



中國計算機學會
CHINA COMPUTER FEDERATION

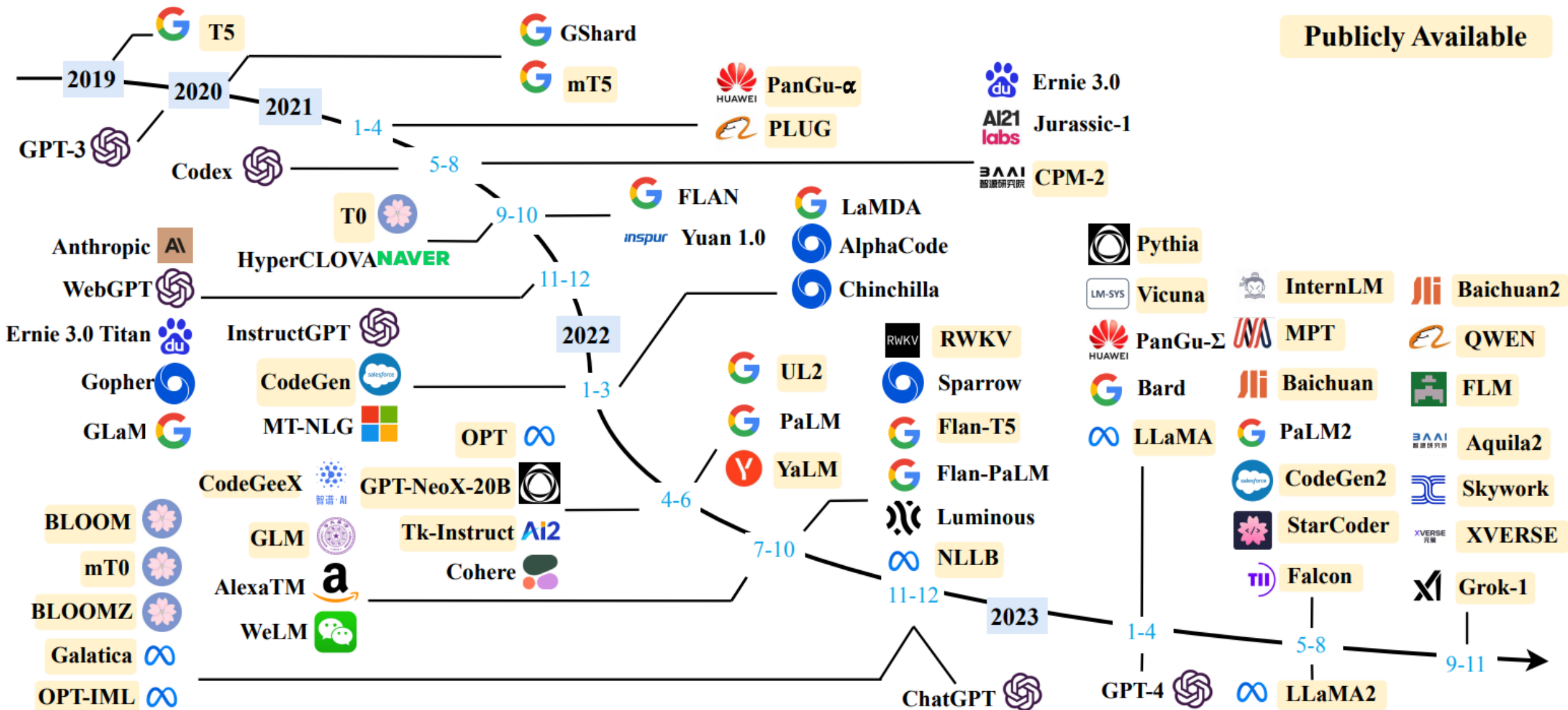
Vibe coding PCB: LLM4KiCAD

汇报人：赖晓铮 副教授

华南理工大学计算机科学与工程学院

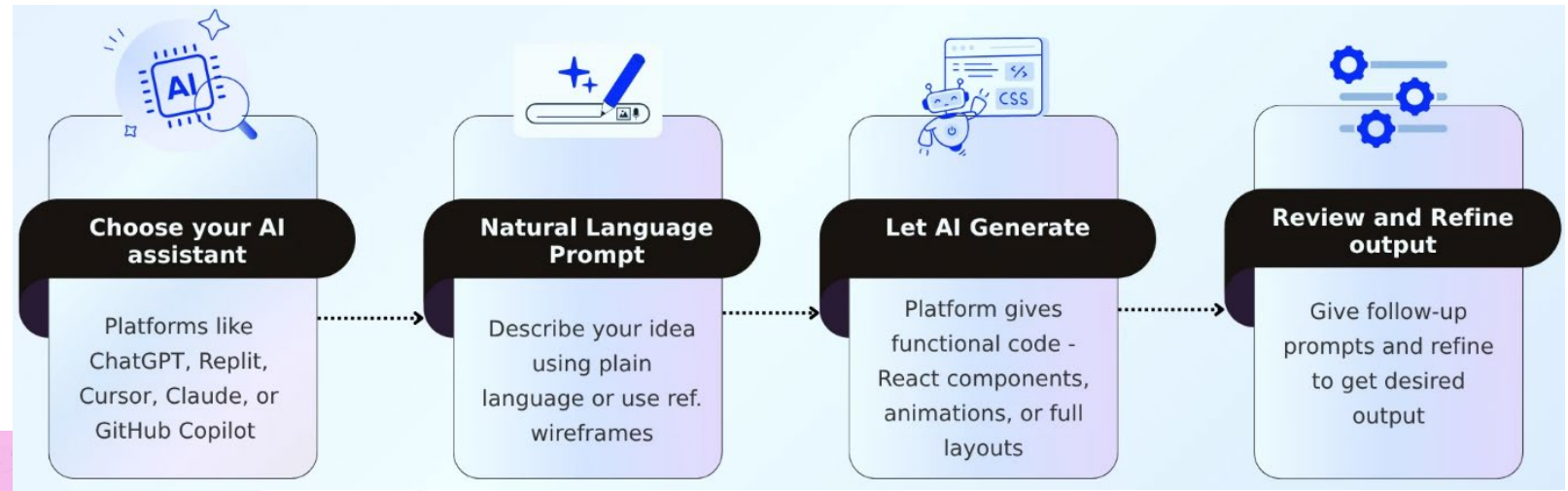


LLM发展迅猛

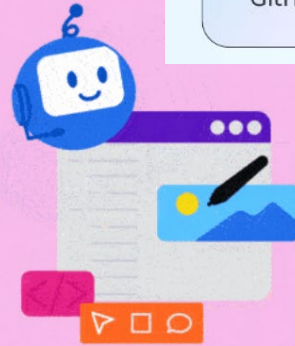




Vibe coding时代



VS

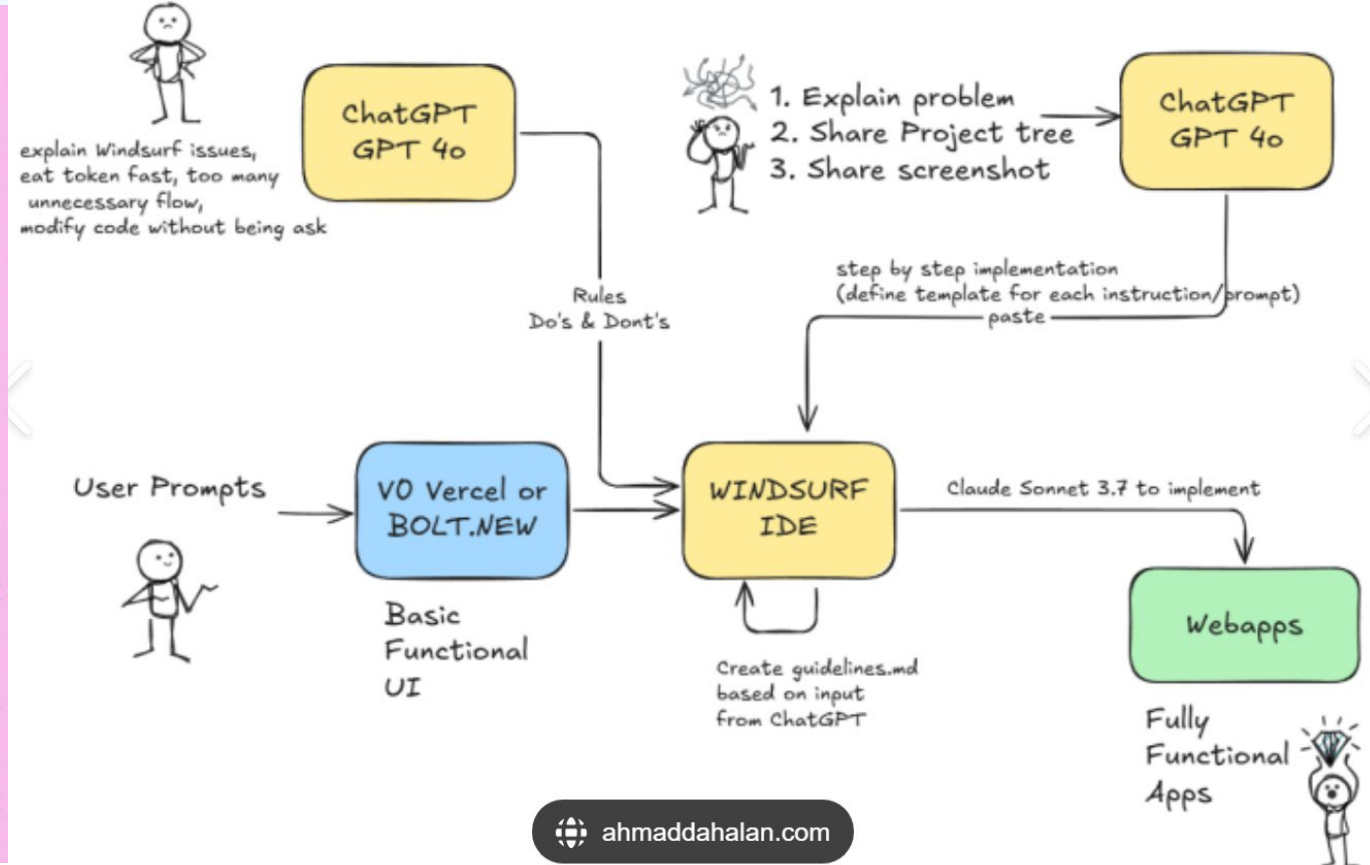


Traditional Coding

- Structured, planned, logic-driven
- Full-stack IDEs, linters, version control, test suites
- Correctness, scalability, maintainability
- Formal reviews, documentation, tickets, agile workflows
- 100% human creativity
- Production-ready systems and features

Vibe Coding

- Intuitive, spontaneous, flow-based
- Lightweight editors, live previews, minimal setup
- Creativity, speed, instant feedback
- Casual collabs, pair coding, idea jamming
- Risk of not fully understanding the code
- Casual collabs, pair coding, idea jamming





Python-based DSL: Skidl

```
led_circuit.py 6
led_circuit.py > ...
1 from skidl import *
2
3 # 创建一个新的电路
4 circ = Circuit()
5
6 # 创建电源和地
7 vdd = Net('3V3')
8 gnd = Net('GND')
9
10 # 创建LED元件
11 led = Part('Device', 'LED', footprint='LED_THT:LED_D5.0mm')
12
13 # 创建330Ω电阻
14 r1 = Part('Device', 'R', value='330', footprint='Resistor_THT:R_Axial_DIN0207_L6.3mm_D2')
15
16 # 连接电路
17 vdd += led['A']      # LED阳极接3.3V
18 led['K'] += r1[1]    # LED阴极接电阻一端
19 r1[2] += gnd        # 电阻另一端接地
20
21 # 生成网表
22 circ.generate_netlist()
```

工作流程:

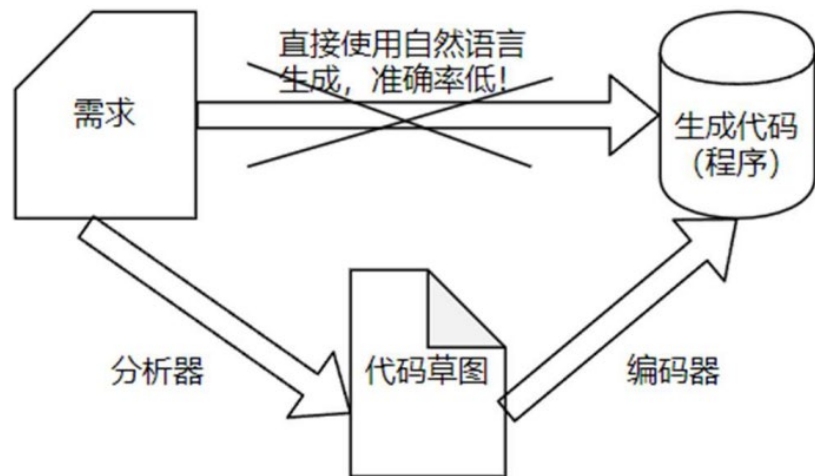
- 1.在Cursor中用SKiDL写电路代码
- 2.AI帮助生成和优化代码
- 3.运行代码生成网表文件
- 4.在KiCad中导入网表进行PCB设计

问题:

- 1.电路复杂就不行
- 2.代码化描述是程序员思维, 不符合电路工程师的习惯 (看图)



Spec-coding: 寻找人与AI都可以理解的“IR”（中间表示）



1. 数据库理论

markdown

(1) 数据库分类

数据库大体可以分为 **关系型数据库** 和 **非关系型数据库**。

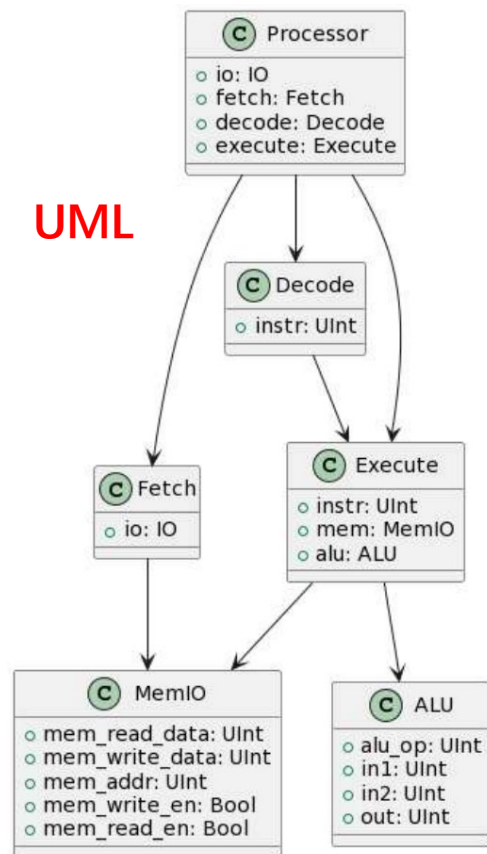
关系型数据库与非关系型数据库的 **区别**:

	关系型数据库	**非关系型数据库**
常见数据库	Oracle、MySQL、SQL Server	memcache
使用SQL	是	不强制要
事务支持	支持	不支持
复杂操作	支持	不支持
海量读写操作	效率低	效率高
基本结构	基于表和列, 结构固定	灵活性比较高
使用场景	业务方面的OLTP系统	用于数据的缓存

注: OLTP (On-Line Transaction Processing) 是指联机事务处理,

(2) SQL 语言分类

UML



伪代码

DSL

BubbleSort($A[0..n-1]$)

//该算法用冒泡排序对数组 $A[0..n-1]$ 进行排序

//输入: 一个可排序数组 $A[0..n-1]$

//输出: 非降序排列的数组 $A[0..n-1]$

for $i \leftarrow 0$ to $n-2$ do

 for $j \leftarrow 0$ to $n-2-i$ do

 if $A[j+1] < A[j]$ swap $A[j]$ and $A[j+1]$

"results":

```
{
  "location": {
    "id": "WSSU6EXX52RE",
    "name": "Fuzhou",
    "country": "CN",
    "path": "Fuzhou, Fuzhou, Fujian, China",
    "timezone": "Asia/Shanghai",
    "timezone_offset": "+08:00"
  },
  "now": {
    "text": "Sunny",
    "code": "0",
    "temperature": "20"
  },
  "last_update": "2017-12-10T16:00:00+08:00"
}
```

JSON格式数据

```
%ymal 1.2
---
person:
  name: kmor
  age: 22
  sex: 男
  funny:
    - a: football
    - b: basketball
  address:
    province: 湖北,
    city: 武汉,
    area: 江夏,
    street: 马房山街道办
```

yaml文件声明

对象声明

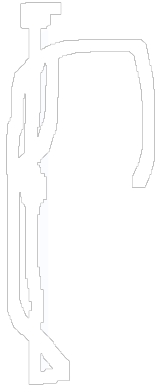
对象的属性值

funny数组

字典



Spec-coding: Celus



Welcome back, Antonio Becerra Esteban

Continue working on your projects, create a new project, or get inspired by a featured project.

Create new project

3

Recent projects 1

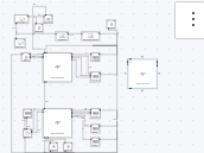


My Home Weather Station

This project aims to create a home interior weather station. It will...

Last updated 04/05/2024, 2:37 PM
Created 04/04/2024, 3:12 PM

Go to project

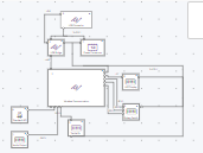


Pro WiFi Radio

This project aims to create an example for a tutorial. It will...

Last updated 03/22/2024, 8:48 PM
Created 03/21/2024, 11:40 AM

Go to project

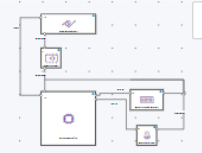


Tutorial WiFi Radio

This project aims to Show how the CELUS Design Platform works. It...

Last updated 03/21/2024, 5:40 PM
Created 03/21/2024, 5:08 PM

Go to project



Generic MCU Minimum Via...

This project aims to develop a versatile, entry-level developme...

Last updated 03/13/2024, 1:34 PM
Created 03/13/2024, 1:26 PM

Go to project



RA4M1 Minimum Viable Bo...

This project aims to create a simplified, cost-effective...

Last updated 03/12/2024, 3:28 PM
Created 03/08/2024, 3:08 PM

Go to project

Featured projects 2



Würth Elektronik Calypso IoT Desi...

This project aims to simplify the development of secure end-to-end IoT...

 Antonio Becerra Esteban
Last updated 03/12/2024, 12:35 PM



Basic WiFi Radio

This project aims to create an interactive, user-friendly WiFi Radio for music and...

 Antonio Becerra Esteban
Last updated 03/12/2024, 12:42 PM



Retro Game Console

This project aims to create a portable retro gaming console. It will simulate classic...

 Jean Rodriguez
Last updated 03/12/2024, 12:45 PM



IoT Dev Board

This project aims to create an IoT development board. It will enable...

 José Ginjo
Last updated 03/12/2024, 12:48 PM



Spec-coding: Celus

Project Settings

Description Project Information Project Specification

Description

Project Settings is the first step in the CELUS Design Studio electronics design process. It collects basic information and global specifications. This enables more accurate recommendations for the design.

Project Summary

This project aims to create an interactive, user-friendly WiFi Radio for music and audio streaming. It will utilize a Wi-Fi module to connect to Wi-Fi networks and stream audio content, and feature user input through a rotary encoder, push buttons, and an display for navigation and status information as well as an audio jack to output the music. It should act as a device that users can interact with to select and play their preferred audio streams. This comprises of WiFi connectivity, audio output via an embedded DAC to an audio jack, user interface controls, and visual feedback through a display. It should operate under standard USB-C power delivery specifications for easy power management.

It should meet these standards and regulations. It must work within a home or office environment and under the constraints of being handheld and fit in the case of a music cassette.

The project cost is expected to be under this budget. Parts are sourced from Espressif, Texas Instruments, Wuerth and Silicon Labs. The expected outcome of this project is a functional prototype that demonstrates the WiFi Radio capabilities with scalability options for future feature enhancements and market production.

Skip this step Save

Project Settings

Description Project Information Project Specification

Project Information

This section gathers information about this project. Some recommended values may already be filled out.

1

* Project Name

WiFi Radio

2

Design Function

Functionality

Power Conversion × Wireless Communication × Audio Output ×

3

* Application

Consumer Electronics × IoT ×

4

Output

* Target CAD Tool

Altium Designer

* BOM Type

Flat

5

Optional Information

Estimated Annual Units

10

Project Identifier

CLSTMP003

Production Start Date

2024-04-09

Save

Project Settings

Description Project Information Project Specification

1

Parts & Manufacturers

Preferred Parts

Search by Part Number

Excluded Parts

Search by Part Number

Preferred Manufacturers

ESPRESSIF SYSTEMS (SHANGHAI) PTE LTD × TEXAS INSTRUMENTS INC ×

WUERTH ELEKTRONIK GMBH & CO KG × SILICON LABORATORIES INC ×

Excluded Manufacturers

Search by Manufacturer

2

Power Budget

10.0

Watt

3

Compliance

Regulations and Standards

☐ REACH Compliant ☐ EU RoHS Compliant ☐ China RoHS Compliant ☐ IEC Conformant

☐ MIL Conformant

4

Operating Temperature

-40.0

TO

85.0

Celsius

Save and go to Canvas



Spec-coding: Celus

Templates

Templates are recommended based on the following project settings.

Application

Consumer Electronics

IoT

Change application settings

Search by template name



Generic MCU Minimum Viable Board

This project aims to develop a versatile, entry-level development platform for embedded systems enthusiasts and...

[Read more](#)

Last updated 03/13/2024, 1:47 PM

Consumer El...

IoT

Use Template



RA4M1 Minimum Viable Board

This project aims to create a simplified, cost-effective development platform for testing and initial deployment of smart...

[Read more](#)

Last updated 03/11/2024, 2:27 PM

Consumer El...

IoT

Use Template



Retro Game Console

This project aims to create a portable retro gaming console. It will simulate classic games and provide a user-friendly gaming...

[Read more](#)

Last updated 03/12/2024, 12:45 PM

Consumer El...

IoT

Use Template



WiFi and Bluetooth Minimum Viabl...

This project aims to establish a foundational development platform for applications utilizing Wi-Fi and Bluetooth connectivity. It...

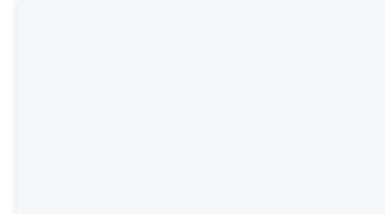
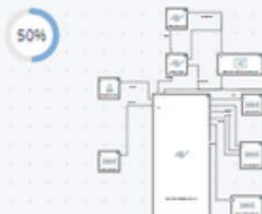
[Read more](#)

Last updated 03/11/2024, 3:20 PM

Consumer El...

IoT

Use Template



Start from scratch



Spec-coding: Celus

EFdsw Resolve 1 5 ? 🔔 👤

Design Library «

Search for a Block 🔍

2

SWITCHING DC-DC... POWER CONVERSION

POWER SUPPLY AN... ACTIVE LINEAR...

LINEAR DC-DC CONVERSION MONOLITHIC SWITCHING...

DISCRETE SWITCHING... LOAD SWITCHING

POWER SWITCHING POWER MANAGEMENT

DC POWER PLUGS /... POWER CONNECTO...

POWER DELIVERY DIGITAL SIGNAL...

6

USB 6

USB Connector

SUPPLY

3

USB Bridge

7

Power Conversion

UART

2

Wireless Communication

SUPPLY

GPIO

4

RGB LED

GPIO

5

Tactile Pu...

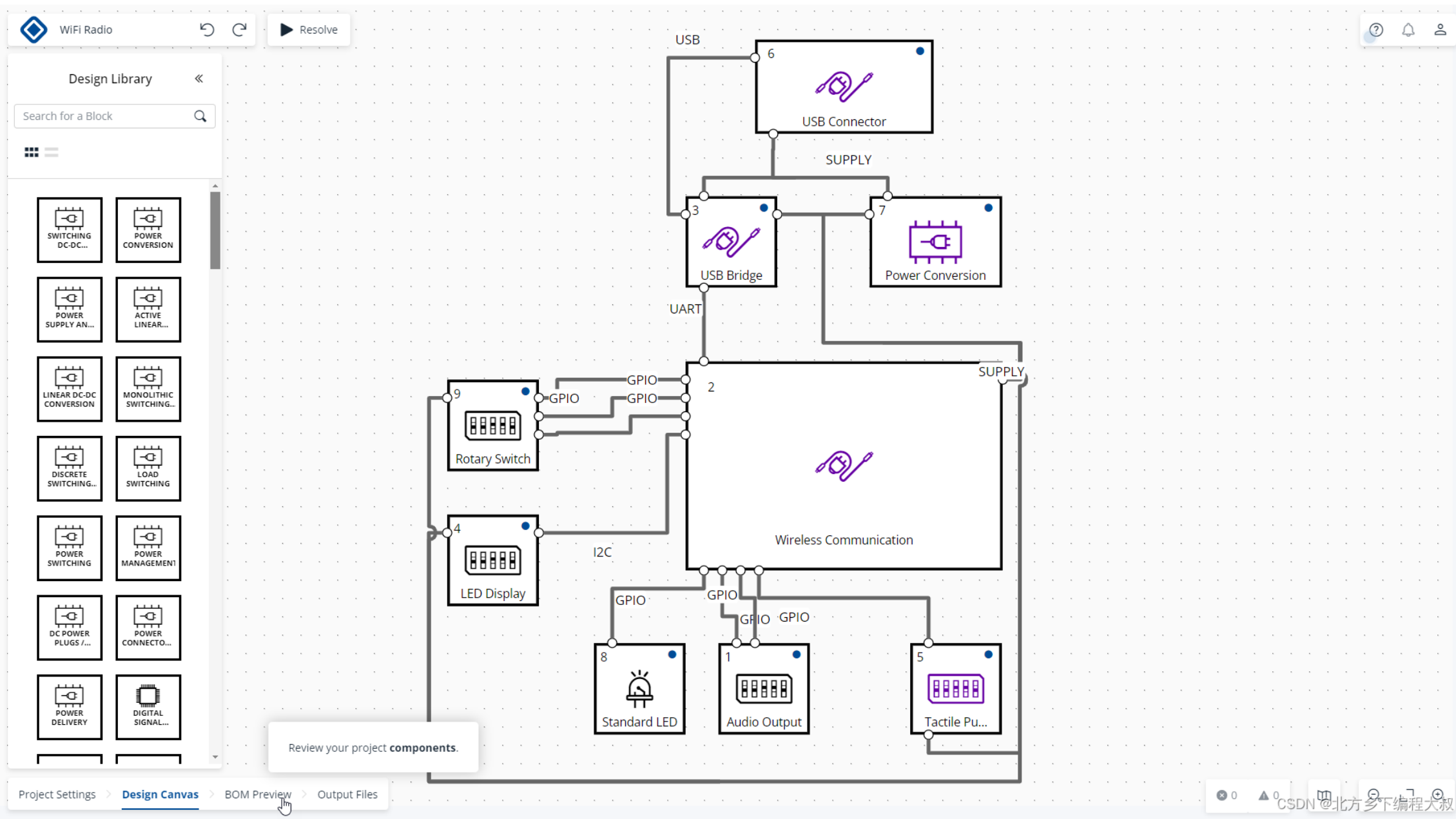
3 4 0 CS DN @ 北 方 乡 下 编 程 大 叔

Project Settings > Design Canvas > BOM Preview > Output Files

The image displays the Celus software interface for spec-coding. It features a top toolbar with a logo, a 'Resolve' button, and navigation icons. A left sidebar contains a 'Design Library' with a search bar and a grid of component blocks categorized by function (e.g., Switching, Power Conversion, Power Supply, Active Linear, Linear DC-DC Conversion, Monolithic Switching, Discrete Switching, Load Switching, Power Switching, Power Management, DC Power Plugs, Power Connectors, Power Delivery, Digital Signal). The main workspace shows a circuit diagram with components like a USB Connector, USB Bridge, Power Conversion, Wireless Communication, RGB LED, and Tactile Pushbutton, interconnected with labeled lines (USB, SUPPLY, UART, GPIO). A bottom navigation bar includes tabs for Project Settings, Design Canvas (active), BOM Preview, and Output Files. A footer contains a watermark for 'CS DN @北方乡下编程大叔'.



Spec-coding: Celus





Spec-coding: Celus

Back to project

Matching CUBOs for Audio Output

These CUBOs match the specifications for this project. Please select the CUBO to solve this block.

1. SJ2-35364B-SMT-TR 3.5mm Audio Jack Mono V2

Default select

2. PS1720P02 Buzzer without controller V1

3. CPT-9019A-SMT-TR Buzzer w/out Controller V1

4. PS1240P02BT Buzzer w/ controller V1

5. SJ2-35364B-SMT-TR 3.5mm Audio Jack Stereo V1

6. PS1240P02BT Buzzer V2

7. SJ2-35364B-SMT-TR 3.5mm Audio Jack Mono V1

J1

SJ2-35364B-SMT-TR

2 TIP

3 RING_1

4 RING_2

1 SLEEVE

10 TIP_SWITCH

AUDIO

MIC

GND

R1

1k

PZT1

PS1240P02BT

GND

CUBot AI Assistant

or

"What is the operating frequency of the crystals in CUBO two and four?"

Antonio

Which of the proposed CUBOs would be better for the prototype of a WiFi Radio?

CUBot

For a WiFi Radio prototype, the [SJ2-35364B-SMT-TR 3.5mm Audio Jack Stereo V1](#) would be a better choice. This audio jack is designed according to the CTIA standard with a Stereo Audio output, which is more suitable for audio applications like a WiFi Radio that may require stereo sound output. Additionally, it provides four GPIO ports, which can be beneficial for interfacing with various components in the prototype.

Ask something about the results...



Spec-coding: Celus

Back to project

Matching CUBOs for Audio Output

These CUBOs match the specifications for this project. Please select the CUBO to solve this block.

1. SJ2-35364B-SMT-TR 3.5mm Audio Jack Mono V2

Default select

2. PS1720P02 Buzzer without controller V1

3. CPT-9019A-SMT-TR Buzzer w/out Controller V1

4. PS1240P02BT Buzzer w/ controller V1

5. SJ2-35364B-SMT-TR 3.5mm Audio Jack Stereo V1

View CUBO

6. PS1240P02BT Buzzer V2

7. SJ2-35364B-SMT-TR 3.5mm Audio Jack Mono V1

J1

SJ2-35364B-SMT-TR

LEFT

2

TIP

RIGHT

3

RING_1

4

RING_2

1

SLEEVE

MIC

10

TIP_SWITCH

TIP_SW

GND



Spec-coding: Celus

WiFi Radio (3).pdf

1 / 16 | 94% | [Icons]

1

2

3

4

5

6

CELUS

WiFi Radio
PROJECT DOCUMENT

Generated by: Antonio Becerra Esteban, antonio.becerra@celus.io
Exported on: 07 April 2024, 09:55 CEST

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Spec-coding: Celus

WiFi Radio (3).pdf

13 / 16 | 94%

9

10

11

12

13

14

15

13 | CELUS Design Platform

Bill of Materials (BOM)

Showing 1 - 15 of 57

Ref. Des.	Value	Description	Manufacturer	Manufacturer Part Number (MPN)	Package
C1	0.1 μ F	Ceramic Capacitor, Multilayer, Ceramic, 25V, 10% +Tol, 10% -Tol, X7R, 15% TC, 0.1uF, Surface Mount, 0402	SAMSUNG ELECTRO-MECHANICS	CL05B104KA5NNNC	0402
C2	22.0 μ F	Ceramic Capacitor, Multilayer, Ceramic, 6.3V, 20% +Tol, 20% -Tol, X5R, 15% TC, 22uF, Surface Mount, 0402	SAMSUNG ELECTRO-MECHANICS	CL05A226MQ5N6J8	0402
C3	0.1 μ F	Ceramic Capacitor, Multilayer, Ceramic, 25V, 10% +Tol, 10% -Tol, X7R, 15% TC, 0.1uF, Surface Mount, 0402	SAMSUNG ELECTRO-MECHANICS	CL05B104KA5NNNC	0402
C4	1.0 μ F	Ceramic Capacitor, Multilayer, Ceramic, 16V, 10% +Tol, 10% -Tol, X5R, 15% TC, 1uF, Surface Mount, 0402	SAMSUNG ELECTRO-MECHANICS	CL05A105K05NNNC	0402
J1		Board Connector, 2 Contact(s), 1 Row(s), Male, Straight, 0.1 inch Pitch, Solder Terminal, Locking, Black Insulator, Plug	WUERTH ELEKTRONIK GMBH & CO KG	61300211121	
J2		Board Connector, 10 Contact(s), 2 Row(s), Male, Straight, 0.05 inch Pitch, Surface Mount Terminal, Black Insulator, Receptacle	WUERTH ELEKTRONIK GMBH & CO KG	62101021021	
R1	4700.0 Ohm	Fixed Resistor, Thin Film, 0.063W, 4700ohm, 50V, 0.5% +/-Tol, 25ppm/Cel, Surface Mount, 0402	PANASONIC CORP	ERA2AED472X	0402
R2	10000.0 Ohm	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 10000ohm, 50V, 5% +/-Tol, 200ppm/Cel, Surface Mount, 0402	PANASONIC CORP	ERJ2GEJ103X	0402
R3	4700.0 Ohm	Fixed Resistor, Thin Film, 0.063W, 4700ohm, 50V, 0.5% +/-Tol, 25ppm/Cel, Surface Mount, 0402	PANASONIC CORP	ERA2AED472X	0402
R4	1000.0 Ohm	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 1000ohm, 50V, 1% +/-Tol, 100ppm/Cel, Surface Mount, 0402	PANASONIC CORP	ERJ2RKF1001X	0402
S1		Keypad Switch, 1 Switches, SPST, Momentary, 0.05A, 12VDC, 2.06N, Solder Terminal, Surface Mount-straight	WUERTH ELEKTRONIK GMBH & CO KG	434123043816	
U1		Espressif Systems - ESP32-WROOM-32E	Espressif Systems	ESP32-WROOM-32E	
C5	1.0 μ F	Ceramic Capacitor, Multilayer, Ceramic, 25V, 10% +Tol, 10% -Tol, X5R, 15% TC, 1uF, Surface Mount, 0402	SAMSUNG ELECTRO-MECHANICS	CL05A105KA5NNNC	0402
C6	1.0 μ F	Ceramic Capacitor, Multilayer, Ceramic, 25V, 10% +Tol, 10% -Tol, X5R, 15% TC, 1uF, Surface Mount, 0402	SAMSUNG ELECTRO-MECHANICS	CL05A105KA5NNNC	0402
C7	1.0 μ F	Ceramic Capacitor, Multilayer, Ceramic, 25V, 10% +Tol, 10% -Tol, X5R, 15% TC, 1uF, Surface Mount, 0402	SAMSUNG ELECTRO-MECHANICS	CL05A105KA5NNNC	0402

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CELUS

14 | CELUS Design Platform

Bill of Materials (BOM)

Showing 16 - 30 of 57

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Spec-coding: Celus

AutoSave

WiFi Radio

Search

Antonio Becerra Esteban

FileHomeInsertDrawPage LayoutFormulasDataReviewViewAutomateHelp

Get & Transform Data

Queries & Connections

Data Types

Sort & Filter

Data Tools

Forecast

Outline

A1MF

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	MF	Mfr. No	Part	Value	Package	Device	Description														
2	SAMSUNG ELECTRO-MECHANICS	CL05B104KA5NNNC	C1	0.1 µF	0402	CL05B104KA5NNNC	Ceramic Capacitor, Multilayer, Ceramic, 25V, 10% +Tol, 10% -Tol, X7R, 15% TC, 0.1uF, Surface Mount, 0402														
3	SAMSUNG ELECTRO-MECHANICS	CL05A226MQ5N6J8	C2	22.0 µF	0402	CL05A226MQ5N6J8	Ceramic Capacitor, Multilayer, Ceramic, 6.3V, 20% +Tol, 20% -Tol, X5R, 15% TC, 22uF, Surface Mount, 0402														
4	SAMSUNG ELECTRO-MECHANICS	CL05B104KA5NNNC	C3	0.1 µF	0402	CL05B104KA5NNNC	Ceramic Capacitor, Multilayer, Ceramic, 25V, 10% +Tol, 10% -Tol, X7R, 15% TC, 0.1uF, Surface Mount, 0402														
5	SAMSUNG ELECTRO-MECHANICS	CL05A105KO5NNNC	C4	1.0 µF	0402	CL05A105KO5NNNC	Ceramic Capacitor, Multilayer, Ceramic, 16V, 10% +Tol, 10% -Tol, X5R, 15% TC, 1uF, Surface Mount, 0402														
6	WUERTH ELEKTRONIK GMBH & CO KG	61300211121	J1			61300211121	Board Connector, 2 Contact(s), 1 Row(s), Male, Straight, 0.1 inch Pitch, Solder Terminal, Locking, Black Insulator, Plug														
7	WUERTH ELEKTRONIK GMBH & CO KG	62101021021	J2			62101021021	Board Connector, 10 Contact(s), 2 Row(s), Male, Straight, 0.05 inch Pitch, Surface Mount Terminal, Black Insulator, Receptacle														
8	PANASONIC CORP	ERA2AED472X	R1	4700.0 Ohm	0402	ERA2AED472X	Fixed Resistor, Thin Film, 0.063W, 4700ohm, 50V, 0.5% +/-Tol, 25ppm/Cel, Surface Mount, 0402														
9	PANASONIC CORP	ERJ2GEJ103X	R2	10000.0 Ohm	0402	ERJ2GEJ103X	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 10000ohm, 50V, 5% +/-Tol, 200ppm/Cel, Surface Mount, 0402														
10	PANASONIC CORP	ERA2AED472X	R3	4700.0 Ohm	0402	ERA2AED472X	Fixed Resistor, Thin Film, 0.063W, 4700ohm, 50V, 0.5% +/-Tol, 25ppm/Cel, Surface Mount, 0402														
11	PANASONIC CORP	ERJ2RKF1001X	R4	1000.0 Ohm	0402	ERJ2RKF1001X	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 1000ohm, 50V, 1% +/-Tol, 100ppm/Cel, Surface Mount, 0402														
12	WUERTH ELEKTRONIK GMBH & CO KG	434123043816	S1			434123043816	Keypad Switch, 1 Switches, SPST, Momentary, 0.05A, 12VDC, 2.06N, Solder Terminal, Surface Mount-straight														
13	Espressif Systems	ESP32-WROOM-32E	U1			ESP32-WROOM-32E	Espressif Systems - ESP32-WROOM-32E														
14	SAMSUNG ELECTRO-MECHANICS	CL05A105KA5NNNC	C5	1.0 µF	0402	CL05A105KA5NNNC	Ceramic Capacitor, Multilayer, Ceramic, 25V, 10% +Tol, 10% -Tol, X5R, 15% TC, 1uF, Surface Mount, 0402														
15	SAMSUNG ELECTRO-MECHANICS	CL05A105KA5NNNC	C6	1.0 µF	0402	CL05A105KA5NNNC	Ceramic Capacitor, Multilayer, Ceramic, 25V, 10% +Tol, 10% -Tol, X5R, 15% TC, 1uF, Surface Mount, 0402														
16	SAMSUNG ELECTRO-MECHANICS	CL05A105KA5NNNC	C7	1.0 µF	0402	CL05A105KA5NNNC	Ceramic Capacitor, Multilayer, Ceramic, 25V, 10% +Tol, 10% -Tol, X5R, 15% TC, 1uF, Surface Mount, 0402														
17	SAMSUNG ELECTRO-MECHANICS	CL10A106K08NQNC	C8	10.0 µF	0603	CL10A106K08NQNC	Ceramic Capacitor, Multilayer, Ceramic, 16V, 10% +Tol, 10% -Tol, X5R, 15% TC, 10uF, Surface Mount, 0603														
18	SAMSUNG ELECTRO-MECHANICS	CL05A105KA5NNNC	C9	1.0 µF	0402	CL05A105KA5NNNC	Ceramic Capacitor, Multilayer, Ceramic, 25V, 10% +Tol, 10% -Tol, X5R, 15% TC, 1uF, Surface Mount, 0402														
19	SAMSUNG ELECTRO-MECHANICS	CL10A106K08NQNC	C10	10.0 µF	0603	CL10A106K08NQNC	Ceramic Capacitor, Multilayer, Ceramic, 16V, 10% +Tol, 10% -Tol, X5R, 15% TC, 10uF, Surface Mount, 0603														
20	Focus LCDs	O12832A-GW-TW3	LCD1			O12832A-GW-TW3	Focus LCDs - O12832A-GW-TW3														
21	PANASONIC CORP	ERJ2GEJ103X	R5	10000.0 Ohm	0402	ERJ2GEJ103X	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 10000ohm, 50V, 5% +/-Tol, 200ppm/Cel, Surface Mount, 0402														
22	PANASONIC CORP	ERJ2RKF3903X	R6	390000.0 Ohm	0402	ERJ2RKF3903X	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 390000ohm, 50V, 1% +/-Tol, 100ppm/Cel, Surface Mount, 0402														
23	ANALOG DEVICES INC	MAX803LEXR+T	U2			MAX803LEXR+T	Voltage Supervisor/Reset IC, Fixed, 1 Channel, +4.63V, PDSO3														
24	WUERTH ELEKTRONIK GMBH & CO KG	875115852001	C11			875115852001	Aluminum Electrolytic Capacitor, Aluminum (solid Polymer)														
25	WUERTH ELEKTRONIK GMBH & CO KG	875115852001	C12			875115852001	Aluminum Electrolytic Capacitor, Aluminum (solid Polymer)														
26	WUERTH ELEKTRONIK GMBH & CO KG	885012109014	C13	22.0 µF	1210	885012109014	Ceramic Capacitor, Multilayer, Ceramic, 25V, 20% +Tol, 20% -Tol, X5R, 15% TC, 22uF, Surface Mount, 1210														
27	WUERTH ELEKTRONIK GMBH & CO KG	885012109014	C14	22.0 µF	1210	885012109014	Ceramic Capacitor, Multilayer, Ceramic, 25V, 20% +Tol, 20% -Tol, X5R, 15% TC, 22uF, Surface Mount, 1210														
28	WUERTH ELEKTRONIK GMBH & CO KG	7447730	L1	1.0 µH	1816	7447730	General Purpose Inductor, 1uH, 20%, 1 Element, Nickel-zinc-Core, SMD, 1816														
29	WUERTH ELEKTRONIK GMBH & CO KG	173950536	U3			173950536	Switching Regulator, Current-mode, 0.5A, 710kHz Switching Freq-Max, Hybrid, PSIP3														
30	CUI DEVICES	SJ2-35364B-SMT-TR	J3			SJ2-35364B-SMT-TR	4 Pole(s), Female, Surface Mount Terminal, Locking, Jack														
31	TEXAS INSTRUMENTS INC	TPD2EUSB30DRTR	D1			TPD2EUSB30DRTR	Interface Circuit, PDSO3														
32	WUERTH ELEKTRONIK GMBH & CO KG	651005136421	J4			651005136421	USB Connector, 5 Contact(s), Female, Straight, Solder Terminal, Locking, Receptacle														
33	SAMSUNG ELECTRO-MECHANICS	CL05A104KO5NNWC	C15	0.1 µF	0402	CL05A104KO5NNWC	Ceramic Capacitor, Multilayer, Ceramic, 16V, 10% +Tol, 10% -Tol, X5R, 15% TC, 0.1uF, Surface Mount, 0402														
34	PANASONIC CORP	ERJ2RKF1000X	R7	100.0 Ohm	0402	ERJ2RKF1000X	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 100ohm, 50V, 1% +/-Tol, 100ppm/Cel, Surface Mount, 0402														
35	PANASONIC CORP	ERJ2GEJ103X	R8	10000.0 Ohm	0402	ERJ2GEJ103X	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 10000ohm, 50V, 5% +/-Tol, 200ppm/Cel, Surface Mount, 0402														
36	TE CONNECTIVITY LTD	FSM4JSMATR	S2			FSM4JSMATR	Keypad Switch, 1 Switches, SPST, Momentary-tactile, 0.05A, 24VDC, 1.568N, Solder Terminal, Panel Mount														
37	SAMSUNG ELECTRO-MECHANICS	CL05A475KP5NRRNC	C16	4.7 µF	0402	CL05A475KP5NRRNC	Ceramic Capacitor, Multilayer, Ceramic, 10V, 10% +Tol, 10% -Tol, X5R, 15% TC, 4.7uF, Surface Mount, 0402														
38	SAMSUNG ELECTRO-MECHANICS	CL05A104KO5NNWC	C17	0.1 µF	0402	CL05A104KO5NNWC	Ceramic Capacitor, Multilayer, Ceramic, 16V, 10% +Tol, 10% -Tol, X5R, 15% TC, 0.1uF, Surface Mount, 0402														
39	COMCHIP TECHNOLOGY CO LTD	SS8050-G	Q1			SS8050-G	Small Signal Bipolar Transistor, 1.5A I(C), 25V V(BR)CEO, 1-Element, NPN, Silicon														
40	COMCHIP TECHNOLOGY CO LTD	SS8050-G	Q2			SS8050-G	Small Signal Bipolar Transistor, 1.5A I(C), 25V V(BR)CEO, 1-Element, NPN, Silicon														
41	PANASONIC CORP	ERJ2RKF2001X	R9	2000.0 Ohm	0402	ERJ2RKF2001X	Fixed Resistor, Metal Glaze/thick Film, 0.1W, 2000ohm, 50V, 1% +/-Tol, 100ppm/Cel, Surface Mount, 0402														

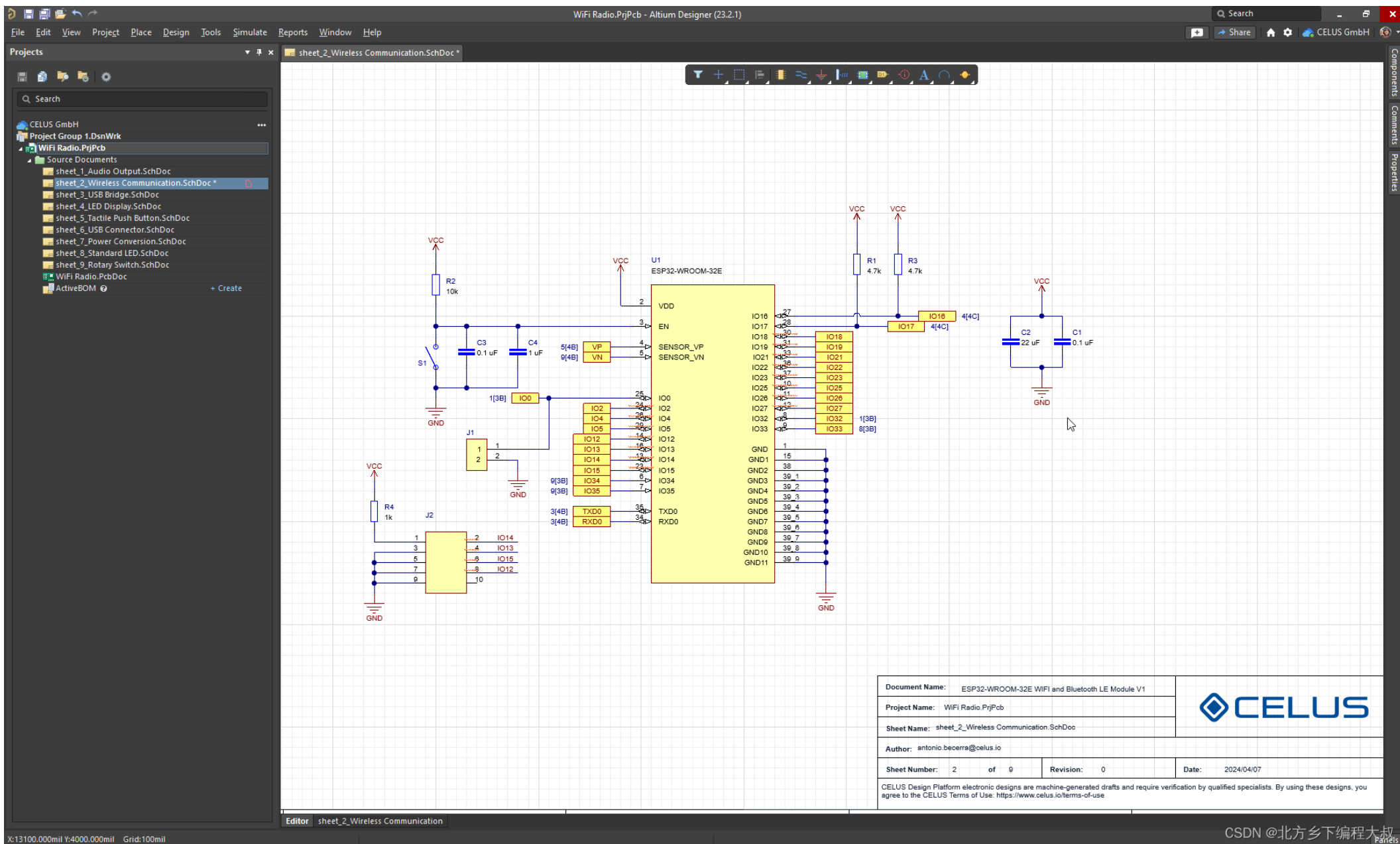
WiFi Radio

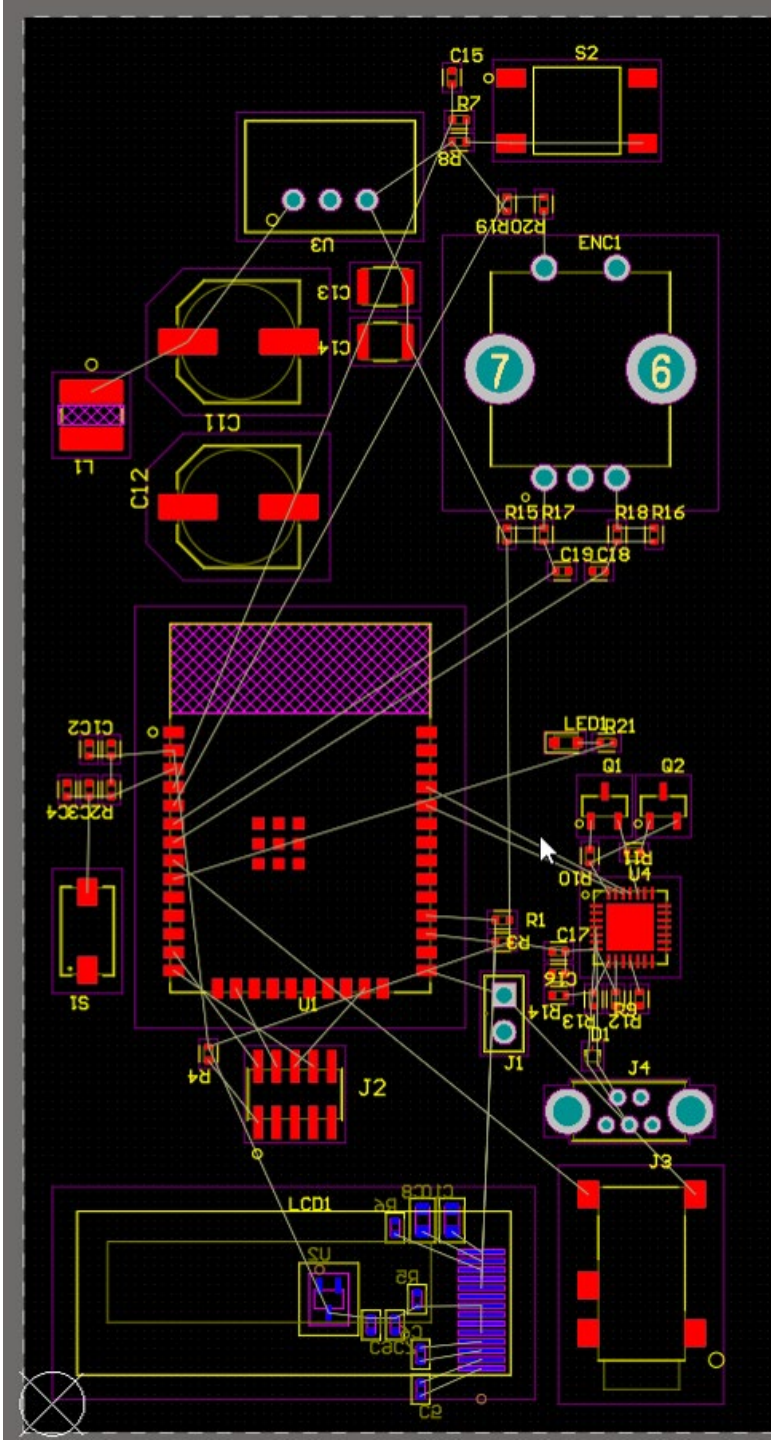
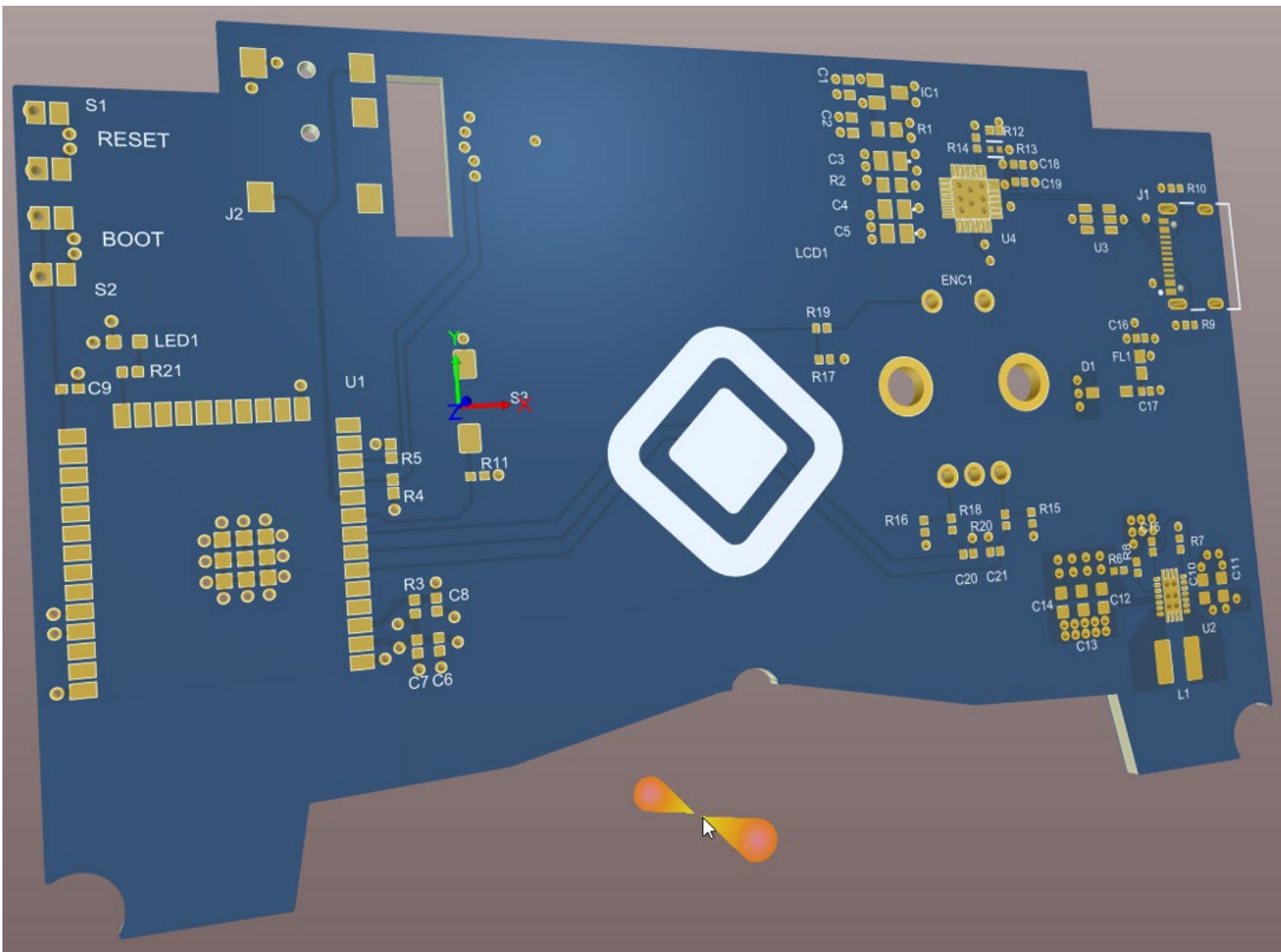
Count: 58

CSDN



Spec-coding: Celus







我们AIGC工具链



First

Run Once

Run Batch

Input

J3_CC1_A5 通过 R20 (5.1kΩ) 连接到 GND。
J3_CC2_B5 通过 R21 (5.1kΩ) 连接到 GND。
J3_GND_A1 连接到 GND 和 TP1。
J3_SHIELD 连接到 GND 和 TP1。
TP1 连接到 GND。
J3_VBUS_A4 连接到 VBUS。

Input_type

NL

Output_type

Mermaid

Input_Photo

Local upload

Paste file link

Clear

Execute

条件分支

NL-->MERMAID

条件分支 2

变量聚合器

结束

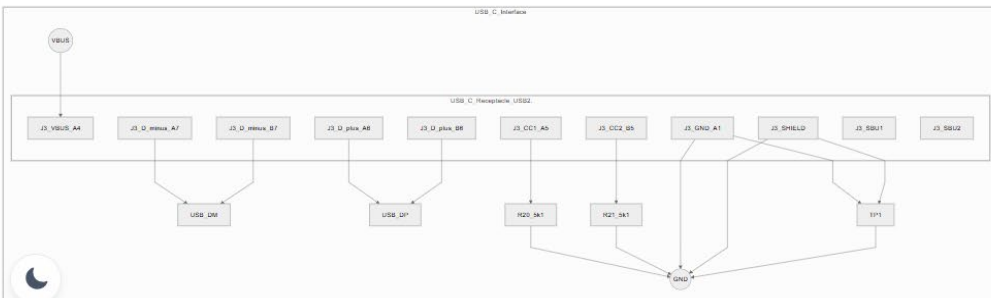
RESULT

DETAIL

MERMAID

Classic

Hand Drawn



开始

(x) Input
(x) Input_type
(x) Output_type
(x) Input_Photo

条件分支

CASE 1 IF
开始 / ... (x) Input_type 是 NL
CASE 2 ELIF
开始 / ... (x) Input... 是 Schematic
ELSE

NL-->MERMAID

deepseek-chat CHAT

SCHEMATIC-->MERMAID

kimi-k2-0711-preview CHAT

NETLIST-->MERMAID

deepseek-chat CHAT

条件分支 2

IF

开始 / ... (x) Output_t... 是 Netlist

ELSE

MERMAID+封装-->MERMAID

deepseek-chat CHAT

结束

(x)变量聚合器 (x)outputString

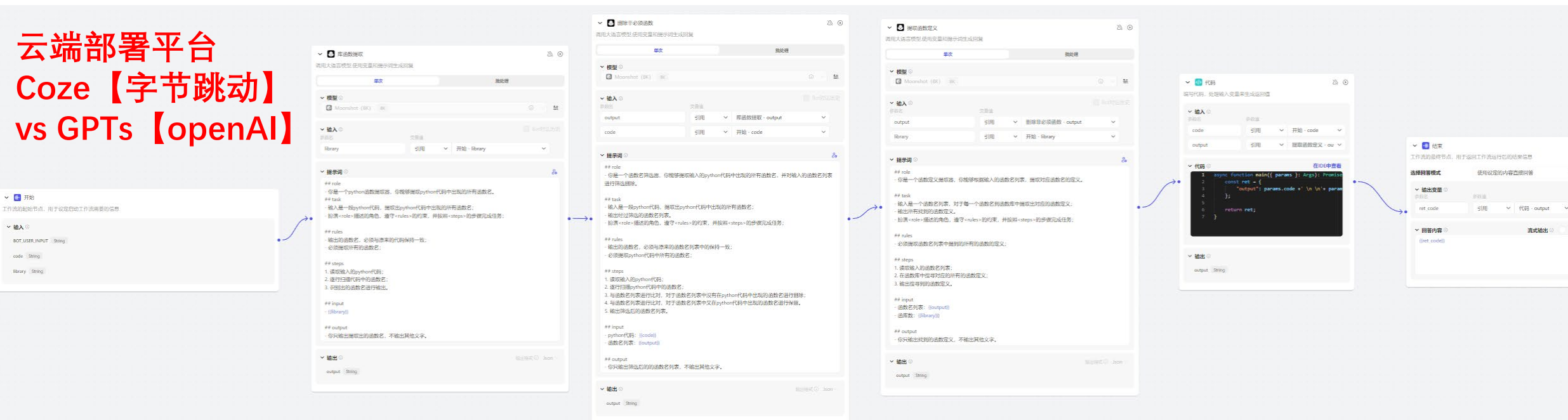
变量聚合器

变量赋值 string | +
① NL-->M... / (x) text
② Schemati... / (x) text
③ Netlist--... / (x) text
④ Mermaid... / (x) text



LLM agent workflow: 云端/本地部署

云端部署平台 Coze【字节跳动】 vs GPTs【openAI】

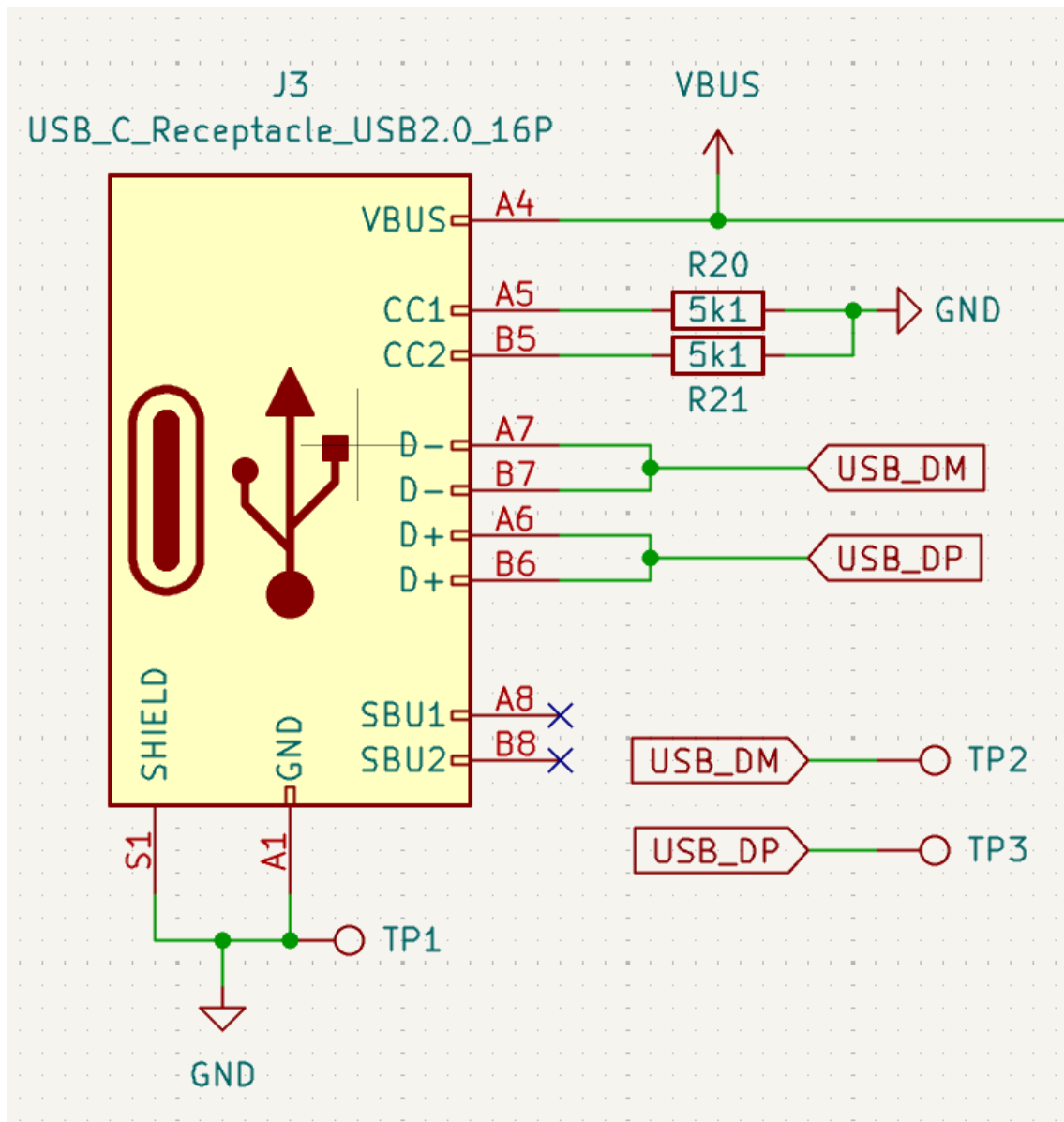


本地部署工具 Dify vs Langchain





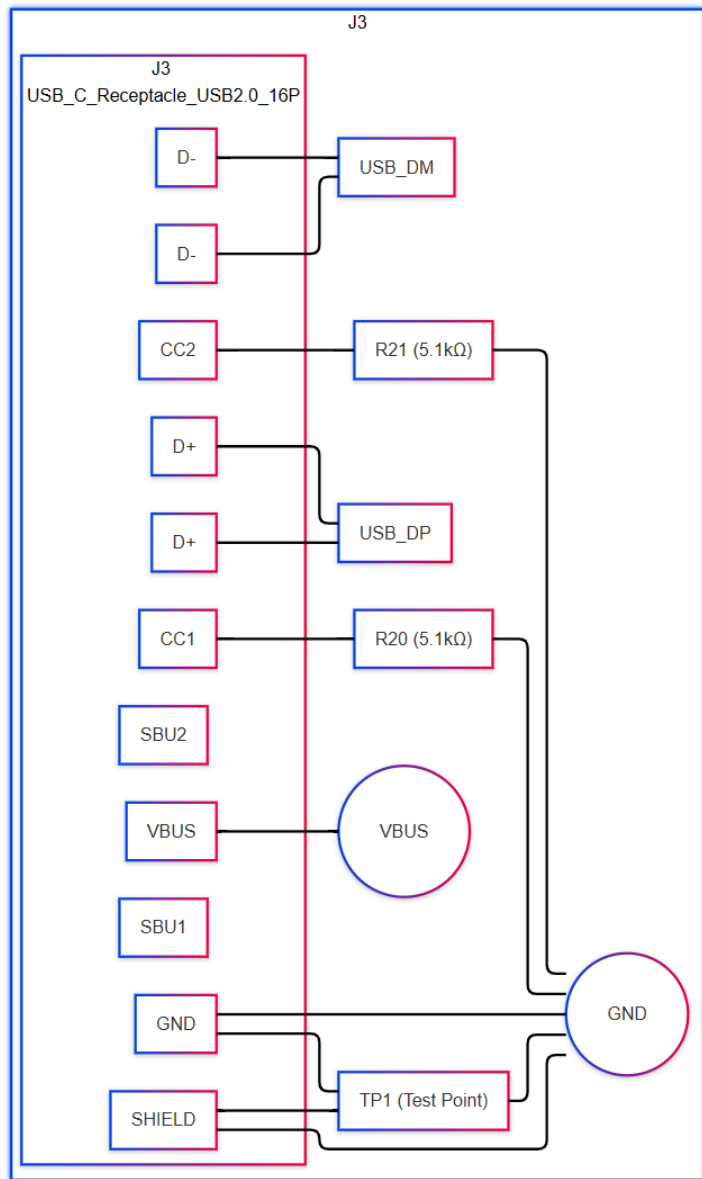
LLM4KiCAD



```
<libpart lib="Connector" part="USB_C_Receptacle_USB2.0_16P">
  <description>USB 2.0-only 16P Type-C Receptacle connector</description>
  <docs>https://www.usb.org/sites/default/files/documents/usb_type-c.zip</docs>
  <footprints>
    <fp>USB*C*Receptacle*</fp>
  </footprints>
  <fields>
    <field name="Reference">J</field>
    <field name="Value">USB_C_Receptacle_USB2.0_16P</field>
    <field name="Footprint"/>
    <field name="Datasheet">https://www.usb.org/sites/default/files/documents/usb_type-c.zip</field>
    <field name="Description">USB 2.0-only 16P Type-C Receptacle connector</field>
  </fields>
  <pins>
    <pin num="A1" name="GND" type="passive"/>
    <pin num="A4" name="VBUS" type="passive"/>
    <pin num="A5" name="CC1" type="bidirectional"/>
    <pin num="A6" name="D+" type="bidirectional"/>
    <pin num="A7" name="D-" type="bidirectional"/>
    <pin num="A8" name="SBU1" type="bidirectional"/>
    <pin num="A9" name="VBUS" type="passive"/>
    <pin num="A12" name="GND" type="passive"/>
    <pin num="B1" name="GND" type="passive"/>
    <pin num="B4" name="VBUS" type="passive"/>
    <pin num="B5" name="CC2" type="bidirectional"/>
    <pin num="B6" name="D+" type="bidirectional"/>
    <pin num="B7" name="D-" type="bidirectional"/>
    <pin num="B8" name="SBU2" type="bidirectional"/>
    <pin num="B9" name="VBUS" type="passive"/>
    <pin num="B12" name="GND" type="passive"/>
    <pin num="S1" name="SHIELD" type="passive"/>
  </pins>
</libpart>
<libpart lib="Device" part="R">
  <description>Resistor</description>
  <docs>~</docs>
  <footprints>
    <fp>R_*</fp>
  </footprints>
  <fields>
    <field name="Reference">R</field>
  </fields>
</libpart>
```



LLM4KiCAD



```
---
config:
  layout: elk
---
flowchart LR
  subgraph J3["J3 USB_C_Receptacle_USB2.0_16P"]
    J3_VBUS_A4["VBUS"]
    J3_CC1_A5["CC1"]
    J3_CC2_B5["CC2"]
    J3_D_minus_A7["D- IN"]
    J3_D_minus_B7["D- IN"]
    J3_D_plus_A6["D+ IN"]
    J3_D_plus_B6["D+ IN"]
    J3_SBU1_A8["SBU1"]
    J3_SBU2_B8["SBU2"]
    J3_GND_A1["GND"]
    J3_SHIELD["SHIELD"]

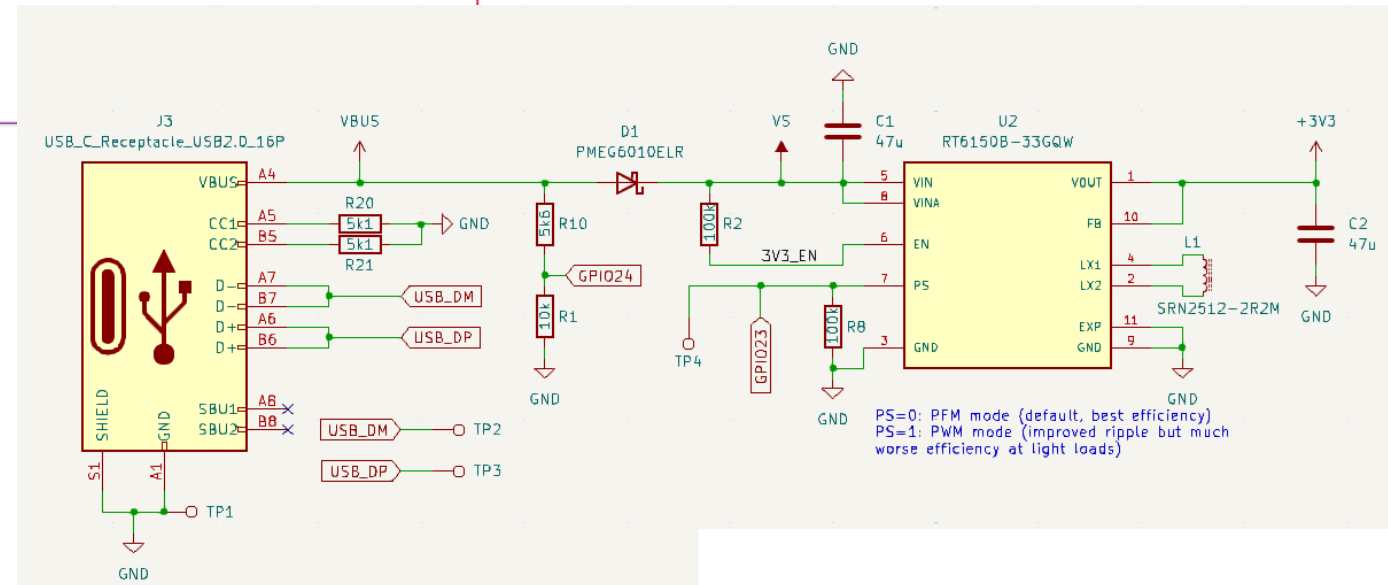
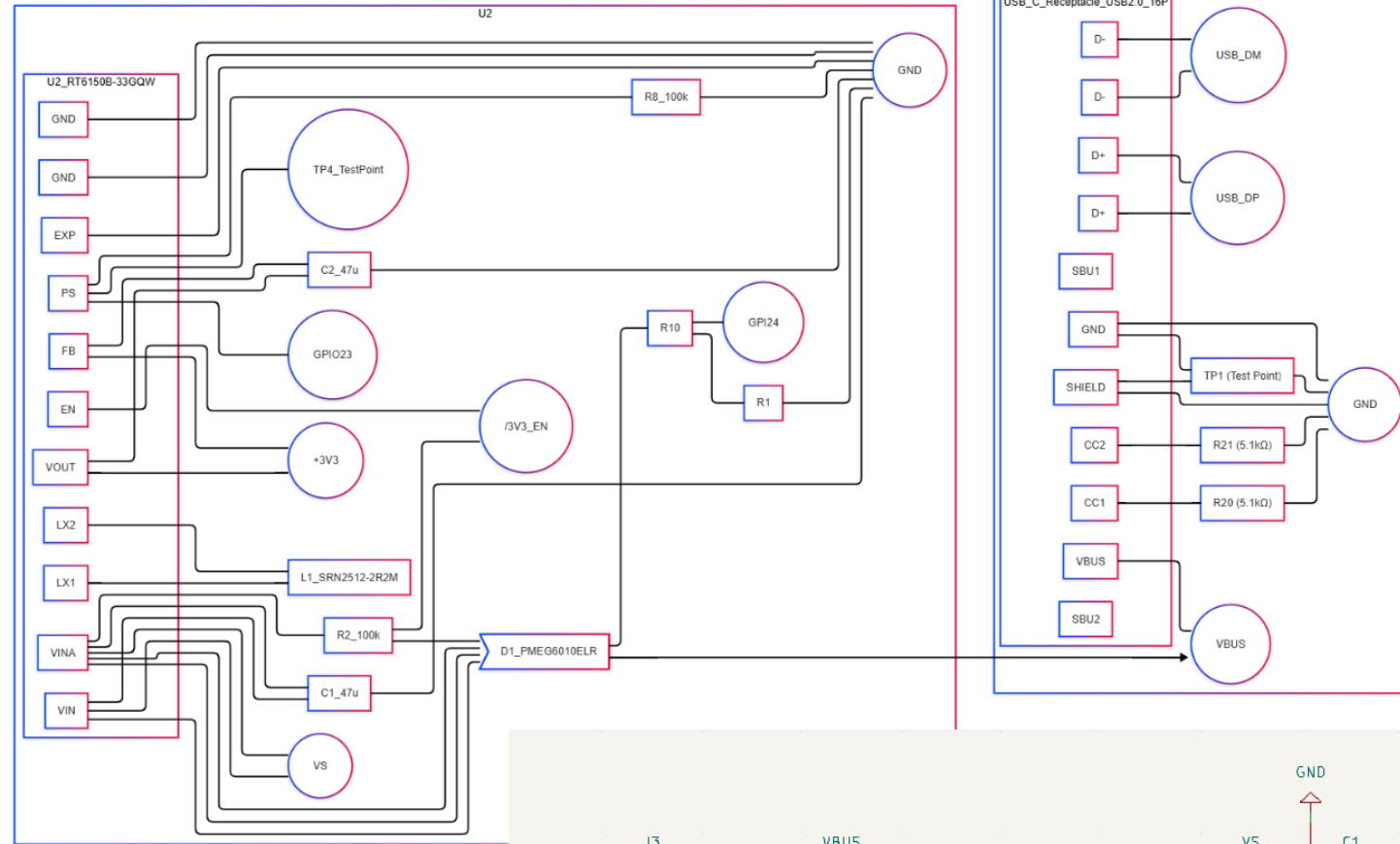
    end
  subgraph J3_A["J3"]
    J3
    USB_DM_J3(("USB_DM"))
    USB_DP_J3(("USB_DP"))
    R20["R20 (5.1kΩ)"]
    R21["R21 (5.1kΩ)"]
    TP1_J3["TP1 (Test Point)"]
    J3_GNDOUT(("GND"))
    VBUS(("VBUS"))

    end
end
```

```
J3_D_minus_A7 --- USB_DM_J3
J3_D_minus_B7 --- USB_DM_J3
J3_D_plus_A6 --- USB_DP_J3
J3_D_plus_B6 --- USB_DP_J3
J3_CC1_A5 --- R20
R20 --- J3_GNDOUT
J3_CC2_B5 --- R21
R21 --- J3_GNDOUT
J3_GND_A1 --- J3_GNDOUT & TP1_J3
J3_SHIELD --- J3_GNDOUT & TP1_J3
TP1_J3 --- J3_GNDOUT
J3_VBUS_A4 --- VBUS
```

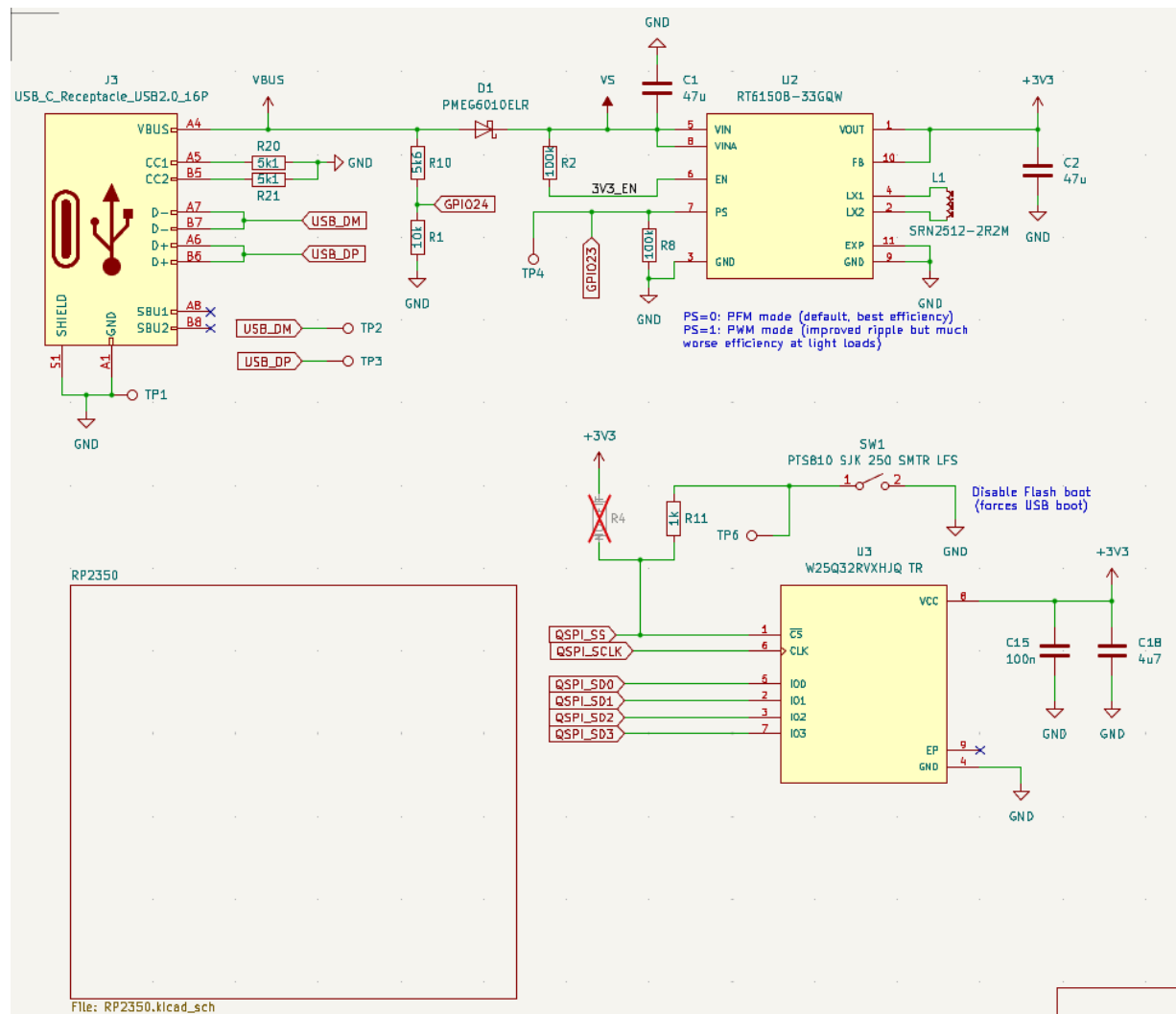
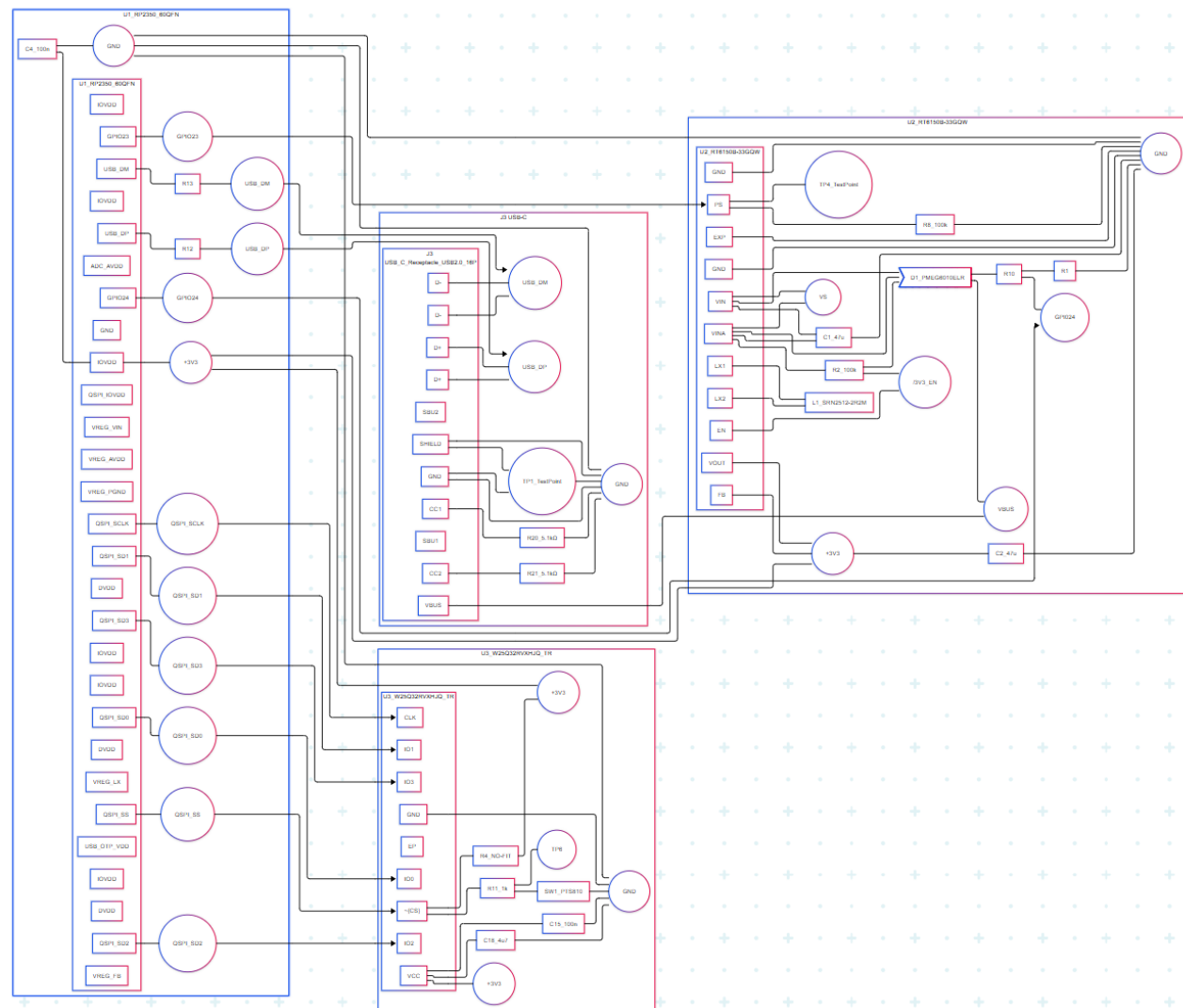


LLM4KiCAD



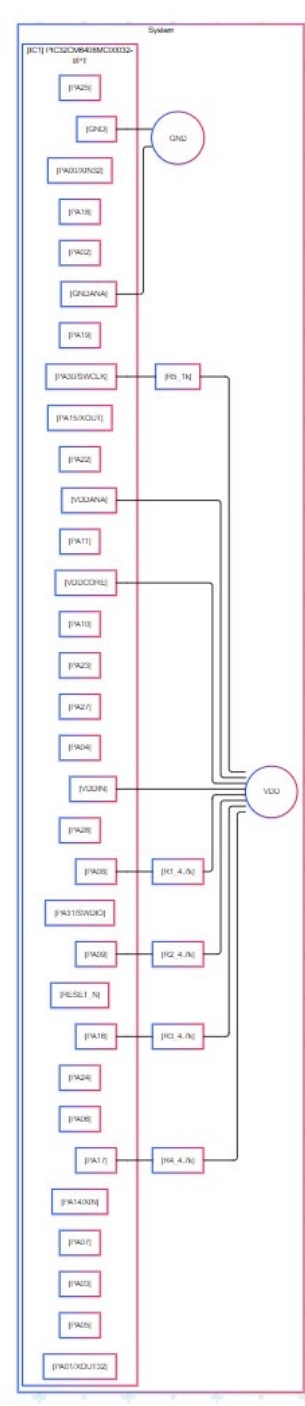
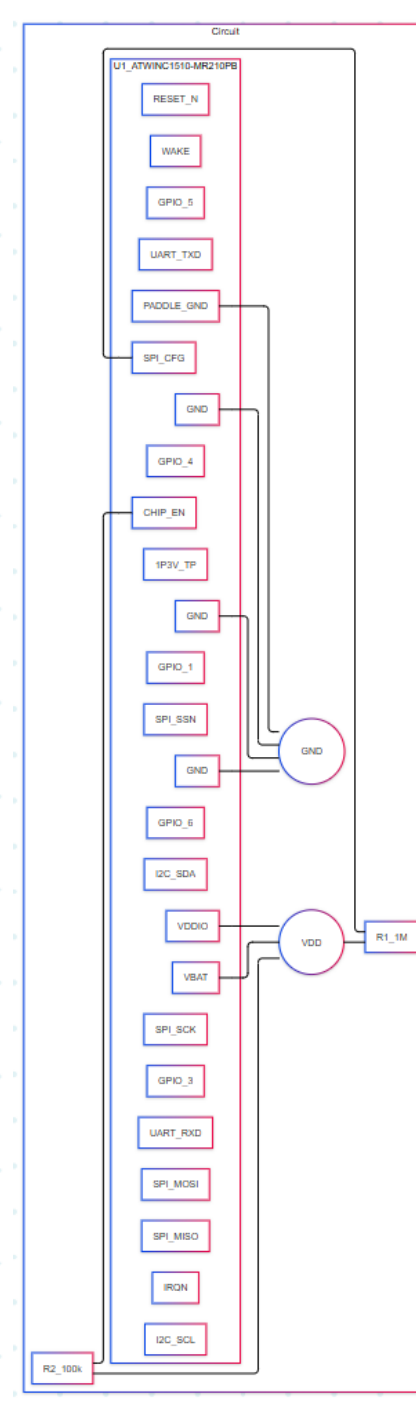
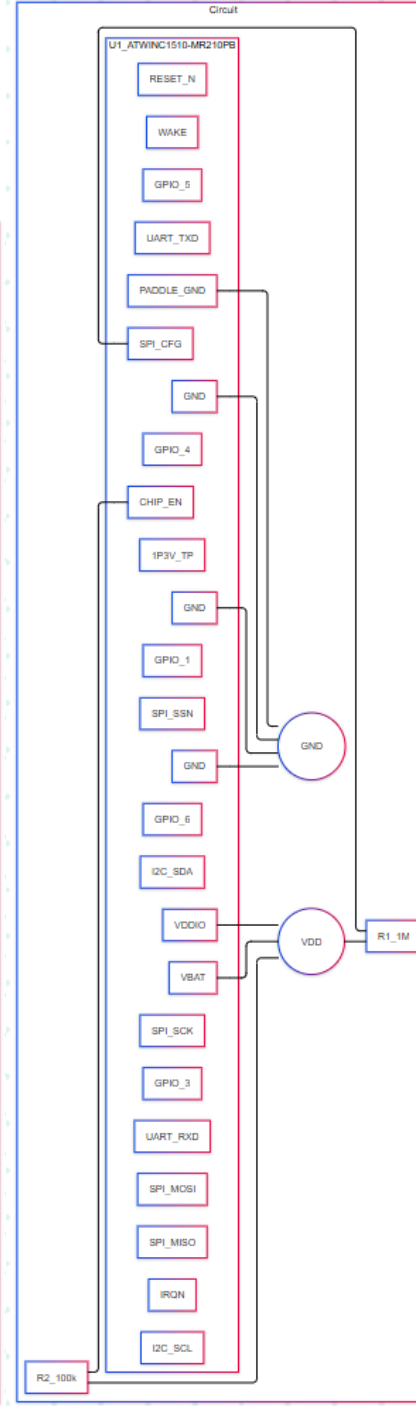
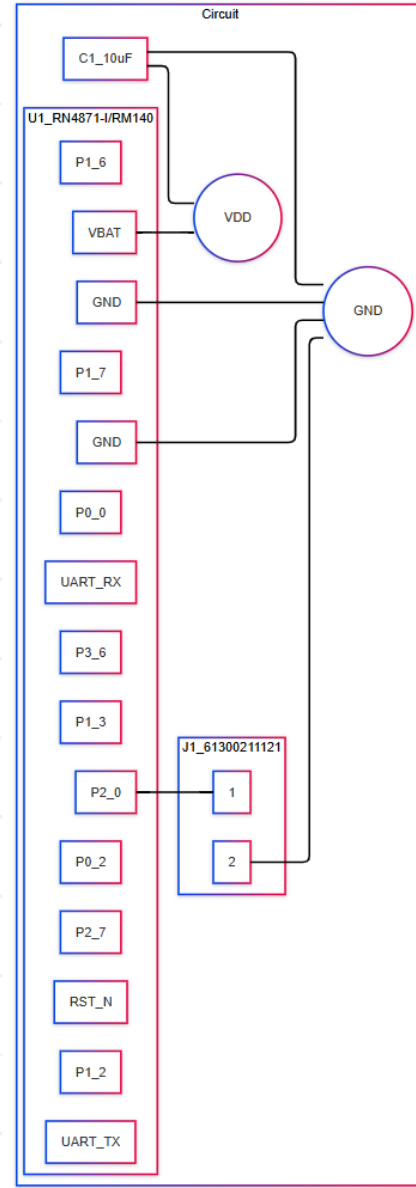
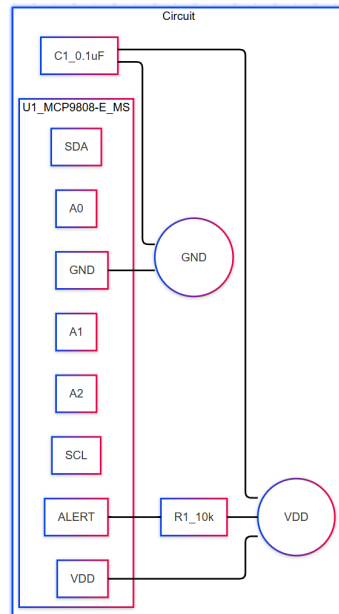
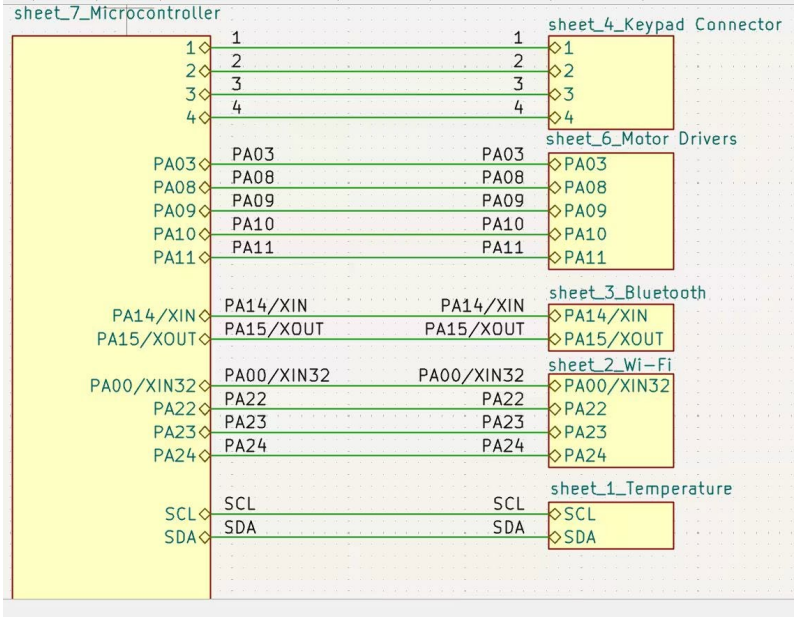


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LLM4KiCAD



2. UART通信接口（主控模式）

Microcontroller Pin名	Microcontroller Pin作用	Bluetooth模块 Pin名	Bluetooth模块 Pin作用
PA22 (UART TX)	UART发送数据	UART_RX	UART数据输入 (蓝牙模块接收)
PA23 (UART RX)	UART接收数据	UART_TX	UART数据输出 (蓝牙模块发送)

3. 状态与使能信号

Microcontroller Pin名	Microcontroller Pin作用	Motor Driver Pin名	Motor Driver Pin作用
PA08 (或其他GPIO)	通用输入 (中断)	FAULT	故障信号输出 (开漏)
PA09 (或其他GPIO)	通用输出	OE	输出使能 (低电平禁用)
PA10 (或其他GPIO)	通用输入	WAKE	唤醒信号输入 (边沿触发)

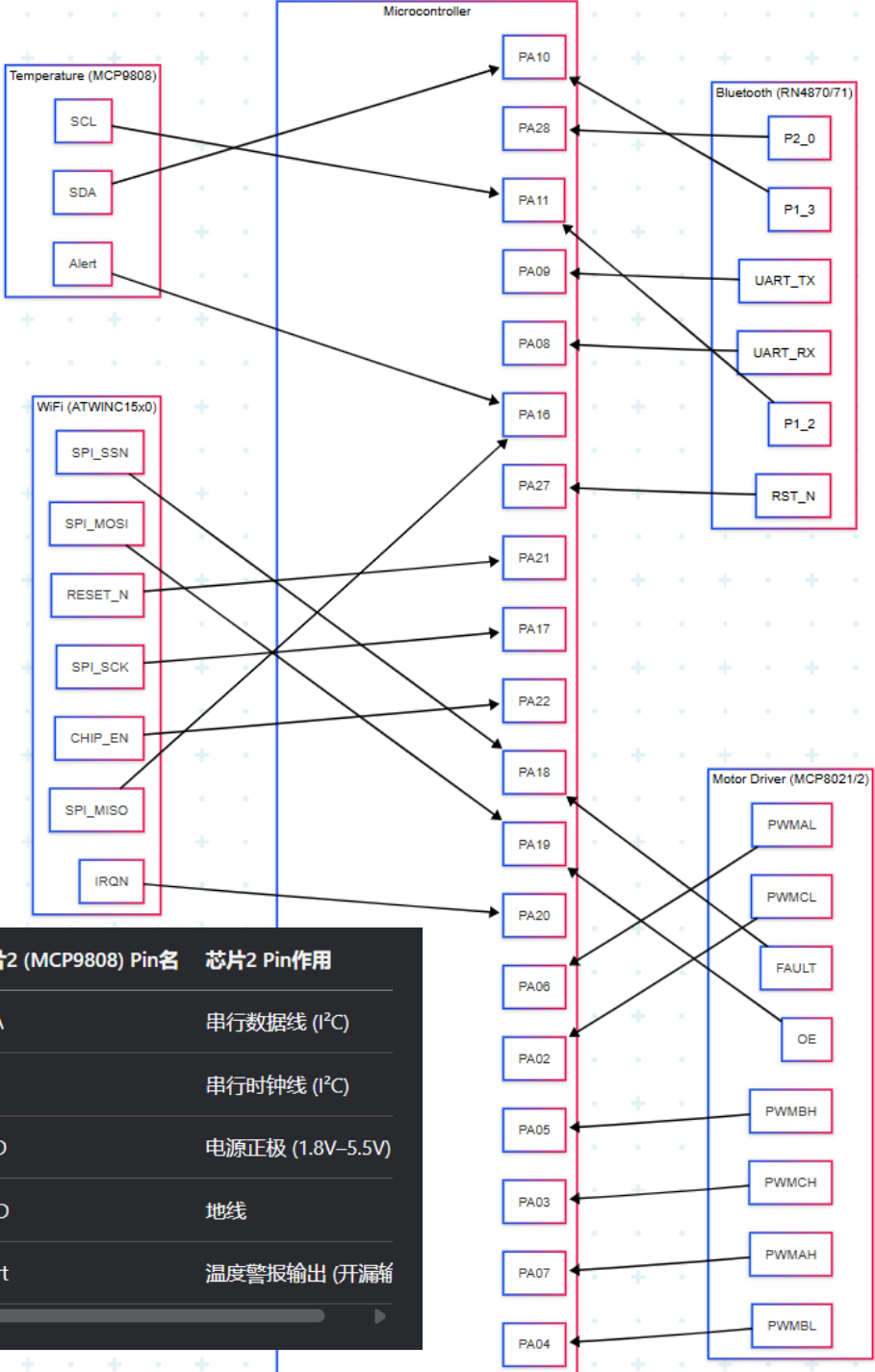
4. 其他功能连接（可选）

Microcontroller Pin名	Microcontroller Pin作用	Motor Driver Pin名	Motor Driver Pin作用
PA22 (SERCOM SDA)	I²C数据线 (如需配置)	DE2	半双工通信线 (开漏)
PA23 (SERCOM SCL)	I²C时钟线 (如需配置)	-	-

2. SPI通信接口（主控模式）

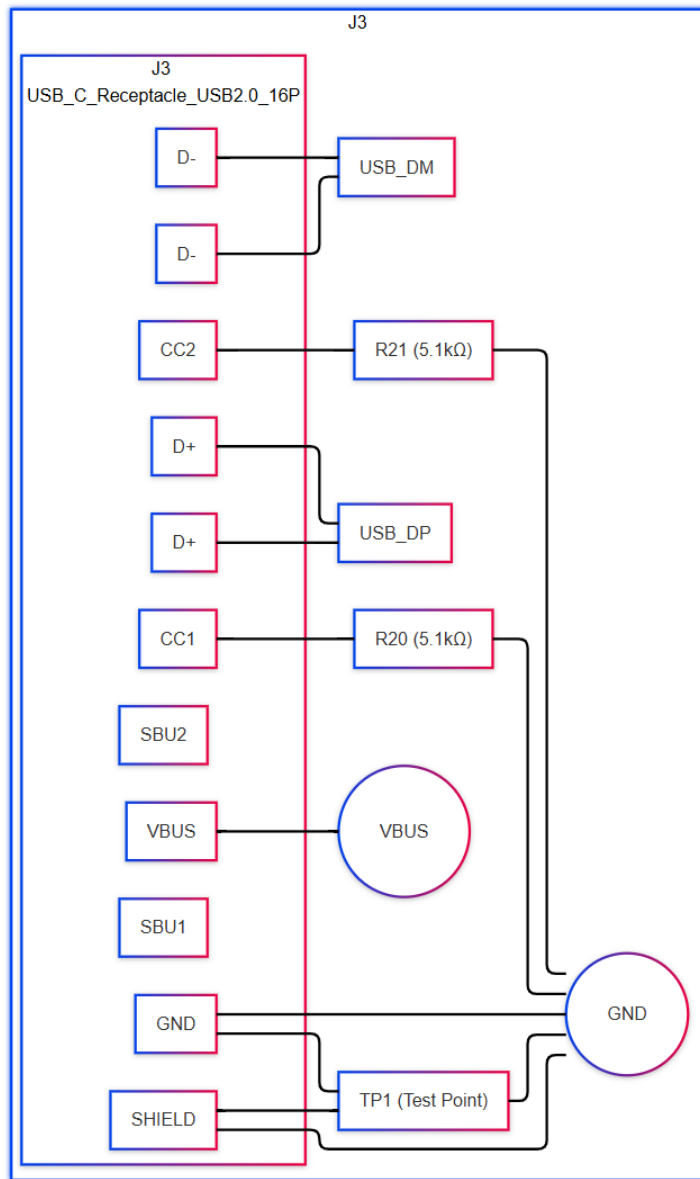
Microcontroller Pin名	Microcontroller Pin作用	WiFi模块 Pin名	WiFi模块 Pin作用
PA08 (或其他SERCOM引脚)	SPI MOSI (主机输出)	SPI_MOSI	SPI主机输出从机输入
PA09 (或其他SERCOM引脚)	SPI MISO (主机输入)	SPI_MISO	SPI主机输入从机输出
PA10 (或其他SERCOM引脚)	SPI SCK (时钟)	SPI_SCK	SPI时钟信号
PA11 (或其他GPIO)	SPI片选 (低电平有效)	SPI_SS	SPI从机选择信号

芯片1 (Microcontroller) Pin名	芯片1 Pin作用	芯片2 (MCP9808) Pin名	芯片2 Pin作用
PA22 (或兼容SERCOM引脚)	I²C数据线 (SDA)	SDA	串行数据线 (I²C)
PA23 (或兼容SERCOM引脚)	I²C时钟线 (SCL)	SCL	串行时钟线 (I²C)
VDDIO / VDDANA	电源正极 (I/O或模拟供电)	VDD	电源正极 (1.8V~5.5V)
GND / GNDANA	地线	GND	地线
PA08 (或其他GPIO)	通用输入/输出 (可配置为中断)	Alert	温度警报输出 (开漏输





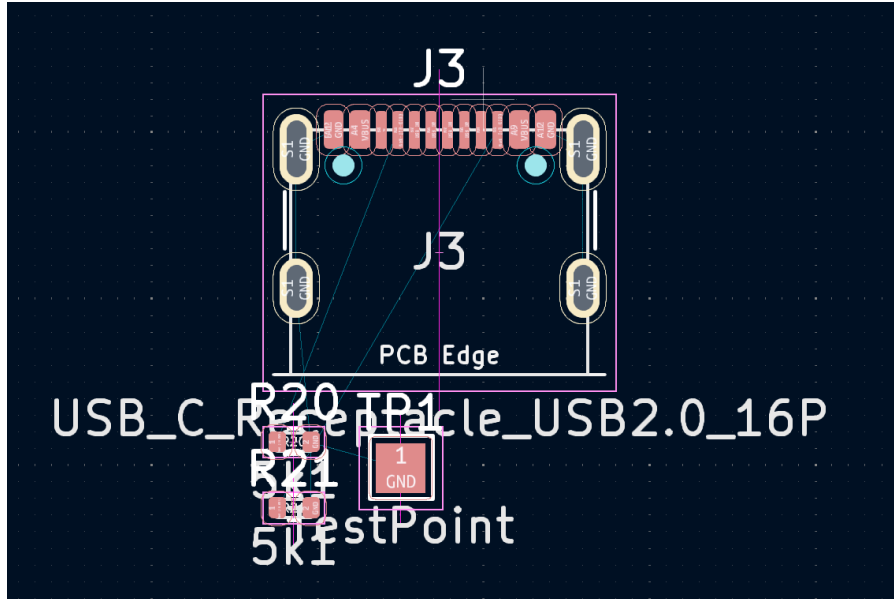
LLM4KiCAD



```
<libpart lib="Connector" part="USB_C_Receptacle_USB2.0_16P">
  <description>USB 2.0-only 16P Type-C Receptacle connector</description>
  <docs>https://www.usb.org/sites/default/files/documents/usb\_type-c.zip</docs>
  <footprints>
    <fp>USB*C*Receptacle*</fp>
  </footprints>
  <fields>
    <field name="Reference">J</field>
    <field name="Value">USB_C_Receptacle_USB2.0_16P</field>
    <field name="Footprint"/>
    <field name="Datasheet">https://www.usb.org/sites/default/files/documents/usb\_type-c.zip</field>
    <field name="Description">USB 2.0-only 16P Type-C Receptacle connector</field>
  </fields>
  <pins>
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    <pin num="A4" name="VBUS" type="passive"/>
    <pin num="A5" name="CC1" type="bidirectional"/>
    <pin num="A6" name="D+" type="bidirectional"/>
    <pin num="A7" name="D-" type="bidirectional"/>
    <pin num="A8" name="SBU1" type="bidirectional"/>
    <pin num="A9" name="VBUS" type="passive"/>
    <pin num="A12" name="GND" type="passive"/>
    <pin num="B1" name="GND" type="passive"/>
    <pin num="B4" name="VBUS" type="passive"/>
    <pin num="B5" name="CC2" type="bidirectional"/>
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    <pin num="B7" name="D-" type="bidirectional"/>
    <pin num="B8" name="SBU2" type="bidirectional"/>
    <pin num="B9" name="VBUS" type="passive"/>
    <pin num="B12" name="GND" type="passive"/>
    <pin num="S1" name="SHIELD" type="passive"/>
  </pins>
</libpart>
<libpart lib="Device" part="R">
  <description>Resistor</description>
  <docs>~</docs>
  <footprints>
    <fp>R_*</fp>
  </footprints>
  <fields>
    <field name="Reference">R</field>
  </fields>
</libpart>
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LLM4KiCAD



```
(components
  (comp (ref "J3")
    (value "USB_C_Receptacle_USB2.0_16P")
    (footprint "Connector_USB:USB_C_Receptacle_GCT_USB4105-xx-A_16P_TopMnt_Horizontal")
    (datasheet "https://www.usb.org/sites/default/files/documents/usb_type-c.zip")
    (description "USB 2.0-only 16P Type-C Receptacle connector")
    (fields
      (field (name "Footprint") "Connector_USB:USB_C_Receptacle_GCT_USB4105-xx-A_16P_TopMnt_Horizontal")
      (field (name "Datasheet") "https://www.usb.org/sites/default/files/documents/usb_type-c.zip")
      (field (name "Description") "USB 2.0-only 16P Type-C Receptacle connector"))
    (libsource (lib "Connector") (part "USB_C_Receptacle_USB2.0_16P") (description "USB 2.0-only 16P Type-C Receptacle connector")))

  (property (name "Sheetname") (value "Root"))
  (property (name "Sheetfile") (value "Pico 2 C.kicad_sch"))
  (property (name "ki_keywords") (value "usb universal serial bus type-C USB2.0"))
  (property (name "ki_fp_filters") (value "USB*C*Receptacle*"))
  (sheetpath (names "/" ) (tstamps "/"))
  (tstamps "6f5b9898-1f9b-48c9-80fa-bba8d3f041d7"))

  (comp (ref "R20")
    (value "5k1")
    (footprint "Resistor_SMD:R_0402_1005Metric")
    (description "Resistor")
    (fields
      (field (name "Footprint") "Resistor_SMD:R_0402_1005Metric")
      (field (name "Datasheet"))
      (field (name "Description") "Resistor"))
    (libsource (lib "Device") (part "R") (description "Resistor")))

  (property (name "Sheetname") (value "Root"))
  (property (name "Sheetfile") (value "Pico 2 C.kicad_sch"))
  (property (name "ki_keywords") (value "R res resistor"))
  (property (name "ki_fp_filters") (value "R*"))
  (sheetpath (names "/" ) (tstamps "/"))
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  (comp (ref "R21")
    (value "5k1")
    (footprint "Resistor_SMD:R_0402_1005Metric")
    (description "Resistor")
```



LLM4KiCAD 未来展望：PCB布局布线

Repository (40) Installed (1) Pending (0)

KiCad official repository

Plugins (23) Libraries (7) Color themes (10)

Filter

Sierra Quote Plugin
Get an instant quote and order without leaving KiCad.
Install

PCBGOGO Plug-in for KiCad
Start prototype and assembly by sending files to PCBGOGO with just one click.
Install

Freerouting
Freerouting KiCad integration
Install

KiCad用PCBGOGOプラグイン
PCBGOGOを送信して、基板製造と部品実装サービスを利用しましょう。
Install

kicad-action-scripts

FreeRouting (Alfons Wirtz et al.)

Signals Algorithm Route layers Debug

Signals to be routed:

- #
- 1
- 2
- B
- CLK
- CS
- DI
- GND
- IN
- PA3
- PB0
- PB1
- PB2
- PB3
- PB4
- PB5
- PB6
- PB7
- Sig\$17
- Sig\$20
- VDD

Signal tracks

Minimum track-width: 0,3 mm

Minimum track spacing: 0,2 mm

☐ Aura counts as minimum spacing ?

☒ Same-Net-Checking

Vias

Drillhole diameter minimum: 0,6 mm

Thickness of the annular copper ring around a drill hole: 0,3 mm

<... Select all

<... Deselect all

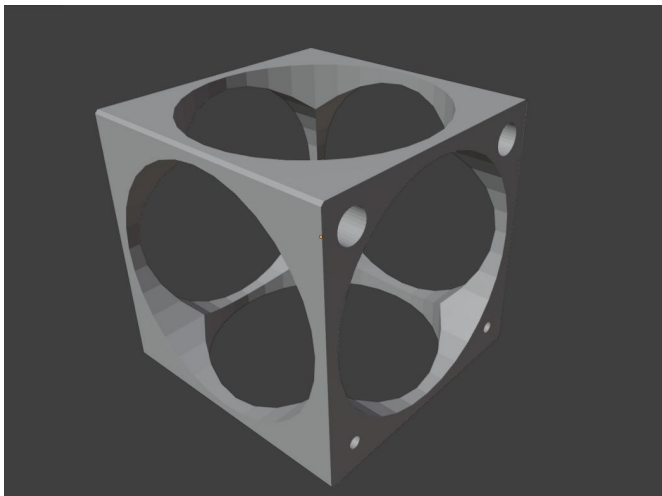
Default

Help One question... Start Apply Close

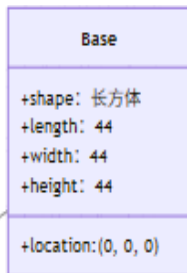
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LLM4CAD



BlenderCAD



role

- 你是一个代码生成器, 你能够将mermaid图转换为blender中的python代码。你是一个专业的代码生成器。

task

- 输入是一个mermaid图, 这个mermaid图是对于blender中一个3D模型的描述, 输出是一段python代码, 要求输出的python代码可以在blender中作为脚本, 生成mermaid图所表示的3D模型;

- 扮演<role>描述的角色, 遵守<rules>的约束, 并按照<steps>的步骤完成任务;

rules

- 输出代码和对应的中文注释内容;

- 注意生成的python代码需适配blender4.2版本;

- 注意生成的python代码需要在blender中运行, 并生成相应的3D模型;

- 注意生成的python代码直接使用blender中的对应的函数, 无需自定义类;

- 注意在生成实体后, 需要更改其名称, 使其与对应的类的名称相同;

- 注意在python代码中, 首先需要注意清除所有现有对象以确保干净的环境;

- 注意在python代码中, 若需复制某个实体, 则使用copy()函数, 而非duplicate()函数;

- 注意在mermaid图中若涉及到某个具体的建模操作, 则需遵守一定的操作规则和示例代码进行代码编写, 此操作规则于后续给出;

steps

1. 读取输入的mermaid图描述;

2. 分析mermaid图所表示的3D模型的结构;

3. 使用python语言, 借助blender中的bpy库, 创建相应的3D模型;

4. 检查生成的python代码, 确保每个函数均能正确执行, 且创建的3D模型符合mermaid图描述, 并且没有任何语法错误;

5. 检查<rules>约束条件, 确保生成的python代码是全部符合<rules>约束的;

通过mermaid代码在开源blender中支持九种类型CAD操作描述:

网格实体创建操作

平面/曲面创建操作

三维阵列操作

拉伸操作

旋转操作

扫掠/放样操作

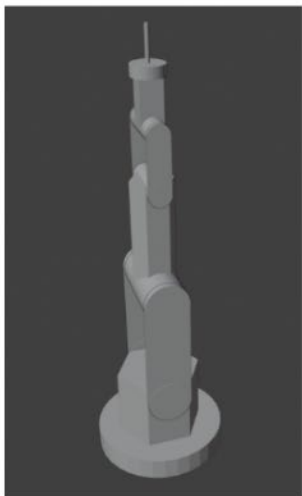
布尔运算操作

抽壳操作

倒角操作



LLM4CAD



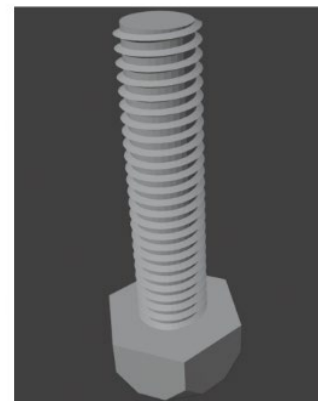
a)机械臂模型生成结果



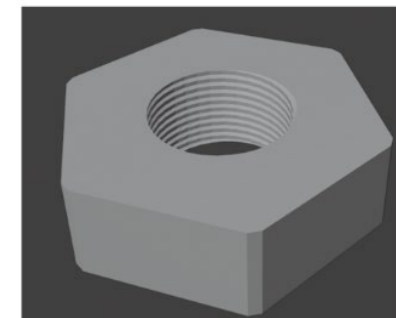
b)机械臂模型可动展示



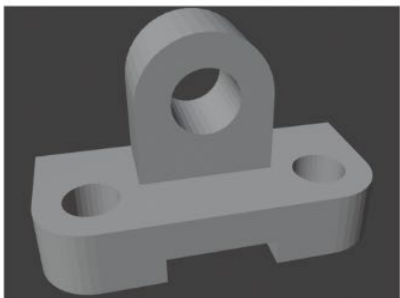
c)实体节点树形结构



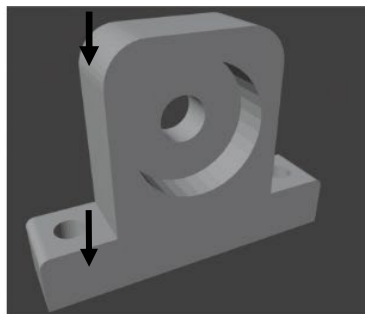
a)螺丝零件模型



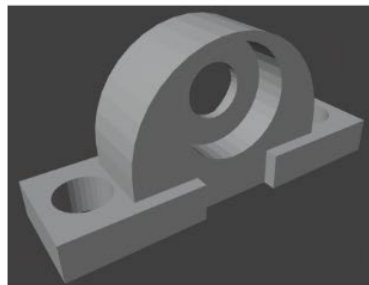
b)螺母零件模型



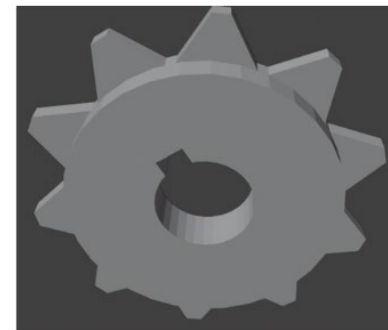
a)轴承零件模型1



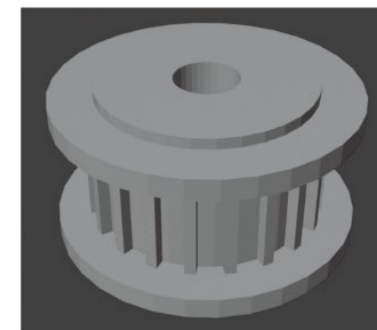
b)轴承零件模型2



c)轴承零件模型3



a)齿轮零件模型



b)滚轮零件模型



中國計算機學會
CHINA COMPUTER FEDERATION

感谢聆听!

