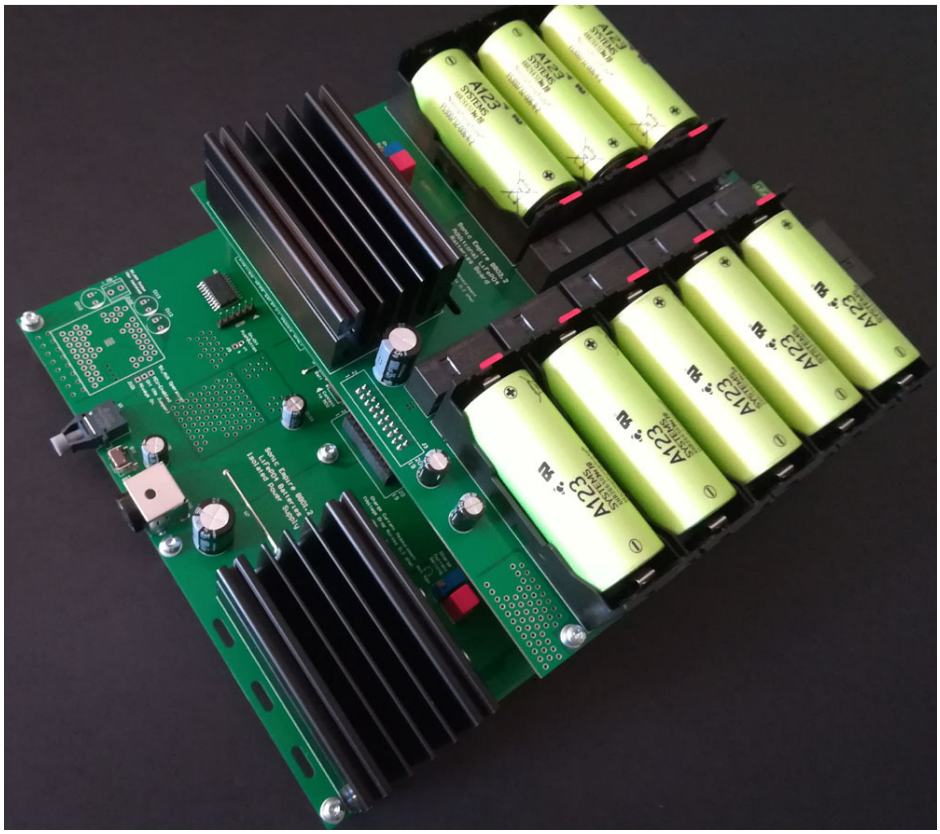
TWRPS-LBS-D LiFePo4 batteries power supply daughter board



This board is part of the new LiFePo4 batteries power supply system. This is an extra board intended to add more rails to the main board. It's controlled by the main board processor.

Features:

Input: TWRPS-LBS-M main board

Output voltage:

2x 3.3V to 13.2V, typically for DAC analog stage

Board size: 184mm x 195mm

Board options: finished and semi-finished

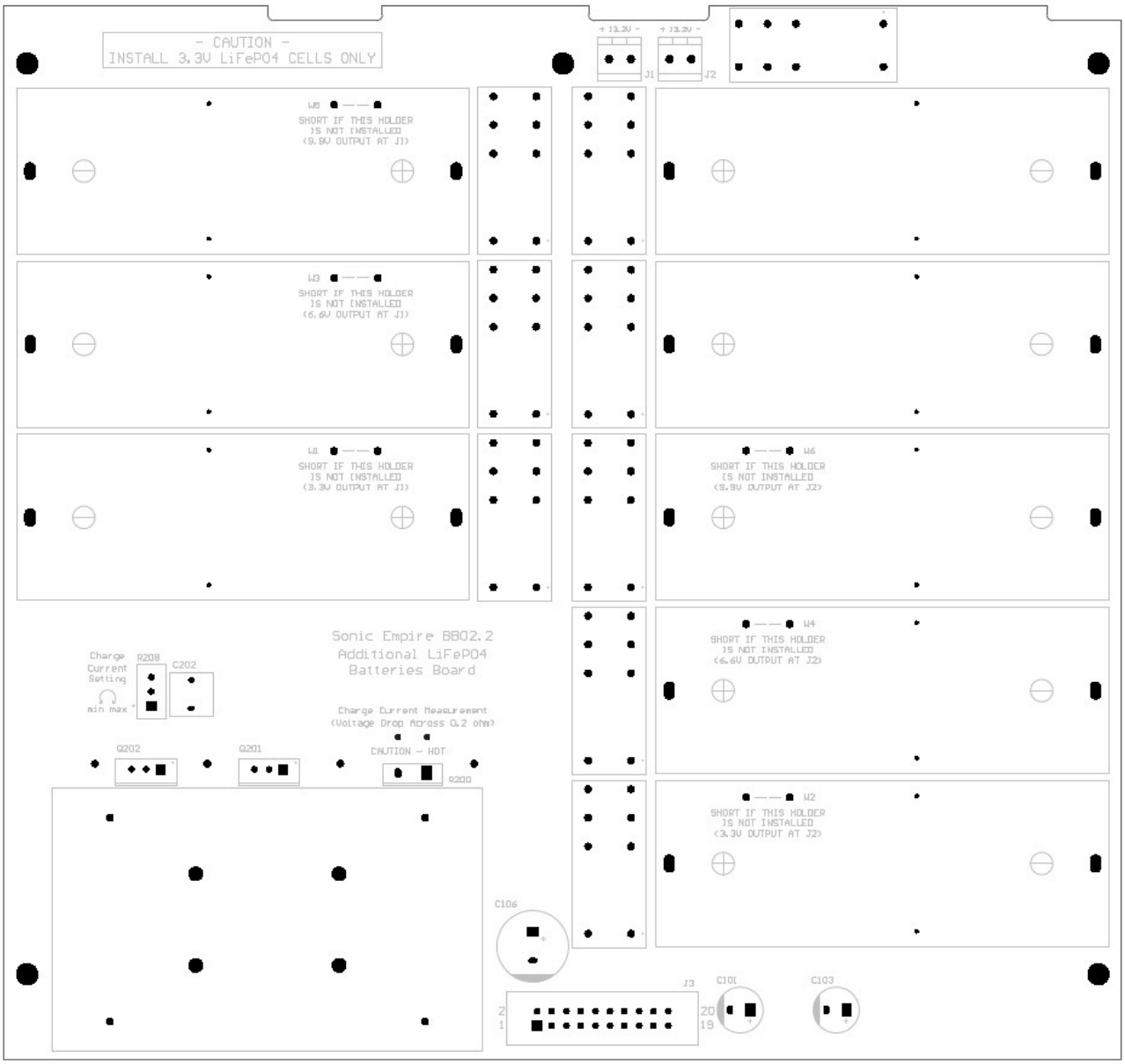
Note: supplied without batteries and battery holders

Fits the main board with a single connector

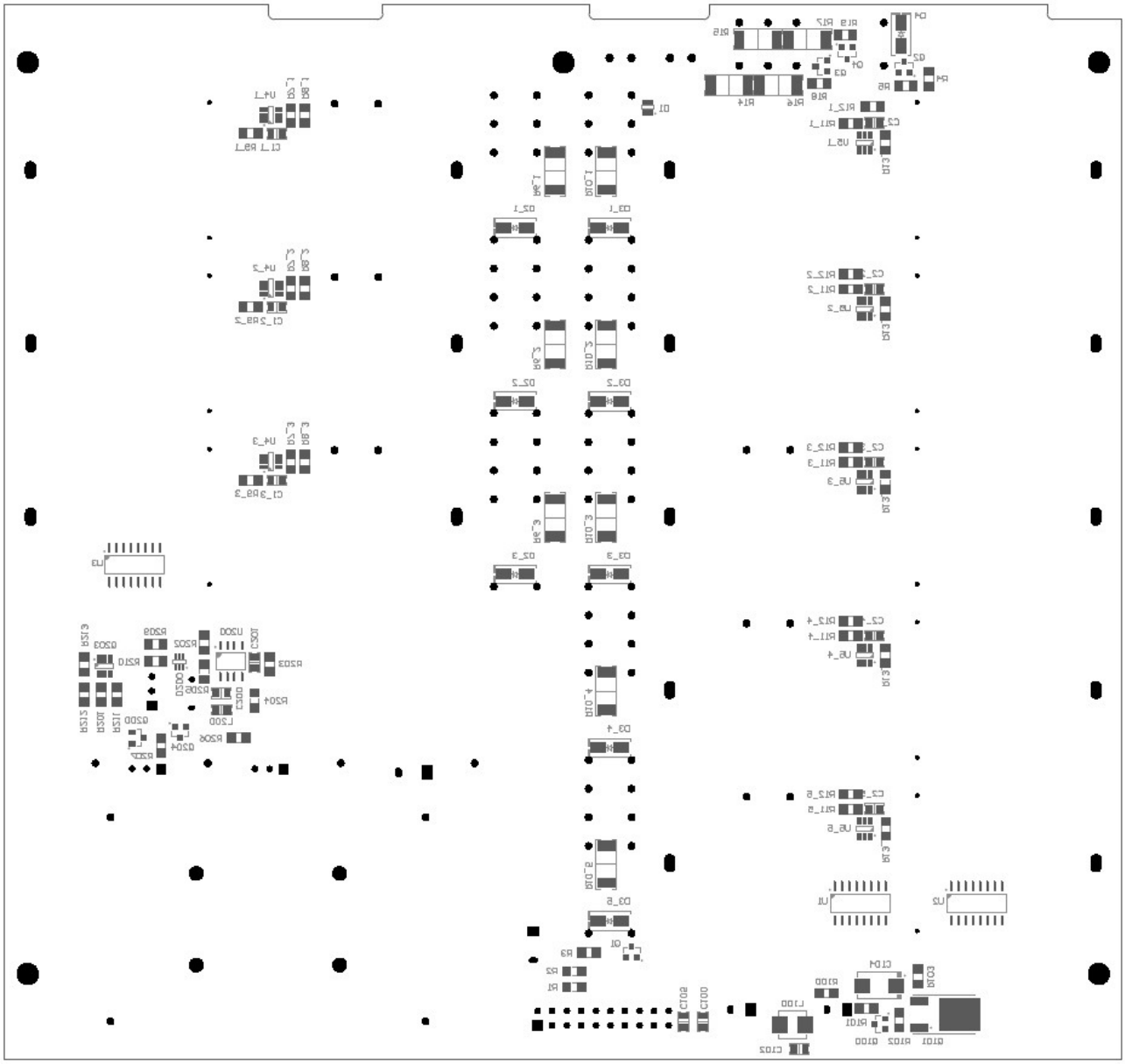
No switching devices or active oscillators during listening

No RF emissions at all (no multiplexed display)

PCB layout (Top view)



PCB layout (Bottom view)



Connectors

J1: 3V3, 6V6, 9V9, 13V2 output rail depending on the installed batteries. It can be used to power the output stage of a DAC.

J2: 3V3, 6V6, 9V9, 13V2 output rail depending on the installed batteries. It can be used to power the output stage of a DAC.

J3: 20 pin flexible board stacker to fit the TWRPS-LBS-M main board. Suitable connector is Samtec EW-10-13-G-D-400 (Mouser part# 200-EW-10-13-G-D-400). It is provided separately with finished board option. To set the right height, the connector has to be soldered with the two bards stacked up.

Charge current measurement test point (close to R200): Use this test point to measure the voltage drop across R200 (0.2 Ohm) in order to calculate the charge current. The current is calculated by the Ohm's law I=V/R where V is the measured voltage and R is 0.2 Ohm. For example measuring 0.5V the charge current is 2.5A (0.5V/0.2R=2.5A).

Settings

The only necessary setting is the charge current. The max charge current is around 2.5A.

Turn the trimmer R208 to set the charge current at the desired value using the Charge current measurement test point.

The charge current might be set to the maximum value without any damage for the batteries. The charge current should be decreased if not all the batteries are installed. As a rule of thumb, 250mA for each battery can be used as reference to set the charge current.

Getting started

Both finished and semi-finished boards are supplied without batteries and battery holders.

A good source for the LiFePo4 batteries is NKON: https://eu.nkon.nl/a123-systems-anr26650m1b-a-grade-3-3v-a-grade.html

CAUTION: INSTALL 3.3V LiFePO4 CELLS ONLY.

Battery holders can be sourced from Aliexpress or eBay.

Suitable battery holders.

The battery holders should be installed only the cell has to be installed. Don't install the battery holders on unused rails.

Use zip ties to keep the batteries securely in place.

The rails can be adjusted to get lower output voltage than the nominal one. For each composed rail install the battery holders to get the desired output voltage, for example to get 3V3 from one of the 13V2 rails, just one batter holder has to be installed. Then in place of the other battery holders install jumpers to connect the output as indicated on the PCB overlay.

CAUTION: DON'T INSTALL BOTH BATTERY HOLDER AND JUMPER IN THE SAME BATTERY REGION TO AVOID SHORT CIRCUIT.

CAUTION: don't install new battery when the other cells are already charged and the board is switched on to avoid overvoltage of the batteries that are already charged. Firstly switch off the board, then install the new battery and wait at least 2-3 hours. This way the higher level cells yield energy to the low ones, balancing the charge of all the installed cells.

There are 2 available options for this board:

- finished boards (fully assembled)

- semi-finished boards (users have to solder some parts, mostly TH)

The BOM for semi-finished board is available at post #165 on the diyaudio.com thread: The Well Regulated Power Supply.

5x male/female PCB spacers, M3, 30mm length, must be installed on the main board to stack the two boards.

Notes on semi-finished board

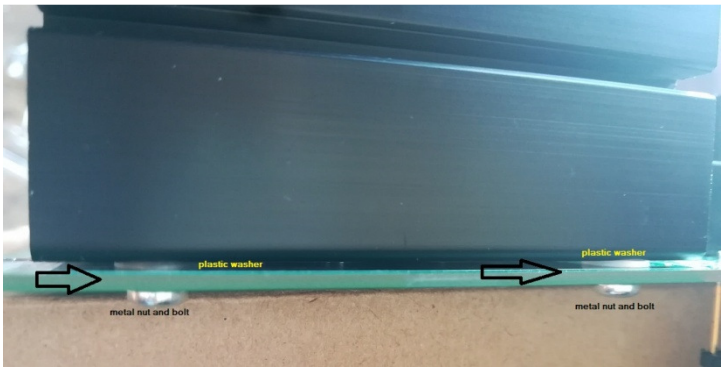
The semi-finished board option needs some parts to be soldered (mostly through hole parts), both on the top and the bottom layer.

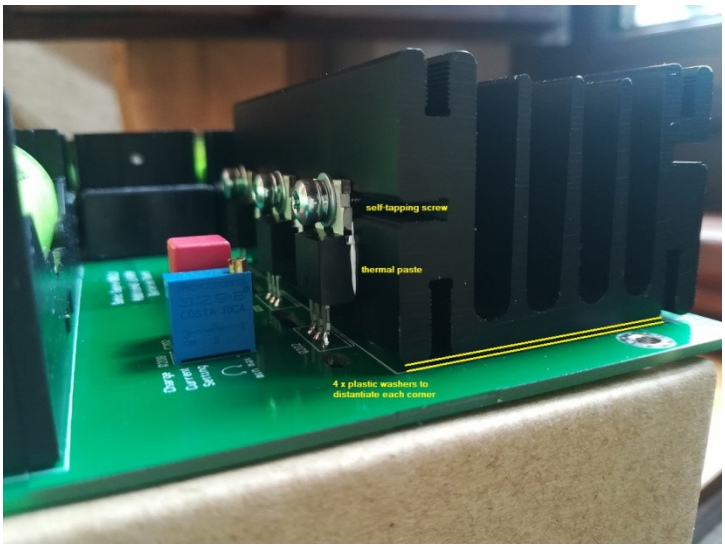
There are a few things to pay the maximum attention:

- be careful installing connectors and polarized parts with the right orientation, the component orientation is clearly visible on the PCB overlay

- pay particular attention to the comparators to be soldered on the bottom layer (part MCP65R41T-1202E/CHY) because the laser marked pin 1 is not well identifiable. If the orientation of the component is not respected the cell undervoltage protection will not work and some batteries could be damaged

- be careful assembling the heat-sinks and the components attached to them; the heat-sink has to be spaced from the PCB using 4 plastic washers (one for each corner), then they have to be blocked with M3 screws. To align to the heat-sink slot, TO220 parts should be soldered after the heat-sink has been installed and their tabs have been fixed with M3 screws (aluminum is not so hard, be careful when tightening); use thermal paste to improve thermal transfer to the heat-sink;





Operation and Status indicator see the TWRPS-LBS-M main board User Manual.