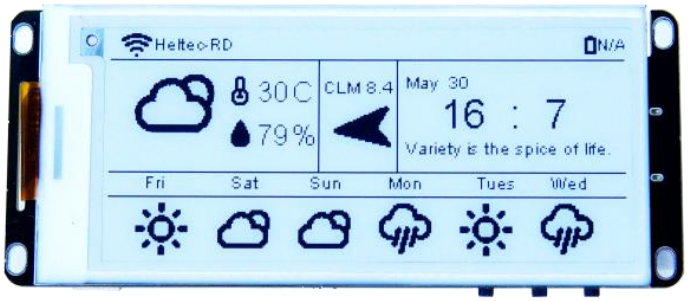
Vision Master E290



2.90 E-ink Display with ESP32 and LoRa

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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1 Description

1.1 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.

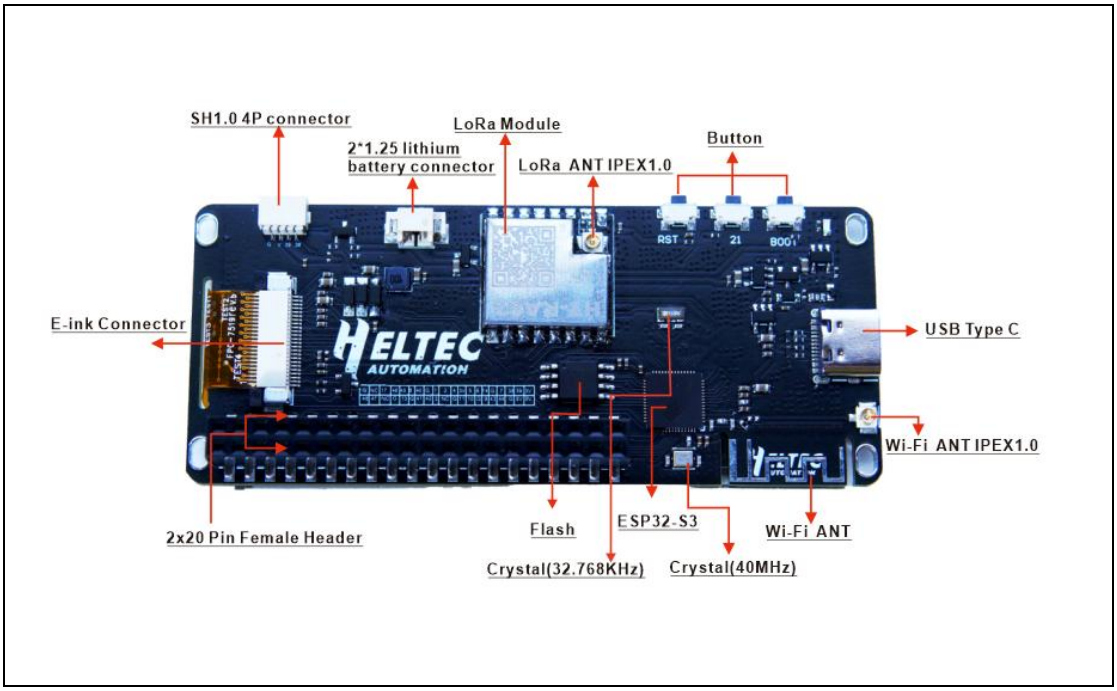
VM-E290 are available in two product variants:

Table 1.1: Product model list

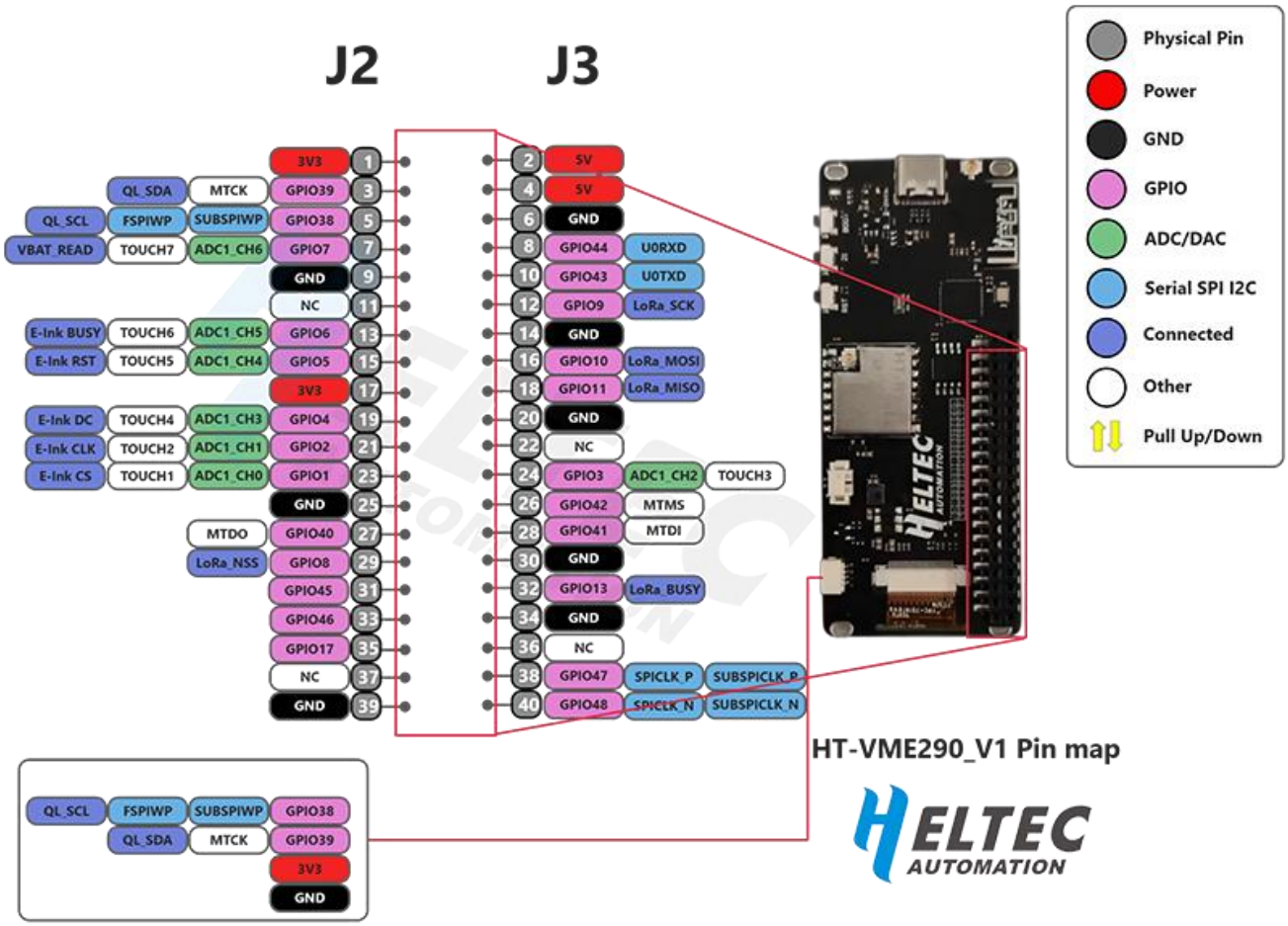
No.	Model	Description
1	HT-VME290	Without LoRa Module
2	HT-VME290-LF	470~510MHz working LoRa frequency, used for China mainland (CN470) LPW band.
3	HT-VME290-HF	For EU868, IN865, US915, AU915, AS923, KR920 and other LPW networks with operating frequencies between 863~928MHz.

1.2 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.



2 Pin definition



2.2 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.

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
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

3.2 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

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

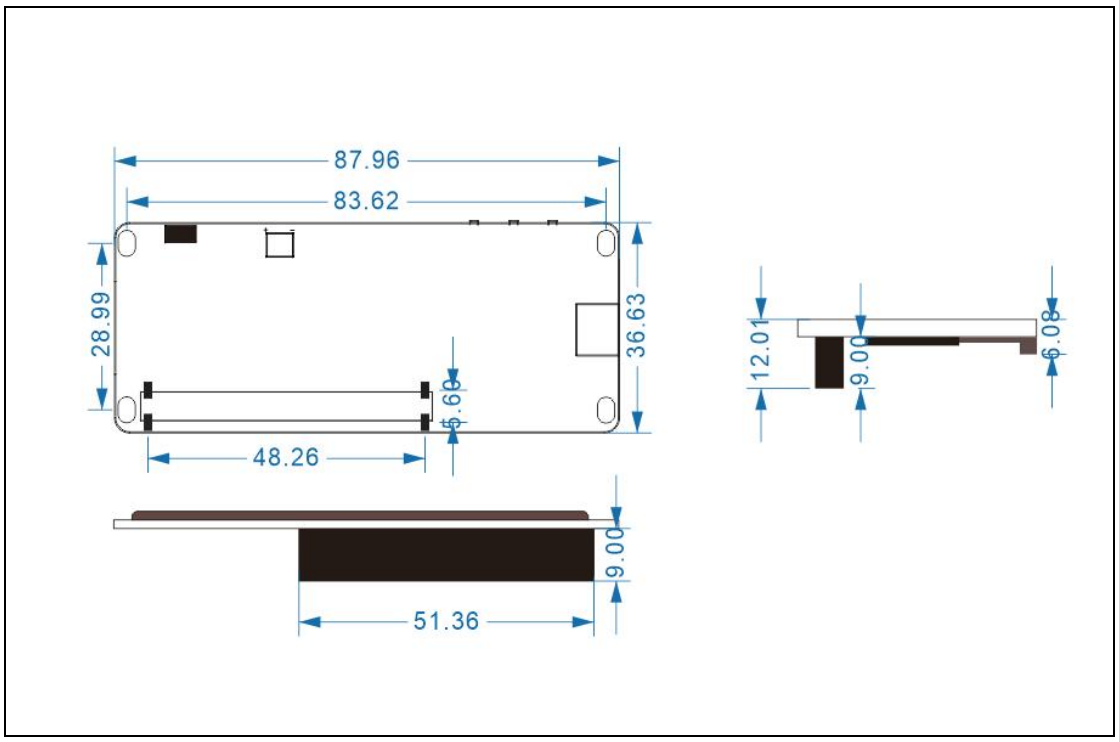
HT-VME290 supports LoRaWAN frequency channels and models corresponding table.

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

4 Physical dimensions

Unit: mm



5 Resource

5.1 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

5.2 Heltec Contact Information

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