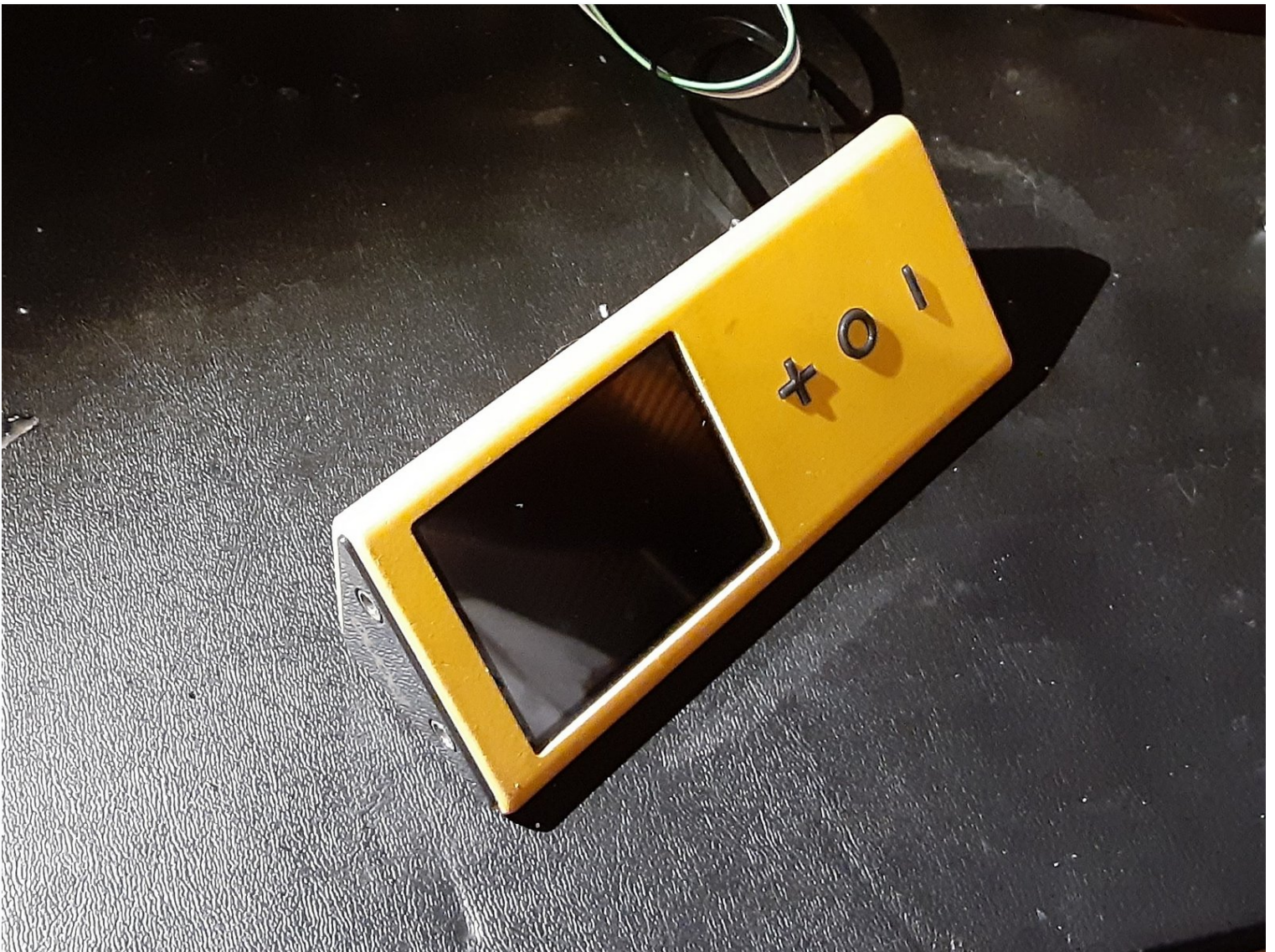




Pono Player Battery Replacement

Originally my Pono Player would run for 5 or 6...

Written By: Jim Davis



INTRODUCTION

Originally my Pono Player would run for 5 or 6 hours. Now, 6 years later, the battery can only play a 45 minute album on a good day. Time to upgrade that battery 'cause I love this little music player.

Let face facts, 18650 batteries will recharge a couple of hundred times but the capacity degrades. Perhaps the Panasonics, Sonys, Sanyos and LGs really are higher quality and will keep recharging to full capacity in the 1000s; show me the data. My Pono has a "McNair New Power" 3.78V, 2950mAh cell (they all had the same cell). Remove the black plastic wrapper and label (thanks for the label and specs fellas) low and behold it is a Samsung 18650, rated at 3.7, 3000 mAh, with a little protection PCB added on the plus end.

The Pono's original battery is "protected". Can the Pono power IC work with an unprotected battery? No, I don't think that is a good idea. Will an off the shelf protected 18650 battery work with the Pono power design? I don't know, I haven't delved into it, if you do post it.

I bought a high capacity, name brand, medium low current, unprotected, flat top 18650 to put in my Pono. I want to spot weld nickle tabs on the plus and minus contacts (like a real battery manufacturer) rather than solder to the battery (like a hobbyist). Then I will reinstall the original little PCB in the plus end, it has the cable and connector for the Pono power input, cool.

It turns out people are doing this spot welding operation quite a bit using a motorcycle battery or a "super cap array" and a moped starter relay to make DIY battery arrays for e-bikes and e-skate boards. Spot welding batteries at home is fun and dangerous, PPE required. There are battery spot welders that can do this work for < \$200 on Amazon which are safer. I plan on using a few batteries not hundreds so I'm using a 100 CCA motorcycle battery I have available, a \$15 dollar 12 V relay and 2 copper nails for welding contacts. Should you solder or spot weld your battery? WELL, MISUSING OR MISHANDLING LITHIUM ION BATTERIES CAN POSE A SERIOUS RISK OF PERSONAL INJURY, PROPERTY DAMAGE, OR DEATH.

This is a link to the very well done Pono Player Teardown by Mike Beauchamp, I will not repeat this effort here.

<https://www.youtube.com/watch?v=xIV8Od-e...>

This is a link to the SWEET! youtube video by "darkevind" of a home grown battery tab spot welder that inspired me. The linked video has 100k views but his follow on video (also valuable for this project) has over 400k views. Very fun as I said but play with 18650s at your own risk, seriously.

<https://www.youtube.com/watch?v=fEV21DIV...>

Here is the battery I installed. Do not buy 18650 batteries from a flaky vendor, there have been confirmed counterfeit batteries sold online.

<https://www.18650batterystore.com/Sanyo-...>



TOOLS:

Soldering Iron 60w Hakko 503F (1)
DIY Battery tab spot welder (optional) (1)
Tweezers (1)
Large Needle Nose Pliers (1)
IR Thermometer (optional) (1)
Safety Glasses (1)



PARTS:

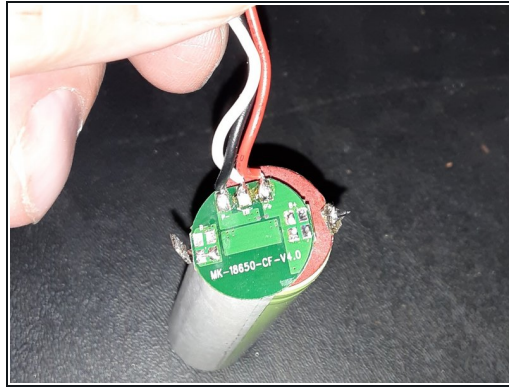
Good Quality 18650 battery 3.6 to 3.8 V
>3000 mAh (1)
roll of Kapton tape (1)
package Nickle battery tab material (1)
Lead-Free Solder (1)

Step 1 — Open Pono Player to replace the Li-Ion cell



- Open the Pono Player (watch the video, the link is in the intro).
- ⓘ Be sure to catch / save the 1cm square felt pad that falls out. If there is one... I think it is necessary and I have a photo showing where it goes in the last step.
- Disconnect the battery cable.
- Take some time to remove the glue from the crevices of the shell. I used the guitar pick and tweezers.
- ⓘ The tear down video suggests it is "hot glue" but I don't think I will use hot glue during reassembly. I think some electronics safe RTV or nothing initially.
- ⓘ That is my new battery in the photo, your original one will be black.

Step 2



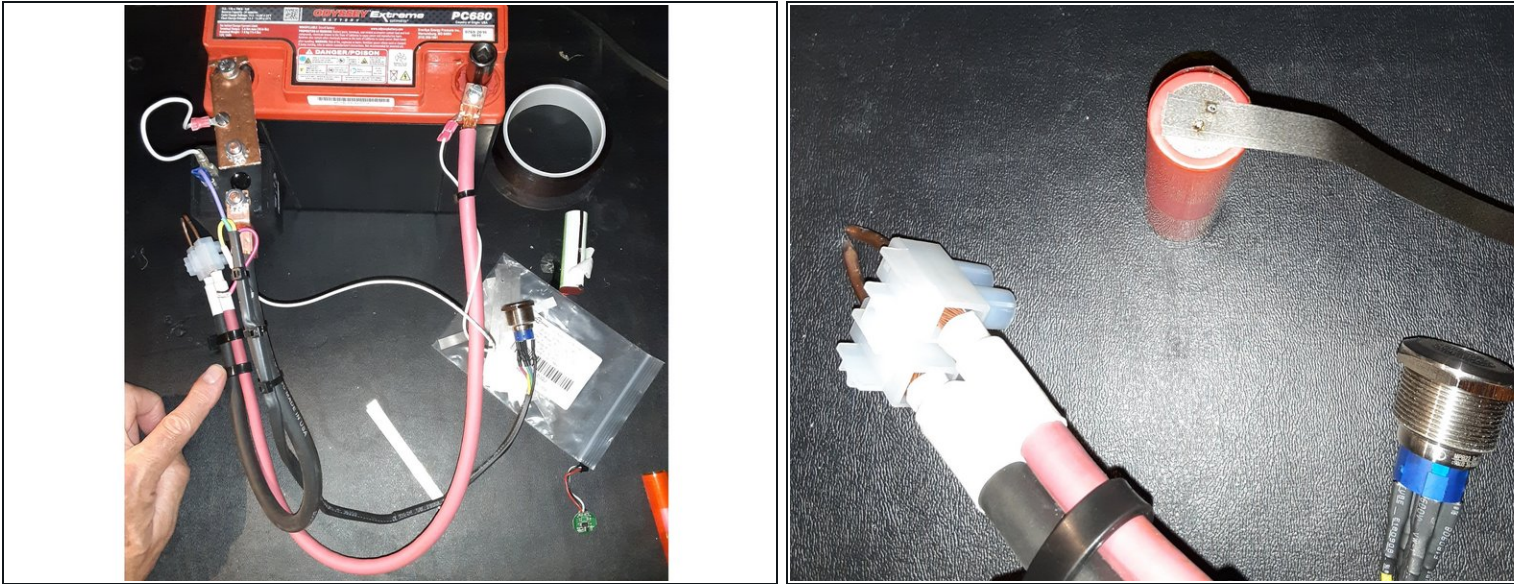
- I peeled / carefully cut the outer wrapper off of the original Pono battery.
 - Using a hot soldering iron lift the nickle tabs off of the protection PCBA.
 - ⓘ Save the orange paper insulator pieces for the new battery assembly.
 - ⓘ See the long negative nickle tab in photo 3, that is going to be duplicated on the new battery.
 - ⓘ The plus nickle tab is a shorter "U" shaped piece that goes from the plus battery terminal to the B+ pad of the PCB.
- ⚠ Yikes, that is a live battery lying there. I cut off the tabs and taped it up the ends.

Step 3



- On your new battery, put a strip of Kapton high temperature adhesive tape lengthwise almost the full length of the battery.
- Wrap each end of the battery one wrap of Kapton. Let 1/8" or so overhang the end of the battery.
- ⓘ The original battery has paper tape under, the nickle tab, over the nickle tab and the battery rim, protecting the battery from mechanical damage, so this is the purpose of the Kapton tape.
- ⓘ The Pono's battery compartment is snug. Too much tape could make the fit too tight but too little tape is also not advised.

Step 4



- ① This is a DIY battery tab spot welder I made. There is a link in the intro that describes making and using one.
- I spot welded a nickle strip to the minus end of the new battery. The new minus tab is aligned over the lengthwise Kapton strip.
- ① An alternate method is solder to the battery. There are videos on youtube of people doing this. Presumably their projects have not caught fire (yet).
- ⚠ The online battery store that sold me my batteries says, "DO NOT solder" in the long list of disclaimers. This surprised me but it doesn't mean spot welding is safe. My first try spot welding on an actual cell I burned a tiny hole in the case and some fluid sprayed out. I thoroughly discharged the damaged cell and sent it to the HAZMAT bin.

Step 5

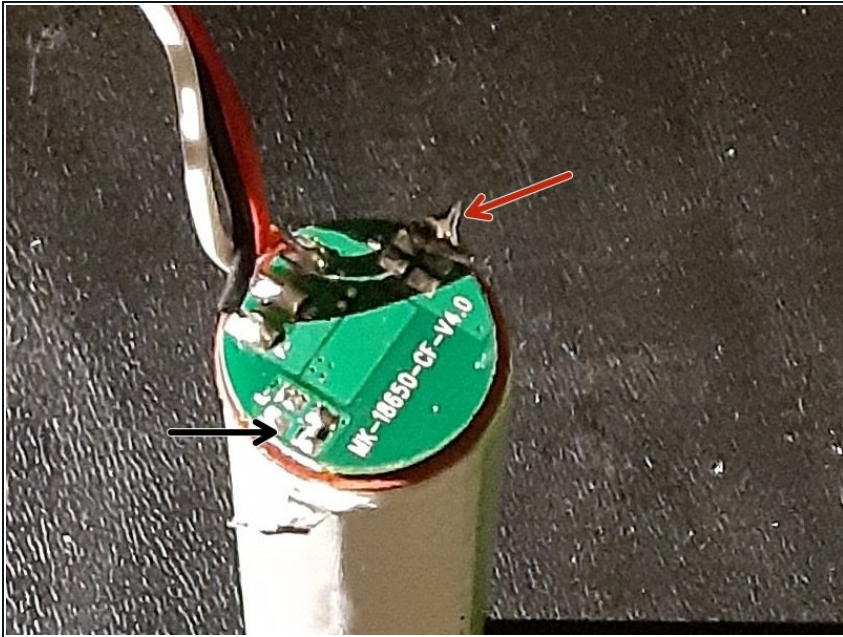


- I spot welded the 2nd nickle tab on the plus end of the battery.

i The plus and minus tabs are 180 degrees opposed.

! If the 2 battery tabs touch they may spark and discharge the battery very quickly.

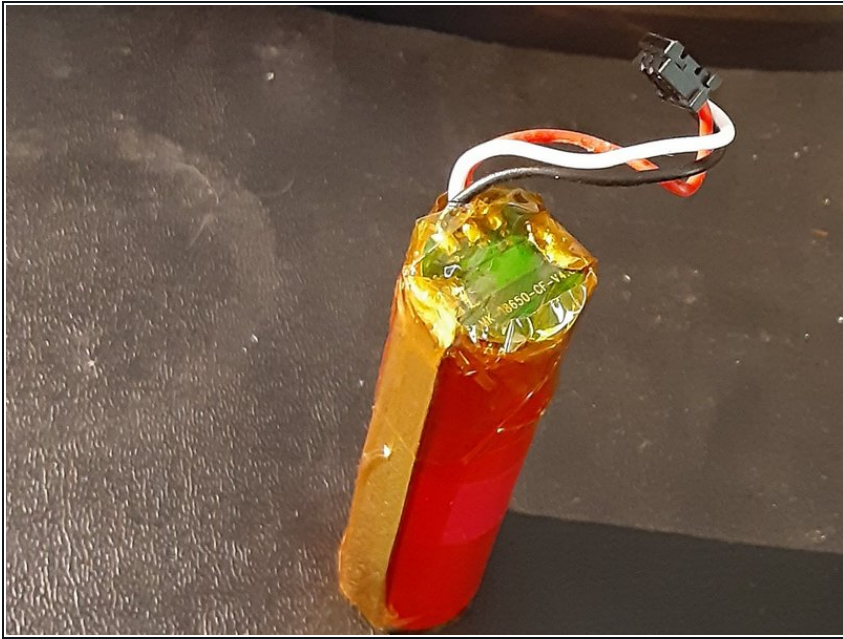
Step 6



⚠ Do not let the + and - battery tabs touch.

- i** Red arrow is indicating the B+ pads and the Black arrow points to the B- pads.
- Install the ring shaped orange paper insulator under the plus tab. Put the disk shaped insulator in place and tape them down.
 - Trim the minus nickle tab to length first, I used a scissors. Hold the end of the MINUS tab away from the PLUS terminal and bend it. Bend the minus tab making a 90 degree above the PLUS terminal (battery top) but leave enough room for the PCBA and insulators, maybe 3/16ths inch above the battery edge.
 - Trim the plus nickle tab to length. Bend the plus tab now and leave enough room for the PCBA and insulators, maybe 3/16ths inch above the battery edge.
 - Shape (cut) each nickle tab to make contact to the protection PCBA pads. The nickle material I used was wider than the original so I trimmed the edges to meet the pads.

Step 7



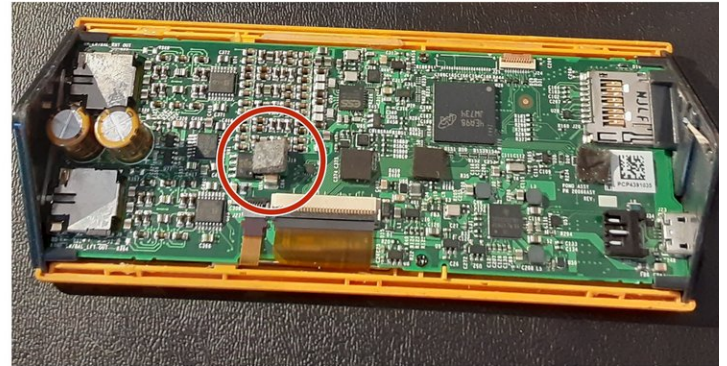
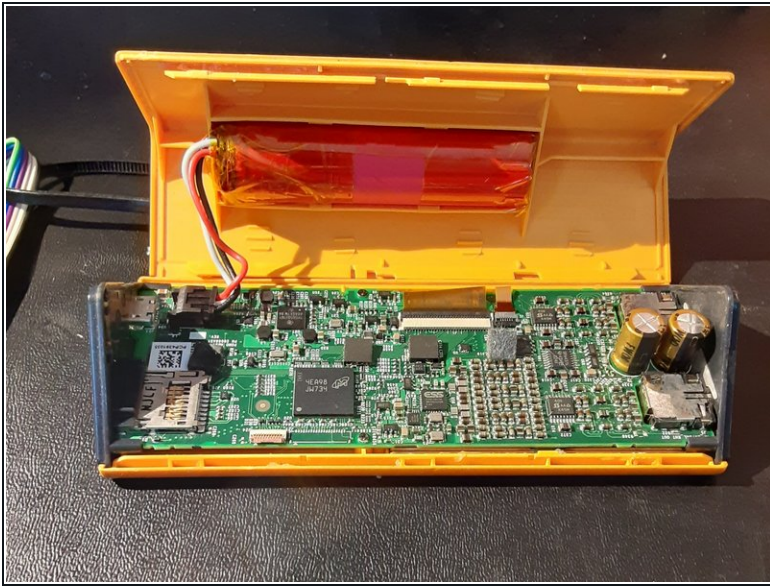
- ❗ It is a good idea to put the battery in something to hold it steady.
- ❗ If you are not an expert solderer then you may want to practice soldering nickle strips together, before doing it on the battery.
- Leave the PCB aside for now, with the soldering iron melt some solder on the + and - tabs, in the areas/sides that will connect to the "B+" and "B-" PCB pads ("Tin" the areas of the tabs to be soldered).
- Leave the battery aside, inspect the PCB and clean any solder flecks or splashes away. Flow some solder on the "B+" and "B-" PCB pads.
- Place the PCB on the battery top. Align the B+ pads to the plus tab and the B- pads to the minus tab.
- Press the minus tab down on the PCB "B-" pads with the hot iron and when the solder melts then flow some more solder into the joint. Hold the tab in place with the tip of the tweezers or other tool and remove the iron. Let the solder joint cool without moving it.

- Press the plus tab down on the PCB "B+" pads with the hot iron and flow some more solder into the joint. Hold the tab in place with the tip of

the tweezers or other tool and remove the iron. Let the solder joint cool without moving it.

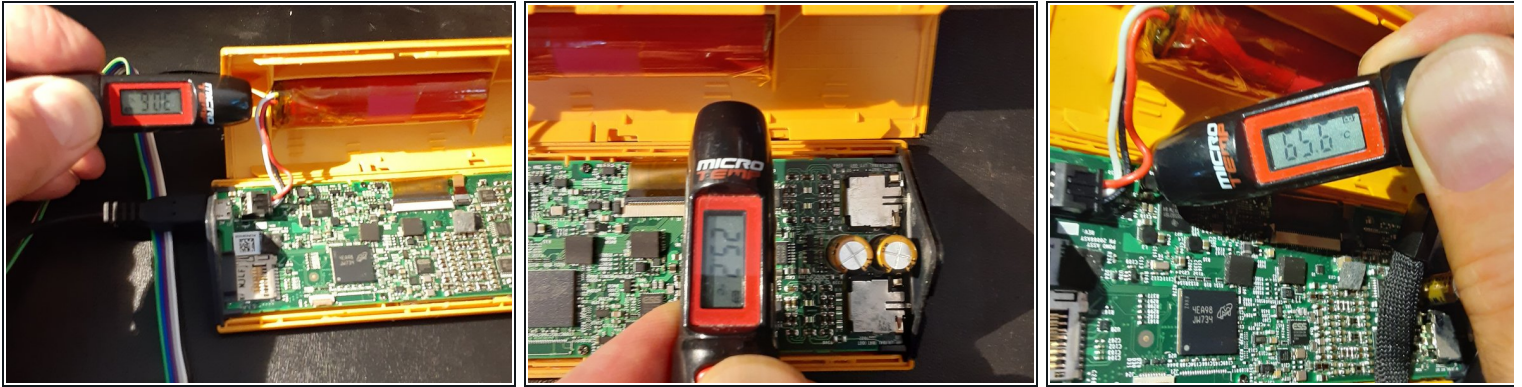
- After the solder joints have cooled lay down one more layer of Kapton covering over the exposed PCB, exposed nickel and battery ends.

Step 8



- ① Time to connect the battery and test and then close your Pono or close and then test your Pono. It is your call I was confident with my battery so I closed it plugged in the charger and watched it while it charged for an hour.
- When I opened my Pono a small felt pad fell out. I deduced it should rest on the end cap of the large surface mount MLCC capacitor to cushion the battery. I think if you rest the felt pad as shown in the red circle then close the Pono shell the pad will be held in place.
- Line up the (triangle shaped) black end plates in the slots and press home the shell with a satisfying snap.
- ① I have one bonus step, however.

Step 9



- ① The Pono charge circuit does get warm when charging at maximum of 0.5 Amps. The battery, if we have done our job well, will not. The following test was done with a depleted battery.
- In photo 1, you can see I have connected the USB charger and the protection board temperature is elevated at 31 degrees C after 1 or 2 minutes of charging. Ambient temperature is 24 degrees C.
- In photo 2 the minus terminal of the battery is 25 degrees C and rising. Eventually the whole battery reached ~30 C.
- In photo 3 you see the business of charging heats up U50 quite a lot. The maximum temperature I found was 66 degrees C, the related components were also warm. I think this is normal and working as designed. After an hour of charging the battery voltage climbed, charge current fell and the temperature of U50 dropped to 40 C.
- ① So the Pono after receiving a new battery will get warm (as it did when it was new). The end by the USB on the front panel is the warmest spot.
- ① My rule of thumb is - around 60 C you will pull your finger off a hot IC. So U50 is too hot to touch at 66 C but safe. With the shell closed things could get even a little bit warmer but still that is normal and as designed.

It was fun writing this, I needed to fix my Ponoplayer. Please be careful.