News Release

Japanese Start-up demonstrated a radiation-resistant FPGA Using semiconductor technology of the FinFET generation.

Tokyo, Nov 6, 2023 - NanoBridge Semiconductor, Inc. (NBS*1), Up-coming Japanese start-up, which possesses the NanoBridge(R) technology, a domestically developed semiconductor technology known for enhancing radiation resistance and reducing power consumption in electronic devices, has collaborated with the Japan Aerospace Exploration Agency (JAXA*2) to develop and demonstrate the basic operation of a radiation-resistant NanoBridge FPGA (NBFPGA*3) using semiconductor technology of the FinFET generation*4.

NBS is a venture company established by NEC researchers in September 2019. NanoBridge is a technology to control the creation or elimination of nanometer sized metal bridges in a solid electrolyte through the application of voltage, thereby realizing on and off-switch status. It is attracting attention as an ideal technology for FPGA (*4) and memories that can repeatedly rewrite circuits. This is because NanoBridge consumes less power, as it does not require power to maintain an on or off status, and is highly resistant to both radiation and extreme temperatures. In the future, it is expected to be a green innovation for aerospace applications and low-power applications.

NBS has been working on commercializing NanoBridge technology*5. In this endeavor, NBS has developed NanoBridge application technology for the FinFET generation of semiconductors, which is essential in radiation-resistant areas such as aerospace and

communication infrastructure. NBS has also produced prototype NanoBridge FPGA chips for small-scale information processing, demonstrating the basic functionality.

To enhance the radiation resistance of miniaturized semiconductor devices, NBS has incorporated JAXA's Radiation Hardened by Design (RHBD*6) technology, improving the radiation resistance characteristics of the semiconductor circuitry. By combining NanoBridge technology with RHBD technology, NBS can create NBFPGA with excellent radiation resistance. In the future, NBS plans to further develop larger-scale NBFPGA based on this technology and expand the NanoBridge business for a wide range of applications, including aerospace and manufacturing industries both domestically and internationally.

The details of the developed technology were presented at The Microelectronics Workshop (MEWS36), which took place in Tsukuba, Ibaraki, Japan on October 16-17, 2023.
（Program : https://ssl.tksc.jaxa.jp/mews/jp/index.html?top）

The results have been achieved by “Research and development of innovative FPGA for satellite digitalization”, the Ministry of Education, Culture, Sports, Science and Technology (MEXT), JAPAN.

NBS is actively recruiting semiconductor device/circuit researchers and engineers to further expand the potential of NanoBridge technology.
（Contact : https://nanobridgesemi.com/?page_id=463）

<Technical Background>

In space, the environment is harsh for electronic circuits due to direct exposure to intense radiation from space. One of the particular challenges is the malfunctioning of semiconductor components.

Currently, a significant portion of high-functionality LSIs with high radiation resistance, which are used as core components in large and medium-sized domestically produced artificial satellites, are imported from overseas. There is a desire for domestic production to enhance economic and security considerations.

NanoBridge FPGA (NBFPGA) is a logic integrated circuit with extremely high radiation resistance. Its foundational technology was demonstrated during the Innovative Satellite Technology Demonstration 1st Unit Small Demonstration Satellite 1st Unit (RAPIS-1*7), and the development phase has transitioned to practical use. With this development, NanoBridge can now be applied to even more miniaturized generations of semiconductors, making it possible to provide larger-scale NBFPGA.

(*1) Headquarter : Tsukuba, Ibaraki, CEO : Tadahiko Sugibayashi

(*2) Headquarter : Headquarters: Chofu, Tokyo, Chairman: Hiroshi Yamakawa

(*3) NEC has spun off a company based on its unique technology, NanoBridge, creating an FPGA that achieves a 90% reduction in power consumption.
httphttps://jpn.nec.com/rd/special/202101/index.html

(*4) A Fin Field-Effect Transistor (FinFET) is a type of MOSFET (Metal-Oxide-Semiconductor Field-Effect Transistor) that introduces a three-dimensional channel structure. It is called "FinFET" because the shape of the channel resembles the "fin" of a fish. This technology is commonly introduced in logic technology nodes starting from the 16nm generation and beyond. In this context, the technology is being utilized in the 16-12nm technology nodes.

(*5) Series-A2 round,
https://nanobridgesemi.com/?page_id=7

(*6) In the presence of radiation, soft errors (bit-flip errors caused by radiation) can occur. The collective term for the technology to mitigate these errors through circuit design is known as "radiation hardening."（Radiation Hardening By Designing : RHBD）

(*7) Innovative FPGA（NBFPGA :NanoBridge based Field Programmable Gate Array）
https://www.kenkai.jaxa.jp/kakushin/kakushin01.html

About NanoBridge Semiconductor, Inc.

NanoBridge Semiconductor, Inc. (NBS) was established in 2019 at Tsukuba to "Deliver ICT applications everywhere with Nanobridge technology". NBS provides low-power and rad-hard programmable AIoT terminals and nonvolatile memory through NanoBridge. At NBS, customers come first. NBS strives to build deep relationships with customers and works together for opening up Carbon Neutral Society. For more information, visit NBS at https://nanobridgesemi.com/