

Embedded Packaging Technologies for Microwave and mmWave Applications

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Abstract

In recent years, interest in highly integrated RF modules in millimeter-wave (mmWave) bands has increased rapidly in fifth generation (5G) communication and a variety of emerging applications. One of the critical issues in implementing microwave and mmWave modules is high-performance module packaging. For example, realizing short and low-loss signal interconnects between RF devices is very challenging at such high frequency ranges. This presentation covers the recent advanced embedded packaging technologies for microwave and mmWave applications. The embedded packaging technologies provide excellent electrical performance, high design flexibility and high integration by embedding RF devices in the epoxy molding compound, silicon/organic interposer or PCB [1],[2]. Furthermore, these innovative packaging technologies can meet the stringent requirements on high system performance using heterogeneous system integration capability.

This talk first covers the fan-out wafer level packaging (FOWLP) which is using the molding compound to embed the RF devices without a laminate substrate. The reduced parasitics and inductance by shorter interconnects using thin film redistribution layers can provide better electrical design and performance over conventional packages such as FC-BGA, etc. The structure, design and performance of the implemented RF front-end module operating in 28 GHz band are described. Finally, I introduce the interposer-based MMIC (iMMIC) technology which can be one of the other key packaging technologies for microwave and mmWave applications. The silicon iMMIC technology including fine lines, spaces and through-silicon vias (TSVs) offers very compact and low-profile solution by embedding RF devices in recesses below the surface of the silicon interposer. Some experimental results from the miniature RF front-end modules and microwave power amplifiers based on this technology are presented as well.

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Keywords: *Fan-out WLP, Interposer, iMMIC, Embedded Packaging, RF Front-end Module*

References

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Biography

Dongsu Kim received his Ph.D. degree in electrical and computer engineering from the Georgia Institute of Technology, Atlanta, USA, in 2004. He is currently a principal researcher and packaging team leader in the ICT Device and Packaging Research Center, Korea Electronics Technology Institute (KETI). His current research interests include microwave and mmWave passive devices and modules, microwave power amplifiers and 2.5D & 3D packaging.