



CBI
Ministry of Foreign Affairs

CBI Product Factsheet:

Microcontrollers in Germany

Introduction

The demand for electrical and electronic components in Germany is growing and benefiting from the strong export orientation of its economy. This provides good business prospects for exporters from developing countries in the microcontroller market. The delivery of efficient, high-quality and low-value microcontrollers should be the primary focus. Exporters from developing countries should optimise their production and order-processing procedures in order to meet the needs of German buyer.

Product Definition

A microcontroller is a small computer on a single integrated circuit containing a processor core, memory and programmable input/output peripherals. Microcontrollers are designed for embedded applications, including in consumer electronics (e.g. mobile phones), as well as in industrial, automotive and medical applications. This is in contrast to microprocessors, which are used in personal computers and other general-purpose applications. By reducing size and cost relative to designs that use separate microprocessors, memory and input/output devices, microcontrollers are making it economically feasible to control even more devices and processes digitally.

The following types of microcontrollers are typically sold in Europe:

Type	HS Code
Monolithic integrated circuits, digital, of MOS type, as microcontrollers and microcomputers, with a processing capacity exceeding 16 bits, but not exceeding 32 bits (excl. in wafer or chip form)	85421154
Monolithic integrated circuits, digital, of MOS type, incl. BIMOS, microcontrollers, incl. microcomputers, with a processing capacity exceeding 8 bits, but not exceeding 16 bits (excl. in wafer or chip form)	85421173
Monolithic integrated circuits, digital, of MOS type, incl. BIMOS, microcontrollers, incl. microcomputers, with a processing capacity exceeding 16 bits, but not exceeding 32 bits (excl. in wafer or chip form)	85421174
Monolithic integrated circuits, digital, of MOS type, as microcontrollers and microcomputers (excl. in wafer or chip form)	85421360, 85422150
Monolithic integrated circuits, digital, of MOS type, as microcontrollers and microcomputers, with a processing capacity exceeding 8 bits, but not exceeding 16 bits (excl. in wafer or chip form)	85421365, 85421367
Monolithic integrated circuits, digital, of MOS type, as microcontrollers and microcomputers, with a processing capacity exceeding 32 bits (excl. in wafer or chip form)	85421369
Monolithic integrated circuits, digital, of MOS type, obtained by bipolar technology, as microcontrollers and microcomputers (excl. in wafer or chip form)	85421440
Monolithic integrated circuits, digital, of MOS type, obtained by bipolar technology, as microcontrollers and microcomputers, with a processing capacity of exceeding 4 bits (excl. in wafer or chip form)	85421444
Monolithic integrated circuits, digital, of MOS type, obtained by BIMOS technology or other technology (excl. MOS and bipolar), as microcontrollers and microcomputers, (excl. in wafer or chip form)	85421966
Monolithic integrated circuits, digital, of MOS type, obtained by BIMOS technology or other technology (excl. MOS and bipolar), as microcontrollers and microcomputers, with a processing capacity of exceeding 4 bits (excl. in wafer or chip form)	85421968
Hybrid integrated circuits, as microprocessors, microcontrollers and microcomputers (01/01/1990-31/12/1994): Hybrid integrated circuits, as microprocessors or microcontrollers, incl. microcomputers	85422010
Monolithic integrated circuits, digital, of MOS type, obtained by bipolar technology, BIMOS technology or other technologies, as microcontrollers and microcomputers (excl. in wafer or chip form and only MOS type)	85422185
Hybrid integrated circuits, as microprocessors, microcontrollers and microcomputers	85424010

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, all kinds of consumer electronics and other embedded systems.

Brand names are not essential for microcontrollers, as long as quality and design meet the needs of the market. In some applications, however, brand names can play a significant role. Established brands have the advantage of good reputations, and they are known for their superior quality and design, which provides security to procurement officers who must justify their decisions. For this reason, industrial users may prefer established brands. The number of global suppliers of microcontrollers is quite large. The following are amongst the leading suppliers of microcontrollers: [Analog Devices](#), [STM Electronics](#), [Texas Instruments](#), [ZiLOG](#).

Product Specifications

Quality: First, microcontrollers must meet the current requirements of customers.

- Microcontrollers have a range of specifications and classifications (e.g. with regard to construction, permissible power, type of integration and shape).
- Current market requirements for microcontrollers include:
 - increased efficiency;
 - memory capacity;
 - computing power;
 - more compact size;
 - compatibility with peripheral systems;
 - pricing.
- Products must comply with the relevant EU regulations and standards. This assures quality and safety. The materials used, and especially any hazardous substances, must comply with RoHS, and they must fulfil the REACH requirements (see the heading 'Legislative requirements' in this document).

Labelling:

- Microcontrollers are typically marked with the description of content. This includes:
 - type of product;
 - model type;
 - supplier/manufacturer name
 - supplier/manufacturer location;
 - serial number.

Packaging:

- Microcontrollers are usually packaged in plastic bags and cardboard boxes.

Legislative Requirements

In addition to ensuring the durability and safety of products (key factors in market success), exporters must ensure that their products comply with the relevant EU regulations and standards. Compliance with European legislative and non-legislative requirements is a prerequisite for all exporters in the electronics and electrical engineering sector. An overview of the most important requirements with which your products must comply is provided below. Be familiar with all legal requirements in terms of labelling, hazardous substances, product safety and liability. Products must comply with all relevant EU directives.

Liability for defective products. The liability applies to all products manufactured or imported into the European market. Although the company that brings the product onto the European market is usually responsible, claims can be passed along to producers or exporters.

Tip:

- Be familiar with standards that apply specifically to your products. To ensure that your products are of high quality, review your quality assurance and testing procedure (e.g. by implementing an accredited quality management system; ISO 9001). Formulate labels, instructions for use and disclaimers carefully. Finally, be sure that your insurance covers product liability. Additional information is available in the document on EU legislation: [Liability for defective products](#). Other resources include the [EU Export Help Desk](#) and the [ITC standards map](#).

CE marking. As components, microcontrollers are typically sold to equipment manufacturers. With a few exceptions, microcontrollers must be marked with the CE mark. Microcontrollers that are sold within assemblies, sub-assemblies or finished goods are not legally required to bear a CE mark. Driven by market requirements, however, nearly all customers continue to demand the CE mark for most components, particularly those that are critical to the application. The following directives may be relevant for microcontrollers:

- Electromagnetic compatibility (EMC Directive 2004/108/EC),
- Low-voltage equipment (LVD 2006/95/EC),
- Eco-design for Energy-related products (Directive 2009/125/EC),
- Equipment for use in a potentially explosive atmosphere (ATEX Directive 94/9/EC),

Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive 2002/95/EC). Additional details are available in the section on RoHS below

Tips:

- Apply for CE marking, which is required by many customers, even if your product is a sub-system or part of a finished good and is thus not legally required to bear a CE mark. If you are a manufacturer, you should be familiar with the [process of affixing the CE marking](#) to microcontrollers. The European Commission's insightful website '[Export Helpdesk](#)' illustrates the key steps to take from the beginning to the trading of the product. The following documents provide additional information on EU legislation:
- [CE marking for Electromagnetic compatibility](#)
- [CE marking for Low-Voltage Devices](#)
- [CE marking for Eco-design of energy-related products](#)
- [Directive 94/9/EC \(ATEX\)](#)

Waste of Electrical and Electronic Equipment (WEEE). If you are considering exporting electronic or electrical products to the EU, you be aware that EU buyers have obligations regarding the waste of these products. Producers in the EU are obliged to participate in product take-back schemes. Although this does not directly affect exporters from developing countries, such requirements may have an impact when EU buyers ask their suppliers to meet specific design requirements or provide certain information.

Tip:

- Ensure that your product design complies with WEEE and enables product recycling, recovery or dismantling (note that these requirements may differ from one EU Member State to another). Formulate labels carefully, and mark products in accordance with WEEE (e.g. the symbol of the crossed-out wheeled bin). Obtain additional information on the EU legislation concerning [Waste Electrical and Electronic Equipment \(WEEE\)](#).



Labelling of energy-related products. Producers and exporters in the EU are obliged to indicate energy consumption by household appliances and other energy-related products (the list is being extended to include products used for industrial purposes. Be sure to check this when importing your products, and discuss it with your European customers).

Tip:

- Be sure to indicate all product details (e.g. energy class, performance, capacity, noise level) required by the EU. Consult the EU legislation on energy labelling for energy-using and energy-related products on the [EU website](#).

The **REACH regulations** are intended to manage risks relating to chemicals and to provide safety information on such substances. This legislation restricts the use of certain hazardous chemicals. It also established requirements regarding information on chemicals that have been used. Manufacturers are required to provide buyers with information on the properties of any chemical substances used.

Tip:

- Ask your buyer about their requirements regarding REACH. List all chemicals, including raw materials and additional materials, used in your production process. The EU legislation [REACH on chemicals is available on the EU website](#).

Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS). The directive bans the placing on the EU market of electrical and electronic equipment containing more than the agreed levels of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl and polybrominateddiphenyl ether flame retardants.

Tip:

- Be sure that none of the hazardous substances referred to in the RoHS Directive is used in your production process. Exporters of electronic components are required to meet the standards specified under both the RoHS and the REACH directives, as they are complementary. The EU legislation on the Restriction of Hazardous Substances (RoHS) is available [on the EU website](#).

Non-legislative Requirements

Although compliance with non-legislative requirements remains voluntary, buyers often request such compliance. Many 'private' or 'voluntary' standards were originally established by industry players themselves. Although producers often perceive such standards as a barrier entering a market, compliance also constitutes an opportunity to enhance the export competitiveness of your products.



Quality management systems (QMS) – ISO 9001. If you plan to export to Europe, all products must meet the quality demands of the buyer. The ISO 9001 system was designed to ensure that products manufactured in and/or exported to Europe meet the needs of customers.

Tips:

- Apply for ISO 9001 as quickly as possible. Understand the requirements of your target customers and, if you plan to target the automotive industry, obtain ISO/TS 16949.
- Consult the document ISO [Quality management systems](#).

For automotive applications, components within assemblies, sub-assemblies and finished goods must meet the quality demands outlined in ISO/TS 16949 QMS.

Tip:

- Requirements relating to automotive applications with regard to quality-management systems are also available on the [ISO website](#).

Functional Safety in accordance with ISO 26262. The ISO 26262 requirements focus on the functional safety of electrical and electronic systems in vehicles.

Tip:

- Apply for ISO 26262. Even though these requirements are not mandatory, they are sure to provide you with an advantage over other exporters from developing countries serving the vehicle industry. Consult the ISO website for additional information on the guidelines [ISO 26262](#).

Occupational health and safety in the electronic-components sector. Occupational health and safety (OHS) issues include all aspects relating to labour conditions, and they are very often part of the social requirements that EU buyers impose on their suppliers.

Tip:

- Consider implementing a management system on OHS (e.g. OHSAS 18000). European buyers are becoming increasingly sensitive and are demanding transparency in the supply chain and with regard to labour conditions at all levels. Even though these requirements are not mandatory, compliance is sure to provide you with an advantage over other exporters from developing countries. Additional information on occupational health and safety in the electronic components sector is available on the [ISO website](#).

Electronic Industry Citizenship Coalition (EICC) Initiative. The most important sustainability initiative in the Electronics Sector, in Europe and internationally, focuses on social, ethical, health and safety, and environmental issues. Members are required to comply with the requirements of the Code. Some industry buyers can require their suppliers to follow the EICC code of conduct. This is especially relevant for first-tier suppliers.

Tip:

- Identify which of your potential clients or which industries are likely to require the EICC code of conduct. Try to implement this policy. It could provide you with an advantage over other exporters. Explain the steps that you have taken in this regard on your website and in your company's other literature. Consult the [EICC](#) website for additional information on the sustainability initiative.

Trade Statistics

Imports and Exports

In July 2015, Germany reported a new record in the export of electronics. Exports increased by 8.1% between January and August, reaching a value of €101.7 billion. Exports to partner countries in the eurozone increased by 9.5%, with exports to third countries increasing by 7%.

Figure 1: Imports of microcontrollers to Germany (2014), in %

	Share of total import in EU (2014)	CAGR* of total imports (2009- 2014)
Imports	73%	8.8%
*Compound annual growth rate		

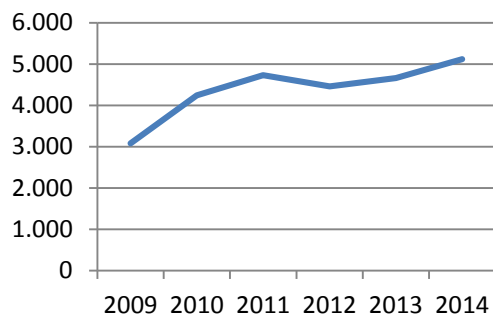
Source: Eurostat Prodcom (2015)

Figure 2: Exports of microcontrollers from Germany (2014), in %

	Share of total EU exports (2014)	CAGR* of total exports (2009- 2014)
Exports	90%	10.6%
*Compound annual growth rate		

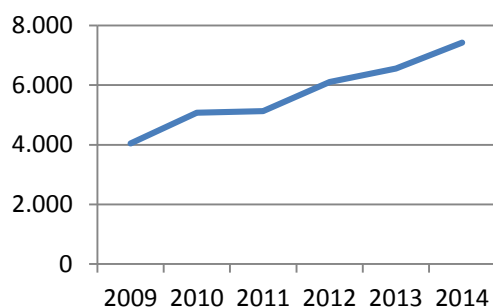
Source: Eurostat Prodcom (2015)

Figure 3: Imports of microcontrollers to Germany, value in € million



Source: Eurostat Prodcorn (2015)

Figure 4: Exports of microcontrollers from Germany, value in € million



Source: Eurostat Prodcorn (2015)

Most important developments

Germany's economy is doing very well, as it benefits from a very competitive position within the EU. In addition, German export products (e.g. cars) are experiencing high demand in growth markets, including China and the USA. Given that microcontrollers are a key component in the electronics of every car, the demand for controllers is high. German manufacturers of premium cars (e.g. Mercedes-Benz, Audi) are focusing particularly on highly demanding car applications (e.g. driver's assistance and autonomous driving).

Tip:

- Enter the German market with a value-for-money proposition for microcontrollers. Low-bit products would be an excellent starting point for building a reputation. Once your product is well-placed and you understand the market requirements, you will be able to explore options for investing in higher-bit (e.g. 32-bit) products and marketing them in Germany.

The import of microcontrollers from Asia to Germany has been increasing again, benefiting primarily from the better-priced product offerings, as well as from the low cost of logistics.

Tip:

- Enter the German market with a value-for-money proposition for microcontrollers. Low-bit products would be an excellent Manufacturers in developing countries with solid product expertise and efficient processes are likely to find partners, including distribution partners in the German market. Focus particularly on small and medium-sized distributors, bearing the size of your own company in mind. point for building a reputation. Once your product is well-placed and you understand the market requirements, you will be able to explore options for investing in higher-bit (e.g. 32-bit) products and marketing them in Germany.

German exports of microcontrollers are increasing, due largely to the country's high level of productivity and its strong position as a trading hub.

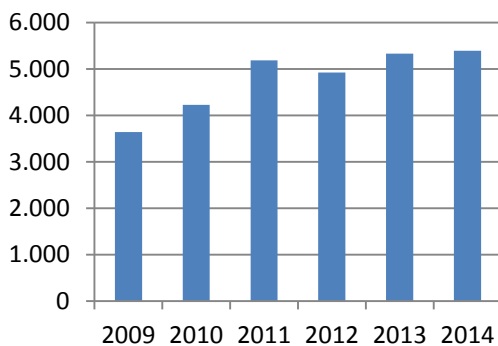
Tip:

- There is a possibility to target other European countries through re-exports. It is nevertheless important to be aware of the weak economic development in European countries.

Production and Consumption

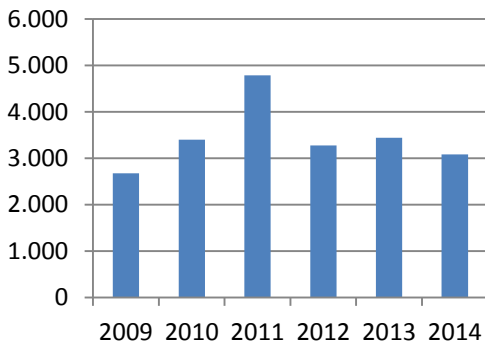
The Internet of Things (IOT) is a major driving force for growth in the consumption and production of microcontrollers. Given Germany's status as a leader in the integration of IoT into automotive or industrial applications, as well as in consumer-oriented applications (e.g. lighting, building automation), suppliers from developing countries are facing an attractive market for microcontrollers.

Figure 5: Production of microcontrollers in Germany, value in € million



Source: Eurostat Prodcom (2015)

Figure 6: Consumption of microcontrollers in Germany, value in € million



Source: Eurostat Prodcom (2015)

Most important developments

The production of microcontrollers is increasing in line with current growth in the German manufacturing industry. The demand for advanced and intelligent engineering products is increasing and, with it, the demand for microcontrollers, which are key components for processing information and controlling machinery

Tip:

- Consider supplying Germany with low-cost passive components, including microcontrollers, to support the expected growth in the electronic industry. Be aware of other current market requirements, including those relating to the quality and design of products, short production times and favourable delivery terms.

Consumption is stagnating in terms of value. This is a result of price pressure in the industry, which is related to shrinking margins for suppliers.

Tip:

- Depending on your production capacity and expertise, consider supplying microcontrollers to the new markets for intelligent machinery. Differentiate your product offerings in order to enter distinct application industries (e.g. automotive, automation or smart grids). Offering 8-bit controllers could be a good market-entry option.

For additional information on trade statistics, consult [CBI Trade Statistics for Electronics and Electrical Engineering](#).

Market Trends

Most important developments

Technological development: Companies have started to switch from 8-bit to 16-bit and 32-bit technology. Reasons for the platform change are diverse, ranging from higher requirements by end customers and issues of pricing or power loss to aspects relating to architecture and tools. Nevertheless, 8-bit technology is still applied in the low-performance, low-cost sector (e.g. in valves, relays, temperature controls and other simple applications). In areas where higher performance is required, 32-bit technology is the most commonly used, although 16-bit technology remains important for specific automotive and metering applications.

Tip:

- Be sure to anticipate the aforementioned technological developments. This will increase your market opportunities significantly. Focus on your strengths. If your products do not meet the market requirements, you should invest in innovation and demonstrate openness to cooperation with existing or potential customers.

Moreover, the spread of the ARM standard (**ARM**, originally **Acorn RISC Machine**, is a family of [reduced instruction set computing](#) [RISC] [architectures](#) for [computer processors](#), configured for various environments, developed by British company [ARM Holdings](#)) as a platform technology is another major trend in the microcontroller market, offering an alternative to the x86-standard. While the x86-platform is most suitable for Microsoft-operated systems, ARM is the leading platform for applications operating on Linux or Android. The ARM technology is not yet compatible for automotive applications.

Product design: New product design requires a higher level of connectivity and a stronger linkage to peripheral systems. Typical interfaces in this context include USB, Ethernet and CAN Bus.

Tip:

- Your products must meet connectivity and interface standards to be competitive. Be sure that your customers are aware that your products meet the latest standards.

Product quality: As the demand for energy grows, contemporary electronic systems will be expected to handle higher voltages. This means that requirements concerning the quality, endurance and efficiency of products will become stricter. Lead time will become shorter, and the reliability of suppliers will play a significant role in cooperation.

Tip:

- Meet the safety and quality demands by incorporating a quality-assurance programme into your production process. Work to optimise the production process and reduce delivery time. Increase the efficiency and flexibility of the production process by introducing a modular production approach and using different technologies. Minimise the risk of damage during production, and meet customer requirements in terms of product quality and delivery time.

Political measures: Various EU Directives have been issued in recent years that are aimed at reducing the environmental impact of industries, primarily through CO2 emissions. In addition to these aspects, efforts have been made to promote the development of renewable energy applications.

Tip:

- A high level of energy efficiency combined with productivity can help potential customers to meet legislative requirements.

For additional information on market trends, consult [CBI Trends for Electronics and Electrical Engineering](#).

Market Channels and Segments

The CBI document on [Market Channels and Segments for Electronics and Electrical Engineering](#) provides a general overview.

Market Competitiveness

The document [CBI Competition for Electronics and Electrical Engineering](#) provides a general overview.

What are the end-market prices for microcontrollers?

Price range for microcontrollers

Like most electronic components, microcontrollers have a wide price range. The following table provides indications of this price range. In Europe, the price for microcontrollers ranges from €0.35 to €1,000, depending upon specifications. Suppliers in several European countries have harmonised their prices; any differences in pricing are due to differences in logistics, taxes and other local costs.

Most important groups of microcontrollers	OEM volume price range, in €
Microcontrollers, 32-bit	2 – 1,000
Microcontrollers, 16-bit	1 – 76
Microcontrollers, 8-bit	0.35 – 250
Microcontrollers, ARM	0.55 – 400

Producers from developing countries should consider different costs and margins along the value chain that could add to the product price. The production and administration costs of the producer usually account for around 50% of the end price. These costs should include all costs for raw materials, development and labour, as well as other fixed and administration costs. Exporters from developing countries should understand their own costs, liabilities and responsibilities, and they would do well to analyse product market price levels. This is necessary to developing a unique selling proposition (USP).

OEM volume price breakdown	Margin
Production and administration costs	50%
Marketing and sales costs in developing countries	3%
Freight to Europe and other related costs	6%
Import and other (e.g. VAT, financing) costs	5%
Marketing costs in Europe	7%
Importer margin	8% – 10%
Distributor margin	20%

Useful resources

Leading trade fairs in Europe

- [Electronica](#), world's leading fair for electronic components, systems and applications
- [Embedded World](#), world's leading fair for embedded technologies
- [Hannover Messe](#), world's leading fair for industrial applications and automation
- [PCIM](#), Europe's largest fair for control electronics, intelligent power trains and energy management
- [SPS IPC DRIVES](#), Europe's leading fair for electrical automation
- [Light & Building](#), world's largest fair for light and building applications

Important resources

- [Elektronikpraxis Vogel](#)
- [Eurostat](#)
- [Eurostat Prodcom](#)
- [FBDI](#)
- [Mouser Electronics](#)
- [Rohm Semiconductor](#)
- [ZVEI](#)

Additional information

CBI market information:

- [Trade Statistics for Electronics and Electrical Engineering;](#)
- [Trends for Electronics and Electrical Engineering;](#)
- [Market Channels and Segments for Electronics and Electrical Engineering;](#)
- [Competition for Electronics and Electrical Engineering;](#)
- [10 Tips for Doing Business in the Electronics and Electrical Engineering sector](#)
- [Finding Buyers in the Electronics and Electrical Engineering sector](#)



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