Manual for bGeigieZen Kit assembling for board V3.X.X.

General:

The kit is an excellent tool for DIY learning. Assembly can take as little as 15-30 minutes, depending on your level of skill and experience with electronics.

Current board version V3.x.x is for firmware 3.x.x. And works with M5StackCore(gray only power up from the power switch. M5StackCore Black can be used but need to have the switch on AND the power button on the M5Stack core pressed), M5StackCore2 and M5Stack AWS.

As with any project, take the time to prepare by gathering the necessary tools, clearing space, reading the manual, and turning off distractions before you start.

WARNINGS:

- The temperature of the soldering iron should be about 200–350 degrees Celsius (400–650 degrees Fahrenheit).
- Smoke from solder is dangerous for your health, so work in a well-ventilated area.
- Wear safety glasses when cutting off leads.
- Do not puncture the Li-Po battery.
- Be gentle with the kit. Some components are fragile. For example, it's possible to inadvertently break the wire leads from the battery.

TOOLS NEEDED:

- Nippers (for cutting pin headers)
- Solder iron (fine tip)
- Solder (60/40)
- Hex-/ Allen-key 2.5 mm (for M3 screws)
- Power to heat the solder iron.
- Screwdrivers (small flat-head and a Phillips-head)

OPTIONAL PARTS:

- USB-C cable for programming/charging
- IPA (isopropyl alcohol) for cleaning up the flux from the soldering.

Index: **3**

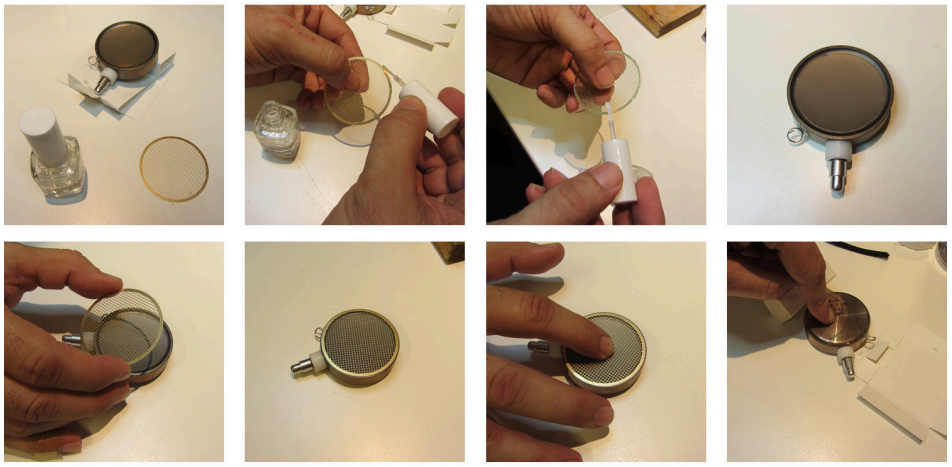
- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

BEFORE YOU START:

Note that the LND_7317 pancake sensor is very delicate. It has a thin mica covering on one face, inside which there is a partial vacuum. The mica is easily punctured. Should this occur, it will damage the tube irreparably. We recommend that you leave the pancake sensor in the box until you're ready to attach it.

IMPORTANT:

Some kits are provided with a protective mesh screen already attached. Check the sensor in your kit now before you begin building. If the protective mesh screen has not yet been attached, please complete section…



NOTE: This step is only necessary in cases where the sensor provided in the kit does not already have the screen mesh attached.
The copper mesh cover should be attached to the pancake sensor so that it protects the membrane. We've found that a thin coat of clear acrylic nail polish carefully applied to the edge of the mesh works well as an adhesive. It can also easily be removed later if needed by using nail polish remover.

Use clear nail polish or "nail top coat," without glitter or other anything like that in it. Only a thin coat is needed. You should apply it to the edge of the mesh because it's easier to handle than the sensor. Carefully position it on the sensor as shown in the photo, and press down on it lightly with your finger for a minute or so until the polish starts to set. Let it dry for about 5 minutes.

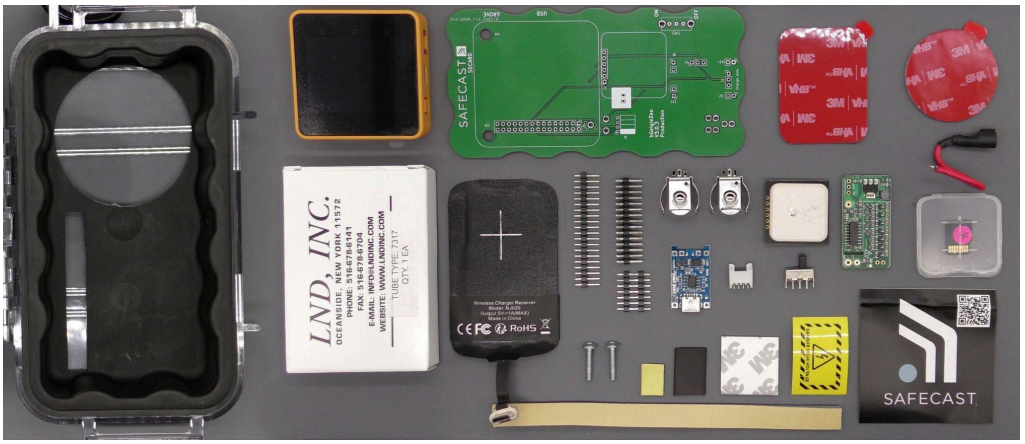
Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

Kit assembling

Hardware bGeigieZen

- **Parts check:**
  - Check if all correct parts and the correct counts are there.
  - All parts in picture below **except the LiPo 18650 3.7V battery.**



  - M5StackCore(grey), Core2 and AWS versions can be used.

.

- **Remove the backplate of the M5Stack:**

Picture Core1 (2 Hexagon socket countersunk head M3 screws)

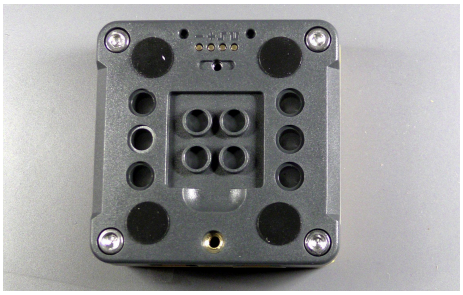
Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

Picture Core 2 (4 Hexagon socket countersunk head M3 screws)

Picture Core AWS (4 Hexagon socket countersunk head M3 screws)

- Turn M5Stack upside down.



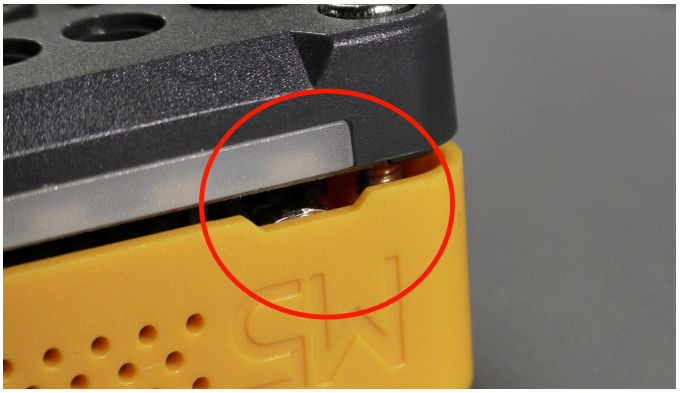
Loosen the hex screws with the hex key.

Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

Locate the “screwdriver hole”

Put flat head screwdriver in the hole and rotate the screwdriver. The M5Stack will split.



Remove the backplate.

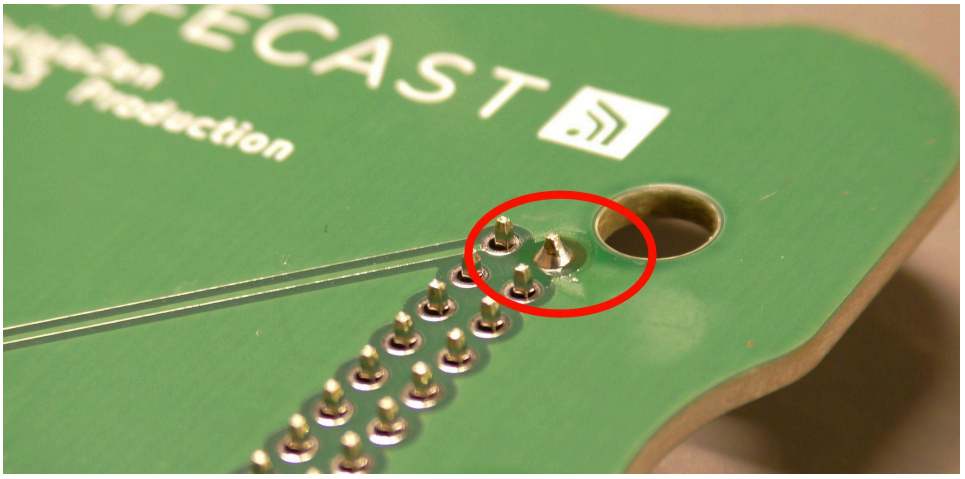
Note: the backplate and the hex-screws won't be needed for this project.

- **Basic solder instructions:**
  - Solder instructions video link.
  - First one pin align correct and then the rest of the pins.
  - Ground pins require longer heating to let the solder flow correctly.
  - First solder on the tip, then touch the pin and area.
  - Then add more solder till correct shape of the solder and pin (pictures)

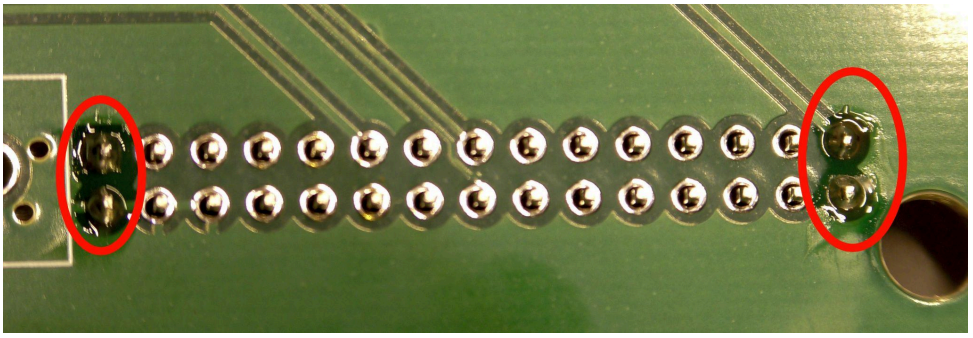
Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

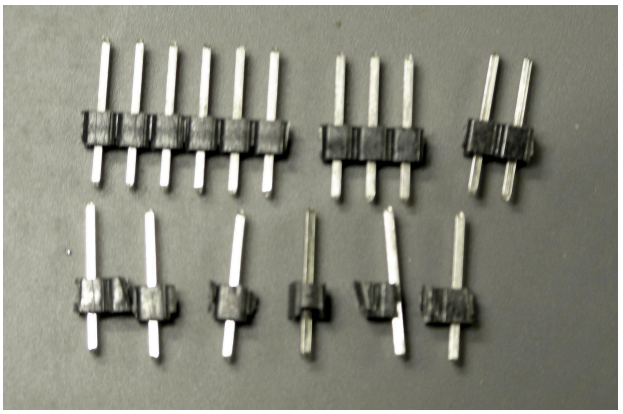
- **Solder the board with pins only.**
    - Start with 2×15 pin connector
    - Place board with top up.
    - Place the 2×15 pin connector in the holes.
    - Turn the board around while holding the 2×15 pin header.
    - Solder only one corner pin.



    - Check if alignment is correct. Solder last pin.



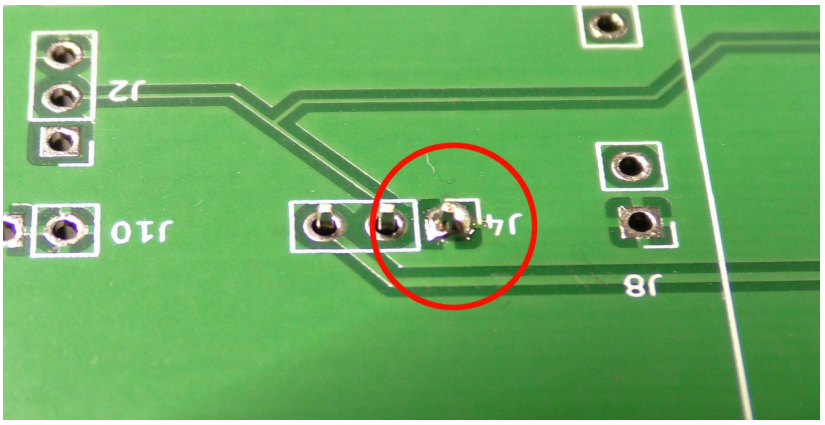
    - Solder the between pins one by one.
    - Split the 40pin 2.54 pitch pin header into smaller parts. See picture below:



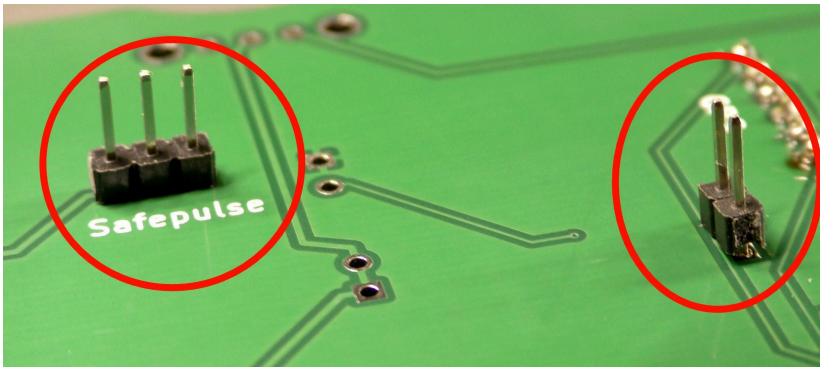
Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

- Keep the board with the bottom up.
- Place the 1×3 pin header in the safepulse or the Irover holes. Hold the board and turn it over. Solder one pin.



-
- Check alignment (needs to be 90 degree with the board). Picture needed. If alignment is good, solder the rest of the pins.
-
- Turn the board with the bottom up again. Place the 1×2 pin header for the safepulse (not for the Irover):

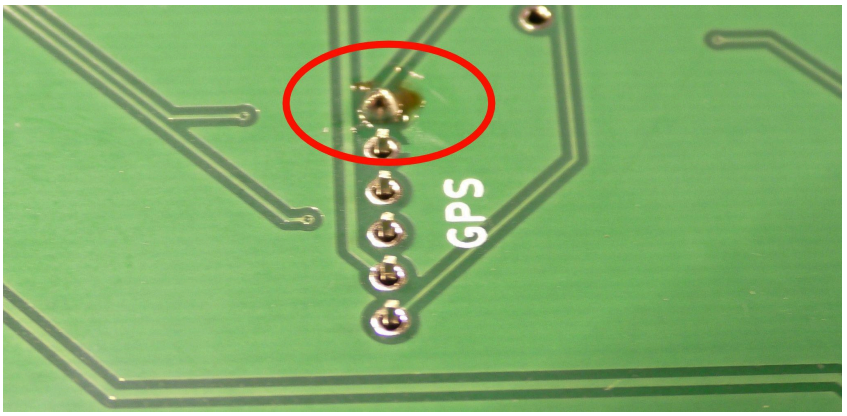


- Turn the board with the top-up.
- Place the 6 pins pin header for the GPS
- Flip the board while holding the pin header for the GPS

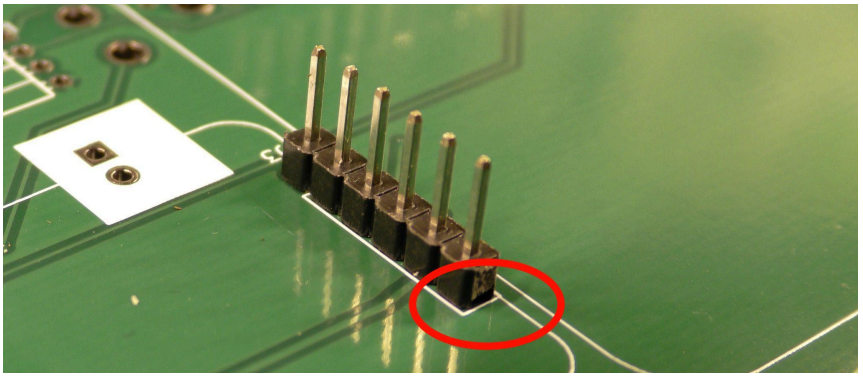
Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

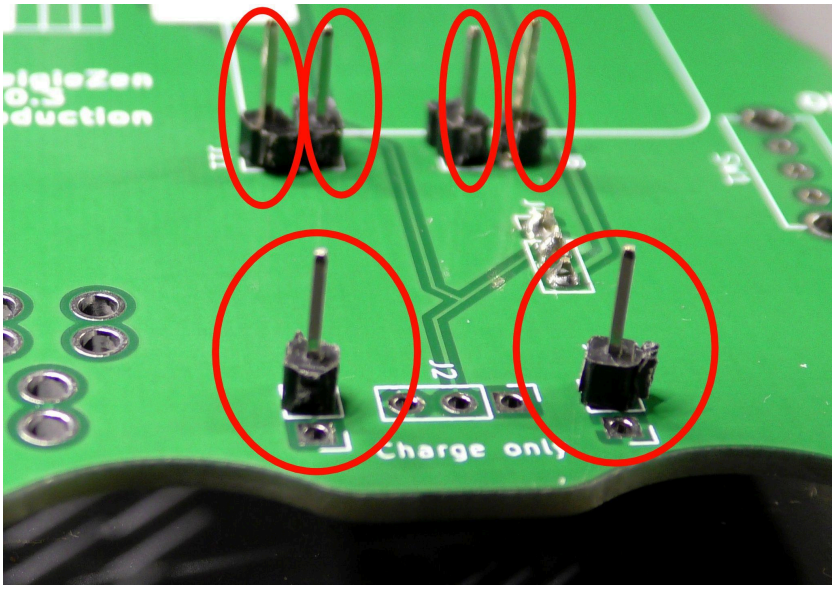
- Solder one pin of the 6 pin header.



- Check if the header is placed correctly.

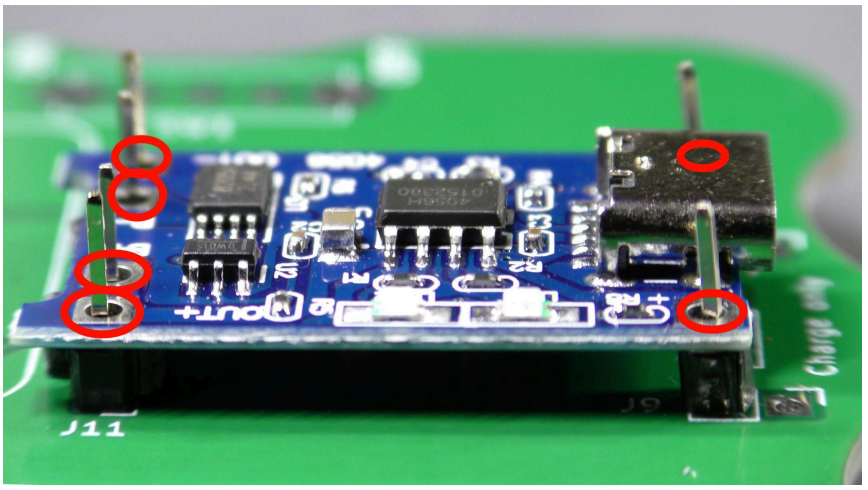


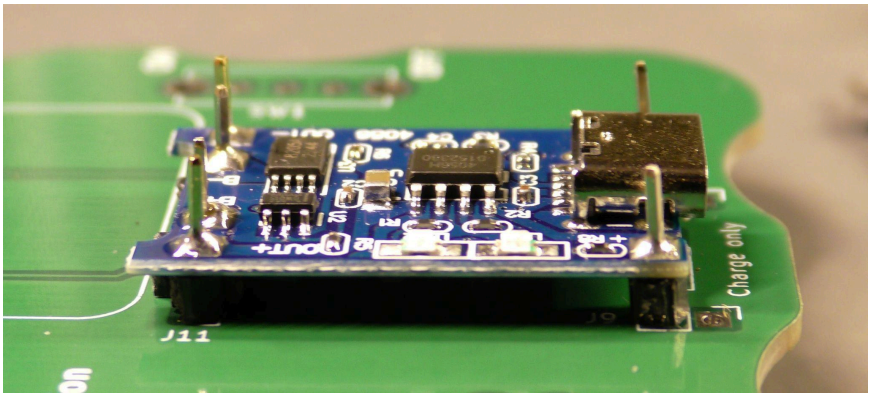
- Solder the rest of the pins
- After soldering the pins, flip to board to the top side up.
- Insert the single pins (6) for the 4056 charger in the holes (do not solder yet)



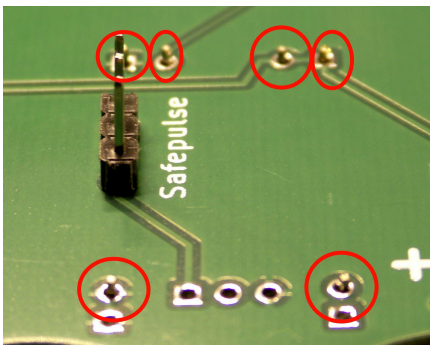
Index: **3**

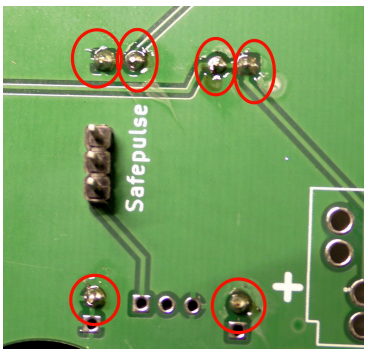
- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

- Place the 4056 charger on the pins
- 

- Solder 6 pins of the 4056
- 

- Hold the 4056 board and the main board and flip it bottom side up
- Solder the bottom pins of the 4056

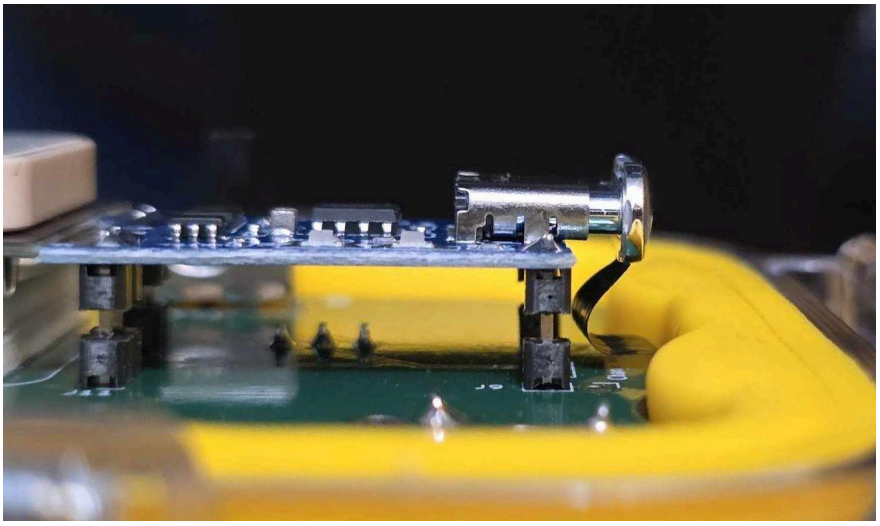


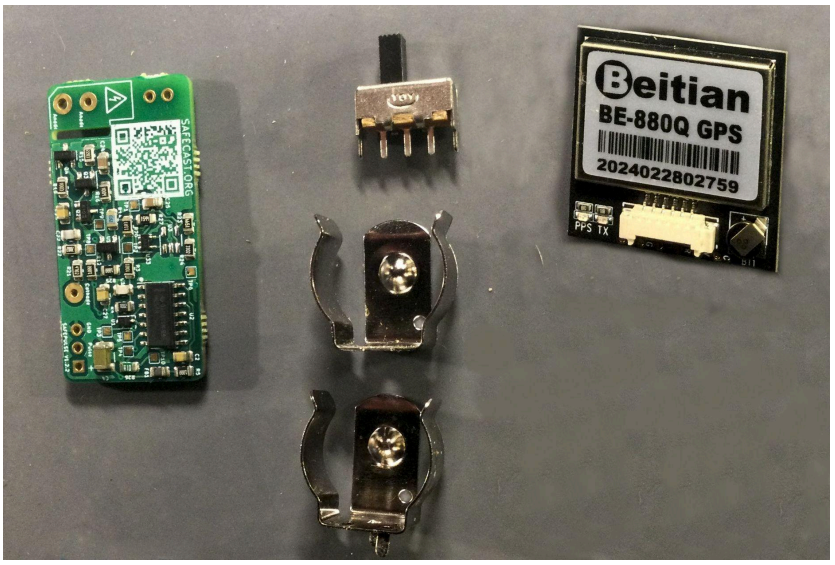


Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

An improved version can be made with different pin headers like below picture.

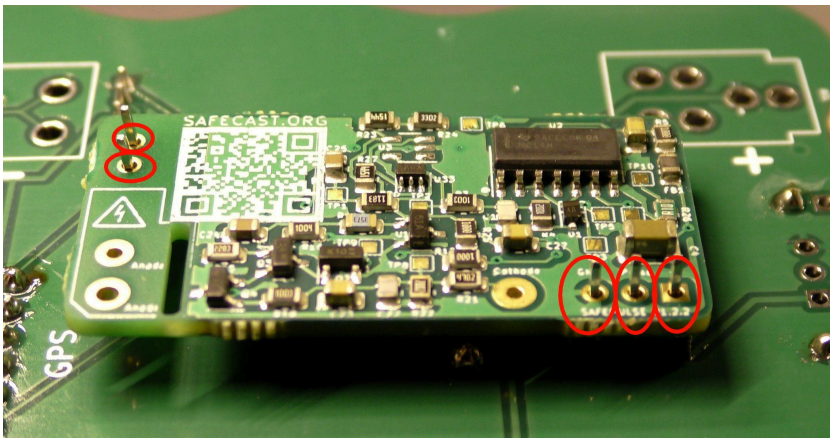


- **Prepare the next group of parts to be soldered (see picture below for the parts):**
- 

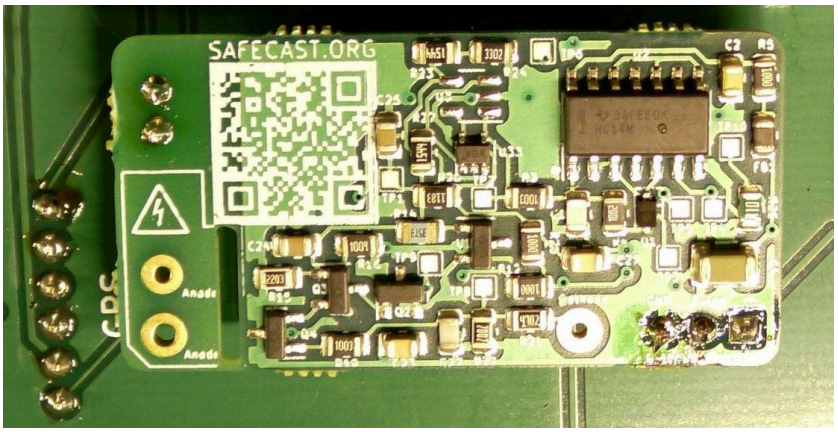
Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

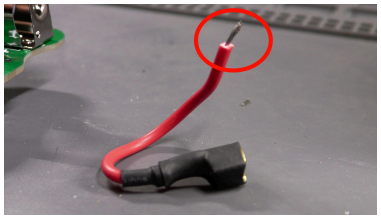
- Install the Safepulse

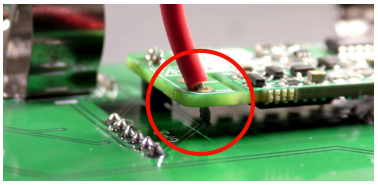


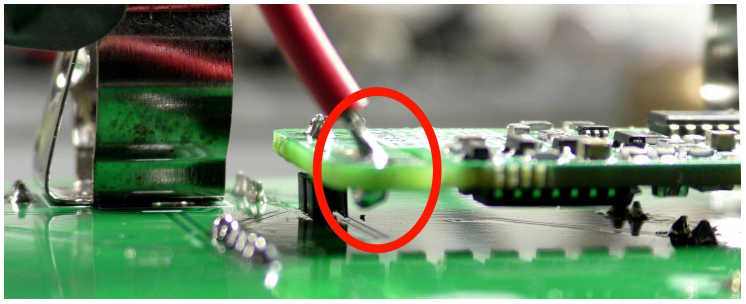
- Solder the pins of the Safepulse



- Solder the wire for the connector of the anode (red). First strip, then put though the hole and then solder.





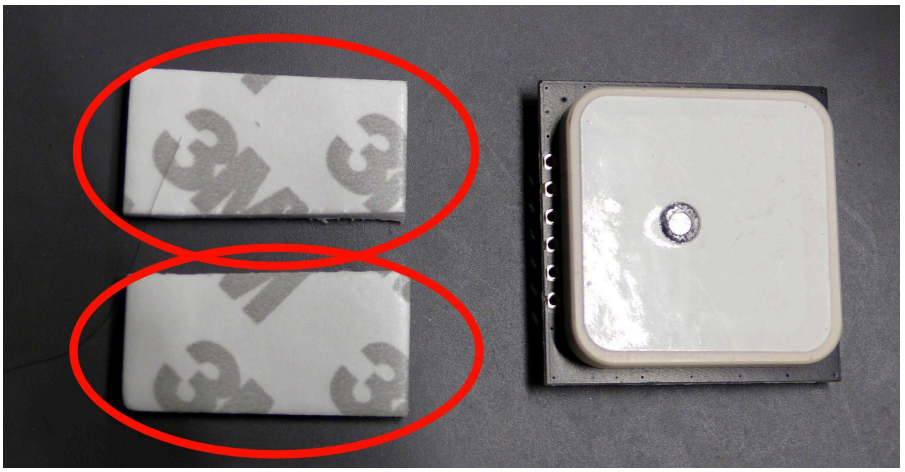


- Put the board with the top side up.

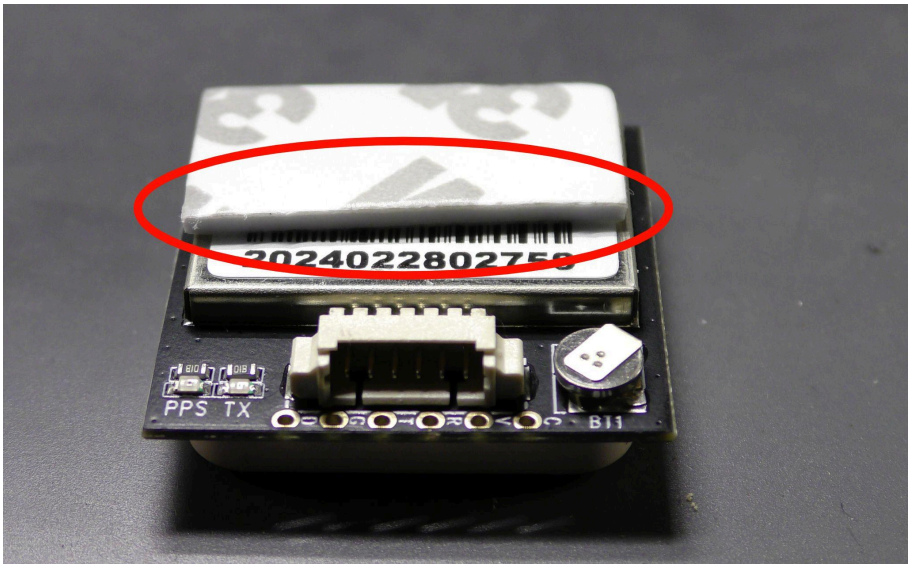
Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

- Cut the square white 3M double-sided tape in half.



- Remove two sides of the protection of the tape and stick in side on the GPS module.



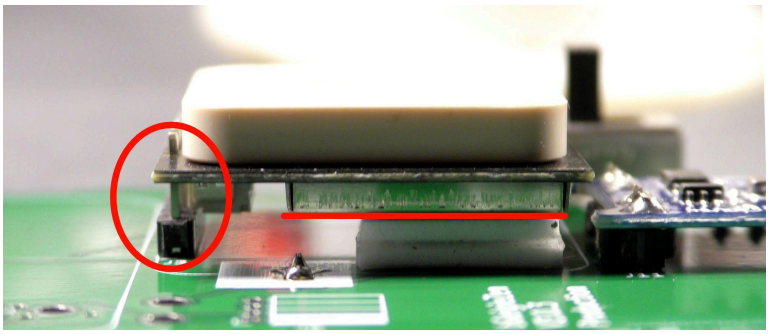
- Remove from the other part of the double-sided tape, only one side, and stick that on the sticky part of the first part of the tape. That way, the height of the

Index: **3**

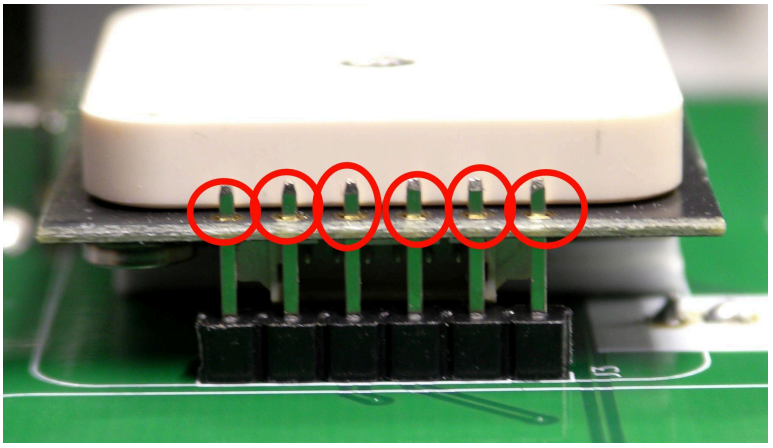
- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

double-sided tape is “perfect”.

- Place the GPS module over the pin header and check the alignment.



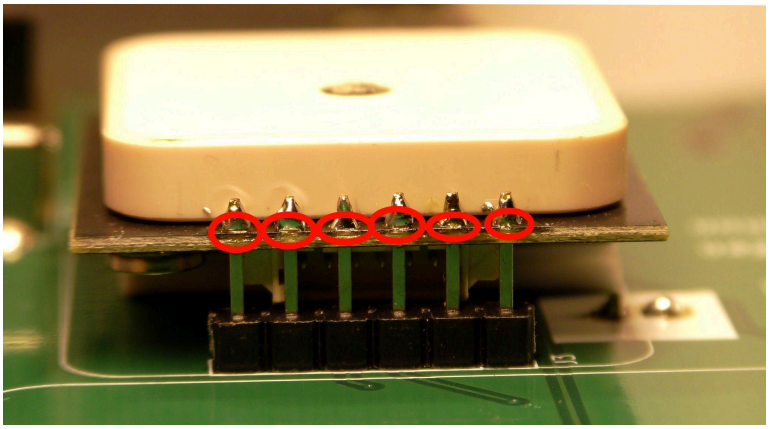
- Heat up the pins and the GPS module pads very well. The pads on the GPS module do not easily flow the solder with flux.

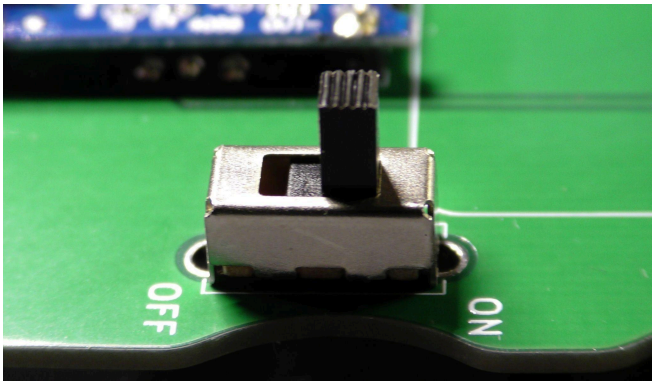


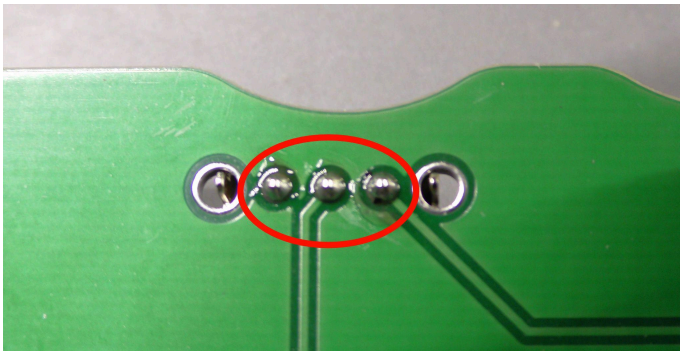
- Solder the pins well. And check thoroughly if all are well done.!!

Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

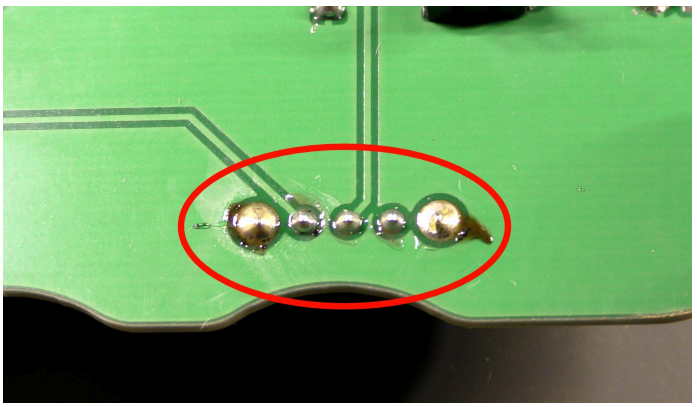
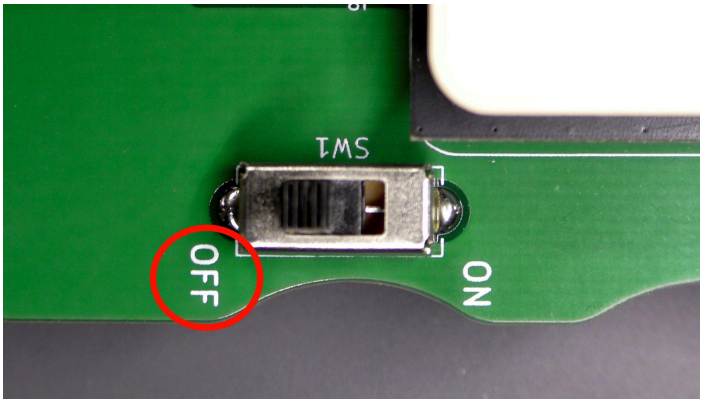


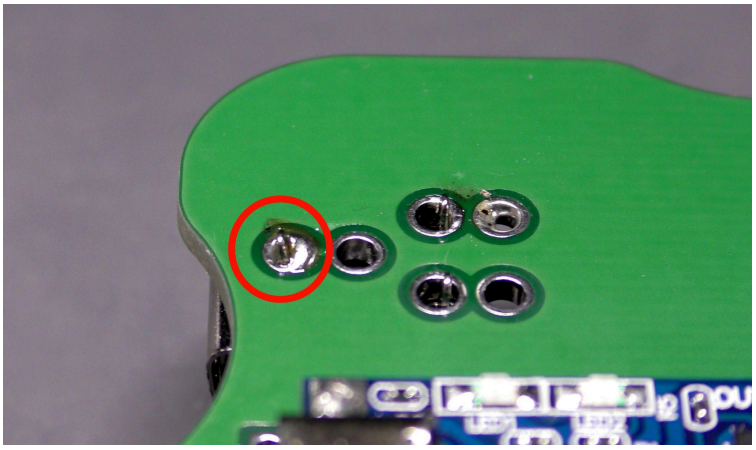
- Install the switch on the top of the board:
- 

- Flip the board over and solder one pin for the 3 smaller pins first. Check the alignment of the switch
- Solder the remaining two small pins. Then solder the two big outer pins (they need a lot of heating time and a lot of solder) **BE CAREFUL, THE METAL PART OF THE SWITCH WILL BE VERY HOT!!**.
- 

Index: **3**

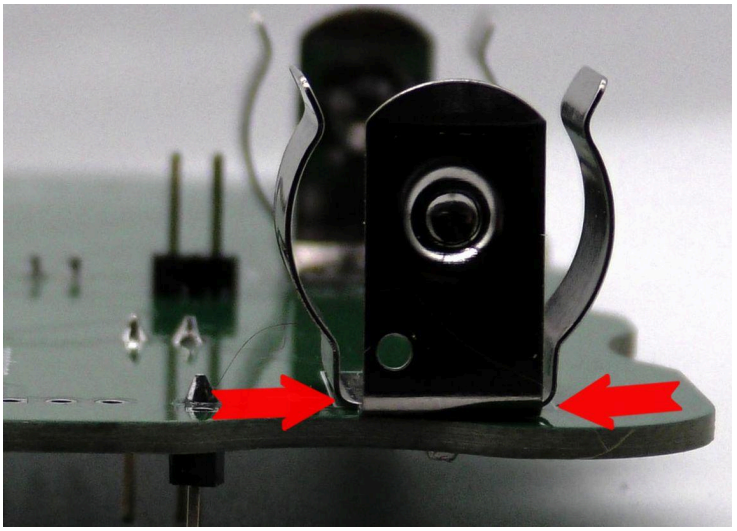
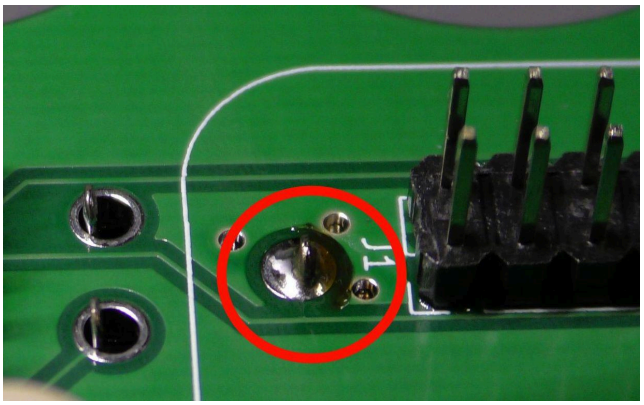
- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

- 
- Set the switch in the OFF position
- 

- Place the battery holder clip in the holes. With protected batteries, use the left holes. With unprotected (not advisable but up to you to use them) use the right holes. See picture below.
- Solder one pin (of the three pins) only and check alignment of the battery holder on the top side of the board. You need a lot of heat to get a good solder connection and **BE CAREFUL, THE BATTER HOLDER WILL BE VERY HOT!!**.
- 
- The flat bottom of the holder should be touching the board.

Index: **3**

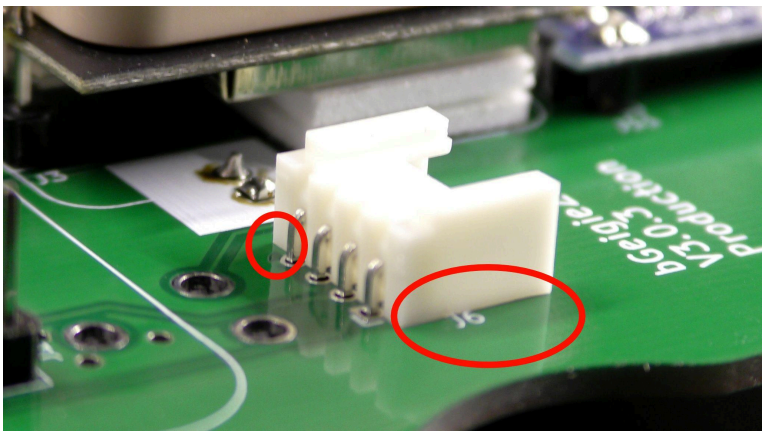
- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

- 
- solder the other pins of the battery holder,
- Solder other battery holder. Again, one pin first and check alignment, then solder the other two pins to the board.
- 

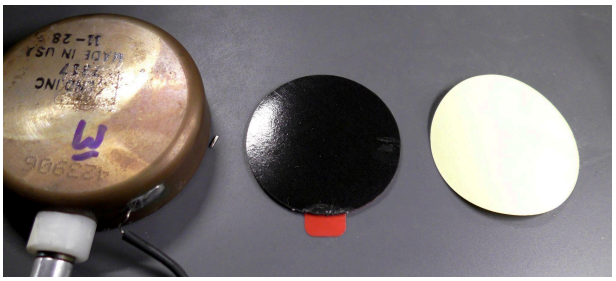
- Place the grove (white) connector and solder it in place after checking the alignment.

Index: **3**

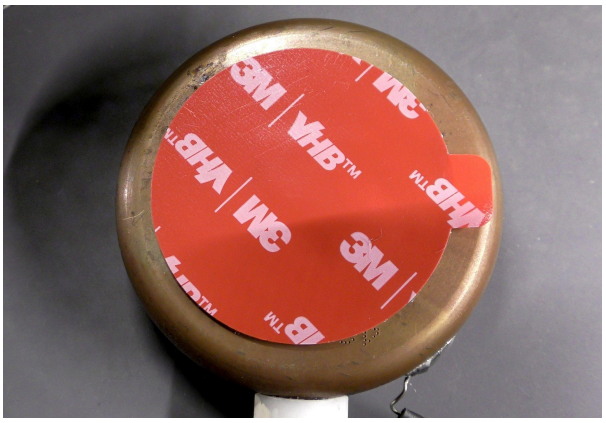
- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20



- **Prepare tube:**
  - **BE ALWAYS CAREFUL WHERE YOU PLACE THE TUBE WHEN THE GRID TOUCHES SOMETHING THE MIRA IS VERY FRAGILE AND CAN EASILY BE PUNCTURE**
  - Remove yellow part from round 3M sticker.



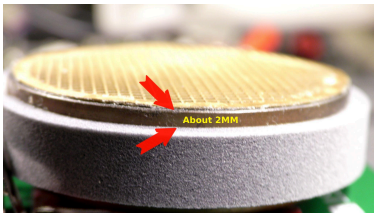
  - Place and press firmly on the backside of the tube.



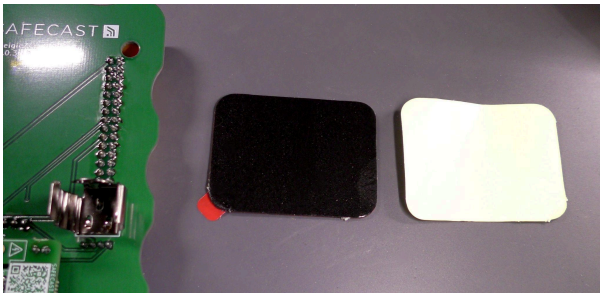
  - Remove the backside of the protected gray rubber/foam for the tube. And wrap it around the tube according to the pictures below. Leave the edge about 2 mm from the tube, so when the tube is placed into the black or yellow rubber lining, the rubber will be flushed against the gray proceed foam.

Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20



- Remove yellow part from rectangle 3M sticker.



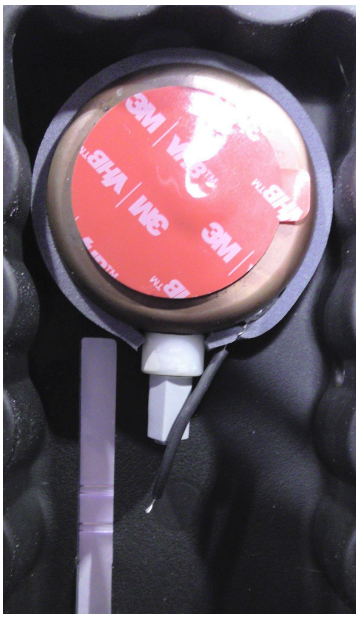
- Place and press firmly on the place in the picture below. Be sure the two holes on the board are not covered.

DO NOT TAKE THE RED PARTS OF THE STICKER OFF YET (that will be later when the tube in placed correctly.)

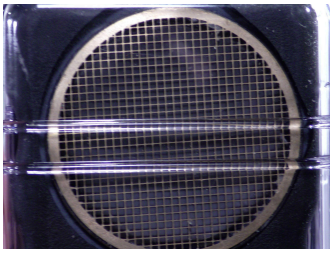
- Place the tube with the grid down into the case.

Index: **3**

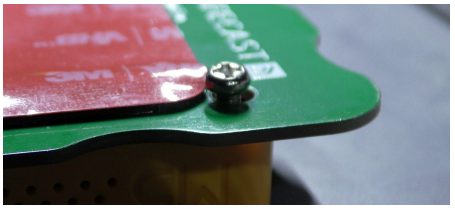
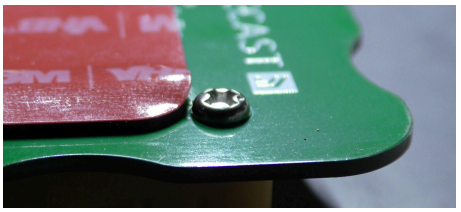
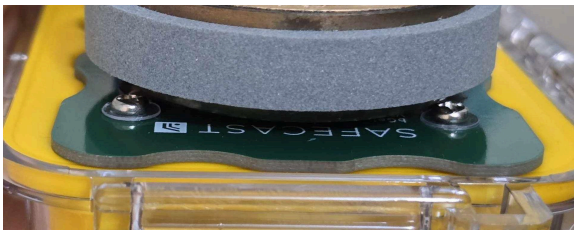
- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

- Confirm the placement is correct.

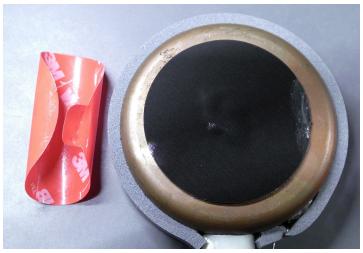
- Put the M3 15 mm screws for mounting the M5StackCore module (display and MPU) in the holes and tighten them. **DO NOT TIGHTEN THEM TOO MUCH. THE DISPLAY CAN BREAK IF THE SCREWS ARE PUNCTURING THE DISPLAY!!**

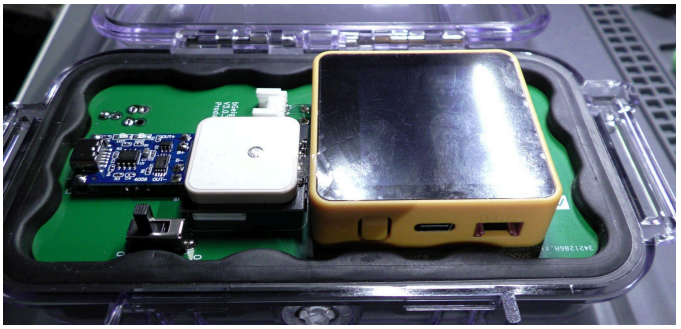
- Remove the rounded and rectangular red protected tape from the tube and the board.

Index: **3**

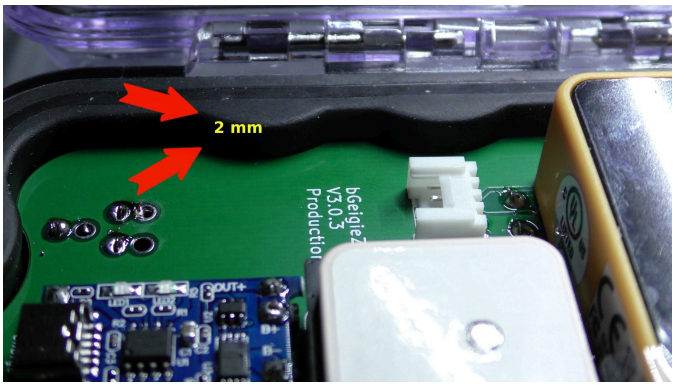
- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20




- Without moving the tube i the case, place the board in the case and press firmly.



- Confirm that the top of the rubber liner is 2 mm above the board.



- The bottom of the case should like this.

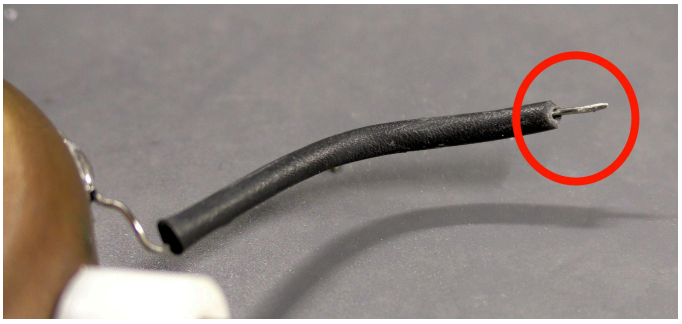
Index: **3**

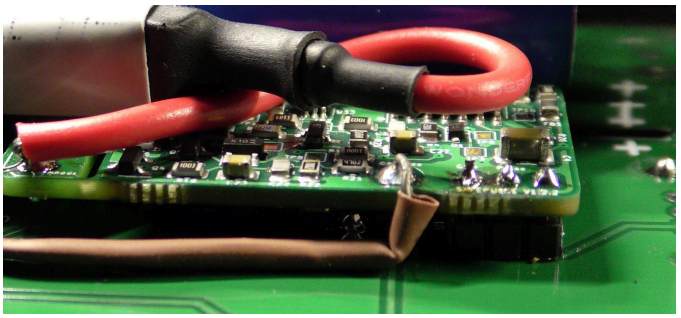
- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

- **Connecting the cathode of the tube to the safepulse.**
  - Prepare the “ground” cathode wire of the tube.
  - Be sure the aluminum connector of the anode of the is firmly screwed on. We have seen some LND7317 where the aluminum cap is not firmly screwed on and will course incorrect counts.

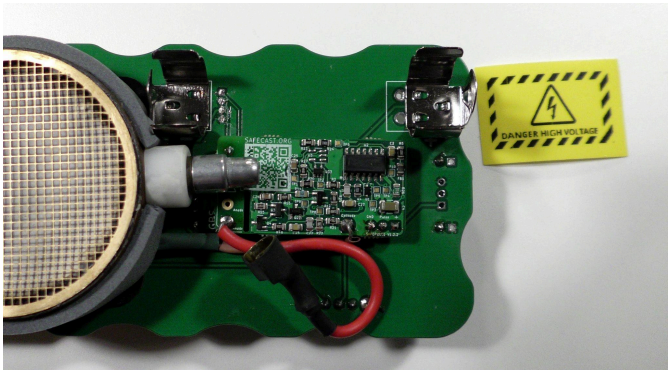


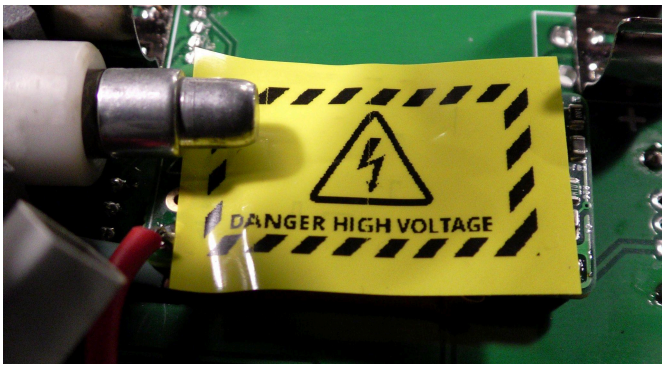


Add the yellow high voltage warning sticker

Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20



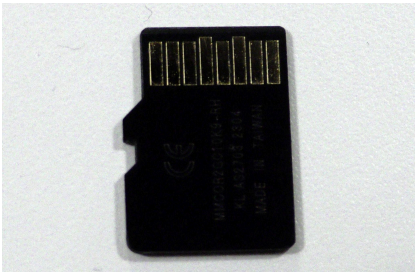


- Connect the anode connector (red wire) with the anode of the tube

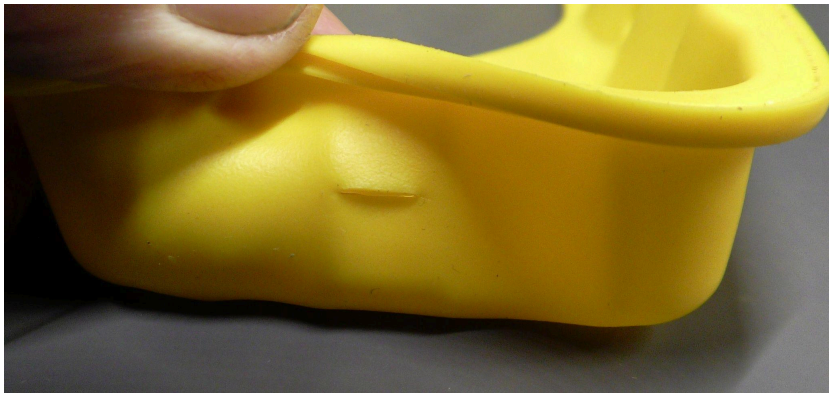
Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

- SD Card insert

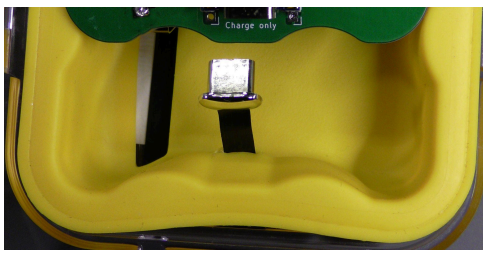


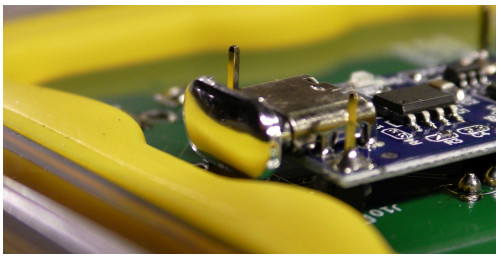
- **Case Preparation:**
  - Cut a small hole for USB-C connector of the QI receiver to go through.
  - Take backside of Safecast black sticker off and place it over the bottom top part of the QI changer (see Picture)
  -

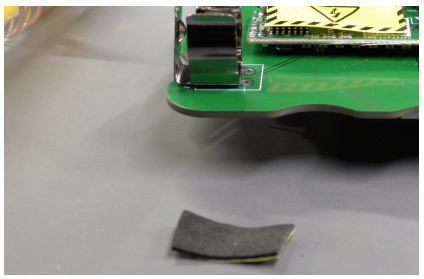
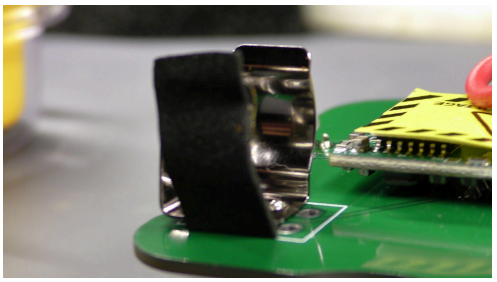


Index: **3**
- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

- 

- 


- Add a protected piece of tape on the + side of the battery holder. To prevent a short if the bGeigieZen is placed on it's side on a metal conducting surface.

Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

- **Case closure checks:**
  - Test closing the case. If proper made, you should not hear a “hard” click (when the M5StackCore 2 hits the upper part of the Pelican 1015 case. The sound should be a soft “rubber touching the case” sound.

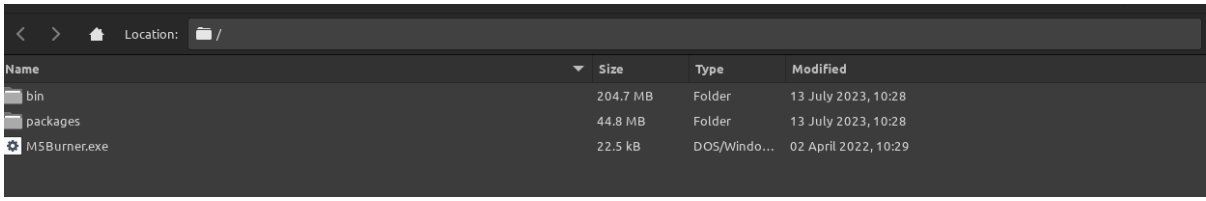
Software install/M5Burner

- Download the Burning tool from following website: https://docs.m5stack.com/en/download
- Choose your operating system and download the “UIFLOW FIRMWARE BURNING TOOL”

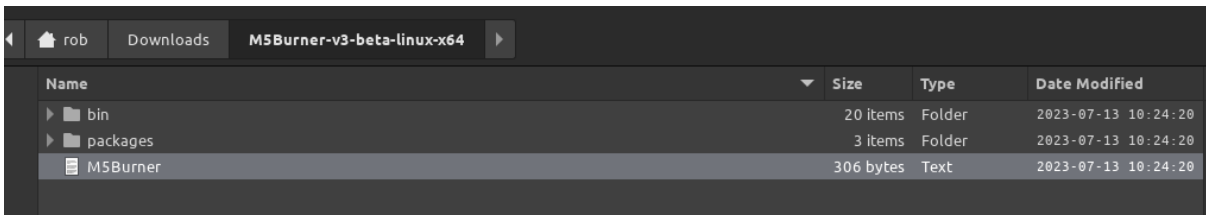
UIFLOW FIRMWARE BURNING TOOL

NO	Name	Download
1	M5Burner Win10 x64 v3.0	
2	M5Burner MacOS x64 v3.0	
3	M5Burner Linux x64 v3.0	

- For Windows users, unpack the .zip Folder and open the M5Burner.exe



- For Linux users, unzip and double-click on the M5burner.

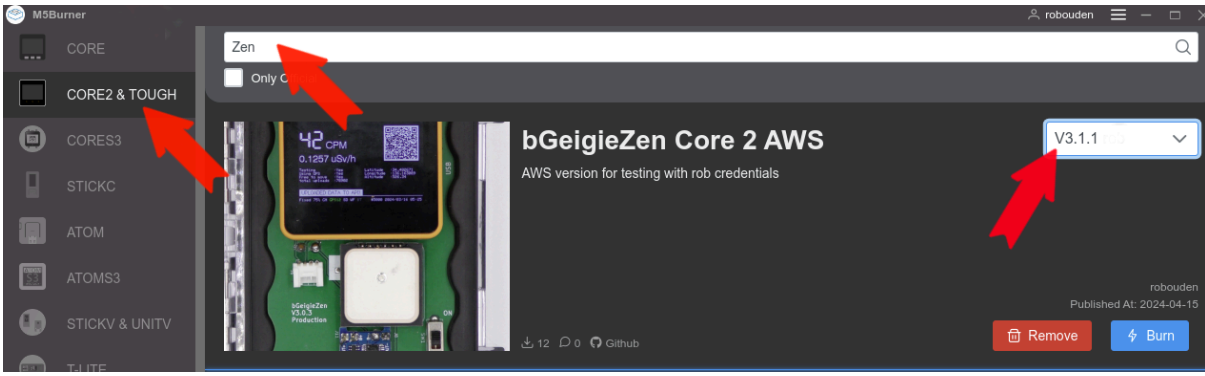


- If you have a M5StackCore Gray with 3 hardware buttons (not M5StackCore2 or AWS) select Core otherwise select Core2 or Tough (software touchscreen buttons)

Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20

- Use the search-function and search for “Zen”



- Select the latest version (the highest number) for your board (V3.x.x board run V3.x.x firmware).
- Hit the Download-Button
- Connect the M5Stack with a USB-C cable (not the charging port of the blue PCB). The M5Stack should switch on and the Burning-Software should detect the M5Stack and display a message (PICTURE?)
- Press the Burn-Button
- Wait till flashing is finished
- Update should be complete now

Index: **3**

- Parts check: 3
- Remove the backplate of the M5Stack: 4
- Basic solder instructions: 5
- Solder the board with pins only. 5
- Prepare the next group of parts to be soldered (see picture below for the parts): 10
- Prepare tube: 15
- Connecting the cathode of the tube to the safepulse. 19
- Case Preparation: 20