SAO101: Intro to designing PCBs in KiCad

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Overview

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

Project Files: `github.com/joshajohnson/CBRhardware`

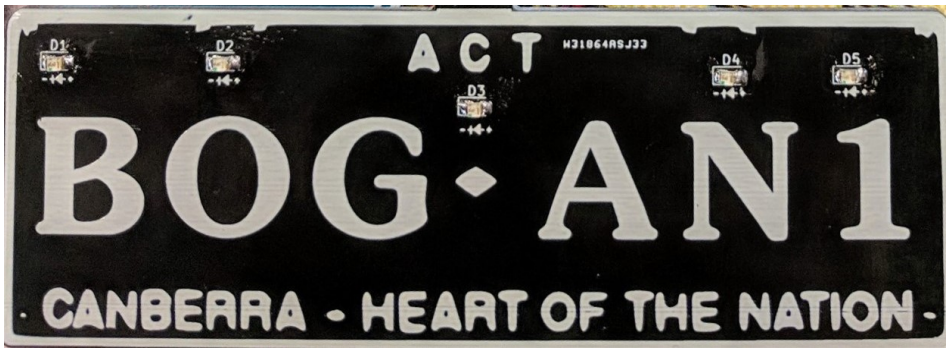
What's KiCad?

A Cross Platform and Open Source Electronic Design Automation Suite

- KiCad - project manager
- Eeschema – schematic capture
- Pcbnew - layout program
- GerbView - gerber viewer
- Bitmap2Component - import images to PCB

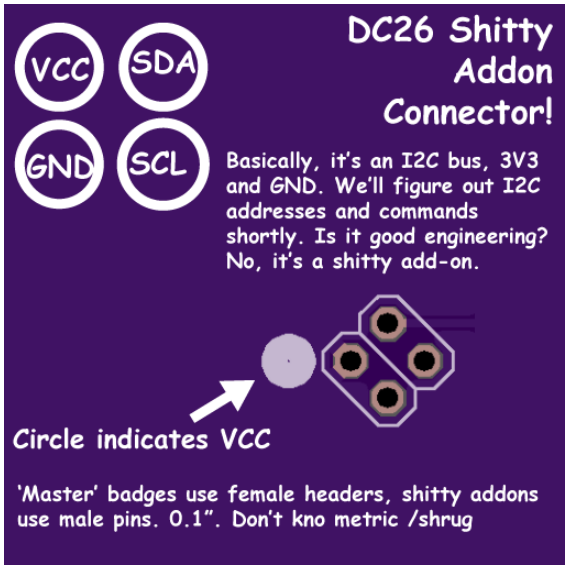
What's a Shitty Add On?

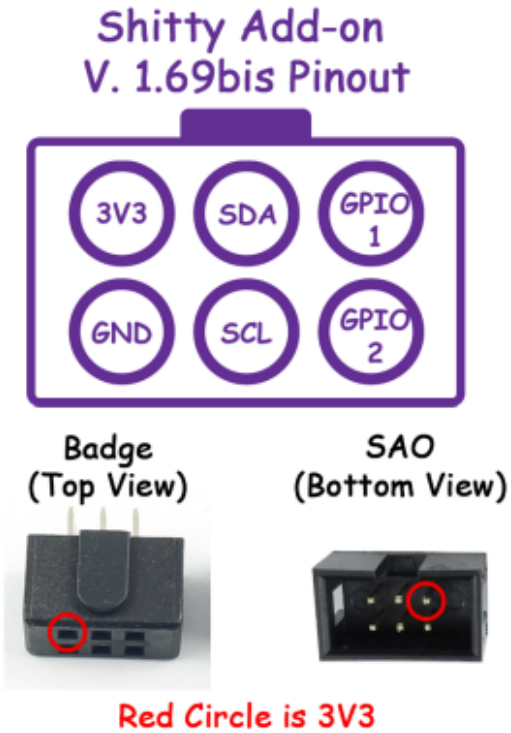
Cool PCBs



What's a Shitty Add On?

"Standardised" Connector

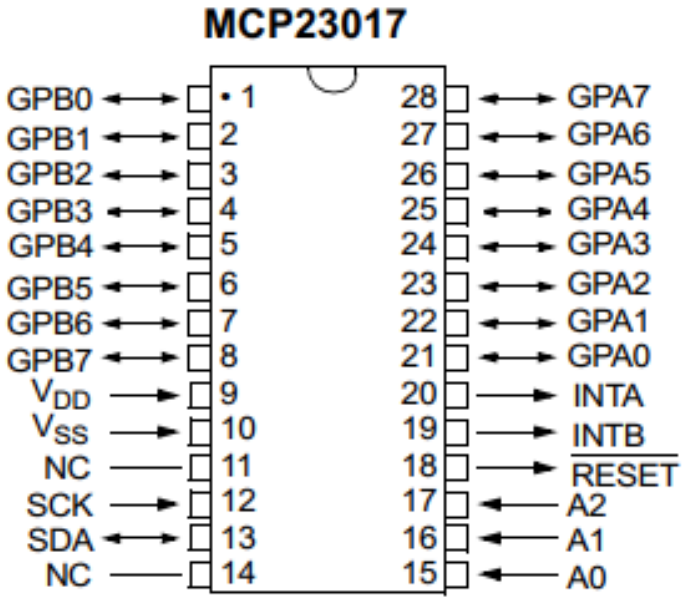


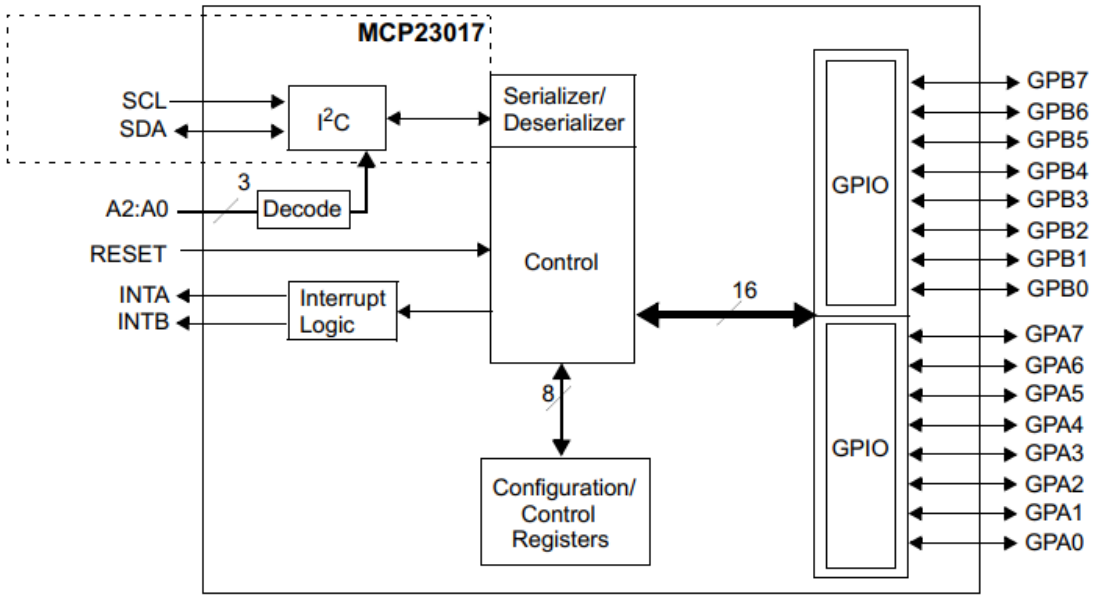


https://hackaday.com/2019/03/20/introducing-the-shitty-add-on-v1-69bis-standard/

Today's Design

Based around Microchip's MCP23017 I^2C 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^2C bus.

Schematic Capture Time!

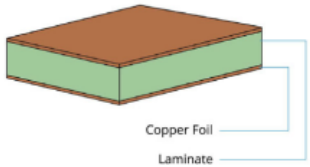
Enough theory, time to draw up the schematic.

PCB Manufacturing and Assembly Process

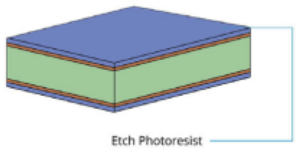
Figure 1

Standard PCB Manufacturing Process

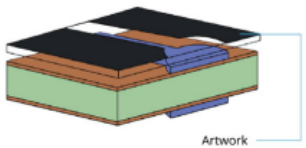
1 - Data transfer from customer
2 - Data prep
3 - Cores/laminate



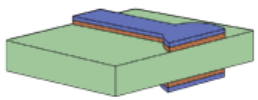
4 - Dry film resist coating



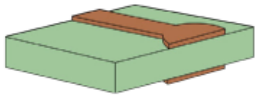
5 - Place artwork
6 - Expose panels to ultraviolet light
7 - Develop panels (resist removal)



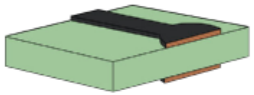
8 - Etch



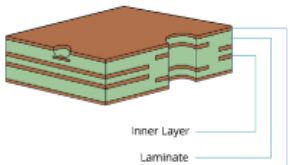
9 - Strip resist



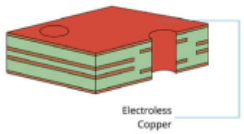
10 - Oxide coating



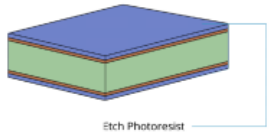
11 - Multilayer lamination
12 - Primary drilling



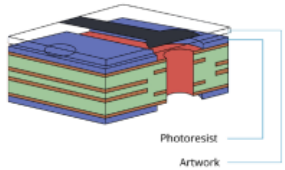
13 - Deburr and clean
14 - Desmear
15 - Copper deposition



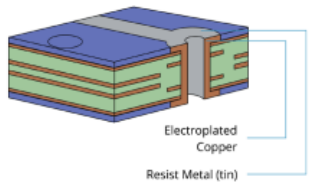
16 - Dry film photoresist coat



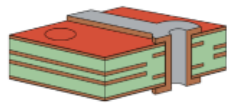
17 - Expose and develop



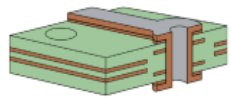
18 - Copper pattern plate
(electroplating)



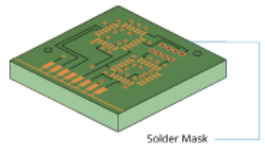
19 - Strip resist



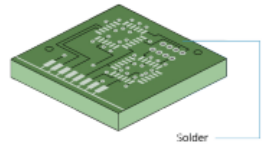
20 - Etch



21 - Solder mask and cure

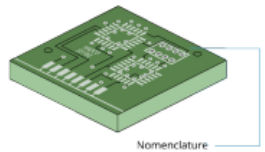


22 - Hot air solder leveling
(most common PCB surface finish)

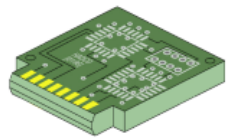


23 - Surface finishes

24 - Legend and cure



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!

Want to learn more?

Board ready to route: `uC101/RouteMe`
Links to resources: `SAO101/README.md`

Feedback

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

- Workshop / Talks / Project Show & Tell / ?
- Suggested 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!

Say Hello!
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Twitter: @_joshajohnson
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Project Files: `github.com/joshajohnson/CBRhardware`