HEAT DISSIPATION THROUGH FINS AND ITS OPTIMIZATION. COMPARISON BETWEEN A 3D AND 1D MODEL

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Abstract. Heat dissipation of hot spots is of fundamental importance, especially in small-scale systems such as microelectronic devices. A simple way to achieve this is through systems with a high surface-to-volume ratio exposed to a cooled environment, such as metal fins that efficiently conduct heat which is dissipated by convection and/or radiation. In this work we model a conducting fin with variable cross-sectional area, exposed to an atmosphere of constant temperature, with one end connected to a heat source. We simulate the fin in three dimensions by a finite elements software, and we compared the results to an effective one-dimensional model solved by the finite difference method, studying its validity range. The total power extracted from the heat source is analyzed in terms of the fin's shape, material parameters, and environment, seeking an optimization of the geometry.