

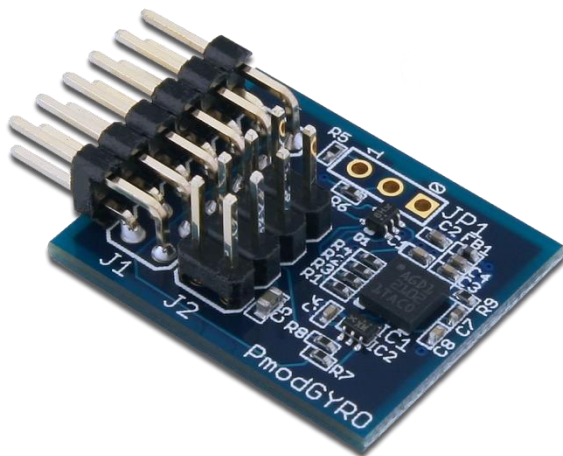
## PmodGYRO™ Reference Manual

Revised April 12, 2016

This manual applies to the PmodGYRO rev. A

### Overview

The PmodGYRO is a 3-axis gyroscope powered by the STMicroelectronics L3G4200D. By communicating with the chip through SPI or I<sup>2</sup>C, users may configure the module to report angular momentum at a resolution of up to 2000 dps at an output rate up to 800Hz.



The PmodGYRO.

Features include:

- 3-axis MEMS digital gyroscope with high shock survivability
- Get angular momentum data with user selectable resolution (250/500/2000dps)
- Two customizable interrupt pins
- User configurable signal filtering
- Power-down and Sleep modes
- Small PCB size for flexible designs 1.0 in × 0.8 in (2.5 cm × 2.0 cm)
- 12-pin Pmod port with SPI interface and additional I<sup>2</sup>C interface
- Library and example code available in [resource center](#)

## 1 Functional Description

The PmodGYRO utilizes [ST L3G4200D gyroscope](#) to provide motion sensing data on each of the three Cartesian axes. Users may configure both the resolution and filtering options for the measured data.

## 2 Interfacing with the Pmod

The PmodGYRO communicates with the host board via the SPI or I<sup>2</sup>C protocols. By driving the Chip Select (CS) line to a logic low voltage state, SPI mode is enabled. The first byte sent over SPI informs the on-board chip if a read or write command is going to be issued, if the register address should be incremented after a particular command has been completed, and the 5 bit address of the register that is to be written to.

An example timing diagram for SPI read and writes from the L3G4200D datasheet is provided below:

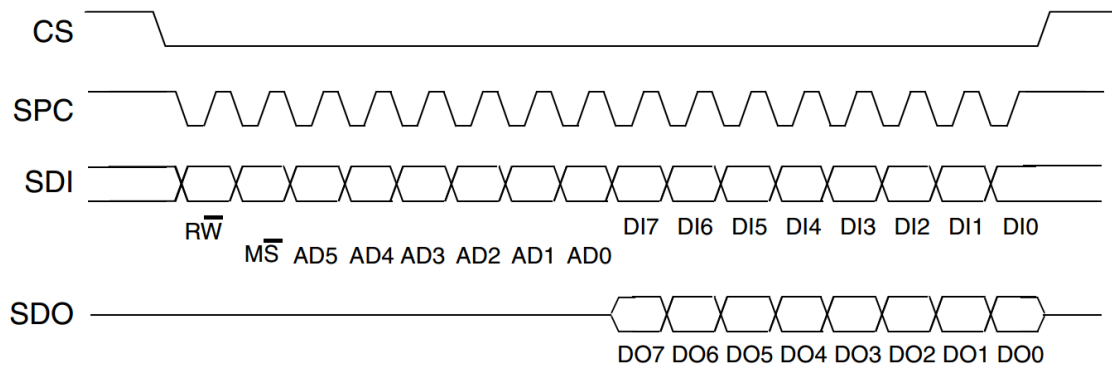


Figure 1. Timing diagram.

Correspondingly, if the CS line is left at a high voltage state by an internal pull-up resistor, the I<sup>2</sup>C mode of the PmodGYRO is enabled. The on-board chip has two possible slave address in the form of 110100x where x is the voltage state of the Master-In-Slave-Out (MISO) pin on the SPI header. After the slave address and the read or write bit has been transmitted and the message was acknowledged, a 7-bit register address can then be transmitted. The most significant bit (the first bit of the 8-bit of the transfer) indicates if multiple bytes of information are to be transferred.

An example transfer scheme for a master device reading multiple bytes of data from the PmodGYRO is provided below:

| Master                              | Slave |
|-------------------------------------|-------|
| Start                               |       |
| Slave address and Write bit         |       |
|                                     | ACK   |
| Multi-byte bit and register address |       |
|                                     | ACK   |
| Restart                             |       |
| Slave address and read bit          |       |
|                                     | ACK   |
|                                     | Data  |
| ACK                                 |       |
|                                     | Data  |
| ACK                                 |       |
|                                     | Data  |
| NACK                                |       |
| Stop                                |       |

Table 1. Example transfer scheme.

Data is recorded and stored within the registers of the L3G4200D in degrees per second (dps). Correspondingly, a measured value of 360 dps is equivalent to 60 rpm. Users can retrieve data from the PmodGYRO by following the provided code example.

## 2.1 Pinout Description Table

| Header J1 |        |                              |     |        |                              | Header J2 |        |                              |
|-----------|--------|------------------------------|-----|--------|------------------------------|-----------|--------|------------------------------|
| Pin       | Signal | Description                  | Pin | Signal | Description                  | Pin       | Signal | Description                  |
| 1         | ~CS    | Chip Select                  | 7   | INT1   | Interrupt 1                  | 1, 5      | SCL    | Serial Clock                 |
| 2         | MOSI   | Master-Out-Slave-In          | 8   | INT2   | Interrupt 2                  | 2, 6      | SDA    | Serial Data                  |
| 3         | MISO   | Master-In-Slave-Out          | 9   | (NC)   | Not Connected                | 3, 7      | GND    | Power Supply Ground          |
| 4         | SCLK   | Serial Clock                 | 10  | (NC)   | Not Connected                | 4, 8      | VCC    | Positive Power Supply (3.3V) |
| 5         | GND    | Power Supply Ground          | 11  | GND    | Power Supply Ground          |           |        |                              |
| 6         | VCC    | Positive Power Supply (3.3V) | 12  | VCC    | Positive Power Supply (3.3V) |           |        |                              |

Table 2. Pinout description table.

Any external power applied to the PmodGYRO must be within 2.4V and 3.6V; however, it is recommended that Pmod is operated at 3.3V.

## 3 Physical Dimensions

The pins on the pin header are spaced 100 mil apart. The PCB is 1 inch long on the sides parallel to the pins on the pin header and 0.8 inches long on the sides perpendicular to the pin header.



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