

Coela Can't!

Manufacturing Files:

Protogen LED Board V1

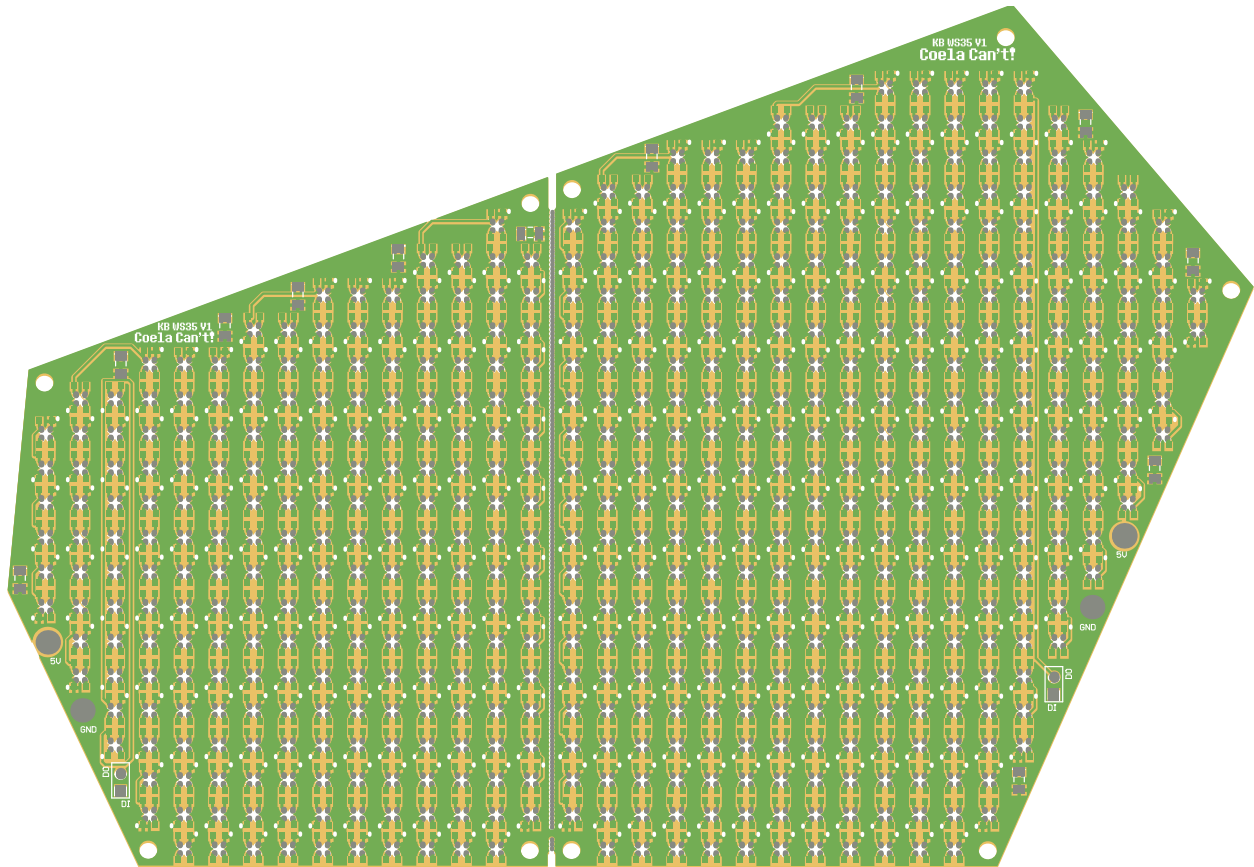
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0 Overview

0.1 Background Information

The following documentation will walk you through how to order a PCB from JLCPCB with SMT Assembly for the following design:



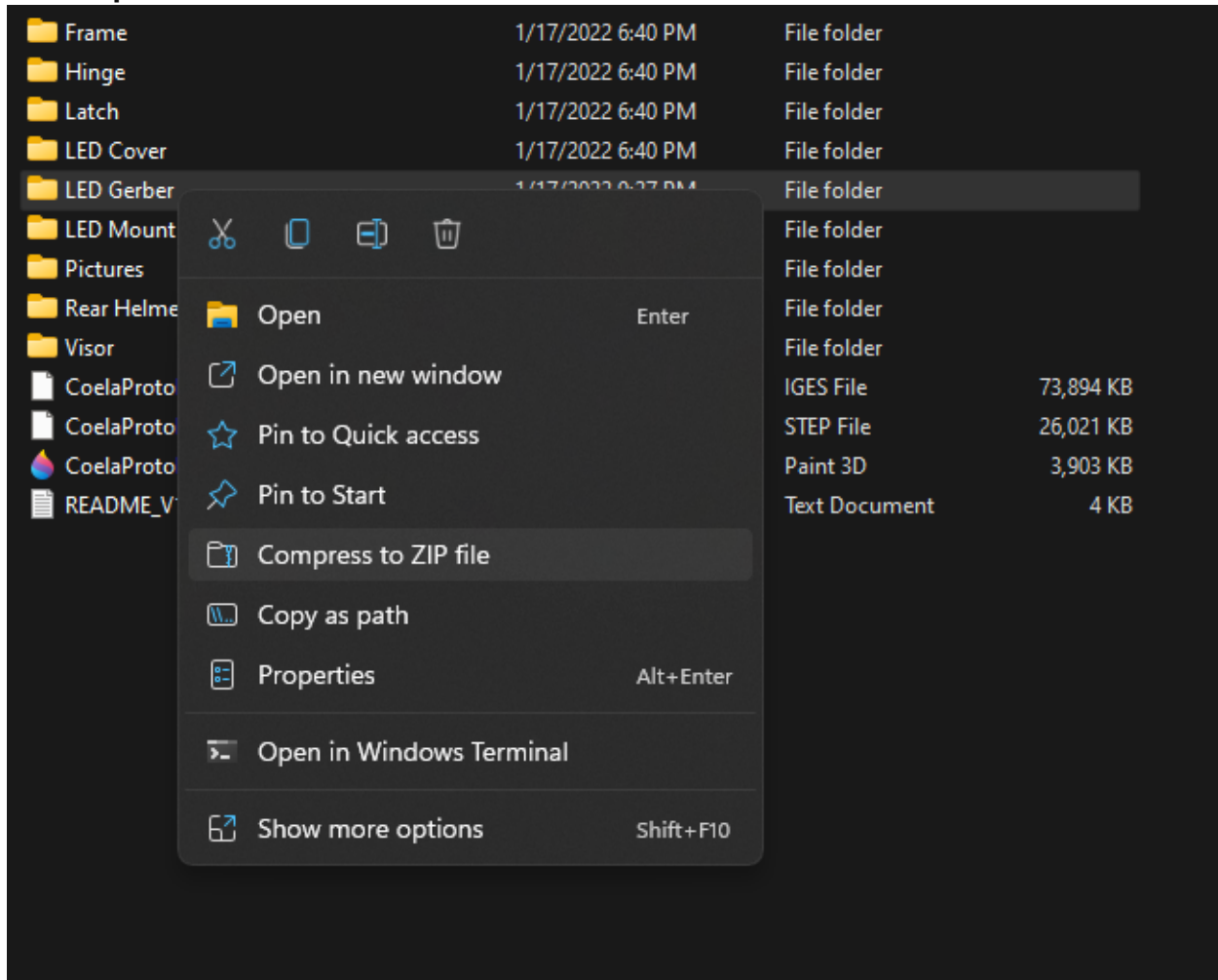
0.2 What's necessary?

To make a Protogen you will need two sides of this PCB populated, you will need to order the topside board with pick and place and order the bottomside board with pick and place.

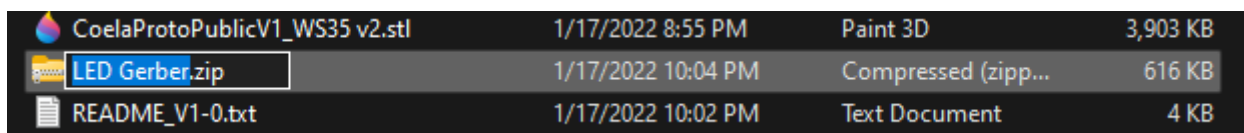
1 Ordering the LED Panels

1.1 Ordering the Base LED Panel PCB

1.1.1 Zip the LED Gerber Files Folder



Rename the zip file if preferred:



1.1.2 Upload the Gerber Zip to JLCPCB

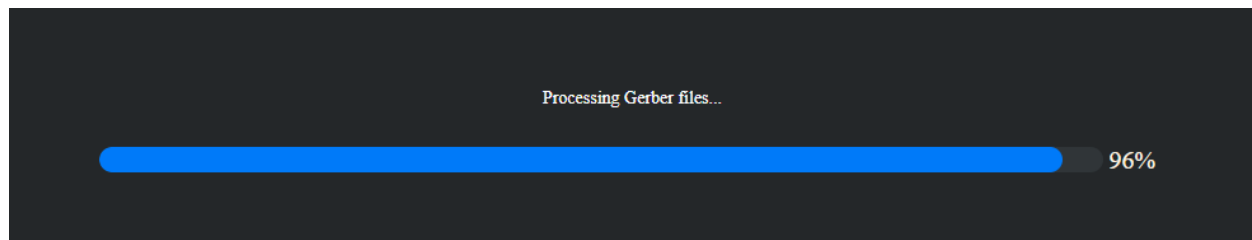
Head to JLCPCB.com: <https://cart.jlcpcb.com/quote>

Click “Add gerber file” and upload your Zip file:

The screenshot shows the JLCPCB quote form with the following configuration options:

- PCB** (Selected)
- SMT Stencil**
- 3D-Printing**
- Add gerber file** (Button)
- Only accept zip or rar, Max 10 M, View example >**
- Instructions for ordering** (Link)
- Log in to view your upload history** (Link)
- Layers**: 1, 2 (Selected), 4, 6
- Dimensions**: 100 * 100 mm
- PCB Qty**: 5
- Different Design**: 1 (Selected), 2, 3, 4
- Delivery Format**: Single PCB (Selected), Panel by Customer, Panel by JLCPCB
- PCB Thickness**: 0.4, 0.6, 0.8, 1.0, 1.2, 1.6 (Selected), 2.0
- PCB Color**: Green (Selected), Red, Yellow, Blue, White, Black
- Silkscreen**: White (Selected)
- Charge Details** (Section)
 - Build Time**
 - Calculated Price** (Additional charges may apply for official cases)
 - Weight** (kg)
 - SAVE TO CART** (Button)
 - Shipping Estimate**

Wait for the upload to complete, this may take a minute or two:

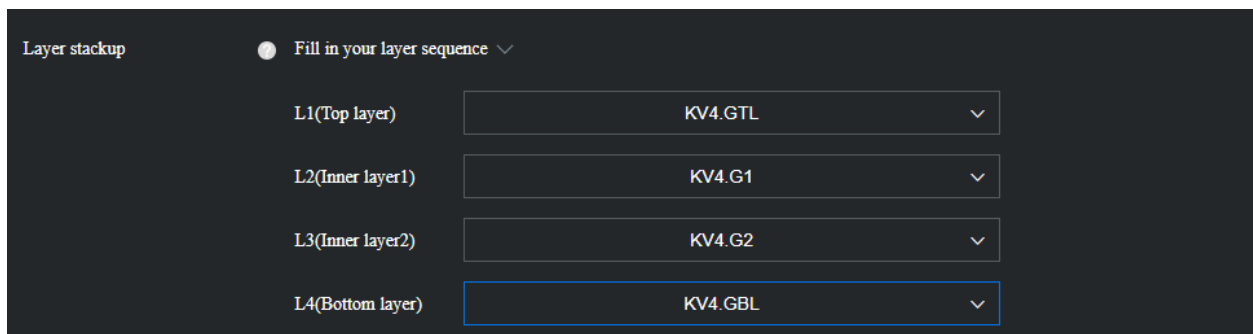


1.1.3 Configure the Board Specifications

Once uploaded you can configure different parameters about your board, leave most as default except for layer stack up:



Link the Layer stackup with the following settings:




1.2 Configuring the Topside SMT

1.2.1 Enable SMT Assembly

Enable SMT assembly by clicking the switch on the right near the bottom of the window:



Select the quantity of LED boards you would like assembled, 2 or 5. For more you will need to order one board first, test it, and then repurchase from the site with your confirmed files:



SMT Assembly

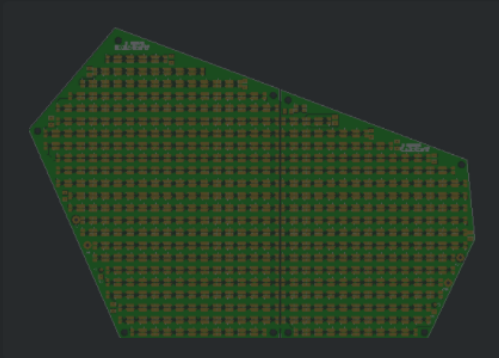
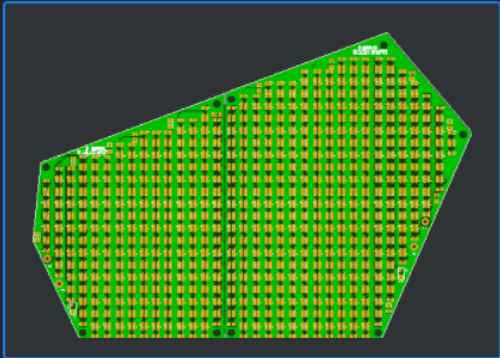
Coupon

Free SMT Assembly for your PCB order

Only accept single sided placement, we recommend you choose the side which has more SMD parts.

*The parts that are not in JLCPCB SMT Parts Library won't be placed on your board.

*Panels with V-cut can not be made with SMT assembly, please panelize PCBs with stamp holes.



☒ Assemble top side

☐ Assemble bottom side

SMT QTY

5

2

Tooling holes

Added by Customer

Added by JLCPCB

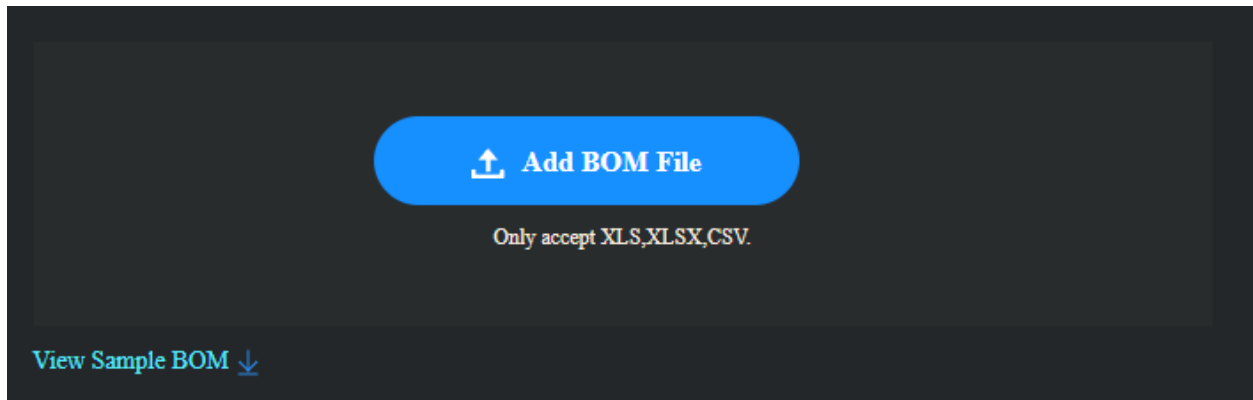
☒ I agree to the Terms and Conditions of JLCPCB SMT Service.

Confirm




Click confirm to continue to the rest of the process.

1.2.2 Add the Bill of Materials

On the next page, click “Add BOM File”.

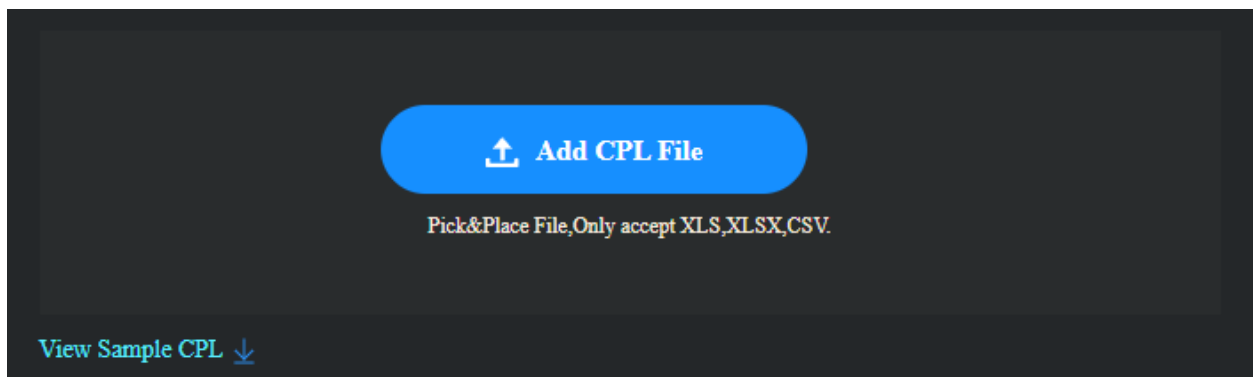


Select BOM_KV4.csv:


 BOM_KV4.csv	1/17/2022 9:27 PM	Microsoft Excel C...	1 KB
 KV4.apr	1/17/2022 5:28 PM	CAMtastic Apertu...	1 KB
 KV4.DRB	1/17/2022 7:11 PM	Altium NC Drill B...	2 KB

1.2.3 Add the Pick and Place File

Add the pick and place CPL file:



Select PickPlaceKV4_Top.csv:

 PickPlaceKV4_Top.csv	1/17/2022 7:19 PM	Microsoft Excel C...	23 KB
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Click next or manually search the Matched Part detail if the WS2812B-Mini or compatible does not show up:

Top Side

Select the parts you want to assemble on your boards. No restrictions on using extended parts for each order now.

Total 1 parts detected

1 Parts confirmed

0 parts not selected

Uploaded BOM Data			Review Matched Parts				
Designator	Comment	Footprint	Matched Part Detail	Qty	Source	Total Cost	Select
LED1,LED2,...	WS2812B-Mini	SMD_4	WS2812B-Mini SMD,3.5x3.5mm Light Emitting Diodes...	1142	JLCPCB	\$83.1376	<input checked="" type="checkbox"/>

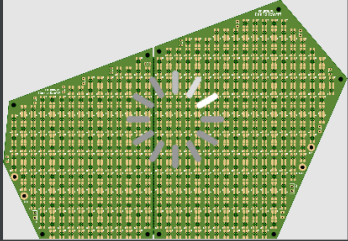
Please carefully check the packages of selected parts before proceeding.

NEXT

1.2.4 Add Topside LED Panel to Cart

Add the panels to your cart and continue to order the bottom LED panels:

Review Parts Placement



The parts placement is for reference purposes only. Our engineer will review and fix the components orientation in 4-6 hours after you place the order. You can check the result in your order history.

Selected Parts(1 item)

Download Selected Parts List

Part Detail	Designator	Qty	Source	Price
WS2812B-Mini	LED1,LED2,LED3,...	1142	JLCPCB	\$83.1376

Unselected Parts(1 item)

Download Table

Designator	Comment	Footprint	Qty
DESIGNATOR	COMMENT	FOOTPRINT	0

Charge Details

PCB Price

Engineering fee

Board

\$35.00

\$12.70

SMT Price

Setup fee

Stencil

Panel

Large Size

Components

Extended components fee

SMT Assembly

\$7.00

\$1.50

\$0.00

\$0.00

\$83.14

\$3.00

\$6.85

Build Time

PCB: 4 days

SMT: 72 hours

\$0.00

Total Price

\$149.19

Weight

552.72g

SAVE TO CART

By placing your order, pls read the Terms and Conditions of JLCPCB SMT Service.

1.3 Configuring the Topside SMT

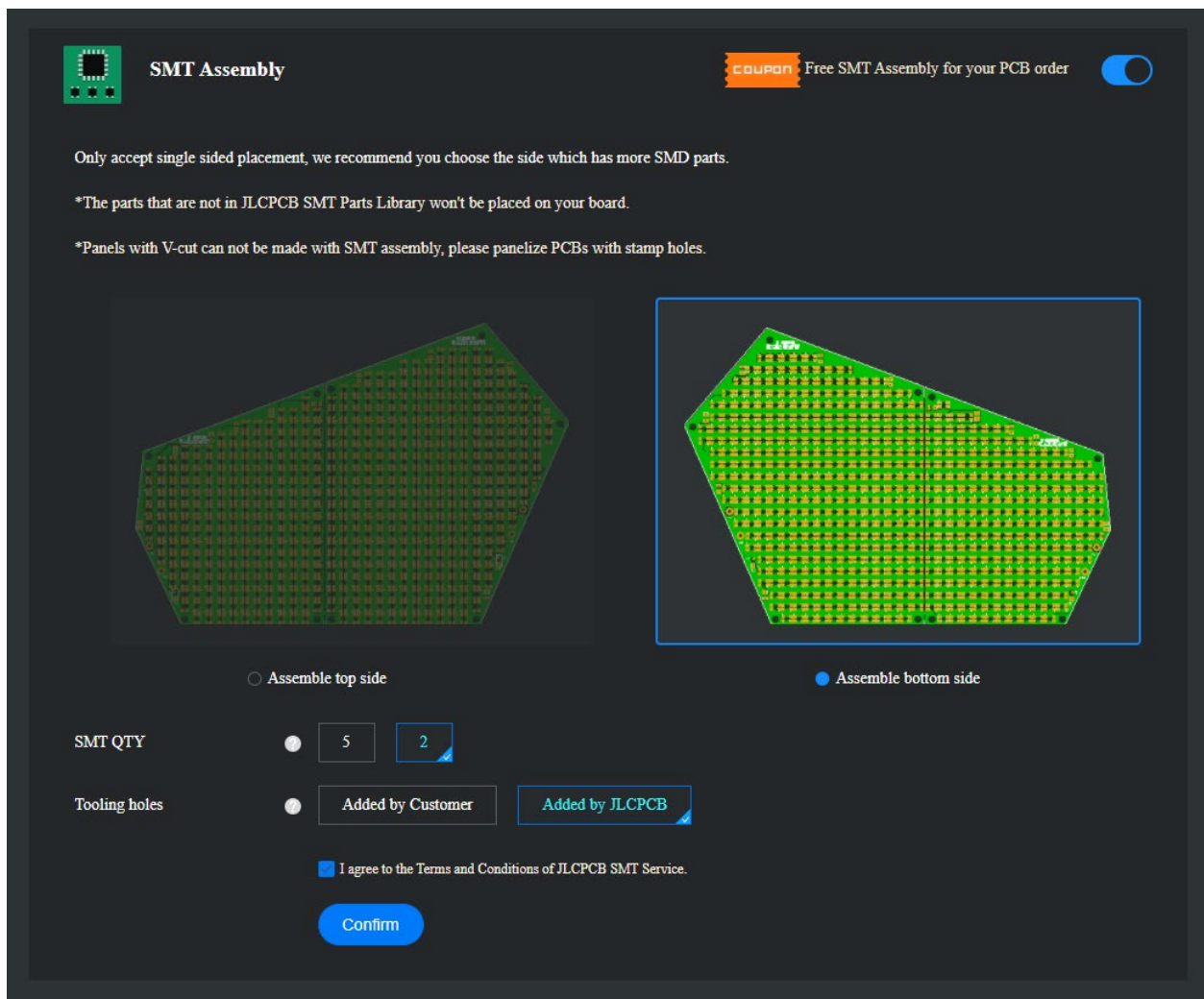
Repeat ALL the steps in section 1.1 and then continue at SMT assembly steps here:

1.3.1 Enable SMT Assembly

Click the switch on the left to enable SMT assembly:

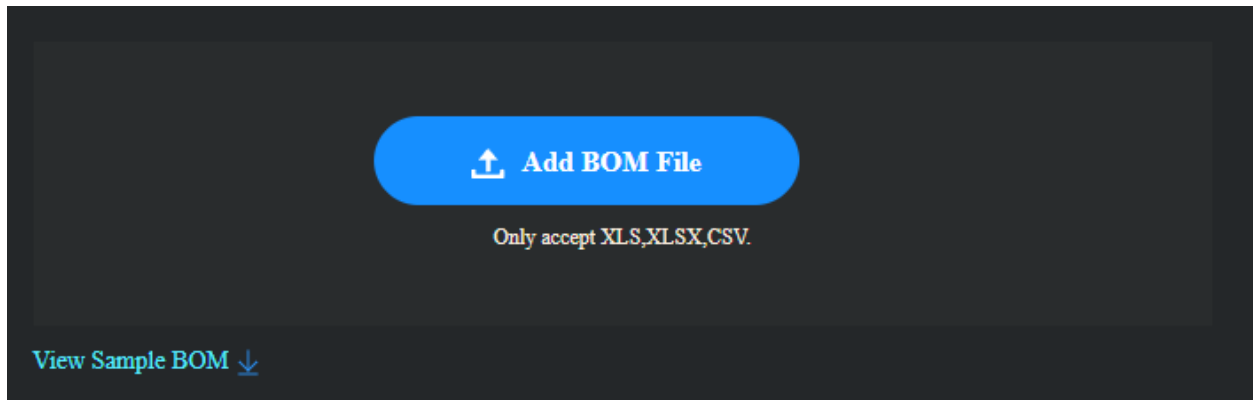


Select Assemble Bottom side, select the quantity that you would like and then click confirm:






1.2.2 Add the Bill of Materials

Click “Add BOM File” to upload the bill of materials:

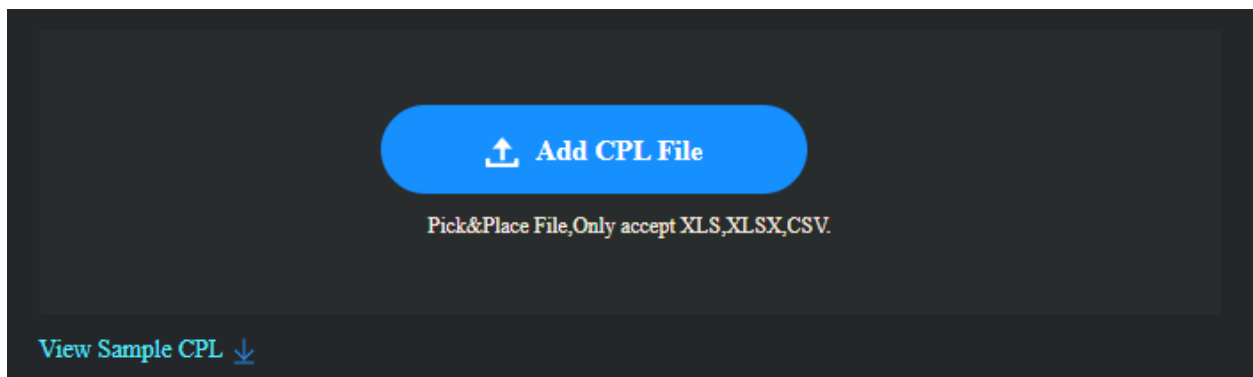


Select BOM_KV4.csv:


 BOM_KV4.csv	1/17/2022 9:27 PM	Microsoft Excel C...	1 KB
 KV4.apr	1/17/2022 5:28 PM	CAMtastic Apertu...	1 KB
 KV4.DRP	1/17/2022 7:11 PM	Altium NC Drill P...	2 KB

1.2.3 Add the Pick and Place File

Click “Add CPL File”:



Select PickPlaceKV4_Bottom.csv:

 PickPlaceKV4_Bottom.csv	1/17/2022 10:36 PM	Microsoft Excel C...	20 KB
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Select next or set the Matched Part Detail to the WS2812B-Mini or equivalent:

Top Side

Select the parts you want to assemble on your boards. No restrictions on using extended parts for each order now.

Total 1 parts detected

1 Parts confirmed

0 parts not selected

Uploaded BOM Data			Review Matched Parts				
Designator	Comment	Footprint	Matched Part Detail	Qty	Source	Total Cost	Select
LED1,LED2,...	WS2812B-Mini	SMD_4	WS2812B-Mini SMD,3.5x3.5mm Light Emitting Diodes...	1142	JLPCPB	\$83.1376	<input checked="" type="checkbox"/>

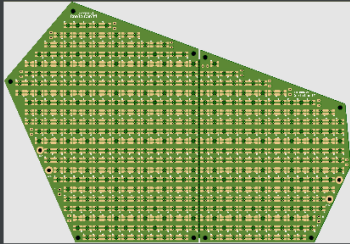
Please carefully check the packages of selected parts before proceeding.

NEXT

1.2.4 Add Bottom Side LED Panel to Cart

Save this to your cart and proceed with purchasing the LED boards.


Review Parts Placement



The parts placement is for reference purposes only. Our engineer will review and fix the components orientation in 4-6 hours after you place the order. You can check the result in your order history.

Selected Parts(1 item)

Download Selected Parts List

Part Detail	Designator	Qty	Source	Price
 WS2812B-Mini	LED1,LED2,LED3,...	1142	JLPCPB	\$83.1376

Unselected Parts(1 item)

Download Table

Designator	Comment	Footprint	Qty
DESIGNATOR	COMMENT	FOOTPRINT	0

Charge Details

PCB Price

Engineering fee

Board

\$35.00

\$12.70

SMT Price

Setup fee

Stencil

Panel

Large Size

Components

Extended components fee

SMT Assembly

\$7.00

\$1.50

\$0.00

\$0.00

\$83.14

\$3.00

\$6.85

Build Time

PCB: 4 days

SMT: 72 hours

\$0.00

Total Price

\$149.19

Weight

552.72g

SAVE TO CART

By placing your order, pls read the [Terms and Conditions of JLPCPB SMT Service](#).

2 Using the LED Panels

These LED boards use WS2812B-Mini serialized LEDs, these are glorified LED strips and can be controlled with the same controller! Each board has 571 LEDs which need to be controlled. This can be done through several means; I would recommend using my ProtoTracer program which will ray trace a live 3D model of a Protogen face to the LED panel in real time! You can find this here:

<https://github.com/coelacant1/ProtoTracer>

An alternative is to use FastLED with Arduino and manually define the pixels in order.

The hardware necessary to controller the panels is a Teensy 4.0 microcontroller:

<https://www.pjrc.com/store/teensy40.html> and an [OctoWS2811](#) LED controller:

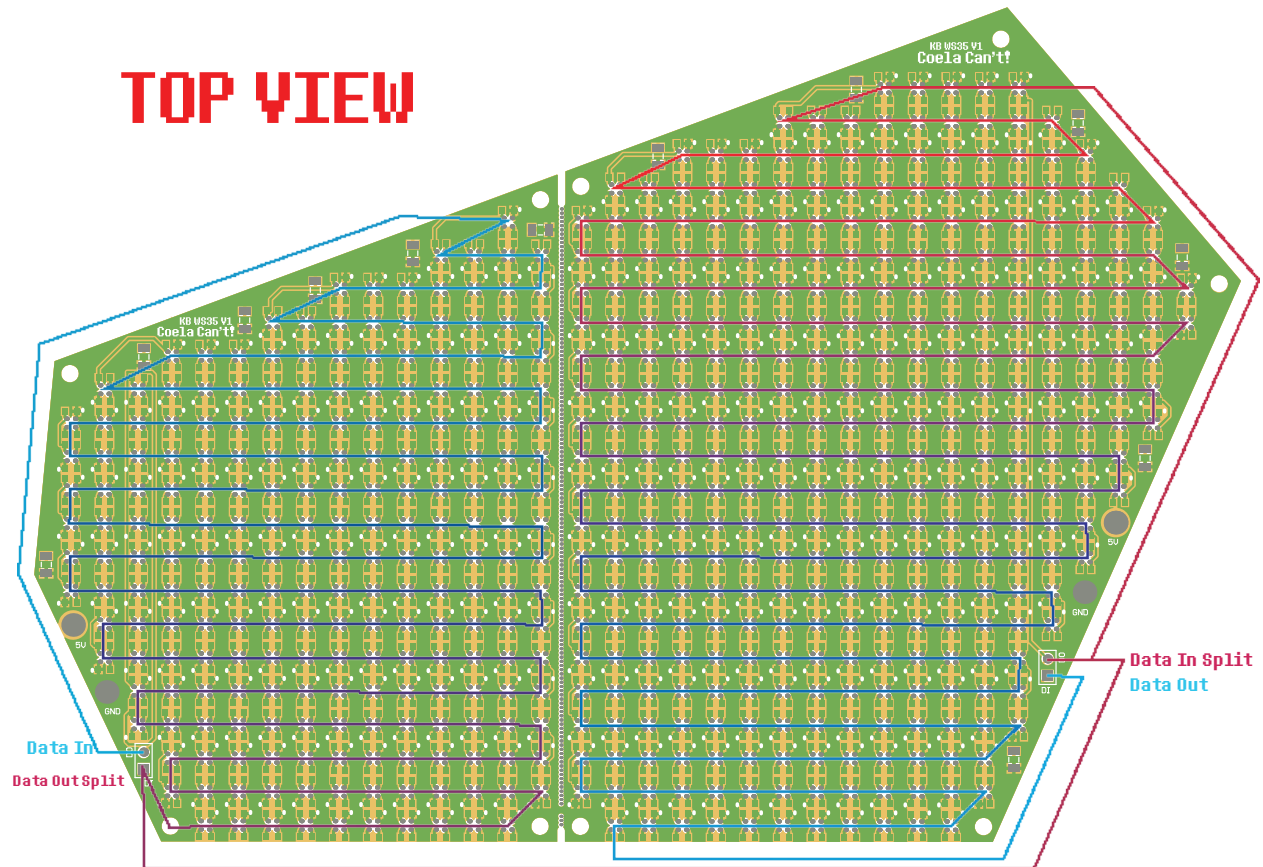
https://www.pjrc.com/store/octo28_adaptor.html

To use this, include the ProtoV2Controller.h as the primary controller and pick the animation to display on the face from the animations class. Use the KaiborgV1 animation as a default Protogen face.

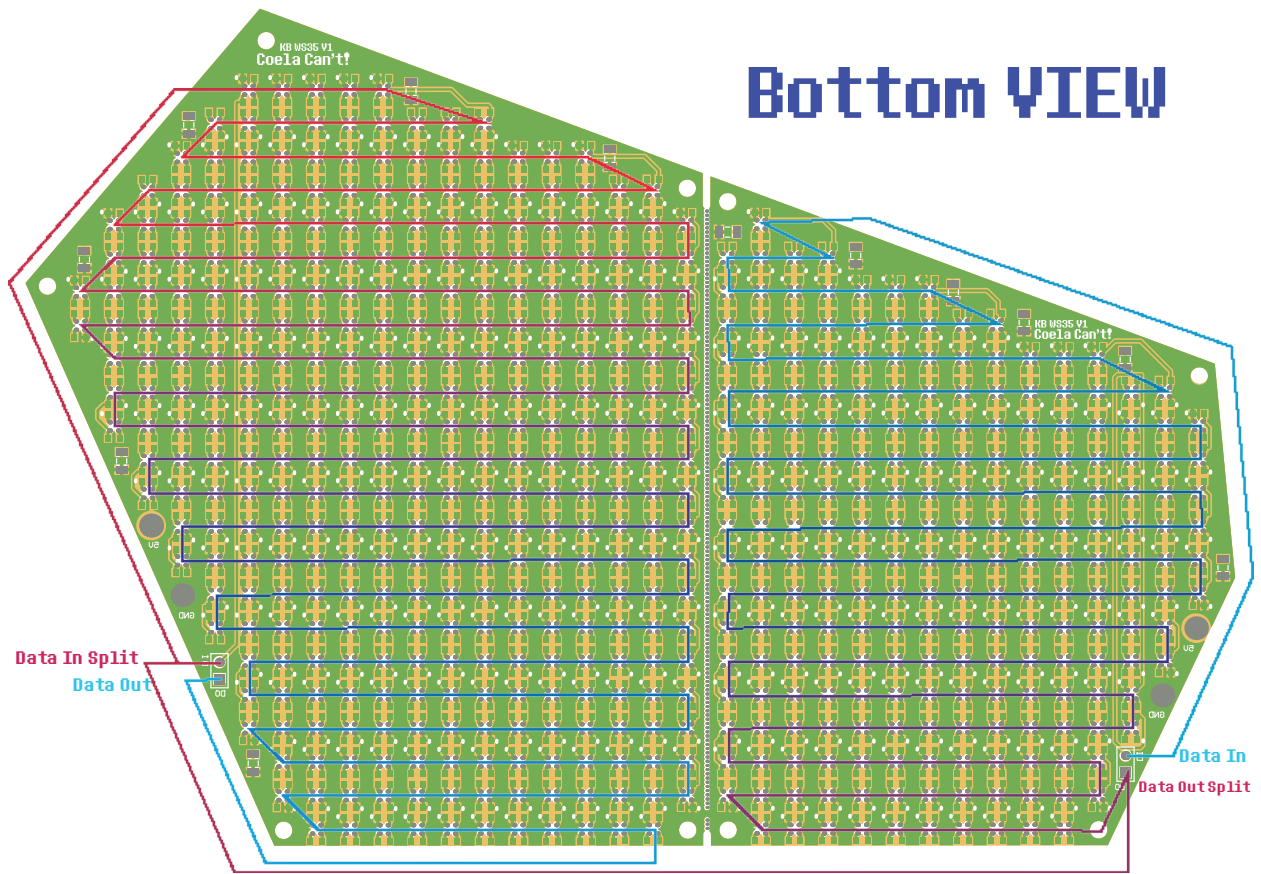
To increase the framerate the boards can be split in two with the perforation in the middle.

2.1 Top-Side LED Panel

As stated, before these panels are essentially LED strips, the order of the LEDs follows the pattern as below. The exact positions of each LED can be found in the PickPlace files in the Gerber folder.



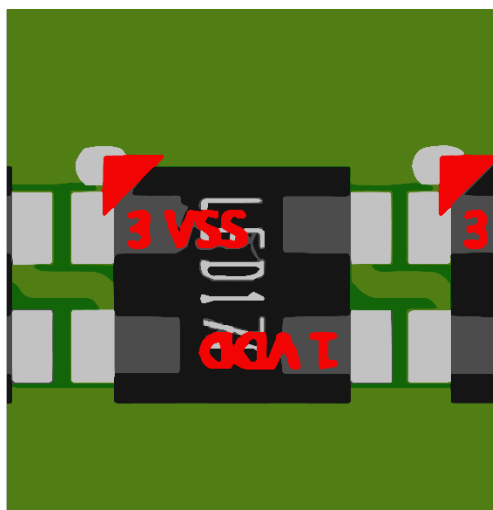
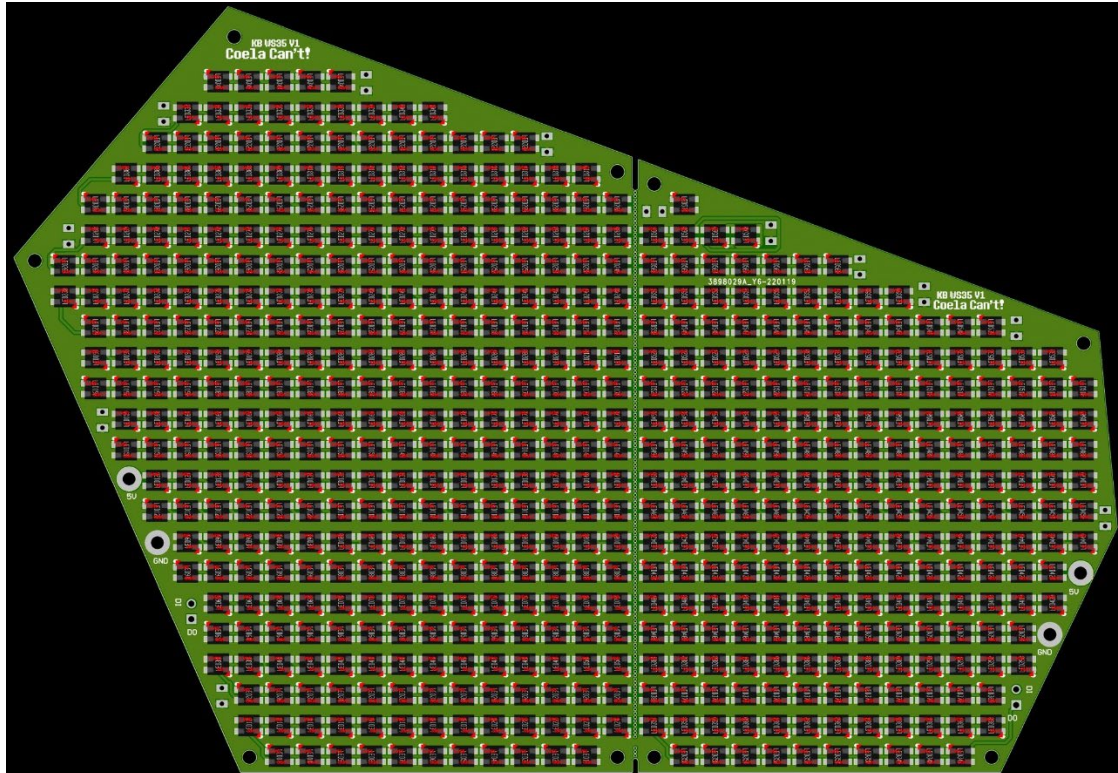
2.2 Bottom-Side LED Panel



3 Troubleshooting

3.1 Manufacturing Issues

If asked by the manufacturing engineer about the polarity of the LEDs, ensure their uploaded diagrams match the following images:



If the dot marker on the board is not aligned with the arrow on the LED, then request that they flip the polarity. If the boards are populated in the incorrect polarity, they will still function. But +5V will switch with GND and DIN will switch with DOUT.

4 Contact Information

If you have any questions that this document did not answer, or have recommendations please let me know at any of my messaging platforms here: <https://linktr.ee/coelacant1>

For easiest and quickest responses, use Telegram: @coelacant1, Twitter: @coelacant1, or Discord: @Coelacanth#1250