

NetWeaver

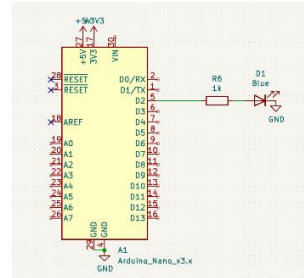
block-based PCB design in the browser

Leo McElroy (leomcelroy@gmail.com)

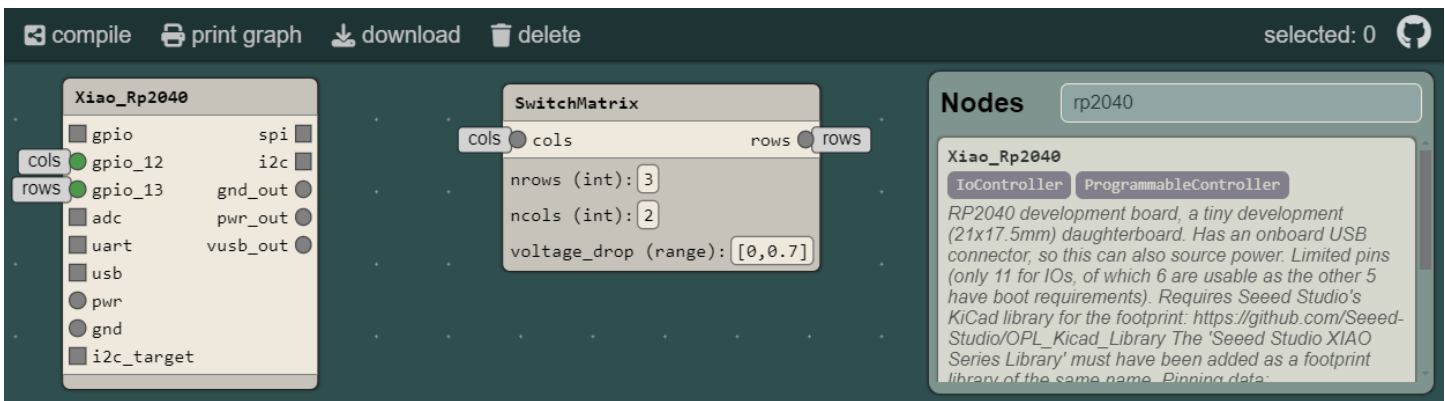
Richard Lin (richard.lin@berkeley.edu)

Schematics and PCB Design are Hard...

- 👤 Need electronics expertise
- 🤔 Must know many subcircuits and where / how to use them
- 👩 Gotchas: voltage compatibility, current limits, and more...

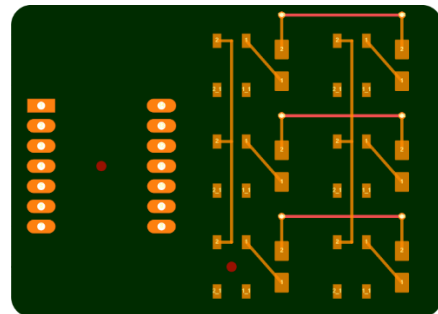


... Block-based Design to the Rescue!



generated layout skeleton ↴

- 📚 High-level block library: easy-to-use components
- 🚫 Automatic electrical checks: pin types, voltages, and more



Open-source, try it at:

<https://leomcelroy.com/net-weaver/>



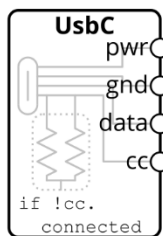
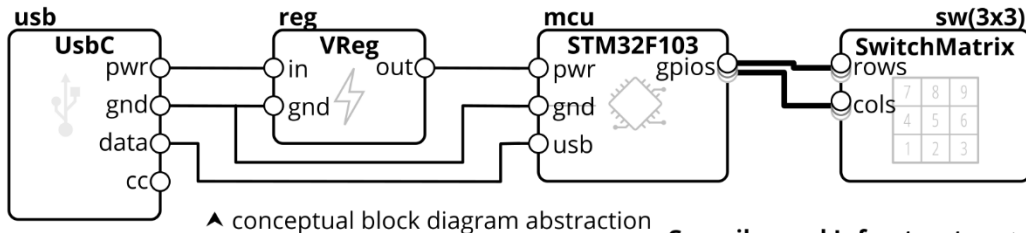
Underlying Technologies

Circuit Builder: PolymorphicBlocks

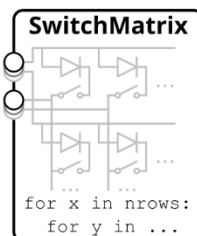
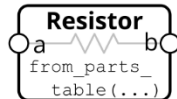
Richard Lin • *high-level, library-based PCB design with Python*

User system-level design
as Python-embedded HDL ▶

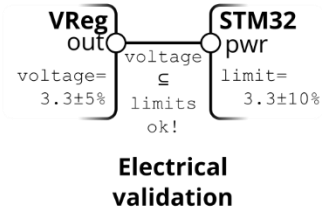
```
self.mcu = self.Block(Stm32f103_48())
self.sw = self.Block(SwitchMatrix(nrows=3, ncols=2))
self.connect(self.sw.cols, self.mcu.gpio.request_vector())
```



Generator Libraries
community-supplied
or user defined



Compiler and Infrastructure ▼



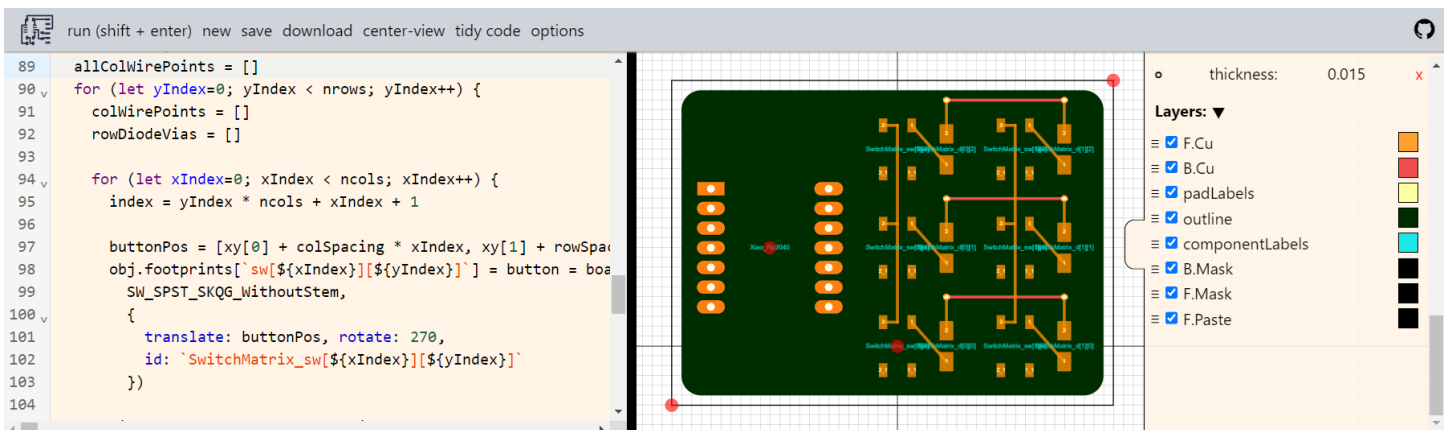
Open-source (BSD), check out the tutorial at:

<https://github.com/BerkeleyHCI/PolymorphicBlocks>



Layout Interface: SVG-PCB

Leo McElroy • *parametric PCB layout in Javascript*



Open-source (GPL-3.0), try the hosted version at:

<https://leomcelroy.com/svg-pcb/>



PolymorphicBlocks Examples

beyond the block diagram interface

from maker devices ...

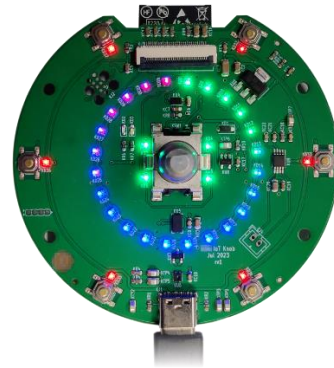
Charlieplexing LED Matrix

5x6-LED matrix with 7 IOs
Charlieplexing matrix generator
Quadpack resistor array



Internet-of-things Knob

ESPHome firmware
Parametric LED array layout
A whole bunch of sensors



... to advanced instruments ...

BLE Multimeter

Volts/Ohms/diode/continuity
Soft power gate
nRF52840 (BLE capable)



USB Source-Measure

ESPHome firmware
USB-PD powered
1mV/1mA (meas) over 30V/3A



... with more design automation:

towards library-based development

like software engineering:

user-definable libraries

including parameterized generators

high-level blocks and parameters

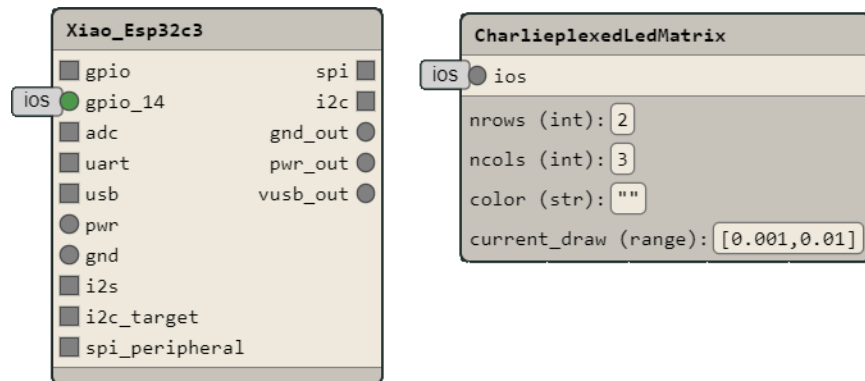
... but flexible with optional details

automated parts selection

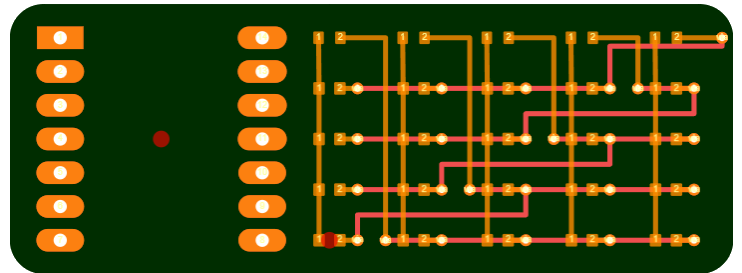
automated electrical checks

NetWeaver Examples

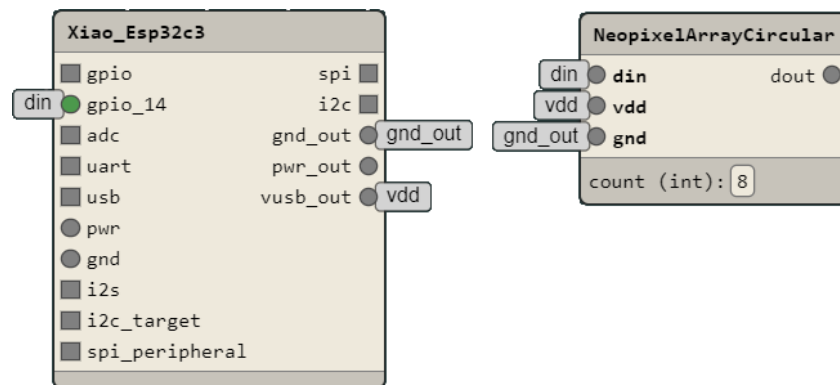
Charlieplexing LED Matrix



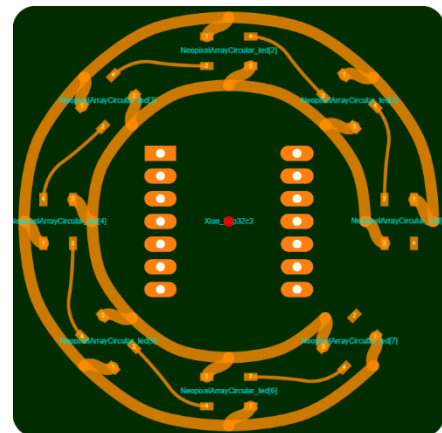
ESP32-C3 dev board w/ WiFi
Many LEDs with GPIOs
Parameterized circuit generator
Parameterized layout template



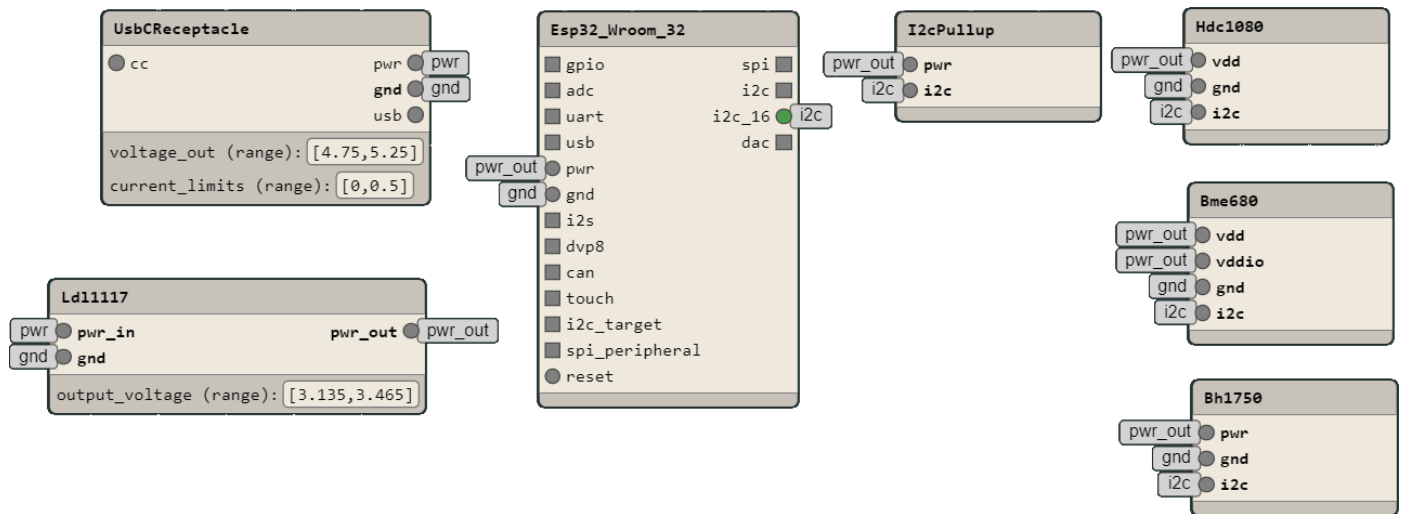
LED Neopixel Array



ESP32-C3 dev board w/ WiFi
Parameterized layout template



IoT Sensor Thing



Discrete ESP32 module
USB-C powered
Many I²C sensors

