

SAO101: Intro to designing PCBs in KiCad

Josh Johnson

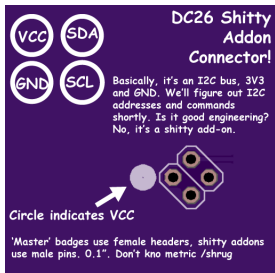
8/4/2019

Overview

- What and why?
- Schematic Capture
- How a PCB is manufactured
- Design rules
- Layout / Gerber generation
- Profit?

What's a Shitty Add On?

"Standardised" Connector



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

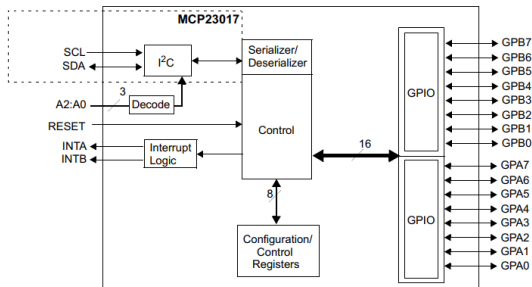
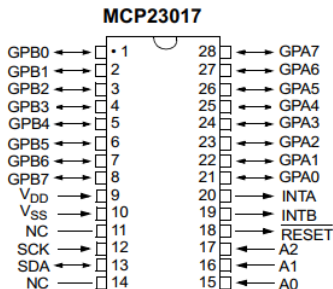
What's a Shitty Add On?

Artistic PCBs



Today's Design

Based around Microchip's MCP23017 I²C 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 I²C bus.

With Charileplexing, you could control 16256 LEDs!

Schematic Capture Time!

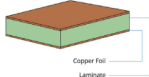
Enough theory, time to draw up the schematic.

PCB Manufacturing Process

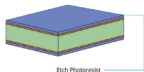
Figure 1

Standard PCB Manufacturing Process

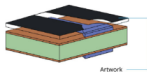
- 1 - Data transfer from customer
- 2 - Data prep
- 3 - Cores/laminate



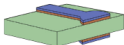
- 4 - Dry film resist coating



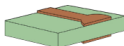
- 5 - Place artwork
- 6 - Expose panels to ultraviolet light
- 7 - Develop panels (resist removal)



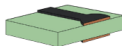
- 8 - Etch



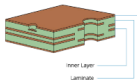
- 9 - Strip resist



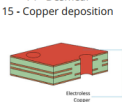
- 10 - Oxide coating



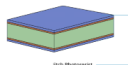
- 11 - Multilayer lamination
- 12 - Primary drilling



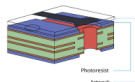
- 13 - Deburr and clean
- 14 - Desmear
- 15 - Copper deposition



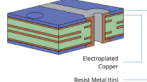
- 16 - Dry film photoresist coat



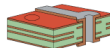
- 17 - Expose and develop



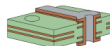
- 18 - Copper pattern plate (electroplating)



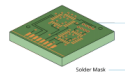
- 19 - Strip resist



- 20 - Etch



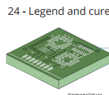
- 21 - Solder mask and cure



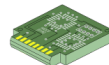
- 22 - Hot air solder leveling (most common PCB surface finish)



- 23 - Surface finishes



- 25 - Fabrication and routing



- 26 - Electrical test/final inspection

Design Rules

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

Feedback

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

- Workshop / 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!

Get in contact:

BSidesCbr Slack: josh

Twitter: @joshajohnson

Email: josh@joshajohnson.com