Federal Ministry
Republic of Austria
Climate Action, Environment, Energy, Mobility, Innovation and Technology

Federal Ministry
Republic of Austria
Labour and Economy

AT & S Austria Technologie & Systemtechnik AG: **Advanced Packaging Technology Initiative for European Power Efficient Electronic Based Systems**

Company presentation

AT&S is a globally leading solution provider for interconnection solutions in electronic and microelectronic applications. AT&S supports applications in the markets for mobile devices, IC substrates, automotive, industrial, and medical technology. AT&S has a global presence with production sites in Austria (Leoben, Fehring) and plants in India (Nanjangud), China (Shanghai, Chongqing), and Korea (Ansan near Seoul), as well as a global sales and application development network. A new high-end IC substrate manufacturing facility is currently under construction in Kulim, Malaysia.

By combining the core business with new technologies and entering a new level of the value chain, AT&S is developing from a circuit board manufacturer to an interconnection solutions provider, creating sustainable growth and positioning itself for future market opportunities. By providing innovative solutions, the company enables new technologies such as 5G networks, IoT, autonomous driving, or artificial intelligence.

The company employs around 13,000 people and generated sales of more than 1.2 billion euros in the financial year 2020/21. AT&S offers innovative circuit board and interconnection solutions for use in a wide variety of high-tech areas. The applications range from mobile communication and high-performance computers to modern driver assistance systems and industrial applications to medical technology products.

Project information

- Technology field(s): Power Semiconductor TF2
- Project coordinator: Sandra Eger, Robert Ofner
- Project duration: 07.2019 – 01.2023
- National implementing agencies: FFG and aws
- Location: Leoben, Austria

Challenges

The global electronic industry is currently facing a significant change. Many applications that have been previously solved mechanically deserve for smart electronic solutions today (e.g. electric vehicles and electrification of cars in general, Industry 4.0, autonomous driving). In addition to this, many new applications are under development that require complex electronic solutions in the upcoming years (e.g. robotics, AI, etc.).

Many of these applications will generate data that have to be processed, stored, communicated and reacted on to. These applications require significant processing power that is performed by the backbone of each electronic device: silicon based processors. Their development, however, is slowing down (Moore's Law no longer applies). It seems that development on silicon-based processors is reaching a physical limit. Every step closer to this limit is causing higher development costs and consequently is slowing down the speed of development. As a consequence, digital processors ("More More" devices) lose the dominant role in Electronic Based Systems and "More than Moore"-devices and the combination and interaction of these devices (i.e. "Package") are getting of more importance for all Electronic Based Systems.

All these upcoming and future applications will have one common challenge: massive consumption of electric energy and electric loss. All solutions that are developed in the up-coming years must have a strong focus on energy efficiency and reduction of conversion loss (not effective) of electrical energy.

Objective

In IPCEI on Microelectronics AT&S wants to leapfrog existing packaging technologies in specific and well-selected areas by focusing on implementing the next generation of packaging and critical OSAT (outsourced semiconductor assembly and test) technology in Austria. This will be achieved by merging and combining 3 main existing competences of AT&S.

In the competence of Main Board / High Density Interconnects AT&S is the second biggest supplier on a global scale and is a technology leader in this field. Since 2015 AT&S has entered the segment of substrate technology and became meanwhile one of the most important players in the according high end segment. More than 10 years ago AT&S started as one of the first companies to integrate components (actives and passives) into PCBs and this lead to establish a significant competence on component and packaging technology that is currently applied for simple packaging a few "simple" components. This is an essential milestone for achieving our long term vision of "More than AT&S" where AT&S will become an expert for module integration.

The objectives behind this combination is in absolute synergy with the objectives of TF2 in the IPCEI on Microelectronics:

- of smaller size;
- with less energy losses
- with smaller cooling structures
- with longer lifetime
- meeting advanced application and market requirements

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Solution approaches

In its project, AT&S is creating a first industrial deployment of organic substrate cores for power and processor packages with a huge research and development effort. The development work ranges from process and material development to quality assurance (functional test) and process control.

New concepts for novel packaging concepts for high frequency applications will be developed and implemented. With this novel concept, heat dissipation can be improved massively, without consuming additional footprint.

For new technology node test and reference boards research and development activities has to be forced to achieve miniaturization requirements. The entire process chain must be further developed – there is a need for advanced processes in plating, imaging, mechanical and laser technologies. Besides, there is also a high need for a new materials selection and registration chain.

In addition, production steps must be automated and integrated in the direction of Industry 4.0 (data analyses,...). Another focus is on resource recycling technologies in order to conserve resources and to correspond to the European Green Deal initiative.

Perspectives

The project not only strengthens existing collaborations with European corporate partners but also supports and promotes new collaborations. To ensure the dissemination of the results, cooperation with universities and research institutions is also planned and ongoing.

The results of the project increase the competitiveness of AT&S and Europe in the field of packging technology. The developed technology modules can be applied and transferred for many different applications (automotive, medical,...).

With the development of high-performance and energy-saving printed circuit boards and IC substrates, AT&S's project contributes to advancing the key technology of micro- and nanoelectronics as a common European goal and to addressing the societal challenge of digitalization.

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