



Quantifying the Impact of Heterogeneous Integration: Chiplets and SiP

The industry can no longer count on monolithic integration to achieve the economic gains of the previous era. New packaging solutions are being adopted to achieve the economic advantages that were previously met with silicon scaling. The role of heterogeneous integration, especially chiplets, is pivotal in this new era. TSMC indicates that the use of chiplets will be one of the most important developments for the next 10 to 20 years. A chiplet can be created by partitioning a die into functions and is typically attached to a substrate or interposer. System-in-Package (SiP) is defined as two or more dissimilar die, typically combined with other components. SiP is a broader term that has been in production for many years. Chiplets are one type of SiP.

This report describes the drivers for growth in each segment and package types for different applications. Market projections for chiplets and SiP are provided. An analysis of the impact of the use of chiplets instead on monolithic die integration is provided. Critical material needs for packaging and assembly are identified and the roles for OSAT and foundry are discussed. Investment requirements and the supply chain for chiplets are highlighted. A set of PowerPoint slides is included with the detailed analysis.

- 1 Drivers for Heterogeneous Integration
 - 1.1 What is heterogeneous integration?
 - 1.2 What is System-in-Package (SiP)?
 - 1.3 What is a chiplet and how is it different?
- 2 Drivers and Applications for SiP
 - 2.1 Drivers for different applications and package types
 - 2.2 Mobile, wearable, and consumer
 - 2.3 High performance computing and telecommunication
 - 2.4 Military and Aerospace
 - 2.5 Automotive
- 3 Drivers and Applications for Chiplets
 - 3.1 Drivers for different applications and package types
 - 3.2 Mobile applications
 - 3.3 High-performance applications including server, AI, telecom
 - 3.4 Military and aerospace
- 4 Equipment and Material Developments
 - 4.1 New assembly equipment needs and developments, including hybrid bonding
 - 4.2 Materials requirements and new developments
 - 4.3 Substrates requirements and developments
- 5 Infrastructure Investment: Players, Supply Chain, Consortia What is Different about Chiplets?
- 6 Design, Inspection, and Test Challenges and New Developments
- 7 Market Projections
 - 7.1 SiP market forecast
 - 7.2 Chiplet market forecast

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