TITLE

"A SINGULAR PERTURBATION ANALYSIS OF THE FUNDAMENTAL SEMICONDUCTOR DEVICE EQUATIONS - ANALYSIS AND NUMERICAL EXPERIMENTS"

ABSTRACT

We present a singular perturbation analysis of the fundamental semiconductor device equations which form a system of three second order elliptic differential equations subject to mixed Neumann-Dirichlet boundary conditions. The system consists of Poisson's equation and the continuity equations and describes potential and carrier distributions in semiconductor devices. We demonstrate the occurence of internal layers at surfaces across which the impurity distribution has a jump-discontinuity (these surfaces are called "junctions") and the occurence of boundary layers at semiconductor-oxide interfaces. We derive the layer-equations and the reduced problem (charge-neutral-approximation). Numerical results for diodes, thyristors and transistors are presented.

Author(s) full name(s) and address(es) including department/division, city, state and zip code

Peter A. Markowich

Institut für Angewandte und Numerische Mathematik

Technische Universität Wien

Gusshausstrasse 27-29

A - 1040 W I E N

AUSTRIA

Siegfried Selberherr

Institut für Allg. Elektrotechnik

Technische Universität Wien

Gusshausstrasse 27-29

A - 1040 W I E N

AUSTRIA