HELTEC Vision Master E290 2.90 E-ink Display with ESP32 and LoRa

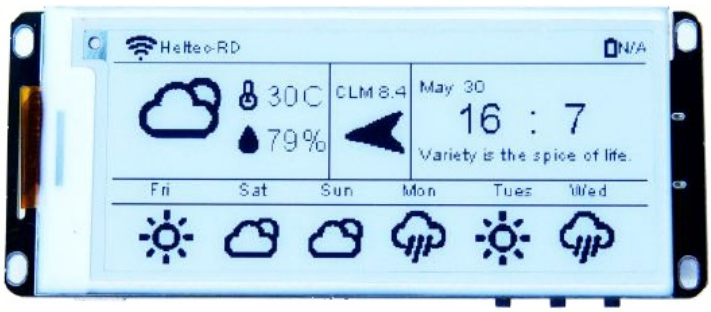
# HELTEC Vision Master E290 2.90 E-ink Display with ESP32 and LoRa Owner's Manual



Contents



## HELTEC Vision Master E290 2.90 E-ink Display with ESP32 and LoRa



## Product Information

### Specifications

- Display: 2.90-inch black and white E-Ink
- Wireless Connectivity: Bluetooth, Wi-Fi, LoRa
- Processor: ESP32-S3R8
- Display Resolution: 296 x 128 pixels
- Power Consumption: 20uA in deep sleep
- Interface: SH1.0-4P sensor interface, 2*20 Pin female header
- Compatibility: Arduino, Raspberry PI

## Product Usage Instructions

### Overview

The Vision Master E290 is a versatile E-Ink development kit that supports various wireless drive methods such as Bluetooth, Wi-Fi, and LoRa. It is ideal for developing applications like electronic tags and identity tags.

### Features

- Supports Wi-Fi, BLE, and optional LoRa module
- High contrast, high reflectance display with ultra-wide viewing angle
- Low power consumption with deep sleep mode and long display duration
- Sensor interface compatible with QuickLink series sensors
- Compatible with Arduino and Raspberry PI

### Pin Definitions

Refer to the product manual for detailed pin definitions based on the headers J2 and J3.

### Frequently Asked Questions (FAQ)

1. **Q: Can I use the Vision Master E290 without the LoRa module?**
   A: Yes, the Vision Master E290 can be used without the LoRa module for Bluetooth and Wi-Fi operations.
2. **Q: How long does the display last after a power outage?**
   A: The display can continuously operate for 180 days after a power outage.
3. **Q: Is the Vision Master E290 compatible with open-source projects like Meshtastic?**
   A: Yes, the Vision Master E290 is compatible with Meshtastic and supports running open-source projects.

### Document version

| Version | Time | Description | Remark |
|---|---|---|---|
| Rev. 0.3.0 | 2024-5-16 | Preliminary version | Richard |
| Rev.0.3.1 | 2024-9-14 | Fixed Flash size | Richard |

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## Description

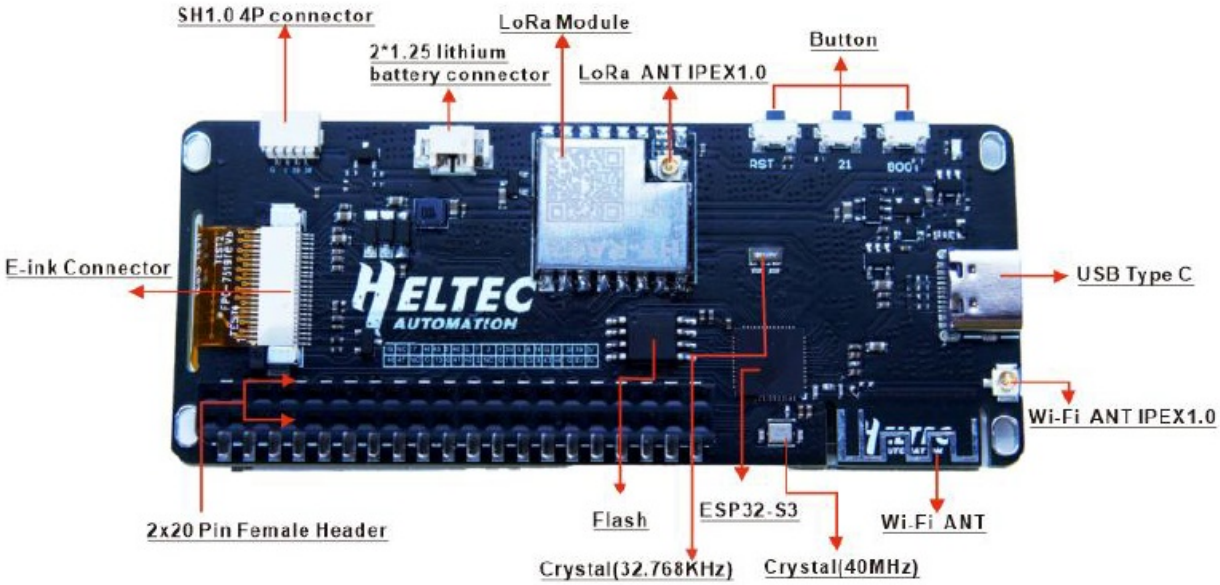
**Overview**
Vision Master E290 (HT-VME290) is an E-Ink development kit with multiple wireless drive methods. Collaborate with the sample programs and development tools we provide, users can operate the display via Bluetooth, Wi-Fi and LoRa. This board is equipped with a default 2.90-inch black and white E-Ink display screen, continuous display for 180 days after power outage. It can be used to develop applications such as electronic tags and identity tags, it is also possible to run open source projects like Meshtastic.

**VM-E290 are available in two product variants:**
Table 1.1: Product model list

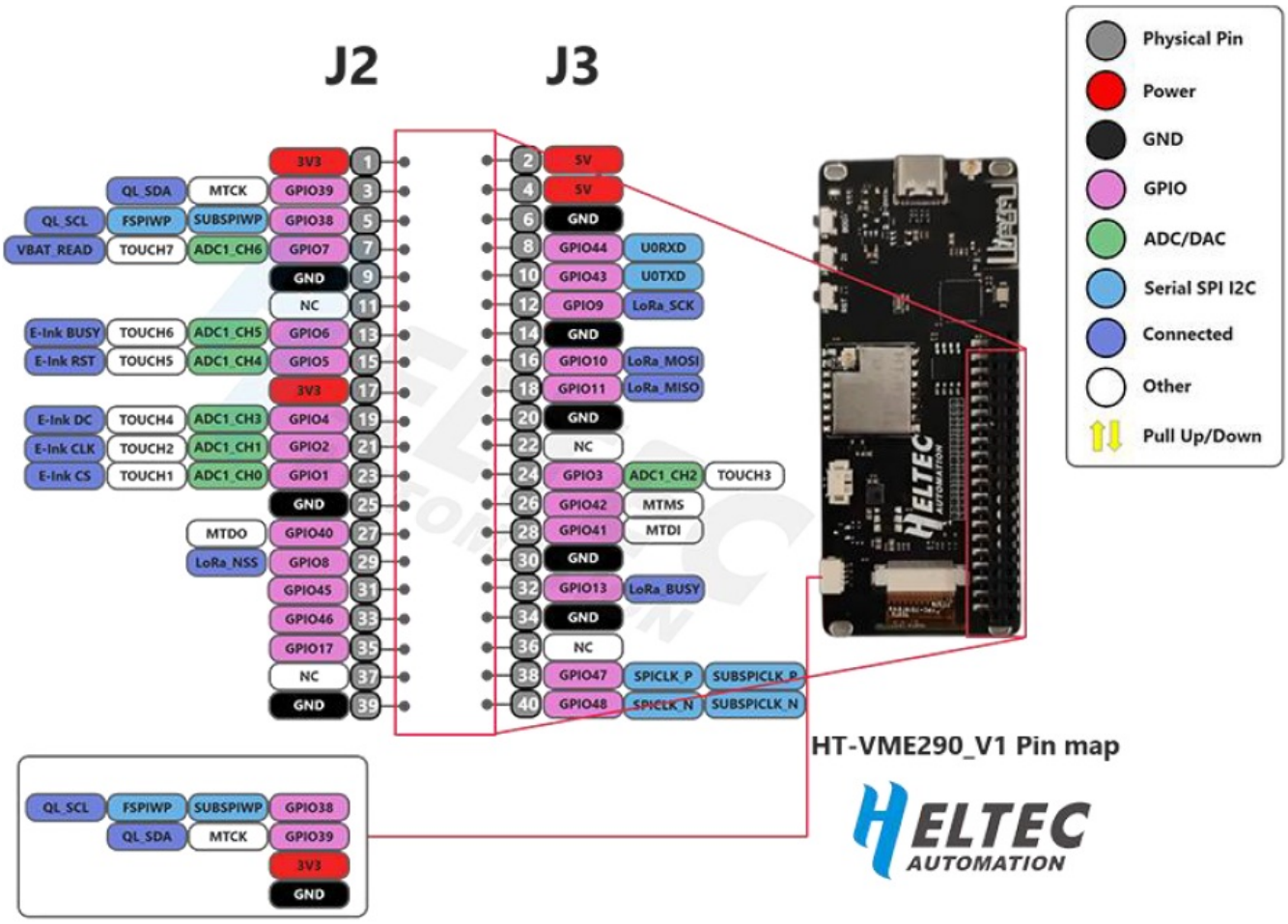
| No. | Model | Description |
|---|---|---|
| 1 | HT-VME290 | With LoRa Module |
| 2 | HT-VME290-LF | 470~510MHz working LoRa frequency, used for China mainland (CN470) LPW band. |
| 3 | HT-VME290-HF | For EU868, IN865, US915, AU915, AS923, KR920 and other LPW networks with operating frequencies between 863~928MHz. |

**Product features**

- ESP32-S3R8, support Wi-Fi, BLE.
- LoRa module is optional, compatible with Mashtastic.
- Default 296 x 128 pixels black-white display, support for partial refresh.
- High contrast, high reflectance, ultra-wide viewing angle.
- Low power consumption, 20uA in deep sleep, continuous display for 180 days after power outage.
- SH1.0-4P sensor interface is perfectly compatible with QuickLink series sensors.
- 2*20 Pin female header are great for connecting Raspberry PI.
- Compatible with Arduino, we provide development frameworks and libraries.




## Pin definition




## Pin definition

### Header J2

| NO. | Name | Type | Description |
|---|---|---|---|
| 1 | 3V | P | 3V3 output. |

| | | | |
|---|---|---|---|
| 3 | 39 | I/O | GPIO39, MTCK, QL_SDA.① |
| 5 | 38 | I/O | GPIO38, SUBSPIWP, FSPIWP, QL_SCL.② |
| 7 | 7 | I/O | GPIO7, ADC1_CH6, TOUCH7, VBAT_READ. |
| 9 | G | P | GND. |
| 11 | 14 | I/O | NC. |
| 13 | 6 | I/O | GPIO6, ADC1_CH5, TOUCH6, EINK_BUSY. |
| 15 | 5 | I/O | GPIO5, ADC1_CH4, TOUCH5, EINK_RST. |
| 17 | 3V | P | 3V3 output. |
| 19 | 4 | I/O | GPIO4, ADC1_CH3, TOUCH4, E-Ink_D/C. |
| 21 | 2 | I/O | GPIO2, ADC1_CH1, TOUCH2, E-Ink_CLK. |
| 23 | 1 | I/O | GPIO1, ADC1_CH0, TOUCH1, E-Ink_SDI. |
| 25 | G | P | GND. |
| 27 | 40 | I/O | GPIO40, MTDO. |
| 29 | 8 | I/O | GPIO8, LoRa_NSS. |
| 31 | 45 | I/O | GPIO45. |
| 33 | 46 | I/O | GPIO46. |
| 35 | 17 | I/O | GPIO17. |
| 37 | NC | I/O | NC. |
| 39 | G | P | GND. |

**Header J3**

| NO. | Name | Type | Description |
|---|---|---|---|
| 2 | 5V | P | 5V Input. |
| 4 | 5V | P | 5V Input. |
| 6 | G | P | GND |
| 8 | 44 | I/O | GPIO44, U0RXD. |
| 10 | 43 | I/O | GPIO43, U0TXD. |
| 12 | 9 | I/O | GPIO9, LoRa_SCK. |
| 14 | G | P | GND |
| 16 | 10 | I/O | GPIO10, LoRa_MOSI. |
| 18 | 11 | I/O | GPIO11, LoRa_MISO. |
| 20 | G | I/O | GND. |
| 22 | NC | I/O | NC. |

① QL stands for QuickLink Sensor Interface.
② QL stands for QuickLink Sensor Interface.

| | | | |
|---|---|---|---|
| 24 | 3 | I/O | GPIO3, ADC1_CH2, TOUCH3, E-Ink_CS. |
| 26 | 42 | I/O | GPIO42,MTMS. |
| 28 | 41 | I/O | GPIO41, MTDI. |
| 30 | G | P | GND. |
| 32 | 13 | I/O | GPIO13, LoRa_BUSY. |
| 34 | G | P | GND. |
| 36 | NC | I/O | NC. |
| 38 | 47 | I/O | GPIO47. |
| 40 | 48 | I/O | GPIO48. |

## Specifications

### General specification

Table 3.1: General specification

| Parameters | Description |
|---|---|
| MCU | ESP32-S3R8 |
| LoRa chipset | SX1262 |
| Memory | 384KB ROM; 512KB SRAM; 16KB RTC SRAM; 16MB SiP Flash |
| E-Ink | DEPG0290BNS800F6_V2.1 |
| Display color | Black, White |
| Grayscale | 2 |
| Refresh time | 2 seconds |
| Storage temperature | -25~70℃, <45%rh |
| Operating temperature | 0~50℃ |
| Operating Humidity | 0~65%rh |
| Power Supply | 3~5V (USB), 3~4.2(Battery) |

| | |
|---|---|
| Screen Size | 2.90 Inch |
| Display Resolution | 128(H)x296(V) Pixel |
| Active Area | 29x67mm |
| Pixel Pitch | 0.227×0.226mm |
| Pixel Configuration | Square |
| Hardware Resource | 6*ADC_1, 1*ADC_2, 6*Touch, 16M*PSRAM, 3*UART; 2*I2C; 2*SPI. Etc. |
| Interface | Type-C USB; 2*1.25mm lithium battery interface; LoRa ANT(IPEX1.0); Sensor interface(SH1.0-4P) |
| Dimensions | 88mm*36.6mm*12mm |

**Power consumption**
Table 3.2: Working current

| Mode | Condition | Consumption(Battry@3.8V) |
|---|---|---|
| LoRa | 5dBm | 150mA |
| | 10dBm | 175mA |
| | 15dBm | 200mA |
| | 20dBm | 220mA |
| Wi-Fi | Scan | 105mA |
| | AP | 140mA |
| BT | | 108mA |
| Sleep | | 18uA |

**LoRa RF characteristics**

**Transmit power**
Table3-5-1: Transmit power

| Operating frequency band | Maximum power value/[dBm] |
|---|---|
| 470~510 | 21 ± 1 |
| 867~870 | 21 ± 1 |
| 902~928 | 11 ± 1 |

**Receiving sensitivity**
The following table gives typically sensitivity level.
Table3-5-2: Receiving sensitivity

| Signal Bandwidth/[KHz] | Spreading Factor | Sensitivity/[dBm] |
|---|---|---|
| 125 | SF12 | -135 |
| 125 | SF10 | -130 |
| 125 | SF7 | -124 |

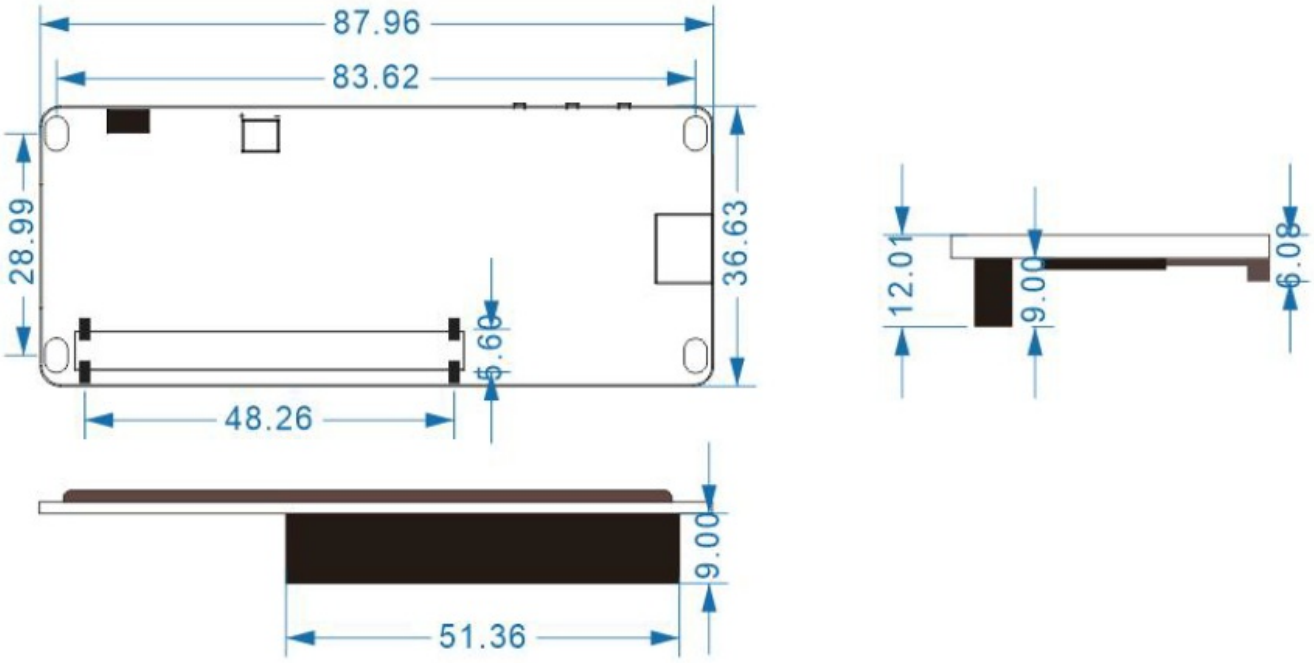
**Operation Frequencies**

HT-VME290 supports LoRaWAN frequency channels and models corresponding table.
Table3-5-3: Operation Frequencies

| Region | Frequency (MHz) | Model |
|---|---|---|
| EU433 | 433.175~434.665 | HT-VME290-LF |
| CN470 | 470~510 | HT-VME290-LF |
| IN868 | 865~867 | HT-VME290-HF |
| EU868 | 863~870 | HT-VME290-HF |
| US915 | 902~928 | HT-VME290-HF |
| AU915 | 915~928 | HT-VME290-HF |
| KR920 | 920~923 | HT-VME290-HF |
| AS923 | 920~925 | HT-VME290-HF |

## Physical dimensions

Unit: mm




## Resource

### Relevant resource

- Heltec ESP32 framework and Lib
- Heltec LoRaWAN test server based on TTS V3
- SnapEmu IoT platform
- User Manual Document
- E-Ink Datasheet
- Schematic Diagram

**Heltec Contact Information**
Heltec Automation Technology Co., Ltd
Chengdu, Sichuan, China

- Email: **support@heltec.cn**
- Phone: +86-028-62374838
- **https://heltec.org**

## FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

To assure continued compliance, any changes or modifications not expressly approved by the party. Responsible for compliance could void the user's authority to operate this equipment. (Example- use only shielded interface cables when connecting to computer or peripheral devices).

This equipment complies with Part 15 of the FCC Rules.

**Operation is subject to the following two conditions:**

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

**FCC Radiation Exposure Statement:**
The equipment complies with FCC Radiation exposure limits set forth for uncontrolled enviroment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

## Documents / Resources

| | |
|---|---|
|  | HELTEC Vision Master E290 2.90 E-ink Display with ESP32 and LoRa [pdf] Owner's Manual HT-VME290, 2A2GJ-HT-VME290, 2A2GJHTVME290, Vision Master E290 2.90 E-ink Display with ESP32 and LoRa, Vision Master E290, 2.90 E-ink Display with ESP32 and LoRa, E-ink Display with ESP32 and LoRa, Display with ESP32 and LoRa, ESP32 and LoRa, LoRa |

## References

- Heltec Automation –
- User Manual