



How To Solder Mask PCBs

Created by Ruiz Brothers



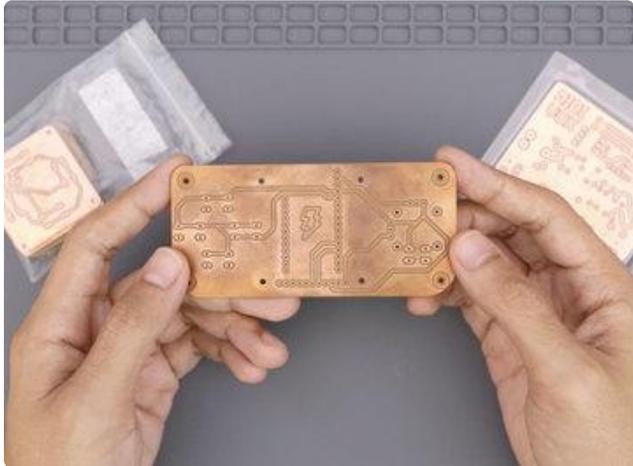
<https://learn.adafruit.com/how-to-solder-mask-pcbs>

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Overview



Rusty PCBs?

Whether you're etching or CNC milling your own PCBs, the copper layer on the substrate will eventually begin to oxidize and rust. The best way to prolong the life of your PCBs is to give them a protective coating. This is where PCB Solder Masks come into play.

Solder masks resist solder and act as a protective layer that rests on top of the copper traces. It's the green stuff found on most common PCBs. Solder masks can take high temperatures, so it can handle the intense heat from the tip of a soldering iron.



Mechanic's Solder Mask

UV curable solder mask is a special type of resin that hardens when exposed to ultraviolet light. It comes in different colors in a syringe type tube. You can find it online or purchase it from your local electronics hobby shop.



There's a few household items and supplies that can help assist the procedure. Most important parts needed is the UV resin and transparency film.

UV Curable Solder Mask Resin
Transparency Film
Isopropyl alcohol
Nitrile gloves
Paper towels
Topperware tray
X-acto knife
Ruler / T-square
Silicone mat
Cutting mat

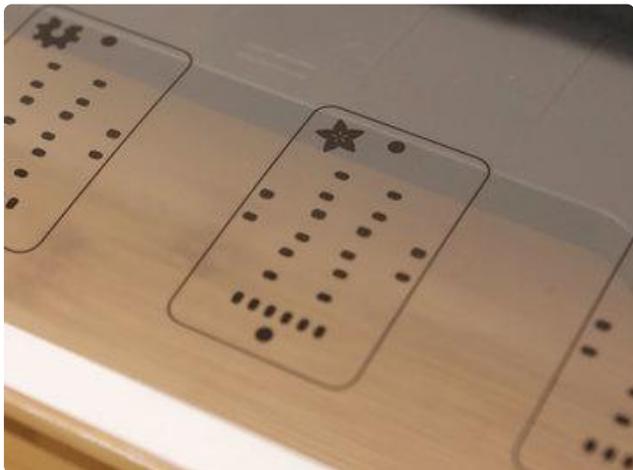
1 x [Mechanic UV Curable Solder Mask](https://www.amazon.com/MECHANIC-Prevent-Corrosive-Soldering-Welding/dp/B0747P2CWJ/)
Type: LY-UVH900

<https://www.amazon.com/MECHANIC-Prevent-Corrosive-Soldering-Welding/dp/B0747P2CWJ/>

1 x [Transparency Film](https://www.amazon.com/Apollo-Universal-Inkjet-Transparency-CG7033S/dp/B003BM42L2/)
Quick Dry type for InkJet Printers

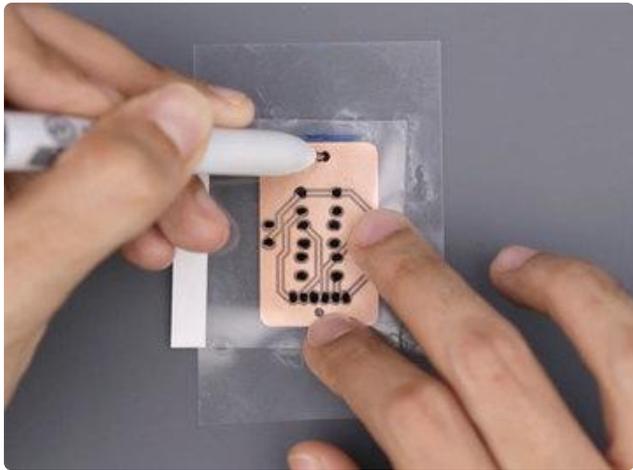
<https://www.amazon.com/Apollo-Universal-Inkjet-Transparency-CG7033S/dp/B003BM42L2/>

Solder Mask



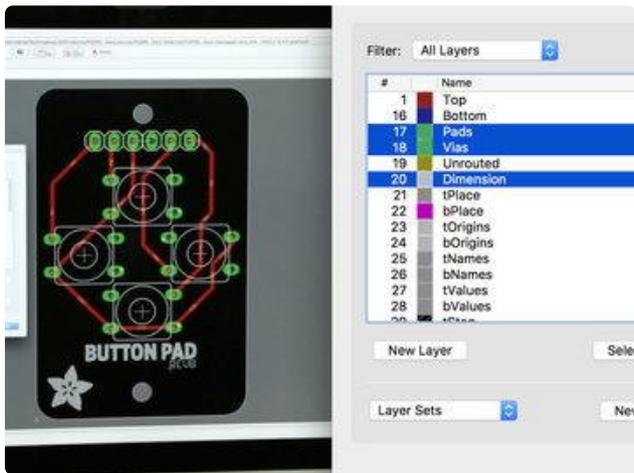
Making A Solder Mask Template

The first thing I need to do was to make a solder mask template. This is basically a transparent film that has artwork of the pads and vias in your PCB design.



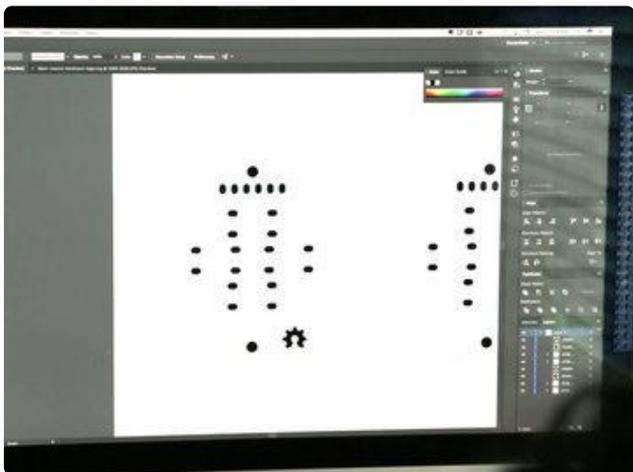
DIY Sharpie Solder Mask

If your PCB design is simple, you could DIY your own solder mask template with a sharpie. Overlay a piece of transparency film over the PCB and mark in the pads and vias using a fine tipped sharpie. You'll want to double up on transparency film to make the pads more darker, which will be helpful to block out the UV light when exposing the solder mask resin.



Eagle CAD

For more complex designs, I suggest making a custom template with the help of your CAD software. In Autodesk Eagle, it's as easy as isolating the pads and vias layer. I also suggest showing the mounting holes and board outline, which is helpful for obtaining good alignment. You can use the "Print" feature to save out a PDF.



Tweak Artwork

You may find it useful to tweak the pads and outlines using a vector graphics editing software (such as Adobe Illustrator or Inkscape) – I found it necessary to fill in the holes in the pads so the resin doesn't harden when exposed. You can also add vector graphics for getting DIY silkscreen graphics.

You'll want to layout multiple copies of the PCB so that they can be doubled up. I did this by copying and pasting the vectors in Adobe Illustrator and tried to maintain even padding/margin space between them.



Printing on Transparency Film

Getting the solder mask artwork onto a transparency film can be done with either laser toner printer or an inkjet printer. The inkjet printers are more common and require a special "Quick-Dry" type transparency paper. One side has a coarse texture which is the side we'll need to print on. The rough surface allows the ink to dry so it sticks and it doesn't wipe off.

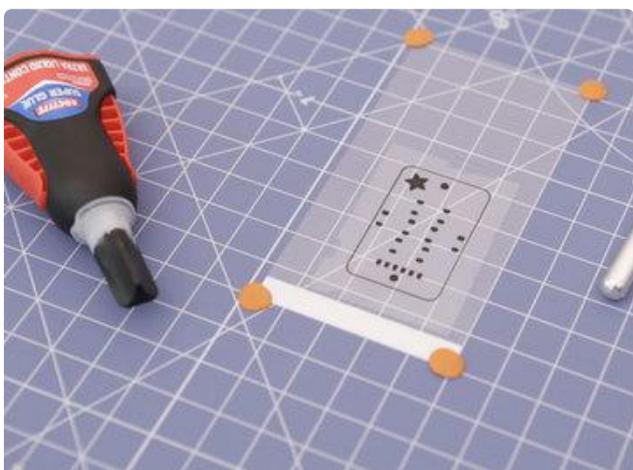
Print Settings

Using the print dialog, I changed the paper type to the glossy paper and cranked up to the highest quality print setting – This will ensure the ink sticks to the transparency film.



Prep Film

Using an x-acto knife, cut out the artwork and make sure to leave padding around the edges so it's easier to handle the film. You'll need to double up the artwork because the ink just isn't dark enough to fully block out the UV light.



Double-Mask

To stick them together, I added drops of superglue along the edges. You'll want to make sure not to get this on the ink, so make sure there's plenty of blank space. Perfect alignment is very important, so you may want to tack the artwork down so it stays in place. Blank pieces film can be used to spread the resin, so make sure you have a few.

Applying Resin



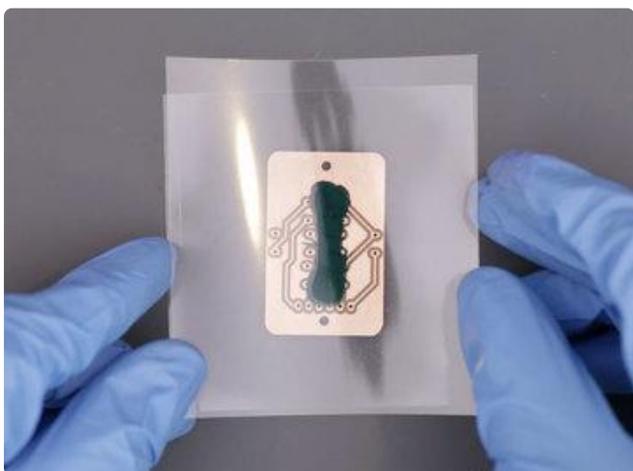
Clean PCB

Before applying the resin, you'll want to make sure the PCB is cleaned and free of any rust. Since mine were CNC milled, I used a scotch brite pad to lightly buff out the burrs and was even able to remove a small amount of oxidization.



Apply Resin

Once cleaned, place the PCB down on a piece of blank film. Remove the protective cap from the tube and press your finger against the plunger to dispense the resin onto the PCB. It's easy to dispense onto the PCB but how much to use will depend on the size of the PCB. Use your best judgement to determine how much resin can cover the entire PCB.



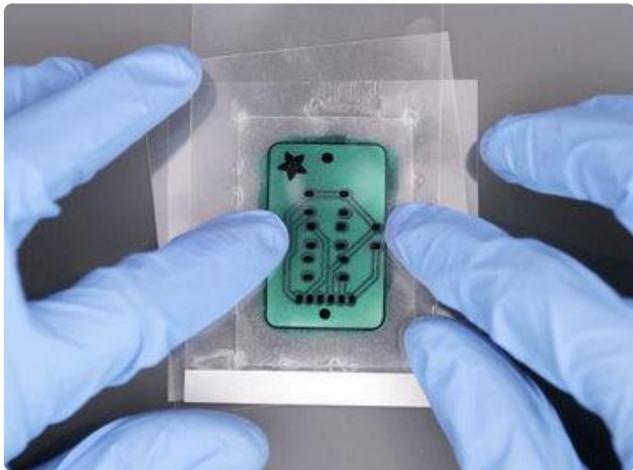
Spread Resin

Grab a second piece of blank transparency film and lay it over the glob of resin. This will help spread the resin across the surface of the PCB. Lightly press down on the piece of film and let the resin spread. A piece of glass or acrylic can then be placed on top of the blank film to further evenly distribute the resin.



Squeegee Resin

You can use a squeegee to further spread the resin, especially to the corners and any hard to reach areas. Don't press too hard or you may get thin spots. Avoid causing any air bubbles – slowly move the squeegee across the surface of the PCB. Any excess resin can be scrapped off the edges of the PCB. It's a little tricky to get perfect, so take your time!



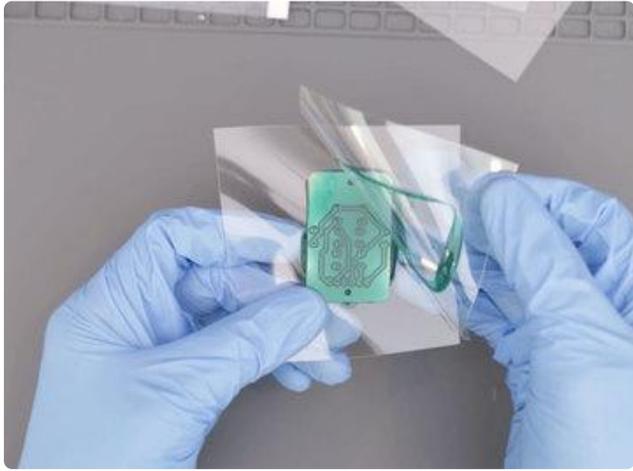
Place Mask

Once you're happy with the resin application, place the solder mask film over the PCB and line up the artwork. Alignment is super important here, so you may want to take your time finessing the placement. To give the film a bit more "grip", I added a drop of alcohol to the back of the mask so that it would stick to the blank film better.



Expose UV Resin

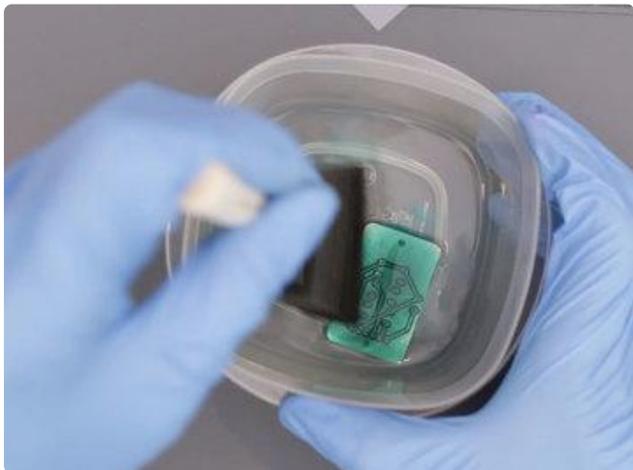
Now it's time to expose the resin! To do this, I used a 100LED UV flashlight. You can use a lamp too, just make sure the light source is large enough to cover the whole PCB. To properly expose the resin, you'll need to find the right balance of exposure time. In my project, I exposed the resin for about 10 seconds with the flashlight about 2-3 inches away from the PCB.



Peel Film

When I first tried this, I started to peel away the film and quickly knew I didn't expose it evenly enough. The some of resin stuck to the PCB but a big chunk tore off. The size of the PCB, amount of resin and the distance of light source all matters so you'll need to do a few tests to get it right. After a few trials and tribulations, I found 10 seconds works well with the right amount of resin. Any longer can result in over exposed solder mask.

Clean & Cure



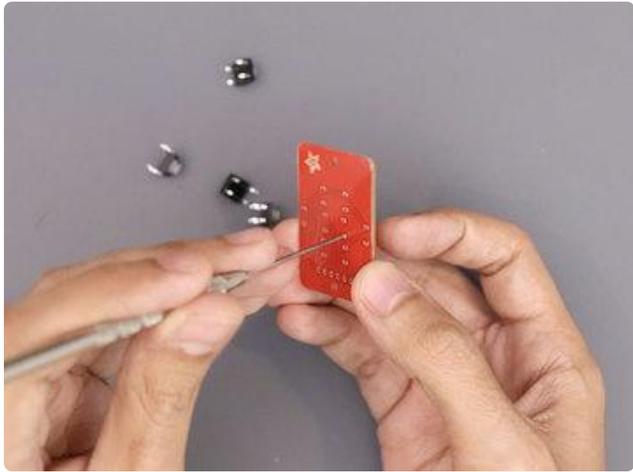
Post Processing

Now it's time to get rid of all the uncured resin. I suggest submerging the PCB in a container with isopropyl alcohol. That will help loosen up the unexposed resins and any excess globs. You'll want to agitate the PCB by shaking it back and forth in the container.



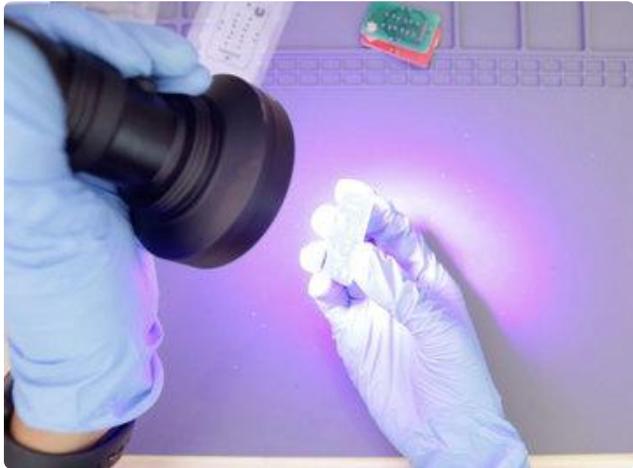
Rub, Wash and Rinse

Then, use a paper towel to scrub away any remaining resin. The copper pads should be exposed, along with any extra artwork. If not, the resin may have been overexposed (too much time under the UV light).



Through Holes

If your PCB features any through hole components or mounting holes, you'll want to use a tool to poke out any resin that may be clogging the holes. A needle, fine tipped tweezers or similar tool can be used.



Final Cure

Once all of the under exposed resin has been removed and PCB cleaned, it's time to fully cure the resin. Using the UV light, expose the PCB again, this time for about a minute. This will ensure all of the resin is hardened and fully cured.



Solder Components

Now it's time to add the components to your PCB! So, How well does the solder mask actually work? Well, pretty good. It resists solder and looks pretty clean after soldering. It actually flows onto the pads much better than bare copper, which is pretty nice.