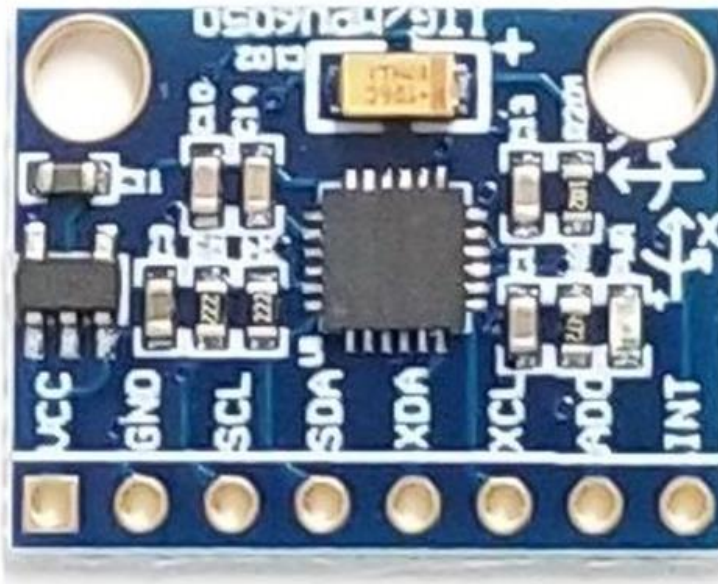


EPT-M6050-BD-S8 Gyro-Accel Breakout Board

EPT-M6050-BD-S8

MPU 6050 Break Out Board

Data Sheet



This breakout board is based on the MPU-6050 3-axis gyroscope and a 3-axis accelerometer on the same silicon die together with an onboard Digital Motion Processor (DMP) capable of processing complex 9-axis MotionFusion algorithms. The parts' integrated 9-axis MotionFusion algorithms access external magnetometers or other sensors through an auxiliary master I2C bus, allowing the devices to gather a full set of sensor data without intervention from the system processor.



## EPT-M6050-BD-S8 Gyro-Accel Breakout Board

The 6 Dof sensor breakout integrate with the MPU6050 sensor and the low noise 3.3v regulator and pull-up resistors for the I2C bus. So it's available to directly hook up the sensor with the Arduino processors for your robotics, HCI and wearable projects. With the Arduino library from i2cdevlib it's easy for you to drive this sensor and get the pitch,roll,yaw, quaternion,euler data.

### **Hardware Features:**

- Small form factor, 14 x 21mm(0.55x0.83")
- Compatible with +3.3V or +5V interface
- On board +3.3V regulator
- Power LED
- I2C address selection
- Simple common pinout with other Arduino style sensors
- Bread Board compatible

## 1 Description

The EPT-M6050-BD-S8 is compatible with the following Arduino Boards:

- Uno
- Genuino 101
- Ardudino 101
- Zero
- Yun
- Leonardo
- Pro

### **1.1 Hardware Description**

The MPU-6050 Breakout Board consists of the following hardware



## EPT-M6050-BD-S8 Gyro-Accel Breakout Board

- I2C Digital-output of 6 or 9-axis MotionFusion data in rotation matrix, quaternion, Euler Angle, or raw data format
- Tri-Axis angular rate sensor (gyro) with a sensitivity up to 131 LSBs/dps and a full-scale range of  $\pm 250$ ,  $\pm 500$ ,  $\pm 1000$ , and  $\pm 2000$ dps
- Tri-Axis accelerometer with a programmable full scale range of  $\pm 2g$ ,  $\pm 4g$ ,  $\pm 8g$  and  $\pm 16g$
- Digital Motion Processing (DMP) engine offloads complex MotionFusion, sensor timing synchronization and gesture detection
- Embedded algorithms for run-time bias and compass calibration. No user intervention required

### 1.2 6 DOF Sensor

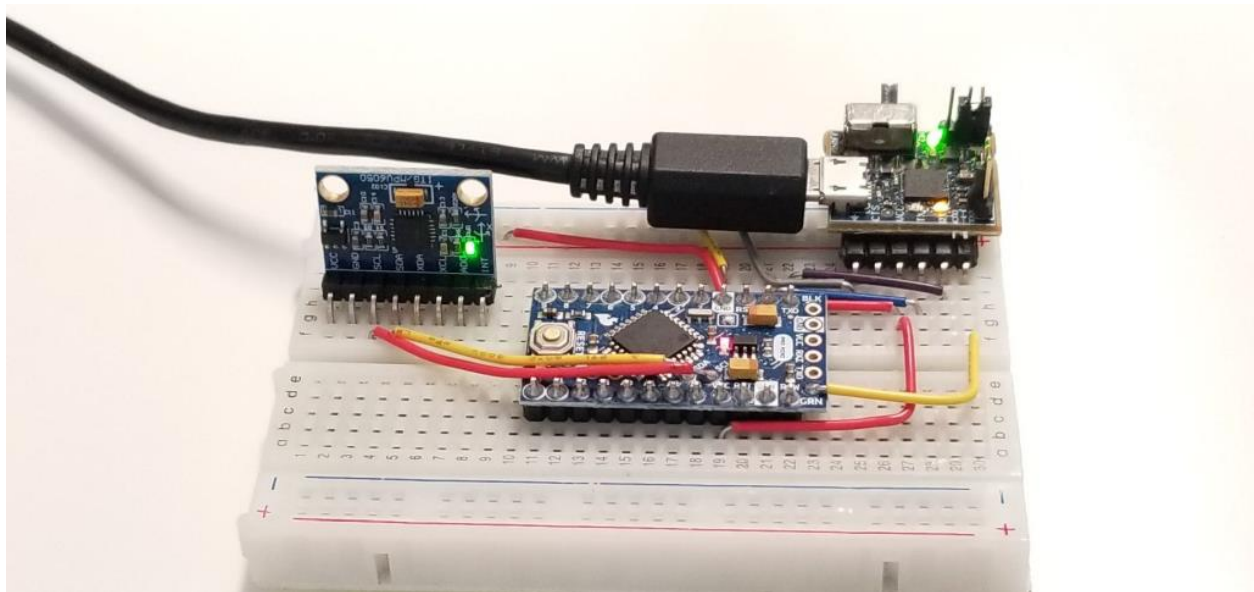
The MPU-6000™ family provides the world's first integrated 6-axis MotionProcessing™ solution that eliminates the package-level gyro/accel cross-axis misalignment associated with discrete solutions. The devices combine a 3-axis gyroscope and a 3-axis accelerometer on the same silicon die together with an onboard Digital Motion Processor™ (DMP™) capable of processing complex 9-axis MotionFusion algorithms. The parts' integrated 9-axis MotionFusion algorithms access external magnetometers or other sensors through an auxiliary master I2C bus, allowing the devices to gather a full set of sensor data without intervention from the system processor. The devices are offered in the same 4x4x0.9 mm QFN footprint and pinout as the current MPU-3000™ family of integrated 3-axis gyroscopes, providing a simple upgrade path and making it easy to fit on space constrained boards.

### 1.3 Overview

- The MPU-60X0 is comprised of the following key blocks and functions:
- Three-axis MEMS rate gyroscope sensor with 16-bit ADCs and signal conditioning
- Three-axis MEMS accelerometer sensor with 16-bit ADCs and signal conditioning
- Digital Motion Processor (DMP) engine
- Primary I2C and SPI (MPU-6000 only) serial communications interfaces
- Auxiliary I2C serial interface for 3rd party magnetometer & other sensors
- Clocking
- Sensor Data Registers
- FIFO

## EPT-M6050-BD-S8 Gyro-Accel Breakout Board

- Interrupts
- Digital-Output Temperature Sensor
- Gyroscope & Accelerometer Self-test
- Bias and LDO
- Charge Pump



### 1.4 I2C Bus

The daughter board has built-in 4.7 k $\Omega$  pull up resistors for I2C communications. If connecting multiple I2C devices on the same bus, ensure that the pull-up resistors for one or more boards is disabled. If multiple pull-up resistors are connected in parallel on the I2C bus, the combined resistance will be lower than the 4.7 k $\Omega$ . This could cause failure in the I2C transactions as the master will be required to the bus with more current than it is designed for.

### 1.5 Serial Bus Address

To communicate with the MPU-6050, the master must first address slave devices via a slave address byte. The slave address byte consists of seven address bits, and a direction bit indicating the intent of executing a read or write operation. The EPT-M6050-BD-S8 board features an



## EPT-M6050-BD-S8 Gyro-Accel Breakout Board

address pin to allow up to two devices to be addressed on a single bus.

The MPU-60X0 always operates as a slave device when communicating to the system processor, which thus acts as the master. SDA and SCL lines typically need pull-up resistors to VDD. The maximum bus speed is 400 kHz.

The slave address of the MPU-60X0 is b110100X which is 7 bits long. The LSB bit of the 7 bit address is determined by the logic level on pin AD0. This allows two MPU-60X0s to be connected to the same I2C bus.

When used in this configuration, the address of the one of the devices should be b1101000 (pin AD0 is logic low) and the address of the other should be b1101001 (pin AD0 is logic high).

### 1.6 Configuration variables

- address (Optional, int): Manually specify the I<sup>2</sup>C address of the sensor. Defaults to 0x68.
- accel\_x (Optional): Use the X-Axis of the Accelerometer. All options from Sensor.
- accel\_y (Optional): Use the Y-Axis of the Accelerometer. All options from Sensor.
- accel\_z (Optional): Use the Z-Axis of the Accelerometer. All options from Sensor.
- gyro\_x (Optional): Use the X-Axis of the Gyroscope. All options from Sensor.
- gyro\_y (Optional): Use the Y-Axis of the Gyroscope. All options from Sensor.
- gyro\_z (Optional): Use the Z-Axis of the Gyroscope. All options from Sensor.
- temperature (Optional): Use the internal temperature of the sensor. All options from Sensor.
- update\_interval (Optional, Time): The interval to check the sensor. Defaults to 60s.
- id (Optional, ID): Manually specify the ID used for code generation.

### 1.7 Sensor Data Registers

The sensor data registers contain the latest gyro, accelerometer, auxiliary sensor, and temperature measurement data. They are read-only registers, and are accessed via the serial interface. Data from these registers may be read anytime. However, the interrupt function may be used to determine when new data is available.

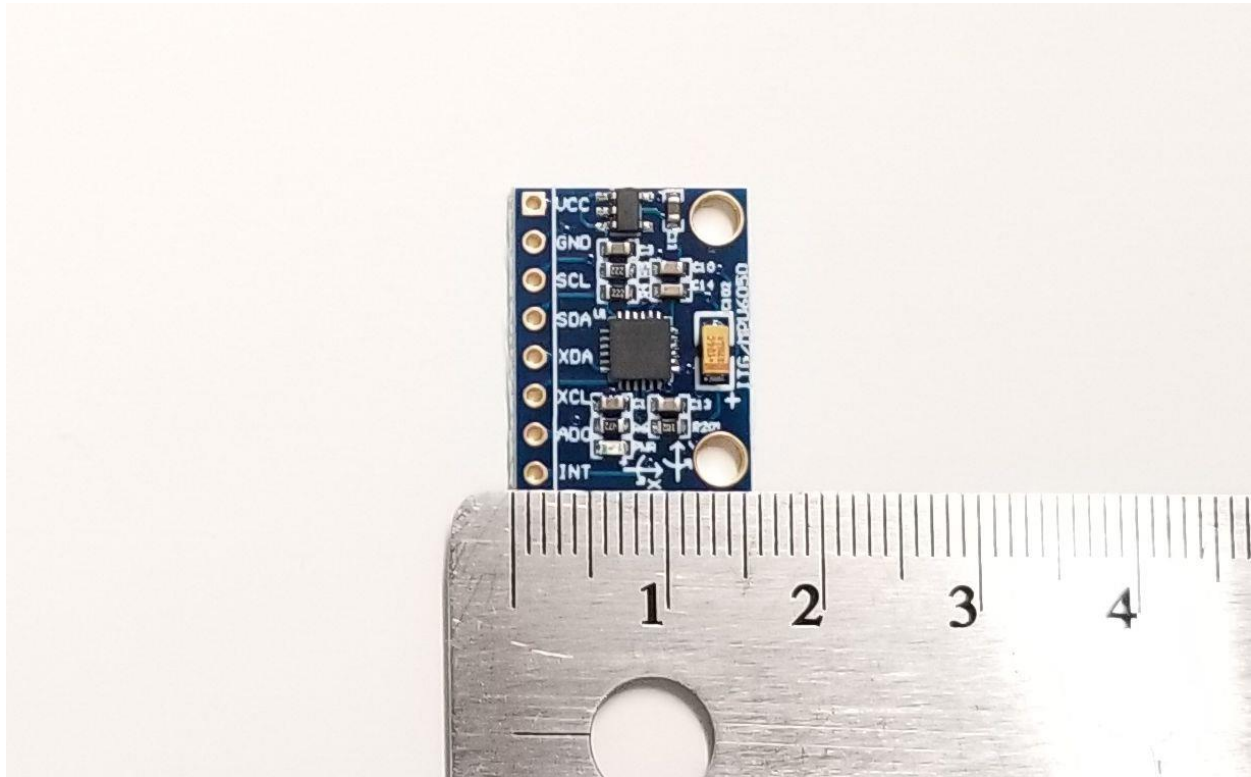


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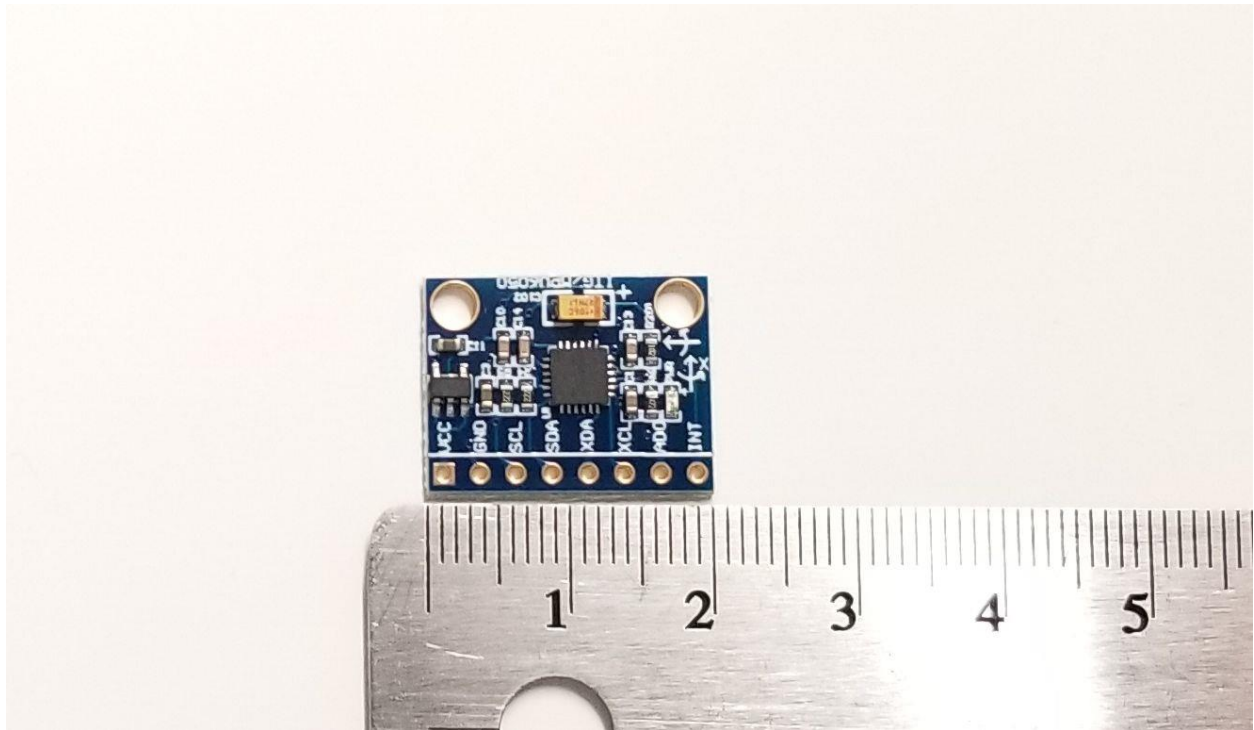
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## 2 Mechanical Dimensions



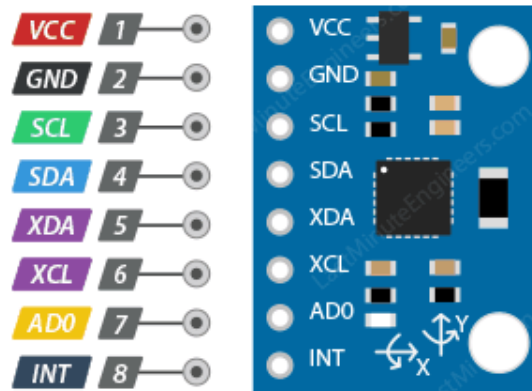


EPT-M6050-BD-S8 Gyro-Accel Breakout Board



### 3 Pin Mapping

## EPT-M6050-BD-S8 Gyro-Accel Breakout Board



EPT-M6050-BD-S8 Pin Mapping

## 4 Inputs/Outputs

The MPU-6050 I/O pins are compatible with either +3.3V or +5V. The MPU-6050 is powered from the +3.3V provided by the Arduino on pin 4 of J1. Because the SDA and SCL signals are open drain, due to I2C specification, they can be pulled up to either +3.3V or +5V. The EPT-MPU-6050 has no problem recognizing either voltage on its I2C bus. The user LED on the EPT-M6050-BD-S8 is a current sink, so either float the signal to turn it off or assert to ground to turn the LED on.





## EPT-M6050-BD-S8 Gyro-Accel Breakout Board

### 4.1.1 Power Budget

<b>Device</b>	<b>Part Number</b>	<b>+5V</b>	<b>+3.3V</b>		
Gyro/Accelerometer Sensor	MPU-6050		1mA		
Power LED		6mA			
<b>Total</b>		<b>6mA</b>	<b>1mA</b>		