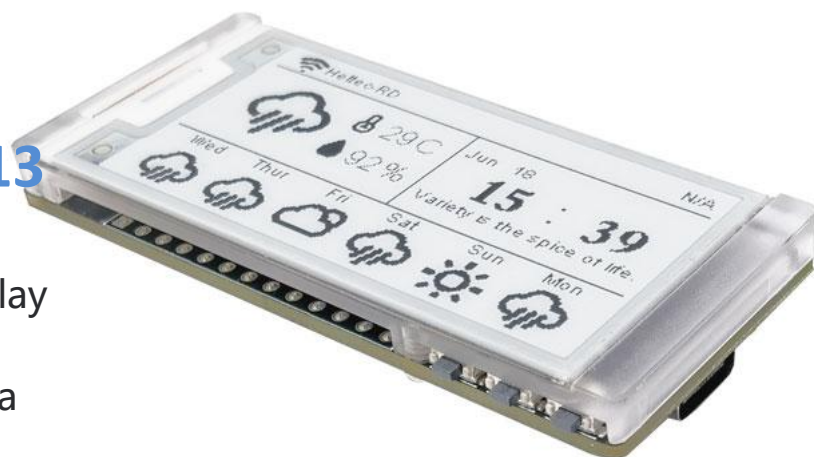




## HT-VME213

### 2.13 E-ink Display

ESP32 and LoRa



## Document version

| Version    | Time      | Description         | Remark  |
|------------|-----------|---------------------|---------|
| Rev. 1.0.0 | 2024-5-16 | Preliminary version | Richard |
| Rev.1.0.1  | 2024-9-14 | Fixed Flash size    | Richard |

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# 1 Description

## 1.1 Overview

**Vision Master E213 (HT-VME213)** 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 2.13 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.

HT-VME213 are available in 3 product variants:

Table 1.1: Product model list

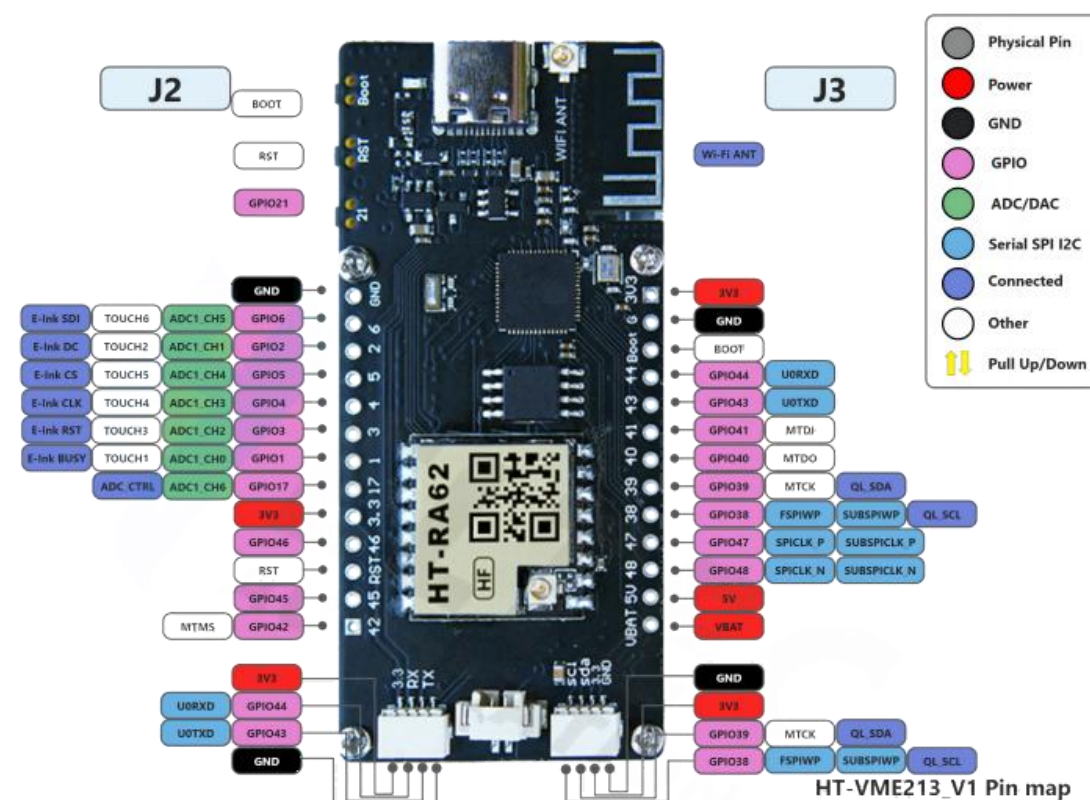
| No. | Model        | Description                                                                                                        |
|-----|--------------|--------------------------------------------------------------------------------------------------------------------|
| 1   | HT-VME213    | Without LoRa module                                                                                                |
| 2   | HT-VME213-LF | 470~510MHz working LoRa frequency, used for China mainland (CN470) LPW band.                                       |
| 3   | HT-VME213-HF | For EU868, IN865, US915, AU915, AS923, KR920 and other LPW networks with operating frequencies between 863~928MHz. |



## 1.2 Product features

- ESP32-S3R8 MCU, support Wi-Fi and BLE.
- LoRa module is optional, compatible with Mashtastic.
- Low power consumption, 18uA in deep sleep, continuous display for 180 days after power outage.
- 250 x 122 pixels display, support for partial refresh.
- High contrast, high reflectance, ultra-wide viewing angle.
- Commercial temperature range: -25 ~ 70°C.
- 2\*SH1.0-4P sensor interfaces is compatible with [QuickLink](#) series sensors.
- Compatible with Arduino, we provide [development frameworks and libraries](#).

## 2 Pin definition





## Header J2

| Name | Type | Description                         |
|------|------|-------------------------------------|
| GND  | P    | Ground.                             |
| 6    | I/O  | GPIO6, ADC1_CH5, TOUCH6, EINK_SDI.  |
| 2    | I/O  | GPIO2, ADC1_CH1, TOUCH2, EINK_DC.   |
| 5    | I/O  | GPIO5, ADC1_CH4, TOUCH5, EINK_CS.   |
| 4    | I/O  | GPIO4, ADC1_CH3, TOUCH4, EINK_CLK.  |
| 3    | I/O  | GPIO3, ADC1_CH2, TOUCH3, EINK_RST.  |
| 1    | I/O  | GPIO1, ADC1_CH0, TOUCH1, EINK_BUSY. |
| 17   | I/O  | GPIO17, ADC1_CH6, ADC_CTRL.         |
| 3.3  | P    | 3V3 output.                         |
| 46   | I/O  | GPIO46.                             |
| RST  | P    | RST.                                |
| 45   | I/O  | GPIO45.                             |
| 42   | I/O  | GPIO42, MTMS.                       |

## Header J3

| Name | Type | Description    |
|------|------|----------------|
| 3V3  | P    | 3V3 output.    |
| GND  | P    | Ground.        |
| BOOT | P    | Boot.          |
| 44   | I/O  | GPIO44, U0RXD. |
| 43   | I/O  | GPIO43, U0TXD. |
| 41   | I/O  | GPIO41, MTDI.  |

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|      |     |                                                 |
|------|-----|-------------------------------------------------|
| 40   | I/O | GPIO40, MTDO.                                   |
| 39   | I/O | GPIO39, MTCK, QL_SDA <sup>①</sup> .             |
| 38   | I/O | GPIO38, FSPIWP, SubSPIWP, QL_SCL <sup>②</sup> . |
| 47   | I/O | GPIO47, SPICLK_P, SUBSPICLK_P.                  |
| 48   | I/O | GPIO48, SPICLK_N, SUBSPICLK_N.                  |
| 5V   | P   | 5V Power Supply.                                |
| VBAT | P   | Battery powered.                                |

## 3 Specifications

### 3.1 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 |
| Wi-Fi         | 802.11 b/g/n                                         |
| Bluetooth     | Bluetooth LE: Bluetooth 5, Bluetooth mesh            |
| E-Ink         | <u>LCMEN2R13EFC1</u>                                 |
| Display color | Black, White                                         |
| Grayscale     | 2                                                    |
| Refresh time  | 2 Seconds                                            |

<sup>①</sup> QL stands for QuickLink Sensor Interface.

<sup>②</sup> QL stands for QuickLink Sensor Interface.



|                       |                                                                                                                              |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------|
| Storage temperature   | -25~70℃                                                                                                                      |
| Operating temperature | 0~50℃ (Optimal operating temperature of E-Ink)                                                                               |
| Operating Humidity    | 0~65%(Optimal operating humidity of E-Ink)                                                                                   |
| Power Supply          | 3~5V (USB), 3~4.2(Battery)                                                                                                   |
| Screen Size           | 2.13 Inch                                                                                                                    |
| Display Resolution    | 122(H)x250(V) Pixel                                                                                                          |
| Active Area           | 23.7x48.6mm                                                                                                                  |
| Pixel Pitch           | 0.1942X0.1942mm                                                                                                              |
| Pixel Configuration   | Square                                                                                                                       |
| Hardware Resource     | 6*ADC_1, 1*ADC_2, 6*Touch, 16M*PSRAM, 3*UART; 2*I2C;<br>2*SPI. Etc.                                                          |
| Interface             | Type-C USB, 2*1.25mm lithium battery interface, LoRa ANT<br>(IPEX1.0), Sensor connector(SH1.0-4P), 2*13*2.54mm Header<br>Pin |
| Dimensions            | 66.75*30.41*10mm                                                                                                             |

## 3.2 Power consumption

Table 2.2: Working current

| Mode  | Condition | Consumption(Battry@3.8V) |
|-------|-----------|--------------------------|
| LoRa  | 5dBm      | 150mA                    |
|       | 10dBm     | 175mA                    |
|       | 15dBm     | 200mA                    |
|       | 20dBm     | 220mA                    |
| Wi-Fi | Scan      | 105mA                    |

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|       |    |       |
|-------|----|-------|
|       | AP | 140mA |
| BT    |    | 108mA |
| Sleep |    | 18uA  |

### 3.3 LoRa RF characteristics

#### 3.3.1 Transmit power

Table3-5-1: Transmit power

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

#### 3.5.2 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              |

#### 3.5.3 Operation Frequencies

HT-VME213 supports LoRaWAN frequency channels and models corresponding table.

Table3-5-3: Operation Frequencies

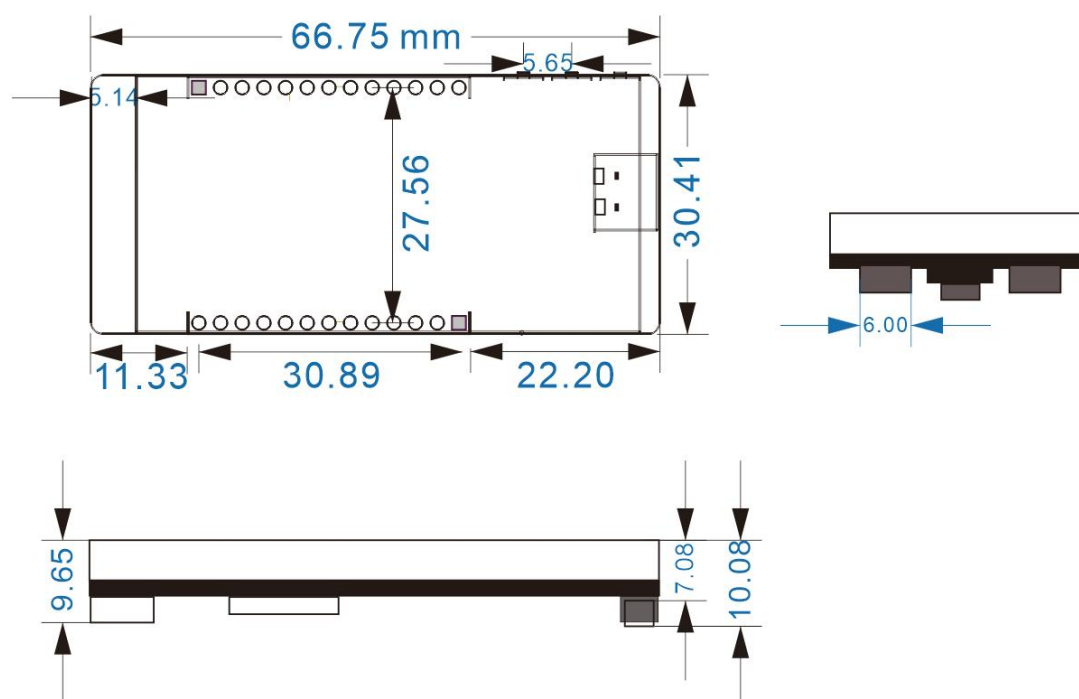
| Region | Frequency (MHz) | Model |
|--------|-----------------|-------|
|--------|-----------------|-------|

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|       |                 |               |
|-------|-----------------|---------------|
| EU433 | 433.175~434.665 | HT-VME213-LF  |
| CN470 | 470~510         | HT-VME213r-LF |
| IN868 | 865~867         | HT-VME213-HF  |
| EU868 | 863~870         | HT-VME213-HF  |
| US915 | 902~928         | HT-VME213-HF  |
| AU915 | 915~928         | HT-VME213-HF  |
| KR920 | 920~923         | HT-VME213-HF  |
| AS923 | 920~925         | HT-VME213-HF  |

## 4 Physical dimensions



## 5 Resource

### 5.1 Relevant resource

- [Heltec ESP32 framework](#)
- [Heltec LoRaWAN test server](#)
- [Heltec ESP32 library](#)
- [User Manual Document](#)

<https://heltec.org>



- [E-Ink Datasheet](#)

- [Schematic Diagram](#)

## 5.2 Heltec Contact Information

Heltec Automation Technology Co., Ltd

Chengdu, Sichuan, China

Email: [support@heltec.cn](mailto:support@heltec.cn)

Phone: +86-028-62374838

<https://heltec.org>