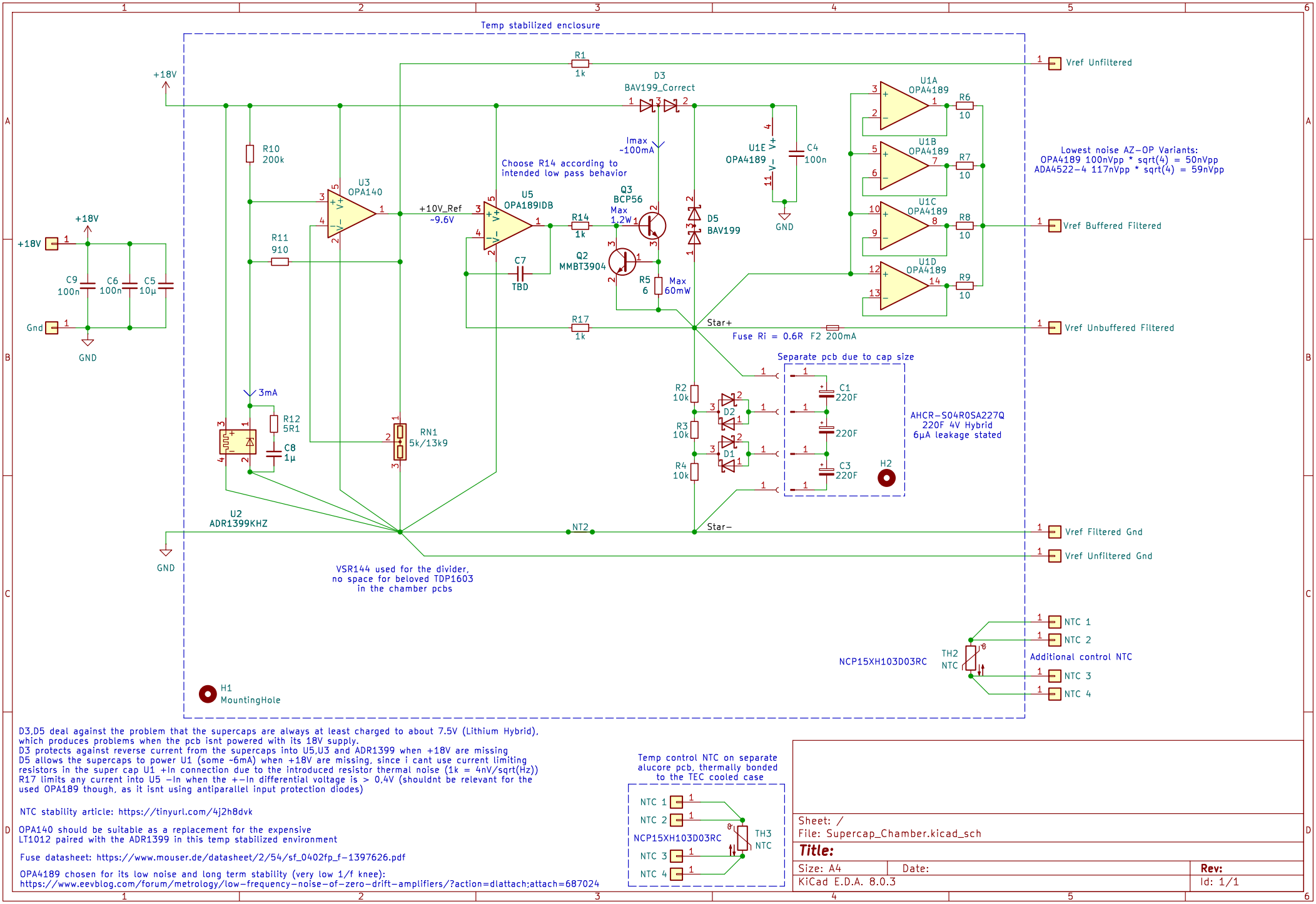
Temp stabilized enclosure
+18V
R1
1k
D3
BAV199_Correct
Vref Unfiltered
R10
200k
U3
OPA140
+10V_Ref
~9.6V
Imax
~100mA
Choose R14 according to
intended low pass behavior
U5
OPA189IDB
R14
1k
Q3
BCP56
Max
1.2W
D5
BAV199
U1E
OPA4189
C4
100n
GND
U1A
OPA4189
R6
10
U1B
OPA4189
R7
10
U1C
OPA4189
R8
10
U1D
OPA4189
R9
10
Lowest noise AZ-OP Variants:
OPA4189 100nVpp * sqrt(4) = 50nVpp
ADA4522-4 117nVpp * sqrt(4) = 59nVpp
Vref Buffered Filtered
+18V
C9
100n
C6
100n
C5
10µ
Gnd
GND
R11
910
C7
TBD
Q2
MMBT3904
R5
6
Max
60mW
R17
1k
Star+
Fuse Ri = 0.6R F2 200mA
Vref Unbuffered Filtered
Separate pcb due to cap size
3mA
R12
5R1
C8
1µ
RN1
5k/13k9
R2
10k
R3
10k
R4
10k
D2
D1
C1
220F
220F
C3
220F
H2
AHCR-S04R0SA227Q
220F 4V Hybrid
6µA leakage stated
U2
ADR1399KHZ
NT2
Star-
Vref Filtered Gnd
Vref Unfiltered Gnd
GND
VSR144 used for the divider,
no space for beloved TDP1603
in the chamber pcbs
NTC 1
NTC 2
Additional control NTC
NTC 3
NTC 4
NCP15XH103D03RC
TH2
NTC
H1
MountingHole
D3,D5 deal against the problem that the supercaps are always at least charged to about 7.5V (Lithium Hybrid),
which produces problems when the pcb isnt powered with its 18V supply.
D3 protects against reverse current from the supercaps into U5,U3 and ADR1399 when +18V are missing
D5 allows the supercaps to power U1 (some ~6mA) when +18V are missing, since i cant use current limiting
resistors in the super cap U1 +In connection due to the introduced resistor thermal noise (1k = 4nV/sqrt(Hz))
R17 limits any current into U5 -In when the +-In differential voltage is > 0,4V (shouldnt be relevant for the
used OPA189 though, as it isnt using antiparallel input protection diodes)
NTC stability article: https://tinyurl.com/4j2h8dvk
OPA140 should be suitable as a replacement for the expensive
LT1012 paired with the ADR1399 in this temp stabilized environment
Fuse datasheet: https://www.mouser.de/datasheet/2/54/sf_0402fp_f-1397626.pdf
OPA4189 chosen for its low noise and long term stability (very low 1/f knee):
https://www.eevblog.com/forum/metrology/low-frequency-noise-of-zero-drift-amplifiers/?action=dlattach;attach=687024
Temp control NTC on separate
alucore pcb, thermally bonded
to the TEC cooled case
NTC 1
NTC 2
NCP15XH103D03RC
TH3
NTC
NTC 3
NTC 4
Sheet: /
File: Supercap_Chamber.kicad_sch
Title:
Size: A4
Date:
Rev:
KiCad E.D.A. 8.0.3
Id: 1/1