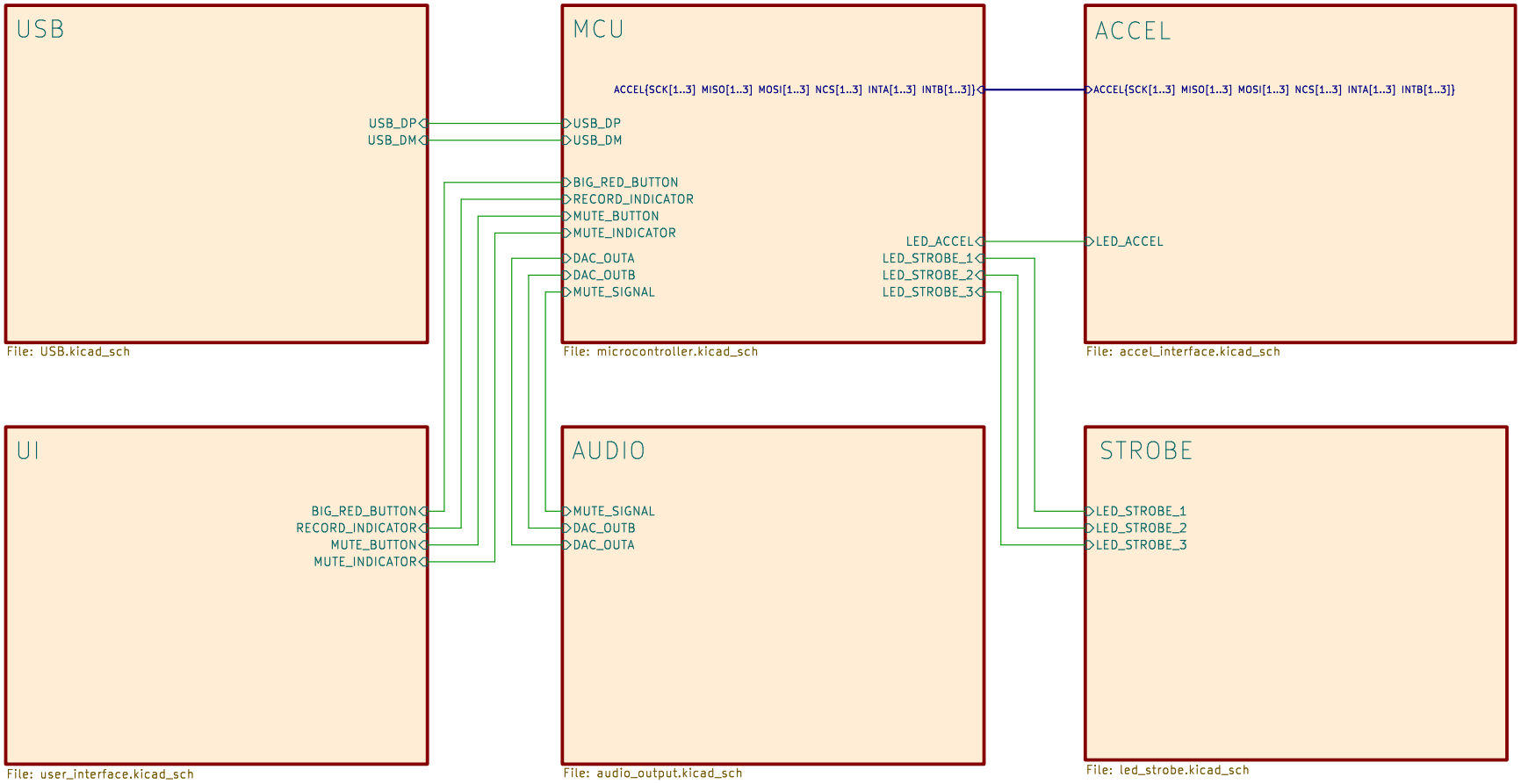

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File: vibrometer_h7.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.4		Id: 1/10

POWER FILTER CAPACITORS

+3V3

LOW ESR <1 OHM placed close to MCU pin

C201 10u C202 100n C203 100n C205 100n C207 100n C209 100n C210 100n

BOOT SWITCH

+3V3 SW201 SW_Push BOOT_SW R205 330 BOOT0 R204 10k C208 100n

NEOPIXEL LEVEL SHIFTER

+5V +3V3 TP201 RGBLED_5V R203 10k Q202 BSS138 R206 10k LED_ACCEL LED_ACCEL_3V3

STEMMA QT CONNECTOR

+5V +3V3 R201 10k R202 10k R207 10k R208 10k Q201 BSS138 Q203 BSS138 I2C2_SCL I2C2_SDA J201 SCL_QT STA_QT 5V_QT D201 +5V

Conn_01x04_Socket

https://learn.adafruit.com/introducing-adafruit-stemma-qt/technical-specs

VCAP FILTER CAPACITORS

VCAP1 VCAP2 C204 2u2 C206 2u2

LOW ESR: <100 mOHM
PLACED CLOSE TO VCAP PINS

+3V3 +3V3A

U201 STM32H723VGTx

SWD_NRST 14 NRST
+3V3A BOOT0 94 BOOT0
20 VREF+
HSE_IN 12 PH0
HSE_OUT 13 PH1

ACCEL.SCK3 1 PE2
ACCEL.INTA3 2 PE3
ACCEL.NCS3 3 PE4
ACCEL.MISO3 4 PE5
ACCEL.MOSI3 5 PE6
UART_RX 37 PE7
UART_TX 38 PE8
UART_RTS 39 PE9
UART_CTS 40 PE10

ACCEL.NCS2 81 PD0
ACCEL.INTA2 82 PD1
ACCEL.INTB2 83 PD2
ACCEL.INTA1 55 PD8
ACCEL.INTB1 56 PD9
LED_ACCEL_3V3 59 PD12

VCAP1 48 VCAP
VCAP2 73 VCAP

TP203 GPIO_timing1
PA0 22
PA1 23 MUTE_INDICATOR
PA2 24 MUTE_BUTTON
PA3 25 MUTE_SIGNAL
PA4 28 DAC_OUTA
PA5 29 DAC_OUTB
PA6 30 ADC2_INP
PA7 31 ADC2_INN
PA11 70 USB_DM
PA12 71 USB_DP
PA13(JTMS 72 SWD_DIO
PA14(JTCK 76 SWD_CLK
PA15(JTDI) 77 BIG_RED_BUTTON

PB3(JTDO 89 SWD_SWO
PB6 92 VCP_TX
PB7 93 VCP_RX
PB8 95 RECORD_INDICATOR
PB10 46 I2C2_SCL
PB11 47 I2C2_SDA
PB12 51 ACCEL.NCS1
PB13 52 ACCEL.SCK1
PB14 53 ACCEL.MISO1
PB15 54 ACCEL.MOSI1

TP204 GPIO_timing2
PC4 32 ADC1_INP
PC5 33 ADC1_INN
PC6 63 LED_STROBE_1
PC7 64 LED_STROBE_2
PC8 65 LED_STROBE_3
PC9 66 DAC_EXT_TRG
PC10 78 ACCEL.SCK2
PC11 79 ACCEL.MISO2
PC12 80 ACCEL.MOSI2
PC13 7 ACCEL.INTB3

ACCEL{SCK[1..3] MISO[1..3] MOSI[1..3] NCS[1..3] INTA[1..3] INTB[1..3]}

GPIO HEADER

+3V3 J202 Conn_02x06
UART_CTS ADC2_INP
UART_RTS ADC2_INN
UART_TX ADC1_INP
UART_RX ADC1_INN
VCP_RX
VCP_TX
TP202 DAC TRG
DAC_EXT_TRG

HIGH SPEED CRYSTAL

HSE_IN Y201 24MHz HSE_OUT R209 47 C212 12p C213 12p

TODO:
- PICK COLORS FOR MUTE / RECORD LEDS, CHANGE LCSC PARTS TO MATCH
- CHECK CRYSTAL FOOTPRINT
- EDIT FOOTPRINT FOR LED SWITCHING FETS
- CHECK PUSH SWITCH FOOTPRINT SIZE / CONNECTION
- AMPLIFIER SAYS SOIC-8, USING SSOP-8 FOOTPRINT? CHECK THIS!
SPEC VALUES FOR AUDIO FILTER
SPEC RESISTOR VAL FOR STROBE LED CURRENT LIM

TAG CONNECT DEBUG PORT

+3V3 J204 C211 100n SWD_NRST SWD_CLK SWD_DIO SWD_SWO RESET SWCLK SWDIO SWO VCC GND TC2030-NL

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File: microcontroller.kicad_sch

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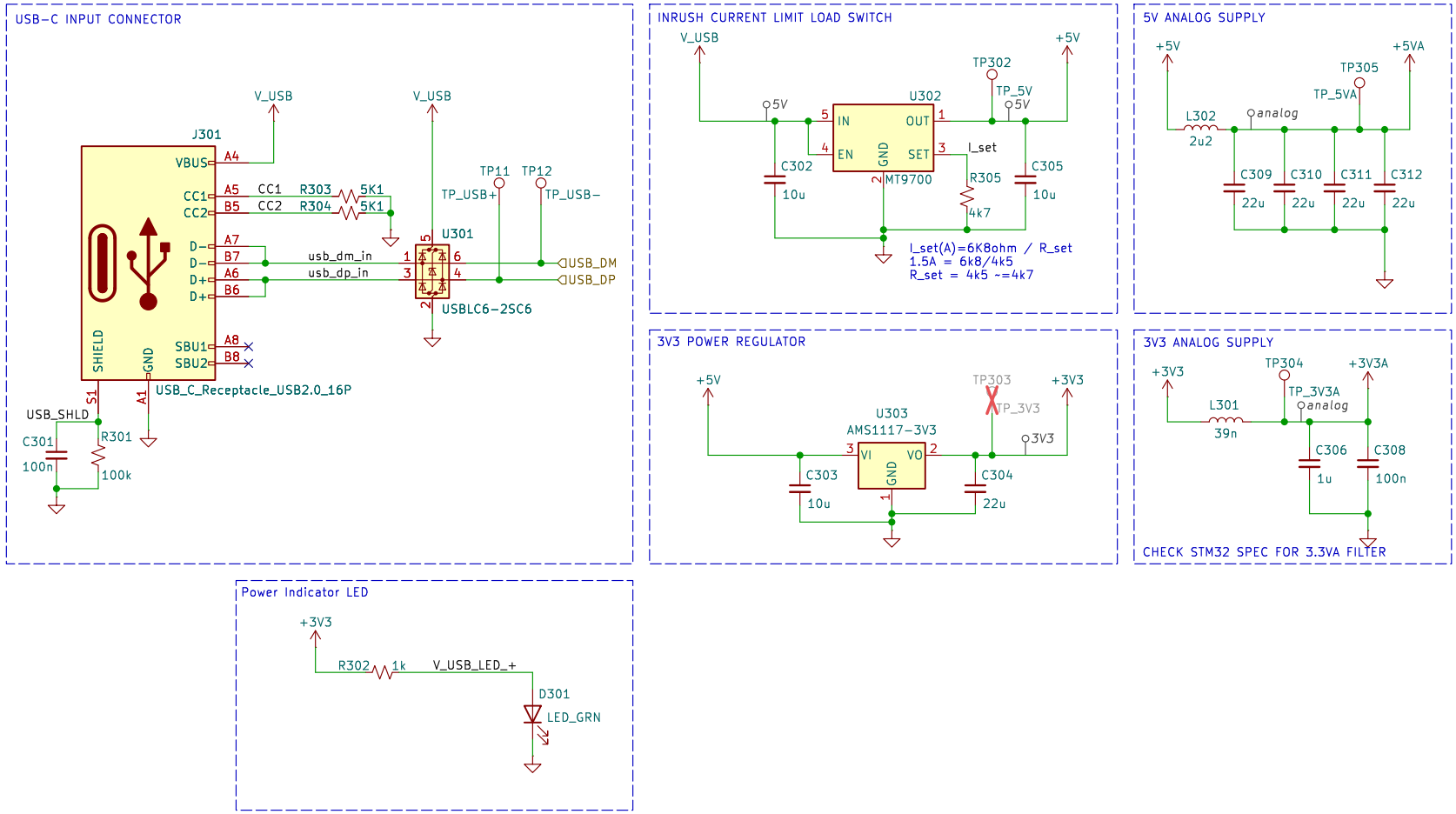
Size: A4 Date: Rev:
KiCad E.D.A. 8.0.4 Id: 2/10



ST USB Power app note:
https://www.st.com/resource/en/application_note/an5225-introduction-to-usb-typec-power-delivery-for-stm32-mcus-and-mpus-stmicroelectronics.pdf

Sheet: /USB/		
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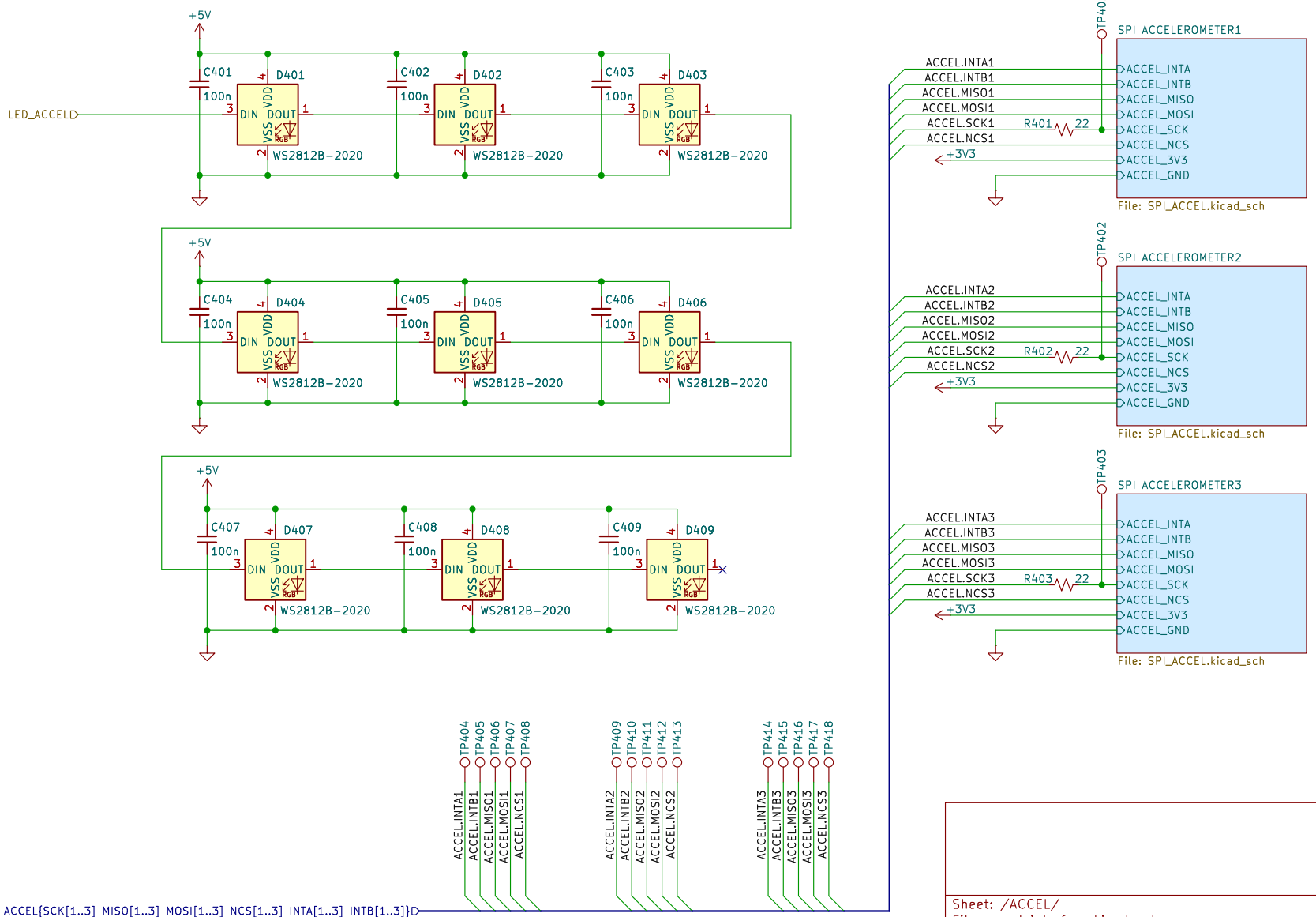
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.4		Id: 3/10



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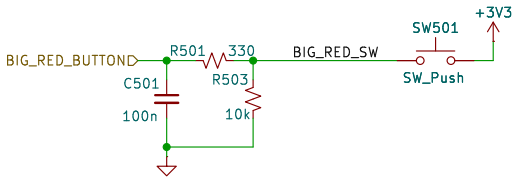
File: accel_interface.kicad_sch

Title:

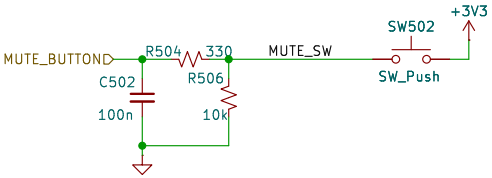
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.4		Id: 4/10

BIG RED BUTTON



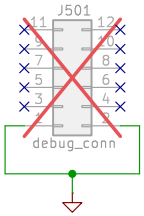
RECORD INDICATOR LED

MUTE BUTTON



MUTE INDICATOR LED

DEBUG CONNECTOR



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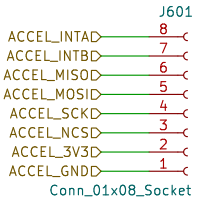
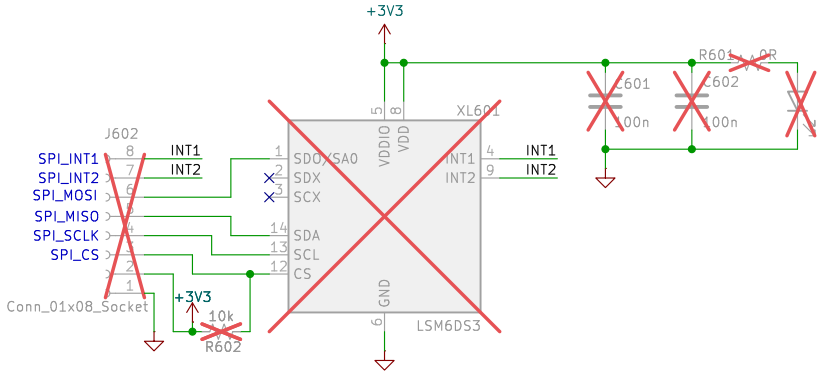
Size: A4 | Date: | **Rev:**
KiCad E.D.A. 8.0.4 | Id: 5/10





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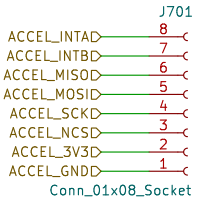
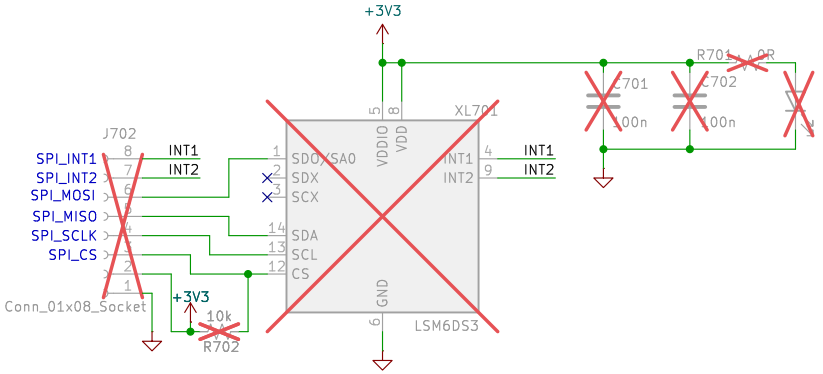
Size: A4	Date:	**Rev:**
KiCad E.D.A. 8.0.4		Id: 6/10





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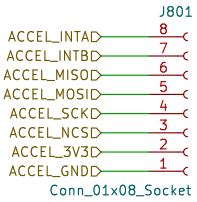

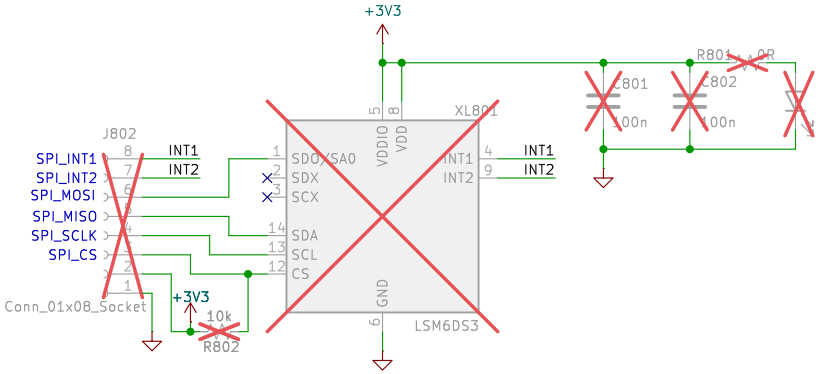

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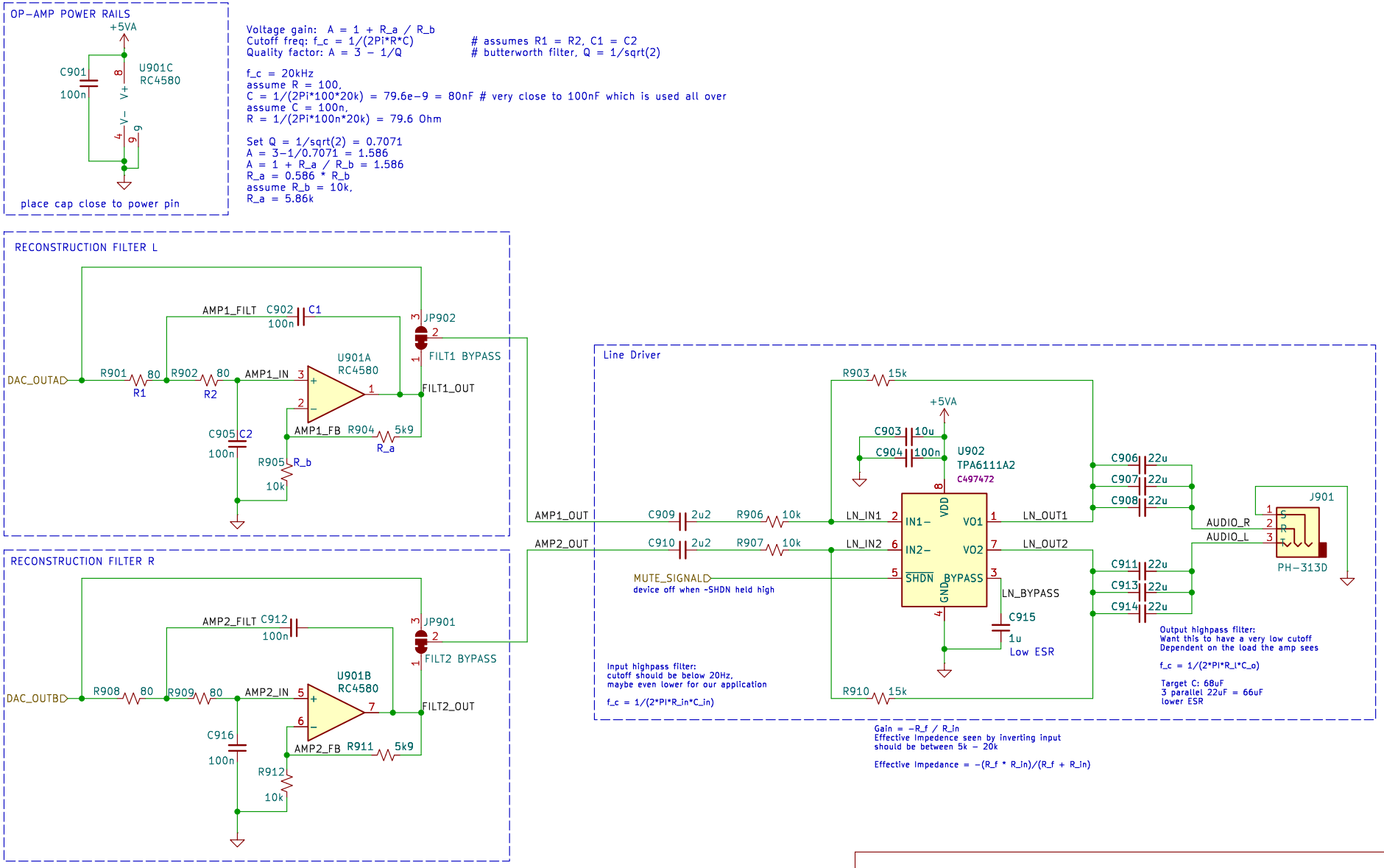
OP-AMP POWER RAILS
+5VA
C901
100n
U901C
RC4580
V+
V-
place cap close to power pin
Voltage gain: A = 1 + R_a / R_b
Cutoff freq: f_c = 1/(2Pi*R*C) # assumes R1 = R2, C1 = C2
Quality factor: A = 3 - 1/Q # butterworth filter, Q = 1/sqrt(2)
f_c = 20kHz
assume R = 100,
C = 1/(2Pi*100*20k) = 79.6e-9 = 80nF # very close to 100nF which is used all over
assume C = 100n,
R = 1/(2Pi*100n*20k) = 79.6 Ohm
Set Q = 1/sqrt(2) = 0.7071
A = 3-1/0.7071 = 1.586
A = 1 + R_a / R_b = 1.586
R_a = 0.586 * R_b
assume R_b = 10k,
R_a = 5.86k
RECONSTRUCTION FILTER L
AMP1_FILT
C902
100n
C1
JP902
FILT1 BYPASS
DAC_OUTAD
R901
80
R1
R902
80
R2
AMP1_IN
U901A
RC4580
FILT1_OUT
C905
C2
100n
AMP1_FB
R904
5k9
R_a
R905
R_b
10k
RECONSTRUCTION FILTER R
AMP2_FILT
C912
100n
JP901
FILT2 BYPASS
DAC_OUTBD
R908
80
R909
80
AMP2_IN
U901B
RC4580
FILT2_OUT
C916
100n
AMP2_FB
R911
5k9
R912
10k
AMP1_OUT
AMP2_OUT
Line Driver
R903
15k
+5VA
C903
10u
C904
100n
U902
TPA6111A2
C497472
C909
2u2
R906
10k
C910
2u2
R907
10k
LN_IN1
LN_IN2
IN1-
IN2-
VDD
VO1
VO2
SHDN
BYPASS
GND
LN_OUT1
LN_OUT2
LN_BYPASS
C915
1u
Low ESR
MUTE_SIGNAL
device off when -SHDN held high
R910
15k
C906
22u
C907
22u
C908
22u
C911
22u
C913
22u
C914
22u
J901
AUDIO_R
AUDIO_L
PH-313D
Output highpass filter:
Want this to have a very low cutoff
Dependent on the load the amp sees
f_c = 1/(2*PI*R_l*C_o)
Target C: 68uF
3 parallel 22uF = 66uF
lower ESR
Input highpass filter:
cutoff should be below 20Hz,
maybe even lower for our application
f_c = 1/(2*PI*R_in*C_in)
Gain = -R_f / R_in
Effective impedence seen by inverting input
should be between 5k - 20k
Effective impedance = -(R_f * R_in)/(R_f + R_in)
https://www.electronics-tutorials.ws/filter/second-order-filters.html
https://www.ti.com/lit/an/sboa226/sboa226.pdf?ts=1723445954076&ref_url=https%253A%252F%252Fwww.google.com%252F
https://www.ti.com/lit/an/slea048/slea048.pdf?ts=1722405290905
https://www.analogfilters.com/high-quality-reconstruction-lowpass-filter-for-digital-audio/
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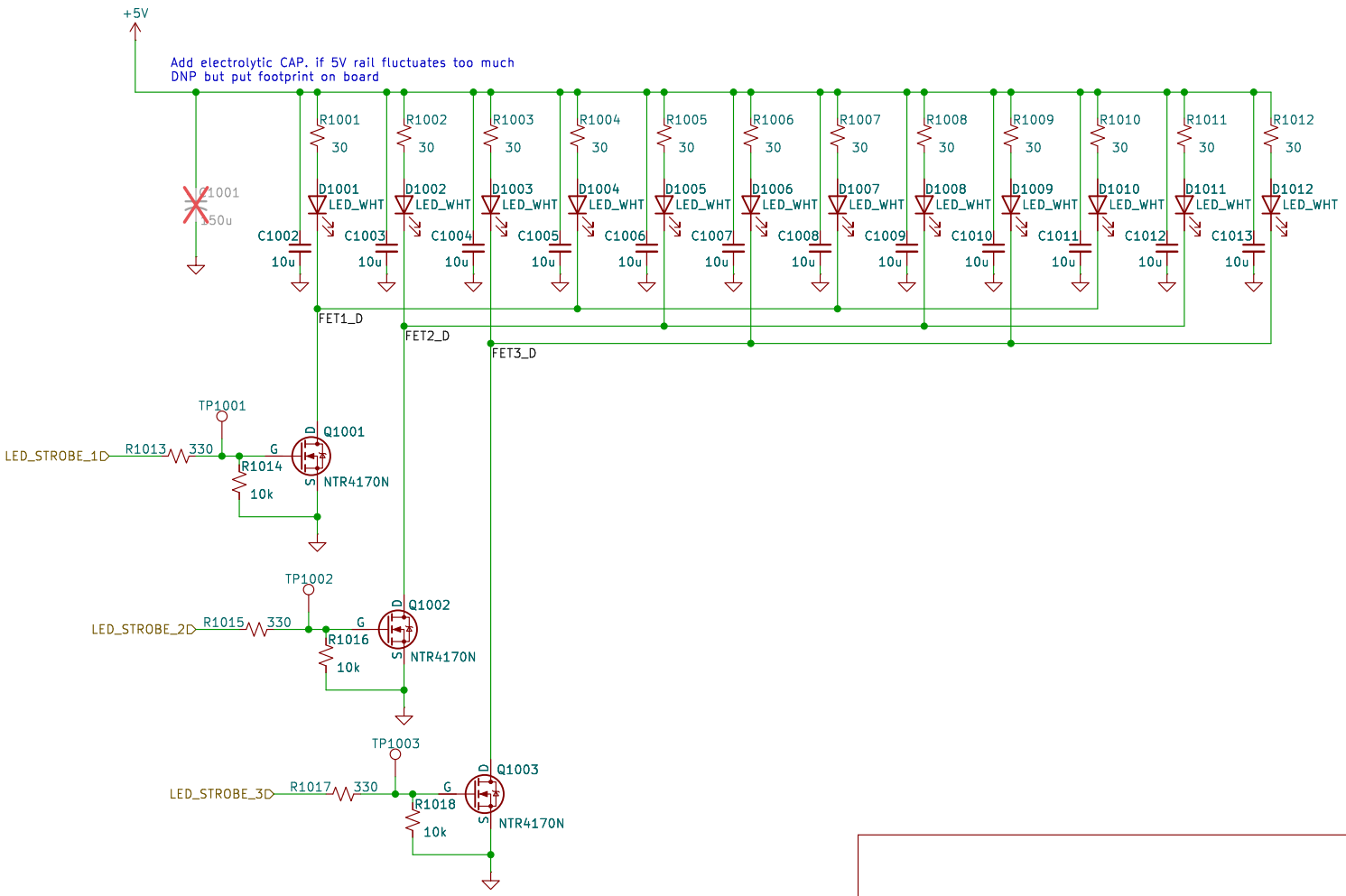
Rev:
KiCad E.D.A. 8.0.4
Id: 9/10



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KiCad E.D.A. 8.0.4		Id: 10/10