

The root directory for Photogate on the Qosain cloud is:

[Type B / Photogate / Machining Packages /](#)

Mechanical Part:

These files are to be printed on an FDM printer. The print would be carried out using **x3g** files copied to the SD card of the printer, which can be found in [...Minimal / Mechanical](#) directory. The source files of **Ultimaker Cura** i.e. the 3mf project files can be found in [...Source / Mechanical](#) directory. The optimal print parameters set in these x3g files are attached in **Appendix-A**. Following is the list of files you will need to print for photogate:

Part	File name (x3g)	No. of Parts in one x3g file	Printing time	PLA length (m)
Photogate Casing bottom	PhotoGate_Casing_x6.x3g	6	3 hours 15 mins	16.5 m PLA
Photogate casing top	PhotoGate_Cover_x6.x3g	6	1 hours 38 mins	8.44 m PLA

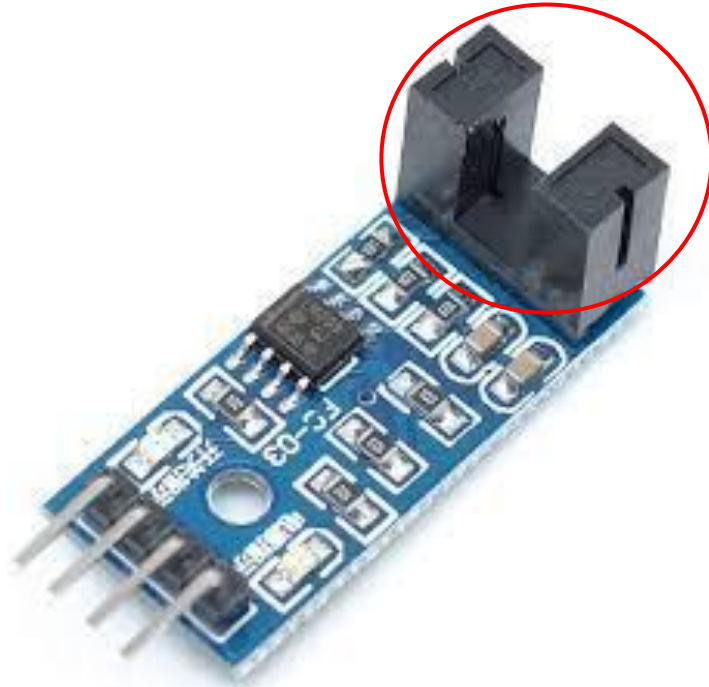
Print both parts, do proper finishing with files. Now the parts will look like:



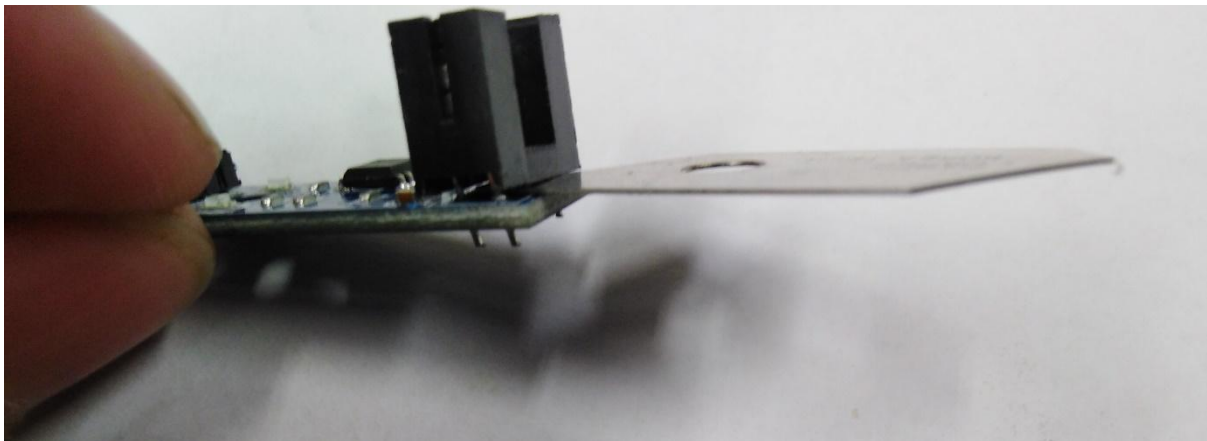
Electrical:

The list of all the electrical components for Photogate is provided in **Appendix-B**.

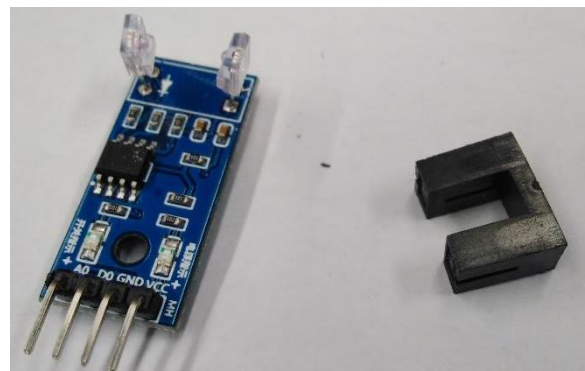
There is no PCB making step in photogate, just grab a “Slot type IR Optocoupler Module” which will look like:



Now take the black casing part (as highlighted in above picture) out. Something thin like blade/flat screw driver can be used for increased moment arm like this:



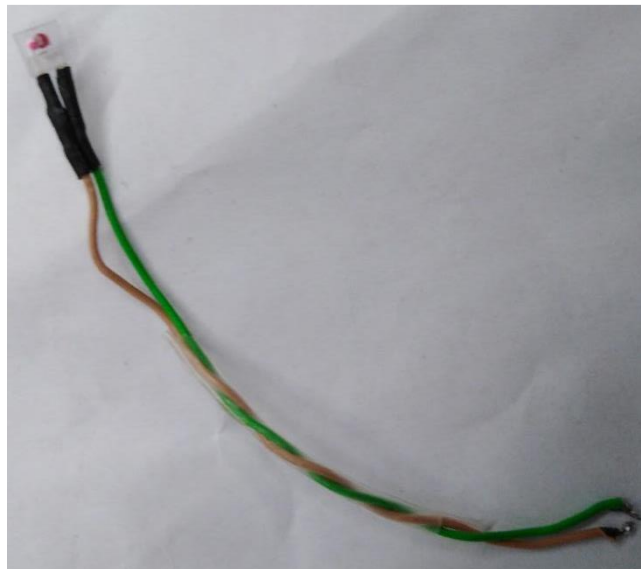
Now we have the following components:



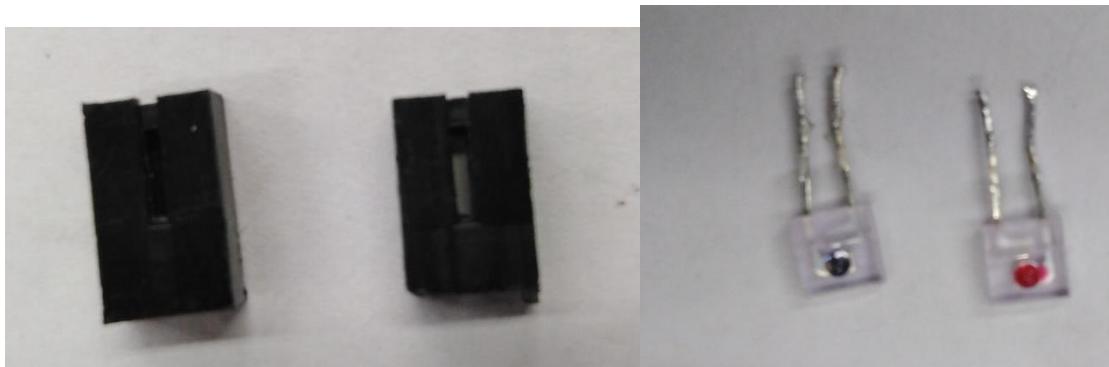
Now de-solder the LED and photodiode from the module like this:



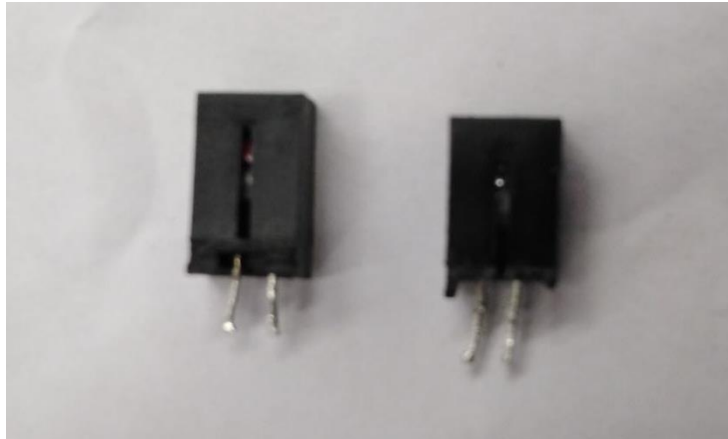
Solder the ribbon jumper wire to the legs of both LED and photodiode and enclose using sleeve. It will look like:



Now cut the black part into two pieces using a wire cutter. These will act as housings for the LED and photodiode:

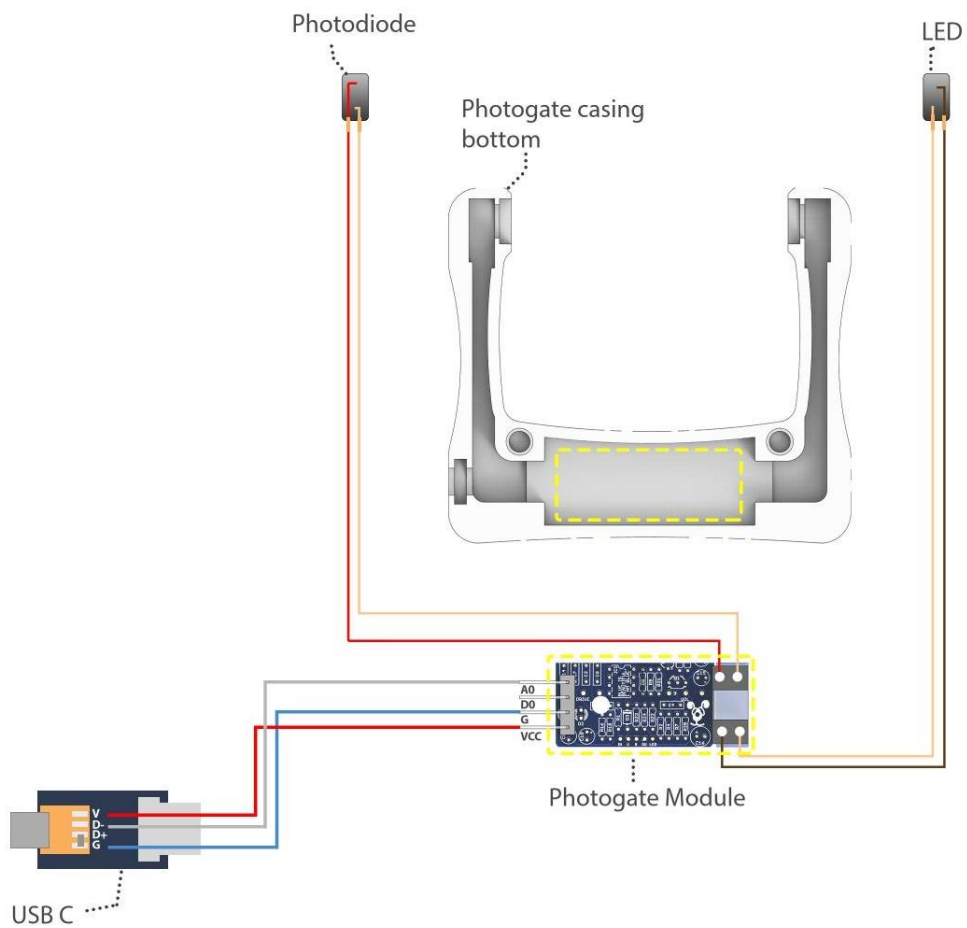


The one with red dot is the LED and the other one is photodiode. Put the LED and photodiode in the housings:

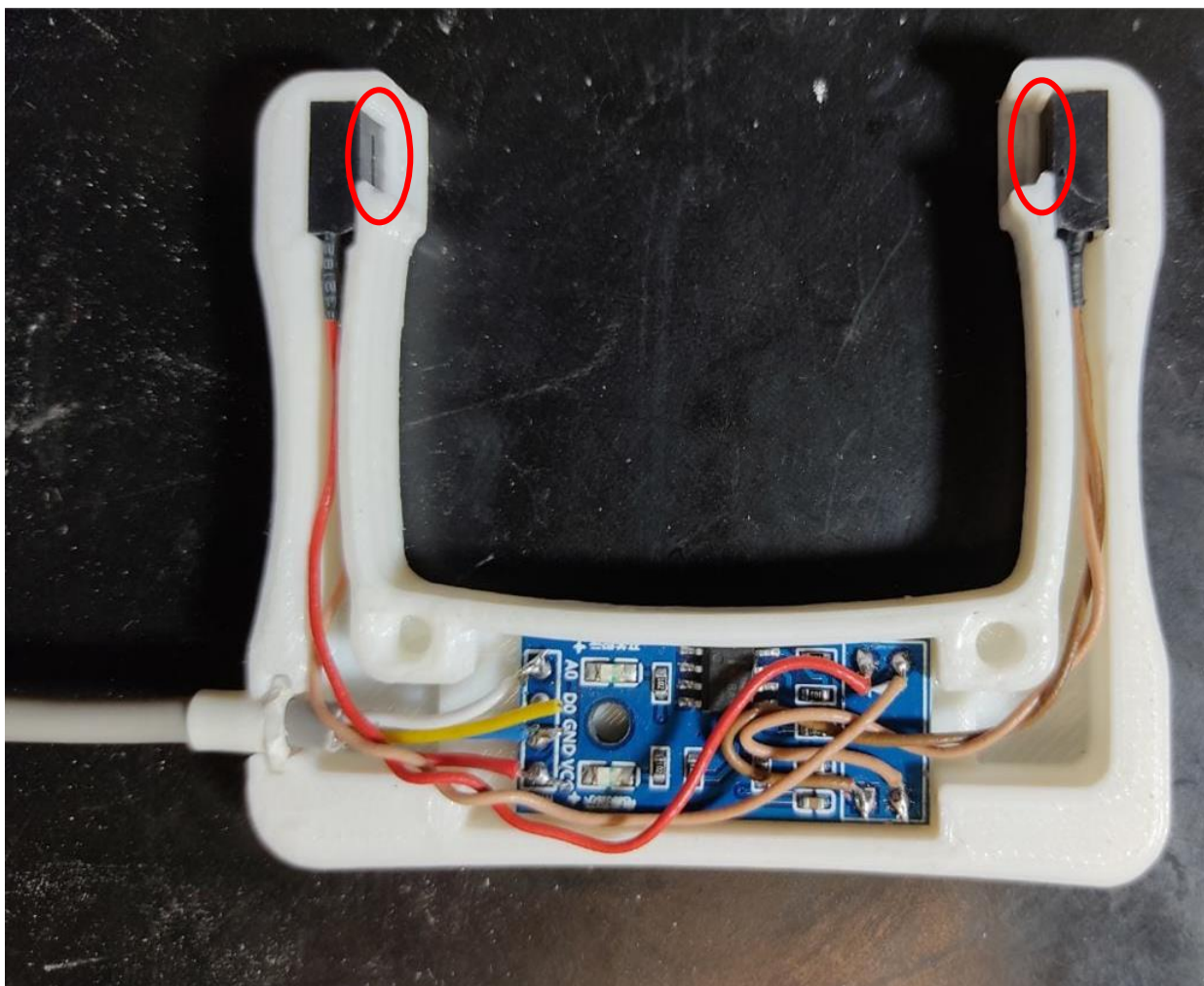


Wiring:

The wiring diagram for the photogate is as follows:

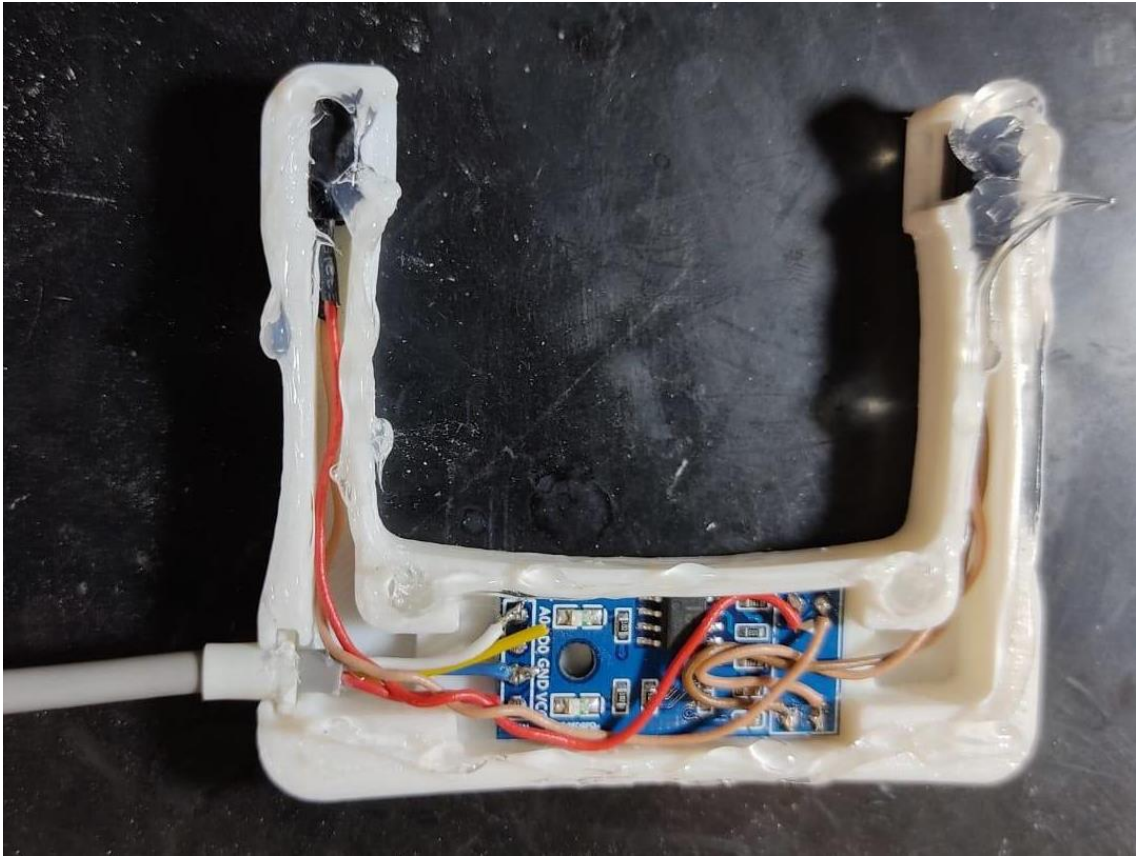


Complete the wiring as illustrated in the diagram above and fit it inside the bottom casing of photogate. It will look like:

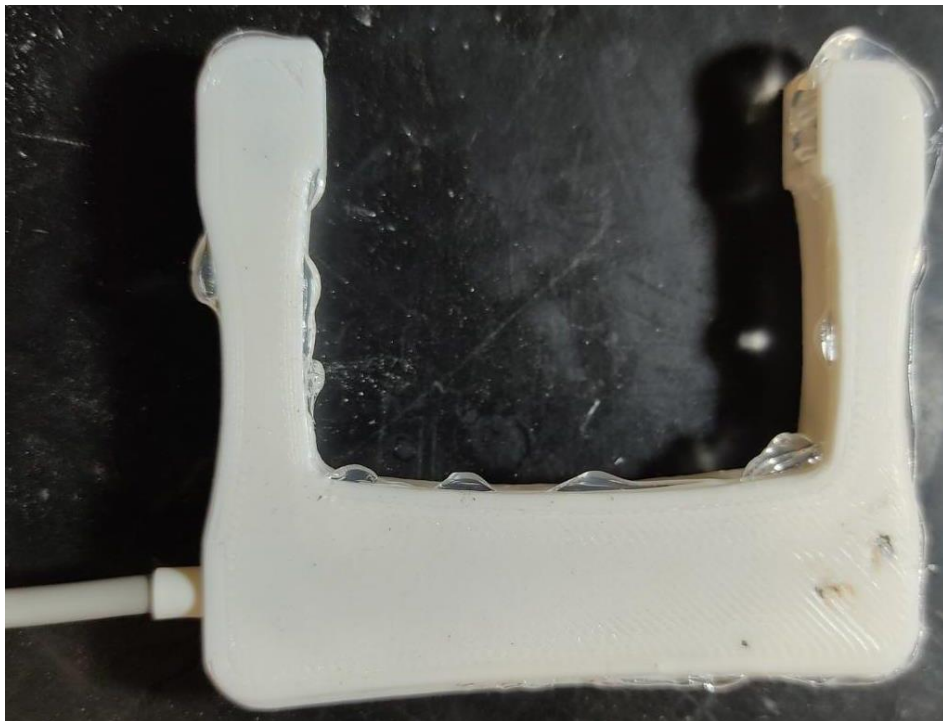


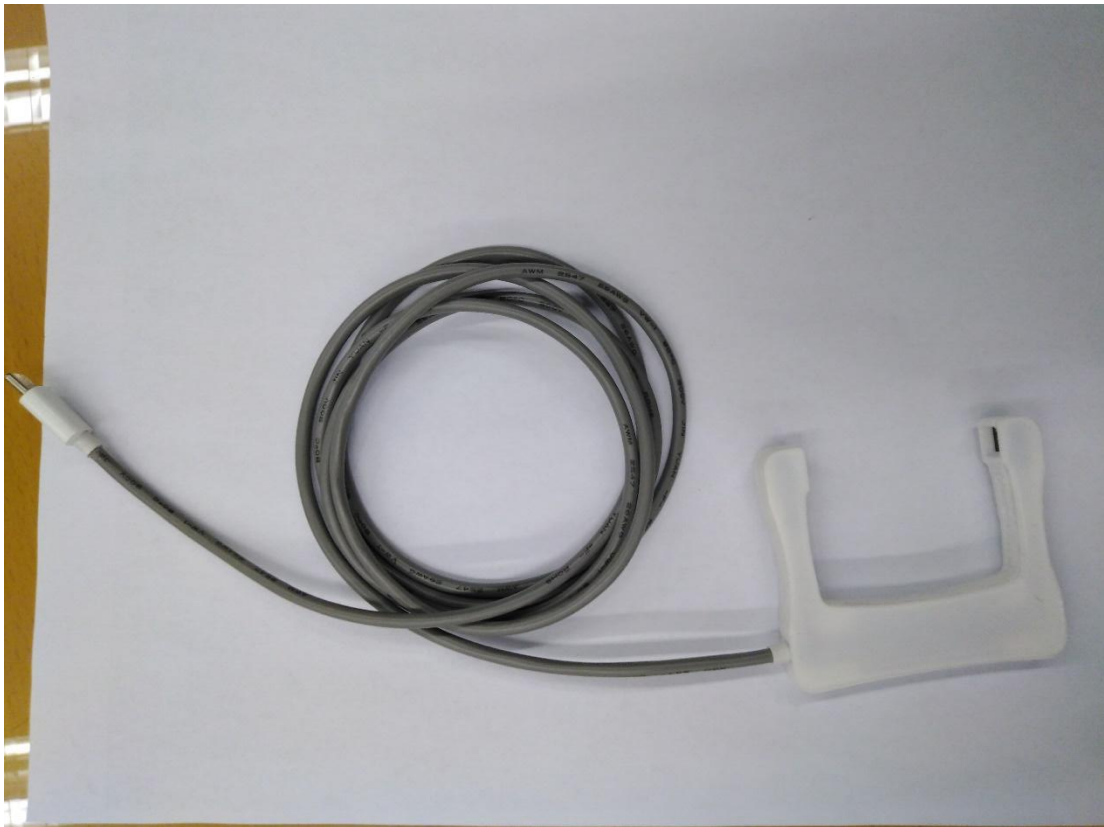


On the other side of the cable which is coming out of the photogate casing, solder 4 wires to a USB-C male connector just like making a USB C to C cable (you can refer to readme file of USB C to C cable on the Qosain Cloud for help). Now fill in the silicon generously while making sure that the silicon should not hinder the LED or photogate front side.

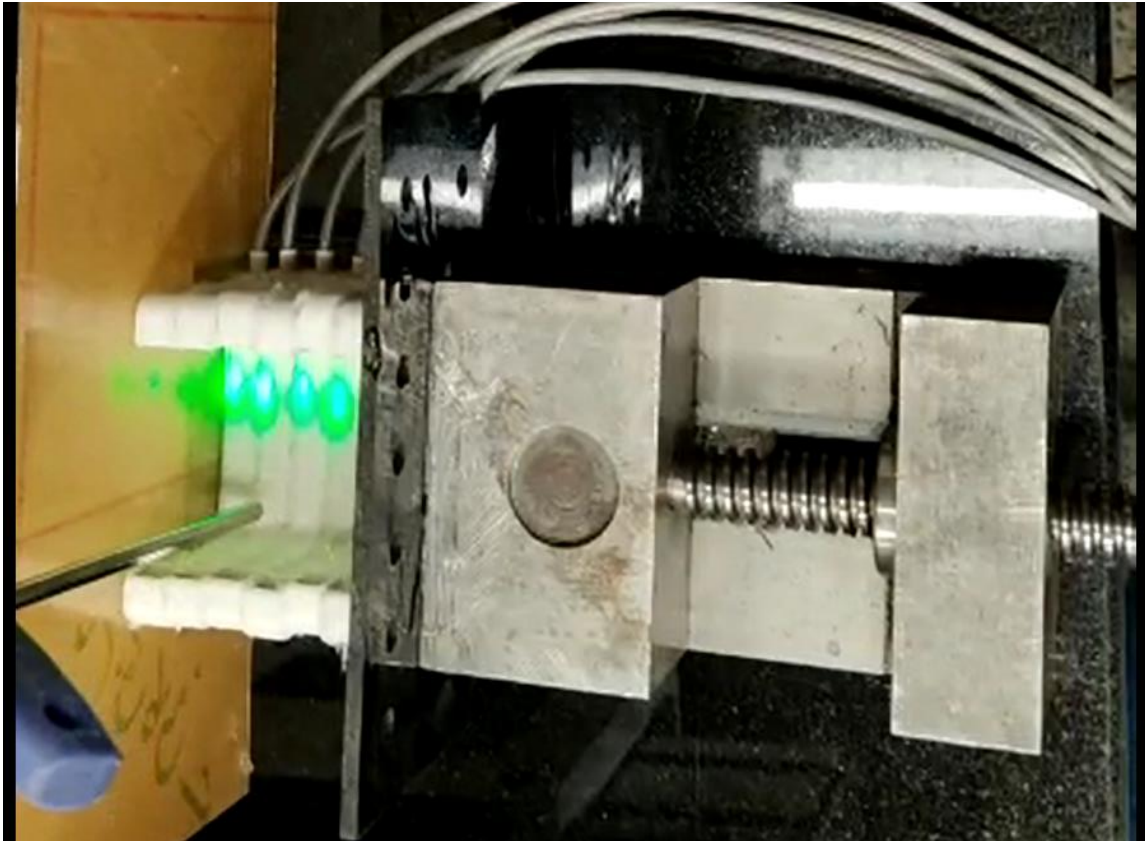


Now put the top cover on, press lightly and clean the extra silicon on the sides:





Now fit the photogate assembly in a bench vise and leave for 30 mins.



Testing:

While the photogates are in bench vise, you can test them using a PhysLogger. Connect the USB-C of photogate to any channel of PhysLogger and connect the PhysLogger to your computer. When there is blockage between LED and photogate, the LED will be turned OFF, otherwise it will stay ON.

The testing video is located as [...Videos / Photogate Testing Video.](#)

Appendix-A:

Print Parameters for Photogate FDM 3D printed parts	
Feature	Value
Layer height	0.3 mm
Temperature	220 C
Brim / Skirt	Skirt
Retract distance	2 mm
Infill line distance	8 mm (Grid)
Supports Configuration	OFF

Appendix B:

Bill of Materials for Photogate (Electrical)			
Item name	Link	Count	Cost (Rs)
Slot type IR Optocoupler Module	link	1	90
USB-C male DIY connector	link	1	25
USB-C extension wire (90 cm or whichever required)		1	50
Ribbon jumper wires	-	-	1
Total			165

For 3D printing:

Bill of Materials for Photogate (Mechanical)				
Part	File name (x3g)	Printing time	Material Qty	Cost (Rs)
Photogate Casing bottom	PhotoGate_Casing_x6.x3g	3 hours 15 mins	16.5 m PLA	180
Photogate casing top	PhotoGate_Cover_x6.x3g	1 hours 38 mins	8.44 m PLA	90
Total cost for the lot				270
Total calculated cost for one unit				45
Total cost for a Photogate unit				210 Rs