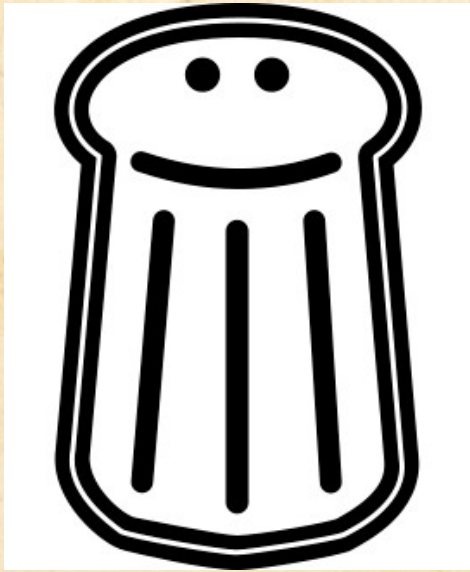




Pass The Salt 2026



PCB (Printed Circuit Board)

Let's get started, it's not so complicated!

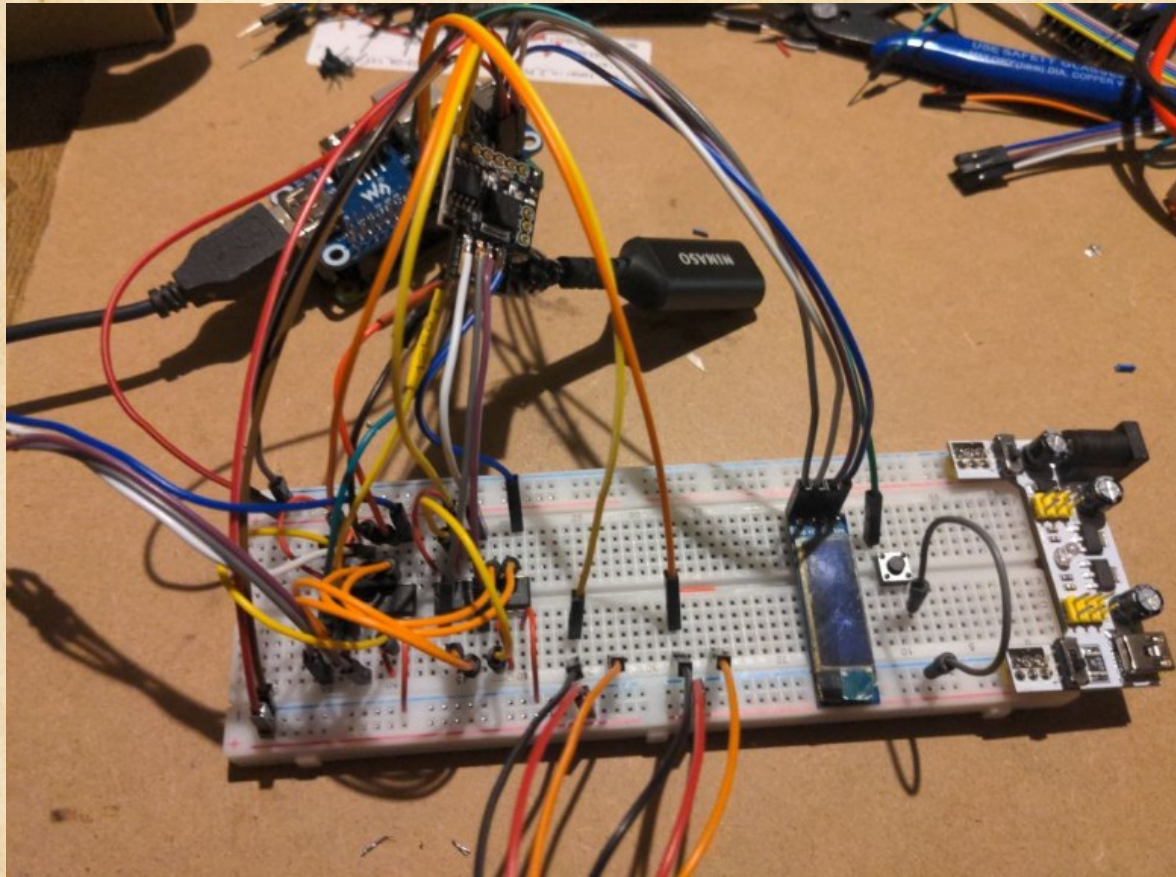
Workshop Agenda

- Why make your own PCB
- A few reminders
- A bit of hands-on practice
 - Reading a datasheet
 - The difference between digital and analog electronics
 - Using an open-source circuit-design software
 - Sending your PCB out for fabrication
 - Buying the components
- Going further
- Maybe practice:)



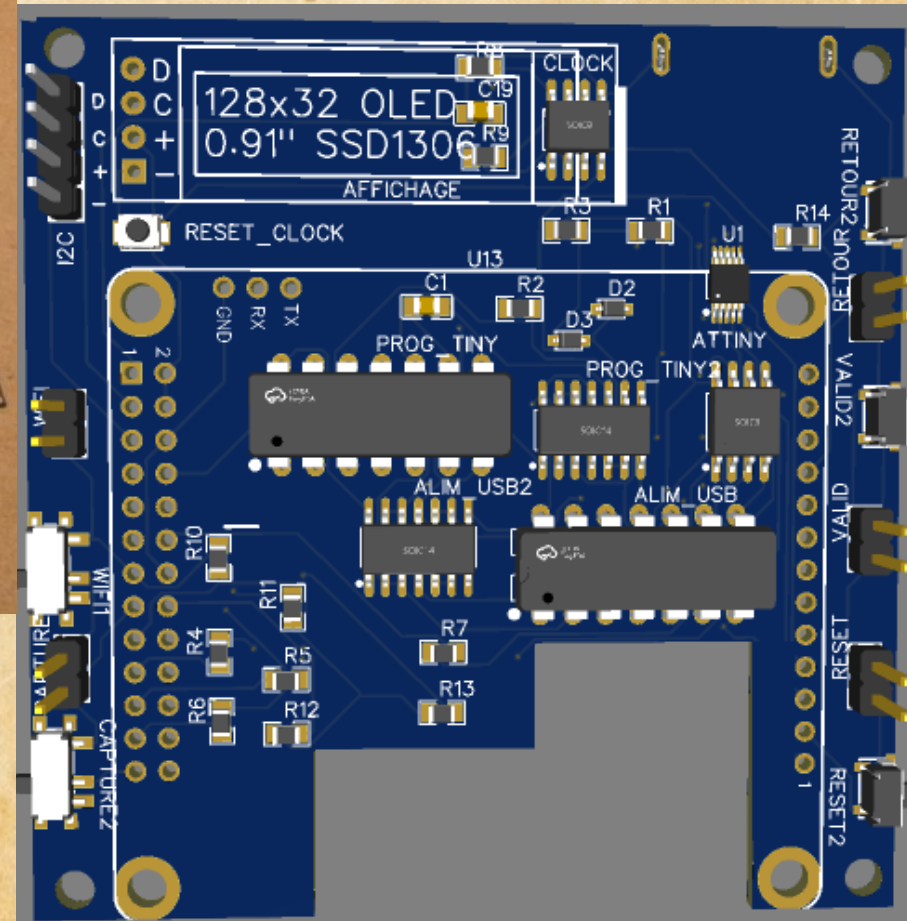
Why make your own PCB

Prototyping



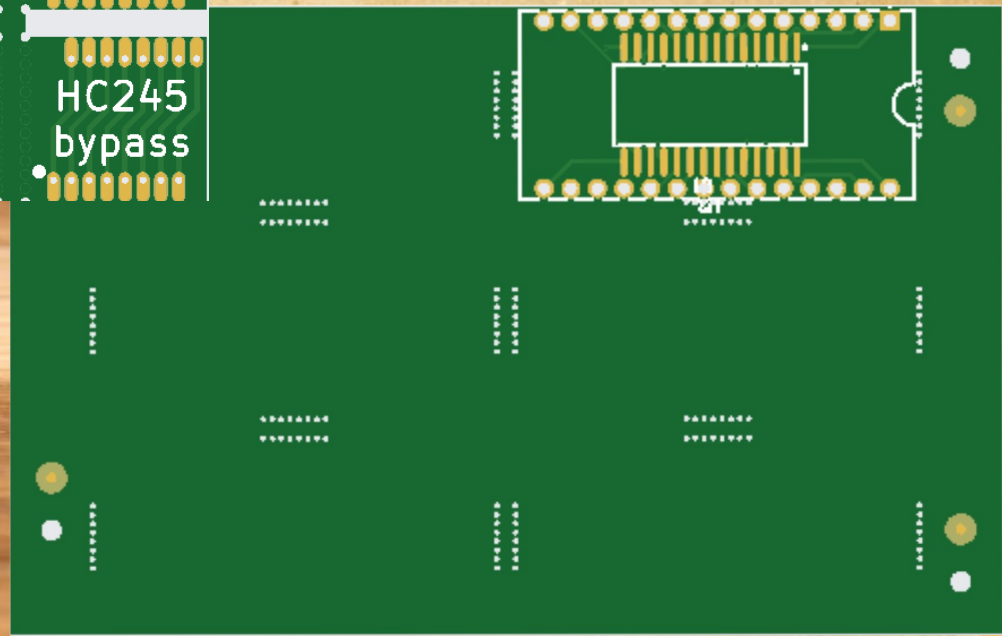
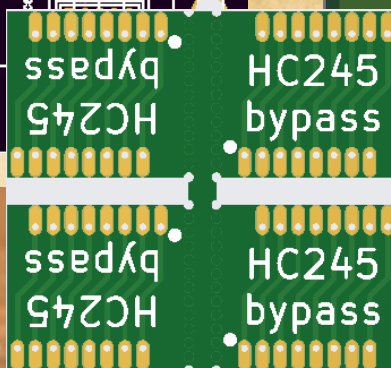
Idea

Hands-on execution

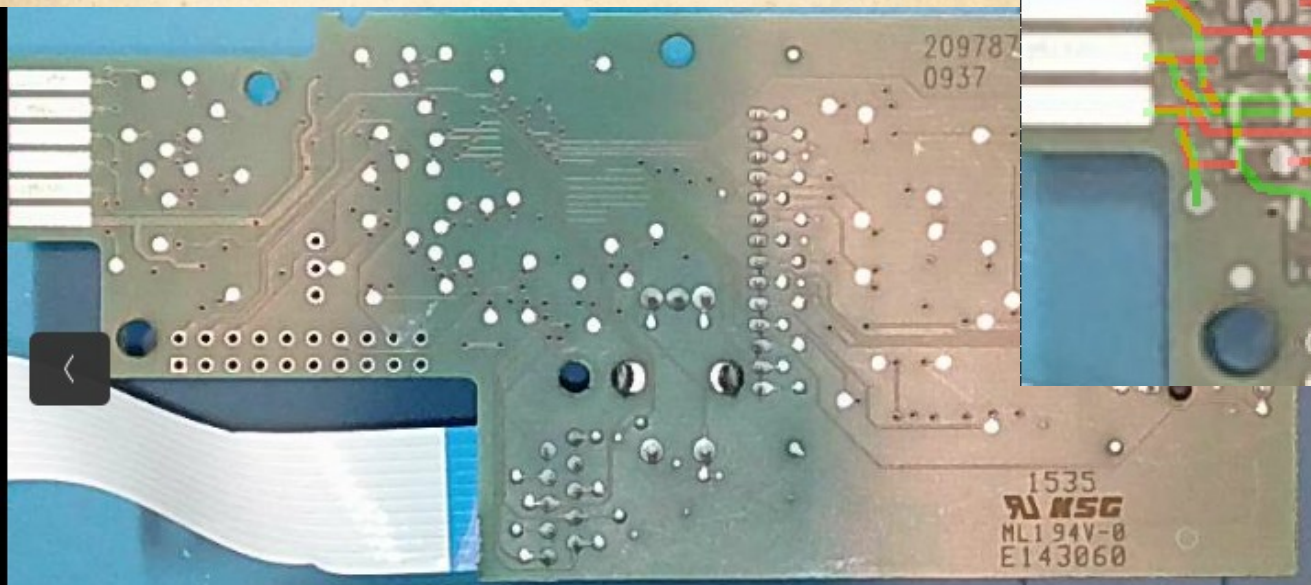
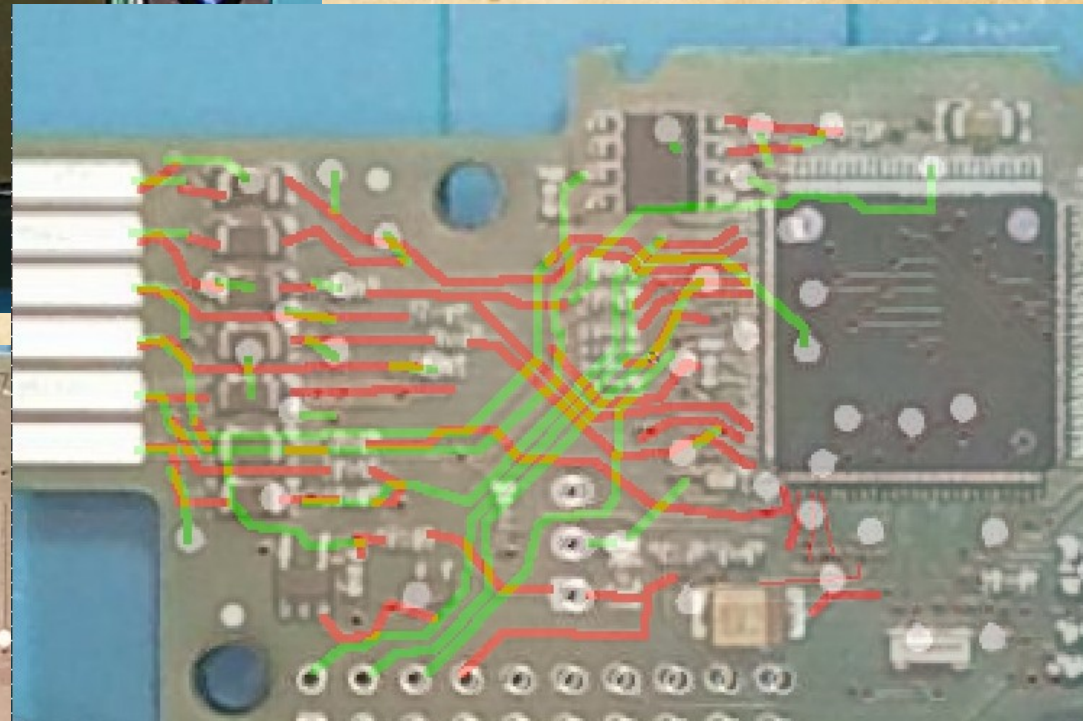
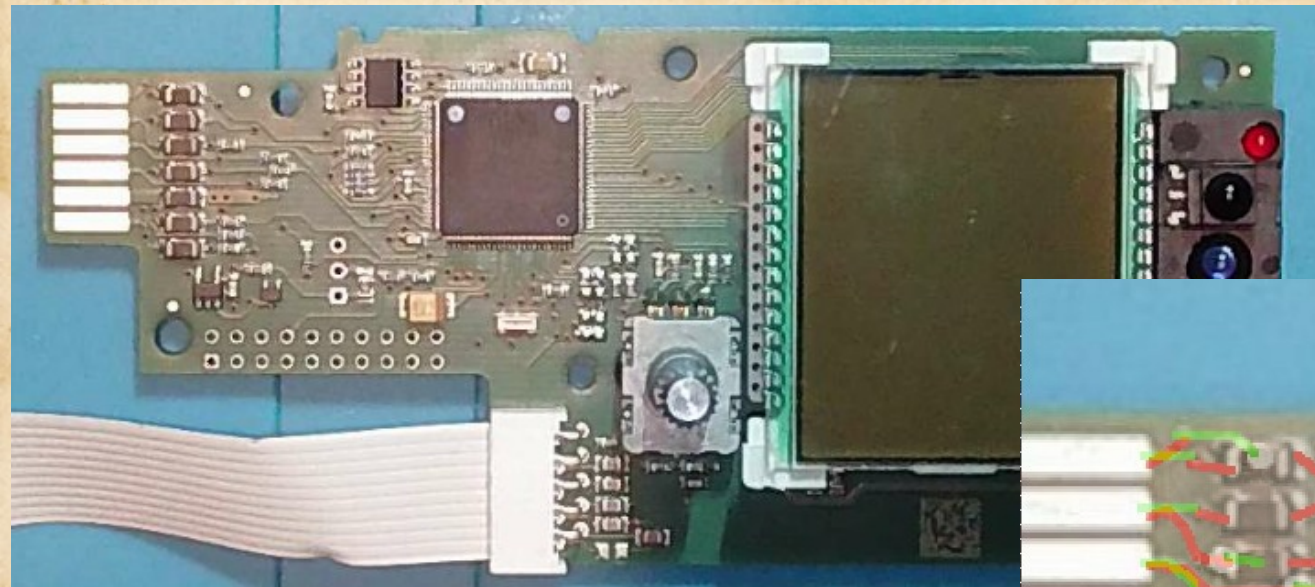


The image shows a custom PCB labeled "Kiwi's programmer board v0.1a". It is designed to interface with a Raspberry Pi Zero W. Key components and features include:

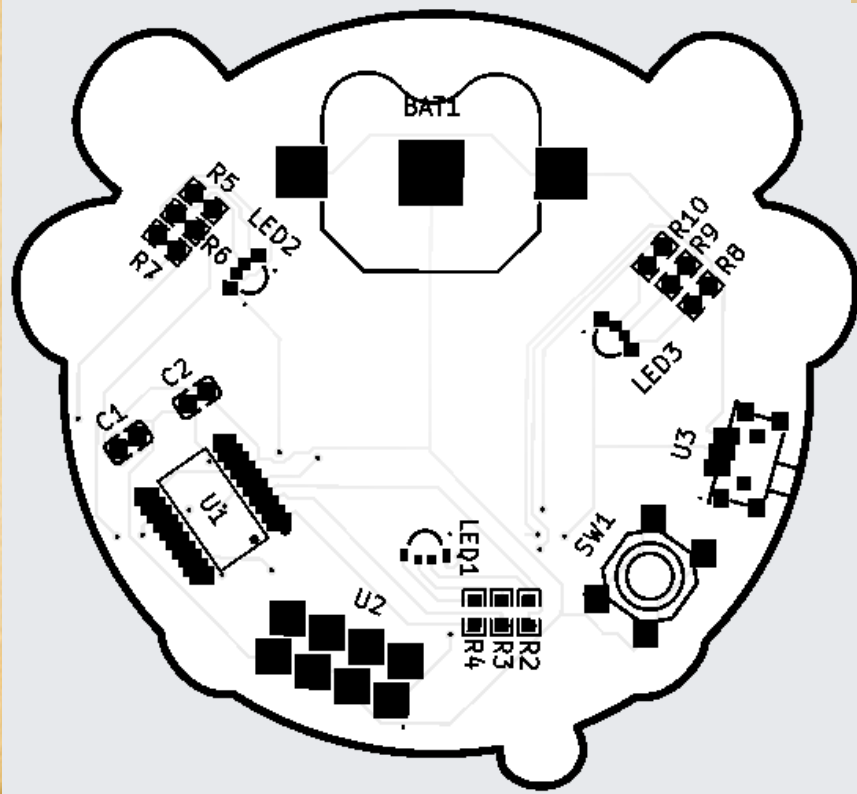
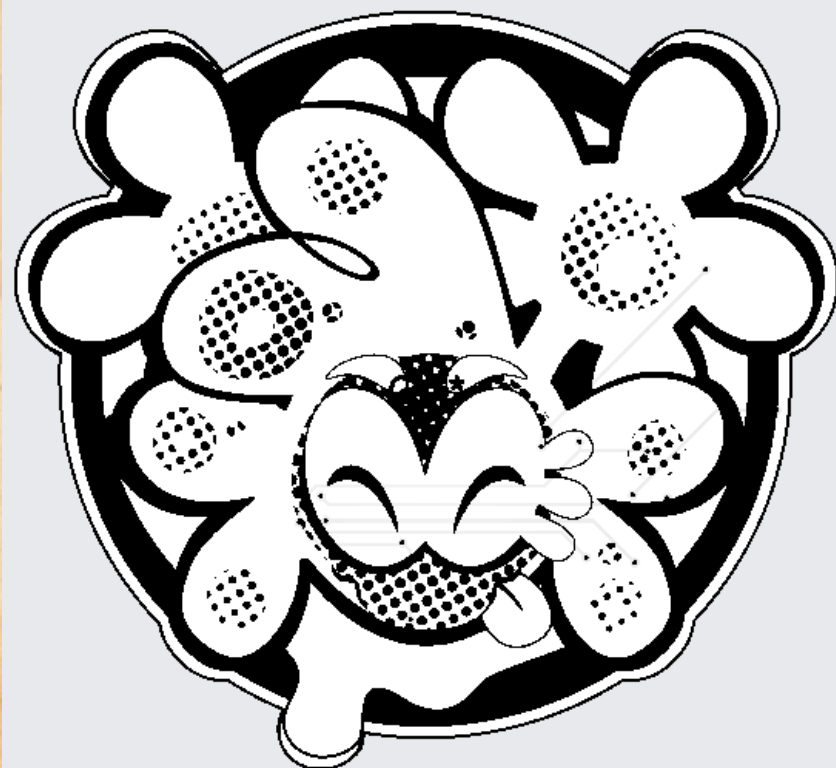
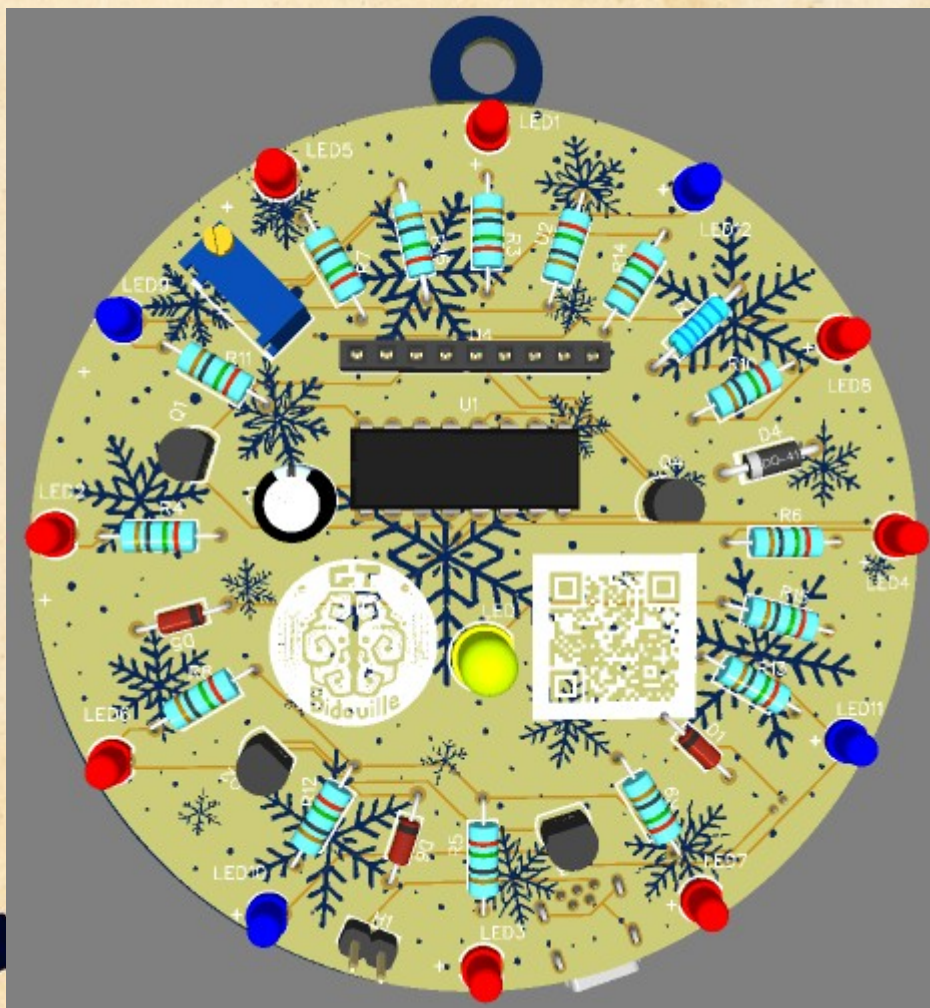
- Microcontroller:** A Raspberry Pi Zero W is mounted on the left side.
- Connectors:** Multiple pin headers are present for SPI (PA1, PA0, PA7), I2C (SCL, GND), and UART (TX, RX, GND). There is also a USB-C port.
- Power and Grounding:** Various power pins are labeled, including VCC (PWR/REF), IO (SBW/SWD), CLK, GND, and VREF.
- Debugging and Programming:** A small yellow duck is mounted on the board. A green "bypass" switch is located at the bottom right. A "MSP-FET" header is also visible.
- Labels and Markings:** The board is labeled "Kiwi's programmer board v0.1a" and "saleae". There are also various pin numbers and labels for different functions.



A bit of reverse engineering



For fun !



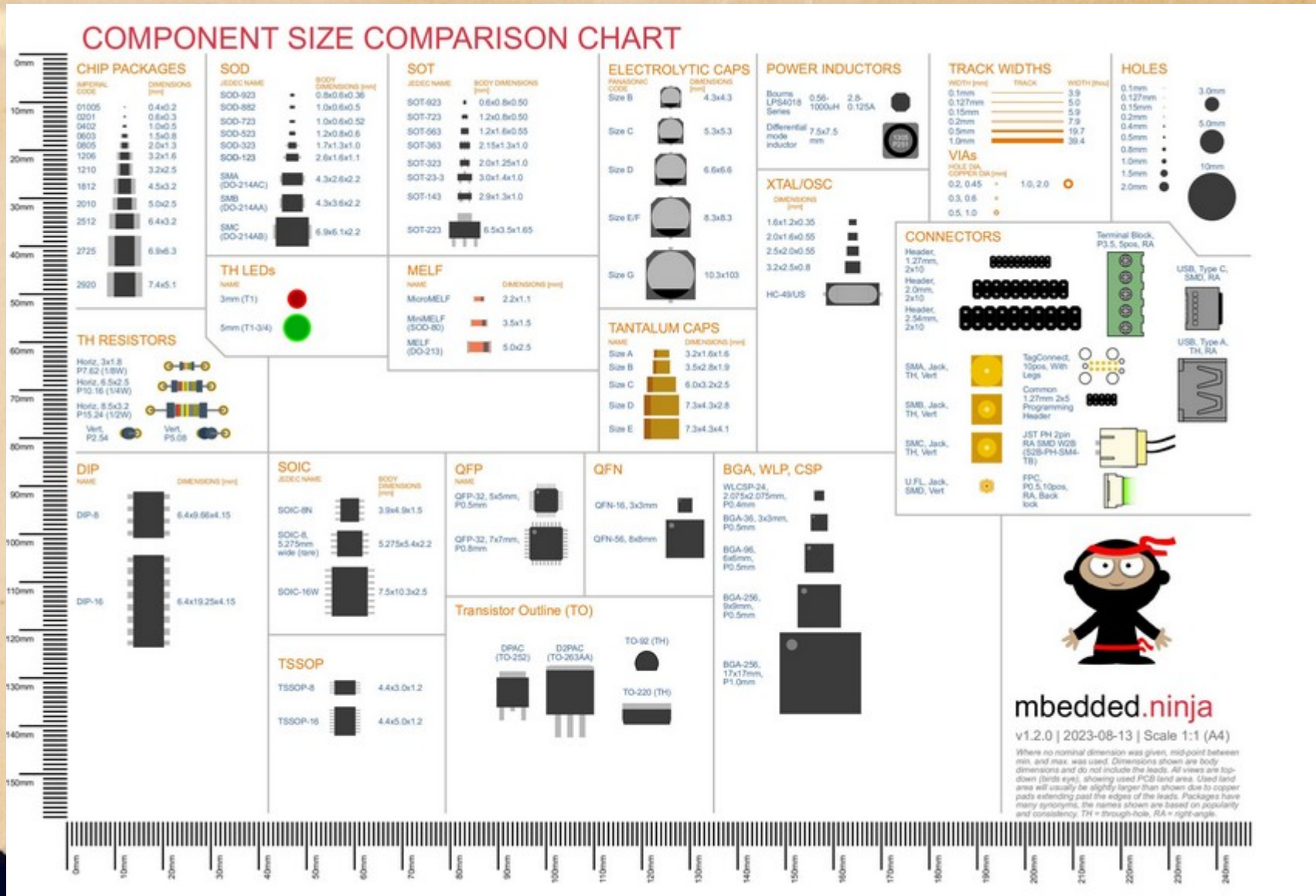


A few reminders

Not so much, I promise



How to choose your component



Resistors

- What they're used for, and how to tell their power/size,

1ère Bande	2ème Bande	3ème Bande	Multiplicateur	Tolérance
Black 0	0	0	x 1	
Brown 1	1	1	x 10	± 1%
Red 2	2	2	x 100	± 2%
Orange 3	3	3	x 1k	
Yellow 4	4	4	x 10k	
Green 5	5	5	x 100k	± 0.5%
Blue 6	6	6	x 1M	± 0.25%
Violet 7	7	7	x 10M	± 0.10%
Gray 8	8	8	x 100M	± 0.05%
White 9	9	9	x 1G	
Gold			x 0.1	± 5%
Silver			x 0.01	± 10%

3-Digit and 4-Digit SMD Resistor Value Calculator

Use when code only contains numbers

4 7 000

3-Digit Resistor

473

0	0	0	- - -
1	1	1	+0
2	2	2	+00
3	3	3	+000
4	4	4	+0 000
5	5	5	+00 000
6	6	6	+000 000
7	7	7	
8	8	8	
9	9	9	

4-Digit Resistor

4702

4 7 0 00

47 000 = 47K

Small values may use a code with 'R':
Swap R for a decimal point. Don't include Multiplier!

R10 **R68**
0.1 Ohms 0.68 Ohms

1R0 **6R8**
1 Ohm 6.8 Ohms

0R10 **0R68**
0.1 Ohms 0.68 Ohms

1R00 **6R80**
1 Ohm 6.8 Ohms

10R0 **68R0**
10 Ohms 68 Ohms

ECOBION LABS

(C) 2016 Ecobion Industries Ltd.

capacitors

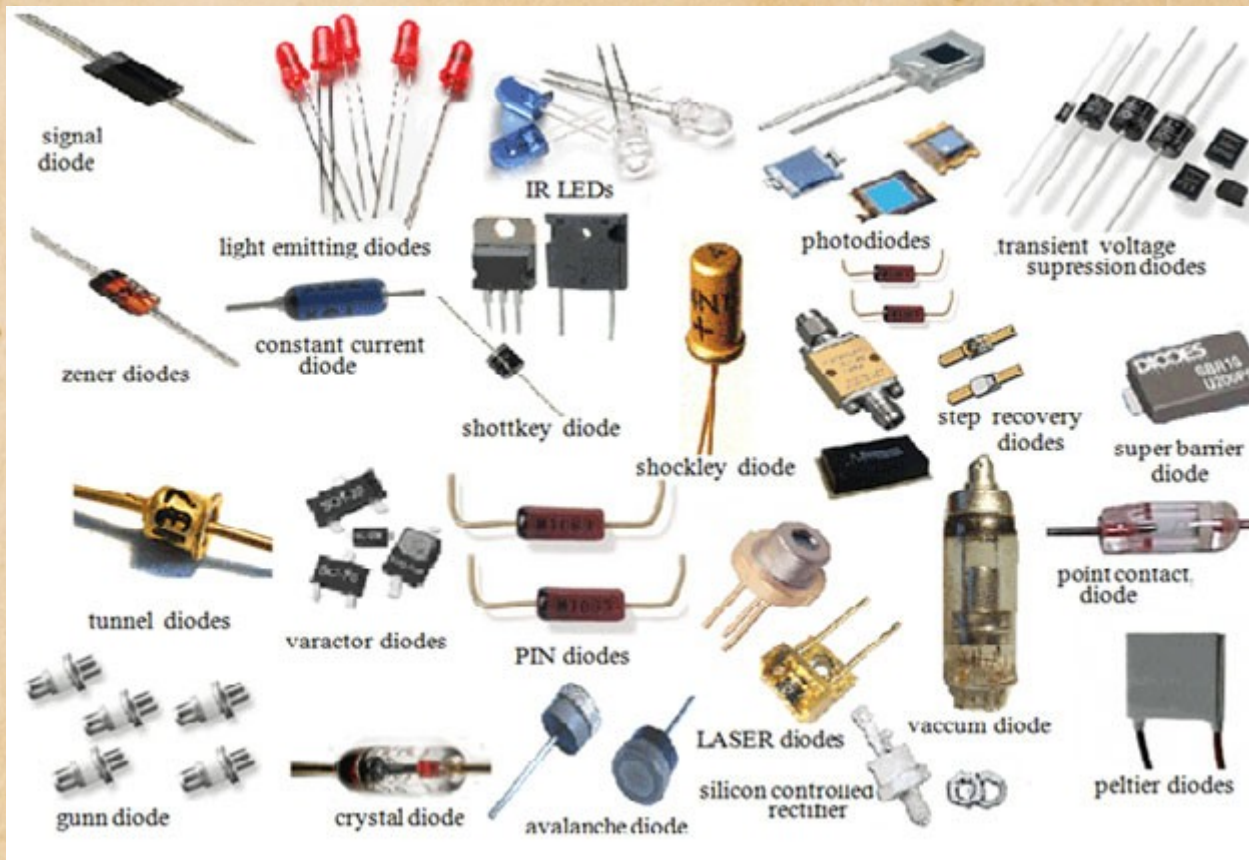
- What they're used for, and how to tell their power/size,

Chiffres significatifs	Multiplicateur	Tolérance	Coefficient température	Tension de service
		Rien : +/- 20 %		Rien : 500 V
	Argent : x 0,01	Argent : +/- 10 %		Argent : 2000 V
	Or : x 0,1	Or : +/- 5 %	Or : + 100	Or : 1000 V
Noir : 0	Noir : x 1	Noir : +/- 20 %	Noir : 0	
Marron : 1	Marron : x 10	Marron : +/- 1 %	Marron : - 30	Marron : 100 V
Rouge : 2	Rouge : x 100	Rouge : +/- 2 %	Rouge : - 80	Rouge : 200 V
Orange : 3	Orange : x 1 K		Orange : - 150	Orange : 300 V
Jaune : 4	Jaune : x 10 K		Jaune : - 220	Jaune : 400 V
Vert : 5	Vert : x 100 K	Vert : +/- 5 %	Vert : - 330	Vert : 500 V
Bleu : 6	Bleu : x 1 M		Bleu : - 470	Bleu : 600 V
Violet : 7	Violet : x 10 M		Violet : - 750	Violet : 700 V
Gris : 8			Gris : - 2200	Gris : 800 V
Blanc : 9		Blanc : +/- 10 %		Blanc : 900 V

Picture	Type	Package
	Ceramic	0603
	Ceramic	0805

Diodes

- You know them without even realizing it!



TYPES OF DIODES

BYJU'S
The Learning App



Junction Diode



Zener Diode



Tunnel Diode



Schottky Diode



Varactor Diode



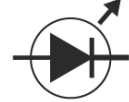
Diac



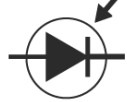
Triac



SCR



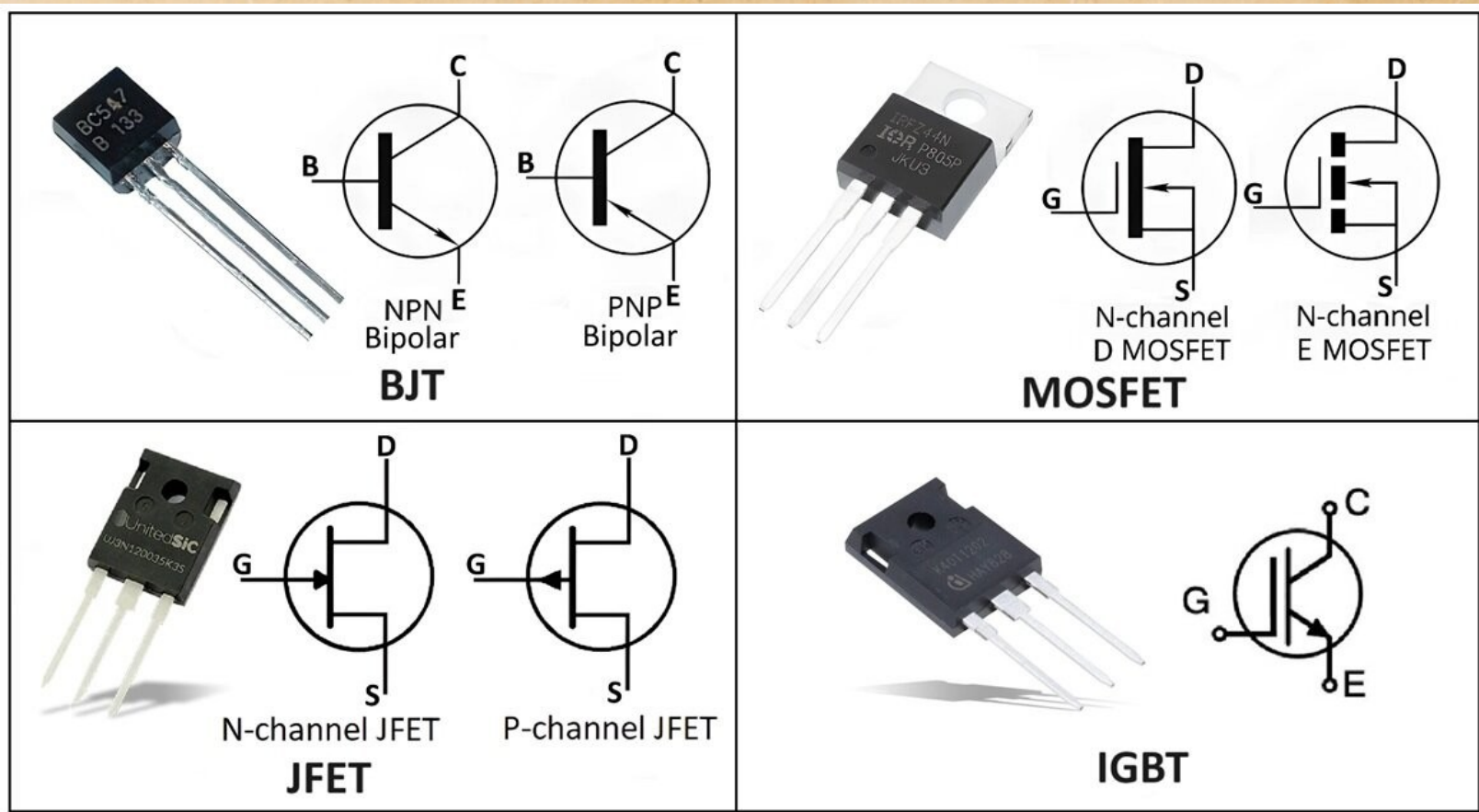
Light Emitting Diode (LED)



Photodiode

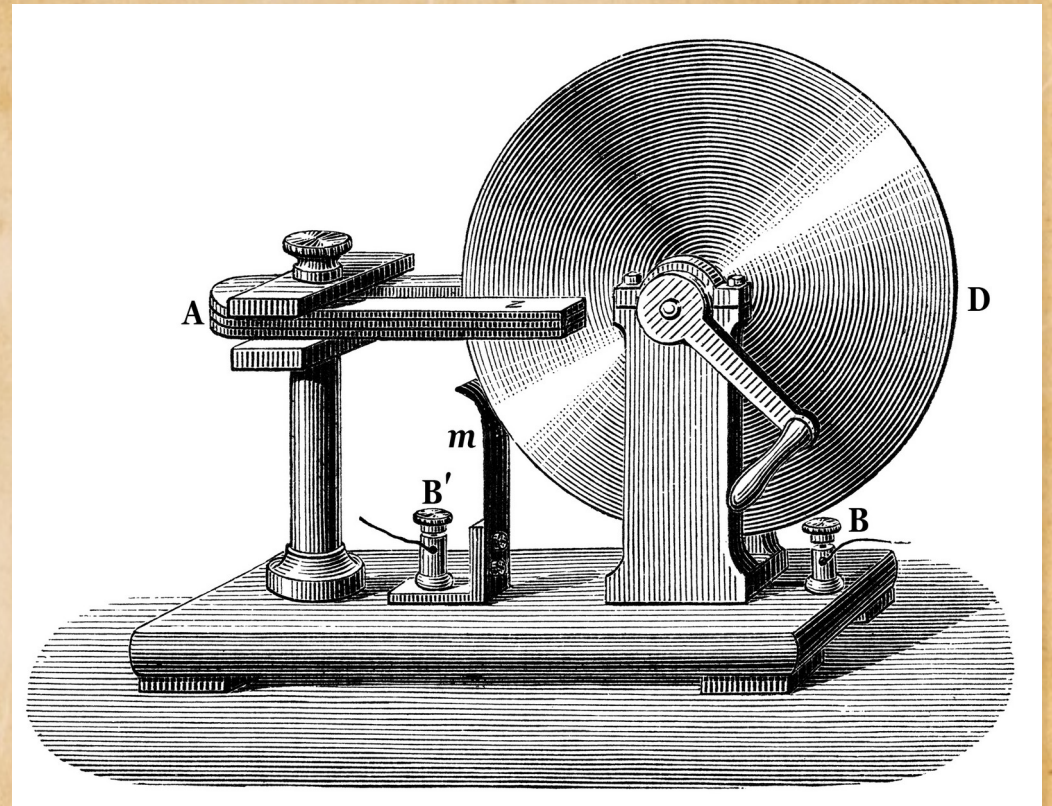
transistors

- PNP, NPN, suiveur de tension, simple inter



Power source

The different types of power sources



Logical circuits

- Example of a 74x00

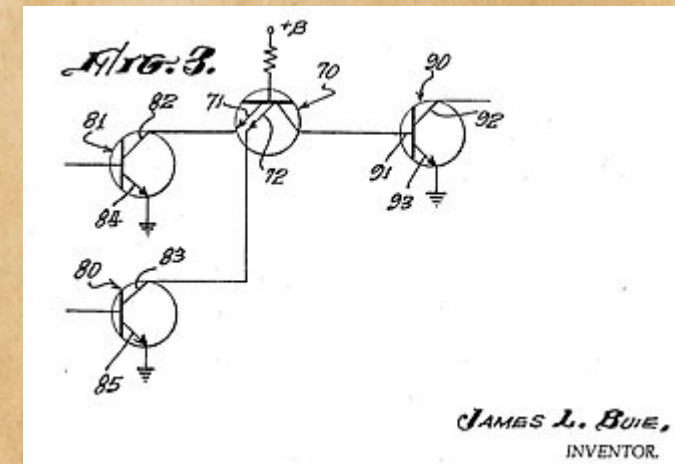
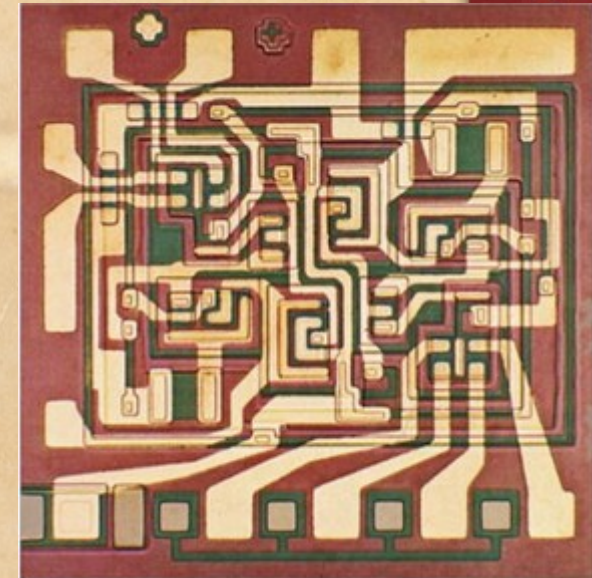
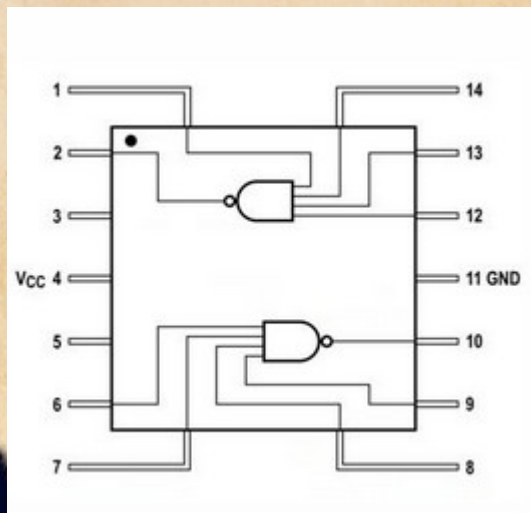
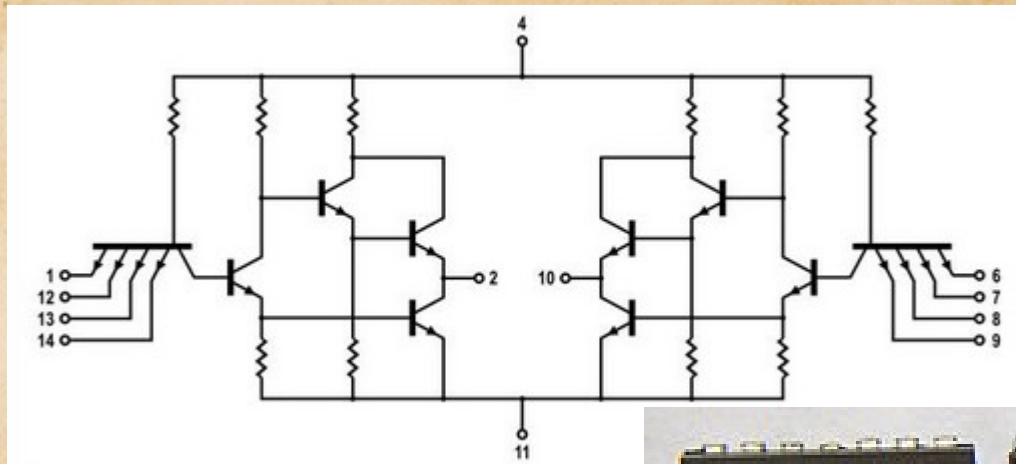
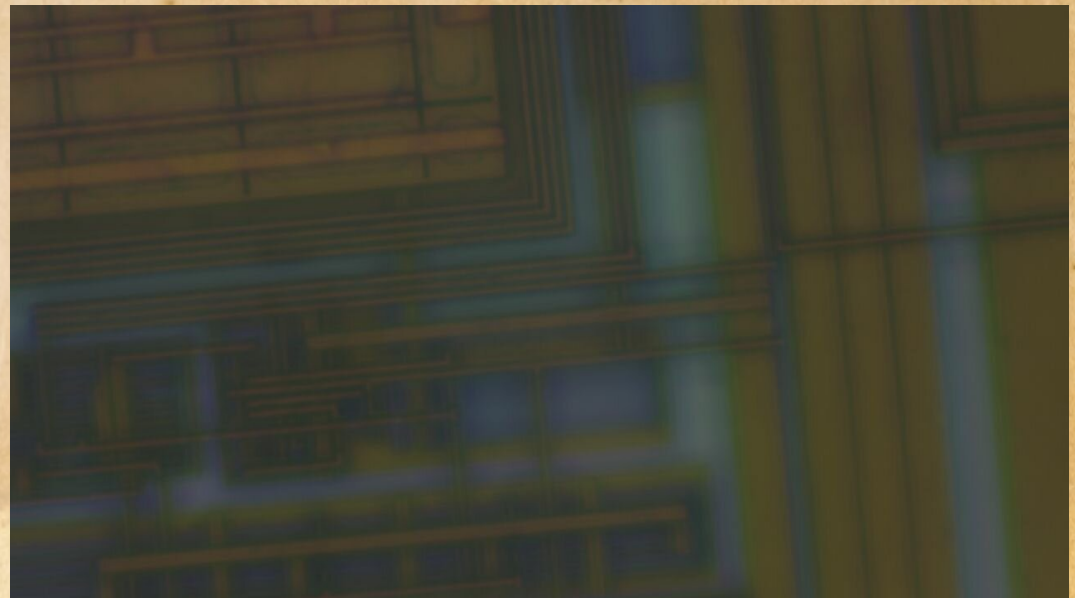
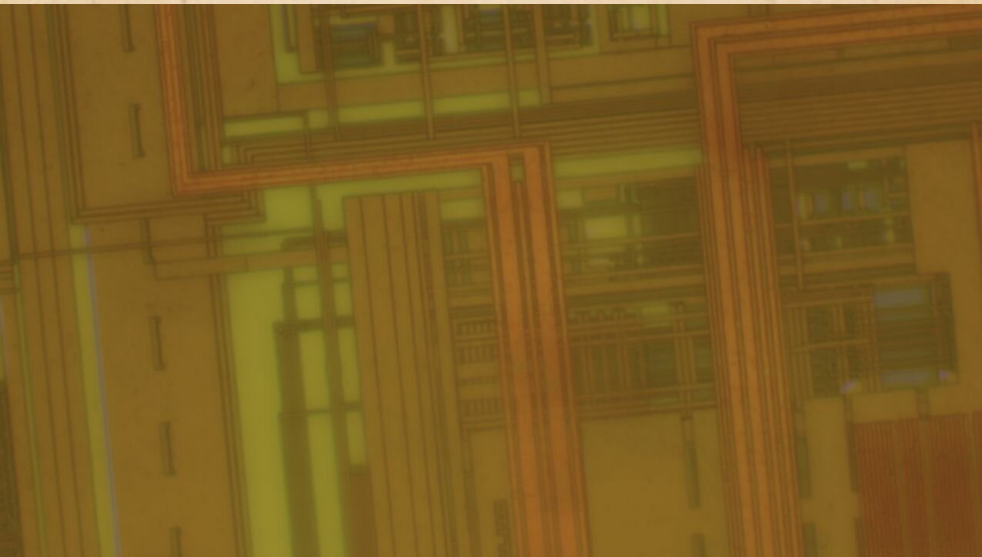
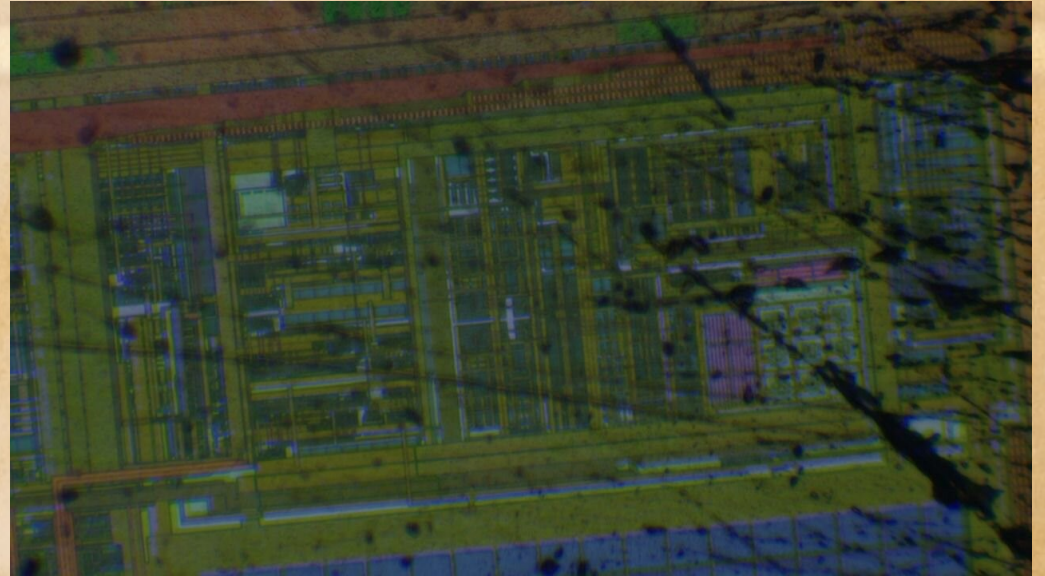
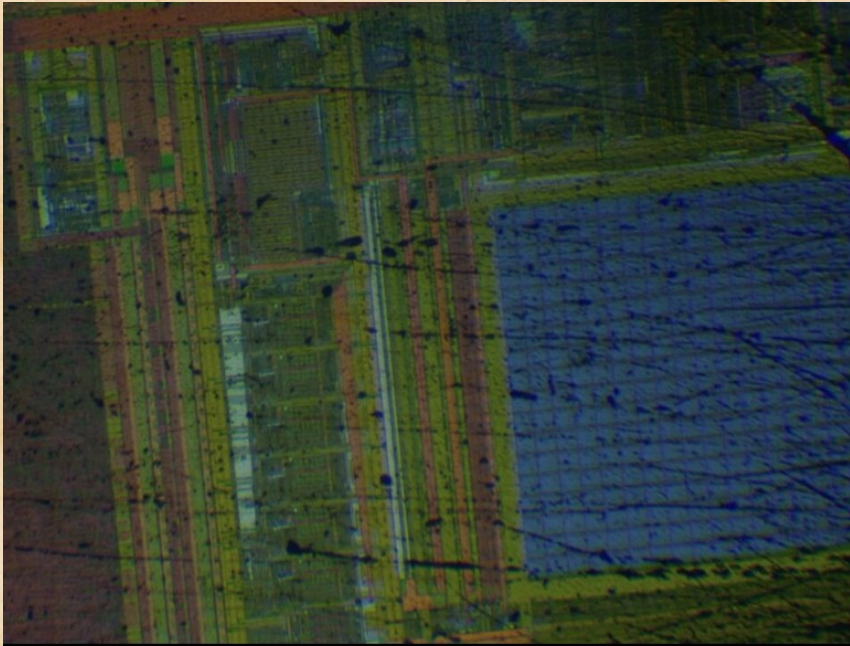


Table 1. Functional Table (Each Gate)

INPUTS		OUTPUT
A	B	Y
H	H	L
L	X	H
X	L	H

Integrated circuit – a big small PCB



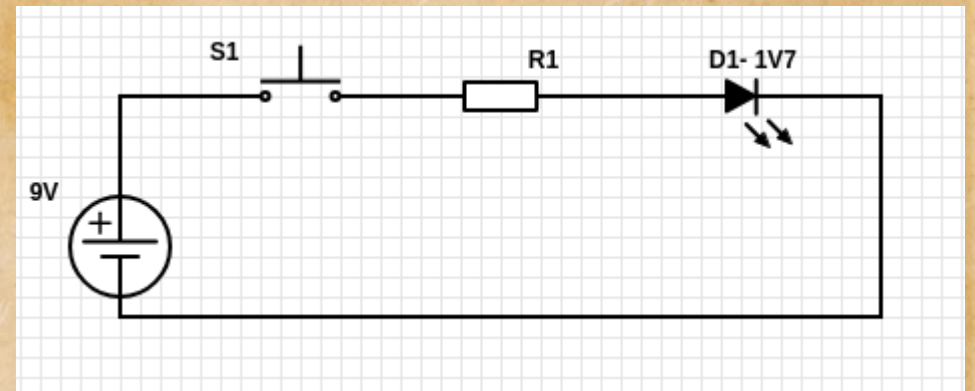
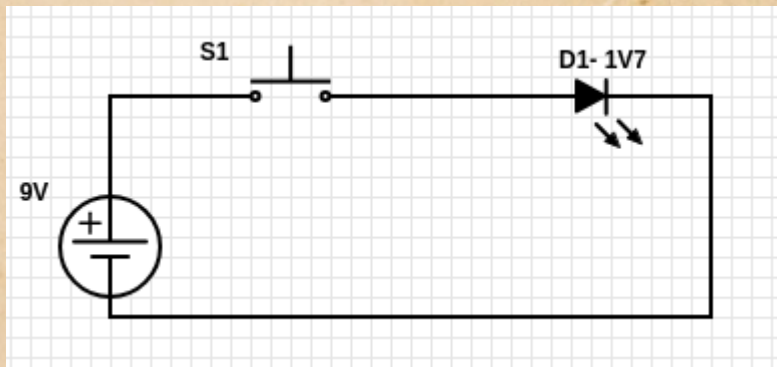


applications

A bit of hands-on stuff



Turn on an LED

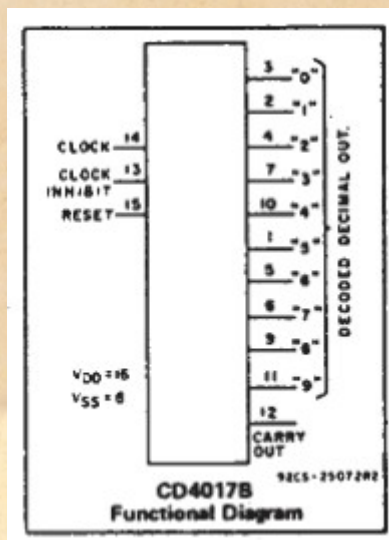
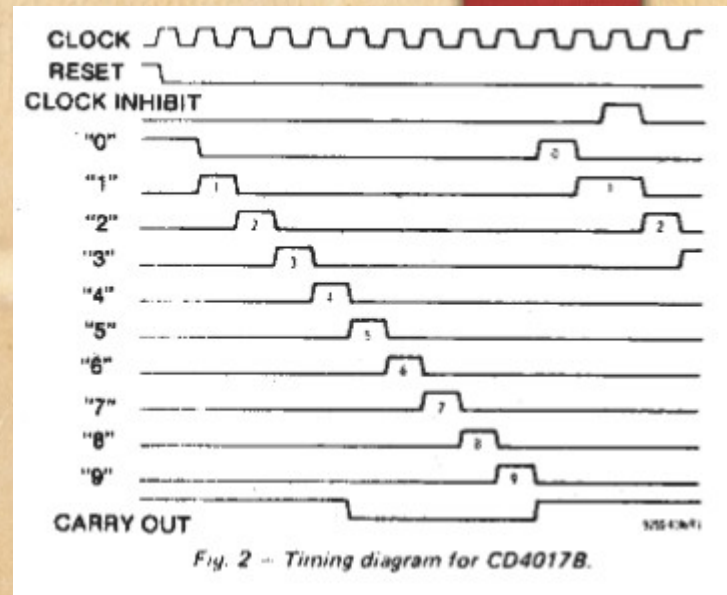
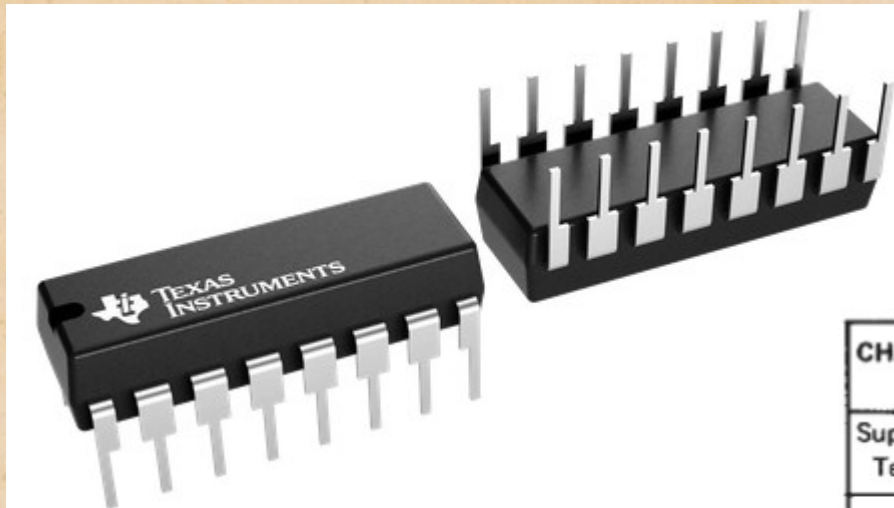


$$r = u/i$$

$$r = (9-1,7)/0.02$$

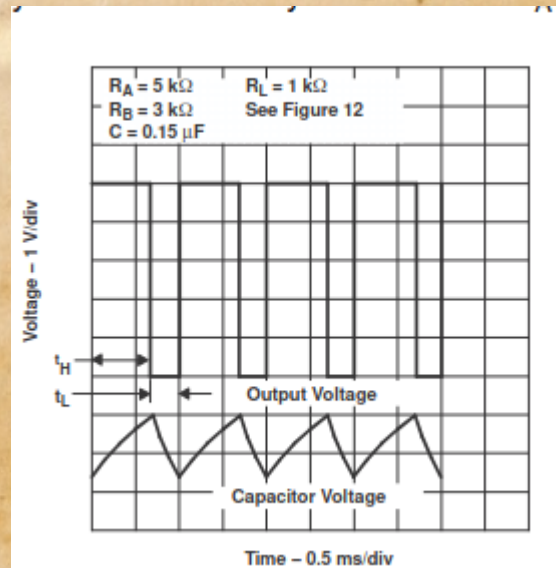
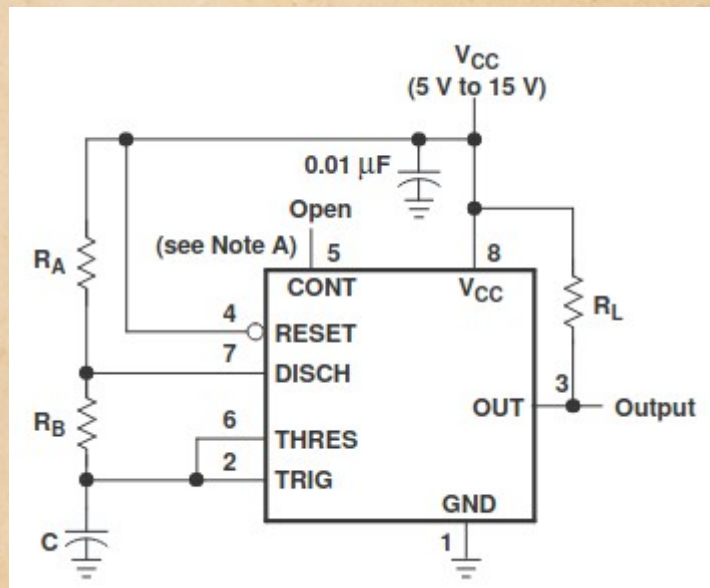
$$r = 365 \text{ Ohms}$$

How to read a Datasheet



CHARACTERISTICS	V _{DD} (V)	LIMITS		UNITS
		Min.	Max.	
Supply-Voltage Range (For T _A = Full Package-Temperature Range)		3	18	V
Clock Input Frequency, f _{CL}	5	—	2.5	MHz
	10	—	5	
	15	—	5.5	
Clock Pulse Width, t _W	5	200	—	ns
	10	90	—	
	15	60	—	
Clock Rise & Fall Time, t _{rCL} , t _{fCL}	5	UNLIMITED*		
	10			
	15			
Clock Inhibit Setup Time, t _s	5	230	—	ns
	10	100	—	
	15	70	—	
Reset Pulse Width, t _{RW}	5	260	—	ns
	10	110	—	
	15	60	—	
Reset Removal Time, t _{rem}	5	400	—	ns
	10	280	—	
	15	150	—	

Creating a nice square wave



$$T = t_H + t_L \cong 0.693 \times (R_A + 2R_B) \times C$$

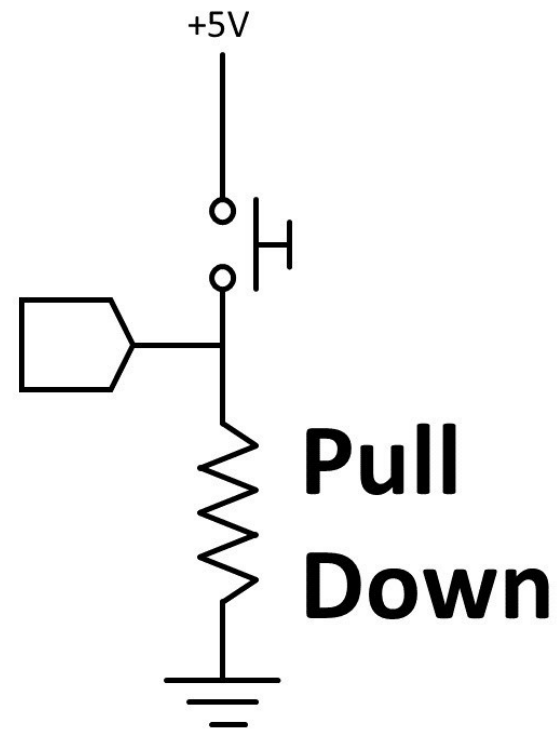
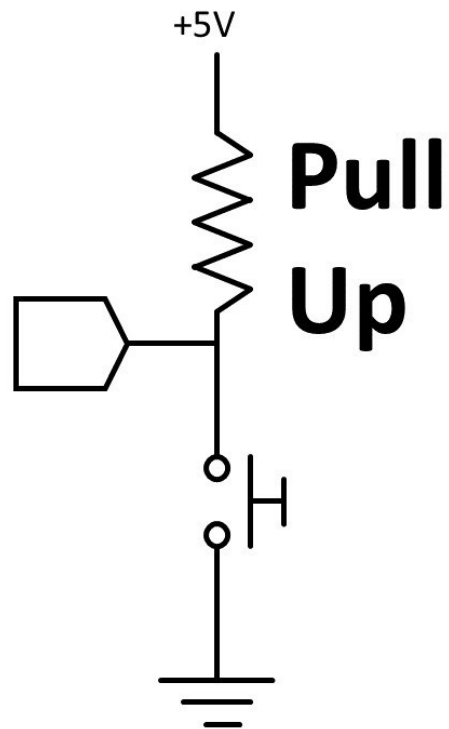
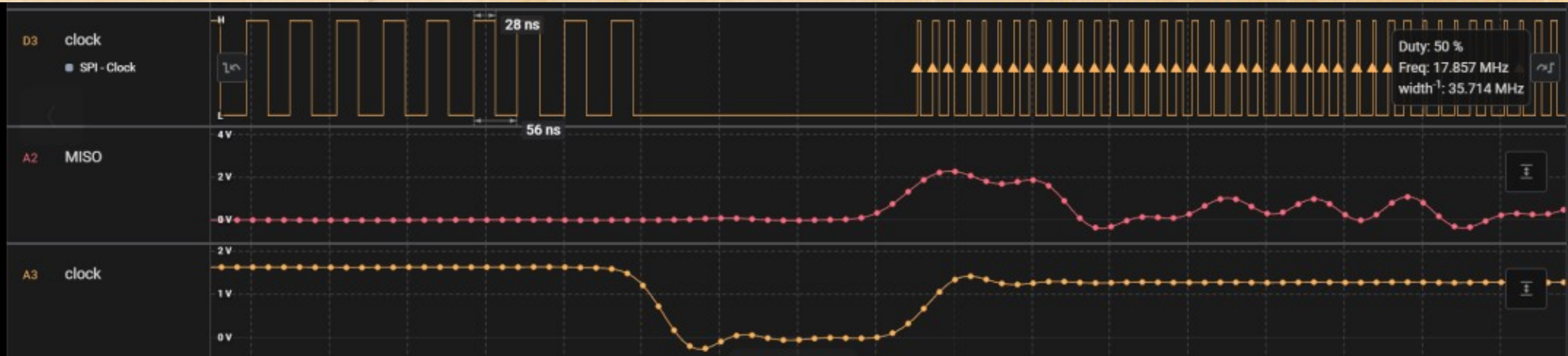
$$f = \frac{1}{T} \cong \frac{1.44}{(R_A + 2R_B) \times C}$$

$$\text{Output driver duty cycle} = \frac{t_L}{T} \cong \frac{R_B}{R_A + 2R_B}$$

$$\text{Output waveform duty cycle} = \frac{t_H}{T} \cong 1 - \frac{R_B}{R_A + 2R_B} = \frac{R_A + R_B}{R_A + 2R_B}$$

- $t_{\text{HIGH}} = 0.693 \cdot (R_1 + R_2) \cdot C$
- $t_{\text{LOW}} = 0.693 \cdot R_2 \cdot C$

Important warning



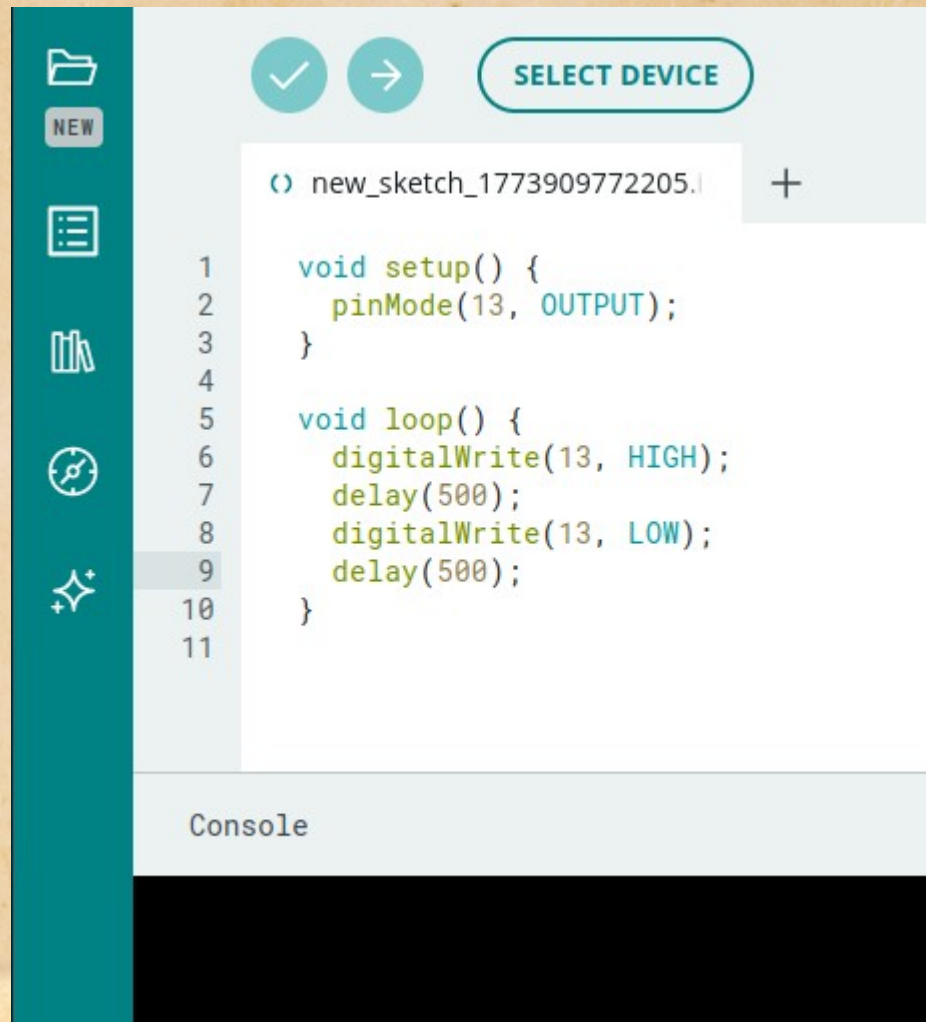


Hello Word

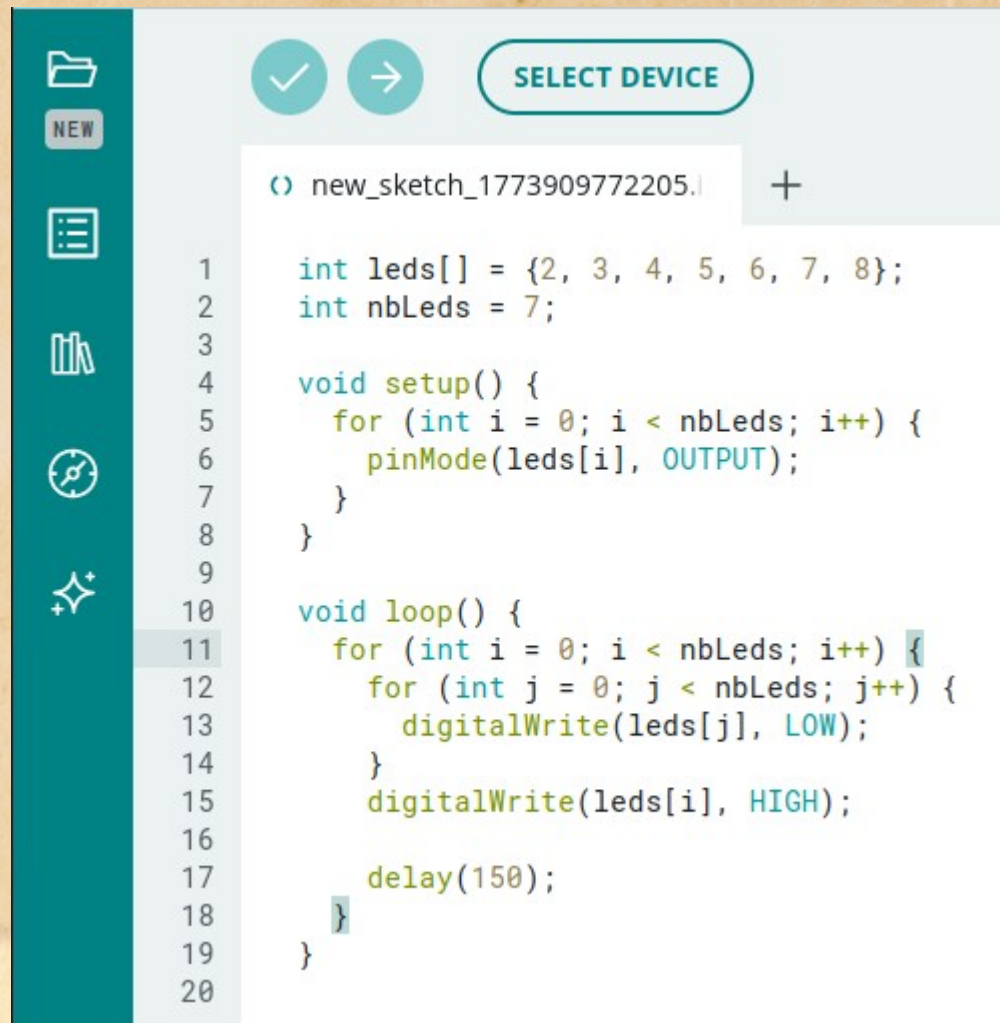
A bit of hands-on stuff



Hello world



Hello world +



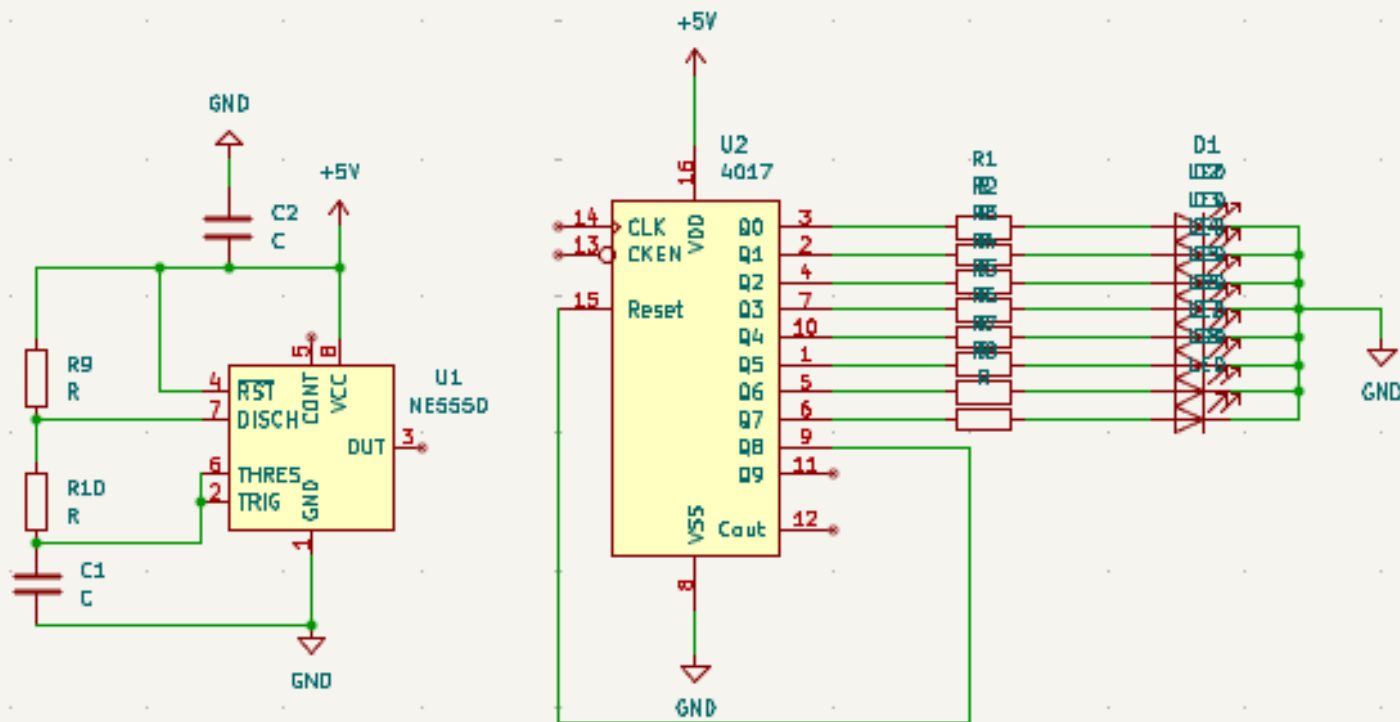
The image shows the Arduino IDE interface. On the left is a dark teal sidebar with icons for File, Edit, View, Tools, and Help. The main workspace is light blue and contains a C++ sketch. At the top of the workspace are a checkmark icon, a right arrow icon, and a 'SELECT DEVICE' button. Below these is a tab labeled 'new_sketch_1773909772205.' with a plus icon to its right. The sketch code is as follows:

```
1  int leds[] = {2, 3, 4, 5, 6, 7, 8};
2  int nbLeds = 7;
3
4  void setup() {
5      for (int i = 0; i < nbLeds; i++) {
6          pinMode(leds[i], OUTPUT);
7      }
8  }
9
10 void loop() {
11     for (int i = 0; i < nbLeds; i++) {
12         for (int j = 0; j < nbLeds; j++) {
13             digitalWrite(leds[j], LOW);
14         }
15         digitalWrite(leds[i], HIGH);
16
17         delay(150);
18     }
19 }
20
```

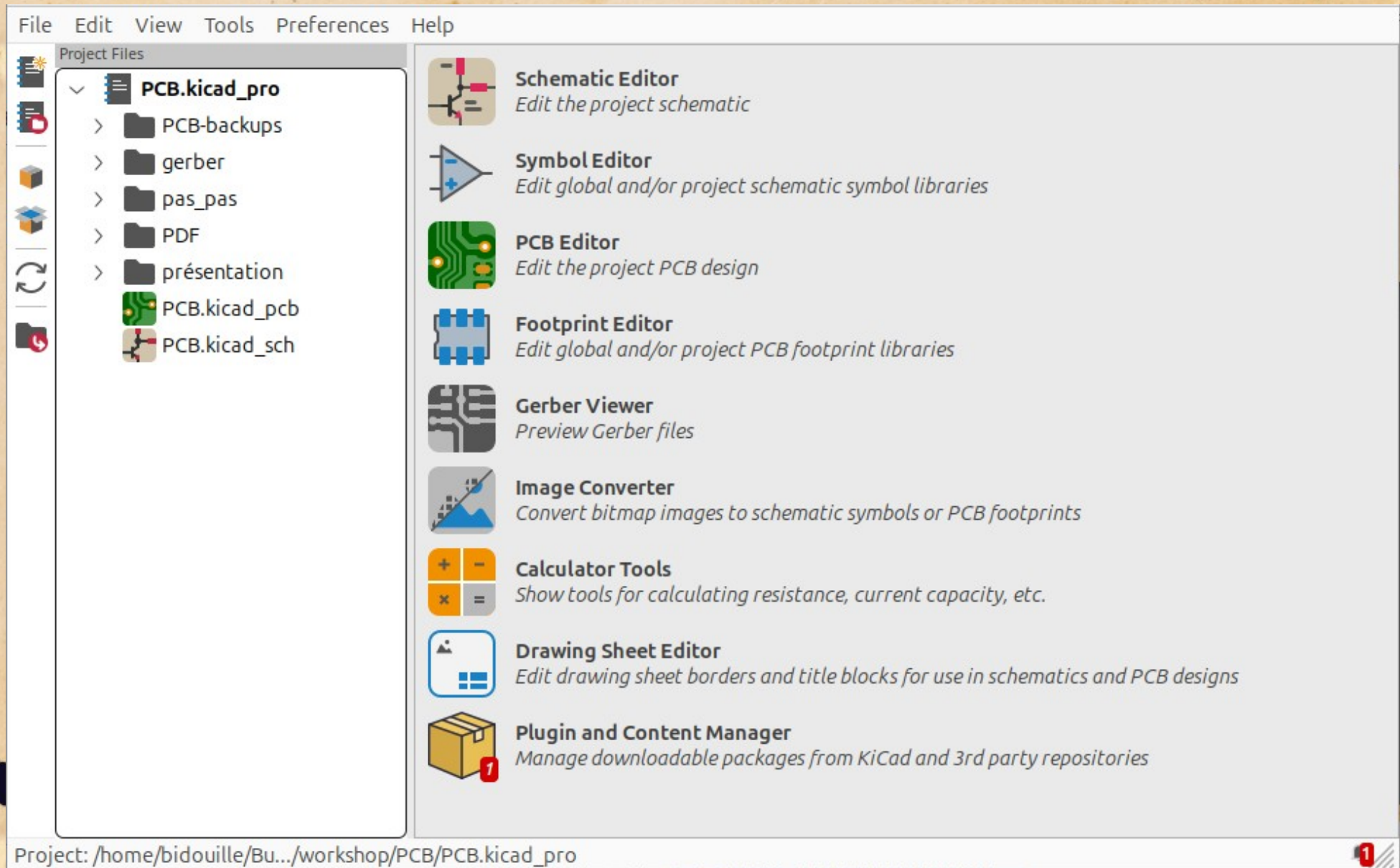
What do we need ?

- A press simulator → a NE555 timer
- A circuit that shifts its output on each press → a CD4017 counter
- LEDs for visual feedback
- A few resistors to keep our LEDs from burning out
- A few resistors and capacitors to adjust the speed (and without any reprogramming!)

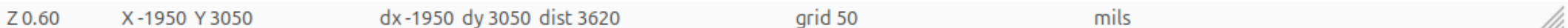
Let's build our hello world +



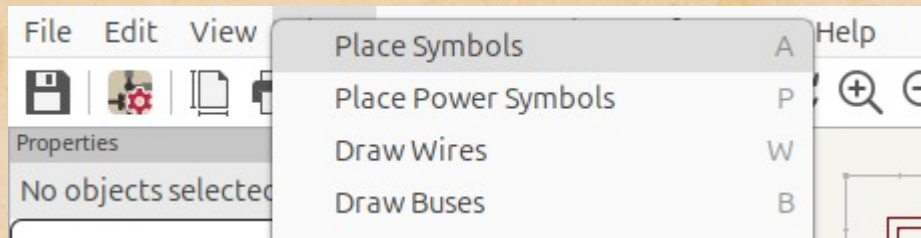
Step by step



ic



Step by step – building your schematic



Q ne555

Item	Description
Timer	Assorted timer dev
NE555D	Precision Timers, 5
NE555P	Precision Timers, 5
NA555D	Precision Timers, 5
NA555P	Precision Timers, 5
SA555D	Precision Timers, 5
SA555P	Precision Timers, 5
SE555D	Precision Timers, 5
SE555P	Precision Timers, 5

NE555D
Precision Timers, 555 compatible, SOIC-8
Keywords: single timer 555

Reference U?

Footprint Package_SO:SOIC-8_3.9x4.9mm_P1.27mm

[Default] Package_SO:SOIC-8_3.9x4.9mm_P1.27mm

[Défaut] Package_DIP:DIP-8_W7.62mm

[Défaut] Package_DIP:DIP-8_W7.62mm

Package_DIP:DIP-8-16_W7.62mm

Package_DIP:DIP-8-16_W7.62mm_Socket

Package_DIP:DIP-8-16_W7.62mm_Socket_LongPads

Package_DIP:DIP-8_W7.62mm

Package_DIP:DIP-8_W7.62mm_LongPads

Package_DIP:DIP-8_W7.62mm_SMDSocket_SmallPads

Package_DIP:DIP-8_W7.62mm_Socket

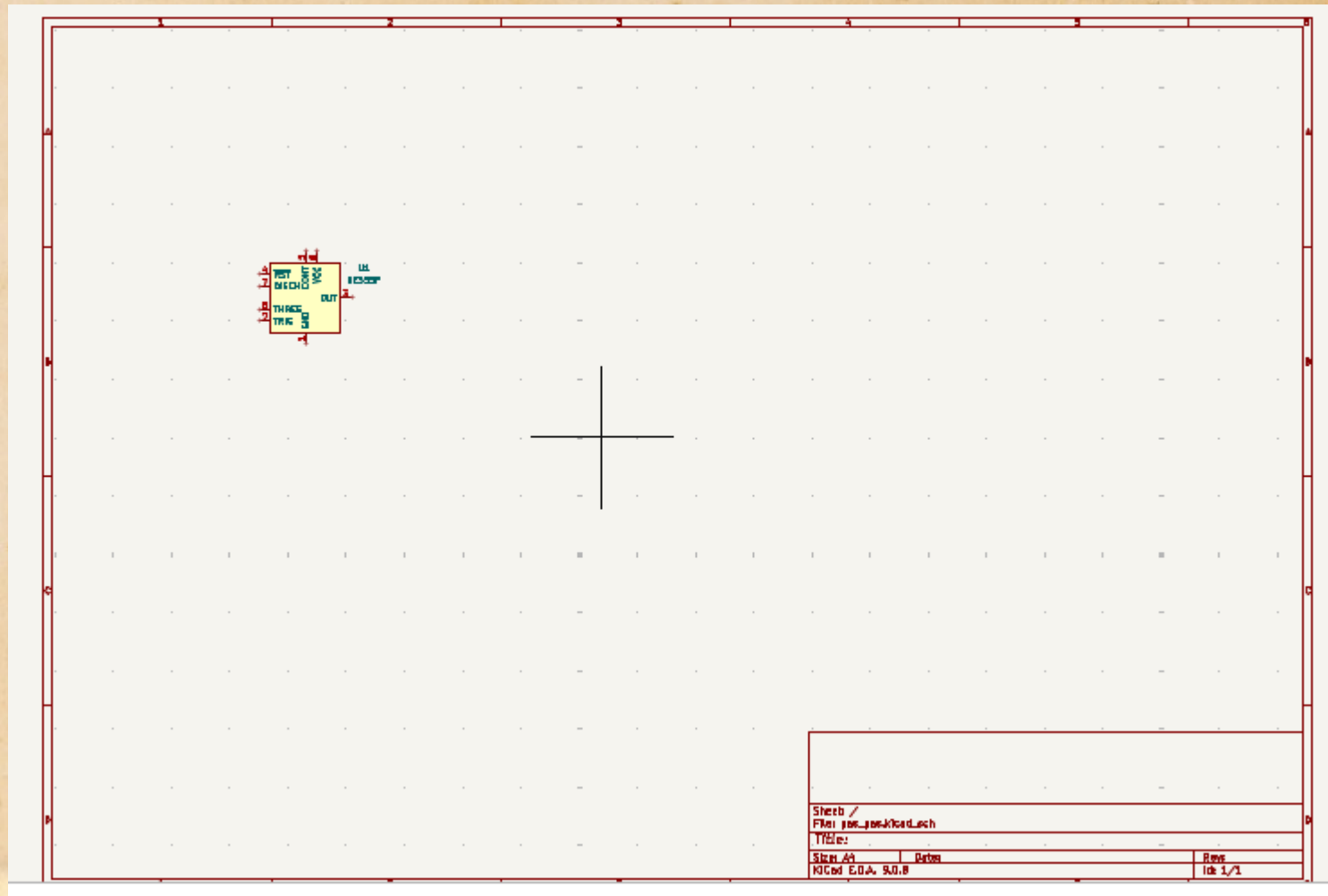
Package_DIP:DIP-8_W7.62mm_Socket_LongPads

DIP-8_W7.62mm

REF**

DIP-8_W7.62mm

Step by step – building your schematic



Step by step – building your schematic

Choisir Symbole (22380 items chargés)

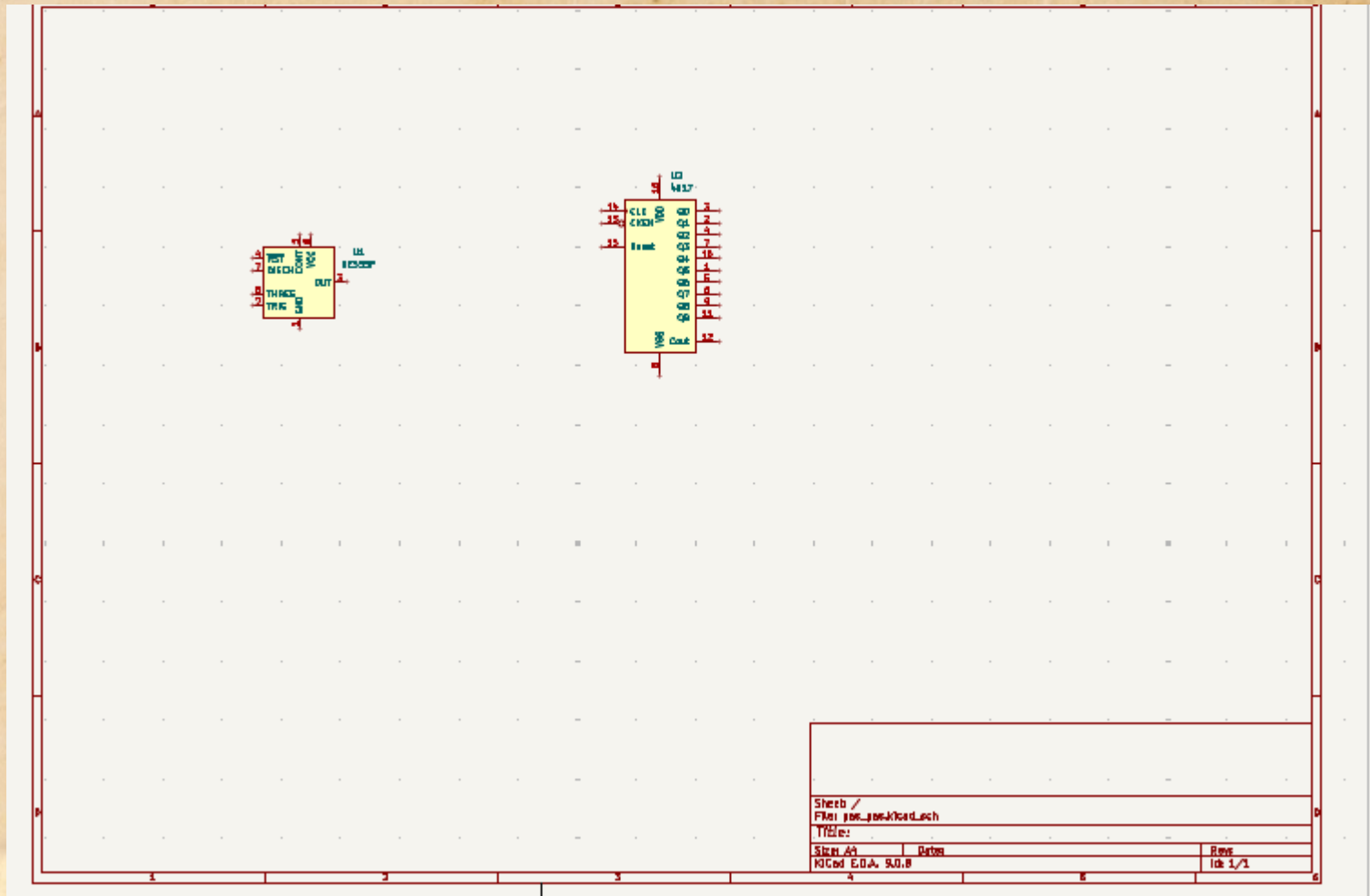
Q CD4017

Élément	Description
4xxx	4xxx series symbol
4017	Johnson Counter (8)
4022	Johnson Counter (8)

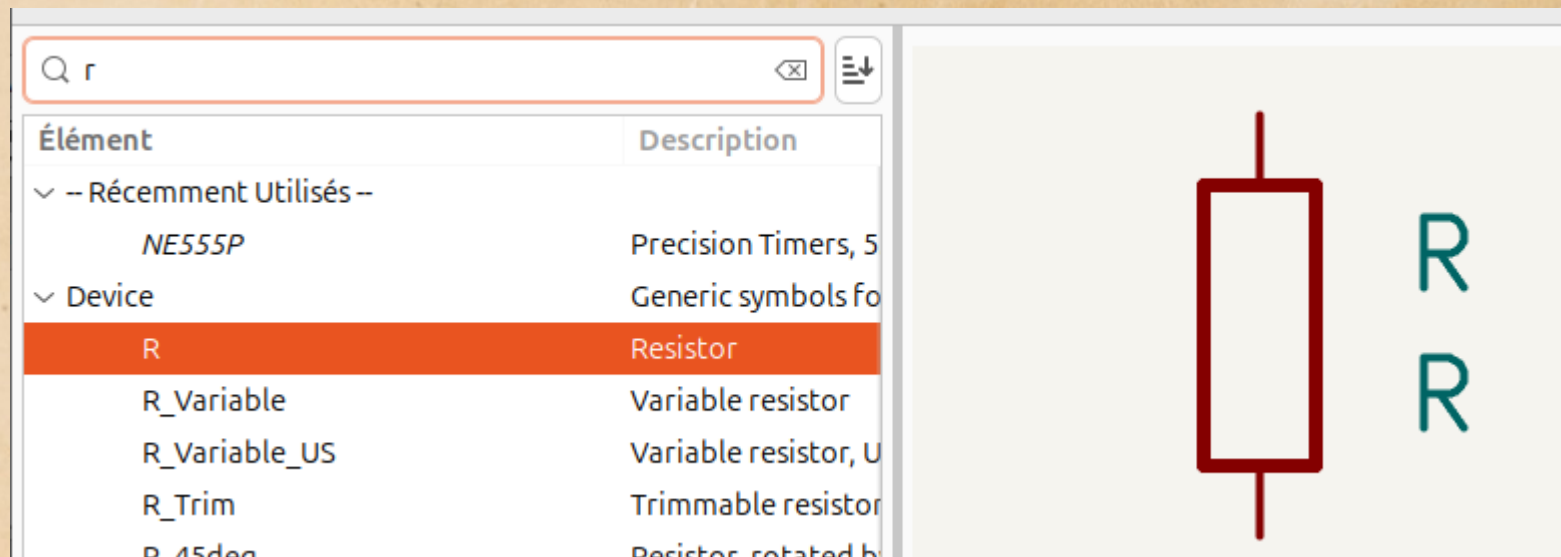
4017

Pas d'empreinte par défaut

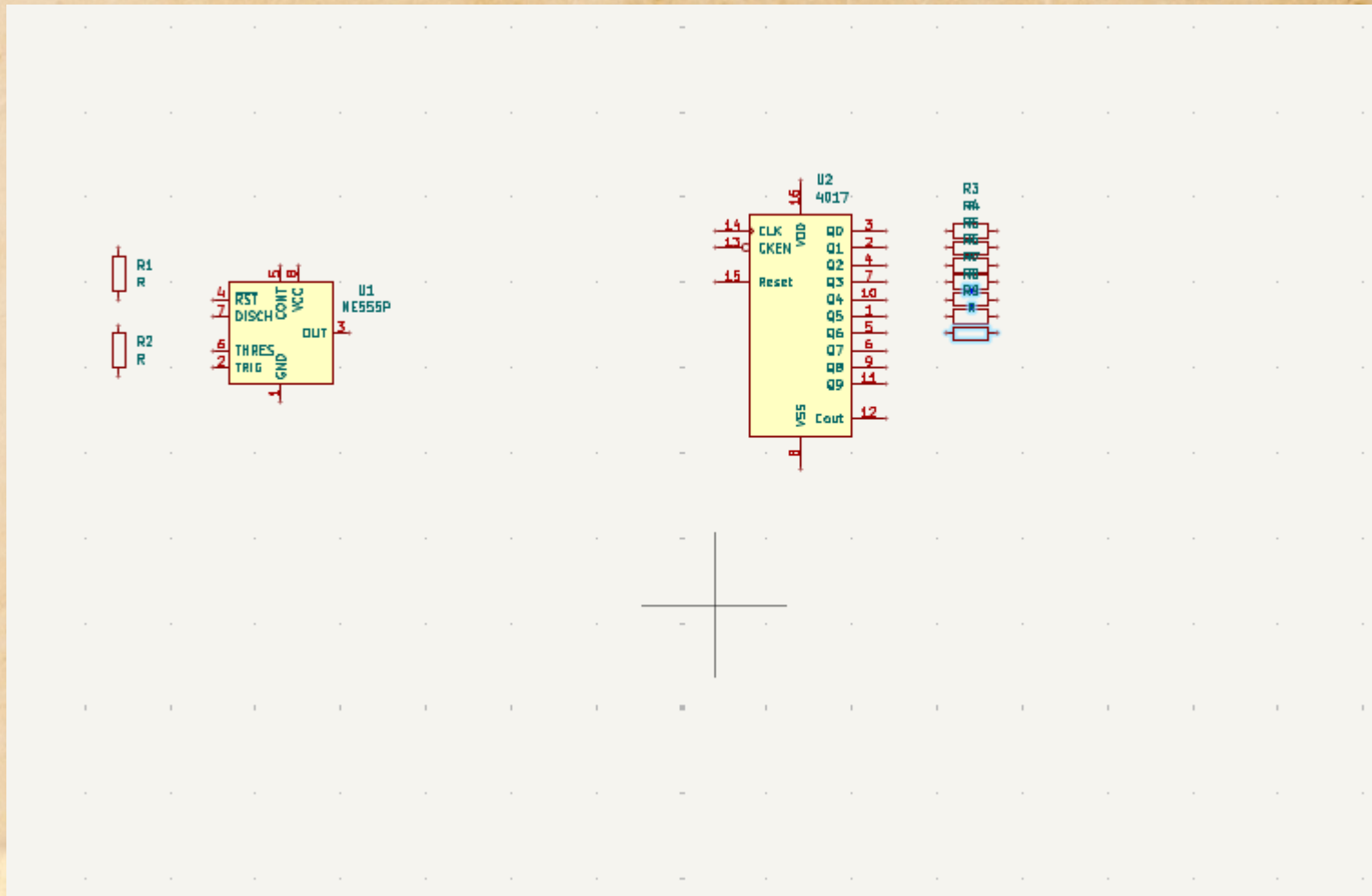
Step by step – building your schematic



Step by step – building your schematic



Step by step – building your schematic



Step by step – building your schematic

Choisir Symbole (22589 items chargés)

Q led

Élément	Description
HDMI_C_1.4	HDMI 1.4+ type C c
HDMI_D_1.4	HDMI 1.4+ type D c
Device	Generic symbols fo
LED	Light emitting diode
LED_ABGR	RGB LED, anode/bl
LED_ABRG	RGB LED, anode/bl
LED_AGBR	RGB LED, anode/gr
LED_AGRB	RGB LED, anode/gr
LED_ARBG	RGB LED, anode/re
LED_ARGB	RGB LED, anode/re
LED_BAGR	RGB LED, blue/anod
LED_BARG	RGB LED, blue/anod
LED_BGAR	RGB LED, blue/gree

LED
Light emitting diode

D
LED



Pas d'empreinte par défaut

ic



Step by step – building your schematic

Choisir Symbole (22591 items chargés)

Q c

Élément	Description
NE555P	Precision Timers, 5
Device	Generic symbols fo
C	Unpolarized capac
C_Small_US	capacitor, small US
C_US	capacitor, US symb
C_45deg	Unpolarized capac
C_Polarized	Polarized capacito
C_Polarized_Series_2C	Set of two polarize
C_Polarized_Small	Polarized capacito
C_Polarized_Small_Series_2C	Set of two polarize
C_Polarized_Small_US	Polarized capacito
C_Polarized_Small_US_Series_2C	Polarized capacito
C_Polarized_US	Polarized capacito

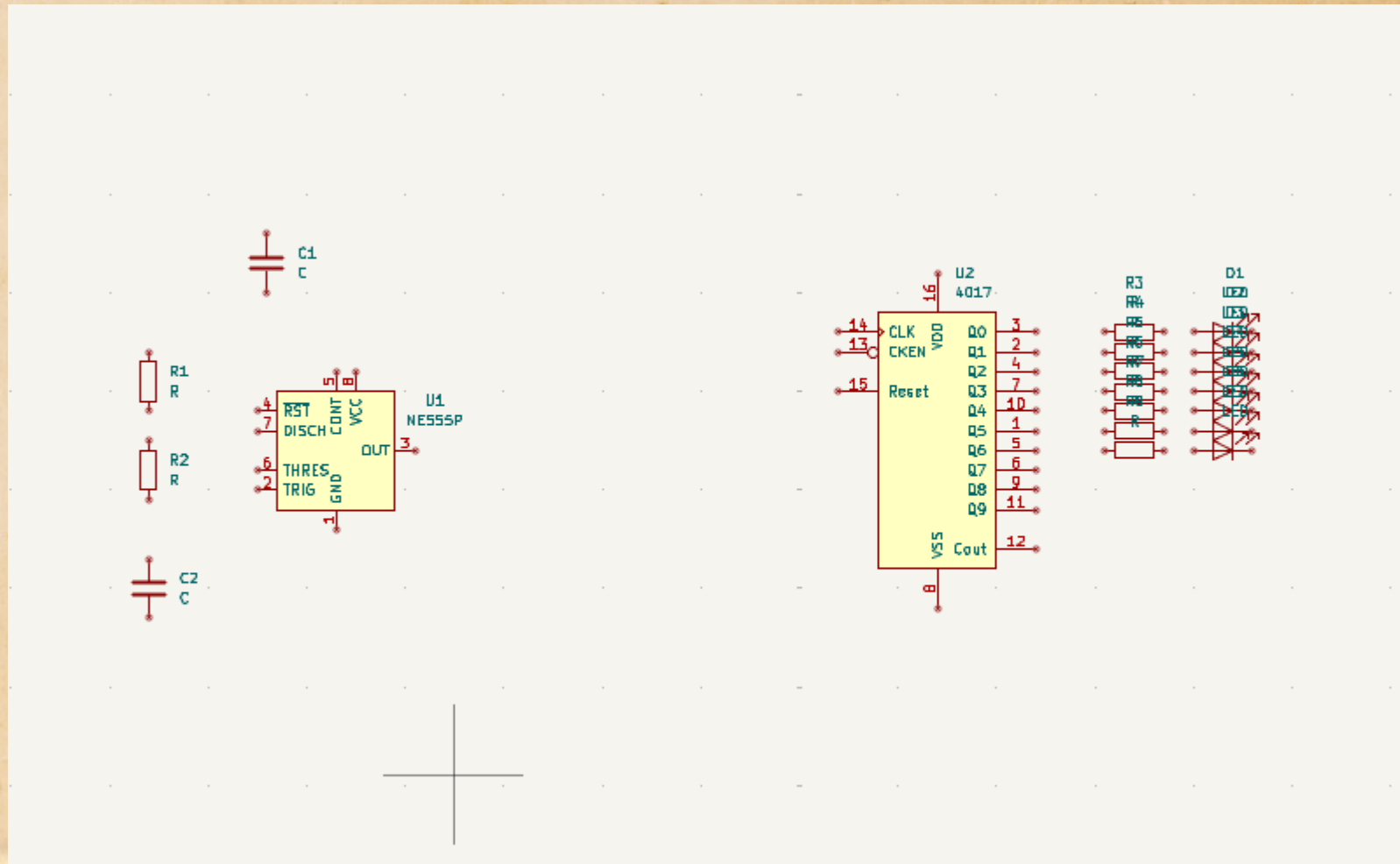
C

Unpolarized capacitor

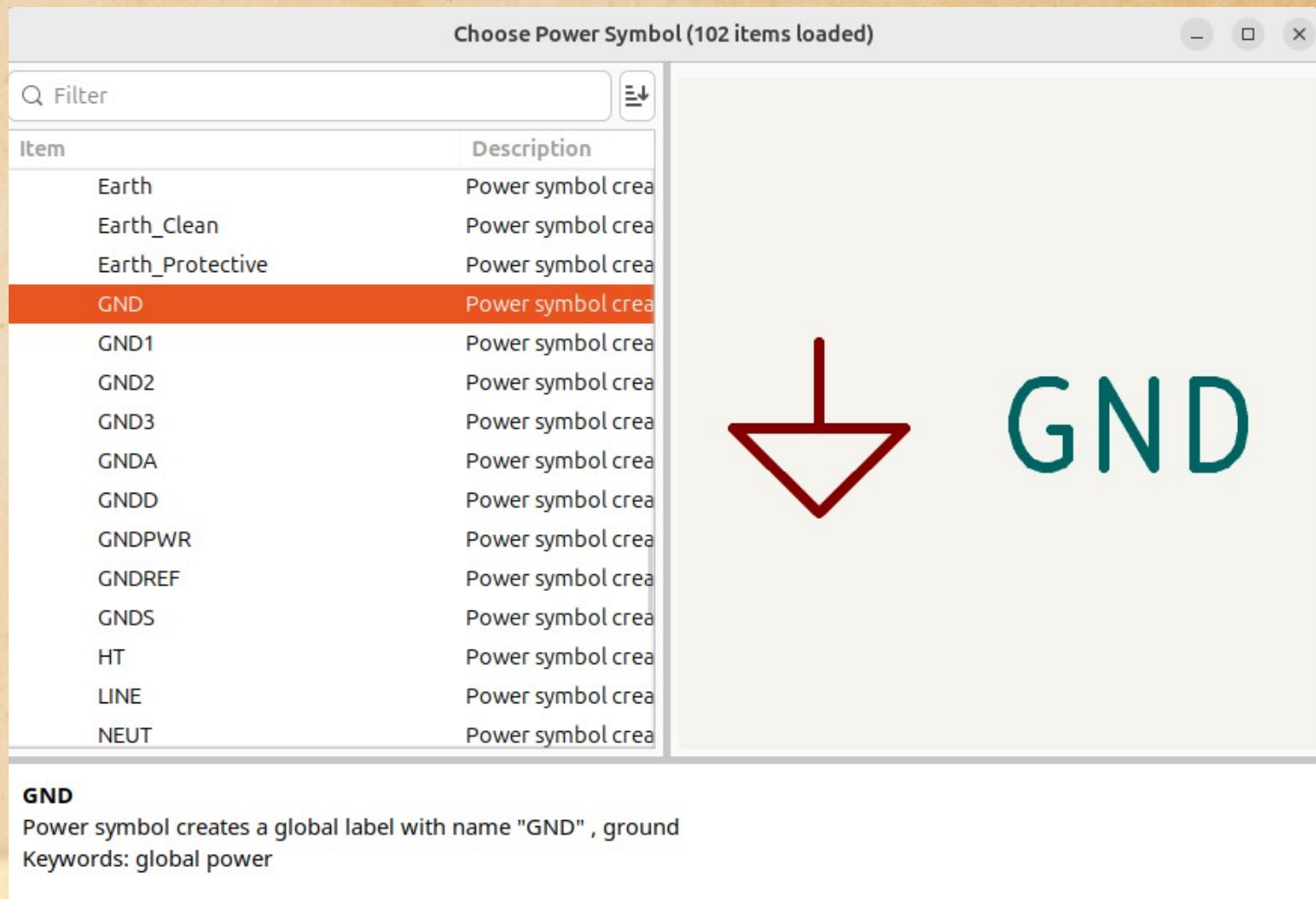
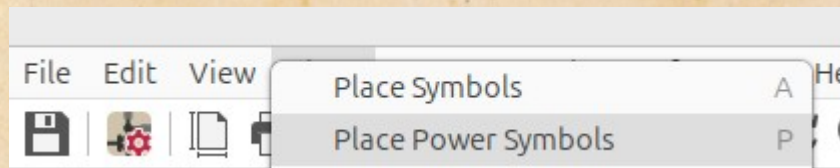


Pas d'empreinte par défaut

Step by step – building your schematic



Step by step – building your schematic



Step by step – building your schematic

Choose Power Symbol (102 items loaded)

Q Filter

Item	Description
+5C	Power symbol crea
+5F	Power symbol crea
+5P	Power symbol crea
+5V	Power symbol crea
+5VA	Power symbol crea
+5VD	Power symbol crea
+5VL	Power symbol crea
+5VP	Power symbol crea
+6V	Power symbol crea
+7.5V	Power symbol crea
+8V	Power symbol crea
+9V	Power symbol crea
+9VA	Power symbol crea
+10V	Power symbol crea
+12C	Power symbol crea



+5V

+5V

Power symbol creates a global label with name "+5V"

Keywords: global power

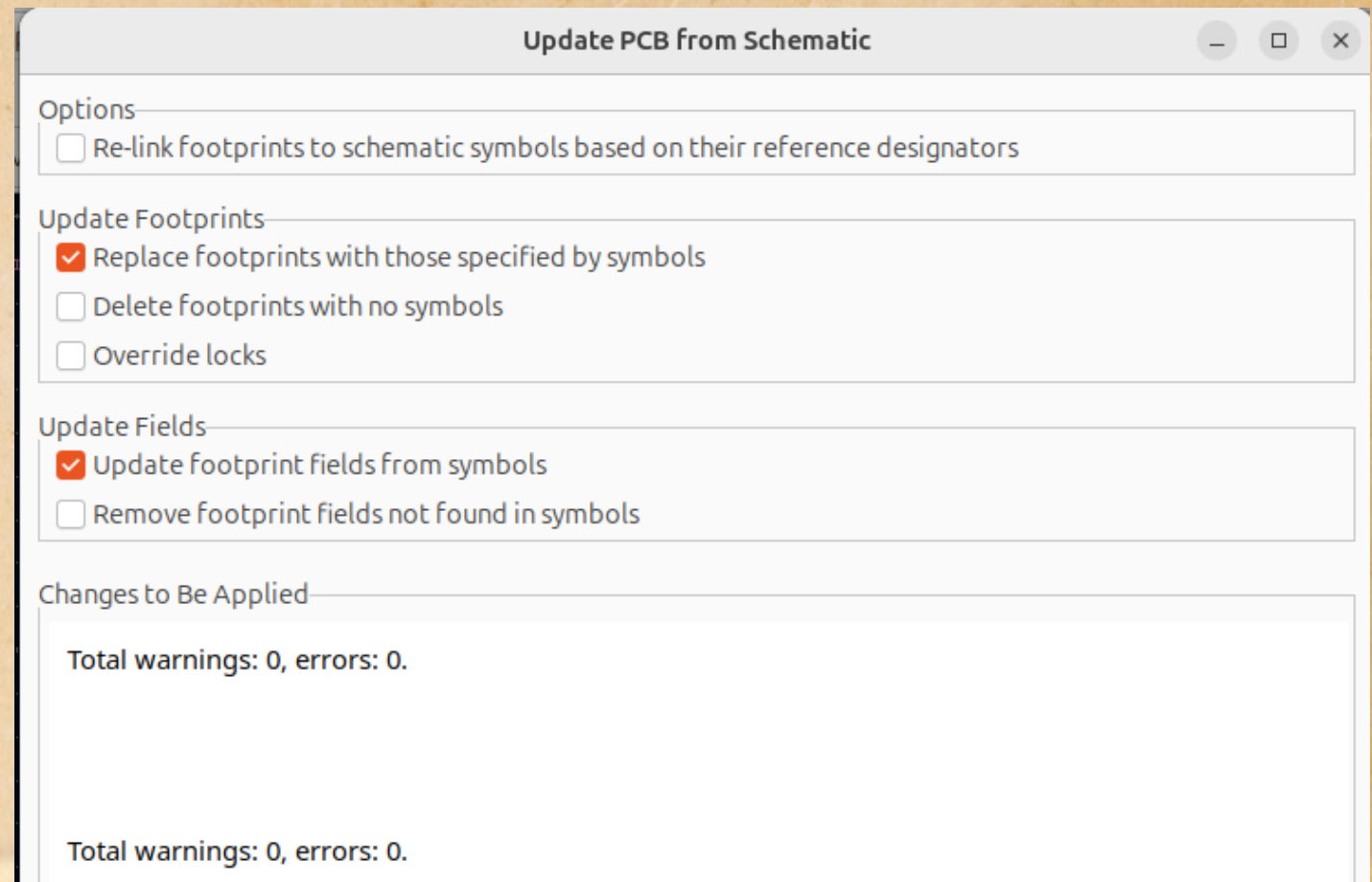
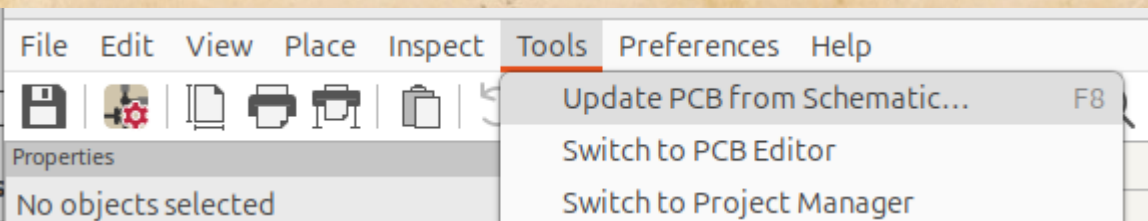
ic



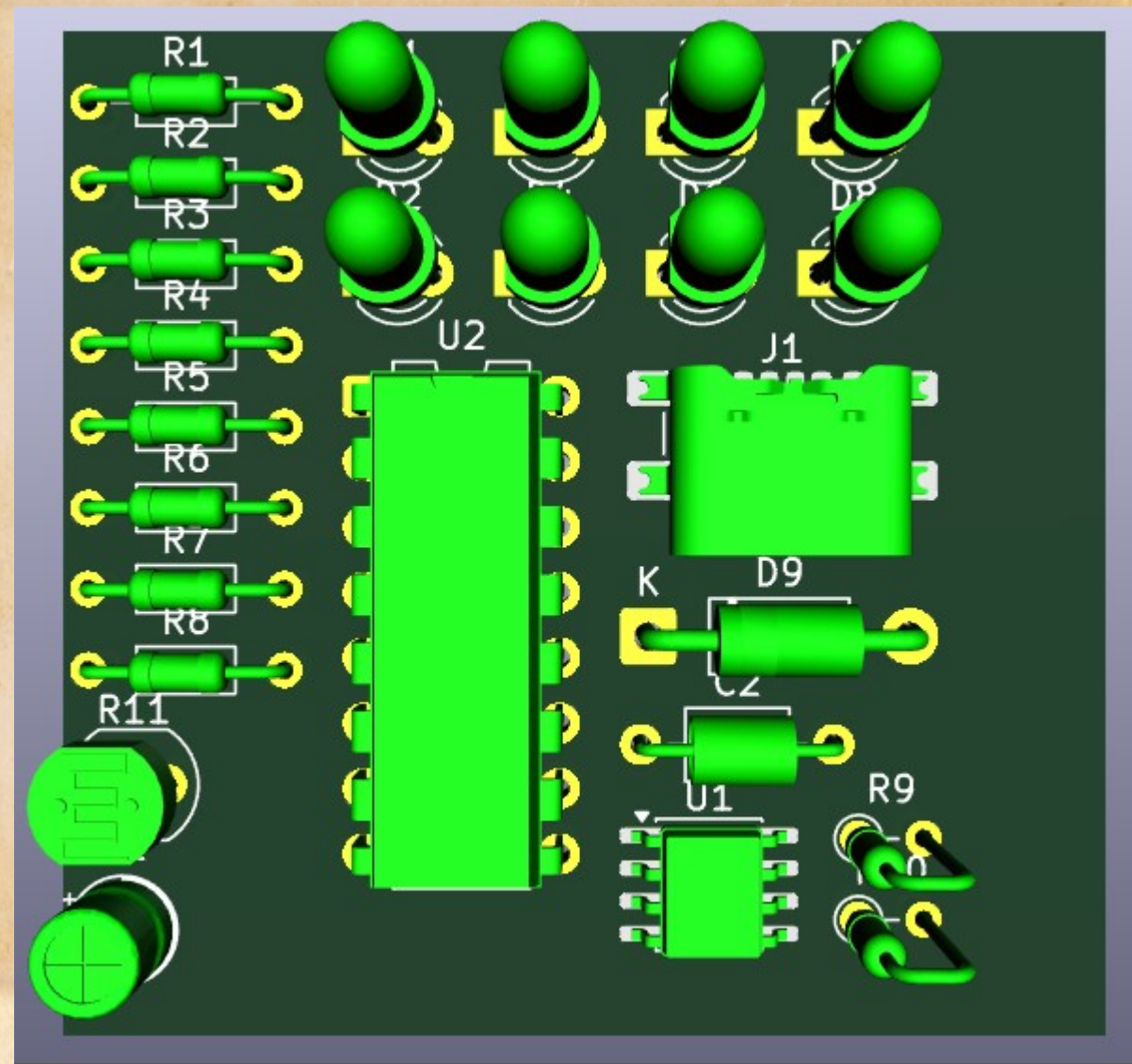
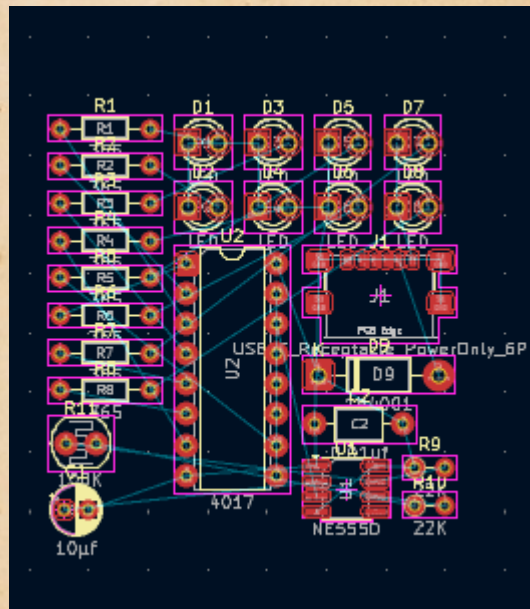
ic

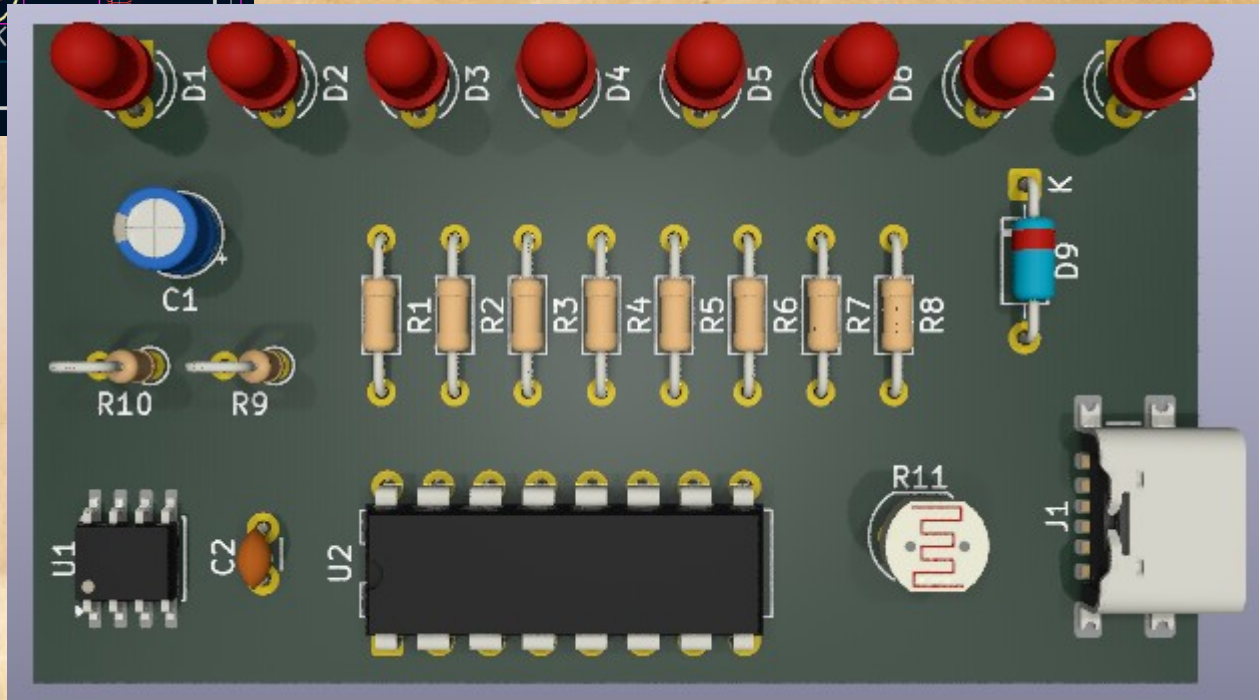


Step by step – building your schematic

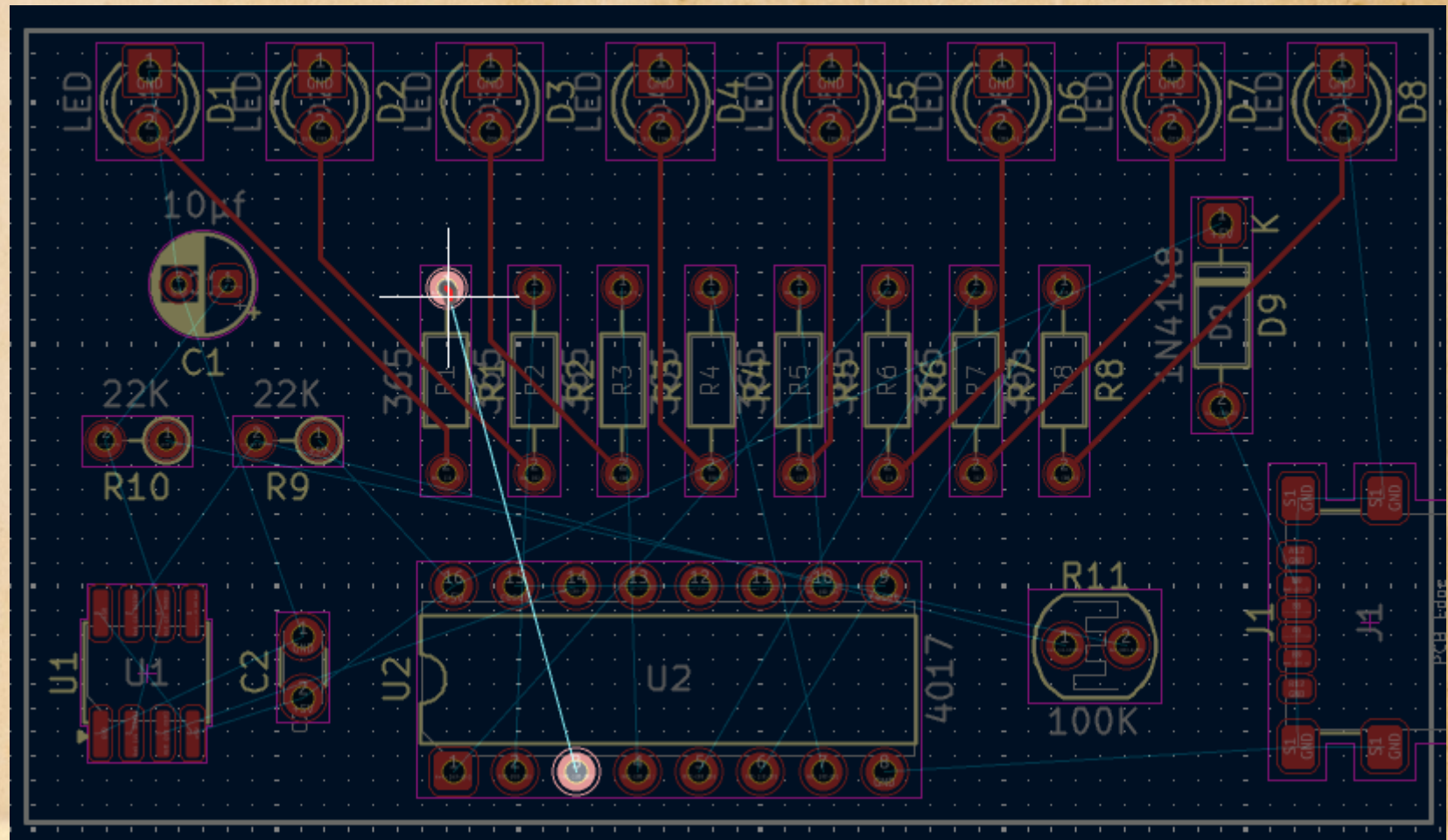


Step by step – building your PCB





Step by step – routing



Step by step – autorouting

Dépôt (100)Installé (0)En attente (0)

KiCad official repository

Plugins (59)Plugins de fabrication (8)Librairies (16)Thèmes de couleurs (17)



Freerouting
Freerouting KiCad integration

Installer



Transform It
Batch resize, scale, mirror graphics, tracks, zones, footprints and other items in the PCB editor.

Installer



KiVar
PCB Assembly Variants for KiCad

Installer

Freerouting

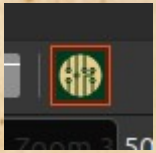
This is the official KiCad integration for Freerouting, an advanced auto

It needs Java JRE 21, download it from <https://adoptium.net/temurin/re>

Metadonnées

- Identificateur de paquet: app.freerouting.kicad-plugin
- Licence: GPL-3.0
- Auteur: Andras Fuchs
 - email: info@freerouting.app
 - web: <https://www.freerouting.app/>
- Mainteneur: Andras Fuchs
 - email: info@freerouting.app

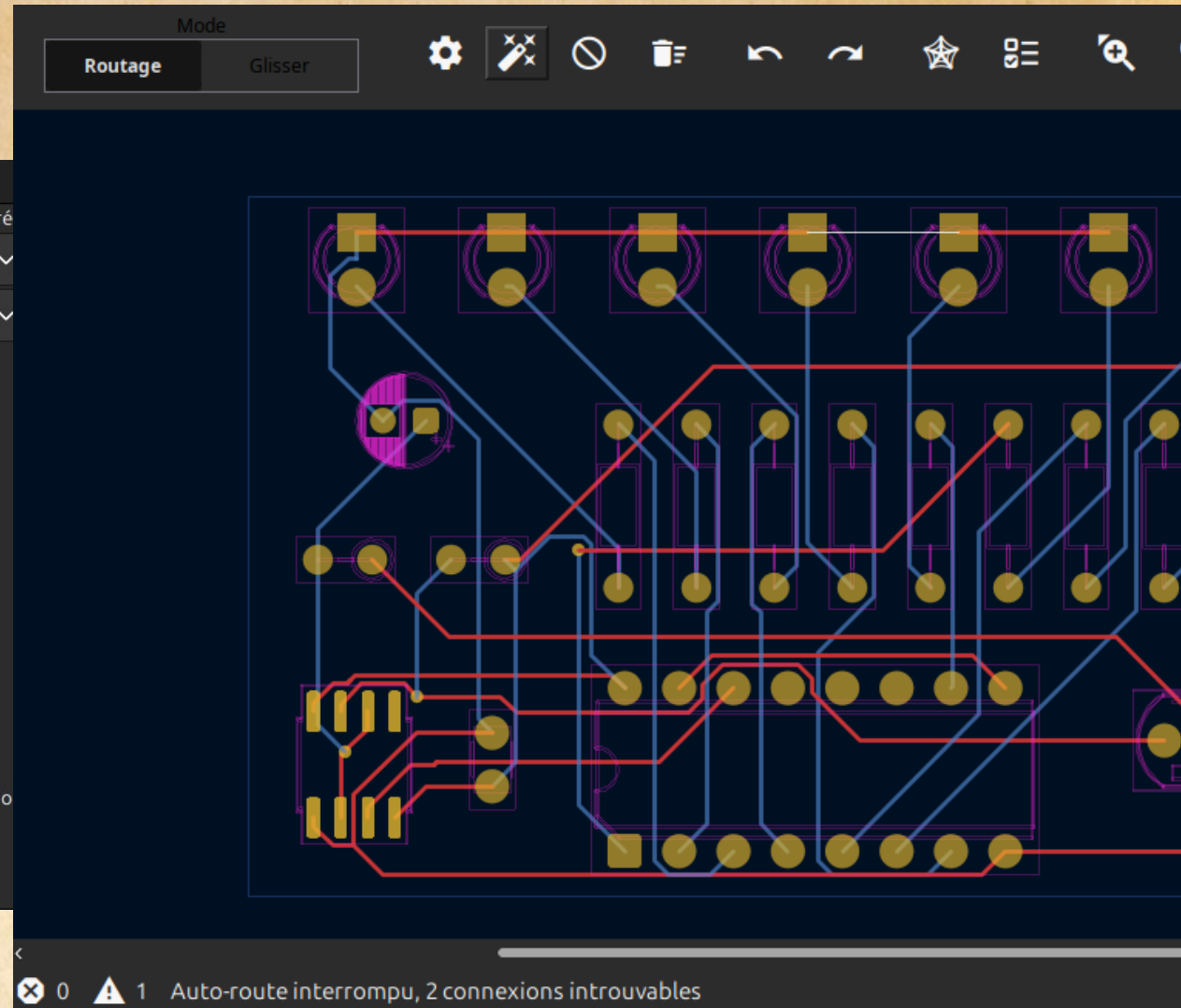
Step by step – autorouting



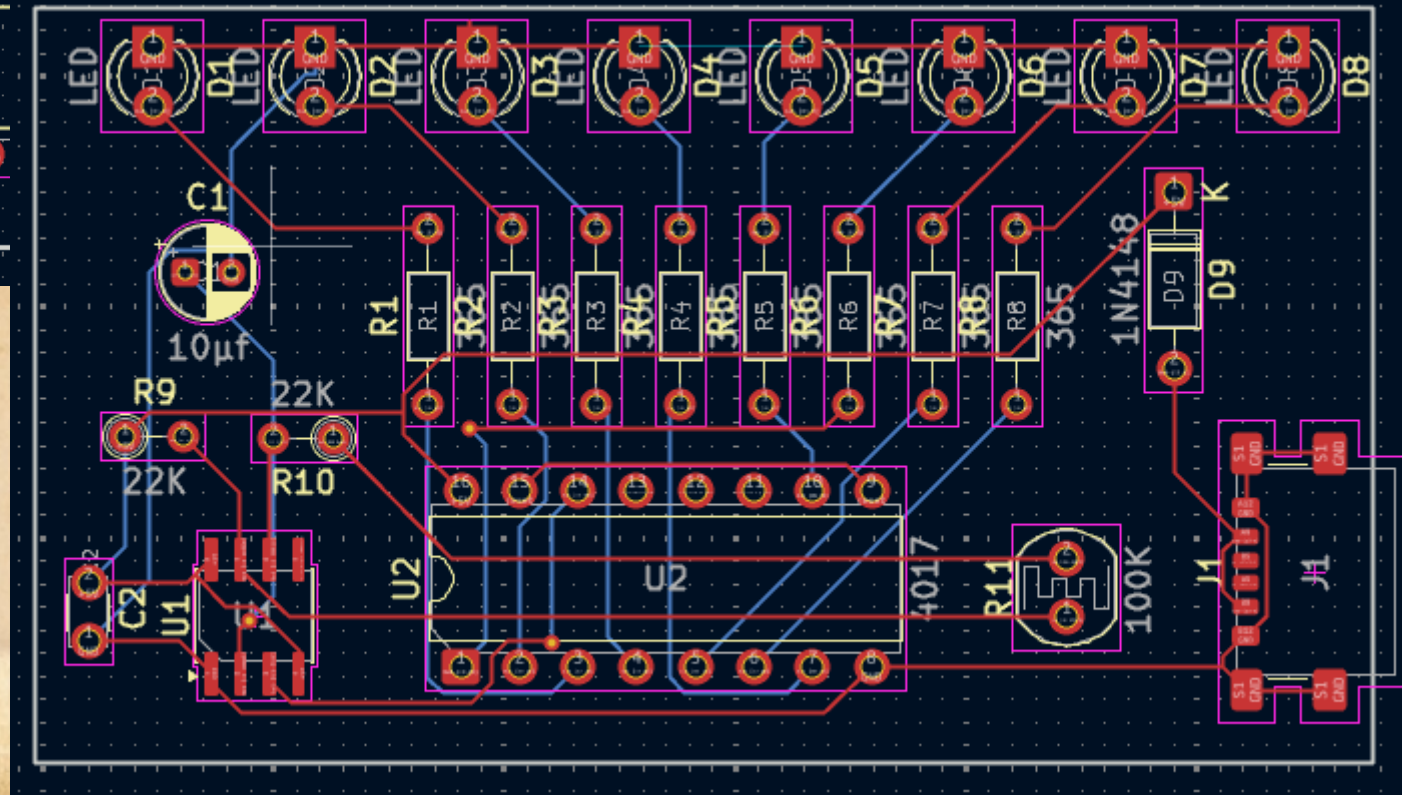
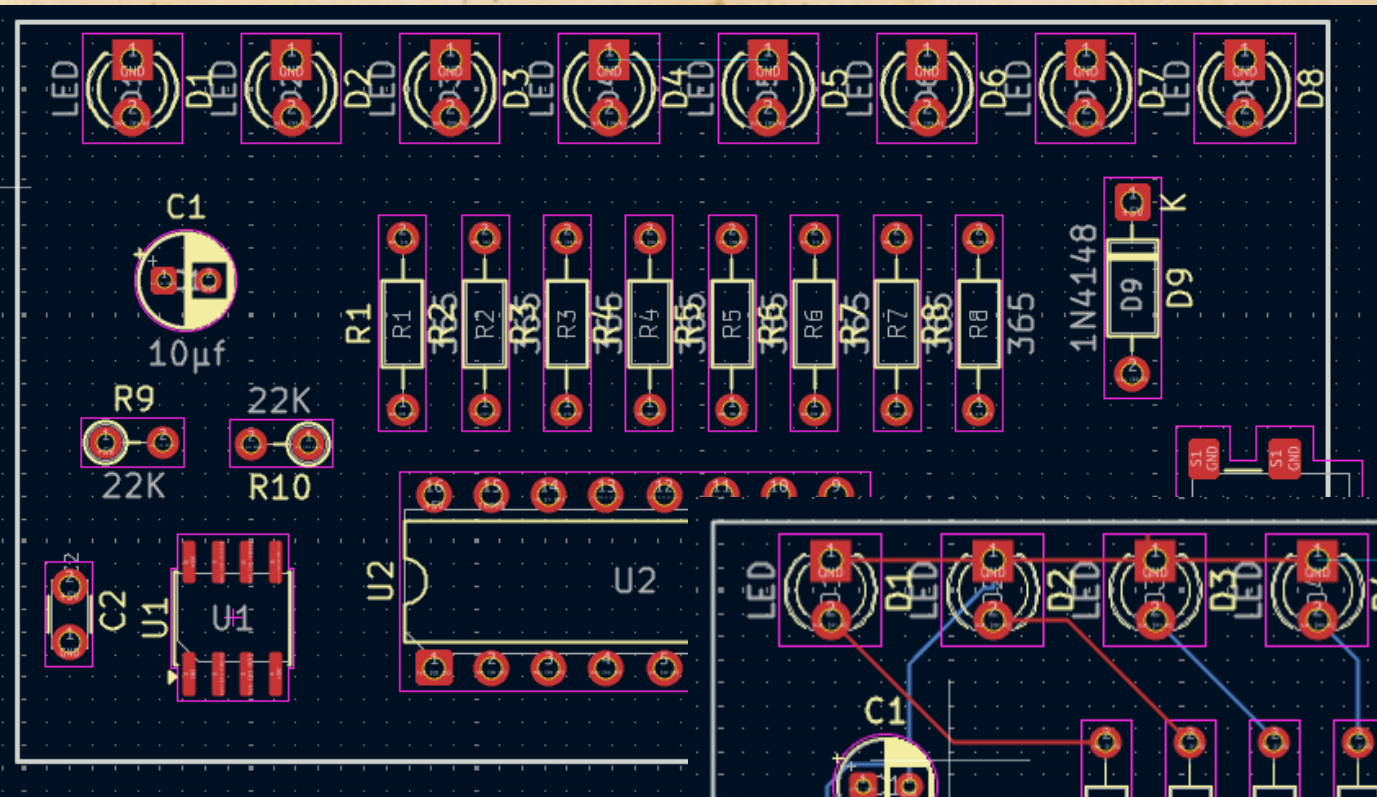
Paramètre d'autoroute

Couche :	Actif :	Direction préférée :
F.Cu	☒	horizontal
B.Cu	☒	vertical
Vias autorisés :	☒	
Passe :	☐ Fanout	
	☒ Autoroute	
	☒ Postroute	
Via les coûts :	50	
Powerplane via les coûts :	5	
Commencez à passer :	1	
Coûts de démarrage de l'opération :	100	
Vitesse :	rapide	▼
Tracer les coûts sur la couche :	Dans la direction préférée :	Contre la direction :
F.Cu	1,0	4,3
B.Cu	1,0	3,1

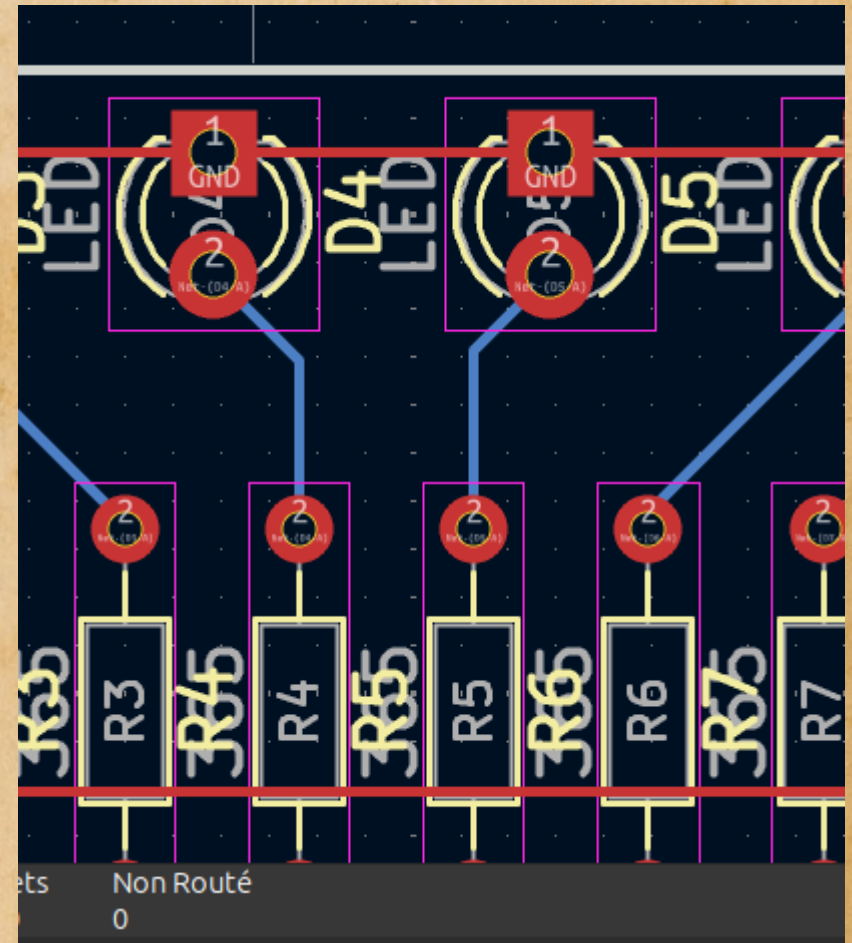
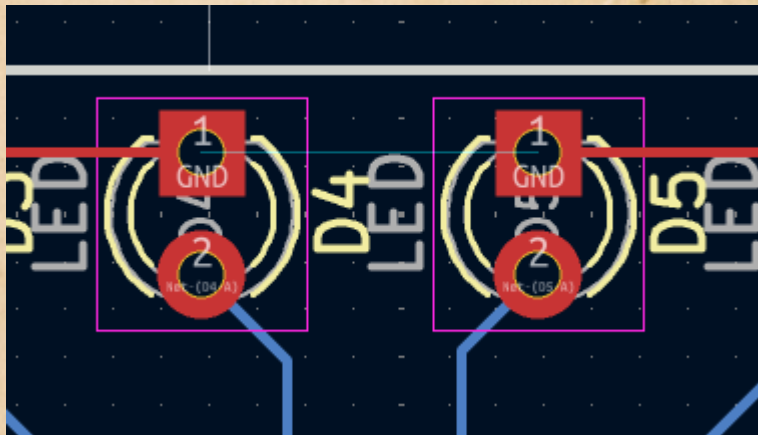
(note: you need to press Enter to apply the new values)



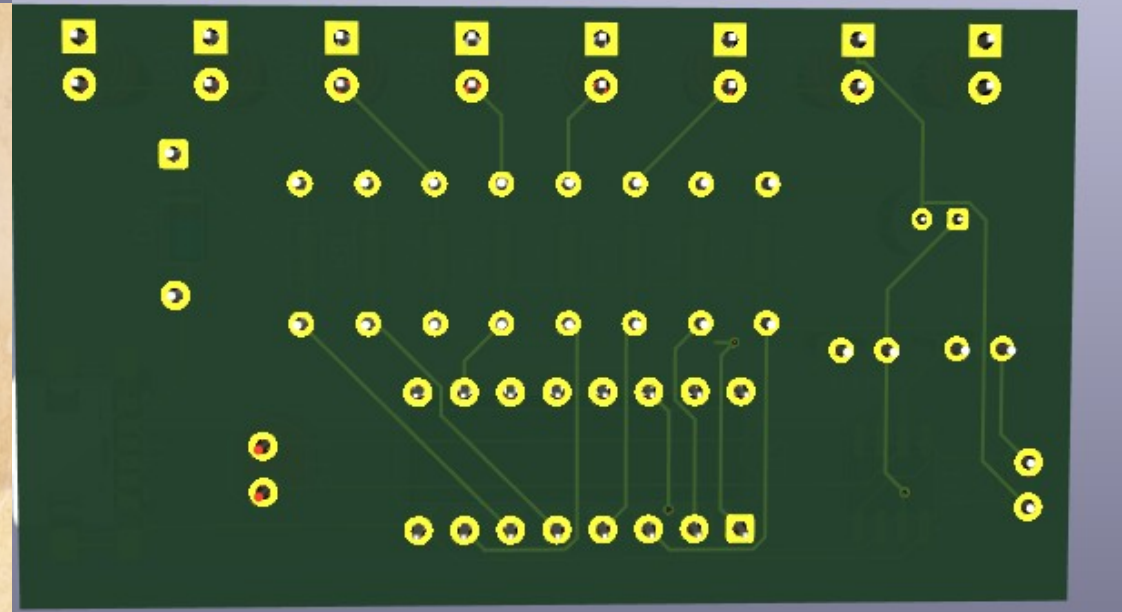
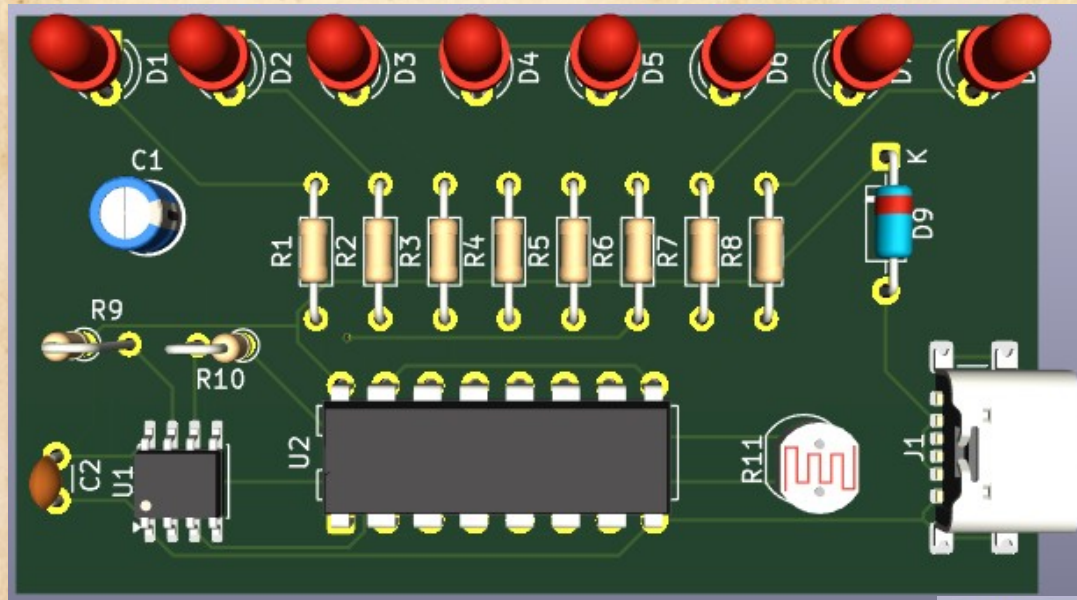
Step by step – autorouting



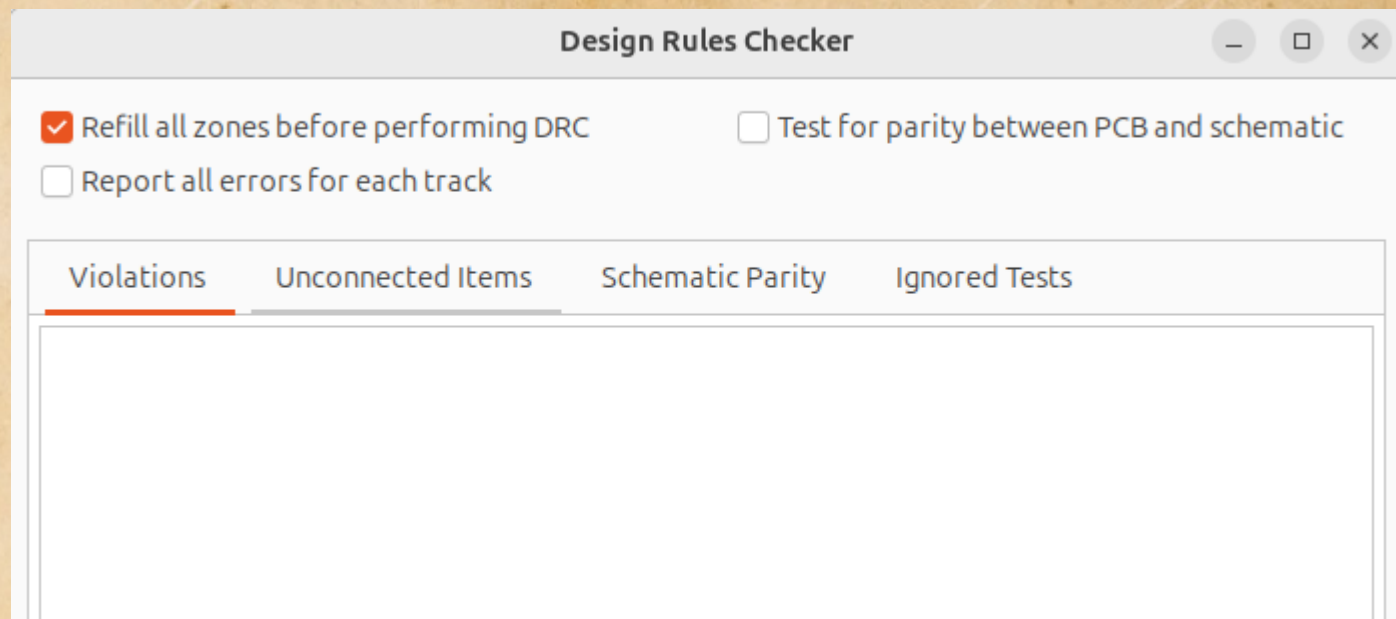
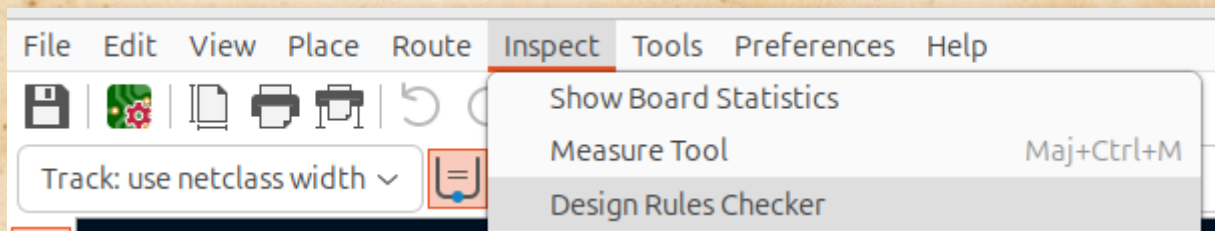
Step by step – autorouting



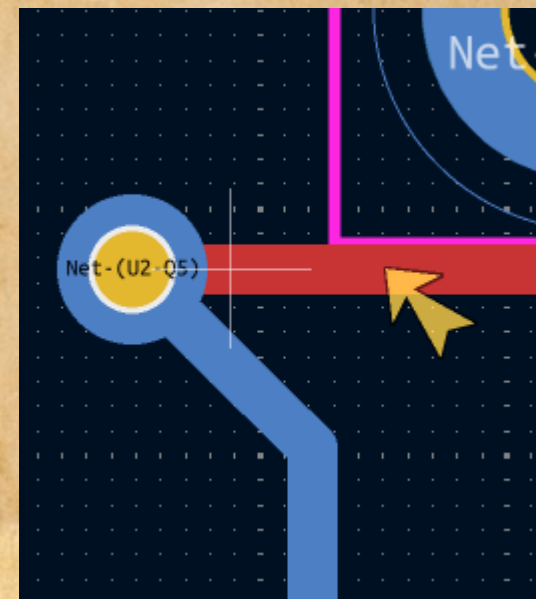
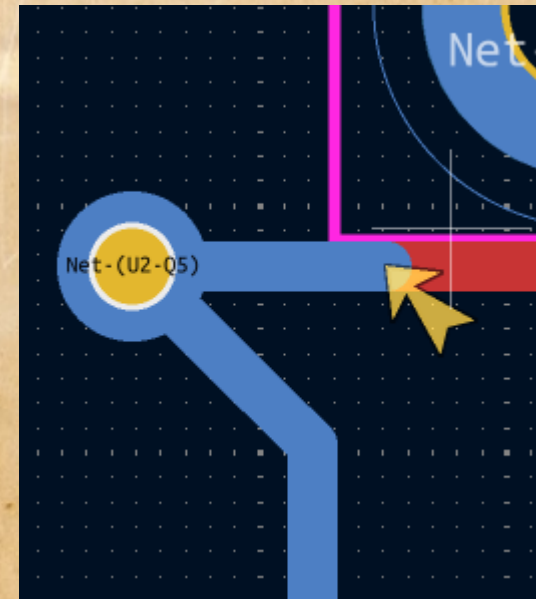
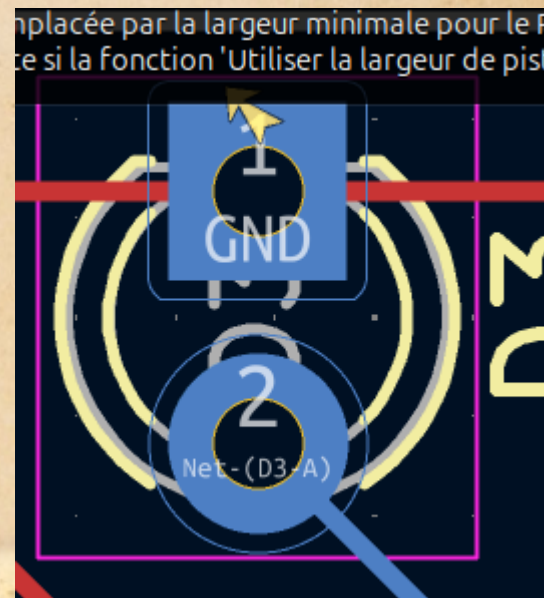
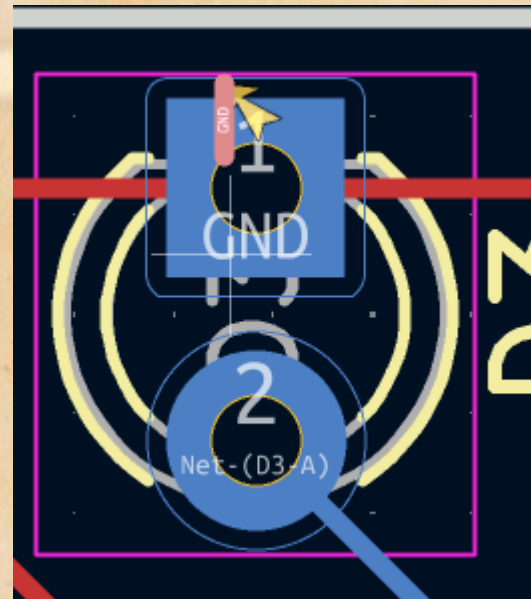
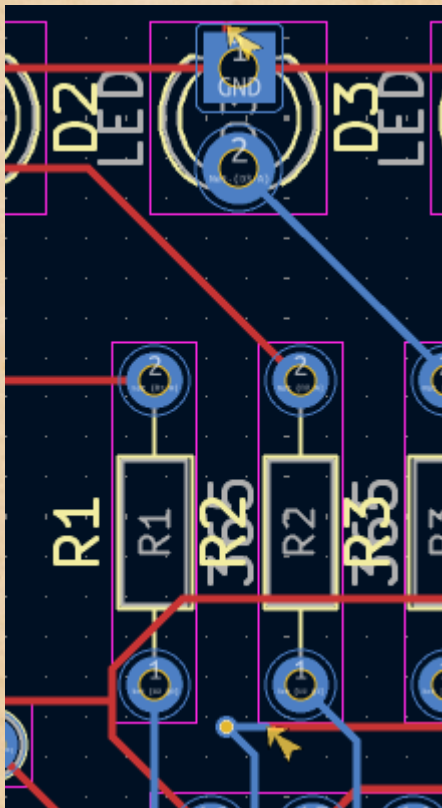
Step by step – building your PCB



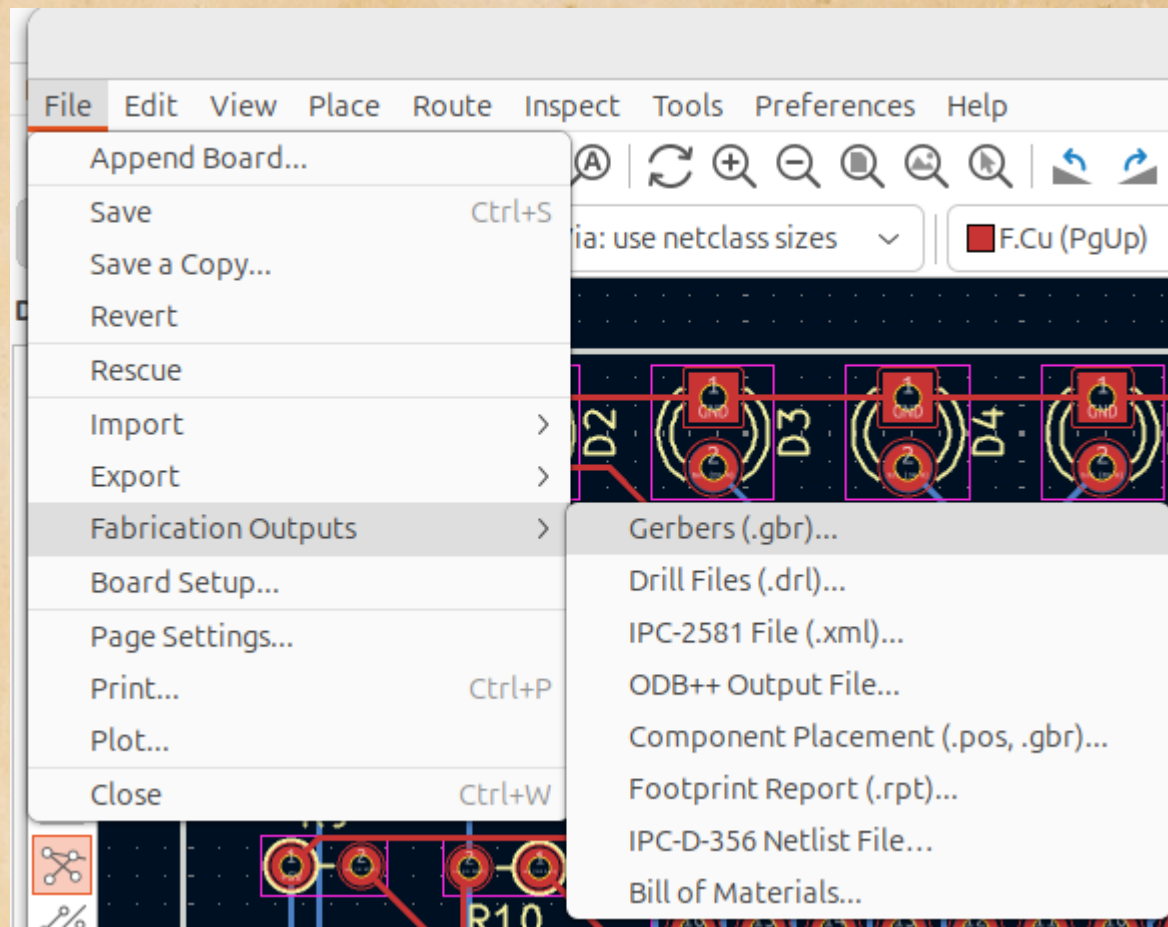
Step by step – getting your PCB manufactured



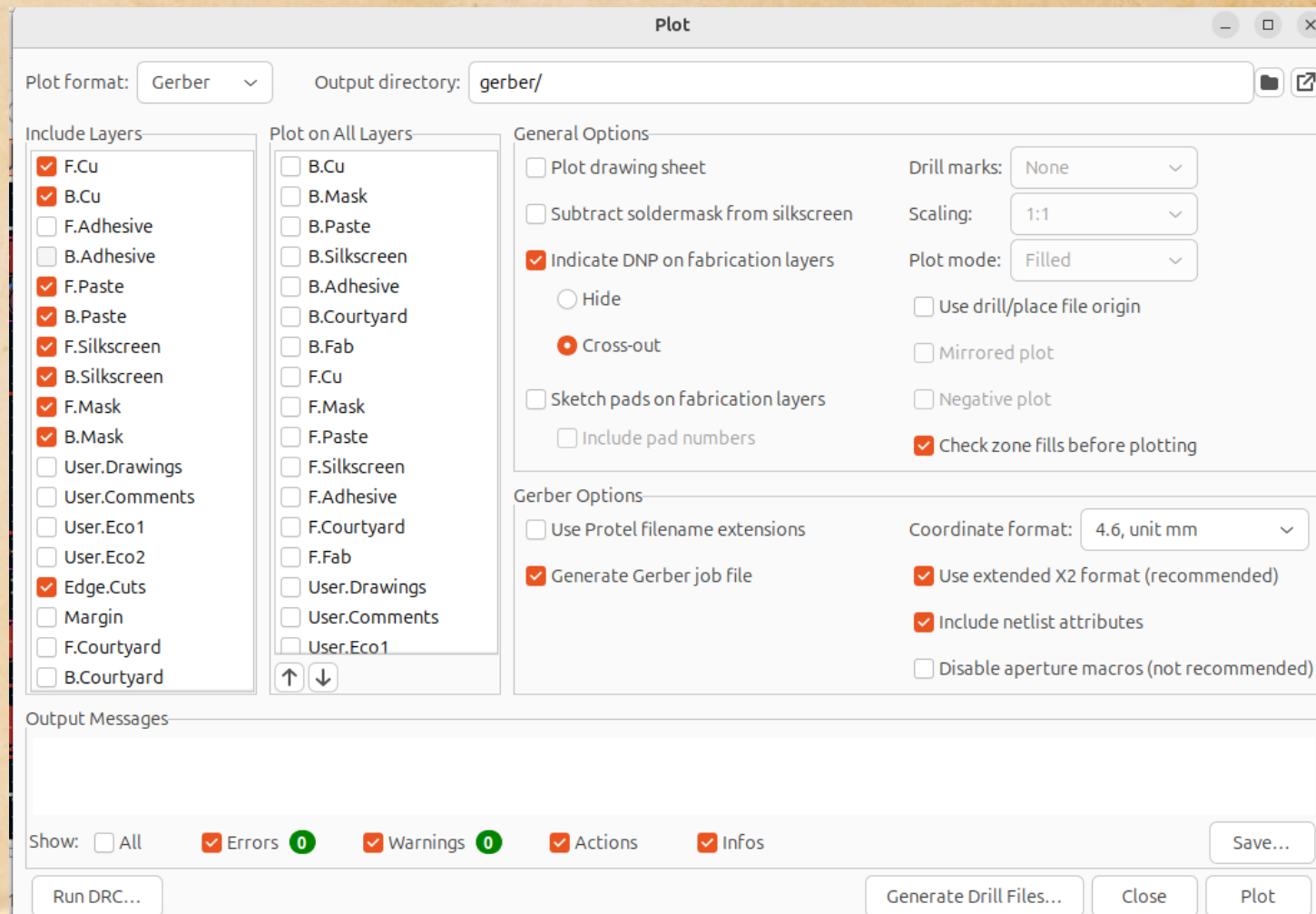
Step by step – building your PCB



Step by step – getting your PCB manufactured



Step by step – getting your PCB manufactured



The screenshot shows the 'Plot' dialog box in Protel 99 SE. The 'Plot format' is set to 'Gerber' and the 'Output directory' is 'gerber/'. The 'Include Layers' list on the left contains the following checked items: F.Cu, B.Cu, F.Paste, B.Paste, F.Silkscreen, B.Silkscreen, F.Mask, B.Mask, Edge.Cuts, and Margin. The 'Plot on All Layers' list on the right contains the following checked items: B.Cu, B.Mask, B.Paste, B.Silkscreen, B.Adhesive, B.Courtyard, B.Fab, F.Cu, F.Mask, F.Paste, F.Silkscreen, F.Adhesive, F.Courtyard, F.Fab, User.Drawings, User.Comments, and User.Eco1. The 'General Options' section includes 'Indicate DNP on fabrication layers' (checked), 'Drill marks' set to 'None', 'Scaling' set to '1:1', 'Plot mode' set to 'Filled', and 'Check zone fills before plotting' (checked). The 'Gerber Options' section includes 'Generate Gerber job file' (checked), 'Coordinate format' set to '4.6, unit mm', 'Use extended X2 format (recommended)' (checked), 'Include netlist attributes' (checked), and 'Disable aperture macros (not recommended)' (unchecked). The 'Output Messages' section at the bottom shows 'Show: All' (unchecked), 'Errors 0' (checked), 'Warnings 0' (checked), 'Actions' (checked), and 'Infos' (checked). The 'Run DRC...' button is visible at the bottom left, and the 'Generate Drill Files...', 'Close', and 'Plot' buttons are at the bottom right.

Plot

Plot format: Gerber Output directory: gerber/

Include Layers

- ☒ F.Cu
- ☒ B.Cu
- ☐ F.Adhesive
- ☐ B.Adhesive
- ☒ F.Paste
- ☒ B.Paste
- ☒ F.Silkscreen
- ☒ B.Silkscreen
- ☒ F.Mask
- ☒ B.Mask
- ☐ User.Drawings
- ☐ User.Comments
- ☐ User.Eco1
- ☐ User.Eco2
- ☒ Edge.Cuts
- ☐ Margin
- ☐ F.Courtyard
- ☐ B.Courtyard

Plot on All Layers

- ☐ B.Cu
- ☐ B.Mask
- ☐ B.Paste
- ☐ B.Silkscreen
- ☐ B.Adhesive
- ☐ B.Courtyard
- ☐ B.Fab
- ☐ F.Cu
- ☐ F.Mask
- ☐ F.Paste
- ☐ F.Silkscreen
- ☐ F.Adhesive
- ☐ F.Courtyard
- ☐ F.Fab
- ☐ User.Drawings
- ☐ User.Comments
- ☐ User.Eco1

General Options

- ☐ Plot drawing sheet
- ☐ Subtract soldermask from silkscreen
- ☒ Indicate DNP on fabrication layers
 - ☐ Hide
 - ☒ Cross-out
- ☐ Sketch pads on fabrication layers
- ☐ Include pad numbers
- Drill marks: None
- Scaling: 1:1
- Plot mode: Filled
- ☐ Use drill/place file origin
- ☐ Mirrored plot
- ☐ Negative plot
- ☒ Check zone fills before plotting

Gerber Options

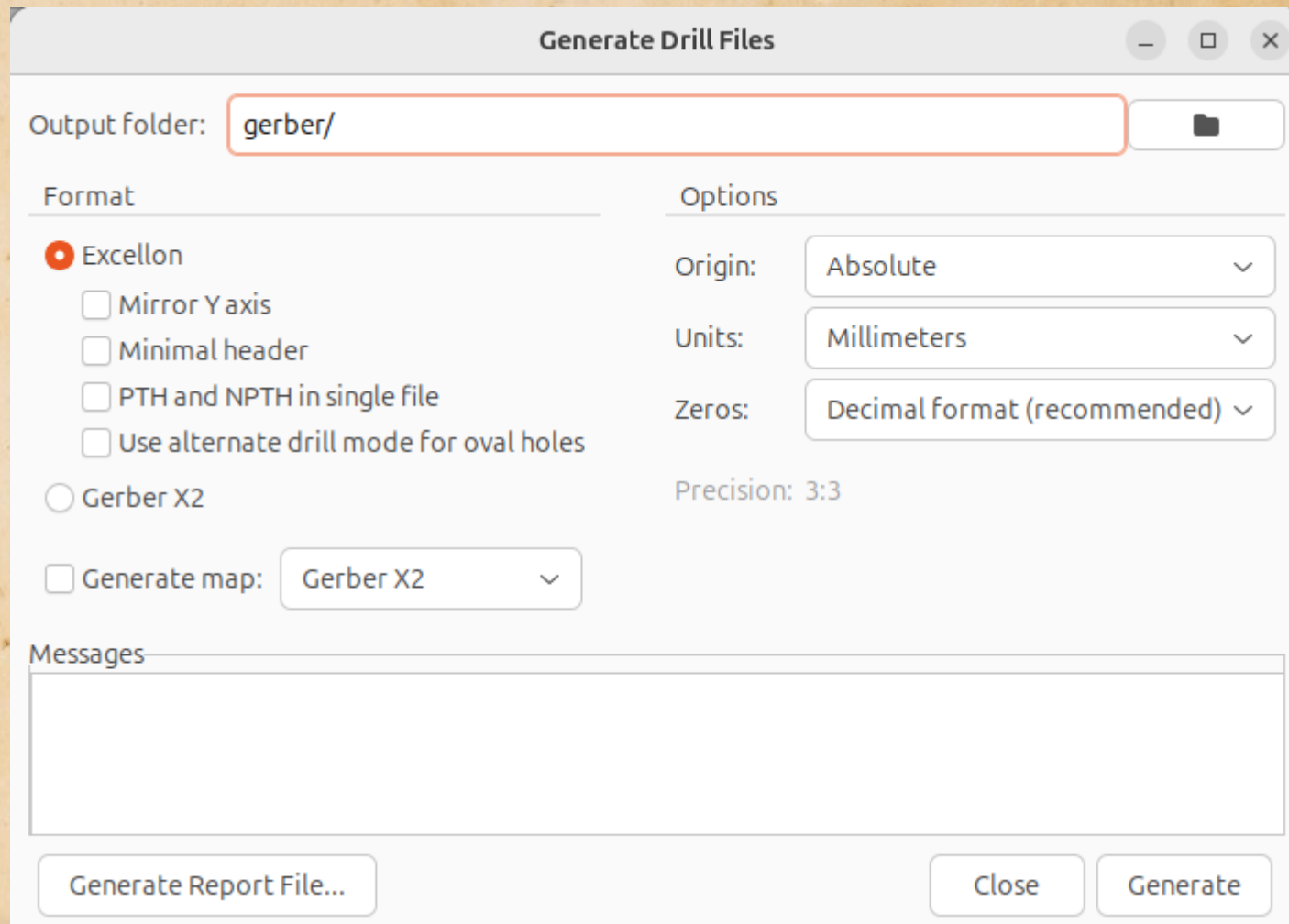
- ☐ Use Protel filename extensions
- ☒ Generate Gerber job file
- Coordinate format: 4.6, unit mm
- ☒ Use extended X2 format (recommended)
- ☒ Include netlist attributes
- ☐ Disable aperture macros (not recommended)

Output Messages

Show: ☐ All ☒ Errors 0 ☒ Warnings 0 ☒ Actions ☒ Infos

Run DRC... Generate Drill Files... Close Plot

Step by step – getting your PCB manufactured



Generate Drill Files

Output folder:

Format

- ☒ Excellon
 - ☐ Mirror Y axis
 - ☐ Minimal header
 - ☐ PTH and NPTH in single file
 - ☐ Use alternate drill mode for oval holes
- ☐ Gerber X2

Options

Origin:

Units:

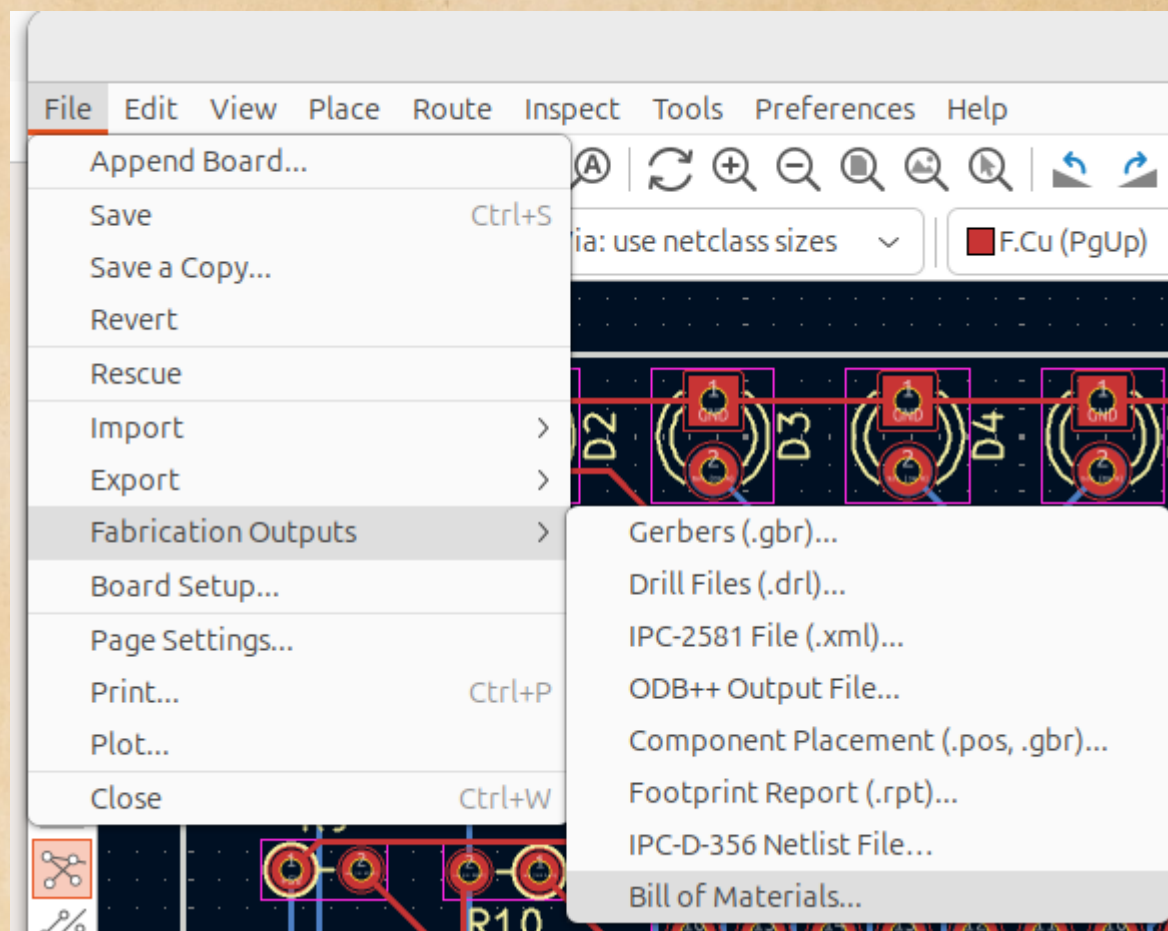
Zeros:

Precision: 3:3

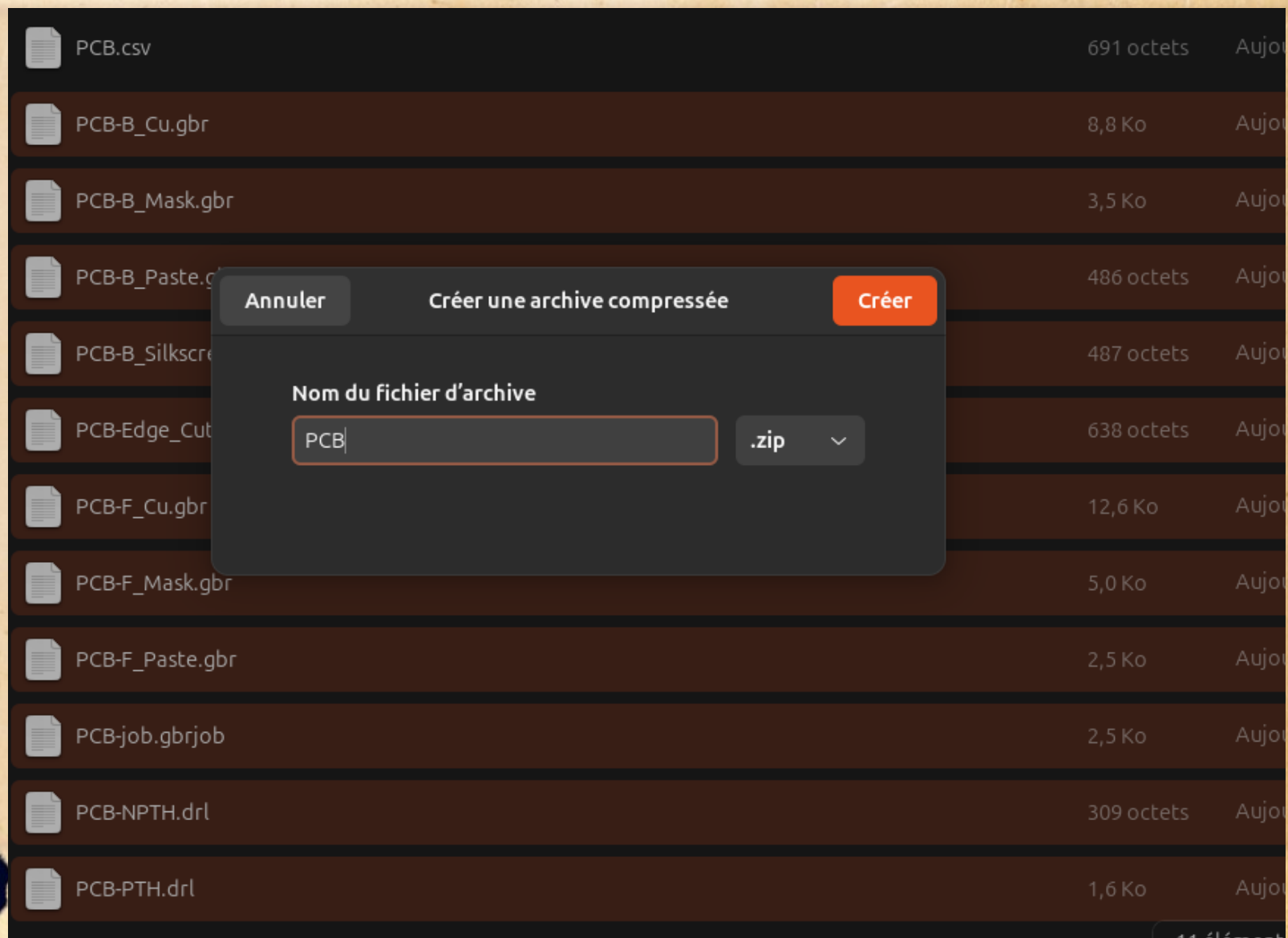
☐ Generate map:

Messages

Step by step – getting your PCB manufactured

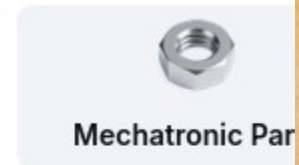
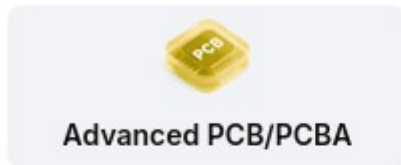


Step by step – getting your PCB manufactured



Step by step – getting your PCB manufactured

Select Product



Online PCB Quote

[Instructions For Ordering>](#)

[Upload History >](#)

 Add gerber file

Only accept zip or rar, Max 100 MB, [View example >](#)

Annuler

Envoi du fichier - Online PCB Instant Quote - JLCPCB — Mozilla Firefox

🕒 Récents

🏠 Dossier ...

📄 Docume...

🖼 Images

🎵 Musique

🏠 bidouille

📁 Bureau

workshop

PCB

gerber

Nom

Taille

📄 PCB.zip

12,7 Ko

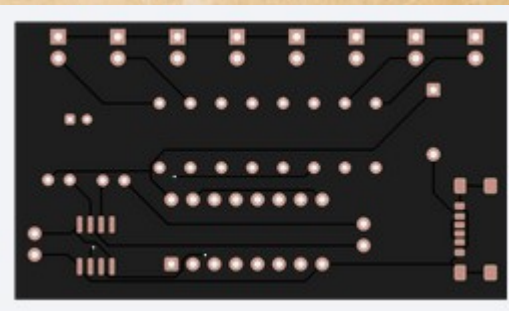
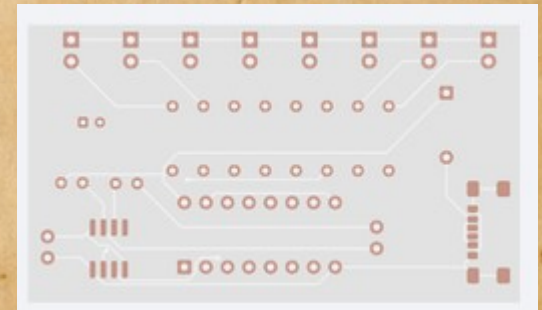
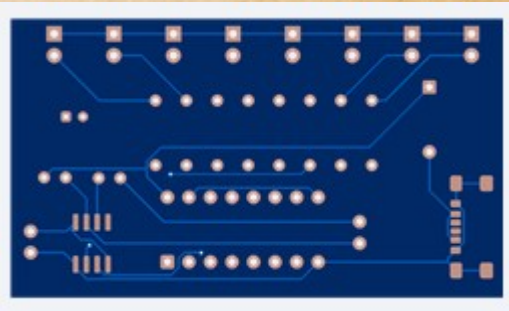
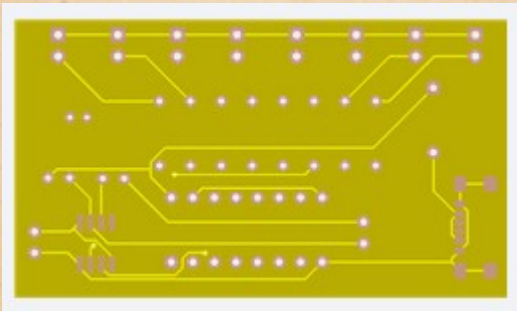
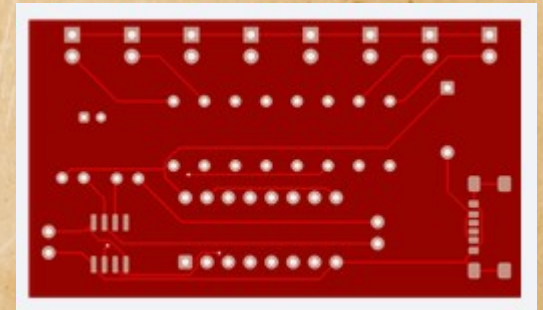
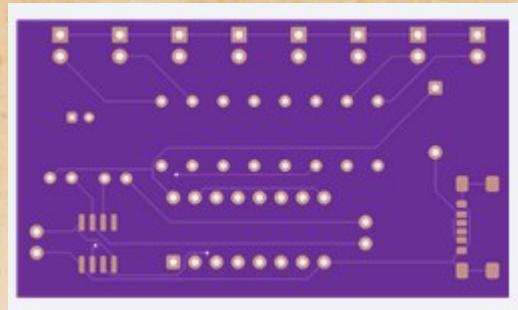
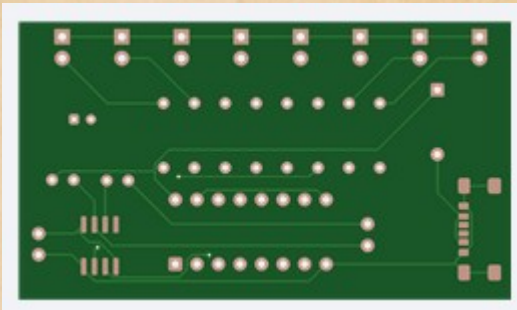
📄 PCB.csv

691 octets

📄 PCB-NPTH.drl

309 octets

Step by step – getting your PCB manufactured



Step by step – getting your PCB manufactured

PCB Specifications

Different Design	?	1	2	3	4			
Delivery Format	?	Single PCB	Panel by Customer	Panel by JLCPCB				
PCB Thickness	?	0.4mm	0.6mm	0.8mm	1.0mm	1.2mm	1.6mm	2.0mm
PCB Color	?	Green	Purple	Red	Yellow	Blue	White	Black
Silkscreen	?	White						
Material Type	?	FR4 TG135	KB6164 - TG135	Nan Ya NP-140F	S1141 TG140	S1000H TG155		
Surface Finish	?	HASL(with lead)	LeadFree HASL	ENIG				

High-spec Options

Step by step – getting your PCB manufactured

Outer Copper Weight	☒ 1 oz	☐ 2 oz	☐ 2.5 oz	☐ 3.5 oz	☐ 4.5 oz
Via Covering	☒ Tented	☐ Untented	☐ Plugged	☐ Epoxy Filled & Capped	☐ Copper paste Filled & Capped
Via Plating Method	☒ Not Specified	☐ Conductive Adhesive	☐ Horizontal Electroless Copper Plating		
Min via hole size/diameter	☒ 0.3mm/(0.4/0.45mm)	☐ 0.25mm/(0.35/0.4mm)	☐ 0.2mm/(0.3/0.35mm)	☐ 0.15mm/(0.25/0.3mm)	
Board Outline Tolerance	☒ ±0.2mm(Regular)	☐ ±0.1mm(Precision)			
Confirm Production file	☒ No	☐ Yes			
Mark on PCB	☒ Remove Mark	☐ Order Number(Specify Position)	☐ 2D barcode (Serial Number)	☐ Order Number	
Electrical Test	☒ Flying Probe Fully Test				
Gold Fingers	☒ No	☐ Yes			
Castellated Holes	☒ No	☐ Yes			
Edge Plating	☒ No	☐ Yes			
Blind Slots	☒ No	☐ Yes			

Step by step – getting your PCB manufactured



Upload BOM File

Support .xls, .xlsx and .csv files under 4MB.

[↓ BOM Template](#)
[BOM Lists \(Projects\)](#)

BOM Mapping

A preview of the uploaded data is shown below and columns have been mapped based on file contents.

- * **Step 1:** Please select the **Row** where part information begins.
- * **Step 2:** At least two column types are required. **Quantity** and **others** (LCSC Part Number / Mfr.# / Description)
- * **Remark:** The more categories you identify, the more accurate the matching result is.

Row	Column 1 select type ▼	Column 2 select type ▼	Column 3 Package ▼	Column 4 Quantity ▼	Column 5 select type ▼	Column 6 LCSC Part Num...
☐ 1	Id	ref	footprint	quantity	designation	ref
☒ 2	1	U2	DIP-16_W7.62mm	1	4017	C32710674
☐ 3	2	R5,R2,R1,R8,R4,R7,R3,R6	R_Axial_DIN0204_L3.6mm_D1.6mm_P7...	8	365 – 390 (normal)	C119315
☐ 4	3	D1,D2,D4,D8,D7,D3,D5,D6	LED_D3.0mm	8	LED	C330774
☐ 5	4	R11	R_LDR_4.9x4.2mm_P2.54mm_Vertical	1	100K	C125630
☐ 6	5	R9,R10	R_Axial_DIN0204_L3.6mm_D1.6mm_P2...	2	22K	C1744116
☐ 7	6	J1	USB_C_Receptacle_GCT_USB4135-GF-...	1	USB_C_Receptacle_PowerOnly_6P	C5438410
☐ 8	7	C2	C_Disc_D3.0mm_W1.6mm_P2.50mm	1	0.01µf	C2832505
☐ 9	8	D9	D_DO-35_SOD27_P7.62mm_Horizontal	1	1N4148	C84410

Step by step – getting your PCB manufactured



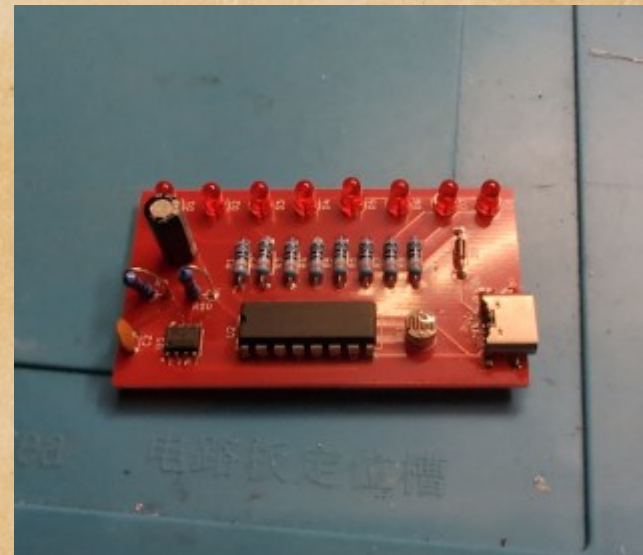
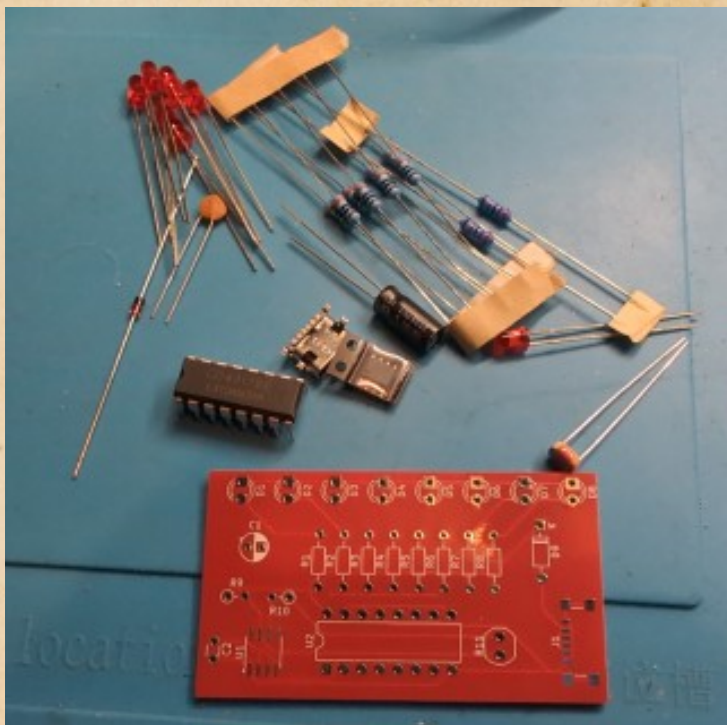
All (10) Exact Matches (10) Partial Matches (0) No Matches Found (0) Search Availability: ☒ In-Stock(10) ☒ Backordered(0) ☒									
☒	Uploaded Data	Product Detail	Match Status	Requested Qty	Order Qty ⓘ	Stock Availability	Target Price & Lead Time	Unit Price	Ext. Price
☒ 1	LCSC#: C32710674 Package: DIP-16_W7.62mm	 Mfr.#: CD4017BE(LX) Mfr.: lingxingic LCSC#: C32710674 Rising Edge 11MHz DIP-16 Counters, Dividers RoHS Product Details > Customer #:	☒	1 Min:5, Mult:5 SPQ: 25/Tube	5 MOQ Required	800 In-Stock Ship Now	\$ Target Price Lead Time days	\$0.1292 ⓘ	\$0.65
☒ 2	LCSC#: C119315 Package: R_Axial_DIN0204_L9.6mm_D1.6mm_P7.62mm_Horizontal	 Mfr.#: MF1/4W-390Ω±1% T Mfr.: CCO(Chian Chia Elec) LCSC#: C119315 390Ω 250mW 250V Metal Film Resistor ±100ppm/°C ±1% Through Hole,D2.3x1.6mm Through Hole Resistors RoHS Product Details > Customer #:	☒	8 Min:50, Mult:50 SPQ: 5000/Box	50 MOQ Required	15,050 In-Stock Ship Now	\$ Target Price Lead Time days	\$0.0109 ⓘ	\$0.55
☒ 3	LCSC#: C330774 Package: LED_D3.0mm	 Mfr.#: TJ-L3FYTGHRMFLCFLC2R-A5 Mfr.: TOGIALED LCSC#: C330774 Red 630nm LED Indication - Discrete 1.7V~2.5V Through Hole,D=3mm	☒	8 Min:20, Mult:20 SPQ: 1000/Bag	20 MOQ Required	28,420 In-Stock Ship Now	\$ Target Price Lead Time days	\$0.0258 ⓘ	\$0.52

Step by step – getting your PCB manufactured



☒	Uploaded Data	Product Detail	Match Status	Requested Qty	Order Qty ①	Stock Availability	Target Price & Lead Time	Unit Price	Ext. Price
☒ 1	LCSC#: C32710674 Package: DIP-16_W7.62mm	 Mfr. #: CD4017BE(LX) Mfr.: lingxingjia LCSC#: C32710674 Rising Edge 11MHz DIP-16 Counters, Dividers RoHS Product Details > Customer #:	☒	20 Min:5, Mult:5 SPQ: 25/Tube	20	800 In-Stock Ship Now	\$ Target Price Lead Time days	\$0.1292	\$2.58
☒ 2	LCSC#: C119315 Package: R_Axial_DIN0204_L3-6mm_D1.6mm_P7.62mm_Horizontal	 Mfr. #: MF1/4W-390Ω±1% T Mfr.: CCO(Chian Chia Elec) LCSC#: C119315 390Ω 250mW 250V Metal Film Resistor ±100ppm/°C ±1% Through Hole,D2.3xL6.5mm Through Hole Resistors RoHS Product Details > Customer #:	☒	200 Min:50, Mult:50 SPQ: 5000/Box	200	15,050 In-Stock Ship Now	\$ Target Price Lead Time days	\$0.0109	\$2.18
☒ 3	LCSC#: C330774 Package: LED_D3.0mm	 Mfr. #: TJ-L3FYTGHMFLC2R-A5 Mfr.: TOGIALED LCSC#: C330774 Red 630nm LED Indication - Discrete 1.7V~2.5V Through Hole,D=3mm Product Details > Customer #:	☒	160 Min:20, Mult:20 SPQ: 1000/Bag	160	28,420 In-Stock Ship Now	\$ Target Price Lead Time days	\$0.0258	\$4.13

« oh c'est beau »





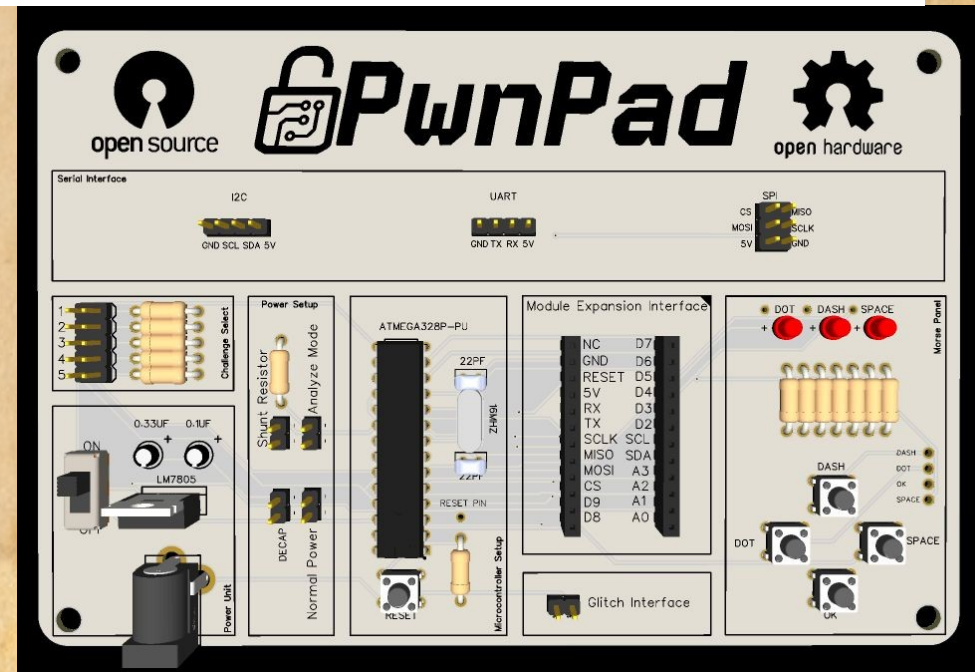
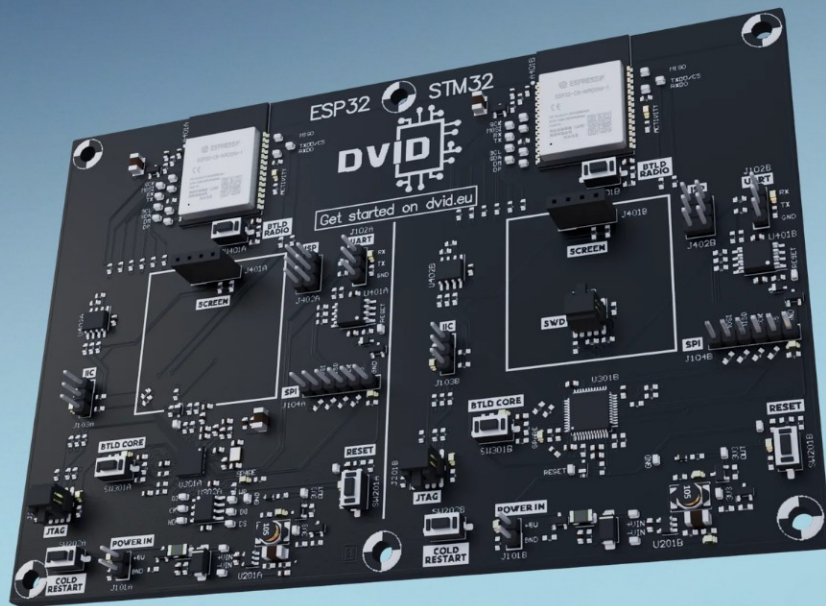
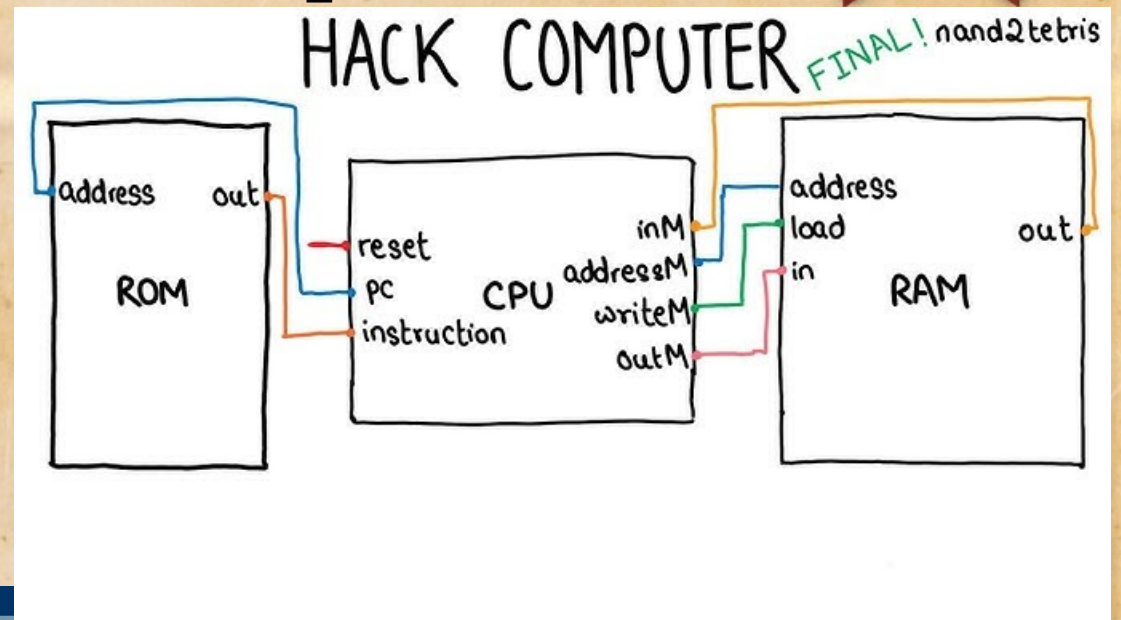
To go further

Just a few open-hardware examples:)



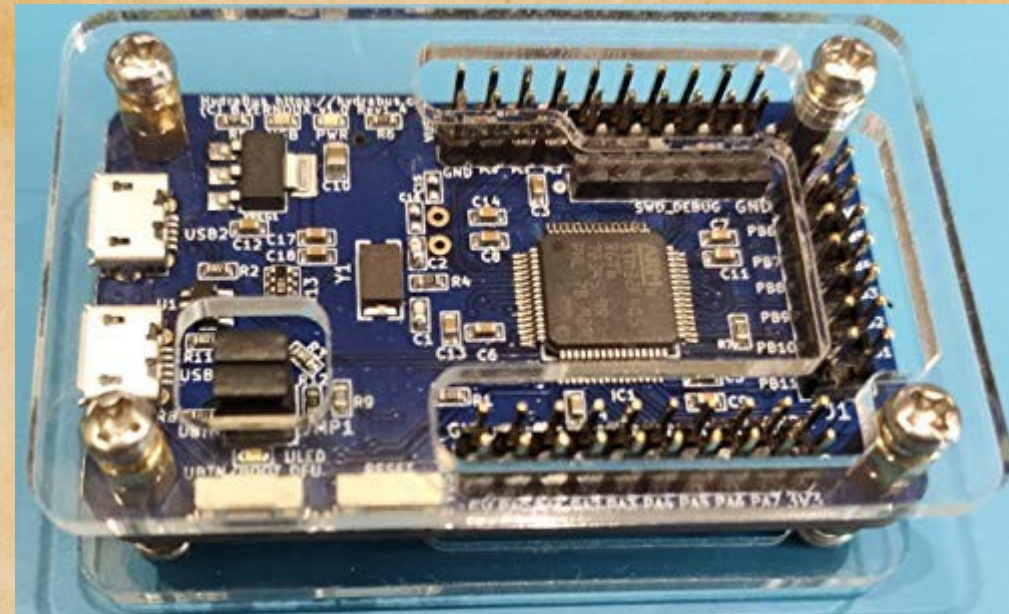
Learning-oriented examples

- PwnPad
- Dvid 1 and 2
- Nand2tetris

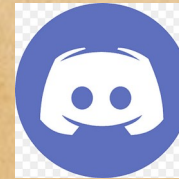


Measurement-oriented examples

- Bus pirate
- hydrabus
- Glasgow
- HackRF one
- ...



THANK YOU FOR YOUR ATTENTION BUT THE FUN ISN'T OVER....



TCCCCORP



@TCCCCORP



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