Faculty of Electrical Engineering & Computer Science
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Simulation of Eddy Currents for Wireless Power Transfer in LED Leadframe.

ABSTRACT - Masterthesis

This thesis deals with near field wireless energy transfer to power the LED using inductively coupled system. Major objectives of this work include design and optimization of a coil in order to provide maximum coupling efficiency between the coil and the leadframe in which the LEDs are placed. Solving of eddy current characteristics in the LED leadframe in order to obtain coupling in a given area of the leadframe is the other part of the thesis.

To analyze wireless power transfer, electromagnetic theory and inductively coupled systems are studied in detail. For simulation tools selection, various computational electromagnetic schemes are explored with regard to the desired goal of this work. Ansys−HFSS and Keysight—ADS tools are used in this work. To design optimal coil geometry, various design geometries are simulated along with multiple optimization steps. Influence of physical parameters is studied in order to achieve optimal physical parameters for coil geometry. After simulation and performance analysis of various design geometries, proposed coil geometry is finalized. To solve eddy current characteristics with respect to proposed coil design, multiple parametric simulations are performed.

The last step in this thesis work is to perform measurements with the proposed coil design to compare simulations and measurements results data for positional tolerance over X-, Y-, & Z- direction and concentrated coupling over specified area. All the simulation work was performed at IHP Microelectronics GmbH, Frankfurt (Oder) and physical measurements on test bench were done at OSRAM OS GmbH, Regensburg. To validate proposed design, two pre-designed and fabricated coil designs are used for comparison purpose in order to confirm the performance of the designed, simulated and measured proposed coil design. IHP Microelectronics GmbH and OSRAM OS GmbH resources and licenses are used to carry out this thesis work from simulations and measurements.