Press release

ZeroAMP announces a Horizon 2020 funded project to develop ultra-low power computing and memory, using nanomechanical switches capable of surviving extreme environments.

Ultra-low power computing for everywhere, from the Arctic to AGA ovens

Neuchatel, 16 April 2020 – Electronics that can operate at high temperatures with very high energy efficiency are necessary to power future electric cars and aircraft, as well as Internet of Things (IoT) applications. On the other hand, superconducting quantum circuits need to operate at cryogenic temperatures. To serve both these emerging requirements, the EU-funded project ZeroAMP, in which CSEM is involved, will develop ultra-low power computing and memory, using nanomechanical switches that can survive extreme environments. The project will use novel materials, switch designs and circuit techniques along with advanced 3D stacking to maximize energy efficiency and environmental capability.

Transistors are the ubiquitous building blocks of digital integrated circuits found in every modern electronic device, from cell phones and computers to industrial electronics. However, emerging applications work with ultra-low power sources that transistor-based electronics can't efficiently use. They also need to operate at low power in harsh environmental conditions, where transistors cannot perform. Autonomous nodes for the IoT require, for example, extremely energy-efficient processors with zero standby power, while all-electric vehicles and more-electric aircraft need electronics controllers that work at very high temperatures. At the other end of the spectrum, readout circuitry for superconducting quantum circuits must operate at close to cryogenic temperatures.

To push beyond the limits of transistors, Microchip Technology (MICROCHIP), a leading provider of smart, connected, and secure embedded control solutions, alongside X-FAB MEMS Foundry GmbH (X-FAB), a leading semiconductor foundry, are developing the first large-scale integrated nanoelectromechanical relay-based computer for harsh environments.

Critical expertise will be provided in this international project by the University of Bristol (UNIVBRIS, UK), KTH Royal Institute of Technology (KTH, SE), Gesellschaft für Angewandte Mikro- und Optoelektronik GmbH (AMO, DE), the Swiss Center for Electronics and Microtechnology SA (CSEM, CH) and SCIPROM Sàrl (CH).

The goal of ZeroAMP is to develop nanoelectromechanical relay-based field-programmable gate arrays (FPGA) with integrated non-volatile memory, which work at temperatures up to 275°C with zero current leakage and standby power. This technological solution will incorporate novel materials, switch designs and circuit techniques alongside advanced 3D stacking for large-scale integration of the nanomechanical switching elements. The solution builds on the ground-breaking work already carried out by the consortium partners in the area of nanoelectromechanical relay-based computing.

Together with ZeroAMP's partners, CSEM will be involved in the optimization process, developing nanocrystalline graphite (NCG) as a contact material to improve reliability.

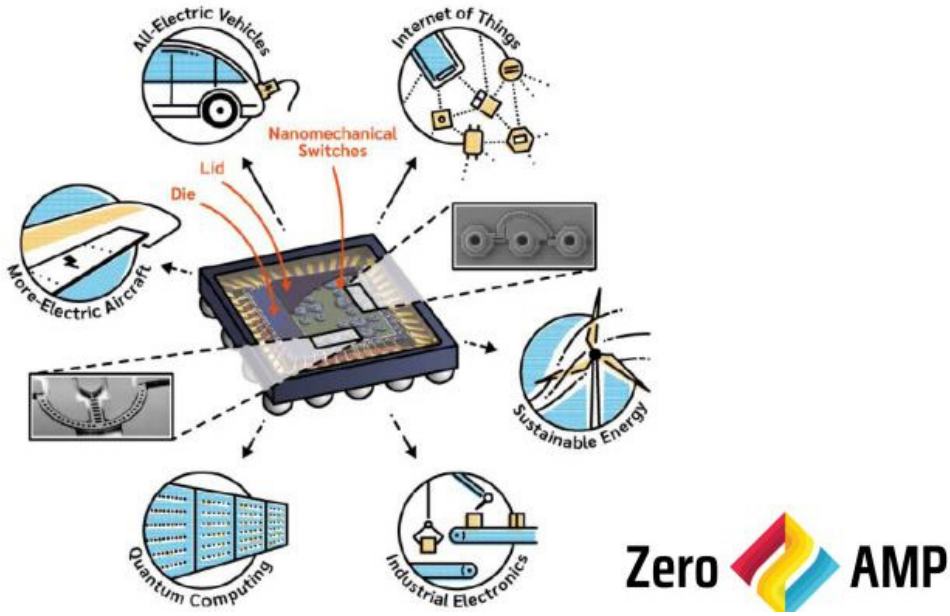
The NCG acts as a solid conducting lubricant to protect the contacts from wear and tear over repeated cycling, and the low surface forces of this material help reduce stiction.

Moreover, a key issue to consider with nanomechanical (NEM) relays as contact switches is their reliability, manifesting in several failure modes. In response, CSEM will establish a new NEMS test methodology and investigate an in-depth root-cause analysis for eventual improvement of NEM switch performance.

The ZeroAMP project's target market is electronic solutions that unlock the full power of the IoT, aid cryogenic quantum computing, wirelessly log temperatures deep in industrial processes and advance technologies such as electric vehicles that help reduce our dependency on fossil fuels.

The ZeroAMP project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 871740 (ZeroAMP).

For more information on ZeroAMP, please visit https://www.zeroamp.eu



© Image courtesy of Jamie Reynolds, Simon J. Bleiker and SCIPROM

Additional information

CSEM
Olha Sereda
Section Head
Head CSEM Center Landquart
Tel: +41 32 720 5437
Mobile: +79 842 3472
Email: olha.sereda@csem.ch

Press release

Ultra-low power computing for everywhere, from the Arctic to AGA ovens

About CSEM

CSEM—technologies that make the difference

CSEM, founded in 1984, is a Swiss research and development center (public-private partnership) specializing in microtechnology, nanotechnology, microelectronics, system engineering, photovoltaics and communications technologies. Around 500 highly qualified specialists from various scientific and technical disciplines work for CSEM in Neuchâtel, Zurich, Muttenz, Alpnach, and Landquart.

Further information is available at www.csem.ch

Follow us on:

Media contact

CSEM
Florence Amez-Droz
Corporate Communication Manager
Tel. +41 32 720 5203
Mobile : +41 79 394 47 31
Email : florence.amez-droz@csem.ch

CSEM
Laure-Anne Pessina
Communication Manager
Tel. +41 32 720 5226
Mobile: +41 79 360 2538
Email: laure-anne.pessina@csem.ch