

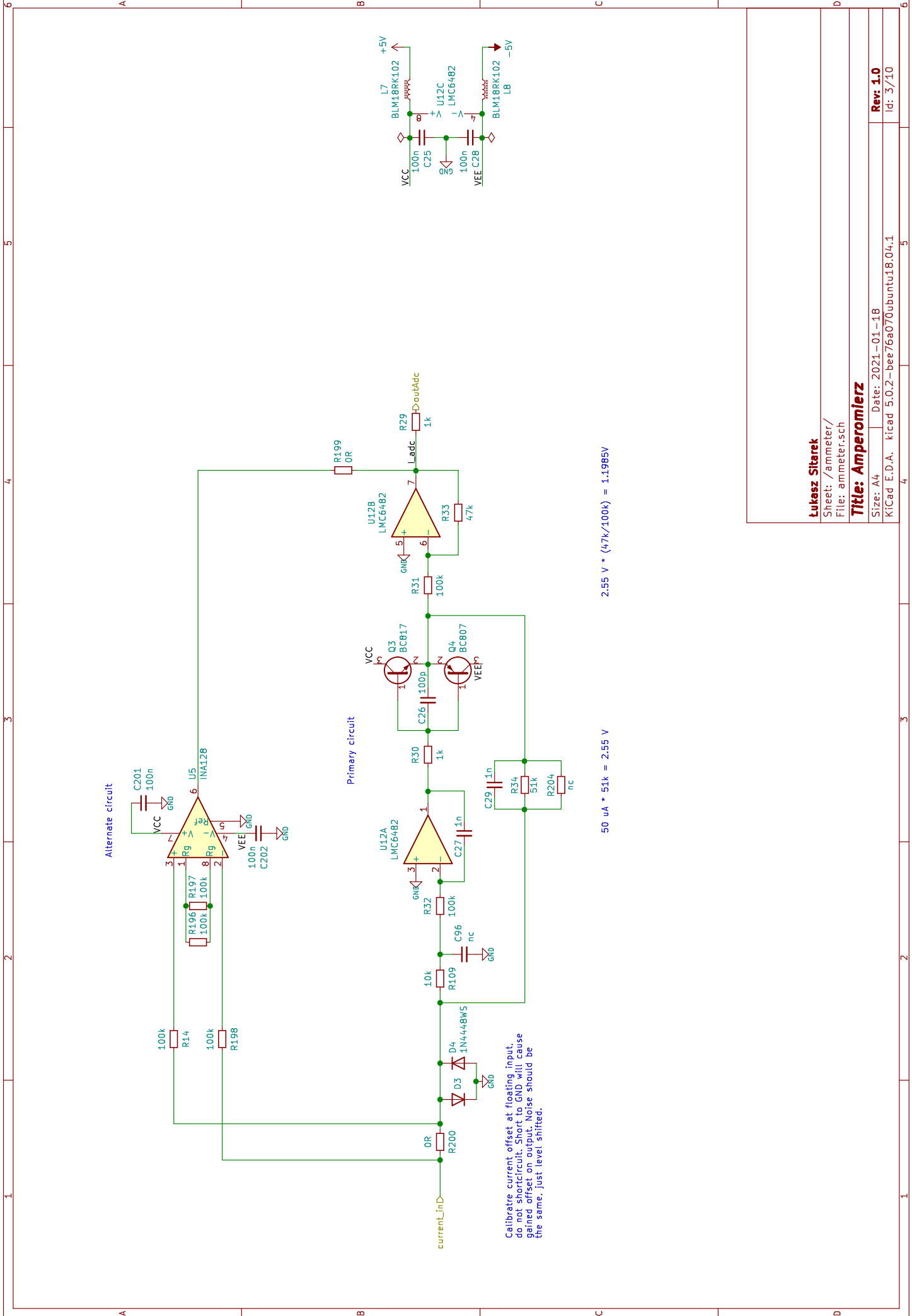
**NOTE:**

- R01311M06 pin-to-pin compatible with: —M08
- ERRATA/REVISIONS of PCB 120250:
- U33 (BOOT0) on both MCUs would be connected to GND (problem with startup)
- need large capacitor between BMS input and battery fuses, large dropout on fuses caused UVLO at startup, 2700 uF works fine.
- designators of testpads on silkscreen
- more testpoints: Vusb, Vbat.
- more control of supply: turn-off ability (at least of Recom and high side) is useful at charging

**POSSIBLE IMPROVEMENTS:**

- current measurement on each output
- current and/or voltage measurement on pump (use rather IL300 and isolated DC-DC than separate ADC)
- add buzzer to warn about High Voltage output, overload, etc.





Lukasz Sitarek

Sheet: /ammeter/  
File: ammeter.sch

Title: Amperomierz

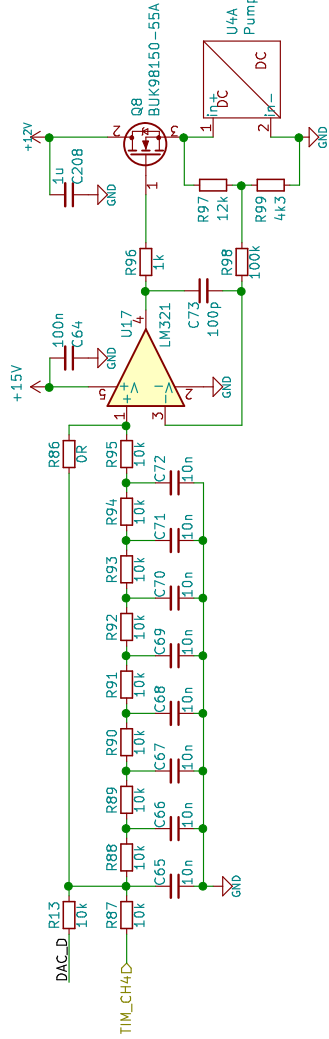
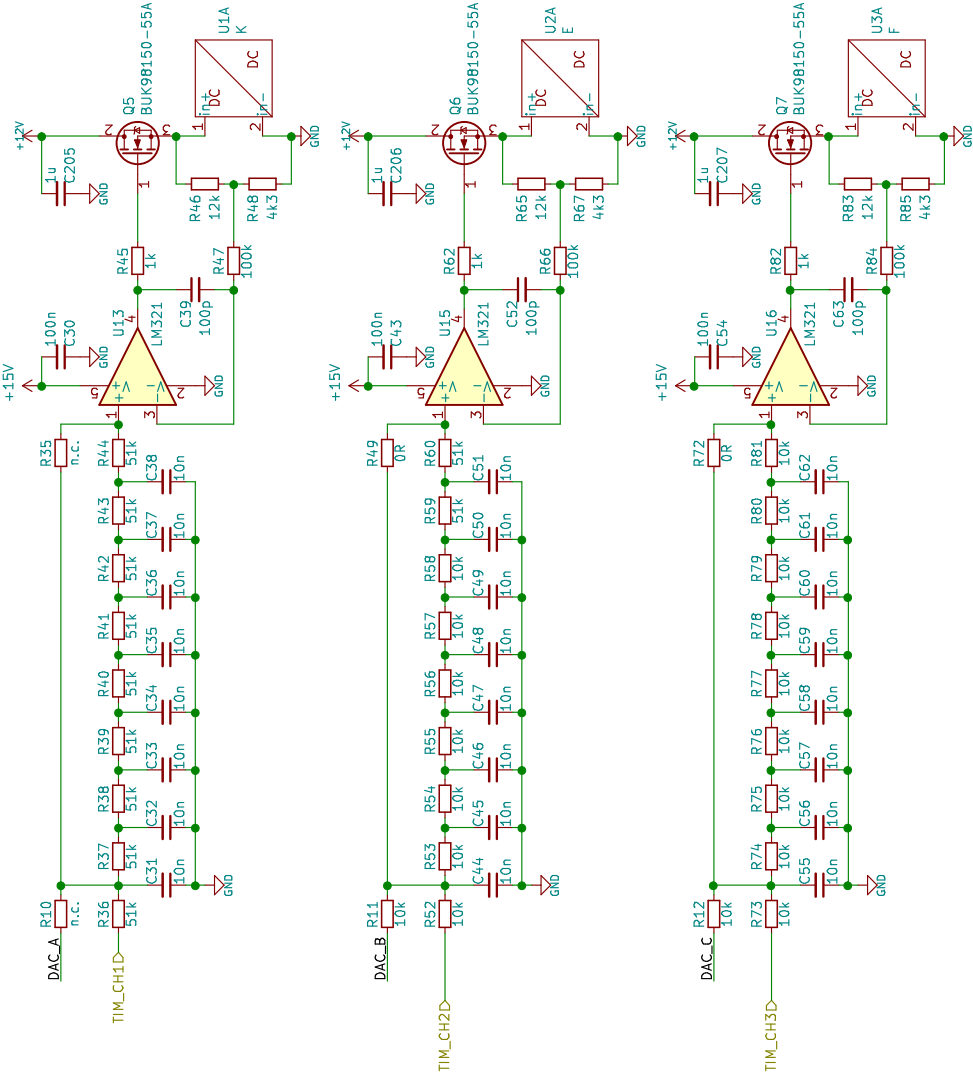
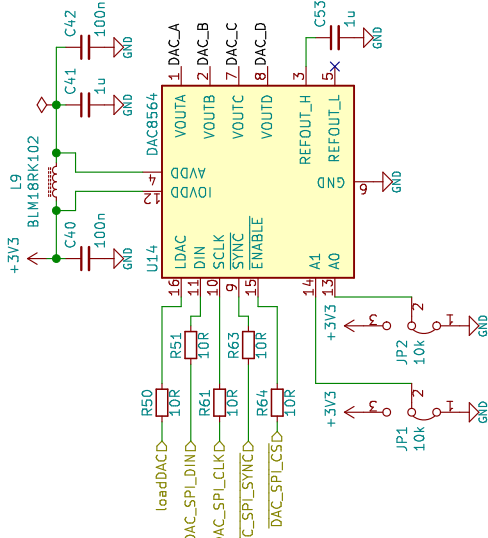
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Rev: 1.0

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LM321 (ONsemi):  
 3 – 32 V supply  
 bias typ. –10 nA max. –500 nA  
 Z<sub>out</sub> 1200 Ω  
 Output current min. 10 mA  
 GBWP 750 kHz  
 SR 0.3 V/μs  
 I<sub>q</sub> typ. 0.25 mA max 0.5 mA  
 stable with 1.5 nF load



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Sheet: /drivers/  
 File: drivers.sch

**Title: Sterowniki**

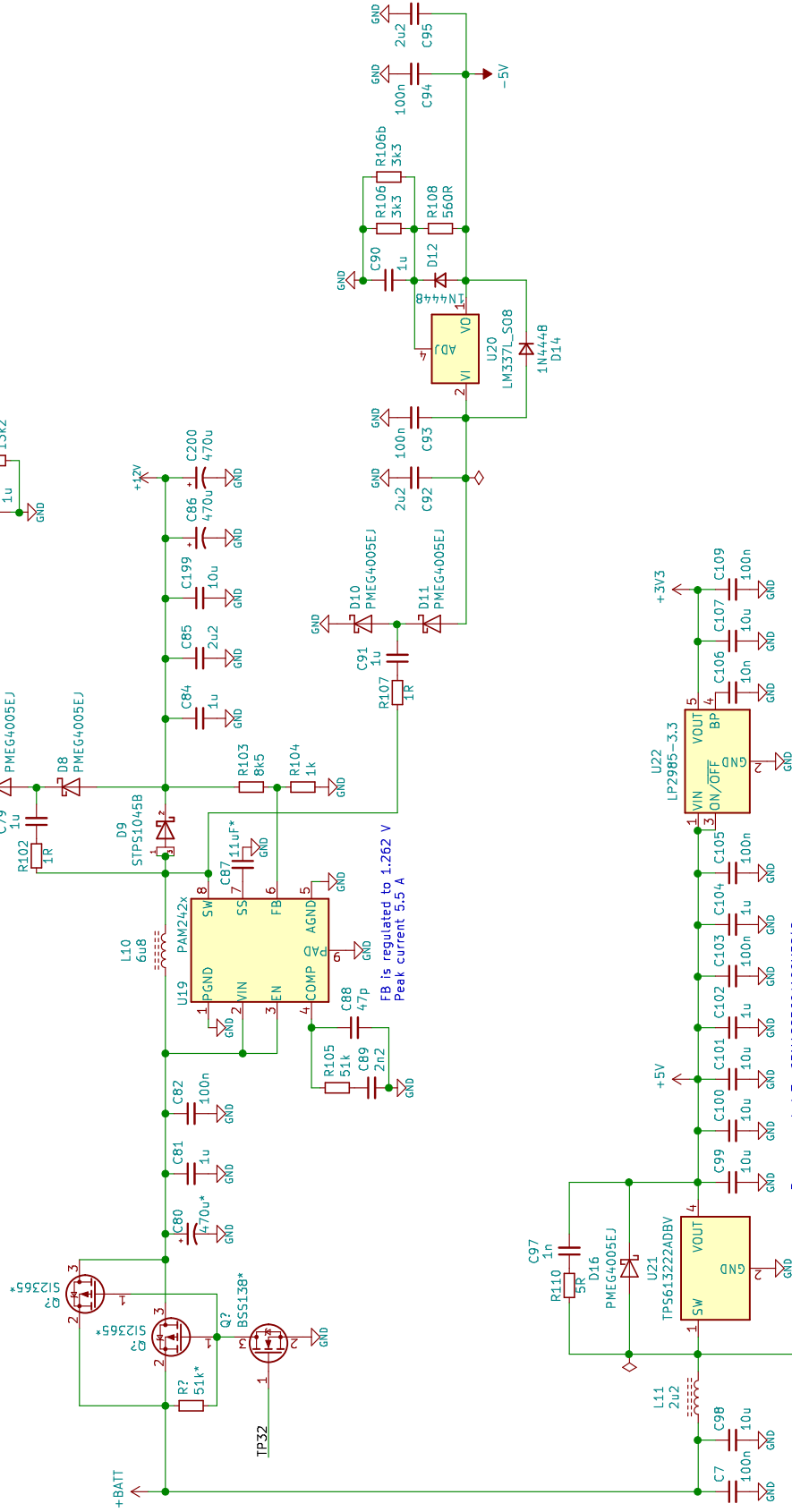
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PMEG4005 – Ir = 8 uA, surge 10 A  
 Cd = 43 pF – that is, @12V 500 kHz → W = 6.2nJ, P = 3 mW  
 PMEG4005EJ – 5 Aavg  
 5 V line current: ca. 100–150 mA  
 LM317/LM337 was used instead fixed LDO's beacouse of lower Iq (bias) current.



Recommended 3x GRM188R60J106ME84D  
 0603 10 uF 6.3V X5R 20% MLCC

Snubber: C must be >3x diode capacitance

Patch: additional pump circuit added to pull -5 V  
 below GND, when 12 V converter is disabled.

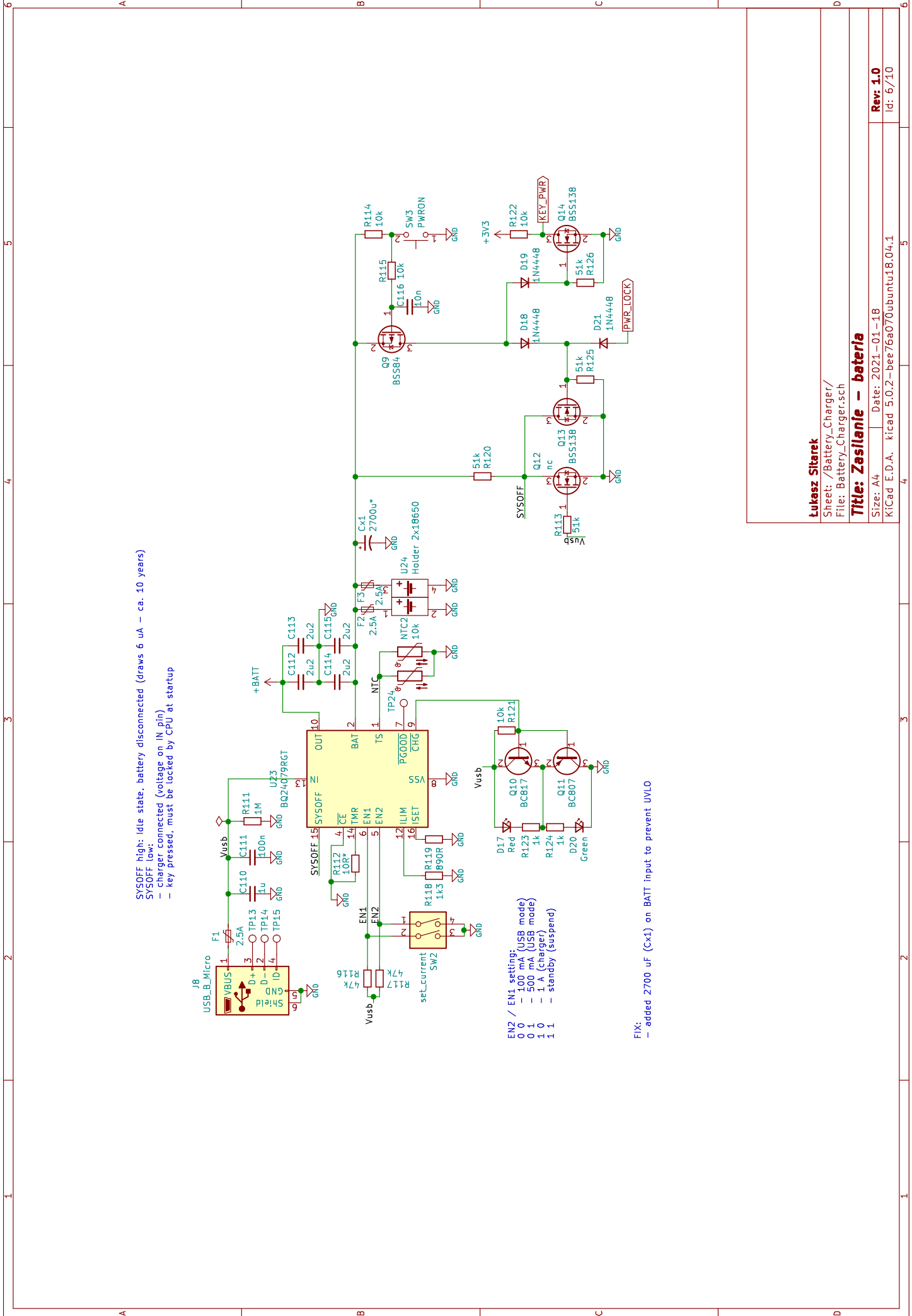
! It works on battery, but don't works when battery is charged  
 and charger gives 5 V out – converter passes voltage without boosting.

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Sheet: /supply/  
 File: supply.sch

**Title: Zasilanie – anoda**

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SYSOFF high: Idle state, battery disconnected (draws 6 uA – ca. 10 years)  
SYSOFF low:  
– charger connected (voltage on IN pin)  
– key pressed, must be locked by CPU at startup

EN2 / EN1 setting:  
0 0 – 100 mA (USB mode)  
0 1 – 500 mA (USB mode)  
1 0 – 1 A (charger)  
1 1 – standby (suspend)

FIX:  
– added 2700 uF (Cx1) on BATT input to prevent UVLO

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Sheet: /Battery\_Charger/  
File: Battery\_Charger.sch

**Title: Zasilanie – bateria**

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OPT1128  
If typ. 7.5 mA Uf max 1.5 V  
Open collector output  
Output supply 5V +/- 0.5V

The diagram illustrates a bidirectional UART interface using an OPT1128 optocoupler. The circuit is divided into three main sections: the MCU side, the HV side, and the bidirectional optocoupler (U28).

**MCU Side:**

- Power supply: +3V3.
- Resistor R163 (1k) is connected to the +3V3 supply.
- Transistor Q17 (BSS138) is connected to the +3V3 supply and the RX\_LV pin of the optocoupler.
- Resistor R165 (470R) is connected to the TX\_LV pin of the optocoupler and the +3V3 supply.
- Capacitor C151 (100nF) is connected to the TX\_LV pin and ground.
- The RX\_LV pin of the optocoupler is connected to the RX pin of the MCU.
- The TX\_LV pin of the optocoupler is connected to the TX pin of the MCU.

**HV Side:**

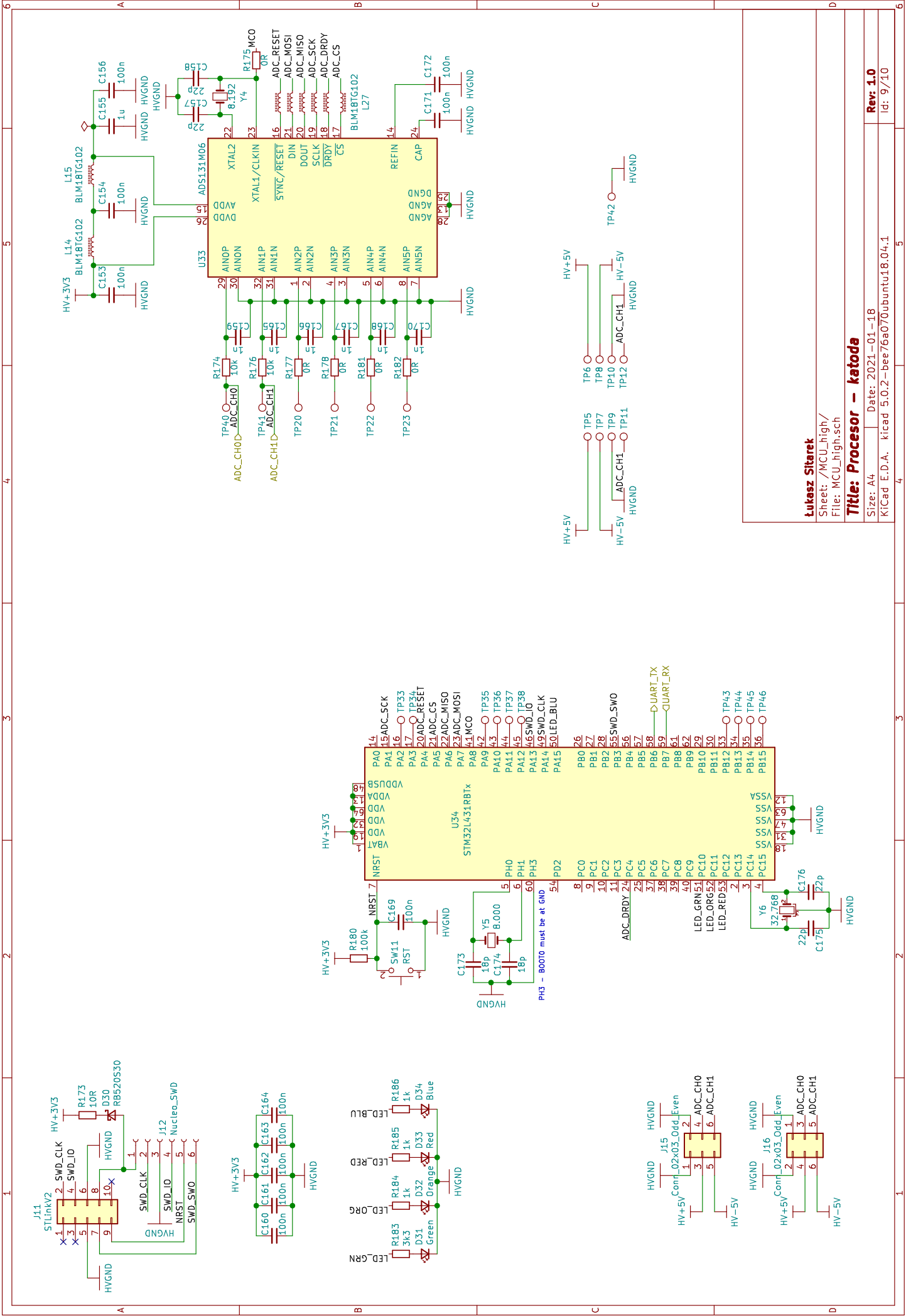
- Power supply: HV+3V3.
- Resistor R168 (1k) is connected to the HV+3V3 supply.
- Transistor Q19 (BSS138) is connected to the HV+3V3 supply and the TX pin of the optocoupler.
- Resistor R170 (470R) is connected to the RX pin of the optocoupler and the HV+3V3 supply.
- Capacitor C152 (100nF) is connected to the TX pin and ground.
- The RX pin of the optocoupler is connected to the RX pin of the HV device.
- The TX pin of the optocoupler is connected to the TX pin of the HV device.

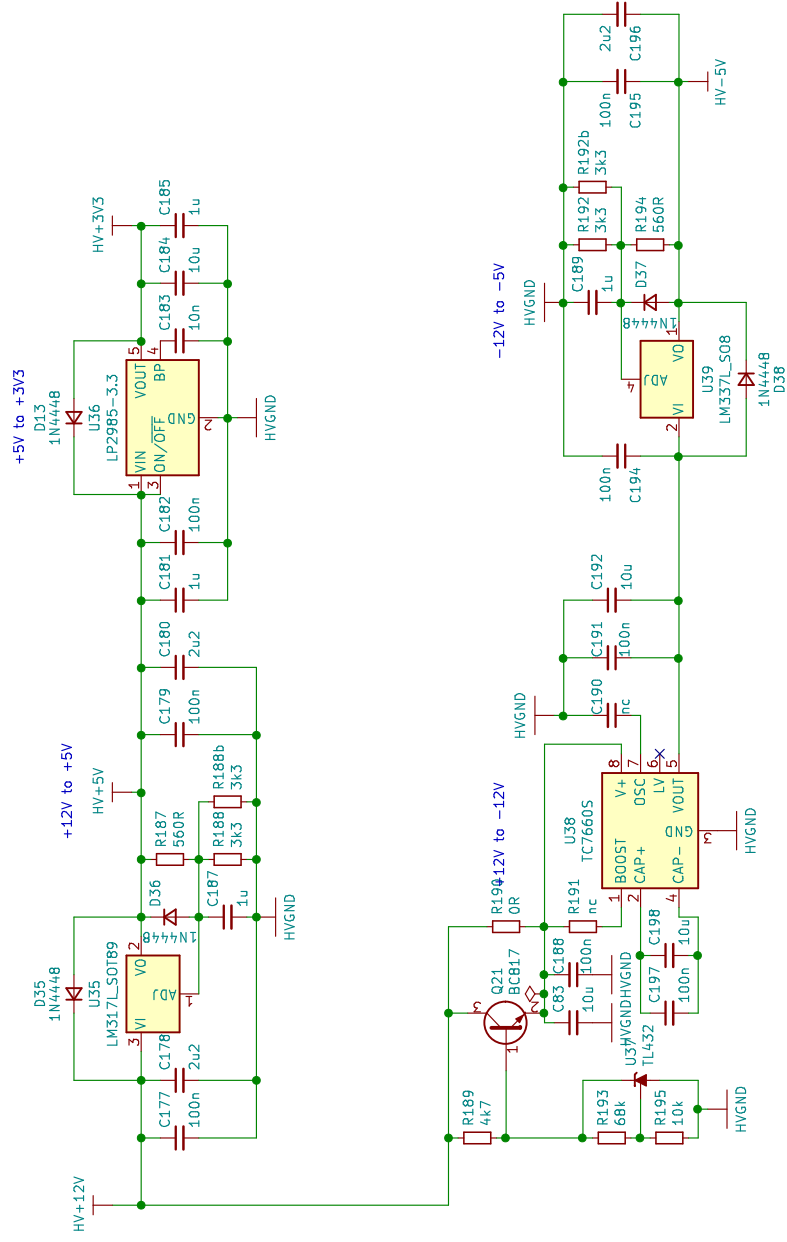
**Optocoupler (U28):**

- The optocoupler is a bidirectional device with pins labeled RX\_LV, TX\_LV, and GND.
- The RX\_LV pin is connected to the RX pin of the MCU.
- The TX\_LV pin is connected to the TX pin of the MCU.
- The GND pin is connected to ground.

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Sheet: /supply\_high/  
File: supply\_high.sch

Title: Zasilanie – katoda

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