LILYGO T-Embed K167

LILYGO T-Embed ESP32-S3 IOT Embedded Panel User Manual

Model: T-Embed K167
Brand: LILYGO

1. Product Overview

The LILYGO T-Embed is an Internet of Things (IOT) embedded panel designed for programmable development. It integrates an ESP32-S3 microcontroller, a 1.9-inch IPS Color TFT LCD, and various wireless communication capabilities, making it suitable for a wide range of embedded projects and applications.

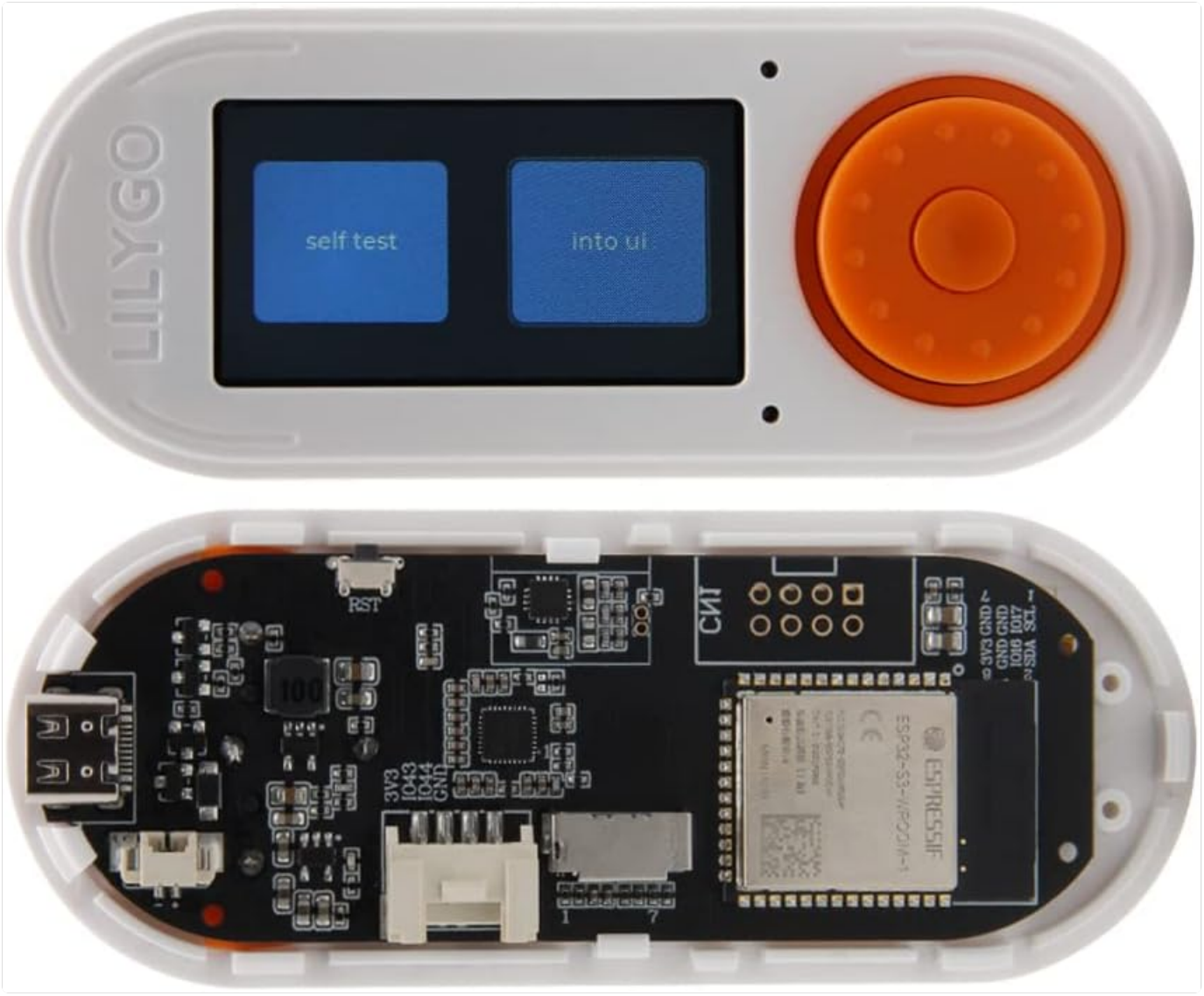

Figure 1.1: Front and back view of the LILYGO T-Embed, showcasing the display, rotary encoder, and internal circuitry.

Key features include:

- ESP32-S3 Dual-core LX7 microprocessor for powerful processing.
- Integrated Wi-Fi (802.11 b/g/n) and Bluetooth (BLE 5) for versatile connectivity.
- 1.9-inch IPS Color TFT LCD with 170x320 resolution for clear visual feedback.
- Support for USB and Li-Po battery dual power supply.
- Onboard functions including Reset and Boot buttons, microphone, and RGB LEDs.

2. Setup and Assembly

This section guides you through the initial setup and assembly of your LILYGO T-Embed device.

2.1 Package Contents

Verify that all components are present in your package:

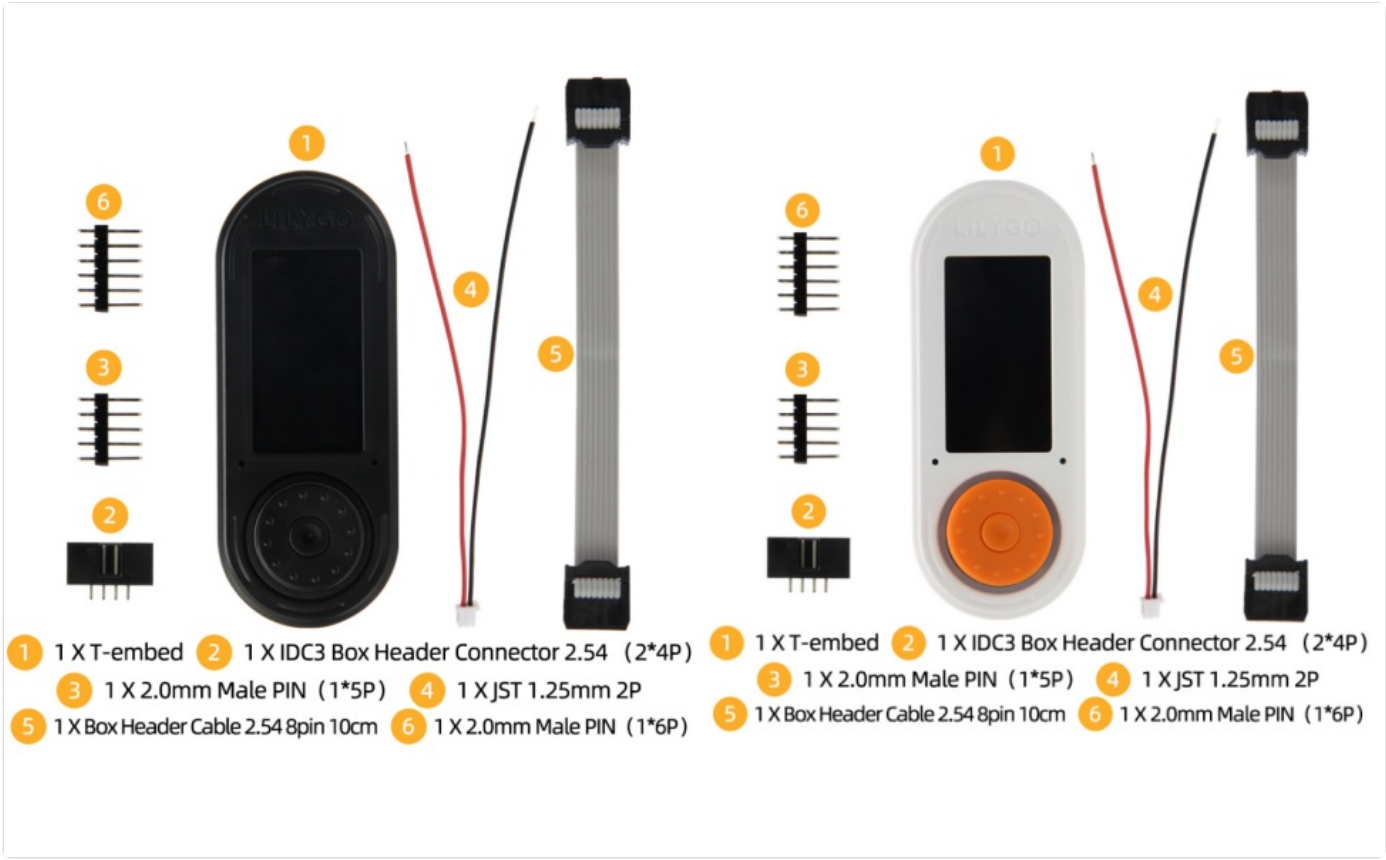

Figure 2.1: Diagram illustrating the typical package contents for the LILYGO T-Embed, including the main unit and various connectors.

1. 1 x T-Embed Unit
2. 1 x IDC3 Box Header Connector 2.54 (2*4P)
3. 1 x 2.0mm Male PIN (1*5P)
4. 1 x JST 1.25mm 2P
5. 1 x Box Header Cable 2.54 8pin 10cm
6. 1 x 2.0mm Male PIN (1*6P)

2.2 Powering the Device

The T-Embed supports dual power supply options:

- **USB Power:** Connect the device to a 5V USB power source using the USB Type-C port. This is the primary method for initial setup and programming.
- **Li-Po Battery:** For portable applications, a user-supplied Li-Po battery can be connected to the dedicated battery connector on the board. The device includes built-in circuitry for managing battery charging.

Figure 2.2: The LILYGO T-Embed connected via USB for power and data transfer.

2.3 Development Environment Setup

The LILYGO T-Embed is designed for programmable development using the ESP32-S3. Supported programming platforms include:

- **Arduino IDE:** A popular choice for beginners and rapid prototyping.
- **ESP-IDF:** Espressif IoT Development Framework, offering more advanced control and features for experienced developers.

For detailed instructions on setting up your development environment and accessing sample code, please refer to the official LILYGO T-Embed GitHub repository:

github.com/Xinyuan-LilyGO/T-Embed

For shell design files, visit:

github.com/Xinyuan-LilyGO/T-Embed/tree/main/Shell_file

3. Operating Instructions

This section provides general guidance on operating your LILYGO T-Embed.

3.1 Basic Interaction

The T-Embed features a 1.9-inch IPS TFT LCD for visual output and a rotary encoder with an integrated button for user input.

Figure 3.1: A hand demonstrating interaction with the LILYGO T-Embed's rotary encoder.

- **LCD Display:** Displays information, menus, and application interfaces.
- **Rotary Encoder:** Rotate to navigate menus or adjust values. Press the encoder to select an option or confirm an action.
- **Reset Button:** Located on the board, used to restart the device.
- **Boot Button:** Located on the board, used for entering bootloader mode for firmware flashing.

3.2 Connectivity

The T-Embed supports Wi-Fi and Bluetooth for wireless communication. Specific usage will depend on the firmware loaded onto the device.

- **Wi-Fi:** Enables connection to local networks for internet access, data transfer, and IoT communication.
- **Bluetooth:** Facilitates short-range wireless communication with other Bluetooth-enabled devices.

4. Maintenance

Proper maintenance ensures the longevity and optimal performance of your LILYGO T-Embed.

- **Cleaning:** Use a soft, dry cloth to clean the exterior of the device. Avoid using liquid cleaners or abrasive materials, as they may damage the screen or casing.
- **Storage:** Store the device in a cool, dry place away from direct sunlight and extreme temperatures. If storing for extended periods, ensure any connected Li-Po battery is charged to approximately 50% to prevent degradation.
- **Handling:** Handle the device with care to avoid dropping it or subjecting it to strong impacts, which could damage internal components or the display.

5. Troubleshooting

This section addresses common issues you might encounter with your LILYGO T-Embed.

5.1 Power Issues

- **Device does not power on:**
  - Ensure the USB cable is securely connected to a working power source and the device.
  - If using a Li-Po battery, verify it is properly connected and sufficiently charged. Note that the device does not come with a pre-installed battery; one must be supplied by the user for portable operation.

5.2 Development and Programming Issues

- **Sketches fail to compile or upload in Arduino IDE:**
  - Ensure you have selected the correct board in the Arduino IDE. For the T-Embed, the*ESP32S3 Dev Module* is often the correct choice, even if a specific T-Embed option is available.
  - Verify that the correct COM port is selected.
- **Blank display after uploading code (LVGL issues):**
  - The T-Embed's LCD is connected via SPI. If you are using LVGL or similar graphics libraries, ensure they are configured for SPI communication, not parallel. Refer to the LILYGO GitHub examples for correct configuration.

5.3 Hardware Issues

- **Rotary encoder feels rough or does not rotate smoothly:**
  - Inspect the encoder for any visible obstructions or debris.
  - If the issue persists and affects functionality, contact LILYGO support for assistance.

6. Specifications

Detailed technical specifications for the LILYGO T-Embed K167.

Figure 6.1: Overview of LILYGO T-Embed's main components and specifications.

Feature	Specification
Model Name	T-Embed K167
Processor	ESP32-S3 Dual-core LX7 microprocessor
RAM	PSRAM
Flash Memory	16MB
Wireless Connectivity	Wi-Fi 802.11 b/g/n, BLE 5 (Bluetooth)
Display	1.9-inch IPS Color TFT LCD
Display Resolution	170(H)RGB x 320(V)
Display Interface	SPI
Drive Chip	ST7789
Operating System	FreeRTOS (default)
Power Supply	USB Type-C, Li-Po Battery (user-supplied)
Onboard Functions	Reset Button, Boot Button, Microphone, Rotary Encoder, RGB LEDs
Dimensions (Approx.)	4.72 x 2.36 x 1.18 inches (Package Dimensions)
Item Weight	2.4 ounces

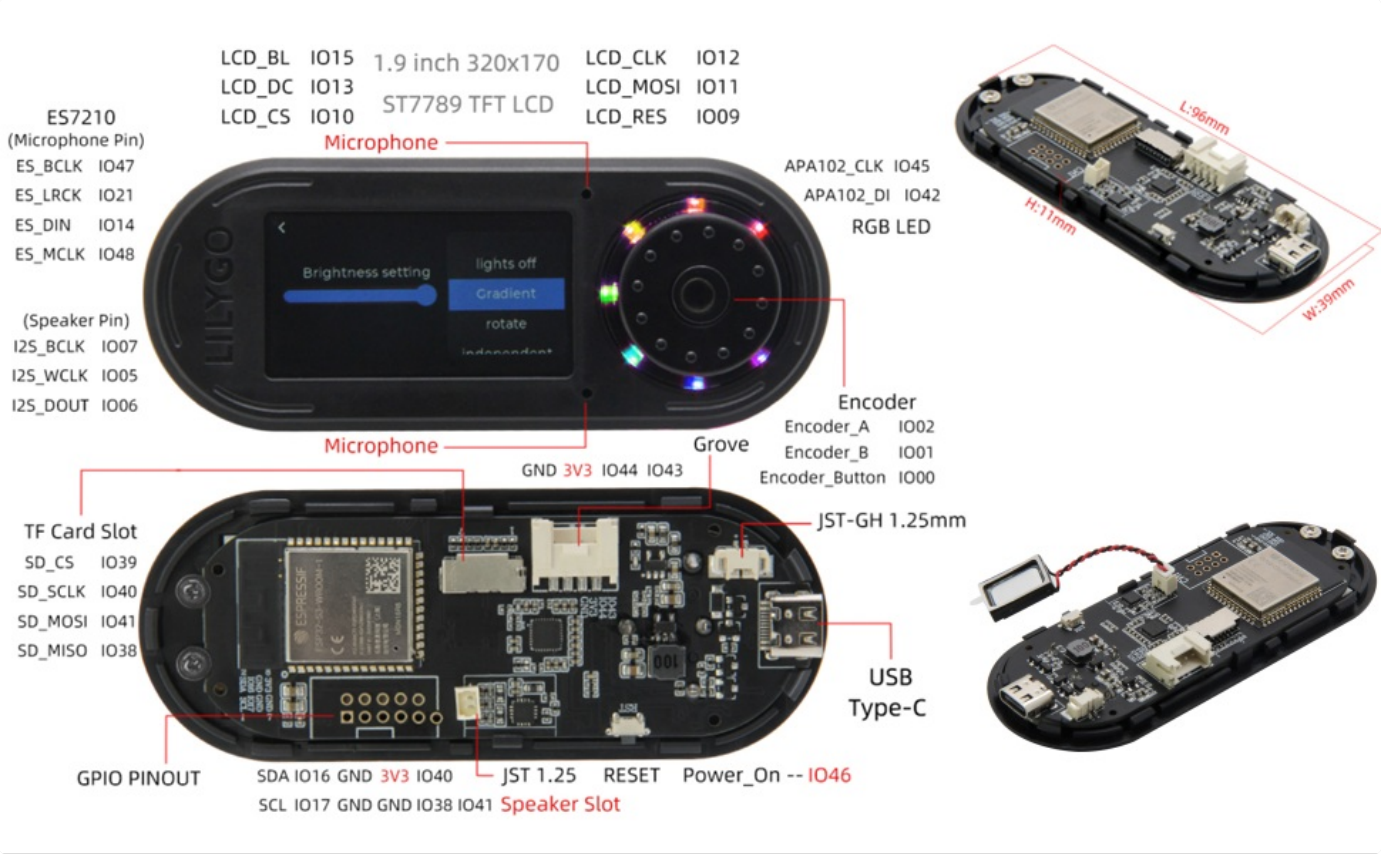

Figure 6.2: Detailed diagram of the LILYGO T-Embed's internal components, pinout, and interfaces.

7. Warranty and Support

For product support, technical inquiries, and warranty information, please refer to the official LILYGO resources.

- **Official LILYGO Store:** For general inquiries and product information, visit the LILYGO store on Amazon: amazon.com/stores/LILYGO
- **GitHub Repository:** For technical documentation, sample code, and community support, the primary resource is the LILYGO T-Embed GitHub repository: github.com/Xinyuan-LilyGO/T-Embed
- **Warranty:** Specific warranty terms and conditions may vary. Please consult your point of purchase or the official LILYGO website for the most up-to-date warranty information.