE – ADVANCED DIGITAL SKILLS • Reinforcing Skills in semiconductors
SPAIN		
	Chip PERTE	
Other subsidies peripherally consistent with microelectronics strategy		
EUROPE		
	EUREKA PROGRAMME (Others) • Eureka clusters (Others); Network projects; Eurostars	
SPAIN		
B1) Other PERTEs	Electric and connected vehicles PERTE Aerospace PERTE Maritime PERTE	Agro-food PERTE Health PERTE
B2) CDTI instruments	CDTI R&D projects (PID) CDTI Missions Programme CDTI LIC-A Direct Expansion Finance	Aeronautical Technologies Programme (PTA) Cervera Subsidies for Technology Centres Interconecta ERDF Projects
B3) Industry	Subsidies for Innovative Business Clusters (AEIs) Red.es IA + THDs EOI finance for Active Industry 4.0 (consultancy)	SEPIDES Productive Industrial Investment Support Fund (FAIIP) Future Public Innovation Procurement Programmes for prototypes and demonstrators
B4) Research	Public-private partnership projects for innovation projects by the State Research Agency 2023 Torres Quevedo Programme	
REGIONAL LEVEL		
	Regional incentives Aragon – R&D&I projects in priority and multidisciplinary areas (2021-2023) Castile-La Mancha: Innova-Adelante Catalonia – Business R&D&I clusters	Castile and León – Subsidies to finance innovation projects Valencia Region PIDI-CV – R&D SMEs Galicia – INNOVA Y EMPRENDE The Basque Country – HaziteK 2023
Subsidies for newly created companies		
	NEOTEC initiative ENISA loans Activa Startup EOI financing (consultancy)	
Tax and other incentives (mainly for companies)		
	Tax credits for R&D&I Tax Equity	Bonuses for research staff IP Box (technology transfer)

Ecosystem Organisations

	Company/Organisation	Value chain position	Aut. Community
1	Acceleration Robotics	IPs and equipment provider	Basque Country
2	Accenture	Equipment provider	Madrid
3	Acorde Technologies SA	Fabless RF devices and microwave equipment	Cantabria
4	Aerolaser System	Electronic equipment manufacturers	Canary Islands
5	AESEMI	Association/Cluster	Madrid
6	Agnos PCB	OSAT (assembly, test and encapsulation)	Canary Islands
7	Alcyon Photonics	Fabless	Madrid
8	Alma technologies	IPs provider	Madrid
9	Alter Technology Tüv Nord	OSAT (assembly, test and encapsulation)	Andalusia
10	Alternative Energy Innovations (AEInnova)	Electronic equipment manufacturers	Catalonia
11	AMETIC	Association/Cluster	Madrid
12	Amper - Sensing & Control	IPs provider	Catalonia
13	ams OSRAM	Chip manufacturing (Foundry or IDM)	Valencian Community
14	Analog Devices	Chip manufacturing (Foundry or IDM)	Valencian Community
15	Aragon Photonics	Design and manufacture of photonic instrumentation	Aragon
16	Airbus	Electronic equipment manufacturer	Madrid
17	Arquimea Aerospace Defence and Security	Fabless	Zaragoza
18	Arrow Electronica	Semiconductors and components distributor	Madrid
19	Arteixo	Design and manufacture of electronic equipment. Mechatronics backend	Galicia
20	Arxitec	Design and manufacture of electronic equipment. FW for embedded systems.	Madrid
21	Atos	Service providers	Catalonia
22	Avnet Iberia	Semiconductors and components distributor	Madrid
23	Barcelona Supercomputing Center (BSC-CNS)	Microelectronics R&D Centre	Catalonia
24	Beamagine	Electronic equipment manufacturers	Catalonia
25	BioBee Technologies	Fabless	Extremadura
26	Bioherent	Photonic biosensors	Andalusia
27	Bosch Security Systems	Electronic equipment manufacturers	Madrid
28	CalSens	Fabless	Valencian Community

	Company/Organisation	Value chain position	Aut. Community
29	Celestica	ICT Engineering Services Provider (Healthcare and Aerospace)	Valencian Community
30	Centro de Desarrollo de Sensores, Instrumentación y Sistemas (CD6)	Microelectronics R&D Centre	Catalonia
31	Cinergia Power	Electronic equipment manufacturers	Catalonia
32	Circutor	Commercialisation of electronic equipment	Catalonia
33	Cirsa	Electronic equipment manufacturers	Catalonia
34	Cisco Systems España	Network engineering and marketing services	Madrid
35	Clue Technologies	Electronic equipment manufacturers	Andalusia
36	Clúster Chip Canarias	Association/Cluster	Canary Islands
37	Clúster Inn. Tecnológica y Talento en Semic.	Association/Cluster	Madrid
38	Commtia Systems	Electronic equipment manufacturers	Catalonia
39	D+T Microelectrónica A.I.E. (CNM - INM - CSIC)	Chip manufacturing (Foundry or IDM)	Catalonia
40	Das Nano	Test equipment provider (THz)	Navarre
41	DAS Photonics	Electronic equipment manufacturers	Valencian Community
42	Derivados del Fluor	Materials supplier “chemicals”.	Cantabria
43	Dismuntel	Electronic equipment manufacturer and electronic engineering services	Valencian Community
44	Emea Electro Solutions	Microelectronics and electronics manufacturing engineering services	Catalonia
45	Ephoox	Design and manufacture of photonic equipment	Valencian Community
46	Equip Electronics	Industry 4.0 and digitalisation consulting	Castellon
47	Escuelas Profesionales Salesianos de Sarriá	Vocational Training Centre	Catalonia
48	e-Signus	Cybersecurity consultancy	Canary Islands
49	Esperanto	Fabless	Catalonia
50	Eurecat	Microelectronics R&D Centre	Catalonia
51	Fagor Electrónica EMS	Design and manufacture of electronic equipment	Basque Country
52	Fagor Electrónica S.Coop	Manufacturing, assembly, testing and encapsulation	Basque Country
53	Falcon Electronics	Manufacture of electronic equipment. Mechatronics assembly services	Navarre
54	Fermax	Electronic equipment manufacturers	Valencian Community
55	Ficosa	Electronic equipment manufacturers	Catalonia
56	Fundación IMDEA Nanociencia	Nanotechnology R&D Centre	Madrid
57	Fyla	Electronic equipment manufacturers	Valencian Community
58	Gradiant - Centro Tecnológico de Telecom. de Galicia	Microelectronics R&D Centre	Galicia
59	Graphenea Semiconductor	Chip manufacturing (Foundry or IDM)	Basque Country
60	Grupo Antolin-Irausa	Downstream Industry (design and manufacturing)	Castile and Leon
61	Hybtronics	Fabless y Electronic equipment manufacturers	Basque Country

	Company/Organisation	Value chain position	Aut. Community
62	Ideaded	Production of small series semi chips. Organic	Barcelona
63	IDeTIC Fotonica Integrada (ULPGC)	Microelectronics R&D Centre	Canary Islands
64	Ignion	Electronic equipment manufacturers y Fabless	Catalonia
65	Ikerlan	Microelectronics R&D Centre	Basque Country
66	Imasenic	Fabless (Fabless Image Sensors)	Barcelona
67	IMDEA Nanoscience	Nanotechnology R&D Centre	Madrid
68	Indra sistemas	Equipment manufacturers	Madrid
69	Inelcom	Electronic equipment manufacturers	Madrid
70	Inetum España	Technology consulting and digitalisation	Madrid
71	Infineon Technologies	IDM	Madrid
72	Ingenia Cat	Robotics consultancy	Catalonia
73	Innova IRV microelectronics	Fabless	Andalusia
74	Insititut Català de Nanociència i Nanotecnologia (ICN2)	Microelectronics R&D Centre	Catalonia
75	Institut de Ciències Fotòniques (ICFO)	Photonics R&D Centre	Catalonia
76	Instituto de Astrofísica de Canarias (IAC)	Microelectronics R&D Centre	Canary Islands
77	Instituto de Micro y Nanotecnología (CNM - IMDEA)	Microelectronics R&D Centre	Madrid
78	Instituto de Microelectrónica Aplicada (IUMA)	Microelectronics R&D Centre	Canary Islands
79	Instituto de Microelectrónica de Barcelona (IMB-CNM-CSIC)	Microelectronics R&D Centre	Catalonia
80	Instituto de Microelectronica de Sevilla	Fabless	Andalusia
81	Instituto de Óptica (IO - CSIC)	Optics and Photonics R&D Centre (CSIC)	Madrid
82	Instituto de Telecom. y Aplicaciones Multimedia (ITEAM)	Microelectronics & ICT R&D Centre	Valencian Community
83	Instituto Tecnológico de Castilla y León (ITCL)	Microelectronics R&D Centre	Castile and Leon
84	Insyte Instalaciones	Electronic equipment manufacturers	Madrid
85	Integrated Circuits Málaga	Fabless	Andalusia
86	iPronics Programmable Photonics	Fabless	Valencian Community
87	Itainnova	Microelectronics R&D Centre	Zaragoza
88	JBC	OSAT equipment provider	Catalonia
89	Knowledge Development for POF	Fabless	Madrid
90	LeapWave Technologies	OSAT equipment provider	Madrid
91	Lear	Electronic equipment manufacturers	Catalonia
92	Libelium	Electronic equipment manufacturers	Aragon
93	LittleFuse	lectronic equipment manufacturers	Basque Country
94	Lumensia	Manufacturer photonic sensors	Valencian Community
95	LuxQuanta	Electronic equipment manufacturers (Ciberseguridad Q)	Catalonia
96	Luz Wavelabs	Design and manufacture of photonic equipment	Madrid
97	Marvell Technology	Fabless	Catalonia

8/ Ecosystem Organisations

	Company/Organisation	Value chain position	Aut. Community
98	Maxlinear Hispania	Fabless	Valencian Community
99	Maxwell Applied Technologies	Electronic equipment manufacturers	Galicia
100	MedLumics	Design and manufacture of photonic equipment	Madrid
101	Metalor Techologies	Materials Supplier	Madrid
102	Microchip Technology Incorporated	Chip manufacturing (Foundry or IDM)	Aragon
103	MonoCrom	Design and manufacture of photonic equipment	Catalonia
104	Monolithic Power System	Fabless	Catalonia
105	Nanophotonics Technology Center Micronanofabs (ICTS)	Microelectronics R&D Centre	Valencian Community
106	Nanusens	Fabless	Catalonia
107	Nippon Gases España	Materials Supplier	Madrid
108	NIT New Infrared Technologies	Fabless y fabricación equipos electrónicos	Madrid
109	Nvidia	Fabless y fabricación equipos electrónicos	Madrid
110	NXP Semiconductor	Chip manufacturing (Foundry or IDM)	Madrid
111	Ommatidia Lidar	Fabless, encapsulation and manufacturing	Madrid
112	Ontech Security	Fabless	Andalusia
113	Open Chip	Fabless	Catalonia
114	P4Q Professionals for Quality	Electronic equipment manufacturers	Basque Country
115	Peta Optik	IPs provider	Basque Country
116	Photonic Sensors & Algorithms	IDM	Valencian Community
117	Premo	Encapsulation	Andalusia
118	Qilimanjaro Quantum Tech	Fabless	Catalonia
119	Qualcomm	Fabeless ; in Spain: Commercialisation	Madrid
120	Qurv	Fabless graphene sensors	Catalonia
121	Quside Technologies	Fabless	Catalonia
122	Renesas	Chip manufacturing (Foundry or IDM)	Madrid
123	Sapec	Electronic equipment manufacturers	Madrid
124	Secpho	Association/Cluster	Catalonia
125	Semi Zabala	Fabless (IDM) GaN	Basque Country
126	Semidynamics	IPs provider	Catalonia
127	Sener	Fabless y Equipment manufacturers	Catalonia
128	Sensia Solutions	Security solutions consultancy	Madrid
129	Sensorlab	Electronic equipment manufacturers	Canary Islands
130	Siemens	Electronic equipment manufacturers	Madrid
131	Simon electric	Electronic equipment manufacturers	Andalusia
132	SiPearl	Fabless	Catalonia
133	Smart Health TV Solutions	Downstream Industry (design and manufacturing)	Andalusia
134	SoCe System on Chip	IPs provider	Basque Country

	Company/Organisation	Value chain position	Aut. Community
135	Solar MEMS	Electronic equipment manufacturers	Canary Islands
136	Space Submicron Electronic (2sE)	Fabless	Andalusia
137	Sparc Foundry	Chip manufacturing (Foundry or IDM) Photonics III-V	Galicia
138	ST Microlectronics	Chip manufacturing (Foundry or IDM)	Catalonia
139	Subsea Mechatronic	Electronic equipment manufacturers	Canary Islands
140	Tecnalia	Microelectronics R&D Centre	Basque Country
141	Teledyne Innovaciones Microelectrónicas	Fabless	Andalusia
142	Telefonica Innovación Digital	ICT R&D Centre	Various
143	Televes	Electronic equipment manufacturers	Galicia
144	Teydisa	Services Engineering and electronics manufacturing	Madrid
145	Thales	Electronic equipment manufacturers & Fabless	Madrid
146	Triax	Electronic equipment manufacturers	Basque Country
147	TST Sistemas	Electronic equipment manufacturers	Cantabria
148	T-Systems	Microelectronics R&D Centre	Catalonia
149	UniSCool	Commercialisation of electronic components	Catalonia
150	Universidad Carlos III	Microelectronics R&D Centre	Madrid
151	Universidad de Cantabria	Microelectronics R&D Centre	Cantabria
152	Universidad de Extremadura	Microelectronics R&D Centre	Extremadura
153	Universidad de Málaga	Microelectronics R&D Centre	Andalusia
154	Universidad de Sevilla	Microelectronics R&D Centre	Andalusia
155	Universidad de Vigo	Microelectronics R&D Centre	Galicia
156	Universidad Politécnica De Madrid	Microelectronics R&D Centre	Madrid
157	Universitat la Salle	Microelectronics R&D Centre	Catalonia
158	Universitat Autònoma de Barcelona	Microelectronics R&D Centre	Catalonia
159	Universitat de les Illes Balears	Microelectronics R&D Centre	Baleares
160	Universitat Politècnica de Catalunya	Microelectronics R&D Centre	Catalonia
161	Universitat Politècnica de València (UPV Fab)	IDM	Valencian Community
162	Uvax	Smart Cities solutions consultancy	Valencian Community
163	Valencia Silicon Clúster	Association/Cluster	Valencian Community
164	Vishay Measurements Group Iberica	Chip manufacturing (Foundry or IDM)	Madrid
165	VLC Photonics	IPs provider (Photonics)	Valencian Community
166	Vodafone España	Fabless	Madrid
167	Wave and Particle Engineering Solutions	Fabless and manufacturing for prototyping	Madrid
168	Wimmic	Fabless	Canary Islands
169	Wiyo	Fabless	Madrid
170	Wooptix	Manufacturing equipment supplier	Canary Islands

© **ICEX España Exportación e Inversiones, E.P.E.**
Pº de la Castellana, 278
28046 Madrid
Tel: 902 34 90 00
Fax: 914 31 61 28

icex@icex.es
www.icex.es

© **AMETIC**
Asociación Multisectorial de Empresas de Tecnologías de la Información, Comunicaciones y Electrónica

MADRID
Príncipe de Vergara, 74, 4ª planta 28006
Tel: 91 590 23 00

BARCELONA
Avda. Sarriá, 28, 1º- 1ª 08029
Tel: 93 241 80 60

ametic@ametic.es
www.ametic.es

Diseño y maquetación
Dixi Grafismo, S.L.
Tel: 654 339 546 / 655 511 406
San Antón, 75. Ap.1A. 18005, Granada

proyectos@dixi.es

NIPO: 114230040

October 2023

EXECUTIVE SUMMARY

Mapping of the Spanish Microelectronics Ecosystem

Ametic LA VOZ DE LA INDUSTRIA DIGITAL

aniversario 50 1973 - 2023

GOBIERNO DE ESPAÑA | MINISTERIO DE ECONOMÍA, COMERCIO Y EMPRESA

ICEX España Exportación e Inversiones