Electrical Component Modelling of Mechanical Structures in Circuit Board Designs

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Overview

Passive devices represent about 90% of the total component count and about 40% of the total board area for printed circuit board (PCB) assemblies. Continued advancement in active device integration and miniaturisation will result in increasing levels of circuit board area being dedicated to passive components (e.g. up to 80% in some mobile phone PCBs). This represents a challenge for the electronics manufacturing industry faced with the need to reduce circuit board sizes. Embedded passive component technology is one solution to reducing overall package size and costs.

The estimated adoption rate of embedded passive components is poised to accelerate as these size and cost constraints are addressed. The delivery of embedded passive component technology solutions will deliver cost reductions. There is however a general lack of design tool capability in the area of embedded passive components that will impede a large scale adoption of the embedded passive component technology. Without validated integrated design tools and processes which address not only physical design of the PCB, but also design integrity, EMC integrity, cost and reliability factors, the widespread industry adoption of embedded passive components will be restricted by the need to manually design and place embedded components. In addition, take-up will be limited in situations where designers do not have access to validated models which can be integrated with widely deployed, industry standard PCB design EDA (electronic design automation) toolsets, further delaying the technology implementation in the UK.

The fundamental objective of the proposed project is therefore to research the integration of passive component models into an integrated, “industry standard” PCB design EDA toolset and to validate these implementations. Particular applications will be in the area of electronic ballasts for lighting applications.

Aim of study:

1. To survey the existing realisable range of embedded passive component implementations, industry standard PCB design packages in relation to design integrity CAD checking facilities and reliability of these implementations.
2. Investigation of electrical models for a range of physical structures for passive electronic component realisation in the mechanical circuit board assembly and correlation of these model results with real circuit realisations.
3. Investigation of model variations with the substrate and material properties and evaluation of the limitations of existing models and technologies.