



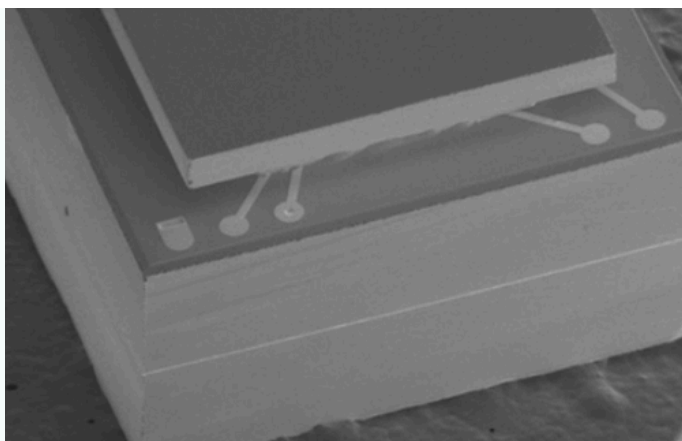
Heterogeneous Integration Technologies

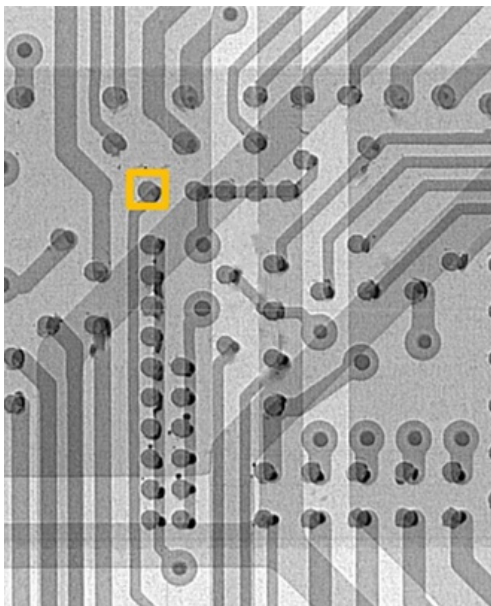
Service Portfolio

Heterogeneous Integration refers to the integration of separately manufactured components into a higher-level assembly that provides enhanced functionality and improved operating characteristics.

The research unit provides services around the following topics using its state-of-the-art facilities for packaging, analysis and characterization:

- Packaging (Discrete, module and system)
- Interconnects
- Micro assembly technologies
- Wafer bonding and debonding
- Backend processing
- Molding and embedding
- Failure analysis and characterization
- Chip-to-package and Multiphysics simulation
- Photonic assembly



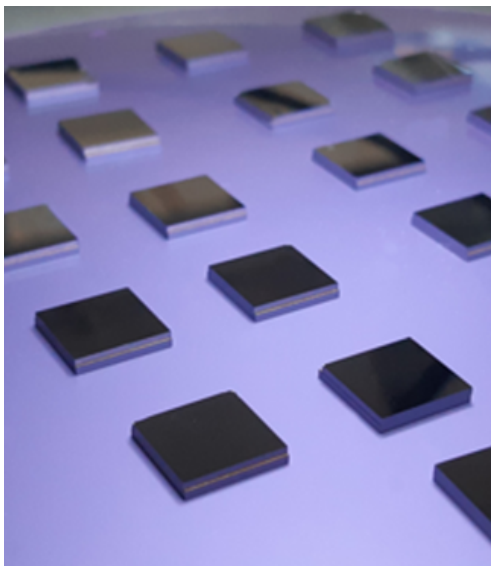


© SAL – Flip Chip bonded chip

Interconnects

Reliable interconnect solutions are essential for high-performance electronic packaging. SAL's advanced interconnect technologies ensure strong electrical and mechanical connections for various semiconductor applications including:

- Wire, Ribbon, Clip bonding
- Die-attach (Solders, ACP/NCP, ACF/NCF)
- Encapsulation (Globtop, Molding)
- Parylene coating (C, AF4)
- Underfill and over-molding
- Sinterconnects[®]
- Sintering (Pressure-less & Pressure-assisted Ag, Cu, TLP)

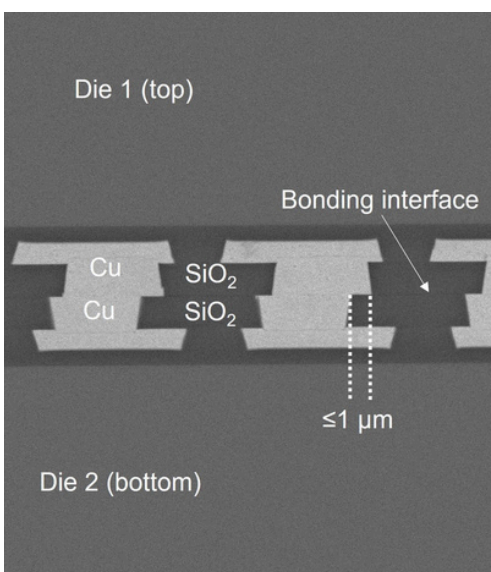


© SAL – 3D stacking

Micro assembly technologies

Our state-of-the-art micro assembly technologies enable high-density, compact, and reliable packaging solutions for modern electronic applications. We specialize in a range of assembly methods to optimize performance, miniaturization, and integration including:

- Flip Chip
- Chip on Board (CoB)
- System in Package (SiP) and System in Module (SiM)
- Quad Flat No-lead package (QFN)
- Lead frame
- Flexible and stretchable electronics

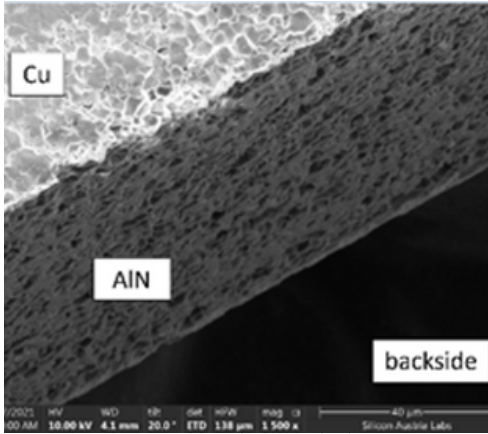


© SAL – Hybrid bonding

Wafer bonding and debonding

SAL's wafer bonding and debonding solutions provide high-precision, reliable techniques for semiconductor and MEMS applications. These processes ensure strong adhesion, thermal stability, and seamless integration of wafers for advanced device fabrication:

- Anodic
- Thermocompression
- Eutectic
- Glass frit
- Adhesive (Temporary and permanent)
- Direct bonding

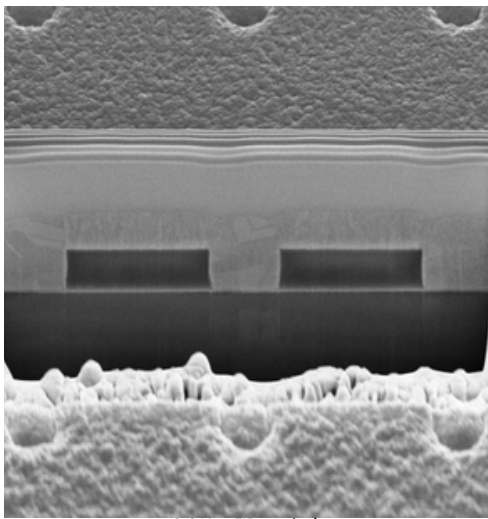


© SAL – Back Side metallization

Backend processing

Our backend processing services ensure high-performance semiconductor packaging with precision and reliability including:

- Backside metallization
- Bumping
- Passivation
- Dicing
- Testing and characterization

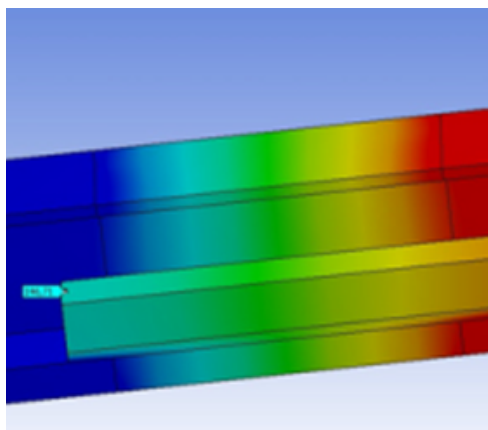


© SAL – FIB analysis

Failure analysis and characterization

We offer failure analysis and characterization services to ensure product reliability, identify defects, and enhance process optimization. Our techniques provide in-depth insights into material integrity, structural defects, and failure mechanisms including:

- SAM and SEM
- Focused Ion Beam
- Shear and leakage tests
- Metallography and cross-sectional analysis
- Electrical measurements and wafer probing

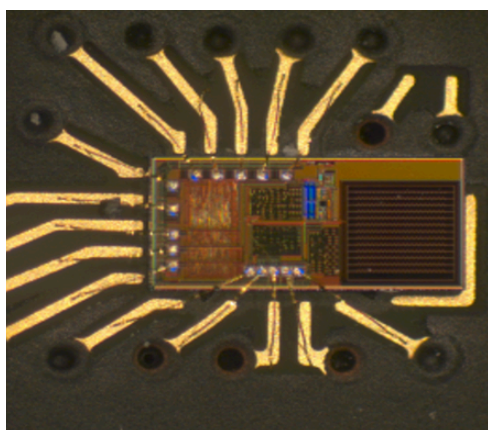


© SAL – Temperature distribution on chip inside a sensor package

Chip-to-Package and Multiphysics simulations

SAL's advanced simulation capabilities enable optimized electronic packaging by analyzing electromagnetic, thermal, and mechanical behaviors at multiple scales:

- Electromagnetic and thermo-mechanical simulations
- 3D FEM and CFD simulations
- Multidomain simulations
- Reduced order models and system simulations



© SAL – Particle sensor

Photonic assembly

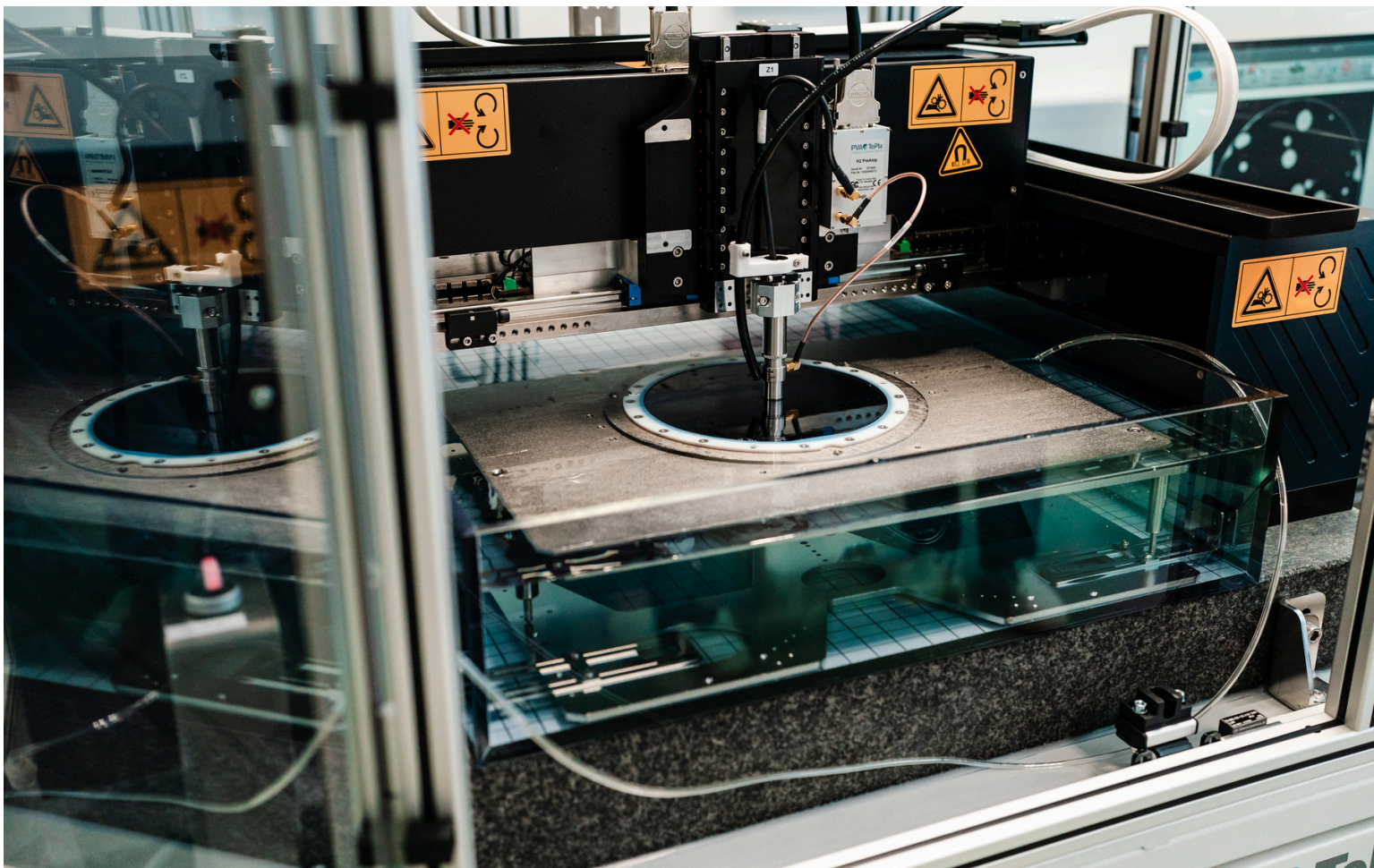
Our photonic assembly solutions provide precise integration of optical components for high-performance photonic and optoelectronic devices. We specialize in advanced micro- and nano-scale assembly techniques to meet the demands of modern optical systems:

- 3D photonic micro-assembly
- Meso/micro-optical assembly
- Two Photon Printing of optical elements



Key equipment and infrastructure

- Wafer Bonder
- Bond Aligner
- Automatic Die Bonder
- Manual/Semi-Automatic Die Bonder
- CMP
- Thermocompression Wafer Molding
- Cleanroom ISO8 (400 m²)
- SAM
- Nano Indenter
- Shear Tester
- Two-Photon Polymerization
- Photonic Assembly
- Micro-Assembly Station
- Cleanroom ISO5 (1300 m²)



ABOUT SAL

Silicon Austria Labs (SAL) is a top European research center for Electronics and Software Based Systems (ESBS). The application-oriented center offers cooperative research & services at three locations – Graz, Linz and Villach – in the pioneering research areas of Sensor Systems, Microsystems, Intelligent Wireless Systems, Power Electronics and Embedded Systems. | www.silicon-austria-labs.com

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