AIXTRON says YESvGaN / Epitaxy specialist AIXTRON is partner of EU research project YESvGaN / High energy efficiency and low CO2 emissions by using GaN power transistors – December 14, 2021

AIXTRON says YESvGaN

Epitaxy specialist AIXTRON is partner of EU research project YESvGaN / High Wide-Band-Gap performance at low silicon cost / High energy efficiency and low CO_2 emissions by using GaN power transistors / Range extension for electromobility

Herzogenrath/Germany, December 14, 2021 - Especially digitalization has triggered a massive increase in applications and electronic devices and thus also in the consumption of electrical energy. Intelligent and efficient power electronics are necessary to secure the power supply and an environmentally friendly high energy use efficiency. The "YESvGaN" (Vertical GaN on Silicon: Wide Band Gap Power at Silicon Cost) research project therefore aims to develop highly efficient power transistors based on a novel process technology for large-scale industrial production.

For the development of vertical gallium nitride (GaN) power transistors with silicon as substrate, the consortium relies on the epitaxy expertise of AIXTRON SE (FSE: AIXA, ISIN DE000A0WMPJ6), a leading global provider of deposition equipment for the semiconductor industry. This is because for this newly developed power device, the compound semiconductor material gallium nitride must grow over a large area in the form of crystalline layers on a suitable substrate such as a silicon wafer.

Combining wide-band-gap high performance and cost advantages of silicon technology

"GaN power transistors on silicon wafers provide us with the intriguing opportunity to combine about 15% higher power density in gallium nitride compared to silicon (Si) with the cost advantages of the established silicon technology. The performance is thus expected to exceed that of modern SiC MOSFETs at chip costs rivaling those of Si IGBTs," says Prof. Dr. Michael Heuken, Vice President Advanced Technologies at AIXTRON SE.

This is made possible by the performance advantages of vertical wide band gap (WBG) transistors. These properties allow to realize transistors made of wide band gap semiconductors such as gallium nitride (GaN) to be more powerful than conventional silicon semiconductors. The lower energy losses of up to 50% when switching high electrical power and the lower production costs due to the use of silicon wafers predestine GaN power transistors for use in many price-sensitive applications.

High energy efficiency and low CO_2 emissions

"Added to this is the advantage that they can significantly reduce energy consumption and CO_2 emissions," adds Prof. Dr. Michael Heuken. The "YESvGaN" consortium estimates the potential electricity savings by the consistent use of such YESvGaN vertical membrane GaN transistors in the EU in 2030 to be equivalent to the power output of seven nuclear power plants or ten coal-fired power plants.

Energy efficiency makes the use of these transistors attractive, particularly in the field of data centers with their high power consumption. These devices are also very beneficial as traction inverters for electric vehicles. The use of low-loss power electronics makes a valuable contribution to electromobility, not only by saving energy but also by extending the ranges of electric vehicles.

In order to further drive the market penetration of GaN-based devices, AIXTRON is also testing epitaxial growth on epi wafers with 300 mm diameter as part of the "YESvGaN" research project; currently, MOCVD technology is primarily used for crystalline growth on 150 mm to 200 mm wafers. For the deposition of GaN layers on 300 mm silicon substrates, the deposition systems specialist is developing the required equipment.

"YESvGaN" clusters the relevant competences along the value chain in a consortium of large companies, small and medium-sized companies and institutes from seven European countries. Partners are beside AIXTRON SE Bosch GmbH, Ferdinand-Braun-Institut gGmbH, Leibnitz Institute for Highest Frequency Technology, Fraunhofer Institute for Integrated Systems and Device Technology IISB, Finepower GmbH, X-FAB Dresden GmbH & Co. KG, X-FAB Global Services GmbH, NanoWired GmbH and Siltronic AG, Centre national de la recherche scientifique CNRS, Ion Beam Services S.A., STMicroelectronics (Tours) SAS (France), EpiGan N.V., Universiteit Gent (Belgium), EV Group E. Thallner GmbH, Materials Center Leoben Forschung GmbH (Austria), Hexagam AB, Linkopings Universitet (Sweden), Smart Induction Converter Technologies S.L., Universitat de València (Spain), AUREL S.P.A., Consorzio nazionale interuniversitario per la nanoelettronica, Raw Power Srl (Italy).

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Further Information: YESvGaN and AIXTRON

Contact Persons

Guido Pickert
Vice President Investor Relations & Corporate Communications
fon +49 (2407) 9030-444
e-mail g.pickert@aixtron.com

Rita Syre
Senior PR Manager
fon +49 (2407) 9030-3665
mobile +49 (162) 269 3791
e-mail r.syre@aixtron.com

About AIXTRON

AIXTRON SE is a leading provider of deposition equipment to the semiconductor industry. The Company was founded in 1983 and is headquartered in Herzogenrath (near Aachen), Germany, with subsidiaries and sales offices in Asia, United States and in Europe. AIXTRON's technology solutions are used by a diverse range of customers worldwide to build advanced components for electronic and optoelectronic applications based on compound or organic semiconductor materials. Such components are used in a broad range of innovative applications, technologies and industries. These include Laser and LED applications, display technologies, data transmission, SiC and GaN power management and conversion, communication, signaling and lighting as well as a range of other leading-edge applications.

For further information on AIXTRON (FSE: AIXA, ISIN DE000A0WMPJ6) please visit our website at: www.axitron.com

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