MESHnology

Version: Ver 0.1.1

W10 LoRa AIoT Dev Kit ESP32-S3 Long-Range IoT Development Board

Product Specification

1 Product Overview

1.1 Product Name

LoRa AIOT Dev Kit

1.2 Product Model

DEVK1.0

1.3 Product Presentation

This product is designed to provide the first **AIOT** hardware development platform for Internet of Things engineers and smart hardware developers, which is a hardware product designed to facilitate developers to debug software functions, expand peripheral modules, test software performance and other requirements;

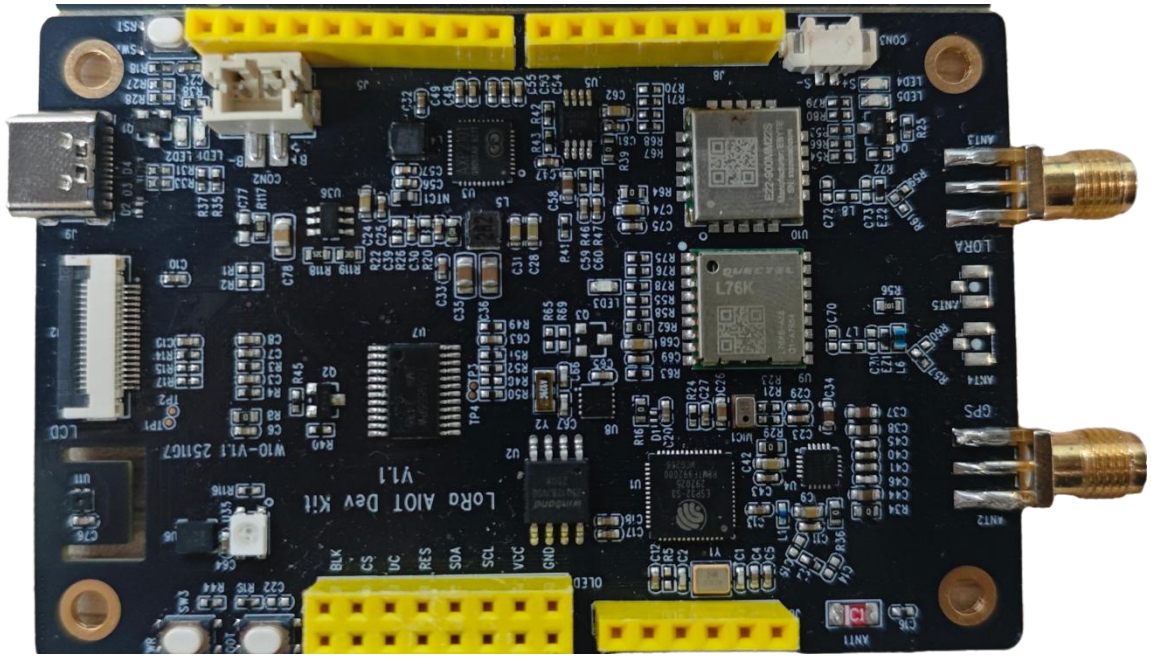
This product utilizes the mainstream **ESP32-S3** processor, paired with **LoRa** and **GPS** modules. It integrates IoT-standard communication protocols including **WiFi**, Bluetooth, and **LoRa**, supporting the **850-930MHz** frequency band and **LoRaWAN** protocol. Designed for **Mesh** networks, it meets the demands of smart city applications and industrial control scenarios.

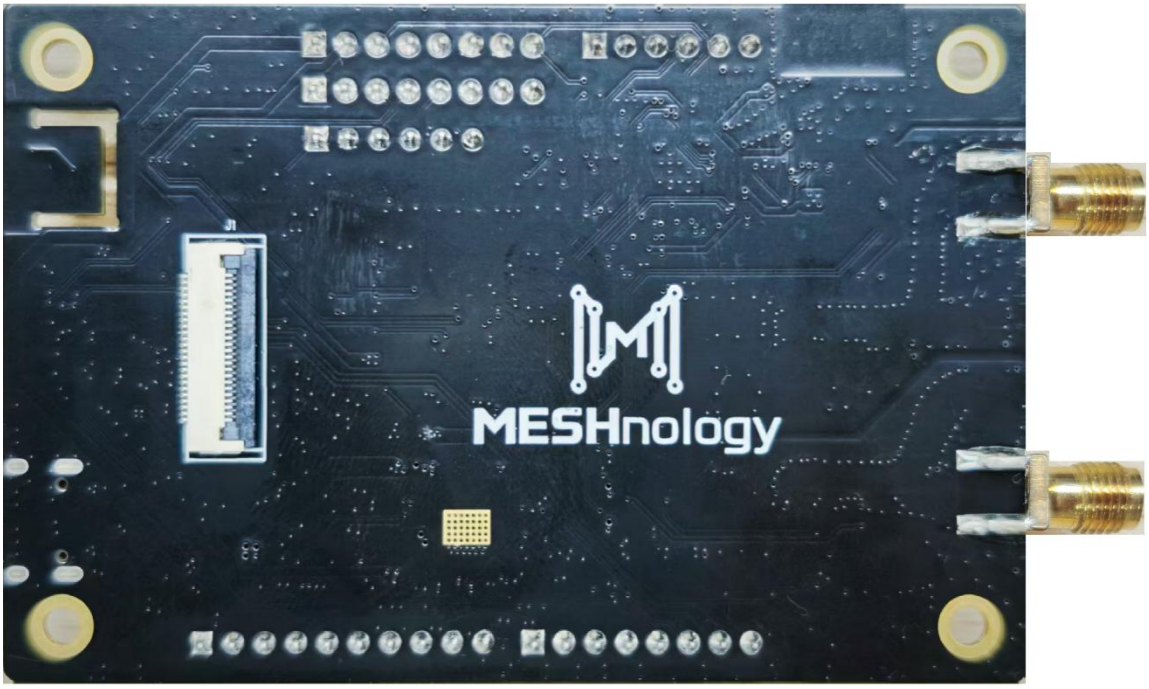
1.4 Product Orientation

This product is primarily designed to provide an IoT development kit for engineers specializing in IoT, smart hardware engineers, open-source hardware enthusiasts, STEM students in North America, and university IoT teaching programs. It offers a hardware development platform supporting **WiFi**, Bluetooth, and **LoRa** communication technologies. Additionally, the product is designed according to the **Arduino UNO** standard interface, enabling compatibility with **Arduino** peripheral modules and expansion boards, thereby enhancing developers' scalability.

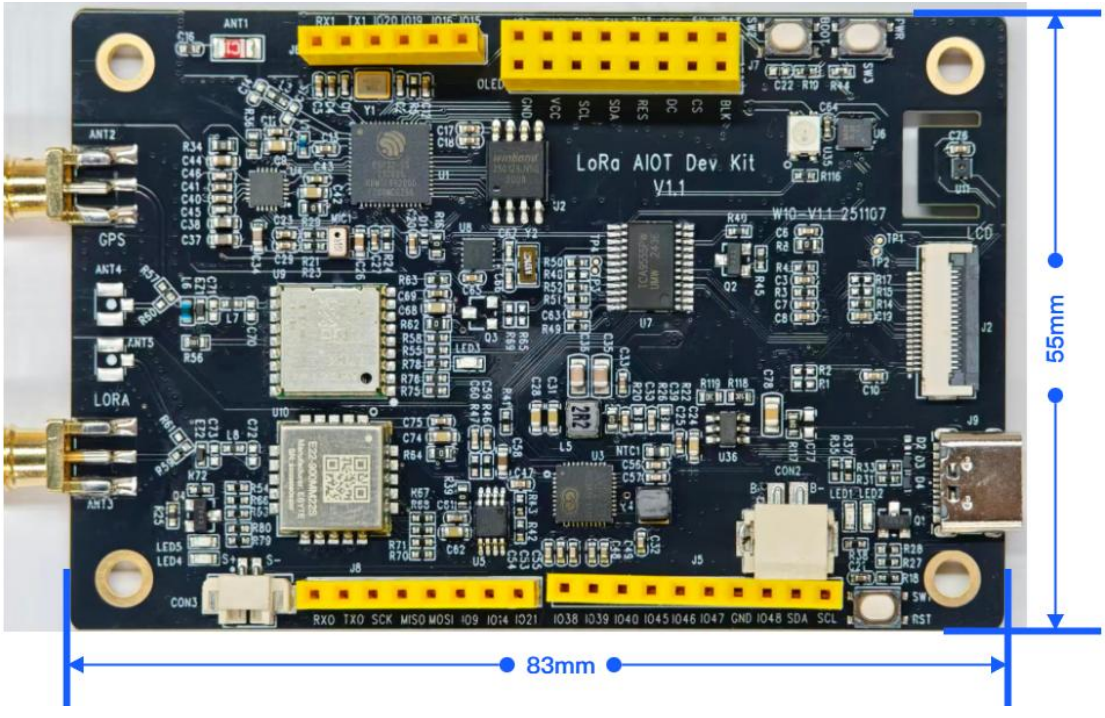
Target audience: network engineer, intelligent hardware engineer, open source hardware enthusiast, North American engineering man, university programming enthusiast.

1.5 Product Illustration





1.6 Dimension Illustration



1.7 Hardware Specifications

Functional category	Functional description
Product name	LoRa AIOT Dev Kit
Power supply interface	USB TYPE-C 5V/3A
Master chip	**ESP32-S3R8 Xtensa® 32-bit LX7 dual-core microprocessor with a clock speed up to 240MHz**
LoRa module	**The EYTE B E22-900MM22S supports the 850-930MHz frequency band and LoRaWAN protocol.**
GPS module	**The Quectel L76K supports multiple satellite systems including GPS, GLONASS, BDS, and QZSS.**
LCD	Supports 3.5 inch capacitive touch display,**FPC**(**SPI+I2C**) interface, resolution **320x 480**,**262K** color
	Supports 3.5-inch TFT Arduino (LCD) interface display with a resolution of 320* 480
	Supports 1.54 inch **ISP** full view **SPI** interface display, resolution **240x240**, full color **RGB**
	Supports 1.3 inch **OLED SPI** LCD with resolution **128x64** and full color **RGB**
	Supports 1.47 inch **TFT SPI** LCD with resolution **172x320** and full color **RGB**
Camera	Supports **OV2640 200** megapixel camera
	Supports **OV5640 500** megapixel camera
Audio codec	**ES8311** Low-power audio codec chip,24 bit, sampling frequency support 8 to **96kHz**
Temperature and humidity sensor	**SHT41** Temperature:**0-75** ℃ accuracy **±0.2** ℃, humidity:**0-100%**accuracy **±2%**
IMU sensor	**QMI8658 6** axis **MEMS IMU** chip, integrated 3 axis gyroscope and 3 axis accelerometer
RTC real time clock	**PCF85063 RTC** calendar chip, very low power consumption, standby current is only **0.25μA**
Power Management	**AXP2101** Highly integrated **PMIC** with 4 channels of **DC-DC** converter and 1 channel of power meter

IO expansion port	**Compatible with Arduino interfaces, featuring 2 UARTs, 1 ADC, 1 SPI, and 1 I2C port.**
Debugging interface	**1 JTAG interface group**
USB communication port	**1** Group **USB 2.0** communication interface, mainly using **USB CDC** function
Push-button	**1** Multiple reset buttons,1 **BOOT** buttons
Memory	**External 16MB SPI Flash**
Number of board layers	**4** layer
Board material	**RF-4 (**fiberglass board)
Single board weight	30.8g
Fixed hole spacing	73.80*45.00mm
Board size	83.40*55.00mm
Working temperature	-40℃~85℃
Product certification	FCC、CE、RoHs

2 Product Features

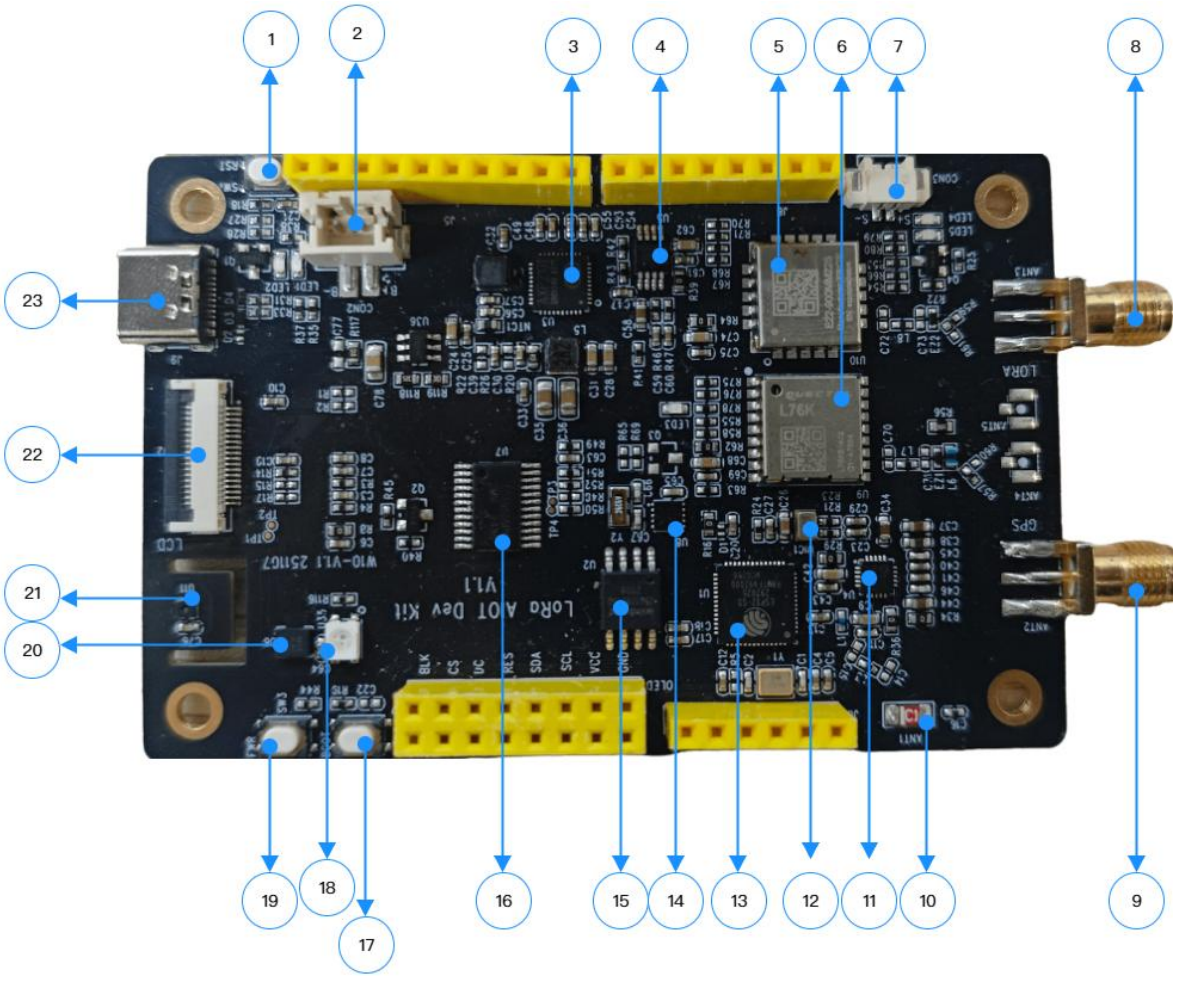
2.1 Feature Overview

The product features a **Xtensa® 32** bit **LX7** dual-core processor with a clock speed of up to **240 MHz**, offering significantly higher floating-point performance than **ARM CortexM33** architecture processors. It incorporates mainstream onboard modules including **LoRa SX1262** and **GPS L76K** for seamless integration in wireless communication and outdoor positioning applications. The board also includes an audio **Codec** chip and power amplifier components, enabling effortless implementation of Xiaozhi **AI** voice interaction and chat functionality when paired with a display. Equipped with temperature/humidity sensors and inertial sensors, it provides flexible solutions for environmental monitoring and motion control. Additionally, the board features a **RTC** real-time clock chip to preserve data timeliness and accuracy during communication processes.

2.2 Product Features

1. **Powered by an Xtensa® 32-bit LX7 dual-core processor with a clock speed of up to 240MHz, it features built-in WiFi and Bluetooth Low Energy (BLE) capabilities.**
2. Integrated **LoRa** and **GPS** modules, easily achieve the needs of communication and data publishing in the environment without network, as well as outdoor positioning and tracking;
3. The onboard **IMU** and temperature/humidity sensors enable motion and environmental detection, with wireless synchronization and upload capabilities.
4. The onboard **RTC** clock chip can realize the functions of clock, alarm and perpetual calendar, and can also be used as the timestamp standard for wireless communication;
5. Equipped with an audio **Codec** chip, it is compatible with mainstream **LCD** and **OLED** displays, and can easily achieve **AI** voice intercom and chat functions;
6. Equipped with camera interface, it supports **OV2640** and **OV5640** cameras, which can realize the functions of image and video acquisition, display and upload;
7. Equipped with lithium battery interface, the product can be powered and worked normally without connecting **USB**;
8. The **IO** is compatible with **Arduino** interface, which can be adapted to various modules and accessories of **Arduino** peripheral;

2.3 Resource Introduction



Number	Resource Description
1	**RESET** Reset key. Press it to restart the device for fault recovery and program re-run.
2	**PH2.0** lithium battery interface, connected to **3.7V** lithium battery through **PH2.0_2PIN** connector
3	**AXP2101** Power management chip, responsible for power distribution, voltage regulation, and power consumption control to ensure stable power supply for the device
4	The audio amplifier **NS4150B** has an output power of **2.8W** and a maximum output of **3W** under the **4Ω** load condition
5	Ebert **E22-900MM22S LoRa** module, based on **SX1262** chip, operates in the **850-930MHz** band, with a maximum transmission power of **22dBm**.
6	**The Quectel L76K GPS module supports multiple satellite systems including GPS, GLONASS, BDS, and QZSS.**
7	**PH1.25** The speaker interface (speaker) is used for audio output and supports up to **3W** speakers.
8	**SMA base station with LoRa 850-930MHz antenna.**
9	**SMA** station, access to **GPS** active antenna.
10	The ceramic patch antenna enables wireless signal (**Wi-Fi**, Bluetooth) transmission and reception without the need for an additional external antenna.
11	**ES8311** is a low-power audio codec chip that processes audio signals (encoding and decoding) to enable devices to record and play audio.
12	Microphone, used to capture sound signals for recording and voice interaction.
13	**ESP32-S3R8** core master control, is an integrated system-on-chip (**SoC**) with **Wi-Fi** and Bluetooth functions, operating frequency **240MHz**,

	It also has a **8MB** pseudo-static random access memory (**PSRAM** for extended storage).
14	**PCF85063 RTC** clock chip provides accurate time reference and real-time clock function for devices.
15	**W25Q128JVSIQ, a 16MB NOR-Flash memory chip.**
16	**TCA9555PWR 16** bit **I ² C/SMBus IO** expansion chip, supports **1.65-5.5V** voltage, with interrupt, weak pull-up and configuration register.
17	**BOOT** button, a boot mode selection button, often used with the reset button to burn the device with a program.
18	**3030 0.6W Colorful LED Light**
19	**PWR** Power button to control power on/off of the device.
20	**QMI8658** six-axis inertial measurement unit (**IMU**), including 3 axis gyroscope (measuring angular velocity) and 3 axis accelerometer (measuring acceleration).
21	**SHT41** Temperature and humidity sensor,**I ² C** interface, with high precision (± 0.1 ° **C/**± **1.5% RH**), low power consumption, and small size (2.5 × 2.5 × **0.9mm**).
22	**3.5** FPC base with inch LCD display, integrated with SPI, I2C, and SDIO interfaces
23	**Type-C** interface for power supply and data transmission.