12V / 10A MPPT Solar Charge Controller with USB

MCU

MCU

mcu.sch

DCDC power stage

DC/DC

dcdc.sch

Power Supply

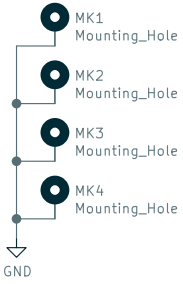
Power

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



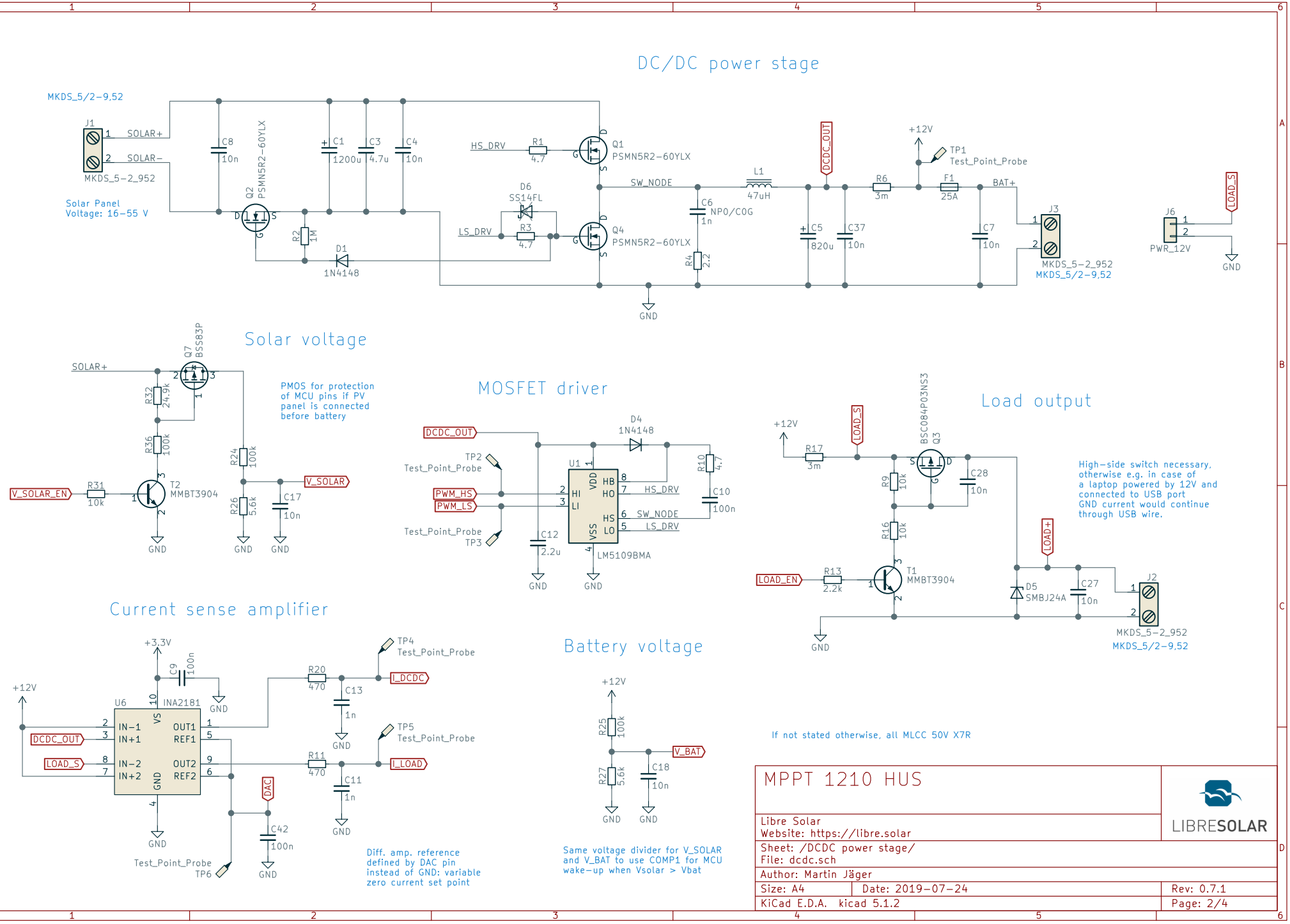
LOGO1

LIBRE_SOLAR

LOGO2

OPEN_HARDWARE

MPPT 1210 HUS		LIBRESOLAR
Libre Solar Website: https://libre.solar		
Sheet: / File: mppt-1210-hus.sch		
Author: Martin Jäger		
Size: A4	Date: 2019-07-24	Rev: 0.7.1
KiCad E.D.A. kicad 5.1.2		Page: 1/4


DC/DC power stage
MKDS_5/2-9,52
J1
SOLAR+
SOLAR-
MKDS_5-2_952
Solar Panel
Voltage: 16-55 V
C8
10n
Q2
PSMN5R2-60YLX
C1
1200u
C3
4.7u
C4
10n
R2
1M
D1
1N4148
HS_DRV
R1
4.7
Q1
PSMN5R2-60YLX
SW_NODE
D6
SS14FL
LS_DRV
R3
4.7
Q4
PSMN5R2-60YLX
C6
NP0/C0G
1n
R4
2.2
L1
47uH
DCDC_OUT
C5
820u
C37
10n
R6
3m
+12V
TP1
Test_Point_Probe
F1
25A
BAT+
C7
10n
J3
MKDS_5-2_952
MKDS_5/2-9,52
J6
PWR_12V
LOAD_S
GND
Solar voltage
SOLAR+
Q7
BSS83P
R32
24.9k
R36
100k
R24
100k
V_SOLAR_EN
R31
10k
T2
MMBT3904
R26
5.6k
C17
10n
V_SOLAR
PMOS for protection
of MCU pins if PV
panel is connected
before battery
MOSFET driver
DCDC_OUT
D4
1N4148
TP2
Test_Point_Probe
PWM_HS
PWM_LS
Test_Point_Probe
TP3
U1
VDD
HI
LI
VSS
HB
HO
HS
LO
HS_DRV
SW_NODE
LS_DRV
LM5109BMA
R10
4.7
C10
100n
C12
2.2u
Load output
+12V
LOAD_S
R17
3m
BSC084P03NS3
Q3
R9
10k
C28
10n
R16
10k
LOAD_EN
R13
2.2k
T1
MMBT3904
LOAD+
D5
SMBJ24A
C27
10n
J2
MKDS_5-2_952
MKDS_5/2-9,52
High-side switch necessary,
otherwise e.g. in case of
a laptop powered by 12V and
connected to USB port
GND current would continue
through USB wire.
Current sense amplifier
+3.3V
C9
100n
+12V
U6
INA2181
VS
IN-1
IN+1
IN-2
IN+2
GND
OUT1
REF1
OUT2
REF2
DCDC_OUT
LOAD_S
R20
470
C13
1n
TP4
Test_Point_Probe
I_DCDC
TP5
Test_Point_Probe
I_LOAD
R11
470
C11
1n
DAC
C42
100n
Test_Point_Probe
TP6
Diff. amp. reference
defined by DAC pin
instead of GND: variable
zero current set point
Battery voltage
+12V
R25
100k
R27
5.6k
C18
10n
V_BAT
Same voltage divider for V_SOLAR
and V_BAT to use COMP1 for MCU
wake-up when Vsolar > Vbat
If not stated otherwise, all MLCC 50V X7R
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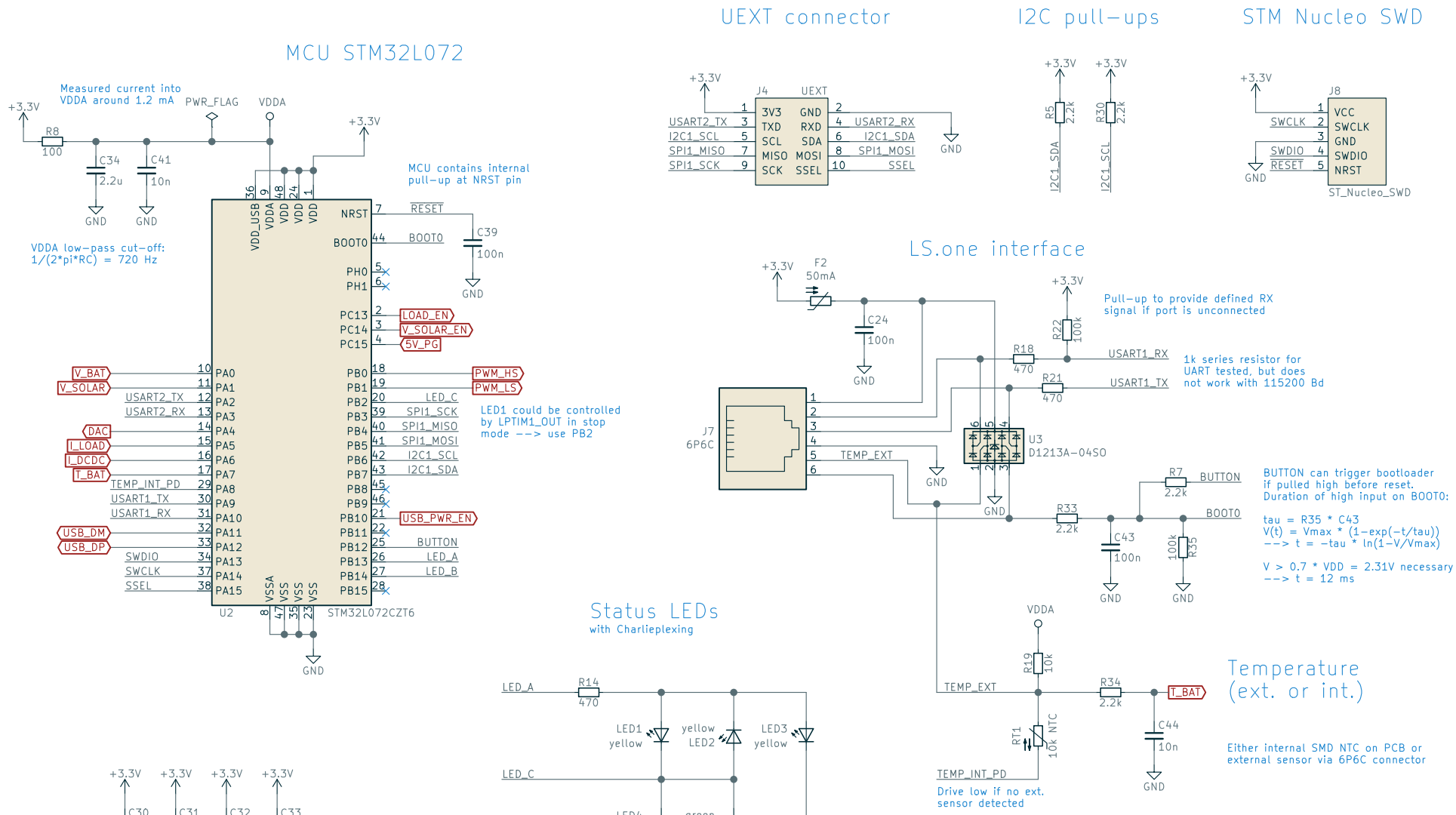

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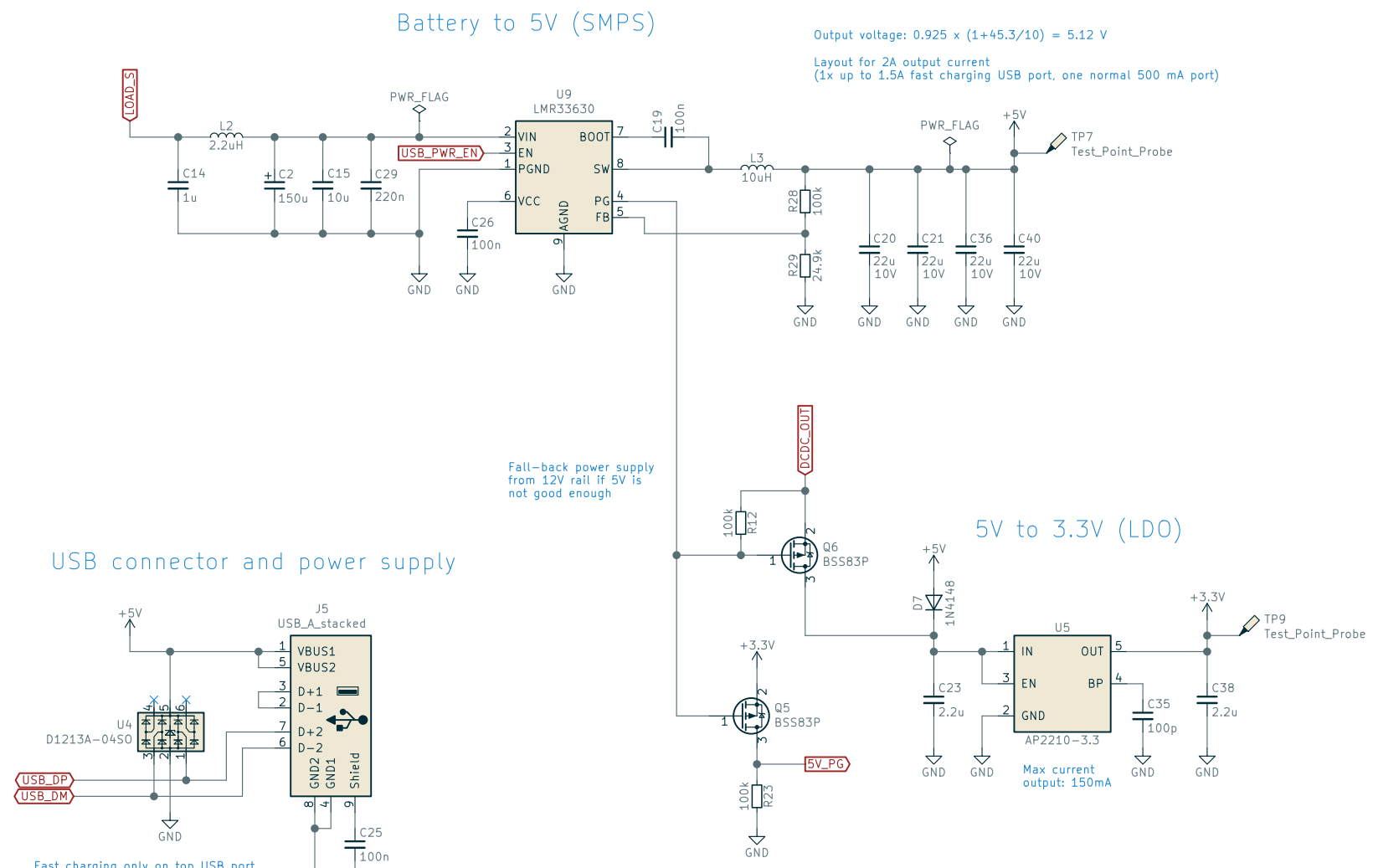

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