PeeCeeBee V4 Amplifier Assembling/Setup Guide

Rev-1

shaan

Hello!

(English is not my first language. So if you do not understand any part of the following texts please let me know in the group-buy thread or through PM or through my email s4shaan2244@gmail.com. I will do my best to explain. Also use the same if you face any problem during setup.)

Section 1: Assembling

Here is a brief guide to assembling the PeeCeeBee V4 amplifier with the group-buy PCB and all the BOM components available. If you are experienced and confident about it then skip to Section 2.

In the end of this file you will find the component placement indication. Our job is to follow the indication and solder the components accordingly to their indicated places. While different people have different ways to approach this, I would like to share how I do it most of the time.

The 2-layer group-buy PCBs have a thickness of 2.4mm which is not really that common for PCBs of this size but I chose this size for it to be as sturdy as possible (and it looks good!). While they came out to be as sturdy as I expected them to be, some might face ocassional problem with solder not covering both the upper and lower layer pads if a relatively lower power iron is used due to the 2.4mm PCB material draining more heat than the standard 1.4mm or 1.6mm. I recommend a 35Watt iron. But their tips may be oversized to reach some joints. The trick I use is simple: remove the 35Watt tip and insert a 25Watt tip. If your iron has needle-type or pointed tip then you won't need to do this.

The best component sequence of soldering in my experience is to start with soldering all the resistors and diodes, then solder the terminals and pin headers, then the small signal transistors, then the pF and nF capacitors, then the MOSFETs, then the medium size transistors and finally the electrolytics. This sequence will make sure that the iron tip isn't blocked by any components while soldering at top layer.

We solder the MOSFETs before the medium size transistors because we need to keep the back of all four bottom layer semiconductors to be as much parallel to each other as possible for ease of fixing to the heatsink, and matching the height of the backs of the medium size transistors to that of the MOSFETs **after** the MOSFETs are soldered is easier and more practical than the reverse.

Take extra care placing the resistors in correct places and also about the polarity of diodes and electrolytic capacitors. Also try to keep the time the iron is touched to a joint to less than 5-6 seconds.

Section 2: Setup

Preliminary Steps: (Before powering up)

a. Place the amplifier to a suitable heatsink with mica or other insulation and make sure that the metal backs of the bottom layer semiconductors do not have a short to the heatsink.
b. Make sure that the heatsink is connected to power-supply's 0V ground. Without this, the amplifier may start oscillating and burn the zobel resistors.
c. Keep the jumpers “open” i.e. jumper shunts not connected. Keep the input open.
d. Turn VR1 and VR2 to maximum resistance (turning clockwise) and VR3 to zero resistance (turning anti-clockwise).
e. Connect a 1R/2Watt resistor in series with each power rail to the amplifier (two resistors needed for +ve and -ve)
f. The two Ground terminals PGND and SGND must be connected to the power supply ground.
g. Set the mumtimeter to mV(millivolt) and connect the probes to the two legs of any one of the two 47R (R29/R30) resistors placed just by the medium size transistors.

After doing all the above, connect power supply and turn on power for 1 second then turn it off. The LEDs should be lit for a few seconds and there should be a reading of between 1mV and 50mV in the multimeter, decreasing gradually. Slightly touch the 1R/2Watt resistors and see if they are warm. If they do not feel warm, then we are okay to proceed.

VAS biasing:

Turn on power back again and notice multimeter reading. It indicates the current flowing through the 47R resistors i.e. the VAS bias current which needs to be around 10mA in our case. So we need to see a reading of 470mV. We trim it to a reading of 450mV as the VAS bias will increase slightly as the amplifier warms up and the reading will reach 460-470mV within a few minutes.

Turn VR1 and VR2 trimmers “anti-clockwise”, two turns each time for both trimmers, you should see the reading to increas slowly. Turning both trimmers equally at a time is important for fastest setup. Hence, if we turn the left trimmer two times, we must also turn the right trimmer two times, every time. When the reading shows 450mV, stop turning them and carefully remove the multimeter probes (take care not to short any leads while doing so; you may turn off power before removing the probes if you have shaky hands).

Offset trimming:

Turn on the amplifier again if you turned it off and connect the -ve(black) probe to ground terminal and the +ve(red) probe to output terminal (multimeter at same mV setting). Check the initial reading and also notice the polarity. We need to trim it to within +2mV and -2mV.

See the following table for trimmer turn direction corresponding to the polarity of multimeter reading. Whatever the initial reading shows, following the table instructions will help bring the offset close to zero within a couple minutes.

METER READING POLARITY	TRIMMER TURN DIRECTION
Positive	VR1 Anti-Clockwise, VR2 Clockwise
Negative	VR1 Clockwise, VR2 Anti-Clockwise

Slowly turn the trimmers in small steps. Stop as soon as the meter shows a reading between + and – 2mV. Both trimmers should be turned equally every time a trimming is done. This will make sure that the VAS vias doesn't change too much while trimming the offset. Notice that this time the trimmers are turned opposite in direction to each other.

MOSFET biasing:

Connect the multimeter probes to the two legs of any one of the 1R/2Watt rail resistors in (probe polarity doesn't matter, multimeter at same mV setting). It should show above 10mV and below 50mV reading. This reading indicates the total amplifier current. For a 100mA MOSFET bias plus previously set 10mA VAS bias we need to see around 110mV. Input bias is about 1-2mA and is not so much of a contributor to this reading.

Slowly turn VR3 “clockwise” while keeping an eye on the reading. Stop when the reading shows above 110mV (polarity of reading doesn't matter). Remove the probes from the resistor.

Now turn off the amplifier, close the jumpers J1 and J2 (i.e. put the jumper shunts on the jumper pins), connect test speakers (not your main speakers), connect input and play some music. If everything seems okay then turn it off, connect main speakers and input and enjoy. The heatsinks may be a little warm when the amplifier is on. At turn off the two LEDs may not dim equally, this is normal and won't cause any problem.

Component Placement Indications:
(Except for Pins and Terminals)

RESISTORS:

R1,R13,R14,R17,R18	1K
R2	10K
R3,R4,R15,R16,R19,R20	2K2
R5,R6,R21,R22,R23,R24	100R
R7,R8	220R
R9,R10	10R
R11,R12	22K
R25,R26,R27,R28,R29,R30	47R
VR1,VR2,VR3	500R Trimmer

CAPACITORS:

C1	100pF
C2	1uF
C3,C4,C11,C12,C15	100nF
C5,C6	2200uF
C7,C8,C13,C14	220uF
C9,C10	47pF

SEMICONDUCTORS:

Q1,Q3,Q5,Q7	BC556B(PNP)
Q2,Q4,Q6,Q8	BC546B(NPN)
Q9	BD140(PNP)
Q10	BD139(NPN)
Q11	2SK1058(N-Ch.)
Q12	2SJ162(P-Ch.)
D1,D2	1N4007
D3,D4	1N4148
D5,D6	LED