



# 3D TECHNOLOGY BRICKS

## + 300MM 3D DEMONSTRATORS OVERVIEW

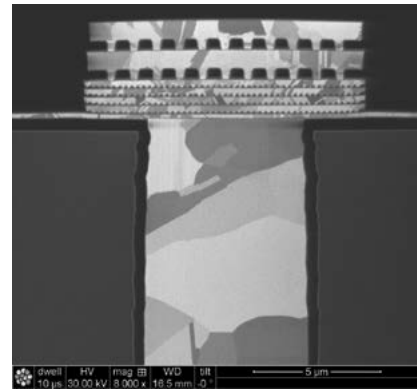
Leti has developed a large panel of state-of-the-art technologies using 300mm industrial tools for the success of 3D high performance applications: computing, mobile and heterogeneous.

## + HIGH ASPECT RATIO TSVs

Strong expertise in high aspect ratio TSVs have been developed at Leti. Via-mid TSVs with  $AR > 12$  have already shown excellent electrical performances and filling demonstration of TSVs  $AR_{20}$  has been demonstrated. Barrier and seed layer limitation for high aspect ratio Mid-process TSV have been overcome through strong partnership and common development with our advanced industrial partners (SPTS, Aveni). Partnership with advanced chemical companies have also permitted to develop high density TSVs with diameter  $< 2\mu\text{m}$  as well as high aspect ratio TSV last ( $AR > 3$ ).

## + FINE PITCH COPPER PILLARS & ASSEMBLY TECHNOLOGIES

Fine pitch interconnection is mandatory to pursue 3D silicon stacking roadmaps. Therefore  $10\mu\text{m}$  diameter ( $20\mu\text{m}$  pitch)  $\mu\text{bumps}$  and  $\mu\text{pillars}$  are now available at Leti. Developments are being pursued to stabilize our  $5\mu\text{m}$  diameter interconnection process. Furthermore, Leti has developed a strong knowledge in thermocompression Die to Wafer stacking and associated underfill technologies as NCP and WLUF techniques, specifically with fine pitch interconnection.



## + FINE PITCH HYBRID BONDING TECHNOLOGIES

Leti developed great expertise in high density connection with hybrid bonding technology since early 2000's, covering both wafer to wafer as well as Die to wafer stacking strategies.

We demonstrated that  $3\mu\text{m}$  diameter connection presents a resistance of only few mOHms and that 30.000 connections daisy-chains perfectly withstand reliability (environmental and electromigration) without resistance, leakage or copper diffusion variation (100% Yield on 300mm wafers).

## + TEMPORARY BONDING & WAFER-LEVEL PLANARIZATION

Realization of thin interposer technologies requires the control of thin waferhandling and temporary bonding technologies in 300mm. Leti was an early promoter of this technique, and now 2 major thin wafer handling technologies are available in 300mm at Leti , and have been key in the success of numerous demonstrators.

Leti is pursuing the process flow diversification, by also integrating stress-free wafer-level planarization materials. Such materials already shown excellent behaviors for RF applications.

## + INTERPOSER STRESS MANAGEMENT STRATEGY

Leti developed strong expertise in the evaluation of stress issues in interposers:

- TSVs induced stress
- Warpage control of large interposers
- Chip/Package Interaction

All topics are studied through comparison of realistic 3D models with in-situ measurements on real 3D demonstrators. In parallel, a large panel of materials have been qualified in order to offer complete Wafer-Level compensation strategy.



## INTERESTED IN THIS TECHNOLOGY?

Contact us to discuss your specific needs and explore the many cooperation possibilities with Leti!

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