PRODUCTION OF A TUNNEL FIELD-EFFECT TRANSISTOR (TFET) FOR ENERGY-EFFICIENT NANOELECTRONICS

Ref-No: TA-PT 1.2684

BACKGROUND

The technology, a tunnel field-effect transistor (TFET), features two advantages over conventional TFET devices. First, the tunnel junction is steeper with high doping concentration, leading to a thinner tunnel barrier, and thus higher tunnelling currents. This was achieved by a new process that provides both silicidation and dopant segregation directly in the source region. Second, the tunnelling area with tunnelling parallel to the electric field of the gate is enlarged by means of selective and self-adjusting silicidation. This further increases the tunnelling currents.

Forschungszentrum Jülich has extensive expertise in this field and holds several patents. The technology described above is continuously being developed further. The Peter Grünberg Institute (PGI-9) – Semiconductor Nanoelectronics – already cooperates with numerous national and international companies and scientific partners. Forschungszentrum Jülich focuses on energy efficient devices, finding solutions to reduce the power consumption of integrated circuits. We are continuously seeking for cooperation partners and/or licensees in this and adjacent areas of research and applications.

PROBLEM

The invention addresses increasing energy consumption issues related to the continuous reduction of transistor sizes and increasing packing density of transistors per chip.

SOLUTION

The TFET combines a tunnel junction parallel to the electric field of the gate with a material having a narrower band gap, featuring an enlarged tunnel region below the gate. The production process comprises selective, self-adjusting silicidation and additionally dopant segregation. These advantages allow a production of the tunnel junction for higher tunnelling probabilities. Reproducibility of the process was proven, showing a great potential for ultra-low power applications of TFETs.

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DEVELOPMENT STATUS

Prototype

CATEGORIES

//Energy engineering and energy storage //Electronics and electrical engineering //Electronic circuits //Electric power transmission //Energy engineering //Nanotechnology

SCOPE OF APPLICATION

In the potential fields of application Green Nanoelectronics and Internet of Things (IoT), more energy-efficient transistors are essential for the development of higher-performance mobile devices and computers.

SERVICE

If you have questions about the technology please refer to:

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