



Heterogeneous Integration and IOT Collaborative Packaging Innovations

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It is a great honor to be invited to prepare a Preface for the Journal of Japan Institute of Electronic Packaging. As I complete my first year as President of the IEEE CPMT Society I can honestly say that there has never been a more interesting time to work in the field of electronic packaging! As semiconductor scaling has slowed down making the cost per transistor increase the world has turned to packaging to lead the charge of innovation. This is evident by the growth in packaging papers published per year at IEEE conferences and workshops. They have increased over 3X in past 20 years with over 3,800 publications in 2015 alone! Packaging innovation papers are not only being seen in the traditional packaging forums sponsored by the IEEE CPMT but they are cropping up in many of the IEEE societies. The CPMT Society recognizes this and we are driving collaboration across societies, and organizations to provide a comprehensive roadmap to be used by the industry at large. The Heterogeneous Integration Roadmap activities continue following SIA's closure of ITRS activities in 2015 through sponsorship by IEEE CPMT, SEMI, IEEE Electron Devices Society and IEEE Photonics Society. We expect to announce at least two other organizations in formal support by the end of 2016. The purpose of the Heterogeneous Integration Roadmap (HIR) is to serve as a guideline for the global electronics industry of projected technology needs and opportunities for innovation. Serving the Profession, Industry, Academia and Research Institutes. Interest is very strong we have held 14 workshops this year in 7 countries. In particular the HIR Workshop in Tokyo Japan, August 2016, brought together over 110 scientists and engineers across a wide variety disciplines, and we appreciate very much the strong support of JIEP for the success of the workshop.

Why is packaging growing so rapidly? Early on it was driven by cell phone advances and now we are seeing the functionality demands again increasing with the fruition of the Internet of Things (IOT). There is a lot of talk about IOT, what applications IOT will enable as well as what systems, software, communications, and regulations will be needed to enable IOT. I believe we have only just scratched the surface of what electronic packaging innovations will be required. The first thing that comes to mind is the multitude of sensors which will need new packaging to accomplish for form, fit and function requirements. For instance the materials and reliability challenges that come from the array of harsh environments we demand to put these sensors in, from the human body, to automotive, to outer space will need to be solved. Moving from the sensors to the interconnects, innovations in the electrical packaging areas of signal and power integrity for wired and wireless communications will be stressed with ever increasing bandwidth and latency requirements. Assembly manufacturing will be challenged as a much broader set of components, optical, electronic, actives, passives, and antennas are being tightly integrated to reduce losses and interference. Modeling and simulation will be challenged to predict the effectiveness as well as thermal and mechanical resilience of the heterogeneously integrated systems. The compute power and massive storage needs will drive new packaging advances to support localized low cost, low power processors for data analysis as well the other extreme requirements of the highly secure high power central processing hubs.

As the Packaging Society for IEEE, we welcome the continuing strong collaboration between JIEP and CPMT as we strive to support the collaboration of global technical communities working together for our membership through the exchange of ideas during this exciting time of exploration!

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