

(<https://www.dfrobot.com/product-1730.html>)

Introduction

DFRobot I2C ADS1115 16-bit ADC module can accurately collect and convert analog signals. Through this ADC module, Raspberry Pi can easily use a wide range of Gravity series analog sensors to measure various signals, and perceive this world.

Raspberry Pi is a common master control board which is powerful in its functions, but the I/O pins of Raspberry Pi can read digital signals only, what's more, only through an external analog-to-digital conversion (ADC) module can it read signals of analog sensor or device, it is not convenient to use.

DFRobot I2C ADS1115 16-bit ADC module is specially designed for Raspberry Pi and Gravity series analog sensors, which greatly reduces the difficulty of using the Gravity series analog sensors, plug and play, no welding, very convenient. The number of Gravity series sensors is large and its wide variety can meet the needs of various sensors of the Raspberry Pi.

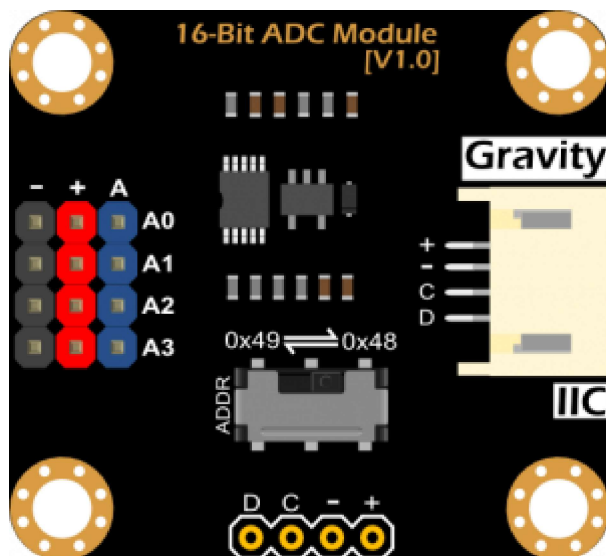
This module uses 16-bit ADC chip ADS1115, supports 3.3 ~ 5V wide voltage power supply. The chip has a precision reference voltage and programmable gain adjustment (PGA), therefore, accurate acquisition and conversion can be performed for both weak and highly variable signals. So it is also applicable to all types of applications that the main control board needs to accurately collect the analog signals.

One ADC module can read analog signals of 4 channels. Because of the on-board I2C address selection switch, it supports the cascade of two ADC modules and can read analog signals of 8 channels, it can satisfy the needs of various applications.

Specification

- Supply Voltage (VCC): 3.3~5.0V
- Analog Signal Detection Range: 0~VCC
- Number of Analog Channels: 4
- ADC Bits: 16 Bit
- Operating Current: 2~3mA (Not include sensor module)
- Interface Type: Gravity I2C
- Interface Level: High 3.3V, Low 0V
- Product Size: 32mm * 32mm(1.26in*1.26in)

Board Overview



Num	Label	Description
\	VCC	Power VCC(3.3~5.0V)
-	GND	Power GND(0V)
C	SCL	I2C Bus Clock Line
D	SDA	I2C Bus Data Line
A	Analog In	Analog Input Channels: A0, A1, A2, A3
ADDR	I2C Address	I2C address selection switch,I2C address: 0x48, 0x49

Tutorial



The voltage on analog input pins must be less than VCC 0.3V! That is, Analog Signal \leq VCC 0.3V

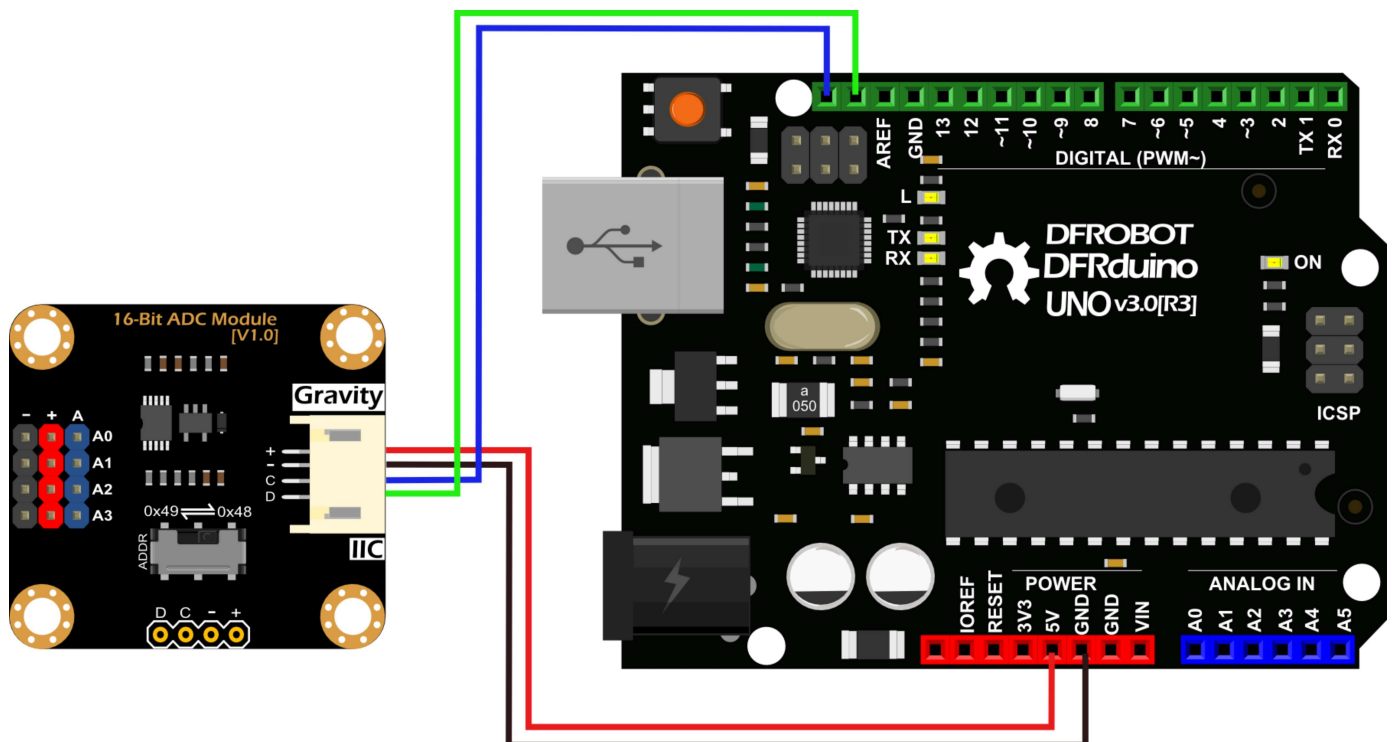
Arduino Tutorial

This tutorial will demonstrate how to use the ADC module to read 4 channels analog signals with the Arduino board. Please switch the I2C address to 0x48.

Requirements

- **Hardware**
 - DFRduino UNO R3 (<https://www.dfrobot.com/product-838.html>) (or similar) x 1
 - I2C ADS1115 16-bit ADC Module x 1
 - Analog Sensors(sound, voltage, temperature, ambient light, etc.) x4
 - Gravity 4pin Cable (or several DuPont cables) x1
- **Software**
 - Arduino IDE (Version requirements: V1.0.x or V1.8.x), Click to Download Arduino IDE from Arduino® (<https://www.arduino.cc/en/Main/Software>)

Connection Diagram



Sample Code

Please down the DFRobot_ADS1115 Library (https://codeload.github.com/DFRobot/DFRobot_ADS1115/zip/master) and install it. How to install Libraries in Arduino IDE (<https://www.arduino.cc/en/Guide/Libraries#.UxU8mdzF9H0>)

Description of the I2C Address in this Library:

- ADS1115_IIC_ADDRESS0: 0x48

▲ ADS1115_IIC_ADDRESS1: 0x40

• ADS1115_IIC_ADDRESS1. 0x49

```
/*
 * file ADS1115_ReadVoltage.ino
 *
 * @ https://github.com/DFRobot/DFRobot_ADS1115
 *
 * connect ADS1115 I2C interface with your board (please reference board compatibility)
 *
 * The voltage value read by A0 A1 A2 A3 is printed through the serial port.
 *
 * Copyright [DFRobot](https://www.dfrobot.com), 2016
 * Copyright GNU Lesser General Public License
 *
 * version V1.0
 * date 2018-01-21
 */
#include <Wire.h>
#include <DFRobot_ADS1115.h>

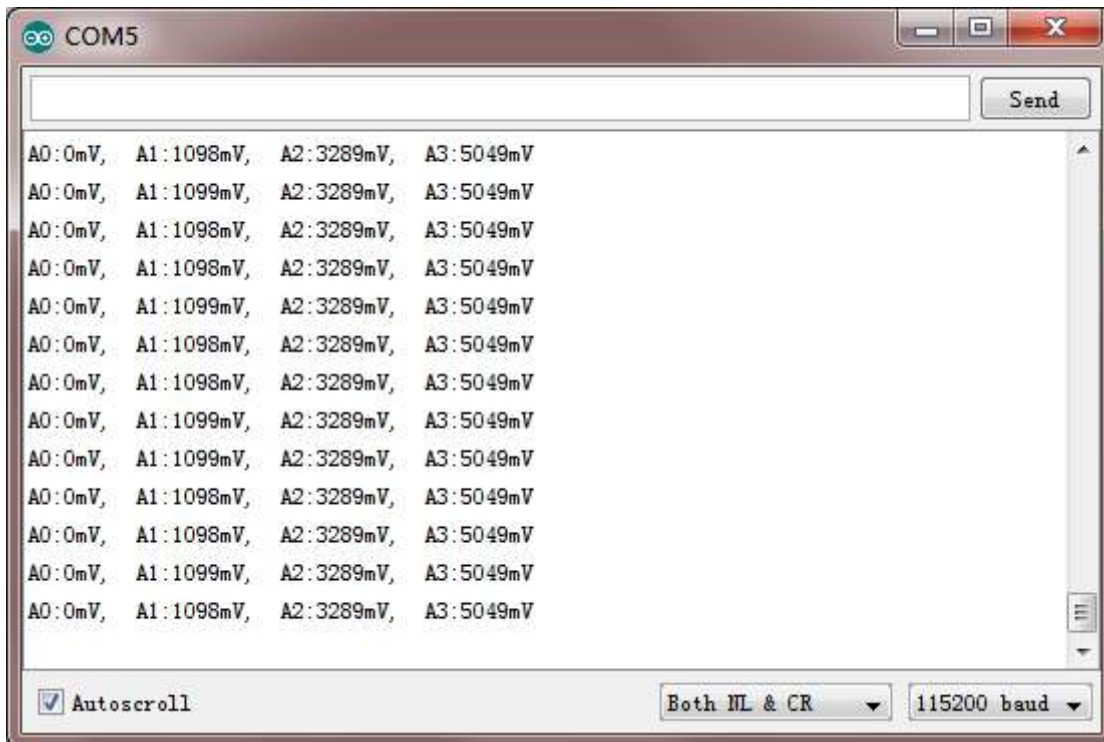
DFRobot_ADS1115 ads;

void setup(void)
{
  Serial.begin(115200);
  ads.setAddr_ADS1115(ADS1115_IIC_ADDRESS0); // 0x48
  ads.setGain(eGAIN_TWOTHIRDS); // 2/3x gain
  ads.setMode(eMODE_SINGLE); // single-shot mode
  ads.setRate(eRATE_128); // 128SPS (default)
  ads.setOSMode(eOSMODE_SINGLE); // Set to start a single-conversion
  ads.init();
}

void loop(void)
{
  if (ads.checkADS1115())
  {
    int16_t adc0, adc1, adc2, adc3;
    adc0 = ads.readVoltage(0);
    Serial.print("A0:");
    Serial.print(adc0);
    Serial.print("mV, ");
    adc1 = ads.readVoltage(1);
    Serial.print("A1:");
    Serial.print(adc1);
    Serial.print("mV, ");
    adc2 = ads.readVoltage(2);
    Serial.print("A2:");
    Serial.print(adc2);
    Serial.print("mV, ");
    adc3 = ads.readVoltage(3);
```

```
        Serial.print("A3:");  
        Serial.print(adc3);  
        Serial.println("mV");  
    }  
    else  
    {  
        Serial.println("ADS1115 Disconnected!");  
    }  
  
    delay(1000);  
}
```

Expected Results



Raspberry Pi Tutorial

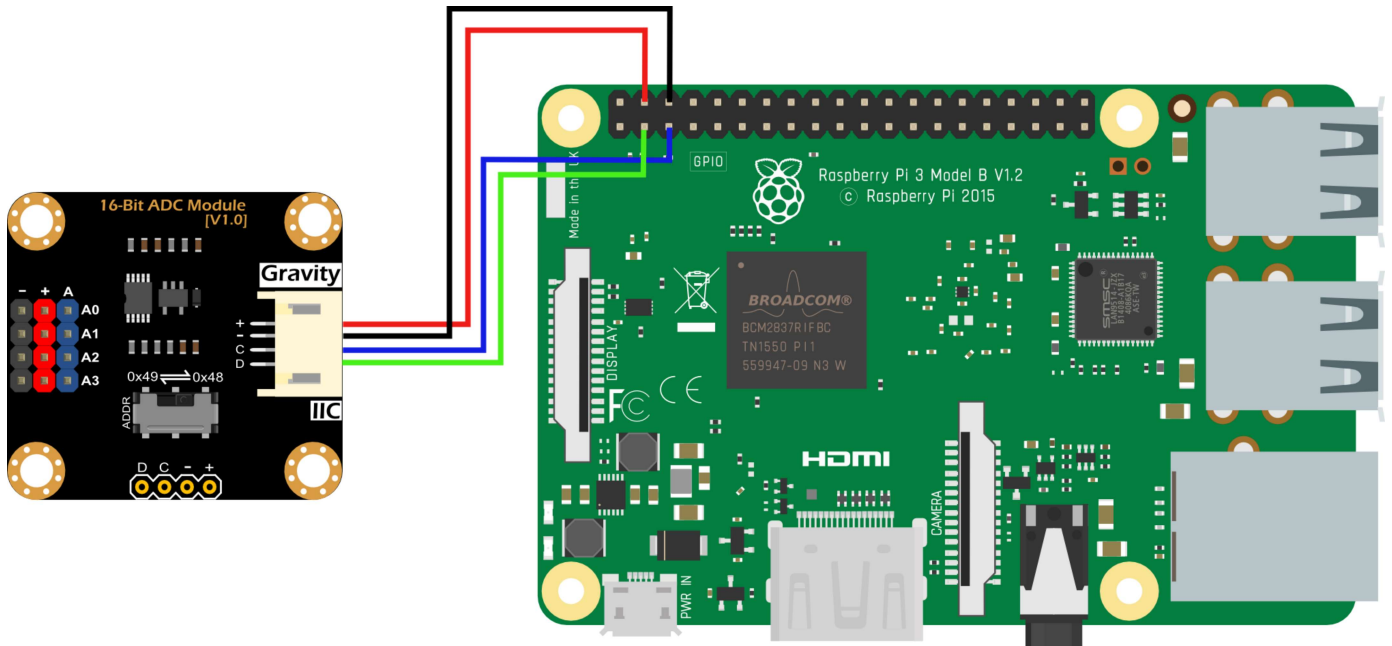
This tutorial will demonstrate how to use the ADC module to read 4 channels analog signals with Raspberry Pi. Please switch the I2C address to 0x48.

Requirements

- **Hardware**
 - Raspberry Pi 3 Model B (<https://www.dfrobot.com/product-1419.html>) (or similar) x 1
 - I2C ADS1115 16-bit ADC Module x 1
 - Analog Sensors(sound, voltage, temperature, ambient light, etc.) x4
 - Gravity 4pin Cable (or several DuPont cables) x1
- **Software**

- DFRobot_ADS1115 Raspberry Driver
(https://github.com/DFRobot/DFRobot_ADS1115/tree/master/RaspberryPi)
- RASPBIAN (<https://www.raspberrypi.org/downloads/raspbian>)

Connection Diagram



Install Driver

- 1. Open the Raspberry Pi I2C interface. If it is already open, skip this step.

Open Terminal, type the following command, and press Enter:

```
sudo raspi-config
```

Then use the up and down keys to select "5 Interfacing Options", press Enter, select "P5 I2C" and press Enter to confirm "YES". Restart the Raspberry Pi.

- 2. Install the Python related libraries and git, then Raspberry Pi requires networking. If it is already installed, skip this step.

In the terminal, type in the following commands in order, and press Enter:

```
sudo apt-get update
sudo apt-get install build-essential python-dev python-smbus git
```

- 3. Download the driver and run. In the terminal, type in the following commands in order, and press Enter.

```
git clone <https://github.com/DFRobot/DFRobot_ADS1115.git>
cd DFRobot_ADS1115/RaspberryPi/Python
```

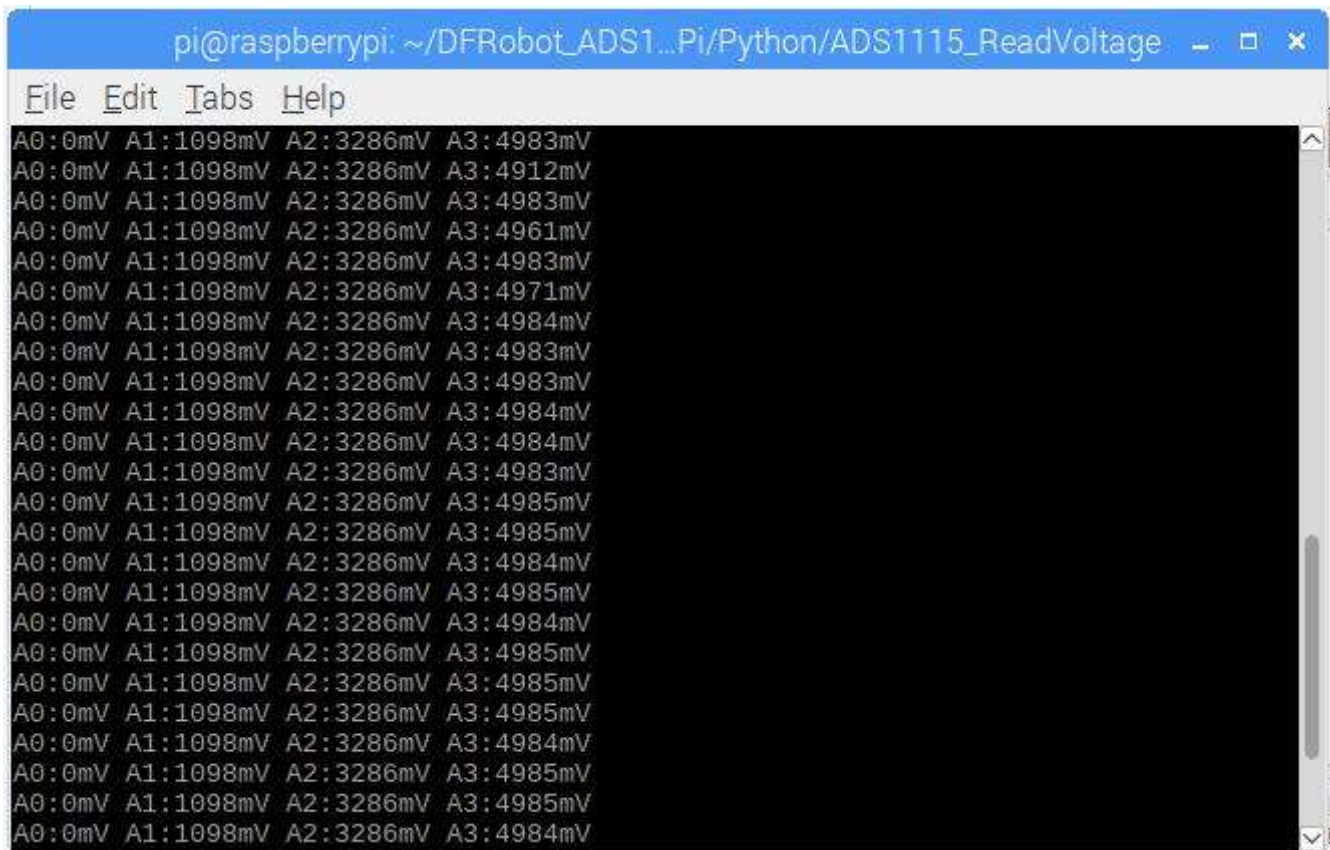
```
sudo python DFRobot_ADS1115.py
```

Run the Sample Code

- In the terminal, type the following commands in order, and press Enter:

```
cd ~/DFRobot_ADS1115/RaspberryPi/Python/ADS1115_ReadVoltage
sudo python ADS1115_ReadVoltage.py
```

Expected Results



```
pi@raspberrypi: ~/DFRobot_ADS1115/RaspberryPi/Python/ADS1115_ReadVoltage
File Edit Tabs Help
A0:0mV A1:1098mV A2:3286mV A3:4983mV
A0:0mV A1:1098mV A2:3286mV A3:4912mV
A0:0mV A1:1098mV A2:3286mV A3:4983mV
A0:0mV A1:1098mV A2:3286mV A3:4961mV
A0:0mV A1:1098mV A2:3286mV A3:4983mV
A0:0mV A1:1098mV A2:3286mV A3:4971mV
A0:0mV A1:1098mV A2:3286mV A3:4984mV
A0:0mV A1:1098mV A2:3286mV A3:4983mV
A0:0mV A1:1098mV A2:3286mV A3:4983mV
A0:0mV A1:1098mV A2:3286mV A3:4984mV
A0:0mV A1:1098mV A2:3286mV A3:4984mV
A0:0mV A1:1098mV A2:3286mV A3:4983mV
A0:0mV A1:1098mV A2:3286mV A3:4985mV
A0:0mV A1:1098mV A2:3286mV A3:4985mV
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A0:0mV A1:1098mV A2:3286mV A3:4985mV
A0:0mV A1:1098mV A2:3286mV A3:4985mV
A0:0mV A1:1098mV A2:3286mV A3:4984mV
A0:0mV A1:1098mV A2:3286mV A3:4985mV
A0:0mV A1:1098mV A2:3286mV A3:4985mV
A0:0mV A1:1098mV A2:3286mV A3:4984mV
```

FAQ

Q1. How do these two ADC modules cascade? Any sample code?

A1. If cascade is needed, you need to set the I2C address of one ADC module to 0x48 and the I2C address of another ADC module to 0x49. Connect the two ADC modules to the I2C bus interface of the main control board.

We provide cascade sample code with two platforms:

Cascade Sample Code of Arduino

(https://github.com/DFRobot/DFRobot_ADS1115/blob/master/Examples/ADS1115_ReadVoltage_cascade/ADS1115_ReadVoltage_cascade.ino)

Cascade Sample Code of Raspberry Pi

https://wiki.dfrobot.com/Gravity_I2C_ADS1115_16-Bit_ADC_Module_Arduino_&_Raspberry_Pi_Compatible__SKU__DFR0553

Cascade Sample Code of Raspberry Pi

(https://github.com/DFRobot/DFRobot_ADS1115/blob/master/RaspberryPi/Python/ADS1115_ReadVoltage_cascade/ADS1115_ReadVoltage_cascade.py)

For any questions, advice or cool ideas to share, please visit the **DFRobot Forum** (<https://www.dfrobot.com/forum/>).

More Documents

- [Schematic]
([https://github.com/Arduinolibrary/DFRobot_Gravity_I2C_ADS1115_16Bit_ADC_Module/raw/master/\[DFR0553\]_V1.0](https://github.com/Arduinolibrary/DFRobot_Gravity_I2C_ADS1115_16Bit_ADC_Module/raw/master/[DFR0553]_V1.0))
([https://github.com/Arduinolibrary/DFRobot_Gravity_I2C_ADS1115_16Bit_ADC_Module/raw/master/%5BDFR0553%5D_V1.0\)_Schematic.pdf](https://github.com/Arduinolibrary/DFRobot_Gravity_I2C_ADS1115_16Bit_ADC_Module/raw/master/%5BDFR0553%5D_V1.0)_Schematic.pdf))
- [Layout]
([https://github.com/Arduinolibrary/DFRobot_Gravity_I2C_ADS1115_16Bit_ADC_Module/raw/master/\[DFR0553\]_V1.0](https://github.com/Arduinolibrary/DFRobot_Gravity_I2C_ADS1115_16Bit_ADC_Module/raw/master/[DFR0553]_V1.0))
([https://github.com/Arduinolibrary/DFRobot_Gravity_I2C_ADS1115_16Bit_ADC_Module/raw/master/%5BDFR0553%5D_V1.0\)_Layout.pdf](https://github.com/Arduinolibrary/DFRobot_Gravity_I2C_ADS1115_16Bit_ADC_Module/raw/master/%5BDFR0553%5D_V1.0)_Layout.pdf))
- ADS1115 Datasheet
(https://github.com/Arduinolibrary/DFRobot_Gravity_I2C_ADS1115_16Bit_ADC_Module/raw/master/ads1115.pdf)
- ADS1115 Arduino Library (Github)
(https://codeload.github.com/DFRobot/DFRobot_ADS1115/zip/master)



Get **Gravity: I2C ADS1115 16-Bit ADC Module (Arduino & Raspberry Pi Compatible)**

(<https://www.dfrobot.com/product-1730.html>) from DFRobot Store or **DFRobot Distributor**.

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Turn to the Top