CV, OVP & OCP

File: cv-von.kicad_sch

MOSFET Loops

Monitoring, Crossover, Von

LoopIset
LoopImon

LoopIset
LoopImon

File: Monitoring.kicad_sch

File: MOSFET-Loops.kicad_sch

DAC & ADC

File: dac_adc.kicad_sch

MCU connection

File: MCU.kicad_sch

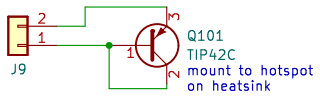
DIB connection

File: DIB.kicad_sch

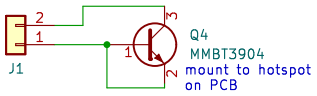
Power & References

File: shifts-refs.kicad_sch

Temp Sensor heatsink



Temp Sensor PCB

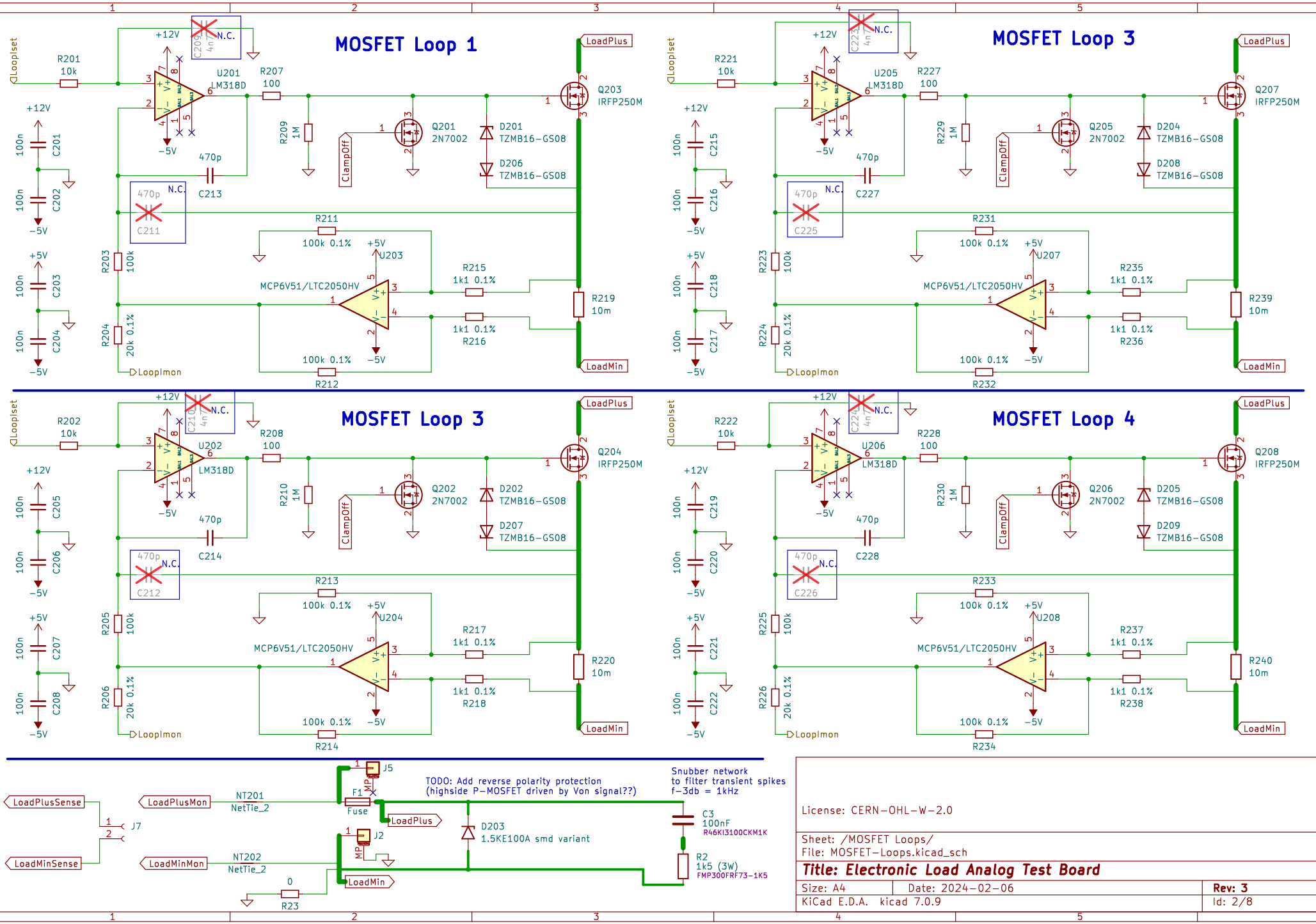


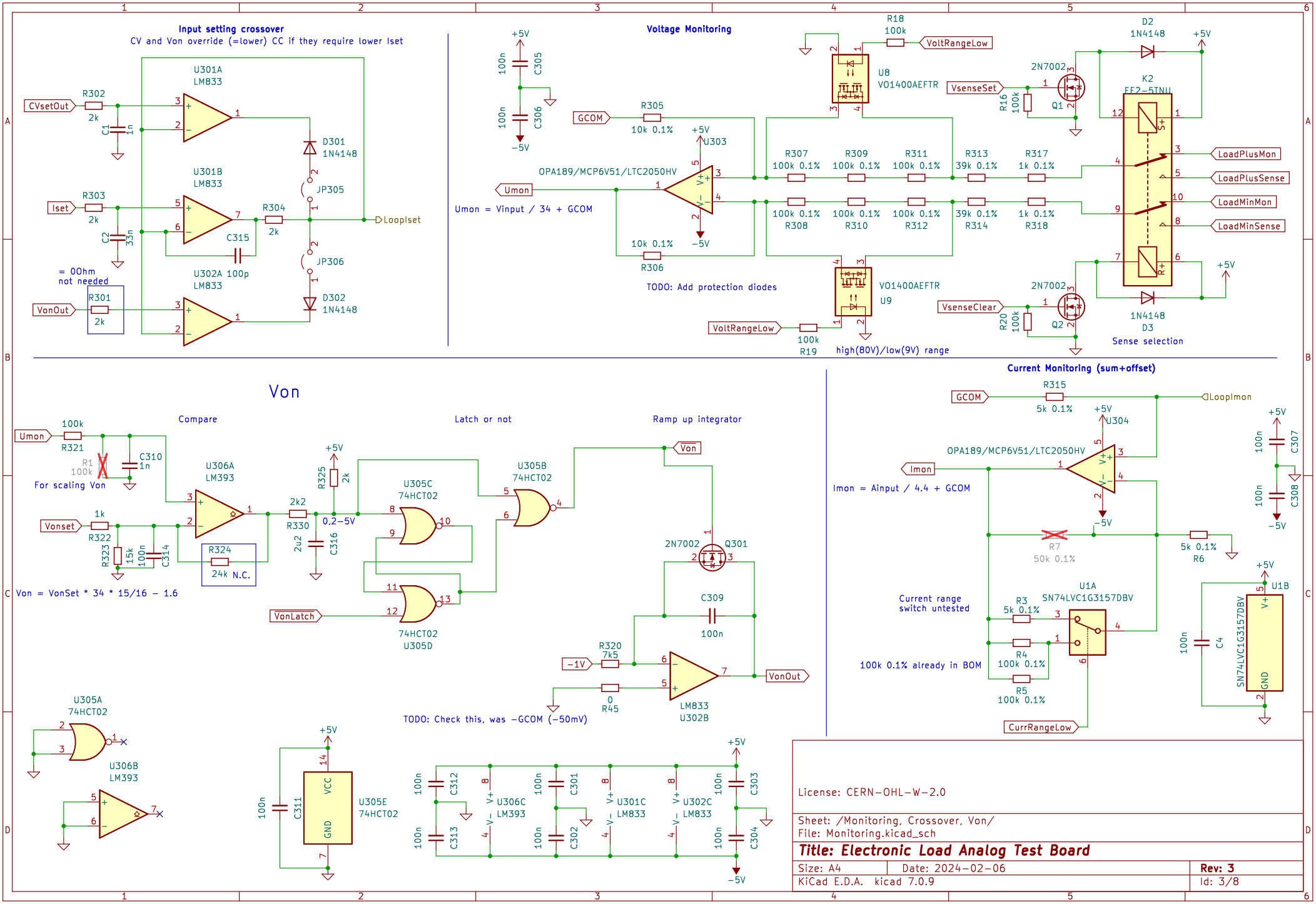
H101
MountingHole
H102
MountingHole
H103
MountingHole
H104
MountingHole

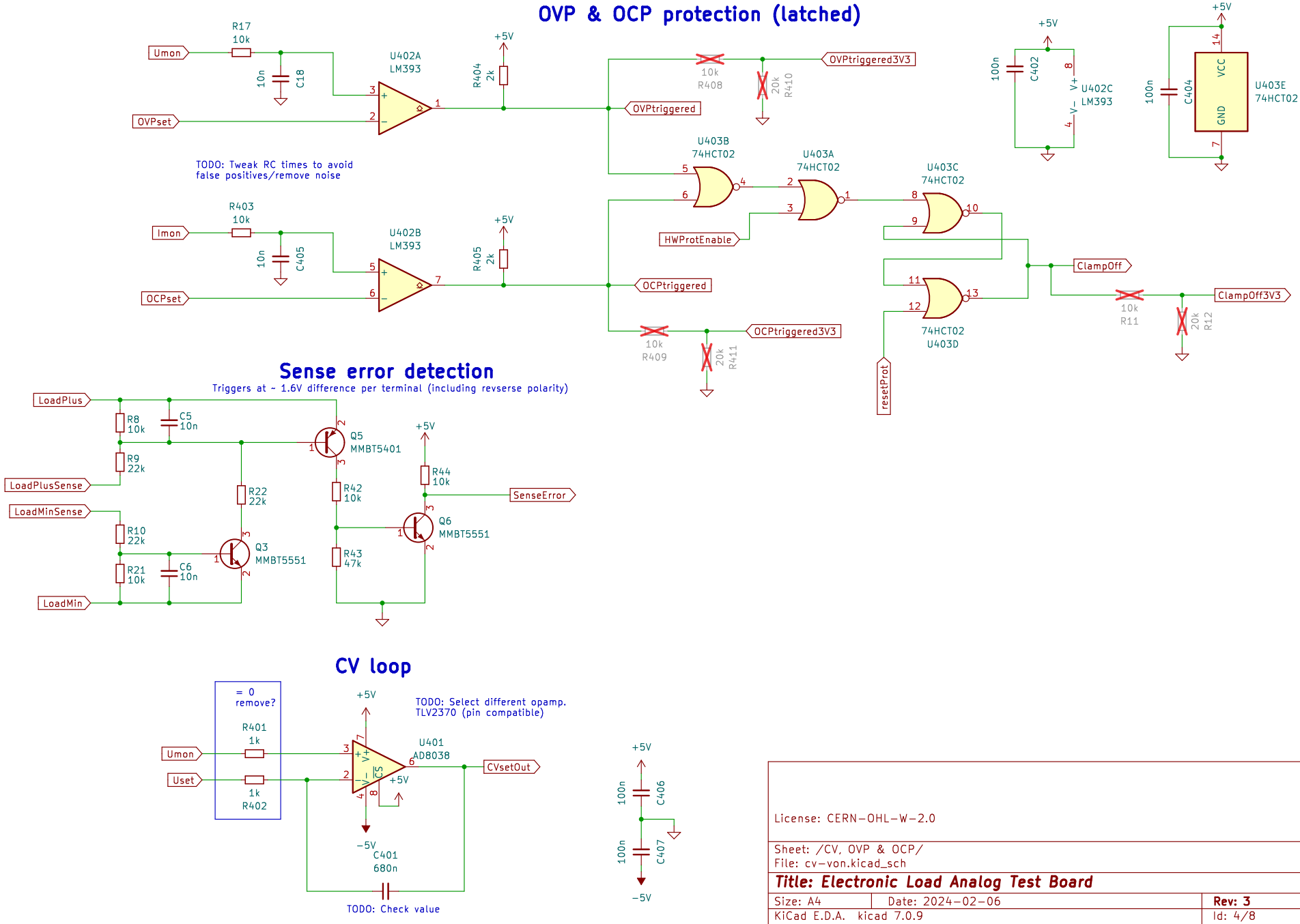
Sheet: /
File: EL-Load-Analog.kicad_sch

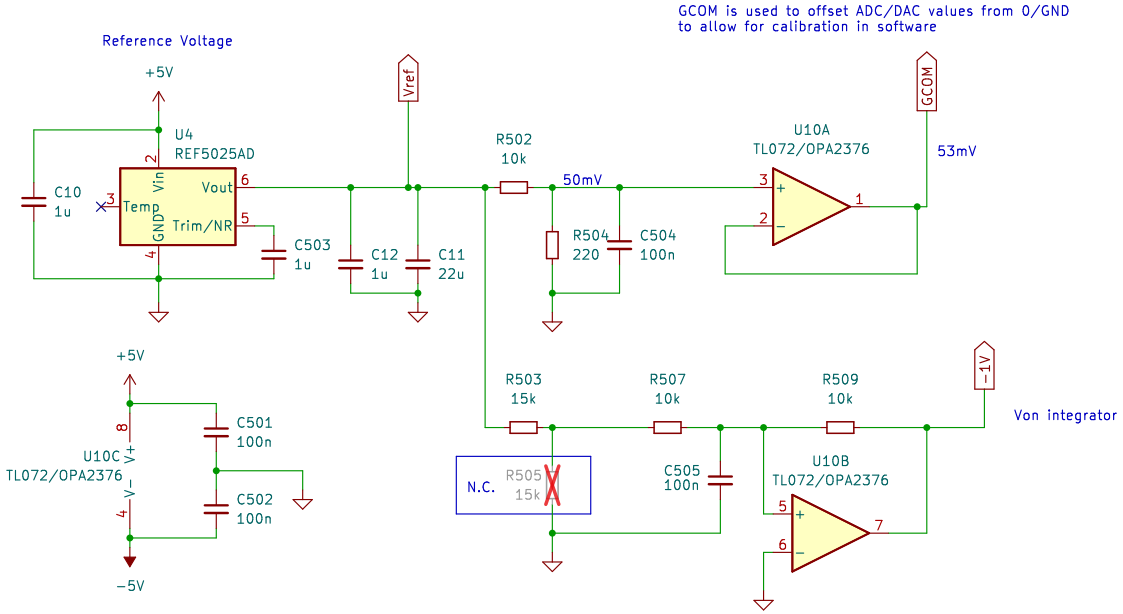
Title: Electronic Load Analog Test Board

Size: A4	Date: 2024-02-06	**Rev: 3**
KiCad E.D.A. kicad 7.0.9		Id: 1/8

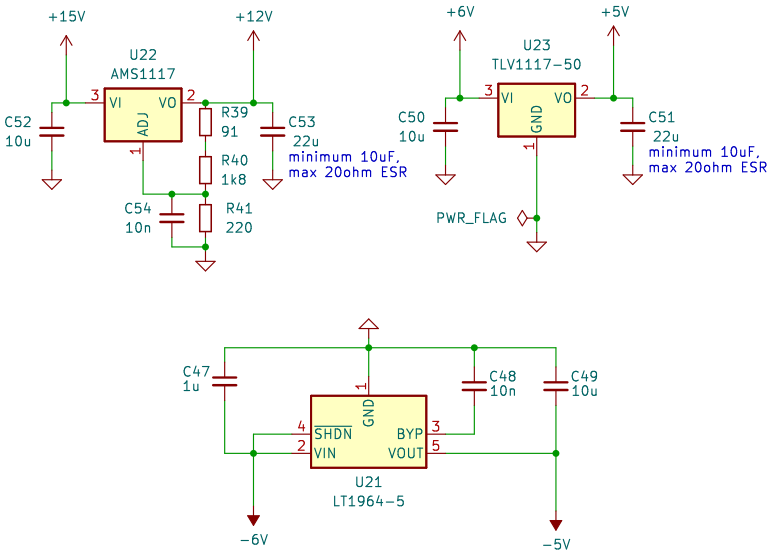

MOSFET Loop 1
MOSFET Loop 3
MOSFET Loop 3
MOSFET Loop 4
Loopiset
LoadPlus
LoadMin
LoopImon
+12V
-5V
+5V
U201 LM318D
U205 LM318D
U202 LM318D
U206 LM318D
MCP6V51/LTC2050HV
U203
U207
U204
U208
Q203 IRFP250M
Q207 IRFP250M
Q204 IRFP250M
Q208 IRFP250M
Q201 2N7002
Q205 2N7002
Q202 2N7002
Q206 2N7002
ClampOff
D201 TZMB16-GS08
D206 TZMB16-GS08
D204 TZMB16-GS08
D208 TZMB16-GS08
D202 TZMB16-GS08
D207 TZMB16-GS08
D205 TZMB16-GS08
D209 TZMB16-GS08
N.C.
470p
100k 0.1%
20k 0.1%
1k1 0.1%
100n
10m
TODO: Add reverse polarity protection
(highside P-MOSFET driven by Von signal??)
Snubber network
to filter transient spikes
f-3db = 1kHz
LoadPlusSense
LoadMinSense
LoadPlusMon
LoadMinMon
NT201
NT202
NetTie_2
Fuse
D203
1.5KE100A smd variant
C3
100nF
R46KI3100CKM1K
R2
1k5 (3W)
FMP300FRF73-1K5
R23
License: CERN-OHL-W-2.0
Sheet: /MOSFET Loops/
File: MOSFET-Loops.kicad_sch
Title: Electronic Load Analog Test Board
Size: A4
Date: 2024-02-06
Rev: 3
KiCad E.D.A. kicad 7.0.9
Id: 2/8


Input setting crossover
CV and Von override (=lower) CC if they require lower Iset
CVsetOut
R302
2k
C1
1n
U301A
LM833
U301B
LM833
Iset
R303
2k
C2
33n
R304
2k
C315
U302A 100p
LM833
= 0Ohm
not needed
VonOut
R301
2k
D301
1N4148
JP305
JP306
D302
1N4148
LoopIset
Voltage Monitoring
+5V
100n
C305
C306
−5V
GCOM
R305
10k 0.1%
U303
OPA189/MCP6V51/LTC2050HV
Umon
Umon = Vinput / 34 + GCOM
10k 0.1%
R306
−5V
R18
100k
VoltRangeLow
U8
VO1400AEFTR
R307
100k 0.1%
R309
100k 0.1%
R311
100k 0.1%
R313
39k 0.1%
R317
1k 0.1%
100k 0.1%
R308
100k 0.1%
R310
100k 0.1%
R312
39k 0.1%
R314
1k 0.1%
R318
TODO: Add protection diodes
VO1400AEFTR
U9
VoltRangeLow
100k
R19
high(80V)/low(9V) range
2N7002
Q1
VsenseSet
R16
100k
D2
1N4148
K2
FE2-5TNU
LoadPlusMon
LoadPlusSense
LoadMinMon
LoadMinSense
2N7002
Q2
VsenseClear
R20
100k
1N4148
D3
Sense selection
Von
Compare
Latch or not
Ramp up integrator
Umon
100k
R321
R1
100k
For scaling Von
C310
1n
U306A
LM393
Vonset
1k
R322
R323
15k
100n
C314
R324
24k N.C.
Von = VonSet * 34 * 15/16 − 1.6
+5V
R325
2k
2k2
R330
2u2
C316
0.2−5V
U305C
74HCT02
U305B
74HCT02
VonLatch
74HCT02
U305D
Von
2N7002
Q301
C309
100n
R320
7k5
−1V
R45
0
LM833
U302B
VonOut
TODO: Check this, was −GCOM (−50mV)
U305A
74HCT02
U306B
LM393
U305E
74HCT02
VCC
GND
100n
C311
U306C
LM393
C312
C313
U301C
LM833
C301
C302
U302C
LM833
C303
C304
Current Monitoring (sum+offset)
GCOM
R315
5k 0.1%
LoopImon
U304
OPA189/MCP6V51/LTC2050HV
Imon
Imon = Ainput / 4.4 + GCOM
R7
50k 0.1%
5k 0.1%
R6
C307
C308
Current range
switch untested
U1A
SN74LVC1G3157DBV
R3
5k 0.1%
R4
100k 0.1%
R5
100k 0.1%
100k 0.1% already in BOM
CurrRangeLow
U1B
SN74LVC1G3157DBV
C4
License: CERN−OHL−W−2.0
Sheet: /Monitoring, Crossover, Von/
File: Monitoring.kicad_sch
Title: Electronic Load Analog Test Board
Size: A4
Date: 2024−02−06
Rev: 3
KiCad E.D.A. kicad 7.0.9
Id: 3/8


OVP & OCP protection (latched)
R17
10k
Umon
10n
C18
U402A
LM393
OVPset
+5V
R404
2k
OVPtriggered
10k
R408
20k
R410
OVPtriggered3V3
TODO: Tweak RC times to avoid
false positives/remove noise
R403
10k
Imon
10n
C405
U402B
LM393
OCPset
+5V
R405
2k
OCPtriggered
10k
R409
20k
R411
OCPtriggered3V3
U403B
74HCT02
U403A
74HCT02
HWProtEnable
U403C
74HCT02
ClampOff
10k
R11
20k
R12
ClampOff3V3
74HCT02
U403D
resetProt
+5V
100n
C402
U402C
LM393
+5V
100n
C404
U403E
74HCT02
VCC
GND
Sense error detection
Triggers at ~ 1.6V difference per terminal (including revserse polarity)
LoadPlus
R8
10k
C5
10n
Q5
MMBT5401
R9
22k
LoadPlusSense
R22
22k
R42
10k
+5V
R44
10k
SenseError
LoadMinSense
R10
22k
Q3
MMBT5551
Q6
MMBT5551
R21
10k
C6
10n
R43
47k
LoadMin
CV loop
= 0
remove?
R401
1k
Umon
Uset
1k
R402
+5V
TODO: Select different opamp.
TLV2370 (pin compatible)
U401
AD8038
CVsetOut
+5V
-5V
C401
680n
TODO: Check value
+5V
100n
C406
100n
C407
-5V
License: CERN-OHL-W-2.0
Sheet: /CV, OVP & OCP/
File: cv-von.kicad_sch
Title: Electronic Load Analog Test Board
Size: A4
Date: 2024-02-06
Rev: 3
KiCad E.D.A. kicad 7.0.9
Id: 4/8

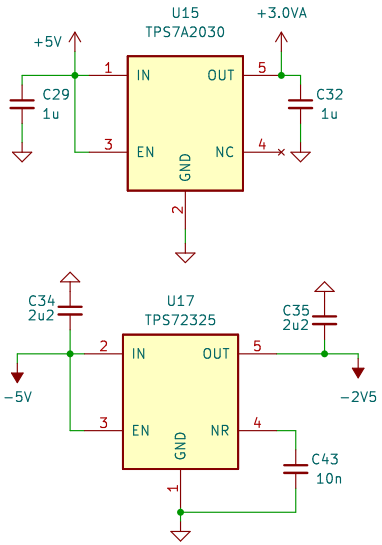


References



Regular power for analog parts.

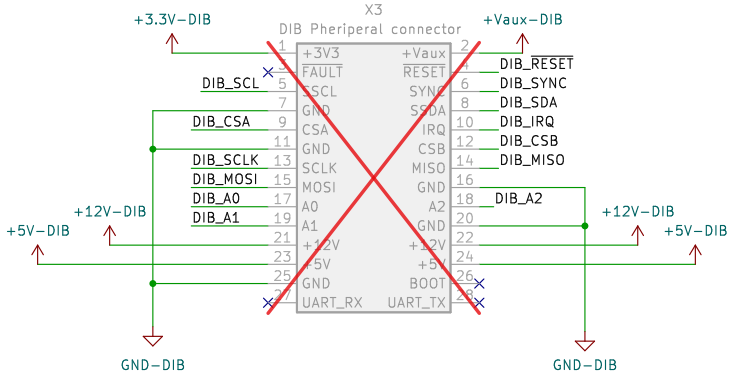
Analog low noise power

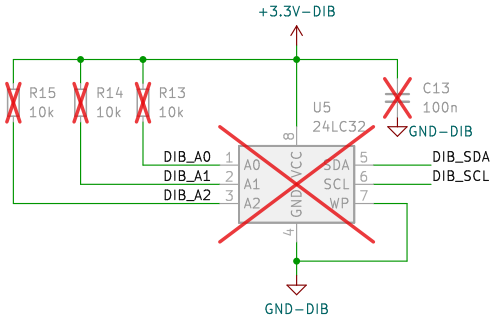


Sheet: /Power & References/
File: shifts−refs.kicad_sch

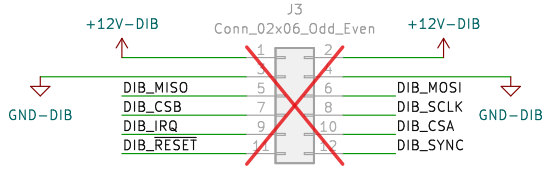
Title: Electronic Load Analog Test Board

Size: A4	Date: 2024−02−06	**Rev: 3**
KiCad E.D.A. kicad 7.0.9		Id: 5/8





Only populate for final BB3 module



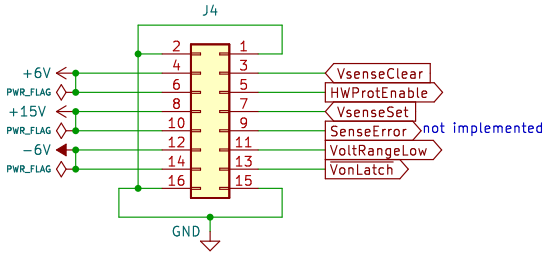
Sheet: /DIB connection/
File: DIB.kicad_sch

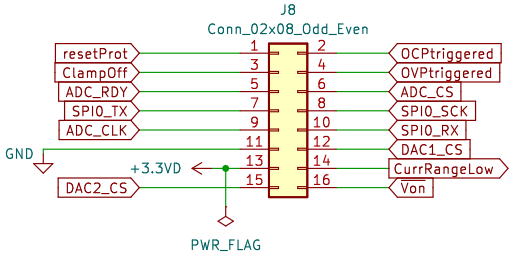
Title: Electronic Load Analog Test Board

Size: A4	Date: 2024-02-06	**Rev: 3**
KiCad E.D.A. kicad 7.0.9		Id: 6/8

Connector 1 to/from DIB:
- 2x GND (2 pins)
- SPI + CSA from DIB (4 pins)
- Reset pin from DIB (1 pin)
- CSB/Boot pin from DIB (1 pin)
- 12V power from DIB. (1-2 pins)
==== 10 PINS

Connector 2 to analog stuff.
- SPI + 3x CS from DAC+ADC (6 pins)
- I2C from GPIO/MCP23008 + Fan control. (2 pins)
- GND
==== 10 PINS

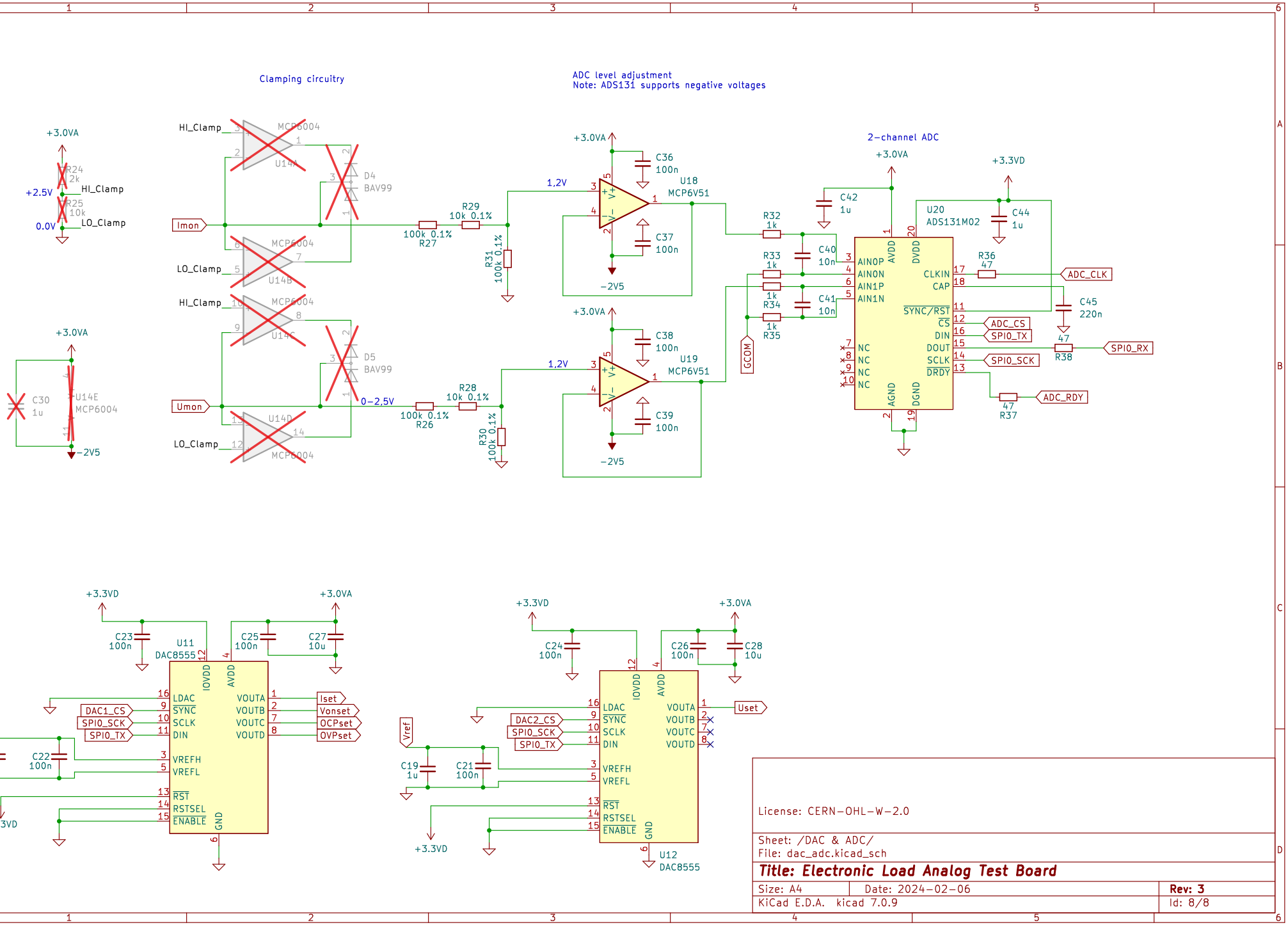




Sheet: /MCU connection/
File: MCU.kicad_sch

Title: Electronic Load Analog Test Board

Size: A4	Date: 2024-02-06	**Rev: 3**
KiCad E.D.A. kicad 7.0.9		Id: 7/8



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Sheet: /DAC & ADC/
File: dac_adc.kicad_sch

Title: Electronic Load Analog Test Board

Size: A4	Date: 2024-02-06	**Rev: 3**
KiCad E.D.A. kicad 7.0.9		Id: 8/8