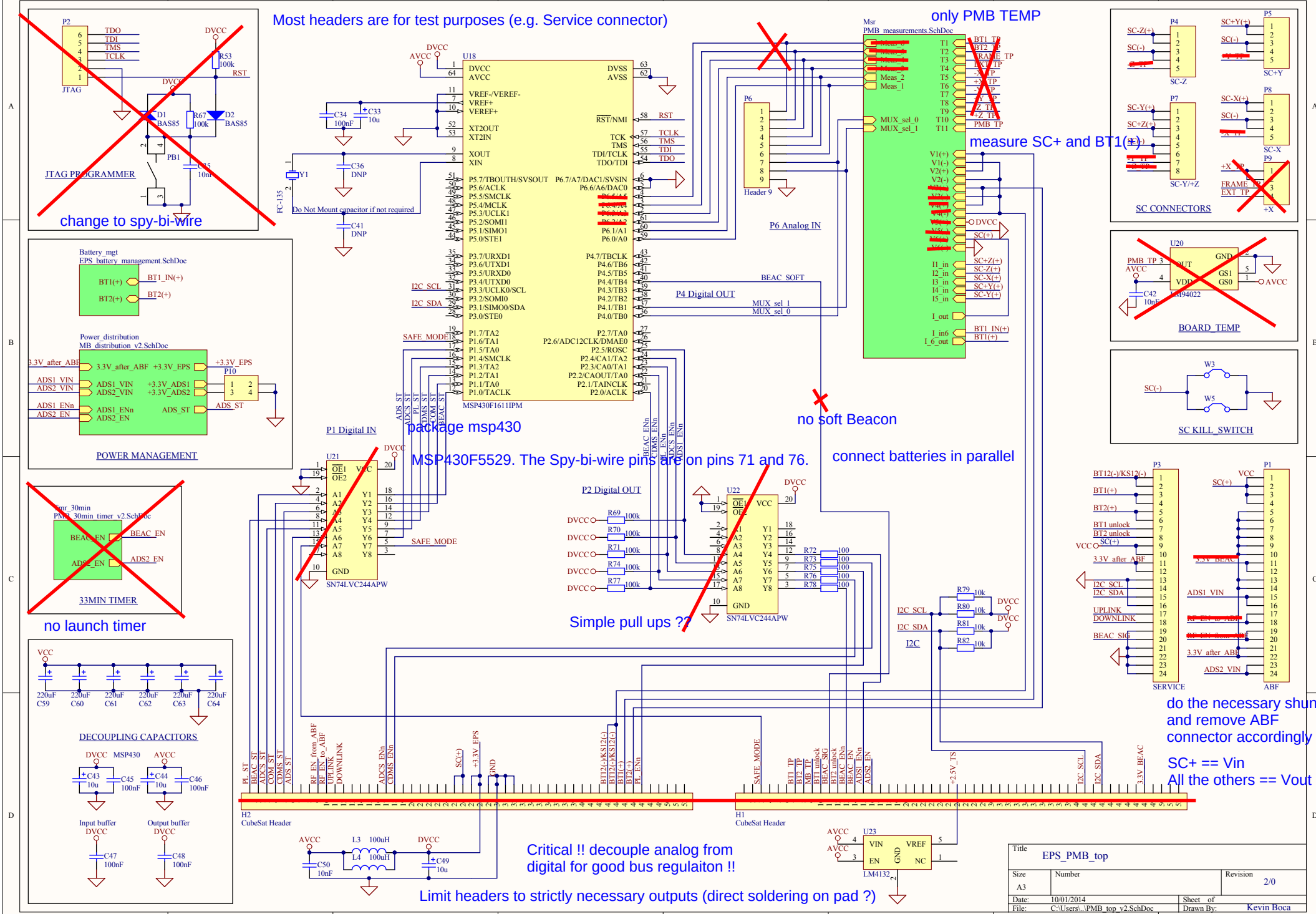
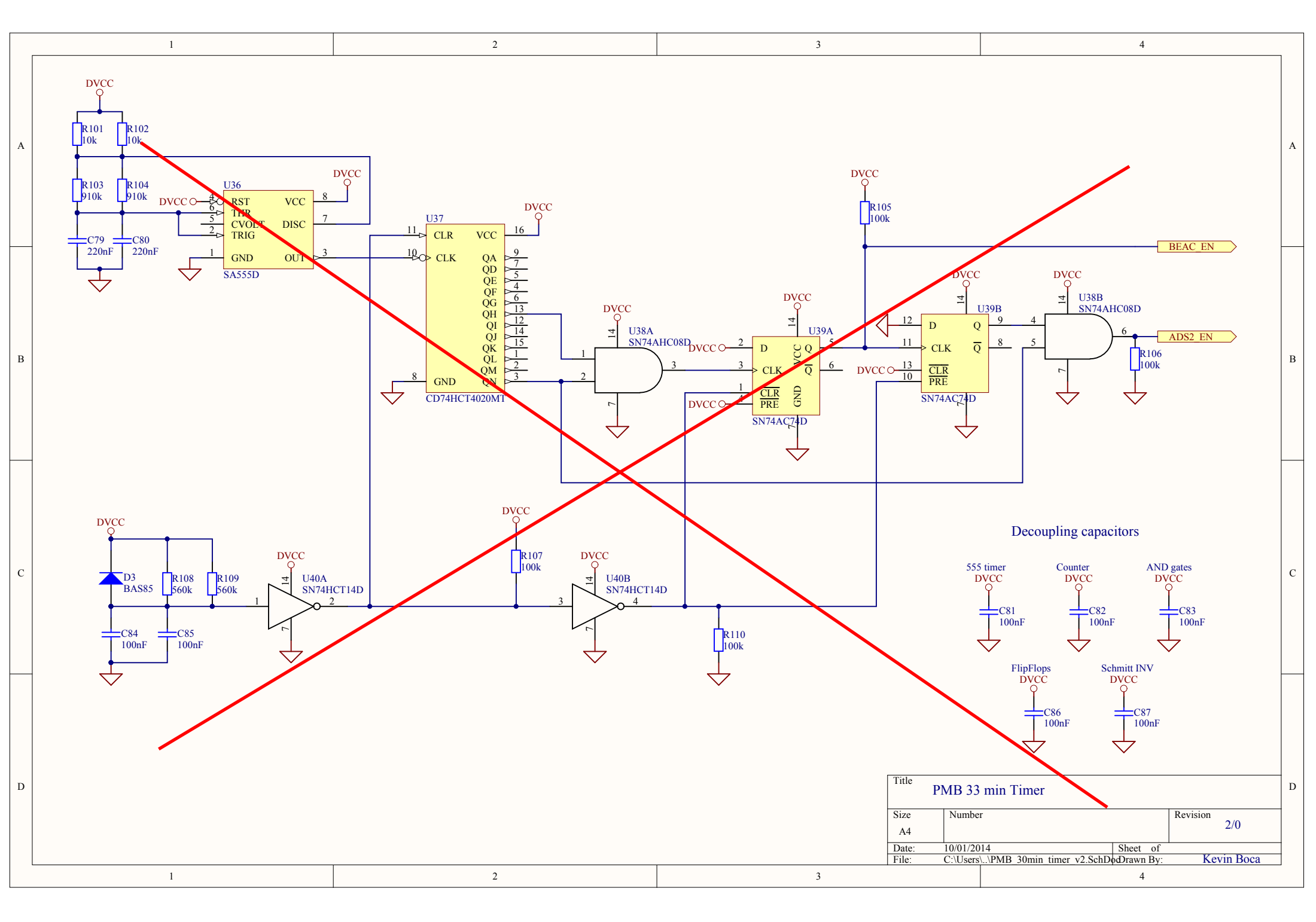
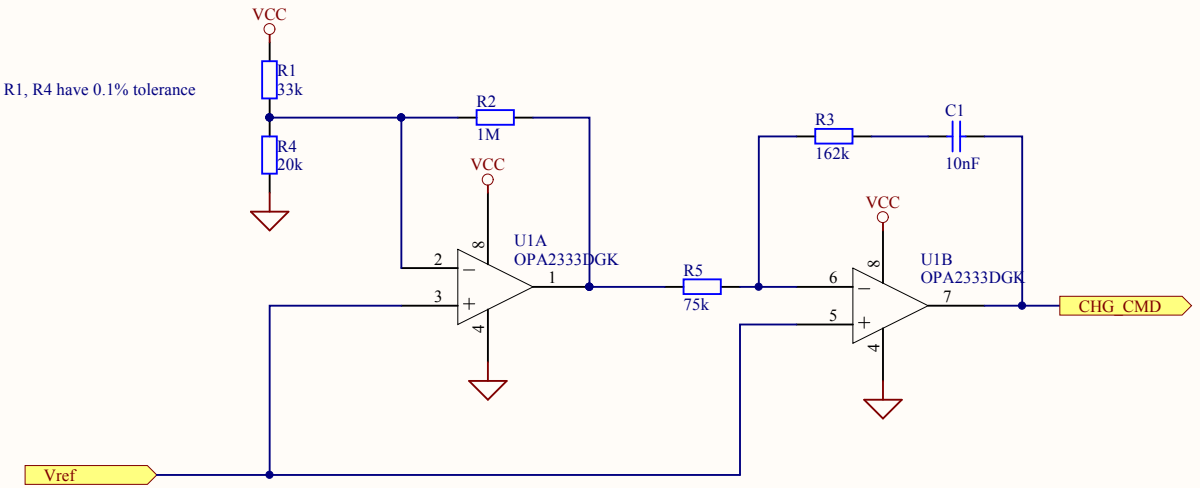
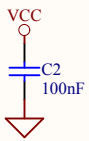

Most headers are for test purposes (e.g. Service connector)
only PMB TEMP
JTAG PROGRAMMER
change to spy-bi-wire
Battery_mgt
EPS_battery_management.SchDoc
Power_distribution
MB_distribution_v2.SchDoc
POWER MANAGEMENT
33MIN TIMER
no launch timer
DECOUPLING CAPACITORS
MSP430F16111PM
package msp430
MSP430F5529. The Spy-bi-wire pins are on pins 71 and 76.
P1 Digital IN
P2 Digital OUT
P4 Digital OUT
P6 Analog IN
SN74LVC244APW
Simple pull ups ??
I2C
measure SC+ and BT1(+)
SC CONNECTORS
BOARD_TEMP
SC KILL_SWITCH
no soft Beacon
connect batteries in parallel
do the necessary shunts
and remove ABF
connector accordingly
SC+ == Vin
All the others == Vout
H2
CubeSat Header
H1
CubeSat Header
Critical !! decouple analog from
digital for good bus regulaiton !!
Limit headers to strictly necessary outputs (direct soldering on pad ?)
Title
EPS_PMB_top
Size
A3
Number
Revision
2/0
Date:
10/01/2014
File:
C:\Users\...\PMB_top_v2.SchDoc
Sheet of
Drawn By:
Kevin Boca


DVCC
R101 10k
R102 10k
R103 910k
R104 910k
C79 220nF
C80 220nF
U36
RST
THR
CVOLT
TRIG
GND
VCC
DISC
OUT
SA555D
U37
CLR
CLK
GND
VCC
QA
QD
QE
QF
QG
QH
QI
QJ
QK
QL
QM
QN
CD74HCT4020MT
U38A
SN74AHC08D
U39A
D
CLK
CLR
PRE
Q
SN74AC74D
R105 100k
BEAC_EN
U39B
U38B
ADS2_EN
R106 100k
D3 BAS85
R108 560k
R109 560k
C84 100nF
C85 100nF
U40A
SN74HCT14D
R107 100k
U40B
R110 100k
Decoupling capacitors
555 timer
Counter
AND gates
C81 100nF
C82 100nF
C83 100nF
FlipFlops
Schmitt INV
C86 100nF
C87 100nF
Title
PMB 33 min Timer
Size
A4
Number
Revision
2/0
Date: 10/01/2014
Sheet of
File: C:\Users\..\PMB_30min_timer_v2.SchDoc
Drawn By: Kevin Boca




Done

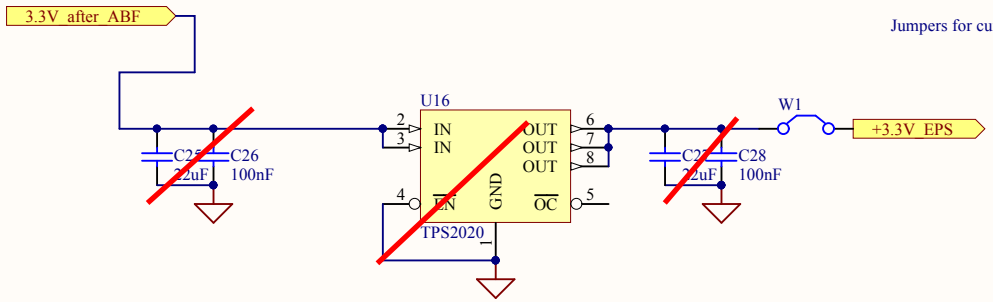
Decoupling capacitors




provides a command for the charge // discharge of the batteries

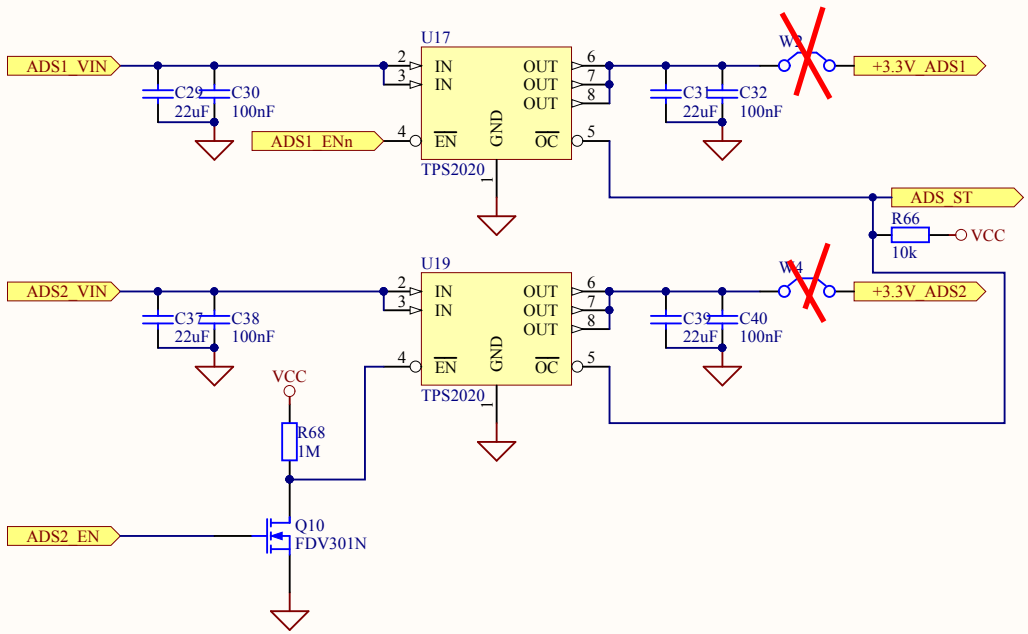
| | | |
|---|---|---|
| Title: MB_bus_regulation | | |
| Size: A4 | Number: | Revision: 1/0 |
| Date: 10/01/2014 | | Sheet of |
| File: C:\Users\..\MB_bus_regulation.SchDoc | | Drawn By: Kevin Boca |

Jumpers for current measures in the prototype




Connect directly for components and space economy

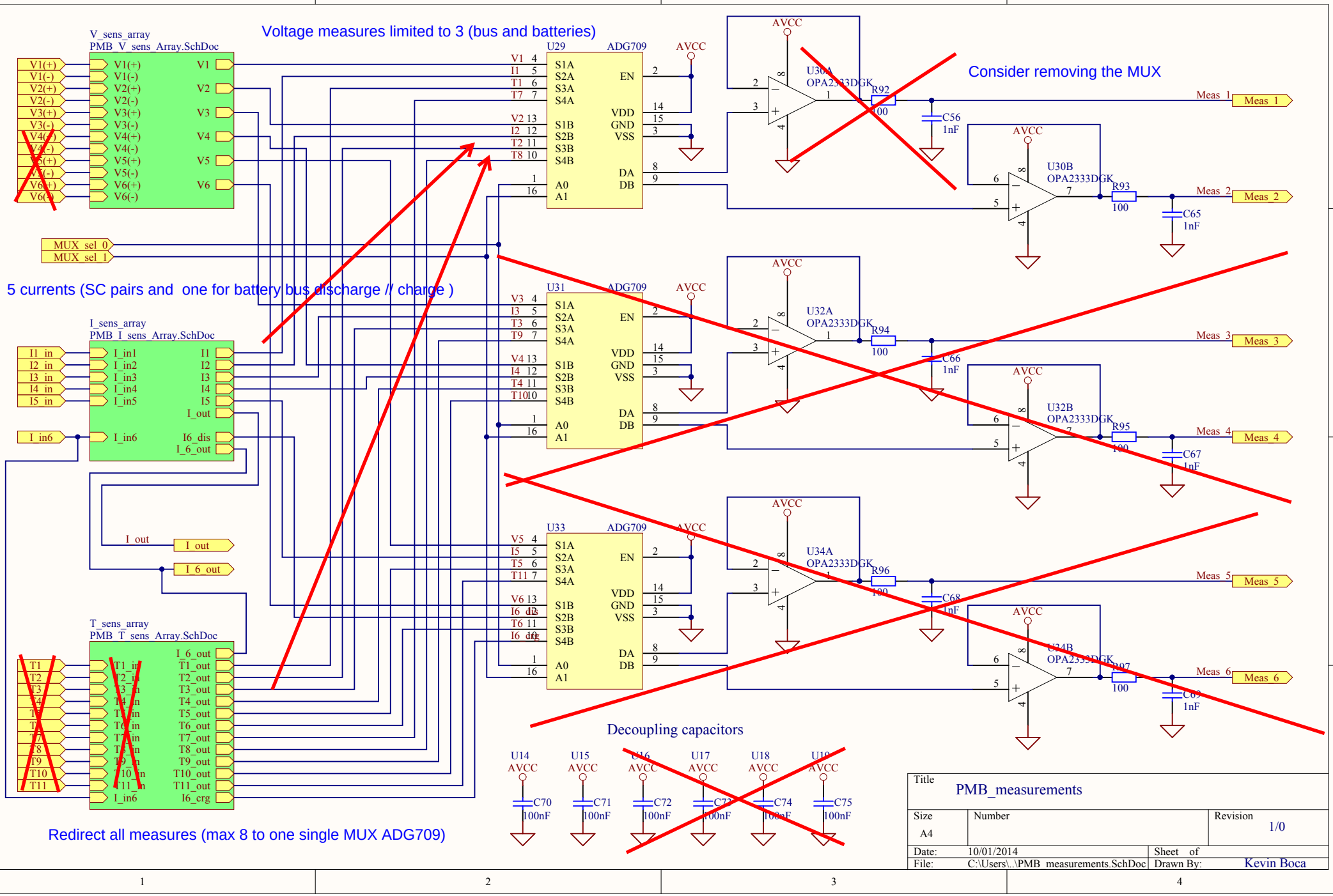
Can keep a group of decoupling capacitors but normally not necessary

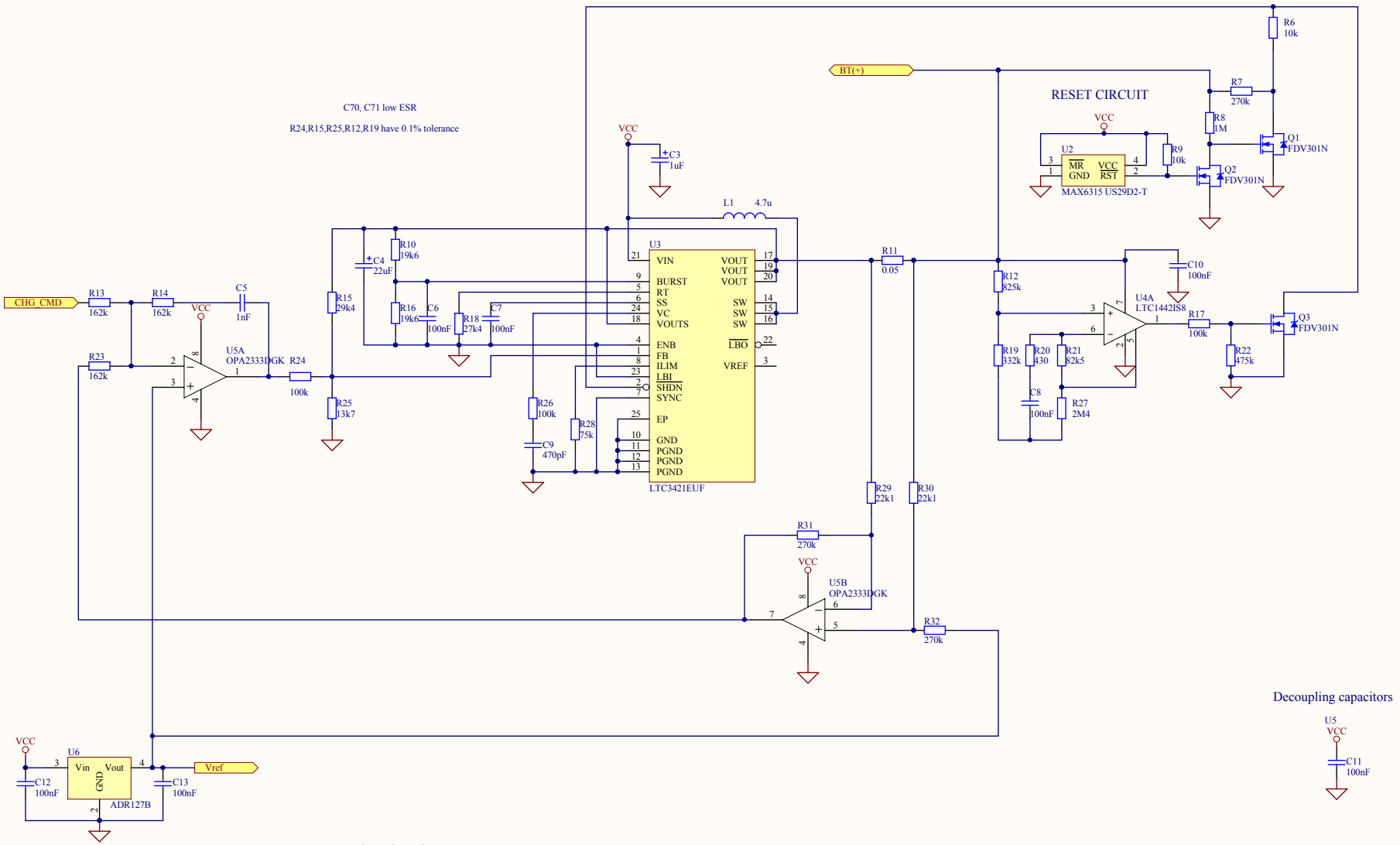



allows to selectively enable or disable power to external boards
Can be repeated if more are needed.
If space is a problem, consider moving the TPS2020 and related capacitors
to the external board, then only two connection lines are needed ( V in and enable pin)

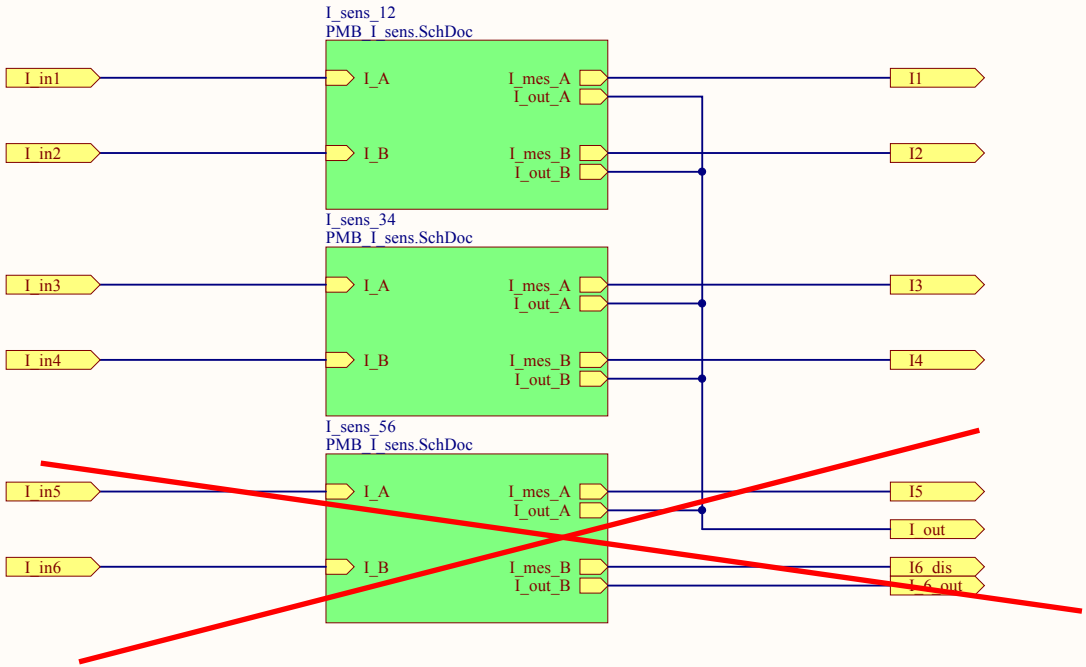
Consider removing the R66 pull-up and the ADS_ST

| | | |
|---|---|---|
| Title | | |
| Size: A4 | Number | Revision: 2/0 |
| Date: 10/01/2014 | | Sheet of |
| File: C:\Users\..\MB_distribution_v2.SchDoc | | Drawn By: Kevin Boca |


Voltage measures limited to 3 (bus and batteries)
V_sens_array
PMB_V_sens_Array.SchDoc
V1(+)
V1(-)
V2(+)
V2(-)
V3(+)
V3(-)
V4(+)
V4(-)
V5(+)
V5(-)
V6(+)
V6(-)
V1
V2
V3
V4
V5
V6
MUX_sel_0
MUX_sel_1
5 currents (SC pairs and one for battery bus discharge // charge )
I_sens_array
PMB_I_sens_Array.SchDoc
I1_in
I2_in
I3_in
I4_in
I5_in
I_in6
I_in1
I_in2
I_in3
I_in4
I_in5
I1
I2
I3
I4
I5
I_out
I6_dis
I_6_out
I_out
I_6_out
T_sens_array
PMB_T_sens_Array.SchDoc
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
I_in6
I_6_out
T1_out
T2_out
T3_out
T4_out
T5_out
T6_out
T7_out
T8_out
T9_out
T10_out
T11_out
I6_crg
Redirect all measures (max 8 to one single MUX ADG709)
U29
ADG709
U31
ADG709
U33
ADG709
S1A
S2A
S3A
S4A
S1B
S2B
S3B
S4B
EN
VDD
GND
VSS
DA
DB
A0
A1
AVCC
U30A
OPA2333DGK
U30B
OPA2333DGK
U32A
OPA2333DGK
U32B
OPA2333DGK
U34A
OPA2333DGK
U34B
OPA2333DGK
R92
R93
R94
R95
R96
R97
100
C56
1nF
C65
1nF
C66
1nF
C67
1nF
C68
1nF
Meas_1
Meas_2
Meas_3
Meas_4
Meas_5
Meas_6
Consider removing the MUX
Decoupling capacitors
U14
U15
U16
U17
U18
C70
C71
C72
C74
C75
100nF
Title
PMB_measurements
Size
A4
Number
Revision
1/0
Date:
10/01/2014
Sheet of
File:
C:\Users\..\PMB_measurements.SchDoc
Drawn By:
Kevin Boca

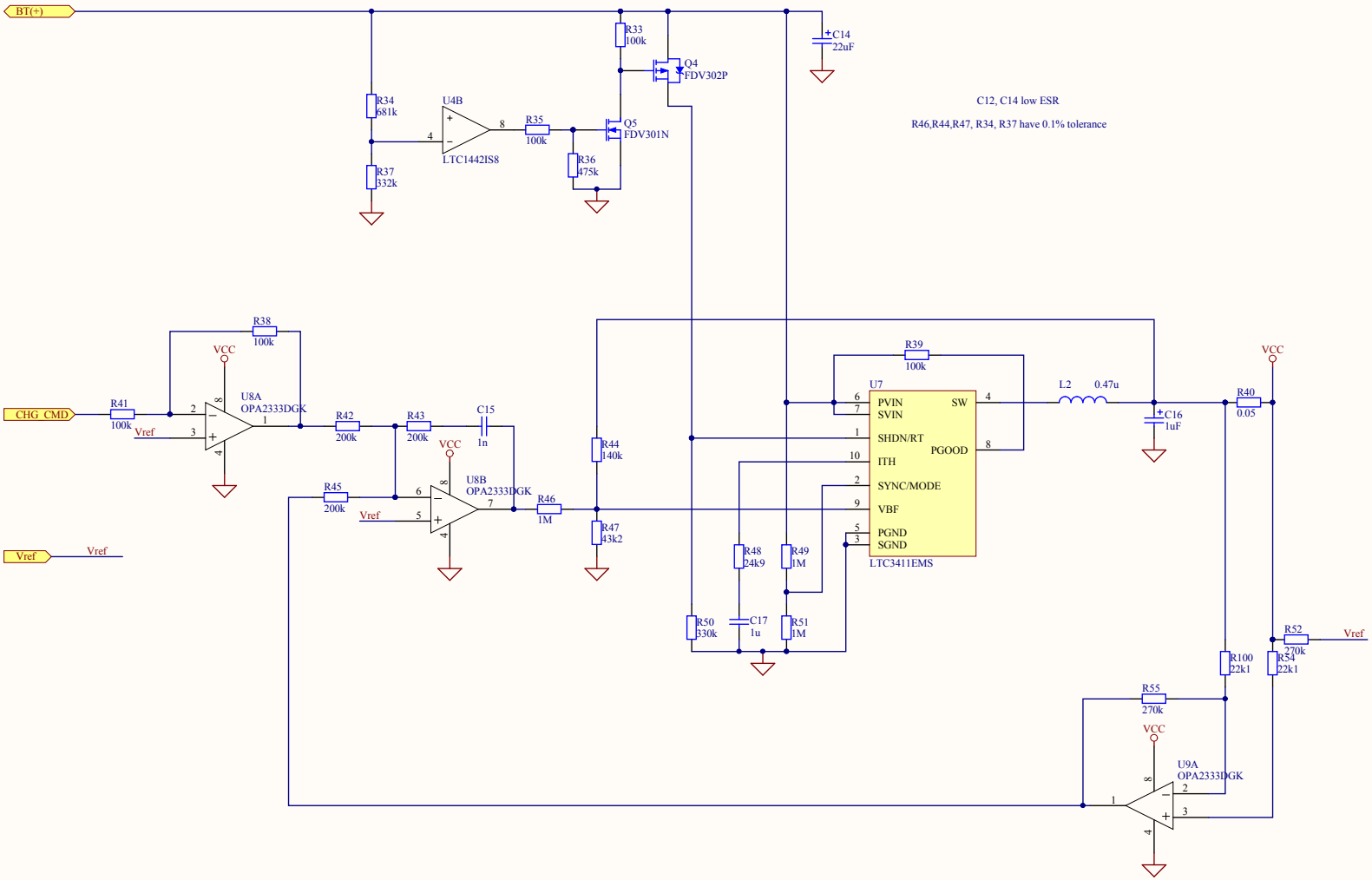



| | | |
|---|---|---|
| Title | MB_charge | |
| Size: A3 | Number | Revision: 1/0 |
| Date: 10/01/2014 | | Sheet of |
| File: C:\Users\..\MB_charge.SchDoc | | Drawn By: Kevin Boca |

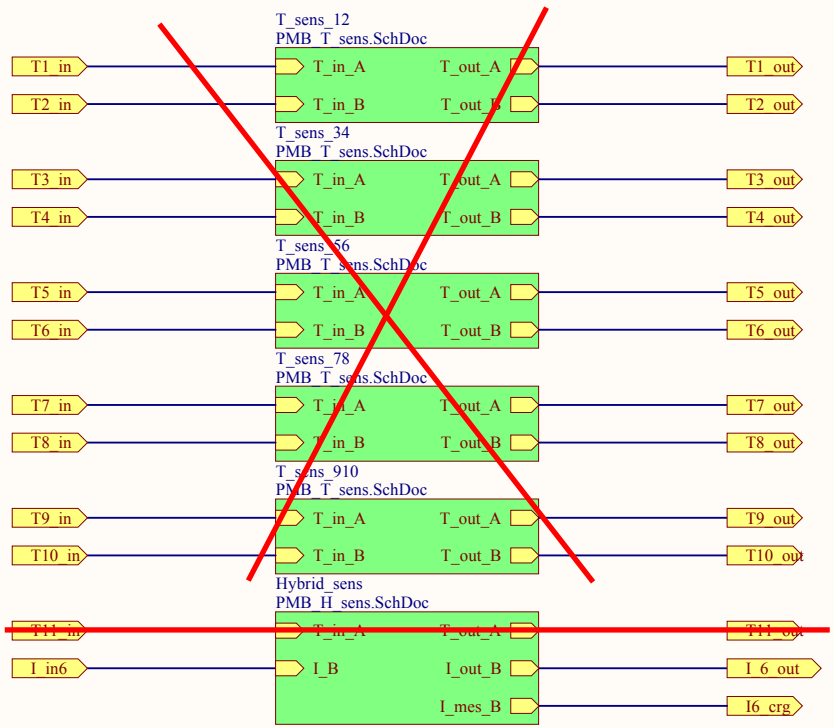



only 4 current measures (one more later on for battery charge)
don't forget to reconnect the line as one power line at the output

| | | |
|---|---|---|
| Title: PMB_I_sens_Array | | |
| Size: A4 | Number: | Revision: 1/0 |
| Date: 10/01/2014 | | Sheet of |
| File: C:\Users\..\PMB_I_sens_Array.SchDoc | | Drawn By: Kevin Boca |

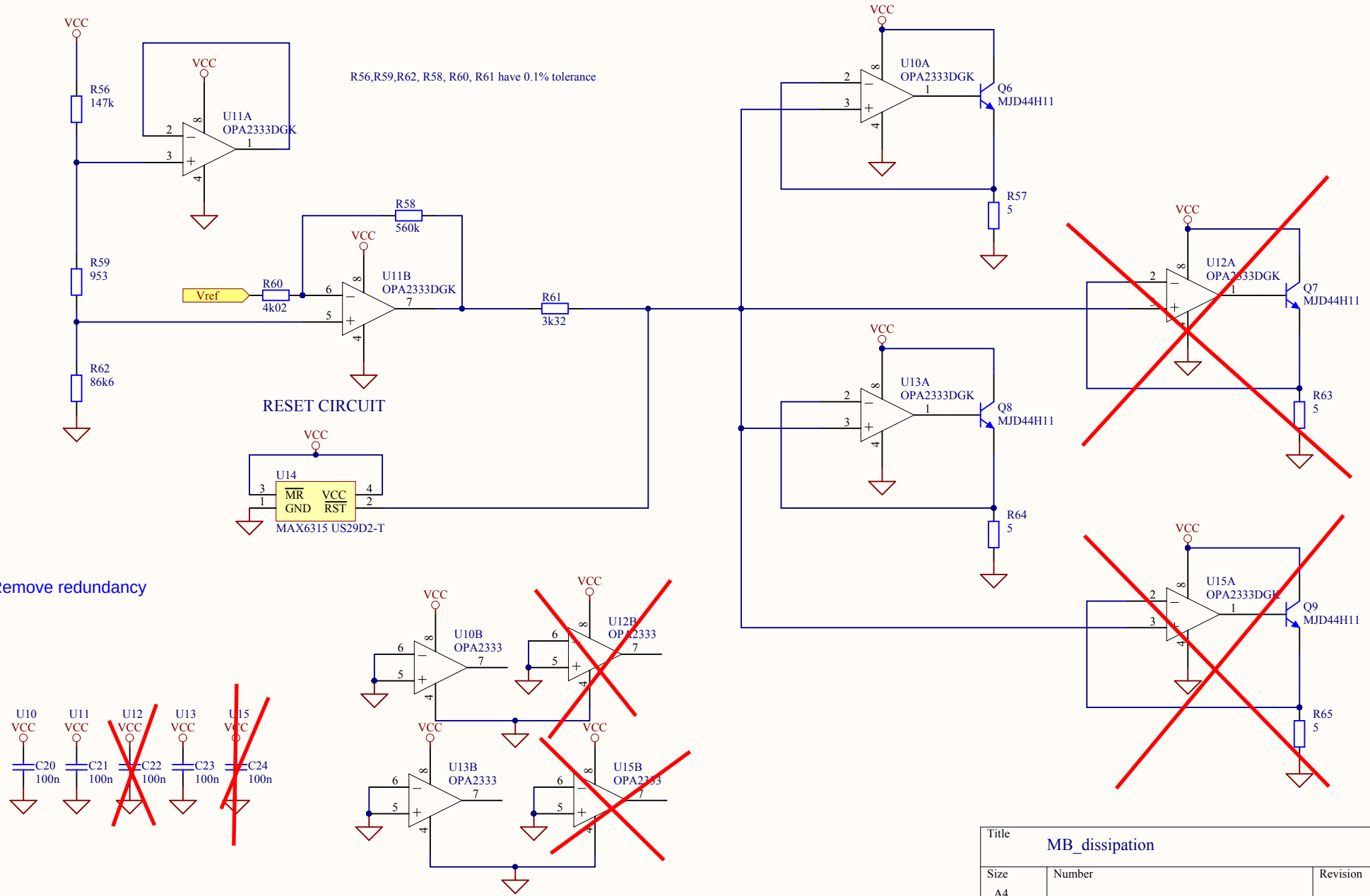



| | | |
|---|---|---|
| Title | MB_discharge | |
| Size: A3 | Number | Revision: 1/0 |
| Date: 10/01/2014 | | Sheet of |
| File: C:\Users\..\MB_discharge.SchDoc | | Drawn By: Kevin Boca |

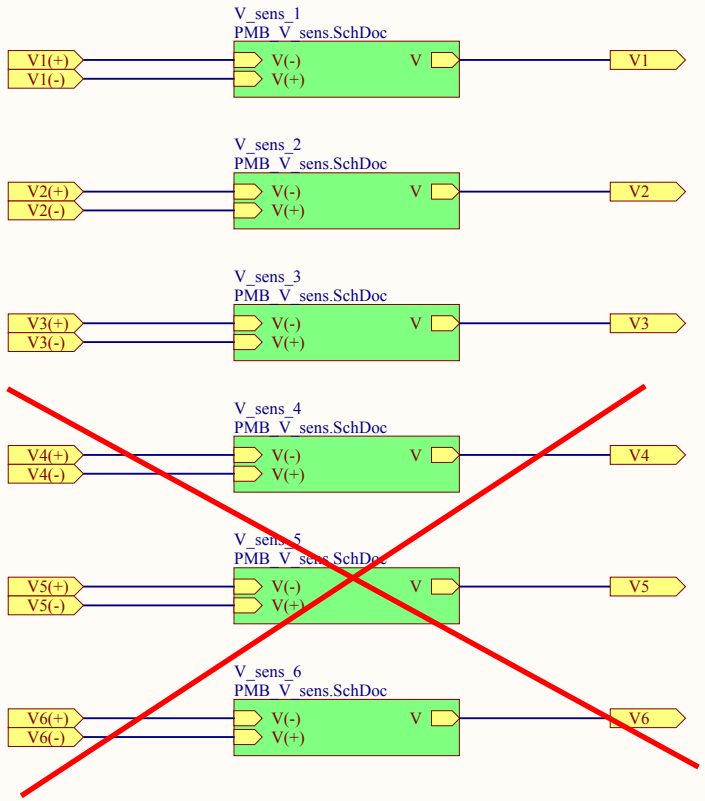



no temperature considered
only keep discharge current

| | | |
|---|---|---|
| Title | PMB_T_sens_Array | |
| Size: A4 | Number: | Revision: 1/0 |
| Date: 10/01/2014 | | Sheet of |
| File: C:\Users\..\PMB_T_sens_Array.SchDoc | | Drawn By: Kevin Boca |

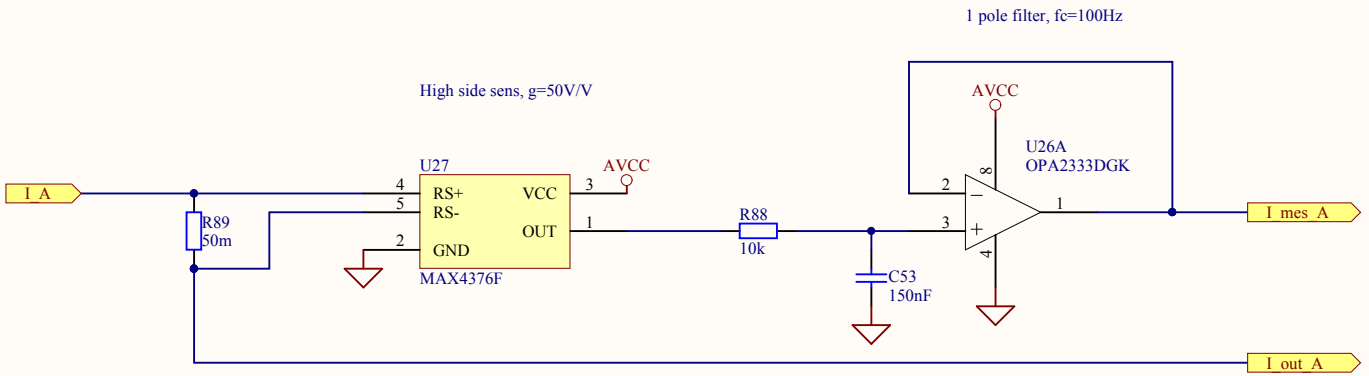


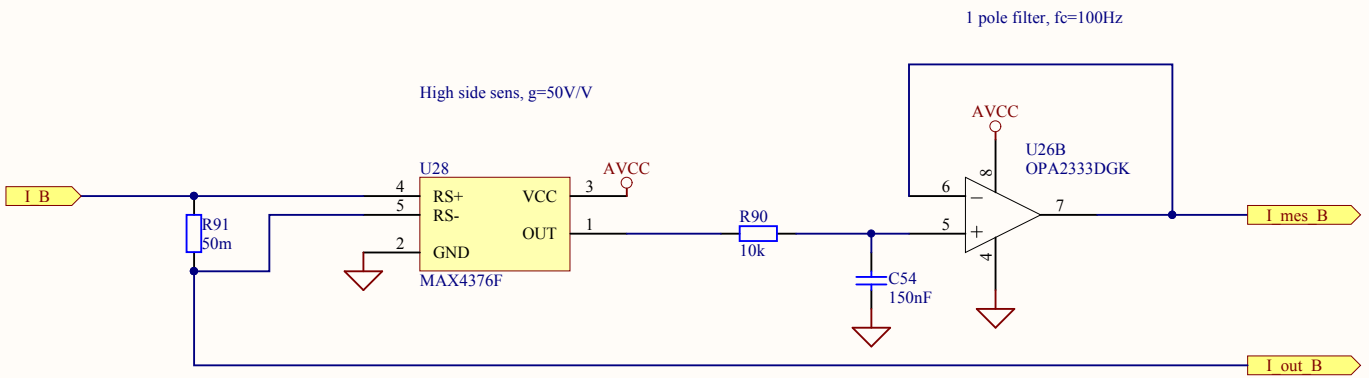

| | | |
|---|---|---|
| Title | MB_dissipation | |
| Size: A4 | Number | Revision: 1/0 |
| Date: 10/01/2014 | | Sheet of |
| File: C:\Users\..\MB_dissipation.SchDoc | | Drawn By: Kevin Boca |



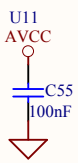

| | | |
|---|---|---|
| Title: PMB_V_sens_Array | | |
| Size: A4 | Number: | Revision: 1/0 |
| Date: 10/01/2014 | | Sheet of |
| File: C:\Users\..\PMB_V_sens_Array.SchDoc | | Drawn By: Kevin Boca |

# Current sensing circuit

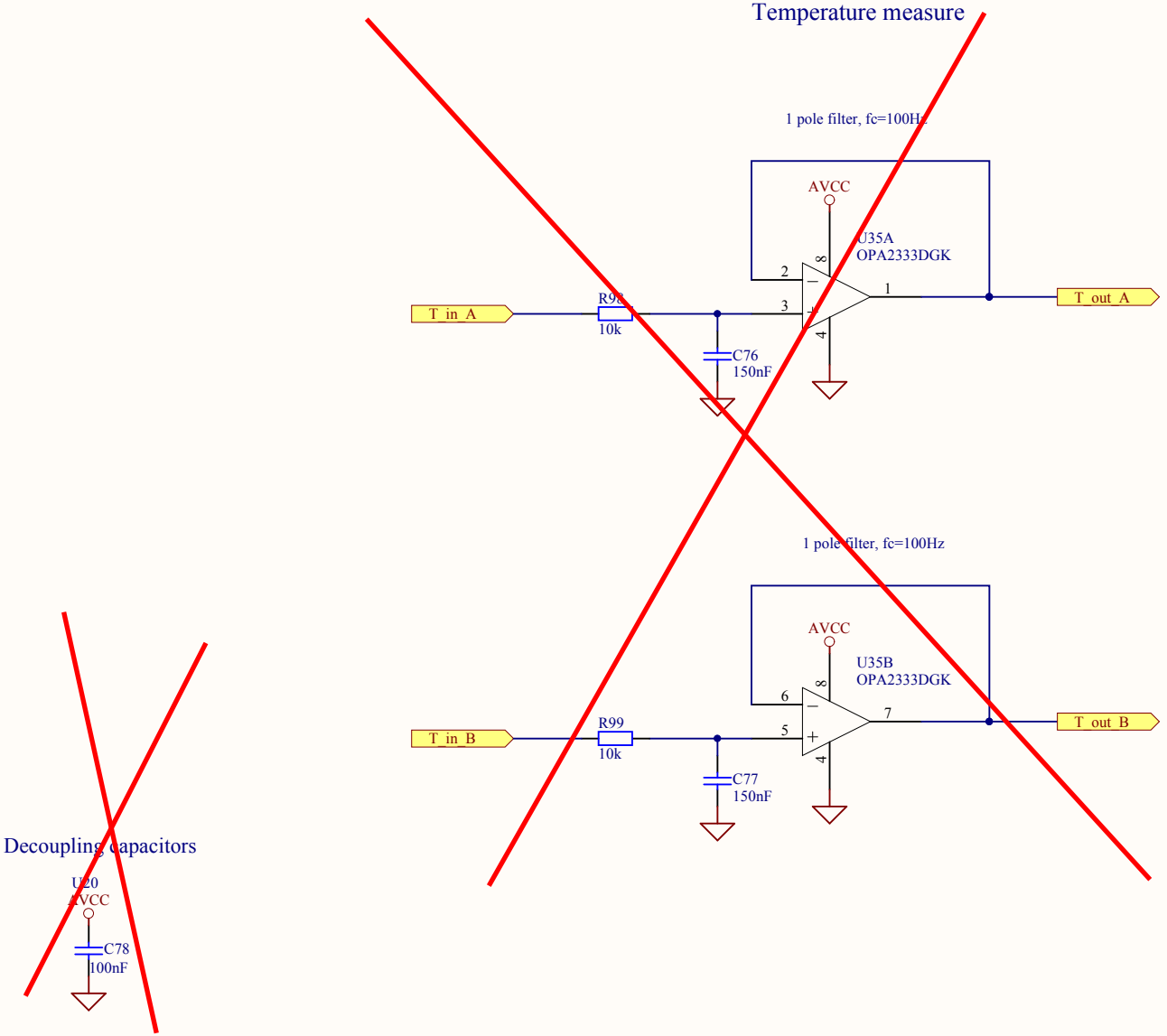



## Decoupling capacitors




| | | |
|---|---|---|
| Title: PMB_I_sens | | |
| Size: A4 | Number: | Revision: 1/0 |
| Date: 10/01/2014 | | Sheet of |
| File: C:\Users\..\PMB_I_sens.SchDoc | | Drawn By: Kevin Boca |

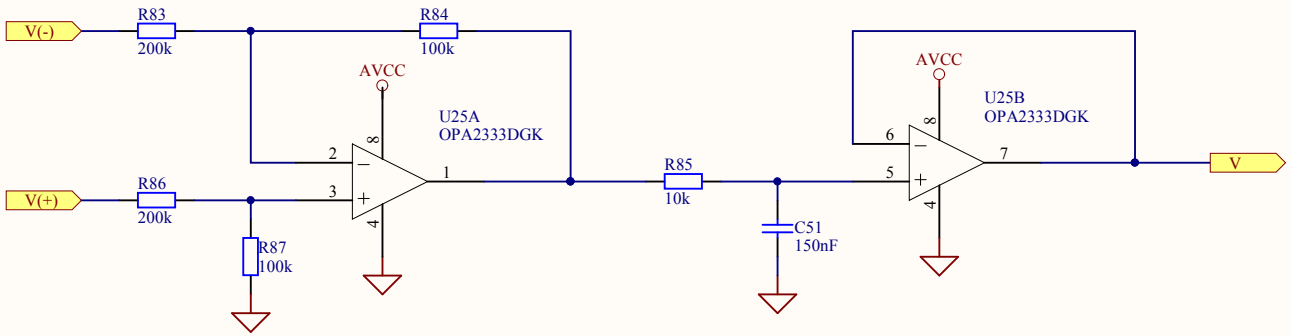



| | | |
|---|---|---|
| Title: PMB_T_sens | | |
| Size: A4 | Number: | Revision: 1/0 |
| Date: 10/01/2014 | | Sheet of |
| File: C:\Users\..\PMB_T_sens.SchDoc | | Drawn By: Kevin Boca |

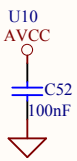
# Voltage sensing circuit

Differential measure, g=0.5

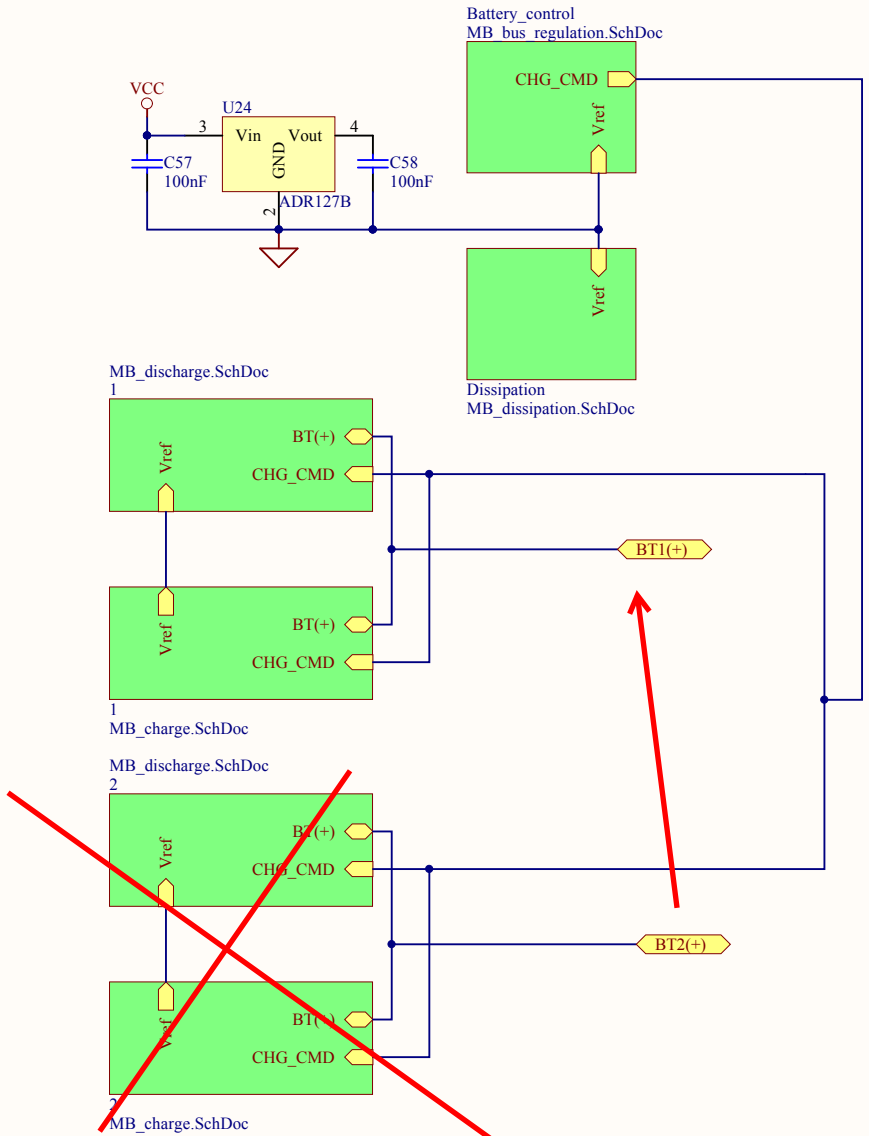
1 pole filter, fc=100Hz




## Decoupling capacitors




| | | |
|---|---|---|
| Title: PMB_V_sens | | |
| Size: A4 | Number: | Revision: 1/0 |
| Date: 10/01/2014 | | Sheet of |
| File: C:\Users\..\PMB_V_sens.SchDoc | | Drawn By: Kevin Boca |

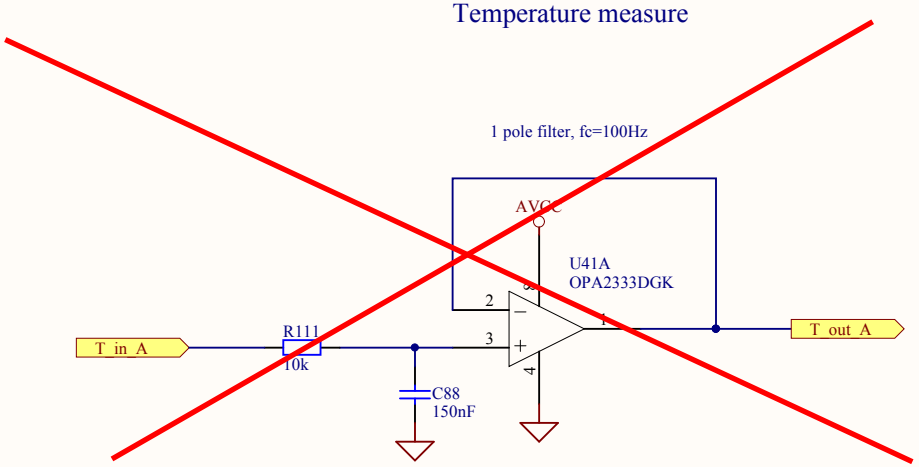



Absolutely necessary
Connect batteries in parallel to divide by 2 the number of remaining components

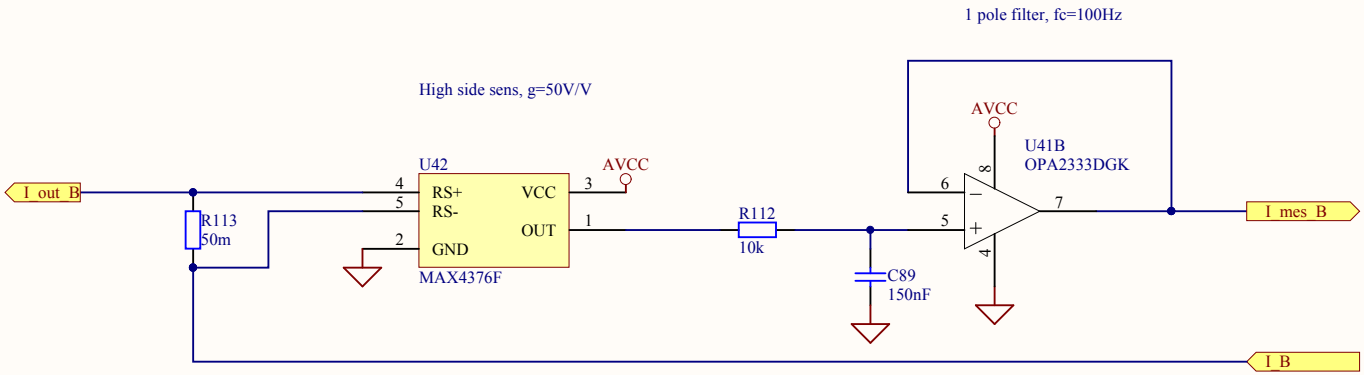
Less redundant and less reliable but cheap and efficient if simplified should fit an Artic application

| | | |
|---|---|---|
| Title | | |
| Size A4 | Number | Revision |
| Date: 10/01/2014 | | Sheet of |
| File: C:\Users\..\EPS_battery_management.SchDoc | | Drawn By: |

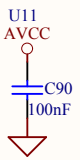
## Temperature measure




## Current sensing circuit




## Decoupling capacitors




| | | |
|---|---|---|
| Title: PMB_hybrid_sens | | |
| Size: A4 | Number | Revision |
| Date: 10/01/2014 | | Sheet of |
| File: C:\Users\..\PMB_H_sens.SchDoc | | Drawn By: |