Sci-Fi 3D Printed Mask With Transparent Display

by Mukesh_Sankhla

This Mask is a 3D Printed Winter Soldier mask from Capital America Civil War, I have modified the mask by adding two Transparent OLED Displays as the eyes of the Mask. This are 128×64 pixels OLED see through displays from DFRobot.com which I am using for showing few animations. Since the display are transparent I can see through them even when the pixels are on.

The transparent display are two way display, means the image is visible on the both side but inverted at one side.

The aim of this project is to make others see the animating eyes, even the image is visible on both side the person wearing the mask cannot see the display content since the displays is too close to the eyes to focus.

To switch between different animations and texts I have used Blynk app.

Thank You NextPCB:

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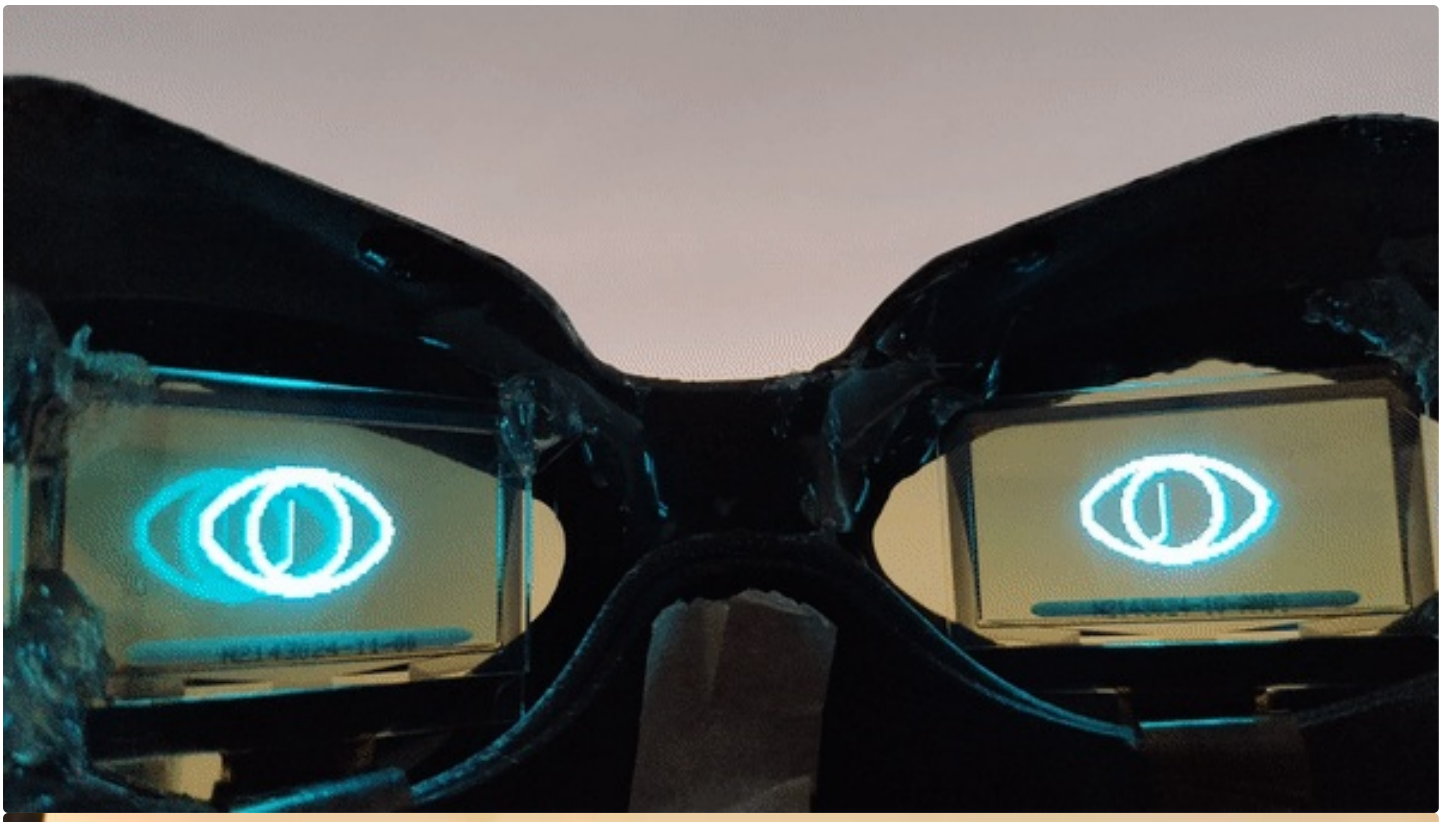
Supplies:

- 2x Transparent Display
- 1x FireBeetle ESP32
- 1x 3.7 V Battery
- 1x Push Switch
- Spray Paint(Silver, Black)
- 3D Printed Parts

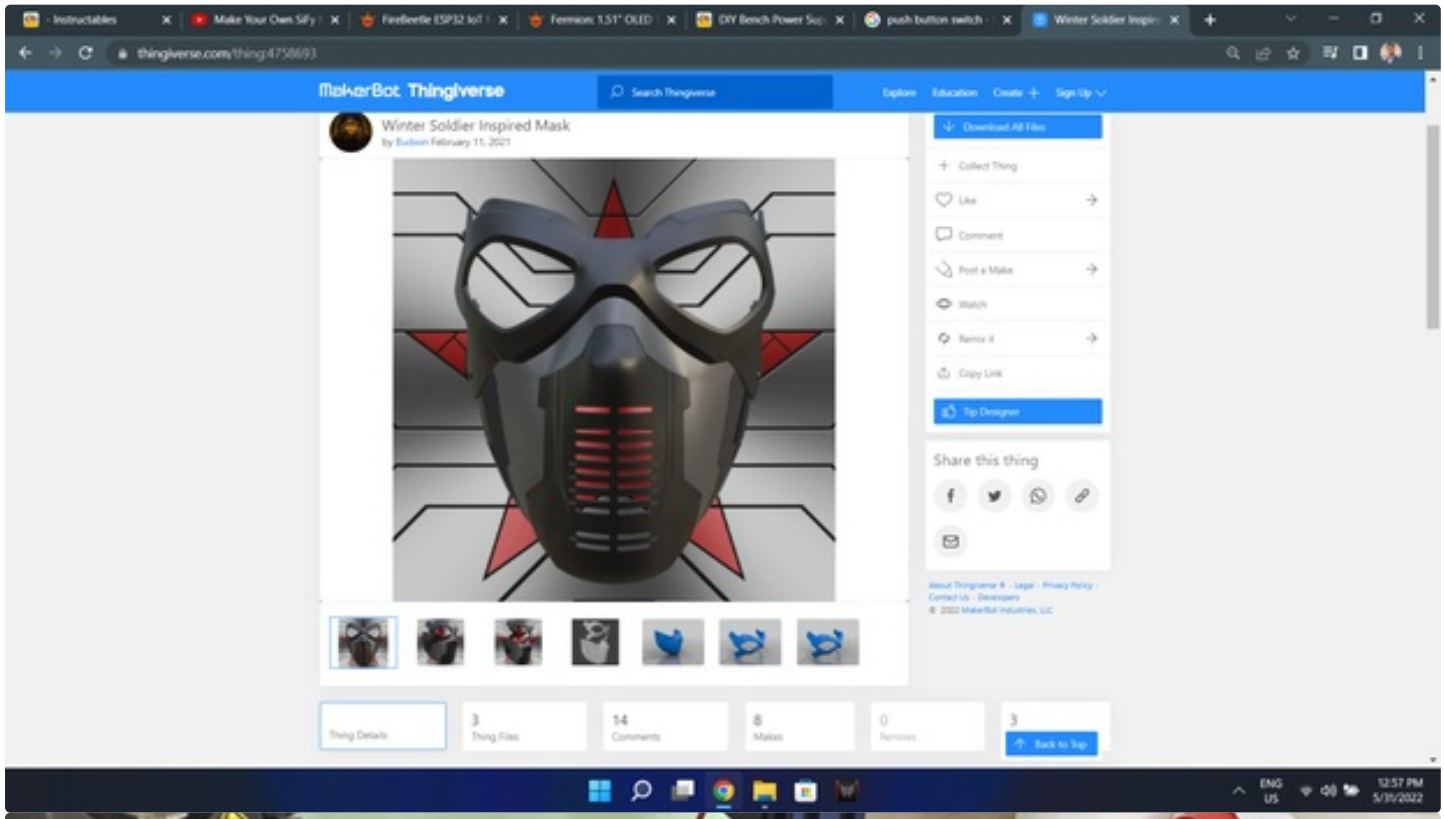
https://youtu.be/Ej0FG-7REmM

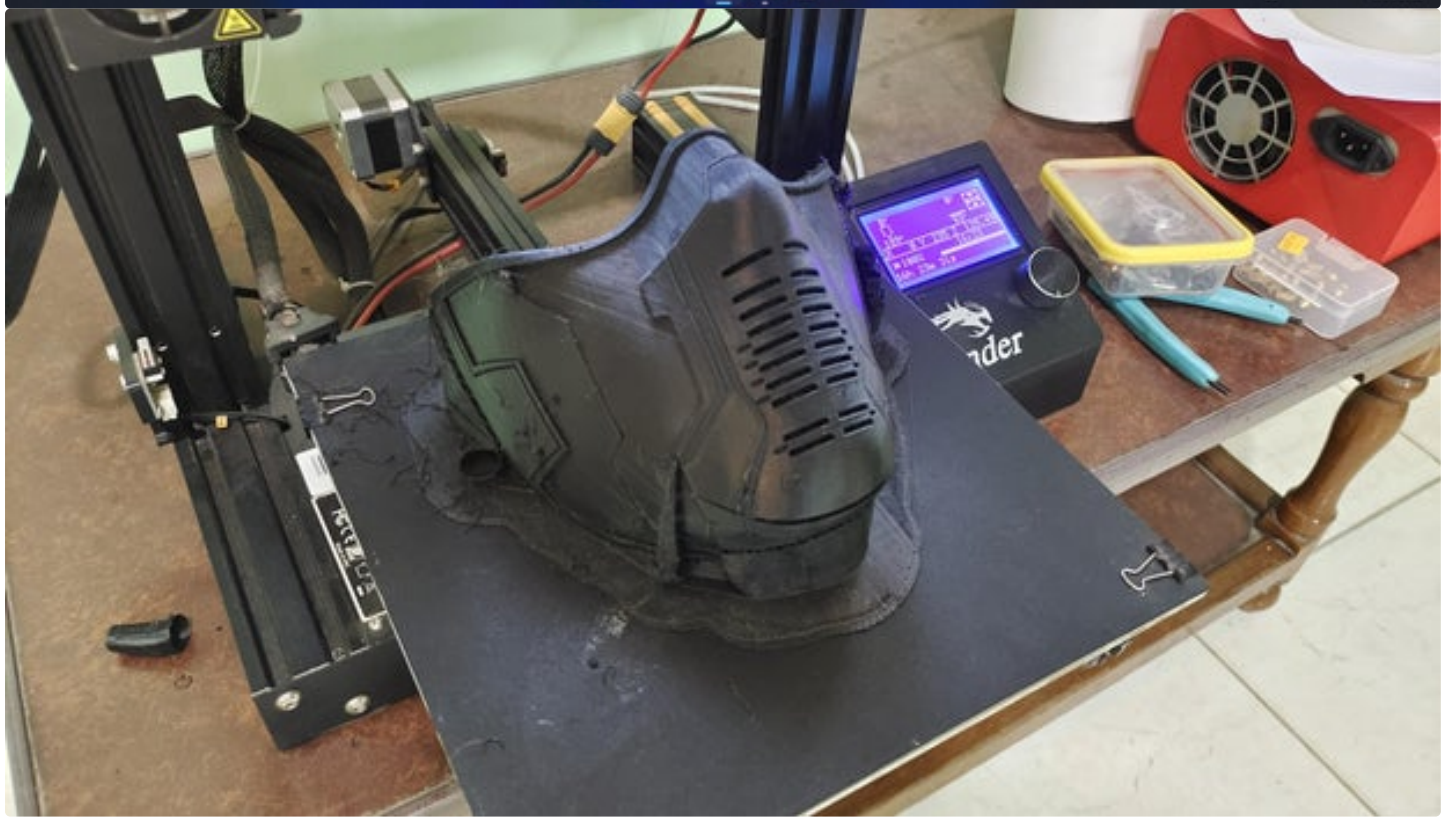



AOYUE
SMD REWORK STA
888A
HOT AIR TEMPERATURE
ON
OFF
SOLDERING IRON TEMPERATURE
SOLDERING IRON

Step 1: 3D Printing

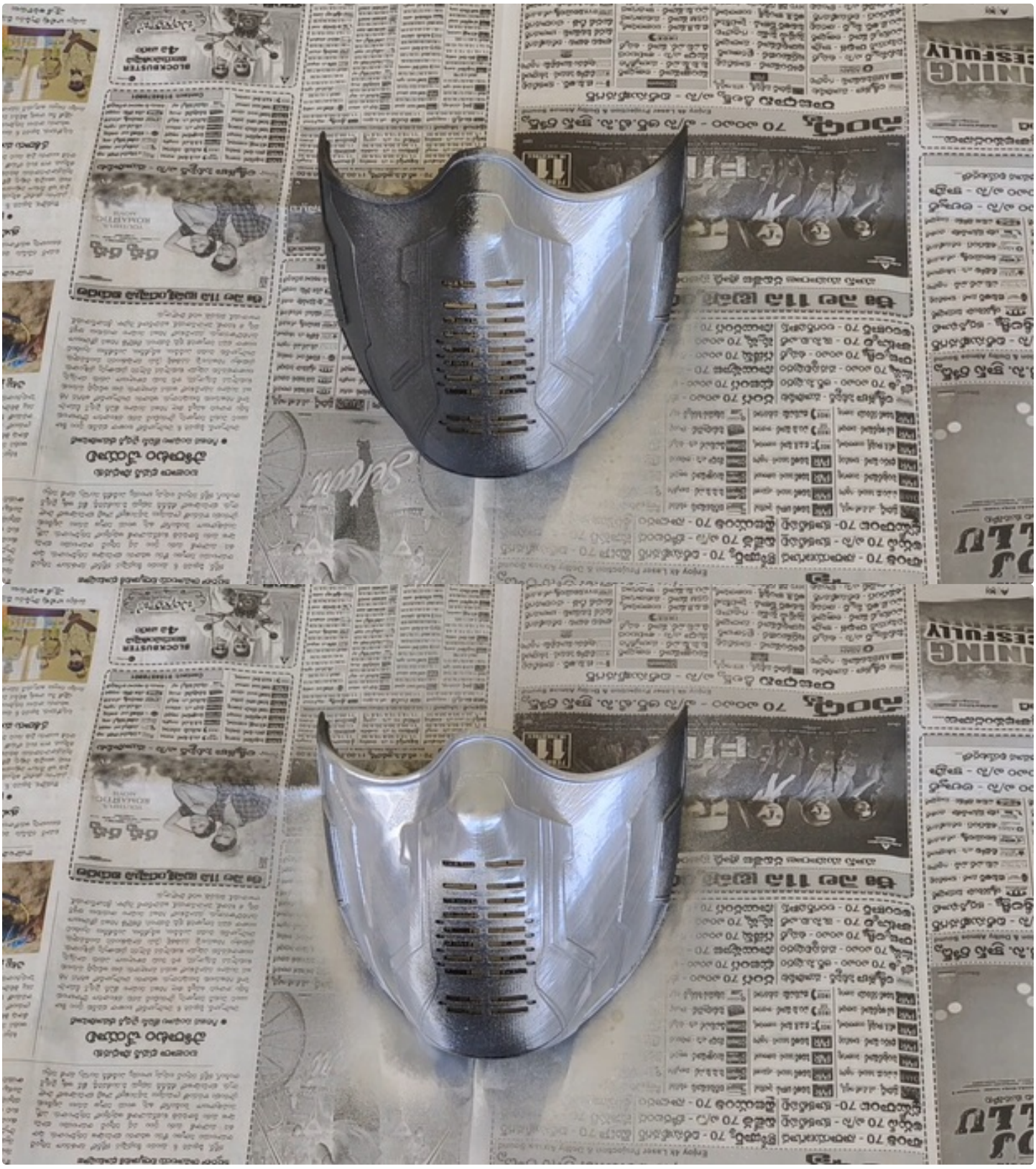
- Download the Winter Soldier Mask stl Files.
- Open the files in slicing software.
- I have printed the objects with 0.2mm layer height, 20% infill and with tree support enabled.
- After slicing 3D print the objects.
- Remove the support material once prints are complete.

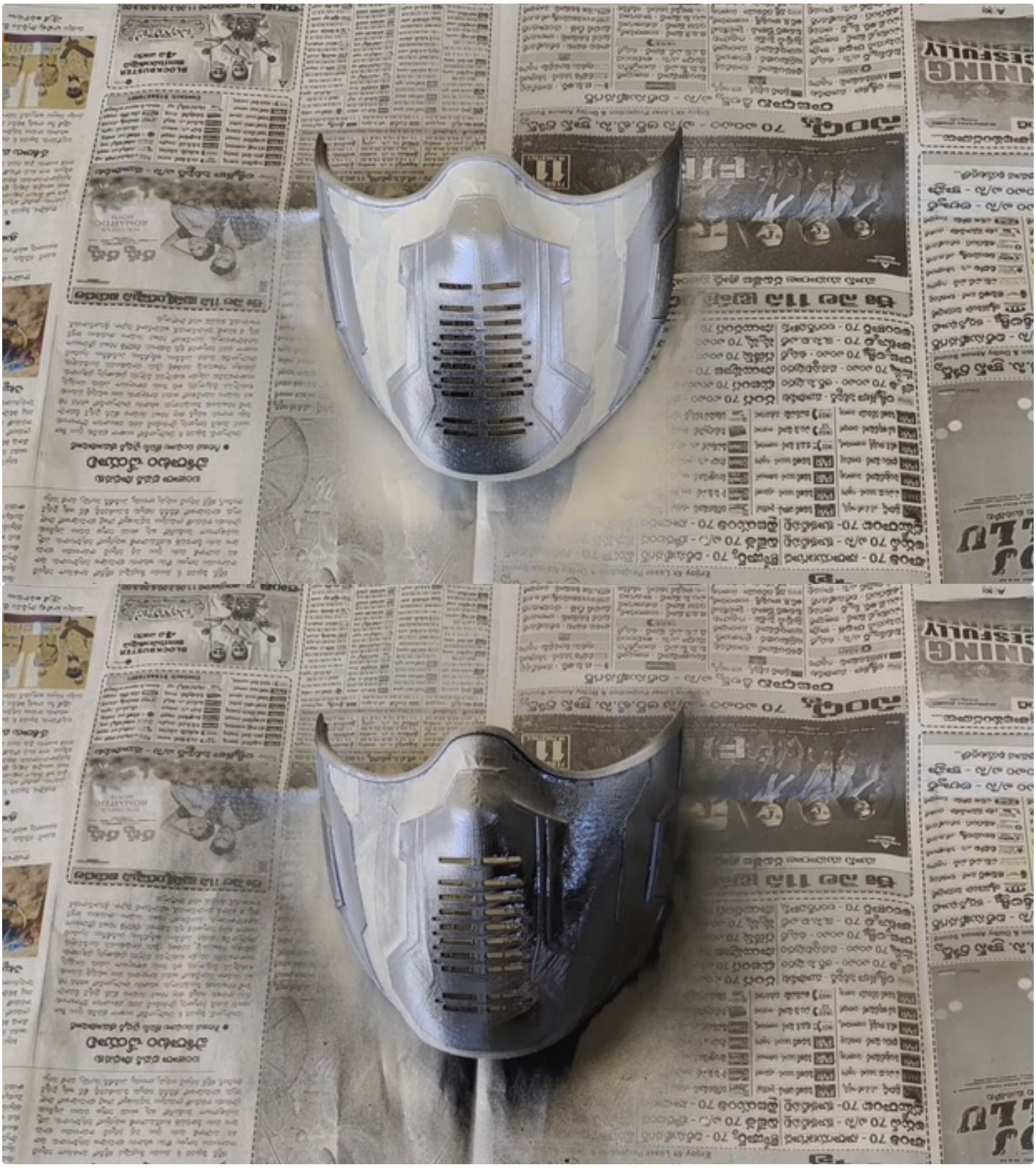


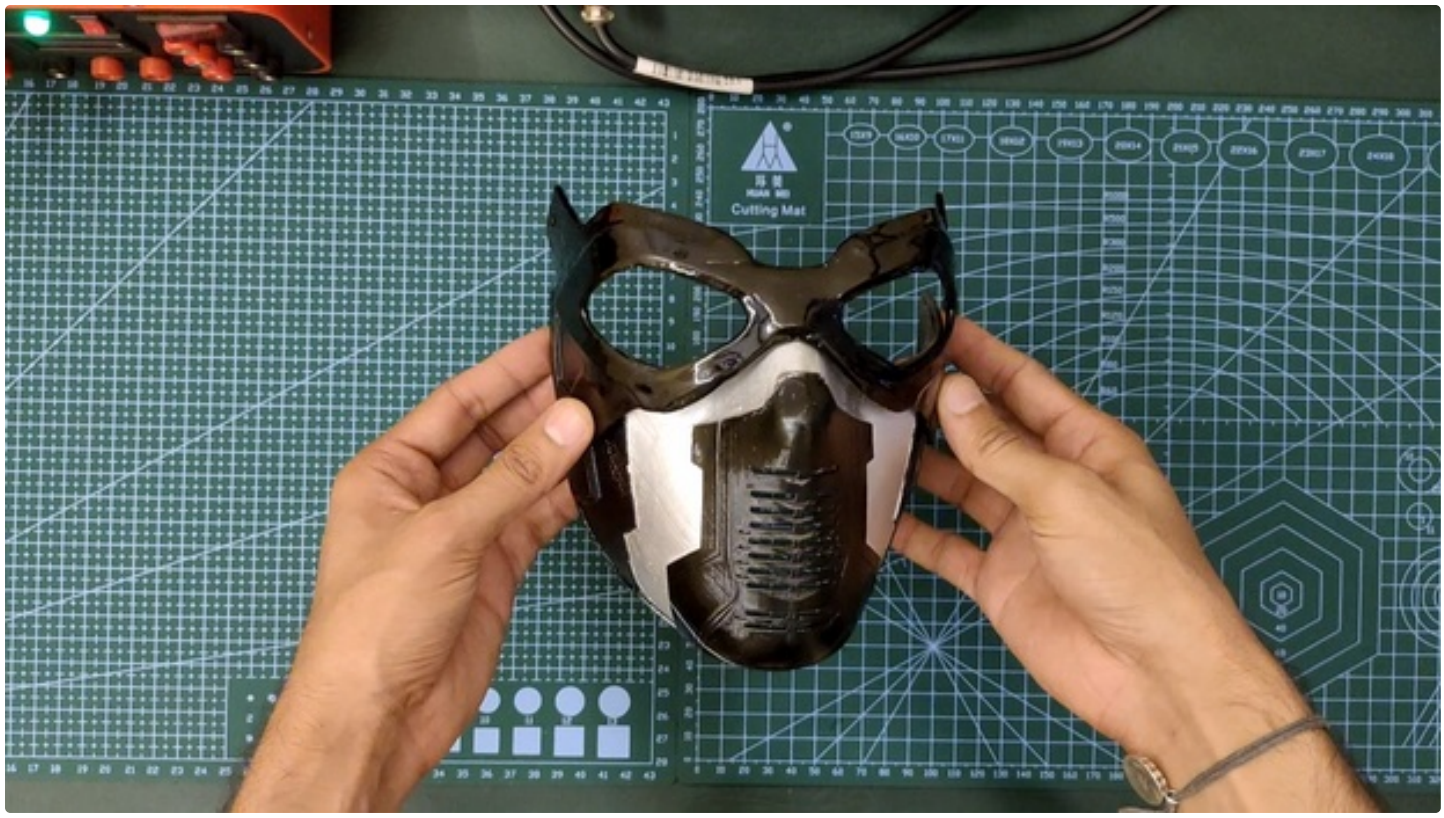


Step 2: Painting

- For painting the mask I am using Silver and Black colored Paint Sprays.
- First I painted the silver part.
- After the silver part is dry I masked it and painted the black.
- I am not using any sanding and smoothening techniques, but if you want then please go for it.
- After the paint is dry glue both the mask objects as one single piece.





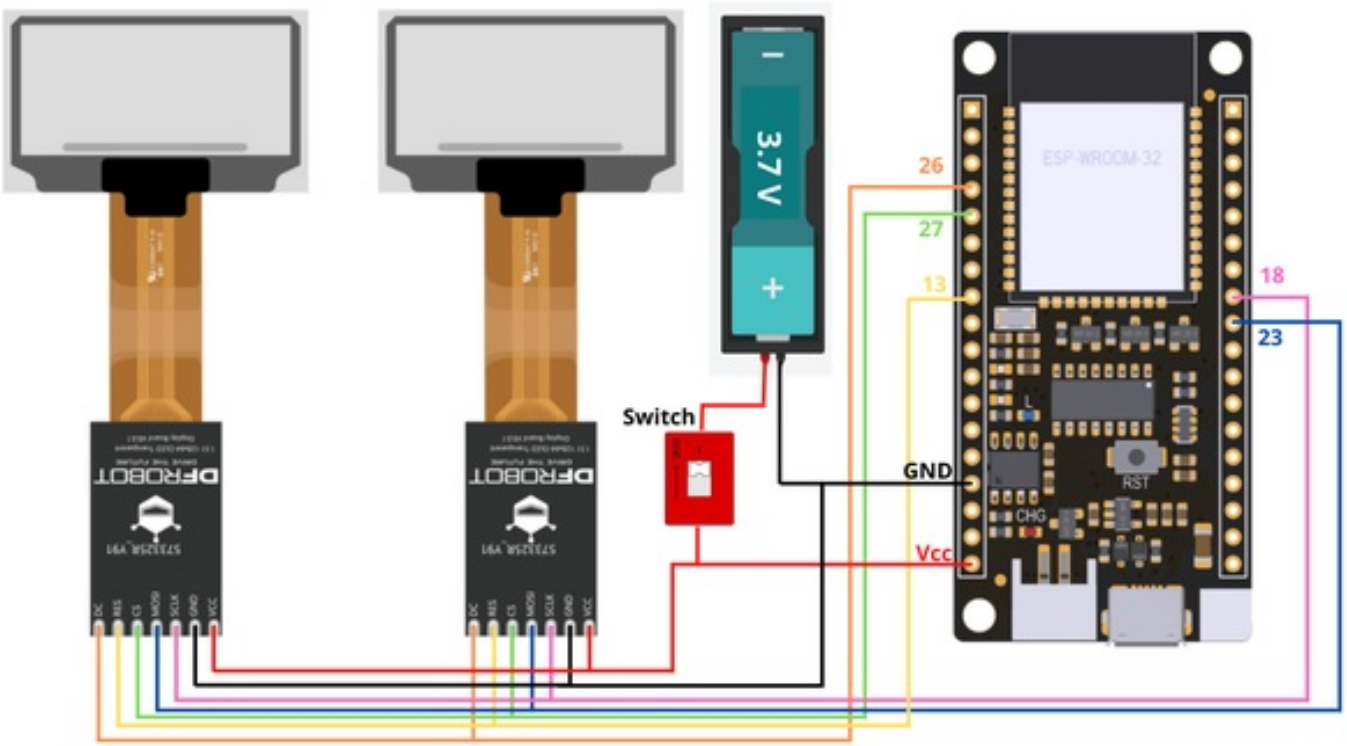


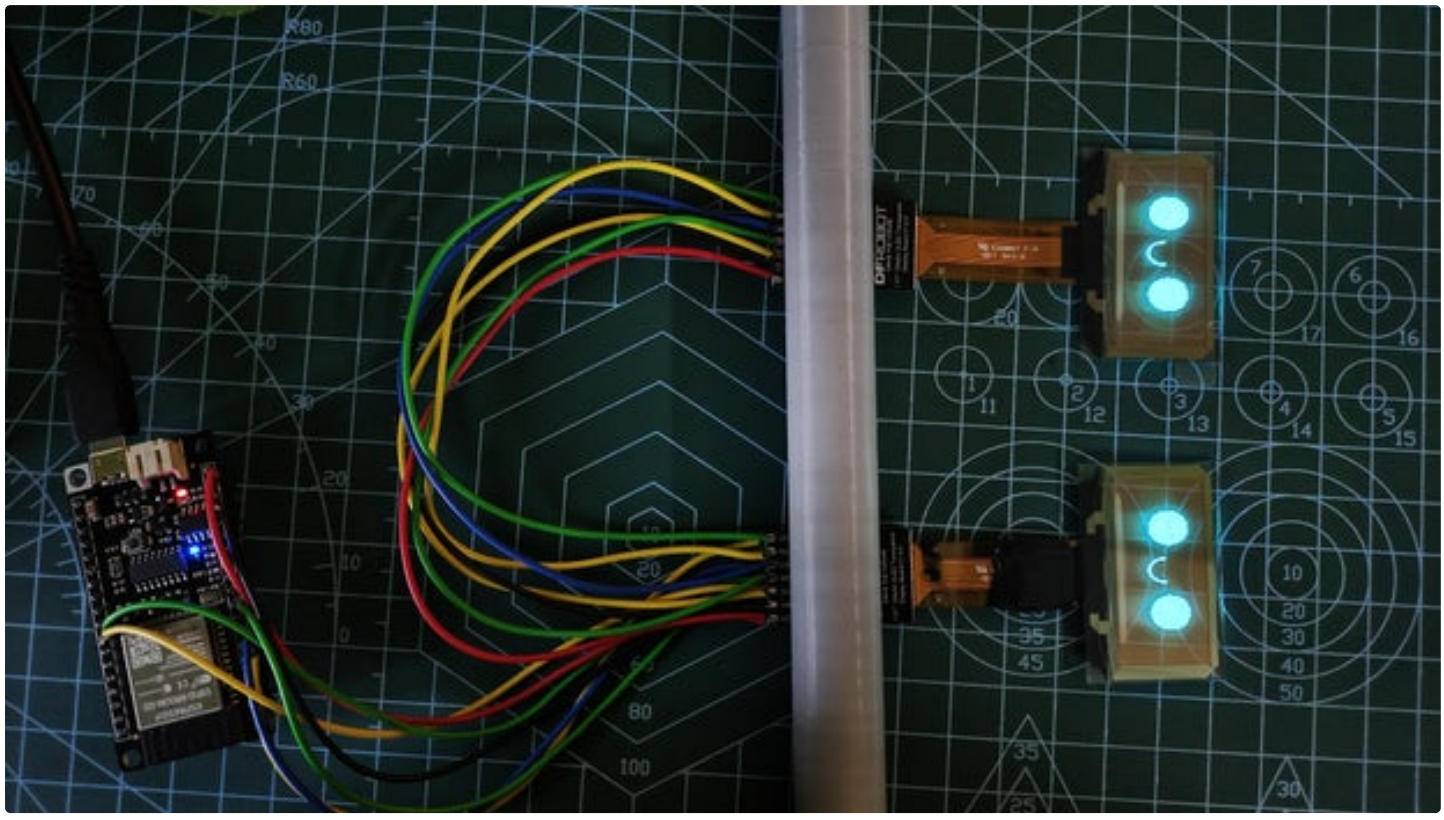
Step 3: Eyes

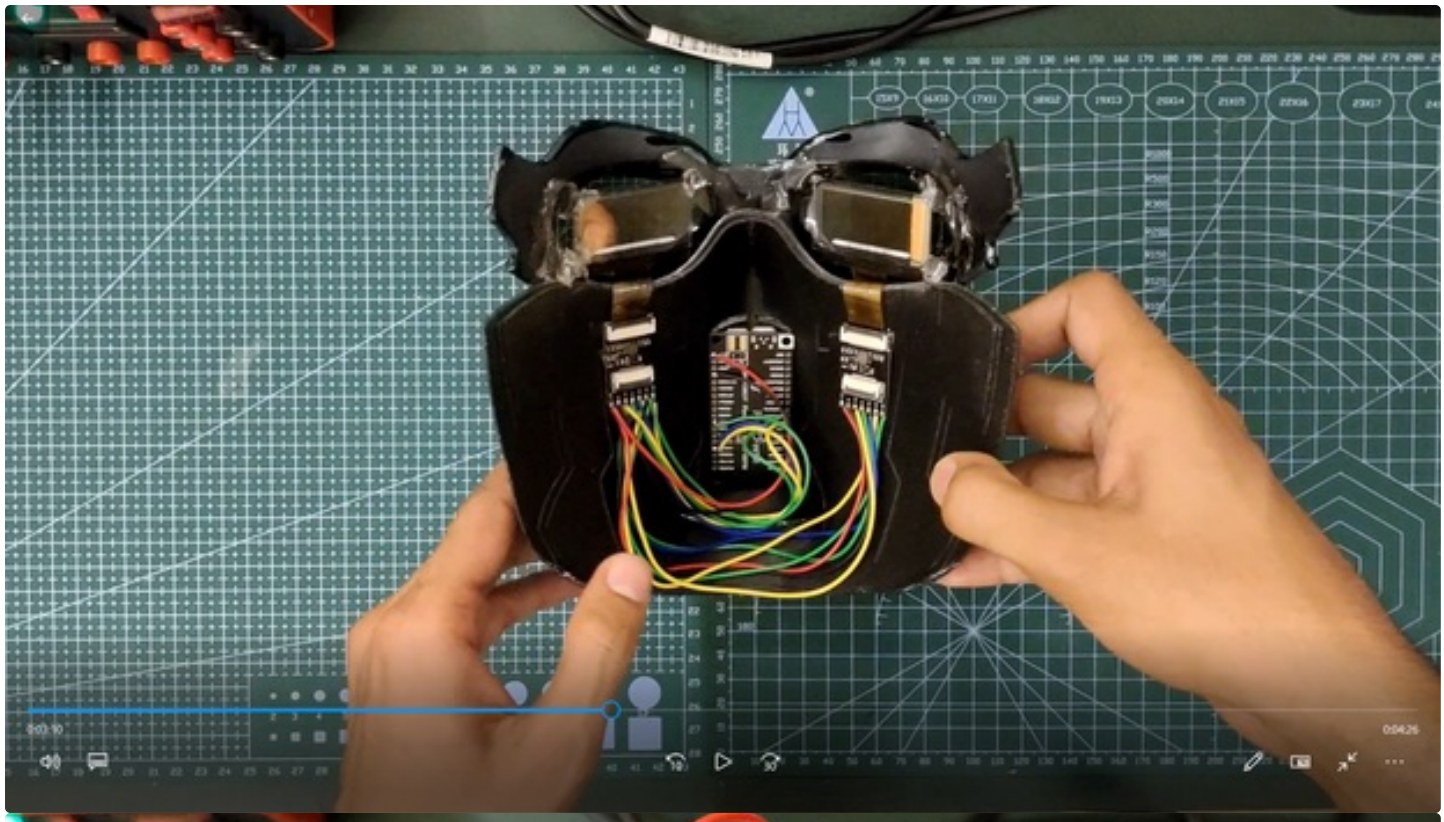
- For the eyes I am using a pair of sunglasses.
- Removed their lenses and glued them to the mask.

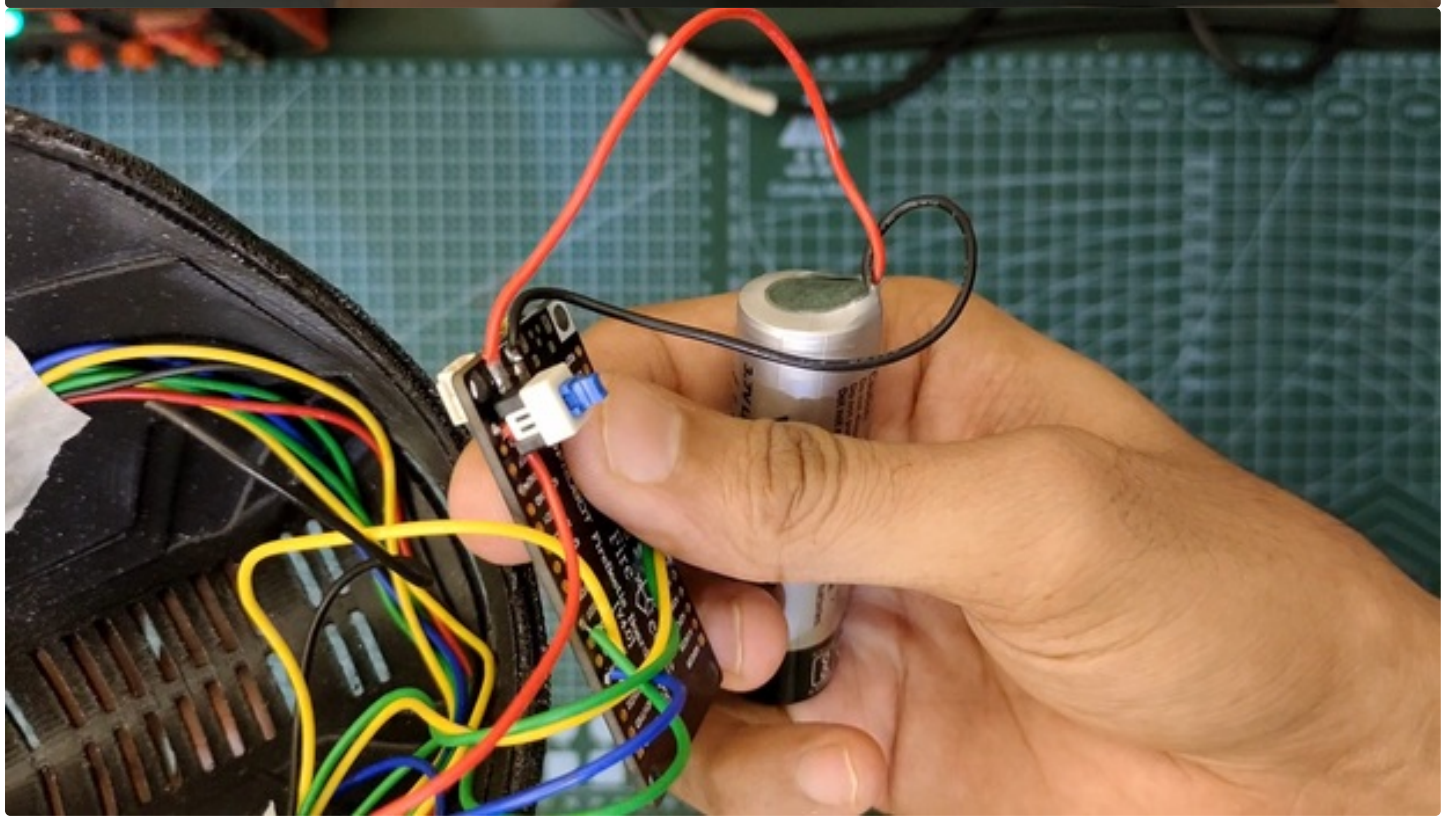
Step 4: Circuit

- Make all the connections as shown in circuit diagram.
- After the connections are made glue and stick all the electronics in the mask.
- I have glued the battery and ESP32 Board inside the mask since I didn't want any wiring coming out of it.


3.7 V
ESP-WROOM-32
26
27
13
18
23
Switch
GND
Vcc
RST
CHG

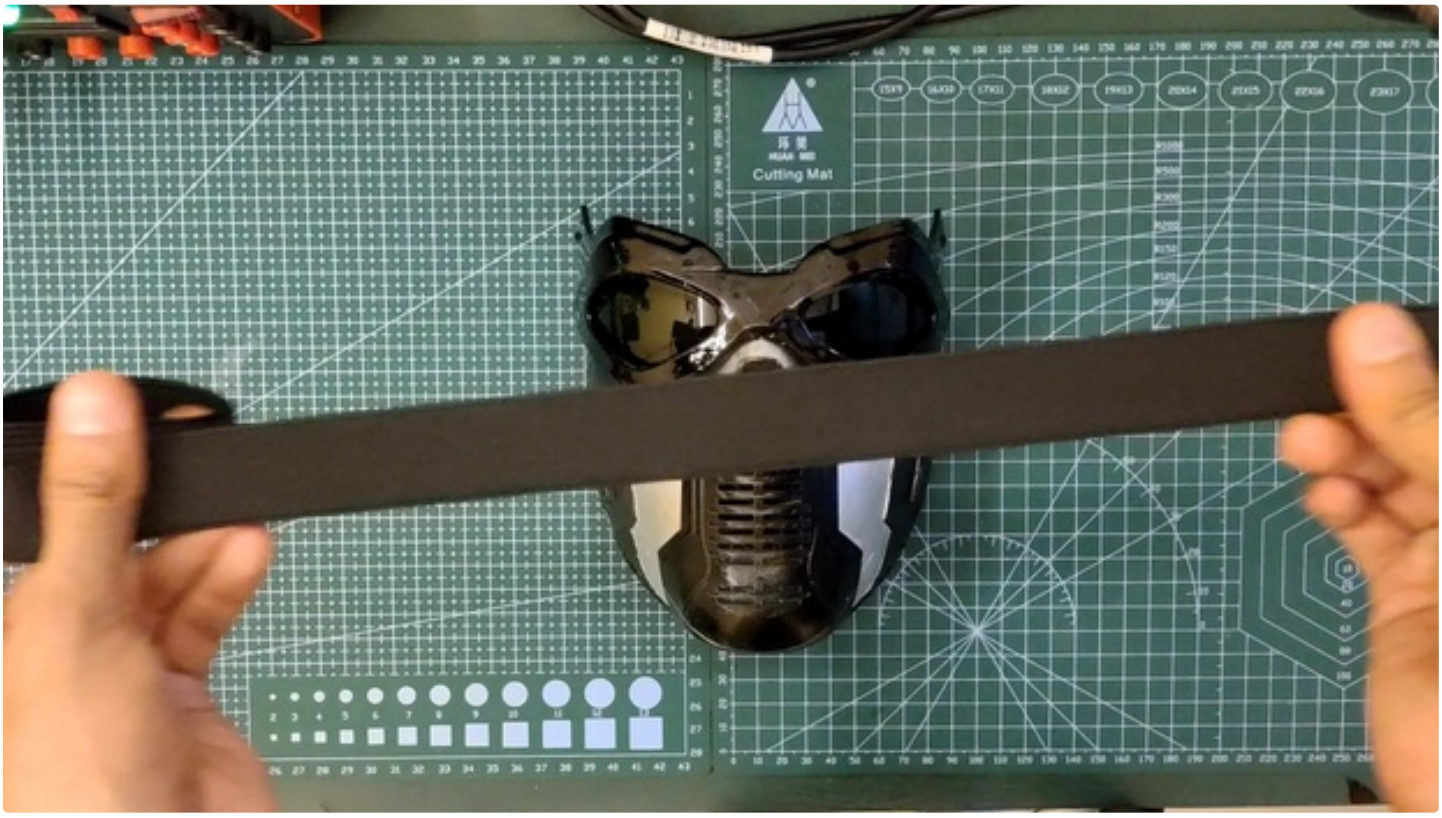


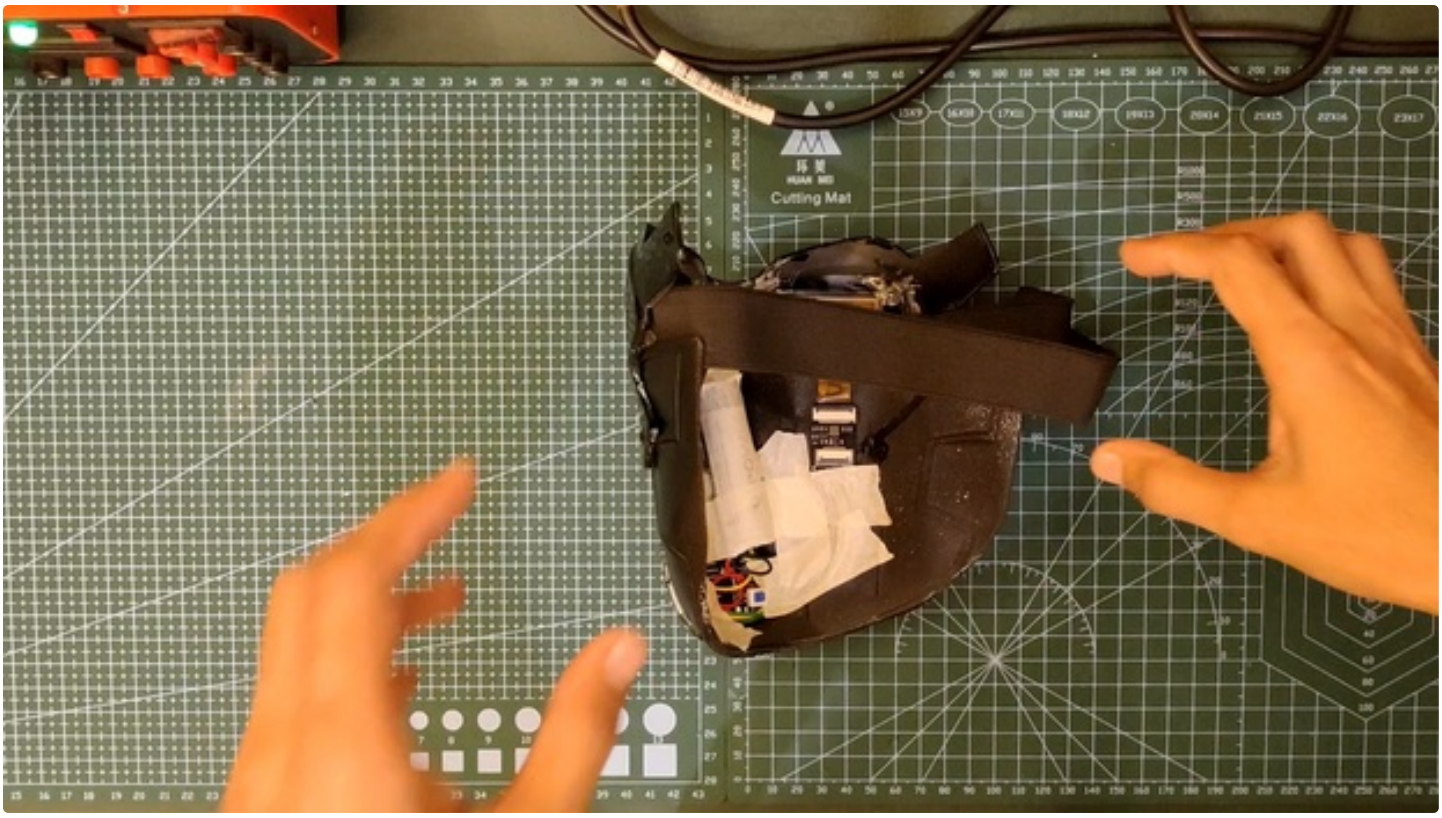




Step 5: Back Support

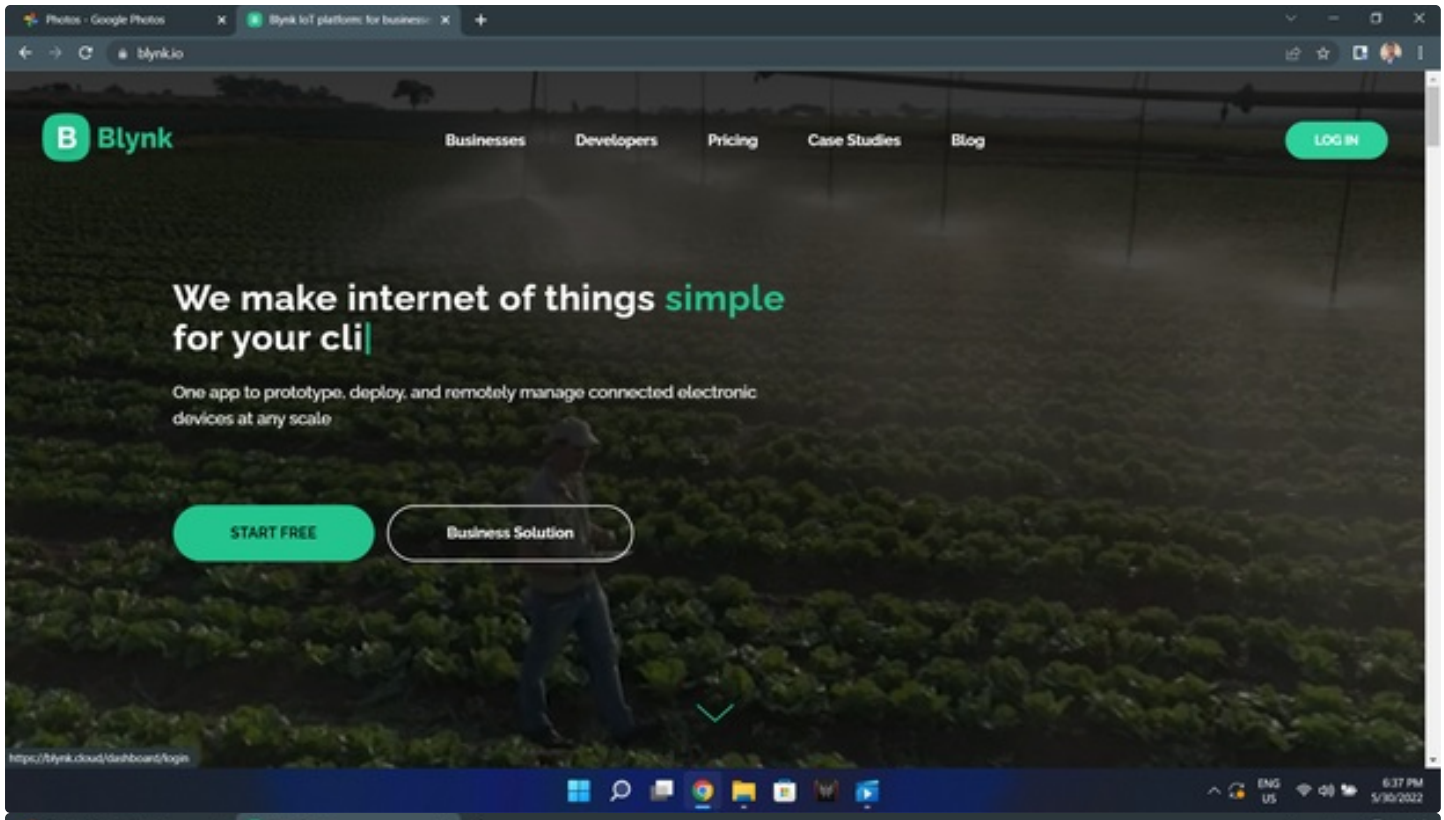
- I am using a 1 inch elastic band for the back support.





Step 6: Blynk Setup

- Go to Blynk.io
- Create a account and logion.
- Go to the templates and create a new template.
- After the template is created copy the Template ID and Name.
- Go to DataStream's and create 3 new data streams(for Animation Number, Text Number, Text Size) as shown in images.
- After creating the DataStream's click on save.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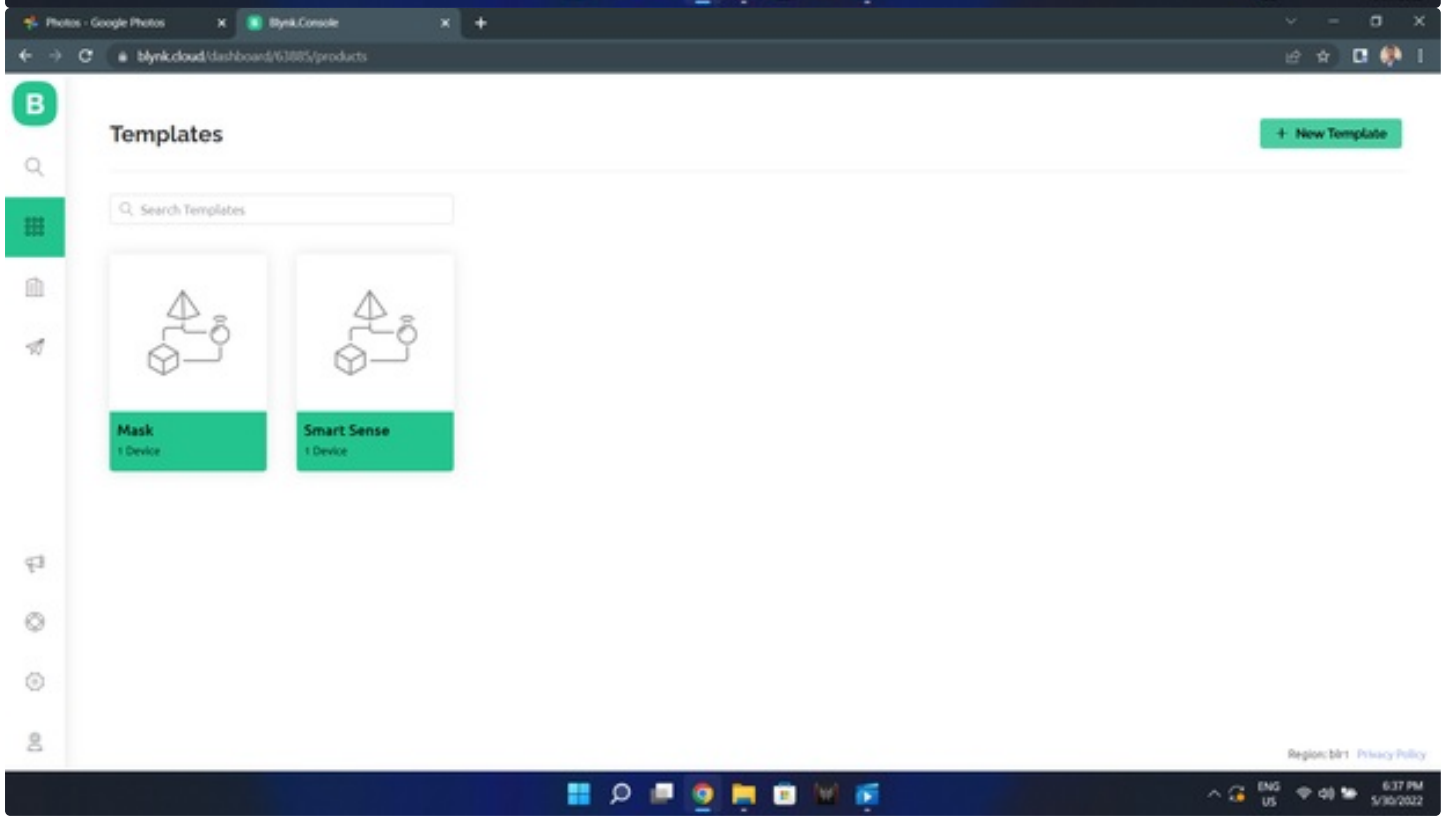
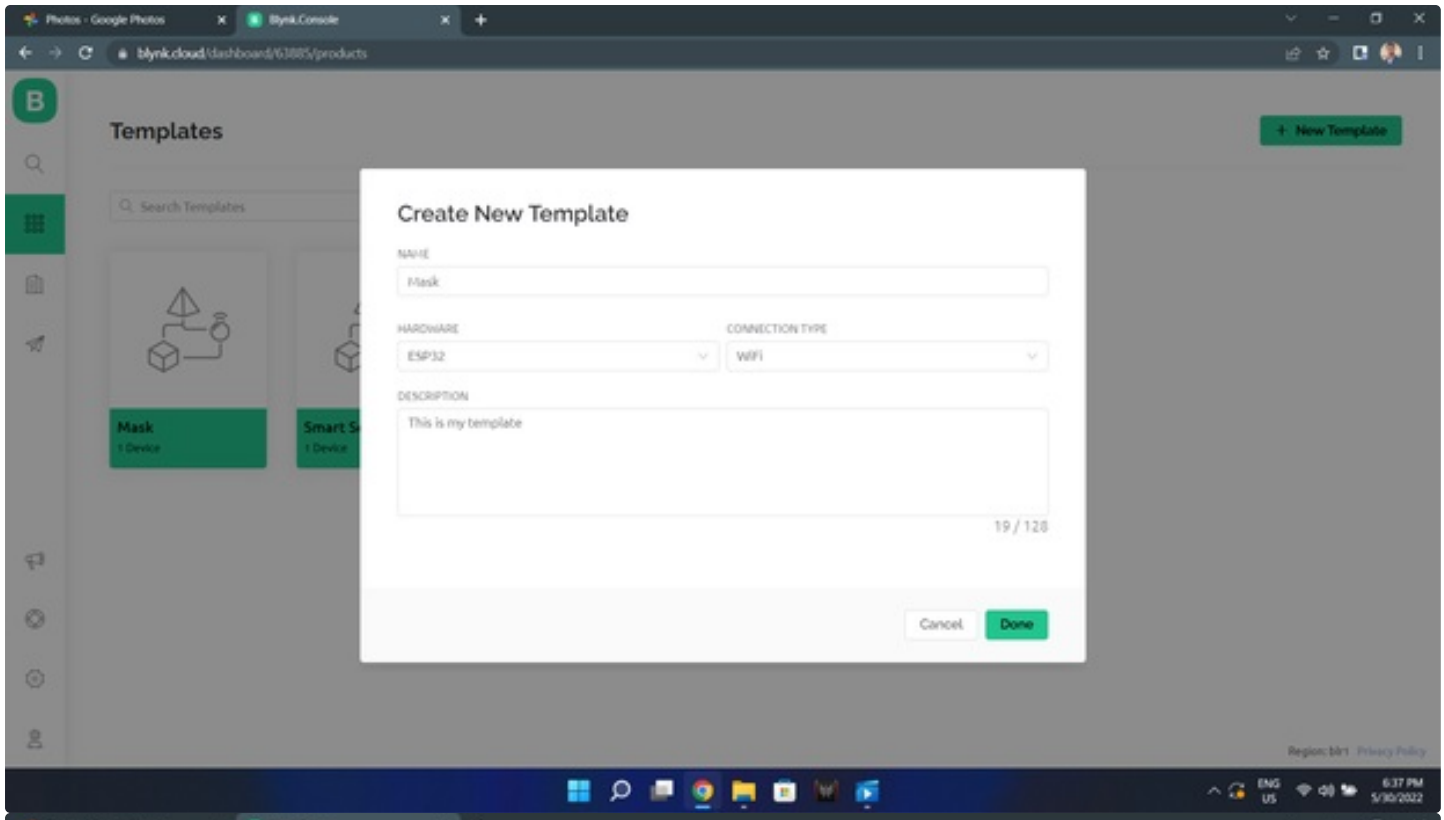
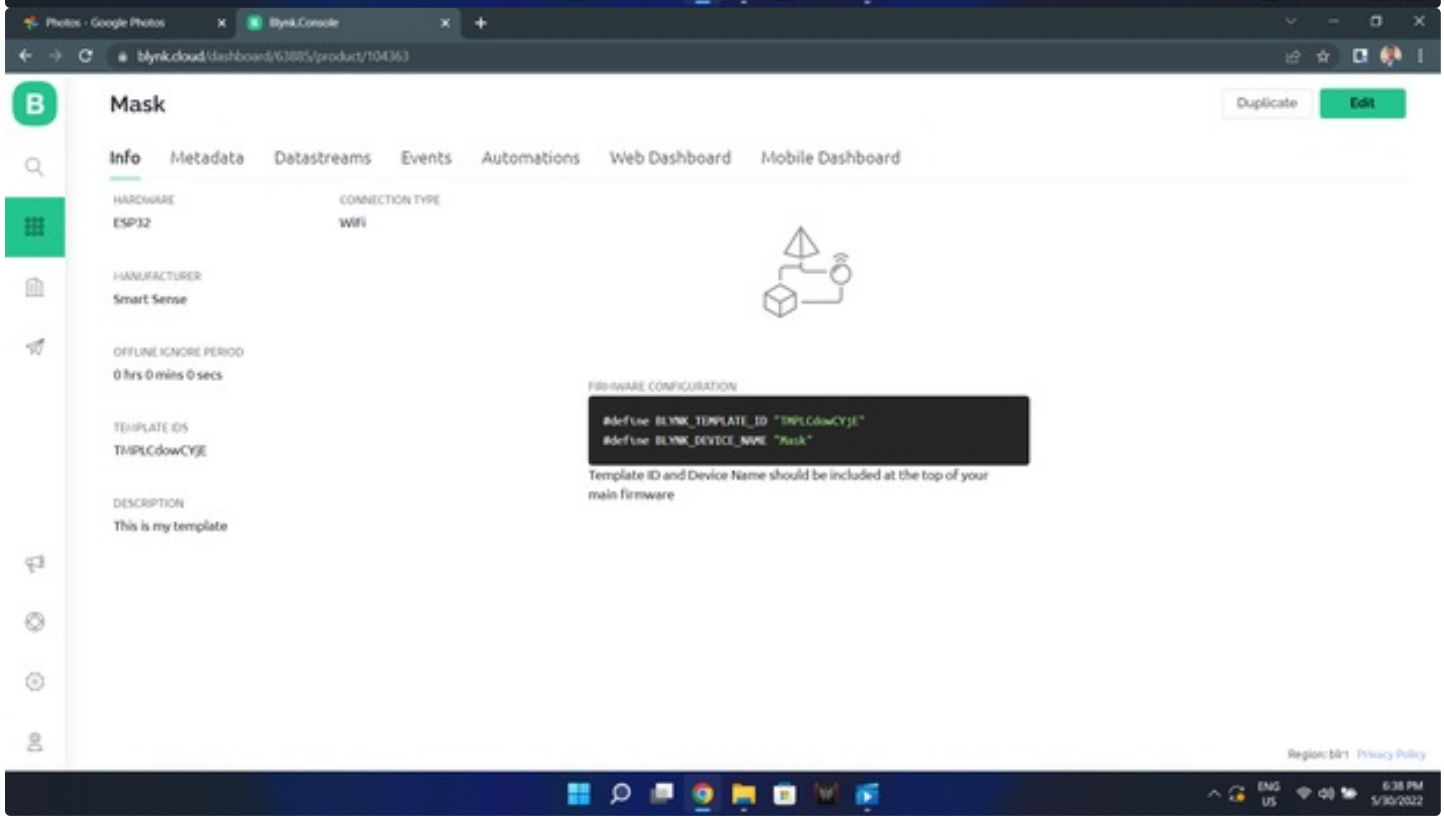
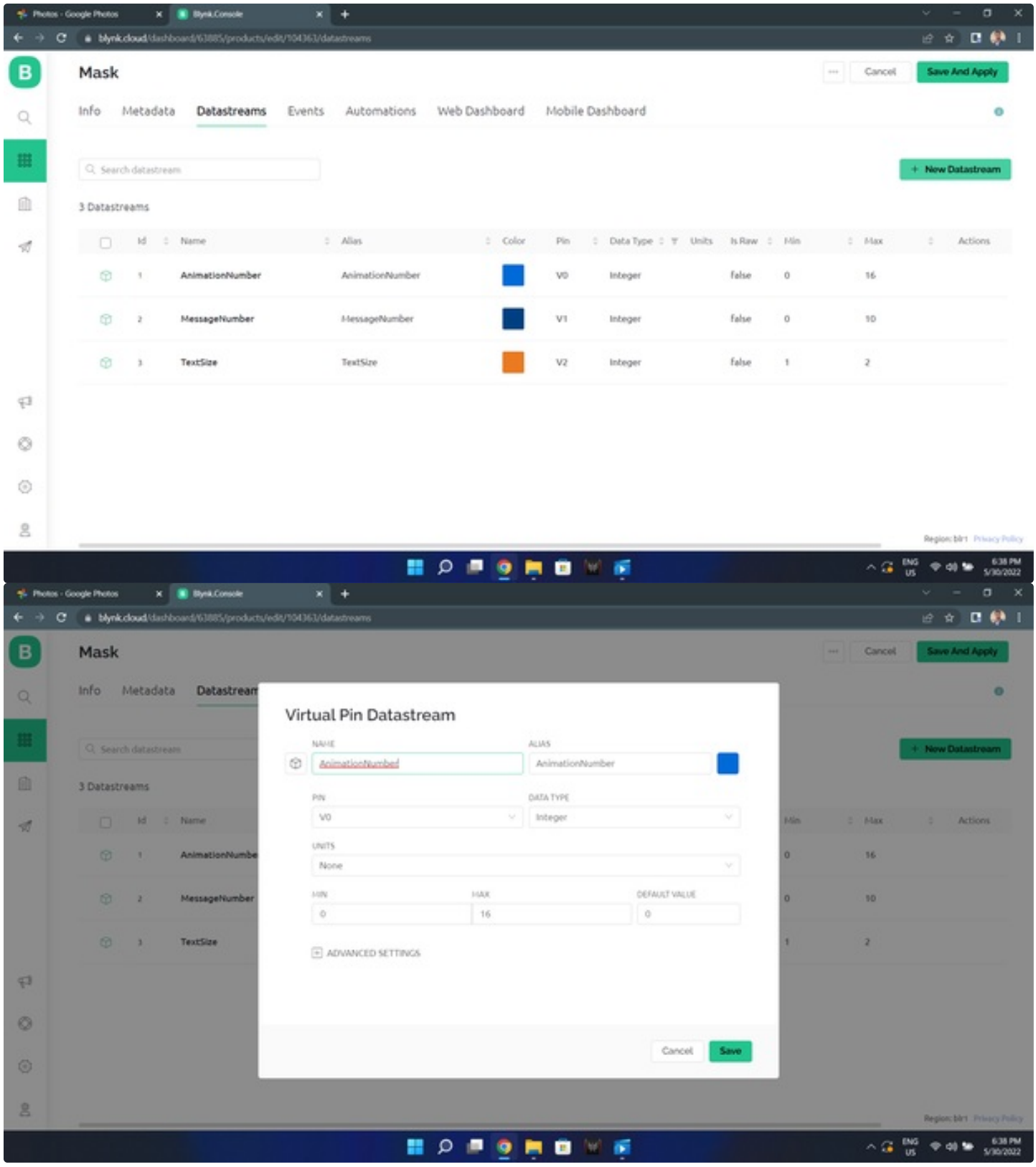
Business Solution


Templates
New Template
Search Templates
Mask
1 Device
Smart Sense
1 Device


Templates
+ New Template
Search Templates
Create New Template
NAME
Mask
HARDWARE
ESP32
CONNECTION TYPE
WiFi
DESCRIPTION
This is my template
19 / 128
Cancel
Done
Mask
1 Device


Mask
Duplicate
Edit
Info
Metadata
Datastreams
Events
Automations
Web Dashboard
Mobile Dashboard
HARDWARE
ESP32
CONNECTION TYPE
WiFi
MANUFACTURER
Smart Sense
OFFLINE IGNORE PERIOD
0 hrs 0 mins 0 secs
TEMPLATE IDS
TMPLCdowCYJE
DESCRIPTION
This is my template
FIRMWARE CONFIGURATION
#define BLYNK_TEMPLATE_ID "TMPLCdowCYJE"
#define BLYNK_DEVICE_NAME "Mask"
Template ID and Device Name should be included at the top of your main firmware


Mask
Cancel
Save And Apply
Info
Metadata
Datastreams
Events
Automations
Web Dashboard
Mobile Dashboard
Search datastream
New Datastream
3 Datastreams
Id
Name
Alias
Color
Pin
Data Type
Units
Is Raw
Min
Max
Actions
1 AnimationNumber AnimationNumber V0 Integer false 0 16
2 MessageNumber MessageNumber V1 Integer false 0 10
3 TextSize TextSize V2 Integer false 1 2
Virtual Pin Datastream
NAME
AnimationNumber
ALIAS
AnimationNumber
PIN
V0
DATA TYPE
Integer
UNITS
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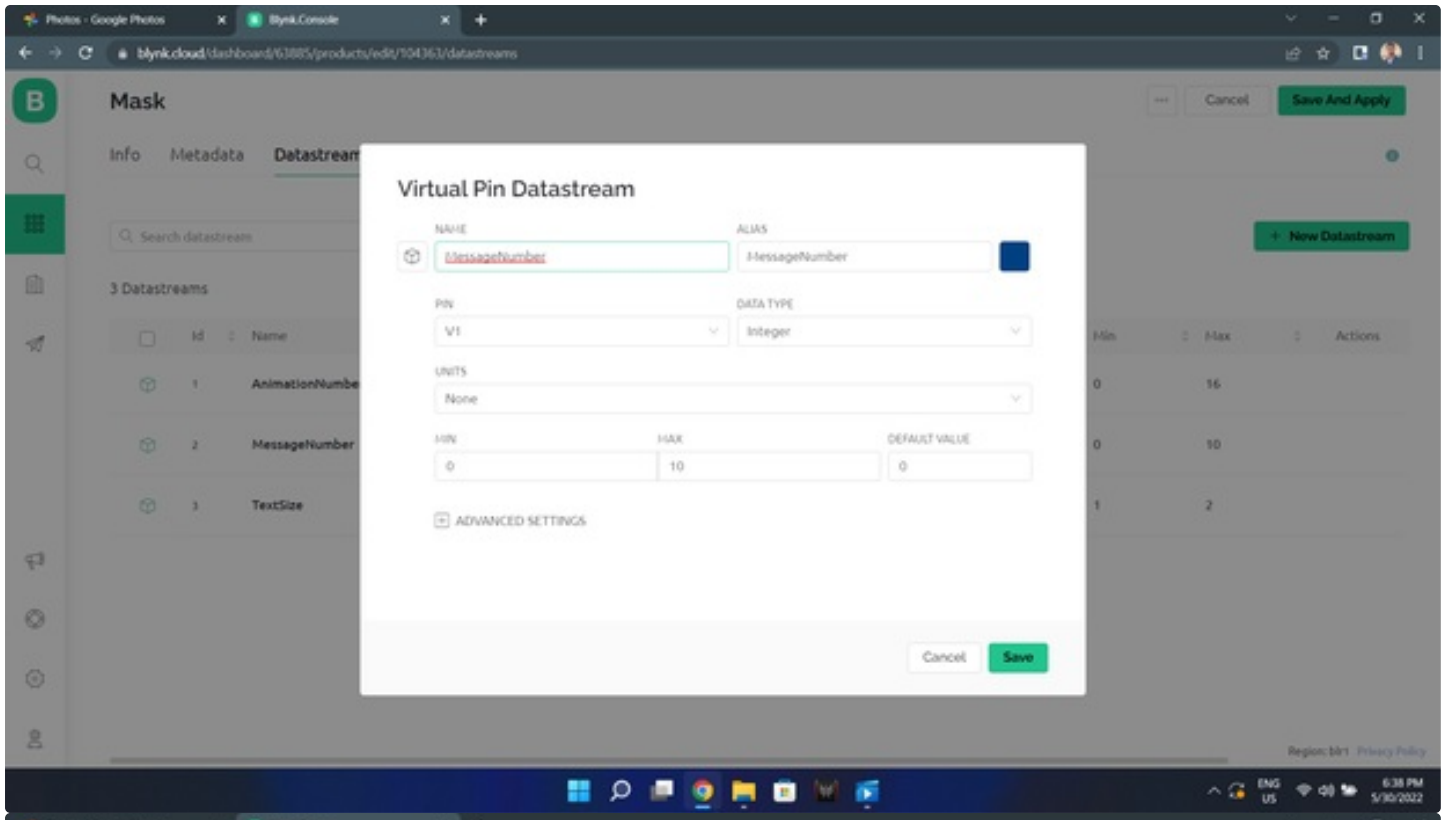
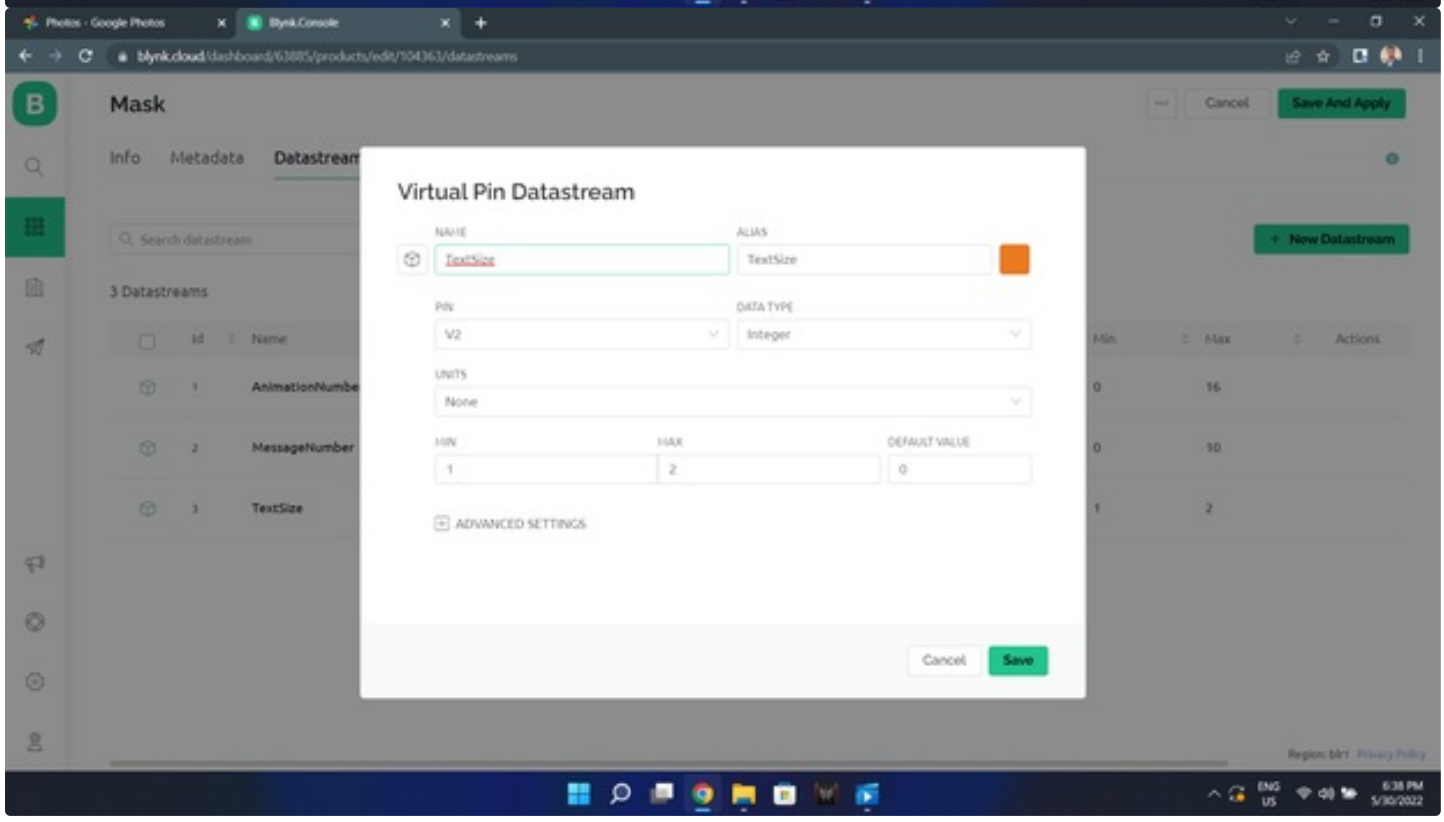
MIN
0
MAX
16
DEFAULT VALUE
0
ADVANCED SETTINGS
Cancel
Save





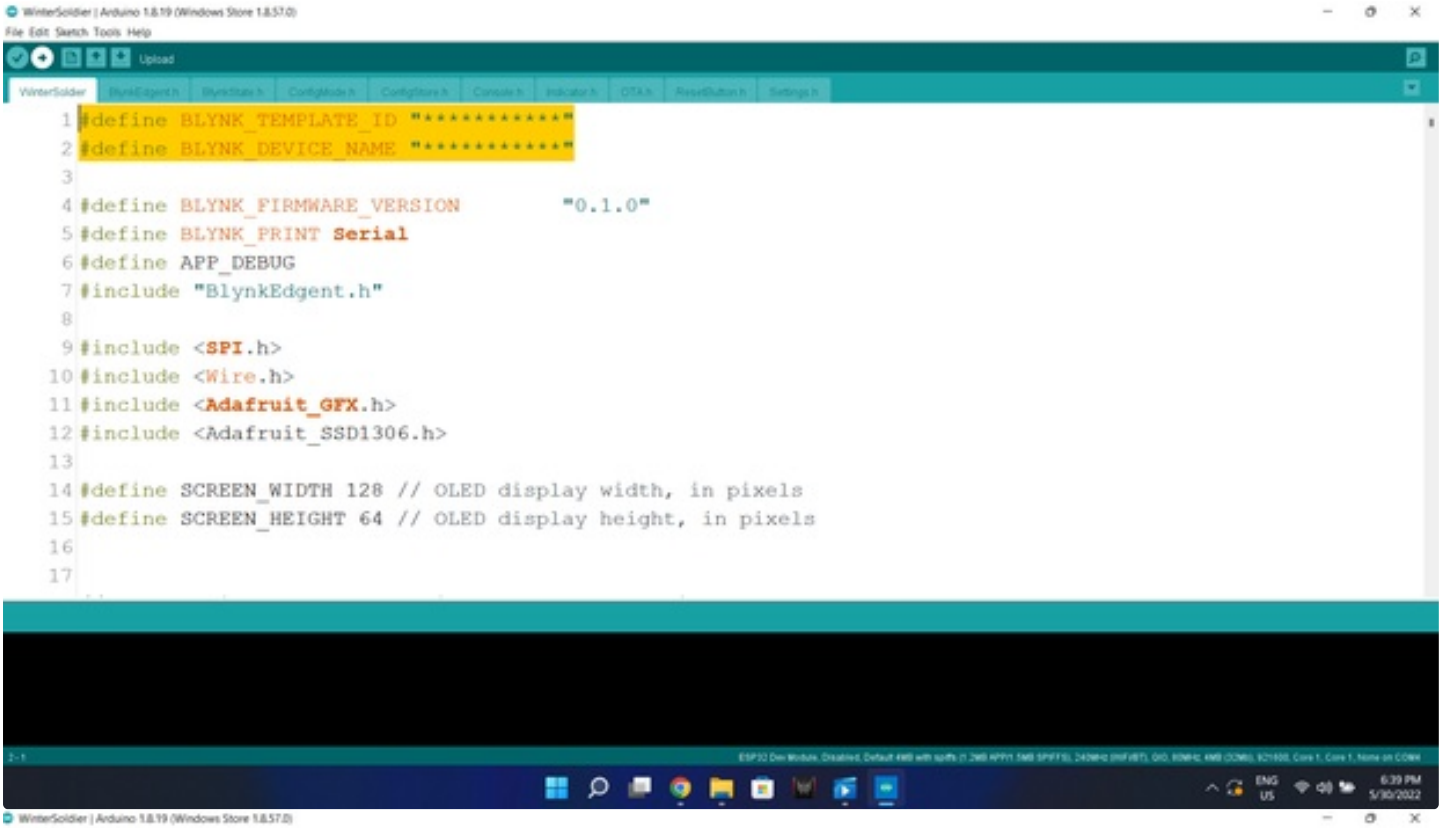
Step 7: Arduino Code

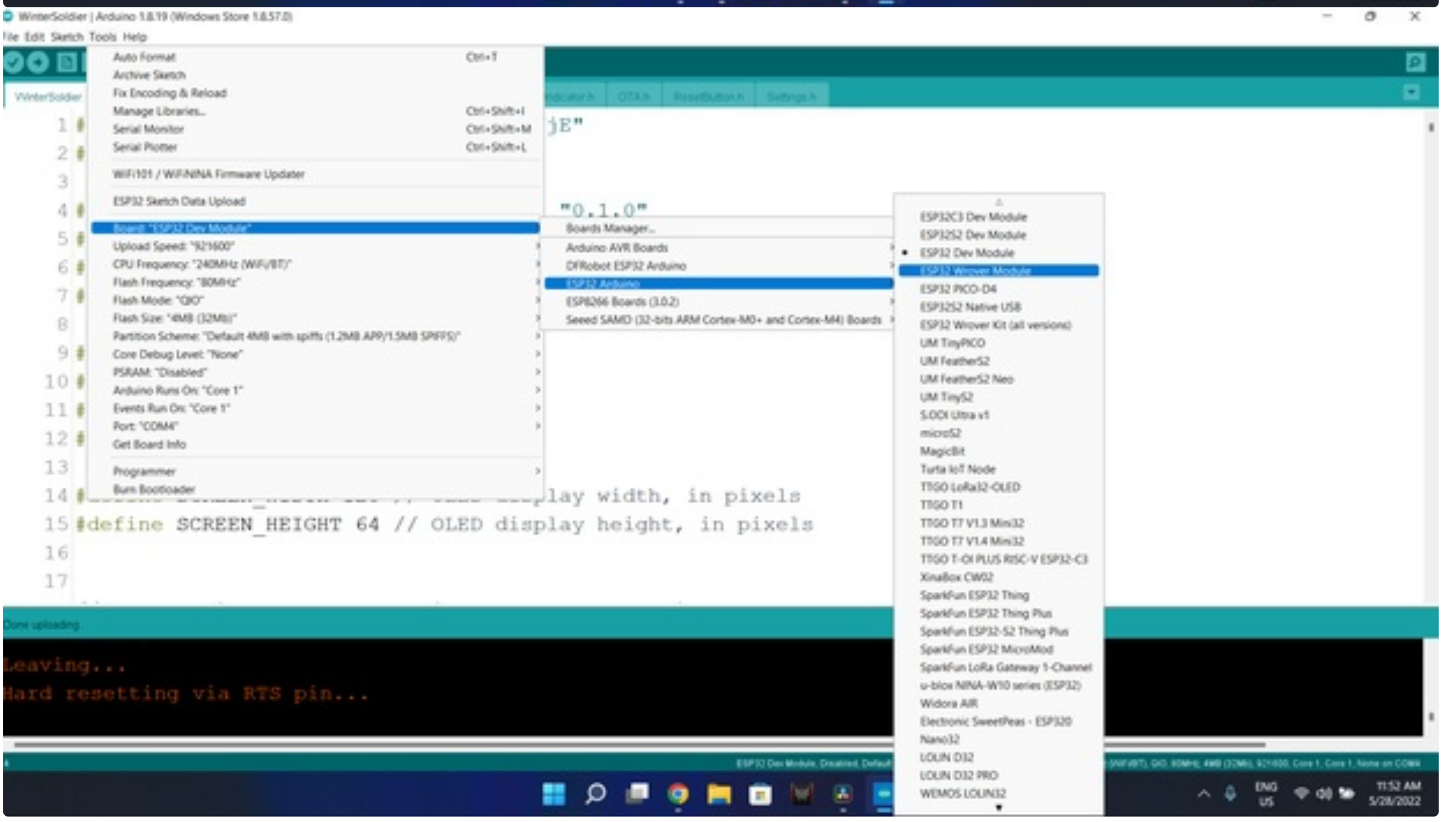
- Download the Arduino Code and extract the files.
- Open the code in Arduino IDE.
- Make sure that you have installed Blynk library in the arduino IDE.

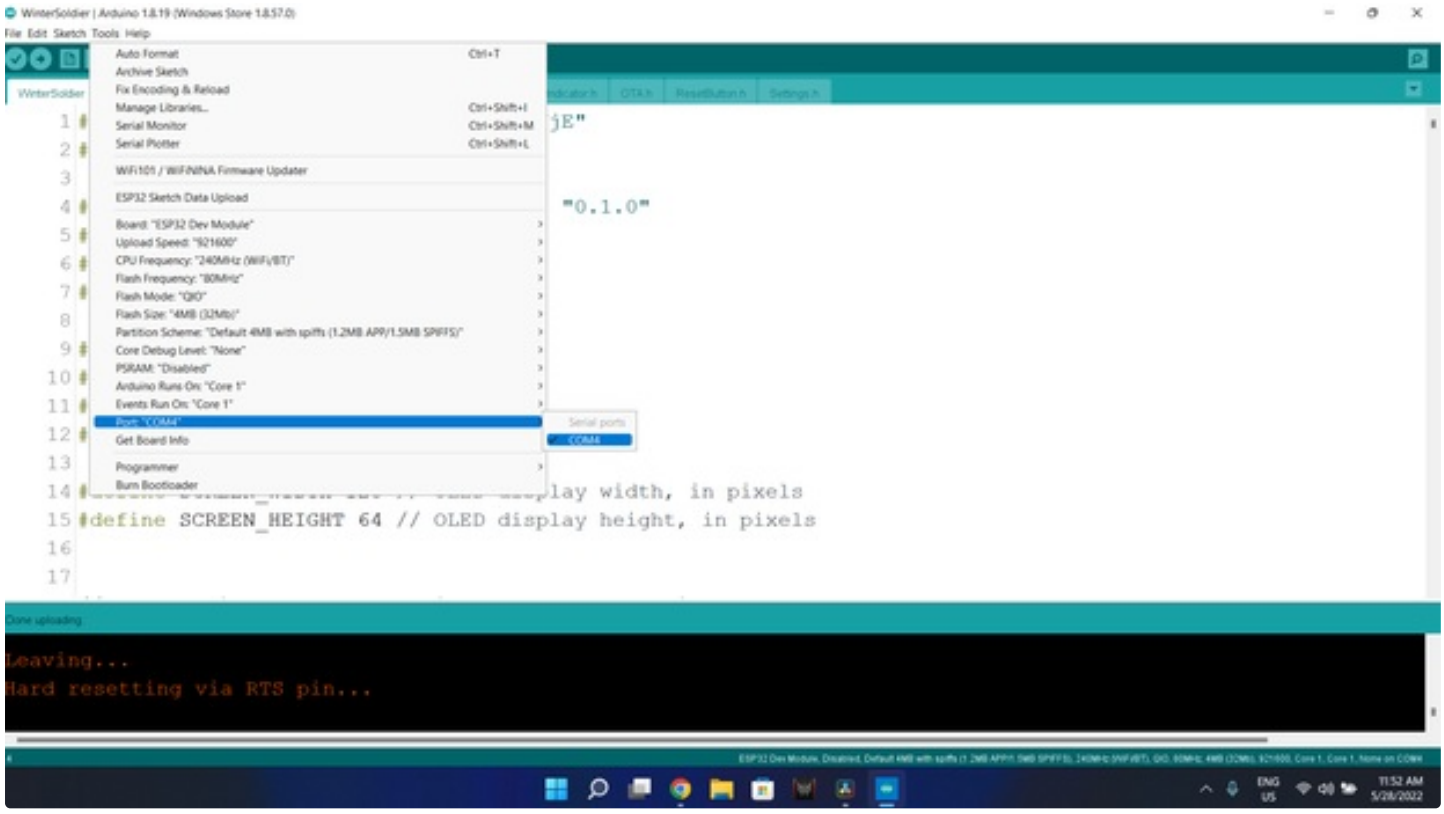
- Paste the Template ID and Name From the blynk template that you have created.

```
#define BLYNK_TEMPLATE_ID "**********"
#define BLYNK_DEVICE_NAME "**********"
```

- Now choose the board type as ESP32, choose the right com port and upload the code.

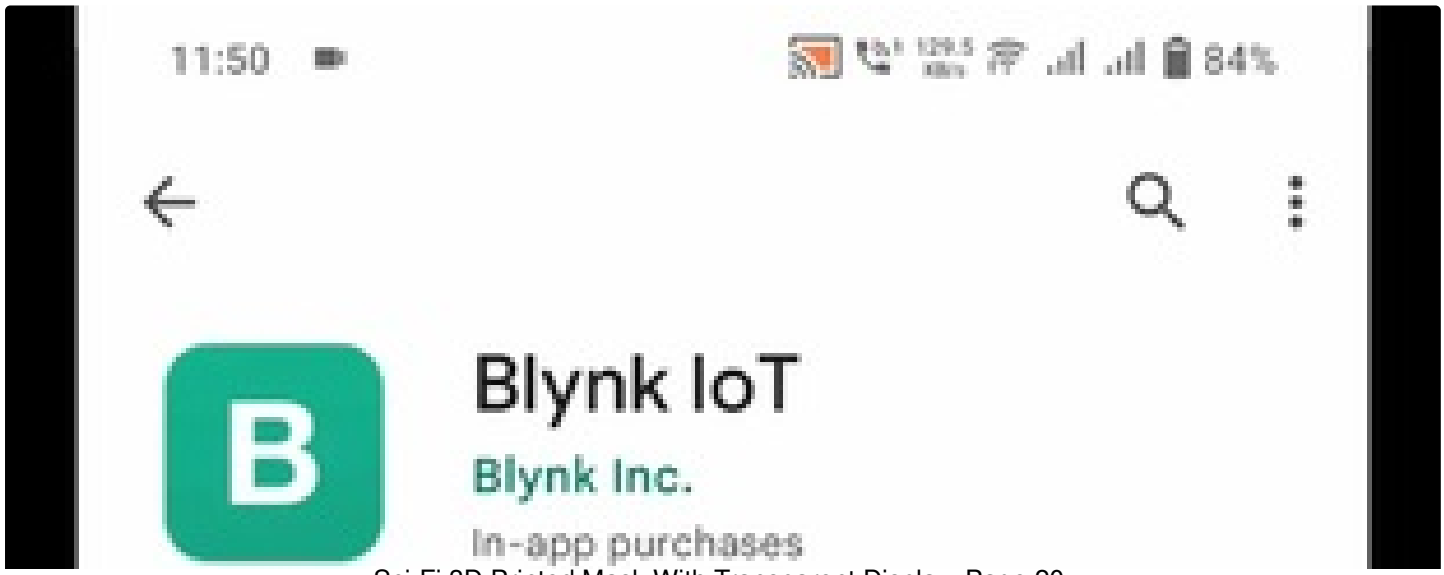


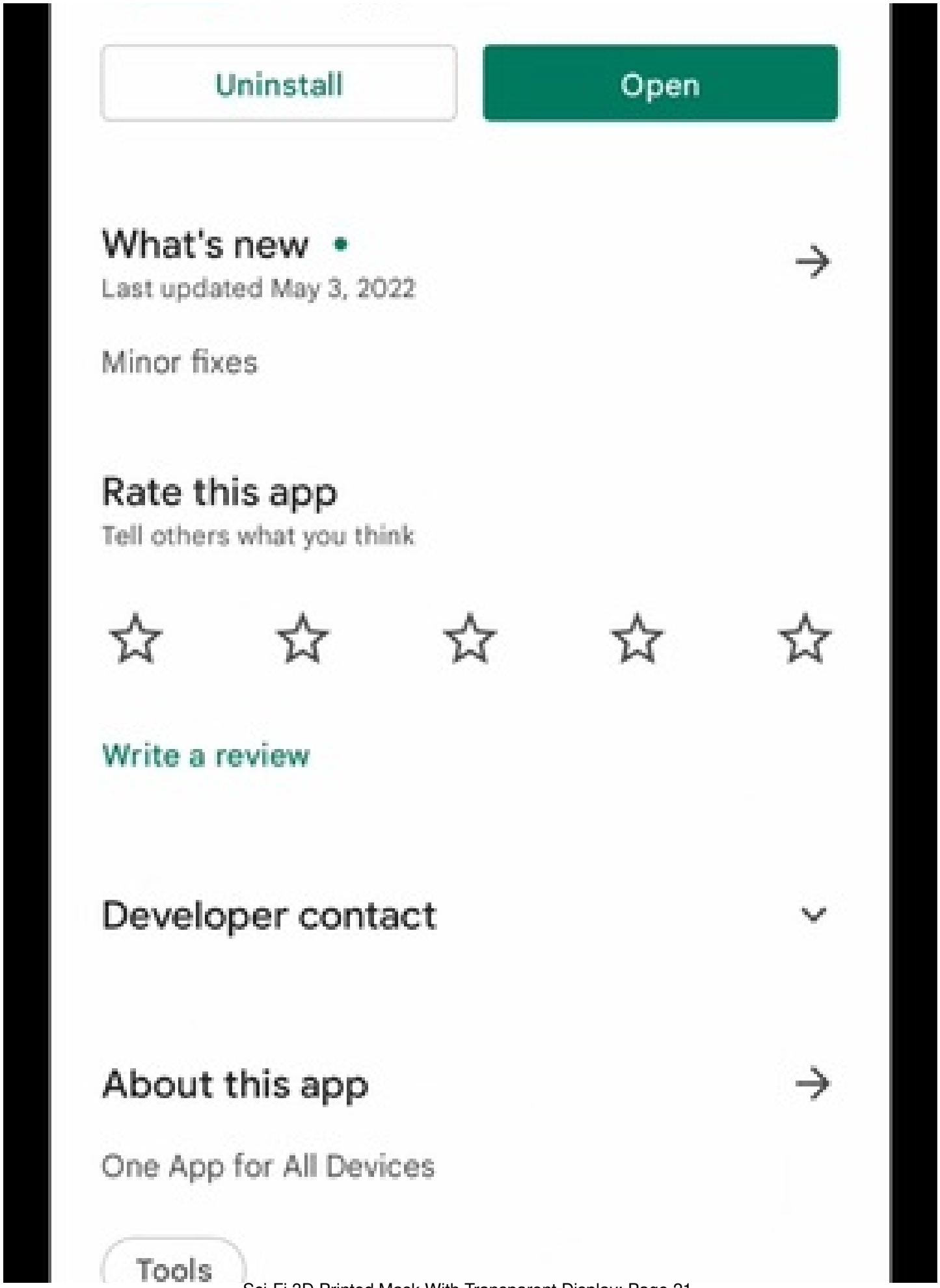


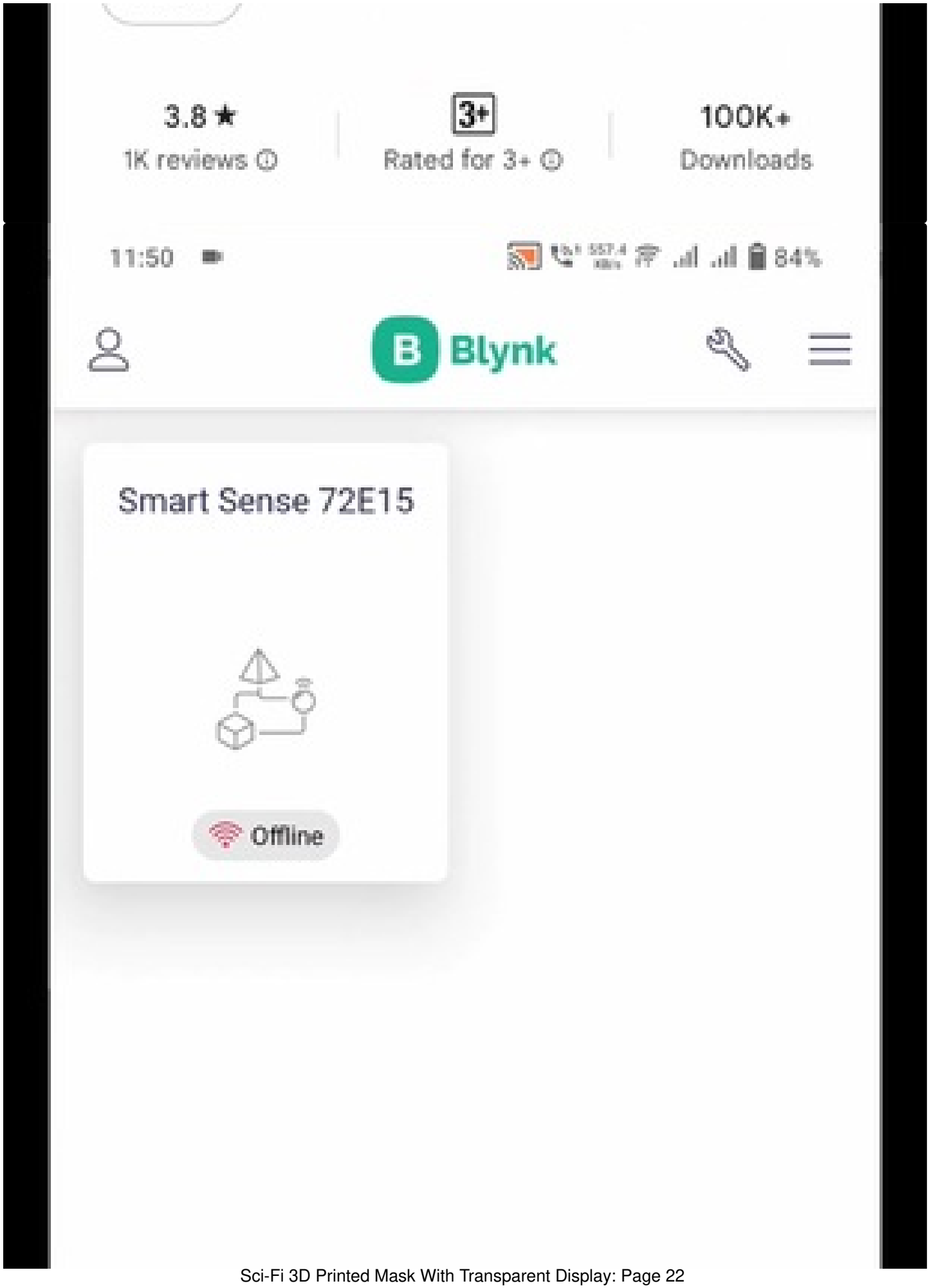


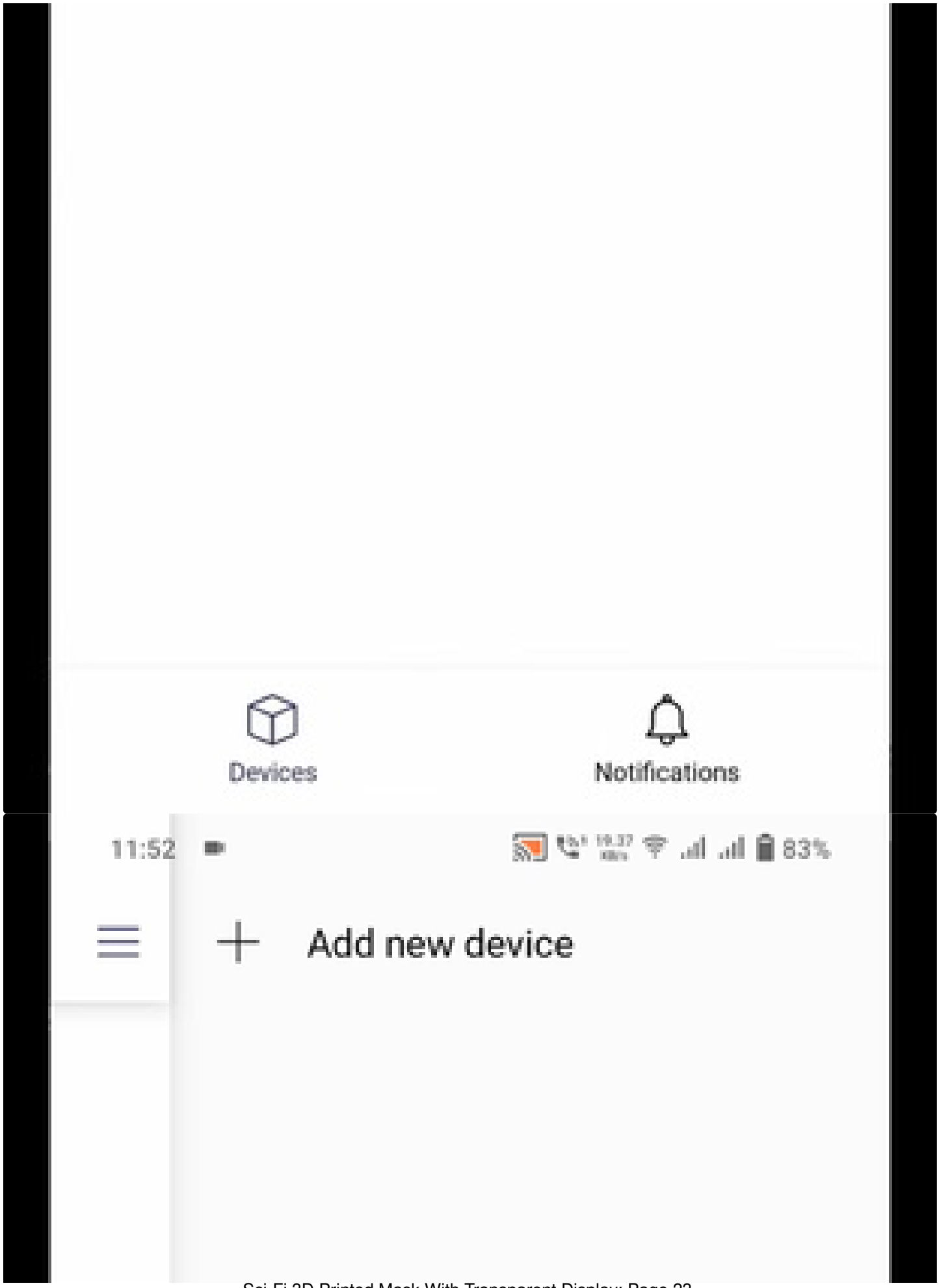
Step 8: Dashboard Setup

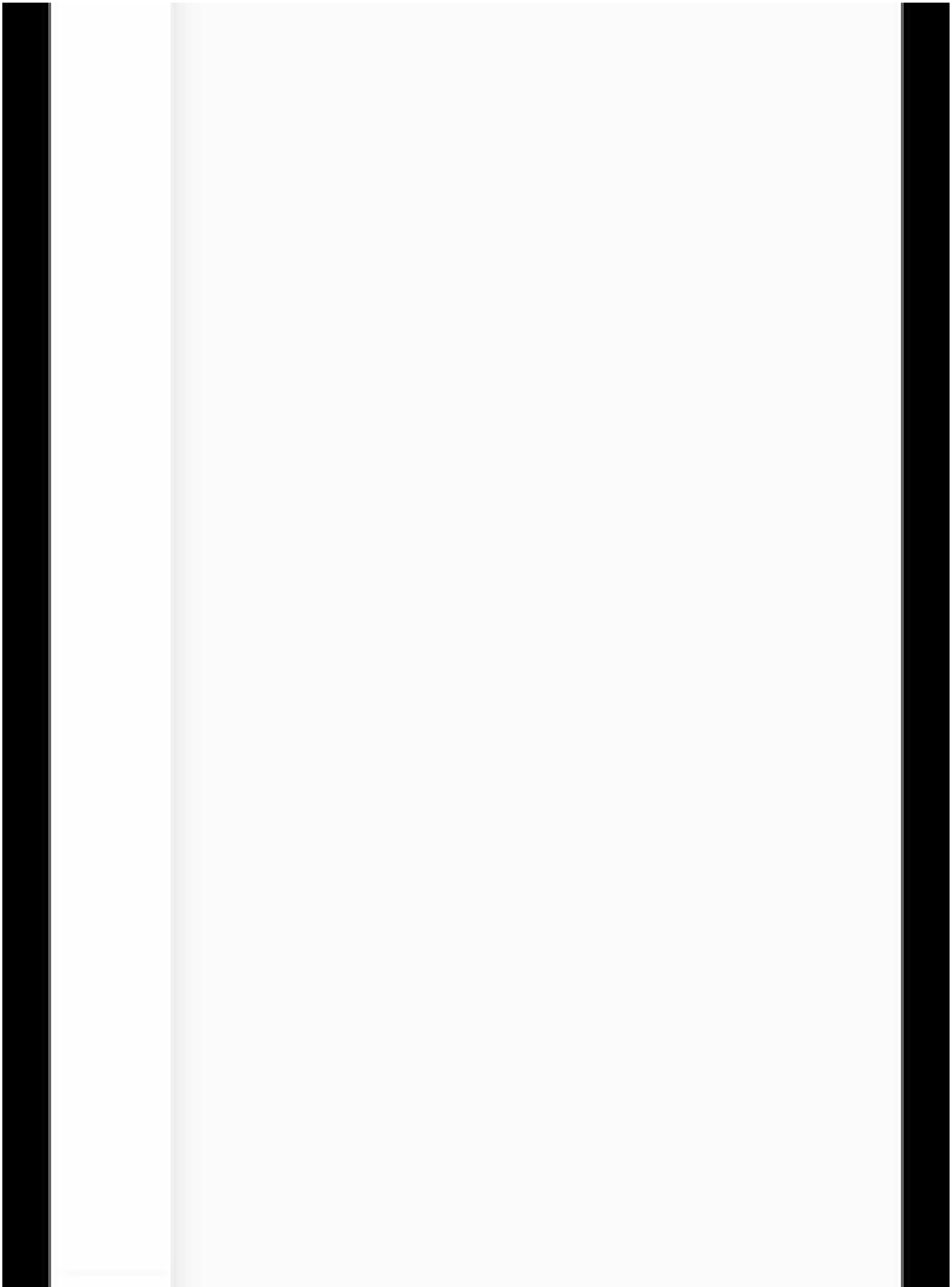
- Install the Blynk IOT app on you smart phone(Android/ IOS).
- Login with the same blynk account.
- Click on the 3 lines on top right side and click on add new device (Make sure the ESP32 is turned ON).
- You will find the device that you have created, click on it.
- Enter your Wi-Fi credentials and click on connect.
- After your device is connected setup the dashboard.
- Drag and drop 3 sliders, resize them as you want and assign each slider a DataStream that you have created.

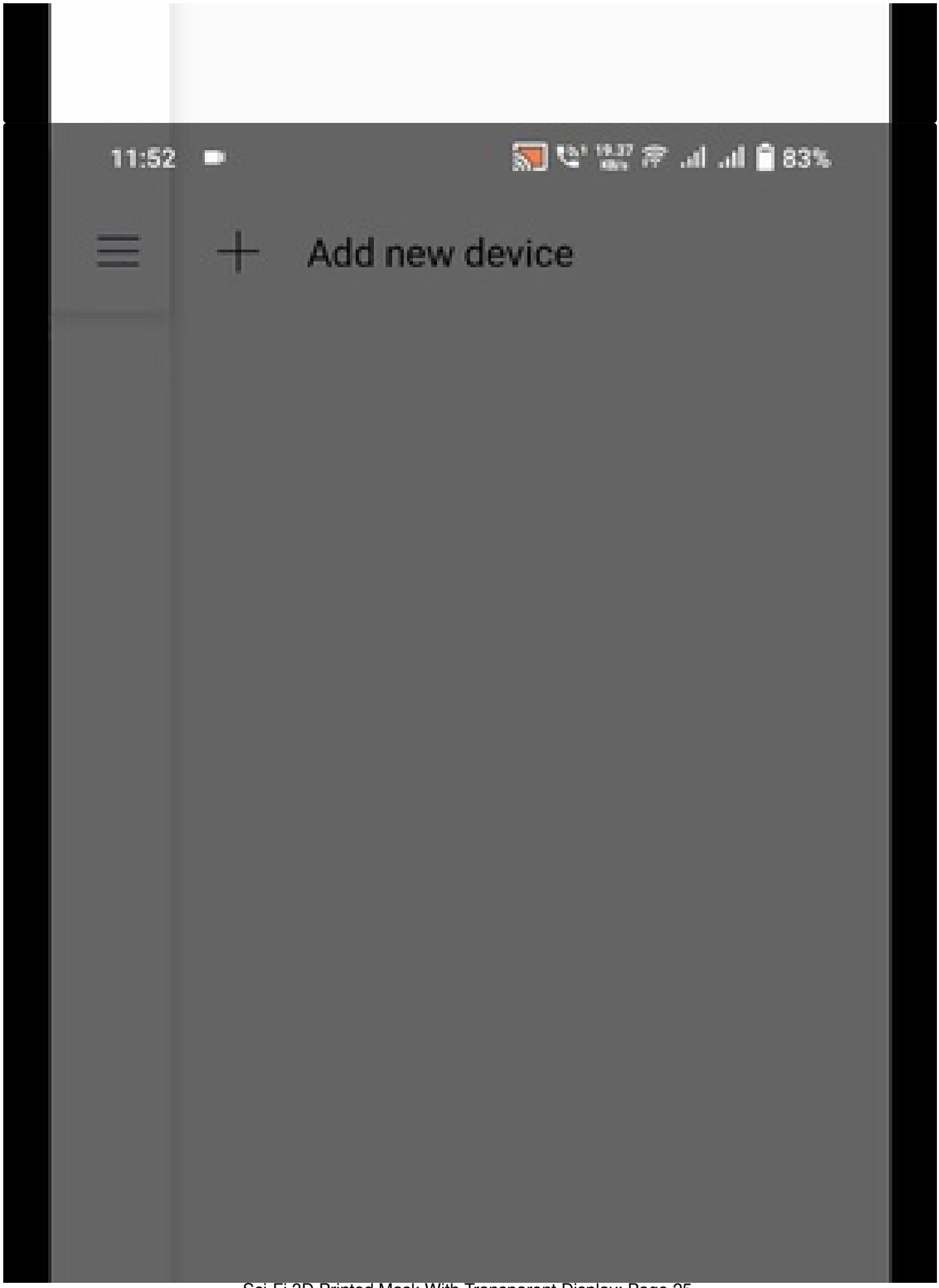


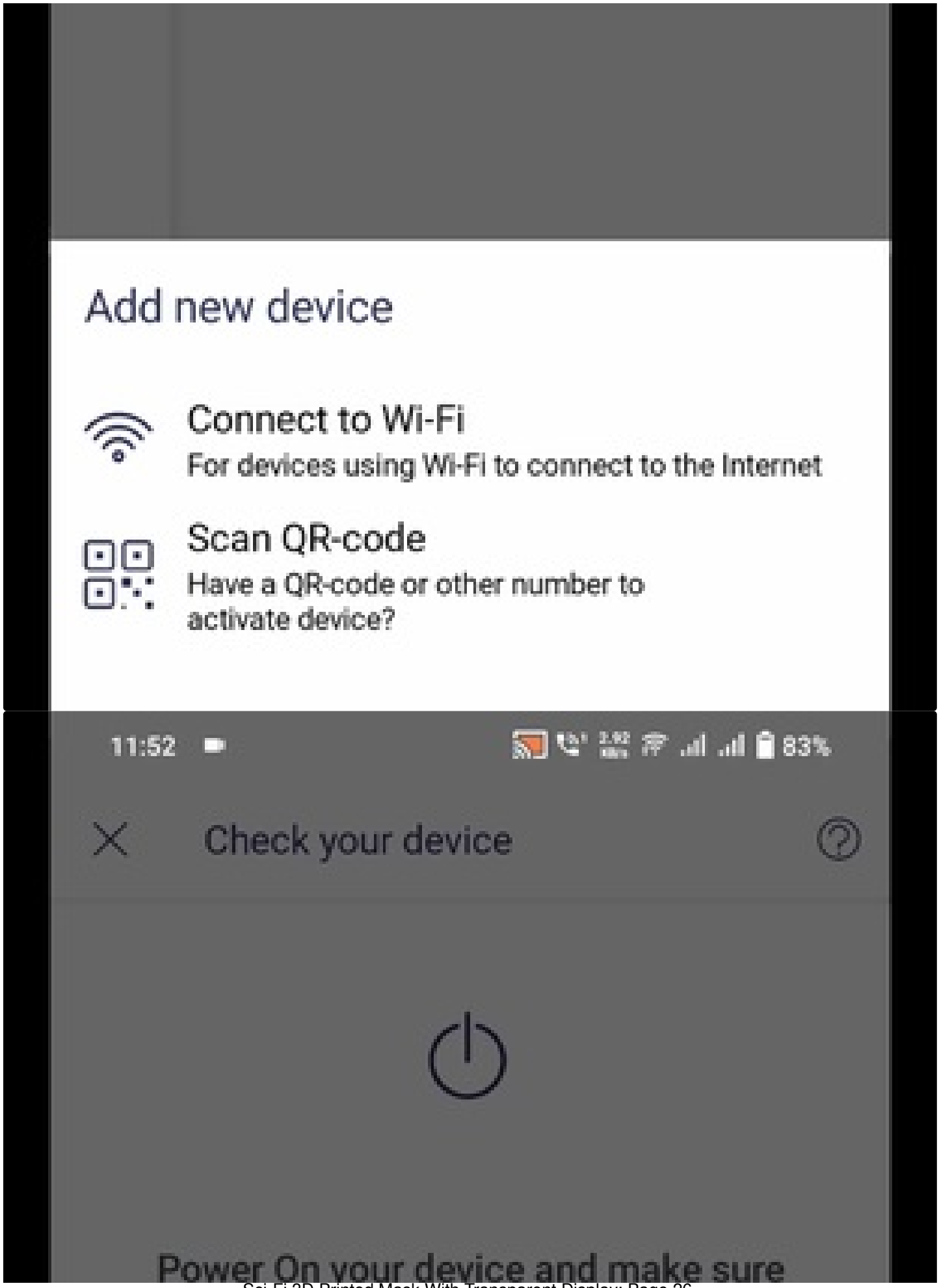

Uninstall
Open
What's new
Last updated May 3, 2022
Minor fixes
Rate this app
Tell others what you think
Write a review
Developer contact
About this app
One App for All Devices
Tools

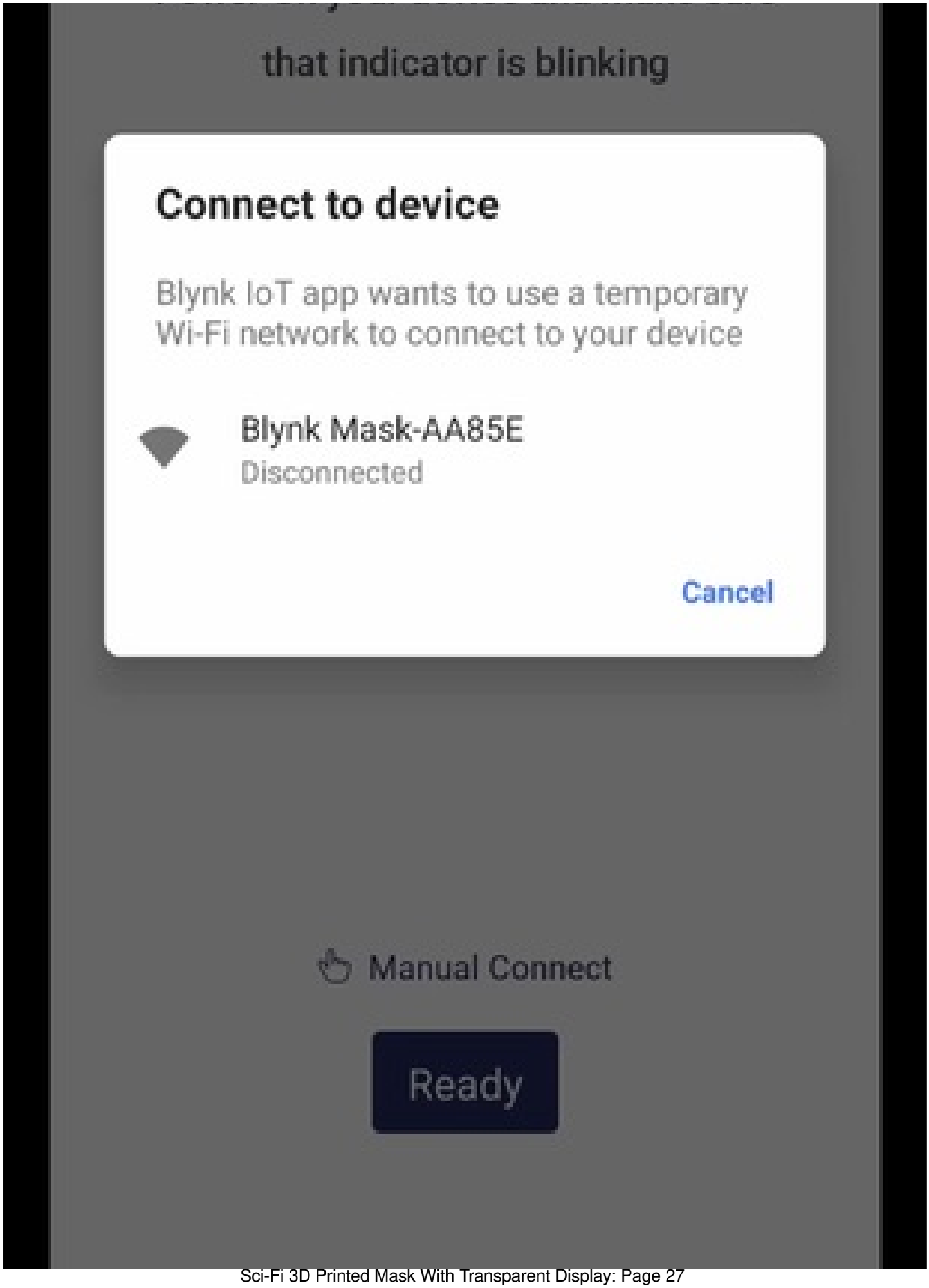

3.8 ★
1K reviews
3+
Rated for 3+
100K+
Downloads
11:50
84%
Blynk
Smart Sense 72E15
Offline

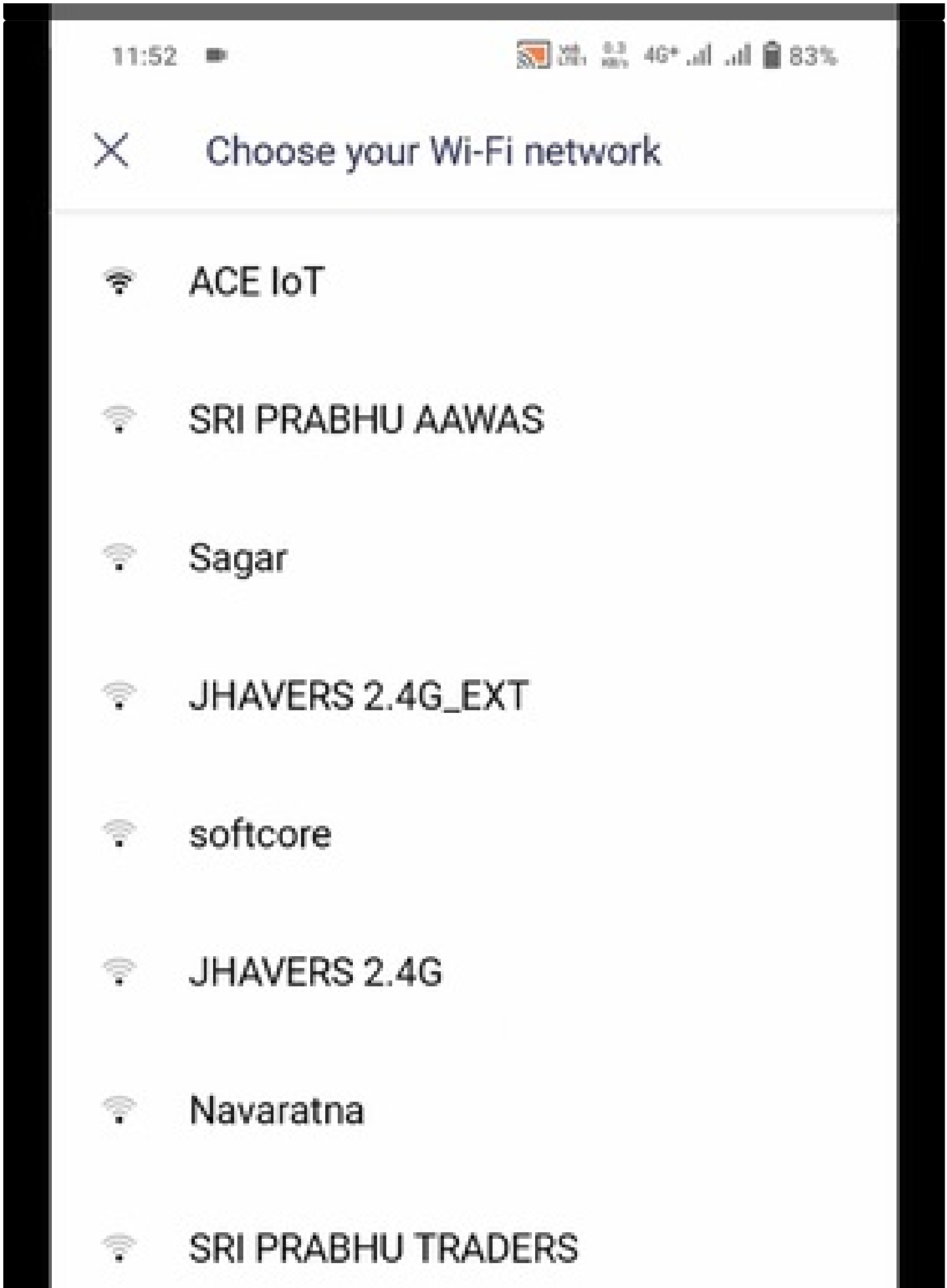

Devices
Notifications
11:52
83%
Add new device

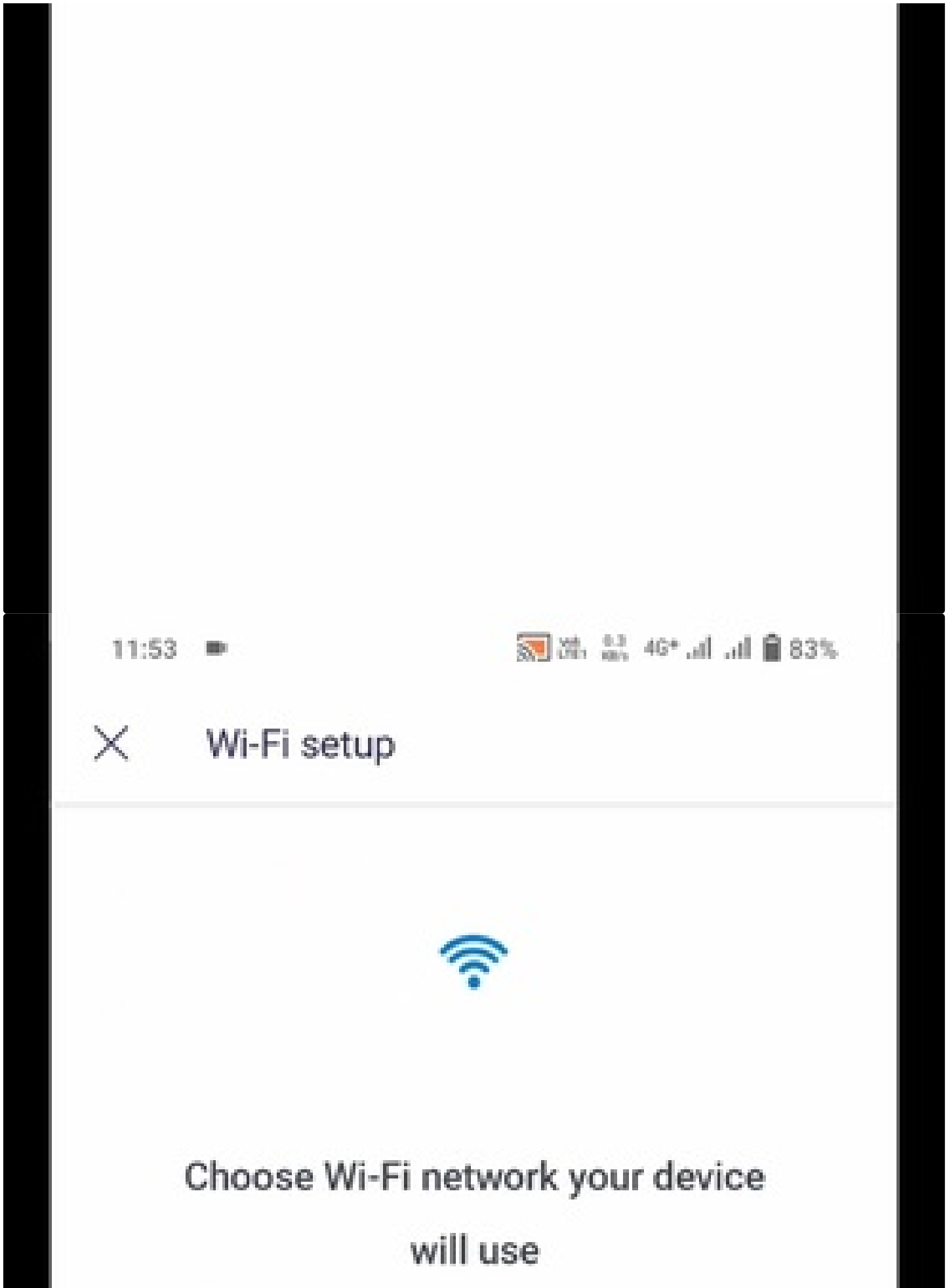


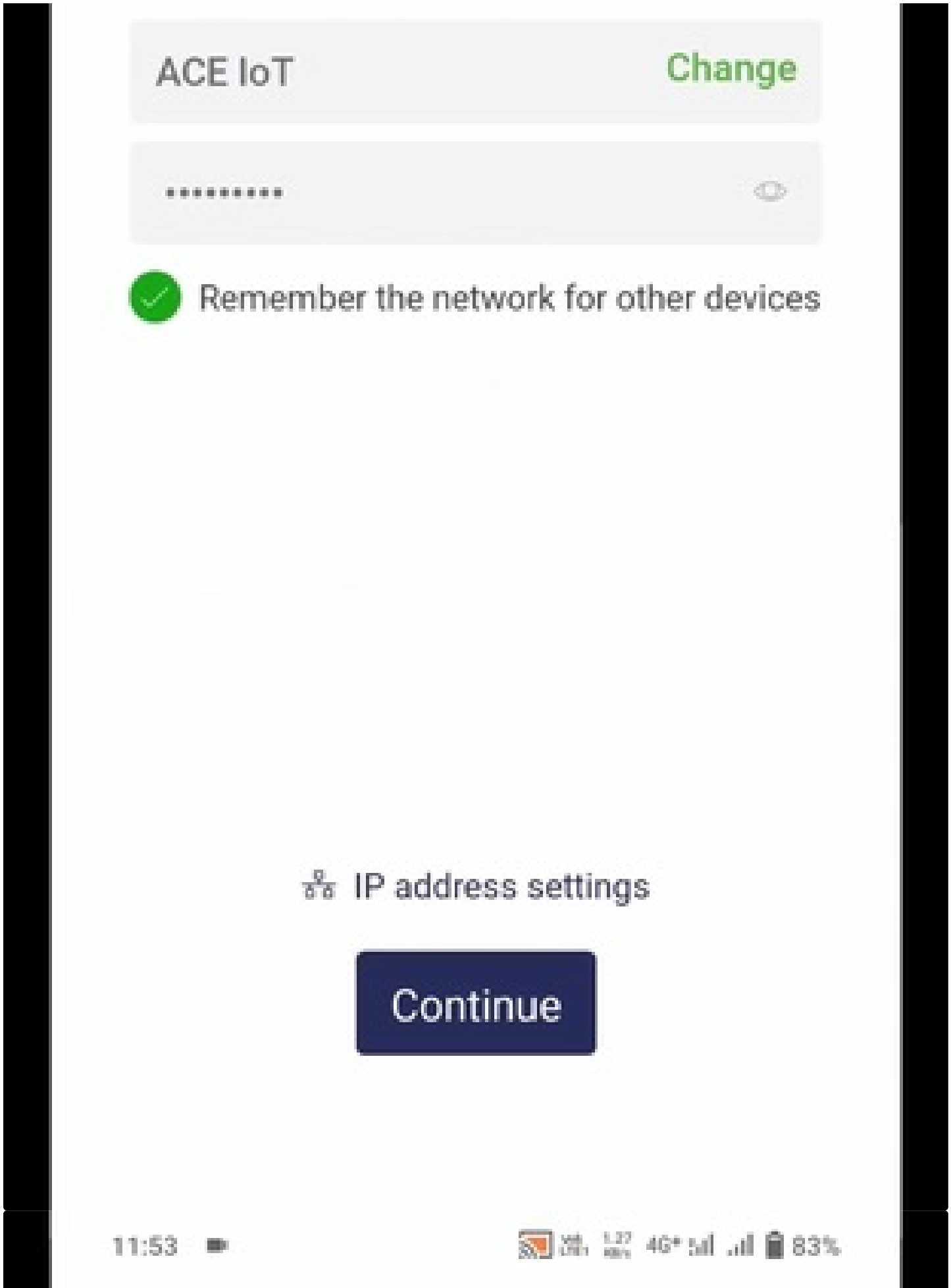

11:52
83%
Add new device

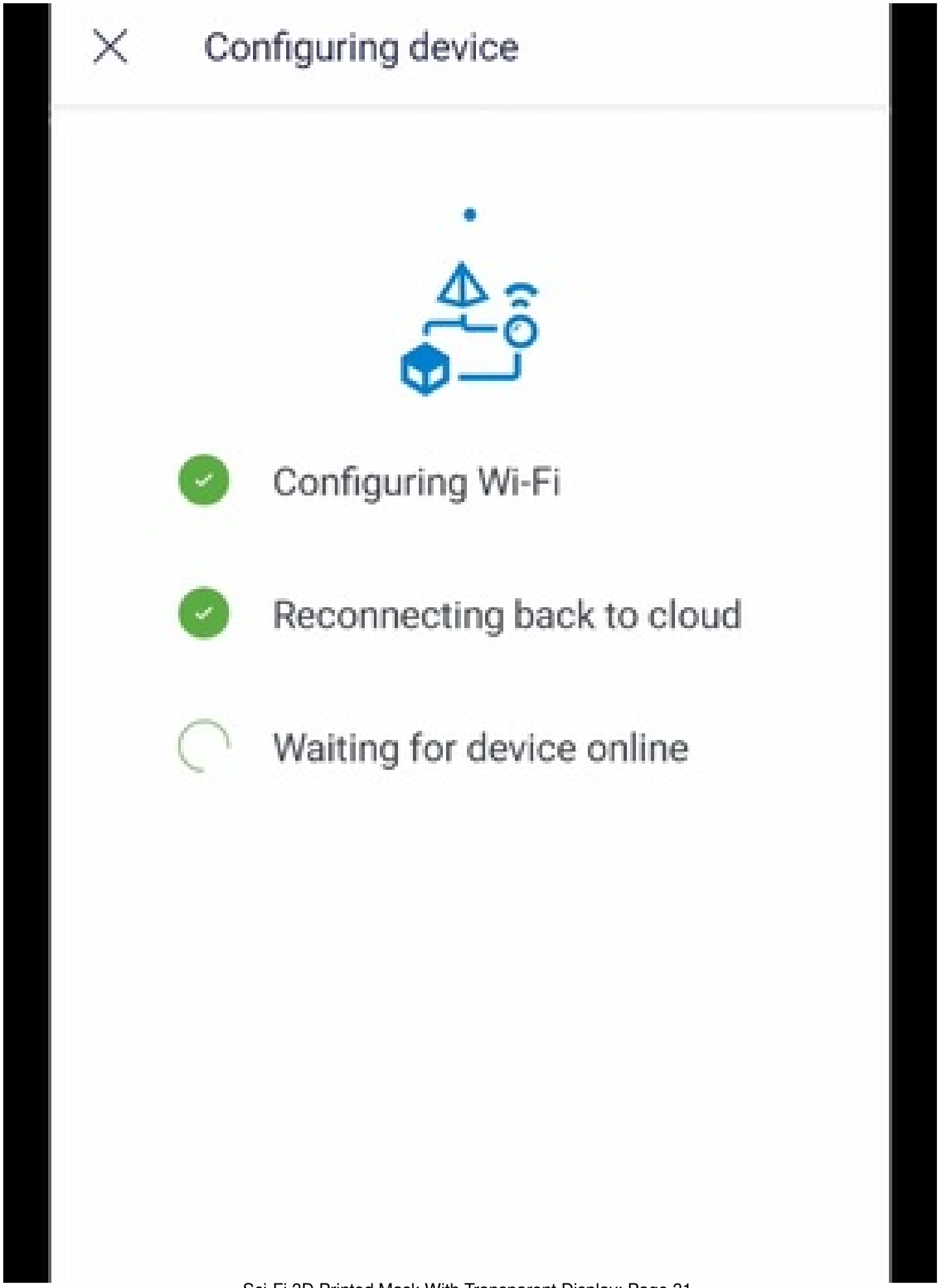

Add new device
Connect to Wi-Fi
For devices using Wi-Fi to connect to the Internet
Scan QR-code
Have a QR-code or other number to activate device?
11:52
83%
Check your device
Power On your device and make sure

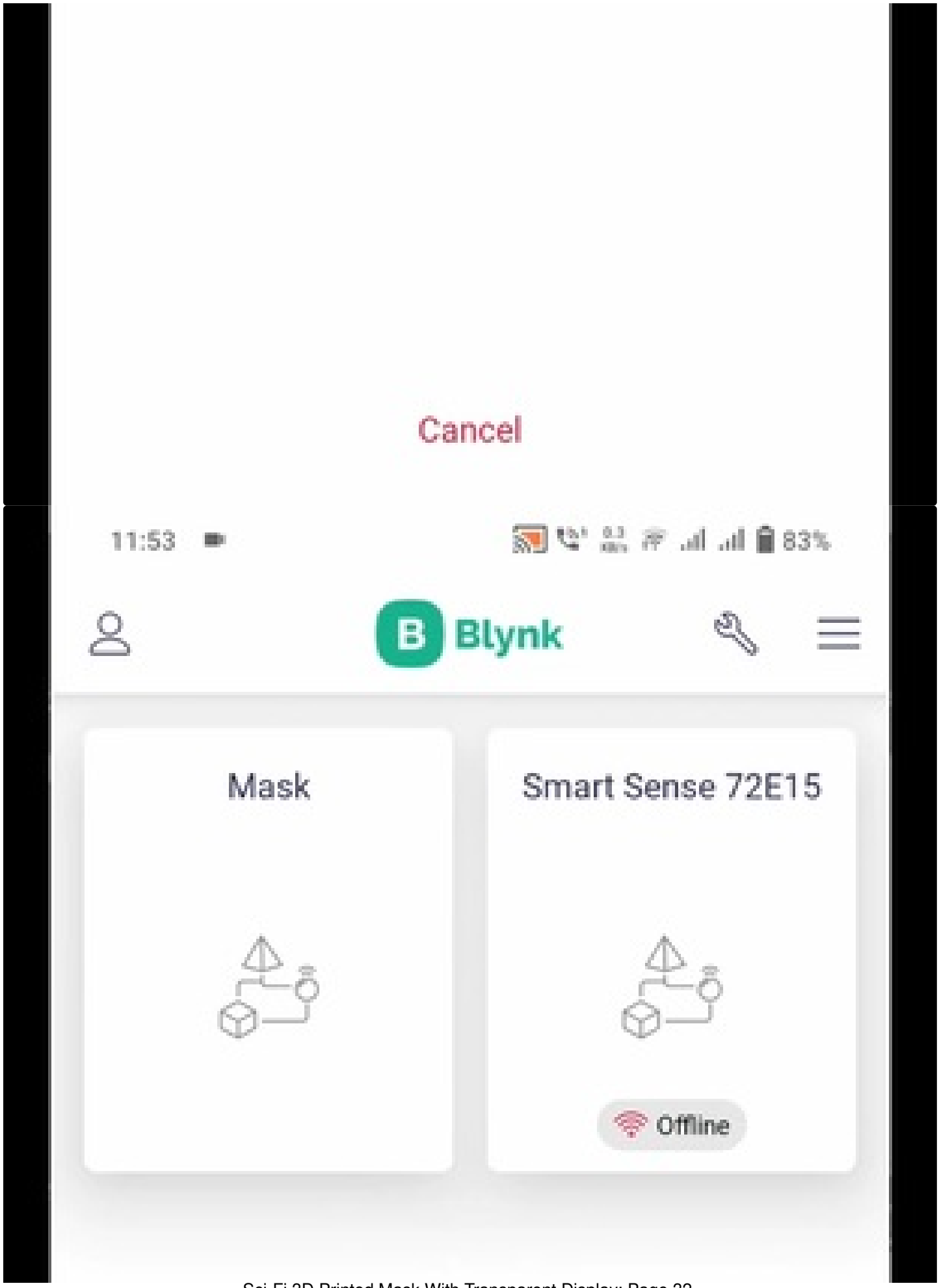

that indicator is blinking
Connect to device
Blynk IoT app wants to use a temporary Wi-Fi network to connect to your device
Blynk Mask-AA85E
Disconnected
Cancel
Manual Connect
Ready

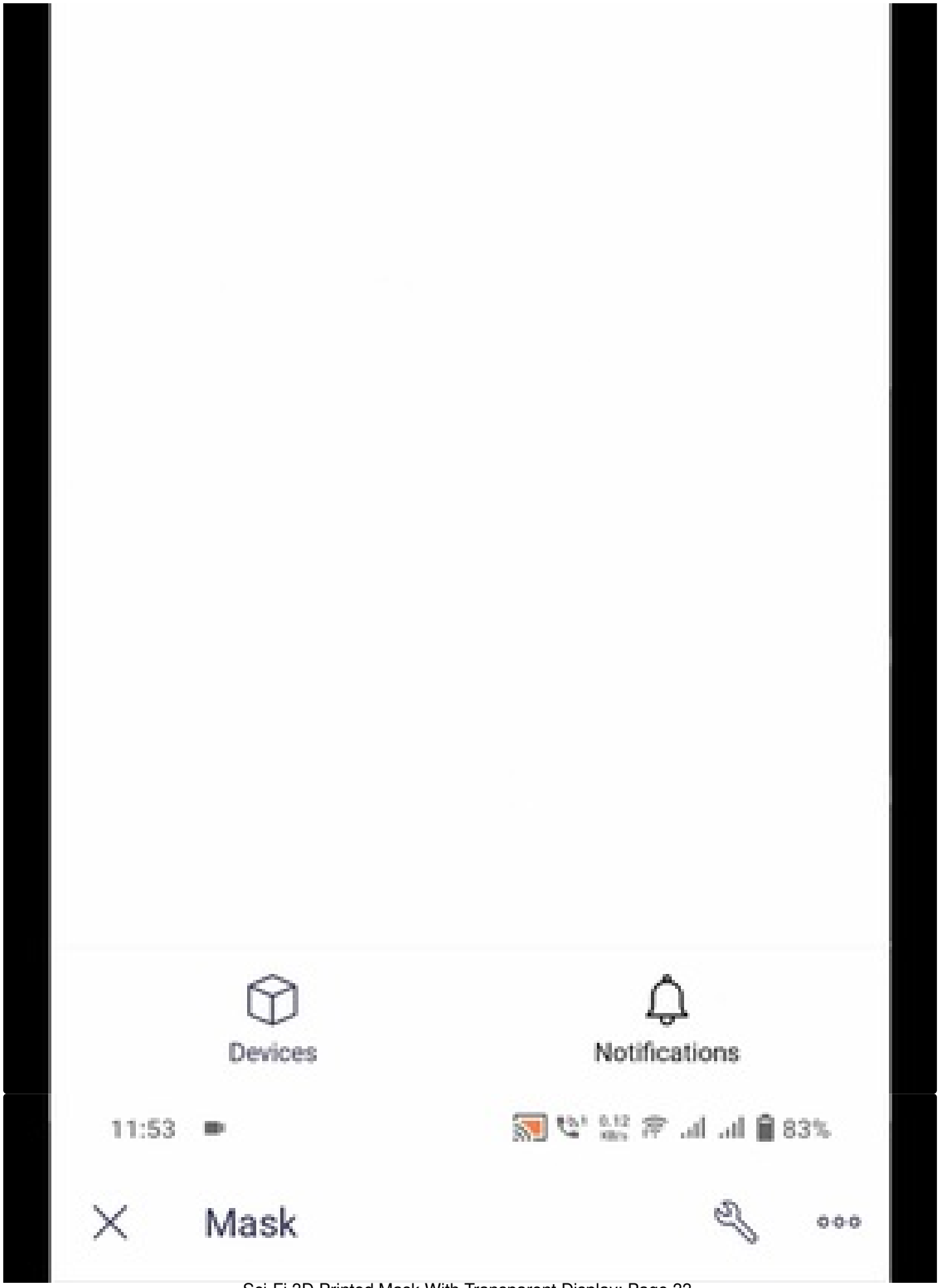

11:52
83%
Choose your Wi-Fi network
ACE IoT
SRI PRABHU AAWAS
Sagar
JHAVERS 2.4G_EXT
softcore
JHAVERS 2.4G
Navaratna
SRI PRABHU TRADERS


11:53
83%
Wi-Fi setup
Choose Wi-Fi network your device
will use


ACE IoT
Change
Remember the network for other devices
IP address settings
Continue
11:53
83%


Configuring device
Configuring Wi-Fi
Reconnecting back to cloud
Waiting for device online

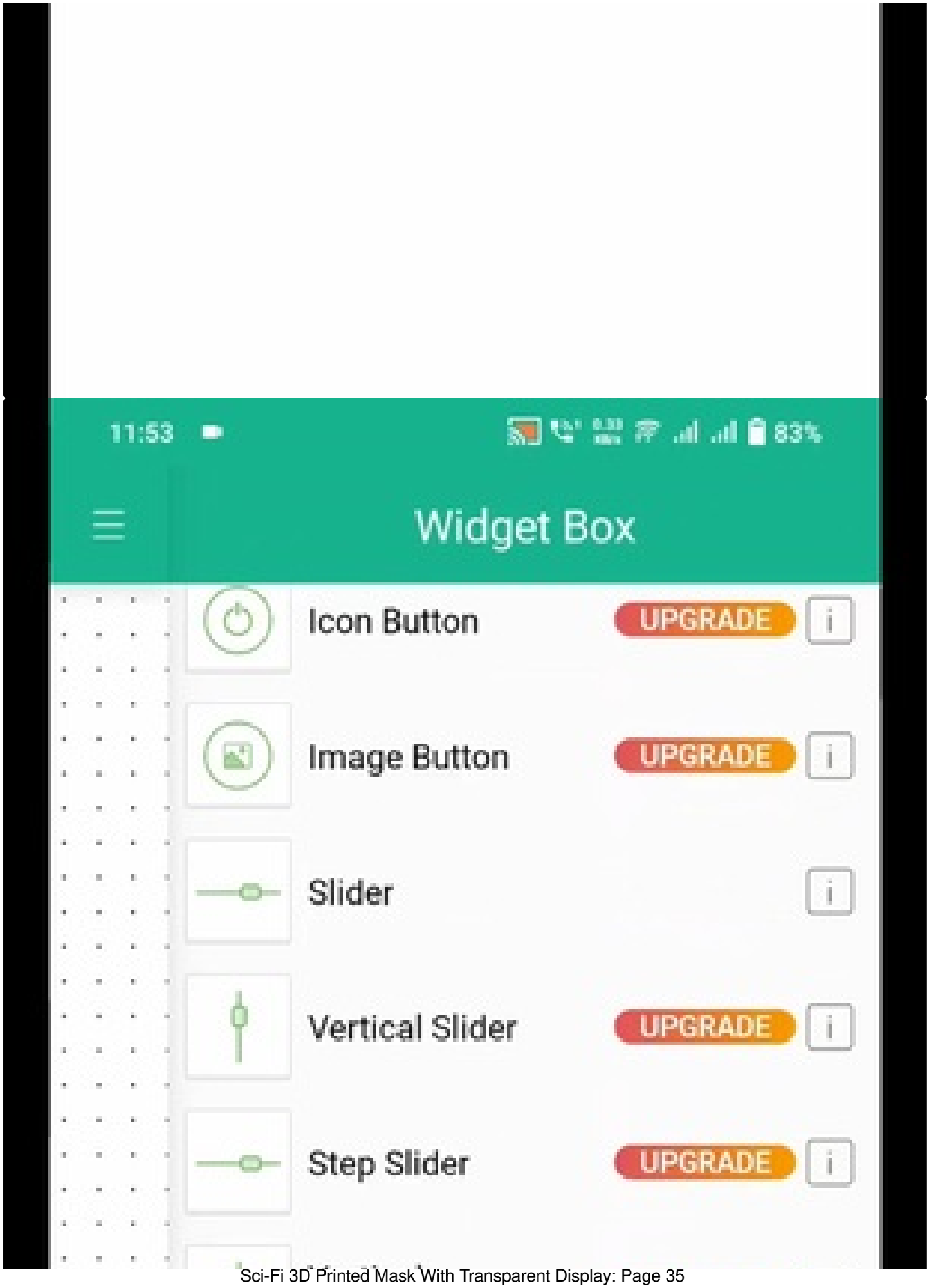

Cancel
11:53
83%
Blynk
Mask
Smart Sense 72E15
Offline

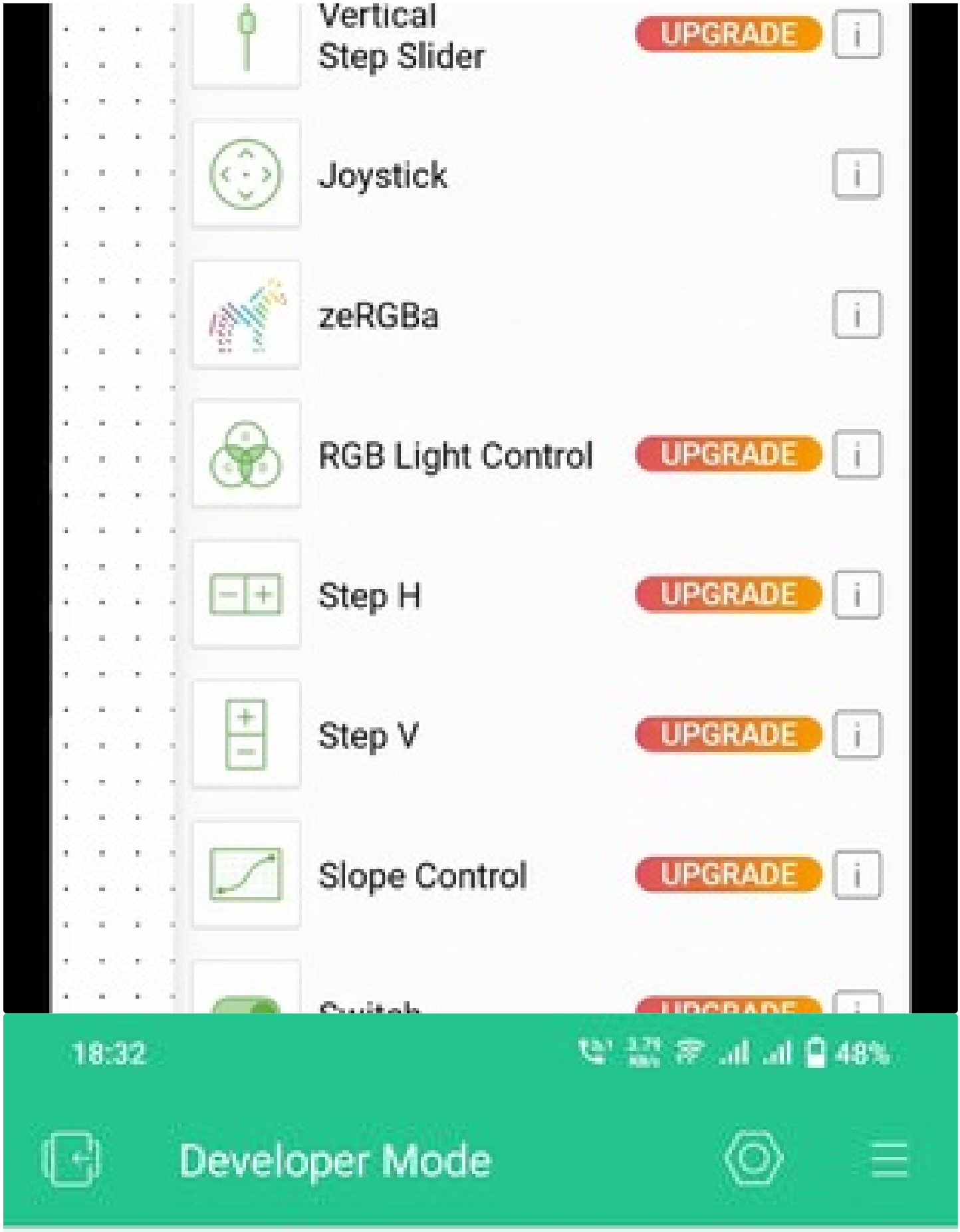

Devices
Notifications
11:53
83%
Mask

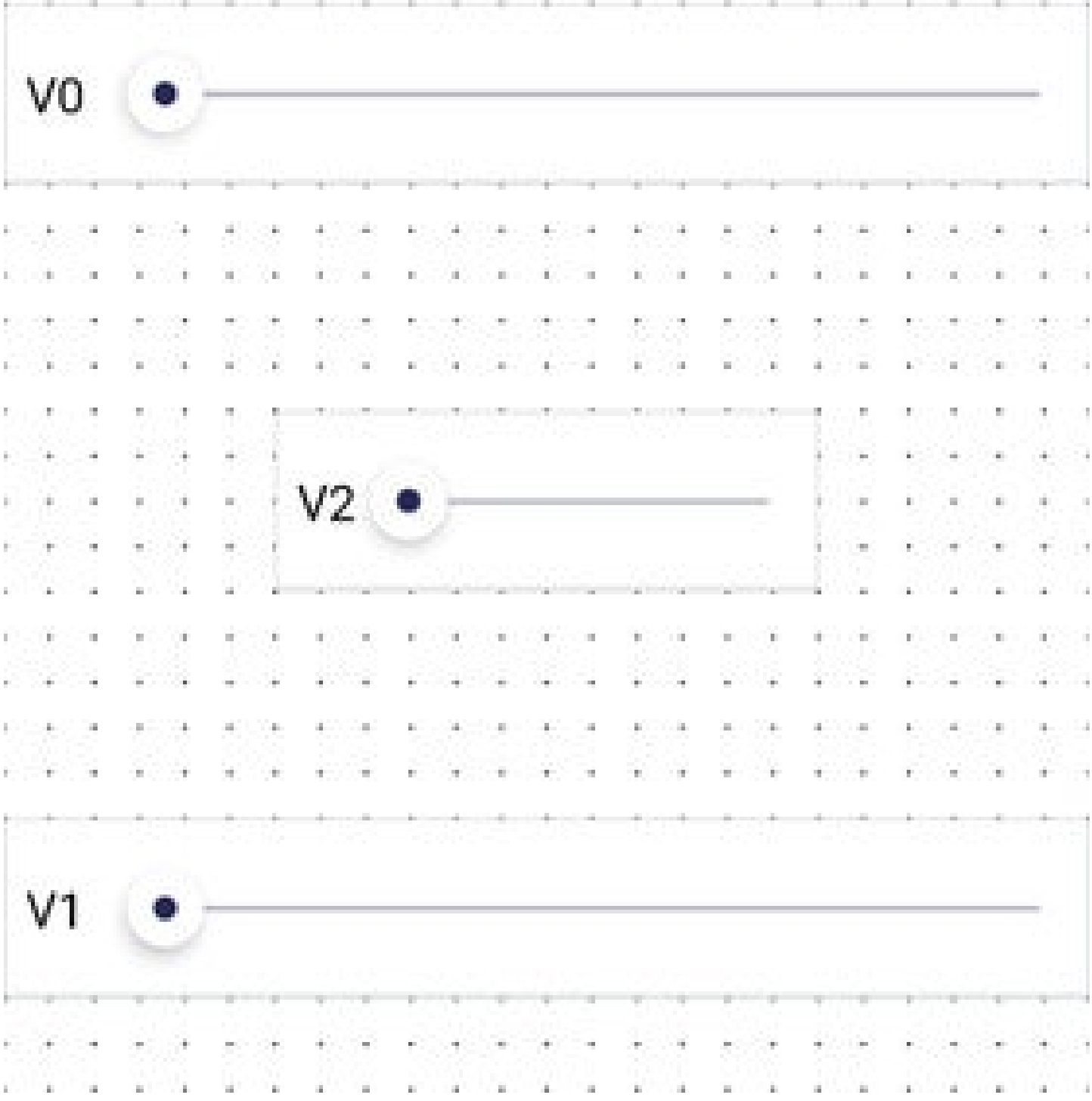
Setup your mobile dashboard

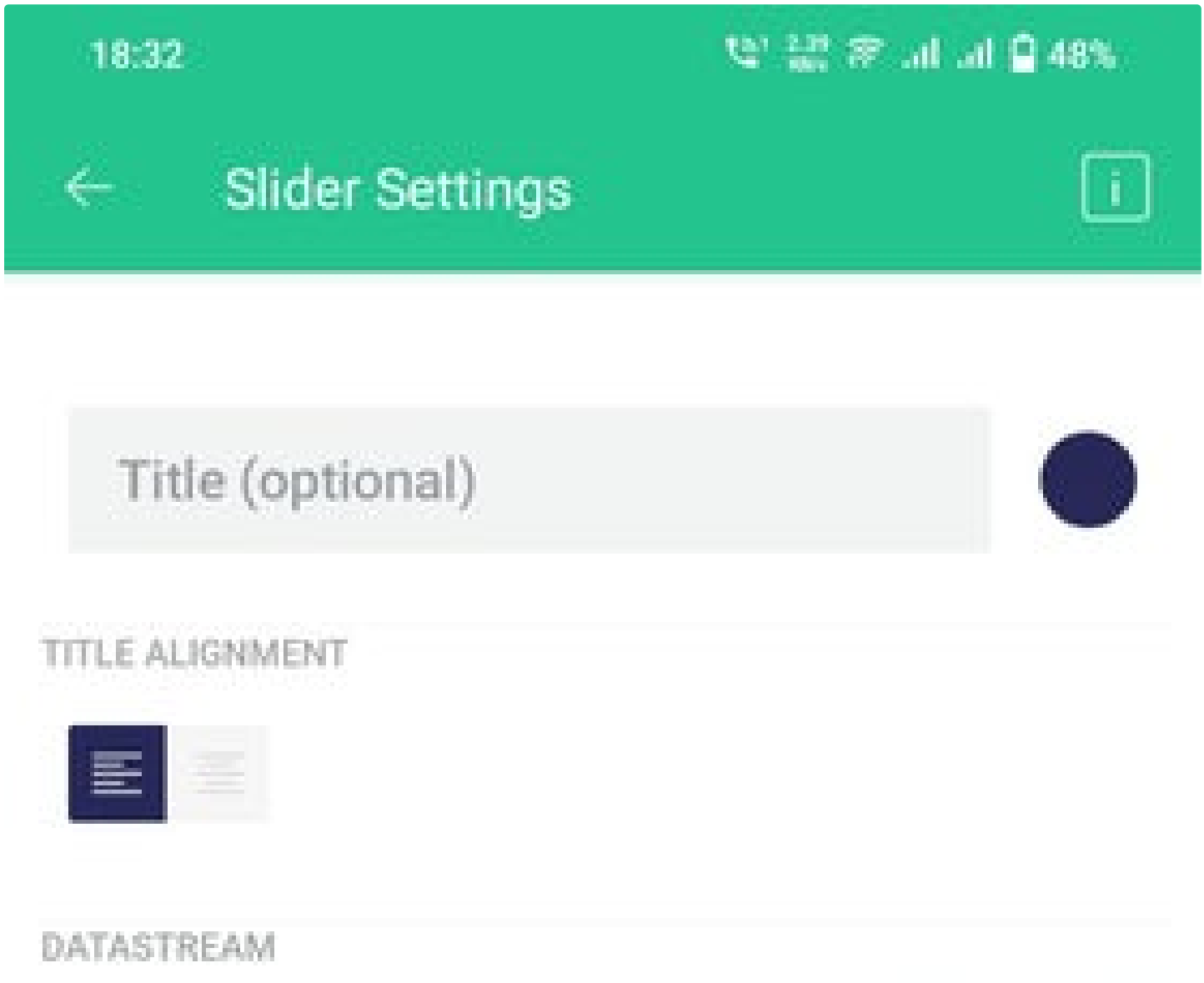
Start adding mobile widgets by tapping the button below

Setup Dashboard


11:53
83%
Widget Box
Icon Button
UPGRADE
Image Button
UPGRADE
Slider
Vertical Slider
UPGRADE
Step Slider
UPGRADE


Vertical
Step Slider
UPGRADE
Joystick
zeRGBa
RGB Light Control
UPGRADE
Step H
UPGRADE
Step V
UPGRADE
Slope Control
UPGRADE
18:32
48%
Developer Mode


V0
V2
V1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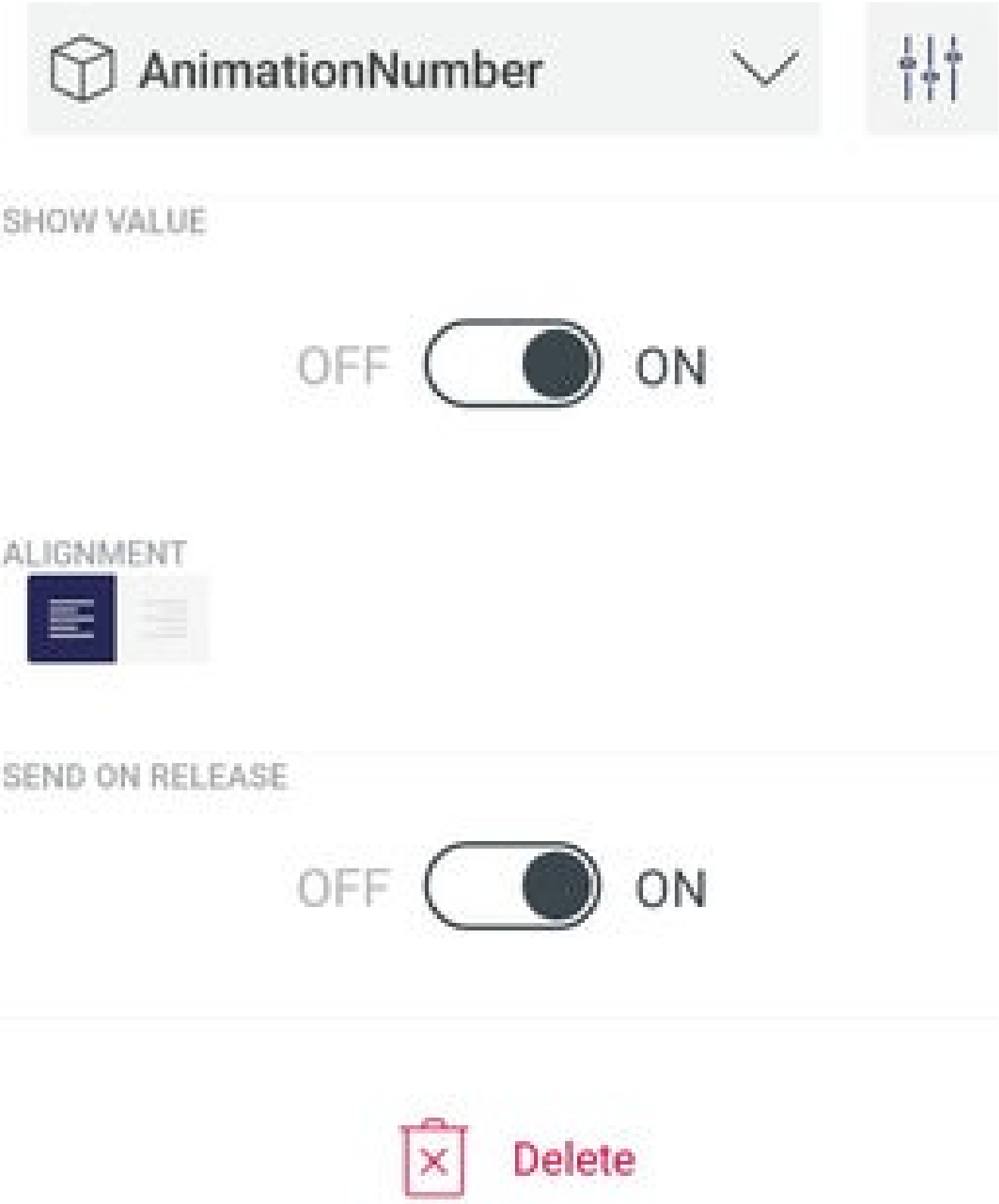
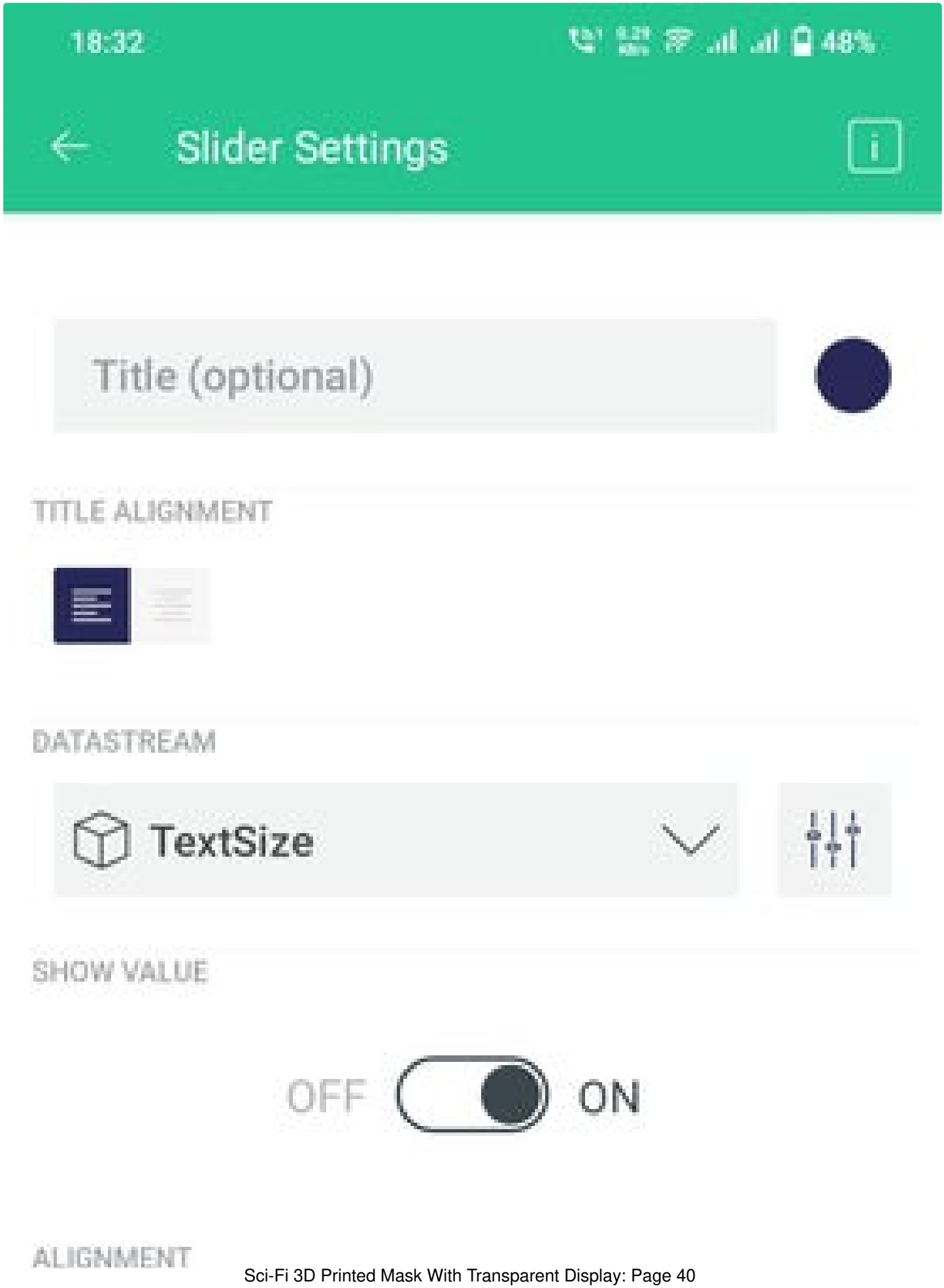
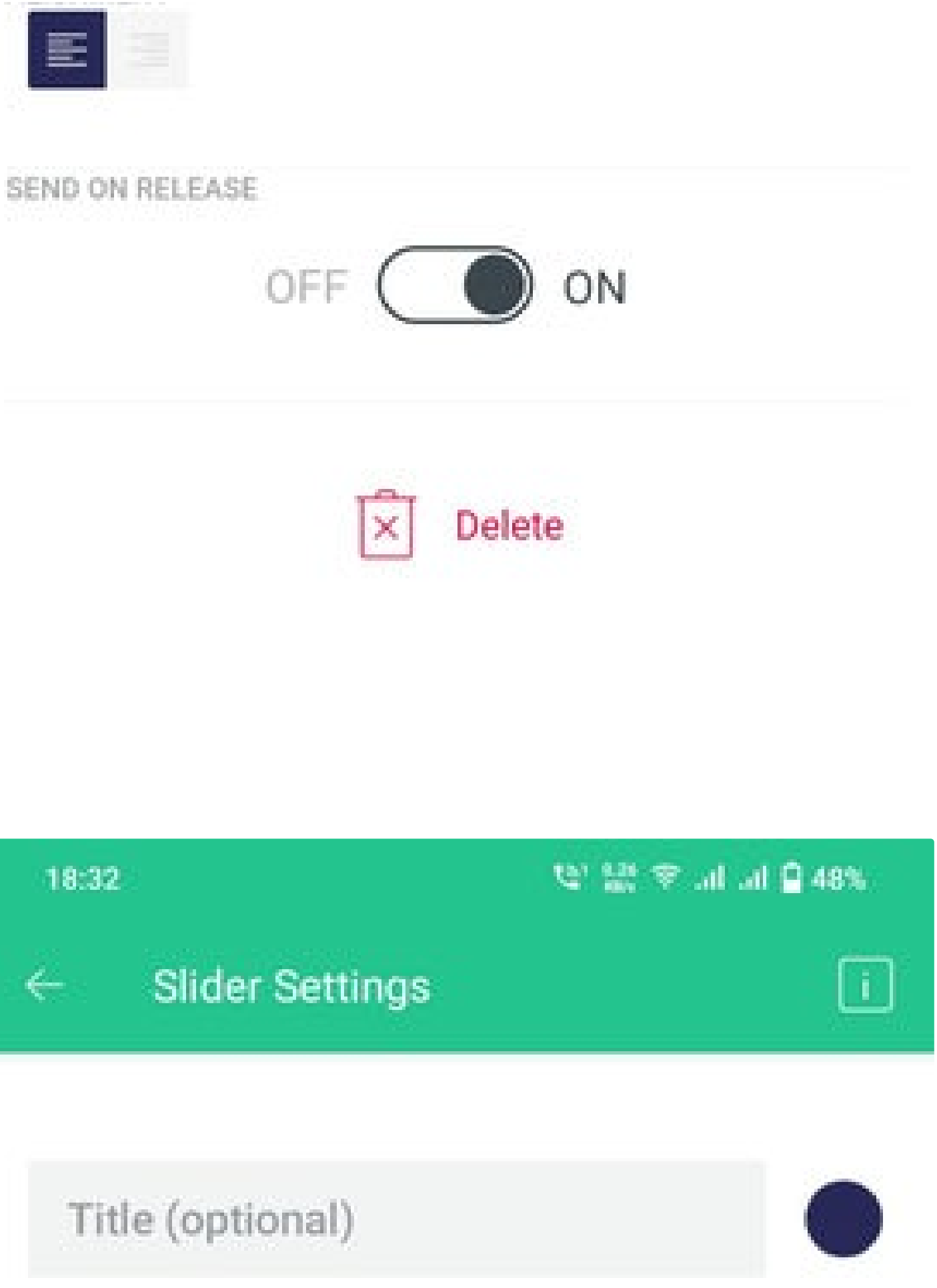
Slider Settings
Title (optional)
TITLE ALIGNMENT
DATASTREAM

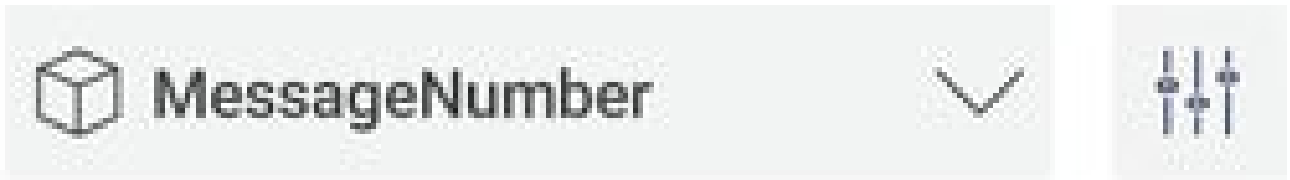

AnimationNumber
SHOW VALUE
OFF
ON
ALIGNMENT
SEND ON RELEASE
OFF
ON
Delete


18:32
48%
Slider Settings
Title (optional)
TITLE ALIGNMENT
DATASTREAM
TextSize
SHOW VALUE
OFF
ON
ALIGNMENT


SEND ON RELEASE
OFF
ON
Delete
18:32
48%
Slider Settings
Title (optional)

TITLE ALIGNMENT

DATASTREAM



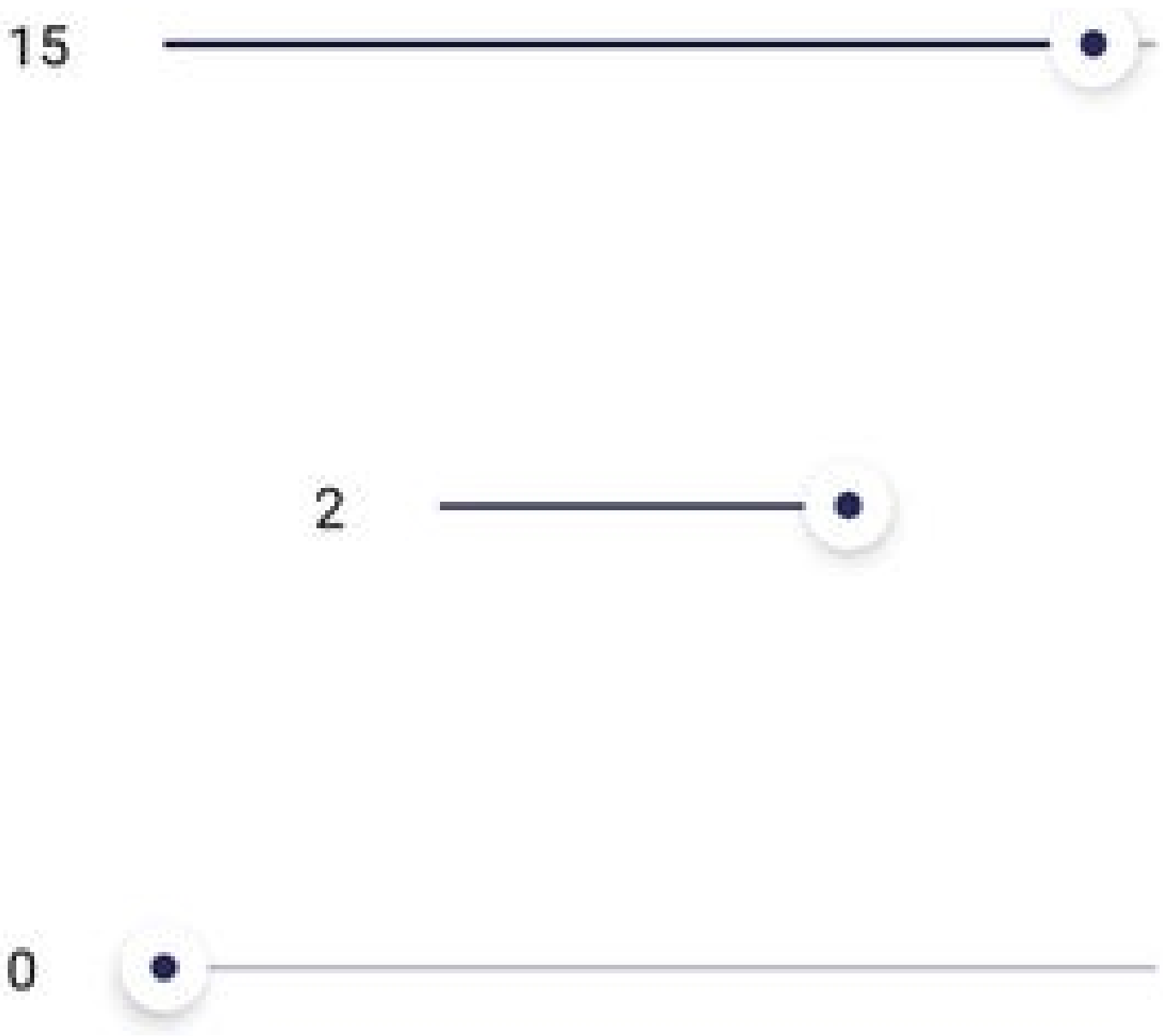
SHOW VALUE

ALIGNMENT

SEND ON RELEASE

Step 9: Working

- The Animation Number slider is for switching between different animation, and the Animation Number 16 is for Displaying the Text.
- The text number is for switching between 11 different fixed text(In Arduino Code).
- Text Size is for choosing between 2 different text sizes.


15
2
0


Mask
13
2
0

Step 10: Code Explanation

- Resize your image or gif using Resizing Tool into 128x64 Pixels.
- If you are using gif Split the gif into frames using Frame Splitter Tool.
- You can skip the frames that you feel unnecessary.
- Now download the frames as zip.
- Extract the zip file.
- Open the images in Arduino Code Converter.
- If your content is black as the above gif then enable the **Invert image colors.**
- Click on Generate Code and copy the code.
- open the notepad paste the code and rename the prefix of the array for convenience.

For Example I have converted the frame name

```
epd_bitmap_frame_00_delay_0
```

to

```
emoji0
```

- Rename all the frames according to your convenience.
- Now copy paste the code in Arduino code and call the frames where ever you want to display that frame.

```
// 'frame_00_delay-0', 128x64px
const unsigned char emoji0[] PROGMEM = {
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
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  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
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  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x01, 0x80, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
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  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x01, 0xfc, 0x1f, 0x80, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x07, 0xc0, 0x01, 0xe0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x0e, 0x00, 0x00, 0x70, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
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  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00
};
```

```
if(Animation_Number == 1){
   display.clearDisplay();
   display.drawBitmap(0,0,emoji0, 128, 64, 1);
   display.display();
   delay(frame_delay);
  }


  if(Animation_Number == 2){
    display.clearDisplay();
    display.drawBitmap(0,0,emoji1, 128, 64, 1);
    display.display();
    delay(frame_delay);
  }
```

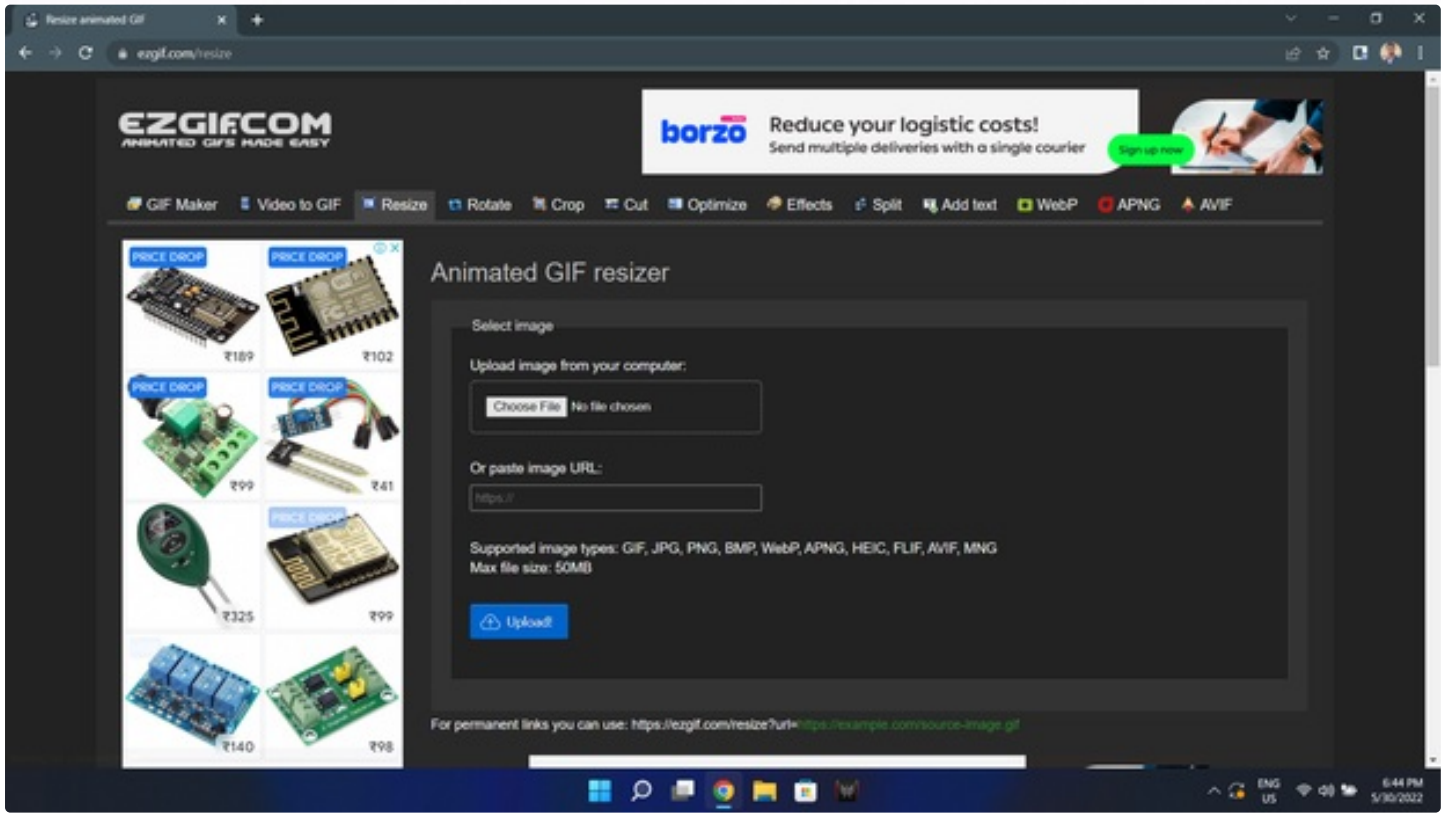
- You can change the text by replacing the following texts in the code

```
  if(MessageNumber ==0){
    Message ="Hello!";
  }
  if(MessageNumber ==1){
    Message ="Hello World!";
  }
  if(MessageNumber ==2){
    Message ="Pretty";
  }if(MessageNumber ==3){
    Message ="Good";
  }
  if(MessageNumber ==4){
    Message ="Love U";
  }
  if(MessageNumber ==5){
    Message ="Hate U";
  }
  if(MessageNumber ==6){
    Message ="?";
  }
  if(MessageNumber ==7){
    Message ="Yes";
  }
  if(MessageNumber ==8){
    Message ="No";
  }
  if(MessageNumber ==9){
    Message ="Hi!";
  }
  if(MessageNumber ==10){
    Message ="How Are You??";
  }
```

- In the code

```
int frame_delay =100;
```

is for the delay between the animating frames, here 100 stands for 0.1 sec delay, if its 1000 it stands for 1 sec delay.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Split
Add text
WebP
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Animated GIF resizer
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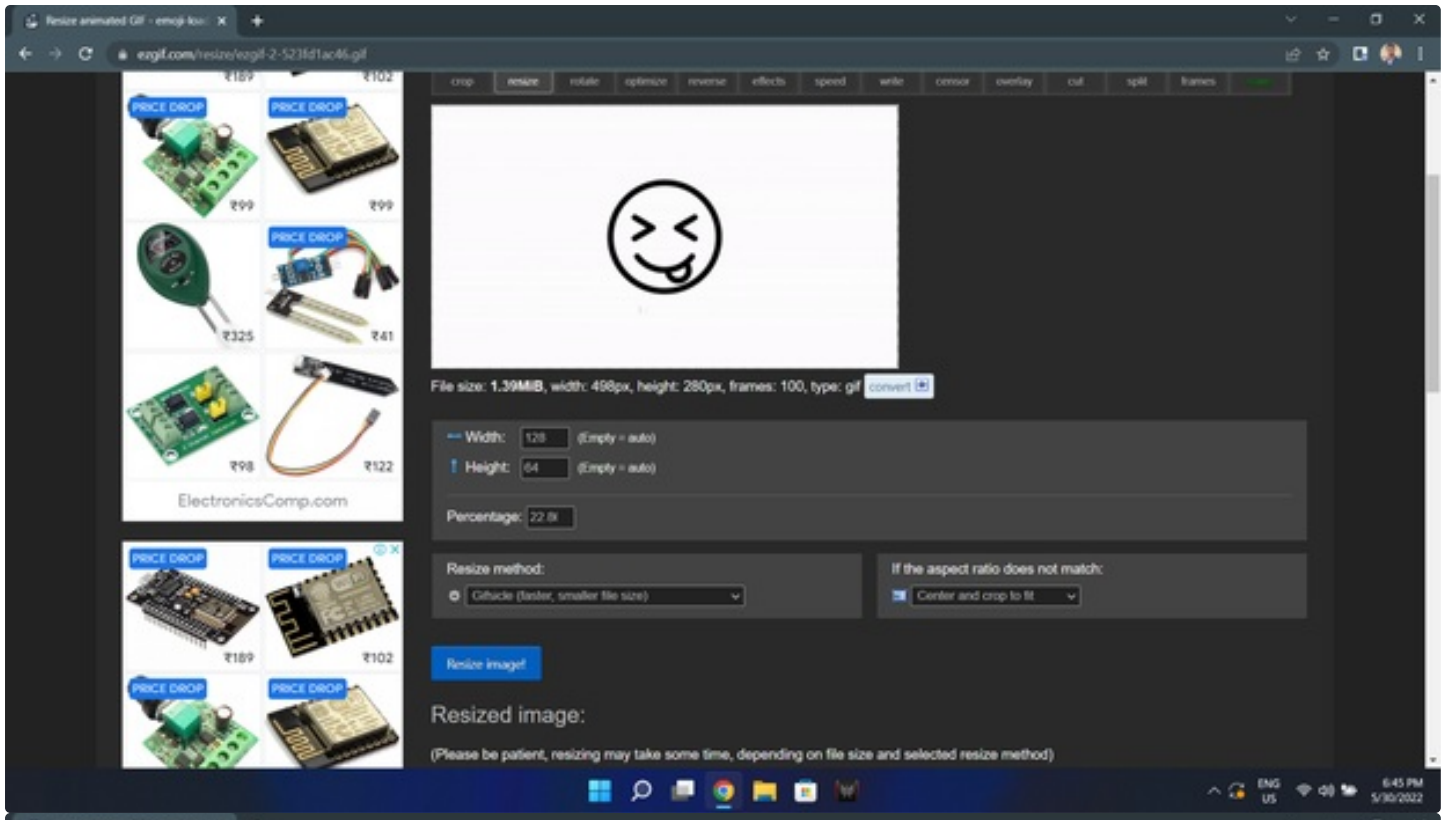
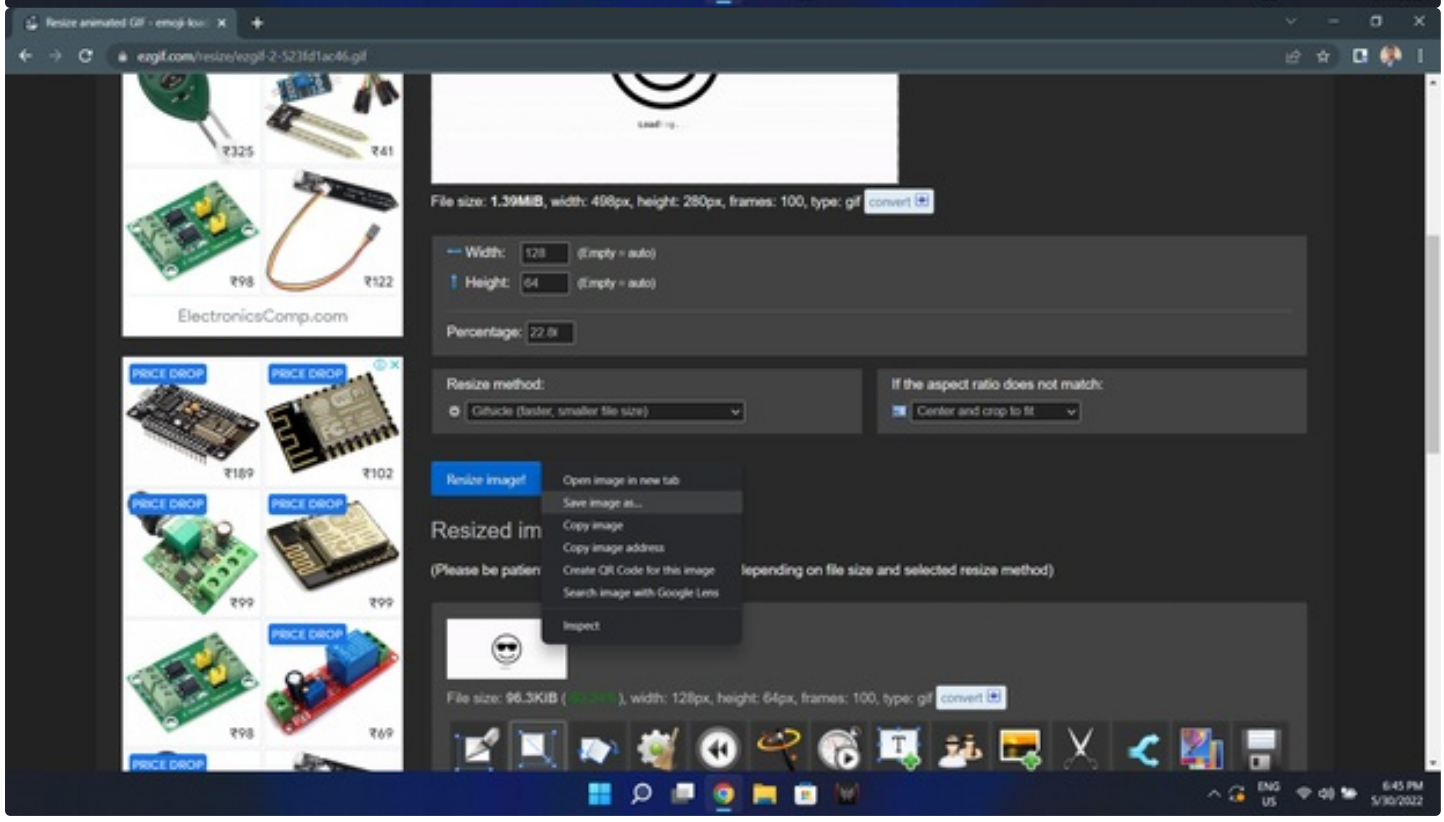
Upload image from your computer:
Choose File
No file chosen
Or paste image URL:
Supported image types: GIF, JPG, PNG, BMP, WebP, APNG, HEIC, FLIF, AVIF, MNG
Max file size: 50MB
Upload!
For permanent links you can use: https://ezgif.com/resize?url=


ezgif.com/resize/ezgif-2-523fd1ac46.gif
crop
resize
rotate
optimize
reverse
effects
speed
write
censor
overlay
cut
split
frames
File size: 1.39MiB, width: 498px, height: 280px, frames: 100, type: gif
convert
Width:
128
(Empty = auto)
Height:
64
(Empty = auto)
Percentage:
22.0%
Resize method:
Gifsicle (faster, smaller file size)
If the aspect ratio does not match:
Center and crop to fit
Resize image!
Resized image:
(Please be patient, resizing may take some time, depending on file size and selected resize method)
PRICE DROP
₹99
₹325
₹41
₹98
₹122
ElectronicsComp.com
₹189
₹102
ENG
US
6:45 PM
5/30/2022


ezgif.com/resize/ezgif-2-523fd1ac46.gif
File size: 1.39MiB, width: 498px, height: 280px, frames: 100, type: gif
convert
Width:
128
(Empty = auto)
Height:
64
(Empty = auto)
Percentage:
22.0%
Resize method:
Gifsicle (faster, smaller file size)
If the aspect ratio does not match:
Center and crop to fit
Resize image!
Open image in new tab
Save image as...
Copy image
Copy image address
Create QR Code for this image
Search image with Google Lens
Inspect
Resized im
(Please be patien
lepending on file size and selected resize method)
File size: 96.3KiB
), width: 128px, height: 64px, frames: 100, type: gif
convert
PRICE DROP
₹325
₹41
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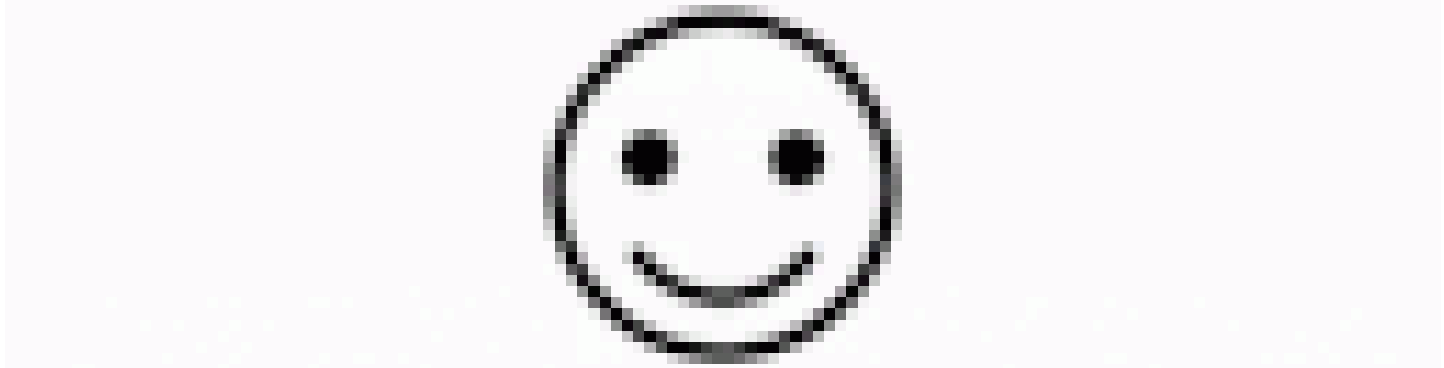
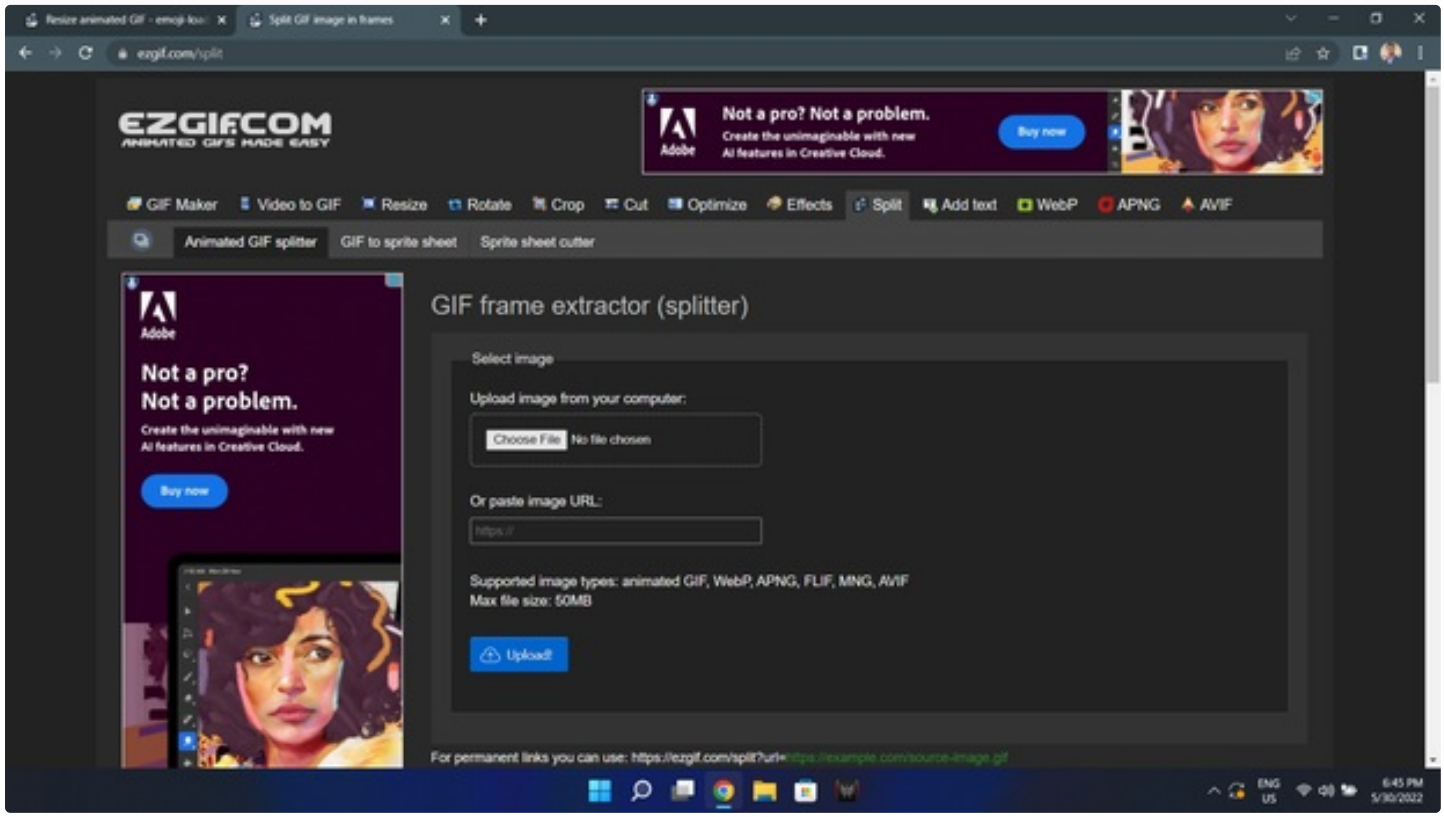
ENG
US
6:45 PM
5/30/2022

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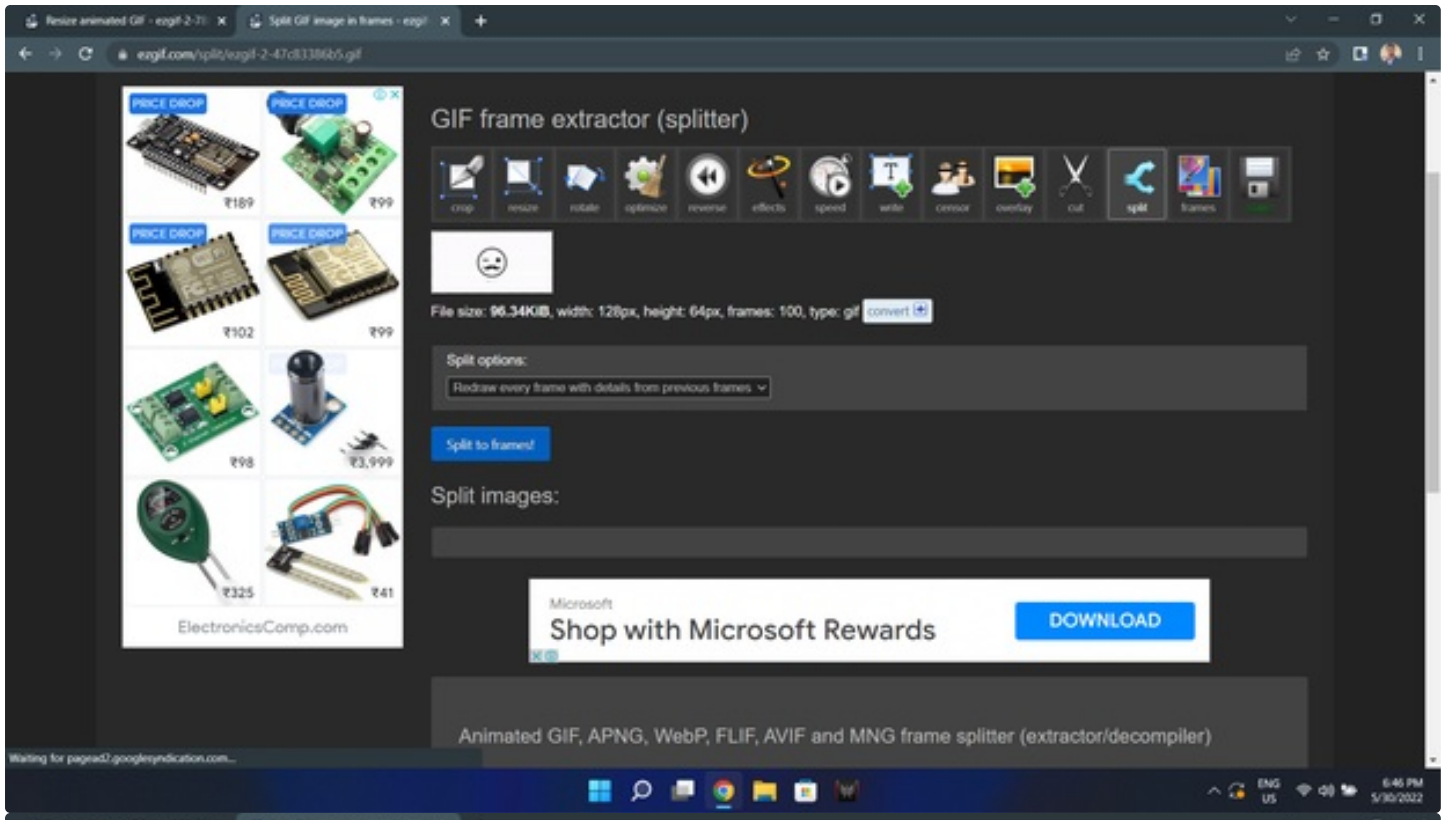
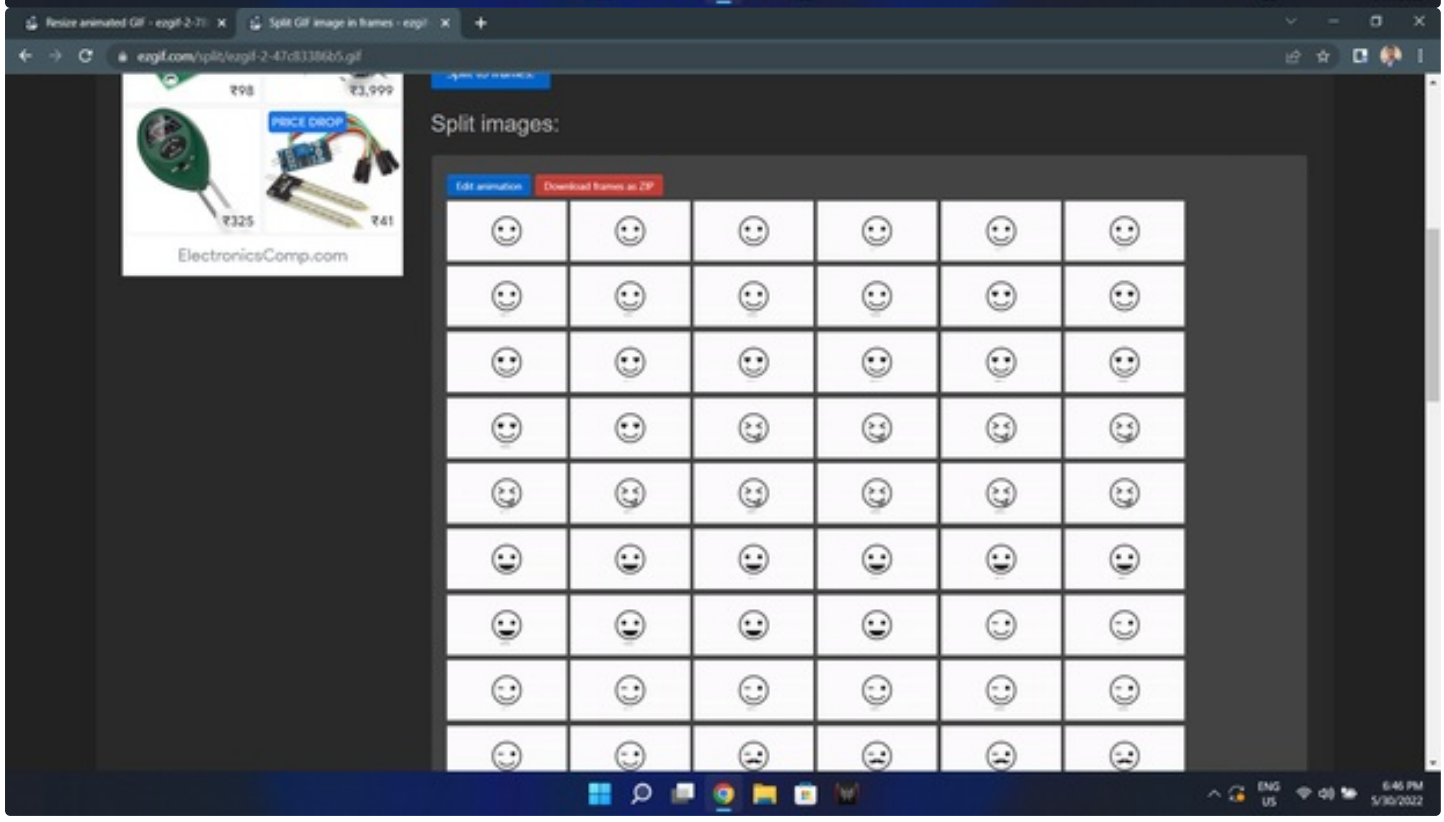
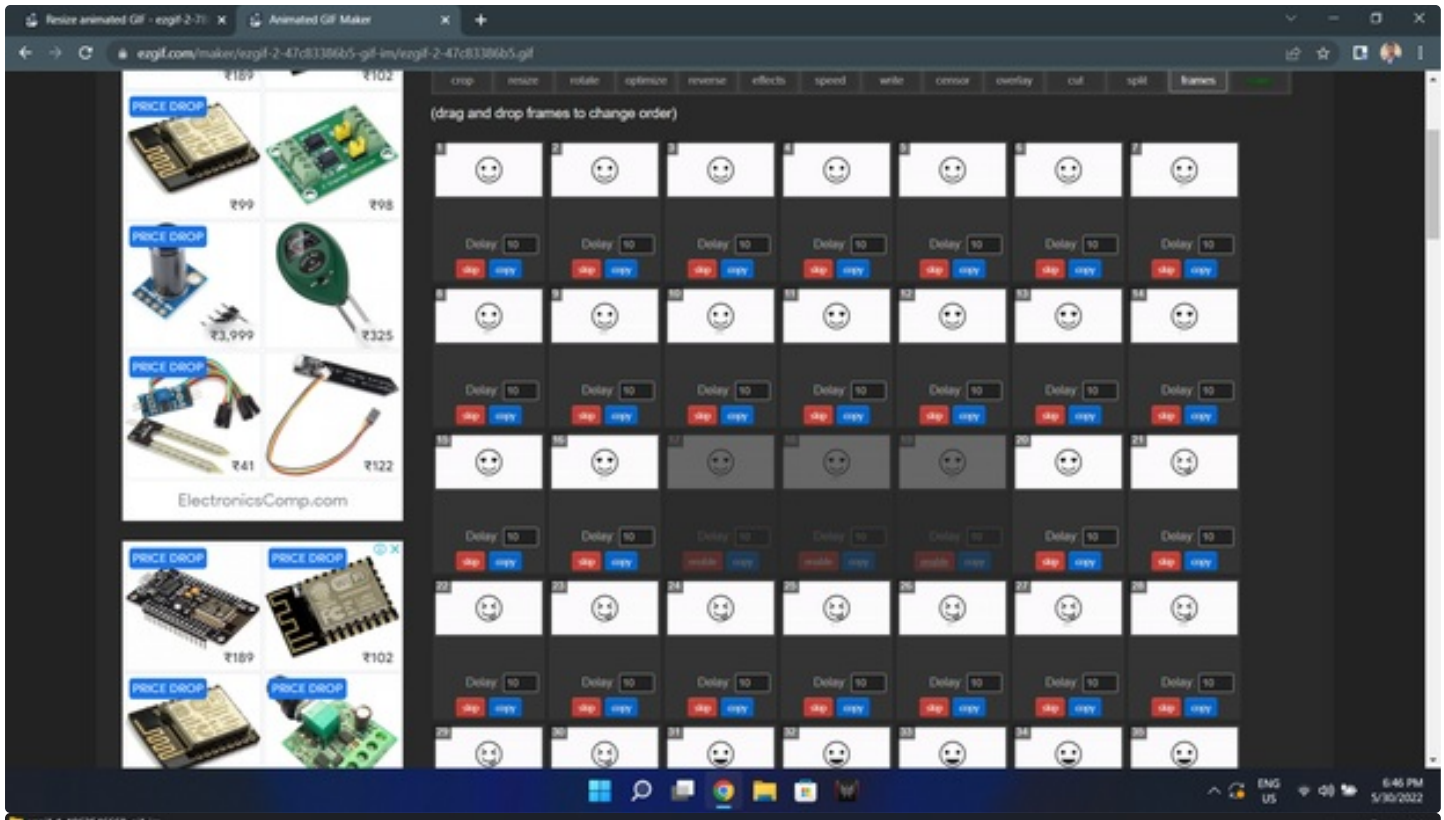
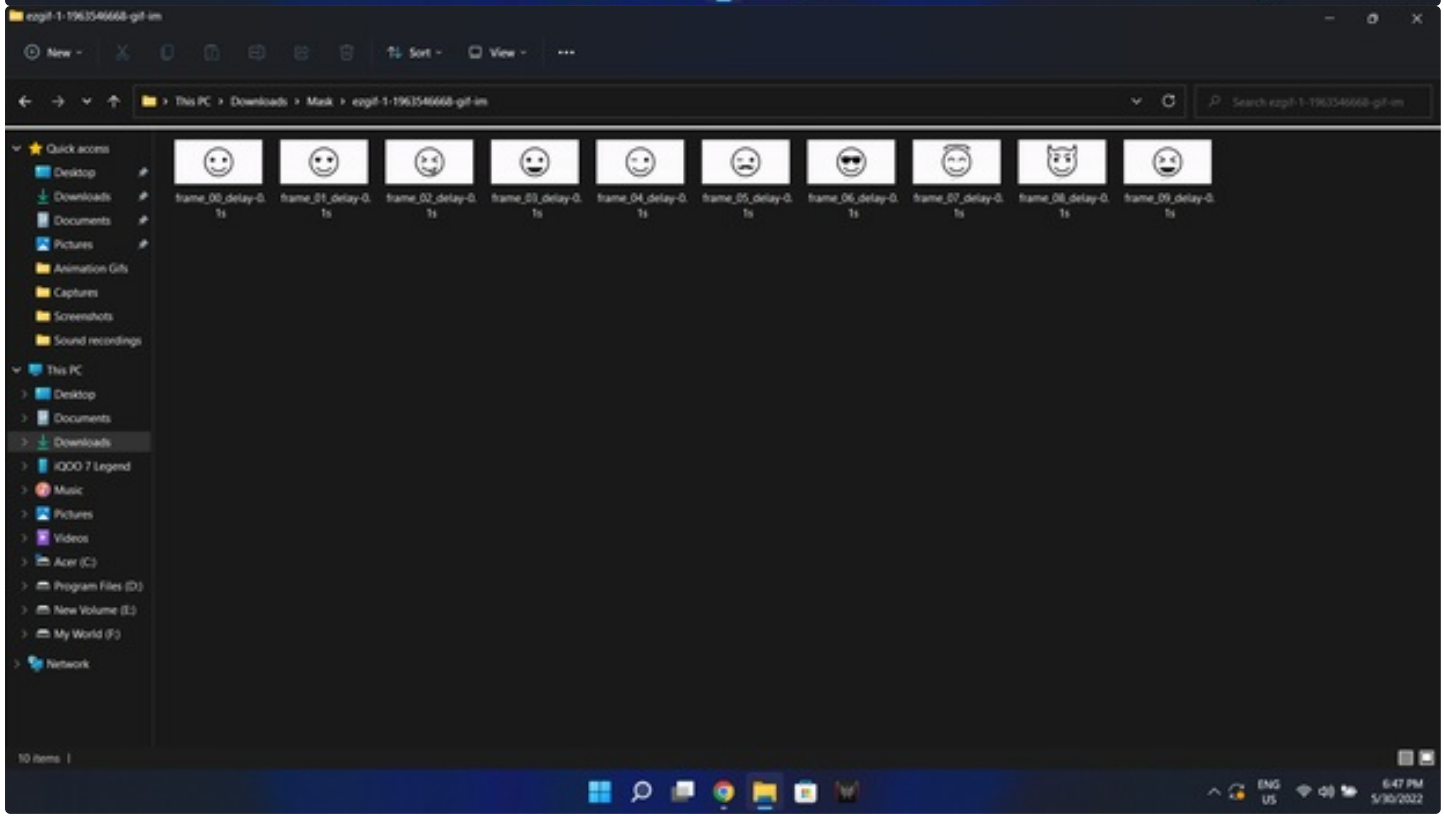
Animated GIF splitter
GIF to sprite sheet
Sprite sheet cutter
GIF frame extractor (splitter)
Select image
Upload image from your computer:
Choose File
No file chosen
Or paste image URL:
Supported image types: animated GIF, WebP, APNG, FLIF, MNG, AVIF
Max file size: 50MB
Upload!
For permanent links you can use: https://ezgif.com/split?url=


GIF frame extractor (splitter)
File size: 96.34KiB, width: 128px, height: 64px, frames: 100, type: gif
convert
Split options:
Redraw every frame with details from previous frames
Split to frames!
Split images:
Microsoft
Shop with Microsoft Rewards
DOWNLOAD
Animated GIF, APNG, WebP, FLIF, AVIF and MNG frame splitter (extractor/decompiler)
ElectronicsComp.com


Split images:
Edit animation
ElectronicsComp.com


ezgif.com/maker/ezgif-2-47c83386b5-gif-im/ezgif-2-47c83386b5.gif
crop
resize
rotate
optimize
reverse
effects
speed
write
censor
overlay
cut
split
frames
(drag and drop frames to change order)
PRICE DROP
ElectronicsComp.com


ezgif-1-19635466668-gif-im
New
Sort
View
This PC
Downloads
Mask
ezgif-1-19635466668-gif-im
Quick access
Desktop
Downloads
Documents
Pictures
Animation Gifs
Captures
Screenshots
Sound recordings
This PC
Desktop
Documents
Downloads
iQOO 7 Legend
Music
Pictures
Videos
Acer (C:)
Program Files (D:)
New Volume (E:)
My World (F:)
Network
10 items

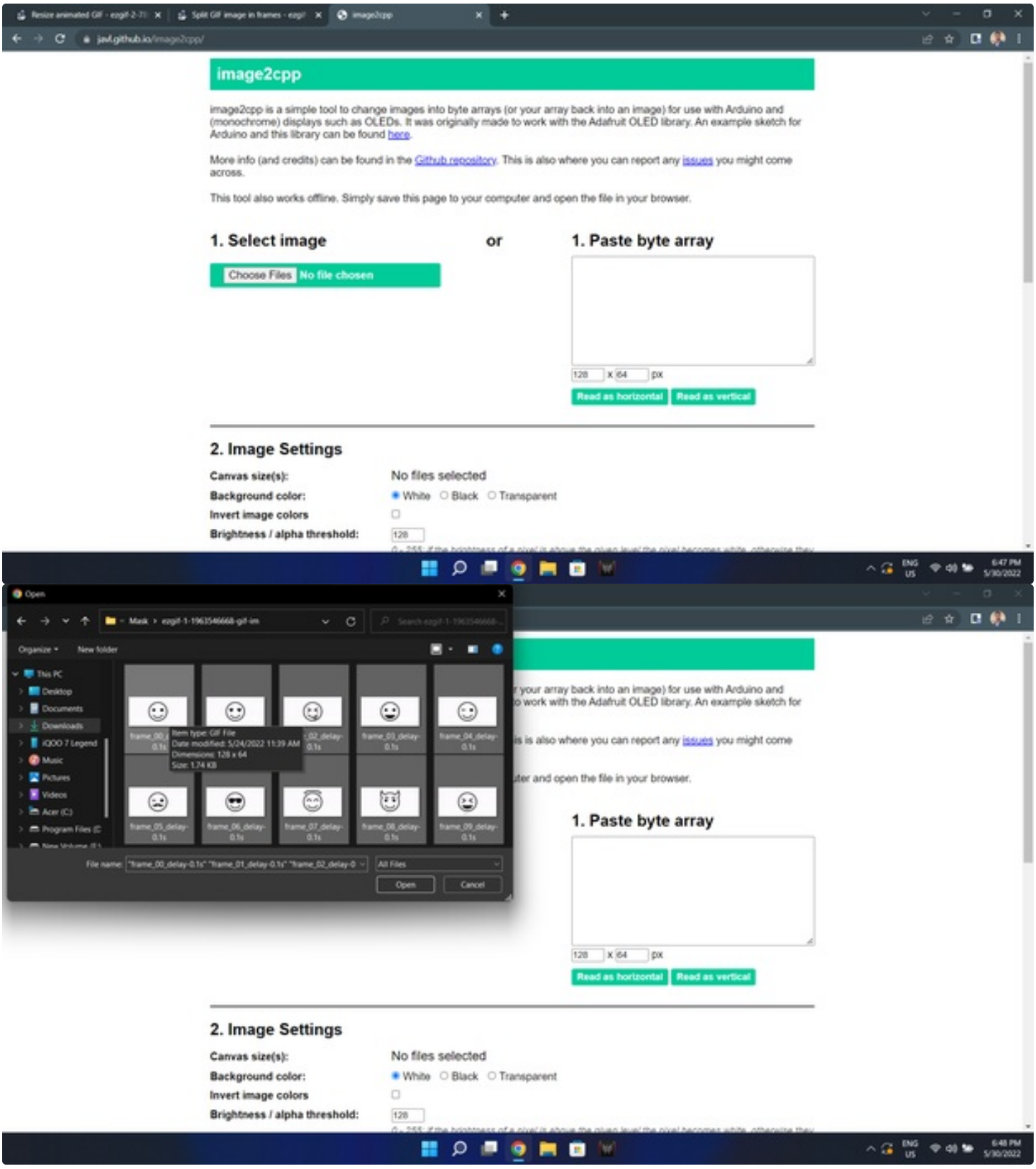
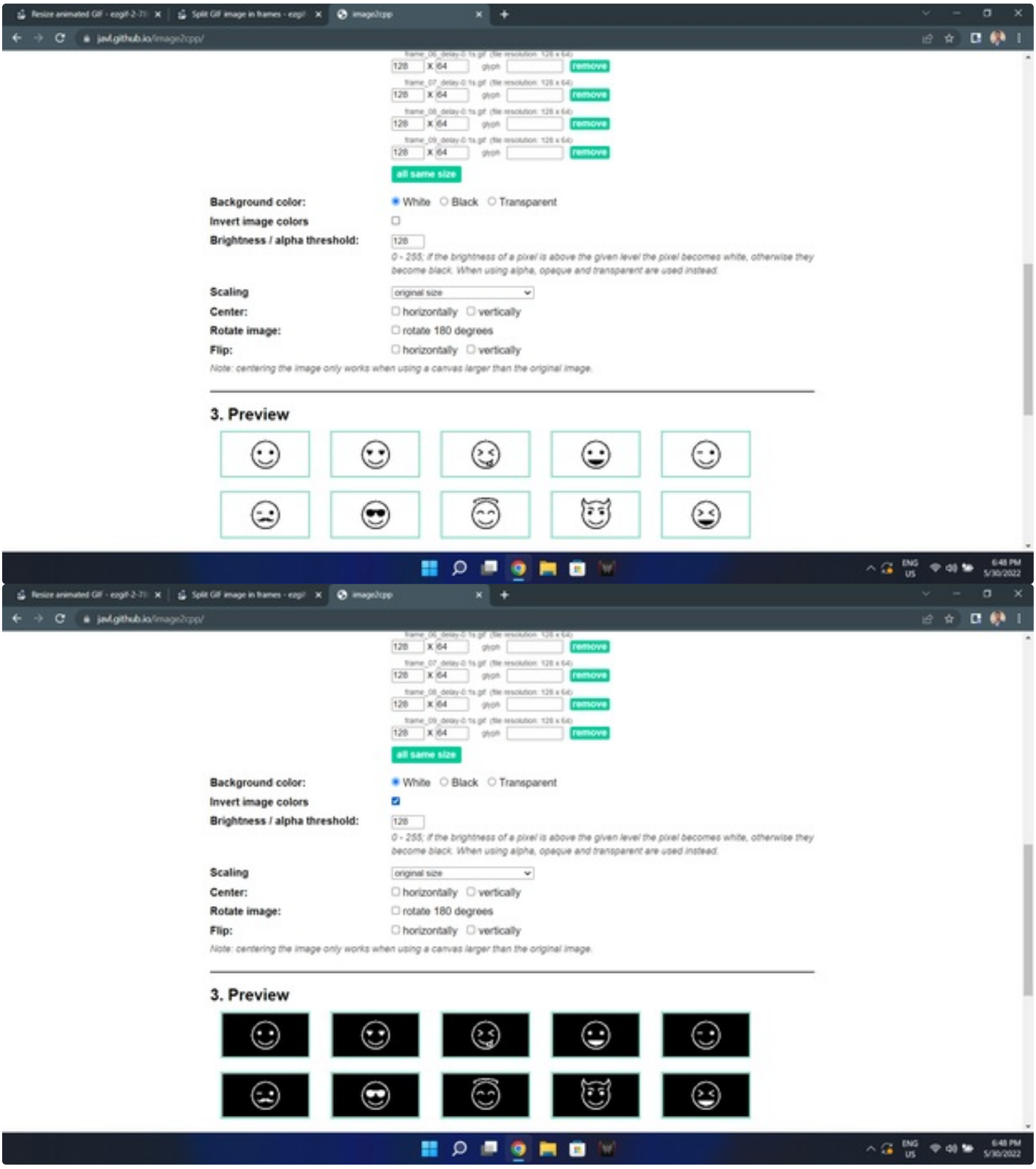


image2cpp
image2cpp is a simple tool to change images into byte arrays (or your array back into an image) for use with Arduino and (monochrome) displays such as OLEDs. It was originally made to work with the Adafruit OLED library. An example sketch for Arduino and this library can be found here.
More info (and credits) can be found in the Github repository. This is also where you can report any issues you might come across.
This tool also works offline. Simply save this page to your computer and open the file in your browser.
1. Select image
Choose Files No file chosen
or
1. Paste byte array
128 x 64 px
Read as horizontal
Read as vertical
2. Image Settings
Canvas size(s):
No files selected
Background color:
White Black Transparent
Invert image colors
Brightness / alpha threshold:
128
Open
Cancel
All Files


Resize animated GIF - ezgif-2-7
Split GIF image in frames - ezgif
image2cpp
javl.github.io/image2cpp/
frame_06_delay-0.1s.gif (file resolution: 128 x 64)
128 x 64 glyph remove
frame_07_delay-0.1s.gif (file resolution: 128 x 64)
128 x 64 glyph remove
frame_08_delay-0.1s.gif (file resolution: 128 x 64)
128 x 64 glyph remove
frame_09_delay-0.1s.gif (file resolution: 128 x 64)
128 x 64 glyph remove
all same size
Background color: White Black Transparent
Invert image colors
Brightness / alpha threshold: 128
0 - 255; if the brightness of a pixel is above the given level the pixel becomes white, otherwise they become black. When using alpha, opaque and transparent are used instead.
Scaling: original size
Center: horizontally vertically
Rotate image: rotate 180 degrees
Flip: horizontally vertically
Note: centering the image only works when using a canvas larger than the original image.
3. Preview
ENG US
6:48 PM 5/30/2022

Resize animated GIF - ezgif-2-7
Split GIF image in frames - ezgif
image2cpp
javl.github.io/image2cpp/
frame_06_delay-0.1s.gif (file resolution: 128 x 64)
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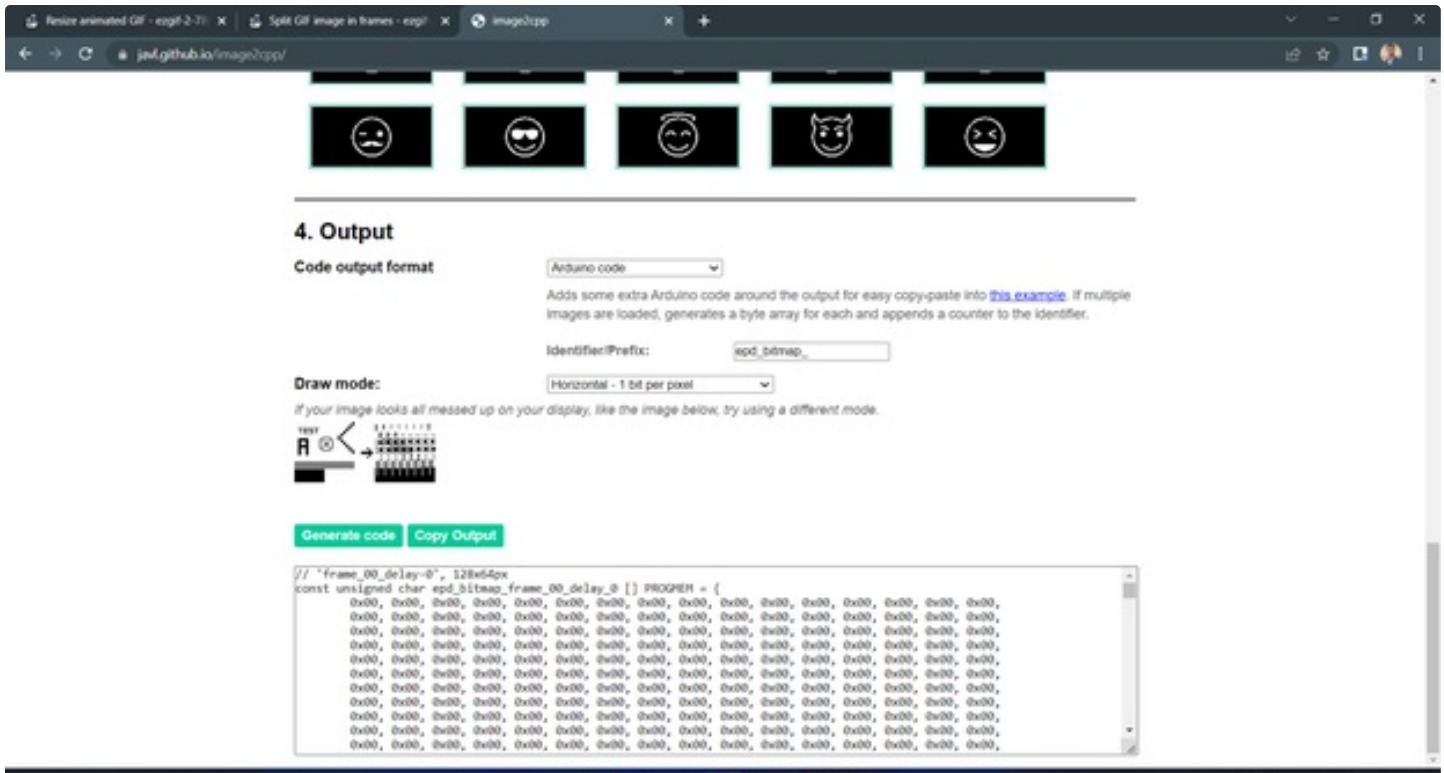
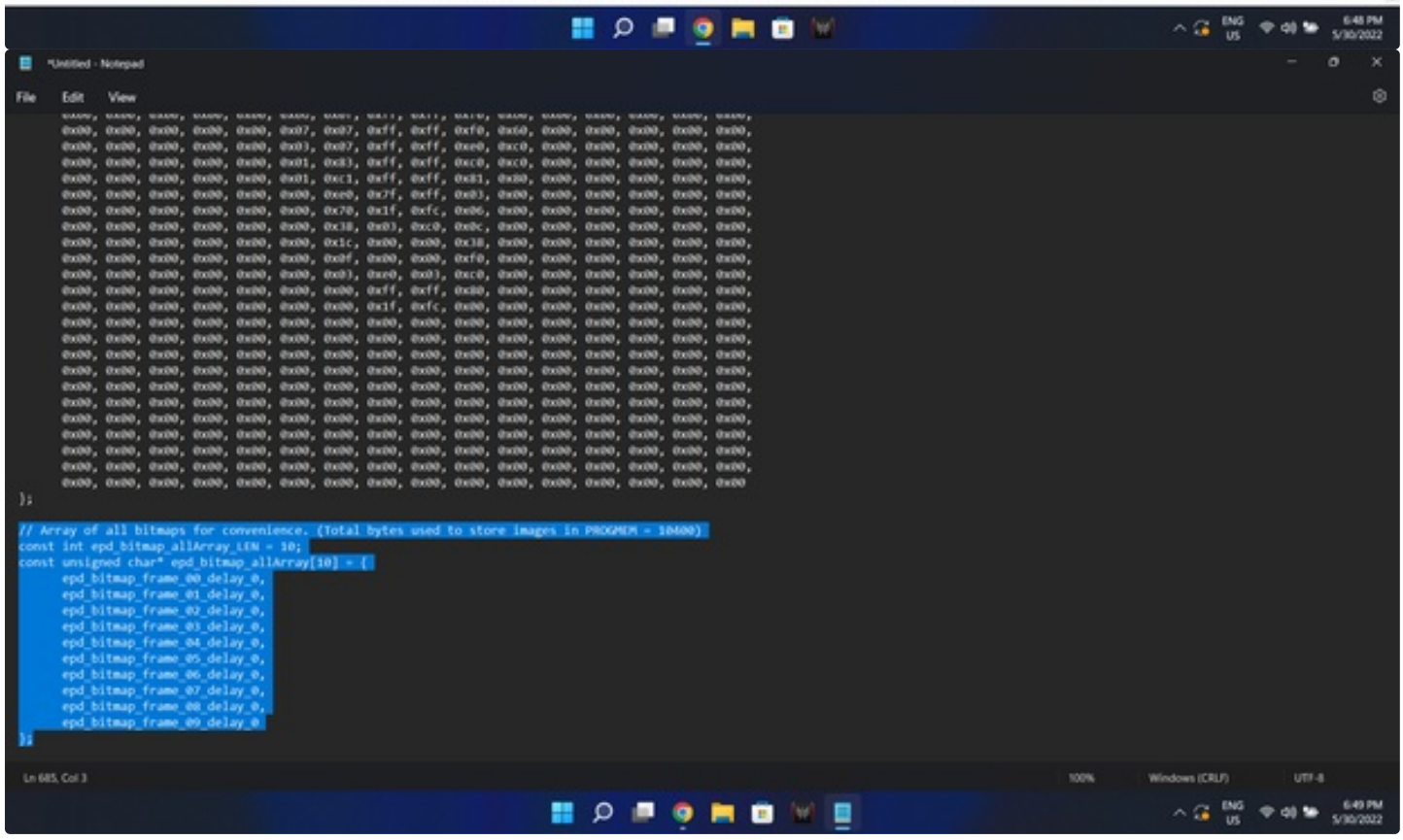
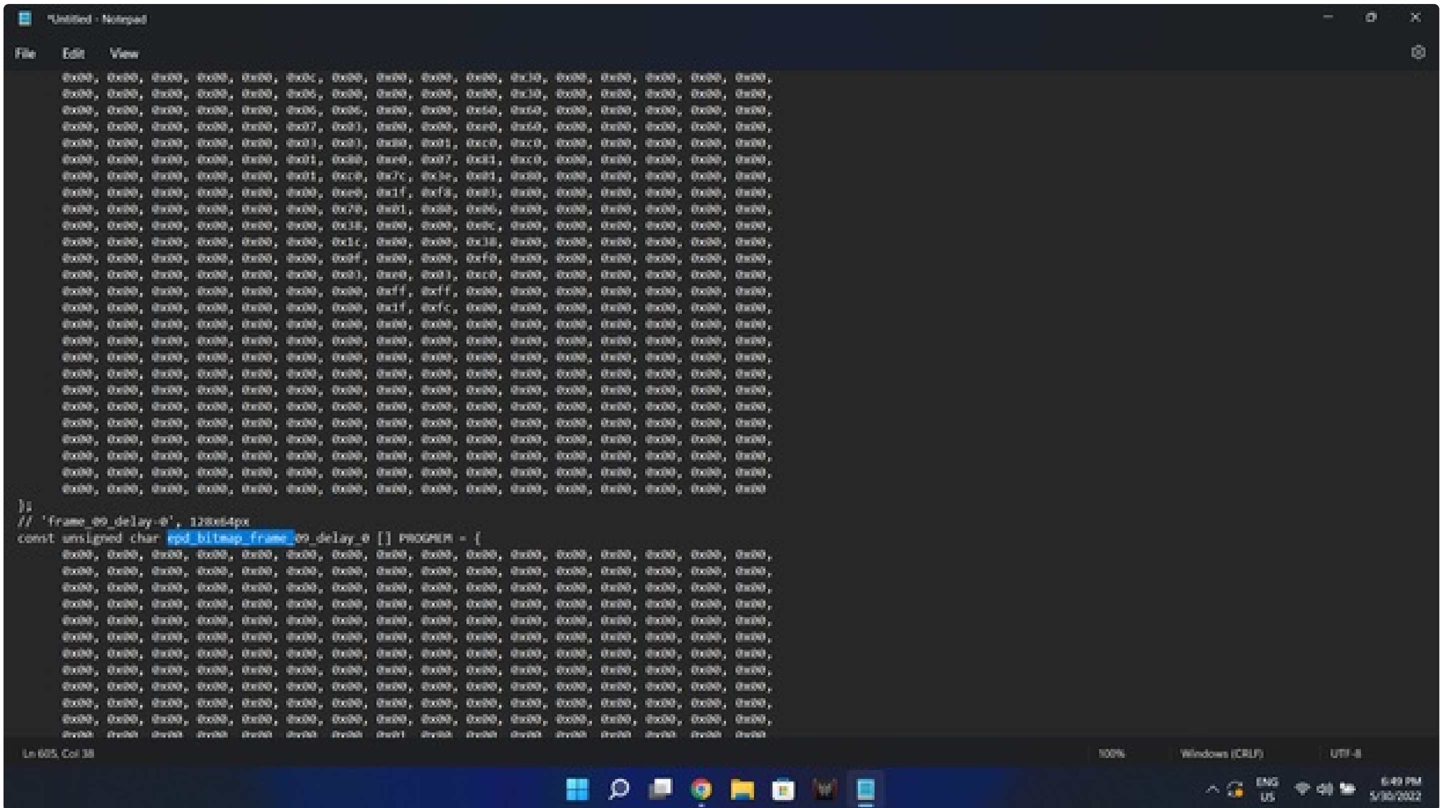
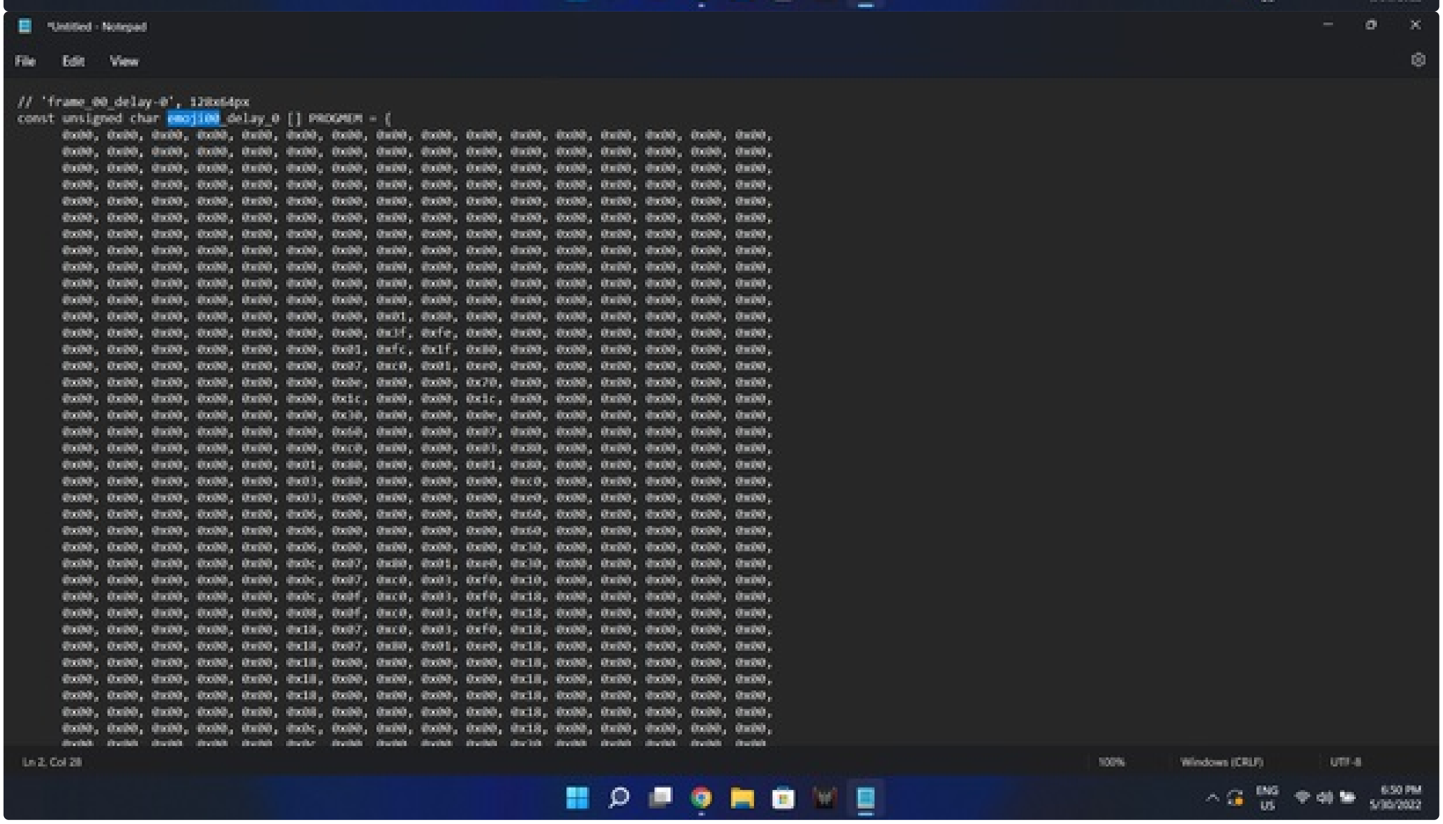
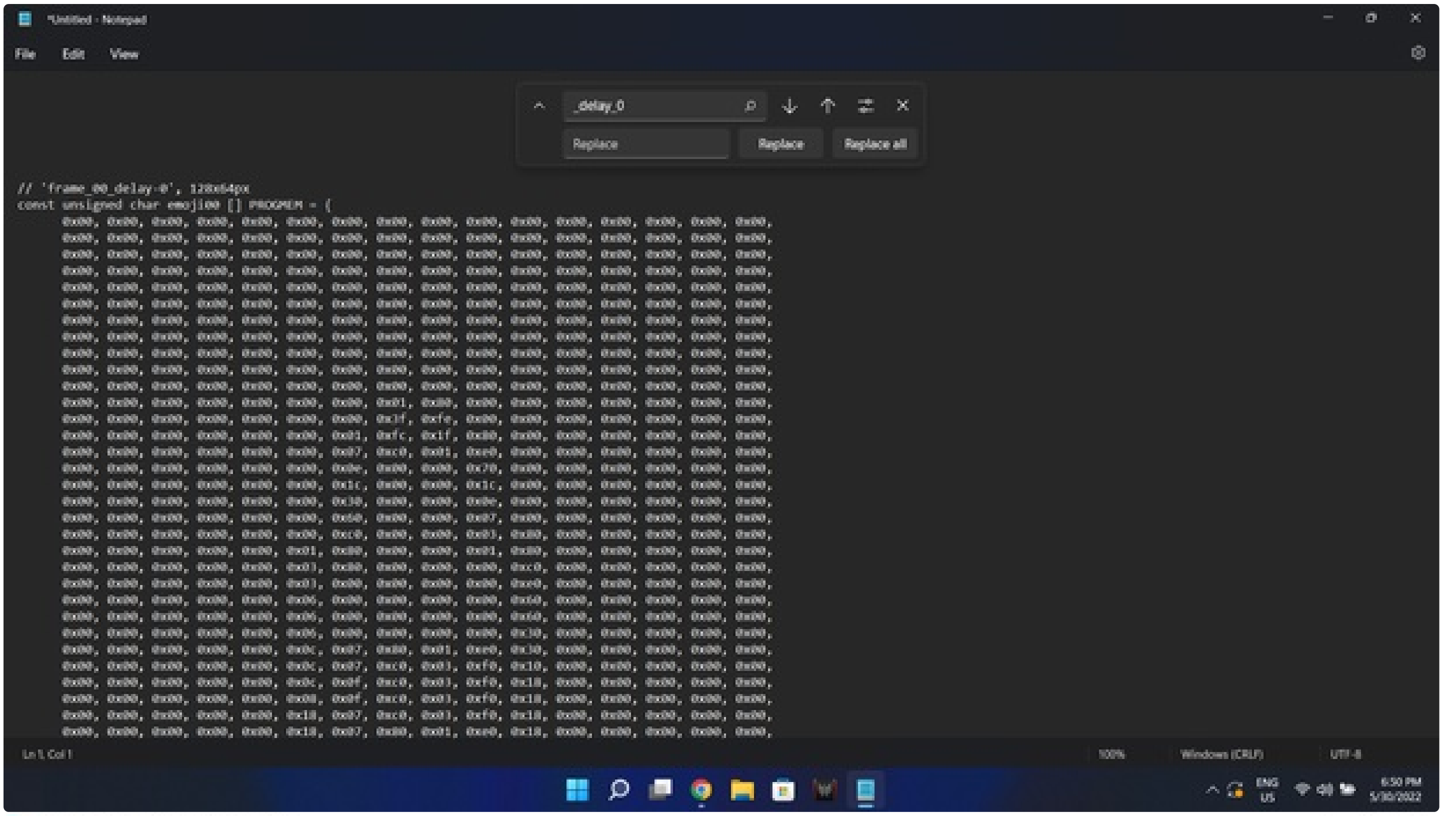
Scaling: original size
Center: horizontally vertically
Rotate image: rotate 180 degrees
Flip: horizontally vertically
Note: centering the image only works when using a canvas larger than the original image.
3. Preview
ENG US
6:48 PM 5/30/2022

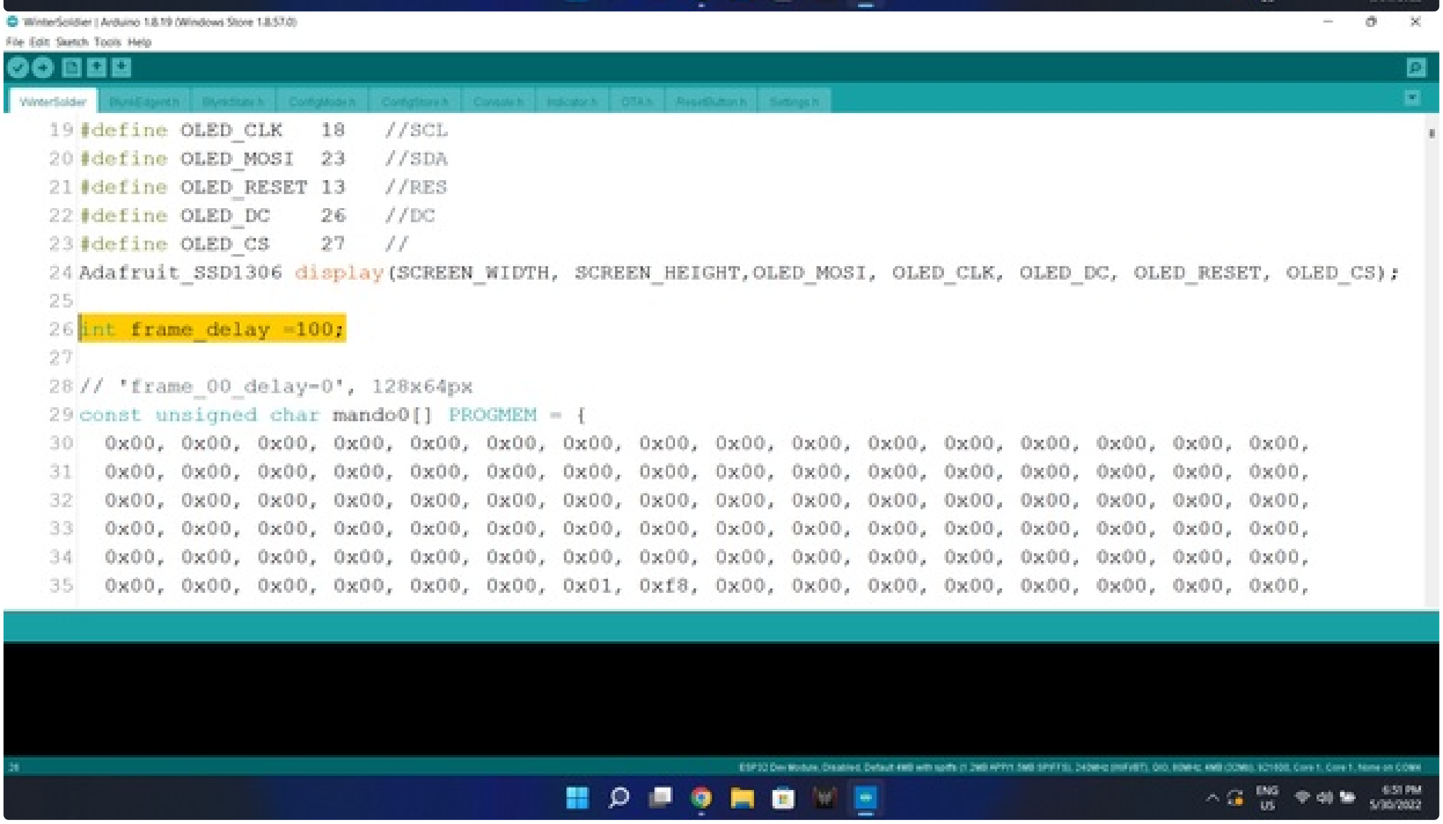

4. Output
Code output format
Arduino code
Adds some extra Arduino code around the output for easy copy-paste into this example. If multiple images are loaded, generates a byte array for each and appends a counter to the identifier.
Identifier/Prefix:
epd_bitmap_
Draw mode:
Horizontal - 1 bit per pixel
If your image looks all messed up on your display, like the image below, try using a different mode.
Generate code
Copy Output
// "frame_00_delay-0", 128x64px
const unsigned char epd_bitmap_frame_00_delay_0 [] PROGMEM = {

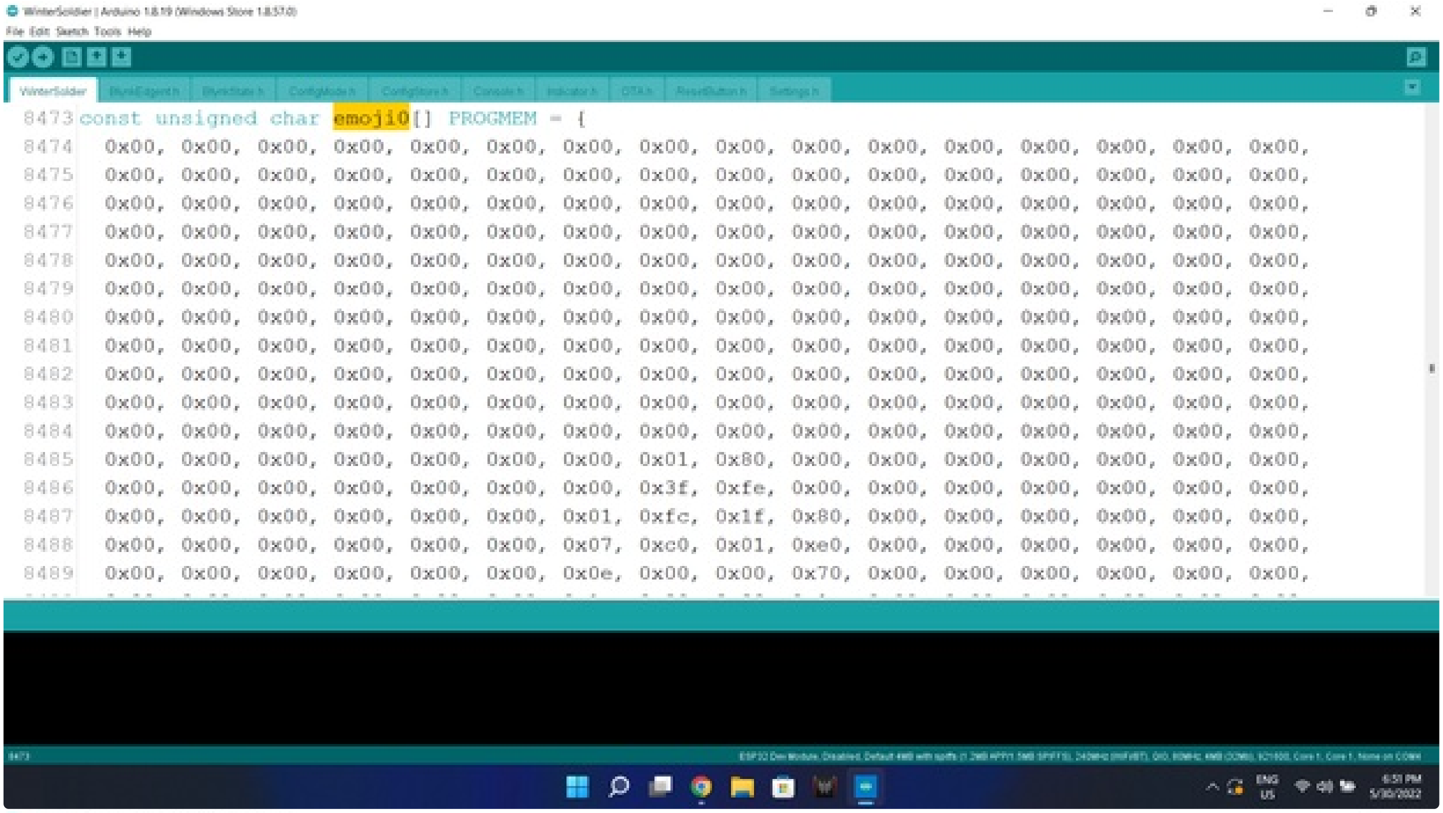

*Untitled - Notepad
File Edit View
};
// Array of all bitmaps for convenience. (Total bytes used to store images in PROGMEM = 10400)
const int epd_bitmap_allArray_LEN = 10;
const unsigned char* epd_bitmap_allArray[10] = {
epd_bitmap_frame_00_delay_0,
epd_bitmap_frame_01_delay_0,
epd_bitmap_frame_02_delay_0,
epd_bitmap_frame_03_delay_0,
epd_bitmap_frame_04_delay_0,
epd_bitmap_frame_05_delay_0,
epd_bitmap_frame_06_delay_0,
epd_bitmap_frame_07_delay_0,
epd_bitmap_frame_08_delay_0,
epd_bitmap_frame_09_delay_0
};
Ln 685, Col 3
100%
Windows (CRLF)
UTF-8


*Untitled - Notepad
File
Edit
View
// 'frame_09_delay-0', 128x64px
const unsigned char epd_bitmap_frame_09_delay_0 [] PROGMEM = {
100%
Windows (CRLF)
UTF-8


*Untitled - Notepad
File
Edit
View
// 'frame_00_delay-0', 128x64px
const unsigned char emoji00_delay_0 [] PROGMEM = {
100%
Windows (CRLF)
UTF-8


*Untitled - Notepad
File Edit View
_delay_0
Replace
Replace
Replace all
// 'frame_00_delay-0', 128x64px
const unsigned char emoji00 [] PROGMEM = {
Ln 1, Col 1
100%
Windows (CRLF)
UTF-8


WinterSoldier | Arduino 1.8.19 (Windows Store 1.8.57.0)
File Edit Sketch Tools Help
WinterSoldier
#define OLED_CLK 18 //SCL
#define OLED_MOSI 23 //SDA
#define OLED_RESET 13 //RES
#define OLED_DC 26 //DC
#define OLED_CS 27 //
Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT,OLED_MOSI, OLED_CLK, OLED_DC, OLED_RESET, OLED_CS);
int frame_delay =100;
// 'frame_00_delay-0', 128x64px
const unsigned char mando0[] PROGMEM = {
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x01, 0xf8, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,



```
const unsigned char emoji0[] PROGMEM = {
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
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  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x3f, 0xfe, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x01, 0xfc, 0x1f, 0x80, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x07, 0xc0, 0x01, 0xe0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x0e, 0x00, 0x00, 0x70, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
```
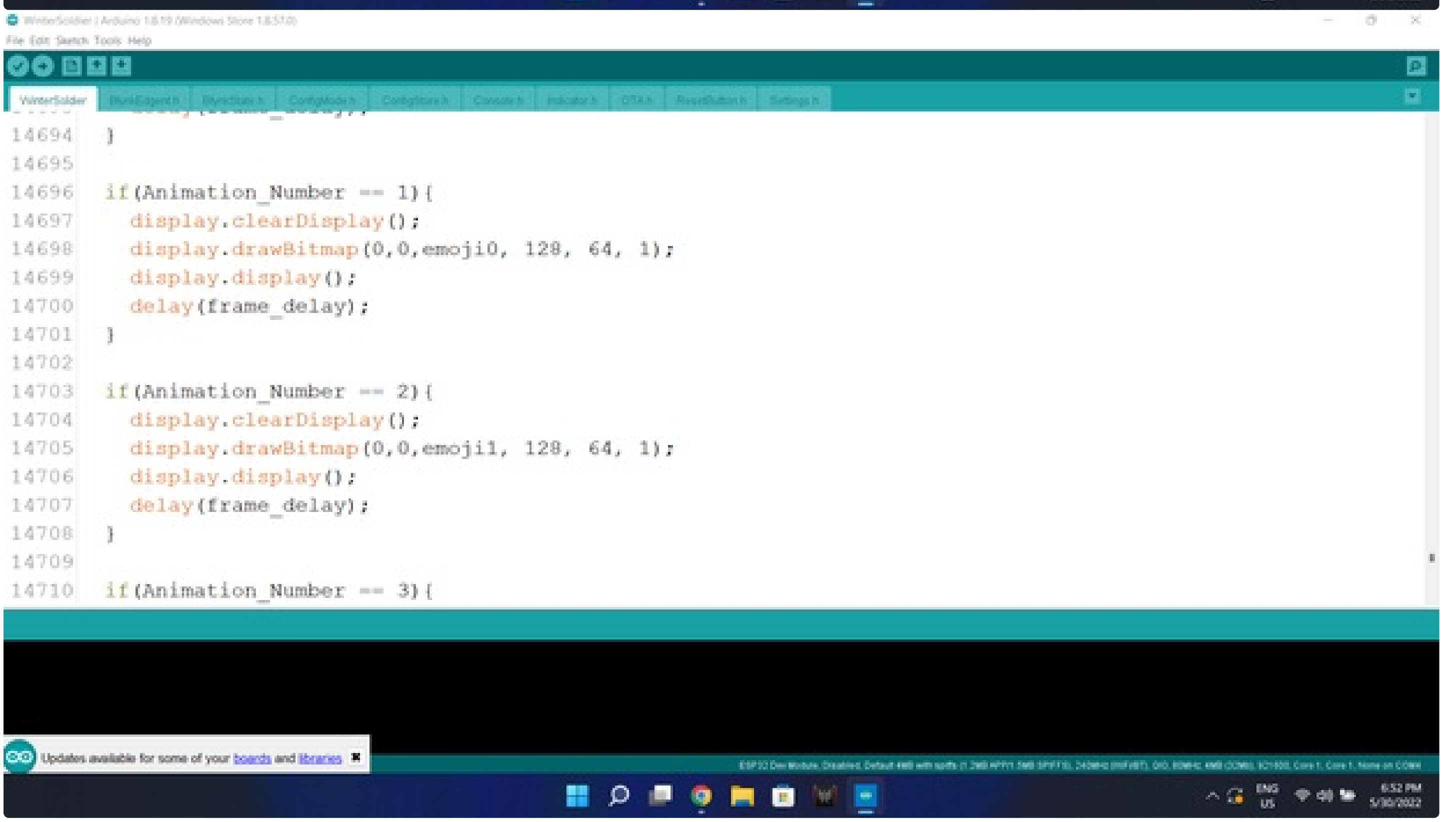
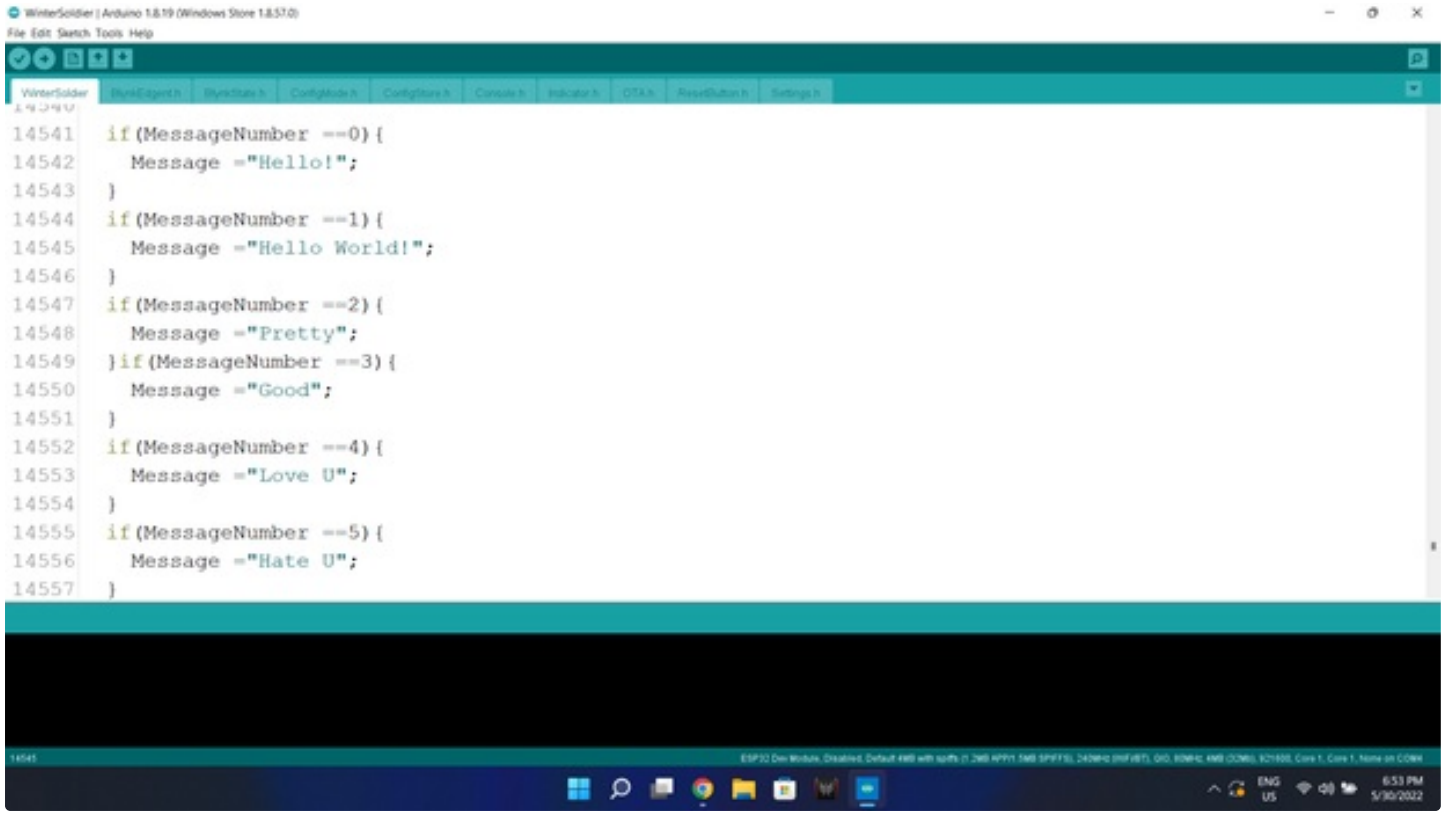



```
  }

  if(Animation_Number == 1){
    display.clearDisplay();
    display.drawBitmap(0,0,emoji0, 128, 64, 1);
    display.display();
    delay(frame_delay);
  }

  if(Animation_Number == 2){
    display.clearDisplay();
    display.drawBitmap(0,0,emoji1, 128, 64, 1);
    display.display();
    delay(frame_delay);
  }

  if(Animation_Number == 3){
```


WinterSoldier | Arduino 1.8.19 (Windows Store 1.8.57.0)
File Edit Sketch Tools Help
WinterSoldier
if(MessageNumber ==0){
Message ="Hello!";
}
if(MessageNumber ==1){
Message ="Hello World!";
}
if(MessageNumber ==2){
Message ="Pretty";
}if(MessageNumber ==3){
Message ="Good";
}
if(MessageNumber ==4){
Message ="Love U";
}
if(MessageNumber ==5){
Message ="Hate U";
}