SAO101: Intro to designing PCBs in KiCad

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Overview

- What and why?
- Schematic Capture
- PCB Manufacturing
- Design rules
- Layout / Gerber generation
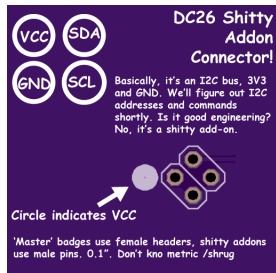- Profit?

Project Files: `bit.ly/CBRhardware`

Cool PCBs

What's a Shitty Add On?

"Standardised" Connector

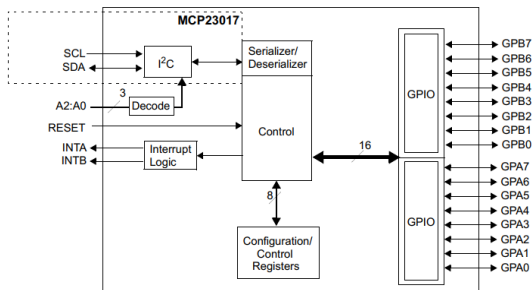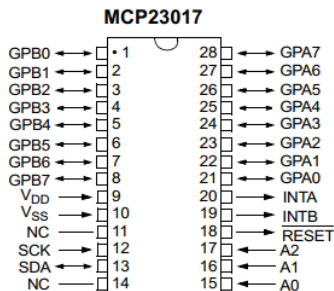https://hackaday.com/2019/03/20/introducing-the-shitty-add-on-v1-69bis-standard/

Today's Design

Based around Microchip's MCP23017 I^{2}C 16 Bit I/O expander

Allows control of 16 pins with just two inputs.
Can connect up to 8 MCP23017's to those same two pins.
128 controlled pins from a single I^{2}C bus.
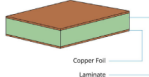With Charileplexing, you could control 16256 LEDs!

Schematic Capture Time!

Enough theory, time to draw up the schematic.
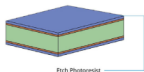
PCB Manufacturing Process

Figure 1
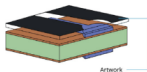
Standard PCB Manufacturing Process

1 - Data transfer from customer
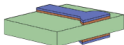2 - Data prep
3 - Cores/laminate

Copper Foil
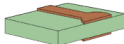Laminate

4 - Dry film resist coating

Etch Photoresist

5 - Place artwork
6 - Expose panels to ultraviolet light
7 - Develop panels (resist removal)

Artwork
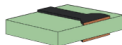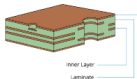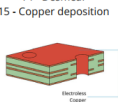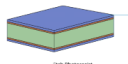
8 - Etch

9 - Strip resist

10 - Oxide coating

11 - Multilayer lamination
12 - Primary drilling

Inner Layer
Laminate
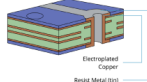
13 - Deburr and clean
14 - Desmear
15 - Copper deposition

Electroless Copper

16 - Dry film photoresist coat

Etch Photoresist

17 - Expose and develop

Photoresist
Artwork
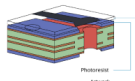
18 - Copper pattern plate
(electroplating)
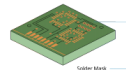
Electroplated Copper
Resist Metal (tin)
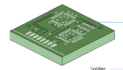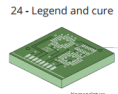
19 - Strip resist
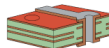
20 - Etch
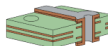
21 - Solder mask and cure

Solder Mask

22 - Hot air solder leveling
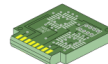(most common PCB surface finish)

Solder

23 - Surface finishes

24 - Legend and cure

Nomenclature

25 - Fabrication and routing

26 - Electrical test/final inspection

Design Rules

Need to ensure that our board can be fabricated (at a reasonable cost).

Time to lay the board out!

This is the fun part!

Feedback

Please let me know what you want these meetups to be.

- Workshop / Talks / Project Show & Tell / ?
- Topics to cover
    - Intro to Microcontrollers / Interfacing with the real world
    - Circuit Design
    - Rapid Prototyping
    - PCB Design, Manufacturing, and Assembly
    - Intro to FPGAs
    - Whatever you want!

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Project Files: bit.ly/CBRhardware