SOLID-STATE ELECTRONICS, RADIO ELECTRONIC COMPONENTS, MICRO- AND NANOELECTRONICS, QUANTUM EFFECT DEVICES

Physical-Analytical Subsystem for the Device and Process Design of a Power U-MOSFET

P.S. Prikhodko, *Dr. Sci. (Engineering), Prof., prikhodko.ps@spacecorp.ru*
Joint Stock Company "Russian Space Systems", Moscow, Russian Federation
Yu.A. Romanov, contact@spacecorp.ru
Joint Stock Company "Russian Space Systems", Moscow, Russian Federation

Abstract. A subsystem of device and process automated design intended for the analysis of the physical principles of creating a power U-MOS transistor is proposed. The subsystem employs a hierarchical structure for representing data of the design and technological model. The hierarchical structure has five levels of data structuring. This provides the possibility of their multi-level transformation and makes it possible to take into account individual physical phenomena occurring during the technological process as part of the route of manufacturing a semiconductor device. Such a structure significantly facilitates the optimization, modification and debugging of the subsystem.

The subsystem has been implemented on the basis of the Proto authoring language for specifying design commands. It has been developed with consideration of the possible significant expansion of the language's functional capabilities. The language is a Lisp dialect and is characterized by extreme simplicity. When executing design commands, user modules, which determine the work with data of the hierarchical structure at all five levels, can be connected.

The subsystem is focused on the development and study of technological processes related to the etching or deposition (epitaxial, vapor, sputtering) of silicon, silicon dioxide, silicon nitride, and metallization formation. With the help of this subsystem, a design and technological model of a power MOS transistor can be obtained. This model will be suitable for extracting electrophysical parameters, thus, allowing the subsequent evaluation of the influence of the features and parameters of technological processes on the characteristics of semiconductor structures.

Correcting such a model during the manufacturing stage will allow for the optimization of the manufacturing process route, taking into account the features of existing technological equipment.

Keywords: power U-MOSFET, device and process design.

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