

Mapping of the Spanish Microelectronics Ecosystem

2023
REPORT

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1. Glossary

To gain a proper understanding of the Semiconductor Ecosystem Map, firstly it is necessary to classify the stakeholders within the ecosystem according to their function in the value chain and their business model.

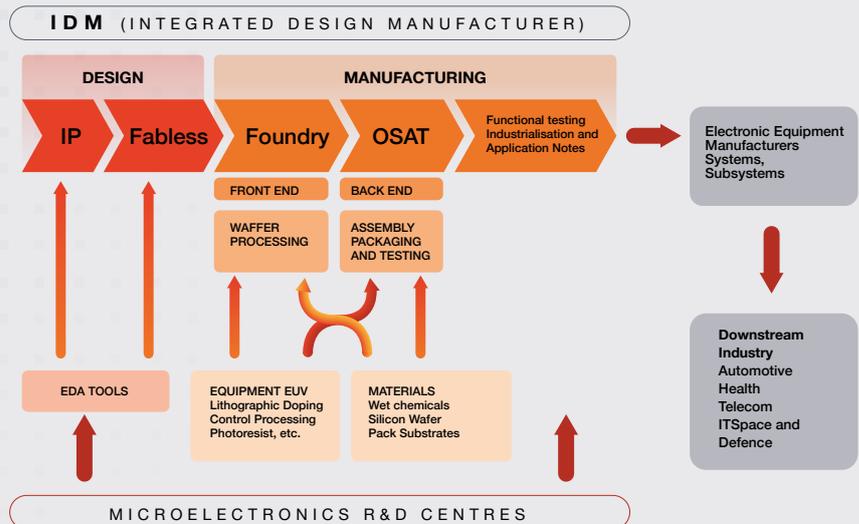


Fig. 1 Graphical reproduction of the semiconductor value chain.
Source: Own data

- **IP (Intellectual Property) block supplier companies:**

These are design groups that produce Intellectual Property (IP) blocks consisting of reusable modular parts of chip designs that can be incorporated into complete chip designs. An IP typically consists of a description of high-level simulatable hardware, firmware, and software, as well as a series of test vectors and technical notes. An IP previously implemented in silicon in a technology node compatible with users who wish to integrate it into a more complex chip has a greater value. Digital IPs can also be implemented in FPGAs. IPs tend to be distributed through licences. Economic returns can also be agreed in the form of royalties per unit sold (chip) in which the IP is included.

Remember that by firmware, we mean the software that interfaces with the hardware (it allows control of the chips hardware and does not interact directly with the user). By software, we mean the application that runs on the HW.

- **Fabless companies:**

These companies design and sell chips, but purchase chip manufacturing services from foundries (companies that provide chip manufacturing services as part of different technological processes), as well as assembly, test and packaging services from outsourced semiconductor assembly and test (OSAT) companies. Fabless companies also usually run functional tests, write application notes and assume responsibility for industrialisation (operation specifications, reliability tests, quality, etc.). These companies also look to IP block supplier companies to speed up their designs and market access for their products.

- **Foundries:**

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

1/ Glossary

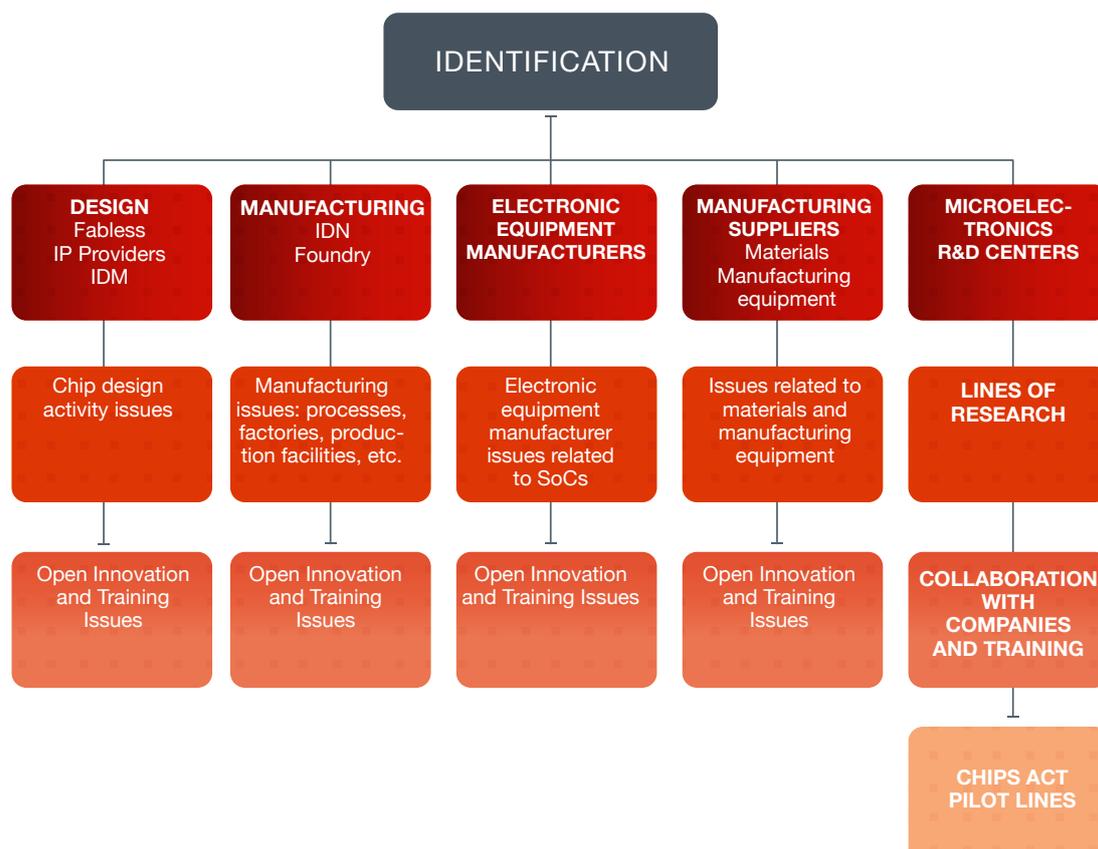
- **Chip manufacturing:**
The manufacturing process converts designs into chips, relying on a variety of semiconductor manufacturing equipment (lithography equipment, ion implanters, diffusion furnaces, etc.) and manufacturing materials (photoresists, high-purity chemicals, gases, etc.) in environments with extremely pure air (clean rooms).
- **IDM (Integrated Device Manufacturing) companies:**
Integrated Device Manufacturers (IDMs) are companies that perform all three steps of production: design, manufacturing, and assembly, testing and packaging.
- **OSAT (Outsourced Semiconductor Assembly and Test) companies:**
Outsourced semiconductor assembly and test (OSAT) companies are responsible for assembly, testing and packaging on behalf of external customers.
- **EDA (Electronic Design Automation) tool suppliers:**
Software tools used to design chips and electronic systems
- **Manufacturing equipment:**
Semiconductor manufacturing equipment includes the machinery and tools used to manufacture, assemble, test and encapsulate chips (this includes photolithography equipment to generate the set of «masks» required for a given technological process).
- **Material suppliers:**
These provide the materials used in the manufacture of the chips: silicon wafers, “wet chemicals”, gases, encapsulation materials, etc.
- **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, SoC communications, etc.), passive electronic components and mechanical components. They also usually produce the software and control the reliability and quality of the equipment they supply. These manufacturers usually market their equipment to different industries (downstream industry).
- **Downstream Industry:**
Manufacturers of end systems and products in which electronic equipment, systems and sub-systems are installed, usually provided by “electronic equipment manufacturers”, and often following the specifications of these final system manufacturers. One example of a “Downstream Industry” are automobile manufacturers, who include equipment and electronic systems in their final systems (automobiles) to control the different vehicle parts (powertrain, LiDAR, ADVA, etc.). Other examples of “Downstream Industries” are aircraft and wind turbine manufacturers, shipping, the agro-food industry, robotics, health, etc.
- **Microelectronics R&D centre:**
This 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 do not form part of it. This does not include R&D activities carried out by the companies themselves, which turn R&D outcomes into innovations, and are the backbone of the semiconductor value chain: design, manufacturing, etc. This is how R&D centres contribute to the value chain and thus form part of the semiconductor ecosystem as a whole.

2. Preparation of the report

The main source of information used in the preparation of the report was a survey of the bodies that make up Spain's microelectronics ecosystem, led by AMETIC. These bodies were identified by using the ORBIS database, and lists of AMETIC and AESEMI members. Taking the definition of the microelectronics value chain as a starting point, the companies and other bodies concerned were asked to place themselves in the different segments of the value chain. The survey was structured as can be seen in the Figure.

Explanatory note regarding the survey population and the sample used: difference between the value chain in the strictest sense and in the broadest sense.

- All the institutions surveyed operate in Spain.
- The population surveyed comprises institutions (companies, foundations, universities, technology centres and R&D centres) that are systematically involved in RD&I, design, manufacturing, marketing and manufacturing of semiconductors that make up the ecosystem, strictly speaking, plus a group of companies that design and manufacture electronic equipment that includes complex semiconductors.
- With this in mind, if we were to stick to companies in the ecosystem in the strictest sense, then this would no longer be a sample, but rather a population, since our sample would be very close to the total population, meaning it would not make sense to talk of a population "sample".



**Elisa García Grande**

Executive Director
Invest in Spain
ICEX Spain Trade & Investment



ICEX España
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e Inversiones

3. Introduction

Recently, many industrial sectors have experienced a severe shortage of semiconductors in the market, causing delays in the manufacture of many basic products in the capital goods and consumer industries.

Through the European Parliament and the EC, the EU has proposed a series of measures aimed at alleviating these problems in the future by boosting technological sovereignty, and which are in part included in the **Chips Act** ([European Chips Act | European Commission \(europa.eu\)](#)).

One of the key points is to increase Europe's share of global microelectronics production from today's 10% to 20% by 2030.

Europe is determined to invest in an infrastructure to develop knowledge and experience in the creation of emerging technologies such as AI, neuromorphic processors, quantum processors, etc. and to build an industry for new forms of sub-10nm semiconductor production.

The impact of the Covid-19 pandemic and Russia's invasion of Ukraine have highlighted the insufficient reliability of longer and more complex global value chains when unexpected shocks occur. These serious upheavals have caused major disruption in the supply of certain strategic inputs and goods.

Against this backdrop, many transnational companies have begun to pursue strategies to relocate their production processes. The aim of relocation is to guarantee the supply of certain goods, especially those with a high technological and innovative content, either by encouraging production locally, or by trying to achieve greater diversification, simplification and shortening of global supply chains. Nearshoring, which involves moving the production location closer to the consumption location, and friendshoring, which is the reorganisation of a multinational's production activities, preferably linking these to allied countries with shared common values, are booming.

The recent shortfall of semiconductors in the market has been particularly significant, as the semiconductor value chain is heavily dependent on a very limited number of players, the vast majority being based in regions that are highly exposed to the geostrategic risks arising from the recent global crises. The chip

supply crisis has in fact resulted in the temporary closure of numerous factories and massive delays in the manufacture of industrial products, since these components are critical to many sectors such as the automotive industry, and in addition to the consumer electronics, medical equipment and military sectors.

Furthermore, semiconductors are of increasing importance to European industry and society. In fact, the industry expects chip demand in Europe to double between now and 2030. The EU has therefore decided to adopt a strategy to regain sovereignty in chip manufacturing by boosting local semiconductor production to enable a rapid response to any potential disruption in the supply chain. The European Chip Law is the key measure, and is expected to mobilise more than 43 billion euros of public and private investment in the sector.

Spain is very well positioned in a variety of areas, such as the development of alternative, free hardware architectures such as RISC-V, with the Barcelona Supercomputing Center considered an international point of reference; in integrated photonics, where our country is considered a global benchmark, and also in the field of quantum chip development, led by the

Spain represents an attractive destination in the EU for semiconductor investments, thanks to both its strategic assets and the attractive package of investment incentives offered by the PERTE Chip.

Institute of Photonic Sciences (ICFO), the Spanish National Research Council (CSIC) and the Quantum Spain project.

Moreover, the growth in semiconductor demand in sectors such as the automotive industry (Spain is the second largest producer of vehicles in the EU), the manufacture of machine tools (where Spain is the third largest producer and exporter in the EU and ninth in the world), the aerospace sector, which is expanding fast in Spain, and household appliances all justify the existence of the economies of scale required to undertake this type of investment in our country.

The EU's Recovery, Transformation and Resilience Plan Funds represent a great opportunity to consolidate and boost the emerging Spanish semiconductor ecosystem. Spain has therefore launched the Strategic Project for the Economic Recovery and Transformation of Microelectronics and Semiconductors (abbreviated to PERTE Chip) which will entail a public investment of 12.25 billion euros between now and 2027. This will in turn activate a significant volume of private investment and will be implemented in coordination by public authorities, industry, universities and research centres.

The trend towards the reorganisation of global value chains in the semiconductor sector represents an opportunity to strengthen Spain's position within them, attracting new foreign investment and increasing our exports. And this is precisely what we at ICEX are trying to do. To achieve this, ICEX-Invest in Spain has sought the collaboration of AMETIC by sponsoring this report on the "Mapping of the Spanish Semiconductor Ecosystem", which provides a detailed diagnosis of the microelectronics situation in Spain, and which will also serve as a starting point for developing industrial innovation policy strategies.

**Pedro Mier**

President of Ametic



AMETIC is an association representing the digital technology industry in Spain. Its main goal is to foster the development of a robust, innovative and competitive industry to accompany our country in its digital, economic and social transformation process. Industry is indeed essential in order to make sure that process is also sustainable.

In the case in question, it is also widely known that microchips and semiconductors are the basis for technologies that have enabled accelerated growth in productivity worldwide. A key enabling technology with global dynamics and large-scale activity that requires actions and decisions to be made, and according to confirmed analysis and strategic vision.

At AMETIC we did therefore see the need to analyse the Spanish microelectronics ecosystem to ascertain our reality and lay out the roadmap to enable the industry to make the most of this great opportunity for industrial transformation. We created the Microelectronic Working Group for this purpose, which brings together companies in the industry and embarked on its first task in mapping out the Spanish Microelectronics Ecosystem.

This mapping we have presented is the result of rapid, broad and positive collaboration. In just a few weeks, AMETIC received the assistance of all the agents needed to prepare the map: companies, specialised research and development centres, technology centres, universities, vocational training centres, public authorities and industry experts. A verifiable methodology was established, general surveys were conducted, as well as individual interviews, working groups, etc., in order to obtain information and reliably reflect the reality of the microelectronics value chain in Spain, whilst also identifying the position of each agent involved. The information obtained also allowed us to identify the challenges and opportunities that must be addressed and to prepare proposals that can help predict short and long-term movements. The main priorities were identified:

- The first is to help companies grow with adequate investment and training so they can develop innovation projects in different technologies, such as integrated photonics or quantum electronics, and to strengthen IP, SoC and SiP providers, areas where most of the 'Design' companies in the Spanish microelectronics value chain are to be found.
- The second priority is to create new companies with the investments and projects now activated. This will incorporate new capacities into the current value chain. Accompanying these new agents in their growth is also vital so they can become SMEs in the short term.
- The third priority is to attract new companies and investments so as to incorporate new agents into the ecosystem and cover segment gaps in our current value chain. The 'PERTE Chip' fund programme is vital in this sense.

Achieving these three priorities will obviously provide Spain with a better positioned industry, thus contributing to the European goal of growth in global microelectronic production.

We do in short invite all current and new agents to share our vision and join in this transformation opportunity. Investments are undoubtedly key to launching major global projects that enable us to be competitive in the future. We are facing a unique opportunity, and I'm convinced that, together, we will achieve it.

4. Spanish Semiconductor Ecosystem

The Spanish semiconductor ecosystem constitutes an open innovation system in which companies, universities, technology centres, research centres, vocational training centres and companies interact with each other.

The first chart shows the different types of organizations, in percentage terms, that make up the Spanish semiconductor ecosystem (Fig. 1).

Most companies in the sector are small or micro enterprises (66%), while organizations with more than 1,000 employees are mainly universities and technology companies, primarily dedicated to other activities but capable of contributing to the microelectronics value chain: Spanish companies such as Indra Sistemas, Grupo Antolín and Grupo Premo, and foreign firms like Siemens, T-Systems and Vodafone Spain, S.A.

The Spanish market is made up of young companies, coming up with radical innovations.

The oldest are the universities that contribute talent and knowledge to the ecosystem, as well as incumbent companies.

The degree of internationalisation of companies is notable. Looking at their shareholder base, 25% have foreign shareholders, mainly from the USA, followed by Germany, the United Kingdom and Japan.

Fig. 1 Types of bodies, in percentage terms, in the Spanish semiconductor ecosystem.

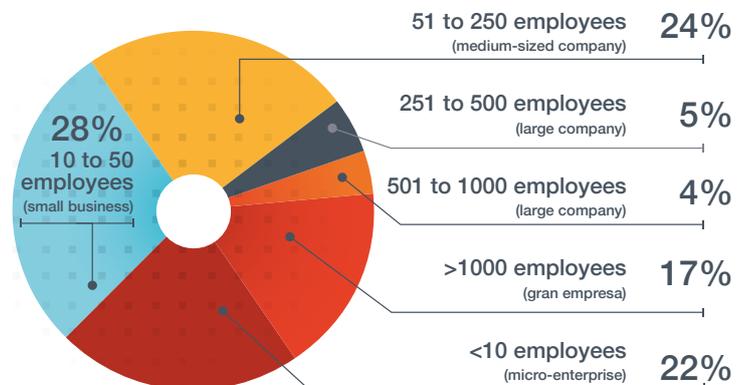
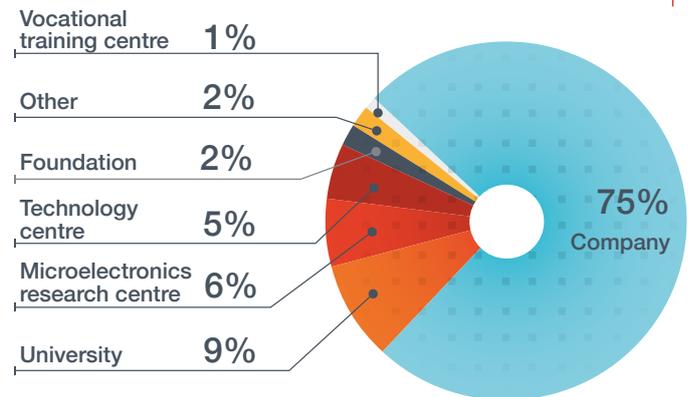


Fig. 2 Percentage of organizations in the Spanish semiconductor ecosystem by number of employees

4.1 THE VALUE CHAIN IN THE SPANISH SEMICONDUCTOR ECOSYSTEM

The Spanish semiconductor ecosystem is led by **fabless companies**. Fig. 3 shows the distribution of the value chain by segment and supplier.

Strictly speaking, and by only considering the position of companies in the supply chain, the organisation of the Spanish market would be as explained in Fig. 4, which shows the percentage distribution of the value chain in the Spanish semiconductor ecosystem.

Spain, like its European neighbours, does not have any EDA tool manufacturers, this sector being dominated by US companies.

The EDA tool manufacturers' market is an oligopoly made up of very few companies, the vast majority from the USA. Two American companies born in Silicon Valley are worth particular mention. These are a) CADENCE and b) SYNOPSIS. These companies not only control the EDA tools required to implement the different chip design phases, but they also take advantage of their distribution channels to sell IPs developed by other companies. Furthermore, EDA design ideas that could be developed by universities or small startups have been absorbed or incorporated by this oligopoly through inorganic growth (either by buying the startup or acquiring the intellectual property rights). Between them, CADENCE and SYNOPSIS have a 75 % share of the EDA tools market.

A third American company, MENTOR, with a 13% market share, has been acquired by Siemens and renamed EDA Siemens, although R&D is still based in the USA. There are also a number of small cutting-edge EDA tool companies that are particularly strong when it comes to testing, emulation and ML for chips that dominate the rest of the market worldwide. However, no company has been identified in Spain that markets these technologies.

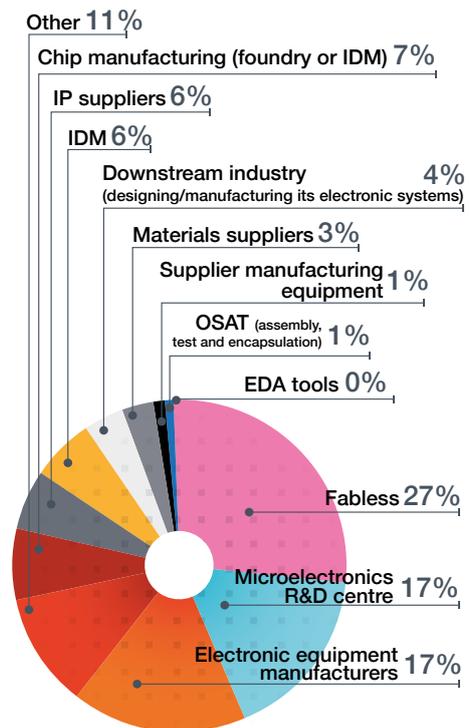


Fig. 3 Percentage distribution of value chain segments in the Spanish semiconductor ecosystem

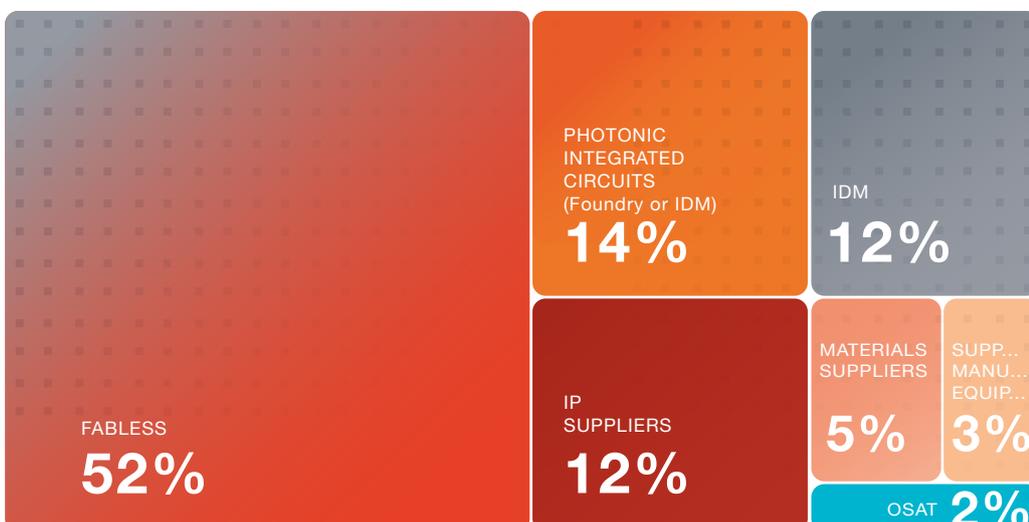


Fig. 4 Percentage distribution of the value chain in the Spanish ecosystem of semiconductor companies.

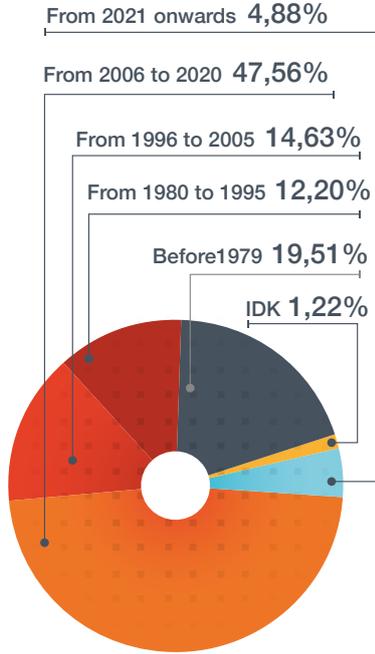


Fig. 5 Ages of organizations in the Spanish microelectronics ecosystem

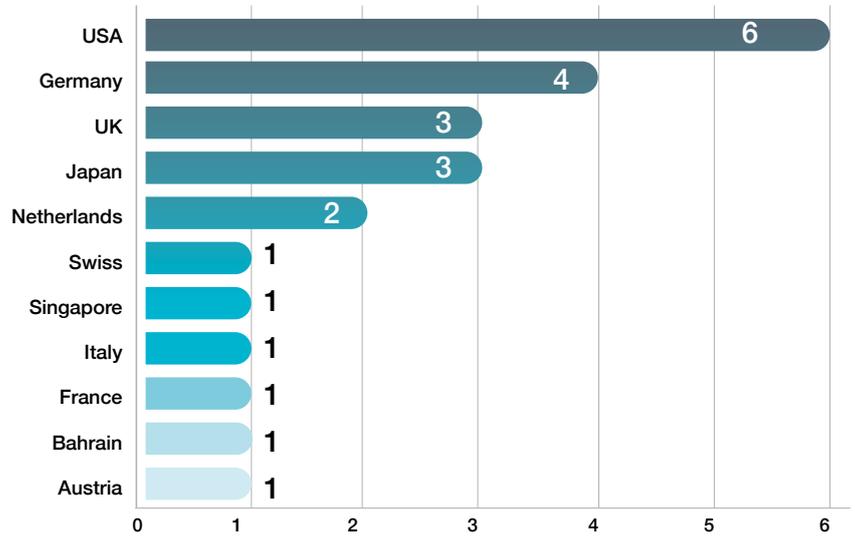


Fig. 6 Origin of foreign shareholdings in organizations in the Spanish semiconductor ecosystem.

In terms of the companies categorised as **chip manufacturers**, these companies are dedicated to the manufacture of semiconductor components, especially photonic circuits and discrete components.

When it comes to the **manufacture of equipment**, there are a few companies that produce metrology equipment for technological processes. Furthermore, Spain has the necessary potential with respect to companies that make machine tools, together with Industry 4.0 companies, allowing them to convert some of their equipment for this industrial sector. With regard to materials suppliers, some chemical product companies could reconvert part of their parts list into materials for the semiconductor industry (higher purity requirements, etc.)

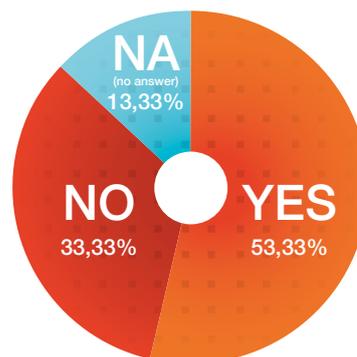
It is worth highlighting the solid **R&D base in microelectronics**, which has growth potential from an industry that would make it possible to increase its global presence in specific niches such as integrated photonics or sensors.

The scenario described above highlights a potential shift in the business orientation of certain electronic equipment manufacturers. Systems are becoming increasingly integrated and increasingly complex. Electronic equipment manufacturers will increasingly tend to make their systems SoC and SiP, meaning that they will try to stand out from the competition, and the design of these differentiating systems, in

terms of consumption, speed and price, will be done in-house. This means they will functionally integrate the chip design stage into their engineering and RD&I departments, i.e. they will tend to be fabless from a functional point of view, manufacturing their circuits in a foundry. This is how equipment manufacturers like Apple operate.

Equipment manufacturers **were asked** whether they are considering either designing their own SoCs and SiPs in-house or creating a fabless company in the near future.

Below is the percentage of electronic equipment manufacturers surveyed that are considering moving to fabless in the near future:



Percentage of electronic equipment manufacturers surveyed that are considering moving to fabless in the near future.

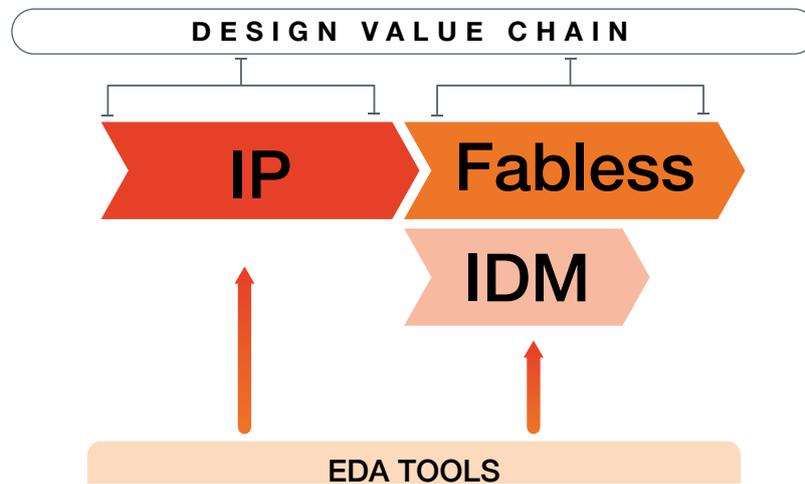


Fig. 7 Chip design value chain, where the fabless and IDM business models coincide.

4.2 DESIGN ECOSYSTEM

The design ecosystem is made up of **fabless companies, IP suppliers and IDMs**, as these also design the chips they manufacture in their own factories. The suppliers and segments on which “fabless” companies are reliant include EDA tool providers, who supply automated design tools such as simulators, synthesisers, P&R, design rule checkers, etc., and IP suppliers.

From a procedural perspective, IP design is similar to chip design. Many IPs are sold with silicon implementation in order to be able to emulate their behaviour with the other blocks that will make up the final chip, meaning the design flow of an IP is equivalent to the design flow of a chip. So if a respondent company classifies itself as an “IP Provider”, it is asked the same list of questions as a company that classifies itself as “fabless”. If a company classifies itself as an IDM, designing its own chips just like a fabless company, it is asked to answer the same questions as an IP supplier or fabless company; however it is then asked to answer those that are put to a foundry as well. From a design flow perspective, there are no conceptual differences between “IP Providers”, Fabless Companies and IDMs. Fig. 7 shows that IP suppliers tend to licence their IPs, mostly to fabless companies as well as to IDMs. As a result, the three business models are classified in the value chain as part of the chip design phase. As for the manufacturing phase, Fabless companies use foundries and IDMs use their own fabs, although, depending on the technologies used in the design, they may also manufacture in foundries.

Semiconductor **IP cores** or IP blocks are reusable design components used to design more complex integrated circuits. IP designers are critical upstream enablers of the design ecosystem, supporting chip designers and streamlining time-to-market offerings by reducing design time, selling the rights to design architectures and elements, and helping to reduce the risk of hardware and software integration. A simple analogy is to imagine each specific chip design as a modern house. The IP blocks as pre-built sections (e.g. a modular kitchen, appliances, etc.), that are independently designed and tested. In most cases, it is impossible or at least cost prohibitive to create new circuit designs from scratch, on account of the amount of technical expertise and design verification and validation time required. Pre-built blocks are used instead as a starting point. These blocks are owned by the company that designs the IP and are typically licensed to other companies who include them as-is, or further customise them for specific applications. Many of these IPs are now marketed by companies that sell EDA tools, since the IPs contain simulation and layout models made using the EDA tools themselves¹.

Fabless companies, IP suppliers and IDMs **design integrated circuits** with different functional characteristics, such as digital, analogue, RF, etc.

In Spain, **digital circuits** predominate, followed by analogue circuits.

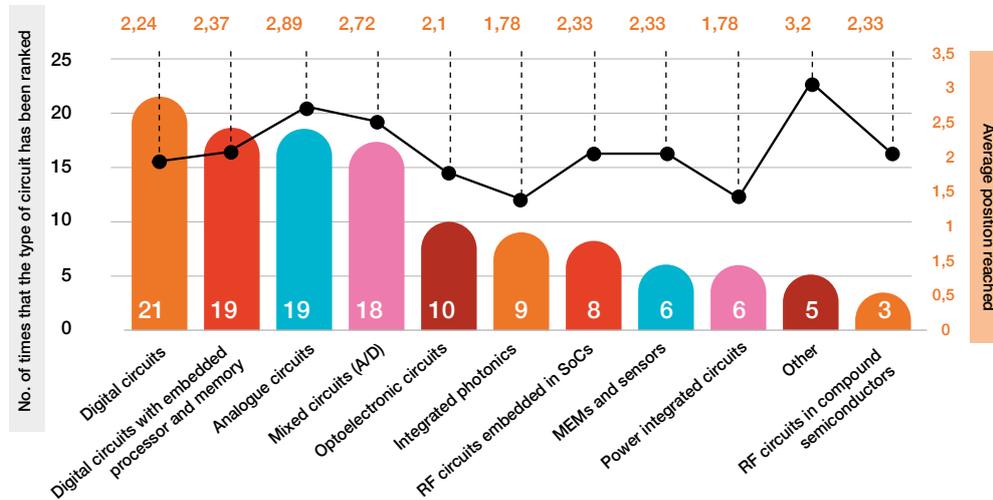


Fig. 8 No. of times that the type of circuit has been ranked in the first four vs average position reached when ranking circuit types by respondents.

According to Fig. 8, “**Integrated Photonics**” has achieved the highest position on average when it comes to the preference of those surveyed with regard to “circuit type”.

Design companies, “fabless” companies and IDMs, usually create designs for their own catalogue, although they may also create designs for third parties. In Spain, more than 70% of companies on the market accept third-party designs.

4.2.1 IP business model

As for the IP blocks used in chip design, in the Spanish semiconductor ecosystem, more than half acquire third-party IPs and just under half sell their own IPs to third parties.

These companies have implemented the IP block to guarantee functionality according to specifications and integration with the chip being designed, based on three main types: in specific silicon chips, in FPGAs² or only in HDL and test vectors.

Alternatively, some companies base their licensing business model on the design of mixed (image and depth) cameras for specific applications, on InP and even IP design on integrated photonics, an emerging market in which a tailor-made licence is usually negotiated.

As for the revenue generated from licensing to third parties, most companies charge for the license itself, and for royalties per unit sold by the customer. Other methods involve a single-use license, an unlimited-use licence and annual maintenance or solely the payment of royalties.

4.2.2 EDA tools

The world’s leading EDA suppliers are located in the USA, and control 70% of the world’s EDA tools market. These are Cadence, Synopsys and Mentor (Siemens). In Spain, there are no commercial manufacturers of EDA tools.

In the Spanish ecosystem, more than half (55.5%) of the companies that classified themselves as fabless, IP suppliers or IDMs have proprietary EDA tool licences with a periodic maintenance subscription, while the remaining companies use cloud EDA tool services instead of proprietary licences in a local computing environment or on a rental basis.

Given the high cost of these licences and the semiconductor companies’ critical dependence on them, a “**Virtual Platform**” system is proposed in pillar 1 of the Chip Act to facilitate access to the latest EDA tools for EU companies.

When asked, more than 80% of companies in the Spanish ecosystem replied that they were in favour of joining this platform.

Within the design segment, Spanish companies use the following tools as part of their design flows:

Chiplet design tools are still at an early stage in the Spanish ecosystem, although this technology is on an upward trend, thanks to heterogeneous integration and advanced encapsulations, as well as “software regression test environment” tools.

Other types of EDA tools used in the design segment include mechanical, optical and RF design, optical lightning simulators (ZEMAX) and diffractive optical simulators (VirtualLab FUSION), optical and optical-electronic simulation and modelling and electromagnetic simulators.

² FPGAs: Field Programmable Gate Arrays are semiconductor devices that are based on a matrix of configurable logic blocks (CLBs) connected through programmable interconnects. FPGAs can be reprogrammed according to the desired application or functionality requirements after the manufacturing process.

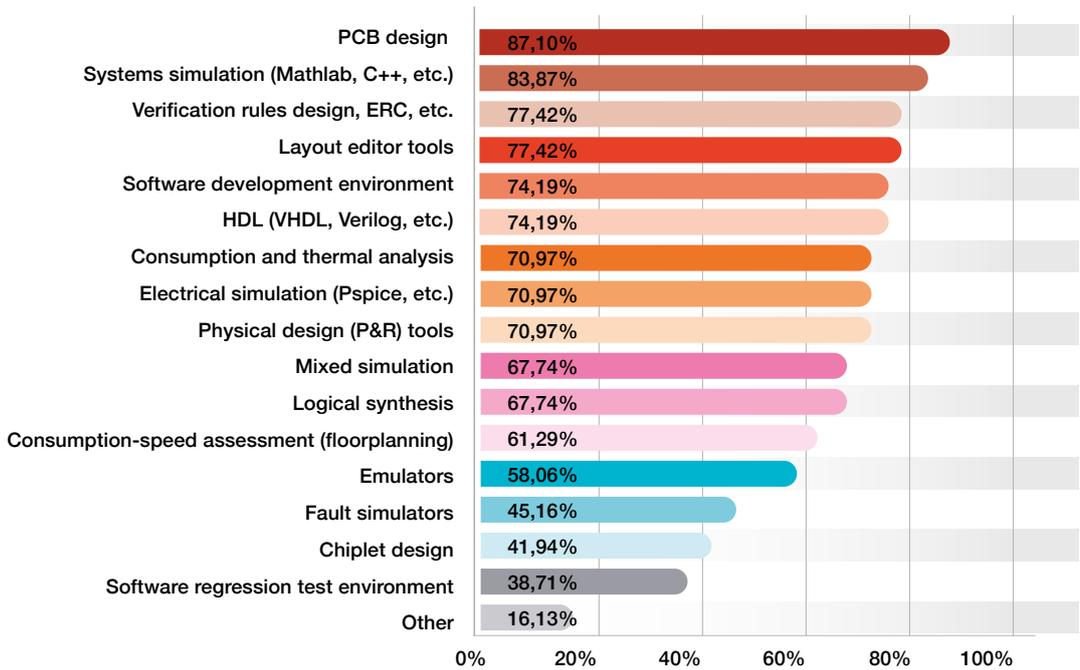


Fig. 9 Percentage availability of EDA tools in the semiconductor design business ecosystem.

4.2.3 Complexity of digital designs

Digital designs have been increasing in complexity, measured by the advance in the number of logic gates and in accordance with Moore’s Law. Dennard scaling techniques have been applied to advance towards ever-smaller nodes. These techniques have reached a turning point; as transistor dimensions continue to decrease, consumption per mm2 is increasingly higher (increased leakage currents, etc.), meaning that technological processes require innovations such as FDSOI to overcome these obstacles³.

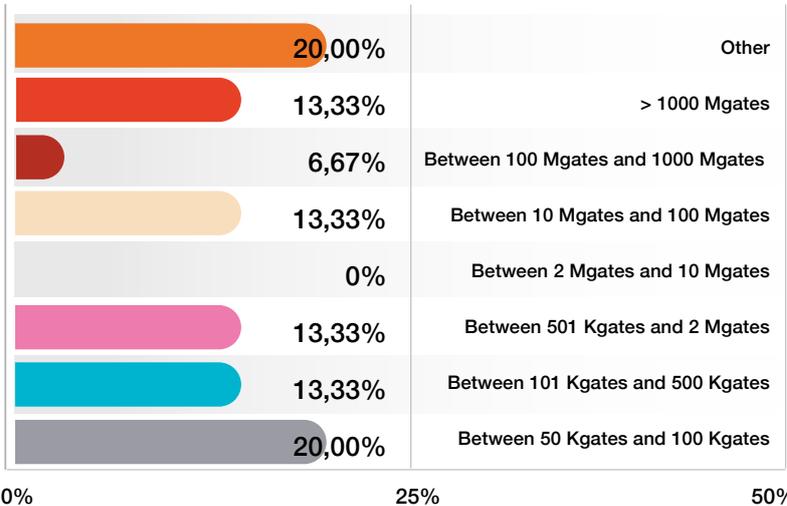
The next **level of complexity** in the Spanish ecosystem is in **digital design**. These designs usually include embedded memories and ARM or RISC-V type microprocessors, as well as neural networks for deep-learning:

The “other” category includes superconducting qubit chips and 10 Kgates.

In the case of **photonic chips**, companies do not use electronic gates, as in integrated photonics, and complexity is not measured in gates (transistors) but in functional blocks, which are much more diverse. Complexity would currently be between 10-100 on average.

A complexity of > 1 billion gates (logic gates) is the highest in the Spanish design ecosystem and represents 13.33% of all companies, although one of them is not established in Spain as a design centre.

Fig. 10. Complexity of digital designs (Measurements are a percentage of the total number of responses).



³ FDSOI (Fully Depleted Silicon On Insulator): A technological process marketed by STMicroelectronics. This consists of a planar process technology that is structured around two main innovations: First, an ultra-thin insulator layer, known as buried oxide, is placed on top of the silicon base. Then a very thin silicon film implements the transistor channel. Thanks to its thinness, there is no need to dope the channel, which means that the transistor is completely depleted.

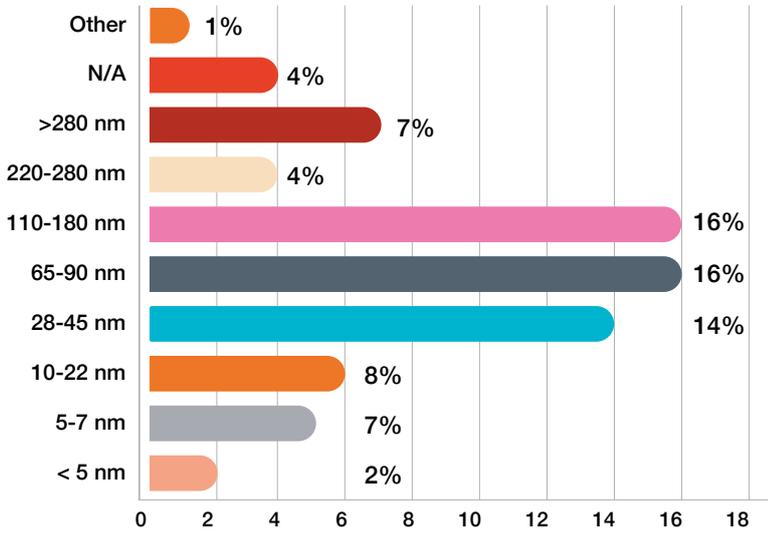


Fig. 11 Technology nodes used in the Spanish microelectronics ecosystem as a percentage of the total number of technology nodes considered.

4.2.4 Technology nodes used

The technology nodes used by companies in the Spanish semiconductor ecosystem are as follows:

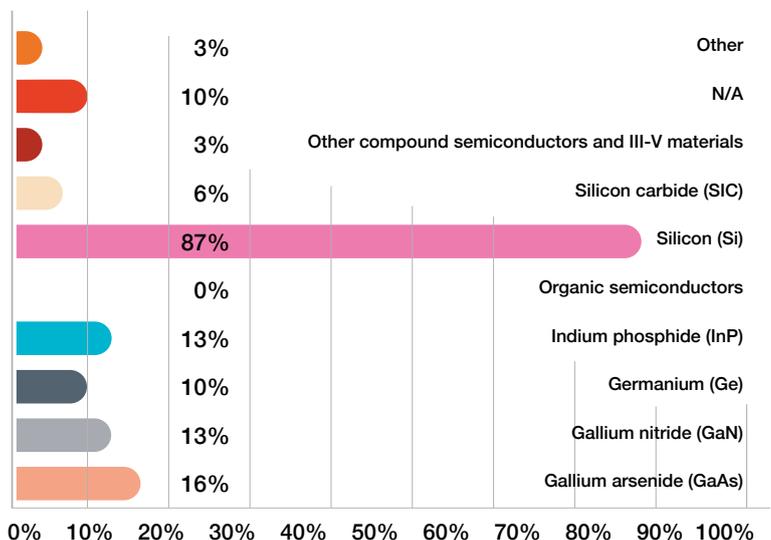
It should be noted that nodes in the 5-7 nm range are used by 22.58% of the ecosystem, including companies that design chips with RISC-V architecture and which support machine learning for the telecommunications market and Edge processing.

In terms of technology percentages, the 65-90 nm and 110-180 nm nodes are at the forefront, each with 20% of the total. The 5-7 nm node corresponds to 9% of all the technologies used. With regard to the 9% in 5-7 nm nodes, it should be noted that 7% corresponds to IP providers that use them in FPGAs manufactured in the 5-7nm technology node. (See Fig. 11).

Fig. 12 Distribution of the types of semiconductor materials used in the Spanish semiconductor ecosystem expressed as a percentage.

4.2.5 Semiconductor materials used

The Spanish ecosystem includes companies dedicated to photonics, optoelectronics, MEMs, sensors, RF, high-speed digital processors, etc. This suggests that optimised semiconductor materials are used for optical communications applications, wide bandgap materials (WBG) such as the GaN widely used for better energy efficiency and other compound semiconductors, in addition to silicon, which is obviously the primary material and is used by 87.1% of all respondents.



4/ Spanish Semiconductor Ecosystem

4.2.6 Use of microprocessors in SoCs

A key aspect in the vast majority of SoCs is the use of microprocessors to run application algorithms, such as for control, data processing, etc. The de facto standard processor used in the industry, especially for automotive and consumer applications, is the ARM, a RISC (Reduced Instruction Set Computer) type processor.

RISC-V was born in 2010 as part of a project organised by the Silicon Valley academic community, in particular the University of California at Berkeley and Stanford. RISC-V is a standard architecture managed by a foundation, a RISC architecture just like ARM, with an even simpler set of instructions, but most importantly, one that is open and modular.

RISC-V architecture has gained significant momentum recently and is supported by companies including Intel or Samsung. As a result, it is gaining more and more ground and is becoming a standard that has the advantage of being open and modular.

Fig. 13 shows the distribution of microprocessors used in SoCs in the Spanish semiconductor ecosystem.

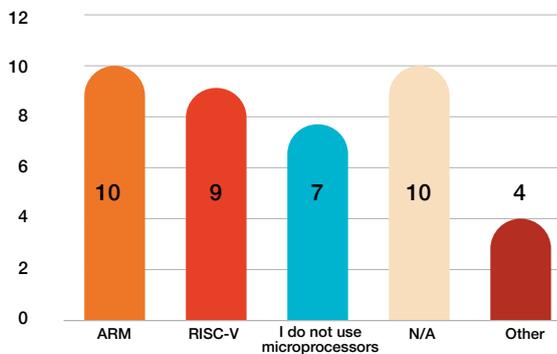


Fig. 13 distribution of microprocessor use in SoCs by the Spanish semiconductor ecosystem. Source: Semico Research

“Others” include ARC, Tensilica, Power Architecture and in-house microprocessors.

Source: Semico Research.

Semico Research has produced a market forecast for RISC-V CPU cores in which it predicts that around 80 billion chips containing the RISC-V core will be in use as CPUs by 2025 (see Fig. 14). The colours in the graph correspond to the applications in which RISC-V is most often used. “Communications” stands out, followed by “others” (defence, space, health, etc.) and in third place comes “industrial” (industry 4.0, robotics, etc.). The bottom line is that it has been estimated that by 2025 more than 14% of the CPU core business will be captured by RISC-V in almost all applications and in a broad set of technical performance levels.

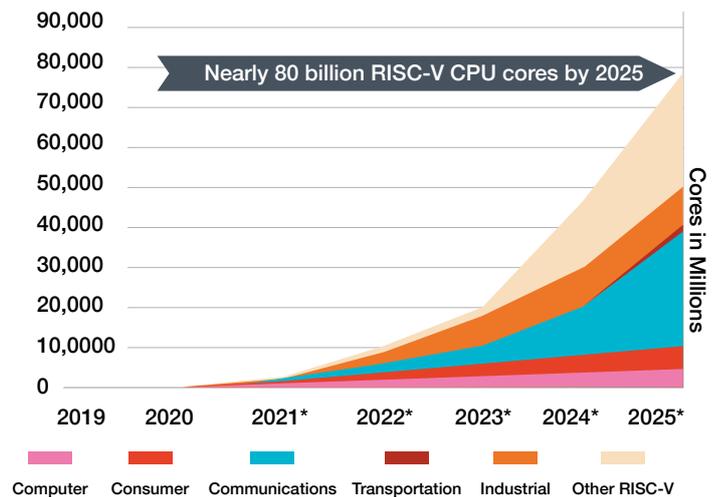


Fig. 14 Forecasted RISC-V core use in chip design until 2025.

* Semico Research predicts the market for RISC-V CPU cores will grow at 114.9% CAGR from 2025-25. By 2025, RISC-V cores will capture over 14% of the overall CPU core business across all major end applications, targeting as broad range of performance levels

4.2.7 Use of Embedded Memories

When using microprocessors, AI, DSP, etc. it is essential to use built-in memories for several reasons: better access time, elimination of bottlenecks, cybersecurity protection, etc.

Companies in the Spanish ecosystem use the embedded memories in their SoCs shown in the figure on the right.

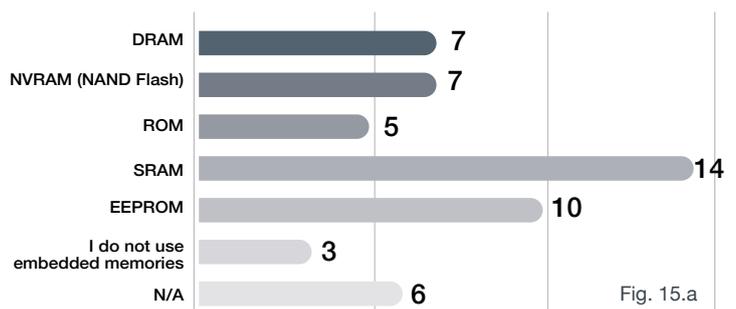


Fig. 15.a

4.2.8 Heterogenous integration (Chiplet)

Heterogeneous integration, as defined by HIR⁴, corresponds to the integration of separately manufactured components (generally chips using different technologies or even different semiconductors, such as a GaN chip with one 22 nm silicon chip and another 65 nm chip) in a higher level assembly (SiP) that, when combined, provide enhanced functionality and operational characteristics.

With the continuous reduction in chip size (< 10 nm), the continuation of Moore's Law becomes increasingly difficult. Heterogeneous integration has now become one of the most important trends in electronic technology, and presents significant challenges.

Focusing on problems including system integration and interconnection in orders of magnitude ranging from submicrons to 10 µm, 3D heterogeneous integration formed by multiple chip connections on package substrates compatible with active through-silicon vias breaks the scale barrier of micro-nano technology with system integration at an acceptable cost.

Although only 3% of companies in the ecosystem currently use it, more than 50% plan on using it. It is a technology that is constantly evolving, closely related to complex systems and systems that use chips that employ different technologies to optimise behaviour (consumption, latency, etc.).

4.2.9 Use of Operating Systems in SoCs

As can be seen in Fig. 15.b, most companies using OS on their SoCs use the LinuxOS, as it is a non-proprietary operating system.

The use of microprocessors that incorporate LinuxOS will in principle expand the market for these chips, this operating system (OS) being widely used t as it is both open source and non-proprietary, something which has undoubted advantages, such as the absence of royalties, which favours better prices. Furthermore, Linux is considered to be more secure than other operating systems because of its strong user and file permissions, secure architecture and updates provided by the open source community.

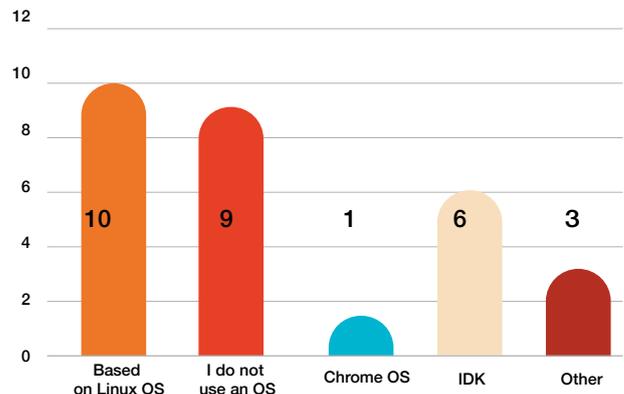
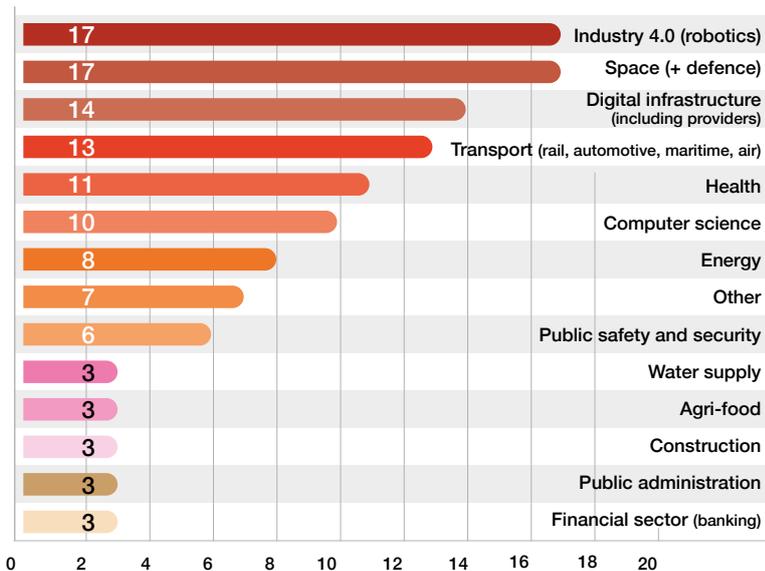


Fig. 15.b Distribution of operating systems used in SoCs



4.2.10 Sectors of use of SoCs in the design ecosystem

The industrial sectors Spanish companies work with most are space and defence and Industry 4.0 (robotics), followed by digital infrastructures (wireless and wired (optical) communications networks and data centres, transport, including the automotive, rail, air and maritime sectors, and in fourth position the health sector.

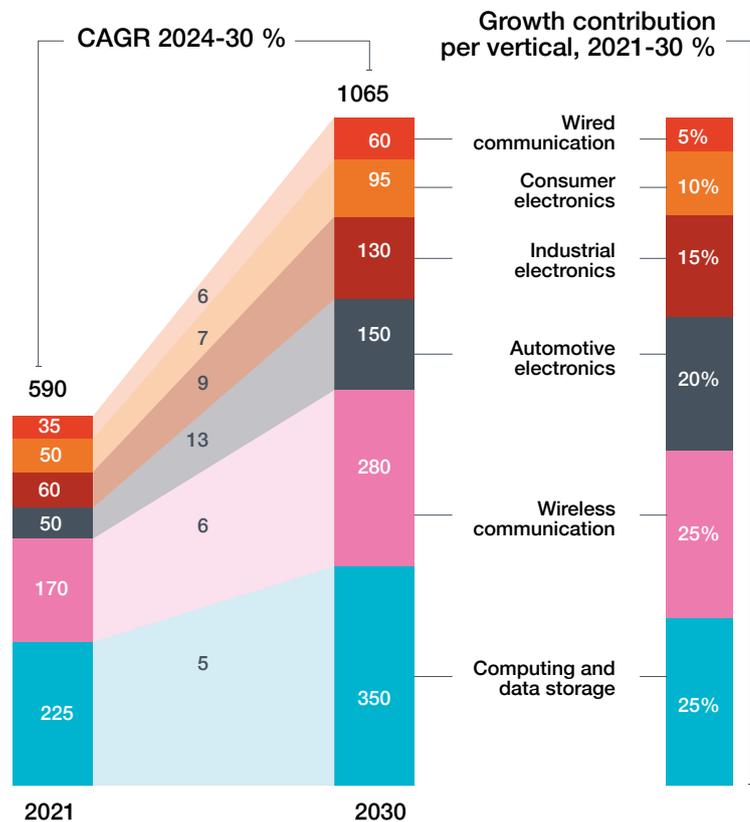
Fig. 16 Distribution of industrial sectors to which the companies surveyed sell their chips.

4 HIR = Heterogeneous Integration Roadmap

Fig. 17 Distribution of global semiconductor market value, broken down by industrial applications. Source: McKinsey.

Fig. 17 shows the distribution of the (vertical) global market by application segments and its CAGR, 2021-2030, as a percentage. The percentage growth contribution of the global semiconductor market in the period 2021-2030 by market segment is shown on the right, The **automotive sector** has the highest CAGR, 13%, and contributes 20% to the sector's total growth. The next highest CAGR is the **industrial sector** (IoT, Industry 4.0, etc.) at 9% and here the contribution to the sector's total growth during the period in question was 15%.

In this respect, there is an alignment with the **Spanish microelectronics ecosystem**, as **Industry 4.0** is where most companies sell their designs, as well as in the **automotive** sector. The **space/defence** sector is the most important sector for the national microelectronics industry in Spain. It is a sector that offers high added value, and it has the capacity to be a driving force towards other sectors, as it involves the widespread development of optoelectronics, photonics and RF, which can also be applied to other rapidly growing sectors such as the automotive industry and Industry 4.0.



4.2.11 Technology innovation in Fabless

In microelectronics, technological innovation is a strong driver of sales, as well as a launchpad into new industrial sectors.

A large part of the technological innovation at fabless companies is possible thanks to advances in technological processes, new materials, etc., as a result of R&D in these fields undertaken by companies, technology centres, and universities, as well as in the R&D of new algorithms applied to EDA tools.

In the Spanish semiconductor ecosystem, 90% of respondents reported that they have collaborated with other institutions on RD&I projects. Almost 93% of the companies surveyed have collaborated with one another, and more than 96% have done so with technology centres and university groups, making it a sector fully aligned with open innovation.

The aspects most appreciated by companies as a result of collaboration with academia include access to resources, such as clean room infrastructures, specialist talent and new areas of knowledge, as well as prototyping, collaboration on European projects and mutual learning.

4.3 ELECTRONIC EQUIPMENT MANUFACTURERS

In accordance with the glossary in the semiconductor value chain section of this study, the term **“electronic equipment manufacturers”** refers to 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. They also usually produce the software and control the reliability and quality of the equipment they supply. These manufacturers usually market their equipment across different industries (downstream industries), although some of those known as “downstream industries” may be vertically integrated and considered to be electronic equipment manufacturers as well. For example, medical equipment such as blood pressure monitors designed and manufactured by an electronic equipment manufacturer such as OMRON, which can also be considered a downstream industry in the health sector and sold to the end customer through pharmacies or parapharmacies.

“Electronic Equipment Manufacturers” as buyers of semiconductor components and SoCs are therefore part of the last link in the semiconductor value chain, and fabless companies and IDMs are interested in supplying them with products that 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).

4.3.1 Typology of microelectronic components used

In order to determine whether there is a good fit between the needs of the equipment manufacturers and what the design companies (fabless companies and IDMs) have to offer,

efforts were made to find out what type of microelectronic components are used by the electronic equipment manufacturers in their designs.

Although fabless companies and IDMs in the ecosystem offer a global supply, it is interesting to understand whether demand from the electronic equipment manufacturers that supply the different industrial sectors (downstream industry) can also be satisfied by components in the Spanish microelectronics ecosystem in the strictest sense.

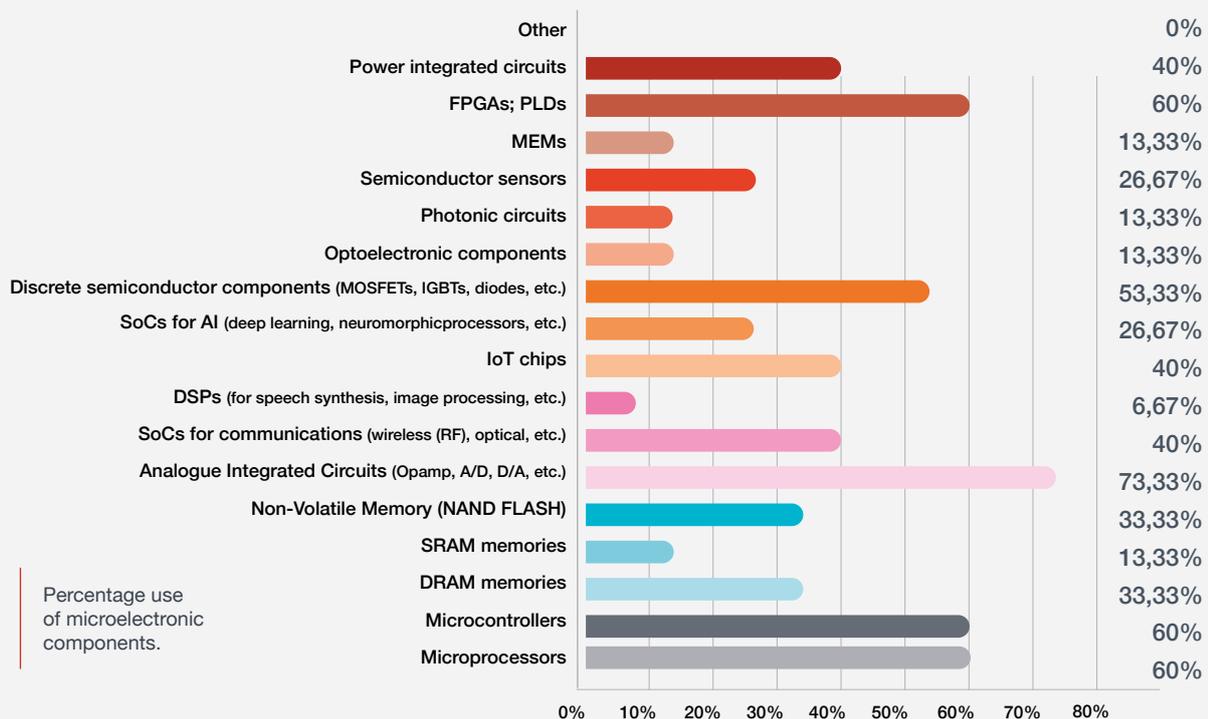
The aim of this study is essentially to obtain a map of the Spanish microelectronics ecosystem, and a sample of electronic equipment manufacturers was therefore selected to see which components were the most in demand and, in particular, whether these manufacturers could be integrated into the value chain strictly speaking, i.e. whether they could somehow become component designers (fabless). The aim is to match the supply made available by the fabless and IDM ecosystem

with the demand from electronic equipment manufacturers, and to see what percentage of their needs can be satisfied within the Spanish microelectronics ecosystem.

4.3.2 Electronic equipment manufacturers moving to Fabless

As systems become more and more integrated and complex, electronic equipment manufacturers are tending to make their systems progressively more SoC and SiP in order to stand out from the competition, designing their systems in-house through their engineering and RD&I departments.

In the case of the Spanish ecosystem, electronic equipment manufacturers were asked whether they are considering designing their own SoCs and SiPs in-house or creating a fabless company in the near future (3 to 5 years). 53% said yes, 33% said they had no plans to do so, and the remaining 13% replied that they had not considered it.



4/ Spanish Semiconductor Ecosystem

REPORT

Fig. 18.a Distribution of customer sectors served by the electronic equipment manufacturers surveyed

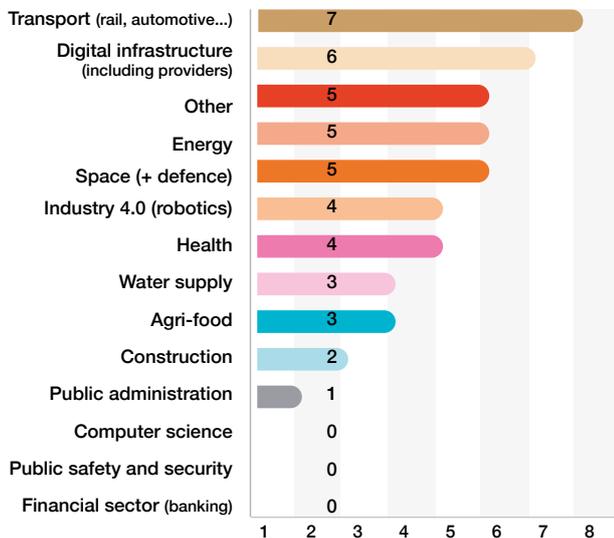


Fig. 18.b Distribution of IDM companies, foundries and OSAT companies, by type of semiconductor components.

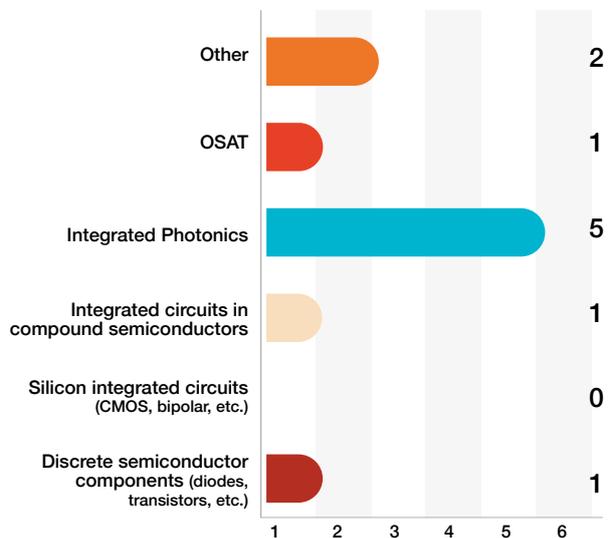
4.3.3 Customer sectors of
electronic equipment manufacturers

Figure 18.a shows the main target sectors for electronic equipment and software suppliers.

“Others” includes:

- Oil and gas, steel, paper, cement, chemicals, etc.
- Digital TV entertainment (consumer electronics, telecommunications operators)
- Oceanographic research
- Defence
- IoT

4.4 “FRONT-END” AND “BACK-END”
SEMICONDUCTOR MANUFACTURING

“Front-end” manufacturing consists of the implementation of chips on semiconductor wafers, by transferring the designs (generally by using a photolithographic process) produced by fabless or IDM companies onto the wafer itself. These designs consist of a series of masks that define the circuit in a given technological node, and depending on the node and the type of technology, the process may involve a higher or lower number of masks.

“Back-end” manufacturing consists of the process known as assembly, testing and encapsulation.

Almost 39% of companies in the Spanish semiconductor ecosystem engage in front-end and/or back-end manufacturing, compared to 61% that do not and have no plans to do so in the future.

Regarding the types of components manufactured, **integrated photonics**, is once again the most important, as reflected in Fig. 18.b

The level of specialisation required by the sector is very high. Within the Spanish ecosystem we found a manufacturer of mini-cameras for mobile phones, VR/AR/MR goggles and robotics that described itself as a FSOV-FAT (Fabless Semiconductor and Optical Vendor with Final Assembly and Testing) and whose main added value lies in its algorithms and the manufacture of cameras, and chiplets that require a manufacturing precision of 10 nm in the alignment between optics and electronics.

We also found a manufacturer of prototypes and a small series of integrated circuits and semiconductor components for very specific applications.

4.5 SEMICONDUCTOR MANUFACTURING
EQUIPMENT AND MATERIAL SUPPLIERS

There are several equipment manufacturers in the Spanish ecosystem, specifically:

Front-end:

ION IMPLANTATION / SPUTTERING TARGETS (2)
PLATING - CLEANERS - ETCHING - CATALYST - ENIG - ENEPIG - ENIGAG - Gold Plating (Immersion/Electrolytic) - Pd Plating (Immersion/Electrolytic) - Nickel Plating Ni/NiP (Electroless/Electrolytic), WIRE BONDING.

Back-end:

Silicon wafer metrology at multiple stages of the chip manufacturing chain.

There are also suppliers of chemical products and gases for the manufacture of chips in the Spanish market.

5. ACADEMIA: Technological Centres and University R&D Groups in Microelectronics

5.1. CURRENT UNIVERSITY TRAINING OFFER (ACADEMIC YEAR 2022-2023)

The following is a summary of the **university-level training currently available at Spanish universities in topics related to PERTE Chip**. The data has been provided informally by the members of the universities participating in the Working Group, and includes the information received up to 31 March 2023.

Source: The ACADEMIA-AMETIC Working Group prepared a specific document on the university-level training currently available on key topics related to the PERTE Chip. The following table is merely an extract.

It considers both the number of places offered and the average number of graduates in recent years, as this information is considered useful for understanding the difficulties involved in attracting students to these courses, as well as the existing training capacities with current resources.

Table summarising the university-level training currently available at Spanish universities

Source: The ACADEMIA-AMETIC Working Group prepared a specific document on university-level training - the following table is merely an extract.

Explanatory notes for reading the columns

Type	G: Bachelor's M: Master's D: Doctorate O: other (own degrees)
Name	Name of the pathway/specialisation that fulfils the conditions defined in the instructions.
Maximum places offered	For all pathways/specialisations in the degree programme
Graduates/academic year	Average number of graduates (approx.) in past 3 years
Graduates/academic year	For pathway/specialisation or optional subjects, only those who have fulfilled the requirement in terms of credits taken (see instructions).

To define the **type of training in microelectronics** involved in each degree programme and to display it in the following table, a convention has been established by using numbers for four types of training, as follows:

Nº	Type of training
1	Basic training in semiconductor technologies
2	Basic training in microelectronic design
3	Specialist training in semiconductor technologies
4	Specialist training in microelectronic design

5/ ACADEMIA

Technology centres and university groups involved in Microelectronics R&D

Bachelor Degrees

Ranging from those with the highest content in microelectronics to those with the lowest.

University	Specialisation/ Optional subjects	Training Type	Speciali- sation	Places	Gradu- ates
Autonomous University of Madrid (UAM)	Degree in Physics	Analogue and digital electronics/ Functional materials	1	125	101
Autonomous University of Madrid (UAM)	Bachelor's Degree in Technology and Telecommunications Services Engineering	Electronics/ Technology specific to electronic systems	2	66	45
Charles III University of Madrid (UC3M)	Bachelor's Degree in Industrial Electronics and Automation Engineering		2	115	120
Complutense University of Madrid (UCM)	Bachelor's Degree in Electronic Communications Engineering		2	50	20
University of Alcalá (UAH)	Bachelor's Degree in Industrial Electronics and Automation Engineering	Electronic Design/ Advanced Digital Electronic Systems	2	75	56
University of Alcalá (UAH)	Bachelor's Degree in Electronic Communications Engineering		2	75	21
University of Alcalá (UAH)	Double Bachelor's Degree in Electronic Communications Engineering and Electronics and Industrial Automation Engineering		2	25	(ongoing)
University of Alcalá (UAH)	Bachelor's Degree in Telecommunications Technology Engineering		2	75	22
University of Alcalá (UAH)	Bachelor's Degree in Telecommunications Systems Engineering	Photonic Technologies/ Electronic Subsystems/ Advanced Digital Echo Systems	2	75	17
University of Alcalá (UAH)	Degree in Electronic Engineering	Photonic Technologies/ Electronic Subsystems/ Advanced Digital Echo Systems	2	75	18
University of Cantabria (UNICAN)	Bachelor's Degree in Telecommunications Technology Engineering	Electronic Systems		25	10
University of Extremadura (UEX)	Bachelor's Degree in Electronic and Automation Engineering (Industrial Branch)	Industrial electronics intensification		80	15
University of Extremadura (UEX)	Bachelor's Degree in Industrial Technology Engineering	Industrial electronics intensification		50	12
University of Granada (UGR)	Bachelor's Degree in Industrial Electronic Engineering		1.2	65	39
University of Granada (UGR)	Bachelor's Degree in Telecommunications Technology Engineering	Electronic Systems	1.2	100	20
University of Las Palmas de Gran Canaria (ULPGC)	Bach. of Engineering. Degree in Electronics and Telecommunication Technologies		1,2,3,4	50	30
University of Las Palmas de Gran Canaria (ULPGC)	Bach. of Engineering Degree in Industrial Electronics and Automatic Control		1.2	25	10

University	Specialisation/ Optional subjects	Training Type	Speciali- sation	Places	Gradu- ates
University of Las Palmas de Gran Canaria (ULPGC)	Bachelor's Degree in Chemical Engineering		1.3	25	20
University of Málaga (UMA)	Bachelor's Degree in Computer Engineering			60	8
University of Málaga (UMA)	Bachelor's Degree in Electronic Systems Engineering			120	18
University of Málaga (UMA)	Bachelor's Degree in Telecommunications Technology Engineering			96	22
University of Málaga (UMA)	Bachelor's Degree in Industrial Electronic Engineering			90	27
University of Málaga (UMA)	Bachelor's Degree in Electronic Engineering, Robotics and Mechatronics			72	44
University of Navarre (UNAV-Tecnun)	Bachelor's Degree in Industrial Electronic Engineering		2	90	10
University of Navarre (UNAV-Tecnun)	Bachelor's Degree in Telecommunications Systems Engineering		2	90	15
University of Oviedo (UO)	Bachelor's Degree in Technology and Telecommunications Services Engineering	Specialisation in Electronic Systems	2	110	10
University of Oviedo (UO)	Bachelor's Degree in Industrial Electronics and Automation Engineering	Specialisation in Electronics for Energy Efficiency	2	110	20
University of Salamanca (USAL)	Degree in Physics		1.2	80	50
University of Salamanca (USAL)	Design, Manufacture and Characterisation of THz Sensors		3.4	unlimited	
University of Salamanca (USAL)	Atomistic TCAD design of advanced transistors		3.4	unlimited	
University of Seville (USE)	Bachelor's Degree in Telecommunications Technology Engineering		1	150	30
University of Seville (USE)	Bachelor's Degree in Industrial Technology Engineering			150	30
University of Valladolid (UVa)	Bachelor's Degree in Technology Engineering Specific to Telecommunications	Specialisation in Electronic Systems	1.2	100	29
University of Valladolid (UVa)	Bachelor's Degree in Industrial Electronics and Automation Engineering		2	120	42
Miguel Hernández de Elche University (UMH)	Bachelor's Degree in Telecommunications Technology Engineering	Electronic Systems	2	75	30
Polytechnic University of Madrid (UPM)	Bachelor's Degree in Technology and Telecommunications Services Engineering	Electronic Systems	2	330	40
Polytechnic University of Madrid (UPM)	Bachelor's Degree in Materials Engineering	Functional Materials	1	90	5

5/ ACADEMIA

Technology centres and university groups involved in Microelectronics R&D

University	Specialisation/ Optional subjects	Training Type	Speciali- sation	Places	Gradu- ates
Polytechnic University of Madrid (UPM)	Bachelor's Degree in Electronic Communications Engineering		2	67	45
Polytechnic University of Madrid (UPM)	Double Bachelor's Degree in Electronic Communications Engineering and Electronic Engineering		2	20	----
Polytechnic University of Madrid (UPM)	Bachelor's Degree in Industrial Electronics and Automation Engineering	n/a	2	100	70
Polytechnic University of Madrid (UPM)	Double Bachelor's Degree in Electrical Engineering and Electronic Engineering	n/a	2	20	15
Public University of Navarre (UPNA)	Bachelor's Degree in Electrical and Electronic Engineering		2	72	25
Public University of Navarre (UPNA)	Bachelor's Degree in Telecommunications Technology Engineering	Telecommunications systems	2	60	36
Rey Juan Carlos University (URJC)	Bachelor's Degree in Industrial Electronics and Automation Engineering	Manufacturing Technologies, Structure of Electronic Components, Circuit Design and Electronic Systems	1.2	50	
Rey Juan Carlos University (URJC)	Bachelor's Degree in Telecommunications Engineering	Digital Systems, Radiation and Propagation, Computer Architecture, Broadband Communications	1.2	200	80
Autonomous University of Barcelona (UAB)	Bachelor's Degree in Electronic Telecommunications Engineering		2	140	40
Autonomous University of Barcelona (UAB)	Double Bachelor's Degree in Computer Engineering and Electronic Telecommunications Engineering		2	20	18
University of Barcelona (UB)	Bachelor's Degree in Electronic Telecommunications Engineering			50	30
University of Barcelona (UB)	Degree in Physics	Applied specialisation		100	80
University of the Balearic Islands (UIB)	Bachelor's Degree in Industrial Electronics and Automation Engineering		2	60	25
Polytechnic University of Catalonia (UPC)	Bachelor's Degree in Electronic Telecommunications Engineering	Electronic systems, microelectronics	1.2	50	35
Polytechnic University of Catalonia (UPC)	Bachelor's Degree in Technology and Telecommunications Services Engineering	Electronic systems	2	220	25
Polytechnic University of Valencia (UPV)	Bachelor's Degree in Technology and Telecommunications Services Engineering	Electronic Systems	2	140	33
Polytechnic University of Valencia (UPV)	Bachelor's Degree in Engineering Physics		1.2	75	

Master's Degrees with microelectronics content

University	Specialisation/ Optional subject	Training type	Speciali- sation	Places	Grad- uates
Autonomous University of Madrid (UAM)	Master's Degree in Advanced Materials, Nanotechnology and Photonics	Introduction to Nanotechnology and Optoelectronics	3	40	19
Autonomous University of Madrid (UAM)	Master's Degree in Telecommunications Engineering	Electronic systems and devices: embedded electronic systems, sensors and actuators, control technology	4	40	18
Charles III University of Madrid (UC3M)	Master's Degree in Photonic Engineering		1.2	20	8
Charles III University of Madrid (UC3M)	Master's Degree in Electronic Systems Engineering and Applications		2.4	30	26
Complutense University of Madrid	Master's Degree in New Electronic Technologies and Photonics		1.2	25	12
University of Alcalá (UAH)	Master's Degree in Electronic Engineering		2	20	13
University of Alcalá (UAH)	Master's Degree in Telecommunications Engineering	Specialisation in Space and Defence Technologies	2	100	18
University of Extremadura (UJEX)	Master's Degree in Industrial Engineering	Electronic systems and industrial instrumentation		30	10
University of Extremadura (UJEX)	Master's Degree in Engineering and Architecture Research	Microelectronics research		30	10
University of Granada (UGR)	Master's Degree in Industrial Electronics		3.4	60	10
University of Granada (UGR)	Master's Degree in Telecommunications Engineering		4	60	15
University of Las Palmas de Gran Canaria (ULPGC)	Master's Degree in Computer Engineering		2	15	5
University of Las Palmas de Gran Canaria (ULPGC)	Master's Degree in Telecommunications Engineering		1,2,3,4	15	10
University of Las Palmas de Gran Canaria (ULPGC)	Master's Degree in Industrial Engineering		1.3	25	20
University of Las Palmas de Gran Canaria (ULPGC)	Master's Degree in Applied Electronics and Telecommunications		3.4	15	9
University of Málaga (UMA)	Master's Degree in Telecommunications Engineering			24	7
University of Málaga (UMA)	Master's Degree in Electronic Systems for Smart Environments			42	14

5/ ACADEMIA

Technology centres and university groups involved in Microelectronics R&D

University	Specialisation/ Optional subject	Training type	Speciali- sation	Places	Grad- uates
University of Málaga (UMA)	Master's Degree in Mechatronics			48	16
University of Oviedo (UO)	Master's Degree in Telecommunications Engineering		2	45	11
University of Salamanca (USAL)	Master's Degree in Physics and Mathematics	Specialisation: Applied Physics	1,2,3,4	30	5
University of Salamanca (USAL)	Master's Degree in Physics and Laser Technology	Nanomanufacturing	1,2,3,4	30	15
University of Salamanca (USAL)	Master's Degree in Semiconductors and Electronics for Sustainable Technologies		1,3	20	
University of Seville (USE)	Master's Degree in Microelectronics: design and application of micro/nanometric Systems		2,4	30	20
University of Seville (USE)	Master's degree in Electronic Engineering, Robotics and Mechatronics	Electronic engineering	1	75	40
University of Seville (USE)	Master's Degree in Telecommunications Engineering	Internet of Things	1	50	30
University of Valladolid (UVa)	Master's Degree in Telecommunications Engineering		2,4	50	15
University of Valladolid (UVa)	Master's Degree in Physics	Materials Physics	1,3	40	10
Miguel Hernández de Elche University (UMH)	Master's Degree in Telecommunications Engineering		2	30	12
Polytechnic University of Madrid (UPM)	Master's Degree in Telecommunications Engineering	Electronics	2	180	8
Polytechnic University of Madrid (UPM)	Master's Degree in Materials Engineering	Functional Materials	1	90	5
Polytechnic University of Madrid (UPM)	Master's Degree in Industrial Electronics		2,4	84	20
Polytechnic University of Madrid (UPM)	Master's Degree in Electromechanical Engineering	n/a	2	30	15
Polytechnic University of Madrid (UPM)	Master's Degree in Electronic Systems Engineering	None	2	35	22
Public University of Navarre (UPNA)	Master's Degree in Industrial Engineering	Industrial electronics	2	34	20
Rey Juan Carlos University (URJC)	Master's Degree in Telecommunications Engineering	Digital Devices and Microelectronics	1,2	50	5
Rey Juan Carlos University (URJC)	Master's Degree in Industrial Engineering	Digital Devices and Microelectronics	1,2	50	25
Autonomous University of Barcelona (UAB)	Master's Degree in Telecommunications Engineering		4	40	20
Autonomous University of Barcelona (UAB)	Master's Degree in Nanoscience and Advanced Nanotechnology	Nanoelectronics	3	30	7

University	Specialisation/ Optional subject	Training type	Speciali- sation	Places	Grad- uates
Polytechnic University of Catalonia (UPC)	Master's Degree in Electronic Engineering	Electronic systems, microelectronics	2.4	60	26
Polytechnic University of Catalonia (UPC)	Master's Degree in Telecommunications Engineering	Electronic systems	2	80	3
Polytechnic University of Valencia (UPV)	Master's Degree in Telecommunications Engineering	Microelectronics	2.3	100	5
Polytechnic University of Valencia (UPV)	Master's Degree in Telecommunications Engineering	Integrated Photonics	2	100	20
Polytechnic University of Valencia (UPV)	Master's Degree in Telecommunications Engineering	Other specialisations	2	100	50
Polytechnic University of Valencia (UPV)	Master's Degree in Electronic Systems		2.4	60	50
University of Barcelona (UB)	Master's Degree in Nanoscience and Nanotechnology			30	10

Doctoral degrees with microelectronic content

University	Name	Maximum Places	Gradu- ates	Training type
University of Las Palmas de Gran Canaria (ULPGC)	PhD in Chemical, Mechanical and Manufacturing Engineering	3	15	7
University of Las Palmas de Gran Canaria (ULPGC)	PhD in Telecommunications Technologies and Computer Engineering	3.4	15	10

Universities' own degrees with microelectronic content

University	Name	Maximum Places	Gradu- ates	Training type
University of Cantabria (UNICAN)	Master's Degree in Modular Microelectronics	30		

5/ ACADEMIA

Technology centres and university groups involved in Microelectronics R&D

5.2. CURRENT VOCATIONAL TRAINING OFFER

INTERMEDIATE LEVEL VOCATIONAL TRAINING

It does not seem appropriate to propose new **intermediate level vocational training** programmes (16+ years of age) on account of the limited professional skills at an occupational level.

There are two intermediate level vocational training courses currently available, in the field of electricity and electronics, and there is a module on electronics, which is suitable as a basis for the subsequent pursuit of higher level vocational training studies.

Scan the QR No. 1 for more information

Intermediate-level vocational training in electrical and automatic installations

Scan the QR No. 2 for more information

- Professional module 9: electronics
- Duration: 66 hours
- Training units included:
 - Digital electronics: 26 hours
 - Analogue electronics: 40 hours

Intermediate-level vocational training on electrical and automatic installations currently available:

General information on the course, as well as the Royal Decree related to the syllabus can be found at the **QR No. 3**.

In Spain, this course is offered at 501 vocational training centres, and you can find the name and characteristics of each centre by **scanning QR No. 4**. Each centre offers 30 places per academic year, although specific details of how many were filled could not be determined.

Job placement information for this programme can be found by **scanning QR No. 5**.

Intermediate vocational training on telecommunications installations

Scan QR No. 6 for more information

- Professional module 9: applied electronics
- Duration: 231 hours
- Training units included:
 - Direct current circuits and electromagnetism. 39 hours
 - Alternating current circuits. 39 hours
 - Analogue electronics. 53 hours
 - Non-programmable digital electronics. 40 hours
 - Microprogrammable digital electronics. 60 hours

Intermediate-level vocational training currently available at telecommunications installations:

General information on the course, as well as the Royal Decree related to the syllabus can be found at **QR No. 7**.

In Spain, this course is offered at 263 vocational training centres and you can find the name and characteristics of each centre by **scanning the QR No. 8**.

Each centre offers 30 places per academic year, although specific details of how many were filled could not be determined.

Job placement information for this programme can be found by **scanning QR No. 9**.



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Advanced-Level Vocational Training

With respect to **advanced-level vocational training** (18 + years of age), a course in “Advanced Electronic Maintenance Training” is currently available in **QR No 10**.

Advanced level vocational training currently available for Electronic Maintenance:

General information on the course, as well as the Royal Decree related to the syllabus can be found at **QR No 10**.

In Spain, this course is offered at 131 vocational training centres and you can find the name and characteristics of each centre by scanning the **QR No 11**.

Each centre offers 30 places per academic year, although specific details of how many were filled could not be determined.

Job placement information for this programme can be found by scanning **QR No 12**.

11



12



5.3 INFRASTRUCTURE AVAILABLE FOR TRAINING IN MICROELECTRONICS

Below is a list of the specific infrastructure available in the education system and its capacity to provide specialist training regulated by the Working Group up until 31 March 2023.

Source: The ACADEMIA-AMETIC Working Group prepared a specific document on equipment for semiconductor technology. The following table is merely an extract.

Institution	Centre/ Department/ School	ICTS?	Clean Room Surface Area	Techniques
Polytechnic University of Madrid (UPM)	Institute of Optoelectronic and Microtechnology Systems (ISOM-UPM)	Yes	400 m ² + characterisation labs	The types of training to be provided are based on demand by companies: clean room work, welding, cutting, photolithography, e-beam, metal evaporation, etc.
Polytechnic University of Madrid (UPM)	Solar Power Institute (IESUPM)	No	80 m ² + auxiliary and characterisation labs	Semiconductor processing in a cleanroom, in particular photovoltaic devices: epitaxial growth, diffusion furnaces, chemical processes, photolithography, evaporation, RTA, wire encapsulation and soldering, etc. Advanced optoelectronic characterisation techniques
Polytechnic University of Madrid (UPM)	Centre for Advanced ICT Devices and Materials (CEMDATIC-UPM)	No	50 m ² (SL1) + 30 m ² (SL2) + characterisation labs	Processing of materials (insulators, metals, semiconductors) and thin-film electronic and optoelectronic devices in a clean room. Spraying, evaporation, chemical vapour deposition, dry and wet etching, growth and diffusion furnaces, chemical processes, photolithography, evaporation, RTA, encapsulation and wire welding, etc. Advanced optoelectronic characterisation techniques
Polytechnic University of Catalonia (UPC)	Electronic Engineering Department (MNT-UPC)	No	100 m ² + characterisation labs	Thin film deposition. Optical lithography for manufacturing solar cells and photodiodes
Spanish National Research Council (CSIC)	Barcelona Institute of Microelectronics (IMB-CNM, CSIC)	Yes	1500 m ² + labs	Analysing demand to identify processes, stages and techniques. Clean room training on best practices, manufacturing processes, post-processing and back-end. Including the manufacturing and characterisation of an NMOS device (in its extended and complete version)

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Technology centres and university groups involved in Microelectronics R&D

Institution	Centre/ Department/ School	ICTS?	Clean Room Surface Area	Techniques
Polytechnic University of Valencia (UPV)	Nanophotonics Technology Centre (NTC-UPV)	Yes	500 m2 + labs	Assessing the demand and needs of users/ customers in terms of processes and techniques, including best clean room practices, wafer and back-end photonic integrated circuit (PICs) processing
University of Cantabria (Unican)	Communications Engineering Department (DICOM)	No	50 m2+ PCB laser lab, photolithography and LPKF + 100 m2 of characterisation labs up to 80 GHz	Analysing company demand to identify techniques for which training is required: work in a clean room, welding, cutting, photolithography, etc.
Autonomous University of Barcelona (UAB)	Microelectronics and Electronic Systems Department (MiSE-UBA)	No	30m2+ Prototype lab (Design+Fab+Mount+ PCB Testing) + 20m2+ Printed Electronics lab (DMP 2800)	Prototype assembly and analogue-digital testing
University of the Balearic Islands (UIB)	Engineering Department (DE-UIB)	No	100m2 + prototype lab and autom. PCB assembly	Design and testing of MEMS systems and digital circuits
University of Salamanca (USAL)	USAL-NANOLAB	No	150 M2 + LAB. Low Temperatures, Terahertz Lab, Solar Cells Lab, High Frequency Lab, Colloidal Nanomaterials Lab	Processing and characterisation of III-V and 2D Materials
Spanish National Research Council (CSIC)	Institute of Micro and Nanotechnology	No	400 m2 ISO 7+ characterisation labs	Ultraviolet photolithography, metal and oxide thin film deposition, wet and RIE etching, morphological and compositional characterisation (high resolution scanning electron microscope), electron beam lithography, ion beam etching (FIB), X-ray spectroscopy (XRD), molecular beam epitaxy (MBE)
Fundación Instituto Madrileño de Estudios Avanzados en Nanociencia (Nanoscience IMDEA)	Nanoscience IMDEA	No	250 m2+Labs+750 Grey area	Emerging technologies, micro and nanomanufacturing on 2D materials and superconducting thin films. Space and Defence
Complutense University of Madrid (UCM) UII-CAI-TF UCM	Ionic Implementation Unit (Physical Techniques CAI)	No	80 m2 + auxiliary labs	Ionic implantation, rapid thermal annealing, optical lithography, ECR-CVD deposition and Joule and e-beam metallisation
CEIT (University of Navarre)	Ionic Implementation Unit (Physical Techniques CAI)	No	230m2+ 8 RF characterisation posts for undergraduate students + 2 RF characterisation posts up to 110GHz (modular and expandable) for research and master's students	UV lithography, mask aligner. Deposition: PECVD LPCVD, PVD. Etching: RIE, wet etching. Hot stamping. Functional ink printer. Wafer cutter. Ultrasonic welding. Quartz furnaces (thermal oxidation, diffusion and thermal annealing). Surface or structural characterisation: AFM, profilometer, XRD, SEM, FE-SEM, FIB. Automatic test stations: climatic chamber, MFC-based gas mixer, multimeters and picoammeters. Thermographic camera with millimetric resolution. Cascade Microtech 9000 wafer measuring desk. On-wafer temperature characterisation plate: Instek HCC208RF

Institution	Centre/ Department/ School	ICTS?	Clean Room Surface Area	Techniques
Public University of Navarre (UPNA-ISC)	Smart Cities Institute	No	32 m2+labs (currently expanding)	Micro and nano manufacturing laboratory (LAMINA)
Rey Juan Carlos University (URJC-CAT)	Technology support centre	No	25 m2 (1e4 class, ISO7) + another 100 m2 under construction	Complete solar cells production line, LEDs and sensors in an inert atmosphere (dissolution layer processing, contact evaporation, electric arc and oxidation lithography, encapsulation) on a mesoscopic scale. Optical, electrical and surface characterisation laboratory (AFM, profilometry). Electron microscopy centre. PCB prototype and micro antenna characterisation stations
University of Alcalá (UALH)		No	Various laboratories	Various laboratories
Autonomous University of Madrid (UAM)	Microelectronics Laboratory		160 m2 (SL1) + 100 m2 (SL2) + characterisation labs	Photolithography, evaporation of metals and dielectrics, heat treatments, welding, chemical processes, wet and dry etching, ellipsometric thin film characterisation. Analogue and digital tests
University of Las Palmas de Gran Canaria (ULPGC)	IUMA Applied Microelectronics Institute		200 m2 + Prototype Lab (Design+Fab+Mount+Xray-Inspection+ PCBs Test, BGA Test) + 50 m2 Tipping Stations, Bonding and 80 GHz Characterisation Lab + 180 m2 Design Labs ASIC-RFIC-MMIC Full Europractice Tool and Technologies Suite	
University of Las Palmas de Gran Canaria (ULPGC)	IUNAT Natural Resources Institute-FEAM		500 m2 + Photocatalysis Labs, Spectroscopy, Electron Microscopy, Chemical Vapour Deposition, Sputtering, Thin Film, X-ray Diffraction	The IUNAT/FEAM offers its labs for training in chemical-physical techniques, synthesis and characterisation of semiconductor materials, and 2D thin film (graphene)
Microelectronic Institute of Seville (IMSE-CNM-CSIC-US)	Microelectronic Institute of Seville		1000m2 test laboratories + design tools	Supercomputing cluster with professional circuit design tools, as well as 1000m2 of Device Characterisation Laboratories, Optoelectronics, Radiofrequency, A/D Measurements, Pulsed Lasers, Hardware Cybersecurity, Complex Systems, Agilent 93000, Special Assemblies, Encapsulation and Mechanisation and PCB Assembly
University of Granada (UGR) (CITIC-UGR)	Nanoelectronics Laboratory. Computer Technology and Electronics Department		150m2 (clean room) + electronic, photonic and structural characterisation lab	Cleanroom for nanomaterial synthesis (TMDs) and nano and microelectronic processing
University of Barcelona (UB) (DEEB-UB)	Department of Electronic and Biomedical Engineering		200m2 ISO-7+50m2 ISO-6	Photolithography, metal evaporation, sputtering, RIE, AFM, electrical characterisation

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Technology centres and university groups involved in Microelectronics R&D

5.4 HUMAN RESOURCES IN R&D CENTRES IN MICROELECTRONICS

The 13 members from academia in the Spanish ecosystem, who responded to the AMETIC survey, including the most important in the country in Microelectronics R&D, provided information on their HR.

As previously mentioned, collaboration between academia and business is common in the Spanish semiconductor sector. So much so that close to 70% of microelectronics R&D centres have contracts in place with companies in the microelectronics ecosystem for the implementation of projects.

Most contracts are entered into with Spanish fabless companies, followed by other technology centres and universities in collaborations at European and national level, and then in third place, European fabless companies.

HR	Number	
	Minimum	Maximum
Number of people working in R&D in microelectronics in groups, departments or technology centres		
Doctors	223	440
Engineers, Graduates, Postgraduates	282	475
Laboratory Technicians	72	160
Support staff (clerical, etc.)	67	155
Others	134	200
TOTAL	778	1430

5.5 MAIN LINES OF RESEARCH IN MICROELECTRONICS

The research priorities at microelectronics R&D centres in the Spanish semiconductor ecosystem are as seen in Fig. 19.

“Others” includes printed microelectronics, microelectronic system design, sensors and industrial applications for downstream industry.

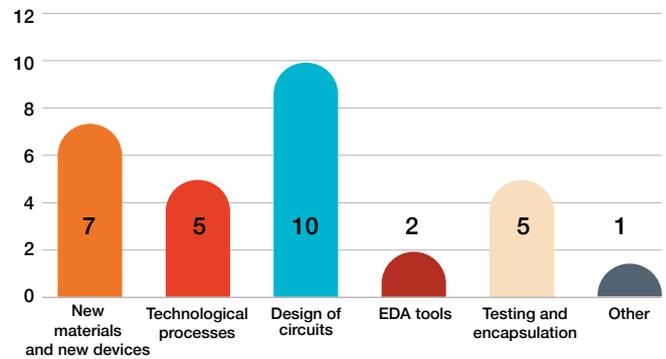


Fig. 19 Research priorities at microelectronics R&D centres in the Spanish semiconductor ecosystem.

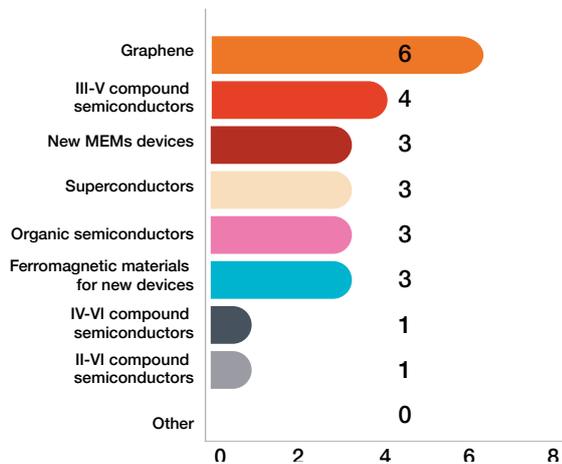
A breakdown of the different research areas is provided here:

Technological processes

Fig. 20 R&D objectives of the “Technological Processes” priority research area at microelectronics R&D centres in the Spanish microelectronics ecosystem.

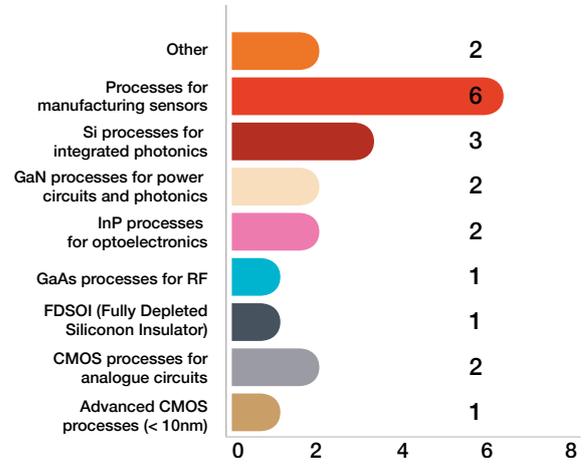
Others:

- InAs QD and III-Sb for photonics and quantum computing.
- Fledgling (quantum and neuromorphic) technologies.



News Materials and Devices

Fig. 21 R&D objectives of the “New Materials and Devices” priority research area at microelectronics R&D centres in the Spanish microelectronics ecosystem.

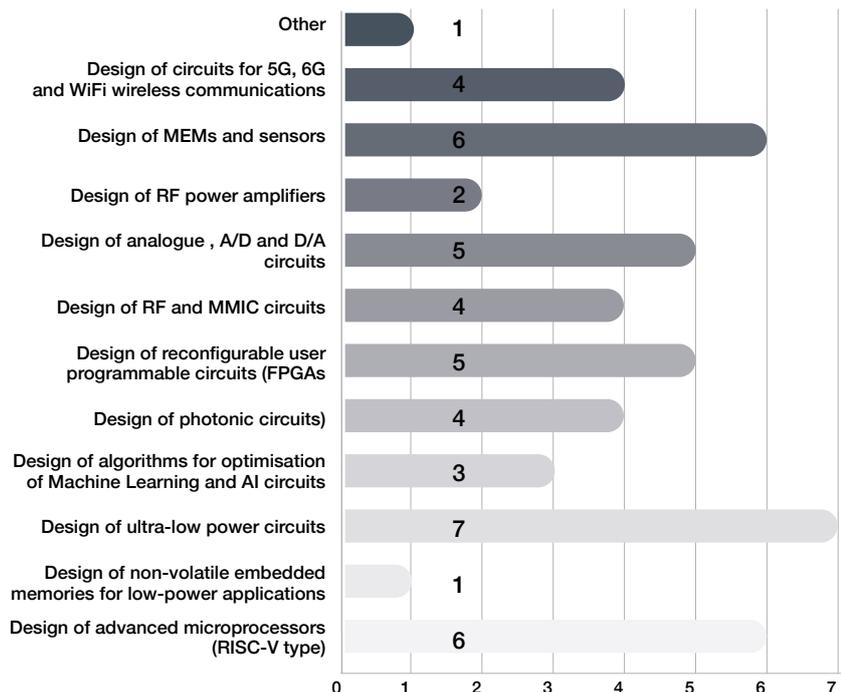


Circuit Design

Fig. 22 R&D objectives of the “Circuit design” priority research area at microelectronics R&D centres in the Spanish microelectronics ecosystem.

Others:

- Firmware, Embedded AI, Lab on Chips
- Systems on Chips, Thin Film Devices



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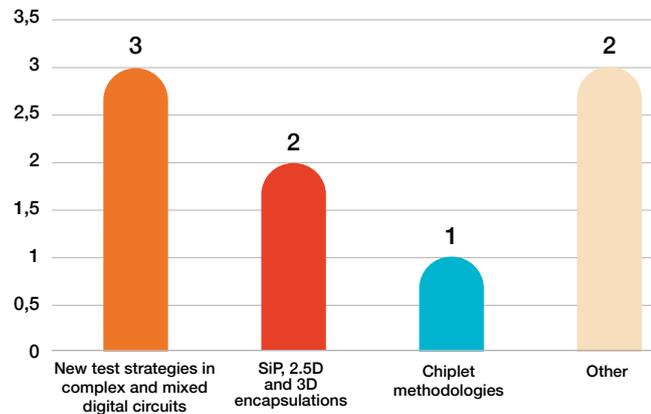
Technology centres and university groups involved in Microelectronics R&D

“Testing and encapsulated” (“back-end”)

Fig. 23 R&D objectives of the “Testing and encapsulated” priority research area at microelectronics R&D centres in the Spanish microelectronics ecosystem.

Others:

- Power encapsulated
- Testing and assembly of very high frequency and high power circuits in GaN technology



EDA tools line

EDA tools	Comments
If you have selected “EDA tools”, please indicate the type of tools involved in your R&D	Compact graphene device models for circuit simulation Non-linear simulation, electromagnetics, etc.

The key factors driving the growth of the EDA software market include incorporating machine learning (ML) concepts into manufacturing processes in an attempt to reduce design costs by allowing the tools to suggest solutions to common design problems. It is therefore possible that groups from university R&D centres, working on ML, can provide solutions to the challenges posed by electronic system design.

5.6 INFRASTRUCTURES

In Spain, microelectronics R&D centres have the following infrastructure available to meet the innovation needs of the industry, as reflected in Fig. 24.

Tipping stations and device characterisation, test and electron microscope equipment are worth particular mention as they are key to the detection of defects such as electromigration in the case of chips designed with very innovative and scarcely characterised processes or full custom designs.

Also worth a mention is the existence of micronano fabs.

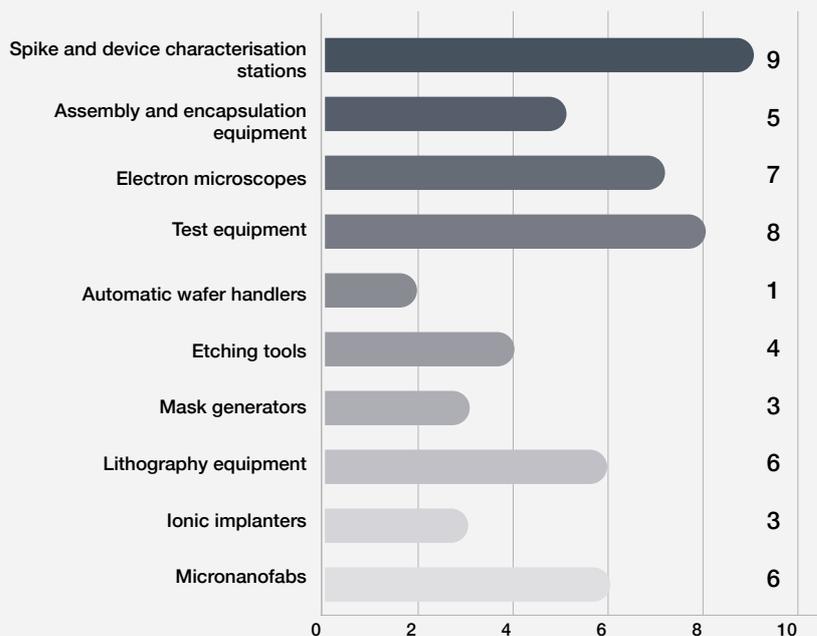


Fig. 24 Infrastructure for addressing microelectronics RD&I projects currently available in the microelectronics R&D centres in the Spanish ecosystem.

Other infrastructure mentioned by R&D centres include:

- IC design software licences (EUROPRACTICE). Other test and characterisation equipment: Spectrum analysers. Precision semiconductor parameter analysers. Network analysers. Logic analysers. High performance oscilloscopes. Active, passive and differential probes and transmission, reflection and calibration sets. High precision multimeters. LCR meters. PCB manufacturing devices. Laboratory for the design and manufacture of microelectromechanical systems – MEMSLAB.
- Test and measurement equipment for electronic circuits and RF laboratory for the design and testing of atom-based quantum sensors at room temperature
- Rapid prototyping (lasers and cutting plotter, etc.), printed electronics, reverse engineering
- FIB- SEM Thin Film Deposition AFM SNOM Light Microscopy Defect Analysis
- Functional printing lab, in-mold electronics lab, materials and smart devices lab
- Laser machine for PCB manufacturing on ceramic and plastic substrates. Equipment for measuring cryogenic circuits.

Worth special mention is the existence of the **MEMSLAB** laboratory for the design and manufacture of MEMs, as well as a rapid prototyping facility and a laboratory for the design and testing of atom-based quantum sensors at room temperature.

This infrastructure is available for use by companies under contract, as well as for the training of engineers and technicians.

5.7 INNOVATION BASED ON THE PILLARS OF THE CHIPS ACT

The European Chips Act is designed to strengthen Europe's competitiveness and resilience in semiconductor technologies and applications and help achieve the digital and green transition. Its goal is to make Europe a technological leader in this field.

Chips are strategic assets in key industrial value chains. As part of the digital transformation, new markets are emerging for the chip industry, such as highly automated motor vehicles, the cloud, the Internet of Things, connectivity, space, defence and supercomputing.

The recent global shortage of semiconductors that resulted in the closure of factories across a wide range of sectors, from motor vehicles to healthcare equipment, was a reflection of the extreme reliance of the global semiconductor value chain on a very limited number of suppliers in a complex geopolitical context.

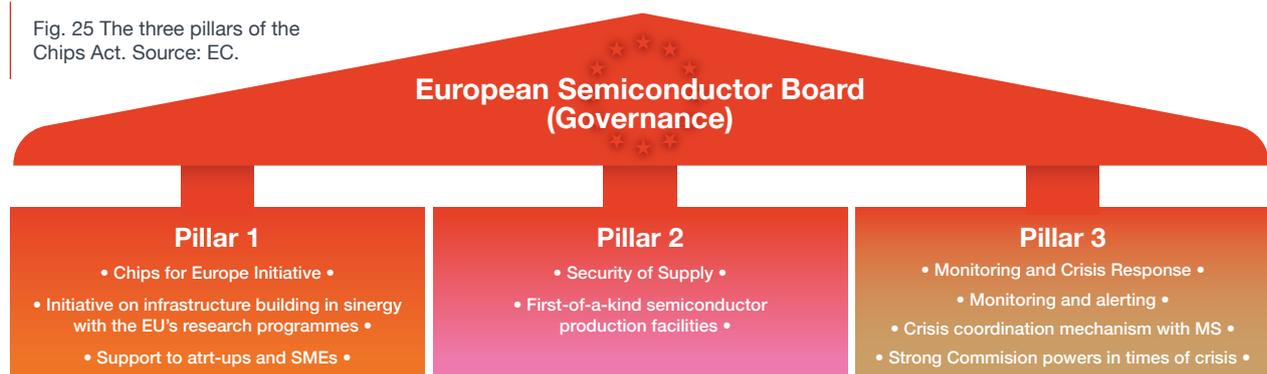
The results of the *Chip Survey*, launched by the European Commission, stresses that the industry expects chip demand to double by 2030, from the current market share of 10% to 20% in 2030. This reflects the growing importance of semiconductors to industry and European society.

Through the European Chip Law, the aim of the EU is to address the shortage of semiconductors, and strengthen Europe's technological leadership. It is expected to mobilise more than 43 billion euros of public and private investment and to put measures in place to prepare, pre-empt and rapidly respond to any future supply chain disruptions, in cooperation with EU Member States and international partners.

The EC's strategic approach to overcome the threats and weaknesses, as well as to harness the strengths and opportunities of the semiconductor industry has been to structure the European Chip Law around three pillars (Fig. 25):

- a) Pillar 1: "Chips for Europe Initiative".
- b) Pillar 2: "Security of Supply".
- c) Pillar 3: "Monitoring and Crisis Response".

Fig. 25 The three pillars of the Chips Act. Source: EC.



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Technology centres and university groups involved in Microelectronics R&D

Pillar 1 of the European “Chips Act”, “**Chips for Europe Initiative**”, is focused on driving innovation in the European microelectronics ecosystem, “moving from the laboratory to the factory”, and is structured around five components. The first component of the initiative, which relates to chip design, is as follows:

Design capabilities for embedded semiconductor technologies:

The initiative would establish a **virtual EU-wide platform** that would integrate new and existing design facilities with extended libraries and electronic design automation (EDA) tools. It would also include innovative developments, such as processor architectures structured around the open-source reduced instruction set computing architecture (RISC-V).

65% of companies and 65% of microelectronics R&D centres in the Spanish ecosystem are in favour of joining this virtual platform.

The second component of the “**Chips for Europe Initiative**” refers to “**Pilot lines of experimentation**”:

Pilot lines to prepare innovative production, testing and experimentation facilities: access to these pilot lines for the experimentation, testing and validation of new design concepts that integrate key functionalities is aimed at promoting large-scale innovation in the chip ecosystem, improving the existing pilot lines and developing new advanced pilot lines, with a focus on next-generation chip production technologies, such as cutting-edge sub-2 nanometre nodes, fully depleted silicon-on-insulator (FD-SOI) of 10 nanometres or less, and the integration of 3D heterogeneous systems and advanced encapsulation, new materials and architectures for power electronics that promote sustainable energy and electromobility, lower power consumption, security, higher levels of computing performance and the integration of innovative technologies such as neuromorphic and embedded artificial intelligence chips, embedded photonics, graphene, and other 2D material-based technologies.

Companies in the Spanish ecosystem showed a preference for participating in the “Pilot lines of experimentation” described in graph 26.

Featured areas were pilot lines in the field of integrated photonics, MEMS and sensors and heterogeneous integration.

With respect to microelectronics R&D centres, the areas of knowledge coincide with slight differences in terms of their order of priority, and so reflect a very positive matching of interests for public-private collaboration.

Fig. 26 Preferred Chip Act pilot lines for Spanish semiconductor companies.

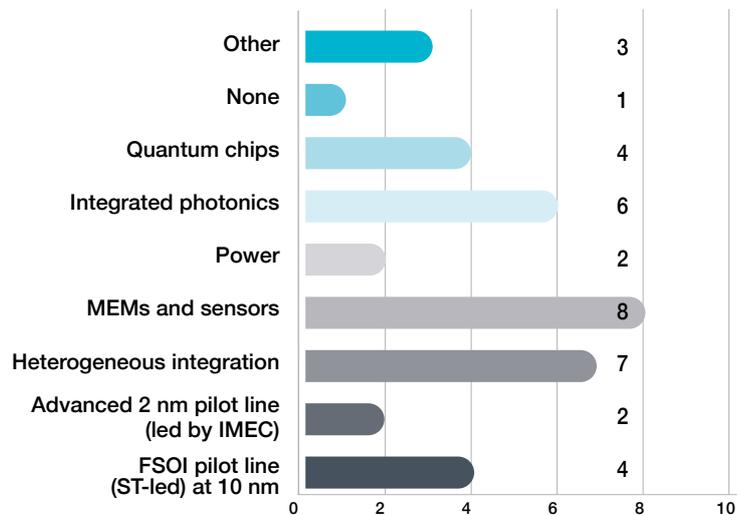
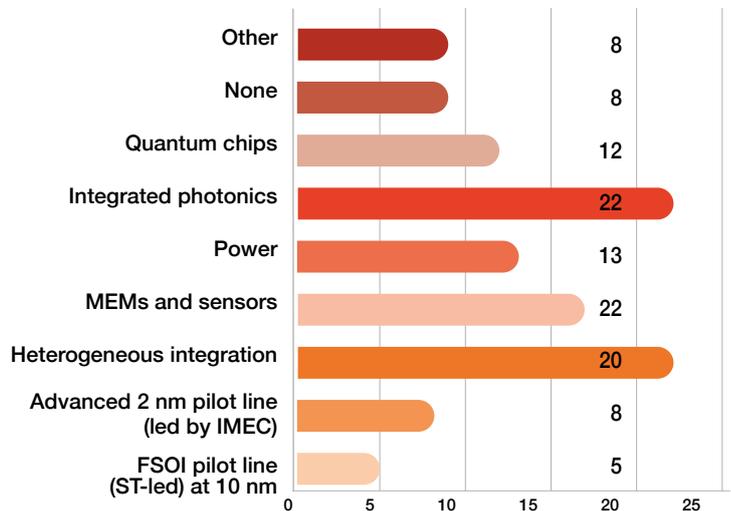


Fig. 27 Preferred pilot lines in the Chip Act for Spanish microelectronic R&D centres.

Aside from the existing pilot lines, Spanish microelectronics R&D centres have shown an interest in developing new pilot lines in the following areas of knowledge:

- Radiation, graphene and power sensors
- Twin pilot lines in mature nodes, such as the 60 nm node
- Strengthening of micro and nanomanufacturing capacities in existing ISO4 clean rooms
- Experimental 2D materials pilot line created as part of the Graphene Flagship project.

6. Funding streams and support instruments for microelectronics

In line with the actions envisaged in the Digital Spain 2025 Agenda and its extension, the Digital Spain 2026 Agenda, a series of specific funding mechanisms have been established and are being coordinated in Spain for the microelectronics industry.

With the aim of helping companies in the Spanish market to access these funding mechanisms and develop projects in microelectronics, the following is a list of national and international funding programmes dedicated to this area, or which could be used to fund projects in this field. Furthermore, specific programmes have been included for the creation of new companies and other incentives and instruments to support innovation.

6.1 AID CLOSELY ALIGNED WITH THE STRATEGY

Below is a list of the main public financing instruments in Spain and Europe for the microelectronics sector and/or R&D&I projects. AMETIC has drawn up a document describing each of the instruments which will be included as an annex to this map report, and with a view to providing the companies in the ecosystem with a description of the programmes in which they can find financing, collaboration and other opportunities to further their development.

EUROPEAN SCOPE

- CHIPS ACT
- IPCEI - Microelectronics and communication technologies
- IPCEI - Introduction to the European Battery Alliance
- Key Digital Technologies
- HORIZON EUROPE
- EUREKA PROGRAMME
- Eureka Clusters

NATIONAL LEVEL

- Chip PERTE (Strategic Project for Economic Recovery and Transformation)

6.2 OTHER AID WITH A TANGENTIAL LINK TO THE MICROELECTRONICS STRATEGY

EUROPEAN SCOPE

- EUREKA PROGRAMME (Others)
- Eureka clusters (Others)
- Network projects
- Eurostars

NATIONAL LEVEL

- Electric and connected vehicles PERTE
- Aerospace PERTE
- Maritime PERTE
- Agro-food PERTE

- Instruments CDTI (Spanish Technology Development Centre)
 - ✦ CDTI R&D projects (PID)
 - ✦ CDTI Missions Programme
 - ✦ CDTI LIC-A Direct Expansion Line
- Aeronautical Technologies Programme (PTA)
- Cervera Subsidies for Technology Centres
- Interconecta ERDF Projects
- Industry Instruments
 - ✦ Subsidies for Innovative Business Clusters (AEIs)
 - ✦ Red.es IA + THDs
 - ✦ EOI (Industrial Organization School) for Active Industry 4.0 (consultancy)
 - ✦ SEPIDES (Government Financing Body) Productive Industrial Investment Support Fund (FAIIP)
 - ✦ Future Public Innovation Procurement Programmes for prototypes and demonstrators
- Research instruments
 - ✦ Public-private partnership projects for the development of innovation projects by the State Research Agency
 - ✦ 2023 Torres Quevedo Programme
 - ✦ Regional instruments (others)
 - ✦ Subsidies for newly created companies (others)
 - ✦ Tax incentives and others (mainly for companies)

7. Conclusions

Within the European context, the Chips Act serves as a framework for action to try to implement a joint coordinated strategy that will enable all the Member States to achieve the desired position in the semiconductor industry.

The Spanish Government has made a clear commitment to the recovery of sovereignty in the semiconductor industry, the maximum exponent of which is the Chip PERTE, and for which 12.25 billion euros have been set aside. A High Commissioner has also been appointed for the Chip PERTE, who is in charge of channelling sector investments.

Furthermore, EC instruments such as the IPCEI on microelectronics, which has seen broad participation in Spain and the submission of 11 projects, will serve to promote the development of the industry in our country. Of the 11 projects finally presented, 4 Direct Partners and 6 Associated Partners (1 retired) remain, with a total investment of more than 500 million euros.

Spain, in particular, is an ideal location for chip design, and this can be seen in the investments made by Intel and Cisco, who have chosen to set up their design centres in our country.

Consolidated innovation ecosystems capable of attracting talent and generating cutting-edge innovations have placed our country in a leading position. This is the case of the Vodafone R&D Centre in Malaga and the Fundación Instituto Ricardo Valle (Innova IRV), created to promote the transfer of knowledge to the market for a wide range of technologies.

Companies and technology centres in Spain are already working on research areas for new technologies such as heterogeneous integration, 6G standardisation and integrated photonics.

Design segment

The Spanish design ecosystem includes highly **innovative fabless companies when it comes to integrated photonics**.

There are a wide range of technology nodes in use. Nodes in the 65-90 nm and 110-180 nm range are used by 51.6% of ecosystem members, with the 28-45 nm range being used by 45.16%, and the 10-22 nm range by 25.81%. Some 9% of fabless companies use advanced technological nodes, smaller than 10nm.

In terms of the semiconductor materials used, silicon is the main one, followed by III-V compounds.

The industrial sectors with which design companies most frequently work are:

1. Space (+defence) and Industry 4.0 (robotics)
2. Digital infrastructure (wireless and wired (optical) communications networks, data centres)
3. Transport
4. Health
5. Sensory market, IoT

The open innovation model is the model most widely used by design companies in their technological innovation projects, with almost 97% of companies using them.

- The main strengths of the Spanish ecosystem are as follows:
- Fabless multinational companies including MaxLinear, Analog Devices, ams-OSRAM and Teledyne.
- Integrated photonics companies with very innovative products, such as the photonic FPGA by iPronics.
- IP suppliers with high growth potential.

- Fabless companies that are global leaders in the chips segment for optical communications in vehicles, KDPOF.
- Integrated photonics foundries.
- Leader in 2D materials, Graphenea.
- National Microelectronics Centre for certain sensors and MEMs.

Manufacturing Segment

In the manufacturing segment, there are integrated photonics foundries in the Spanish market that cover both front-end and back-end.

What's more, technology centres have facilities to produce very specific types of semiconductor devices, such as the CNM in Bellaterra. For non-mainstream chip devices, there are certain facilities that, updated accordingly, could serve for the purposes of tests and future pilot lines.

The main strengths of our market are as follows:

- Fabless multinational companies including MaxLinear, Analog Devices, ams-OSRAM, Teledyne.
- Good locations with the required material resources for advanced chip manufacturing facilities.
- Good quality of life to attract talent.
- Strong environment of R&D and university centres.

SoC-using electronic equipment manufacturing segment

The main feature of companies in this segment is that they are inclined to develop their own SoC, given the optimal conditions for doing so.

The main strengths of our ecosystem are as follows:

- Some companies have huge growth, patent and international expansion potential.
- Good quality of life to attract talent.
- Strong environment of R&D and university centres.

Microelectronics R&D 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.

The priority research areas are circuit designs, new materials and devices, and technological processes, testing and encapsulation.

8. Entities that make up the Spanish microelectronics ecosystem

8.1 TABLE OF ENTITIES IN THE SPANISH MICROELECTRONICS ECOSYSTEM AND THEIR ROLE IN THE VALUE CHAIN

	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
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	Circuitor	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

8/ Entities that make up the Spanish microelectronics ecosystem

	Company/Organisation	Value chain position	Aut. 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
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	Institut 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

8/ Entities that make up the Spanish microelectronics ecosystem

	Company/Organisation	Value chain position	Aut. Community
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	Electronic 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
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 Technologies	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	Fabless ; in Spain: Commercialisation	Madrid
120	Qurv	Fabless graphene sensors	Catalonia
121	Quside Technologies	Fabless	Catalonia
122	Renesas	Chip manufacturing (Foundry or IDM)	Madrid
123	Saptec	Electronic equipment manufacturers	Madrid
124	Secpho	Association/Cluster	Catalonia
125	Semi Zabala	Fabless (IDM) GaN	Basque Country

8/ Entities that make up the Spanish microelectronics ecosystem

	Company/Organisation	Value chain position	Aut. Community
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
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 Microelectronics	Chip manufacturing (Foundry or IDM)	Catalonia
139	Subsea Mechatronic	Electronic equipment manufacturers	Canary Islands
140	Tecnalía	Microelectronics R&D Centre	Basque Country
141	Teledyne Innovaciones Microelectrónicas	Fabless	Andalusia
142	Telefonica Innovación Digital	ICT R&D Centre	Various
143	Televés	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	Balears
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	Wiyó	Fabless	Madrid
170	Wooptix	Manufacturing equipment supplier	Canary Islands

8.2 DESCRIPTION OF COMPANIES IN THE MICROELECTRONICS ECOSYSTEM WITH ACTIVITIES IN SPAIN

ACCELERATION ROBOTICS

ACCELERATION ROBOTICS

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Acceleration Robotics is a firm focused on designing customized hardware, or “brains”, that speed up a robot’s operation. In particular, the company creates custom compute architectures for high performance robots through hardware acceleration solutions (CPU, FPGAs, GPUs and combinations).

accenture

ACCENTURE, S.L.U.

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Accenture is a global professional services company, a leader in digital, cloud and security capabilities. Combining an unmatched experience and specialized skills in more than 40 economic sectors; we deliver Strategy & Consulting, Marketing, Technology and Operations services, powered by the world’s largest network of intelligent operations and advanced technology centers.

From our microelectronics practice, we are committed to working with manufacturers and semiconductor companies to help capitalize on the oppor-

tunities created by digital disruption and optimize efficiencies in product development, manufacturing, supply chain, and business operations. We have experience and knowledge in the entire semiconductor ecosystem: IDM, IP designers, fabless, foundries and equipment manufacturers. We also have specialized practice areas and results in growth strategy, mergers and acquisitions, engineering operations, silicon design services, supply chain operations, systems integration, and analytics in manufacturing areas.



ACORDE

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NATO AQAP-2110 certified, designs, develops and manufactures in-house high-performance RF subsystems for satellite communications and electronic warfare, from S band up to Q band, being a world reference in X and Ka bands.

ACORDE supports and contributes to the technology evolution by actively participating in ESA (European Space Agency) and EU (European Union) collaborative projects in the fields of satellite communications, Galileo-GNSS or Smart Wireless Sensors Networks



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AEROLASER SYSTEM S.L. is a company with innovative technological solutions, committed to carry out projects and develop more advanced sensor systems in geospatial technology. As a result of our effort and commitment in research, development and innovation, we have achieved the development of our own technology, generating highly competitive geospatial systems and services worldwide.



AESEMI ASOCIACIÓN ESPAÑOLA DE SEMICONDUCTORES

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It was founded at the end of 2021 by the companies Wiyo (Yocto Technologies), Imasenic, Kdpof and ICMálaga.. Creation motivated by the great need to digitize processes, simulate more productive and efficient physical scenarios in real time, develop new technologies for automation, optoelectronic development and advances in the automotive sector, among others. The objective is to give visibility to all companies in the semiconductor technology ecosystem in Spain.

8/ Entities that make up the Spanish microelectronics ecosystem

**AGNOS PCB**

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AgnosPCB is an automated optical inspection (AOI) service for electronic manufacturing processes. Our neural network assisted software will search for component failures and highlight them in a matter of seconds. Any panel, any circuit, any type of component. If there is a defect, the software will show you where it is. AgnosPCB adapts to your inspection needs. AgnosPCB doesn't just check the integrity of your already assembled PCB. It can find any SMT placement flaws in the solder paste layer after the pick-and-place process. This AOI system knows where the PCBA is in the manufacturing process, adapts accordingly and looks for potential failures.

**AIRBUS**

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As one of the company's three founding nations, Spain is home to major production facilities for commercial aircraft, helicopter, space and defence activities, not least final assembly lines for all Airbus Defence and Space military aircraft. The company has also established dedicated Research and Development Centres where projects at the leading edge of science and technology are researched.

**ALCYON PHOTONICS**

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Alcyon Photonics is a deep tech start up that works to massify Photonics adoption to serve the unmet demand for information management from the coms and sensor markets, among others. Alcyon delivers a portfolio of IP integrated photonics designs. Alcyon leverages its know-how to deliver a portfolio of combinable designs through an open innovation environment. Alcyon facilitates outstanding Photonic Integrated Circuits (PICs) designs with unprecedented bandwidth and unique polarization management.

**ALMA TECHNOLOGIES**

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Technology company, based in Madrid, with solutions for outsourcing companies, digital transformation, and software development among others.

**ALTER TECHNOLOGY
TÜV NORD**

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ALTER is a leading engineering company which provides reliable and agile solutions to many of the world's most innovative technologies, such as semiconductors, photonics, electronic equipment and geospatial intelligence.

Our company is present in space, aeronautics, automotive, medical, defence, energy and sustainability, among many others.

**ALTERNATIVE ENERGY
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AEInnova, founded in 2014 by highly qualified researchers and engineers of the Microelectronics Department at the Autonomous University of Barcelona, is one of the TOP30 EU companies (ranked by the European Commission) and the TOP EU innovator in autonomous sensors. AEInnova owns very strong convictions and very clear ideas about who we are, where we are going, and how we want to get there.



AMETIC, LA VOZ DE LA INDUSTRIA DIGITAL

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AMETIC, the association that represents the digital industry in Spain, has been coordinating strategic actions for the Spanish microelectronics ecosystem since 2019. The association has set up a Microelectronics and Semiconductors Commission with the following objectives:

- Draw up and update the map of the Spanish microelectronics ecosystem to provide a general overview of the capacities and roles of the agents in the value chain, and identify collaboration opportunities.

- Contribute to the definition of a national strategy for microelectronics and semiconductors focused on strengthening the industry.

- Positioning and aligning the reality of the Spanish ecosystem with PERTE Chip, IPCEI, Chips Act and the European Semiconductor Alliance.

AMETIC's Microelectronics and Semiconductors Commission currently brings together more than 70 organisations, making it the most representative group of the microelectronics ecosystem in Spain.



AMPER S&C IOT S.L.

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S&C is a company that develops and commercialize IoT solutions based on its IoT proprietary platform and the integration of "data analytics" strategies based on artificial intelligence algorithms. These solutions include EDGE computing, so S&C also develops hardware accelerators, either based on RISC-V or stand-alone architectures, with the goal of lowering computing latency and data throughput, increasing reliability, and providing greater hard data security.



AMS OSRAM

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ams OSRAM is a global leader in optical solutions. We offer a unique product and technology portfolio for sensing, illumination, and visualization: from prime-quality light emitters and optical components to micro-modules, light sensors, ICs and related software. Designing pioneering optical solutions that inspire our customers is what we do best.



AHEAD OF WHAT'S POSSIBLE™

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Analog Devices, Inc (ADI) is a global leader in the area of semiconductors. ADI has more than 24,000 employees worldwide, it is an IDM, and our annual revenue exceeds 7 billion dollars. Since 2005, ADI has a Development Center in Valencia, Spain, which currently employs over 150 people, most of them in R&D activities related to the design and evaluation of microelectronic integrated circuits in the markets of communications, industrial, automotive, and consumer.



ARAGON PHOTONICS C/ PRADO 5, LOCAL

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At Aragon Photonics we develop, build and market highly innovative optical and optic telecom, fiber optic sensing, concentrated solar power... Our growing portfolio of unique products is based on proprietary or exclusively licensed patents. R&D is at our core, we have a highly skilled team and foster close collaborations with Universities and research centers to convert great ideas into great products.

8/ Entities that make up the Spanish microelectronics ecosystem

 ARQUIMEAARQUIMEA AEROSPACE
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Arquimea is a technological company providing innovative solutions for aerospace, defense, and science. The company is specialized in design, development and validation of rad-hardened analog, digital and mixed signal IPs and integrated circuits. Success cases include active antenna control electronics, wide-bandwidth and high-dynamic range D/A converters, high speed interfaces, some of them included in the ESA PPL.

 ARROW

ARROW ELECTRÓNICA

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Arrow ECS is a global technology vendor that brings innovative IT solutions to market to solve complex business challenges. We offer a value-added distribution, business consulting and channel enablement service to the world's leading technology manufacturers and their channel partners, serving commercial markets and governments.

 ARTEIXO
TELECOM

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Established in 1972, headquarters in As Pontes, A Coruña, with a 6,000 m² factory.

Three SMD assembly lines insert 180,000 components/hour with sizes from 01005, BGAs reworking and X-ray verification guaranteeing manufacturing. A robotic verification system by artificial vision together with wave soldering systems (RoHS/non-RoHS) supported by manual assembly benches, conformal coating and potting, wiring, mechanical assemblies, tests, etc. make up the manufacturing line supervised by the Engineering and Quality departments that allow us to obtain the most demanding certifications, including PECAL 2110 of NATO military scope.

 ARXITEC
CRITICAL SYSTEMS

ARXITEC

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ArXiTEC is a digital hardware design company with applications for the transport, renewable energy and healthcare sectors. It is specialized in the development of projects that require functional safety and reliability.

The main capabilities that ArXiTEC offers its clients are: Design for clients of Logic IP for high-performance digital accelerators in parallel and control of peripherals (new sensors or actuators) internally connected to ARM or RISC-V microprocessor architecture. Design of circuit cards based on FPGA, SoC and RFSOC chips with processors embedded in the chip itself.

 Atos

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In relation to the value chain of microelectronics and communication technologies, Atos is recognized as a pioneer in Artificial Intelligence & Machine Learning, Big Data & Analytics, Hybrid Cloud, IoT and Unified Communications, Cybersecurity, High Performance. Computing (HPC) and Quantum Computing activities. Also, in the application of these technologies in specific domains such as Industry 4.0, health and life sciences, financial services, applications oriented to the public sector and defense, telecommunications and multimedia

technologies, resource management and energy or mobility services.

Among all the technologies included in the company's strategy, the use of a new generation of processors and electronic components is a key aspect that will increase Atos' position as a reference at European and global level, as well as increase its competitiveness. Atos is the only European manufacturer of supercomputers and one of the leading manufacturers of Mission Critical Servers.

8/ Entities that make up the Spanish microelectronics ecosystem

AVNET SILICA

AVNET IBERIA

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Avnet Silica: The Engineers of Evolution. Helping you bring secure, intelligent and connected products to market. Whether you're developing a complete edge to cloud concept, working on a new design or facing complex supply chain issues, Avnet Silica is the partner that fully anticipates your challenges and requirements. Solving your problems is what we do best.

With decades of experience in hardware components and supply chain, deep knowledge of edge devices and investments into IoT platforms, we bring the solutions that drive your success. And we're supported by most of the world's leading suppliers of electronic components, embedded modules, and software solutions.

BIOBEE semiconductors

BIOBEE TECHNOLOGIES S.L.

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BIOBEE is a fabless engineering company of bioimpedance semiconductors with a proprietary analog application-specific integrated circuit (ASIC). BIOBEE aims to provide customer satisfaction resulting in repeat business by identifying, in aggregate, customer requirements and expectations in terms of quality, performance, timelines, and costs.



BARCELONA SUPERCOMPUTING CENTER CENTRO NACIONAL DE SUPERCOMPUTACIÓN (BSC-CNS)

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Barcelona Supercomputing Center Centro (BSC-CNS) is the national supercomputing center in Spain. We specialize in high performance computing (HPC) and manage MareNostrum, one of the most powerful supercomputers in Europe, located in the Torre Girona chapel. BSC is at the service of the international scientific community and of industry that requires HPC resources.



BEAMAGINE SL

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Beamagine is an SME based in Barcelona, dedicated to the design and production of solid-state LIDAR image sensors. LIDAR image sensors generate 3D images using the time-of-flight technique that consists of sending laser pulses and measuring the time lapse between their emission and reception. This technology uses specific integrated circuits for high-precision time counting. Beamagine develops its own ASICs for time-of-flight measurement.?



BIOHERENT

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Bioherent's mission is to create above state-of-the-art photonic biosensors for a variety of clinical applications, with the goal of simplifying and accelerating the diagnostics pathway at hospitals and other healthcare institutions. Created in 2021 as a deep tech spin-off of the University of Malaga, our technology is the result of decades of research and development in photonics, chemical and clinical sciences. The company is moving fast to solve unmet clinical diagnostics challenges.



BOSCH SECURITY SYSTEMS

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Bosch Building Technologies is a leading global supplier of products and systems for safety, security, and communications. In selected countries, Bosch offers solutions and services for building security, energy efficiency and building automation. Around 8,800 associates generated sales of €1.9 billion in 2021. Protecting lives, buildings and assets is the main focus. The product portfolio includes video security, intrusion detection, fire detection and voice evacuation systems, as well as access control and management systems.

8/ Entities that make up the Spanish microelectronics ecosystem

**CALSENS SL**

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CalSens SL is a technology-based company and spin-off of the Polytechnic University of Valencia. It was born from the union of telecommunications and civil engineering professionals working together since 2004 in research projects of photonic technology applied to processes and structural monitoring. It offers 24/7 online monitoring services of structures and processes, advice on safety assessment and decision-making services to ensure proper operation.

**CELESTICA**

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Celestica's plant in Valencia is dedicated to the assembly of electronic systems and sub-assemblies on printed circuit boards (PCBA). It specialises in highly complex products, with medium to low volumes, and a wide variety of types and models. The Valencia plant is Celestica's Centre of Excellence in Europe for the Aerospace and Defence segment. It provides Engineering Services and performs New Product Introduction (NPI) for numerous customers worldwide, being able to provide full support throughout the product life cycle.

**CD6**

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CD6 is a technological innovation centre located at the Campus of the UPC in Terrassa, which operates in the field of Optical Engineering. The activity of CD6 is aimed at creating value through innovation. Applied research developed by CD6 is defined in order the new knowledge generated, reaches the market as new products or new processes.

**CINERGIA POWER**

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CINERGIA is the result of more than ten years of experience in the conception, design, production and service of customized power electronics solutions. Our key areas of expertise include power electronics, DSP-based digital control of converters, communications and software user interface (HMI).

**CIRCUTOR S.A.U**

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Design and manufacture of equipment to improve energy efficiency: electrical energy and supply quality measurement and control equipment, industrial electrical protection, reactive power compensation and harmonic filtering, intelligent recharging of electric vehicles and renewable energies.

**CIRSA**

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The leading multinational in the gaming and leisure sector in Spain and in Latin America, in terms of creativity, innovation, professionalism, diversity, service and results.

Since 1978, CIRSA has been offering tailor made solutions and supplies markets, members and clients with the best products and services, and with swift, efficient and personalised responses. As a group, we strive to maximise our efficiency and productivity while simultaneously developing and consolidating profitable growth through solid investment plans.

8/ Entities that make up the Spanish microelectronics ecosystem



CISCO SYSTEMS ESPAÑA

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www.cisco.com

Cisco is the worldwide leader in networking and IT. We help businesses of all sizes transform the way people connect.



CLUE TECHNOLOGIES

C/ Palmeras del Limonar, 31
 29016, Málaga (Andalucía)
 Tel +34 951 286 911
hello@clue.aero
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At Clue, we research, design, and manufacture innovative electronic systems for the aerospace industry. Our motto is to create simple solutions to big problems.

The company combines world-class engineering and the innovation drive of the lean approach of the start-up world. Our inspiration comes from disruptive technologies, no matter what the field of application or the original market.

CLUSTER CHIP CANARIAS C3

UMA, Universidad de Las Palmas GC
 35017, Las Palmas de Gran Canaria
 (Islas Canarias)
 Tel +34 928451233

It is committed to developing projects as diverse as the manufacture of cutting-edge and disruptive machinery, for key stages in the manufacture and inspection of chips; circuit design, production, inspection and testing; design ASIC, RFIC, MMIC, Mixed-Signal, Sensors and FPGA; light field technologies (LFT), LIDAR, integrated photonics, and quantum communication; and applications developed in multiple fields (communications and cybersecurity, sensors and IoT, aerospace, marine or astrophysics).



CLÚSTER DE INNOVACIÓN TECNOLÓGICA Y TALENTO (CITT) DE LA COMUNIDAD DE MADRID

C/ del Maestro Ángel Llorca 6
 Madrid (Madrid)
citt.semiconductores@madrimasd.org
www.madrimasd.org/cluster-en-semiconductores

Constituted within the Foundation for Knowledge madri+d, it is a platform that brings together the community of agents interested in the areas of work, research and innovation related to semiconductors.

CITT promotes the participation in the Strategic Project for the recovery and economic transformation (PERTE) of semiconductors, Horizon Europe or any other framework that allows attracting investments to the Community of Madrid related to this sector.



COMMTIA SYSTEMS, S.A.

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COMMTIA is a company specialized in RF, microwave and professional electronics technologies, devoted to the design, development, manufacture and installation of equipment, systems and solutions for critical infrastructures in different market segments.

The company designs and manufactures advanced systems for broadcasting, defence & security, timing & synchronization, or scientific applications, among others.



D + T MICROELECTRÓNICA A.I.E (CNM – INM – CSIC)

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D+T Microelectrónica A.I.E. is an Economic Interest Association in charge of the commercial exploitation of the Clean Room of the IMB-CNM CSIC whose mission is to provide services to the industry based on microelectronics technology. The mission of D+T is the industrial projection of the Clean Room of the National Microelectronics Centre (CNM), as well as the equipment available in the laboratories of the IMB-CNM, providing industry with microelectronics solutions covering the Design - Development - Production cycle.

8/ Entities that make up the Spanish microelectronics ecosystem

**DAS - NANO**

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das-Nano, founded in 2012, is a company that consists of experienced business and industry entrepreneurs. Our team boasts world-leading scientists with a long track-record in scientific research, technological and international business.

With 40% of our team holding PhDs and being based in Navarre (Spain), develops cutting-edge solutions with terahertz-based technology. Our customer portfolio includes some of the major players in the automotive, aerospace and research materials industries.

**DAS PHOTONICS S.L**

Camino de Vera (Edificio 8F), s/n
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www.dasphotonics.com

DAS Photonics provides high-end solutions based on its proprietary photonics technology for applications both in Space Communications and in Signal Intelligence fields. DAS' products competitive advantage is given by the intrinsic features of photonics technology, beating electronics in terms of Bandwidth, Size, Weight, and Power consumption. Our customers, (platform prime contractors or Government Agencies) deploy these systems in three different continents for Defense and Space applications.

**DERIVADOS DEL FLUOR (DDF)**

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www.ddfluor.com

Derivados del Fluor (DDF) is a world leader in the manufacture, supply and distribution of Hydrofluoric Acid, from Aqueous HF to High Purity Electronic Grade, as well as a wide range of fluorinated inorganic acids and salts, which are used for industrial applications essential for daily life.

**DISMUNTEL**

P.I. Cotes - C/. Aiguaders, 15
46680, Algemesí (Valencia)
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Dismuntel's mission is to develop quality, reliable and robust products in order to provide our customers with added value to the activity they carry out.

We develop and produce device control electronics, even reaching software or platforms developed adhoc that allow our partners to have full control over their products.

**EMEA ELECTRO SOLUTIONS**

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EMEA produces equipment for the development and manufacture of Electronics and Microelectronics. Its main objective is to offer standard and customized solutions to its customers in order to improve the assembly of electronic components on printed circuit boards and all related processes. That is why they collaborate in the EMEA market with the most prestigious world manufacturers to offer the end customer the best solution and a turnkey project for their facilities.

**EPHOOX TECHNOLOGY**

Universitat Politècnica de València (UPV)
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Production equipment for the development and manufacture of Electronics and Microelectronics.

Its main objective is to offer standard and customized solutions to its customers in order to improve the assembly of electronic components on printed circuit boards and all related processes. That is why they collaborate in the EMEA market with the most prestigious world manufacturers to offer the end customer the best solution and a turnkey project for their facilities. Ephoox has the objective of introducing innovative products on the market basing all of its activity on the principle of excellence as a guarantee of an added value.

8/ Entities that make up the Spanish microelectronics ecosystem



EQUIP ELECTRONICS

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Equip Electronics is a connected microelectronics assembler specialized in the design of integrated circuits for industry and R + D + I, located in Castellón. The objective is to offer services for the industry by providing cutting-edge tools within information technologies in order to provide maximum service and professional quality.



SALESIANS SARRIÀ

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Vocational Training and Baccalaureate School with more than 130 years of experience, works to respond to the current educational needs of young people, in a family environment and with a close and direct treatment following the style of San Juan Bosco, to build a relationship trusted educational. Completion of 18 training cycles in Dual Vocational Training and Project Work in: Information Technologies, Telecommunications, Electronics, Internet of Things, Automation, Robotics.



E-SIGNUS

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Solutions to safeguard cryptocurrencies and digital assets for Web3. We facilitate the integration of the decentralized economy into enterprise environments, providing recognized and truly secure user experiences that enable mass adoption.



ESPERANTO TECHNOLOGIES

C/ Caballero, 79
08014, Barcelona (Cataluña)
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Esperanto delivers high-performance, energy-efficient computing solutions that are the compelling choice for the most demanding AI and non-AI applications. The changing, computationally intensive workloads of the machine learning era mandate a new clean-sheet solution, without the programmability limitations of overspecialized hardware. Esperanto leverages open standard RISC-V instruction set architecture (ISA) to deliver flexibility, scalability, performance and energy-efficiency advantages.



EURECAT

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Eurecat, Technology Centre focused on accelerating innovation and technological development of companies. It stands out for its multi-sector model and the integration of multiple advanced technologies, which make it especially suitable for tackling complex challenges. Eurecat brings together enabling, digital, industrial, bio technologies and infrastructures. Among others, it can provide capabilities in microelectronics, sensors, LoCs, printed electronics, AI, plastronics and quantum.



FAGOR ELECTRÓNICA S.COOP Y FAGOR EMS

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Fagor Electrónica is a specialist in electronic and digitalization solutions. A diverse and flexible project with a common essence: solutions created from customer needs. We are driven by innovation and backed by more than 50 years of experience. European semiconductor manufacturer. Our diodes and thyristors are present in the main OEM's of the market. More than 50 years in the market. High power, intelligent consumption.

Fagor EMS

High quality electronic circuits development, oriented to the specific needs of each client. We work closely, providing global services for companies that outsource electronic solutions.

8/ Entities that make up the Spanish microelectronics ecosystem

**FALCON ELECTRONICS**

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From design and engineering services to mass production, we provide high value-added services throughout the product lifecycle, driving the growth of our customers.

Experts in technologically advanced sectors with highly complex products, we offer high technical performance, innovative manufacturing solutions, dedication, and solid level of service, guiding our customers in their projects.

**FERMAX ELECTRÓNICA**

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Manufacture and sale of connected electronic video door entry systems and access controls.

**FICOSA**

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Pioneers in safety, connectivity and efficiency systems for the automotive and mobility industry We are a global company dedicated to the creation of vision, safety, efficiency and connectivity solutions of high technological content for the automotive and mobility industry, with a vocation to contribute to society through our commitment to technological innovation, human values and energy efficiency.

**FYLA**

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Fyla is Valencian company that creates and markets laser technology, combining uniqueness, quality and profitability for its customers and stakeholders, aiming to lead the transformation of the industry towards photonics as a lever for the development of new sectors and new applications.

**GRADIANT -
FUNDACIÓN CENTRO
TECNOLÓGICO DE
TELECOMUNICACIONES
DE GALICIA**

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Gradient is a Research and Technology Organisation (RTO) whose mission is to improve the competitiveness of companies by transferring knowledge and technologies in the fields of Connectivity, Intelligence and Security. Our activity in the field of microelectronics is focused on R&D in electronics systems for communications, positioning and navigation in Telco, Aerospace and Defence sectors, with high specialization in the design and development of digital circuits on FPGA and SoC.

**GRAPHENEA
SEMICONDUCTOR**

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Graphenea Semiconductor is a pure-play foundry for graphene-based solid-state devices. Thanks to our expertise with 2D semiconductors, we work with universities, SMEs and large companies to fabricate the microelectronic devices they need, with the requirements they demand. We are involved in the biotech, integrated photonics & optoelectronics markets.

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GRUPO ANTOLIN - IRAUSA, S.A.

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Antolin, one of the largest providers of technological solutions for automotive interiors and with presence in 26 countries, supplies the main manufacturers in the following areas: Roofs, Cockpits, Doors & Cladding, Lighting & HMI, Electronics and Integrated Products.

Antolin offers a complete service, in engineering and production, by incorporating the perspective of the end user through a correct definition of the UX (User Experience) and the UI (User Interface).



IDETIC FOTÓNICA INTEGRADA (ULPGC)

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The Photonics and Communications Division focuses its activity on two fundamental axes: unguided photonic systems and the development of Internet of Things applications, with a wide range of applications in both cases, consolidated with national and international projects, ranging from the positioning of sensors in nuclear power plants, to submarine communications systems, waste management, or the development of smart urban environments.



HYBTRONICS

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The Company's core competence is the design and manufacturing of thick film hybrids, either on ceramic or stainless-steel substrates, initially intended for the Defense, Medical and High reliability industrial markets.



IDEADED

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IDEADED is developing processes and materials technologies enabling the next generation of highly cost effective everyday IoT electronics, paving the way for billions of connected devices.

Currently building the southern Europe's largest semiconductor clean-room, which has 500 square meters and will become operational in early 2023.



IKERLAN

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IKERLAN is a leading technology centre in the transfer of knowledge and the contribution of competitive value to companies. We seek excellence in R&D&I, thanks to our continuous adaptation to the needs of our customers and our proximity to business reality. True to our mission, we have been working every day since 1974 to develop solutions that allow our customers to be increasingly competitive. We are a cooperative member of the MONDRAGON Corporation and the Basque Research and Technology Alliance (BRTA).

Thanks to a unique model of collaboration that combines technology transfer activities, our own research and the training of highly specialised personnel, IKERLAN is today the trusted technology partner of important companies in the country.



IGNION

Av. Alcalde Barnils, 64-68
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Ignion is reshaping the world's IoT connectivity. A global antenna innovator with proven manufacturing capabilities to scale and create the new generation of multiband, multipurpose and ready-to-use, chip antennas. Ignion's mission is to accelerate IoT and empower the ecosystem with off-the-shelf antenna solutions.

8/ Entities that make up the Spanish microelectronics ecosystem



IMASENIC

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IMASENIC, develops custom CMOS Image Sensors, from specifications to volume production. We work with customers from the initial specifications, refining them and making into a viable product. We are customer-focussed. We know how important an investment for a custom sensor is and want our customer to be totally satisfied with their new product. IMASENIC team has decades of experience in developing custom CMOS image sensors and taking to market high-volume products, our mission is to create outstanding products for customers, matching or exceeding their goals. IMASENIC has been officially recognised as an innovative SME, by the European Union.



INELCOM

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ESTA EMPRESA TIENE LOS DOS TEXTOS
EN ESPAÑOL

INELCOM is a global company, with presence in Spain, Germany and Latin America, specialized in turnkey projects with more than thirty years of experience in the electronic equipment and systems market.

We provide our customers with a comprehensive service that includes the design, manufacture, installation, maintenance and operation of equipment and systems, always with the objAMPERective of protecting their investment.

FUNDACIÓN IMDEA
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The IMDEA Nanoscience Institute is an interdisciplinary research center dedicated to exploring Nanoscience and developing applications of Nanotechnology in connection with other research institutions and innovative industries. It is part of one of the strategic lines of the International Excellence Campus UAM + CSIC and is a Severo Ochoa Excellence Center of the AEI. It has a Nanofabrication Center (ISO-5 Clean Room) focused on the development of emerging technologies (Quantum, Superconducting, Neuromorphic and 2d semiconductors).



INETUM ESPAÑA

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Inetum is an agile IT services company that provides digital services and solutions. It is also a global group that helps companies and institutions to make the most of the digital flow. In a context of perpetual motion, where needs and uses are constantly reinventing themselves, the Inetum group relies on all these players to innovate, continue to adapt and stay ahead of the curve.



INDRA SISTEMAS

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Indra is one of the leading global technology and consulting companies and the technological partner for core business operations of its customers world-wide. It is a world-leader in providing proprietary solutions in specific segments in Transport and Defence markets, and the leading firm in Digital Transformation Consultancy and Information Technologies in Spain and Latin America through its affiliate Min-sait. Its business model is based on a comprehensive range of proprietary products, with a high-value focus and with a high innovation component.

INFINEON
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Infineon Technologies AG is a world leader in semiconductor solutions that make life easier, safer and greener. Microelectronics from Infineon are the key to a better future. With around 56,200 employees¹ worldwide, Infineon is the global leader in automotive, power management, energy efficient technologies and IoT.

Our silicon-, silicon-carbide-, and gallium-nitride-based power, driver, microcontroller, and software solutions are essential to take energy efficiency and green power to the next level.

INGENIA

INGENIA CAT

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Ingenia is a servo drives company. Our servo drives control motors accurately and reliably on the most advanced robotics and industrial applications.

We are part of Celera Motion – a motion control business of Novanta Inc. (NASDAQ: NOVNT) and operate globally, with offices in UK, USA & Germany – plus a network of international agents.



INSTITUTO DE ASTROFÍSICA DE CANARIAS (IAC)

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The Instituto de Astrofísica de Canarias (IAC), a Spanish public research body recognized as Severo Ochoa Center of Excellence, is a reference center in semiconductors for Astrophysical Instrumentation and Aerospace. In administrative terms, it is a Public Consortium constituted by the General Administration of the Spanish State, the Public Administration of the Autonomous Community of the Canary Islands, the University of La Laguna (ULL), and Spain's Science Research Council (CSIC)



INSTITUT CATALÀ DE NANOTECNOLOGIA (ICN2)

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 Tel. + 34 937 372 649
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ICN2, is a non-profit international research institute located close to Barcelona (Catalonia, Spain). It is devoted to the generation of knowledge, materials and devices in the broad fields of ICT, health, energy and the environment. The expertise of the ICN2 lies at the nanoscale, where new properties, interactions and ways to exploit them in everyday life are being discovered. Among its goals is to bring together scientists from diverse backgrounds in the pursuit of better science, better training and better outreach to society, while also seeking out new ways to engage with local and global industry.



INSTITUT DE CIÈNCIES FOTÒNIQUES ICFO

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ICFO is a research center equipped with state-of-the-art nano-manufacturing and nano-characterization equipment, which houses 450 people. The research lines cover applications for medicine and biology; information technology; sensors and metrology; quantum technologies; nanomaterials, and photonic chips and microelectronic-photonic hybrid chips. ICFO collaborates with industries interested in the technological frontier.



INNOVA IRV MICROELECTRONICS

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INNOVA IRV, Fundación Instituto Ricardo Valle de Innovación, is a center for technological innovation applied to industry that promotes, develops, and fosters knowledge transfer activities to generate value in the market.



INSTITUTO DE MICRO Y NANOTECNOLOGÍA - CENTRO NACIONAL DE MICROELECTRÓNICA - CSIC

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Fundamental and applied research within the field of nanoscience and nanotechnology. It has a micro and nanofabrication (MiNa) service that meets the most unique and demanding requirements. Manufacturing lines for semiconductor nanostructures for devices for quantum information technologies, advanced solar cells, magnetoplasmonic nanostructures for optically active devices, and nanoengineering of thermoelectric devices to harvest electrical energy from waste heat. Development of thin-film manufacturing processes and prototypes for photovoltaic devices and superconducting radiation detectors for ESA mission instruments

8/ Entities that make up the Spanish microelectronics ecosystem



INSTITUTO UNIVERSITARIO DE MICROELECTRÓNICA APLICADA

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The University Institute of Applied Microelectronics is a research, development and innovation center in the field of Information and Communication Technologies, covering disciplines such as electronics, computer science, mathematics and computing, or Telematics, whose applications are mainly oriented to the fields of electronics, telecommunications, information systems and industry 4.0.



IO INVESTIGACIÓN

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Through the combination of different study methodologies (face-to-face, telephone and online), the use of the latest technologies and a team made up of specialists in market research, marketing and statistics, we measure the market and provide recommendations derived from the conclusions of the studies we carry out.



INSTITUTO DE MICROELECTRÓNICA DE BARCELONA, IMB-CNM-CSIC

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IMB-CNM is a research center dependent on the CSIC. It develops and exploits micro and nanotechnologies for the manufacture of electronic and photonic devices with multiple applications and socioeconomic impact. It manages the largest clean room in the country (1500 m²). It is the main node of the ICTS Micronanofabs; it is open to third parties; it has its own staff and, in addition to accommodating R&D activities, it has the capacity for prototyping and manufacturing of small and medium series.



ITEAM

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The Institute of Telecommunications and Multimedia Applications (ITEAM) is a research centre integrated in the Polytechnic City of Innovation, the new science park of the Universitat Politècnica de València, where it develops its Research, Development and Innovation (R+D+I) activities within the area of Information and Communication Technologies.

ITEAM participates in a large number of competitive R+D+I projects in the Autonomous Region, National and European levels, as well as maintaining a close link and a large number of agreements and projects with private companies.



INSTITUTO DE MICROELECTRÓNICA DE SEVILLA (UNIVERSIDAD DE SEVILLA)

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IMSE-CNM is a mixed institute between the Spanish Research Council and the University of Seville. Since 1989 we have been devoted to research, innovation, development and teaching microelectronics circuits and systems. We host 3.000m² of labs equipped with advanced instrumentation for packaging, mounting and characterization of circuits and complex systems. We count with top researchers in microelectronics in the international rankings and a master degree in microelectronics design.



INSYTE S.A

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Specialized for more than 30 years in industrialization and manufacturing of electronic boards as well as finished electronic products for the avionics, defense, naval, medical and industrial sectors (IPC Class 3). They also manufacture wiring harnesses and cabling for cabinets and racks. Insyte offers a customized service to its customers: support in design, industrialization, manufacturing of electronic equipment with state-of-the-art means of production and quality control with 3D inspections. These services include the purchase of all product elements. Performing all types of tests including pre-certification tests.

8/ Entities that make up the Spanish microelectronics ecosystem



ITCL INSTITUTO TECNOLÓGICO DE CASTILLA Y LEÓN

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Private non-profit technology center, created in 1989, accredited by the Ministry of Science and Innovation of Spain, closely linked to the industrial ecosystem of Castilla y León, dedicated to own R+D projects and in cooperation with companies nationally and internationally. They develop prototypes and provide innovation support services with high added value for SMEs.

At ITCL we develop tools derived from our research groups in Artificial Intelligence, Big Data, electronic design and embedded systems applied to manufacturing and industrial maintenance processes, smart infrastructures, electric mobility and digital health, as well as energy modelling, virtual reality applied to high-performance simulators and cyber-physical systems.



ITAINNOVA

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ITAINNOVA's mission is to help companies and promote the technological possibilities of this region, to develop new products and processes, with the aim of boosting competitiveness in the European Union. It is a public body dedicated to research at three levels: regional, national and European.



INTEGRATED CIRCUITS MALAGA

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iC-Malaga is a microelectronics engineering company founded in 2002 and located in Mallorca (Spain) specialized in analog circuits design and their industrial applications development. Thanks to the support of german company iC-Haus GmbH, iC-Malaga is able to approach high technology level products, from their conception to their series production. iC-Malaga is also distributor of iC-Haus products in Spain and Portugal.



IPRONICS PROGRAMMABLE PHOTONICS

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iPronics is making the computational power of photonics commercially affordable. It has pioneered the field of programmable photonics and developed the first general-purpose photonic processor capable of programming high-speed light signals on-chip with unprecedented flexibility. iPronics processors share a common hardware platform that is reconfigurable by software.



JBC TOOLS

Ramón y Cajal, 3
08750, Molins de Rei (Cataluña)
Tel +34 933 253 200
europe@jbctools.com
www.jbctools.com

JBC TOOLS is a leading manufacturer of hand soldering devices and electronics maintenance work. The company has more than 80 years of experience that helped it to create several innovative solutions. JBC products are divided into two groups: Classic (for general soldering work) and Advanced (specialised solutions for electronics).



KNOWLEDGE DEVELOPMENT FOR POF SL (KDPOF)

Ronda de Poniente 14, 2CD
Tres Cantos (Madrid)
Tel +34 918 043 387
www.kdpof.com

Design and manufacturing of optical communication transceivers for rugged environments like the automotive industry.

8/ Entities that make up the Spanish microelectronics ecosystem



LEAPWAVE TECHNOLOGIES

Av. Gregorio Peces Barba, 1,
28919, Leganés (Madrid)
Tel +34 664 134 703
info@leapwavetech.com
www.leapwavetech.com

LeapWave Technologies is preparing the ground to offer unseen bandwidth opportunities for an unlimited speed.

LeapWave Technologies is a newly created deep tech company. Its vision is a paradigm shift in high-bandwidth interconnections, offering enabling solutions beyond current capabilities in applications such as: Broadband interconnects millimeter and sub-millimeter waves.



LEAR

Carrer Soler i Cartró, 10 - Bajo,
08870, Sitges (Cataluña)
Tel +34 938 947 208
www.lear.com

With over 100 years of experience, Lear has earned a legacy of operational excellence while building its future on innovation. Our talented team is committed to creating products that ensure the comfort, well-being, convenience and safety of consumers.

Its activity focuses from developing innovative intelligent vehicle experiences to streamlining operations.



LIBELIUM

Avda. María Zambrano 31
Edificio WTCZ, Torre Este Planta 7
50018, Zaragoza (Aragón)
Tel +34 976 547 492
www.libelium.com

Company with a solid team of experience in Visible Light Communications Technology (VLC). We combine expertise in wireless optical communication, coding schemes, VLC and RF applications, sensor networks and enterprise management. We have developed an entire ecosystem with our own technology fully integrated into the market as one of the first access, identification and validation systems through Visible Light Communications.



LITTLE FUSE

Parque Empresarial Zuatzu (Edif. Urgull),
3 - planta 1ª - Of. 2
20018, San Sebastián (País Vasco)
Tel +34 943 317 378
www.littelfuse.com

Littelfuse products are vital components in applications that use electrical energy, from consumer electronics to vehicles and industrial facilities. Littelfuse's history of innovation and technical expertise enable the company to provide objective, comprehensive, and personalized customer solutions. Littelfuse offers the industry's broadest and deepest portfolio of circuit protection products, with growing platforms in power control and sensing. Littelfuse also provides power semiconductors, heavy-duty switches, magnetic, optical, electromechanical, and temperature sensors, as well as products that provide safe control and distribution of electrical power.



LUMENSIA

Camino de Vera, Edificio 8F, 3ª planta,
46022, Valencia (Valencia)
Tel +34 963 556 150
https://lumensia.com/

LUMENSIA SENSORS is a Valencian startup dedicated to the development of biological control systems for food safety, environmental control, veterinary and health applications.

Lumensia, by putting its biological detection products on the market, aims to respond to a need common to different production sectors: The accurate, fast, low-cost and simple identification and quantification of biological and chemical elements. This detection is particularly important for the health, food, environment and safety sectors.



LUXQUANTA

Avenida de Carl Friedrich Gauss,
3 - 3, Oficina 349
08860, Castelldefels (Cataluña)
Tel +34 692 358 723
info@luxquanta.com
www.luxquanta.com

LuxQuanta is a spin-off from ICFO, The Institute of Photonic Sciences. Enabling a new age of security in telecommunications with Quantum Key Distribution (QKD) systems we strive to deliver Quantum Key Distribution (QKD) systems and technologies to be integrated into existing network infrastructures while capable of providing a quantum-safe layer of security on top of mathematical cryptographic techniques.

8/ Entities that make up the Spanish microelectronics ecosystem

LUZ WAVELABS

Av. Gregorio Peces Barba, 1
28919, Madrid (Madrid)
Tel +34 910 052 210
luzwavelabs@luzwavelabs.com
<https://luzwavelabs.com/>

Design and manufacture of products and solutions for the generation and detection of Terahertz waves, the last untapped range of the electromagnetic spectrum.

Luz Wavelabs has created a prototype (pure-T-wave) that combines all the advantages of the THZ technologies with the highest potential and achieves a signal quality more than a million times better than the best phonic generator on the market. The existing and potential applications for this product are numerous: biomedicine, science, industry, security, art conservation, among others.

MARVELL TECHNOLOGY

C. Rossello,
372, Unit 4, Floor 4,
08025, Barcelona (Cataluña)
www.marvell.com

To deliver the data infrastructure technology that connects the world, we're building solutions on the most powerful foundation: our partnerships with our customers. Trusted by the world's leading technology companies for over 25 years, we move, store, process and secure the world's data with semiconductor solutions designed for our customers' current needs and future ambitions.

MAX LINEAR HISPANIA S.L.

C/ Narcis Monturiol I Estarriol 11
46980, Paterna (Valencia)
Tel +34 961 366 004
www.maxlinear.com

MaxLinear makes multi-gig connectivity a reality through digital, high-performance analog and mixed-signal integrated circuits and software solutions. We revolutionize how people connect - driving faster, smarter networks - through engineering innovation.

It has a design center in Valencia with 130 people. The center of Valencia designs chips for communications, both by various types of cable (PowerLine, Coaxial) and wireless. The group develops the future WiFi chips. MaxLinear is a major company in the semiconductor industry, with 2022 income of 1.1B\$.

MAXWELL APPLIED TECHNOLOGIES

Rúa das Hedras 2, 3ºd.
15895, O Milladoiro (Galicia)
Tel +34 981 522 200
info@maxwell.team
www.maxwell-atech.com

Maxwell is a company of Televes Corporation specialized in the design and development of advanced engineering solutions for the most challenging applications in the RF, microwave and digital field and focused on the development of custom MMIC solutions in III-V technologies. Our strong background is inherited from the technological knowledge gained by Televes Corporation since 1971. Our capabilities, efficiency, and flexibility position us as a solid technology partner within the industry.

MEDLUMICS

Pl. de la Encina, 10, 11
28760, Tres Cantos (Madrid)
Tel +34 918 033 925
info@medlumics.com
www.medlumics.com

MedLumics is a medical device company whose aim is to take the latest technological and scientific advances in biophotonics and turn them into innovative, quality products to improve quality of life. Its work focuses on one of the most successful light-based diagnostic techniques, optical coherence tomography, which is currently experiencing rapid expansion and growth.

METALOR TECHNOLOGIES (IBÉRICA), S.A.

C/ Albasanz, 14bis. 1ºG,
28037, Madrid (Madrid)
Tel +34 913 757 480
metalor.es@metalor.com
www.metalor.com

Metalor Technologies is a Swiss multinational belonging to the Japanese group Tanaka. It is one of the most important and recognized players in the sector where it supplies surface treatment technologies and equipment for the production of semiconductors. In addition, it offers an integrated precious metal recycling service to reduce environmental impact and improve environmental sustainability.

8/ Entities that make up the Spanish microelectronics ecosystem



MICROCHIP TECHNOLOGY INCORPORATED

Avenida de Juan Pablo II, 35, Edificio Torre Aragonia, Planta 7
50009, Zaragoza (Aragón)
Tel +34 976 010 300
www.microchip.com

Microchip Technology Incorporated is a leading provider of integrated, intelligent, connected and secure control solutions. Its easy-to-use development tools and comprehensive product portfolio enable customers to create optimal designs that reduce risk while lowering total system cost and time to market. The company's solutions serve more than 120,000 customers in the industrial, automotive, consumer, aerospace and defence, communications and computing markets. Headquartered in Chandler, Arizona, with Spanish offices in Zaragoza, development center, and Madrid, commercial support.



MONOCROM

C/ Vilanoveta nº6
08800, Vilanova i la Geltrú (Cataluña)
Tel +34 938 149 450
marketing@monocrom.com
www.monocrom.com

MonoCrom operates in a wide range of sectors and markets supplying with success Laser Diode Solutions for Medical Therapies and Diagnostics, Aesthetics Treatments, Ophthalmic Surgery, Optical Pumping, Test and Measurement Instrumentation, Offset Printing, Quality Assurance, LIDAR Systems, Material Processing, Science Research, Automotive and Military applications.



MONOLITHIC POWER SYSTEM

Av. Josep Tarradellas 123, 5-A,
08029, Barcelona (Cataluña)
Tel +34 931 815 400
www.monolithicpower.com

With our innovative proprietary technology processes, we thrive on re-imagining and re-defining the possibilities of high-performance power solutions in industrial applications, Telecom Infrastructures, Cloud Computing, Automotive, and Consumer Applications.

Monolithic Power Systems (MPS) creates cutting-edge solutions to improve the quality of life with green, easy-to-use products.



NANOPHOTONICS TECHNOLOGY CENTER

Universitat Politècnica de València.
Camino de Vera, s/n. Edificio 8F | Planta 2ª
46022, Valencia (Valencia)
Tel +34 963 879 736
info-ntc@upv.es
www.ntc.webs.upv.es

The Nanophotonics Technology Center (NTC), placed at the Universitat Politècnica de València (UPV) campus, was created on 2005 to become a leading R&D center in nanophotonic science and technology. Our main mission is to place the NTC at the forefront of the knowledge in fundamental nanophotonic science as well as to use this knowledge to build novel materials, devices and systems for a wide range of applications.

Together with the CNM (Centro Nacional de Microelectrónica) in Barcelona and the ISOM in Madrid, our clean-room is part of the Micronanofabs network, approved by the Ministry of Science, Technology and University as an ICTS.



NANUSENS S.L.U.

Avenida Parc Tecnològic 3,
08290, Cerdanyola del Vallès (Cataluña)
Tel +34 661 443 215
info@nanusens.com
www.nanusens.com

Nanusens is a pioneer in the design of MEMS sensors and RF-MEMS devices built with the standard CMOS process. Nanusens builds nanoscale sensors (NEMS - Nano Electro Mechanical Systems) together with control electronics allowing to reduce their size and cost. On the other hand, reconfigurable RF-MEMS devices for the RF front-end (RFFE) of smartphones allow better voice and data transmission and will improve battery life.

8/ Entities that make up the Spanish microelectronics ecosystem



NIPPON GASES

C/ de Orense, 11, 5^a
28020, Madrid (Madrid)
Tel +34 914 533 000
info.spain@nippongases.com
www.nippongases.es

Nippon Gases, one of the leading industrial gases companies in Europe, is part of the Nippon Sanso Holdings Corporation (NSHD), which has over 100 years of experience and a significant global presence in 32 countries with over 19,000 employees. Nippon Gases is relying on the extensive experience of the NSHD Group, one of the major suppliers of special gases for semiconductors, considering the great potential for growth in this sector in Europe.



NIT NEW INFRARED TECHNOLOGIES

C/ Vidrieros, 30 – Nave 2,
Boadilla del Monte (Madrid)
Tel +34 916 324 363
info@niteurope.com
www.niteurope.com

New Infrared Technologies (NIT) is a private SME which develops and commercializes industrial cameras and solutions for real-time monitoring and smart control of laser-based industrial processes. These solutions are based in self-produced infrared cameras, manufactured with a unique technology, and sensitive in the medium wavelength infrared (MWIR, 1-5 microns), high-speed capabilities and uncooled operation at room temperature.



NVIDIA

www.nvidia.com

NVIDIA is pioneering accelerated computing to address challenges that no one else can solve. Our work on AI and the metaverse is transforming the world's largest sectors and profoundly affecting society. They also work in design and simulation, HPC, gaming and creation, and autonomous vehicles.



NXP SEMICONDUCTOR

C/ Anochece, 2.
28223, Pozuelo de Alarcón (Madrid)
Tel +34 917 159 392
www.nxp.com

Semiconductor manufacturer. NXP enables a smarter, safer and more sustainable world through innovation. As a world leader in secure connectivity solutions for embedded applications, NXP is pushing boundaries in the automotive, industrial & IoT, mobile, and communication infrastructure markets. Built on more than 60 years of combined experience and expertise, the company has approximately 31,000 employees in more than 30 countries and posted revenue of \$13.21 billion in 2022.



OMMATIDIA LIDAR

Parque Científico de Madrid
C/ Faraday 7
28049, Madrid (Madrid)
Tel +34 610 012 748
info@ommatidia-lidar.com
www.ommatidia-lidar.com

Advanced 3D imaging and metrology solutions for different markets including aeronautics, rail, industrial robotics and autonomous vehicles. The company has proprietary technology that is inspired by the compound eye of insects, in which scenes are reconstructed by combining thousands of light-sensitive elements. This novel approach allows for radically higher than possible resolution and range in the state of the art.



ONTECH SECURITY S.L.

C/ Hispano Aviación nº 7-9
41300, La Rinconada (Andalucía)
Tel +34 955 314 552
info@ontech.es
www.ontech.es

Ontech Security SL is a technology company founded in 2011. It focuses its activities on research, design and development of advanced sensor technology integrated in proprietary ASICs. Ontech's core technology is sensors for the control of electromagnetic fields (CEMF), a globally patented technology. Its activity is applicable to multiple sectors (Extended Reality (XR), IoT, Industry, Automotive, Security, Robotics, Defense...) where our partners (manufacturers and integrators) integrate our ASICs or CEMF modules in their products improving performance, increasing their differentiation in different verticals.

8/ Entities that make up the Spanish microelectronics ecosystem



OPEN CHIP

Plaça d'Eusebi Güell, 1-3
08034, Barcelona (Cataluña)
Tel +34 934 137 716

Design and commercialise a new generation of general-purpose accelerators and processors, emphasising their applications in supercomputing and Artificial Intelligence.

Openchip's work will result in a low-cost chip with high processing power and low energy consumption. To this end, the proposal includes an additional innovative element by being entirely focused on the generation of open-source hardware products.

P4Q PROFESSIONALS
FOR QUALITY

Elkartegi de Alonsotegi, 27
48810, Alonsotegi (País Vasco)
Tel +34 944 982 028
sales@p4q.com
www.p4q.com

P4Q manufactures its electronics in-house for its own product range, as well as being a trusted partner in the manufacture of electronics for demanding sectors such as industrial, automotive and rail.



PETA OPTIK

Avenida de la Libertad 18 5ºB,
San Sebastián (País Vasco)
Tel +34 629 042 366
ilaffitti@petaoptik.com
www.petaoptik.com

Peta Optik is a startup company for Deep Tech solutions on low carbon and ultra-high speed optical telecommunication.

Peta Optik is implementing key technologies that are being used in 5G and WIFI6 for its use on optical communication link. There is an obvious industry need to evolve optical networks to bring them into line with 5G and WIFI6 technologies to incorporate to optical networks the same benefits that mobile networks have experienced over the last two decades.

PHOTONIC SENSORS
& ALGORITHMS S.L.
"PHOTONICSENS"

C/ Carboner 11, Parque Táctica
46980, Paterna (Valencia)
Tel +34 960 097 481
info@photonicSENS.com
www.photonicSENS.com

photonicSENS independently designs, develops and manufactures single lens 3D camera modules to simultaneously offer images and the highest resolution depth maps for immersive applications such as augmented reality on XR-glasses, 3D reconstruction of objects and metrology and inspection in robotics and industrial applications. photonicSENS' core expertise and ambitions include the design of optical systems and image processing ASICs.



PREMO S.L.

C/ Severo Ochoa 47
29590, Málaga (Andalucía)
Tel +34 951 232 320
info@grupopremo.com
www.grupopremo.com

Premo is a Spanish multinational that designs, develops and manufactures components for the key technologies of IoT, e-mobility, VR/AR, etc. It especially develops and manufactures components (sensors) for RFID applications and magnetic power components for e-mobility (hybrid and electric vehicles), where semiconductors with high processing capacity and low consumption are required, for which PREMO is beginning the design of chips (SoC) mainly for secure vehicle access systems (NFC) and IoT sensors.

QILIMANJARO
QUANTUM TECH

Paseo de Gracia 58, 4-2
08007, Barcelona (Cataluña)
Tel +34 934 091 190
qilimanjaro@qilimanjaro.tech
www.qilimanjaro.tech

Qilimanjaro brings practical applications of quantum computing to the market in a shorter timeframe than digital quantum computers, by using a different but complementary model of quantum computation: the analog model. We create a coherent quantum annealer accessible via our cloud to run real-world applications such as optimisation tasks in the logistics, finance, and energy sector, among others, and quantum simulation of chemical and physical processes, very present in the materials and pharmaceutical research industries. We aim at providing our clients with a faster, more accurate and sustainable solution to their computing problems.

8/ Entities that make up the Spanish microelectronics ecosystem



QUALCOMM

Avenida de Europa 4, 28108,
 Alcobendas (Madrid)
 Tel +34 916 267 790
 www.qualcomm.com

Qualcomm is enabling a world where everyone and everything can be intelligently connected. Qualcomm 5G and AI innovations are the power behind the connected intelligent edge. Our portfolio includes products for processors, modems, platforms, RF systems, and connectivity, plus products based on the end-use application of your design. We offer a full range of purpose-built, pre-packaged software, hardware, and tools that help you get your invention to market faster.



QURV

C/ d'Esteve Terradas, 1, oficina 320
 08860, Castelldefels (Cataluña)
 hello@qurv.tech
 www.qurv.tech

Is a startup established in 2020 developing wide-spectrum image sensors based on graphene and quantum-dot technologies. Qurv's technology allows operation across the spectrum from the visible to the short-wave infrared (SWIR) range and can be integrated with CMOS processes. Qurv's "plug and play" approach aims to bring advanced machine vision capabilities to markets that are not accessible by the current state-of-the-art SWIR sensors.



QUSIDE TECHNOLOGIES S.L.

C/ d'Esteve Terradas 1, Of. 304
 08860, Castelldefels (Barcelona)
 Tel +34 934 314 796
 info@quside.com
 www.quside.com

Quside (QS) develops quantum random number generation (QRNG) products for secure data communication and high-performance computing. Quside has expertise in the development of advanced optical technologies and high frequency (GHz) electronics and FPGA integration. Applications of Quside's products range from mobile security to data centre security, or numerical analysis in Monte Carlo methods and machine learning.



RENESAS

Paseo de la Castellana 200, Suite 414
 28046, Madrid (Madrid)
 www.renesas.com

Renesas Electronics Corporation delivers trusted embedded design innovation with complete semiconductor solutions that enable billions of connected, intelligent devices to enhance the way people work and live. A global leader in microcontrollers, antilog, power, connectivity and SoC products, Renesas provides comprehensive solutions for a broad range of automotive, industrial, home electronics, office automation, and information communication technology applications that help shape a limitless future.



SAPEC

Rufino González, 15
 28037, Madrid (Madrid)
 Tel +34 917 283 910
 sapec@sapec.es www.sapec.es

Sapec develops equipment and solutions for the transport of TV signals with very high quality for professional environments. SAPEC's goal is to become a worldwide benchmark in professional video compression products.

SAPEC believes in a world where technological barriers to creating and delivering quality content no longer exist. SAPEC's vision is to allow the transport of audiovisual content with professional quality in real time and without limitations.



SECPHO

C/ Milà i Fontanals 14-26, 1º-6ª
 08012, Barcelona (Cataluña)
 Tel +34 937 833 664
 info@secpho.org
 www.secpho.org

A cluster formed by more than 170 organizations that drive innovation through deep tech in all sectors of our economy: photonic technologies, AI, Robotics and Drones, Quantum Computing, Microelectronics, Biotechnology, Advanced Materials and Blockchain.

Experts in generating synergies between researchers, investors and companies, to create innovations through deep tech that respond to industry and societal challenges.

8/ Entities that make up the Spanish microelectronics ecosystem

**SEMI ZABALA**

Avenida de la Libertad 17-2º,
20004, San Sebastián (País Vasco)
Tel +34 647 910 665
info@semizabala.com
www.semizabala.com

Is dedicated to the design, manufacture, testing and marketing of components and integrated circuits made of gallium nitride (GaN) for space and high reliability applications.

**SEMIDYNAMICS
TECNOLOGY
SERVICES, S.L**

Carrer de Galileu 303, Planta 2
08028, Barcelona (Cataluña)
Tel +34 934 068 704
info@semidynamics.com
www.semidynamics.com

Founded in 2016 in Barcelona, Semidynamics Technology Services, is an SME specialized in the design of RISC-V microprocessors, both for ASIC and FPGA solutions. The company, as a provider of semiconductor intellectual property, aims to become the market leader in RISC-V IP cores for machine learning and artificial intelligence applications.

**SENER**

Zugatzarte Etorb. 56
48930, Getxo (País Vasco)
Tel +34 932 283 300
www.group.sener

Development of innovative engineering and technology solutions in different markets, with the purpose of contributing to the progress of society in a sustainable environment, through our commitment to our customers, people and the environment.

It is active in the following sectors: aerospace and defense, mobility, energy, digital, naval, diagnostics, investment in renewables.

**SENSIA SOLUTIONS**

C/ Margarita Salas Nº12
28919, Leganés (Madrid)
Tel +34 910 559 290
contact@sensia-solutions.com
https://sensia-solutions.com

Sensia Solutions is a leading company in the infrared imaging market. Our technology covers industry, environmental, safety and security applications.

**SENSORLAB SL**

C/ Invierno 113
35018 Las Palmas de Gran Canaria
(Islas Canarias)
Tel + 34 928 236 040
contact@sensorlab.eu
www.sensorlab.es

SensorLab is a young and small company developing high accuracy environmental instruments with a special focus in oceanographic research. SensorLab produces both high accuracy pH sensors and high stability spectrophotometric led light sources and also works on customized products for specific customer requirements.

**SIEMENS**

Ronda de Europa, 5
28760, Tres Cantos (Madrid)
Tel +34 915 148 000
www.siemens.com/es

Siemens offers a wide range of network automation and control solutions; distribution, switching and control of low and medium voltage energy; and building automation, fire safety and protection, heating, ventilation and air conditioning control, and energy. The portfolio is balanced between products, systems, solutions and a full range of services.

8/ Entities that make up the Spanish microelectronics ecosystem

SIMON ELECTRIC

C/ de Sancho de Ávila 66
08018, Barcelona (Cataluña)
Tel +34 630 722 465
<https://www.simonelectric.com>

The company's international trajectory and scope covers business areas ranging from small electrical equipment, connectivity for workplaces, interior and urban lighting and control systems, to the recharging of electric vehicles, hardware and DIY, where design and technology are subject to constant research and improvement processes.

SIPEARL SL

Parc Mediterrani de la Tecnologia
Esteve Terrades, 1
08860 Castelldefels (Cataluña)
Tel +34 654 016 607
contact@sipearl.com
<https://sipearl.com>

SiPearl SL is a R&D center designing the European low-power high-performance microprocessor for super-computing and High Performance Computing (HPC) infrastructures. The company has been funded with an initial private investment to build and bring to market the project of the European Processor Initiative (EPI) consortium. SiPearl SL is part of the SiPearl group headquartered in France with a subsidiary in Germany (SiPearl GmbH). The group employs more than 120 people and is accelerating its recruitment strategy.

SMART HEALTH TV SOLUTION SL

C/ Severo Ochoa 27
Parque Tecnológico
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www.smarttvolution.com

The company designs and manufactures products related to telecare, monitoring of chronic patients and deployment of preventive programs, among others.

SOCE SYSTEM ON CHIP ENGINEERING, SL

Ribera de Axpe Etorbidea, 50, Planta 6
48950, Erandio (País Vasco)
Tel +34 944 420 700
info@soc-e.com
<https://soc-e.com>

SoC-e is a leading global provider of Ethernet communication solutions based on FPGA technology. SoC-e is a pioneer in developing a portfolio of IP cores that implement the most advanced networking, synchronization, and security technologies for critical systems. This SoC-e technology has been applied in more than 100 projects worldwide in very different applications for the Electrical, Industrial and Aerospace sectors.

SOLAR MEMS

Parque Aeroespacial de Andalucía
Aerópolis
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Tel +34 954 460 113
smt@solar-mems.com
www.solar-mems.com

Solar MEMS is a company leader in Sun Sensor technologies for small and medium Spacecraft. Our flight heritage and quality policy always guarantee the best solution for our customers.

Our aim is to introduce MEMS technology to improve current systems and reduce costs, bring the space closer to the technology developers' community and diversify the use of sun sensors in different markets for novel technological applications

2SE - SPACE SUBMICRON ELECTRONIC

C/ Hispano Aviación nº 11, 1ª Planta, Edif. Norte. San José de la Rinconada
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info@2se.es
www.2se.es/company

Space Submicron Electronic S.L. (2SE) is a Spanish company based in Seville (Spain). The company specializes in the design, development and production of integrated microelectronic circuits in sub-micron CMOS (Complementary Metal-Oxide Semiconductor) technology. Its activity is focused on the development of cutting-edge state-of-the-art solutions or the aerospace, defense, industrial and automotive sectors.

8/ Entities that make up the Spanish microelectronics ecosystem

SPARC

SPARC FOUNDRY

C/ Oporto 3, planta 3
36201, Vigo (Galicia)
info@sparcfoundry.com
www.sparcfoundry.com

SPARC is born as a “one-stop-shop” foundry for the development and manufacturing of photonic products that contain III-V semiconductor microchips. SPARC seeks to produce photonic integrated circuits and discrete components based on different III-V group semiconductors, such as Gallium Arsenide and Indium Phosphide.



life.augmentec
ST MICROELECTRONICS
S.A

Torre Inbisa – Plaça d’Europa, 9 – 6º B
08908, L’Hospitalet de Llobregat
(Catalunya)
www.st.com

At ST, we are 50,000 creators and manufacturers of semiconductor technologies that dominate the semiconductor supply chain with state-of-the-art manufacturing facilities. As a manufacturer of embedded devices, we work with more than 200,000 customers and thousands of partners to design and build products, solutions and ecosystems that address their challenges and opportunities.

Our technologies enable smarter mobility, more efficient power and energy management, and large-scale deployment of the Internet of Things and connectivity. ST is committed to becoming carbon neutral by 2027.



SUBSEA MECHATRONIC

Marine Park Innovation
Bajos de La Playa de las Alcaravanas s/n
35006, Las Palmas de Gran Canaria
(Islas Canarias)
www.subseamechatronics.com
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Subsea Mechatronics is a newly created R+D SME focused on mechatronic developments and consulting services, including design and manufacturing. Its experience as a group focuses on the marine environment, hence its name, but it is not limited to this area, being the naval and aerospace industry the two main strategic lines of the company. The company also has experience in the field of digital manufacturing, additive manufacturing and in the field of bioengineering.

tecnal:a

TECNALIA

Parque Científico y Tecnológico de Bizkaia
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https://www.tecnalia.com

The largest applied research and technological development centre in Spain, a benchmark in Europe and a member of the Basque Research and Technology Alliance. We collaborate with companies and institutions. With a model based on trust, and a shared technological strategy, being our main areas of action: smart manufacturing, digital transformation, energy transition, sustainable mobility, personalized health, urban ecosystem and circular economy.


TELEDYNE INNOVACIONES MICROELECTRÓNICAS
SLU (TELEDYNE ANAFOCUS)

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Tel +34 955 258 350
www.teledyne-e2v.com

Teledyne AnaFocus/e2v creates imaging solutions for our customers, permitting them to differentiate by enabling their technology innovation with application specific solutions. We design and manufacture CMOS image sensors, modules, digital cameras, and systems for a variety of applications, such as machine vision, medical and life sciences, logistics and robotics, automation, transport and automotive, surveillance, space & defense, 3D and ultra-low noise. We are market leaders in ophthalmology and dental sensors. In Seville, we have around 80 engineers and 15 technicians, two clean rooms for wafer sort and final test, and a qualification and optical test laboratory.

8/ Entities that make up the Spanish microelectronics ecosystem

TELEVES

Rúa B. de Conxo, 17
15706, Santiago de Compostela (Galicia)
Tel +34 981 522 200
televes@televes.com
www.televes.com

Televes is a worldwide technology company specialized in the design, development and manufacture of telecommunication infrastructure solutions and service platforms for homes, buildings and cities.

Televes is the main agent of a Corporation formed by more than 20 industrial companies which all work to achieve the common objective of designing, developing and manufacturing high-quality solutions in Europe for the telecommunications industry and incorporating its own integrated circuits.

TELEFÓNICA

Distrito Telefónica
Edificio Central, Pl. 2ª
Ronda de la comunicación s/n,
28050, Madrid (Madrid)
Tel +34 914 823 800
www.telefonica.es/es

An open innovation space in which to test, experiment and develop the solutions of the future in the fields of 5G, IoT, edge computing, artificial intelligence, virtual and augmented reality, TV, etc.

TEYDISA

C/ del Sauce, 58
28850, Torrejón de Ardoz (Madrid)
Tel +34 916 775 816
teydisa@teydisa.com
https://teydisa.com

Subcontracting solutions adapted to all your needs in the field of electronics covering several sectors such as telecommunications, defense, railway, technology, aerospace, aeronautics. Smd, Test, Selective welding, Conventional welding. Tests and test Flying Probe, Boundary scan, personalized tests.

THALES

C/ Serrano Galvache 56,
28033, Madrid (Madrid)
Tel +34 912 737 200
comunicacion@thalesgroup.com
https://www.thalesgroup.com/en/global/group

Thales is a global technology leader with more than 81,000 employees on five continents. The Group is investing in digital and “deep tech” innovations – Big Data, artificial intelligence, connectivity, cybersecurity and quantum technology – to build a future we can all trust.

In the markets of defence and security, aerospace and space, digital identity and security, and transport, Thales provides solutions, services and products to help its customers – companies, organisations and governments.

TRIAX

Donostia Ibilbidea, 28
20115, Astigarraga (País Vasco)
Tel +34 943 448 895
tds@triaux.com
https://triaux.com/es-es

Trusted global provider of innovative products and solutions for the reception and distribution of video, audio and data signals for use in homes, businesses and TV, satellite, cable and telecommunications operator networks.

Our Solutions combine our hardware and software expertise to deliver value to the hospitality industry and related markets, through a partner network of system integrators, large installers and operators.

TST SISTEMAS

Parque Científico y Tecnológico de Cantabria
C/ Isabel Torres, 9
39011 Santander (Cantabria)
Tel +34 942 760 540
sales@tst-sistemas.es
https://tst-sistemas.com/tst

We have been working in IoT since 2007 and have extensive experience in design, manufacture and industrialization of products meeting the requirements of our customers in the Industry 4.0, Agriculture and Precision Livestock and Smart Metering sectors.

8/ Entities that make up the Spanish microelectronics ecosystem

T Systems**T-SYSTEMS IBERIA**

C/ Sancho De Avila , 110 – 130,
08018, Barcelona (Cataluña)
t-systems.marketing@t-systems.com

T-Systems Iberia is the subsidiary in Spain and Portugal of the German multinational computer services and consulting company founded in October 2000 belonging to the German group Deutsche Telekom. It offers services to the process industry and electronics and supply companies such as the chemical, pharmaceutical, supply and electronics manufacturers.

**UNISCOOL**

Parc de Gardeny s/n, Edifici CeDiCo.
25003, Lleida (Cataluña)
ramon.jimenez@uniscool.tech
<https://uniscool.tech>

From Lleida, UniSCool seeks the green digitalization of technology, through direct liquid cooling for advanced microelectronics, reducing energy consumption, maximizing the punctual extraction of heat and extending the useful life of the components, thanks to a cutting-edge and patented technology.



Universitat Autònoma
de Barcelona

**UNIVERSITAT
AUTÒNOMA DE
BARCELONA**

Plaça Cívica s/n,
08193, Bellaterra, (Cataluña)
Tel +34 935 811 111
rector@uab.cat
www.uab.cat

Universitat Autònoma de Barcelona is a public university dedicated to higher education and research in multiple disciplines of science, engineering and humanities. In particular, it has a long trajectory in research in microelectronic and nanoelectronic technologies, as well as in the training of professionals in the field of electronic engineering applied to telecommunications.

**UNIVERSIDAD DE
CANTABRIA (GRUPO
DE INGENIERÍA
MICROELECTRÓNICA)**

Av. Los Castros s/n.
Edif. ETSIIT Dept. TEISA
E-39005, Santander (Cantabria)
Tel +34 942 201 560
<https://www.teisa.unican.es>

This group forms the Department of Electronic Technology, Systems Engineering and Automation (TEISA) of the University of Cantabria.

Since 1995, the group has maintained a high participation in R+D projects in the different national and European programs, as well as numerous agreements with companies. It has also made it possible to create and keep updated the research laboratories of microelectronic design and test of digital and mixed circuits VLSI.

**UNIVERSIDAD
CARLOS III**

C/ Madrid, 126,
28903, Getafe (Madrid)
Tel +34 916 249 500
<https://www.uc3m.es/inicio>

The Carlos III University of Madrid was created by the Law of the Cortes Generales of 5 May 1989, within the framework of the University Reform Law of 1983. From its inception, its vocation was to be an innovative public university, small in size, of high quality and with a priority focus on research. Its first Rector was Professor Gregorio Peces-Barba.

The mission of the Carlos III University of Madrid is to contribute to the improvement of society through quality teaching and advanced research in accordance with demanding international criteria. The university aspires to excellence in all its activities, with the aim of becoming one of the best European universities.

**UNIVERSIDAD DE
EXTREMADURA**

Avd. Elvas s/n.
06006 Badajoz (Extremadura)
Tel +34 924 289 302
uexba@unex.es
<https://www.unex.es>

Higher education institution that includes undergraduate and postgraduate training programs in electronic and microelectronic engineering among its academic offerings. Research and development is carried out in the design and verification of analog and mixed-mode application-specific integrated circuits (ASICs) with low power consumption and supply voltage for IoT, energy harvesting, and biomedical applications. The institution is a member of the EURO PRACTICE consortium.

8/ Entities that make up the Spanish microelectronics ecosystem

UNIVERSITAT RAMON LLULL

UNIVERSITAT LA SALLE – RAMON LLUL

C/ Sant Joan de La Salle, 42
08022, Barcelona (Cataluña)
Tel +34 670 770 078
<https://www.salleurl.edu/es>

University with a wide range of degrees. The International University Campus of Barcelona offers degrees in ICT Engineering, Architecture, Business, Digital Arts, Animation, Philosophy and Humanities and Health Engineering. Technology, artificial intelligence and innovation.

In the field of microelectronics and ICT Engineering, the introductory subject to the microelectronic design of digital circuits nMOS and CMOS is taught. The practice allows you to deepen your knowledge of microelectronic design at a full-custom level.



POLITÉCNICA

UNIVERSIDAD POLITÉCNICA DE MADRID

C/ Ramiro de Maeztu, 7
28040, Madrid (Madrid)
www.upm.es

Universidad Politécnica de Madrid (UPM) is the largest Spanish technological university, involving all engineering fields and architecture. The UPM has a long tradition of research in the fields of technology for microelectronics and optoelectronics and nowadays there are three large clean rooms with facilities for semiconductor growth and processing. There is strong research activity in the fields of microelectronic design, photonics, photovoltaic, plasmonic and new semiconductor materials.



Universitat
de les Illes Balears

UNIVERSITAT DE LES ILLES BALEARS

Cra. de Valldemossa, km 7.5
07122, Palma (Islas Baleares)
Tel +34 971 173 000
www.uib.es

The Balearic Islands University (UIB) is a public center. Its academic offer includes the degree of Industrial and automatic electronic engineering. It houses several research groups with experience in the use of microelectronic design tools, design and characterization of digital and mixed-signal ICs and CMOS-MEMS (Electronic Systems Group), in reconfigurable computing and memristor modeling (Electronic Engineering Group). It has laboratories for design, characterization and tests of circuits, integrated devices, MEMS and automated PCB-SMD.



UNIVERSITAT
POLITÈCNICA
DE CATALUNYA
BARCELONATECH

UNIVERSITAT POLITÈCNICA DE CATALUNYA (DEPARTAMENTO DE INGENIERÍA ELECTRÓNICA)

C/ Jordi Girona, 1-3. Edificio C4
08034, Barcelona (Cataluña)
Tel +34 93 401 7486
usd.utgcntic@upc.edu
www.upc.edu

The Department of Electronic Engineering of the UPC was created in 1987 within the framework of the University Reform Law.

It has about 6,000 undergraduate students, 110 students in the Doctoral Programme in Electronic Engineering and a staff consisting of 150 teaching and research staff, 6 administrative staff, 5 laboratory technical staff and an average of 30 technical research support staff.



UNIVERSIDAD
DE MÁLAGA

UNIVERSIDAD DE MÁLAGA (GRUPO DE INVESTIGACIÓN DE INGENIERÍA DE FABRICACIÓN)

Av. de Cervantes, 2
29016, Málaga (Andalucía)
Tel +34 952 131 000
<https://www.uma.es>

The Manufacturing Engineering Research Group is formed by researchers belonging to the Knowledge Area and Teaching Unit of Manufacturing Processes Engineering of the Department of Civil, Materials and Manufacturing Engineering of the University of Málaga, and is mainly dedicated to the study and optimised development of manufacturing processes and measurement methods. It is a Group belonging to the Andalusian Plan for Research, Development and Innovation (PAIDI) of the Andalusian Regional Government.



UNIVERSITAT POLITÈCNICA DE VALÈNCIA - UPVFAB

Ed. 8B – Acceso L – Planta 2
C/ Camino de Vera s/n
465022, Valencia (Valencia)
Tel +34 963 879 760
pascual.munoz@upv.es
www.fab.upv.es

UPVfab is the manufacturing clean room, 500 m² class 10,000 / ISO 7, in semiconductors at the Universitat Politècnica de València. It is operated by the institutes with the highest scientific and transfer productivity of the UPV, iTEAM and ITQ, specialized in integrated photonics, electronics, and chemical engineering. It is configured as a pilot line, and has a program for resident companies that is unique in Spain, which allows the development of new processes, products, and mass production.

8/ Entities that make up the Spanish microelectronics ecosystem



UNIVERSIDAD DE VIGO

Circunvalación ao Campus Universitario
36310, Vigo (Galicia)
Tel +34 986 812 000
informacion@uvigo.gal
<https://www.uvigo.gal/es>

The Department of Systems and Automation Engineering covers 3 main areas: robotics (Industrial Robotics, Design and manufacture of robots, Implementation of robots in industry, Mobile Robotics, Aerial Robotics

Service robotics, special robotics, vision). Automation (automation of machinery, automation of industrial and manufacturing processes, control systems for these industries: mechatronic systems, real time and embedded systems in industrial applications, industrial computing: industry 4.0, industrial communications, and control (Control Theory, Systems Modeling and Identification, Advanced Control Techniques, Artificial Intelligence Techniques).

VISHAY
MEASUREMENTS
GROUP IBERICA

C/ de Toronga, 25
28043, Madrid (Madrid)
Tel +34 917 218 890
<https://www.vishay.com/>

Global manufacturer of semiconductors (diodes, MOSFETS, and optoelectronics) and passive electronic components (resistors, inductors and capacitors).



UVAX

Parque Empresarial Táctica
C/ Corretger, nº71-2
46980, Valencia (Valencia)
Tel +34 961 325 479
info@uvax.es
<https://uvax.es/>

UVAX has focused its development in a unique technology that uses power lines for high-speed broadband data transmission, thus allowing the use of existing infrastructures to facilitate the integration of a wide range of functionalities in a single communication channel. This avoids the need to use different communication channels for each application or vertical, with its consequent cost savings on both, CAPEX (Capital Expenditure) and OPEX (Operational Expenditures).

VALENCIA SILICON
CLUSTER

Plaza del Ayuntamiento, 13. Planta 2
46002, Valencia (Valencia)

The main objective is to frame the immense capacities of the Valencian territory under a single operational proposal and the same brand identity, placing the aspirations of the Valencian ecosystem with respect to all possible levels of the value chain of a key technological sector in the development of the global digital economy. It is intended to place the potential of the Valencian ecosystem as a priority application environment in the financing of the PERTE of semiconductors, with the strategic support of the Universitat Politècnica de València and Universitat de València.



VLC PHOTONICS S.L.

Ed. 074, UPV, Camino de Vera s/n,
46022 Valencia (Valencia)
Tel + 34 961 337 884
info@vlcphotonics.com
www.vlcphotonics.com

VLC Photonics is an engineering company providing services for the development of integrated photonic components and circuits. The company focuses its activities on the consultancy, design and test activities for the main semiconductors platforms (Si, SiN, InP, PLC, etc.), working with national and international customers and foundry providers for more than a decade. Since 2020, it is part of the Hitachi group.

VODAFONE ESPAÑA
S.A.U.

Avenida de América 115
28042 Madrid
(Madrid)
comunicacioncorporativa@vodafone.com
www.vodafone.es

Vodafone keeps society connected and building a digital future for everyone. Operates in 21 countries with more than 100,000 employees. Vodafone develops new technologies and business models in the microelectronics value chain, supporting the design, development and test of "system-on-chip" (SoCs). Additionally, Vodafone aims to support Fabless functions inside its development chain, addressing improvements in performance and energy efficiency, demanded in chip-set market, towards 6G evolution.

8/ Entities that make up the Spanish microelectronics ecosystem



WAVE AND PARTICLE ENGINEERING SOLUTIONS, S.L.

C/ Zurbano 45, 1ª planta
28010 Madrid (Madrid)
Tel +34 910059762
info@waptel.es
https://waptel.es

Company focused on the design and development of high-technology solutions, services and products based on photonics and electronics. The capabilities of WAPTEL cover a wide range of aspects, from the concept and physical simulation of nanostructures and devices to the definition of the fabrication technology, to the characterization of the final system. The major fields of specialization of WAPTEL include semiconductors (III-V and other materials), quantum technology and communications.



WIRELESS INNOVATIVE MMIC (WIMMIC)

C/ Practicante Ignacio Rodriguez s/n,
Edificio Polivalente IV, 307-308
35018, Las Palmas (Islas Canarias)
Tel +34 928941776
info@wimmic.com
www.wimmic.com

WIMMIC is a fabless semiconductor company established in Las Palmas de Gran Canaria designing integrated circuits, with expertise in the aerospace, communications, and defence industries as well as in beamforming integrated circuits (BFICs). The company has established track record in designing different types of circuits, from power amplifiers and low noise amplifiers to mixers, temperature sensors and beamformers using different processes such as CMOS, BiCMOS, SiGe and GaN.



WIYO

C/ Caléndula, 95
Edificio O, Oficina 9
28109, Alcobendas, (Madrid)
Tel + 34 916640602
www.wiyotech.com

WIYO is the commercial arm of Yocto Technologies, fabless ASIC design, specialized in energy harvesting, identification and communication. It is the first IoT-based data platform, whose source is an innovative and disruptive battery-free IoT technology that only uses WiFi. Wiyo's technology for data capture is an evolution of today's RFID, as it solves many of the physical and cost limitations of this technology.



WOOPTIX SL

Avda. Trinidad 61
38205, San Cristóbal de La Laguna
(Islas Canarias)
Tel + 34 619177299
Info@wooptix.com
www.wooptix.com

Wooptix has patented and developed a new technique for subnanometer metrology of wafer blanks and standard wafers. The technique offers 80 million data points referenced to wafer deformation instantly. It is based on a new wavefront phase sensor that offers one data per detector pixel, and whose intellectual property belongs to Wooptix.

This Report lists the companies that make up the microelectronics value chain in Spain. The information and logo shown have been extracted from the companies' public websites. The content of the sheets is an extract of the information describing their activity and the company logo has been incorporated.

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de la Información, Comunicaciones y Electrónica

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

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

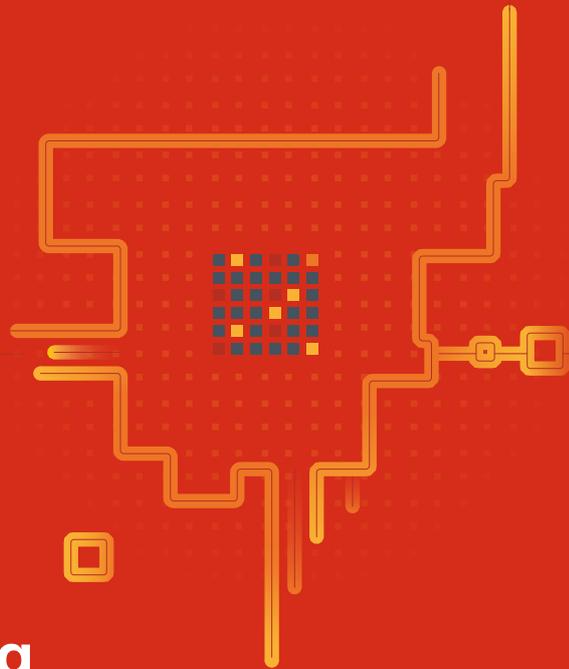
ametic@ametic.es
www.ametic.es

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: 224240263



2023
REPORT

Mapping of the Spanish Microelectronics Ecosystem

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