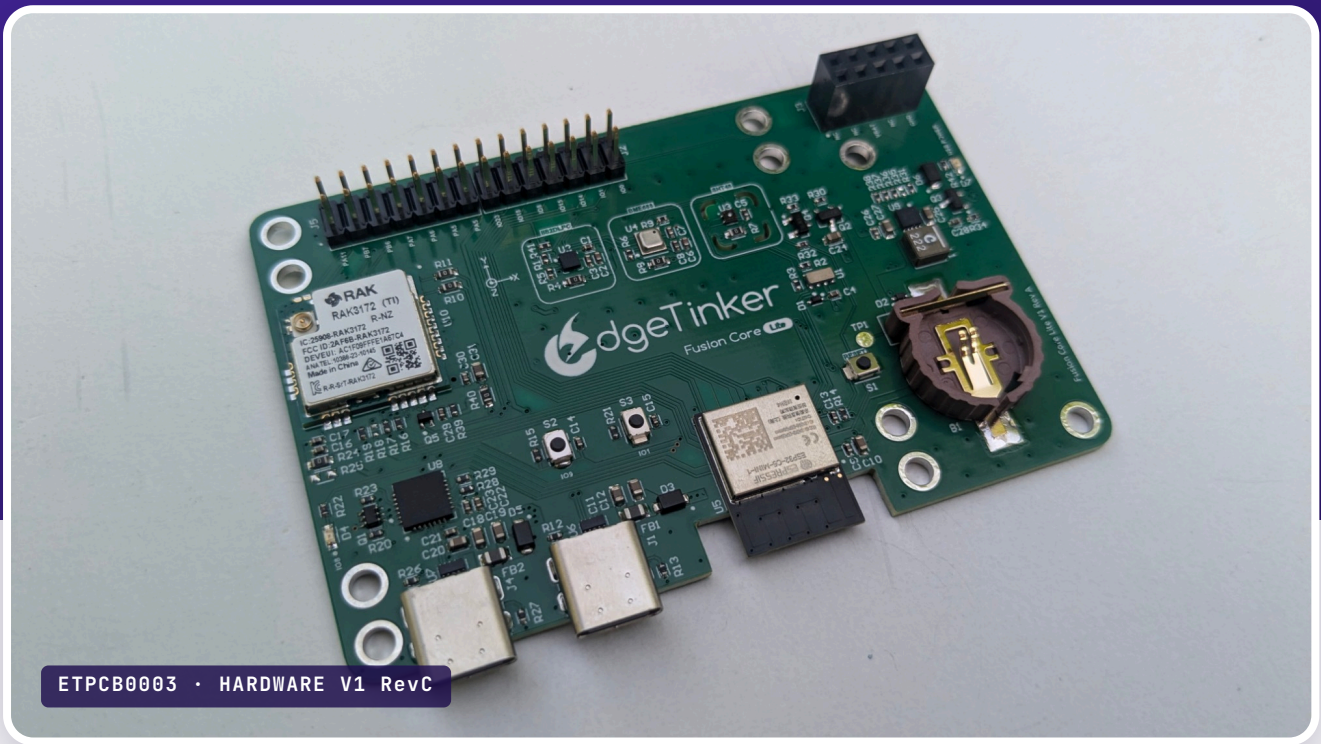
DEVELOPMENT BOARD · PRELIMINARY

EdgeTinker Lite

LoRa, Wi-Fi 6, Bluetooth LE and Zigbee on one ultra-low-power board



OVERVIEW

EdgeTinker Lite is a development board for battery-powered wireless projects. An ESP32-C6 runs your code and gives you Wi-Fi 6, Bluetooth LE and Zigbee. A RAK3172 module adds long-range LoRa and LoRaWAN, driven from the ESP32-C6 low-power UART.

Motion, temperature, humidity and VOC sensors, a real-time clock and a microSD socket are already on the board. The board is built to sleep: the sensors and SD card sit on a 3.3 V rail your code can switch off.

CONTROLLER
ESP32-C6
Wi-Fi 6 · BLE · Zigbee · 4 MB flash

LONG RANGE
RAK3172
LoRa / LoRaWAN, IPEX antenna

POWER
3.3 V · 400 mA
USB-C or 1.8 to 5.5 V battery

ON BOARD
4 sensors + SD
Accel · T/RH · VOC · RTC · microSD

- LoRaWAN sensor nodes
- LoRa to Wi-Fi / BLE / Zigbee bridges
- Environmental data loggers
- Wake-on-motion trackers
- ESP32-C6 + Qwiic prototyping

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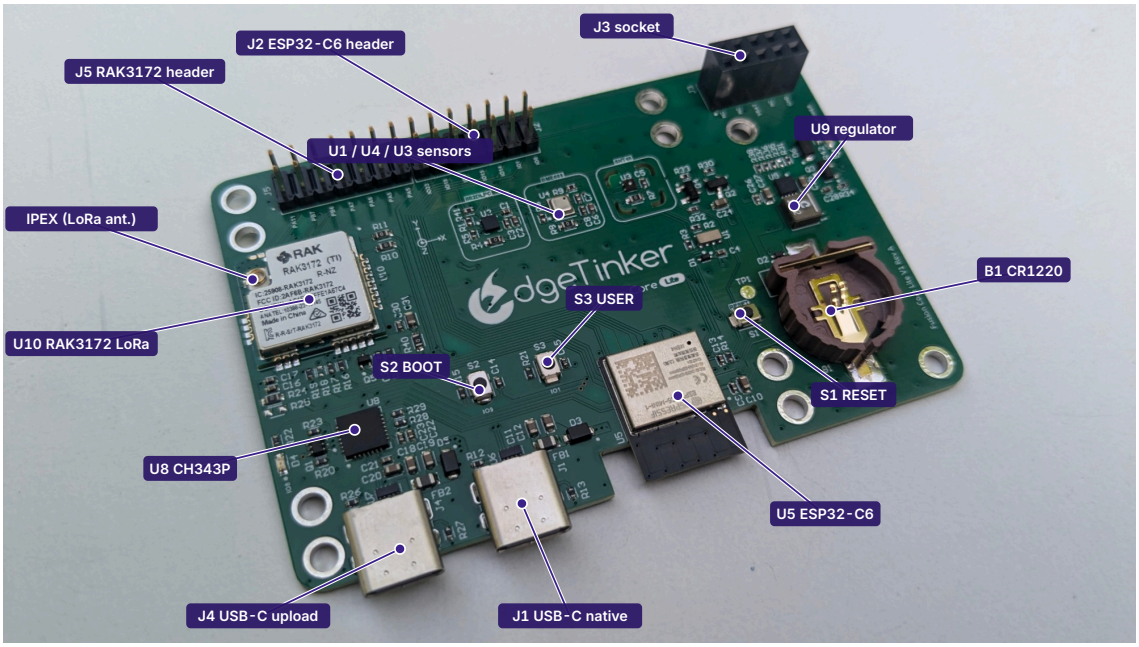
1 Features

- **ESP32-C6-MINI-1 module** (4 MB flash): 2.4 GHz Wi-Fi 6, Bluetooth LE and IEEE 802.15.4 (Zigbee), PCB antenna
- **RAK3172 LoRa / LoRaWAN module** with an IPEX connector for an external antenna, wired to the ESP32-C6 low-power UART
- **Switchable 3.3 V rail** (3V3_COM) for the sensors, RTC supply, microSD and I2C pull-ups, controlled from IO2
- **Sensors:** LIS2DH12 3-axis accelerometer with wake-on-motion interrupt, AHT20 temperature and humidity, AGS10 VOC gas
- **PCF85063A real-time clock** with a CR1220 backup cell holder; **microSD** socket on SPI
- **Two USB-C ports:** CH343P USB-to-UART with auto-download (J4) and ESP32-C6 native USB (J1)
- **Power** from USB or a battery on a JST XH connector, automatic switchover, TPS63900 buck-boost regulator, 3.3 V at 400 mA
- **Expansion:** Qwiic-compatible I2C connector, 2.54 mm headers for the ESP32-C6 (J2) and RAK3172 (J5) pins, 2×5 socket (J3)
- **User interface:** reset, boot and user buttons; green user LED and red USB power LED

1.1 Variants

SKU	LoRa module	LoRa band	Flash	Notes
ETPCB0003	RAK3172-T-9-SM-I	915 / 920 / 923 MHz (BOM description)	4 MB	Only variant defined. Other regional variants: TBD

1.2 Board views



Early prototype photo; the V1 RevC silkscreen differs. Labels from the Confluence design page.

Figure 1. Product photo with the main components labelled. The to-scale V1 RevC layout is in Figure 7.

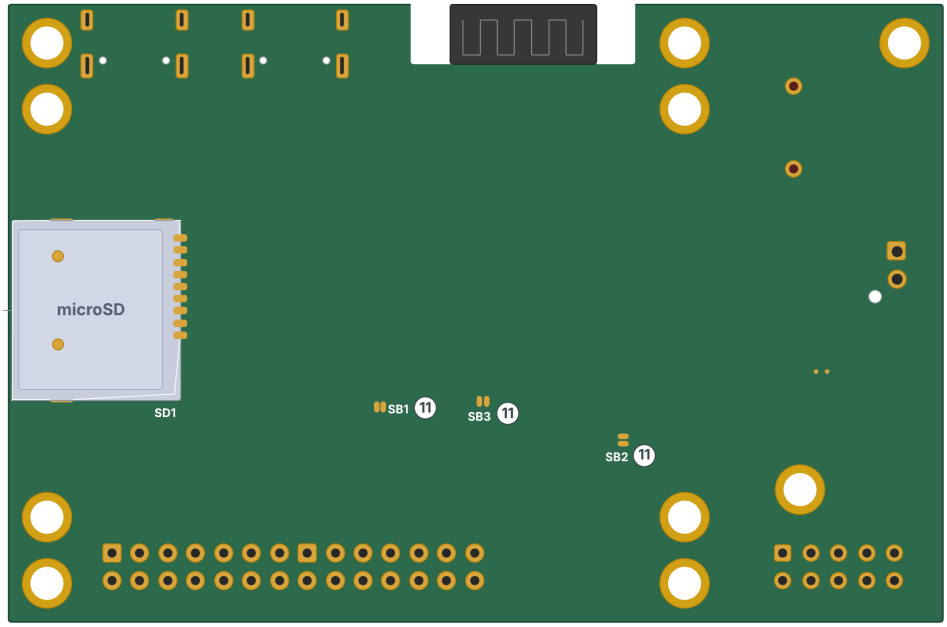


Figure 2. Bottom view, board flipped top to bottom, drawn to scale from the PCB. The microSD socket SD1 and solder bridges SB1 to SB3 (marker 11) are on this side.

1.3 Specifications

Processing and memory

Item	Part	Details
Main controller	ESP32-C6-MINI-1-H4 (U5), Espressif	Runs user code. Wi-Fi 6, Bluetooth LE, IEEE 802.15.4. CPU core, clock and RAM: TBD (not stated in the product documentation)
Flash	In the ESP32-C6 module	4 MB
LoRa co-processor	RAK3172-T-9-SM-I (U10), RAKwireless	LoRa / LoRaWAN module, AT commands on its UART2 (wired to the ESP32-C6 LP UART). Factory firmware version: TBD
Real-time clock	PCF85063AT/AY (U2), NXP	32.768 kHz crystal Y1, CR1220 backup. INT and CLKOUT not connected
Storage	microSD socket SD1 (Molex 1040310811)	SPI on IO19 to IO22. Maximum card size: TBD

Connectivity

Radio	Module	Antenna
Wi-Fi 6 (802.11ax), 2.4 GHz	ESP32-C6	On-module PCB antenna
Bluetooth LE	ESP32-C6	On-module PCB antenna
IEEE 802.15.4 (Zigbee)	ESP32-C6	On-module PCB antenna
LoRa / LoRaWAN	RAK3172 (915 / 920 / 923 MHz BOM variant)	External antenna on the module IPEX connector. Fit the antenna before transmitting

RF output power, sensitivity and range: TBD (test cases TC-015 and TC-016 not run).

On-board devices

Device	Function	Interface
LIS2DH12 (U1)	3-axis accelerometer	I2C 0x18, INT1 on IO0 (wake-on-motion)
AHT20 (U3)	Temperature and humidity	I2C 0x38
AGS10 (U4)	VOC gas sensor	I2C 0x1A
PCF85063A (U2)	Real-time clock	I2C 0x51
microSD socket (SD1)	Storage	SPI: SCK IO19, MOSI IO20, MISO IO21, CS IO22
RAK3172 (U10)	LoRa / LoRaWAN	LP UART: IO4 receive, IO5 transmit; reset on IO3
User LED D4	Green	IO8, high = on
User button S3	Push button	IO1, low when pressed

Interfaces

Interface	Connector / pins	Notes
USB (upload, console)	J4 USB-C, CH343P	UART0 (IO16, IO17) with DTR / RTS auto-download
USB (native)	J1 USB-C	ESP32-C6 USB on IO12 (D-) and IO13 (D+)
I2C	IO6 SDA, IO7 SCL; J7, J2, J3	10 kΩ pull-ups to 3V3_COM: switch the rail on before using the bus
SPI	IO19 to IO22	Used by the microSD socket
Free GPIO	J2: IO14, IO15, IO18, IO23	Plus IO0, IO1 and IO8, shared with the accelerometer interrupt, user button and user LED. Any GPIO can output PWM (LEDC)
ADC	J2: IO0 (ADC1_CH0), IO1 (ADC1_CH1)	Shared with ACC_INT and the user button
RAK3172 breakout	J5	UART1, SPI, I2C, SWD, BOOT0 and reset of the LoRa module

Power

Item	Details
Inputs	5 V from either USB-C port; battery on J6 (JST XH 2-pin). USB takes over from the battery automatically
Battery	1.8 to 5.5 V on J6, reverse-polarity protected. Chemistry: TBD. No charger on this revision
Regulator	TPS63900 buck-boost (U9), 3.3 V, 400 mA design value shared with the on-board circuits
Switched rail	3V3_COM through P-MOSFET Q2, IO2 high = on, off after reset
Protection	ESD protection on both USB ports (TPD4E05U06, U6 and U7); reverse-polarity diode D9 on the battery input. No over-current protection

2 Ratings

> **Preliminary data.** No electrical value has been measured on V1 hardware yet (all test cases are NOT RUN). Values below are design values from the product documentation. Fields marked TBD will be filled from validation results.

2.1 Absolute maximum ratings

Stresses beyond these limits may permanently damage the board. They are stress ratings only; functional operation is not implied.

Parameter	Min	Typ	Max	Unit	Notes
USB input voltage (VUSB1, VUSB2)	TBD	–	TBD	V	
Battery input voltage (J6)	TBD	–	TBD	V	Reverse-polarity protected by D9
Voltage on any I/O pin	TBD	–	TBD	V	Pins are not 5 V tolerant
Storage temperature	TBD	–	TBD	°C	

2.2 Recommended operating conditions

Parameter	Min	Typ	Max	Unit	Notes
USB input voltage	TBD	5	TBD	V	Either USB-C port
Battery input voltage (J6)	1.8	–	5.5	V	Design range from the pinout reference; to be confirmed by test
3.3 V rail output current (3V3_ESP)	–	–	400	mA	Design value, shared with the on-board circuits
Logic level	–	3.3	–	V	Not 5 V tolerant
Operating temperature	TBD	–	TBD	°C	

2.3 On-board voltage rails

Rail	Source	Min	Typ	Max	Unit	Consumers / notes
VUSB1	J1 USB-C	–	5	–	V	Feeds 5V0 through FB1 and D3
VUSB2	J4 USB-C	–	5	–	V	CH343P supply; feeds 5V0 through FB2 and D5
5V0	Diode-OR of VUSB1 and VUSB2	–	TBD	–	V	5 V less one Schottky drop. USB power LED D7, power path, J3 pin 5
VBAT	J6 through D9	TBD	TBD	TBD	V	Power path, J2 pin 2, J3 pin 3
VIN	5V0 via D6, else VBAT via Q3	TBD	–	TBD	V	U9 input
3V3_ESP	U9 TPS63900, L1 2.2 µH	–	3.3	–	V	Always on, 400 mA max. ESP32-C6, RAK3172, CH343P I/O, LEDs, buttons, J7, J2 pin 4, TP1
3V3_LORA	3V3_ESP through R41 (0 Ω)	–	3.3	–	V	RAK3172, J5 pin 2
3V3_COM	3V3_ESP through Q2	–	3.3	–	V	Switched by IO2 (high = on, off by default). Sensors, RTC, microSD, I2C pull-ups, J2 pin 6
3V3_SD	3V3_COM through R24 (0 Ω)	–	3.3	–	V	microSD; R25 (from 3V3_ESP) not fitted
VRTC	B1 CR1220 coin cell	–	3	–	V	RTC backup through D2, J2 pin 8

2.4 Current consumption

Condition	Min	Typ	Max	Unit	Test
Deep sleep, battery powered, 3V3_COM off, RAK3172 asleep	–	TBD	TBD	µA	TC-007

Condition	Min	Typ	Max	Unit	Test
Deep sleep, 3V3_COM on	–	TBD	TBD	µA	TC-007
Idle, radios off	–	TBD	TBD	mA	
Peak, Wi-Fi transmit	–	–	TBD	mA	TC-016
Peak, LoRa transmit at maximum power	–	–	TBD	mA	TC-015
Regulator efficiency, light load and 400 mA	–	TBD	–	%	TC-002
Minimum battery voltage for operation	TBD	–	–	V	

Sleep current and IO8. The user LED net on IO8 has a 10 kΩ pull-up (R22) to 3V3_ESP. If IO8 floats during sleep the LED stays on; holding IO8 low still draws current through R22. See Known design issues (BUG-002).

3 Functional overview

3.1 Block diagram

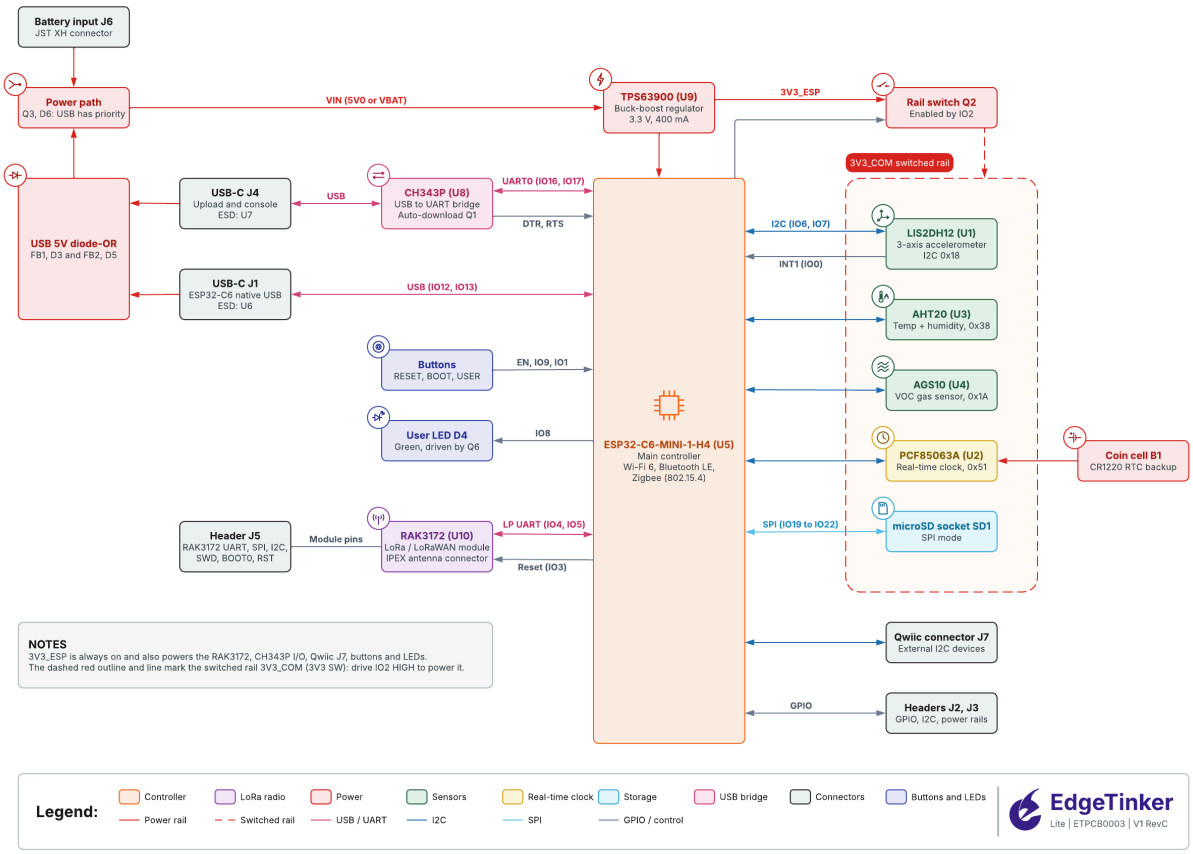


Figure 3. Block diagram. Block colour = component type, line colour = connection type. Parts inside the dashed red outline are on the switched rail 3V3_COM.

The ESP32-C6-MINI-1-H4 (U5) is the main controller. It talks to the RAK3172 LoRa module (U10) over its low-power UART, to the sensors and real-time clock over one I2C bus, and to the microSD socket over SPI. USB-C J1 goes to the ESP32-C6 native USB pins; USB-C J4 goes to a CH343P USB-to-UART bridge with a DTR / RTS auto-download circuit.

3.2 Power architecture

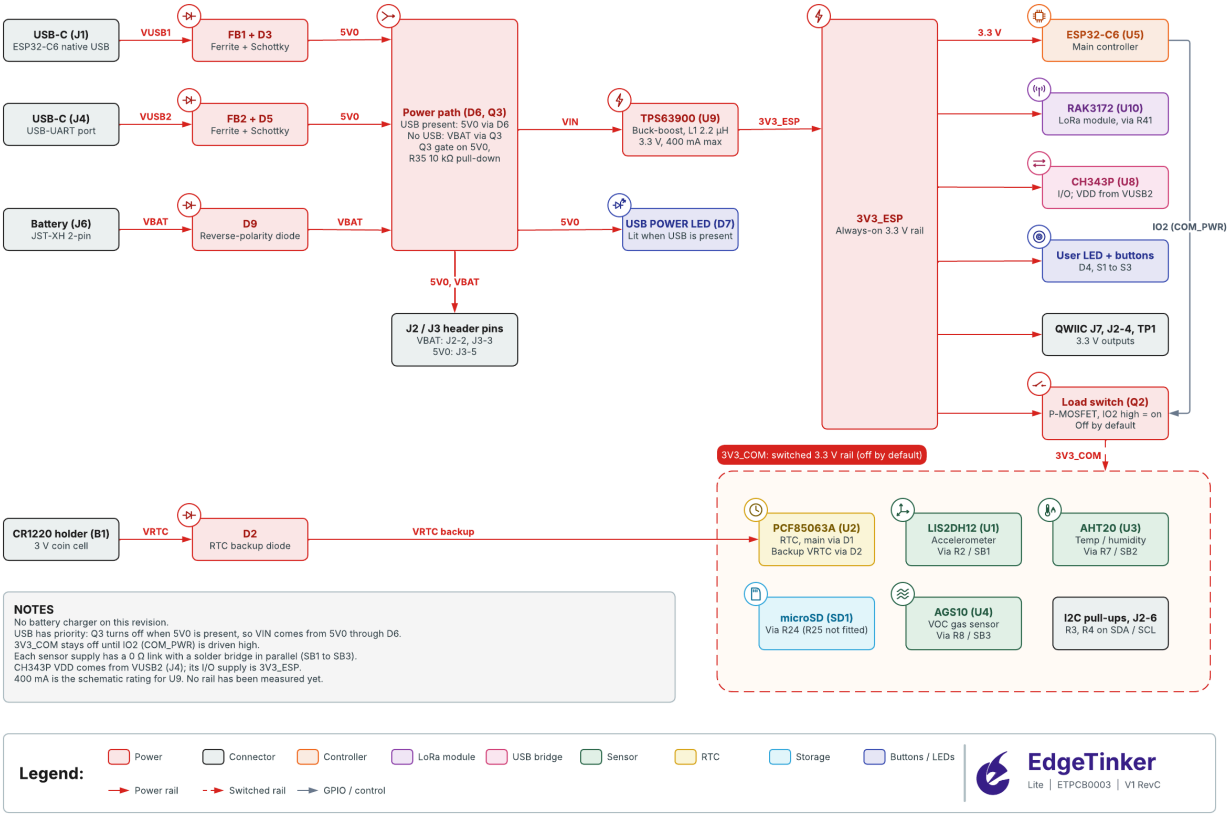


Figure 4. Power tree. Dashed lines = switched rail 3V3_COM, off by default.

Sources. Both USB-C ports supply 5 V. Each passes through a ferrite bead and a Schottky diode (FB1 + D3 for J1, FB2 + D5 for J4) into a diode-OR rail, 5V0, so the two ports never back-feed each other. A battery on J6 enters through the reverse-polarity diode D9 as VBAT.

Power path. The gate of P-MOSFET Q3 sits on 5V0 with a 10 kΩ pull-down (R35). With USB connected the gate is high, Q3 is off and VIN is fed from 5V0 through D6. With USB removed the gate falls, Q3 turns on and VIN is fed from the battery. There is no battery charger on this revision.

Regulation. The TPS63900 buck-boost regulator (U9) makes the always-on 3.3 V rail 3V3_ESP from VIN, with a 400 mA design limit. It powers the ESP32-C6, the RAK3172 (as 3V3_LORA through R41), the CH343P I/O supply, LEDs, buttons, J7, J2 pin 4 and test point TP1.

Switched peripheral rail. P-MOSFET Q2, driven from IO2 (COM_PWR) through Q4, creates 3V3_COM for the LIS2DH12, AHT20, AGS10, the RTC supply (through D1), the microSD socket (3V3_SD through R24) and the I2C pull-ups R3 and R4. COM_PWR is pulled down, so the rail is off after reset; set IO2 high to turn it on. The RAK3172 stays on 3V3_ESP so it keeps its LoRaWAN session and relies on its own sleep mode.

RTC backup. A CR1220 cell in B1 supplies VRTC (3 V) to the RTC through D2, so the clock keeps time when the board is unpowered.

4 Pinout

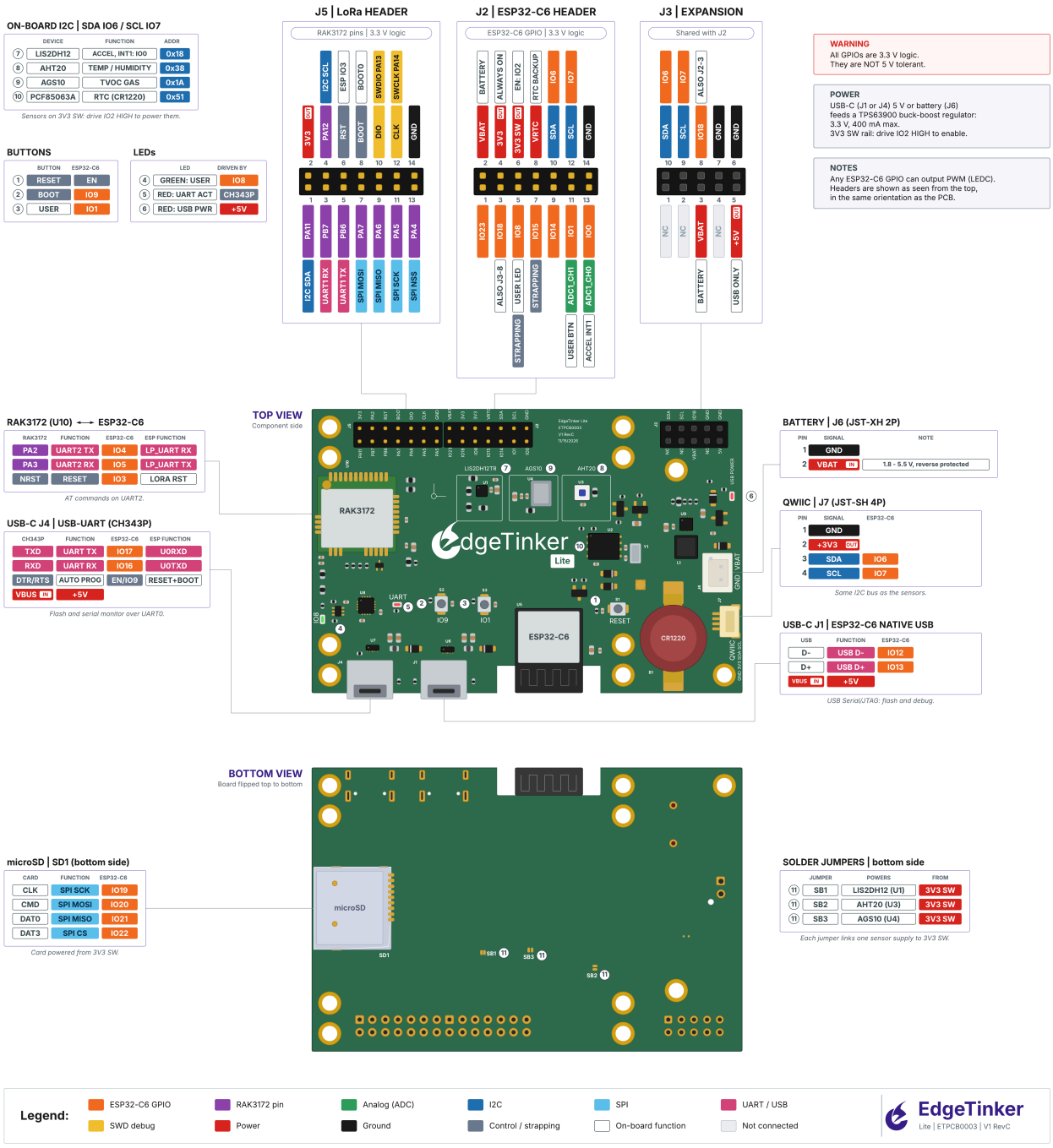


Figure 5. Pinout reference, hardware V1 RevC. Headers are shown as seen from the top, in the same orientation as the PCB; board views are drawn to scale. Colour legend at the bottom.

4.1 Header pin detail



Figure 6. J5, J2 and J3 enlarged from Figure 5. Pin 1 is at the lower left of each header; even pins are on the board-edge row.

ON-BOARD I2C | SDA IO6 / SCL IO7

	DEVICE	FUNCTION	ADDR
7	LIS2DH12	ACCEL, INT1: IO0	0x18
8	AHT20	TEMP / HUMIDITY	0x38
9	AGS10	TVOC GAS	0x1A
10	PCF85063A	RTC (CR1220)	0x51

Sensors on 3V3 SW: drive IO2 HIGH to power them.

BUTTONS

	BUTTON	ESP32-C6
1	RESET	EN
2	BOOT	IO9
3	USER	IO1

LEDs

	LED	DRIVEN BY
4	GREEN: USER	IO8
5	RED: UART ACT	CH343P
6	RED: USB PWR	+5V

WARNING
All GPIOs are 3.3 V logic.
They are NOT 5 V tolerant.

POWER
USB-C (J1 or J4) 5 V or battery (J6)
feeds a TPS63900 buck-boost regulator:
3.3 V, 400 mA max.
3V3 SW rail: drive IO2 HIGH to enable.

NOTES
Any ESP32-C6 GPIO can output PWM (LEDC).
Headers are shown as seen from the top,
in the same orientation as the PCB.

The numbered markers 1 to 10 match the markers on the board views (Figures 2 and 7).

5 Connectors and pin tables

Designators match the PCB silkscreen and the schematic. Signal names are schematic net names. Voltage domain: **3V3_ESP** = always-on 3.3 V logic, **3V3_LORA** = RAK3172 3.3 V logic. No pin is 5 V tolerant.

5.1 Connector and component locations

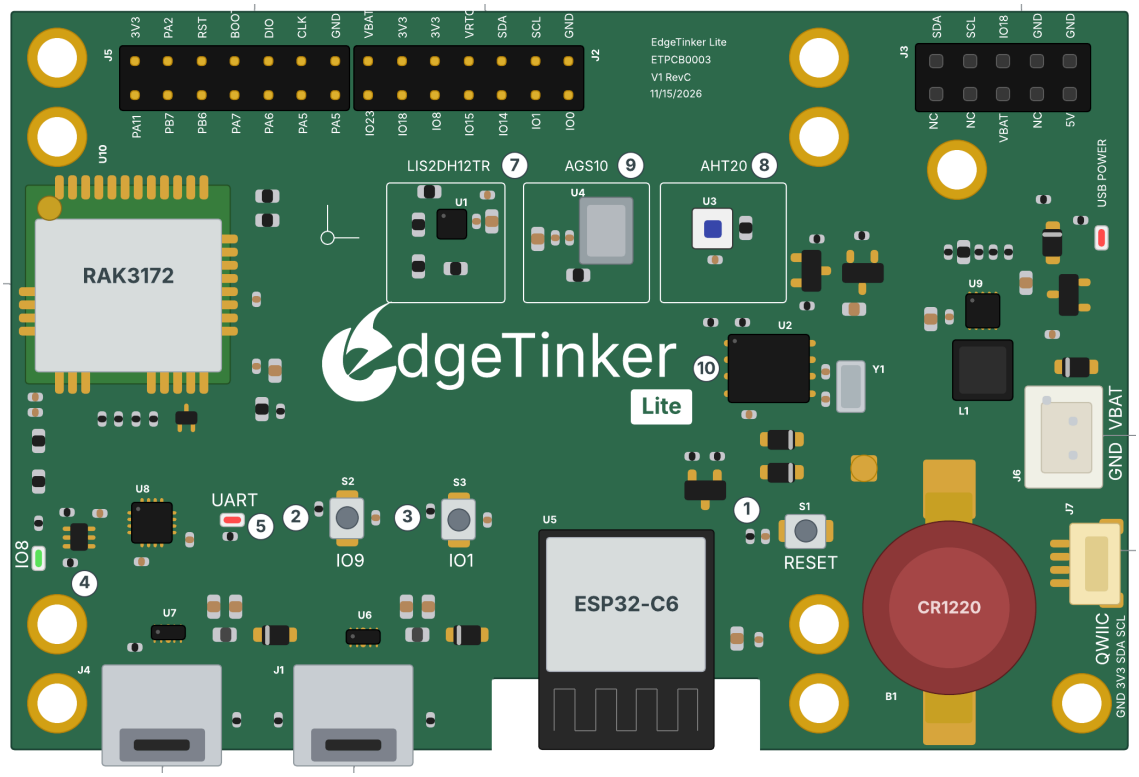


Figure 7. Connector, button and LED locations, top view drawn to scale from the PCB. Markers: 1 to 3 buttons, 4 to 6 LEDs, 7 to 10 on-board I2C devices (see Section 4).

5.2 J2: ESP32-C6 header

2×7 pin header, 2.54 mm (HMTCONN HMT-PZ254V-2X07P-C60).

Pin	Signal	MCU pin	Domain	Notes
1	IO23	GPIO23 (U5 pin 29)	3V3_ESP	Free
2	VBAT	–	Battery	Battery after D9
3	IO18	GPIO18 (U5 pin 24)	3V3_ESP	Free; also on J3 pin 8
4	3V3_ESP	–	3.3 V	Always-on rail, shares the 400 mA budget
5	LED	GPIO8 (U5 pin 22)	3V3_ESP	User LED D4 (high = on), 10 kΩ pull-up R22; strapping pin
6	3V3_COM	–	3.3 V	Switched rail, on when IO2 is high
7	IO15	GPIO15 (U5 pin 20)	3V3_ESP	Free; strapping pin
8	VRTC	–	3 V	Coin-cell rail
9	IO14	GPIO14 (U5 pin 19)	3V3_ESP	Free
10	SDA	GPIO6 (U5 pin 15)	3V3_COM	I2C data, 10 kΩ pull-up R3

Pin	Signal	MCU pin	Domain	Notes
11	BTN	GPIO1 (U5 pin 13)	3V3_ESP	User button S3, active low, 10 kΩ pull-up; ADC1_CH1
12	SCL	GPIO7 (U5 pin 16)	3V3_COM	I2C clock, 10 kΩ pull-up R4
13	IO0	GPIO0 (U5 pin 12)	3V3_ESP	Shared with LIS2DH12 INT1 (ACC_INT); ADC1_CH0
14	GND	–	–	Ground

5.3 J5: RAK3172 header

2×7 pin header, 2.54 mm (HMTCONN HMT-PZ254V-2X07P-C60). These pins belong to the RAK3172 module, not to the ESP32-C6.

Pin	Signal	RAK3172 pin	Domain	Notes
1	PA11	SDA/PA11 (pin 10)	3V3_LORA	Module I2C SDA
2	3V3_LORA	VCC (pin 24)	3.3 V	From 3V3_ESP through R41
3	PB7	UART1_RX/PB7 (pin 5)	3V3_LORA	Module UART1 receive
4	PA12	SCL/PA12 (pin 9)	3V3_LORA	Module I2C SCL
5	PB6	UART1_TX/PB6 (pin 4)	3V3_LORA	Module UART1 transmit
6	LORA_RST_RAW	RST (pin 22)	3V3_LORA	Module reset, 10 kΩ pull-up R40; driven by Q5 from IO3
7	PA7	MOSI/PA7 (pin 13)	3V3_LORA	Module SPI MOSI
8	BOOT	BOOT0 (pin 21)	3V3_LORA	Module boot select
9	PA6	MISO/PA6 (pin 14)	3V3_LORA	Module SPI MISO
10	LORA_DIO	SWDIO/PA13 (pin 7)	3V3_LORA	SWD data
11	PA5	SCK/PA5 (pin 15)	3V3_LORA	Module SPI SCK
12	LORA_CLK	SWCLK/PA14 (pin 8)	3V3_LORA	SWD clock
13	PA4	SS/PA4 (pin 16)	3V3_LORA	Module SPI chip select
14	GND	–	–	Ground

5.4 J3: expansion socket

2×5 socket, 2.54 mm (Würth Elektronik 61301021821). Intended use of this port: TBD (open question in the requirements).

Pin	Signal	MCU pin	Domain	Notes
1	NC	–	–	Not connected
2	NC	–	–	Not connected
3	VBAT	–	Battery	Battery after D9
4	NC	–	–	Not connected
5	5V0	–	5 V	USB 5 V after the diode-OR; present only with USB connected
6	GND	–	–	Ground
7	GND	–	–	Ground
8	IO18	GPIO18 (U5 pin 24)	3V3_ESP	Shared with J2 pin 3

Pin	Signal	MCU pin	Domain	Notes
9	SCL	GPIO7 (U5 pin 16)	3V3_COM	I2C clock
10	SDA	GPIO6 (U5 pin 15)	3V3_COM	I2C data

5.5 J7: Qwiic I2C and J6: battery

J7: JST SH 4-pin, 1 mm (SM04B-SRSS-TB), Qwiic pin order.

Pin	Signal	MCU pin	Notes
1	GND	–	Shield also to GND
2	3V3_ESP	–	Always on
3	SDA	GPIO6	Pull-up on 3V3_COM
4	SCL	GPIO7	Pull-up on 3V3_COM

J6: JST XH 2-pin, 2.5 mm (B2B-XH-AM).

Pin	Signal	Notes
1	GND	Ground
2	BAT+	Battery positive, to VBAT through D9

I2C and the switched rail. The I2C pull-ups are on 3V3_COM, but J7 is powered from the always-on 3V3_ESP. With the rail off the bus has no pull-ups, so an external device on J7, J2 or J3 cannot be reached. Turn 3V3_COM on (IO2 high) before using I2C (BUG-001).

5.6 J1 and J4: USB-C

Both receptacles: Kinghelm KH-TYPE-C-16P.

Ref	Function	Data lines	Notes
J1	ESP32-C6 native USB	EUSB_N = IO12 (D-), EUSB_P = IO13 (D+)	VUSB1. 5.1 kΩ CC pull-downs (R11, R12). ESD: U6
J4	USB-to-UART (CH343P, U8)	USB_P / USB_N to U8; UART0 IO16 (TX) / IO17 (RX)	VUSB2. 5.1 kΩ CC pull-downs (R26, R28). ESD: U7. Upload with auto-download. Left-hand USB-C port

5.7 ESP32-C6 GPIO allocation

GPIO	U5 pin	Net	Function	Notes
EN	8	ESP_EN	Reset button S1, auto-download	10 kΩ pull-up, 0.1 µF
IO0	12	ACC_INT	LIS2DH12 INT1; also J2 pin 13	Shared between the sensor and the header
IO1	13	BTN	User button S3 (active low); also J2 pin 11	10 kΩ pull-up, 0.1 µF
IO2	5	COM_PWR	3V3_COM enable	High = on; pulled down, off by default
IO3	6	LORA_RST	RAK3172 reset through Q5	High = module held in reset
IO4	9	LPRXD	LP UART receive, from RAK3172 UART2_TX (PA2)	0 Ω series R9; strapping pin
IO5	10	LPTXD	LP UART transmit, to RAK3172 UART2_RX (PA3)	0 Ω series R10; strapping pin
IO6	15	SDA	I2C data: sensors, RTC, J7, J2 pin 10, J3 pin 10	10 kΩ pull-up to 3V3_COM
IO7	16	SCL	I2C clock: sensors, RTC, J7, J2 pin 12, J3 pin 9	10 kΩ pull-up to 3V3_COM
IO8	22	LED	User LED D4 through Q6 (high = on); also J2 pin 5	10 kΩ pull-up R22; strapping pin

GPIO	U5 pin	Net	Function	Notes
IO9	23	IO9	BOOT button S2, auto-download	10 kΩ pull-up, 0.1 µF; strapping pin
IO12	17	EUSB_N	Native USB D- on J1	
IO13	18	EUSB_P	Native USB D+ on J1	
IO14	19	IO14	J2 pin 9	Free
IO15	20	IO15	J2 pin 7	Free; strapping pin
IO16	31	ESP_TX	UART0 transmit, to CH343P RXD	
IO17	30	ESP_RX	UART0 receive, from CH343P TXD	
IO18	24	IO18	J2 pin 3 and J3 pin 8	Free
IO19	25	SCK	microSD clock	Pull-up R17 not fitted
IO20	26	MOSI	microSD CMD	10 kΩ pull-up to 3V3_SD
IO21	27	MISO	microSD DAT0	10 kΩ pull-up to 3V3_SD
IO22	28	CS_SD	microSD chip select (CD/DAT3)	10 kΩ pull-up to 3V3_SD
IO23	29	IO23	J2 pin 1	Free

5.8 I2C devices

Device	Address	Supply	Notes
LIS2DH12 (U1)	0x18	3V3_COM through R2 / SB1	SA0 tied low through R5; fitting it high gives 0x19. INT1 to IO0, INT2 not connected
AGS10 (U4)	0x1A	3V3_COM through R8 / SB3	Supply net named 3V3_BME on the schematic
AHT20 (U3)	0x38	3V3_COM through R7 / SB2	
PCF85063A (U2)	0x51	3V3_COM through D1, or the coin cell through D2	INT and CLKOUT not connected

5.9 Buttons, LEDs and test points

Ref	Type	Net / GPIO	Behaviour
S1	RESET button	ESP_EN (EN)	Resets the ESP32-C6
S2	BOOT button	IO9	Hold during reset to enter boot mode
S3	USER button	BTN (IO1)	Reads low when pressed
D4	LED, green	LED (IO8) through Q6	User LED, on when IO8 is high
D7	LED, red	5V0	USB PWR: on when either USB port is powered
D8	LED, red	CH343P ACT	UART ACT: USB-to-UART bridge activity, driven by CH343P
TP1	Test point	3V3_ESP	Only test point on this revision

5.10 Configuration links (jumpers)

To isolate a sensor for current measurement, remove its 0 Ω link and open its solder bridge.

Ref	Purpose	As built
R2 with SB1	Accelerometer supply	0 Ω fitted, solder bridge in parallel (bottom side)
R7 with SB2	AHT20 supply	0 Ω fitted, solder bridge in parallel (bottom side)
R8 with SB3	AGS10 supply	0 Ω fitted, solder bridge in parallel (bottom side)
R24 / R25	microSD supply source	R24 fitted (3V3_COM); R25 not fitted (3V3_ESP)
R41	RAK3172 supply from 3V3_ESP	0 Ω fitted
R9, R10	Series links on the LoRa UART	0 Ω fitted

6 Usage

> **Draft procedures.** The steps in this section come from the product documentation and have not yet been tried on hardware. Supported toolchains (Arduino, PlatformIO, ESP-IDF, MicroPython) are TBD.

6.1 Getting started

1. Connect a USB-C cable to the USB-to-UART port J4 (the left one of the two). The red USB power LED D7 lights.
2. Install your toolchain and select the ESP32-C6 board.
3. Upload a blink example for IO8. The green LED D4 flashes.
4. Set IO2 high, then scan the I2C bus on IO6 (SDA) and IO7 (SCL). Four devices answer: 0x18, 0x1A, 0x38 and 0x51.

6.2 First example

Arduino-style sketch: power the peripheral rail, list the I2C devices on the serial console (J4), then blink the user LED. Not yet tested on hardware.

```
// EdgeTinker Lite (ETPCB0003): first example
#include <Wire.h>
const int PIN_LED     = 8;   // D4, high = on
const int PIN_COM_PWR = 2;   // 3V3_COM enable, high = on
const int PIN_SDA = 6, PIN_SCL = 7;
void setup() {
  Serial.begin(115200);
  pinMode(PIN_LED, OUTPUT);
  pinMode(PIN_COM_PWR, OUTPUT);
  digitalWrite(PIN_COM_PWR, HIGH);       // sensors, RTC, microSD, I2C pull-ups on
  delay(10);
  Wire.begin(PIN_SDA, PIN_SCL);
  for (uint8_t a = 1; a < 127; a++) {     // expect 0x18, 0x1A, 0x38, 0x51
    Wire.beginTransmission(a);
    if (Wire.endTransmission() == 0) Serial.printf("I2C device at 0x%02X\n", a);
  }
}
void loop() {
  digitalWrite(PIN_LED, !digitalRead(PIN_LED));
  delay(500);
}
```

6.3 Powering the board

Option	How	Notes
USB, upload port	USB-C J4, 5 V	Also powers the CH343P bridge
USB, native port	USB-C J1, 5 V	Both ports may be connected; the diode-OR prevents back-feed
Battery	J6, JST XH 2-pin, pin 2 positive	1.8 to 5.5 V, reverse-polarity protected. Chemistry: TBD
USB and battery	Both connected	The board runs from USB and the battery is disconnected from the load. USB does not charge the battery

The 3.3 V regulator supplies 400 mA in total. Anything powered from 3V3_ESP or 3V3_COM on J2, J7 or J3 shares this budget with the on-board circuits. 5V0 on J3 pin 5 is present only while USB is connected.

6.4 Programming and flashing

- **J4 (recommended):** the CH343P DTR and RTS lines drive EN and IO9 through Q1, so firmware uploads without pressing a button. J4 also carries the serial console (UART0, IO16 / IO17).
- **J1:** the ESP32-C6 native USB port, for uploads over native USB and USB device experiments.
- **RAK3172:** program and debug the LoRa module through SWD on J5 (pin 10 SWDIO, pin 12 SWCLK, pin 14 GND, pin 2 3V3_LORA). BOOT0 is on J5 pin 8. The ESP32-C6 talks to the RAK3172 with AT commands on its UART2 (LP UART, IO4 / IO5). Factory firmware version: TBD.

6.5 Boot modes and strapping pins

Mode	How to enter
Normal run	Power up or press S1 (RESET) with S2 released
Boot (download) mode	Hold S2 (BOOT, IO9) while the ESP32-C6 comes out of reset (S1 or power-up). Uploads through J4 do this automatically through DTR / RTS
RAK3172 reset	Drive IO3 high to hold the module in reset; release to restart it

Strapping pins: IO4, IO5, IO8, IO9 and IO15. Avoid circuits on J2 pins 5 (IO8) and 7 (IO15) that pull these pins away from their default level at reset.

6.6 Good to know and known design issues

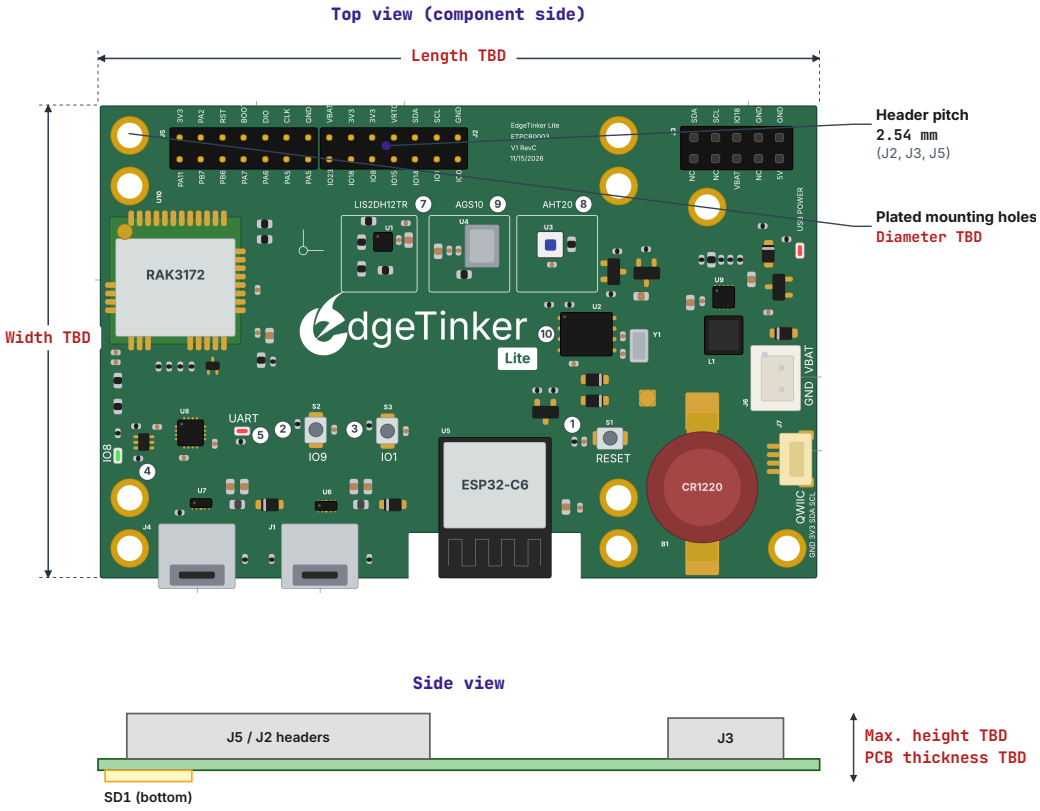
- The sensors, RTC supply, microSD and I2C pull-ups are off after reset. Set IO2 high to power them.
- USB does not charge the battery. There is no charger on this revision.
- Connect a LoRa antenna to the RAK3172 IPEX connector before transmitting.
- The RTC needs a CR1220 cell to keep time while the board is unpowered.

ID	Issue (open, from schematic review)	Workaround
BUG-001	I2C pull-ups are on the switched rail 3V3_COM; with it off, external I2C devices on J7, J2 or J3 cannot be reached	Turn 3V3_COM on before using I2C
BUG-002	R22 pulls IO8 (user LED) up: the LED is on whenever IO8 is not driven low, and holding IO8 low still draws current through R22	None that removes the R22 current
BUG-003	RTC INT and CLKOUT are not connected, so an RTC alarm cannot wake the ESP32-C6	Use the ESP32-C6 internal timer for timed wake-ups

6.7 Online resources

Resource	Location
EdgeTinker website	www.edgetinker.com
EdgeTinker wiki	www.edgetinker.com/wiki
Product page and store listing	TBD
Schematic, 3D model (STEP), design files	TBD. Schematic: Appendix A of this document
Libraries and example code	TBD

7 Mechanical information



Outline from the to-scale PCB drawing (pinout reference). Side view not to scale. Dimensions not yet published.

Figure 8. Mechanical drawing on the to-scale PCB outline. Dimensions in mm; numeric values are not yet published.

Parameter	Value
Board dimensions (mm)	TBD
Layers and thickness	TBD
Mounting holes	10 plated holes at the corners and beside the headers (to-scale drawing); diameter and positions TBD
Header pitch (mm)	2.54 (J2, J3, J5)
Component sides	Top: all components except the microSD socket. Bottom: microSD socket SD1 and solder bridges SB1 to SB3
Antennas	ESP32-C6 PCB antenna at the board edge between the USB-C ports and the coin cell (keep clear of metal); RAK3172 IPEX connector for an external LoRa antenna
Maximum component height (mm)	TBD
Weight (g)	TBD
Surface finish, solder mask	TBD

8 Bill of materials

Major components only. The complete BOM is not yet published.

Ref	Description	Manufacturer	Manufacturer part number	Qty	LCSC
U5	Main controller: Wi-Fi, Bluetooth LE, 802.15.4; PCB antenna	Espressif	ESP32-C6-MINI-1-H4	1	C6553337
U10	LoRa / LoRaWAN module, IPEX antenna connector	RAKwireless	RAK3172-T-9-SM-I	1	C19723909
U9	Buck-boost regulator for 3V3_ESP	Texas Instruments	TPS63900DSKR	1	C1518762
U8	USB-to-UART bridge	WCH	CH343P	1	C2846043
U1	3-axis accelerometer	ST	LIS2DH12TR	1	C110926
U2	Real-time clock	NXP	PCF85063AT/AY	1	C5151540
U3	Temperature and humidity sensor	Aosong	AHT20	1	C2757850
U4	VOC gas sensor	Aosong	AGS10	1	C3012632
U6, U7	USB ESD protection	Texas Instruments	TPD4E05U06DQAR	2	C2972498
Q2, Q3	P-channel MOSFET: rail switch, battery power path	Infineon	IRLML5203TRPBF	2	C2592
Q5	Pre-biased NPN, RAK3172 reset	Rohm	DTC043ZEBTL	1	C96459
L1	2.2 µH regulator inductor	PROD Tech	PSTMAA4030-2R2MG	1	C45385247
Y1	32.768 kHz crystal for the RTC	Epson	Q13FC13500004	1	C32346
SD1	microSD socket (bottom side)	Molex	1040310811	1	C585350
J1, J4	USB-C receptacle	Kinghelm	KH-TYPE-C-16P	2	C709357
J2, J5	2×7 pin header, 2.54 mm	HMTCONN	HMT-PZ254V-2X07P-C60	2	C54570403
J3	2×5 socket, 2.54 mm	Würth Elektronik	61301021821	1	Not listed
J6	Battery connector, JST XH 2-pin	JST	B2B-XH-AM	1	C161869
J7	I2C connector, JST SH 4-pin, 1 mm	JST	SM04B-SRSS-TB(LF)(SN)	1	C157926
B1	CR1220 coin-cell holder	Adam Tech	BH-44C-5	1	C969906

9 Certifications and compliance

Item	Status
RoHS	TBD
CE / UKCA	TBD
FCC / ISED	TBD
Hardware licence	TBD
Software licence	TBD

No board-level certification is confirmed for this revision. EdgeTinker Lite is a development board intended for prototyping. A product built on it needs its own compliance assessment.

10 Company information

Item	Details
Company	EdgeTinker
Website	www.edgetinker.com
Contact	www.edgetinker.com/contact
Postal address	TBD

11 Revision history

Document

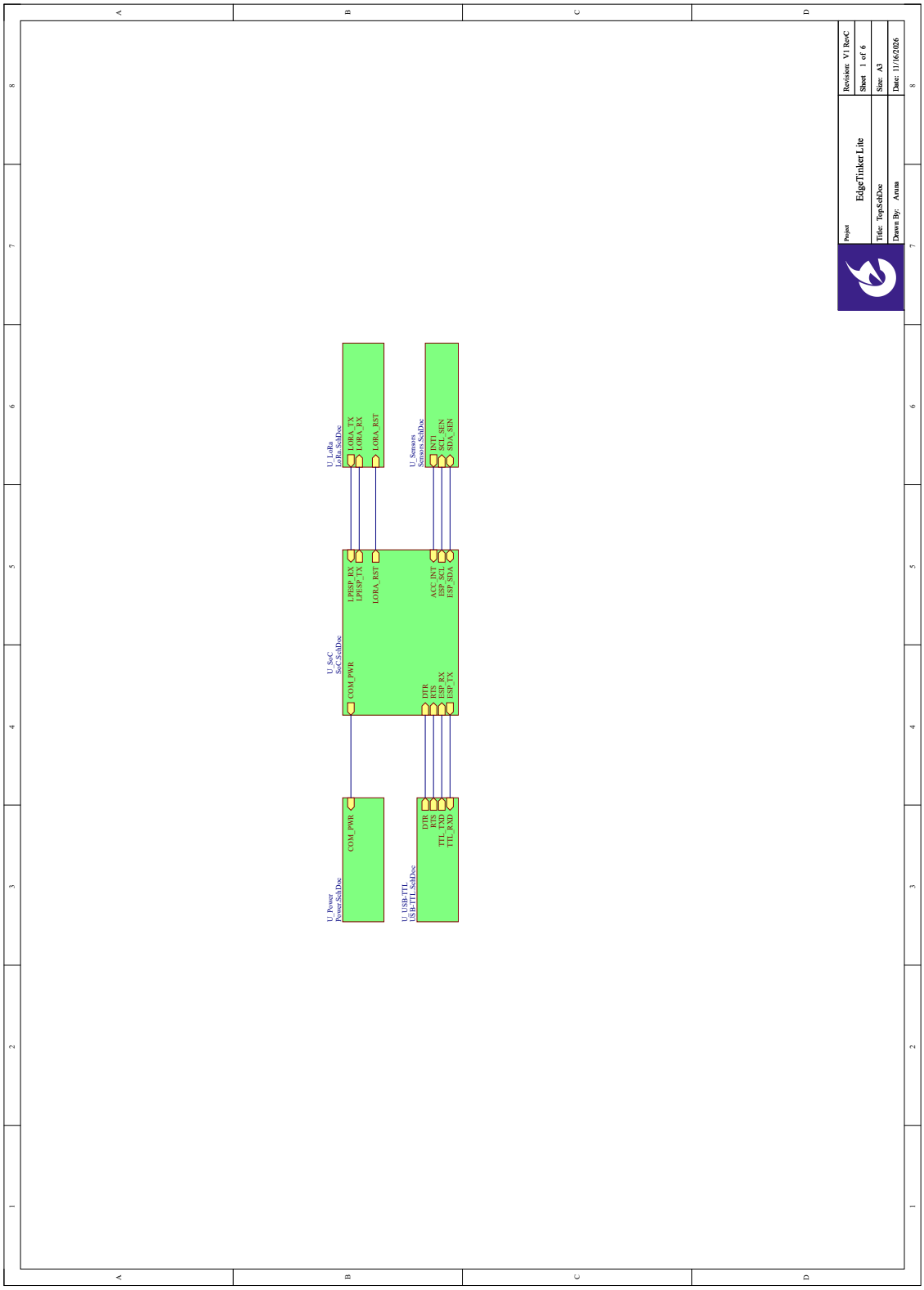
Revision	Date	Changes
0.1	2026-11-15	First preliminary release for hardware V1 RevC. Electrical values not yet validated
0.2	2026-11-16	New block diagram, power tree and pinout (to scale); V1 RevC schematic of 2026-11-16; battery range 1.8 to 5.5 V; ADC, PWM, LED D8 and RAK3172 AT interface added; new layout, cover and back page

Hardware

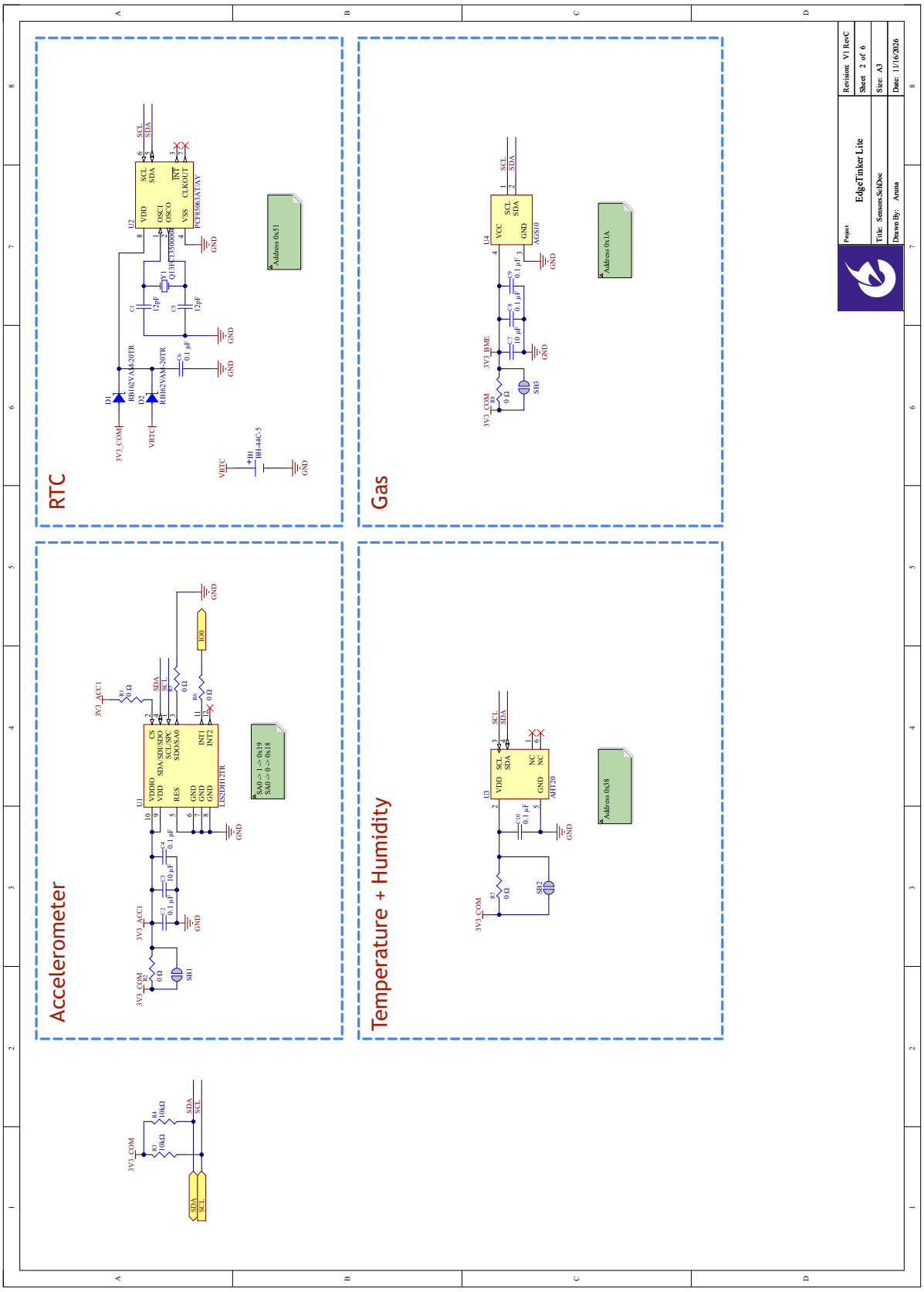
Revision	Date	Changes
V1 RevC	2026-11-16	First design; schematic in Appendix A. Status: ordered

A Appendix A: Schematics

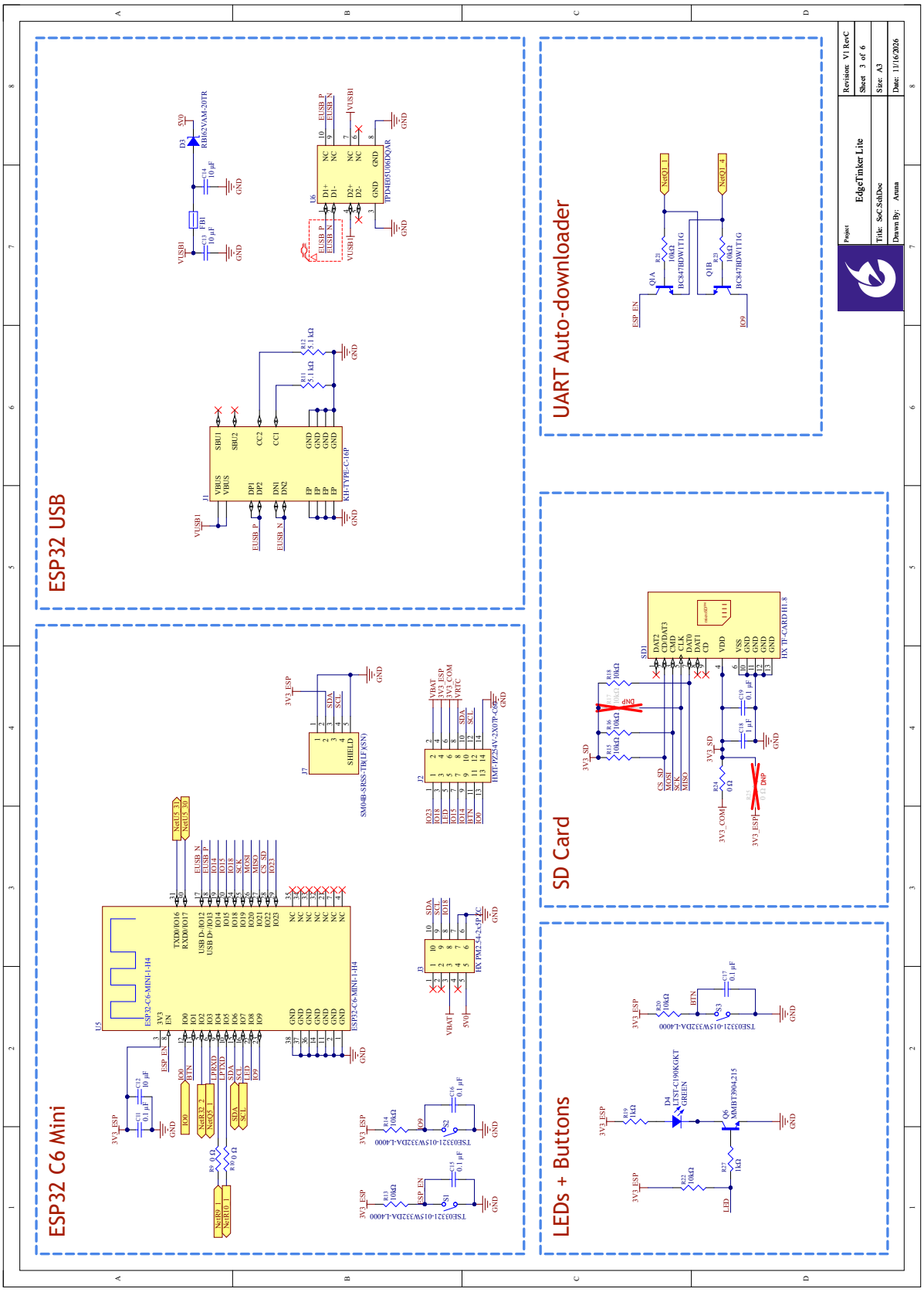
Sheet 1 of 6 · Top.SchDoc: hierarchy and sheet connections. Hardware V1 RevC, 2026-11-16. Turn the page clockwise to read.



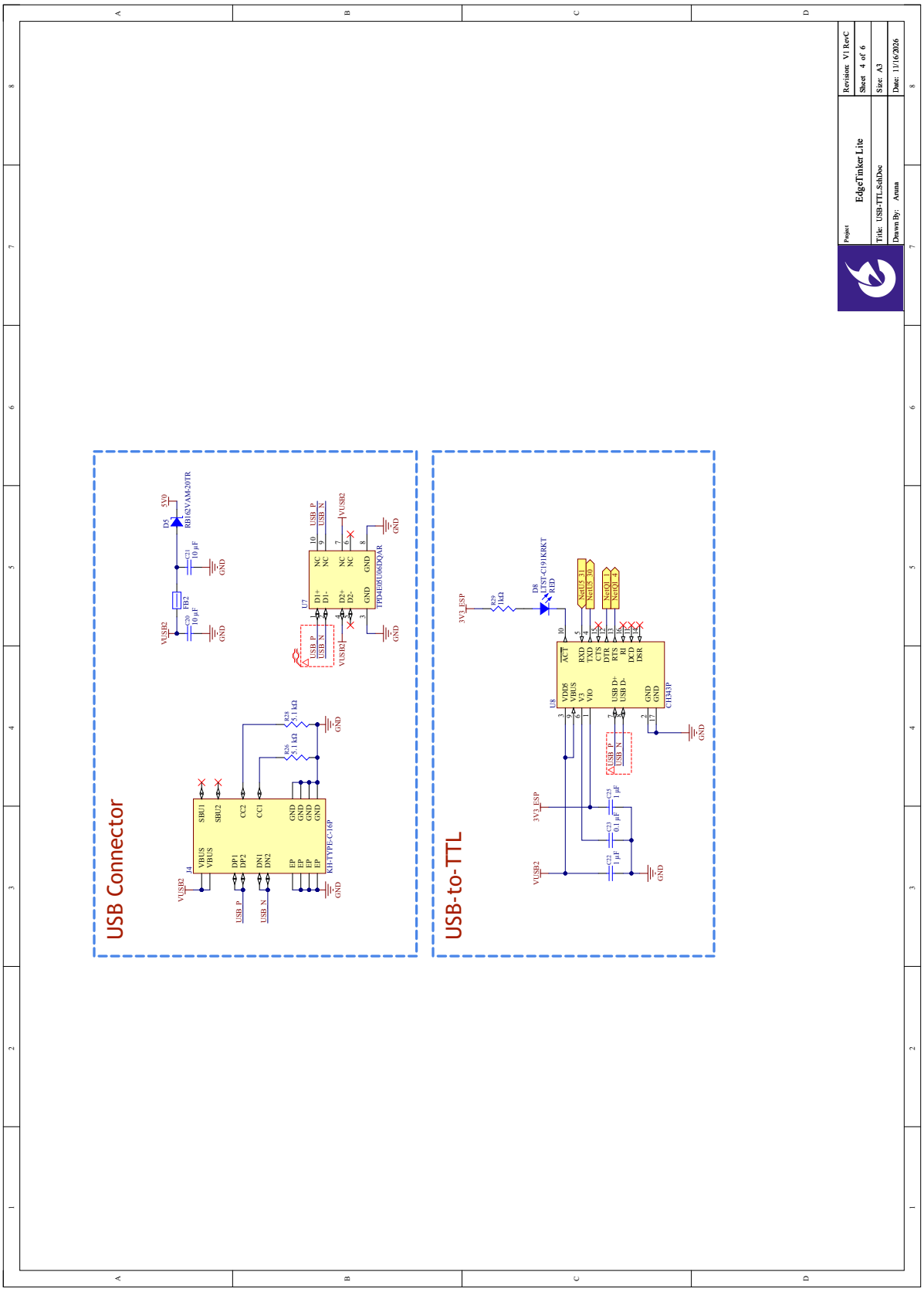
Sheet 2 of 6 · Sensors.SchDoc: accelerometer, RTC, temperature and humidity, gas sensor.



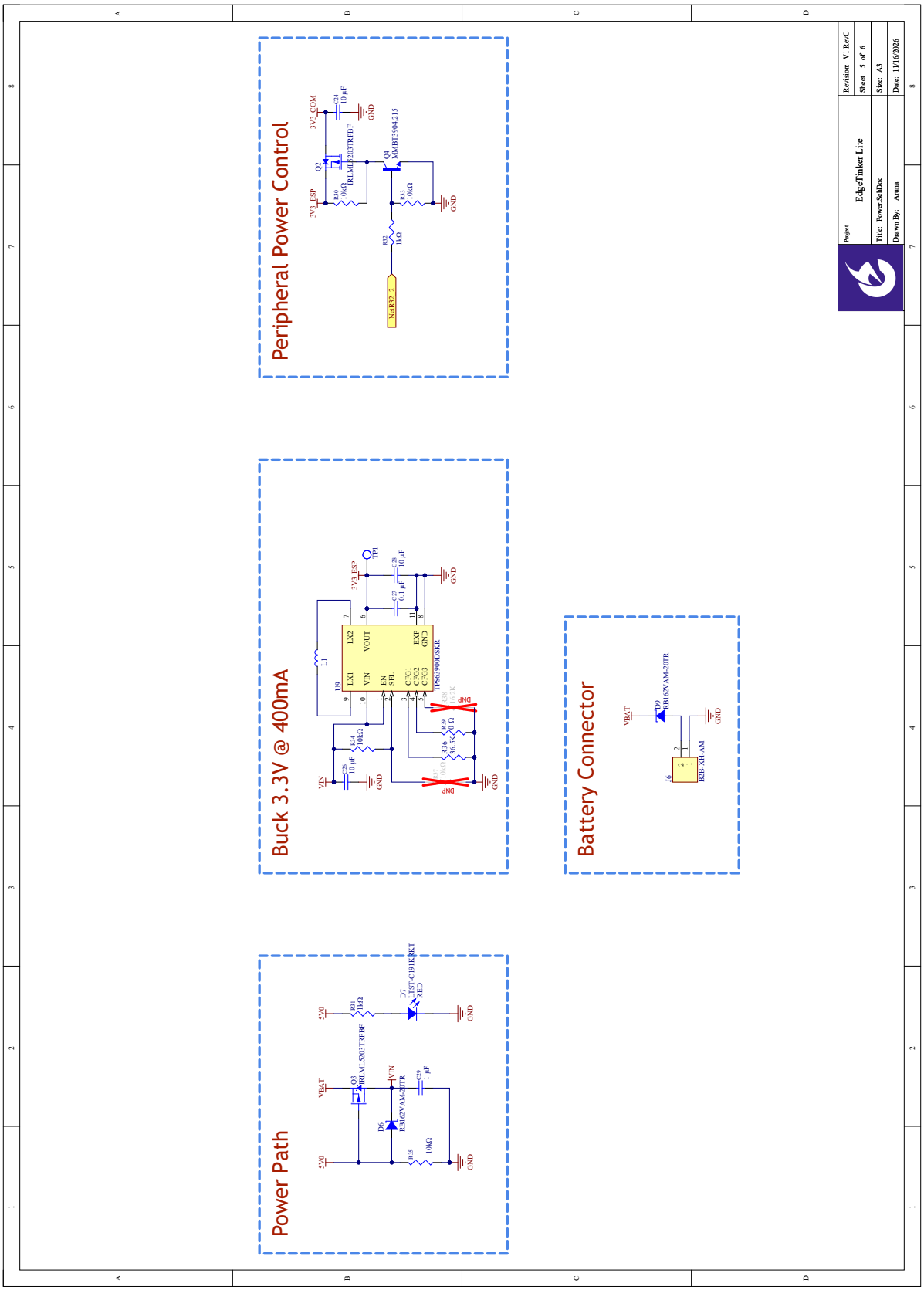
Sheet 3 of 6 · SoC.SchDoc: ESP32-C6, native USB, headers, LEDs and buttons, microSD, auto-download.



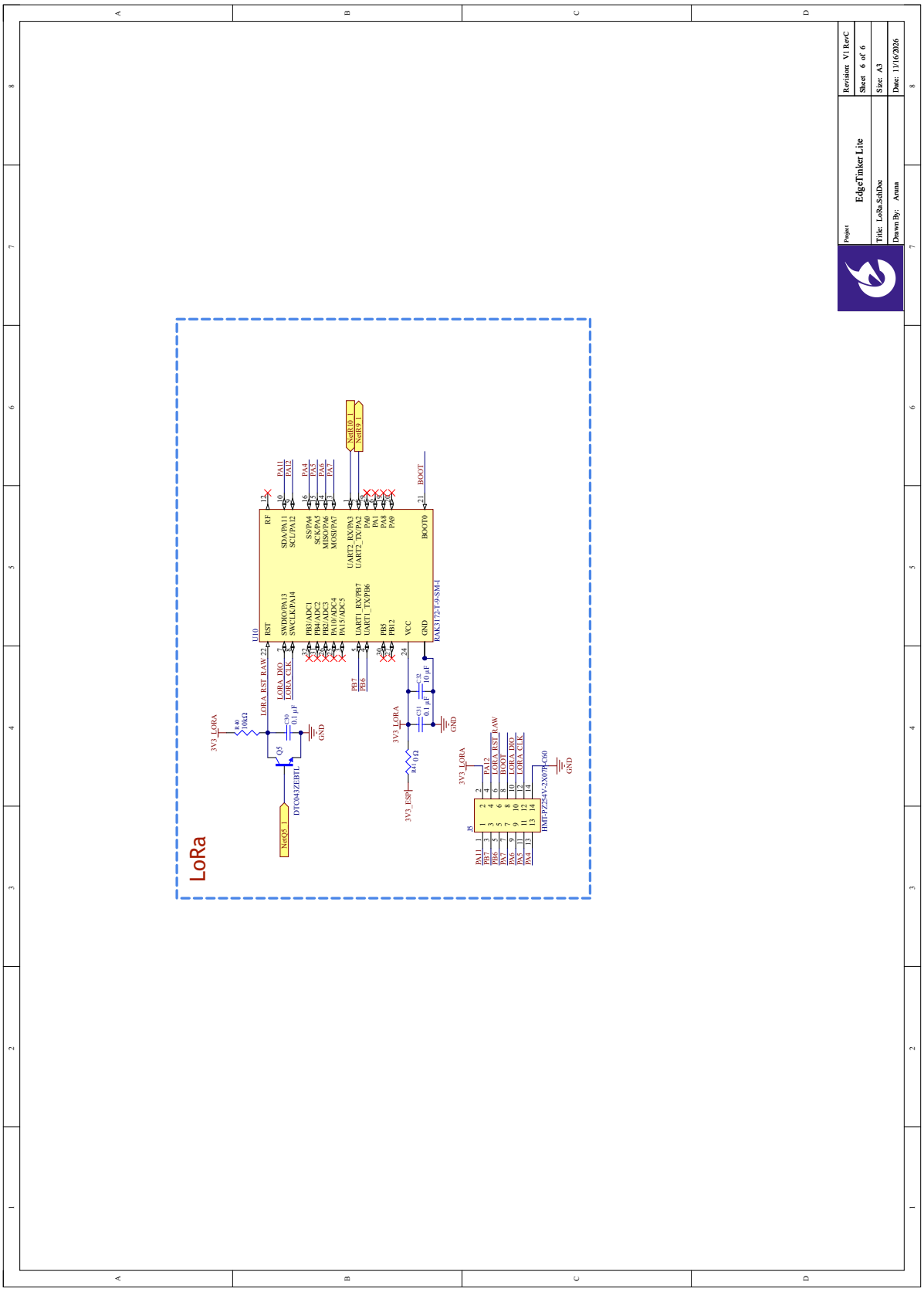
Sheet 4 of 6 · USB-TTL.SchDoc: USB-C J4 and CH343P USB-to-UART bridge.



Sheet 5 of 6 · Power.SchDoc: power path, TPS63900 regulator, peripheral power control, battery connector.



Sheet 6 of 6 · LoRa.SchDoc: RAK3172 module and header J5.



EdgeTinker Lite

LoRa, Wi-Fi, Bluetooth LE and Zigbee on one ultra-low-power board.

www.edgetinker.com

THIS DOCUMENT

Title	EdgeTinker Lite datasheet
SKU	ETPCB0003
Hardware	V1 RevC
Revision	0.2 Preliminary
Date	2026-11-16

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This is a preliminary datasheet for a product in development. Values marked TBD have not been measured yet, and EdgeTinker may change specifications and descriptions without notice. Check www.edgetinker.com for the latest revision.

EdgeTinker Lite is a development board intended for prototyping. It is not certified for use in end products; any product built on it needs its own compliance assessment.

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