

KICAD: OPEN HARDWARE DESIGN

PRESENTED BY
SÂMBOUAN DARIUS

AGENDA

1. Introduction to KiCad
2. A brief history of KiCad
3. Core Functionalities & Features



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INTRODUCTION TO KICAD

WHAT IN THE FOSS IS KICAD?

- **Cross-Platform:** Support for Windows, macOS, and Linux.
- **Fully Unrestricted:** No limits on layers, board size, or complexity.
- **Open-Source (GPL v3)**
- **Transparent Data:** ASCII files for easy version control.



Free as in Freedom

OK. SO WHAT DO I DO WITH IT?

- **1. Schematic Capture**

- Place your symbols (chips, resistors, sensors).
- Connect the dots: Draw the electrical paths between them.

- **2. Footprint Assignment**

- Map your symbols to real-world physical parts.
- **Choose the size:** Decide between SMD (surface mount) or Through-hole.

OK. SO WHAT DO I DO WITH IT?

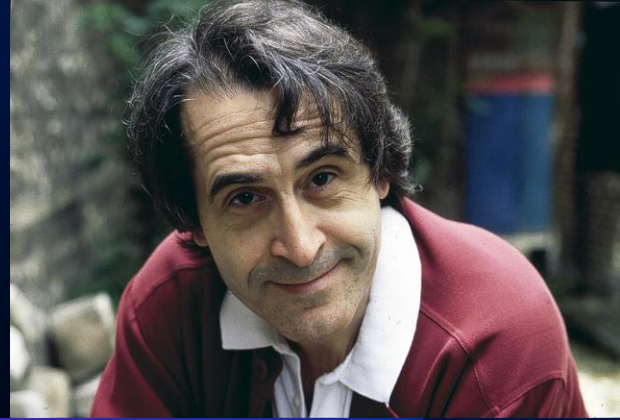
- **3. PCB Layout**

- Place your components in their physical spots.
- Route the actual wires that will carry the current.

- **4. Manufacturing**

- Generate the "blueprints" for the factory.
- **Check in 3D:** See exactly how the final hardware will look.

THE EVOLUTION OF KICAD



- **1992: Jean-Pierre Charras**, a professor at IUT de Grenoble, starts the project.
- **2007:** Developers worldwide start contributing (interface still hard to use compared to professional tools)
- **2013:** CERN researchers join the project, contributing the advanced routing tech used in modern high-speed electronics.
- **2015: (KiCad 4.0)** Major tech companies (like Arduino, Raspberry Pi) start using and supporting it.
- **2019:**
 - KiCad moved under the **Linux Foundation**
 - Secured massive funding from **Google, Digi-Key, and AISLER.**
- **March 2026:** KiCad v 10.0



KICAD VS OTHER COMPETITORS		
Feature	The "Big Giants" (Altium / Eagle)	KiCad (The People's Choice)
Financial Entry	\$5,000+ or "Rent-to-Work" subscriptions.	\$0: accessible to everyone.
Data Rights	Stop paying? Lose access to your own files.	Ownership: Your work is yours forever.
Platform	Windows only	Windows, macOS, and Linux.
Design Limits	Pay more for more layers or larger boards.	Unlimited: 32 layers, massive boards, zero restrictions.
File Format	Proprietary binary files you can't read.	Human Readable: ASCII/Plain text. Easy to audit and hack.
Support Ecosystem	Paid technical tickets & sales reps	Rapid, community-driven global support

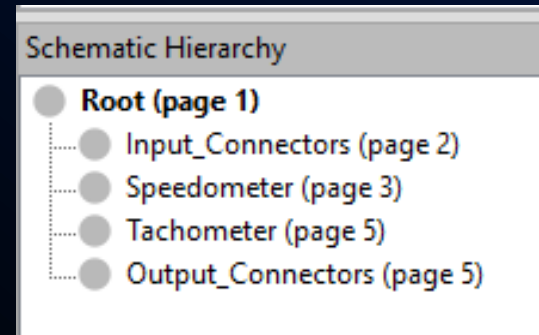
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CORE FUNCTIONALITIES & FEATURES

3.1 THE SCHEMATIC EDITOR

- Hierarchical Sheets

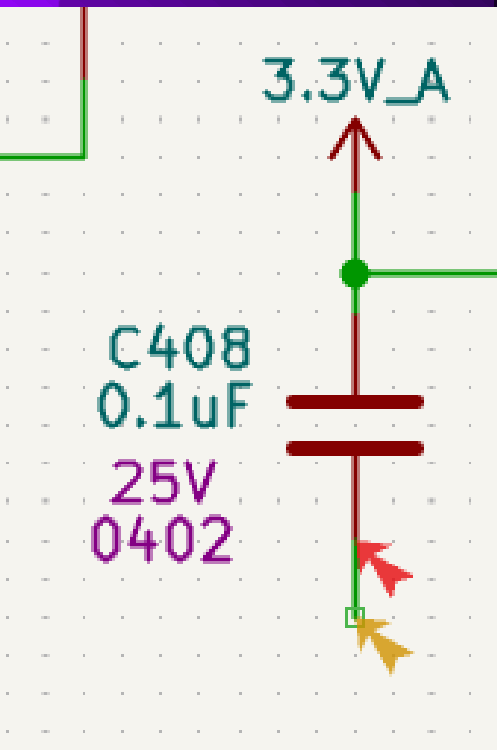
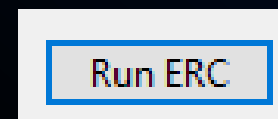
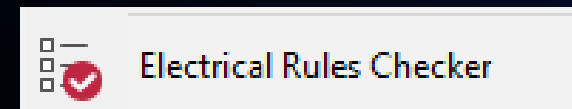
- For complex projects
- Sub-sheets



- **Symbol Libraries:** Access to over **20,000+** verified symbols

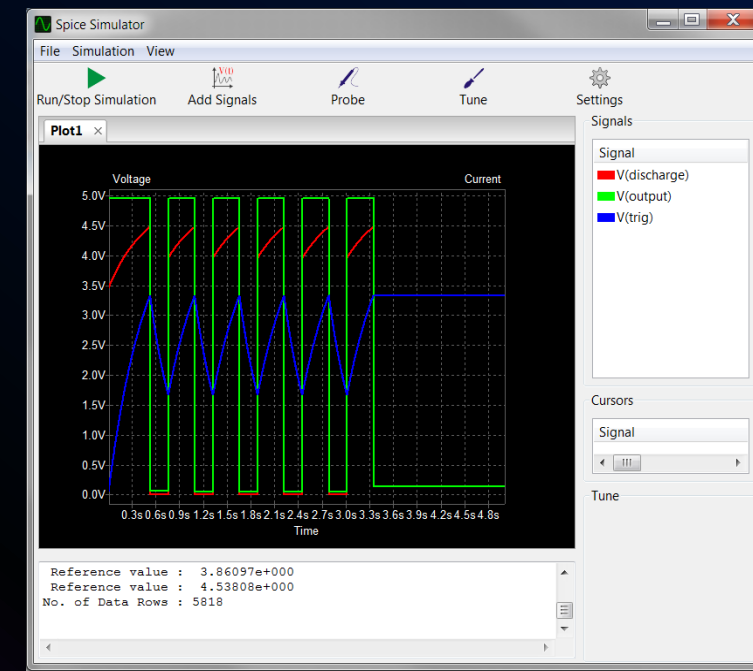
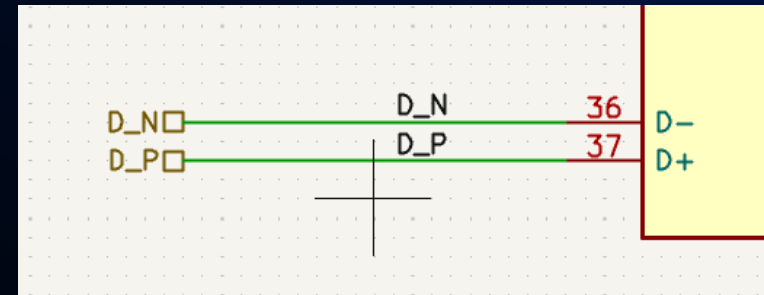
- ERC (Electrical Rules Check): The "Compiler" for hardware. It catches errors like:

- Floating Pins
- Output-to-Output contentions
- Missing **Power Flags** (where the voltage is being supplied to the board)

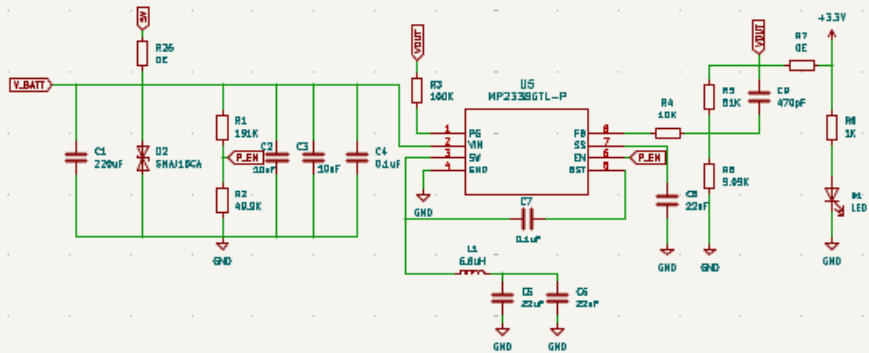


3.1 THE SCHEMATIC EDITOR

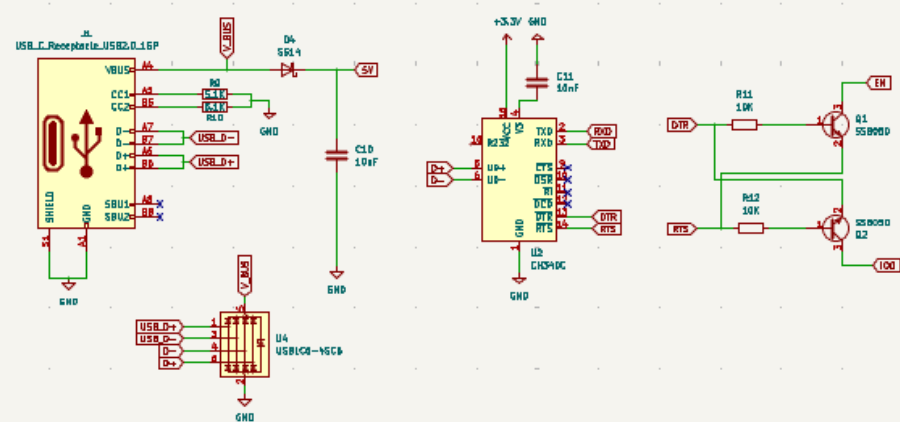
- Net Labels & Global Nets:
- Symbol Fields Table
 - you can edit the properties of 100 components at once
- Spice Simulation Integration:
- Integration with LTspice / OrCAD / SolidWorks



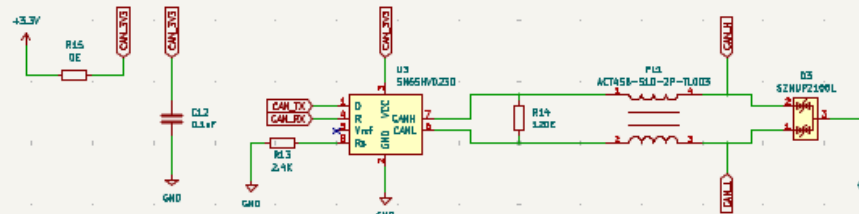
PWR SUPPLY



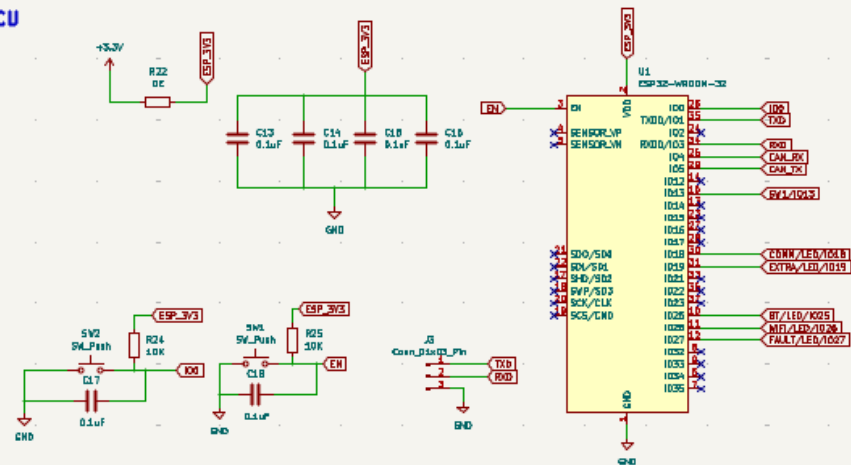
PROGRAMMER/DEBUGGER



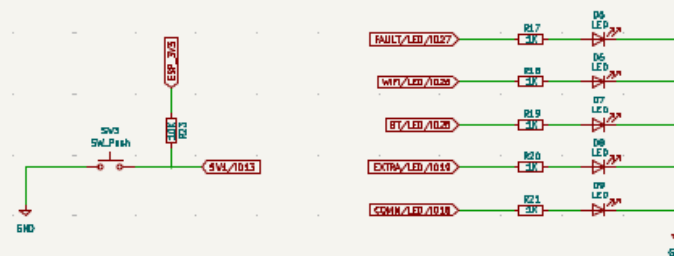
CAN



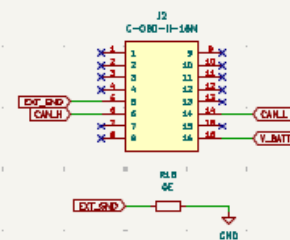
NCU



STATUS LEDs



OBD CONNECTOR



Open-Source Design-By Md Ammar Manlyar (@Ampnics).
Free for educational & commercial use.
Thank you for supporting open-source creativity!

Design By - Md Ammar Manlyar
Ampnics
Sheet 7
File: ESP32-WiFi2CAN_Raw0.1.kicad_sch
Title: CAN to WiFi Converter (Dongle)

Size: A3 Date: 2025-02-22
KiCad E.D.A. 9.0.0

Rev: 0.1
14: 1/1

3.2 THE PCB EDITOR

- **Interactive Router:**

- Real-time "Push-and-Shove" technology.
- Walkaround and Spaced obstacle avoidance modes.

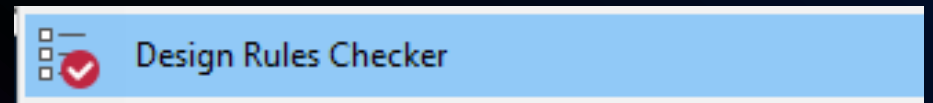
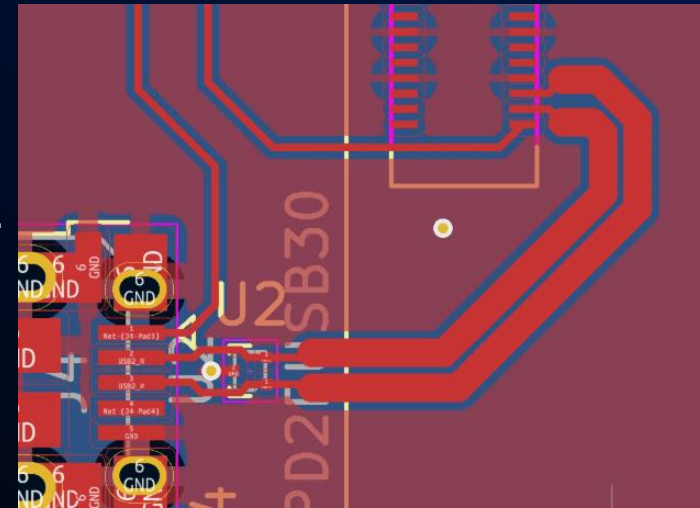
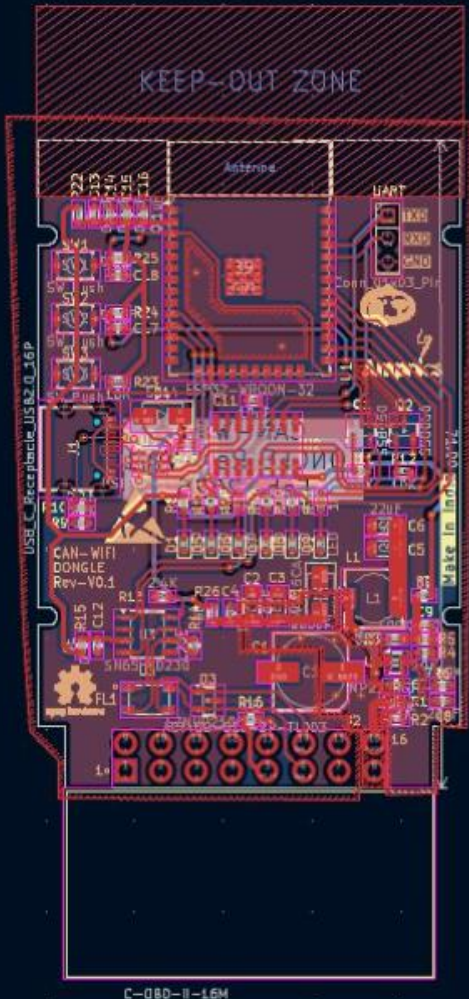
- **High-Speed Signal Integrity:**

- **Differential Pair Routing** ($_N/_P$ matching).
- **Length Tuning:** Sub-millimeter timing matched traces with auto-meanders.

- **DRC (Design Rule Check):**

- The manufacturing audit. Prevents minimum clearance violations, thermal traps, and disconnected nets.

- **32 Copper Layer Support**



3.3: 3D VIEW & VERIFICATION

- **Raytracing Engine:**

- Generates photorealistic **renders** with accurate light, shadows, and material textures



3D Viewer

Alt+3

- **Mechanical Validation:**

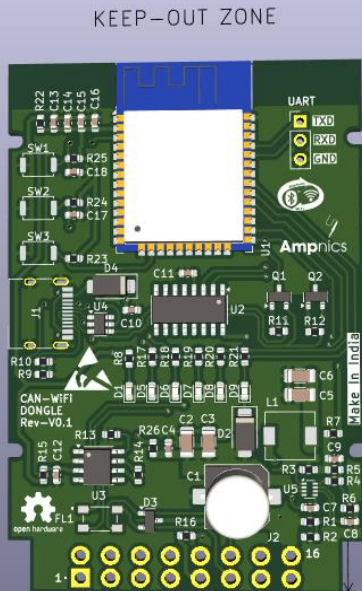
- Inspect component heights and connector alignments against physical enclosure constraints.

- **Industry Interoperability:**

- Export **STEP** or **VRML** files for seamless integration with **AutoCAD** and **SolidWorks**.

- **BOM (Bill of Materials):**

- One-click generation of the part list for manufacturing and procurement.



THANK YOU

Sâmbouan Darius

Dariussambouan2@gmail.com