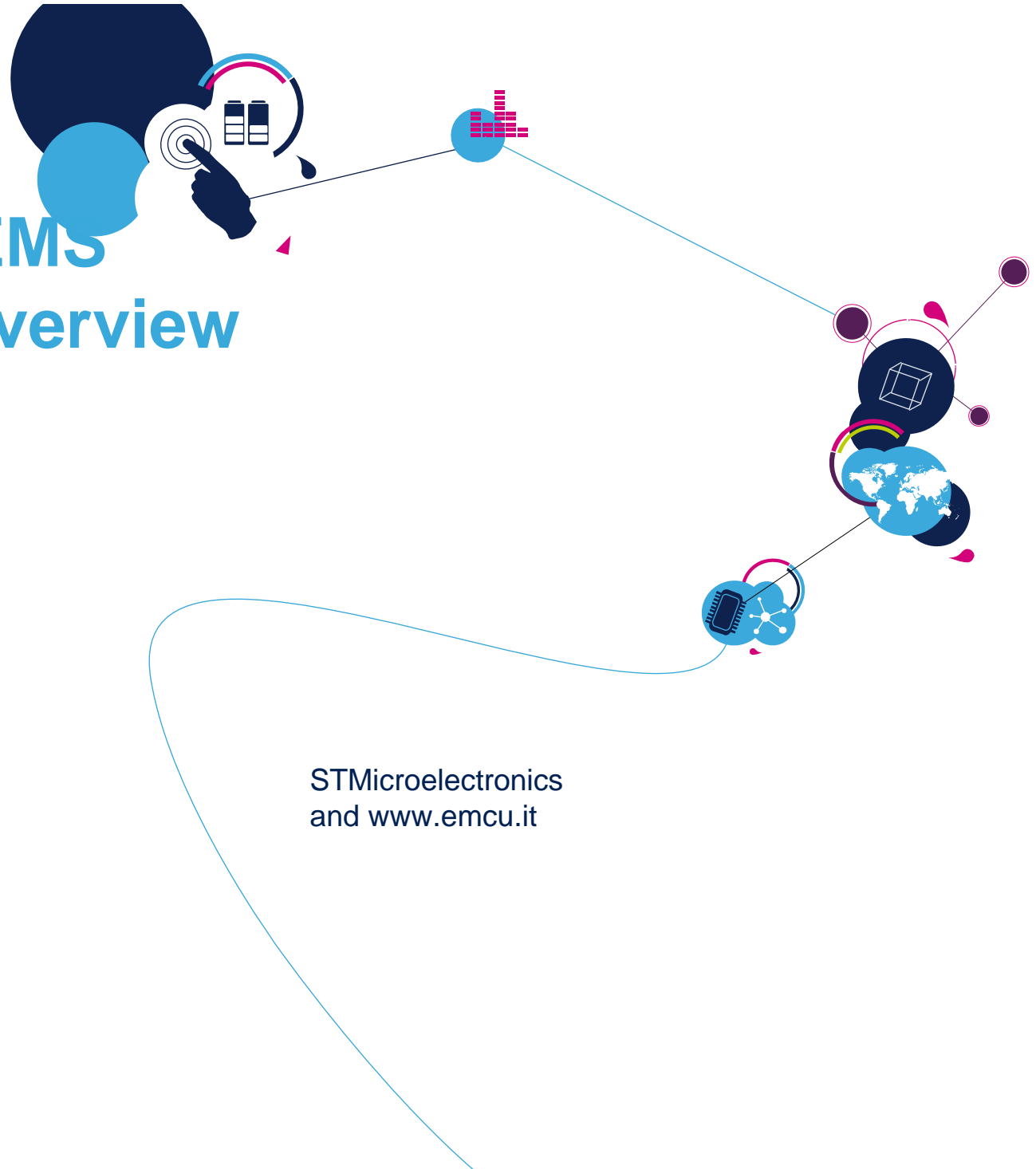# Motion MEMS
Product Overview
Feb. 2013
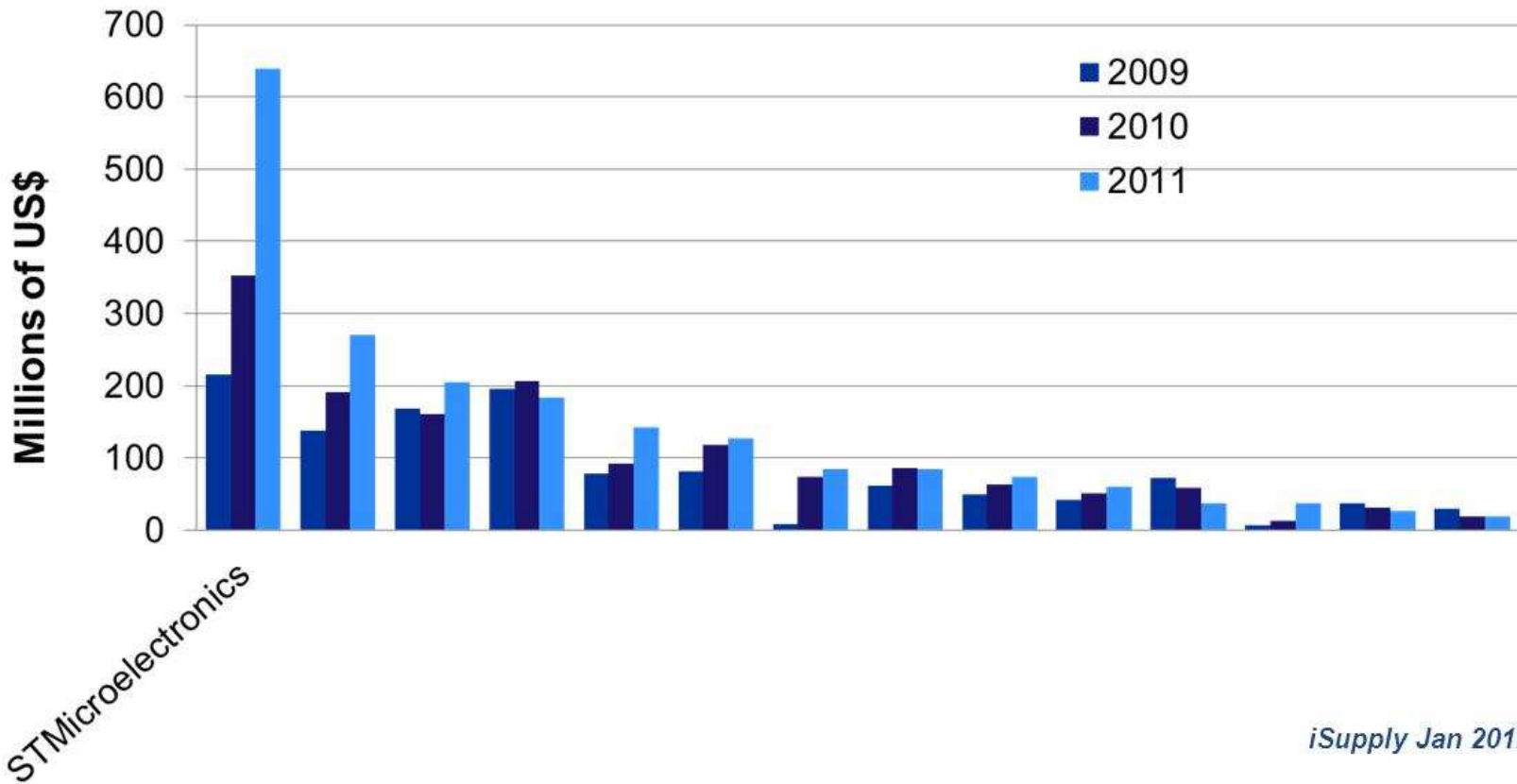
STMicroelectronics
and www.emcu.it

The MEMS wave moves forward

iNemo

Gyroscope

Accelero meter

Magneto meter
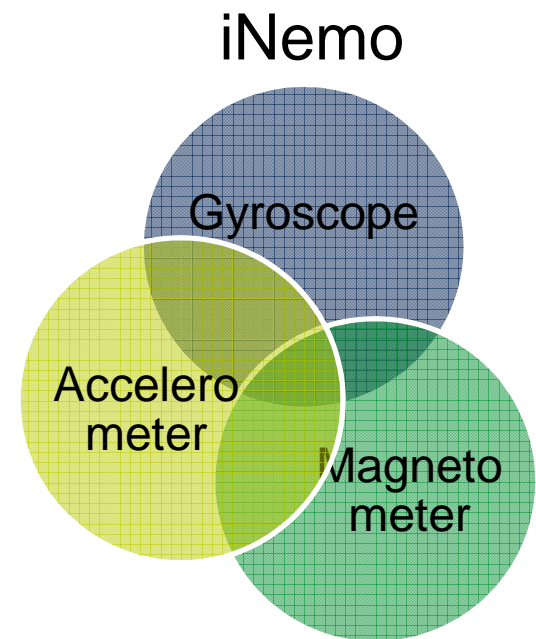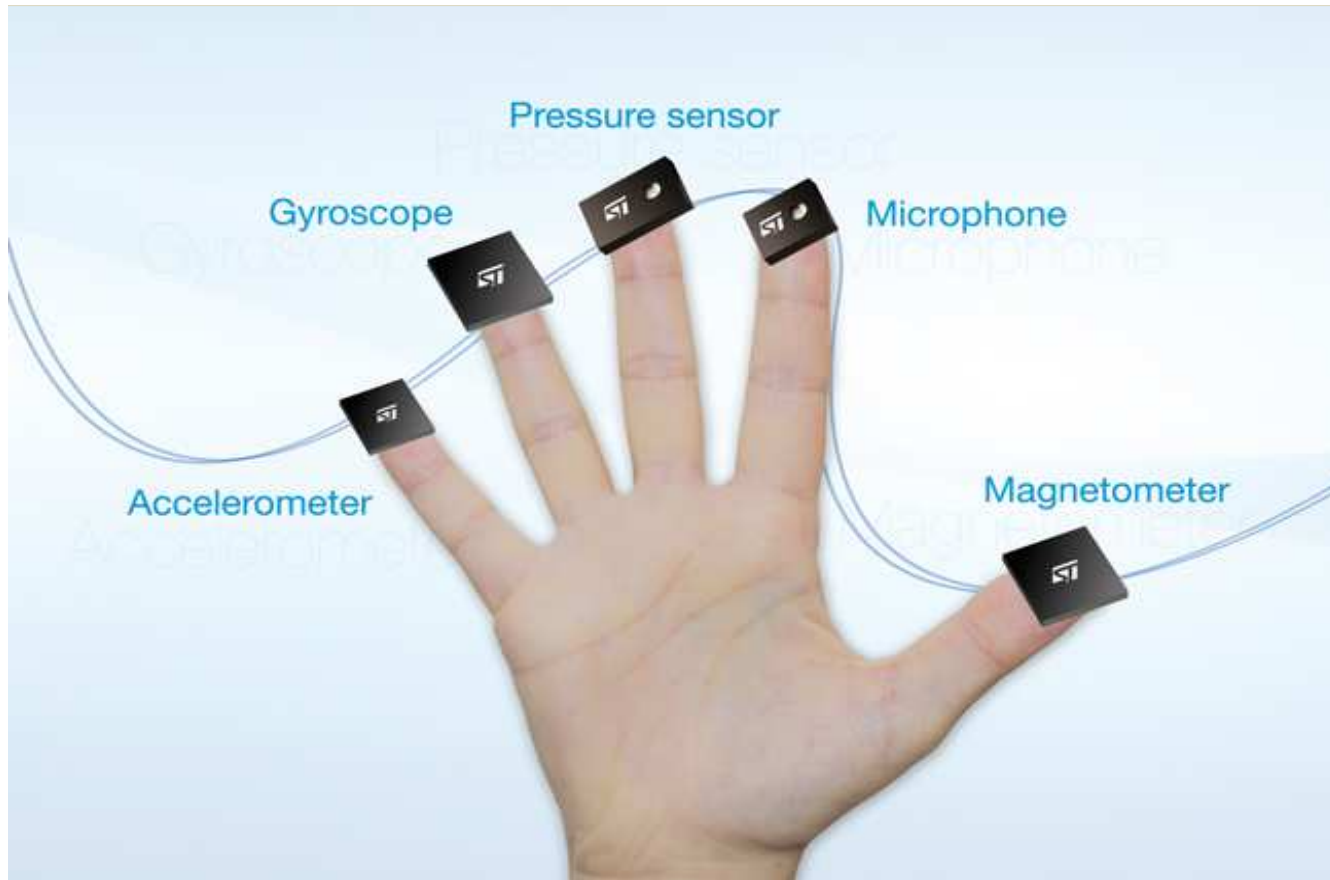
iSupply Jan 2012

ST #1 in MEMS Motion Sensors for consumer electronics and mobile handset market

Accelerometers (M$)	2006	2007	2008	2009	2010	2011	2012
STMicroelectronics	39%	54%	70%	44%	43%	48%	53%
	3%	3%	16%	27%	34%	27%	22%
	11%	9%	5%	6%	6%	9%	11%
	0%	1%	1%	12%	7%	7%	6%
	9%	3%	1%	6%	7%	7%	3%
	26%	23%	6%	5%	2%	2%	3%
	0%	0%	0%	0%	0%	0%	2%
	13%	9%	1%	0%	0%	0%	0%
	0%	0%	1%	1%	1%	0%	0%
Grand Total	100%	100%	100%	100%	100%	100%	100%

Gyroscopes (M$)	2006	2007	2008	2009	2010	2011	2012
STMicroelectronics	-	-	-	-	90%	81%	90%
	-	-	-	-	10%	19%	9%
	-	-	-	-	0%	0%	1%
Grand Total	100%	100%	100%	100%	100%	100%	100%

Source iSuppli (MEMS H2 2012 Special Report)

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Optical Image Stabilization

Location Based Services
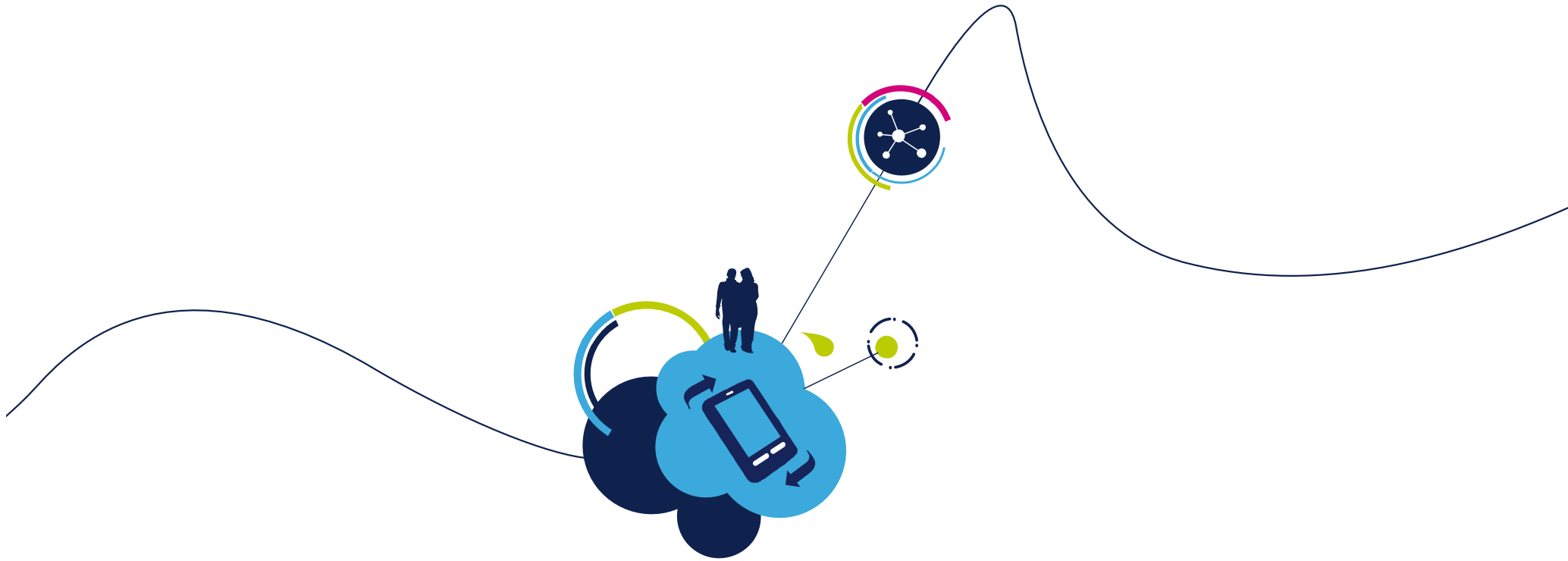
Indoor navigation

Advanced User Interface & Gaming

Augmented Reality

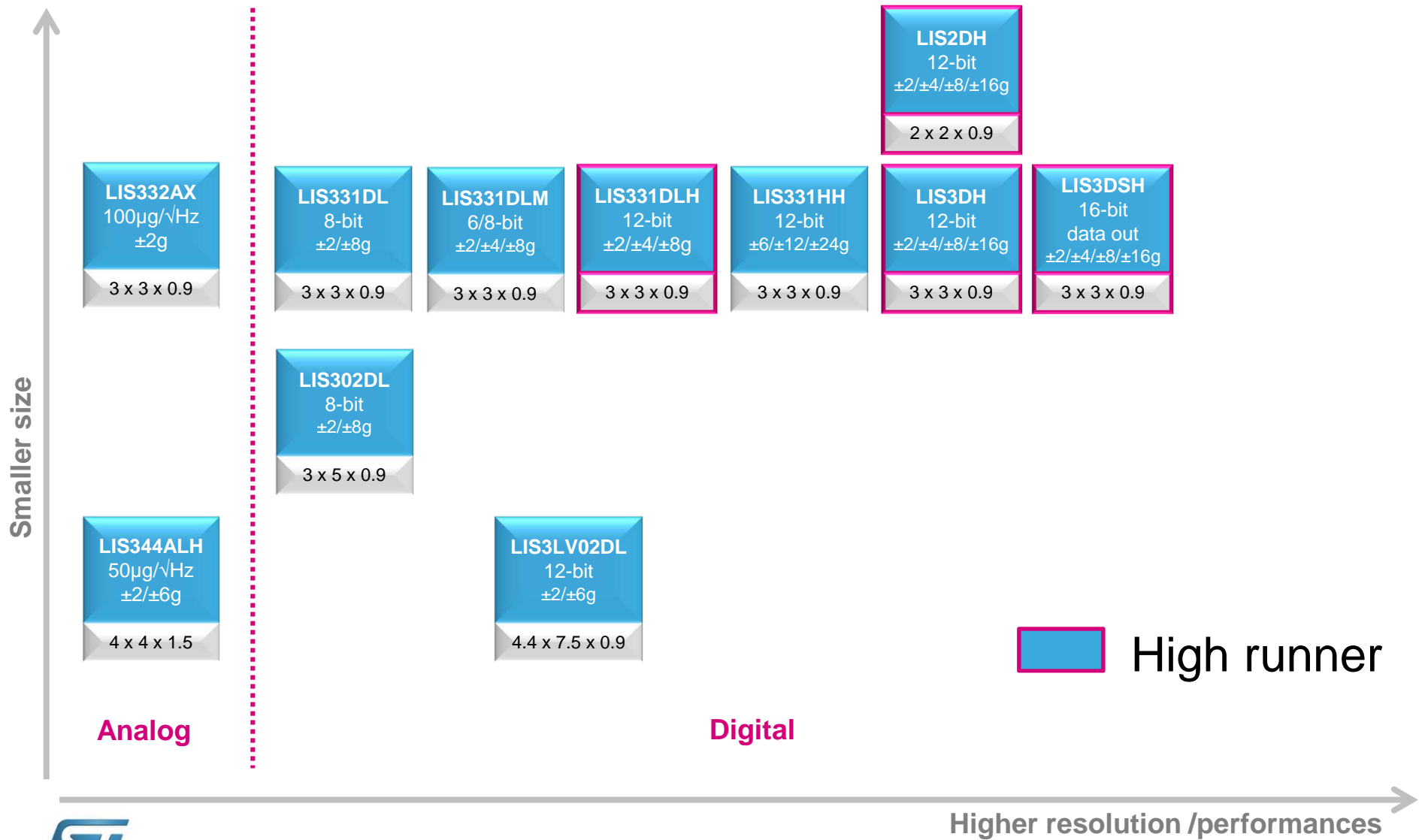Fitness/Wellness & In-House Tele-health

All trademarks and logos are the property of their respective owners. All rights reserved. They are used here only as conceptual examples
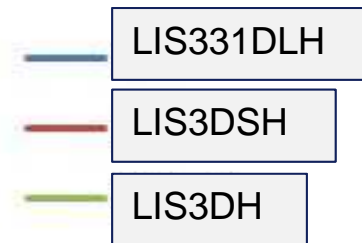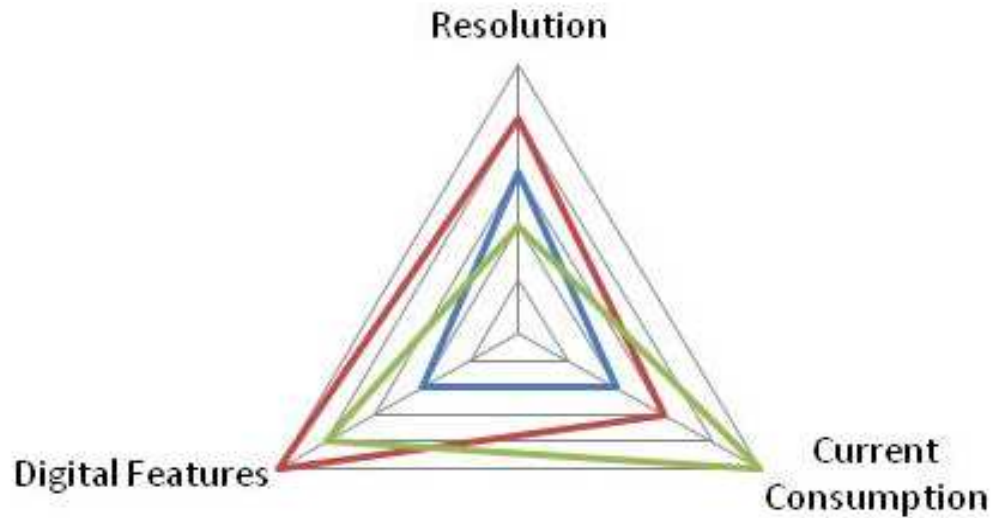
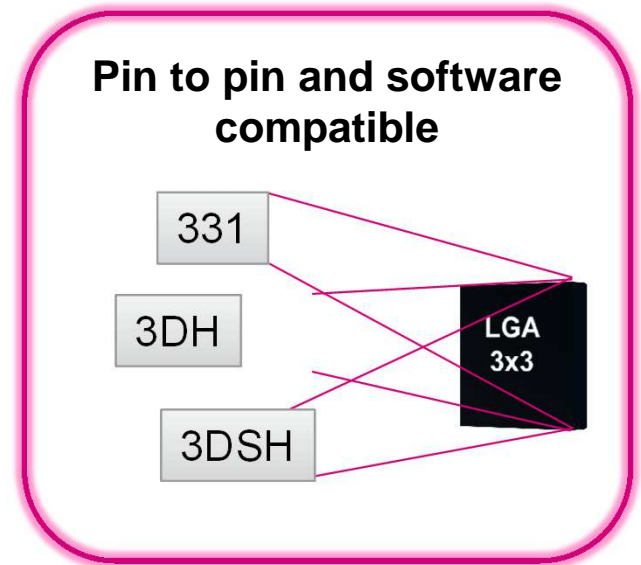# Accelerometers

3-axis Accelerometers Portfolio

Smaller size →

LIS2DH
12-bit
±2/±4/±8/±16g
2 x 2 x 0.9

LIS332AX
100µg/√Hz
±2g
3 x 3 x 0.9

LIS331DL
8-bit
±2/±8g
3 x 3 x 0.9

LIS331DLM
6/8-bit
±2/±4/±8g
3 x 3 x 0.9

LIS331DLH
12-bit
±2/±4/±8g
3 x 3 x 0.9

LIS331HH
12-bit
±6/±12/±24g
3 x 3 x 0.9

LIS3DH
12-bit
±2/±4/±8/±16g
3 x 3 x 0.9

LIS3DSH
16-bit
data out
±2/±4/±8/±16g
3 x 3 x 0.9

LIS302DL
8-bit
±2/±8g
3 x 5 x 0.9

LIS344ALH
50µg/√Hz
±2/±6g
4 x 4 x 1.5

LIS3LV02DL
12-bit
±2/±6g
4.4 x 7.5 x 0.9

High runner

Analog   **Digital**

Higher resolution /performances →

Resolution

Digital Features

Current Consumption

LIS331DLH
LIS3DSH
LIS3DH

LIS331DLH

LIS3DH

LIS3DSH

LIS2DH

Pin to pin and software compatible

331

3DH

3DSH

LGA 3x3

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High Performance Accelerometers
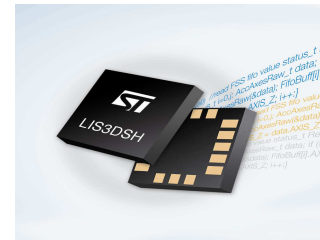
LIS331DLH

FEATURES

- User selectable from ±2g up to ±8g

- 16 bit data output

- Package - 3x3x1mm LGA

- 2 independent programmable
  interrupt generators for free-fall
  and motion detection

- Sleep to wake-up function

LIS3DSH

FEATURES

- User selectable form ±2g up to ±16g

- Embedded FIFO

- Embedded Finite State Machine

- 14-bit data resolution

- Package - 3x3x1mm LGA

- Higher performances – more functionalities
  integrated inside the sensor

- Complete customizable motion recognition
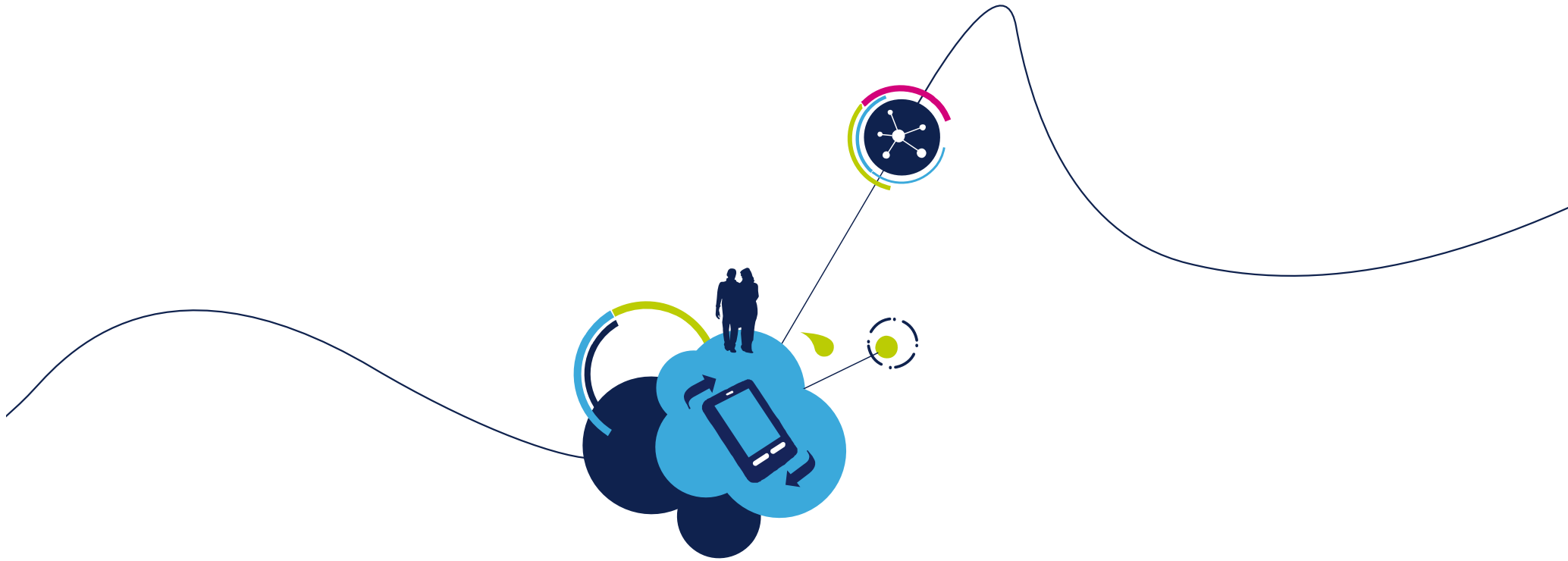
Ultra low-power Accelerometers

LIS3DH

FEATURES

- Selectable Full-scale from ±2g up to ±16g
- High resolution
- Ultra low power consumption
- 4D/6D orientation detection
- Programmable interrupts
- Embedded FIFO
- Power-down and Sleep mode
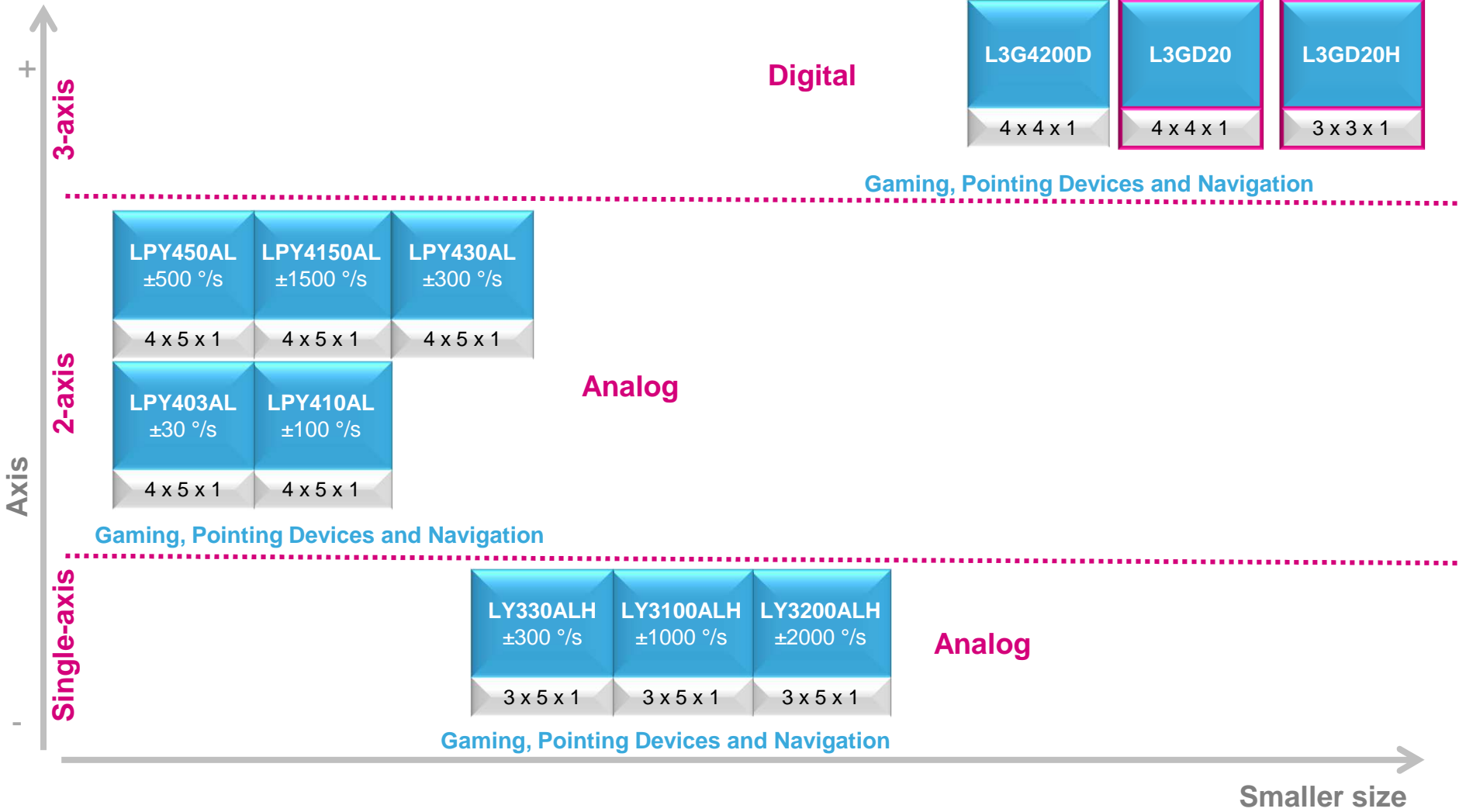- Digital Interfaces I2C/SPI
- Small Package 3x3x1mm LGA

LIS2DH

FEATURES

- Selectable Full-scale from ±2g up to ±16g
- High resolution
- Ultra low power consumption
- 4D/6D orientation detection
- Programmable interrupts
- Embedded FIFO
- Power-down and Sleep mode
- Digital Interfaces I2C/SPI
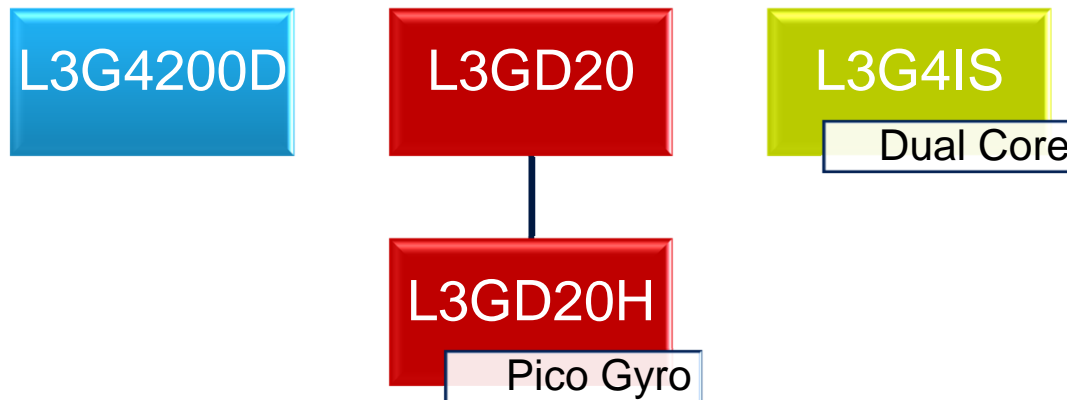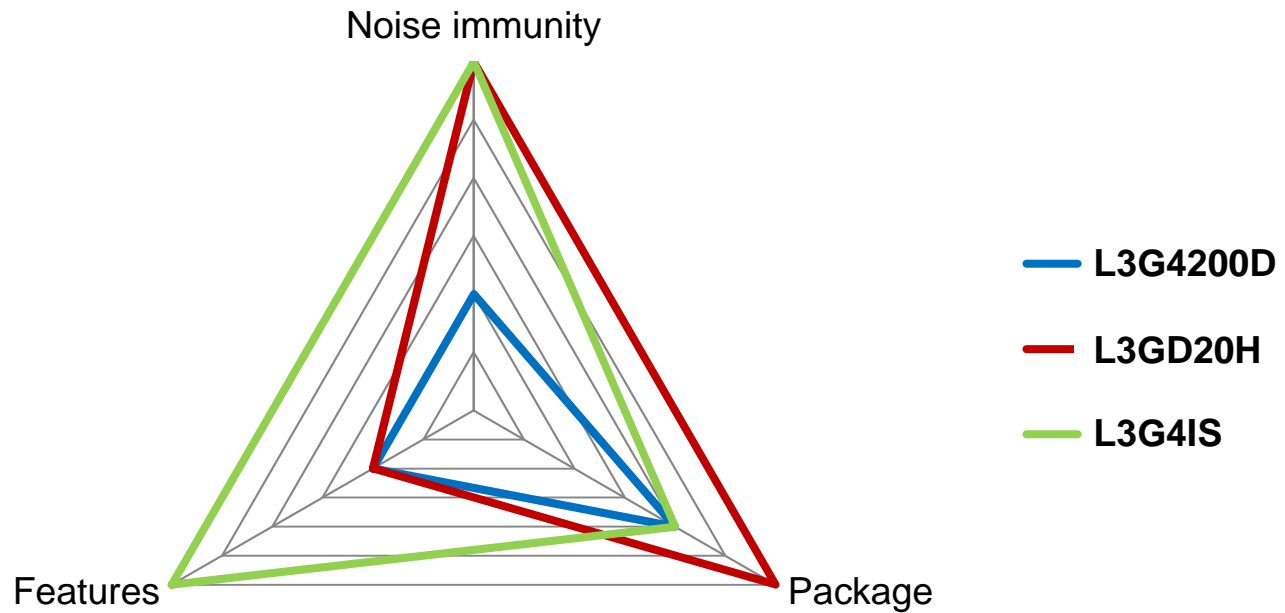- **Small Package 2x2x1mm LGA**

Gyroscopes

Gyroscopes Portfolio

Axis

+

3-axis

Digital

L3G4200D	L3GD20	L3GD20H
4 x 4 x 1	4 x 4 x 1	3 x 3 x 1

Gaming, Pointing Devices and Navigation

2-axis

LPY450AL ±500 °/s	LPY4150AL ±1500 °/s	LPY430AL ±300 °/s
4 x 5 x 1	4 x 5 x 1	4 x 5 x 1

LPY403AL ±30 °/s	LPY410AL ±100 °/s
4 x 5 x 1	4 x 5 x 1

Analog

Gaming, Pointing Devices and Navigation

Single-axis

LY330ALH ±300 °/s	LY3100ALH ±1000 °/s	LY3200ALH ±2000 °/s
3 x 5 x 1	3 x 5 x 1	3 x 5 x 1

Analog

Gaming, Pointing Devices and Navigation

-

Smaller size

High runner

Always the Right Tradeoff

Noise immunity

- L3G4200D
- L3GD20H
- L3G4IS

Features

Package

L3G4200D

L3GD20

L3G4IS

Dual Core

L3GD20H

Pico Gyro

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Gyroscopes

L3GD20

FEATURES

- Immunity to audio noise and mechanical vibrations
- Full-scale from ±250 dps3 up to ±2000 dps
- Digital interfaces I2C/SPI
- Embedded FIFO
- Programmable interrupts
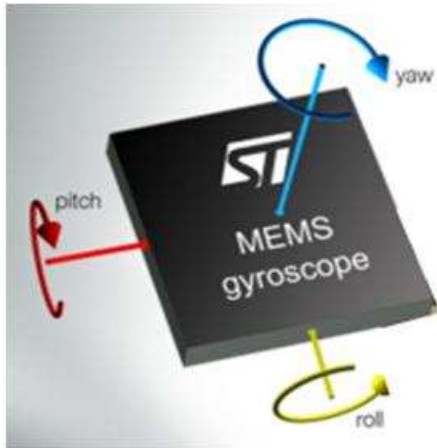- Power-down/sleep mode for smart power saving
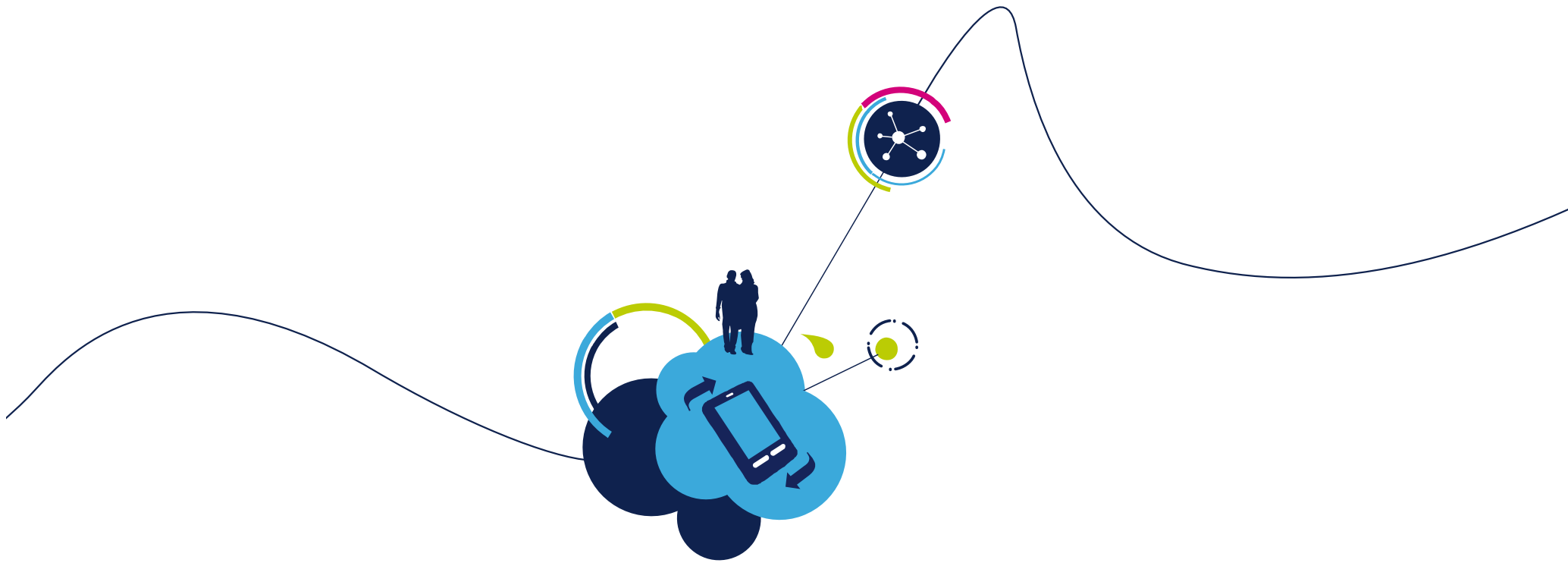- LGA package - 4x4x1mm

L3GD20H

FEATURES

- Immunity to audio noise and mechanical vibrations
- Full-scale from ±245 dps3 up to ±2000 dps
- Digital interfaces I2C/SPI
- Low power consumption
- Programmable interrupts
- Embedded FIFO
- Power-down/sleep mode for smart power saving
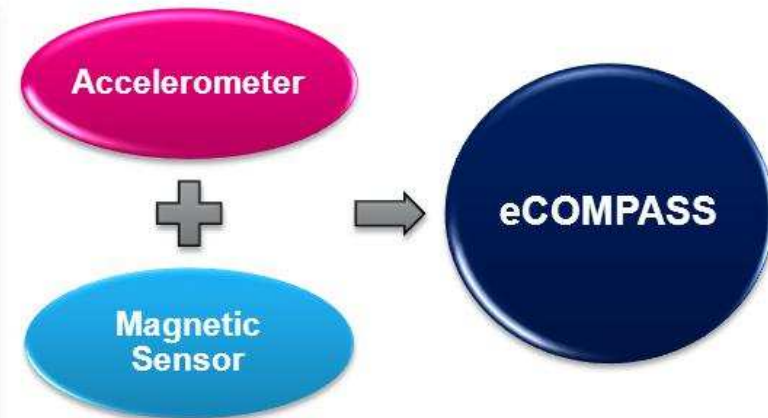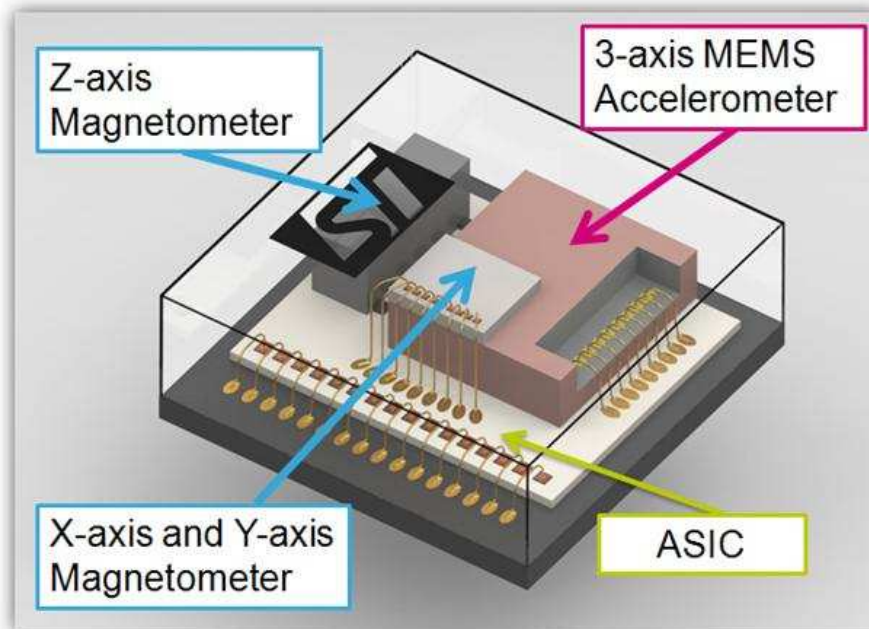- **LGA package - 3x3x1mm**

Gyroscope: L3GD20 vs. L3GD20H

L3GD20

L3GD20H

	L3GD20	L3GD20H
Mechanical frequency	Single driving frequency: 20 KHz	Single driving frequency: 20 KHz
Wide supply voltage	From 2.4V to 3.6V	From 2.2V to 3.6V
Turn-on time	250 msec	50 msec
Supply current	6.1 mA	5.0 mA
Rate noise density	0.03 dps/$\sqrt{Hz}$	0.011 dps/$\sqrt{Hz}$
Output Data Rate	105 / 208 / 420 / 840 Hz	12 / 24 / 48 / 96 / 190 / 380 / 758 Hz
Digital interfaces	SPI / I^2C	SPI / I^2C
Embedded FIFO	5 different modes	7 different modes
Package size	4x4x1 LGA-16	3x3x1 LGA-16

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Digital Compasses

eCompasses

- More compact, robust and easy-to-assemble solutions
- Superior stability over time and temperature
- Particularly suitable for applications such as location-based services, pedestrian dead reckoning, map/display orientation, and direction finding

Accelerometer

+

Magnetometer
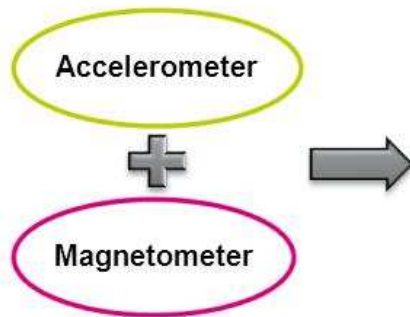
	LSM303DLHC	LSM303D
Accelerometer full-scale	±2g/±4g/±8g/±16g	±2g/±4g/±8g/±16g
Acceleration Noise density	220 µg	150 µg
Magnetic field full-scale	From ±1.3 to ±8.1 gauss	From ±2 to ±12 gauss
Magnetometer Sensitivity drift over temperature compensation	✓	✓
Magnetometer Offset bridge compensation	✓	✓
Two independent programmable interrupt generators	✓	✓
Digital interfaces	I^2C	SPI / I^2C
Embedded FIFO	✓	✓
Supply Voltage 2.16V to 3.6V	✓	✓
Package size	3x5x1 LGA-14	3x3x1 LGA-16
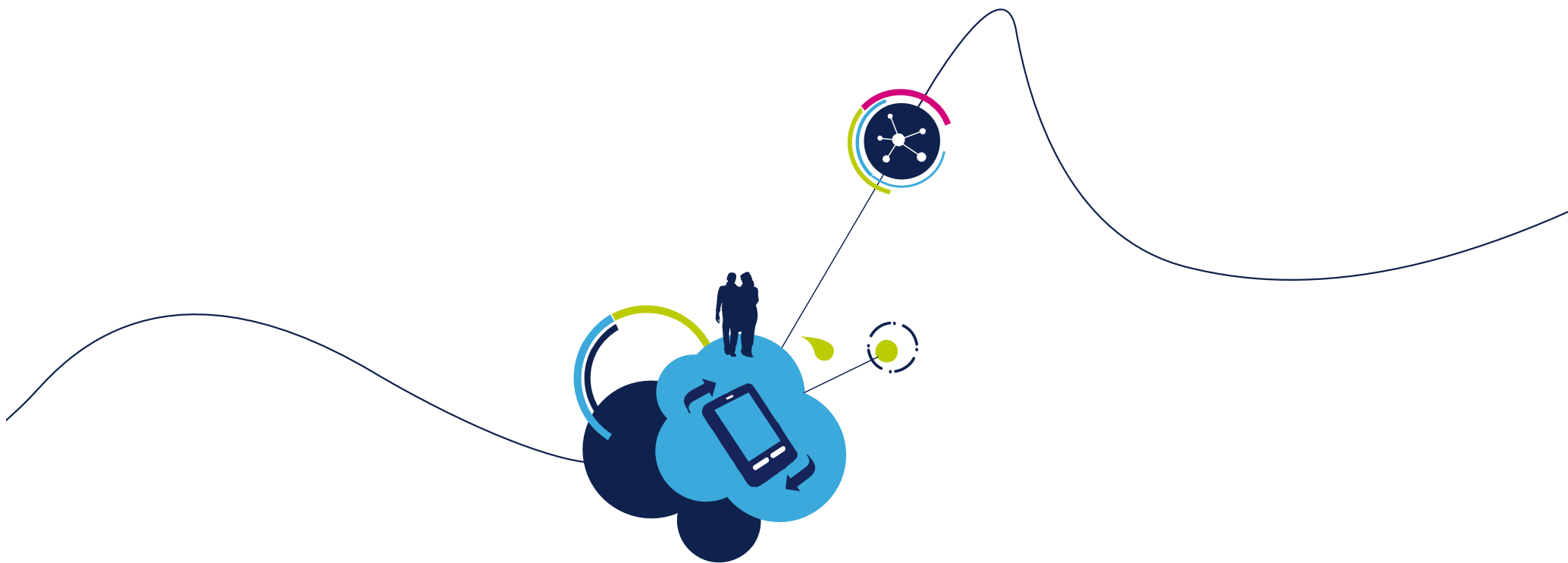
iNEMO® Inertial Modules

Accelerometer

Gyroscope

6-axis

LSM330DLC

LSM330D