CV, OVP & OCP

File: cv-von.kicad_sch

Monitoring, Crossover, Von

LoopIset
LoopImon

File: Monitoring.kicad_sch

MOSFET Loops

LoopIset
LoopImon

File: MOSFET-Loops.kicad_sch

DAC & ADC

File: dac_adc.kicad_sch

MCU connection

File: MCU.kicad_sch

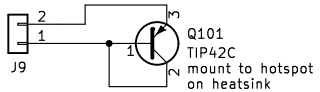
DIB connection

File: DIB.kicad_sch

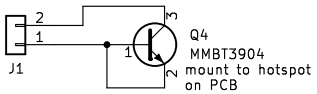
Power & References

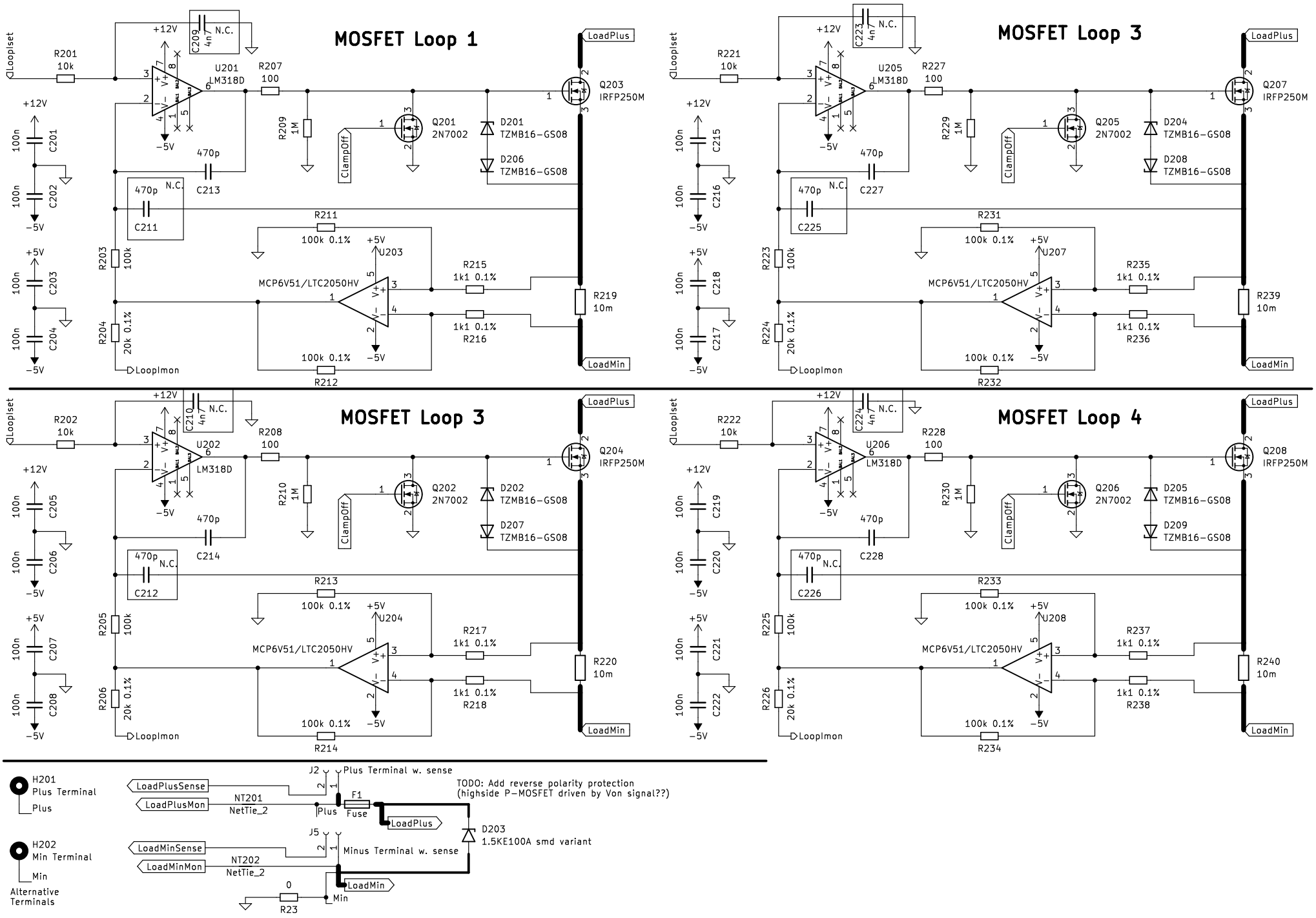
File: shifts-refs.kicad_sch

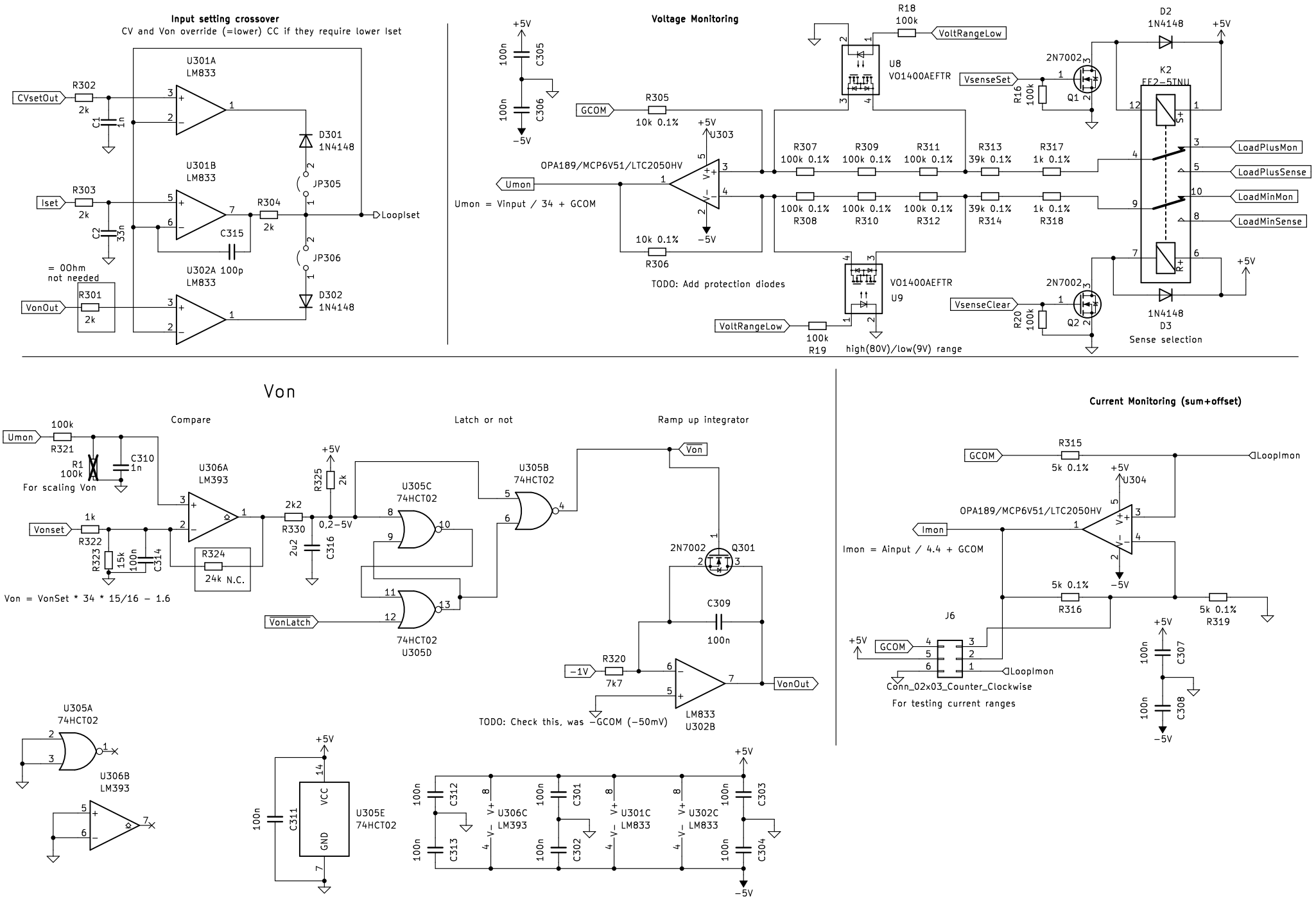
Temp Sensor heatsink

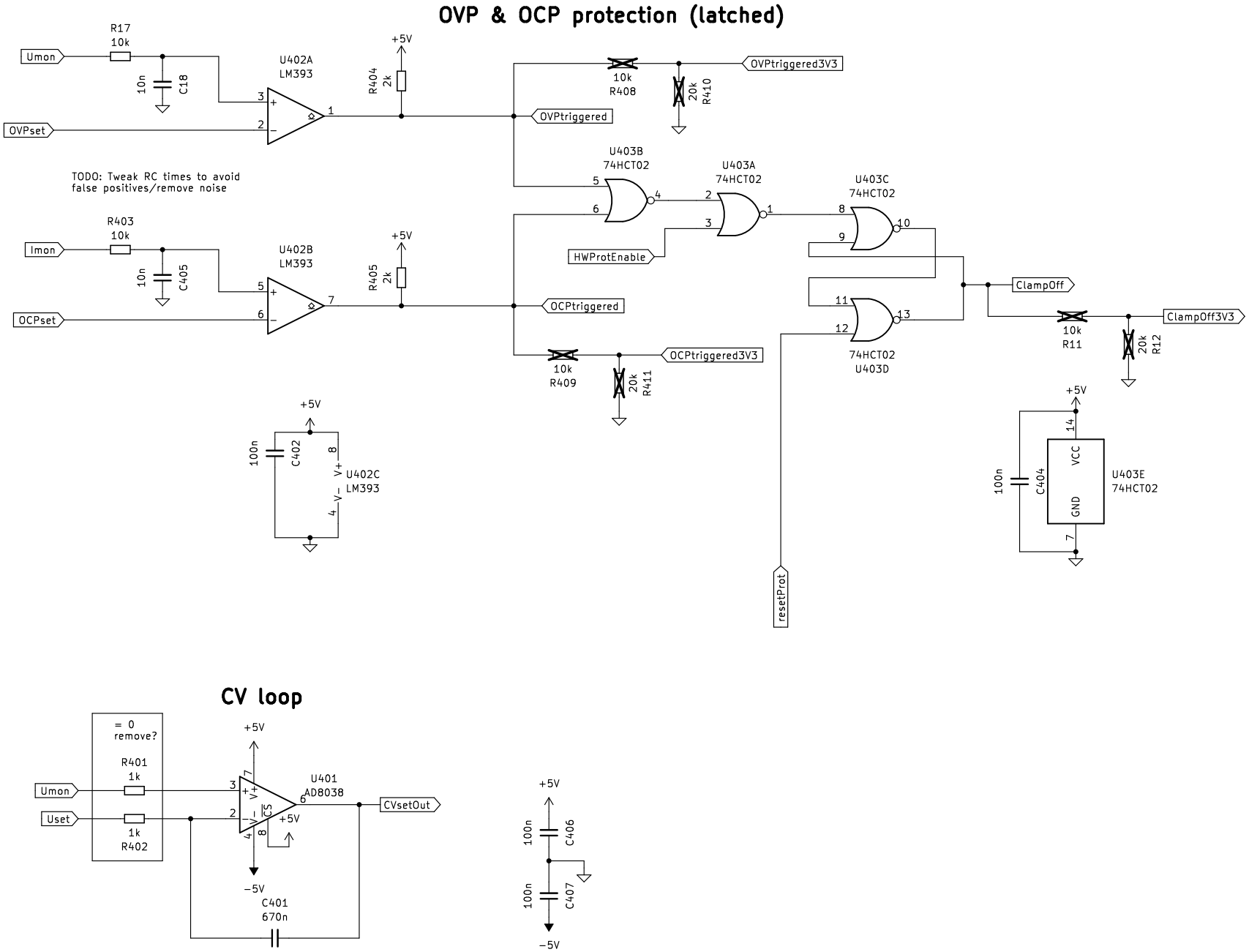


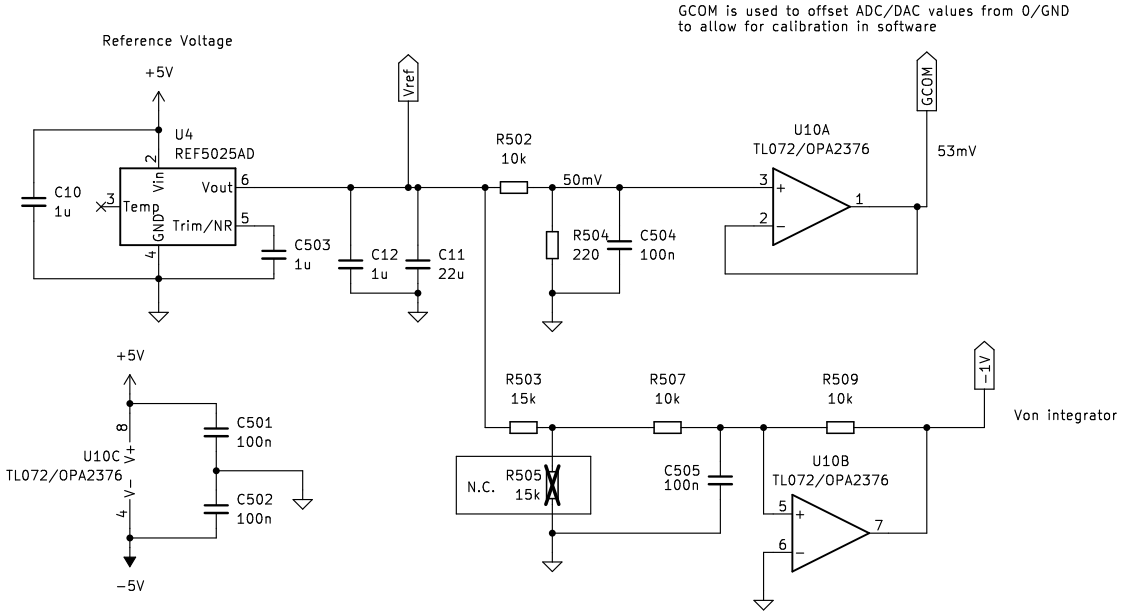
Temp Sensor PCB



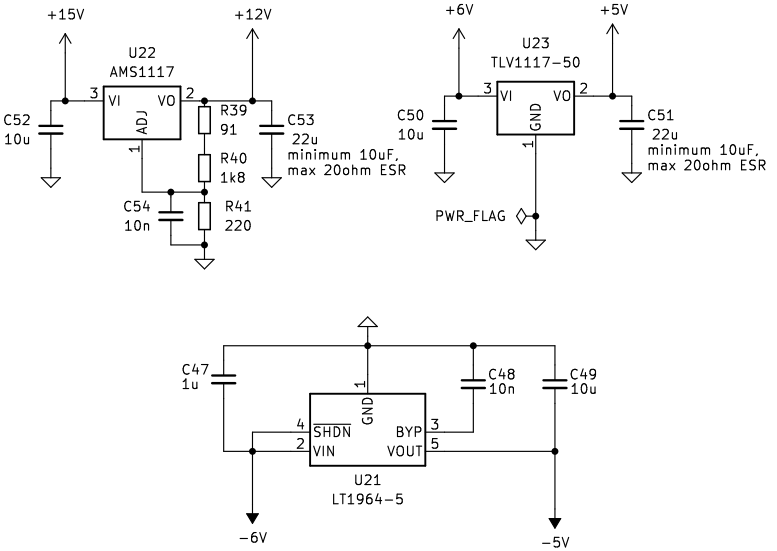

MOSFET Loop 1
MOSFET Loop 3
MOSFET Loop 3
MOSFET Loop 4
Loopiset
LoadPlus
LoadMin
LoopImon
+12V
-5V
+5V
U201 LM318D
U205 LM318D
U202 LM318D
U206 LM318D
MCP6V51/LTC2050HV
U203
U207
U204
U208
Q203 IRFP250M
Q207 IRFP250M
Q204 IRFP250M
Q208 IRFP250M
Q201 2N7002
Q205 2N7002
Q202 2N7002
Q206 2N7002
ClampOff
D201 TZMB16-GS08
D206 TZMB16-GS08
D204 TZMB16-GS08
D208 TZMB16-GS08
D202 TZMB16-GS08
D207 TZMB16-GS08
D205 TZMB16-GS08
D209 TZMB16-GS08
R201 10k
R221 10k
R202 10k
R222 10k
R207 100
R227 100
R208 100
R228 100
R209 1M
R229 1M
R210 1M
R230 1M
R211 100k 0.1%
R231 100k 0.1%
R212
R232
R213 100k 0.1%
R233 100k 0.1%
R214
R234
R203 100k
R223 100k
R205 100k
R225 100k
R204 20k 0.1%
R224 20k 0.1%
R206 20k 0.1%
R226 20k 0.1%
R215 1k1 0.1%
R235 1k1 0.1%
R217 1k1 0.1%
R237 1k1 0.1%
R216 1k1 0.1%
R236 1k1 0.1%
R218 1k1 0.1%
R238 1k1 0.1%
R219 10m
R239 10m
R220 10m
R240 10m
C209 4n7 N.C.
C223 4n7 N.C.
C210 4n7 N.C.
C224 4n7 N.C.
C213 470p
C227 470p
C214 470p
C228 470p
C211 470p N.C.
C225 470p N.C.
C212 470p N.C.
C226 470p N.C.
C201 100n
C202 100n
C203 100n
C204 100n
C215 100n
C216 100n
C218 100n
C217 100n
C205 100n
C206 100n
C207 100n
C208 100n
C219 100n
C220 100n
C221 100n
C222 100n
H201 Plus Terminal
Plus
H202 Min Terminal
Min
Alternative Terminals
LoadPlusSense
LoadPlusMon
LoadMinSense
LoadMinMon
J2 Plus Terminal w. sense
J5 Minus Terminal w. sense
NT201 NetTie_2
NT202 NetTie_2
F1 Fuse
D203 1.5KE100A smd variant
TODO: Add reverse polarity protection
(highside P-MOSFET driven by Von signal??)
0 R23


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
R301
2k
VonOut
D301
1N4148
JP305
JP306
D302
1N4148
LoopIset
Voltage Monitoring
+5V
100n
C305
100n
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
2N7002
Q2
VsenseClear
R20
100k
D2
1N4148
+5V
K2
FF2−5INU
S+
R+
LoadPlusMon
LoadPlusSense
LoadMinMon
LoadMinSense
+5V
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
0.2−5V
2u2
C316
U305C
74HCT02
U305B
74HCT02
VonLatch
74HCT02
U305D
Von
2N7002
Q301
C309
100n
R320
7k7
−1V
LM833
U302B
VonOut
TODO: Check this, was −GCOM (−50mV)
U305A
74HCT02
U306B
LM393
U305E
74HCT02
U306C
LM393
U301C
LM833
U302C
LM833
Current Monitoring (sum+offset)
GCOM
R315
5k 0.1%
LoopImon
U304
OPA189/MCP6V51/LTC2050HV
Imon
Imon = Ainput / 4.4 + GCOM
5k 0.1%
R316
−5V
5k 0.1%
R319
J6
GCOM
LoopImon
Conn_02x03_Counter_Clockwise
For testing current ranges
C307
C308


OVP & OCP protection (latched)
R17
10k
Umon
10n
C18
OVPset
U402A
LM393
+5V
R404
2k
OVPtriggered
10k
R408
OVPtriggered3V3
20k
R410
TODO: Tweak RC times to avoid
false positives/remove noise
U403B
74HCT02
U403A
74HCT02
U403C
74HCT02
HWProtEnable
R403
10k
Imon
10n
C405
OCPset
U402B
LM393
+5V
R405
2k
OCPtriggered
ClampOff
10k
R11
ClampOff3V3
20k
R12
10k
R409
OCPtriggered3V3
20k
R411
U403D
74HCT02
+5V
100n
C402
U402C
LM393
+5V
100n
C404
U403E
74HCT02
resetProt
CV loop
= 0
remove?
R401
1k
Umon
Uset
1k
R402
+5V
U401
AD8038
CVsetOut
−5V
C401
670n
+5V
100n
C406
100n
C407
−5V

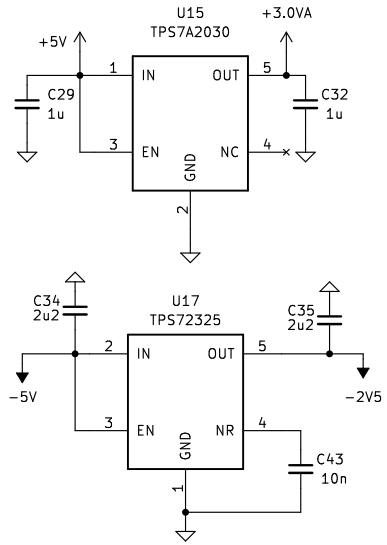


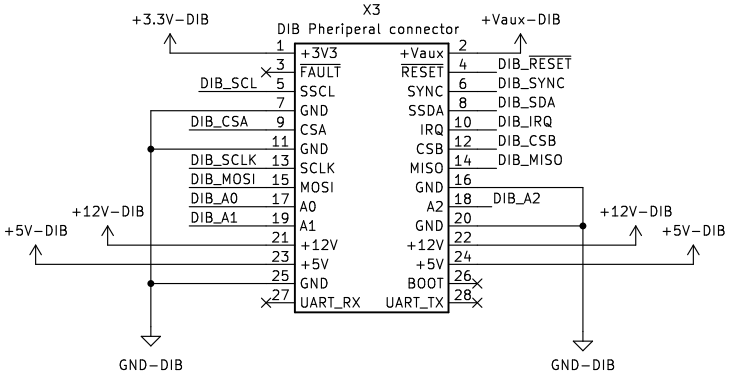
References

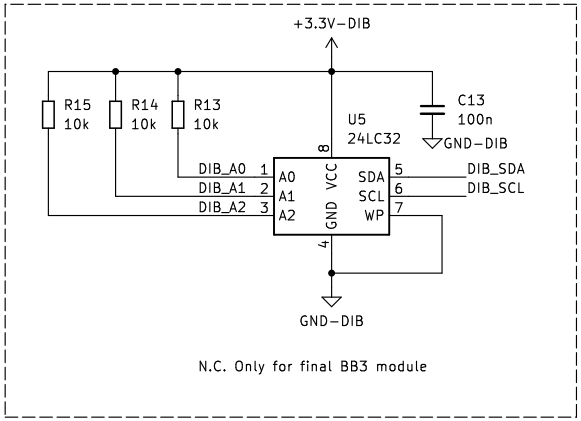


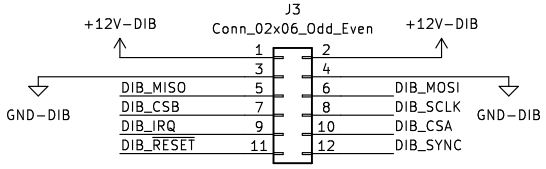
Regular power for analog parts.

Analog low noise power



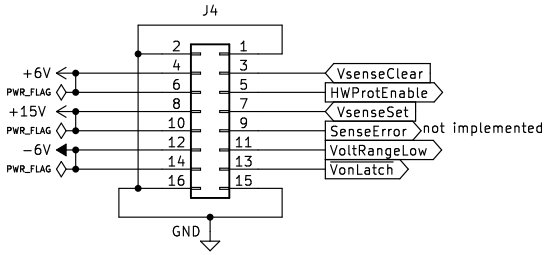

X3
DIB Pheriperal connector
+3.3V-DIB
+Vaux-DIB
+3V3
FAULT
SSCL
GND
CSA
GND
SCLK
MOSI
A0
A1
+12V
+5V
GND
UART_RX
+Vaux
RESET
SYNC
SSDA
IRQ
CSB
MISO
GND
A2
GND
+12V
+5V
BOOT
UART_TX
DIB_SCL
DIB_CSA
DIB_SCLK
DIB_MOSI
DIB_A0
DIB_A1
DIB_RESET
DIB_SYNC
DIB_SDA
DIB_IRQ
DIB_CSB
DIB_MISO
DIB_A2
+12V-DIB
+5V-DIB
GND-DIB

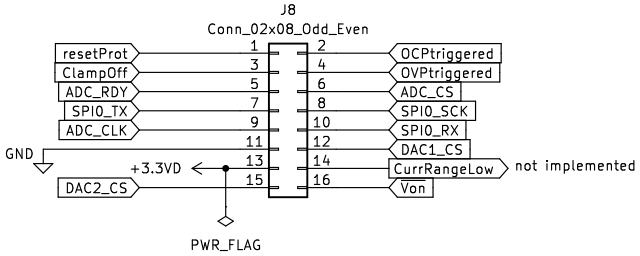

+3.3V-DIB
R15
10k
R14
10k
R13
10k
U5
24LC32
C13
100n
GND-DIB
DIB_A0
DIB_A1
DIB_A2
A0
A1
A2
VCC
GND
SDA
SCL
WP
DIB_SDA
DIB_SCL
GND-DIB
N.C. Only for final BB3 module

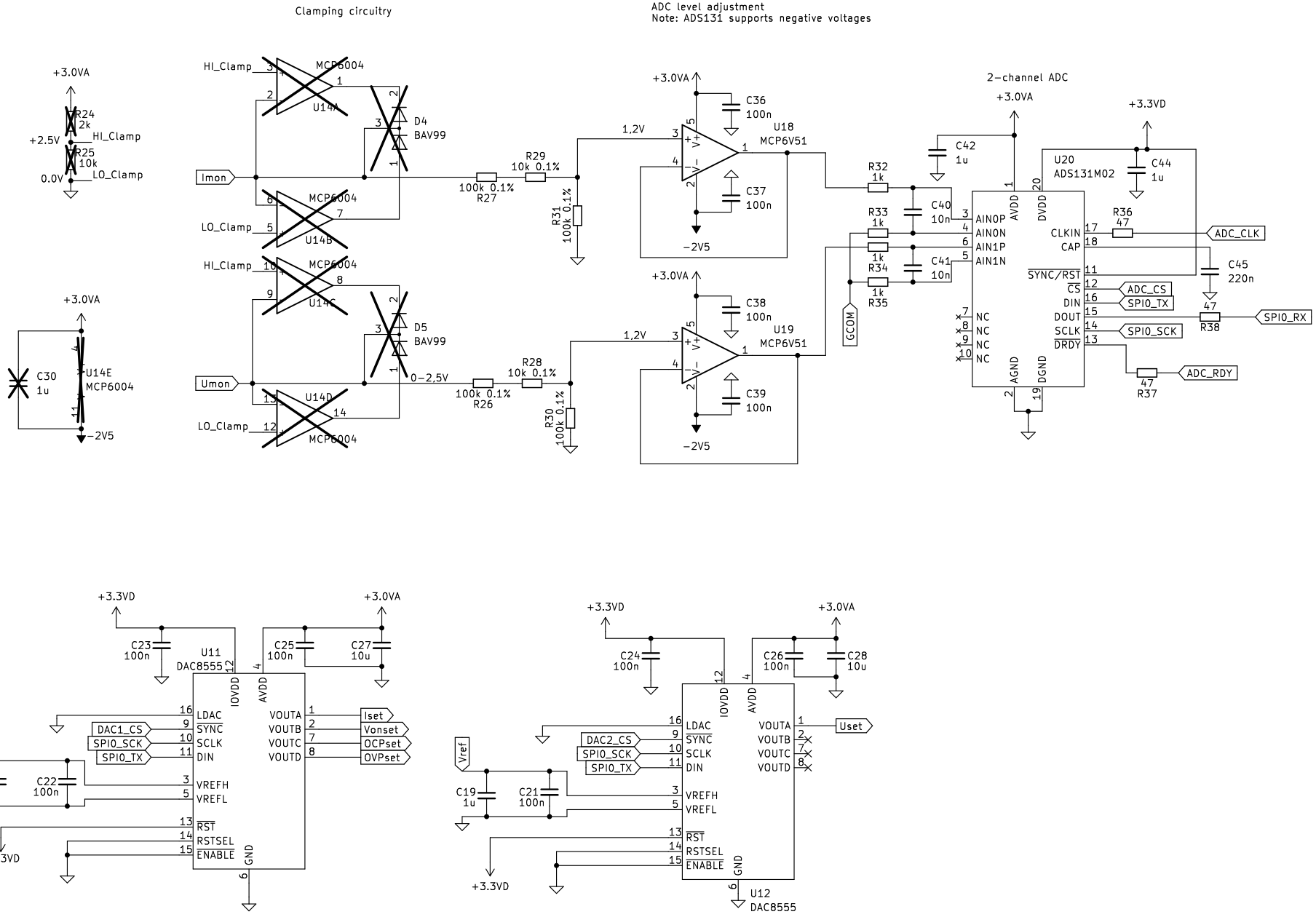

J3
Conn_02x06_Odd_Even
+12V-DIB
+12V-DIB
GND-DIB
GND-DIB
DIB_MISO
DIB_CSB
DIB_IRQ
DIB_RESET
DIB_MOSI
DIB_SCLK
DIB_CSA
DIB_SYNC

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






Clamping circuitry
ADC level adjustment
Note: ADS131 supports negative voltages
2-channel ADC
+3.0VA
+2.5V
R24
2k
HI_Clamp
R25
10k
0.0V
LO_Clamp
HI_Clamp
MCP6004
U14A
D4
BAV99
Imon
LO_Clamp
U14B
R29
10k 0.1%
100k 0.1%
R27
R31
100k 0.1%
1,2V
U18
MCP6V51
C36
100n
C37
100n
-2V5
C30
1u
U14E
MCP6004
-2V5
HI_Clamp
U14C
D5
BAV99
Umon
0-2,5V
U14D
LO_Clamp
MCP6004
R28
10k 0.1%
100k 0.1%
R26
R30
100k 0.1%
1,2V
U19
MCP6V51
C38
100n
C39
100n
-2V5
R32
1k
R33
1k
R34
1k
R35
1k
C42
1u
C40
10n
C41
10n
GCOM
+3.3VD
C44
1u
U20
ADS131M02
AINOP
AIN0N
AIN1P
AIN1N
AVDD
DVDD
CLKIN
CAP
SYNC/RST
CS
DIN
DOUT
SCLK
DRDY
NC
AGND
DGND
R36
47
C45
220n
47
R38
47
R37
ADC_CLK
ADC_CS
SPI0_TX
SPI0_RX
SPI0_SCK
ADC_RDY
+3.3VD
+3.0VA
C23
100n
U11
DAC8555
IOVDD
AVDD
C25
100n
C27
10u
LDAC
SYNC
SCLK
DIN
VOUTA
VOUTB
VOUTC
VOUTD
Iset
Vonset
OCPset
OVPset
DAC1_CS
SPI0_SCK
SPI0_TX
Vref
C20
1u
C22
100n
VREFH
VREFL
RST
RSTSEL
ENABLE
GND
+3.3VD
+3.3VD
+3.0VA
C24
100n
C26
100n
C28
10u
U12
DAC8555
DAC2_CS
SPI0_SCK
SPI0_TX
Uset
Vref
C19
1u
C21
100n
+3.3VD