



Making #Badgeline: Godzilla vs. Blade Runner Badge



Presented by @alt_bier



How do you make a Badge?

- Determine Concept – Shape/Art/Function/Etc.
- Choose a Program to Design With
- Work Out Electronics via Schematic/Breadboard
- Layout Electronics/Components on PCB Design
- Layer PCB Shape/Cutouts/Silkscreen-Art
- Output Gerber Files for Manufacturer
- Choose a Manufacturer to Make Your Badge
- Assemble Your Badge

Determine Concept

Figure out what you want your badge to look like and what it will do. Then consider:

- PCB Shape and Cutouts and Color
- Electronics / Components Required
- Silkscreen Artwork and Text and Color
- Power Source and Attachment to PCB
- Overall Wearability / Usability



Determine Concept

The Godzilla vs. Blade Runner Badge was born out of my Brothers 3000 Society gaming conference. His con theme was Godzilla vs. Blade Runner since it was taking place in 2019 on the weekend that the new Godzilla movie was released.

I started reviewing movie artwork and moving pieces around when the final concept came to me. Using the Spinner allowed for some big LEDs on the light bar and the Tyrel building lends itself well to exposed copper capacitive touch. The idea of having Godzilla breath fire via LED came to me later during the design process.

The result is a great looking badge that uses capacitive touch and lots of Neo-Pixel LEDs to complete its look.



Choose a Program to Design With

Figure out what program you will use to design your badge. There are many options each with pros and cons. Here are a few:

- KiCad EDA (<http://kicad-pcb.org>)
- Eagle PCB (<https://www.autodesk.com/products/eagle/>)
- DesignSpark (<https://www.rs-online.com/designspark/>)



Choose a Program to Design With

Figure out what program you will use to work on the ART for your badge. Most PCB design programs require vector graphics for importing art to the silkscreen layers. There are many options each with pros and cons. Here are a few:

- Adobe Illustrator (<https://www.adobe.com/products/illustrator.html>)
- Inkscape (<https://inkscape.org/>)
- BoxySVG (<https://boxy-svg.com/>)



INKSCAPE



BOXY SVG

Choose a Program to Design With

For the Godzilla vs. Blade Runner Badge, I decided to use KiCad for the PCB design.



This made the most sense since I had been using this platform for other badges and PCB designs and had quite a bit of experience with it.

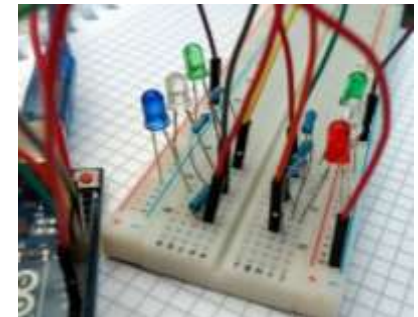
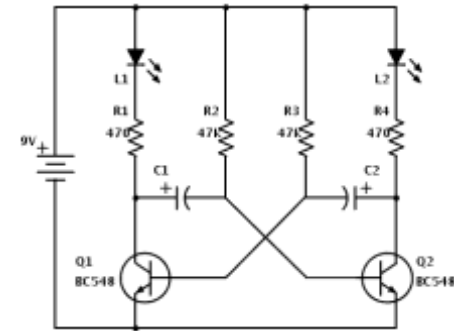
As for vector graphics, I have used Adobe Illustrator for many years making it my preferred choice for graphics.



Work Out Electronics via Schematic

Figure out how the electronics should work for whatever it is your badge will do.

- It is best to start with a circuit schematic.
- If possible, you should test your electronics prior to committing them to a PCB. This can be accomplished by building your circuit schematic on a breadboard or prototyping board.
- Having a “known good” working electronics design will prevent issues with your final manufactured badge.

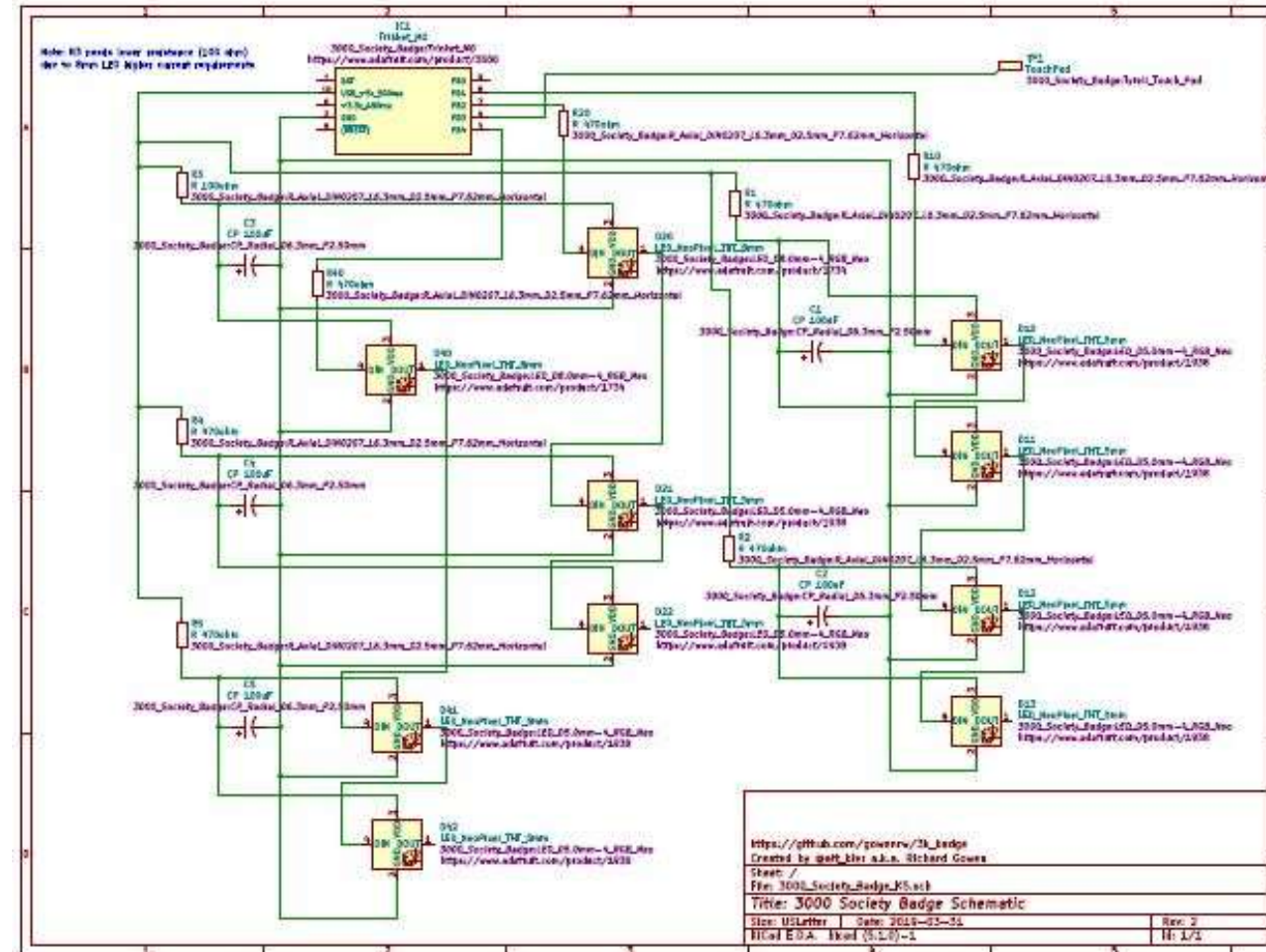


Work Out Electronics via Schematic

For the Godzilla vs. Blade Runner Badge I had to do research on the Adafruit Trinket M0 microcontroller that I wanted to use and then build the schematic and footprint files for it.

This circuit used some of the Trinket's built in functions for capacitive touch and NeoPixel LED control. But otherwise was not very complicated.

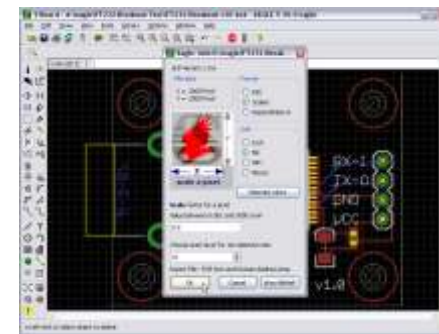
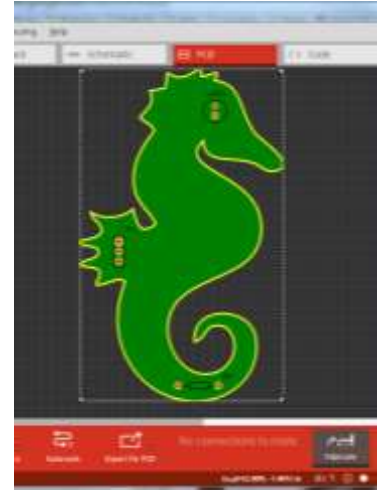
The one thing of note on the circuit is the placement of the capacitors. Due to the current draw of the NeoPixel LEDs used I had to use one capacitor for each two LEDs. I probably could have used one large cap for all of them but that would not have looked good on the badge.



Layer PCB Shape/Cutouts/Art

Once your basic PCB design is complete layer in other things like PCB shape and cutouts and Silkscreen Art.

- The outer shape of the PCB, the internal cutouts, and the silkscreen art are all separate layers in the PCB design.
- Add each of these to the design (usually by importing a vector graphics file) and adjust your component layout and traces and vias accordingly.



Layer PCB Shape/Cutouts/Art

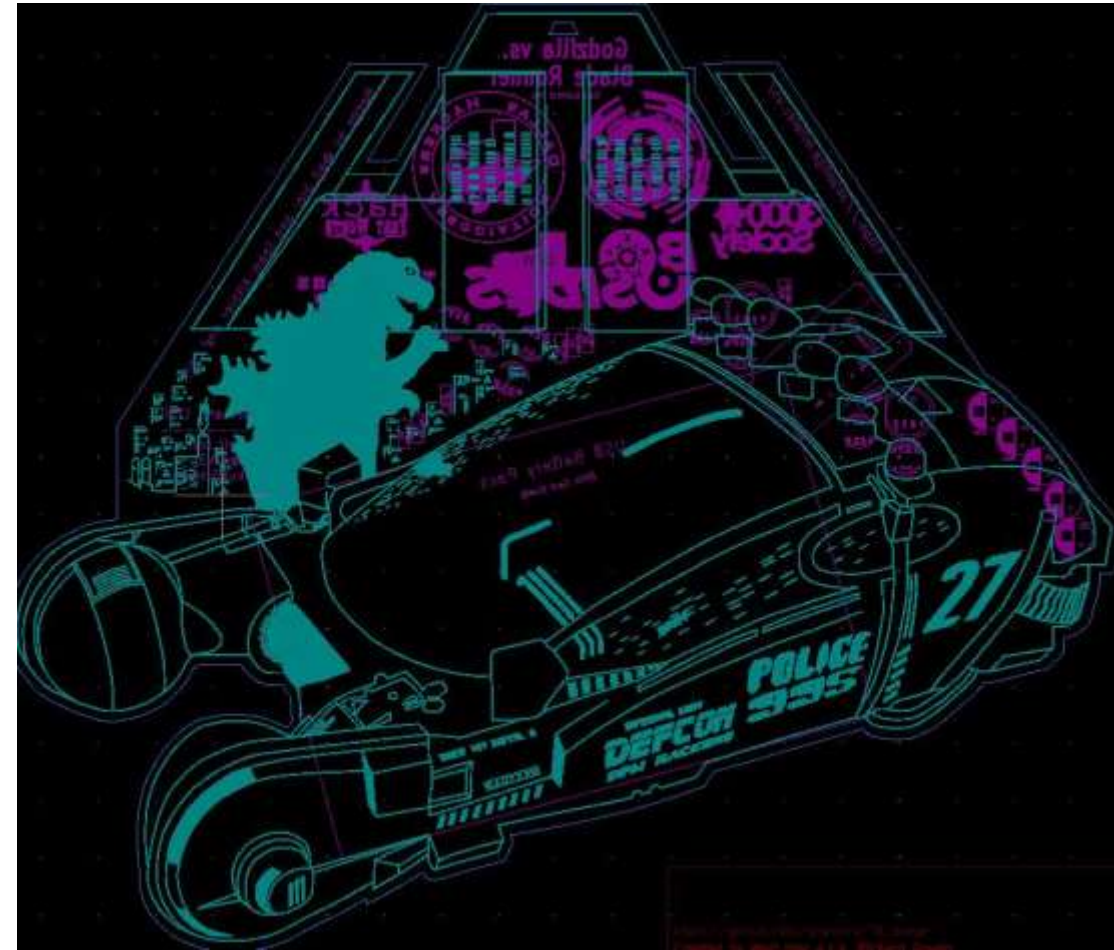
For the Godzilla vs. Blade Runner Badge I created several images using Illustrator that I imported into KiCad.

One image was the edge cuts layer that had the badge shape. Another contained the top layer silkscreen art. Several more contained logos for the bottom layer silkscreen.

I imported some of these files into the KiCad using its Bitmap2Component tool which turned them into Kicad Module files (.kicad_mod) that I could import within Kicad's PCBnew editor. This worked for all the images in the F.Silks and B.Silks layers.

However, the Edge Cuts layer is special and required the image to be exported to DXF format in order to be imported into the Edge.Cuts layer properly.

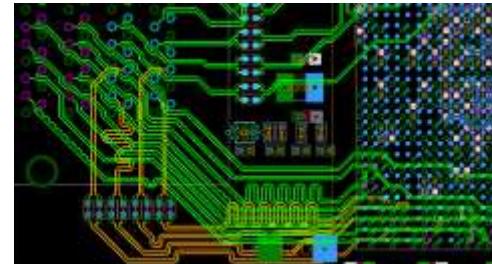
I used different silkscreen art on the 3000 Society version and DC27 version of this badge.



Layout Electronics on PCB Design

Convert your electronics schematic into a PCB design by placing components and trace wires between them.

- Most PCB design software will auto populate the PCB design with components from a schematic.
- Move the components around to where you want them placed on your PCB
 - For Through Hole components make sure the spacing between the holes matches your component specifications
- Connect the component leads with lines that represent the copper traces that will be added to the PCB.
 - Place and connect VIA (vertical interconnect access) points on multi-layer boards to connect the layers where needed



Layout Electronics on PCB Design

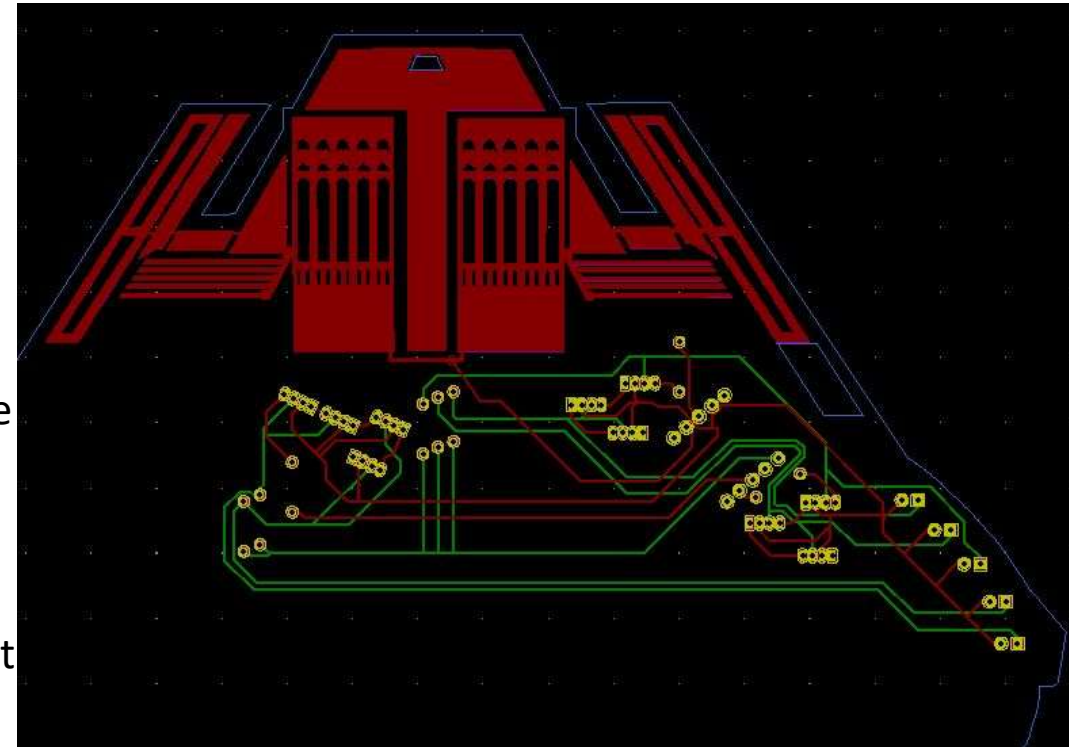
For the Godzilla vs Blade Runner Badge I knew that the design was to be very heavily influenced by the art including capacitive touch on the Tyrel building. So I had to lay out all the front silkscreen artwork first and overlay all the components in the correct positions.

For the capacitive touch pad I had created a separate artwork file for this in Adobe Illustrator and imported it into KiCad as a footprint which I then manually modified to move from the silkscreen layer to the copper layer.

I had to verify and adjust each components size in the software so that the components and their solder pads would be placed in the correct positions. This was done by downloading the specification sheets for the components I was going to use which detailed the spacing requirements.

For many components, footprint files existed but for some I had to create them. Regardless if a footprint existed or not, I verified that each footprint I chose matched the specifications I needed.

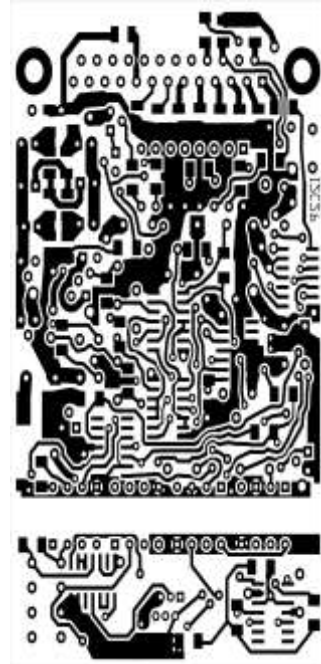
For the 3000 Society run of this badge I got the traces a bit too thin which resulted in electrical problems with some of the badges. This was corrected in the DC27 run of this badge by increasing the width of the traces.



Output Gerber Files for Mfr.

When your PCB design is complete you will want to export Gerber files for the PCB manufacturer. The Gerber file format is a standard that most PCB manufacturers use.

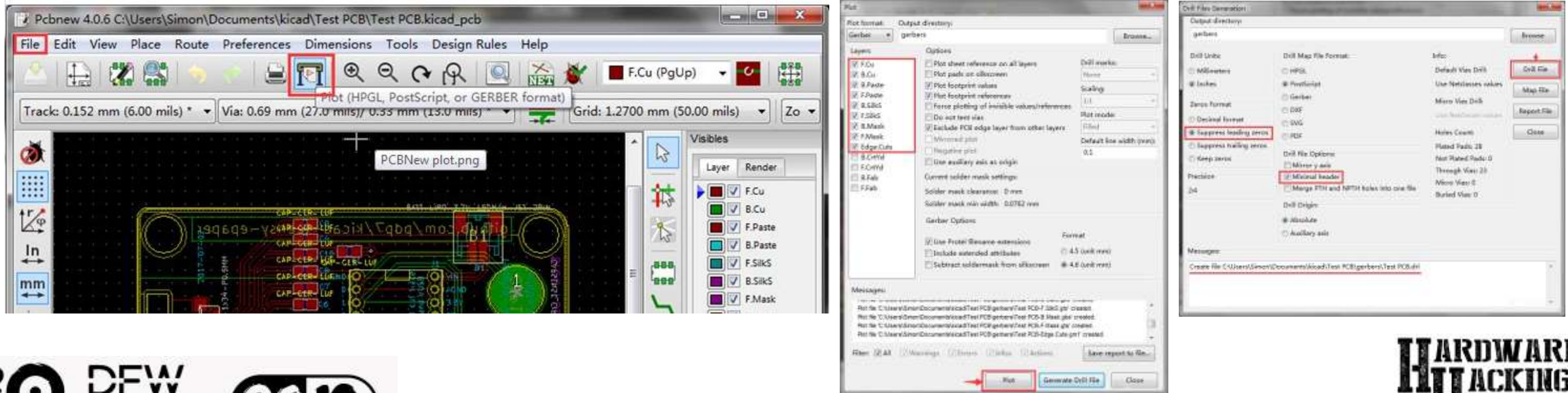
- The Gerber format is an open ASCII vector format that has been the de facto standard used by the PCB industry for over 30 years.
- The Gerber files describe the printed circuit board images: copper layers, solder mask, legend, etc. The Mfr. uses these files to fabricate the PCB
- Most PCB design software provide a method for exporting the Gerber files that the Manufacturer will need.
- Most PCB Mfrs. will tell you how they want to receive these files. (e.g. Zip file via Web upload)



Output Gerber Files for Mfr.

For the Godzilla vs. Blade Runner Badge I used the KiCad export function to export the Gerber files required to produce the PCBs.

This was done by choosing the “Plot” setting within the PCBNew tool. Using the menus I chose all the layers I wanted plotted to Gerber files and also created a drill file. This created a total of nine files that I then added to a single ZIP file to send to the manufacturer.



Choose a Mfr. to Make Your Badge

There are several factors to consider when choosing a PCB manufacturer. Cost is probably the top factor. But, time and location and quality are all also important. The cheapest PCB Mfr. might take months to deliver or might have poor quality. Look at customer reviews and do some small prototype runs to confirm they meet your needs. There are many PCB Mfrs. to choose from. Here are a few:

- <https://pcbshopper.com/> ← Travelocity like site for PCB Mfrs.
- <https://jlcpcb.com/> ← Inexpensive but with some limitations.
- <https://pcbway.com/> ← Inexpensive but with some limitations.
- <https://oshpark.com/> ← A bit pricy but beautiful and made in USA

Choose a Mfr. to Make Your Badge

For the Godzilla vs. Blade Runner Badge I was in a time crunch and did not have time to research manufacturers. I had used JLCPCB before and knew they could do what I needed for this badge. So, they were my first and only choice.

• <https://jlcpcb.com/>

← Used This Manufacturer

Godzilla vs. Blade Runner Badge

Success! Questions?

I hope everyone who purchased one of these badges (and supported BSidesDFW with their purchase) enjoys it as much as I enjoyed creating it.

<https://3kbadge.altbier.us/> ← Badge Code & Info

