

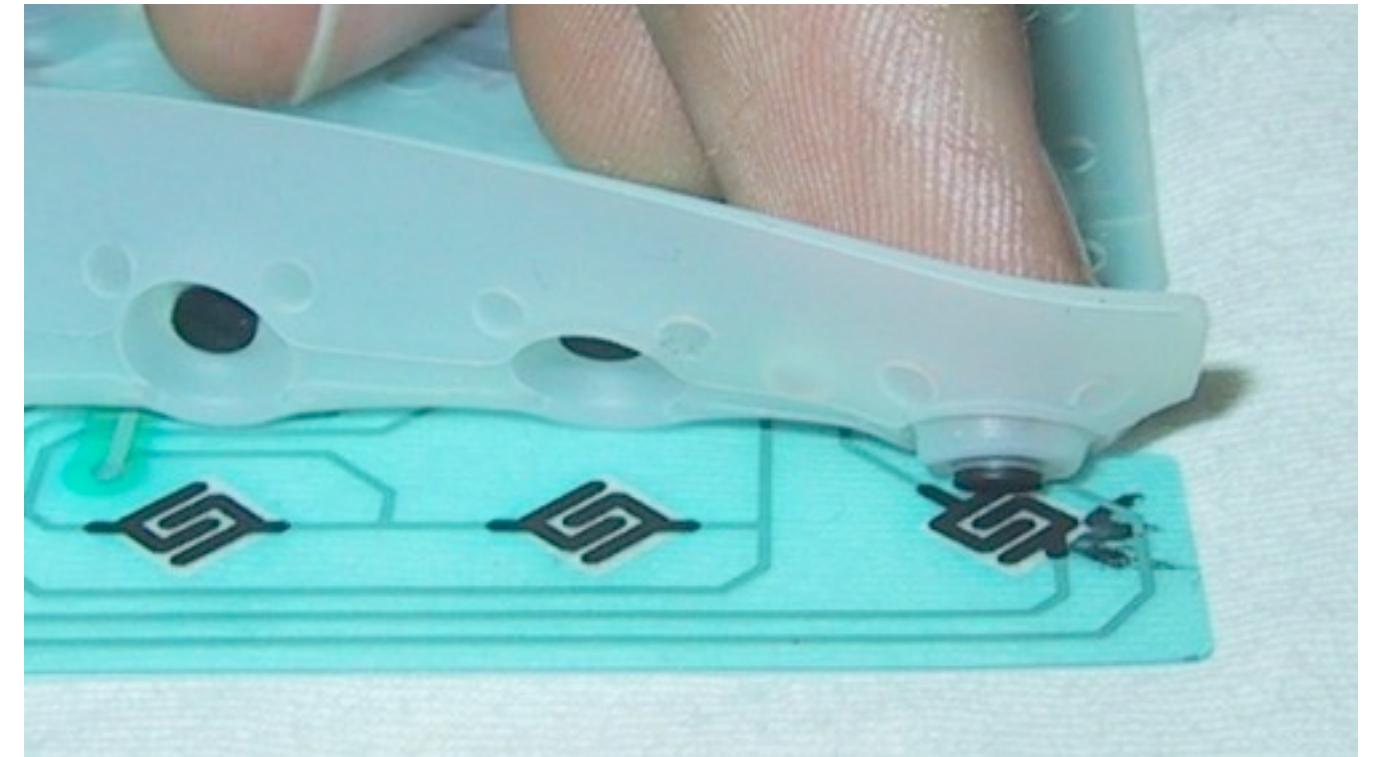
Mechanical Keyboards

Your next hobby

'Mechanical' keyboard?

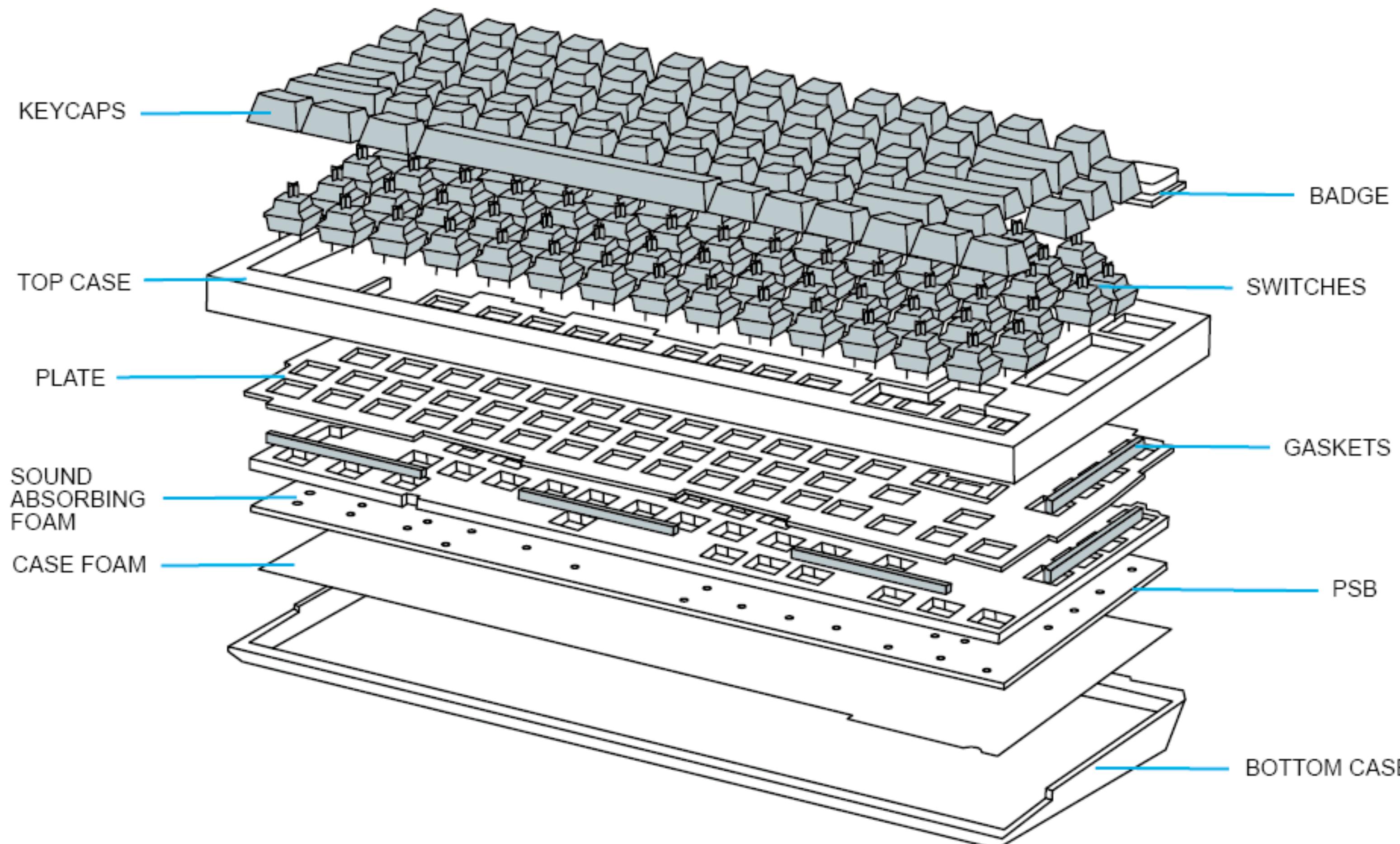
Aren't all keyboards mechanical?

- Non-Mech
 - Membranes under keys, have a squishy feeling.
 - No real tactile feedback.
 - Generally lack support for n-key rollover.
- Mech
 - Mechanical switches under each key.
 - Often combined with other higher quality parts; cases, keycaps, customized via firmware.



What's it made of?

Parts of a Mechanical Keyboard



Form Factors

Full-size



Tenkeyless/TKL/80%



75%



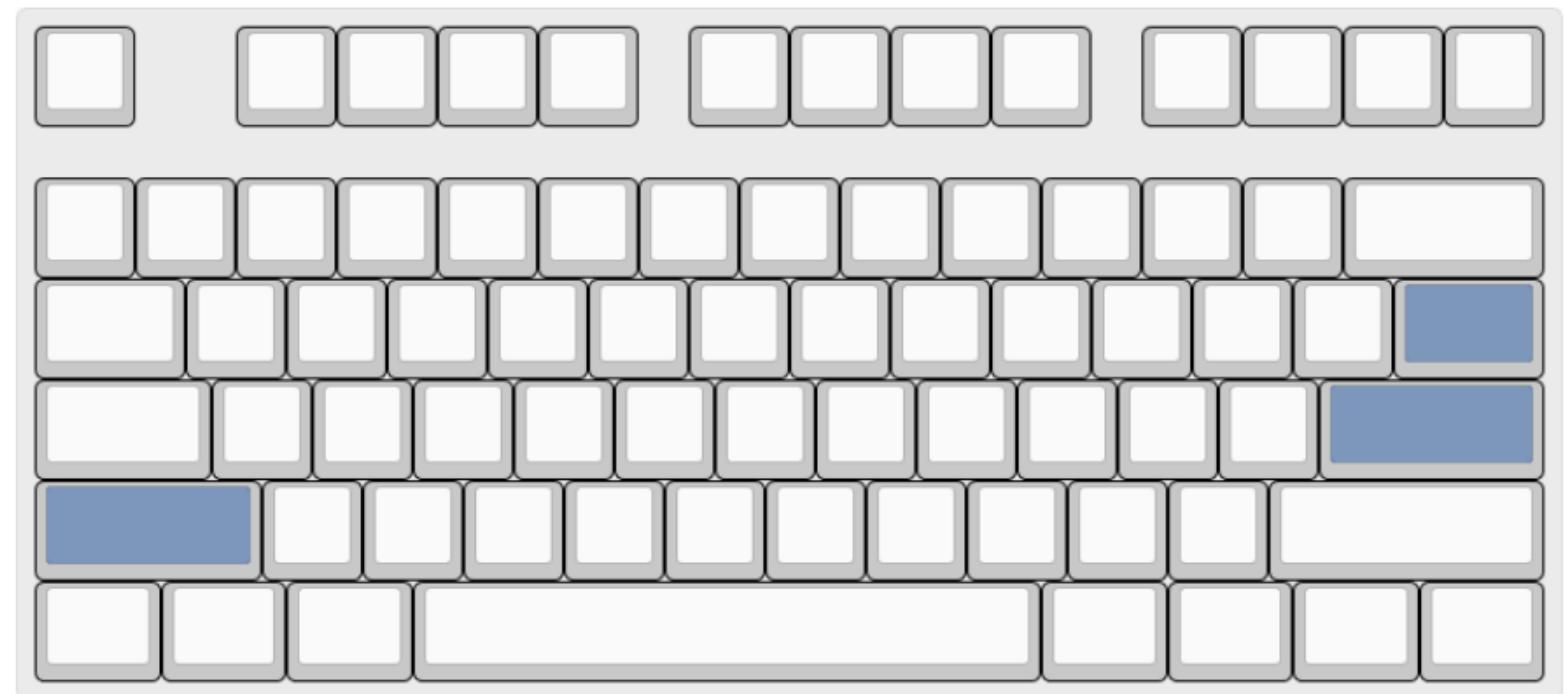
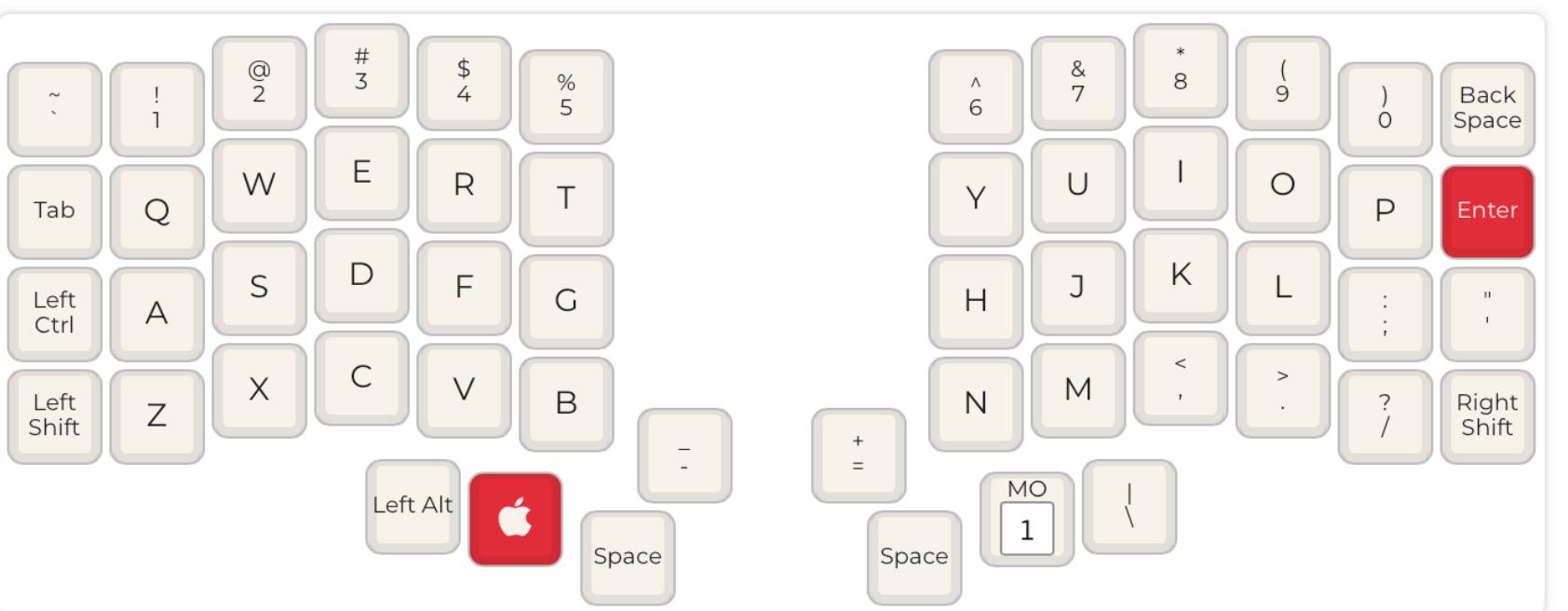
60%



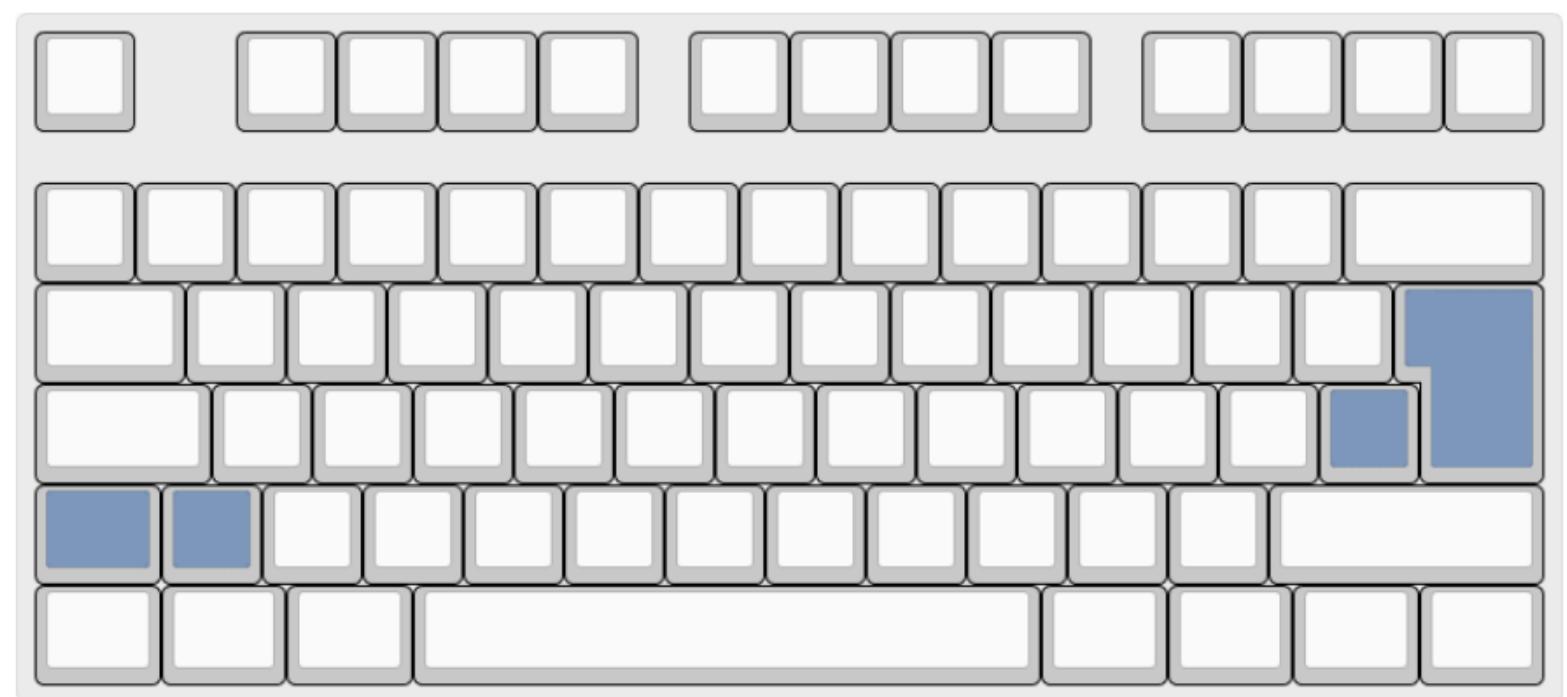
40%



Layouts

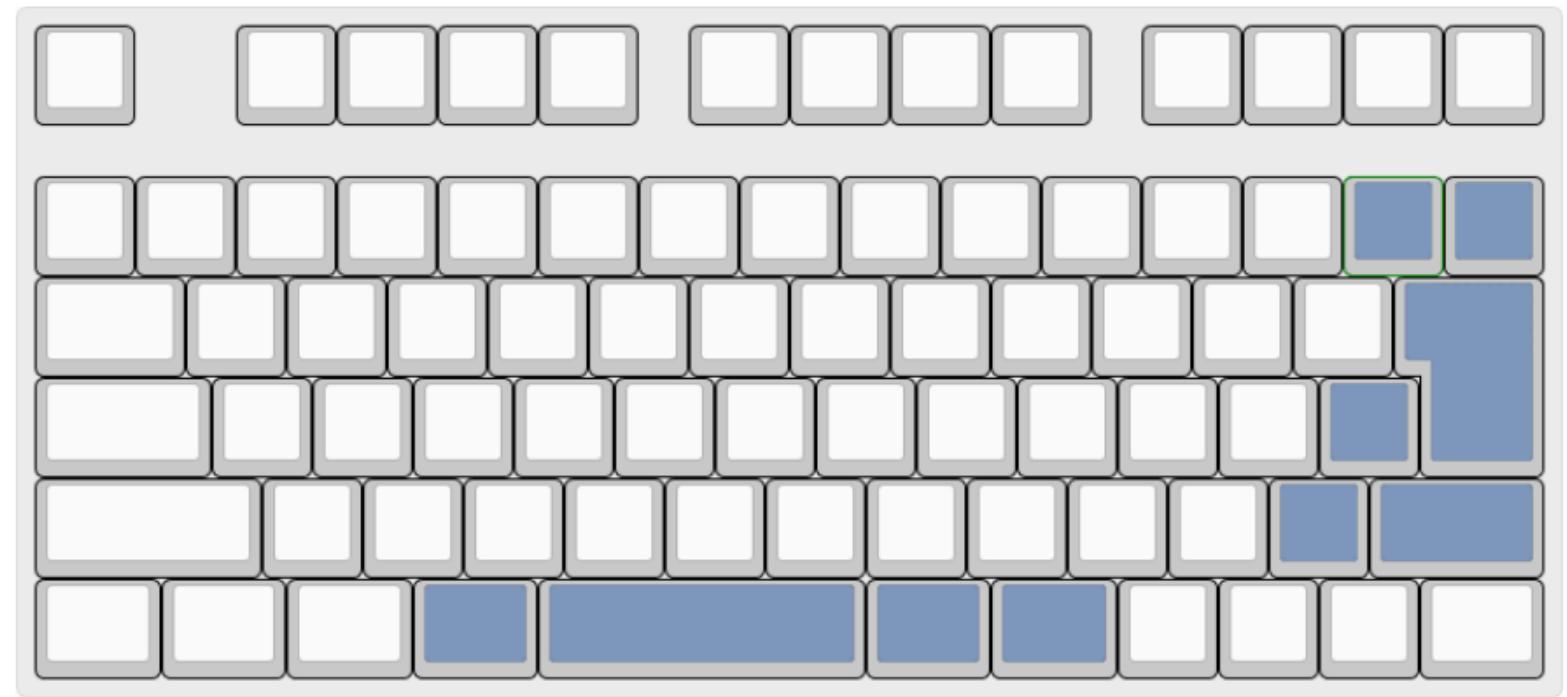


ANSI layout



ISO layout

Staggered

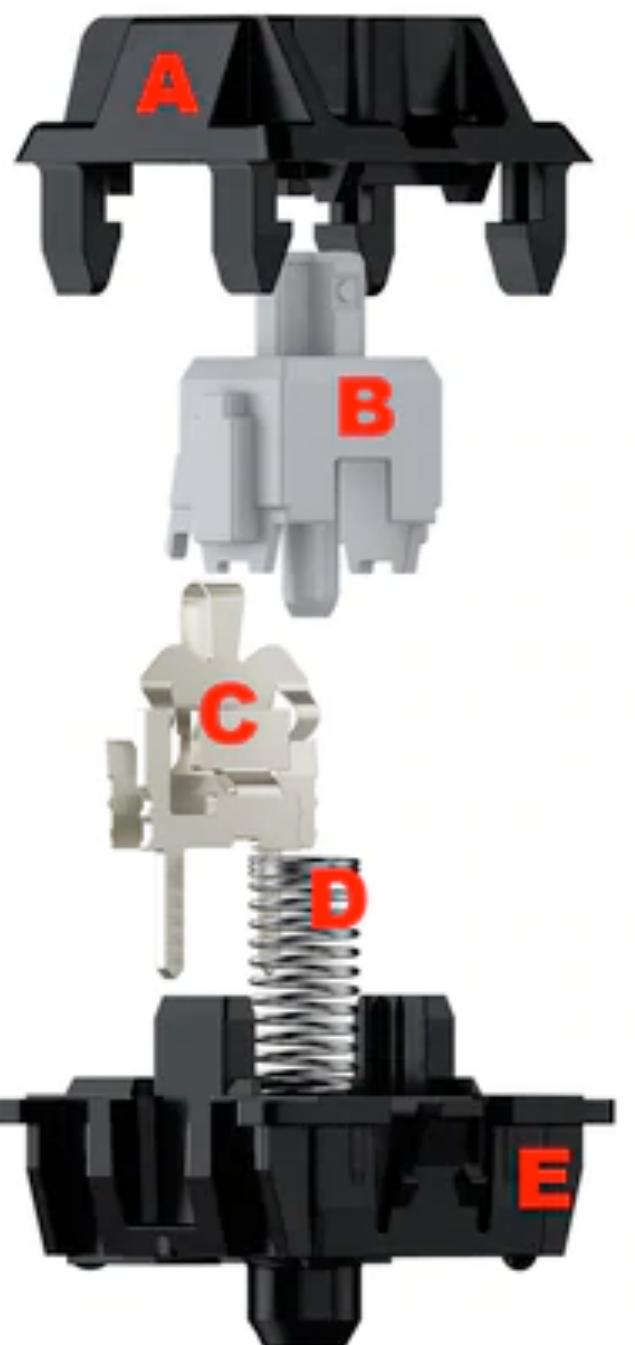


JIS layout

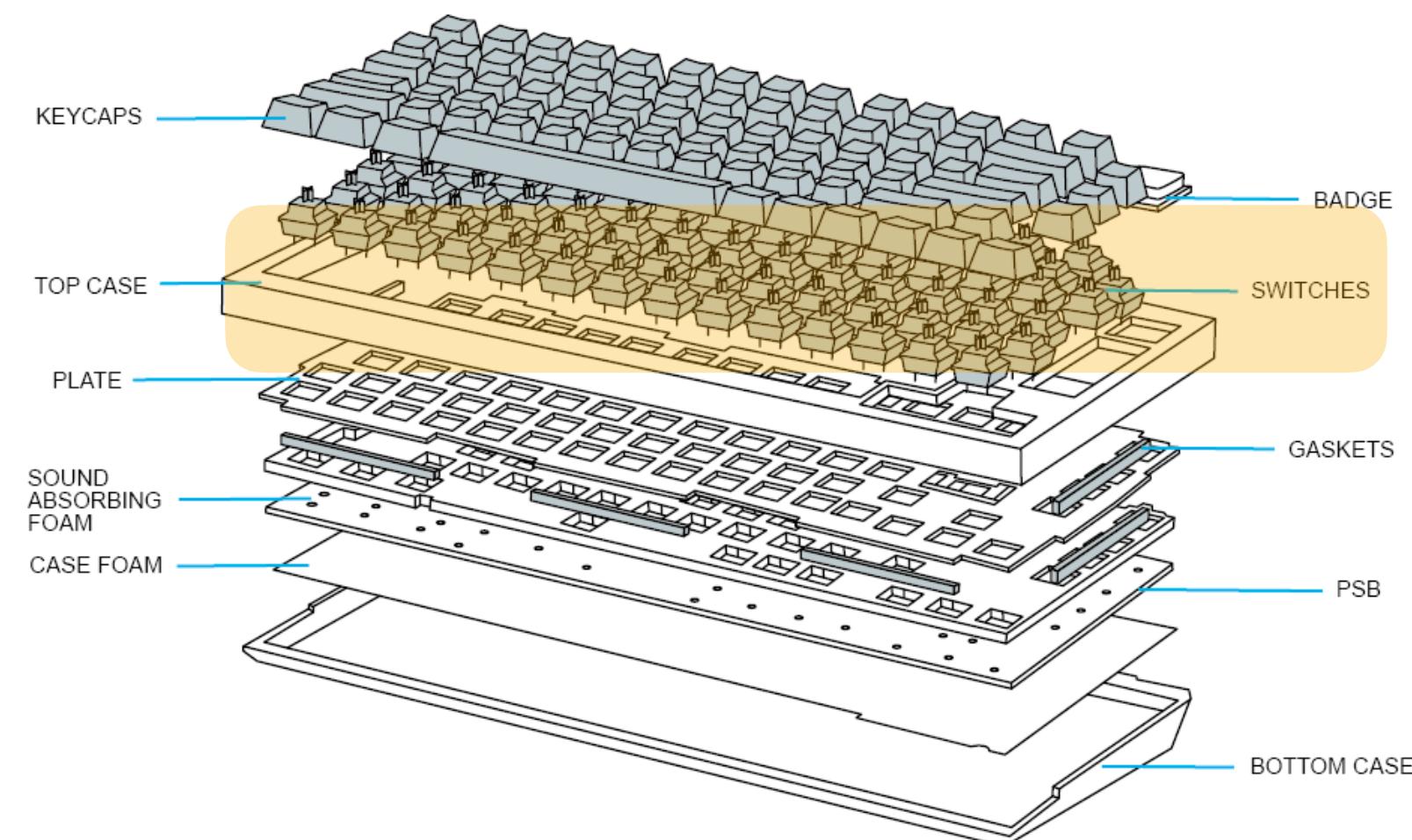
Ortholinear

Switches

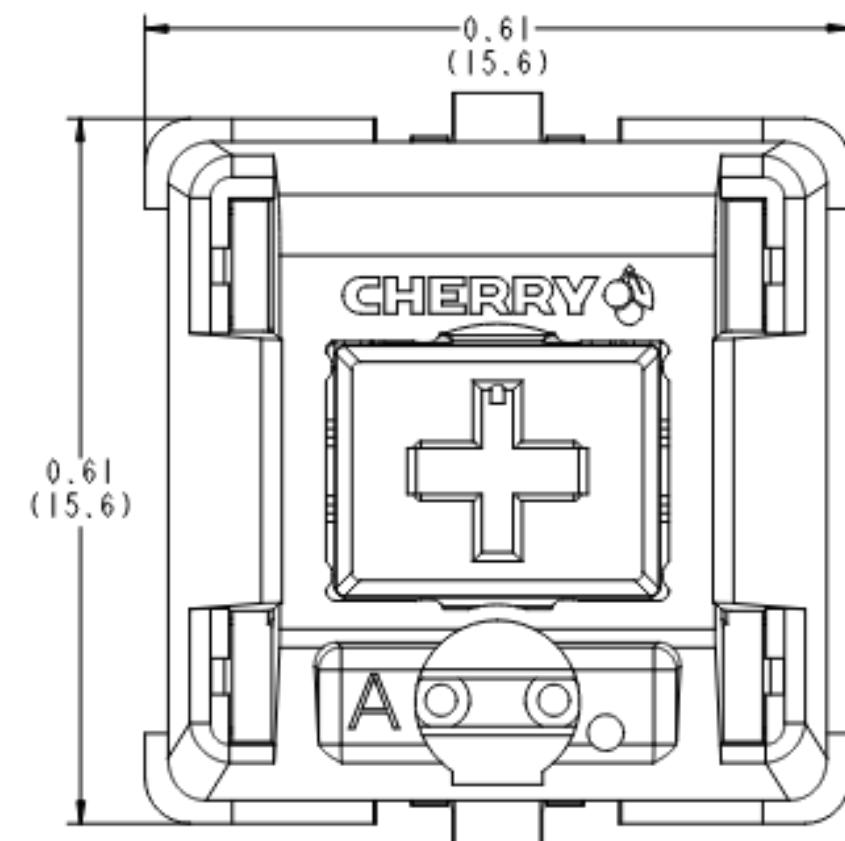
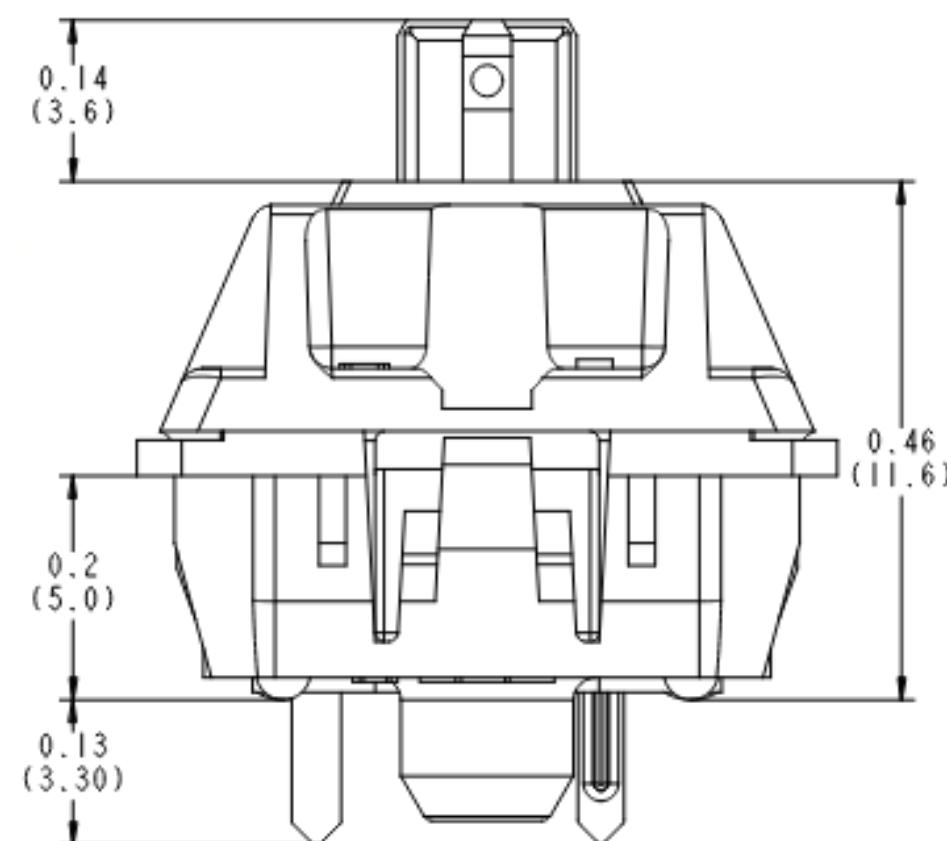
- Components
 - Upper and Lower Housing
 - Stem
 - Metal contacts
 - Spring
- Cherry MX is a common style
- Distinguished by color



Parts of a Mechanical Keyboard



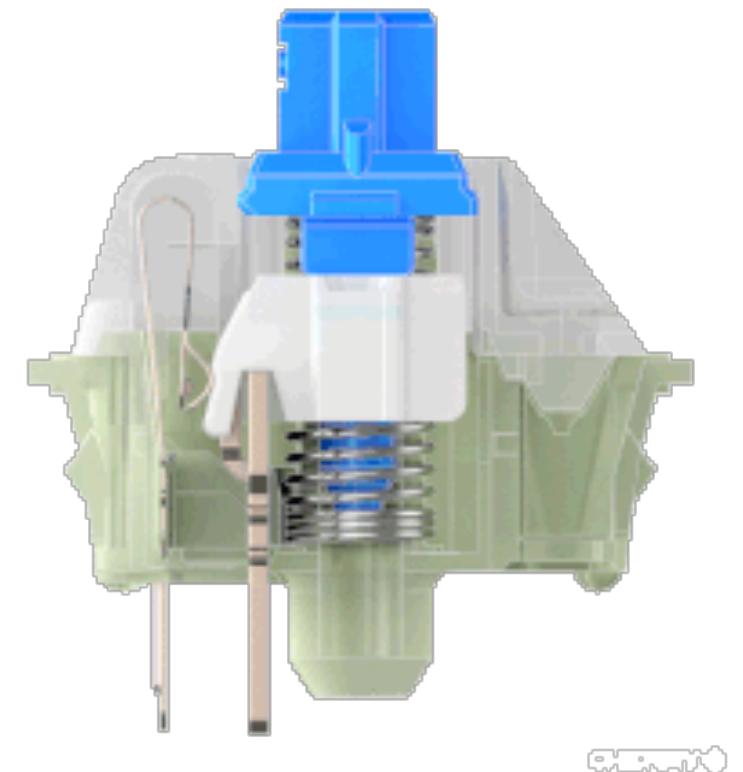
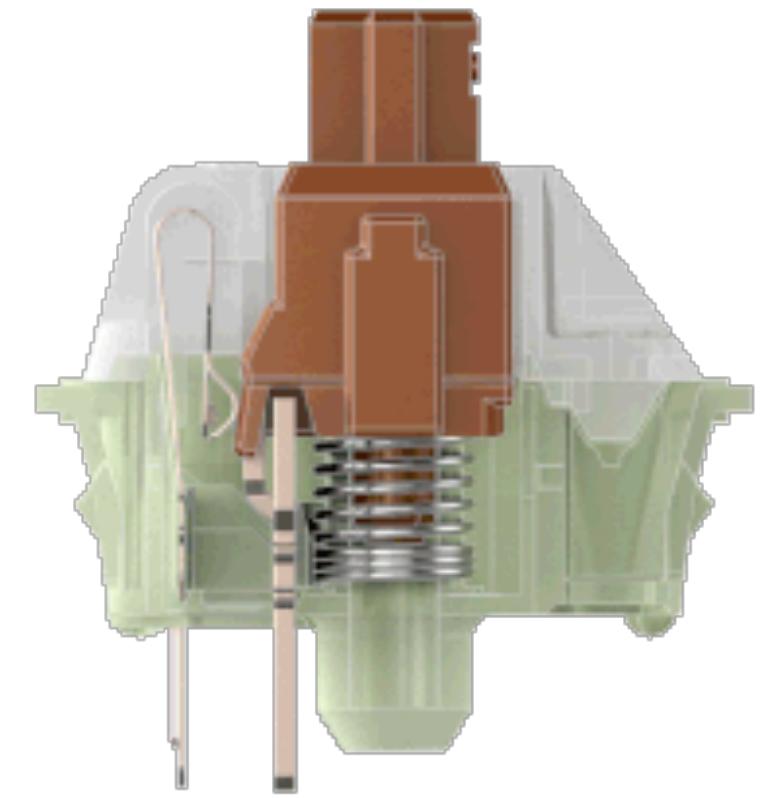
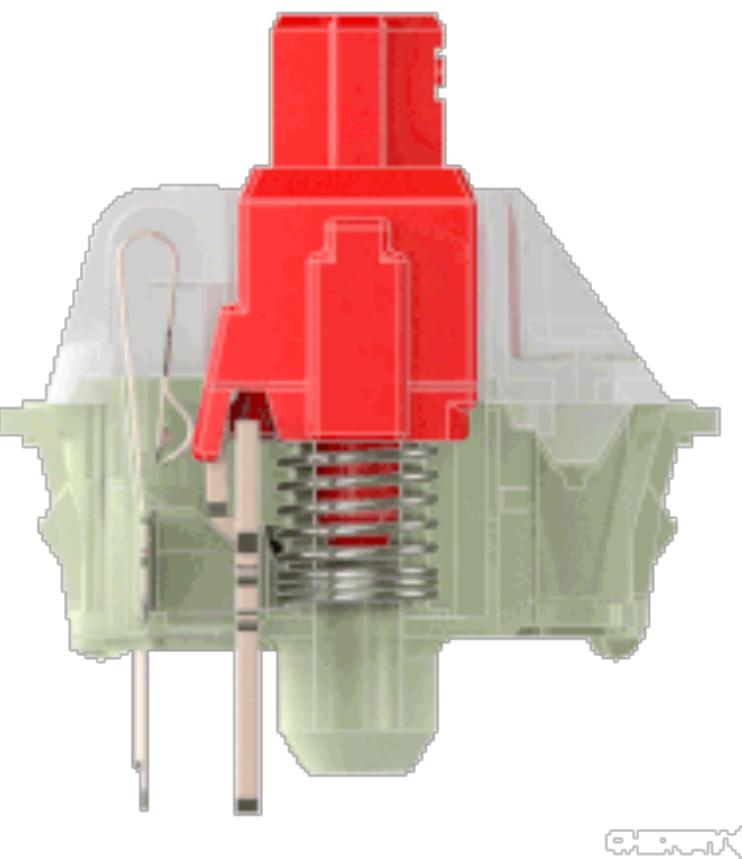
TechWithTech.com



Switch Types

The keyboard feel & sound

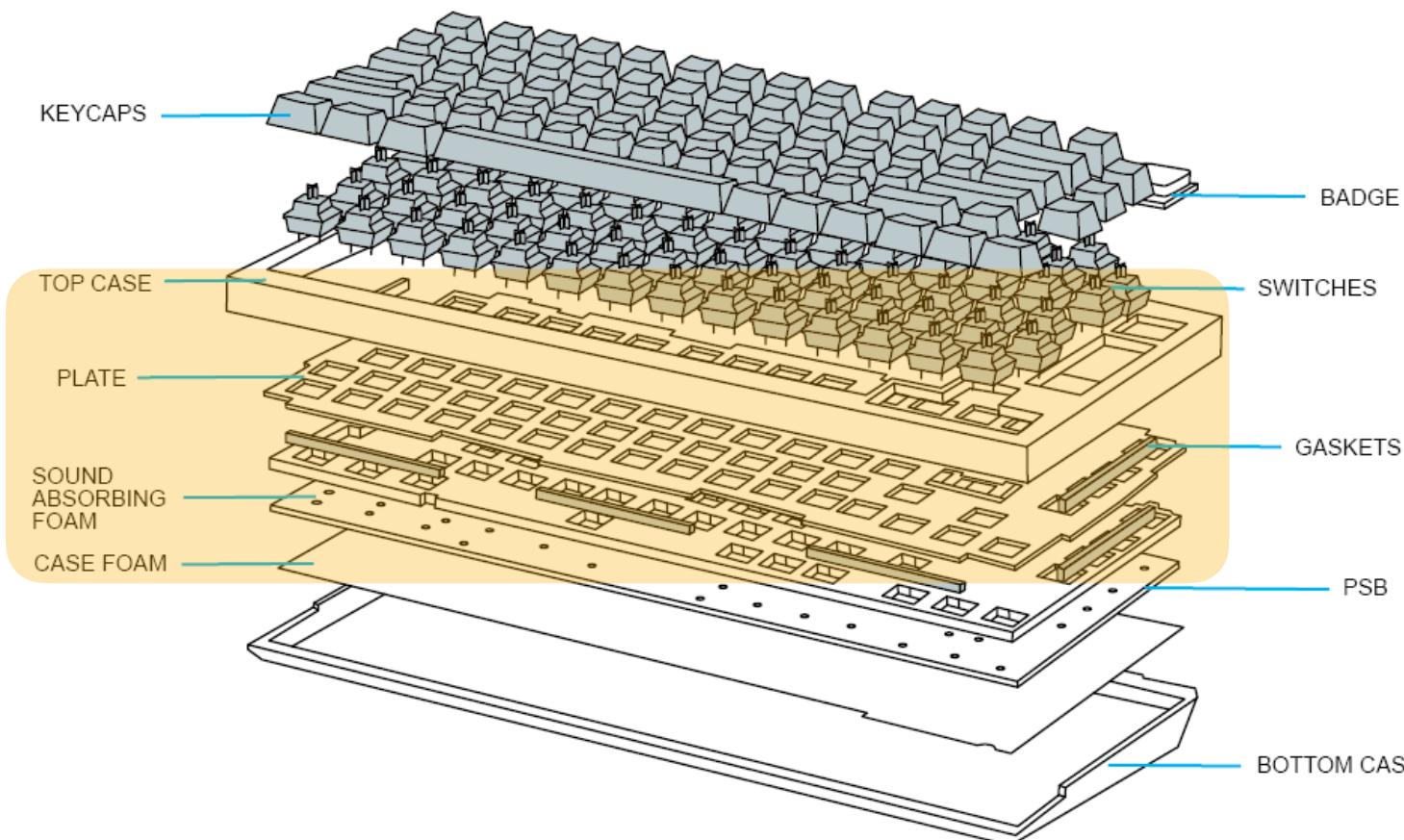
- Linear
 - smooth, quiet, no ‘bump’, faster feel, bottom out.
- Tactile
 - a bump midway through stroke / actuation-point
- Clicky
 - a bump & click midway through stroke / actuation-point
- Others...
 - Buckling Spring, Alps, Topre



Case & Plates

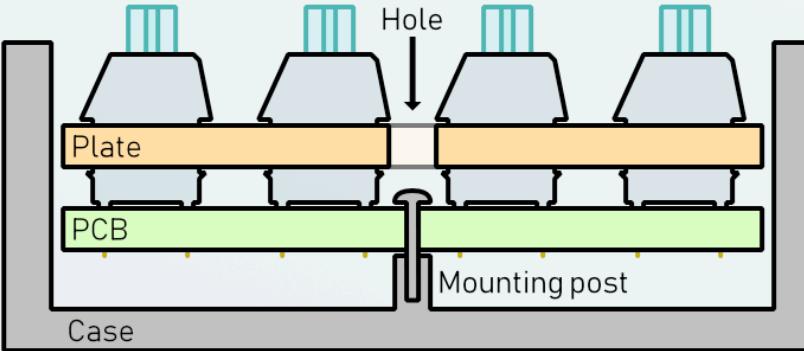
- Cases come in plastic, acrylic, aluminum, brass, etc.
- Plates come in plastic, aluminum, brass, steel, etc.

Parts of a Mechanical Keyboard



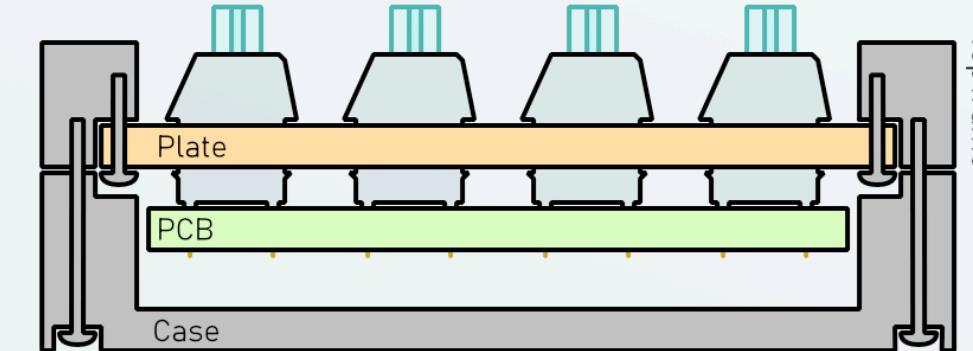
Tray mount

- The PCB is affixed to the case by means of screws, mounting into threaded mounting posts.
 - Holes in the plate allow for the screws to be installed.
- + Standardized mounting post positions for 60% boards
+ Affordable and relatively easy to machine
- Standardized positions can provide an uneven stiffness
- May cause inconsistent sound



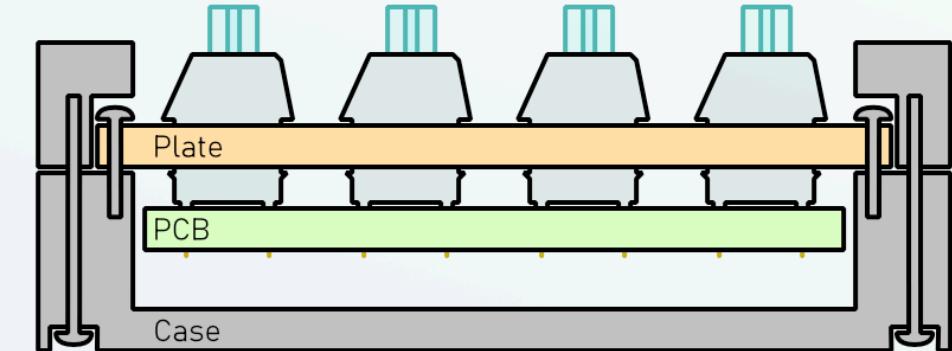
Top mount

- The plate is attached to a top frame, which is attached to the bottom of the case.
- + Can provide a more singular sound and more consistent feel
+ Many design variations possible
+ Compatible with both harder and softer plate materials
- Requires a custom plate



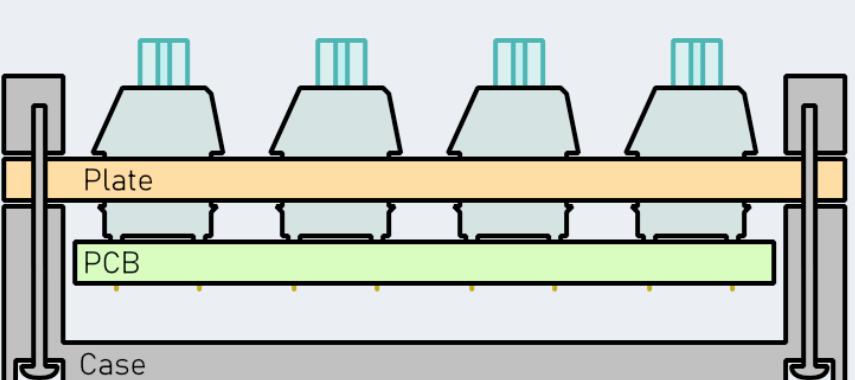
Bottom mount

- The plate is attached to the bottom frame.
 - The top frame is optional, making it much like a sandwich mount.
- + Can provide a more singular sound and more consistent feel when compared to the top mounting style
- Requires a custom plate



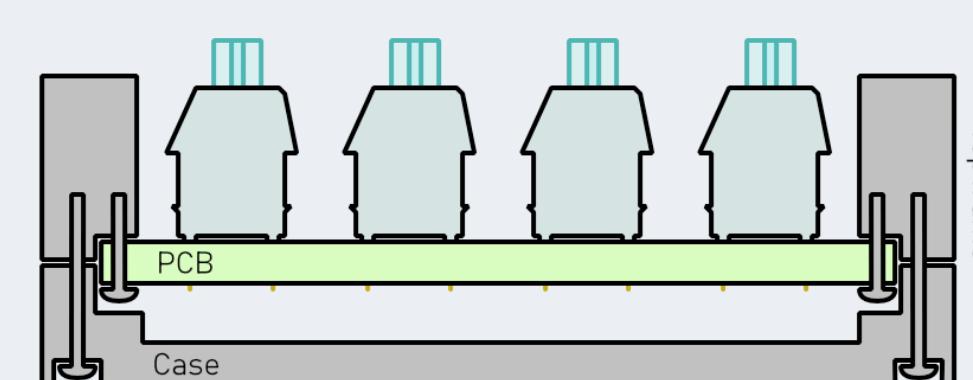
Sandwich mount

- The bottom case, plate and top frame are layered on top of each other, then affixed with a screw from the bottom.
 - The top frame is optional, making for a low profile case.
- + Can provide a more singular sound and more consistent feel
+ Cost effective and relatively easy to design
- Tends to be stiffer than alternatives



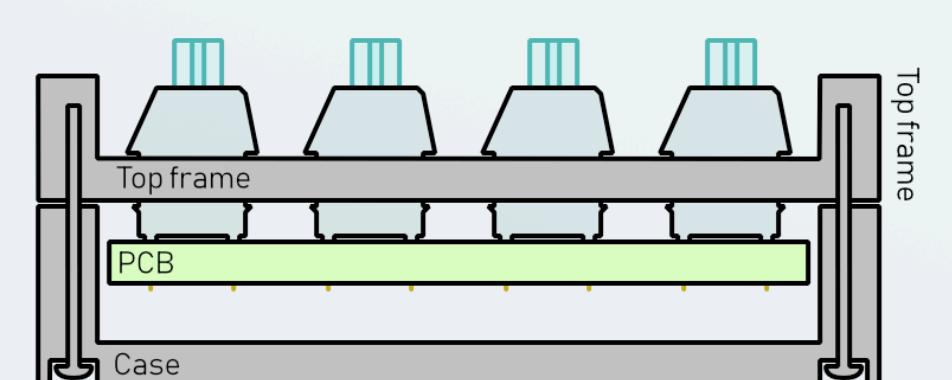
Plateless mount

- Like with a top- or bottom mount case, the PCB can be affixed to either a top frame or the bottom case. Plateless top mount is shown.
 - Also known as PCB mount.
- + Provides much more flex than alternatives
+ Tends to be more affordable than more complex mounting styles
- Can be more fragile than cases that do use a plate



Integrated plate

- The top frame and plate are milled from one block of material.
- + Relatively easy to machine
+ Provides a unique look
- Tends to be louder when attached to just the top frame
- Tends to be stiffer than alternatives



Cheat sheet: Custom keyboard mounting styles

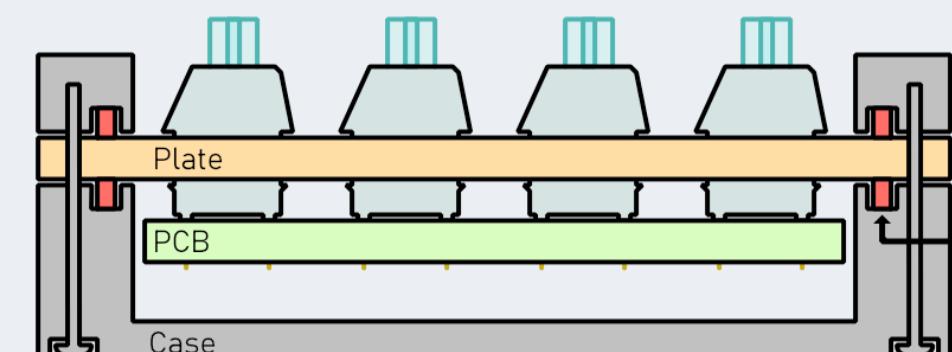
Custom mechanical keyboard cases come in many different shapes and sizes. While each case has unique qualities, the way in which keyboard components are mounted often boil down to a number of different styles. Some designers might combine concepts from various styles to incorporate the various benefits of the different mounting styles. I hope that with these diagrams, you'll gain a better understanding of some popular mounting styles.

 Thomas Baart

This cheat sheet was composed using the generous input from the community on the r/MechanicalKeyboards Discord server, and by using the following sources:
<https://brianleereviews.wordpress.com/2018/11/23/guide-keyboard-construction-explained/>
https://deskthority.net/wiki/Custom_Keyboard_Construction

Gasket mount

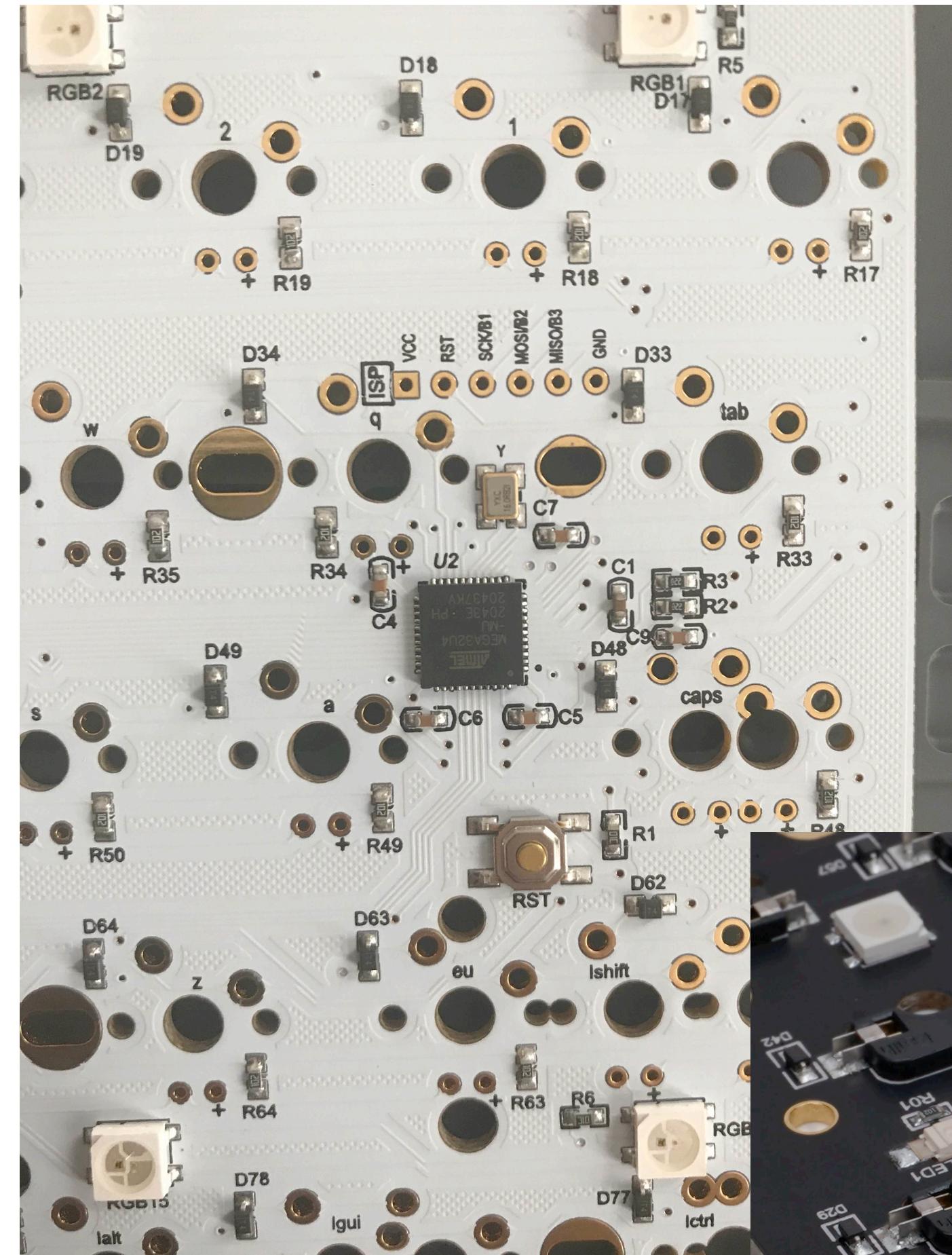
- A form of dampener, often elastic material, is inserted between the top frame and case.
 - Many variations available, using various materials and form factors.
 - Most mounting styles can be made into a gasket mount.
- + Is able to provide a damped sound and feel, tends to be quieter
+ More tolerant to factory tolerances than alternatives
- Tends to be more expensive than alternatives



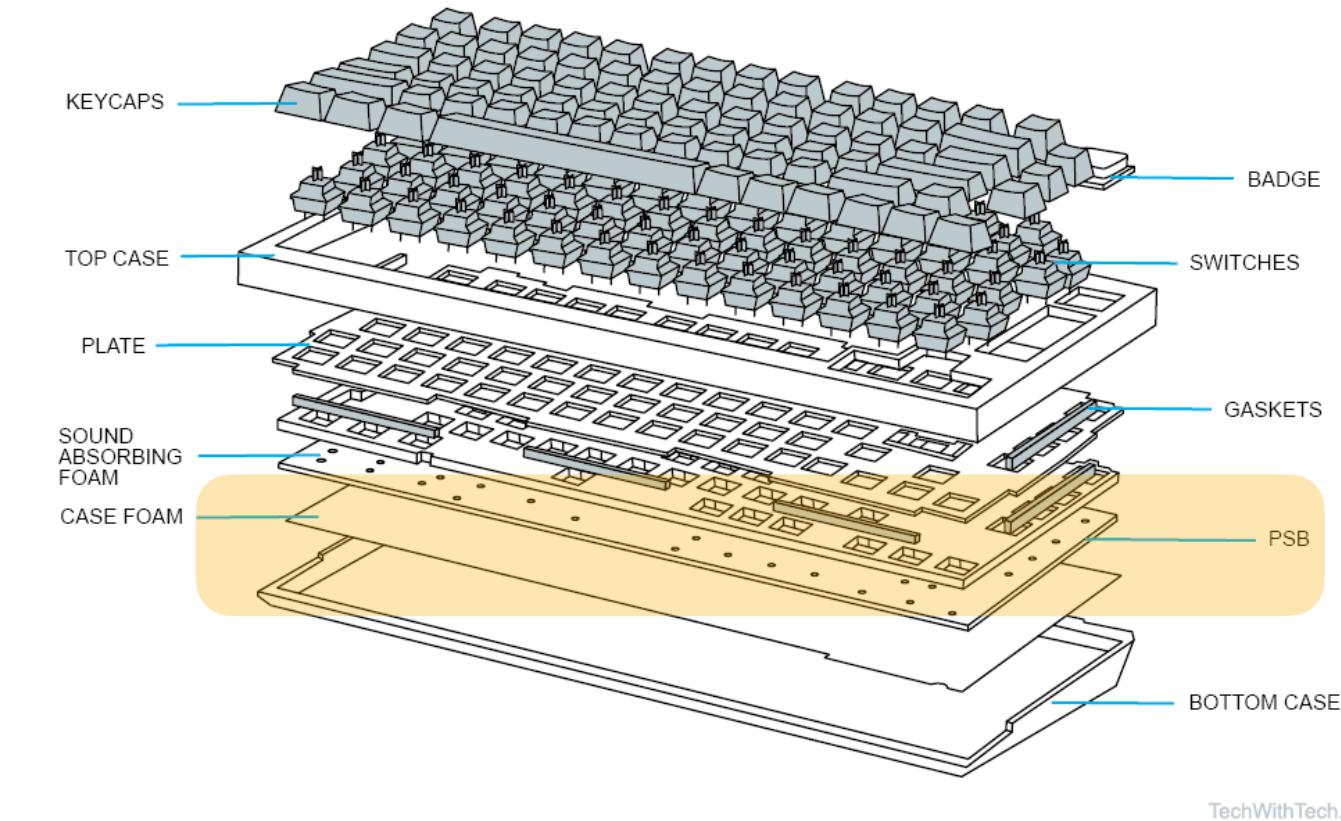
PCB

- Match the form factor
- USB I/O / Bluetooth
- uController - Firmware (QMK)
- Hot-Swap PCB
 - no soldering, swap switches in/out
- Standard PCB w/ SMT
 - solder switches with some options on placement
- Through hole or no PCB
 - no SMT, harder to find
 - hand-wired

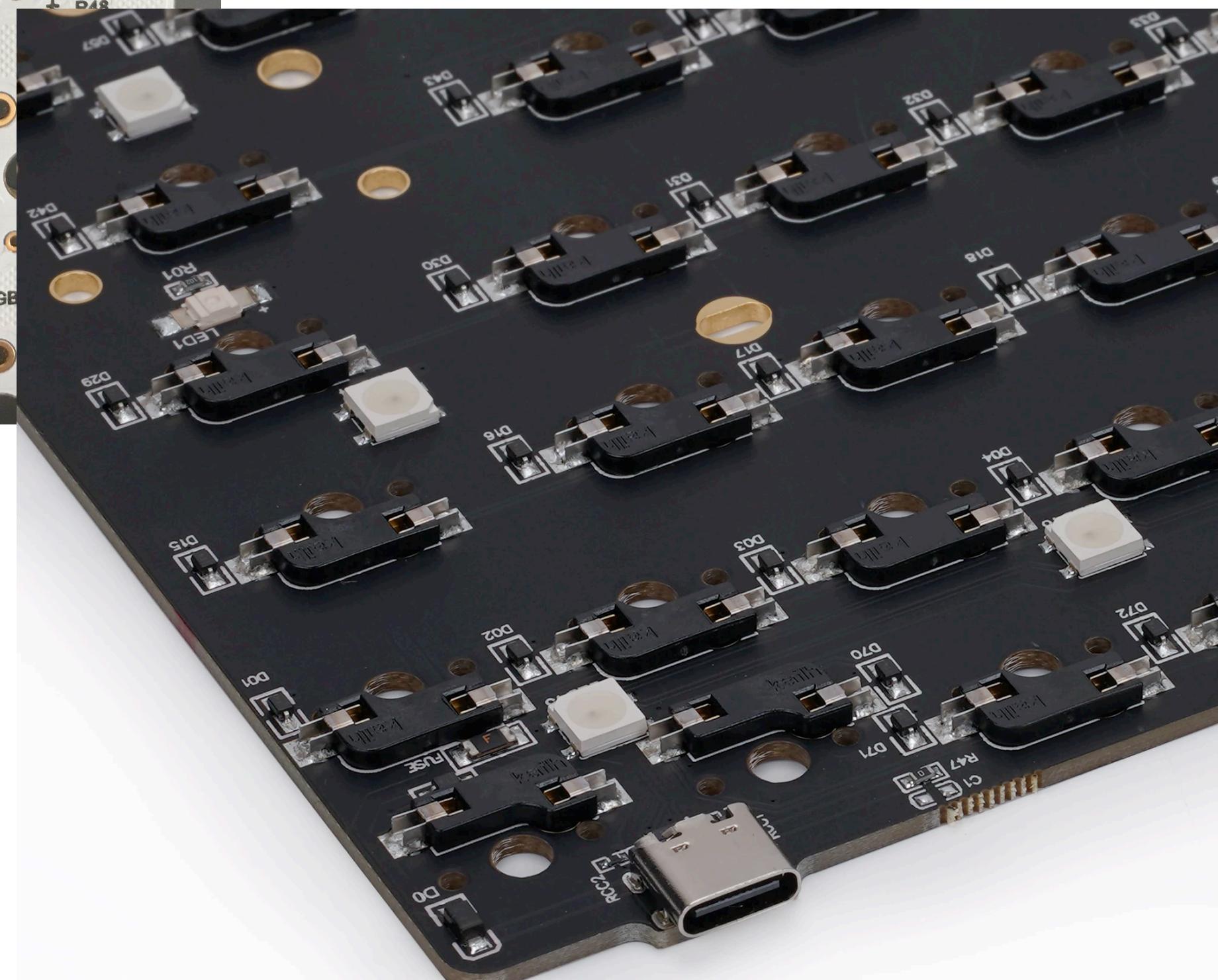
Solder PCB



Parts of a Mechanical Keyboard

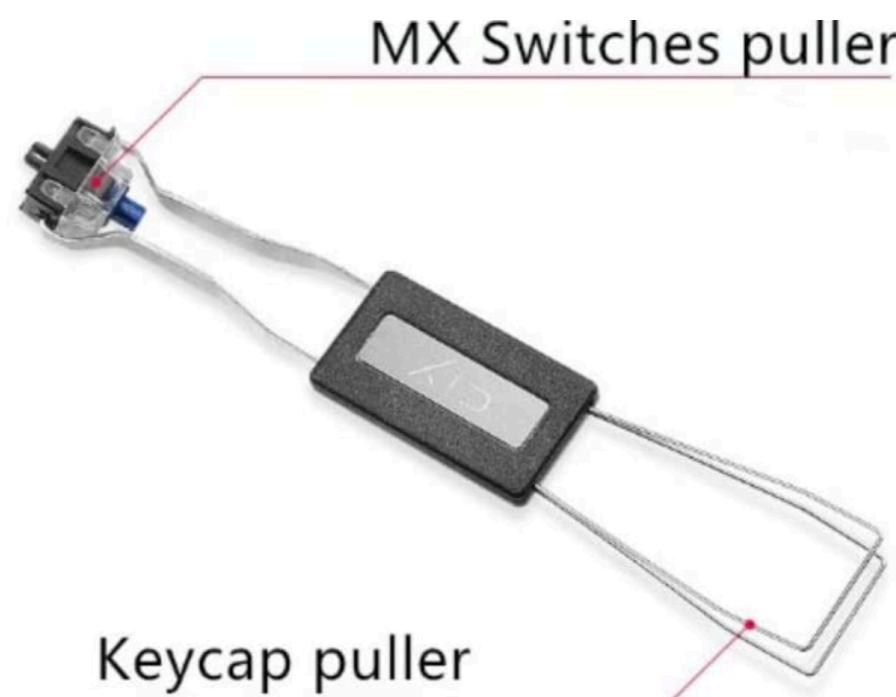


Hot-Swap Socket (bottom)

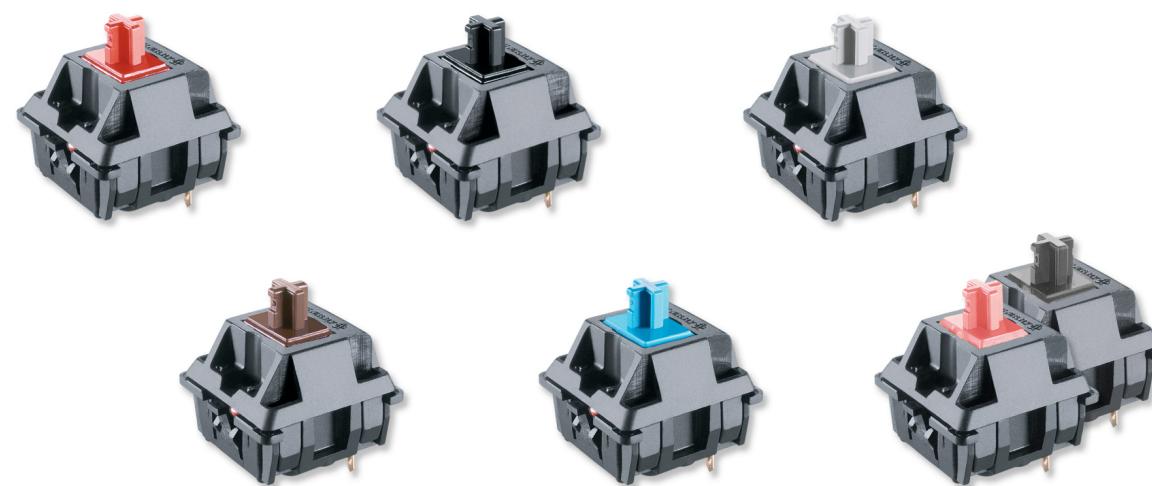


Build Tools / Parts

Hot-Swap Style



Switches



Keycaps



Solder Style

Soldering Station



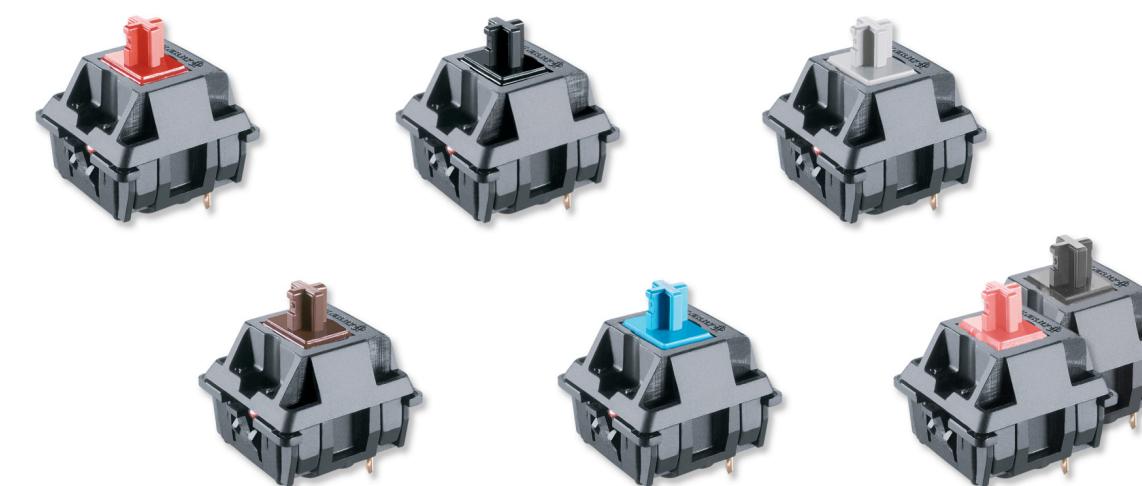
Tweezers



Case/PCB/Plate



Switches



Stabilizers



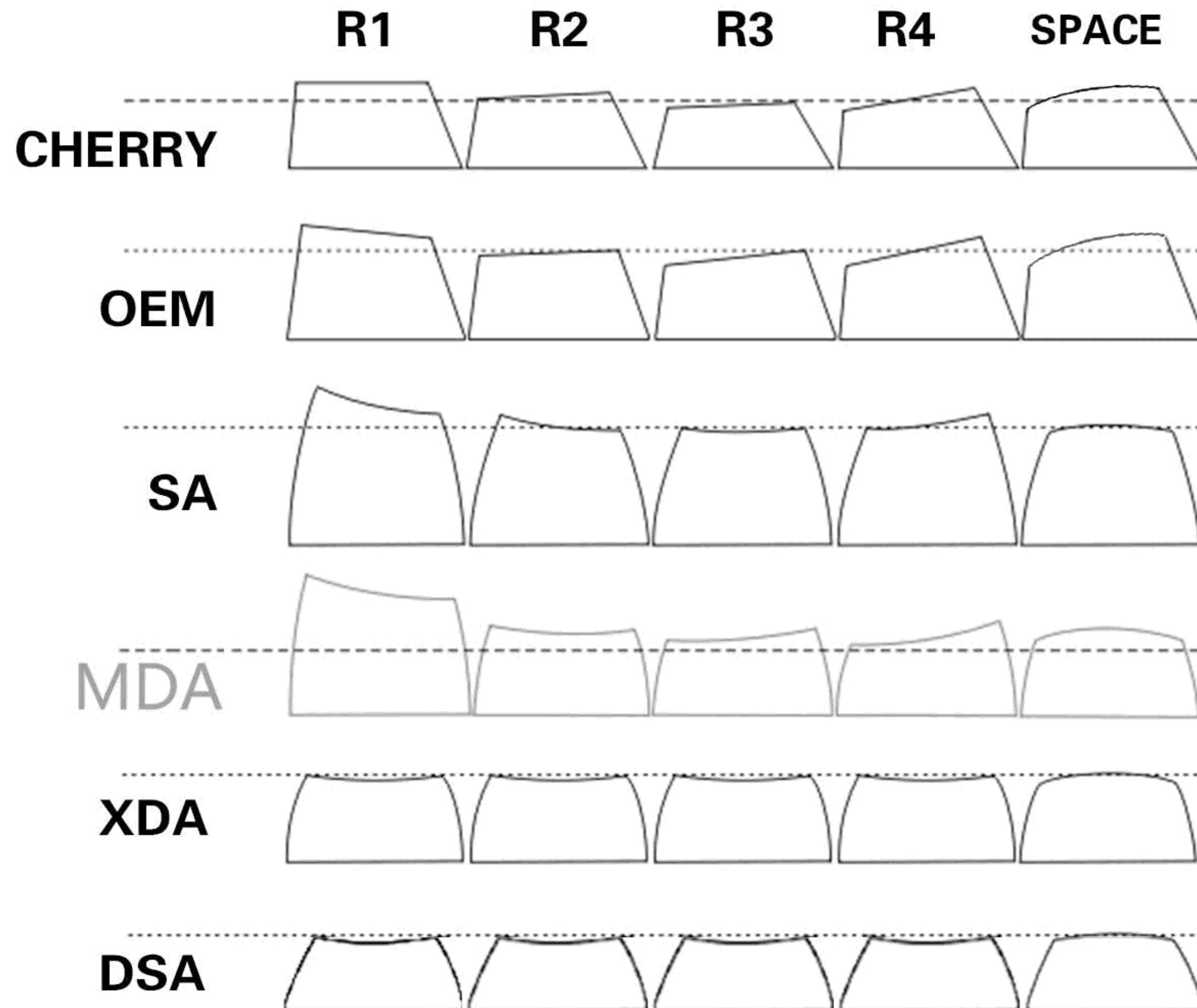
Screwdriver Set



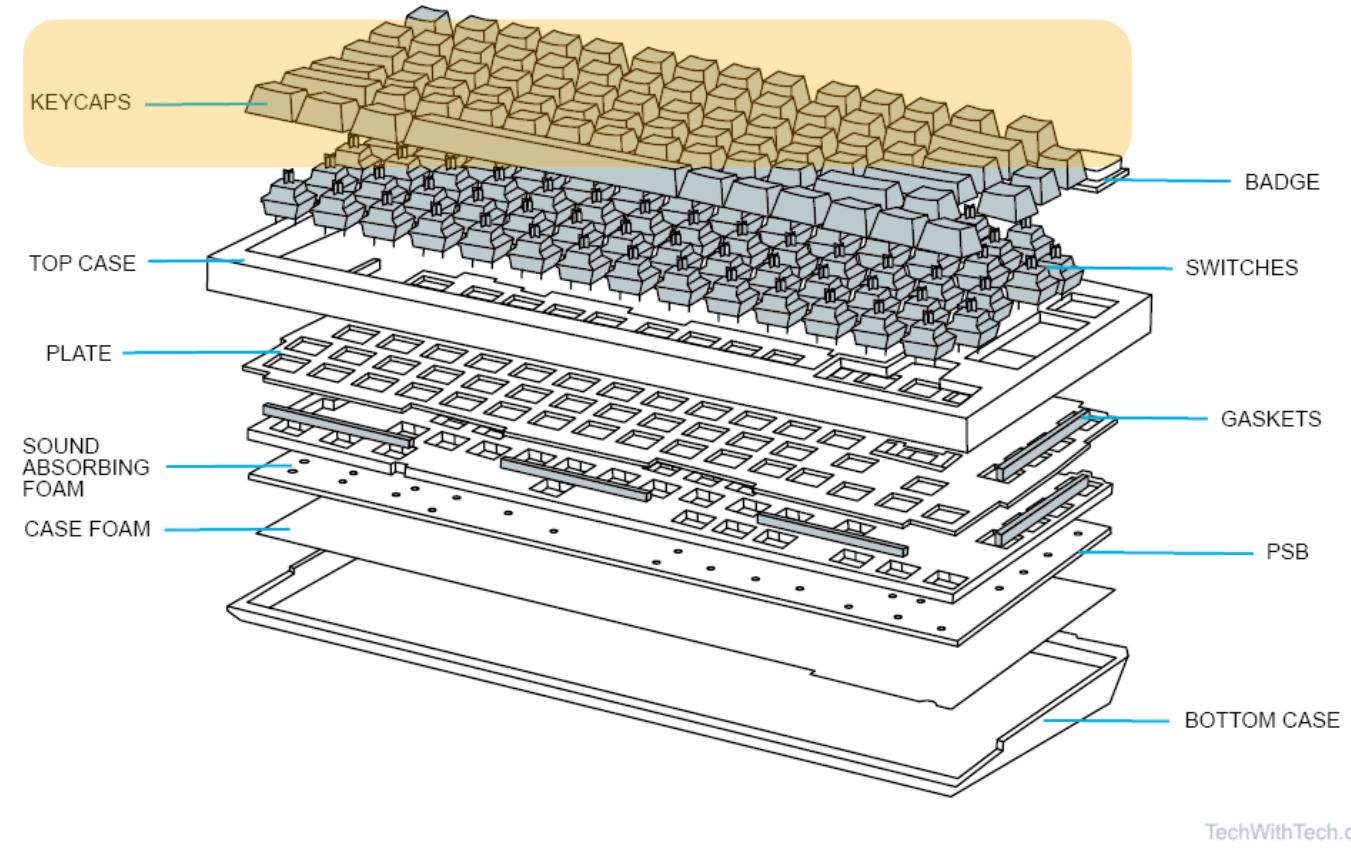
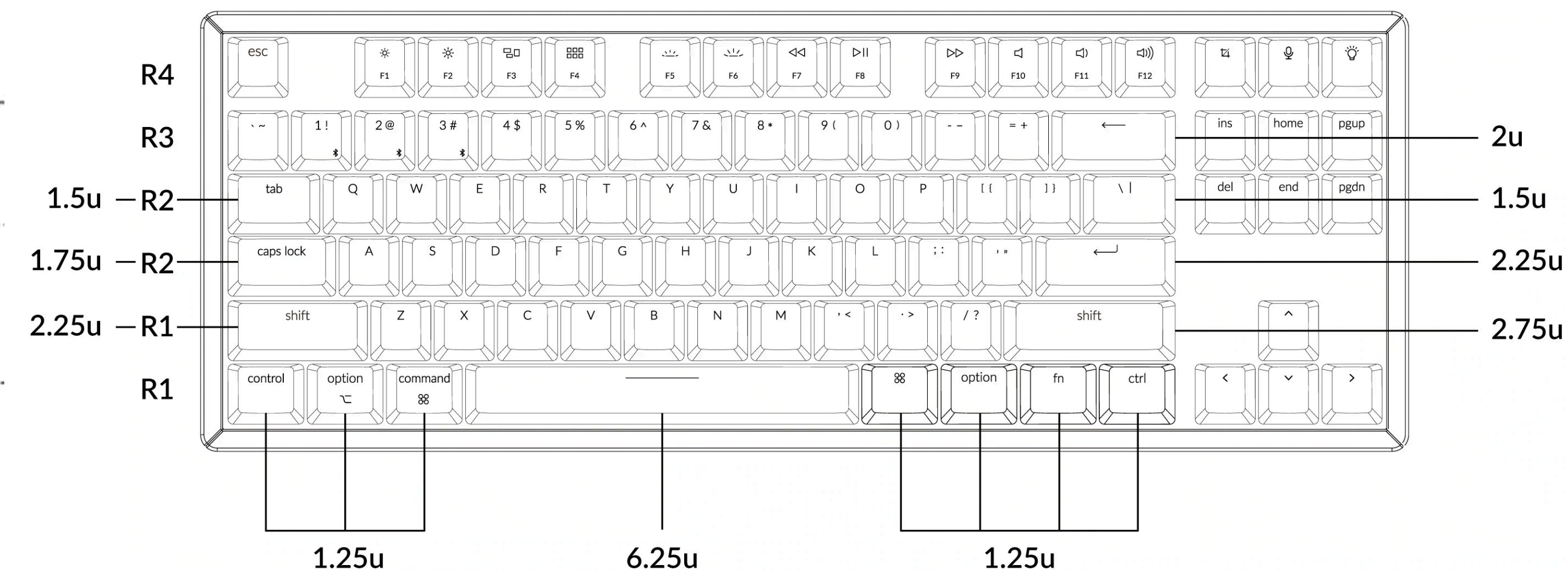
Keycaps



Keycaps



All keycaps size are 1u except those with notice with the numbers mentioned.



Appendix

Switch Properties

Operation Force

It's **how hard you have to press the key**. Operating force is measured in centinewton (cN) or gram-force (gf). 1 gf is equal to 0.98 cN, so they are almost equivalent. You can say that a switch with 0.50 cN has 0.50 gf.

Activation Point

It is **the point where a keypress is recognized** by the keyboard. This is measured in millimeters. It is also known as Actuation Point or Operating Position.

Total Travel Distance

It's the distance your keycap travels until it hits the upper housing of the switch. It's basically **the distance until you bottom out**. This is also measured in millimeters.

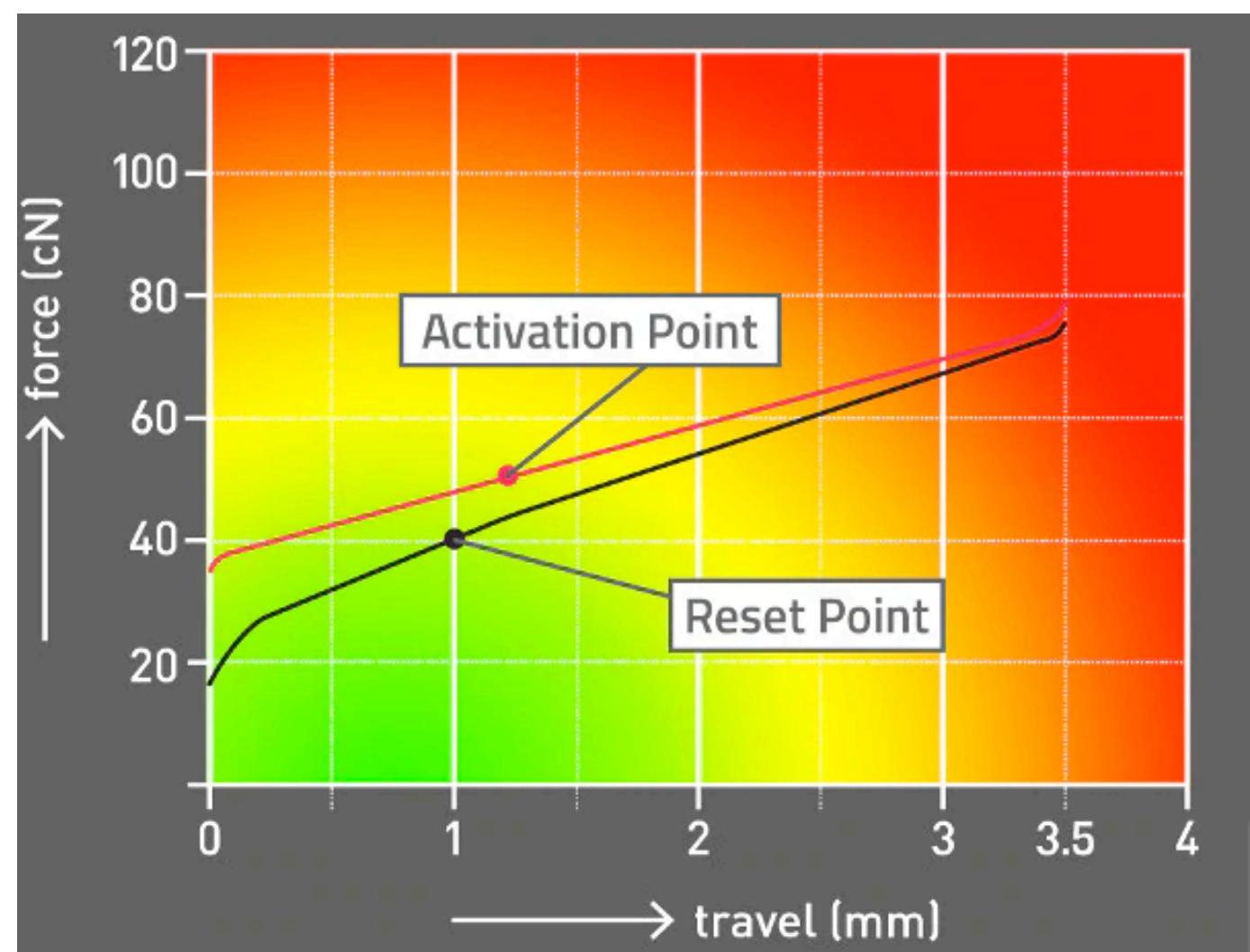
Tactile Position

Tactile position is **where you feel the bump** on tactile and clicky switches. On linear switches, there's no tactile position.

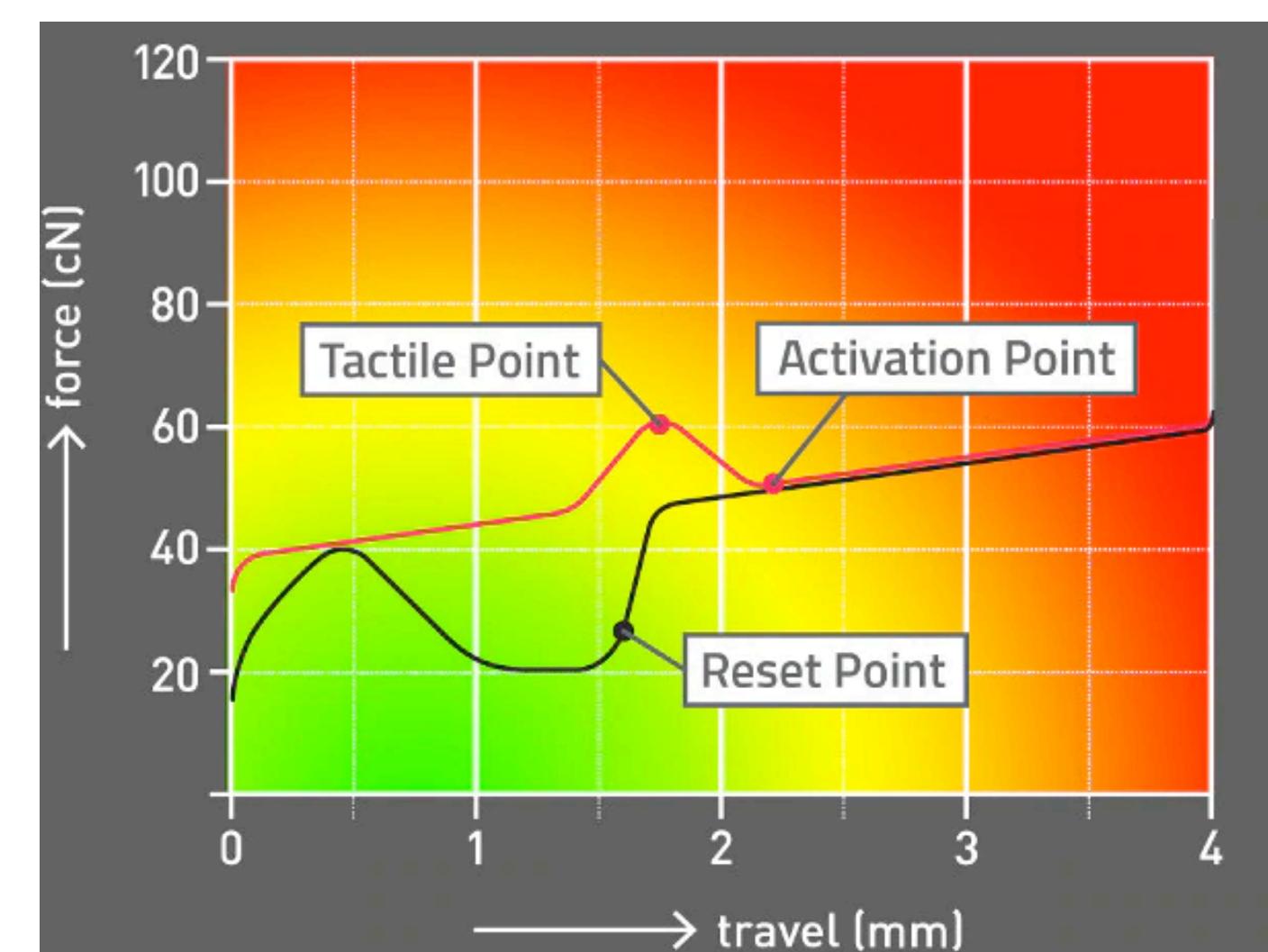
Reset Point

Reset position is the distance at which the **key is deactivated when released**.

Kalih Speed Silver



Cherry MX Blue



Switch	Feel	Activation	Bottom Out	Activation	Travel
MX Red	Linear	37	54	2	4
MX Black	Linear	55	75	2	4
MX Dark Grey	Linear	80	110	2	4
MX RGB Nature White	Linear	55	65	2	4
MX Silent Red	Linear	45	60	2	3.7
MX Silent Black	Linear	60	80	2	3.7
MX Brown	Tactile	45	55	2	4
MX Clear	Tactile	50	85	2	4
MX Light Grey	Tactile	67	110	2.2	4
MX Blue	Clicky	55	60	2	4
MX Green	Clicky	65	90	2	4
MX White	Clicky	60	82	2.2	4

References

- <https://aaronbush.github.io/keyboards/builds/first.html>
- <https://wiki.geekhack.org/index.php?title=GeekHackWiki>
- <https://blog.wooting.nl/the-ultimate-guide-to-keyboard-layouts-and-form-factors/>
- <https://www.keychron.com/blogs/news/keyboard-size-layout-buying-guide>
- <https://techwithtech.com/mechanical-keyboard-parts/>
- <https://www.daskeyboard.com/blog/mechanical-keyboard-guide/>
- <https://www.cherrymx.de/en/>