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› Wonrabai ESP32-C6 Mini Development Board User Manual

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Model: ESP32-C6 Mini Development Board

Brand: Wonrabai

1. INTRODUCTION

The Wonrabai ESP32-C6 Mini Development Board is a compact and powerful module designed for a wide range of IoT and AIoT applications. Based on the ESP32-C6FH4 dual-processor system, it integrates 2.4GHz WiFi 6 and Bluetooth 5, offering robust wireless communication capabilities. This manual provides essential information for setting up, operating, and troubleshooting your development board.

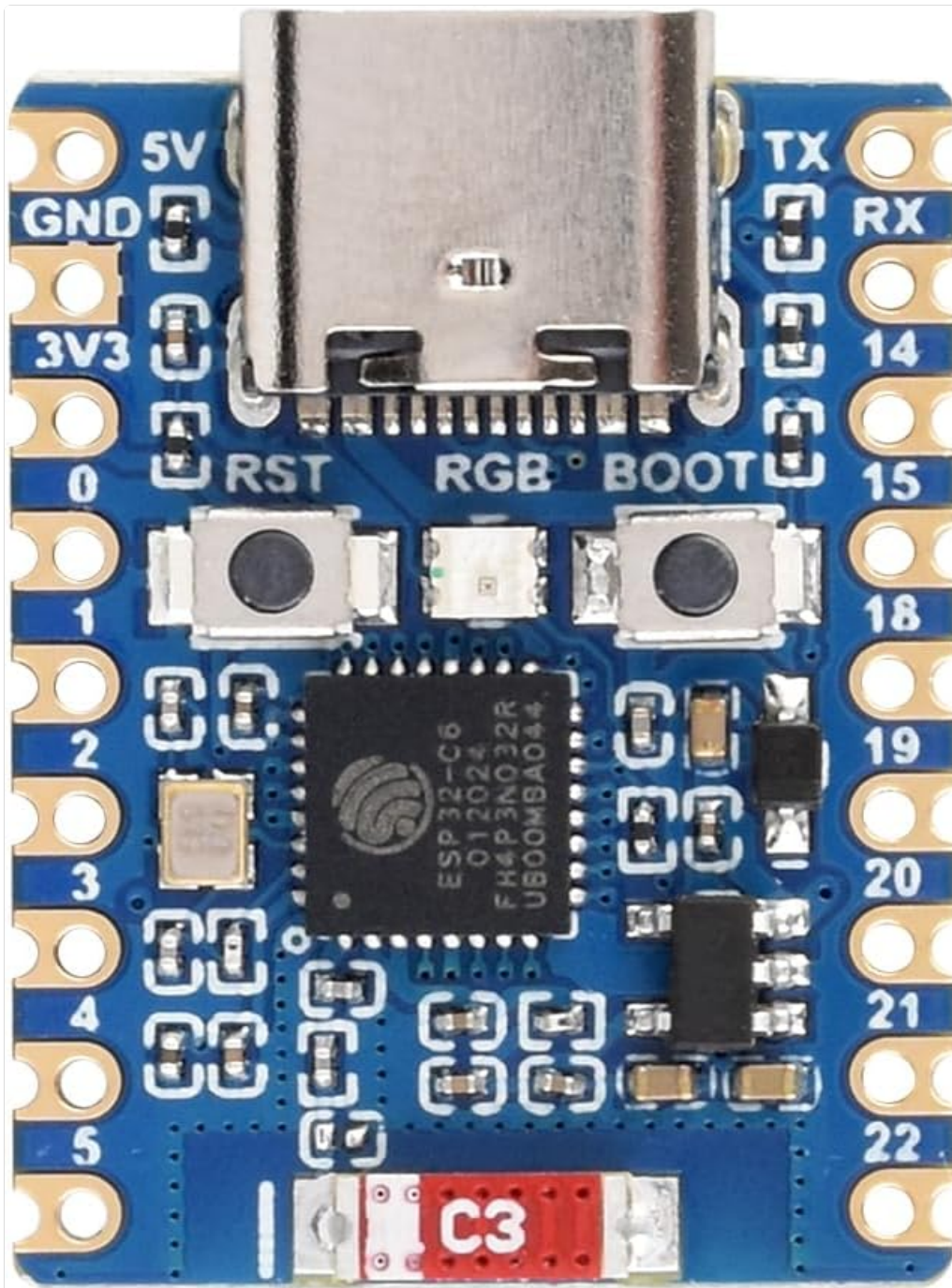


Figure 1: Top-down view of the ESP32-C6 Mini Development Board, showing the USB Type-C port, buttons, and main chip.

2. KEY FEATURES

- **Dual Processors:** Equipped with a high-performance 32-bit RISC-V processor (up to 160 MHz) and a low-power 32-bit RISC-V processor (up to 20 MHz).
- **Memory:** Built-in 320KB ROM, 512KB HP SRAM, 16KB LP SRAM, and 4MB Flash memory.
- **Wireless Connectivity:** Integrated 2.4GHz Wi-Fi 6 (802.11 ax/b/g/n) with 40 MHz bandwidth and Bluetooth Low Energy (Bluetooth 5 and Bluetooth Mesh).
- **GPIO Pins:** 22 flexible GPIO pins for various peripheral connections.
- **USB Interface:** Onboard USB Type-C port for power, programming, and debugging.
- **Compact Design:** Castellated module and onboard ceramic antenna, suitable for direct soldering to carrier boards.
- **Low Power Consumption:** Supports flexible clock and module power supply independent settings for

optimized power usage.

3. BOARD OVERVIEW

This section details the main components and their functions on the ESP32-C6 Mini Development Board.

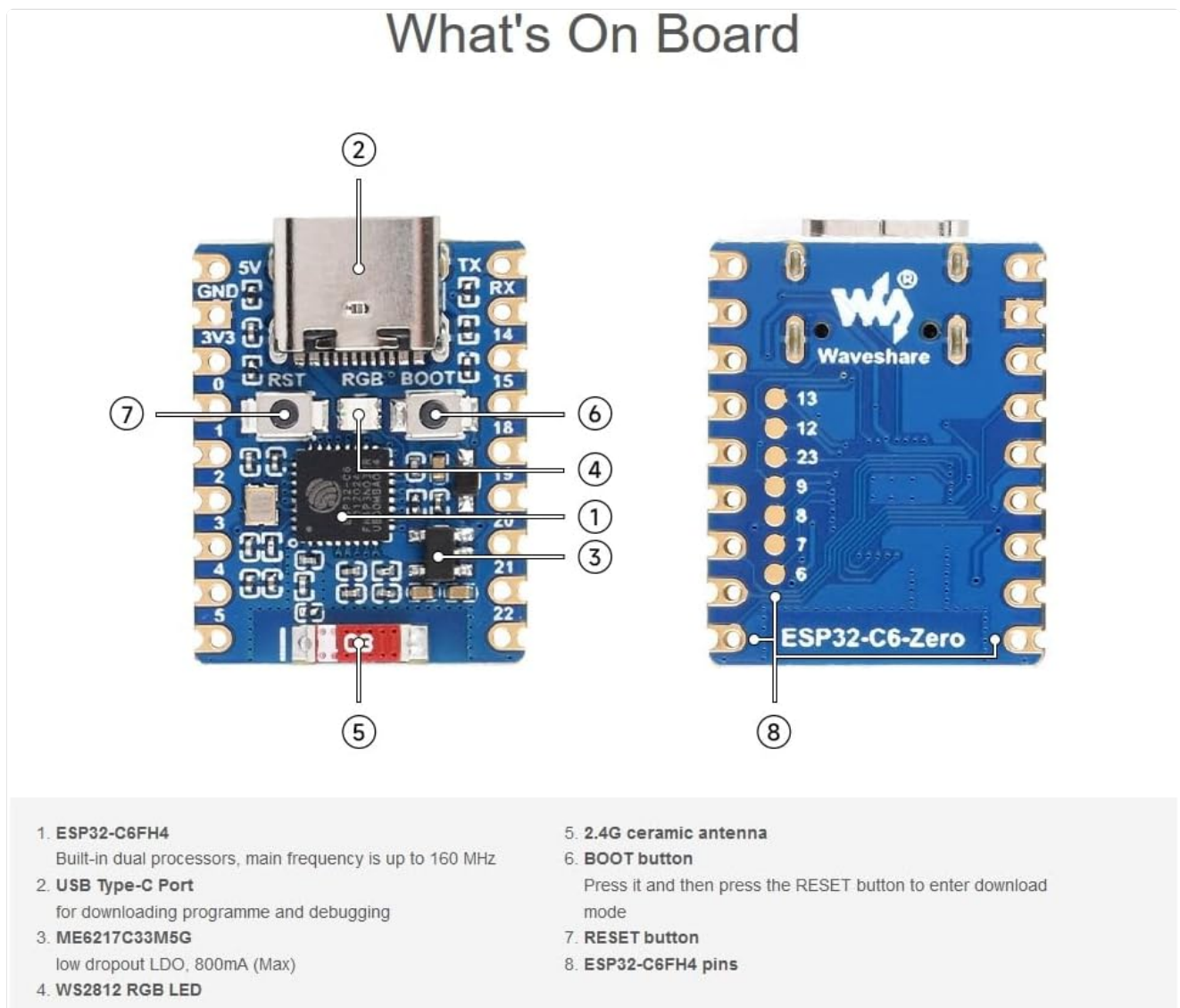


Figure 2: Labeled components of the ESP32-C6 Mini Development Board.

1. **ESP32-C6FH4:** Built-in dual processors, main frequency up to 160 MHz.
2. **USB Type-C Port:** For downloading programs and debugging.
3. **ME917C33M5G:** Low dropout LDO, 800mA (Max).
4. **WS2812 RGB LED:** Programmable RGB LED.
5. **2.4G Ceramic Antenna:** Integrated antenna for wireless communication.
6. **BOOT Button:** Used in conjunction with the RESET button to enter download mode.
7. **RESET Button:** Resets the board.
8. **ESP32-C6FH4 Pins:** General Purpose Input/Output pins.

4. PIN DEFINITION

The ESP32-C6 Mini Development Board offers 22 GPIO pins, each capable of various functions including UART,

PWM, I2S, ADC, I2C, and SPI. Refer to the diagram below for a visual representation of the pinout and their primary functions.

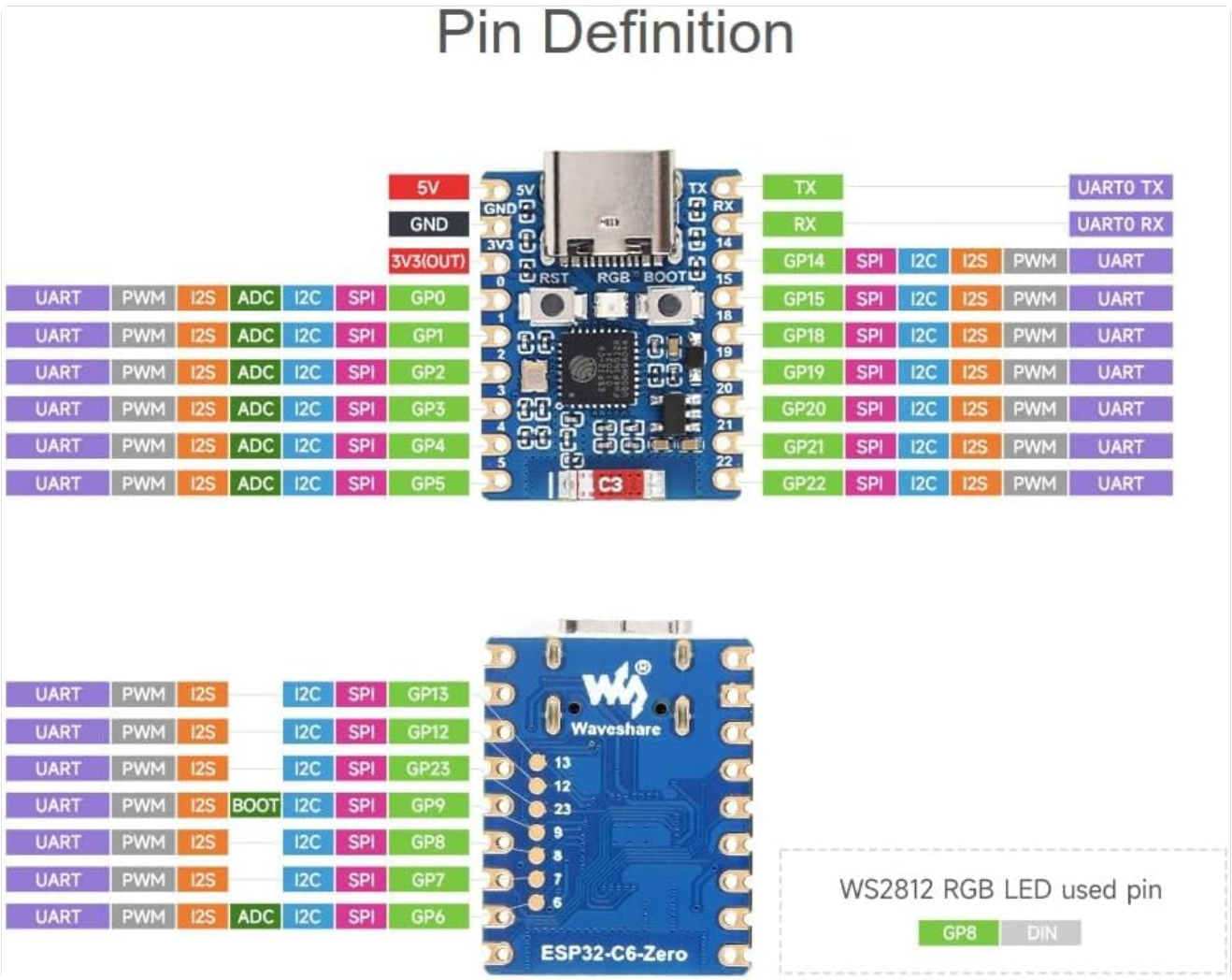


Figure 3: Pinout diagram illustrating the various functions of each GPIO pin.

- **5V:** 5V power input/output.
- **GND:** Ground connection.
- **3V3:** 3.3V power output.
- **TX/RX:** UART (Universal Asynchronous Receiver/Transmitter) for serial communication.
- **GPIO (0-5, 14-15, 18-22):** General Purpose Input/Output pins, configurable for various digital and analog functions.
- **ADC:** Analog-to-Digital Converter inputs.
- **SPI:** Serial Peripheral Interface for high-speed communication with peripherals.
- **I2C:** Inter-Integrated Circuit for communication with sensors and other devices.
- **PWM:** Pulse Width Modulation for controlling motors, LEDs, etc.
- **I2S:** Inter-IC Sound for audio applications.

5. SPECIFICATIONS

Feature	Detail
Processor	Dual 32-bit RISC-V (HP up to 160MHz, LP up to 20MHz)

Feature	Detail
ROM	320KB
HP SRAM	512KB
LP SRAM	16KB
Flash Memory	4MB
Wi-Fi	2.4GHz Wi-Fi 6 (802.11 ax/b/g/n)
Bluetooth	Bluetooth 5 (LE) and Bluetooth Mesh
GPIO Pins	22
USB Interface	USB Type-C
Operating System Compatibility	FreeRTOS, Linux Compatible
Item Weight	0.317 ounces (approx. 9 grams)
Package Dimensions	2.8 x 2.01 x 0.94 inches

6. SETUP GUIDE

To begin using your ESP32-C6 Mini Development Board, follow these general steps:

- 1. Install USB Drivers:** Connect the board to your computer using a USB Type-C cable. Your operating system may automatically install necessary drivers. If not, you may need to manually install CP210x or CH340 drivers, depending on the USB-to-serial chip used on your specific board revision.
- 2. Install Development Environment:**
 - **Arduino IDE:** Install the Arduino IDE. Then, add the ESP32 board support package. For ESP32-C6, ensure you are using a recent version of the ESP32 core that supports the C6 series. This may involve adding a development board URL to the preferences and installing the ESP32 boards via the Boards Manager.
 - **ESP-IDF:** For more advanced development, install Espressif's IoT Development Framework (ESP-IDF). Follow the official Espressif documentation for installation and setup, which typically involves installing Python, Git, and the ESP-IDF tools.
- 3. Select Board and Port:** In your chosen IDE, select the correct ESP32-C6 board variant and the serial port corresponding to your connected board.
- 4. Upload First Program:** Test your setup by uploading a simple program, such as a "Blink" sketch to control the onboard RGB LED, or a "Hello World" serial print example.

7. OPERATING INSTRUCTIONS

Operating the ESP32-C6 Mini Development Board primarily involves writing and uploading firmware using a development environment. Here are general steps for programming:

- 1. Write Code:** Develop your application code using C/C++ (Arduino IDE or ESP-IDF) or MicroPython.
- 2. Connect Board:** Ensure the ESP32-C6 board is connected to your computer via the USB Type-C cable.

3. **Enter Download Mode:** For some operations, you might need to manually put the board into download (bootloader) mode. This typically involves:

- Press and hold the **BOOT** button.
- Press and release the **RESET** button.
- Release the **BOOT** button.

Many modern IDEs and tools can automatically handle this process.

4. **Compile and Upload:** Use your IDE's upload function to compile your code and flash it onto the ESP32-C6.

5. **Monitor Serial Output:** Open the serial monitor in your IDE to view debug messages or application output from the board.

8. MAINTENANCE

The ESP32-C6 Mini Development Board is a robust electronic component, but proper handling and care will ensure its longevity:

- **Handle with Care:** Avoid dropping the board or subjecting it to excessive physical stress.
- **Static Electricity:** Always handle the board in an anti-static environment or take precautions to discharge static electricity before touching it.
- **Power Supply:** Use a stable 5V power supply via the USB Type-C port. Ensure external power sources do not exceed the board's voltage limits.
- **Storage:** Store the board in a dry, cool environment, away from direct sunlight and extreme temperatures.
- **Cleaning:** If necessary, gently clean the board with a soft, dry brush or compressed air. Avoid using liquids.

9. TROUBLESHOOTING

Here are some common issues and their potential solutions:

- **Board Not Detected by Computer:**
 - Check USB cable: Ensure it's a data-capable cable, not just a charging cable.
 - Install/Update USB drivers: Verify that the correct CP210x or CH340 drivers are installed for your operating system.
 - Try a different USB port or computer.
- **Failed to Upload Sketch/Firmware:**
 - Verify board selection: Ensure the correct ESP32-C6 board is selected in your IDE.
 - Verify serial port: Make sure the correct COM/serial port is selected.
 - Enter download mode: Manually put the board into download mode (hold BOOT, press/release RESET, then release BOOT) before attempting to upload.
 - Check power supply: Ensure the board is receiving adequate power.
 - Close other serial applications: Only one application can access the serial port at a time.
- **No Output on Serial Monitor:**
 - Check baud rate: Ensure the serial monitor's baud rate matches the baud rate set in your code (e.g., `Serial.begin(115200);`).
 - Verify code: Make sure your code actually includes serial print statements.

- Reset board: Press the RESET button on the board.
- **Wi-Fi/Bluetooth Connectivity Issues:**
 - Check antenna: Ensure the onboard ceramic antenna is not obstructed or damaged.
 - Verify code: Double-check Wi-Fi credentials (SSID, password) or Bluetooth pairing logic.
 - Power supply: Insufficient power can affect wireless performance.
 - Interference: Minimize interference from other 2.4GHz devices.

10. OUTLINE DIMENSIONS

The physical dimensions of the ESP32-C6 Mini Development Board are provided below for integration into projects and enclosures.

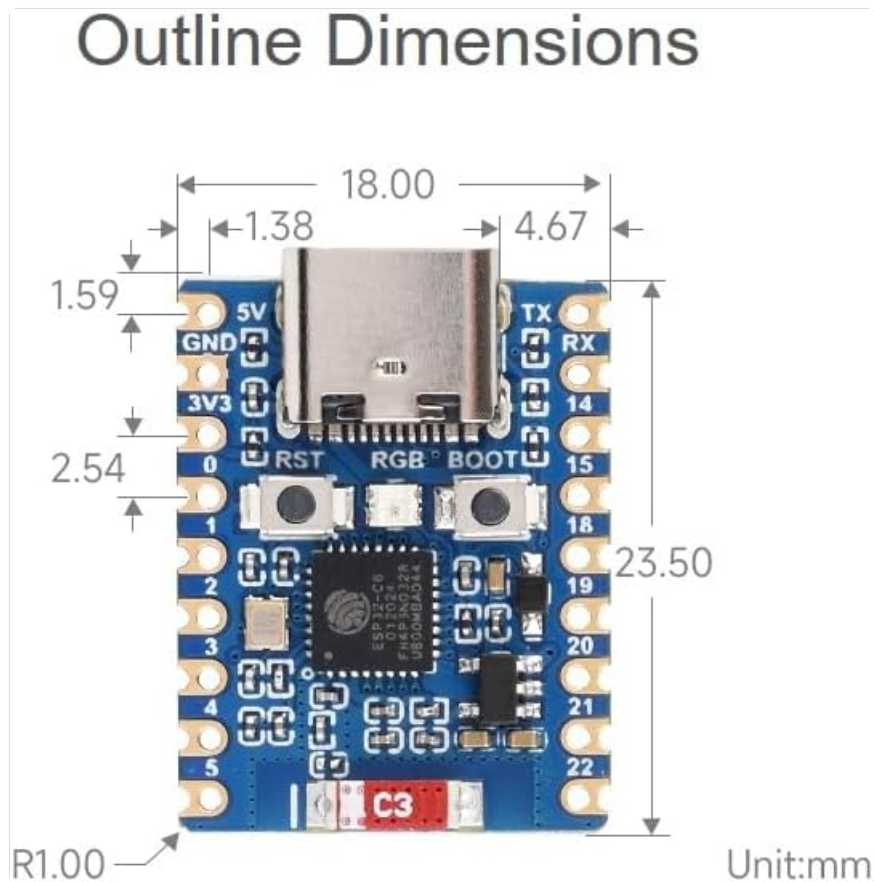


Figure 4: Outline dimensions of the ESP32-C6 Mini Development Board (Unit: mm).

11. PACKAGE CONTENTS

The standard package for the Wonrabai ESP32-C6 Mini Development Board includes:

- ESP32-C6-Zero x1

12. WARRANTY AND SUPPORT

For warranty information and technical support, please refer to the official Wonrabai website or contact your retailer. Keep your proof of purchase for any warranty claims.

