

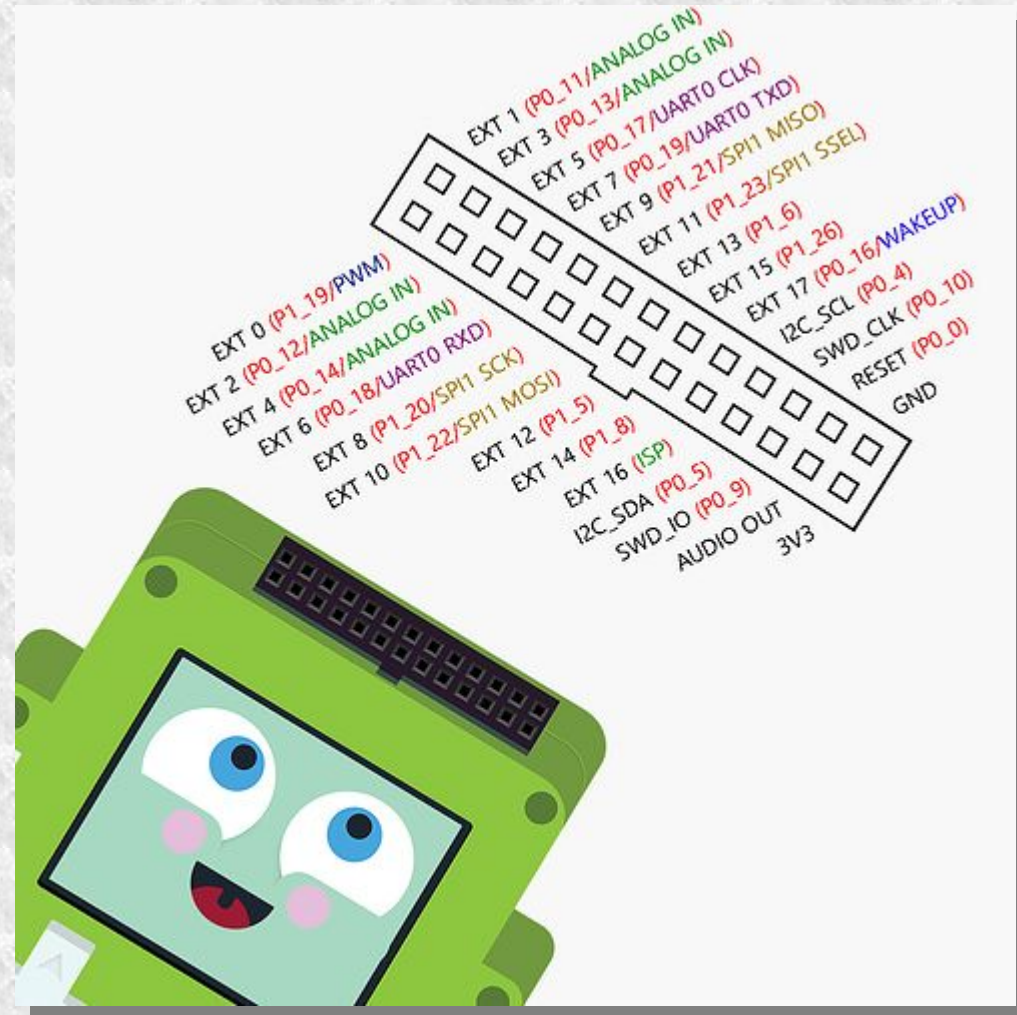
# Pokitto Robot Car Part 1

*With this course you will learn to build an autonomous robot car and how to use Pokitto and python to control it!*



# What you need?

- Pokitto device: [www.pokitto.com](http://www.pokitto.com).
- Pokitto has the PEX connector: female, 26 pins (EXT0-EXT17, "3,3 V", GND, etc.)
- Pokitto should have a rom image which has MicroPython REPL and USB serial connection enabled.

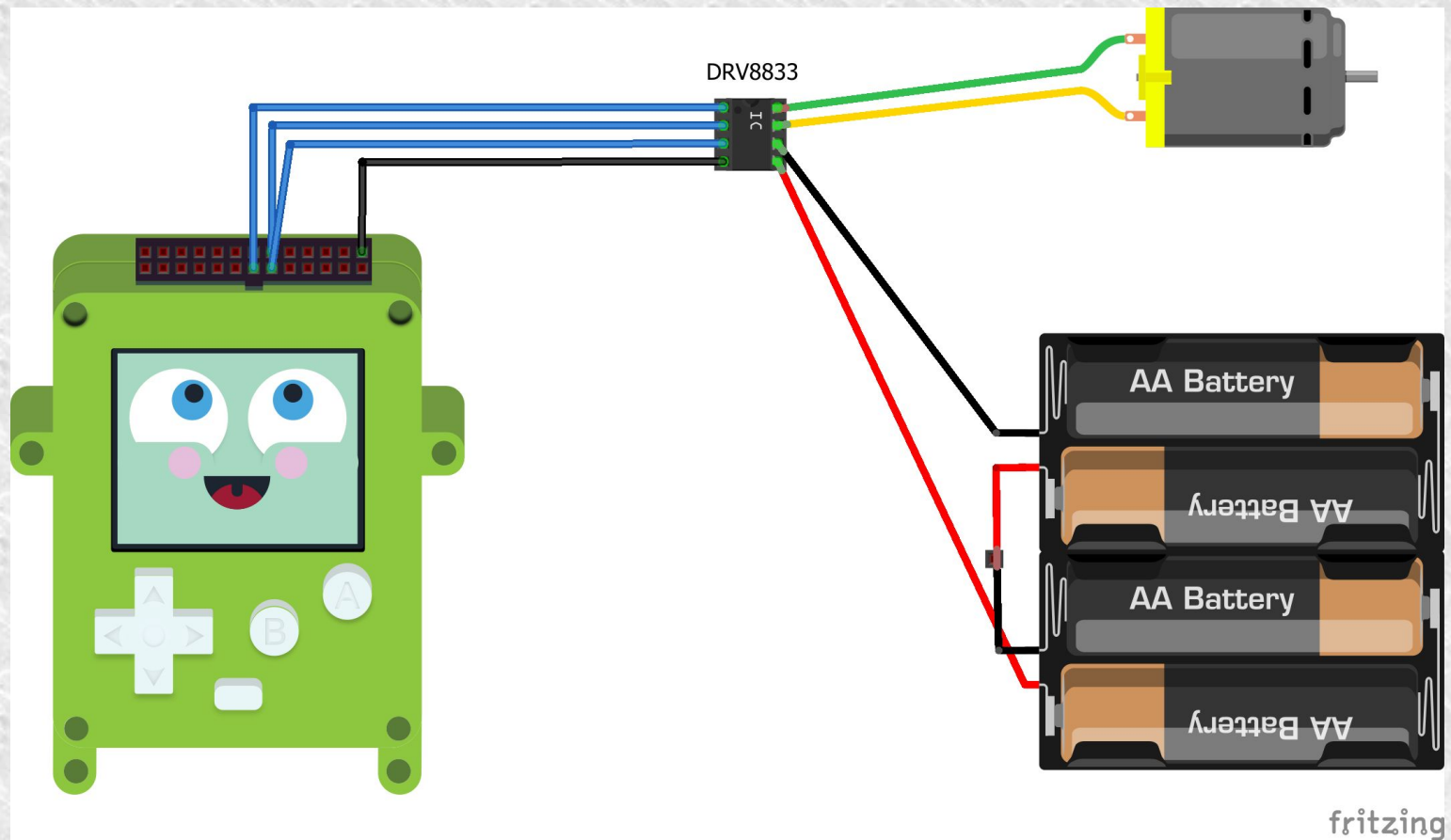


- Pokitto rom-image:  
[https://www.dropbox.com/s/wmkhrqh0ciacgek/pythonex\\_repl.bin?dl=0](https://www.dropbox.com/s/wmkhrqh0ciacgek/pythonex_repl.bin?dl=0)

# What you need?

- The easiest way to purchase the robot car parts is by buying CamJam Edukit #3 by the Cambridge Raspberry Jam: [http://camjam.me/?page\\_id=1035](http://camjam.me/?page_id=1035) . You can also buy the parts below separately.
- Battery box, 6 V
- Motor controller board (DRV8833)
- DC motor, 6 v
- Line Following sensor, based on sending and receiving UV-light.
- Cables

# Connecting the motor



# Connecting the motor

- The motor is a DC -motor where the polarity of the supply voltage determines the rotating direction
- Connect the motor and the battery box to the motor controller (DRV8833) .
- Note: Make sure the battery box switch is "off".
- Motor "+" is connected to DRV8833 "AIN1"
- Motor "-" is connected to DRV8833 "A IN2"
- Battery box "+" is connected to DRV8833 "VCC"
- Battery box "-" is connected to DRV8833 "GND"

# Connecting the motor

- Next we connect the 3.3 v side of DRV8833 to Pokitto.  
Note: Make sure the power switch is off in Pokitto.
- Connect Pokitto PEX to DRV8833, which has Raspberry Pi (RPI) GPIO-socket vastakappale (mirrored).
- Pokitto "EXT12" is connected to the RPI pin #17 ("3.3V")
- Pokitto "EXT14" is connected to the RPI pin #19 ("MOSI").
- Pokitto "EXT15" is connected to the RPI pin #21 ("MOSI").
- Pokitto "GND" is connected to the RPI pin #25 ("GND").

	Pin 1	Pin 2	
+3,3V	1	2	+5V
SDA1	3	4	+5V
SCL1	5	6	GND
GPIO 4	7	8	TXD0
GND	9	10	RXD0
GPIO 17	11	12	GPIO 18
GPIO 21	13	14	GND
GPIO 22	15	16	GPIO 23
+3,3V	17	18	GPIO 24
MOSI	19	20	GND
MISO	21	22	GPIO 25
SCLK	23	24	CE0#
GND	25	26	CE1#

# Preparing PC

- Before we can start programming Pokitto, the USB Virtual Serial Driver must be installed. It can be downloaded here:

[https://github.com/pokitto/PokittoLib/tree/master/Pokitto/POKITTO\\_LIBS/USBDevice/working%20serial%20driver](https://github.com/pokitto/PokittoLib/tree/master/Pokitto/POKITTO_LIBS/USBDevice/working%20serial%20driver)

- Connect Pokitto to PC with a USB cable.
- Switch on the battery box and Pokitto.
- Start Tera Term terminal application (or equivalent) on PC, and connect it to the virtual serial port (Com5 etc.)
- Press the A button on Pokitto until the text "MicroPython.." and the ">>>"-prompt is shown in Tera Term.
- Pokitto is now ready for programming!

# Running the motor

- Make sure the motor can rotate freely!
- Import the python "umachine"-modul, which contains functions for controlling the pins. Give the command:  
`from umachine import *`
- Create the pin object for the EXT14 pin, and set it for output.  
`m1 = Pin( Pin.EXT14, Pin.OUT )`
- The motor is running! Stop it by writing:  
`m1.on()`



# Running the motor in reverse direction

- Reverse the rotating direction of the motor by using the pin EXT15, and stop the motor after the test.  

```
m2 = Pin( Pin.EXT15, Pin.OUT )  
m2.on()
```
- As it can be observed above, the pins must be in the "on" state one at a time. If both pins are "on" or "off" the motor does not rotate.

# Connecting the line following sensor

- The line following sensor contains the UV light sender and receiver. When the light of the sender reflects from the white surface, the sensor sets the signal to "1" (high), otherwise the signal is "0" (low).
- Switch off Pokitto and the battery box.
- Disconnect all cables from the Pokitto PEX connector.
- The Pokitto "EXT16" pin is connected to the sensor OUT cable.
- The Pokitto "3,3 v" pin is connected to the sensor VCC cable.
- The Pokitto "GND" pin is connected to the sensor GND cable.

# Reading the line following sensor

- Switch on Pokitto, and open Tera Term on PC.
- Press the A button on Pokitto until the text "MicroPython.." and the ">>>"-prompt is shown in Tera Term.
- Import the python "umachine" modul.  
`from umachine import *`
- Create the pin object for the EXT16 pin, and set it for input.  
`linepin = Pin( Pin.EXT16, Pin.IN )`

# Reading the line following sensor

- Read the pin continuously in a loop
- Note: After the "while" command and the return key, python goes to edit mode, where there is "..." instead of ">>>" prompt. Indentation is important in python. Insert 3 spaces before the "print" command.

```
while True:  
    print('status=', linepin.value())
```

- Stop the editing mode by pressing ctrl+d
- Now you can see the status of the sensor on the terminal screen: "0". Bring a white object in the front of the sensor, and the state changes to "1".
- The sensor can be used as a "touch" button or for following a black line on the floor.

# Building the car

- Now you can build the chassis for the robot car as you will, and attach the parts to it.
- Here are a instructions by CamJam Edukit #3 for building the car on the cardboard box that comes with it:

<https://github.com/CamJam-EduKit/EduKit3/raw/master/CamJam%20EduKit%203%20-%20Robotics%20Worksheet%202%20-%20Building%20a%20Robot.pdf>

- You can skip the instructions where Raspberry Pi is mentioned, because that is replaced by Pokitto.
- Here are instructions to build the chassis of Lego parts:  
<http://www.instructables.com/id/Lego-Chassis-for-Raspberry-Pi-Robot/>