Gyroscope & Accelerometer Module

BMS56M605
User Guide

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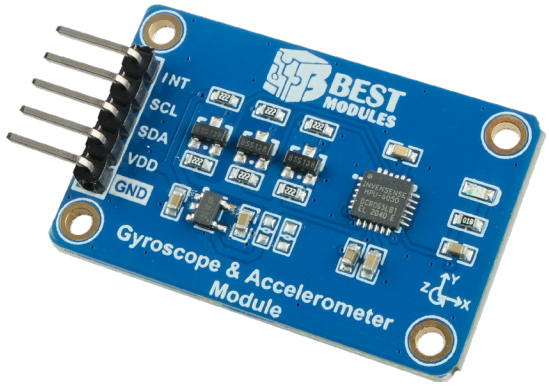
www.bestmodulescorp.com

Contents

Introduction

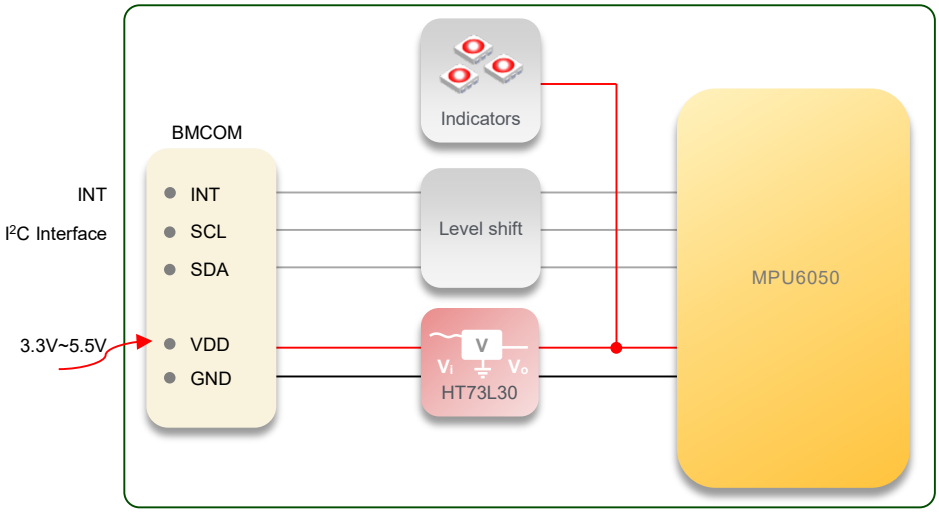
The Best Modules BMS56M605 is a gyroscope and accelerometer module, which is developed by using the MPU6050 sensor. The module integrates a 3-axis gyroscope sensor and a 3-axis acceleration sensor, which can determine the object precise position in 3D space or track the object motion state. The measurement range is user programmable. The gyroscope and accelerometer each adopts multiple 16-bit A/D converters for digitizing the measured analog outputs. The module includes a level shift circuit to support wide-range voltage applications. The module can use I²C communication mode through BMCOM interface to read the gyroscope value, acceleration value and other functions. The module is suitable for use in motion sensing games, augmented reality, electronic image stabilization, navigation devices, handheld gaming and other products.



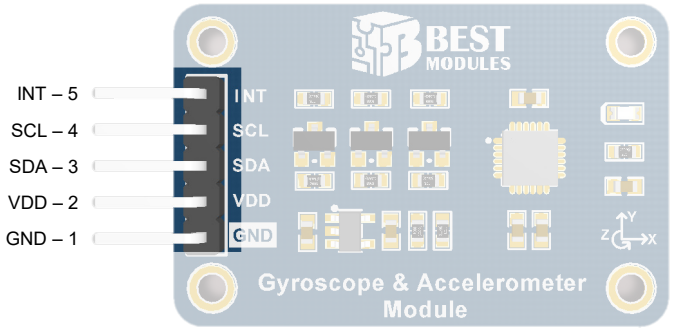
Features

- Operating voltage: 3.3V~5.5V
- Standby current: 5μA
- Sensor: MPU6050
- Gyroscope features:
  - Operating current: 3.6mA
  - Integrated 16-bit ADCs for simultaneous sampling of 3-axis gyroscopes, digital-output X-, Y- and Z-axis angular velocities
  - User-programmable full-scale range of ±250, ±500, ±1000 and ±2000°/sec
- Accelerometer features
  - Operating current: 500μA
  - Integrated 16-bit ADCs for simultaneous sampling of 3-axis accelerometers, digital-output X-, Y- and Z-axis accelerations
  - User-programmable full-scale range of ±2g, ±4g, ±8g and ±16g
  - Multiple interrupt sources (user-programmable): Free fall interrupt, zero motion interrupt and motion interrupt
- Flexible level shift circuit
- Communication interface:
  - BMCOM×1 (INT, SCL, SDA, VDD, GND)
  - Communication mode: I²C (address: default 0x68)
- Provide Arduino Library support
- Module size: 36mm×23.3mm×7.4mm

Block Diagram



Pin Description



BMCOM Pin:

Pin	Function	Description
1	GND	Negative power supply, ground
2	VDD	Positive power supply
3	SDA	I²C data line
4	SCL	I²C clock line
5	INT	Interrupt pin, for interrupt alarm

Technical Specification

Recommended Operating Conditions

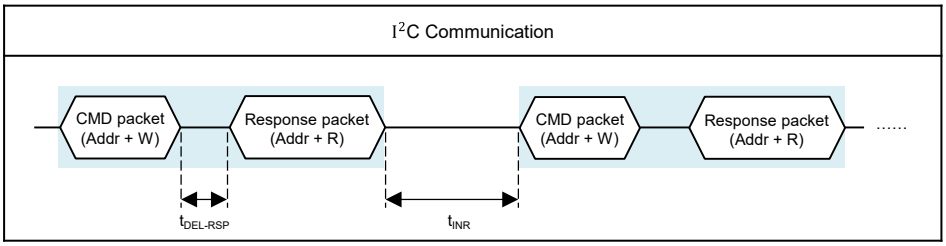
Ta=25°C

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{DD}	Operating Voltage	—	3.3	—	5.5	V
I_{DD}	Operating Current	Gyroscope	—	3.6	—	mA
		Accelerometer	—	500	—	μA
I_{STB}	Standby Current	Gyroscope/Accelerometer	—	5	—	μA
—	ADC Word Length	Gyroscope/Accelerometer	—	16	—	bits
—	Full-scale Range	Gyroscope	±250	—	±2000	°/S
		Accelerometer	±2	—	±16	g
—	Sensitivity	Gyroscope	16.4	—	131	LSB/(°/S)
		Accelerometer	2048	—	16384	LSB/g
—	Output Data Rate	Gyroscope	4	—	8000	Hz
		Accelerometer	4	—	1000	Hz

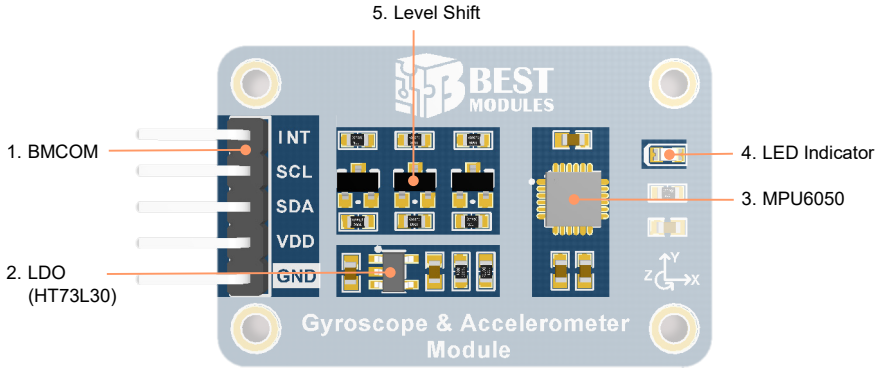
Timing Specification

Ta=25°C

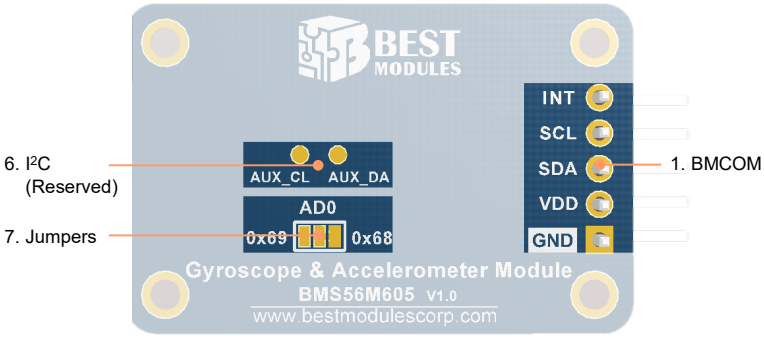
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$t_{DEL-RSP}$	Response Delay Time	V_{DD}=5V	30	—	—	μs
t_{INR}	Interval Time	V_{DD}=5V	1.3	—	—	μs



Hardware Overview

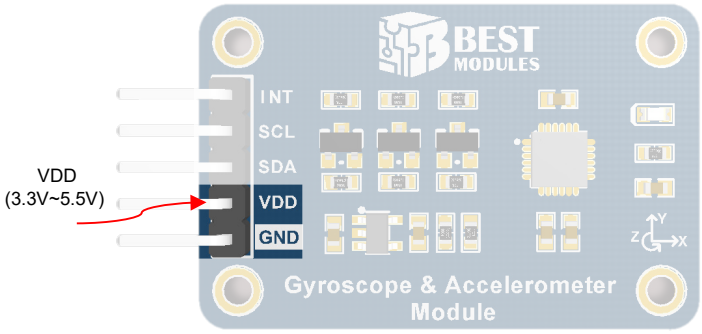


PCBA Front View



PCBA Back View

Power Supply



- BMCOM Pin: Enter 3.3V~5.5V through VDD

INT Pin

- Interrupt pin, for interrupt alarm
- Interrupt pin polarity can be set: high level active or low level active
- Interrupt alarm:
  - Multiple interrupt sources (user-programmable): Free fall interrupt, zero motion interrupt and motion interrupt
  - Trigger conditions: Each interrupt source can set the corresponding threshold for triggering and the duration

LED Indicator

- Power supply indicator

Sensor MPU6050

- 1024-byte FIFO buffer
- Product transmission can be through I²C interface up to 400kHz
- Integrated 16-bit ADCs for simultaneous sampling of 3-axis gyroscopes, digital-output X-, Y- and Z-axis angular velocities with a user-programmable full-scale range of ±250, ±500, ±1000 and ±2000°/sec
- Integrated 16-bit ADCs for simultaneous sampling of 3-axis accelerometers, digital-output X-, Y- and Z-axis accelerations with a user-programmable full-scale range of ±2g, ±4g, ±8g and ±16g
- Reliable low-frequency noise performance
- Digital programmable low-pass filter

Communication Interface

- Communication mode: I²C
- I²C address: default 0x68
  I²C address format:

MSB LSB

A6	A5	A4	A3	A2	A1	A0	R/W
1	1	0	1	0	0	0	

Slave address(0x68)

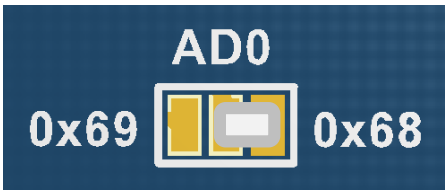
Note: R/W=1: Read
=0: Write

- I²C communication rate: 100kHz~400kHz
- Communication logic reference voltage: 3.3V~5.5V
- The SCL/SDA pin of the module with 10kΩ pull-high resistor
- Communication protocol:
  - Refer to the MPU6050 datasheet

Jumpers

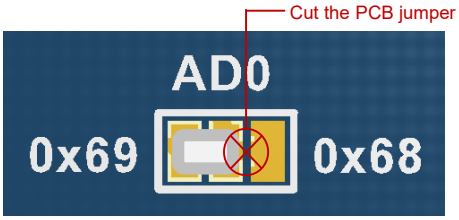
- I²C address selection:

Jumper		I²C Address
AD0-0x68	AD0-0x69	
Short circuit	Open circuit	0x68 (Factory default)
Open circuit	Short circuit	0x69



Addr = 0x68

Apply a jumper to the right, address: 0x68



Addr = 0x69

Apply a jumper to the left, address: 0x69

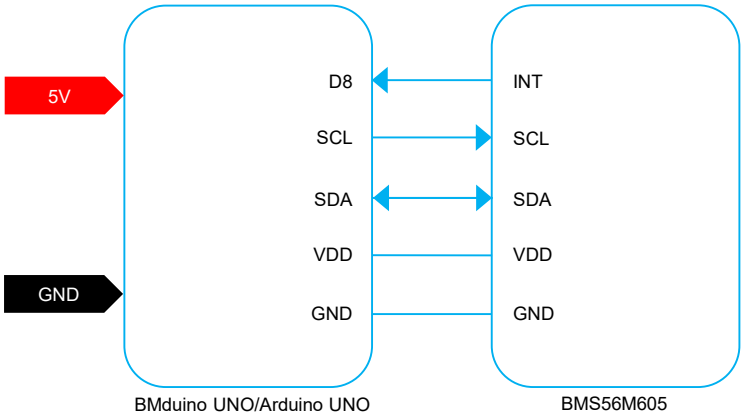
The module defaults to connect AD0 to 0x68, the I²C address defaults to 0x68. When users need to switch the address to 0x69, they should cut the PCB jumper that connects AD0 to 0x68, then apply the jumper to the 0x69.

Backup I²C Interface

- Backup I²C communication interface can be used to communicate with external sensors, such as magnetometers

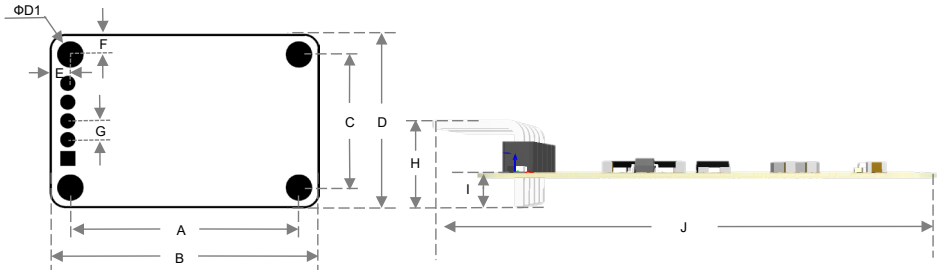
AUX_CL: I²C Clock Line
AUX_DA: I²C Data Line

Application Circuit



Connection Diagram

Dimensions



Dimension Information

No. \ Unit	mm	inch
A	30.70	1.209
B	36.00	1.417
C	18.00	0.709
D	23.30	0.917
E	2.76	0.109
F	2.80	0.110
G	2.54	0.100
H	7.40	0.291
I	1.40	0.055
J	40.90	1.610
D1	2.20	0.087

Dimension List