

# ESP32-LyraT

## User Guide



Version 1.5  
Espressif Systems  
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# About This Guide

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## Release Notes

Date	Version	Release Notes
2018.03	V1.0	First release.
2018.04	V1.1	Updated section 1.1.
2018.04	V1.2	Added Appendix A with schematics.
2018.05	V1.3	Updated section 2.2.2.
2019.06	V1.4	Updated document cover and format.
2019.10	V1.5	Updated development board figure in section 1.2; Updated schematics.

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# 1.

# Overview

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The ESP32-LyraT development board is designed for the speech and voice recognition market. It integrates the ESP32-WROVER-B 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.

## 1.1. ESP32-LyraT

ESP32-LyraT has the following 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.



## 1.2. Hardware Resources

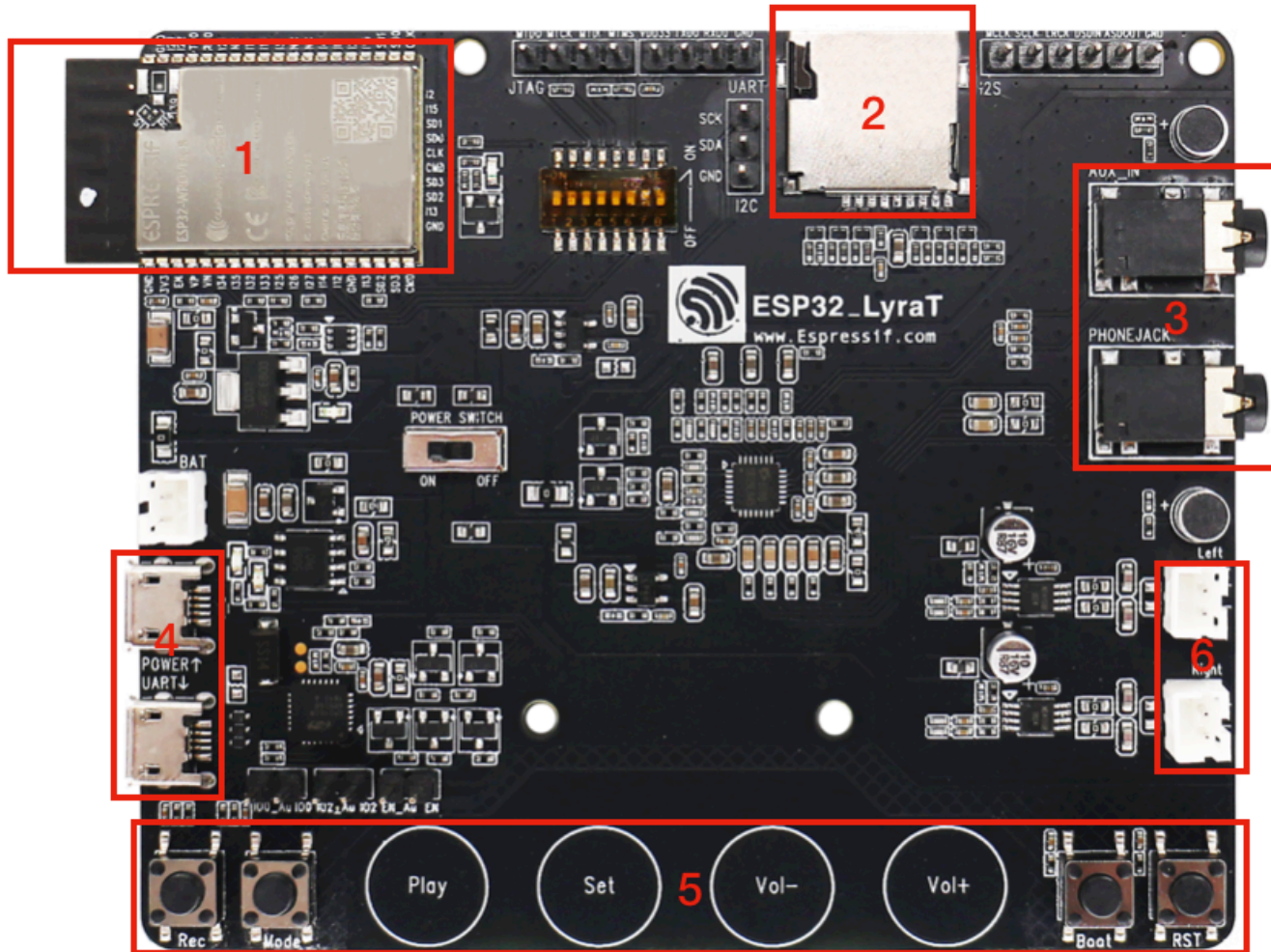


Figure 1-1. ESP32-LyraT Development Board

### 1. ESP32-WROVER-B Module

ESP32-WROVER-B 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-B 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

## 2.2. Flashing ESP32

### 2.2.1. ESP32 Download Tool

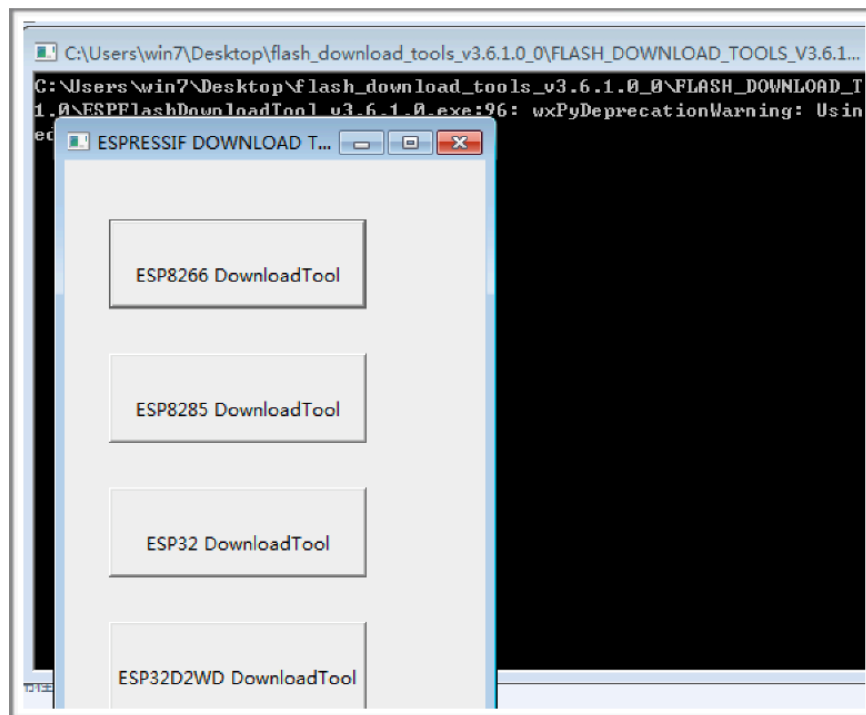


Figure 2-2. ESP32 Download Tool



### 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:

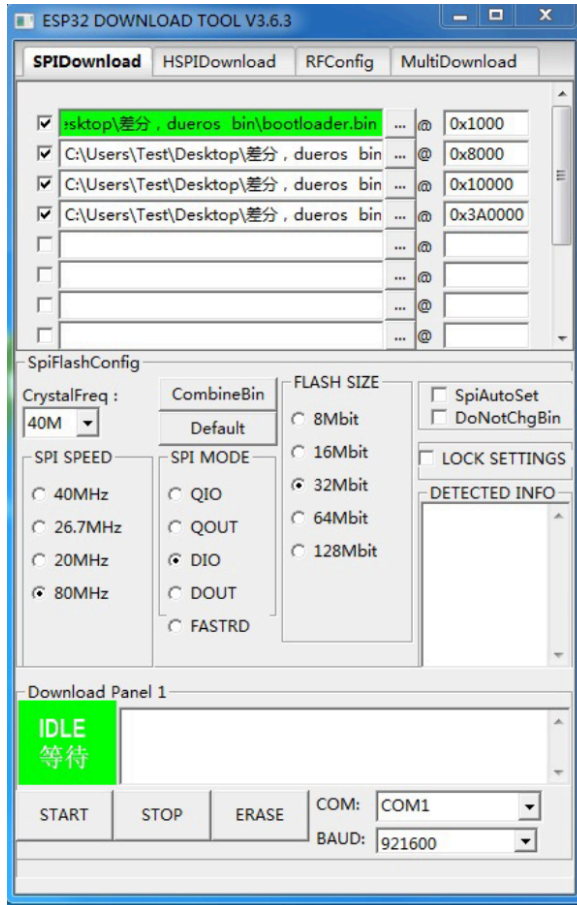


Figure 2-3. ESP32 Download Tool V3.6.3

2. Configuration for Flashing Firmware

- Addresses for Downloading Firmware

Bin Files	Address	Function
<i>Bootloader.bin</i>	0x1000	Basic configuration
<i>partitions_esp_audio.bin</i>	0x8000	Basic configuration
<i>esp32-audio-app.bin</i>	0x10000	Audio application
<i>audio-esp.bin</i>	0x3A0000	Audio application

- 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

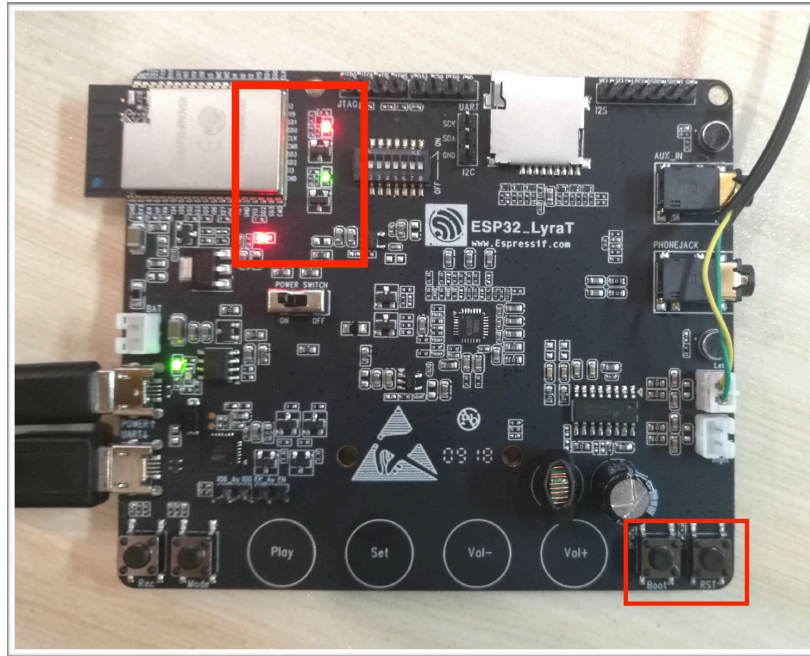


Figure 2-4. Powering on the Board

- 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.

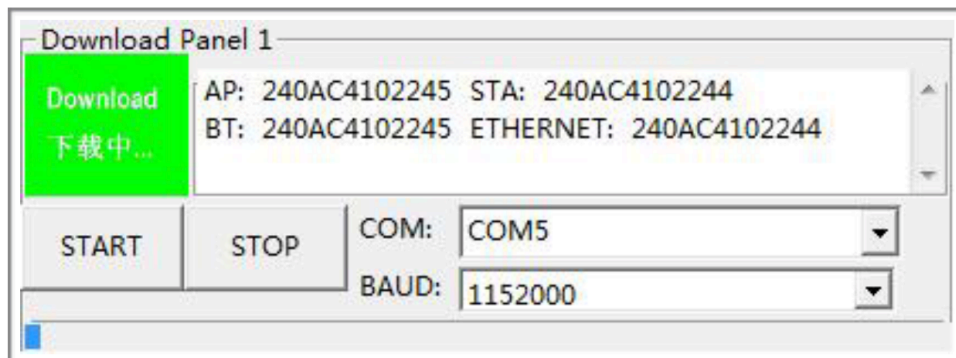


Figure 2-5. Downloading Firmware



# 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.

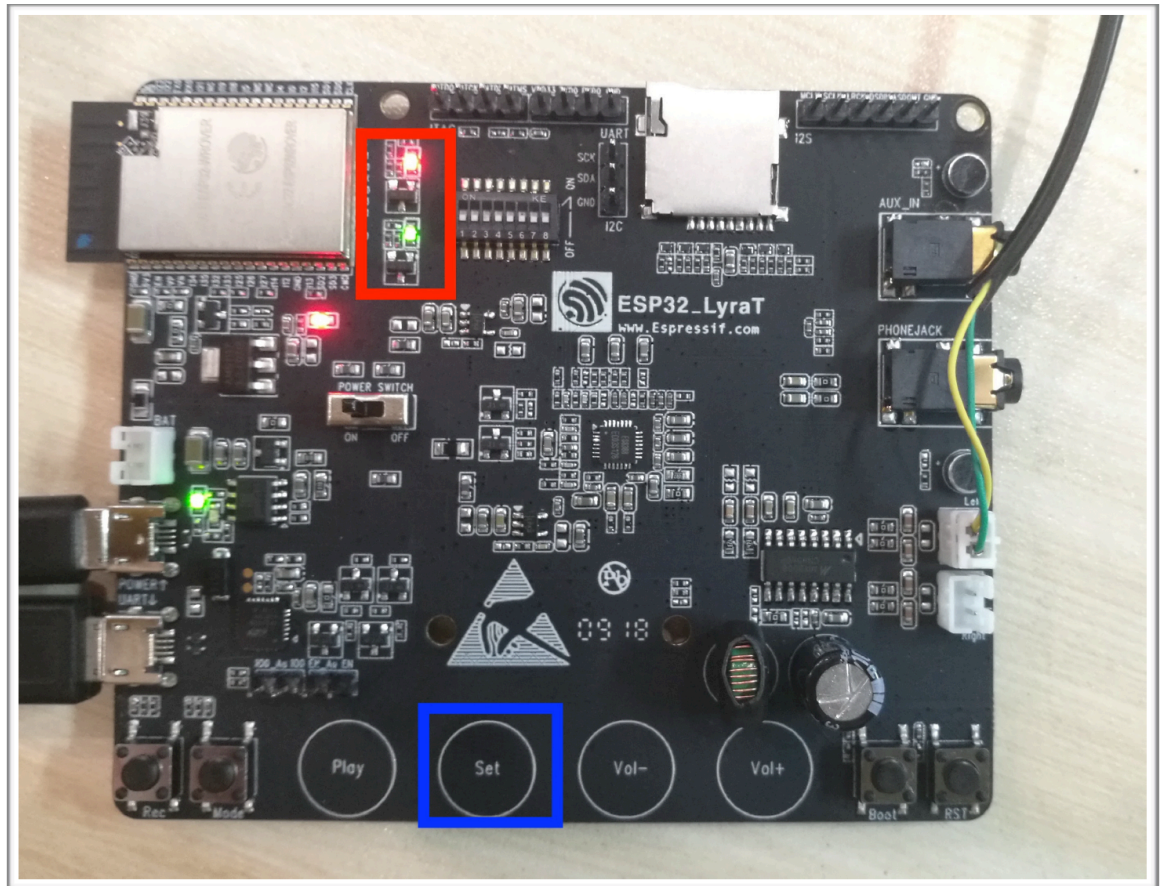


Figure 3-1. The LED Light on ESP32-LyraT

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

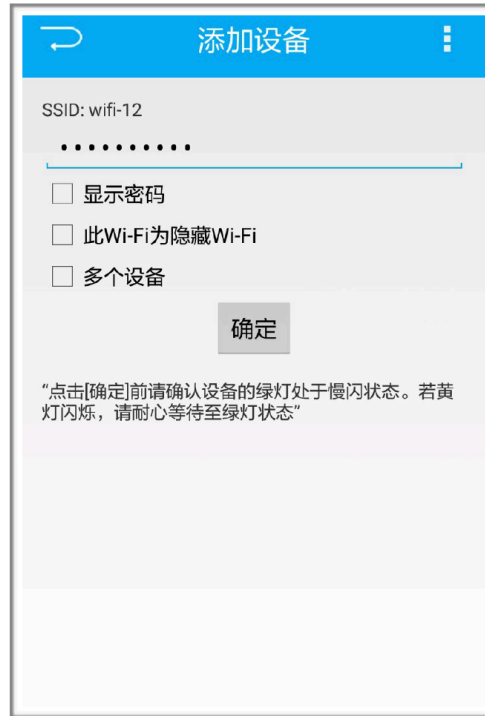


图 3-2. IoT Espressif 安卓版应用界面

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 cheng 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-MSD 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

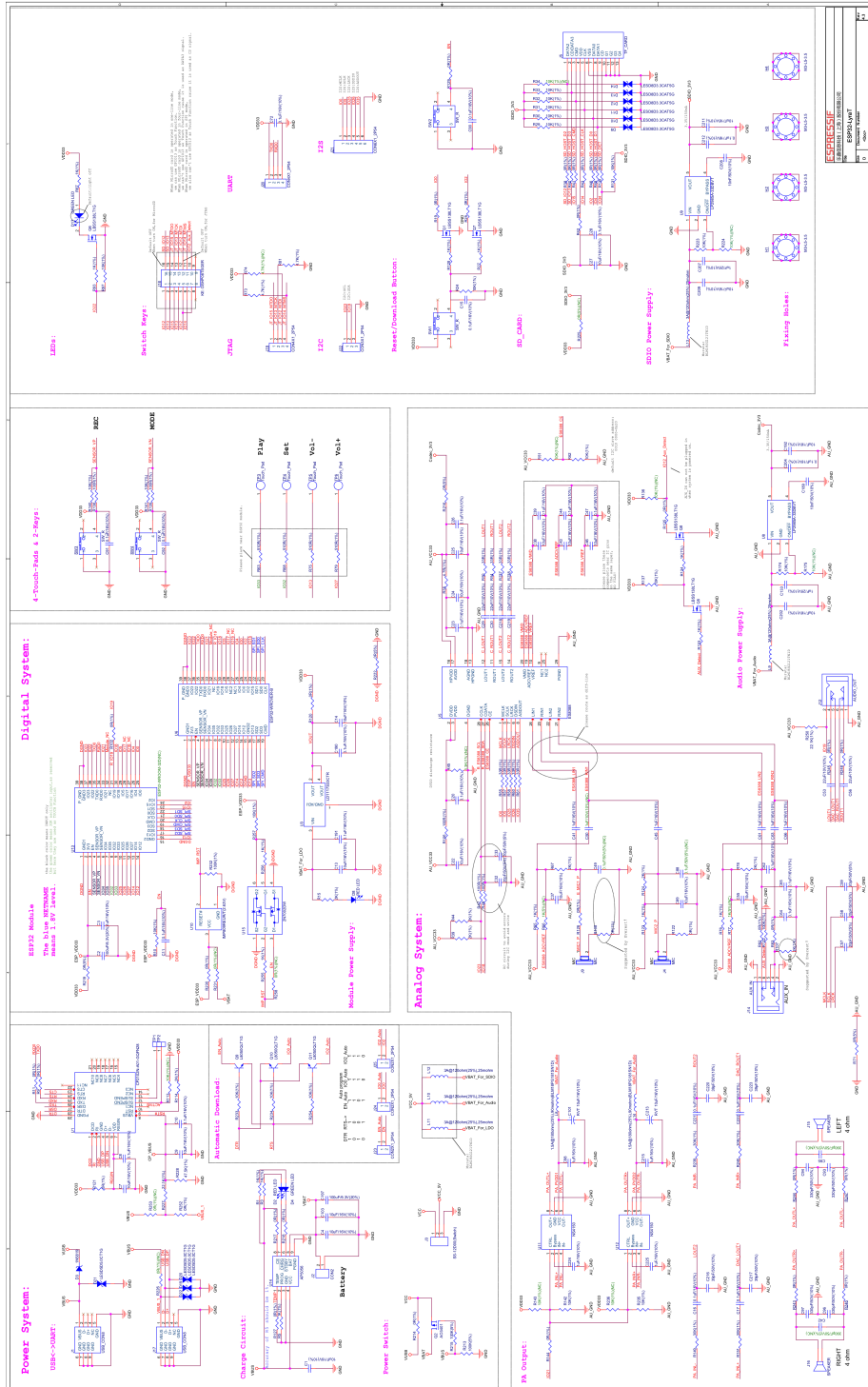
If the development board is not connected to the network, it supports playing audio files stored in the Micro SD card. The precise operation steps are as follows:



- 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.



# A. Appendix – Schematics





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