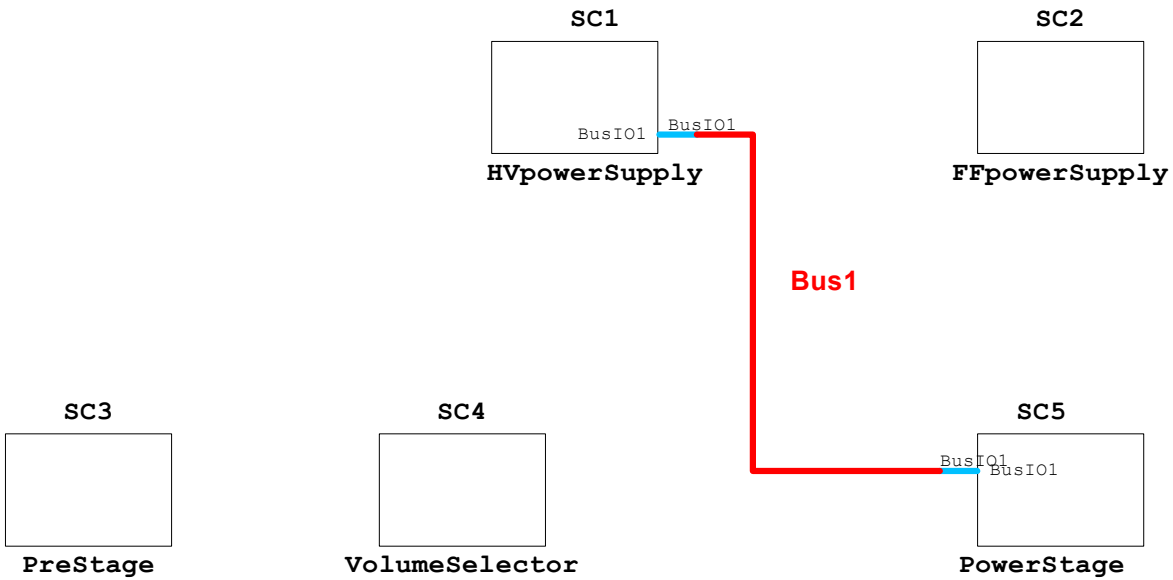
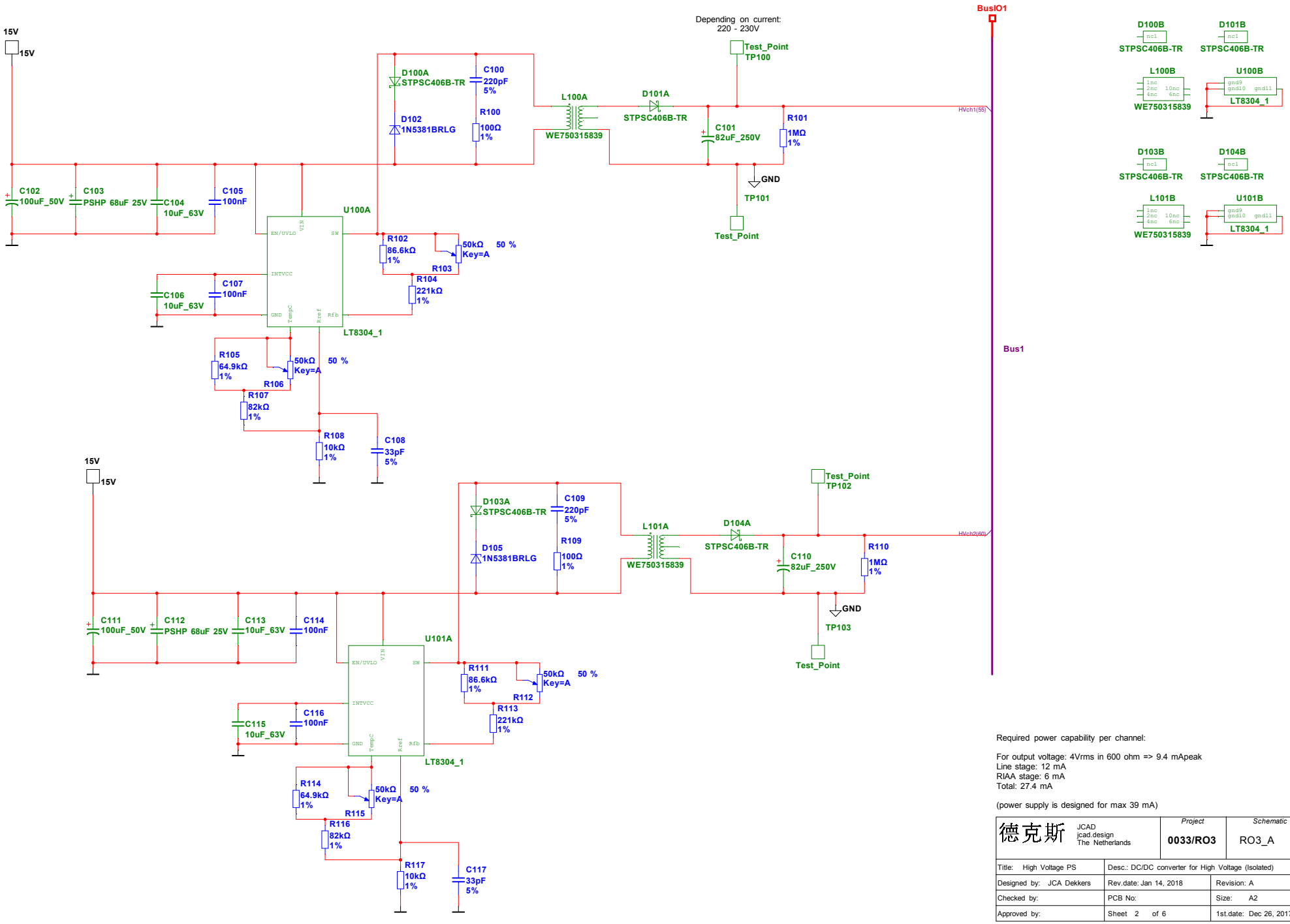
Revision History:
A Initial design

X1 MH X2 MH X3 MH X4 MH X5 MH X6 MH



U1
WP_SMSH_M3

德克斯 JCAD jcad.design The Netherlands		*Project* **0033/RO3**	*Schematic* RO3_A
Title: Functional Diagram	Desc.: Overview and Revision History		
Designed by: JCA Dekkers	Rev.date: Jan 14, 2018	Revision: A	
Checked by:	PCB No:	Size: A4	
Approved by:	Sheet 1 of 6	1st.date: Nov 4, 2017	



Required power capability per channel:

For output voltage: 4Vrms in 600 ohm => 9.4 mApeak
Line stage: 12 mA
RIAA stage: 6 mA
Total: 27.4 mA

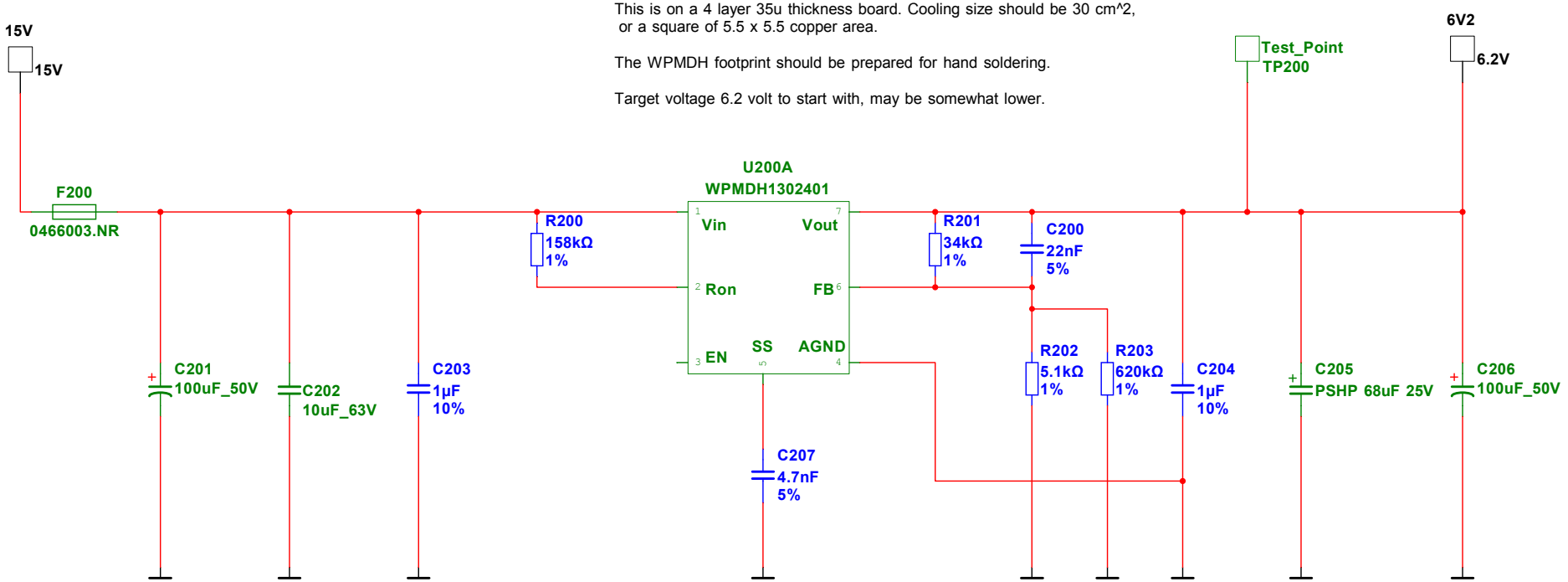
(power supply is designed for max 39 mA)

德克斯 JCAD jcad.design The Netherlands		*Project* **0033/RO3**	*Schematic* RO3_A
Title: High Voltage PS	Desc.: DC/DC converter for High Voltage (Isolated)		
Designed by: JCA Dekkers	Rev.date: Jan 14, 2018	Revision: A	
Checked by:	PCB No:	Size: A2	
Approved by:	Sheet 2 of 6	1st.date: Dec 26, 2017	

For 2.5 A ampere one needs 22 K/W thermal resisantce (see datasheet).
This is on a 4 layer 35u thickness board. Cooling size should be 30 cm^2,
or a square of 5.5 x 5.5 copper area.

The WPMDH footprint should be prepared for hand soldering.

Target voltage 6.2 volt to start with, may be somewhat lower.



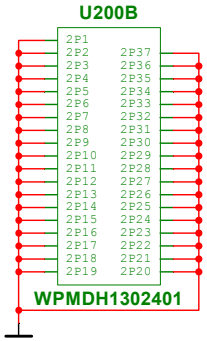
AGND should be connected
to 1uF Cout as short as possible.

Design procedure:
1a. Rfbt/Rfbb = (Vout/0.803) - 1 = 6.72...
1b. Resistors should be between 1k ... 50k
1c. Choose Rfbt = 34k => Rfbb = 5.059 k

2a. Fsw(ccm) should be between 200kHz...800kHz, target 300kHz
2b. Ron = Vout/(1.3e-10 * Fsw(ccm)) => 158k
2c. Check whether Ron equal or greater than Vinmax*150e-9/1.3e-10 => okay!

With Vin = 15, Vout = 6.2 and Fsw = 300k the DCM/CCM boundary is at approx 600 mA.

3a. Worst case input ripple current 0.5*Iout*sqrt(D/(1-D)) => 1.18 A. Input C should be able to withstand this.
3b. Value of Cin is related to the maximum DeltaVin: Cin equal or greater than Iout*D*(1-D)/(Fsw(ccm)*DeltaVin) => 100uF safe choice



Required power capability:
Filament: 6.3V at 2 x 1.095...1425 mA = 2.19...2.85 A

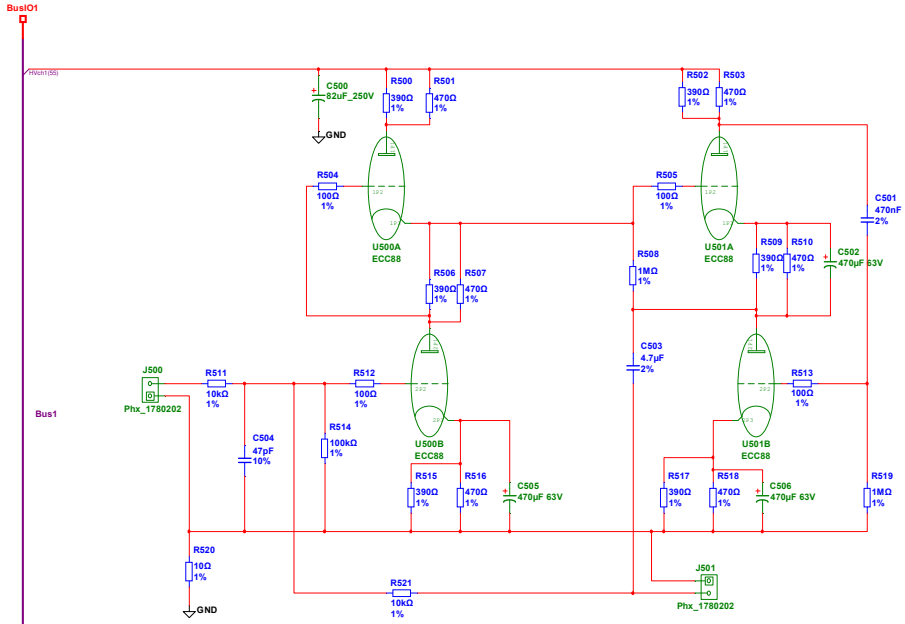
德克斯 JCAD jcad.design The Netherlands		*Project* 0033/RO3	*Schematic* RO3_A
Title: Filament PS	Desc.: DC/DC power supply for filaments		
Designed by: JCA Dekkers	Rev.date: Jan 14, 2018	Revision: A	
Checked by:	PCB No:	Size: A3	
Approved by:	Sheet 3 of 6	1st.date: Dec 24, 2017	

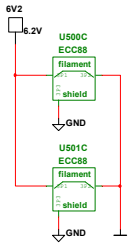
Expected power consumption:
High Voltage 3...6 mA
Filament: 1 x 365...475 mA = 475 mA worst case

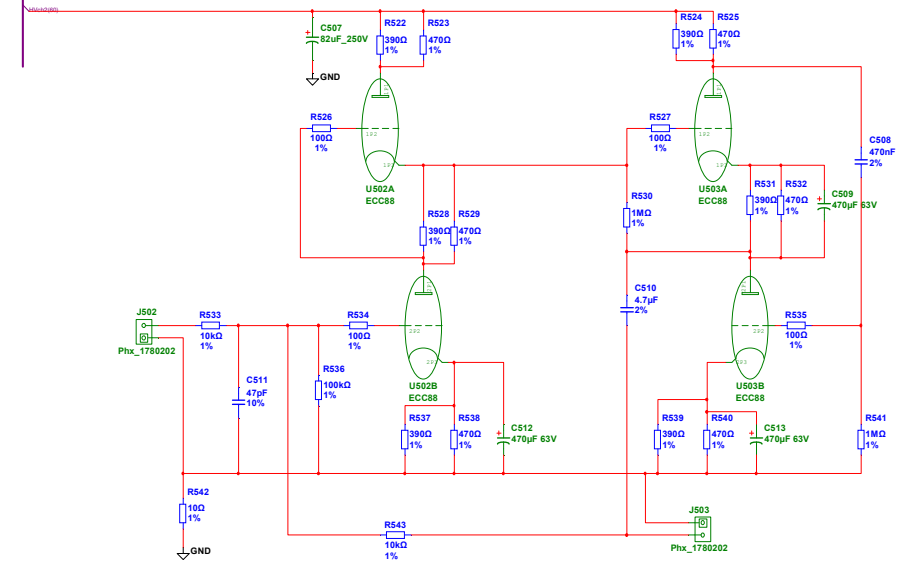
德克斯 JCAD jcad.design The Netherlands		*Project* **0033/RO3**	*Schematic* RO3_A
Title: RIAA stage	Desc.: RO3_A		
Designed by: JCA Dekkers	Rev.date: Jan 14, 2018	Revision: A	
Checked by:	PCB No:	Size: A3	
Approved by:	Sheet 4 of 6	1st.date: Nov 4, 2017	

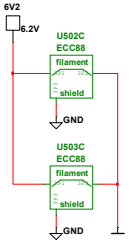
德克斯	JCAD jcad.design The Netherlands	*Project* **0033/RO3**	*Schematic* RO3_A

Title: Input Selection	Desc.: RO3_A	
Designed by: JCA Dekkers	Rev.date: Jan 14, 2018	Revision: A
Checked by:	PCB No:	Size: A3
Approved by:	Sheet 5 of 6	1st.date: Nov 4, 2017









Bandwidth 7 MHz

f = 1 kHz, B = 20 Hz - 30 kHz:

Vin,rms	Vout,rms	THD+N [%]	SNR [dB]
0.0707	0.0645	0.008	82.0
0.707	0.645	0.0023	98.6
2.0	1.82	0.0021	105.1
4.0	3.64	0.0038	101.2

With 50 ohm source and 2.2 kohm load (optimum load).

Vin,dc = 0 mV
Vout,dc = 0 mV

f = 1kHz at -0.92 dB, 20 Hz at -0.96 dB, 20 kHz at -0.92 dB, 100 kHz at -0.94 dB
Without feedback (R23 desoldered): Av = 25.56 dB at 1 kHz.

Rin = 10k4 (1 kHz), Rout = 36 ohm (20 Hz), 12 ohm (1 kHz and 10 kHz).

4u7:
Audyn Cap Plus, 1341762
D = 36mm, L = 63mm, d2 = 1.5mm

Audyn Cap Plus, 1341758
D = 25mm, L = 43mm, d2 = 1mm

Audyn Cap Plus, 1341755
D = 25mm, L = 43mm, d2 = 1mm

Expected power consumption:
High Voltage 12 mA
Filament: 2 x 365...475 mA = 950 mA worst case

德克斯 JCAD jcad.design The Netherlands		Project: 0033/RO3	Schematic: RO3_A
Title: Line Driver	Desc.: RO3_A		
Designed by: JCA Dekkers	Rev.date: Jan 14, 2018	Revision: A	
Checked by:	PCB No:	Size: A1	
Approved by:	Sheet 6 of 6	1st.date: Nov 4, 2017	