BIG DADDY'S PYTHON TOOLBOX For 3.5

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V041418a

P3 RA8

RPi.GPIO Module Usage

Import the module:

import RPi.GPIO [**as** *string*] - **as "IO"** is assumed in the following

Pin numbering:

a choice is required to specify which system you will use for channel designation:

IO.setmode(IO.BOARD)
...Or... (see reverse side for diagram)
IO.setmode(IO.BCM)

Setup:

for every channel that is to be used:

IO.setup(channel, IO.IN)
IO.setup(channel, IO.OUT)

You can specify an initial state for the pin:

IO.setup(channel, IO.OUT, initial=IO.HIGH)

Or setup a group at once:

chan_list = [11,12] add multiple channels
can use tuples instead, i.e.: chanlist = (11,12)
IO.setup(chan_list, IO.OUT)

Read or write (set) pins:

(NOTE: a "pin" is the same as a "channel")

IO.input(channel) (0=False=IO.Low, 1=True=IO.High)
IO.output(channel, state) (states same as above)

Can output to several channels with one command:

chanlist = [11,12] <- this also works with tuples
IO.output(chanlist, IO.LOW) <- this sets all in chanlist to LOW
IO.output(chanlist, (IO.HIGH, IO.LOW)) <- this sets first HIGH and the second LOW

Environmental information:

GPIO.RPI_INFO about your RPi
GPIO.RPI_INFO['P1_REVISION'] Raspberry Pi board revision
GPIO.VERSION RPi.GPIO version number

Find the function of a channel:

func = IO.gpio_function(pin)

will return a value from:
IO.IN, IO.OUT, IO.SPI, IO.I2C, IO.HARD_PWM, IO.SERIAL, IO.UNKNOWN

Pull UP / Pull DOWN:

Unconnected pins float.
Default values (High or Low) can be set in **software** or with **hardware**

Hardware:

Pull Up:
Input channel -> 10K resistor -> 3.3V
Pull Down:
Input channel -> 10K resistor -> 0V

Software:

IO.setup (channel, IO.IN, pull_up_down = IO.PUD_UP) or **IO.PUD_DOWN)** or **IO.PUD_OFF)**

Edge detection:

change of state event — 3 ways to handle

1. wait_for_edge()

function - stops everything until an edge is detected.

IO.wait_for_edge (channel, IO.RISING) can detect edges of type IO.RISING, IO.FALLING or IO.BOTH

2. event_detected()

function - use in a loop with other activity — event triggers priority response. Example:

IO.add_event_detect(channel, IO.RISING) activity detection on a channel
[your loop activity here]
if **IO.event_detected(channel)**:
print('Button pressed')

3. threaded callbacks -

RPi.GPIO runs a second thread for callback functions. This means that callback functions can be run at the same time as your main program, in immediate response to an edge. For example:

```
def my_callback(channel):
    print('Edge detected on channel %s'%channel')
    print('This is run in a different thread to your
    main program.')
```

IO.add_event_detect(channel, IO.RISING, callback=my_callback) add rising edge detection on a channel
...the rest of your program...

If you want more than one callback function:

```
def my_callback_one (channel):
    print ('Callback one')
def my_callback_two (channel):
    print ('Callback two')
```

IO.add_event_detect(channel, IO.RISING)
IO.add_event_callback(channel, my_callback_one)
IO.add_event_callback(channel, my_callback_two)

Note that in this case, the callback functions are run **sequentially, not concurrently**. This is because there is only one thread used for callbacks, and every callback is run in the order in which it is defined.

Switch debounce:

solutions to a button event causing multiple callbacks

Hardware:

add a 0.1uF capacitor across your switch.

Software:

add the bouncetime= parameter to a function where you specify a callback function. bouncetime= should be specified in milliseconds.

IO.add_event_detect(channel, IO.RISING, callback=my_callback, bouncetime=200)
or
IO.add_event_callback(channel, my_callback, bouncetime=200)

Remove Event Detection:

IO.remove_event_detect(channel)

Cleanup:

resets all channels and clears the pin numbering system at the end of a program. Just good practice.

IO.cleanup()

Or cleanup selected pins:

IO.cleanup(channel)
IO.cleanup((channel1, channel2)) <-tuple
IO.cleanup([channel1, channel2]) <-or list

BIG DADDY'S PYTHON TOOLBOX For 3.5+

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PWM in RPi.GPIO is an analog signal, **P**ulse **W**idth **M**odulation - available ONLY One of the Pi's pins: board #12 = BCM #18 ; is hardware used mostly for audio

To create a **software** instance of PWM on any in/out pin:

p = IO.PWM(channel, frequency)

To start PWM: p.start(dc)

where dc is the duty cycle (0.0 <= dc <= 100.0)

To change the frequency:

p.ChangeFrequency(freq) freq is the new frequency in Hz*

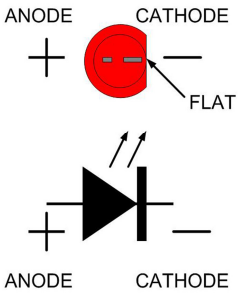
To change the duty cycle:

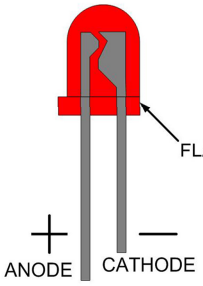
p.ChangeDutyCycle(dc) where 0.0 <= dc <= 100.0

To stop PWM:

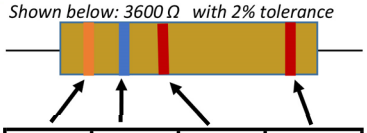
p.stop()

*100 = 100 times a second, .5 = once every 2 seconds, .1 is every 10 seconds, .0167 = once a minute





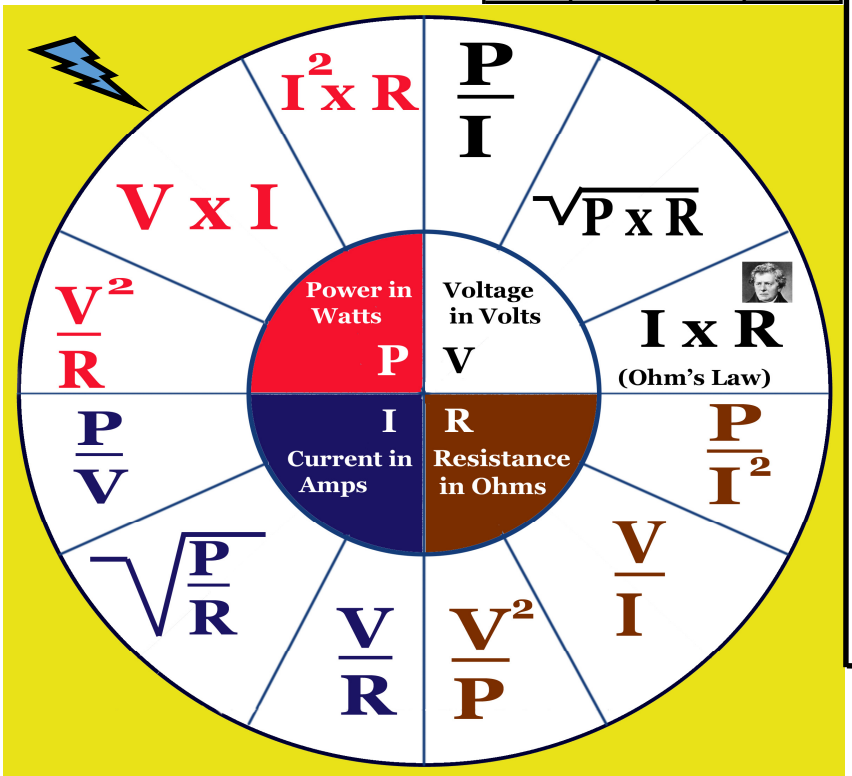
Shown below: 3600 Ω with 2% tolerance

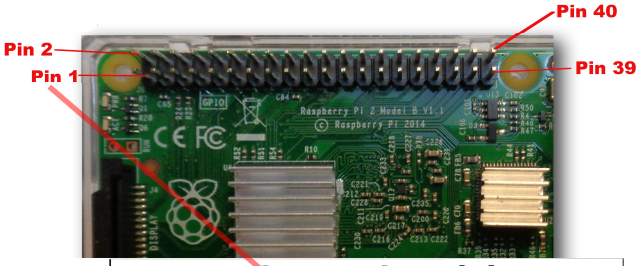


1st Digit	2nd Digit	Multiplier	Tolerance
0	0	1	
1	1	10	1%
2	2	100	2%
3	3	1 K	
4	4	10 K	
5	5	100 K	
6	6	1 M	
7	7	10M	
8	8		5% gold
9	9		10% silver

270Ω -> red, purple, brown
330Ω -> orange, orange, brown
10KΩ -> brown, black, yellow

Note: RPi maximum current to a single pin is 16ma, to all pins is 50ma





Common breadboard numbering

	Raspberry Pi Model B+			
1	3V Power	1	2	5V Power
2	GPIO [2] SDA1 12C	3	4	5V Power
3	GPIO [3] SCL1 12C	5	6	Ground
4	GPIO [4]	7	8	GPIO [14] UART0-TXD
5	Ground	9	10	GPIO [15] UART0-RXD
6	GPIO [17]	11	12	GPIO [18] PCM-CLK
7	GPIO [27]	13	14	Ground
8	GPIO [22]	15	16	GPIO [23]
9	3V Power	17	18	GPIO [24]
10	GPIO [10] SPIo-MOSI	19	20	Ground
11	GPIO [9] SPIo-MOSO	21	22	GPIO [25]
12	GPIO [11] SPIo-SCLK	23	24	GPIO [8] SPIo-CEo-N
13	Ground	25	26	GPIO [7] SPIo-CE1-N
14	ID_SD [0] 12C ID EEPROM	27	28	ID_SC [1] 12C ID EEPROM
15	GPIO [5]	29	30	Ground
16	GPIO [6]	31	32	GPIO [12]
17	GPIO [13]	33	34	Ground
18	GPIO [19] PCM-FS	35	36	GPIO [16]
19	GPIO [26]	37	38	GPIO [20] PCM-DIN
20	Ground	39	40	GPIO [21] PCM-DOUT

comments and suggestions appreciated: john@johnoakey.com

SERIAL PERIPHERAL INTERFACE PINS

19 MOSI-master output, slave input
21 MISO-mastter input, slave output
23 SCK-serial clock **24** & 26-slave select pins

UART - UNIVERAL ASYNCHRONOUS RECEIEVER/TRANSMITTER pins

8 UART-TDX & **10** UART-RDX