Getting started with Melopero Shake RP2040



This guide is constantly updated with corrections and new content.

When a new version is released, we also update the version number:

Version 1.1.0 October 2021

Contents

1. Hardware overview	4
1.1 LiPo Battery Charger	5
1.2 Low Battery Monitor	5
2. Pinout	б
3. Installing CircuitPython	7
3.1 Download CircuitPython	7
3.2 Install CircuitPython	8
3.3 Install Mu editor	9
3.4 Mu quick start	10
3.5 The REPL	10
4. Installing MicroPython	11
4.1 Download MicroPython	11
4.2 Install Thonny editor	12
4.3 Thonny quick start	13
4.4 The REPL	13
5. Setting up Arduino IDE	
5.1 Download the Arduino IDE	14
5.2 Add Shake RP2040 to Arduino IDE	14
5.3 Using default I2C on Arduino IDE	15
6. Clear the Flash memory	
5.1 Flash nuke	16

1. Hardware overview

The Melopero Shake RP2040 is a development board based on the Raspberry Pi RP2040 microcontroller, programmable in C/C++, MicroPython, CircuitPython and Arduino.

The board features:

- 16MB of FLASH Memory
- 3.7-4.2 LiPo battery charger (200mA charge current)
- Battery monitor (it sends an alert when the battery voltage drops at 3.4V)
- Reset and boot buttons (no need to detach/attach the board to enter boot mode)
- Qwiic/Stemma QT connector for attaching lots of Melopero, Adafruit and * SparkFun sensors
- Classic Feather pinout for maximum compatibility
- USB-C connector for powering, programming and charging
- JST 2-pin connector for attaching the battery (we follow the Adafruit and SparkFun batteries polarity)
- Green user LED on pin 13
- RGB WS2812 LED (aka NeoPixel)
- Orange LED for signaling the charging status
- SWD header for debugging
- 4 mounting holes
- Programmable in C/C++, MicroPython, CircuitPython and with the Arduino IDE.

Dimensions: 2.0" x 0.9" x 0.28" (50.8mm x 22.8mm x 7.05/max height)



1.1 LiPo Battery Charger

The Melopero Shake RP2040 features a battery charger based on the MCP73831 IC, for use with LiPo 1-cell 3.7-4.2 batteries.

The JST connector polarity is shown on the pinout chart in section 2, and it follows the same polarity of Adafruit's and Sparkfun's batteries.

The fast charge current has been set to ~200mA, for this reason a battery with a capacity of at least 500mAh must be used.

1.2 Low Battery Monitor

The Shake RP2040 is also equipped with a low battery monitor, connected to pin GP17, that will send a LOW signal on the ouput as soon as the battery voltage drops to 3.4V.

After a low battery status is detected, the battery monitor output will be back to HIGH when the voltage will reach around 3.6V.

Please note the monitor works when the battery is not in charging status and no power input is connects to the USB-C or to VBUS pin.

The battery monitor output is available as a digital signal (HIGH or LOW) on pin GP17, depending on the language IDE, the pin name will be:

- D17 for CircuitPython
- 17 for MicroPython
- 17 for the Arduino IDE

2. Pinout MELOPERO SHAKE RP2040 PINOUT



🕂 GPIO MAX current 12mA per pin



The pinout chart above is useful to quickly find the right name to use for a specific pin, depending on the language and IDE. As example, note how the pins labeled as 4, 5 and 6 change name depending on which platform are using to program the board:

- CircuitPython refer to those pins as D4, D5 and D6
- In the Arduino IDE they are 7, 8 and 6 (check the green labels)
- For use with MicroPython, they are called with the number you find in the GPxx labels (only the number)

3. Installing CircuitPython

CircuitPython is a derivative of MicroPython designed to simplify experimentation and education on low-cost microcontrollers. It makes it easier than ever to get prototyping by requiring no upfront desktop software downloads. Simply copy and edit files on the CIRCUITPY drive to iterate. CircuitPython is developed and maintained by Adafruit Industries, along with many sensors libraries to start your project in the blink of an eye.

3.1 Download CircuitPython

As we write the first version of this guide, the Melopero Shake Rp2040 is already listed on the official CircuitPython.org website, but the .uf2 file is not available yet, it'll be released automatically at the first new CircuitPython release.

For the sake of completeness, we show you where to always find the latest version of CircuitPython for the Melopero Shake RP2040 in the near future.

In the meantime, you can download the latest current version (7.0.0) from our server, at the following address:

www.melopero.com/melopero_shake_rp2040_circuitpython.uf2

To download the latest version of CircuitPython for Melopero Shake RP2040, visit www.circuitpython.org, click "download" and search for "melopero shake rp2040". On the Shake RP2040 page, you can select your preferred language and download the .uf2 file.



3.2 Install CircuitPython

After downloading the latest version of CircuitPython, activate the boot loader mode on your board and copy the .uf2 file to it.

To enter the bootloader, when the Shake is already connected to your computer's USB port, press and hold the BOOT / BOOTSEL button (circled in red in the image below), then press and release the reset button (circled in green). Continue holding the BOOT / BOOTSEL button until the RPI-RP2 appears.

You can also start with your board unplugged from USB, press and hold the BOOTSEL button on your Shake RP2040. While holding the button, connect the other end of the USB cable to the Shake board. This will cause Shake to load his bootloader. You should see the RPI-RP2 appear as a new drive on your computer when you do this.



You will see a new disk drive appear called RPI-RP2.

Drag (or copy and paste) the adafruit_circuitpython_melopero_shake_rp2040_xxxxxx.uf2 file to RPI-RP2.

The RPI-RP2 drive will disappear and a new disk drive called CIRCUITPY will appear.



3.3 Install Mu editor

Mu is a Python code editor for beginner programmers and it's the recommended editor for programming in CircuitPython.

It's available for Windows, Mac and Linux at the following address: https://codewith.mu/en/download

The first time you'll run Mu editor, it should ask for which mode you want to load. Select "CircuitPython". You can always change mode by clicking on "mode" in the upper menu and selecting your favourite one.

	+)
Mode	New	Load Save Serial Plotter Zoom-in Zoom-out Theme Check Tidy Help Quit Select Mode	
1 2	Please se	select the desired mode then click "OK".Otherwise,click "Cancel".	
	\odot	BBC micro:bit Δ Write MicroPython for the BBC micro:bit.	
	2	CircuitPython Write code for boards running CircuitPython.	
		ESP MicroPython Write MicroPython on ESP8266/ESP32 boards.	
		Lego MicroPython Write MicroPython directly on Lego Spike devices.	
	nn.	Pyboard MicroPython Use MicroPython on the Pyboard line of boards	
	••••	Pygame Zero Make games with Pygame Zero.	
	2	Python 3 Create code using standard Python 3.	
	ŏ	RP2040 Write MicroPython directly on a Raspberry Pi Pico.	
	Change n	mode at any time by clicking the "Mode" button containing Mu's logo.	
		Cancel OK	
		CircuitPython	\$

3.4 Mu quick start

Mu will auto-detect your CircuitPython board.

On the upper menu, clicking "new", you'll create a new file.

Once you have connected the Melopero Shake RP2040, click "Load", then select the CIRCUITPY driver, and open code.py. After editing this file, click "Save", and it'll be loaded on your board.



3.5 The REPL

The REPL, Read-Evaluate-Print-Loop, allows you to execute lines of code directly in the console and get an immediate result.

Click "Serial" to open the serial console and then press any key to enter the REPL. Use CTRL-D to reload.

Try to run the command print("hello world") and press enter. The REPL will interpret the line of code and get you the result, in this case it'll print "hello world".

CircuitPython REPL
Auto reload is on. Simply save files over USB to run them or enter REPL to disable.
Press any key to enter the REPL. Use CTRL-D to reload.
Adafruit CircuitPython 7.0.0 alpha.4-851 g994d0eb34 dirty on 2021 10-06; Melopero Shake RP2040 with rp2040
>>> print("hello world")
hello world
>>>
CircuitPython 🎬 🔅

4. Installing MicroPython

MicroPython is a lean and efficient implementation of the Python 3 programming language that includes a small subset of the Python standard library and is optimised to run on microcontrollers and in constrained environments.

MicroPython is a full Python compiler and runtime that runs on the bare-metal. You get an interactive prompt (the REPL) to execute commands immediately, along with the ability to run and import scripts from the built-in filesystem. The REPL has history, tab completion, auto-indent and paste mode for a great user experience.

4.1 Download MicroPython

To download the latest MicroPython release for the Melopero Shake RP2040 from our server, go to the following address:

www.melopero.com/melopero_shake_rp2040_micropython.uf2

After downloading the MicroPython uf2 file, activate the boot loader mode on your board and copy the .uf2 file to it.

To enter the bootloader, when the Shake is already connected to your computer's USB port, press and hold the BOOT / BOOTSEL button (circled in red in the image below), then press and release the reset button (circled in green). Continue holding the BOOT / BOOTSEL button until the RPI-RP2 appears.

You can also start with your board unplugged from USB, press and hold the BOOTSEL button on your Shake RP2040. While holding the button, connect the other end of the USB cable to the Shake board. This will cause Shake to load his bootloader. You should see the RPI-RP2 appear as a new drive on your computer when you do this.



You will see a new disk drive appear called RPI-RP2.

Drag (or copy and paste) the adafruit_circuitpython_melopero_shake_rp2040_xxxxxx.uf2 file to RPI-RP2.

The RPI-RP2 drive will disappear and a new disk drive called CIRCUITPY will appear.



4.2 Install Thonny editor

Thonny is a Python code editor for beginner programmers and it's the recommended editor for programming in RP2040 based boards with MicroPython. It's available for Windows, Mac and Linux at the following address: https://thonny.org

The first time you'll run Thonny editor, you should set MicroPython on Raspberry Pi Pico and select the right port fo your connected device.

Go to Preferences (should be options/settings on windows), click "Interpreter" tab and then select Micropython (Raspberry Pi Pico) and the right port from the port menu (your board must be connected and with MicroPython already installed)

••			TI	honny options				
eneral	Interpreter	Editor	Theme & Font	Run & Debug	Terminal	Shell	Assistant	
Which i	nterpreter or o	device sh	ould Thonny use	for running your	code?			
MicroP	ython (Raspb	erry Pi Pic	co)					
If you Port Board	d in FS mode	you may r	usbmodem14201	oper USB driver f	irst.			
If you Port Boar	d in FS mode (you may r (/dev/cu.u	usbmodem14201	oper USB driver f	irst.			-
If you Port Boar	d in FS mode i	(/dev/cu.u	usbmodem14201	oper USB driver f	irst.			T
If you Port Board	d in FS mode ((/dev/cu.u	usbmodem14201)	irst.			T
If you Port Board	d in FS mode i	(/dev/cu.u	usbmodem14201) pper USB driver f	irst.			T

4.3 Thonny quick start

Write some code in the script area of Thonny. When ready click RUN or SAVE, Thonny will promt you to select where you want to execute/save the script. Select "Raspberry Pi Pico" and give a name to the file. If you have some prints in your code, you'll see them in the Shell.

import uti	me	
i=3	Where to save to?	
whil		
	This computer	
<u> </u>		
	Raspberry Pi Pico	

4.4 The REPL

The REPL, Read-Evaluate-Print-Loop, allows you to execute lines of code directly in the console and get an immediate result.

In the Shell, try to run the command print("hello world") and press enter.

The REPL will interpret the line of code and get you the result, in this case it'll print "hello world".

Shell 🗶	
<pre>MicroPython v1.16-341-g215292166-dirty on 2021-10-06; Melopero Shake RP2040 with Type "help()" for more information. >>> print("Hello World")</pre>	RP2040
Hello World	
>>>	

MicroPython (Raspberry Pi Pico)

5. Setting up Arduino IDE

5.1 Download the Arduino IDE

To download the Arduino IDE for your favourit OS go to: https://www.arduino.cc/en/software

5.2 Add Shake RP2040 to Arduino IDE

To add support for the Shake RP2040 to the Arduino IDE, we use the port of the RP2040 developed by Earle F. Philhower, III (earlephilhower on GitHub)

Go to File>Preferences and enter the following URL in the "Additional Boards Manager URLs" field:

 $https://github.com/earlephilhower/arduino-pico/releases/download/global/package_rp2040_index.json$

00	Preferences
	Settings Network
Sketchbook location:	
/Users/francesco/Documents	s/Arduino Browse
Editor language:	English (English) (requires restart of Arduino)
Editor font size:	12
Interface scale:	Automatic 100 0% (requires restart of Arduino)
Theme:	Default theme ᅌ (requires restart of Arduino)
Show verbose output during:	compilation upload
Compiler warnings:	None ᅌ
Display line numbers	Enable Code Folding
🗹 Verify code after upload	Use external editor
Check for updates on star	tup 🗹 Save when verifying or uploading
Use accessibility features	
Additional Boards Manager UR	Ls: https://github.com/earlephilhower/arduino-pico/releases/download/global/
More preferences can be edite	d directly in the file
/Users/francesco/Library/Ard	uino15/preferences.txt
(edit only when Arduino is not	running)
	OV Canad

Once the URL has been added, go to Tools>Board>Boards Manager and search "Melopero"

ype	All	😒 melo	opero
Rasp	berry Pi Pico/R	P2040	
Inc. Do	I. F. DLUL		
Dy Ea	irle F. Philhower, J	III version 1.9.5 IN	NSTALLED
Board Raspb	Is included in this pa berry Pi Pico, Adafru	III version 1.9.5 IN ackage: it Feather RP2040, /	NSTALLED Adafruit ItsyBitsy RP2040, Adafruit Macropad RP2040, Adafruit QTPy RP2040, Adafruit STEMMA
Board Raspt Friend	Ine F. Philhower, J Is included in this pa perry Pi Pico, Adafru J RP2040, Adafruit T Info	III version 1.9.5 IN ackage: it Feather RP2040, 7 Frinkey RP2040 QT,	NSTALLED Adafruit ItsyBitsy RP2040, Adafruit Macropad RP2040, Adafruit QTPy RP2040, Adafruit STEMMA Arduino Nano RP2040 Connect, SparkFun ProMicro RP2040, Generic RP2040 Module.

After the installation, you'll be able to select Melopero Shake RP2040 as the board, going to Tools>Board>Raspberry Pi RP2040 boards>Melopero Shake RP2040

5.3 Using default I2C on Arduino IDE

If you look at the pinout diagram in section 2, you'll notice that you have two I2C buses, Wire on pins GP09 and GP08, and Wire 1 on pins GP03 and GP02, also available through the Qwiic connector.

If you are connecting a sensor on the I2C bus using the Qwiic connector on the Shake, remember to replace, in your Arduino Sketch, Wire with Wire1.

(This modification does not apply if you are using I2C0/Wire pins on the Shake RP2040, GP09 and GP08, check the pinout diagram in section 2).

Usually, this modification must be applied on the initialization: Wirel.begin() instead of Wire.begin(),

on the object initialization, passing to the function the I2C address and the bus instead of using defaults values (it's common use on the libraries to give the user the option of passing these information to the init function): sensor.init device(0x77, Wire1)

Finally, you must modify all the calls to the Wire library, e.g.: Wire1.beginTransmission() Wire1.endTransmission() etc.



6. Clear the Flash memory 5.1 Flash nuke

If you need to do a deep clean of the flash memory, download the following uf2 file and install it on the Shake RP2040 as you did for CircuitPython or MicroPython (see sections 3.2 and 4.1): www.melopero.com/melopero_shake_rp2040_flash_nuke.uf2