



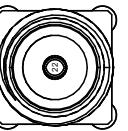
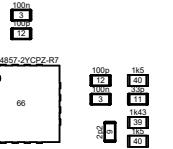
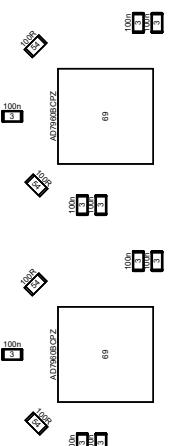
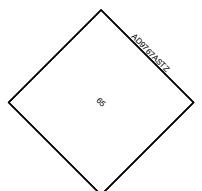
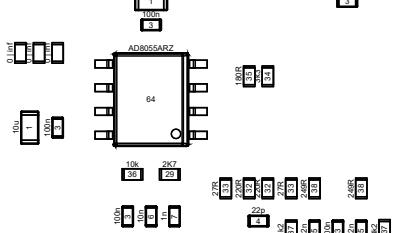
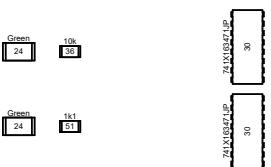
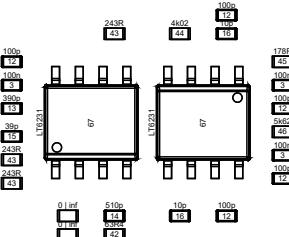
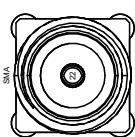
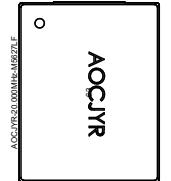
A View from Top side (Scale 2.47:1)

B

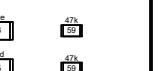
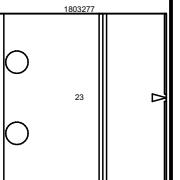
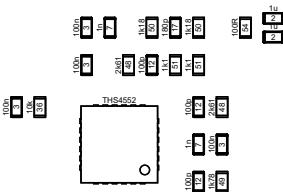
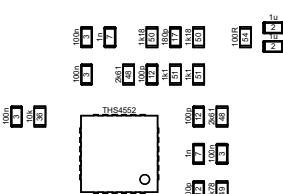
C

D

E



EPG.1B.314.LN



A

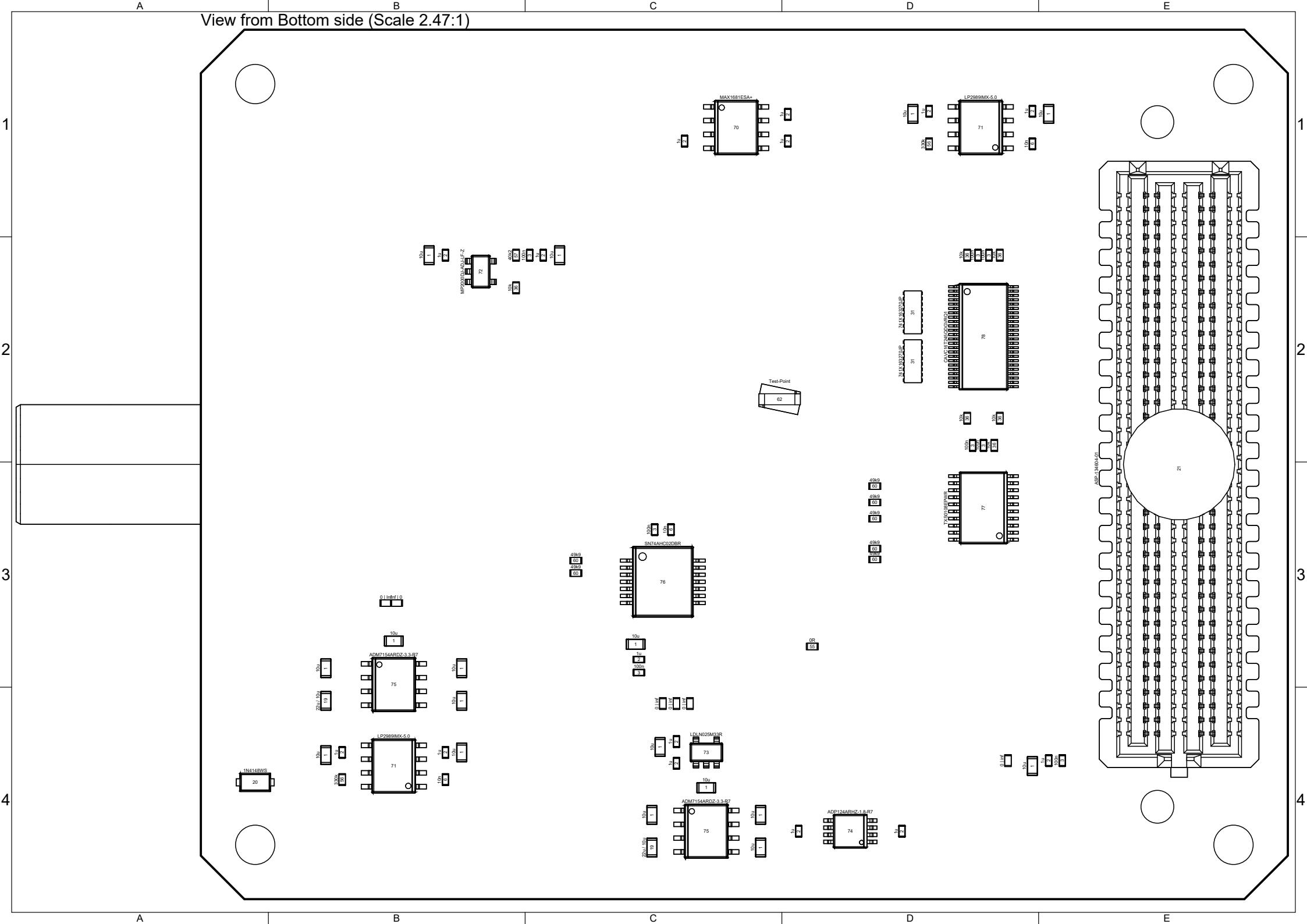
B

C

D

E

A      B      C      D      E  
View from Bottom side (Scale 2.47:1)



A

B

C

D

E

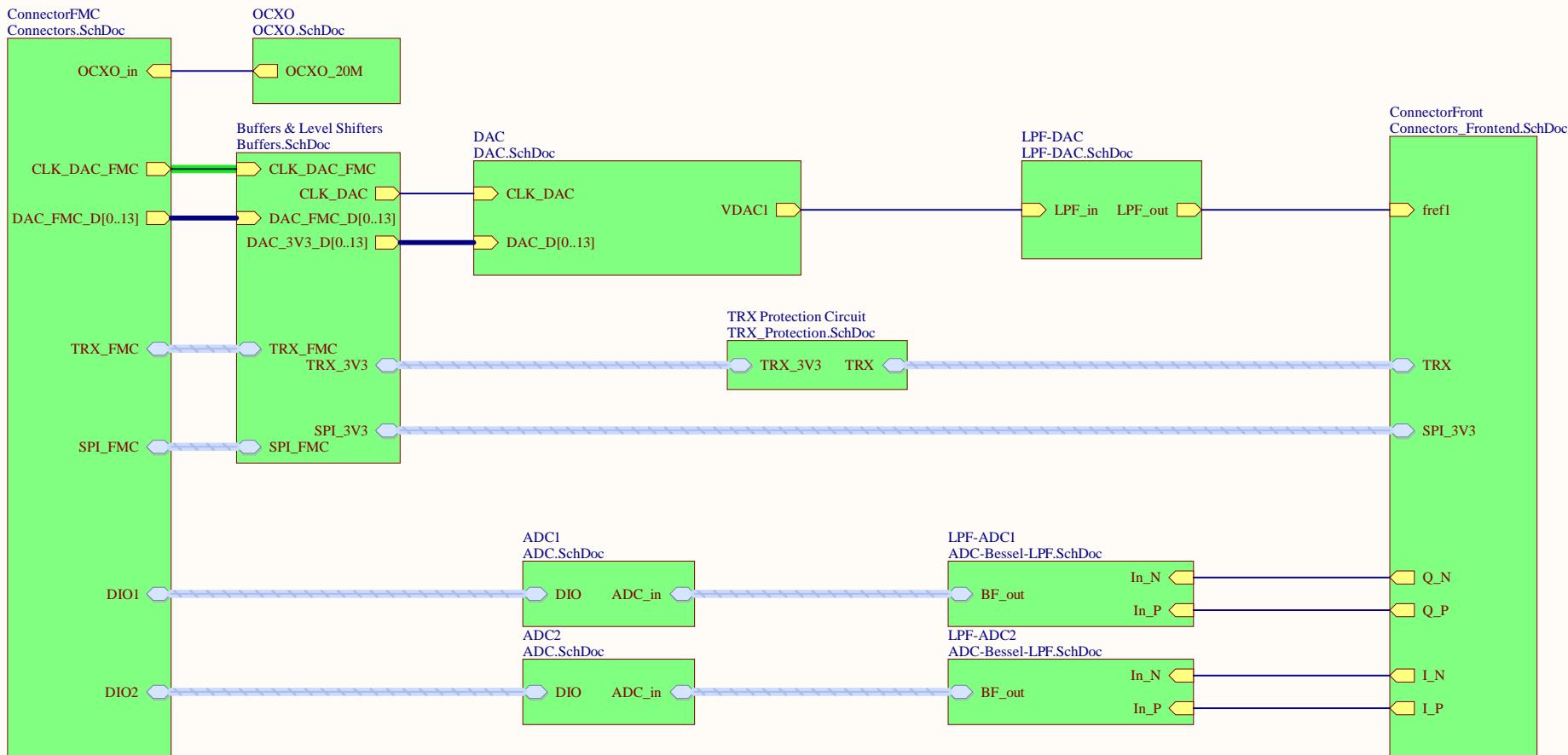
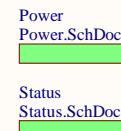
### Bill Of Materials

Line #	Designator	Name	Quantity
1	C1, C6, C8, C59_ADC1, C59_ADC2, C69, C72, C74, C78, C81, C85, C87, C89, C90, C91, C94, C97, C99, C101, C102, C103	10u	21
2	C2, C44_LPF-ADC1, C44_LPF-ADC2, C49_LPF-ADC1, C49_LPF-ADC2, C66, C67, C68, C70, C71, C75, C77, C79, C80, C82, C84, C86, C95, C96	1u	19
3	C3, C5, C7, C11, C12, C15, C22, C24, C26, C28, C37, C39, C41, C53_LPF-ADC1, C53_LPF-ADC2, C55_LPF-ADC1, C55_LPF-ADC2, C56_LPF-ADC1, C56_LPF-ADC2, C57_LPF-ADC1, C57_LPF-ADC2, C58_ADC1, C58_ADC2, C60_ADC1, C60_ADC2, C61_ADC1, C61_ADC2, C62_ADC1, C62_ADC2, C63_ADC1, C63_ADC2, C64_ADC1, C64_ADC2, C65_ADC1, C65_ADC2, C76, C83, C92, C104, C105, C106, C107	100n	42
4	C4	22p	1
5	C9, C10	22n	2
6	C13, C16, C73, C93, C98	10n	5
7	C14, C17, C52_LPF-ADC1, C52_LPF-ADC2, C54_LPF-ADC1, C54_LPF-ADC2	1n	6
8	C18	3p3	1
9	C19	2p2	1
10	C20	12p	1
11	C21	33p	1
12	C23, C25, C27, C29, C31, C32, C38, C40, C42, C45_LPF-ADC1, C45_LPF-ADC2, C46_LPF-ADC1, C46_LPF-ADC2, C50_LPF-ADC1, C50_LPF-ADC2, C51_LPF-ADC1, C51_LPF-ADC2	100p	17
13	C30	390p	1
14	C33	510p	1
15	C34	39p	1
16	C35, C36	10p	2
17	C47_LPF-ADC1, C47_LPF-ADC2	180p	2

### Bill Of Materials

Line #	Designator	Name	Quantity
18	C48_LPF-ADC1, C48_LPF-ADC2	430p	2
19	C88, C100	22u / 10u	2
20	D1	1N4148WS	1
21	J1	ASP-134604-01	1
22	J2, J3	SMA	2
23	J4	1803277	1
24	LED1, LED2, LED3, LED4	Green	4
25	LED5	Red	1
26	LED6	Blue	1
27	P1	EPG.1B.314.NLN	1
	R1, R18, R19, R20, R21, R22, R23, R37, R38, R40, R65, R66, R67, R78	0   inf	14
29	R2	2K7	1
30	R3, R12	741X163471JP	2
31	R4, R10	741X163270JP	2
32	R5, R6	220R	2
33	R7, R8	27R	2
34	R9	3k3	1
35	R11	180R	1
36	R13, R44_LPF-ADC1, R44_LPF-ADC2, R45_LPF-ADC1, R45_LPF-ADC2, R64, R68, R81, R82, R86, R87, R88	10k	12
37	R14, R16	8k2	2
38	R15, R17	249R	2
39	R24, R26, R29	1k43	3
40	R25, R28	1k5	2
41	R27	1k33	1
42	R30	63R4	1
43	R31, R32, R33	243R	3
44	R34	4k02	1
45	R35	178R	1
46	R36	5k62	1
47	R41	49R9	1
48	R46_LPF-ADC1, R46_LPF-ADC2, R57_LPF-ADC1, R57_LPF-ADC2	2k61	4
49	R47_LPF-ADC1, R47_LPF-ADC2, R58_LPF-ADC1, R58_LPF-ADC2	1k78	4
50	R48_LPF-ADC1, R48_LPF-ADC2, R53_LPF-ADC1, R53_LPF-ADC2	1k18	4
51	R49_LPF-ADC1, R49_LPF-ADC2, R54_LPF-ADC1, R54_LPF-ADC2, R69, R71	1k1	6
52	R50_LPF-ADC1, R50_LPF-ADC2, R55_LPF-ADC1, R55_LPF-ADC2	787R	4

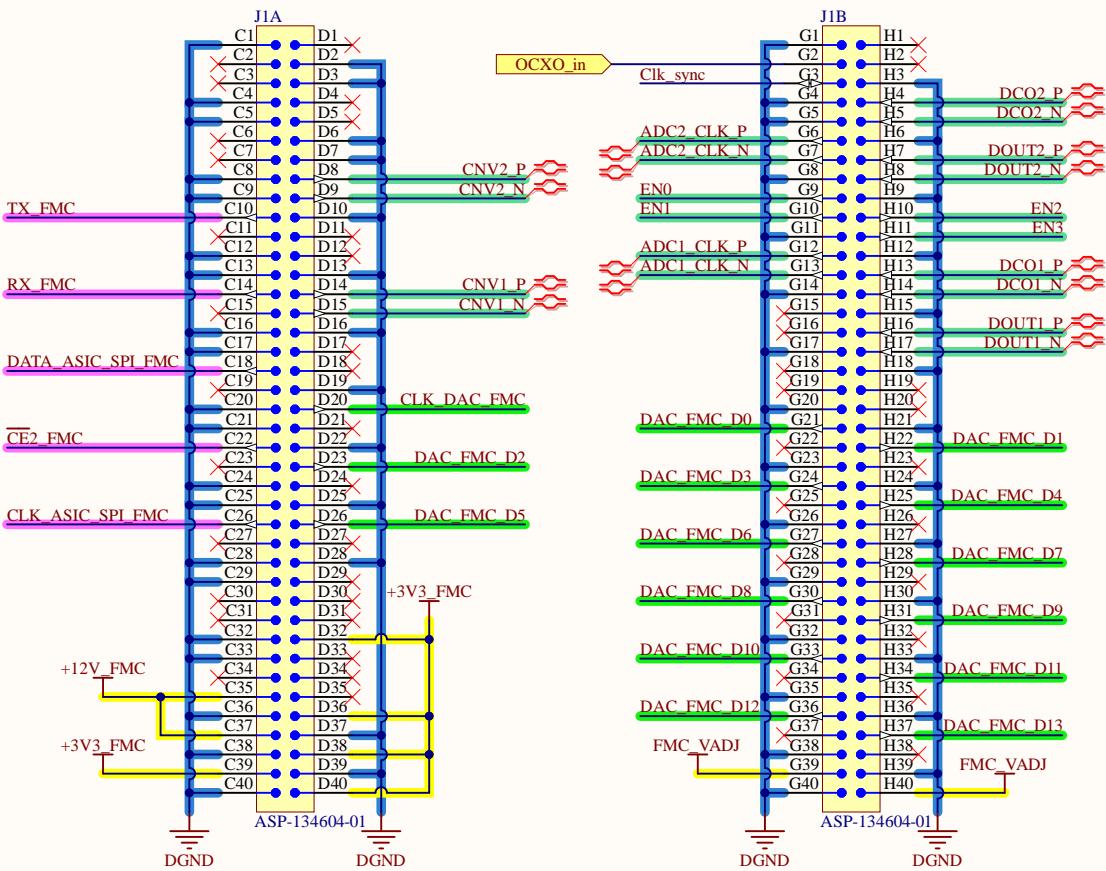




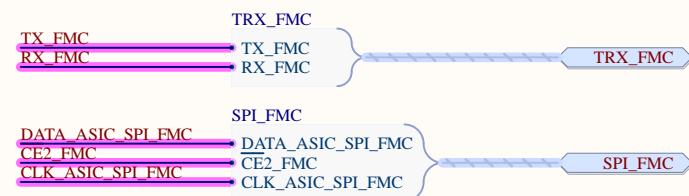
Title	
FMC interface to FPGA - Top Level	
Size	Project
A4	AUS - NMR System
Date: 27.09.2023	Revision: V1.1
Sheet 1 of 16	Drawn By: M.Sc. Tobias Wirth



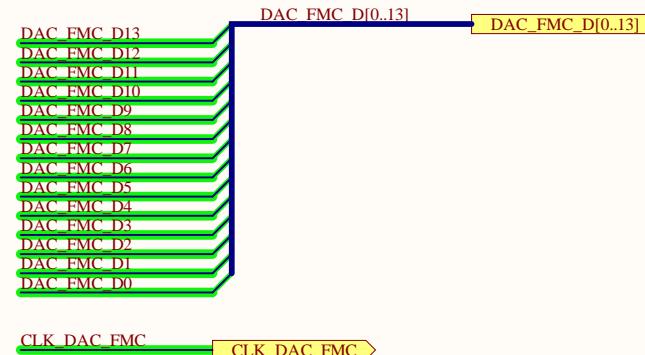
A



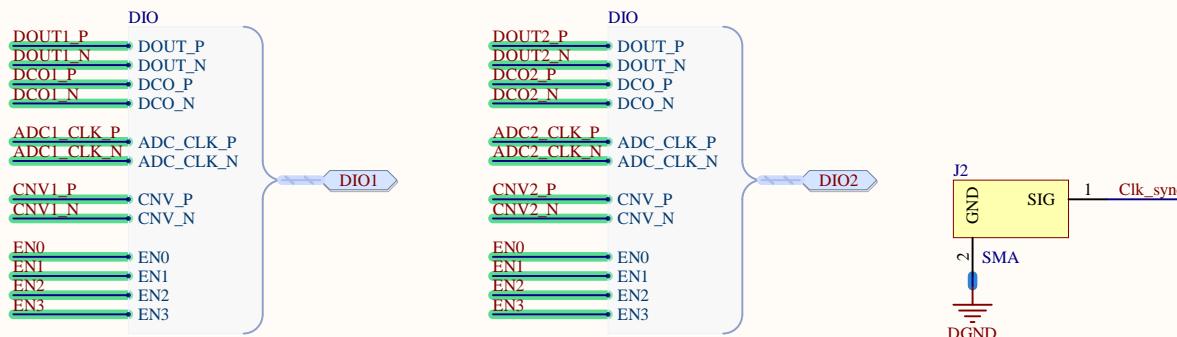
B



C



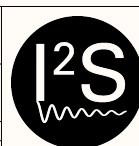
D



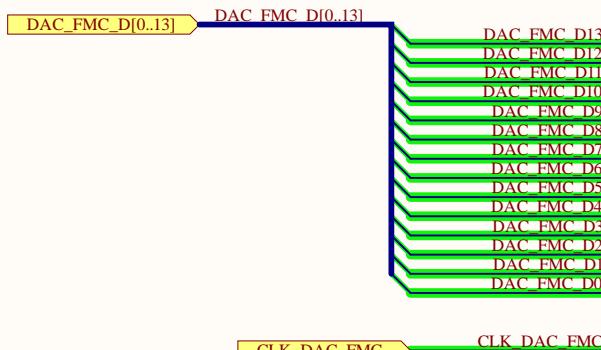
## Connectors

Title: Connectors  
Size: A4 Project: AUS - NMR System

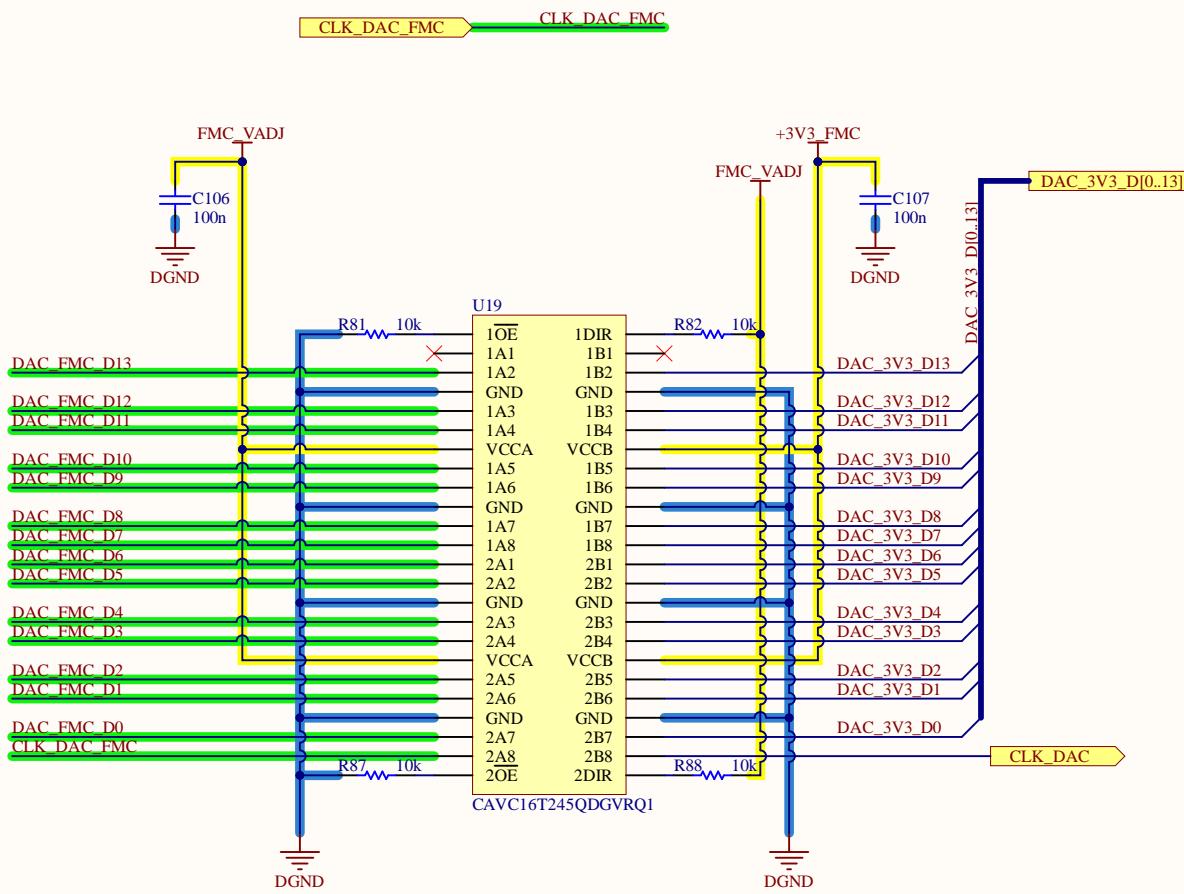
Date: 27.09.2023 Revision: V1.4  
Sheet 2 of 16 Drawn By: M.Sc. Tobias Wirth



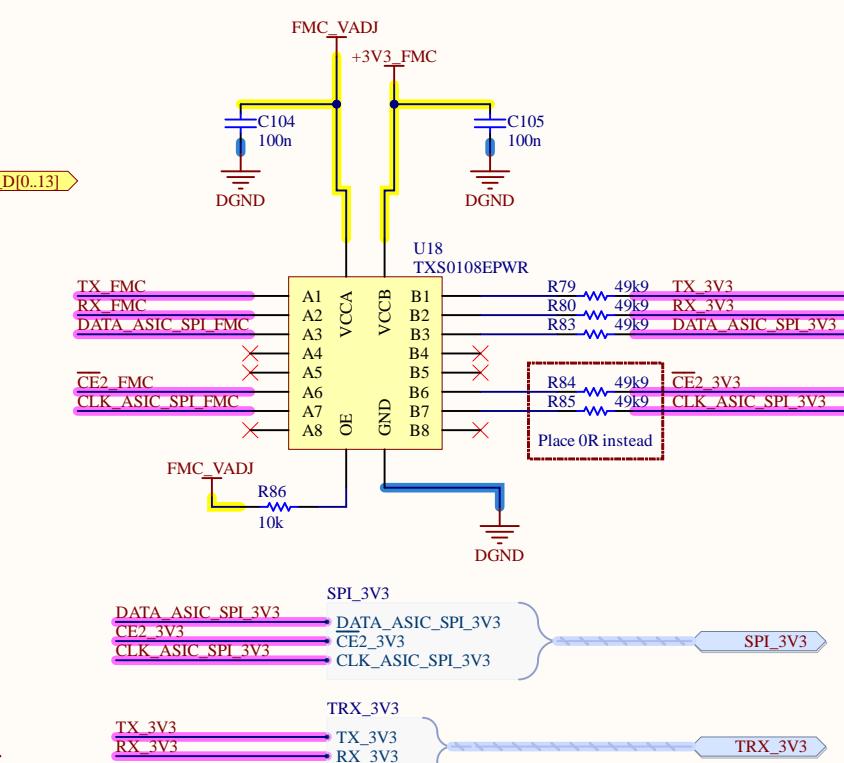
A



B



C



## Title Buffers / Level Shifters

Size A4 Project AUS - NMR System

Date: 14.11.2023 Revision: V0.1  
Sheet 3 of 16 Drawn By: M.Sc. Tobias Wirth



A

A

B

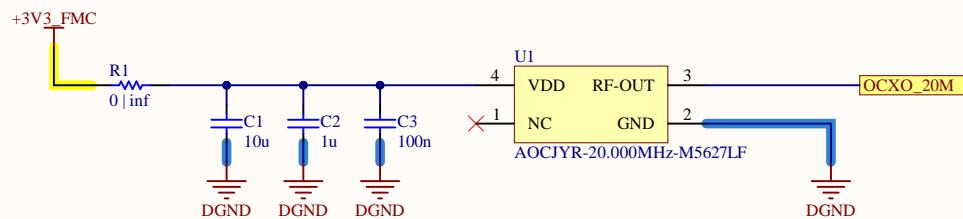
B

C

C

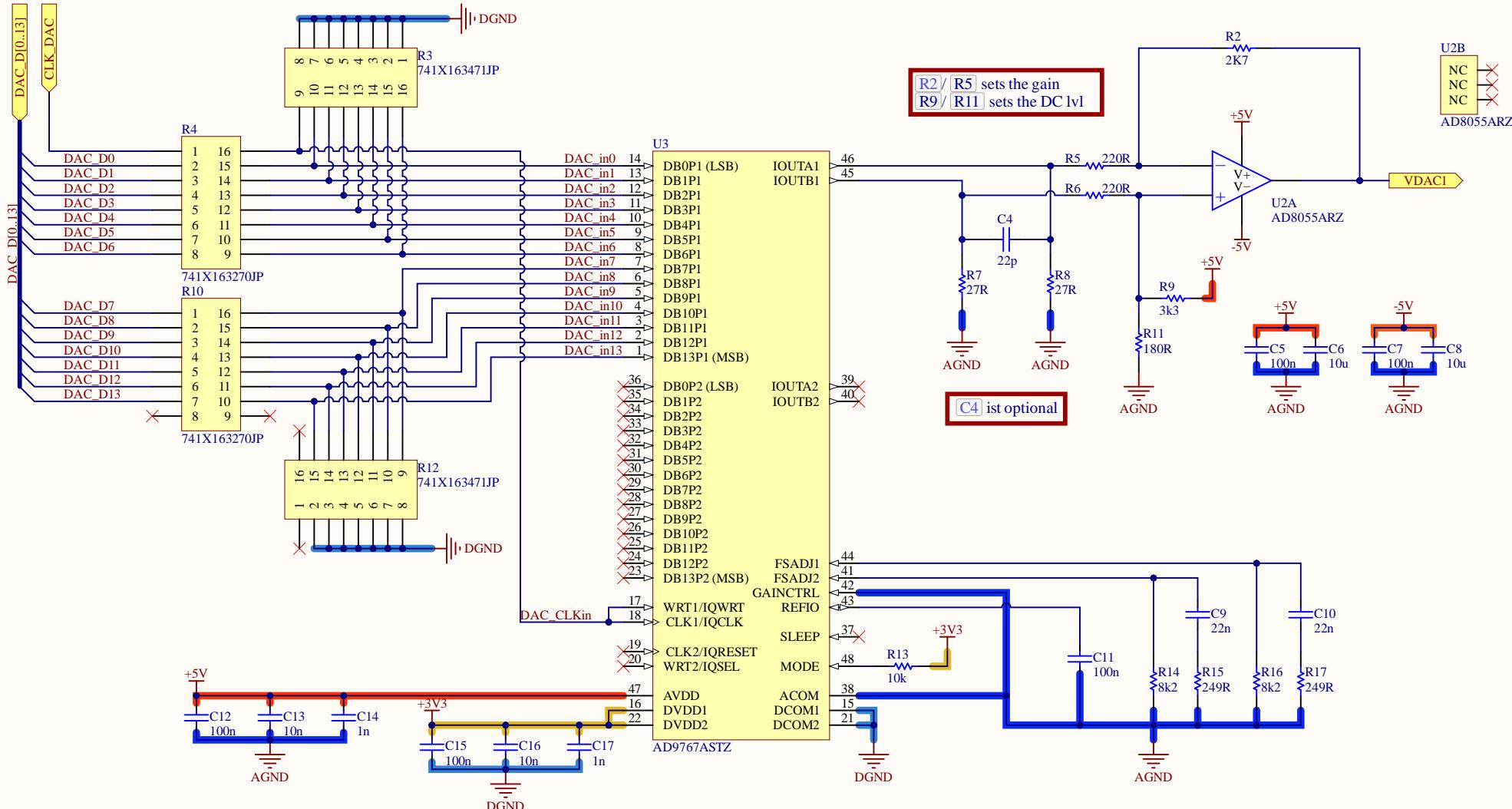
D

D



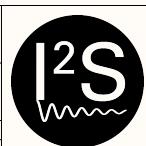
Title	
<b>Oven Controlled Crystal Oscillator</b>	
Size A4	Project AUS - NMR System
Date: 27.09.2023	Revision: V1.1
Sheet 4 of 16	Drawn By: M.Sc. Tobias Wirth





Title: Digital to Analog Converter

Size: A4	Project: AUS - NMR System
Date: 27.09.2023	Revision: V1.5
Sheet 5 of 16 Drawn By: M.Sc. Tobias Wirth	



A

A

B

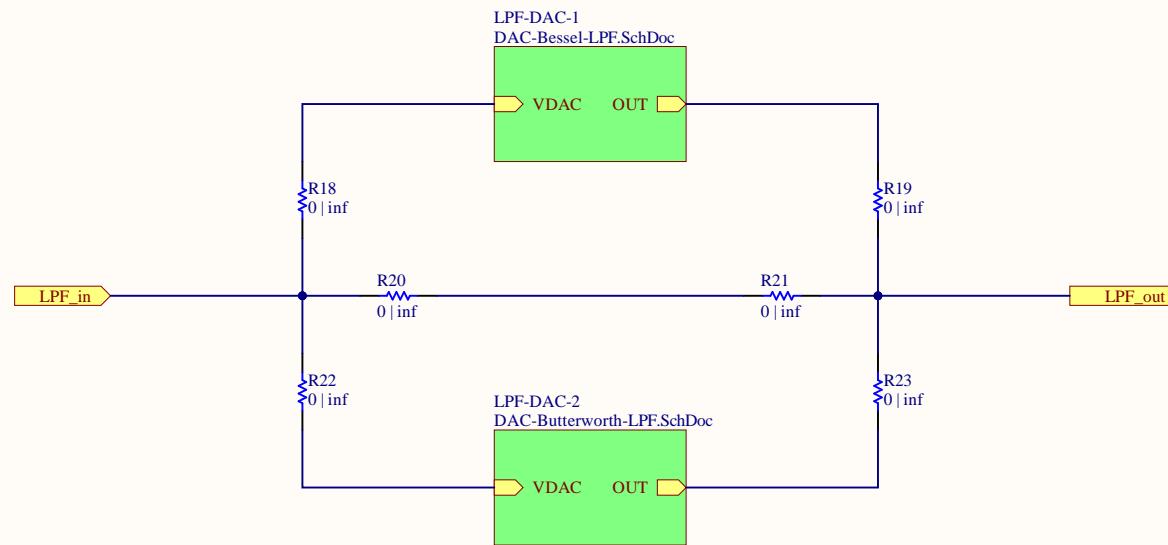
B

C

C

D

D



R22 & R23 = 12MHz LPF  
 R18 & R19 = 4MHz LPF  
 R20 & R21 = Ommit LPFs

On PCB:  
 (...)  
 (...)  
 (...)

Title	
Low Pass Filters	
Size	Project
A4	AUS - NMR System
Date: 27.09.2023	Revision: V1.1
Sheet 6 of 16	Drawn By: M.Sc. Tobias Wirth



A

A

B

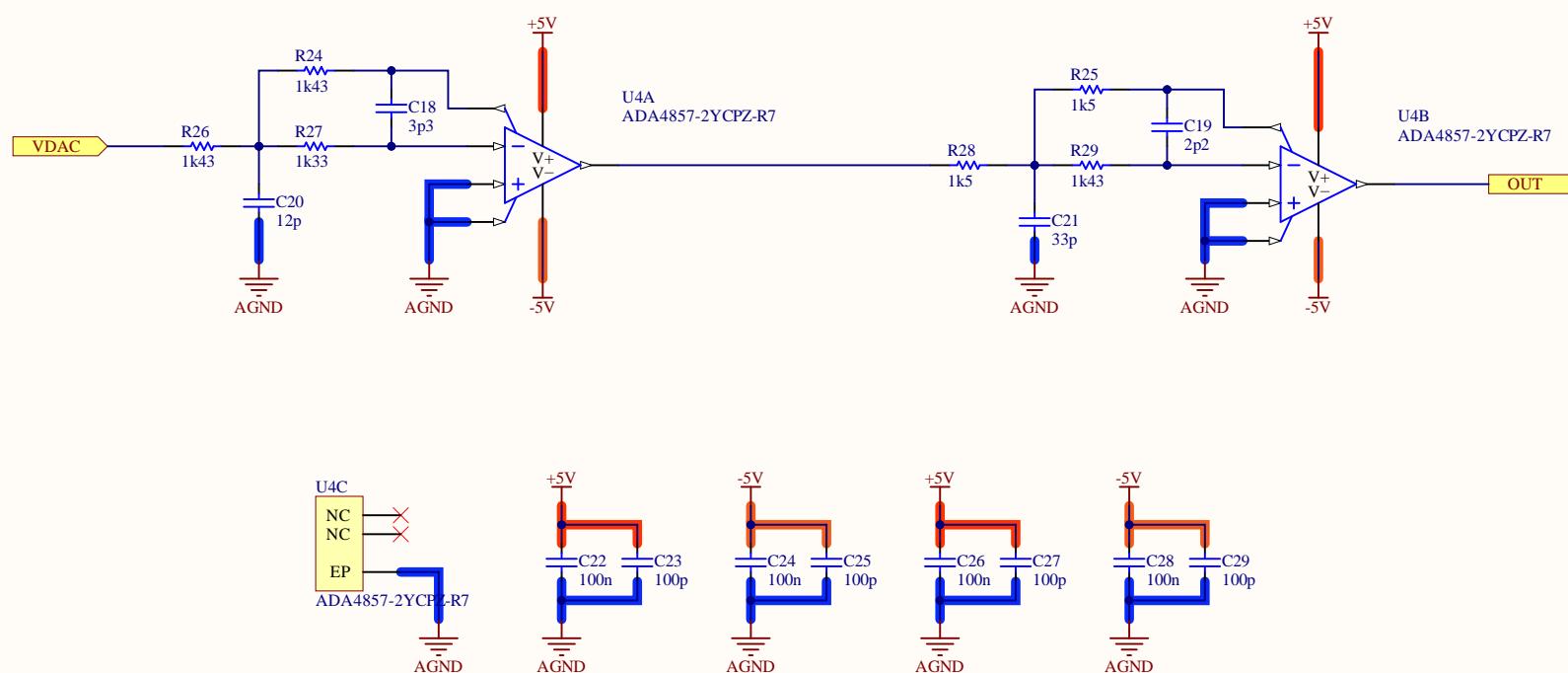
B

C

C

D

D



**Active Butterworth Low Pass Filter**  
12MHz Passband  
Gain 0dB

Title	
Butterworth LPF (12MHz / 0dB)	
Size	Project
A4	AUS - NMR System
Date: 27.09.2023	Revision: V0.1
Sheet 7 of 16	Drawn By: M.Sc. Tobias Wirth



A

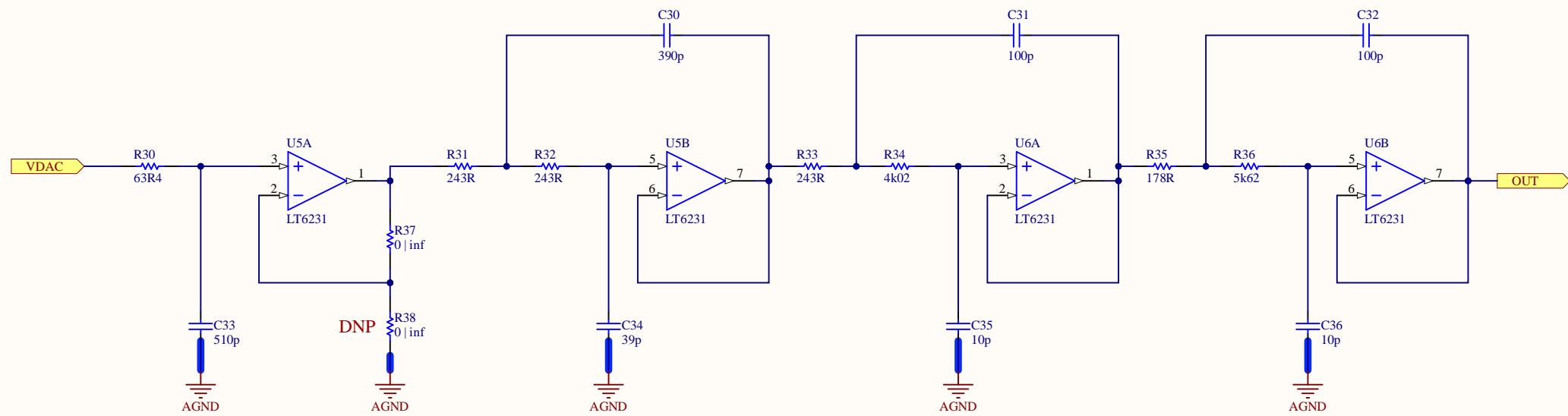
A

**U5A**  
1st stage  
Low Pass Buffered RC

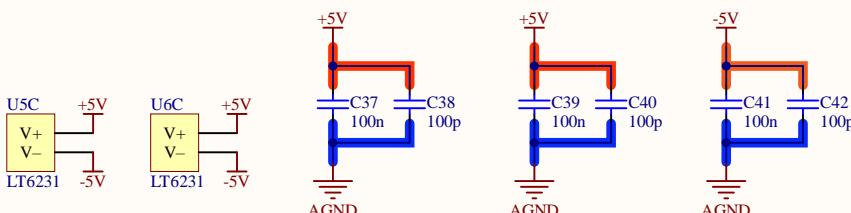
**U5B**  
2nd stage  
Low Pass Sallen Key

**U6A**  
2nd stage  
Low Pass Sallen Key

**U6B**  
2nd stage  
Low Pass Sallen Key



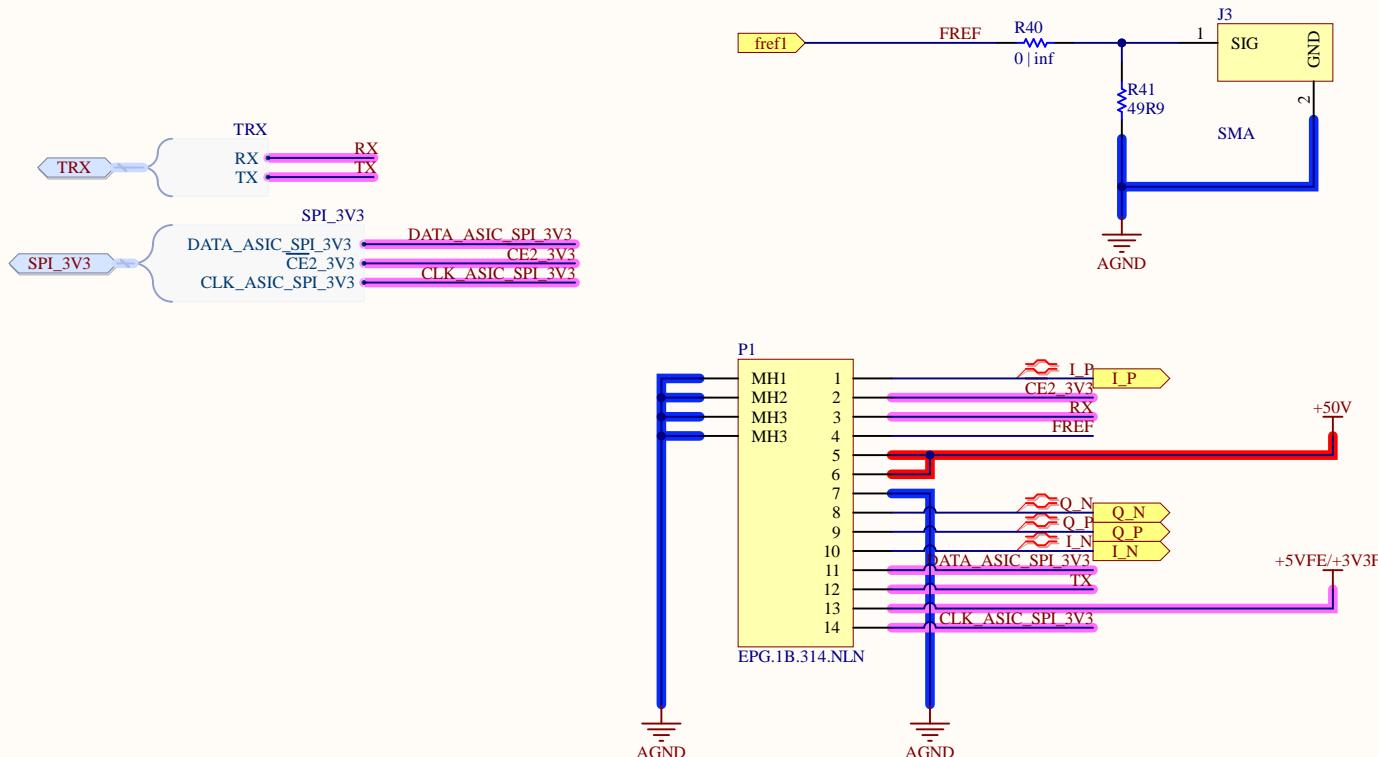
**7th Order Active Butterworth Bessel Low Pass Filter**  
4MHz passband  
Gain 0dB



Title	
<b>Bessel LPF (4MHz / 0dB)</b>	
Size	Project
A4	AUS - NMR System
Date: 27.09.2023	Revision: V1.1
Sheet 8 of 16	Drawn By: M.Sc. Tobias Wirth



A



**J3** SMA is used for an external reference frequency

## Title Connectors - Frontend

Size A4 Project AUS - NMR System

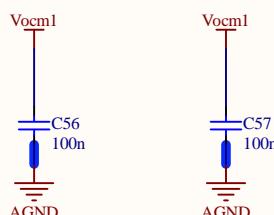
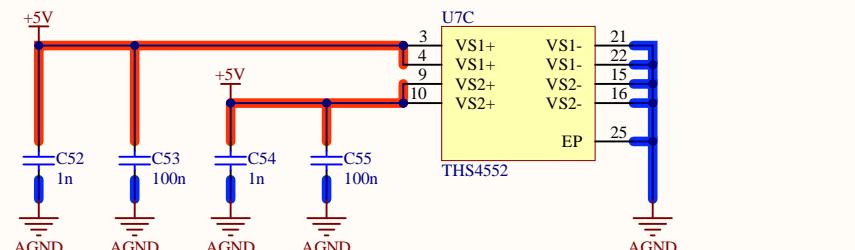
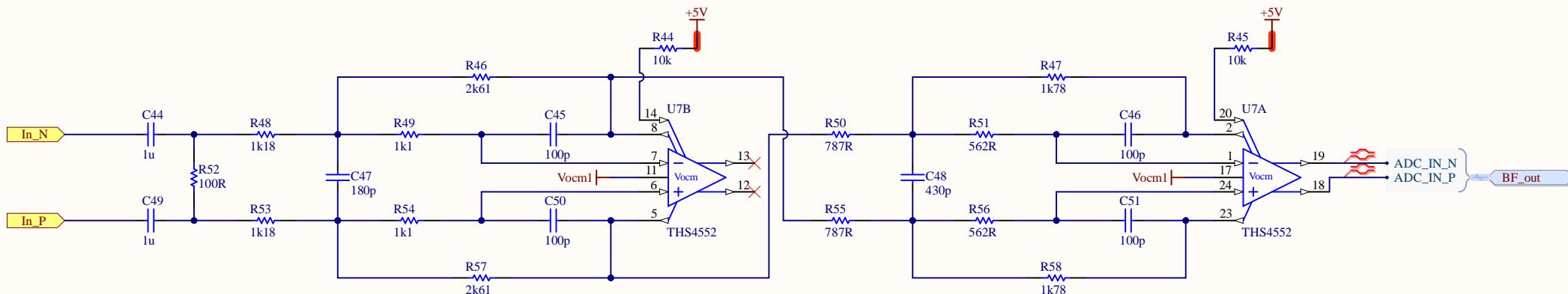
Date: 28.09.2023 Revision: V1.2  
Sheet 9 of 16 Drawn By: M.Sc. Tobias Wirth



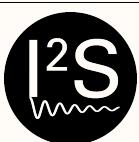
Components [R52], [C44] & [C49] form a HPF with a cutoff frequency of 3.18kHz. This is observable as an additional exponential decay of the DC level in the recorded FID.

To omit the HPF, DNP [R52] and replace [C44] & [C49] with 0Ohm resistors.

Not applicable in combination with LFNMR Gen4 (HB's ASIC) due to its high DC output level. Omitting the AC coupling / DC block will oversaturate the LPF!



Title		Bessel LPF / AAF (350kHz / 14dB)
Size	Project	AUS - NMR System
A4	Date: 06.10.2023	Revision: V1.3
	Sheet 10 of 16	Drawn By: M.Sc. Tobias Wirth



A

A

B

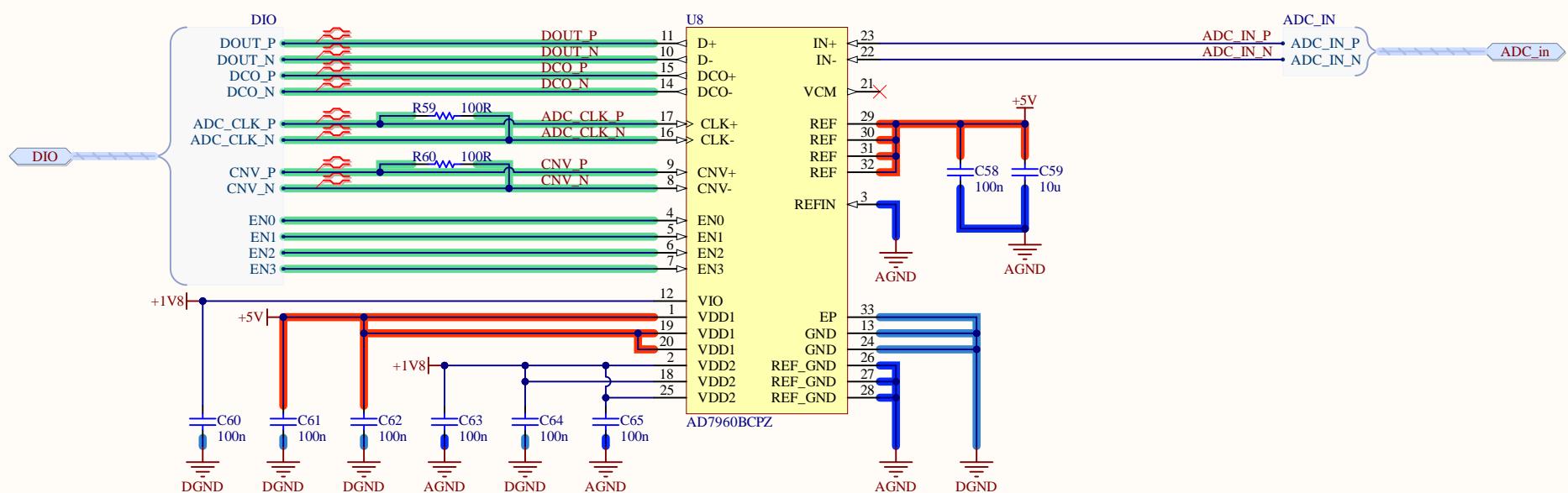
B

C

C

D

D



Title Analog to Digital Converter	
Size A4	Project AUS - NMR System
Date: 06.10.2023	Revision: V1.1
Sheet 11 of 16	Drawn By: M.Sc. Tobias Wirth



A

A

B

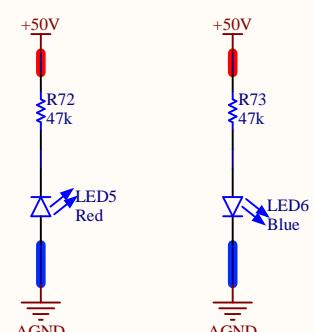
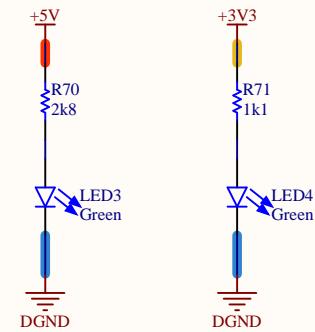
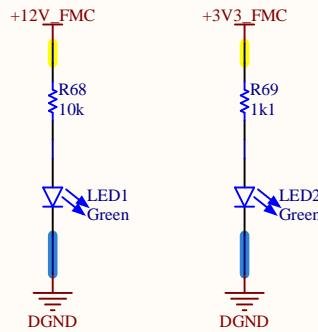
B

C

C

D

D



[LED5] is used to indicate a reverse polarity of the +50V rail

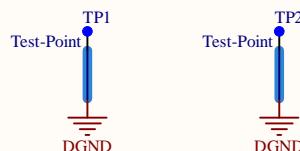
[LED6] is used to indicate a live +50V

#### Forward bias voltage:

R: +1V7  
Y: +2V  
G: +2V2  
B: +3V

#### Current rating:

IDmax = 20mA  
IDnom = 1mA



Title: Status LEDs / Test Points

Size: A4 Project: AUS - NMR System

Date: 06.10.2023 Revision: V1.2  
Sheet 12 of 16 Drawn By: M.Sc. Tobias Wirth



A

A

B

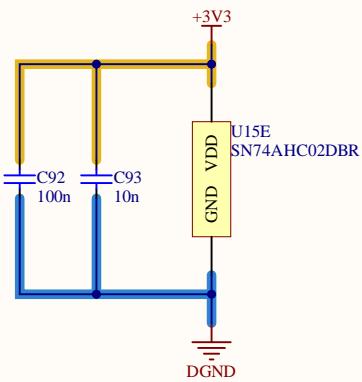
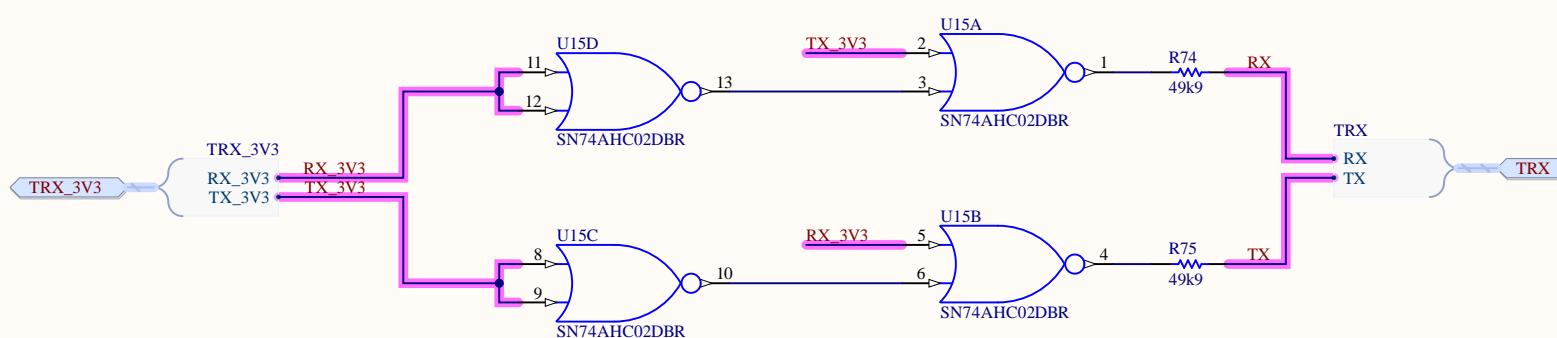
B

C

C

D

D



Title	
TRX Protection Circuit	
Size	Project
A4	AUS - NMR System
Date: 07.10.2023	Revision: V1.1
Sheet 13 of 16	Drawn By: M.Sc. Tobias Wirth



A

A

B

B

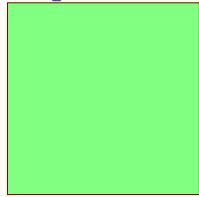
C

C

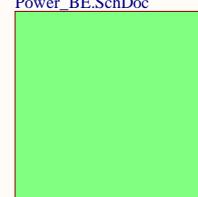
D

D

PDN Frontend  
Power\_FE.SchDoc



PDN Backend  
Power\_BE.SchDoc



U10 & U16 are end of life products,  
for future revisions switch to TPS7A26

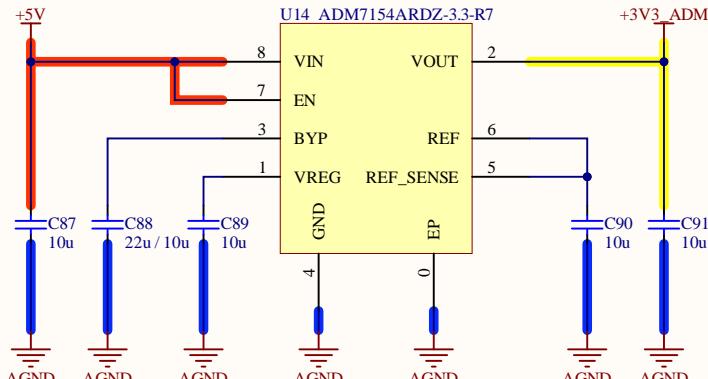
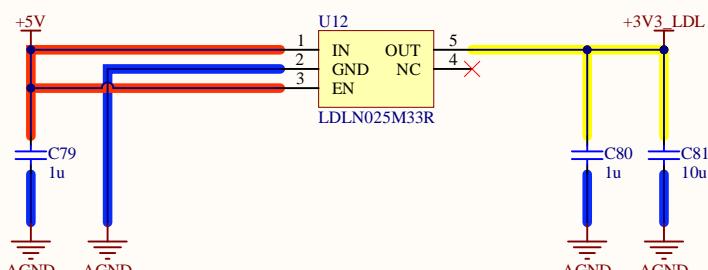
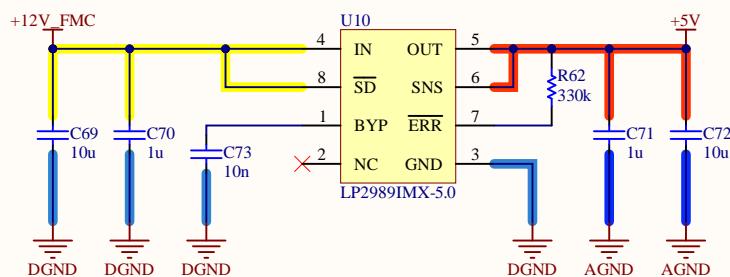
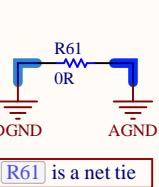
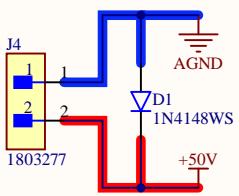
Title  
**Power Delivery Network**

Size A4 Project AUS - NMR System

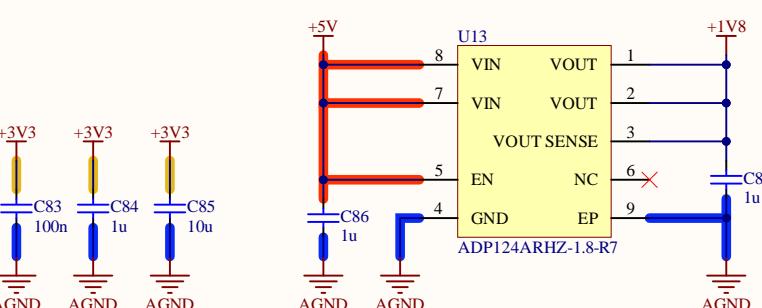
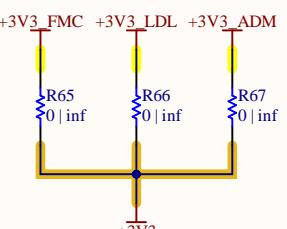
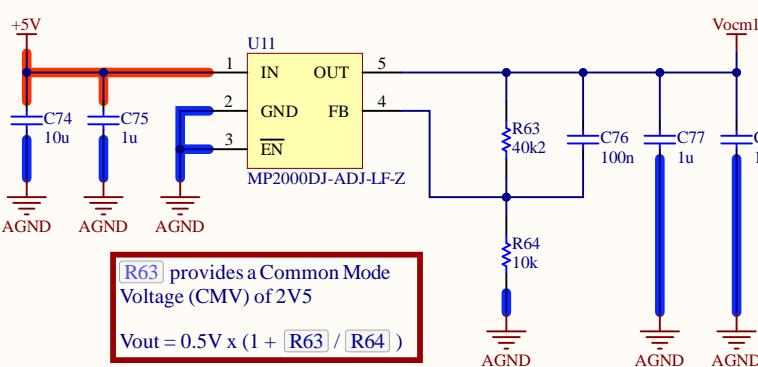
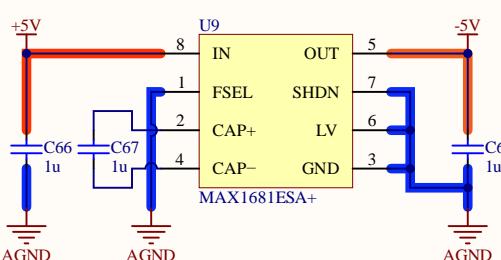
Date: 01.11.2023 Revision: V0.1  
Sheet 14 of 16 Drawn By: M.Sc. Tobias Wirth



A



[R65], [R66], and [R67] are used to control the +3V3 VDD of the DAC and TRX protection circuit



## Title PDN - Backend

Size

A4

Project

AUS - NMR System

Date:

06.10.2023

Revision:

V1.2

Sheet

15 of

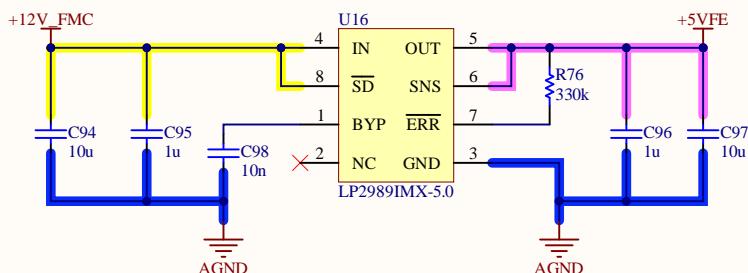
16

Drawn By: M.Sc. Tobias Wirth



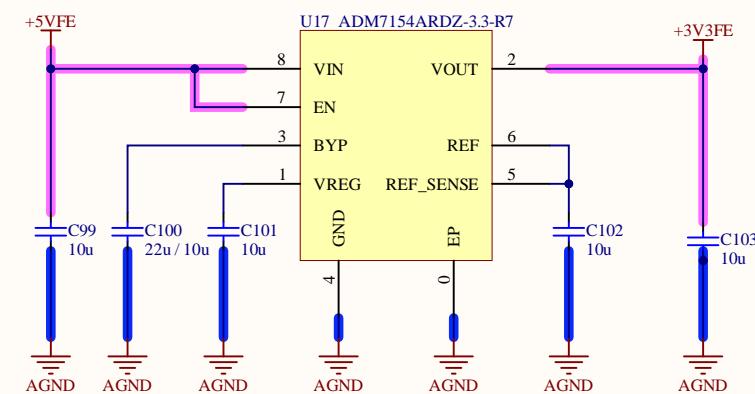
A

A



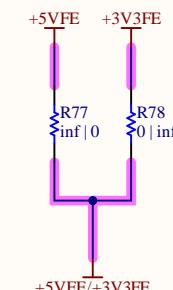
B

B



C

C



**U16** is used exclusively for the frontend power supply

**U17** is used / placed on backend if temperatures exceed 125°C on the frontend otherwise DNP.  
Also choose **R77** & **R78** accordingly.

Title  
**PDN - Frontend**

Size  
**A4** Project  
**AUS - NMR System**

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Sheet 16 of 16 Drawn By: M.Sc. Tobias Wirth



