Manuals+
Q & A | Deep Search | Upload

waveshare ESP32-S3 1.8inch Knob Display Development Board

waveshare ESP32-S3 1.8inch Knob Display Development Board User Manual

Model: ESP32-S3 1.8inch Knob Display Development Board

1. Introduction

This manual provides detailed instructions for the setup, operation, and maintenance of the waveshare ESP32-S3 1.8inch Knob Display Development Board. This high-performance, highly integrated MCU board is designed for various interactive applications, featuring an ESP32-S3 dual-core processor, a 1.8-inch capacitive touch display, and extensive wireless connectivity options.

Image 1.1: Front view of the waveshare ESP32-S3 1.8inch Knob Display Development Board, showcasing its circular display and blue textured knob.

2. Package Contents

Verify that all items listed below are included in your package. If any items are missing or damaged, please contact customer support.

- ESP32-S3-Knob-Touch-LCD-1.8-EN × 1
- Back cover × 1

Image 2.1: The package includes the ESP32-S3 Knob Display Development Board and a separate back cover.

3. Key Features

The waveshare ESP32-S3 1.8inch Knob Display Development Board offers a range of advanced features:

- **1.8-inch Capacitive Touchscreen:** Provides excellent touch sensitivity for interactive applications.
- **ESP32-S3 Chip:** High-performance dual-core processing with hardware support for AI and machine learning tasks.
- **Dual Wireless Connectivity:** Integrated Wi-Fi and Bluetooth 5.0 for seamless IoT and remote control applications.
- **Audio and Voice Integration:** Equipped with an audio decoder and microphone for voice recognition and audio playback.
- **Flexible Power Supply:** Can be powered via USB Type-C or a 3.7V lithium battery.
- **CNC Process Metal Case:** Durable and aesthetically pleasing enclosure.

Image 3.1: Visual representation of the board highlighting its multi-functional knob screen, wireless connection, and CNC metal case, along with icons for Pomodoro Timer, Bluetooth, Volume Control, Video Playback, Digital Photo Frame, AIDA64 Wireless Aux Display, Audio Spectrum, E-book, and CNC Process.

4. Technical Specifications

Detailed technical specifications for the ESP32-S3 1.8inch Knob Display Development Board:

Feature	Detail
Display Panel	IPS
Display Size	1.8 inch
Resolution	360 × 360
Display Color	262K
Brightness	600cd/m²

Feature	Detail
Contrast Ratio	1200:1
Communication Interface	QSPI
Driver IC	ST77916
Touch Type	Capacitive
Touch IC	CST816
Wireless Connectivity	2.4GHz Wi-Fi (802.11 b/g/n) and Bluetooth 5 (LE)
Flash Memory	16MB
PSRAM	8MB
Audio	Audio decoder chip, microphone
Power Supply	USB Type-C or 3.7V Lithium Battery

This product is a high-performance, highly integrated MCU board designed by Waveshare, features ESP32-S3 and ESP32 dual MCUs control, integrated large-capacity Flash and PSRAM. Onboard 1.8inch touch LCD screen and multiple peripherals such as audio decoder chip and knob encoder, enabling rapid development of smart voice AI applications.

- Equipped with ESP32-S3 and ESP32 dual MCUs, up to 4 cores and 240MHz main frequency
- Supports 2.4GHz Wi-Fi (802.11 b/g/n) and Bluetooth 5 (LE) and Classic Bluetooth, with onboard antenna
- Built-in 512KB SRAM and 384KB ROM, with onboard 16MB Flash and 8MB PSRAM
- Onboard 1.8inch LCD display, 360 × 360 resolution, 262K color
- Supports touch control via I2C interface, with interrupt support
- Onboard audio decoder chip, microphone, knob encoder, vibration motor, TF card slot, and battery recharge management module
- CNC process metal case, nice looking and durable, easy to carry

LCD Specifications

DISPLAY PANEL	IPS	**DISPLAY SIZE**	1.8 inch
RESOLUTION	360 × 360	**DISPLAY COLOR**	262K
BRIGHTNESS	600cd/m²	**CONTRAST RATIO**	1200:1
COMMUNICATION INTERFACE	QSPI	**DRIVER IC**	ST77916
TOUCH TYPE	Capacitive	**TOUCH IC**	CST816

Application Scenarios

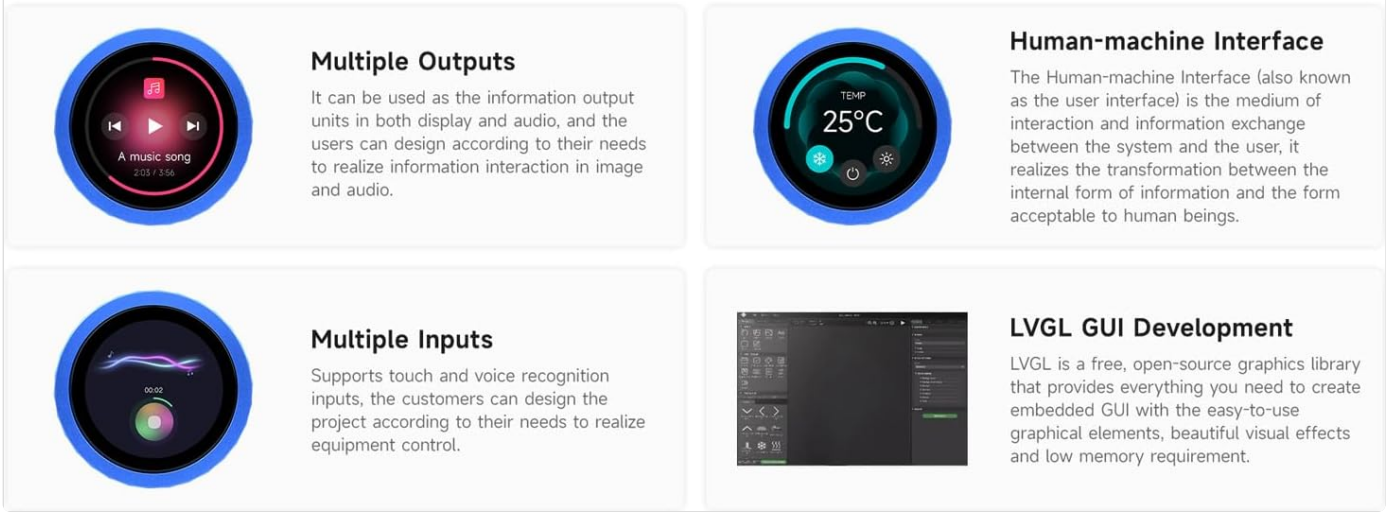


Image 4.1: A visual table detailing the LCD specifications and examples of application scenarios for the development board.

5. Application Scenarios

The versatility of the ESP32-S3 Knob Display Development Board allows for a wide range of applications:

- **Multiple Outputs:** Can function as an information output unit for both display and audio, enabling rich interaction in image and sound.
- **Human-machine Interface (HMI):** Serves as a medium for interaction and information exchange between the system and the user.
- **Multiple Inputs:** Supports touch and voice recognition, allowing for custom equipment control projects.
- **LVGL GUI Development:** Utilizes the LVGL open-source graphics library for creating embedded GUIs with visual effects and low memory requirements.

6. Initial Setup

To begin using your waveshare ESP32-S3 1.8inch Knob Display Development Board, follow these general steps:

1. **Power Connection:** Connect the board to a power source using a USB Type-C cable. Alternatively, if using a 3.7V lithium battery, ensure it is properly connected to the battery header.
2. **Software Environment:** Set up your development environment. This typically involves installing the ESP-IDF (Espressif IoT Development Framework) or Arduino IDE with ESP32 board support.
3. **Driver Installation:** Install necessary USB-to-UART drivers for your operating system to enable communication with the board.
4. **Firmware Upload:** Upload your desired firmware or example code to the board via the USB Type-C port. Refer to the official Waveshare Wiki for detailed programming guides and examples.
5. **Initial Test:** After uploading, the display should power on and show the programmed interface. Test the knob and touch functionalities.

For detailed programming instructions and resources, please visit the Waveshare Wiki.

7. Operating Instructions

The ESP32-S3 Knob Display Development Board is designed for intuitive interaction. Its primary control mechanisms include the rotary knob and the capacitive touchscreen.

7.1. Smart Rotary Knob and Touch Display

The integrated rotary knob and touch display allow for versatile control and interaction:

- **Intuitive Control:** Rotate the knob to navigate menus, adjust values, or scroll through content. The capacitive touch screen allows for direct interaction with on-screen elements.
- **Pomodoro Timer Themes:** Supports various Pomodoro Timer themes for productivity and playful applications.

Image 7.1: Demonstrates the smart rotary knob display in use, showing different interface themes and intuitive control with fingertips.

7.2. Media Playback and Display Functions

- **Smartphone Bluetooth Connection for Music Playback:** Connect your smartphone via Bluetooth to play music. The board supports audio output via a 3.5mm jack. You can upload lyrics and covers, and control volume by sliding the knob.

  Note: The product does not have a built-in speaker. An external speaker must be connected via the 3.5mm audio jack for music playback.
- **Seamless Left-Right Swipe:** Utilize swipe gestures to switch between photos or videos, functioning as a digital photo frame or video player.
- **E-book Reading:** Supports TXT file reading, allowing you to swipe through stories directly on the display.

Image 7.2: Illustrates the precision-machined CNC metal case and the board's capability to connect to a smartphone via Bluetooth for music playback, requiring an external speaker.

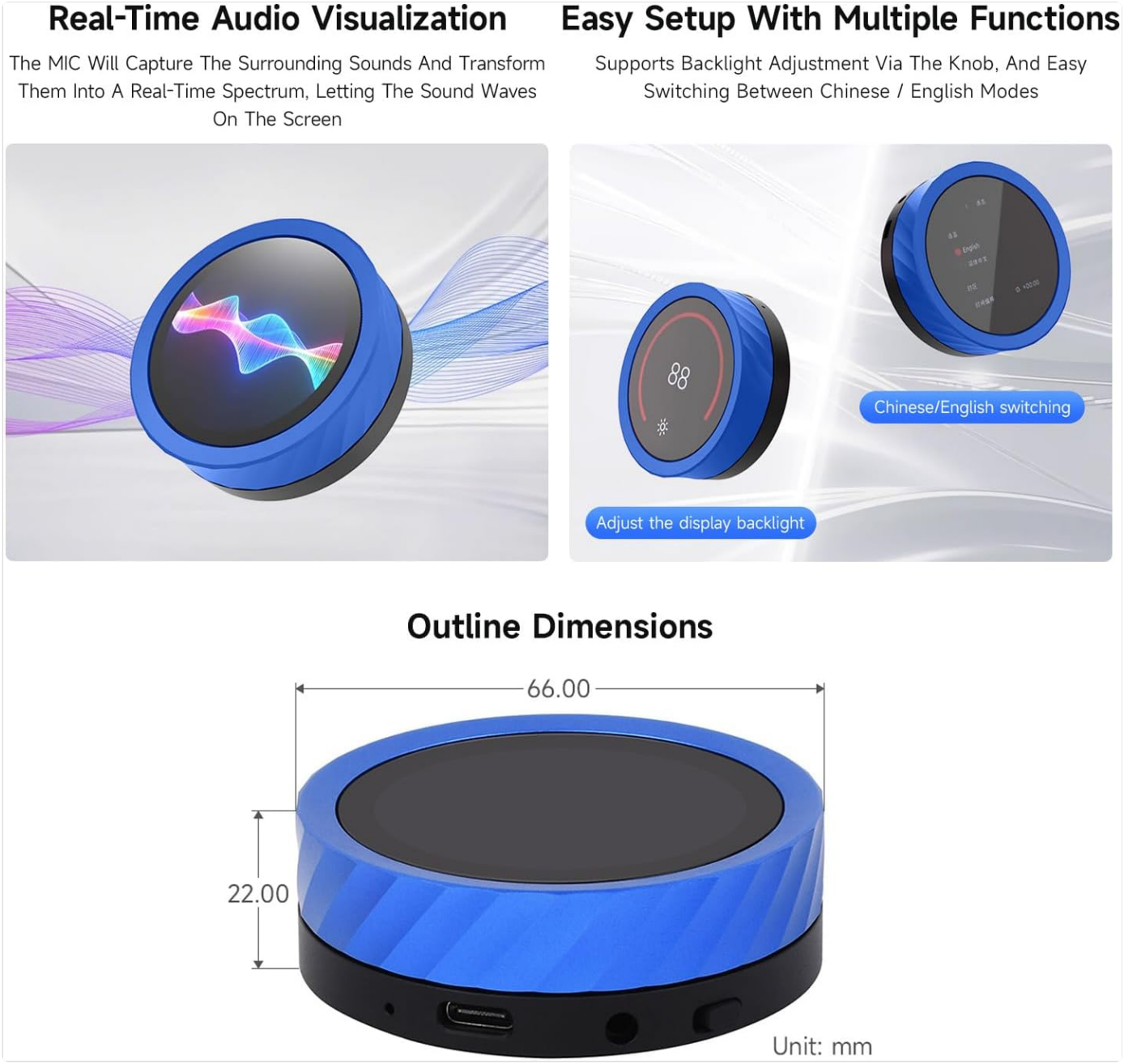
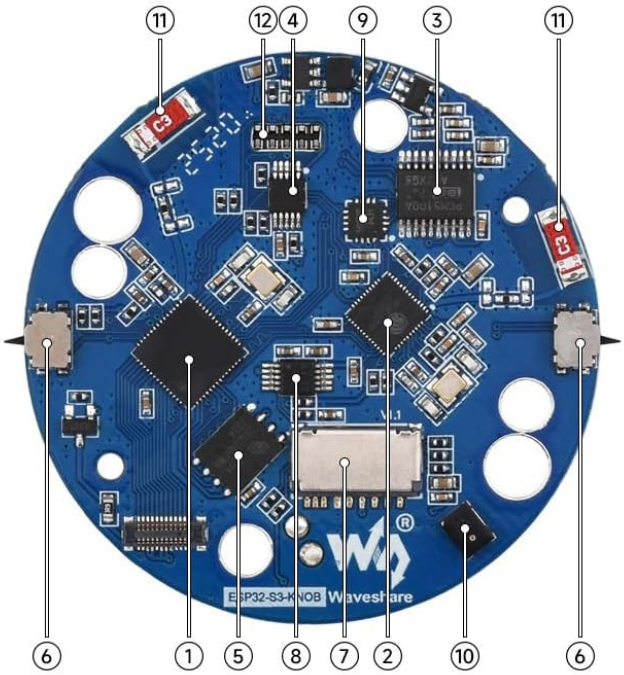


Image 7.3: Shows the left-right swipe functionality for switching between video playback and digital photo frames, and the display reading a text file.

7.3. PC Integration

- **PC Secondary Screen:** Can be used to display CPU and GPU parameters for real-time data monitoring.
- **PC Bluetooth Volume Control:** Connect to your PC via Bluetooth to smoothly adjust movie and music volume using the rotary knob.



1. **ESP32-S3R8**
   Wi-Fi and Bluetooth SoC, 240MHz operating frequency, with 8MB PSRAM
2. **ESP32-U4WDH**
   Wi-Fi and Classic Bluetooth, 240MHz operating frequency, with 4MB Flash
3. **PCM5100A**
   High-performance stereo DAC with I2S interface
4. **USB To UART**
5. **16MB Flash**
6. **Dual encoder**
   for ESP32-S3 and ESP32 respectively
7. **TF card slot**
8. **DRV2605**
   Vibration motor driver with I2C interface
9. **CH445P**
   4-SPDT 3.3V low-resistance analog switch IC
10. **Digital MIC**
11. **Ceramic antenna**
12. **PH1.27 10P SMD Connector**

1. **Vibration motor**
2. **PH1.27 10P SMD header**
3. **PH1.25 Lithium battery header**
4. **3.5mm audio jack**
5. **Power button**
6. **Type-C connector**
   Switching ESP32-S3 USB or ESP32 UART based on Type-C plug orientation
7. **ESP32-S3R8 BOOT button**
   Press it and power on again to enter download mode

Image 7.4: Depicts the board functioning as a secondary PC screen for monitoring system parameters and controlling PC volume via Bluetooth.

7.4. Audio Visualization and Setup

- **Real-Time Audio Visualization:** The built-in microphone captures surrounding sounds and transforms them into a real-time spectrum displayed on the screen.
- **Easy Setup with Multiple Functions:** Supports backlight adjustment via the knob and easy switching between Chinese and English display modes.

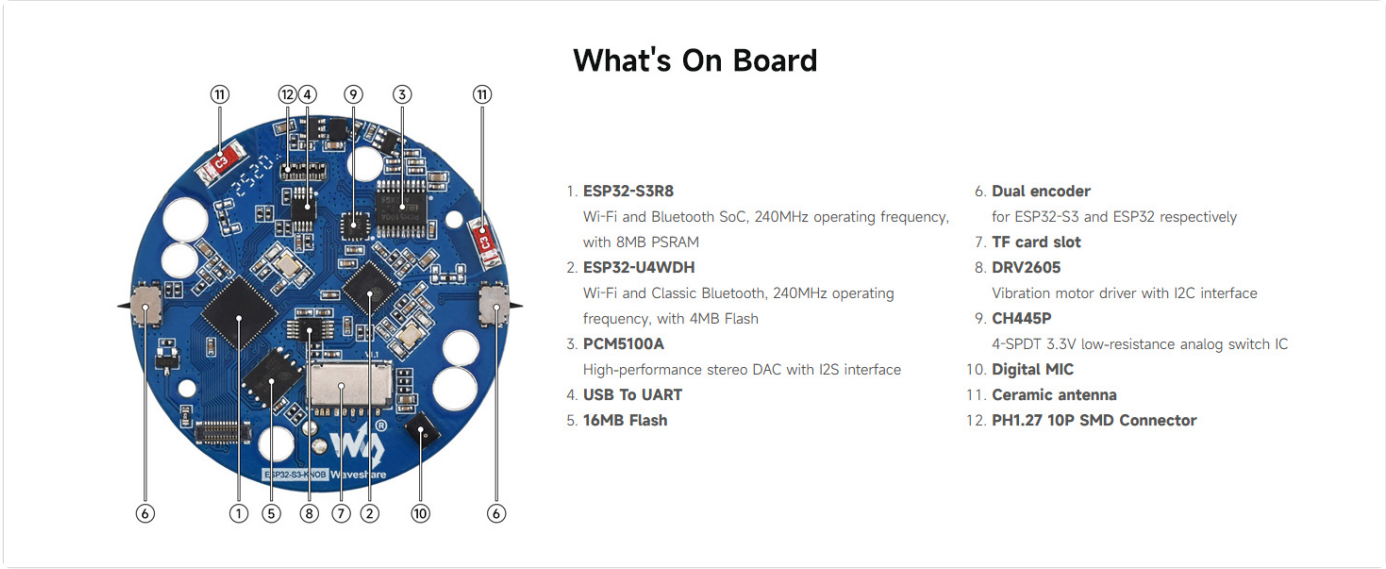


Image 7.5: Shows the real-time audio spectrum visualization feature and the ease of adjusting backlight and switching languages using the knob.

8. Board Components Overview

Understanding the components of the development board is crucial for advanced usage and troubleshooting.

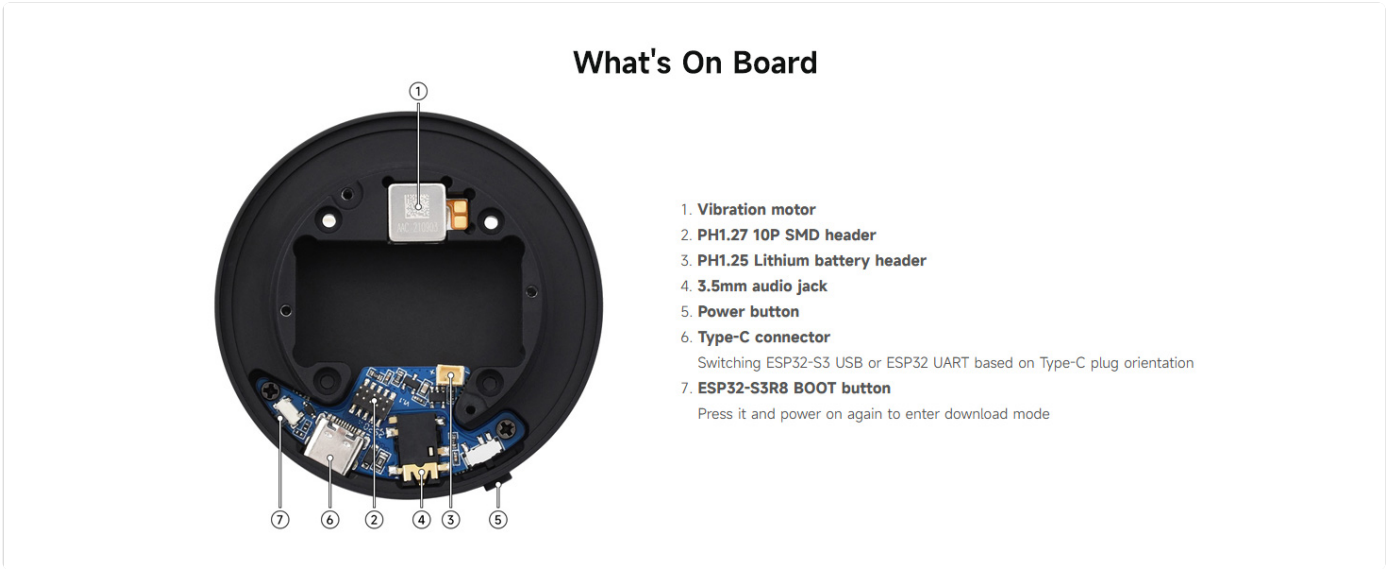


Image 8.1: An annotated diagram showing the internal components of the board, including the ESP32-S3R8, ESP32-U4WDH, PCM5100A, USB to UART, 16MB Flash, Dual encoder, TF card slot, DRV2605, CH445P, Digital MIC, Ceramic antenna, and PH1.27 10P SMD Connector.

Key components and their functions:

1. **Vibration motor:** Provides haptic feedback.
2. **PH1.27 10P SMD header:** Connector for external components.
3. **PH1.25 Lithium battery header:** For connecting a 3.7V lithium battery.
4. **3.5mm audio jack:** For connecting external speakers or headphones.
5. **Power button:** Controls power on/off.
6. **Type-C connector:** Used for power supply, data transfer (USB to UART), and firmware uploading. Supports switching between ESP32-S3 USB or ESP32 UART based on Type-C plug orientation.
7. **ESP32-S3R8 BOOT button:** Press and power on again to enter download mode for firmware updates.
8. **ESP32-S3R8:** Wi-Fi and Bluetooth SoC, 240MHz operating frequency, with 8MB PSRAM.
9. **ESP32-U4WDH:** Wi-Fi and Classic Bluetooth, 240MHz operating frequency, with 4MB Flash.
10. **PCM5100A:** High-performance stereo DAC with I2S interface.

11. **USB To UART:** For serial communication.
12. **16MB Flash:** Storage for firmware and data.
13. **Dual encoder:** For ESP32-S3 and ESP32 respectively, likely referring to the rotary knob's encoder.
14. **TF card slot:** For expandable storage.
15. **DRV2605:** Vibration motor driver with I2C interface.
16. **CH445P:** 4-SPDT 3.3V low-resistance analog switch IC.
17. **Digital MIC:** For audio input and voice recognition.
18. **Ceramic antenna:** For wireless communication.

9. Outline Dimensions

The physical dimensions of the waveshare ESP32-S3 1.8inch Knob Display Development Board are as follows:

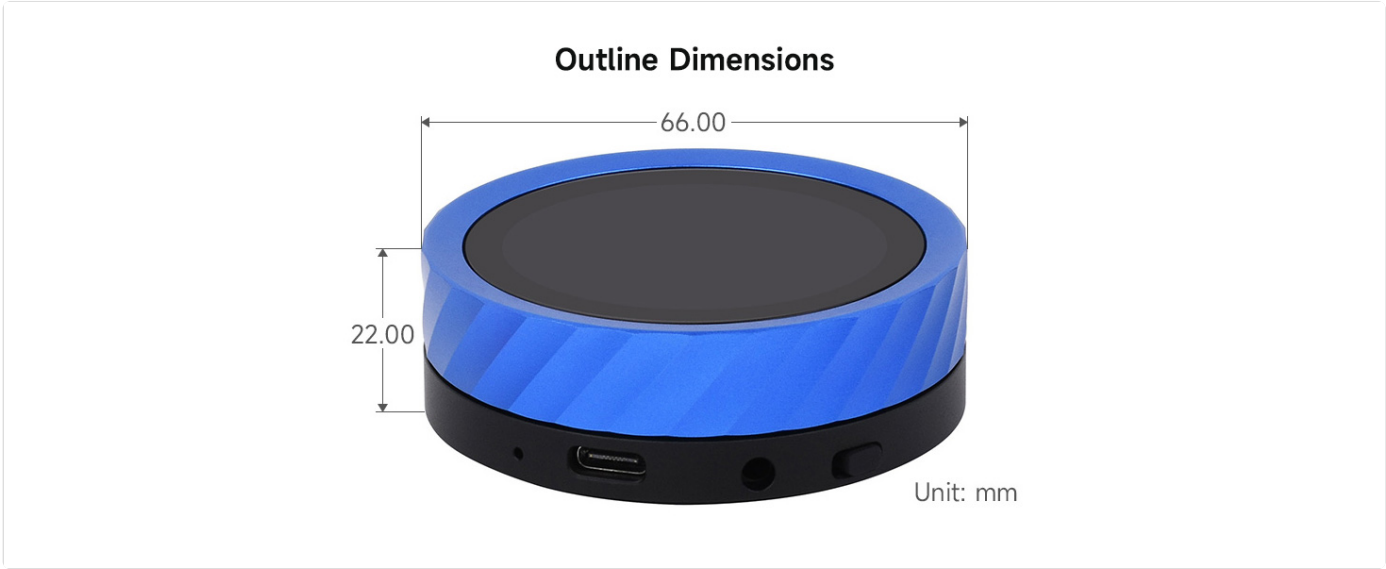


Image 9.1: Technical drawing showing the top and side view dimensions of the board, with a diameter of 66.00 mm and a height of 22.00 mm.

- **Diameter:** 66.00 mm
- **Height:** 22.00 mm

10. Maintenance

Proper maintenance ensures the longevity and optimal performance of your development board:

- **Cleaning:** Use a soft, dry cloth to clean the display and casing. Avoid abrasive cleaners or solvents.
- **Storage:** Store the board in a cool, dry environment, away from direct sunlight and extreme temperatures.
- **Handling:** Handle the board with care to avoid physical damage to components or the display.
- **Firmware Updates:** Regularly check the Waveshare Wiki for firmware updates to ensure you have the latest features and bug fixes.

11. Troubleshooting

If you encounter issues with your ESP32-S3 Knob Display Development Board, refer to the following common problems and solutions:

Problem	Possible Cause / Solution

Problem	Possible Cause / Solution
Board does not power on.	◦ Ensure the USB Type-C cable is securely connected to a working power source. ◦ If using a battery, check if it is charged and properly connected. ◦ Verify the power button is pressed.
Display is blank or unresponsive.	◦ Check power connection. ◦ Ensure firmware is correctly uploaded and running. ◦ Try resetting the board by pressing the power button.
Cannot upload firmware.	◦ Verify USB-to-UART drivers are installed. ◦ Ensure the board is in download mode (press BOOT button while powering on). ◦ Check your development environment settings (port, board selection). ◦ Try a different USB cable or port.
Bluetooth or Wi-Fi not connecting.	◦ Ensure the firmware includes the necessary Wi-Fi/Bluetooth stack and configuration. ◦ Check network credentials (SSID, password) if connecting to Wi-Fi. ◦ Verify the device you are trying to connect to is in pairing mode.
Knob or touch input not working.	◦ Ensure the firmware properly initializes and reads input from the knob and touch controller. ◦ Check for any physical obstructions or damage.

For more advanced troubleshooting and community support, please refer to the officialWaveshare Wiki or contact Waveshare technical support.

12. Warranty and Support

Waveshare products typically come with a standard manufacturer's warranty. For specific warranty terms and conditions, please refer to the documentation included with your purchase or visit the official Waveshare website.
For technical support, additional resources, and community forums, please visit the official Waveshare Wiki:
https://www.waveshare.com/wiki/ESP32-S3-Knob-Touch-LCD-1.8-EN
You can also contact Waveshare customer service directly through their official website for assistance.

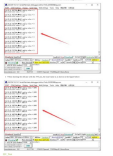
© 2025 waveshare. All rights reserved.

Related Documents - ESP32-S3 1.8inch Knob Display Development Board











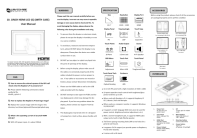
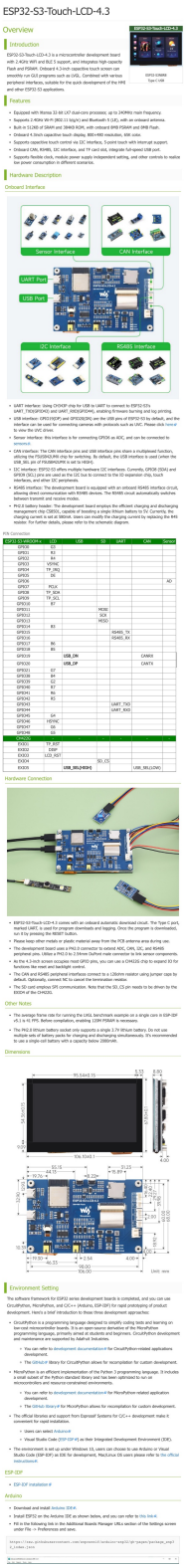
[Waveshare ESP32-S3-Touch-LCD-4.3 Development Board: Features & Guide]

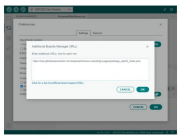
Explore the Waveshare ESP32-S3-Touch-LCD-4.3, a powerful microcontroller development board featuring a 4.3-inch capacitive touch display, WiFi, BLE 5, and multiple interfaces like CAN, RS485, and I2C. Learn about its hardware, setup, and sample demos for HMI development.

	
	[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 10.4HP-CAPQLED: 10.4-inch QLED Touchscreen Display (1600x720)]

Discover the Waveshare 10.4HP-CAPQLED, a versatile 10.4-inch QLED capacitive touchscreen with 1600x720 resolution. This display is compatible with Raspberry Pi, Jetson Nano, and PCs, offering excellent visual performance and multi-touch capabilities via HDMI and USB.

	[Waveshare 10.1-inch HDMI LCD (G) User Manual: Setup, Specs, and Connections] Explore the Waveshare 10.1-inch HDMI LCD (G) with Case. This user manual covers essential specifications, safety warnings, connection guides for Raspberry Pi, Jetson Nano, and PCs, and answers common questions.
	[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.
	[ESP32-S3-Touch-LCD-4.3 Development Board Overview and Setup] A comprehensive guide to the ESP32-S3-Touch-LCD-4.3 development board, detailing its features, hardware description, pin connections, environmental setup for CircuitPython, MicroPython, and C/C++ (Arduino, ESP-IDF), and configuration within the Arduino IDE.



- Search esp32 on Board Manager to install, and restart Arduino IDE to take effect.

3. Open the Arduino IDE and note that Tools is the menu bar selects the corresponding Flash (8MB) and enables PSRAM (8MB QSPI), as shown in the following figure.

Resource

Document

- ESP32 Arduino Core's documentation
- arduino-esp32
- ESP-IDF

Demo

Software

Datasheet

- ESP32-S3 Series Datasheet
- ESP32-S3 Xtensa® Datasheet
- CH343 Datasheet
- CH343