About This Guide

Release Notes

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<tr>
<td>2018.03</td>
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<td>Added Appendix A with schematics.</td>
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<td>V1.3</td>
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Certificates

Please download the product certificate(s) from here.
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A. **Appendix - Schematics** ..........................................................................................................11
The ESP32-LyraT development board is designed for the speech and voice recognition market. It integrates the ESP32-WROVER module, which includes a dual-core processor and 4.5 MB of operating memory. With this development board, only few peripheral devices are required for implementing a highly-integrated audio solution.

1. Overview

1.1. ESP32-LyraT

**Key Supported Features:**

- A variety of mainstream, both lossy and lossless, compressed audio formats, including M4A, AAC, FLAC, OGG, OPUS, MP3, etc.
- One-key configuration and wake-up from the standby mode.
- SoftAP and Station mode.
- Various wireless protocols: Wi-Fi 802.11b/g/n, Classic BT and BLE.
- A series of audio inputs, including Wi-Fi, BT-audio, DLNA, Line-in, etc.
- BLE network configuration, and smart network configuration such as WeChat.
- Two microphones for the development of near-field and far-field voice recognition applications.
- Peripherals for differentiated demands.
1. Overview

1.2. Hardware Resources

1. ESP32-WROVER Module

ESP32-WROVER is a powerful, general-purpose Wi-Fi+BT+BLE MCU module that targets a wide variety of applications, ranging from low-power sensor networks to the most demanding tasks, such as voice encoding, music streaming and MP3 decoding. For more information, please refer to the ESP32-WROVER Datasheet.

2. Micro SD Card

Supports SPI, 1-bit and 4-bit modes.

3. Audio Output AUX_IN

Works as the input to the ES8388 codec.

4. USB-UART Interface and USB Power Supply Interface

- USB-UART Interface: the integrated CP2102N-A01-GQFN28 chip is used to convert USB to UART and supports a baud rate of up to 3 Mbit/s.
- USB Power Supply Interface: the working current of the Wi-Fi module is very high at peak times. Therefore, a power supply with a capacity of more than 500 mA is recommended.
5. **Touch Buttons**

Four touch buttons are available on the development board: Play, Set, Vol+ and Vol−. Used as keys for audio functions, they bring such advantages as reduced BOM cost and design flexibility.

6. **Speaker Interfaces**

Supports two external speakers.

### 1.3. Software Preparation

1. **Flash Download Tool**

   To flash firmware into the board, please download the [Flash Download Tool](#).

2. **App for Device Networking**

   To use the SmartConfig functionality and configure the ESP32-LyraT network, please download IOT Espressif for Android APK or ESP-TOUCH for iOS IPA at [Espressif Apps](#).

3. **Debugging Tool**

   Use a debugging tool that suits your development environment, such as Xshell or SSCOM, etc.

4. **Hardware**

   - 1 x PC (Windows Operating System is recommended);
   - 2 x Micro USB cables (one is for the USB power supply);
   - 1 x Speaker.
2. Flashing the Firmware

2.1. Driver Installation

Connect the board to a PC with a Micro-USB cable to install the USB-to-UART driver.

![Figure 2-1. Installing the USB-to-UART Driver](image)

2.2. Flashing ESP32

2.2.1. ESP32 Download Tool

![Figure 2-2. ESP32 Download Tool](image)
2. Flashing the Firmware

2.2.2. Flashing Firmware into ESP32

1. Double-click on the “ESP32 Download Tool” at the interface, as shown in Figure 2-2, after downloading the Flash Download Tool. The following interface will be shown:

![Figure 2-3. ESP32 Download Tool V3.6.3](image)

2. Configuration for Flashing Firmware

- Addresses for Downloading Firmware

<table>
<thead>
<tr>
<th>Binary Files</th>
<th>Address</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bootloader.bin</td>
<td>0x1000</td>
<td>basic configuration</td>
</tr>
<tr>
<td>partitionsEspAudio.bin</td>
<td>0x8000</td>
<td>basic configuration</td>
</tr>
<tr>
<td>esp32-audio-app.bin</td>
<td>0x10000</td>
<td>audio application</td>
</tr>
<tr>
<td>audio-esp.bin</td>
<td>0x3A0000</td>
<td>audio instruction</td>
</tr>
</tbody>
</table>

- The SPI Download configuration on the ESP32 Download Tool is shown in Figure 2-3.
- Select “80 MHz” by default for “SPI SPEED” (users can select other options as needed); select “DIO” by default for “SPI MODE” (users can select other options as needed); select the option for “FLASH SIZE” according to the actual condition, and here we select “32 Mbit” for demo.
- Select the COM port in line with the one used by the PC; select “1152000” for baud rate.
3. Power-on and Programming

- Power on ESP32-LyraT.
- Click the “Start” button on the ESP32 Flash Download Tool to start downloading the firmware.
- Press and hold the “Boot” button, and press the “RST” button on the board to enter the download mode.
- Wait for the download to finish.

![Figure 2-4. Powering on the Board](image)

![Figure 2-5. Downloading Firmware](image)
3. Network Configuration

3.1. Wi-Fi Networking

1. After successfully downloading the firmware, power on the board again by pressing the RST button. In about 2 seconds, the green LED light on the board will flash, indicating that ESP32 is searching for a wireless network.

![The LED Light on ESP32-LyraT](image)

Figure 3-1. The LED Light on ESP32-LyraT

2. To configure the network for the first time (or to change the SSID of the network), press the “SET” button on the board for as long as 6 seconds.
   - Upon hearing the Chinese audio message “kai shi pei dui” (meaning “networking starts”) or when the green LED light starts blinking, release the “SET” key.
3. Network Configuration

- Connect ESP32-LyraT to the network, using the IoT Espressif app downloaded to your phone.

![Figure 3-2.Interface of IoT Espressif for Android APK](image)

3. After connecting ESP32-LyraT to the network, the green LED light will be on steadily, and an audio message in Chinese "wang luo lian jie gong" (meaning "successful network connection") will be played.

4. Reboot the board after successful networking. The board will automatically connect to the network configured during the last connection.
4. Interactive Function

Key triggering and far-field voice triggering are supported by the wake-up function of ESP32-LyraT.

4.1. Voice Recognition

When ESP32-LyraTD-MSC is connected to DuerOS, ESP32 supports “Alexa” as a wake-up phrase. Saying “Alexa” to the board prompts the following response in Chinese: “nin hao you shen me fen fu,” (meaning: “Hi! How can I help?”). Users can talk to the board and instruct it to play songs and news, or they can perform other similar voice interactions. Operation sample:

- Say “Alexa” to the board, and it will respond in Chinese by saying: “nin hao you shen me fen fu.”
- Then, ask the following question in Chinese: “tian qi zen me yang” (meaning “How is the weather?”).
- The board will respond in Chinese by saying: “jin tian yin zhuan duo yun” (meaning “It’s getting from overcast to just cloudy today.”).

⚠ Notice:
Please keep a distance of over 20 cm from the microphone when saying phrases to the board.

4.2. Wake-up Button

When ESP32-LyraT is connected to DuerOS, users can press and hold the “REC” button, addressing a question or saying a song title to the audio-development board. The board will respond with a voice message. The precise operation steps are as follows:

- Press and hold the “REC” button, asking a question such as: “tian qi zen me yang” (meaning “How is the weather?”).
- Release the button and the board will respond with the following voice message: “jin tian yin zhuan duo yun” (meaning “It’s getting from overcast to cloudy today.”).

⚠ Notice:
After pressing the button, please wait for approximately 0.5 to 1 second before speaking.

4.3. Play Local Audio Files

If the development board is not connected to the network, it supports playing audio files stored in the Micro SD card. The precise operation steps are as follows:
4. Interactive Function

- Touch the “Play” button and the board will start playing audio files stored in the Micro SD card.

- Press momentarily the “Vol–” or “Vol+” button to adjust the volume to a lower or higher level, respectively. Repeat until you reach the desired sound volume.

- Press and hold firmly the “Vol–” or “Vol+” button to play the previous or next audio file, respectively.
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