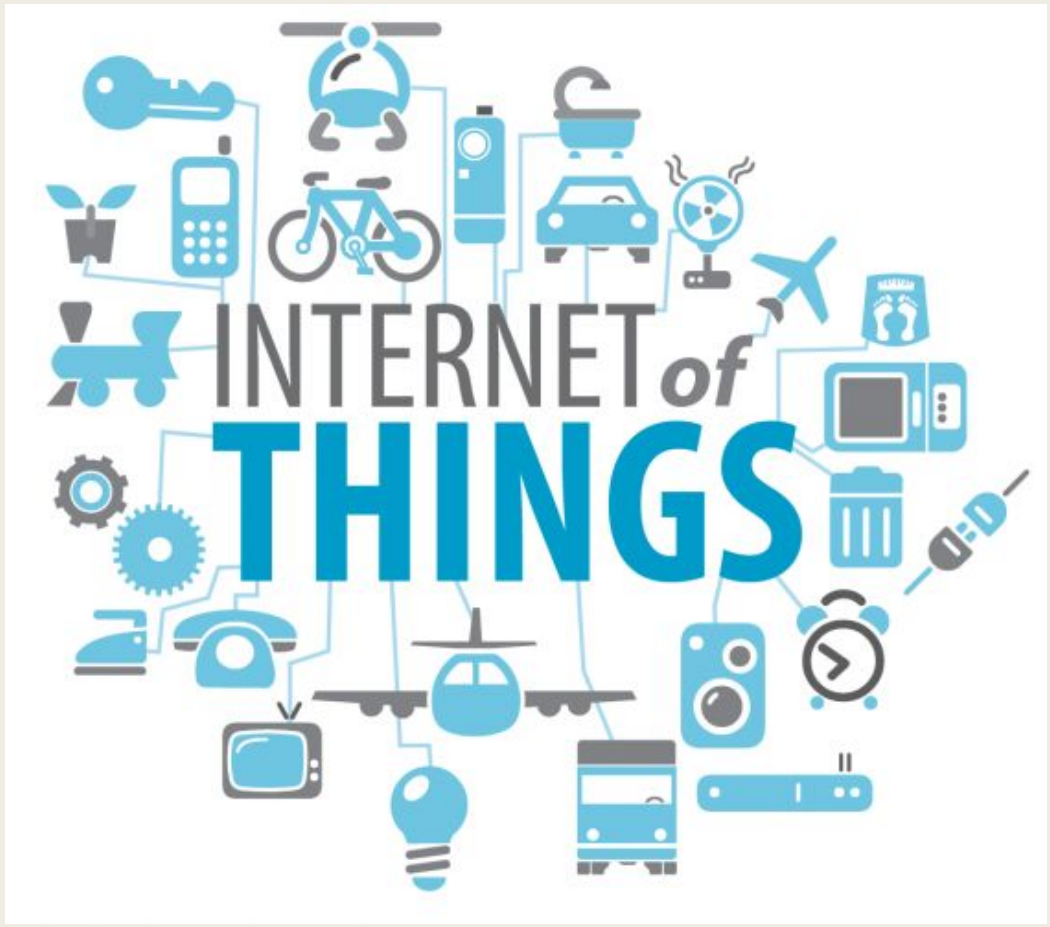
IOT

Device Creation

Contents

- The Business of IoT
- Technologies
- Experience in creating devices



THE BUSINESS

IoT technologies

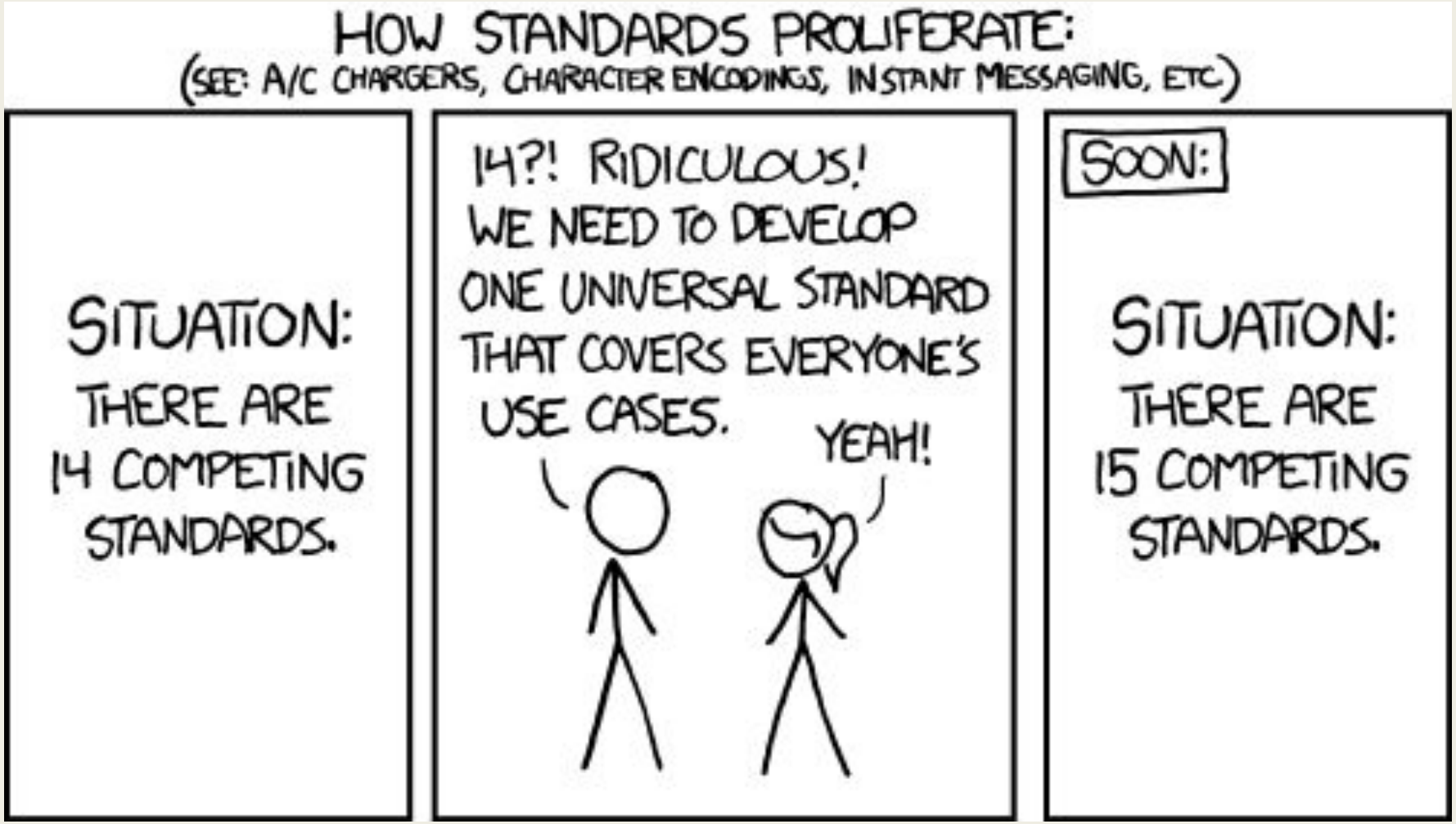
Generally, there are 3 areas where implementation is required in an IoT ecosystem:

1. Sensors - devices, hardware
2. Aggregators – Where data received or fetched.
3. Analysis/Altering Framework – Data Visualization services (i.e. Tableau) or Altering (i.e. push messages)

Companies

- Phidgets - Modular devices for sensing over USB
- Z-Wave/ZigBee - A wireless protocol targeted at the home automation. Solutions like SmartThings, Wink, ADT, and OpenHAB use this.
- Lutron Caseta - Lighting controls- their own proprietary connectivity solution.
- SimplySafe - Home monitoring and security, uses its own proprietary solution for communicating between devices.
- WEMO - Wifi based IoT plugs
- NEST - Wifi based thermostat.
- ...etc...

Fragmentation

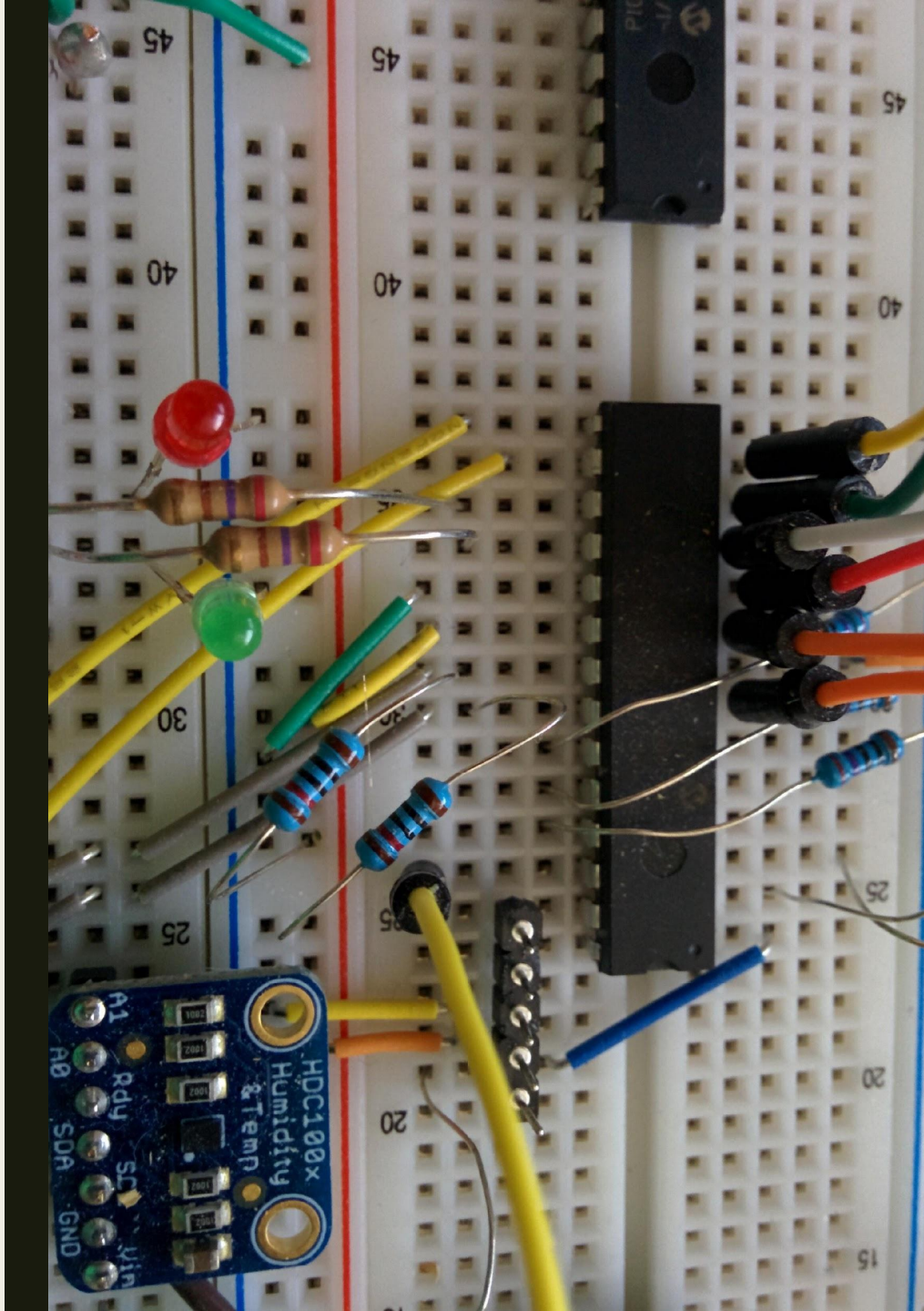


CREATING AN IOT DEVICE

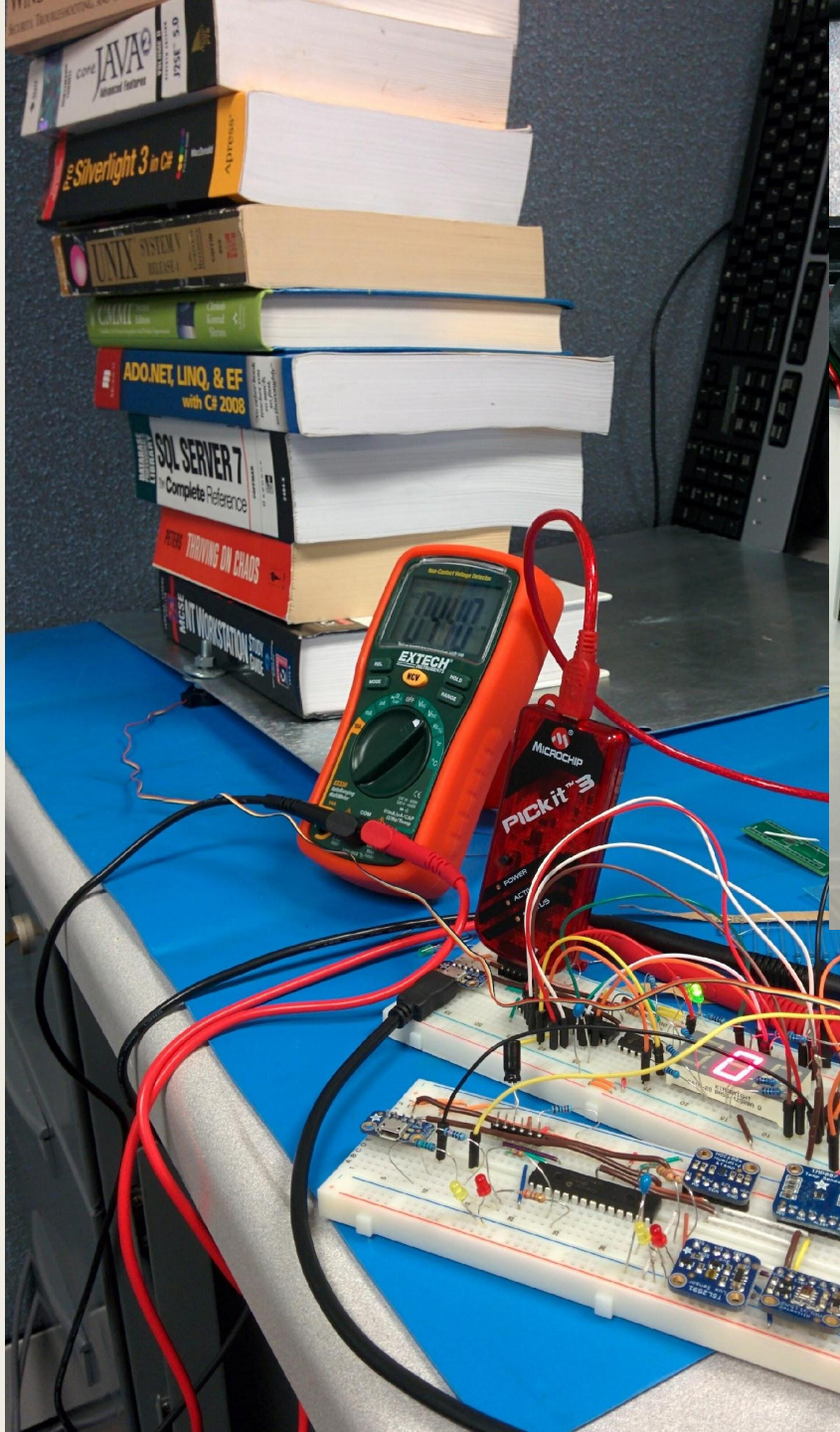
How I created a cheap IoT sensors and saved $10million per year.

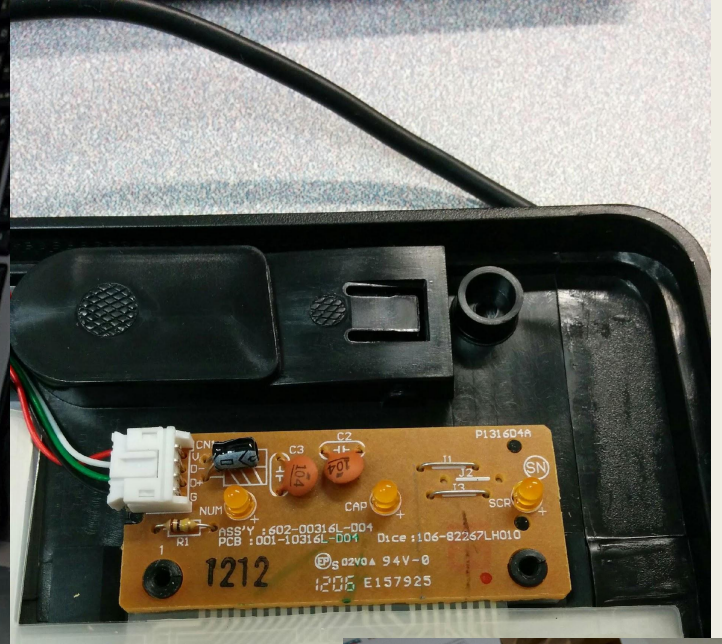
Prototyping & Schematic

- Select the right chips
- Get Schematic/PCB software
- Test individual components with Arduino or raspberry pie
- Test integration of components
- Read the documentation



Setting up a workspace - EEVBlog


Silverlight 3 in C#
ADO.NET, LINQ, & EF with C# 2008
SQL SERVER 7 The Complete Reference
THRIVING ON CHAOS
EXTECH
MICROCHIP
PICkit™3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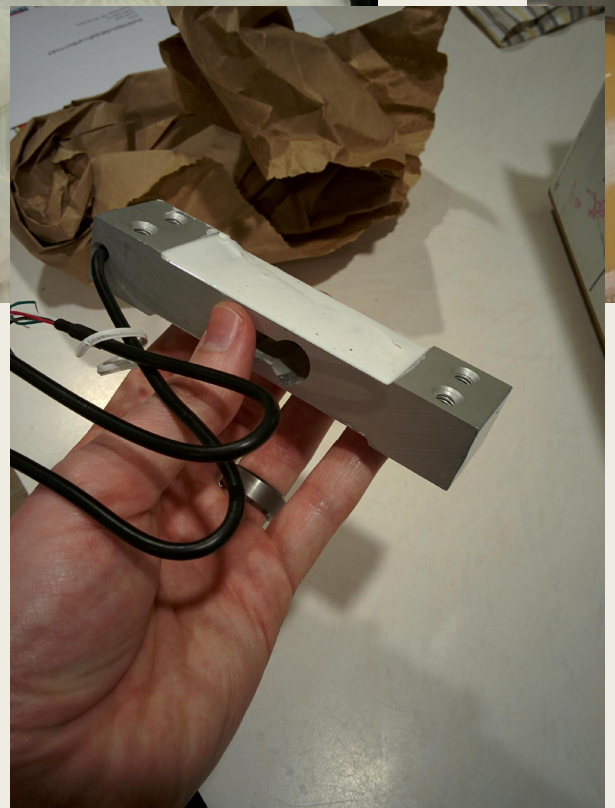
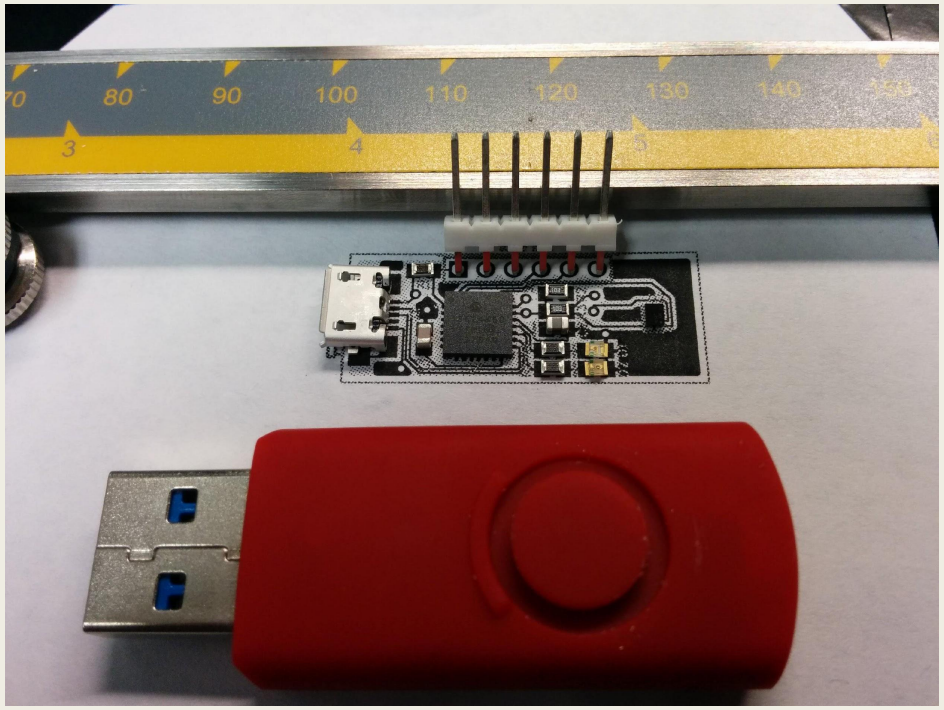
HYDE



Designing the Printed Circuit Board (PCB)



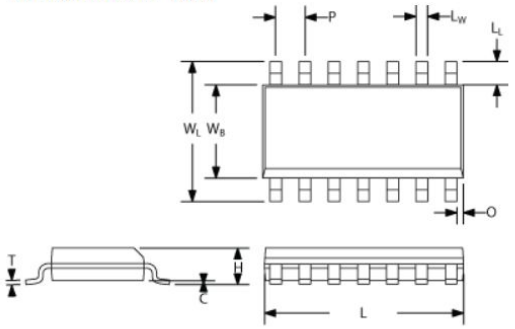
First prototype PCB layout

- Learned (mostly) from Youtube
- Used “Diptrace” for PCB editing. I recommend KiCad now.
- Learn from the EEVBlog
- Between each revision I checked for clearances

Chip Packaging

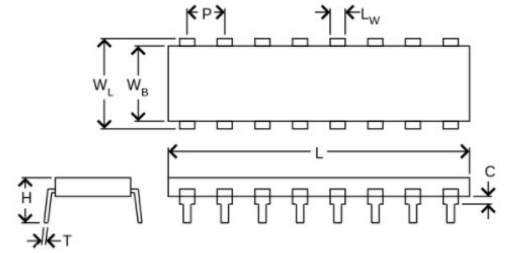
Dimension reference [edit]

Surface-mount [edit]



C - Clearance between IC body and PCB
H - Total Height
T - Lead Thickness
L - Total Carrier Length
L_W - Lead Width
L_L - Lead Length
P - Pitch

Through hole [edit]

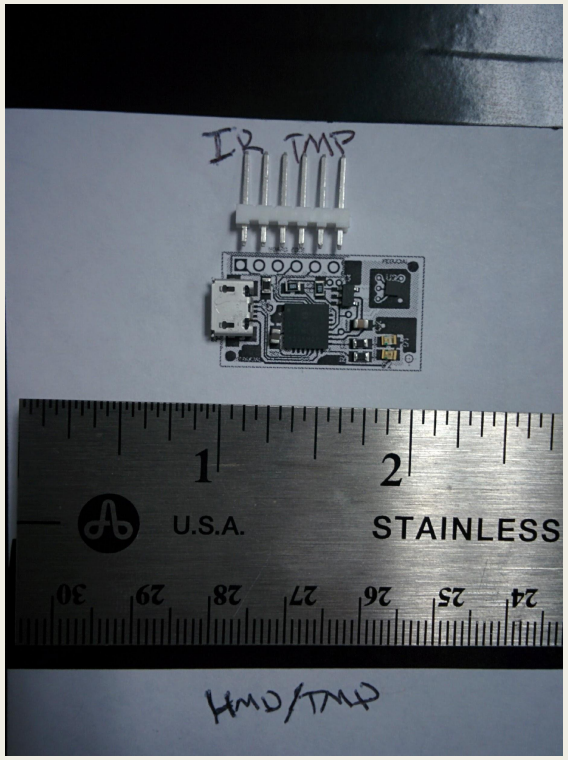


C - Clearance between IC body and board
H Total Height
T - Lead Thickness
L - Total Carrier Length
L_W - Lead Width
L_L - Lead Length
P - Pitch
W_B - IC Body Width
W_L - Lead-to-Lead Width-

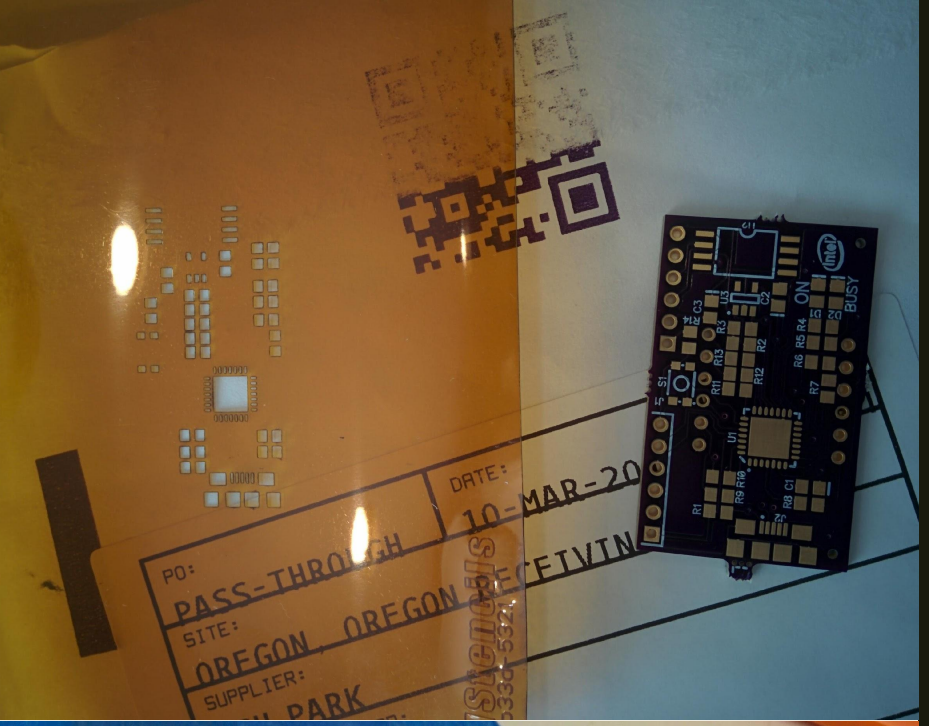
	DIP
	LFCSP
	MSOP
	SO SOIC SOP
	SOT
	SSOP
	TDFN
	TSOP
	TSSOP
	µSOP
	US8[23]

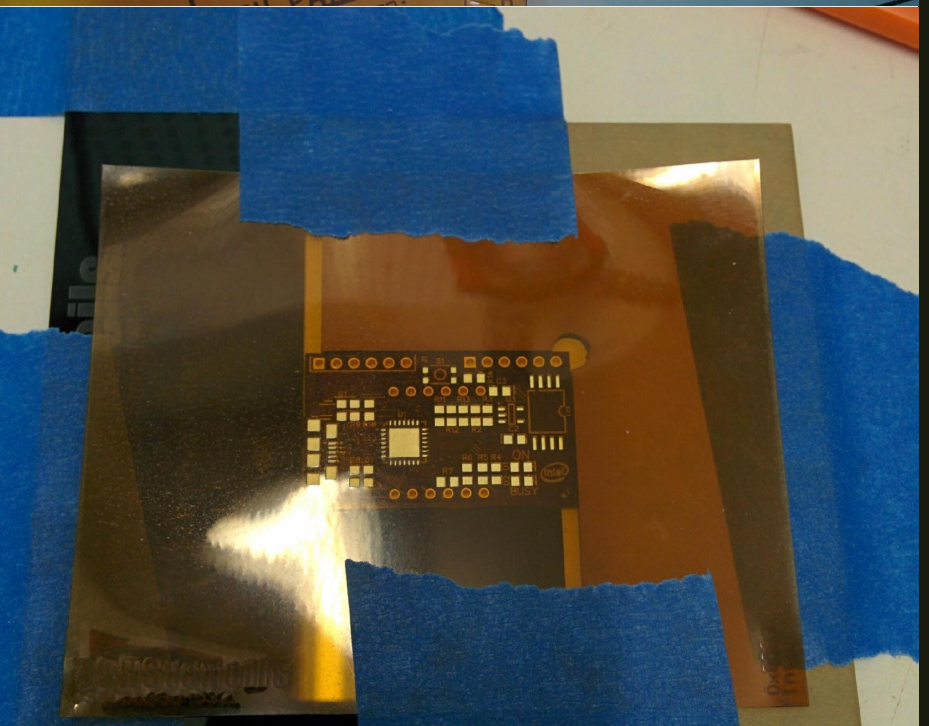
	PLCC
	CLCC
	LQFP
	TQFP
	TQFN

Making a Prototype



- You'll need:
  - *PCB design files*
  - *(Chip) Bill of Materials*
  - *Firmware, Drivers, Application for Test*
  - *Electrical Test Points (if applicable)*

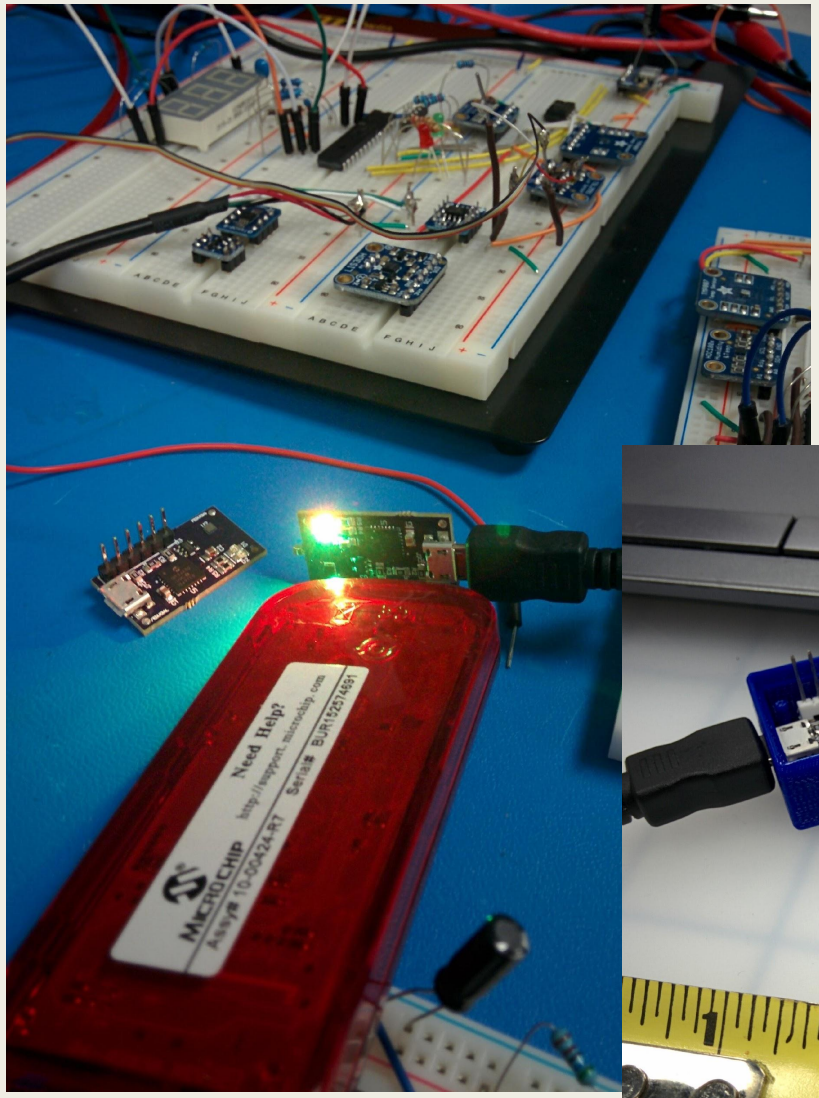


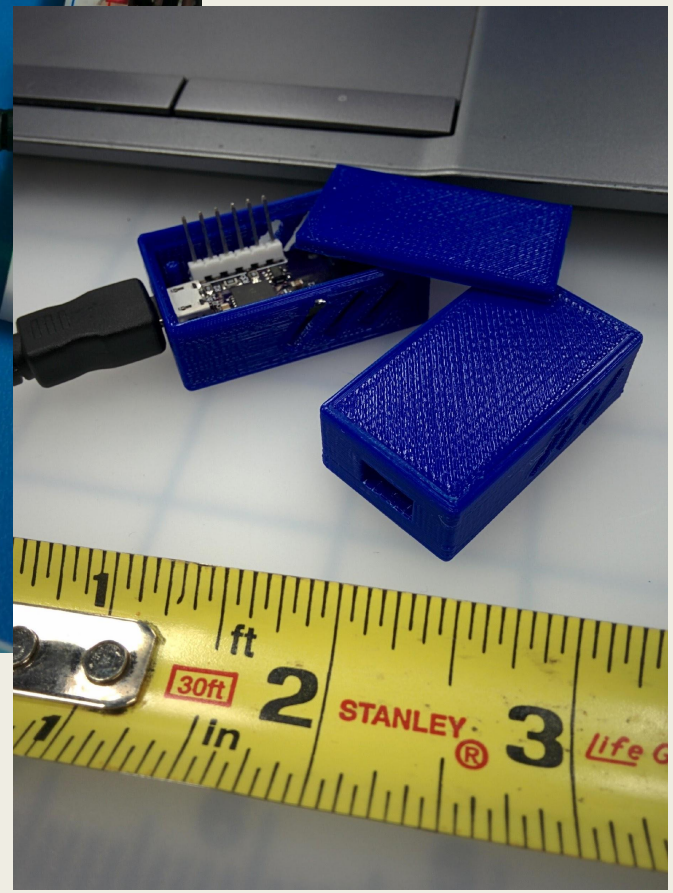


Prototype Runs

Testing Prototypes

- I make about 3 revisions before I got it right:
    - *Light to bright*
    - *Missing Pull-up resistor*
    - *Design was ugly*





Future plans

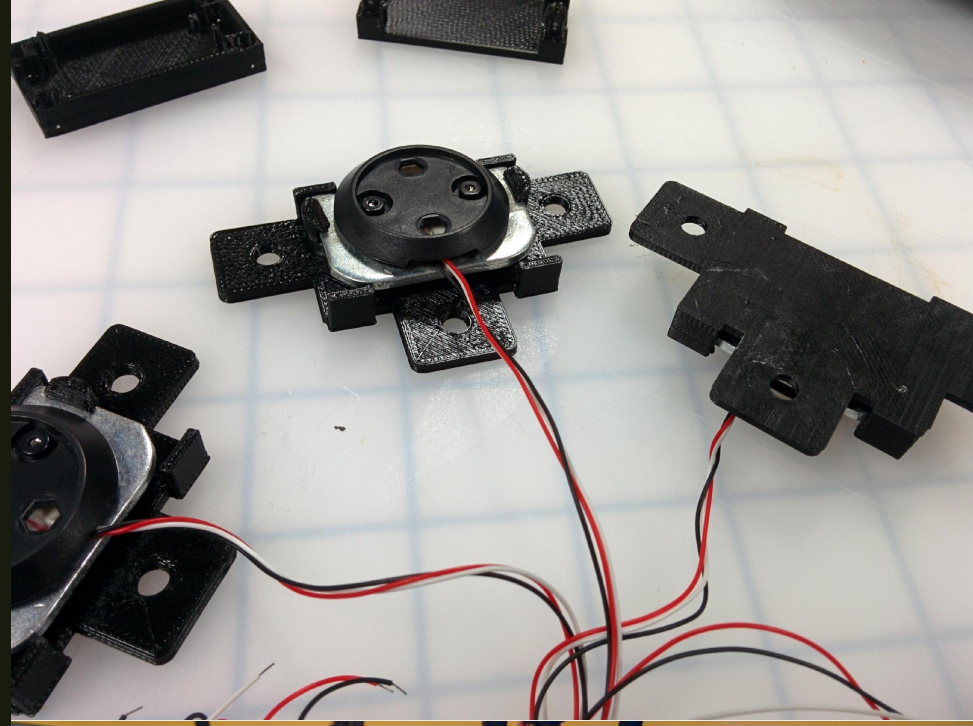
- Wireless devices
- UL and FCC approval
- More sensors and gauges

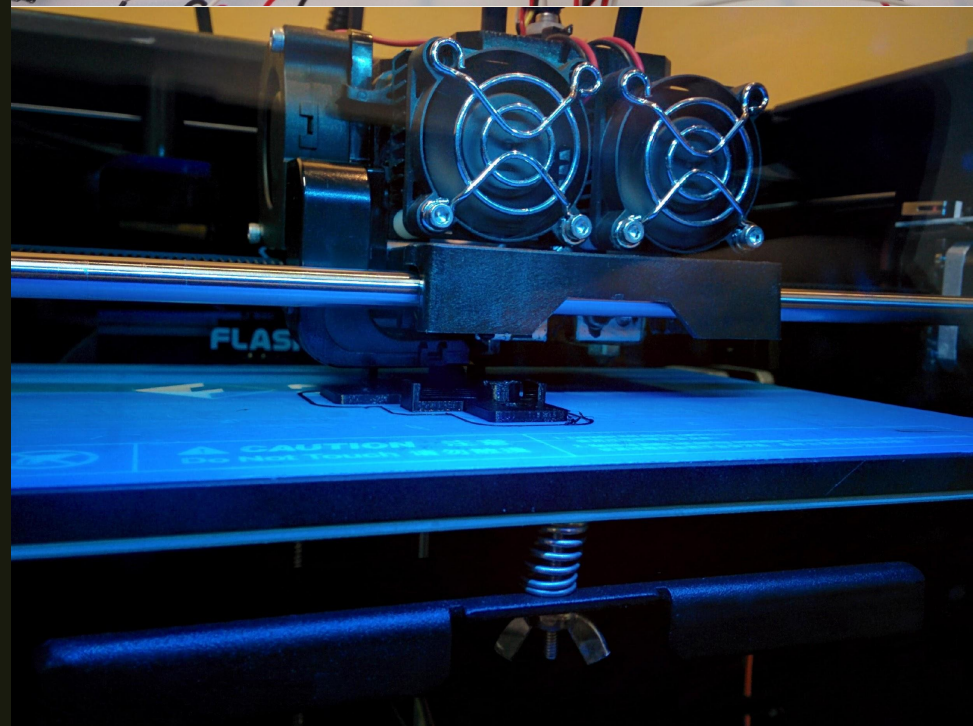
QUESTIONS?

The End

3D Printing

- Used OpenSCAD
- Printed case, sensor mounts

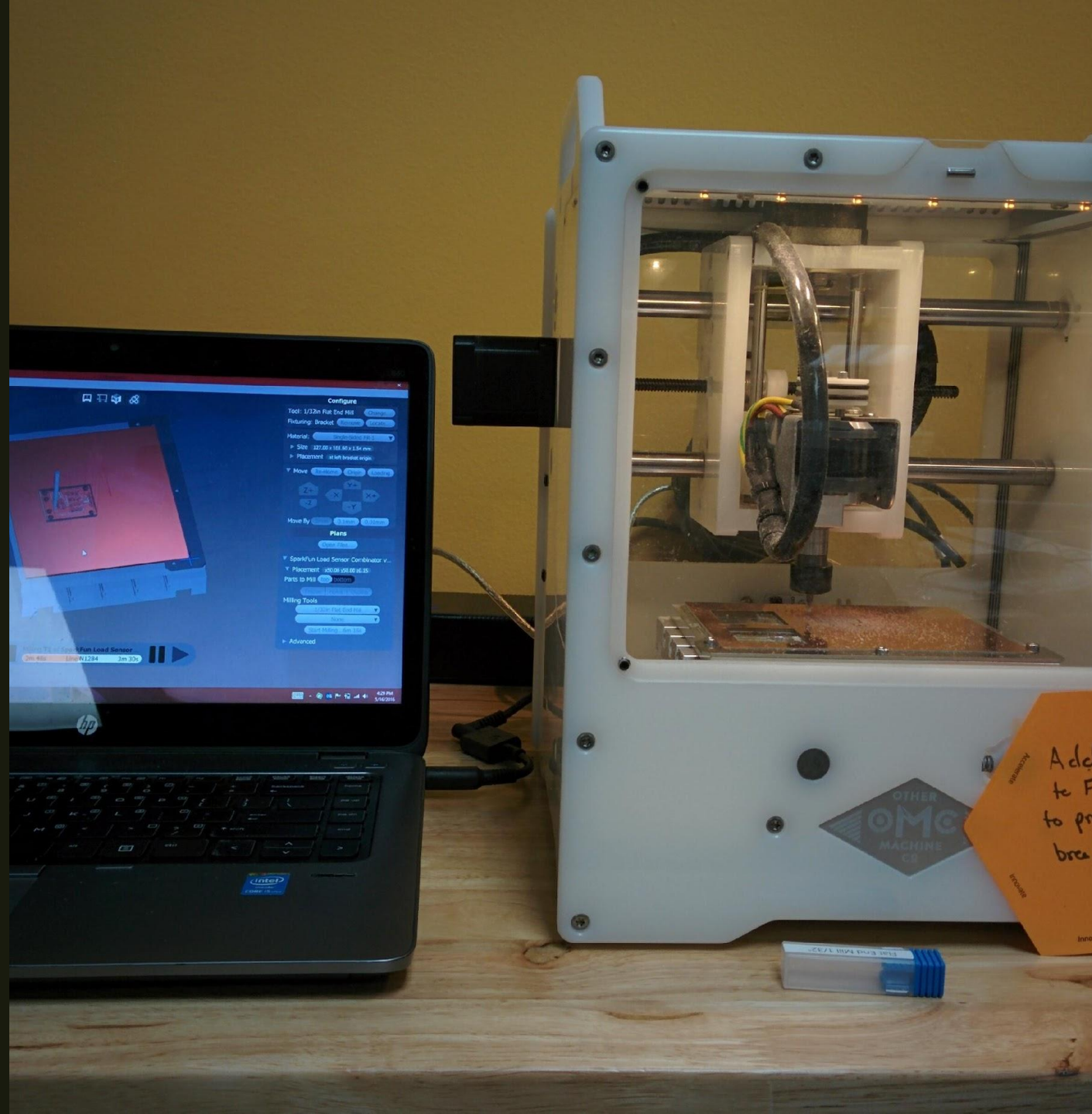


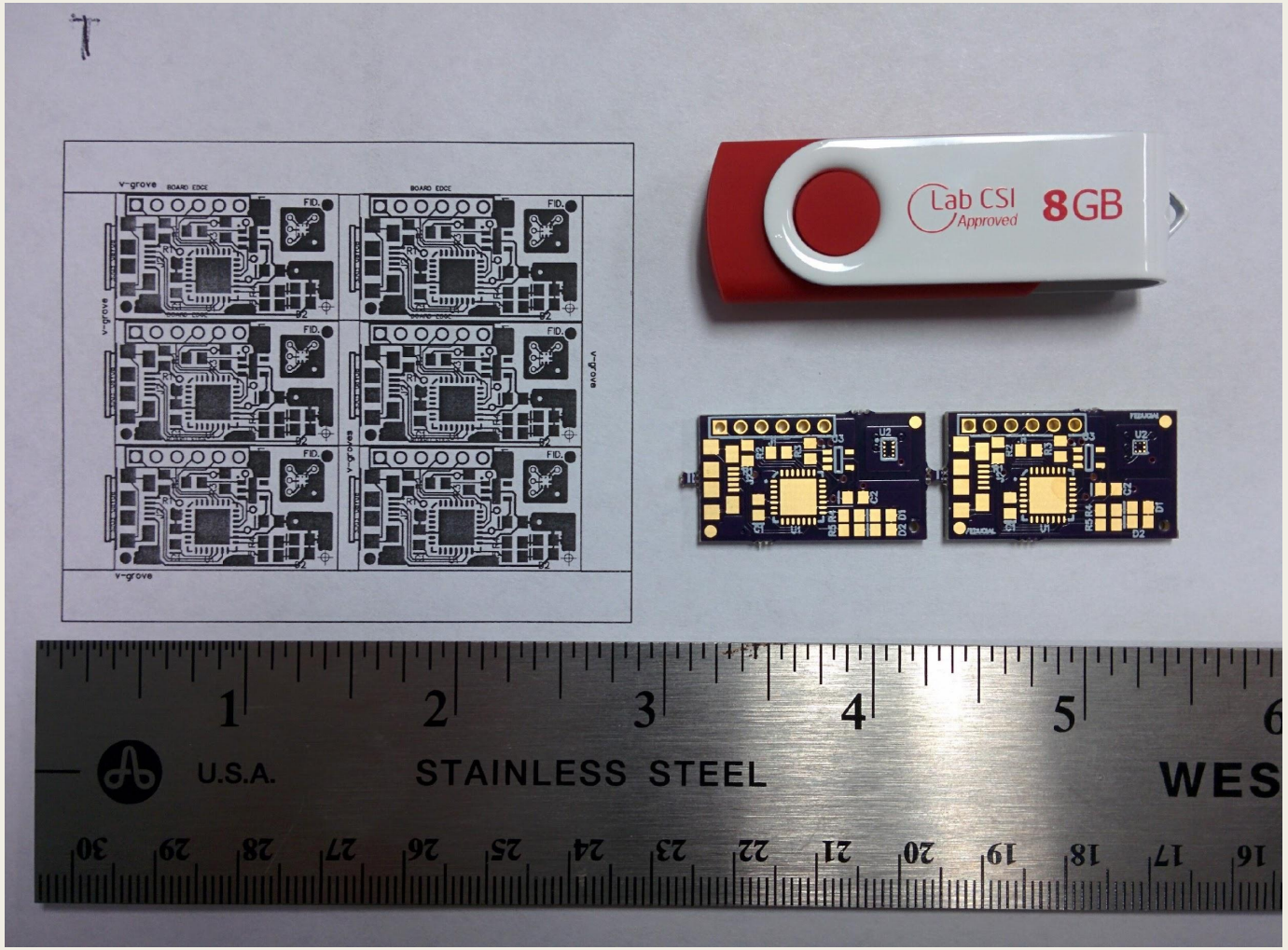


PCB manufacture at home

You can do this in a number of ways:

- Routing coper plates
- Chemical baths
- Perfboard





Prepare for manufacture

- Put into panels, this makes production cheaper