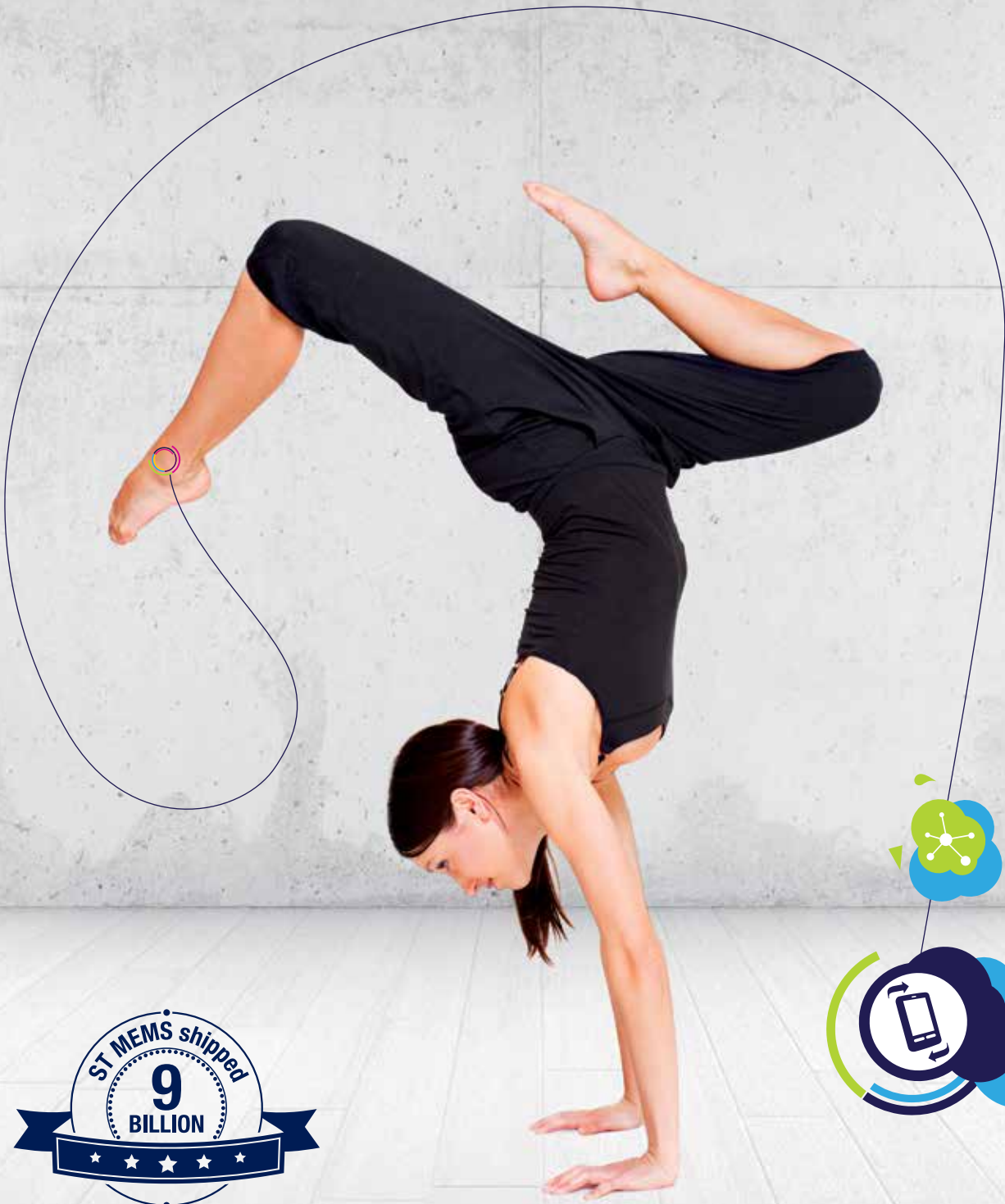




life.augmented

MEMS and Sensors

Smart solutions for IoT and enhanced user experience





Content

The one-stop MEMS supplier	3
Sensors in your hand.....	4
Sensors in your training.....	5
Sensors in your home	6
Sensors in your car	7
Sensors at work	8
Sensors in health care	9
Accelerometers	10
Gyroscopes.....	12
Digital compasses	14
iNEMO inertial modules	15
Environmental sensors	17
Design support	19
Technical support	21





The one-stop MEMS supplier



For your MEMS needs, ST provides a complete solution

ST has shipped more than 9 billion micro-electromechanical sensors and has one of the industry's most extensive MEMS portfolio including accelerometers, gyroscopes, digital compasses, inertial modules, MEMS microphones, and environmental sensors including pressure, temperature and humidity sensors.

- A unique sensor portfolio, from discrete to fully-integrated solutions, to meet all design needs
- High-volume manufacturing capacity to provide cost-competitive solutions, fast time-to-market and security of supply
- High-performance sensor fusion to improve the accuracy of multi-axis sensor systems in order to enable new emerging and highly-demanding applications, such as indoor navigation and location-based services
- High-quality products, already tested in different application fields, including mobile, portable, gaming, consumer, automotive and health care segments
- Multiple sites dedicated to MEMS, with full in-house dual sourcing, guaranteeing 100% security of supply

COMPLETE SOLUTION

- Large sensor portfolio
- Integrated HW + SW solutions
- 100% security of supply
- Scalability of solutions
- Quality is a must for ST
- ST is MEMS market leader

ST's leadership continues with a strong commitment to Sustainable Technology, delivering motion MEMS products with decreasing environmental impact, generation after generation, providing improved life quality by bringing environmental and social benefits to end users.



**SUSTAINABLE
TECHNOLOGY**



Sensors in your hand

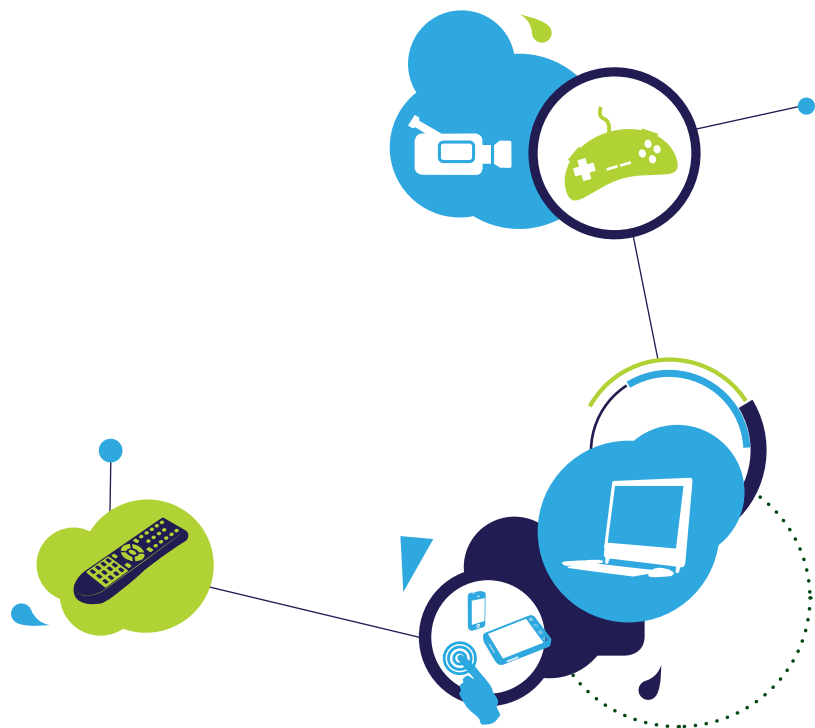


All portable devices become easy-to-use and fun

4

CONSUMER APPLIANCES

- Smartphones and tablets (AXL, GYRO, MAG, PS, RH*)
 - Motion tracking for gesture-based user interfaces
 - Electronic compasses
 - Location-based services
 - Heading and navigation
 - Relative humidity sensing
- Gaming devices (AXL, GYRO, MAG)
 - Accurate detection of orientation and angular rate
- Remote control (AXL, GYRO, MAG)
 - Gesture recognition and pointing (3D mouse)
- Notebooks and ultrabooks (AXL, GYRO, MAG, TS)
 - Sensor hub
 - Hard-disk protection
 - Lid closure
 - Orientation
- Cameras (DSC/DVD) (AXL, GYRO)
 - OIS and user interfaces



*
AXL: accelerometer
GYRO: gyroscope
MAG: magnetometer
PS: pressure sensor
TS: temperature sensor
RH: humidity sensor



Sensors in your training



Sensors for improving your fitness workout

FITNESS AND WELLNESS APPLICATIONS

- Athlete performance monitoring
 - Movement recognition through shoes and wearable sensors (AXL, GYRO)
 - Golf and tennis swing detection (AXL, GYRO, MAG)
 - Body tracking recognition (AXL, GYRO, MAG)
- Watches, personal navigation devices (PND) and pedometers (AXL, GYRO, MAG, PS)
 - Map orientation
 - Heading and navigation
 - Power-saving using auto-wake-up functionality
 - Taps (display activation)
- Treadmills and barbells (AXL)
 - Tilting angle and shock detection during steps





Sensors in your home



Devices offer enhanced user interfaces helping to decrease energy consumption

6

HOME APPLIANCES

- Home alarm systems and car garages (AXL)
 - Vibration and shock detection
 - Detection of door open/close position
- White goods (AXL, GYRO, PS, RH, TS)
 - Control of basket rotation (washing machines)
 - Power consumption optimization
 - Vibration detection for noise reduction and maintenance
 - Detection of door open/close position
 - Fluid column pressure measurement
- Smart home automation control (TS, RH)
 - Heating, ventilation and air conditioning (HVAC)
 - Relative humidity level monitoring and weather stations
 - Incubators, refrigerator crispers and storage
 - Respiratory equipment/humidifiers
- Electric, gas/water meters (AXL)
 - Tilting, vibration and shock detection
 - Anti-tamper mechanisms
- Home environment monitoring (TS, RH)
 - Ambient temperature and relative humidity monitoring





Sensors in your car



For safer cars and easier navigation

AUTOMOTIVE

- Telematics
 - E-Calls (AXL)
 - Black boxes and crash detection (AXL)
 - Fleet tracking (AXL, GYRO)
 - Driver's behavior tracking (AXL, GYRO)
 - Key fobs (AXL)
- Security
 - Car alarms and anti-theft systems (AXL)
 - Tilt detection (AXL)
- Navigation
 - 3D navigation (AXL, GYRO, PS)
 - Dead reckoning (AXL, GYRO, PS)
- Safety
 - SRS with rollover detection (AXL, GYRO, PS)
 - Hill-start assist, head safety light leveling and braking assistance (AXL)
 - Vehicle dynamics, stability control (AXL, GYRO)
 - Electronic suspensions (AXL, GYRO)
 - Tire pressure monitoring systems (AXL, PS)
 - Smart tires (AXL, PS)





Sensors at work



For industrial applications

8

INDUSTRIAL

- Robotics and automation (AXL, GYRO)
 - inertial navigation and wheel encoder position accuracy
 - Self-balancing robots
- Condition monitoring of transportation and industrial equipment (high-g AXL, RH, TS)
 - Vibration and rotational speed monitoring
- Asset and parcel tracking and monitoring (High-g AXL, GYRO, TS)
 - Shock detection and logging
- Building and structure monitoring (AXL)
 - Vibration and tilt monitoring
- Seismic exploration and geophones (AXL)
 - Vibration monitoring
- Drills (AXL, GYRO)
 - Safety and chuck rotation monitoring
 - Tilt detection





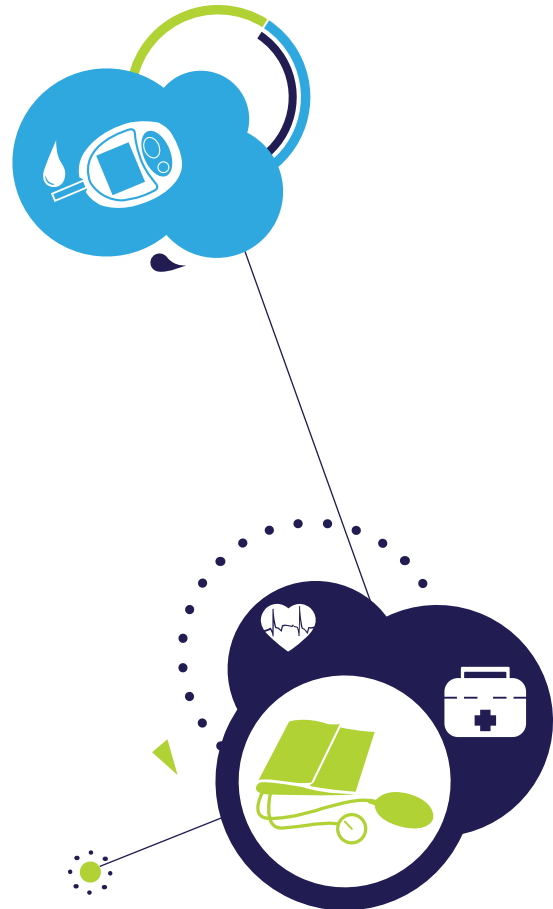
Sensors in health care



For advanced medical applications

MEDICAL

- Implantable medical devices (AXL)
 - Pacemakers, defibrillators and neuro-stimulators
- Concussion detection in sports (high g AXL)
 - Helmets, patches and mouth guards
- Motion detection and body motion reconstruction (AXL, GYRO, MAG, PS)
 - Man-down and personal emergency response systems (PERS)
 - Rehabilitation and training
 - Improved straight line motion and tilt detection for safety
- Instrument guidance in surgery (AXL, GYRO)
- Healthcare mobility aids including wheelchairs and scooters (AXL, GYRO, PS)





Accelerometers



Smart motion features with ultra-low power consumption

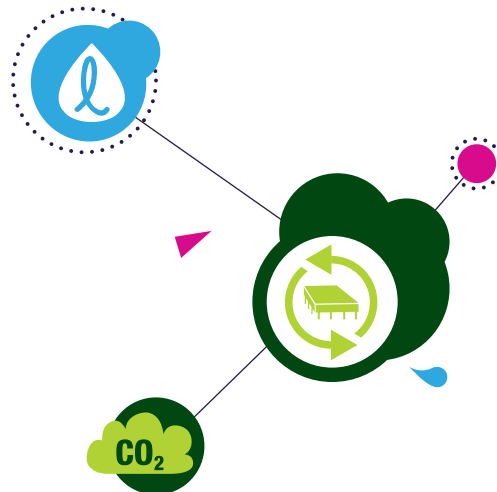
ST's state-of-the-art MEMS accelerometers include analog and digital sensors featuring up to $\pm 400g$ acceleration full scale and from 1.71 to 3.6 V supply voltage. Accelerometers have advanced power-saving features that make them suitable for ultra-low-power applications. These features include low-power mode, auto wake-up function and a FIFO buffer that can be used to store data, thus reducing the host processor loading and system power consumption.

The small size and embedded features of ST's accelerometers make them an ideal choice for handheld portable applications and where long battery life is required.

10

BENEFITS

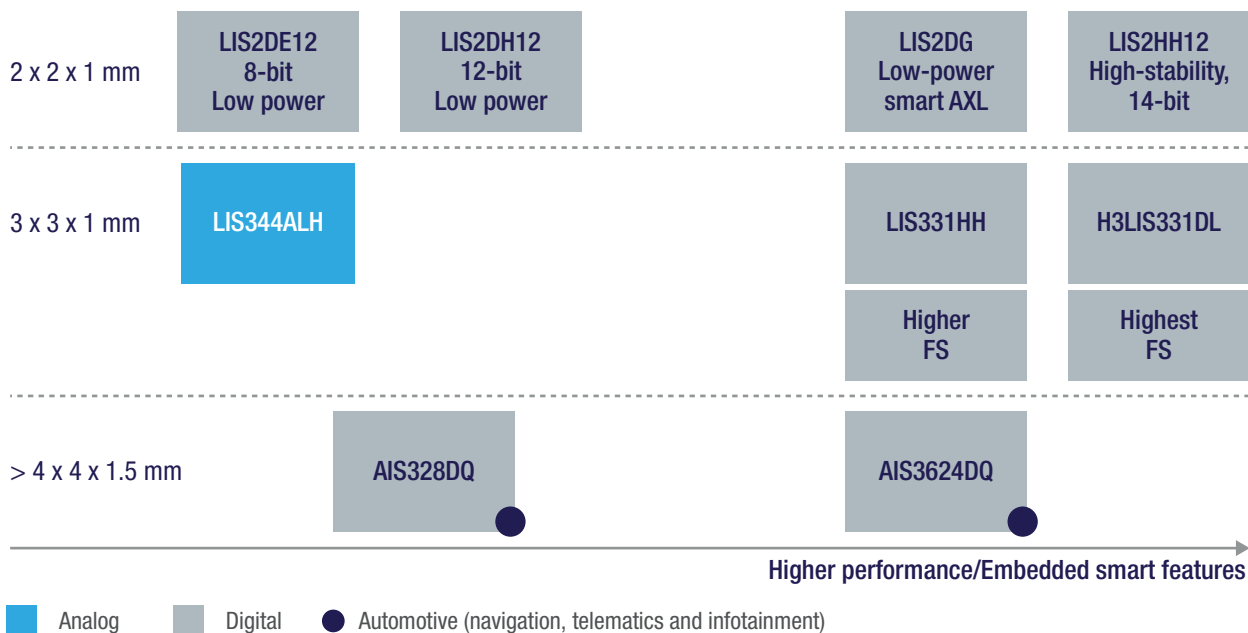
- High performance
- Small footprint for ultra-compact solutions
- Low power consumption and ultra-low-power operating modes that allow advanced power saving and smart sleep-to-wake-up functions
- Practical and easy-to-use built-in features
- Embedded state machines enable custom motion recognition reducing system complexity



**SUSTAINABLE
TECHNOLOGY**

CO₂ -42%
l -43%

ACCELEROMETERS - RECOMMENDED PRODUCTS



RECOMMENDED PRODUCTS SUMMARY

Part number	Package size (mm)	Full-scale typ (g)	Noise density (An) typ ($\mu\text{g}/\sqrt{\text{Hz}}$)	Key features
LIS2DH12	2 x 2 x 1	$\pm 2; \pm 4; \pm 8; \pm 16$	220	12-bit, embedded FIFO, board-compatible with compasses
LIS2HH12	2 x 2 x 1	$\pm 2; \pm 4; \pm 8$	140	16-bit, higher temperature stability
LIS2DG	2 x 2 x 0.8	$\pm 2; \pm 4; \pm 8; \pm 16$	100	16-bit, embedded smart functionalities
LIS2DE12	2 x 2 x 1	$\pm 2; \pm 4; \pm 8; \pm 16$	220	8-bit
LIS331HH	3 x 3 x 1	$\pm 6; \pm 12; \pm 24$	650	16-bit, up to $\pm 24\text{g}$ full scale
H3LIS331DL	3 x 3 x 1	$\pm 100; \pm 200; \pm 400$	15	16-bit, up to $\pm 400\text{g}$ full scale, low power
LIS344ALH	4 x 4 x 1.5	$\pm 2; \pm 6$	50	Low noise, analog
AIS328DQ	4 x 4 x 1.8	$\pm 2; \pm 4; \pm 8$	218	16-bit, temperature range -40 to +105 °C
AIS3624DQ	4 x 4 x 1.8	$\pm 6; \pm 12; \pm 24$	600	12-bit, temperature range -40 to +105 °C

Note: a complete list of part numbers is available at www.st.com/accelerometers



Gyroscoptes



Superior accuracy and stability over time and temperature

ST's innovatively-designed sensors with different combinations of analog and digital outputs provide high performance. Our gyroscopes offer superior stability over time and temperature, with a resolution lower than $0.01 \text{ dps}/\sqrt{\text{Hz}}$ for zero-rate level. This guarantees the level of accuracy required by the most advanced motion-based applications.

These 3-axis gyroscopes have a single sensing structure for motion measurement along all three orthogonal axes, while other solutions on the market rely on two or three independent structures. ST's solution eliminates any interference between the axes that inherently degrades the output signal, thus increasing the accuracy and reliability of motion-controlled functionalities.

ST's gyroscopes measure angular rate with a large full-scale range to meet the requirements of different applications, ranging from gesture recognition and image stabilization, to indoor and personal navigation. ST's angular rate sensors are already used in mobile phones, tablets, 3D pointers, game consoles, digital cameras and many other devices.

12

BENEFITS

- Wide full-scale range (from ± 65 to ± 2000 dps) for optical image stabilization and smart user interfaces
- High performance combined with low power consumption to address demanding applications and extend battery life
- Embedded FIFO for smart data storage and power saving
- Fast start-up for high responsiveness and system efficiency



**SUSTAINABLE
TECHNOLOGY**

CO₂ -33%
-32%

3-AXIS DIGITAL GYROSCOPES - RECOMMENDED PRODUCTS

Gaming, pointing devices and navigation	L3GD20H 16-bit $\pm 250/\pm 2000$ °/s
Optical image stabilization (OIS)	L2G2IS 16-bit $\pm 100/\pm 200$ °/s
Automotive	A3G4250D 16-bit ± 245 °/s

RECOMMENDED PRODUCTS SUMMARY

Part number	Package size (mm)	Full-scale typ (dps)	Noise density typ (°/s/√ Hz)	Key features
A3G4250D	4 x 4 x 1.1	± 245	0.03	AEC-Q100 qualification
L2G2IS	2.3 x 2.3 x 0.7	$\pm 100/\pm 200$	0.06	OIS gyro
L3GD20H	3 x 3 x 1.0	$\pm 245/\pm 500/\pm 2000$	0.011	Embedded FIFO

Note: a complete list of part numbers is available at www.st.com/gyroscopes





Digital compasses



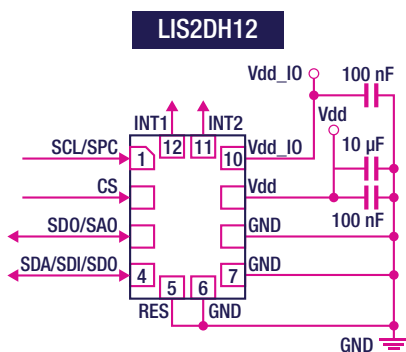
Accurate compass heading in any condition

14

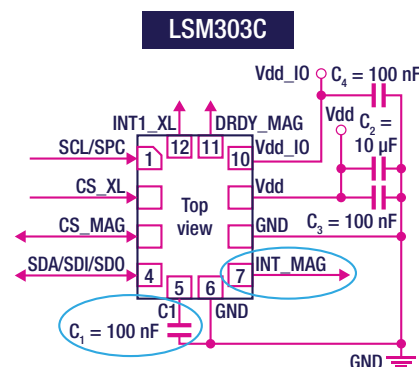
ST's digital compasses include combo solutions, with accelerometer and magnetic sensor integrated in a single LGA package and standalone magnetometers, to give the possibility of designing a solution locating the magnetic sensor in the suitable position of printed circuit board (PCB).

Accurately detecting the direction and magnitude of external magnetic fields and using accelerometer measurements for tilt compensation, ST's digital compasses ensure very accurate compass heading even when the portable device is inclined.

ST's low-noise e-compasses offer better than 3 mGauss resolution and a wide range of full scales, all selectable by the user: up to $\pm 16g$ full scale acceleration and up to ± 16 Gauss magnetic field full scale. The compass family includes embedded self-test and smart power functionalities to minimize current consumption. The LSM303C is board and software compatible with the latest generation of accelerometers, thus offering maximum design flexibility.



- EASY BOARD COMPATIBILITY**
- Same component outline dimensions
 - Same pinout dimensions
 - Same pinout structure



- Small changes to:
 - Pin 5, connect a capacitor
 - Pin 7, connect to EXT (interrupt signal for other use)

BENEFITS

- Superior sensing precision combined with low power consumption
- Extended magnetic-scale range
- Minimized measurement noise
- Very small package to address footprint reduction
- Temperature detection for advanced thermal drift compensation
- New possibilities for advanced navigation and location-based services in ever portable consumer devices



SUSTAINABLE TECHNOLOGY





iNEMO[®] inertial modules



Accelerometer + gyroscope SIP solution featuring multiple degrees of freedom

iNEMO inertial modules integrate complementary types of sensors to offer more compact, robust and easy-to-assemble solutions compared to discrete MEMS products. iNEMO solutions bring motion sensing systems to the level required for the most demanding applications, such as enhanced gesture recognition, gaming, augmented reality, indoor navigation and localization-based services.

FOCUS ON LSM6DS3

Ultra low power	Industry-leading low-power performance for 3A+3G combo Down to 0.6 mA in Always-on mode 20% better than the best alternative solution
Ultra small size	Tiny size to fit in the smallest, slimmest mobile, wearable and Internet of Things devices 2.5 x 3.0 x 0.8 mm
Ultra performing	Industry-best resolution for gyroscope and accelerometer Gyroscope rate noise down to 0.007 dps/ $\sqrt{\text{Hz}}$ typical
Ultra capable	8-Kbyte "smart" FIFO memory to batch more data before system wake-up 2 times larger than the best alternative solution
Ultra smart	Embedded efficient and reliable motion tracking, pedometer and context awareness Saving power and enabling faster system reaction time
Ultra scalable	Ideal companion for the ultra-low-power STM32 family of microcontrollers The best combination of 6-axis sensor plus sensor hub



2.5 x 3 x 0.8 mm



SUSTAINABLE TECHNOLOGY



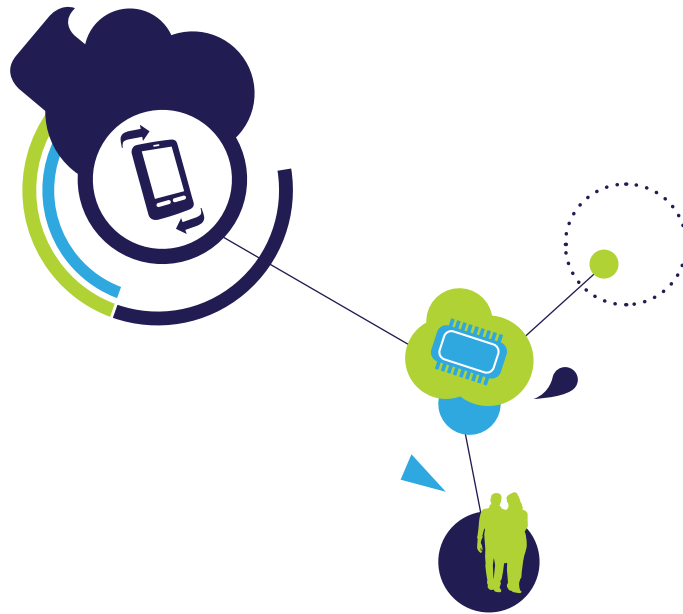
INEMO-M1 system-on-board

INEMO-M1 integrates multiple sensors (accelerometers, gyroscopes and magnetometer) with all the features and the computational power of the STM32F103 32-bit MCU in a SMD module with very small form factor (13 x 13 x 2 mm). First member of a system-on-board family of products that offer scalable computational and sensing features in the same footprint and pinout, INEMO-M1 may be used in combination with ST's sensor fusion software to seamlessly design high-performance 3D orientation and motion sensing applications.

An open architecture, where all the rich features, peripherals and communication interfaces of the MCU and all the sensors are completely accessible by the user's software, provides unlimited flexibility and greatly reduces the needs for additional external components to design a broad variety of applications in robotics, personal navigation, gaming and wearable sensors for healthcare, sports and fitness.

INEMO-M1 BENEFITS

- Turnkey solution for easy and quick motion sensing application development
- Integrates 9 DoF sensors with a powerful ARM® Cortex®-M3 32-bit MCU, with 512-Kbyte Flash and 64-Kbyte SRAM
- Ultra-compact SMD module
- Complete software accessibility to the on-board microcontroller and sensors
- Sensor fusion software and firmware libraries available to ease and speed up creation of high-performance applications





Environmental sensors



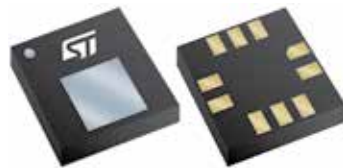
Collect humidity, atmospheric pressure and temperature accurate data for environmental awareness

STMicroelectronics offers a full kit of environmental sensors, including pressure, humidity and temperature sensors. These sensors rely on dedicated mechanical structures that guarantee the best performance even in challenging environmental conditions.

They are adopted in many wearable devices to monitor health and for fitness programs, in smart home or other industrial applications to monitor weather conditions and guarantee good equipment safety.

PRESSURE SENSORS

ST's absolute digital output barometer integrates ST's consolidated pressure sensor with the new fully molded package to further improve robustness, reliability and moisture resistance while reducing package thickness.



BENEFITS

- Ultra-small footprint
- Low-power consumption
- Fully-molded package ensure stability in any condition and water resistance

Part number	General description	Package (mm)	Embedded compensation	Supply voltage min-max (V)	Current consumption (Power Down Mode) typ (mA)
LPS25H	260-1260 hPa absolute digital output barometer	HCLGA-10L, 2.5 x 2.5 x 1.0	Yes	1.7-3.6	0.0005
LPS25HB		HLGA-10L, 2.5 x 2.5 x 0.76			

Note: a complete list of part numbers is available at www.st.com/pressure

HUMIDITY AND TEMPERATURE SENSOR

The HTS221 is an ultra-compact sensor that measures relative humidity and temperature. Housed in a tiny but robust HLGA package (2 x 2 x 0.9 mm), the HTS221 is suitable for wearable and portable devices and all applications where comfort, health and safety might be negatively impacted by humidity and temperature variations.



BENEFITS

- Ultra-small footprint
- Low-power consumption to address wearable devices
- Allows customized calibration for best design flexibility

Part number	General description	Package	Supply voltage min-max (V)	Humidity (RH) min-max (% RH)	Interfaces
HTS221	Capacitive digital sensor for relative humidity and temperature	HLGA-6L 2 x 2 x 0.9 mm	1.7-3.6	0-100	SPI, I ² C

TEMPERATURE SENSORS

ST's temperature sensors include both analog and digital temperature sensor ICs. Both types are suitable for use in a wide range of applications, such as industrial, consumer, medical and computer market segments.

The analog temperature sensors feature low power consumption and good linearity, and can operate over a temperature range as wide as -55 to +130 °C. The digital temperature sensors feature low power consumption, up to 12-bit resolution and can operate over a temperature range as wide as -55 to +125 °C.



2 x 2 x 0.5 mm

BENEFITS

- Small footprint
- High accuracy
- Dual alarm
- One-shot mode for energy saving

DIGITAL TEMPERATURE SENSORS

Part number	Package	Package size	General description	I/O Interface	Operating voltage min-max (V)
STCN75	MSOP(TSSOP8)	3 x 3 mm	Digital temperature sensor and thermal watchdog	SMBus/I ² C compatible	2.7-5.5
STDS75	MSOP(TSSOP8)	3 x 3 mm	Digital temperature sensor and thermal watchdog	SMBus/I ² C compatible	2.7-5.5
STLM75	MSOP(TSSOP8), SO-8	3 x 3 mm, 4.90 x 3.90 mm	Digital temperature sensor and thermal watchdog	SMBus/I ² C compatible	2.7-5.5
STTS75	MSOP(TSSOP8), SO-8	3 x 3 mm, 4.90 x 3.90 mm	Digital temperature sensor and thermal watchdog	SMBus/I ² C compatible	2.7-5.5
STTS751	UDFN-6L	2 x 2 mm	2.25 V low-voltage local digital temperature sensor	SMBus/I ² C compatible	2.25-3.6
STTS2002	TDFN8	2 x 3 mm	2.3 V memory module temperature sensor with a 2 Kb SPD EEPROM	SMBus/I ² C compatible	2.3-3.6
STTS2004	TDFN8	2 x 3 mm	2.2 V memory module temperature sensor with a 4 Kb SPD EEPROM	SMBus/I ² C compatible	2.2-3.6

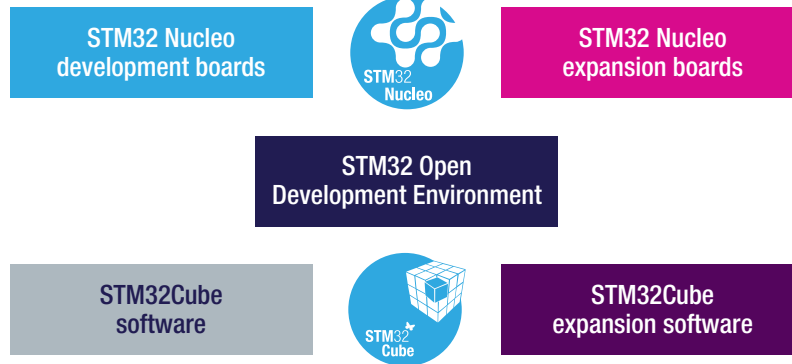
ANALOG TEMPERATURE SENSOR

Part number	Package	Package size	General description	Operating voltage min-max (V)	Operating supply current typ (mA)
STLM20	UDFN-4L, SOT323-5L	1 x 1.30 mm, 2 x 1.25 mm	Ultra-low current 2.4 V precision analog temperature sensor	2.4-5.5	0.008

Note: a complete list of part numbers is available at www.st.com/tempsensors



Design support



Open Development Environment

The STM32 Open Development Environment (STM32 ODE) is an open, flexible, easy and affordable way to develop innovative devices and applications based on the STM32 32-bit microcontroller family combined with other state-of-the-art ST components connected via expansion boards. It enables fast prototyping with leading-edge components that can quickly be transformed into final designs.

The STM32 ODE is made up of four elements:

- **STM32 Nucleo development boards.** A comprehensive range of affordable development boards for all STM32 microcontroller series, with unlimited unified expansion capability, and with integrated debugger/programmer.
- **STM32 Nucleo expansion boards.** Boards with additional functionality to add sense, control, connectivity, power, audio or other functions as needed. The expansion boards are plugged on top of the STM32 Nucleo development boards. More complex functionalities can be achieved by stacking the expansion boards.
- **STM32Cube software.** A set of free-of-charge tools and embedded software bricks to enable fast and easy development on the STM32, including a Hardware Abstraction Layer, middleware and the STM32CubeMX PC-based configurator and code generator.
- **STM32Cube expansion software.** Expansion software provided free of charge for use with STM32 Nucleo expansion boards and compatible with the STM32Cube software framework.

The STM32 Open Development Environment is compatible with a number of IDEs including IAR EWARM, Keil MDK, mbed and GCC-based environments.

FOCUS ON THE NEW NUCLEO EXPANSION BOARD FOR SENSORS

The X-NUCLEO-IKS01A1 is a MEMS inertial and environmental sensor evaluation board system. It is compatible with the Arduino UNO R3 connector layout, and is designed around STMicroelectronics' LSM6DS0 3-axis accelerometer + 3-axis gyroscope, the LIS3MDL 3-axis magnetometer, the HTS221 humidity sensor and the LPS25HB pressure sensor.

The board can also be used to evaluate the new LSM6DS3, evolution of LSM6DS0, by connecting the STEVAL-MKI160V1 DIL24 adapter.

The X-NUCLEO-IKS01A1 interfaces with the STM32 microcontroller via the I²C pin, and it is possible to change the default I²C port.



X-NUCLEO-IKS01A1



STEVAL-MKI160V1

OPEN SOFTWARE EXPANSION

The Open Software Expansion development suite offers drivers, middleware and application software to jump start your STM32 design with ST products like MEMS, Bluetooth low energy, sensors, etc. It enables fast prototyping using the STM32 Open Development Environment with leading-edge components that can quickly be transformed into final designs.

The Open Software Expansion environment is made up of several free libraries, such as:

- Open.MEMS: sensor fusion library for STM32 platform
- Open.RF: BlueNRG Bluetooth low energy library for the most commonly-used BT smart profiles

Open.MEMS

Open.MEMS libraries combine data from several sensors achieving the high level of accuracy required by portable and wearable devices and other emerging applications, such as IoT.

The osxMotionFX library is the evolution of iNEMO Engine Pro sensor fusion algorithm and API, ported to the STM32 Open Development Environment. Like its predecessor, the osxMotionFX is filtering and predictive software that uses advanced algorithms to integrate and read real-time outputs from multiple sensors, achieving accurate position information, independently of environmental conditions. The fusion of real-time motion-sensor data is set to significantly improve user experience by increasing accuracy, resolution, stability and response time in advanced motion-based applications in the consumer, computer, industrial and medical fields. The osxMotionFX sensor fusion library is designed for use in combination with the STM32F4 Nucleo development board (NUCLEO-F401RE). When installed on your PC, Open.MEMS libraries must be activated through a licensing wizard tool (included into the osxMotionFX software package).

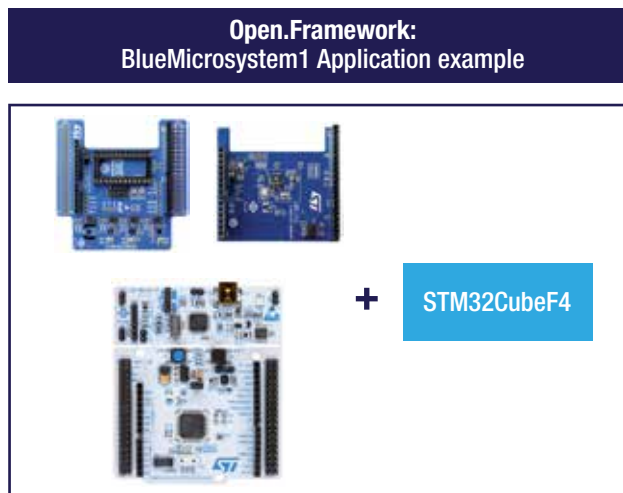
BENEFITS

- Licensing wizard tool makes it easier to quickly get started evaluating your sensor fusion design

APPLICATION EXAMPLE: BLUEMICROSYSTEM1

The BLUEMICROSYSTEM1 framework uses Bluetooth low energy, inertial (e.g. Motion MEMS) and environmental (e.g. humidity, pressure, temperature) sensors. It enables fusing together and transmitting real-time sensor data to a smartphone (Android- or iOS-based) via Bluetooth. BLUEMICROSYSTEM1 provides an implementation example for the STM32F4 Nucleo platform equipped with the MEMS and environmental sensor expansion board (X-NUCLEO-IKS01A1) and the Bluetooth low energy expansion board (X-NUCLEO-IDB04A1).

BLUEMICROSYSTEM1 is suitable for all applications and markets, including IoT and wearables, that need to effectively sense, process and transmit valuable information with very low power consumption and high performance.





Technical support

TECHNICAL DOCUMENTS

To see all technical documents and files for a specific product, go to www.st.com/sensors and select the product you are interested in through our product catalogue. Each part number has a corresponding web page where you can easily find all associated technical documents and resources.

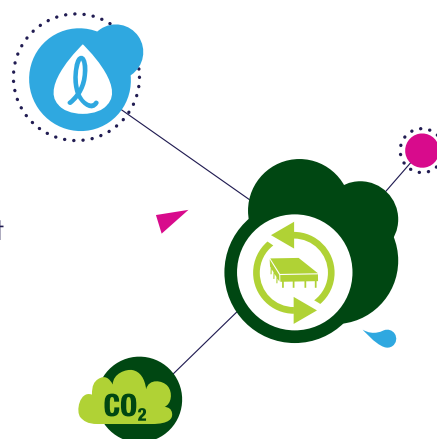
DEVELOPERS' LINKS

- For more information about STM320DE: www.st.com/stm320de
- To download Open Software suites: www.st.com/opensoftware
- For more information about expansion boards: www.st.com/x-nucleo
- To take part to our forums: www.st.com/e2e

ONLINE SUPPORT

For technical support or questions about product availability, pricing, where-to-buy, or other related issues, go to www.st.com/onlinesupport.







ST's Sustainable Technology Program provides a single, consistent framework for all the different programs that we implement to reduce the impact of our products on the environment and improve quality of life for the end user. The program includes three main domains:

- Compliance with legislation and with customers' requirements
- Eco-design to measure and take into account during the design phase the environmental impact of our products
- Responsible products which identify innovative products that provide clear environmental and social benefits to society

ST's motion MEMS products within sustainable technology

- All motion MEMS products are ECOPACK® compliant
- Improvements in our manufacturing technologies and product design have reduced our products' carbon footprint by up to 44% and water footprint up to 43%⁽¹⁾
- Products identified as socially responsible:
 - H3LIS331DL is suited for concussion detection (3-STAR rating⁽²⁾)
 - AIS328DQ and A3G4250D are accelerometers and gyroscopes used for navigation and telematics (2-STAR rating⁽²⁾)
 - LIS2DH12 and LSM303C are recommended for fitness monitoring applications (1-STAR rating⁽²⁾)

Product family	Carbon footprint evolution [%]	Water footprint evolution [%]
		
Accelerometers	-42	-43
Gyroscopes	-33	-32
Digital compasses	-44	-42
Inertial modules	-32	-33



(1) Screening LCA results for cradle-to-gate scope. Use phase is excluded. Values are reported as average for the whole product family in comparison to previous generation. For more information about eco-design, visit <http://www.st.com/eco-design>

(2) For more information about Star responsible product ratings, visit http://www.st.com/responsible_products



life.augmented



© STMicroelectronics - March 2015 - Printed in United Kingdom - 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

