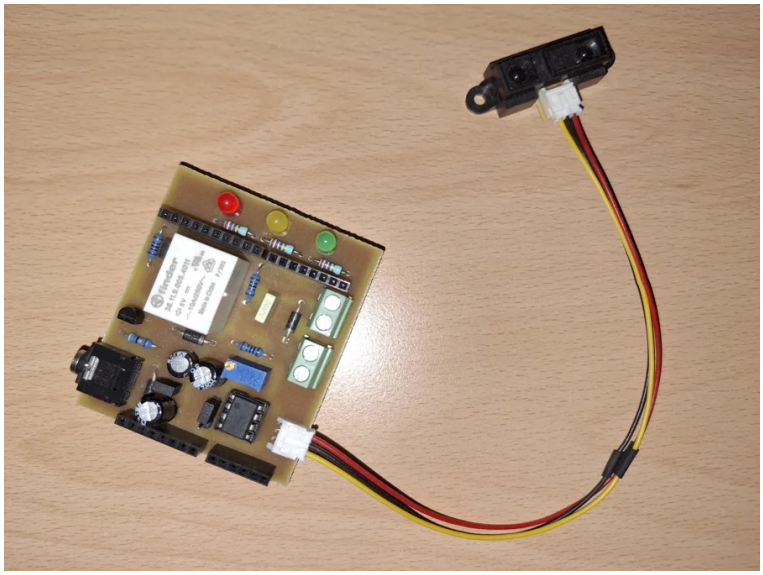
Infrared parking-assist board

We designed a 54 × 63 mm board in KiCad. Routing used the bottom copper layer, with the top layer reserved for markings. The two-layer board required no vias.



Assembled board with its Sharp infrared distance sensor. The three LEDs and the relay are visible on the PCB.

From the distance sensor to the outputs

A jumper selects the raw Sharp GP2Y0A21YK0F signal or the output of a non-inverting LM358 amplifier with adjustable gain. The ON/OFF output uses a PN2222A transistor and a Finder relay. A flyback diode protects the switching circuit.

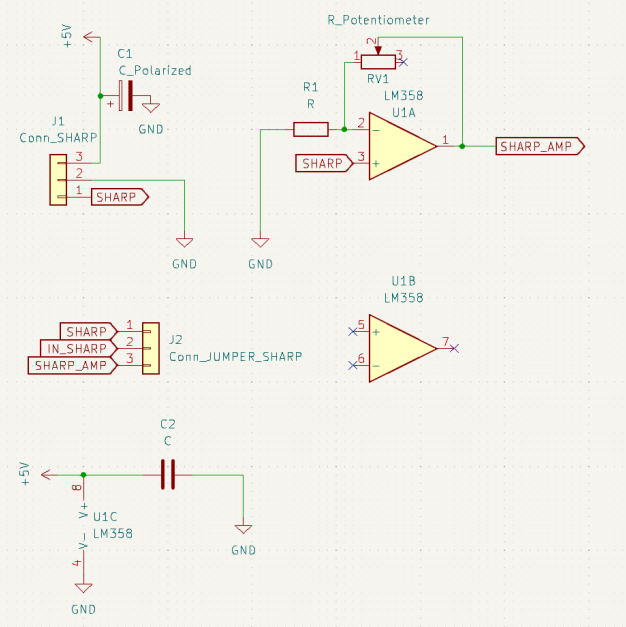
A first-order RC filter drives the audio path. A jumper bypasses the filter for comparison. The FPGA also controls three distance-indicator LEDs.

Routing the 5 V rail

The design used a 210 mA allowance for the sensor, relay, audio and amplifier. The calculated minimum trace width was below the fabrication limit, so we selected the 0.6 mm manufacturing minimum.

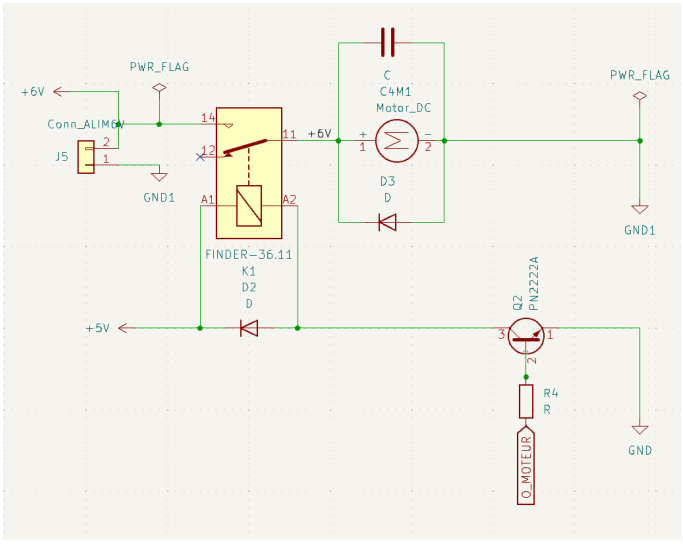
Infrared parking-assist board

Sensor input



Original sensor-stage schematic. The selectable output paths let the team compare the raw and amplified readings.

Relay driver



Original relay-stage schematic. A transistor switches the relay coil, which has its own flyback diode.