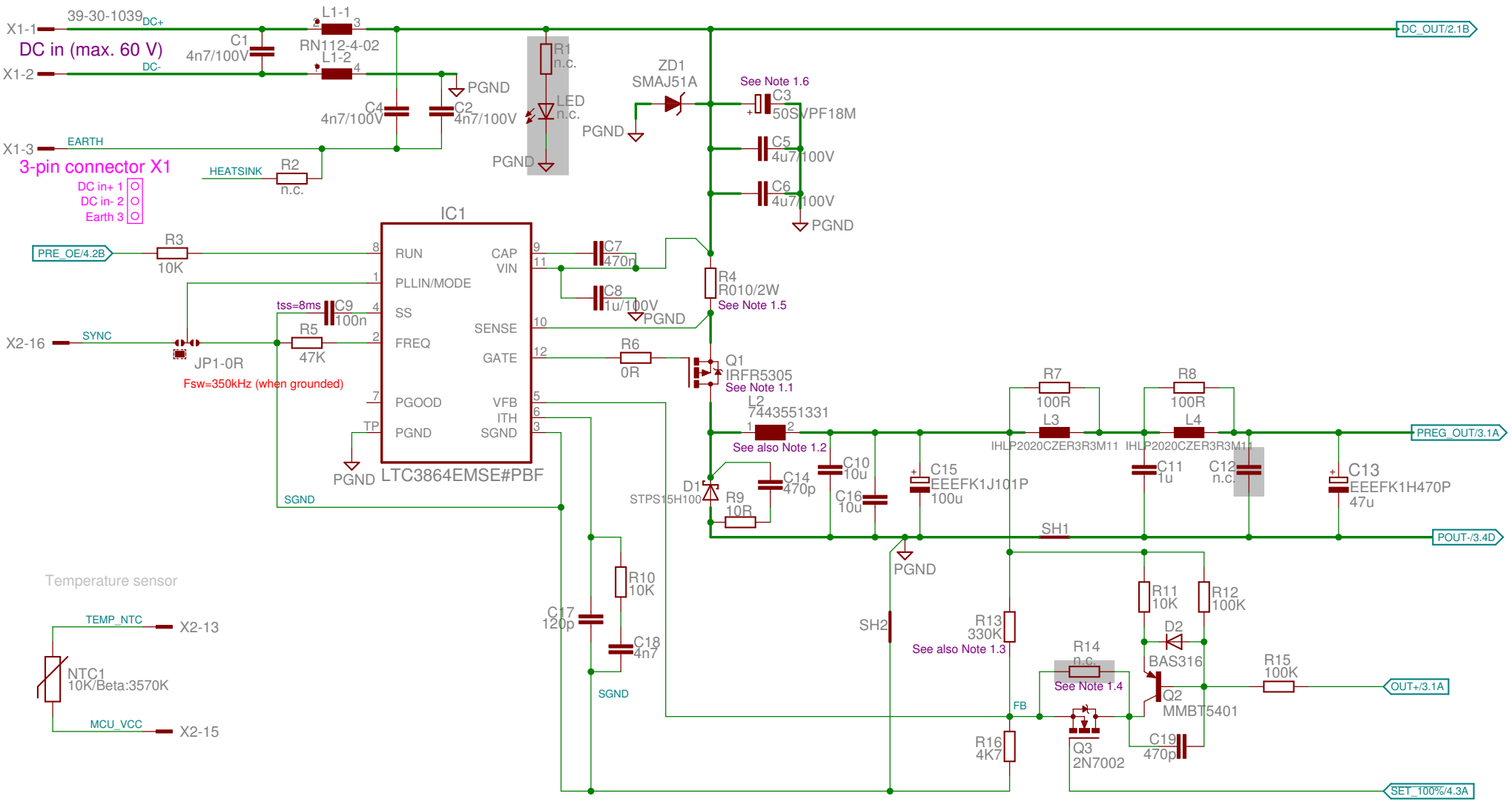

Note 1.1: Possible alternative AUIRFR5305, SUD19P06-60, SPD30P06P or other with similar or lower input capacitance
Note 1.2: WE 7447709330, WE 7443551331, Coilcraft MSS1210-333, Coilcraft XAL1510-333, Vishay IHLP4040DZER470M11, etc.
Note 1.3: Use 240K for 30 VAC main transformer
Note 1.4: Install 0R only if 100% Duty cycle feature for Low Ripple mode is not needed
Note 1.5: Use R020 for 0-3.12 A or R015 for 0-4.16 A range
Note 1.6: Replace ZD1 and C3, C5, C6 if Vin is above 50 V

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Repository: https://github.com/eez-open

SMPS power pre-regulator with 100% duty cycle

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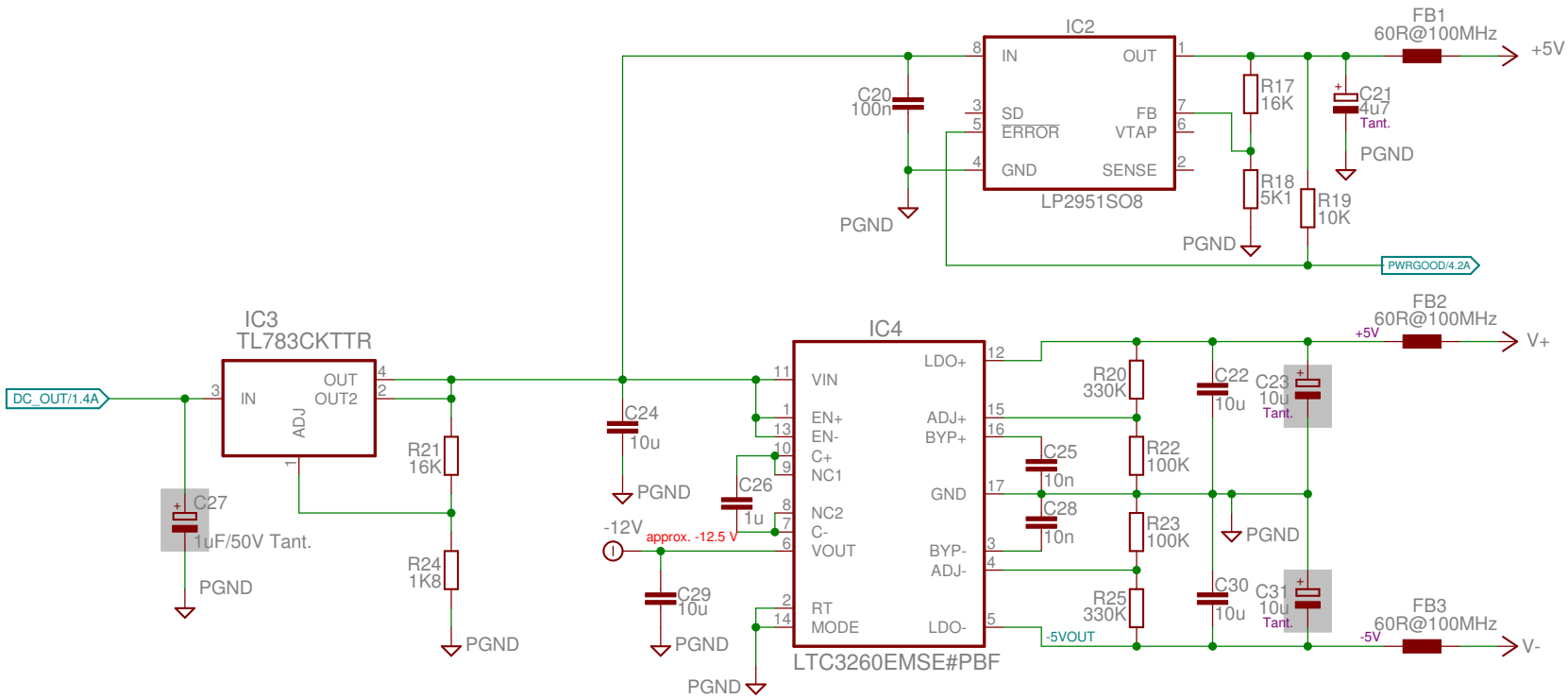

Bias power supply (+/-5V, -10V)

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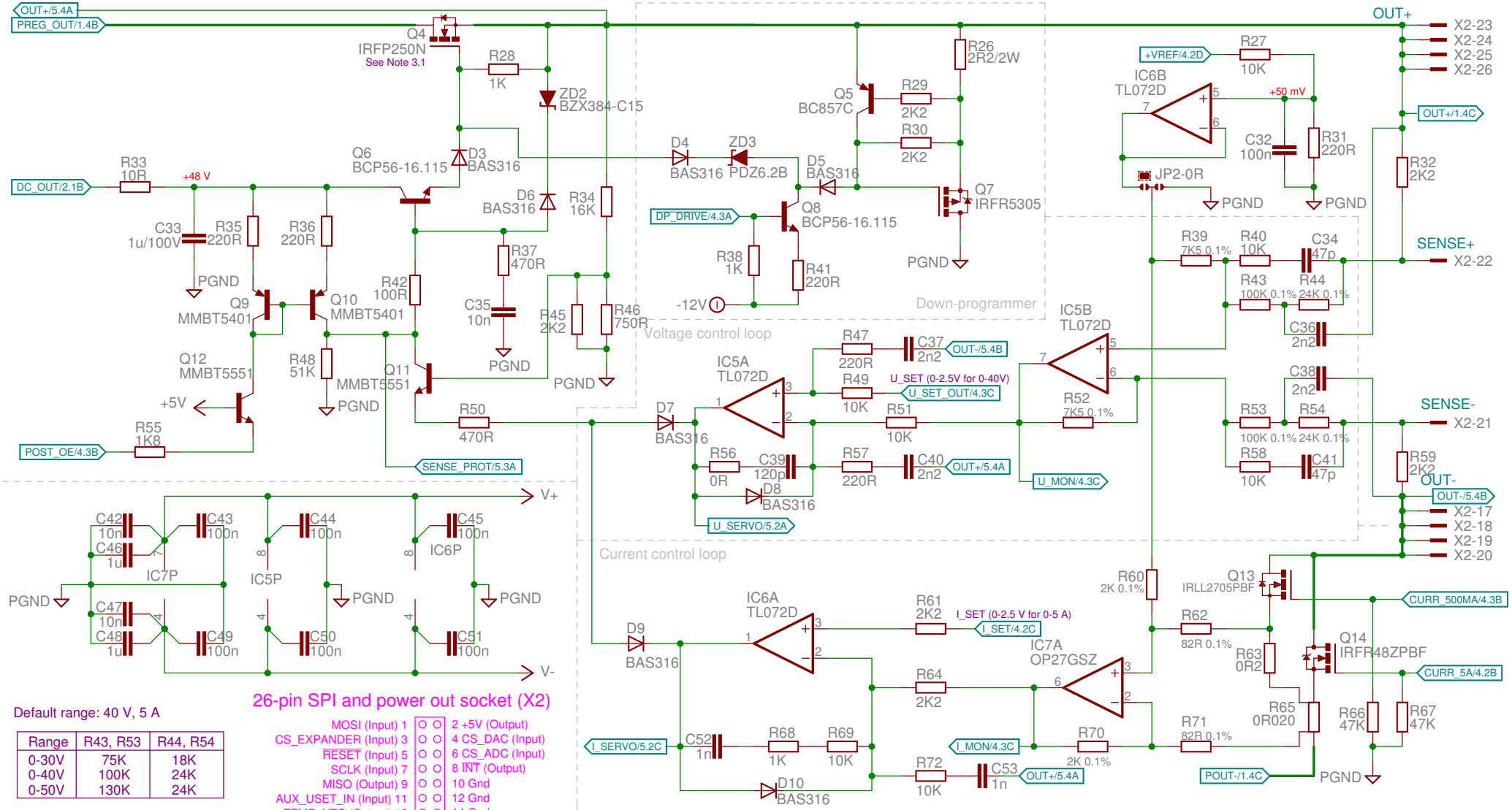

Default range: 40 V, 5 A

Range	R43, R53	R44, R54
0-30V	75K	18K
0-40V	100K	24K
0-50V	130K	24K

Range	R60, R70
0-3.12A	3K24
0-4.16A	2K74
0-5A	2K

26-pin SPI and power out socket (X2)

MOSI (Input) 1		2 +5V (Output)
CS_EXPANDER (Input) 3		4 CS_DAC (Input)
RESET (Input) 5		6 CS_ADC (Input)
SCLK (Input) 7		8 INT (Output)
MISO (Output) 9		10 Gnd
AUX_USET_IN (Input) 11		12 Gnd
TEMP_NTC (Output) 13		14 Gnd
MCU_VCC (Input) 15		16 Sync (Input)
-Vout 17		18 -Vout
-Vout 19		20 -Vout
Sense- (Input) 21		22 Sense+ (Input)
+Vout (Output) 23		24 +Vout (Output)
+Vout (Output) 25		26 +Vout (Output)

Note 3.1: Q4 is mounted on the external heatsink (e.g. RAD-A4463/120)

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CV/CC linear post-regulator
Output enable and "down-programmer"

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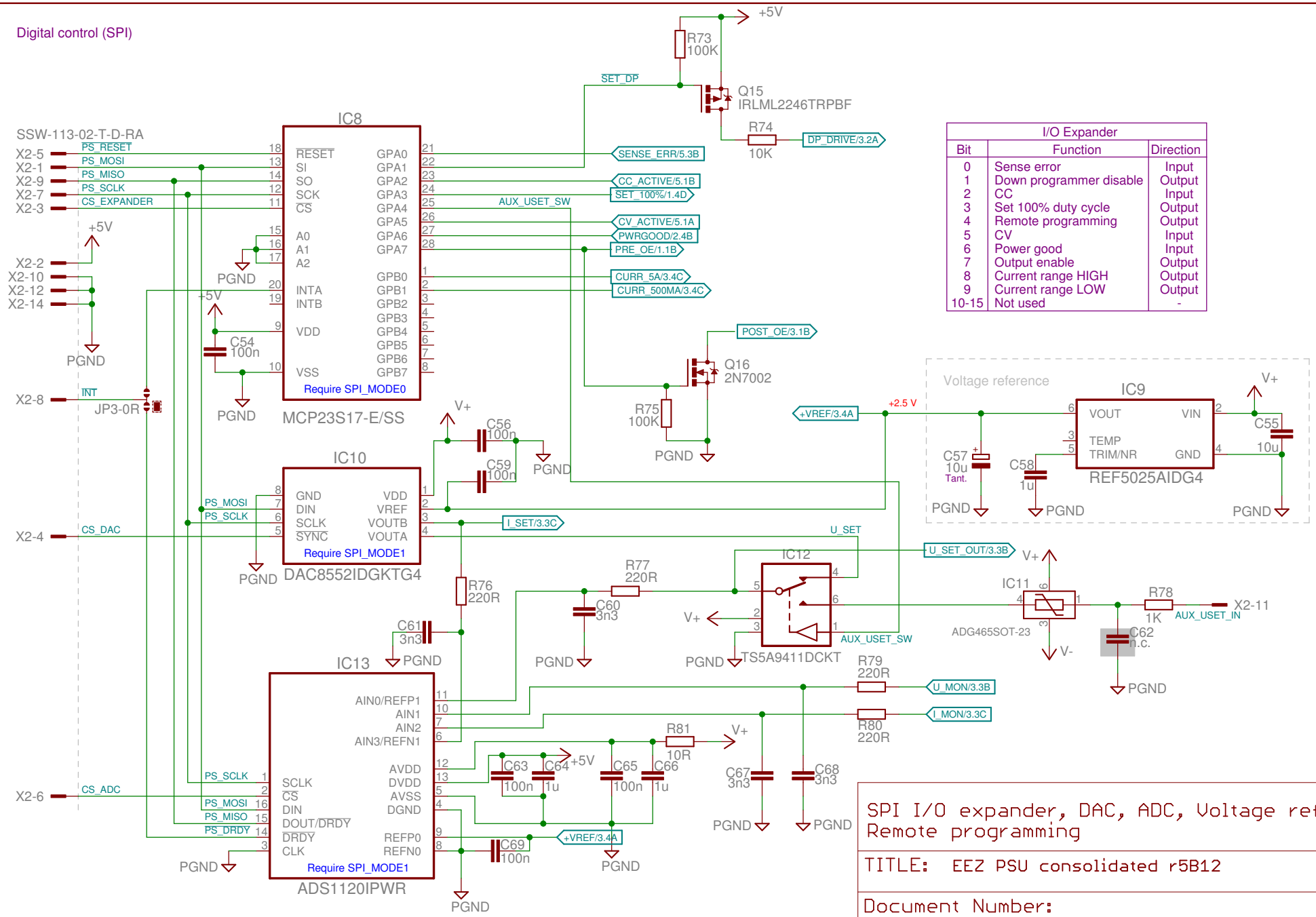
Digital control (SPI)



I/O Expander		
Bit	Function	Direction
0	Sense error	Input
1	Down programmer disable	Output
2	CC	Input
3	Set 100% duty cycle	Output
4	Remote programming	Output
5	CV	Input
6	Power good	Input
7	Output enable	Output
8	Current range HIGH	Output
9	Current range LOW	Output
10-15	Not used	-

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SPI I/O expander, DAC, ADC, Voltage reference
Remote programming

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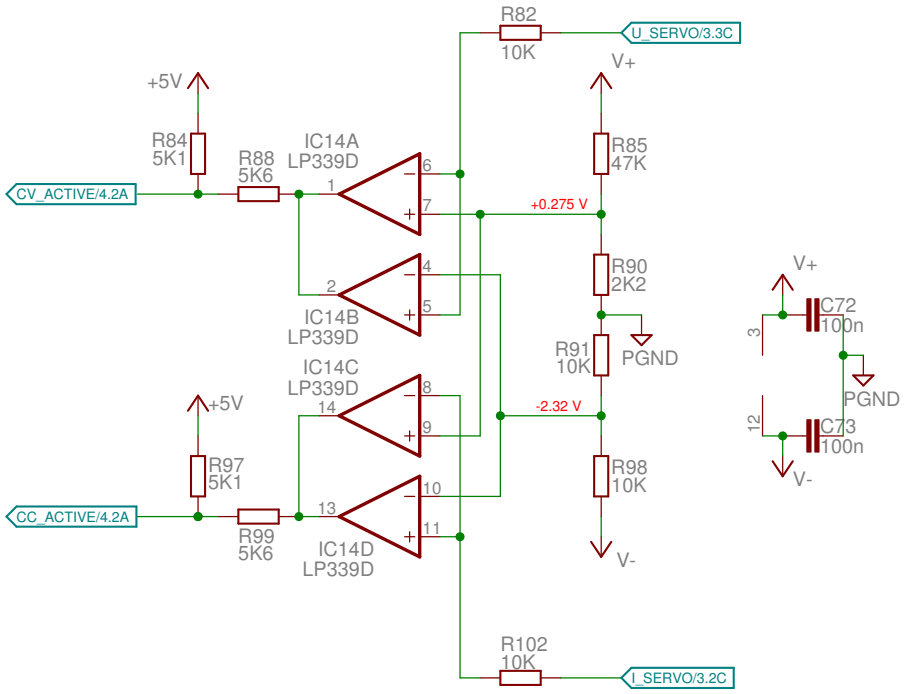
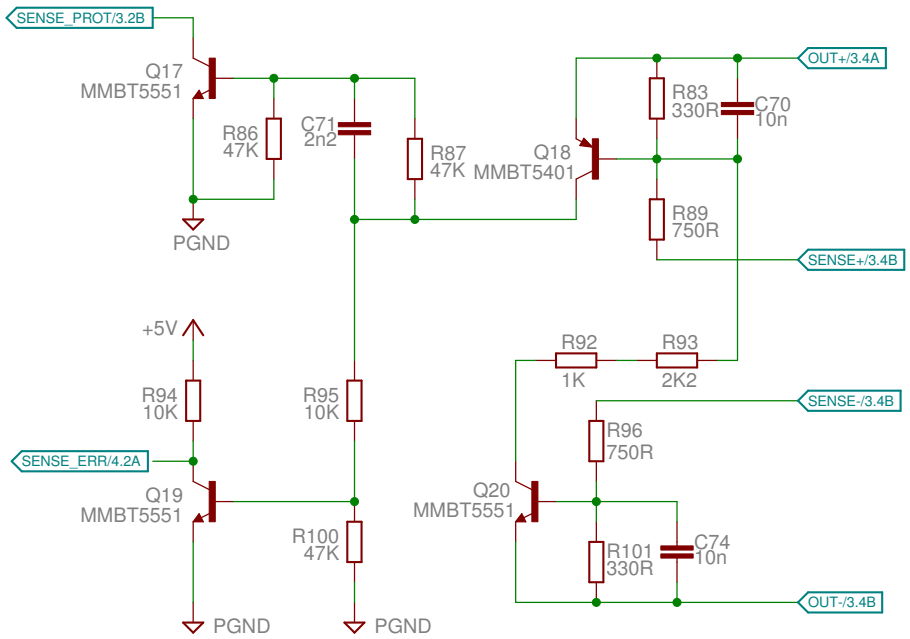
Constant Voltage (CV) and Constant Current (CC) mode indicator



Remote sense reverse polarity detection



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CC/CV indicators, Sense error detection	
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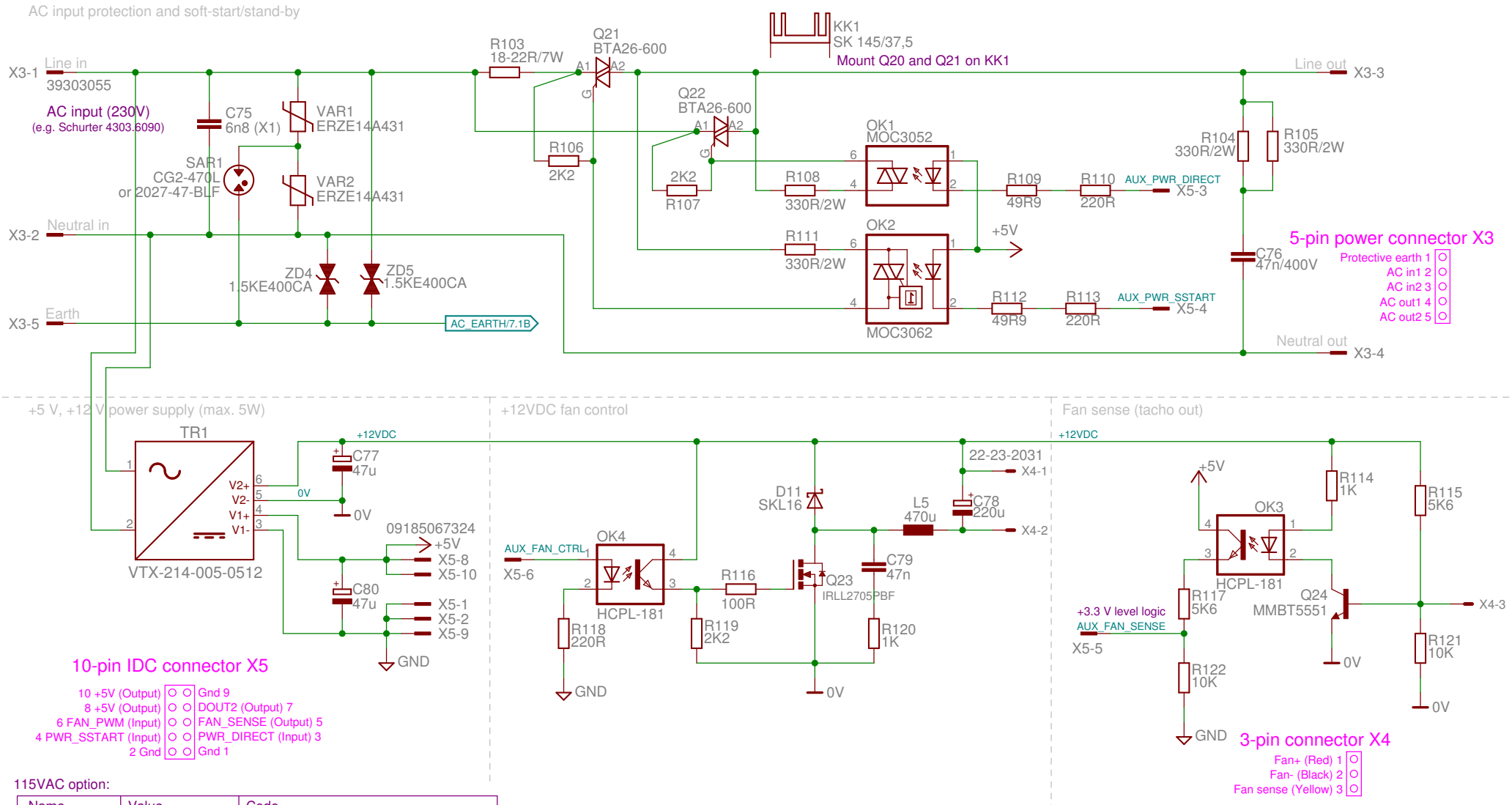

115VAC option:

Name	Value	Code
SAR1	2027-23-BLF	Farnell: 1780455, TME: CG2-230L
TR2	VPP24-210	Digikey: 237-1085-ND Mouser: 553-VPP24-210 Newark: 93F8764
	or AC/DC module Myrra 47202	Farnell: 2469211
VAR1, VAR2	S20K140	Farnell: 1004387, TME: SIOV-S20K140
ZD1, ZD2	1.5KE200CA	Farnell: 1837117, TME: 1.5KE200CA

AC input protection, in-rush current limiter
+5V/+12V 5W power supply, fan control

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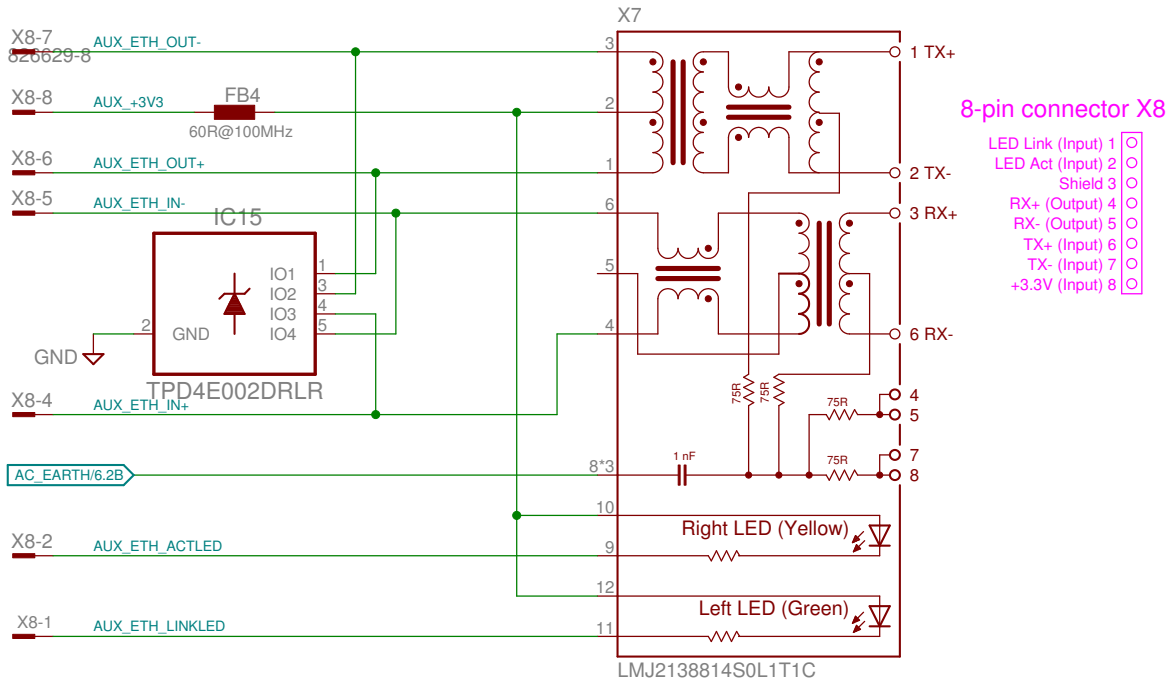
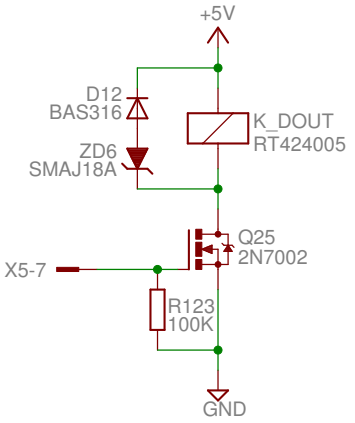
Ethernet connector with optional surge protection

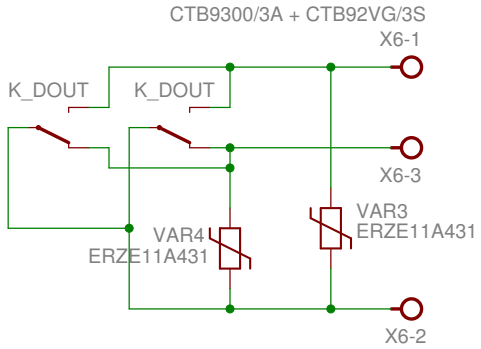


8-pin connector X8

- LED Link (Input) 1
- LED Act (Input) 2
- Shield 3
- RX+ (Output) 4
- RX- (Output) 5
- TX+ (Input) 6
- TX- (Input) 7
- +3.3V (Input) 8

Digital OUT2 relay

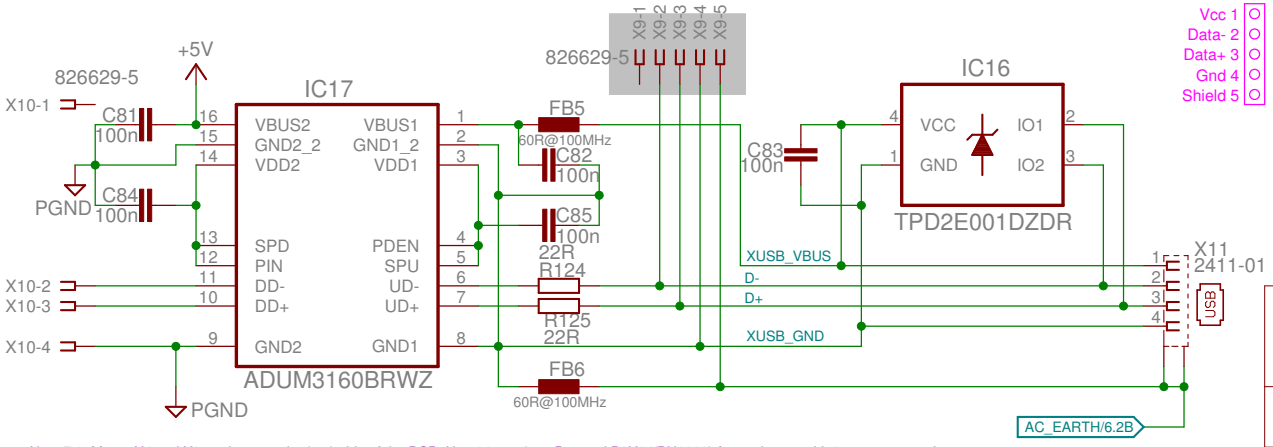




3-pin connector X6

- NO contact 1
- Common 2
- NC contact 3

USB connector with optional isolator and surge protection



5-pin connector X9, X10

- Vcc 1
- Data- 2
- Data+ 3
- Gnd 4
- Shield 5

Note 7.1: Mount X4 and X8 on the opposite (top) side of the PCB. Use 14 mm (e.g. Bossard B3X14/BN3320) for enclosure with 3 mm rear panel

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Ethernet and USB PCB connectors	
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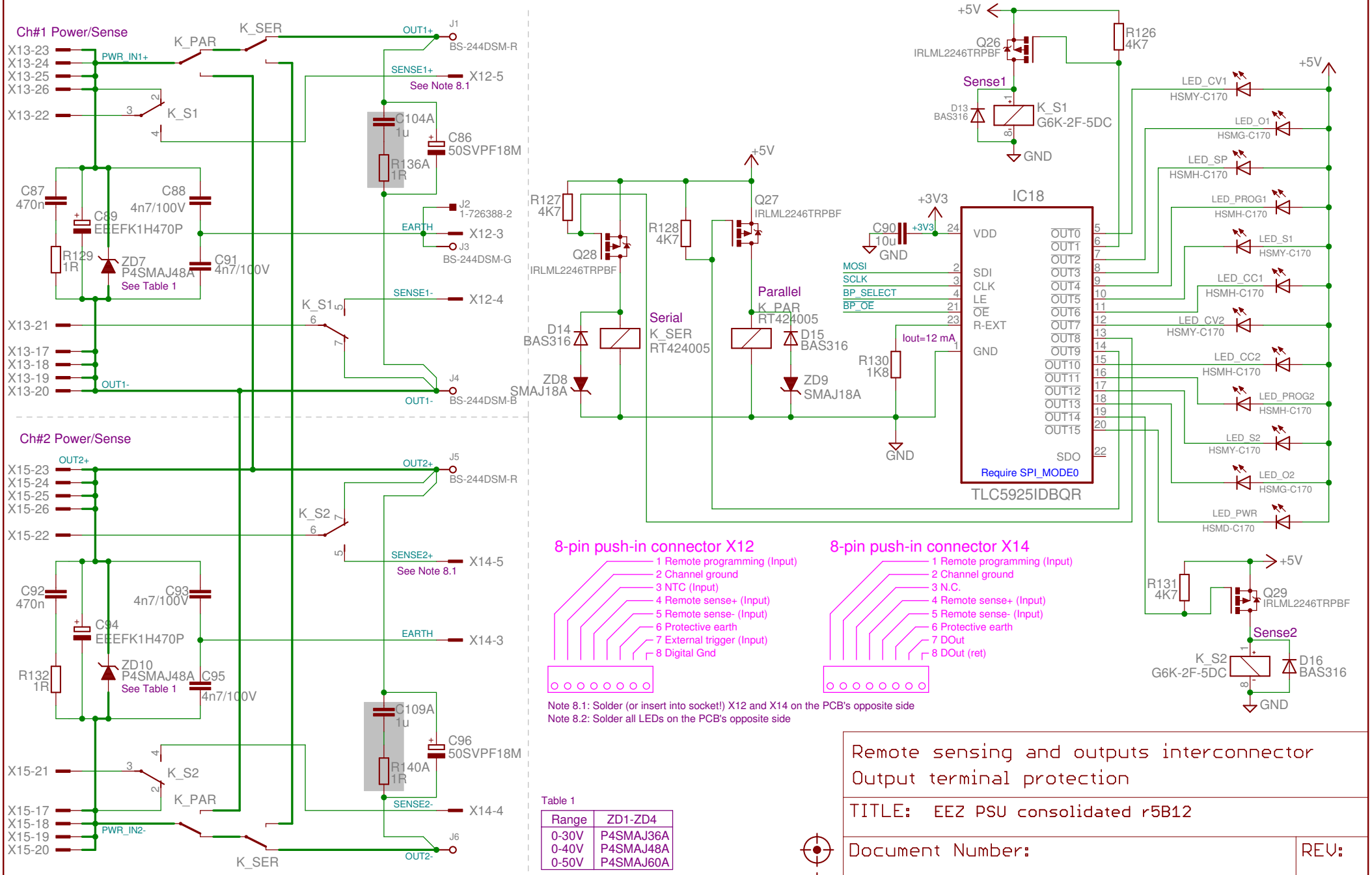

Note 8.1: Solder (or insert into socket!) X12 and X14 on the PCB's opposite side
Note 8.2: Solder all LEDs on the PCB's opposite side

Table 1

Range	ZD1-ZD4
0-30V	P4SMAJ36A
0-40V	P4SMAJ48A
0-50V	P4SMAJ60A

Remote sensing and outputs interconnector
Output terminal protection

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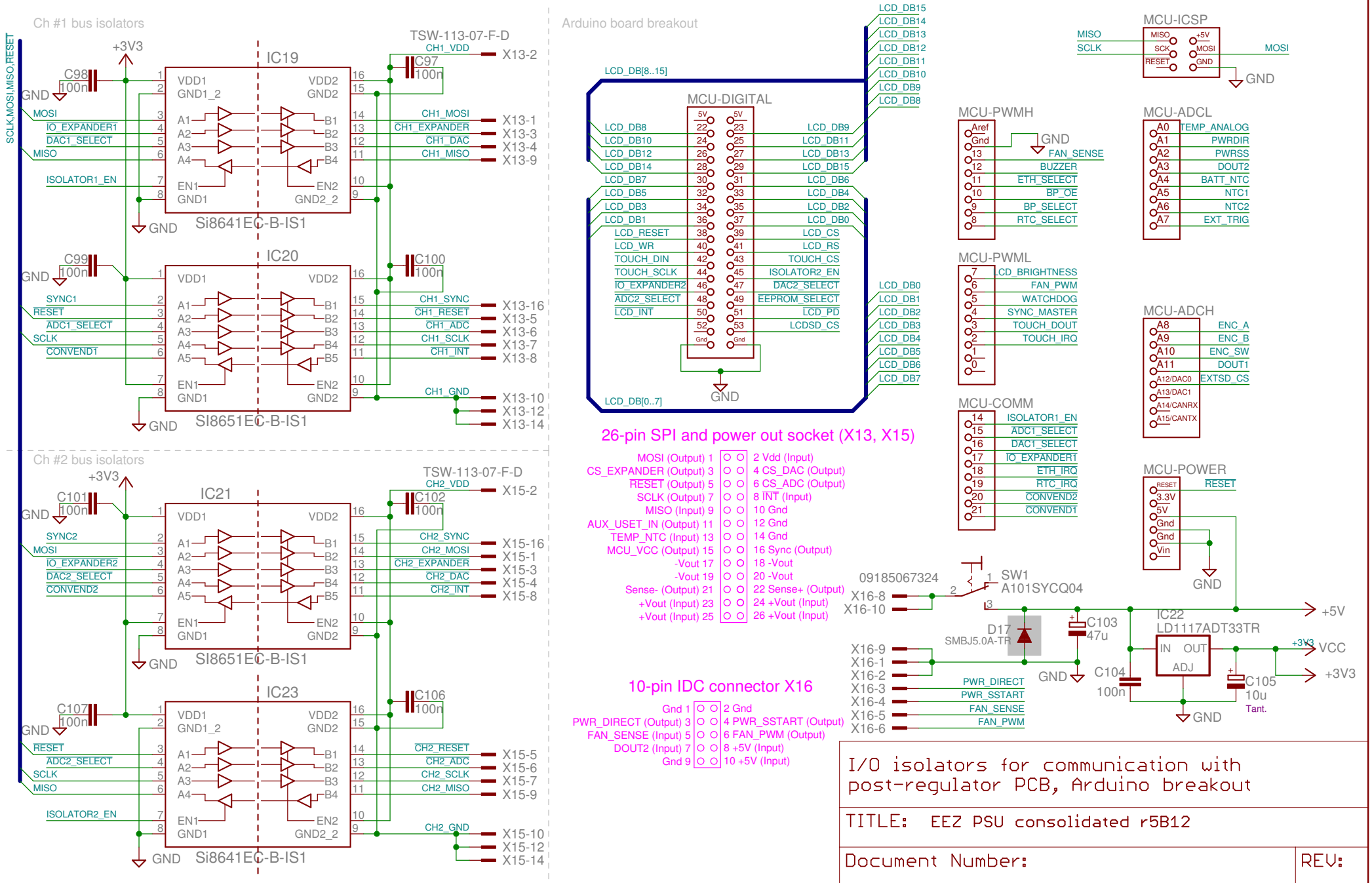

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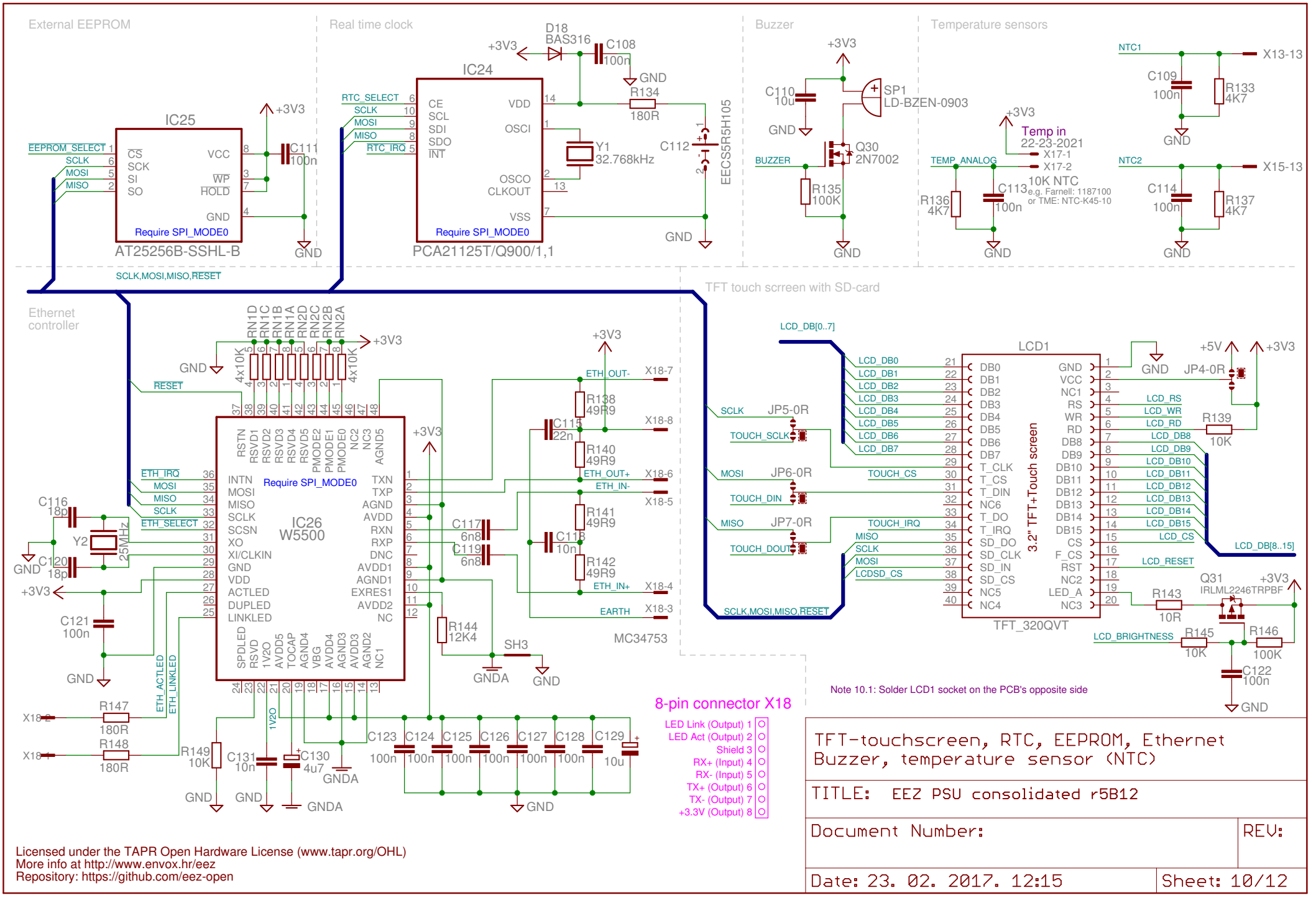

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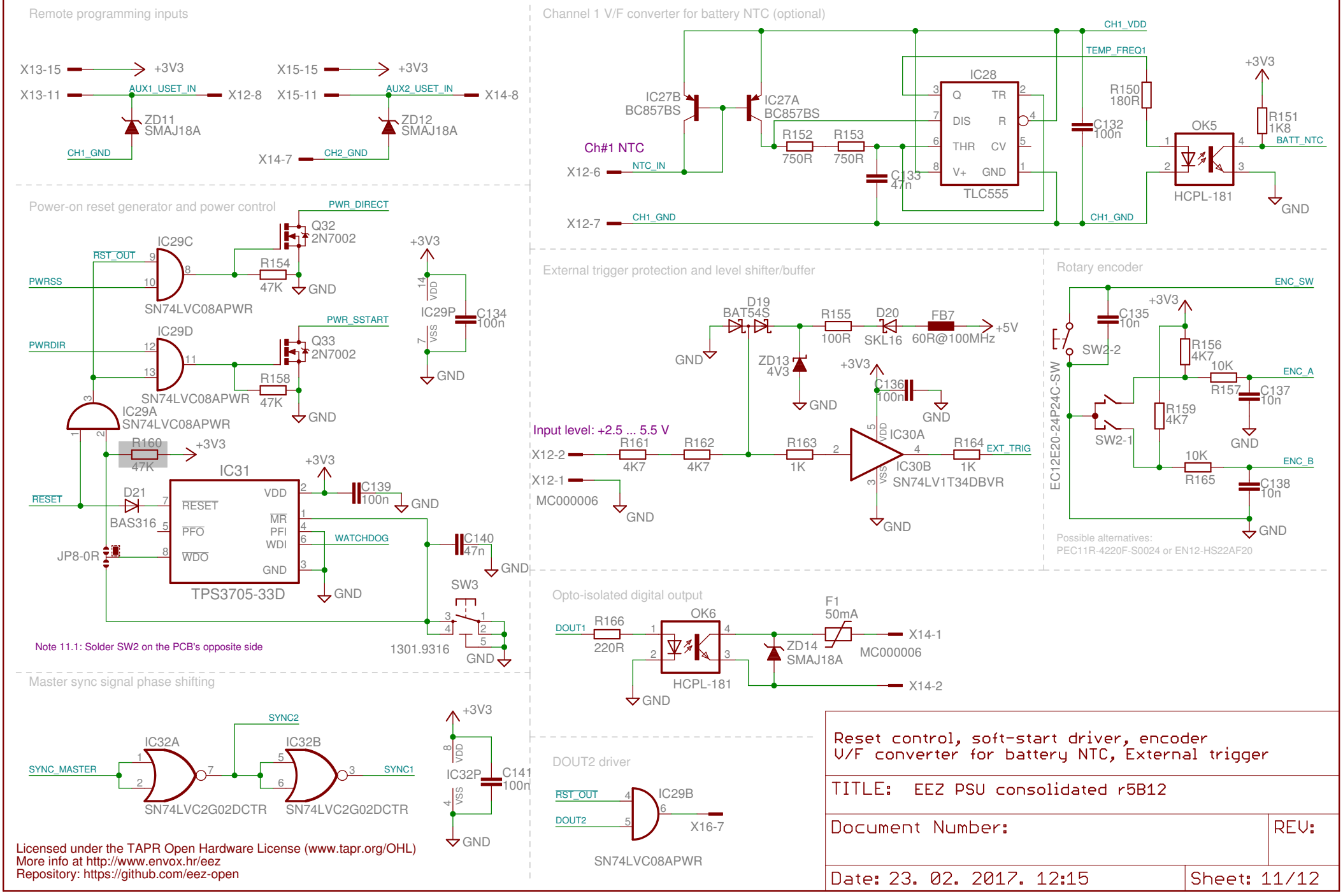
Remote programming inputs
X13-15
+3V3
X13-11
AUX1_USET_IN
X12-8
ZD11
SMAJ18A
CH1_GND
X15-15
+3V3
X15-11
AUX2_USET_IN
X14-8
ZD12
SMAJ18A
X14-7
CH2_GND
Channel 1 V/F converter for battery NTC (optional)
CH1_VDD
TEMP_FREQ1
IC28
IC27B
BC857BS
IC27A
BC857BS
Ch#1 NTC
X12-6
NTC_IN
R152
750R
R153
750R
C133
47n
Q
TR
DIS
R
THR
CV
V+
GND
TLC555
R150
180R
C132
100n
OK5
HCPL-181
+3V3
R151
1K8
BATT_NTC
GND
X12-7
CH1_GND
CH1_GND
Power-on reset generator and power control
PWR_DIRECT
Q32
2N7002
IC29C
RST_OUT
PWRSS
SN74LVC08APWR
R154
47K
GND
+3V3
IC29P
C134
100n
GND
PWR_SSTART
IC29D
PWRDIR
Q33
2N7002
SN74LVC08APWR
R158
47K
GND
IC29A
SN74LVC08APWR
R160
47K
+3V3
IC31
+3V3
C139
100n
GND
RESET
D21
BAS316
RESET
VDD
MR
PFO
PFI
WDI
WDO
GND
WATCHDOG
C140
47n
GND
JP8-0R
TPS3705-33D
GND
SW3
1301.9316
GND
Note 11.1: Solder SW2 on the PCB's opposite side
External trigger protection and level shifter/buffer
D19
BAT54S
R155
100R
D20
SKL16
FB7
60R@100MHz
+5V
GND
ZD13
4V3
GND
+3V3
C136
100n
GND
Input level: +2.5 ... 5.5 V
X12-2
R161
4K7
R162
4K7
R163
1K
IC30A
IC30B
SN74LV1T34DBVR
R164
1K
EXT_TRIG
X12-1
MC000006
GND
GND
Rotary encoder
ENC_SW
+3V3
C135
10n
SW2-2
R156
4K7
10K
R157
ENC_A
C137
10n
EC12E20-24P24C-SW
R159
4K7
SW2-1
GND
10K
R165
ENC_B
C138
10n
GND
Possible alternatives:
PEC11R-4220F-S0024 or EN12-HS22AF20
Opto-isolated digital output
DOUT1
R166
220R
OK6
HCPL-181
F1
50mA
ZD14
SMAJ18A
X14-1
MC000006
X14-2
GND
Master sync signal phase shifting
SYNC2
IC32A
IC32B
SYNC_MASTER
SYNC1
SN74LVC2G02DCTR
SN74LVC2G02DCTR
+3V3
IC32P
C141
100n
GND
DOUT2 driver
RST_OUT
DOUT2
IC29B
X16-7
SN74LVC08APWR
Reset control, soft-start driver, encoder
V/F converter for battery NTC, External trigger
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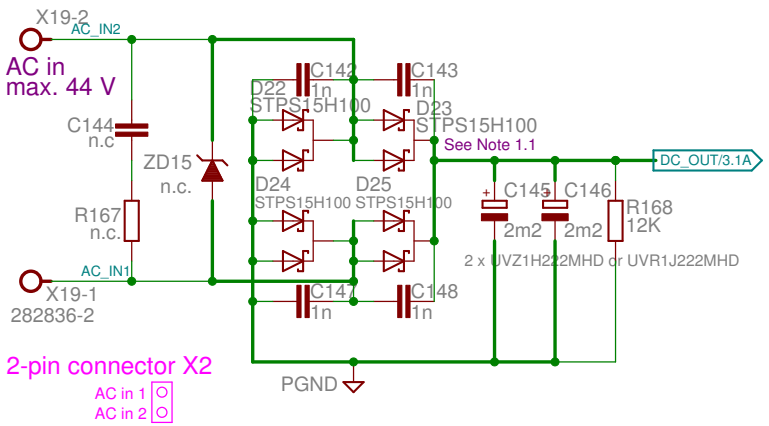
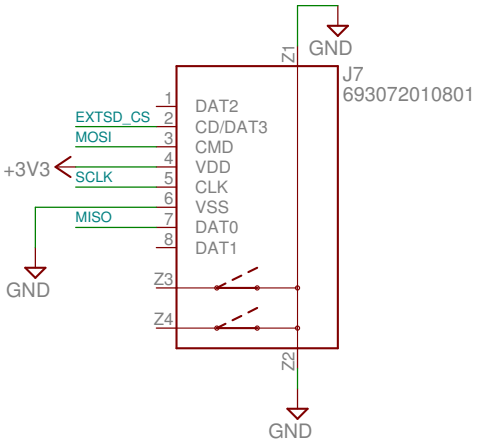
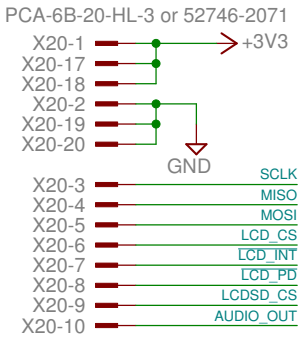
AC input option



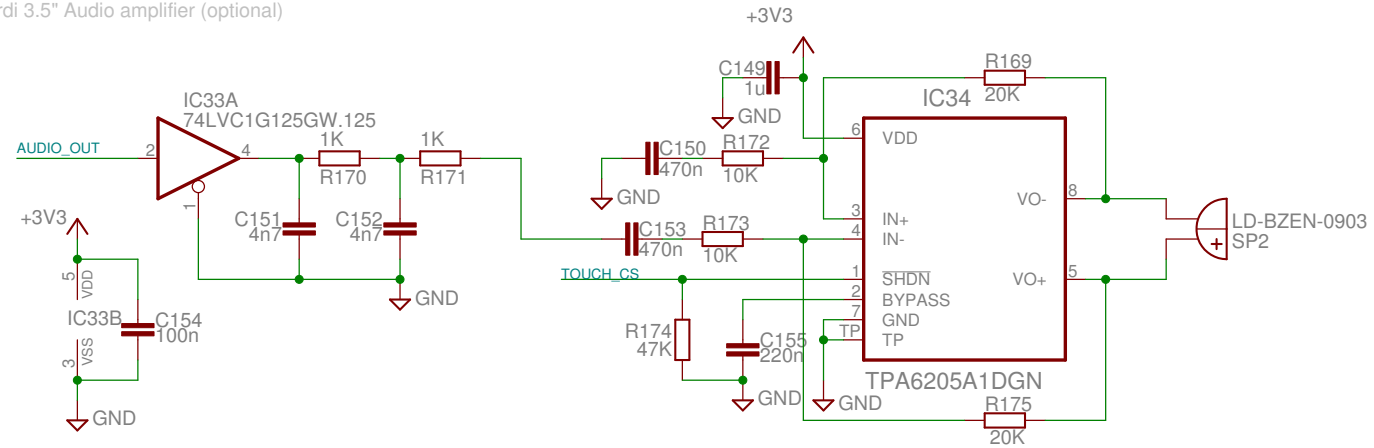
Micro SD card (optional)



Riverdi 3.5" LCD (optional)



Riverdi 3.5" Audio amplifier (optional)



Optional sections: AC input, 20-pin 3.5" TFT display
Audio amplifier for 3.5" TFT display, Micro SD card

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