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TWO DIMENSIONAL MOS-TRANSISTOR MODELLING

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A program package for the two dimensional numerical exact simulation of planar MOS structures is described. The model is based upon the fundamental semicondcutor equations: Poisson's equation, continuity equations and current relations for electrons and holes. Very sophisticated programming techniques have been used to ensure a maximum amount of flexibility and low computing costs; p.e.: dynamic memory management has been included to adjust automatically the memory requirements to the necessary number of grid points depending on bias values and doping profile. The looped parts of the solution routines are widely coded in assembly language to allow a very fast execution. For one operating point typical execution times have been found to be between 15 and 60 seconds on a CDC Cyber 74 Computer, again depending on bias values and doping profile. The calculation of the current-voltage characteristic of a MOS transistor in the subthreshold region can be performed in about 120 seconds CPU time with 10 operating points. The input processor syntax is casy to read and therefore no problems can arise for the non experienced programer to handle this package. The two dimensional doping profile is calculated by own methods or by SUPREM with a fit in the lateral direction. It should be noted that short channel problems cannot arise within this program. Tests for widely varying devices, geometries and bias conditions have been successfully performed and reasonable agreement between theory and experiment has been obtained in almost all cases.

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