E2SWITCH
Energy Efficient Tunnel FET Switches and Circuits

Co-funded by the European Union

E²SWITCH

Energy Efficient Tunnel FET Switches and Circuits

Grant Agreement No.: 619509

Funding Scheme: Collaborative project

Thematic Area: Energy efficient switch, tunnel FET, nanotechnology III-V, SiGe and Ge, low power integrated circuits, digital and analog/RF circuits, CMOS, simulation and modeling of nano-electronic devices & circuits

Project start date: 01/11/2013

Deliverable D7.3 — Press release in the project end

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Date of delivery: M49

Lead partner: EPFL

Contributing partners: SCIPROM, all

Authors Lars-Erik Wernersson (LUND); Véronique Gobry, Kirsten Leufgen (SCIPROM)

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[1] R = Report, P = Prototype, D = Demonstrator, O = Other

[2] PU = Public, PP = Restricted to other programme participants (including the Commission Services, RE = Restricted to a group specified by the consortium (including the Commission Services), CO = Confidential, only for the members of the consortium (including the Commission Services)

[3] Measured in months from the project start date (M01)

Revision history

Version	Date	Authors	Comment
0.1	02.11.2017	Véronique Gobry	First version
0.2	17.11.2017	Véronique Gobry	Completions
0.9	24.11.2017	Kirsten Leufgen, Peter Ulrich	Revisions. Final draft
1.0	29.11.2017	Adrian Ionescu, Kirsten Leufgen	Final deliverable version, approved by the coordinator AI

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Contents

Summary

The European project E²SWITCH is aiming to develop new electronic systems with ultra-low energy consumption.

The coordinating entity, EPFL, launched a first press release presenting the project by the end of the first year of the project.

This document is the final project press release. This document has been prepared by Lund University, circulated in the consortium and approved by all. It has been published in English on the website of the Lund University:

http://www.lunduniversity.lu.se/article/smarter-transistors-could-be-three-times-more-energy-efficient

and announced in the E²SWITCH news on:

http://e2switch.org/news/index.php?id=2151014565454309708

1. Complete press release

Smarter transistors could be three times more energy-efficient

Published on Dec, 7, 2016

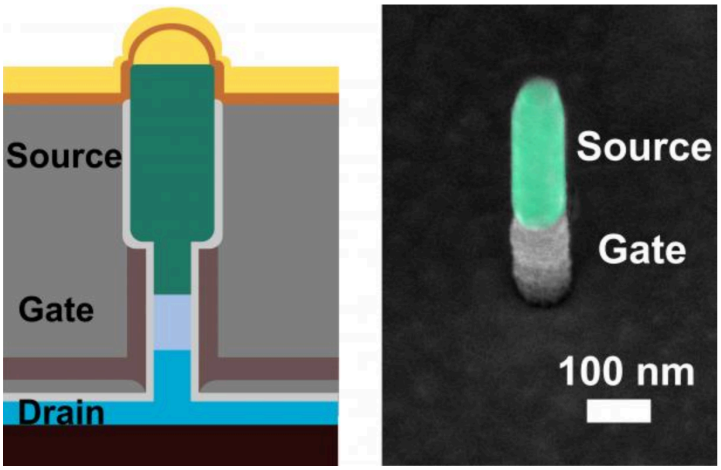
The original article was published in Swedish and in English on the section Lunds Tekniska Högskola of the LUND University website*:*

http://www.lunduniversity.lu.se/article/smarter-transistors-could-be-three-times-more-energy-efficient

Below is the complete English version of the press release.

Together with his research team, Lars-Erik Wernersson, professor of nanoelectronics at Lund University in Sweden, has developed a technology for smarter transistors which could be used in electronics that operate on low energy, such as sensors for the Internet of Things. Using the new transistors on a large scale could save enormous amounts of energy.

Transistors are the smallest building blocks in electronics - a kind of switch. When the amount of energy required to switch the transistors on or off is reduced, major savings can be made overall. Transistors with low-energy consumption are expected to be highly significant for applications within the Internet of Things.



With the help of nanotechnology, the material and architecture in the transistors have been optimised so that they consume only a third of the energy required with the current technology when operating at low voltages. They can be used in digital circuits, various sensors and communication.

"We have been able to operate the transistors under what is known as the fundamental thermionic limit, which reduces energy consumption. The next step is to continue to study the physics and to understand the components better, so that they can be further optimised. We also want to find new ways of transferring the technology to industry," says Lars-Erik Wernersson.

The researchers' findings will probably have moved into production processes within five to ten years. According to Lars-Erik Wernersson, the extent of the energy savings will depend on the quality of the components which can be produced in industry.

"The dream scenario is that all data servers will consume less energy thanks to the technology we use. In that case, the savings in one year would be comparable to all the energy consumed in Great Britain during the same period."

When his researcher colleagues recently reported data from an experiment conducted within the EU-funded E2SWITCH project, Lars-Erik Wernersson, along with the doctoral students who carried out the test, realised that these were ground-breaking results:

"We have repeated the tests many times and succeeded in demonstrating that the performance with this new, energy-saving technology is not only satisfactory, but even better than that based on the traditional technologies."

According to Lars-Erik Wernersson, the new technology is a complement and one of several technologies which can be used to create more energy-efficient transistors – and different types of applications require different solutions.

"We are very happy to have found something that many people have been searching for. We have shown that the transistors have high performance and that it is possible to reduce energy consumption. And now we can continue to add pieces to the puzzle," concludes Lars-Erik Wernersson.

Facts / E²SWITCH:
E²SWITCH is a research project funded by the EU which aims to find smart electronic components which also save energy. The consortium comprises nine partners from six European countries.

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2. Article on the E²SWITCH news webpage

Smarter transistors could be three times more energy-efficient

Published by SCIPROM on the E²SWITCH website on Dec, 15, 2016:

Together with his research team, Lars-Erik Wernersson, E²SWITCH dissemination manager and professor of nanoelectronics at Lund University in Sweden, has developed a technology for smarter transistors which could be used in electronics that operate on low energy, such as sensors for the Internet of Things. Using the new transistors on a large scale could save enormous amounts of energy.

Transistors are the smallest building blocks in electronics - a kind of switch. When the amount of energy required to switch the transistors on or off is reduced, major savings can be made overall. Transistors with low-energy consumption are expected to be highly significant for applications within the Internet of Things.

With the help of nanotechnology, the material and architecture in the transistors have been optimised so that they consume only a third of the energy required with the current technology when operating at low voltages. They can be used in digital circuits, various sensors and communication.

“We have been able to operate the transistors under what is known as the fundamental thermionic limit, which reduces energy consumption. The next step is to continue to study the physics and to understand the components better, so that they can be further optimised. We also want to find new ways of transferring the technology to industry,” says Lars-Erik Wernersson.

Benefits of III-V nanowires are the electrostatic control in the small dimensions and the flexibility in heterostructure design. Challenges include defect control and processing technology. Combining understanding in heterostructure control with defect reduction methods developed within E²SWITCH, LUND has demonstrated a TFET where the critical I60 current level has been increased more than a factor 100 as compared to state-of-the-art. With drive currents of 10 µA/µm (at 1nA/µm Ioff) it shows promise for IoT applications.

Read the full press release by Lund university: http://www.lunduniversity.lu.se/article/smarter-transistors-could-be-three-times-more-energy-efficient

3. Distribution channels of the press release

This final E²SWITCH press release was distributed via the "Cision" distribution system (selected to a few hundred journalists) as well as "expertsvar.se" that connects to national journalists of interests.

Internationally, it was released by via the AAAS journalist platform. The press release was taken up by several online news sites:

- WorldNews Network: https://article.wn.com/view/2016/12/06/Smarter_transistors_could_be_three_times_more_energyefficien
- PressReleasePoint: http://www.pressreleasepoint.com/smarter-transistors-could-be-three-times-more-energy-efficient
- myScience:
- https://www.myscience.org/wire/smarter_transistors_could_be_three_times_more_energy_efficient-2016-LUND

Below are the links to popular and scientific Swedish media in which the press release has been published:

- NordicHardware, a Swedish is an online magazine that features reviews, news, community, and recommendations on computer hardware, on December 07 2016 "Svenskt transistorgenombrott kan ge 3x energieffektivare processorer": https://www.nordichardware.se/nyheter/svenskt-transistorgenombrott-kan-ge-3-ganger-energieffektivare-processorer.html
- Elektroniktidningen, the main news source for professionals in the Swedish electronics industry, on November 9, 2017 "LTH-genombrott för snal transistor": http://www.etn.se/index.php/nyheter/62980-lth-geonmbrott-foer-snal-transistor
- In the January 2017 edition of the LTH magazin Lunds Tekniska Högskola, p. 42-43 "Drömscenariot är att alla dataservrar konsumerar mindre energi med hjälp av den teknik vi använder.": https://www.lth.se/fileadmin/lth/omlth/kommunikation/lthnytt/LTH_Nytt_2017_utanFoliering_lowres.pdf

In addition it was posted on twitter via Lund University. And finally it has been on the front web page of both Lund University and the Technical Faculty of Lund University (LTH).