STEPHEN MUSANGI

CIRCUIT & PCB DESIGNER | EMBEDDED HARDWARE DEVELOPER

+254 792001961 | musangisteph@gmail.com | https://stephenmusangi.com/

PROFESSIONAL SUMMARY

Innovative Circuit and PCB Designer with over 4 years of hands-on freelancing experience successfully delivering 150+ commercial-grade hardware solutions across IoT, motor control, automation, RF, and embedded systems. Expert in designing 2–4 layer PCBs , specializing in advanced practices including impedance control, differential routing, and high-current design. Proven ability to architect and engineer high-reliability systems based on ESP32, STM32, nRF, and RP series microcontrollers , covering high-power switching, RF modules, and real-time data streaming architectures. A proven leader who guides hardware development from concept to production , supported by multidisciplinary engineering knowledge.

PROFESSIONAL EXPERIENCE

Fiverr International Ltd   2022 – 2025

Freelance Circuit & PCB Designer | Embedded Systems Developer

- Designed, engineered, and delivered over 150+ hardware systems for global clients, covering IoT devices, motor controllers, automation systems, RF modules, and high-power electronics.

Selected Projects

High-Power Multi-Motor Control Board (4-Layer)

- Engineered an STM32-based 4-layer control system to manage complex automation tasks.
- Integrated two TMC2160 stepper drivers, MOSFET power stages, and solenoid valves, ensuring reliable, high-torque operation.
- Optimized the PCB design for 24V high-current operation, successfully implementing thermal management to prevent performance degradation.
- Secured remote diagnostics and data logging by integrating an ESP32 module for WiFi data streaming and environmental sensors (BME688, BH1750).

ESP32-Based Multi-Channel Energy & IO Controller (WiFi + LTE)

- Architected a robust controller system that managed generator/mains source switching and load control for reliable power management.
- Integrated an LTE module to provide 99% uptime for remote cloud connectivity and monitoring, crucial for industrial deployment.
- Designed and validated high-current MOSFET switching stages and multiple real-time monitoring channels, ensuring accurate system oversight.

Bone-Conduction Hearing Assist Device

- Utilized a Teensy 4.0 and Teensy Audio Shield as the core processing units for high-fidelity audio.
- Developed a compact PCB and optimized the audio signal path to minimize noise.
- Incorporated dual condenser mic pre-amps and a 3W amplifier to achieve the required bone-conduction performance level.

MIDI-Controlled Steam-Powered Calliope

- Designed a reliable solenoid driver board to control 12V, 1A solenoids.
- Secured the system against voltage spikes by implementing safe flyback protection with Schottky diodes.
- Handled MIDI input protocols, translating digital signals into precise mechanical valve control.

nRF24L01 + PA/LNA Custom RF Module

- Elevated RF by integrating the RFX2401C power amplifier/LNA to extend range by over 50%.
- Executed professional RF design, including controlled-impedance traces, precise filters, and antenna matching, ensuring optimal signal quality.
- Achieved a high-density, small-form-factor design (30 × 30 mm) that fully integrated the nRF52840, battery charging, haptics, sensors, and display connector.

CAN Bus Motor Controller (ESP32 + MCP2515)

- Created a reliable motor control system designed for brushless, DC, and stepper motors.
- Ensured system resilience by including isolated CAN communication, robust power stages, and noise filtering.
- Utilized the ESP32 and MCP2515 to handle motor control logic and communication with a larger system

CORE SKILLS

Hardware & PCB Design

- Advanced PCB Layout (2–4 Layer): High-speed digital routing, controlled impedance routing, differential pairs, and Design for Manufacturing (DFM).
- Power Electronics: Buck/boost regulators, LiPo charging, Battery Management Systems (BMS), and load sharing.
- High-Power Control: High-power MOSFET switching, solenoid/relay drivers, stepper & DC motor control.
- RF Design & Layout: Antenna matching/tuning, practical experience with nRF, ESP32, BLE, and WiFi systems, including nRF24L01 PA/LNA.
- Signal Integrity: USB routing, USB hub design, controlled power switching, Sensor integration, and Audio circuits.

Embedded Systems

- Microcontrollers: ESP32, STM32, Atmega, Teensy, nRF SoC, and RP series.
- Communication Protocols: CAN bus, UART, SPI (Standard, Dual and Quad) , I2C, I2S and MIDI systems (USB & serial).
- Wireless Systems: Bluetooth Low Energy (BLE), WiFi, and LTE IoT systems, enabling real-time data streaming and remote monitoring.
- Actuation: Motor drivers and control systems.

EDUCATION

Bachelor of Science in Mechatronic Engineering   2019-2024

Dedan Kimathi University of Technology

- Capstone Project: "Grid Synchronization with Monitoring using SCADA System"

LEADERSHIP

Founder & CEO of Fiteklabs and KeOrigin IoT Startup   2023-2024

- Spearheaded and managed hardware/software teams, successfully delivering client projects by overseeing technical execution and adherence to timelines.
- Oversaw the complete product development lifecycle (from concept to production).
- Created open-source modules, contributing to the broader hardware community.
- Established and maintained transparency through weekly technical and organizational reports, informing strategic growth and resource allocation decisions

LANGUAGES

1. English (Fluent)
2. Swahili (Fluent)

HOBBIES & COMMUNITY ROLES

1. Electronics prototyping and DIY hardware projects.

2. Mentoring other junior engineers.

3. Participation in IoT meetups.

4. Open-source hardware contributions.

REFERENCES

Mr Julius Karanja

- Manager, Center for Development of Electronic Devices
- +254 722 956166
- julius.karanja@dkut.ac.ke

Mr. Peterson M. Nyaga

- Ag. Chief Technologist
- +254 786 966374
- peterson.nyaga@dkut.ac.ke