

Readiness report — Meshtastic LoRa Mesh Radio Node

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Readiness: Meshtastic LoRa Mesh Radio Node

Verdict: Ready with caveats · 2026-09-03 · est. parts cost \$35–\$60 per core node (optional telemetry sensors add \$1.40–\$54 each) **Cybersecurity — software & network: Do not place on an open network**

This is the cold check — no previous readiness report exists for this lab, so every price, stock level and lifecycle status below establishes the baseline that the next check will measure drift against. The core node is fully sourceable today: the Heltec WiFi LoRa 32 V3 is listed by the vendor at \$17.90–\$19.90 with no end-of-life notice and sells through US resellers at \$28.57–\$35.99, and the antenna, U.FL-to-SMA pigtail, 1S LiPo and USB-C data cable are all commodity items in stock. The caveats are entirely in the optional telemetry-sensor menu: two sensors are obsolete (DPS310XTSA1, TSL2561FN), one is discontinued with no authorized stock anywhere (LTR-390UV-01), one is Not For New Designs (BH1750FVI-TR), and two BOM part numbers (SCD41-2090, WS2812B-B) are listed by no authorized distributor at all. A further group of bare sensor ICs has zero distributor stock with 8–45 week factory lead times, but the snapshot explicitly permits breakout modules for each of them and those breakouts are Active and in stock.

Action required

Part	Problem	Recommended action
DPS310XTSA1	Obsolete at Infineon; zero stock at Newark, Mouser and DigiKey (14-week factory lead); ECIA lifecycle risk High	Substitute DPS368XTSA1 (\$2.70, 196 in stock) — identical package and supply rail, but confirm absolute-vs-gauge pressure reference and Adafruit DPS310 library support first. See Substitutes.
TSL2561FN	Obsolete; zero stock at DigiKey (16-week lead) and Mouser; ECIA lifecycle risk High	Switch the optional light sensor to TSL25911FN (\$1.74, 29,061 in stock), which this lab already supports as its own BOM line and driver. Not a footprint drop-in.
LTR-390UV-01	"Discontinued at DigiKey"; zero stock at Avnet, Mouser and DigiKey (18-week lead)	No verified substitute found — this is the BOM's only UV-capable sensor. Source manually or drop the UV module from the exercise.

Part	Problem	Recommended action
SCD41-2090	No authorized distributor lists this part number (DigiKey 0 results; ECIA "no authorized distributor")	Order SCD41-D-R2 (\$20.54, 13,032 in stock) — Sensirion's actual catalog code for this sensor.
WS2812B-B	No authorized distributor lists this part number (DigiKey 0 results; ECIA "no authorized distributor")	Order a generic 5050 WS2812B: SparkFun 16347 (\$0.68, 196,668 in stock). Confirm the 3.3 V data-logic threshold from the datasheet.
BH1750FVI-TR	Not For New Designs; only one ECIA distributor holds stock	Buildable today (2,532 in stock at \$3.42) — buy what the course needs now, and expect to switch to VEML7700 or OPT3001 at the next check.
BME280, BME680, BMM150, MPU-6050, ICM-20948 (bare ICs)	Zero stock across ECIA-authorized distributors; 8–45 week factory lead times; MPU-6050 and ICM-20948 carry High lifecycle and supply-chain risk	Buy the vendor breakout boards the snapshot already permits — all Active and in stock. See Substitutes.
USB Type-A to Type-C cable	Heltec's own FAQ states the board reboots intermittently below 600 mA; the snapshot specifies only "minimum 500 mA rated"	Specify a data cable rated 600 mA or better. The Adafruit #4474 cable below is forced to 5 V at up to ~2 A.
DFRobot Lark Weather Station	Not carried by DigiKey or any ECIA distributor (SKU EDU0157-EN returned 0 results); vendor page carried no price	Order direct from DFRobot; price not established this run.

Cybersecurity — software & network

Do not place on an open network — The firmware grants unauthenticated administrative access - including export of the node's private keys - to anyone on its Bluetooth, USB, Wi-Fi or Ethernet interfaces by design, and that has no fix, only isolation.

Component	Version	How known	Support status
Meshtastic firmware (meshtastic/firmware)	not determined	not determined (The lab's firmware_platformio.ini pins library archives, not a firmware release; its - DAPP_VERSION=1.0.0 is a build placeholder, not the firmware's version.)	—

Component	Version	How known	Support status
Meshtastic Python client and CLI (meshtastic, PyPI)	not determined	unpinned (python_cli_README.md installs from PyPI with no version constraint, so an instructor gets whatever is current on the day.)	—
PlatformIO Core build toolchain	not determined	unpinned (firmware_platformio.ini names PlatformIO as the build system without a version.)	—
Espressif Arduino core framework	not determined	unpinned (firmware_platformio.ini line 80 sets framework = arduino with no version.)	—
Cppcheck static analysis tool	not determined	not determined (firmware_platformio.ini line 71 sets check_tool = cppcheck with no version.)	—
RadioLib (LoRa transceiver driver)	510e00cfb05bbc3c2b7b524262785454944adb6e	inferred (Commit-pinned GitHub archive at firmware_platformio.ini line 105, as recorded in the snapshot; not re-read from a file fetched this run.)	—
meshtastic/ device-ui (on-device and web UI)	5870d3a55254aa46bbcab13a5a700d533ab304e3	inferred (Commit-pinned GitHub archive at firmware_platformio.ini line 109, as recorded in the snapshot.)	—
Nanopb (protocol buffer runtime)	0.4.92	inferred (GitHub tag archive at firmware_platformio.ini line 68, as recorded in the snapshot; PyPI has no such version (see Not checked).)	—
TBPubSubClient (MQTT client)	v2.12.1	inferred (Tag archive at firmware_platformio.ini line 94, as recorded in the snapshot.)	—

Component	Version	How known	Support status
NTPClient	3.2.1	inferred (Tag archive at firmware_platformio.ini line 96, as recorded in the snapshot.)	—
Syslog (UDP logging client)	v2.0	inferred (Tag archive at firmware_platformio.ini line 101, as recorded in the snapshot.)	—
Arduino/ PlatformIO library set (about 50 further archives)	not determined	not determined (Each is pinned by git tag or commit in firmware_platformio.ini; none belongs to a package registry with an advisory database.)	—
urllib3	2.6.3	read from project (poetry.lock of meshtastic/python, fetched this run)	—
click	8.1.8	read from project (poetry.lock of meshtastic/python, fetched this run)	—
requests	2.32.5	read from project (poetry.lock of meshtastic/python, fetched this run)	—
pillow	11.3.0	read from project (poetry.lock of meshtastic/python, fetched this run (12.0.0 is also pinned there and carries the same advisories))	—
jupyterlab	4.5.7	read from project (poetry.lock of meshtastic/python, fetched this run)	—
jupyter-server	2.18.2	read from project (poetry.lock of meshtastic/python, fetched this run (2.19.0 also pinned there, same advisory))	—
mistune	3.2.1	read from project (poetry.lock of meshtastic/python, fetched this run)	—

Component	Version	How known	Support status
tornado	6.5.6	read from project (poetry.lock of meshtastic/python, fetched this run)	—
soupsieve	2.8	read from project (poetry.lock of meshtastic/python, fetched this run)	—
pyarrow	18.1.0	read from project (poetry.lock of meshtastic/python, fetched this run (22.0.0 also pinned there, same advisory))	—
bleach	6.3.0	read from project (poetry.lock of meshtastic/python, fetched this run (6.2.0 also pinned there))	—
werkzeug	3.0.6	read from project (poetry.lock of meshtastic/python, fetched this run)	—
flask	3.0.3	read from project (poetry.lock of meshtastic/python, fetched this run)	—
pytest	8.4.2	read from project (poetry.lock of meshtastic/python, fetched this run)	—
setuptools	82.0.1	read from project (poetry.lock of meshtastic/python, fetched this run)	—

Component	Finding	Severity	Fix available?
jupyter-server	The notebook server pinned in the Meshtastic Python project's poetry.lock stores cross-site scripting through its nbconvert handlers; it runs on the instructor's computer, not on the radio node. — GHSA-fcw5-x6j4-ccmp , CVE-2026-44727	critical	Yes - update to 2.20.0

Component	Finding	Severity	Fix available?
click	The command-line parsing library pinned in the project's lockfile lets an unprivileged caller inject operating-system commands through <code>click.edit()</code> . — PYSEC-2026-2132 , CVE-2026-7246	high	Yes - update to 8.3.3
jupyterlab	The notebook environment declared in <code>pyproject.toml</code> has several cross-site scripting and extension-blocklist bypass flaws; it is analysis tooling on the instructor's computer, not firmware on the node. — GHSA-gx64-gj6p-pc4c , GHSA-pppj-hq3g-57pj , GHSA-89vp-jrxv-24w8 , GHSA-h5v5-8746-g7mm (+2 more)	high	Yes - update to 4.5.10
mistune	The markdown renderer that comes with the notebook toolchain can be stalled by crafted input and can be tricked into emitting javascript: URLs. — GHSA-qcq2-496w-v96p , GHSA-4j32-57v6-6g45 , GHSA-c8j7-8cv4-2xmq , GHSA-ffq3-xpv3-j92q (+2 more)	high	Yes - update to 3.3.0
pillow	The image library used by the project's plotting and notebook extras has several out-of-bounds writes and decompression-bomb bypasses that a malicious image file could trigger on the instructor's computer. — GHSA-xj96-63gp-2gmr , GHSA-pwv6-vv43-88gr , GHSA-ijj6-mw9f-p565 , GHSA-6r8x-57c9-28j4 (+2 more)	high	Yes - update to 12.3.0
pyarrow	The data-table library used by the project's analysis extras has a use-after-free when reading a crafted Arrow IPC file. — GHSA-rgxp-2hwp-jwgg , CVE-2026-25087	high	Yes - update to 23.0.1
soupsieve	The CSS selector library used by the HTML tooling can be driven into memory exhaustion or a regular-expression denial of service by long selector lists. — GHSA-2wc2-fm75-p42x , GHSA-836r-79rf-4m37	high	Yes - update to 2.8.4

Component	Finding	Severity	Fix available?
tornado	The web server underneath the notebook toolchain can be stalled by a single crafted request and leaks per-request credentials when its curl client reuses handles. — GHSA-mpf4-983q-p7j4 , GHSA-pw6j-qg29-8w7f , GHSA-8423-8fgw-73vq , GHSA-www5-g3v4-889x	high	Yes - update to 6.5.8
urllib3	The HTTP library the CLI uses to talk to the network can be made to bypass decompression-bomb limits and can leak sensitive headers across origins on proxied redirects. — GHSA-mf9v-mfxr-j63j , GHSA-qccp-gfcp-xxvc	high	Yes - update to 2.7.0
bleach	The HTML sanitiser used by the notebook toolchain lets some dangerous URI schemes through, and one of its three flaws - CPU exhaustion in linkify(parse_email=True) - has no fixed version at all. — GHSA-gj48-438w-jh9v , GHSA-g75f-g53v-794x , GHSA-8rfp-98v4-mm6	moderate	Mitigation only - updating to 6.4.0 fixes two of the three; for the email-linkify CPU exhaustion there is no fixed release, so avoid linkify(parse_email=True) on untrusted text.
pytest	The test runner declared in pyproject.toml handles temporary directories unsafely; it matters only to someone running the project's own test suite. — GHSA-6w46-j5rx-g56g , CVE-2025-71176	moderate	Yes - update to 9.0.3
requests	The HTTP client the CLI uses reuses an insecure temporary file in extract_zipped_paths(), which a local user on the same machine could exploit. — GHSA-gc5v-m9x4-r6x2 , CVE-2026-25645	moderate	Yes - update to 2.33.0
setuptools	The Python packaging tool can be tricked into including files a MANIFEST.in meant to exclude when building a source distribution on macOS. — GHSA-h35f-9h28-mq5c , CVE-2026-59890	moderate	Yes - update to 83.0.0

Component	Finding	Severity	Fix available?
werkzeug	The web toolkit under the project's dashboard extras mishandles Windows special device names in <code>safe_join()</code> , which can be used to reach unintended files on a Windows host. — GHSA-29vq-49wr-vm6x , GHSA-87hc-h4r5-73f7 , GHSA-hgf8-39gv-g3f2	moderate	Yes - update to 3.1.6
flask	The web framework under the project's dashboard extras omits a <code>Vary: Cookie</code> header in some session paths, which can cause a shared cache to serve one user's page to another. — GHSA-68rp-wp8r-4726 , CVE-2026-27205	low	Yes - update to 3.1.3
LoRa channel encryption	Group and broadcast channel traffic is protected only by a shared pre-shared key with AES256-CTR and is unauthenticated on firmware 2.7.x and earlier, so anyone holding the channel key can transmit as any node; because this lab's firmware version is not determined, it is unknown whether the 2.8.x packet signing applies.	posture	Mitigation only - give each class its own channel key rather than a shared default, and treat everything sent on a channel as readable by anyone who has that key.
Meshtastic firmware - local trust boundary	By design the node grants full, unauthenticated administrative access over Bluetooth LE, USB serial, Wi-Fi and Ethernet: anyone who reaches one of those links can read decrypted traffic, transmit as the node, change its configuration and export its private keys.	posture	Mitigation only - treat any BLE, USB, Wi-Fi or Ethernet access as complete control of the node: set the BLE pairing PIN, keep nodes physically supervised, and do not enable the Wi-Fi or Ethernet interfaces on a shared campus network.
Meshtastic Python CLI dependencies	Dependencies unpinned: 42 of 42 in <code>pyproject.toml</code> , and the lab itself pins no version of the meshtastic CLI, so what an instructor installs has no fixed, checkable security state.	posture	Mitigation only - pin versions / install from the project's <code>poetry.lock</code> rather than letting pip resolve whatever is current.
MQTT bridge (TBPubSubClient)	The node can bridge mesh packets outward to an MQTT broker over TCP/IP, which republishes classroom mesh traffic beyond the room.	posture	Mitigation only - leave the MQTT uplink disabled unless publishing mesh traffic is an intended part of the exercise.
Syslog and NTP clients	When enabled the node broadcasts log telemetry unencrypted on UDP port 514 and sends unauthenticated time queries on UDP port 123.	posture	Mitigation only - leave syslog off outside debugging, and expect the node to reach a time server if it is on a network.

Component	Finding	Severity	Fix available?
Wi-Fi device administration	Setting Wi-Fi credentials or administering the node over an untrusted Wi-Fi link sends those credentials and the control traffic unencrypted onto the local network.	posture	Mitigation only - do all device configuration over the USB serial link, never over untrusted Wi-Fi.

What this means for your lab

Two things matter here, and neither is a software bug. First, a Meshtastic node hands out complete control to anyone who can reach it over Bluetooth, USB, Wi-Fi or Ethernet - there is no password, by design. Someone within Bluetooth range, or on the same Wi-Fi network, can read the messages your mesh is carrying, send messages that appear to come from your node, change its settings and copy out its private keys. So keep these nodes off the campus network: configure them over the USB cable, leave the Wi-Fi and Ethernet interfaces switched off, set the Bluetooth pairing PIN, and do not leave a node unattended where a stranger can pick it up. Second, the radio channel itself is protected only by a shared key: everyone who has that key can read and send on the channel, so give each class its own key instead of a default one, and treat anything sent over the mesh as readable by anyone you handed the key to. On the software side, the lab pins no version of the Meshtastic firmware or of the Python command-line tool, so we could not check either against a vulnerability database - that is an unknown, not a clean bill of health. The advisories listed above were found in the Meshtastic Python project's own dependency lockfile, and most of them affect notebook and plotting tools that run on your computer rather than anything on the radio; the ones worth acting on are the HTTP libraries the command-line tool actually uses. Before connecting these nodes to anything the campus runs, raise it with campus IT.

Not checked

- Meshtastic firmware (meshtastic/firmware): Version not determined - the lab pins library archives and a placeholder -DAPP_VERSION=1.0.0 rather than a firmware release, so no advisory database could be queried for the firmware itself. This is a real gap, not a clean result.
- Meshtastic Python CLI (the meshtastic package itself): Unpinned - the lab installs whatever PyPI serves on the day, so there is no specific version to check. The advisories above come from the upstream project's own poetry.lock, which is what the project developers pin, not necessarily what pip resolves for an instructor.
- Arduino and PlatformIO libraries pinned in firmware_platformio.ini (about 50 archives): No vulnerability database covers Arduino/PlatformIO library archives pinned by git tag or commit - including RadioLib, meshtastic/device-ui, TBPubSubClient, NTPClient, Syslog, TinyGPSPlus, OneButton, ArduinoThread, arduino-fsm, Fusion, the Adafruit, SparkFun,

Sensirion and DFRobot driver sets. Absence of an advisory here means nothing was checked, not that they are clean.

- PlatformIO Core build toolchain: Version not stated in the sources, so neither a support-status nor an advisory lookup was possible.
- Espressif Arduino core framework: Version not stated in the root configuration (framework = arduino only).
- Cppcheck static analysis tool: Version not stated in the sources.
- nanopb 0.4.92: this version does not exist in the package registry (a kit or hardware release number is not a software version)

Parts

Primary host platform

Part	Spec/Package	Status	Stock	Price	Source
Heltec WiFi LoRa 32 (V3)	ESP32-S3FN8 + SX1262, 18-pin DIP module, onboard 0.96" OLED, SH1.25-2 battery header	Active, no EOL notice on vendor page	Vendor listing live; US resellers stocking	~~\$17.90-\$19.90~~ (Heltec) · ~~\$29.97~~ (Rokland)	Heltec Automation; Rokland, AliExpress \$28.57, Banggood \$35.99

Modular core components (DIY / custom builds)

Part	Spec/Package	Status	Stock	Price	Source
SX1262IMLTRT	150-960 MHz, 22 dBm, 1.8-3.7 V, 24-VFQFN (4x4)	Active	37,721 (DigiKey); Newark 2,188, Mouser 28	~~\$8.53~~	DigiKey (Semtech)
Sub-GHz antenna, 915 MHz, SMA	50 Ω, SMA male whip/paddle	Available (retail)	Multiple sellers	~~\$3.40-~~ ~~\$12.99~~	Elecrow \$3.40, Nooelec \$8.95, Bingfu \$9.99, Meshnology \$12.99. One antenna ships with the Heltec board.
U.FL to SMA female pigtail	RG178, 15 cm, panel-mount SMA	Available	In stock	~~\$3.95~~	Adafruit #851 (SMA, not RP-SMA — #852 is the RP-SMA version and is not compatible)
1S LiPo battery, 1.25 mm connector	3.7 V, 2000 mAh, JST 1.25, PCM protection	Available (retail)	Multiple sellers	~~\$7.95~~	Ameridroid \$7.95, MakerNova \$7.99, MakerFocus 4-pack \$24.99. 1.25 mm connectors have no standard polarity — check before connecting.

Part	Spec/Package	Status	Stock	Price	Source
USB 2.0 Type-A to Type-C cable	~1 m, 28 AWG data + 24 AWG power, 5 V up to ~2 A	Available	In stock	\$4.95	Adafruit #4474 (data cable — power-only cables fail flashing)

Displays, indicators and user controls

Part	Spec/Package	Status	Stock	Price	Source
0.96" I2C OLED module (SSD1306)	128x64, 4-pin 2.54 mm, 3.3-5 V	Available (retail); integrated on the Heltec V3	Multiple sellers	~~\$2.07~~ \$19.50	AliExpress \$2.07, BuyDisplay \$2.49, Elecrow \$3.10, CANADUINO via DigiKey \$4.99
PTS645SM43SMTR92 LFS (tactile switch, x2)	SPST NO, finger-accessible tactile	Active	173,986	\$0.36	DigiKey (C&K)
WS2812B-B (addressable RGB LED)	5050 SMD, single-wire 800 kHz	Part number not listed by any authorized distributor	—	—	DigiKey 0 results; ECIA: no authorized distributor lists this exact part number. See Substitutes.

GNSS / location peripherals

Part	Spec/Package	Status	Stock	Price	Source
Serial GNSS module (u-blox NEO-8M class)	Breakout with ceramic patch antenna, 3.3 V UART, NMEA-0183	Available (retail); bare u-blox modules via distribution	Multiple sellers	~~\$5.00~~ \$49.99	GY-NEO-6M/7M/8M breakout \$5.00 (Xpart); bare u-blox NEO-M8M-0 \$13.26 (DigiKey), \$8.39 (Richardson RFPD)

Environmental telemetry sensors (all optional)

Part	Spec/Package	Status	Stock	Price	Source
BME280	LGA-8 or breakout, 1.71–3.6 V, I2C	Bare IC hard to obtain (0 stock ECIA-wide, 12-week lead); breakout Active	2,603 (breakout)	\$14.95	Adafruit #2652 breakout (bare Bosch BME280 unavailable)

Part	Spec/ Package	Status	Stock	Price	Source
DPS310XTSA1	8-VFLGA (PG-VLGA-8-1), 1.7–3.6 V	Obsolete	0 everywhere; 14-week factory lead	no price	DigiKey (Infineon) — see Substitutes
LPS22HBTR	10-WFLGA / 10-HLGA (2x2), 1.7– 3.6 V	Active	0 at DigiKey; Future 16,000, Newark 11,973, Arrow 2,914, Mouser 86	\$3.18 (DigiKey list) · \$3.12 Newark	ST via Newark/ Future/Arrow
MCP9808-E/MS	8-MSOP, 2.7–5.5 V	Active	4,965	\$1.40	DigiKey (Microchip)
PCT2075DP,118	8-TSSOP, 2.7–5.5 V	Active	61,665	\$0.76	DigiKey (NXP)
AHT20	SMD-6 or breakout, 2.0–5.5 V, I2C 0x38	Bare part not ECIA- listed; module Active	1,183	\$4.50	Adafruit #5183 (2.2–5.5 V, 4-SIP); #4566 STEMMA QT also \$4.50, 833
SHT31-DIS-B	8-VDFDN / 8- DFN (2.5x2.5), 2.15–5.5 V	Active	18,534 (reel code B2.5KS); Newark 9,573 on the base number	\$4.50 · \$4.88 Newark	DigiKey stocks SHT31-DIS-B2.5KS (same die/package, reel quantity suffix)
SCD41-2090	SMD-20 or breakout, 2.4–5.5 V	Part number not listed by any authorized distributor	—	—	DigiKey 0 results; ECIA: none. Order SCD41-D-R2 instead — see Substitutes.
SCD30	Module, 3.3– 5.5 V, 75 mA	Active	6,690	\$47.36	DigiKey (Sensirion)
SFA30	Module, 4- pin header, 3.15–5.5 V	Active	111	\$54.00	Seeed Grove SFA30 via DigiKey (bare SFA30 not ECIA- listed)
BME680	LGA-8 or breakout, 1.71–3.6 V	Bare IC hard to obtain (0 stock ECIA-wide, 12-week lead); breakout Active	269 (breakout)	\$18.95	Adafruit #3660; DFRobot SEN0248 \$18.90 (52)

Part	Spec/ Package	Status	Stock	Price	Source
HM3301 (PM2.5)	Module, 8-pin, 3.3–5 V	Active	52	\$32.90	Seeed Grove HM3301 via DigiKey (Seeed's own page returned no price)
MLX90614ESF-BAA-000-TU	TO-39, 3.3 V (BAA variant)	Active	1,280	\$10.42	DigiKey (Melexis)
MLX90632SLD-DCB-000-RE	5-SFN (3x3), 3.0–3.6 V	Active	3,021	\$11.76	DigiKey (Melexis)
MPU-6050	QFN-24 or GY-521 breakout, 2.375–3.46 V	Bare IC hard to obtain (0 stock, 26-week lead, lifecycle risk High); breakout Active	895 (breakout)	\$12.95	Adafruit #3886; DFRobot SEN0142 \$12.90 (557)
ICM-20948	QFN-24 or breakout, 1.71–1.95 V logic	Bare IC hard to obtain (0 stock, 45-week lead, lifecycle risk High); Adafruit breakout Active	822 (breakout)	\$19.95	Adafruit #4554. SparkFun #15335 is Obsolete — do not order it.
ICM-42670-P	14-VFLGA (2.5x3), 1.71–3.6 V	Active but thin	0 at DigiKey (45-week lead); Mouser 72	\$2.89 DigiKey list · \$3.47 Mouser · \$32.45 chip carrier	Buy from Mouser while stock holds
LIS3DHTR	16-VFLGA (3x3), 1.71–3.6 V	Active but thin	0 at DigiKey; Mouser 150	\$1.94	ST via Mouser
LSM6DSOXTR	14-VFLGA (2.5x3)	Active	32 at DigiKey; Newark 18,486	\$5.30 · \$3.43 Newark	ST
QMC5883L	LCC-16 (3x3) or breakout, 2.16–3.6 V	Bare IC not ECIA-listed; module Active	39	\$4.56	Olimex MOD-QMC5883L. DigiKey's description reads "EVAL BOARD FOR HMC5883" — see Substitutes before ordering.

Part	Spec/ Package	Status	Stock	Price	Source
BMM150	WLCSP-12 or breakout, 1.62–3.6 V	Bare IC hard to obtain (0 stock, 8-week lead, lifecycle risk High); breakout Active	30 (breakout)	\$6.90	DFRobot SEN0419 Fermion; Seeed #101020492 \$11.80 (57)
MMC5983MA	16-VFLGA (3x3), 2.8–3.5 V	Active	39,569	\$3.32	DigiKey (MEMSIC)
TSL25911FN	6-WDFN / 6-DFN (2x2.2), 2.7–3.6 V	Active	29,061	\$1.74	DigiKey (ams OSRAM)
TSL2561FN	6-WDFN / 6-DFN (2x2), 2.7–3.6 V	Obsolete	0 at DigiKey (16-week lead) and Mouser	no price	DigiKey (ams OSRAM) — see Substitutes
BH1750FVI-TR	6-WSOF, 2.4–3.6 V	Not For New Designs	2,532 (DigiKey only)	\$3.42	DigiKey (ROHM)
VEML7700-TR	4-SMD J-lead, 2.5–3.6 V	Active	7,520	\$1.44	DigiKey (Vishay)
OPT3001DNPR	6-UDFN / 6-USON (2x2), 1.6–3.6 V	Active	14,936	\$1.48	DigiKey (TI)
LTR-390UV-01	6-WDFN, 1.7–3.6 V	Discontinued at DigiKey	0 at Avnet, Mouser, DigiKey (18-week lead)	no price	DigiKey (Lite-On) — no substitute verified
AS3935-BQFT	MLPQ-16 (4x4), 2.4–5.5 V	Active	1,421 (DigiKey); Mouser 4,001	\$9.35	DigiKey (ScioSense)
MAX30102EFD+T	14-pin OESIP	Active	2,173	\$14.72	DigiKey (ADI/Maxim)

Power and telemetry monitor hardware

Part	Spec/Package	Status	Stock	Price	Source
INA219AIDR	SOT-23-8, 3.0–5.5 V	Active	29,736	\$2.12	DigiKey (TI)
INA226AIDGSR	VSSOP-10, 2.7–5.5 V	Active	95,750	\$2.82	DigiKey (TI)

Part	Spec/Package	Status	Stock	Price	Source
INA260AIPWR	TSSOP-16, 2.7-5.5 V	Active	9,274	\$6.56	DigiKey (TI)
INA3221AIRGVR	QFN-16 (4x4), 2.7-5.5 V	Active	74,078	\$3.47	DigiKey (TI)
MAX17048G+T10	TDFN-8 (2x3), 2.5-4.5 V	Active	16,471	\$4.61	DigiKey (ADI/Maxim)
NAU7802SGI	SOP-16, 2.7- 5.5 V	Active	129,489	\$2.07	DigiKey (Nuvoton)
ADS1115IDGSR	VSSOP-10, 2.0-5.5 V	Active	42,250	\$5.28	DigiKey (TI)
DS2482S-100+T&R	SOIC-8, 1.71- 5.5 V	Active	34,009	\$3.57	DigiKey (ADI/Maxim)
DFRobot Rainfall Sensor	Tipping bucket, I2C/ UART, 3.3-5 V	Active	73	\$29.90	DFRobot SEN0575 via DigiKey. Vendor page warns the signal adapter board is not waterproof.
DFRobot Lark Weather Station	5-in-1 module, UART/I2C, 3.3- 5 V	not checked (no distributor listing, vendor page carried no price)	—	—	Product confirmed current on DFRobot's page; order direct

Substitutes

For part	Substitute	Differences	Verified	Judgment
DPS310XTSA1 (obsolete)	DPS368XTSA1 — \$2.70, 196 in stock	Package identical (8-VFLGA, supplier package PG- VLGA-8-1 on both); supply identical (1.7-3.6 V both, covers the 3.3 V rail); operating temperature identical (-40 to 85 °C). DigiKey's descriptions differ: DPS310XTSA1 "17.4PSIA" (absolute) vs DPS368XTSA1 "17.4PSIG" (gauge) — absolute is what barometry needs.	verified: package + supplier device package (DigiKey parametrics, both parts), supply range (DigiKey parametrics, both parts), operating temperature (DigiKey parametrics, both parts). not verified: pressure reference type (absolute vs gauge), Adafruit DPS310 library compatibility	Acceptable on footprint and supply rail — confirm the pressure reference and driver support against the datasheet before ordering

For part	Substitute	Differences	Verified	Judgment
TSL2561FN (obsolete)	TSL25911FN — \$1.74, 29,061 in stock	Supply identical (2.7–3.6 V both). Package NOT equivalent: 6-DFN (2x2) vs 6-DFN (2x2.2) — a hard stop for a shared PCB land pattern, though this lab wires breakout modules on 2.54 mm headers rather than a custom board. Different driver too: Adafruit_TSL2561 vs Adafruit TSL2591, and the lab already supports TSL2591 in its own right.	verified: supply range (DigiKey parametrics, both parts). not verified — disproved: footprint equivalence (DigiKey parametrics show 6-DFN 2x2 vs 6-DFN 2x2.2)	Acceptable as a sensor swap with the TSL2591 driver; NOT a footprint-compatible drop-in
SCD41-2090 (no distributor listing)	SCD41-D-R2 — \$20.54, 13,032 in stock	Part-number correction rather than a component change: SCD41-D-R2 is Sensirion's catalog code. Supply 2.4–5.5 V matches the snapshot's 2.4–5.5 V requirement; operating range -10 to 60 °C.	verified: supply range (DigiKey parametrics vs snapshot). not verified: package/ footprint (no package parametric returned for either number), and that "SCD41-2090" and SCD41-D-R2 name the same catalog item	Acceptable — order SCD41-D-R2
WS2812B-B (no distributor listing)	SparkFun 16347 — \$0.68, 196,668 in stock; XINGLIGHT XL-5050RGBC-WS2812B-S \$0.0625, 70,000 in stock	Body size matches the snapshot's 5050 requirement: 5.00 mm x 5.00 mm on both, 4-SMD J-lead on the XINGLIGHT part. Supply and logic threshold are NOT established — the only voltage figure returned is a forward voltage, not a supply rail or a data-logic threshold.	verified: package/ body size 5050 (DigiKey parametrics, both candidates). not verified: supply range, 3.3 V logic-level compatibility	Plausible and cheap, not fully verified — confirm the 3.3 V data threshold before driving it from the ESP32-S3 rail

For part	Substitute	Differences	Verified	Judgment
QMC5883L (bare IC unlisted)	Olimex MOD-QMC5883L — \$4.56, 39 in stock (3.95 EUR direct from Olimex)	The claim this hinges on is that the module carries QMC5883L, not HMC5883L — the snapshot warns their I2C register maps differ, and DigiKey's description misleadingly reads "EVAL BOARD FOR HMC5883". Olimex's product page, fetched this run, sells MOD-HMC5883L and MOD-QMC5883L as two variants of one page and states the QMC5883 replaced the obsolete HMC5883.	verified: sensor identity, QMC5883L not HMC5883L (Olimex product page fetched this run). not verified: supply range and footprint (no DigiKey parametrics returned for this module); Olimex's "same functionality" wording is the vendor's, and the snapshot says the register maps differ	Acceptable — order by the MOD-QMC5883L variant code, never by the DigiKey description
BME280, BME680, MPU-6050, ICM-20948, BMM150, AHT20, SFA30, HM3301 (bare ICs with no distributor stock)	Adafruit 2652 \$14.95 · Adafruit 3660 \$18.95 · Adafruit 3886 \$12.95 · Adafruit 4554 \$19.95 · DFRobot SEN0419 \$6.90 · Adafruit 5183 \$4.50 · Seeed 101020972 \$54.00 · Seeed 101020613 \$32.90	Breakout board instead of a bare LGA/QFN die. The snapshot names a breakout board as an allowed footprint for every one of these parts, and this lab wires modules on 2.54 mm headers rather than a custom PCB, so the package change costs nothing. Each breakout is Active and in stock where the bare IC is not.	verified: lifecycle, price and stock for each breakout (DigiKey lookups this run); the snapshot's own text permitting a breakout footprint for each part. not verified: that each breakout carries the exact sensor die and I2C address the firmware driver expects — the DigiKey descriptions name the sensor, but no datasheet or vendor page was fetched for these eight modules	Acceptable — this is the intended sourcing path for the optional sensors
LTR-390UV-01 (discontinued)	None proposed	The lab's other light sensors (TSL2591, VEML7700, OPT3001, BH1750) are ambient-light only and do not provide the UV channel. DigiKey's top keyword hit, MikroElektronika MIKROE-6856 "Ambient 26 Click" (\$19.00, 3 in stock), is not evidenced to carry an LTR-390UV part, so it is not proposed.	not stated — no substitute was verified	No substitute: source the LTR390 module manually or drop the UV measurement from the exercise

Verify any substitute against its datasheet before ordering.

Other dependencies

- **PCB fabrication** — not applicable. The snapshot records that no Gerber, drill or layout files were supplied, and that the Heltec V3's own fabrication parameters are internal to Heltec Automation. The DIY variant is breadboard or an unspecified 2/4-layer carrier board, so there is nothing to quote.
- **Meshtastic project documentation** (meshtastic.org/docs, the build guide, flashing instructions, the encryption technical reference, the Python CLI installation guide, python.meshtastic.org) — not checked this run.
- **PlatformIO project documentation** (docs.platformio.org) — not checked this run.
- **github.com/meshtastic/python** — live: the repository was listed successfully during this run's dependency check.
- **github.com/meshtastic/firmware** and the ghcr.io/meshtastic/python container image — not checked this run as download locations.
- **Heltec vendor documentation** (heltec.org product page, schematics, datasheet, user manual links) — page reachable and current as of this run.

Watch list

- **Heltec WiFi LoRa 32 V3** — a single-vendor COTS board that the entire default build environment (`heltec-v3`) depends on. Vendor price \$17.90–\$19.90 today, US resellers \$28.57–\$35.99. A discontinuation here would force a variant build target for the whole lab.
- **BH1750FVI-TR** — Not For New Designs with exactly one distributor holding stock. Most likely part to become unobtainable before the next check.
- **ICM-42670-P and LIS3DHTR** — each has exactly one ECIA distributor with stock, against 24–45 week factory lead times.
- **LSM6DSOXTR at DigiKey** — 32 pieces; Newark carries the depth, so ordering channel matters more than availability.
- **The bare-IC group (BME280, BME680, BMM150, MPU-6050, ICM-20948)** — zero authorized stock today. The breakout workaround holds only while the module vendors keep building them; MPU-6050 and ICM-20948 both carry High lifecycle and supply-chain risk.
- **DPS310XTSA1 and TSL2561FN** — already obsolete; remaining channel inventory will drain.