Heltec LoRa 32 Build Guide

Overview

The **Heltec LoRa 32** is a compact, low-cost development board combining an **ESP32-family microcontroller**, a **LoRa radio**, and a small **0.96" OLED display** on a single board. The radio and MCU differ by version: the current **V3/V4** boards pair an **ESP32-S3 with an SX1262**, while the earlier, widely-distributed **V2** used an **ESP32 (ESP32-D0) with an SX1276**. **Confirm your board's exact version and radio chip before flashing**, since the radio determines the firmware target. Its built-in display makes it particularly useful for field deployment and diagnostics without requiring a companion phone or laptop.

Versions

- **V2** - Micro-USB, ESP32-D0, 3.3V GPIO logic, and the **SX1276 LoRa radio (SX127x family)**. The older, widely-distributed variant. The SX1262 is only found on V3 and later - the V2 did not ship with an SX1262.
- **V3** - USB-C connector, ESP32-S3, revised GPIO pinout, SX1262 radio, improved power management. *V2 and V3 are different firmware targets - do not flash V2 firmware on V3 hardware or vice versa.*
- **V3.1** - Minor revision to V3 with small hardware corrections. Uses V3 firmware.

Bill of Materials

- Heltec LoRa 32 board (V2 or V3 - confirm your frequency band: 868 or 915 MHz)
- LiPo battery (check your board - Heltec boards have shipped with both **JST 1.25mm and JST 2.0mm** connectors, so verify the pitch on your specific board; many common LiPo packs use JST 2.0mm or PH2 connectors and may require an adapter or re-pinning)
- SMA antenna matched to your frequency band
- USB cable for flashing (Micro-USB for V2, USB-C for V3)
- Optional: weatherproof enclosure (IP65+), SMA bulkhead, cable glands

Why the Heltec LoRa 32 Is Popular

- **Price** - Among the cheapest capable LoRa mesh boards available, often around **$15-20 USD** (volatile; check a current vendor listing, as of 2026-06-08).
- **Built-in OLED** - The 0.96" display shows useful real-time information without any extra hardware.
- **Wide firmware support** - Both Meshtastic and MeshCore support Heltec LoRa 32 V2 and V3 as first-class targets.
- **Compact form factor** - Easier to fit into small enclosures than boards with GPS modules attached.

Flashing Firmware

The flashing procedure follows the same web-flasher approach as other ESP32 boards:

1. Open **Chrome or Edge**.
2. For Meshtastic: navigate to flasher.meshtastic.org. For MeshCore: navigate to flasher.meshcore.io (the canonical MeshCore web flasher run by the MeshCore core team).
3. Connect the Heltec board via USB.
4. Select the correct device: **Heltec LoRa 32 V2** or **Heltec LoRa 32 V3** - these are separate firmware images. Selecting the wrong version is a common mistake.
5. Click **Flash** and wait for the process to complete. The device will reboot automatically.
6. Complete initial configuration via the Meshtastic or MeshCore companion app.

OLED Display Information

When running Meshtastic or MeshCore firmware, the OLED display shows useful runtime information:

- Number of nodes seen on the mesh
- Battery voltage and approximate charge level
- The last received message (truncated)
- GPS coordinates (if a GPS fix is available - note the base Heltec LoRa 32 has no onboard GPS; a GPS fix requires an external GPS module connected via UART)
- Channel and region settings

The display cycles through screens automatically. This makes it ideal for non-headless deployments where you want a quick visual status check without connecting a phone.

Power Notes

- The onboard LiPo charge current is set by the charger IC's PROG resistor and varies by board revision (community/Heltec sources indicate a low default, on the order of ~100 mA on some V2/V3 boards rather than a fixed 500 mA). Check your board's charger IC and PROG resistor for the exact value. A depleted battery can take several hours to fully charge over USB.
- **Polarity caution:** Heltec LiPo connector polarity is not standardized across cells - connecting a battery with reversed polarity can destroy the board and ignite the cell. Verify polarity with a multimeter before connecting, use a protected LiPo, and never charge a swollen cell or charge any lithium cell below 0 °C (32 °F).
- The OLED display draws on the order of **10-20 mA** depending on displayed content (per the SSD1306 datasheet). For power-constrained installs (solar or small battery), disable the display in firmware settings to extend battery life significantly.
- Max TX power: the SX1276 on the V2 has a native maximum of about **+20 dBm (100 mW)** in the typical PA_BOOST configuration. Total active power consumption with OLED enabled is typically 80 - 120 mA during transmit and 30 - 50 mA idle (figures vary with WiFi/BLE state). With OLED disabled, idle drops to approximately 20 - 30 mA.

Enclosure Options

- **Heltec waterproof / solar enclosure** - Heltec sells a waterproof enclosure / solar kit intended for its dev boards, available from Heltec's store and some distributors. Confirm the exact product name and its stated IP rating on Heltec's product page before relying on a specific rating or an OLED-window feature.
- **DIY PVC junction box** - A standard 80×50×26mm or 100×68×40mm PVC electrical junction box works well. Use an SMA bulkhead connector and a proper cable gland through the box wall for the cable entry, and mount the board on standoffs inside. Do not rely on silicone RTV alone to seal cable entries - use a proper cable gland; if RTV is used as a secondary seal, use neutral-cure RTV (not acetic-cure, which corrodes electronics).
- If the OLED display needs to be visible, use a clear-lid polycarbonate box (Hammond 1591 series or equivalent) and verify the lid provides adequate weatherproofing for your environment.

Revision #6
Created 2026-05-03 04:09:03 UTC by Mesh America Admin
Updated 2026-06-13 16:15:58 UTC by Mesh America Admin