Case and Plate Design

Physical goodness.

Kerf Settings for Various Services

Ponoko

Acrylic:

Thickness	Kerf in mm
3mm	0.2
4.5mm	0.25
6mm	0.26
8mm	0.24

Lasergist

Stainless Steel:

Thickness	Kerf in mm
1.5mm	0.15

Switch Dimensions and Physical Specifications

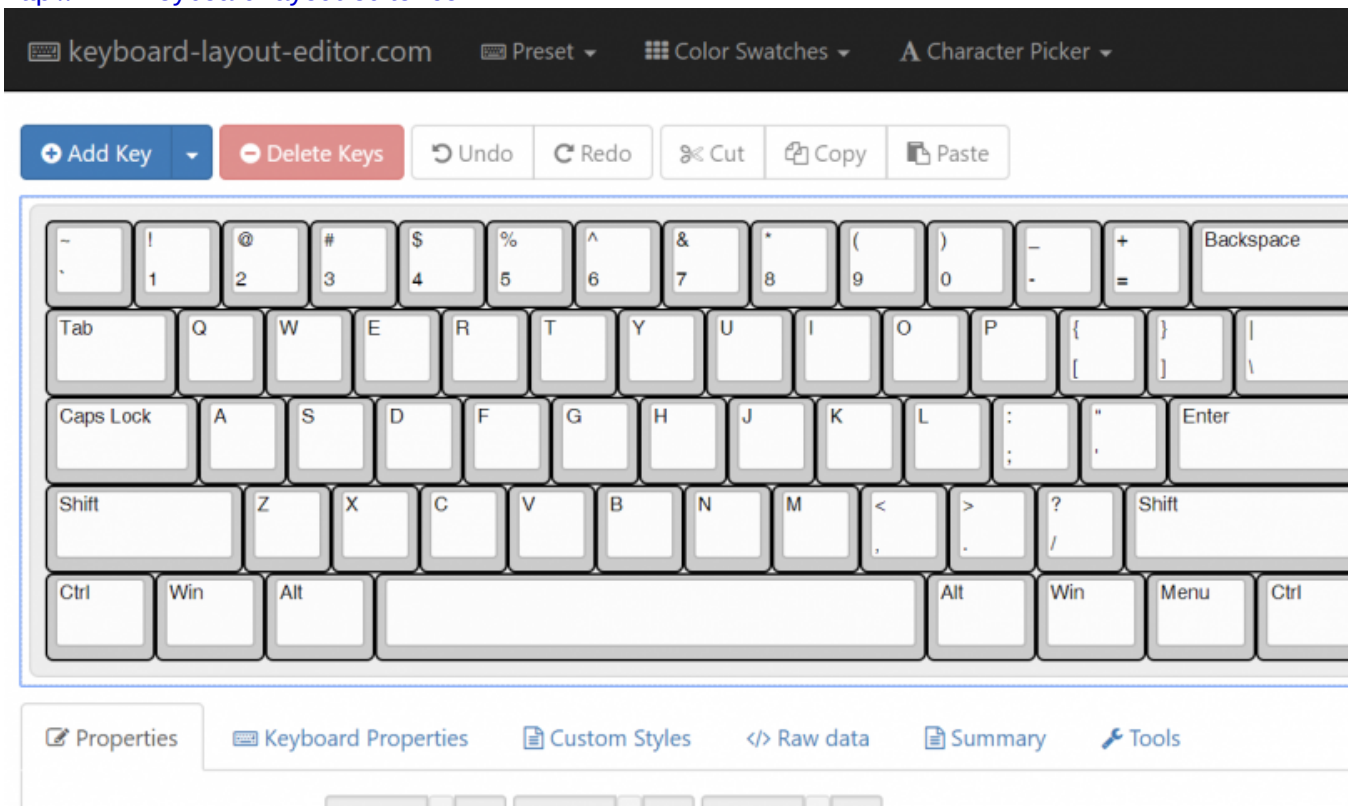
For a list of all switch datasheets available on hand, please see the switch datasheets tab of ai03's designer resources spreadsheet.

Plate with ai03 Plate Generator

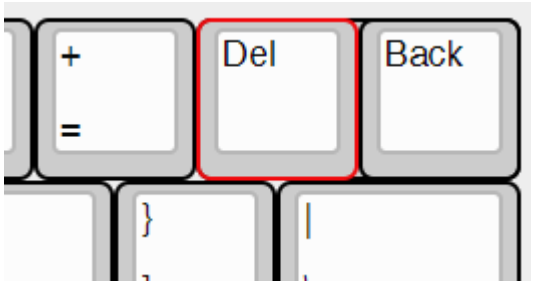
A quick and easy method that doesn't compromise.

Tutorial

1. Begin by making the layout in Keyboard Layout Editor.
   http://www.keyboard-layout-editor.com



   If you need compatibility cutouts, overlay the various options.



2. Copy the info from the Raw Data tab into the KLE Data field at ai03 Plate Generator.
   https://kbplate.ai03.com/
3. Select the switch cutout types, stabilizer types, fillet radii, etc.
4. Press the "Download DXF" button to download the plate.
5. Tune to perfection using a CAD program of your choice. Enjoy!

Using ai03 Plate Generator as a CLI tool

The ai03 plate generator doesn't have to be web-hosted.

Requirements

- Python 3.7 or higher
- The files here
- Requirements in requirements.txt of the repository

Usage

- `python plategen.py -h` for all arguments and their options
- `cat kle-raw | python plategen.py > plate.dxf` to make a plate.dxf based on raw KLE data in the kle-raw file

Brutally honest truths of designing cases

This addresses the most common issues I see with case design.

1. Don't one-off that one-off.

"I want to make this keyboard, but I don't want to sell it, so I'll just make one for myself." Sounds reasonable for the designer, yes.

However, keep in mind that one-offs are completely unprofitable for the factory producing it, and the unspoken expectation is a follow-up production run of at least 50-100 quantity. One-offs have become so unprofitable that many factories are starting to ban keyboards entirely due to the lack of etiquette from the orderers, completely closing available factory options for those serious about case design and production. In addition, running very low quantities at factories shared among others draws significant production time away from larger orders, especially when the engineers have to correct an unmanufacturable design. Finally, if an anodizing pot has to be prepared for one keyboard and thrown out after, it's nothing but pure waste. Consider its environmental impact.

To put it short, follow up your prototypes with proper production runs, or don't produce at all.

2. Your first design is shit.

There is absolutely no way you can nail every feature of the CAD program, every design constraint of the manufacturing method, and every tip and trick of keyboard design on your first shot. That very first practice draft is not something to be manufactured.

Just about every experienced keyboard designer I speak with has spent many months practicing keyboard design over tens, occasionally hundreds of design drafts before putting in their very first order for a case. Yet even then, their first keyboard had flaws which were repaired over multiple prototypes or projects. Only then was the design good enough to sell.

Your design must be manufactured. What does this mean? A set of eyes at the factory must examine your design file to check that it can physically be manufactured, spend even more time repairing it if it cannot be, and send it back for review. This takes a cripplingly long time if the design is not properly designed for manufacturability. As per before, some factories have banned keyboard orders due to this occurring too often. Don't send in your drafts for production.

Keep in mind that your customers are entrusting you with their money to put out a properly designed product, and that you are moving many employees of a factory with each order regardless of whether or not you carry through with it. Design like you mean it.

3. Pocket change is not enough.

Consider the points covered above. It is often that multiple prototypes must be paid for to refine and repair. This costs money.

Consider that a typical keyboard prototype costs roughly 500 USD, often more if the design is complex. With repeated prototyping, the total prototyping cost alone can reach into thousands of dollars. In addition, you must purchase the parts to test the prototypes with, adding to the total cost.

Manufacturing has become accessible, and it is a blessing for all of us. However, there are absolute minimum requirements for doing so. Be financially stable first, then make your cases.

4. One month is not even close to enough.

To design a keyboard, it is crucially important to know boards have existed, and how they have evolved. Even more important is studying in-depth what constitutes the features of a good keyboard. This is not something done overnight; this is something done over many months at minimum as a regular member of the mechanical keyboard community.

To design a keyboard, you must learn material properties, finishing options, manufacturing design constraints, production requirements, logistics planning, proper CAD usage, among many other things. Again, this is not something done overnight; learning about such and properly applying them to drafts to practice is another requirement which takes months.

To design a keyboard, it is important to prototype to check for flaws and test for improvements. Each prototype must be prepared by many machines, factories, and humans. Again, this is not something done overnight; it is not uncommon for a prototype to take over a month.

Designing is a commitment of time. You may have noticed that the time requirement can add up to a year or more; I am an example of one person who has taken such a timespan to produce a case. Two years of activity as a regular keyboard community member and one year of design starting with PCBs was necessary to prepare a final draft for the very first case design presented to the public, with an additional year until being able to produce competitive designs. It is not impossible that your time commitment will be similar.

Yet at the same time, the inverse does not necessarily hold true: just because you have spent much time within the community and wasted hours upon design does not signify that your designs will be decent. See point 6 later on.

5. The quality will be "garbage."

Even the highest end production boards have internal flaws. It is unreasonable to expect a flawless case.

The reason you do not see many flawed units with expensive boards is because they are hidden away from you. It is completely acceptable to see a double-digit B-stock rate, and is expected and planned for by ordering more than necessary. These flawed units are either sold separately as B-stock, or not sold at all and scrapped. Your perspective is skewed since these units are not seen as clearly as the polished, shimmering A-stock. It is unreasonable to expect a flawless case.

No matter how advanced the world may be today, there are still many, many human interactions to the case for production. Humans are not flawless. It is unreasonable to expect a flawless case.

This is another case of factories banning keyboards; this time, it is due to the unreasonable expectations of quality by new designers causing repeated remanufacturing and chargebacks. Be realistic.

6. Not everyone is a designer.

Not all humans are created and raised equally. If they were, you would have equal and maximum capabilities as anyone else, and everyone would be equally skilled as a keyboard case designer. This is not the case.

Designing a case requires a careful balance of engineering and artistic elements, balancing many constraints of components and manufacturability packaged into an accessible, assemblable product with an aesthetically pleasing facade. This requires taking into account many skillsets, which not everyone has readied whether innate or learned.

One very oft-encountered requirement, especially for a first case, is reading a datasheet for dimensions, comprehending them, and applying them to a design. This is absolutely necessary for designing around the set dimensions of keyswitches and USB connectors. Since half of the US adult population cannot read at a meaningful level for this task, not everyone can do the above.

I am all for design variety and collaborative efforts towards keyboard design; however, the cold truth is that only a very small subset of people are fit for the task.

7. You must make your own design decisions.

Unless it is a clear required dimension based on the constraints of a component, there is no set answer for what a dimension should be. It depends on your design, it depends on your design goals, it depends on manufacturing constraints; as a designer, you must make your design decisions.

The functionality of a component completely depends on the implementation on your own unique design. There is no single solution to implementing a component that works across all designs; you must decide and implement your own weight, case, gaskets, screw points, and every other element of your own design. As a designer, you must make your own design decisions.

Not all factories are the same. Not all CNC machines are the same. The tolerances and constraints you should design around should be tailored to the factory and machines you will be using. To guarantee proper manufacturability, it is important to design around such constraints and apply them to each and every part of the design. As a designer, you must make your own design decisions.

After some point, it is necessary to inquire, test, experiment, research, and brainstorm to lead to the dimensions necessary for design. After all, we need more designers, not mere machines which can only act upon and duplicate the design decisions of others; such is not designing.

8. Designing is a learned skill.

As discussed in the above points, many requirements for good case design are either knowledge-based or skill-based. These are learnable. With enough determination and dedication, one can acquire all skills necessary for case design. Even after getting well into case design, knowledge and skills are constantly expanded through experimentation and discussion.

On the flipside, if you dislike learning, you may depart from case design immediately.

This ties into point 4: designing, and learning how to design, is a process which takes time.