GENERAL DESCRIPTION

The MC3635 is an ultra-low power, low-noise, integrated digital output 3-axis accelerometer with a feature set optimized for wearables and consumer product motion sensing. Applications include wearable consumer products, IoT devices, user interface control, gaming motion input, electronic compass tilt compensation for cell phones, game controllers, remote controls and portable media products.

Low noise and low power are inherent in the monolithic fabrication approach, where the MEMS accelerometer is integrated in a single-chip with the electronics integrated circuit.

In the MC3635 the internal sample rate can be set from 14 to 1300 samples / second. Specific tap or sample acquisition conditions can trigger an interrupt to a remote MCU. Alternatively, the device supports the reading of sample and event status via polling.

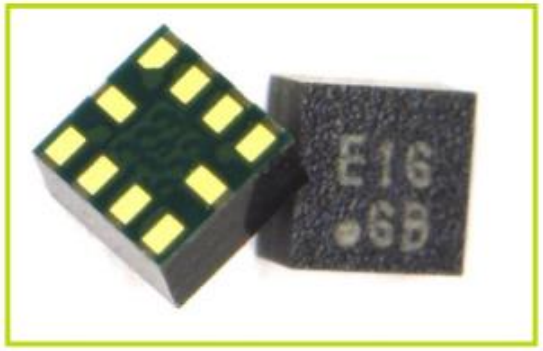
MC3635 FEATURES

Range, Sampling & Power

- ±2, 4, 8, 12 or 16g ranges
- 8, 10 or 12-bit resolution with FIFO
  - 14-bit single samples
- Sample rate 14 - 1300 samples/sec
  - Sample trigger via internal oscillator, clock pin or software command
- Sniff and Wake modes
  - 0.4 µA Sniff current @ 6Hz
  - Separate or combined sniff/wake
- Ultra-Low Power with 32 sample FIFO
  - 0.9 µA typical current @ 25Hz
  - 1.6 µA typical current @ 50Hz
  - 2.8 µA typical current @ 100Hz
  - 36 µA typical current @ 1300Hz

Simple System Integration

- I2C interface, up to 1 MHz
- SPI Interface, up to 8 MHz
- 1.6 × 1.6 × 0.94 mm 10-pin package
- Single-chip 3D silicon MEMS
- Low noise to 2.3mgRMS



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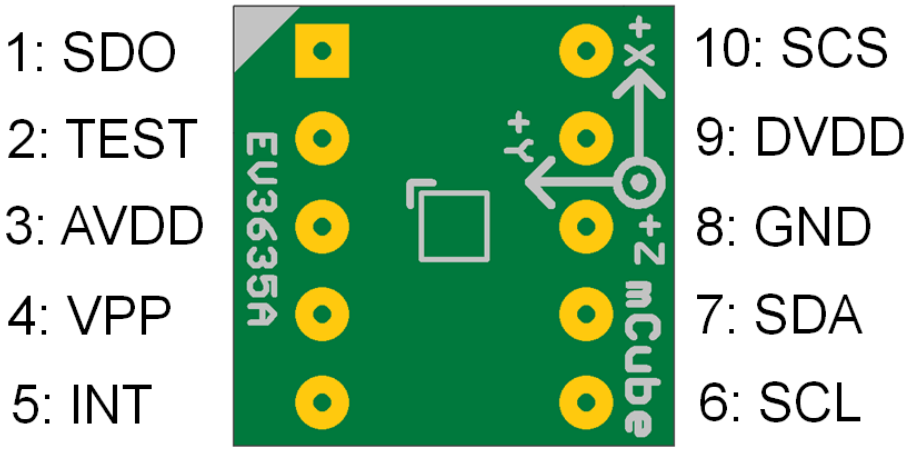
1 GENERAL OPERATION

1.1 PINOUTS



1.2 POWER PINS

- **DVDD** – 3.3V Power Supply Input
- **GND** – Ground Pin for Power and Logic
- **R7**: The current drawn the sensor can be measured by putting an ammeter in place of R7.

1.3 I2C PINS

- Connect the **SCL** (I2C clock pin) to your microcontroller's I2C clock line.
- Connect the **SDA** (I2C data pin) to your microcontroller's I2C data line.

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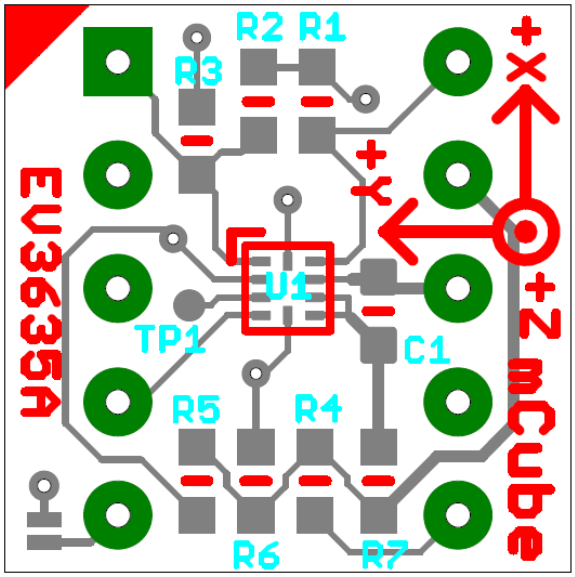

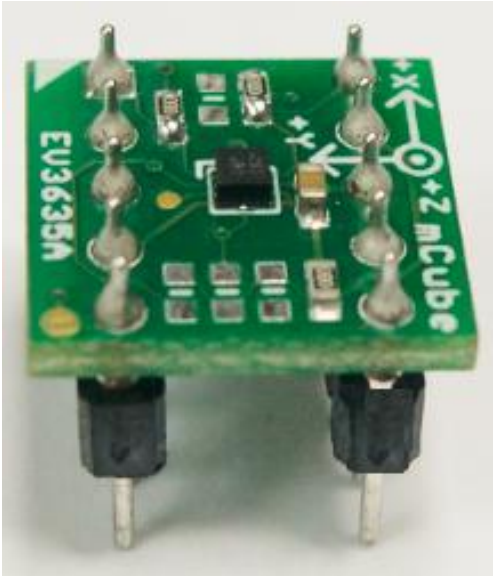

R4, R5: If using I2C and I2C pull-up resistors are needed for your application then install~4.7KΩ resistors into R4 (SCL clock pin) and R5 (SDA data pin) which are not installed by factory default. In addition, besides soldering resisters on R4/R5, you can add axial lead 4.7K ohm resistors to the SDA and SCL pin respectively. It will work the same either way.

NOTE: DO NOT install more than one setup pull-up resistors per I2C bus.

1.4 INTERRUPT PINS

INT - HW interrupt signal pin. It will be driven by the chip when data is ready to read, or a motion event is detected by the accelerometer. (Not currently supported in the library for the interrupt pin, so please check the datasheet for the I2C commands toward related registers).

R6: If using the sensor interrupt signal as open-drain, then install pull-up resistor ~4.7KΩ into R3 (not installed by default).

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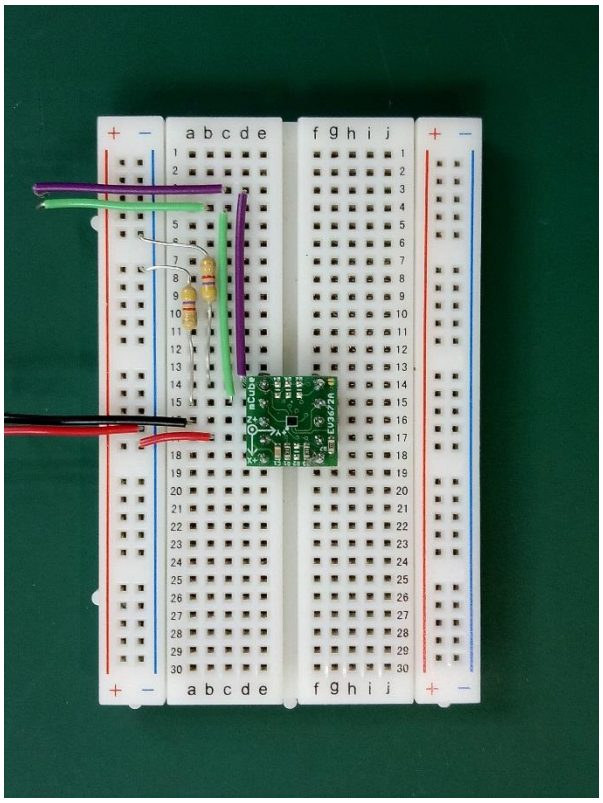
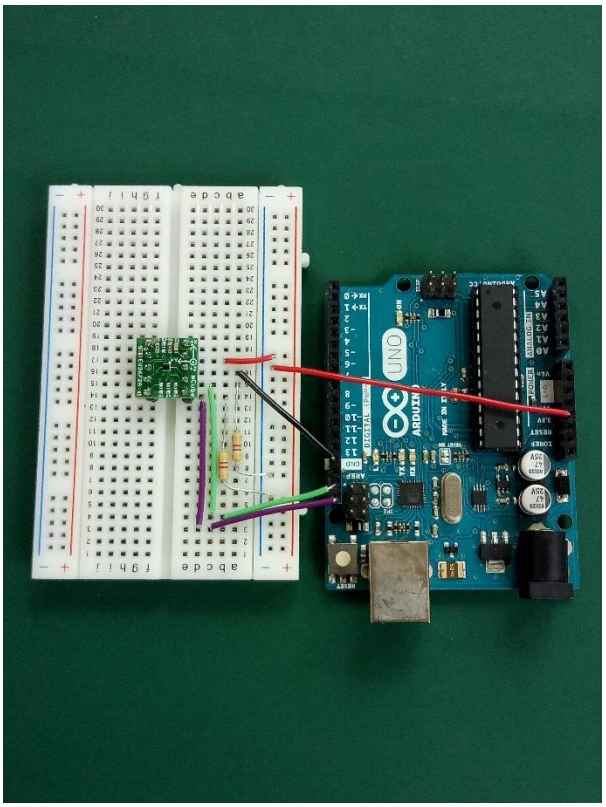
2 ASSEMBLY AND TEST

Please note that the SPI and I2C interfaces cannot both be active at the same time as the clock (SCK) and data (SDA) are shared between the two protocols.

2.1 I2C INTERFACE





The EV3635A evaluation board can be easily wired to any microcontroller. This example shows a typical Arduino UNO platform. For other microcontrollers, be sure it has I2C with repeated-start support, then port the code. Please refer to the illustration below to connect the related pins.

- Connect **DVDD** to the power supply, **3.3V**. (Providing higher voltage, like 5V may damage the sensor).
- Connect **GND** to common power/data ground.
- Connect the **SCL** pin to the I2C clock **SCL** pin on your Arduino.
- Connect the **SDA** pin to the I2C data **SDA** pin on your Arduino.

The MC3635 has a default I2C address of 0x4C and it can be changed to 0x6C by tying the DOUT pin to VDD.

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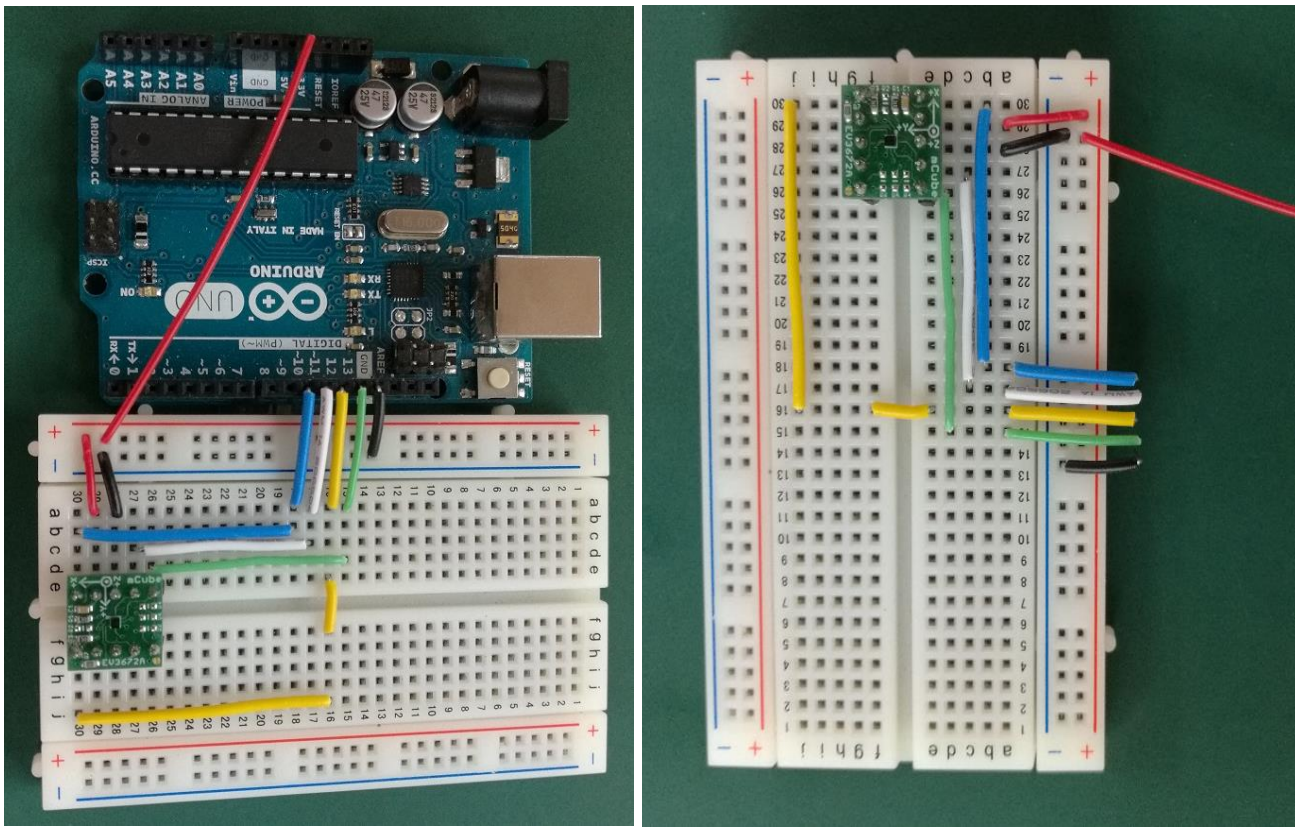
2.2 SPI INTERFACE



The EV3635A evaluation board can be easily wired to any microcontroller. This example shows a typical Arduino UNO platform. Please refer to the illustration below for connecting the related pins and then port the code to get the raw X, Y, Z sensor data.

- Connect **DVDD** to the power supply, **3.3V**. (Providing higher voltage, like 5V may damage the sensor.)
- Connect **GND** to common power/data ground.
- Connect **SCL** to digital I/O pin **13** as Serial Clock.
- Connect **SDO** to digital I/O pin **12** as Master Input, Slave Output.
- Connect **SDA** to digital I/O pin **11** as Master Output, Slave Input.
- Connect **SCS** to digital I/O pin **10** as Slave Select.

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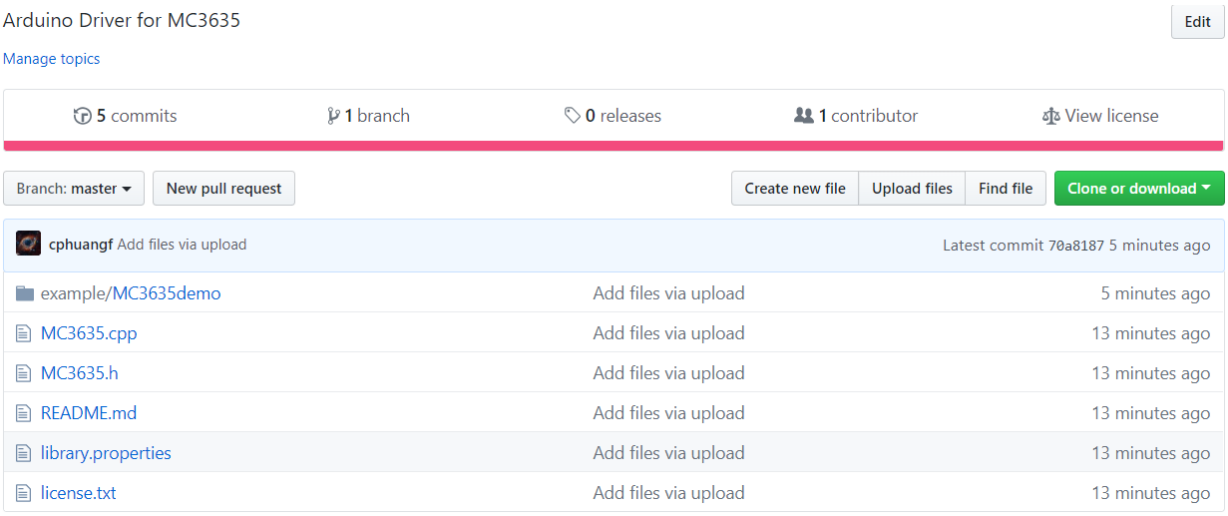
3 DEMO

3.1 DOWNLOAD THE DRIVER FROM GITHUB

To begin reading sensor data, you will need to download the MC3635_Library from the github repository. You can do that by visiting the github repository and manually downloading or simply click this button the attached URL to download the zip file.

https://github.com/mcubemems/Accelerometer_MC3635



Rename the uncompressed folder **Accelerometer_MC3635** and check that the Accelerometer_MC3635 folder contains **MC3635.cpp** and **MC3635.h**

Place the Accelerometer_MC3635 library folder to your **Arduino_sketch_folder/libraries/** folder.

You may need to create the library subfolder if it is your first library. Then just restart the IDE.

An excellent tutorial on Arduino library installation is located at:

http://learn.adafruit.com/adafruit-all-about-arduino-libraries-install-use

3.2 LOAD THE DEMO

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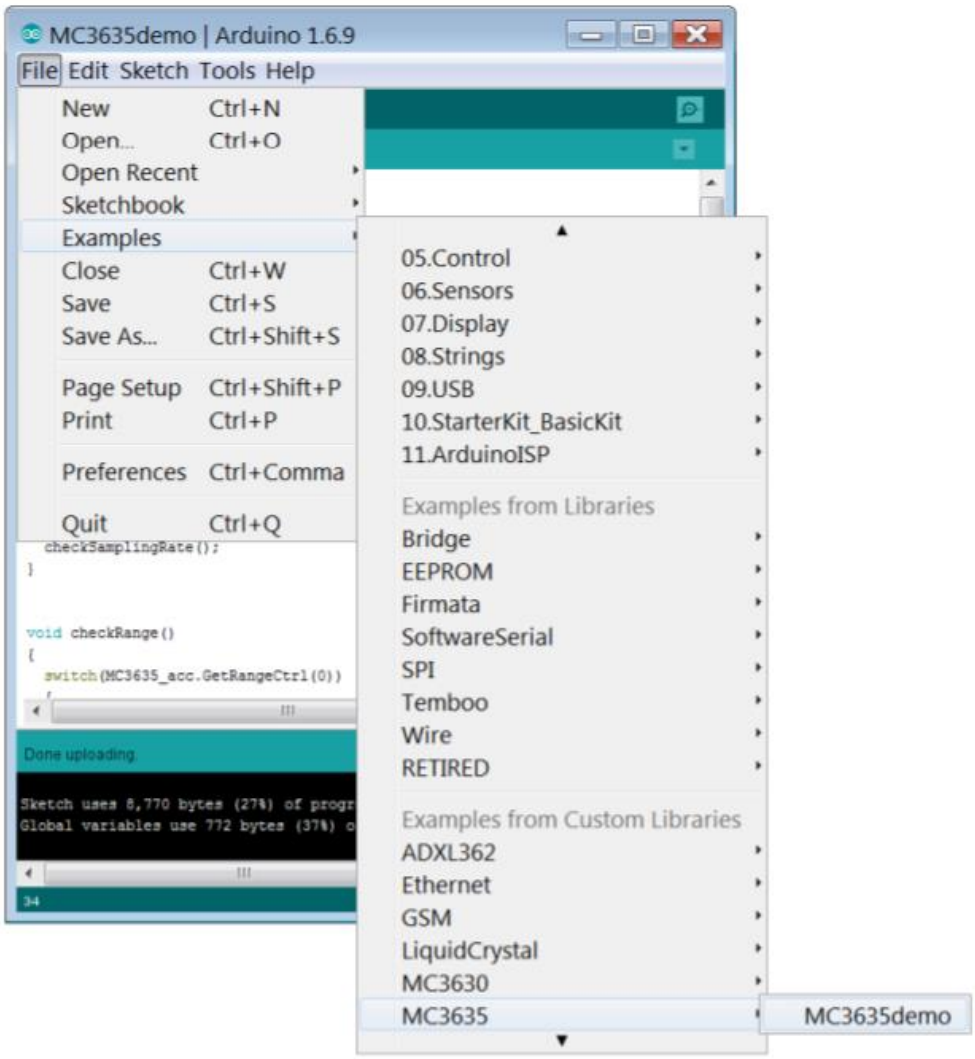
Open up File->Examples->MC3635-> MC3635demo and upload to your Arduino wired up to the sensor



Now open up the serial terminal window at 9600 baud rate speed to begin the test.

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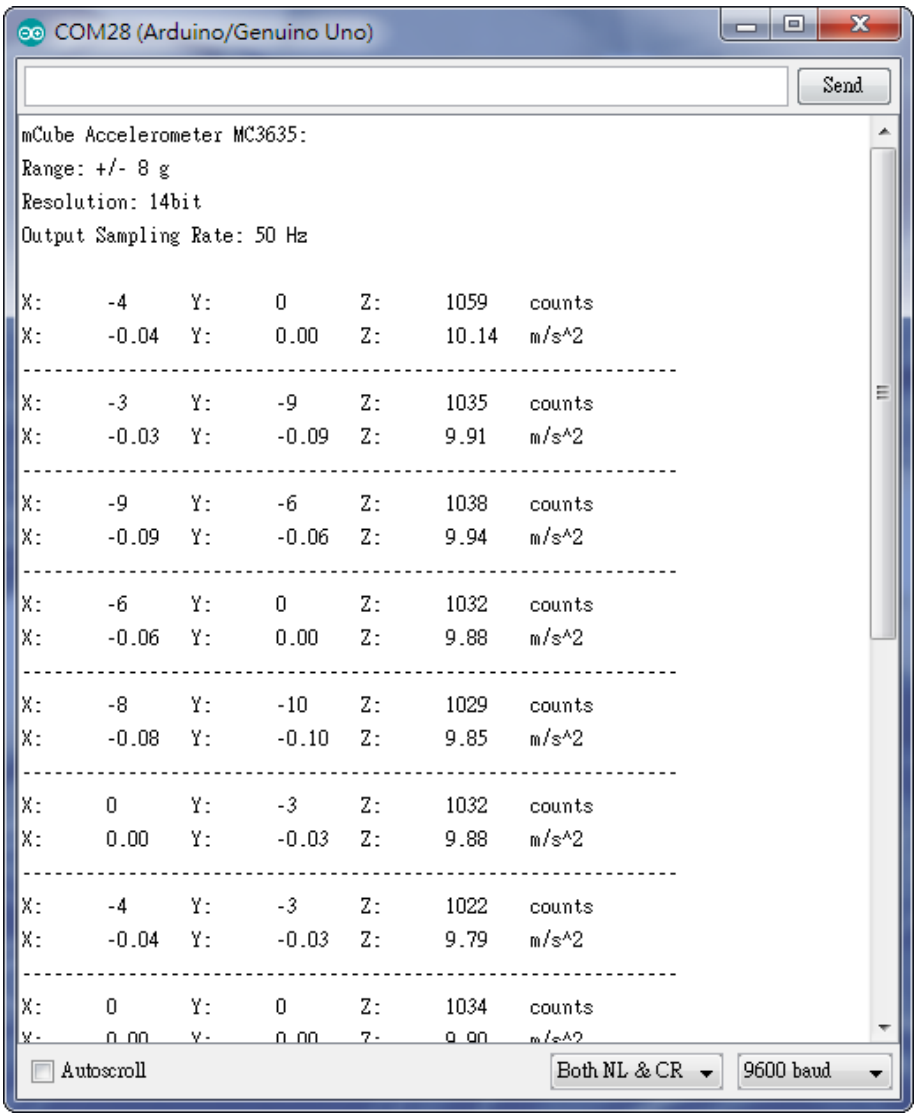

You will see the output from the serial terminal showing the current range scale and resolution of the sensor in the first three lines followed by two lines of output sensor data at some output data rate which depict “raw count" data for line 1: X: -4 Y: 0 Z: 1059 with 8G range, 14bit ADC resolution.

Line 2 indicates the SI units for measuring acceleration as X:-0.04 m/s^2 Y:0.00 m/s^2 Z: 10.14 m/s^2.

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4 LIBRARY REFERENCE

4.1 CREATE MCUBE_MC3635 OBJECT

You can create the MCUBE_MC3635 object with:

```
MC3635 mc3635_acc = MC3635();
```

4.2 INITIALIZE AND CONFIGURE SENSOR

Initialize and configure the sensor with:

```
Mc3635_acc.start();
```

4.3 SET RANGE

Set the accelerometer max range to ±2g, ±4g, ±8g or ±16g with:

```
mc3635_acc.SetRangeCtrl(MC3635_RANGE_2G);
mc3635_acc.SetRangeCtrl(MC3635_RANGE_4G);
mc3635_acc.SetRangeCtrl(MC3635_RANGE_8G);
mc3635_acc.SetRangeCtrl(MC3635_RANGE_16G);
```

4.4 READ RANGE

Read the current range with:

```
mc3635_acc.GetRangeCtrl();
```

Returns: 0 for ±2g, | 1 for ±4g, | 2 for ±8g | 3 for ±16g.

4.5 READ RESOLUTION

Read the current resolution with:

```
mc3635_acc.GetResolutionCtrl();
```

Returns: 0 for 6-bit | 1 for 7-bit | 2 for 8-bit | 3 for 10-bit | 4 for 12-bit | 5 for 14-bit

4.6 READ RAW COUNT DATA

Read the raw count data and SI unit measurement with:

```
mc3635_acc.readRawAccel();
```


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5 DOWNLOADS

5.1 MC3635 ACCELEROMETER DATASHEET

http://www.mcubemems.com/product/mc3635-3-axis-accelerometer/

5.2 EV3635A EVAL BOARD QUICK START GUIDE AND DEMO

5.3 MC3635 DRIVER AT GITHUB

https://github.com/mcubemems/Accelerometer_MC3635

5.4 ALL OTHER MCUBE DOCUMENTATION

http://www.mcubemems.com/resources-support/resources/

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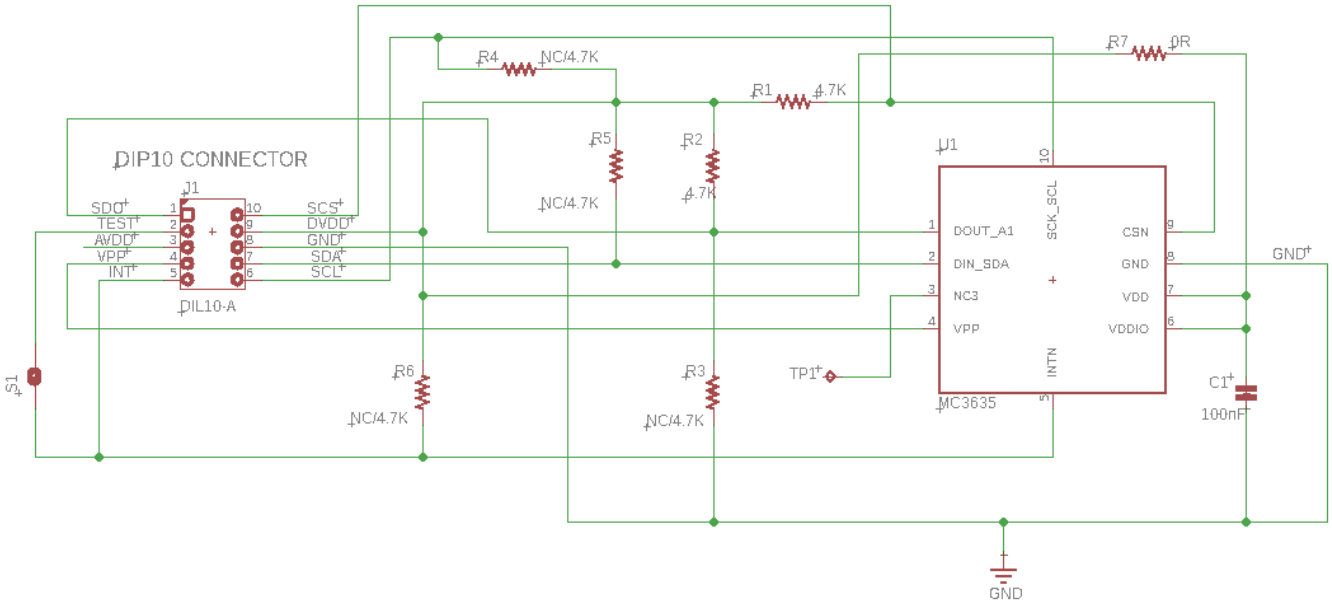
6 SCHEMATICS



Above is a diagram showing setup for SPI protocol. This is the factory preset when receiving the part.

For other options, please refer to the following table:

Interface	R1	R2	R3
SPI @ 1MHz (**Factory default**)	4.7KΩ to 100KΩ	4.7KΩ	DNI
SPI @ 2MHz or I2C 0x6C	4.7KΩ	1KΩ	DNI
I2C 0x4C (0x98)	4.7KΩ	DNI	4.7KΩ
I2C 0x6C (0xD8)	4.7KΩ	4.7KΩ	DNI

DNI = Do not install

R4, R5: Install ~4.7KΩ as the I2C pull-ups if using I2C mode and there is no I2C pull-ups installed. (DNI by default)

Note: It is recommended not to install more than one pull-ups per I2C bus.

R6: Install ~4.7KΩ pull-up resistor if setting the sensor interrupt pin to open-drain. (DNI by default)

R7: Sensor's driving current can be measured by putting an ammeter in place of R7.

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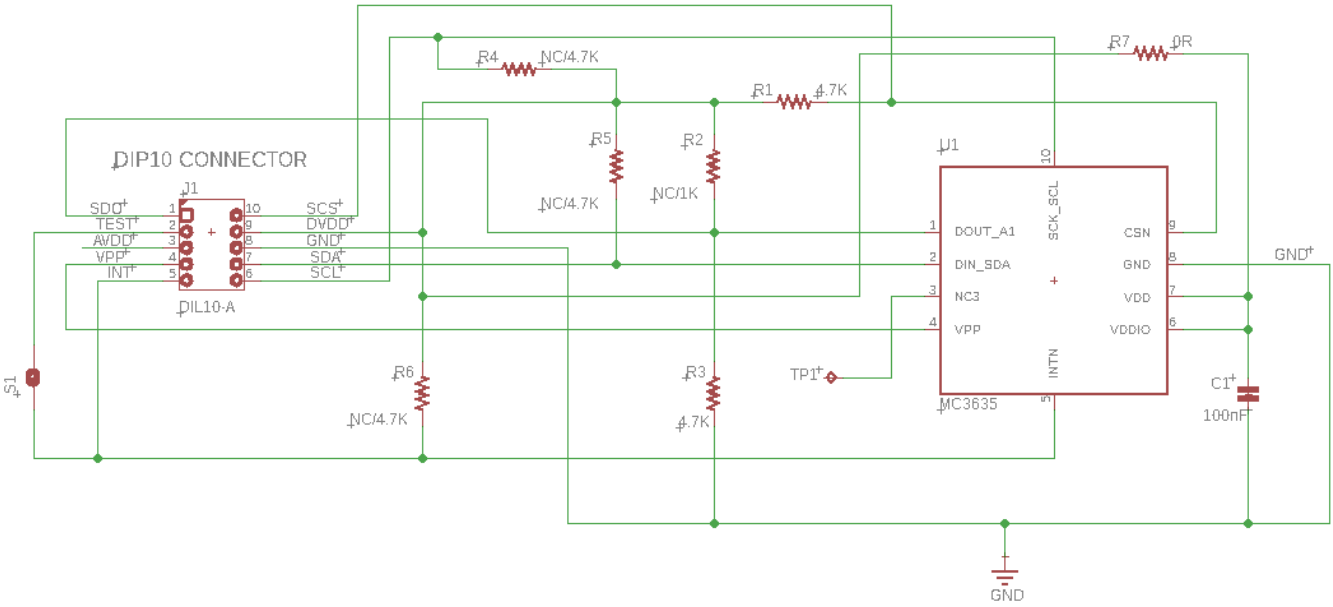
The following is a schematic detailing how to set up the accelerometer for I2C protocol.



Please kindly refer to the resistor settings as:

- R7 = 0R (Jumper)
- R1 = 4.7KΩ
- R3 = 4.7KΩ
- R4, R5 = 4.7KΩ (optional)
- R2,R6 = DNI.

The physical location of the resistor is in the diagram in Section 8.

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7 BILL OF MATERIALS

Item	Part	Value	Package	Vendor	P/N	Install	Layer
1	C1	100nF	CAP-0603	Walsin	0603B104K500	Yes	TOP
2	J1	DIL10-A	DIL10-A	-	-	Yes	BOTTOM
3	R1	4.7K	RES-0603	Walsin	WR06X472JTL	Yes	TOP
4	R2	4.7K	RES-0603	Walsin	WR06X472JTL	Yes	TOP
5	R7	0R	RES-0603	Walsin	WR06X000PTL	Yes	TOP
6	U1	MC3635	LGA10 1.6 x 1.6	mCube	MC3635	Yes	TOP
7	R3	4.7K	RES-0603	Walsin	WR06X472JTL	No	TOP
8	R4	4.7K	RES-0603	Walsin	WR06X472JTL	No	TOP
9	R5	4.7K	RES-0603	Walsin	WR06X472JTL	No	TOP
10	R6	4.7K	RES-0603	Walsin	WR06X472JTL	No	TOP

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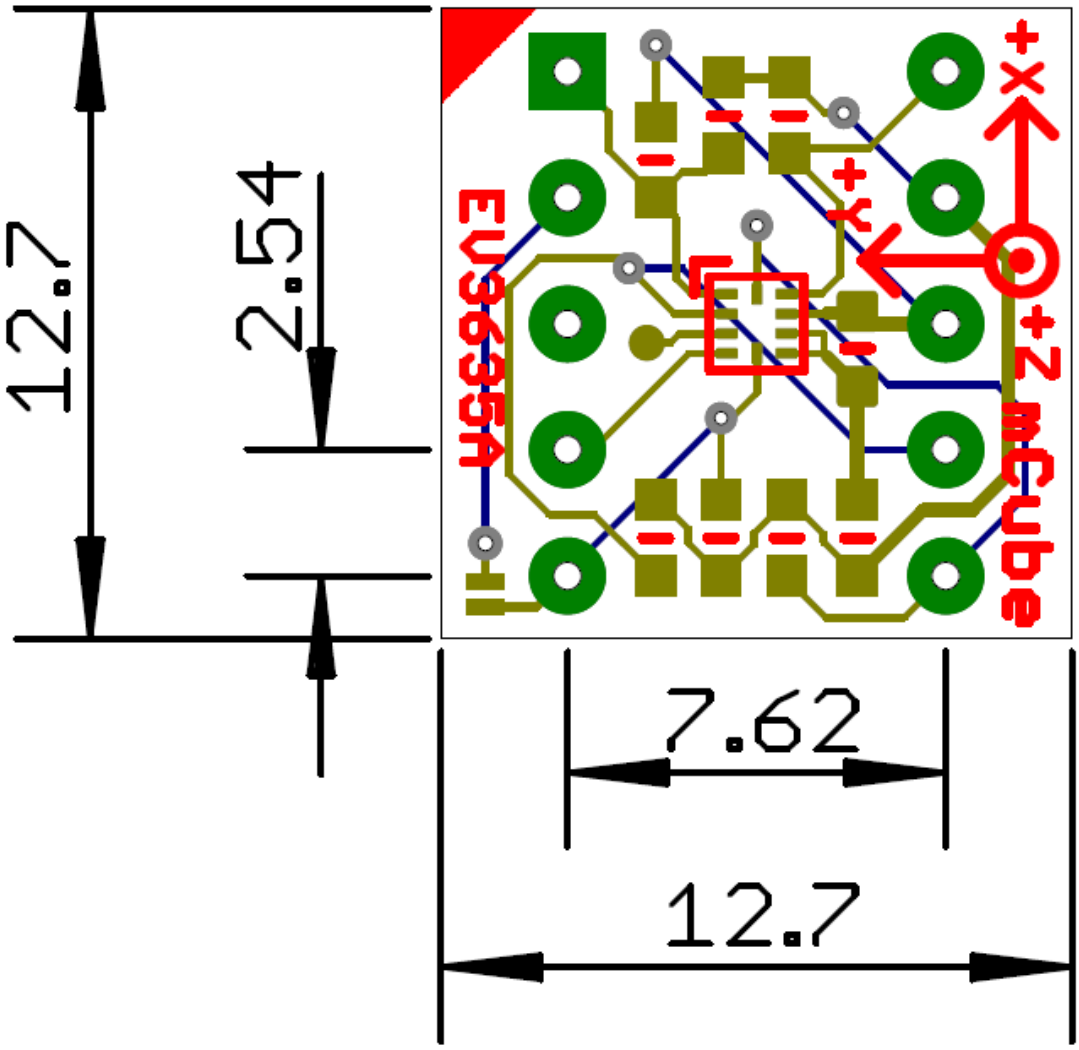
8 FABRICATION PRINT



NOTE: All dimensions are in millimeters.

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9 REVISION HISTORY

Date	Revision	Description
2016-08	APS-045-0018v1.0	First release.
2018-11	APS-045-0018v1.1	Add SPI interface, revised schematics and BOM

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