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Speech subject： AI-enhanced Simulation for Power Package Design

Speech leader: Haibo Fan—Senior Principal Engineer, Nexperia Hong Kong

Speech Description/Objective:
The design of power packages with both high efficiency and high-power density performance while maintaining the highest possible reliability is a challenge. Simulation driven design is an approach that emphasizes utilization of simulation at early stage of designs phase, like DOE study with different variables for design optimization, material selection and tool parameter optimization to guide design engineers to avoid costly design mistake. However, there are some bottlenecks for traditional simulation DOE, like time consuming, no variable correction and discretized design space.

Machine learning is one of the most advanced technologies applied for semiconductor manufacturing, because of its potential capability to help manufacturers fine-tune their processes and design optimization for improvements. By analyzing data from manufacturing line, machine learning algorithms can identify patterns and trends, enabling manufacturers to optimize process or design/ Bill of material (BOM) for better yield, higher quality, and lower costs.

In this talk, thermal agent database is generated by application of ML algorithms and enabled simulation, in which simulations with designs randomly distributed within design scope are conducted to create thermal data of products for AI training to get the relationship among designed parameters of products. Methodology is proposed with a combination of machine learning and finite element analysis (FEA). Thermal performance can be timely estimated when parameters of new development design, meanwhile recommendation of optimized design can be given to achieve robust performance as possible. Additional study is an automatic molding compound selection framework is proposed to generate the optimal material properties of epoxy molding compound (EMC) properties for molding compound selection to minimize molded leadframe warpage related to power device are discussed. Through these cases, it has been demonstrated that the AI-enabled simulation can be utilized to timely estimate thermal performance for new development products, which can highly reduce development cycles time.

Introduction of Speaker:
Dr. Haibo Fan, working as Senior Principal Engineer in Packaging R&D-Advanced Material Technology and Modeling, Nexperia Hong Kong. He got his PhD degree from Hong Kong University of Science and Technology (HKUST), then worked in HKUST, Philips LED lighting global R&D Center, NXP Hong Kong and Nexperia Hong Kong with 20+ year experience on simulation, and 15-year industry experience on design and reliability; He authored or co-authored more than 50 peer-reviewed technique publications, published 2 books and 3 book chapters.