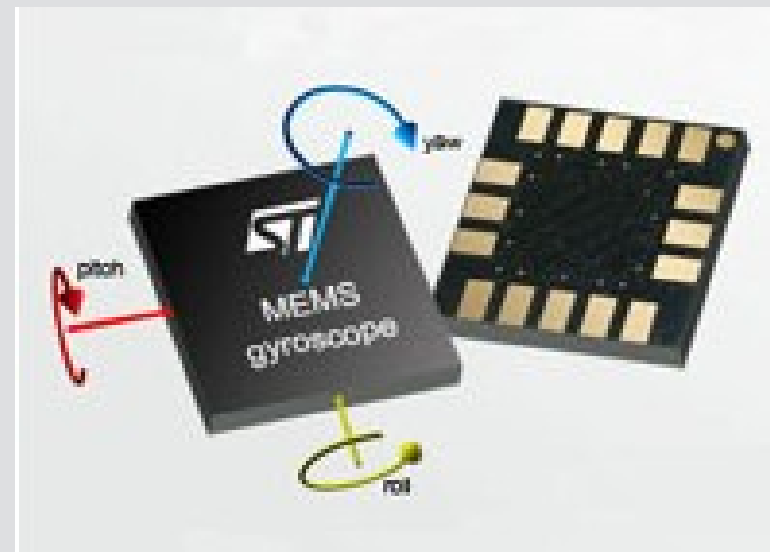
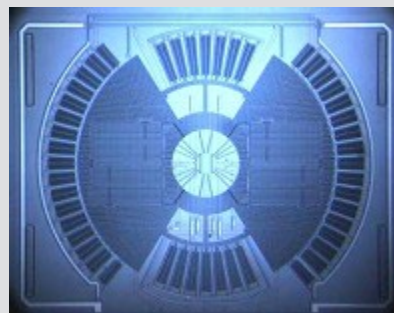
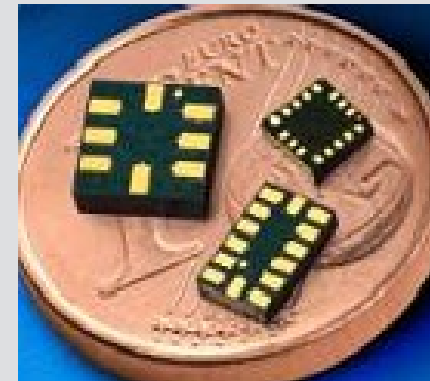


# STM MEMS

MKT pres.



# STM MEMS



[http://www.st.com/stonline/products/families/sensors/motion\\_sensors.htm](http://www.st.com/stonline/products/families/sensors/motion_sensors.htm)

## Motion Sensors (MEMS) Families

▶ Accelerometers

Product selector

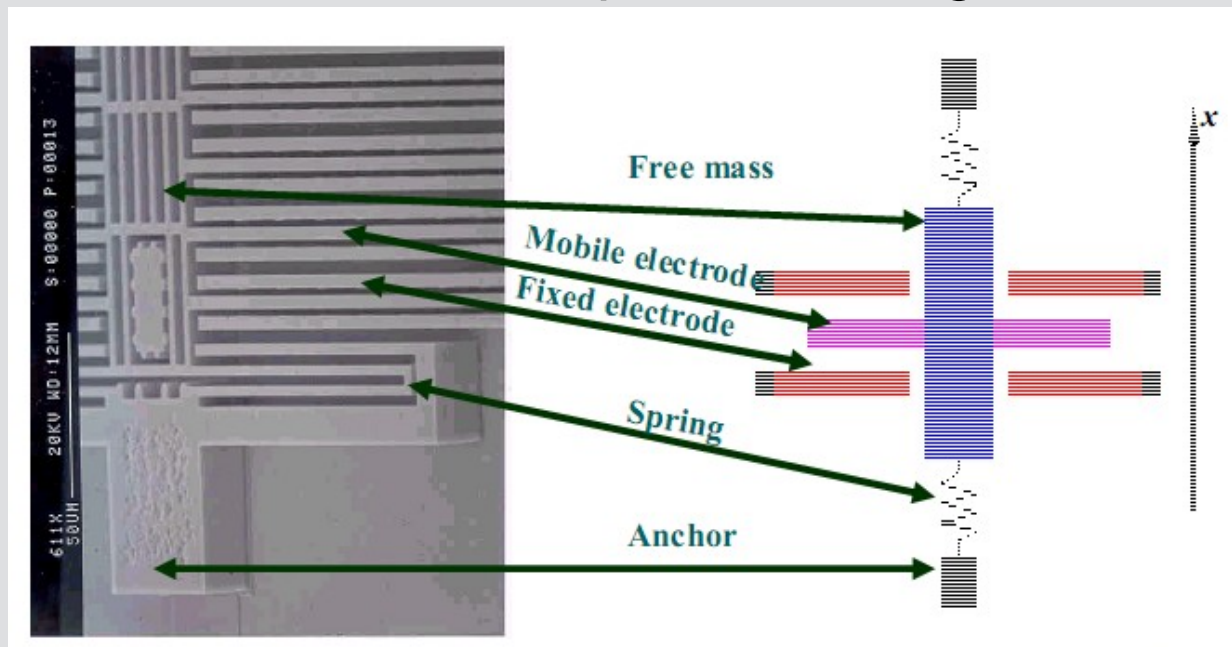
▶ Gyroscopes

Product selector

# STM MEMS 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.



# STM MEMS accelerometers



## Analog Accelerometers - Key features

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

# STM MEMS accelerometers



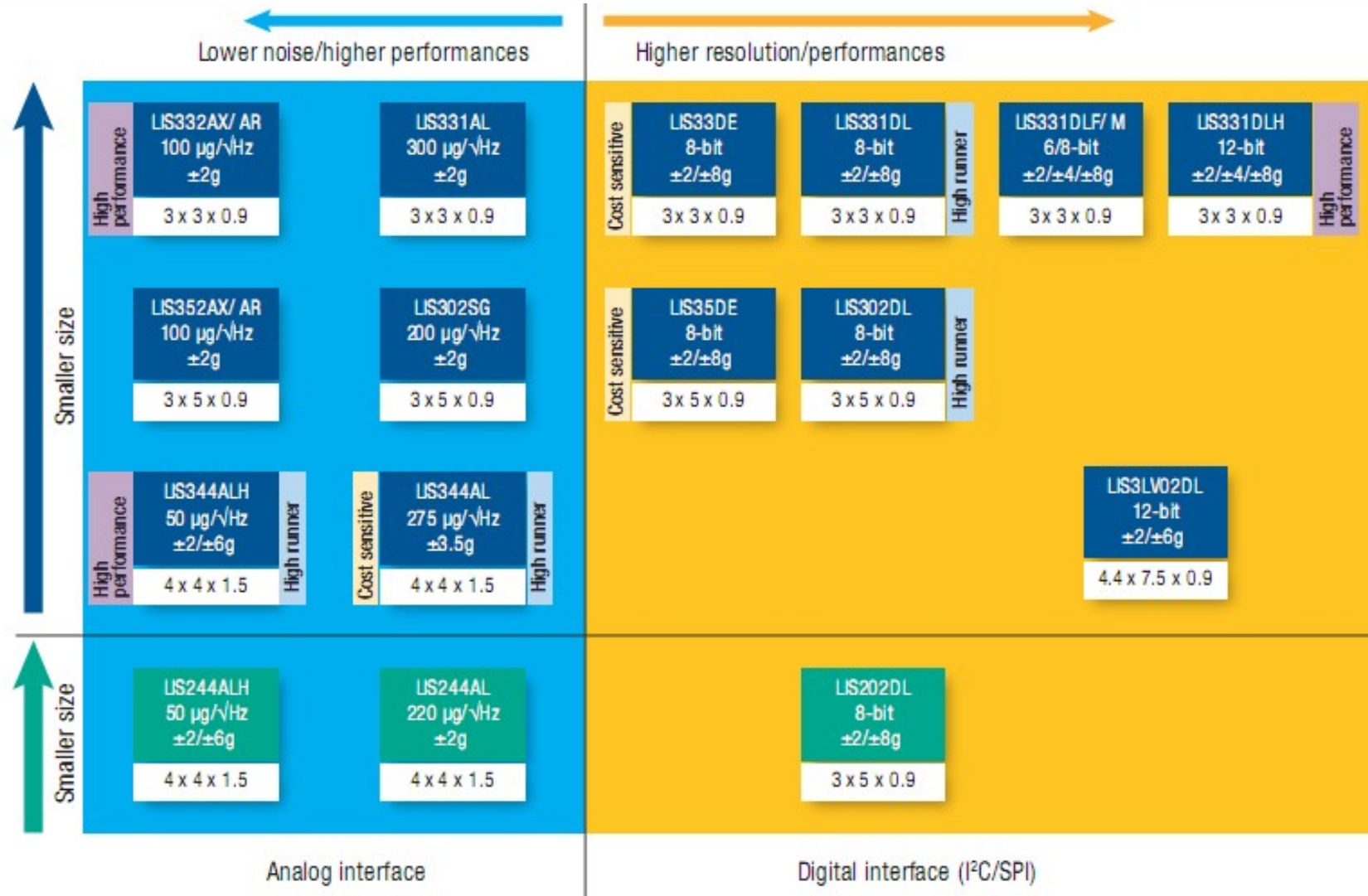
## Digital accelerometers

- Digital SPI, I<sup>2</sup>C interfaces - user selectable
- Selectable full scale:  $\pm 2\text{g}/\pm 4\text{g}/\pm 8\text{g}$
- $< 0.3\text{ mA}$  current consumption in normal mode
- $< 10\text{ }\mu\text{A}$  current consumption in low-power mode
- $< 1\text{ }\mu\text{A}$  current consumption in power-down mode
- Resolution better than  $1\text{ mg}$
  
- Ultra high stability over temperature:  $0.2\text{ mg}/^\circ\text{C}$
- Extended operating temperature range:  $-40\text{ }^\circ\text{C}$   $+85\text{ }^\circ\text{C}$
- Embedded self test
- High shock survivability:  $10,000\text{g}$  for  $0.1\text{ ms}$

## 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

# STM MEMS accelerometers



# STM MEMS accelerometers



## Product Evaluation Boards for Motion Sensors



**MEMS 3-Axis -  $\pm 2g/\pm 6g$  Digital Output Low Voltage Linear Accelerometer Evaluation Board based on LIS3LV02DQ**  
Order Code: **STEVAL-MKI004V1**  
Previous sales code: EK3LV02DQ



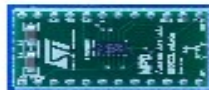
**MEMS 3-Axis -  $\pm 2g/\pm 6g$  Digital Output Low Power Linear Accelerometer Evaluation Board based on LIS3LV02DL**  
Order Code: **STEVAL-MKI005V1**  
Previous sales code: EK3LV02DL



**MEMS 3-Axis -  $\pm 2g/\pm 8g$  Digital Output Low Power Linear Accelerometer Evaluation Board based on LIS302DL**  
Order Code: **STEVAL-MKI006V1**  
Previous sales code: EK302DL



**LIS3LV02DL Adapter Board designed to be plugged into a standard DIL 20 socket**  
Order Code: **STEVAL-MKI009V1**



**LIS302DL Adapter Board designed to be plugged into a standard DIL 24 socket**  
Order Code: **STEVAL-MKI013V1**



**Adapter board for the LIS344ALH**  
Order Code: **STEVAL-MKI015V1**



**Demonstration kit for the LIS344AL**  
Order Code: **STEVAL-MKI016V1**



# STM MEMS multi-axis gyroscopes



## MEMS gyroscopes - some terms

### In plane axis (pitch / roll, x / y)

- Is the axis along the sensor package surface (roll /pitch)

### Out of plane axis (yaw, z)

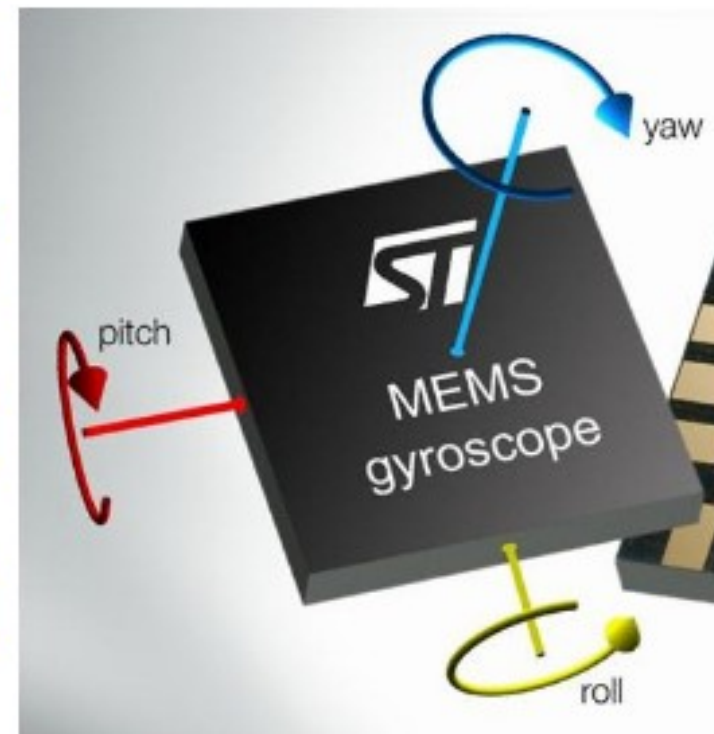
- Is the axis perpendicular to the sensor package surface (yaw)

### Zero rate level

- Sensor output (digital/analog) when no angular rate is applied

### Sensitivity (mV/dps<sup>(\*)</sup> – LSb/dps)

- Is the ratio between sensor output and angular rate applied (gain of the sensor)





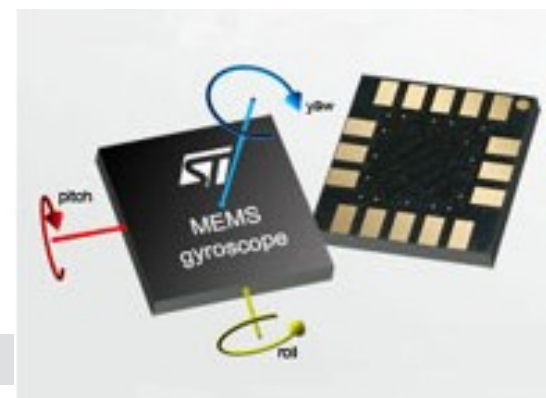
# STM MEMS multi-axis gyroscopes



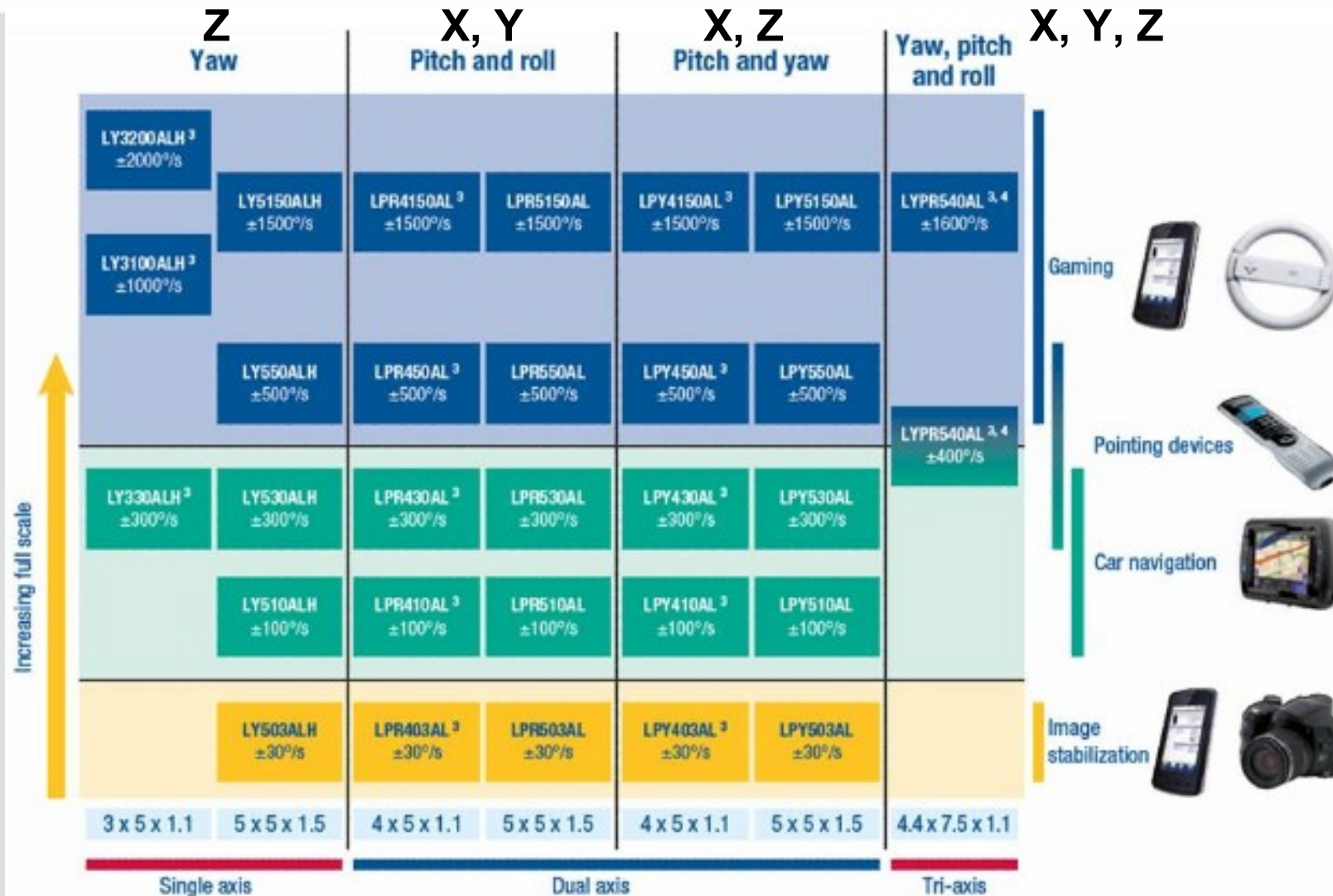
<http://www.st.com/stonline/products/families/sensors/gyroscopes.htm>

## Key features

- Single-axis (Yaw) / multi-axis (Pitch and Roll, Pitch and Yaw) gyroscope sensor family
- Complete range of full scale available (30°/s to 6000°/s)
- Ultra stability over temperature
- Low noise level (0.014°/s/√Hz)
- Amplified and not amplified outputs contemporarily available
- Extended power supply range (2.7 to 3.6 V)
- Power-down mode to ensure low current consumption for battery operated devices
- Absolute angular rate output
- Internal low pass filter
- Embedded self test
- High shock survivability



# STM MEMS portfolio

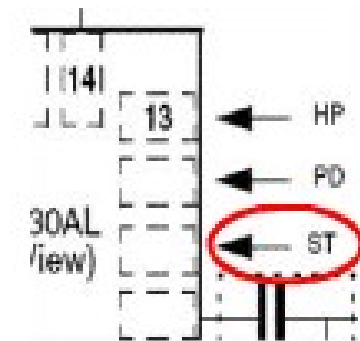


# STM MEMS



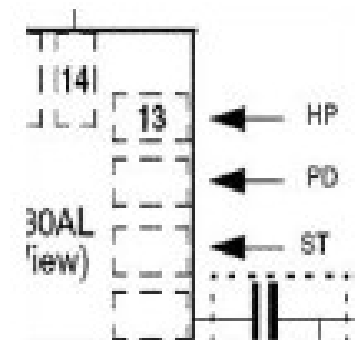
## Self test

The self test function can be activated using the pad ST. The mass is moved by means of an electrostatic force simulating an external angular rate acting on the sensor. If the output is within certain limits, the sensor can be considered as working correctly.



## Power down

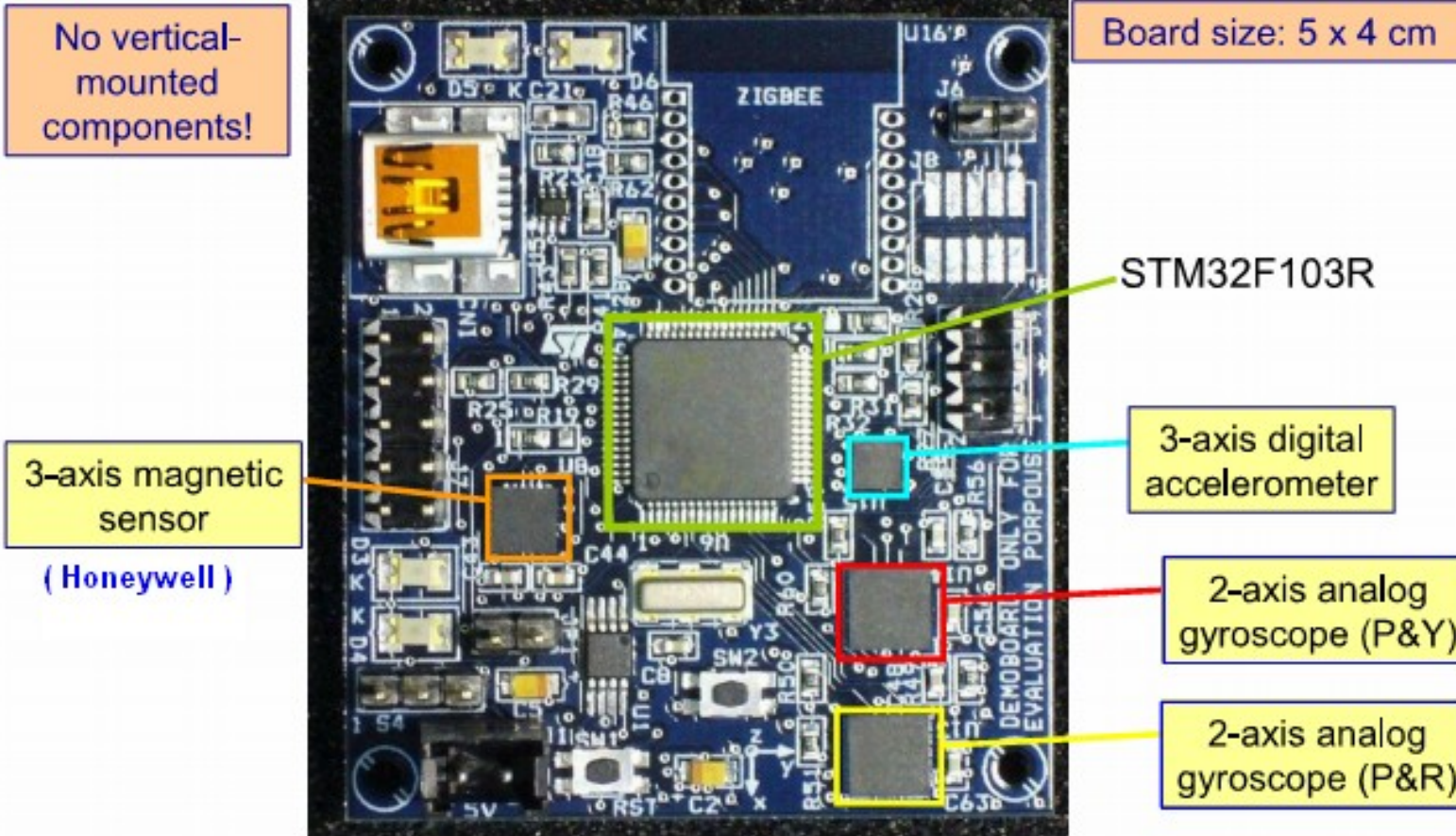
The device may be put into power-down mode using pad PD. While flash trimming values are kept loaded inside internal registers, all the internal circuitry is turned off, so significantly reducing power consumption (<5  $\mu$ A).



# STM MEMS

from  
Q1/10

## STEVAL-MKI062V1



No vertical-mounted components!

Board size: 5 x 4 cm

3-axis magnetic sensor  
(Honeywell)

STM32F103R

3-axis digital accelerometer

2-axis analog gyroscope (P&Y)

2-axis analog gyroscope (P&R)

\* LPS001DL pressure sensor on the bottom layer

# STM MEMS LINK



- <http://www.st.com/stonline/products/families/sensors/gyroscopes.htm>
- [http://www.st.com/stonline/domains/support/presentations/memsgyroscopes/gyros.htm?wt.mc\\_id=enews\\_oct09\\_gyro-present](http://www.st.com/stonline/domains/support/presentations/memsgyroscopes/gyros.htm?wt.mc_id=enews_oct09_gyro-present)
- **Extra info**  
<http://emcu.altervista.org/>