MoleNet PCB Design

Eenesh Chavan

Contents

1 PCB Design **2**
1.1 SMD components 2
1.2 Trace Width 2
1.3 RTC Backup Calculation 4
1.4 DRC 4

List of Figures

1 MoleNet PCB V5.2 2
2 Trace width calculation 3
3 Trace Length 3
4 Trace Impedance Matching 4
5 DRC parameters 5
6 DRC Result 5

1. PCB Design

The MoleNet PCB V5.2 was designed in KiCad 6.0.

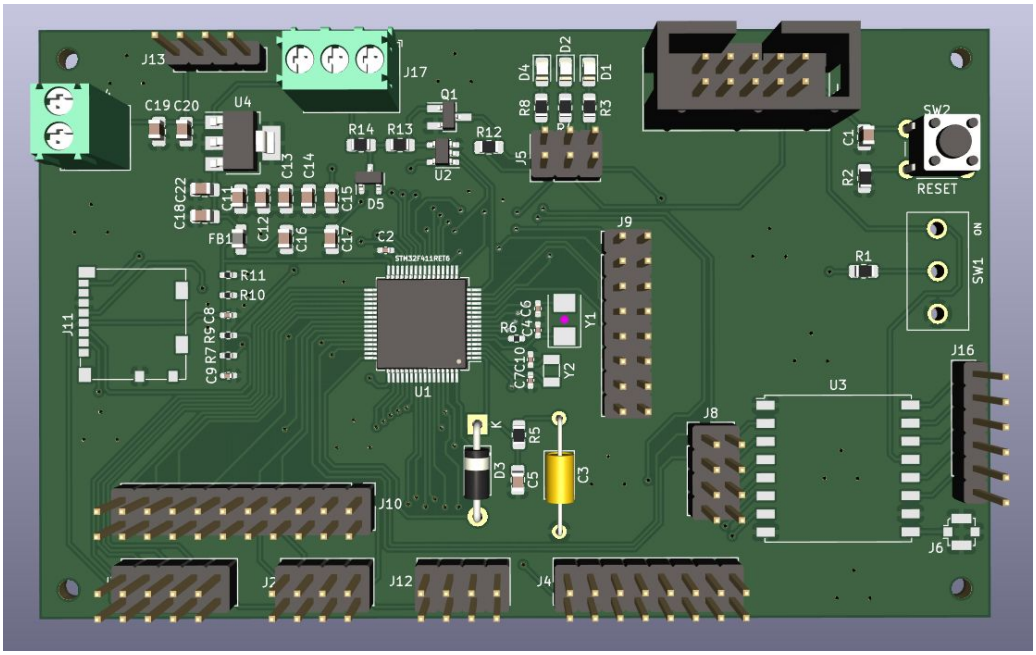

Figure 1: MoleNet PCB V5.2

1.1. SMD components

The Hand solder pad footprint has been used for the 0402 and 0805 SMD components. That is the reason the pads are elongated below the components.

The parts used on the PCB are currently (03/08/2022) all available on JLCPCB Assembly Parts Library. The list of the parts chosen can be found here: [1]. This list is not the exported BOM of the designed PCB, but this sheet was maintained to have an updated Part list during the designing process.

1.2. Trace Width

The trace width for all the traces used is 0.254 mm. The value used was based on the Calculator Tools (available in KiCad 6.0) result 2.

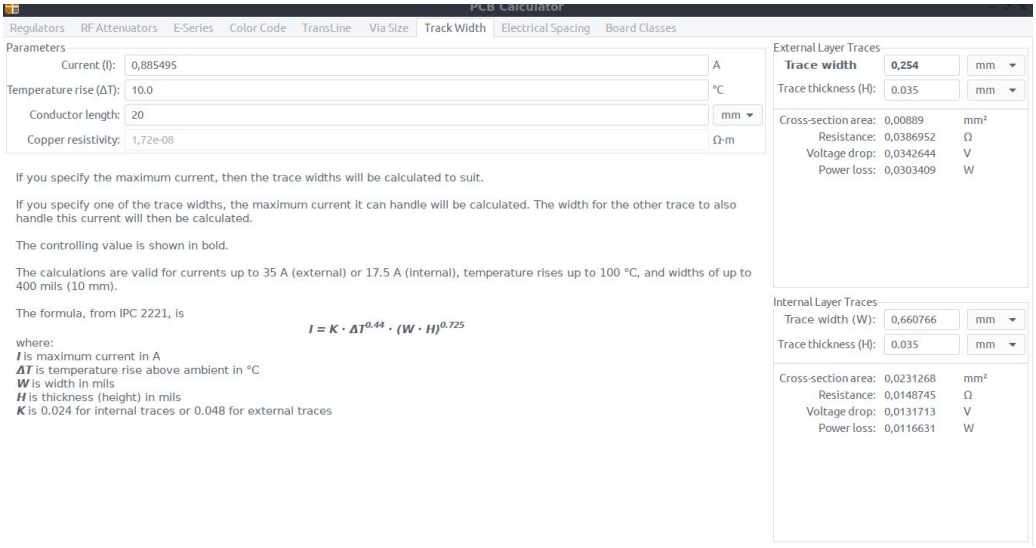

Figure 2: Trace width calculation

The length of the Trace connecting the RF output port of the RFM Module and the U. FL connector is 4.10 mm 3.

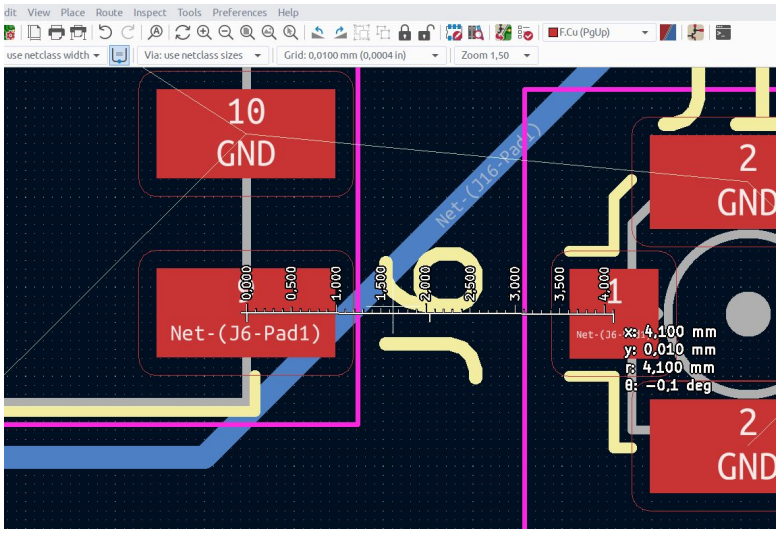

Figure 3: Trace Length

The width of the RF Trace was chosen as per the result from the Calculator Tools result, to keep the impedance of the trace equal to 50Ohms for impedance matching 4.

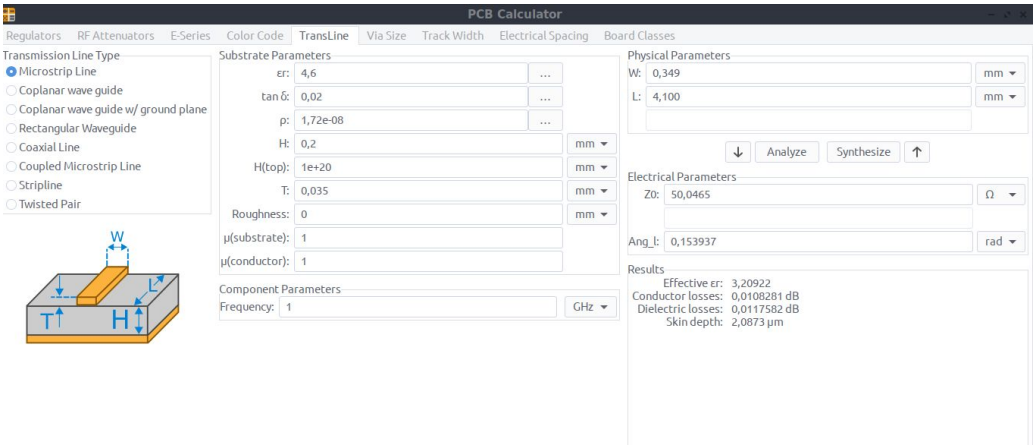

Figure 4: Trace Impedance Matching

1.3. RTC Backup Calculation

The Backup power supply to maintain the RTC function of the MCU is designed to last around 10days. The VBAT supply ckt. uses 1F supercapacitor for this. The capacity of the capacitor is calculated as:

$$C = I.t/\Delta V$$

$$I = 1.6uA$$

$$t = 864000s$$

$$\Delta V = 1.1V$$

The value for I and ΔV was chosen based on the Table 31, on page 76 of the STM32F411x Datasheet [2]. The circuit is made from the reference: [3].

1.4. DRC

There were no errors or warnings in the DRC (in KiCad). The parameters for the DRC were set according to the JLCPCB PCB Manufacturing Capabilities found here: [4].

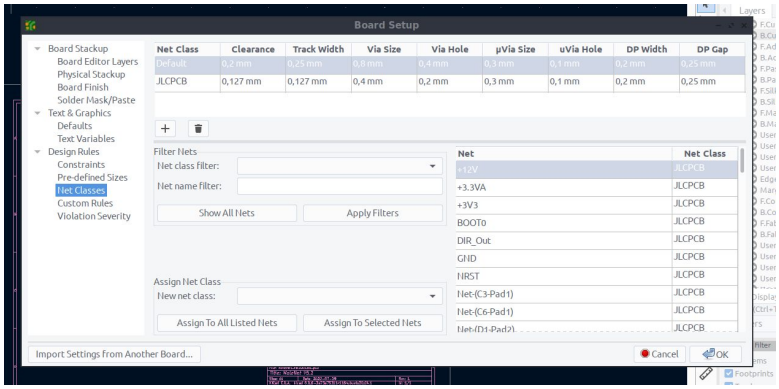

Figure 5: DRC parameters

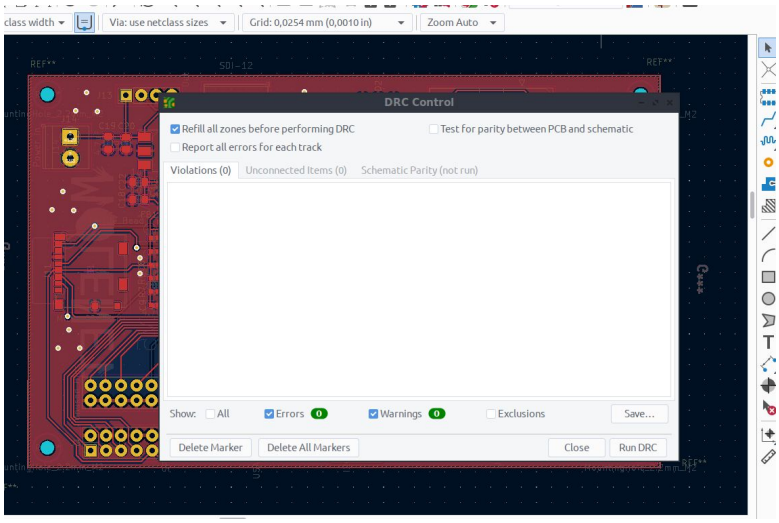

Figure 6: DRC Result

References

[1] Eenesh Chavan. *Part List*. URL: `https://docs.google.com/spreadsheets/d/1JT8qHO8G_W_1jqCkwKPx2EyGsKR18wwE71jqyKe1d2M/edit?usp=sharing` (visited on 08/03/2022).

[2] STMicroelectronics. *STM32F411RET6 Datasheet*. URL: `https://www.st.com/en/microcontrollers-microprocessors/stm32f411.html#` (visited on 08/03/2022).

[3] electronics.stackexchange. *RTC backup on STM32*. URL: `https://electronics.stackexchange.com/questions/129405/supercap-charging-circuit-for-rtc-backup-on-stm32` (visited on 08/03/2022).

[4] JLCPCB. *PCB Manufacturing Assembly Capabilities*. URL: `https://jlcpcb.com/capabilities/pcb-capabilities` (visited on 08/03/2022).