DUAL DOPING RECONFIGURABLE FET FOR USE IN LOW POWER APPLICATIONS

New reconfigurable FET device (R-FET) with a dual PN source/drain useful even in low power applications.

The dual doping configuration proposed makes it possible to modulate the device polarity at all times and obtain a high current for both polarities, thus solving the problems of low performance that characterize the usual R-FET transistors.

Technology for Licensing

Keywords:

Transistor, FET, reconfigurable, R-FET, reprogrammable, dual doping, polarity, electron, hole.

Description:

Metal Oxide Semiconductor Field-Effect Transistors (MOSFETs) are an essential part of almost any electronic component. Currently, more than 90% of consumer electronics use CMOS (Complementary MOS) technology, coupling two complementary MOSFET (N-channel and P-channel) simultaneously.

Lately, the study has focused on reconfigurable transistors (R-FET). These combine both types of transistors (N and P) and can modulate the polarity (N/P) at every moment, reducing the necessary component number. This has traditionally been achieved by the use of metal-semiconductor structures, Schottky junctions. However, low output current and low performance make them unviable for low power applications.

Our new R-FET is based that the source and the drain present two differentiated portions for each type of doping (N and P). This dual configuration allows obtaining a high injection for both polarities without a Schottky contact, thus the main limitations of traditional R-FET devices are solved. The alternative, semiconductor-semiconductor junctions, cause a substantial increase in the current obtained, from 30 to 2500 times according to conservative TCAD simulations.

This technology facilitates its manufacture and improves the performance of conventional R-FET, making them an option for low power applications.

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Advantages and Benefits

- **Performance improvement**

  Cause the dual configuration, a high injection is obtained for both polarities, increasing the currents obtained.

- **Simple manufacturing**

  The absence of metal-semiconductor junctions avoids lateral metallization steps, simplifying the devices manufacturing process.

- **Less metallization variability**

  The absence of Schottky junctions eludes the use of exotic metals and the Fermi Level Pinning effect.

- **Ease of current modulation N/P**

  The lithographic masks, which define the doping regions, can be arbitrarily set in both polarities to obtain any desired current ratio between polarities.

- **Possibility of using traditional strategies to improve the mobility of carriers**

- **Useful for low power applications**

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