COLOGNE CHIP AG

Production of novel programmable logic (FPGA)

Cologne Chip AG (CCAG) is a German chip manufacturer without its own semi-conductor production, specialising in products for the communications industry such as ISDN transceivers ICs for basic and primary multiplex connections. These are used, for example, in ISDN cards, telephones, point-of-sales terminals, private branch exchanges and routers. Cologne Chip AG has been successfully developing and selling integrated circuits (IC) for digital communication for more than 20 years. In addition, CCAG focuses on the sale and licensing of special function blocks for integrated circuits (so-called IP cores).

Challenges

Microelectronics is a key technology for the digitalisation of the economy and Industry 4.0. Without microelectronic components, neither the secure networking of machines nor plant engineering, the electrical industry, automotive engineering or technologies for renewable energies would be conceivable. The microelectronic components used in most products today are application-specific integrated circuits, so-called ASICs (Application Specific Integrated Circuit). These chips can be produced comparatively inexpensively for high sales volumes, are power-saving and verifiable and the processes work at high speed. However, the chip design for ASICs incurs high development costs because, among other things, the initial creation of the masks is very time-consuming. As a result, they are often only economically viable for very high quantities. An alternative to the established ASICs of the mass market are so-called FPGA chips (FPGA = Field Programmable Gate Array), which are particularly suitable for specific applications with low quantities due to their freely programmable logic structure. This makes them particularly attractive for SMEs and universities. FPGA architectures are increasingly replacing the classic, application-specific integrated circuits, but are not yet offered as chips by any European company. Cologne Chip AG plans to become Europe's first manufacturer of FPGA chips. To this end, it is developing the corresponding chips, which require a completely new approach to design drafting and implementation on established production lines. Since Cologne Chip AG itself does not have ist own semiconductor production and the new chip designs cannot be transferred easily, a major challenge is to implement the design draft with the available production infrastructure of a semiconductor manufacturer, in this case GLOBALFOUNDRIES.

Objective

The aim of the project is to create the prerequisites for the design and production of new FPGA chips in order to be able to offer individualised products for Industry 4.0 applications and the Internet of Things in Europe in the future. The focus is on high processing speed, energy efficiency and comparatively low manufacturing costs. The results obtained with the first chip designs should prepare the manufacturing processes for industrial use. This is the only way to provide marketable products following the project, which currently cannot be realised because the risk is too high.

Cologne Chip

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Approaches

Cologne Chip AG develops its FPGA chips on the basis of the 28 nm Super Low Power technology from GLOBALFOUNDRIES – an energy-saving variant of a 28 nm process. It allows the production of robust and energy-efficient chips at low manufacturing costs and thus represents an alternative to the conventional FPGA chips of American and Asian companies. In the course of developing the chip design, basic simulations of the most important design parameters are first carried out. After verifying the design parameters, FPGA sample chips are produced, tested and evaluated via a multi-project wafer (MPW). For evaluation and to achieve a high level of customer acceptance, the development of a user-friendly evaluation board for various applications of the chips and for testing the FPGA chips is also being aimed at.

Perspectives

The project consolidates existing cooperations with other semiconductor manufacturers and chip design houses. The project from the technology field of energy-efficient chips cooperates with the GLOBALFOUNDRIES project, which aims to further develop energy-saving chips. Furthermore there are direct links with the project of the SME Racyics GmbH, in which a so-called system-on-chip platform based on FDSOI technology is being developed. With comparatively low manufacturing costs, especially the lack of mask costs for the user, and availability like a commodity chip, FPGA chips are excellently suited for the future field of the Internet-of-Things. The universally applicable FPGA architecture allows European companies to develop new innovative products and services and to market them quickly. Through a strong link between the user and semiconductor industries,

the project strengthens the German and European microelectronics industry and thus makes an important contribution to the successful implementation of the goals of the European integrated project. With the development of programmable semi-conductor solutions, the Cologne Chip project contributes to advancing the key technology of micro- and nanoelectronics as a common European goal and to addressing the societal challenge of digitalisation.