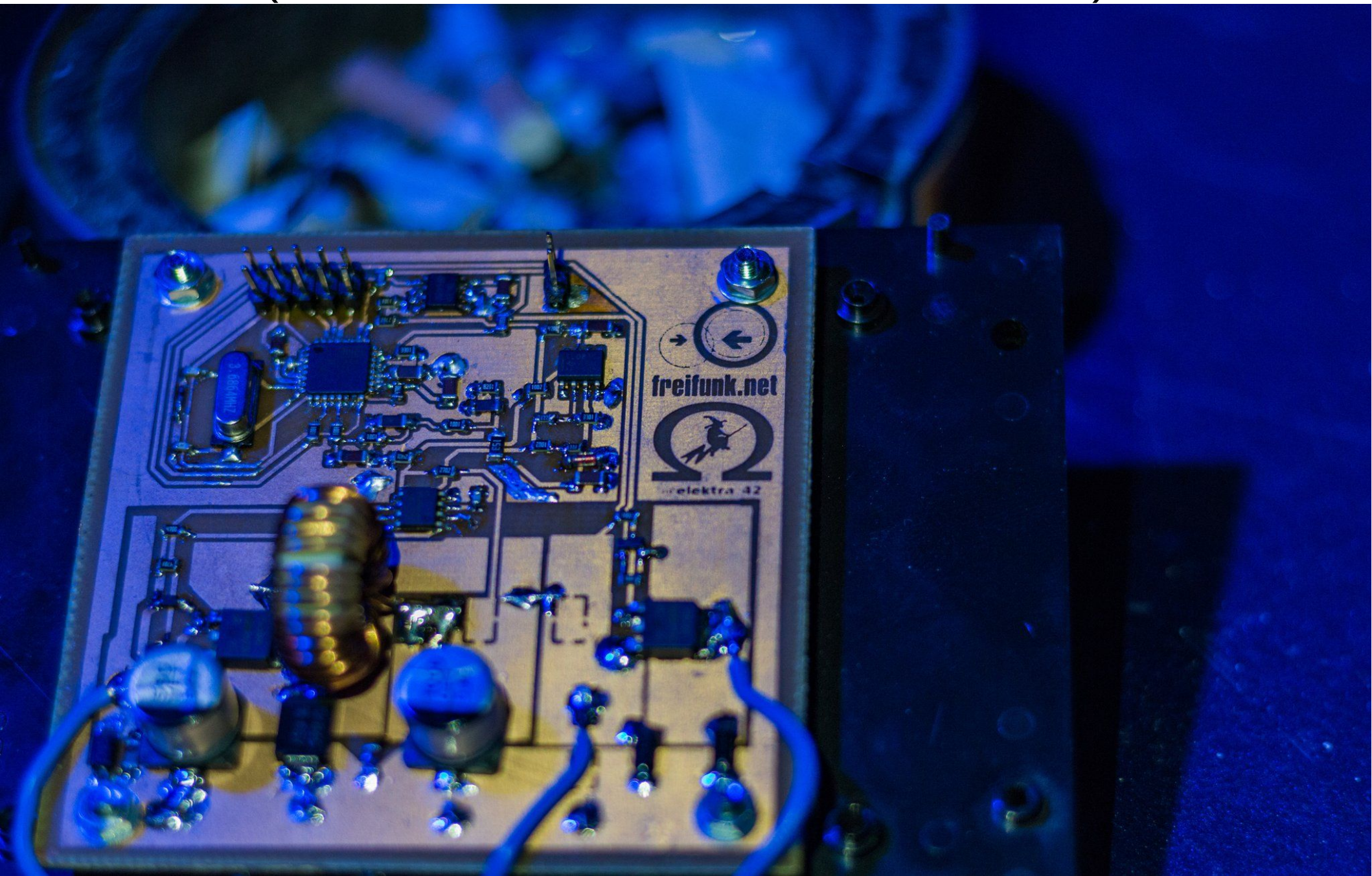
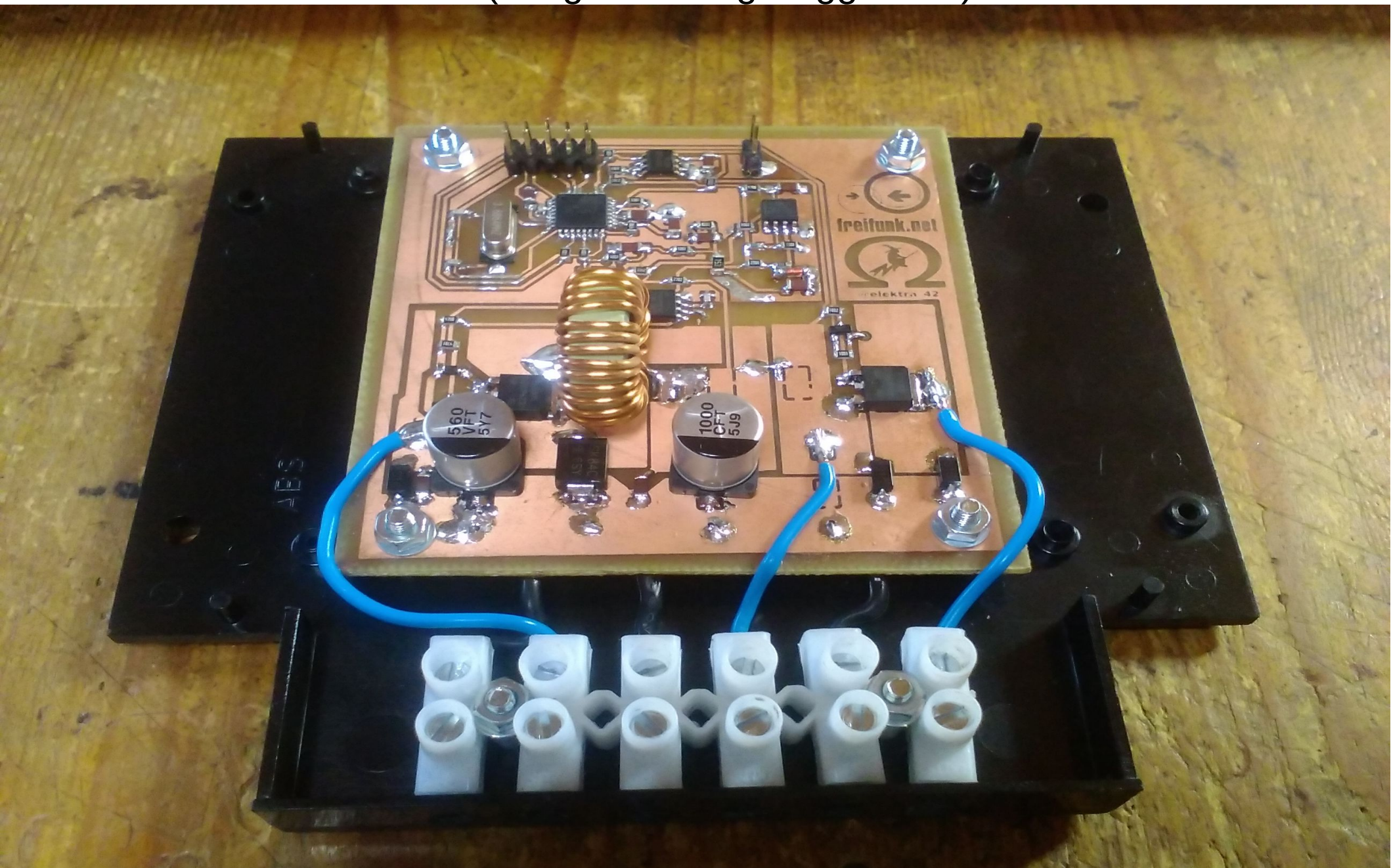
Freifunk-Open-MPPT

(MPPT: Maximum Power Point Tracker)



A small MPPT solar charger (up to 50 watts of module power) with deep discharge protection and serial communication for monitoring and controlling the system
(Image: Serving Suggestion)



Solar charger & measurement data acquisition for resilient and energy autonomous wireless mesh nodes.

Increased energy yield through Maximum Power Point Tracking

Image:
Mobile Freifunk mast

Some applications for energy independent mesh nodes

*** Refugee camps**

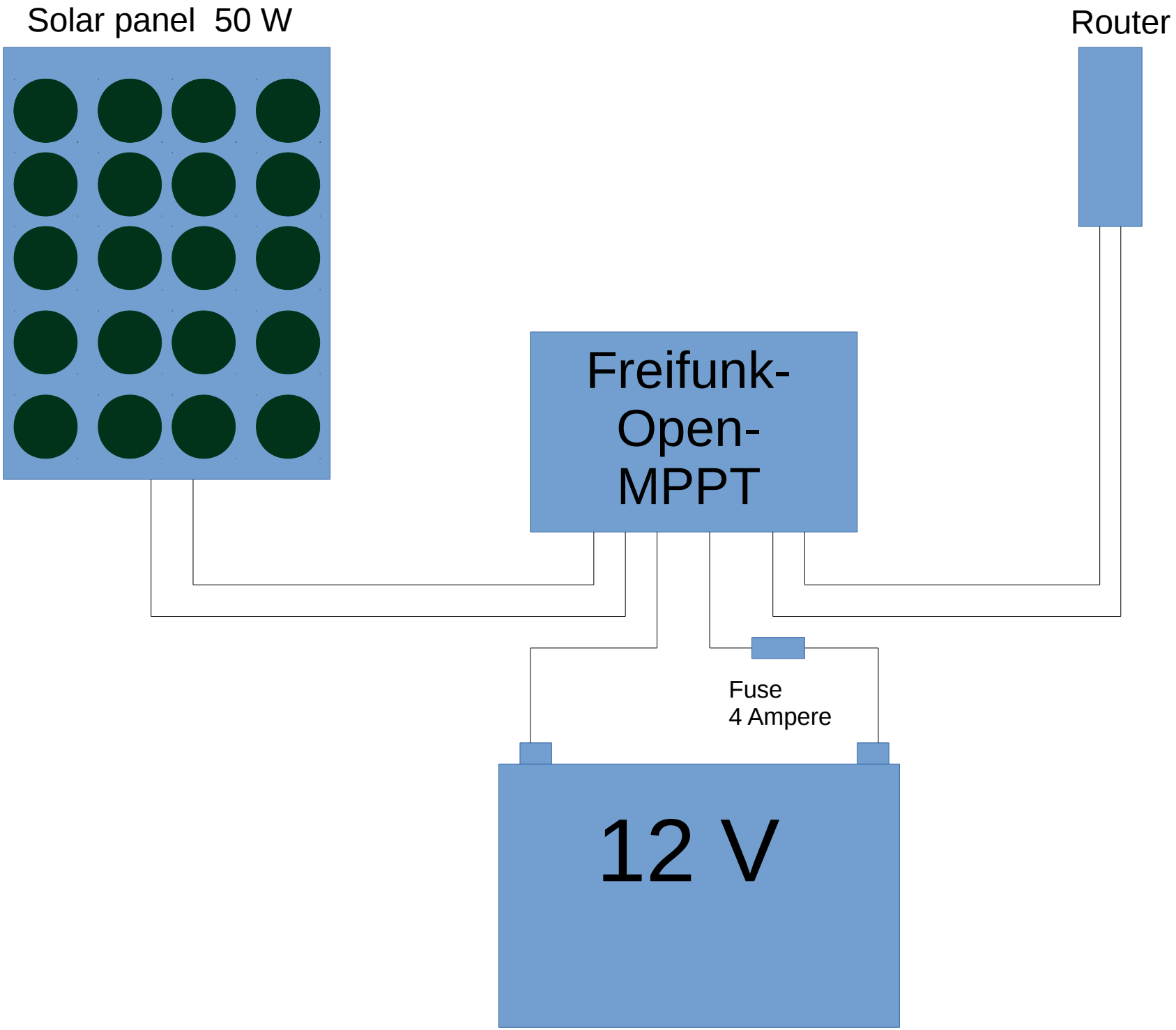
*** Resilient communication infrastructure / networks in crisis and disaster situations**

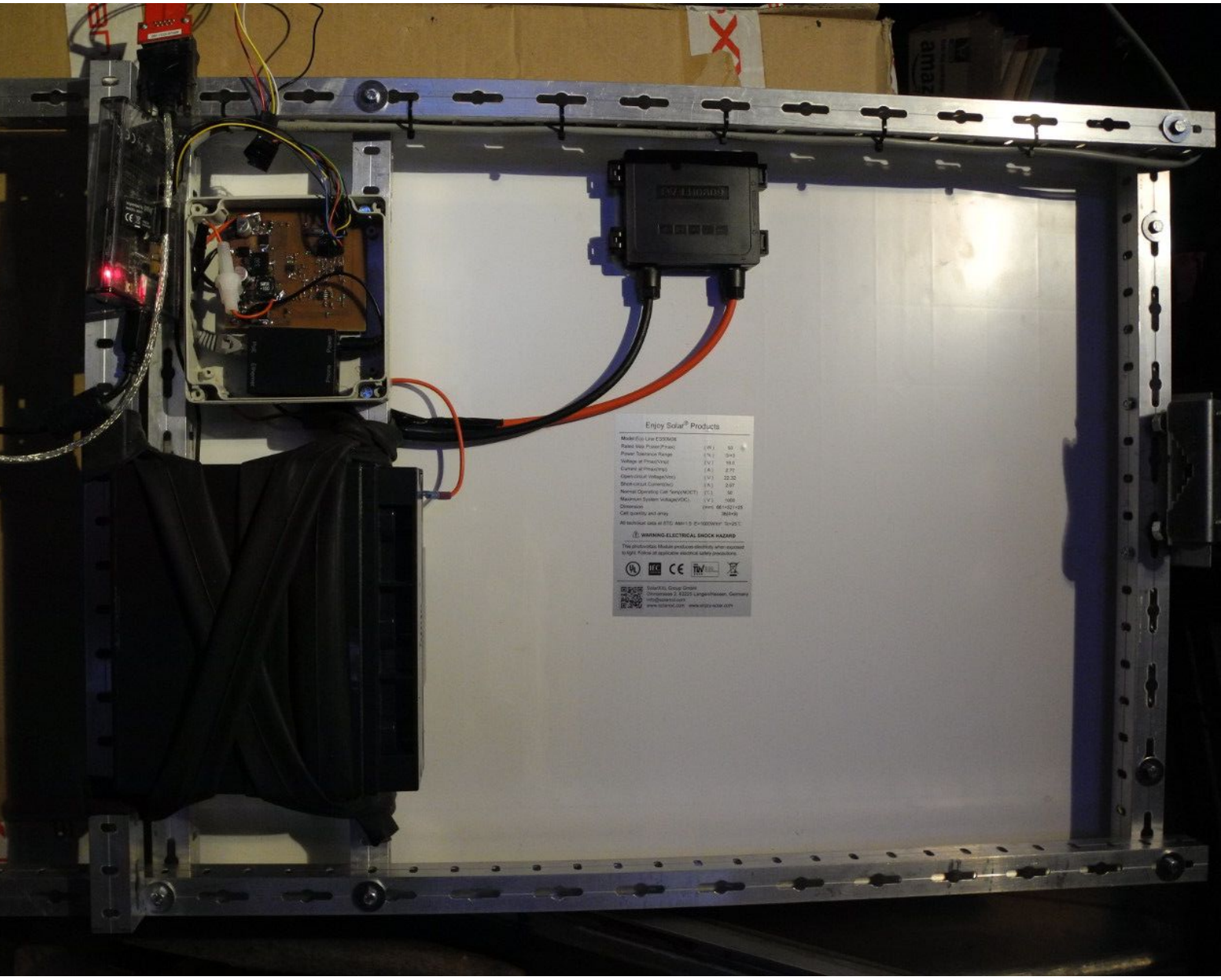
*** Informal settlements in developing countries (controller provides electricity for smartphone, tablet, light, radio,... and mesh node on the roof)**

*** Community network nodes at elevated locations without current, e.g. Barn roof, on the hill / mountain between two places that blocks the Fresnel zone**

*** General purpose solar charger**

*** You name it.**


Solar panel 50 W
Router
Freifunk-
Open-
MPPT
Fuse
4 Ampere
12 V


Enjoy Solar® Products
WARNING-ELECTRICAL SHOCK HAZARD

Special features of the Freifunk-Open-MPPT:

* AVR-GCC Source code for µC firmware under GNU-GPL

* Open source CAD files for KiCAD (open-source -CAD program for Linux, Mac,
  Windoze)

* MPPT design of the solar controller increases energy yield (94.5% efficiency)

* Communicates operating data via serial RS232 interface (3.3 volt level)
  e.g. To the connected router with the mesh network

* Uses only proven and easily available standard components

* Board layout, which allows the two-layer PCB in the DIY process itself
  (Milling or etching in the maker space on only one board side)

* Microprocessor-controlled: AVR ATmega8 with 1kByte RAM and 8kByte Flash (!)

* Firmware update via serial interface and bootloader, easy to do via serial upload (cat main.hex> / dev / tty ***) within 8 seconds after activating the power supply

MPPT – what?!

Electric power in watts is voltage times Power:

Watt = Volt * Ampere

Battery voltage = 11.3 - 14.9V

50 Watt Solar module at MPP:

50 W = 18V * 2.77A

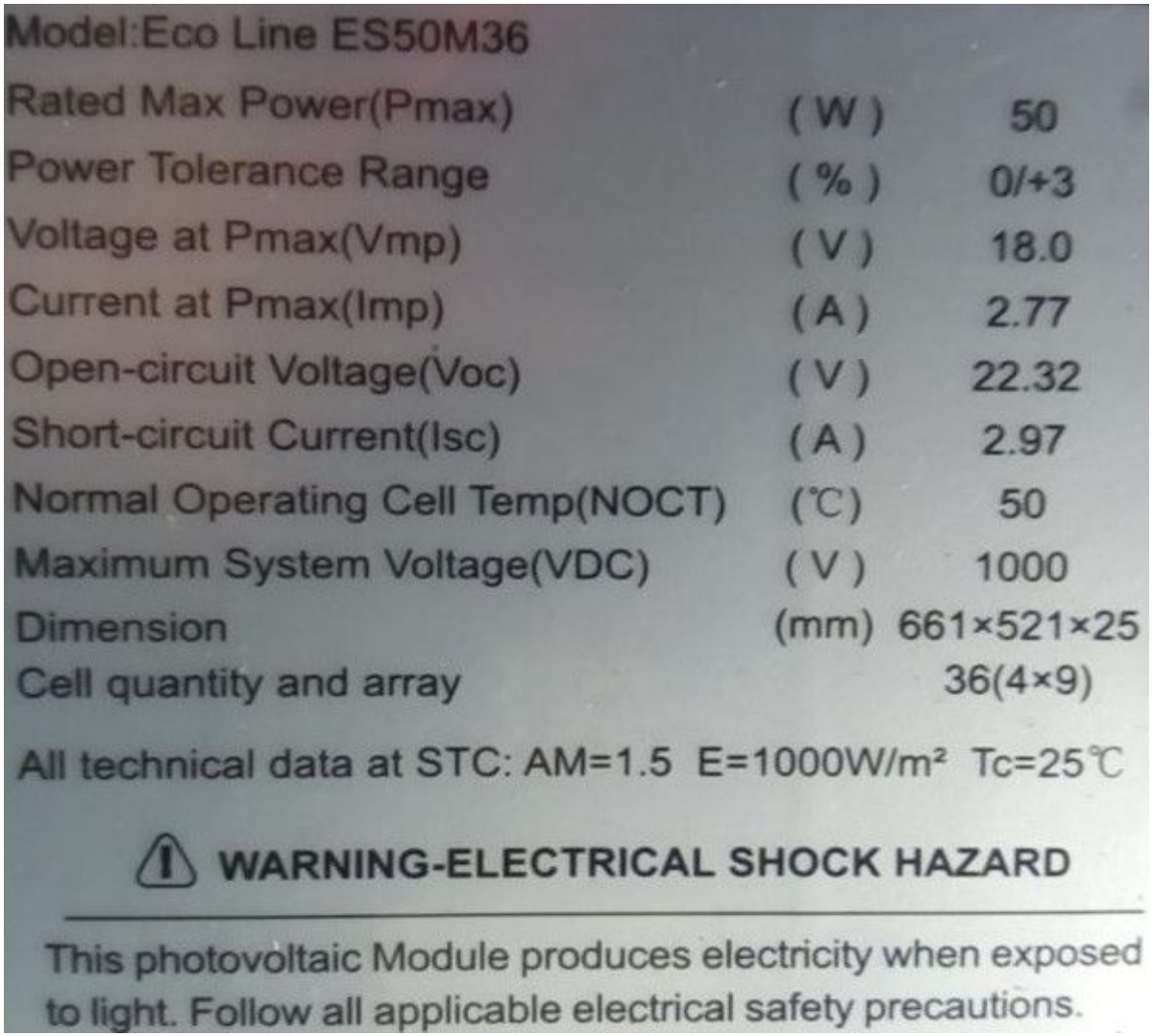
50 Watt solar module connected to 12 V battery voltage without MPPT:

33.24 W = 12 V * 2.77 A

50 Watt Solar module with Freifunk-Open-MPPT (94.5% efficiency):

47.12 W = 18V * 2.77A * 0.945

50 W solar module specs:



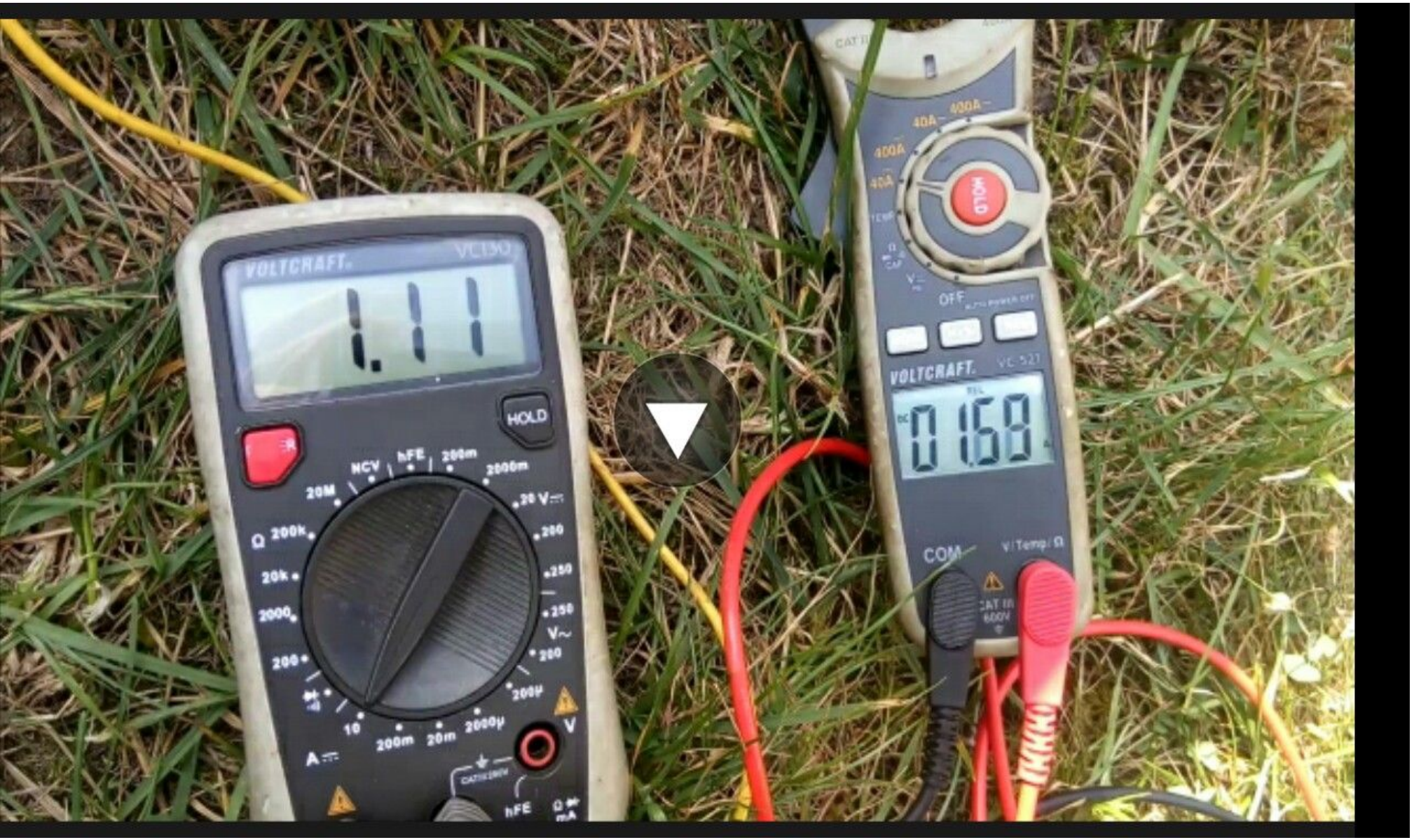
Model:Eco Line ES50M36		
Rated Max Power(Pmax)	(W)	50
Power Tolerance Range	(%)	0/+3
Voltage at Pmax(Vmp)	(V)	18.0
Current at Pmax(Imp)	(A)	2.77
Open-circuit Voltage(Voc)	(V)	22.32
Short-circuit Current(Isc)	(A)	2.97
Normal Operating Cell Temp(NOCT)	(℃)	50
Maximum System Voltage(VDC)	(V)	1000
Dimension	(mm)	661×521×25
Cell quantity and array		36(4×9)

All technical data at STC: AM=1.5 E=1000W/m² Tc=25℃

⚠ WARNING-ELECTRICAL SHOCK HAZARD

This photovoltaic Module produces electricity when exposed to light. Follow all applicable electrical safety precautions.

MPPT in operation



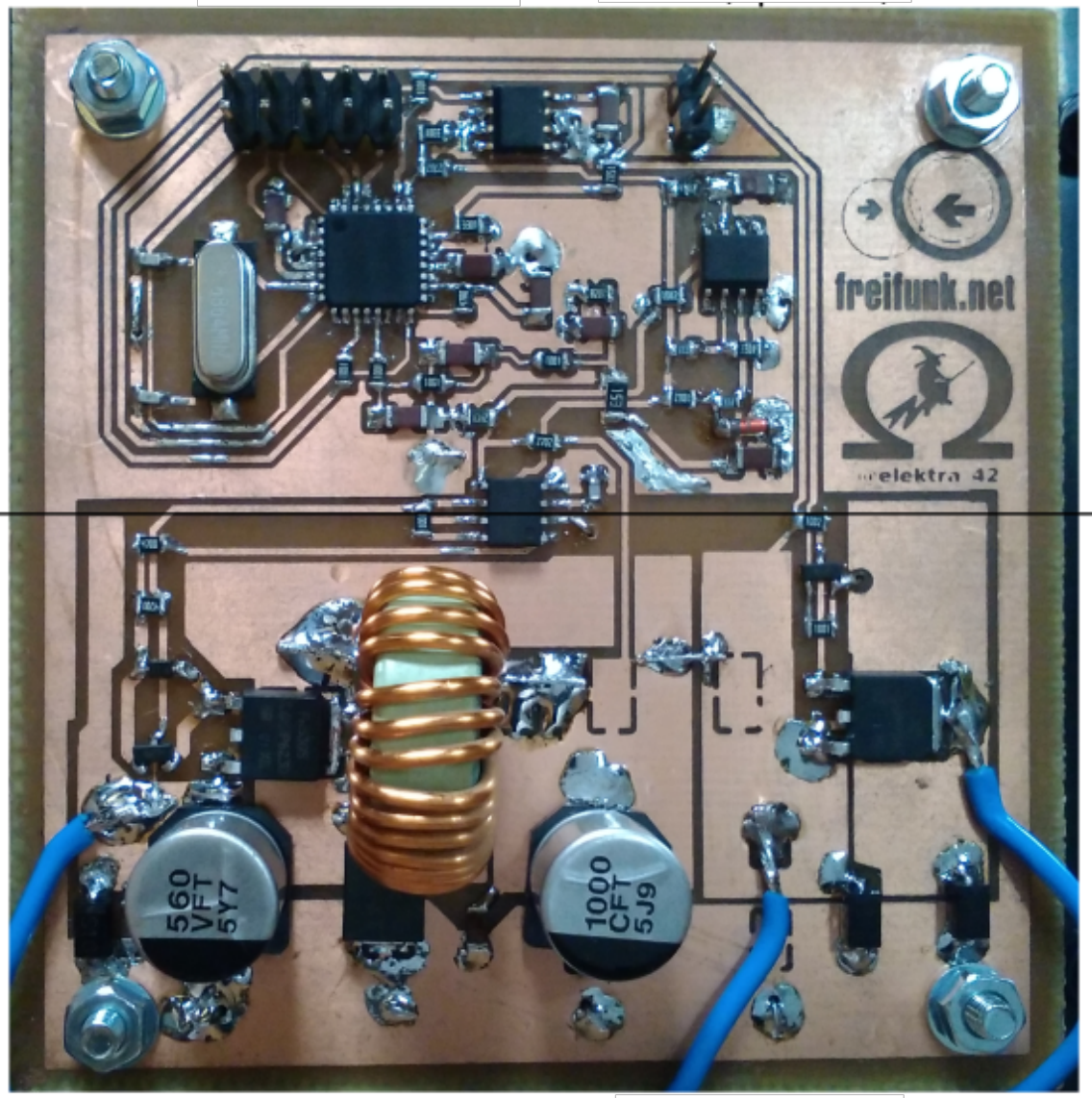
Current from solar module

Current to battery

Serial and ISP-port 3.3 Volt

Temperature sensor

Controller

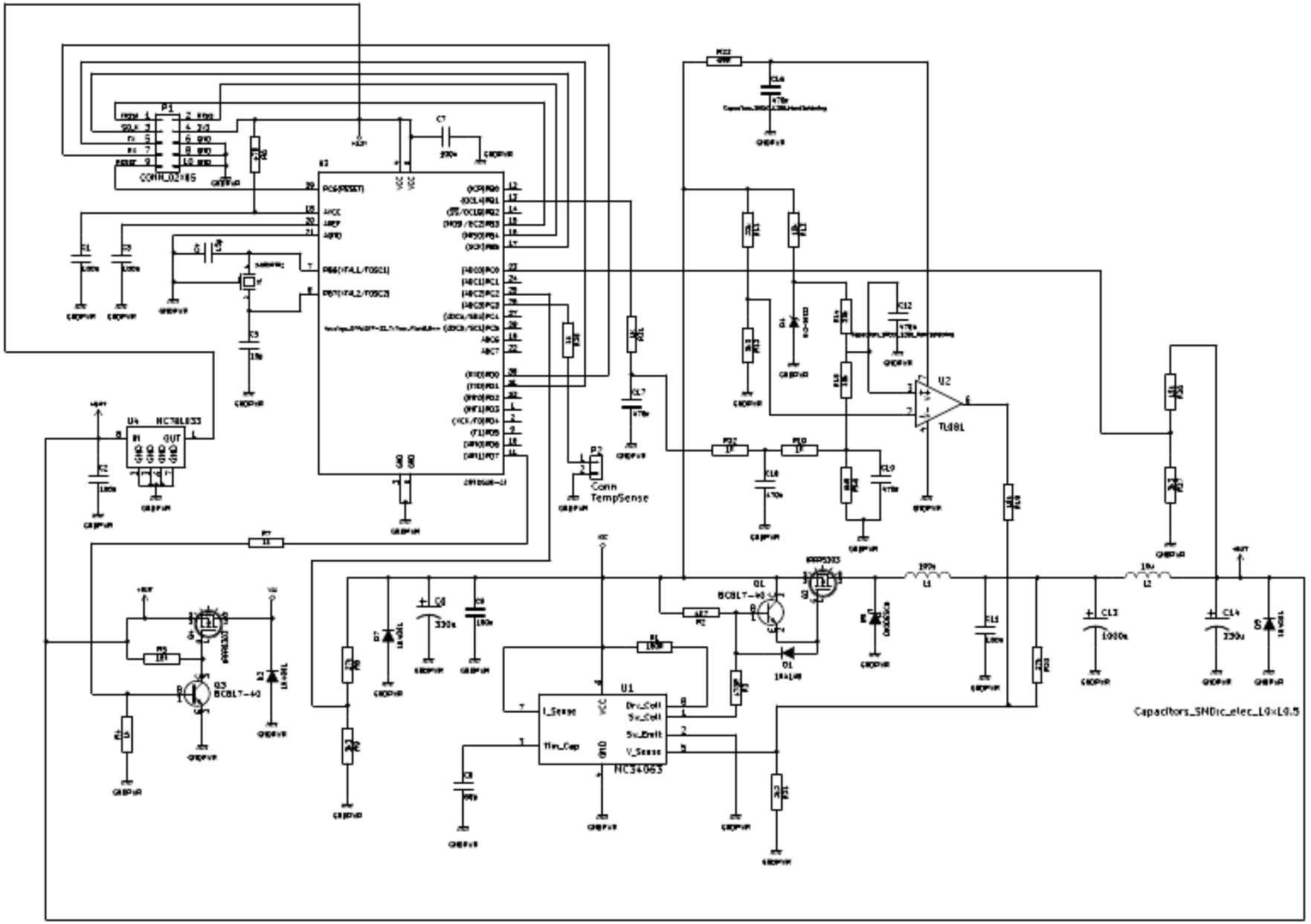


DC/DC Converter

V_in_solar +

V_out +

V_batt +



Copyright 2017 Corinna 'Elektra' Aichele
Some component values are preliminary and also
range of the MPP tracking required and battery vo
License: Creative Commons - Attribution - ShareA
http://creativecommons.org/licenses/by-sa/3.0/

Sheet: /
File: MP-Tracker.sch

Title: Freifunk-Open-MPP-Solar-Tracker Rev. 2

elektra42 / freifunk-open-mppt

Watch 4 Star 6 Fork 0

Open hard- and software solar maximum power point tracker

16 commits **1** branch **0** releases **1** contributor

Branch: master New pull request Find file Clone or download

elektra42 Fixed reverse diode image in slide. Latest commit `fce4d25` 11 days ago

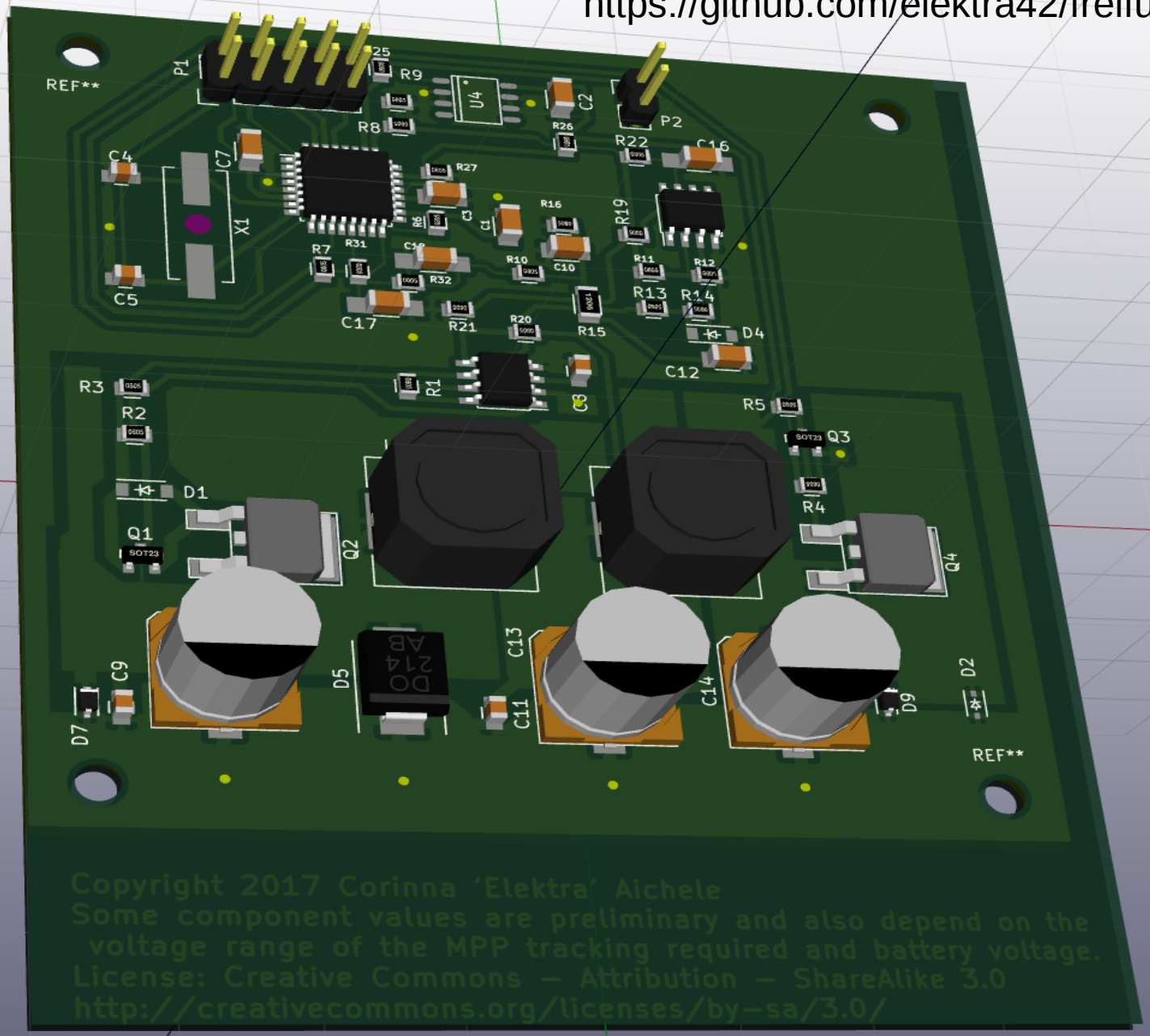
AVR-FUSES	Update Fuse definition for AVR-Burn-O-Mat	12 days ago
Schematic-and-Board	Update schematic and board design and firmware source.	12 days ago
kavr-bootloader	Added bootloader and TL081 library	12 days ago
uC-Sourcecode	Update schematic and board design and firmware source.	12 days ago
Freifunk-Open-MPPT.odp	Fixed reverse diode image in slide.	11 days ago
LICENSE	Initial commit of the prototype files	3 months ago
README-Flashing-Firmware	Added bootloader and TL081 library	12 days ago
README.md	Update schematic and board design and firmware source.	12 days ago
TODO	Initial commit of the prototype files	3 months ago

README.md

These are preliminary sources and CAD files from the Freifunk-Open-MPP-Tracker project.

More information & sources:

https://wiki.freifunk.net/Freifunk-MPP-Tracker
https://wiki.freifunk.net/Freifunk-Mast
https://github.com/elektra42/freifunk-open-mppt



Thank you for your attention!

@elektra_42