UOS EEE Society KiCAD Lectures

Component Selection and Footprint Generation

The University Of Sheffield.

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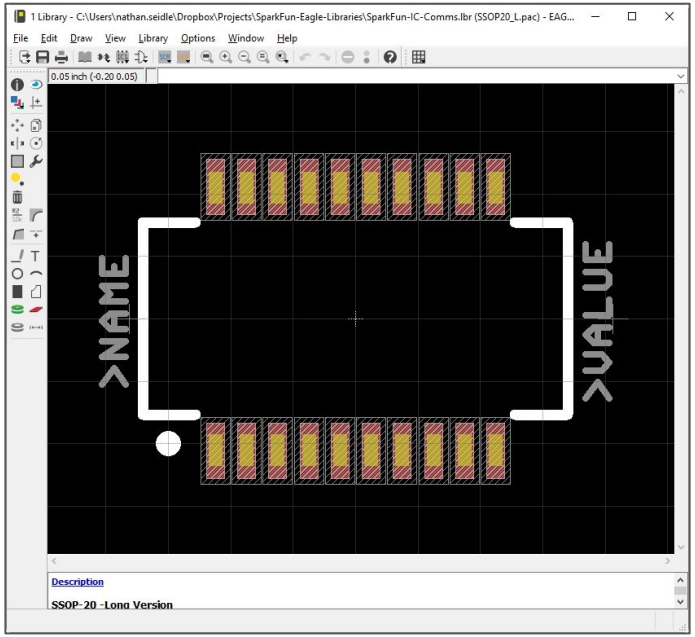


The difference between Theory and Reality?

Theory:

- Theoretical calculations give us exact values for components.
- This is brilliant for simulations and initial design.

Reality:

- In reality, you cannot buy components to specific values. It would be too difficult to manufacture every value anyone would ever want.
- Modern manufacturing methods also cannot provide exact component values at low cost, there is always a tolerance.

Considering your Application

- Choosing components is all about considering the application you are designing for.
- If you are designing for a low cost, low performance application; component cost is key.
- If you are designing for a high cost, high performance application; component tolerance is key.

Component selection is always a trade off. This is why it is difficult to produce a design that is low cost and high performance.

The importance of a Specification

- A good specification will inform you about the key aims of the design.
- It should be clear on the constraints you are working within, as well as the areas where you have space to make changes and expand your design.
- **It should always be used as a reference when selecting components!**

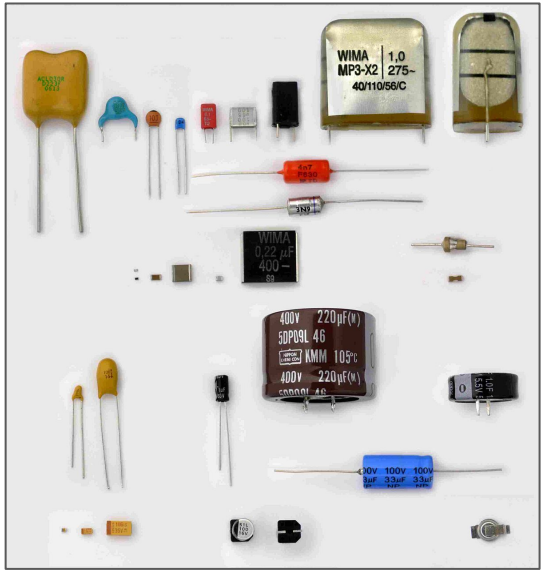
Sample Specification:

1. Switch Mode Power Supply - 20 to 30V Input - 5V Output - 30W Continuous
2. 5% Output Ripple - 2% Output Regulation (10% to 100% of Load)
3. Design should fit within 80mm x 40mm Area
4. Aiming for High Efficiency

What should we look out for when selecting a Component?

Things to look out for

- Cost
- Size and Dimensions
- Value Tolerance
- Peak Power Dissipation
- Continuous Power Dissipation
- Peak Voltage
- Peak Current
- Continuous Current
- Technology (e.g Electrolytic/Ceramic Capacitor)
- Lifetime
- Weight



Datasheets

- Datasheets are your key source of information for choosing components.
- Datasheets give a list of component characteristics, dimensions, etc.
- A good datasheet will give you all the information you need to design your circuit around the component.
- A brilliant datasheet may even give a guide of how to design a commonly used circuit around the component.

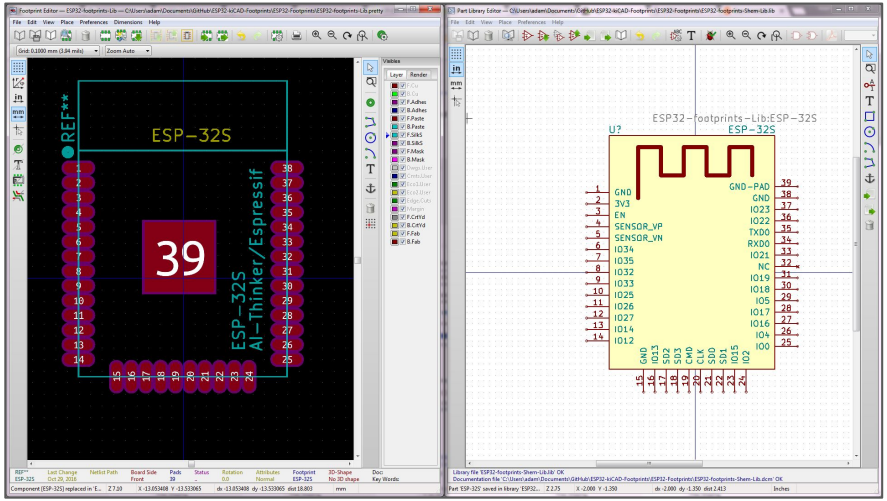
Texas Instruments provide some particularly good datasheets!

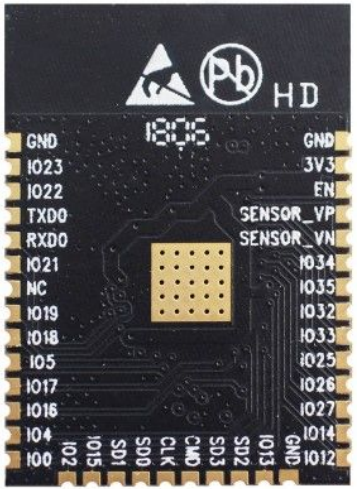
Component Datasheet Example

What is a Footprint?

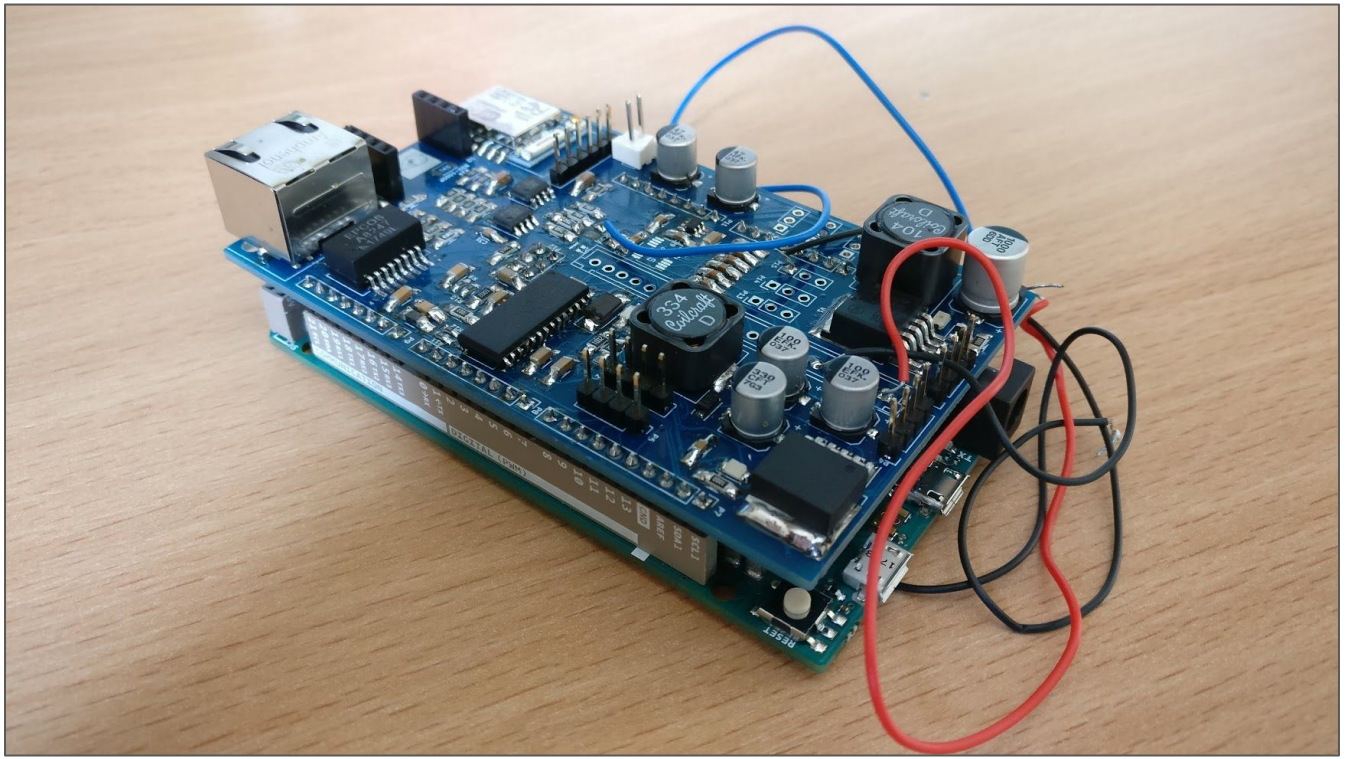
- A footprint is the physical dimension of the metal pads that are used to connect the component to the circuit board.
- Footprints come in many different shapes and sizes, depending upon the type of component and it’s specific characteristics.
- For example, 1206 is a common surface mount resistor footprint. D2PAK is a common surface mount IC footprint.

What is a Footprint?

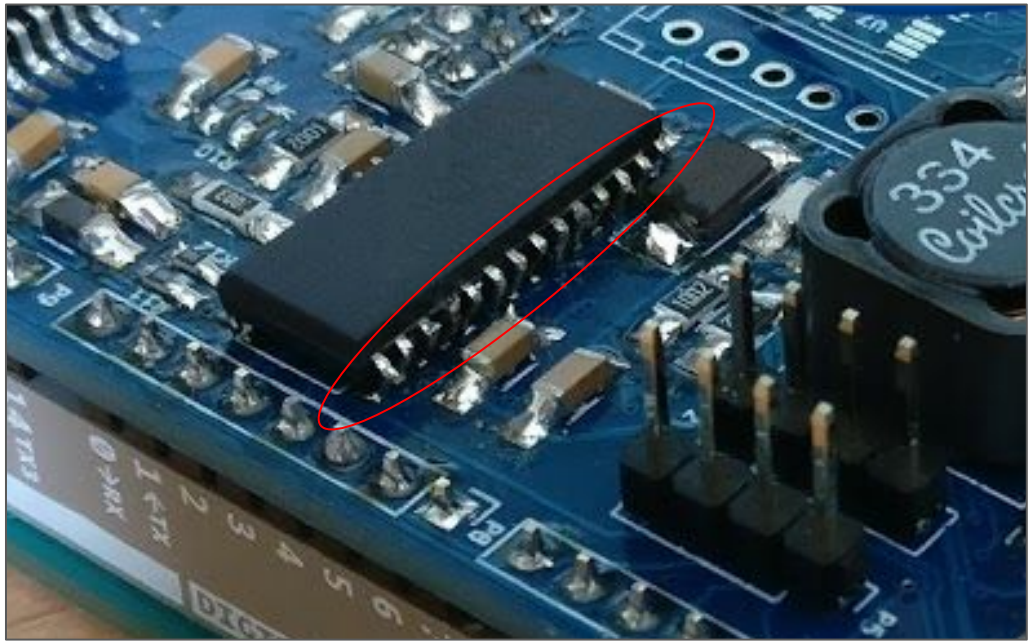




The importance of getting a footprint correct



The importance of getting a footprint correct

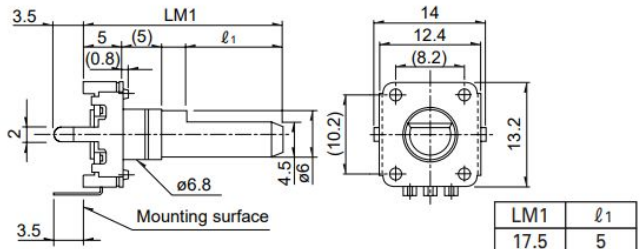
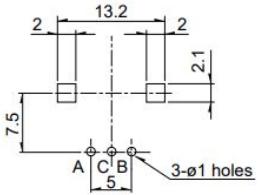


- SOIC footprint used.
- SOIC stated at the top of the datasheet.
- Footprint is incorrect!
- **SOIC Wide** stated at the bottom of the datasheet.

Check and double check!

Component Dimensions from the Datasheet

- All good datasheets will have a mechanical drawing of the dimensions of the component and its footprint.
- In rare cases you will have to purchase the component and measure its footprint yourself.

No.	Model	Style	PC board mounting hole dimensions (Viewed from mounting face)
1			

LM1	ℓ1
17.5	5
20	7
25	12

Entering footprints into KiCAD Example

Summary

- Discussed the differences between theoretical component values and real world components.
- Discussed the importance of component selection, considering the application and a good specification.
- Size, Cost, Weight, Tolerance, Power Dissipation, etc. All things to consider when selecting components.
- A footprint is the metal pads used to connect the component to the circuit board.
- Discussed the process of inserting footprints into KiCAD.
- Discussed the importance of Datasheets in Footprint Generation and Component Selection.

Thanks for listening!

Next time we will be:

1. PCB Layout Process
2. Rules of Thumb for PCBs
3. Things to consider when designing PCBs
4. Extreme Design Cases
5. Examples of PCB Layout

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