GLOSSARY

Power supply (VDD): Operating DC power supply. Correct operation of a sensor using a power supply voltage outside of this range is not guaranteed. The other sensor parameters in the datasheet are provided at defined VDD, e.g. VDD = +2.5 V. It is recommended to keep VDD close to this value, with minimum ripple e.g. using an ultra-low-noise low-dropout regulator to power the accelerometer.

Supply current (Ipp): Average current consumption of a sensor in the given operating range. It varies depending on operating mode selected, sensor Output Data Rate (ODR) and VDD supply voltage.

Output Data Rate (ODR): Rate (in Hz) at which new sensor data are available to the user.

Output Data Rate (ODR): Rate (in Hz) at which new sensor data are available to the user.

VDD: This is the unit of accleration for accelerometers: 1 g is equal to 9.80665 m/s².

°/s or dps: This is the unit of angular rate for gyroscopes.

Gauss/ Tesla: This is the unit of measurement for magnetometers.

hPa and mbar: These are the units of measurement for atmospheric pressure sensors.

Full Scale (FS): It defines the range of acceleration values that can be measured. If the sensor is temporarily exposed to high levels out of the range, no damage in expected unless a critical value is applied. For ST accelerometers, the maximum value which does not result in permanent damage is 10000 g for 0.1 ms.

Turn-on time (tON): This parameter defines the time required before the MEMS sensor is ready to output measured sensor data after exiting power-down mode.

Bandwidth (BW): Bandwidth (in Hz) is the frequency range in which the MEMS sensor operates. Our sensors respond from DC to a user-definable upper cut-off frequency. The maximum bandwidth is determined by the mechanical resonant frequency of the sensor. Example: When ODR = 100 Hz, BW is typically 50 Hz with a built-in low-pass filter. The system recognizes any motion below 50 Hz. If the system has dynamic motion higher than 50 Hz, then the ODR needs to be increased to a higher setting to cover all useful system signals.

Resolution and Noise Density: Resolution (in mg) is the minimum detectable change in acceleration. The resolution is the acceleration noise density (in mg/√Hz) integrated over the equivalent noise bandwidth.

Sensitivity: Sensitivity (in 1LSB@g) also known as gain, is the output change per unit of input acceleration. This value changes with temperature (see sensitivity change vs. temperature in the datasheet) and also varies over time. The sensitivity tolerance describes the range of sensitivities of a large population of sensors.

Sensitivity change vs. Temperature (T): This parameter describes how the sensitivity of the sensors changes with temperature. For example, an accelerometer having a typical sensitivity value equal to 1 mg/LSB, at a ±2.0 g full-scale range, the sensitivity changes within ±0.01%/°C. Therefore, if the environmental temperature changes 10 °C, the sensitivity changes within ±0.01% * 10 °C = ±0.01%. This meets the sensitivity change over 10 °C, which means the sensitivity change over 40 °C is within ±0.04% and ±0.08%, which shows that the sensitivity is very stable versus temperature change. Thus, sensors are calibrated to maintain the sensitivity within ±0.01%, which is ±0.08% of the full-scale range.

Non Linearity: In % of FS: The sensors do not demonstrate a perfectly linear relationship between input acceleration and output value. This non-linearity is the maximum deviation of output voltage from the “best-fit line”, the straight line defined by linearity, expressed in percentage of Full-Scale Output.

Zero-g level (offset): (in mg) describes the actual output signal when no acceleration is applied. The lower, the better.

Cross-axis Sensitivity: It represents the output induced on an axis from the application of acceleration on a perpendicular one and it’s expressed as a percentage of the acceleration value. There are multiple cross-axis sensitivities: Xxy, Xxz, Xyx, Xyz, Zxx, Zyx, Zxy, zwy, zwy, zwy, zwy, zwy, zwy, zwy,要学会。
WHAT TYPES OF MEMS & SENSORS ARE IN ST’S PORTFOLIO?

**Accelerometers**

Accelerometers measure linear acceleration. ST’s MEMS accelerometers embed several useful features for motion and acceleration detection including full-blast, voltage, single/double tap recognition, activity/activity detection and ISO 26262. They can also be used to measure inclination or orientation. The output of ST’s MEMS accelerometers corresponds to [g], where 1 g equals 0.00980665 m/s² (standard gravity).

**Gyrosopes**

Gyroscopes measure angular velocity and are usually combined with an accelerometer in a common package to allow advanced algorithms like sensor fusion (for orientation estimation in 3D space). In this case we call them IMU (Inertial Modules) or more generally IMU (Inertial Measurement Unit, which can also contain a magnetometer). The output of ST’s MEMS gyroscopes corresponds to [°/s] (degrees per second).

**Magnetometers**

Magnetometers measure a magnetic field such as the Earth’s magnetic field. They can be packaged in combination with an accelerometer to allow tilt compensation in the application. Devices integrating both, a magnetometer and an accelerometer in one package are called e-Compasses. The output of ST’s magnetometers corresponds to [µT] (usually abbreviated as [G]) of [G].

**Atmospheric pressure sensors**

Pressure sensors measure absolute ambient pressure (also known as barometric pressure). They are commonly used for indoor navigation (and all possible user activities) or weather monitoring. The output of ST’s pressure sensors corresponds to [hPa].

**Humidity sensors**

ST’s humidity sensors integrate temperature and relative humidity sensors in the sensing element. Their outputs correspond to [°C] or [%RH].

**Temperature sensors**

ST’s portfolio includes analog and digital temperature sensors for measuring absolute ambient temperature. The voltage is directly proportional to the absolute pressure in the case of analog temperature sensors. The output of digital temperature sensors corresponds to [°C].

**Microphones**

MEMS microphones sense voice or soundstrokes. There are two types of microphones: Analog and Digital. Both types can be directly connected to a microcontroller (e.g. an STM32). ST’s MEMS microphones are available with either single-ended analog or PDM (digital) outputs.

![Image of MEMS & Sensors ecosystem](image1.png)

**MEMS SENSORS ECOSYSTEM**

- **Sensor/Tri-box** STW-5K80B00Y1
- **Evaluation board** STW-5N2/ROKA12A
- **STEVAL-MKI109V3**
- **X-NUCLEO-ROKA12A**

**DOWNLOAD NOW!**

- All-in-one software package facilitates the programming of the MEMS & Sensors ecosystem.
- Image view interface allows an easy experience without setting any single line of code.

**FIND THE SENSOR YOU NEED IN SECONDS WITH OUR NEW MOBILE APP**

- **ST SENSORS FINDER**
- **SensorTile.box**
- **STM32 Nucleo expansion**
- **STM32 Nucleo expansion**

**DONT’ GET LOST IN ST MEMS & SENSORS NAMING**

<table>
<thead>
<tr>
<th>I</th>
<th>S</th>
<th>M</th>
<th>3</th>
<th>D</th>
<th>H</th>
<th>C</th>
<th>X</th>
<th>T</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
</tr>
<tr>
<td>S</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
</tr>
<tr>
<td>M</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
</tr>
<tr>
<td>3</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
</tr>
<tr>
<td>D</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
</tr>
<tr>
<td>H</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
</tr>
<tr>
<td>C</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
</tr>
<tr>
<td>X</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
</tr>
<tr>
<td>T</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
</tr>
<tr>
<td>R</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
<td>Linear Load Sensor</td>
</tr>
</tbody>
</table>

**DOWNLOAD NOW!**

- All-in-one software package facilitates the programming of the MEMS & Sensors ecosystem.
- Image view interface allows an easy experience without setting any single line of code.

**WHAT TYPES OF MEMS & SENSORS ARE IN ST’S PORTFOLIO?**

- **Accelerometers**
- **Gyrosopes**
- **Magnetometers**
- **Atmospheric pressure sensors**
- **Humidity sensors**
- **Temperature sensors**
- **Microphones**