



# L3G3250A

## MEMS motion sensor: three-axis analog gyroscope

Preliminary data

### Features

- Two selectable full scales (625/2500 dps)
- Embedded self-test
- Wide supply voltage range: 2.4 V to 3.6 V
- Embedded power-down and sleep mode
- Embedded low-pass filter
- Integrated high-pass filter reset
- High shock survivability
- Extended operating temperature range (-40 °C to 85 °C)
- ECOPACK® RoHS and “Green” compliant

### Applications

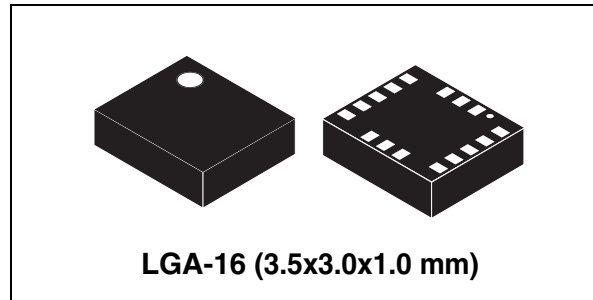
- Gaming and virtual reality input devices
- Motion control with MMI (man-machine interface)
- GPS navigation systems
- Appliances and robotics

### Description

The L3G3250A is a low-power three-axis angular rate sensor.

It includes a sensing element and an IC interface capable of providing the measured angular rate to the external world via three analog outputs.

The sensing element is manufactured using a dedicated micro-machining process developed by STMicroelectronics to produce inertial sensors and actuators on silicon wafers.



The IC interface is manufactured using a CMOS process that allows a high level of integration to design a dedicated circuit which is trimmed to better match the sensing element characteristics.

The L3G3250A is available in a plastic land grid array (LGA) package and can operate within a temperature range from -40 °C to +85 °C.

**Table 1. Device summary**

Order code	Temperature range (°C)	Package	Packing
L3G3250A	-40 to +85	LGA-16 (3.5x3.0x1.0)	Tray
L3G3250ATR	-40 to +85	LGA-16 (3.5x3.0x1.0)	Tape and reel

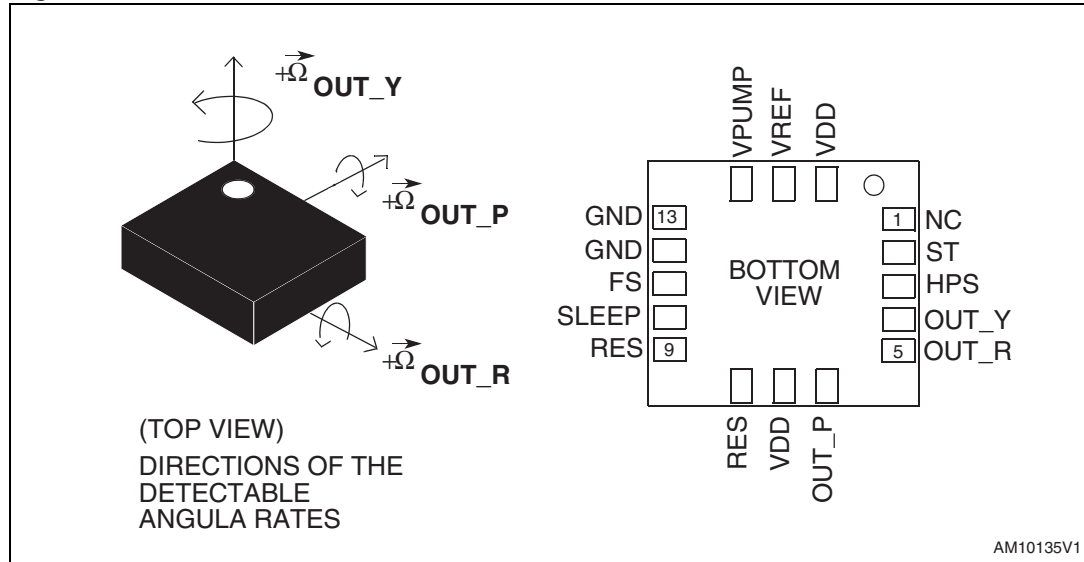
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# 1 Pin description

## 1.1 Pin description

Figure 1. Pin connection



Note: The vibration of the structure is maintained by drive circuitry in a feedback loop. The sensing signal is filtered and appears as an analog output.

Table 2. Pin description

Pin#	Name	Function
1	NC	Internally not connected
2	ST	Self-test pin
3	HPS	High-pass filter reset ('1': reset of external high-pass filter; '0': normal mode)
4	OUT_Y	Yaw axis angular rate output
5	OUT_R	Roll axis angular rate output
6	OUT_P	Pitch axis angular rate output
7	VDD	Power supply
8	RES	Reserved, leave unconnected
9	RES	Reserved, leave unconnected
10	SLEEP	Sleep mode selection
11	FS	Full scale selection
12	GND	0 V supply voltage
13	GND	0 V supply voltage
14	VPUMP	Charge pump capacitor connection pin <sup>(1)</sup>

**Table 2. Pin description (continued)**

Pin#	Name	Function
15	VREF	Reference output voltage
16	VDD	Power supply

1. To be connected to GND through 10 nF, 25 V ceramic capacitor. 1nF min value must be guaranteed under 11 V bias condition.

## 2 Mechanical and electrical specifications

### 2.1 Mechanical characteristics

@ Vdd = 3.0 V, T = 25 °C unless otherwise noted.

**Table 3. Mechanical characteristics (1)**

Symbol	Parameter	Test condition	Min.	Typ. <sup>(2)</sup>	Max.	Unit
FS	Measurement range			±625		dps
				±2500		
So	Sensitivity	FS = 625 dps		2		mV/dps
		FS = 2500 dps		0.5		
SoDr	Sensitivity change vs. temperature			±0.017		%/°C
ZRL	Zero-rate level	FS = 625 dps		1.5		V
		FS = 2500 dps		1.5		
Vref	Reference voltage			1.5		V
OffDr	Zero-rate level change vs. temperature			±0.08		dps/°C
NL	Non linearity <sup>(3)</sup>	Best fit straight line			2	% FS
Rn	Rate noise density			0.015		dps/ √Hz
BW	Bandwidth			140		Hz
Top	Operating temperature range		-40		+85	°C

1. The product is factory calibrated at 3.0 V. The operational power supply range is specified in [Table 4](#).
2. Typical specifications are not guaranteed.
3. Guaranteed by design.

## 2.2 Electrical characteristics

@ V<sub>dd</sub> = 3.0 V, T = 25 °C unless otherwise noted.

**Table 4. Electrical characteristics <sup>(1)</sup>**

Symbol	Parameter	Test condition	Min.	Typ. <sup>(2)</sup>	Max.	Unit
V <sub>dd</sub>	Supply voltage	-	2.4	3.0	3.6	V
I <sub>dd</sub>	Supply current			6.3		mA
I <sub>ddSL</sub>	Supply current in sleep mode <sup>(3)</sup>			2		mA
I <sub>ddPdn</sub>	Supply current in power-down mode			5		μA
Top	Operating temperature range			-40		+85

1. The product is factory calibrated at 3.0 V.
2. Typical specifications are not guaranteed.
3. Sleep mode introduces a faster turn-on time relative to power-down mode.

## 2.3 Absolute maximum ratings

Stresses above those listed as “Absolute maximum ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device under these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

**Table 5. Absolute maximum ratings**

Symbol	Ratings	Value	Unit
V <sub>dd</sub>	Supply voltage	- 0.3 to 4.8	V
V <sub>in</sub>	Input voltage on any control pin (SLEEP, FS, ST)	-0.3 to V <sub>dd</sub> +0.3	V
T <sub>STG</sub>	Storage temperature range	-40 to +125	°C
S <sub>g</sub>	Acceleration <i>g</i> for 0.1 ms	10,000	g
ESD	Electrostatic discharge protection	2 (HBM)	kV

*Note:* Supply voltage on any pin should never exceed 4.8 V.



This is a mechanical shock sensitive device, improper handling can cause permanent damage to the part



This is an ESD sensitive device, improper handling can cause permanent damage to the part

## 2.4 Terminology

### 2.4.1 Sensitivity

An angular rate gyroscope is a device that produces a positive-going digital output for counter-clockwise rotation around the sensitive axis considered. Sensitivity describes the gain of the sensor and can be determined by applying a defined angular velocity to it. This value changes very little over temperature and time.

### 2.4.2 Zero-rate level

Zero-rate level describes the actual output signal if there is no angular rate present. Zero-rate level of precise MEMS sensors is, to some extent, a result of stress to the sensor and therefore zero-rate level can slightly change after mounting the sensor onto a printed circuit board or after exposing it to extensive mechanical stress.

### 2.4.3 Self-test (ST)

Self-test allows the testing of the mechanical and electric parts of the sensor, allowing the seismic mass to be moved by means of an electrostatic test-force. When the ST is activated by the IC, an actuation force is applied to the sensor, emulating a definite Coriolis force. In this case the sensor output will exhibit a change in the output. When ST is active, the device output is given by the algebraic sum of the signals produced by the velocity acting on the sensor and by the electrostatic test-force.

## 2.5 Sleep mode, self-test and power-down

The L3G3250A enables advanced power saving functionality thanks to the different operating modes available. When the device is set in the Sleep mode configuration, the reading chain is completely turned off, allowing lower power consumption. In this condition, the device turn-on time is significantly reduced permitting simpler external power cycling.

The user can select the desired operating mode through two dedicated pins.

**Table 6. Sleep mode, self-test and power-down mode configuration**

Operating mode	ST pin	Sleep pin
Normal mode	0	0
Power-down	0	1
Self-test	1	0
Sleep mode	1	1

## 2.6 Soldering information

The LGA package is compliant with the ECOPACK<sup>®</sup>, RoHS and “Green” standard. It is qualified for soldering heat resistance according to JEDEC J-STD-020.

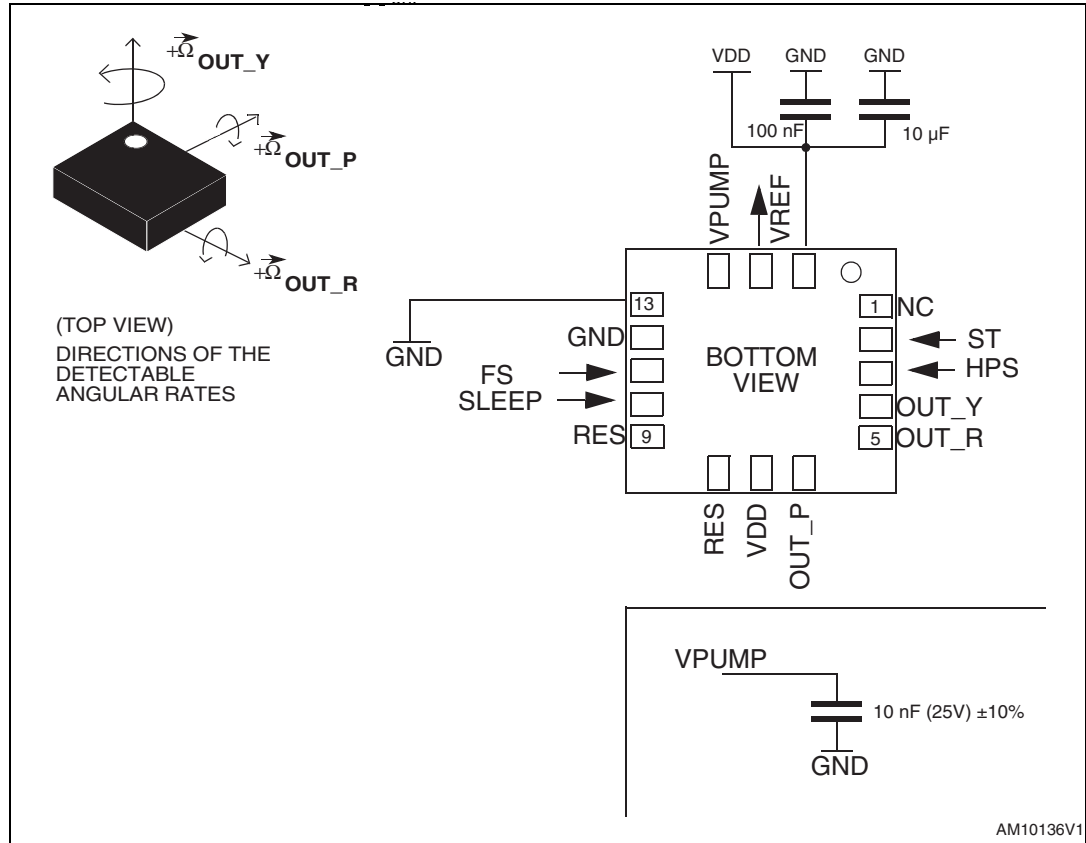
Leave “Pin 1 Indicator” unconnected during soldering.

Land pattern and soldering recommendations are available at [www.st.com/mems](http://www.st.com/mems).



### 3 Application hints

Figure 2. L3G3250A electrical connections and external component values



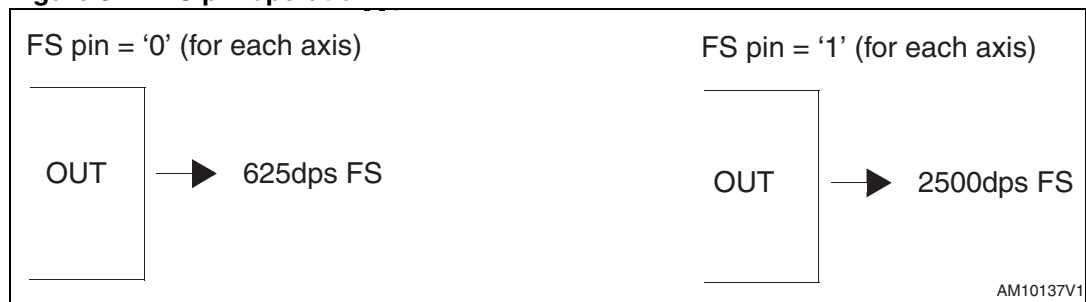
Note: The capacitor on pin 14 must guarantee a 1 nF value under 11 V bias condition.

Power supply decoupling capacitors (100 nF ceramic or polyester + 10 μF aluminum) should be placed as near as possible to the device (common design practice).

A 10 nF, 25 V class capacitor connected to pin 14 is required for proper operation of the device.

#### 3.1 Full scale (FS) pin operation

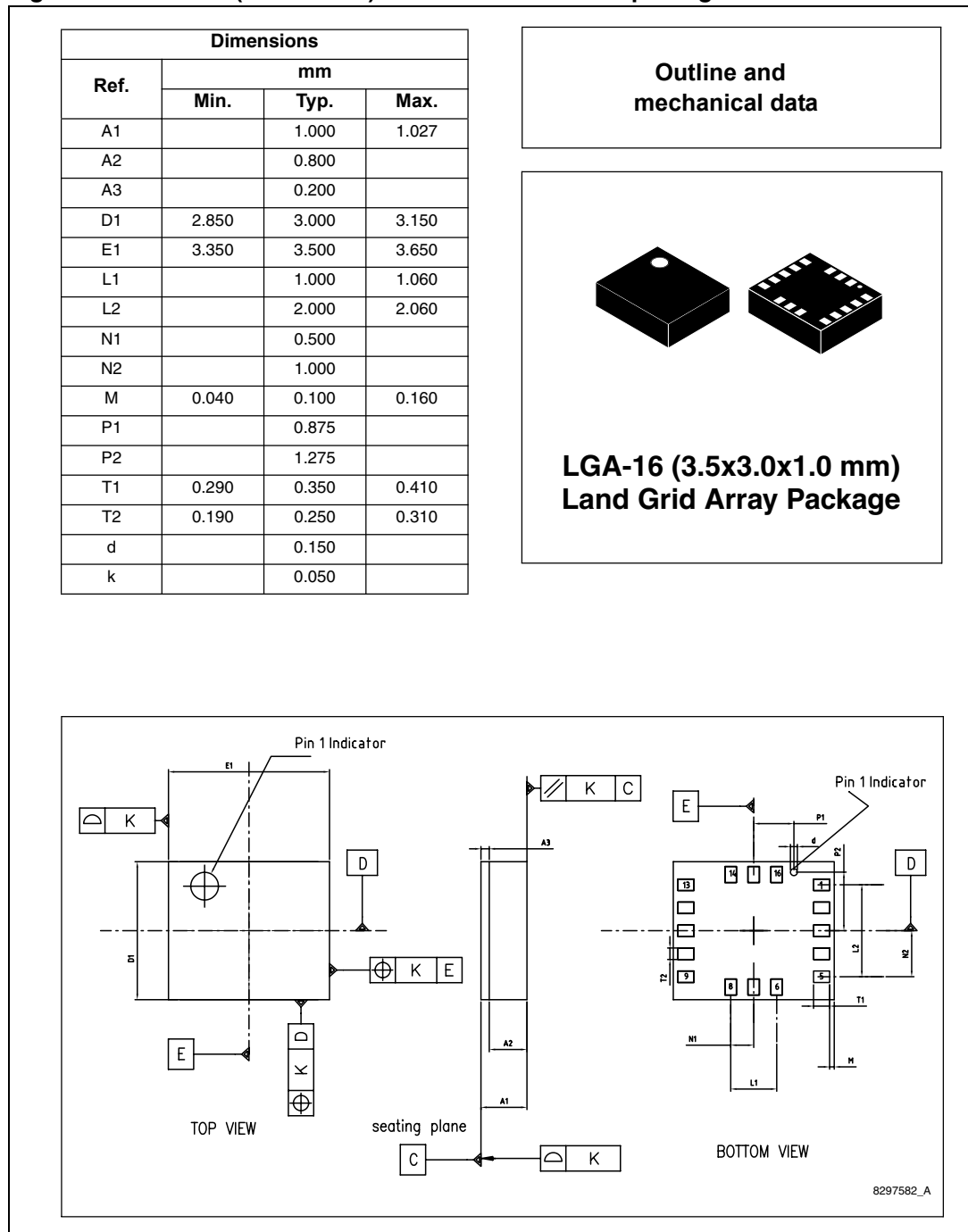
Figure 3. FS pin operation



# 4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

**Figure 4. LGA-16 (3.5x3.0x1.0): mechanical data and package dimensions**



## 5 Revision history

Table 7. Document revision history

Date	Revision	Changes
25-Aug-2011	1	Initial release.

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