Developing a Racing Car with Support from JLCPCB

Introduction:

Brake light is a simple PCB containing 24 red LED's, power section, and a low-side MOSFET switch in order to control it. It lights up when a car is braking.

This PCB is used in PM07, second fully electric car from PUT Motorsport. PUT Motorsport is a racing team located in Poznań, Poland, that participates in Formula Student class events around the Europe.

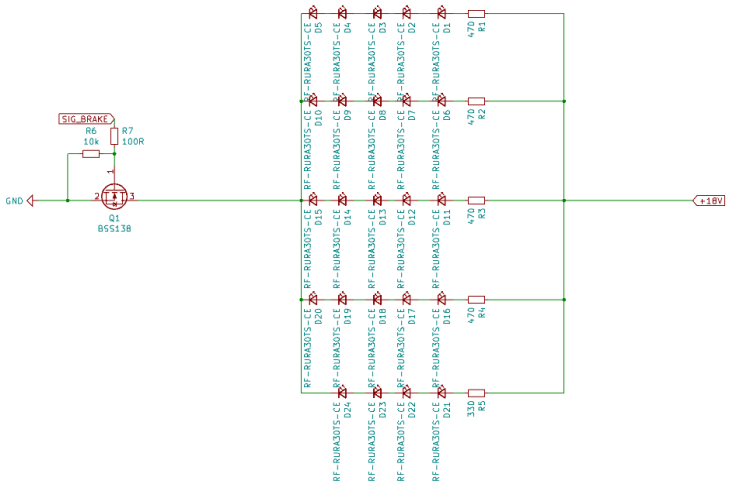
Brake light is obligatory component to participate in FS events, it must also meet the regulations such as minimum illuminated surface of 15 cm^2 with even luminous intensity, and maximum spacing of diodes being 20mm. The light must be red, and be clearly visible in high sunlight.

The circuit operation is fairly simple, when the MOSFET gets signal from brakes (SIG_BRAKE) it closes the circuit to ground lighting up all LED's. Power section contains 18V voltage regulator in order to get a stable voltage across the circuit, a fuse, overvoltage protection and noise filtering capacitors.

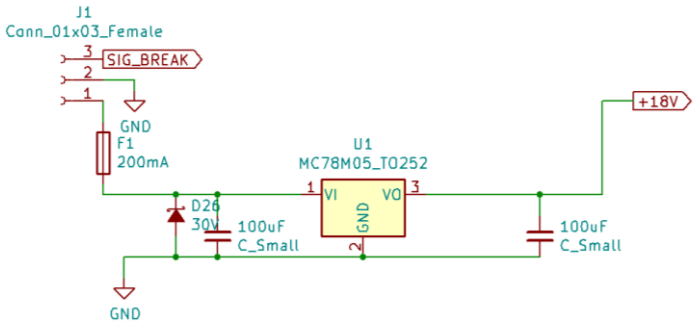
The LED's we choose are REFOND RF-RURA30TS-CE, because of high viewing angle (120°), low profile (it was important for us to keep the PCB as low and light as possible), and high luminosity (542...1192mcd), the parameters of used diodes are shown below:

Manufacturer	REFOND
Type of diode	LED
Mounting	SMD
Case	3528, PLCC2
LED colour	red
Luminosity	542...1192mcd
Dimensions	3.5x2.8x1.9mm
Viewing angle	120°
LED current	20mA
Wavelength	618-627nm
LED lens	transparent
Operating voltage	1.8...2.4V

Schematics:



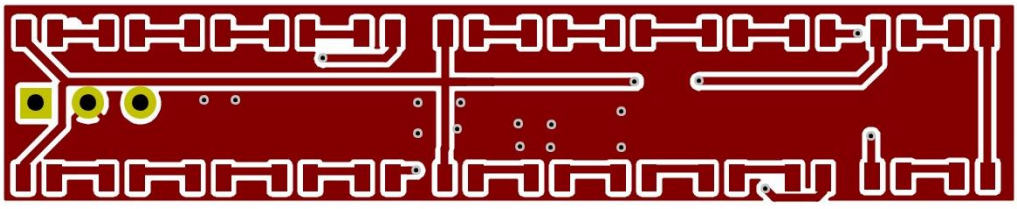
LED’s and MOSFET driver

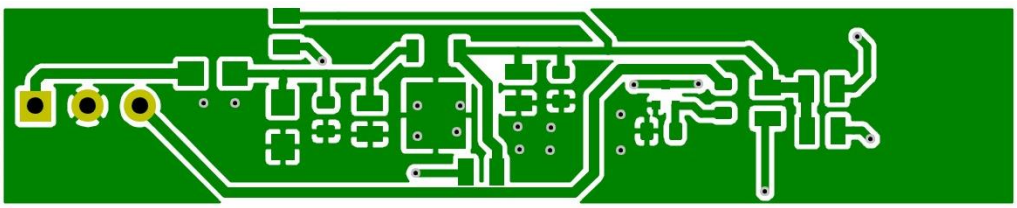


Power section, and main connector

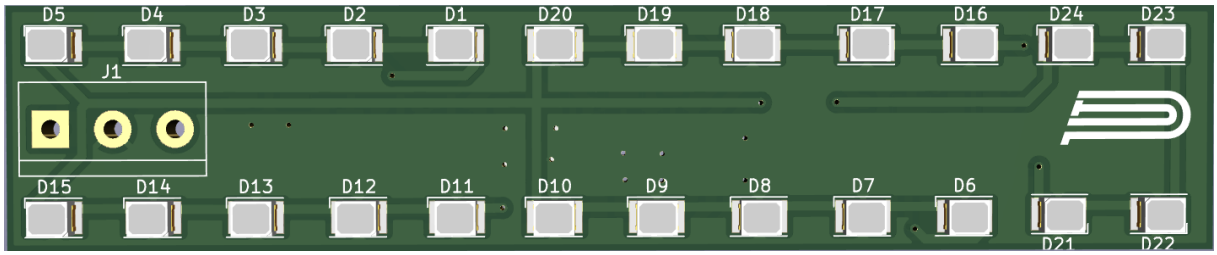
PCB Layers:

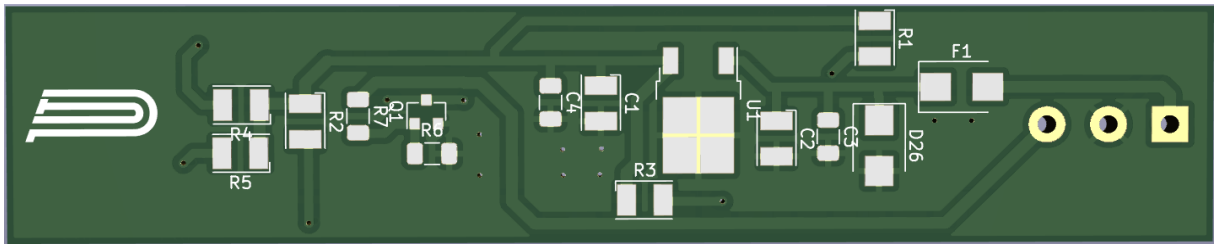
Brake light PCB being a fairly easy project contains only two layers, top and bottom.





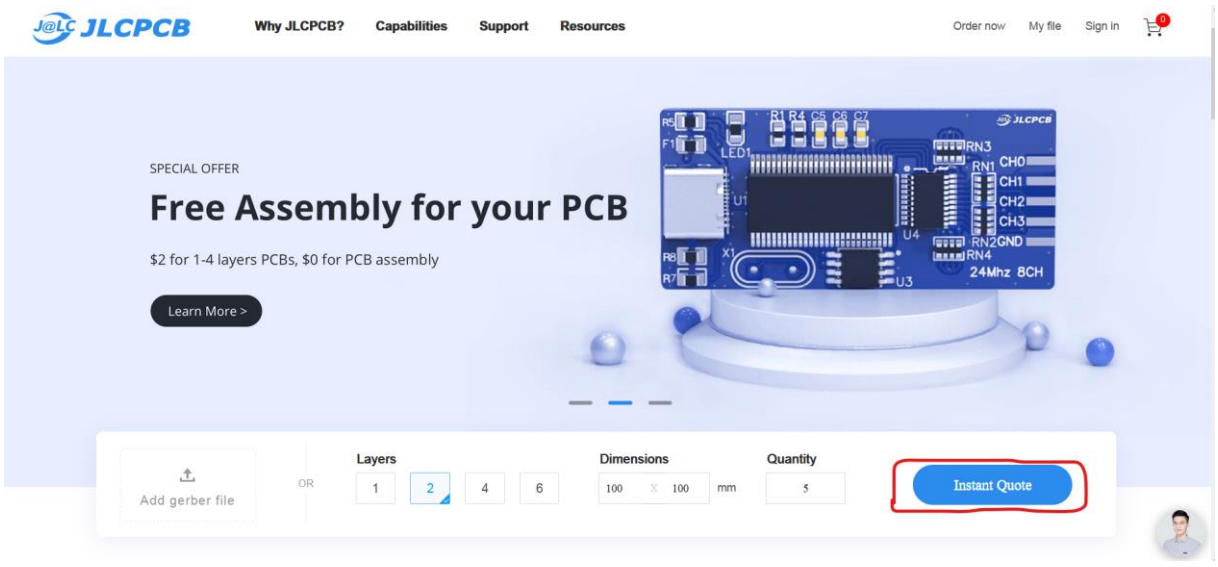
3D Model:





Ordering PCB from JLCPCB:

We finished designing our brake light, now it's time for it to come to life, but first we have to order a PCB. For that you just have to go to jlcpcb.com, and click on the „Instant Quote" button.

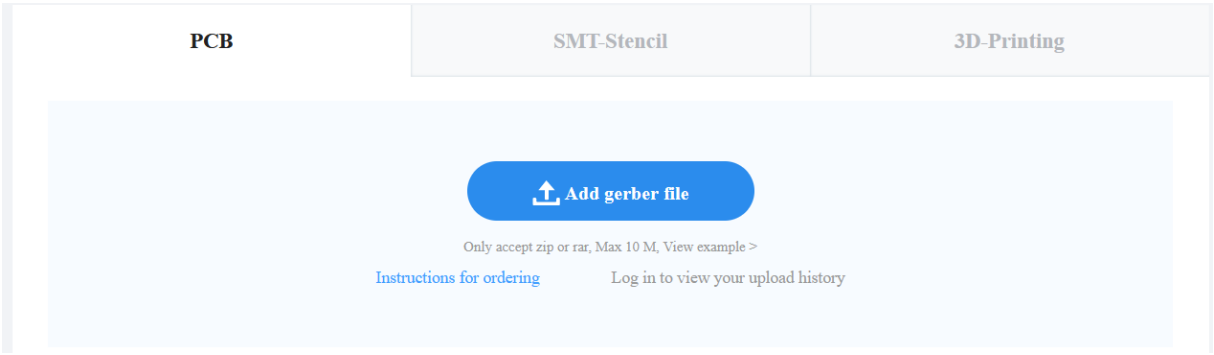


The settings in this tab are not important, we can fine tune everything in the new tab that will open after clicking the button

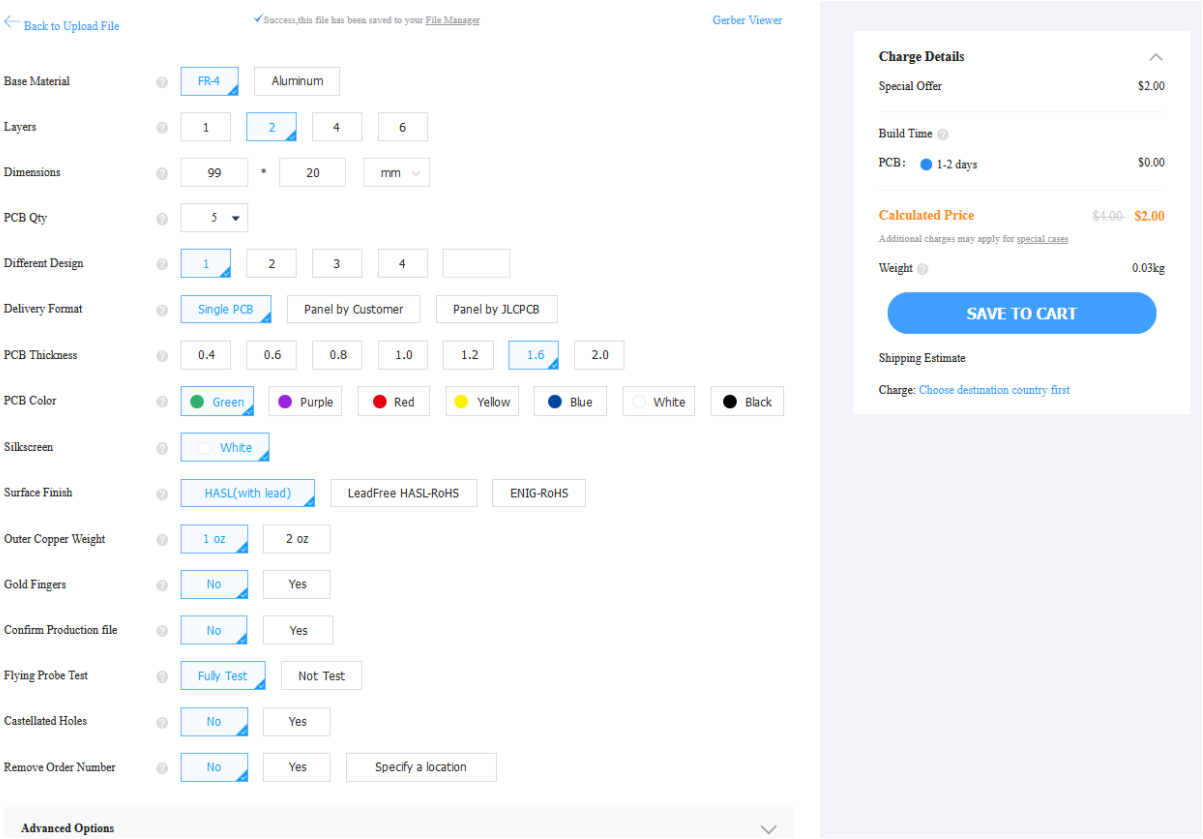
It is good time to say that JLCPCB is a sponsor of PUT motorsport (not only this PCB, but all the PCBs in the car!). JLCPCB (Shenzhen JLC Electronics Co., Ltd.), is the largest PCB prototype enterprise in China and a high-tech manufacturer specializing in quick PCB

prototype and small-batch PCB production. You can order a minimum of 5 PCBs for just $2 (2 layers), just enough to have a few test/spare ones.
To get the PCB manufactured, you have to upload the Gerber files in a .zip, or .rar file. You don't know how to generate proper gerber files in KiCad 5? Don't worry, JLCPCB made tutorial just for you, link below

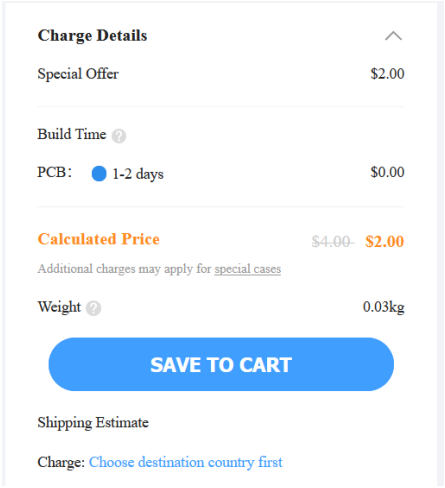
https://support.jlcpcb.com/article/149-how-to-generate-gerber-and-drill-files-in-kicad



After uploading your files it is time to adjust your PCB settings, as you can see you have many options to choose from, even the colour of your board, to make sure you will be happy how your PCB's will come up. Everything here is clearly marked, but if you are still not sure about something you can click on question mark to learn more.



When you are done with your settings, you can click Gerber viewer to see the glimpse of end result. Last checks done, it is time to order. In case of this project, there is 2$ for 5, 2-layers PCB and it will take only 1-2 days to build. To place the order, click on the “SAVE TO CART” button.



I’m always satisfied how my PCB’s come up from JLCPCB, and the price for them is really cheap, so I really recommend using JLCPCB