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**Abstract of the doctorate thesis:**

**Modelling IGBTs in SPICE with Thermal Phenomena Taken into Account**

The subject of the paper is modelling properties of a discrete IGBT and an IGBT module, while the aim of this paper is elaboration and experimental verification of the electrothermal model of IGBT, both discrete and contained in an IGBT module.

The following thesis was posed: “It is possible to formulate a compact electrothermal model of an IGBT that is implementable in SPICE and which takes into account influence of thermal phenomena on characteristics of this device and ensures improved accuracy of the computation of the non-isothermal characteristics of this transistor compared with literature models and allowing to compute junction temperature of the considered device both in a static and dynamic conditions”.

In the paper, the influence of the thermal phenomena on characteristics of the discrete IGBT and the IGBT module. Isothermal model of IGBT was elaborated and compared with a well-known literature models. Also, non-linear compact thermal model of the IGBT and linear compact thermal model of the IGBT module were formulated. On the basis of these models electrothermal models of the IGBT and the IGBT module were formulated with the procedure of their parameters estimation. Electrothermal models of the IGBT and the IGBT module were verified on the basis of measured output and transfer characteristics and transistor switch characteristics containing discrete IGBT and half-bridge DC-DC converter containing IGBT module.

A significant outcome of realization of the work is demonstration that in modeling of IGBT sub-threshold effect should be taken into account. Neglect of this effect can result in large error of computing of characteristics of this device.

An important result of the paper is also elaboration of new methods of measurements of thermal parameters of a discrete IGBT which is a subject of a patent and an IGBT module which is a subject of patent application.

Presented in the paper results of computing and measurements of characteristics of discrete IGBT and IGBT module prove, that formulated electrothermal models of investigated power devices correctly describes their characteristics in wide range of values of input voltage. Formulated model of IGBT transistor ensure significant improvement of accuracy of calculation compared with popular literature models.