

# 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
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:~/RaspberrypiwthIOT/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:~/RaspberrypiwthIOT/ch6 $ python3 dht22test.py
Temp=28.0*C Humidity=33.0%
```

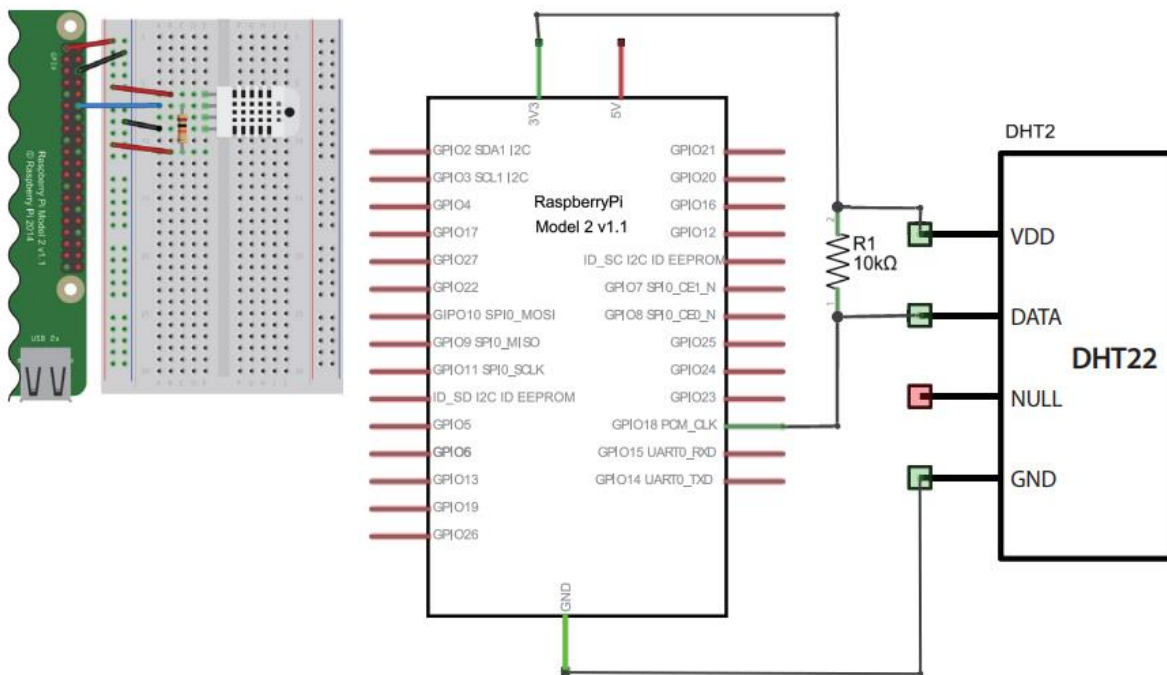
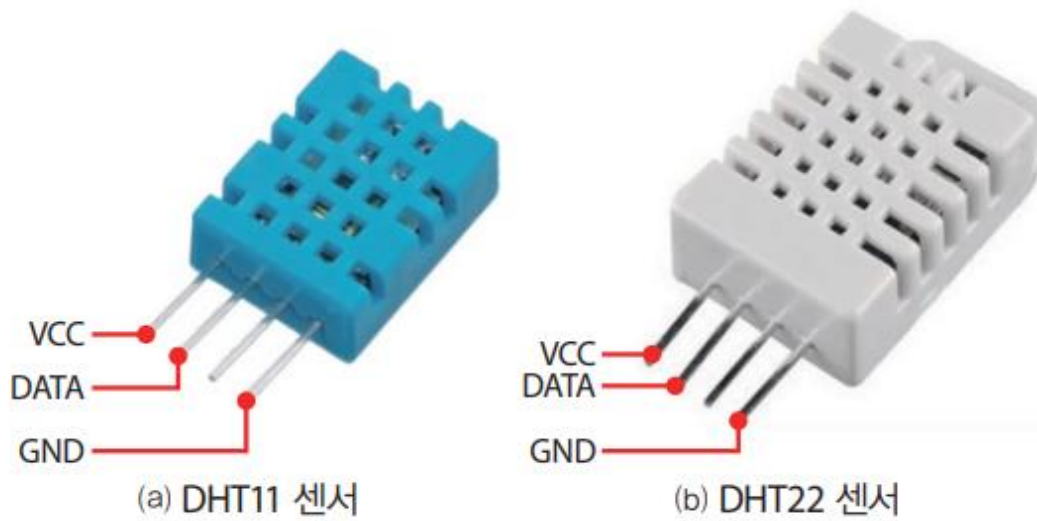
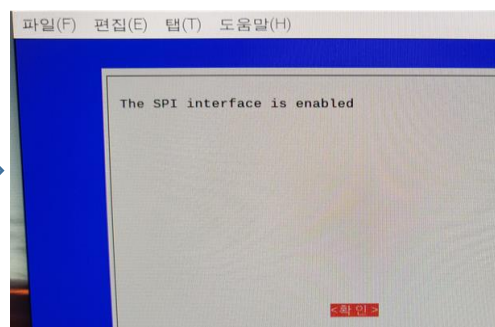
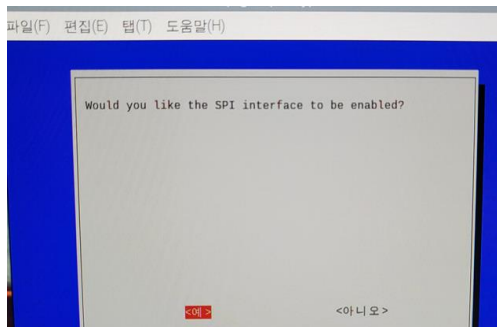
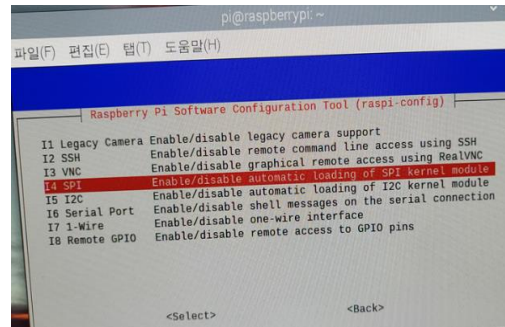
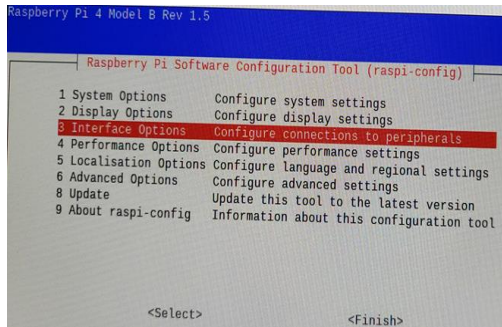


그림 6-30 DHT22 센서 연결

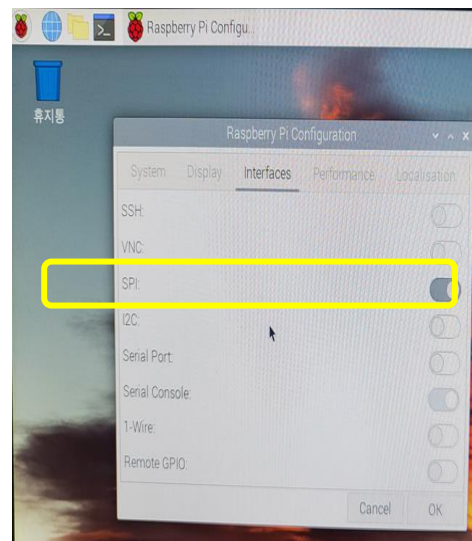
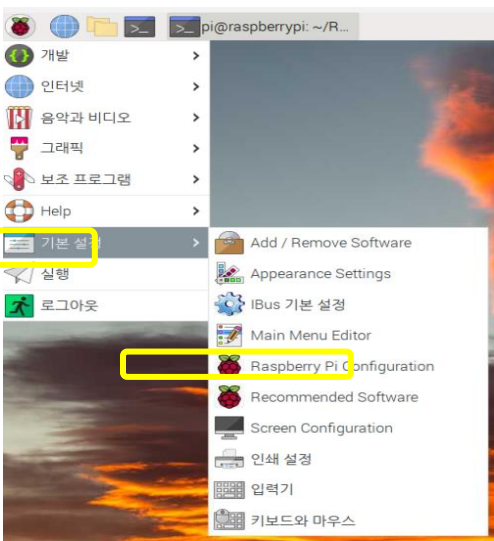
## 2. ADC 장치 실습 (교재 p.327)

. SPI Enable 확인

\$ sudo raspi-config

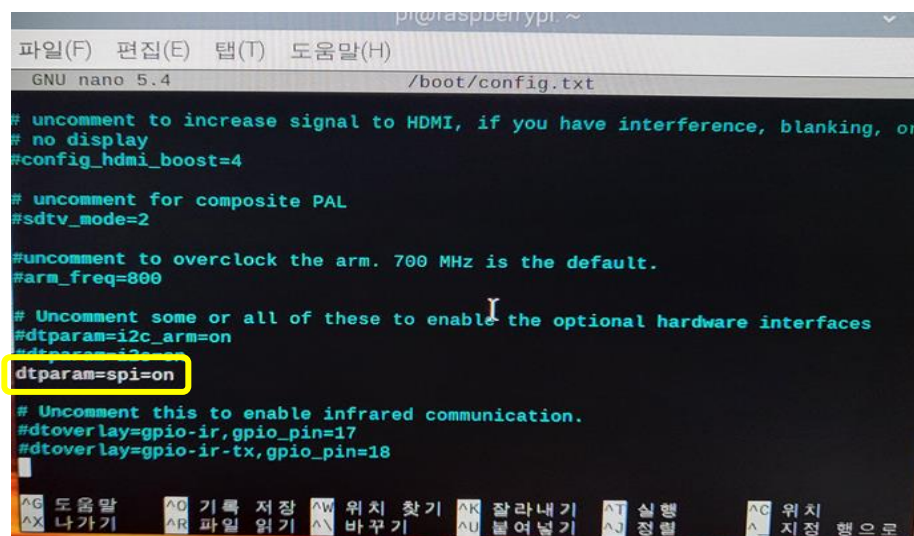


. Tab, Tab, Enter 로 빠져 나옴  
또는



```
$ sudo nano /boot/config.txt
```

\* dtparam=spi=on 체크



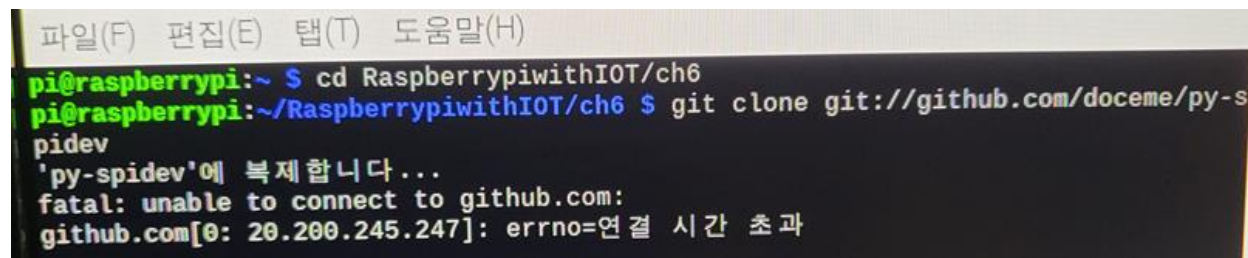
```
pi@raspberrypi:~  
파일(F) 편집(E) 탭(T) 도움말(H)  
GNU nano 5.4 /boot/config.txt  
# uncomment to increase signal to HDMI, if you have interference, blanking, or  
# no display  
#config_hdmi_boost=4  
  
# uncomment for composite PAL  
#sdtv_mode=2  
  
#uncomment to overclock the arm. 700 MHz is the default.  
#arm_freq=800  
  
# Uncomment some or all of these to enable the optional hardware interfaces  
#dtparam=i2c_arm=on  
#dtparam=i2s=on  
dtparam=spi=on  
# Uncomment this to enable infrared communication.  
#dtoverlay=gpio-ir,gpio_pin=17  
#dtoverlay=gpio-ir-tx,gpio_pin=18  
[Tab] [Ctrl] [X] 도움말 [Ctrl] [O] 기록 저장 [Ctrl] [W] 위치 찾기 [Ctrl] [R] 잘라내기 [Ctrl] [T] 실행 [Ctrl] [C] 위치 지정 [Ctrl] [H] 행 이동
```

```
$ 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
```



```
pi@raspberrypi:~ $ cd RaspberrypiwithIOT/ch6  
pi@raspberrypi:~/RaspberrypiwithIOT/ch6 $ git clone git://github.com/doceme/py-spidev  
'py-spidev'에 복제합니다...  
fatal: unable to connect to github.com:  
github.com[0: 20.200.245.247]: errno=연결 시간 초과
```

## 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



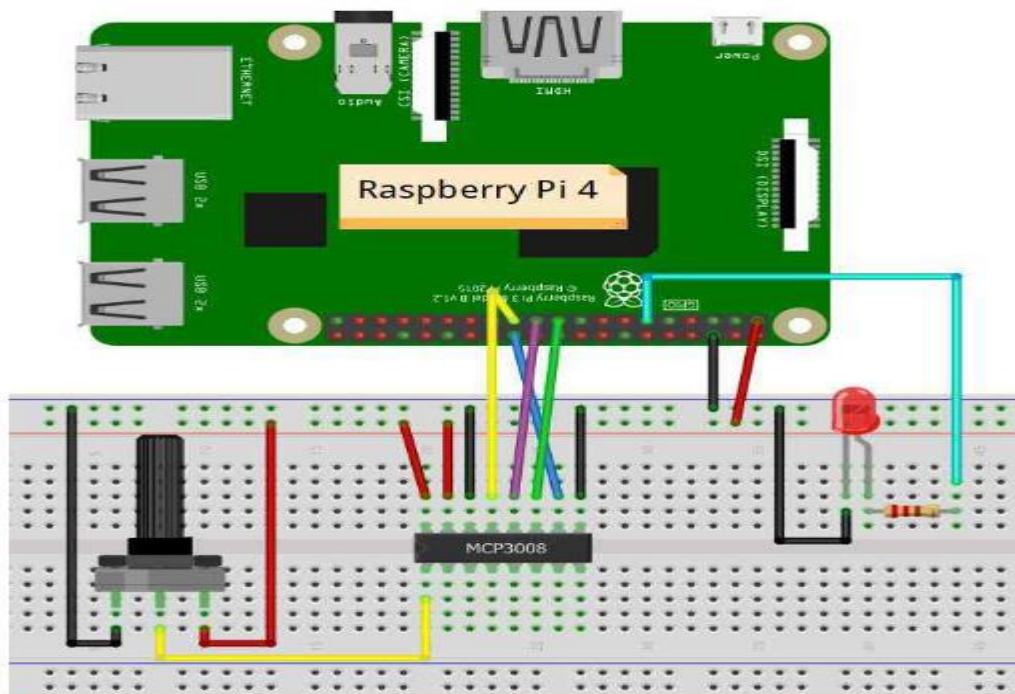
. Upgrade (apt, pip, ...)

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

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

```
pi@raspberrypi:~/Work/SPI $ sudo apt install python3-gpiozero
패키지 목록을 읽는 중입니다... 완료
의존성 트리를 만드는 중입니다... 완료
상태 정보를 읽는 중입니다... 완료
python3-gpiozero is already the newest version (1.6.2-1).
다음 패키지가 자동으로 설치되었지만 더 이상 필요하지 않습니다:
  libfuse2
Use 'sudo apt autoremove' to remove it.
0개 업그레이드, 0개 새로 설치, 0개 제거 및 1개 업그레이드 안 함.
pi@raspberrypi:~/Work/SPI $
```

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)
```

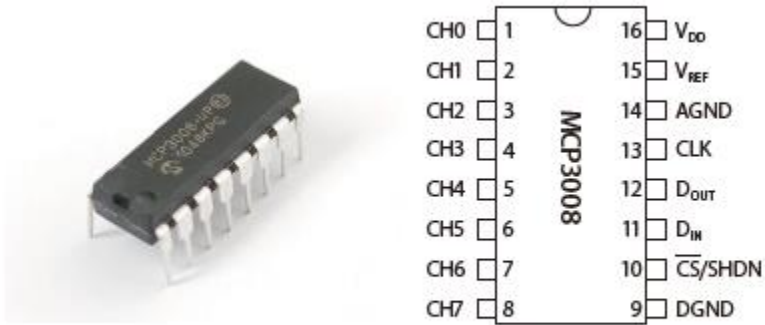


그림 6-21 MCP3008 칩 구성

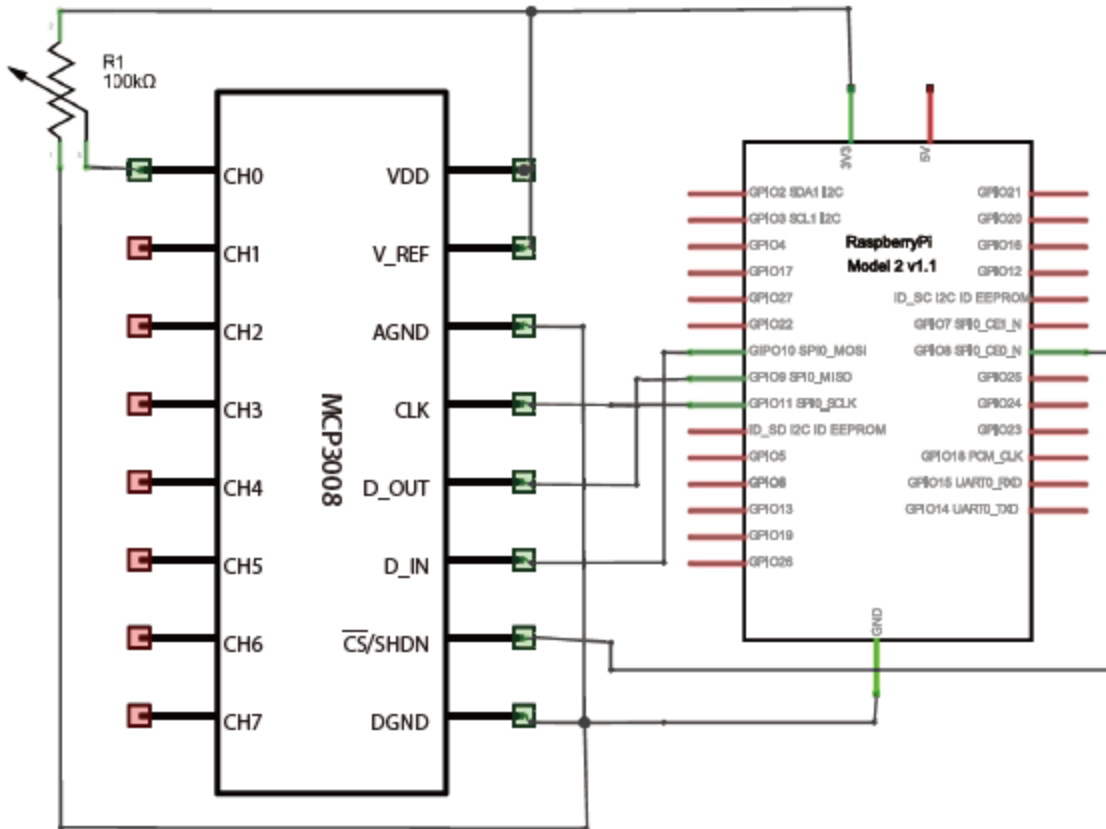
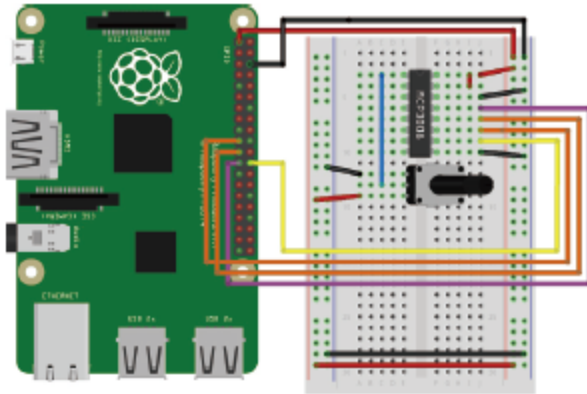


그림 6-22 MCP3008 회로 연결

## 2.2 ADC test

참고:

[https://gpiozero.readthedocs.io/en/v1.6.2/api\\_spi.html?highlight=#module-gpiozero.spi\\_devices](https://gpiozero.readthedocs.io/en/v1.6.2/api_spi.html?highlight=#module-gpiozero.spi_devices)

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



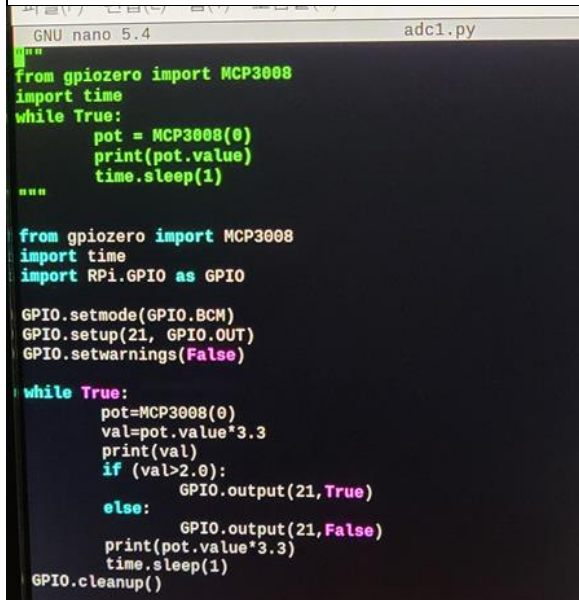
```
while True:
    pot = MCP3008(0)
    print(pot.value)
    time.sleep(1)
```

```
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()
```

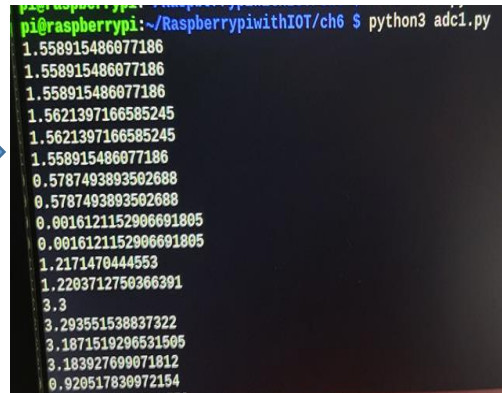


```
GNU nano 5.4 adc1.py
"""
from gpiozero import MCP3008
import time
while True:
    pot = MCP3008(0)
    print(pot.value)
    time.sleep(1)
"""

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()
```



```
pi@raspberrypi:~/RaspberrypiwithIOT/ch6 $ python3 adc1.py
1.558915486077186
1.558915486077186
1.558915486077186
1.5621397166585245
1.5621397166585245
1.558915486077186
0.5787493893502688
0.5787493893502688
0.0016121152906691805
0.0016121152906691805
1.2171470444553
1.2283712750366391
3.3
3.293551538837322
3.1871519296531505
3.183927699071812
0.920517830972154
```

