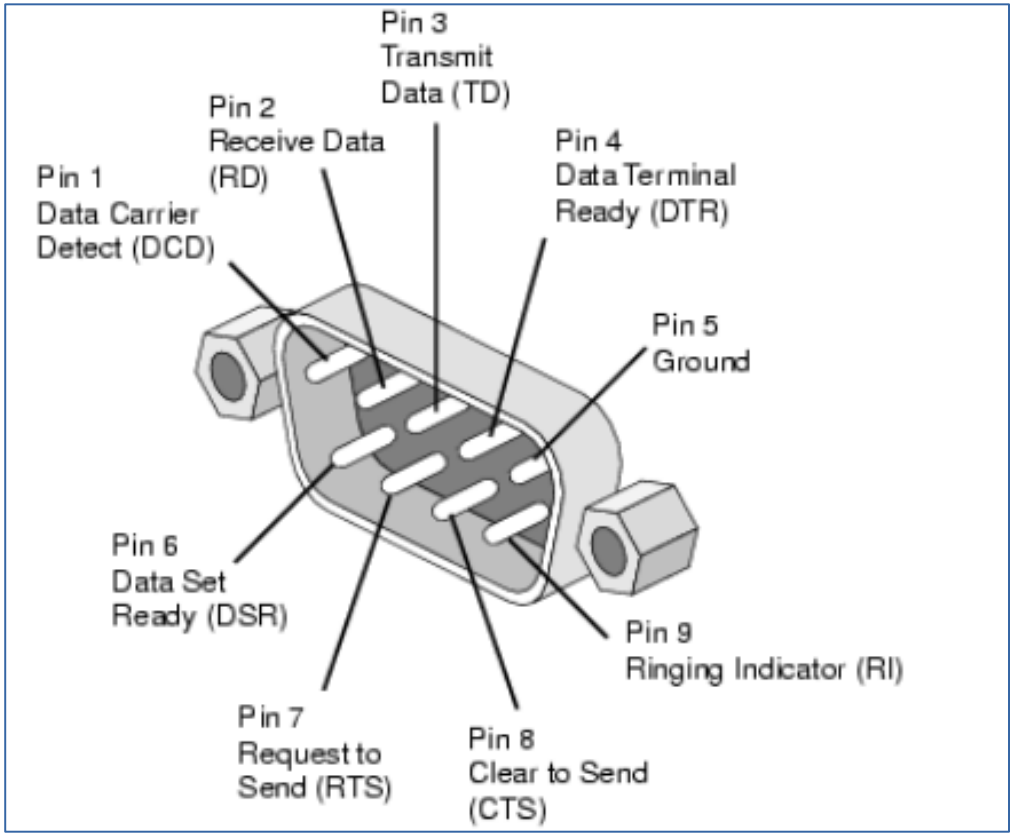
USB-2-Serial (RS232)



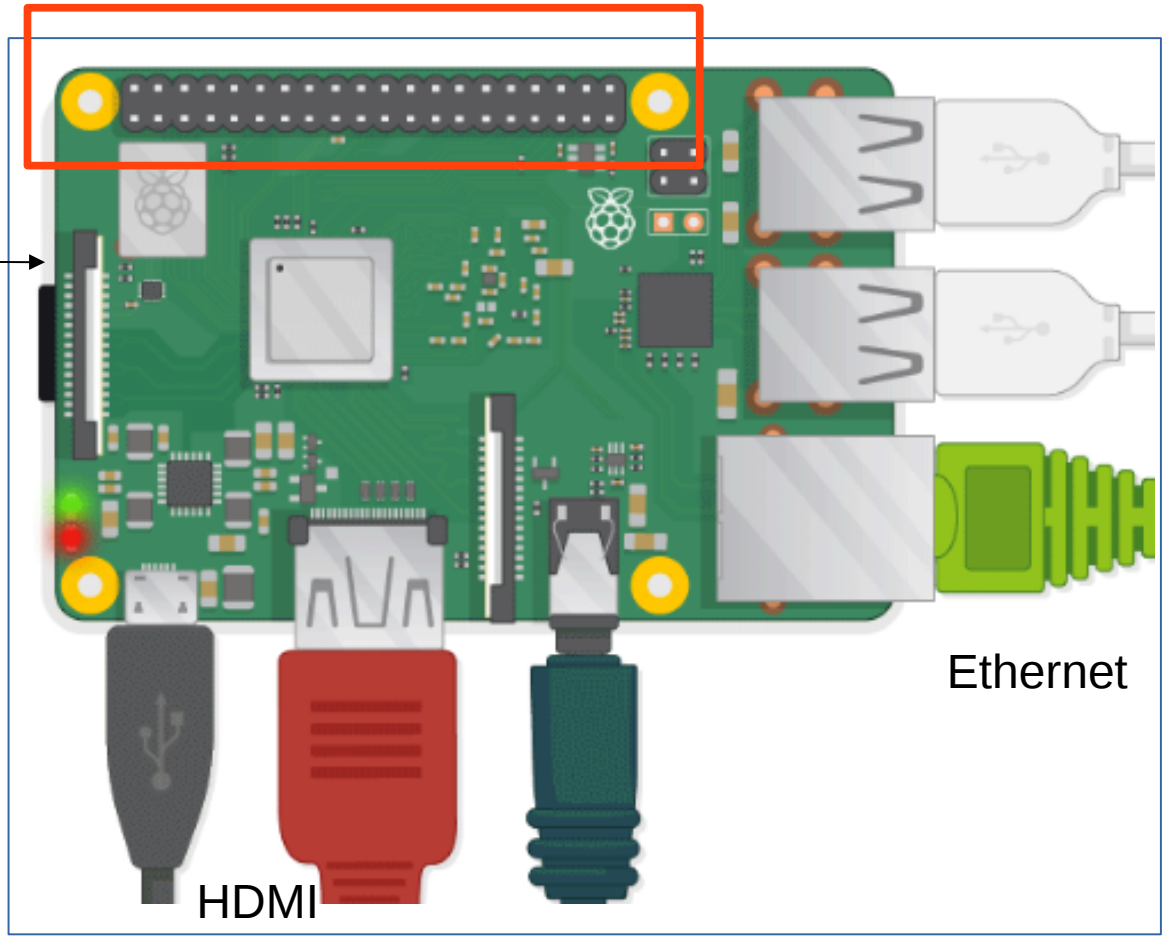
Note: (1) this DB9 connector is male; and (2) it is on the host side.

Note: (1) this DB9 connector is female; and (2) it is on the client (Dev kit) side to be connected to the host.

Pie-3 Board

https://www.raspberrypi.org/help/

Expansion Connectors



32G SD card

OS: Raspbian, comes pre-installed with many software. It supports Python, Scratch, Sonic Pi, Java and more.

C++/C programming for pie

https://raspberry-projects.com/pi/category/programming-in-c

Eclipse Linux

Using A Linux PC With A Cross Compiler: this page does not exist

C programming for pie

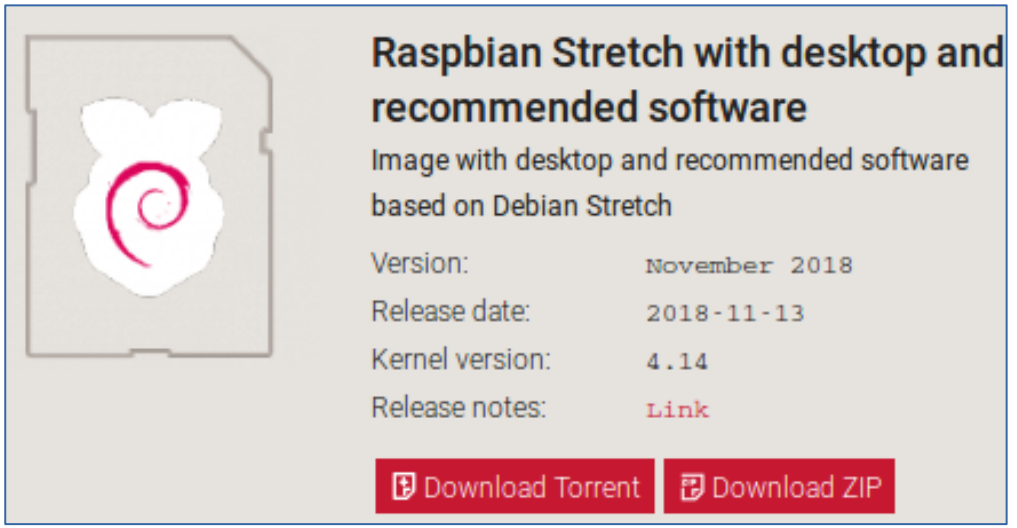
The Raspbian Operating System via NOOBS
Using the NOOBS software to install Raspbian OS on your SD card. Download NOOBS at (https://www.raspberrypi.org/downloads).

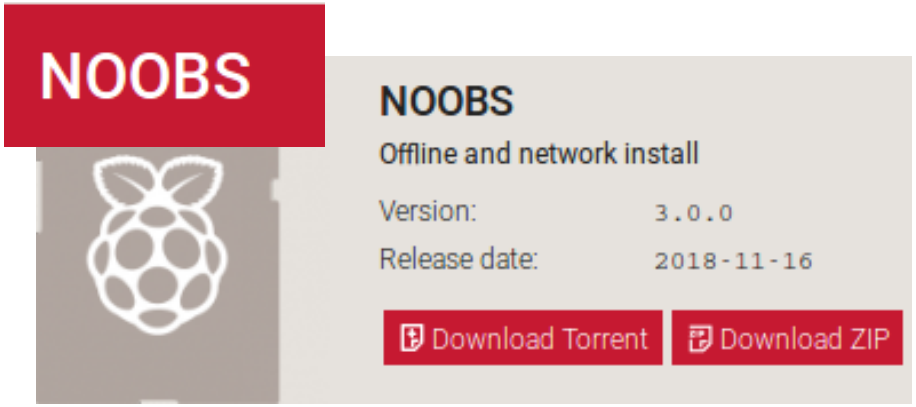
https://raspberry-projects.com/pi/programming-in-c/getting-your-raspberry-pi-ready-for-c-programming

Raspbian OS for Pie-3

https://www.raspberrypi.org/downloads/raspbian/

Raspbian Stretch with desktop and recommended software
Image with desktop and recommended software based on Debian Stretch
Version: November 2018
Release date: 2018-11-13
Kernel version: 4.14
Release notes: Link
download: zip





Go to the downloads page, grab a copy of the NOOBS zip file, and unpack it onto a freshly formatted 32GB (or larger) SD card.

https://www.raspberrypi.org/blog/introducing-noobs/

When the pie boot up for the first time, you'll see a menu prompting you to install one of several operating systems into the free space on the card. Select the boot of the Pi with a regular OS Raspbian, or with a media-centre OS like RaspBMC.

Harry Li, Ph.D.

Prototype Board Layout Design

Prototype Board

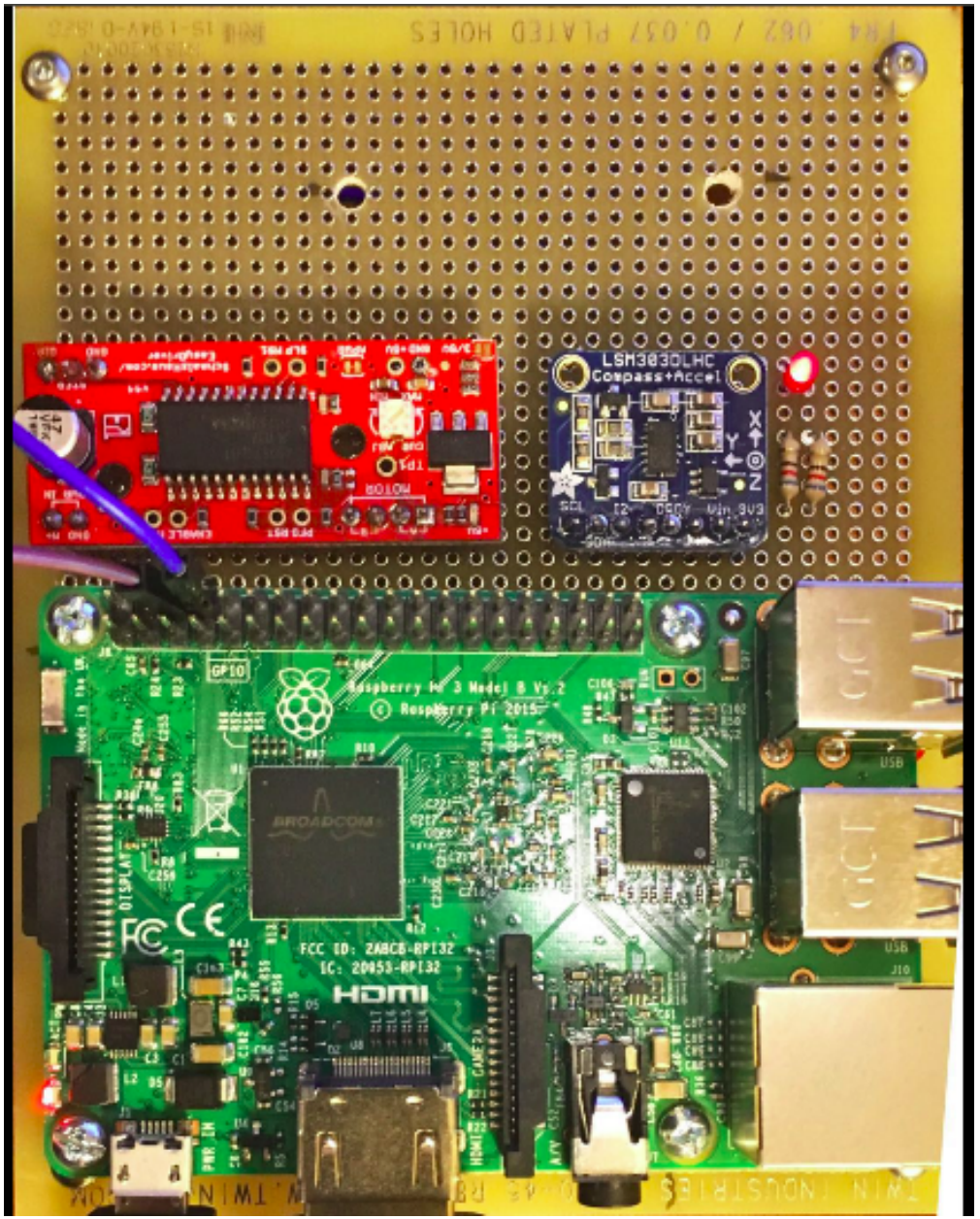
GPIO
I/O
Testing

Stepper
Motor Drive

LSM303

Pwr Unit
(Tier 1)

Pie-3 B+
(Tier 2)



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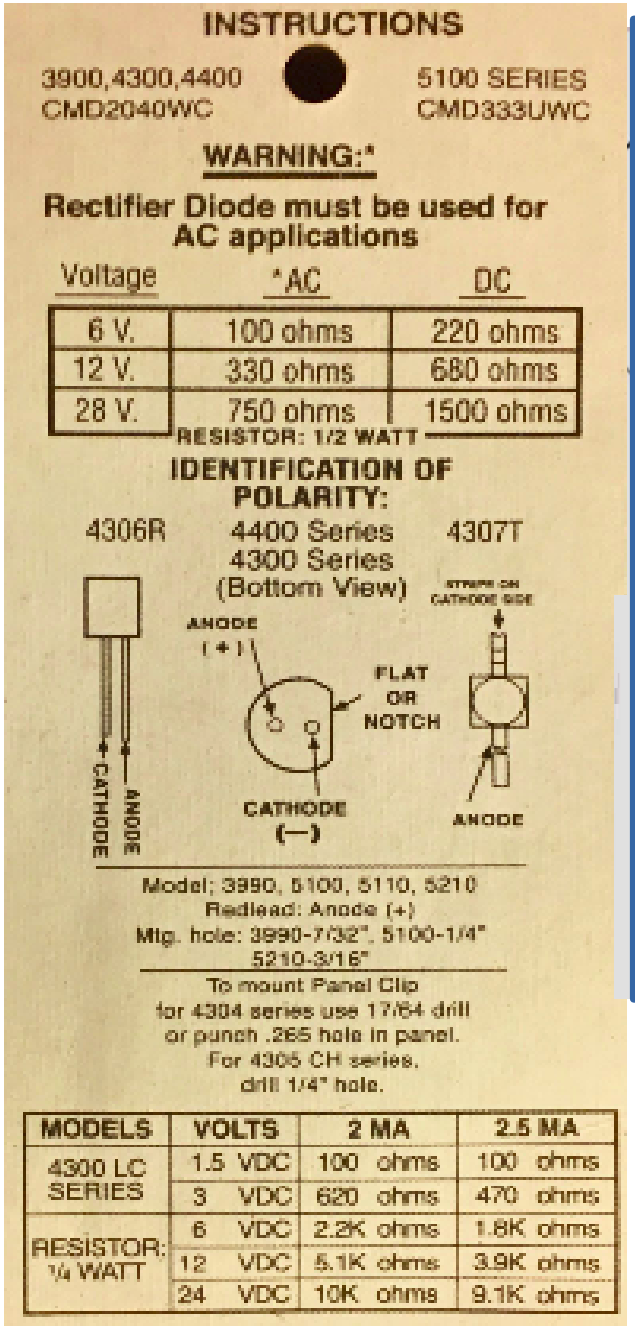
Power Unit Design



INSTRUCTIONS

3900,4300,4400 CMD2040WC — 5100 SERIES CMD333UWC

WARNING:*

Rectifier Diode must be used for AC applications

Voltage	*AC	DC
6 V.	100 ohms	220 ohms
12 V.	330 ohms	680 ohms
28 V.	750 ohms	1500 ohms

RESISTOR: 1/2 WATT

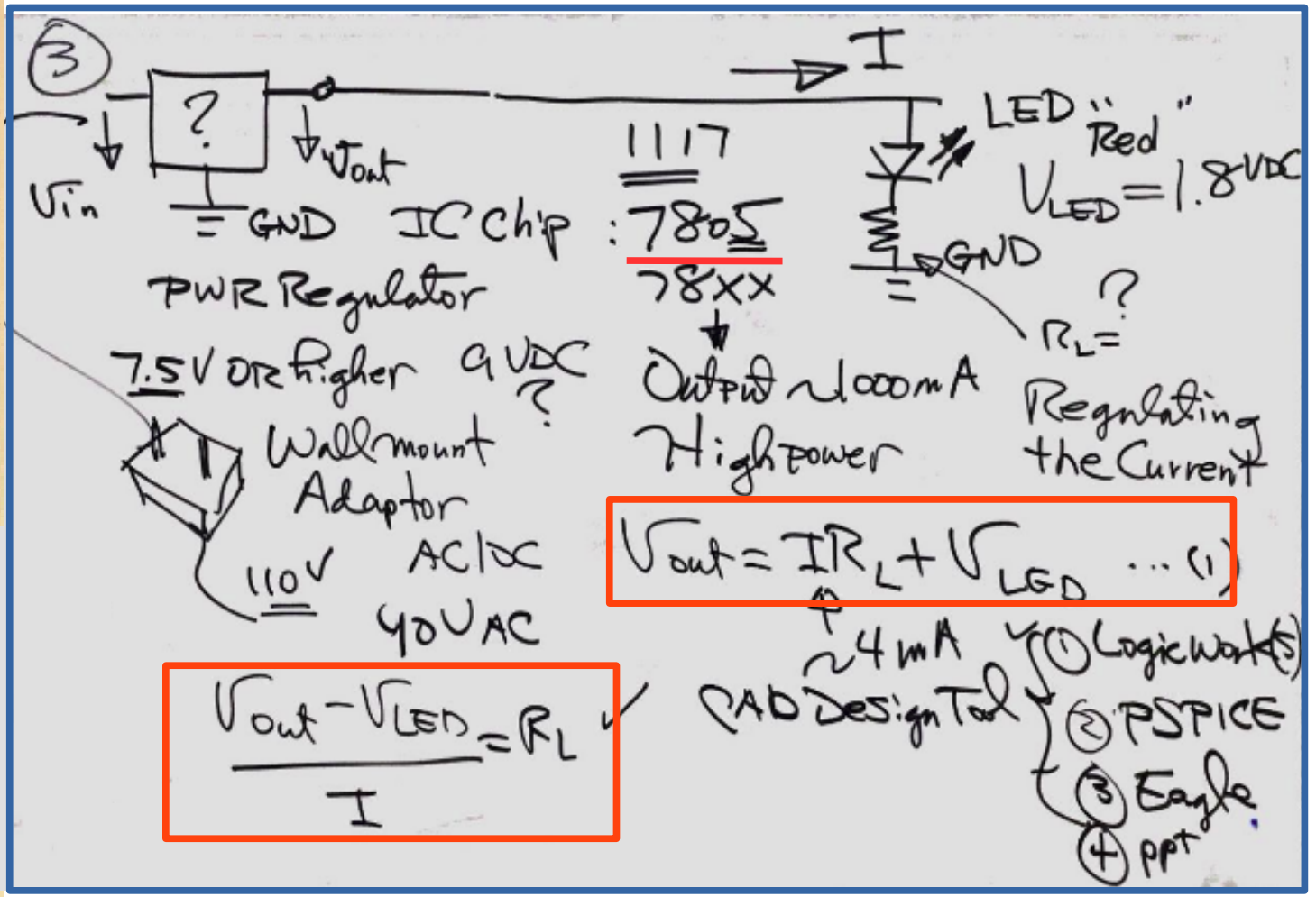
IDENTIFICATION OF POLARITY:

4306R — 4400 Series 4300 Series (Bottom View) — 4307T

Model; 3990, 5100, 5110, 5210
Redlead: Anode (+)
Mtg. hole: 3990-7/32", 5100-1/4" 5210-3/16"

To mount Panel Clip for 4304 series use 17/64 drill or punch .265 hole in panel. For 4305 CH series, drill 1/4" hole.

MODELS	VOLTS	2 MA	2.5 MA
4300 LC SERIES	1.5 VDC	100 ohms	100 ohms
	3 VDC	620 ohms	470 ohms
RESISTOR: ¼ WATT	6 VDC	2.2K ohms	1.8K ohms
	12 VDC	5.1K ohms	3.9K ohms
	24 VDC	10K ohms	9.1K ohms



LED Spec

Estimated Power Budget total: 1750 mA

ARM CPU Board
MLS303
Motor Drive bd
Rest Glue

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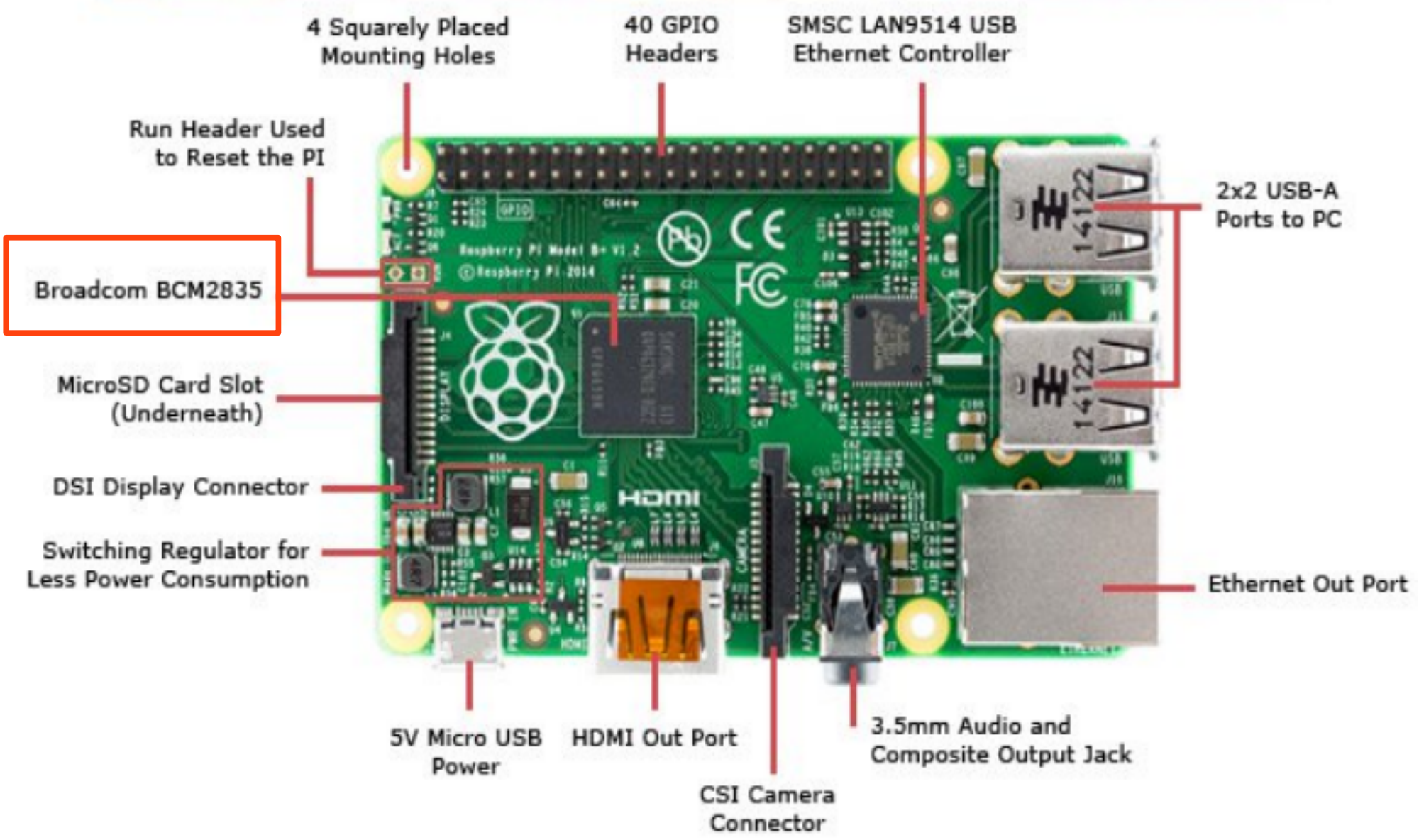
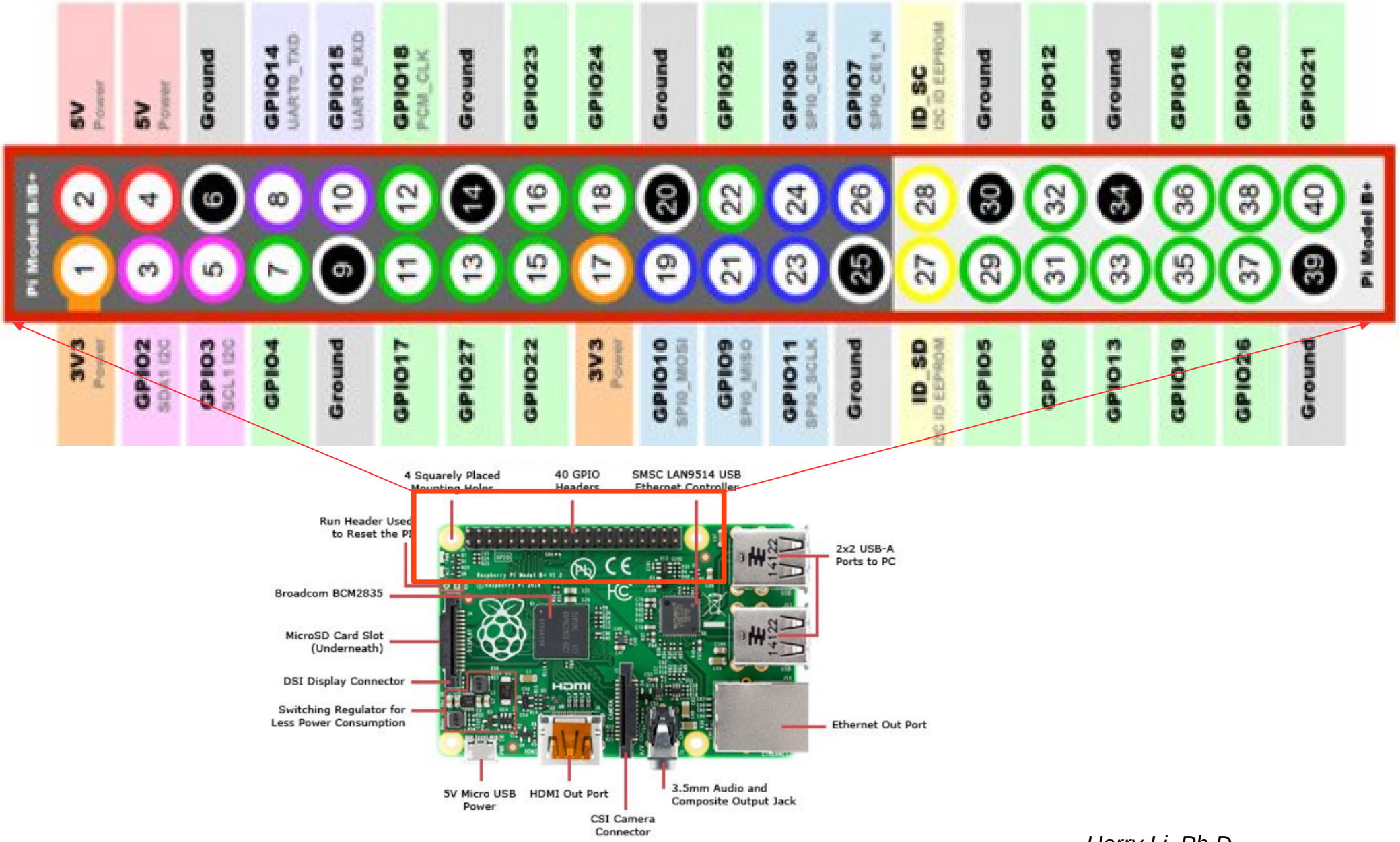
GPIO Testing
Pie-3 Version B GPIO Pins

https://www.jameco.com/Jameco/workshop/circuitnotes/raspberry-pi-circuit-note.html



Pie-3 Version B GPIO Pins

https://www.jameco.com/Jameco/workshop/circuitnotes/raspberry-pi-circuit-note.html



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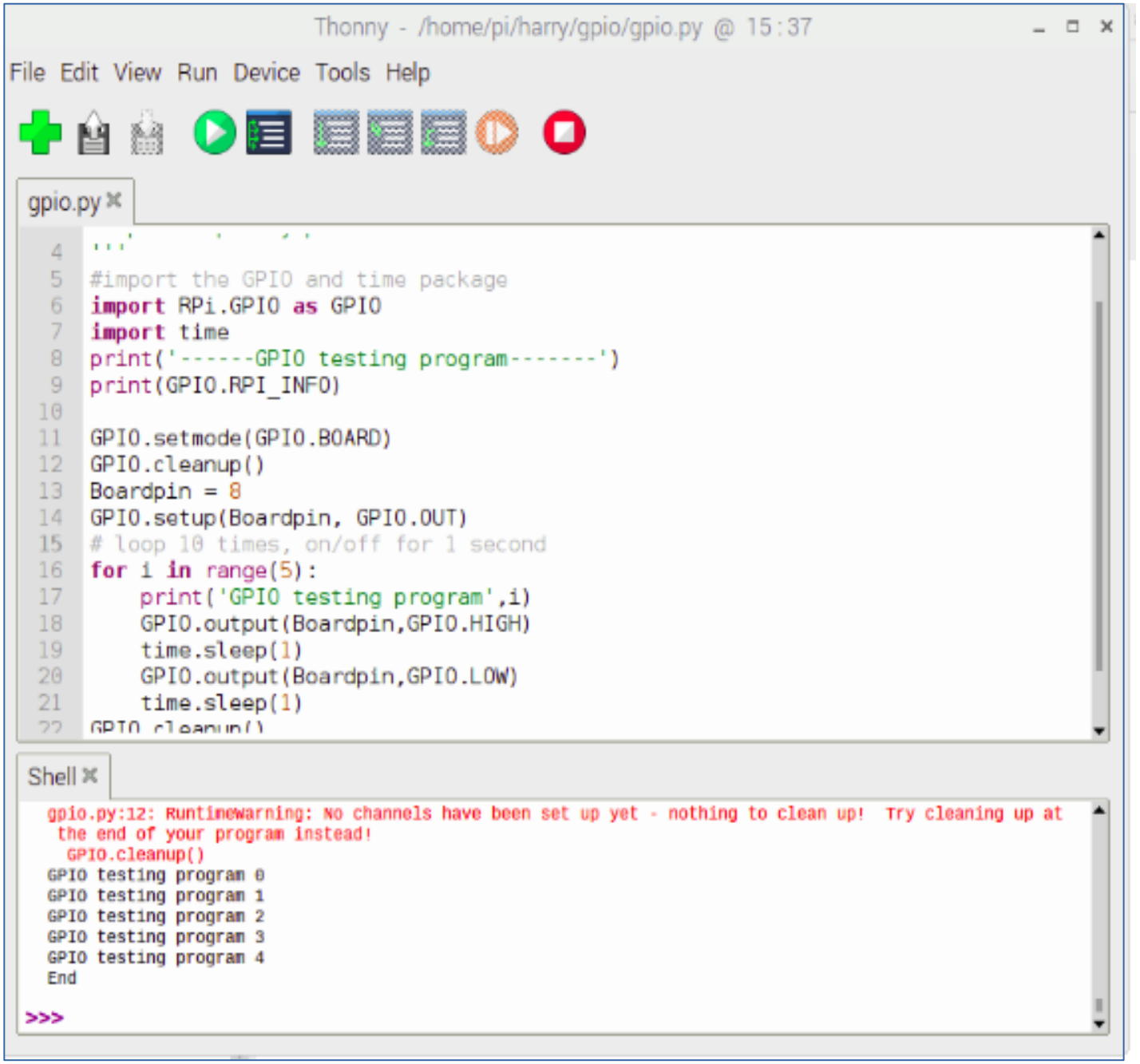
Python GPIO Interface Testing

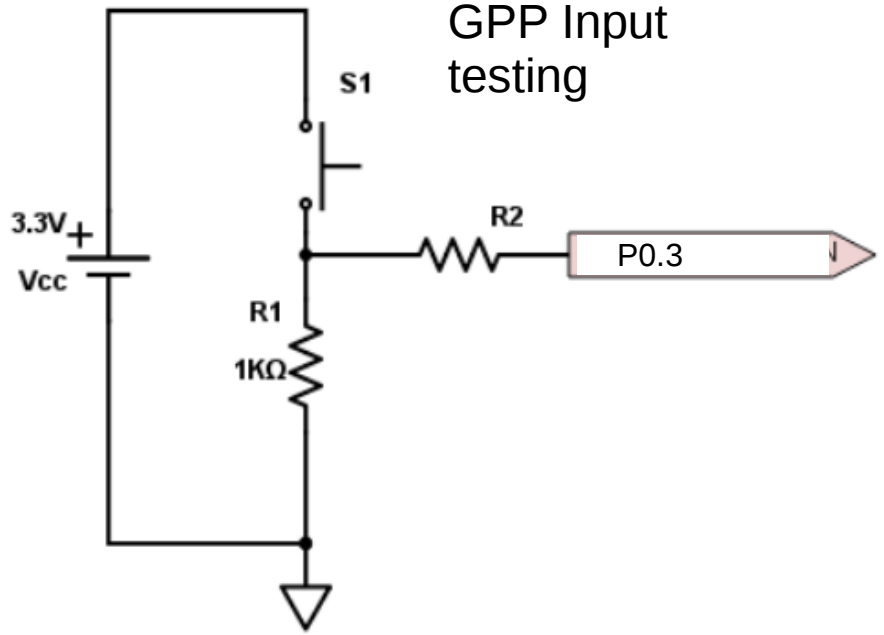
```
'''
Date: Feb 2019;  Coded by: HL
sample raspberry pie GPIO code
'''
#import the GPIO and time package
import RPi.GPIO as GPIO
import time
print('------GPIO testing program-------')
print(GPIO.RPI_INFO)
GPIO.setmode(GPIO.BOARD)
GPIO.cleanup()
Boardpin = 8
GPIO.setup(Boardpin, GPIO.OUT)
# loop 5 times, on/off for 1 second
for i in range(5):
    print('GPIO testing program',i)
    GPIO.output(Boardpin,GPIO.HIGH)
    time.sleep(1)
    GPIO.output(Boardpin,GPIO.LOW)
    time.sleep(1)
GPIO.cleanup()
print('End')
```

RPi.GPIO Python package

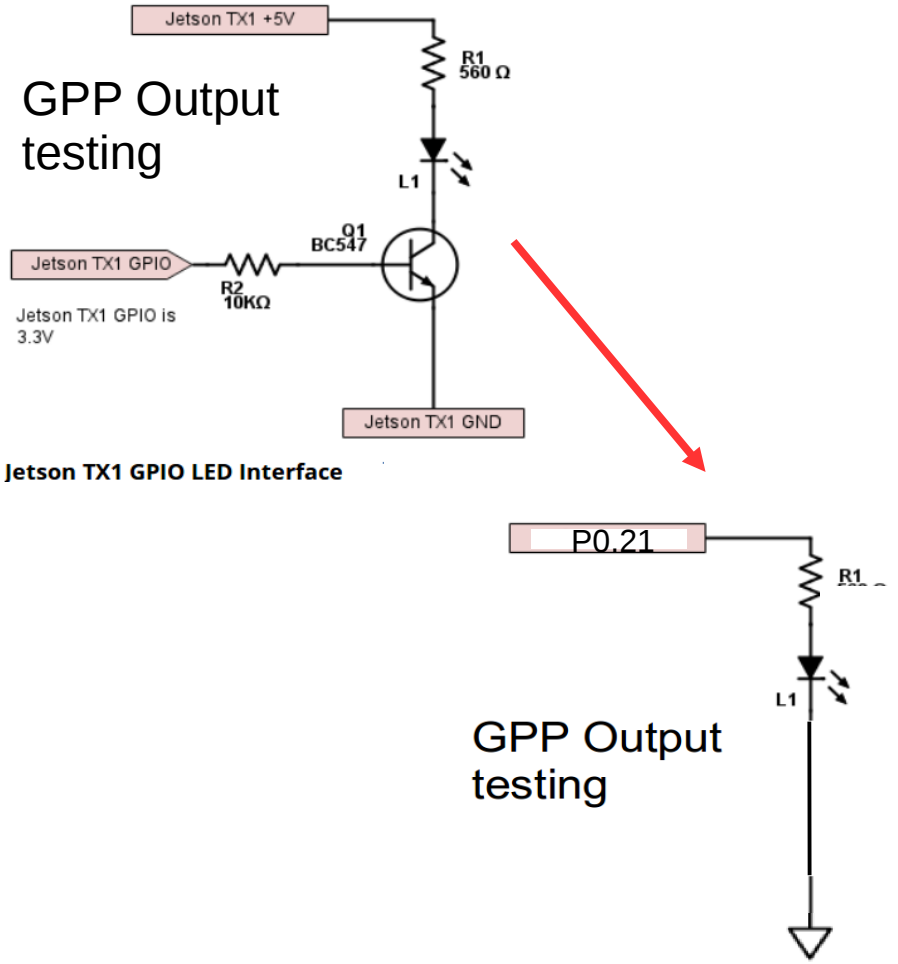
“Thonny” Python IDE On Pie



GPIO Interface Testing



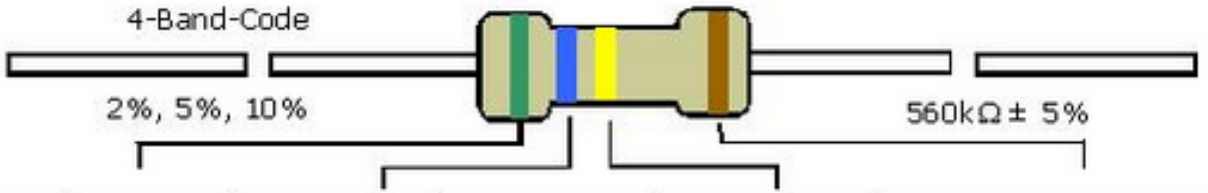
Schematic GPIO



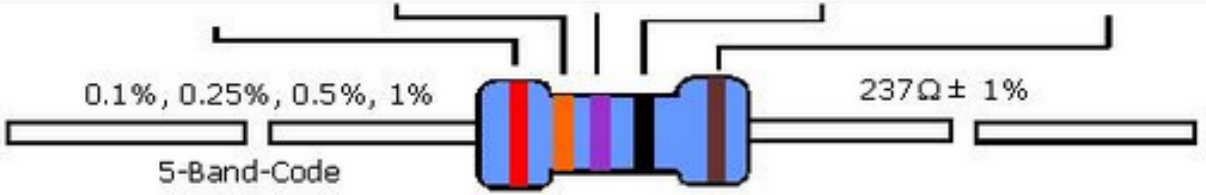
Jetson TX1 GPIO LED Interface

http://www.jetsonhacks.com/2015/12/29/gpio-interfacing-nvidia-jetson-tx1/

Color Code Resistor



COLOR	1st BAND	2nd BAND	3rd BAND	MULTIPLIER	TOLERANCE
Black	0	0	0	1Ω	
Brown	1	1	1	10Ω	± 1% (F)
Red	2	2	2	100Ω	± 2% (G)
Orange	3	3	3	1KΩ	
Yellow	4	4	4	10KΩ	
Green	5	5	5	100KΩ	±0.5% (D)
Blue	6	6	6	1MΩ	±0.25% (C)
Violet	7	7	7	10MΩ	±0.10% (B)
Grey	8	8	8		±0.05%
White	9	9	9		
Gold				0.1	± 5% (J)
Silver				0.01	± 10% (K)



Color	Digit	Multiplier	Tolerance (%)
Black	0	10^0 (1)	
Brown	1	10^1	1
Red	2	10^2	2
Orange	3	10^3	
Yellow	4	10^4	
Green	5	10^5	0.5
Blue	6	10^6	0.25
Violet	7	10^7	0.1
Grey	8	10^8	
White	9	10^9	
Gold		10^{-1}	5
Silver		10^{-2}	10
(none)			20

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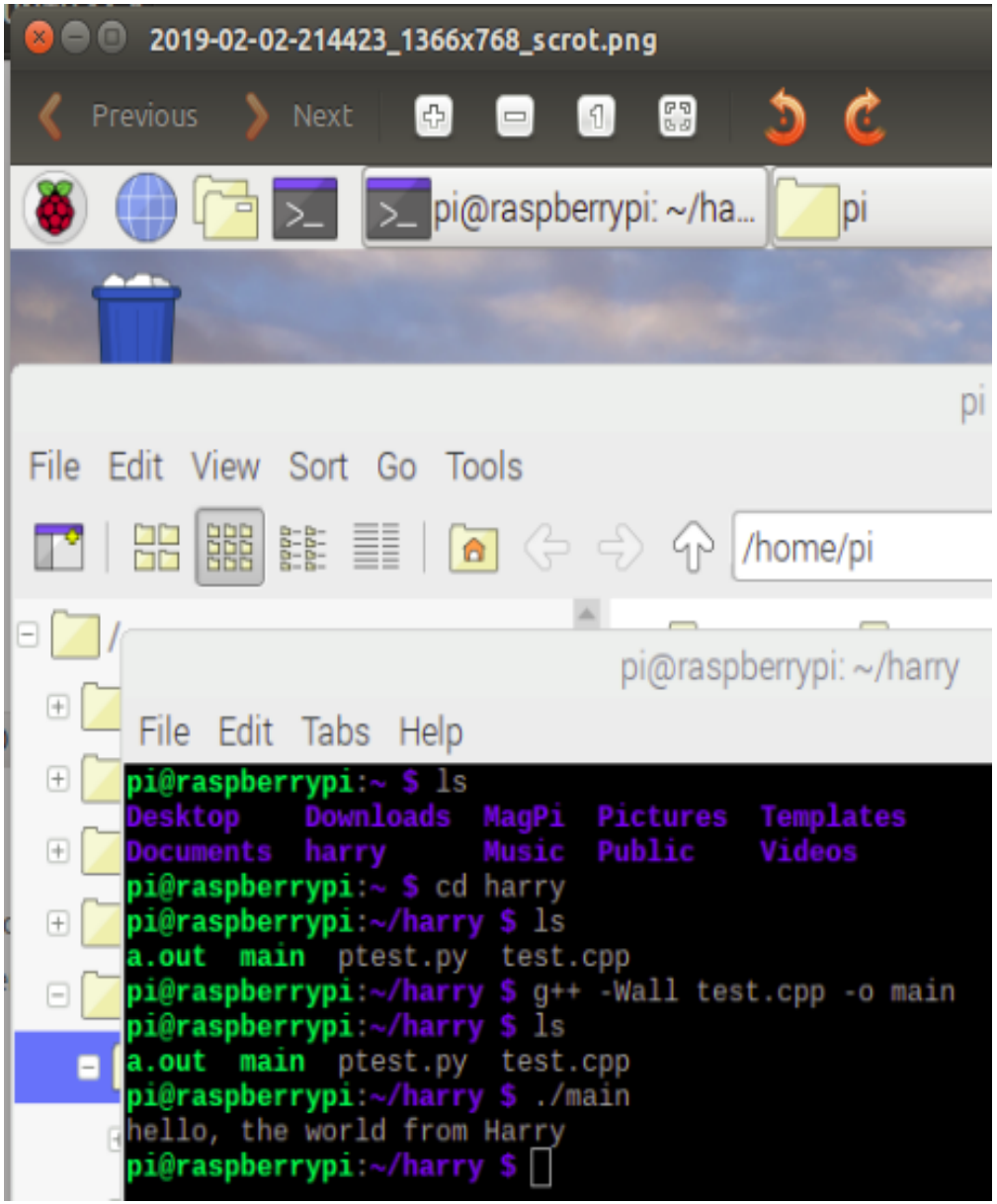
Screen Capture with Scrot

1) Download the scrot a screen capture tool
$ sudo apt-get install scrot

2) once done, restart your system, then open a terminal do
$scrot

This will capture the whole screen for you.



Pie-3 C Programming

1) Download the Raspbian Wheezy SD card image from the Raspberry Pi website downloads page

2) Copy it to a SD card and unzip it.

3) Boot your RPi, log in and start the GUI, then select Raspian to boot.

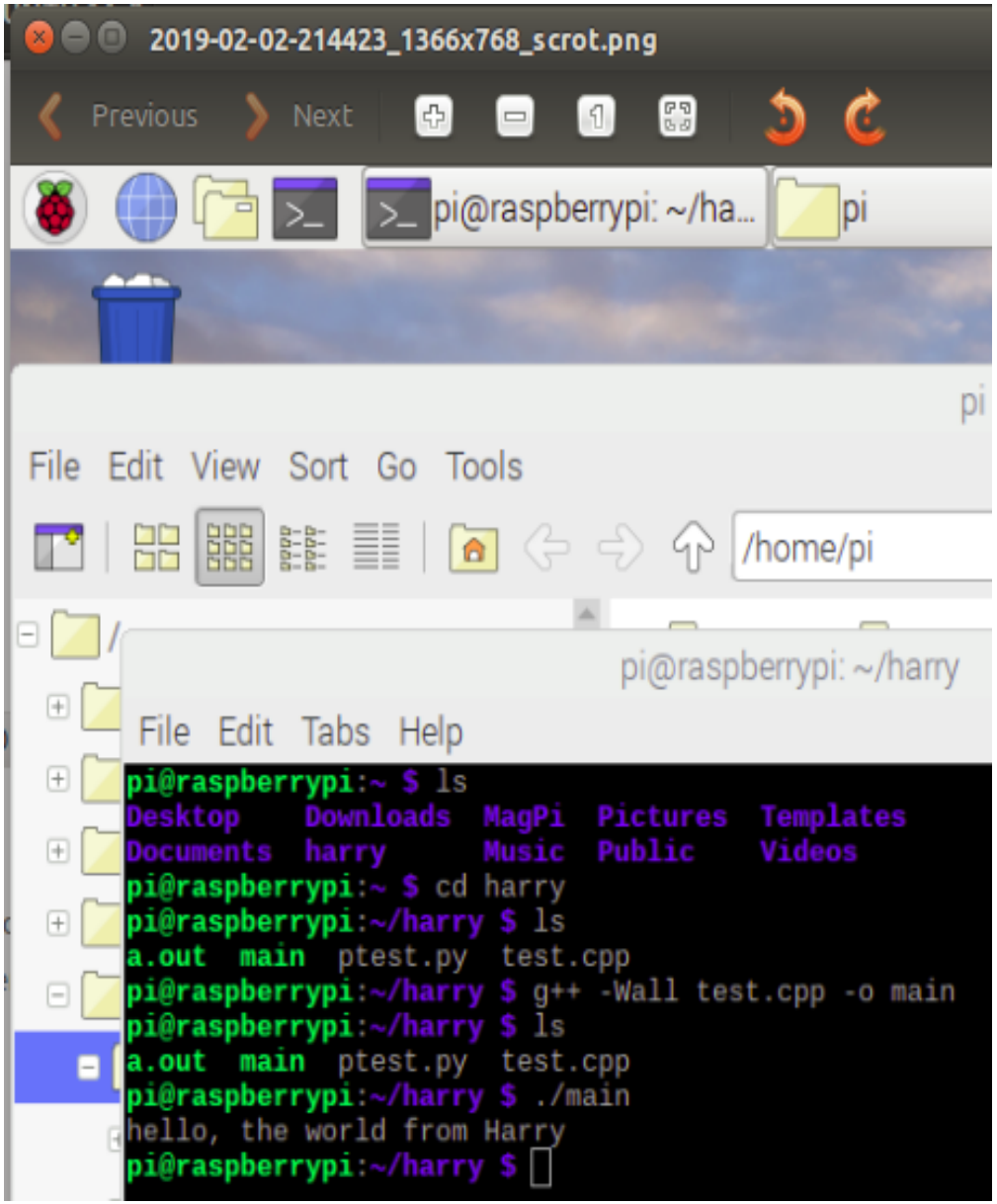
4) Once booted, at the top left select the terminal icon, click on it to open.

5) Then create your working directory, for example, under /home/pi directory, create your working directory.

6) Then use your preferred word editor to create your first test.c program, for example, use “vi” to create test.c.

7) Compile and build: $gcc -Wall test.cpp -o main

8) To execute the program, $./main



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Configure Device Drivers

https://pimylifeup.com/raspberry-pi-gpio/

GPIO is your standard pins that simply be used to turn devices on and off. For example, a LED.
I2C (Inter-Integrated Circuit) pins allow you to connect and talk to hardware modules that support this protocol (I2C Protocol). This protocol will typically take up two pins.
SPI (Serial Peripheral Interface Bus) pins can be used to connect and talk to SPI devices. Pretty much the same as I2C but makes use of a different protocol.
UART (Universal asynchronous receiver/transmitter) is the serial pins used to communicate with other devices.

GPIO Input Testing and exINT

https://opensourceforu.com/2017/07/introduction-raspberry-pi-gpio-programming-using-python/

Setting up an input pin

Just like a ground pin was used to complete the circuit of the output pin, the circuit of an input pin should be completed using a ground pin or 3v3 pin. A lone input pin in a circuit is said to be ‘floating’. Since its voltage can be of any value between 0 and 3.3V, it cannot be used. That should be avoided by using a 3v3 pin or a ground pin and an in-built pull up or pull down resistor.

A pin can be set as input as follows:
GPIO.setup(channel, GPIO.IN, PUD)

Here, the channel is the pin number. PUD can be either GPIO.PUD_DOWN or GPIO.PUD_UP. It tells you whether to use the inbuilt pull up or the pull down resistor. If the 3v3 pin is used, we have to use GPIO.PUD_DOWN (pull down resistor), and for the ground pin, we need to use GPIO.PUD_UP (pull up resistor). The choice of 3v3 or ground is up to you. The only difference is the value read from an open circuit and closed circuit. For the 3v3 pin (GPIO.PUD_DOWN), the input value of the open circuit will be 0 and of a closed circuit will be 1. For a ground pin (GPIO.PUD_UP), open circuit is 1 and closed circuit is 0.