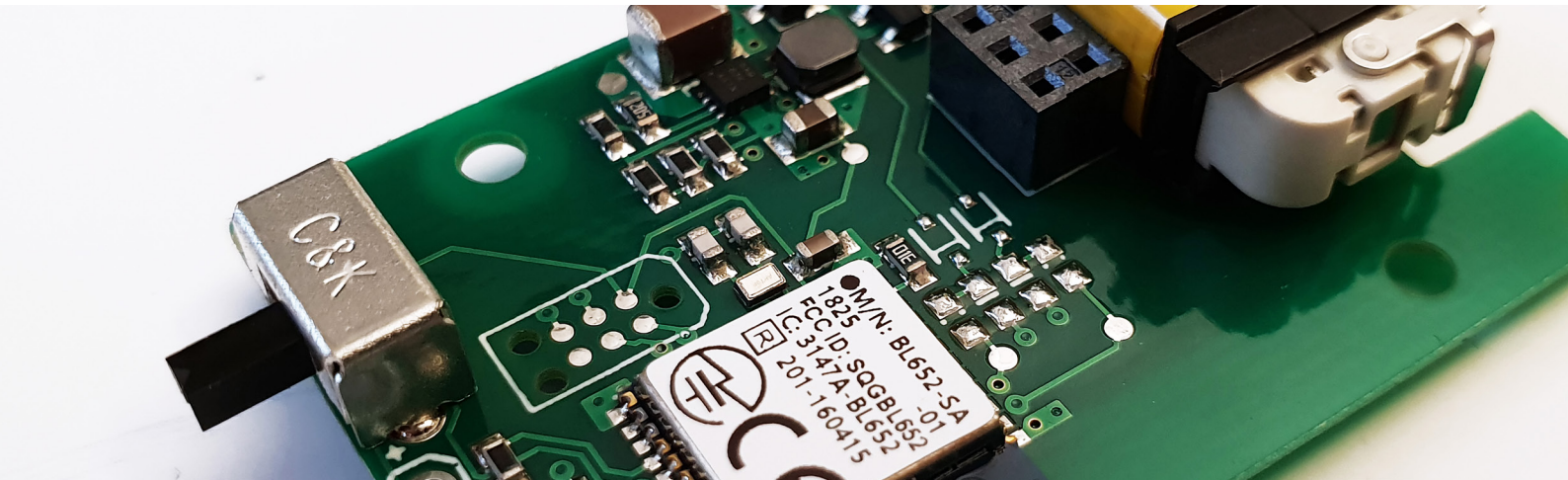


A PCBA Checklist

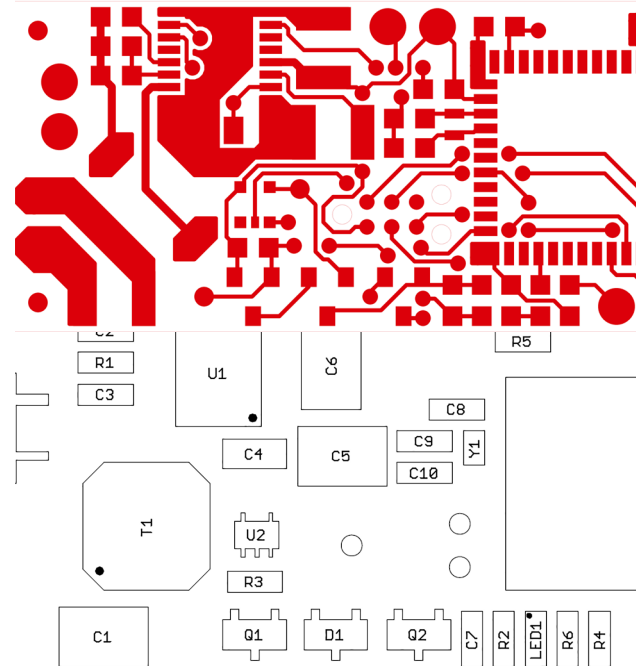
Considerations and what to remember when doing small batch PCBA for prototyping.



Introduction

This handbook contains a brief introduction to some of the things you should consider when doing PCBA for the first time. It covers from schematic and PCB-layout to documentation and manufacturing selection.

The handbook is crafted from the research and experiences done at IdemoLab.

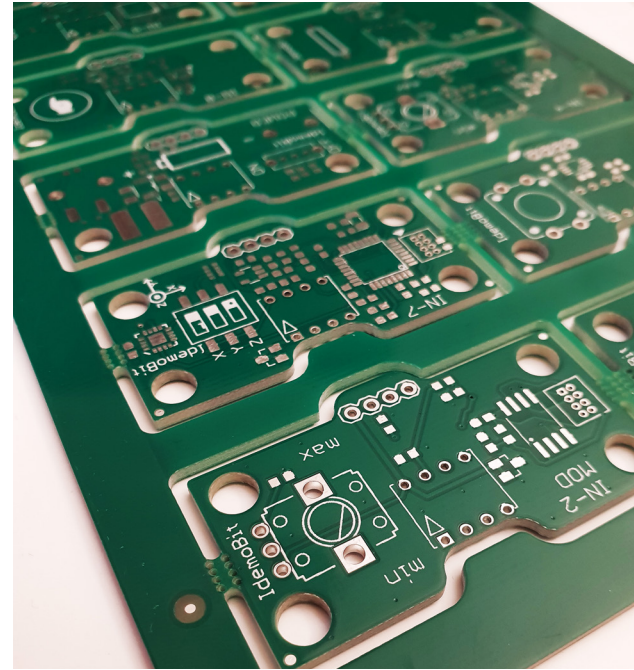


Problem statement

When designing a PCB either for test or for a small production, one will quickly discover how time consuming it can be to mount everything by hand, as soon as the board count reaches ten boards or more.

At this point it can be a good idea to start having another company mounting all of the components, as this can be both cheaper and faster. Generally, this is done in another country, such as eastern Europe or China, if price is important, and in western Europe if fast turnaround times are necessary. There can therefore be several pitfalls one should be aware of, when sending a design off to PCBA for the first time.

This small guide can serve as a general checklist for the engineers responsible of designing the PCB and sending it off to production.



Design checklist

Things to consider when designing the PCB.

1

Design rules

Always follow the design rules and requirements laid out by the selected manufacturer. This includes distance between tracks, holes, via's.

2

Distance between components

At very small volumes, some manufactures mount components by hand. If there is space for it, then the rule of thumb for prototyping is that the clearance around a component should be equal to the height of the component, allowing access to the base of component for rework.

3

Fiducial points

Place three fiducial points in opposite corners. These points on the PCB help aligning the board in the pick and place machine.

4

Generalize components

When choosing components select as generalized components as possible, that are ample in stock and can be sourced from multiple distributors. In this way it will be possible to easily substitute components if they get out of stock.

5

Number of different components

It should be avoided to have too many different components, and instead try to standardize values of e.g. resistors and capacitors as much as possible.

6

Panelization

An important design decision is whether to panelize the design or not. Panelization is necessary if the components are to be mounted by a machine, as it needs extra PCB to grab on to and it makes it possible to place components on multiple boards on one go, saving cost. If the design contains no components that need to be mounted by machine, then panelizing is often not necessary for small batches.

Documentation checklist

The work of the assembly house is only as good as the documentation they receive. Therefore, it is important to create the right documentation for them.

1

Gerber files

The gerber files are used for creating the PCB itself. They should be “RS-274-X” format and made to the manufactures specifications.

2

Mounting file

This file specifies where the SMD components shall be placed.

3

BOM

The list over all the components that are going on the PCB. Only components that the factory shall place should be on it.

4

Assembly guide

A drawing over the PCB where the component placement, name and orientation is clearly marked. This is optional but a good idea.

Production & Tolerances checklist

Be aware of the production requirements and tolerances as they can influence the legality, lifetime or design cost. Here are the two main things to consider.

1

Surface coating

There are three main choices of surface coating, HASL, lead free HASL and ENIG. Select Lead free HASL unless the design contains fine pitched components such as QFN, LGA or BGA.

2

Tolerances

Be aware of manufacturing tolerances in milling, end PCB thickness. These cannot be changed, and the rest of the design should be made to accommodate these. The silkscreen can sometimes be misaligned by several millimeters.

Selecting manufacturer

When selecting a production house, price is not the only thing to consider.

1

Price

A quote should always be collected from at least a couple of manufactures. Price can vary several thousand dollars.

2

Where in the world?

Typically factories in China and eastern Europe are cheaper than factories in the western world, but factories closer to Denmark, might be easier to communicate with. A factory in Europe will also allow faster and cheaper shipping, if a lot of components and boards are going back and forth.

3

Test run

It is always a good idea to do prototype series before high volume. Some manufacturers can help with this, allowing multistep service, where first, the prototype is produced, followed by series 0 and then going into series production.

4

Speed

It can easily take up to two months from boards are ordered till they arrive. It is often possible to speed up the process for a surcharge. China and eastern European factories produce prototypes in 5-6 weeks. European based manufacturers have delivery times in 1-3 weeks.

5

Who buys components?

Components can either be bought by you and shipped to the manufacturer, or the manufacturer can source them. Having the manufacturer source them is often easier, faster and cheaper, but if they have trouble sourcing a component, it can cause unwanted delays.

IDEMOLAB

Who are we?

IdemoLab bridges the gap between technology and design.

We focus on the important early stages of the design process and strive to create meaningful experiences for users and customers.

IdemoLab uses electronics as a design material and explores the properties of electronics, merging them with traditional design materials to explore new possibilities.

Our team specialises in facilitating and creating innovation for technological solutions. We live in a world of early adopters and provide knowledge and access to new and upcoming technologies. We curate and cultivate a culture of learning, exploration and experimentation and will provoke new discoveries through access to new knowledge and inspiration.

We help ideas meet the real world.



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