

# Scratch e os GPIO

## Objetivos

- Activar os GPIO da Raspberry Pi en Raspbian
- Valorizar o uso dos GPIO da Raspberry Pi en proxectos que integren SW e HW.
- Controlar circuítos electrónicos independentes mediante Scratch
- Integrar novos dispositivos electrónicos sinxelos
- Revalidar o cinto amarelo do NINJA do terminal

# Scratch e os GPIO

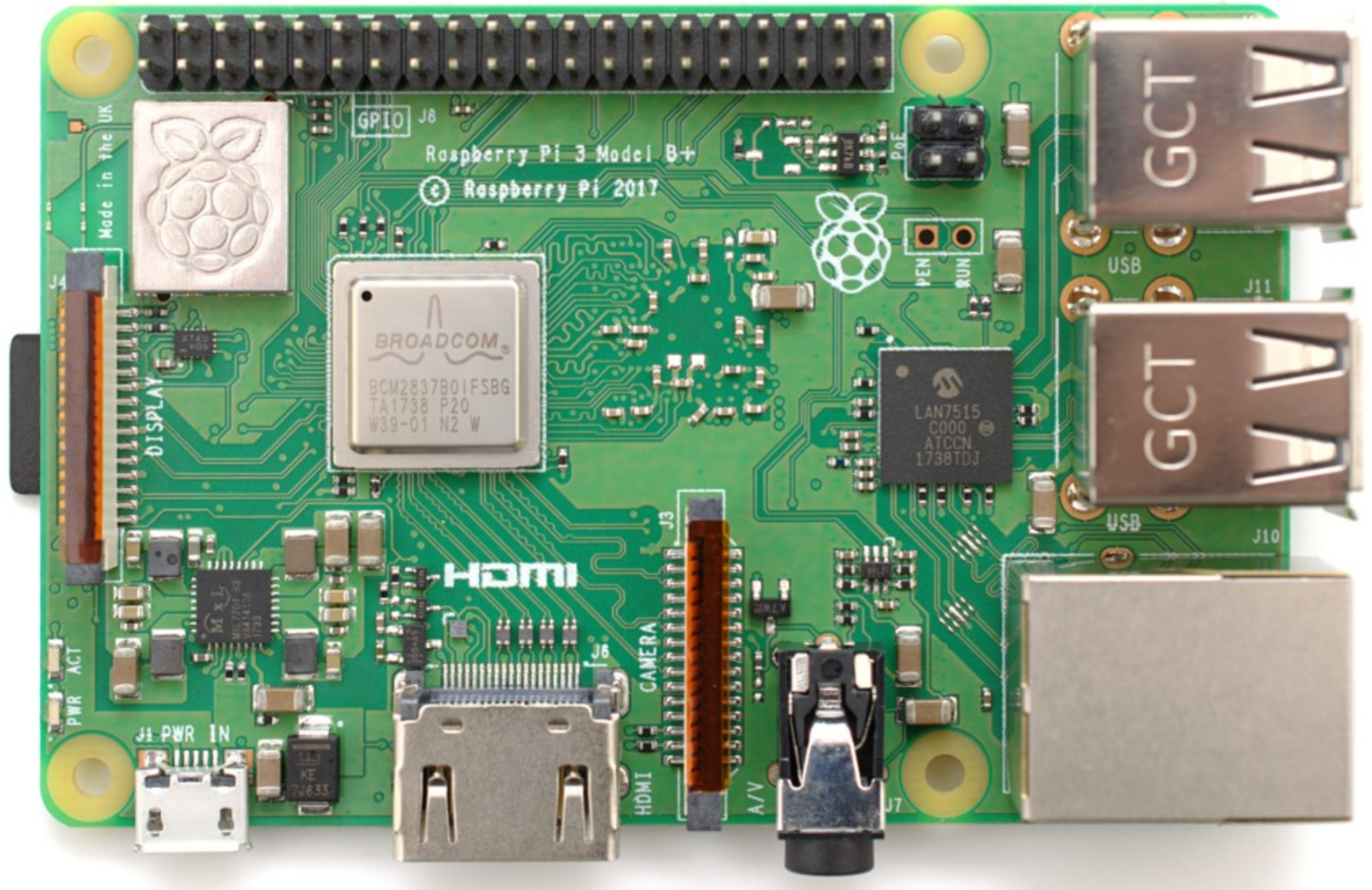
## Contidos

- Pinout da Raspberry Pi
- Uso dos GPIO empregando Scratch 2.0 en local
- Control dun LED con Scratch
- Lectura dun pulsador con Scratch (Pull Up)
- Control dun LED con pulsador + Scratch (+zumbador)
- Lectura dunha LDR (divisor de tensión)
- ... até o infinito e máis alá! Outros dispositivos.

# Scratch e os GPIO

- Raspberry Pi 3 dispón de 40 portos de E/S de propósito xeral (GPIO, General Purpose I/O).
- Están situados no lado oposto ao porto HDMI
- Existen dúas maneiras de numerar os pins GPIO:
  - BCM, a numeración do fabricante do chipset, e
  - Board, a definida pola fundación Raspberry Pi
- Para idendificalos considéranse dúas columnas de 20 pins

# Scratch e os GPIO



# Scratch e os GPIO

Raspberry Pi 3 GPIO Header

Pin#	NAME		NAME	Pin#
01	3.3v DC Power		DC Power 5v	02
03	GPIO02 (SDA1 , I <sup>2</sup> C)		DC Power 5v	04
05	GPIO03 (SCL1 , I <sup>2</sup> C)		Ground	06
07	GPIO04 (GPIO_GCLK)		(TXD0) GPIO14	08
09	Ground		(RXD0) GPIO15	10
11	GPIO17 (GPIO_GEN0)		(GPIO_GEN1) GPIO18	12
13	GPIO27 (GPIO_GEN2)		Ground	14
15	GPIO22 (GPIO_GEN3)		(GPIO_GEN4) GPIO23	16
17	3.3v DC Power		(GPIO_GEN5) GPIO24	18
19	GPIO10 (SPI_MOSI)		Ground	20
21	GPIO09 (SPI_MISO)		(GPIO_GEN6) GPIO25	22
23	GPIO11 (SPI_CLK)		(SPI_CE0_N) GPIO08	24
25	Ground		(SPI_CE1_N) GPIO07	26
27	ID_SD (I <sup>2</sup> C ID EEPROM)		(I <sup>2</sup> C ID EEPROM) ID_SC	28
29	GPIO05		Ground	30
31	GPIO06		GPIO12	32
33	GPIO13		Ground	34
35	GPIO19		GPIO16	36
37	GPIO26		GPIO20	38
39	Ground		GPIO21	40

- Na nomenclatura Board
  - columna esquerda: pins impares
  - columna direita: pins pares

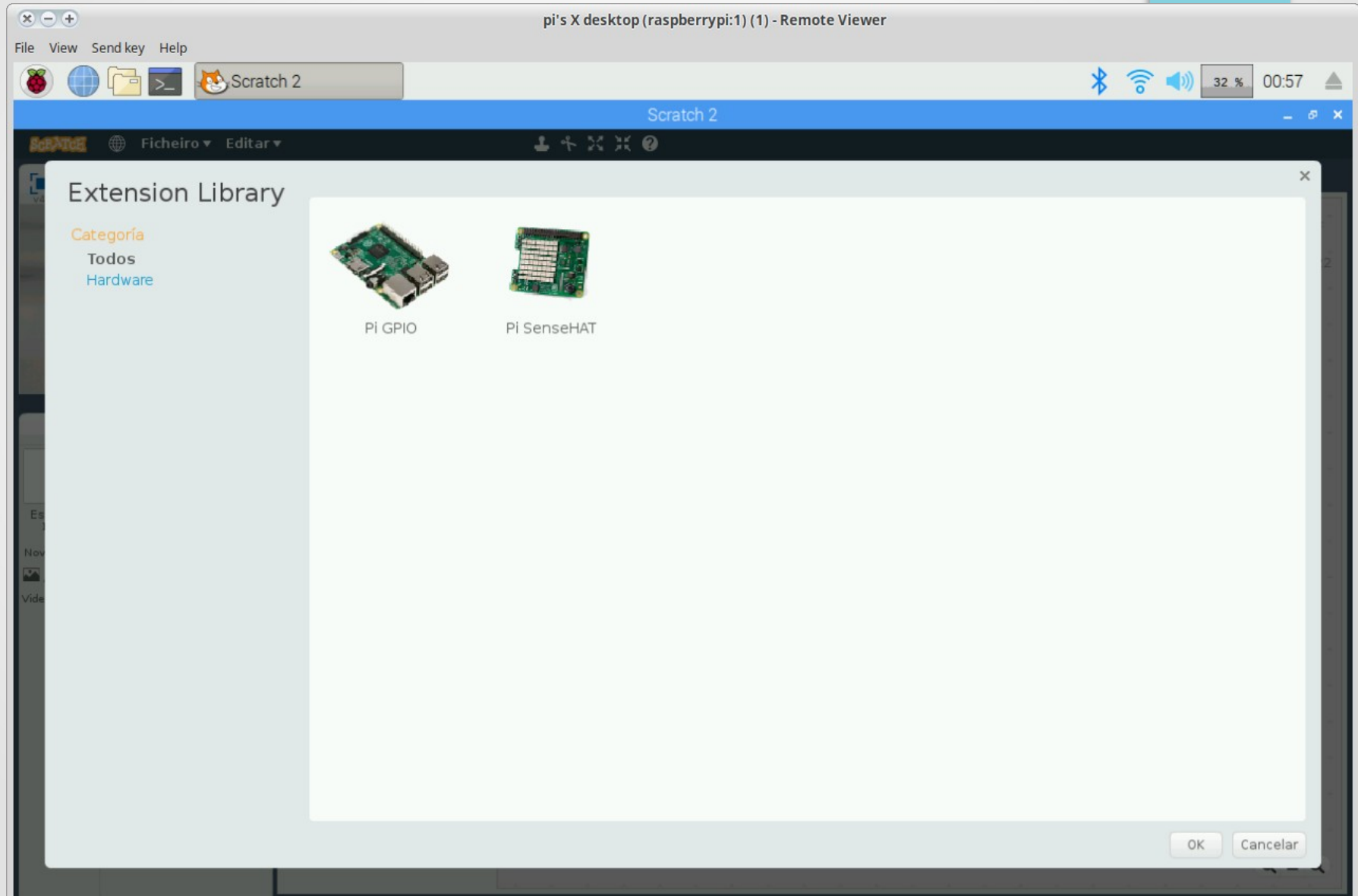
Pinout online:

<https://pinout.xyz/pinout/ground#>

# Scratch e os GPIO

- Raspberry non incorpora por defecto a comunicación cos GPIO
- É preciso cargar o driver ou extensión para ter acceso
- Non están todos os pins dispoñibles en Scratch
- Podemos acceder aos pins de E/S (GPIO) aínda que con algunhas limitacións.

# Scratch e os GPIO



# Scratch e os GPIO

The image shows a Scratch 2 window running on a Raspberry Pi desktop environment, accessed via Remote Viewer. The window title is "pi's X desktop (raspberrypi:1) (1) - Remote Viewer". The Scratch interface includes a menu bar with "File", "View", "Send key", and "Help". The top toolbar shows icons for Raspberry Pi, a globe, a folder, a terminal, and the Scratch logo. The main workspace is titled "Scratch 2" and contains a script with two blocks: "set gpio to output high" and "gpio is high?". The left sidebar shows the "Pi GPIO" extension, which is active (indicated by a green dot). The extension's menu includes "Programas", "Vestimentas", and "Sons". The "Pi GPIO" extension is currently expanded, showing a "set gpio to output high" block and a "gpio is high?" block. The bottom right corner of the Scratch window has a search icon, a play/pause icon, and a zoom icon. The desktop background is a light blue color with a small Scratch logo in the bottom right corner.

# Scratch e os GPIO

The image shows a Scratch 2 window running on a Raspberry Pi X desktop, accessed via Remote Viewer. The desktop environment includes a menu bar with 'File', 'View', 'Send key', and 'Help', and a system tray with icons for Bluetooth, Wi-Fi, audio, battery (38%), and time (01:00). The Scratch 2 window has a blue header and a dark blue sidebar with the 'Scratch' logo and menu options 'Ficheiro' and 'Editar'. The main workspace contains a script with the following blocks:

- set gpio to output high
- gpio is high?

The Pi GPIO extension is visible in the left sidebar, showing a list of GPIO pins (0-22) and a 'gpio is high?' block. The Scratch 2 window also shows a 'proba.camara' window in the background and a 'Cat1' sprite in the bottom left corner.

# Scratch e os GPIO

The image shows a remote viewer window titled "pi's X desktop (raspberrypi:1) (1) - Remote Viewer". Inside the window, the Scratch 2 application is running. The Scratch interface includes a top menu bar with "File", "View", "Send key", and "Help". Below the menu is a toolbar with icons for file operations and a "Scratch 2" label. The main workspace is titled "Scratch 2" and contains a script area with two blocks: "set gpio to output high" and "gpio is high?". The left sidebar shows the "Pi GPIO" extension, with a "set gpio to output high" block and a "gpio is high?" block. The bottom left corner of the Scratch interface shows the "Escenario" (Stage) area with a "Cat1" sprite. The top right corner of the window displays system icons for Bluetooth, Wi-Fi, and volume, along with a battery level of 34% and a time of 01:01.

# Scratch e os GPIO

The image shows a Scratch 2 desktop environment running on a Raspberry Pi, accessed via a Remote Viewer. The window title is "pi's X desktop (raspberrypi:1) (1) - Remote Viewer". The Scratch 2 interface includes a menu bar (File, View, Send key, Help), a toolbar, and a sidebar with categories like "Programas", "Vestimentas", and "Sons". The main workspace contains a script with the following blocks:

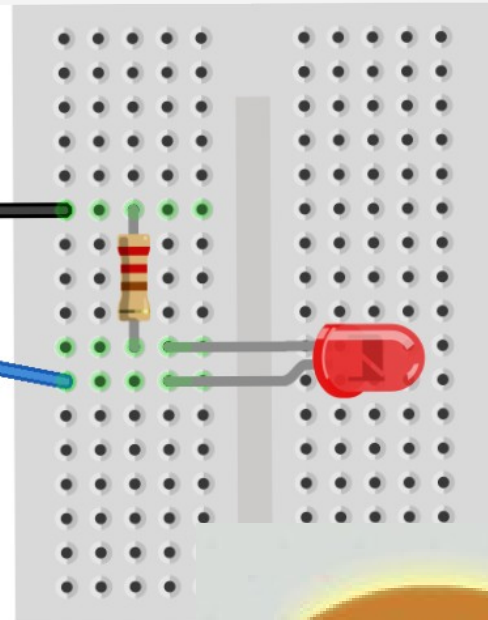
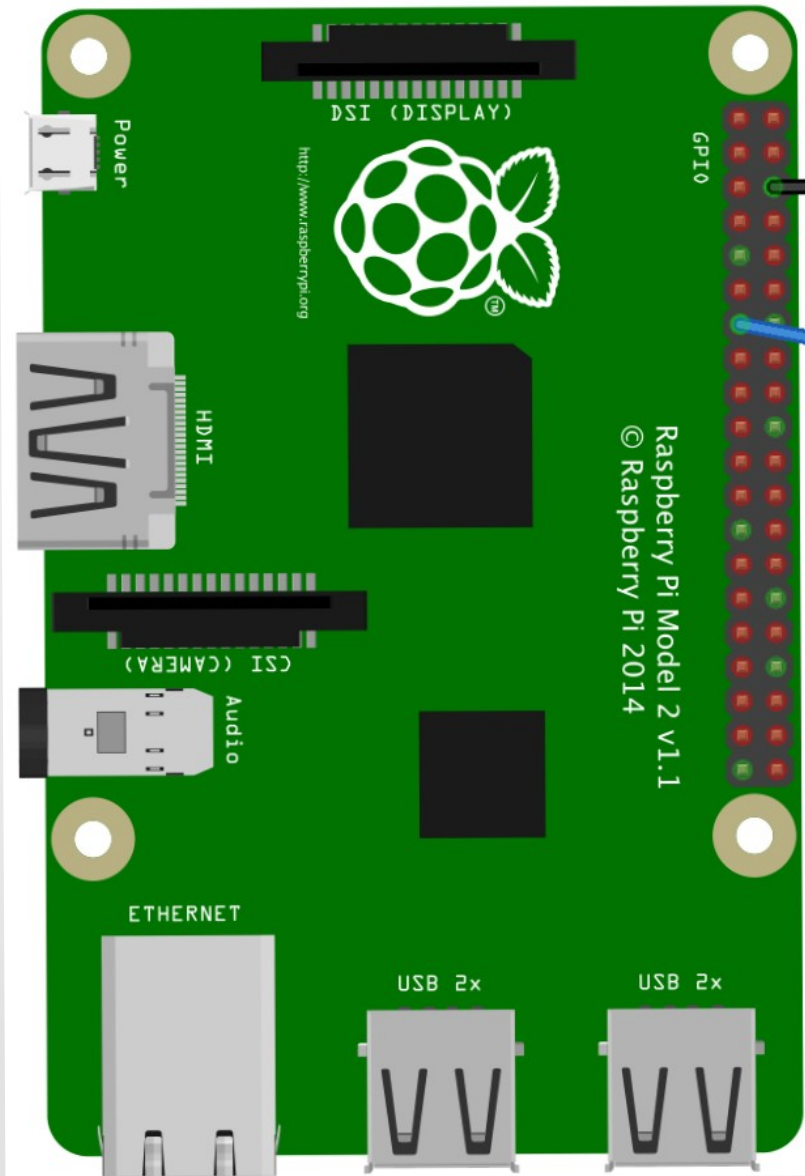
- set gpio to output high
- gpio is high?

The "gpio is high?" block has a vertical list of pins from 0 to 22. The "set gpio to output high" block is currently set to pin 0. The desktop background shows a file manager window titled "proba.camara" and a character named "Cat1" on the stage.

# Scratch e os GPIO - Control dun LED

- Iremos controlar un LED empregando Scratch na Raspi
  - convén que os rapaces comprobem antes que se encende, usando p.ex. os pin 01 (3.3. v) e 09 (ground) e unha resistencia ~330 ohm
  - facemos na placa de proba o circuío
  - elaboramos o programa en Scratch

# Scratch e os GPIO - Control dun LED



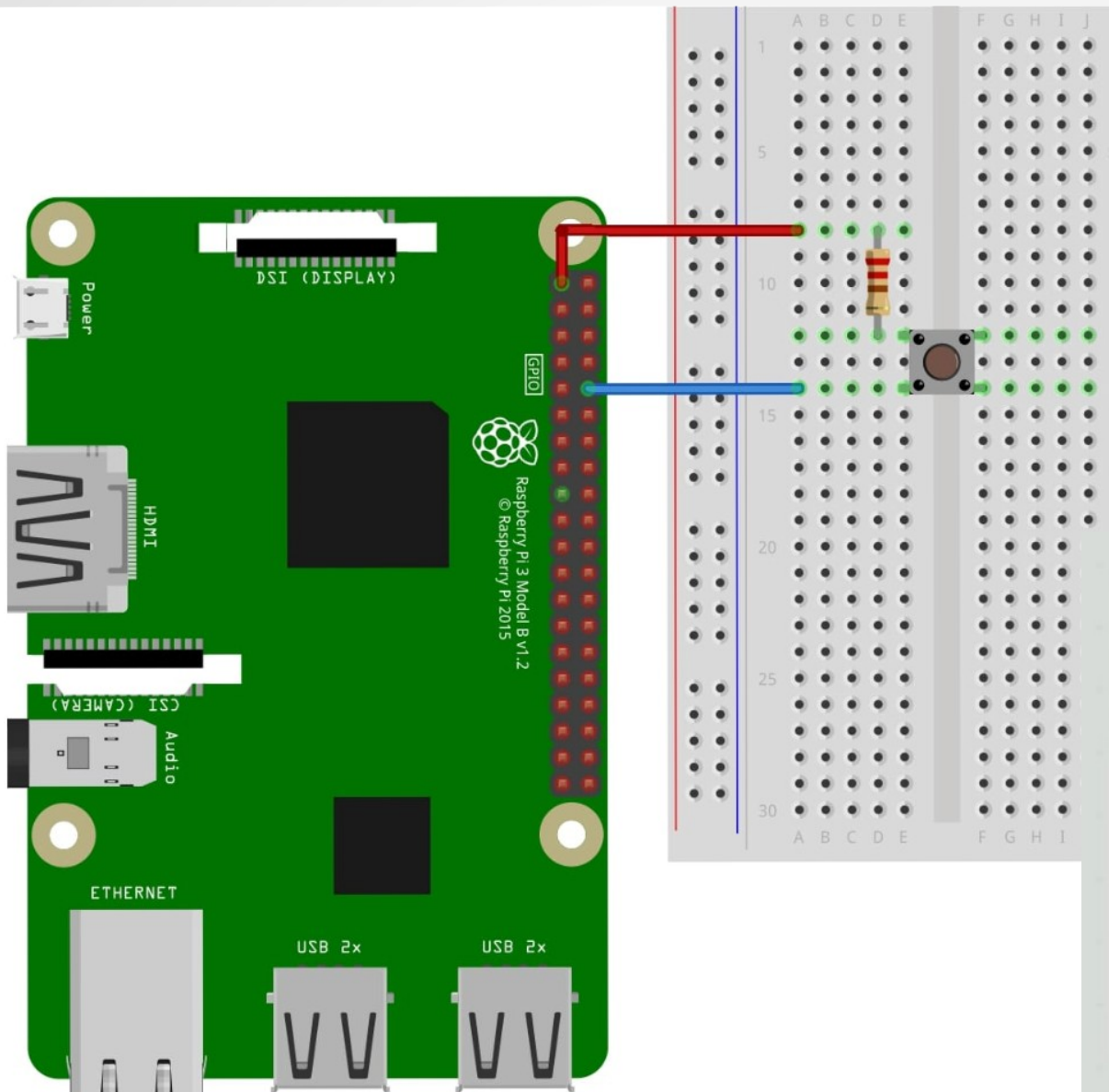
- Os pins son indiferentes sempre que lembremos cales son

```
ao premer
para sempre
  agardar 1 segundos
  set gpio 27 to output high
  agardar 1 segundos
  set gpio 27 to output low
```

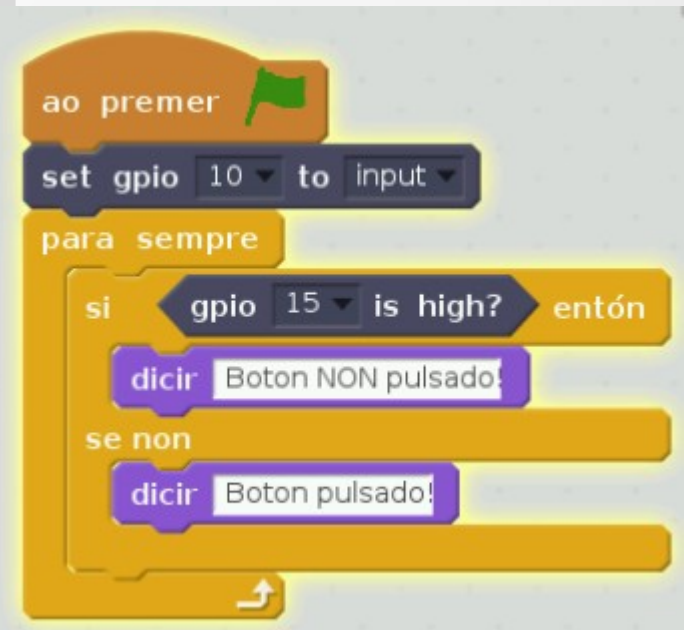
# Scratch e os GPIO - Ler estado pulsador

- Imos comprobar o estado dun pulsador empregando Scratch na Raspi
  - convén que os rapaces sexan conscientes de como son as conexións internas dun pulsador
  - facemos na placa de proba o circuío
  - elaboramos o programa en Scratch

# Scratch e os GPIO - Ler estado pulsador



- Os pins son indiferentes sempre que lembremos cales son



# Scratch e os GPIO - LED + pulsador

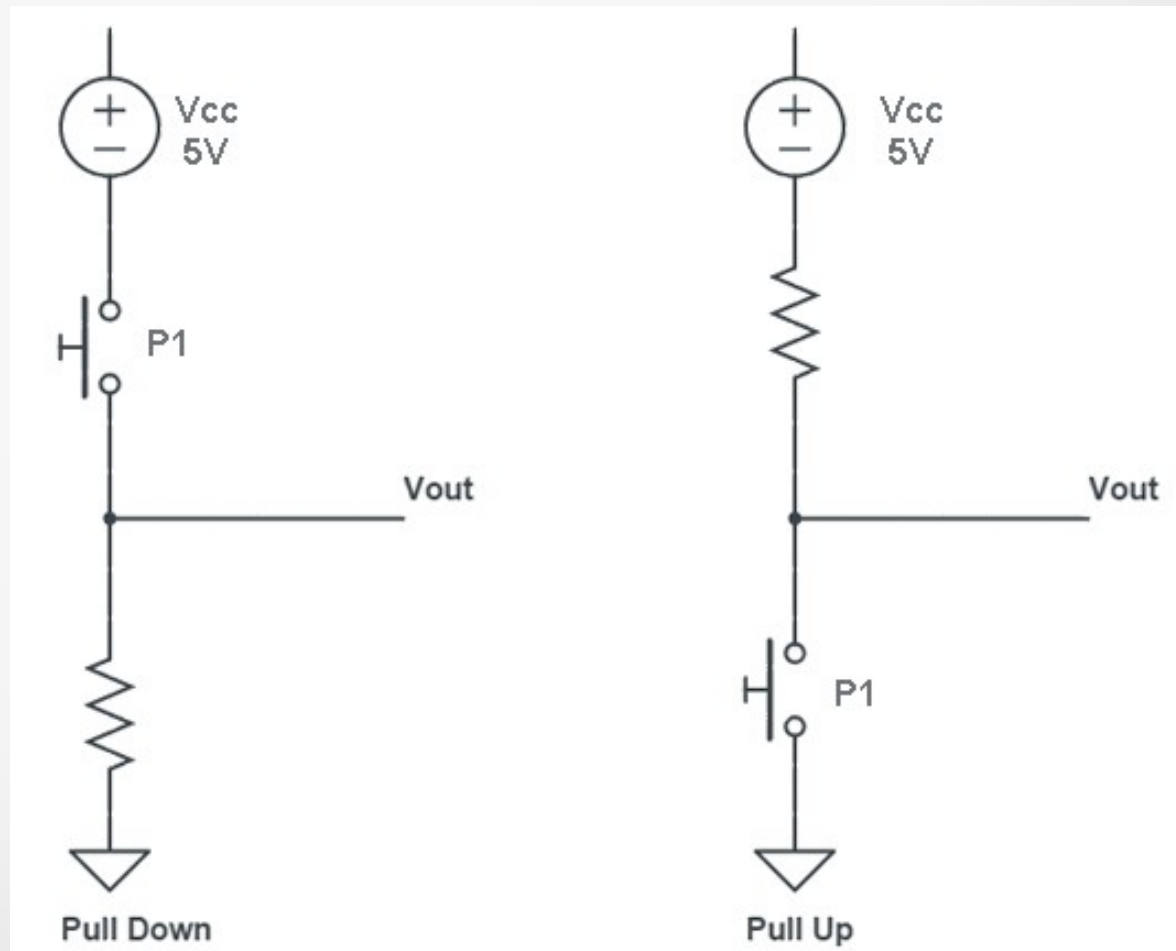
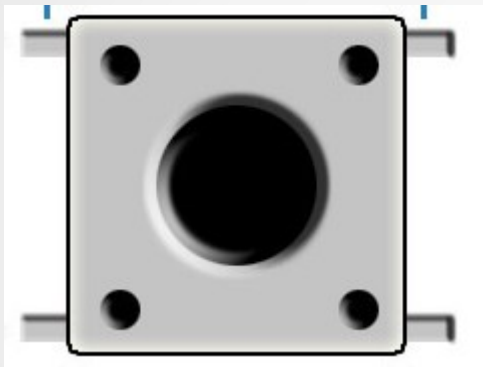
- NON precisamos refacer os dous circuítos, empregaremos a Raspi para detectar a pulsación e mudar a frecuencia de encendido do LED.

```
ao premer
set gpio 15 to input
fixar limite a 5
fixar frecuencia a 1
fixar contador a 1
amosar variable contador
para sempre
  si gpio 15 is high? entón
    dicir non pulsado
    si contador > limite - 1 entón
      fixar frecuencia a 1
      fixar contador a 1
    se non
      dicir pulsado
      si contador < limite entón
        trocar contador por 1
        fixar frecuencia a frecuencia / contador
```

```
ao premer
para sempre
  set gpio 27 to output high
  agardar frecuencia segundos
  set gpio 27 to output low
  agardar frecuencia segundos
```

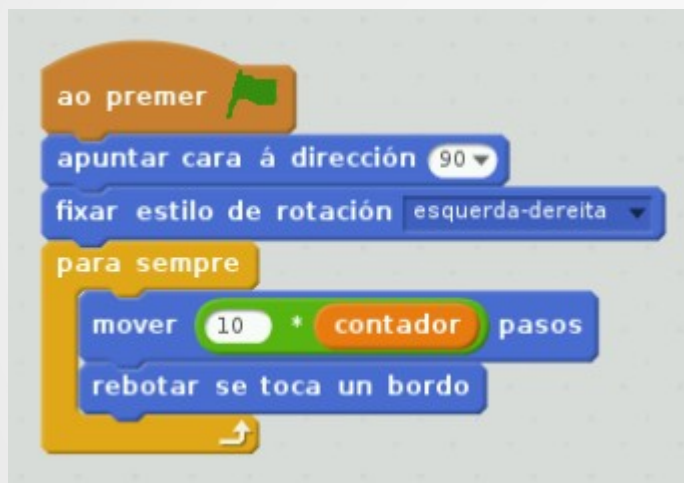
# Scratch e os GPIO - LED + pulsador

- No circuito anterior conectamos o pulsador cunha resistencia de Pull Up



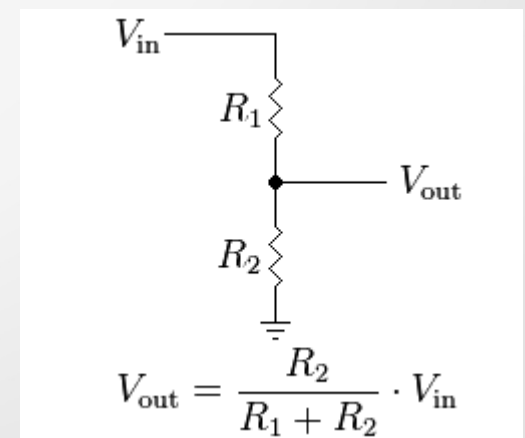
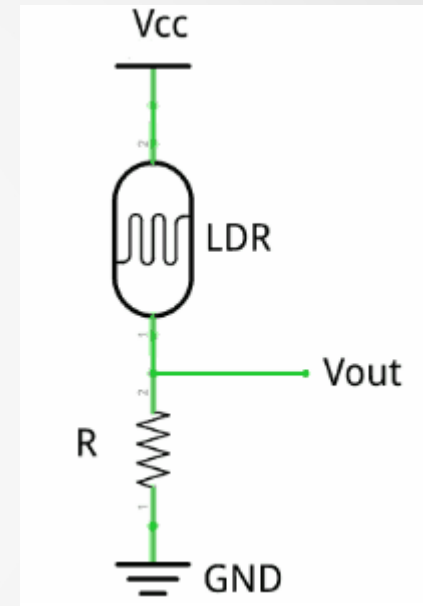
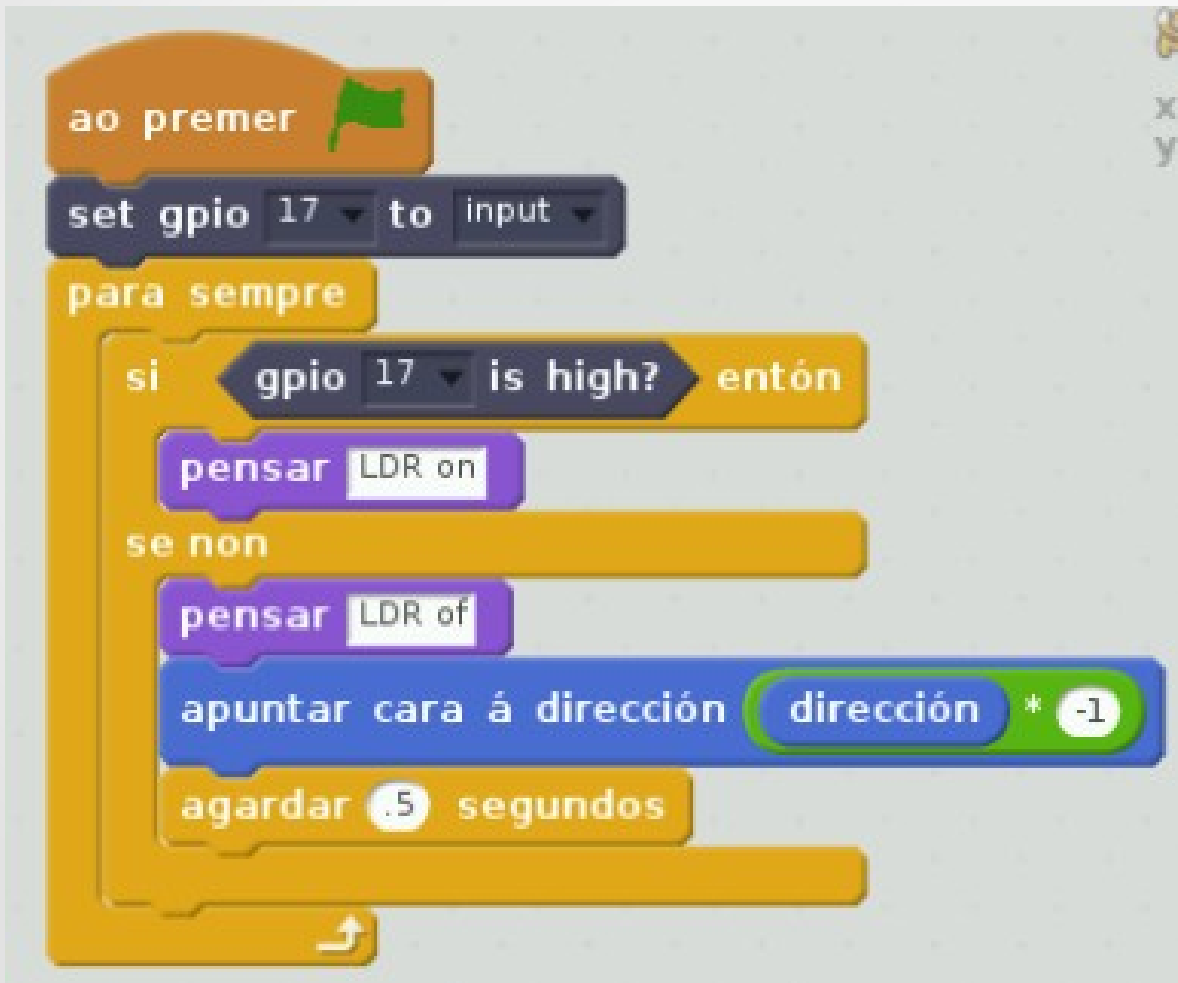
# Scratch e os GPIO - Engadindo zumbador

- Podemos controlar o movementos de Scratch e engadirle un zumbador para avisar cada vez que muda de dirección.



# Scratch e os GPIO - LDR

- Outro elemento co que podemos xogar son as resistencias LDR



# Scratch e os GPIO - LDR

- É correcto este programa se poñemos o divisor de tensión ao revés?

