STM32F100C4T6B Handheld GPS Locator

System Architecture

Power Supply

Power Supply

File: Power Supply.kicad_sch

Controller

Controller

File: Controller.kicad_sch

Peripherals

Peripherals

File: Peripherals.kicad_sch

TO-DO ITEM:
Example text for schematic to-do tasks.

DESIGN NOTE:
Example text for informational design notes.

DESIGN NOTE:
Example text for debug notes.

DESIGN NOTE:
Example text for cautionary design notes.

DESIGN NOTE:
Example text for critical design notes.

LAYOUT NOTE:
Example text for critical layout guidelines.

MTP

Sheet: /
File: STM32F10xPill_GPS_Locator.kicad_sch

Title: STM32F100C4T6B GPS Locator

Size: A3	Date: 2025-03-06	**Rev: 1.0.0**
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+BATT is battery voltage downstream of regulation but upstream of the power switch; it is always connected to power

Place bypass caps close to power pins

Use jumper to determine boot mode
HIGH = Bootloader
LOW = Normal Operation

Assume 6 pF stray capacitance
Assume nominal 17 pF crystal load capacitance
C = 2 * (Cload - Cstray) = 2 * (17 - 6) = 22 pF

Crystal Series Resistor
R = 1 / (2 * pi * F * CL2)
R = 1 / (2 * pi * 16MHz * 22pF)
R = 452.4 => 453 1%
See ST AN2867 Oscillator Design Guide

Place all clock crystals and caps close to MCU

32.768kHz crystal for RTC function
C = 2 * (Cload * Cstray) = 2 * (13 - 6) = 14 pF

LCD on SPI1

GPS on UART1 (PB6/PB7)

Compass on I2C #2
PB10 & PB11

STM32F100x6
Max I into VDD: 150mA
Max I into VBATT: 1.75uA

LED for troubleshooting and error indication

SWD Connector is not ESD protected!

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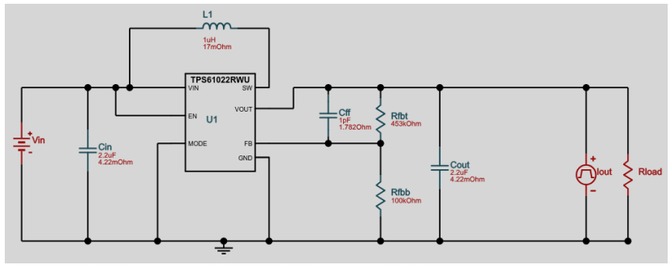
To keep voltages stable regardless of battery voltage, and to provide 5V power to the GPS, battery voltage boosted to 5V and then bucked to 3.3V

Using a single 18650, assume capacity of 2500mAh
Target runtime is 10 hours continuous



Source: webench.ti.com The TPS61022 circuit as computed by the WEBENCH Power Designer tool

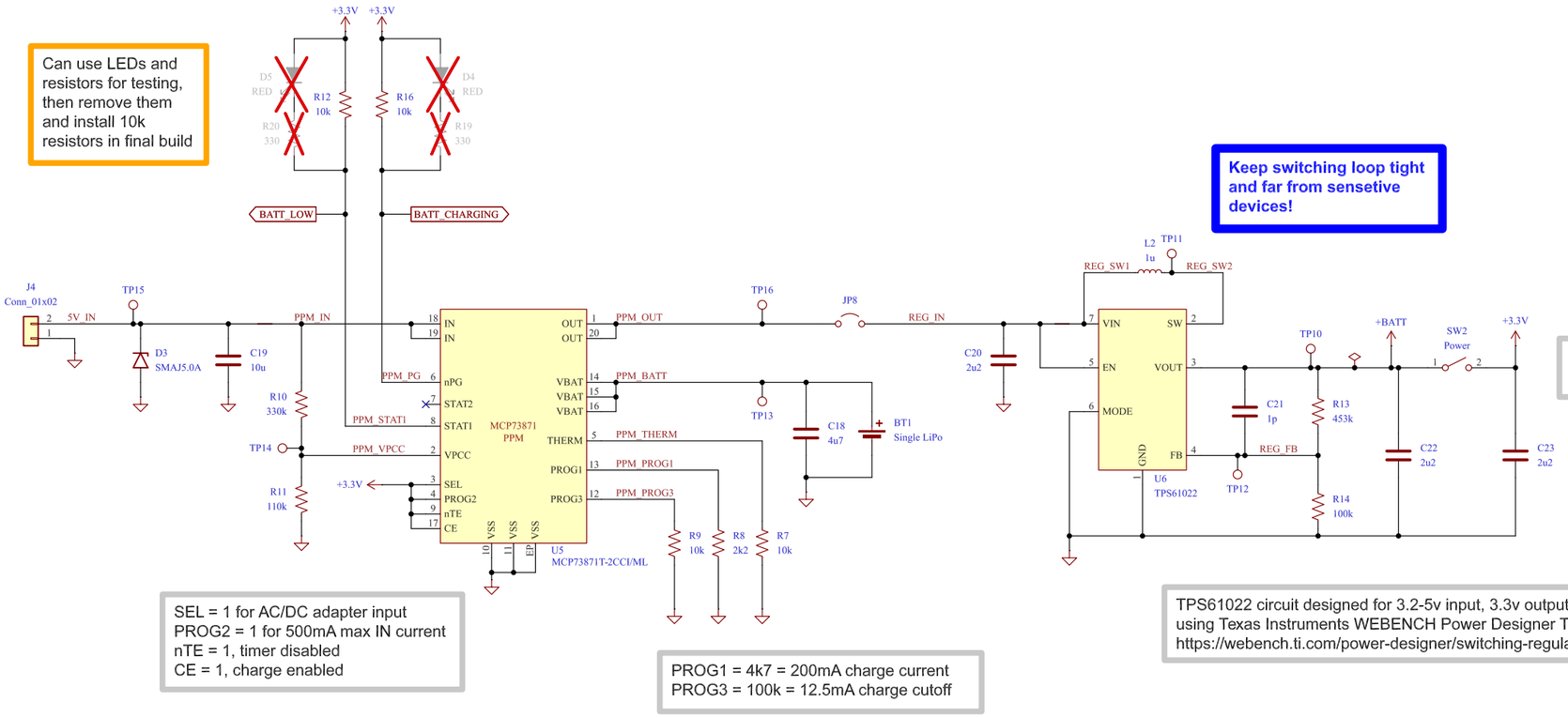
Inputs for battery status signals are active low

Can use LEDs and resistors for testing, then remove them and install 10k resistors in final build

Keep switching loop tight and far from sensetive devices!

Expect 5V 500mA power input

Expect 200mA max current draw on 3v3 rail



SEL = 1 for AC/DC adapter input
PROG2 = 1 for 500mA max IN current
nTE = 1, timer disabled
CE = 1, charge enabled

PROG1 = 4k7 = 200mA charge current
PROG3 = 100k = 12.5mA charge cutoff

TPS61022 circuit designed for 3.2-5v input, 3.3v output, 500mA using Texas Instruments WEBENCH Power Designer Tool
https://webench.ti.com/power-designer/switching-regulator/select

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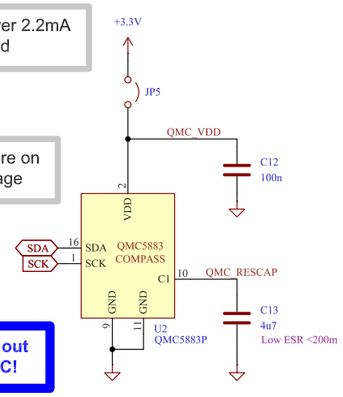
QMC5883P Max Power 2.2mA
22uA when suspended

I2C Pullups are on
main MCU page

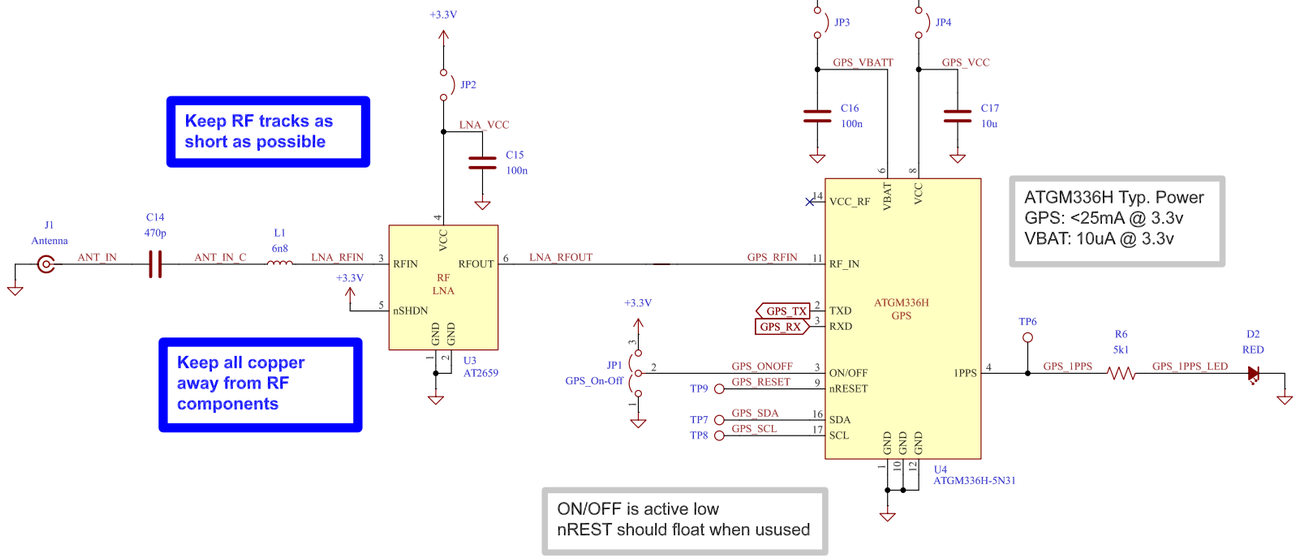


Keep all copper out from under the IC!

Keep all ferrous materials away from the compass IC!

VBAT is battery voltage downstream of regulation but upstream of the power switch; it is always connected to power

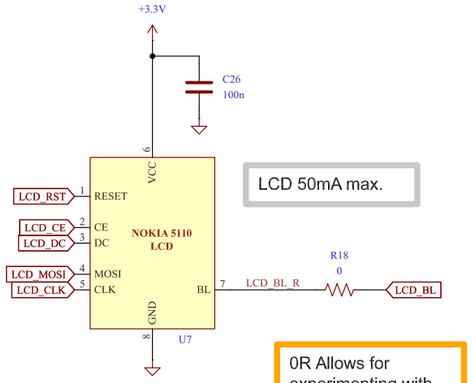
Keep RF tracks as short as possible



ATGM336H Typ. Power
GPS: <25mA @ 3.3v
VBAT: 10uA @ 3.3v

Keep all copper away from RF components

ON/OFF is active low
nREST should float when ususued



LCD 50mA max.

0R Allows for experimenting with PWM signals or rewiring to 3v3 or GND if needed

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