

Practical Python - Internet of Things

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Outline

Introduction

Installation

Circuits

Resources

Introducing MicroPython

- ▶ Python for microcontroller boards
- ▶ Started as a Kickstarter
- ▶ All Open Source

Introducing the ESP8266

- ▶ 80MHZ processor
- ▶ lots of GPIO pins
- ▶ Digital interfaces
- ▶ One Analogue
- ▶ Wifi
- ▶ Cheap
- ▶ reasonably well documented (now)

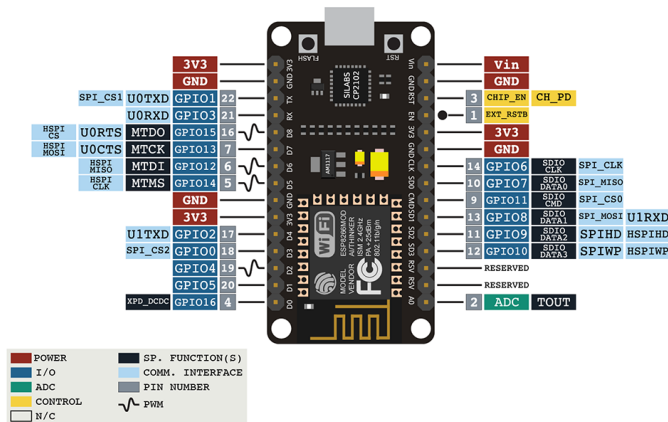
ESP8266 Development Board

Pin Mapping

ESP-12E DEVELOPMENT BOARD PINOUT

NOTES:

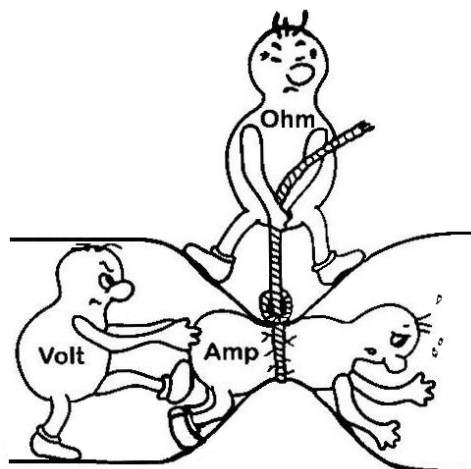
- ▲ Typ. pin current 6mA (Max. 12mA)
- ▲ For sleep mode, connect GPIO16 and EXT_RSTB. On wakeup, GPIO16 will output LOW for system reset.
- ▲ On boot/reset/wakeup, keep GPIO15 LOW and GPIO2 HIGH.



Micropython	Board
0	D3
2	D4 (also Led1 but inverse)*
4	D2
5	D1
9	SD2
10	SD3
12	D6
13	D7
14	D5
15	D8
16	D0 (also Led2 but inverse)*

Introduction to Electricity

- The water analogy



<http://www.electricalonline4u.com/2015/10/ohm-law-explanation-guide.html>

Installation

- Install Python, e.g. <http://anaconda.org>
- Install esptool

```
> pip install esptool
```

- Clear flash memory

```
> esptool.py --port /dev/ttyUSB0 erase_flash
```

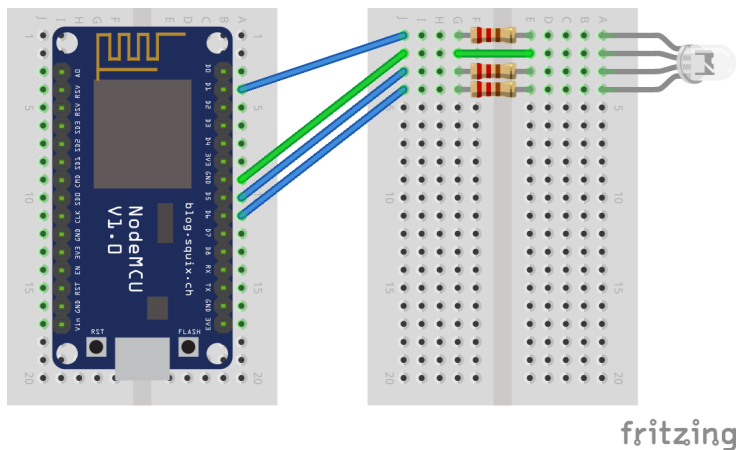
- Download MicroPython
<http://github.com/micropython/micropython/releases>
- Flash board

```
> esptool.py --port /dev/ttyUSB0 --baud 460800 write_flash  
--flash_size=detect 0 ~/Downloads/esp8266-$version.bin
```

Setup

- ▶ Connect to the board
- ```
> screen /dev/ttyUSB0 115200
```
- ▶ Hit enter!
  - ▶ Work out WIFI name
- ```
> import network
> ap = network.WLAN(network.AP_IF)
> ap.config("essid")
```
- ▶ Write this down!
 - ▶ Turn on the Web Server
- ```
> import webrepl_setup
```
- ▶ Follow the prompts. Pick a simple password.
  - ▶ Turn on Web Server
  - ▶ Reboot...
  - ▶ Connect to Board, password is micropython

## RGB LED Layout



## Look Around

- ▶ Micropython implements a filesystem, just like a computer.

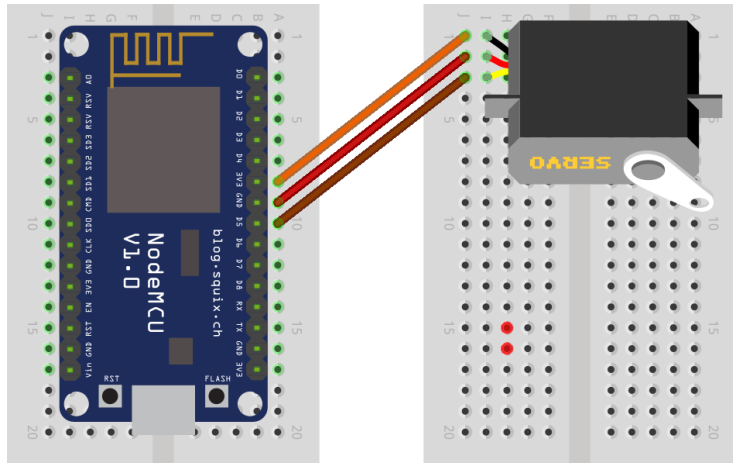
```
> import os
> os.listdir()
```

## RGB LED Code

```
> from machine import Pin, PWM
> r = PWM(Pin(4), freq=500, duty=0)
> g = PWM(Pin(12), freq=500, duty=0)
> b = PWM(Pin(14), freq=500, duty=0)
>
```

## Servo Layout

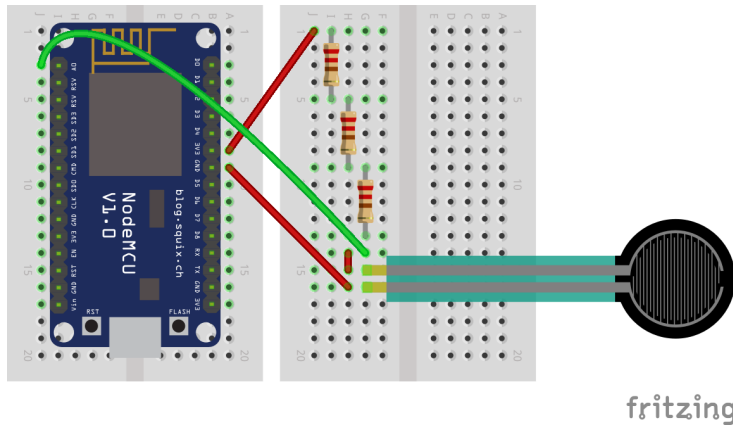
- ▶ Orange - PWM
- ▶ Red - +V
- ▶ Brown - Ground



## Servo Code

```
> from machine import Pin, PWM
> s = PWM(Pin(14), freq=50, duty=0)
```

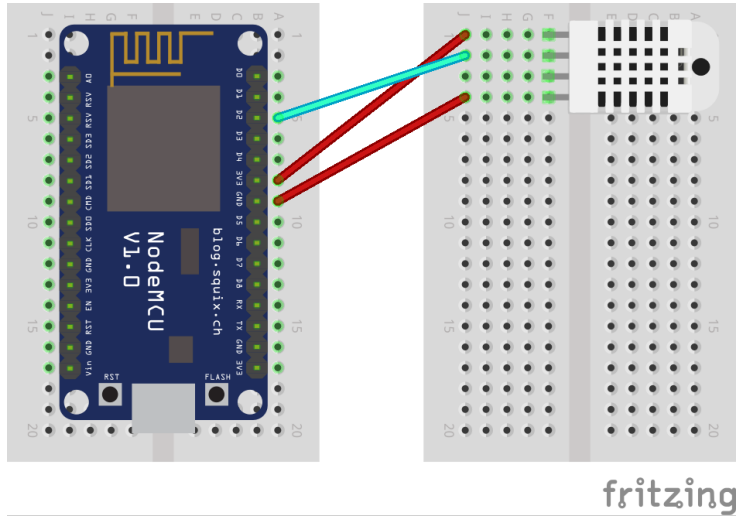
## Force Sensor Layout



## Force Sensor Code

```
> from machine import ADC
> adc = ADC(0)
> adc.read()
```

## Temperature Sensor Layout



## Temperature Sensor Code

```
> import dht
> import machine
> d = dht.DHT11(machine.Pin(4))
>
> # Only once a second.
> d.measure()
> d.temperature()
> d.humidity()
```

## Resources

- ▶ These notes: Copyright © 2017 Clinton Roy
  - ▶ <https://github.com/clintonroy/slq2017python> © ⓘ
- ▶ <https://docs.micropython.org/en/latest/esp8266/esp8266/tutorial/>
- ▶ <http://fritzing.org/>