MEMS and Sensors
Smart Motion tracking, IoT and enhanced user experience
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The most diversified sensor supplier

For all your sensing needs, ST provides a complete solution

ST has shipped more than 14 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.

- 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

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.

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
- STM32 Open Development Environment support
All portable devices become easy-to-use and fun

CONSUMER APPLIANCES

- Smartphones and tablets (AXL, GYRO, MAG, PS, RH, IMU, Microphones)
  - 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, Microphones)
  - 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
OIS: Optical Image Stabilization
IMU: Inertial Measurement Unit
Sensors for improving your fitness workout

**FITNESS AND WELLNESS APPLICATIONS**

- Athlete performance monitoring
  - Movement recognition through shoes and wearable sensors (AXL, IMU)
  - 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, IMU)
  - 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
- Step detection
- Pedometer
- Step counter

**Sensors in your training**

- AXL: Accelerometer
- GYRO: Gyroscope
- MAG: Magnetometer
- PS: Pressure Sensor
- TS: Temperature Sensor
- RH: Humidity Sensor
- IMU: Inertial Measurement Unit
Devices offer enhanced user interfaces helping to decrease energy consumption

**HOME APPLIANCES**

- Home alarm systems and car garages (AXL, MAG, Microphones)
  - Vibration and shock detection
  - Detection of door open/close position
- White goods (AXL, GYRO, PS, RH, IMU, TS, IMU)
  - 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, PS)
  - Relative humidity level monitoring and weather stations
  - Incubators, refrigerator crispers and storage
  - Respiratory equipment/humidifiers
- Electric, gas/water meters (AXL, MAG)
  - Anti-tamper mechanisms
- Home environment monitoring (TS, RH, PS)
  - Ambient temperature and relative humidity monitoring

**Sensors in your home/Smart appliances**

AXL: Accelerometer  
GYRO: Gyroscope  
MAG: Magnetometer  
PS: Pressure Sensor  
TS: Temperature Sensor  
RH: Humidity Sensor  
OIS: Optical Image Stabilization  
IMU: Inertial Measurement Unit
For safer cars and easier navigation

AUTOMOTIVE

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

AXL: Accelerometer
GYRO: Gyroscope
MAG: Magnetometer
MIC: Microphones
TS: Temperature Sensor
RH: Humidity Sensor
IMU: Inertial Measurement Unit
For industrial applications

**KEY APPLICATION**

- Predictive maintenance and early failure detection AXL, TS, MAG, MIC
- Vibration monitoring AXL, MIC
- Industrial IoT and connected devices AXL, GYRO, MAG, IMU, TS, PS, RH
- Robotics, automation and drones AXL, High/g AXL, GYR, IMU, MAG, PS, TS
- Power saving and motion-activated functions AXL, IMU, MAG
- Appliances AXL, MAG, TS, RH, PS
- Inertial navigational systems and motion tracking AXL, GYR, IMU, MAG
- Antenna and platform pointing, leveling and stabilization AXL, GYR, MAG
- Optical image and lens stabilization AXL, GYR, IMU
- Anti-tampering in smart meters AXL, MAG
- Precision inclinometer and leveling instruments AXL
- Positional and distance sensor MAG
- Presence detection, magnetic switch MAG
- Variable magnetic field monitoring MAG
- Asset and parcel tracking, monitoring and shock detection and logging AXL, High/g AXL, GYR, IMU, TS, PS, RH, MIC
- Building and structure monitoring AXL, TS, RH, PS

AXL: Accelerometer  
GYRO: Gyroscope  
MAG: Magnetometer  
TS: Temperature Sensor  
RH: Humidity Sensor  
IMU: Inertial Measurement Unit  
MIC: Microphones
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, IMU)
  - 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, IMU)
- Healthcare mobility aids including wheelchairs and scooters (AXL, GYRO, PS, IMU)

AXL: Accelerometer
GYRO: Gyroscope
MAG: Magnetometer
PS: Pressure Sensor
TS: Temperature Sensor
RH: Humidity Sensor
DIS: Optical Image Stabilization
IMU: Inertial Measurement Unit
Accelerometers

ST’s state-of-the-art MEMS accelerometers include analog and digital sensors featuring up to ±400g acceleration full scale and from 1.62 to 3.6 V supply voltage. Accelerometers have advanced power-saving features that make them the ideal choice for ultra-low-power applications. These features include low-power mode, auto wake-up function and FIFO buffer that can be used to store data, thus reducing the host processor loading and system power consumption. The new generation of accelerometers, recently introduced by ST, makes a significant step forward in miniaturization, with packages sized 2x2x1 mm, and smart embedded functions such as pedometer suitable for wearable devices. ST’s accelerometers are suitable for handheld portable applications such as mobile phones and PDAs, or any other application where low power consumption and reduced package size are required. ST’s portfolio also includes accelerometers for automotive applications, such as the AIS32x family, with extended temperature range and AEC-Q100 qualified, and IISxxx products, that are part of ST’s longevity program and will stay in production for ten years from the date of introduction.

BENEFITS

- High performance (high resolution and stability, wide bandwidth)
- 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
- Pinout compatibility
- FIFO

Smart motion features with ultra-low power consumption

SUSTAINABLE TECHNOLOGY

- CO₂ -42%
- CO₂ -43%
## ACCELEROMETERS

<table>
<thead>
<tr>
<th>Applications</th>
<th>Package size (mm)</th>
<th>Typical full-scale (g)</th>
<th>Typical noise density (µg/√ Hz)</th>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer &amp; Industrial</td>
<td>2 x 2 x 1 mm</td>
<td>±2; ±4; ±8; ±16</td>
<td>90</td>
<td>14-bit, ultra-low-power, ultra-low-noise</td>
</tr>
<tr>
<td></td>
<td>2 x 2 x 1 mm</td>
<td>±2; ±4; ±8; ±16</td>
<td>120</td>
<td>14-bit, FIFO, embedded smart functionalities (pedometer)</td>
</tr>
<tr>
<td></td>
<td>3 x 3 x 1 mm</td>
<td>±2; ±4; ±8; ±16</td>
<td>220</td>
<td>12-bit, FIFO, low-power</td>
</tr>
<tr>
<td></td>
<td>≥4 x 4 x 1.5 mm</td>
<td>±2; ±4; ±8; ±16</td>
<td>140</td>
<td>16-bit FIFO, temperature stability</td>
</tr>
<tr>
<td></td>
<td>≥4 x 4 x 1.5 mm</td>
<td>±2; ±4; ±8; ±16</td>
<td>220</td>
<td>12-bit, FIFO, low-power</td>
</tr>
<tr>
<td>Automotive &amp; Safety (Central &amp; Peripheral; Airbags)</td>
<td>2 x 2 x 1 mm</td>
<td>±2; ±4; ±8; ±16</td>
<td>150</td>
<td>14-bit, FIFO, low-power, temperature stability embedded programmable state machine</td>
</tr>
<tr>
<td>For Implantable Devices</td>
<td>2 x 2 x 1 mm</td>
<td>±2; ±4; ±8; ±16</td>
<td>150</td>
<td>14-bit, FIFO, low-power, temperature stability embedded programmable state machine</td>
</tr>
</tbody>
</table>

## CONSUMER

<table>
<thead>
<tr>
<th>Part number</th>
<th>Package/size (mm)</th>
<th>Typical full-scale (g)</th>
<th>Typical noise density (µg/√ Hz)</th>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIS2DW12</td>
<td>LGA12(2 x 2 x 0.7)</td>
<td>±2; ±4; ±8; ±16</td>
<td>90</td>
<td>14-bit, ultra-low-power, ultra-low-noise</td>
</tr>
<tr>
<td>LIS2DS12</td>
<td>LGA12(2 x 2 x 0.8)</td>
<td>±2; ±4; ±8; ±16</td>
<td>120</td>
<td>14-bit, FIFO, embedded smart functionalities (pedometer)</td>
</tr>
<tr>
<td>LIS3DH</td>
<td>LGA16(3 x 3 x 1)</td>
<td>±2; ±4; ±8; ±16</td>
<td>220</td>
<td>12-bit, FIFO, low-power</td>
</tr>
<tr>
<td>LIS2HH12</td>
<td>LGA12(2 x 2 x 1)</td>
<td>±2; ±4; ±8; ±16</td>
<td>140</td>
<td>16-bit FIFO, temperature stability</td>
</tr>
<tr>
<td>LIS2DH12</td>
<td>LGA12(2 x 2 x 1)</td>
<td>±2; ±4; ±8; ±16</td>
<td>220</td>
<td>12-bit, FIFO, low-power</td>
</tr>
<tr>
<td>LIS3DSH</td>
<td>LGA16(3 x 3 x 1)</td>
<td>±2; ±4; ±8; ±16</td>
<td>150</td>
<td>14-bit, FIFO, low-power, temperature stability embedded programmable state machine</td>
</tr>
</tbody>
</table>

## CONSUMER-SPECIAL PRODUCTS

<table>
<thead>
<tr>
<th>Part number</th>
<th>Package/size (mm)</th>
<th>Typical full-scale (g)</th>
<th>Typical noise density (µg/√ Hz)</th>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIS25BA</td>
<td>VFLGA14(2.5 x 2.5 x 0.86)</td>
<td>±3.85</td>
<td>1% thd+noise</td>
<td>16-bit, low-noise, high-bandwidth filtering, TDM interface, specific for Audio reading</td>
</tr>
<tr>
<td>LIS3DHH</td>
<td>Ceramic LGA16(5 x 5 x 1.7)</td>
<td>±2.5</td>
<td>45</td>
<td>16-bit, ultra-low-noise, excellent stability in temperature and time</td>
</tr>
<tr>
<td>LIS331HH</td>
<td>LGA16(3 x 3 x 1)</td>
<td>±6; ±12; ±24</td>
<td>650</td>
<td>12-bit, low-power, high-G fullscale</td>
</tr>
<tr>
<td>LIS344ALH</td>
<td>LGA16(4 x 4 x 1.5)</td>
<td>±2; ±6</td>
<td>50</td>
<td>Low noise, analog output</td>
</tr>
<tr>
<td>H3LISxxxDL</td>
<td>LGA16(3 x 3 x 1)</td>
<td>±100; ±200; ±400</td>
<td>15000</td>
<td>High-G full scale, low power consumption (ideal for high shock detection)</td>
</tr>
</tbody>
</table>
### INDUSTRIAL

<table>
<thead>
<tr>
<th>Part number</th>
<th>Package/size (mm)</th>
<th>Typical full-scale (g)</th>
<th>Typical noise density (µg/√ Hz)</th>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIS328DQ</td>
<td>QFN24(4 x 4 x 1.8)</td>
<td>±2; ±4; ±8</td>
<td>218</td>
<td>Low-power high performance 3-axis accelerometer with digital output for industrial applications</td>
</tr>
<tr>
<td>IIS2DH</td>
<td>LGA12 (2 x 2 x 1)</td>
<td>±2; ±4; ±8; ±16</td>
<td>220</td>
<td>3μA current consumption at 10HZODR; 185μA current consumption at wide bandwidth up to 2.3kHz and ODR 5.3kHz, temperature range up to105°C</td>
</tr>
<tr>
<td>IIS3DHHC</td>
<td>Ceramic LGA16(5 x 5 x 1.7)</td>
<td>±2</td>
<td>45</td>
<td>16-bit, very-low-noise, high-stability MEMS digital output motion sensor (inclinometer) for double signal integration</td>
</tr>
<tr>
<td>IIS2DLPC</td>
<td>LGA12 (2 x 2 x 0.7)</td>
<td>±2; ±4; ±8; ±16</td>
<td>90</td>
<td>High-performance, ultra-low-power 3-axis accelerometer for industrial applications</td>
</tr>
</tbody>
</table>

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

### AUTOMOTIVE

<table>
<thead>
<tr>
<th>Part number</th>
<th>Package/size (mm)</th>
<th>Typical full-scale (g)</th>
<th>Typical noise density (µg/√ Hz)</th>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIS328DQ</td>
<td>QFN24 (4 x 4 x 1.8)</td>
<td>±2; ±4; ±8</td>
<td>218</td>
<td>AEC-Q100 qualified, temperature range -40 to +105 °C</td>
</tr>
<tr>
<td>AIS3624DQ</td>
<td>QFN24 (4 x 4 x 1.8)</td>
<td>±6;±12;±24</td>
<td>600</td>
<td>AEC-Q100 qualified, ideal for emergency calls, high full scale, temperature range-40 to+105°C</td>
</tr>
<tr>
<td>AIS1120X/</td>
<td>S08</td>
<td>±120</td>
<td>-</td>
<td>AEC-Q100 qualified, Airbag central unit temperature range -40 to+105°C</td>
</tr>
<tr>
<td>AIS2120SX</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIS1200PS</td>
<td>S016</td>
<td>±200</td>
<td>-</td>
<td>AEC-Q100 qualified, Airbag satellite sensor temperature range -40 to +125°C</td>
</tr>
</tbody>
</table>

### MEDICAL

<table>
<thead>
<tr>
<th>Part number</th>
<th>Package/size (mm)</th>
<th>Typical full-scale (g)</th>
<th>Typical noise density (µg/√ Hz)</th>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIS2DH</td>
<td>LGA12 (2 x 2 x 1)</td>
<td>±2; ±4; ±8; ±16</td>
<td>220</td>
<td>Specifically designed for medical applications including Class IIIFDA implantable devices</td>
</tr>
</tbody>
</table>

Note: A complete list of part numbers is available at www.st.com/accelerometers
Superior accuracy and stability over time and temperature

ST’s analog and digital gyroscopes offer superior stability over time and temperature, with competitive low noise level for excellent level of accuracy today required by the most advanced motion-based applications. These 3-axis gyroscopes have a unique 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 advantage is to eliminate any interference between the axes that inherently degrades the output signal, increasing accuracy and reliability of motion-controlled functionalities. ST’s gyros measure angular velocity with a wide fullscale range (from 100 to 2000 dps) to meet the requirements of a variety applications, ranging from gesture recognition and image stabilization, to dead reckoning and personal navigation. ST’s angular rate sensors are already common in mobile phones, tablets, 3D pointers, game consoles, digital cameras and many other devices.

BENEFITS

- Wide full-scale range (from ±65 to ±2000 dps) for optical image stabilization (OIS) smart user interfaces and gaming
- Low noise and lowpower consumption to address the best accuracy in demanding application (as VR/AR, OIS) and extend battery life
- Stability in temperature and time
- Fast start-up for high responsiveness
## 3-AXIS DIGITAL GYROSCOPES

<table>
<thead>
<tr>
<th>Applications</th>
<th>Package size (mm)</th>
<th>Typical full scale (dps)</th>
<th>Typical noise density (dps/√Hz)</th>
<th>Key features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer &amp; Industrial</td>
<td>2 x 2 x 0.7</td>
<td>± 245</td>
<td>0.03</td>
<td>AEC-Q100 qualification, low noise and high/stability over temperature</td>
</tr>
<tr>
<td>Long-life applications</td>
<td>2.3 x 2.3 x 0.7</td>
<td>± 100/±200</td>
<td>0.038</td>
<td>OIS: 2-axis ultra-compact, stability in temperature, low noise, fast start-up time</td>
</tr>
<tr>
<td>Automotive Non-safety</td>
<td>3 x 3 x 1</td>
<td>± 245/±500/±2000</td>
<td>0.011</td>
<td>UI: 3-axis, low-power, FIFO, embedded temperature sensor</td>
</tr>
<tr>
<td>Optical image stabilization (OIS)</td>
<td>4 x 4 x 1</td>
<td>± 245/±500/±2000</td>
<td>0.03</td>
<td>10 years longevity...</td>
</tr>
</tbody>
</table>

**Part numbers and descriptions**

- **A3G4250D**
  - Package/size (mm): LGA16 (4 x 4 x 1.1)
  - Typical full scale: ± 245
  - Typical noise density: 0.03
  - Key features: AEC-Q100 qualification, low noise and high/stability over temperature

- **L20G20IS**
  - Package/size (mm): LGA (2 x 2 x 0.7)
  - Typical full scale: ±100/±200
  - Typical noise density: 0.038
  - Key features: OIS: 2-axis ultra-compact, stability in temperature, low noise, fast start-up time

- **L2G2IS**
  - Package/size (mm): LGA (2.3 x 2.3 x 0.7)
  - Typical full scale: ±100/±200
  - Typical noise density: 0.06
  - Key features: OIS: 2-axis compact package, stability in temperature

- **L3GD20H**
  - Package/size (mm): LGA16 (3 x 3 x 1.0)
  - Typical full scale: ± 245/±500/±2000
  - Typical noise density: 0.011
  - Key features: UI: 3-axis, low-power, FIFO, embedded temperature sensor

- **I3G4250D**
  - Package/size (mm): LGA16 (4 x 4 x 1.1)
  - Typical full scale: ± 245/±500/±2000
  - Typical noise density: 0.03
  - Key features: 10 years longevity...

*Note: a complete list of part numbers is available at [www.st.com/gyroscopes](http://www.st.com/gyroscopes)*
Accurate compass heading in any condition

ST’s e-Compasses include combo solutions built with a 3-axis digital accelerometer and a 3-axis digital magnetic sensor in a single LGA package, as well as standalone 3-axis digital magnetic sensors for designing solutions where the magnetic sensor must be located in a specific position on a printed circuit board. Designed to accurately detect the direction and magnitude of external magnetic fields, ST’s e-Compasses use accelerometer measurements for tilt compensation, thus ensuring very accurate compass headings even when handheld or mobile devices are inclined. ST’s e-Compasses combine high dynamic range with temperature offset compensation. They offer 3 mgauss resolution and a wide range of full scales selectable by the user: from ±2 to ±16 g for acceleration and from ±4 to ±50 gauss for magnetic fields. ST’s e-Compasses include smart power functions to minimize current consumption and an embedded self-test feature that allows the user to check that the sensor functions correctly in the final application.

The full range of products offers new possibilities for advanced navigation and location-based services in increasingly portable consumer/industrial devices such as tilt-compensated compasses, map rotation, intelligent power-saving for handheld devices, gaming and virtual reality input devices and position.

**BENEFITS**

- Superior sensing precision combined with low power consumption
- Wide magnetic range with high sensitivity magnetic-scale range
- Ultra low magnetic offset and low noise
- Compact package footprint, pinout compatible with 2x2 accelerometer

**SUSTAINABLE TECHNOLOGY**

-44%

-42%
<table>
<thead>
<tr>
<th>Part number</th>
<th>Package/size (mm)</th>
<th>Typical range</th>
<th>Idd(mA)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIS2MDL</td>
<td>LGA12 (2 x 2 x 0.7)</td>
<td>Magnetic range X,Y,Z (Gauss): ±50</td>
<td>MAG: HP 0.2, LP 0.05</td>
<td>Ultra-low-power, high performance, offset cancellation</td>
</tr>
<tr>
<td>LIS3MDL</td>
<td>LGA12 (2 x 2 x1)</td>
<td>Magnetic range X,Y,Z (Gauss): ±4, ±8, ±12, ±16</td>
<td>MAG: HP 0.27, LP 0.04</td>
<td>Ultra-low-power, high-performance, High ODR</td>
</tr>
<tr>
<td>LSM303AGR</td>
<td>LGA12 (2 x 2 x1)</td>
<td>Magnetic range X,Y,Z (Gauss): ±50</td>
<td>MAG: HP 0.2, LP 0.05</td>
<td>High-performance, low-power eCompass module, offset cancellation</td>
</tr>
<tr>
<td>LSM303AH</td>
<td>LGA12 (2 x 2 x1)</td>
<td>Magnetic range X,Y,Z (Gauss): ±30</td>
<td>MAG: HP 0.2, LP 0.05</td>
<td>Ultra-compact high-performance eCompass module: with offset cancellation and embedded pedometer</td>
</tr>
<tr>
<td>LSM303C</td>
<td>LGA12 (2 x 2 x1)</td>
<td>Magnetic range X,Y,Z (Gauss): ±16</td>
<td>MAG: HP 0.27, LP 0.04</td>
<td>Ultra-compact, eCompass module: embedded basic functions.</td>
</tr>
</tbody>
</table>

**INDUSTRIAL**

<table>
<thead>
<tr>
<th>Part number</th>
<th>Package/size (mm)</th>
<th>Typical range</th>
<th>Idd(mA)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIS2MDC</td>
<td>LGA12 (2 x 2 x 0.7)</td>
<td>Magnetic range (Gauss): ±50</td>
<td>MAG: HP 0.2, LP 0.05</td>
<td>High accuracy, ultra-low-power, 3-axis digital output magnetometer</td>
</tr>
<tr>
<td>ISM303DAC</td>
<td>LGA12 (2 x 2 x 1)</td>
<td>Magnetic range (Gauss): ±50</td>
<td>0.032 LP combo mode</td>
<td>3-axis magnetometer + 3-axis accelerometer, high performance, low power, compact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acceleration full scale (g): ±2,±4,±8,±16 g</td>
<td>1.45 HP combo mode</td>
<td></td>
</tr>
</tbody>
</table>

---

**CONSUMER**
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. iNEMOSystem-in-packages (SiP) combine accelerometer, gyroscope and magnetometer in a monolithic 6-axis or 9-axis solution. The integration of multiple sensor outputs bring motion sensing systems to the level of accuracy required for the most demanding applications, such as enhanced gesture recognition, gaming, augmented reality, indoor navigation, pedestrian dead reckoning, wearables, OIS/EIS and localization-based services.

FOCUS ON LSM6DSO

KEY ADVANTAGES
- Ultra low power: 0.55mA combo (15μA AXL in ULP)
- UI Interface : I3C / I2C / SPI
- Dedicated OIS SPIAUX interface
- Finite state machine for custom gesture recognition
- U/I-OIS full scale:
  - Gyro U/I-OIS independent full scale
  - XL independent up to ±8g
  - Self test XL and Gyro from OIS chain
- New pedometer 2.0
- Up to 9Kbytes of smart FIFO
Industrial inertial module: 3D accelerometer and 3D gyroscope

The ISM330DLC is a system-in-package featuring a high-performance 3D digital accelerometer and 3D digital gyroscope tailored for Industry 4.0 applications. In the ISM330DLC the sensing element of the accelerometer and of the gyro are implemented on the same silicon die, thus guaranteeing superior stability and robustness.

The ISM330DLC has a full-scale acceleration range of ±2/±4/±8/±16 g and an angular rate range of ±125/±250/±500/±1000/±2000 dps. Delivering high accuracy and stability with ultra-low power consumption (0.75 mA in high-performance, combomode) enables, also in the industrial domain, long-lasting battery operated applications.

The ISM330DLC includes a dedicated configurable signal processing path with low latency, low noise and dedicated filtering specifically intended for control loop stability. Data from this dedicated signal path can be made available through an auxiliary SPI interface, configurable for both the gyroscope and accelerometer. High-performance, high-quality, small size and low power consumption together with high robustness to mechanical shock makes the ISM330DLC the preferred choice of system designers for the creation and manufacturing of versatile and reliable products.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>LSM6DSO</th>
<th>LSM6DSM</th>
<th>LSM6DSL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current consumption in High-performance mode (mA)</td>
<td>0.55</td>
<td>0.65</td>
<td>0.65</td>
</tr>
<tr>
<td>Current consumption in low-power mode (mA)</td>
<td>0.26</td>
<td>0.29</td>
<td>0.29</td>
</tr>
<tr>
<td>(μg/√Hz) Noise density in High-performance mode @2g Accelerometer</td>
<td>70</td>
<td>75</td>
<td>80</td>
</tr>
<tr>
<td>Gyro noise density in High-performance mode (mdps/√Hz)</td>
<td>3.8</td>
<td>3.8</td>
<td>4.0</td>
</tr>
<tr>
<td>ODR(Hz)</td>
<td>Accel:1 to 6664 Gyro:12.5 to 6664</td>
<td>Accel:1.6 to 6664 Gyro:12.5 to 6664</td>
<td>Accel:1.6 to 6664 Gyro:12.5 to 6664</td>
</tr>
<tr>
<td>Smart FIFO depth</td>
<td>Up to 9 Kbytes</td>
<td>Up to 4 Kbytes</td>
<td>Up to 4 Kbytes</td>
</tr>
<tr>
<td>Sensor data collection</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>OIS/EIS</td>
<td>Yes/Yes</td>
<td>Yes/Yes</td>
<td>No/Yes</td>
</tr>
<tr>
<td>Sensorsync</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Automotive inertial module: 3D accelerometer and 3D gyroscope

The ASM330LHH is a system-in-package featuring a 3D digital accelerometer and a 3D digital gyroscope with an extended temperature range up to +105 °C and designed to address automotive non-safety applications. The ASM330LHH is AEC-Q100 compliant and industrialized through a dedicated MEMS production flow to meet automotive reliability standards. All the parts are fully tested with respect to temperature to ensure the highest quality level.

The sensing elements are manufactured using ST’s proprietary 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 ASM330LHH has a full-scale acceleration range of $\pm 2/\pm 4/\pm 8/\pm 16 \text{ g}$ and a wide angular rate range of $\pm 125/\pm 250/\pm 500/\pm 1000/\pm 2000/\pm 4000 \text{ dps}$ that enables its usage in a broad range of automotive applications.

All the design aspects of the ASM330LHH have been optimized to reach superior output stability, extremely low noise and full data synchronization to the benefit of sensor-assisted applications like dead reckoning and sensor fusion.
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 SENSOR
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.

<table>
<thead>
<tr>
<th>Part number</th>
<th>Package (mm)</th>
<th>Pressure range (hPa)</th>
<th>Relative accuracy (hPa)</th>
<th>Absolute accuracy (hPa)</th>
<th>Noise</th>
<th>ODR (Hz)</th>
<th>Current consumption</th>
<th>Highshock survivability (g)</th>
<th>Advanced digital features</th>
<th>Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPS22HH</td>
<td>HLGA-10L, 2x2x0.73 Full-molded</td>
<td>260 to 1260</td>
<td>±0.025</td>
<td>±0.5</td>
<td>0.65Pa RMS (with embedded filter) 1.7Pa RMS (without embedded filter)</td>
<td>1, 10, 25, 50, 75, 100, 200</td>
<td>12μA @1Hz (high resolution mode) 4μA @1Hz (low power mode)</td>
<td>22.000</td>
<td>128 samples FIFO/ Embedded compensation/ Interrupt/ I2C/I3C™/ SPI</td>
<td></td>
</tr>
<tr>
<td>LPS22HB</td>
<td>HLGA-10L, 2x2x0.76 Full-molded</td>
<td>260 to 1260</td>
<td>±0.1</td>
<td>±1</td>
<td>0.75Pa RMS (with embedded filter) 2Pa RMS (without embedded filter)</td>
<td>1, 10, 25, 50, 75</td>
<td>12μA @1Hz (high resolution mode) 3μA @1Hz (low power mode)</td>
<td>22.000</td>
<td>32 samples FIFO/ Embedded compensation/ Interrupt/ I2C/SPI</td>
<td></td>
</tr>
<tr>
<td>LPS25HB</td>
<td>HLGA-10L, 2.5x2.5x0.76 Full-molded</td>
<td>260 to 1260</td>
<td>±0.1</td>
<td>±1</td>
<td>1Pa RMS (with embedded filter) 3Pa RMS(without embedded filter)</td>
<td>1, 10, 25</td>
<td>25μA @1Hz (high resolution mode) 4μA @1Hz (low power mode)</td>
<td>10.000</td>
<td>32 samples FIFO/ Embedded compensation/ Interrupt/ I2C/SPI</td>
<td></td>
</tr>
</tbody>
</table>

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

BENEFITS
- Ultra-small footprint
- Low-power consumption
- Fully-molded package ensure stability and robustness in any condition and water resistance
- Full molded PKG with small holes
- Improved moisture resistance.
- Improved shock/vibration suppression
## WATER-PROOF PRESSURE SENSOR

Waterproof pressure sensors are also available in ST’s pressure sensors portfolio. The LPS35HW is an ultra-compact piezoresistive pressure sensor which functions as a digital output barometer. The device comprises a sensing element and an IC interface which communicates through I2C or SPI from the sensing element to the application. The sensing element, which detects absolute pressure, consists of a suspended membrane manufactured using a dedicated process developed by ST.

The LPS33HW is a waterproof pressure sensor, resistant to chemicals like chlorine, bromine, salt water and also resistant to soaps or detergents.

Due to the sensor’s high-performance built-in processor and the advanced formula of its water-resistant gel filling gives performance advantages and fast recovery between factory and store-shelf. The LPS33HW can withstand being submerged up to 90 meters.

<table>
<thead>
<tr>
<th>Part number</th>
<th>General description</th>
<th>Package</th>
<th>Supply voltage min-max (V)</th>
<th>Humidity (RH) min-max (% RH)</th>
<th>Interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPS35HW</td>
<td>Waterproof pressure sensor</td>
<td>CCLGA10L (3.5x3.5x1.85)</td>
<td>260 to 1260</td>
<td>±1 after OPC</td>
<td>±4 before OPC</td>
</tr>
<tr>
<td>LPS33W</td>
<td>Waterproof pressure sensor</td>
<td>CCLGA10L (3.3x3.3x2.9)</td>
<td>260 to 1260</td>
<td>±1 after OPC</td>
<td>±2.5 before OPC</td>
</tr>
<tr>
<td>LPS33HW</td>
<td>Waterproof pressure sensor</td>
<td>CCLGA10L (3.3x3.3x2.9)</td>
<td>260 to 1260</td>
<td>±0.1</td>
<td>±1 after OPC</td>
</tr>
</tbody>
</table>

Note(*): Water resistant

## 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
- Humidity accuracy: ± 3.5% rH, 20 to +80% rH
- Temperature accuracy: ± 0.5 °C, 15 to +40 °C

<table>
<thead>
<tr>
<th>Part number</th>
<th>General description</th>
<th>Package</th>
<th>Supply voltage min-max (V)</th>
<th>Humidity (RH) min-max (% RH)</th>
<th>Interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>HTS221</td>
<td>Capacitive digital sensor for relative humidity and temperature</td>
<td>HLGA-6L 2 x 2 x 0.9 mm</td>
<td>1.7-3.6</td>
<td>0-100</td>
<td>SPI, I2C</td>
</tr>
</tbody>
</table>
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.

DIGITAL TEMPERATURE SENSORS

<table>
<thead>
<tr>
<th>Part number</th>
<th>Package</th>
<th>Package size</th>
<th>General description</th>
<th>I/O Interface</th>
<th>Operating voltage min-max (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STCN75</td>
<td>MSOP(TSSOP8)</td>
<td>3 x 3 mm</td>
<td>Digital temperature sensor and thermal watchdog</td>
<td>SMBus/I2C compatible</td>
<td>2.7-5.5</td>
</tr>
<tr>
<td>STDS75</td>
<td>MSOP(TSSOP8)</td>
<td>3 x 3 mm</td>
<td>Digital temperature sensor and thermal watchdog</td>
<td>SMBus/I2C compatible</td>
<td>2.7-5.5</td>
</tr>
<tr>
<td>STLM75</td>
<td>MSOP(TSSOP8), SO-8</td>
<td>3 x 3 mm, 4.90 x 3.90 mm</td>
<td>Digital temperature sensor and thermal watchdog</td>
<td>SMBus/I2C compatible</td>
<td>2.7-5.5</td>
</tr>
<tr>
<td>STTS75</td>
<td>MSOP(TSSOP8), SO-8</td>
<td>3 x 3 mm, 4.90 x 3.90 mm</td>
<td>Digital temperature sensor and thermal watchdog</td>
<td>SMBus/I2C compatible</td>
<td>2.7-5.5</td>
</tr>
<tr>
<td>STTS751</td>
<td>UDFN-6L</td>
<td>2 x 2 mm</td>
<td>2.25 V low-voltage local digital temperature sensor</td>
<td>SMBus/I2C compatible</td>
<td>2.25-3.6</td>
</tr>
<tr>
<td>STTS2002</td>
<td>TDFN8</td>
<td>2 x 3 mm</td>
<td>2.3 V memory module temperature sensor with a 2 Kb SPD EEPROM</td>
<td>SMBus/I2C compatible</td>
<td>2.3-3.6</td>
</tr>
<tr>
<td>STTS2004</td>
<td>TDFN8</td>
<td>2 x 3 mm</td>
<td>2.2 V memory module temperature sensor with a 4 Kb SPD EEPROM</td>
<td>SMBus/I2C compatible</td>
<td>2.2-3.6</td>
</tr>
</tbody>
</table>

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

ANALOG TEMPERATURE SENSOR

<table>
<thead>
<tr>
<th>Part number</th>
<th>Package</th>
<th>Package size</th>
<th>General description</th>
<th>Operating voltage min-max (V)</th>
<th>Operating supply current typ (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STLM20</td>
<td>UDFN-4L, SOT223-5L</td>
<td>1 x 1.30 mm, 2 x 1.25 mm</td>
<td>Ultra-low current 2.4 V precision analog temperature sensor</td>
<td>2.4-5.5</td>
<td>0.008</td>
</tr>
</tbody>
</table>

BENEFITS

- Small footprint
- High accuracy
- Dual alarm
- One-shot mode for energy saving
MEMS analog and digital microphones

Crystal-clear audio quality with the size, cost and volume production of MEMS sensors

MEMS microphones target all audio applications where small size, high sound quality, reliability and affordability are key requirements. ST’s MEMS microphones are designed, developed and manufactured inside ST, creating an industry-unique vertical integrated supply chain. Both analog- and digital-input as well as top and bottom port solutions are available. The IMP34DT05 intended for Industrial applications is part of the ST’s longevity program and will stay in production for ten years from the date of introduction.

**BENEFITS OF MEMS MICROPHONES**
- Enhanced performance
- High stability of sensitivity after reflow
- Very stable unit-to-unit performance
- Consolidated micromachining technology
- New applications enabled: stereo capture, noise cancellation, beam forming
- High shock resistance

**TARGETED APPLICATIONS**
- Mobile phones
- Laptops
- Phablets
- Smartphones
- Digital cameras and camcorders
- Gaming
- Portable media players
- Hands-free devices
- Tablets
- Hearing aids
- Headsets
- Smart watches
- Automotive (e-Calls)
- Industrial
- Health care
### DIGITAL MEMS MICROPHONES

<table>
<thead>
<tr>
<th>Part number</th>
<th>Top/bottom port</th>
<th>Package size (mm)</th>
<th>Supply Voltage (V)</th>
<th>SNR (dB)</th>
<th>Sensitivity (dBV)</th>
<th>AOP (dB spl)</th>
<th>Current consumption (µA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMP34DT05</td>
<td>Top</td>
<td>3 x 4 x 1</td>
<td>1.6 to 3.6</td>
<td>64</td>
<td>-26±3</td>
<td>122.5</td>
<td>650</td>
</tr>
<tr>
<td>MP34DT05-A</td>
<td>Top</td>
<td>3 x 4 x 1</td>
<td>1.6 to 3.6</td>
<td>64</td>
<td>-26±3</td>
<td>122.5</td>
<td>650</td>
</tr>
<tr>
<td>MP34DT06J</td>
<td>Top</td>
<td>3 x 4 x 1</td>
<td>1.6 to 3.6</td>
<td>64</td>
<td>-26±1</td>
<td>122.5</td>
<td>650</td>
</tr>
</tbody>
</table>

### ANALOG MEMS MICROPHONES

<table>
<thead>
<tr>
<th>Part number</th>
<th>Top/bottom port</th>
<th>Package size (mm)</th>
<th>Supply Voltage (V)</th>
<th>SNR (dB)</th>
<th>Sensitivity (dBV)</th>
<th>AOP (dB spl)</th>
<th>Current consumption (µA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP23ABS1</td>
<td>Bottom</td>
<td>3.5 x 2.65 x 0.98 (Metal)</td>
<td>1.52 to 3.6</td>
<td>64</td>
<td>-38</td>
<td>130</td>
<td>120</td>
</tr>
</tbody>
</table>
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-IKS01A2 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’s LSM6DSL3D accelerometer + 3D gyroscope, the LSM303AGR3D accelerometer and 3D magnetometer, the HTS221 humidity sensor and the LPS22HB pressure sensor. The board can also be used to evaluate other sensors by connecting the DIL24 adapters. The X-NUCLEO-IKS01A2 interfaces with the STM32 microcontroller via the I2C pin, and it is possible to change the default I2C port.

X-CUBE-MEMS-XT1 SOFTWARE EXPANSION

The sensor solution libraries included in the X-CUBE-MEMS-XT1 software expansion offer developers a useful tool to rapidly develop and evaluate application based on real-time data from ST’s MEMS sensors. Built on STM32Cube software technology for ease of portability across different STM32 microcontroller series, the expansion software package provides advanced motion libraries for microcontrollers based on ARM Cortex Nucleo-64 development boards with high-performance STM32F4 MCU or ultra-low-power STM32L0, STM32L1, STM32L4 MCU. X-CUBE-MEMS-XT1 includes also Low Level and High Level drivers, BSP layer for motion, temperature, humidity and pressure sensors.

To learn more and to download the X-CUBE-MEMS-XT1 Sensor and DSP algorithm expansion software pack for STM32, visit: https://www.st.com/embedded-software/x-cube-mems-xt1.html
MULTI-SENSOR, BLUETOOTH APPLICATION DEVELOPMENT PLATFORM

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.

DESIGN SUPPORT FOR NON- SAFETY AUTOMOTIVE AND INDUSTRIAL SENSORS

With an extensive expertise in sensor integration and the development of new applications, ST can assist customers in their design-in phase. ST’s evaluation kits and firmware allows a real-time evaluation of sensor performance in customer applications.

ST offers a complete evaluation solution including:

- A full set of DIL24 MEMS non-safety automotive and industrial adapters supporting fast prototyping
- eMotion motherboard compatible with all adapters and based on an STM32 microcontroller
- UNICO graphic user interface for direct and real-time access to the sensor outputs and configuration registers.
<table>
<thead>
<tr>
<th>Board</th>
<th>Description</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Motherboard</strong></td>
<td>ST MEMS motherboard is based on the high performance STM32F103 32-bit ARM Cortex™-M3 MCU Interfaces: USB connector and JTAG/SWD for debugging DFU-compatible for USB microprocessor firmware updates Compatible with all ST MEMS adapters</td>
<td>STEVAL-MKI099V2 STEVAL-MKI1099V3</td>
</tr>
<tr>
<td><strong>Adapter board</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LPS22HH</td>
<td>STEVAL-MKI192V1</td>
</tr>
<tr>
<td></td>
<td>LSM6DSO</td>
<td>STEVAL-MKI196V1</td>
</tr>
<tr>
<td></td>
<td>LPS22HB</td>
<td>STEVAL-MET001V1</td>
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<td>LIS344ALH</td>
<td>STEVAL-MKI001V1</td>
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<td>LIS331HHTR</td>
<td>STEVAL-MKI092V1</td>
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<td>LIS3DH</td>
<td>STEVAL-MKI095V1</td>
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<td></td>
<td>AIS328DQ</td>
<td>STEVAL-MKI110V1</td>
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<td></td>
<td>A3G4250D</td>
<td>STEVAL-MKI125V1</td>
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<td>LIS3DSH</td>
<td>STEVAL-MKI134V1</td>
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<td>LIS2DH</td>
<td>STEVAL-MKI135V1</td>
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<td>L3G020H</td>
<td>STEVAL-MKI136V1</td>
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<td></td>
<td>LIS3MDL</td>
<td>STEVAL-MKI137V1</td>
</tr>
<tr>
<td></td>
<td>HTS221</td>
<td>STEVAL-MKI141V2</td>
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<td>LPS25H</td>
<td>STEVAL-MKI142V1</td>
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<td>STEVAL-MKI151V1</td>
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<td>H3LIS331DL</td>
<td>STEVAL-MKI153V1</td>
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<td>AIS3624DQ</td>
<td>STEVAL-MKI158V1</td>
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<td></td>
<td>LSM9DS1</td>
<td>STEVAL-MKI159V1</td>
</tr>
<tr>
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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 STM32ODE: www.st.com/stm32ode
- 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))

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(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