

## FEATURES

- ▶ 10-16 mm body sizes (common); custom body sizes available on request
- ▶ Top package I/O interface flexible for various top connections (die, passives, etc.)
- ▶ Wafer thinning/handling <math><100\ \mu\text{m}</math> is available
- ▶ Mature Package-on-Package (PoP) platform with consistent product performance and reliability
- ▶ Package technology is well established in high volume production
- ▶ Stacked package heights from 0.55 mm available in a variety of configurations (see stack-up table)

# Interposer PoP

## Interposer Package-on-Package

Amkor's popular Interposer Package-on-Package (Interposer PoP) platform supports fine pitch flip chip connection by either thermocompression with non-conductive paste (TCNCP) or mass reflow with capillary underfill (CUF). Top interposer connection is performed by thermocompression bonding with copper core balls (CCB). The CCB connection between the bottom substrate and interposer allows for high speed and high-density interconnect access to interposer mounted devices. This highly reliable package achieves low unit warpage by using mold compound encapsulating the die in between two substrates. The top interposer allows for significantly more top side attach flexibility vs. more restrictive Through Mold Via (TMV<sup>®</sup>) and can be coupled with numerous types of devices (packaged memory, passives, die, etc.).

The tight pitch connection from the bottom substrate to the interposer allows for high-density, large quantity I/O interconnects. Interposer PoP processing enables an increase of die size without increasing package body size by utilizing finer pitch interconnects vs. TMV<sup>®</sup> processing.

Amkor has high volume Interposer PoP experience with the most advanced silicon nodes down to 4 nm, and ongoing projects below 4 nm. Amkor has assembled hundreds of millions of units to date with robust performance for a wide range of customers.

## Benefits as an Enabling Technology

Interposer PoP offers OEMs and EMS providers a flexible platform to cost effectively integrate logic plus numerous companion devices/packages in a 3D stacked architecture. Integration through Interposer PoP provides technical, business and logistics benefits.

- ▶ Direct, high-density electrical connection between top and bottom substrate allows for lower latency and higher signal speeds
- ▶ Low unit warpage is achieved through use of EMC encapsulating the die in-between two substrates
- ▶ The top interposer allows for significantly more top side attach flexibility vs. the more restrictive TMV<sup>®</sup> interconnect layout
- ▶ Due to the Interposer PoP package design, the top interposer can be coupled with numerous types of devices (packaged memory, passives, die, etc.)
- ▶ High-density, and a large quantity of I/O interconnects are enabled by tight CCB pitch connection and top interposer fan-out routing
- ▶ Expertise in high-volume manufacturing with hundreds of millions of units assembled

# Interposer PoP

## Applications

Interposer PoP packages are designed for products requiring efficient memory architectures including multiple buses and increased memory density and performance, while reducing mounted area. Portable electronic products such as mobile phones, portable media players (audio/graphics processor plus memory), gaming and other mobile applications can benefit from the combination of stacked package and small footprint.

## Reliability Qualification

Amkor assures reliable performance by continuously monitoring key indices.

### Package Level

- ▶ Moisture resistance testing: JEDEC level 3 @ 260°C x 3 reflows
- ▶ uHAST: 130°C, 85% RH, 96 hours
- ▶ Temp/Humidity: 85°C, 85% RH, 1000 hours
- ▶ Temp cycle: -55°C/+125°C, 1000 cycles
- ▶ High temp storage: 150°C, 1000 hours

### Board Level

- ▶ Thermal cycle: -40°C/+125°C, 1000 cycles

## Standard Materials

- ▶ Package laminate substrate
  - ▷ Cored and coreless available
- ▶ Chip attach
  - ▷ Mass reflow (MR) and thermocompression (TC) available
- ▶ Encapsulant
  - ▷ Package: Epoxy mold compound (EMC)
  - ▷ Die: Capillary underfill (CUF)
  - ▷ Die: Non-conductive paste (NCP)
- ▶ Solder ball
  - ▷ Pb-free (BGA side passives available)
  - ▷ LGA

## Process Highlights

- ▶ Die thickness: <100 µm is available
- ▶ Bump pitch: Down to 40/80 µm proven in HVM
- ▶ Wafers: 200 mm & 300 mm

## Test Services

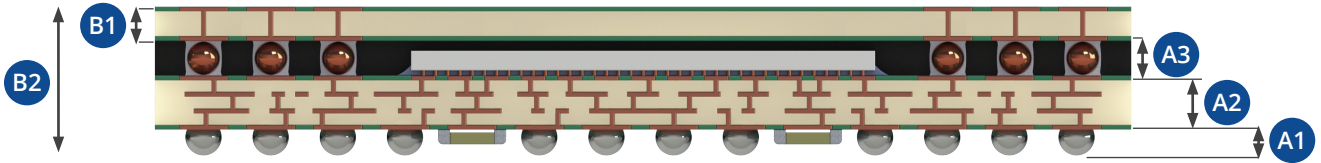
- ▶ Program generation/conversion
- ▶ Product engineering
- ▶ Dual-sided contactor system available
- ▶ Tape and reel service

## Shipping

- ▶ JEDEC trays
- ▶ Tape and reel available

# Interposer PoP

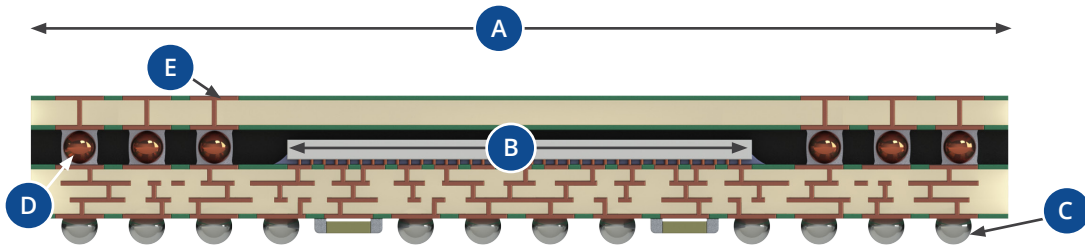
## Interposer PoP Stack-up Table (Reference Example)



Symbol	Interposer PoP – Current HVM (mm)		
	Min	Max	Nom
A1 (Mounted, 0.35 Pitch)	0.115	0.155	0.135
A2 (3L Laminate)	0.090	0.150	0.120
A3 (Mold Cap)	0.130	0.170	0.150
B1 (2L Laminate)	0.075	0.115	0.095
B2 Overall Package Height	0.410	0.590	0.500

\*Both thinner & thicker stack-ups are available. Please contact Sales/Business team for specific design requirements

## Interposer PoP Design Table



A	B	C	D	E
Package Size (mm) <sup>1</sup>	Die Size (mm)	BGA Count to MB (0.35 mm Pitch)	Interposer Connections (Bottom Substrate: Top Interposer) <sup>2</sup>	Memory BGA Pads (Memory I/O Count) <sup>3</sup>
11 x 11	7 x 7	1050	2 Sides: 234 4 Sides: 432	560
12 x 12	8 x 8	1235	2 Sides: 258 4 Sides: 480	672
13 x 13	9 x 9	1512	2 Sides: 282 4 Sides: 528	828
14 x 14	10 x 10	1732	2 Sides: 306 4 Sides: 576	960
15 x 15	11 x 11	1992	2 Sides: 324 4 Sides: 612	1100
17 x 17	14 x 14	2613	2 Sides: 372 4 Sides: 708	1512

<sup>1</sup> Package sizes above/below this range are possible depending on structure

<sup>2</sup> Connection to interposer typically done on 2 sides due to substrate M1 routing constraints; 4 side connection possible depending on design constraints (change in die aspect ratio can change total count)

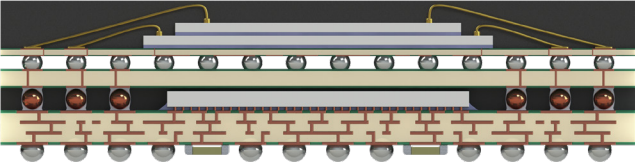
<sup>3</sup> Memory I/O assumes 5 x 5 mm area for substrate marking; increased I/O count can be achieved if memory area is reduced

\*BGA side passives available at pitches >=0.35 mm

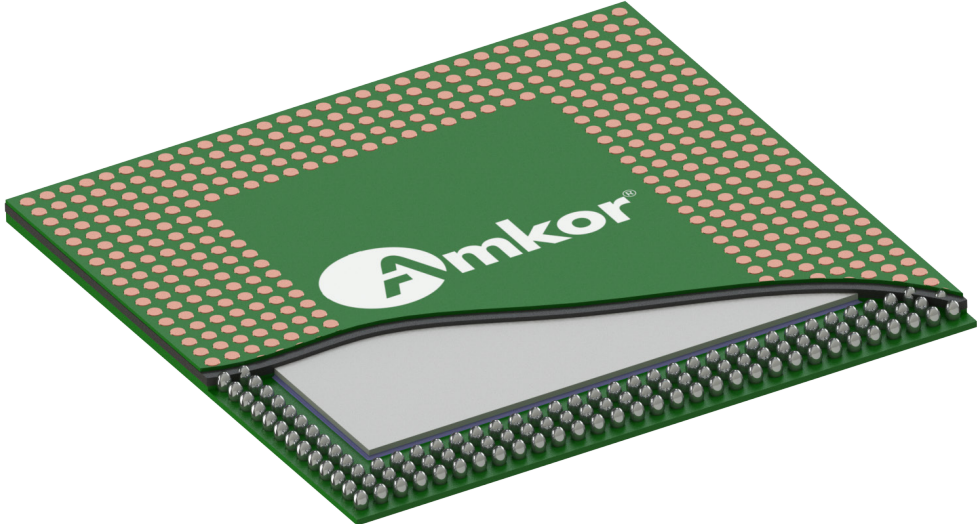
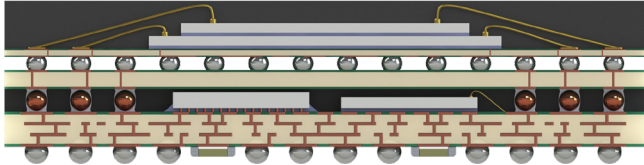
# Interposer PoP

## Cross Sections

Interposer PoP With DDR Attached



Interposer PoP Side by Side Wirebond Die With DDR Attached



Visit [amkor.com](http://amkor.com) or email [sales@amkor.com](mailto:sales@amkor.com) for more information.



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