

Van Zero to Hero in PCB design

- Van Zero to Hero in PCB design
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 - Wire wrap
 - Gaatjes print
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[Open Cursus \(@bruuce/kets-PCB?type=view\)](#)

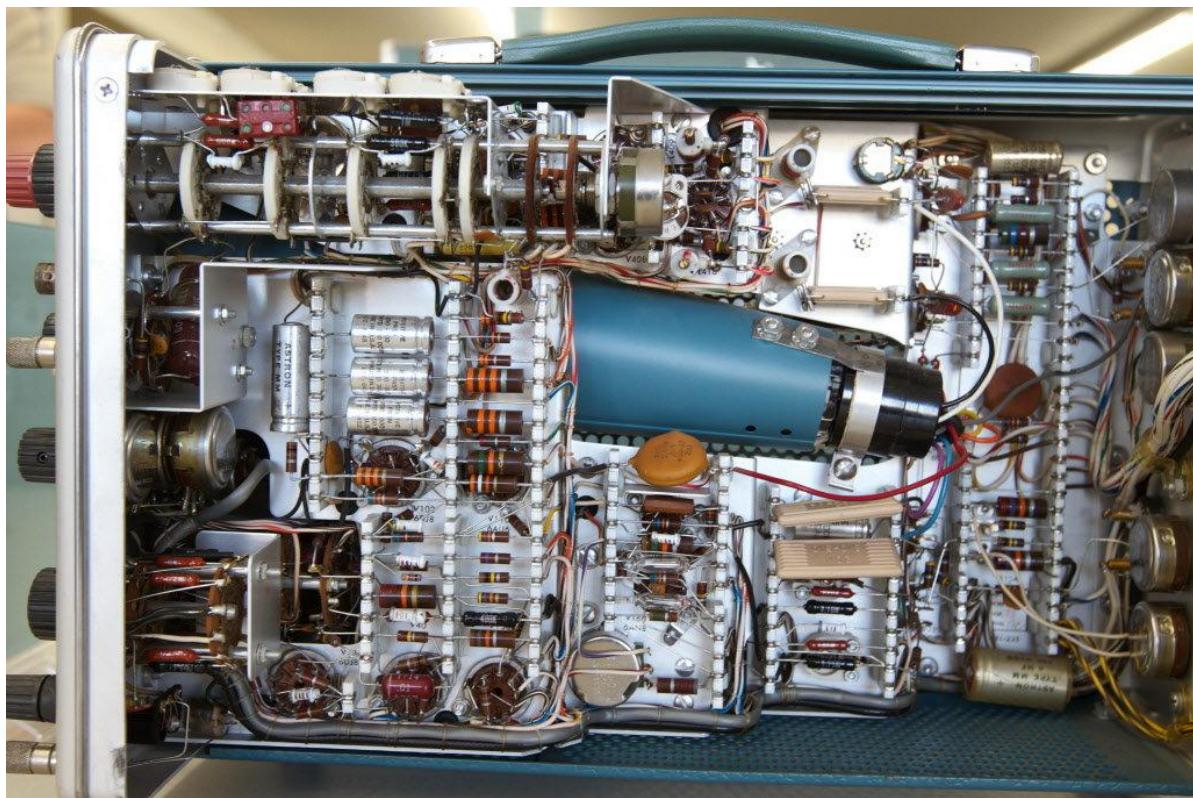
[Open Slides \(@bruuce/kets-PCB?type=slide\)](#)

Deze Les

- Geschiedenis
- Terminologie
- Van prototype tot eindproduct
- PCB productie methoden
- PCB design

Geschiedenis

In the beginning

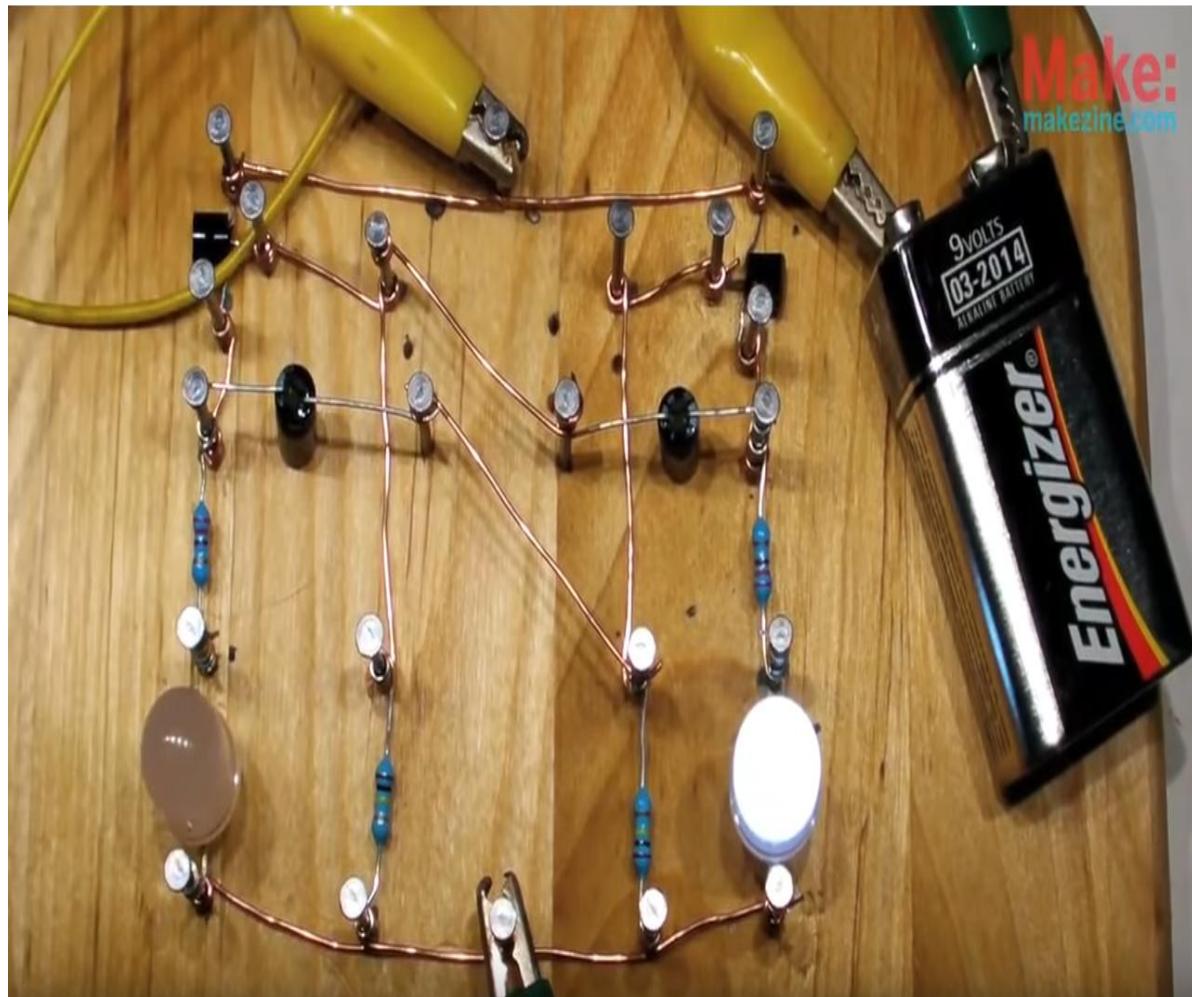


[Full size](<http://media.oregonlive.com/silicon-forest/photo/tek-innards-randyjpg-30653e8021787d4a.jpg>) (<http://media.oregonlive.com/silicon-forest/photo/tek-innards-randyjpg-30653e8021787d4a.jpg>) =x500)

note:

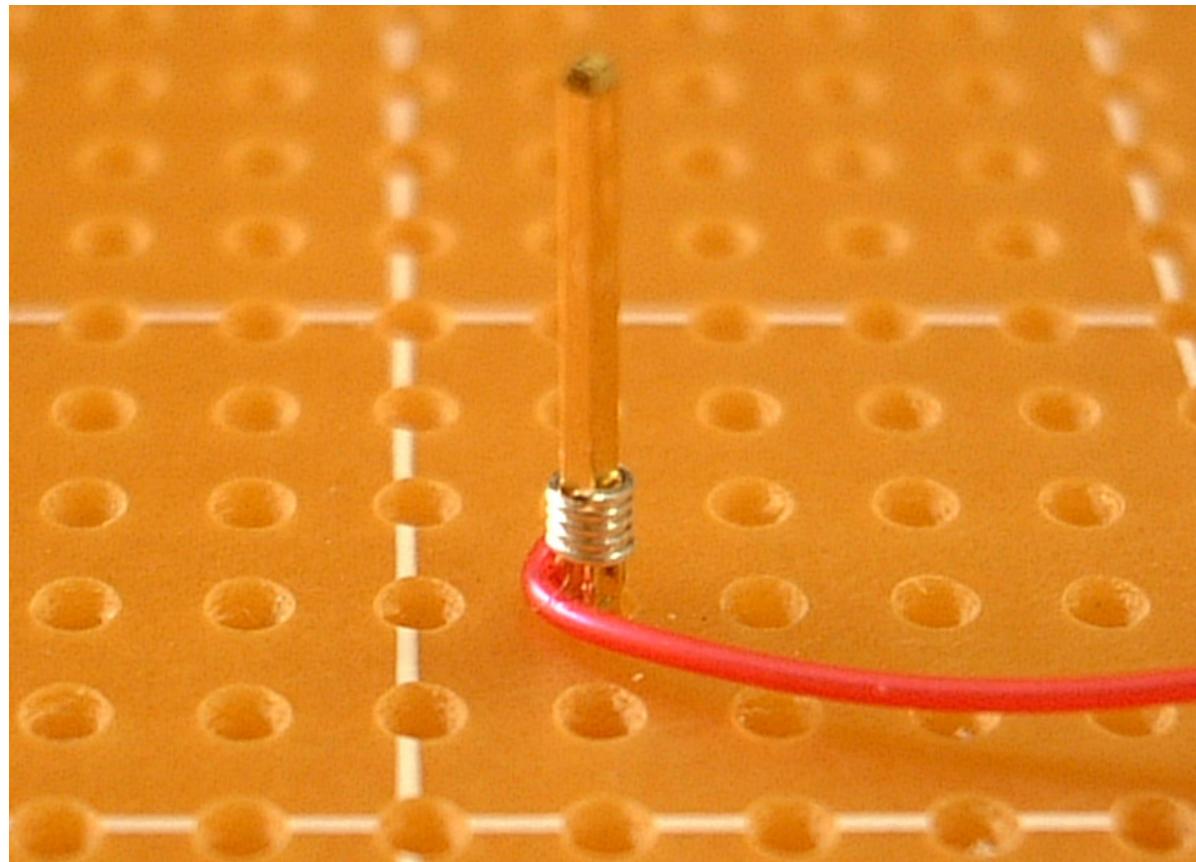
Foto van een oude oscilloscoop, zonder printplaten

Breadboard

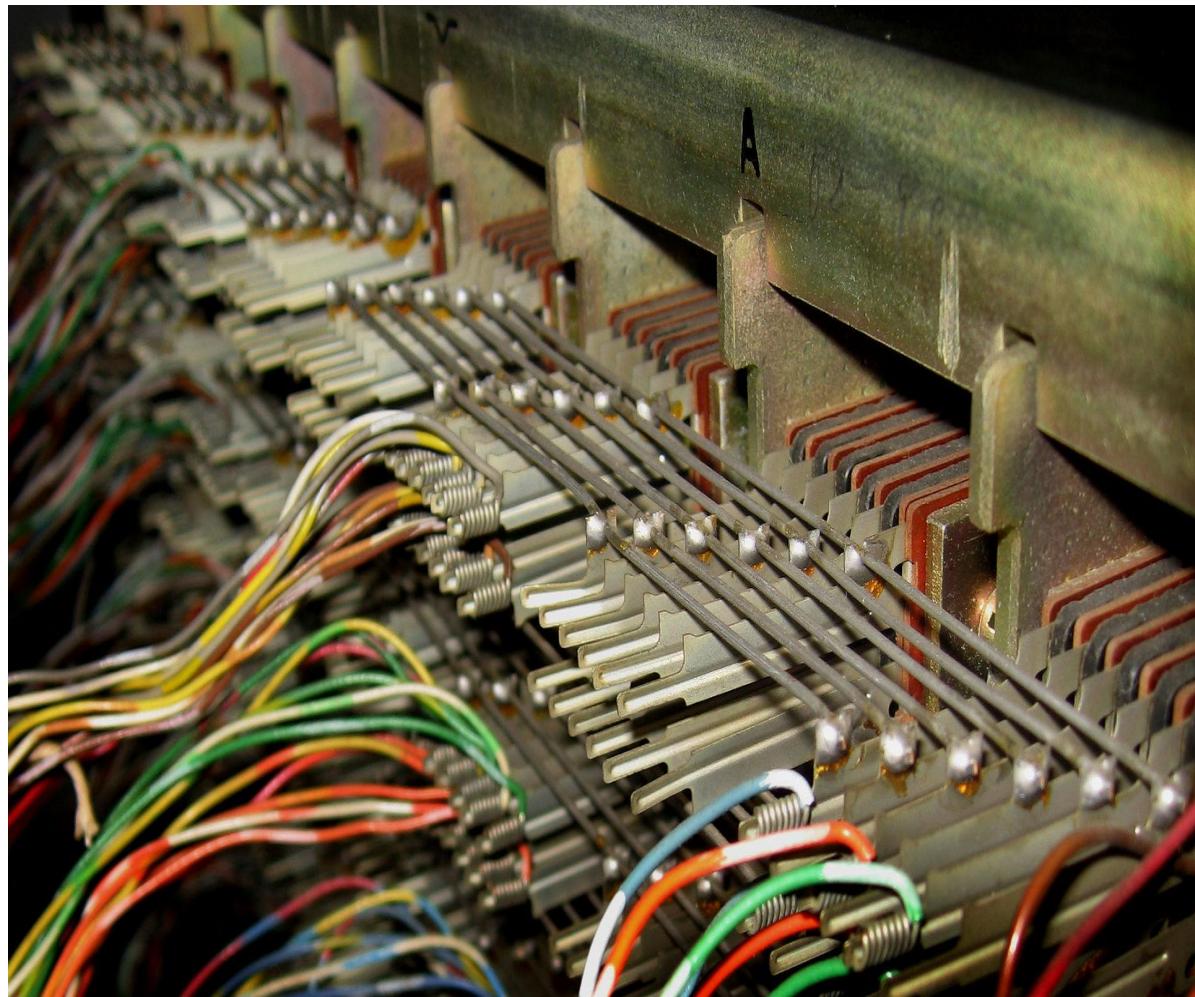


note: een schema gemaakt op een broodplankje

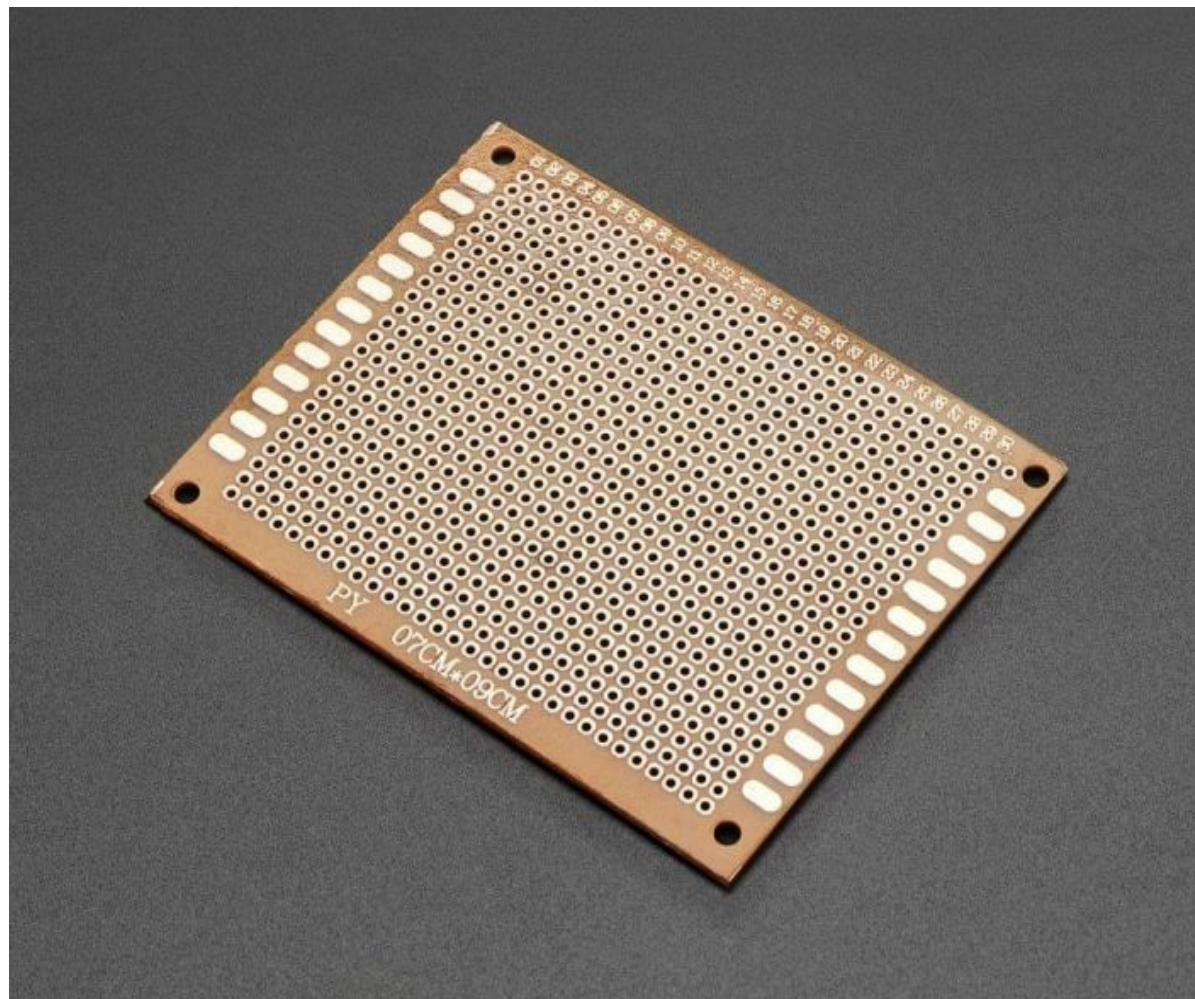
Wire wrap

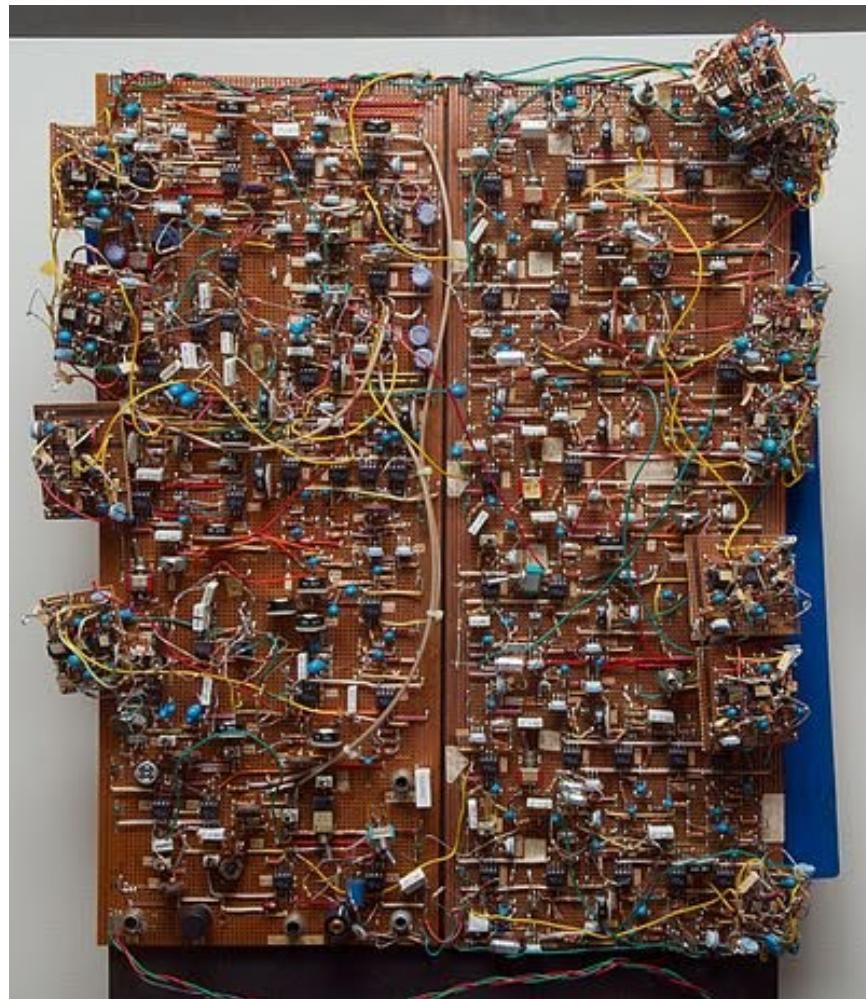


Note: Gaatjes print met wire wrap

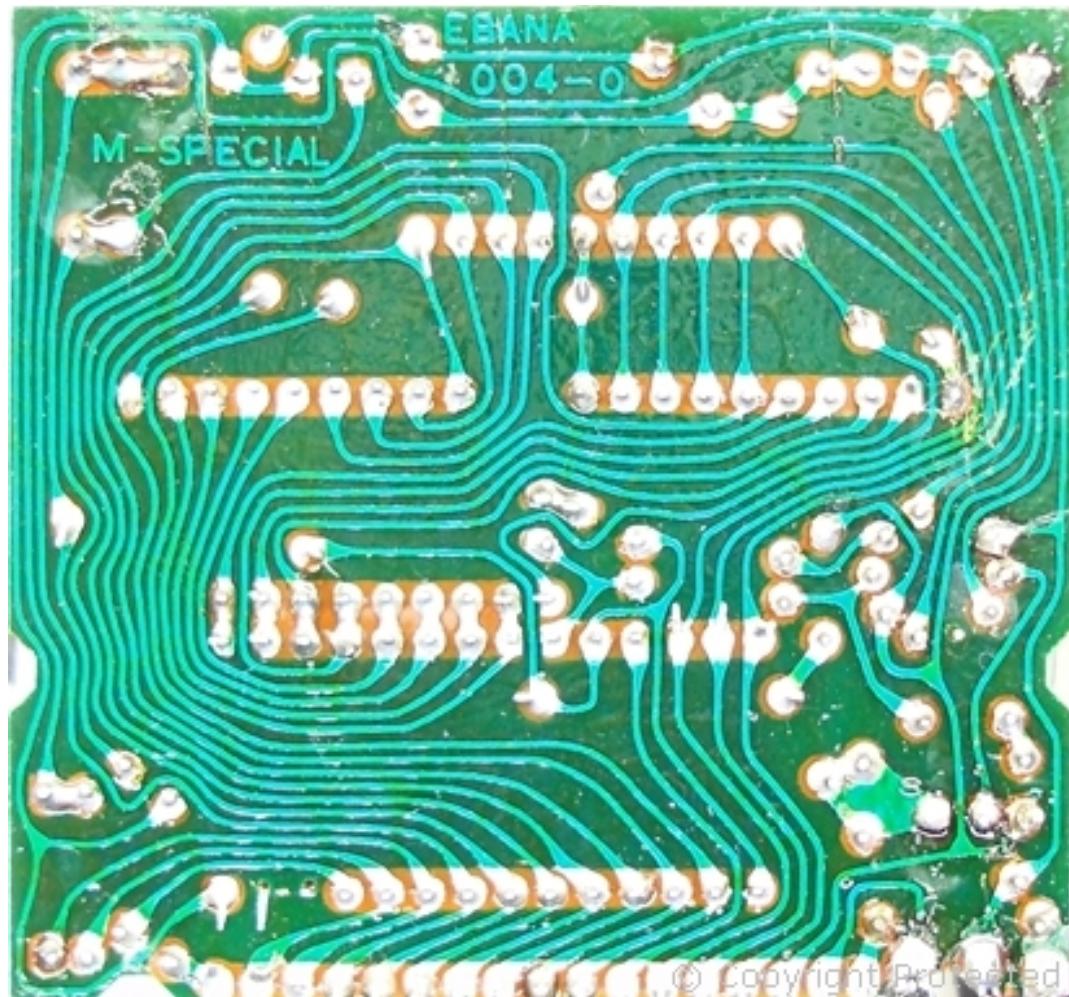


Gaatjes print

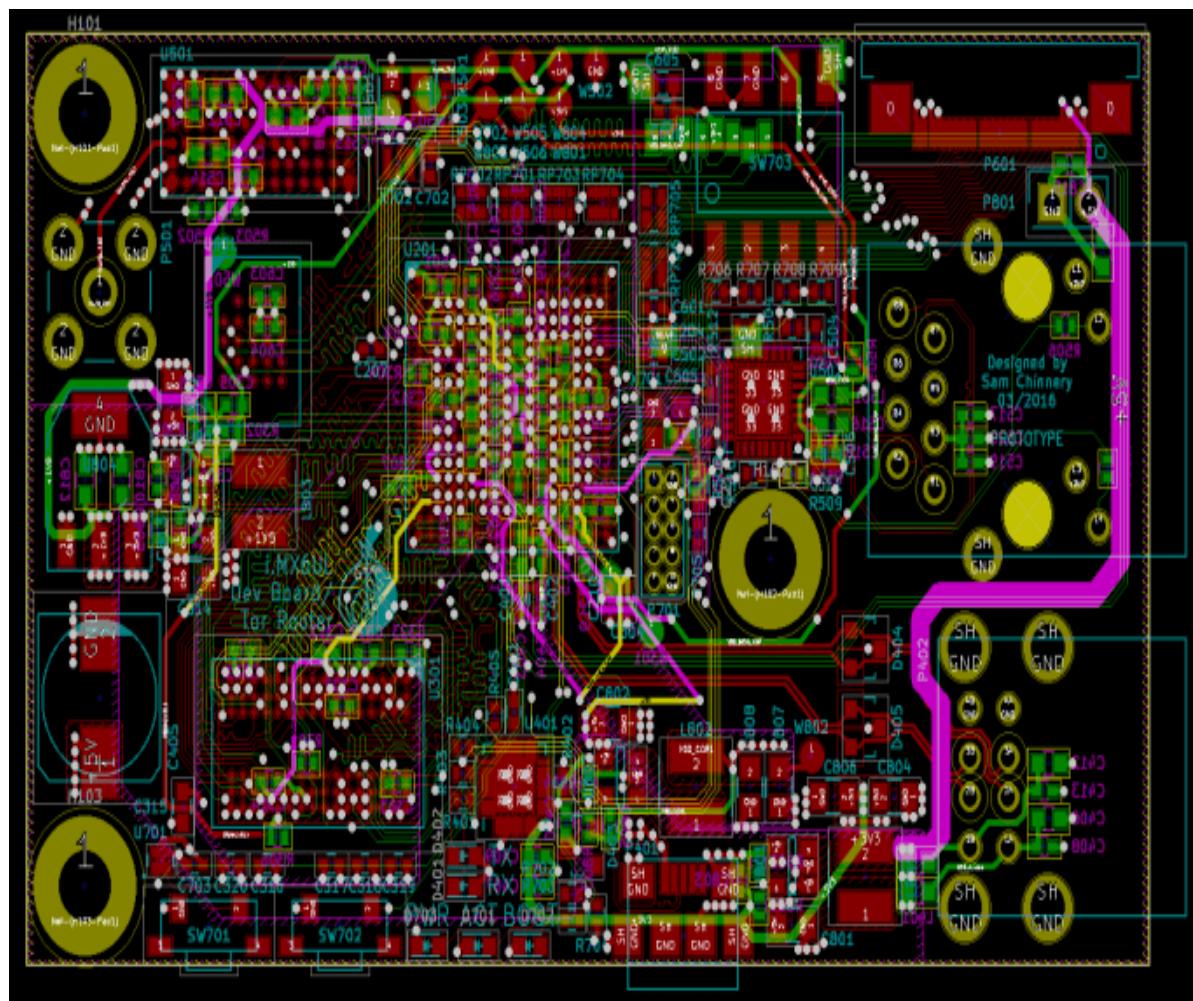




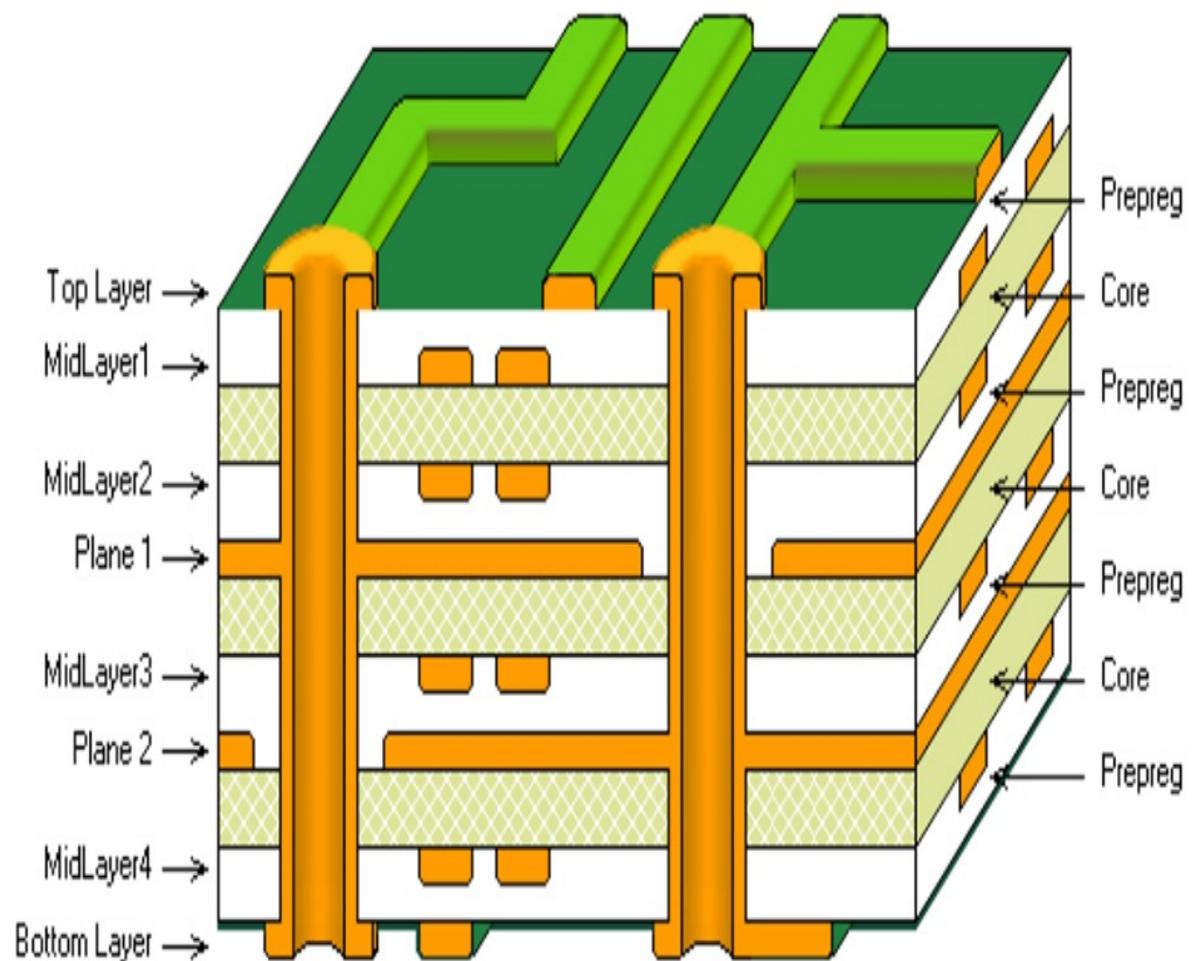
Handgetekende printplaat



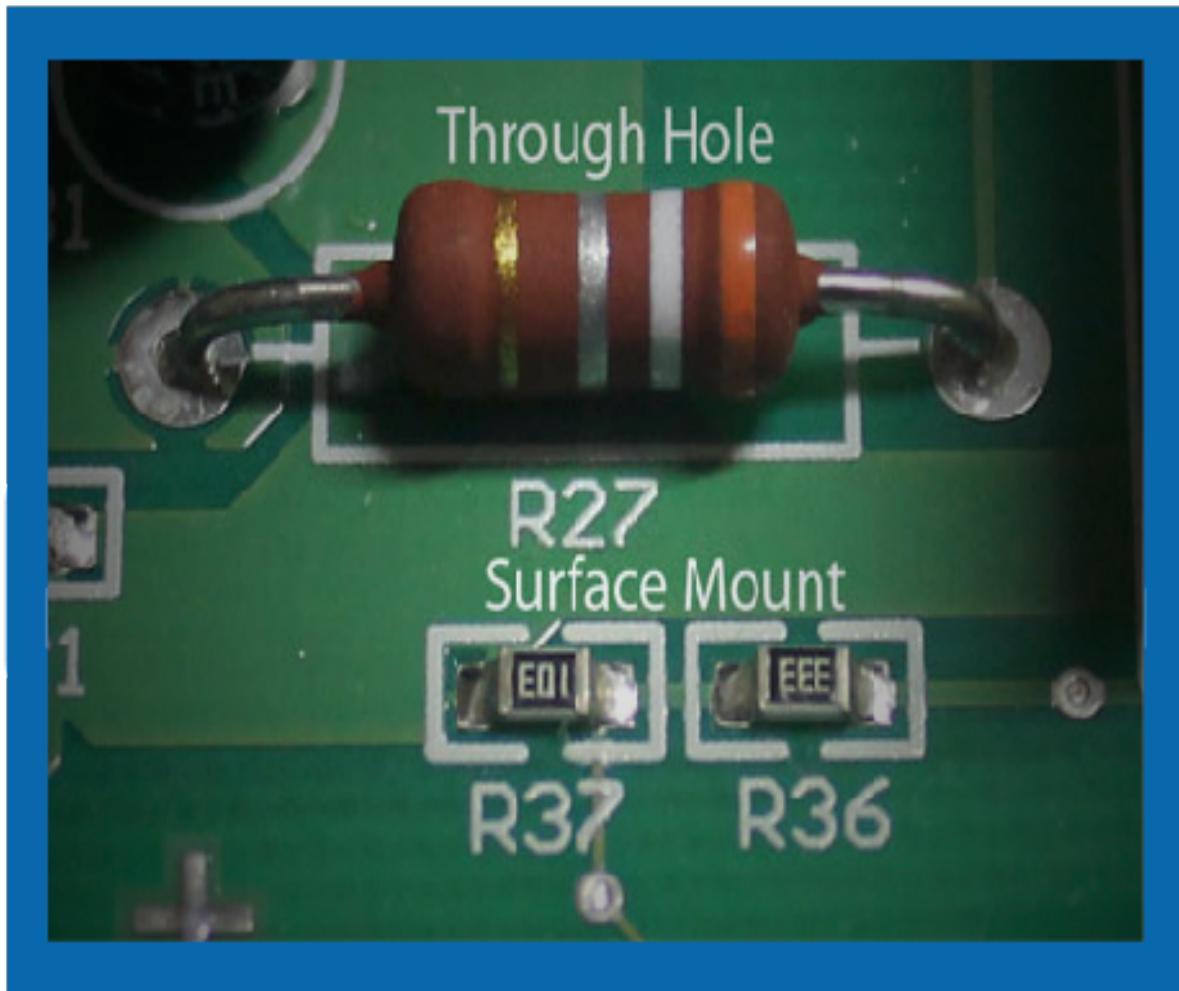
Teken software



Multilayer printplaten

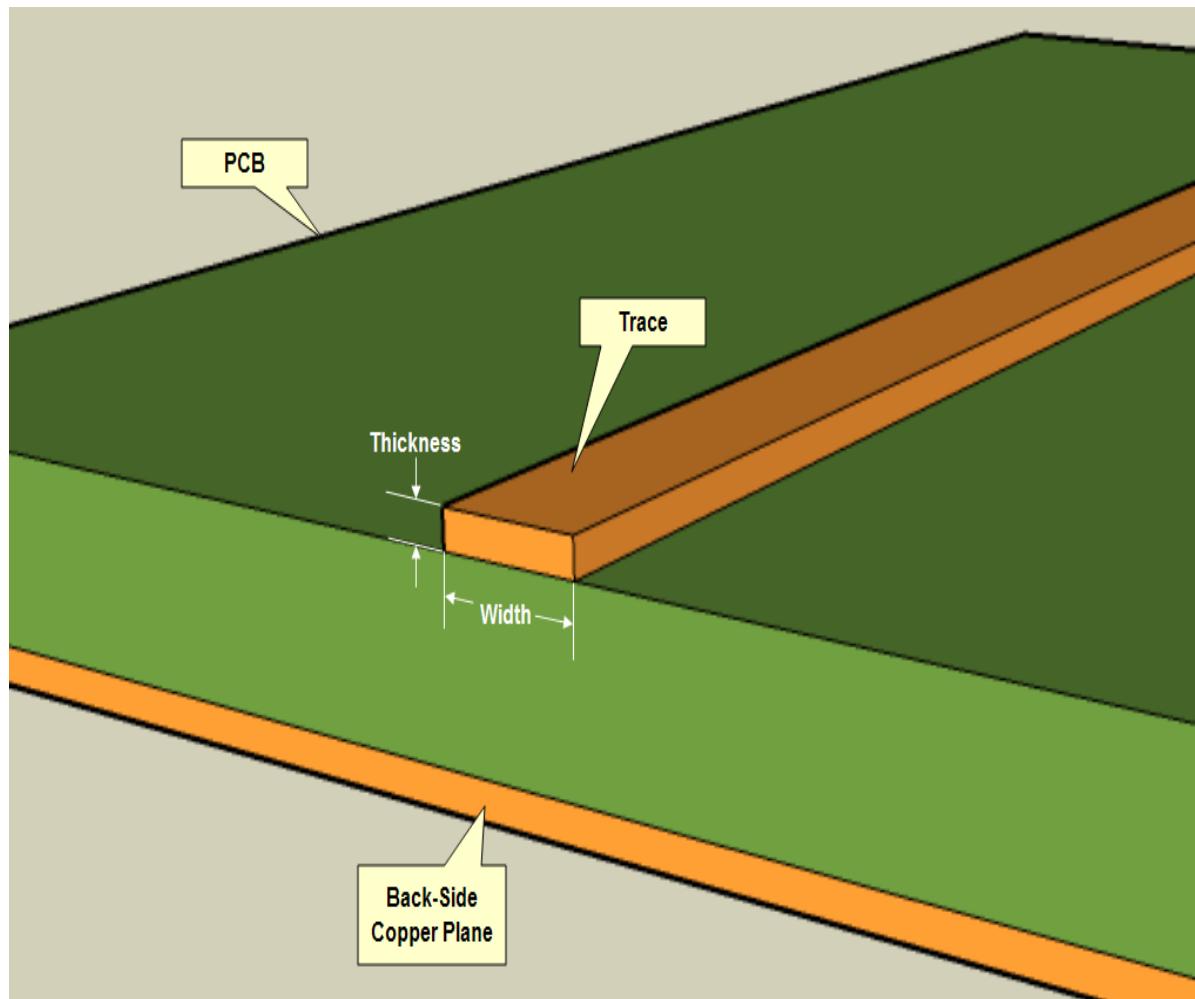


Through hole vs SMD

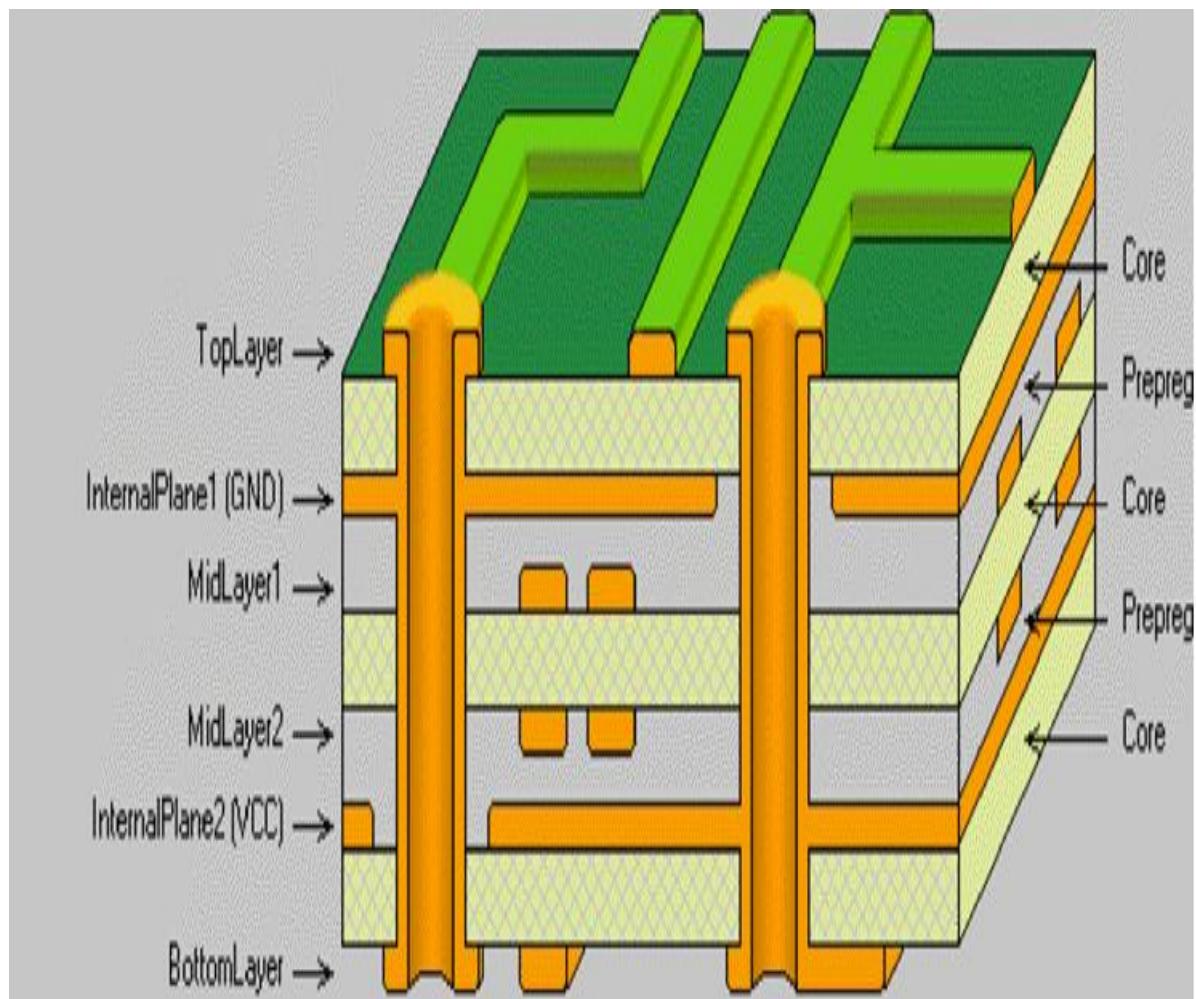


Aanvullende terminologie

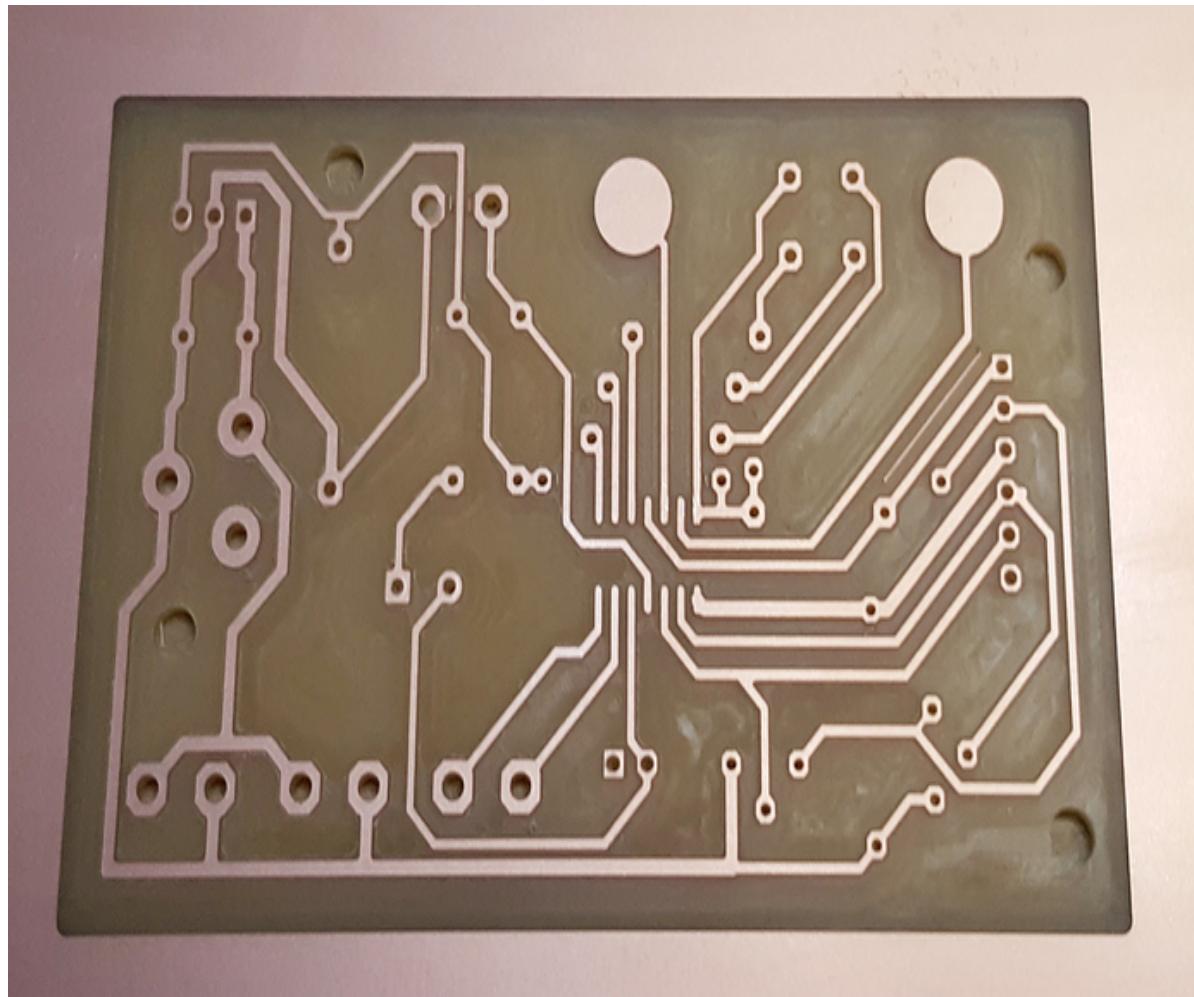
Baantje / Trace / Track



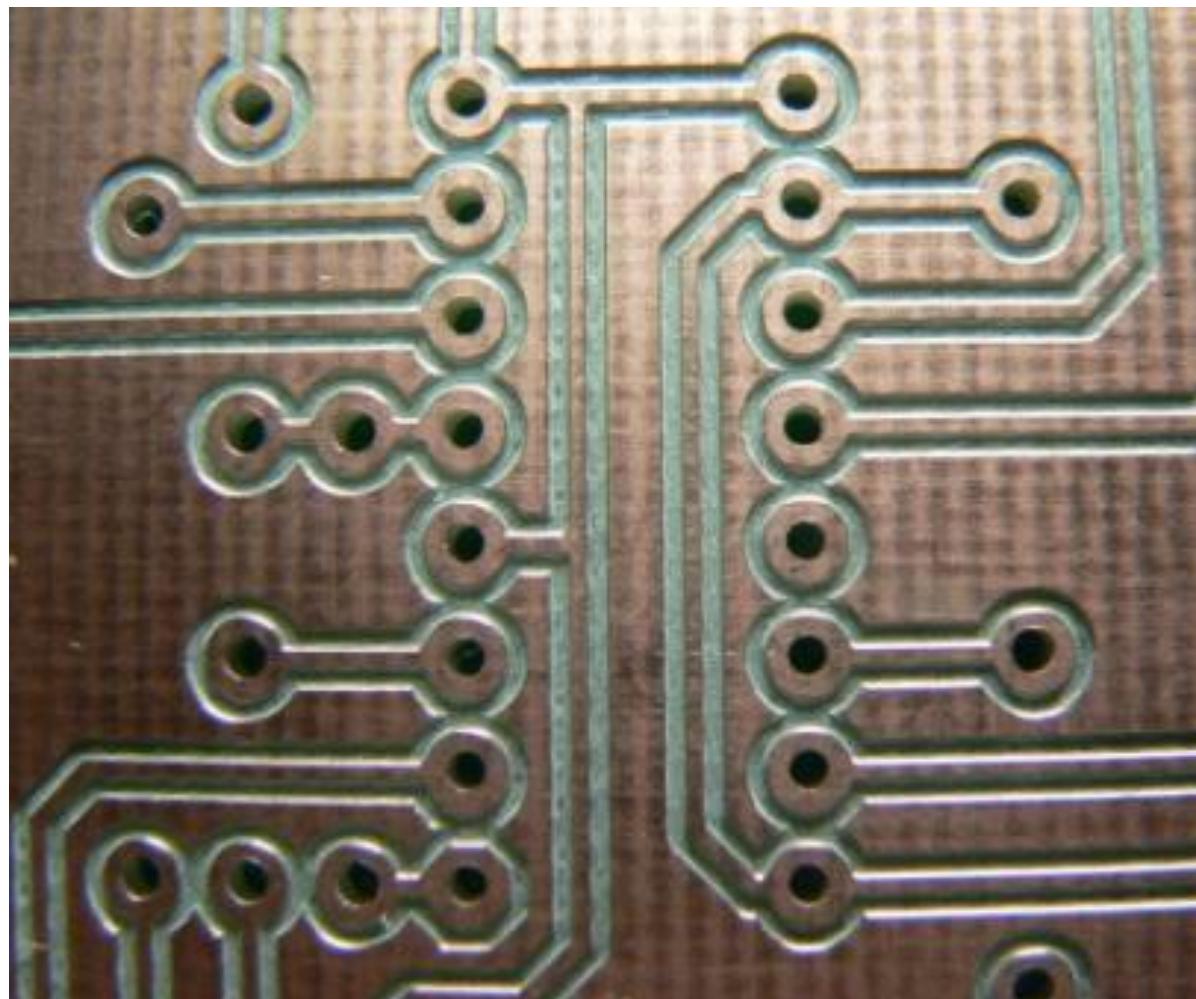
Via



Copper fill / plane



note: no fill, nadeel je verspilt veel tijd en chemicalien met etsen



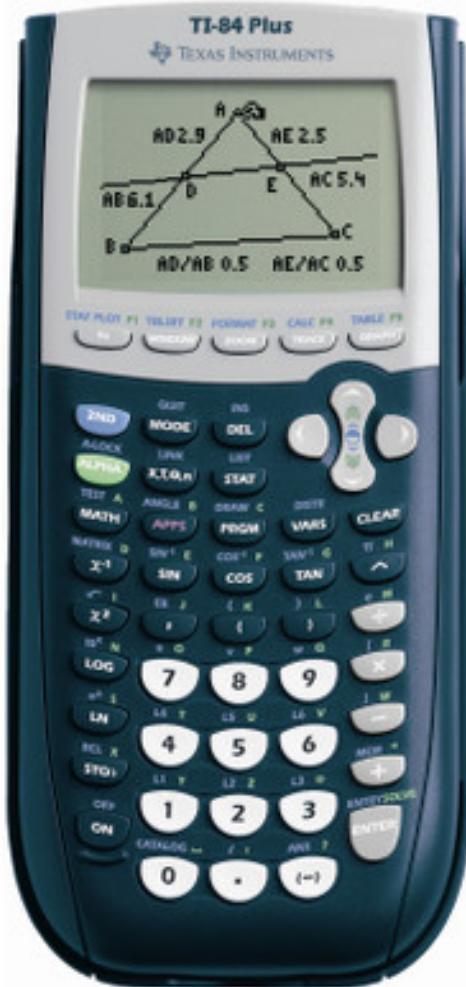
Van prototype tot eindproduct

Idee:

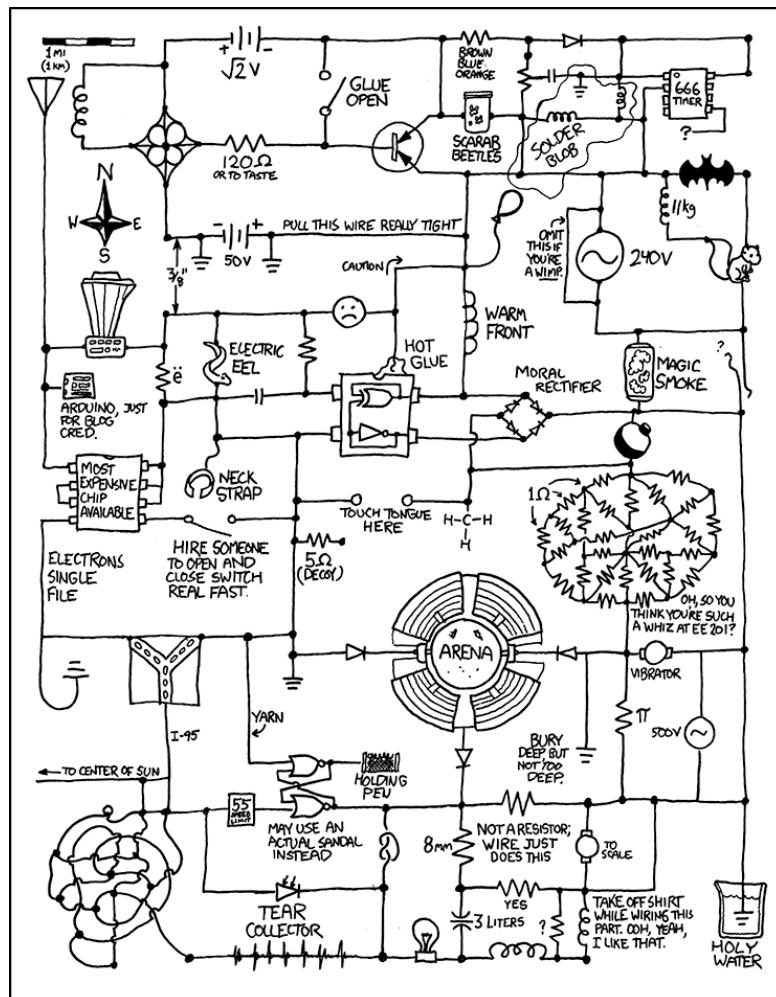


Specificaties

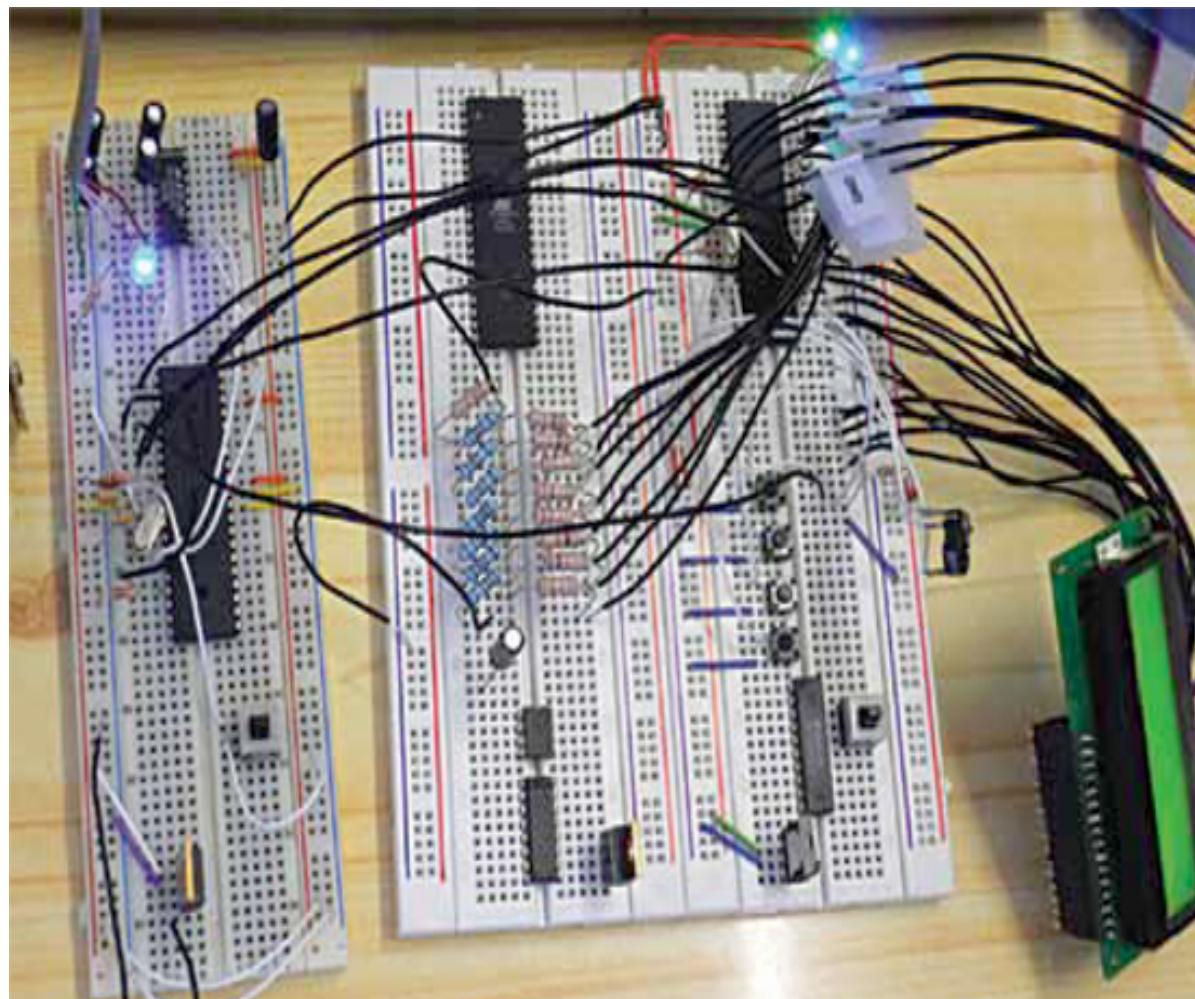
Berekeningen

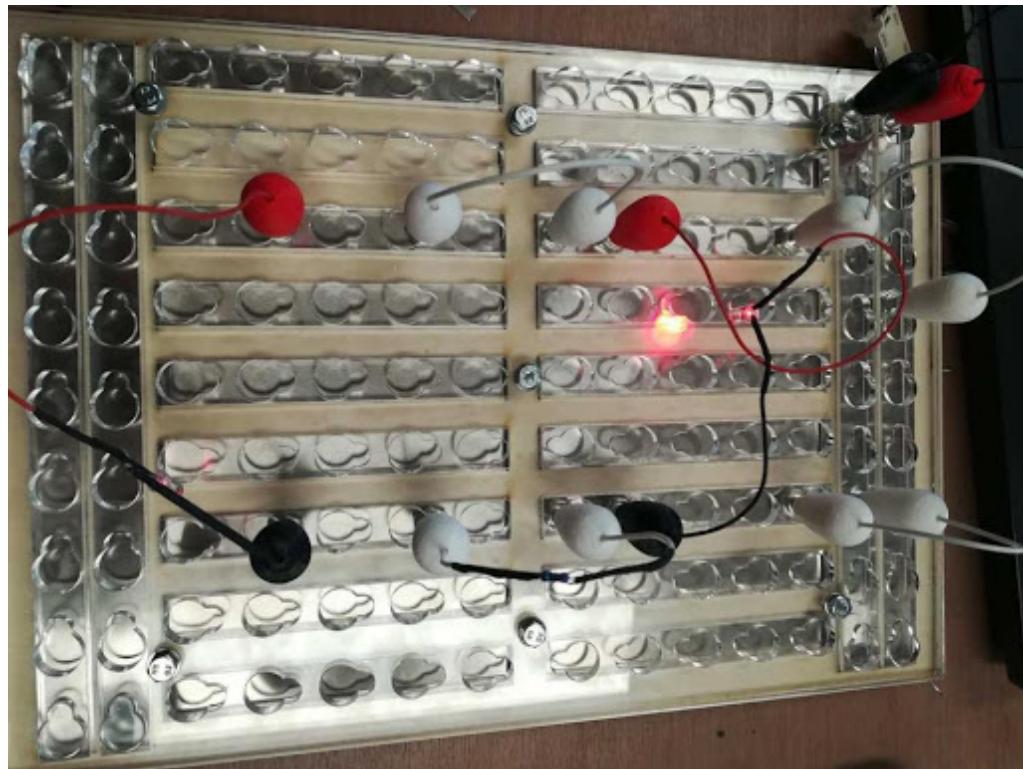


Schema



Prototypen





Verifiëren

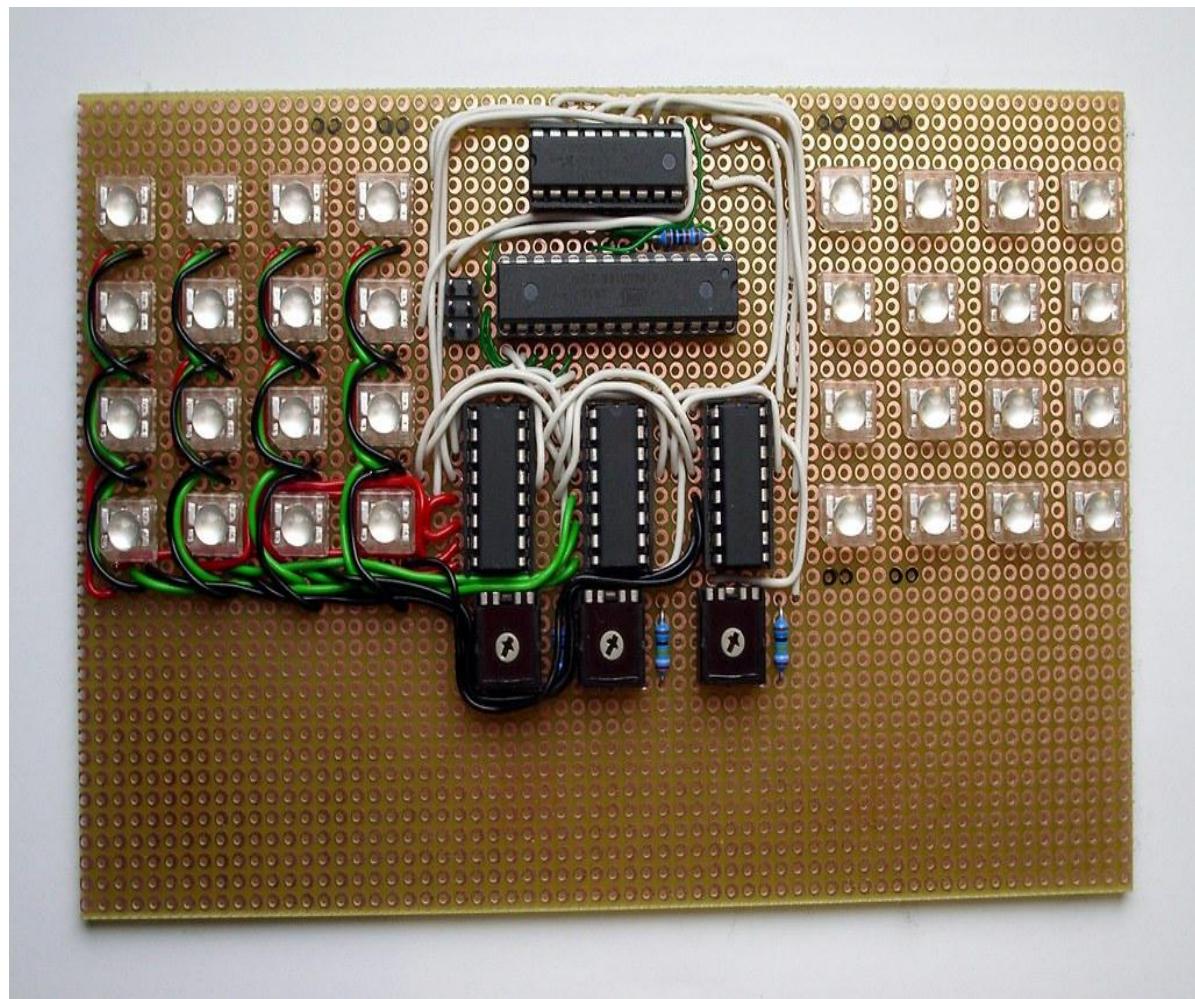




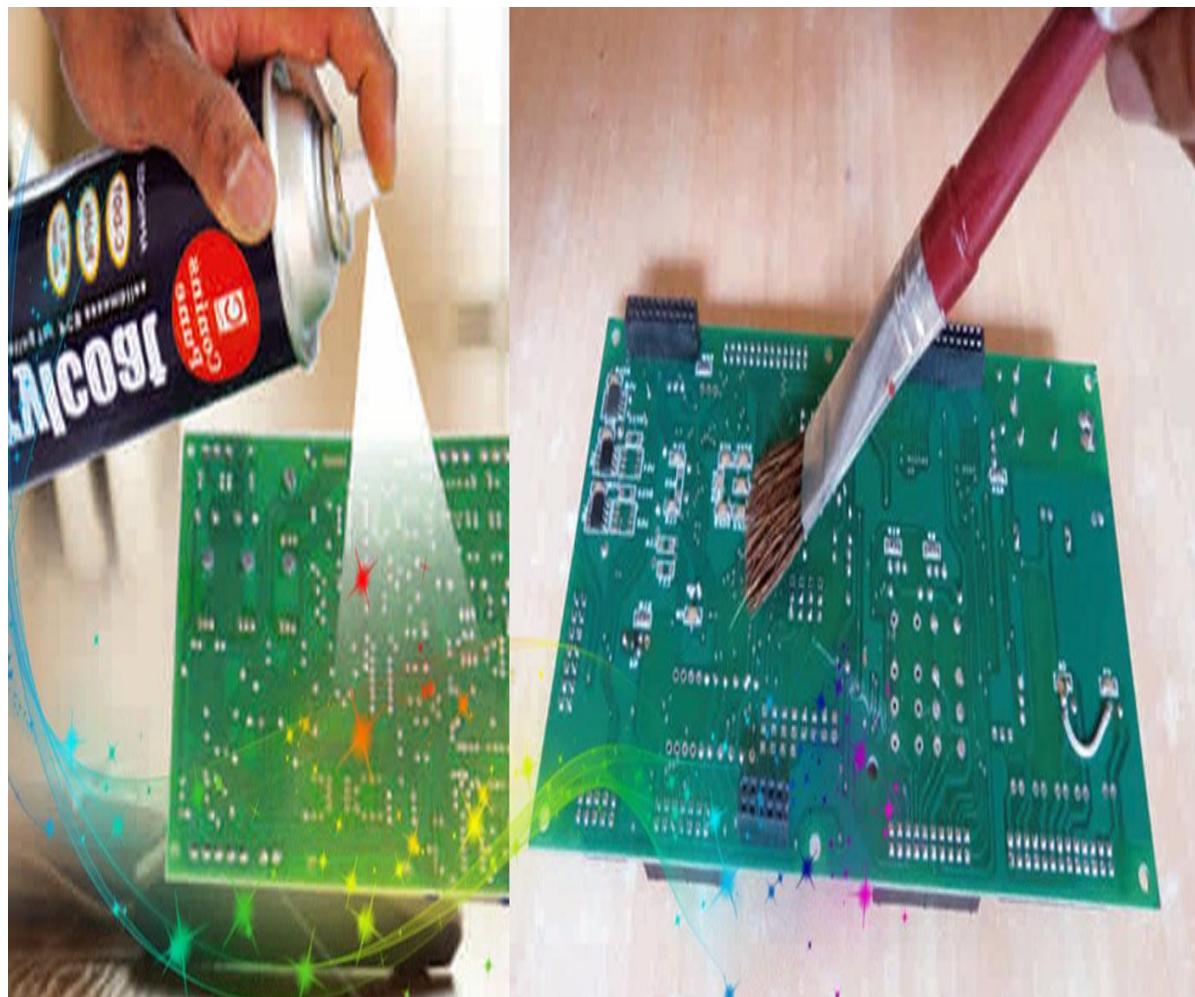
Je design vereeuwigen



Gaatjes print



Corosie bestendig maken

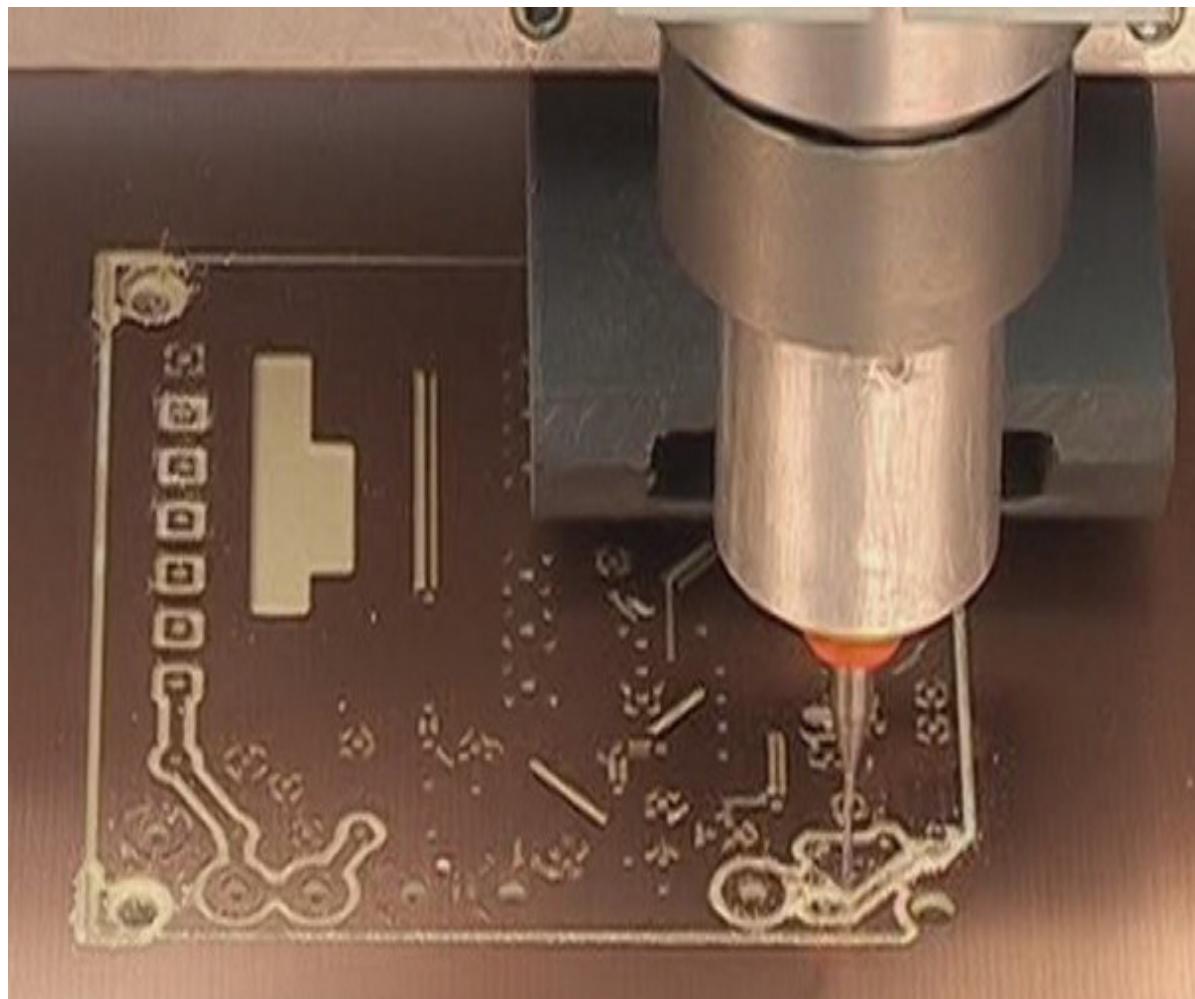


Klaar

Zijn er nog vragen?

PCB Productie methoden

Frezen

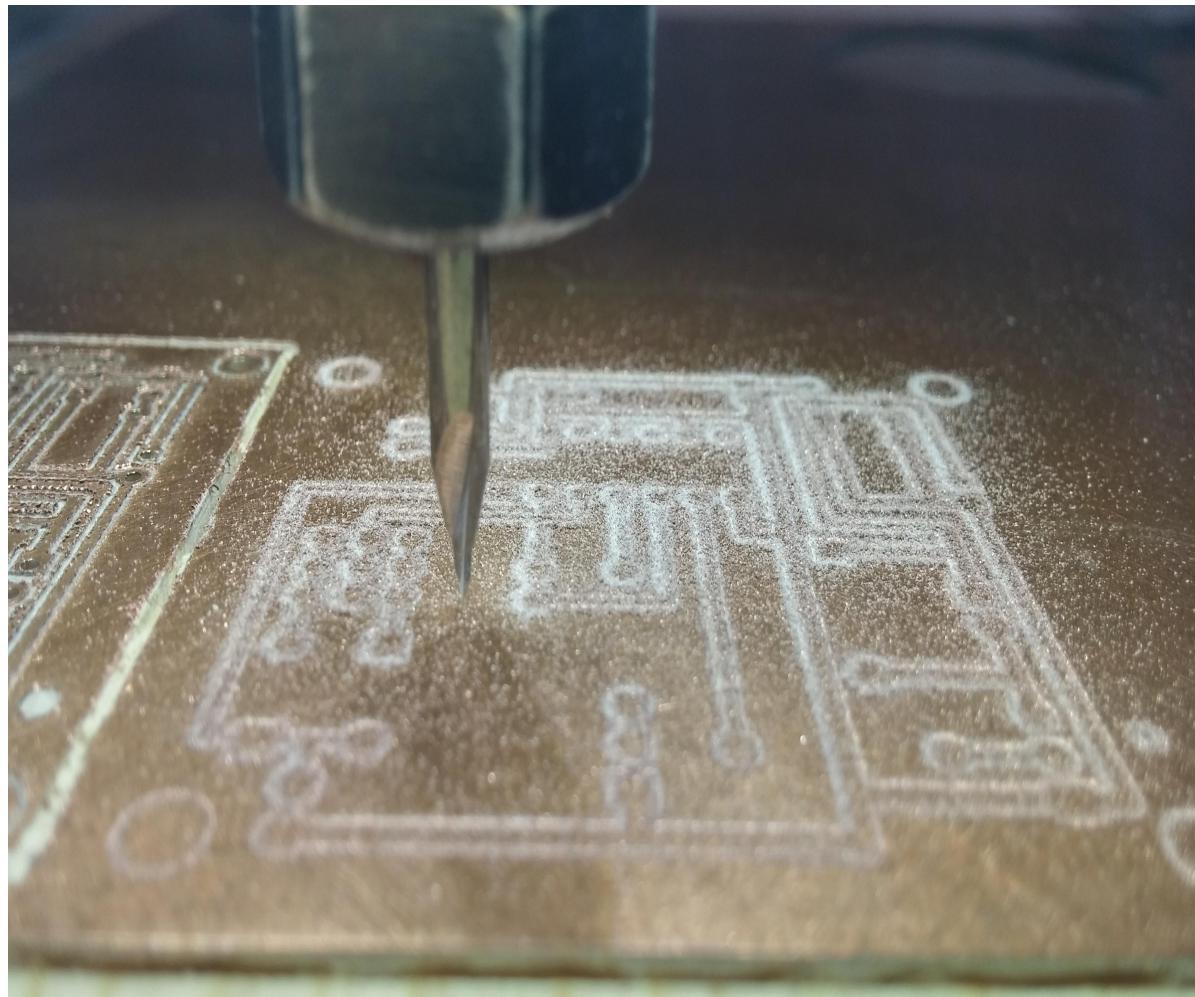


Nadelen

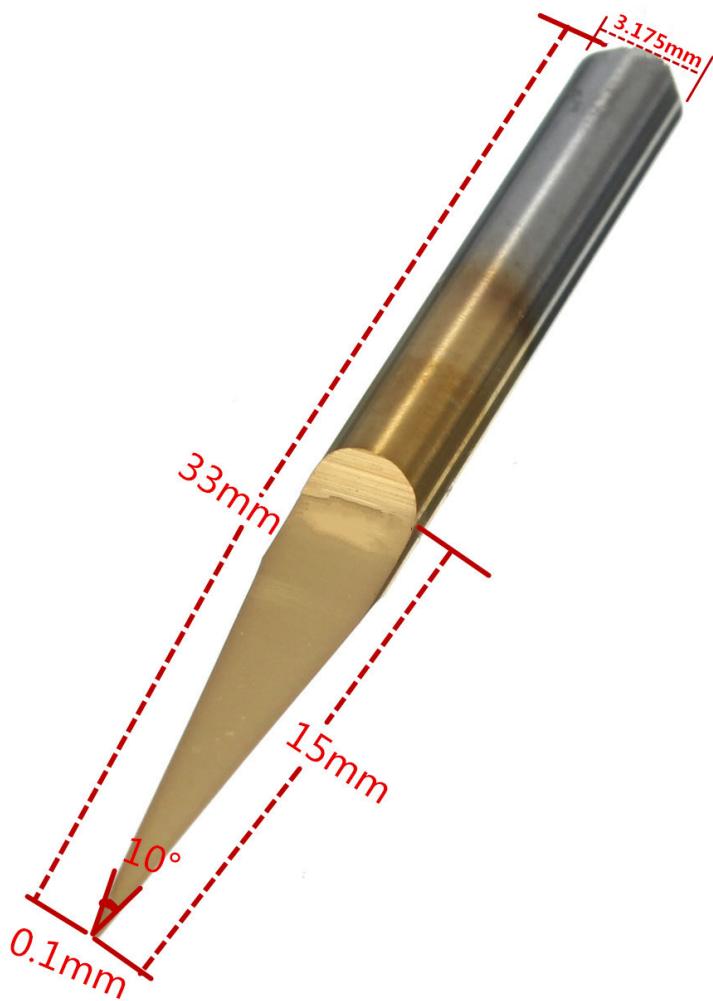
Kan maar zo naukeurig als het kleinste freesje



Veel stof

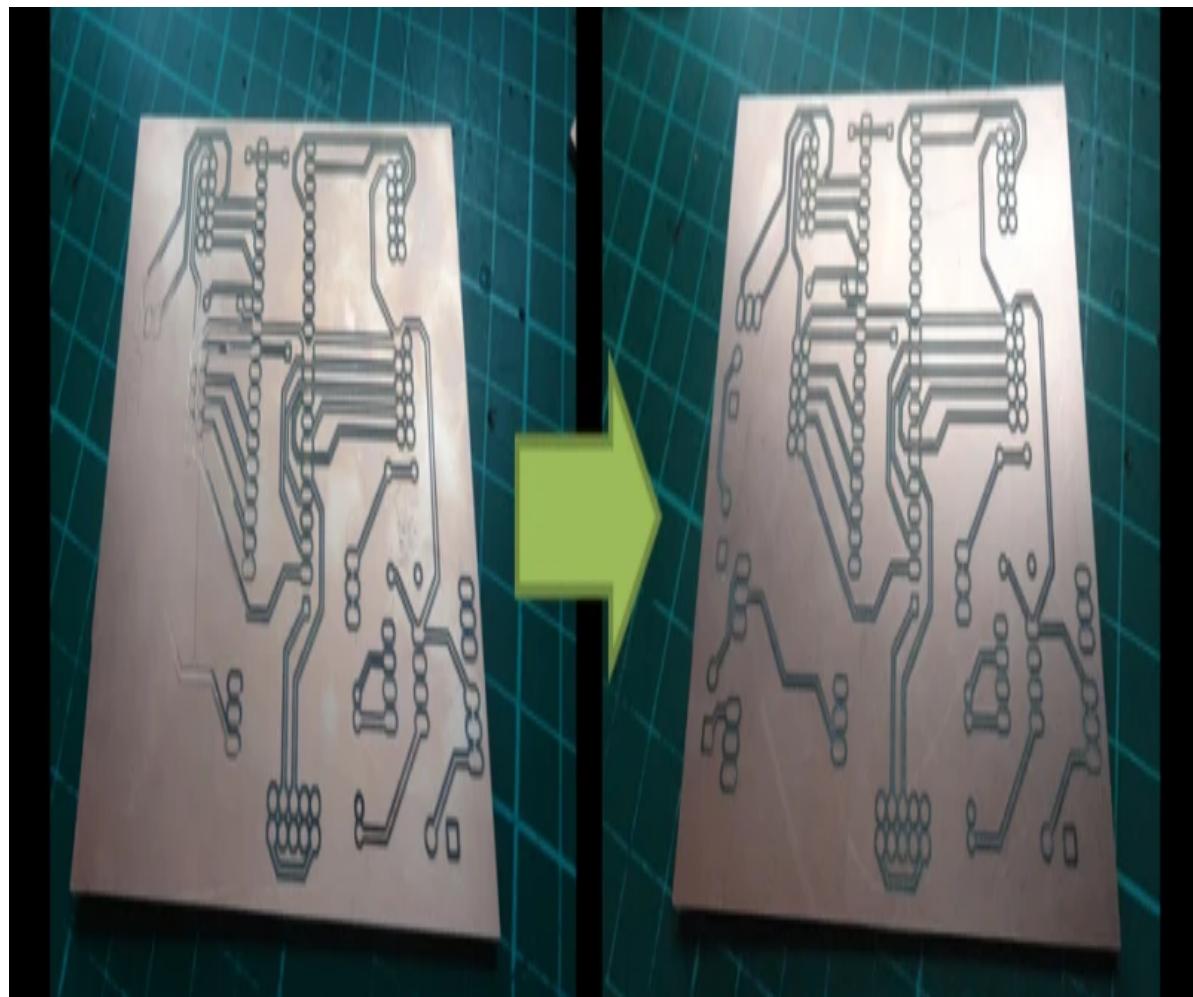


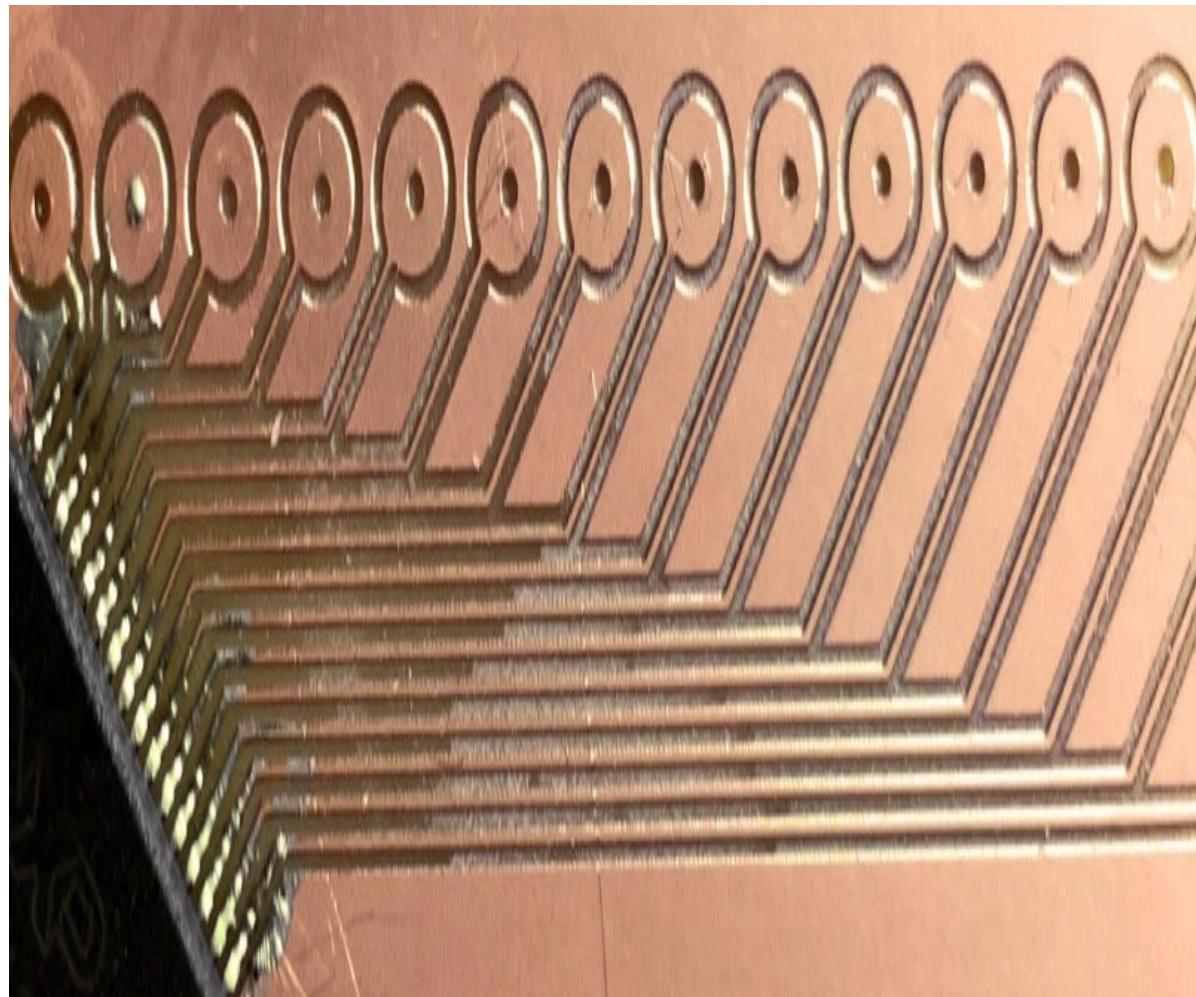
Frezen verslijten snel door het print materiaal

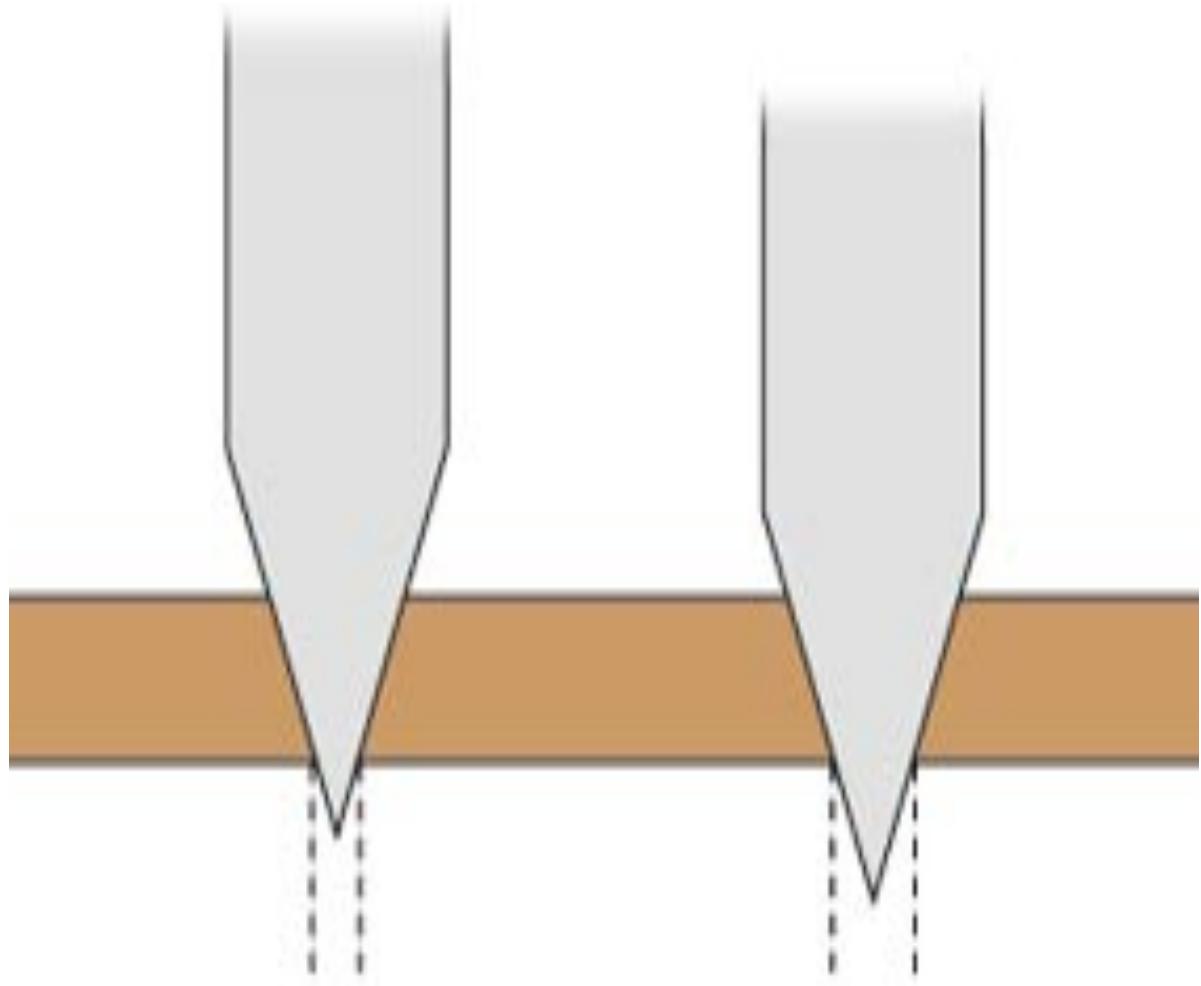


Traag

Print niet overal even dik

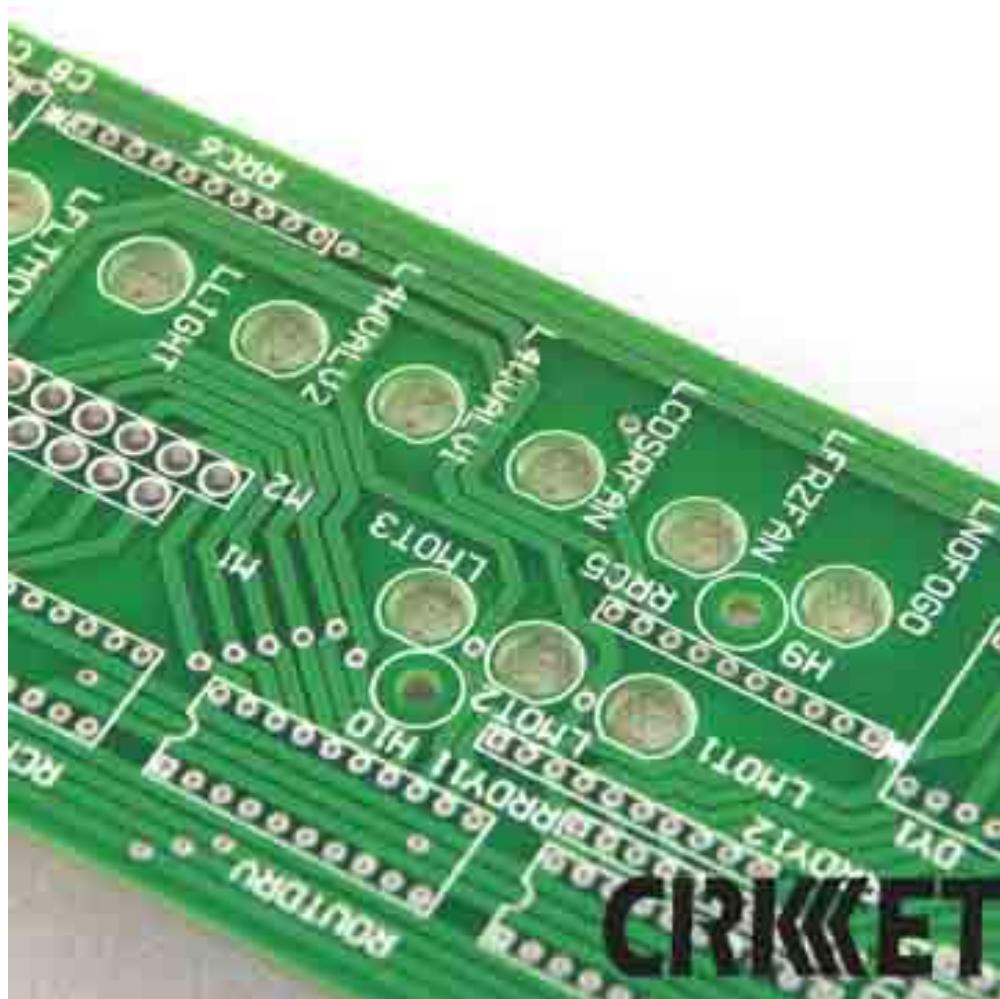






Voordelen

Automatisch boren



Board shape

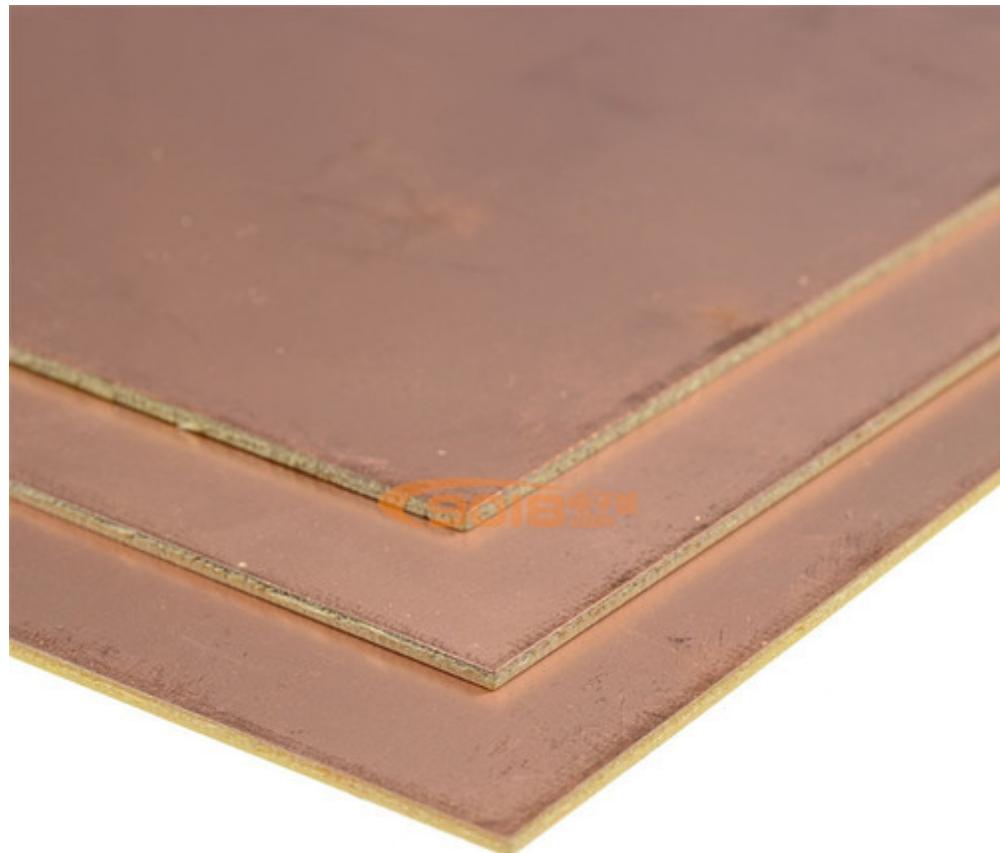


Etsen

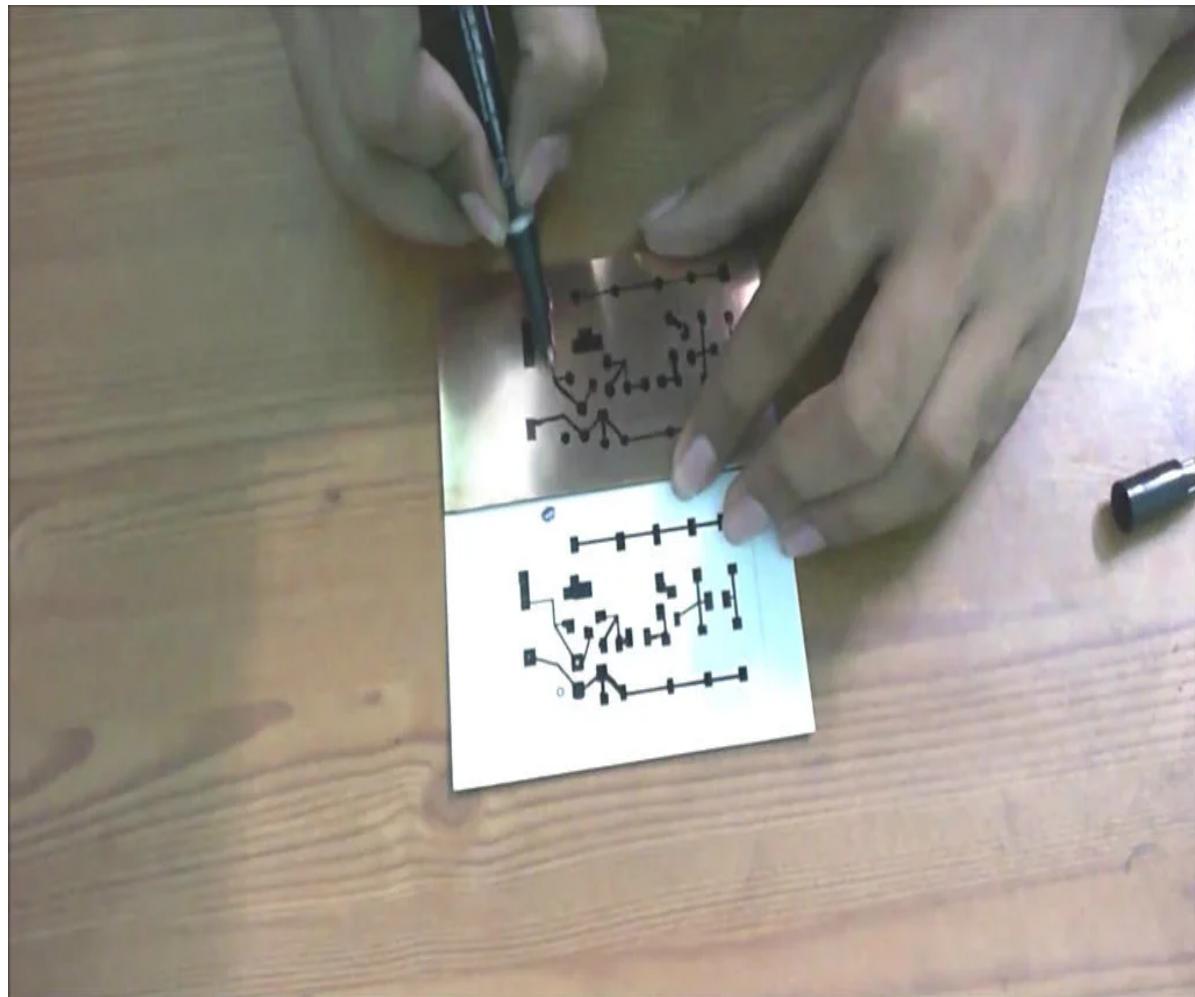
Wat is etsen



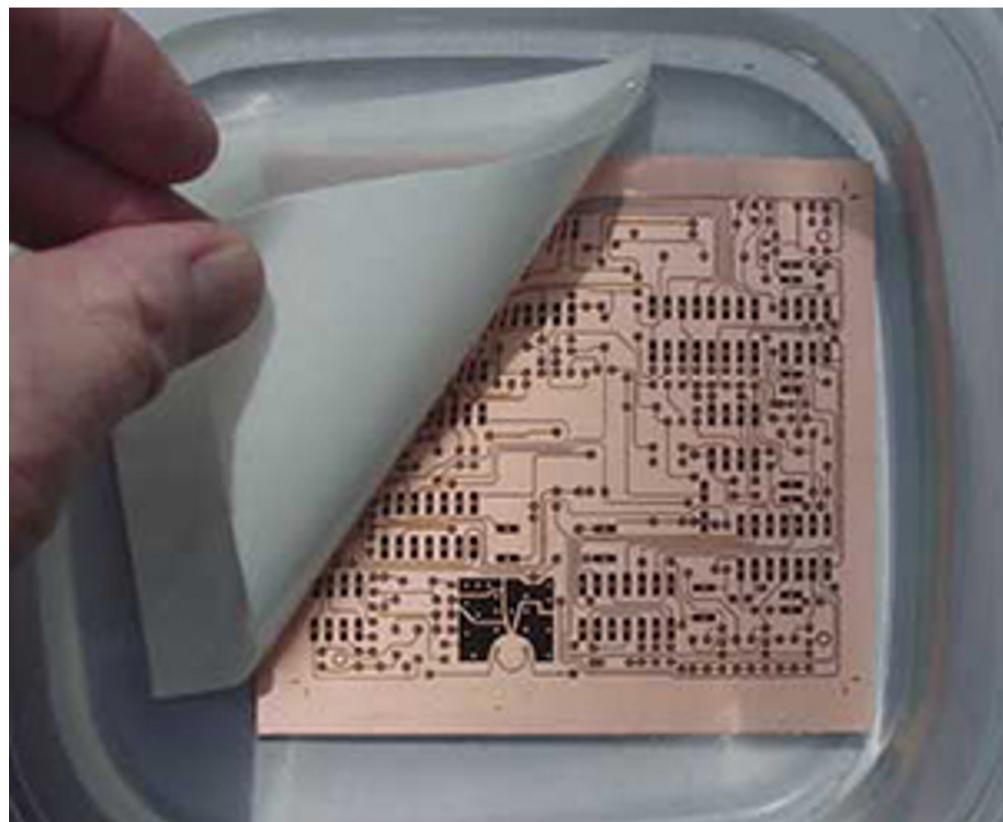
Je design aanbrengen



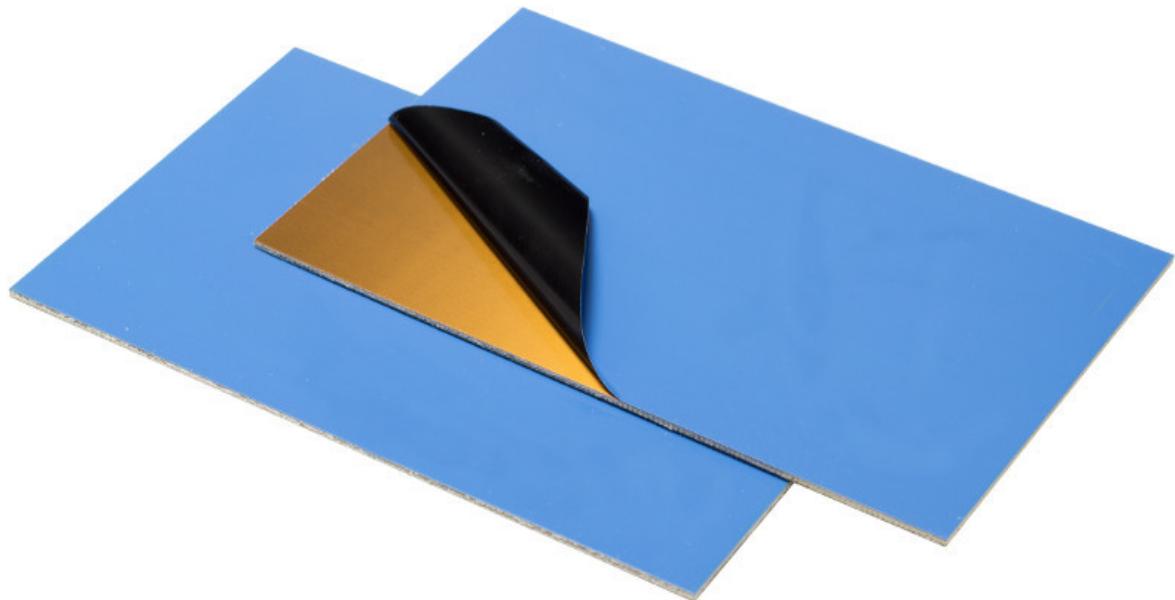
Stift



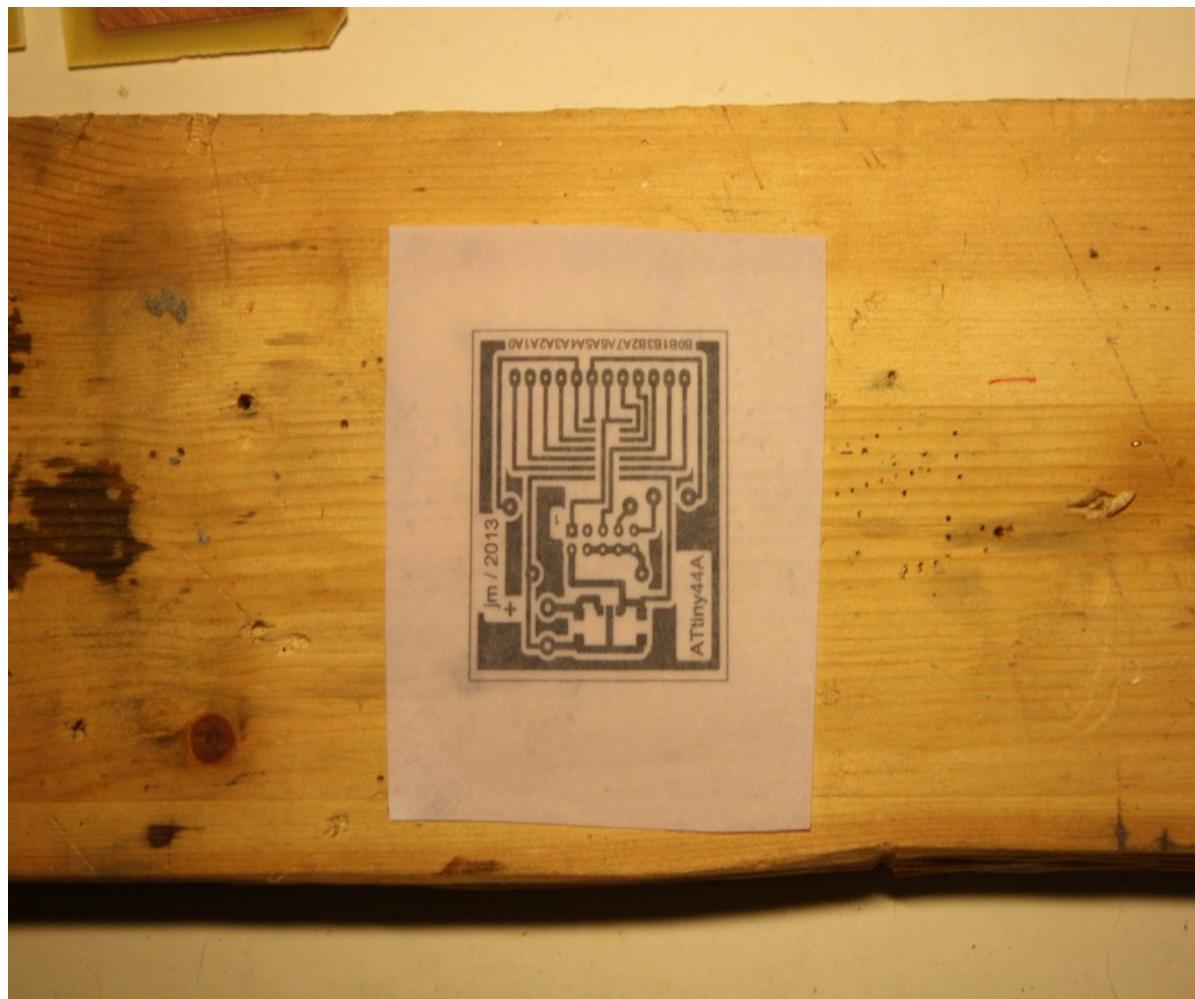
Press and peel / toner transfer



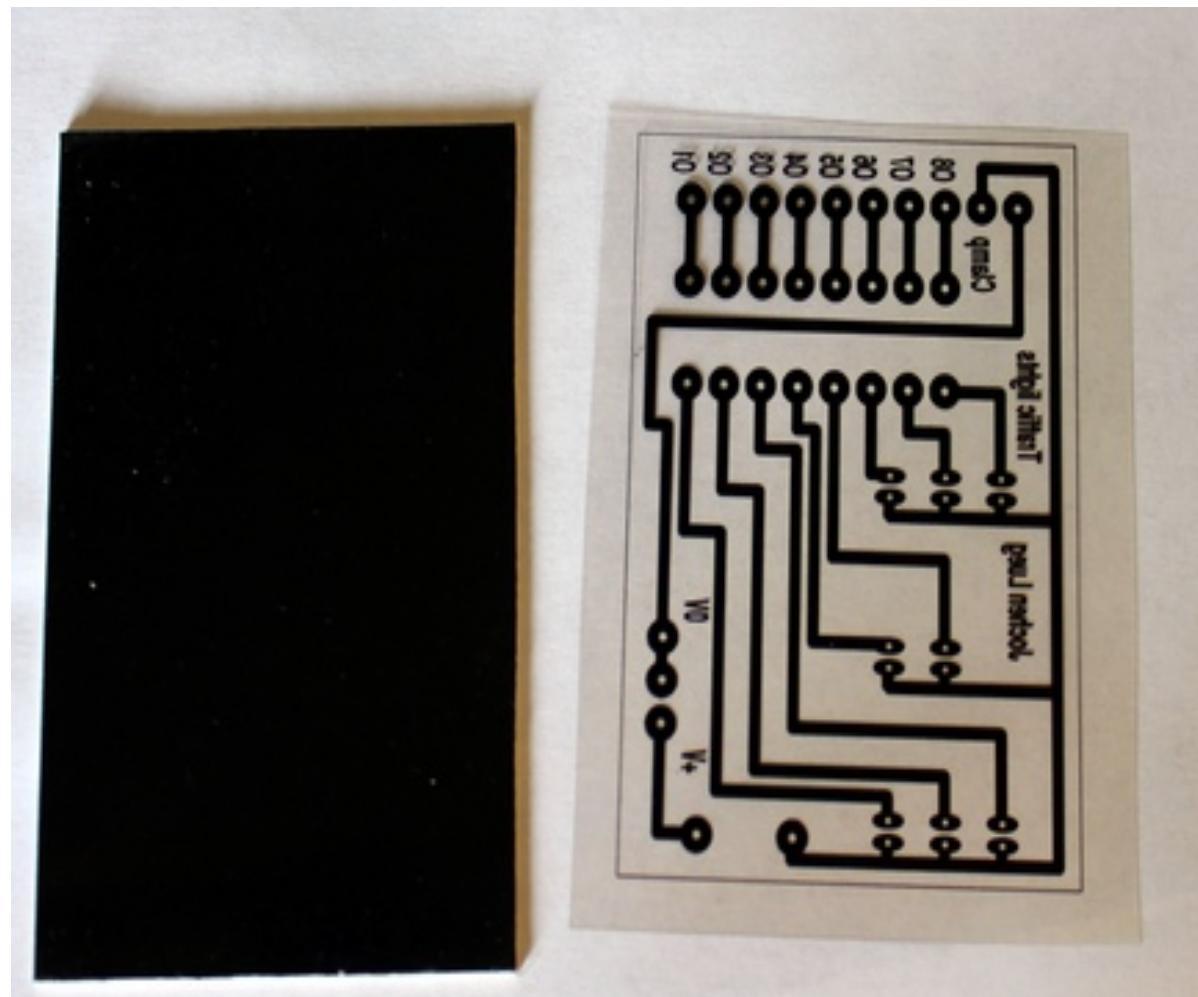
Lichtgevoelige print



Masker: Kalkpapier



Masker: Transparanten



Belichten

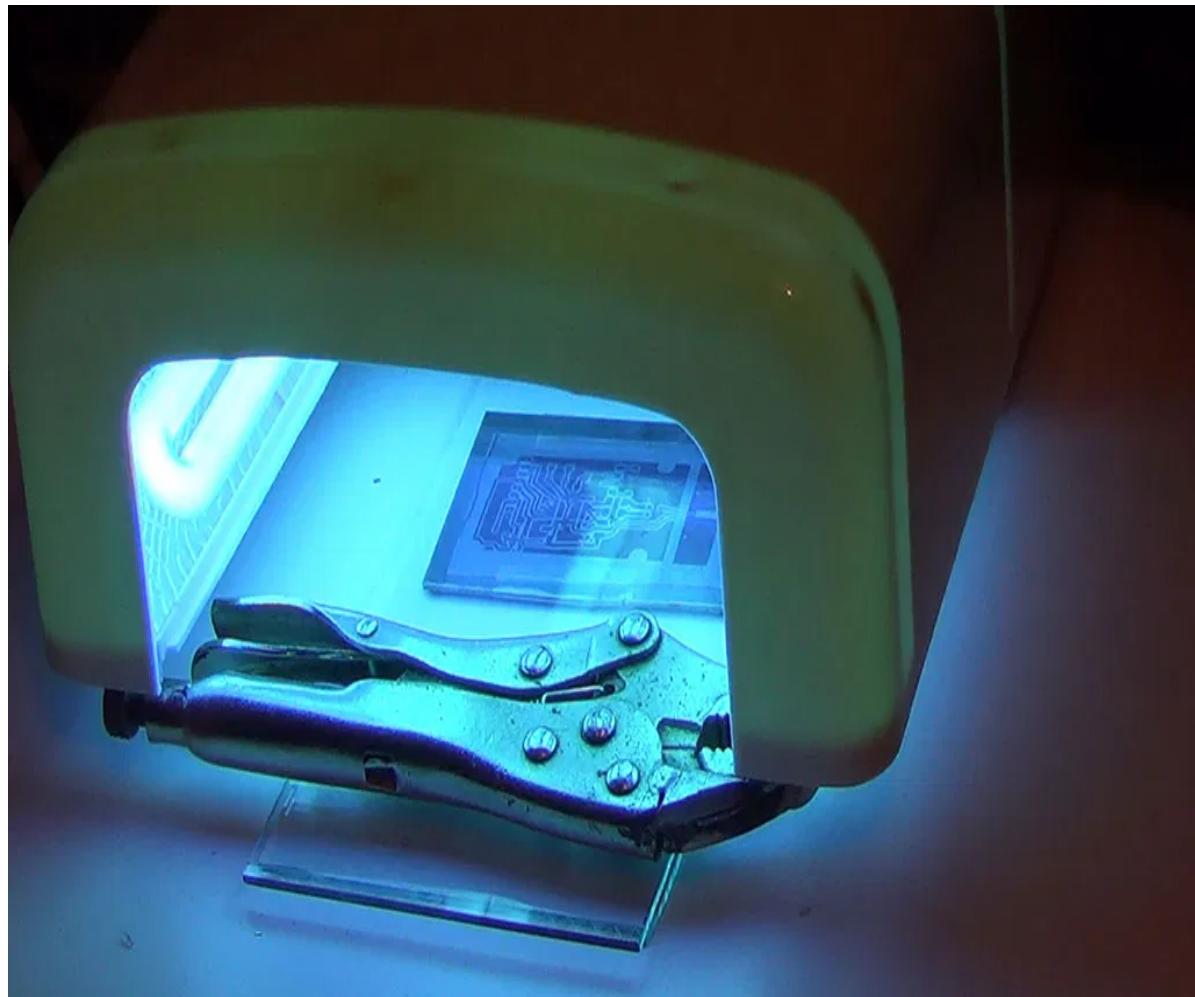
DIY



Professioneel



Redneck



Redneck



Ontwikkelen



Ontwikkelen: Pro tip



note:

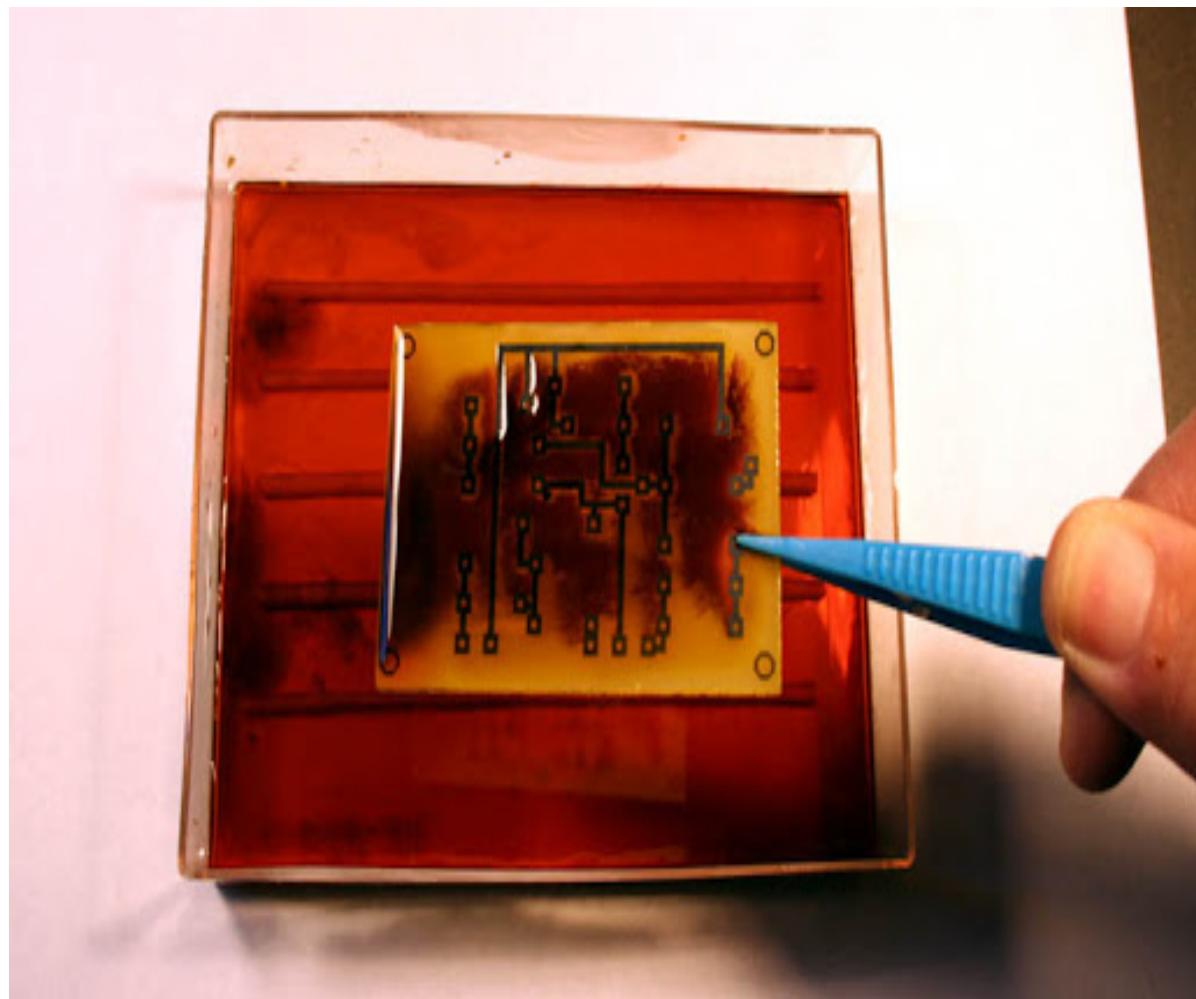
Ga met je vinger over de ontwikkelde printplaat terwijl deze is ondergedompeld in water. Dit zal glibberig aanvoelen. Wrijf met je vinger deze glibberige substantie af de printplaat dit zal de etstijd verkorten en zorgen voor een strakker ontwerp.

Water



Etsen

IJzer(III)chloride



Nadelen:

- Traag
- Vuil

Waterstofperoxide en zoutzuur



Note:

Meer info: http://users.telenet.be/nielsl/hoe_printplaten_esten.htm
(http://users.telenet.be/nielsl/hoe_printplaten_esten.htm)

Etsen met azijn

ETCHING PCBS WITH VINEGAR

by: **Mike Szczyz**

 69 Comments



February 15, 2012



When we hear about etching PCBs at home we assume that either Ferric Chloride or Cupric Chloride were used to eat away unmasked copper from the boards. But [Quinn Dunki] just wrote up [her PCB etching guide](#) and she doesn't use either of those. Instead, she combines vinegar, hydrogen peroxide, and salt. It's easier to find vinegar than muriatic acid ([Cupric Chloride is made using this, peroxide, and adding the copper](#)) so this is something to keep in mind if you're in a pinch (or a Macgyver situation).

note: <https://hackaday.com/2012/02/15/etching-pcb-with-vinegar/>

(<https://hackaday.com/2012/02/15/etching-pcb-with-vinegar/>)

Tips

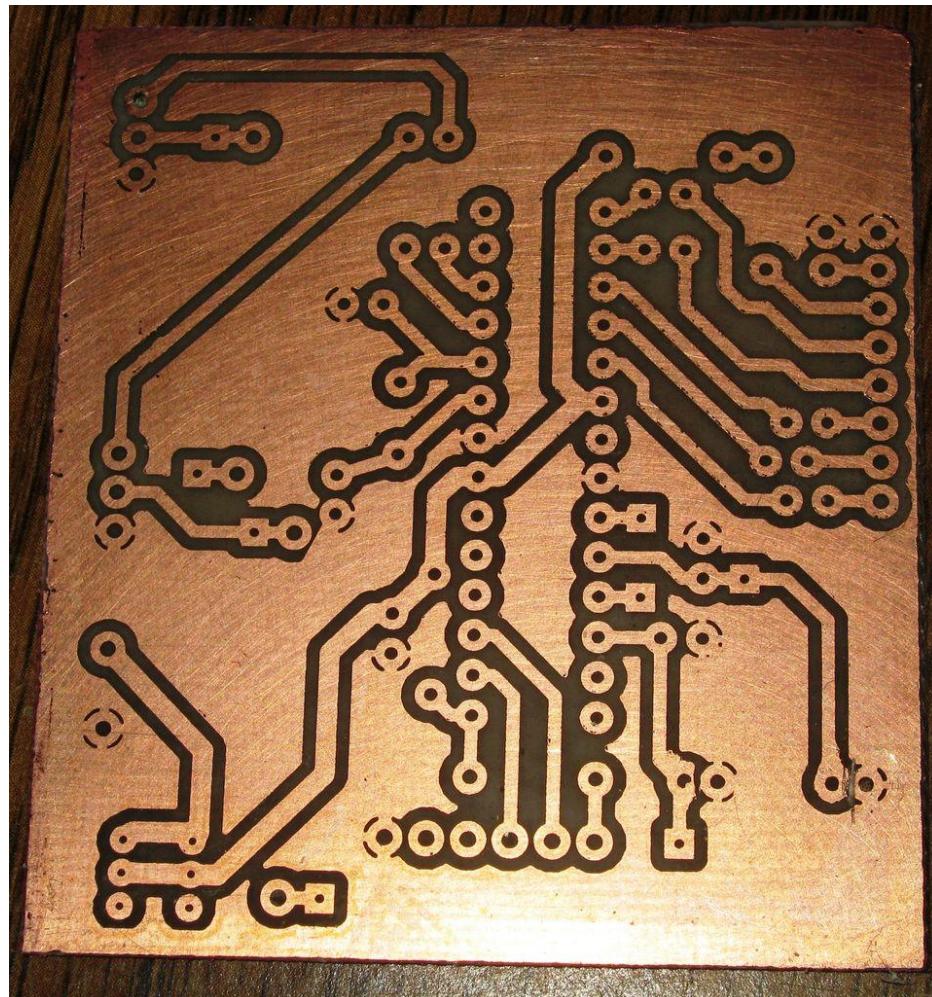


<https://www.instructables.com/id/Sponge-Ferric-Chloride-Method-Etch-Circuit-Bo/> (<https://www.instructables.com/id/Sponge-Ferric-Chloride-Method-Etch-Circuit-Bo/>)

Water



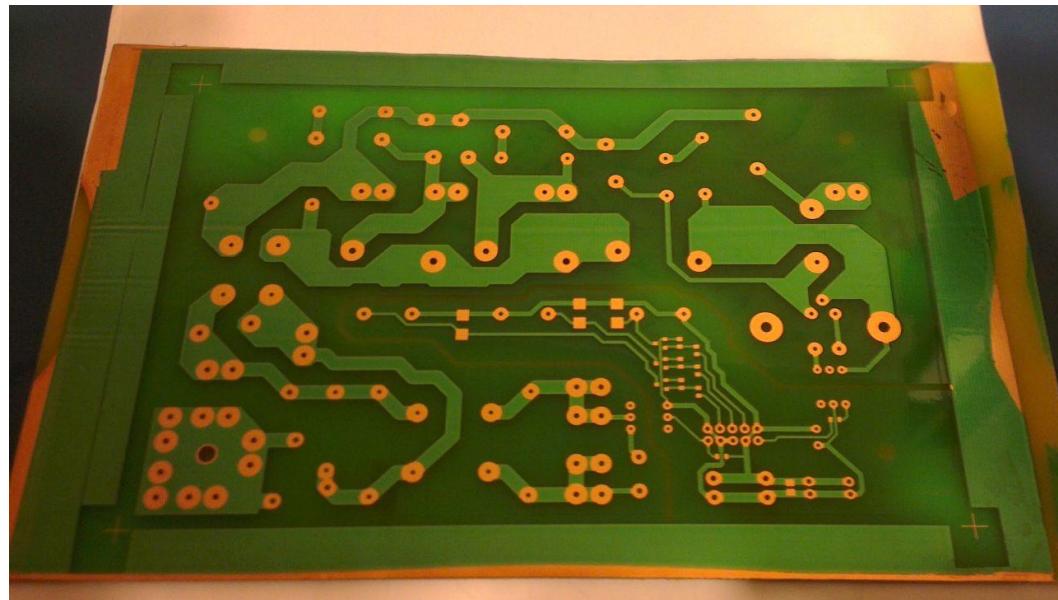
Gaatjes boren





Optioneel

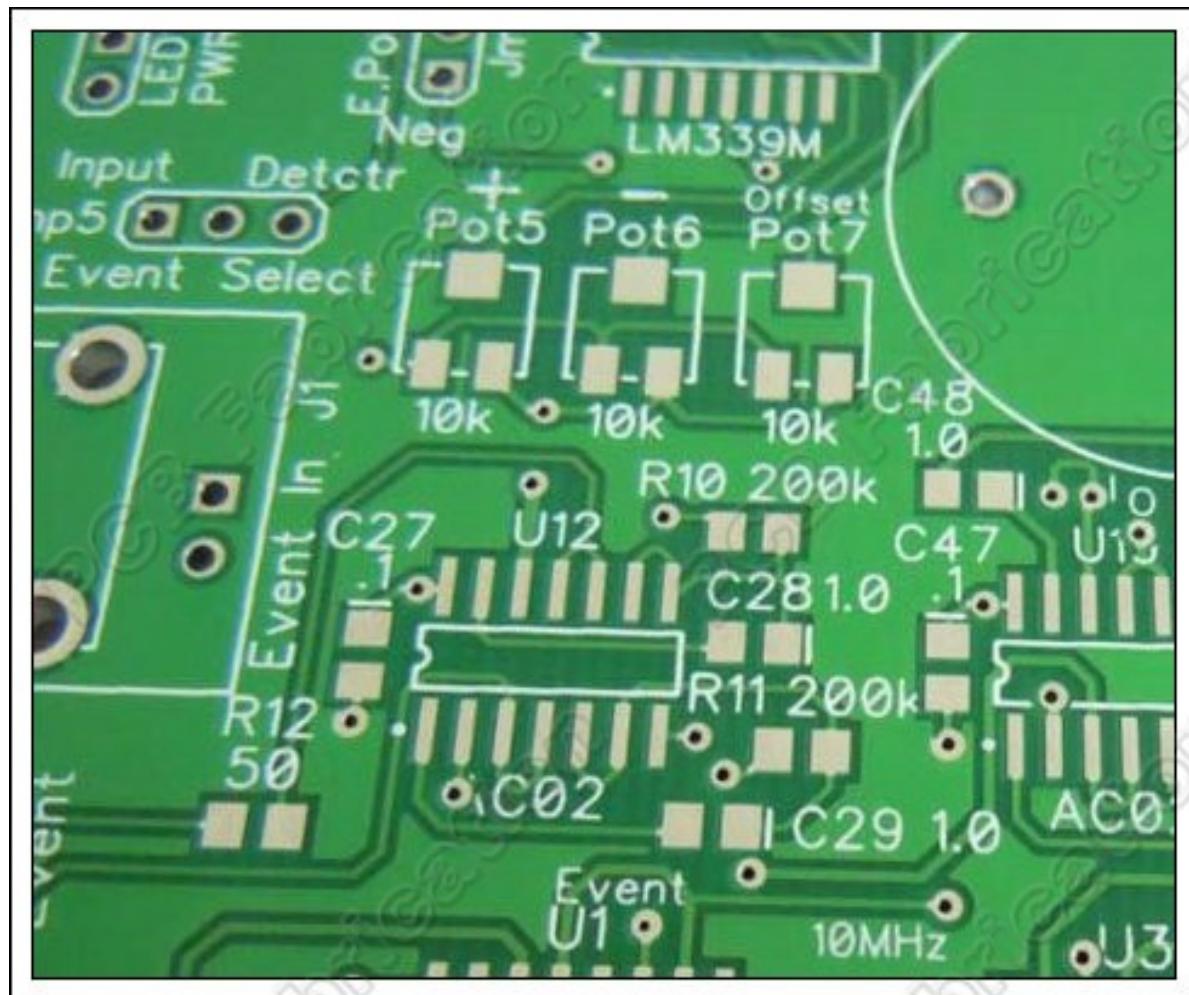
Solder mask



Vertinnen



Silkscreen



Bestellen

<https://pcbshopper.com/> (<https://pcbshopper.com/>)

JLCPCB (EasyEDA) China  (28) Read or write reviews	Green	5 US\$2.00 total US\$0.40 each	Total boards + shipping: PostLink US Registered Mail (Have a risk of delay): US\$8.33 23 days S.F Express Economy: US\$14.90 18 days DHL Express Worldwide: US\$19.99 7 days S.F Express: US\$26.82 9 days
Go to Order Page			
Elecrow China  (64) Read or write reviews	Green	5 US\$4.90 total US\$0.98 each	Total boards + shipping: Registered Airmail: US\$12.94 27 days PLT Express: US\$15.12 20 days EMS: US\$22.98 22 days HongKong DHL: US\$24.97 14 days ShenZhenDHL: US\$25.37 10 days FedEx: US\$32.12 14 days
Go to Order Page			
PCBWay China  (1) Read or write reviews	Green	5 US\$5.22 total US\$1.04 each	Total boards + shipping: E-Packet: US\$13.58 16 days China Post: US\$13.58 41 days HK Post: US\$16.72 31 days DHL: US\$24.03 6 days EMS: US\$29.26 16 days
Go to Order Page			
Smart Prototyping China  (14) Read or write reviews	Green	5 US\$6.90 total US\$1.38 each	Total boards + shipping: Post Airmail: US\$13.79 34 days DHL Express from Hong Kong: US\$26.92 13 days Fedex IE from China: US\$34.20 12 days DHL Express from Shenzhen: US\$35.69 7 days
Go to Order Page			

Hacks

DLP printer - <https://hackaday.com/2018/11/24/put-that-dlp-printer-to-use-making-pcb/> (<https://hackaday.com/2018/11/24/put-that-dlp-printer-to-use-making-pcb/>)

<https://hackaday.com/2019/07/07/a-complete-desktop-pcb-etching-station/> (<https://hackaday.com/2019/07/07/a-complete-desktop-pcb-etching-station/>)

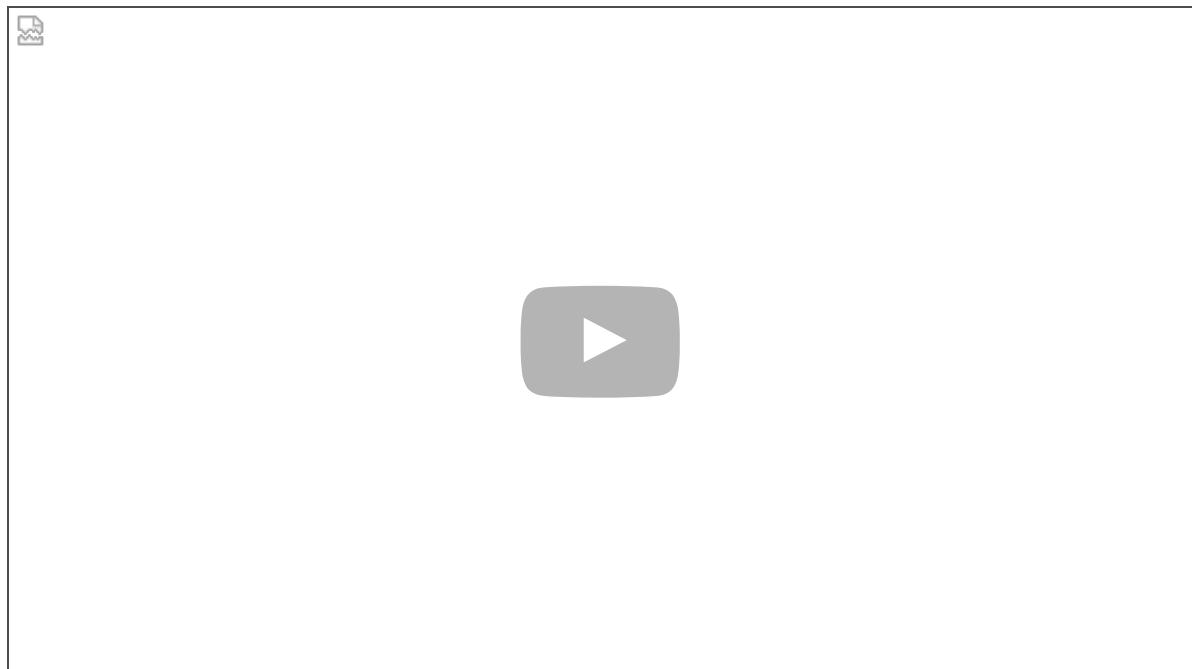
Getting started with KiCad

Downloading KiCad

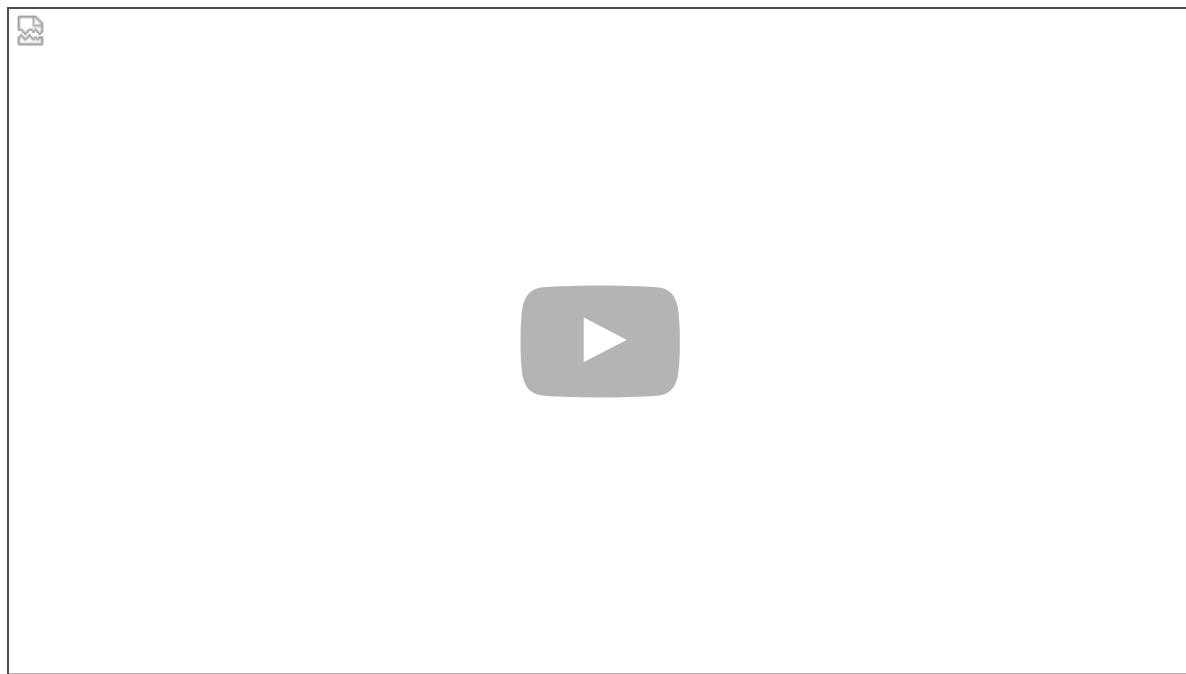
<https://kicad-pcb.org/download/> (<https://kicad-pcb.org/download/>)

Installing KICAD

Your first project



New Project

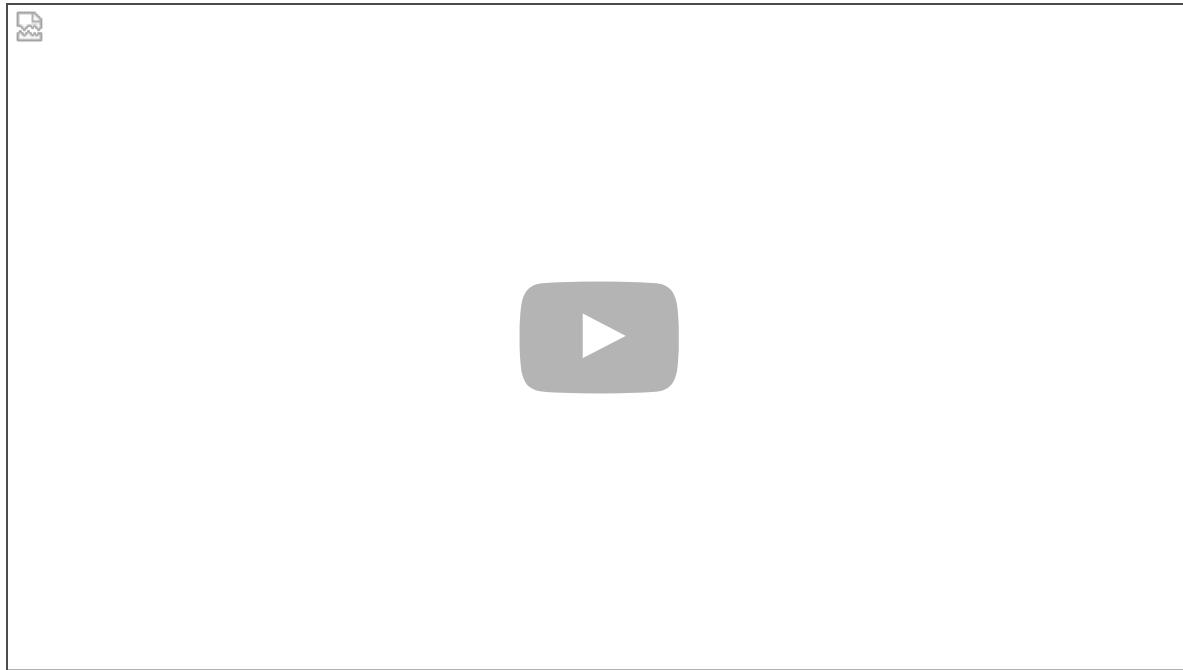


note: Maak een nieuw project aan. Een project bestaat uit:

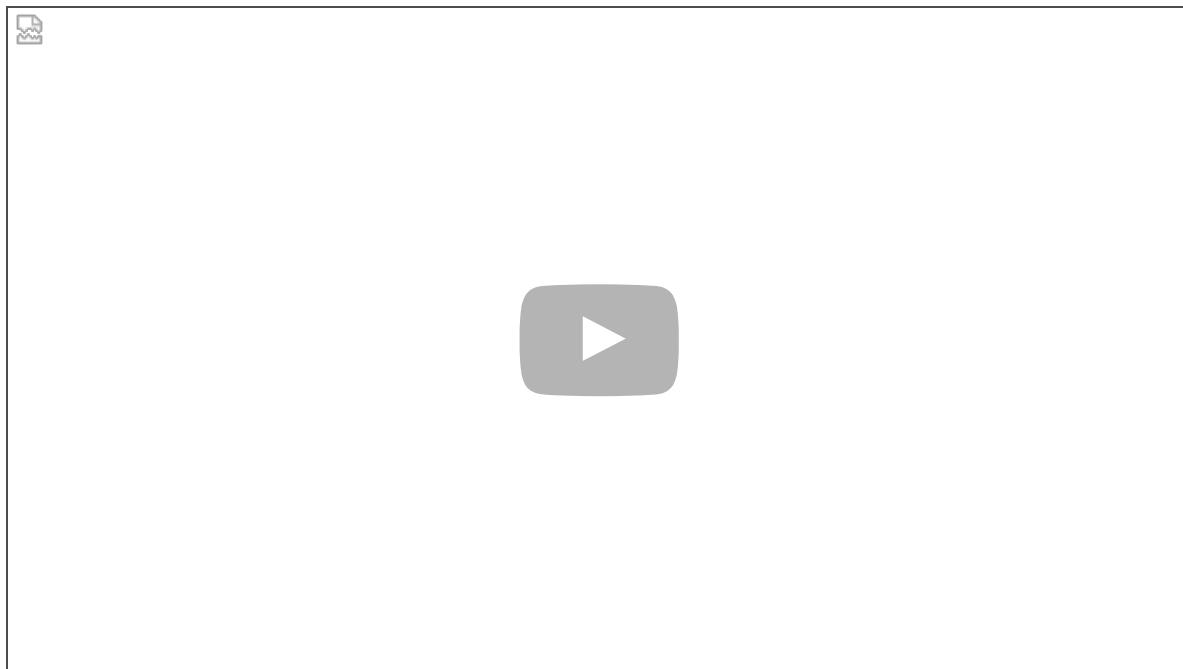
- een schema dit is de voorstelling van de verbindingen die gemaakt moeten worden tussen de componenten.
- een PCB layout dit zijn alle footprints van de componenten op de juiste manier met elkaar verbonden aan de hand van koperbaantjes.

Creating a schematic

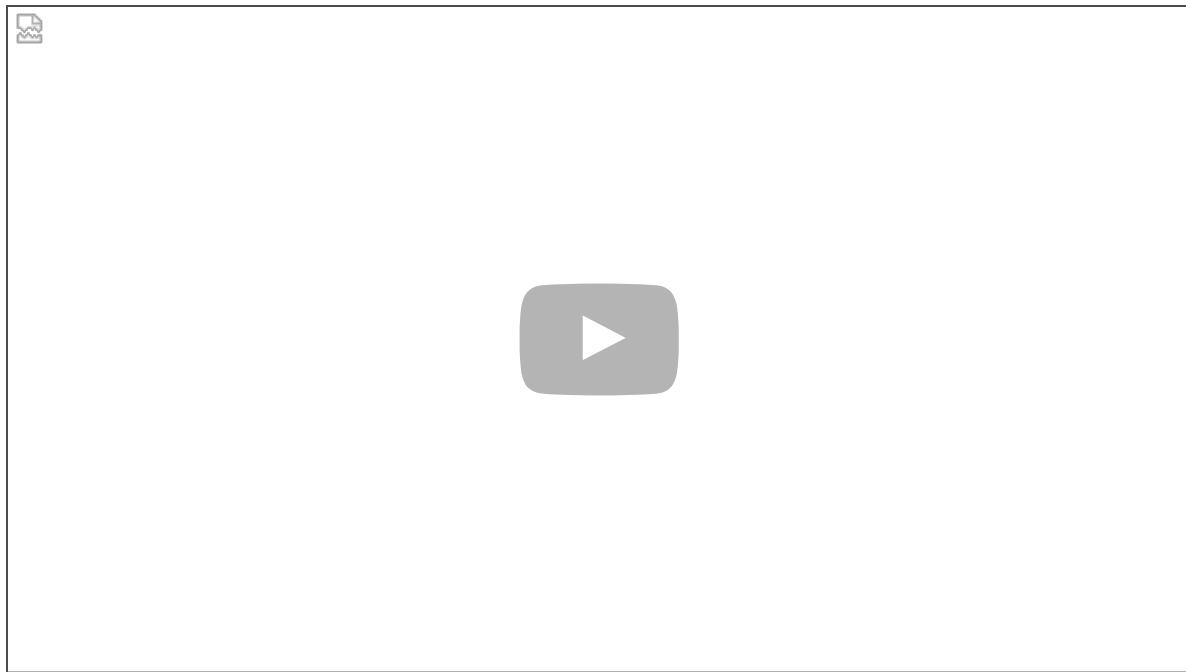
Componenten toevoegen aan het schema



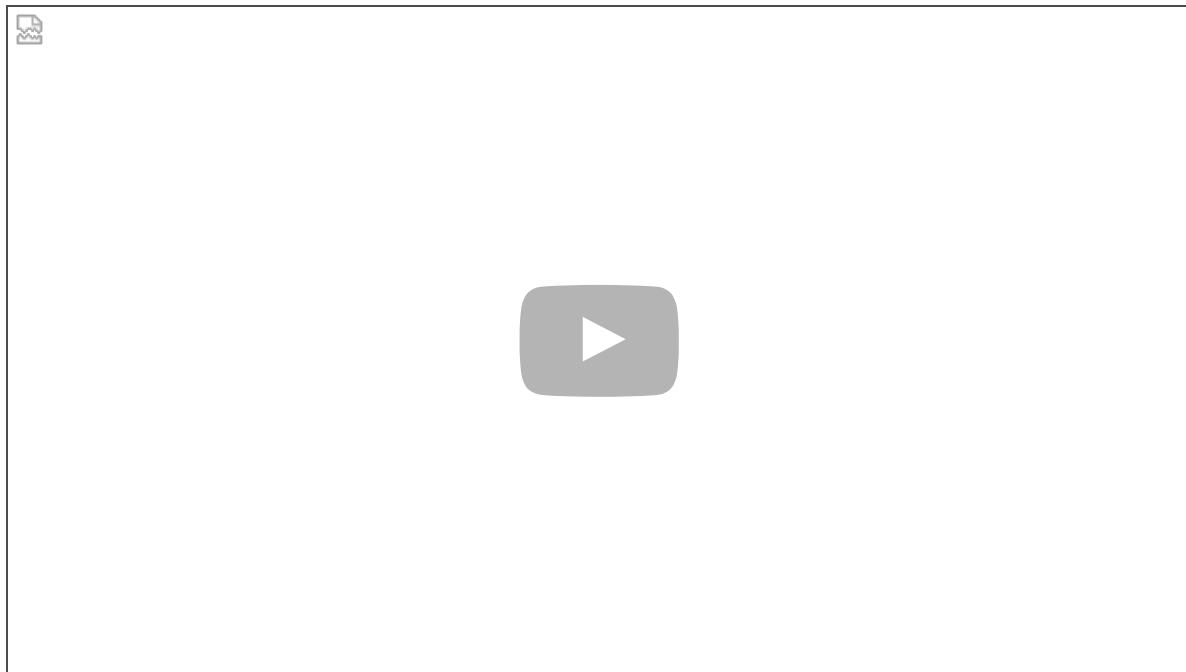
Creating a new library + Drawing a new symbol



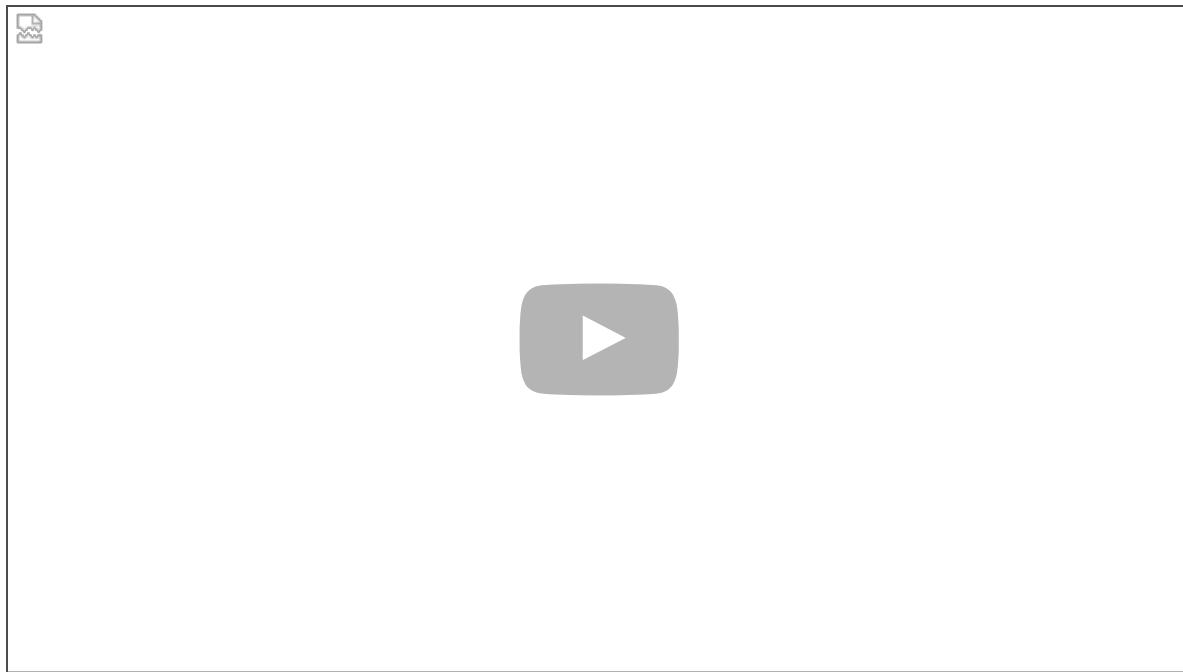
Componenten verbinden



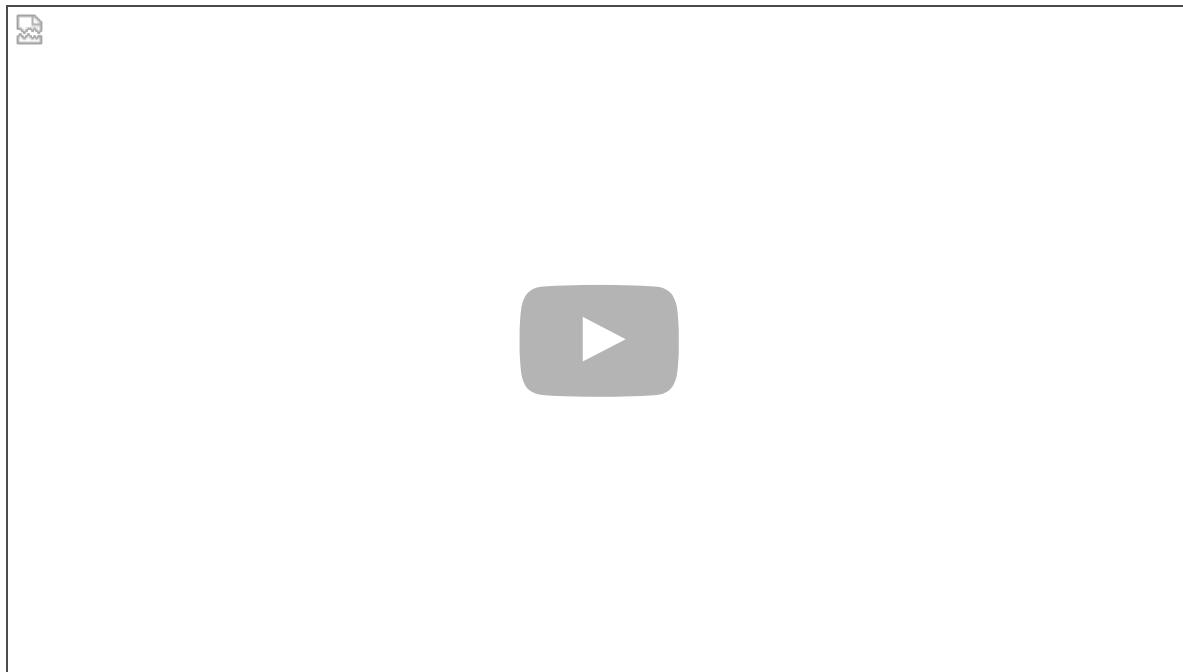
Component waarden toekennen:



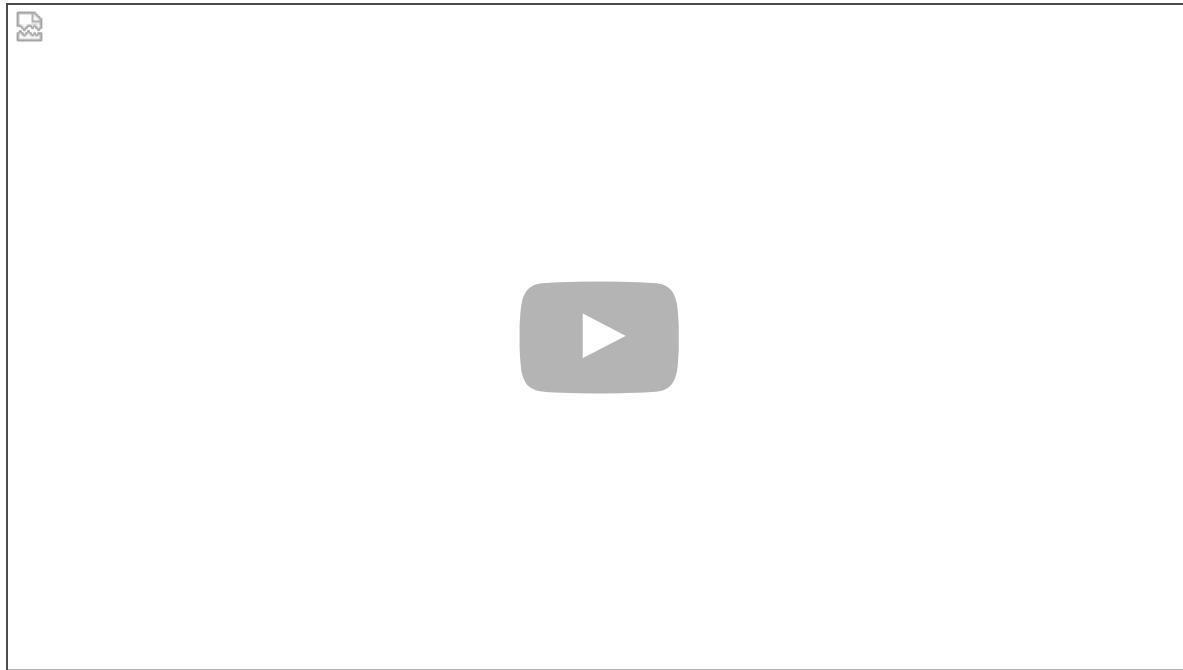
Annotating



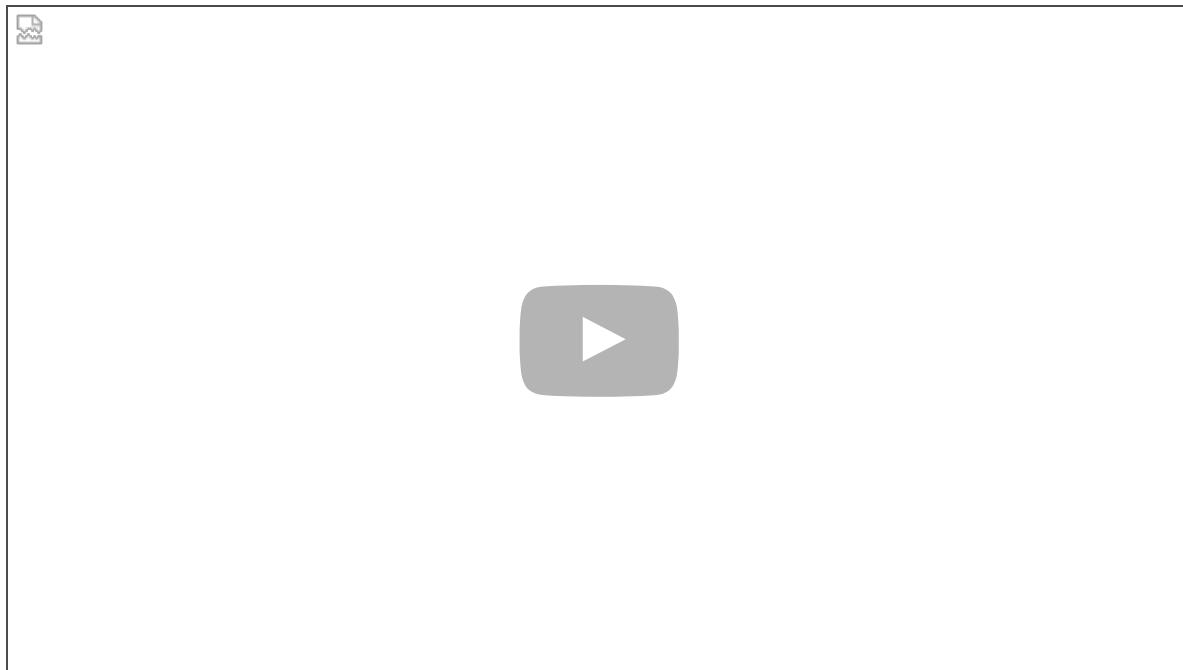
Electrical rule check



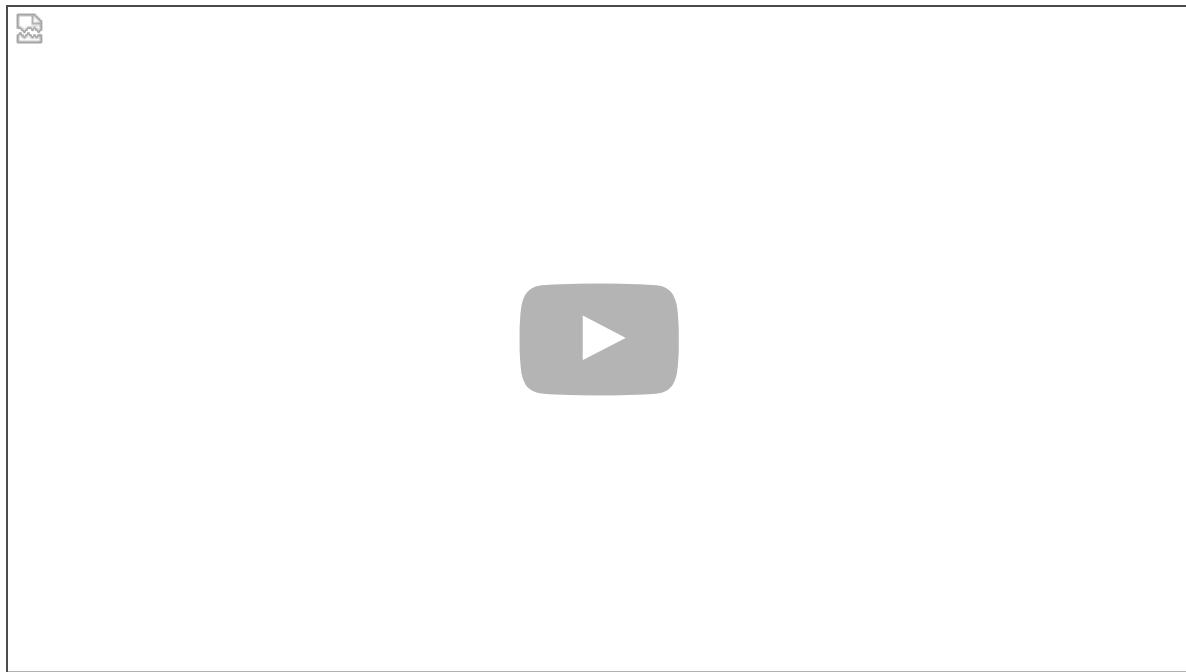
PCB Footprints toekennen aan schema symbolen



Eigen footprint ontwerpen

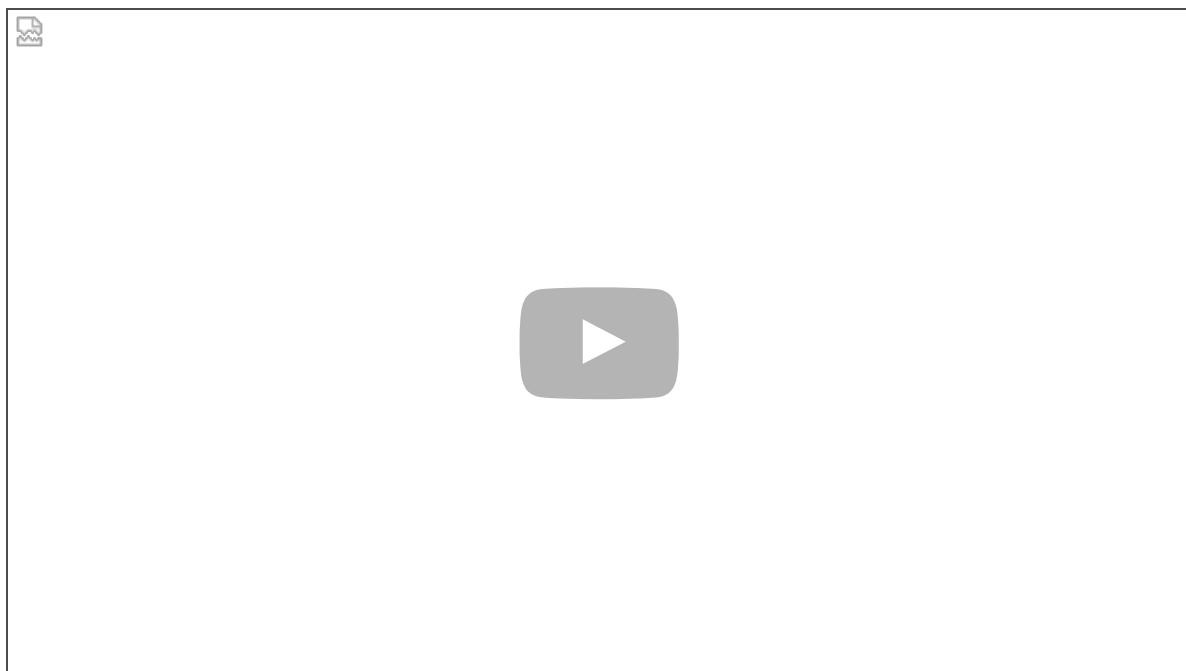


Netlist genereren

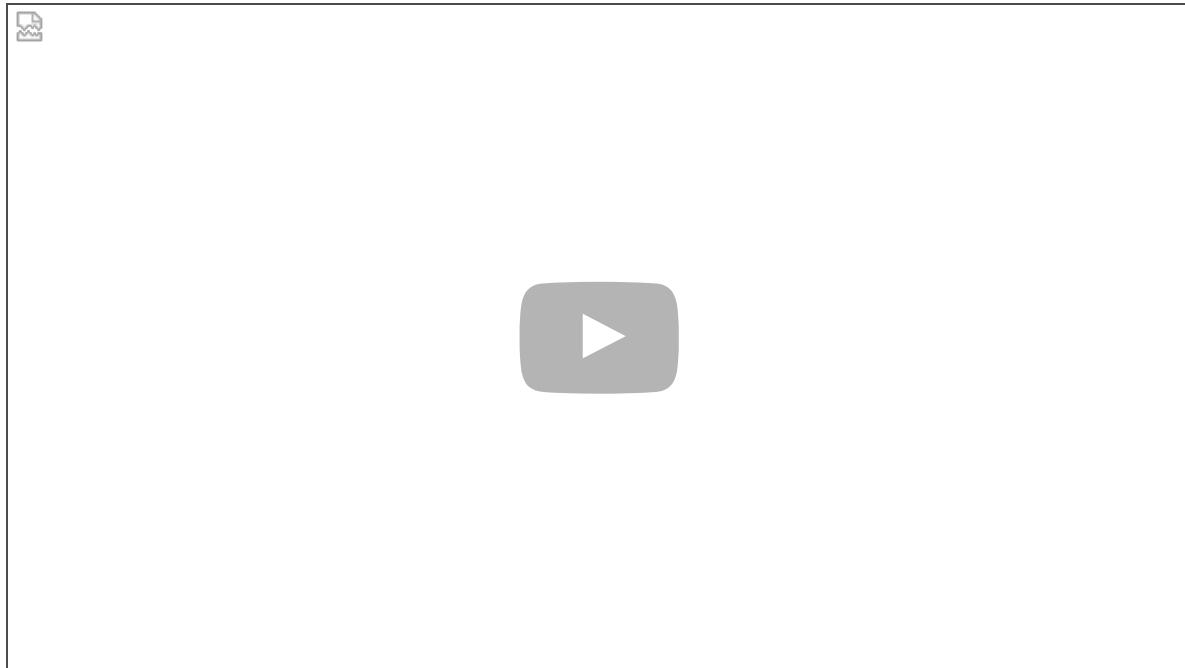


Creating a PCB

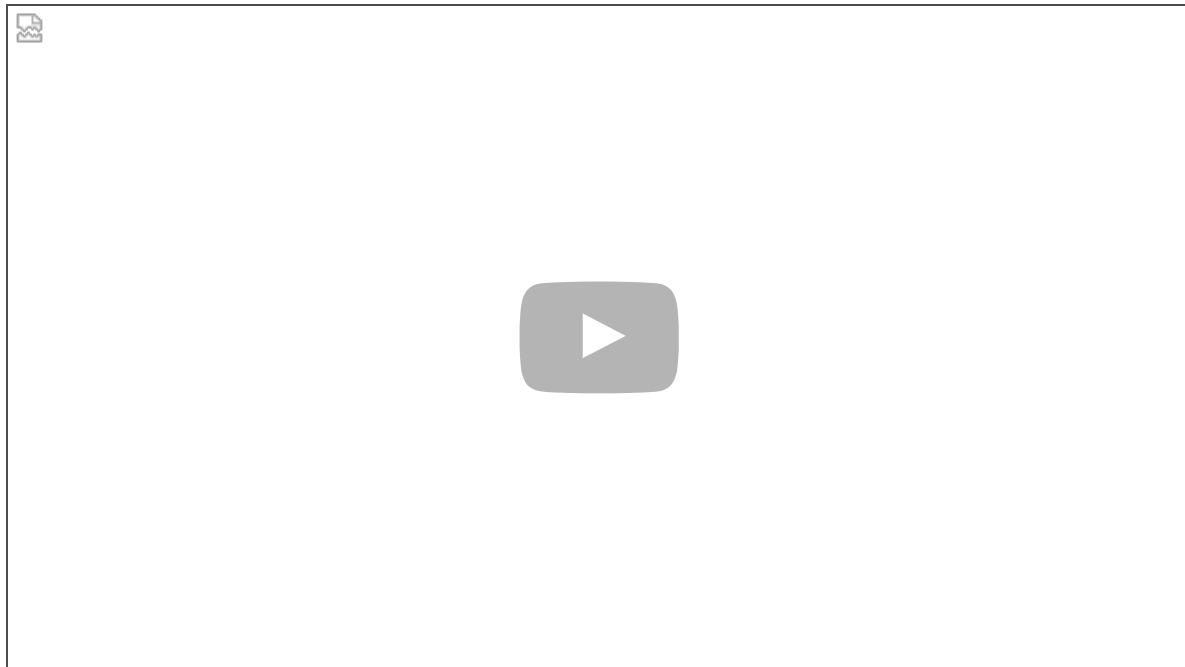
PCB openen en Netlist inladen



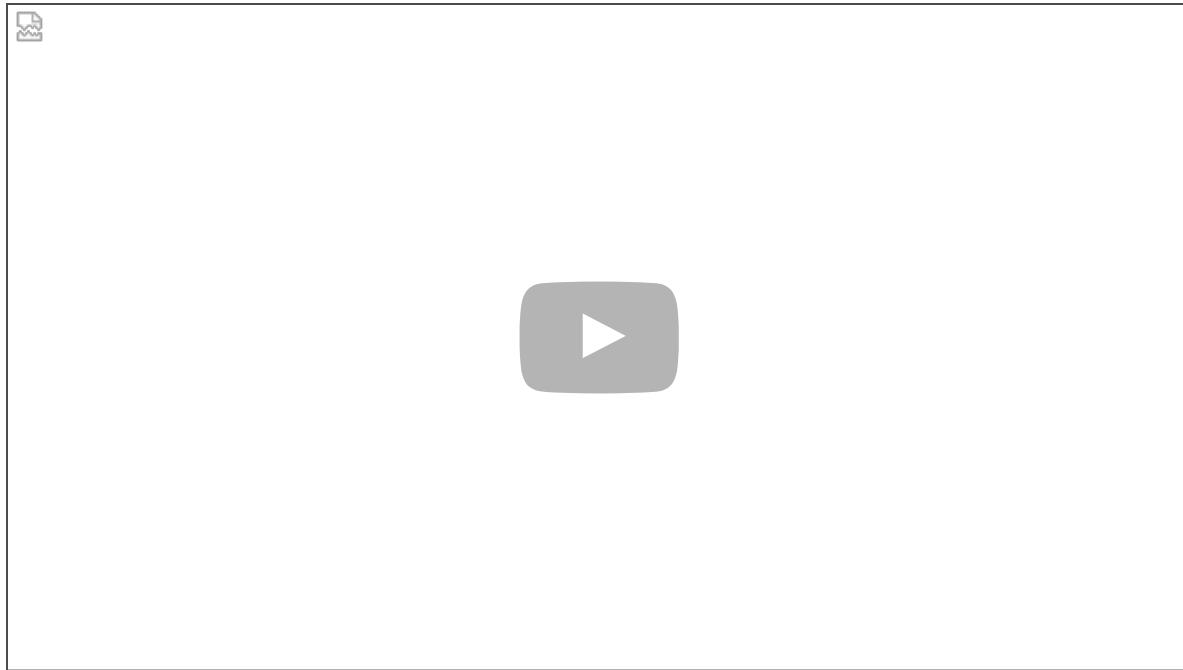
Componenten plaatsen op de PCB



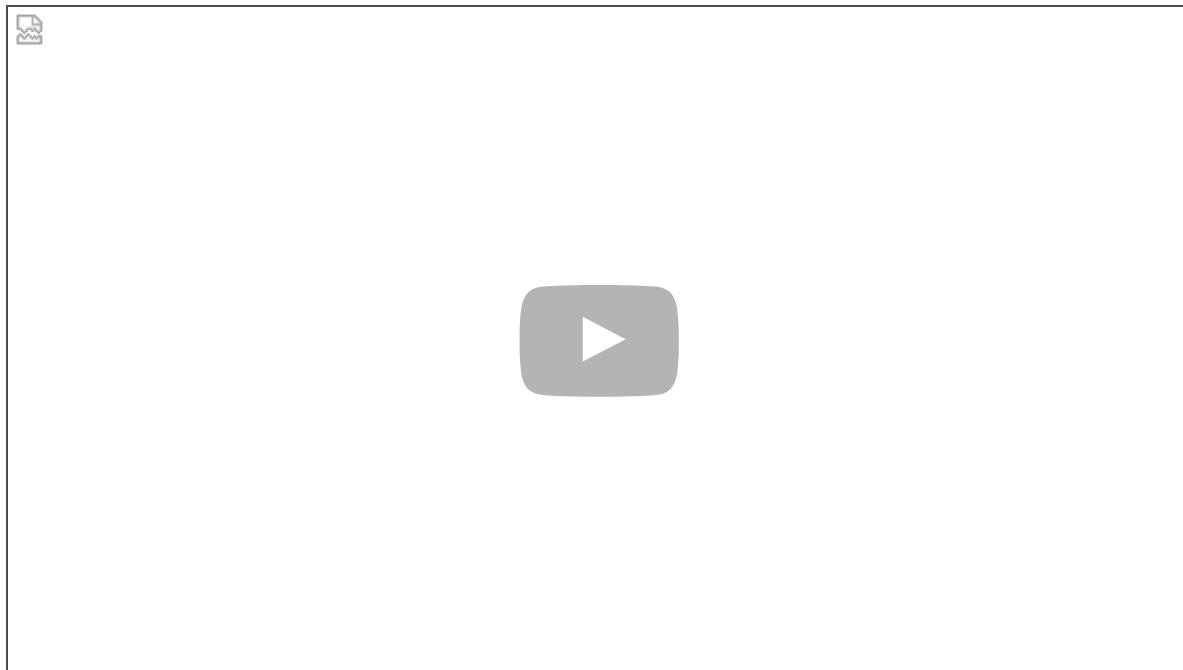
Routen van traces



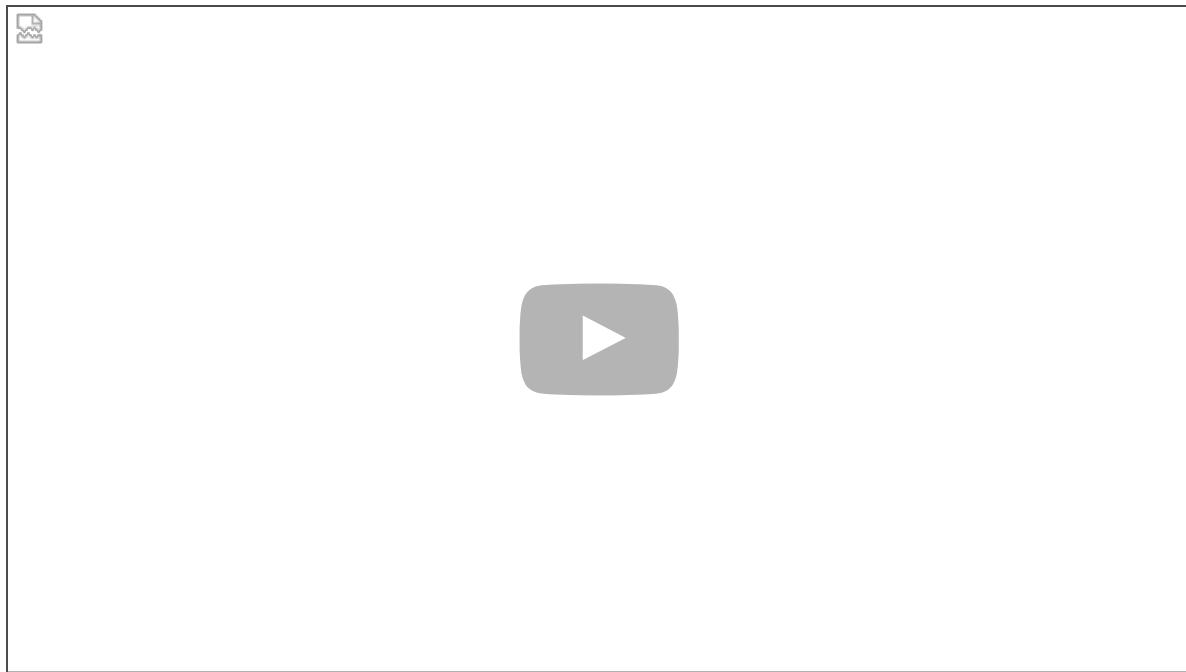
Kopervlakken maken



Bord outline tekenen

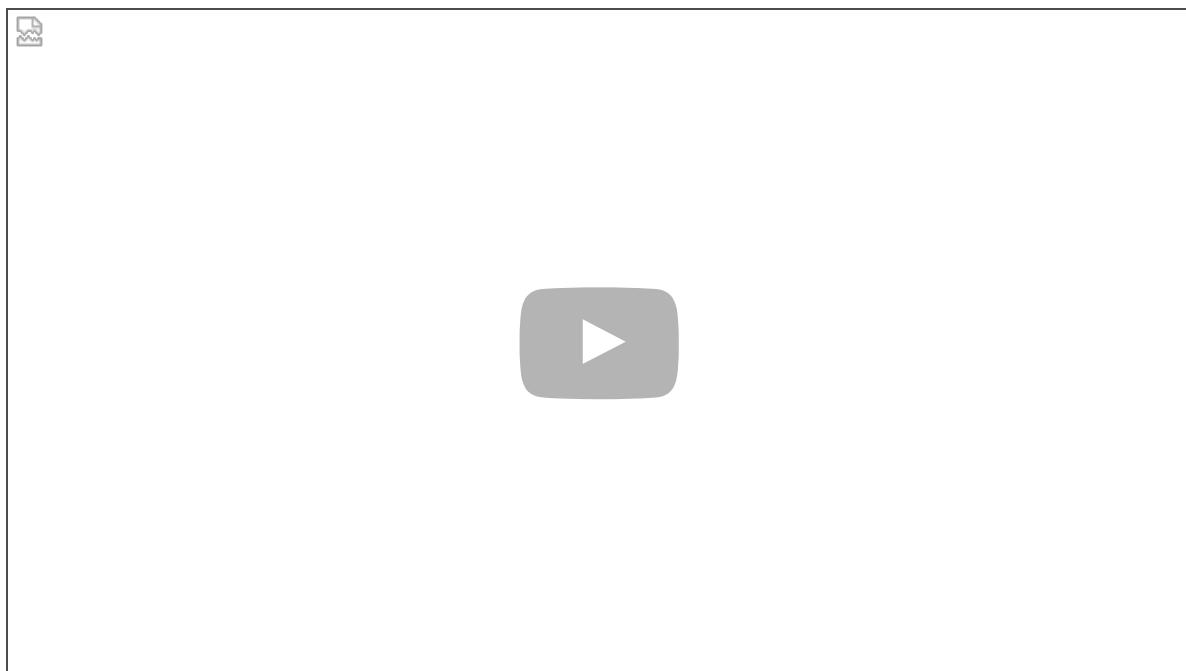


Design Rule Check

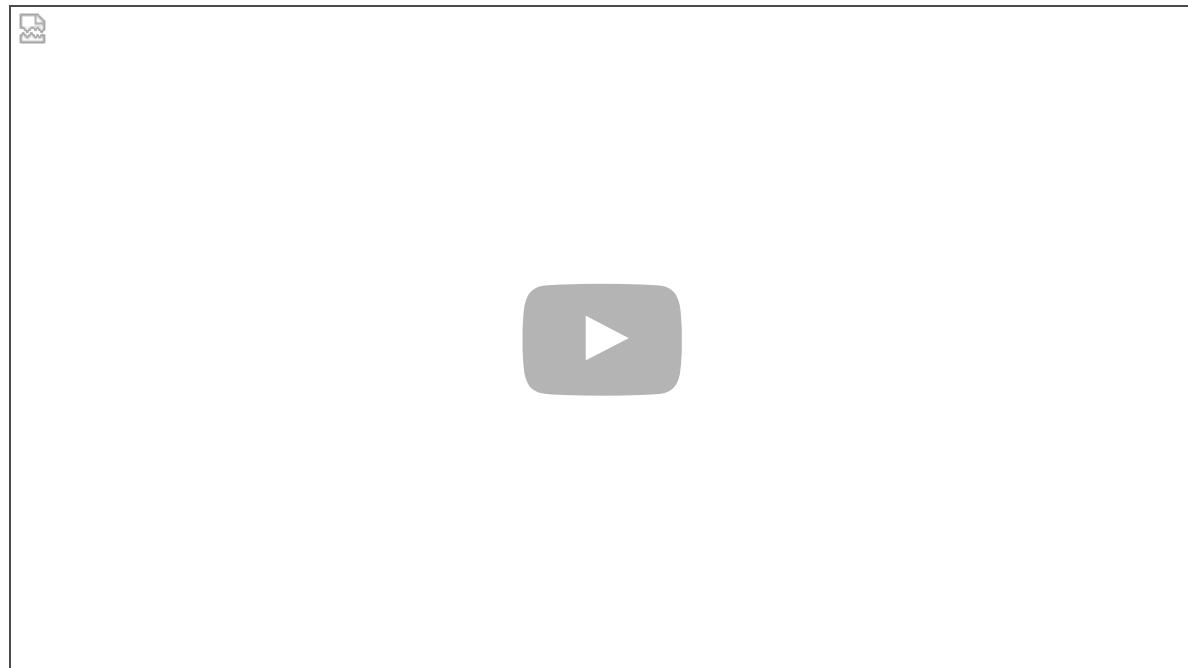


Exporting your files

Exporteren om zelf te etsen



Exporteren naar gerber voor een fabrikant



Adressen

Gotron Gent

Bronnen

https://en.wikipedia.org/wiki/Wire_wrap (https://en.wikipedia.org/wiki/Wire_wrap)
Collin's Lab: The REAL Breadboard (<https://www.youtube.com/watch?v=HrG98HJ3Z6w>)
<https://sites.google.com/site/electricalhustlerss/representing-information>
(<https://sites.google.com/site/electricalhustlerss/representing-information>)