

Embedded Linux WS2812 Driver Board

This board was designed including components selection, schematics drawing and PCB drawing. Schematics and components selection made in 2 weekends, PCB layout + components + routing in 3 days.

Board consists of **NanoPi NEO v1.4 embedded Linux module and RP2040**, creating a Linux + real-time controller architecture. RP2040 handles **7 independent WS2812 LED channels**, using **74HCT125 level shifters** and separate **AP22615AWU-7 load switches** for individual output power control.

Board contains **199 BOM components, including 195 fitted components and 4 DNP**. Power input contains **5 A fuse, TVS protection, reverse-polarity MOSFET, common-mode choke and bulk capacitors**, with wide high-current power paths and optimized components placement for low impedance and good EMC performance.

Each LED output contains local filtering and bulk capacitance close to the connector, while sensitive logic and RP2040 supply are locally decoupled and filtered.

Board uses **2-layer, 1.6 mm stackup**, where:

1 – TOP is components, signals and high-current power routing mixed with GND copper

2 – BOTTOM is signals mixed with large GND copper areas for low-inductance return currents and improved EMC

Decision to use 2 layer PCB was based on economical aspects, also it wasn't too hard to fit it all on 2L.























