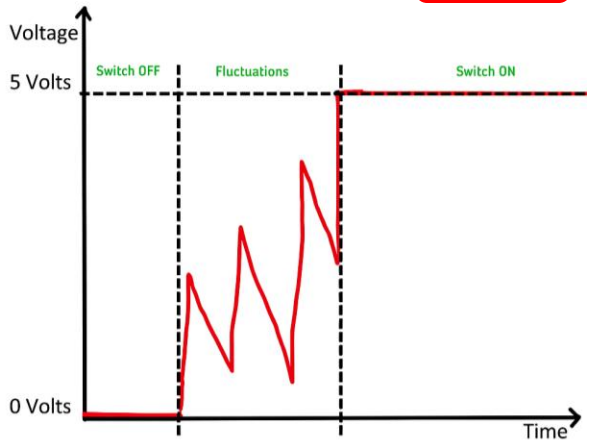
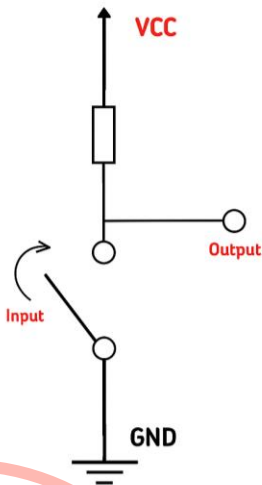


Hardware vs Software Debounce

Which one is better for your button logic?



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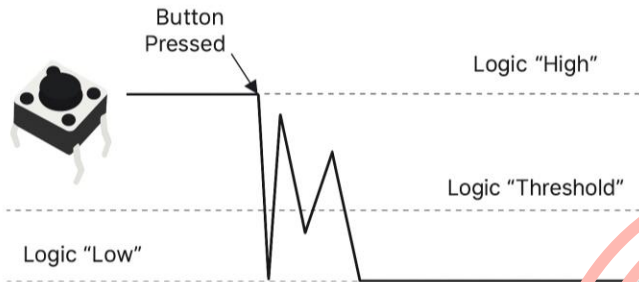
Founder Oxeltech (Embedded Development Service)

What is **Debouncing**?

- When you press a button, it doesn't switch cleanly.
- The signal may bounce ON and OFF several times quickly.
- The microcontroller can detect multiple on/off transitions from a single button press.

There are two main ways to control this:

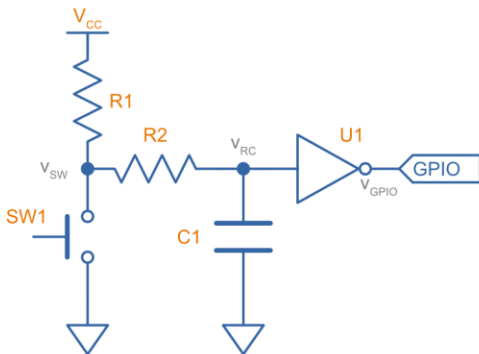
- Hardware Debouncing
- Software Debouncing

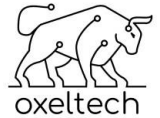




Hardware Debouncing

- Hardware debouncing uses electrical filters, like a resistor and capacitor (RC circuit).
- These components smooth the signal before it enters your microcontroller GPIO pin
- It's a physical solution, independent of software.
- Also used: Schmitt Trigger ICs for sharp, clean transitions.





Software Debouncing

- Done using code logic — e.g., wait 10-50 ms after press before accepting it.
- Uses timers or delays to wait until the signal settles.
- Common in microcontroller projects like Arduino or STM32 as a low-cost solution.

```
if (buttonPressed) {  
    delay(20);  
    if (buttonStillPressed) {  
        // Confirmed press  
    }  
}
```



Where to Use **Hardware** vs **Software** Debouncing

Use Hardware Debouncing When:

- You need fast and reliable button response
- The system runs in real-time (no delay allowed)
- It's an industrial or production environment
- You want a permanent, stable hardware fix

Use Software Debouncing When:

- You want flexibility to adjust in code
- Working on low-speed or Compact systems
- You want to save PCB space and cost
- Prototyping or learning with Arduino, STM32, etc.

Feature	Hardware Debouncing	Software Debouncing
Extra components	Yes (Resistor + Capacitor)	No
Speed	Fast & real-time	Slight delay (10–50 ms)
Flexibility	Fixed once soldered	Easy to adjust in code
Ideal for	Industrial, fast systems	Hobby use Space-limited Compact systems
Cost	Slightly higher (components)	just code



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