1. Programming the DHT11(교재 p. 334) with Python (Raspberrypi 4, Bullseye 용)

$ cd RaspberrypiwithIOT/ch6

$ ls

$ cd Adafruit_Python_DHT

$ git clone https://github.com/adafruit/Adafruit_Python_DHT.git

```
pi@raspberrypi:~ $ cd RaspberrypiwithIOT/ch6
pi@raspberrypi:~/RaspberrypiwithIOT/ch6 $ ls
Adafruit_Python_CharLCD  btn_callback.py   dht22test.py     py-spidev      readtemp.py   waveshare-dtoverlays
Adafruit_Python_DHT      btn_interrupt.py  ledbtn_flask.py  readadc.py     rpioblink.py  writeserial.py
Adafruit_Python_GPIO     btn_poll.py       ledtest.c        readrtc.py     testflash.py
blink.py                 btn_poll2.py      lircled.py       readserial.py  testlcd.py
pi@raspberrypi:~/RaspberrypiwithIOT/ch6 $ cd Adafruit_Python_DHT
pi@raspberrypi:~/RaspberrypiwithIOT/ch6/Adafruit_Python_DHT $ ls
pi@raspberrypi:~/RaspberrypiwithIOT/ch6/Adafruit_Python_DHT $ git clone https://github.com/adafruit/Adafruit_Python_DHT.
git
'Adafruit_Python_DHT'에 복제합니다...
remote: Enumerating objects: 325, done.
remote: Total 325 (delta 0), reused 0 (delta 0), pack-reused 325
오브젝트를 받는 중: 100% (325/325), 98.35 KiB | 4.47 MiB/s, 완료.
델타를 알아내는 중: 100% (176/176), 완료.
```

$ cd Adafruit_Python_DHT

$ ls

```
pi@raspberrypi:~/RaspberrypiwithIOT/ch6 $ cd Adafruit_Python_DHT
pi@raspberrypi:~/RaspberrypiwithIOT/ch6/Adafruit_Python_DHT $ ls
Adafruit_Python_DHT
```

$ cd Adafruit_Python_DHT

$ ls

$ sudo python3 setup.py install

```
pi@raspberrypi:~/RaspberrypiwithIOT/ch6/Adafruit_Python_DHT $ cd Adafruit_Python_DHT/
```

```
pi@raspberrypi:~/RaspberrypiwithIOT/ch6/Adafruit_Python_DHT/Adafruit_Python_DHT $ ls
Adafruit_DHT  LICENSE  MANIFEST.in  README.md  examples  setup.py  source
pi@raspberrypi:~/RaspberrypiwithIOT/ch6/Adafruit_Python_DHT/Adafruit_Python_DHT $ sudo python3 setup.py install
]running install
running bdist_egg
running egg_info
creating Adafruit_DHT.egg-info
writing Adafruit_DHT.egg-info/PKG-INFO
writing dependency_links to Adafruit_DHT.egg-info/dependency_links.txt
```

(중략)

```
zip_safe flag not set; analyzing archive contents...
Adafruit_DHT.__pycache__.Raspberry_Pi_2_Driver.cpython-39: module references __file__
creating dist
creating 'dist/Adafruit_DHT-1.4.0-py3.9-linux-aarch64.egg' and adding 'build/bdist.linux-aarch64/egg' to it
removing 'build/bdist.linux-aarch64/egg' (and everything under it)
Processing Adafruit_DHT-1.4.0-py3.9-linux-aarch64.egg
creating /usr/local/lib/python3.9/dist-packages/Adafruit_DHT-1.4.0-py3.9-linux-aarch64.egg
Extracting Adafruit_DHT-1.4.0-py3.9-linux-aarch64.egg to /usr/local/lib/python3.9/dist-packages
Adding Adafruit-DHT 1.4.0 to easy-install.pth file

Installed /usr/local/lib/python3.9/dist-packages/Adafruit_DHT-1.4.0-py3.9-linux-aarch64.egg
Processing dependencies for Adafruit-DHT==1.4.0
Finished processing dependencies for Adafruit-DHT==1.4.0
pi@raspberrypi:~/RaspberrypiwithIOT/ch6/Adafruit_Python_DHT/Adafruit_Python_DHT $ cd ..
```

$ cd ../..

$ ls

$ nano dht22test.py

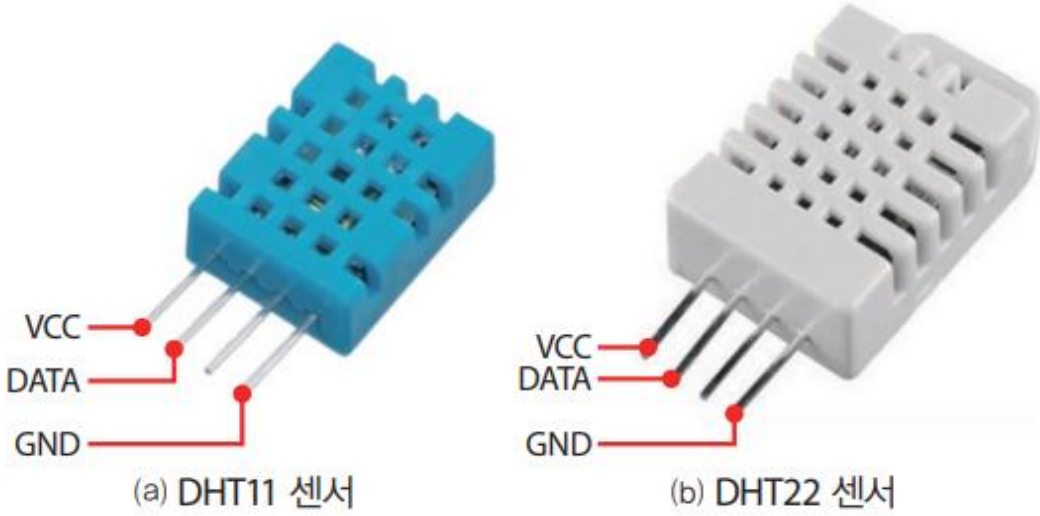
```
#!/usr/bin/env python3
import Adafruit_DHT

#sensor = Adafruit_DHT.DHT22
sensor = Adafruit_DHT.DHT11
pin=18

humidity, temperature = Adafruit_DHT.read_retry(sensor, pin)
if humidity is not None and temperature is not None:
#    print 'Temp={0:0.1f}*C  Humidity={1:0.1f}%'.format(temperature, humidity)
    print('Temp={0:0.1f}*C  Humidity={1:0.1f}%'.format(temperature, humidity))
else:
#    print 'Failed to get reading. Try again!'
    print('Failed to get reading. Try again!')
```

$ python3 dht22test.py

```
pi@raspberrypi:~/RaspberrypiwithIOT/ch6 $ python3 dht22test.py
Temp=28.0*C  Humidity=33.0%
```



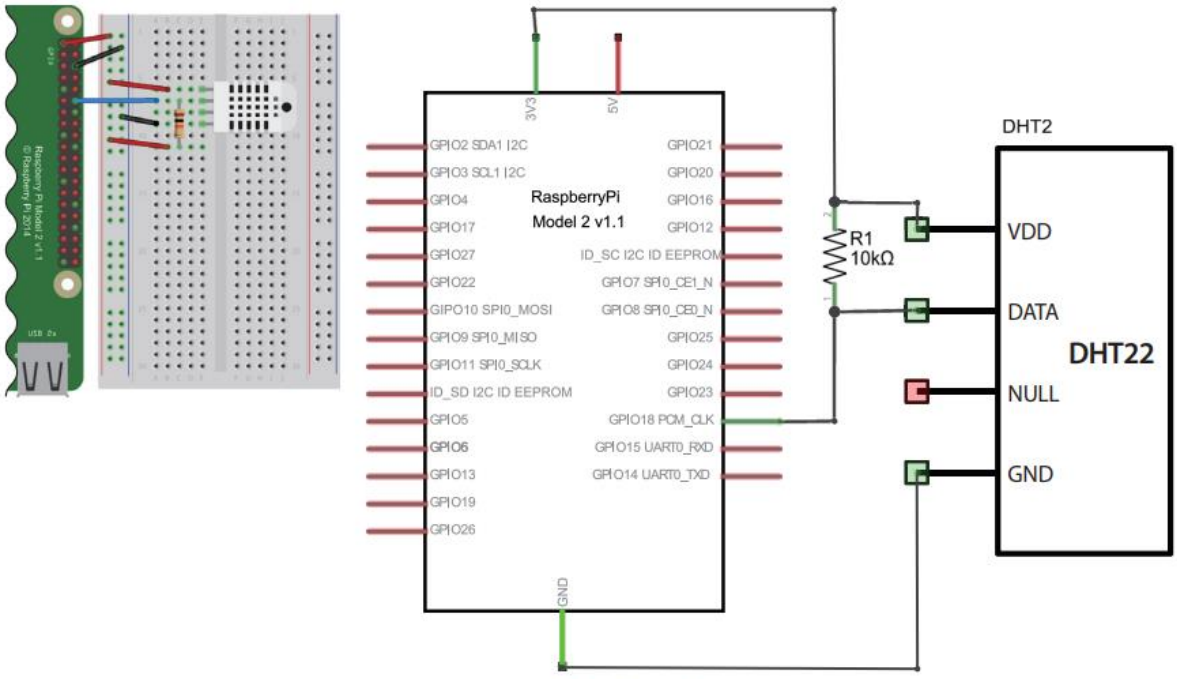
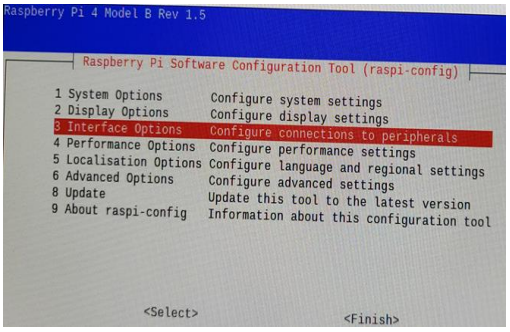


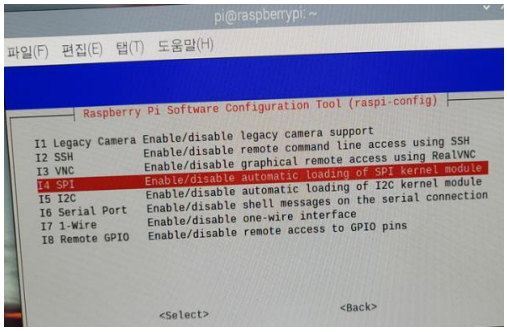
그림 6-30 DHT22 센서 연결

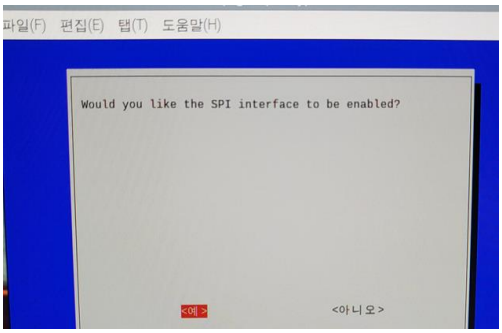
2. ADC 장치 실습 (교재 p.327)

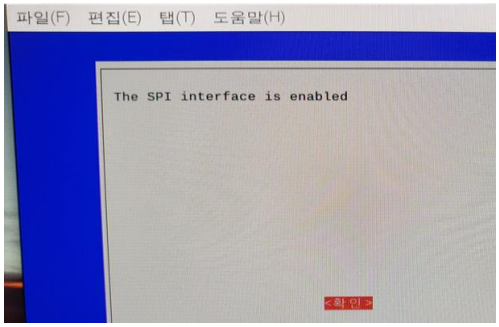
. SPI Enable 확인

$ sudo raspi-config



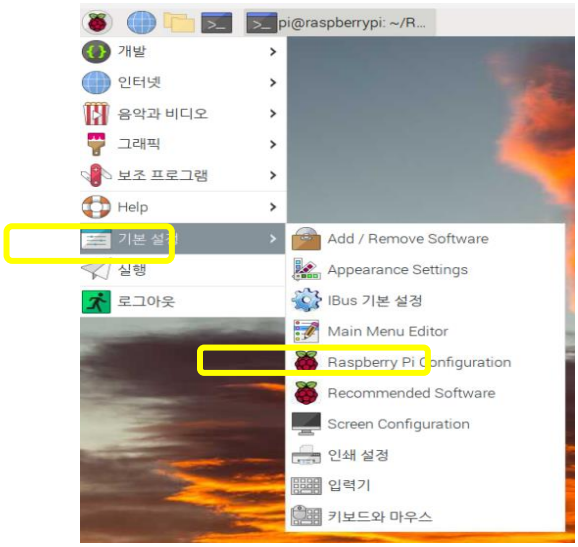


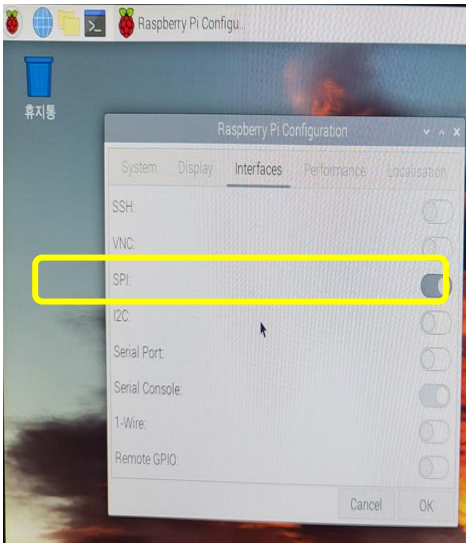




. Tab, Tab, Enter 로 빠져 나옴

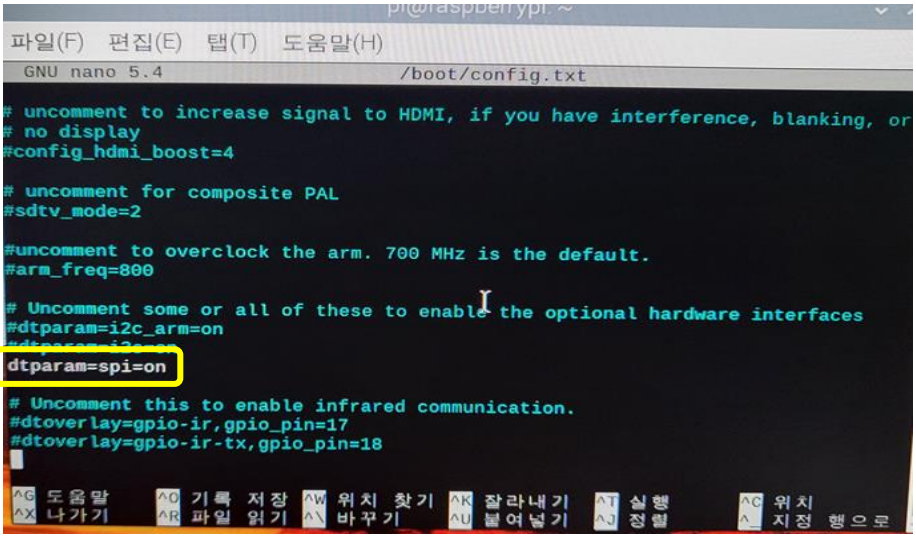
또는





$ sudo nano /boot/config.txt

* dtparam=spi=on 체크

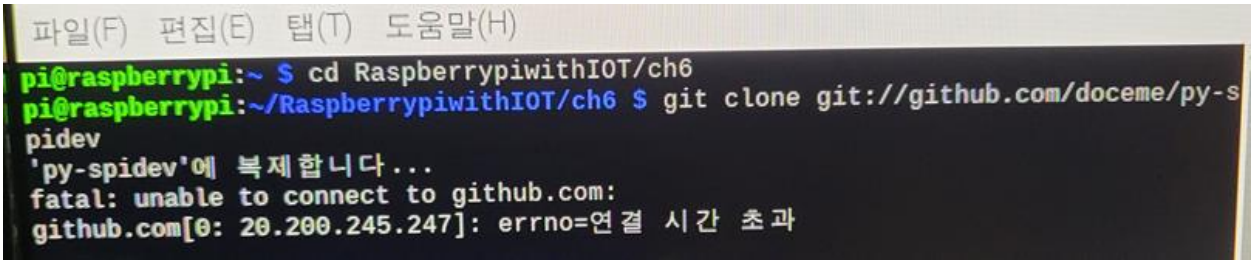


$ sudo apt-get install python3-dev

$ git clone git://github.com/doceme/py-spidev (여기서 cloning(복제)이 아래와 같이 에러가 나서, 2.1 GPIO Zero 방법(인터넷) 이용)

$ cd py-spidev/

$ sudo python3 setup.py install



2.1 Installing GPIO Zero (교재, p.325. spi 설치가 불가하여 GPIO Zero 를 사용)

Installing GPIO Zero

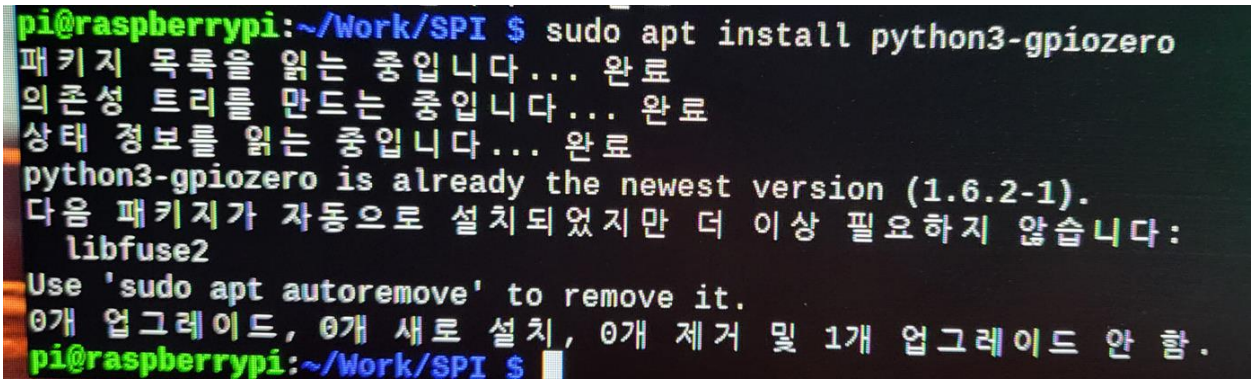
참고:https://gpiozero.readthedocs.io/en/stable/installing.html

. GPIO Zero가default로설치

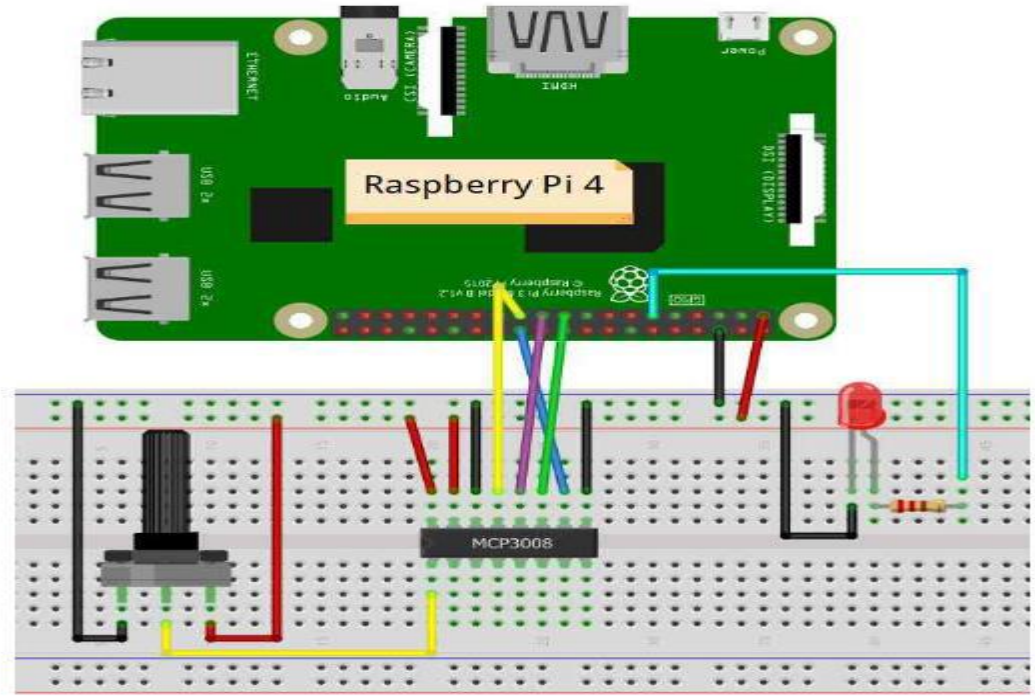
. Upgrade (apt, pip, ...)

```
pi@raspberrypi:~$ sudo apt-get update
$ cd Work
$ mkdir SPI
$ cd SPI
```

```
pi@raspberrypi:~$ sudo apt install python3-gpiozero
```



참고:https://roboticadiy.com/potentiometer-analog-input-for-the-raspberry-pi-4/




```
from gpiozero import PWMLED, MCP3008
from time import sleep
pot = MCP3008(0)
led = PWMLED(17)
while True:
        if (pot.value < 0.002):
                led.value = 0
        else:
                led.value = pot.value
        print(pot.value)
        sleep(0.1)
```

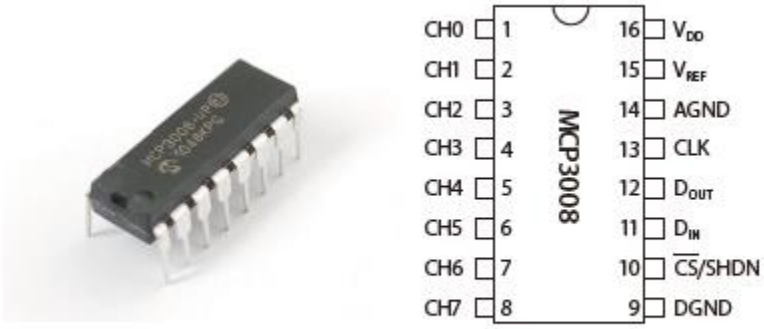


그림 6-21 MCP3008 칩 구성

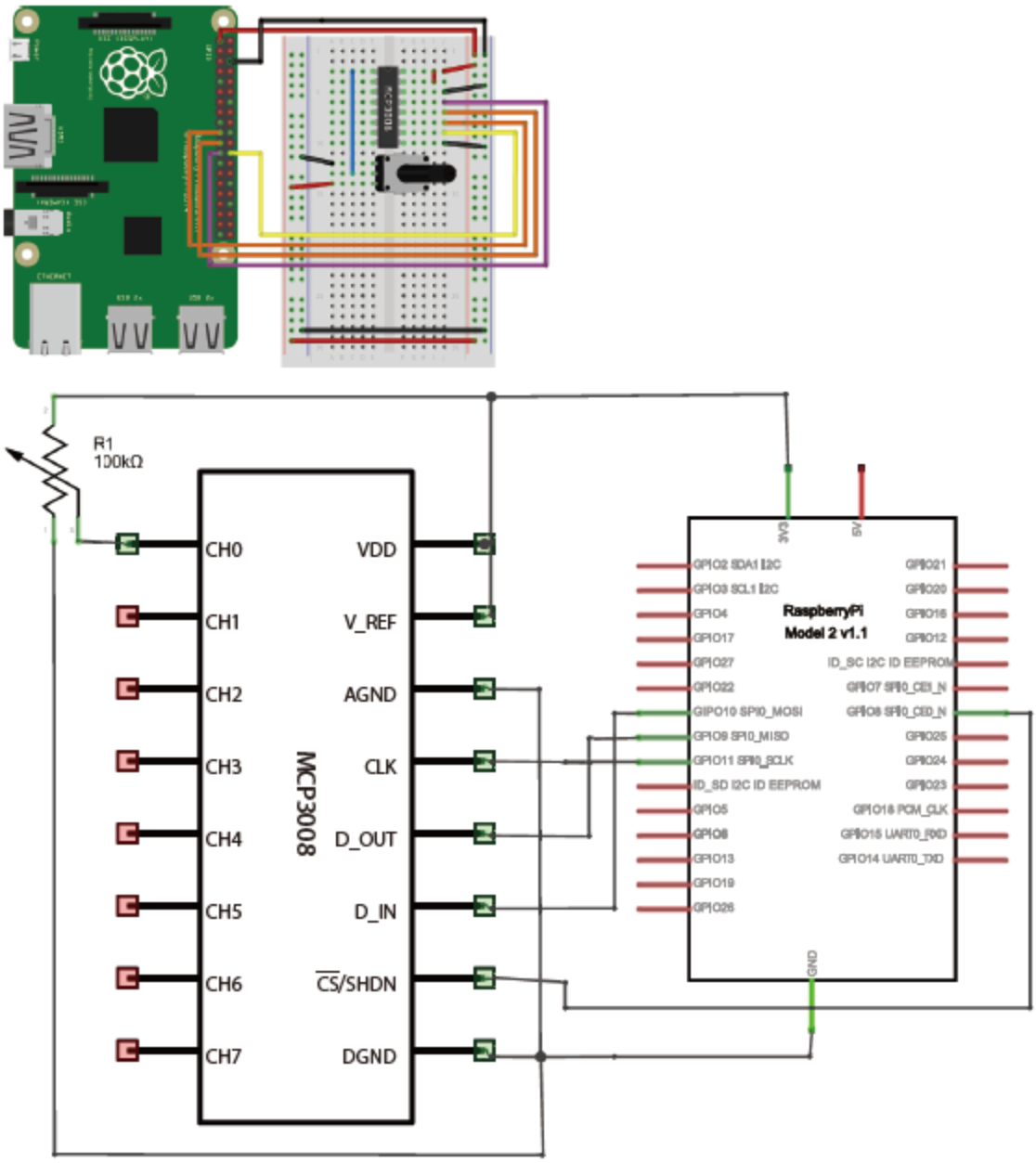


그림 6-22 MCP3008 회로 연결

2.2 ADC test

참고:

https://gpiozero.readthedocs.io/en/v1.6.2/api_spi.html?highlight=#module-gpiozero.spi_devices

```
from gpiozero import MCP3008
import time
```

```
while True:
   pot = MCP3008(0)
   print(pot.value)
   time.sleep(1)
```

```
from gpiozero import MCP3008
import time
import RPi.GPIO as GPIO

GPIO.setmode(GPIO.BCM)
GPIO.setup(21, GPIO.OUT)
GPIO.setwarnings(False)

while True:
          pot=MCP3008(0)
          val=pot.value*3.3
          print(val)
          if (val>2.0):
                    GPIO.output(21,True)
          else:
                    GPIO.output(21,False)

          #print(pot.value*3.3)
          time.sleep(1)
GPIO.cleanup()
```