

MEMS motion sensors



June 2009

STMicroelectronics is driving innovation in MEMS (micro electro-mechanical systems) technology. With several hundred million sensors sold on the market, ST accelerometers and gyroscopes are widely used to enable advanced motion-sensing functions, including portrait/landscape rotation, pedometers, menu browsing, free-fall recognition, personal navigation, or inclination detection.

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

Gyroscopes

Combining an accelerometer and actuator in a single micro-machined structure, ST's gyroscope family leverages on robust and mature manufacturing processes already used for the production of several hundred million accelerometers.

ST's MEMS gyroscopes include a sensing element composed of a single driving mass, kept in continuous oscillating movement and able to react when an angular rate is applied based on the Coriolis principle.

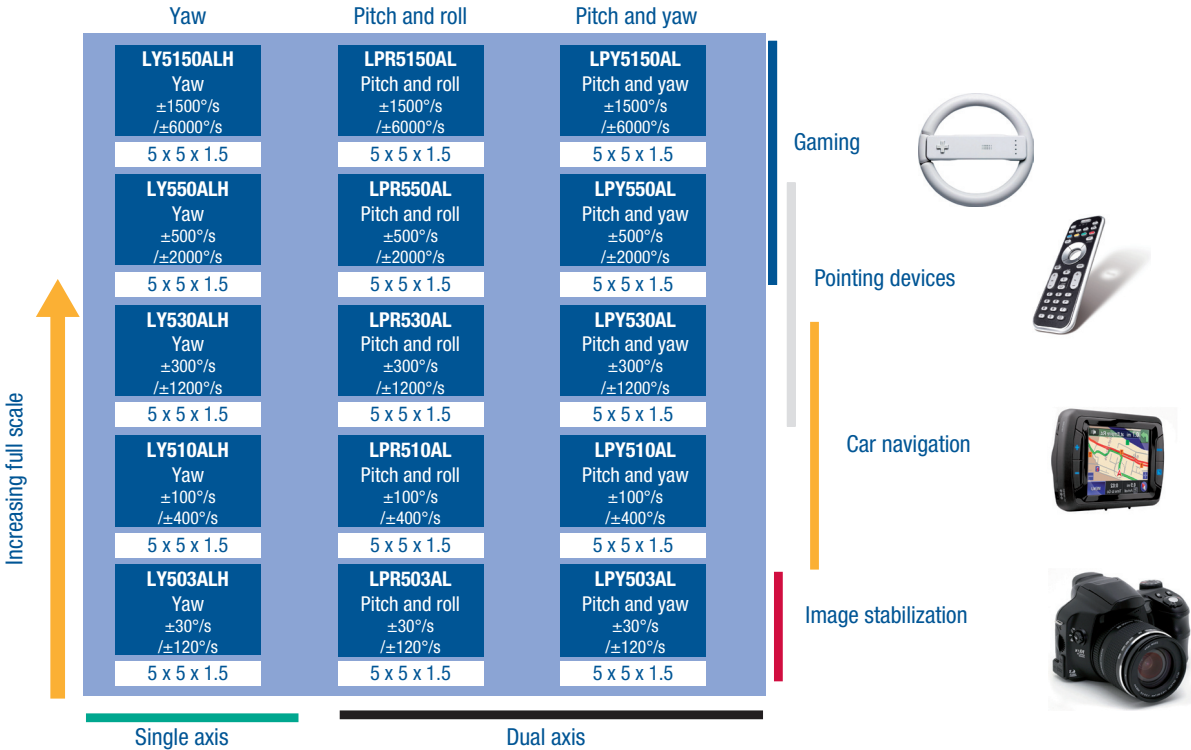
Applications

- Image stabilization in cameras and camcorders
- Pointing devices for smart user interfaces
- Gaming
- Enhanced GPS solutions (dead reckoning algorithm implementation)
- Motion control in robotics
- Platform stabilization for industrial machinery

Key features

- Analog output
- Extended power supply range: 2.7 V to 3.6 V
- Wide range of full scales available: from 30°/s (Lxx503AL) to 6000°/s (Lxx5150AL)
- < 10 µA current consumption in power-down mode
- High resolution: 0.014°/s /√Hz @ 30°/s full scale
- Ultra high stability over temperature: 0.08°/s/°C
- Operating temperature range -40 °C +85 °C
- Embedded self test
- High shock survivability

Gyroscopes portfolio



Linear accelerometers

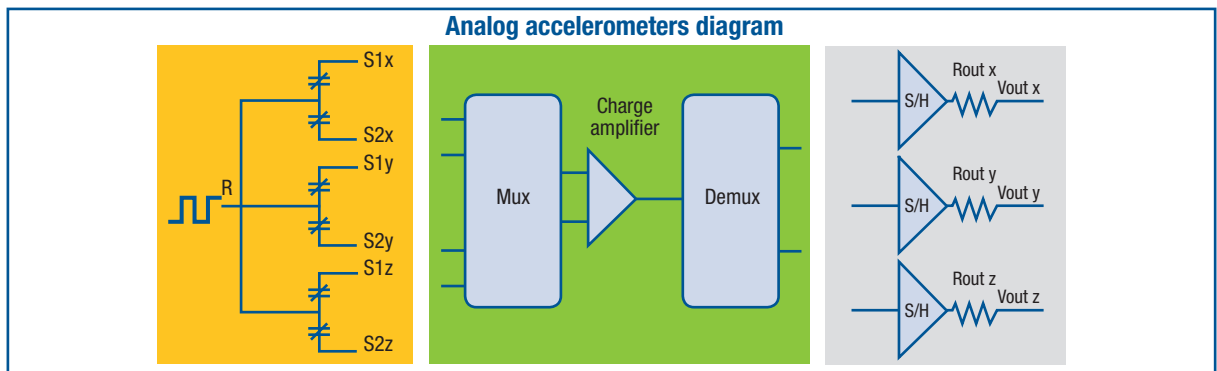
STMicroelectronics offers a complete portfolio of state-of-the-art 2- and 3-axis analog and digital accelerometers with full scale up to $\pm 8g$, high resolution, smart embedded functionalities and advanced power-saving features.

Applications

- Smart user interfaces
- Remote control
- Interactive entertainment
- Sport and health monitoring systems
- Navigation systems
- Compass compensation
- Anti-theft systems
- Machine control
- Vibration monitoring systems
- Motion-activated power-saving systems

Analog accelerometers - key features

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

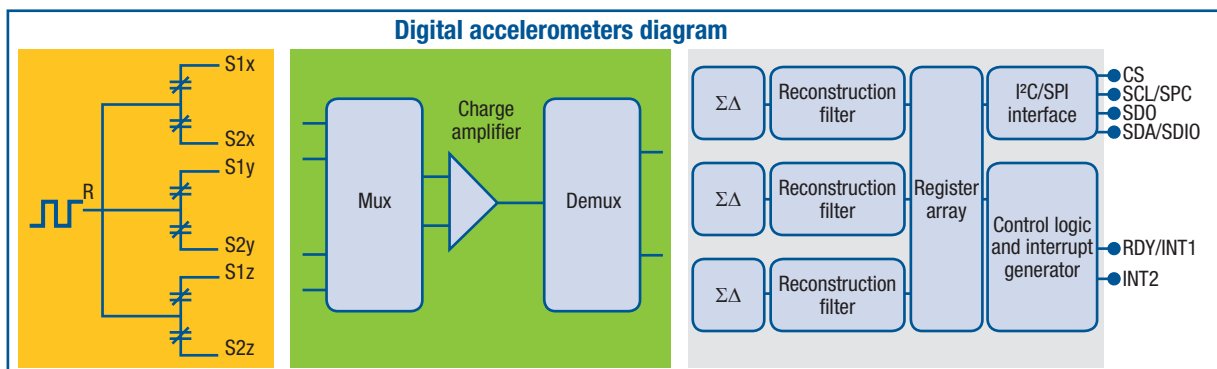


Digital accelerometers - key features

- Digital SPI, I²C interfaces - user selectable
- Selectable full scale: $\pm 2g/\pm 4g/\pm 8g$
- $< 0.3 \text{ mA}$ current consumption in normal mode
- $< 10 \mu\text{A}$ current consumption in low-power mode
- $< 1 \mu\text{A}$ current consumption in power-down mode
- Resolution better than 1 mg
- Ultra high stability over temperature: $0.2 \text{ mg}/^\circ\text{C}$
- Extended operating temperature range: $-40^\circ\text{C} +85^\circ\text{C}$
- 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



Analog interface accelerometers

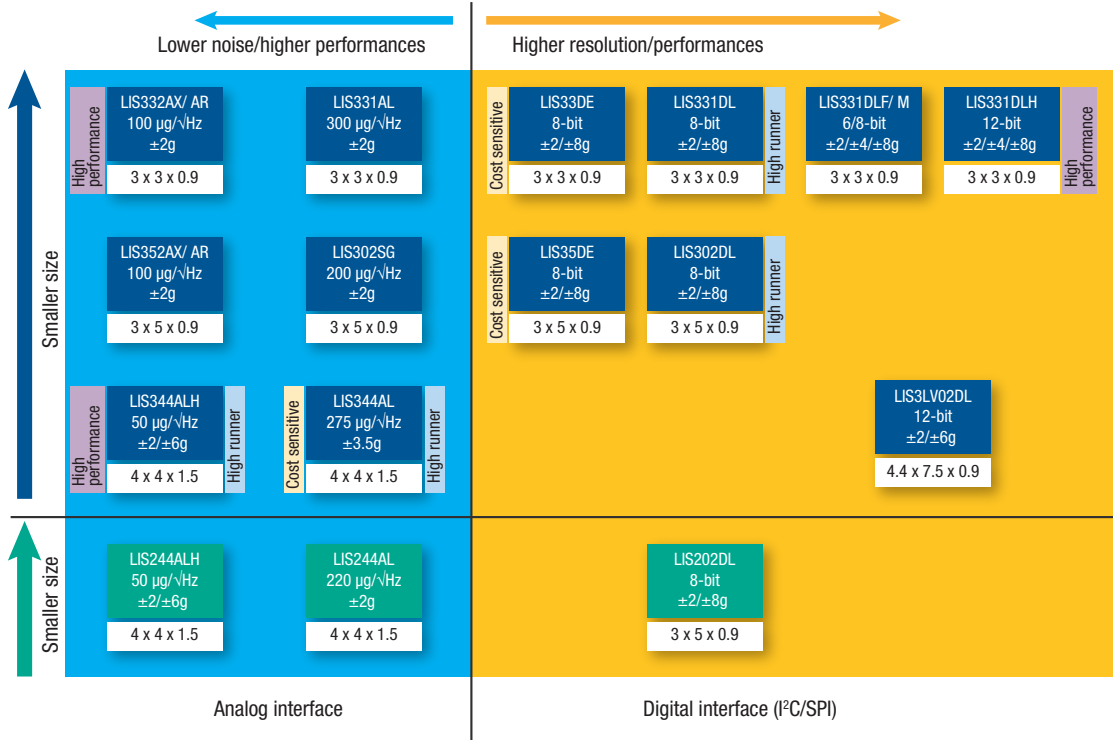
Part number	LGA package (mm - leads)	Sensing axes	Full scale	Supply voltage			Noise density	Current consumption (typ)	Power down
			(typ)	(min)	(typ)	(max)			
		(x,y,z)	(±g)	(V)	(V)	(V)	(µg/√Hz)	(mA)	(µA)
LIS244AL	4 x 4 x 1.5 16L	x,y	2	2.4	3	3.6	220	0.65	-
LIS244ALH	4 x 4 x 1.5 16L	x,y	2/6	2.4	3.3	3.6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

* absolute output

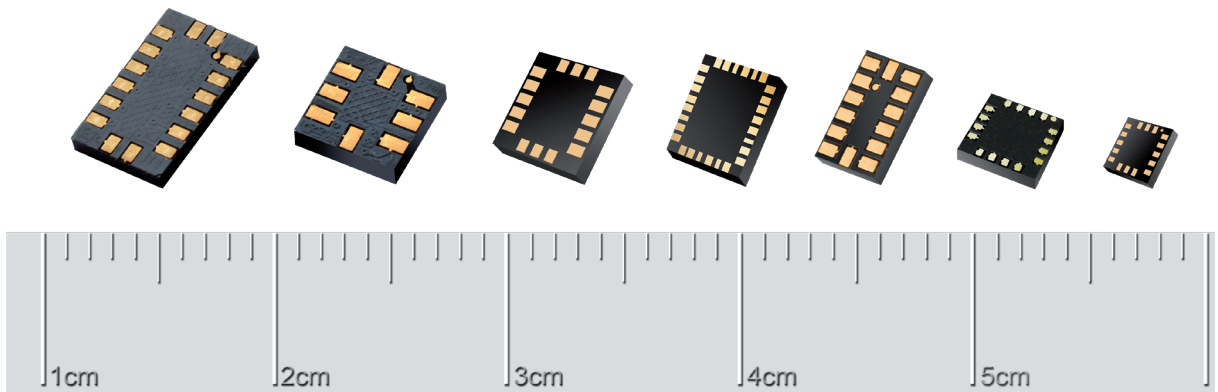
Digital interface accelerometers

Part number	LGA package (mm - leads)	Sensing axes	Full scale	Supply voltage			Number of bits	Current consumption (typ)	Power down	Low power
			(typ)	(min)	(typ)	(max)		(mA)	(µA)	(µA)
		(x,y,z)	(±g)	(V)	(V)	(V)	(mA)	(µA)	(µA)	
LIS202DL	3 x 5 x 0.9 14L	x,y	2/8	2.16	2.5	3.6	8	0.3	1	-
LIS302DL	3 x 5 x 0.9 14L	x,y,z	2/8	2.16	2.5	3.6	8	0.3	1	-
LIS35DE	3 x 5 x 0.9 14L	x,y,z	2/8	2.16	2.5	3.6	8	0.3	1	-
LIS331DL	3 x 3 x 0.9 16L	x,y,z	2/8	2.16	2.5	3.6	8	0.3	1	-
LIS33DE	3 x 3 x 0.9 16L	x,y,z	2/8	2.16	2.5	3.6	8	0.3	1	-
LIS3LV02DL	4.4 x 7.5 x 1 16L	x,y,z	2/6	2.16	3.3	3.6	12	0.65	1	-
LIS331DLF	3 x 3 x 0.9 16L	x,y,z	2/4/8	2.16	2.5	3.6	6	0.25	1	10
LIS331DLM	3 x 3 x 0.9 16L	x,y,z	2/4/8	2.16	2.5	3.6	8	0.25	1	10
LIS331DLH	3 x 3 x 0.9 16L	x,y,z	2/4/8	2.16	2.5	3.6	12	0.25	1	10

Linear accelerometers portfolio



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.



© STMicroelectronics - June 2009 - Printed in Italy - All rights reserved
The STMicroelectronics corporate logo is a registered trademark of the STMicroelectronics group of companies.
All other names are the property of their respective owners.

For more information on ST products and solutions,
visit www.st.com

Order code: BRMEMS0609

