

Project profile

IDEAS

Interactive power devices for efficiency in automotive with increased reliability and safety



In both conventional and electric vehicles, power supply reliability is a major challenge. Electronic packaging has a substantial impact not only on overall complexity and efficiency but also on safety in the event of a crash and/or fire. The main objective of the ENIAC JU project IDEAS is, therefore, to develop advanced packaging for power-supply components and new generation memory systems for applications in electric and/or internal combustion engine vehicles. The project also covers aspects that have not been addressed in other ENIAC and ARTEMIS automotive-electronics projects.

Sub Programme

- Nanoelectronics for automotive and transport
- Nanoelectronics for energy efficiency

Thermal failure of electronic components in a vehicle caused by overload may easily lead to a fire. This can rapidly propagate to the passenger compartment causing injury or even death as well as road traffic disruption. Specific European working groups and initiatives are now addressing those issues with particular focus on electrical vehicles as these are rapidly gaining popularity.

The ENIAC JU project IDEAS addresses the limitation of the risk of fire by careful design of the overall electrical/electronic packaging to allow for adaptive partitioning and electrical isolation of individual circuits. Considerable effort is also being applied to improving the thermal performance of the packaging of the power-supply systems.

Further into the automotive electronics, the control systems, which rely on multi-core microcontroller and complex software architectures, place increasing stress on memory devices, which have to be designed for very high bandwidth, speed and

reliability. This also tends to raise operating temperatures and increases the risk of thermal breakdown.

Reducing losses

A key objective is the enhancement of the power-train platform to ensure that thermal performance and reliability requirements are met under all driving conditions throughout the lifetime of the vehicle. This will be achieved by investigating novel power die attachment processes and advanced interconnection technologies, which are fundamental to the improvement of electrical performance.

The aim will be to minimise electrical and mechanical resistance, optimise current distribution and increase lifetime and performance. An advanced technique for the front metallisation of silicon wafers will be adapted and improved to allow for the development of innovative interconnection and cooling solutions to enhance reliability as a key requirement.

Another key objective is to develop a new memory system specifically designed for the aggressive requirements of the control systems in advanced internal combustion engines or electrically-propelled vehicles. The main demand will be very high bandwidth to ensure fast access for real-time operation with concurrent access. This will allow use of a multi-core processor to cope with rigorous safety requirements and enable complex software architectures to run within low-cost high-performance microcontroller architectures.

Safety is paramount

Electrification of automotive propulsion systems is currently viewed as the most effective answer to the looming shortage of fossil fuels. However, responding to a market that is often resistant to disruptive changes means that this solution requires the highest level of safety technology conceivable today.

Several projects are currently running under ENIAC and ARTEMIS management, while the European Green Cars Initiative established by the European Commission addresses other aspects of electro-mobility technology.

The IDEAS project aims at complementing these projects by covering critical aspects of the safety of electric vehicles, which may also have immediate applications in advanced internal combustion engine vehicles by:

- Providing novel component packaging technologies, which will drastically enhance the performance and reliability of the power-supply systems; and
- Addressing improvements in the data-communication channel – including high bandwidth memories – to make it resistant to electrical interference and malicious attacks. Data communications between sensors, memories and processors for engine management and for assisted driving is a key technological enabler for the deployment of new generation car-computing systems.

Increased energy efficiency

Benefits are envisioned in the distributed propulsion systems, which will equip the new generation of electric vehicles and in future advanced driving systems – both in electric vehicles and in internal combustion engine cars – relying on multi-core microcontroller technologies and complex real-time software algorithms.

Technologically, IDEAS will contribute to the process of making products manufactured in Europe more intelligent, more comfortable, safer and more energy efficient. Makers of all types of vehicle will benefit from the successful outcome by gaining or consolidating a strong market position as a result of cheaper and more reliable devices.

Automotive and transport

Partners:

- Automotive Industry Institute PIMOT
- BITRON
- Brno University of Technology
- Centro Ricerche Fiat
- DEST
- Institut mikroelektronických aplikací
- Institute of information theory and automation
- ISD
- Micron Semiconductors
- Polimodel
- Polytechnic University of Turin
- Puremobility
- Sapienza University of Rome
- SINTEF
- STMicroelectronics
- University of Perugia
- Warsaw University of Technology

Project co-ordinator:

- Roberto Zafalon, STMicroelectronics

Key project dates:

- Start: June 2012
- Finish: May 2015

Countries involved:

- Czech Republic
- Greece
- Italy
- Norway
- Poland

Total budget:

- €9.95 million



The ENIAC Joint Undertaking, set up in February 2008, co-ordinates European nanoelectronics research activities through competitive calls for proposals. It takes public-private partnerships to the next level, bringing together the ENIAC member states, the European Commission and AENEAS, the association of R&D actors in this field, to foster growth and reinforce sustainable European competitiveness.

Details correct at time of print but subject to possible change. Updates will be included in the project summary at the end of the project.

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