

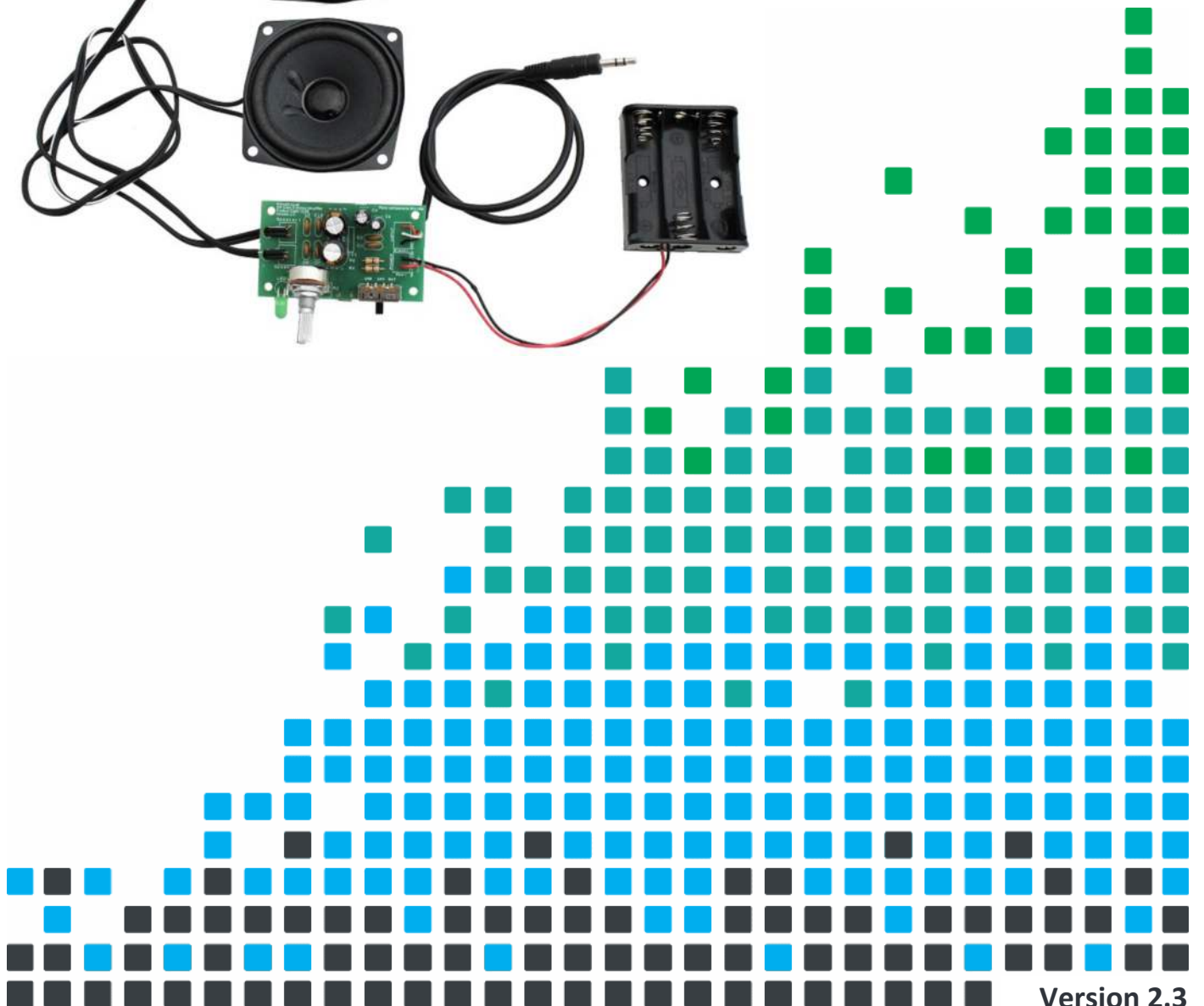


ESSENTIAL INFORMATION

BUILD INSTRUCTIONS
CHECKING YOUR PCB & FAULT-FINDING
MECHANICAL DETAILS
HOW THE KIT WORKS

CREATE YOUR OWN SPEAKER DOCK WITH THIS

3W STERERO AMPLIFIER KIT



Version 2.3

Build Instructions

Before you start, take a look at the Printed Circuit Board (PCB). The components go in the side with the writing on and the solder goes on the side with the tracks and silver pads.

1 PLACE RESISTORS

Start with the three resistors:
The text on the PCB shows where R2, R3 etc go.
Ensure that you put the resistors in the right place.

PCB Ref	Value	Colour Bands
R2 & R4	0Ω	Black
R3	220Ω	Red, Red, Brown



2 SOLDER THE PCB MOUNT SWITCH

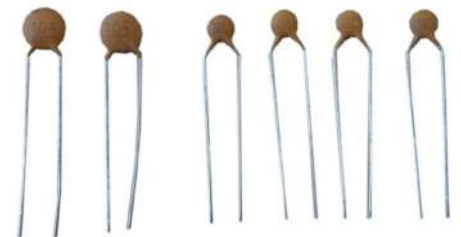
Solder the PCB Mount Right Angled On / Off Switch into the PCB where it is marked “USB OFF BAT”. The row of four pins that exit the back of the switch must be soldered but the other two pins don't need soldering. Make sure the switch is all the way in and flat to the board before soldering.



3 SOLDER THE CERAMIC DISC CAPACITORS

The text on the PCB shows where C1, C2 etc go.
Ensure that you put the capacitors in the right place.

PCB Ref	Value	Marking
C1 & C2	100nF	104
C7, C8, C9 & C10	10nF	103



4 SOLDER THE LED

The LED can be have the legs bent if it needs to go out of the front of the case or can be put on flying leads. Solder the LED into the PCB where it is labelled LED1. When putting it into the board, **make sure that the flat edge on the LED matches the outline on the PCB.**



3W Stereo Amplifier Essentials

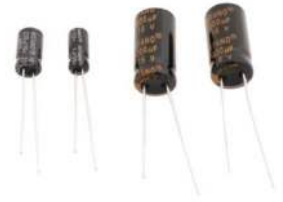
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SOLDER THE ELECTROLYTIC CAPACITORS

Now solder the four electrolytic capacitors. The capacitors have text printed on the side that indicates their value. The $1\mu\text{F}$ capacitor should be soldered into C6 on the PCB and the $220\mu\text{F}$ capacitor should be soldered into C4. The two large $1000\mu\text{F}$ capacitors (C3 & C5) go into the two large capacitor outlines marked on the PCB. Make sure that the capacitors are the correct way around. **The capacitors have a '-' sign marked on them, which should match the same sign on the PCB.**



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SOLDER THE POTENTIOMETER

Solder the potentiometer into the PCB where it is labelled R1. Make sure that the volume knob is facing away from the PCB.



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CONNECT THE SPEAKERS

The kit is supplied with a metre of twin cable. This cable will be used to connect the two speakers. You will need to cut this to the required length to connect each speaker in your enclosure design.

Take each piece of twin cable and strip & tin the ends of the wire. Connect one end of each wire to the two terminals on each speaker (as shown). You will see that the speakers have '+' and '-' indicators. Take the cable connected to one speaker and connect it to the pads labeled 'Speaker 1' on the PCB. The connections on the pads are also labeled with a '+' and '-'. The '+' on the PCB needs to go to the '+' on the speaker and '-' to '-'.



Repeat with the second speaker, this time connecting to the pads labelled 'Speaker 2'.

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CONNECT THE BATTERY PACK

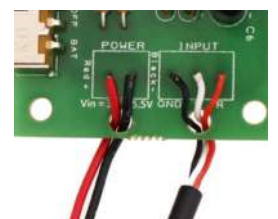
The kit is supplied with a 3x AA battery pack on leads that can be used to power the kit. First thread both wires through the stress relief hole then solder the red wire into the PCB where it is marked 'Red +' and the black wire into the PCB where it is marked 'Black -'.



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CONNECT THE AUDIO CABLE

The stereo Jack lead should be connected to the 'INPUT' terminal. First feed the wires through the strain relief hole. The black wire should be connected to the terminal labelled 'GND'. The other two wires can go to either of the two remaining inputs.



Checking Your Amplifier PCB

Carefully check the following before you connect the power:

Audio equipment may become damaged if connected to an incorrectly built amplifier.

Check the bottom of the board to ensure that:

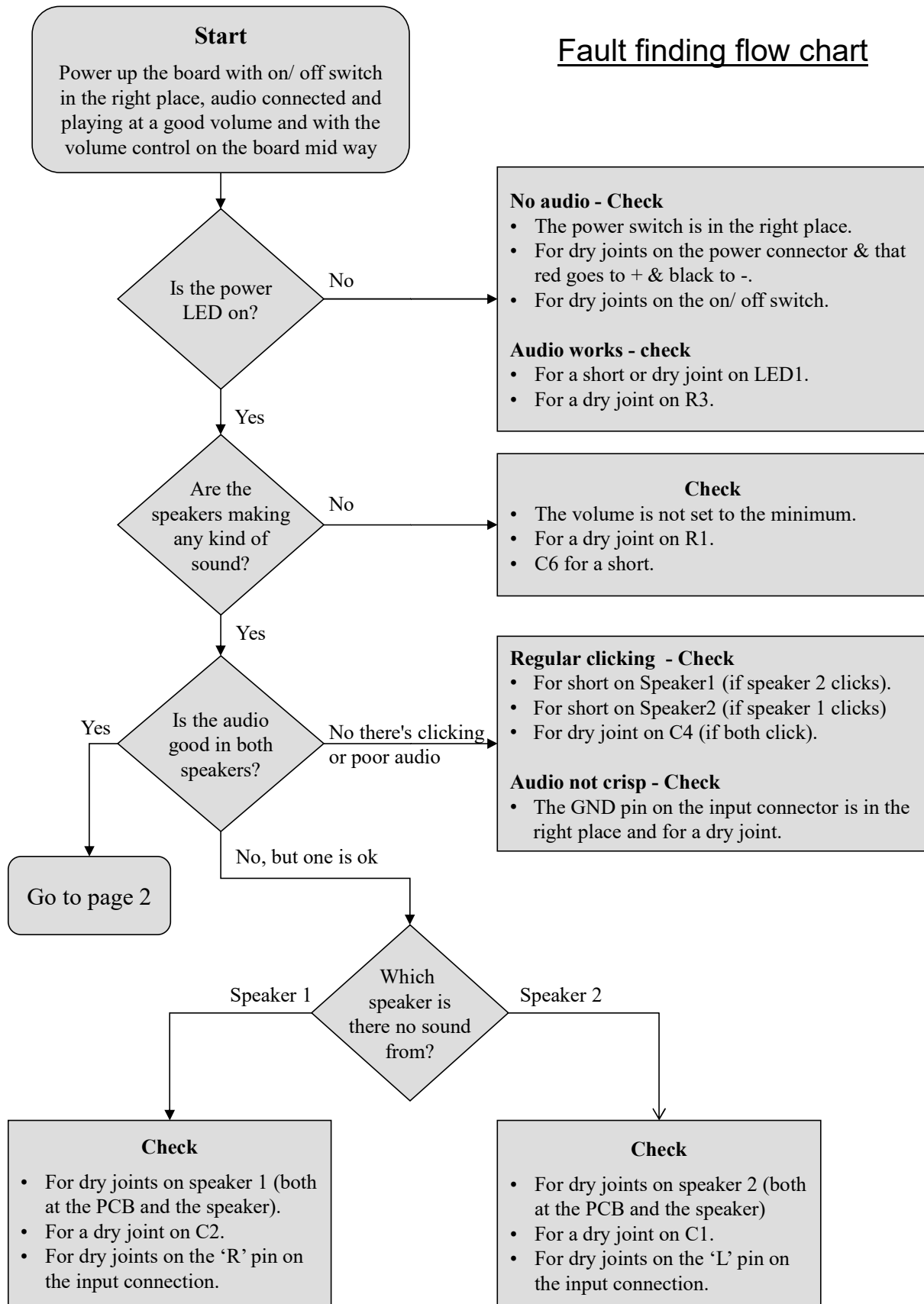
- All holes (except the 4 large (3mm) holes in the corners) are filled with the lead of a component.
- All these leads are soldered.
- Pins next to each other are not soldered together.

Check the top of the board to ensure that:

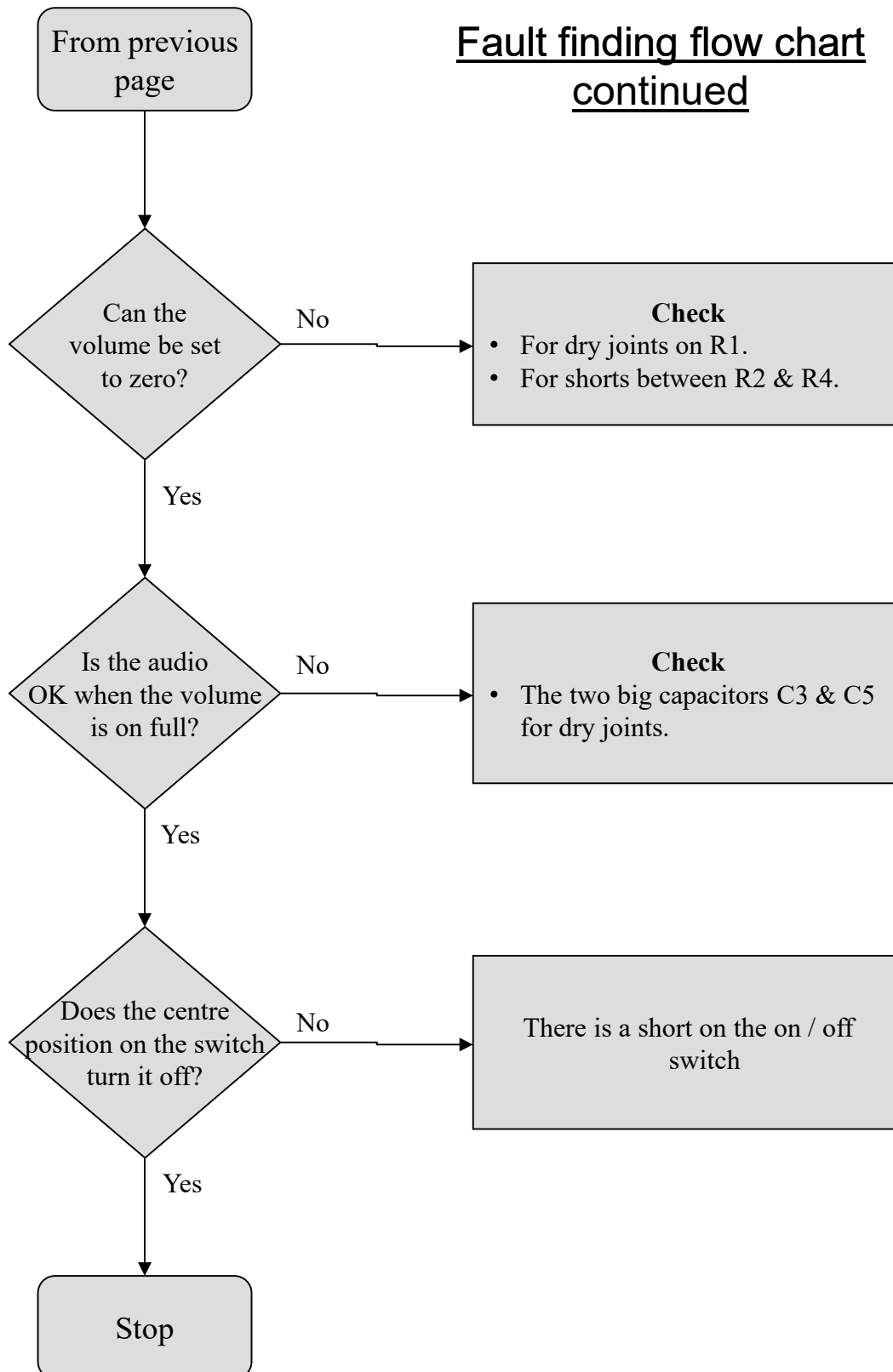
- The battery cage connects to the board where it is labelled 'POWER' and the red wire is next to the red text.
- The '-' on the capacitors match the same marks on the PCB.
- The capacitors C1 & C2 have 104 printed on them.
- The colour bands on R3 are red, red, brown.
- The 'Gnd' labelled terminal on the 'INPUT' connection has the black wire connected to it.
- The flat edge on the LED matches the outline on the PCB.
- The values on the electrolytic capacitors are correct.



Fault finding flow chart



Fault finding flow chart continued



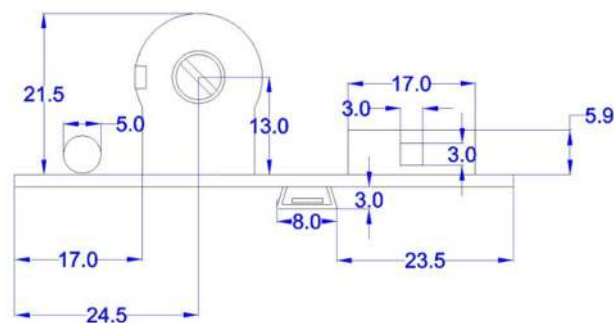
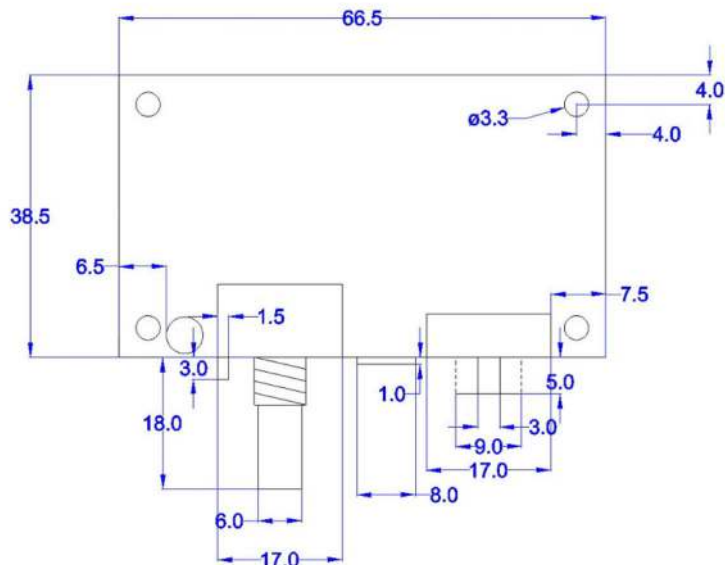
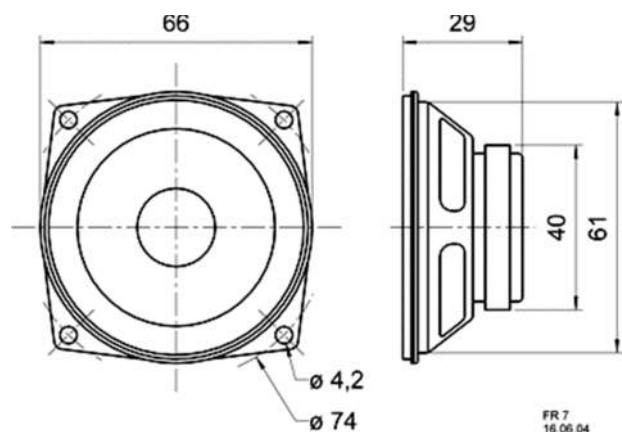
Designing the Enclosure

When you design the enclosure, you will need to consider:

- The size of the PCB (right).
- How to mount the speaker (below).
- How to allow the audio cable out of the box.
- Are you making the amplifier for a particular MP3 player, if so should the player go in the box?

These technical drawings of the amplifier PCB and speaker should help you to plan this.

All dimensions in mm



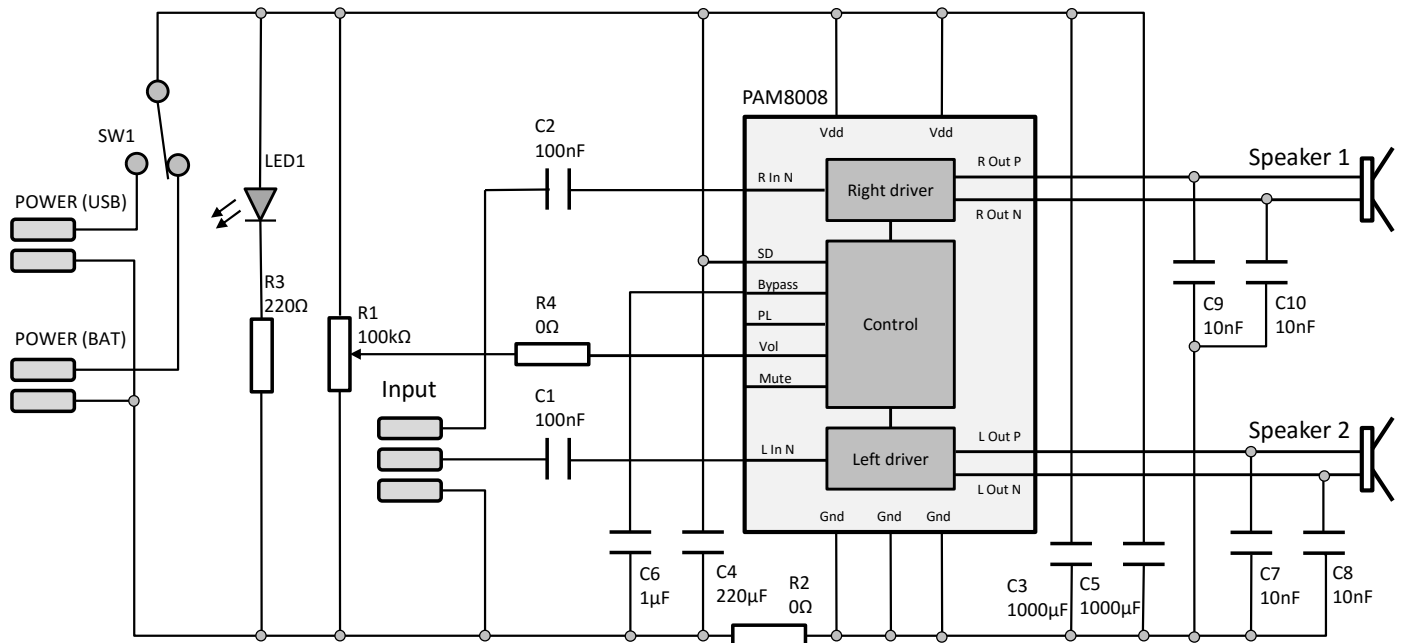
	<p>Mounting the PCB to the enclosure</p> <p>The drawing to the left shows how a hex spacer can be used with two bolts to fix the PCB to the enclosure.</p> <p><i>Your PCB has four mounting holes designed to take M3 bolts.</i></p>
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3W Stereo Amplifier Essentials

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How the Amplifier Works



The 3W amplifier uses a PAM8008 amplifier IC, this delivers 3W across the two channels and contains a number of features to make the circuit simple and compact. The device automatically reduces the volume to prevent distortion, has an internal digital volume control and offers over temperature and short circuit protection.

The audio connected to the input connector goes through the de-coupling capacitors C1 & C2 and into the amplifier IC where it is amplified. The output signal is at a higher voltage and current than the input signal so that it can drive the 4Ω speakers. The driver within the amplifier IC is able to change the voltage on both sides of the speaker which gives twice the voltage range, compared to any amplifiers where only one side of the speaker is driven. This removes the need for a large capacitor on the output and improves the volume of the amplifier. There are also two 10nF capacitors on each channel (C7 to C10) placed between the speaker and ground, these act as a filter allowing the maximum volume to be reached.

The capacitors C3 to C5 are all placed across the power supply and are present to keep the voltage as stable as possible. The bypass pin is used control the audio during power up in order to stop it clicking and popping as the circuit starts up. It is also controls how the amplifier resumes after it has gone in to shut down, the value of C6 controls how long the output is bypassed for.

The volume of the amplifier is controlled by a voltage on the volume pin. This arrangement allows for a single volume potentiometer (R1) to control the volume on both channels. There is a power LED present (LED1) and the resistor R3 has been selected to limit the current in to the LED so that it is illuminated at a good brightness. Finally the circuit can be powered of batteries (3x AA) or from a USB supply. These are connected to a switch (SW1) that also has a centre off position. The switch is able to connect battery power, nothing (powered off) or USB power to the rest of the circuit.

R4 and R2 are just to jump over tracks on the PCB, this allows the circuit to fit onto a single sided PCB to keep down cost.



Online Information

Two sets of information can be downloaded from the product page where the kit can also be reordered from. The 'Essential Information' contains all of the information that you need to get started with the kit and the 'Teaching Resources' contains more information on soldering, components used in the kit, educational schemes of work and so on and also includes the essentials. Download from:

www.kitronik.co.uk/2158



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