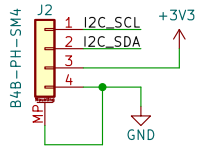


Libre Solar BMS for 3–16 cells

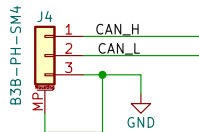
Based on TI bq76952 and ESP32-C3

Development funded by
EnAccess Foundation.
<https://enaccess.org>

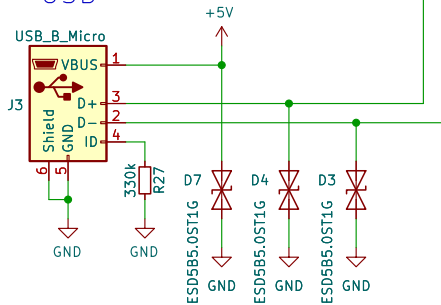
Internal I2C



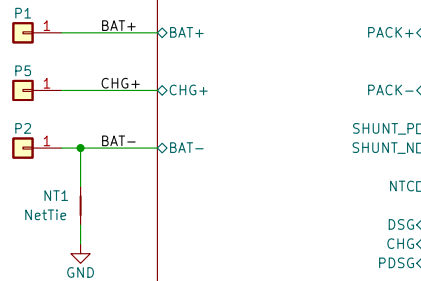
CAN bus



USB

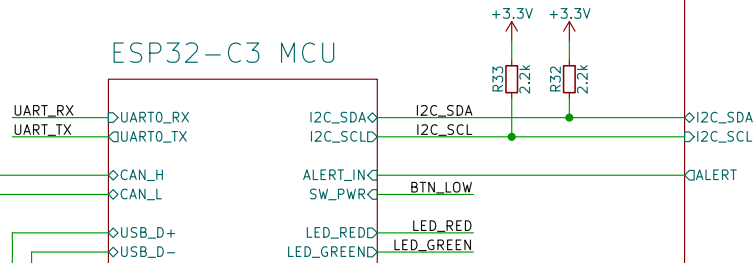


Power Part



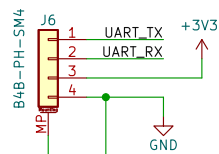
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ESP32-C3 MCU

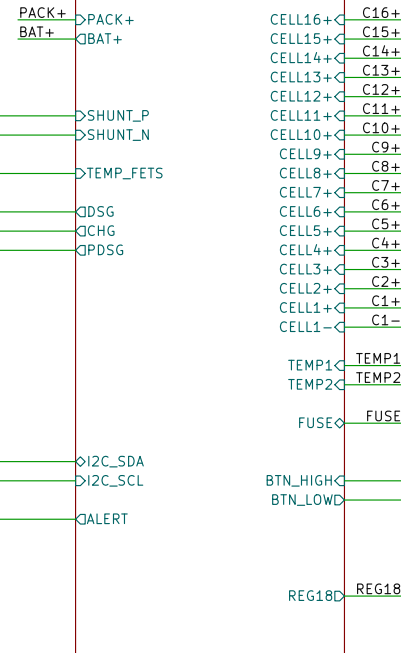


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Serial

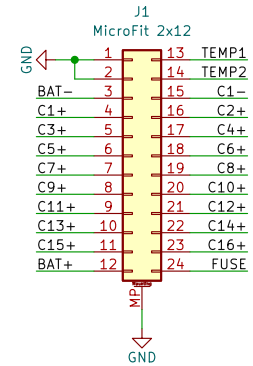


BQ76952

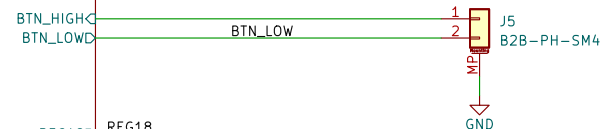


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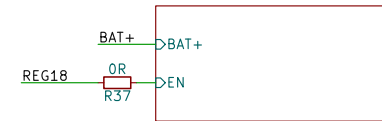
Cell Connector



On/Off button



Power Supply



Date: power_supply.kicad_sch

- FID1 Fiducial
- H1 MountingHole
- H2 MountingHole
- H3 MountingHole
- FID2 Fiducial
- H4 MountingHole
- H5 MountingHole
- H6 MountingHole



Libre Solar BMS C1

Libre Solar Technologies GmbH
Author: Martin Jäger

Website: <https://libre.solar>



Sheet: /
File: bms-c1.kicad_sch

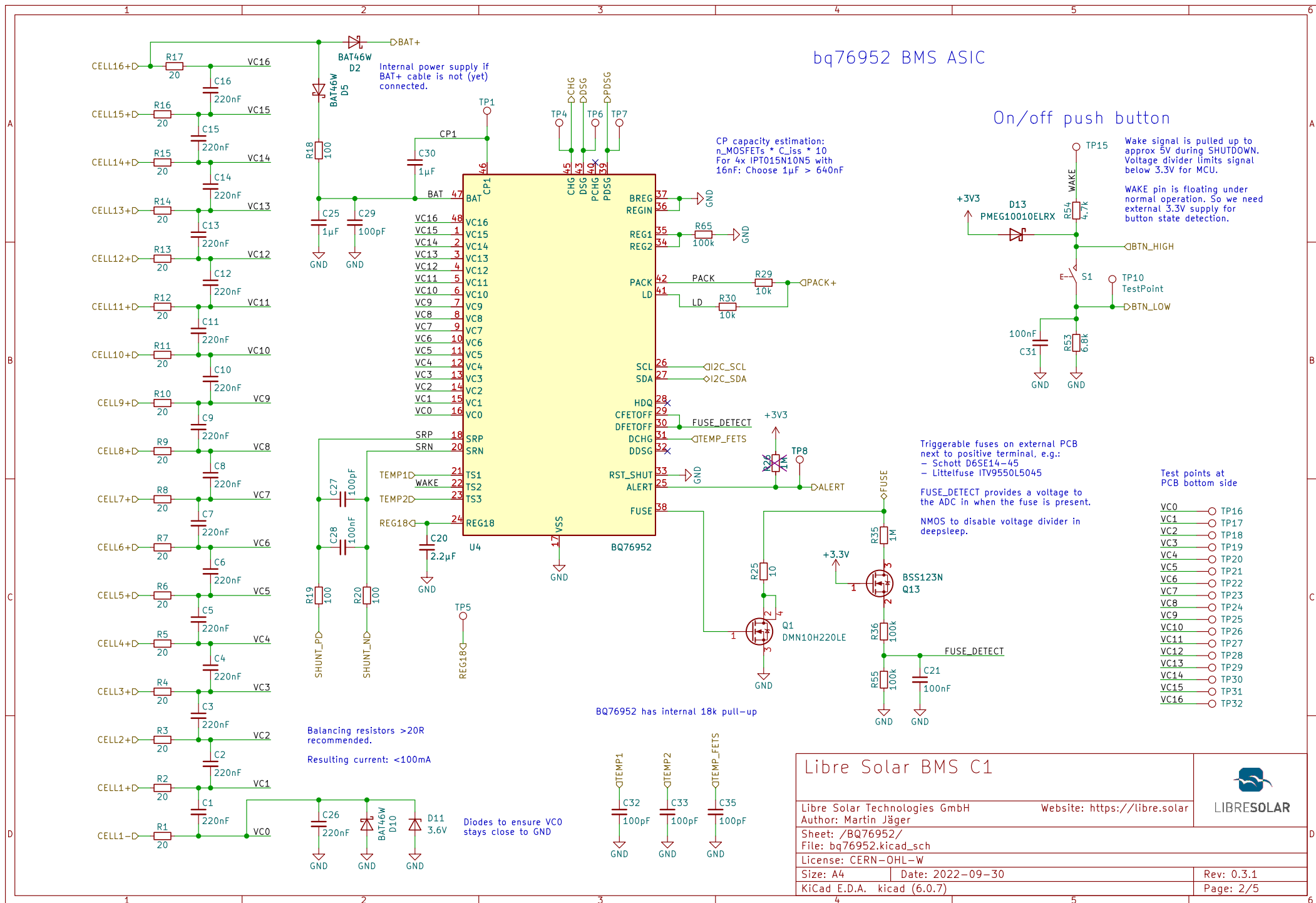
License: CERN-OHL-W

Size: A4 Date: 2022-09-30

KiCad E.D.A. kicad (6.0.7)

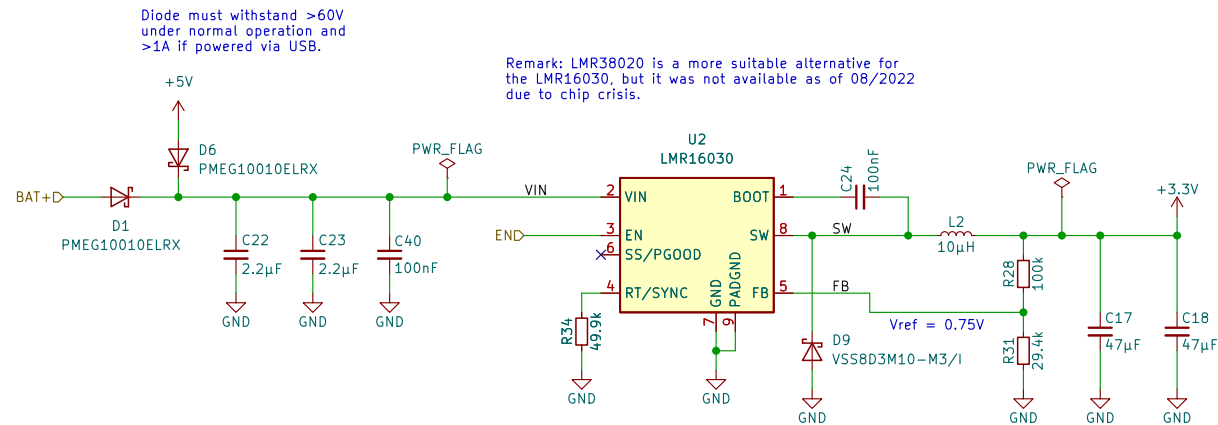
Rev: 0.3.1

Page: 1/5



Battery to 3.3V (SMPS)

ESP32-C3 requires power supply with at least 500 mA



Libre Solar BMS C1

Libre Solar Technologies GmbH
Author: Martin Jäger

Website: <https://libre.solar>



Sheet: /Power Supply/
File: power_supply.kicad_sch

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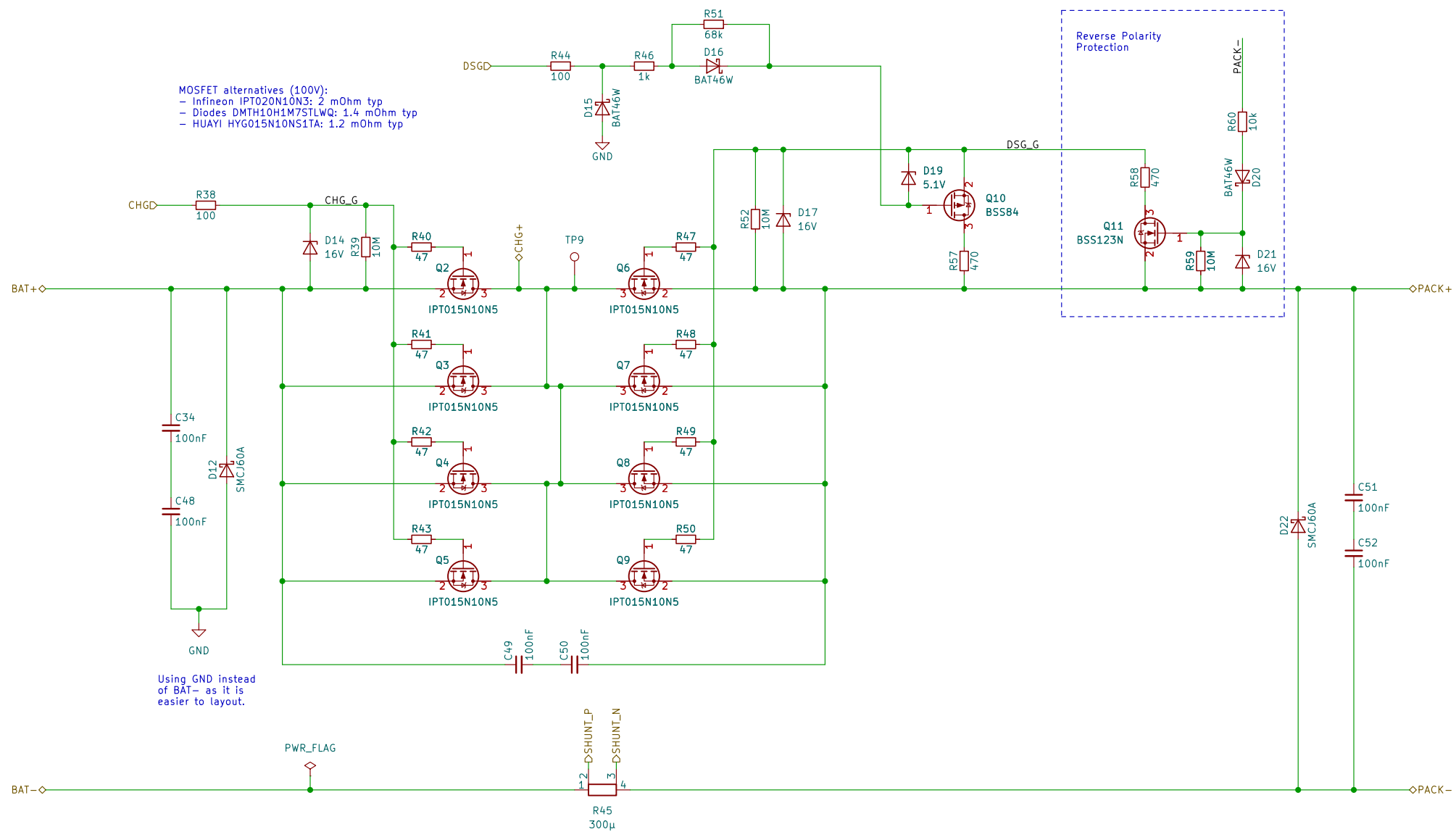
Size: A4 Date: 2022-09-30

Rev: 0.3.1

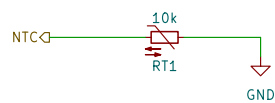
KiCad E.D.A. kicad (6.0.7)

Page: 4/5

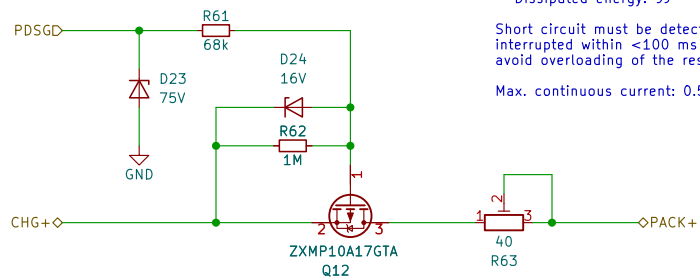
Power Part – MOSFETs and Shunt



MOSFET temperature sensor



Bus precharge circuit



Calculations:

- Peak current: $60V / 40R = 1.5A$
- Time constant for C_{bus} 5mF: 0.2s
- Dissipated energy: 9J

Short circuit must be detected and interrupted within <100 ms to avoid overloading of the resistor.

Max. continuous current: 0.5 A

Libre Solar BMS C1

Libre Solar Technologies GmbH Website: <https://libre.solar>

Author: Martin Jäger

Sheet: /Power Part/

File: power-part.kicad_sch

License: CERN-OHL-W

Size: A3

Date: 2022-09-30

Rev: 0.3.1

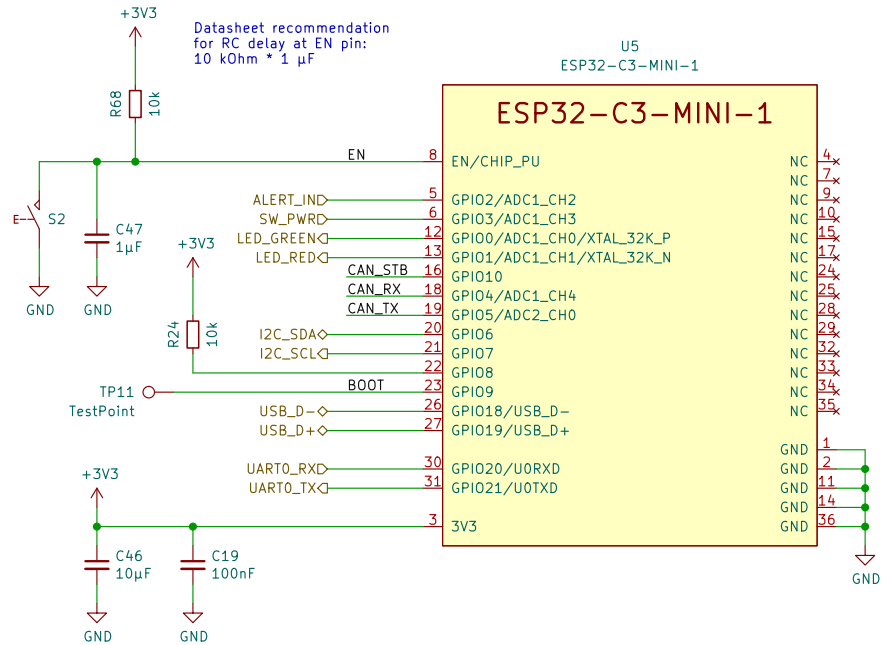
KiCad E.D.A. kicad (6.0.7)

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LIBRESOLAR

ESP32-C3 module



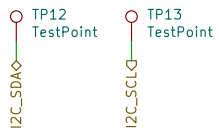
The ESP32-C3 has only one I2C peripheral, which is required for communication with the BMS IC bq76952.

The UEXT I2C pins will not be connected.

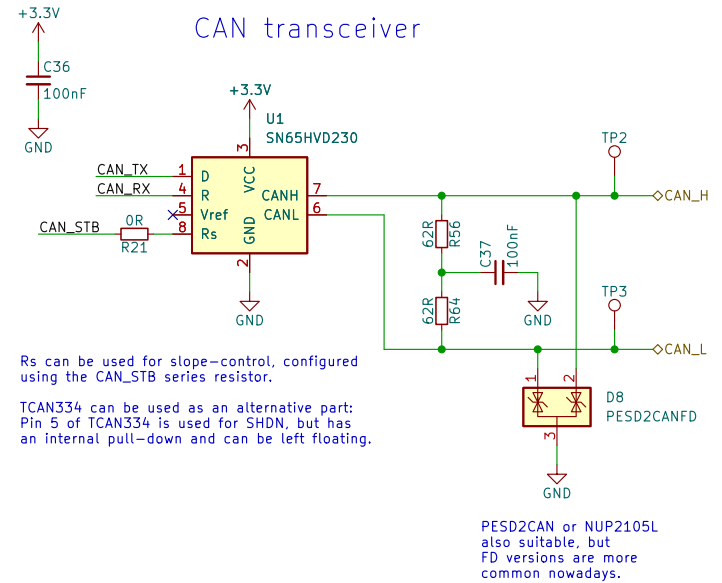
SPI0 and SPI1 are used internally for flash memory access, so we use SPI2 here.

BOOT pin (GPIO9) has an internal pull-up. If connected to GND during start-up, chip enters bootloader mode. Expecting BOOT pin is not required if built-in JTAG is used for firmware upload.

GPIO2 needs to be pulled high during start-up,
which is achieved by the bq76952 ALERT pull-up.



CAN transceiver



Rs can be used for slope-control, configured using the CAN_STB series resistor.

TCAN334 can be used as an alternative part:
Pin 5 of TCAN334 is used for SHDN, but has
an internal pull-down and can be left floating.

PESD2CAN or NUP2105L
also suitable, but
FD versions are more
common nowadays.