Keysight Technologies provides a range of Ball Grid Array (BGA) interposers, optimized for oscilloscope or logic analyzer measurements, that enable accurate testing directly at the ball grid array of memory/processor systems.
Memory System Validation

Keysight Technologies has the measurement tools you need to validate the very latest memory technologies. These include logic analyzers, oscilloscopes and software for automated compliance, decode, and protocol checking.

To complement our high speed digital instruments and software, Keysight offers probing solutions with a comprehensive range of Ball Grid Array (BGA) interposers. When positioned between the processor memory controller and the memory device, the interposers allow you to make signal quality or protocol measurements with minimal effect on the system-under-test.

Memory technology is constantly advancing in speed and density, and you need probing solutions that keep up with these developments. Keysight Technologies is at the forefront of the latest memory standards, chip technologies, and measurement techniques. Your Keysight Applications Engineer and Keysight’s Interposer Design Team can assist you with selecting the best BGA interposer and probing technique for your application.

You can choose from a large selection of existing interposer designs, or define probing solutions customized to your specific needs. Keysight’s standard interposers are available for several JEDEC standard packages with a variety of ball counts. The selection guide in this catalog gives you an overview of the interposers available and provides links to the corresponding data sheets. For additional DRAM packages or to meet different mechanical requirements, Keysight’s proven development process can produce custom BGA interposer designs of the highest quality.

Browse the catalog and then contact your local Keysight Applications Engineer for advice on the right products and measurement techniques to ensure the successful validation of your memory system.

Mark Schnaible
Applications Engineering Manager
Keysight Technologies
### Selection Guide

**Interposers optimized for Oscilloscope Measurements**

<table>
<thead>
<tr>
<th>Interposer</th>
<th>JEDEC Standard</th>
<th>Pin Count</th>
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</thead>
<tbody>
<tr>
<td>LPDDR2/3 168 BGA Signal Integrity Interposer</td>
<td>JESD209-2F &amp; JESD209-3B</td>
<td>168</td>
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<tr>
<td>LPDDR3 178 BGA Signal Integrity Interposer</td>
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<tr>
<td>LPDDR3 253 BGA Signal Integrity Interposer</td>
<td>JESD209-3B</td>
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<tr>
<td>LPDDR3 256 BGA Signal Integrity Interposer</td>
<td>JESD209-3B</td>
<td>256</td>
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<tr>
<td>GDDR5 170 BGA Signal Integrity Interposer</td>
<td>JESD212B.01</td>
<td>170</td>
</tr>
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</table>

**Interposers optimized for Logic Analyzer Measurements**

<table>
<thead>
<tr>
<th>Interposer</th>
<th>JEDEC Standard</th>
<th>Pin Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPDDR2 121 BGA Interposer</td>
<td>JESD209-2F</td>
<td>121</td>
</tr>
<tr>
<td>LPDDR2/3 168 BGA Logic Analyzer Interposer</td>
<td>JESD209-2F &amp; JESD209-3B</td>
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<td>LPDDR3 178 BGA Logic Analyzer Interposer</td>
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<td>LPDDR3 253 BGA Logic Analyzer Interposer</td>
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<tr>
<td>DDR4 x16 BGA Interposer Cable Adapter</td>
<td>JESD79-4</td>
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</tr>
</tbody>
</table>

See [www.keysight.com](http://www.keysight.com) for information on other DDR2, DDR3, and DDR4 BGA interposers.
The LPDDR2/3 168 BGA Interposer is optimized for oscilloscope measurements. It provides access to the LPDDR signals highlighted and passes all power and ground signals between the processor and the memory chip.

**Key Features**

- Enables correct operation of the LPDDR interface while providing access to selected bus signals between the processor and LPDDR memory chip.

- Provides solder pads for use with Keysight E2677A or N5381A InfiniiMax single-ended/differential solder-in or Keysight N5425A ZIF probe head.

- Includes S parameter file to configure the oscilloscope to render waveforms as they exist at the DRAM pins.

- Riser is included to clear surrounding devices in tight keep-out volume applications.

- For dimensional drawings see final page.
The LPDDR3 178 BGA Interposer is optimized for oscilloscope measurements. It provides access to the LPDDR signals highlighted and passes all power and ground signals between the processor and the memory chip.

**Key Features**
- Enables correct operation of the LPDDR interface while providing access to selected bus signals between the processor and LPDDR memory chip.
- Provides solder pads for use with Keysight E2677A or N5381A InfiniiMax single-ended/differential solder-in or Keysight N5425A ZIF probe head.
- Includes S parameter file to configure the oscilloscope to render waveforms as they exist at the DRAM pins.
- Riser is included to clear surrounding devices in tight keep-out volume applications. Riser dimensions: 11.5 mm x 11 mm.
- For dimensional drawings see [final page](#).

**Specifications**
- JEDEC Standard: JESD209-3B
- Ball Count: 178
- DRAM Size: 11.5 mm x 11 mm
- Configuration: Single channel x32 DRAM (JEDEC MO-311A footprint)
- Interposer size, pitch: 19 mm x 19 mm nominal, 0.8 mm x 0.65 mm
- Connectors: Solder-down test points and solder balls
The LPDDR3 253 BGA Interposer is optimized for oscilloscope measurements. It provides access to the LPDDR signals highlighted and passes all power and ground signals between the processor and the memory chip.

**Key Features**

- Enables correct operation of the LPDDR interface while providing access to selected bus signals between the processor and LPDDR memory chip.
- Provides solder pads for use with Keysight E2677A or N5381A InfiniMax single-ended/differential solder-in, or Keysight N5425A ZIF probe head.
- Includes S parameter file to configure the oscilloscope to render waveforms as they exist at the DRAM pins.
- Riser is included to clear surrounding devices in tight keep-out volume applications. Riser dimensions: 11x11.5 mm.
- For dimensional drawings see final page.

**Signals Probed**

The LPDDR3 253 BGA Interposer is optimized for oscilloscope measurements. It provides access to the LPDDR signals highlighted and passes all power and ground signals between the processor and the memory chip.

**Specifications**

- **JEDEC Standard:** JESD209-3B
- **Ball Count:** 253
- **DRAM Size:** 11 mm x 11.5 mm
- **Configuration:** Dual channel x32 RAM (JEDEC MO-276 footprint)
- **Interposer size, pitch:** 16.7 x 16.9 mm nominal, 0.5 mm
- **Connectors:** Solder-down test points and solder balls

**Probes**

Probes JESD209-3B, 253 ball LPDDR3 memory devices
The LPDDR3 256 BGA Interposer is optimized for oscilloscope measurements. It provides access to the LPDDR signals highlighted and passes all power and ground signals between the processor and the memory chip.

**Key Features**

- Enables correct operation of the LPDDR interface while providing access to selected bus signals between the processor and LPDDR memory chip.

- Provides solder pads for use with Keysight E2677A or N5381A InfiniiMax single-ended/differential solder-in probe head or Keysight N5425A ZIF probe head.

- Includes S parameter file to configure the oscilloscope to render waveforms as they exist at the DRAM pins.
The GDDR5 170 BGA Interposer is optimized for oscilloscope measurements. It provides access to the GDDR signals highlighted and passes all power and ground signals between the processor and the memory chip.

**Selection Guide**

**Key Features**

- Enables correct operation of the GDDR5 interface while providing access to selected bus signals between the processor and LPDDR memory chip.
- Provides solder pads for use with Keysight E2677A or N5381A InfiniiMax single-ended/differential solder-in or Keysight N5425A ZIF probe head.
- Includes S parameter file to configure the oscilloscope to render waveforms as they exist at the DRAM pins.

**Specifications**

- **JEDEC Standard:** JESD212B.01
- **Ball Count:** 170
- **DRAM Size:** 12 mm x 14 mm
- **Configuration:** Embedded GDDR
- **Interposer size, pitch:** 14.2 x 16.4 mm nominal, 0.8 mm
- **Connectors:** Solder-down test points and solder balls
The LPDDR2 121 BGA Interposer is optimized for logic analyzer measurements and can also be used for oscilloscope measurements. It provides access to the LPDDR signals highlighted and passes all power and ground signals between the processor and the memory chip.

Key Features
- Enables correct operation of the LPDDR interface while providing access to selected bus signals between the processor and LPDDR memory chip.
- Rigid/flex probe can be soldered in place or used with a BGA socket.
- Logic Analyzer measurements require one modified Keysight E5845A adapter cable (sold separately) to access CKE signals.
- Oscilloscope measurements require two Keysight W3635B scope probe adapters (sold separately).

Specifications
- JEDEC Standard: JESD209-2F
- Ball Count: 121
- DRAM Size: 10 mm x 11 mm
- Configuration: Single channel, x16 RAM
- Interposer size, pitch: 33.4 mm x 21 mm, (Rigid portion 12.5 mm x 11 mm), 0.5mm
- Connectors: Zero Insertion Force (ZIF)
The LPDDR2/3 168 BGA Logic Analyzer Interposer is optimized for logic analyzer measurements. It provides access to the LPDDR signals highlighted and passes all power and ground signals between the processor and the memory chip.

**Key Features**

- Provides access to memory address, control, and data bus signals between a processor and LPDDR memory chip.
- Enables correct operation of the LPDDR interface while being probed with (2) Keysight U4154A logic analyzer modules.
- Riser of 1.2 mm height is included to clear surrounding devices in tight keep-out volume applications. Riser dimensions: 12 mm x 12 mm.
- For dimensional drawings see final page.
The LPDDR3 178 BGA Interposer is optimized for logic analyzer measurements. It provides access to the LPDDR signals highlighted and passes all power and ground signals between the processor and the memory chip.

**Key Features**

- Provides access to memory address, control, and data bus signals between a processor and LPDDR memory chip.

- Enables correct operation of the LPDDR interface while being probed with one Keysight U4154A logic analyzer module.

- Rigid-flex-rigid structure with Soft Touch Pro (STP) connectors requires two modified E5406A cables (sold separately) for connection to the logic analyzer.

- Riser is included to clear surrounding devices in tight keep-out volume applications. Riser dimensions: 11.5 mm x 11 mm.

- For dimensional drawings see final page.
The LPDDR3 253 BGA Interposer is optimized for logic analyzer measurements. It provides access to the LPDDR signals highlighted and passes all power and ground signals between the processor and the memory chip.

### Key Features
- Provides access to memory address, control, and data bus signals between a processor and LPDDR memory chip.
- Enables correct operation of the LPDDR interface while being probed with two Keysight U4154A logic analyzer modules.
- Rigid-flex-rigid structure with Soft Touch Pro (STP) connectors requires two modified E5406A cables (sold separately) for connection to the logic analyzer.
- Riser is included to clear surrounding devices in tight keep-out volume applications. Riser dimensions: 11 mm x 11.5 mm.
- For dimensional drawings see [final page](#).

### Signals Probed

![Signals Probed Diagram]

### Specifications
- **JEDEC Standard:** JESD209-3B
- **Ball Count:** 253
- **DRAM Size:** 11 mm x 11.5 mm
- **Configuration:** Dual channel x32 RAM (JEDEC MO-276 footprint)
- **Interposer size, pitch:** 70 mm x 70 mm (Rigid Portion 26 mm x 26 mm), 0.5 mm
- **Connectors:** 4 Soft Touch Pro Adapters

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**DDR4 x16**

**Cable Adapter**

**BGA Interposer ZIF to 90-pin Logic Analyzer Connector**

**Signals Probed**

The DDR4 x16 cable adapter, used with the Keysight W4631A DDR4 x16 4-wing BGA Interposer, provides access to DDR4 signals highlighted.

**Key Features**

- Logic analyzer cable used to connect Keysight U4154A logic analyzer module to Keysight W4631A DDR4 x16 4-wing BGA interposer.
- Enables all DDR4 x16 data traffic to be monitored using a single U4154A logic analyzer module.
- DDR4 x32 data can be monitored with: (2) W4631A DDR4 x16 BGA interposers, (2) DDR4 x16 cable adapters, and (2) U4154A logic analyzer modules.

**Specifications**

- **Configuration:** DDR4 x16 DRAM (JEDEC MO-207 Variation DY-z footprint)
- **Connectors:** Four (4) Zero-Insertion Force (ZIF) to Five (5) 90-Pin Logic Analyzer pods

Information subject to change
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Keysight Digital Interposers
Dimensional Drawings

For more information on Keysight Technologies’ products, applications or services, please contact your local Keysight Applications Engineer.

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