10A MPPT Charge Controller with USB

MCU

MCU

mcu.sch

DCDC power stage

DC/DC

dcdc.sch

Power Supply

Power

USB

power_supply.sch

Main Specifications

- 12V battery voltage
- 10A max. charge current
- 55V max. solar input
- 32bit ARM MCU (STM32L072)
- Expandable via Olimex Universal Extension Connector (UEXT) featuring I2C, Serial and SPI interface (e.g. used for display, WIFI communication, etc.)
- USB charging
- High-side load switching

MK1
Mounting_Hole

MK2
Mounting_Hole

MK3
Mounting_Hole

MK4
Mounting_Hole

GND

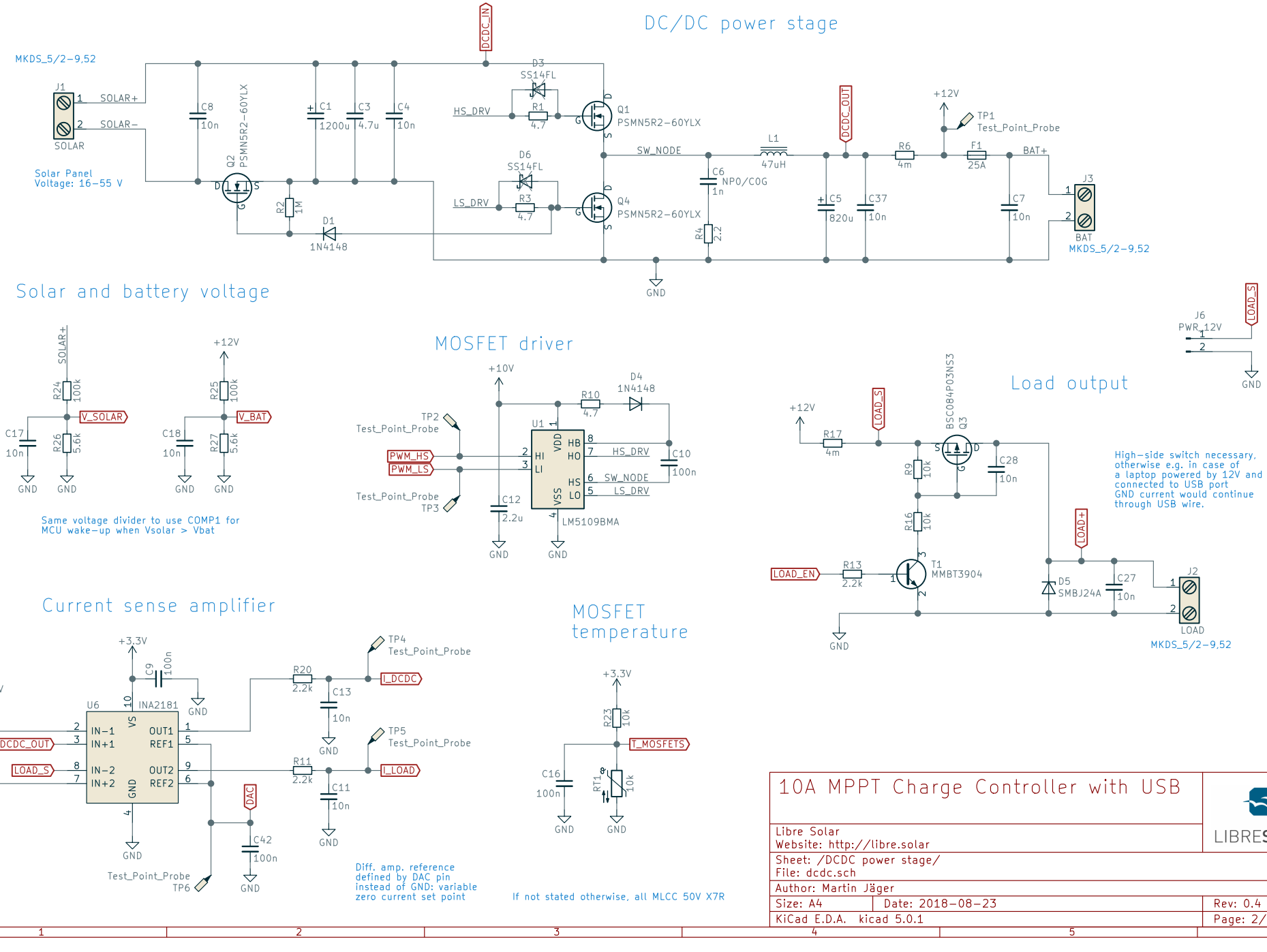
LOGO1

LIBRE_SOLAR

LOGO2

OPEN_HARDWARE

10A MPPT Charge Controller with USB		LIBRESOLAR
Libre Solar Website: http://libre.solar		
Sheet: / File: mppt-10a.sch		
Author: Martin Jäger		
Size: A4	Date: 2018-08-23	Rev: 0.4
KiCad E.D.A. kicad 5.0.1		Page: 1/4



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Sheet: /DCDC power stage/ File: dcdc.sch	
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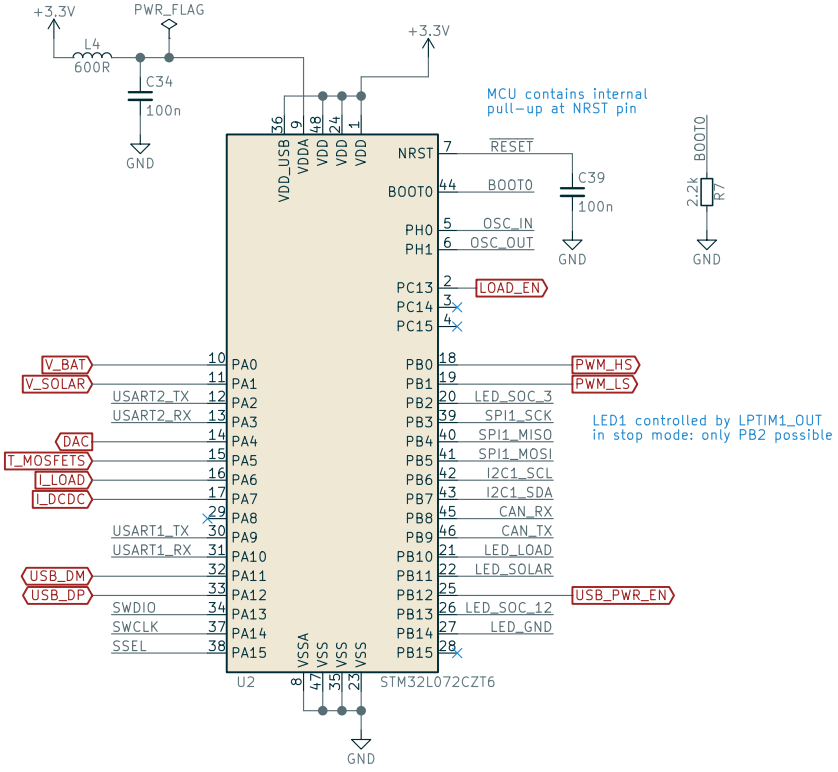
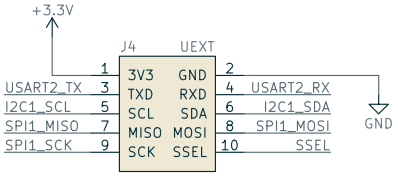
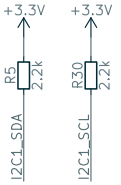
MCU STM32L072



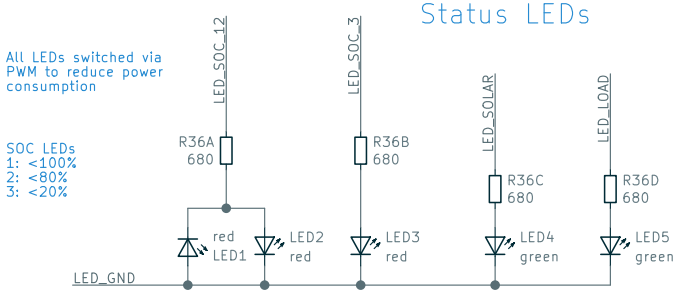
UEXT connector



I2C pull-ups

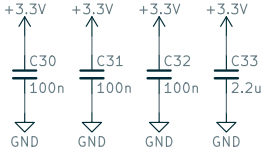


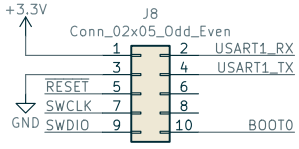
Status LEDs



Maximum power per GPIO pin of STM32L0: 16 mA
LED_GND sinks max. 4 LEDs at the same time
Current per LED: (3.3−1.5)/680 = 2.65A

STM Nucleo SWD and USART





If not stated otherwise, all MLCC 50V X7R

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Battery to 5V (SMPS)

Output voltage: 0.925 x (1+45.3/10) = 5.12 V

Layout for 2A output current
(1x up to 1.5A fast charging USB port, one normal 500 mA port)

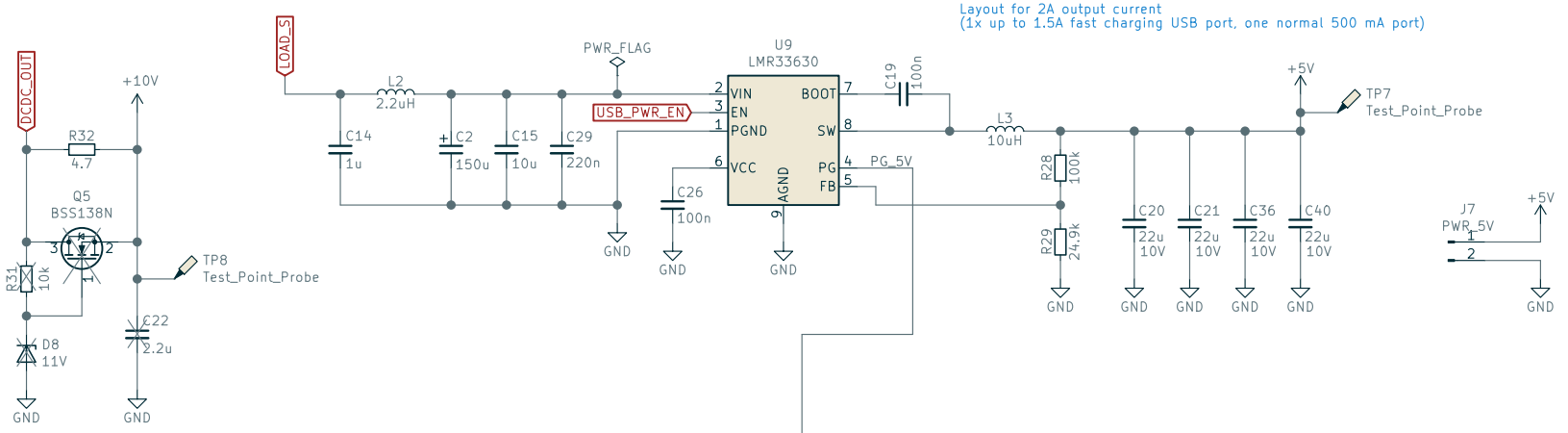
Stuffing options for MOSFET driver supply voltage:

1. Direct supply via 12V (put R32)

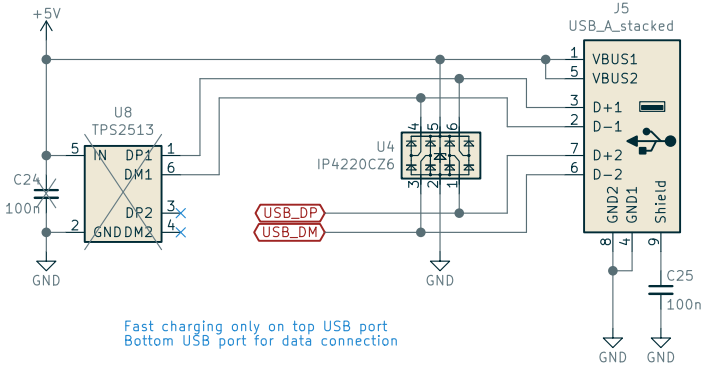
2. Source follower to generate 10V from higher bat. voltage

Test results TP8 using 11V zener:
- 9.28 V with MOSFET driver on (50 kHz)
- 9.62 V with MOSFET driver off

--> 12V zener might be better

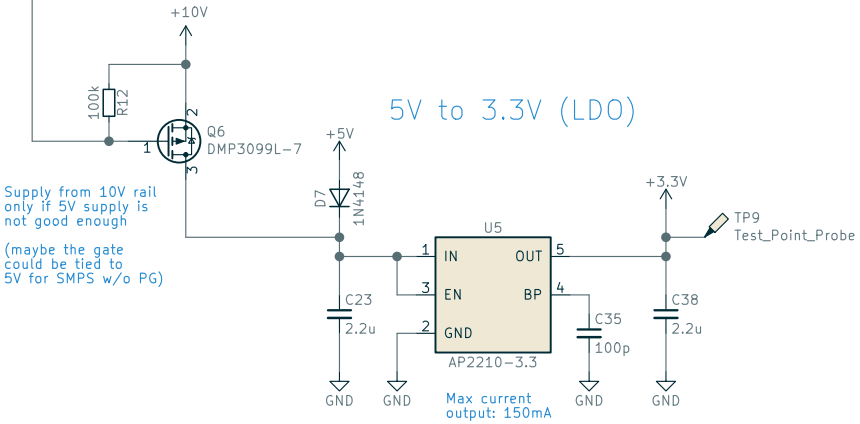


USB connector and power supply



Fast charging only on top USB port
Bottom USB port for data connection

5V to 3.3V (LDO)



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