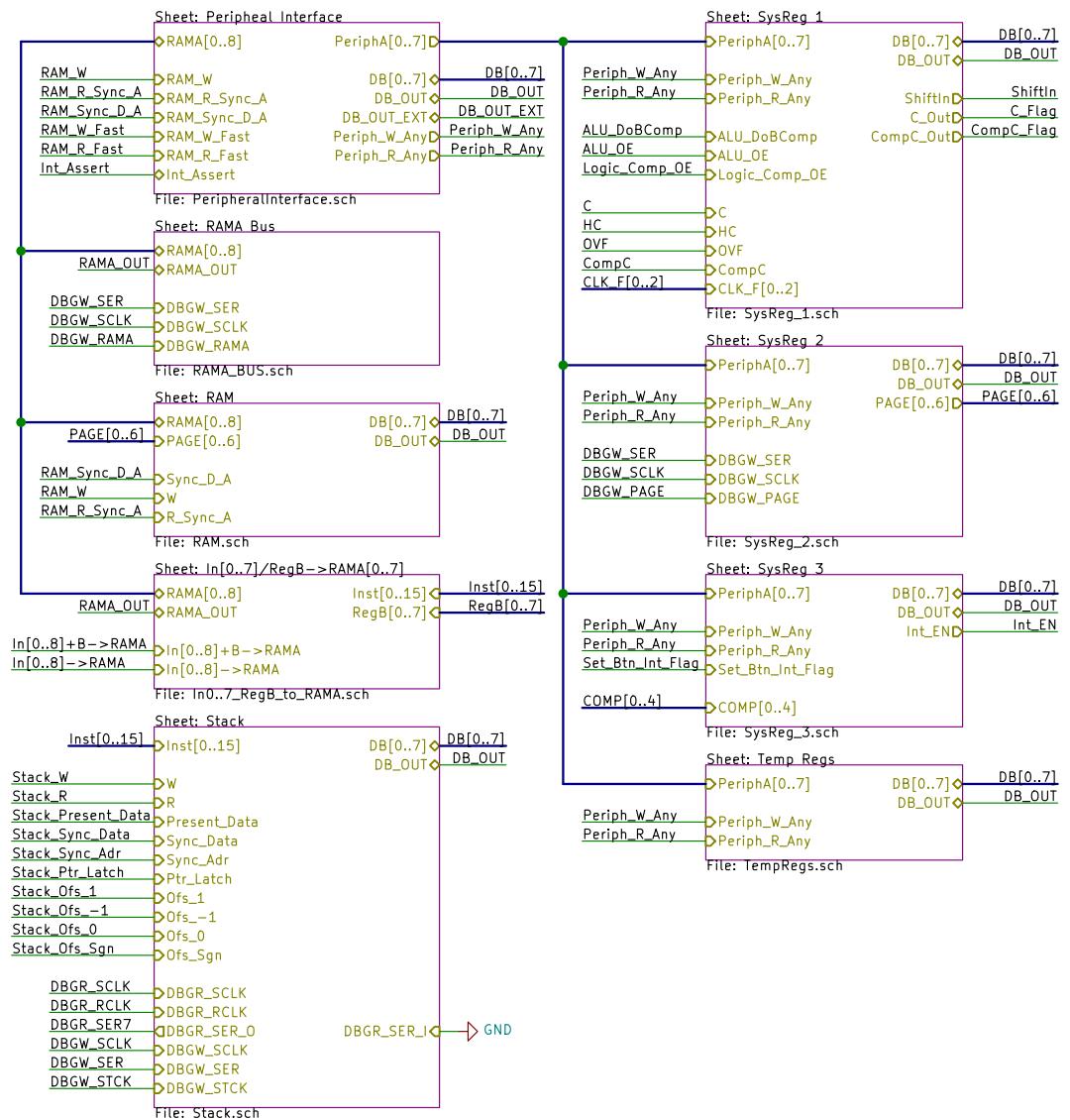
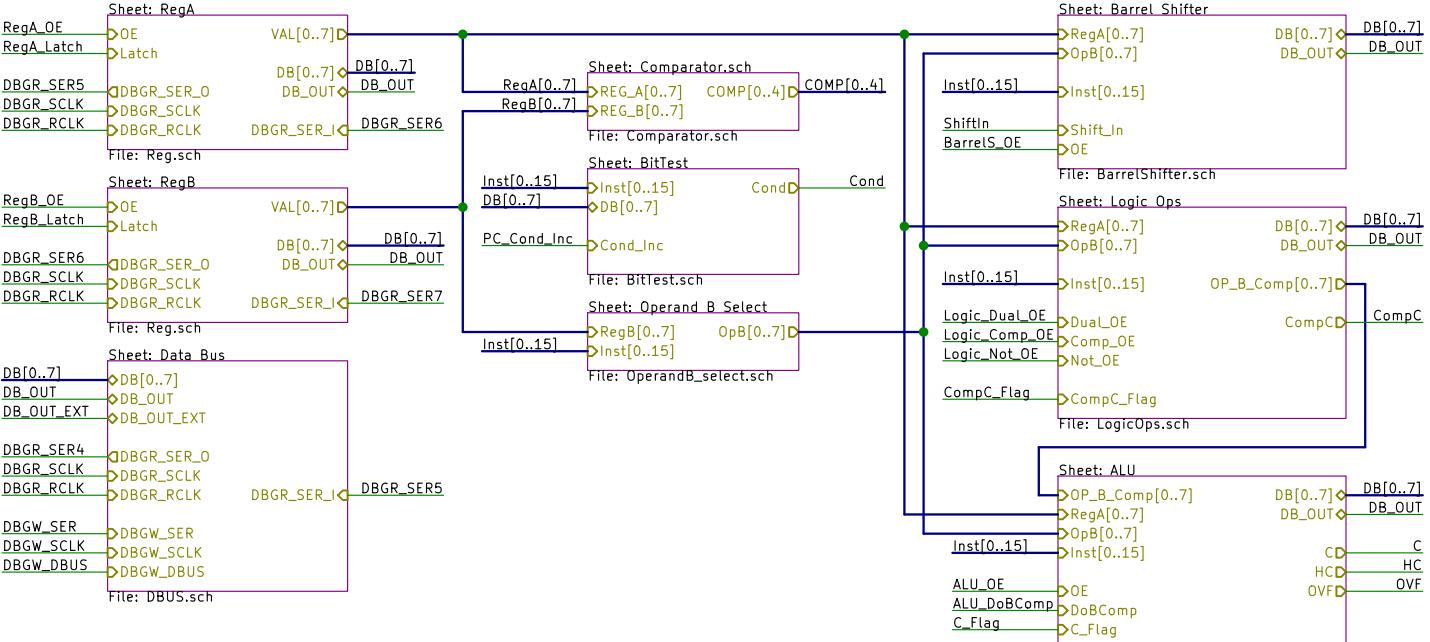


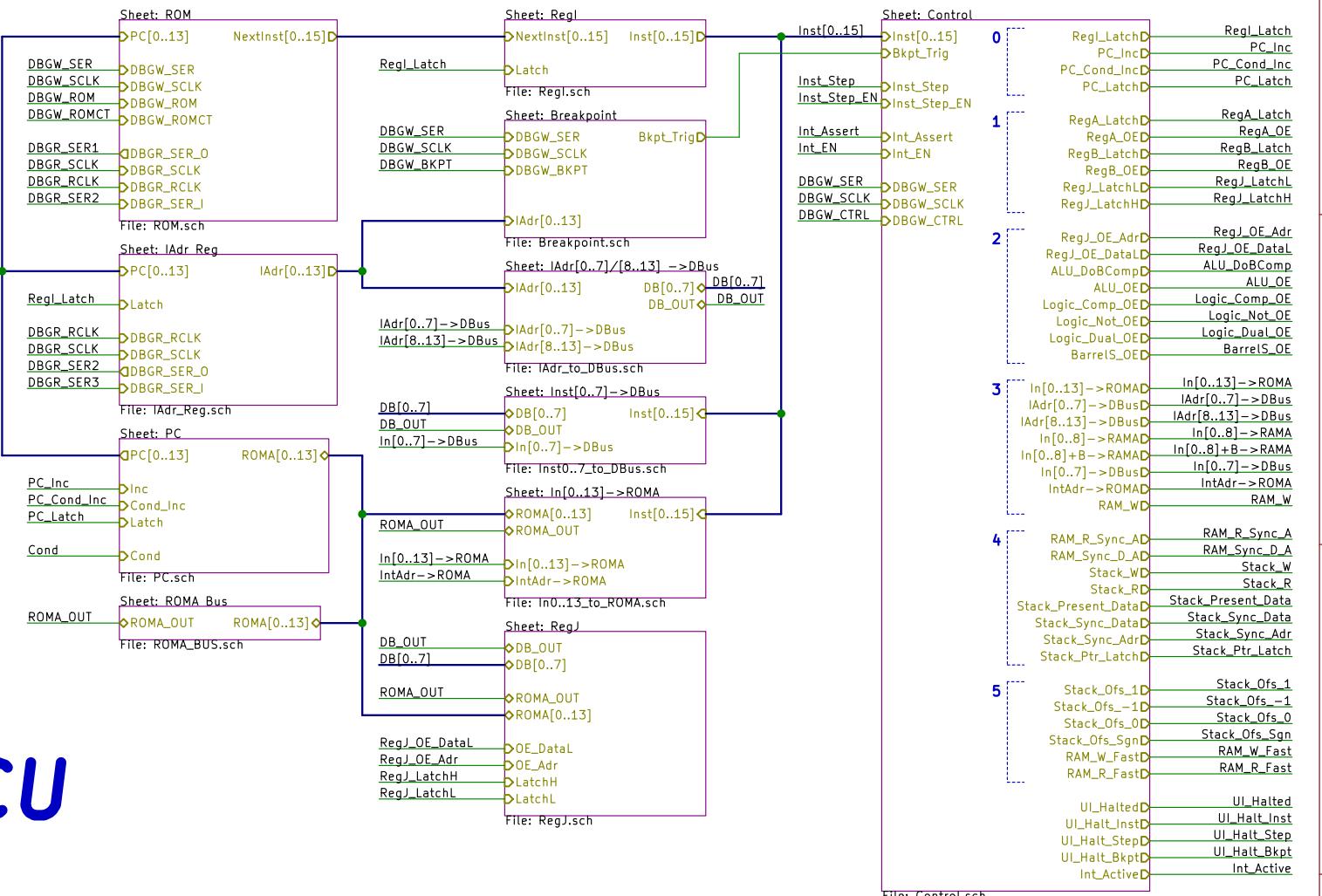
Memory & Peripherals:



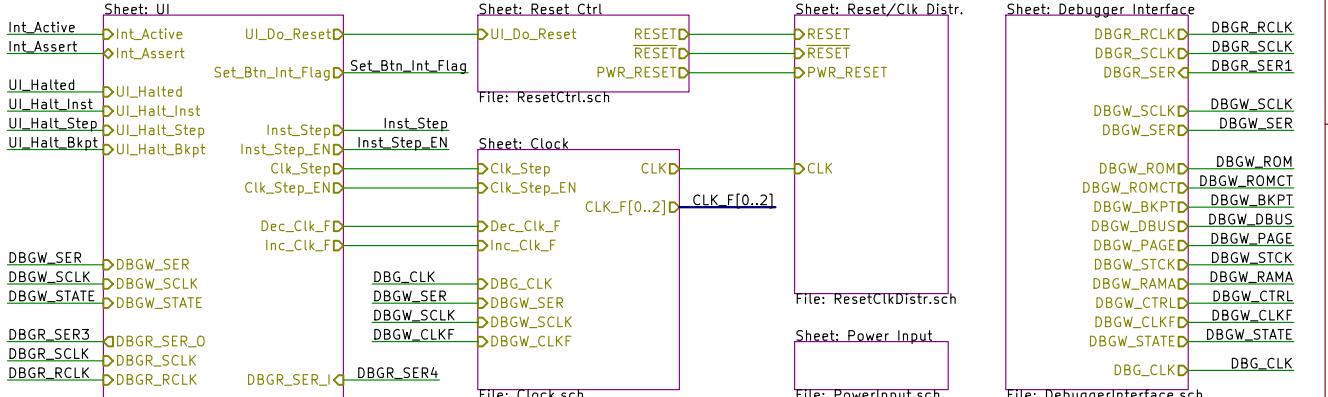
Data Manipulation:



Control:



System Support:



An 8-bit processor built entirely from 74-Series logic

Philip Schilk

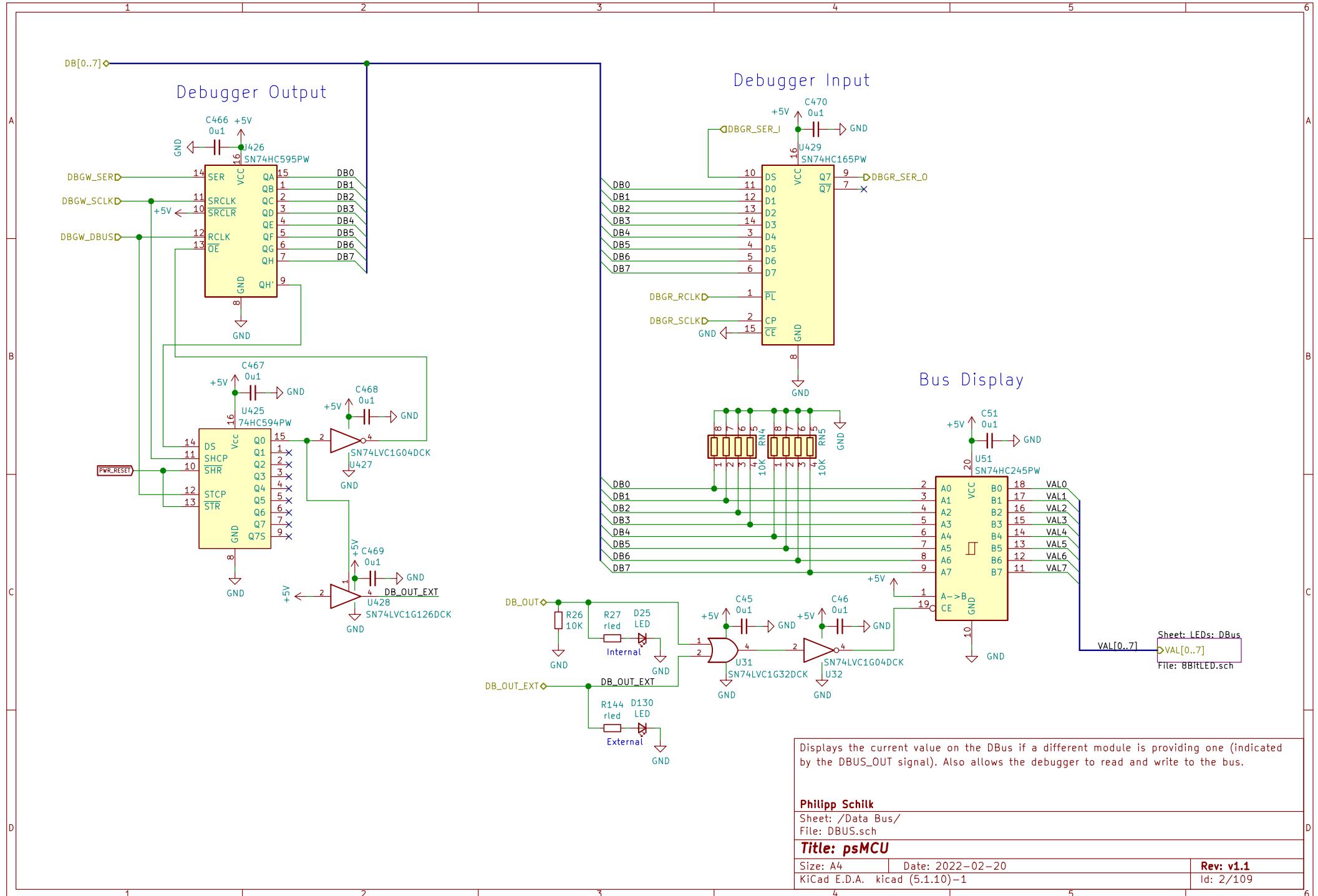
Sheet: /

File: psMCU.sch

Size: A3 Date: 2022-02-20

KiCad E.D.A. kicad (5.1.10)-1

7



A

A

B

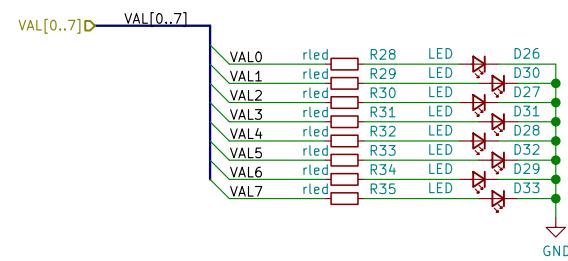
B

C

C

D

D



8bit binary LED display.

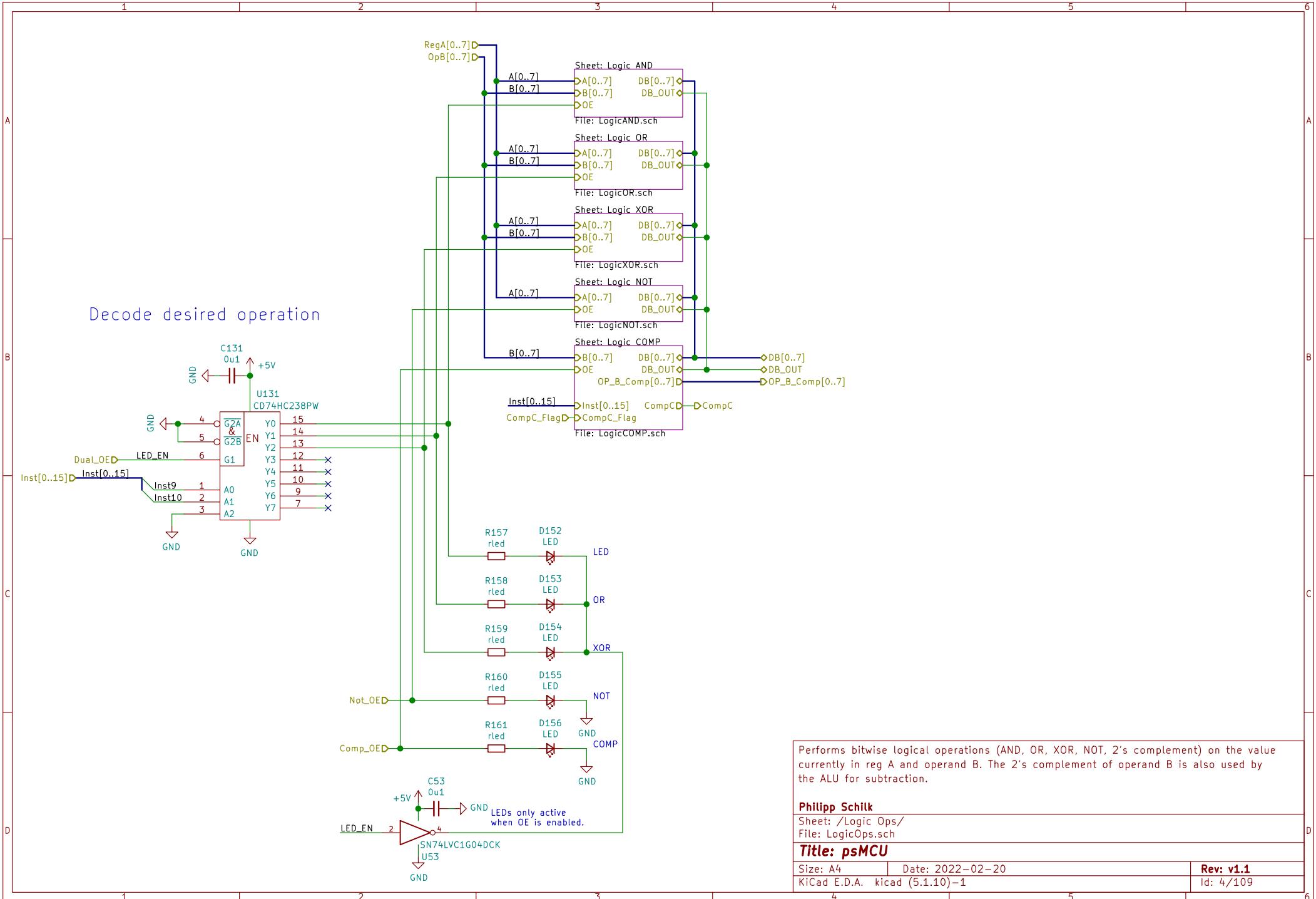
Philipp Schilk

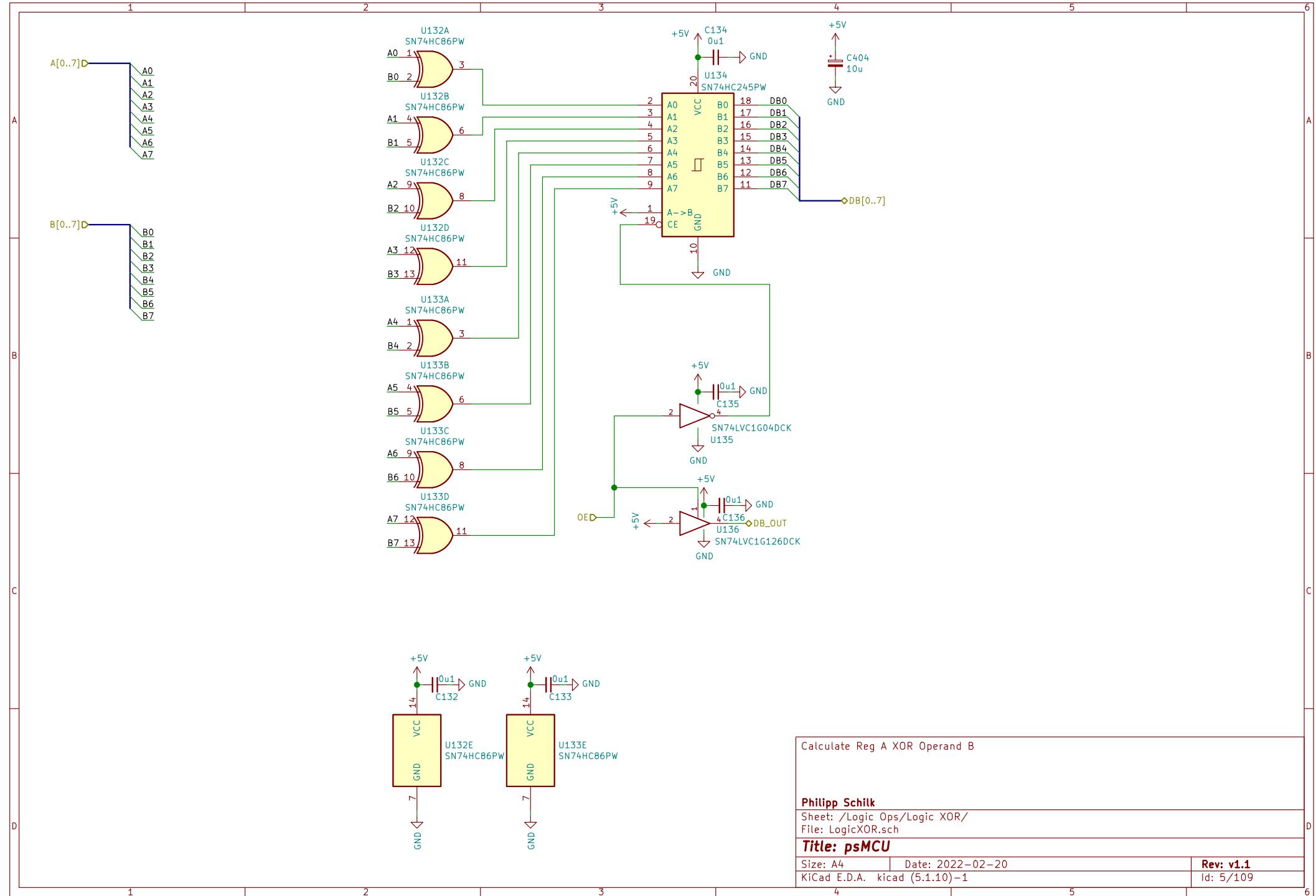
Sheet: /Data Bus/LEDs: DBus /
File: 8BitLED.sch

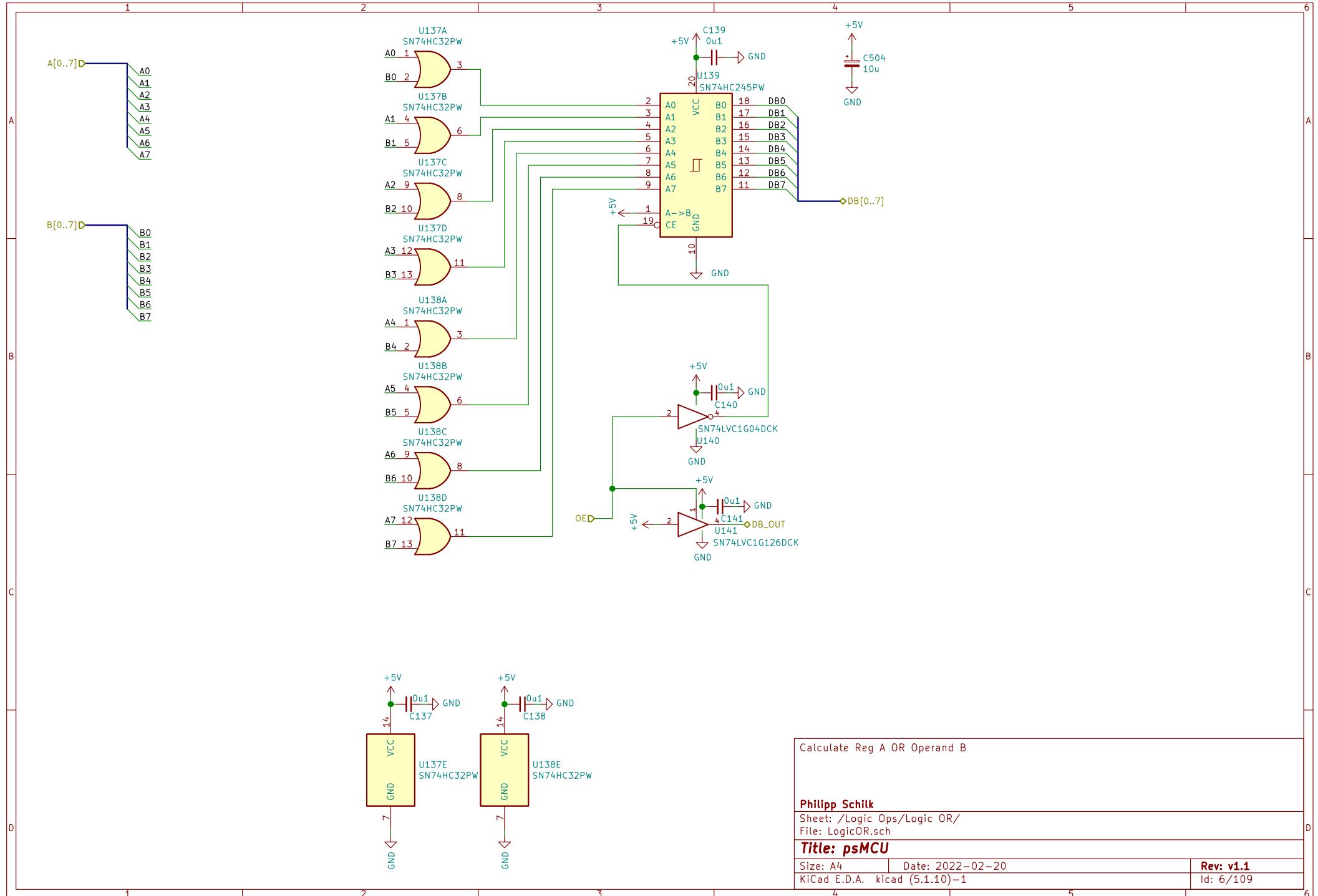
Title: psMCU

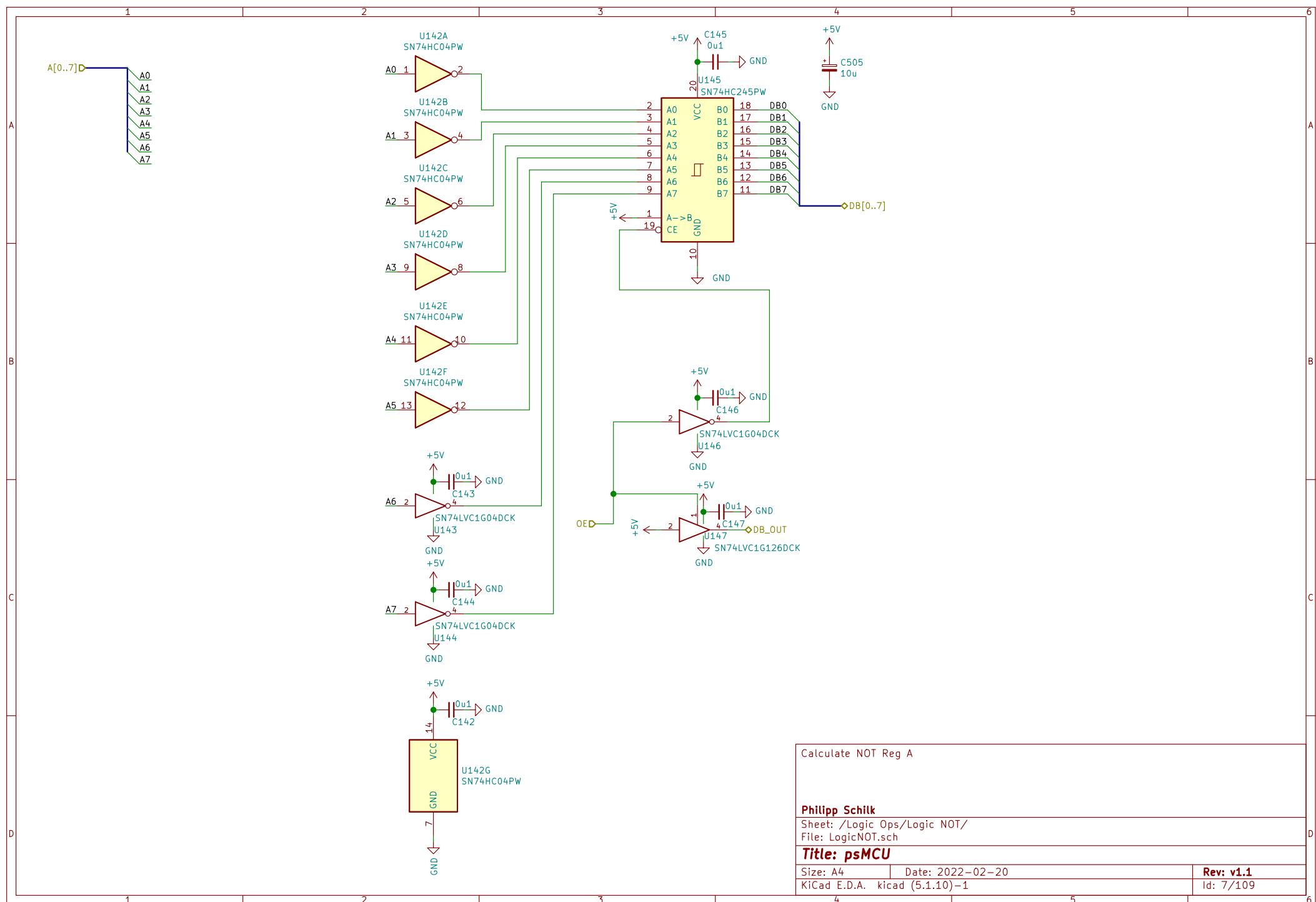
Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

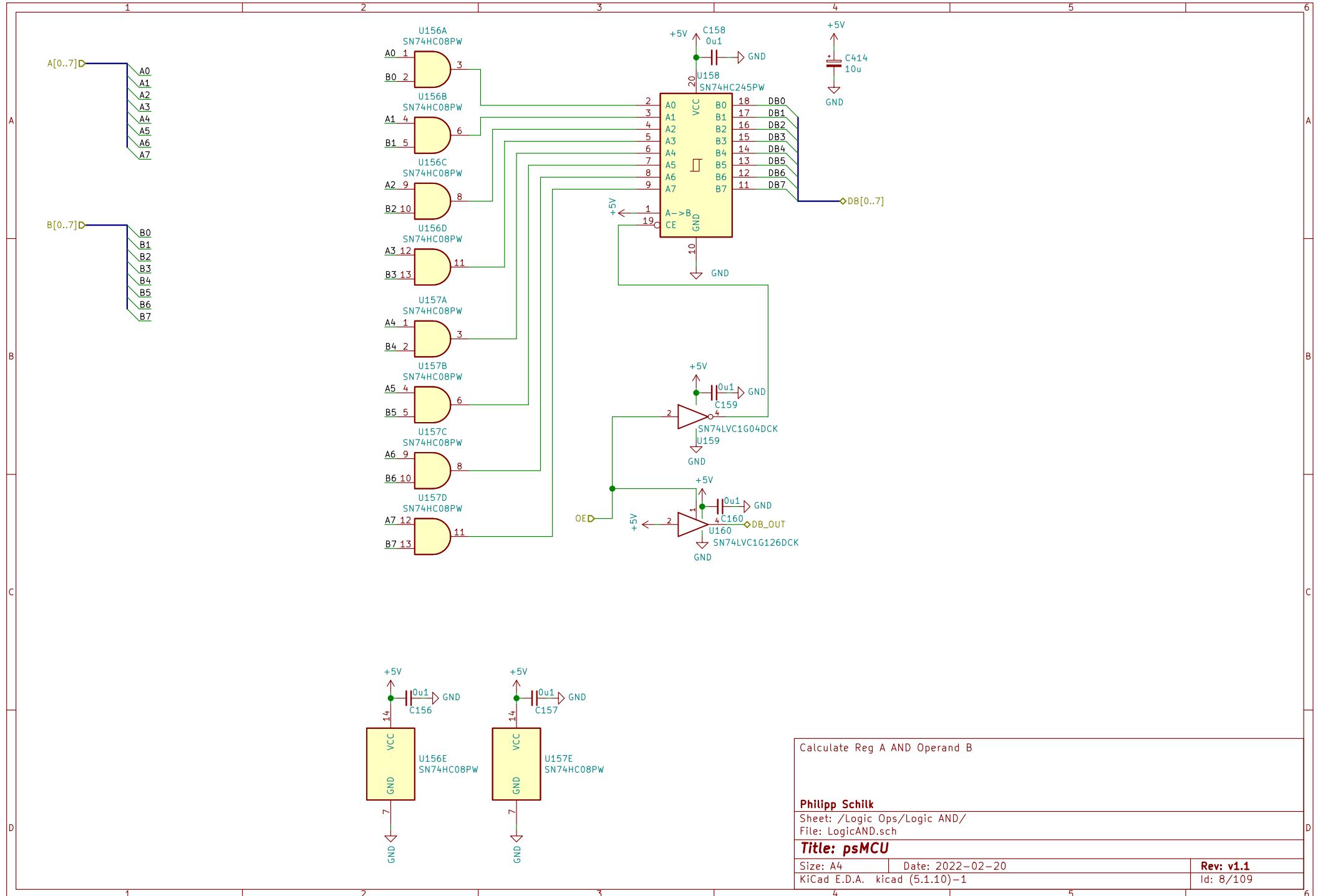
Rev: v1.1
Id: 3/109

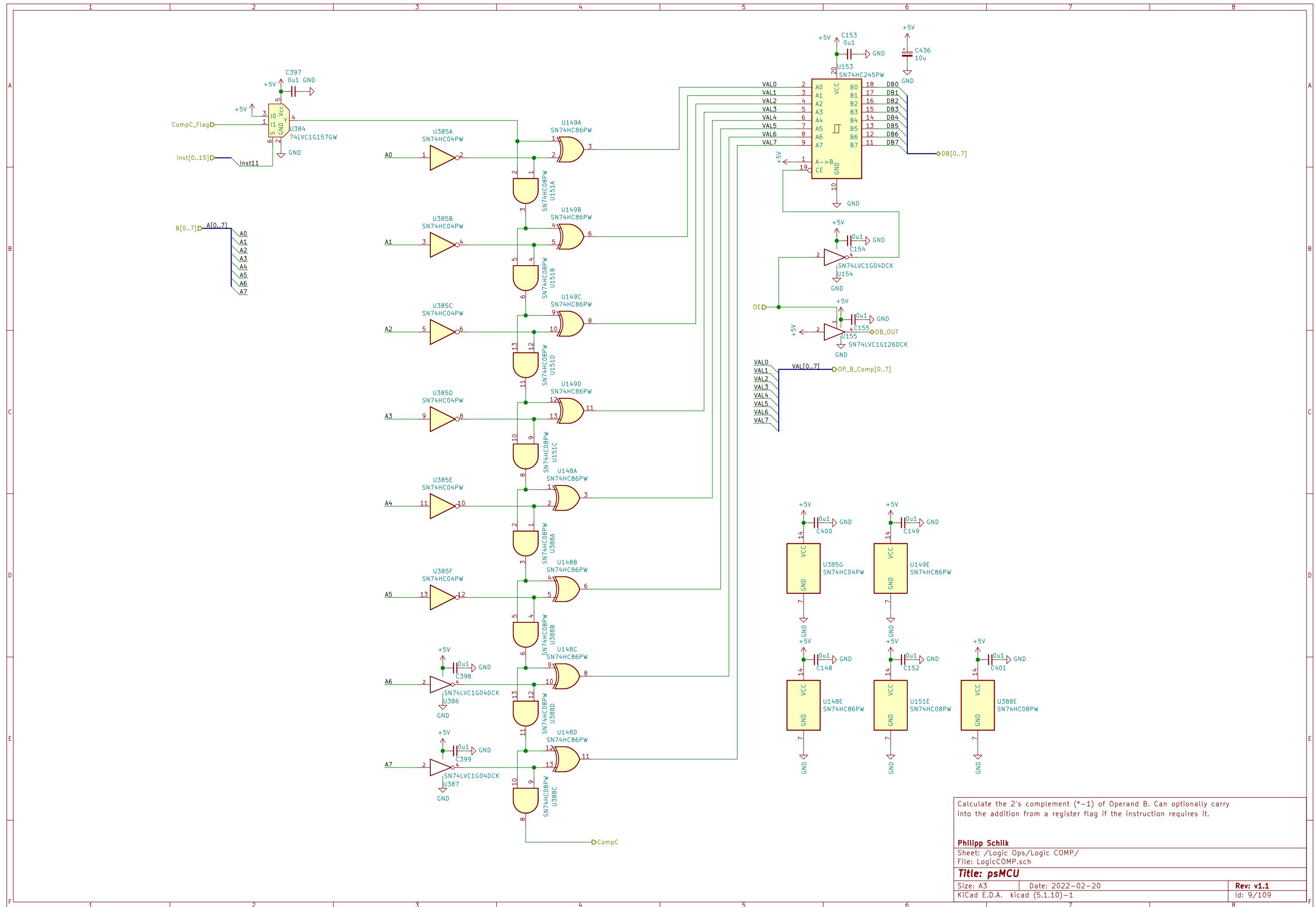












A

B

C

D

E

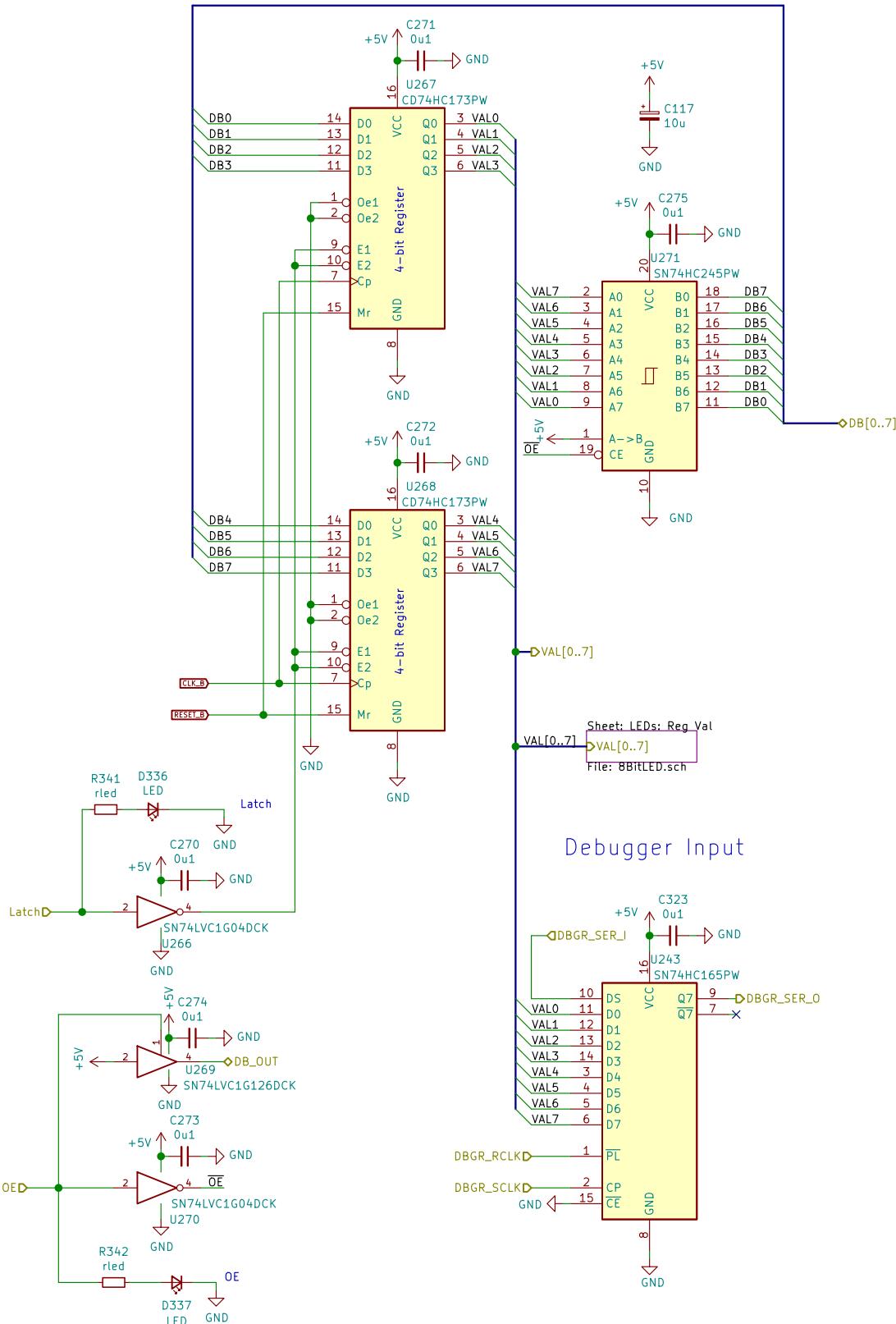
A

B

C

D

E



A basic 8-bit register. Interfaces with the DBus.
Also includes an interface that enables the debugger to read the current value.

Philipp Schilk

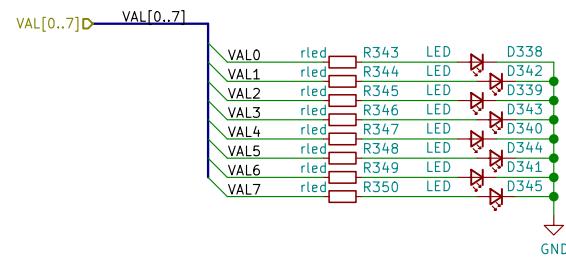
Sheet: /RegB/
File: Reg.sch

Title: psMCU

Size: A4	Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1	Rev: v1.1

F

F



8bit binary LED display.

Philipp Schilk

Sheet: /RegB/LEDs: Reg Val/
File: 8BitLED.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 11/109

A

B

C

D

E

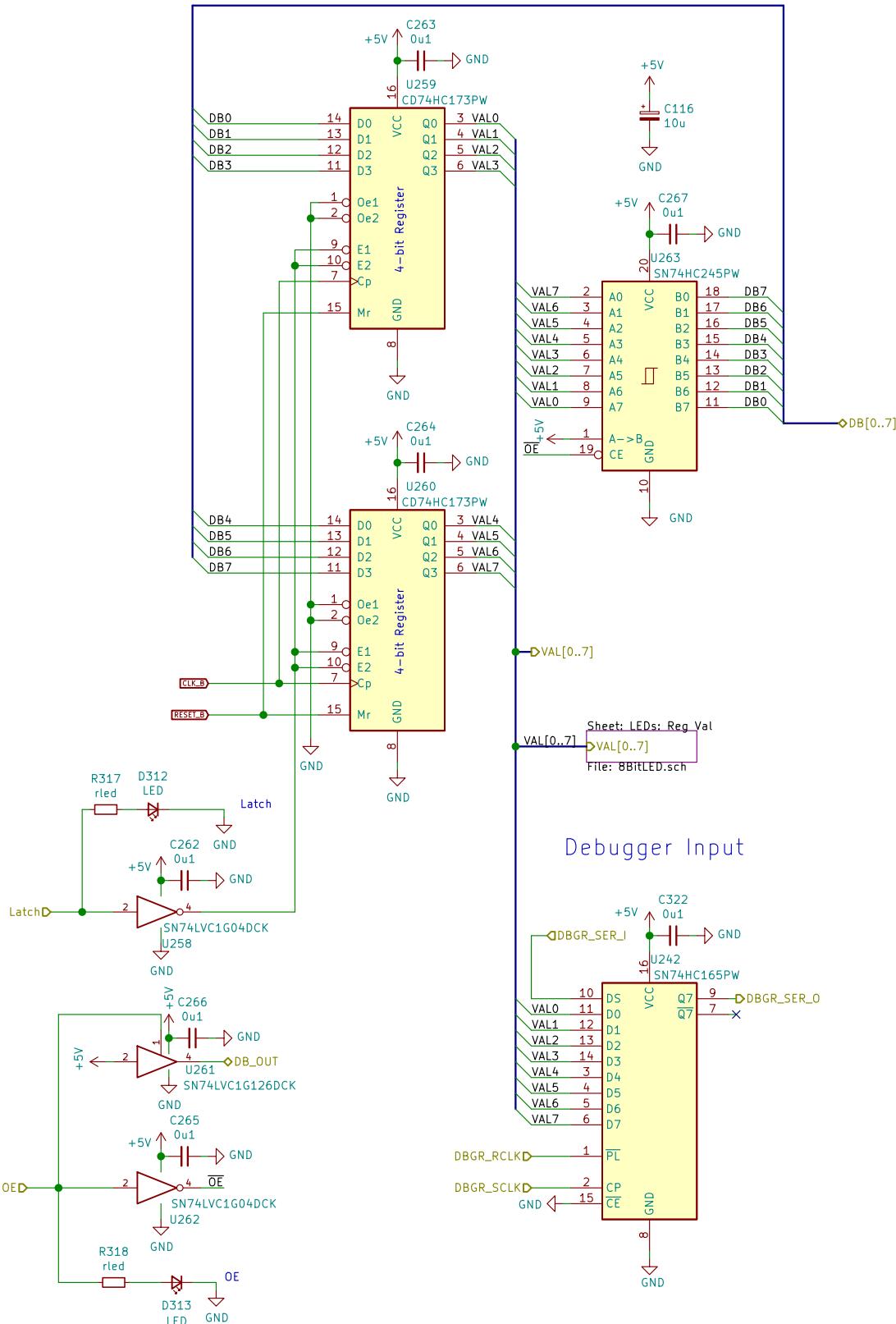
A

B

C

D

E



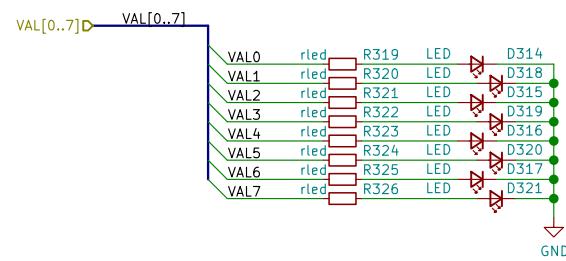
A basic 8-bit register. Interfaces with the DBus.
Also includes an interface that enables the debugger to read the current value.

Philipp Schilk

Sheet: /RegA/
File: Reg.sch

Title: psMCU

Size: A4	Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1	Rev: v1.1



8bit binary LED display.

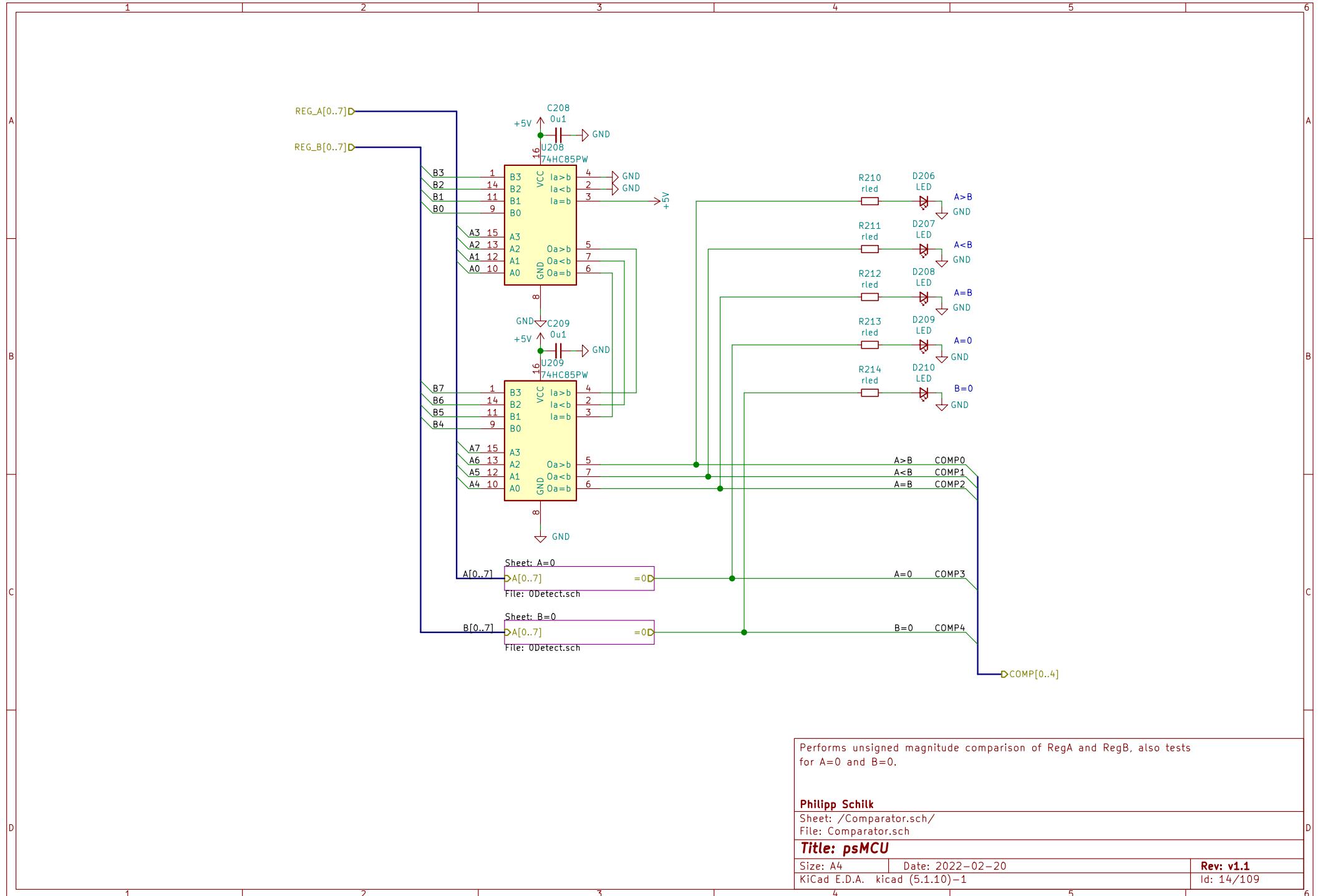
Philipp Schilk

Sheet: /RegA/LEDs: Reg Val/
File: 8BitLED.sch

Title: psMCU

Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 13/109



A

A

B

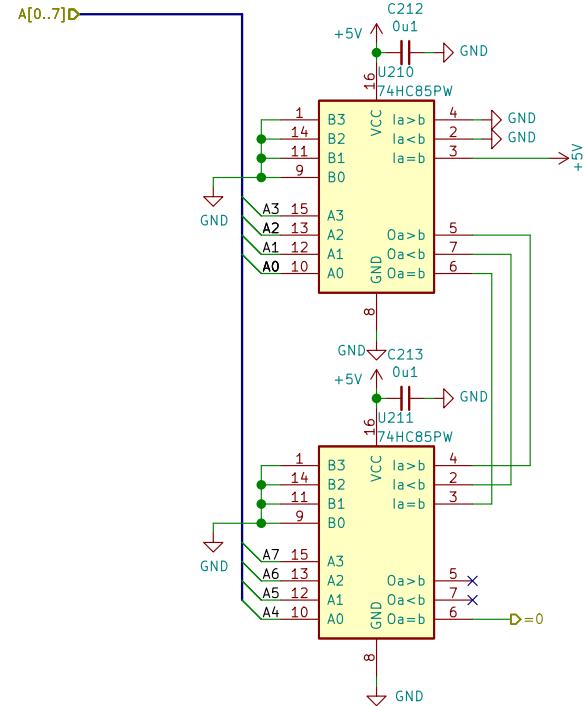
B

C

C

D

D



Test if the input value is equal to 0.

Philipp Schilk

Sheet: /Comparator.sch/A=0/
File: ODetect.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 15/109

A

A

B

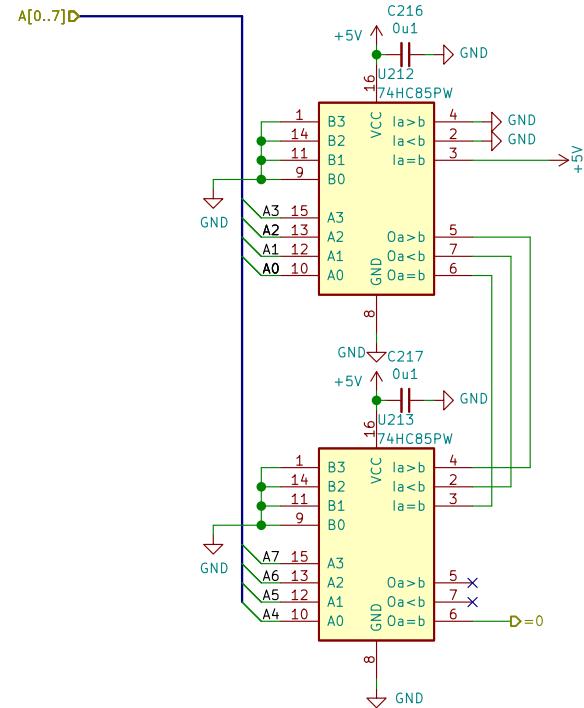
B

C

C

D

D



Test if the input value is equal to 0.

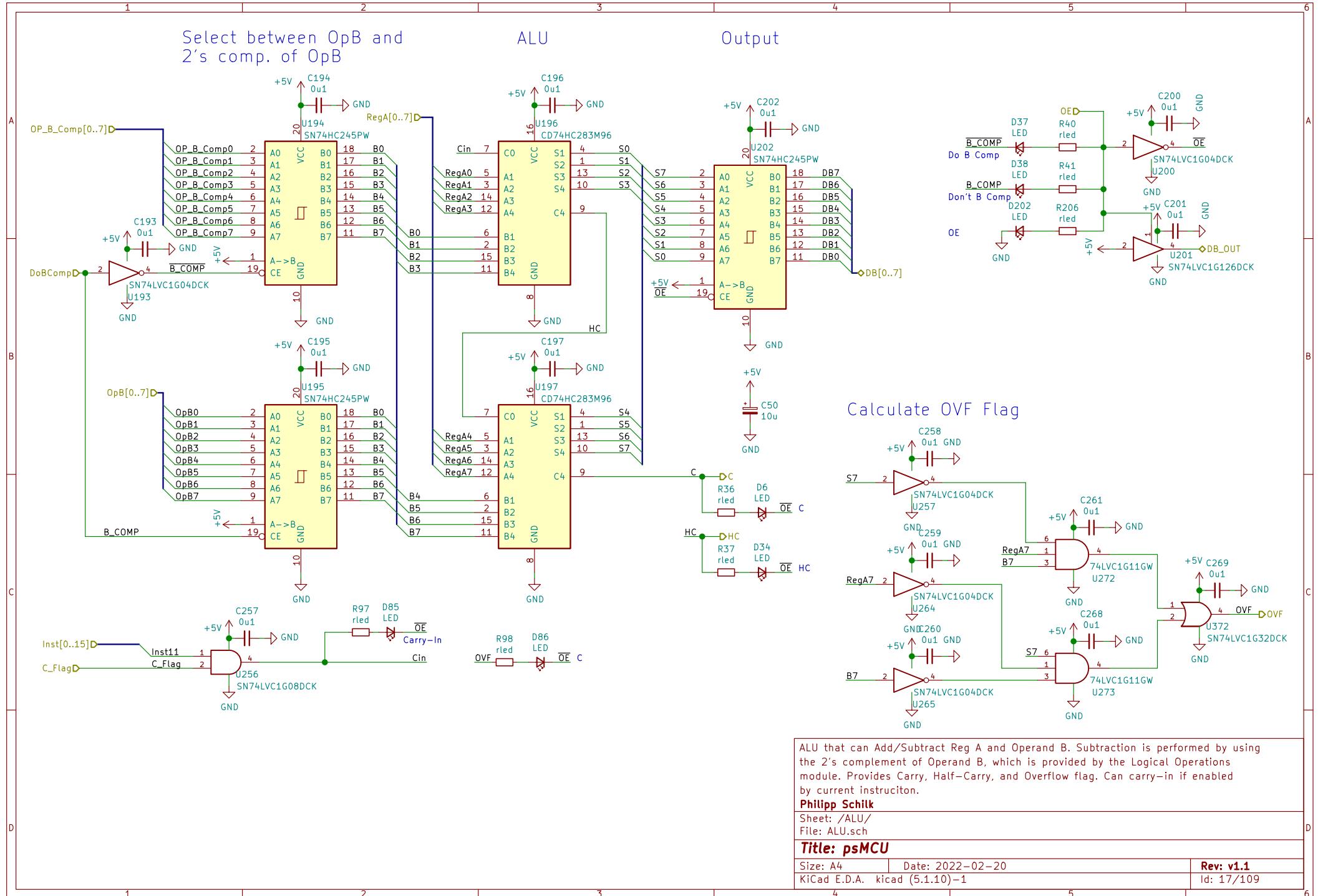
Philipp Schilk

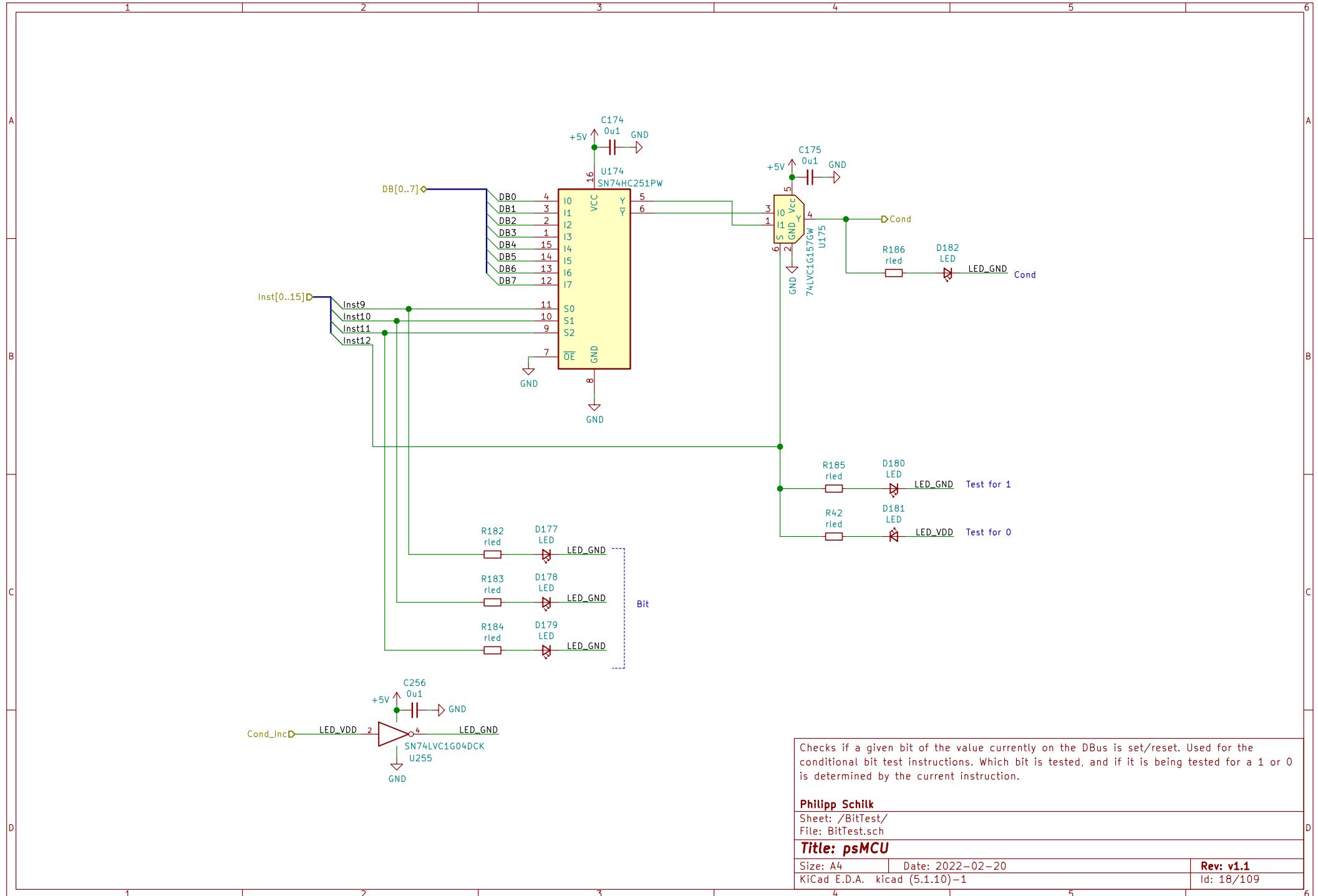
Sheet: /Comparator.sch/B=0/
File: ODetect.sch

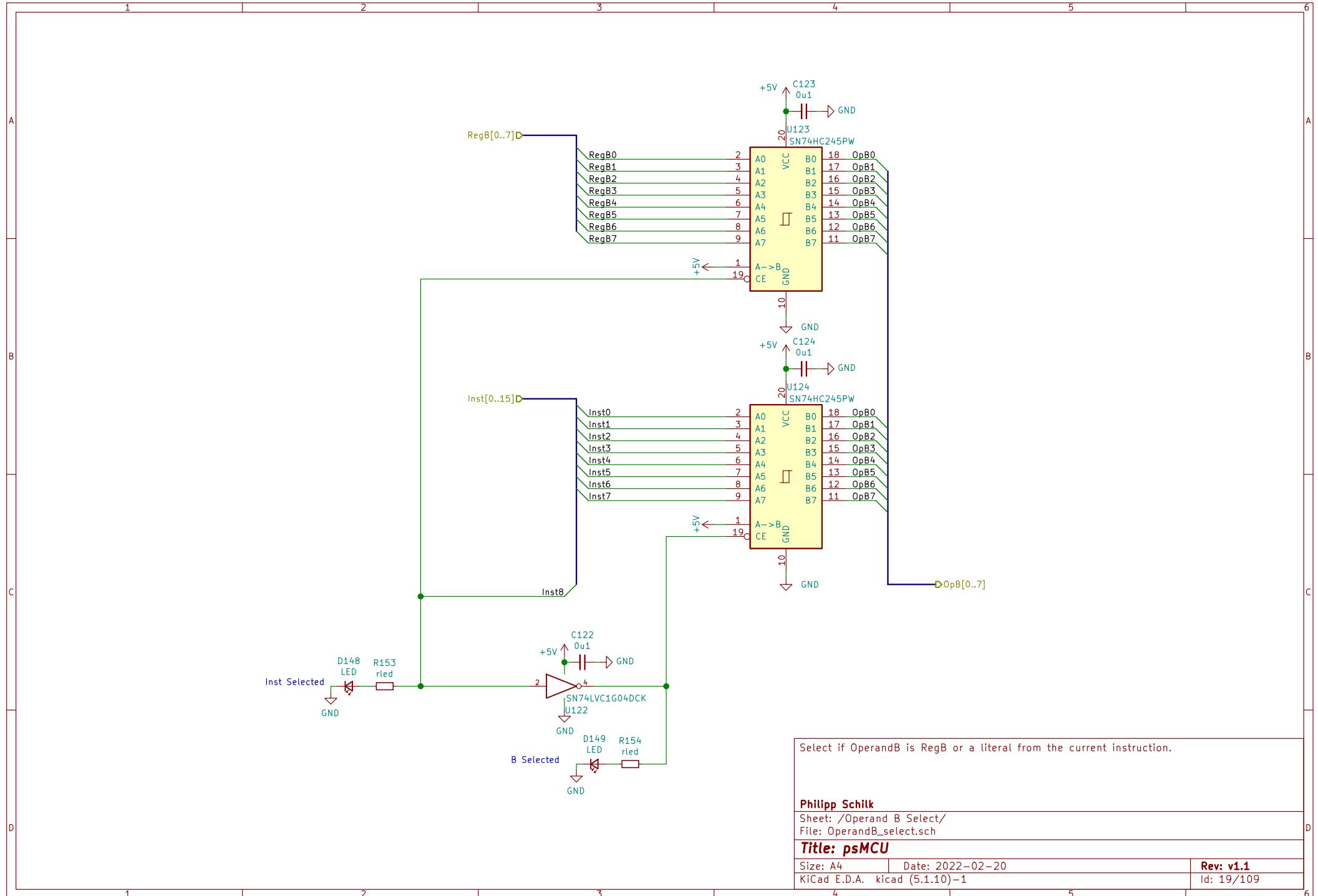
Title: psMCU

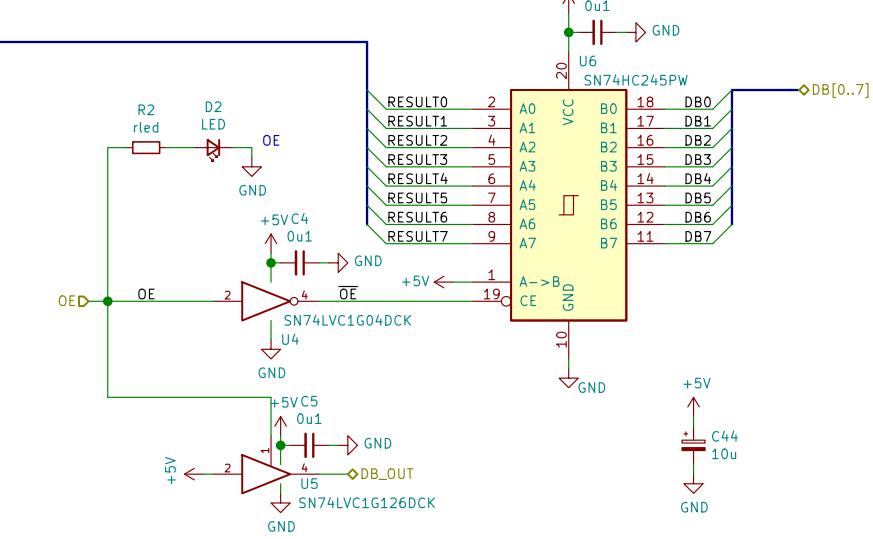
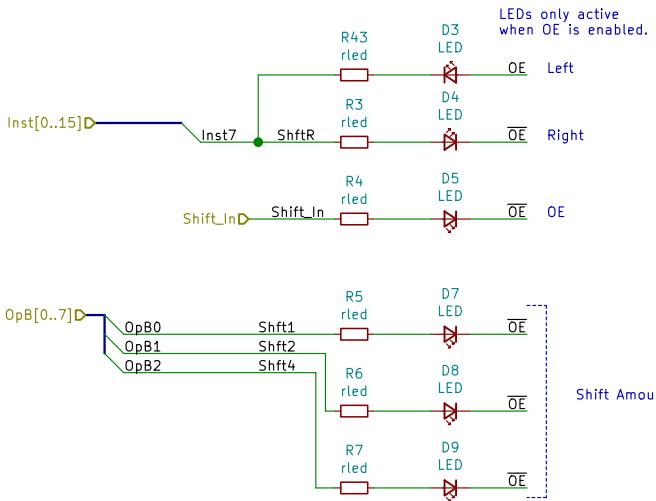
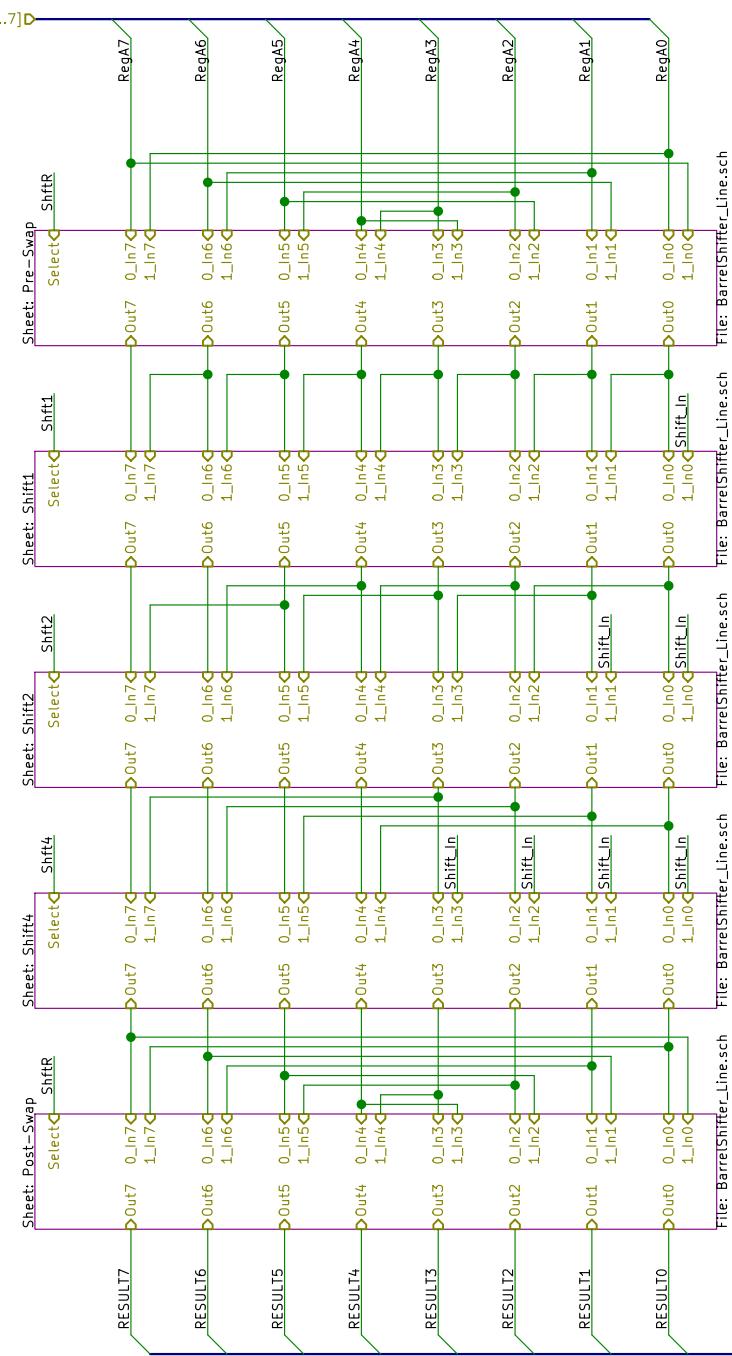
Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 16/109









Barrel shifter that can shift the value currently in register A left or right by 0–7, determined by operand B. The actual barrel shifter always shifts left, right shifting is achieved by swapping the bit order before and after shifting. A 1 or 0 can be shifted in. Direction is controlled by the current instruction.

Philip Schilk

Sheet: /Barrel Shifter/
File: BarrelShifter.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 20/109

A

A

B

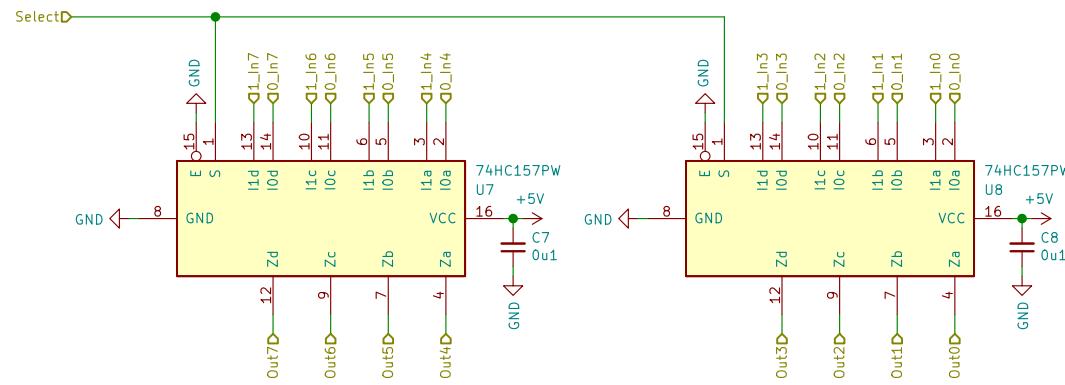
B

C

C

D

D



A line of 8 2in-1out multiplexers used by the barrel shifter.

Philipp Schilk

Sheet: /Barrel Shifter/Shift2/
File: BarrelShifter_Line.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 21/109

A

A

B

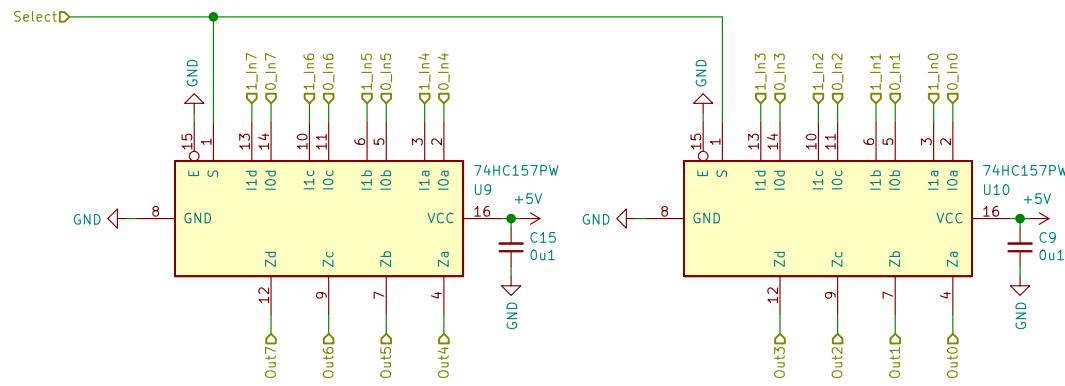
B

C

C

D

D



A line of 8 2in-1out multiplexers used by the barrel shifter.

Philipp Schilk

Sheet: /Barrel Shifter/Shift4/
File: BarrelShifter_Line.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 22/109

A

A

B

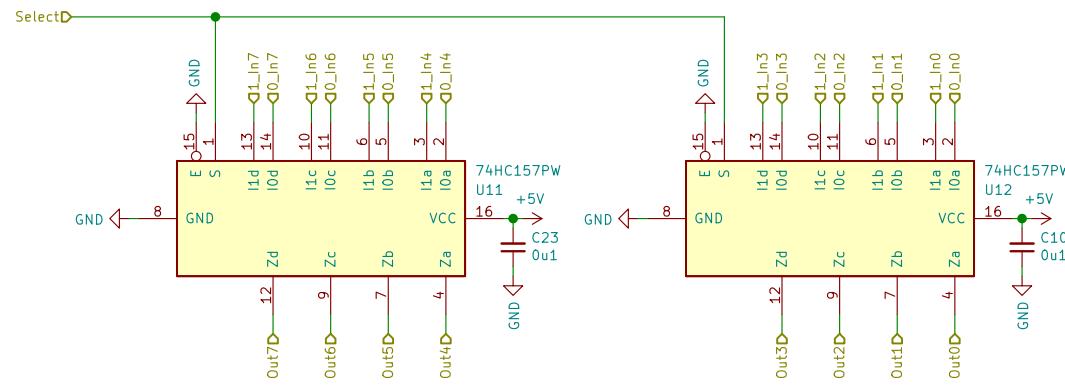
B

C

C

D

D



A line of 8 2in-1out multiplexers used by the barrel shifter.

Philipp Schilk

Sheet: /Barrel Shifter/Post-Swap/
File: BarrelShifter_Line.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 23/109

A

A

B

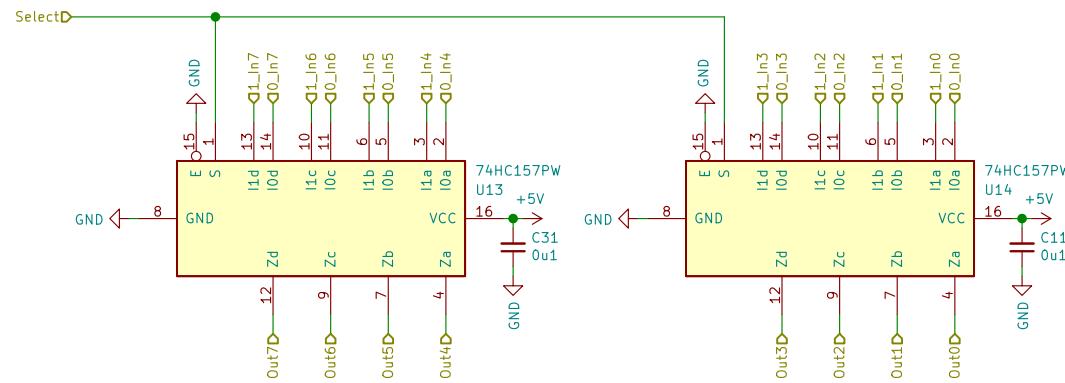
B

C

C

D

D



A line of 8 2in-1out multiplexers used by the barrel shifter.

Philipp Schilk

Sheet: /Barrel Shifter/Pre-Swap/
File: BarrelShifter_Line.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 24/109

A

A

B

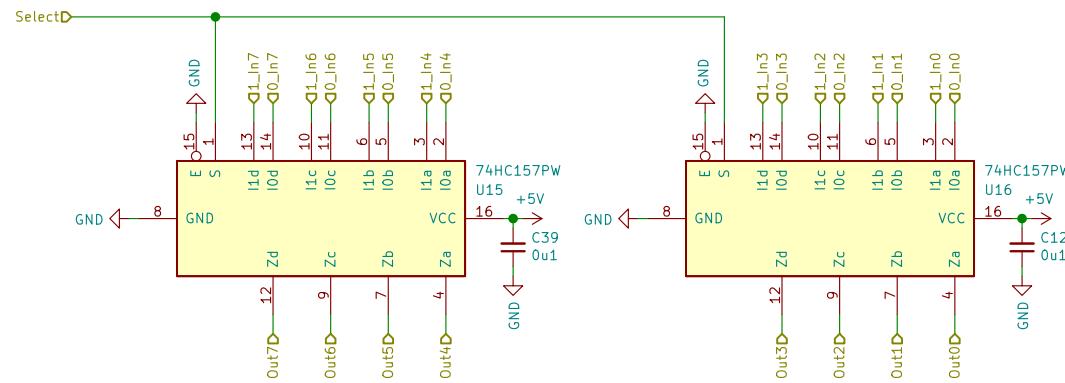
B

C

C

D

D



A line of 8 2in-1out multiplexers used by the barrel shifter.

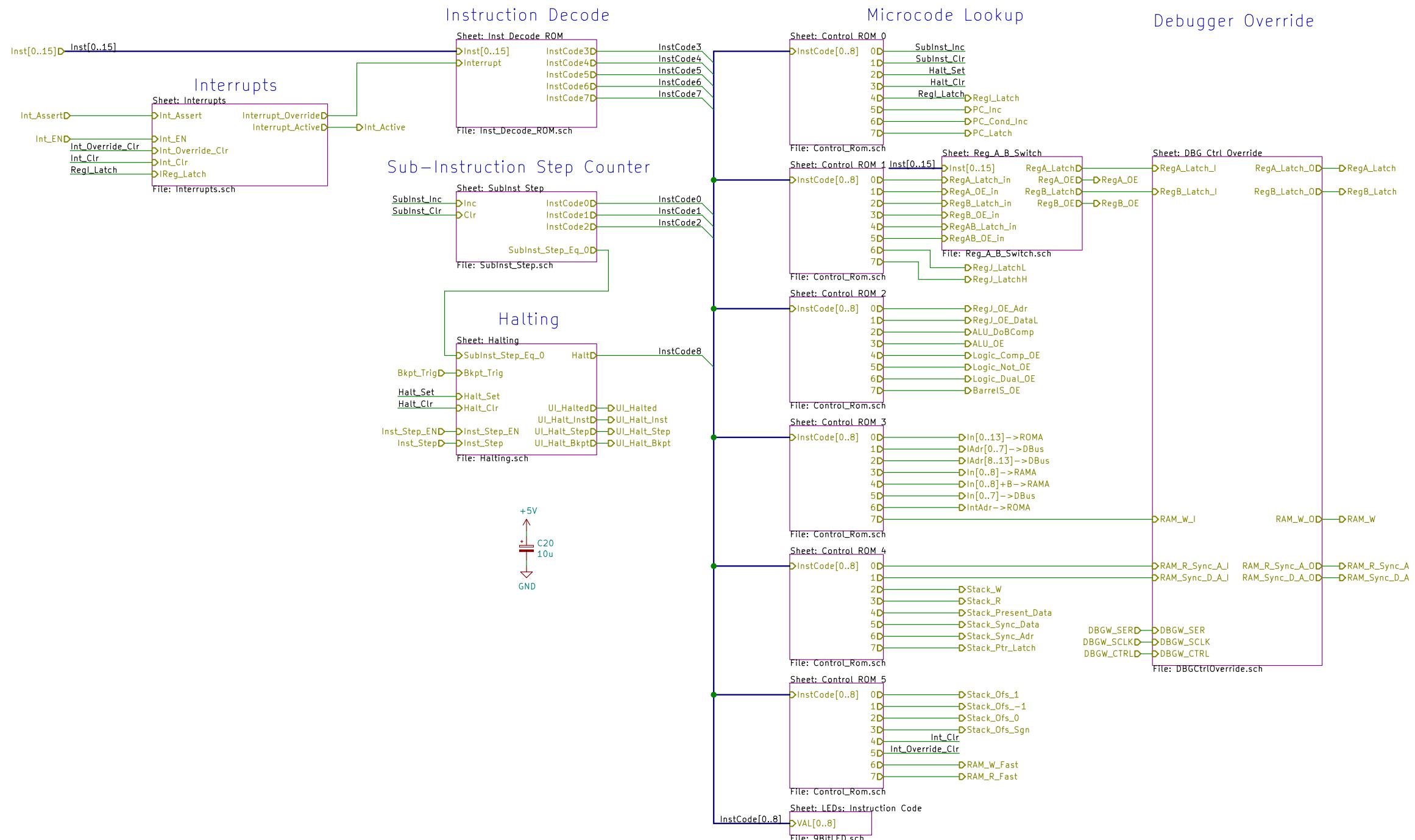
Philipp Schilk

Sheet: /Barrel Shifter/Shift1/
File: BarrelShifter_Line.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 25/109



The central state machine that controls execution. Instructions are decoded, and the individual sub-instruction steps are read from Microcode ROMs. Also handles interrupts and halting/single instruction stepping. Allows the debugger to override some control lines.

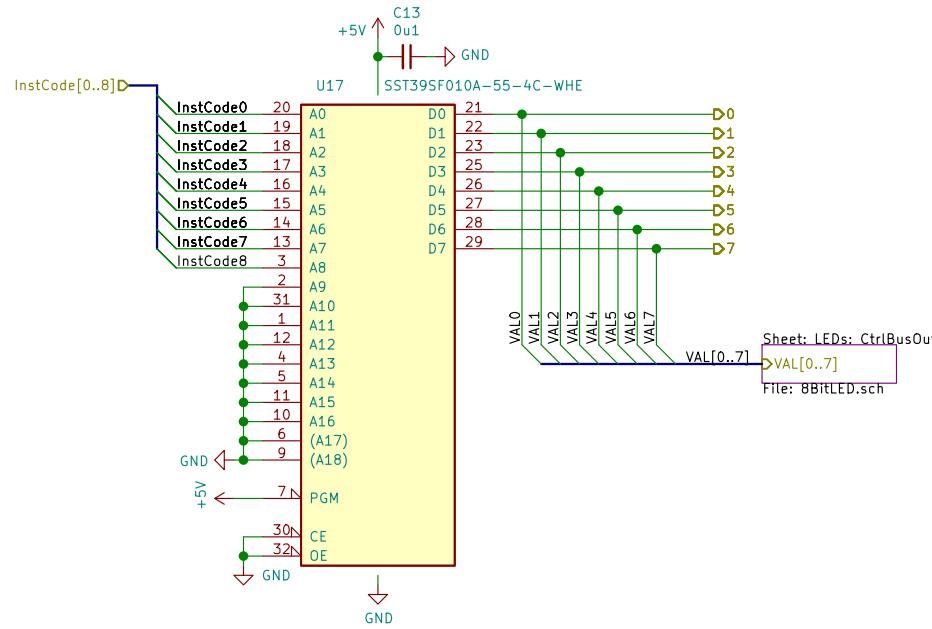
Philipp Schilk

Sheet: /Control/
File: Control.sch

Title: psMCU

Size: A3 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1 | Id: 26/109



Sheet: LEDs; CtrlBusOut
File: 8BitLED.sch

Microcode ROM, stores the control signals for each sub-step of each instruction.

Philipp Schilk

Sheet: /Control/Control ROM 5/
File: Control_Rom.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 27/109

A

A

B

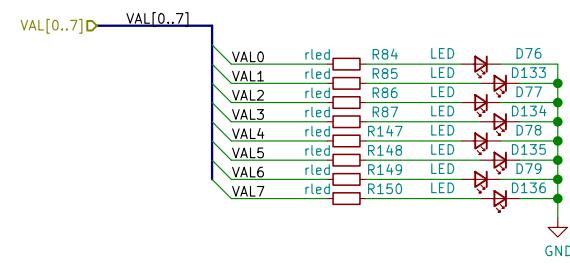
B

C

C

D

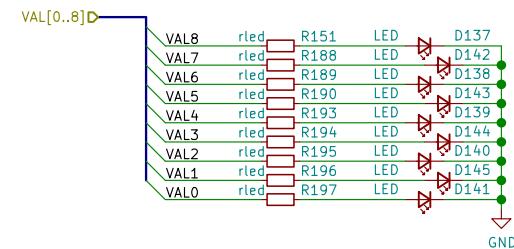
D



8bit binary LED display.

Philipp Schilk

Sheet: /Control/Control ROM 5/LEDs: CtrlBusOut/
File: 8BitLED.sch**Title: psMCU**Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1Rev: v1.1
Id: 28/109



9bit binary LED display.

Philipp Schilk

Sheet: /Control/LEDs: Instruction Code/
File: 9BitLED.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 29/109

A

A

B

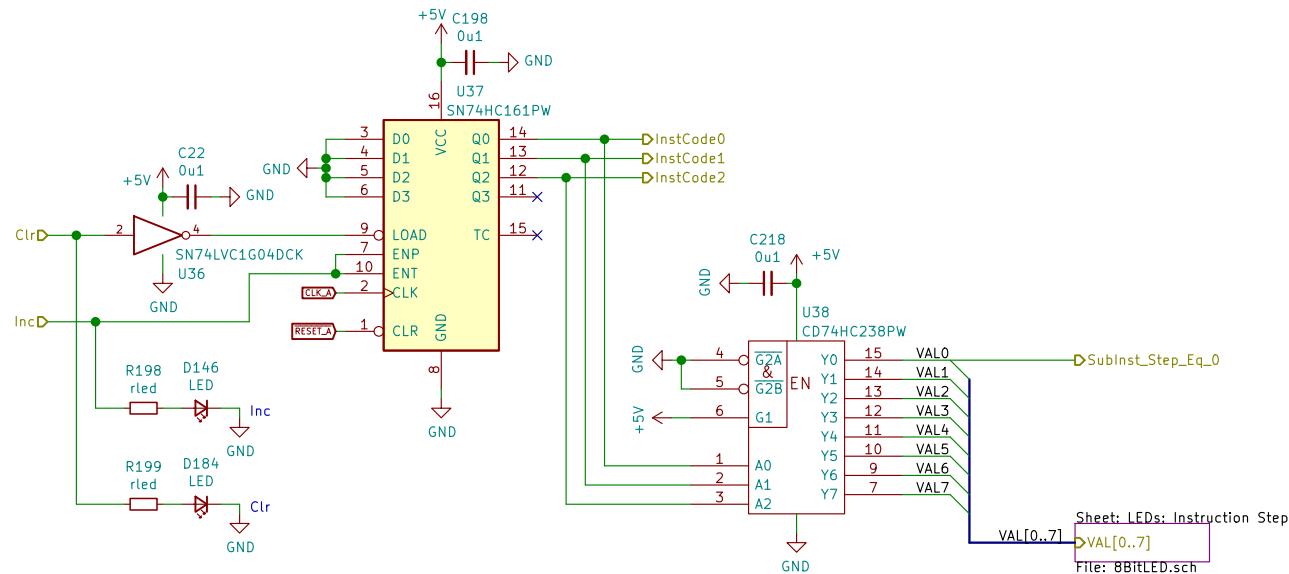
B

C

C

D

D



Counter to determine which sub-instruction step is currently being executed.
The current step is shown on a one-hot display. A signal indicating if the first step is active is provided, which is used by the halt logic.

Philipp Schilk

Sheet: /Control/SubInst Step/
File: SubInst_Step.sch

Title: psMCU

Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 30/109

A

A

B

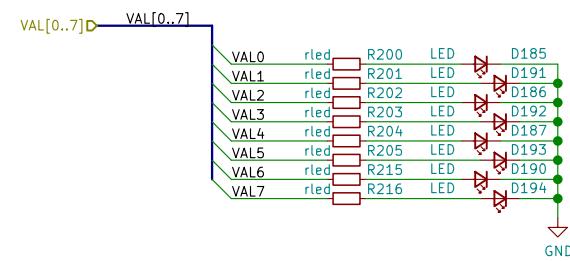
B

C

C

D

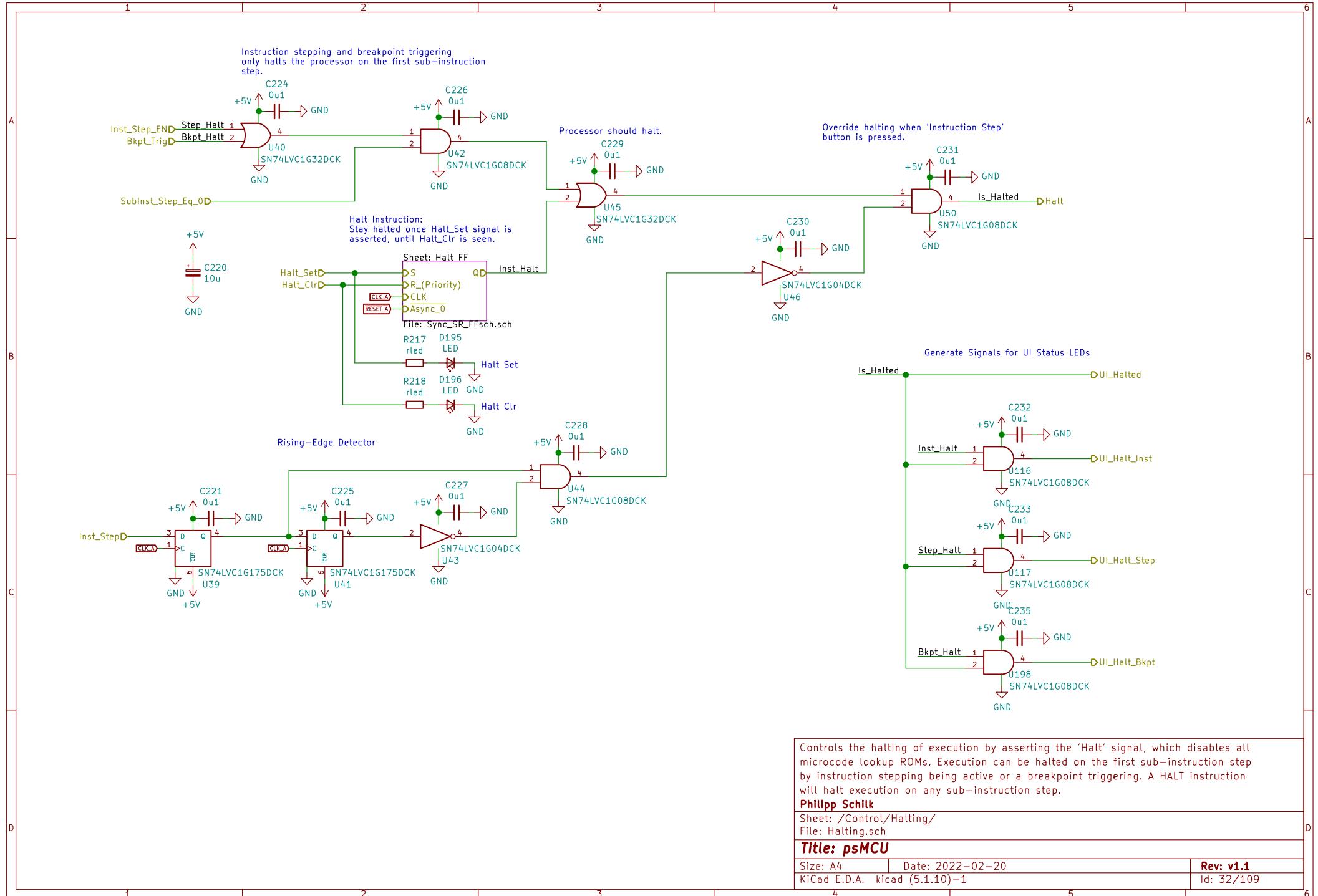
D

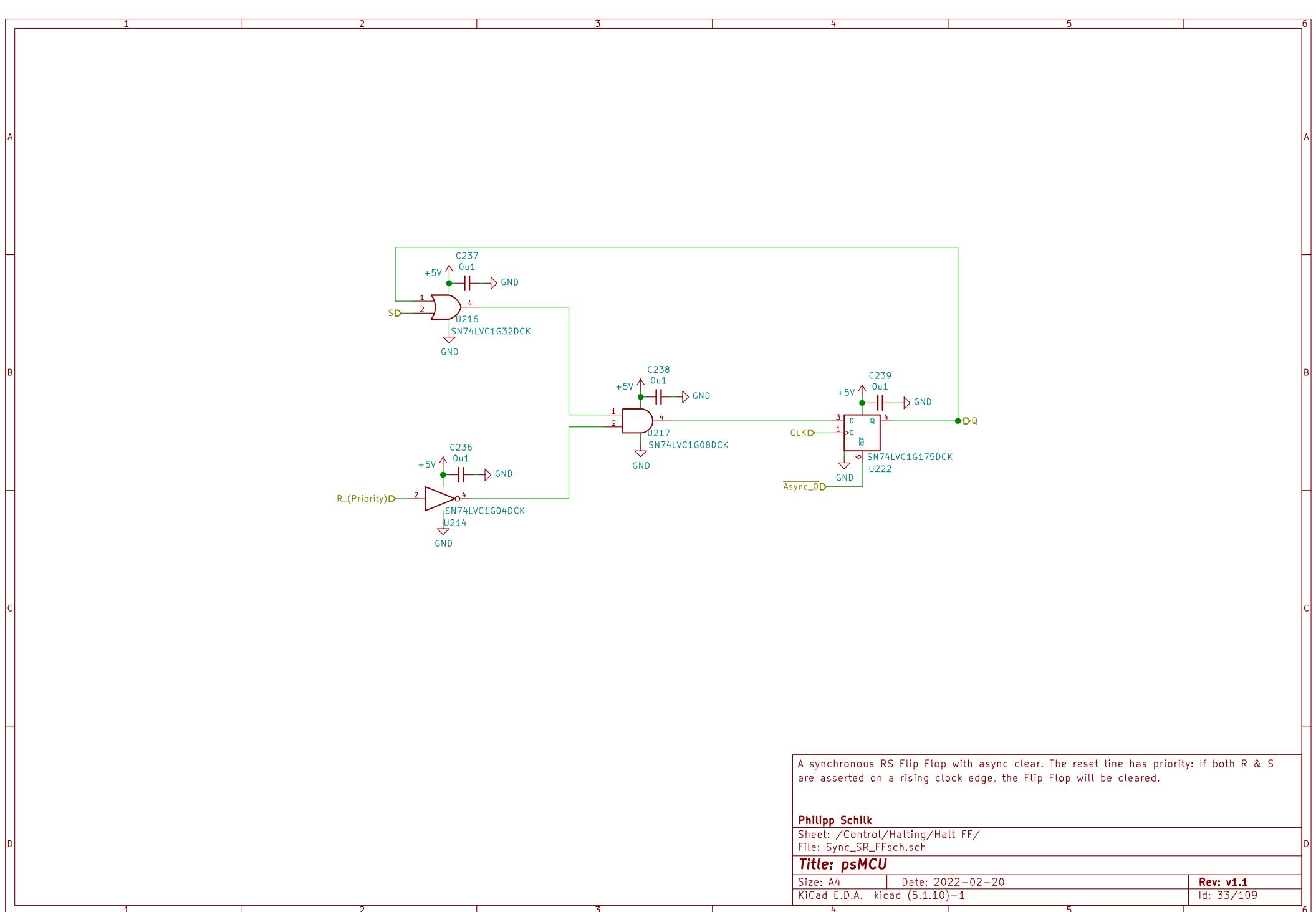


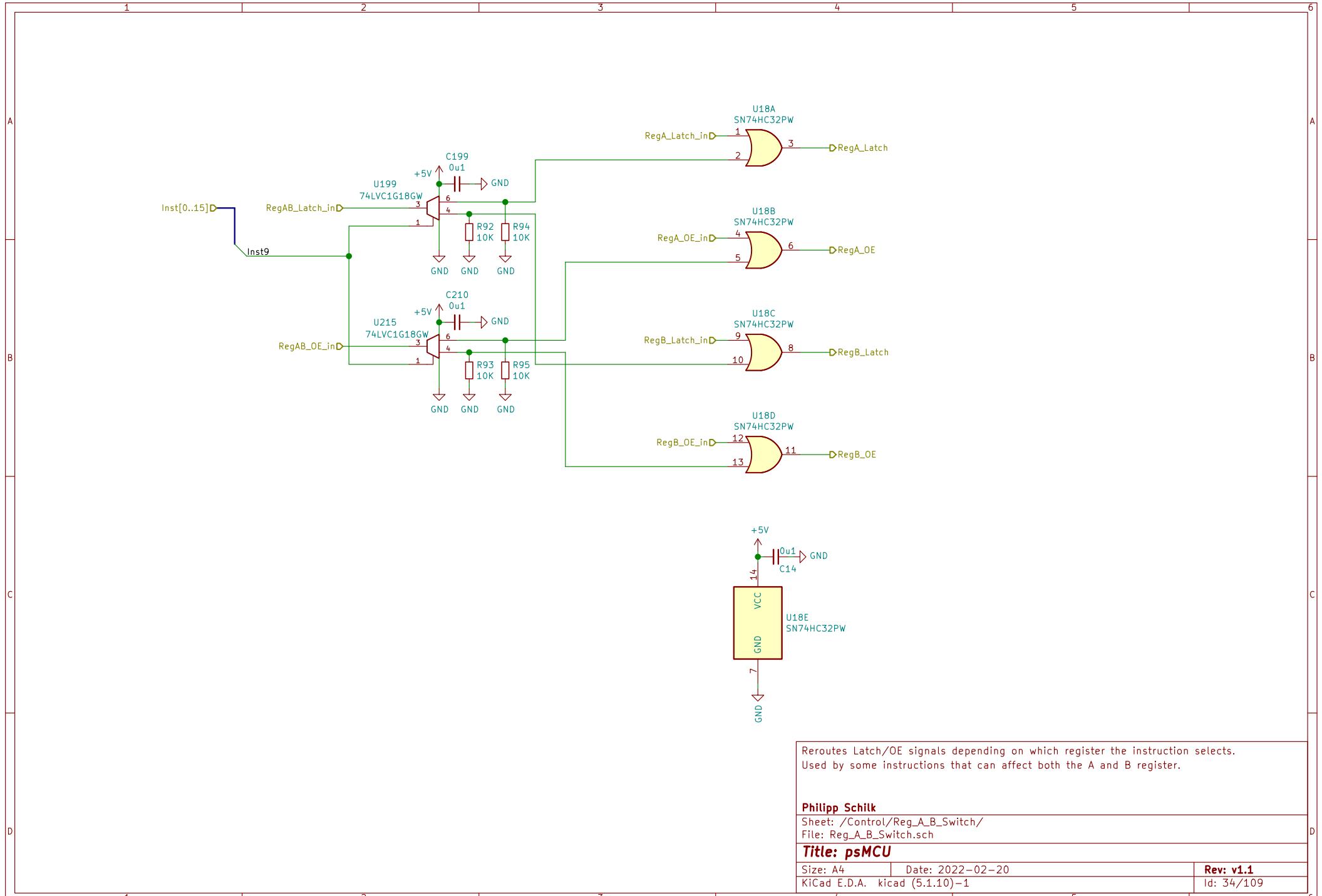
8bit binary LED display.

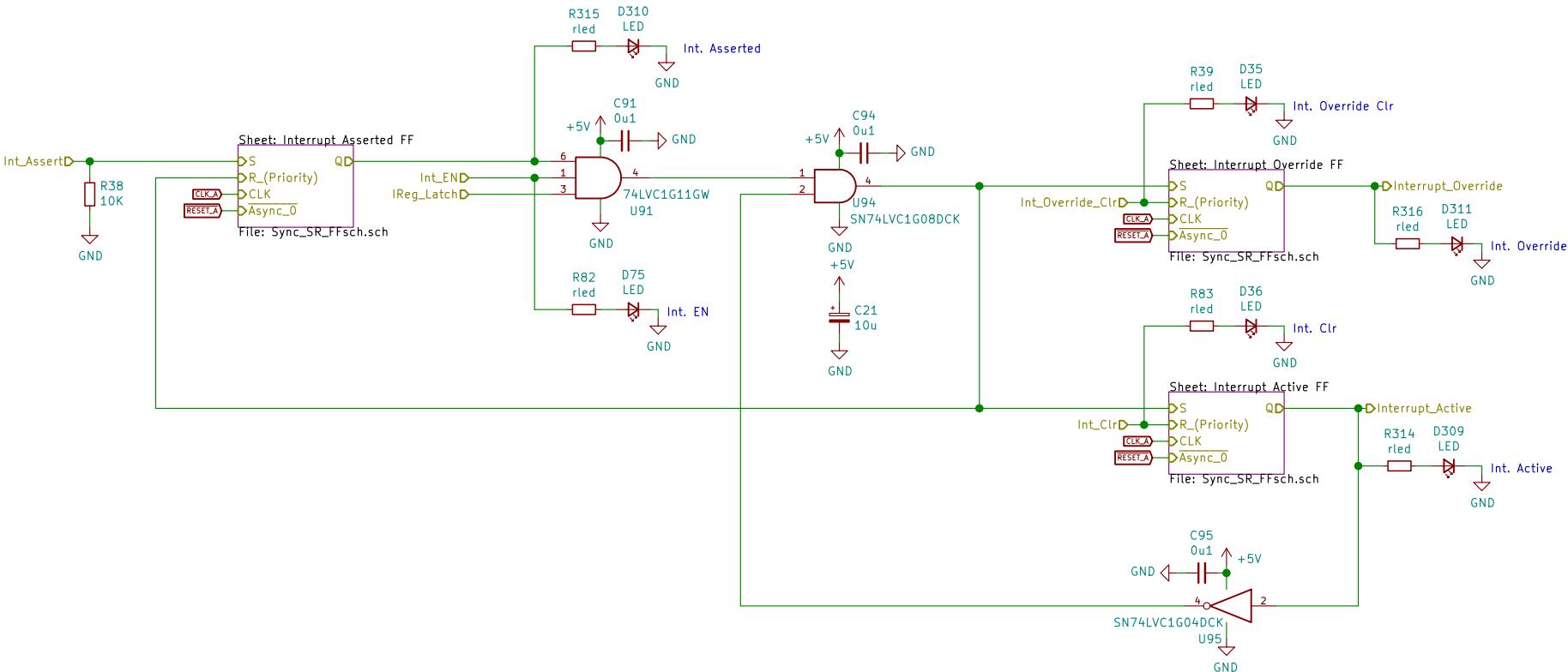
Philipp Schilk

Sheet: /Control/SubInst Step/LEDs: Instruction Step/
File: 8BitLED.sch**Title: psMCU**Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1Rev: v1.1
Id: 31/109









Interrupt logic. Keeps track of if an interrupt is currently being served, and overrides the next instruction with a branch to the interrupt handler if an interrupt occurs.

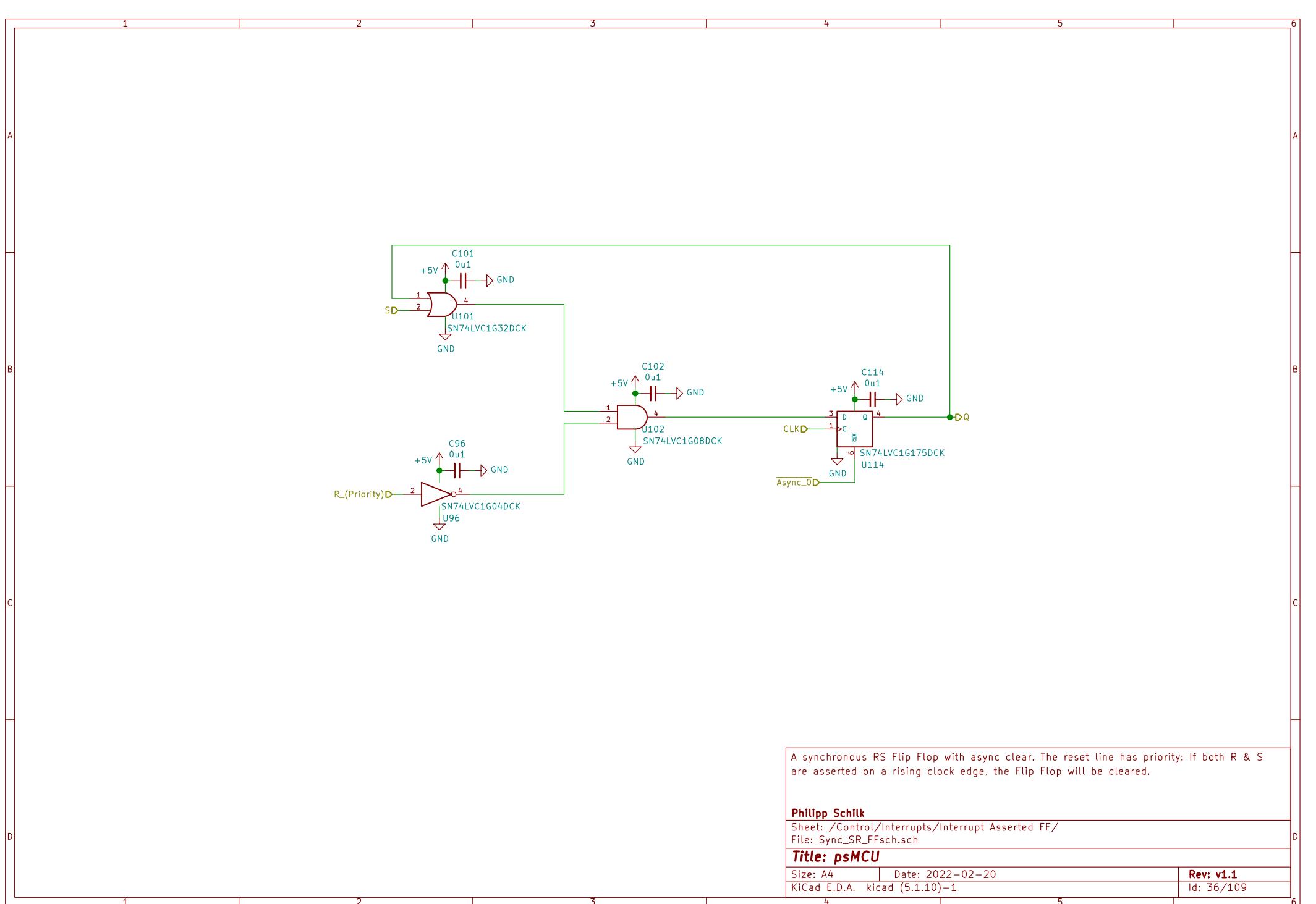
Philipp Schilk

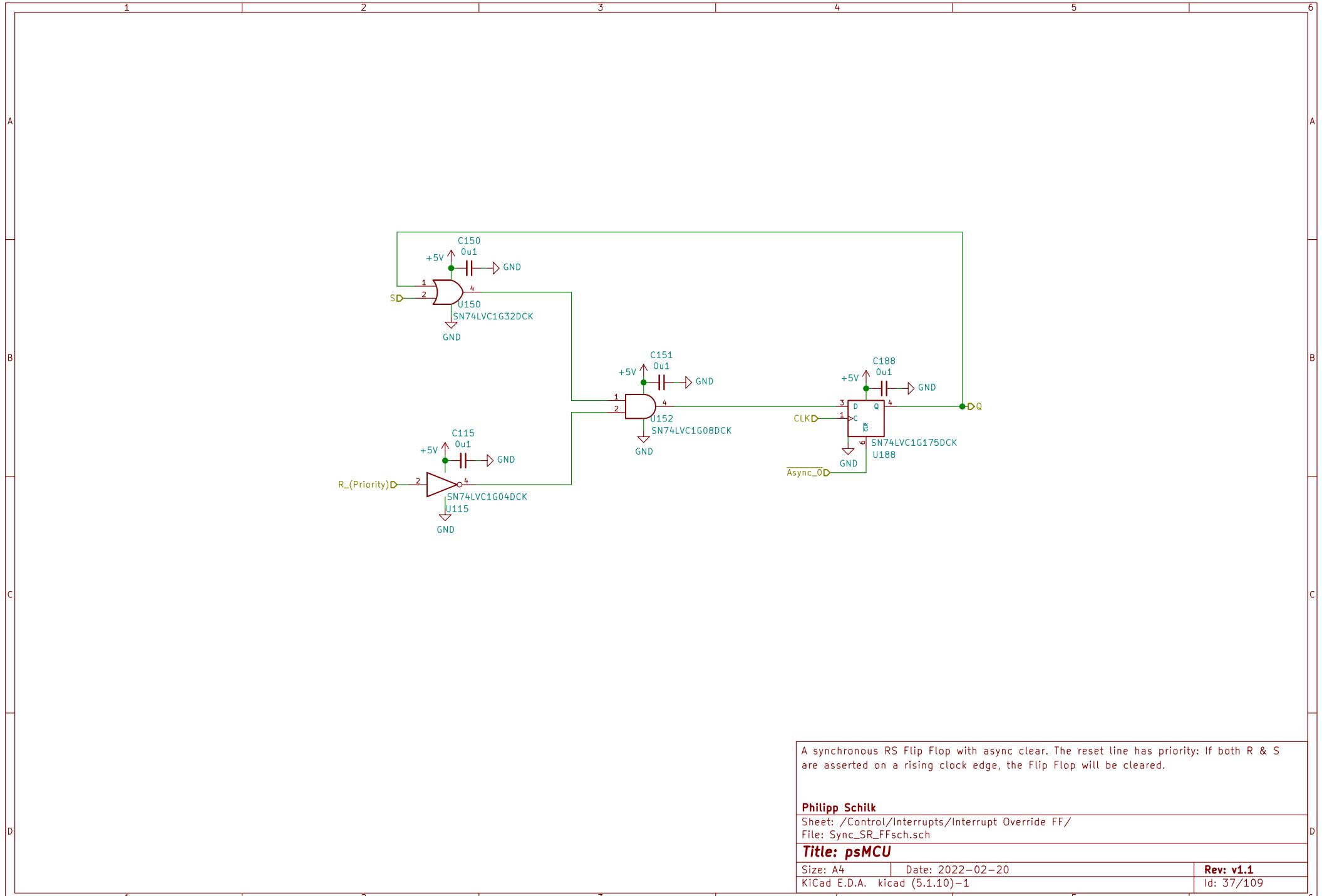
Sheet: /Control/Interrupts/
File: Interrupts.sch

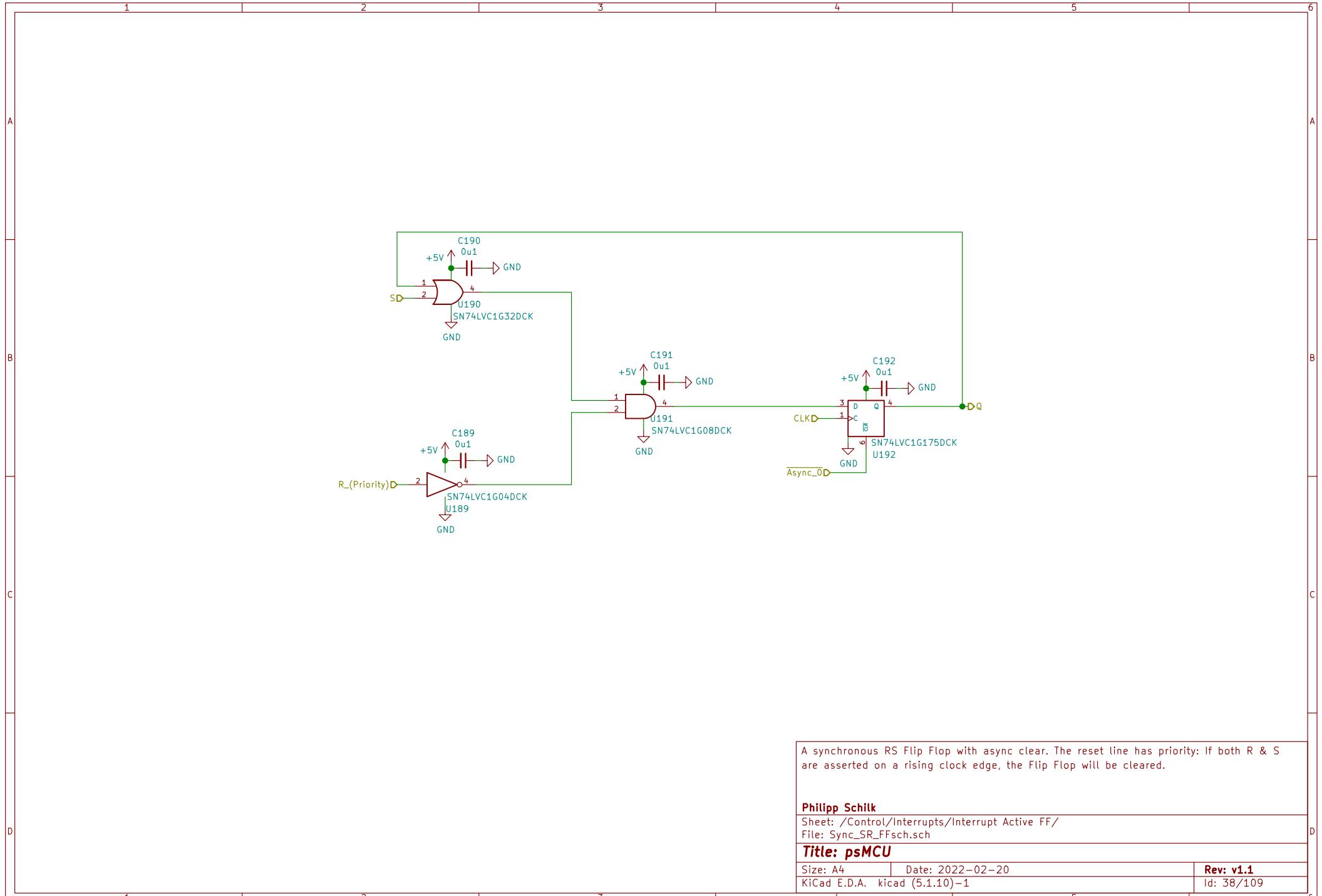
Title: psMCU

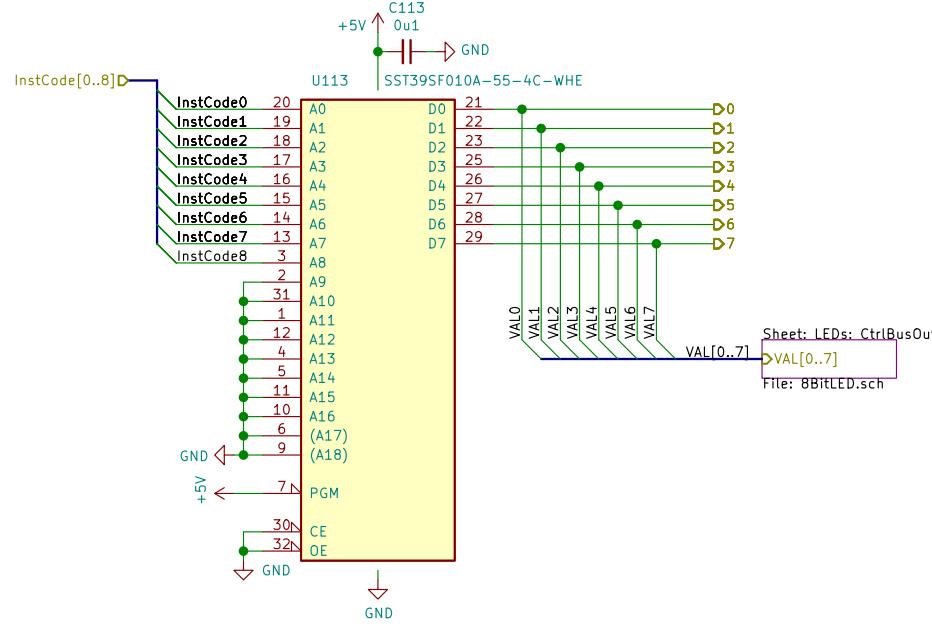
Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 35/109









Microcode ROM, stores the control signals for each sub-step of each instruction.

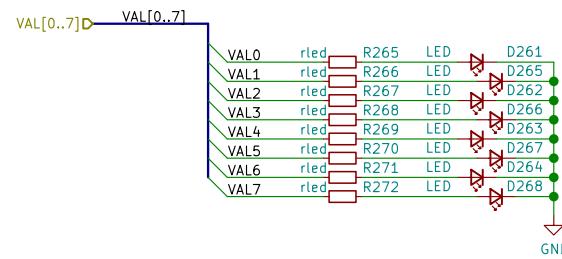
Philipp Schilk

Sheet: /Control/Control ROM 2/
File: Control_Rom.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 39/109



8bit binary LED display.

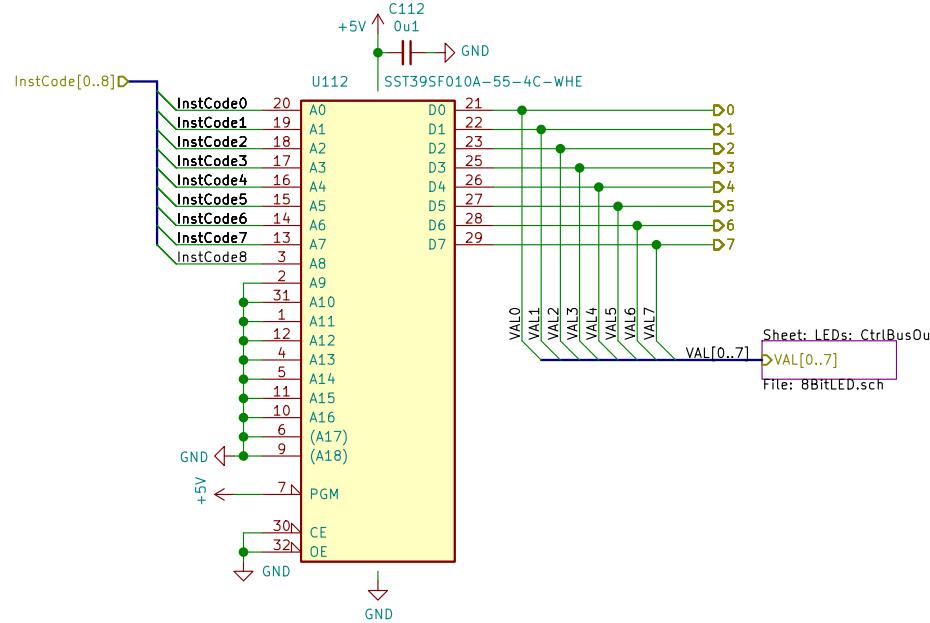
Philipp Schilk

Sheet: /Control/Control ROM 2/LEDs: CtrlBusOut/
File: 8BitLED.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 40/109



Microcode ROM, stores the control signals for each sub-step of each instruction.

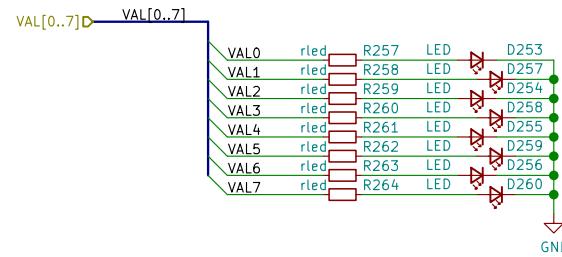
Philipp Schilk

Sheet: /Control/Control ROM 4/
File: Control_Rom.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 41/109



8bit binary LED display.

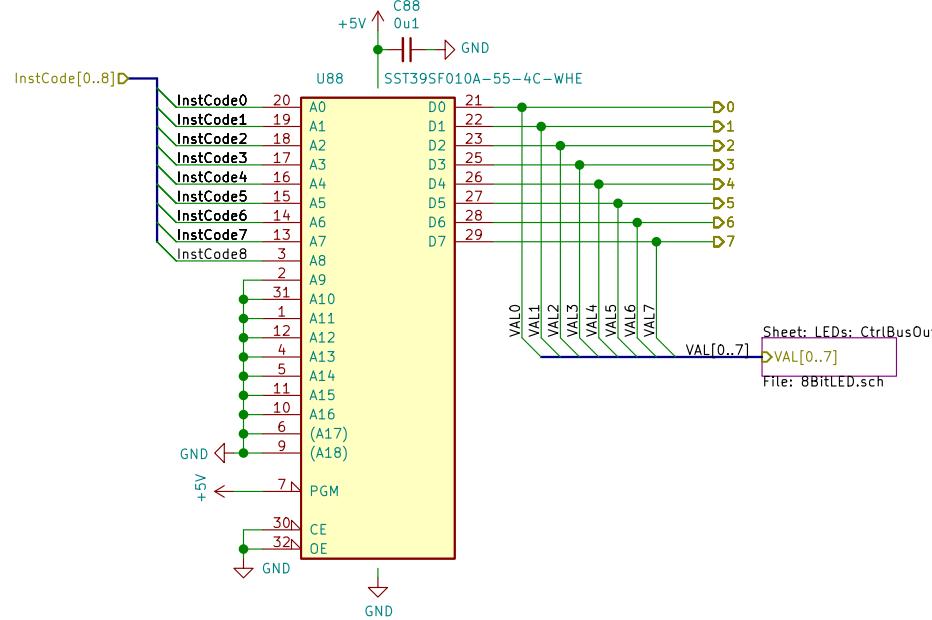
Philipp Schilk

Sheet: /Control/Control ROM 4/LEDs: CtrlBusOut/
File: 8BitLED.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 42/109



Rev: v1.1
Id: 43/109

A

A

B

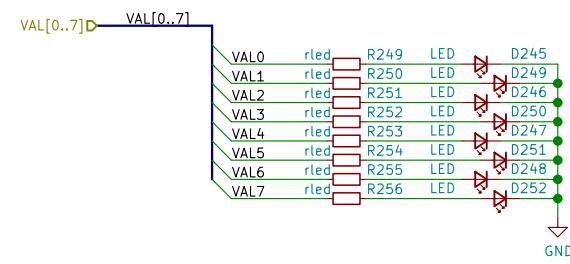
B

C

C

D

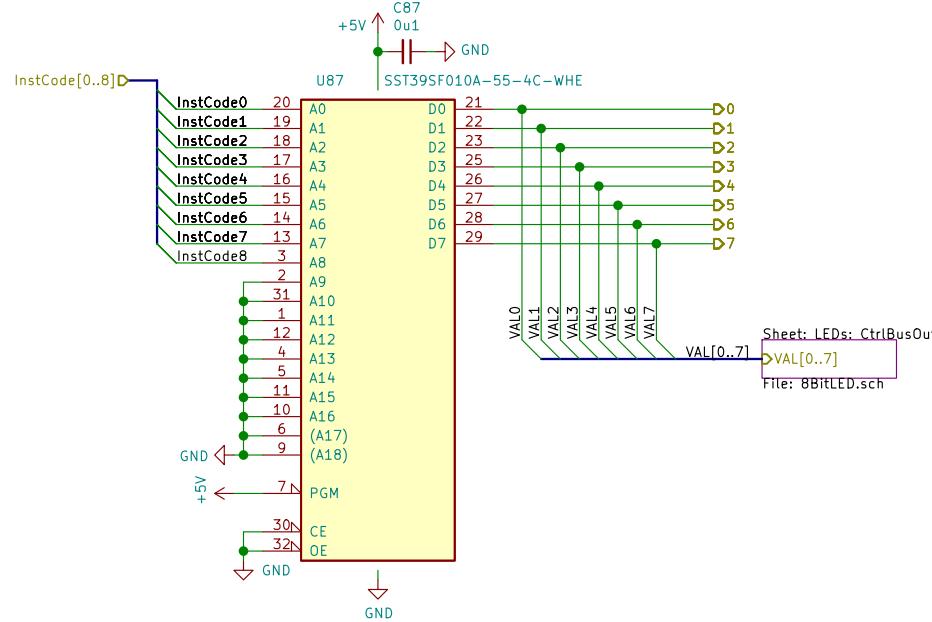
D



8bit binary LED display.

Philipp Schilk

Sheet: /Control/Control ROM 3/LEDs: CtrlBusOut/
File: 8BitLED.sch**Title: psMCU**Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1Rev: v1.1
Id: 44/109



Microcode ROM, stores the control signals for each sub-step of each instruction.

Philipp Schilk

Sheet: /Control/Control ROM 1/
File: Control_Rom.sch

Title: psMCU

Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 45/109

A

B

C

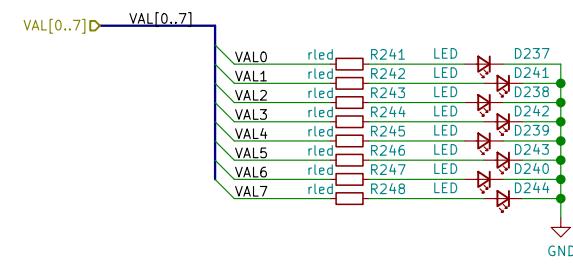
D

A

B

C

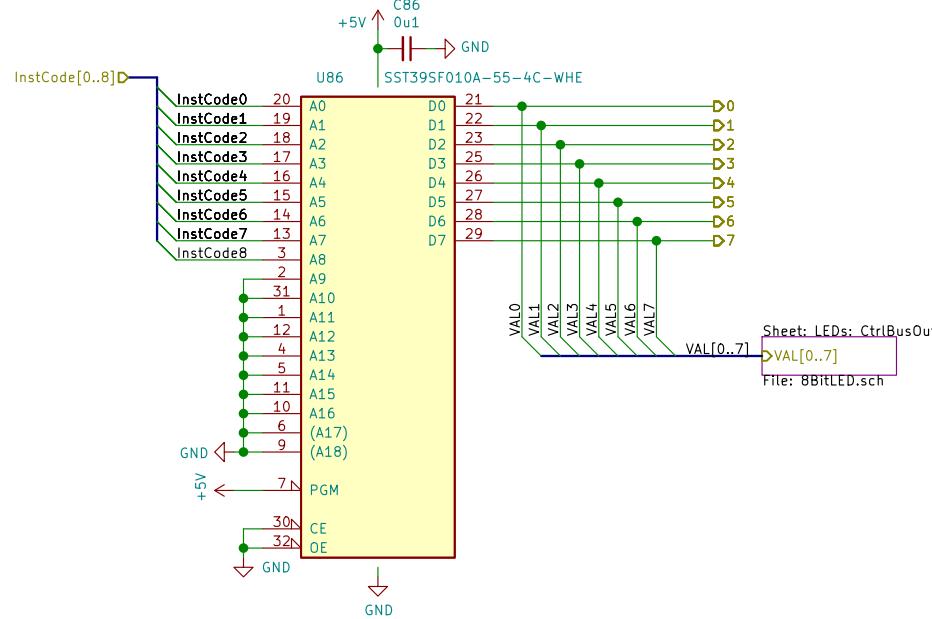
D



8bit binary LED display.

Philipp Schilk

Sheet: /Control/Control ROM 1/LEDs: CtrlBusOut/
File: 8BitLED.sch**Title: psMCU**Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1Rev: v1.1
Id: 46/109



Microcode ROM, stores the control signals for each sub-step of each instruction.

A

B

C

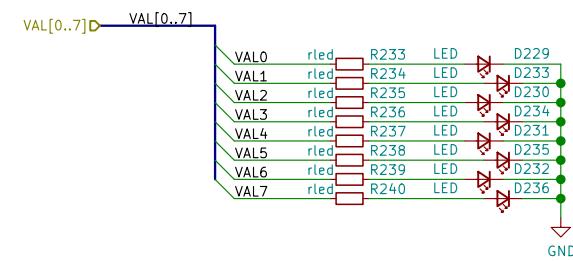
D

A

B

C

D



8bit binary LED display.

Philipp Schilk

Sheet: /Control/Control ROM 0/LEDs: CtrlBusOut/
File: 8BitLED.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 48/109

A

A

B

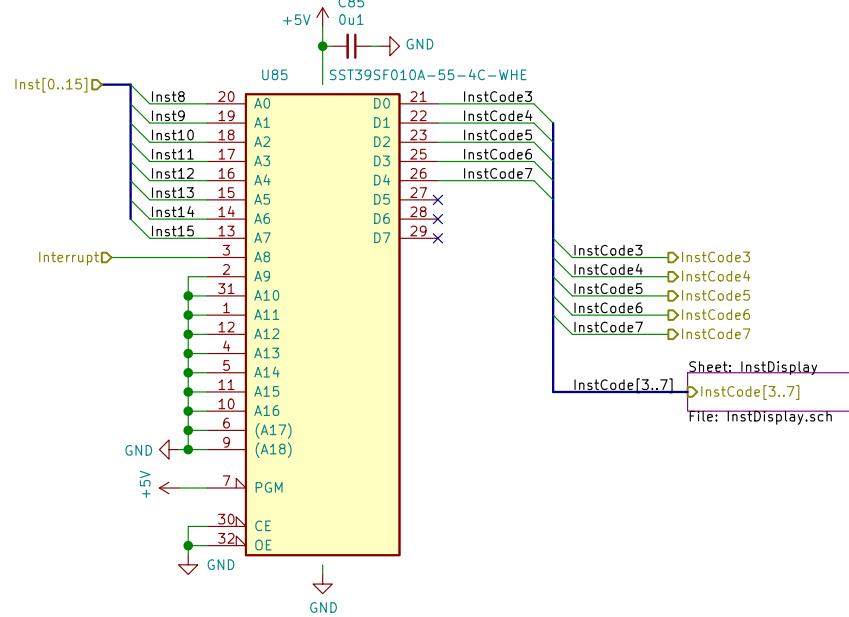
B

C

C

D

D



Sheet: InstDisplay
File: InstDisplay.sch

Decodes the MSBs of an instruction into the actual instruction code for microcode lookup.
If the interrupt override is active, the instruction code for the branch-to-interrupt
instruction is generated, no matter what the current instruction is.

Philipp Schilk
Sheet: /Control/Inst Decode ROM/
File: Inst_Decode_ROM.sch

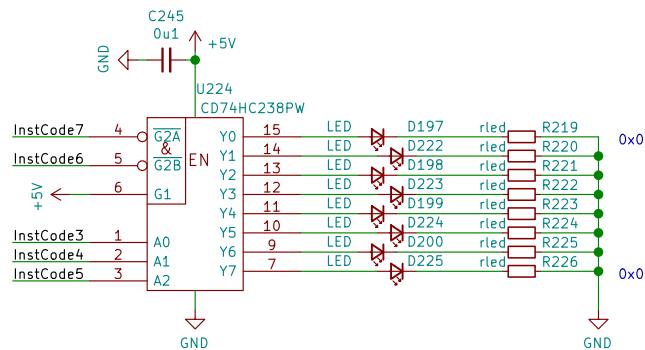
Title: psMCU

Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

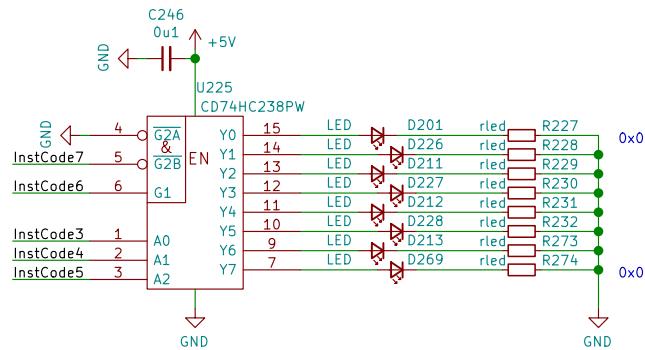
Rev: v1.1
Id: 49/109

1 2 3 4 5 6

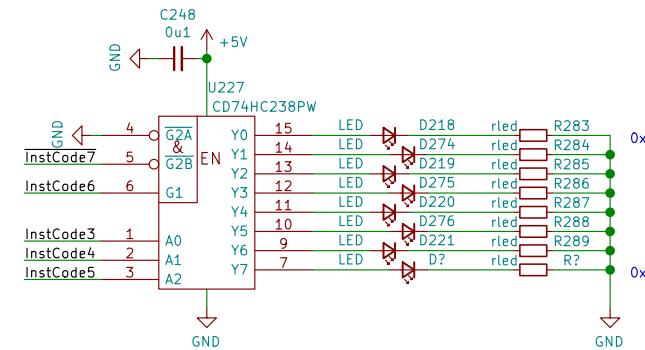
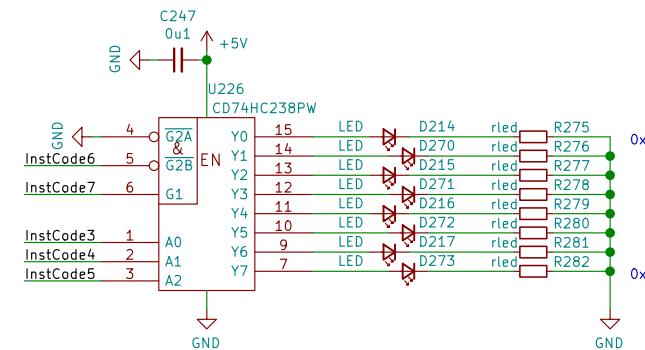
A



B



C



D



Displays which instruction is currently being executed.

Philipp Schilk

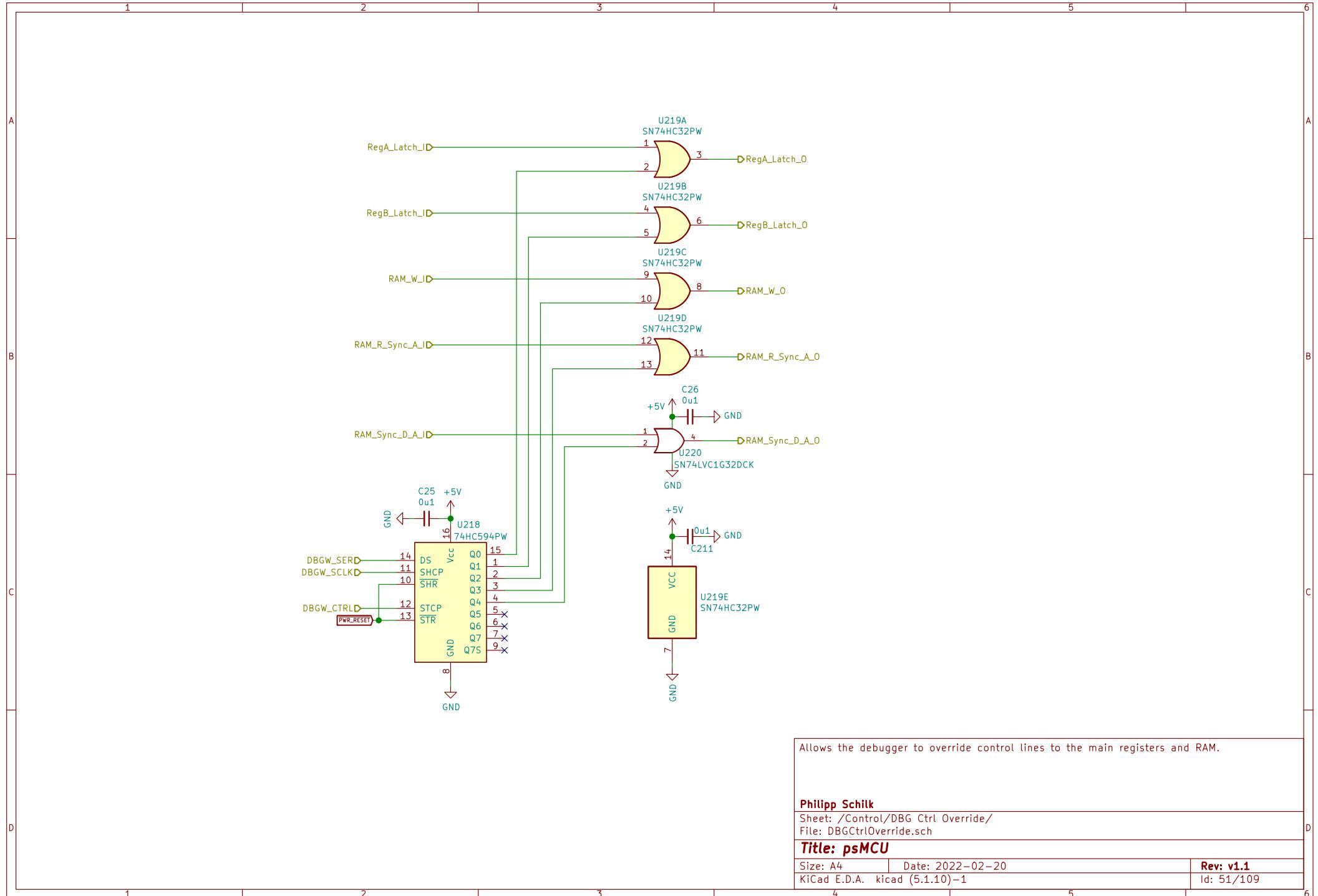
Sheet: /Control/Inst Decode ROM/InstDisplay/
File: InstDisplay.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

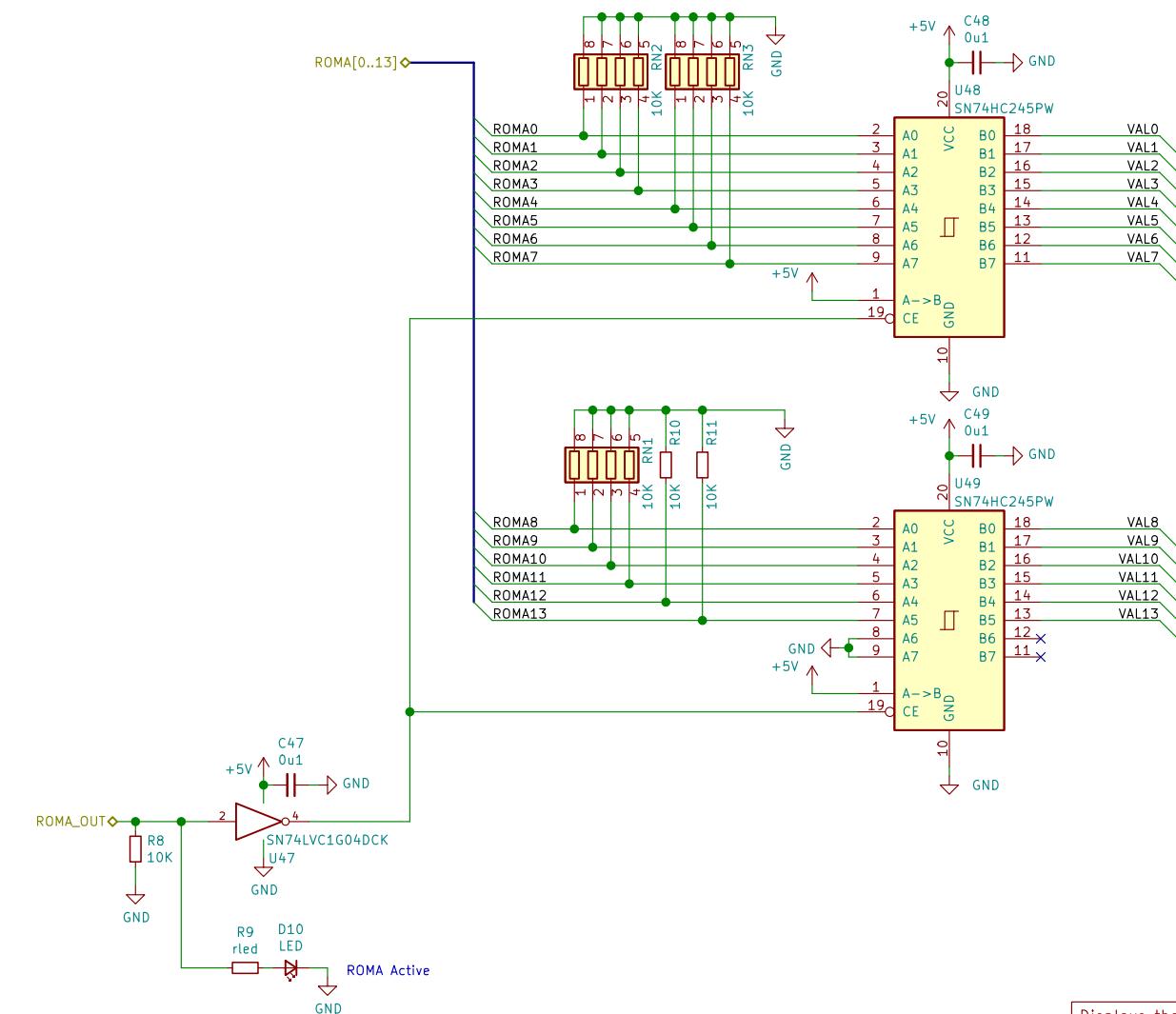
Rev: v1.1
Id: 50/109

1 2 3 4 5 6



1 2 3 4 5 6

A



4

5

6

B

B

C

C

D

D

Displays the current value on the ROMA bus if a different module is providing one (indicated by the ROMA_OUT signal)

Philipp Schilk

Sheet: /ROMA Bus/
File: ROMA_BUS.sch

Title: psMCU

Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 52/109

1

2

3

4

5

6

A

A

B

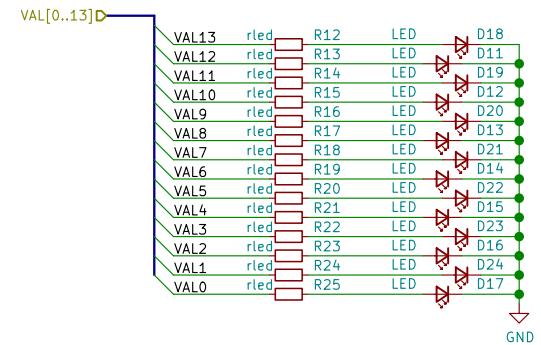
B

C

C

D

D



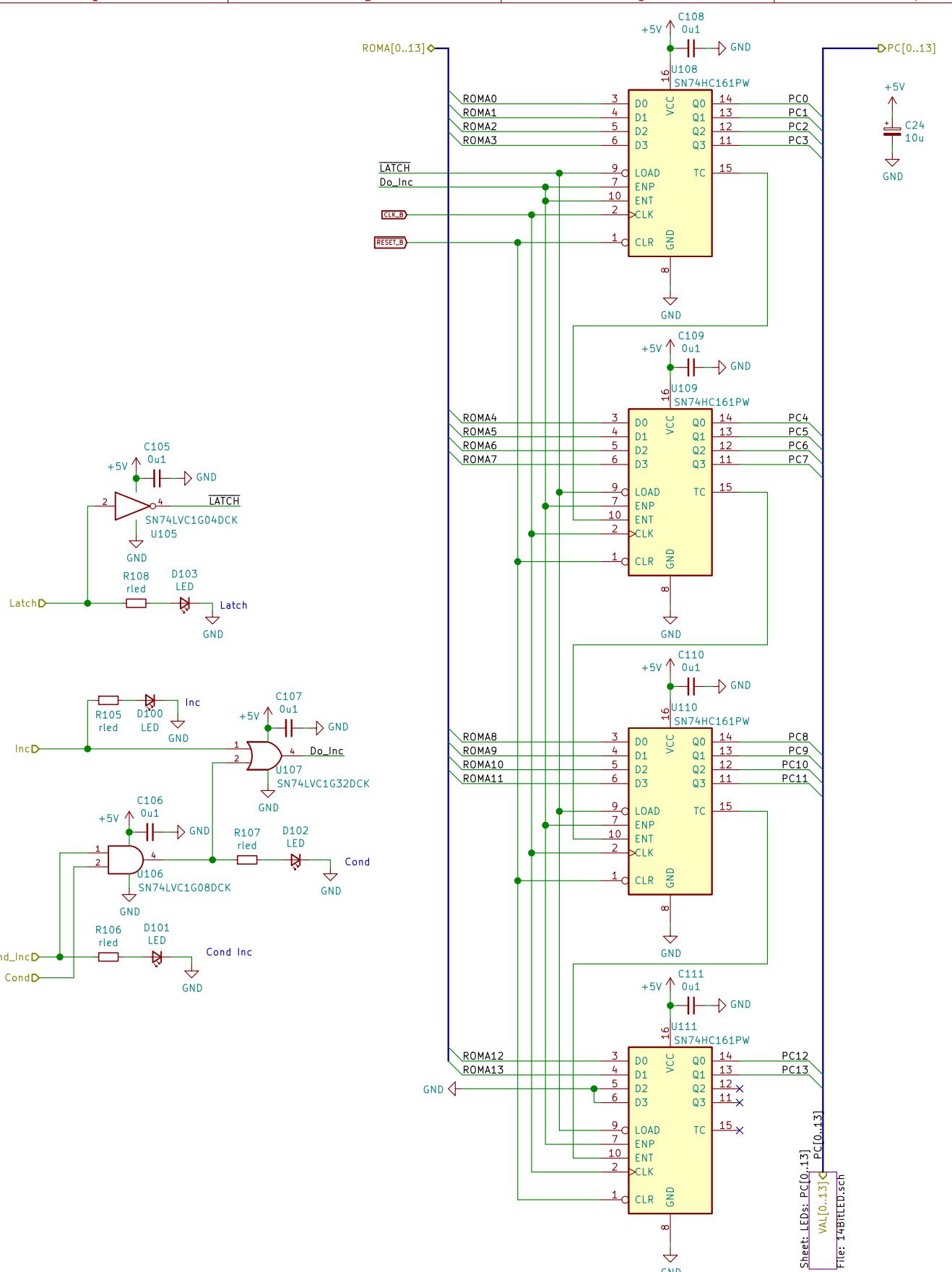
14bit binary LED display.

Philipp Schilk

Sheet: /ROMA Bus/LEDs: ROMA Bus/
File: 14BitLED.sch

Title: psMCU

Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1Rev: v1.1
Id: 53/109



Program Counter. Increment moves to next instruction. Parallel latch enables jumps. Conditional Increment is an increment that is only performed if the bit-test module allows, enabling conditional bit-test instructions.

Philipp Schilk

Sheet: /PC/
File: PC.sch

Title: psmcu

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 54/109

Sheet: LEDs: PC[0..13]
File: 14BITLED.sch

A

A

B

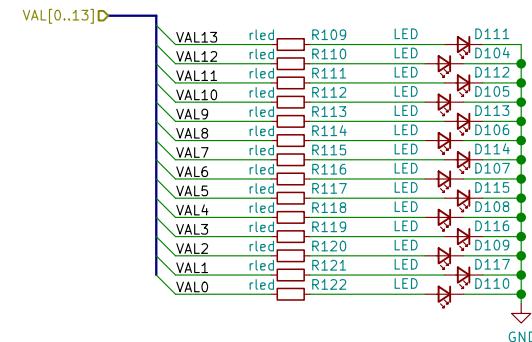
B

C

C

D

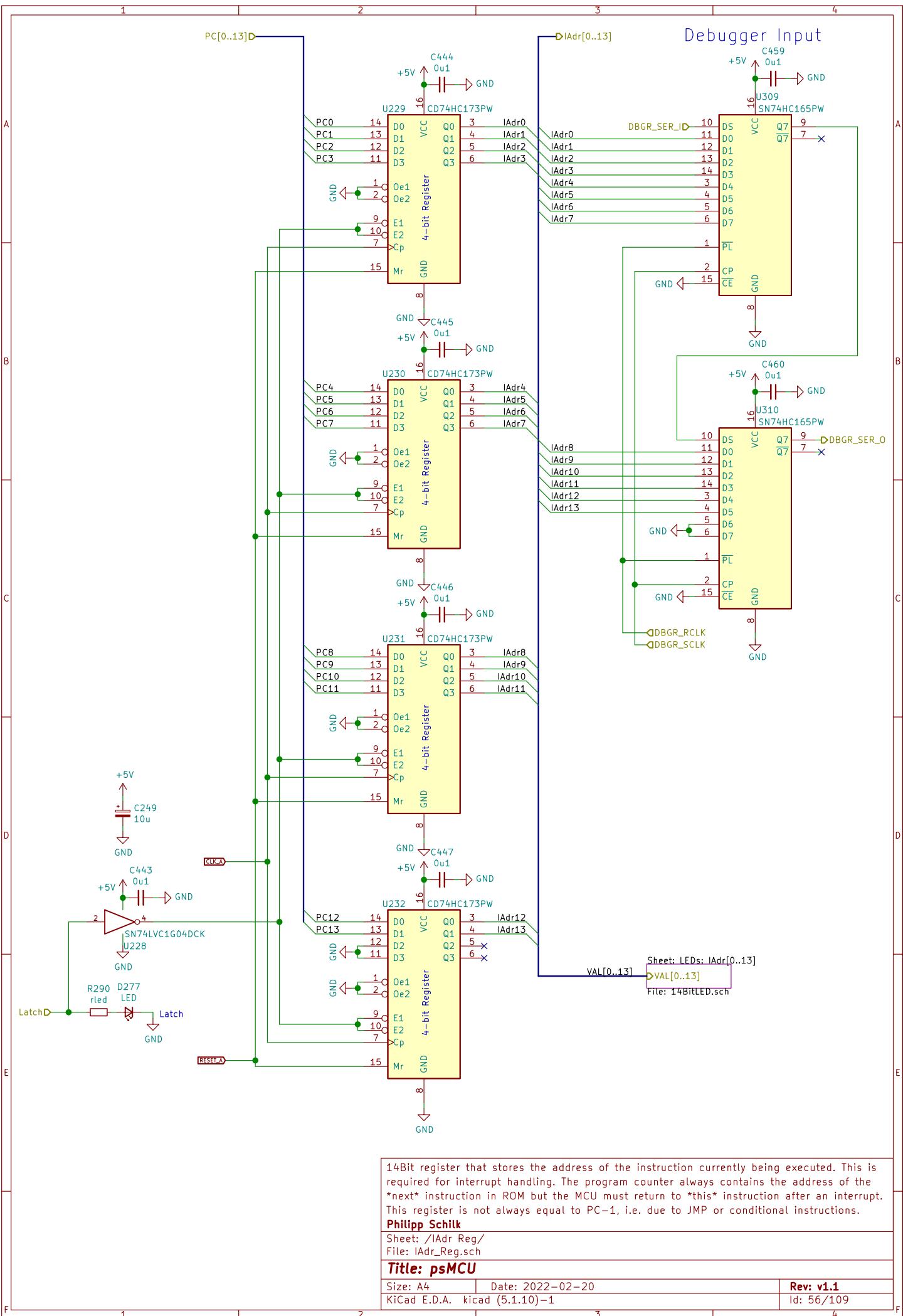
D



14bit binary LED display.

Philipp Schilk

Sheet: /PC/LEDs: PC[0..13]/
File: 14BitLED.sch**Title: psMCU**Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1Rev: v1.1
Id: 55/109



A

A

B

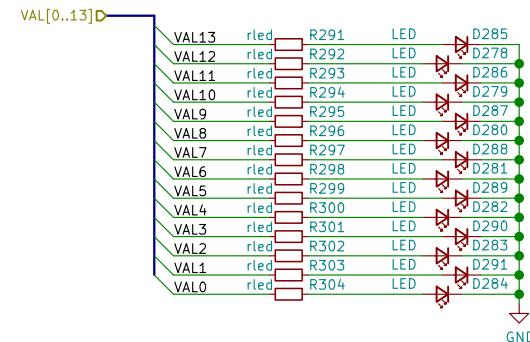
B

C

C

D

D



14bit binary LED display.

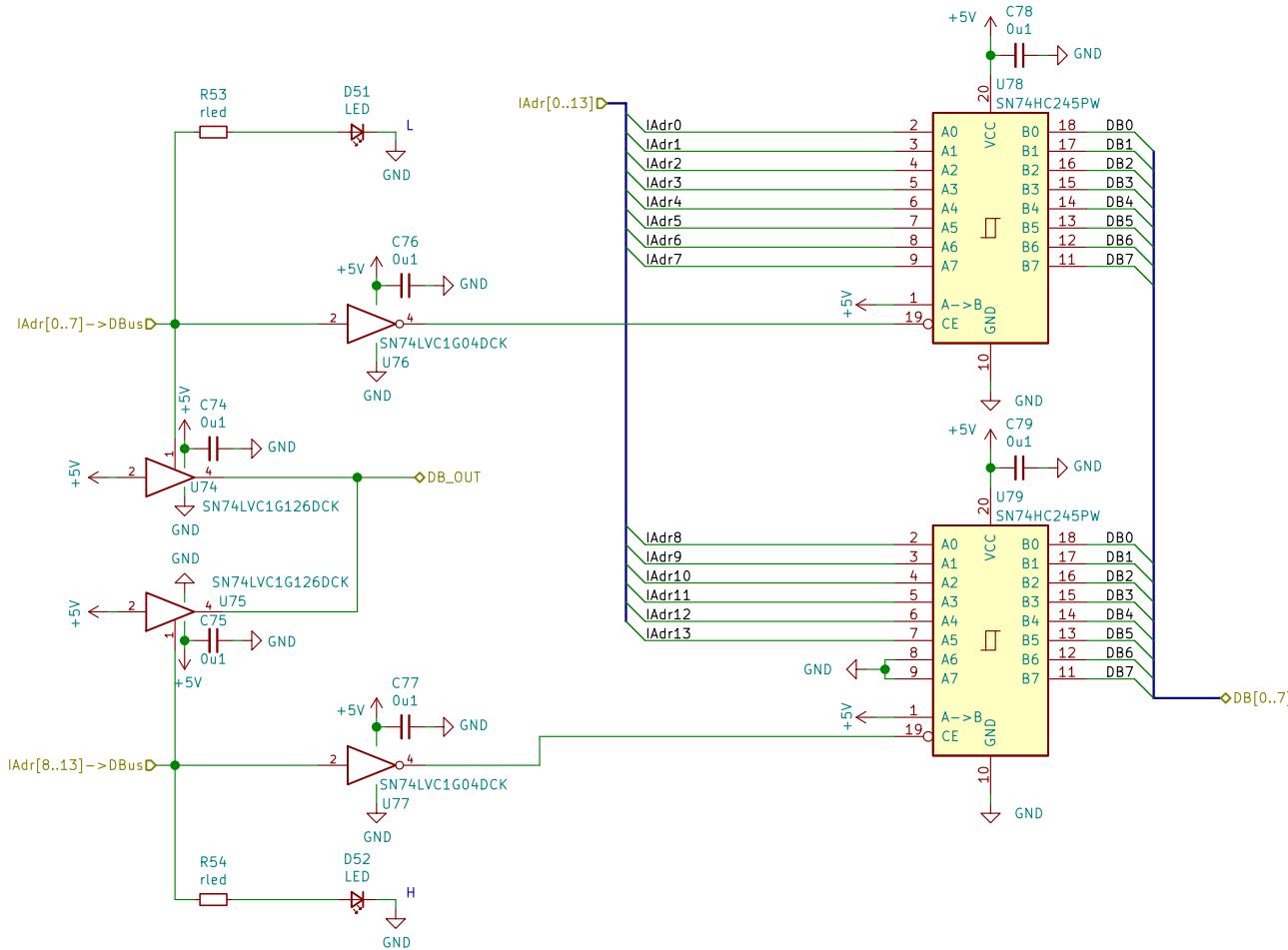
Philipp Schilk

Sheet: /IAdr Reg/LEDs: IAdr[0..13]/
File: 14BitLED.sch

Title: psMCU

Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 57/109



Puts the higher or lower byte of the address of the current instruction onto the DBus.
Used to push a return address onto the stack for a CALL or interrupt onto the stack.

Philipp Schilk

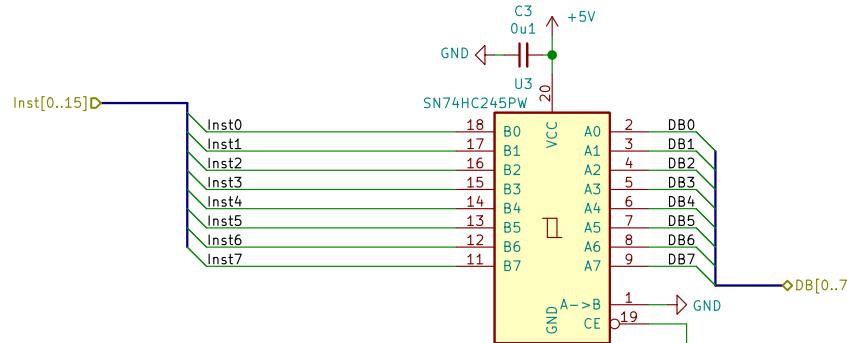
Sheet: /IAdr[0..7]/[8..13] ->DBus/
File: IAdr_to_DBus.sch

Title: psMCU

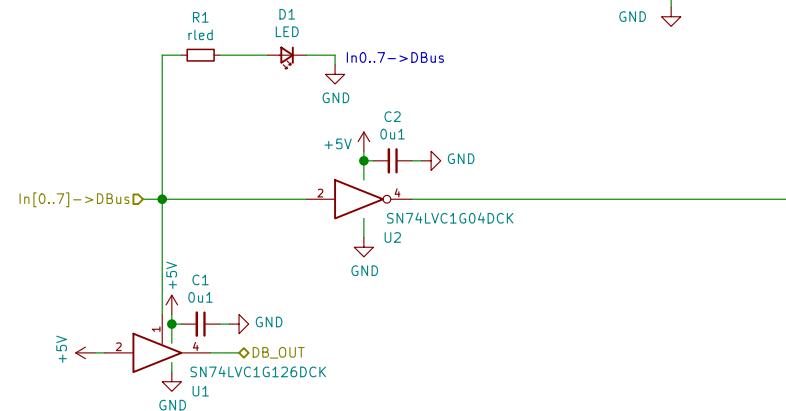
Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 58/109

A



B



C

D

Puts the lowest byte of the current instruction onto the DBus. Used to load literals into registers.

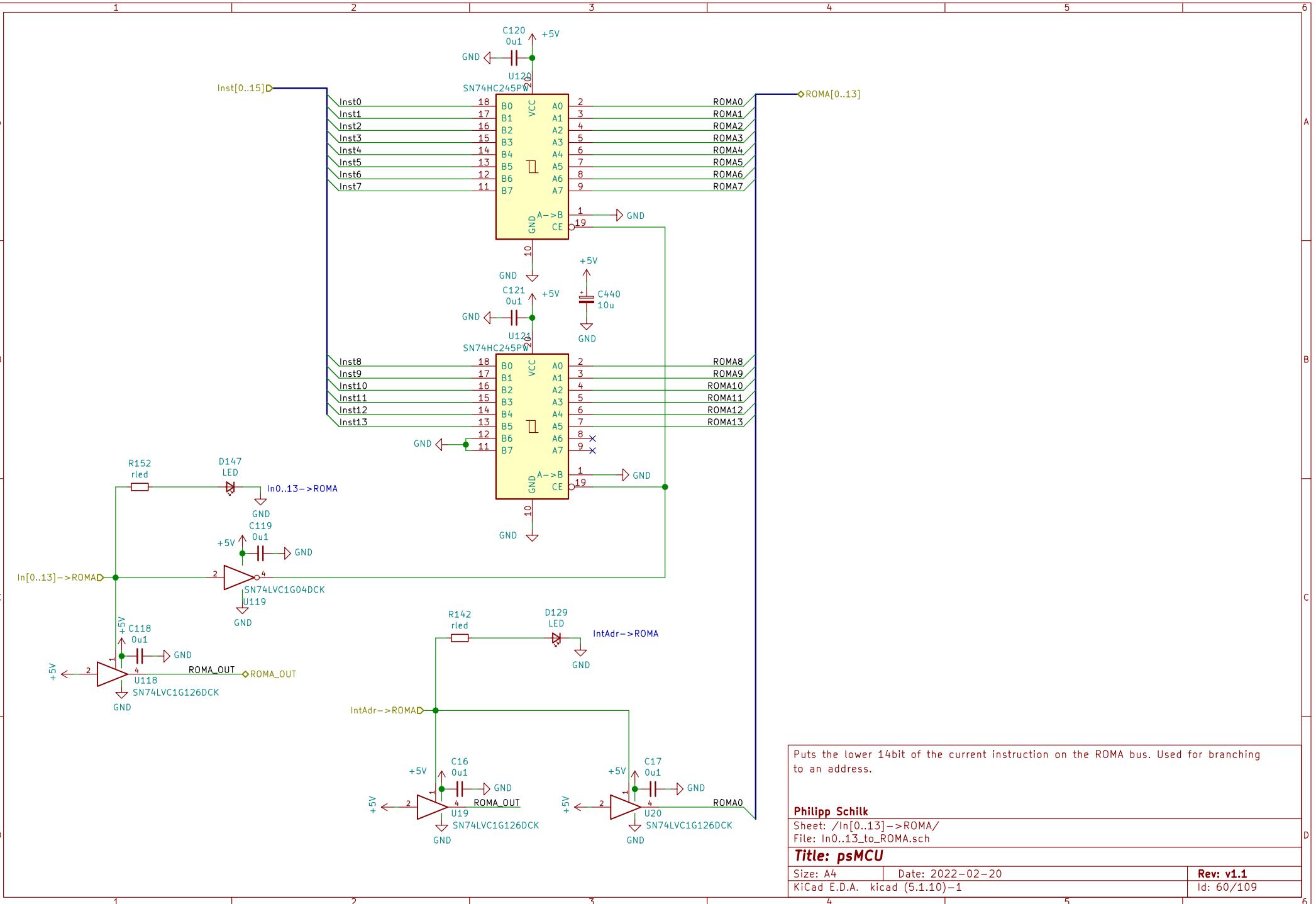
Philipp Schilk

Sheet: /Inst[0..7]->DBus/
File: Inst0..7_to_DBus.sch

Title: psMCU

Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 59/109



Address Comparator

A

A

B

B

C

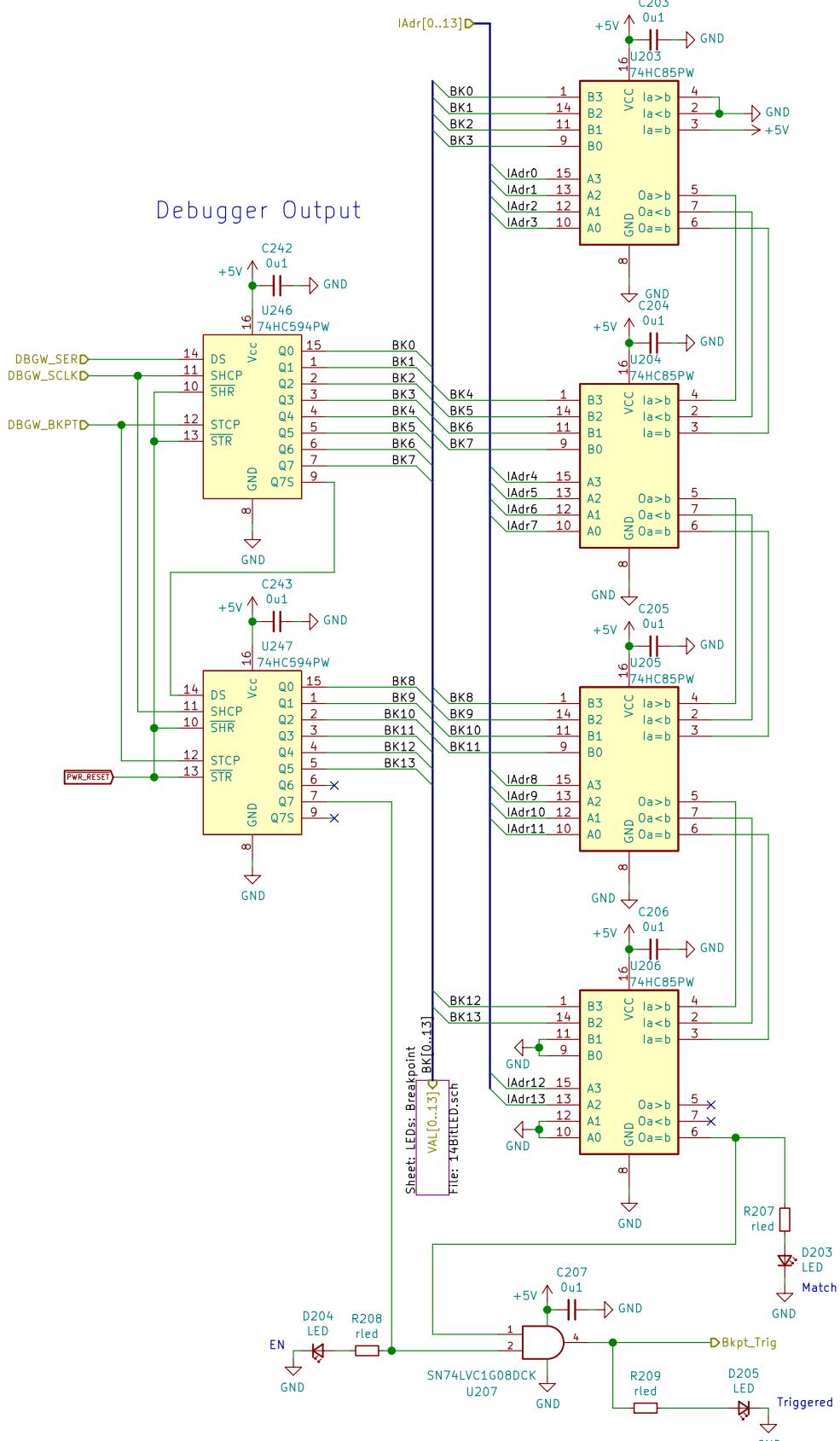
C

D

D

E

E



Circuits compares the address of the current instruction to a breakpoint-address to halt the processor. The debugger is used to set this address and enable/disable the breakpoint.

Philipp Schilk

Sheet: /Breakpoint/
File: Breakpoint.sch

Title: psMCU

Size: A4	Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1	Rev: v1.1

Id: 61/109

F

F

A

A

B

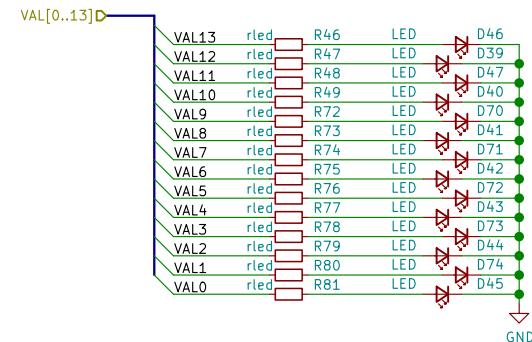
B

C

C

D

D



14bit binary LED display.

Philipp SchilkSheet: /Breakpoint/LEDs: Breakpoint/
File: 14BitLED.sch**Title: psMCU**Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1**Rev: v1.1**
Id: 62/109

NextInst[0..15]D

DInst[0..15]

A

B

C

D

E

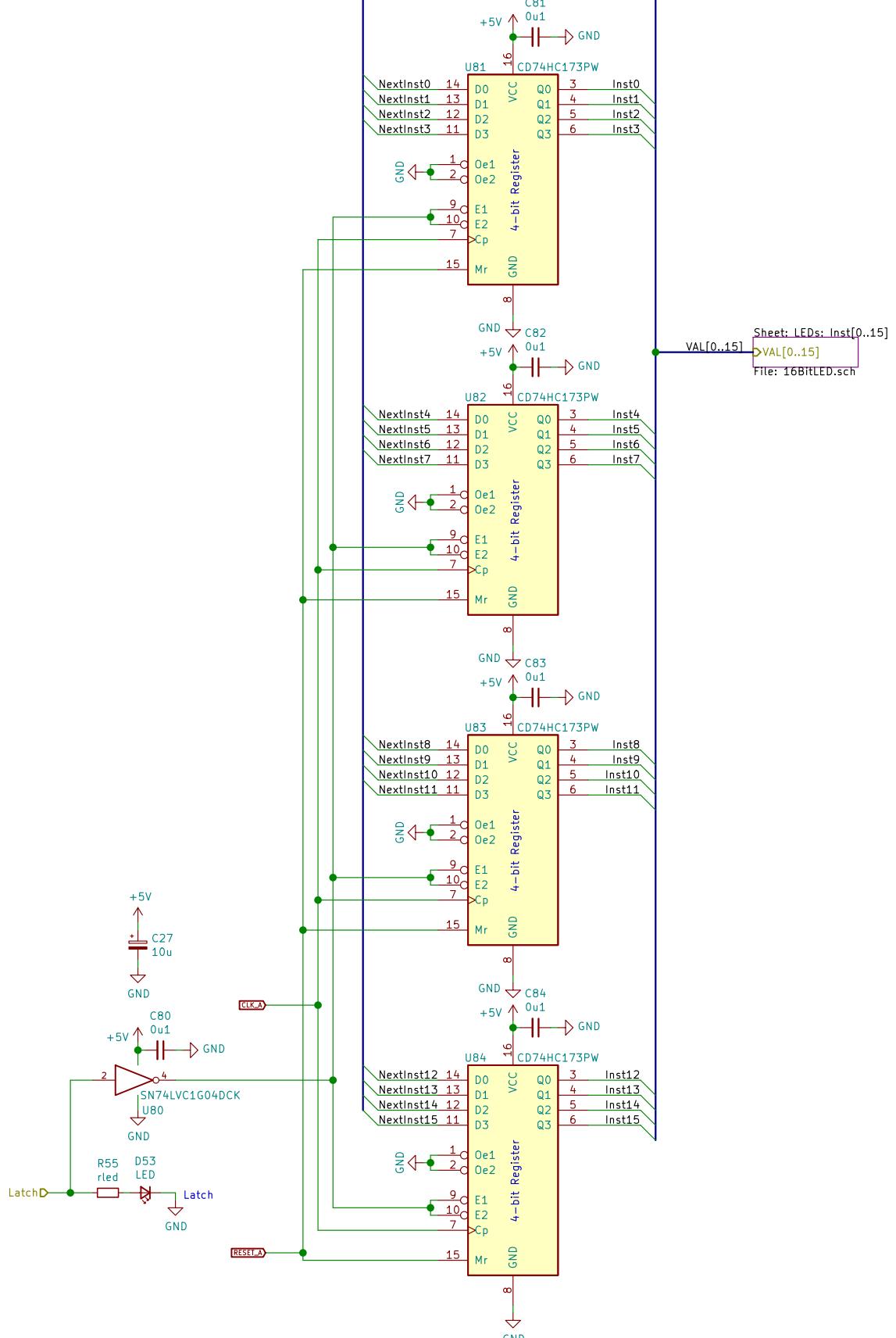
A

B

C

D

E



16Bit register that stores the instruction currently being executed.

Philipp Schilk

Sheet: /Reg1/

File: Reg1.sch

Title: psMCU

Size: A4 Date: 2022-02-20

KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1

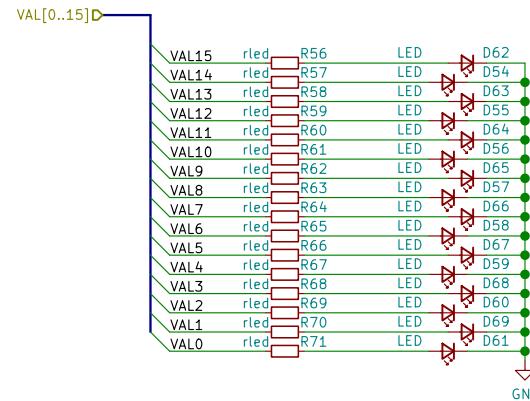
Id: 63/109

1

2

3

4



GND

A 16bit binary LED display.

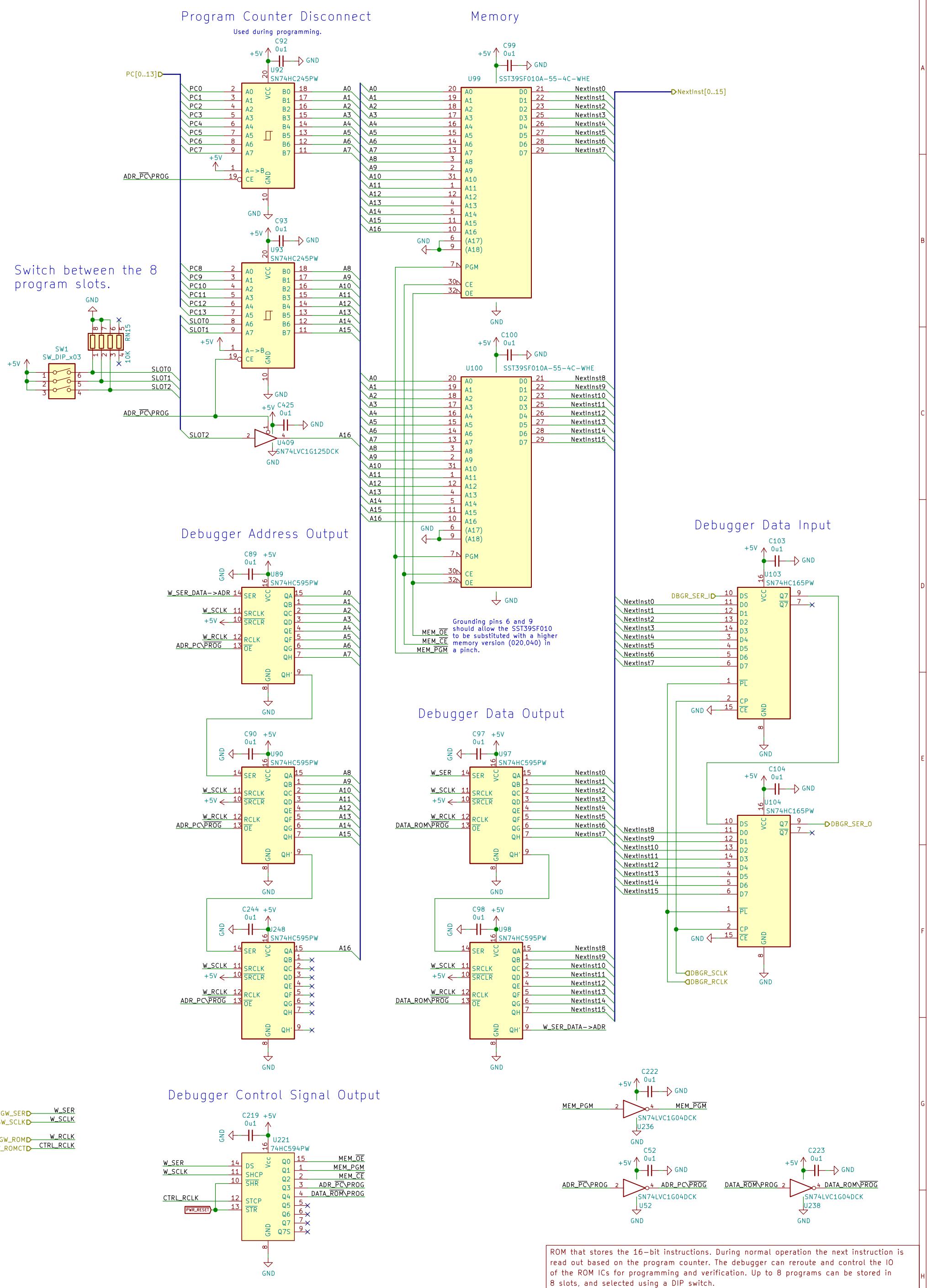
Philipp Schilk

Sheet: /Regl/LEDs: Inst[0..15]/
File: 16BitLED.sch

Title: psMCU

Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 64/109



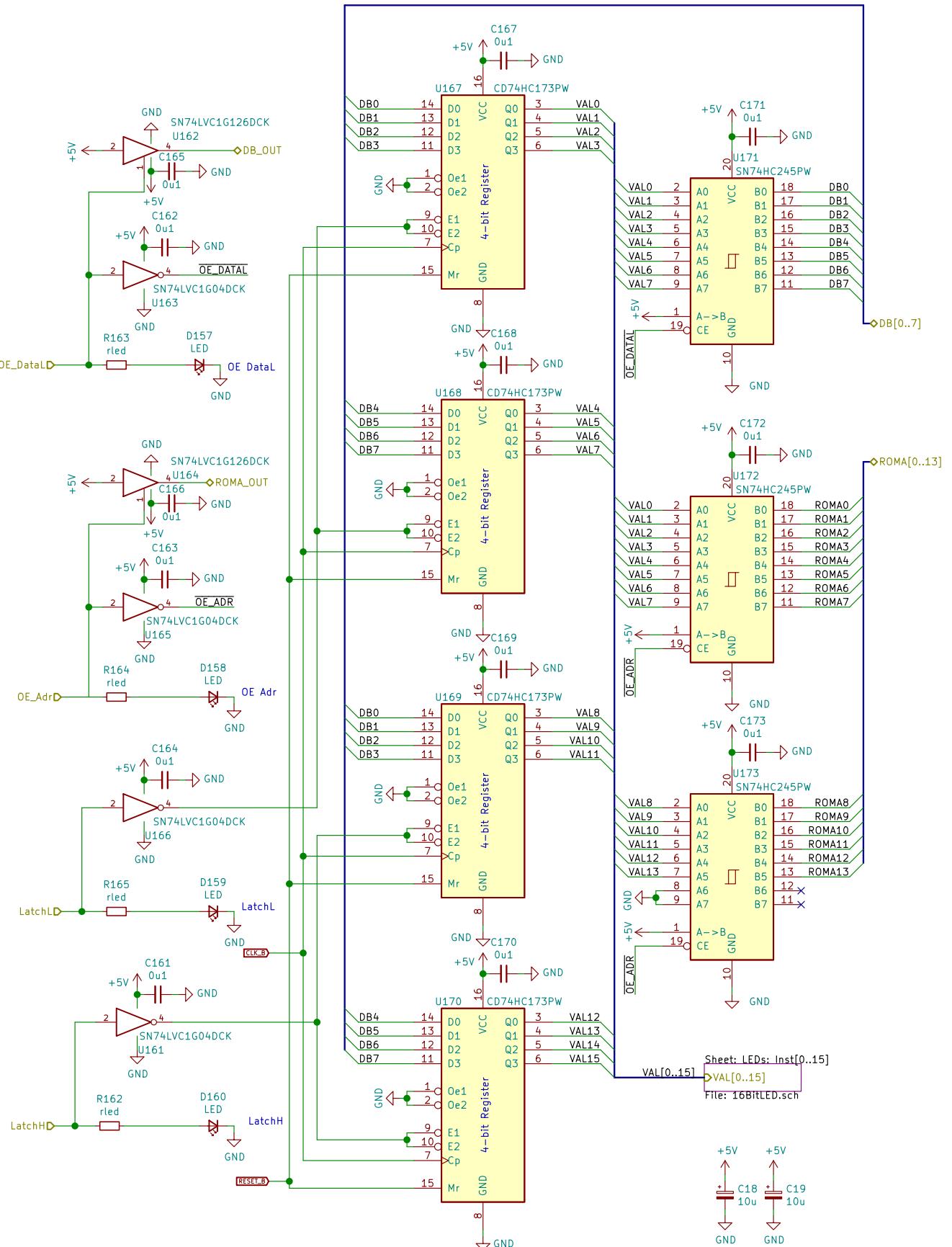
ROM that stores the 16-bit instructions. During normal operation the next instruction is read out based on the program counter. The debugger can reroute and control the IO of the ROM ICs for programming and verification. Up to 8 programs can be stored in 8 slots, and selected using a DIP switch.

8 slots, and s
Philipp Schilk

Sheet: /ROM/

Sheet: ROM
File: ROM.sch

Title: psMCU
Size: A3 **Date:** 2022-02-20



A 16 bit register used during returns or as a temporary store during other instructions. The DBus can be latched into the higher or lower 8 bits. The current content can be outputted to the ROMA bus, or the lower 8 bits can be outputted to the DBus.

Philipp Schilk

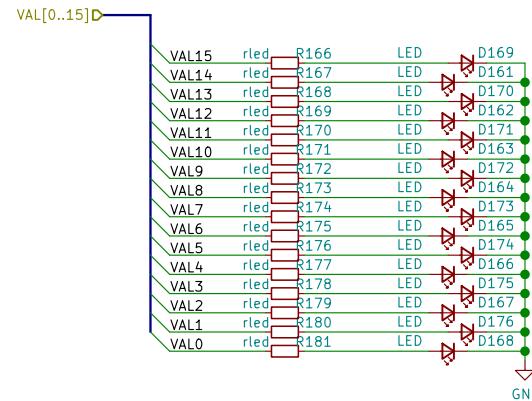
Sheet: /RegJ/
File: RegJ.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1

Id: 66/109



A 16bit binary LED display.

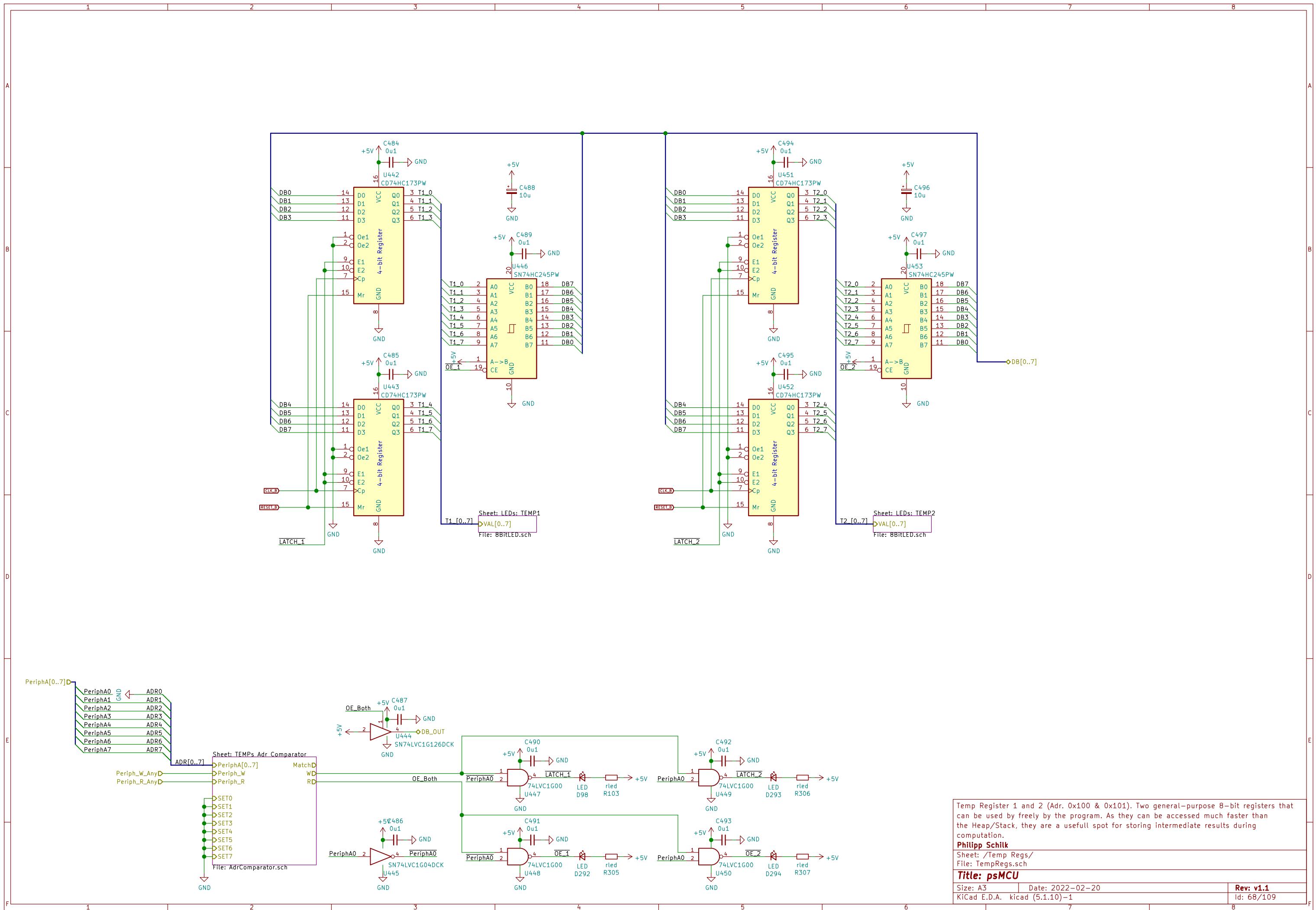
Philipp Schilk

Sheet: /RegJ/LEDs: Inst[0..15]/
File: 16BitLED.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 67/109



A

A

B

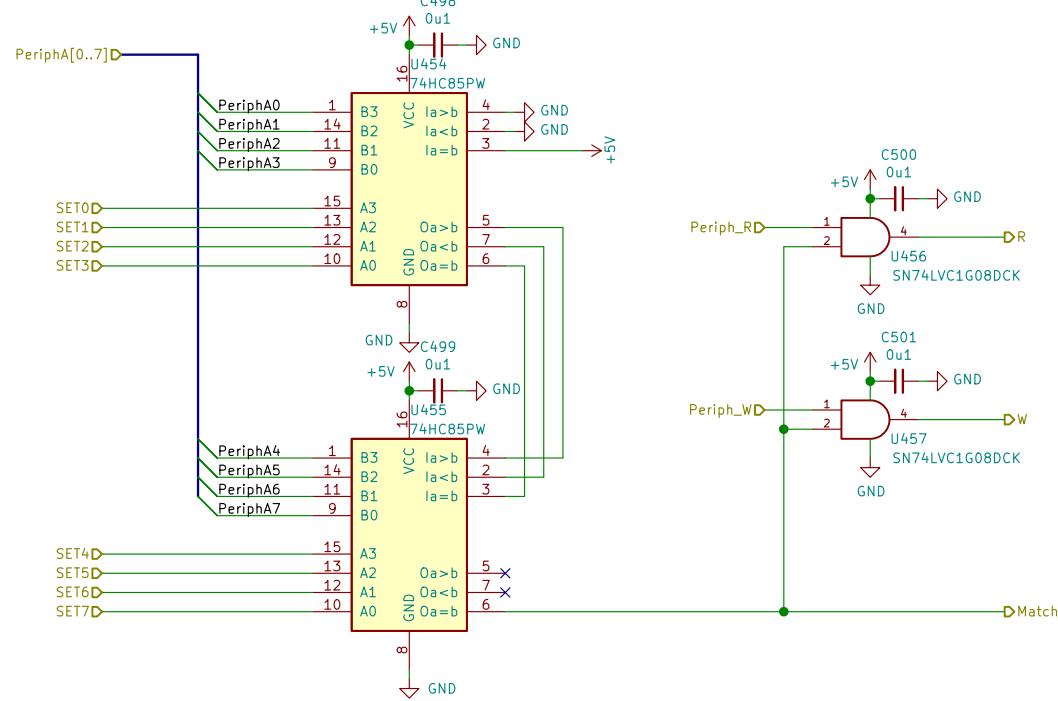
B

C

C

D

D



An adr. comparator. Used to check if the address currently on the RAMA bus corresponds to a specific address.

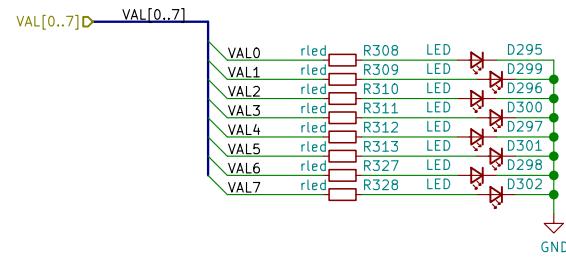
Philipp Schilk

Sheet: /Temp Regs/TEMPS Adr Comparator/
File: AdrComparator.sch

Title: psMCU

Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 69/109



8bit binary LED display.

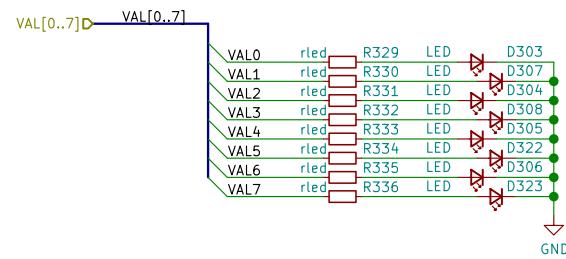
Philipp Schilk

Sheet: /Temp Regs/LEDs: TEMP1/
File: 8BitLED.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 70/109



8bit binary LED display.

Philipp Schilk

Sheet: /Temp Regs/LEDs: TEMP2/
File: 8BitLED.sch

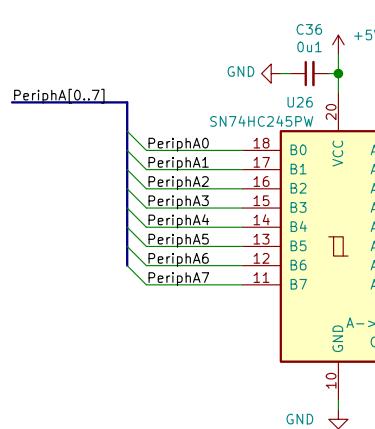
Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

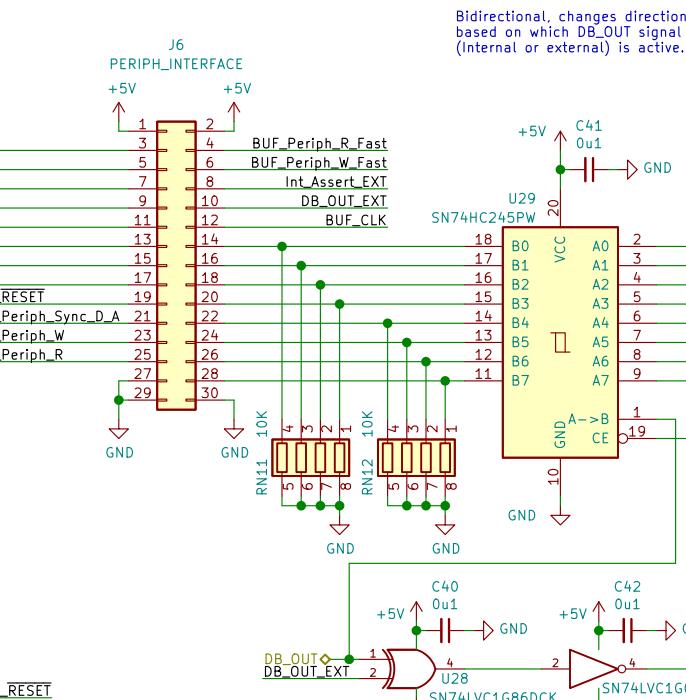
Rev: v1.1
Id: 71/109

A

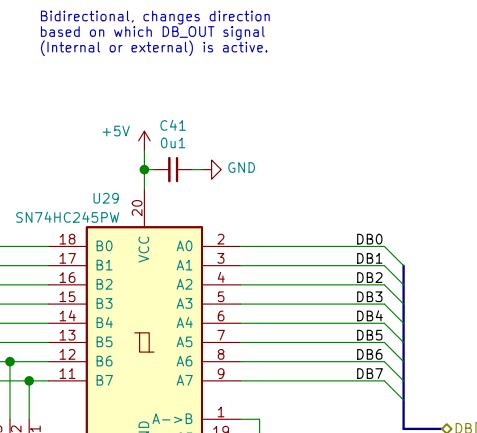
Address Buffer



Peripheral Connector

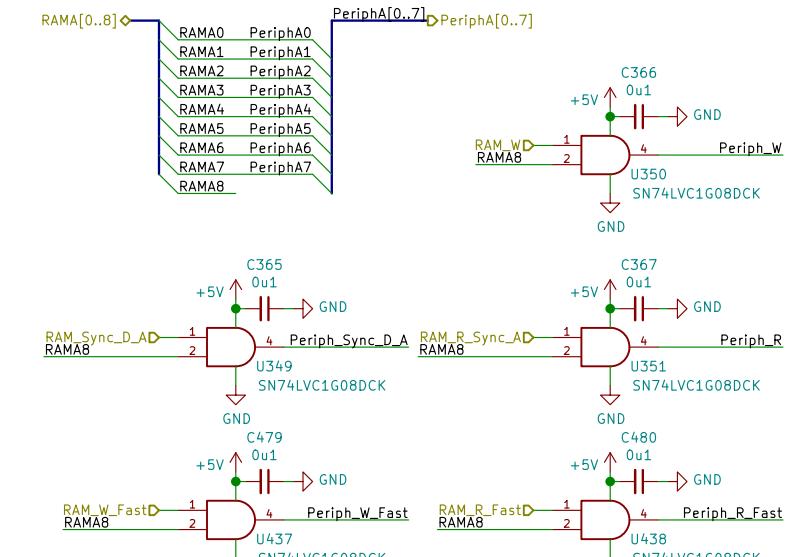


Databus Buffer

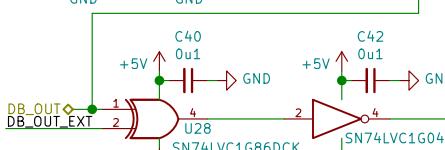
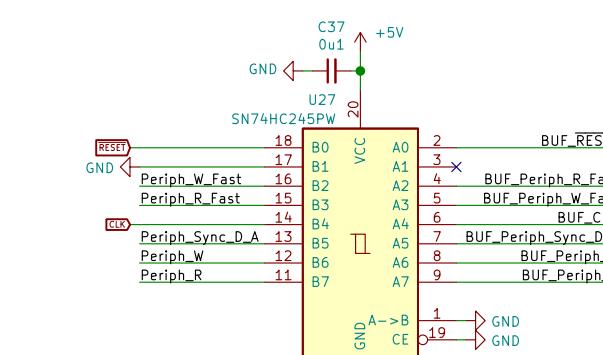


Peripheral Control Gating

All Periph. fall into the address space 0x100 – 0x1ff.
By disabling the read/write and related control signals when the address is outside of this range, peripherals only have to check the first 8 bits of the currently selected address.

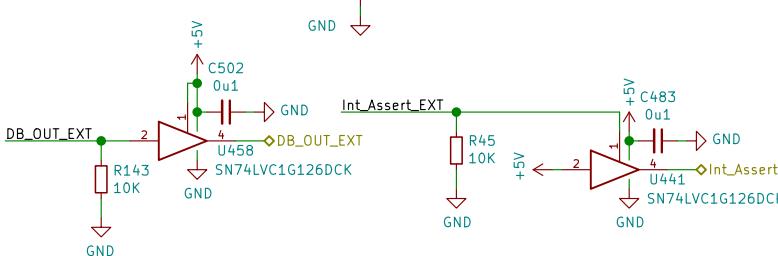
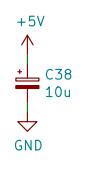
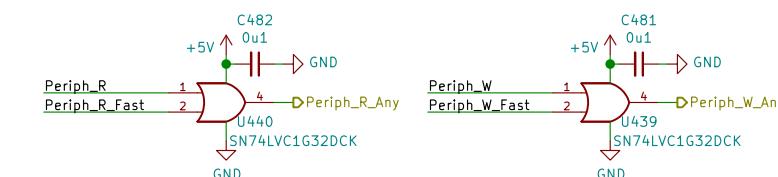


Control Line Buffer



Internal Peripheral Control Signals

All internal peripherals (SYS1–3, TEMP1–2) support both fast and slow access. The fast and slow control lines are combined here for all of these registers, to avoid duplicate circuitry.



Peripheral Connector. Includes buffers to fight signal integrity problems.
Also pre-filters RAMA addresses for peripherals.

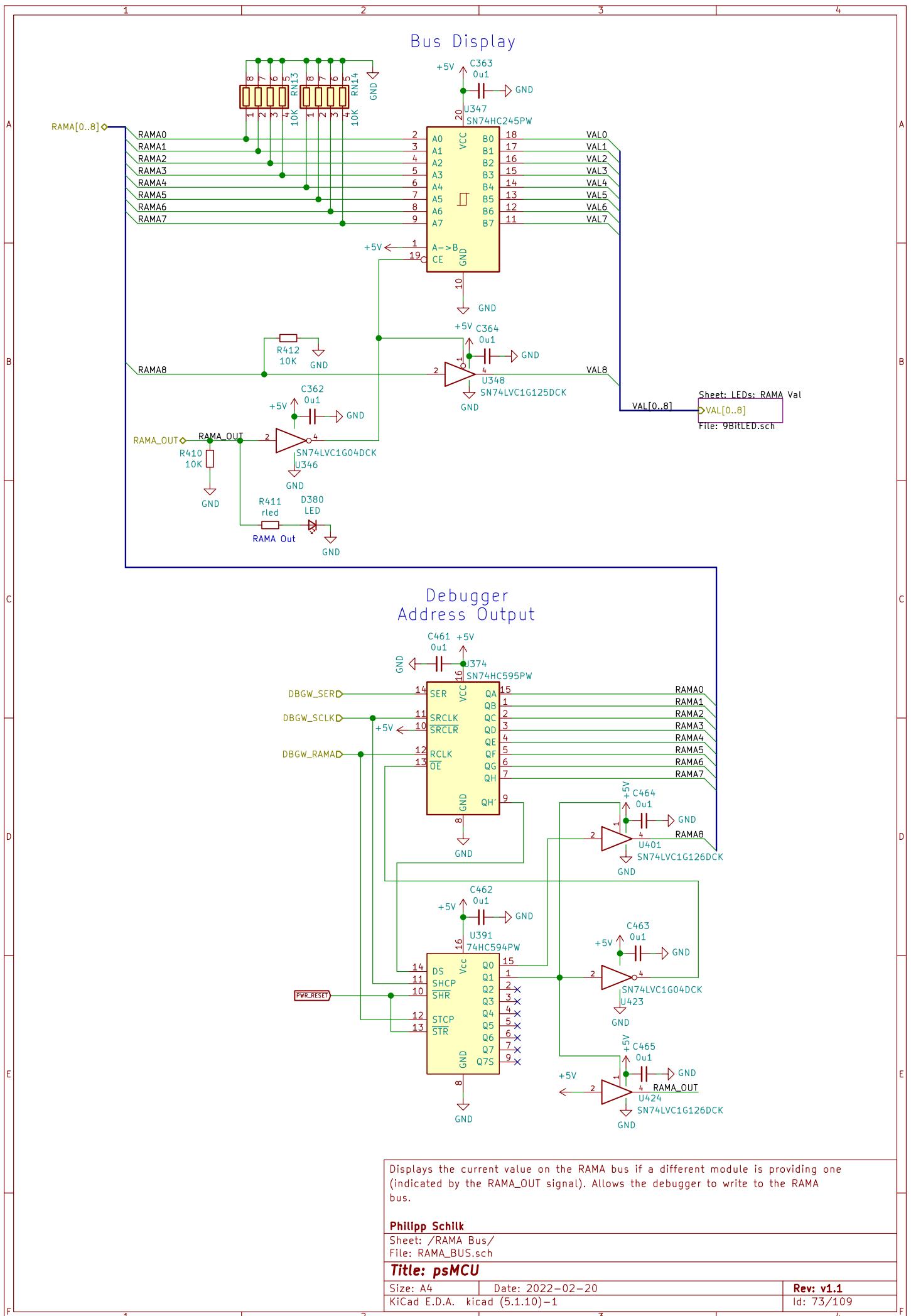
Philipp Schilk

Sheet: /Peripheral Interface/
File: PeripheralInterface.sch

Title: psMCU

Size: A3 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 72/109



A

A

B

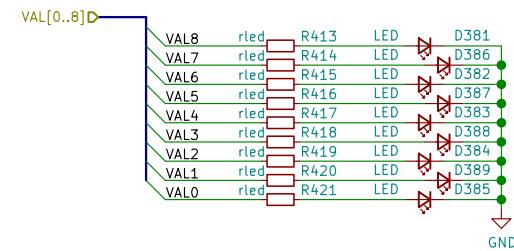
B

C

C

D

D



9bit binary LED display.

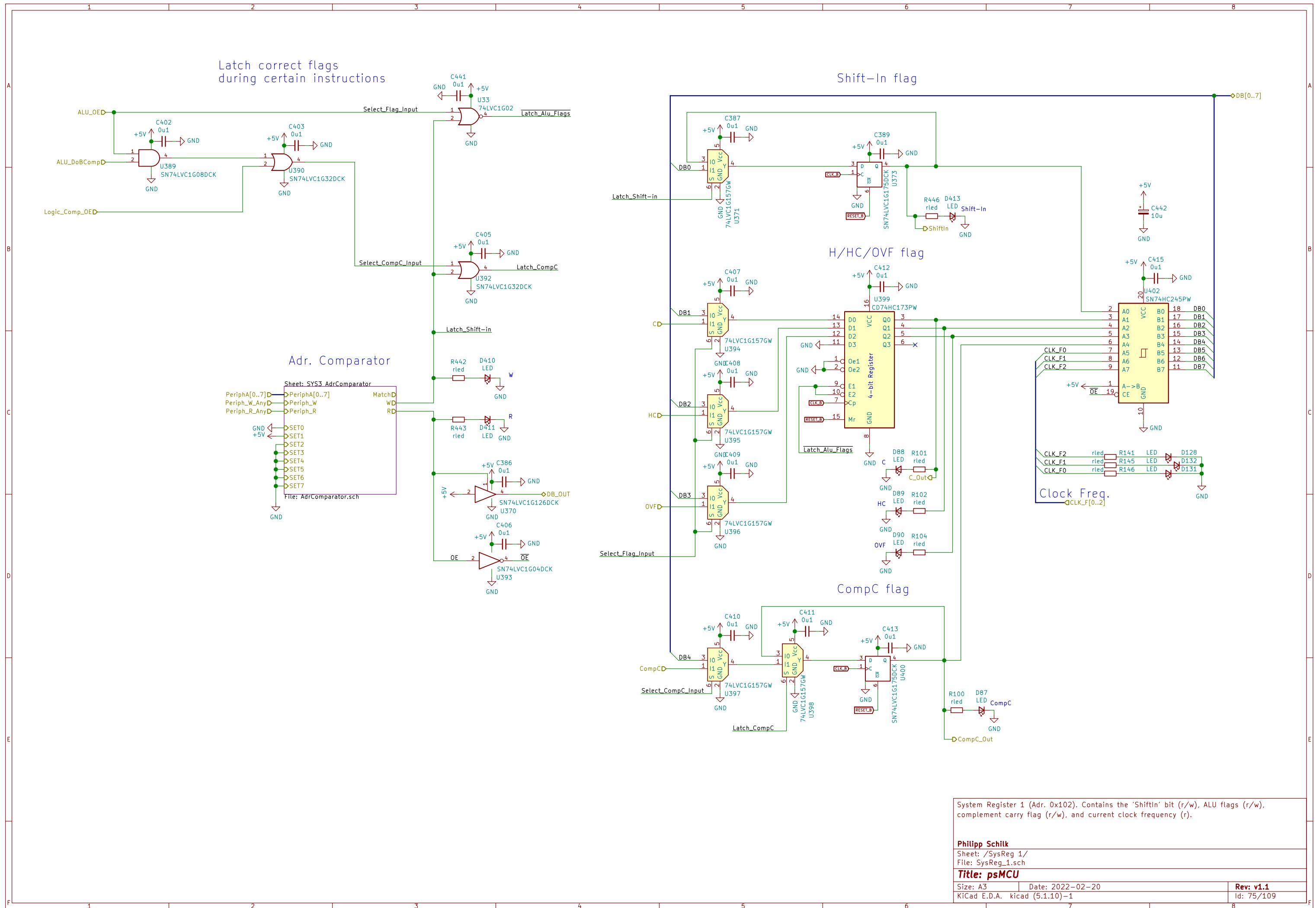
Philipp Schilk

Sheet: /RAMA Bus/LEDs: RAMA Val/
File: 9BitLED.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 74/109



A

A

B

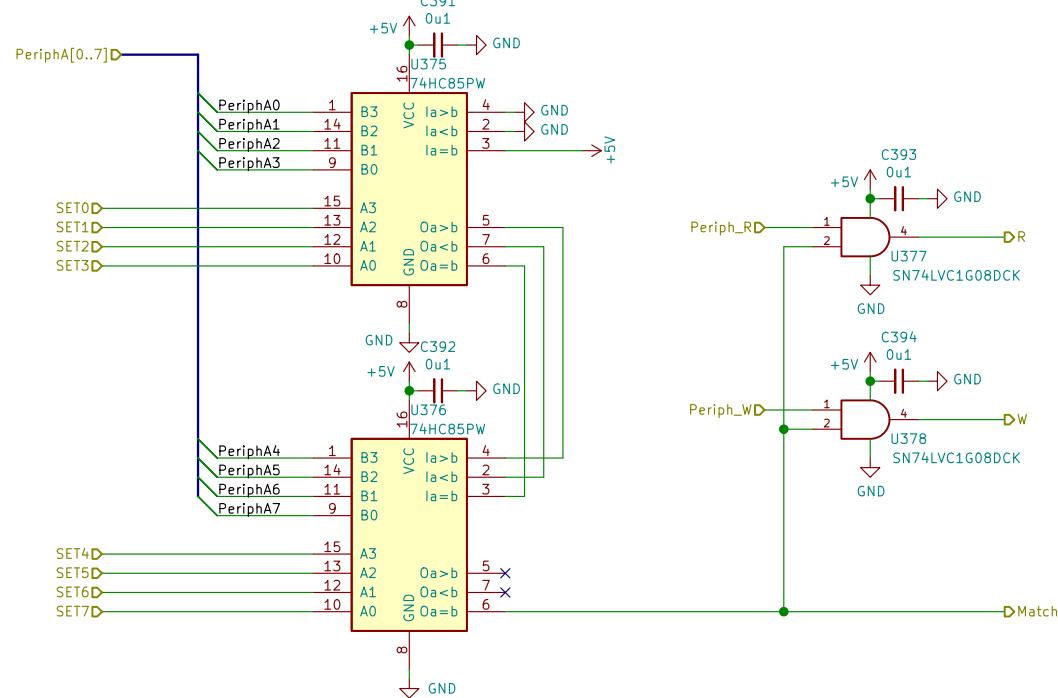
B

C

C

D

D



An adr. comparator. Used to check if the address currently on the RAMA bus corresponds to a specific address.

Philipp Schilk

Sheet: /SysReg 1/SYS3 AdrComparator/
File: AdrComparator.sch

Title: psMCU

Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 76/109

1 2 3 4 5 6

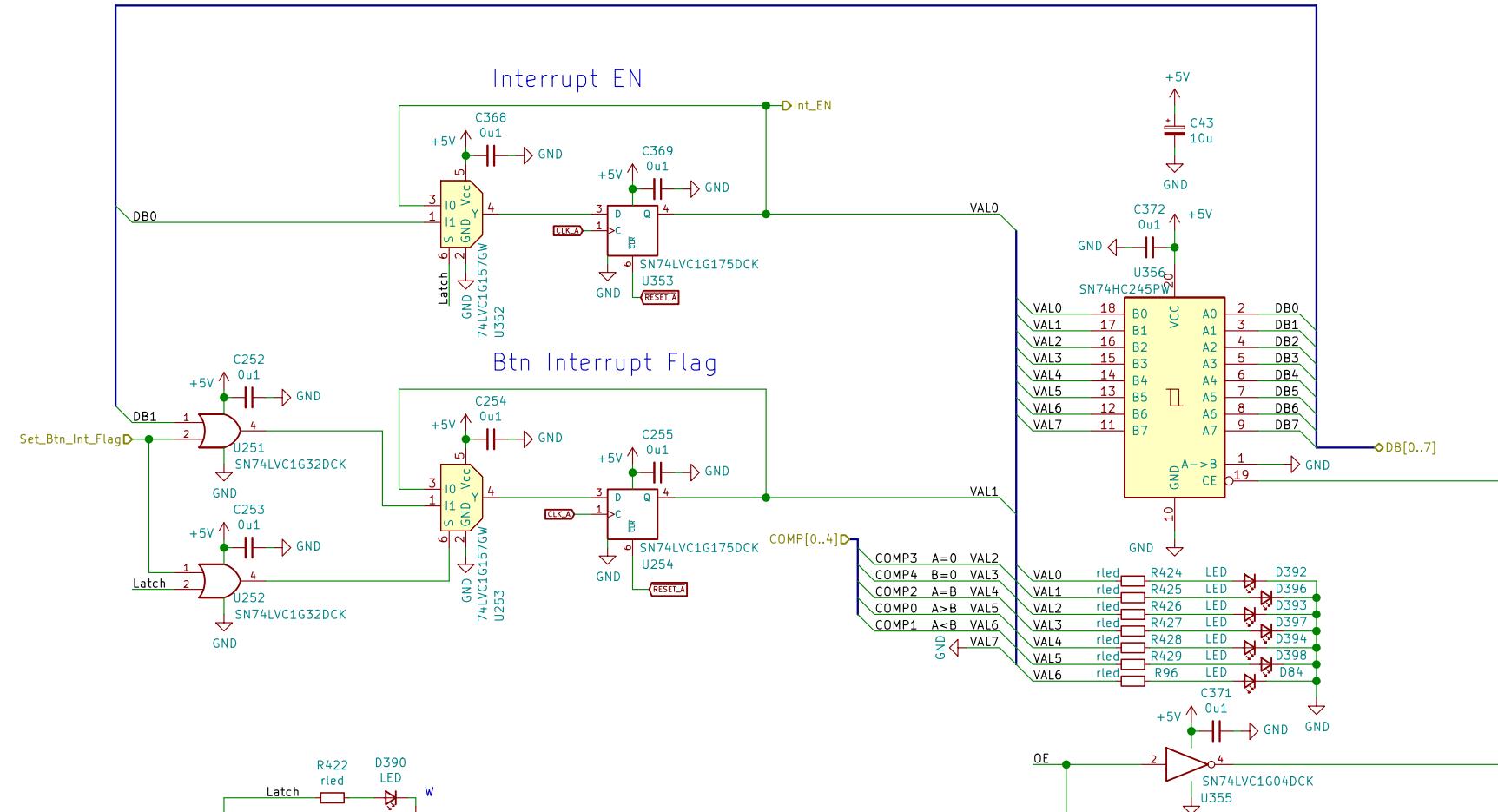
A A

B B

C C

D D

1 2 3 4 5 6



System Register 3 (Adr. 0x104). Contains the Interrupt EN (r/w), Button Interrupt flag (r/w) and comparator outputs (r).

Philipp Schilk

Sheet: /SysReg_3/
 File: SysReg_3.sch

Title: psMCU

Size: A4 Date: 2022-02-20
 KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
 Id: 77/109

A

A

B

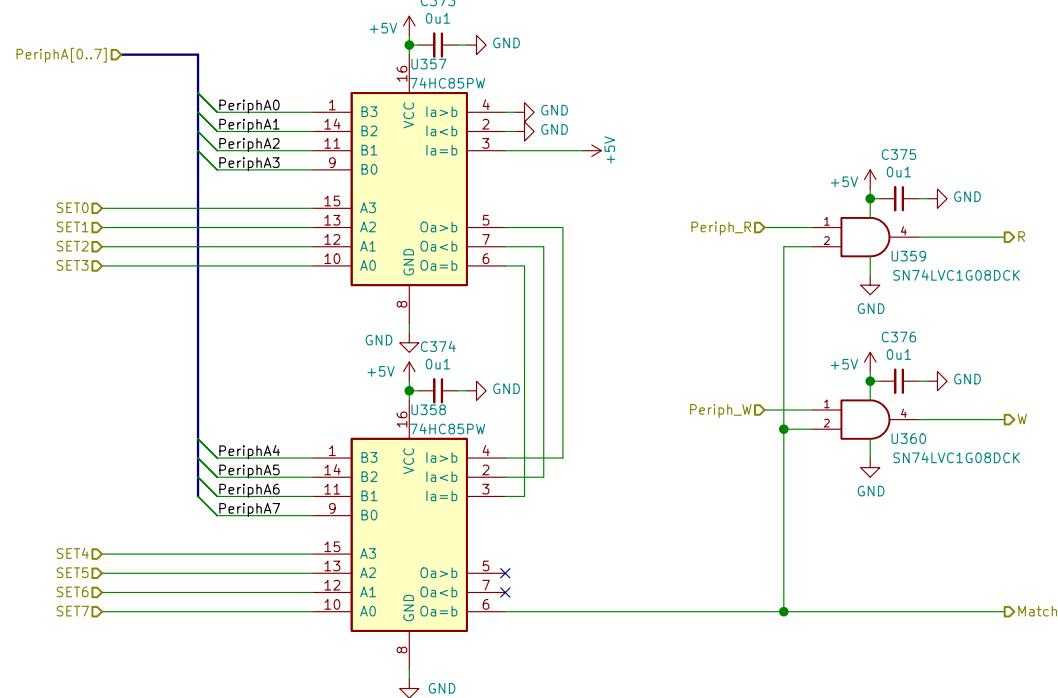
B

C

C

D

D



An adr. comparator. Used to check if the address currently on the RAMA bus corresponds to a specific address.

Philipp Schilk

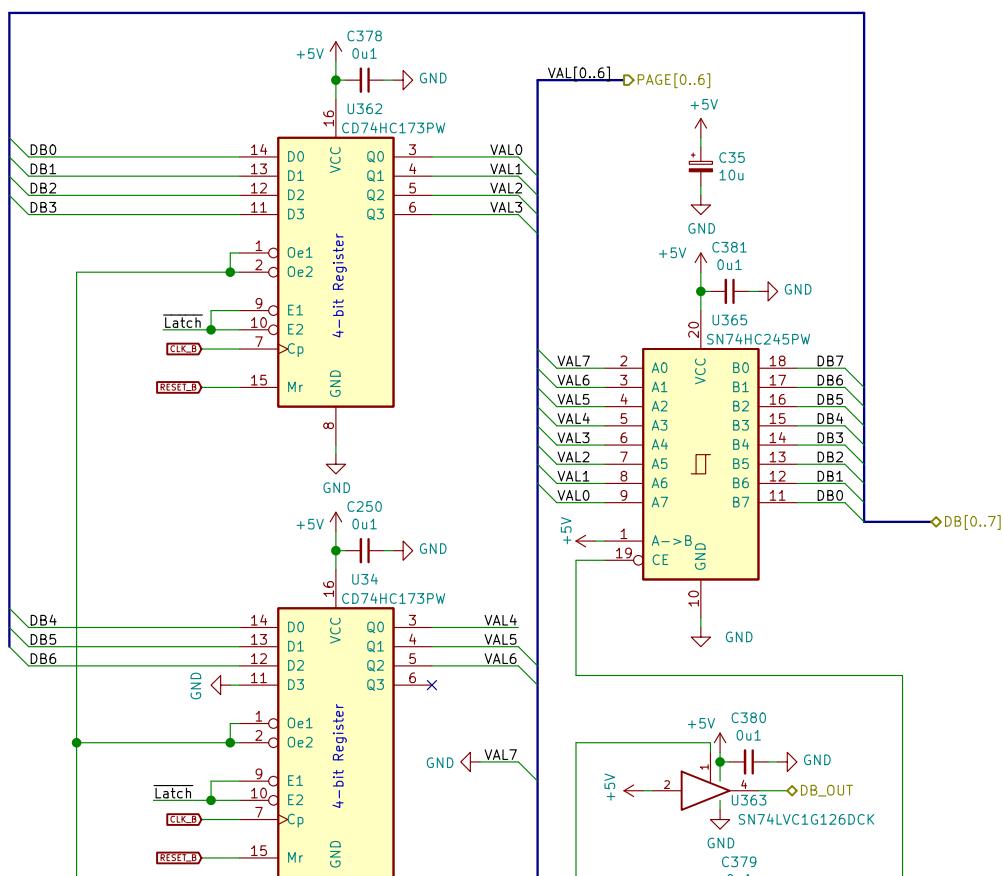
Sheet: /SysReg 3/SYS3 Adr Comparator/
File: AdrComparator.sch

Title: psMCU

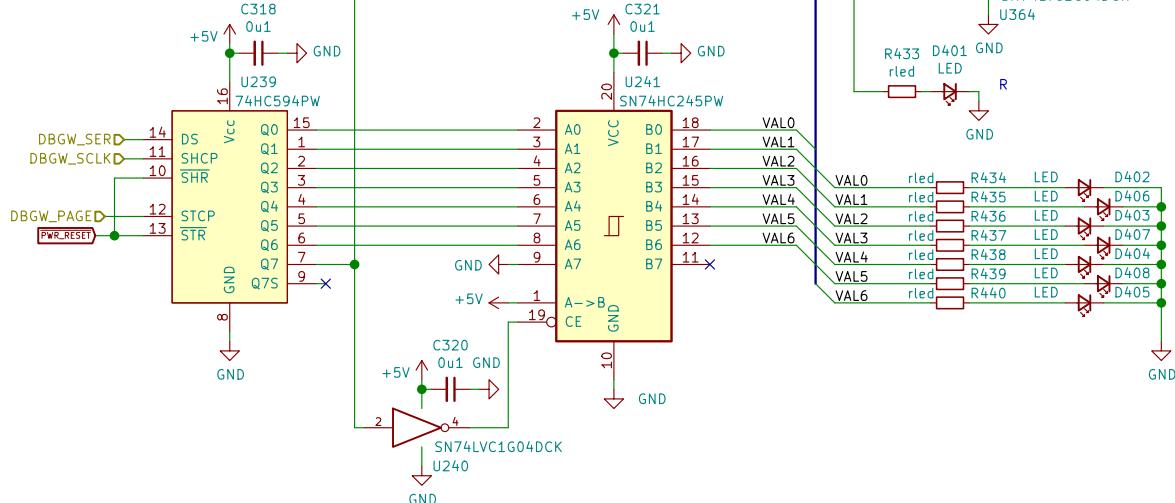
Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 78/109

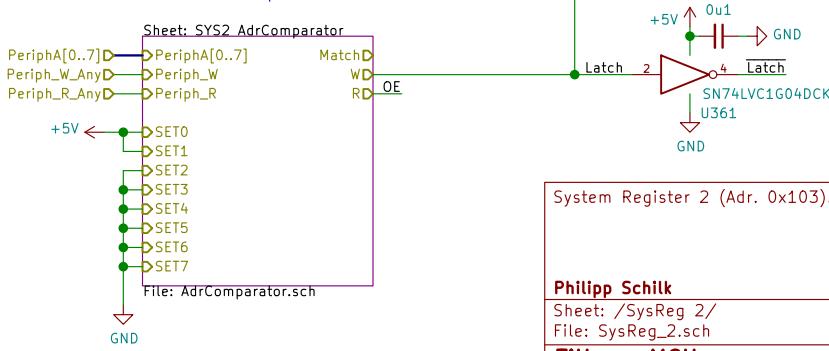
RAM Page



Debugger RAM Page Override



Adr. Comparator



Sheet: SYS2 AdrComparator
File: AdrComparator.sch

Philipp Schilk

Sheet: /SysReg_2/
File: SysReg_2.sch

Title: psmCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 79/109

A

A

B

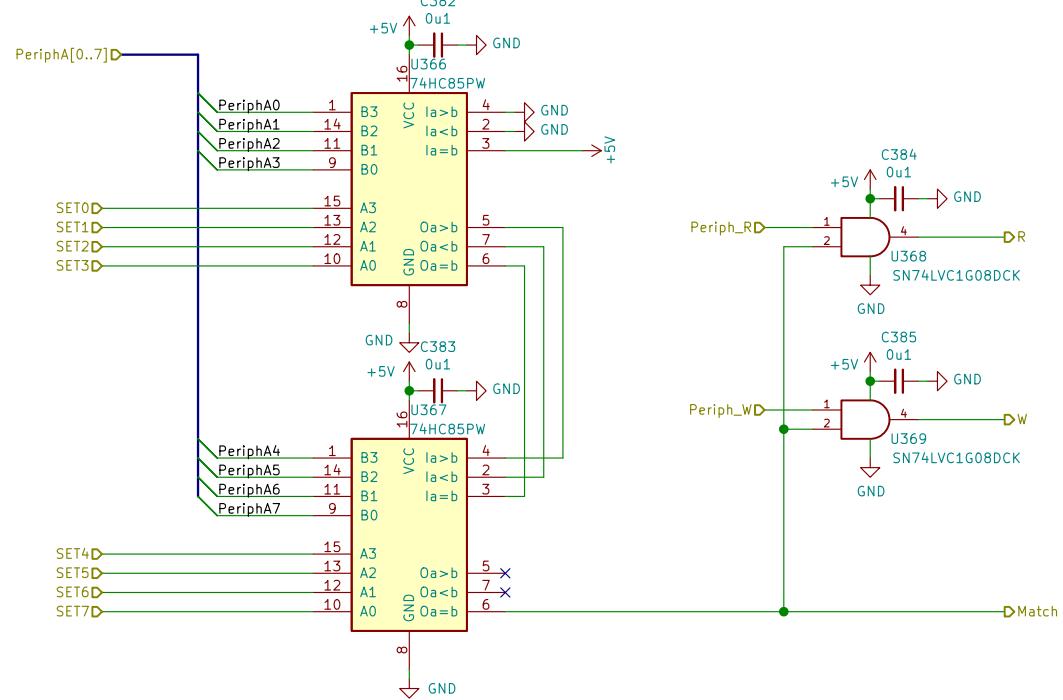
B

C

C

D

D



An adr. comparator. Used to check if the address currently on the RAMA bus corresponds to a specific address.

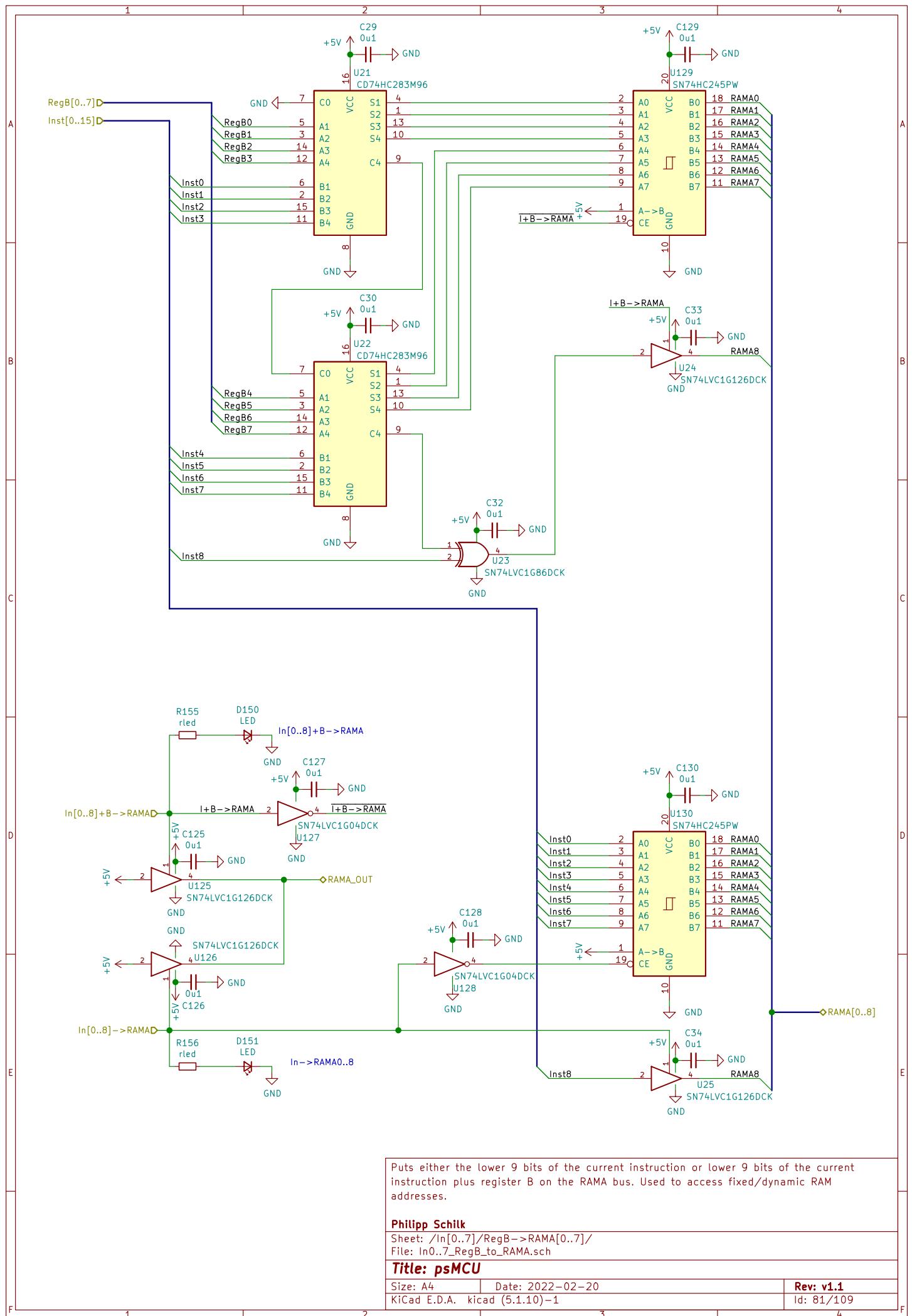
Philipp Schilk

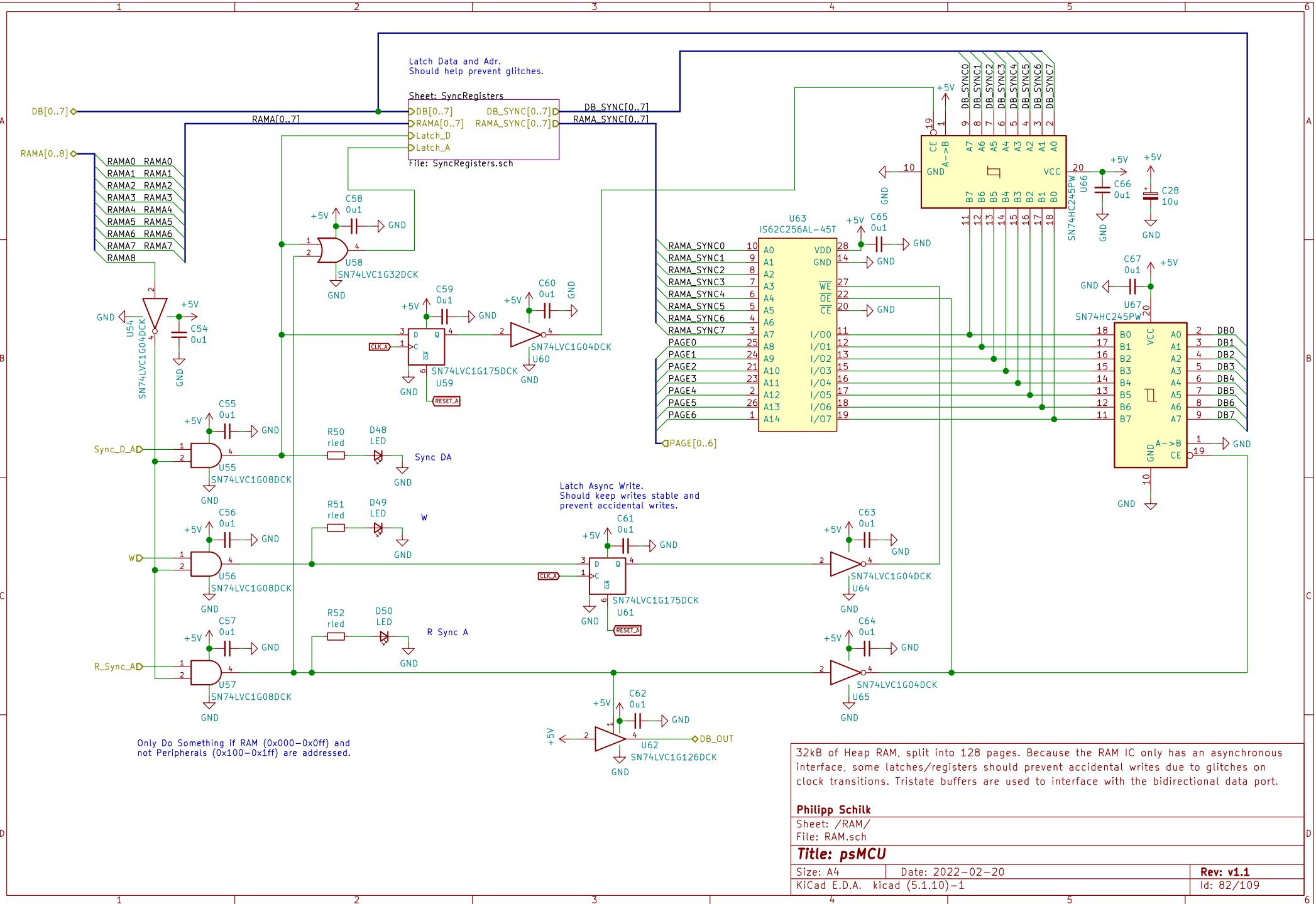
Sheet: /SysReg 2/SYS2 AdrComparator/
File: AdrComparator.sch

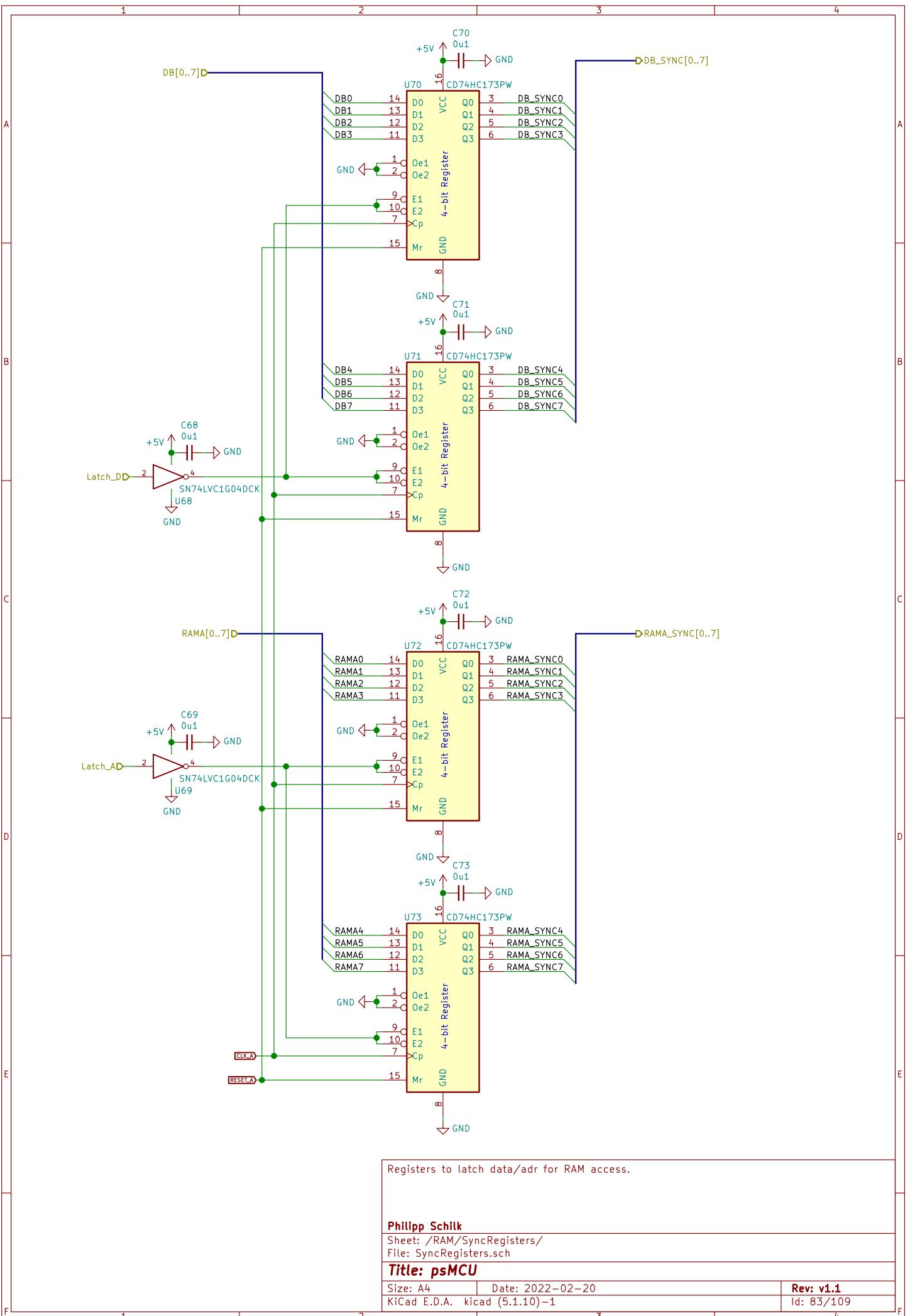
Title: psMCU

Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 80/109







A

A

B

B

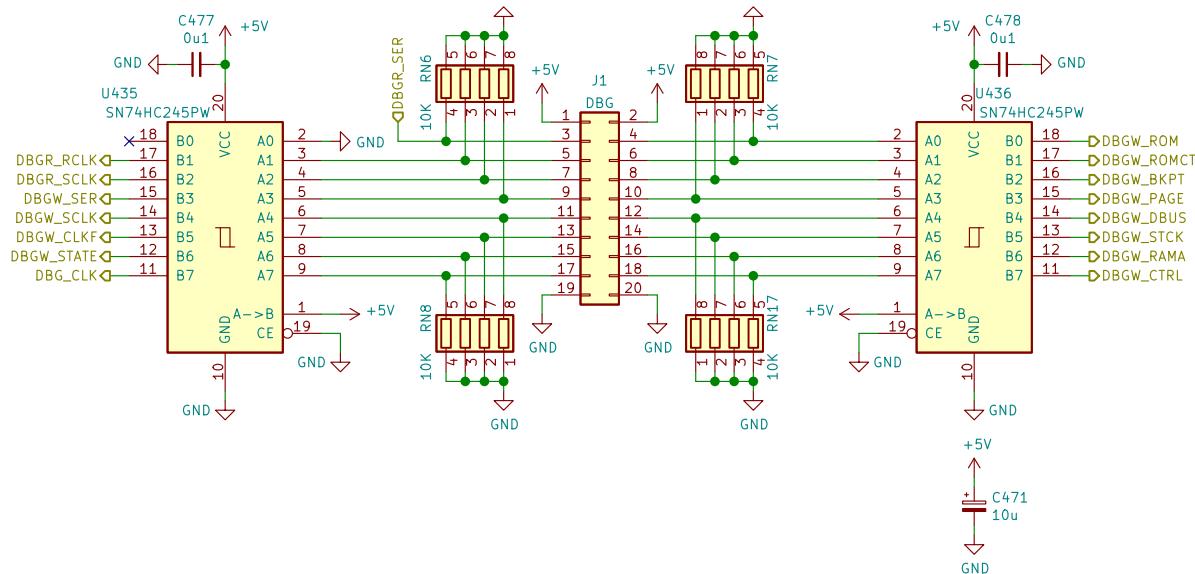
C

C

D

D

Debugger Connector



Connector for the debugger. Allows the debugger to access the various shift registers included to program, monitor, and control the processor.

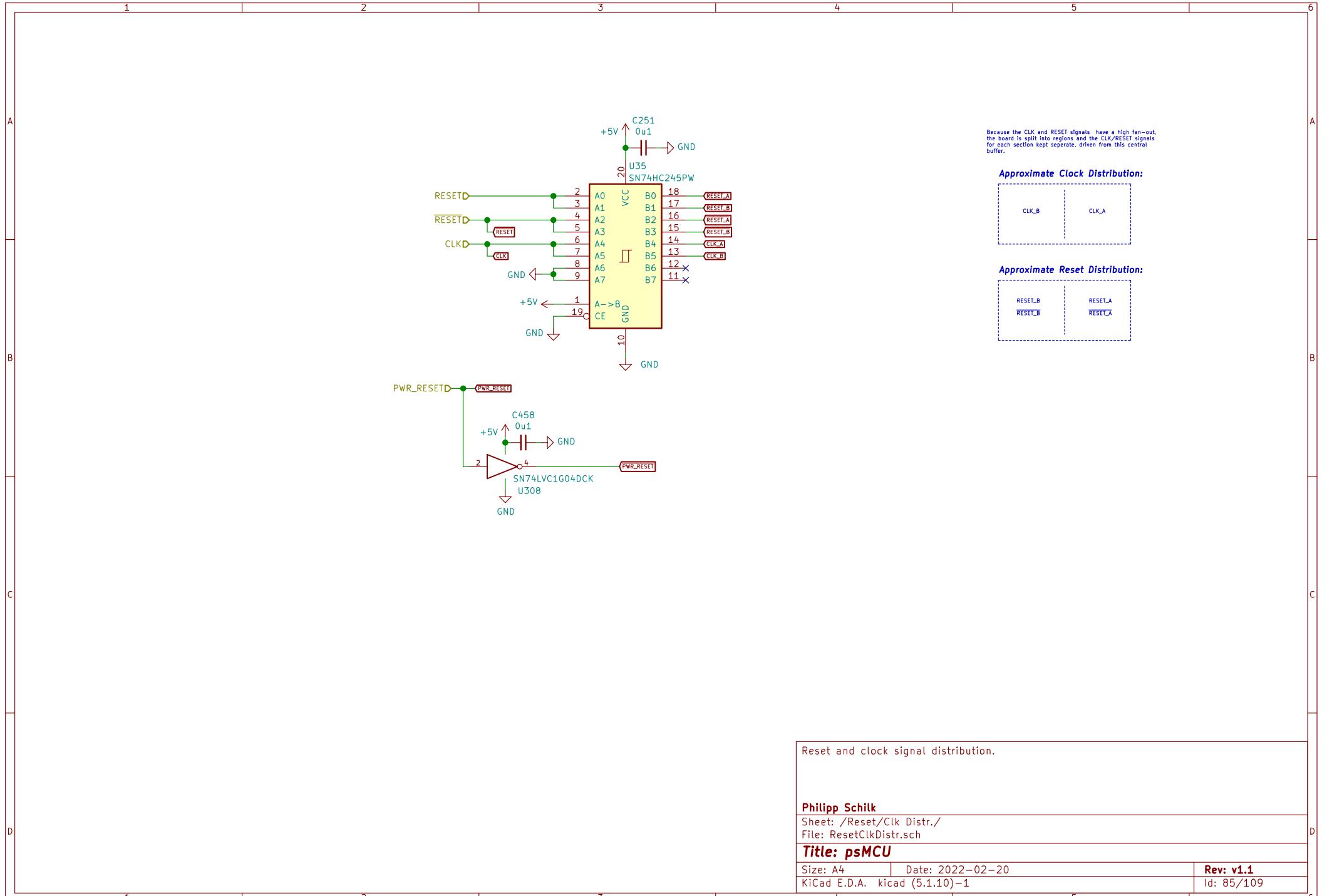
Philipp Schilk

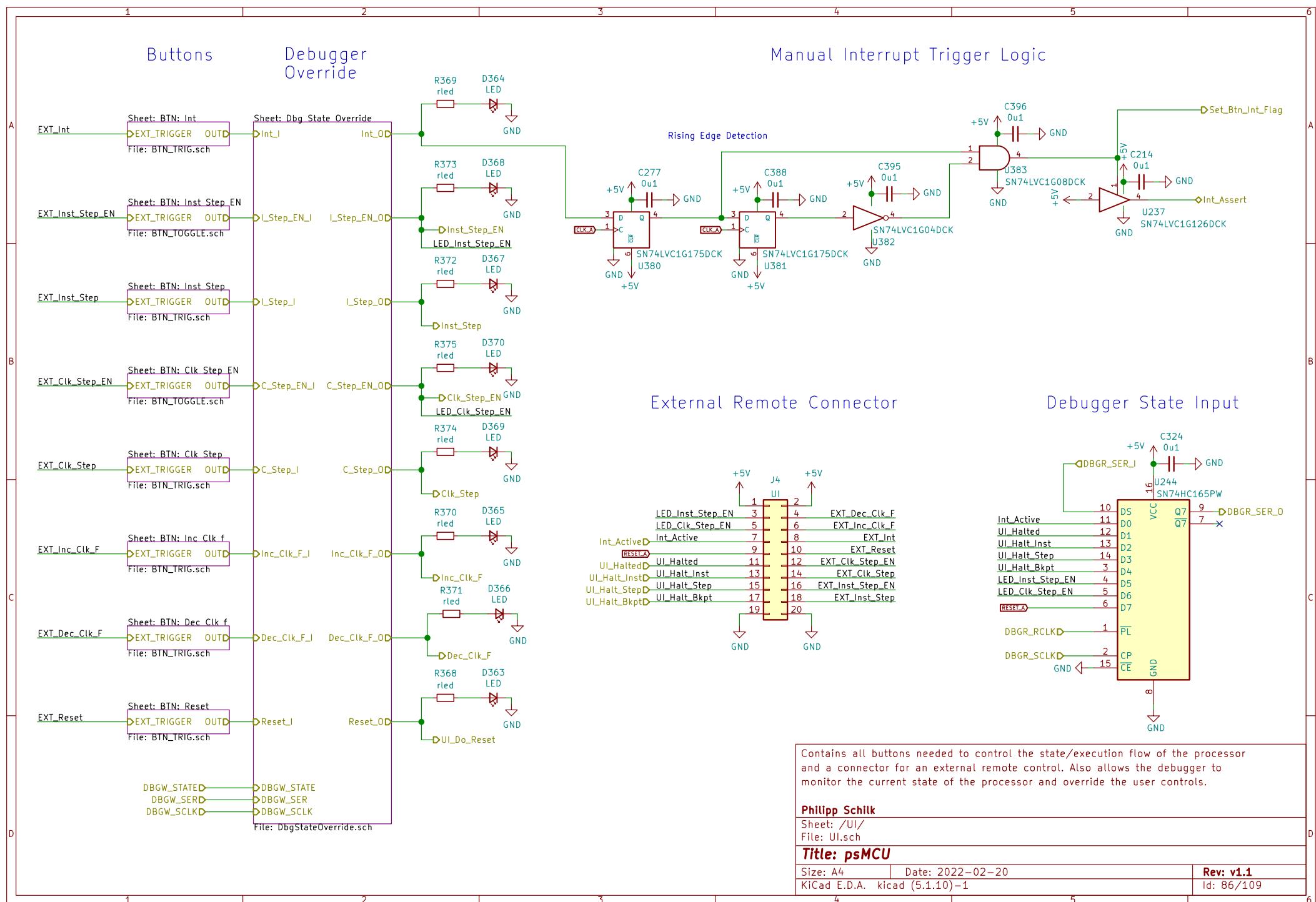
Sheet: /Debugger Interface/
File: DebuggerInterface.sch

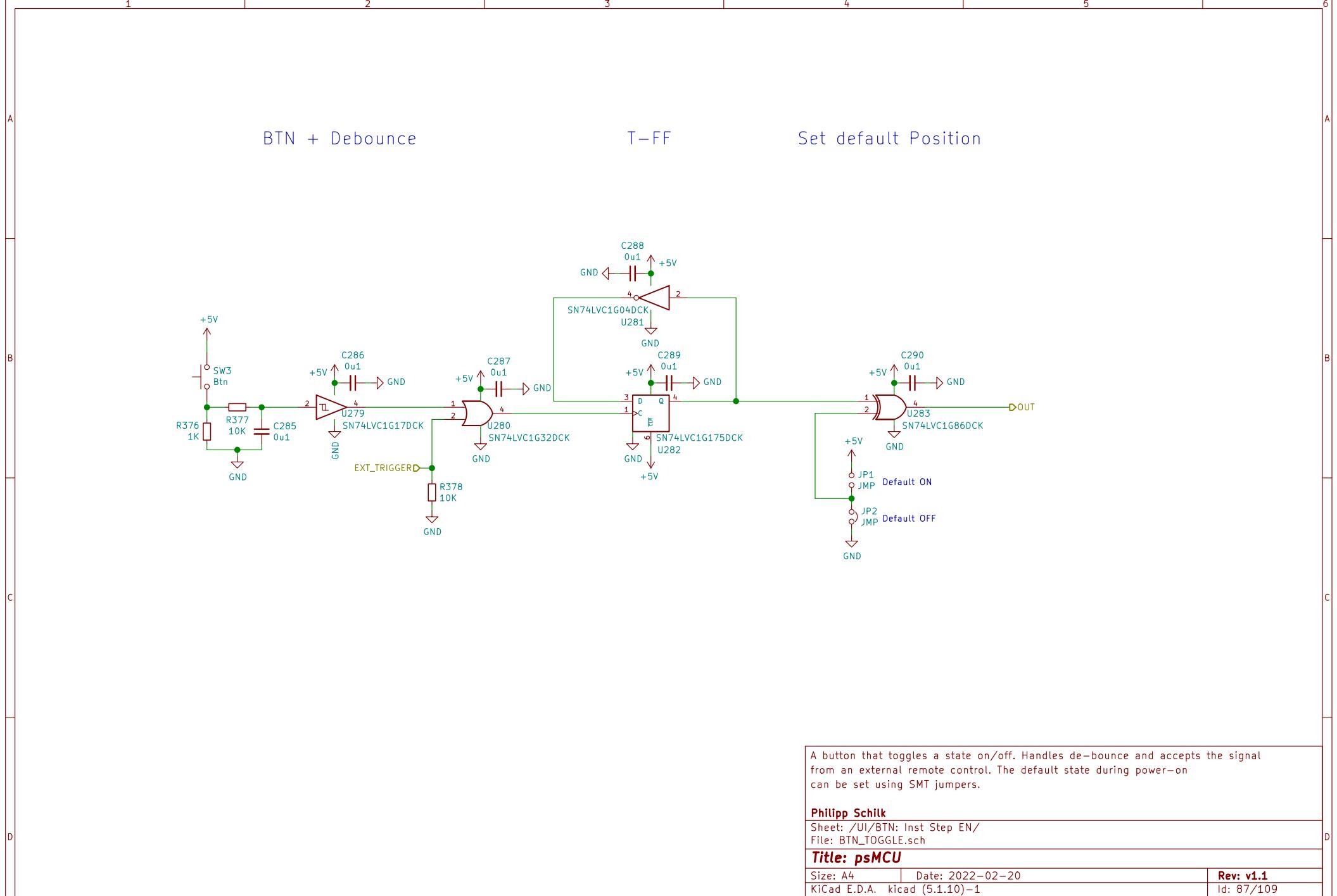
Title: psMCU

Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 84/109







A

A

B

B

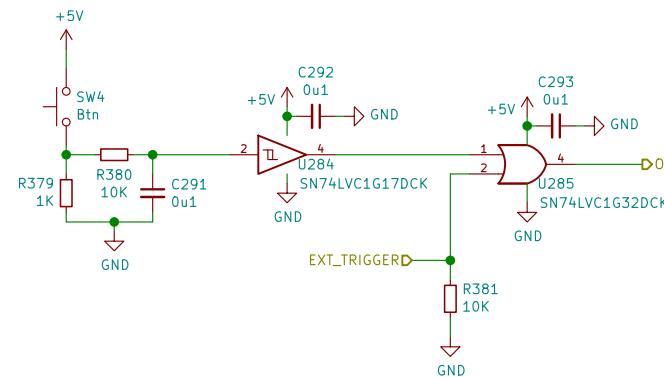
C

C

D

D

BTN + Debounce



A simple button. Handles de-bouncing and also accepts the signal from an external remote.

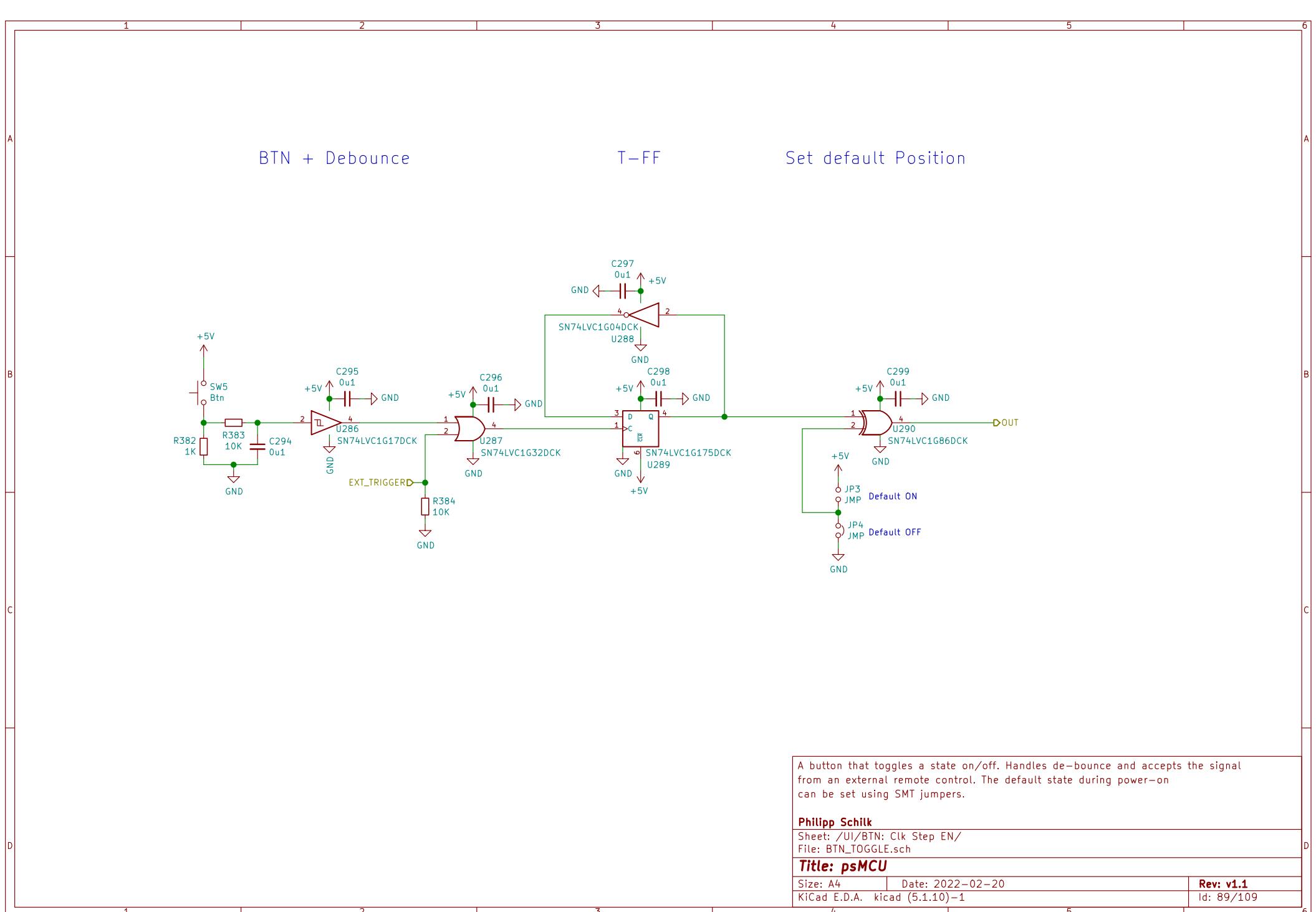
Philipp Schilk

Sheet: /UI/BTN: Inst Step/
File: BTN_TRIGGER.sch

Title: psMCU

Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 88/109



A

A

B

B

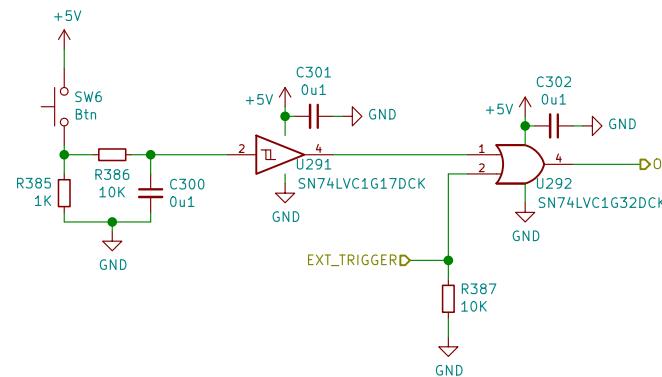
C

C

D

D

BTN + Debounce



A simple button. Handles de-bouncing and also accepts the signal from an external remote.

Philipp Schilk

Sheet: /UI/BTN: Clk Step/
File: BTN_TRIG.sch

Title: psMCU

Size: A4	Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1	

Rev: v1.1
Id: 90/109

A

A

B

B

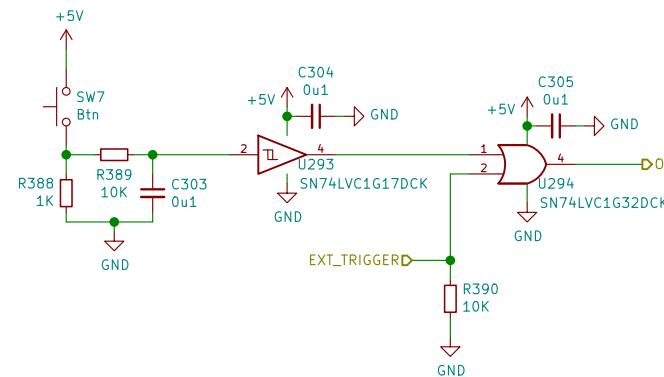
C

C

D

D

BTN + Debounce



A simple button. Handles de-bouncing and also accepts the signal from an external remote.

Philipp Schilk

Sheet: /UI/_BTN: Reset/
File: BTN_TRIG.sch

Title: psMCU

Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 91/109

A

A

B

B

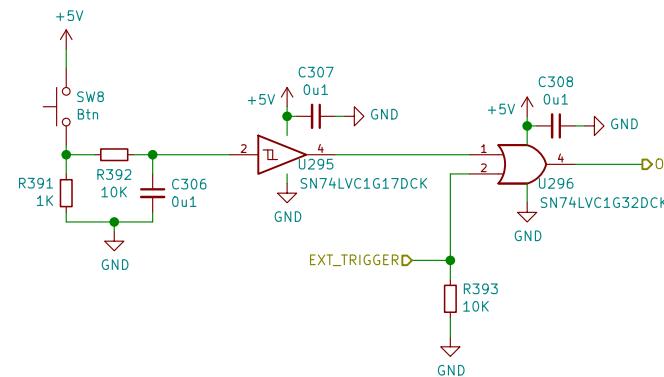
C

C

D

D

BTN + Debounce



A simple button. Handles de-bouncing and also accepts the signal from an external remote.

Philipp Schilk

Sheet: /UI/BTN: Int/
File: BTN_TRIG.sch

Title: psMCU

Size: A4	Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1	

Rev: v1.1
Id: 92/109

A

A

B

B

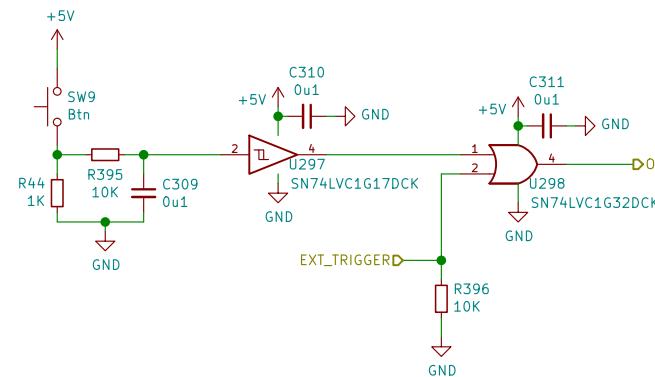
C

C

D

D

BTN + Debounce



A simple button. Handles de-bouncing and also accepts the signal from an external remote.

Philipp Schilk

Sheet: /UI/BTN: Inc Clk f/
File: BTN_TRIGGER.sch

Title: psMCU

Size: A4	Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1	

Rev: v1.1
Id: 93/109

A

A

B

B

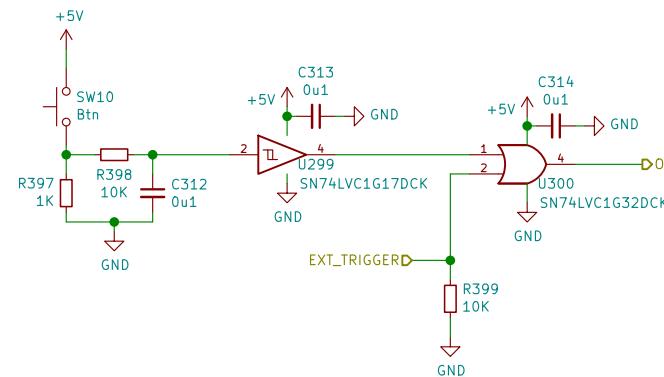
C

C

D

D

BTN + Debounce



A simple button. Handles de-bouncing and also accepts the signal from an external remote.

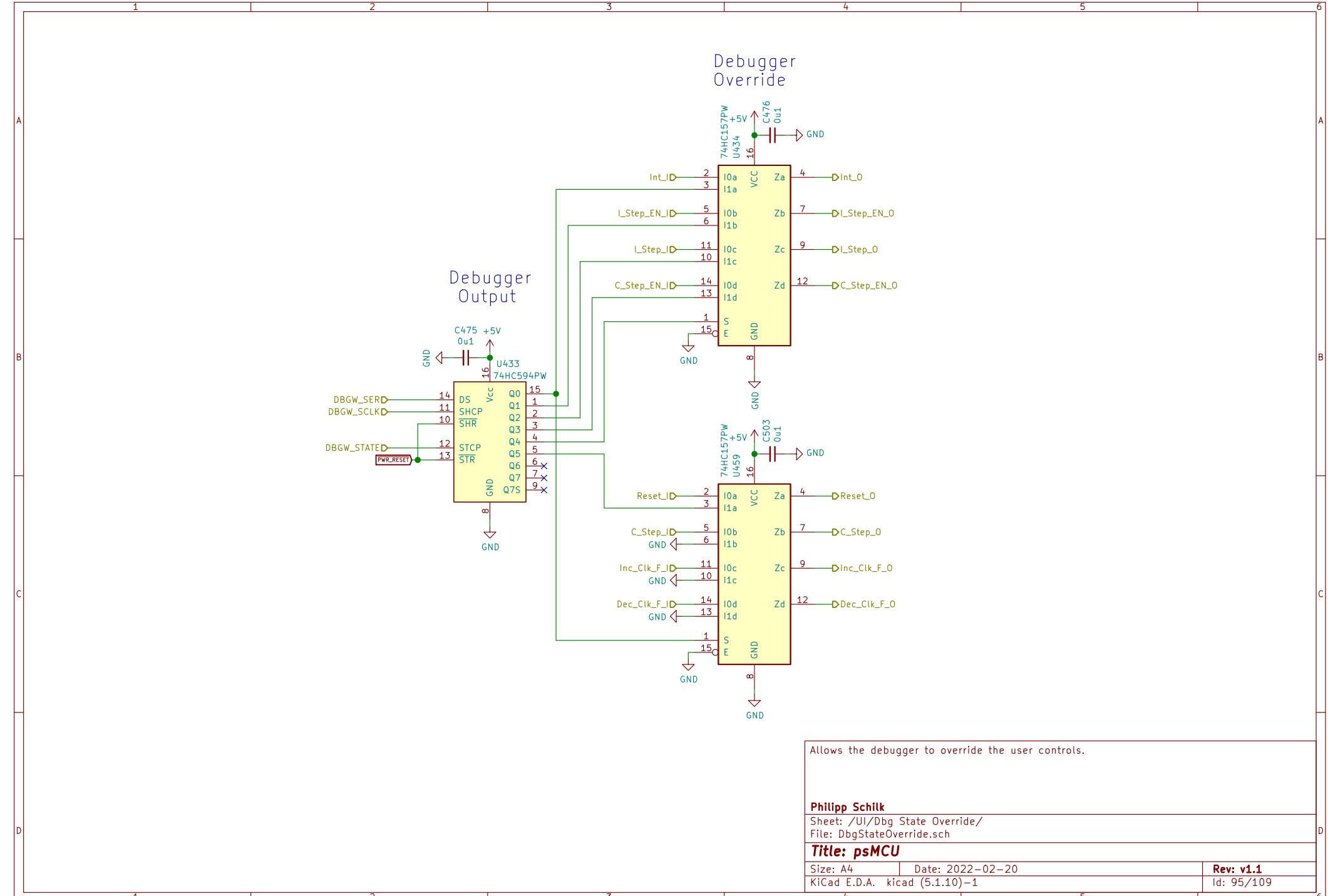
Philipp Schilk

Sheet: /UI/BTN: Dec Clk f/
File: BTN_TRIGGER.sch

Title: psMCU

Size: A4	Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1	

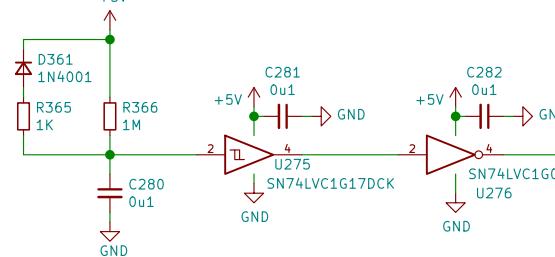
Rev: v1.1
Id: 94/109



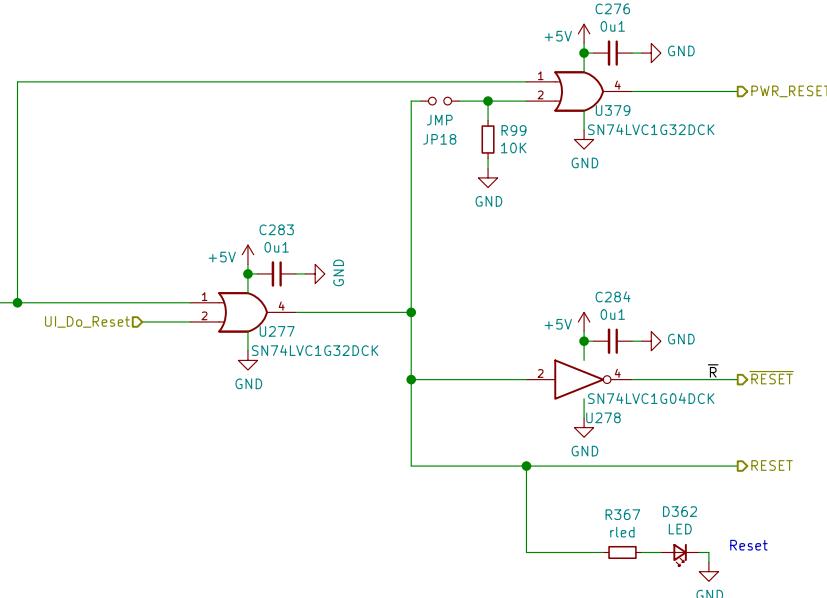
A

A

Automatic Reset on Power-on



Generate different Reset signals



Generates a reset during power-on and generates the RESET and $\overline{\text{RESET}}$ signals.

Philipp Schilk

Sheet: /Reset Ctrl/
File: ResetCtrl.sch

Title: psMCU

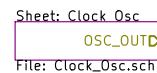
Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 96/109

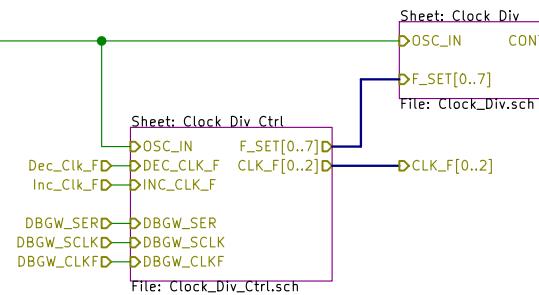
A

A

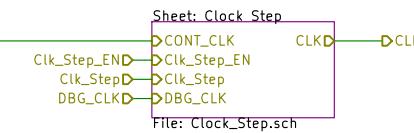
Oscillator



Adjustable Divider



Manual Clock Control



B

B

C

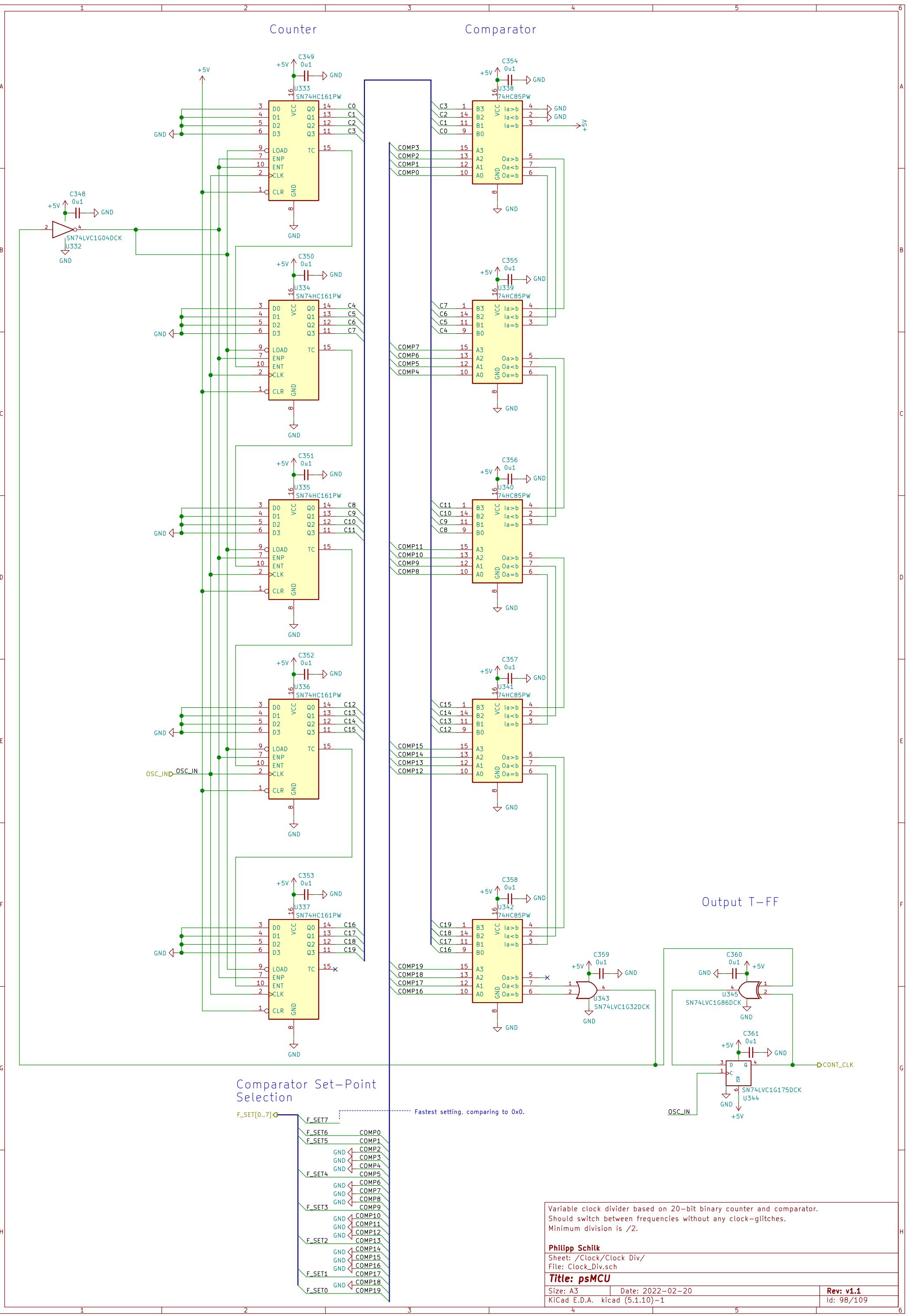
C

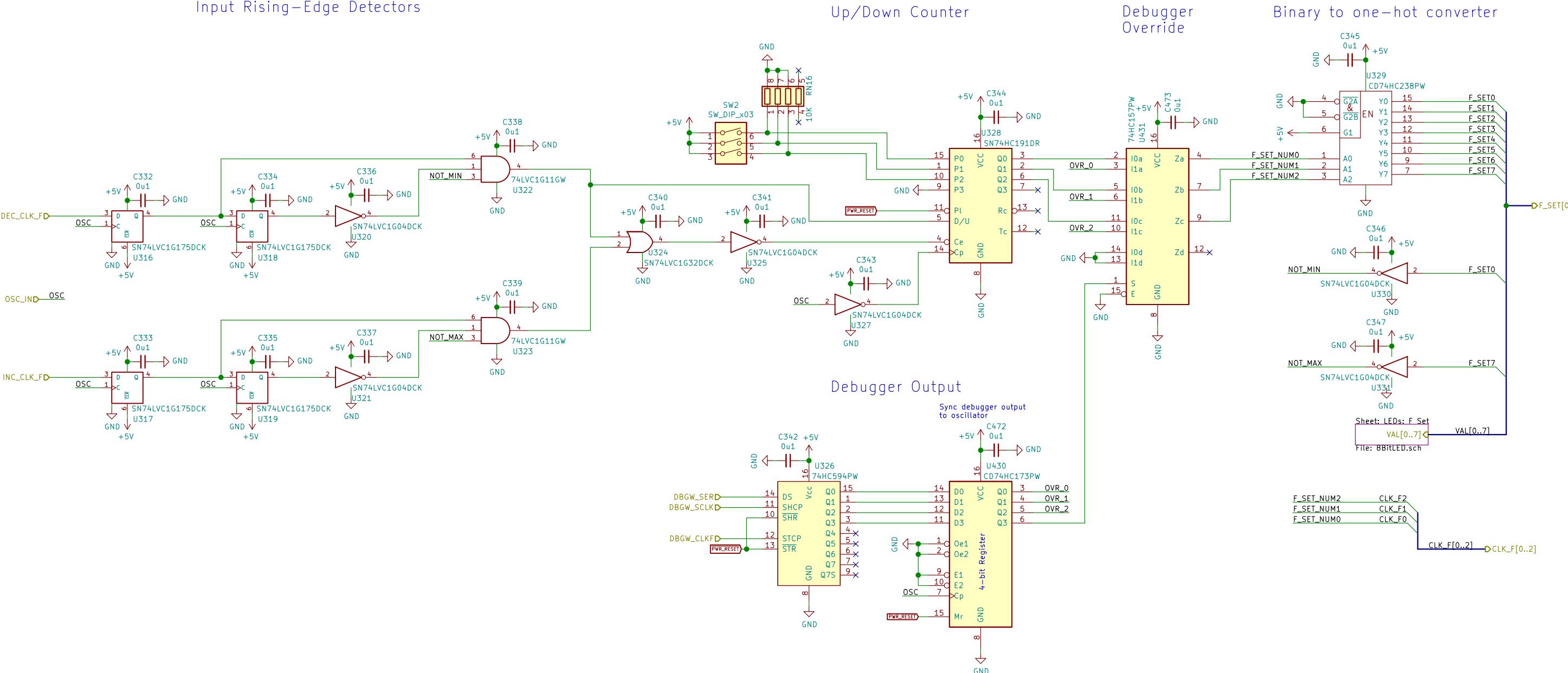
D

D

Variable frequency clock generation.

Philipp SchilkSheet: /Clock/
File: Clock.sch**Title: psMCU**Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1Rev: v1.1
Id: 97/109





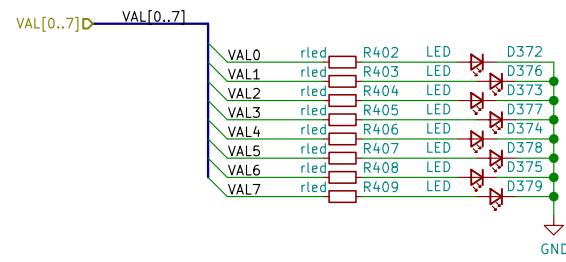
Frequency selection logic/state machine. Allows selection between 8 frequency set-points. Rising-Edge detectors ensure each button press is only counted once. The default clock setting during power-on is configurable with dip switches. Output is encoded as a 1-of-8/one-hot signal. Includes a debugger override.
Philipp Schik

Sheet: /Clock/Clock Div Ctrl/
File: Clock_Div_Ctrl.sch

Title: psMCU

Size: A3 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1 | Id: 99/109



8bit binary LED display.

Philipp Schilk

Sheet: /Clock/Clock_Div Ctrl/LEDs: F_Set/
File: 8BitLED.sch

Title: psMCU

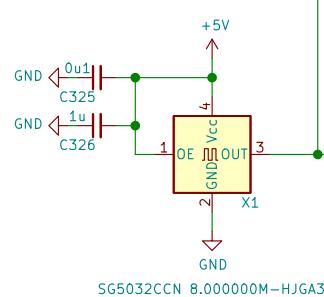
Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 100/109

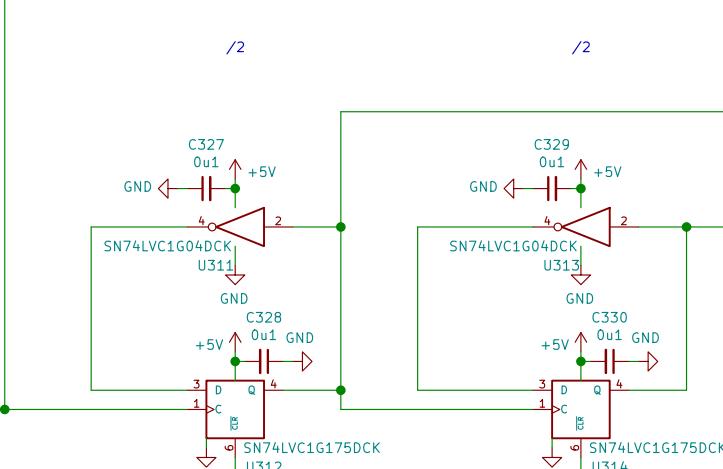
1 2 3 4 5 6

A

8Mhz Oscillator

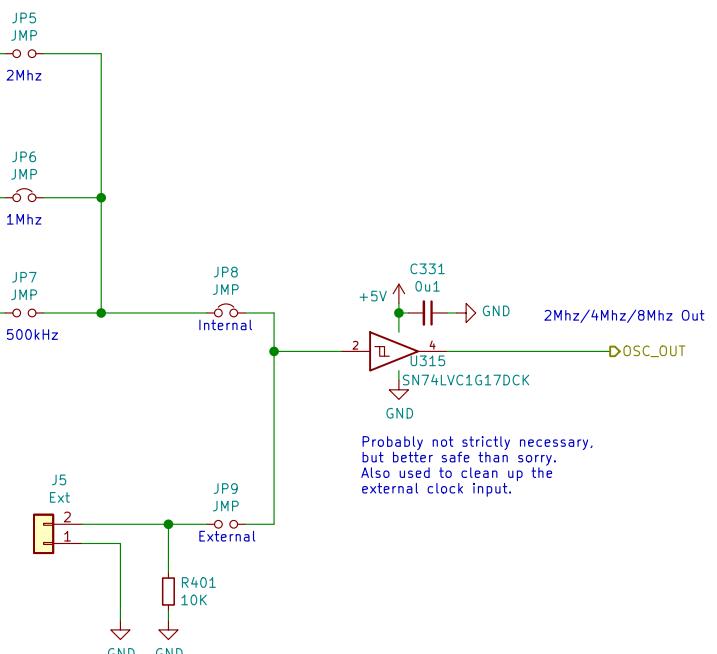


Dividers



Max Frequency Selection

Note: Frequency labels below take into account the division-by-four intrinsic to the divider and clock control, and represent actual maximum clock speed.



Output Buffer

The central oscillator. Allows for 2 optional dividers or an external clock source. Using the internal crystal, this module can generate 2MHz, 4Mhz, or 8MHz

Philipp Schilk

Sheet: /Clock/Clock_Osc/
File: Clock_Osc.sch

Title: psMCU

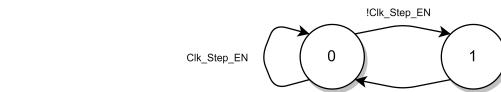
Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 101/109

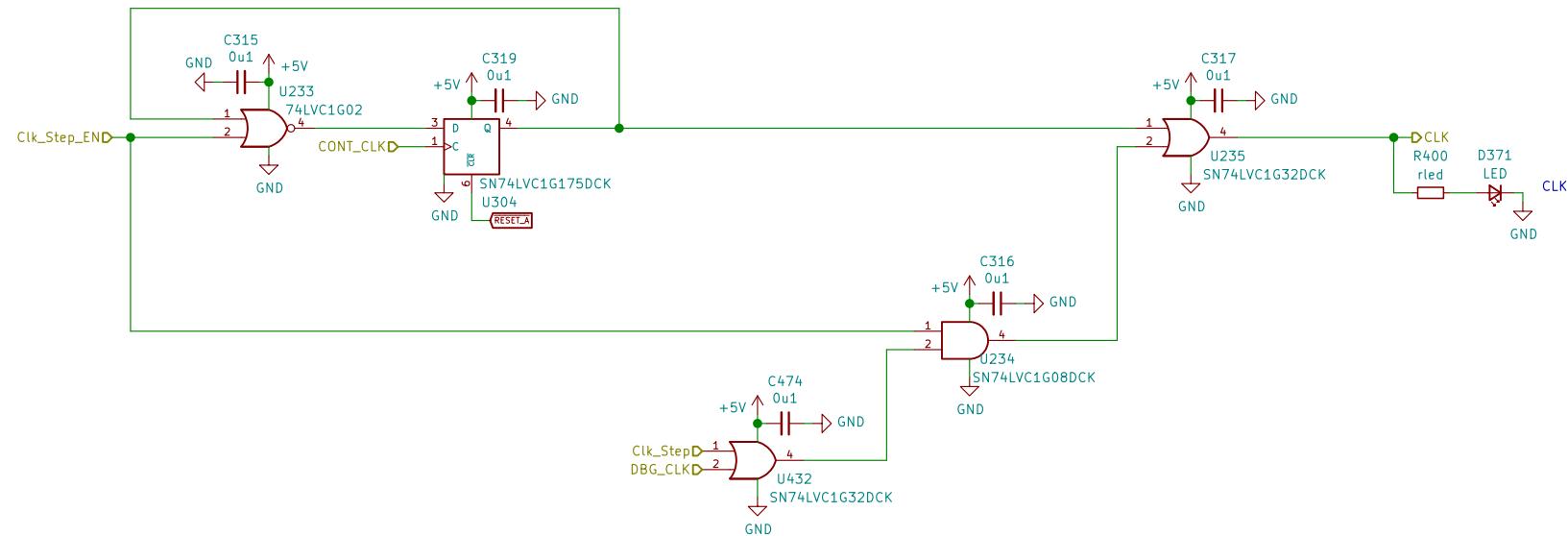
1 2 3 4 5 6

A

Disable Clock for Manual Control



Manual Control



Generates the actual system clock. Can pause the clock and allow manual 'clock stepping'. The flip flop toggles between 1 and 0 to generate the clock as long as clock stepping is disabled. Once clock stepping is enabled, it will return to 0 and stay there.

Philipp Schilk

Sheet: /Clock/Clock Step/
File: Clock_Step.sch

Title: psMCU

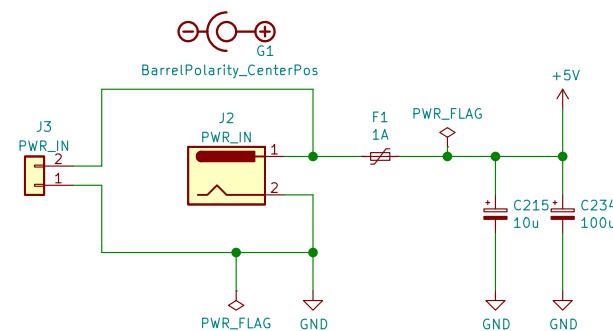
Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 102/109

1 2 3 4 5 6

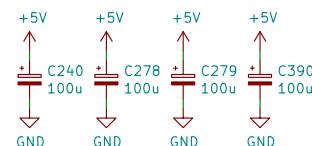
A

Power Input



Bulk Capacitance

Spread around board.



B

Mounting Holes



C

D

Power input. Also includes four M4 mounting holes.

Philipp Schilk

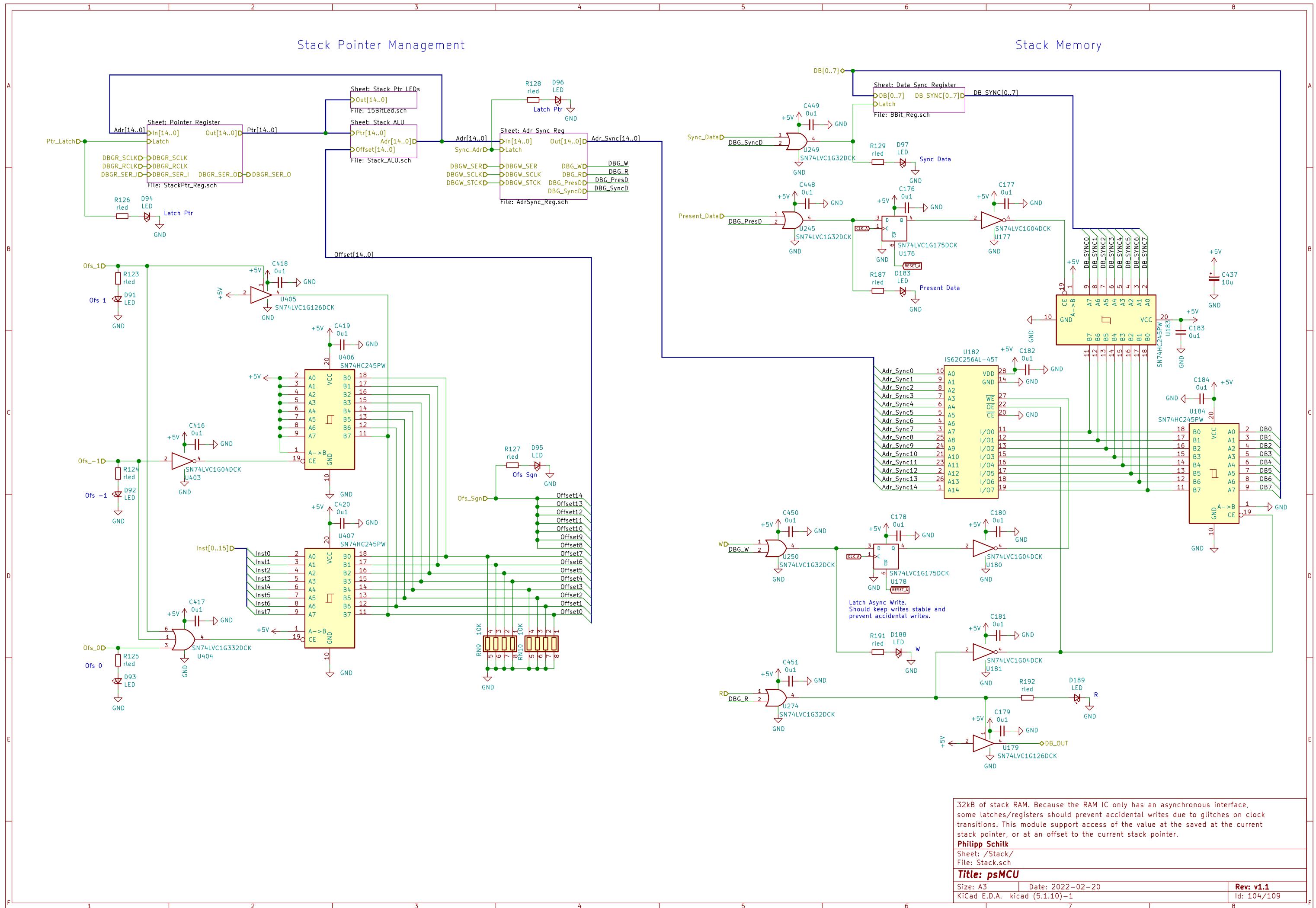
Sheet: /Power Input/
File: PowerInput.sch

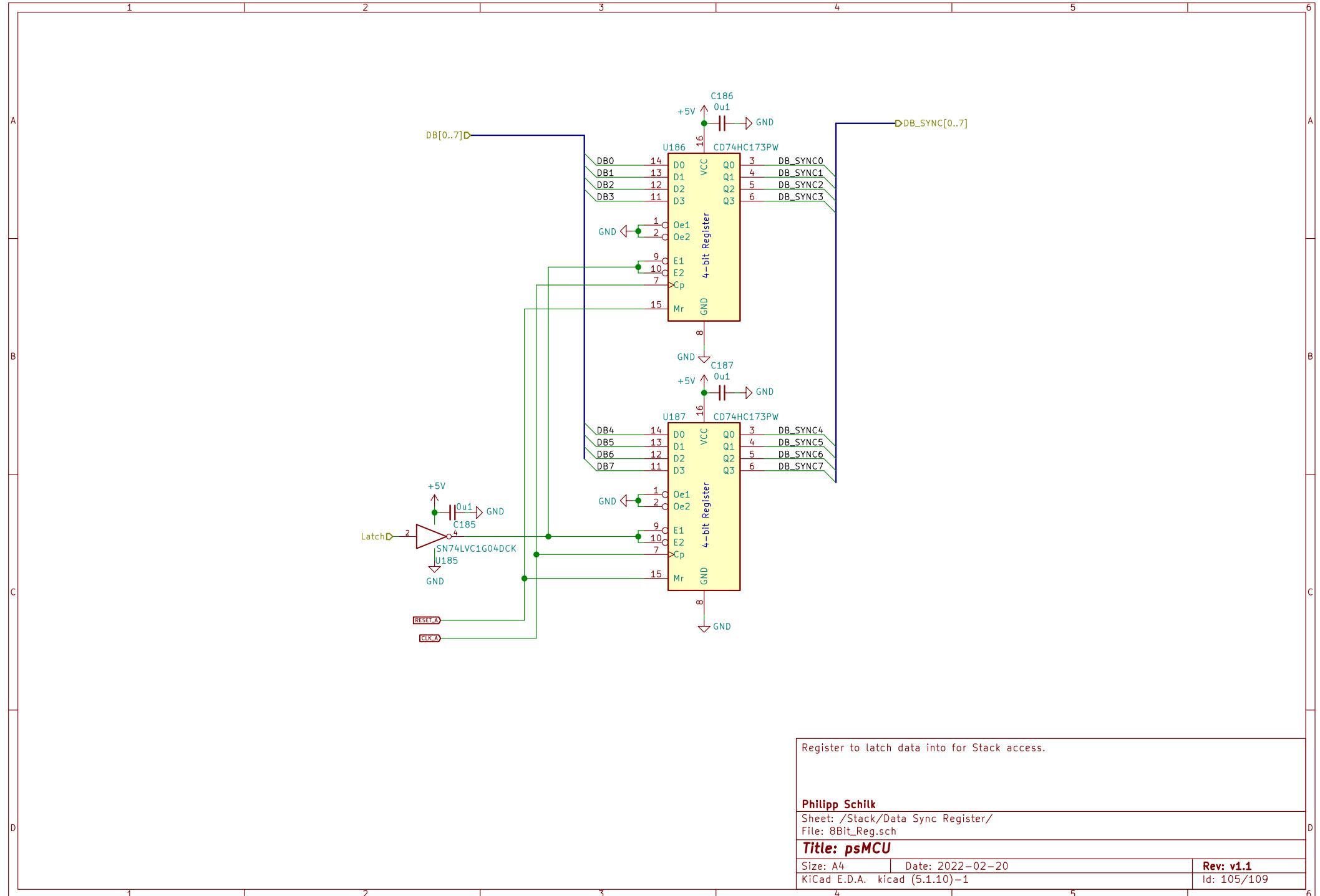
Title: psMCU

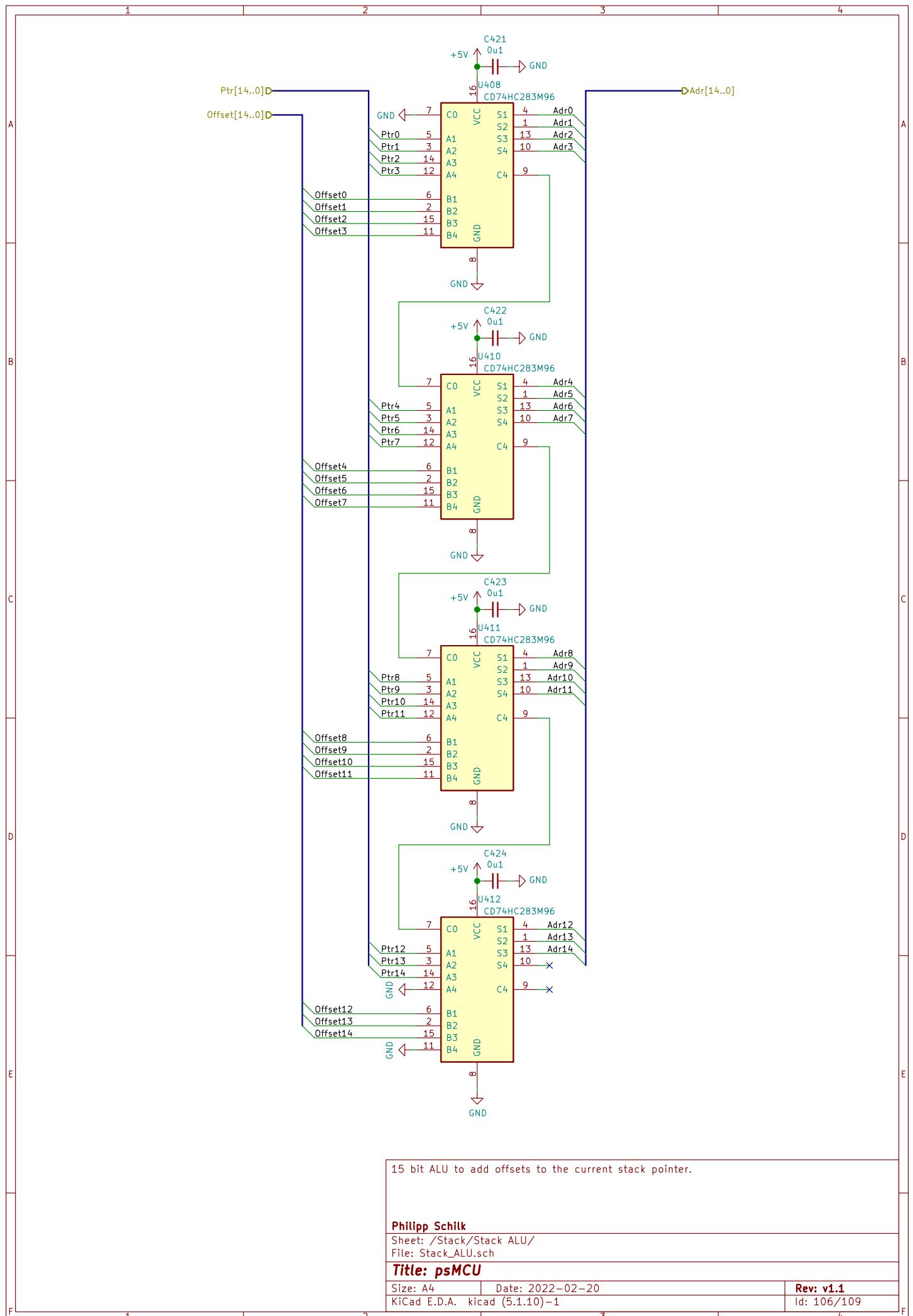
Size: A4 | Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 103/109

1 2 3 4 5 6







A

B

C

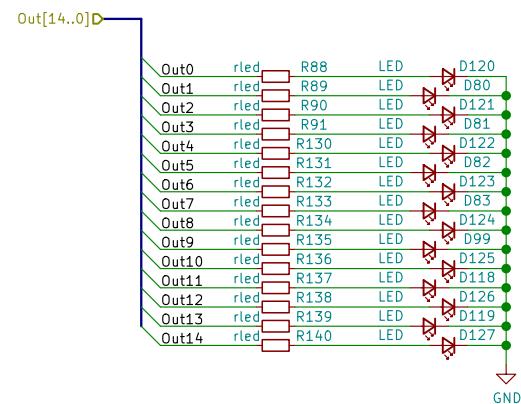
D

A

B

C

D



A 15bit binary LED display.

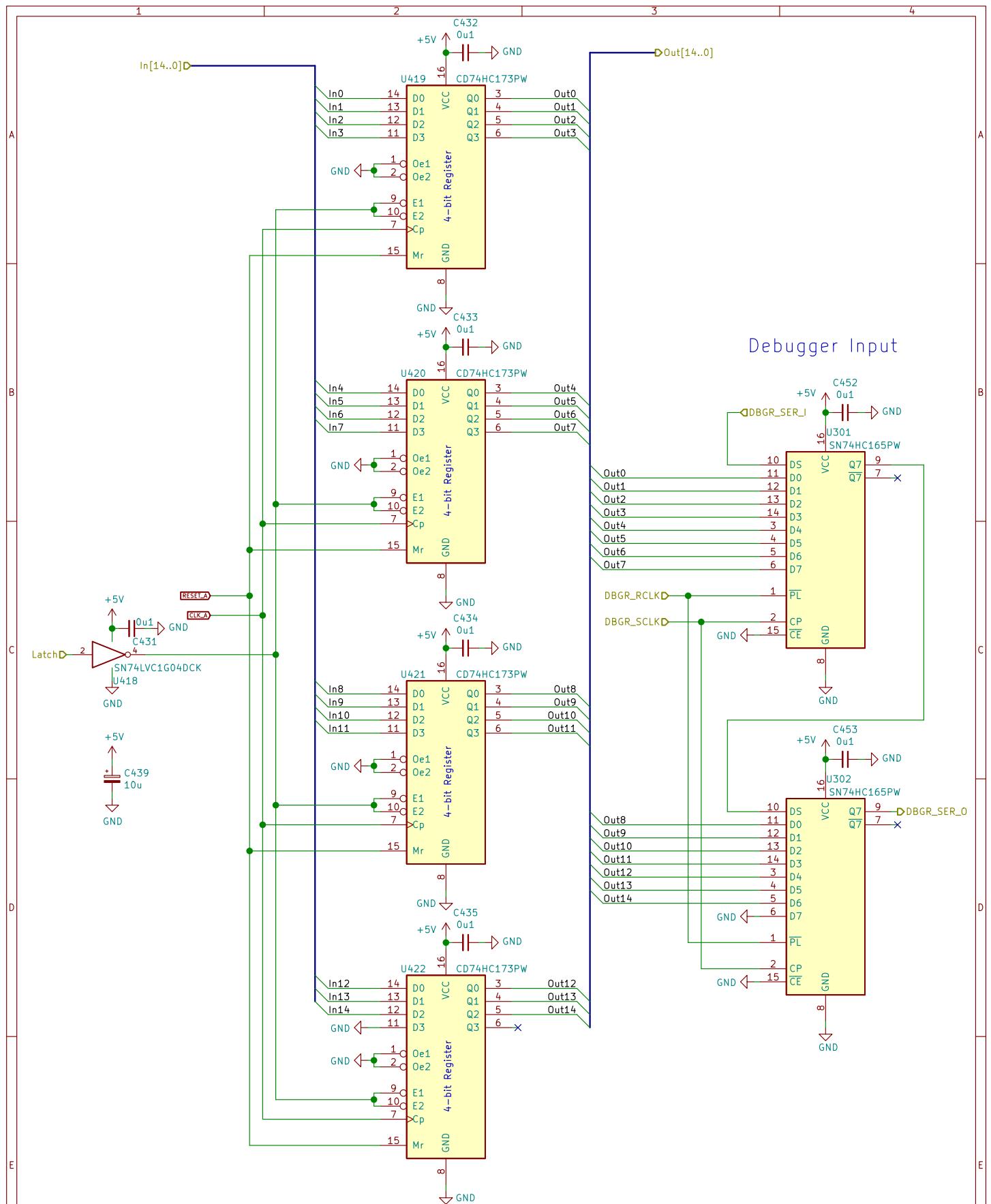
Philipp Schilk

Sheet: /Stack/Stack_Ptr LEDs/
File: 15BitLed.sch

Title: psMCU

Size: A4 Date: 2022-02-20
KiCad E.D.A. kicad (5.1.10)-1

Rev: v1.1
Id: 107/109



15 bit register.			
Philipp Schilk Sheet: /Stack/Pointer Register/ File: StackPtr_Reg.sch Title: psmcu Size: A4 Date: 2022-02-20 Rev: v1.1 KiCad E.D.A. kicad (5.1.10)-1 Id: 108/109			

