



WiFi LoRa 32 V4-R8

Wi-Fi/Bluetooth/LoRa

Battery Management

0.96inch OLED





Document Version

Version	Time	Description	Remark
V4.3.1	2026-06-24	Internal beta version	Richard

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Content

- 1. Introduction** 5
 - 1.1 Overview** 5
 - 1.2 Features** 5
 - 1.3 Application Scenarios** 6
 - 1.4 Components** 6

- 2. Pin Definition** 7
 - 2.1 Pin Layout** 7
 - 2.2 Pin Description** 8
 - 2.2.1 Header J2 8
 - 2.2.2 Header J3 9
 - 2.2.3 Additional Pins 10
 - 2.2.4 Peripherals (I2C/SPI/UART/I2S/PWM/etc.) 10

- 3. Specifications** 11
 - 3.1 General specifications** 11
 - 3.2 Power Supply** 12
 - 3.3 Power Output** 12
 - 3.4 Power Consumption(25℃)** 13
 - 3.5 LoRa RF Characteristics** 13
 - 3.5.1 Transmit Power 13
 - 3.6 LoRaWAN Frequency Plan** 14

- 4. Dimensions** 15

- 5. Resource** 16
 - 5.1 Relevant Resource** 16
 - 5.2 Contact Information** 16

1. Introduction

1.1 Overview

WiFi LoRa 32 V4-R8 is the latest sub-version of Heltec's classic LoRa development board, the WiFi LoRa 32 V4. Its core upgrade lies in replacing the main controller from the ESP32-S3R2 to the ESP32-S3R8 – increasing the onboard PSRAM from 2 MB to 8 MB, providing ample memory for more complex UI interfaces, data processing, and multitasking applications.

The V4-R8 fully inherits all the advantages of the V4 version. It is equipped with the Semtech SX1262 LoRa chip, and the high-power version can achieve a LoRa transmit power of up to 28 ± 1 dBm. The board features a 0.96-inch OLED display, a USB Type-C port, a solar charging input, and a GNSS expansion interface. Its deep sleep current is as low as $< 20 \mu\text{A}$, and it supports lithium-battery charging management as well as solar charging.

The V4-R8 is fully compatible with open-source projects such as Meshtastic, LoRaWAN, and MeshCore, and supports multiple development frameworks including Arduino, PlatformIO, ESP-IDF, and MicroPython. It is an ideal choice for long-range IoT applications in smart cities, smart agriculture, industrial control, and off-grid communications.

Variants

Table 1.1: Product variants

No.	Model	TX Power[dBm]	Description
1	HTIT-WBR8H	28 ± 1	868-928MHz

1.2 Features

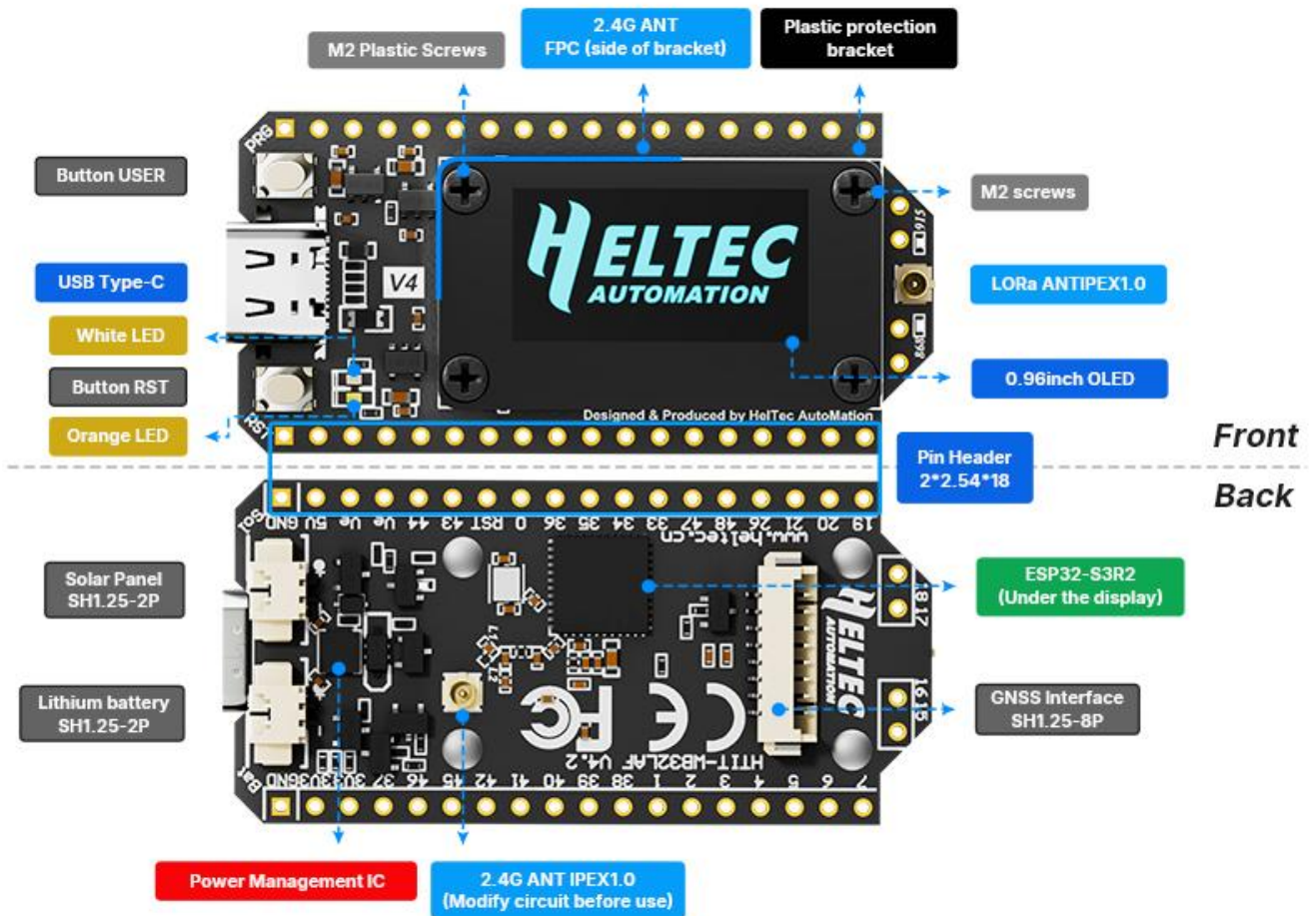
- Base on **ESP32-S3R8 & SX-1262**, supports **Wi-Fi b/g/n**, **BLE**, and **LoRa** communication.
- **2/8MB PSRAM** and **16MB external Flash**, more suitable for UI and complex system .
- High-power version with LoRa transmission power increased to **28 ± 1 dBm**.
- Form factor and **pin compatibility** with WiFi LoRa 32 V3.
- PC **casing protects** the screen and integrates **FPC 2.4G antenna**.
- Added SH1.25-2P **solar panel interface**.
- Optimized **lithium battery management**.
- Added SH1.25-8Pin **GNSS interface**.
- **USB Type-C** interface with integrated voltage regulation, ESD protection, short-circuit protection, and RF isolation design;

- Low power consumption is less than **20µA**.

1.3 Application Scenarios

- Environmental Sensor
- Industrial Internet of Things
- Asset Tracking
- Remote Meter Reading
- Smart Agriculture
- Wireless Alarm
- Innovative Projects and Geek Application

1.4 Components

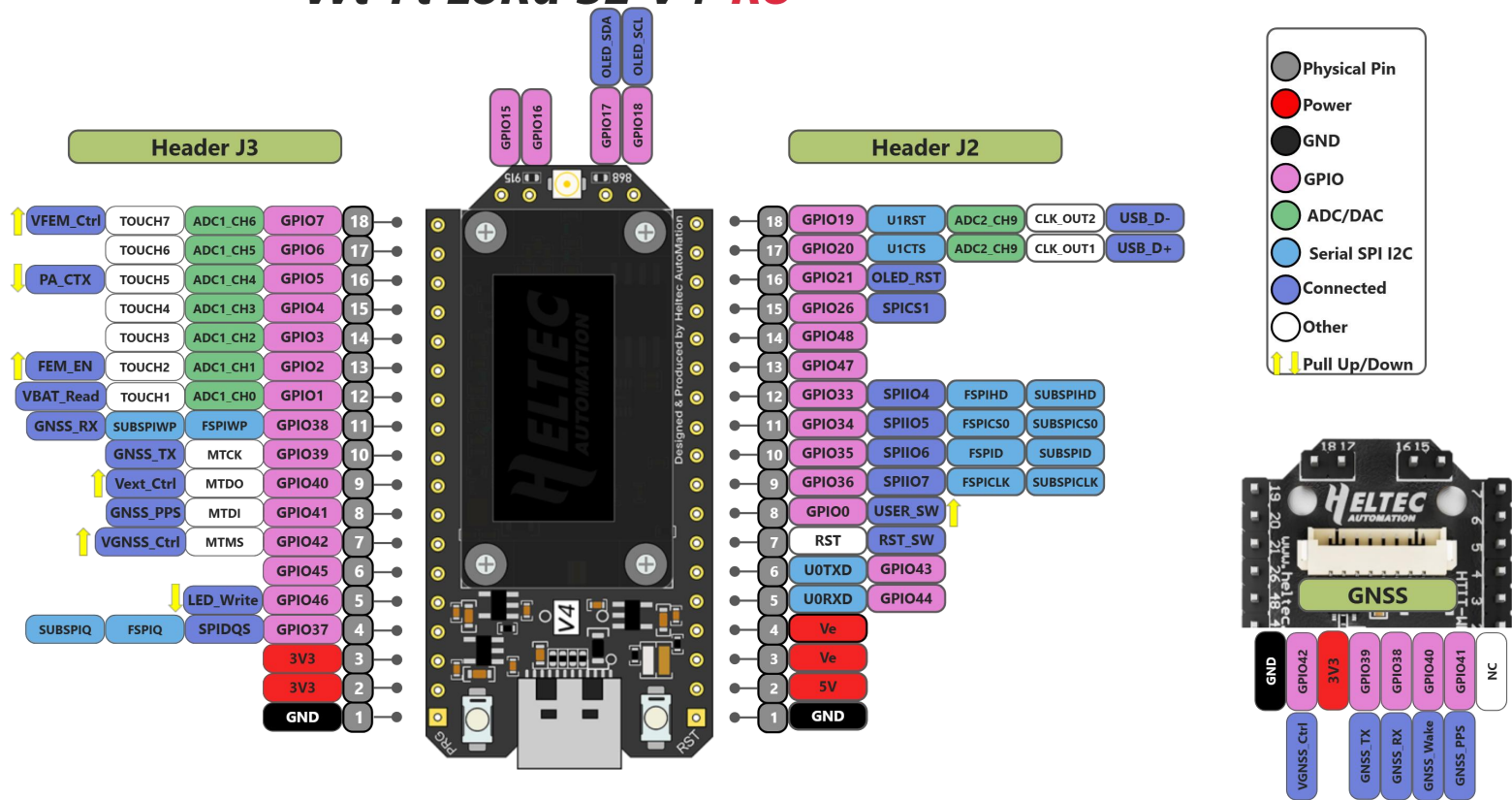


2. Pin Definition

2.1 Pin Layout

The following figure shows some common information and descriptions of the WiFi LoRa 32 pins. For more detailed functional information about each pin, please refer to the ESP32 chip manual. [ESP32-S3 MCU Datasheet](#).

Wi-Fi LoRa 32 V4-R8



2.2 Pin Description

2.2.1 Header J2

Table 2.2.1: Pin description

No.	Name	Type				Function
1	GND	G				Ground
2	5V	P				5V Power Supply
3	Ve	P				Output 3.3V
4	Ve	P				Output 3.3V
5	RX	I/O			IO MUX	GPIO44, U0RXD
6	TX	I/O			IO MUX	GPIO43, U0TXD
7	RST	I				CHIP_PU, Reset Button
8	0	I/O			IO MUX	GPIO0, PRG Button
9	36	I/O			IO MUX	GPIO36, SPIIO7, FSPICK, SUBSPICK
10	35	I/O			IO MUX	GPIO35, SPIIO6, FSPID, SUBSPID,
11	34	I/O			IO MUX	GPIO34, SPIIO5, FSPICS0, SUBSPICS0
12	33	I/O			IO MUX	GPIO33, SPIIO4, FSPICHD, SUBSPICHD
13	47	I/O			IO MUX	GPIO47, SPICK_P_DIFF, SUBSPICK_P_DIFF
14	48	I/O			IO MUX	GPIO48, SPICK_N_DIFF, SUBSPICK_N_DIFF
15	26	I/O			IO MUX	GPIO26, SPICS1
16	21	I/O		RTC	IO MUX	GPIO21, OLED RST
17	20	I/O	Analog	RTC	IO MUX	GPIO20, U1CTS, ADC2_CH9, USB_D+
18	19	I/O	Analog	RTC	IO MUX	GPIO19, U1RTS, ADC2_CH8, USB_D-

2.2.2 Header J3

Table 2.2.2: Pin description

No.	Name	Type				Function
1	GND	P				Ground.
2	3V3	P				3.3V Power Supply
3	3V3	P				3.3V Power Supply
4	37	I/O			IO MUX	GPIO37 , SPIDQS , FSPIQ, SUBSPIQ
5	46	I/O			IO MUX	GPIO46 , LED
6	45	I/O			IO MUX	GPIO45
7	42	I/O			IO MUX	GPIO42 , MTMS, VGNSS_Ctrl
8	41	I/O			IO MUX	GPIO41 , MTDI, GNSS_PPS
9	40	I/O			IO MUX	GPIO40 , MTDO, Vext_Ctrl
10	39	I/O			IO MUX	GPIO39 , MTCK, GNSS_TX
11	38	I/O			IO MUX	GPIO38 , FSPIWP, SUBSPIWP, GNSS_RX
12	1	I/O	Analog	RTC	IO MUX	GPIO1 , ADC1_CH0 , TOUCH1 , VBAT_Read ¹
13	2	I/O	Analog	RTC	IO MUX	GPIO2 , ADC1_CH1 , TOUCH2 , FEM_EN
14	3	I/O	Analog	RTC	IO MUX	GPIO3 , ADC1_CH2 , TOUCH3
15	4	I/O	Analog	RTC	IO MUX	GPIO4 , ADC1_CH3 , TOUCH4
16	5	I/O	Analog	RTC	IO MUX	GPIO5 , ADC1_CH4 , TOUCH5 , PA_CTX
17	6	I/O	Analog	RTC	IO MUX	GPIO6 , ADC1_CH5 , TOUCH6
18	7	I/O	Analog	RTC	IO MUX	GPIO7 , ADC1_CH6 , TOUCH7 , V_FEM_Control

¹ ADC1_CH0 is used to read the lithium battery voltage, the ADC_CTRL(37) pin needs to be pulled high. the voltage of the lithium battery is:

$$VBAT = 100 / (100+390) * VADC_IN1$$

2.2.3 Additional Pins

Table 2.2.3: Additional Pin

No.	Name	Type				Function
1	18	I/O	Analog	RTC	IO MUX	GPIO18, OLED_SCL
2	17	I/O	Analog	RTC	IO MUX	GPIO17, OLED_SDA
3	16	I/O	Analog	RTC	IO MUX	GPIO16, XTAL_32K_N
4	15	I/O	Analog	RTC	IO MUX	GPIO15, XTAL_32K_P

2.2.4 Peripherals (I2C/SPI/UART/I2S/PWM/etc.)

ESP32-S3 can integrate a rich set of peripherals. To learn more about on-chip components, please refer to [ESP32-S3 MCU Datasheet](#).

Owing to the **GPIO Matrix** and **IOMUX** capabilities, the vast majority of GPIO pins can be configured for functions such as I2C, SPI, I2S, PWM or UART. For specific pin assignments and IOMUX correspondences, please refer to the list of pins marked with IOMUX functionality in Appendix Tables [2.2.1](#) and [2.2.2](#).

Note: *The original functionality of the reconfigured pins will be affected. Please select appropriate pins for your application. Such as OLED has occupied one I2C interface, while LoRa and Flash have each utilized a separate SPI interface.*

3. Specifications

3.1 General specifications

Table 3.1: General specifications

Parameters	Description
Master Chip	ESP32-S3R8
LoRa Chip	SX1262
Frequency	433~510 MHz, 863~928 MHz
Max. TX Power	21±1dBm, 28±1 dBm ²
Wi-Fi	802.11 b/g/n, up to 150Mbps
Bluetooth	Bluetooth LE, Bluetooth 5, Bluetooth mesh
OLED	SSD1315 (0.96Inch, 128*64 resolution)
Power Supply	5V@USB/Solar, 3.3-4.2V@Battery
Hardware Resource	7*ADC1 + 2*ADC2, 7*Touch, 3*UART, 2*I2C, 2*I2S, 4*SPI, etc.
Memory	384KB ROM; 512KB SRAM; 16KB RTC SRAM; 16MB Flash; 8MB PSRAM
Interface	USB Type-C; SH1.25-2P lithium battery interface; SH1.25-2P solar panel interface; 2*IPEX1.0 ANT(LoRa&2.4G); 2*18*2.54 Header Pins, 2*2*2.54 Header Pins
Operating Temperature	-40~85°C(OLED operating temperature: -40~ 70°C)
Dimensions	51.7 * 25.4* 10.7mm

² The 433–510 MHz version delivers 21 ±1 dBm transmit power, while the 863–928 MHz version reaches 28 dBm.

3.2 Power Supply

USB or 5V can only be connected to one of them. When either USB or 5V input is connected, the solar panel and lithium battery can be connected simultaneously.

Table 3.2: Power supply

Power Supply Mode	Minimum	Typical	Maximum	Company
Type-C USB($\geq 500\text{mA}$)	4.7	5	6	V
Lithium battery($\geq 250\text{mA}$)	3.3	3.7	4.2	V
5V pin($\geq 500\text{mA}$)	4.7	5	6	V
3V3 pin($\geq 150\text{mA}$)	2.7	3.3	3.5	V
Solar Panel	4.7	5	6	V

3.3 Power Output

When using **VE** for external power supply, the **VextCtrl(GPIO40)** pin needs to be pulled high.

Table 3.3: Power output

Pin	Minimum	Typical	Maximum	Company
3.3V			500	mA
5V@USB			500	mA
Ve			500	mA

3.4 Power Consumption(25°C)

Table 3.4: Power consumption

Mode	Condition	Min.	Typical	Max.	Unit
WiFi Scan	USB powered		119		mA
WiFi AP	USB powered		170		mA
BT	USB powered		115		mA
TX	14dBm,USB powered, 868 TX		290		mA
	17dBm,USB powered, 868 TX		330		mA
	22dBm,USB powered, 868 TX		400		mA
	27dBm,USB powered, 868 TX		750		mA
RX	TX disabled; RX enabled		75		mA
Sleep	USB powered		2		mA
	Battery powered		20		μA
	3.3V header powered		20		μA
Charging	USB@5V		500		mA

3.5 LoRa RF Characteristics

3.5.1 Transmit Power

Table3.5.1: Transmit power

Model	Frequency Band[MHz]	Maximum power[dBm]
HTIT-WBR8H	863-870	28 ± 1
	902-928	28 ± 1

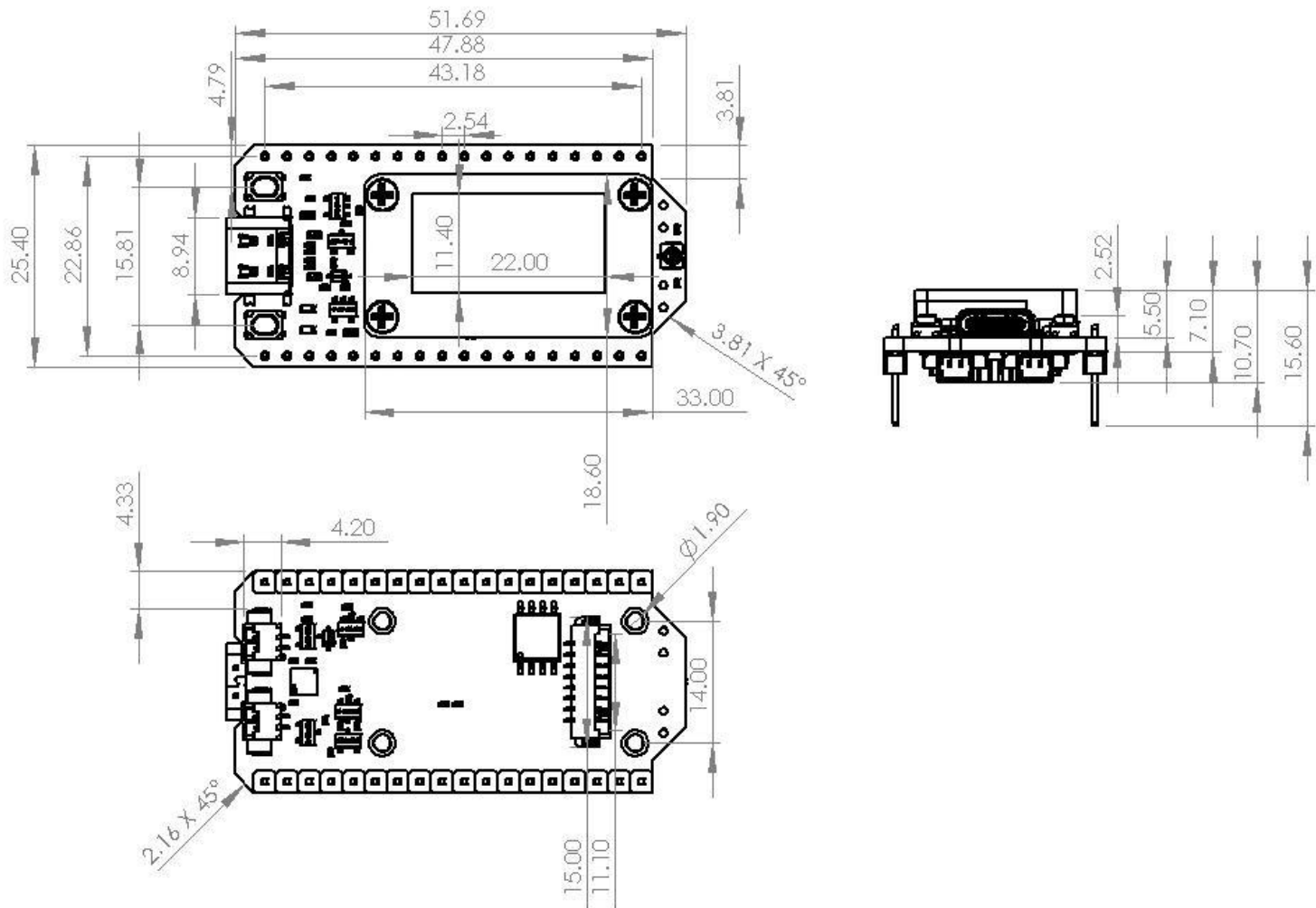
3.6 LoRaWAN Frequency Plan

Supports LoRaWAN frequency channels and models corresponding table.

Table3.6: Frequency Plan

Region	Frequency(MHz)	Model
IN868	865~867	HTIT-WBR8H
EU868	863~870	HTIT-WBR8H
US915	902~928	HTIT-WBR8H
AU915	915~928	HTIT-WBR8H
KR920	920~923	HTIT-WBR8H
AS923	920~925	HTIT-WBR8H
CN470	470~510	HTIT-WBR8N

4. Dimensions



5. Resource

5.1 Relevant Resource

- User Guide
- SDK
 - [Heltec ESP \(ESP32 & ESP8266\) framework](#)
 - [Heltec ESP32 library](#)
- Schematic diagram
- Downloadable resource

5.2 Contact Information

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