

3D Integration for MEMS Devices

Small, reliable and cost effective multi-functional integrated solutions

Accelerometer

Microphone

Gyroscope

Temperature Sensor

Magnetometer

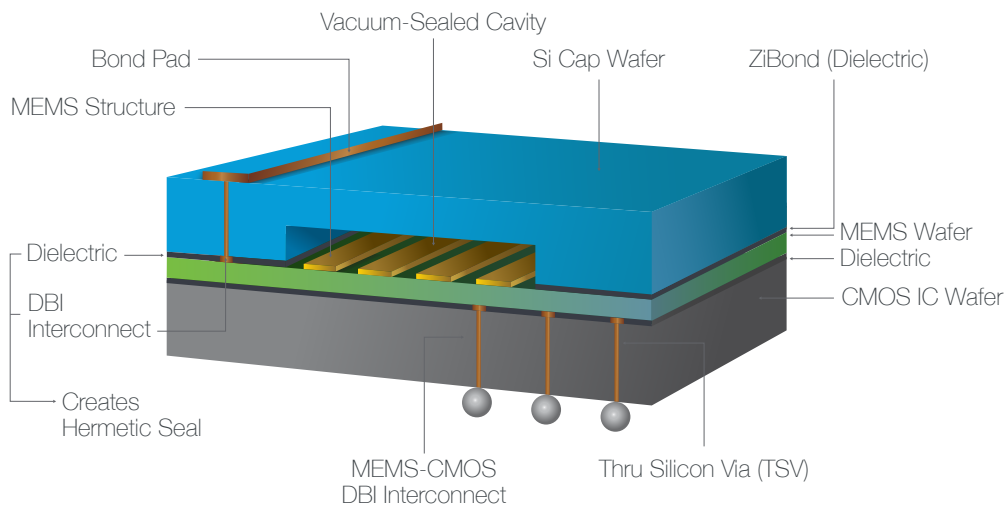
Humidity Sensor

Pressure Sensor

Gas Sensor

MEMS Device with ZiBond® Bonding & DBI® 3D Interconnect

Create the new generation of MEMS devices with world class wafer bonding and 3D interconnect technologies



Key Benefits

- Multi-functional 3D integration
- Wafer level bonding at room temp
- High hermeticity
- Smaller footprint – eliminates wire-bond
- Higher bonding yield and throughput
- Reduces defects

MEMS devices

MEMS devices often require a vacuum or pressurized cavity structure surrounding the sensing elements. The integrity and hermeticity of the bond layers between the cavity structure, the MEMS device and the associated logic device are critical to the proper function of the integrated product. Currently, the industry employs a variety of techniques such as eutectic, anodic, thermo-compression, and glass frit bonding. All of these techniques require long duration processing at high temperatures, leading to constraints on materials selection, lower process throughput and, ultimately, higher overall cost.

ZiBond and Direct Bond Interconnect (DBI)

ZiBond and Direct Bond Interconnect (DBI) are low temperature bonding technologies that deliver the high hermeticity bond interfaces required for MEMS production, with higher throughput and lower process cost compared to traditional bonding techniques.

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 ₃ , LiNbO ₃ , 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

