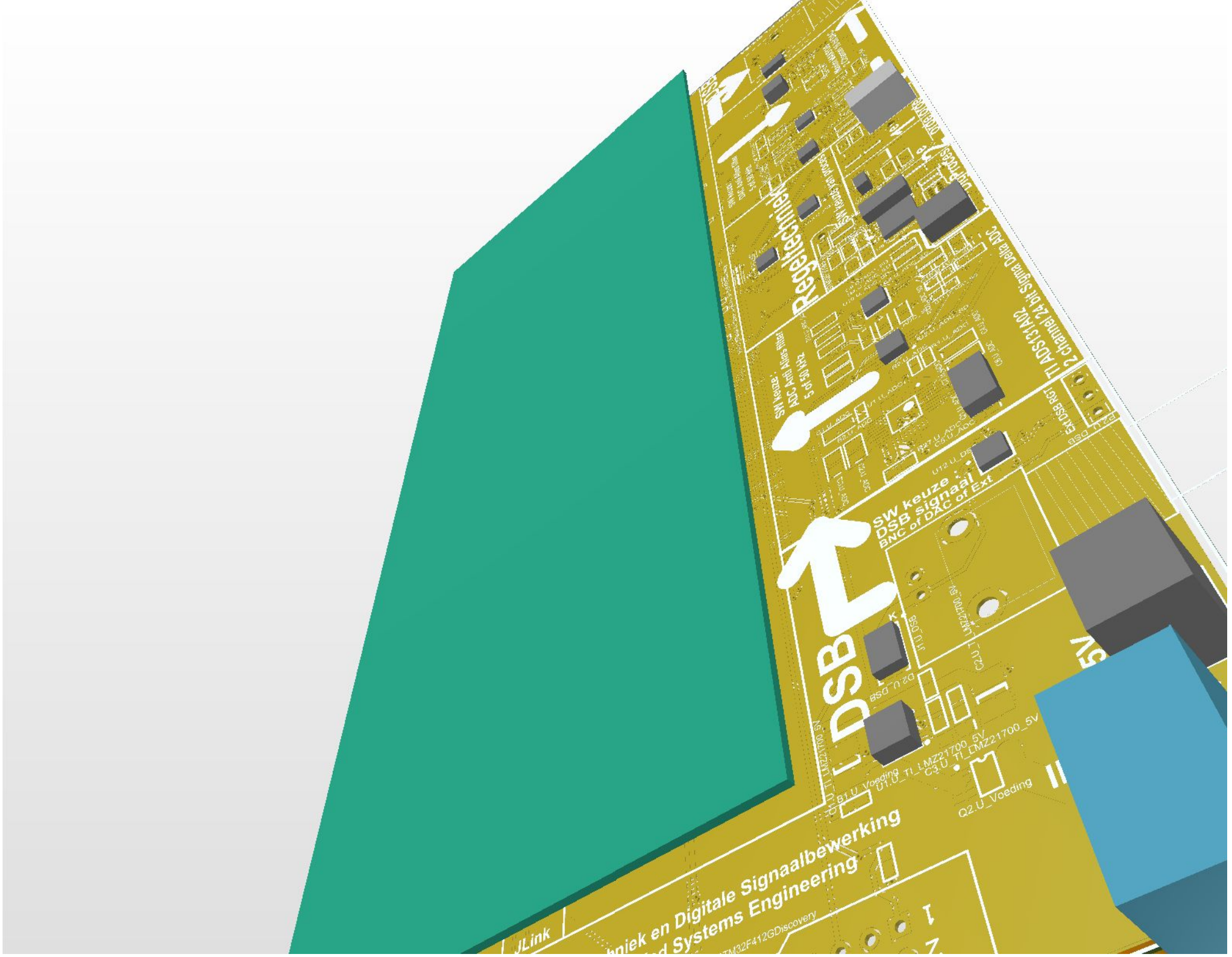
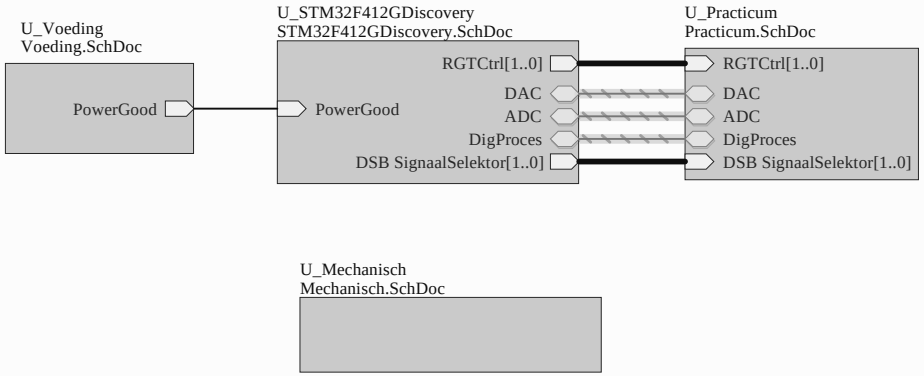
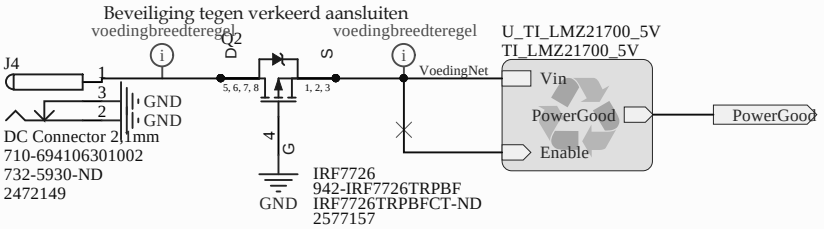

Regeltechniek
SW keuze :
ADC Anti Alias filter
5 of 50 kHz
TI ADS1314A02
2 channel 24 bit Sigma Delta ADC
SW keuze :
DSB signaal
BNC of DAC of Ext
DSB
5V
U1.U_TI_LMZ21700_5V
C3.U_TI_LMZ21700_5V
B1.U_Voeding
Q2.U_Voeding
Digitale Signaalbewerking
Systems Engineering
JLink

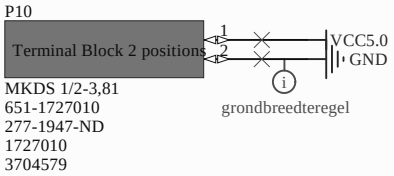


Versie 1.3 Juni 2018

Hogeschool van Arnhem en Nijmegen

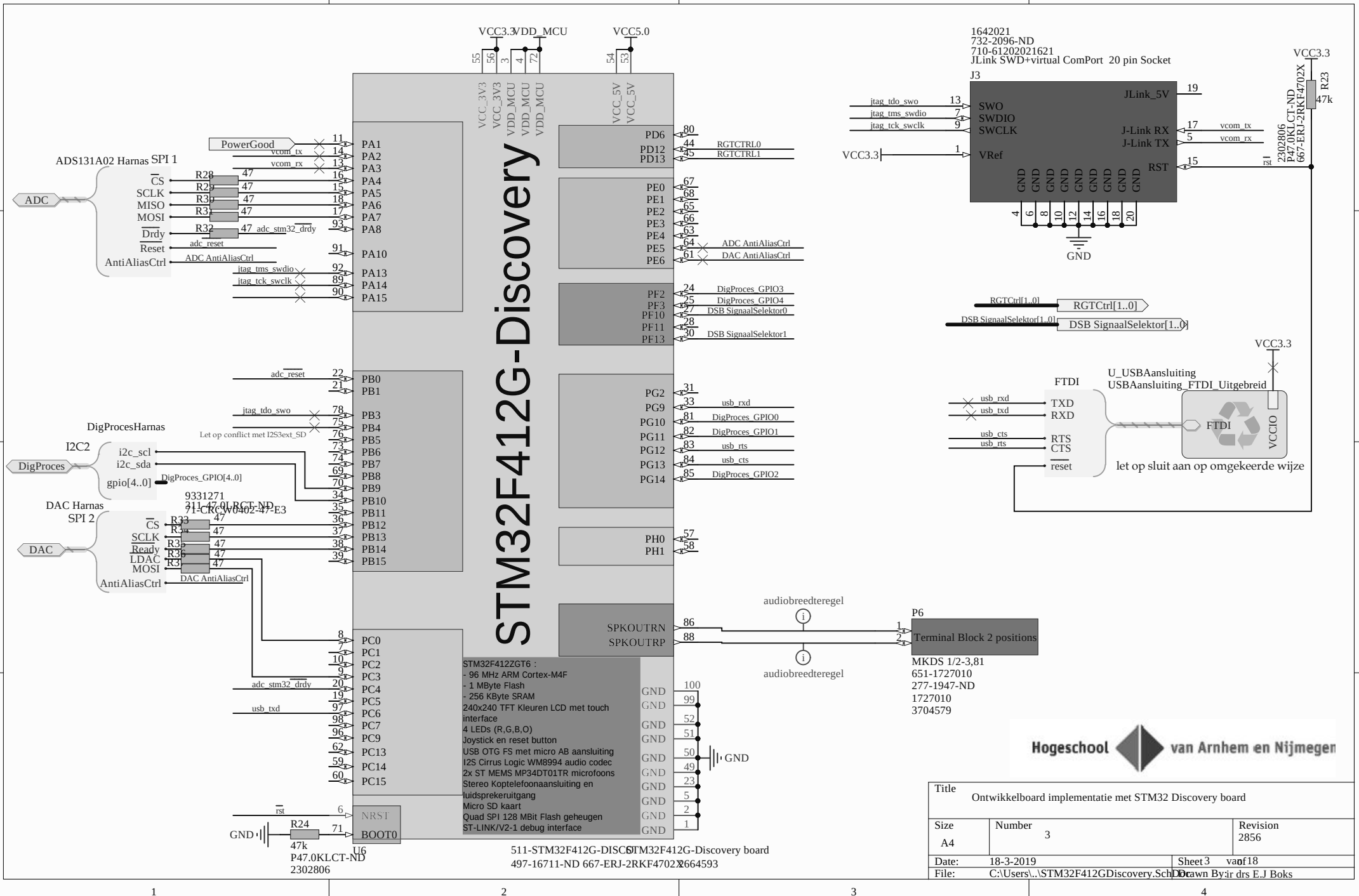
Title: Toplevel van het DSB+RGT development board		
Size: A4	Number: 1	Revision: 2705 [Locally Modified]
Date: 18-3-2019	Sheet 1 van 18	
File: C:\Users\..\Hoofdblad.SchDoc	Drawn By: ir drs E.J Boks	

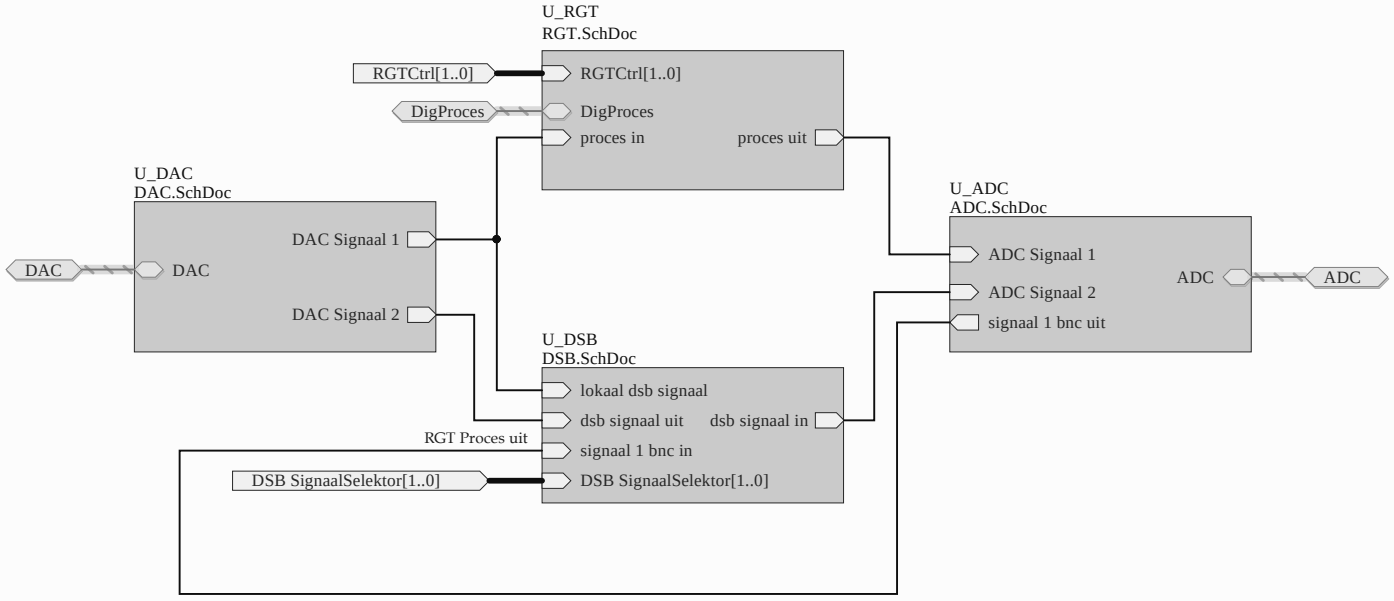




Hogeschool van Arnhem en Nijmegen

Title *		
Size A4	Number 2	Revision 2613
Date: 18-3-2019	Sheet 2 van 18	
File: C:\Users\..\Voeding.SchDoc	Drawn By:*	

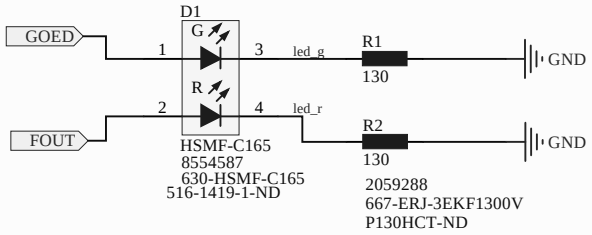

STM32F412G-Discovery
VCC3.3
VDD_MCU
VCC5.0
PowerGood
ADS131A02 Harnas SPI 1
ADC
CS
SCLK
MISO
MOSI
Drdy
Reset
AntiAliasCtrl
adc_reset
ADC AntiAliasCtrl
jtag_tms_swdio
jtag_tck_swclk
vcom_tx
vcom_rx
adc_stm32_drdy
jtag_tdo_swo
DigProcesHarnas
I2C2
DigProces
i2c_scl
i2c_sda
gpio[4..0]
DigProces_GPIO[4..0]
Let op conflict met I2S3ext_SD
DAC Harnas
SPI 2
DAC
SCLK
Ready
LDAC
MOSI
DAC AntiAliasCtrl
usb_txd
usb_rxd
usb_cts
usb_rts
RGTCTRL0
RGTCTRL1
DigProces_GPIO3
DigProces_GPIO4
DSB SignaalSelektor0
DSB SignaalSelektor1
DigProces_GPIO0
DigProces_GPIO1
DigProces_GPIO2
rst
GND
NRST
BOOT0
R24
47k
P47.0KLCT-ND
2302806
U6
STM32F412ZGT6 :
- 96 MHz ARM Cortex-M4F
- 1 MByte Flash
- 256 KByte SRAM
240x240 TFT Kleuren LCD met touch interface
4 LEDs (R,G,B,O)
Joystick en reset button
USB OTG FS met micro AB aansluiting
I2S Cirrus Logic WM8994 audio codec
2x ST MEMS MP34DT01TR microfoons
Stereo Koptelefoonaansluiting en luidsprekeruitgang
Micro SD kaart
Quad SPI 128 MBit Flash geheugen
ST-LINK/V2-1 debug interface
511-STM32F412G-DISCO
497-16711-ND
STM32F412G-Discovery board
667-ERJ-2RKF4702X
2664593
1642021
732-2096-ND
710-61202021621
JLink SWD+virtual ComPort 20 pin Socket
J3
SWO
SWDIO
SWCLK
VRef
JLink_5V
J-Link RX
J-Link TX
RST
vcom_tx
vcom_rx
rst
2302806
P47.0KLCT-ND
667-ERJ-2RKF4702X
R23
47k
RGTCtrl[1..0]
DSB SignaalSelektor[1..0]
FTDI
U_USBAansluiting
USBAansluiting_FTDI_Uitgebreid
TXD
RXD
RTS
CTS
reset
VCCIO
let op sluit aan op omgekeerde wijze
audiobreedteregel
P6
Terminal Block 2 positions
MKDS 1/2-3,81
651-1727010
277-1947-ND
1727010
3704579
Hogeschool van Arnhem en Nijmegen
Title
Ontwikkelboard implementatie met STM32 Discovery board
Size
A4
Number
3
Revision
2856
Date:
18-3-2019
Sheet 3 van 18
File:
C:\Users\..\STM32F412GDiscovery.SchDoc
Drawn By:
ir drs E.J Boks



Hogeschool van Arnhem en Nijmegen

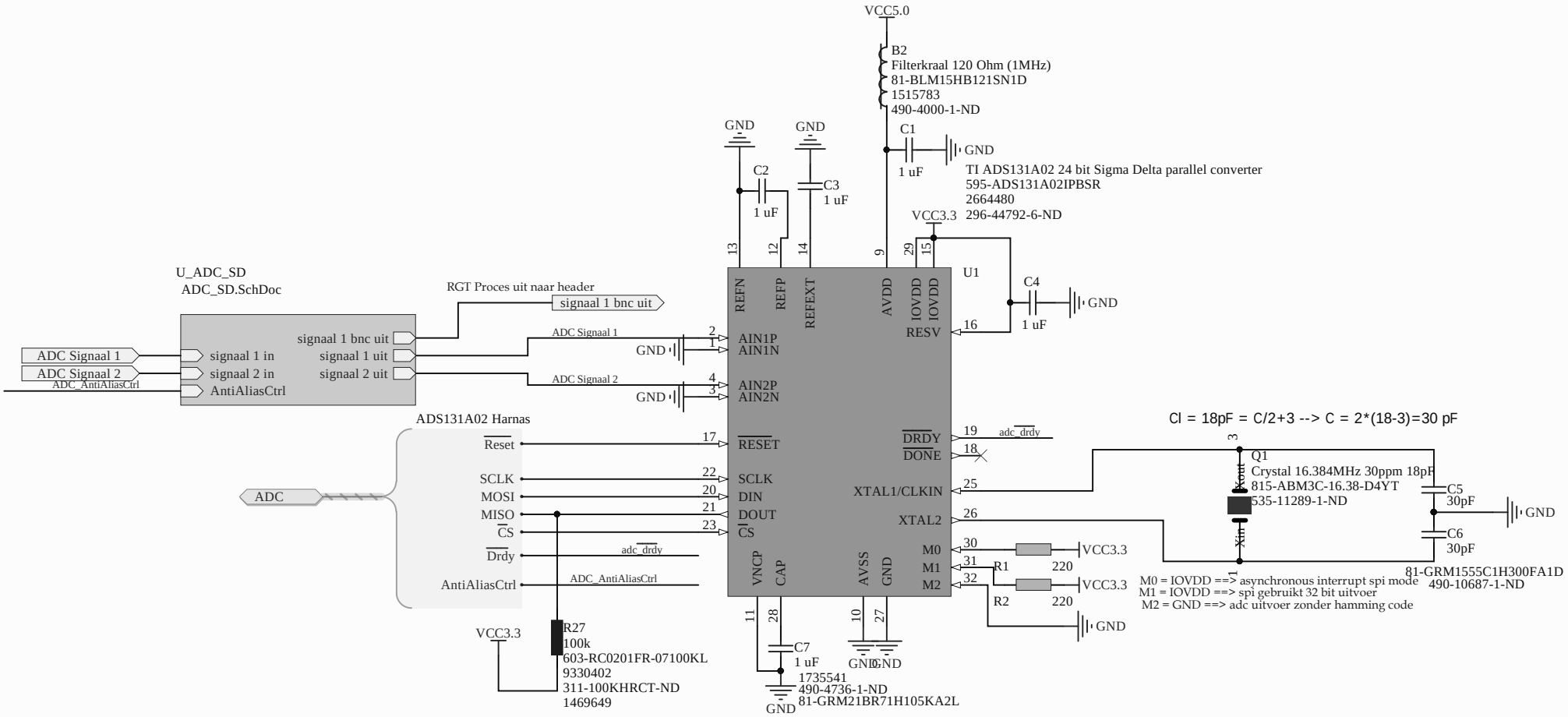
Title: Practicumoverzicht		
Size: A4	Number: 4	Revision: 2703
Date: 18-3-2019		Sheet 4 van 18
File: C:\Users\..\Practicum.SchDoc		Drawn By: ir drs E.J Boks, HAN ESE

(3,3-2)/10E-3 = 130 ohm



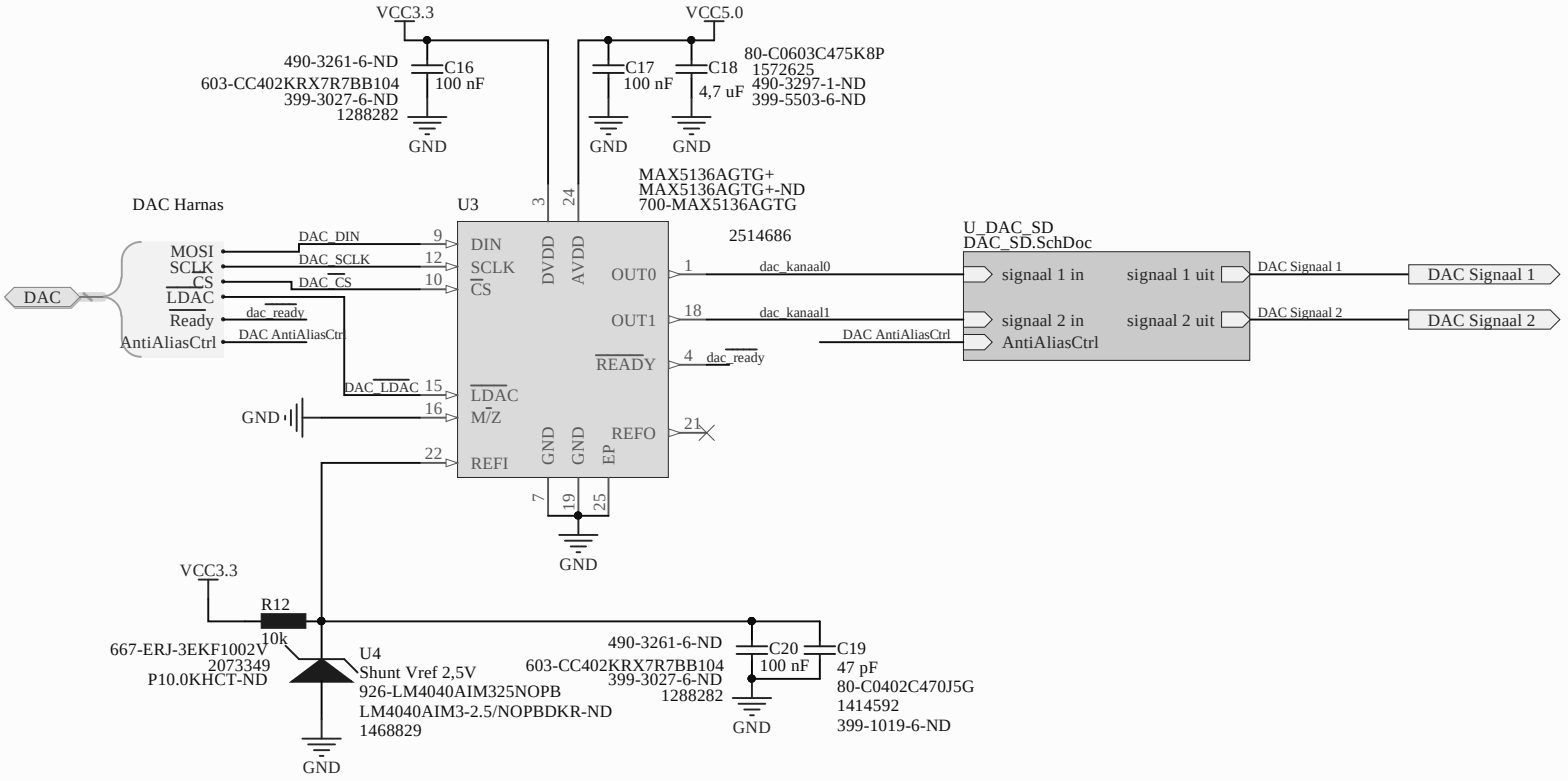
Cannot open file N:\bedrijfsvoering\bedrijfslogo\Kiwanda.jpg

Title: Standaard 3,3V Goed en Fout LED aansturing vanuit microcontroller		
Size: A4	Number: 5	Revision: Unknown revision
Date: 18-3-2019	Sheet 5 of 6	
File: C:\Users\..\GoedFout_RG_LED_3V3.SchDoc	Drawn By: ir drs E.J Boks	



Hogeschool van Arnhem en Nijmegen

Title: ADC component van het board		
Size: A4	Number: 5	Revision: 2703
Date: 18-3-2019	Sheet 5 van 18	
File: C:\Users\..\ADC.SchDoc	Drawn By: ir drs E.J Boks	

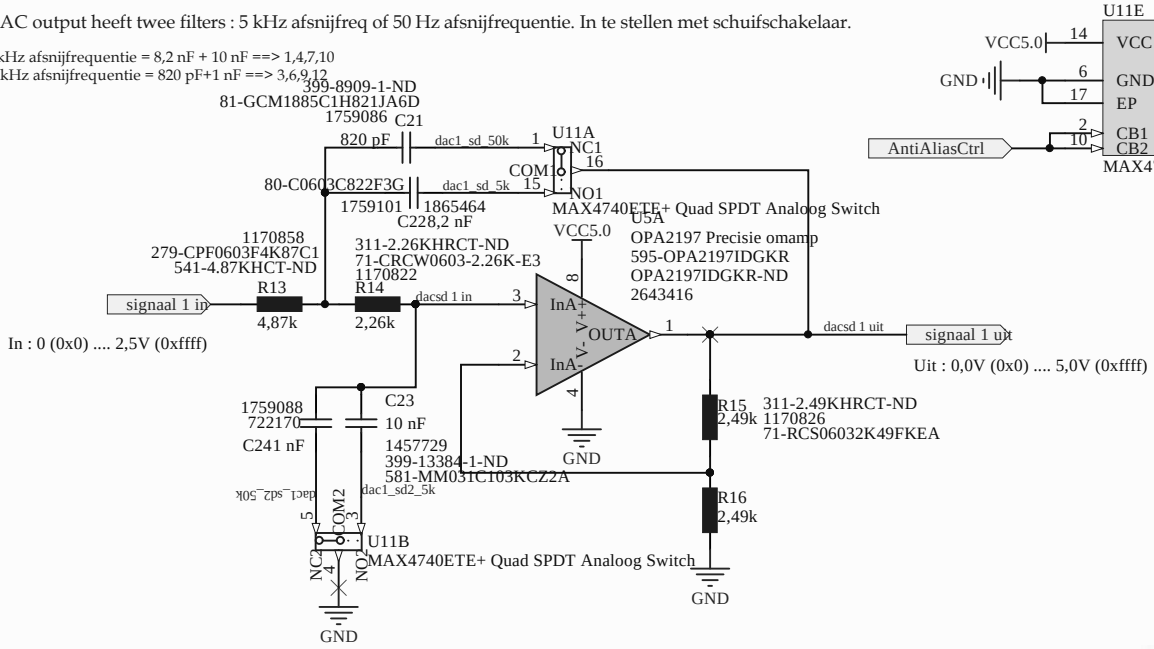


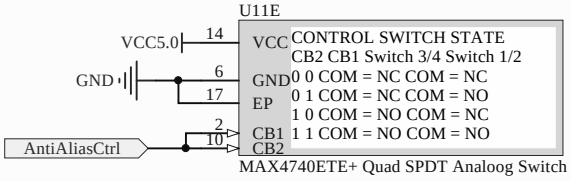
Hogeschool van Arnhem en Nijmegen

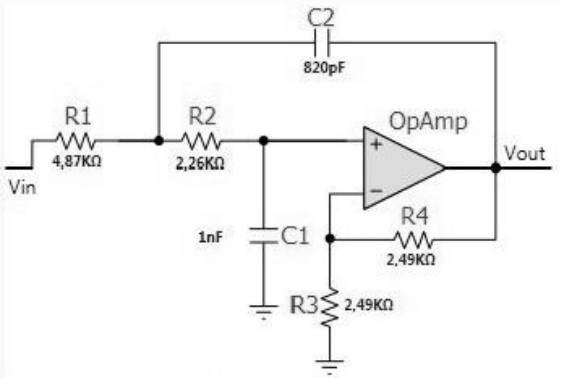
Title: DAC component van het board		
Size: A4	Number: 6	Revision: 2856
Date: 18-3-2019		Sheet 6 van 18
File: C:\Users\..\DAC.SchDoc		Drawn By: ir drs E.J Boks

DAC output heeft twee filters : 5 kHz afsnijfreq of 50 Hz afsnijfrequentie. In te stellen met schuifschakelaar.

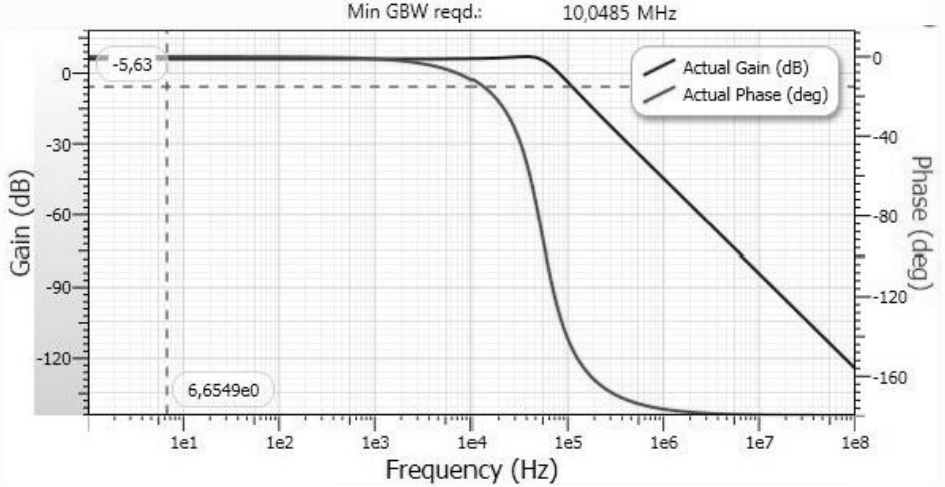
5 kHz afsnijfrequentie = 8,2 nF + 10 nF ==> 1,4,7,10
50 kHz afsnijfrequentie = 820 pF+1 nF ==> 3,6,9,12

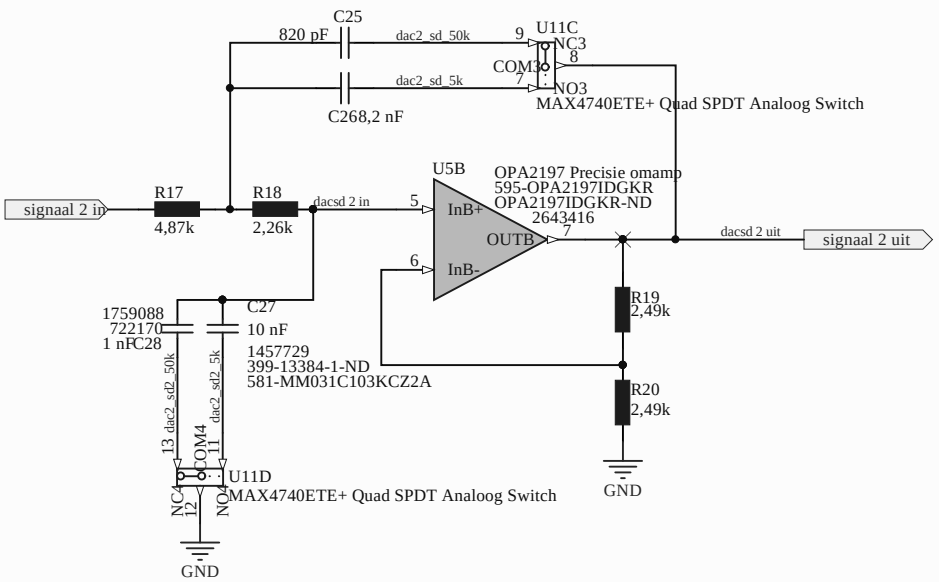






Filter Stage:	1
Passband Gain(Ao) :	2
Cutoff Frequency (fn):	52,5002 kHz
QualityFactor (Q):	0,957
Filter Response:	Chebyshev1dB
Circuit Topology:	SallenKey
Min GBW reqd.:	10,0485 MHz



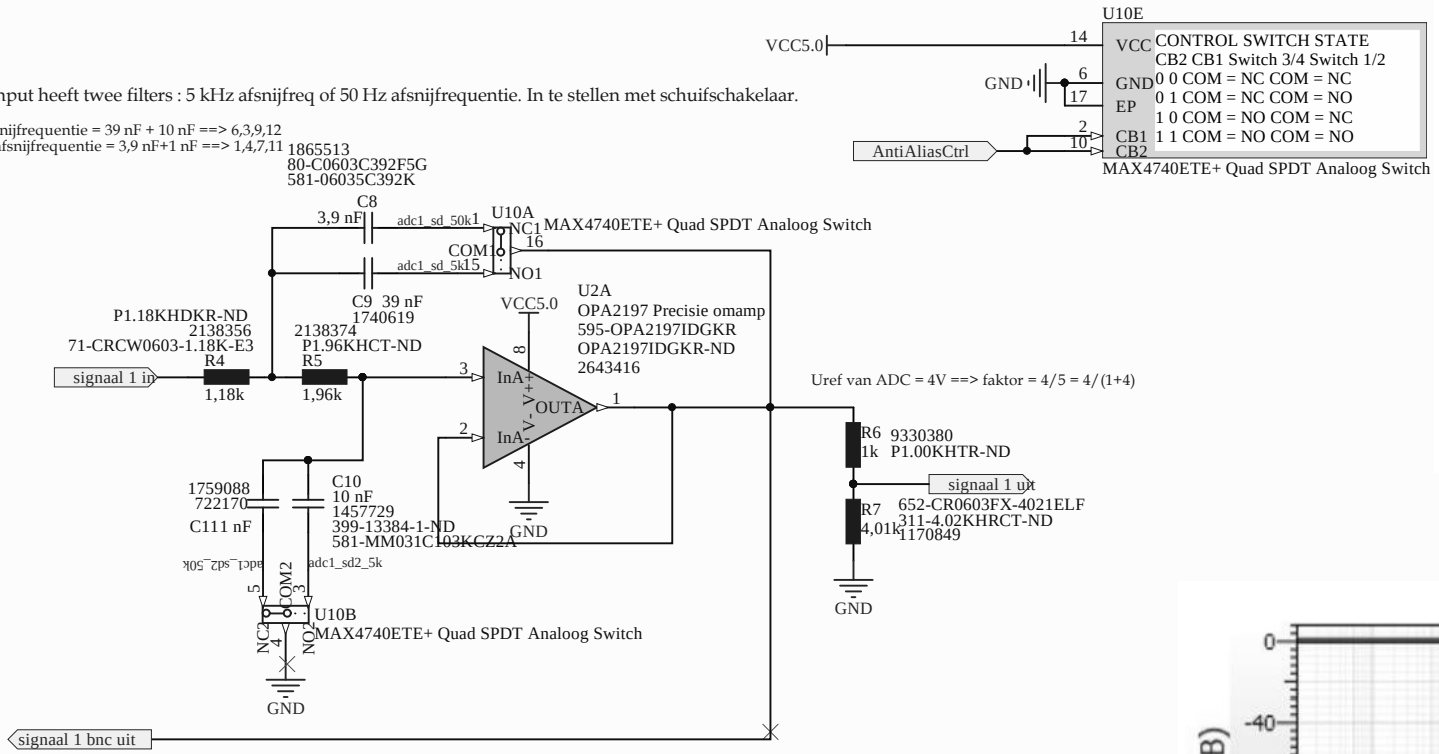


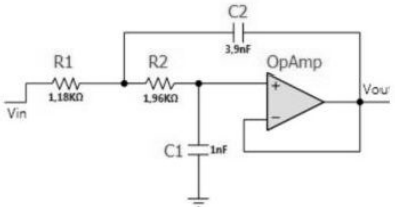
Hogeschool van Arnhem en Nijmegen

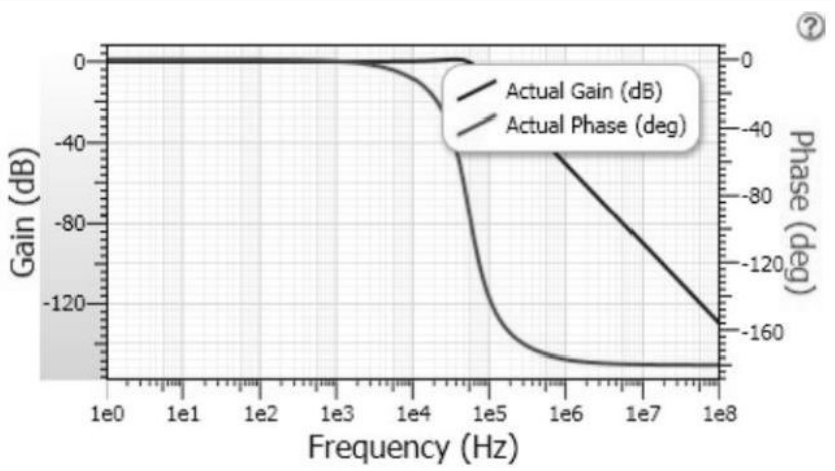
Title	Buffer/Versterker om DAC signaal op 5V uit te sturen. 7 van 18	
Size A4	Number 7	Revision 2613 [Locally Modified]
Date: 18-3-2019	Sheet 7 van 18	
File: C:\Users\..\DAC_SD.SchDoc	Drawn By: ir drs E.J Boks	

ADC input heeft twee filters : 5 kHz afsnijfreq of 50 Hz afsnijfrequentie. In te stellen met schuifschakelaar.

5 kHz afsnijfrequentie = 39 nF + 10 nF ==> 6,3,9,12
50 kHz afsnijfrequentie = 3,9 nF+1 nF ==> 1,4,7,11

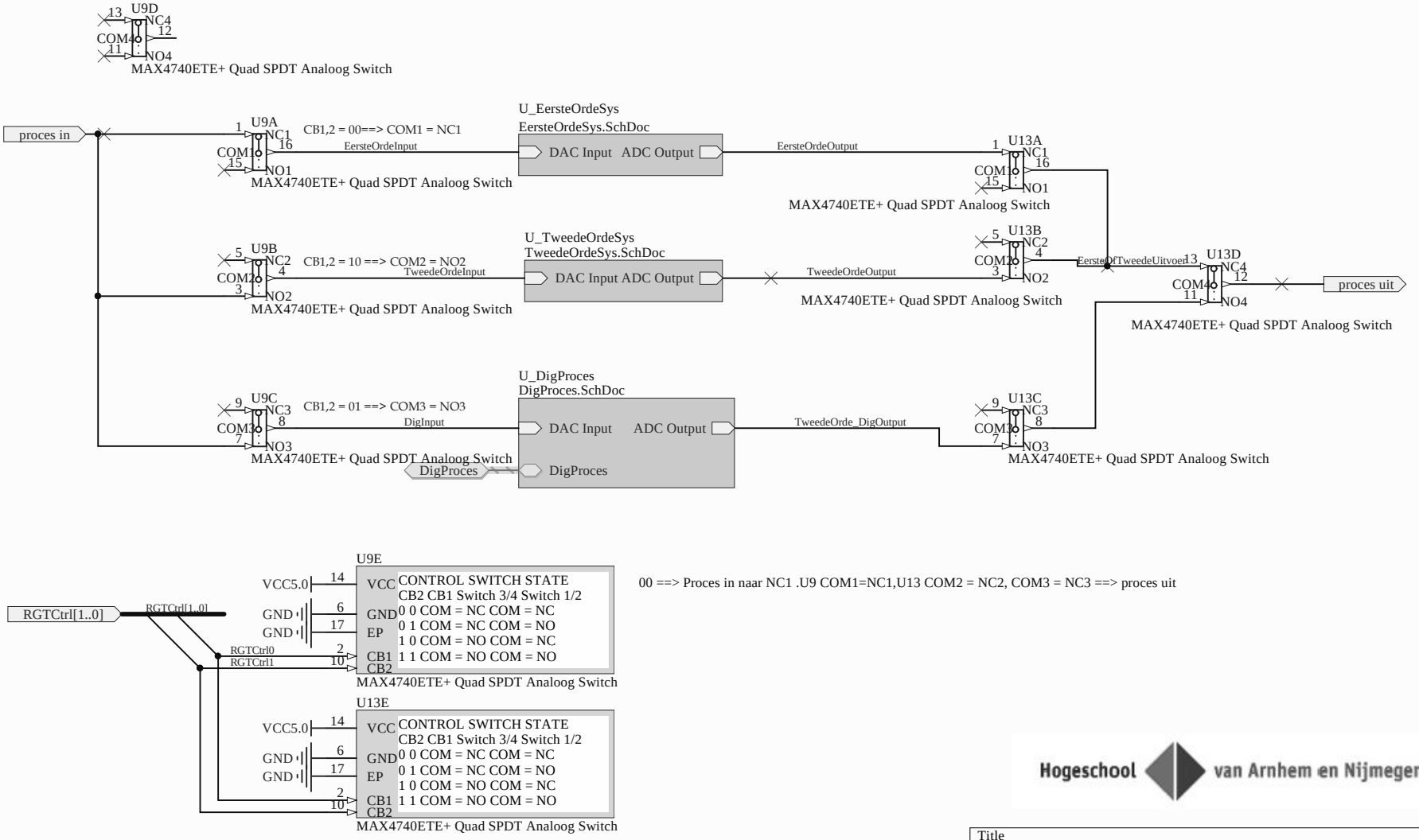






Hogeschool van Arnhem en Nijmegen

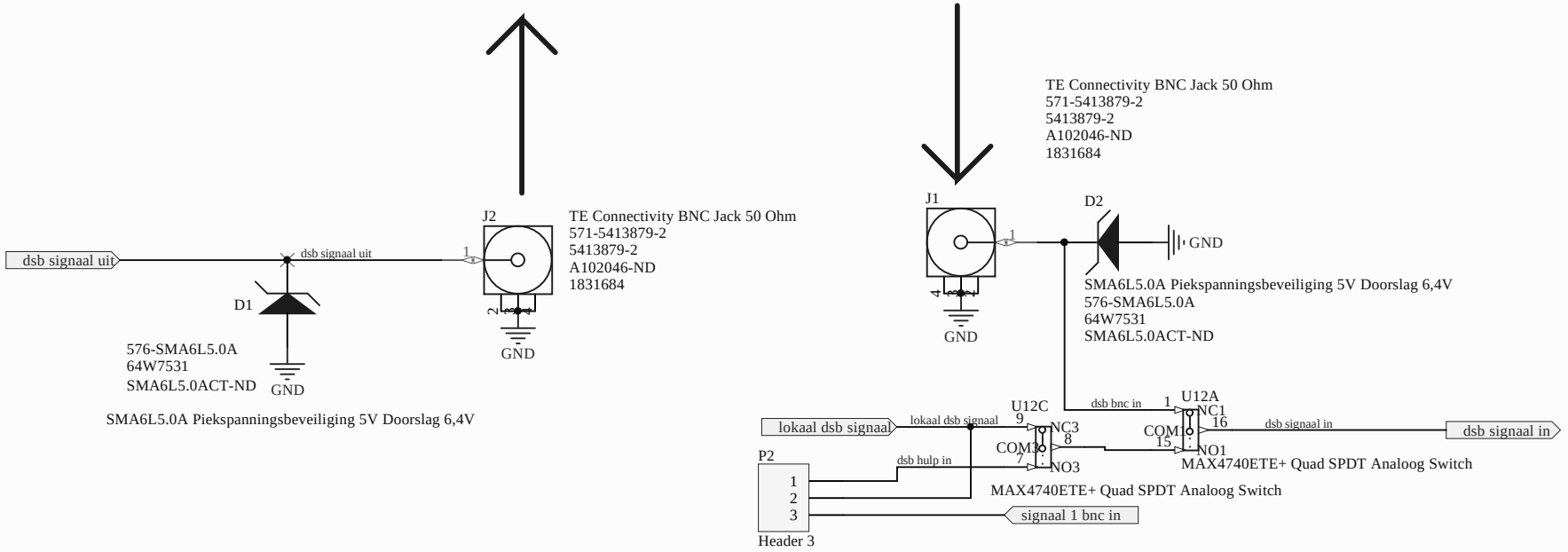
Title: ADC Anti-Alias laagdoorlaatfilter op 5/50 kHz met levelshift naar 4V		
Size: A4	Number: 8	Revision: 2703 [Locally Modified]
Date: 18-3-2019	Sheet 8 van 18	
File: C:\Users\..\ADC_SD.SchDoc	Drawn By: ir drs E.J Boks	



00 ==> Proces in naar NC1 .U9 COM1=NC1,U13 COM2 = NC2, COM3 = NC3 ==> proces uit

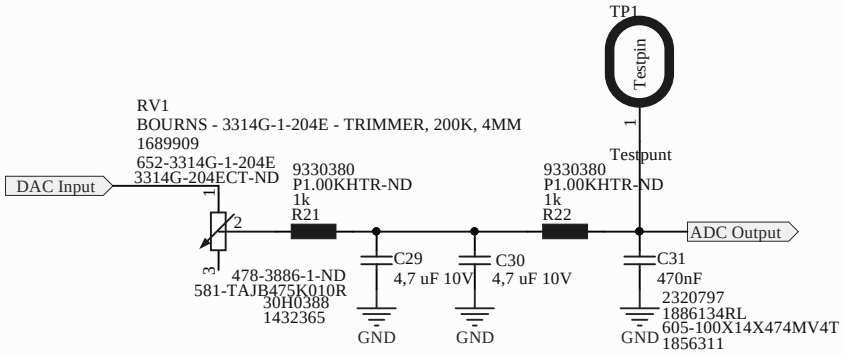
Hogeschool van Arnhem en Nijmegen

Title: Toplevel voor Regeltechniek practicum met keuze uit drie processen.		
Size: A4	Number: 9	Revision: 3010
Date: 18-3-2019		Sheet 9 van 18
File: C:\Users\..\RGT.SchDoc		Drawn By: ir drs E.J Boks



Hogeschool van Arnhem en Nijmegen

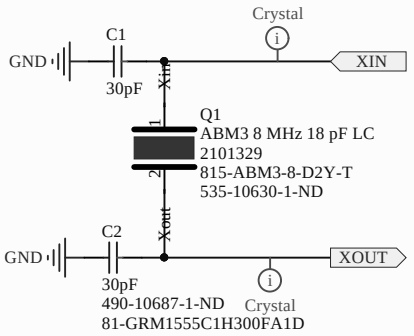
Title: Aansluitpunten voor DSB signalen		
Size: A4	Number: 10	Revision: 2703
Date: 18-3-2019		Sheet 10 van 18
File: C:\Users\..\DSB.SchDoc		Drawn By: ir drs E.J Boks



Hogeschool van Arnhem en Nijmegen

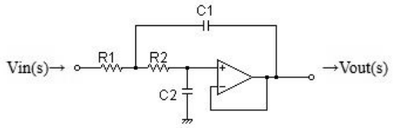
Title: Eerste orde proces voor Fuzzy en RGT practicum		
Size: A4	Number: 11	Revision: 3013
Date: 18-3-2019		Sheet 11 van 18
File: C:\Users\..\EersteOrdeSys.SchDoc		Drawn By: ir drs E.J Boks en H. Arends

Cl = 18pF = C/2+3 --> C = 2*(18-3)=30 pF



kiwanda embedded

Title: STM32 HSE 16 MHz Crystal		
Size: A4	Number: 12	Revision: Unknown revision
Date: 18-3-2019	Sheet 12 of 29	
File: C:\Users\..\STM32_HSE_8MHzCrystal.SchDoc	Drawn By: Ewout Boks	



Transfer Function:

$$G(s)=\frac{40.849673202614}{s^2+1.2777777777778s+40.849673202614}$$

R1 = 36kΩ
R2 = 10kΩ
C1 = 100uF
C2 = 0.68uF

Cut-off frequency

fc = 1.0172189096123[Hz]

Quality factor

Q = 5.0019455794394

Damping ratio

ζ = 0.099961103546441

Pole(s)

p = -0.10168232475316 +1.0121240116239i[Hz]
$|p|$= 1.0172189096123[Hz]
p = -0.10168232475316-1.0121240116239i[Hz]
$|p|$= 1.0172189096123[Hz]

Phase margin

pm= 16.3[deg] (f=1.4[Hz])

Oscillation frequency

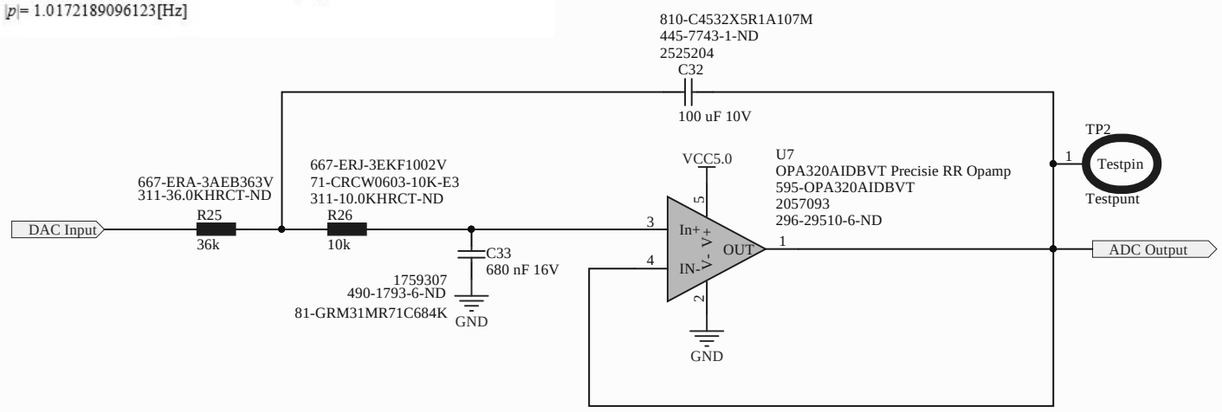
f= 1.0121240116239[Hz]

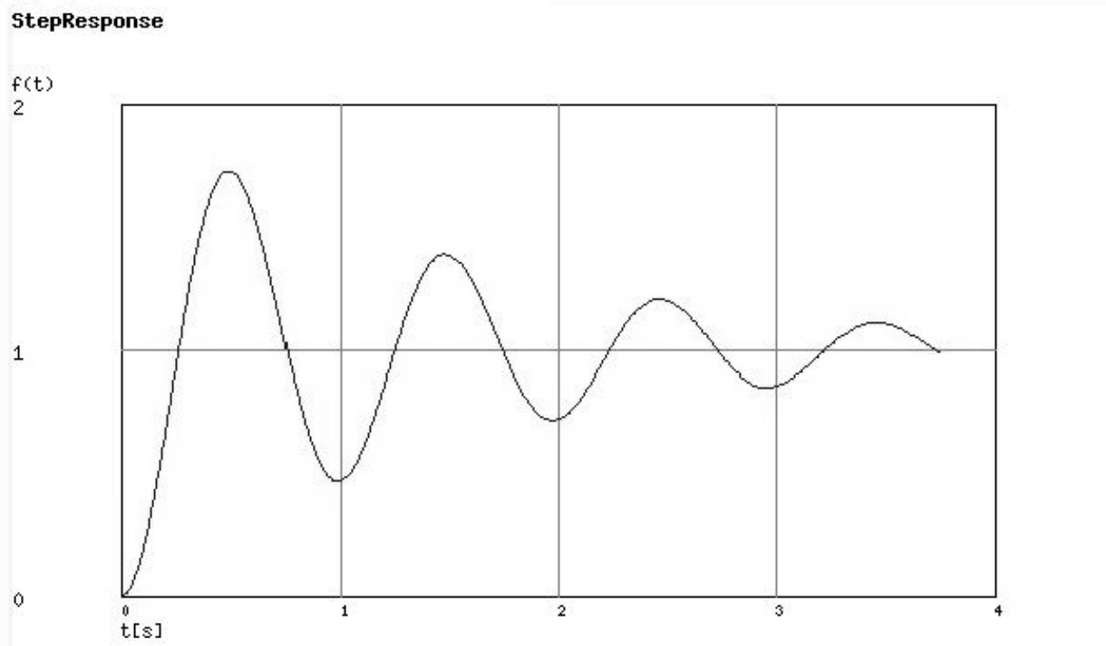
Overshoot (in absolute value)

The 1st peak g_{pk} = 1.73 (t =0.49[sec])
The 2nd peak g_{pk} = 0.47 (t =0.99[sec])
The 3rd peak g_{pk} = 1.39 (t =1.48[sec])

Final value of the step response (on the condition that the system converged when t goes to infinity)

$g(\infty) = 1$





(c)okawa-denshi.jp

Hogeschool van Arnhem en Nijmegen

Title: Tweede Orde Proces voor RGT toepassing		
Size: A3	Number: 12	Revision: 3013
Date: 18-3-2019	Sheet 12 van 18	
File: C:\Users\..\TweedeOrdeSys.SchDoc	Drawn By: ir drs E.J Boks	

V2

Rubber voet onder PCB 11 mm
546-1421T5CL
24B6330
1876520

V1

Rubber voet onder PCB 11 mm
546-1421T5CL
24B6330
1876520

V3

Rubber voet onder PCB 11 mm
546-1421T5CL
24B6330
1876520

V4

Rubber voet onder PCB 11 mm
546-1421T5CL
24B6330
1876520

J5

32x2 header voor STM32F412G-Discovery montage
32x2 2,54mm header
710-61306421121
732-2673-ND
1841240

Connectoren voor montage afsnijden op 2x25 posities

J6

32x2 header voor STM32F412G-Discovery montage
32x2 2,54mm header
710-61306421121
732-2673-ND
1841240

FD2

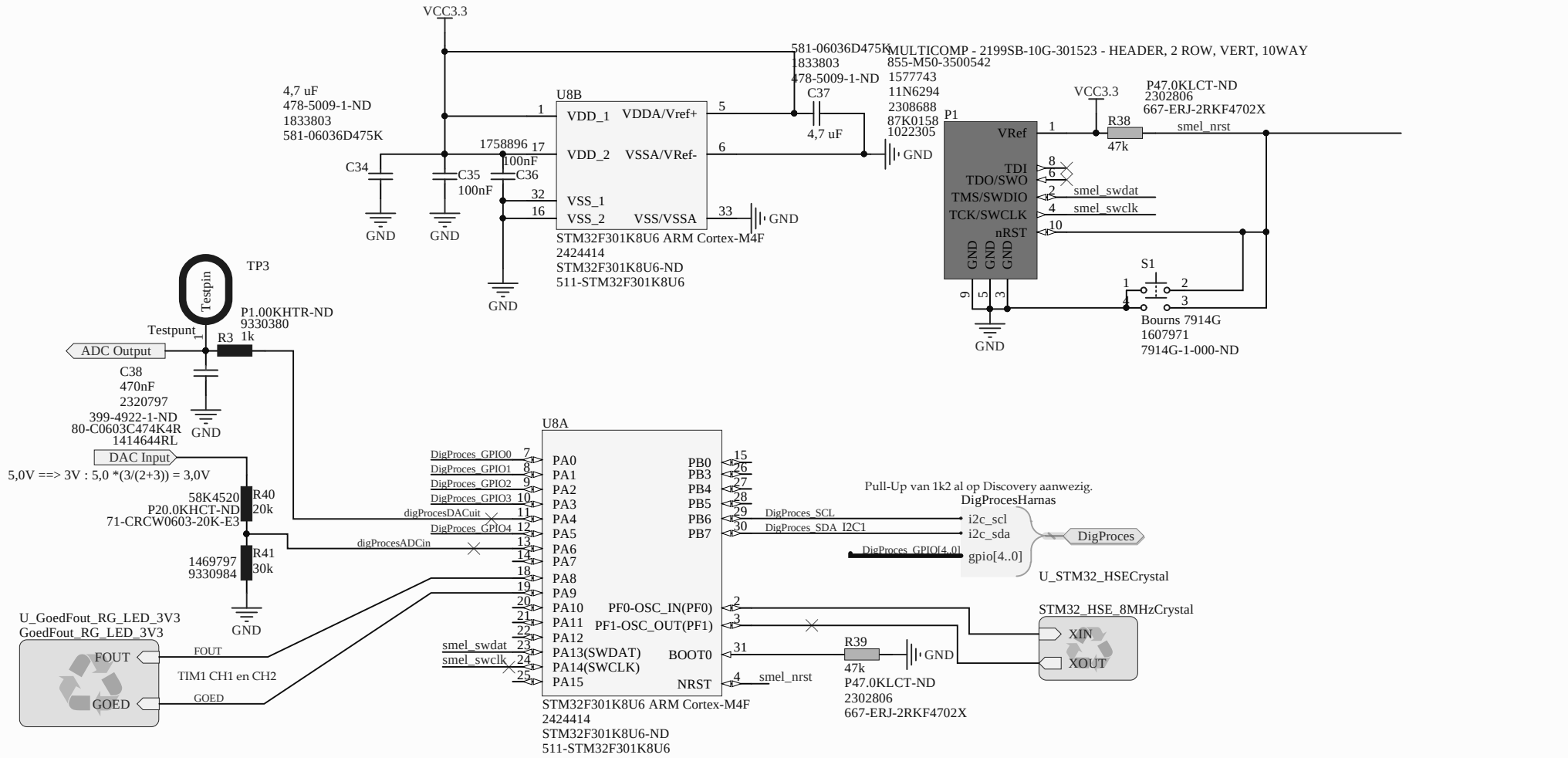
Fabricagepunt

FD1

Fabricagepunt

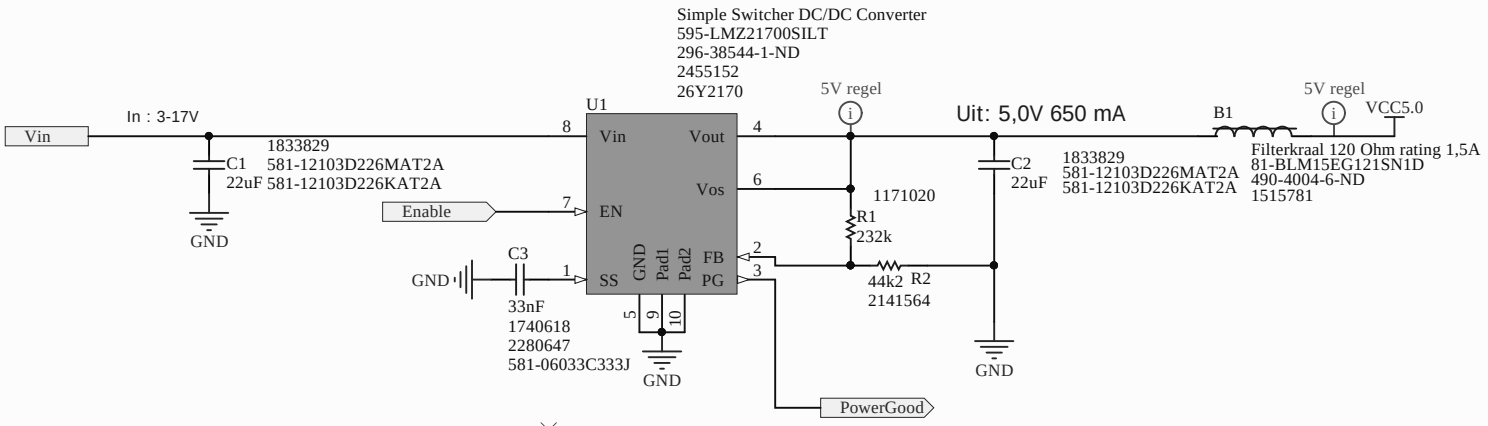
kiwanda embedded

Title: Rubber voeten en montagepunten		
Size: A4	Number: 13	Revision: 2613
Date: 18-3-2019		Sheet 13 of 18
File: C:\Users\..\Mechanisch.SchDoc		Drawn By: ir drs E.J Boks



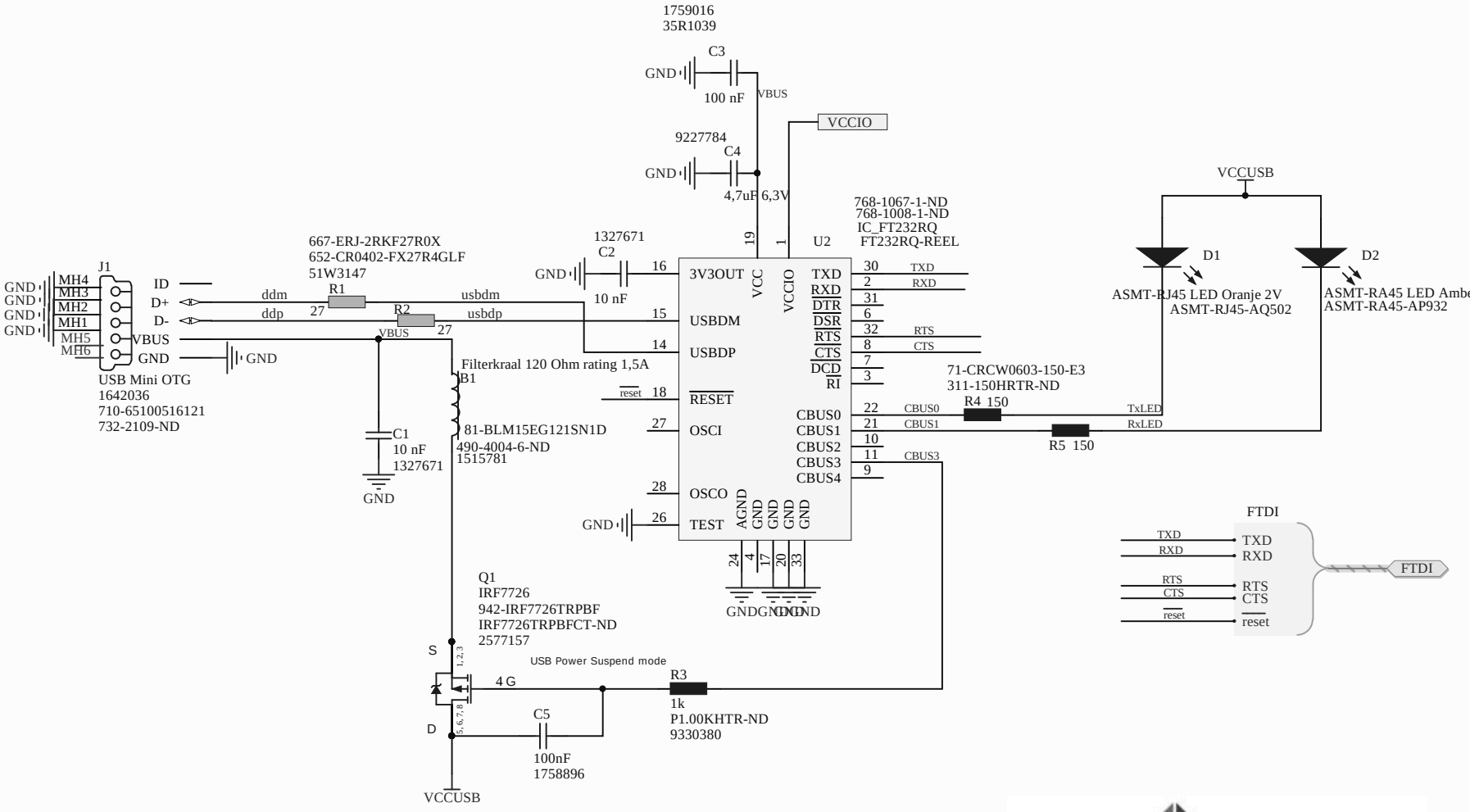
Hogeschool van Arnhem en Nijmegen

Title: Regeltechniek FlexProces op basis van digitale implementatie in een Cortex-M4F processor.		
Size: A4	Number: 14	Revision: 3013
Date: 18-3-2019	Sheet 14 van 18	
File: C:\Users\..\DigProces.SchDoc	Drawn By: ir drs E.J Boks	



kiwanda embedded

Title: Simple Switcher 3-17V --> 1-6V DC/DC 650mA Converter		
Size: A4	Number: 15	Revision:
Date: 18-3-2019	Sheet 15 of 18	
File: C:\Users\..\TI_LMZ21700_5V.SchDoc	Drawn By: ir drs E.J Boks	



Hogeschool van Arnhem en Nijmegen

Title: FTDI USB aansluiting		
Size: A4	Number: 16	Revision: Unknown revision
Date: 18-3-2019	Sheet: 16 of 18	
File: C:\Users\..\USBAansluiting_FTDI_Uitgebreid.SchDoc	Drawn By: ir drs E.J Boks	