BIG DADDY'S PYTHON GPIO TOOLBOX

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Import the module

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

Pins: 3.3V OUT @ ~16ma/pin; total of 50ma older models, 100ma newer; IN 1.8-3.3v High, <1.6v Low;

Pin numbering:

a choice is **required** to specify **BCM** or **BOARD** to designate pins/channels: Note that for all intents a "PIN" means the same thing as a "CHANNEL": (see diagram on page2)
IO.setmode(IO.**BCM**) or **IO.setmode**(IO.**BOARD**)

Setup:

Every pin that is to be used must be defined as in or out:
IO.setup(channel, IO.IN) *or* **IO.setup(channel, IO.OUT)**
An **initial state** can be set by adding: **initial=IO.HIGH** or **IO.LOW**
For example: **IO.setup(channel, IO.OUT, initial=IO.HIGH)**
Multiple channels can be set at once using a list or a tuple:
chan_list = [11,12] or **chan_tuple = (11,12)**
For example: **IO.setup(chan_list, IO.OUT)**

Read or write (set) pins:

IO.input(channel) (returns: 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, etc))

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)**
Returns: IN, OUT, SPI, I2C, HARD_PWM, SERIAL, or 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

LEDs: blue & white <2.1v, others ~3.2v; 20 ma constant; use LM317 for constant I

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) set up detection
   [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.

4. Remove Event Detection:
IO.remove_event_detect(channel)

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)

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

PWM: Pulse Width Modulation - analog signal, Hardware available on (BCM / board)

PWM0: 12/32, 18/12; PWM1: is used for audio 13/33 - so use **PWM0: GPIO12/Pin32**

Create a **Software** instance of PWM on **any** in/out pin:**p = IO.PWM(channel, frequency)**

To start PWM: **p.start(*dc)**
*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

Using 1-wire:

A single channel: **GPIO [4]** is 1-wire capable for low speed sensor input; Rpi must be configured to utilize alternate pin functions like this!

BIG DADDY'S PYTHON TOOLBOX For 3.5+

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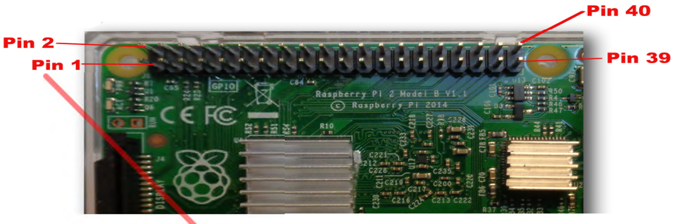
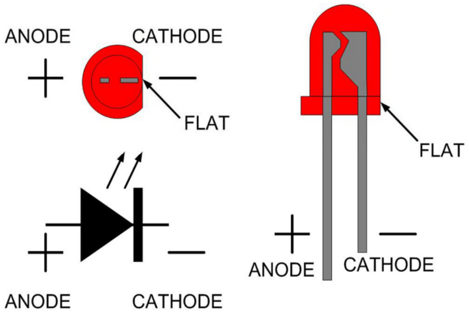
V011225

A Small RPi 2835 BCM\GPIO Glossary of Terms

BCM: Broadcom; BCM = GPIO in pin numbering
CE0/CE1: SPI Chip Select 0/1
DPI: Display Parallel Interface - uses 28GPIP pins
GPCLK: General Purpose Clock
I^{2}C/I2C/i2c/IIC: Inter-Intergrated Circuit; serial bus;
SCK or SCLK: Serial Clock, master to slave; **SCL**: BSC Master clock line; **SDA**: serial data pin; **ID_SC**: connection to SCL0; **ID-SD** connection to SDA0
SPI: Serial Peripheral Interface
JTAG: Joint Test Action Group
MSIO/MOSI: Master Slave Out/In
PCM: Pulse Code Modulation
PWM: Pulse Width Modulation
SDIO: SD card interface
W1-GPIO: 1-Wire interface; defalut is bcm[4]

UART:Universal Asynchronous Receiver/Transmitter,
TDX: transmit, GPIO[8]
RDX: receive, GPIO[10]
default is console in/out

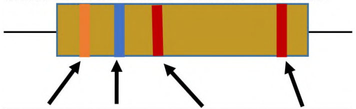




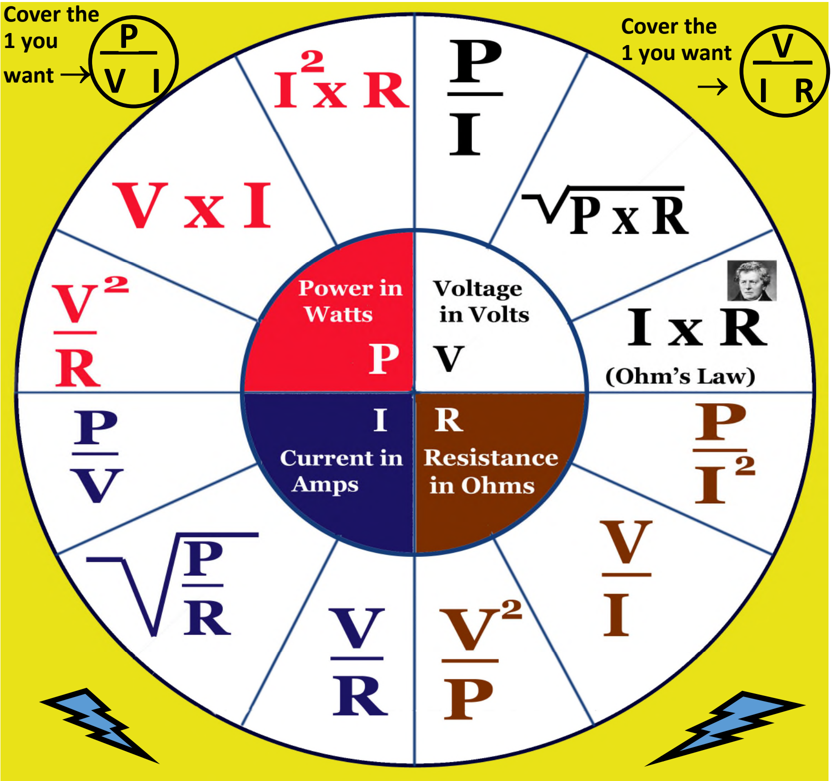
270Ω -> red, purple, brown
330Ω -> orange, orange, brown
10KΩ -> brown, black, yellow

RPi maximum current to a single pin is 16ma, to all pins is 50 mA. A 3v3 supply is ~ 50 mA

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



2835 Raspberry Pi Model B+

common breakboard #		Pin	Pin		wiringpi # system
1	3V3 Power	1	2	5V Power	- / -
2	GPIO [2] SDA i2c	3	4	5V Power	8 / -
3	GPIO [3] SCL i2c	5	6	Ground	9 / -
4	GPIO [4] 1 wire GPCLK0	7	8	GPIO [14] UART0-TXD	7 / 15
5	Ground	9	10	GPIO [15] UART0-RXD	- / 16
6	GPIO [17]	11	12	GPIO [18] PCM-CLK / PWM0	0 / 1
7	GPIO [27]	13	14	Ground	2 / -
8	GPIO [22]	15	16	GPIO [23]	3/4
9	3V3 Power	17	18	GPIO [24]	-/5
10	GPIO [10] SPI0: MOSI	19	20	Ground	12/-
11	GPIO [9] SPI0-MISO	21	22	GPIO [25]	13/6
12	GPIO [11] SPI0-SCLK	23	24	GPIO [8] SPI0-CE0-N	14 / 10
13	Ground	25	26	GPIO [7] SPI0-CE1-N	- / 11
14	ID_SD [0] data i2c0 EEPROM	27	28	ID_SC [1] clock i2c EEPROM	30 / 31
15	GPIO [5]	29	30	Ground	21 / -
16	GPIO [6]	31	32	GPIO [12] PWM0 use this 1	22 / 26
17	GPIO [13] PWM1 audio	33	34	Ground	23 / -
18	GPIO [19] PCM-FS	35	36	GPIO [16]	24 / 27
19	GPIO [26]	37	38	GPIO [20] PCM-DIN	25 / 28
20	Ground	39	40	GPIO [21] PCM-DOUT	- / 29