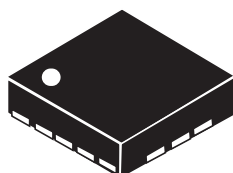


Automotive inertial module: 3D accelerometer and 3D gyroscope

Data brief



LGA-16L (3x3x1.1mm)

Features

- Analog supply voltage: 1.71 V to 3.6 V
- Independent IOs supply (1.71 V) and supply voltage compatible
- Power-down and sleep modes
- 3 independent acceleration channels and 3 angular rate channels
- $\pm 2/\pm 4/\pm 8/\pm 16$ g selectable full scale
- $\pm 125/\pm 245/\pm 500/\pm 1000/\pm 2000$ dps selectable full scale
- SPI/I²C serial interface
- Embedded temperature sensor
- 2 embedded FIFOs
- ECOPACK®, RoHS and “Green” compliant
- AEC-Q100 qualification

Applications

- GPS-assisted car navigation
- Telematics, eTolling
- Anti-theft systems
- Impact recognition and logging
- Motion-activated functions
- Vibration monitoring and compensation
- Appliances and robotics

Description

The ASM330LXH is a system-in-package featuring a 3D digital accelerometer and a 3D digital gyroscope. ST's family of MEMS sensor modules leverages the robust and mature manufacturing processes already used for the production of micromachined accelerometers and gyroscopes.

The various sensing elements are manufactured using specialized micromachining processes, while the IC interfaces are developed using CMOS technology that allows the design of a dedicated circuit which is trimmed to better match the characteristics of the sensing element.

The ASM330LXH has a user-selectable full-scale acceleration range of $\pm 2/\pm 4/\pm 8/\pm 16$ g and an angular rate range of $\pm 125/\pm 245/\pm 500/\pm 1000/\pm 2000$ dps. The ASM330LXH has two operating modes in that the accelerometer and gyroscope sensors can be either activated at the same ODR or the accelerometer can be enabled while the gyroscope is in power-down.

The ASM330LXH is available in a plastic land grid array (LGA) package.

Table 1. Device summary

Part number	Temp. range [°C]	Package	Packing
ASM330LXH	-40 to +85	LGA-16L (3x3x1.1mm)	Tray
ASM330LXHTR	-40 to +85		Tape and reel

1 Pin description

Figure 1. Pin connections

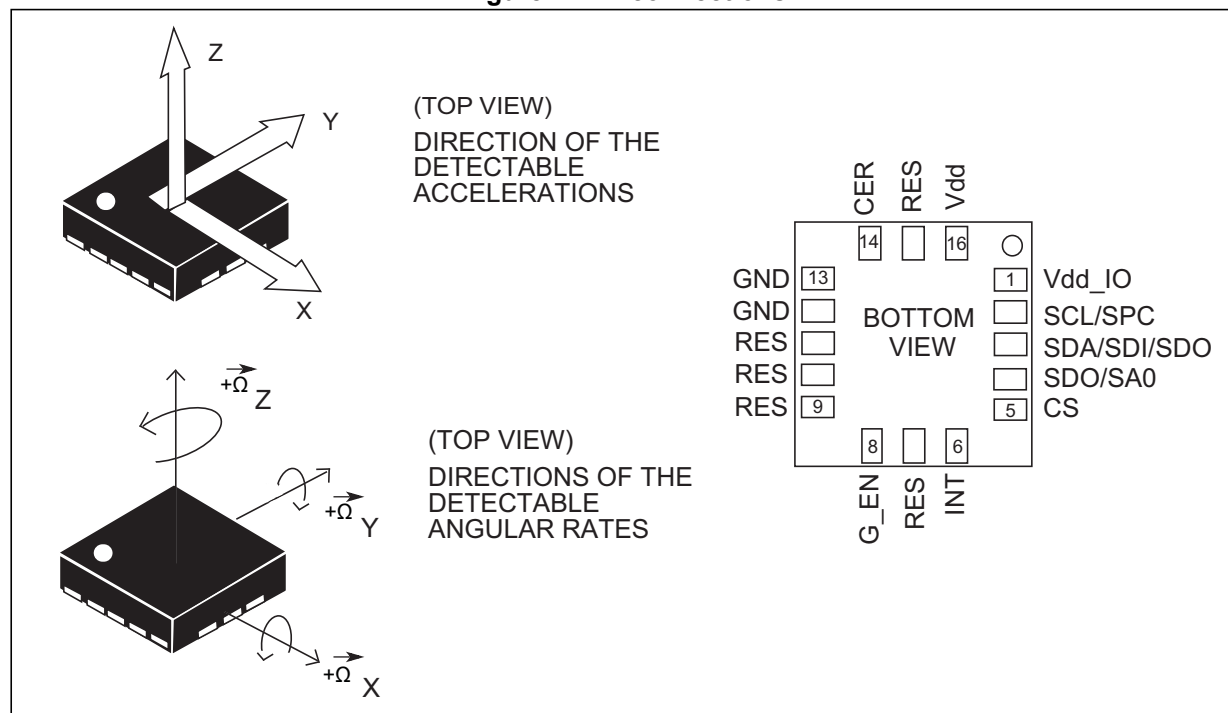


Table 2. Pin description

Pin#	Name	Function
1	Vdd_IO ⁽¹⁾	Power supply for I/O pins
2	SCL SPC	I ² C serial clock (SCL) SPI serial port clock (SPC)
3	SDA SDI SDO	I ² C serial data (SDA) SPI serial data input (SDI) 3-wire interface serial data output (SDO)
4	SDO SA0	SPI serial data output (SDO) I ² C least significant bit of the device address (SA0)
5	CS	I ² C/SPI mode selection (1: SPI idle mode / I ² C communication enabled; 0: SPI communication mode / I ² C disabled)
6	INT	Programmable interrupt
7	RES	Connect to GND
8	G_EN	Gyroscope data enable
9	RES	Connect to GND
10	RES	Connect to GND

Table 2. Pin description (continued)

Pin#	Name	Function
11	RES	Connect to Vdd or GND
12	GND	0 V supply
13	GND	0 V supply
14	CER	Connect to GND with ceramic capacitor ⁽²⁾
15	RES	Connect to Vdd or GND
16	Vdd ⁽³⁾	Power supply

1. Recommended 100 nF filter capacitor.

2. 10 nF ($\pm 10\%$), 16 V. 1 nF minimum value has to be guaranteed under 12 V bias condition.

3. Recommended 100 nF plus 10 μ F capacitors.

2 Module specifications

2.1 Mechanical characteristics

@ Vdd = 3.0 V, T = -40 °C to +85 °C unless otherwise noted ^(a)

Table 3. Mechanical characteristics

Symbol	Parameter	Test conditions	Min.	Typ. ⁽¹⁾	Max.	Unit
LA_FS	Linear acceleration measurement range			2 4 8 16		<i>g</i>
G_FS	Angular rate measurement range			125 245 500 1000 2000		dps
LA_So	Linear acceleration sensitivity	@LA_FS = 2 <i>g</i>		0.061		mg/LSb
		@LA_FS = 4 <i>g</i>		0.122		
		@LA_FS = 8 <i>g</i>		0.244		
		@LA_FS = 16 <i>g</i>		0.488		
G_So	Angular rate sensitivity	@G_FS = 125 dps		4.37		mdps/LSb
		@G_FS = 245 dps		8.75		
		@G_FS = 500 dps		17.5		
		@G_FS = 1000 dps		35		
		@G_FS = 2000 dps		70		
LA_SoDr	Linear acceleration sensitivity change vs. temperature	From -40°C to +85°C		0.01		%/°C
G_SoDr	Angular rate sensitivity change vs. temperature	From -40°C to +85°C		0.01		%/°C
LA_TyOff	Linear acceleration zero-g level accuracy ⁽²⁾⁽³⁾			30		mg
G_TyOff	Gyroscope zero-rate level accuracy ⁽²⁾⁽³⁾			10		dps
LA_TCOff	Linear acceleration zero-g level change vs. temperature	From -40 °C to +85 °C		0.05		mg/°C
G_TCOff	Angular rate zero-rate level change vs. temperature	From -40°C to +85°C		0.05		dps/°C
An	Acceleration noise density	LA_FS = 2 <i>g</i>		80		μg(√Hz)

a. The product is factory calibrated at 3.0 V. The operational power supply range is from 1.71 V to 3.6 V.

Table 3. Mechanical characteristics (continued)

Symbol	Parameter	Test conditions	Min.	Typ. ⁽¹⁾	Max.	Unit
Rn	Rate noise density			0.006		dps/($\sqrt{\text{Hz}}$)
ODR	Output data rate	Gyro OFF / ON		800 400 200 100 50 12.5		Hz
Top	Operating temperature range		-40		+85	°C

1. Typical specifications are not guaranteed.
2. Typical zero-g level offset / zero rate offset values after MSL3 preconditioning.
3. Offset can be eliminated by enabling the built-in high-pass filter.

2.2 Electrical characteristics

@ Vdd = 3.0 V, T = -40 °C to +85 °C unless otherwise noted

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ. ⁽¹⁾	Max.	Unit
Vdd ⁽²⁾	Supply voltage		1.71		3.6	V
Vdd_IO ⁽²⁾	Power supply for I/O		1.71		3.6	V
LA_Idd	Accelerometer current consumption in normal mode	ODR ≥ 100 Hz		245		μA
LA_Idd_LP	Accelerometer current consumption in low-power mode	ODR = 50 Hz		65		μA
		ODR = 100 Hz		115		
LA_G_Idd	Accelerometer and gyroscope current consumption in normal mode			4.3		mA
Idd_PD	Accelerometer and gyroscope current consumption in power-down			6		μA
Trise	Time for power supply rising		0.01		100	ms
Top	Operating temperature range		-40		+85	°C

1. Typical specifications are not guaranteed.

2. Vdd and Vdd_IO can power up in either order.

2.3 Temperature sensor characteristics

@ Vdd = 3.0 V, T = 25 °C unless otherwise noted ^(b)

Table 5. Temperature sensor characteristics

Symbol	Parameter	Test condition	Min.	Typ. ⁽¹⁾	Max.	Unit
TODR	Temperature refresh rate			50		Hz
TSen	Temperature sensitivity			16		LSB/°C
TST	Temperature stabilization time ⁽²⁾				500	μs
Top	Operating temperature range		-40		+85	°C

1. Typical specifications are not guaranteed.

2. Time from power on bit to valid temperature data based on characterization data.

b. The product is factory calibrated at 3.0 V.

2.4 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 6. Absolute maximum ratings

Symbol	Ratings	Maximum value	Unit
Vdd	Supply voltage	-0.3 to 4.8	V
T _{STG}	Storage temperature range	-40 to +125	°C
Sg	Acceleration <i>g</i> for 0.1 ms	10,000	<i>g</i>
ESD	Electrostatic discharge protection	2 (HBM)	kV
Vin	Input voltage on any control pin (including CS, SCL/SPC, SDA/SDI/SDO, SDO/SA0, G_EN)	0.3 to Vdd_IO +0.3	V

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



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



This device is sensitive to electrostatic discharge (ESD), improper handling can cause permanent damage to the part.

3 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. ECOPACK® is an ST trademark.

Figure 2. LGA-16 3x3x1.1 package outline

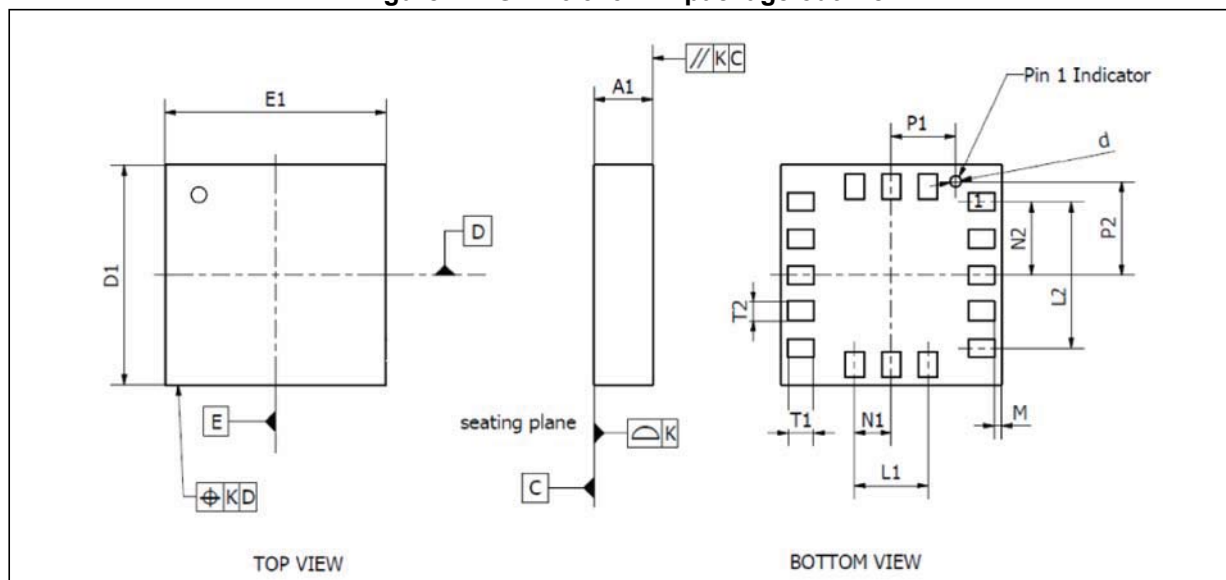


Table 7. LGA-16 3x3x1.1 mechanical data

Dim	mm		
	Min.	Typ.	Max.
A1			1.100
D1	2.900	3.000	3.100
E1	2.900	3.000	3.100
L1		1.000	
L2		2.000	
N1		0.500	
N2		1.000	
M		0.100	
P1		0.875	
P2		1.275	
T1		0.350	
T2		0.250	
d		0.150	
K		0.050	

4 Revision history

Table 8. Document revision history

Date	Revision	Changes
27-Oct-2014	1	Initial release

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