

# MEMS Technology

## MEMS PACKAGING CONSIDERATIONS

Amkor Technology is the world leader in microelectronic packaging technologies and the world's largest outsource provider of MEMS and MOEMS.

### GENERAL REQUIREMENTS

- ▶ Controlling stresses to the MEMS structure
- ▶ Allowing the stimuli to reach the MEMS structure
- ▶ Protecting the MEMS and ASIC devices

### CONSUMER MARKET

- ▶ Quick turn around time
- ▶ Highly reusable packaging
- ▶ Miniaturization roadmap

### AUTOMOTIVE MARKET

- ▶ More stringent device package protection
- ▶ Customized requirements

MEMS are micron-size devices that can sense or manipulate the physical world. MEMS are typically created on silicon wafers, but can also use other substrate types as well. Due to size, tens of thousands of these devices can be fabricated on a single wafer.



Courtesy Sandia National Laboratories SUMMIT™ Technologies [www.mems.sandia.gov](http://www.mems.sandia.gov)

Microelectromechanical Systems (MEMS) are micron-size devices that can sense or manipulate the physical world. MEMS are created using micro machining processes, similar to those used to produce integrated circuit (IC) devices. This allows a two- or three-dimensional mechanical system to be created in the same small area typical of an IC device. Because the fab process is similar to that of IC fabrication, MEMS are most typically created on silicon wafers but can also employ other substrate types as well. Due to their size, tens of thousands of these devices can be fabricated on a single wafer.

## MEMS Applications

Amkor Technology is the world's leader in microelectronic packaging technologies and the world's largest outsource provider of MEMS and MOEMS (Micro Optical Electronic Mechanical Systems).

MEMS/Sensor	Consumer Devices	Automotive	Health & Fitness	Home/Industrial
Accelerometer	✓	✓	✓	✓
Biosensors			✓	
Chemical/Gas	✓			✓
Fingerprint	✓	✓		
Gyroscope	✓	✓	✓	✓
Humidity	✓	✓		✓
Inertial (IMU)	✓	✓	✓	
IR	✓	✓	✓	✓
Light/Optical	✓	✓	✓	✓
Magnetometer	✓	✓		
Microphone	✓	✓	✓	✓
Pressure	✓	✓	✓	
Temperature	✓	✓	✓	✓

## Amkor's Value Proposition

### MEMS Manufacturing

- ▶ Standard Platforms = Faster Development
  - ▷ Faster introduction of new products
  - ▷ Lower development cost
- ▶ Amkor Experience
  - ▷ Dedicated MEMS team
  - ▷ Constantly updating the MEMS Toolbox with investments in new equipment and materials and leveraging other core technologies like TSV and Cu Pillar
  - ▷ In-house test development capability

# MEMS Technology

## Material Characterization

DMA, DSC, TGA, TMA, thermo moiré, FTIR, interferometer, hardness, ARES, diffusivity, solubility and more.

## Modeling and Simulation

Complete electrical and thermo-mechanical capabilities (mechanical, thermal, electrical, EMI/RFI modeling).

## Package and Board Level Reliability

Amkor offers a full range of reliability test capabilities in multiple locations.

**Amkor presently conducts MEMS/sensor-related activities at the following strategic manufacturing locations**

- ▶ Philippines (ATP)
- ▶ Korea (ATK)
- ▶ China (ATC)
- ▶ Japan (ATJ)

## Cavity MEMS Packages

Open Tool Available (Sample Builds)	Lead Count	Body Width (mm)	Body Length (mm)	Body Thickness (mm)	Pkg Type	Lid Type	Die Qty	Inter-connect	Factory	POD Dwg	Unit Dwg
	8	2	2	0.8	Cavity LGA	Metal	Multi-die	WB	P3	TBD	TBD
	8	4	4	0.9	Cavity LGA	Metal	Multi-die	WB	P3	643113PO	TBD
	8	5	5	1	Cavity LGA	Metal	Multi-die	WB	P3	TBD	TBD
	8	7	7	1	Cavity LGA	Metal	Multi-die	WB	P3	647876PO	647874UD
	8	4	3	1	Cavity LGA	L2L	Multi-die	WB	P3	698505PO	698275UD
	8	5	2	1	Molded Cavity LGA	Polymer	Multi-die	WB	K4	774373PO	774370UD
	22	6.8	4.9	1.35	Cavity LGA	Polymer	Multi-die	WB	K4	792161PO	792160UD
	20	6	6	1.9	Cavity LF	Polymer	Multi-die	WB	P3	610182PO	640993UD

## MEMS/Sensor Package Standards

Package Type	Overmolded	Exposed Die Surface	Cavity Package	Molded Cavity Package
Leadframe SOIC/MLF®				
ChipArray® LGA/FPBGA				

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