

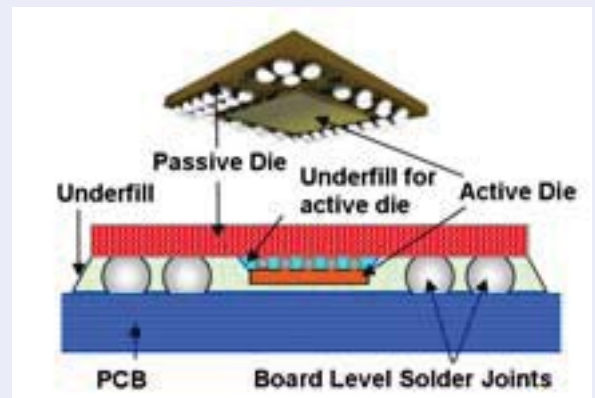
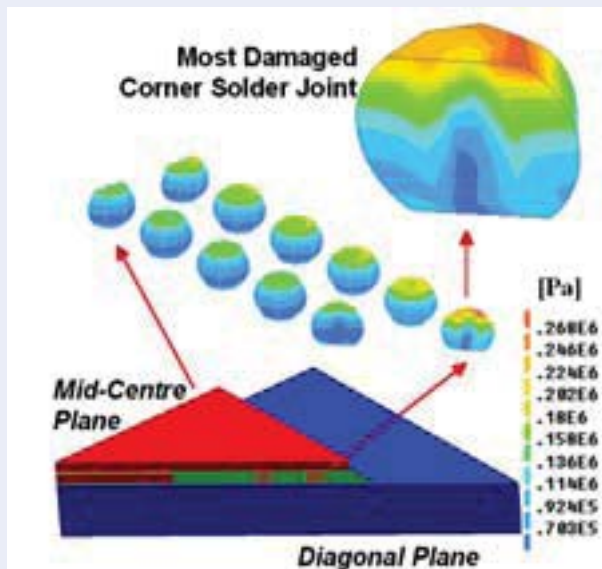


Design for Manufacture Methodology for System in Package Technology

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http://www.engineering.lancs.ac.uk/microsystems/research/Design_for_Manufacture.asp

System-in-Package technology is an extension of the multi-chip module concept providing additional integration possibilities through chip stacking and 3D assembly, together with an opportunity to mix electronic, micromechanical, optical and bio-chemical technologies. The manufacturability of SiP products depends heavily on design and testability, control of thermomechanical behaviour, understanding of defect and degradation sources and tolerance to electromagnetic and electrostatic fields. These issues affect all elements of SiP systems including low noise and high frequency electronics (transistors and interconnect), a range of functional interface materials, embedded package and assemblies and non electrical functions such as biochemical and fluidics that use charge transfer and electro-chemistry as the basic physics associated with their transfer functions.

The project to date has focused on modelling the impact of degradation on the reliability of the SiP materials and assembly, methods of building electrical self-test into functions with non-electrical interfaces and measurement of internal electromagnetic fields.



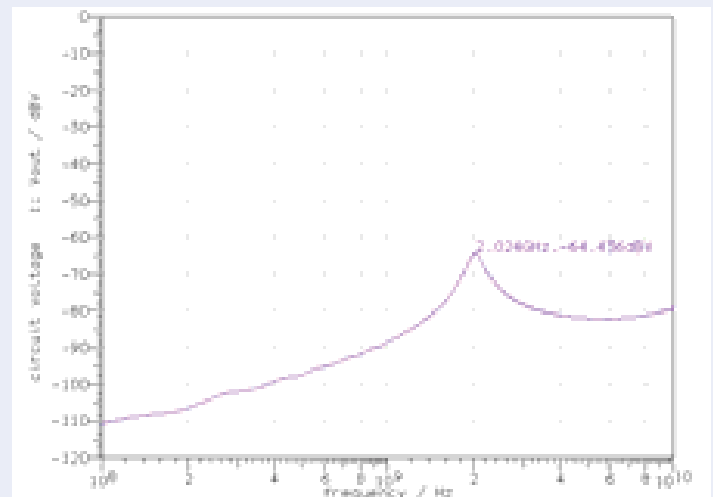
Initial target technology (PICS), solder bump simulations and typical degradation mechanisms.



Standard Project

The focus has been on stacked and embedded die SiP structures based on the bonding of silicon die onto passive interconnect substrates using solder bump-bonding to realise interconnectivity. Reduced order models of solder ball degradation have been developed. Side effects and reliability studies have investigated the impact of a number of SiP design parameters on solder joints life time and risk of stress related failures. The effects of reflow profiles such as both reflow time and temperature or real time temperature on solder ball degradation have been also investigated. Optimal design configurations of the SiP structures and materials that improve reliability of the packages have been identified. In particular, a novel design concept for an embedded "fan-out" die SiP have been studied and developed.

In the case of electromagnetic coupling the focus has been on the design of embedded probes to monitor the internal field inside the package. For a number of applications this is a key issue as many components and integration technologies are sensitive to inductive or capacitive coupled noise from internal fields that can both move functionality out of specification or induce intermittent faults. Basic EM probes have been designed and evaluated in a simulation environment taking into account the SiP architecture.



Probe consisting of a loop antenna and sensitivity