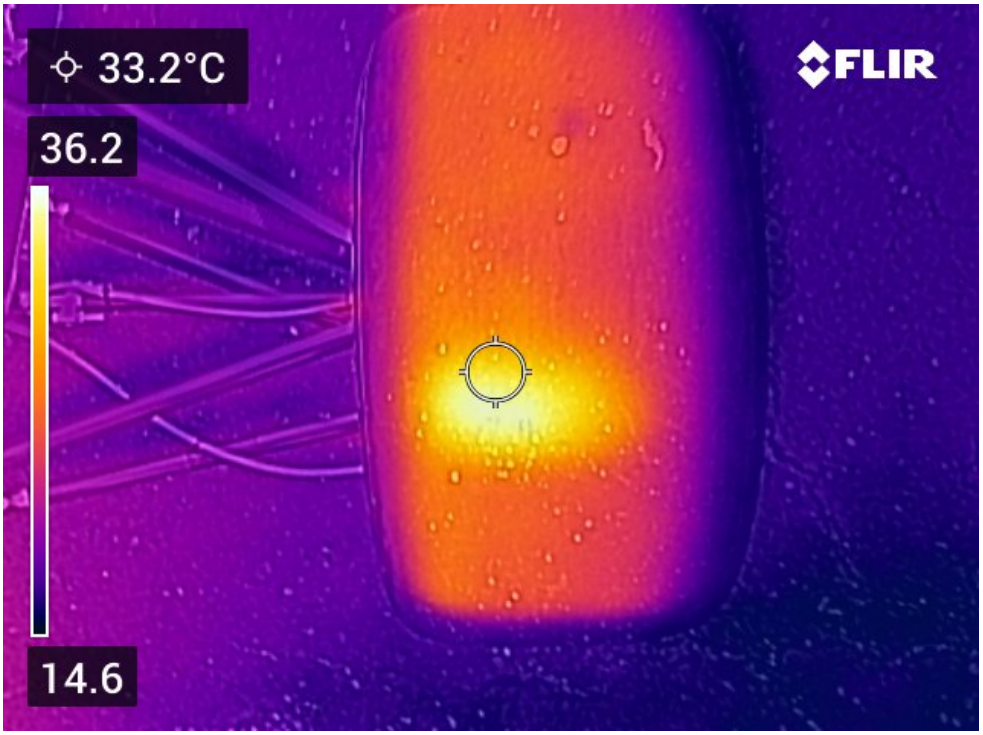
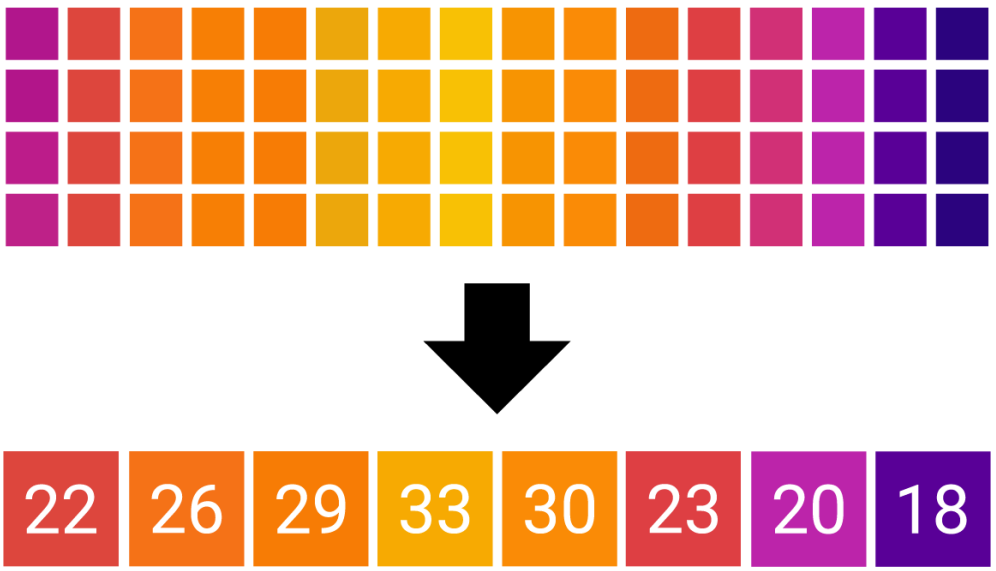
## Introduction

**TTS** (Tire Temperature Sensor) is a PCB designed to measure the temperature quickly, at a distance, and without the need to touch the wheels. The 4x16 pixel IR camera is used to obtain the data. It communicates with the STM microprocessor via the I2C protocol. Data is then averaged out to a 1x8 array of unsigned ints and sent with the CAN Transceiver to the car's CAN network. This array can be then read off of the telemetry system implemented in the PM-08 racing car.



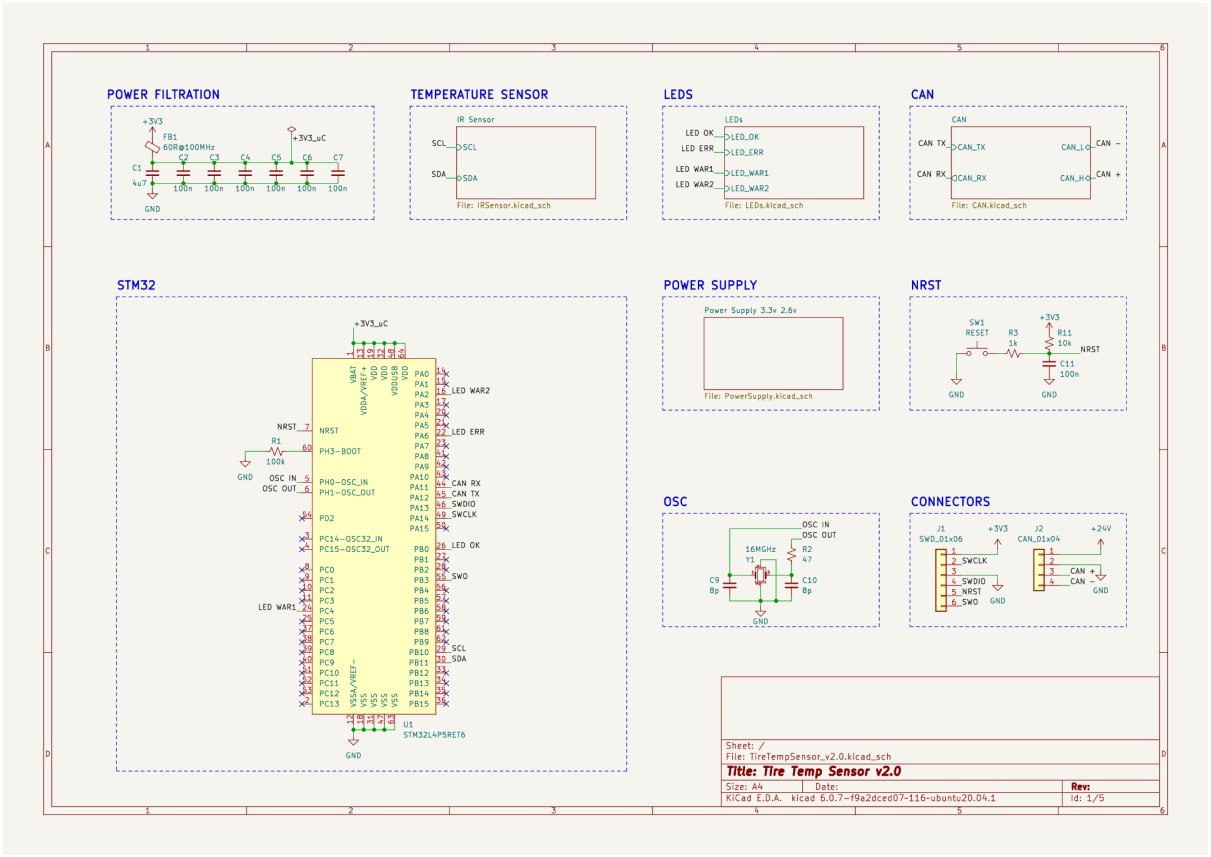
## Applications

While driving, a tire heats up. Heat dissipates differently across its surface and its rate changes depending on many factors (E.g. weather conditions or reoccurring acceleration). As a tire has its maximal temperature, exceeding this value may weaken its structural strength and cause its destruction in the worst-case scenario. This IR Camera PCB makes it possible to monitor a tire across its whole surface and prevent any damage associated with the temperature. As TTS monitors every wheel out of 4, our crew can easily detect if tires wear unevenly or excessively. Tire temperature patterns inform whether the car is properly calibrated, as the out-of-tune suspension causes tires to heat up significantly faster. This may result in grip loss in these areas.

## Core features

- 4x16 pixel MLX90621 thermal camera
- STM32L4P5RET6
- 24V to 3.3V buck converter
- 3.3V to 2.6V LDO
- 3.3V CAN transceiver
- Overcurrent and reverse polarity protection
- Status LEDs

# Schematics


POWER FILTRATION
TEMPERATURE SENSOR
IR Sensor
File: IRSensor.kicad_sch
LEDS
LEDs
File: LEDs.kicad_sch
CAN
File: CAN.kicad_sch
STM32
U1
STM32L4P5RET6
POWER SUPPLY
Power Supply 3.3v 2.6v
File: PowerSupply.kicad_sch
NRST
OSC
CONNECTORS
Sheet: /
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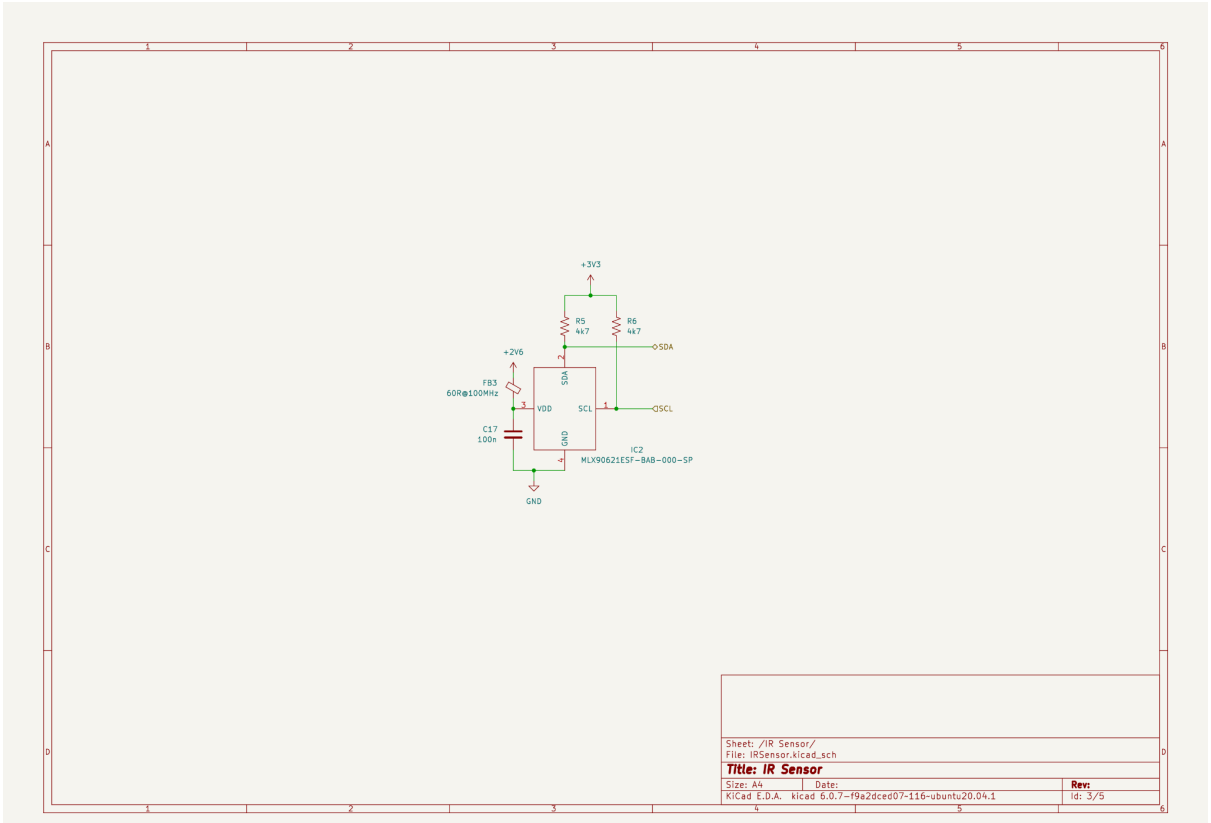
Date:
Rev:
KiCad E.D.A. kicad 6.0.7-f9a2dced07-116-ubuntu20.04.1
Id: 1/5


IC2
MLX90621ESF-BAB-000-SP
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Rev:
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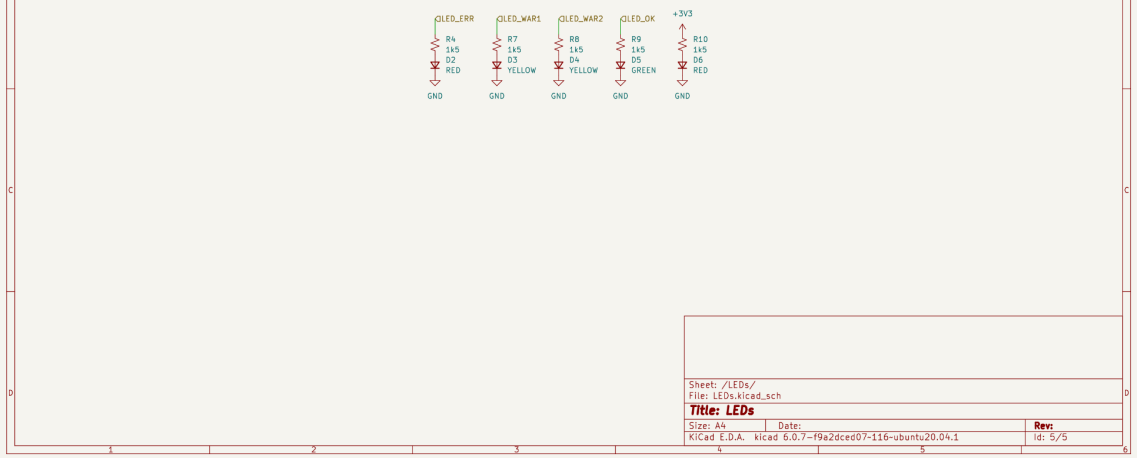
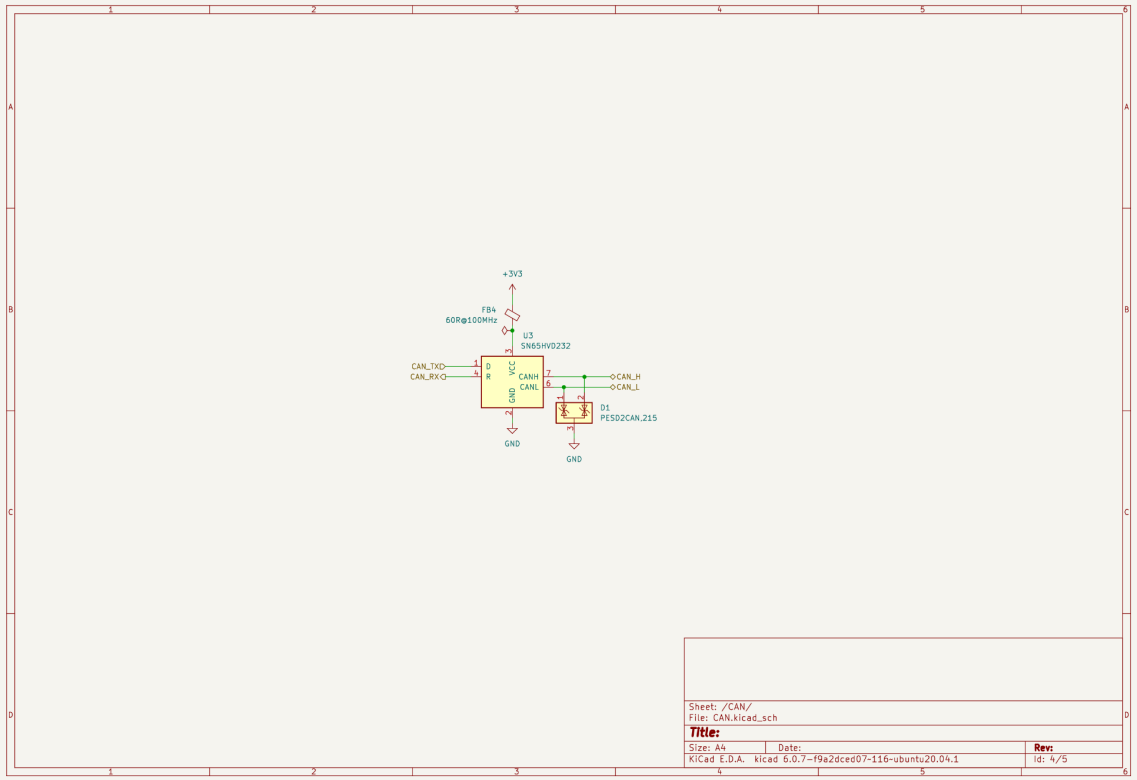
Id: 3/5


LED_ERR
R4
1k5
D2
RED
GND
LED_WAR1
R7
1k5
D3
YELLOW
GND
LED_WAR2
R8
1k5
D4
YELLOW
GND
LED_OK
R9
1k5
D5
GREEN
GND
+3V3
R10
1k5
D6
RED
GND
Sheet: /LEDs/
File: LEDs.kicad_sch
Title: LEDs
Size: A4
Date:
Rev:
KiCad E.D.A. kicad 6.0.7-f9a2dced07-116-ubuntu20.04.1
Id: 5/5


+3V3
FB4
60R@100MHz
U3
SN65HVD232
CAN_TXD
CAN_RX
D
R
VCC
CANH
CANL
GND
CAN_H
CAN_L
D1
PESD2CAN,215
GND
GND
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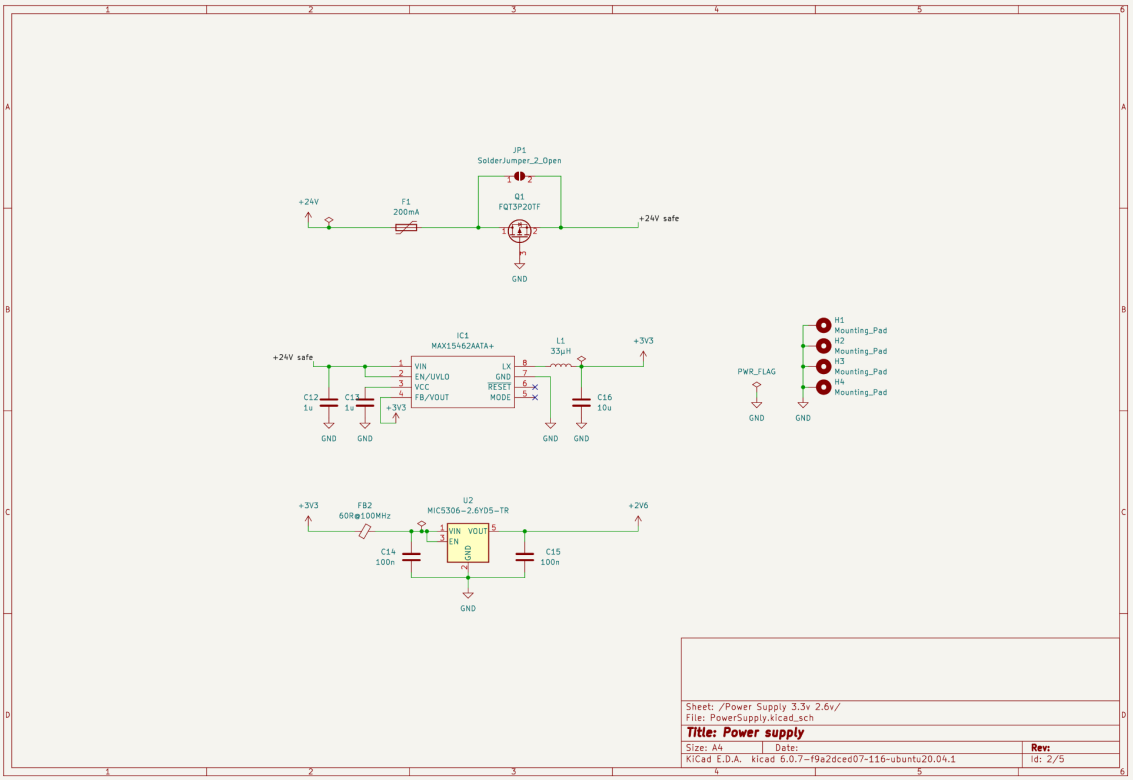
File: CAN.kicad_sch
Title:
Size: A4
Date:
Rev:
KiCad E.D.A. kicad 6.0.7-f9a2dced07-116-ubuntu20.04.1
Id: 4/5

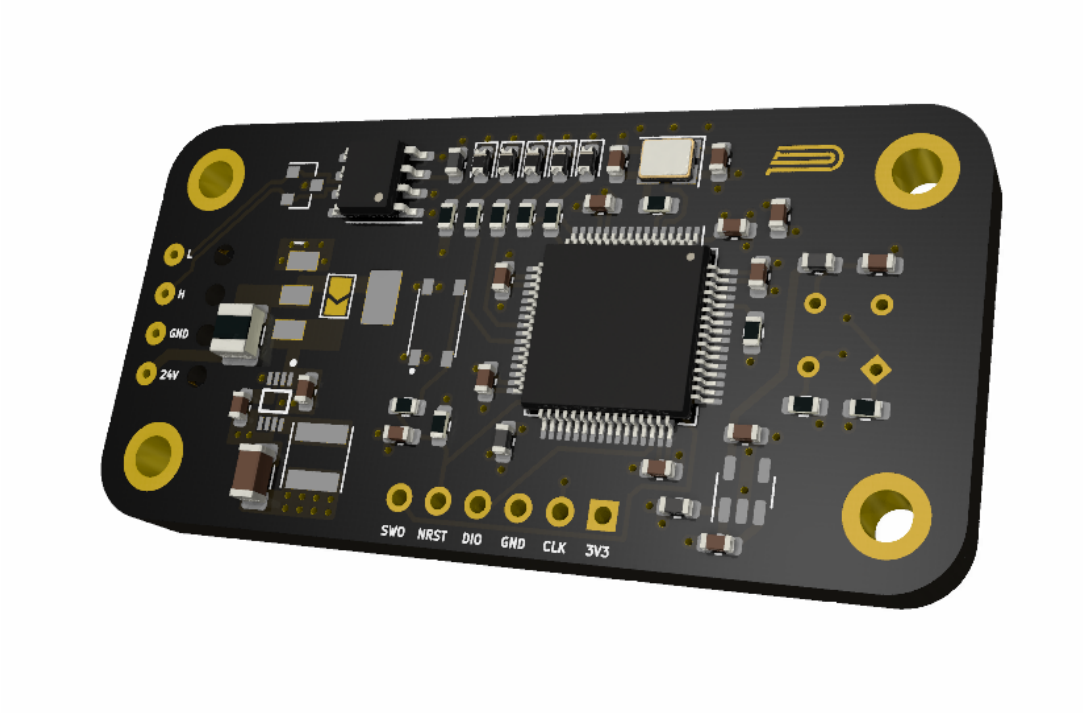



Sheet: /Power Supply 3.3v 2.6v/
File: PowerSupply.kicad_sch

**Title: Power supply**

| Size: A4 | Date: | Rev: |
|---|---|---|
| KiCad E.D.A. kicad 6.0.7-f9a2dced07-116-ubuntu20.04.1 | | Id: 2/5 |

## 3D Model

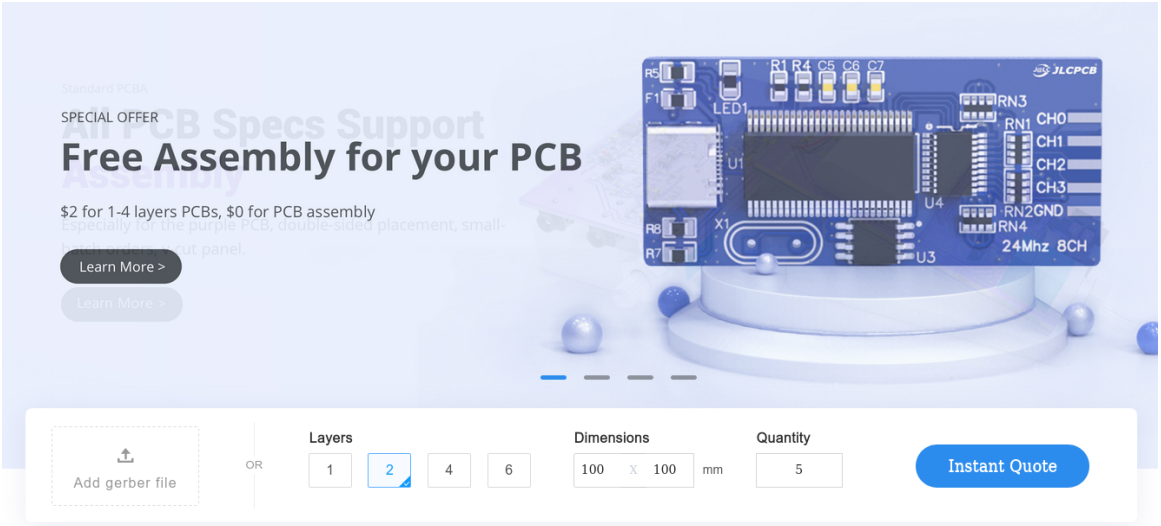

L
H
GND
24V
SWO
NRST
DIO
GND
CLK
3V3


1x8 BYTE
IRCAMERA
BY MATEUSZ KOZA

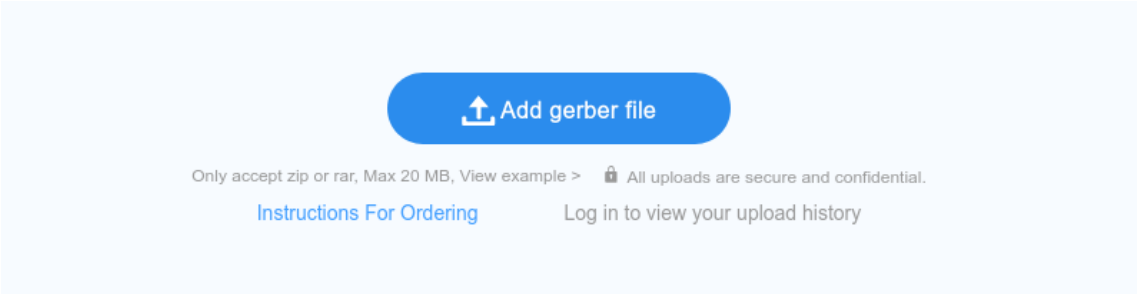
# Manufacturing

PCBs designed by our team are manufactured by JLCPCB - a hardware production company that specializes in batch PCB production. U can create PCBs with up to six layers, and order a batch size that fits your needs. Batch production is beneficial since during the PCB assembly many things may go wrong and the board could get damaged. JLC can assemble your PCB as well.

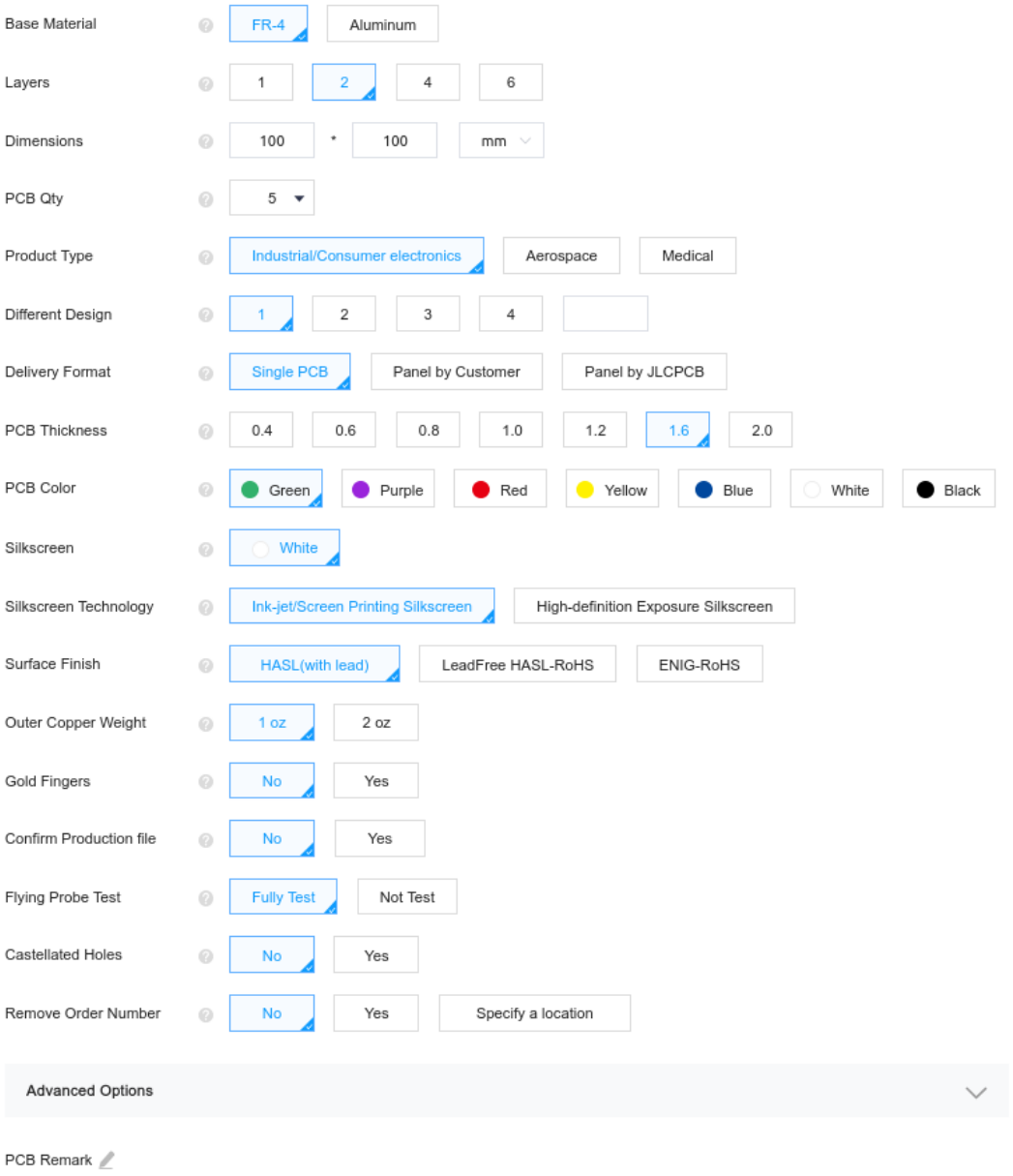
To order a PCB, go to jlcpcb.com and click the “instant quote” button.



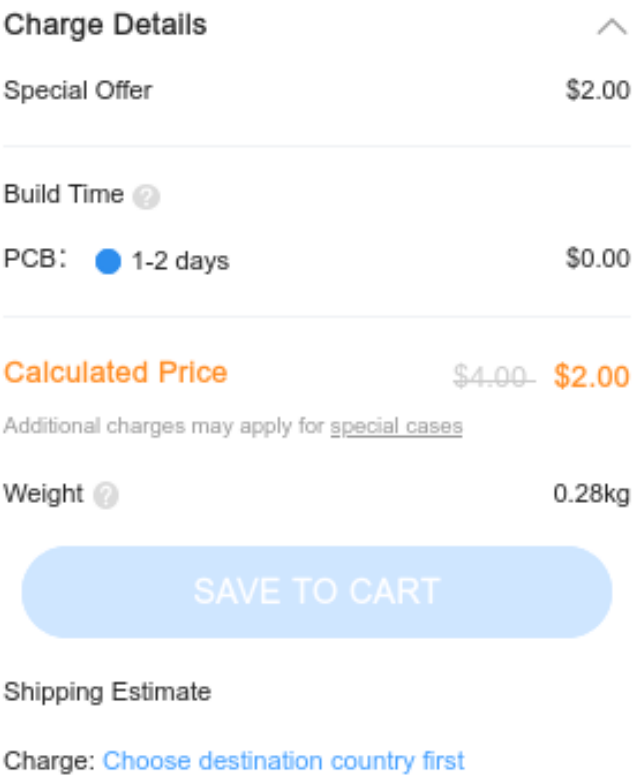

First, upload your gerber files.




You’ll be forwarded to the order editor where you’ll find plenty of options to customize your PCB. Tweak it depending on your needs.




After the process of customization, you can proceed to the checkout section located on the right side of the editor.




The PCBs quality received from JLCPCB is always stunning and we've never been disappointed!