Waveshare RP2350-Tiny

Waveshare RP2350-Tiny Microcontroller Development Board Kit User Manual

Model: RP2350-Tiny

1. Introduction

This manual provides detailed instructions for the Waveshare RP2350-Tiny Microcontroller Development Board Kit. It covers the board's features, specifications, setup procedures, operation guidelines, and troubleshooting tips to help users effectively utilize the development board.
The RP2350-Tiny is a compact development board based on the Raspberry Pi RP2350A microcontroller. It features a unique dual-core and dual-architecture design, integrating an Arm Cortex-M33 processor and a Hazard 3 RISC-V processor, capable of flexible clock speeds up to 150 MHz. This kit is designed for various embedded applications and supports C/C++ and MicroPython programming.

2. Package Contents

Verify that all items listed below are included in your package:

- RP2350-Tiny Development Board x1
- USB Port Adapter x1
- FPC Cable (~15cm) x1

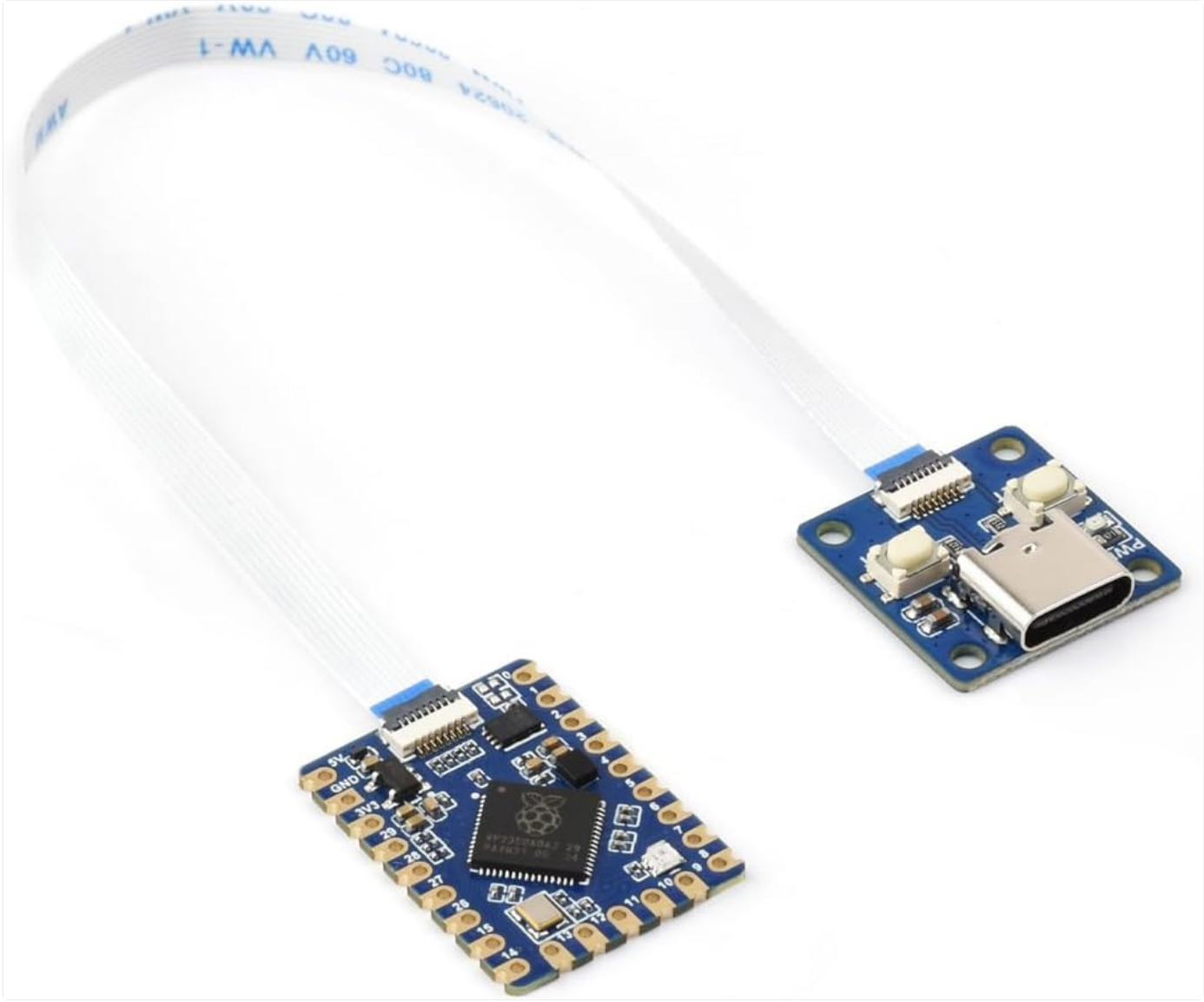


Image: The RP2350-Tiny development board connected via an FPC cable to the USB port adapter, illustrating the main components of the kit.

3. Key Features

The Waveshare RP2350-Tiny Development Board offers the following key features:

- **Microcontroller:** Raspberry Pi RP2350A chip with dual-core Arm Cortex-M33 and dual-core Hazard 3 RISC-V processors.
- **Clock Speed:** Flexible clock running up to 150 MHz.
- **Memory:** 520KB Static Random-Access Memory (SRAM) and 4MB on-board Flash memory.
- **Connectivity:** Onboard FPC 8-PIN connector, adaptable to USB Type-C via adapter board.
- **Form Factor:** Castellated module design for direct soldering to carrier boards.
- **USB:** USB 1.1 with device and host support.
- **Power Modes:** Low-power sleep and dormant modes.
- **Programming:** Drag-and-drop programming via mass storage over USB.
- **GPIO:** 28 multi-function GPIO pins (20 via edge pinout, others via solder points).
- **Peripherals:** 2 SPI, 2 I2C, 2 UART, 4 12-bit ADC, 16 controllable PWM channels.
- **PIO:** 12 Programmable I/O (PIO) state machines for custom peripheral support.
- **Additional:** Accurate clock and timer, on-chip temperature sensor, accelerated floating-point libraries.

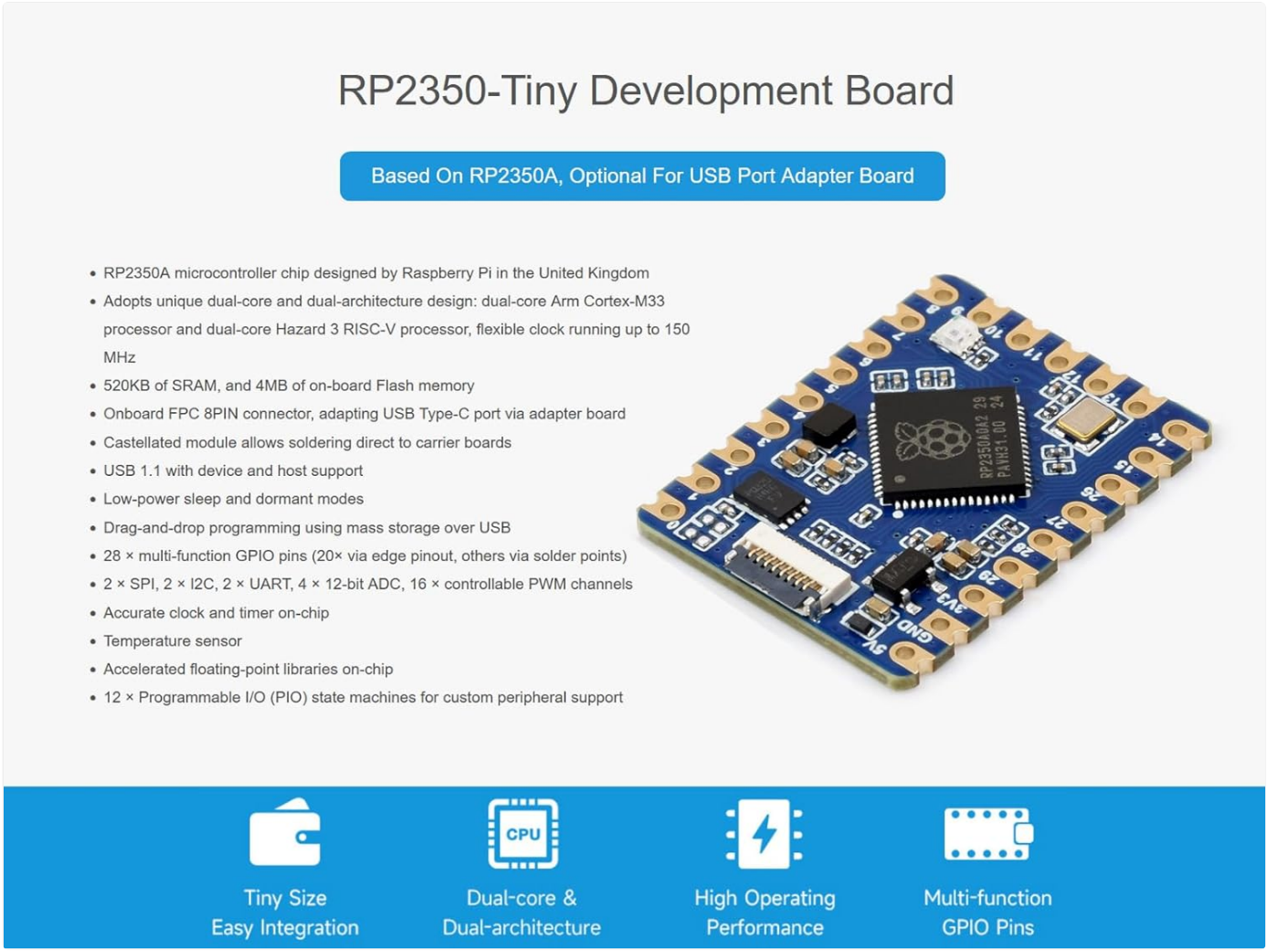


Image: An overview of the RP2350-Tiny Development Board highlighting its key features such as tiny size, dual-core architecture, high operating performance, and multi-function GPIO pins.

4. Technical Specifications

Feature	Specification
Microcontroller	Raspberry Pi RP2350A (Dual-core Arm Cortex-M33, Dual-core Hazard 3 RISC-V)
Clock Speed	Up to 150 MHz
SRAM	520 KB
Flash Memory	4 MB (on-board)
USB	USB 1.1 (Device and Host support)
GPIO Pins	28 multi-function (20 via edge pinout)
Peripherals	2 SPI, 2 I2C, 2 UART, 4 12-bit ADC, 16 PWM channels
PIO State Machines	12
Dimensions (RP2350-Tiny)	0.92 x 0.7 x 0.39 inches (approx. 23.5 x 18 x 10 mm)
Weight	0.16 ounces (approx. 4.5 grams)

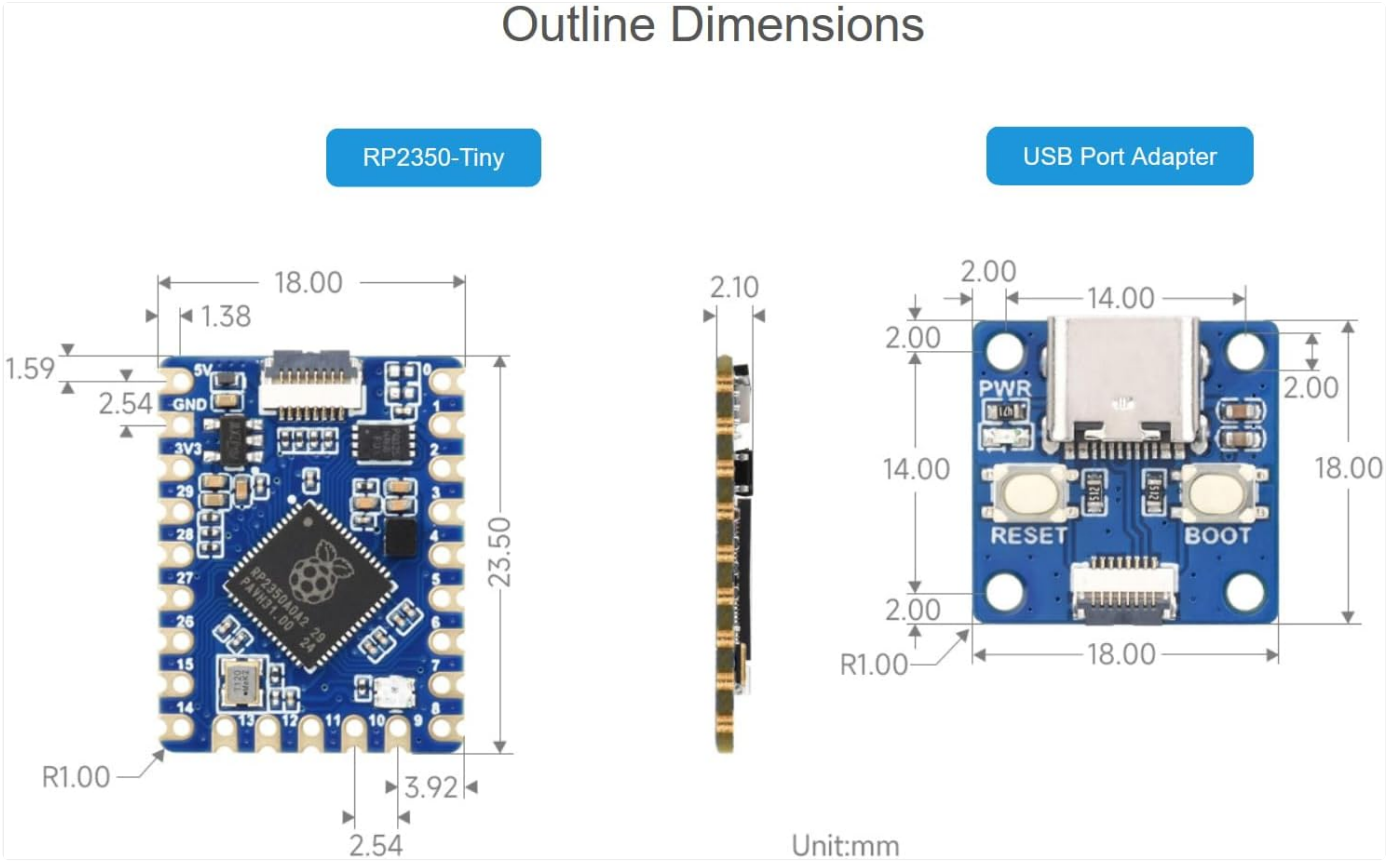
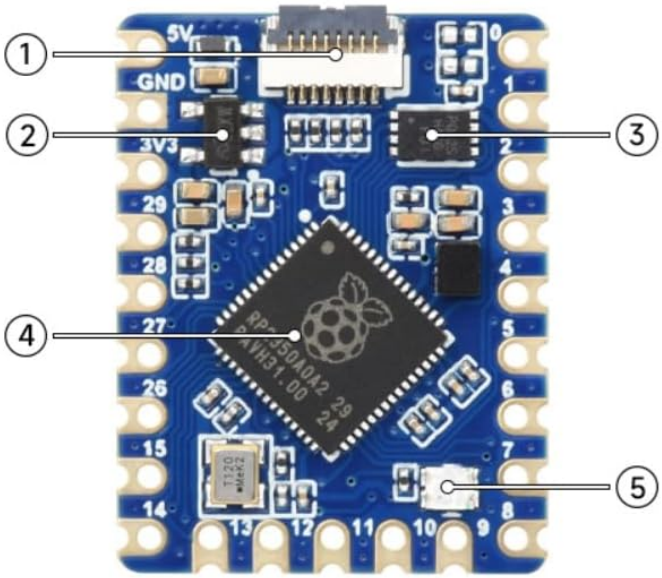


Image: Detailed outline dimensions for both the RP2350-Tiny development board and the USB Port Adapter, shown in millimeters.

5. Board Layout and Components

Understanding the layout of the RP2350-Tiny board is crucial for proper usage. The following diagram identifies key components:

What's On Board



1. **FPC connector**
   0.5mm pitch 8PIN
2. **ME6217C33M5G**
   Low dropout regulator, 800mA output (Max.)
3. **P25Q32SH-UXH-IR**
   4MB NOR-Flash
4. **RP2350A**
   Dual-core and dual-architecture design, up to 150 MHz operating frequency
5. **WS2812**
   RGB LED Indicator

Image: A top-down view of the RP2350-Tiny board with numbered callouts identifying major components such as the FPC connector, voltage regulator, Flash memory, RP2350A chip, and RGB LED indicator.

1. **FPC connector:** 0.5mm pitch 8PIN connector for external connections, typically to the USB adapter.
2. **ME6217C33M5G:** Low dropout regulator, providing up to 800mA output (Max.).
3. **P25Q32SH-UXH-IR:** 4MB NOR-Flash memory for program storage.
4. **RP2350A:** The main dual-core, dual-architecture microcontroller chip.
5. **WS2812:** RGB LED indicator for visual feedback.

GPIO Pinout

The RP2350-Tiny features 28 multi-function GPIO pins. The pinout diagram below illustrates the available pins and their primary functions.

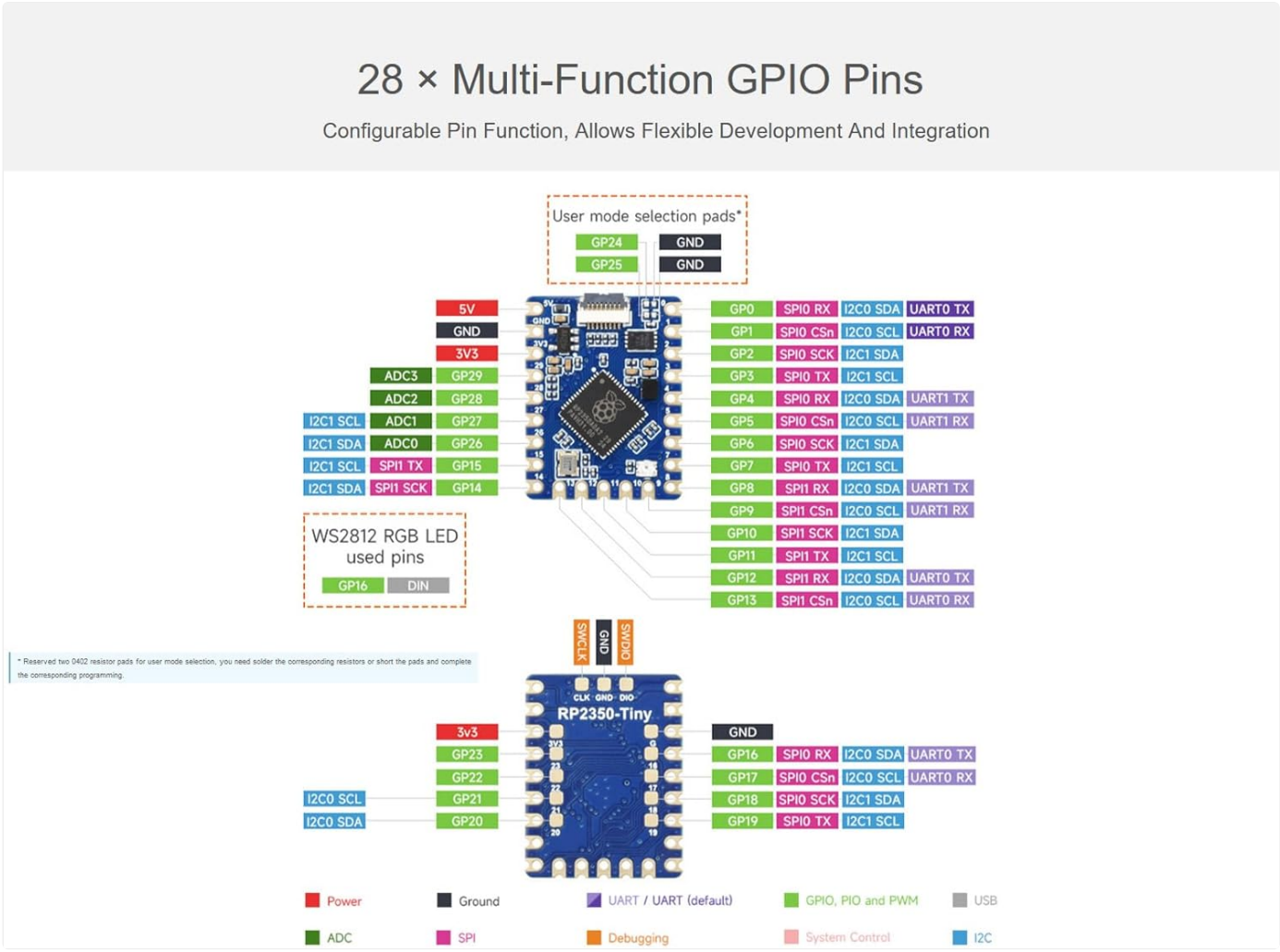


Image: A detailed diagram showing the GPIO pinout of the RP2350-Tiny board, including power, ground, UART, SPI, I2C, ADC, and PWM functions, along with user mode selection pads.

6. Setup Instructions

6.1 Connecting the USB Port Adapter

The RP2350-Tiny development board connects to a host computer via the provided USB Port Adapter and FPC cable.

1. Carefully connect one end of the FPC cable to the 8-PIN FPC connector on the RP2350-Tiny board. Ensure the cable is inserted correctly with the contacts facing the appropriate direction.
2. Connect the other end of the FPC cable to the corresponding 8-PIN FPC connector on the USB Port Adapter.
3. Plug the USB Type-C end of the USB Port Adapter into your computer.

Upon successful connection, the board should be recognized by your computer, typically as a mass storage device for drag-and-drop programming.

6.2 Software Environment Setup

To develop applications for the RP2350-Tiny, you will need to set up a development environment. The board supports C/C++ and MicroPython.

- **For C/C++ Development:** Utilize the Pico C/C++ SDK. This SDK can be used from the command line or integrated with popular development environments like Visual Studio Code and Eclipse. Refer to the official Raspberry Pi Pico documentation for detailed setup instructions.
- **For MicroPython Development:** MicroPython is a full implementation of the Python 3 programming language

optimized for embedded hardware. You can flash a MicroPython firmware to the board and then use a serial terminal or an IDE like Thonny for programming.

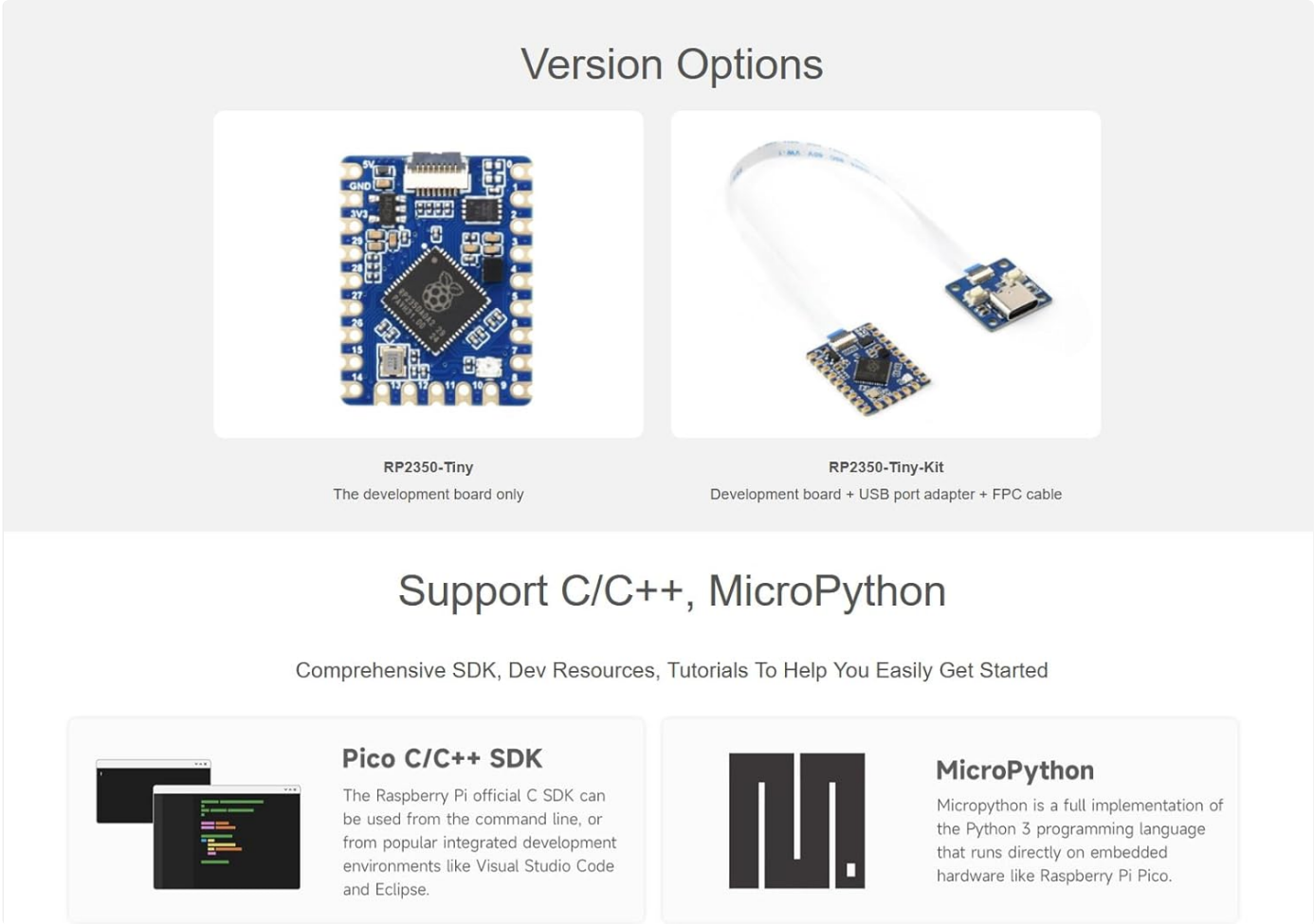


Image: An illustration showing the support for C/C++ SDK and MicroPython development environments for the RP2350-Tiny board.

7. Operating the RP2350-Tiny

7.1 Programming via USB (Drag-and-Drop)

The RP2350-Tiny supports drag-and-drop programming, which is a convenient way to upload firmware or MicroPython scripts.

1. With the board connected to your computer via the USB Port Adapter, press and hold the BOOTSEL button on the USB Port Adapter while plugging it into your computer (or press BOOTSEL and then RESET if already connected).
2. The board will appear as a mass storage device (e.g., "RPI-RP2").
3. Drag and drop your compiled firmware (.uf2 file for C/C++ or .py file for MicroPython) onto this drive.
4. The board will automatically reboot and run the new program.

7.2 GPIO Usage

The 28 multi-function GPIO pins can be configured for various purposes, including digital input/output, analog input (ADC), serial communication (SPI, I2C, UART), and Pulse Width Modulation (PWM).

- Refer to the GPIO pinout diagram in Section 5 for pin assignments.
- When programming, ensure that the correct pin numbers and functions are specified in your code.
- Be mindful of voltage levels; the RP2350-Tiny operates at 3.3V logic.

7.3 Power Management

The RP2350-Tiny supports low-power sleep and dormant modes to conserve energy in battery-powered applications. Consult the RP2350A datasheet and SDK documentation for details on implementing these power-saving features in your code.

8. Maintenance and Care

- **Handling:** Always handle the development board by its edges to avoid touching components, especially the pins, which can be sensitive to electrostatic discharge (ESD).
- **Storage:** Store the board in an anti-static bag when not in use, in a cool, dry environment.
- **Cleaning:** If necessary, gently clean the board with a soft, dry brush or compressed air. Avoid using liquids or abrasive materials.
- **Power Supply:** Ensure a stable 5V power supply when connecting via USB. Over-voltage can damage the board.

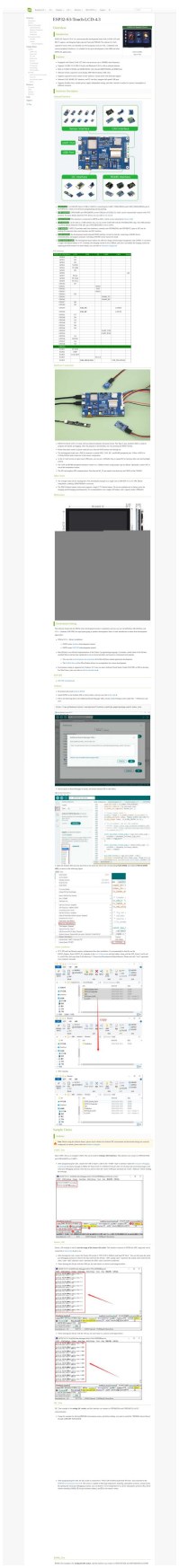
9. Troubleshooting

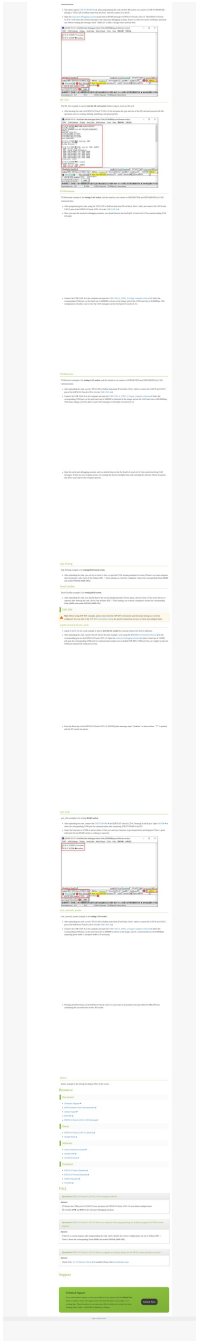
- **Board not recognized by computer:**
  - Ensure the FPC cable is securely connected to both the RP2350-Tiny and the USB Port Adapter.
  - Try a different USB cable or USB port on your computer.
  - Verify that you are holding the BOOTSEL button while connecting the USB adapter to enter mass storage mode.
- **Program not running after upload:**
  - Confirm that the correct .uf2 or .py file was dragged to the "RPI-RP2" drive.
  - Check your code for errors.
  - Ensure the board automatically rebooted after the file transfer. If not, manually reset the board.
- **Peripherals (e.g., I2C, SPI) not working:**
  - Double-check your wiring against the GPIO pinout diagram.
  - Verify that the correct GPIO pins are initialized and configured in your software.
  - Ensure external components are properly powered and connected.
- **Board gets hot:**
  - Disconnect power immediately.
  - Check for short circuits on the board or in your external connections.
  - Ensure the input voltage is within the specified range (5V via USB).

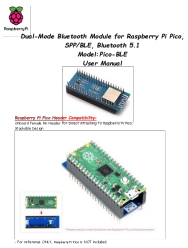
10. Technical Support and Resources

For further assistance, online development resources, and technical support, please refer to the Waveshare official website or contact their support team. Detailed documentation, examples, and community forums are often available to help with advanced projects and specific issues.
You can find additional resources and contact information on theWaveshare Store on Amazon.

Related Documents - RP2350-Tiny

	[Waveshare ESP32-S3-Touch-LCD-4.3 Development Board: Features & Guide] Explore the Waveshare ESP32-S3-Touch-LCD-4.3, a powerful microcontroller development board featuring a 4.3-inch capacitive touch display, WiFi, BLE 5, and multiple interfaces like CAN, RS485, and I2C. Learn about its hardware, setup, and sample demos for HMI development.



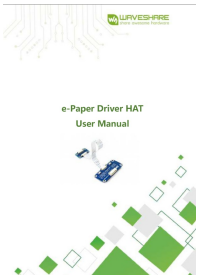


[Raspberry Pi Pico Dual-Mode Bluetooth Module (Pico-BLE) User Manual]

User manual for the Waveshare Pico-BLE, a dual-mode Bluetooth 5.1 module designed for Raspberry Pi Pico, supporting SPP and BLE protocols. Features header compatibility and onboard antenna.

[ESP32-S3-Touch-LCD-4.3B: Development Board Overview and Setup Guide]

Explore the ESP32-S3-Touch-LCD-4.3B, a powerful microcontroller development board from Waveshare. This guide covers its features, hardware description, interface details, and provides instructions for setting up the development environment using ESP-IDF and VSCode.

	[WaveShare X210II Rev1.0 Hardware Manual] Detailed hardware manual for the WaveShare X210II Rev1.0 development board, covering its features, core components, pin definitions, baseboard interfaces, and startup procedures.
	[Waveshare e-Paper Driver HAT User Manual: Connect SPI E-Paper Displays to Raspberry Pi, Arduino, STM32] User manual for the Waveshare e-Paper Driver HAT, detailing its features, product parameters, interface specifications, and supported e-Paper models. Includes setup guides for Raspberry Pi, Arduino, and STM32 development boards.
	[Waveshare 4inch DSI LCD Display for Raspberry Pi: Setup and Guide] Detailed guide for the Waveshare 4inch DSI LCD display, covering features, hardware connection, software installation, screen rotation, backlight control, and troubleshooting for Raspberry Pi.


4inch DSI LCD

Introduction

Features

Working with Raspberry Pi

Hardware connection

Software settings

Method 1: Install Manually

Method 2: Program Pre-Install Image

Rotation

Method 1: Graphical Interface Rotation

Method 2: Rotation Display In Lite Version

Touch To Rotate

Backlight Control

Method 1: Graphical Interface Dimming

Method 2: Lite Version Dimming Command

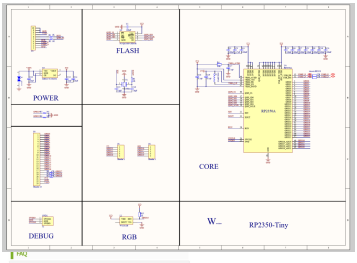
FAQ

Anti-Piracy

Support

If you require technical support, please go to the page and open a ticket.

Documents - Waveshare – RP2350-Tiny



[pdf]

New Output None ll Lib Windows 9x NT 2000 XP User 3V3 GND U2 100nF 17 dic 2024 — P3 GPIOO 1234noro GPIO1 GPIO2 GPIO3 GPI04 5 PI P2 GPIOS 6 GPIO6 1 7 GPIO23 GPIO16 GPI07 2 8 GPIO22 GPIO17 GPIO8 RP2350 Tiny Schematic files waveshare wiki ||| XOUT XIN ESD5451N 1 2 10 PIU1010 A 9 PIU109 8 PIU108 7 PIU107 6 PIU106 5 PIU105 4 PIU104 3 PIU1 ... LSUBSBDD_0PP PIR502 PI2R670R2 NULSUBSBDD_0NN B 61 GND PIU4061 C GND CORE Waveshare COlogo1 5 RP2350-Tiny 6 7 D 8 ...

lang:i-klingon score:30 filesize: 327.46 K page_count: 1 document date: 2024-11-12