

Mosfet power amplifier – mounting instructions

Thanks for buying this mosfet amplifier pcb or kit! Now the fun of mounting starts. Make sure you read the complete instructions before you start mounting. Complete assembly can be done by an experienced hobbyist in about two hours.

List of components

The kit should have the following components. If you bought the pcb, these components are suggested (but you can of course adapt it to your needs).

Qty	Value	Device	Parts
2	Mica	Washer	
2	n/a	Jumper bridge	JP2, JP3 (bridge using diode/resistor wire)
1	5-pin	Connector-kk	J1
1	2-pin	Connector-kk	IN
4	4.8mm	Faston pcb connector	OUT, V+, V-, V0
2	6A3fast/8ohm	Fuseholder+fuse	F1, F2 (10Afast for 4ohm load)
1	G2RE	Relay 16A,48V	K1
2	SE14	Insulated copper wire 1mm	L1, L2
5	33	Resistor	R6, R10, R11, R15, R16
1	82	Resistor	R7
2	100	Resistor	R14, R24
1	220	Resistor	R18
2	560	Resistor	R4, R5
8	1k	Resistor	R9, R26, R12, R19, R21, R27, R13, R29
2	15k	Resistor	R8, R20
2	22k	Resistor	R17, R22
2	0R1	Resistor 3W	R1, R2
1	10	Resistor 3W (flameproof)	R25, inside copper inductor L1/L2
2	10	Resistor 2W (flameproof)	R3, R23
1	2k	Trimmer resistor	R28
1	33p	C Ceramic rm5	C7
2	220p	C Ceramic rm5	C6, between S and G of T10
1	470p	C Ceramic rm5	C10
1	1n	C Ceramic rm5	C5
1	1u	C MKT rm5-10	C11
5	100n	C MKT rm7.5	C1, C2, C3, C4, C9
1	47u/63	C Electric 3.5-8	C14
2	100u/63	C Electric 3.5-10	C12, C13
1	220u/35	C Electric 3.5-10	C8
3	1N4007	Diode	D5, D6, D7
2	1N4148	Diode	D1, D2
2	11V	Zener-diode	D3, D4
1	BC550C	Transistor	T8
4	BC560C	Transistor	T4, T5, T6, T12
1	MJE340	Transistor	T9
1	MJE350	Transistor	T7
3	MPSA42	Transistor	T1, T2, T3
1	2SJ162	Mosfet	T11
1	2SK1058	Mosfet	T10

Tools

Required:

- ✓ Soldering iron and solder
- ✓ Multi-meter (voltage and resistance)
- ✓ Side-cutting pliers

Recommended:

- ✓ Adjustable dual power supply
- ✓ Signal source
- ✓ Oscilloscope

Mounting

In my opinion, the easiest way of mounting is by starting with the components with the lowest height and build up the PCB in steps, where components of the same height are fitted and soldered in each step.

Always double check all components before you solder them, as it is difficult to remove them after soldering, much more time consuming and may break components or PCB.

Start check

First of all, visually check the PCB for any cracks, undesired bridges, etc.

Step1 – resistors, diodes and wire bridge

Fit all small 0.25W metal film resistors, but leave the larger 2W and 3W types as they have a different height. Measure all resistors to be sure. Fit all diodes and zenerdiodes (check orientation). Carefully move the PCB upside down (let it rest on the components) and solder them. Use some spare wire of the resistors/diodes to bridge JP2/JP3, this provides rail supply to the input and VA stage (but can be fed with an independent rail supply)

Fit the resistors R3 and R23 (2W), R1 and R2 (3W), but not R25 and solder them.

Step 2 – connectors, capacitors and trimpot

Fit all connectors (faston, pcb pins, pinheader). Mount all capacitors, except for the electrolytic ones. Fit the trimpot and solder the components.

Step 3 – electrolytic capacitors, fuseholders

Fit all electrolytic capacitors (check orientation), fuseholders and solder them. In some cases the wires of the fuseholders have to be bent slightly to make them fit easier in the holes.

Step 4 – transistors

Fit the TO-92 transistors (BC550/560, MPSA42), carefully checking correct orientation and solder them. Fit the MJE340 and MJE350 transistors (metal side down) and solder them.

Step 5 – output relay and output inductor

Fit and solder the output relay. Prepare the output inductor by bending about 6 turns of 1mm insulated copper wire around a 9mm drill. Remove some of the insulation for soldering. Fit the inductor with resistor R25 inside and solder them.

Step 6 – mosfets

Mosfets must be mounted at the bottom of the PCB. Carefully bend the mosfets at a right angle, so they fit nicely. Attach the mosfets to the PCB with M3 bolts and screws to make sure they do not move while soldering. Fit a 220 pF capacitor between Source and Gate of T10 to compensate for different input capacitance and solder them.

Final check

Re-check all your soldering connections. Connect the PCB to a heatsink using M3 screws. Isolate the Mosfets from the heatsink using the Mica washers and heat conducting paste for improved heat transfer. Check with an ohm-meter that the mosfets are indeed isolated from the heatsink.

Output relay configuration

The output relay is used to disconnect the speakers from the output of the amp. A test with the 48V relay I used showed that it switches already at 27V, which allows a large supply range. Check the web site for possible configurations

An external protection circuit is strongly recommended and can be used for these functions:

- Delayed switch on
- Loss of AC detection
- DC protection
- Instability protection

Short circuit protection

The amplifier has short circuit protection incorporated that will limit the current through the VA stage to approximately 20mA, which means that the short circuit protection will have no effect on 4 or 8 ohm loads, but only if the load is less than about 2 ohm (and a full level input signal exists). Not recommended, but you can completely remove the protection by leaving R27 and T12.

Testing

Before applying power, make sure you check with an ohm-meter that the trimpot is set at minimum resistance!

Make sure the amp is connected to a good heatsink and that the Mosfets are isolated from the heatsink. Do not connect the amplifier to the main power supply for the first test unless you use a Variac. A dual power supply is the suggested supply for testing, so the supply voltage can be gradually increased. Do not connect speakers or a load to the output yet!

Start testing by using a supply of +/- 15V. Then check:

- Output voltage should be smaller than 100 mV.
- Voltage across R1 and R2 should be smaller than 5 mV
- Voltage across R14 should be about 600-700 mV
- Voltage across R7 should be about 600-700 mV

If any of the above is not correct, immediately remove the supply voltage and check for errors. A signal source and oscilloscope are very useful to test if the amp is working correctly!

Bias setting

Check with an ohm-meter that the trimpot is set at minimum resistance!

Connect the main power supply in the final configuration. Connect a multi-meter across R1 or R2 and measure the voltage. The current (in mA) through the output stage equals the voltage (in mV) multiplied by 10. So for a current of 50mA a voltage of 5mV is measured. Slowly increase the value of the trimpot until the voltage increases. The best way to tune the bias is by using a distortion analyser, but since not many have such a piece of equipment, I suggest to set the voltage to 5mV, which is 50mA through the output stage.

As a final check, measure the output voltage, which should be smaller than 100 mV and check the output of the amp with a oscilloscope while connecting a signal source to the input.

Finally, it is time to connect your music source and speaker and enjoy listening to your own self-made Hifi mosfet amplifier.

Schematic

