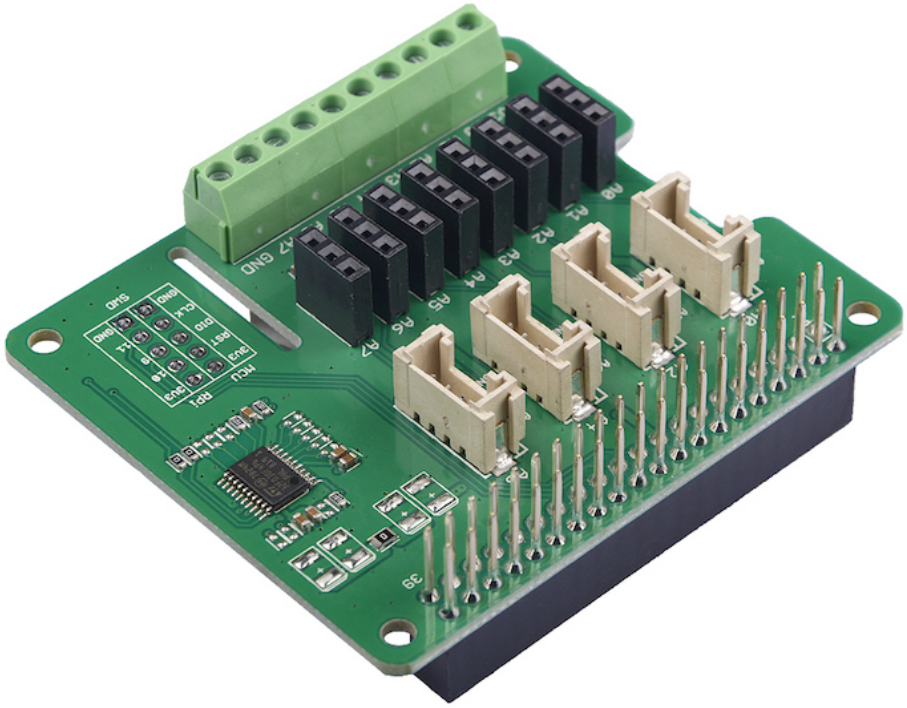
8-Channel 12-Bit ADC for Raspberry Pi (STM32F030) SKU:103030280



ADC is a common accessory for Raspberry Pi. Nowadays many cheap MCUs has built-in ADC, so we make this 8-channel ADC based on STM32F030, which is a cost-effective, low-power ARM Cortex M0 MCU. We breakout 8 channels ADC from the MCU, and integrated 4 analog Grove connector so that you can also use analog Grove modules with it.

Feature

- CRC calculation unit
- 5-channel Direct memory access(DMA) controller
- Calendar RTC with alarm and periodic wakeup from Stop/Standby
- Timers
    - Advanced-control timer
    - General-purpose timers & Basic timers
    - Independent and system watchdog timers
    - SysTick timer
- Real-time clock (RTC)
- Serial wire debug (SWD)

Specification

Item	Value
Operating Supply Voltage	3.3V
ADC Resolution	12 bit
Maximum Clock Frequency	48 MHz
Program Memory Size	16kB
Data RAM Size	4 kB
Data Bus Width	32 bit
Operating Temperature	-40～85℃
Communication Interfaces	I2C
I2C address	0x04(default)
Size	L: 65mm W: 55mm H: 18mm
Weight	25.9g
Package size	L: 140mm W: 75mm H: 25mm
Gross Weight	45g

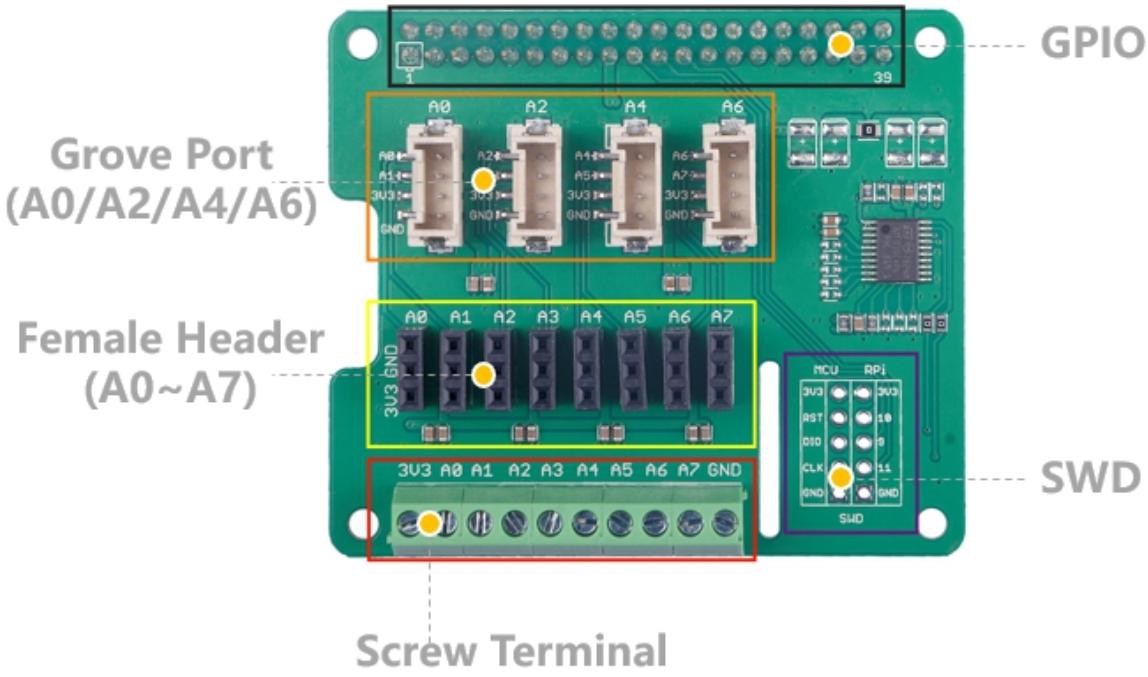
Typical applications

- Temperature measurement
- Consumer goods

Hardware Overview

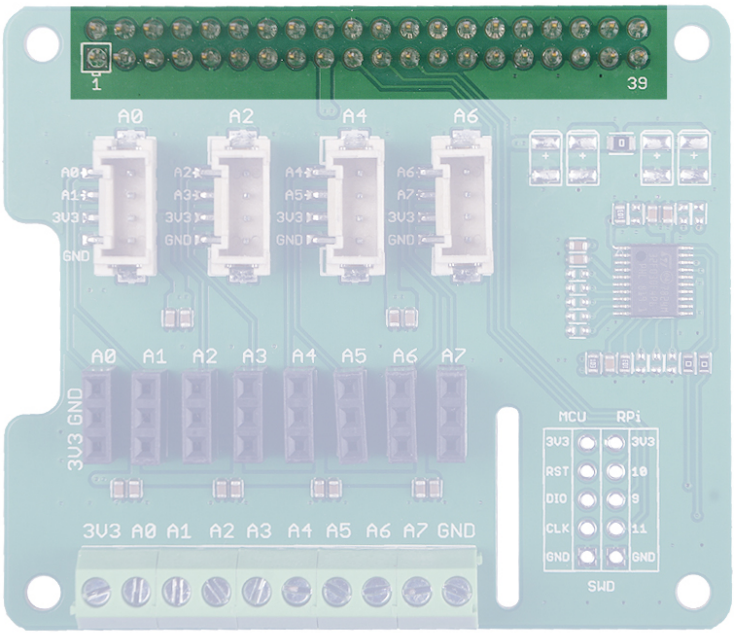
Pin Out

Overview



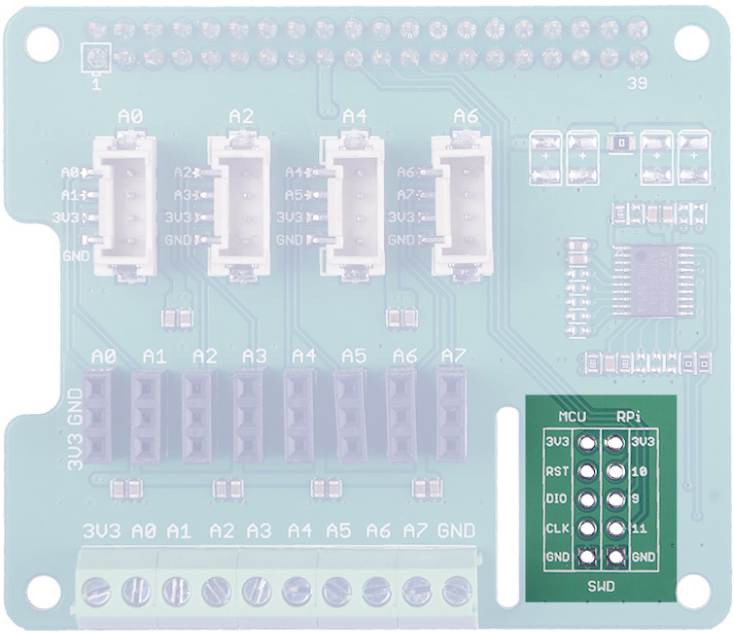
GPIO

The same pin out as the Raspberry Pi.



SWD

We use SWD port to burn the firmware to this board. In addition, you can see pin 9/pin 10/pin 11 in this section. Those three pins do not used by any Grove port, you are free to use them without worrying about pin conflicts.

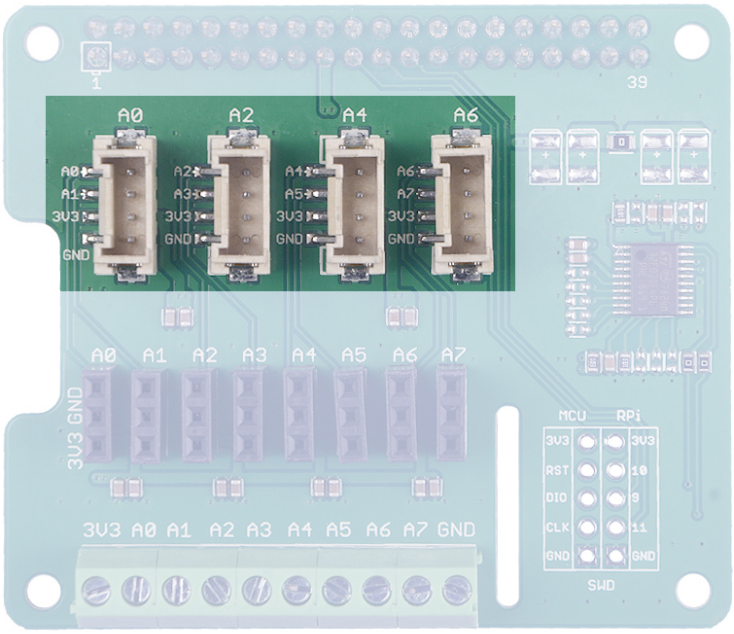


Grove Analog Port

As there is no build-in ADC in the Raspberry Pi, so the STM32-based ADC board allows the analog sensor to work with your Raspberry Pi.

There are 4 grove analog sockets on this board such this ADC board can directly work with grove modules by using Grove - Universal 4 Pin Buckled 5cm Cable.

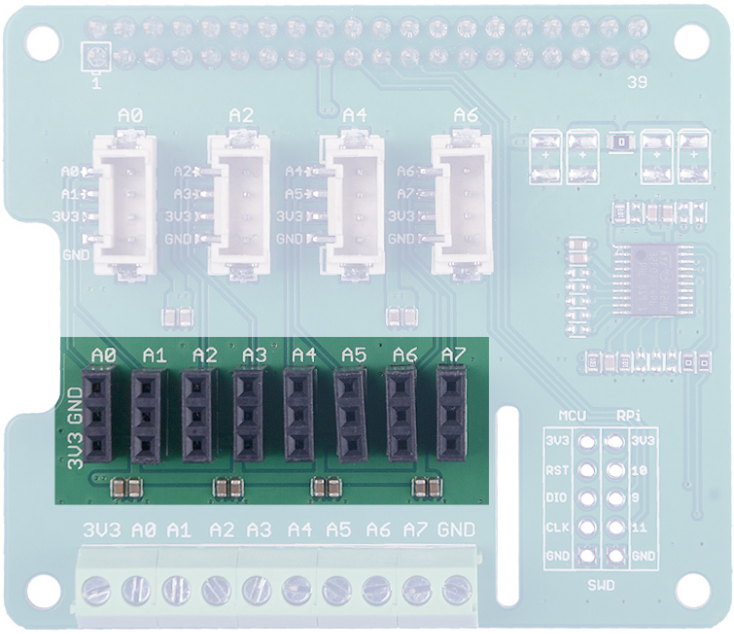
The analog sensor inputs the analog voltage into the 12-bit ADC. After the ADC converts the analog data to digital data, it inputs the digital data to the Raspberry Pi through the I2C interface.



Female pin header ports

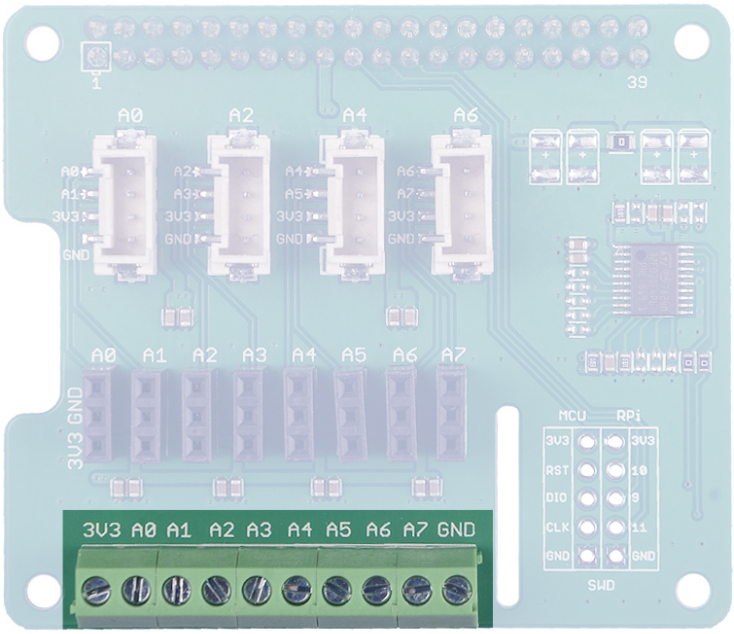
Same as Grove analog port but this part instead of using Grove - Universal 4 Pin Buckled 5cm Cable you need to use Breadboard Jumper Wire Pack.

8 analog junction ports, A0 ~ A7.



Screw terminal

Same as above but with different connection method. This group of pin connectors include analog pin A0 ~ A7, Vcc and GND.



Platforms Supported

Arduino	Raspberry Pi	BeagleBone	Wio	LinkIt ONE
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Getting Started

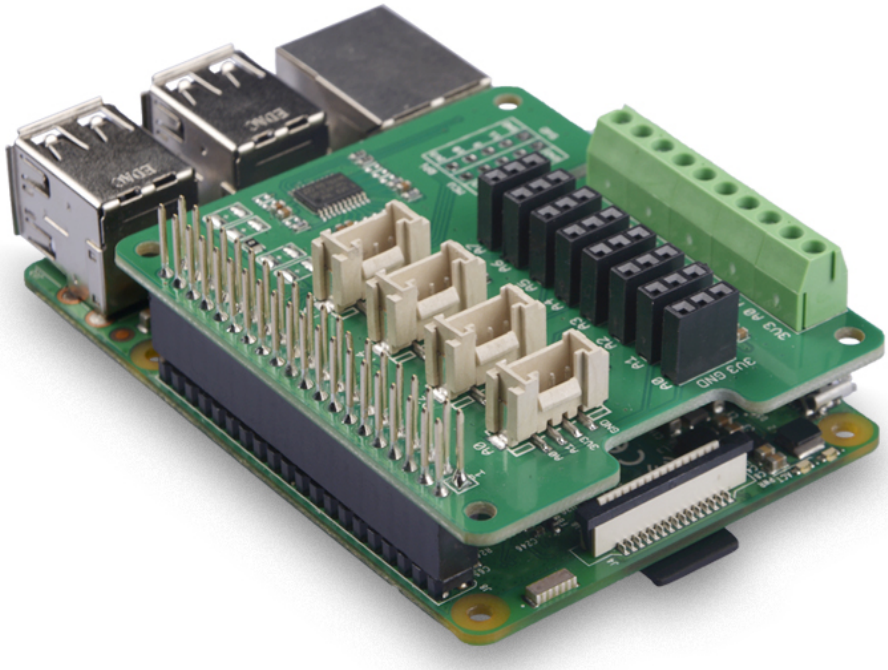
Hardware

Materials required

Raspberry pi	8-Channel 12-Bit ADC for Raspberry Pi(STM32F030)

Raspberry pi	8-Channel 12-Bit ADC for Raspberry Pi(STM32F030)

- **Step 1**. Insert the 8-Channel 12-Bit ADC for Raspberry Pi into Raspberry Pi.
- **Step 2**. Connect the Raspberry Pi to PC through USB cable.



Software

- **Step 1**. Download the source file by cloning the grove.py library.

```
cd ~
git clone https://github.com/Seeed-Studio/grove.py
```

- **Step 2**. Install the grove.py library

```
cd grove.py
# Python2
sudo pip install .
# Python3
sudo pip3 install .
```

- **Step 3**. Excute below commands to run the code.

```
cd grove.py/grove
python adc_8chan_12bit.py
```

Following is the adc_8chan_12bit.py code.

```
import time
from grove.i2c import Bus

ADC_DEFAULT_IIC_ADDR = 0X04

ADC_CHAN_NUM = 8

REG_RAW_DATA_START = 0X10
REG_VOL_START = 0X20
REG_RTO_START = 0X30

REG_SET_ADDR = 0XC0


class Pi_hat_adc():
    def __init__(self,bus_num=1,addr=ADC_DEFAULT_IIC_ADDR):
        self.bus=Bus(bus_num)
        self.addr=addr


    #get all raw adc data,THe max value is 4095,cause it is 12 Bit ADC
    def get_all_adc_raw_data(self):
        array = []
        for i in range(ADC_CHAN_NUM):
            data=self.bus.read_i2c_block_data(self.addr,REG_RAW_DATA_START+i,2)
            val=data[1]<<8|data[0]
            array.append(val)
        return array

    def get_nchan_adc_raw_data(self,n):
        data=self.bus.read_i2c_block_data(self.addr,REG_RAW_DATA_START+n,2)
        val =data[1]<<8|data[0]
        return val
```

```
    #get all data with unit mv.
    def get_all_vol_milli_data(self):
        array = []
        for i in range(ADC_CHAN_NUM):
            data=self.bus.read_i2c_block_data(self.addr,REG_VOL_START+i,2)
            val=data[1]<<8|data[0]
            array.append(val)
        return array

    def get_nchan_vol_milli_data(self,n):
        data=self.bus.read_i2c_block_data(self.addr,REG_VOL_START+n,2)
        val =data[1]<<8|data[0]
        return val

    #get all data ratio,unit is 0.1%
    def get_all_ratio_0_1_data(self):
        array = []
        for i in range(ADC_CHAN_NUM):
            data=self.bus.read_i2c_block_data(self.addr,REG_RTO_START+i,2)
            val=data[1]<<8|data[0]
            array.append(val)
        return array

    def get_nchan_ratio_0_1_data(self,n):
        data=self.bus.read_i2c_block_data(self.addr,REG_RTO_START+n,2)
        val =data[1]<<8|data[0]
        return val



ADC = Pi_hat_adc()
def main():
    raw_data=ADC.get_all_adc_raw_data()
    vol_data=ADC.get_all_vol_milli_data()
    ratio_data=ADC.get_all_ratio_0_1_data()
    print("raw data for each channel:(1-8chan)(12 bit-max=4096):")
    print(raw_data)
    print("voltage for each channel:(unit:mv,max=3300mv):")
    print(vol_data)
    print ("ratio for each channel(unit 0.1%,max=100.0%):")
    print(ratio_data)

    print(" ")
    print("NOTICE!!!:")
    print("The default setting of ADC PIN is floating_input.")
    print(" ")

if __name__ == '__main__':
    main()
```

!!!success If everything goes well, you will be able to see the following result

```
pi@raspberrypi:~/grove.py/grove $ python adc_8chan_12bit.py
raw data for each channel:(1-8chan)(12 bit-max=4096):
[2177, 2098, 2064, 2038, 2127, 2066, 2172, 2145]
voltage for each channel:(unit:mv,max=3300mv):
[1599, 1741, 1668, 1658, 1644, 1787, 1694, 1677]
ratio for each channel(unit 0.1%,max=100.0%):
[521, 544, 514, 504, 500, 559, 524, 505]

NOTICE!!!:
The default setting of ADC PIN is floating_input.
```

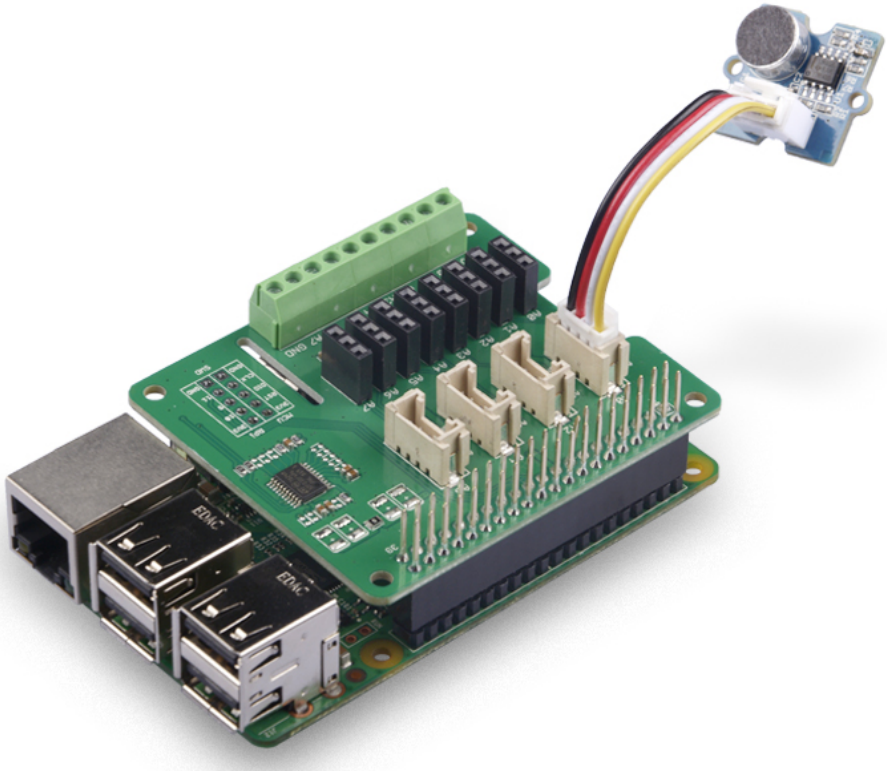
Example

We will take the Grove - Sound Sensor as an example to introduce you how to use this board.

Hardware connection

- **Step 1**. Plug the 8-Channel 12-Bit ADC for Raspberry Pi into Raspberry Pi.
- **Step 2**. Connect the Grove - Sound Sensor to A0 port of the ADC module.
- **Step 3**. Connect the Raspberry Pi to PC through USB cable.

Hardware connection diagram



Tap the following command ++python grove_sound_sensor.py 0++ in the command line interface.

```
pi@raspberrypi:~/grove.py/grove $ python grove_sound_sensor.py 6
Detecting sound...
Sound value: 433
Sound value: 342
Sound value: 443
Sound value: 300
Sound value: 632
Sound value: 258
Sound value: 591
Sound value: 267
Sound value: 871
^CTraceback (most recent call last):
  File "grove_sound_sensor.py", line 67, in <module>
    main()
  File "grove_sound_sensor.py", line 64, in main
    time.sleep(.3)
KeyboardInterrupt
```

You can quit this program by simply press ++ctrl+c++.

Resources

- **[Zip]** 8-Channel 12-Bit ADC for Raspberry Pi (STM32F030) Eagle Files
- **[Zip]** 8-Channel 12-Bit ADC for Raspberry Pi (STM32F030) Software Library
- **[PDF]** Datasheet STM32F030

Tech Support

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