Output port E

Alternative population:

This port is optionally populated.
If not populated, close SJ14.

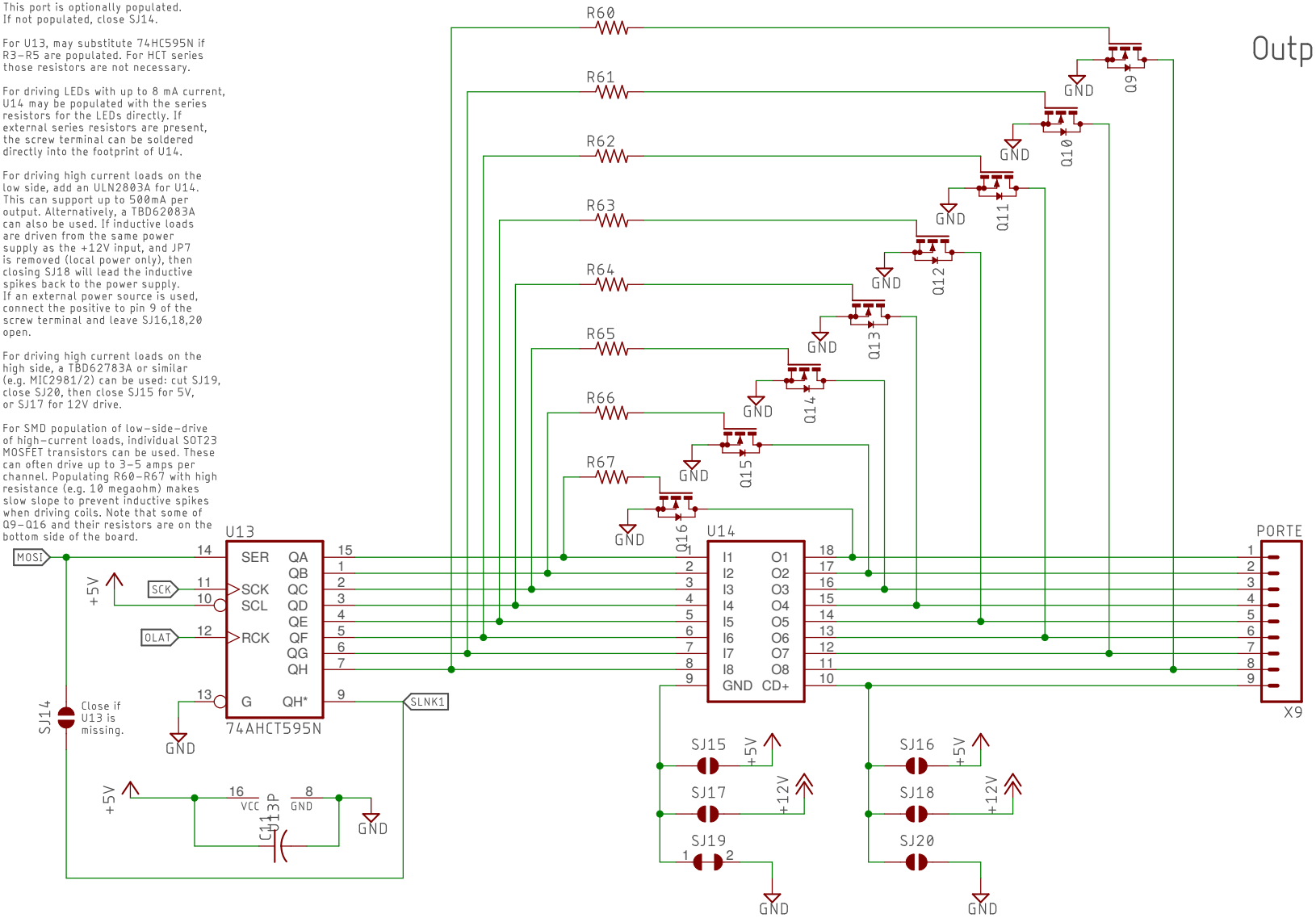
For U13, may substitute 74HC595N if R3–R5 are populated. For HCT series those resistors are not necessary.

For driving LEDs with up to 8 mA current, U14 may be populated with the series resistors for the LEDs directly. If external series resistors are present, the screw terminal can be soldered directly into the footprint of U14.

For driving high current loads on the low side, add an ULN2803A for U14. This can support up to 500mA per output. Alternatively, a TBD62083A can also be used. If inductive loads are driven from the same power supply as the +12V input, and JP7 is removed (local power only), then closing SJ18 will lead the inductive spikes back to the power supply. If an external power source is used, connect the positive to pin 9 of the screw terminal and leave SJ16,18,20 open.

For driving high current loads on the high side, a TBD62783A or similar (e.g. MIC2981/2) can be used: cut SJ19, close SJ20, then close SJ15 for 5V, or SJ17 for 12V drive.

For SMD population of low-side-drive of high-current loads, individual SOT23 MOSFET transistors can be used. These can often drive up to 3–5 amps per channel. Populating R60–R67 with high resistance (e.g. 10 megaohm) makes slow slope to prevent inductive spikes when driving coils. Note that some of Q9–Q16 and their resistors are on the bottom side of the board.



PAGE:	Output port E	
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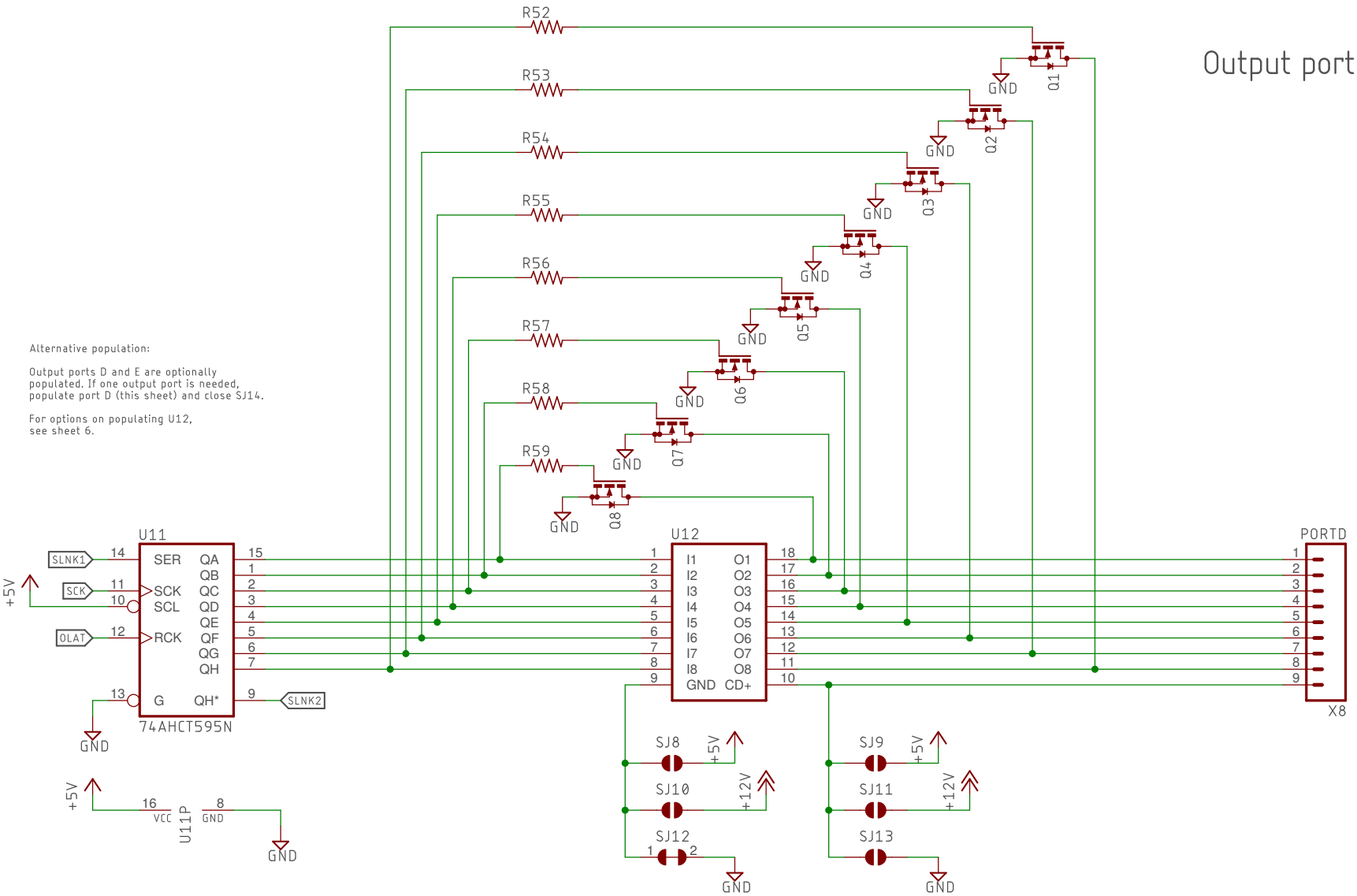

PAGE: Output port D		
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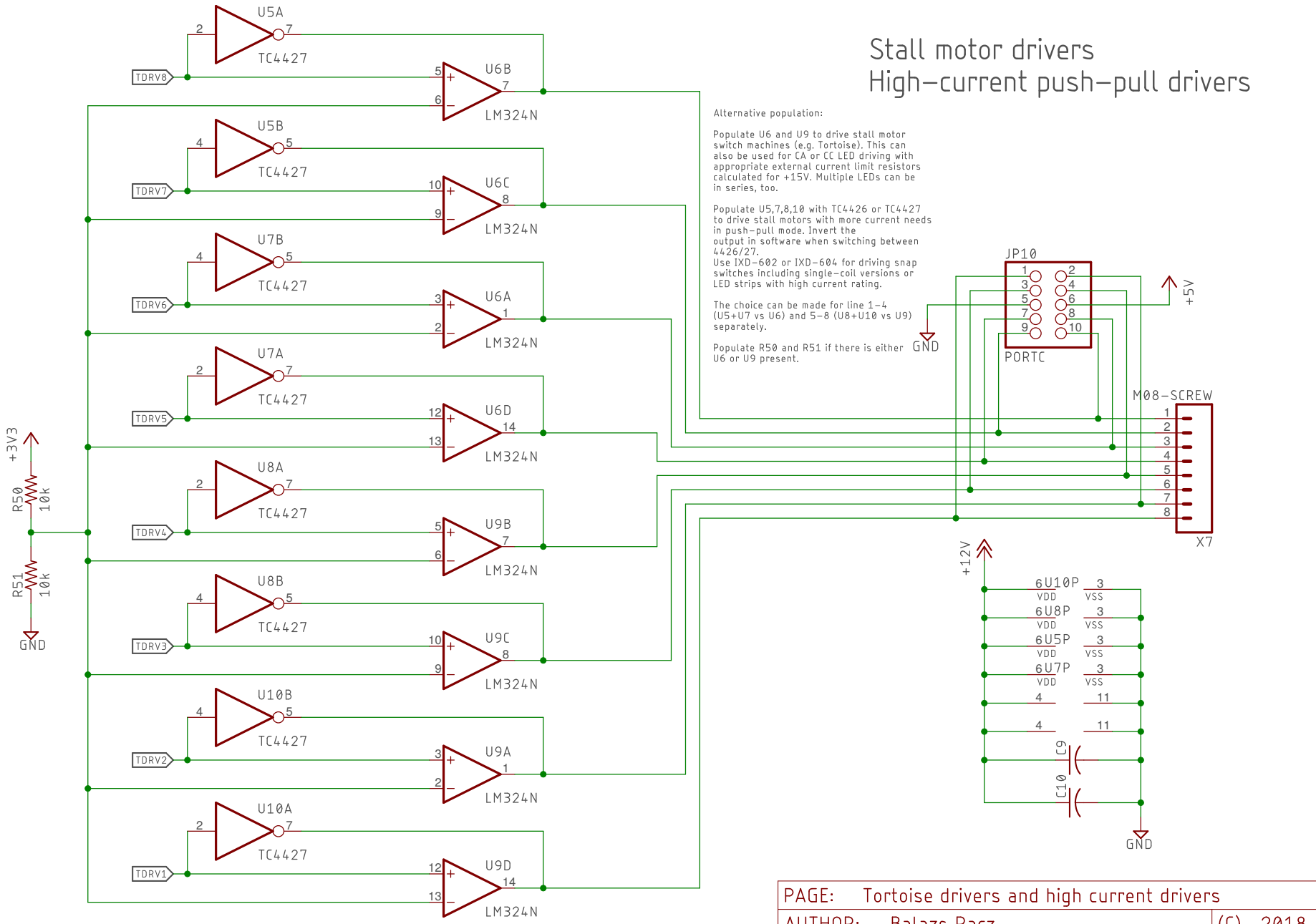
Stall motor drivers
High-current push-pull drivers
Alternative population:
Populate U6 and U9 to drive stall motor switch machines (e.g. Tortoise). This can also be used for CA or CC LED driving with appropriate external current limit resistors calculated for +15V. Multiple LEDs can be in series, too.
Populate U5,7,8,10 with TC4426 or TC4427 to drive stall motors with more current needs in push-pull mode. Invert the output in software when switching between 4426/27.
Use IXD-602 or IXD-604 for driving snap switches including single-coil versions or LED strips with high current rating.
The choice can be made for line 1-4 (U5+U7 vs U6) and 5-8 (U8+U10 vs U9) separately.
Populate R50 and R51 if there is either U6 or U9 present.
U5A
U5B
U7B
U7A
U8A
U8B
U10B
U10A
TC4427
U6B
U6C
U6A
U6D
U9B
U9C
U9A
U9D
LM324N
TDRV8
TDRV7
TDRV6
TDRV5
TDRV4
TDRV3
TDRV2
TDRV1
+3V3
R50
10k
R51
10k
GND
JP10
PORTC
+5V
M08-SCREW
X7
+12V
6U10P
6U8P
6U5P
6U7P
VDD
VSS
C9
C10
PAGE: Tortoise drivers and high current drivers
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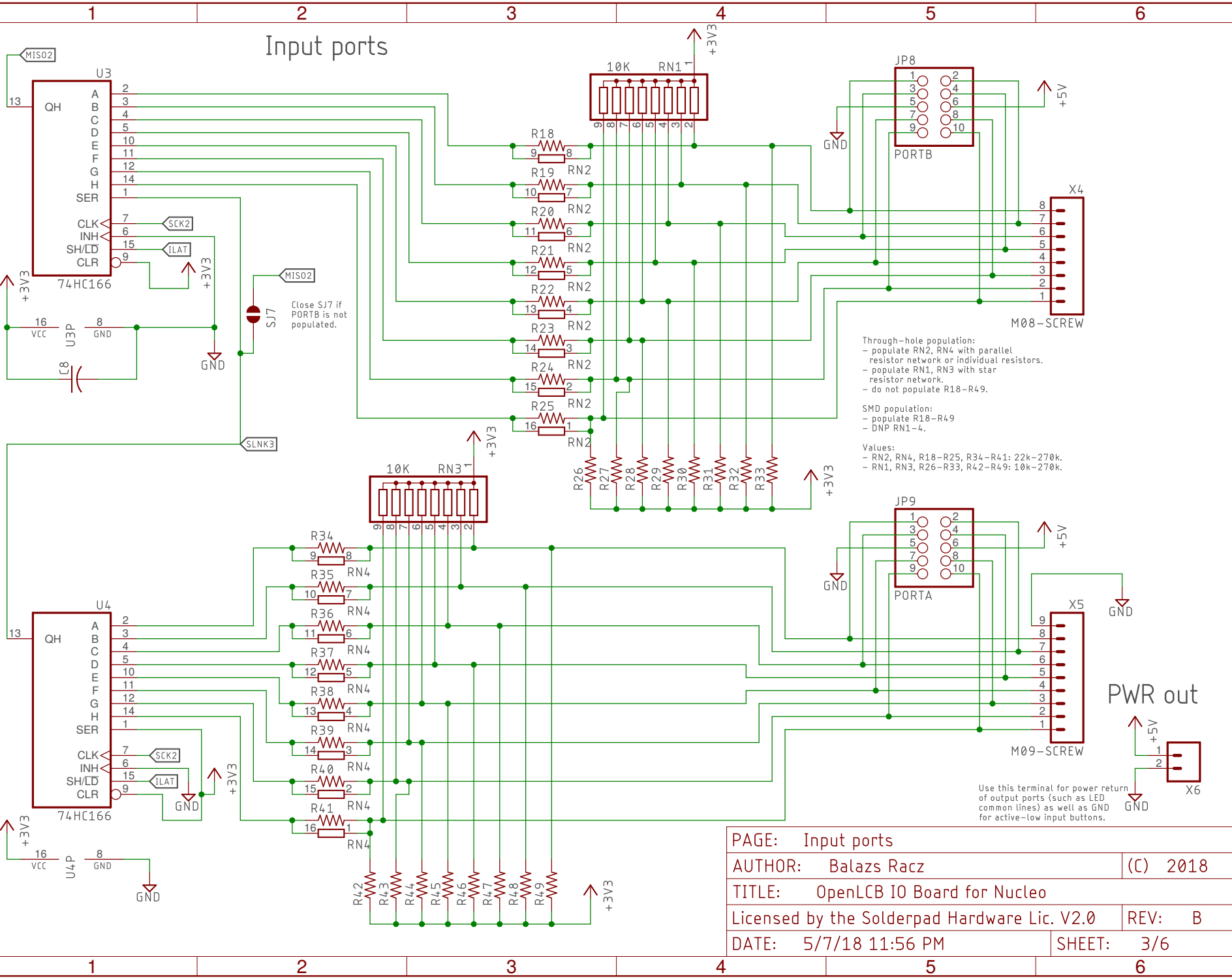
Input ports
MISO2
U3
74HC166
SCK2
ILAT
+3V3
GND
U3P
C8
SJ7
Close SJ7 if PORTB is not populated.
SLNK3
10K
RN1
RN2
R18
R19
R20
R21
R22
R23
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
JP8
PORTB
+5V
X4
M08-SCREW
Through-hole population:
– populate RN2, RN4 with parallel resistor network or individual resistors.
– populate RN1, RN3 with star resistor network.
– do not populate R18–R49.
SMD population:
– populate R18–R49
– DNP RN1–4.
Values:
– RN2, RN4, R18–R25, R34–R41: 22k–270k.
– RN1, RN3, R26–R33, R42–R49: 10k–270k.
RN3
RN4
R34
R35
R36
R37
R38
R39
R40
R41
R42
R43
R44
R45
R46
R47
R48
R49
U4
U4P
JP9
PORTA
X5
M09-SCREW
PWR out
X6
Use this terminal for power return of output ports (such as LED common lines) as well as GND for active-low input buttons.
PAGE: Input ports
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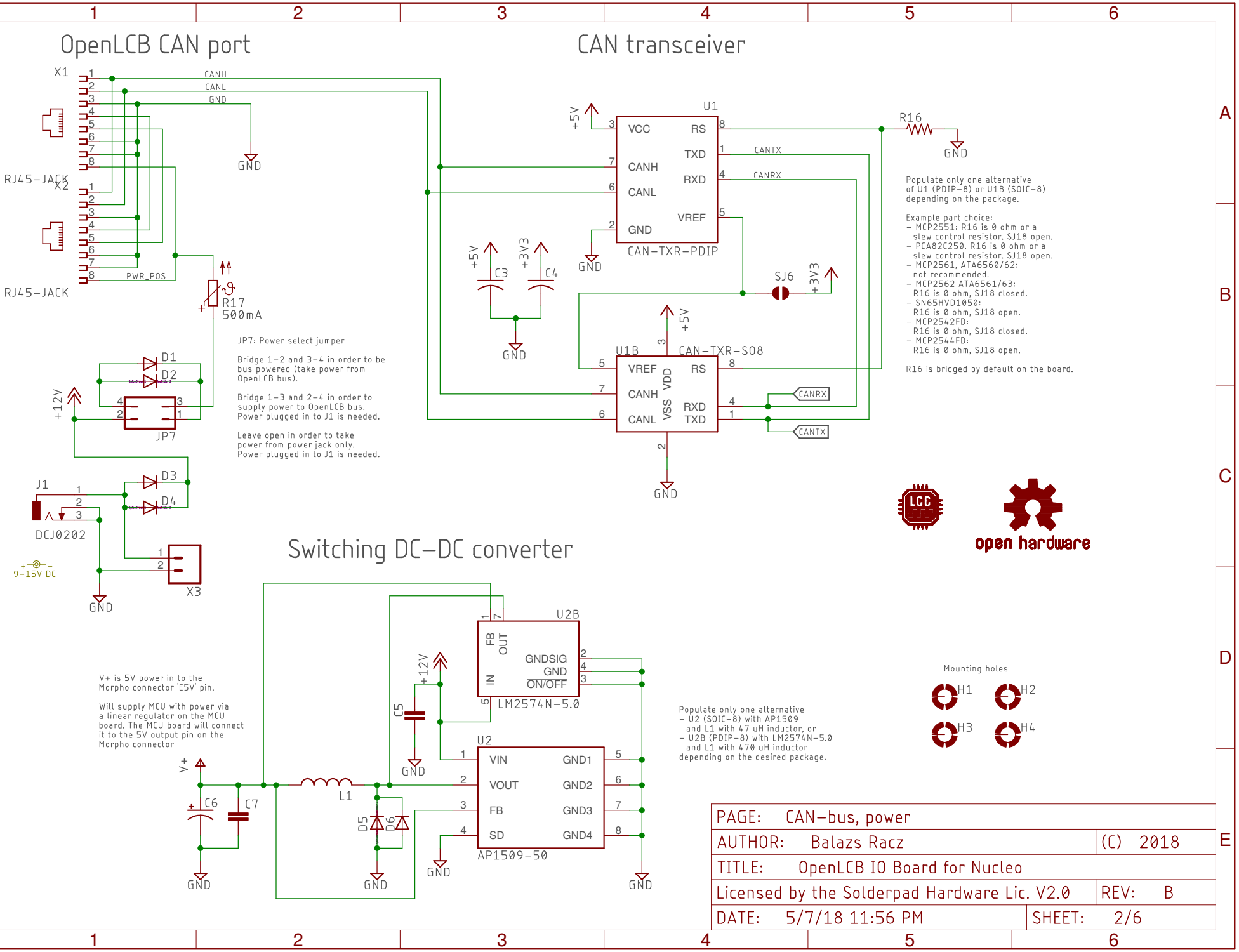
OpenLCB CAN port
CAN transceiver
X1
CANH
CANL
GND
RJ45-JACK
X2
RJ45-JACK
PWR_POS
R17
500mA
D1
D2
+12V
JP7
JP7: Power select jumper
Bridge 1-2 and 3-4 in order to be bus powered (take power from OpenLCB bus).
Bridge 1-3 and 2-4 in order to supply power to OpenLCB bus. Power plugged in to J1 is needed.
Leave open in order to take power from power jack only. Power plugged in to J1 is needed.
J1
DCJ0202
D3
D4
9-15V DC
X3
GND
U1
VCC
RS
TXD
CANH
RXD
CANL
VREF
GND
CAN-TXR-PDIP
+5V
+3V3
C3
C4
SJ6
R16
CANTX
CANRX
Populate only one alternative of U1 (PDIP-8) or U1B (SOIC-8) depending on the package.
Example part choice:
- MCP2551: R16 is 0 ohm or a slew control resistor. SJ18 open.
- PCA82C250. R16 is 0 ohm or a slew control resistor. SJ18 open.
- MCP2561, ATA6560/62: not recommended.
- MCP2562 ATA6561/63: R16 is 0 ohm, SJ18 closed.
- SN65HVD1050: R16 is 0 ohm, SJ18 open.
- MCP2542FD: R16 is 0 ohm, SJ18 closed.
- MCP2544FD: R16 is 0 ohm, SJ18 open.
R16 is bridged by default on the board.
U1B
CAN-TXR-SO8
VREF
VDD
CANH
VSS
CANL
RS
RXD
TXD
open hardware
Switching DC-DC converter
V+ is 5V power in to the Morpho connector 'E5V' pin.
Will supply MCU with power via a linear regulator on the MCU board. The MCU board will connect it to the 5V output pin on the Morpho connector
U2B
FB
OUT
IN
GNDSIG
GND
ON/OFF
LM2574N-5.0
C5
U2
VIN
VOUT
FB
SD
GND1
GND2
GND3
GND4
AP1509-50
L1
D5
D6
C6
C7
V+
Populate only one alternative
- U2 (SOIC-8) with AP1509 and L1 with 47 uH inductor, or
- U2B (PDIP-8) with LM2574N-5.0 and L1 with 470 uH inductor
depending on the desired package.
Mounting holes
H1
H2
H3
H4
PAGE: CAN-bus, power
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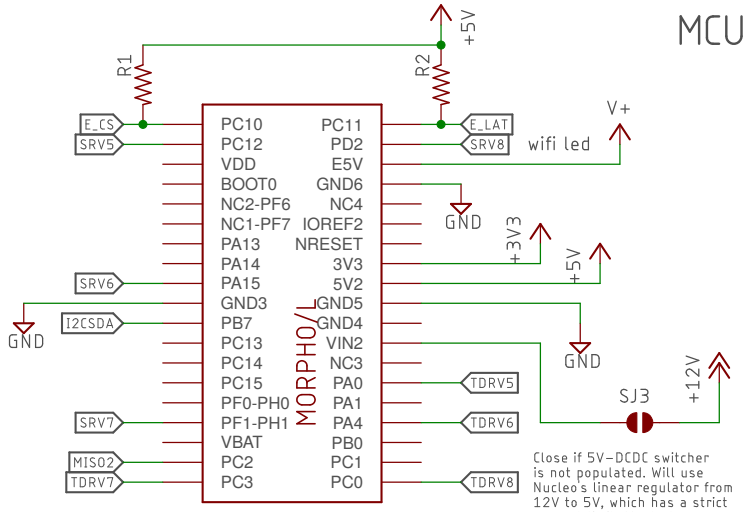
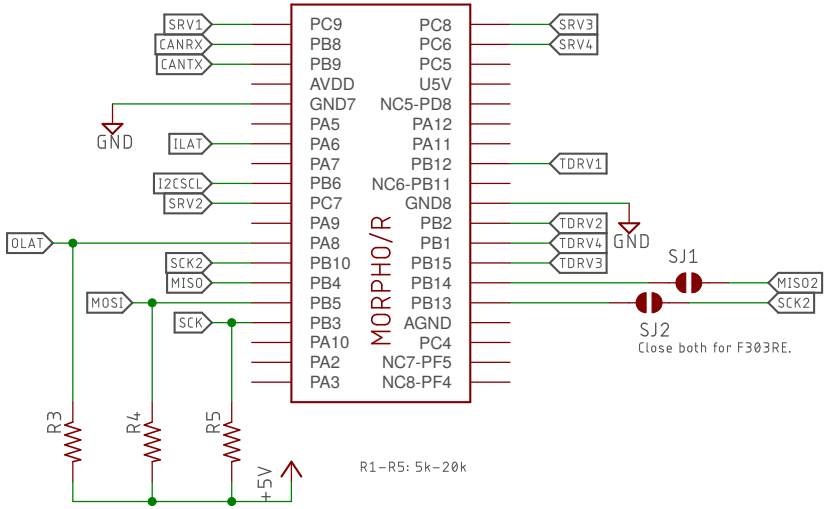
MCU interface



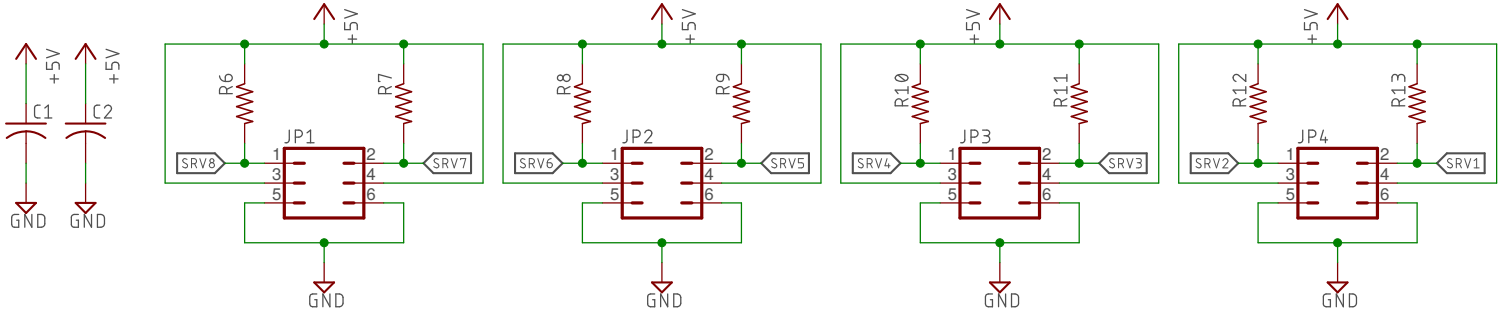
Close if 5V-DCDC switcher is not populated. Will use Nucleo's linear regulator from 12V to 5V, which has a strict current limit. Must observe max current consumption of the Nucleo specification, which depends on the input voltage. Putting any load by external peripherals is not recommended. Might work with lower voltage (e.g. 7V) input power.



Close both for F303RE.

R1-R5: 5k-20k

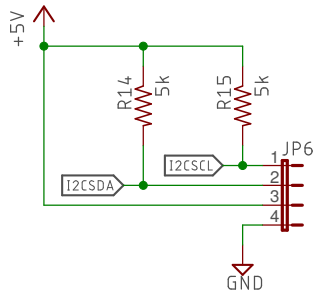
Servo outputs



Populate R6-R13 if the servos in use are not compatible with 3V voltage levels.
R6-R13: 5k-20k

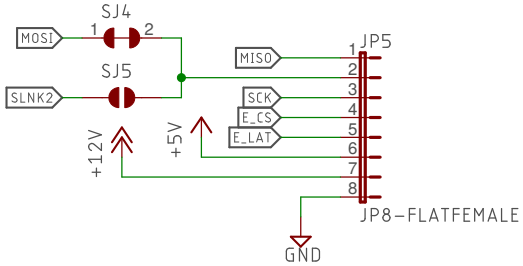
JP1-2 for SRV5-8 can not be populated if a Nucleo-144 board is used.

I2C expansion port



SPI expansion port

If SJ4 is closed, expn port SPI is parallel to onboard shift registers. If SJ4 is open and SJ5 is closed, they get daisy-chained.



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