

# Low Temperature Wafer Bonding and 3D Interconnect for RF Devices

SAW and BAW Filters

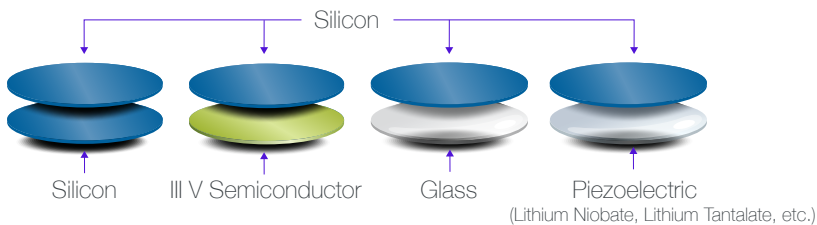
RF Antenna Switches

Amplifiers

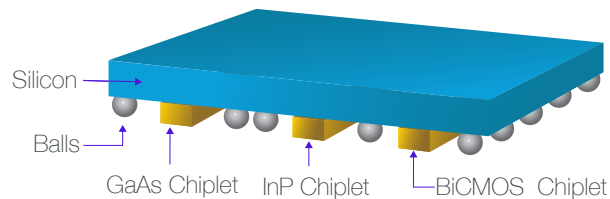
Multi-chip Integration

## Create small, reliable, cost effective RF front-end devices for 4G LTE & 5G mobile applications

Reliable bonding of different materials, RF CMOS layer transfer, up to 15x higher throughput



RF functionality integration with different technologies



## Key Benefits

- Reliable bonding despite highly dissimilar material with different co-efficient of thermal expansion (CTE) ratios
- Improved Signal to Noise Ratio
- RF CMOS to be transferred to a low cost, high resistivity substrate
- Lower cost than conventional SOI
- Simplified manufacturing process
- Smaller footprint

**ZiBond®** technology enables layer transfer in RF front-end devices. It allows the combination of materials for mechanical and electrical performance enhancement. It improves temperature stability in the RF device.

**DBI®** 3D Interconnect technology delivers superior signal transmission and isolation compared to micropillar or conventional micro-bump technology. Minimal insertion and return losses are achieved up to 80 GHz, through small parasitic load of this interconnect coupled with impedance matching.

## ZiBond® Technology

ZiBond technology is a low temperature homogeneous direct bonding solution that forms a strong bond between wafers or die with the same or different coefficients of thermal expansion (CTE). ZiBond technology is in high volume production today.

### Features

Bond Interface Materials	SiO (TEOS, Thermal, Silane)	SiN (CVD or PECVD)	SiON (PECVD)
Substrates	Si, Glass, InP, GaAs, GaN, SiC, LiTaO <sub>3</sub> , LiNbO <sub>3</sub> , Sapphire		
Bonding Temperature	Room Temperature		
Anneal Temperature	75-300°C (application dependent)		
Equipment	Industry standard wafer alignment and bonding equipment		

## DBI® Technology

Direct Bond Interconnect (DBI) technology is a low temperature hybrid direct bonding solution that allows wafers or die to be bonded with exceptionally fine pitch 3D electrical interconnect. DBI can also minimize the need for Thru Silicon Vias (TSVs). DBI technology is in high volume production today.

### Features

3D Interconnect Metals	Cu, Ni
3D Interconnect Pitch	Scalable to <1µm pitch 1.6µm demonstrated 6µm in high volume production
Bond Interface Materials	Same dielectrics as ZiBond with integrated metal interconnect
Substrates	Same as ZiBond
Bonding Temperature	Room Temperature
Anneal Temperature	150-300°C (application dependent)
Equipment	Industry standard wafer alignment and bonding equipment

