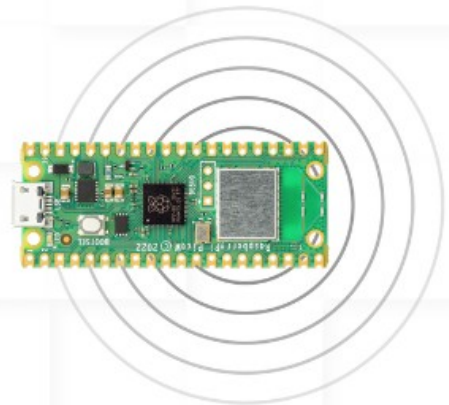
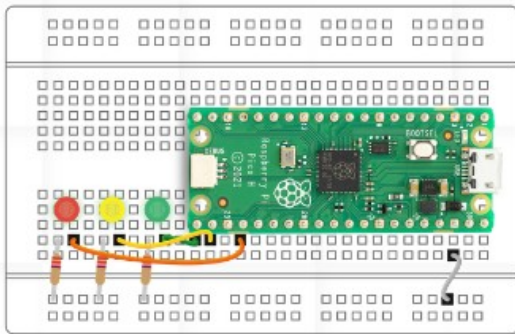
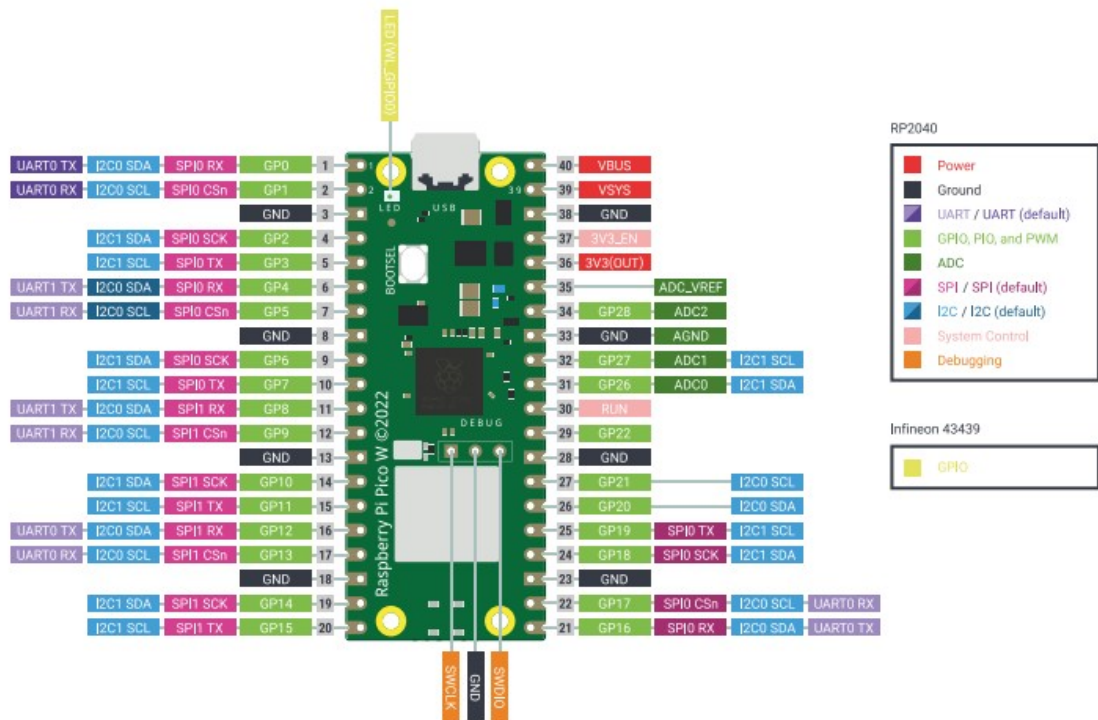


Introducing the Raspberry Pi Pico and Pico W



For those interested in exploring the Internet of Things (IoT) or simply learning how to program a microcontroller (CPU + flash and RAM memory, programmable Input/Output pins - including Analog to Digital conversion, Pulse Width Modulation and built in interfaces for several serial communication options; UART, I2C, SPI), Raspberry Pi sell and support the USB powered and connected Pico and Pico W (Wi-Fi and Bluetooth support) modules. Using readily available electronic components and modules, you can sense, report and respond to environmental changes, etc. <https://www.raspberrypi.com/products/raspberry-pi-pico/>

Figure 2. The pinout of the Pico W Rev3 board



Pico W Pinout from the Raspberry Pi Pico W Datasheet. Pico Pinout is identical, but onboard LED is differently controlled

Pico modules are available for around A\$6 (Pico without header pins) to A\$13 (Pico W with header pins). You can buy a range of kits which include a breadboard and electronic modules to extend their use for well under \$100. With a soldering iron and matrix PC board you can create your own permanent IoT solutions, which you can easily reprogram via the USB connector.

There is excellent Linux support for the Pico. The easiest way to get started is by using MicroPython <https://micropython.org/> <https://en.wikipedia.org/wiki/MicroPython> , originally created by the Australian programmer Damien George. The CircuitPython fork is also supported <https://en.wikipedia.org/wiki/CircuitPython>

Alternatively, you can create your own dedicated firmware using the C/C++ programming languages for faster operation, making full use of the dual core ARM processor with the accompanying 2MB flash storage and 256Kbytes of RAM.

Installing firmware is simple; just connect your Pico module to a USB port, which triggers opening of your file manager, displaying the Pico's file memory. You then drag and drop the firmware file to the Pico's file memory to quickly flash the Pico. If you have installed the MicroPython firmware (updated ~quarterly to add extra support and fix bugs), you can easily use an Integrated Development Environment application such as Thonny, to develop and test scripts. There are many supported modules (libraries) that you can include in your scripts to simplify interfacing with displays and more complex sensor modules, such as pressure, humidity, temperature and GPS modules. When you are satisfied with your script, you can save it to the Pico's flash memory as main.py and the script will automatically run whenever the Pico is powered up.

The Pico W module greatly expands the capability of the Pico, enabling you to connect via Wi-Fi or Bluetooth. You can directly interface with the module via a terminal using a TCP or UDP, application or indeed via an app on your smartphone. You can even set up a small website, enabling you to monitor, report and control via the website or through messaging applications such as Telegram. There's also a support module for a communication protocols widely used in Home Automation and IoT applications, MQTT; see <https://randomnerdtutorials.com/raspberry-pi-pico-w-mqtt-micropython/> (Random Nerd Tutorials provide excellent, tested tutorials).

Further Tips and References

Raspberry Pi Pico specifications and support documents (regularly updated)
<https://www.raspberrypi.com/products/raspberry-pi-pico>

Getting Started

I'd recommend buying a kit containing a Pico W. Such kits typically include an eBook describing how to build a wide range of projects that allow you to explore the Pico's capabilities. Look for one with on-line support; there's plenty of choice on Amazon. https://www.amazon.com/s?k=raspberry+pi+pico+kits&crd=1ZHEGVMQPEPYB&prefix=raspberry+pi+pico+kits%2Caps%2C423&ref=nb_sb_noss_1

Coding with MicroPython is the easiest way to start, with some kits including support for C code tutorial versions. Be wary of unsupported code found on the internet – some has never been tested! Make certain you buy genuine Raspberry Pi units; there are incompatible copies on sale.

Latest MicroPython firmware downloads are available from:-

https://micropython.org/download/RPI_PICO and https://micropython.org/download/RPI_PICO_W

Neil Matthews, 6th May 2024