Switch Device for high power and radiation Environments

CSIC through the Instituto de Microelectrónica de Barcelona - Centro Nacional de Microelectrónica, has developed a novel JFET (Junction Field-Effect Transistor) which is very suitable to be used in high-power devices and/or radiation-level environments such as space, high-flying aircraft, particles accelerator or radio-medical equipment. Due to its particular configuration, the device presents very high radiation hardness.

Industrial partners from the electronic industry focused on radiation detection or power distribution under radiation environments are being sought to collaborate through a patent licence agreement.

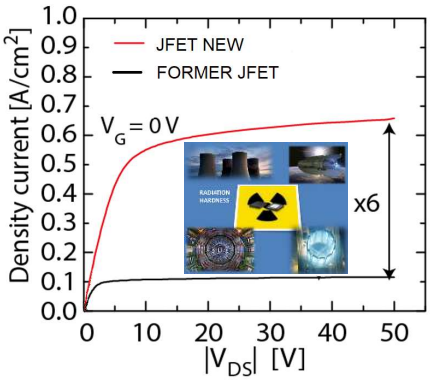
An offer for Patent Licensing

JFET switch operating in harsh radiation environments

JFET devices are widely used as switches or as a passive protection element. However, none of them is ideal for high radiation applications because their fabrication request the use of an inter-level oxide, which fails under expositions to high radiations level. Furthermore, the use of n-doped substrates in electronics devices to improve their electrical properties, increases their vulnerability to the radiation, making them not suitable to operate in high radiation environments.

Thus, one of the relevant research lines of modern power electronics is the search for appropriate devices for power distribution circuits and systems control that are capable of operating in high radiation environments.

The novel JFET device due to its vertical junction configuration presents a very high radiation hardness, which is very suitable to be used in high-radiation environments such as space, aeronautics, as well as nuclear power plants or radiomedical equipment.



Main examples of environments where electronic devices should present radiation hardness. Comparison between density Current between the new developed and former JFET device.

Main innovations and advantages

Its main application are in power distribution in space and nuclear reactors, however can be also used in high-flying aircraft, particles accelerator, or any electronic equipment or component that has to withstand high radiation like radiomedical equipment. It can also be used in energy applications as switch device in high power systems. Its main advantages are the following:

- High robustness to ionizing and non-ionizing radiation damage.
- SEE (Single Event Effects) robustness due to its bulk configuration.
- Improved device design, which allows a higher carrier injection into the channels, and therefore higher current densities.
- High active area ratio (~90%).
- Very high breakdown voltage (> 800 V) and; low voltage control and switching.
- Full custom design capability for specific application.
- Well-known silicon micromachining technology compared to GaN (Gallium Nitride)-based devices suitable for high-power applications.
- Normally-on devices (to be applied as passive current limiter)

Patent Status

Priority patent application filed suitable for international extension.

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