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# **Adafruit LSM9DS1 Library Documentation**

***Release 1.0***

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CircuitPython module for the LSM9DS1 accelerometer, magnetometer, gyroscope.



# CHAPTER 1

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## Dependencies

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This driver depends on:

- [Adafruit CircuitPython](#)
- [Bus Device](#)

Please ensure all dependencies are available on the CircuitPython filesystem. This is easily achieved by downloading the [Adafruit library and driver bundle](#).





## CHAPTER 2

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### Usage Example

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See `examples/lsm9ds1_simpletest.py` for a demo of the usage.



## CHAPTER 3

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### Contributing

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Contributions are welcome! Please read our [Code of Conduct](#) before contributing to help this project stay welcoming.



## CHAPTER 4

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### Building locally

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To build this library locally you'll need to install the `circuitpython-build-tools` package.

```
python3 -m venv .env
source .env/bin/activate
pip install circuitpython-build-tools
```

Once installed, make sure you are in the virtual environment:

```
source .env/bin/activate
```

Then run the build:

```
circuitpython-build-bundles --filename_prefix adafruit-circuitpython-lsm9ds1 --
↳library_location .
```

### 4.1 Sphinx documentation

Sphinx is used to build the documentation based on rST files and comments in the code. First, install dependencies (feel free to reuse the virtual environment from above):

```
python3 -m venv .env
source .env/bin/activate
pip install Sphinx sphinx-rtd-theme
```

Now, once you have the virtual environment activated:

```
cd docs
sphinx-build -E -W -b html . _build/html
```

This will output the documentation to `docs/_build/html`. Open the `index.html` in your browser to view them. It will also (due to `-W`) error out on any warning like Travis will. This is a good way to locally verify it will pass.



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## Table of Contents

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### 5.1 Simple test

Ensure your device works with this simple test.

Listing 1: examples/lsm9ds1\_simpletest.py

```
1  # Simple demo of the LSM9DS1 accelerometer, magnetometer, gyroscope.
2  # Will print the acceleration, magnetometer, and gyroscope values every second.
3  import time
4
5  import board
6  import busio
7  # import digitalio # Use when connected over SPI
8
9  import adafruit_lsm9ds1
10
11
12  # You have a couple options for wiring this sensor, either I2C (recommended)
13  # or a SPI connection. Choose _one_ option below and uncomment it:
14
15  # I2C connection:
16  i2c = busio.I2C(board.SCL, board.SDA)
17  sensor = adafruit_lsm9ds1.LSM9DS1_I2C(i2c)
18
19  # SPI connection:
20  #spi = busio.SPI(board.SCK, MOSI=board.MOSI, MISO=board.MISO)
21  #xgcs = digitalio.DigitalInOut(board.D5) # Pin connected to XGCS (accel/gyro chip_
22  ↪select).
23  #mcs = digitalio.DigitalInOut(board.D6) # Pin connected to MCS (magnetometer chip_
24  ↪select).
25  #sensor = adafruit_lsm9ds1.LSM9DS1_SPI(spi, xgcs, mcs)
26
27  # Main loop will read the acceleration, magnetometer, gyroscope, Temperature
```

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```

26 # values every second and print them out.
27 while True:
28     # Read acceleration, magnetometer, gyroscope, temperature.
29     accel_x, accel_y, accel_z = sensor.accelerometer
30     mag_x, mag_y, mag_z = sensor.magnetometer
31     gyro_x, gyro_y, gyro_z = sensor.gyroscope
32     temp = sensor.temperature
33     # Print values.
34     print('Acceleration (m/s^2): ({0:0.3f},{1:0.3f},{2:0.3f})'.format(accel_x, accel_
↪y, accel_z))
35     print('Magnetometer (gauss): ({0:0.3f},{1:0.3f},{2:0.3f})'.format(mag_x, mag_y,
↪mag_z))
36     print('Gyroscope (degrees/sec): ({0:0.3f},{1:0.3f},{2:0.3f})'.format(gyro_x, gyro_
↪y, gyro_z))
37     print('Temperature: {0:0.3f}C'.format(temp))
38     # Delay for a second.
39     time.sleep(1.0)

```

## 5.2 adafruit\_lsm9ds1

CircuitPython module for the LSM9DS1 accelerometer, magnetometer, gyroscope. Based on the driver from: [https://github.com/adafruit/Adafruit\\_LSM9DS1](https://github.com/adafruit/Adafruit_LSM9DS1)

See examples/simpletest.py for a demo of the usage.

- Author(s): Tony DiCola

### 5.2.1 Implementation Notes

#### Hardware:

- Adafruit 9-DOF Accel/Mag/Gyro+Temp Breakout Board - LSM9DS1 (Product ID: 3387)

#### Software and Dependencies:

- Adafruit CircuitPython firmware for the ESP8622 and M0-based boards: <https://github.com/adafruit/circuitpython/releases>
- Adafruit's Bus Device library: [https://github.com/adafruit/Adafruit\\_CircuitPython\\_BusDevice](https://github.com/adafruit/Adafruit_CircuitPython_BusDevice)

**class** adafruit\_lsm9ds1.LSM9DS1

Driver for the LSM9DS1 accelerometer, magnetometer, gyroscope.

#### accel\_range

The accelerometer range. Must be a value of: - ACCELRange\_2G - ACCELRange\_4G - ACCELRange\_8G - ACCELRange\_16G

#### accelerometer

The accelerometer X, Y, Z axis values as a 3-tuple of m/s^2 values.

#### gyro\_scale

The gyroscope scale. Must be a value of: - GYROScale\_245DPS - GYROScale\_500DPS - GYROScale\_2000DPS

#### gyroscope

The gyroscope X, Y, Z axis values as a 3-tuple of degrees/second values.



**mag\_gain**

The magnetometer gain. Must be a value of: - MAGGAIN\_4GAUSS - MAGGAIN\_8GAUSS - MAGGAIN\_12GAUSS - MAGGAIN\_16GAUSS

**magnetometer**

The magnetometer X, Y, Z axis values as a 3-tuple of gauss values.

**read\_accel\_raw()**

Read the raw accelerometer sensor values and return it as a 3-tuple of X, Y, Z axis values that are 16-bit unsigned values. If you want the acceleration in nice units you probably want to use the accelerometer property!

**read\_gyro\_raw()**

Read the raw gyroscope sensor values and return it as a 3-tuple of X, Y, Z axis values that are 16-bit unsigned values. If you want the gyroscope in nice units you probably want to use the gyroscope property!

**read\_mag\_raw()**

Read the raw magnetometer sensor values and return it as a 3-tuple of X, Y, Z axis values that are 16-bit unsigned values. If you want the magnetometer in nice units you probably want to use the magnetometer property!

**read\_temp\_raw()**

Read the raw temperature sensor value and return it as a 12-bit signed value. If you want the temperature in nice units you probably want to use the temperature property!

**temperature**

The temperature of the sensor in degrees Celsius.

**class** adafruit\_lsm9ds1.**LSM9DS1\_I2C**(*i2c*)

Driver for the LSM9DS1 connect over I2C.

**class** adafruit\_lsm9ds1.**LSM9DS1\_SPI**(*spi, xgcs, mcs*)

Driver for the LSM9DS1 connect over SPI.



## CHAPTER 6

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