

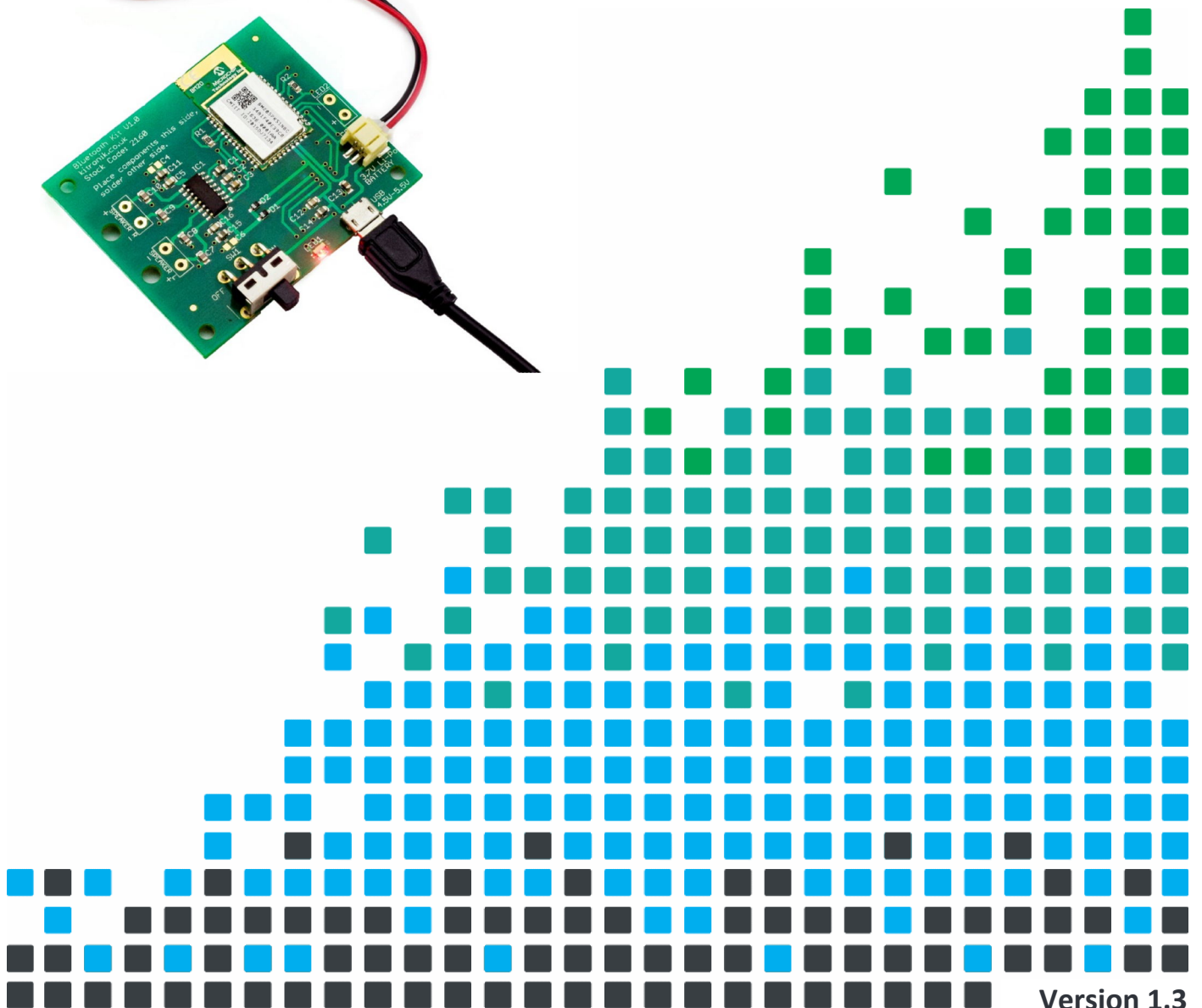
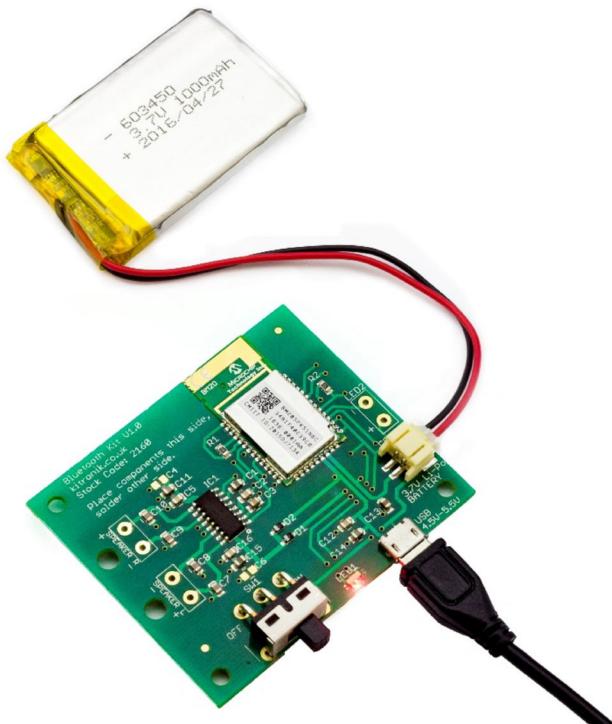


## PRODUCT INFORMATION

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

CREATE YOUR OWN WIRELESS SPEAKER WITH THIS

# BLUETOOTH AMPLIFIER KIT



Version 1.3

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### PRODUCT INFORMATION

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## Main Features

- 3W audio amplifier with Bluetooth link (based on a fully CE compliant module).
- Supports both 4Ω and 8Ω speakers.
- Play music from a phone, tablet or computer wirelessly.
- Simple user interface, via single on / off switch.
- Auto reconnects to last device on power up unless it can't be found when it enters pairing mode.
- LED and sounds indicate status information such as 'paring'.
- Optional connection point for off board LED, for designs where the USB power and LED want to be on different enclosure faces.
- Pauses music when the phone rings and diverts audio back to the handset (subject to compatible phone).
- Operates from a 1A USB supply or LiPo battery (both available separately).
- Includes automatic LiPo battery charging for battery capacities between 400mAh and 1000mAh.
- Automatic power switch over between PSU and battery (when battery present).
- 28 hours continuous operation off a 1000mAh battery at 'normal' volume.
- Slide switch supplied unmounted so an alternative power switch can be used.
- Speakers supplied unconnected allowing cable lengths and cable routing to be personalised to specific enclosure designs.

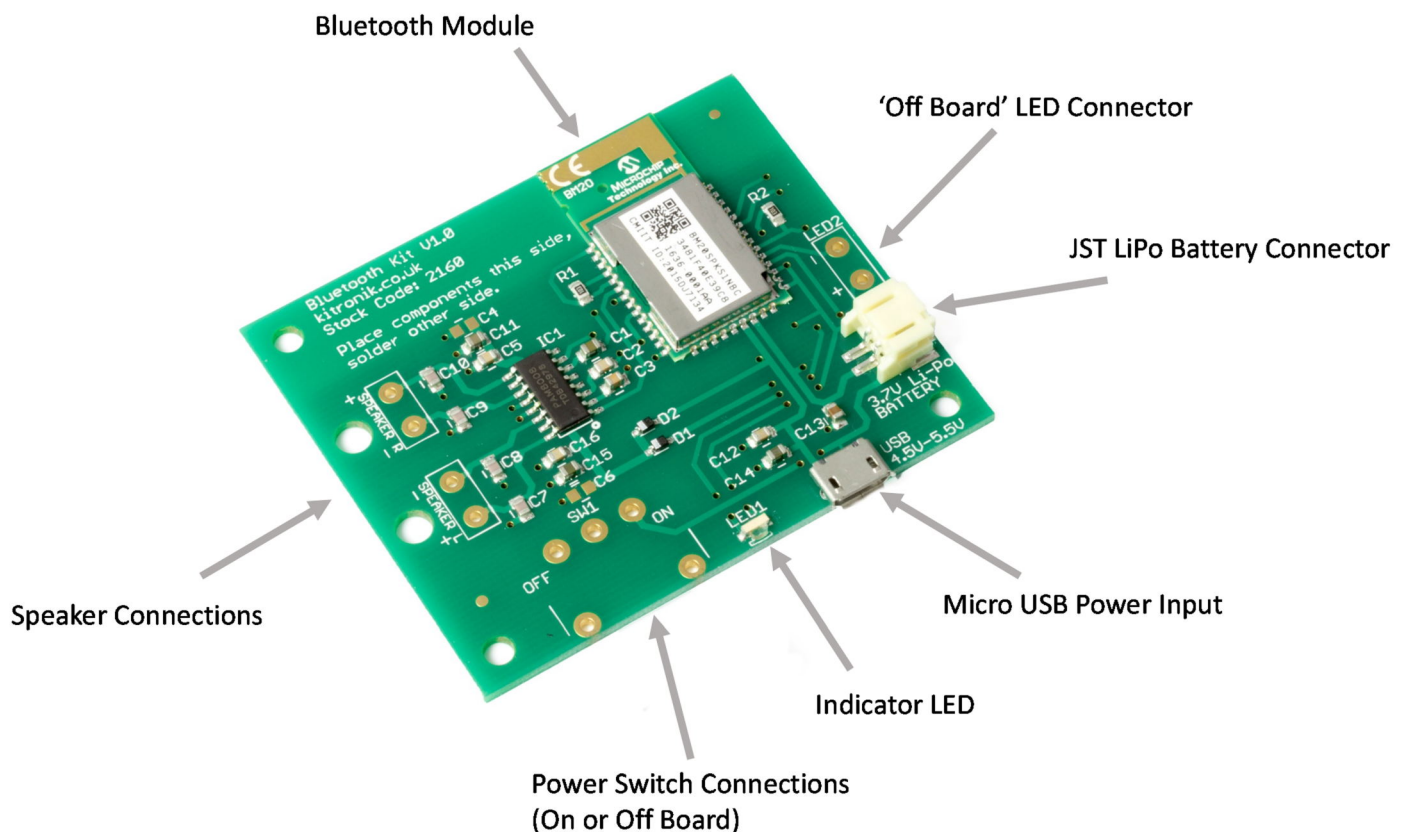


## Power Specification

|                                  |                   |
|----------------------------------|-------------------|
| Operating Voltage (USB supply)   | 4.5V – 5.5V       |
| Supported LiPo Battery Capacity  | 400mAh to 1000mAh |
| Operating voltage (LiPo battery) | 3.1V – 4.2V       |
| Nominal Current in standby mode  | 5 mA              |
| Nominal Current 'normal' volume  | 35 mA             |
| Nominal Current max volume       | 120 mA            |

**Note: USB power supply.** It is important to use a high quality USB power supply that can deliver a minimum of 1A while also providing a stable 5V supply. If this is not the case 'clipping' or 'cutting out' may be experienced when used at high volumes.

## PCB Connections



## Build Instructions

Before you start, take a look at the Printed Circuit Board (PCB). The components go in the side that all of the components are located on and are soldered from the bottom (blank) side of the PCB.

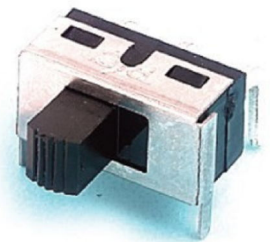
### 1

#### POWER SWITCH

One of the two following power switch options must be used.

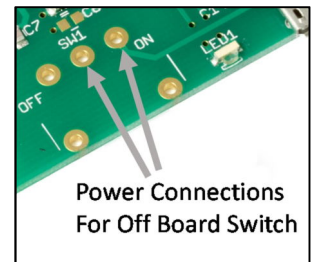
##### On-board (this is the normal option)

Solder the PCB Mount Right Angled On / Off Switch into the PCB where it is marked 'SW1'. The row of three 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 PCB before soldering.



##### Off-board (if the switch needs locating away from the PCB)

It is possible to replace the supplied PCB mount power switch with one that is mounted off the PCB. If this is done the two terminals of the desired power switch should be wired back to the PCB and soldered to the two terminals shown right. It does not matter which way around the wires are connected.



The cable and switch used should both be rated for a minimum of 1A @ 5V. **This cable should be kept as short as is possible and no longer than 150mm.**

### 2

#### 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). If you have chosen one of the product options that includes speakers you will see that the speakers have '+' and '-' indicators. Take the cable connected to one speaker and feed it through the strain relief hole and connect it to the pads labeled 'Speaker R' 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 L'.

If you are using your own choice of speakers then make sure both speakers are connected to the '+' and '-' in the same way.



## 3

### 'OPTIONAL' LED

It is possible to add a second LED (like the example shown to the right) that is mounted off the PCB. This mimics the LED on the PCB and can be used in designs that require the LED to be positioned in a different place.



**Important note: No current limit resistor is needed.**

If this is done the two legs of the desired LED should be wired back to the PCB and soldered to the two terminals labelled 'LED2'. The long LED leg (Anode) should be soldered to the '+' terminal and the short LED leg (Cathode) should be soldered to the '-' terminal.

## 4

### 'OPTIONAL' LIPO BATTERY

The circuit has a built in LiPo battery charging circuit that allows it to be used in rechargeable, portable designs. Battery capacities of between 400mAh and 1000mAh are supported. When a suitable battery is connected it will power the PCB and the battery will be charged if it is also plugged into a micro USB power supply.

**It is important that the polarity of the battery is correct.** It is important that the polarity of the battery is correct. The JST connector on the PCB labelled CON2 is used to connect the battery. The pin next to the bottom right mounting hole is the positive battery connection (as shown in the picture right). This should be checked before connecting a battery.



#### Note:

**The power switch will need to be in the 'on' position for the battery to charge. This connector should only be used with LiPo batteries.**

## Checking Your Bluetooth Amplifier PCB

Carefully check the following before you connect the power:

#### Check the bottom of the board to ensure that:

- All holes (except the 3 large (3mm) holes in the corners) are filled with the lead of a component or wire.
  - This excludes the LED2 terminals if no external LED is fitted.
- All these leads are soldered.
- Pins next to each other are not soldered together.

#### Check the top of the board to ensure that:

- The LiPo battery (if used) connects to the board where it is labelled 'CON2' and the red wire is next to the adjacent PCB mounting hole.



## Operating Instructions

### What is the LED indicating?

| Flash pattern                                                   | Meaning                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Single flash every 5 seconds                                    | Connected, no music playing.                                                                                                                                                                                                                                                      |
| Double flash every 5 seconds                                    | Connected & music playing.                                                                                                                                                                                                                                                        |
| Brief flash 4 times a second                                    | In pairing mode, waiting for a phone to connect.                                                                                                                                                                                                                                  |
| Longer flash (on for more time than it is off) 4 times a second | Link lost. Waiting for a phone to connect or if the link was lost due to the phone being out of range the Bluetooth amp can be switched off and on and will pair again with the phone.                                                                                            |
| No LED                                                          | The phone is temporarily out of range of the Bluetooth amp. If music was playing it is likely that the phone will have paused it. Bring the two devices back in to range and resume the music. If the link is lost for more than a minute then it will show link lost (as above). |

### What do the bleeps indicate?

| Sound                              | Meaning                                                                                                                                                                                            |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Three notes ascending in frequency | Device powered on.                                                                                                                                                                                 |
| Double beep                        | A new device has been successfully paired.                                                                                                                                                         |
| Triple beep                        | The Bluetooth link has been lost, bring the phone closer to the amplifier.                                                                                                                         |
| Quadruple beep                     | The battery is running low. Plug into the USB port. This beep will continue to sound every 2 minutes until the battery is completely flat and the device shuts down or the USB power is connected. |

## Pairing Process

To pair the Bluetooth Amplifier to a device (provided it is not already paired), use the devices Bluetooth settings menu to search for new Bluetooth devices. The Bluetooth Amplifier will appear as 'KITRONIK AMP' followed by a 5 digit unique ID specific to the particular unit being used.

To change to another device the current device requires 'un-pairing'. Again this is done from the devices Bluetooth settings. Once complete the Bluetooth Amp automatically enters pairing mode again.

If the Bluetooth Amplifier is powered down and back up it will automatically connect to any Bluetooth device previously paired to in range. If there are none in range it will automatically entering pairing mode.



## Designing the Enclosure

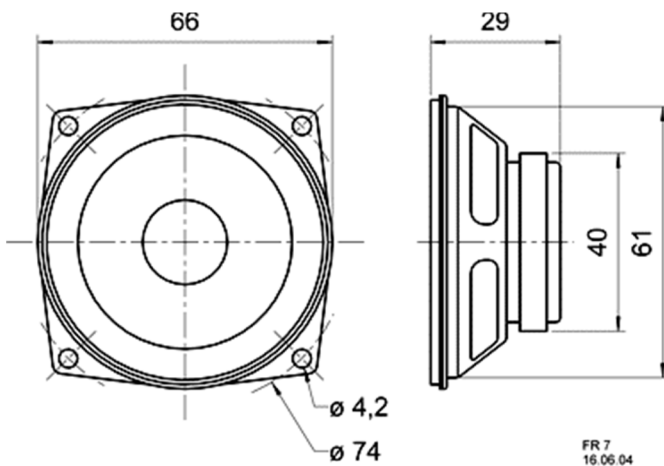
When you design the enclosure, you will need to consider:

- The size of the PCB (right).
- How to mount the speaker (below).
- Where the power switch and LED will be located.

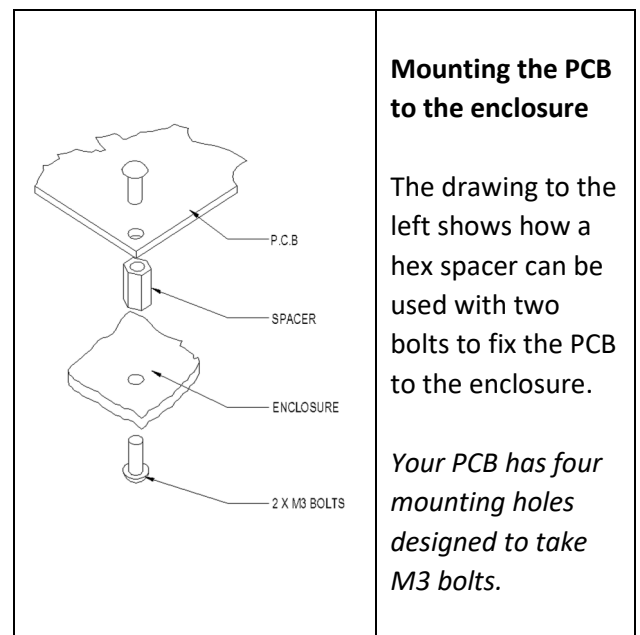
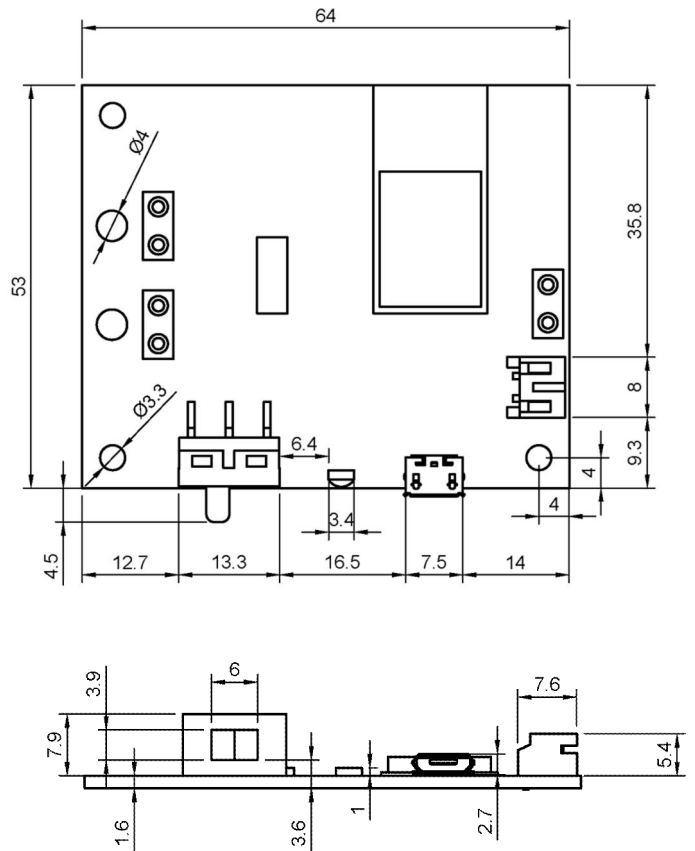
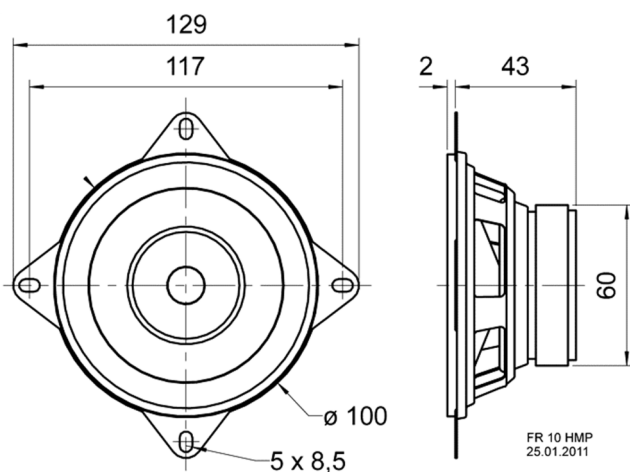
These technical drawings of the amplifier PCB and speakers should help you to plan this.

All dimensions in mm

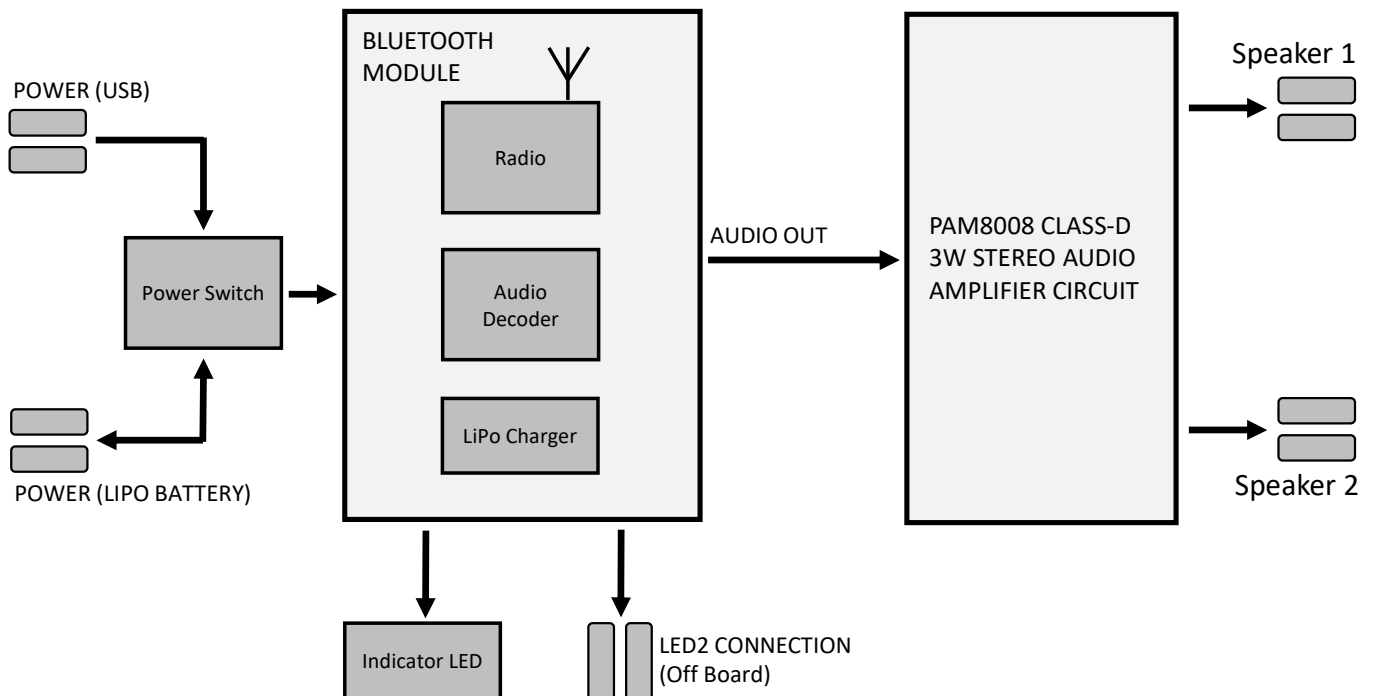
**5W 4 Ohm 65mm Full Range Speaker**



**20W 8 Ohm 100mm Full Range Speaker**



## How the Bluetooth Amplifier Works



## Bluetooth Module

At the heart of the Bluetooth Amplifier PCB is a Bluetooth Radio module. This performs a number of tasks:

- Provides and manages the Bluetooth radio connection. It also has the aerial built into it.
- Decodes the audio signal from the radio connection and outputs this to the amplifier circuit.
- Drives the Indicator LEDs (on board, plus optional off board LED). These are used to display the current mode, such as 'pairing'.
- Supplies charging circuit for a LiPo battery.

## Amplifier

The audio output from the Bluetooth Module is fed into the 3W amplifier circuit. This uses a PAM8008 amplifier IC which delivers 3W across two channels and contains a number of features to make the circuit simple and compact. The device automatically reduces the volume to prevent distortion and offers over temperature and short circuit protection.

The amplifier circuit is setup to have a fixed gain (or amplification) and the output volume is controlled by the Bluetooth Module. This is adjusted by altering the volume on the Bluetooth device to which it is connected.

## Power

The circuit can be powered from either (or both) a micro USB power supply or LiPo battery. The power switch turns the power to the whole circuit fully off. This therefore needs to be in the 'on' for the battery to charge, though the circuit automatically enters a low power mode when not in use.



## Online Information

A copy of this product information is available to download from:

[www.kitronik.co.uk/2160](http://www.kitronik.co.uk/2160)



This kit is designed and manufactured in the UK by Kitronik

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