Low Temperature Wafer Bonding and Fine Pitch 3D Interconnect

Enabling a wide range of high performance, scalable, cost effective IC solutions with ZiBond® & DBI® technologies

Room Temp Bonding  |  Scalable to <1μm Pitch  |  Up to 15x Higher Throughput

**Wafer to Wafer**

- **Image Sensor**
  - De-facto industry standard technology for backside illuminated (BSI) image sensor
  - Very fine pitch 3D interconnect, scalable to pixel-level
  - Eliminates need for Thru Silicon Vias (TSVs)

- **RF**
  - Reliably bonds dissimilar materials
  - Improves thermal stability
  - Enables RF CMOS transfer to a low cost, low RF loss substrate

- **Fingerprint Sensor**
  - Enables high performance fingerprint sensor
  - Smaller footprint – eliminates wire-bond
  - Multi-functional 3D integration

- **MEMS**
  - Multi-function 3D integration
  - Reliable hermetic seal
  - Smaller footprint – eliminates pad limited die shrink

**Die to Wafer**

- **DRAM**
  - Faster, cooler, smaller
  - Very fine pitch 3D interconnect
  - Eliminates under bump metalization, microbumps, solder, and underfill

- **2.5D/3D Logic**
  - Increased memory to logic I/O and bandwidth
  - Improves thermal performance
  - Eliminates under bump metalization, microbumps, solder, and underfill
**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

<table>
<thead>
<tr>
<th>Bond Interface Materials</th>
<th>Bonding Temperature</th>
<th>Anneal Temperature</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SiO (TEOS, Thermal, Silane)</td>
<td>Room Temperature</td>
<td>75-300°C (application dependent)</td>
<td>Industry standard wafer alignment and bonding equipment</td>
</tr>
<tr>
<td>Substrates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Si, Glass, InP, GaAs, GaN, SiC, LiTaO3, LiNbO3, Sapphire</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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

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