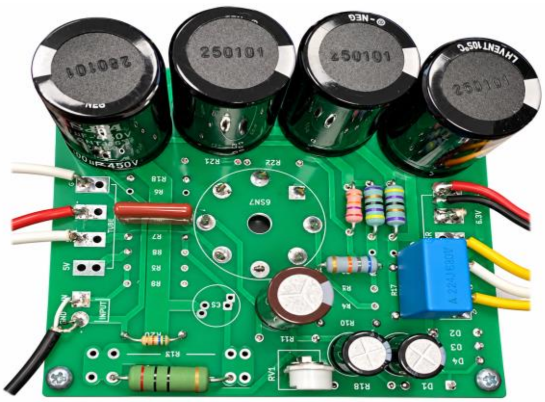

This is one of the simplest and most affordable stereo DIY tube amplifiers to build, making it an excellent choice for both beginners and experienced tube-audio enthusiasts. By selecting different output tubes, the amplifier can deliver up to 15 watts per channel while maintaining excellent sound quality.

The amplifier uses toroidal power and Toroidal output transformers, providing efficient power delivery, low magnetic leakage, and excellent audio performance. Its simple circuit design makes it easy to assemble, service, and modify. The amplifier also allows users to experiment with different output tubes to achieve their preferred sound characteristics and output power.

The following suggestions may be helpful, especially for beginners:

1. Resistor Selection

We do not recommend automatically choosing expensive "audio-grade" carbon-composition resistors. Carbon-composition resistors can generate more noise, and their resistance can change significantly with voltage and temperature. Although they may have a particular sonic character, they are generally not the best technical choice for a low-noise amplifier.

2. High-Power Resistors

For high-power applications, especially in the power supply and screen circuits, metal-oxide or wirewound resistors are generally a better choice because of their higher power-handling capability and better stability.

3. Component **Value 2**

The **Value 2** shown in the component chart may be increased if desired, as long as the physical size of the component fits within the available space on the PCB.

4. Output Tube Selection and Bias Adjustment

When using different output tubes, the values of R12 and R13 must be adjusted as necessary to set the bias current to the proper level for optimal tube operation. Always verify the bias current and operating conditions against the specifications for the tube being used.

5. B+ Voltage Adjustment

If the B+ supply voltage changes, the value of R16 must be adjusted as necessary to keep the supply voltage for the first stage close to the value indicated on the circuit diagram.

6. Tube Socket Installation

When soldering the tube socket onto the PCB, plug a tube into the socket first to make sure the socket pins are properly aligned. This will help prevent misalignment and ensure that the tube can be easily inserted and removed after the socket is soldered in place.

7. Grounding

We recommend connecting the chassis ground (the ground pin of the IEC socket) to one of the GND points next to IN. Proper grounding is important for minimizing hum and noise. If the grounding is done correctly, the amplifier should produce very low hum or no audible hum from the speakers.

Safety Note: Tube amplifiers contain high voltages that can be dangerous even after the power is turned off. Always discharge the power-supply capacitors and follow proper electrical safety procedures before servicing or making any changes to the amplifier.

Components List

Reference	Value1	Value2	Qty
C1	0.22uF	400V	1
C3	47uF	100V	1
C4,C11	47uf	160V	2
C5	220uF	100V	1
C6,C7	100uf	450V	2
C8,C10	100uF	450V	2
D1,D2,D3,D4,D5,D6	1N4007	1000V	6
R1,R11,R16*	27k	2W	3
R2	68k*	2W	1
R3,R4,R5	1k	1/2W	3
R6,R9,R19	270k	1/2W	3
R7,R8	27	1W	2
R10	470	1W	1
R12,R13	1.9k*	5W	2
R14,R15	47	3W	2
R18,RV1	50k	1/2W	2
R20	100K	1/2W	1
R21,R22	270	1/2W	2
U1	6SN7		1

R & C Selection Guide

Application	Recommended resistor	Why
Resistors:		
Signal path / plate load	Metal film	Low noise, stable, low distortion
Cathode resistor	Metal film or metal oxide	Low noise and good stability
Grid stopper	Carbon film or metal film	Good performance; avoid wirewound
Screen-grid resistor	Metal oxide	Handles heat and pulse energy well
Power supply dropping resistor	Wirewound or metal oxide	High power capability
Cathode bypass / high-current areas	Metal oxide	Robust and heat resistant
Grid leak resistor	Metal film	Very low noise and stable
Feedback network	Metal film	Good precision and low noise
Bleeder resistor	Metal oxide / wirewound	Handles continuous power
Capacitors:		
Coupling capacitor	Polypropylene film	Low loss, stable, excellent linearity
Tone-control / signal filtering	Polypropylene film	Low distortion and stable
Feedback network	Polypropylene film	Low dielectric absorption and good stability
Cathode bypass	Electrolytic	Large capacitance, compact and inexpensive
Power-supply filter	Electrolytic	High capacitance and good ripple-current capability
Screen supply filtering	Electrolytic	Large capacitance and suitable for DC filtering
Small-value bypass	Ceramic C0G/NP0 or film	Very stable and low loss
AC line / safety capacitor	Class X2/Y2 safety capacitor	Designed specifically for mains applications
Snubber / high-voltage pulse	Polypropylene film	Good pulse handling and low loss
Output-transformer compensation	Polypropylene film	Stable at high frequency

Bias Settings for Single-Ended Class A Tube Amplifiers

Reference bias current range vs plate voltage, with approximate SE Class A output power.

Tube Type	Bias	250	300	350	400	450	500	550	600	Max. Plate Diss. (W)	Approx. Output (W)
300B	Min.	112	93	80	70	62	56	51	47	40	8 – 10
	Max.	160	133	114	100	89	80	73	67		
6550 SED	Min.	98	82	70	61	54	49	45	41	35	7 – 10
	Max.	140	117	100	88	78	70	64	58		
6550 EH	Min.	118	98	84	74	65	59	53	49	42	8 – 12
	Max.	168	140	120	105	93	84	76	70		
EL34	Min.	70	58	50	44	39	35	32	29	25	5 – 8
	Max.	100	83	71	62	56	50	45	42		
KT77 JJ	Min.	70	58	50	44	39	35	32	29	25	5 – 8
	Max.	100	83	71	62	56	50	45	42		
6L6 25 W	Min.	70	58	50	44	39	35	32	29	25	5 – 7
	Max.	100	83	71	62	56	50	45	42		
6L6 GC30 W	Min.	84	70	60	52	47	42	38	35	30	6 – 8
	Max.	120	100	86	75	67	60	55	50		
6V6 JJ	Min.	39	33	28	24	22	20	18	16	14	2.5 – 4
	Max.	56	47	40	35	31	28	25	23		
6V6	Min.	28	23	20	18	16	14	13	12	10	2 – 3
	Max.	40	33	29	25	22	20	18	17		
KT66	Min.	70	58	50	44	39	35	32	29	25	5 – 7
	Max.	100	83	71	62	56	50	45	42		
KT88 JJ	Min.	118	98	84	74	65	59	53	49	42	8 – 12
	Max.	168	140	120	105	93	84	76	70		
KT88	Min.	112	93	80	70	62	56	51	47	40	8 – 12
	Max.	160	133	114	100	89	80	73	67		

Technical note: Plate voltage is in volts (V); bias current is in mA. The single-ended Class A bias range shown is approximately 70%–100% of maximum plate dissipation.
Approx. Output Power: Engineering reference based on an ideal transformer-coupled single-ended Class A stage near 70% maximum plate dissipation (approximately Pout ≈ 0.35 × maximum plate dissipation). Actual output depends on plate voltage, load impedance, transformer design, screen voltage, tube characteristics, bias point, and distortion limit. Verify final operation with the tube manufacturer's datasheet and amplifier load. This table for design reference only. Do not use this table as a substitute for the tube manufacturer's specified operating limits.

For a single-ended tube amplifier, We would generally recommend setting the power tube at about 65–70% of its maximum plate dissipation.

65%: Cooler operation, longer tube life, less heat, and generally a good reliable setting.
70%: Good compromise between output power, linearity, and tube life.
75%: Can provide slightly more output and may sound good, but runs the tube hotter and reduces tube life.

Why toroidal output transformer can make High-Frequency Oscillation

A well-designed toroidal output transformer can have excellent high-frequency response because of its core material, construction and winding arrangement. That is very good for audio, but it means the transformer does not naturally attenuate high-frequency signals as much as the EI transformer.

How to Reduce High-Frequency Oscillation

1. **Add a small compensation capacitor**
   Add a small capacitor to the feedback or gain stage to reduce high-frequency gain. A typical starting value is **47–220 pF**.
2. **Add a Zobel network**
   Add a **series resistor and capacitor** across the speaker output. A common starting point is **10Ω + 100 nF**. This can help stabilize the amplifier at high frequencies.
3. **Add grid-stopper resistors**
   Install a **1kΩ–10kΩ resistor directly at the power tube grid pin**. This helps prevent high-frequency oscillation in the power tube. The PCB has R3 & R4 resistors. Try to increase to 10KΩ.
4. **Improve grounding and feedback wiring**
   Keep the feedback connection and ground return as short as possible. Make sure the feedback wire is separated from the output signal and high-current wiring.

How to test

Before changing multiple components, use an oscilloscope to check the amplifier for high-frequency oscillation.
Connect a suitable dummy load to the amplifier and monitor the output with the oscilloscope.
Then gradually increase the signal-generator frequency:
10 kHz → 20 kHz → 30 kHz → 50 kHz → 100 kHz → 200 kHz → 500 kHz
Watch for:

1 **Increasing ringing or overshoot**.
2 **A high-frequency waveform riding on the audio signal**
3. **Sudden oscillation**
4. **A significant increase in amplitude at a particular frequency**

You may see something like:
20 kHz — clean
50 kHz — slight ringing
100 kHz — significant ringing
150 kHz — oscillation
This will help identify the frequency where the amplifier becomes unstable.

If you do not have an oscilloscope available, you can still listen to the amplifier with high-power music. You may not be able to hear the high-frequency oscillation directly, but the music may sound abnormal, harsh, or distorted, which can be an indication of instability. However, an oscilloscope is strongly recommended for confirming the problem.

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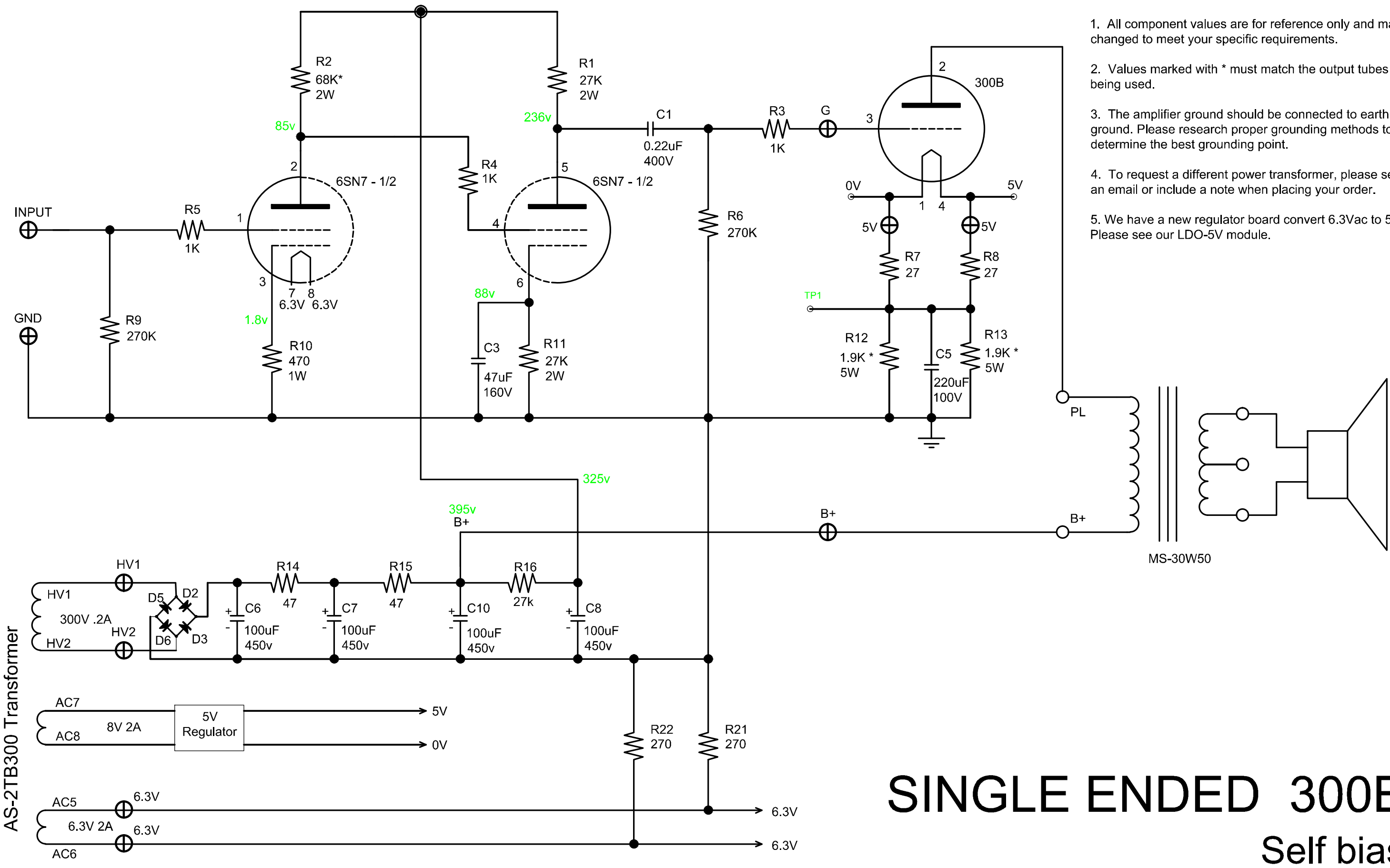


Notes:

1. All component values are for reference only and may be changed to meet your specific requirements.

2. Values marked with * must match the output tubes being used.

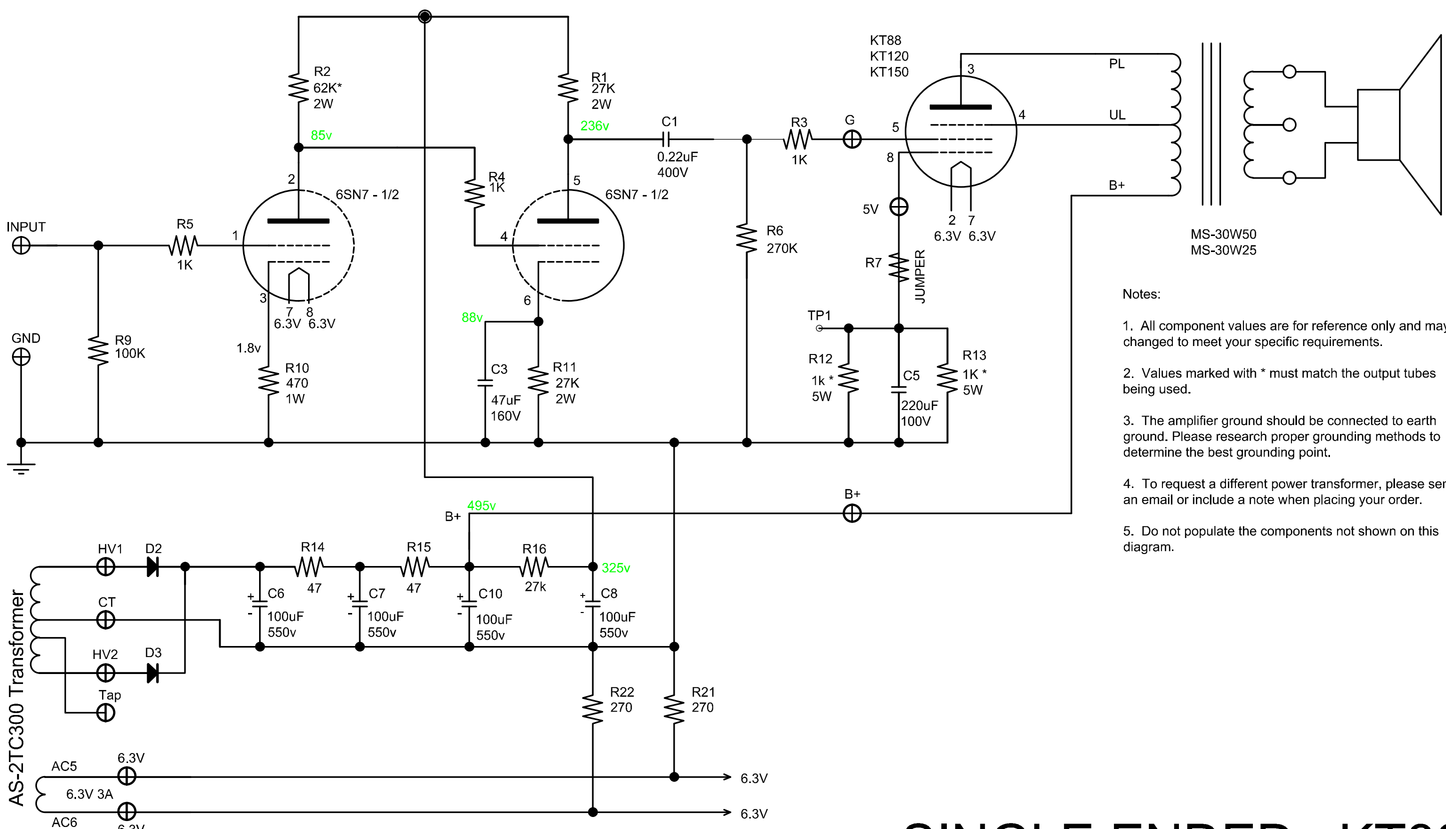
3. The amplifier ground should be connected to earth ground. Please research proper grounding methods to determine the best grounding point.

4. To request a different power transformer, please send an email or include a note when placing your order.

5. We have a new regulator board convert 6.3Vac to 5Vdc. Please see our LDO-5V module.

SINGLE ENDED 300B

Self bias



Notes:

1. All component values are for reference only and may be changed to meet your specific requirements.

2. Values marked with * must match the output tubes being used.

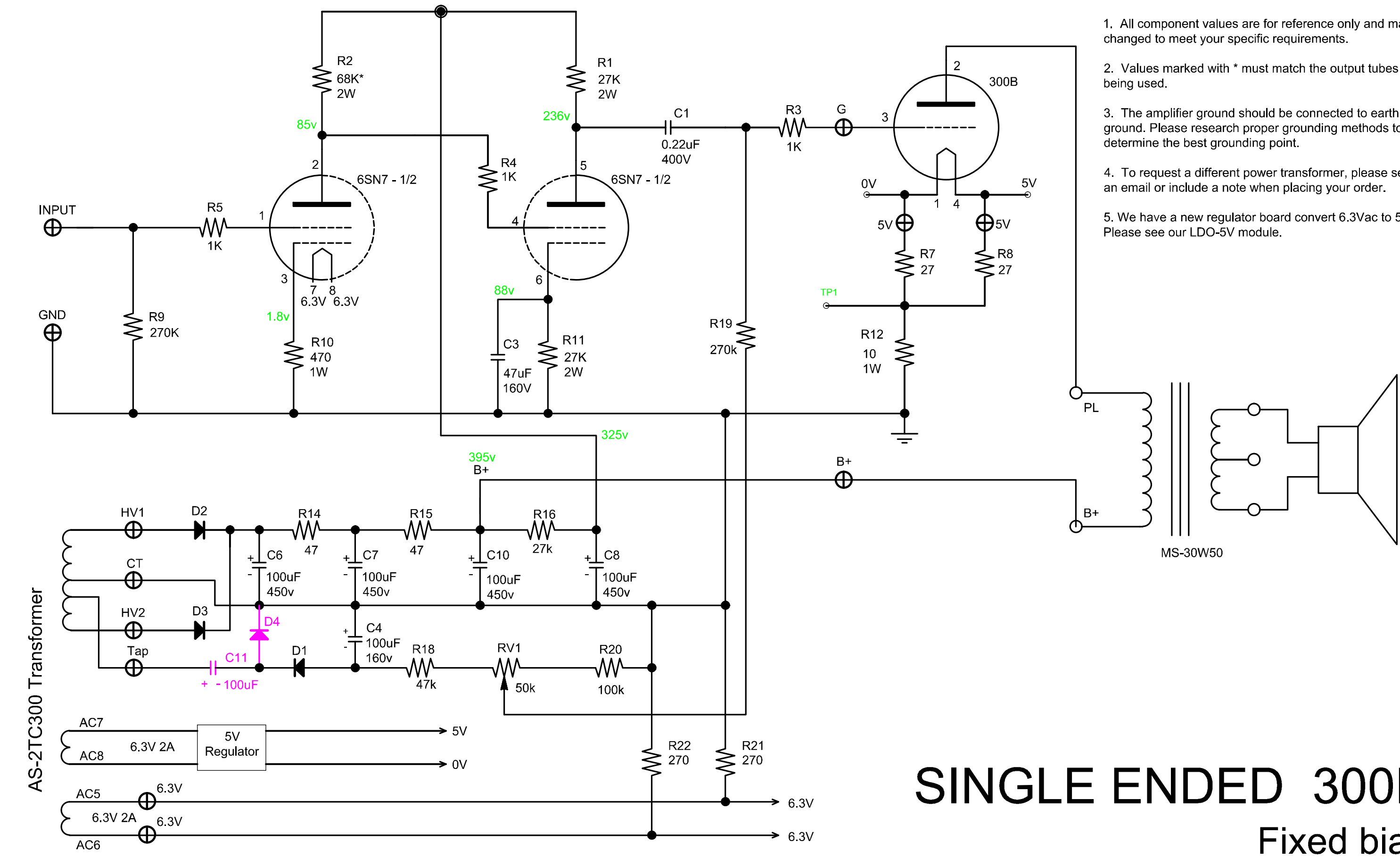
3. The amplifier ground should be connected to earth ground. Please research proper grounding methods to determine the best grounding point.

4. To request a different power transformer, please send an email or include a note when placing your order.

5. Do not populate the components not shown on this diagram.

SINGLE ENDED KT88

Self Bias



Notes:

1. All component values are for reference only and may be changed to meet your specific requirements.

2. Values marked with * must match the output tubes being used.

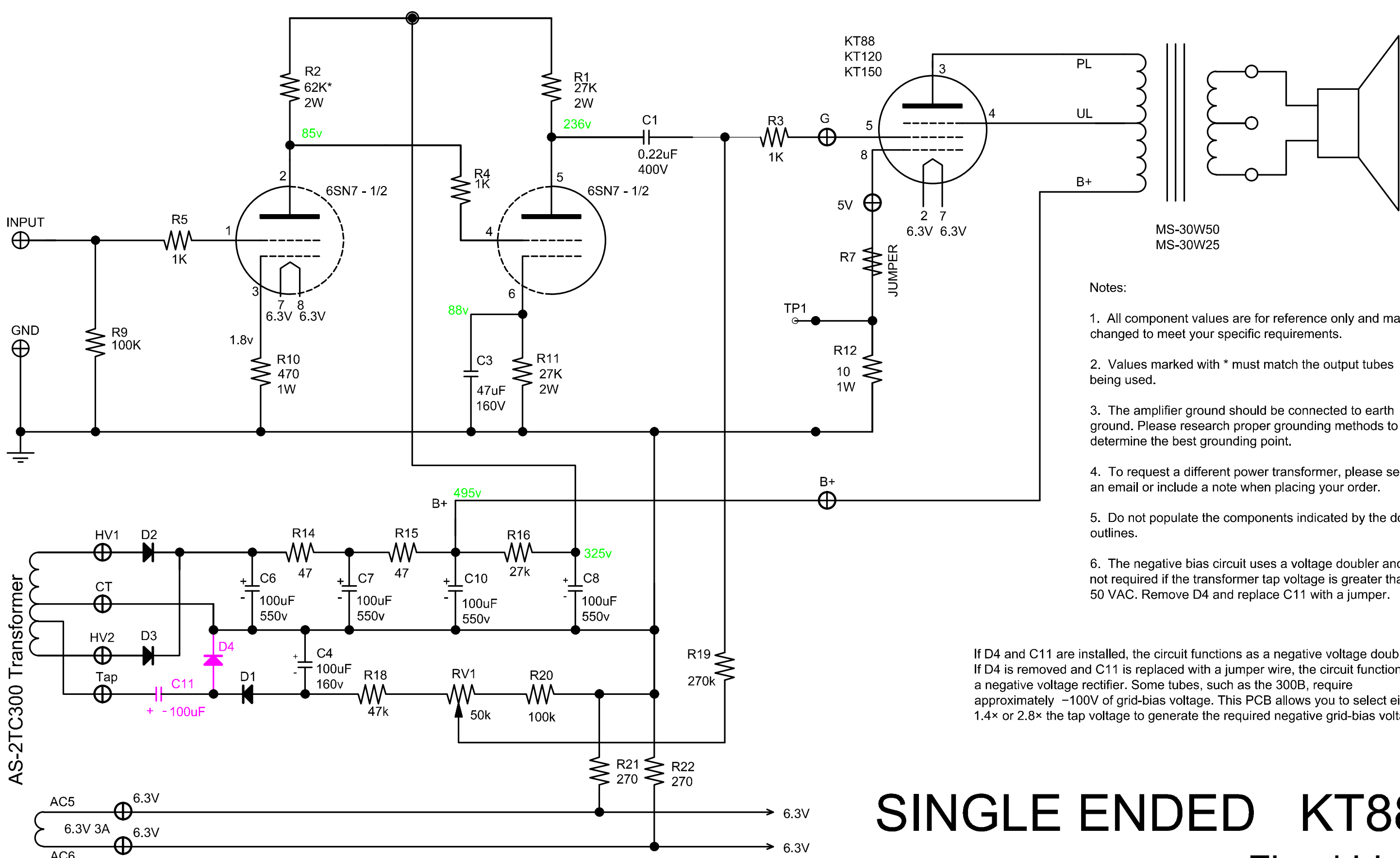
3. The amplifier ground should be connected to earth ground. Please research proper grounding methods to determine the best grounding point.

4. To request a different power transformer, please send an email or include a note when placing your order.

5. We have a new regulator board convert 6.3Vac to 5Vdc. Please see our LDO-5V module.

SINGLE ENDED 300B

Fixed bias



Notes:

1. All component values are for reference only and may be changed to meet your specific requirements.

2. Values marked with * must match the output tubes being used.

3. The amplifier ground should be connected to earth ground. Please research proper grounding methods to determine the best grounding point.

4. To request a different power transformer, please send an email or include a note when placing your order.

5. Do not populate the components indicated by the dotted outlines.

6. The negative bias circuit uses a voltage doubler and is not required if the transformer tap voltage is greater than 50 VAC. Remove D4 and replace C11 with a jumper.

If D4 and C11 are installed, the circuit functions as a negative voltage doubler. If D4 is removed and C11 is replaced with a jumper wire, the circuit functions as a negative voltage rectifier. Some tubes, such as the 300B, require approximately −100V of grid-bias voltage. This PCB allows you to select either 1.4× or 2.8× the tap voltage to generate the required negative grid-bias voltage.

SINGLE ENDED KT88

Fixed bias