

MEMS motion sensors

A complete portfolio of MEMS accelerometers and gyroscopes



October 2009

The one-stop MEMS supplier

STMicroelectronics' innovative, reliable and cost-effective MEMS sensors have revolutionized the way we interact with everyday technology, making it easier and more user friendly.

With more than half a billion accelerometers and gyroscopes in the field and excellent acceptance from the market in terms of quality and reliability, ST is today recognized as undisputed MEMS leader for mobile phones and portable devices.

Encompassing the entire supply chain, ST brings its customers a competitive advantage with complete, reliable and cost-effective solutions, ensuring prompt time-to-volume and time-to-market to effectively address high-volume applications in consumer and industrial segments.

STMicroelectronics offers a wide portfolio of 2- and 3-axis linear accelerometers as well as single- and multi-axis gyroscopes.

Linear accelerometers

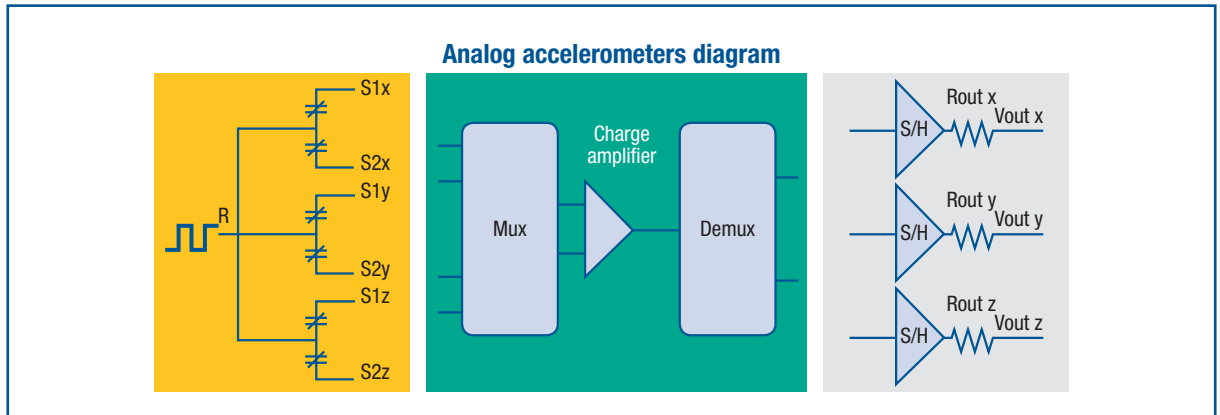
STMicroelectronics' state-of-the-art 2- and 3-axis analog and digital accelerometers feature up to $\pm 24g$ full scale, high resolution, smart embedded functionalities and advanced power-saving features.

Applications



Analog accelerometers - key features

- Analog output with additional multiplexer output
- Selectable full scale: $\pm 2g/\pm 6g$
- < 0.5 mA current consumption in normal mode
- < 1 μA current consumption in power-down mode
- Bandwidth up to 2 kHz
- Resolution better than 0.5 mg @ 100 Hz
- Ultra-high stability over temperature: typ 0.2 mg/ $^{\circ}C$
- Operating temperature range: -40 to + 85 $^{\circ}C$
- Embedded self test
- High shock survivability: 10,000g for 0.1 ms

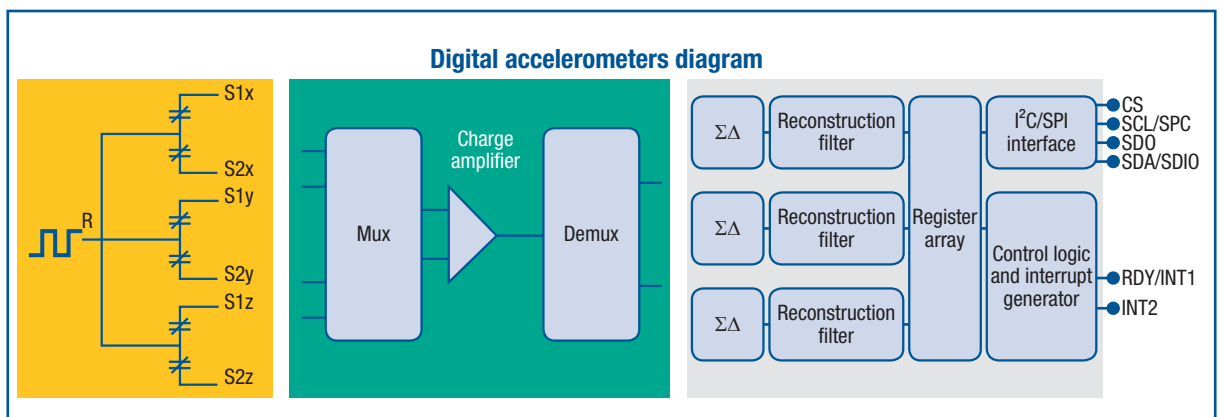


Digital accelerometers - key features

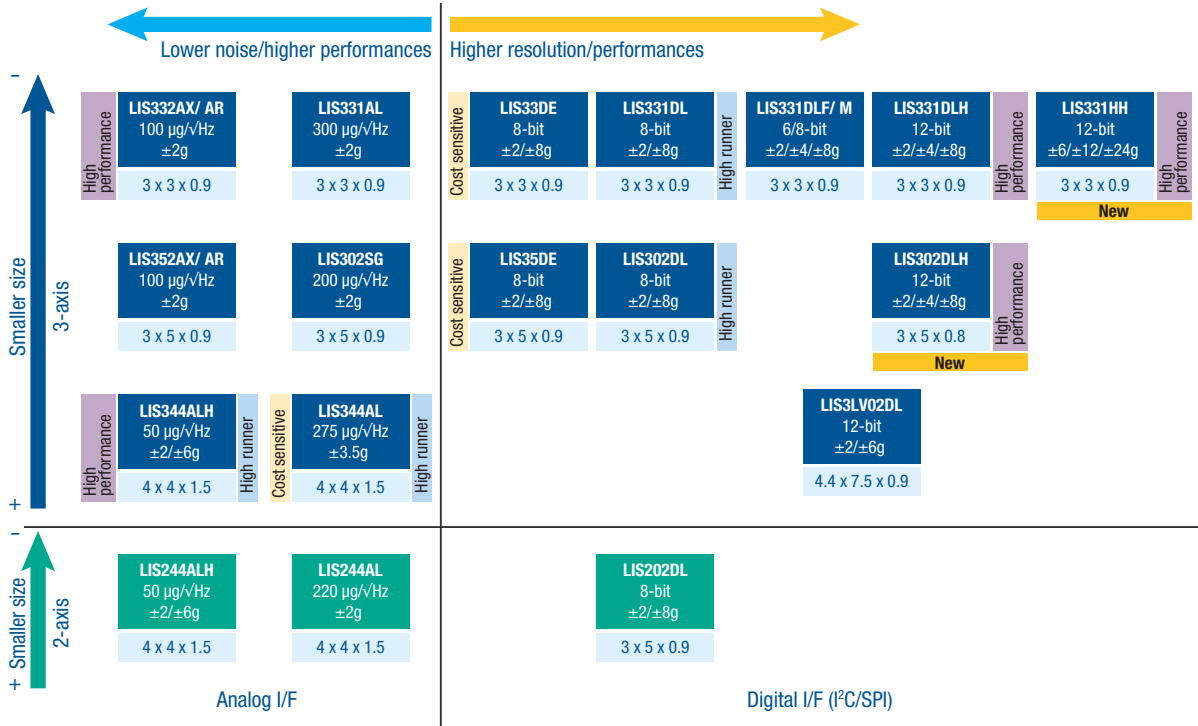
- Digital SPI, I²C interfaces - user selectable
- Selectable full scale: from $\pm 2g$ up to $\pm 24g$
- < 0.25 mA current consumption in normal mode
- < 10 μA current consumption in low-power mode
- < 1 μA current consumption in power-down mode
- Resolution better than 1 mg
- Ultra high stability over temperature: typ 0.1 mg/ $^{\circ}C$
- Operating temperature range: -40 to + 85 $^{\circ}C$
- Embedded self test
- High shock survivability: 10,000g for 0.1 ms

Smart embedded features

- Two independent fully programmable interrupt signals
- Embedded free-fall and wake-up functions
- Click and double click recognition
- Direction detection
- Sleep to wake function
- Embedded high-pass filter



Linear accelerometers portfolio



Analog interface accelerometers

Part number	LGA package (mm - leads)	Sensing axes (x,y,z)	Output response (absolute, ratiometric)	Full scale (typ) (±g)	Supply voltage			Noise density (µg/√Hz)	Current consumption (typ) (mA)	Power down (µA)
					(min) (V)	(typ) (V)	(max) (V)			
LIS244AL	4 x 4x 1.5 16L	x,y	Ratiometric	2	2.4	3	3.6	220	0.65	-
LIS244ALH			Ratiometric	2/6	2.4	3.3	3.6	50	0.68	1
LIS332AR	3 x 3 x 0.9 16L	x,y,z	Ratiometric	2	2.16	3	3.6	100	0.3	1
LIS332AX			Absolute	2	2.16	3	3.6	100	0.3	1
LIS331AL	3 x 5 x 0.9 14L	x,y,z	Ratiometric	2	3	3.3	3.6	300	0.65	1
LIS352AR			Ratiometric	2	2.16	3.3	3.6	100	0.3	1
LIS352AX	3 x 5 x 0.9 14L	x,y,z	Absolute	2	2.16	3.3	3.6	100	0.3	1
LIS302SG			Ratiometric	2	3	3.3	3.6	200	0.65	1
LIS344AL	4 x 4 x 1.5 16L	x,y,z	Ratiometric	3.5	2.7	3	3.3	275	0.69	-
LIS344ALH			Ratiometric	2/6	2.4	3.3	3.6	50	0.68	1

Digital interface accelerometers

Part number	LGA package (mm - leads)	Sensing axes (x,y,z)	Full scale (typ) (±g)	Supply voltage			Number of bits	Current consumption (typ) (mA)	Low power (µA)
				(min) (V)	(typ) (V)	(max) (V)			
LIS202DL	3 x 5 x 0.9 14L	x,y	2/8	2.16	2.5	3.6	8	0.3	-
LIS331DL			2/8	2.16	2.5	3.6	8	0.3	-
LIS333DE	3 x 3 x 0.9 16L	x,y,z	2/8	2.16	2.5	3.6	8	0.3	-
LIS331DLF			2/4/8	2.16	2.5	3.6	6	0.25	10
LIS331DLM			2/4/8	2.16	2.5	3.6	8	0.25	10
LIS331DLH			2/4/8	2.16	2.5	3.6	12	0.25	10
LIS331HH ¹			6/12/24	2.16	2.5	3.6	12	0.25	10
LIS302DLH ¹			3 x 5 x 0.8 14L	x,y,z	2/4/8	2.16	2.5	3.6	12
LIS302DL	3 x 5 x 0.9 14L	x,y,z	2/8	2.16	2.5	3.6	8	0.3	-
LIS35DE			2/8	2.16	2.5	3.6	8	0.3	-
LIS3LV02DL	4.4 x 7.5 x 1 16L	x,y,z	2/6	2.16	3.3	3.6	12	0.6	-

1. New

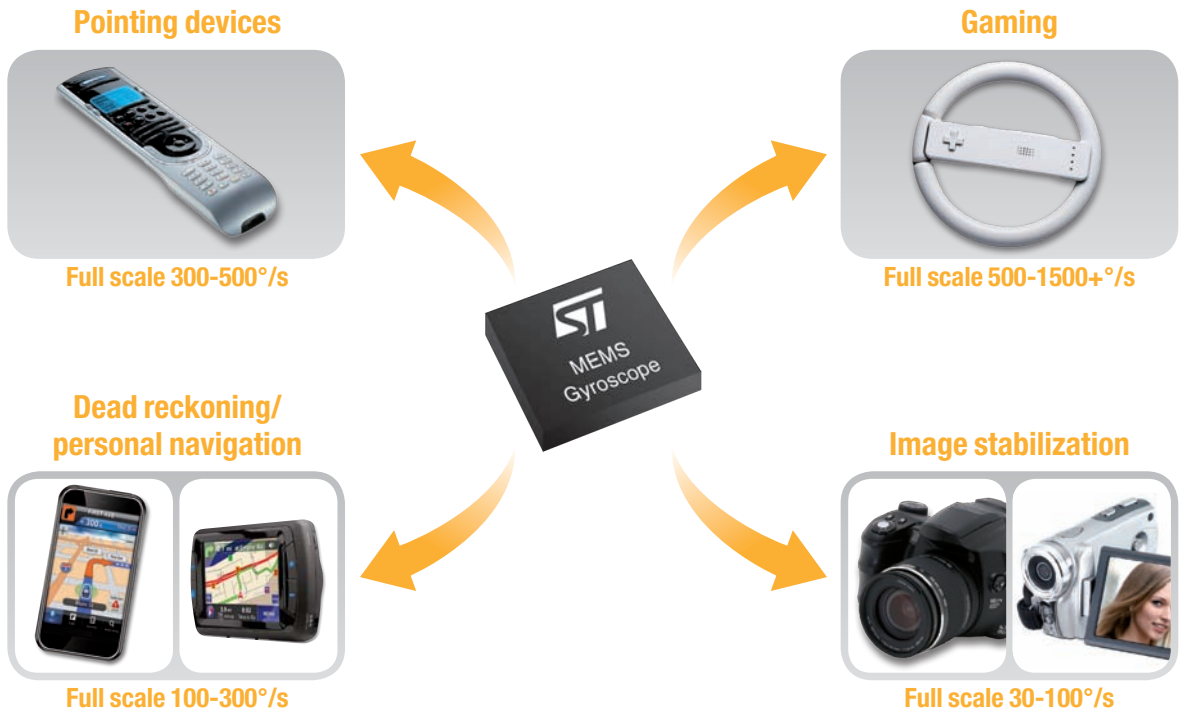
Gyroscopes

ST offers a complete portfolio of single, dual and tri-axis gyroscopes with wide full-scale range (from 30 up to 6000°/s), excellent performance in terms of accuracy, and stability over time and temperature for consumer and industrial markets.

By incorporating an accelerometer and actuator in a single micromachined structure, ST's gyroscope family leverages on robust and mature manufacturing processes already successfully used for the high-volume production of more than half a billion linear accelerometers.

For further details and deeper understanding of ST's gyroscope sensors operating principle, key parameters and applications, an e-presentation is available on www.st.com/mems.

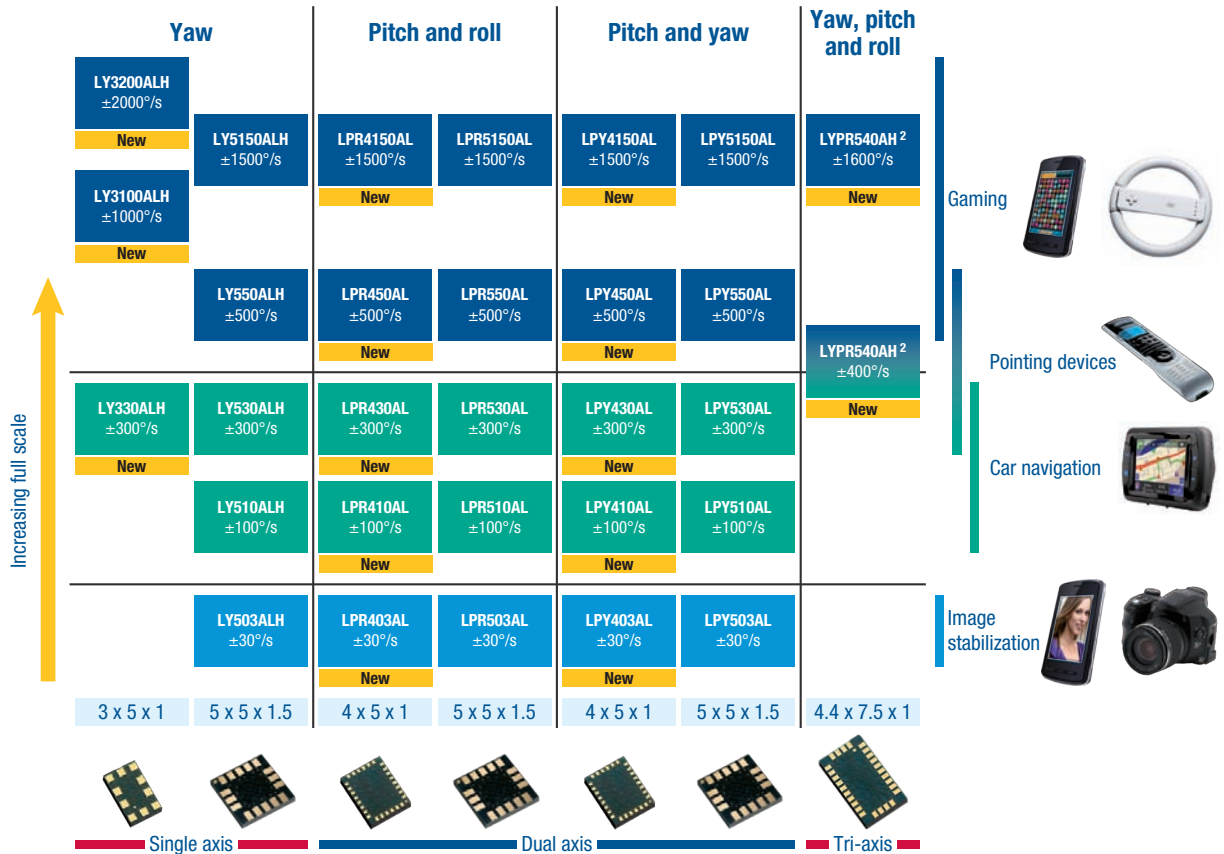
Applications



Key features

- Analog output
- Single and dual axis: yaw, pitch and yaw, pitch and roll
- Tri-axis: yaw, pitch and roll in a single package
- Extended power supply range: 2.7 to 3.6 V
- Wide range of full scales available: 30 to 6000°/s
- < 5 μ A current consumption in power-down mode
- High resolution: up to 0.014°/s/√Hz at 30°/s full scale
- Ultra high stability over temperature: typ - up to 0.08°/s/°C
- Operating temperature range: -40 to + 85 °C
- Embedded self test
- Embedded power down
- Sleep mode
- High shock survivability

Gyroscopes portfolio

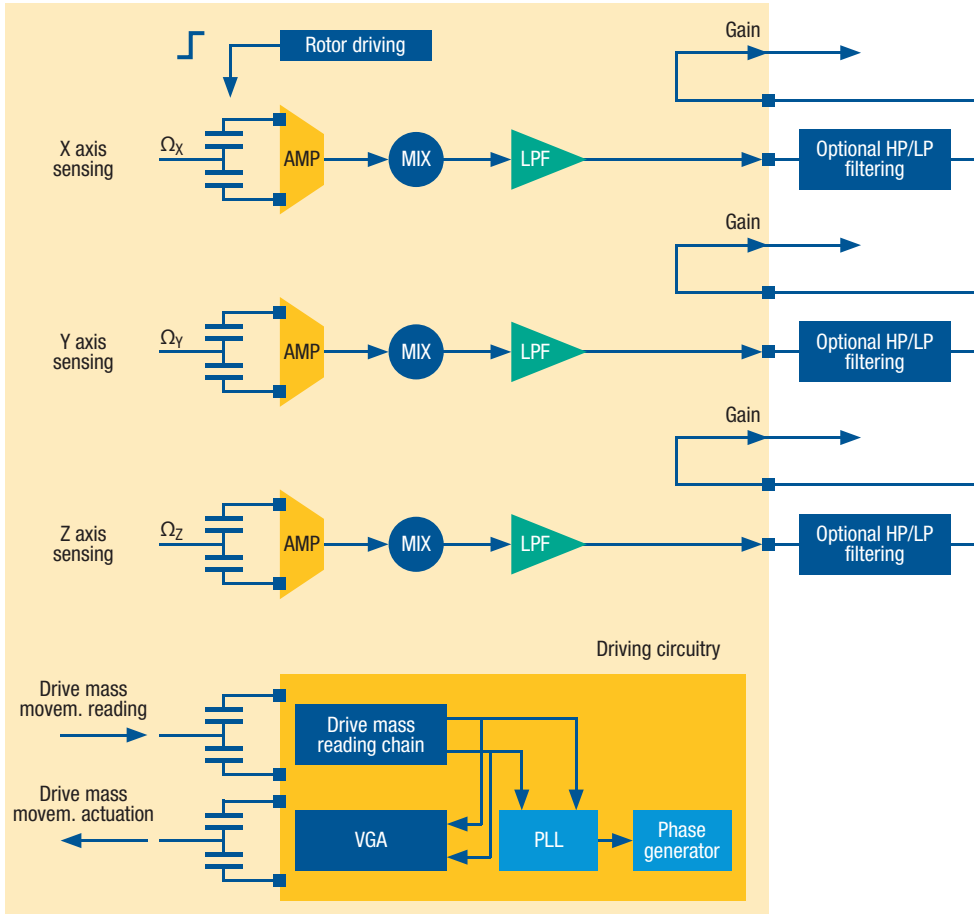


2. Single part number with dual full scale: 400/1600°/s

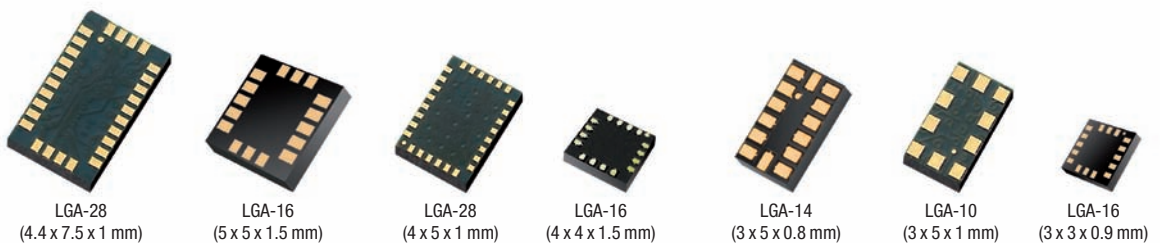
Single and multi-axis gyroscopes

Part number	LGA package (mm - leads)	Sensing axes (Y,P,R)	Full scale (typ) (°/s)	Supply voltage			Noise density (°/s/√Hz)	Current consumption (typ) (mA)
				(min) (V)	(typ) (V)	(max) (V)		
LY330ALH	3 x 5 x 1	Y	±300	2.7	3	3.6	0.018	4.2
LY3100ALH			±1000	2.7	3	3.6	0.018	4.2
LY3200ALH			±2000	2.7	3	3.6	0.078	4.2
LPY403AL	4 x 5 x 1	PY	±30/120	2.7	3	3.6	0.015	6.8
LPY410AL			±100/400	2.7	3	3.6	0.018	6.8
LPY430AL			±300/1200	2.7	3	3.6	0.022	6.8
LPY450AL			±500/2000	2.7	3	3.6	0.031	6.8
LPY4150AL			±1500/6000	2.7	3	3.6	0.088	6.8
LPR403AL			4 x 5 x 1	PR	±30/120	2.7	3	3.6
LPR410AL	±100/400	2.7			3	3.6	0.018	6.8
LPR430AL	±300/1200	2.7			3	3.6	0.022	6.8
LPR450AL	±500/2000	2.7			3	3.6	0.031	6.8
LPR4150AL	±1500/6000	2.7			3	3.6	0.088	6.8
LY503ALH	5 x 5 x 1.5	Y			±30/120	2.7	3	3.6
LY510ALH			±100/400	2.7	3	3.6	0.017	5.0
LY530ALH			±300/1200	2.7	3	3.6	0.035	5.0
LY550ALH			±500/2000	2.7	3	3.6	0.059	5.0
LY5150ALH			±1500/6000	2.7	3	3.6	0.175	5.0
LPY503AL	5 x 5 x 1.5	PY	±30/120	2.7	3	3.6	0.014	6.8
LPY510AL			±100/400	2.7	3	3.6	0.017	6.8
LPY530AL			±300/1200	2.7	3	3.6	0.035	6.8
LPY550AL			±500/2000	2.7	3	3.6	0.059	6.8
LPY5150AL			±1500/6000	2.7	3	3.6	0.175	6.8
LPR503AL			5 x 5 x 1.5	PR	±30/120	2.7	3	3.6
LPR510AL	±100/400	2.7			3	3.6	0.017	6.8
LPR530AL	±300/1200	2.7			3	3.6	0.035	6.8
LPR550AL	±500/2000	2.7			3	3.6	0.059	6.8
LPR5150AL	±1500/6000	2.7			3	3.6	0.175	6.8
LYPR540AH	4.4 x 7.5 x 1	YPR			±400/1600	2.7	3	3.6

Analog 3-axis gyroscope diagram



Accelerometer and gyroscope packages



ST pioneered the successful use of LGA packages for MEMS sensors. ST now has the widest manufacturing capability and greatest expertise for the production of sensor-in-plastic LGA packages.



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