# GATEWAY LORA + 4G + GPS v0.1

ESP32-S3 — LoRa SX1262 (E22-900M22S) — GPS ATGM336H — slot modem 4G A7670E — BQ25798 + Li-ion 1S — DC 5–24 V

Contoh desain rancang.in, belum diproduksi. Blok dari iot-board/Station.

## Power



File: power.kicad_sch

## Power rails



File: power_rails.kicad_sch

## MCU



File: mcu.kicad_sch

## IO



File: io.kicad_sch

## LoRa



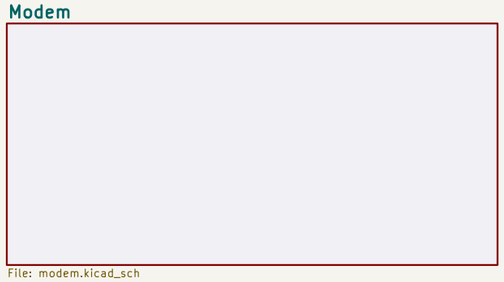
File: lora.kicad_sch

## GPS



File: gps.kicad_sch

## Modem



File: modem.kicad_sch

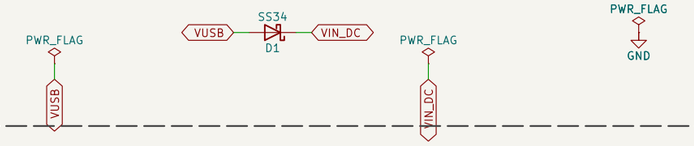
Gateway LoRa 4G GPS — contoh rancang.in (blok iot-board/Station)
**rancang.in**
Sheet: /
File: gateway-lora-4g-gps.kicad_sch

***Title: Gateway LoRa 4G GPS v0.1***

| Size: A3 | Date: 2026-10-28 | **Rev: 0.1** |
|---|---|---|
| KiCad E.D.A. 10.0.8 | | Id: 1/8 |

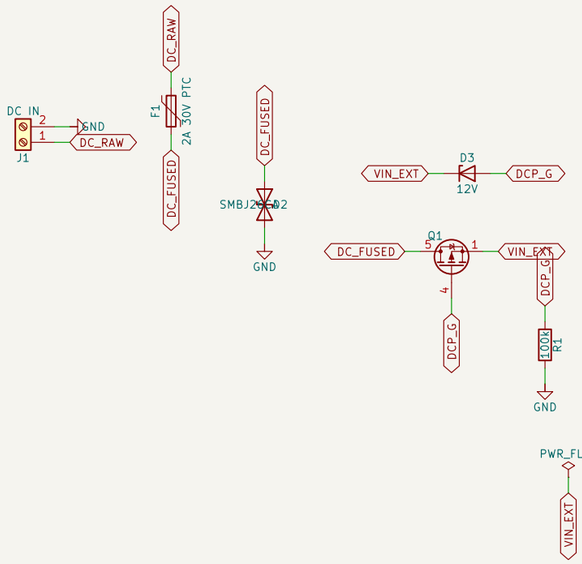
## USB BENCH POWER

*VUSB -> VIN_DC lewat Schottky 40 V (memblokir arus balik)*




## DC INPUT 5–24 V

*Terminal – PTC – TVS – P-FET polaritas terbalik (AO4485)*

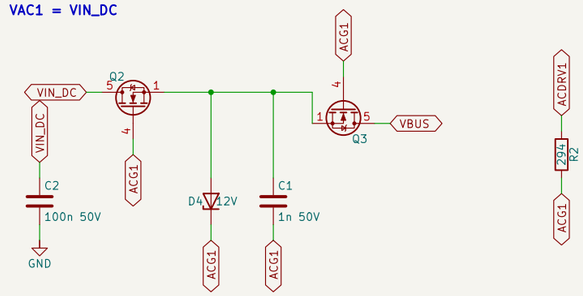



*Masukan 5–24 V (VAC maks charger 26 V); TVS SMBJ26CA menjepit di bawah 42 V.*

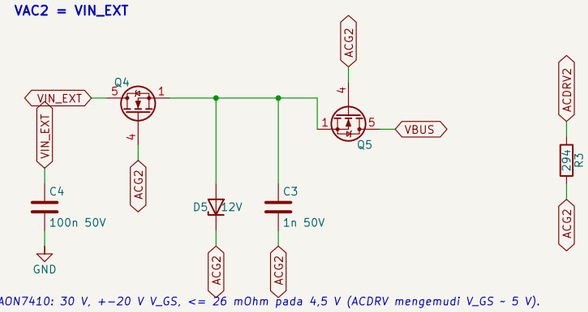
## INPUT SELECTION

*NFET back-to-back di ACDRV1 (USB) dan ACDRV2 (DC)*

**VAC1 = VIN_DC**



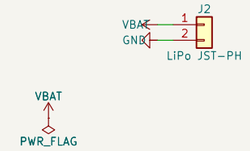

**VAC2 = VIN_EXT**




*Q AON7410: 30 V, +-20 V V_GS, <= 26 mOhm pada 4,5 V (ACDRV mengemudi V_GS ~ 5 V).*

## BATTERY

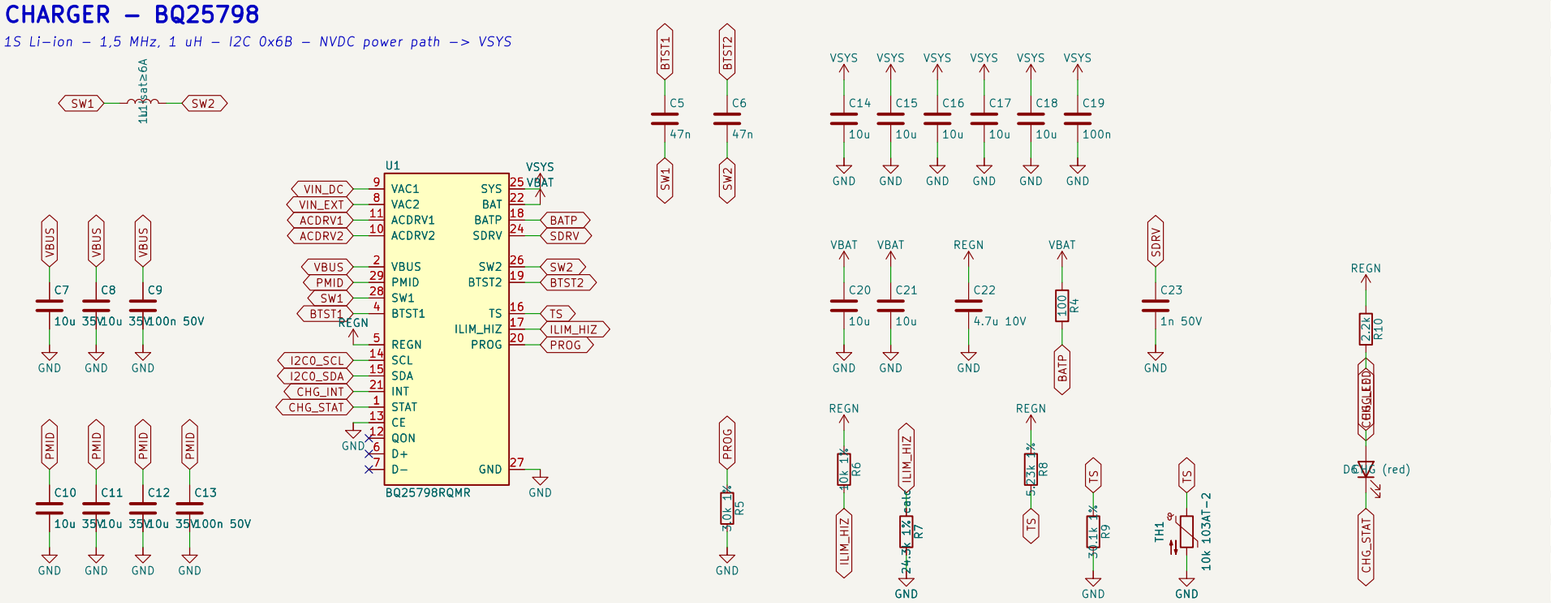
*1S Li-ion berproteksi (PCM), konektor JST-PH (cadangan listrik gateway)*




*Pakai sel berproteksi. NTC dekat sel (kabel).*

## CHARGER – BQ25798

*1S Li-ion – 1,5 MHz, 1 uH – I2C 0x6B – NVDC power path -> VSYS*




## CHARGER NOTES

*PROG 3,0k = 1S, 1,5 MHz (butuh 1 uH). ILIM_HIZ ~ 3,4 V -> batas masukan 3 A (calc).*

*TS 5,23k/30,1k + 103AT = JEITA 0–60 C. Firmware: VAC_OVP 26 V, AUTO_INDET off.*

Gateway LoRa 4G GPS – contoh rancang.in (blok iot-board/Station)

**rancang.in**

Sheet: /Power/

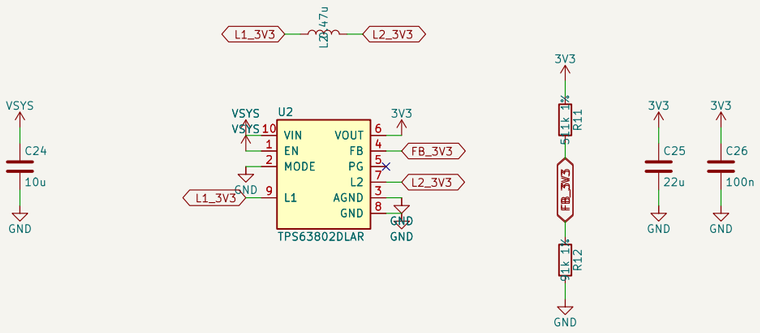
File: power.kicad_sch

**Title: Power: masukan DC 5–24 V, USB, BQ25798 + Li-ion 1S**

| Size: A3 | Date: 2026-10-28 | **Rev: 0.1** |
|---|---|---|
| KiCad E.D.A. 10.0.8 | | Id: 2/8 |

## 3V3 MAIN — TPS63802

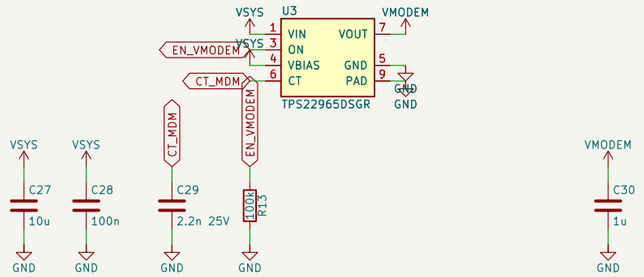
*Buck-boost dari VSYS — selalu hidup — 11 uA Iq — 2 A*




*VOUT = 0,5 V x (1 + 511k/91k) = 3,31 V (E22: maks 3,7 V, jangan dari VBAT langsung).*

## MODEM SUPPLY — TPS22965

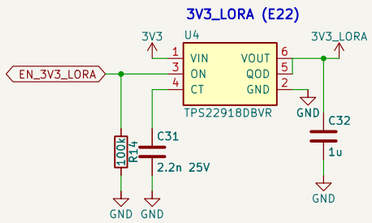
*VSYS -> VMODEM — saklar 6 A, lonjakan 2 A*

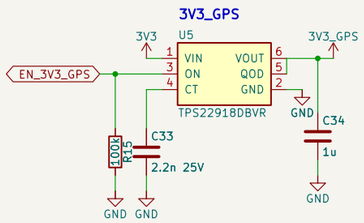



*Bulk 470 uF + 100 uF di header MODEM.*

## SWITCHED 3V3 RAILS

*TPS22918 x2 — OFF saat boot (EN pull-down) — QOD pada VOUT*

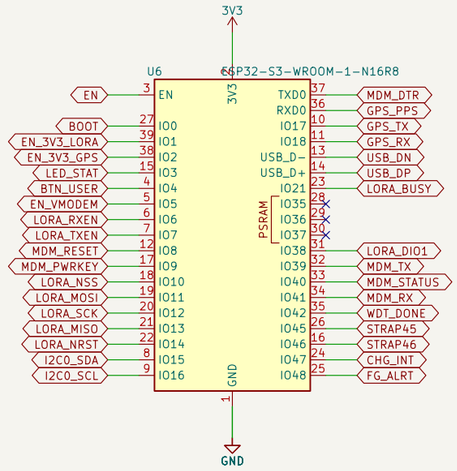


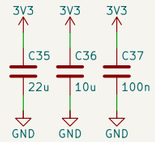




| | | |
|---|---|---|
| Gateway LoRa 4G GPS — contoh rancang.in (blok iot-board/Station)<br>**rancang.in** | | |
| Sheet: /Power rails/<br>File: power_rails.kicad_sch | | |
| ***Title: Rail: 3V3 buck-boost, saklar modem, saklar 3V3 LoRa dan GPS*** | | |
| Size: A3 | Date: 2026-10-28 | **Rev: 0.1** |
| KiCad E.D.A. 10.0.8 | | Id: 3/8 |

## ESP32-S3 MODULE

*ESP32-S3-WROOM-1-N16R8 — peta GPIO di README papan*



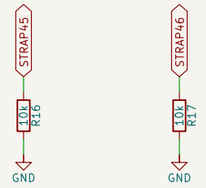




*IO35–IO37 dipakai PSRAM oktal di dalam modul: biarkan.*

*TXD0/RXD0 (IO43/44) dipakai MDM_DTR dan GPS_PPS; console lewat USB native (IO19/20).*

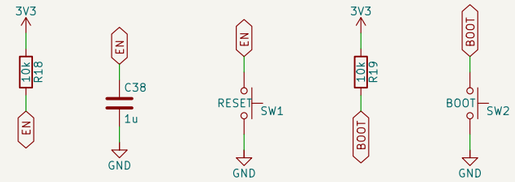
## STRAPPING PINS

*IO45 low = 3.3 V flash — IO46 low for download*



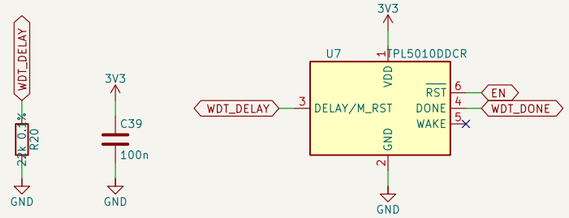

## RESET & BOOT

*EN RC delay — BOOT button on IO0*




## EXTERNAL WATCHDOG

*TPL5010 — ~60 s — pulls EN low if WDT_DONE is not pulsed*

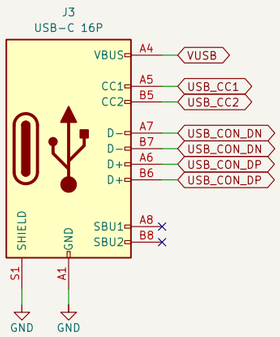


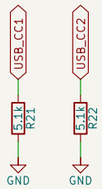

*22 k -> t_IP ~ 60 s (tabel TPL5010). RSTn open-drain ke RC EN (10k pull-up).*

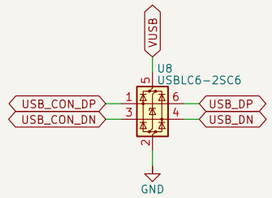
*Firmware harus mengirim pulsa WDT_DONE (IO42) minimal sekali per periode.*

## USB-C

*Flashing, debug console, daya bench (VUSB -> VIN_DC lewat Schottky)*




*USBLC6: D+ lewat pin 1–6 dan D– lewat 3–4 (flow-through).*

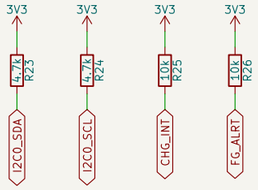
*CC1/CC2 5.1k ke GND: papan adalah sink USB.*

Gateway LoRa 4G GPS — contoh rancang.in (blok iot-board/Station)
**rancang.in**

| | | |
|---|---|---|
| Sheet: /MCU/ | | |
| File: mcu.kicad_sch | | |
| ***Title: MCU: ESP32-S3 module, USB-C, reset/boot, straps, watchdog*** | | |
| Size: A3 | Date: 2026-10-28 | **Rev: 0.1** |
| KiCad E.D.A. 10.0.8 | | Id: 4/8 |

## I2C0 BUS DAN IRQ

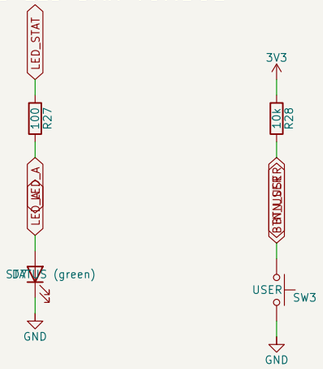
*Pull-up ke 3V3 selalu hidup*




*0x36 MAX17048 — 0x6B BQ25798. CHG_INT (IO47) dan FG_ALRT (IO48) open-drain.*

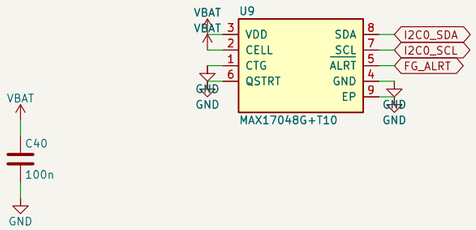
## STATUS LED DAN TOMBOL

*IO3 / IO4*




## FUEL GAUGE — MAX17048

*ModelGauge (Li-ion) — I2C 0x36 — dari VBAT*




Gateway LoRa 4G GPS — contoh rancang.in (blok iot-board/Station)

**rancang.in**

Sheet: /IO/

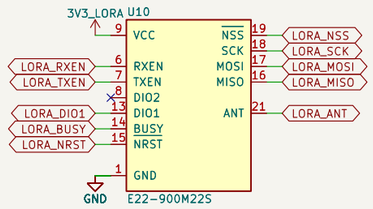
File: io.kicad_sch

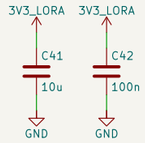
***Title: I/O: bus I2C0, fuel gauge, LED dan tombol***

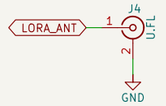
| Size: A3 | Date: 2026-10-28 | **Rev: 0.1** |
|---|---|---|
| KiCad E.D.A. 10.0.8 | | Id: 5/8 |

# LORA – E22-900M22S

*SX1262, 850–930 MHz, 22 dBm – rel 3V3_LORA – frekuensi AS923 UNVERIFIED*




*TXEN dan RXEN dari MCU; DIO2 tidak dipakai (TXEN dan RXEN dua GPIO). ANT ke u.FL lewat jalur 50 ohm pendek.*

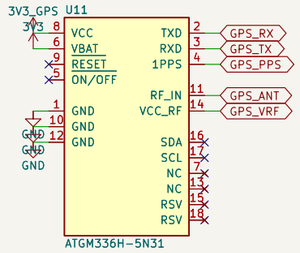
*E22: tegangan di atas 3,7 V merusak modul (rel 3V3 3,31 V). Tanpa trace digital di bawah modul sisi sama.*

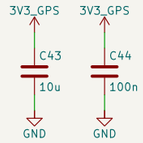
Gateway LoRa 4G GPS – contoh rancang.in (blok iot-board/Station)
**rancang.in**

| | | |
|---|---|---|
| Sheet: /LoRa/ | | |
| File: lora.kicad_sch | | |
| ***Title: LoRa: E22-900M22S (SX1262), SPI ke ESP32-S3, antena u.FL*** | | |
| Size: A3 | Date: 2026-10-28 | **Rev: 0.1** |
| KiCad E.D.A. 10.0.8 | | Id: 6/8 |

# GPS – ATGM336H-5N31

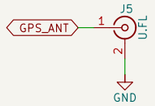
*GPS+BDS – 3V3_GPS (saklar) – VBAT ke 3V3 selalu hidup untuk hot start*










*TXD (pin 2) -> ESP32 GPS_RX (IO18); RXD (pin 3) <- ESP32 GPS_TX (IO17). Pin ON/OFF dan nRESET dibiarkan (UNVERIFIED).*

*Antena aktif: VCC_RF (3,3 V) lewat L 47 nH ke RF_IN (manual 2.7.1); antena pasif butuh LNA (tidak dipasang).*

Gateway LoRa 4G GPS – contoh rancang.in (blok iot-board/Station)

**rancang.in**

Sheet: /GPS/

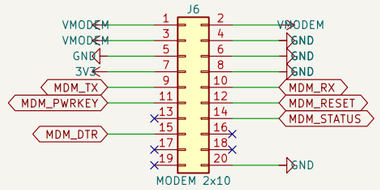
File: gps.kicad_sch

***Title: GPS: ATGM336H-5N31 (UART 9600, 1PPS), antena aktif lewat u.FL***

| Size: A3 | Date: 2026-10-28 | **Rev: 0.1** |
|---|---|---|
| KiCad E.D.A. 10.0.8 | | Id: 7/8 |

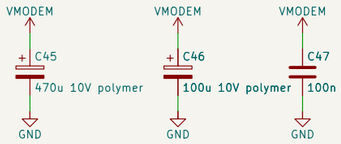
# MODEM SLOT

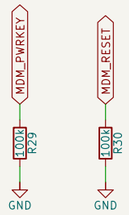
*Header 2x10 2,54 mm — A7670E — logika 3,3 V*




*Pin 9 MDM_TX = ESP32 -> modem (IO39) — pin 10 MDM_RX = modem -> ESP32 (IO41).*

*Pin 7: referensi 3V3 untuk level shifter 1,8 V kartu (maks 50 mA). RI, ID0/ID1 (13, 17, 18) dibiarkan.*




*Pull-down PWRKEY/RESET: GPIO mengambang sampai firmware mengonfigurasinya.*

Gateway LoRa 4G GPS — contoh rancang.in (blok iot-board/Station)
**rancang.in**

Sheet: /Modem/
File: modem.kicad_sch

***Title: Slot MODEM (2x10) untuk kartu LTE A7670E, kapasitansi bulk***

| Size: A3 | Date: 2026-10-28 | **Rev: 0.1** |
|---|---|---|
| KiCad E.D.A. 10.0.8 | | Id: 8/8 |