A96T418

Touch Algorithm Implementation

Application Note

Version 1.02

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1 Introduction

This application note introduces a method how to implement the touch software on the development board focusing on various features of the touch.

Through this document, users can learn main features of the touch algorithm and implement the software on the development board.

All information in this document will be described in the order listed below:

1. Touch algorithm Flow
    A. Baseline
    B. Diff
2. Noise Filter
    A. IIR Filter
    B. Average Filter
    C. Min-Max Filter
3. Debounce
    A. Detect Debounce
    B. Release Debounce

2 Basic touch algorithm

2.1 Touch algorithm flow

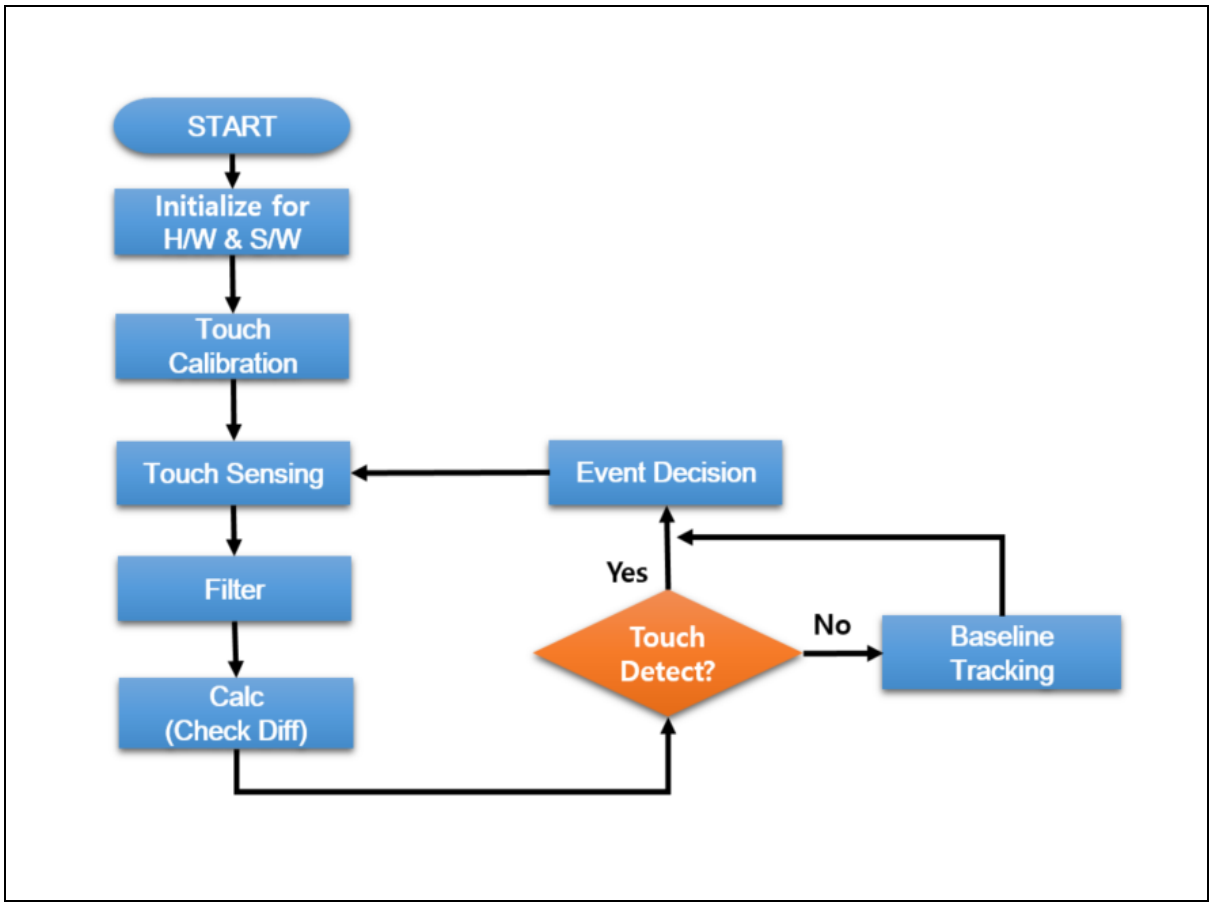

Figure 1. Touch Algorithm Flow

1. Initialize (HW & SW):
   - Initializes Hardware (port) settings: Timer settings and other peripheral settings
   - Initializes Software settings: Variable declaration, value and register settings
2. Touch calibration: Calculates External C_{TOTAL} value of touch sensing channel.
3. Touch sensing: Reads current raw data value. The raw data is primary data collected from the touch IP.
4. Filter : Nose-removing filter
5. Calc: Calculates the difference between the baseline and the raw data.
6. Baseline tracking: The baseline tracking is the process of updating the base for the raw data during untouched status.

2.2 Raw data

The raw data is primary data collected from the touch IP.

2.3 Baseline

The baseline is the reference line for raw data during untouched status.

2.4 Diff

The difference data is the difference between the baseline and the raw data. The touch detection depends on the threshold and difference data. If the diff. data exceeds the threshold, the touch is resulted as ‘detected.’

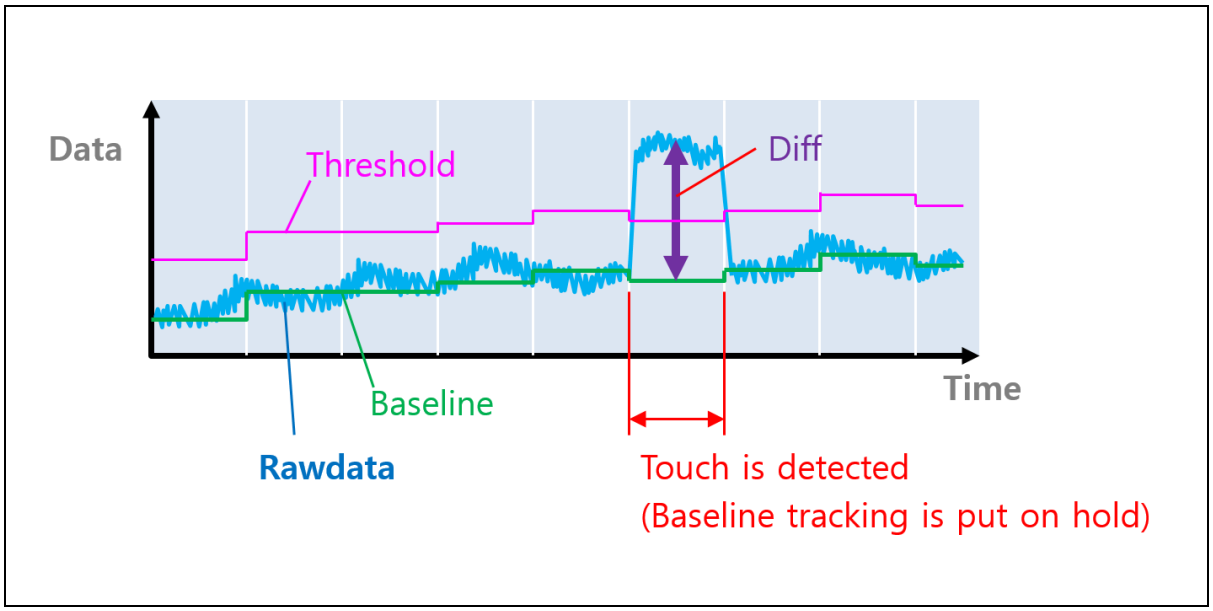

Figure 2. Raw Data, Baseline, Diff, Threshold

3 Noise filter

3.1 IIR filter (Infinite Impulse Response filter)

IIR filter is a digital filter that depends linearly on a finite number of input samples and a finite number of previous filter outputs. In other words, its (new) output value is calculated using both the input and old values of the output as a recursive digital filter.

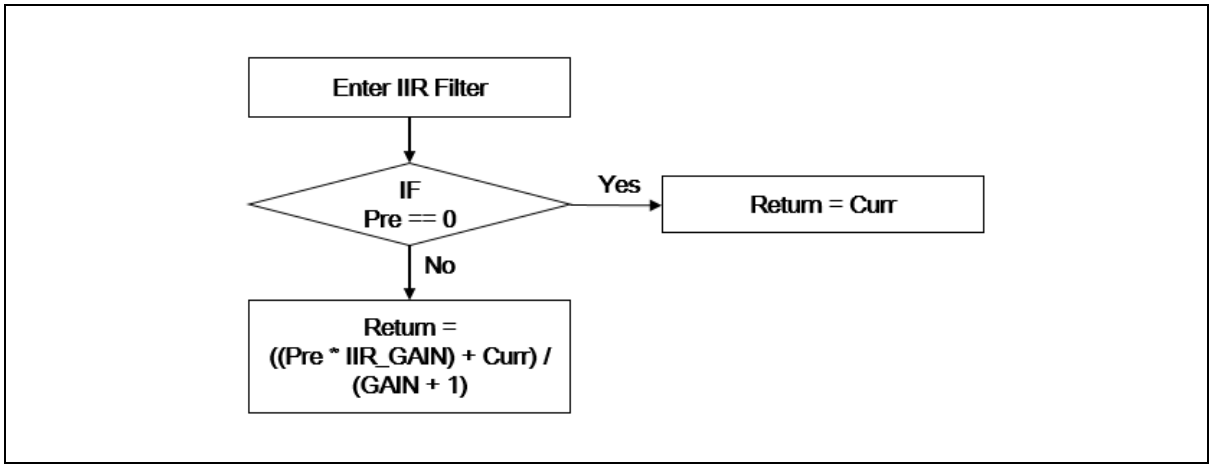

Figure 3. IIR Filter Sequence

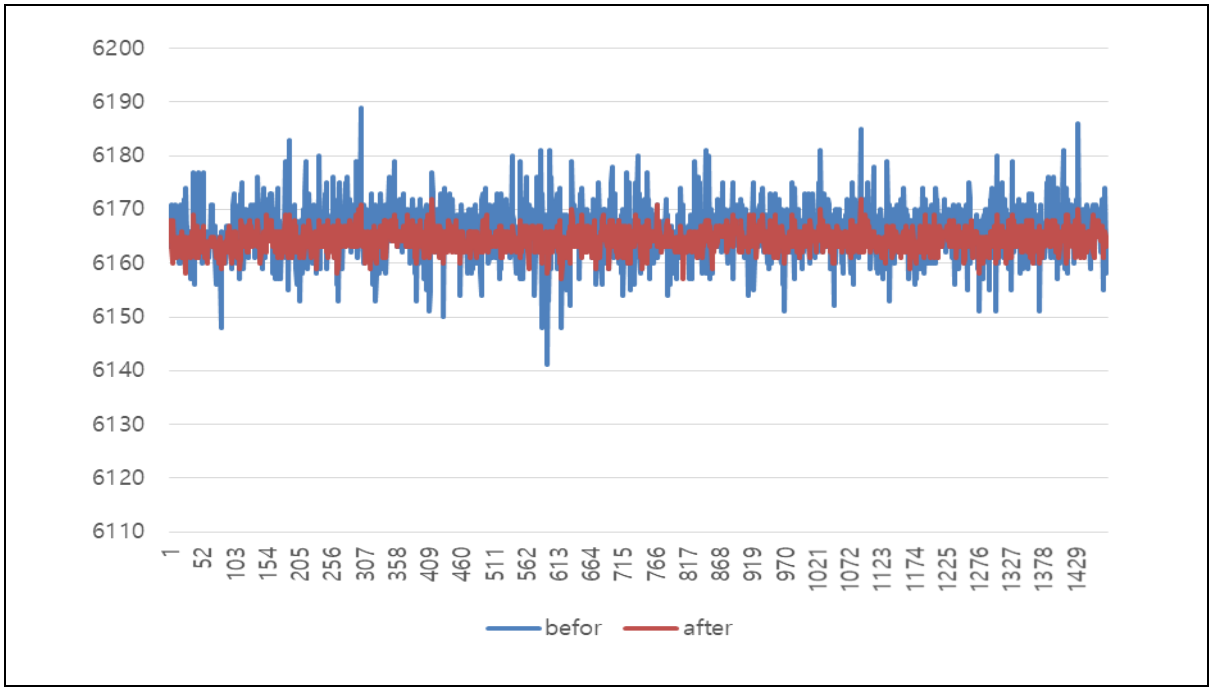

Figure 4. IIR Filter Data Comparison [IIR_GAIN=3]

3.2 Average filter

Average filter operates based on FIR filter (Finite Impulse Response filter) and calculates its outputs using the average from a finite number of input signals. The average filter accumulates the raw data by the buffer size and calculates the mean value of the accumulated data.

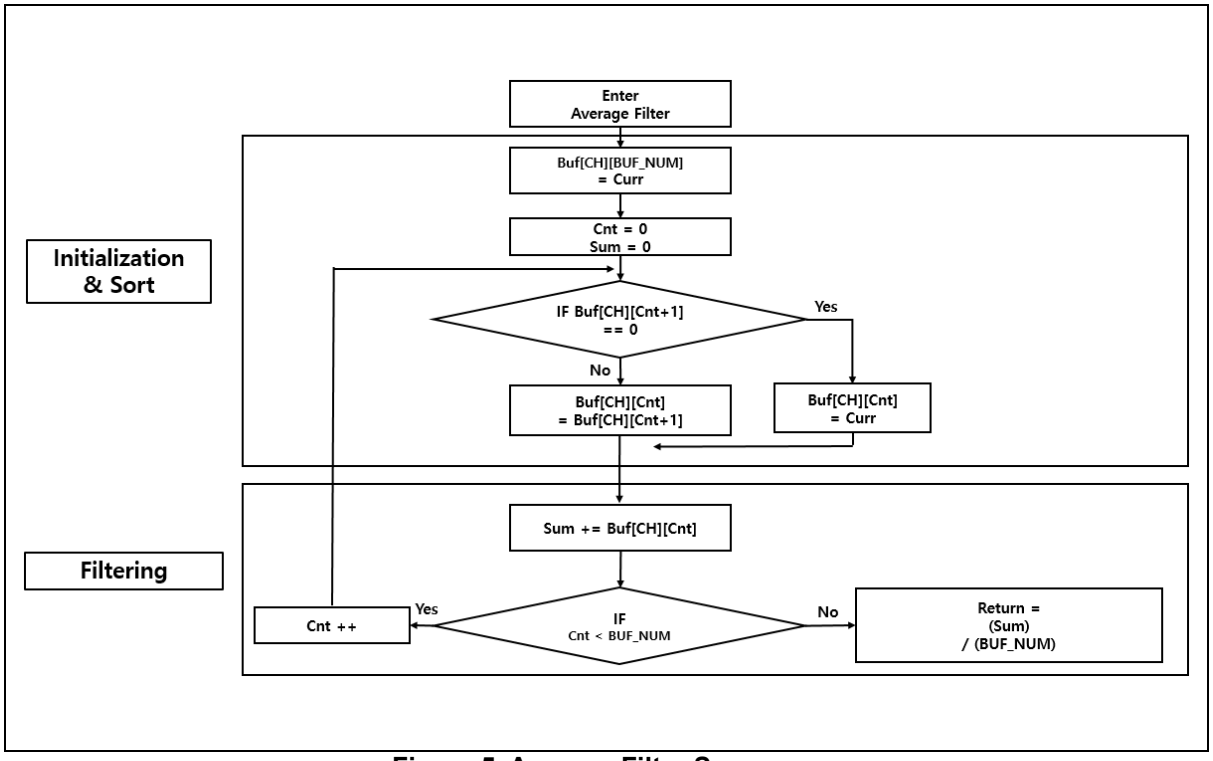

Figure 5. Average Filter Sequence

3.3 Min-Max filter

Min-Max filter operates based on FIR filter (Finite Impulse Response filter). It accumulates the raw data by the buffer size and calculates the mean value of the accumulated data after excluding the maximum value and the minimum value.

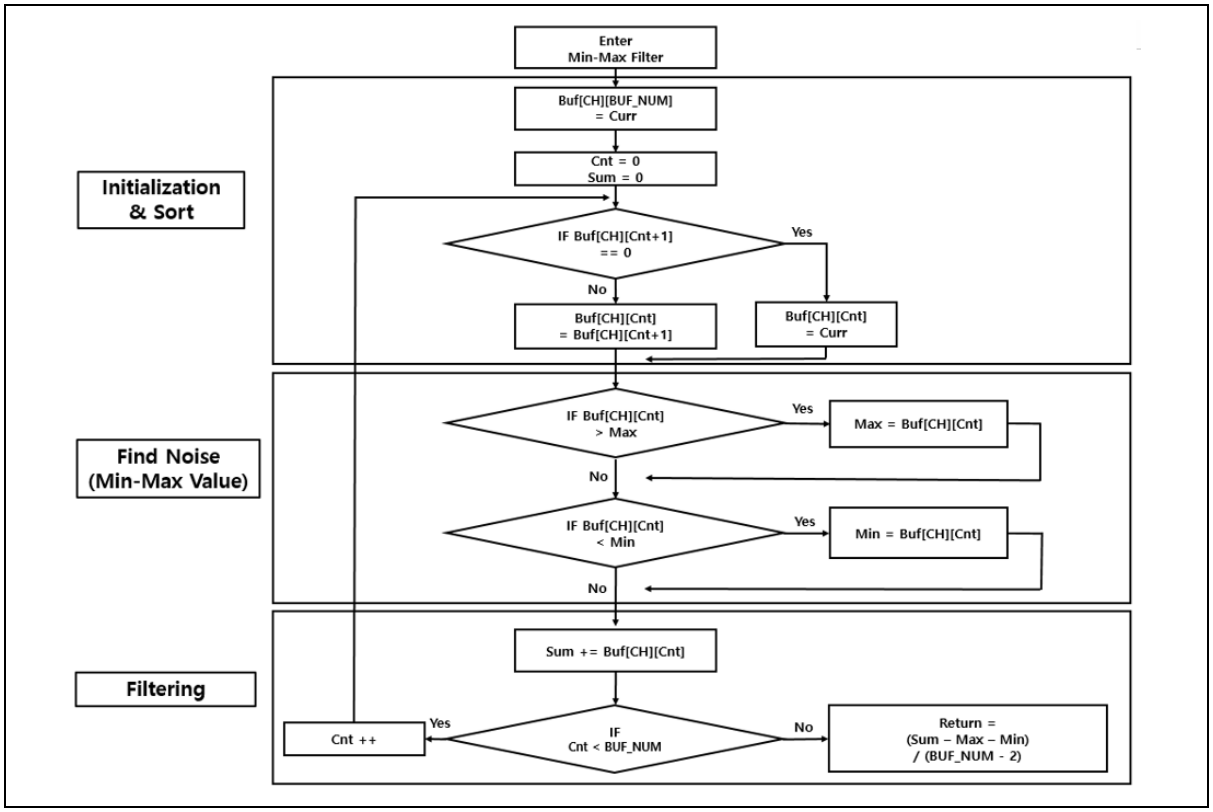

Figure 6. Min-Max Filter Sequence

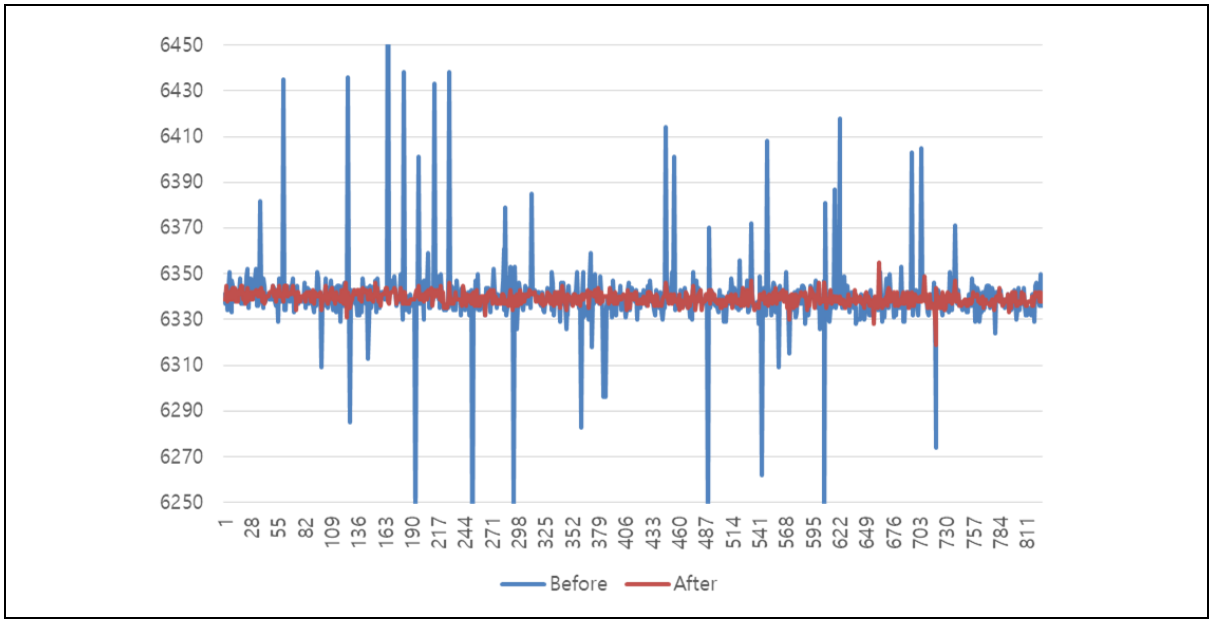

Figure 7. Min-Max Filter Data Comparison

4 Debounce

Debounce algorithm prevents certain functions such as Touch Detect and Release from being repeated by external noise.

4.1 Detect debounce

When the Diff exceeds the Detect Threshold in No Touch state, if this current state is maintained for set time, Detect Debounce algorithm determines Touch Detect.

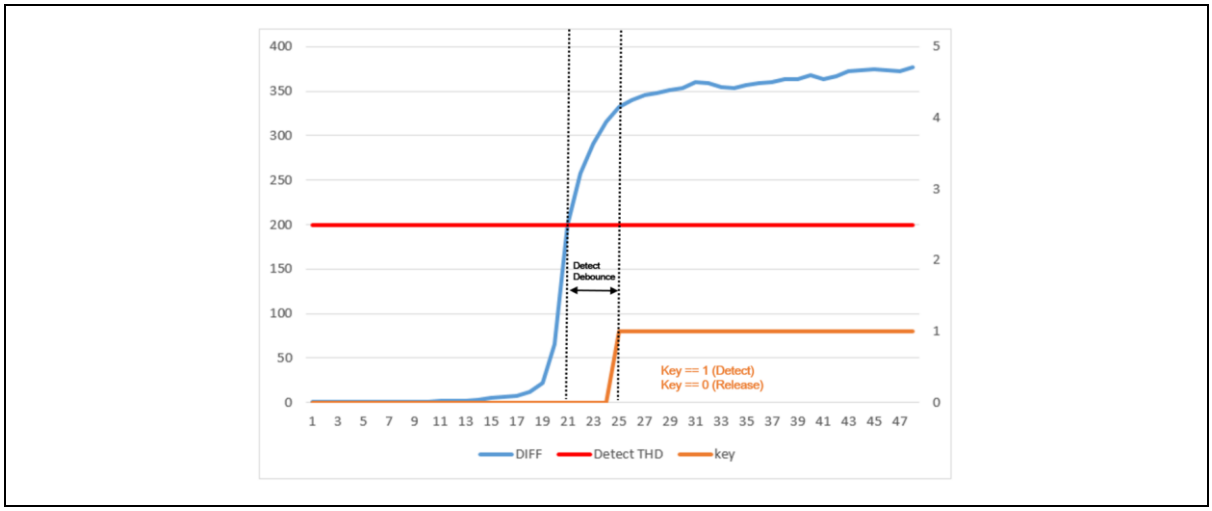

Figure 8. Detect Debounce

4.2 Release debounce

When the Diff doesn't exceed the Release Threshold in Touch Detect state, if this current state is maintained for set time, Release Debounce algorithm determines Touch Release.

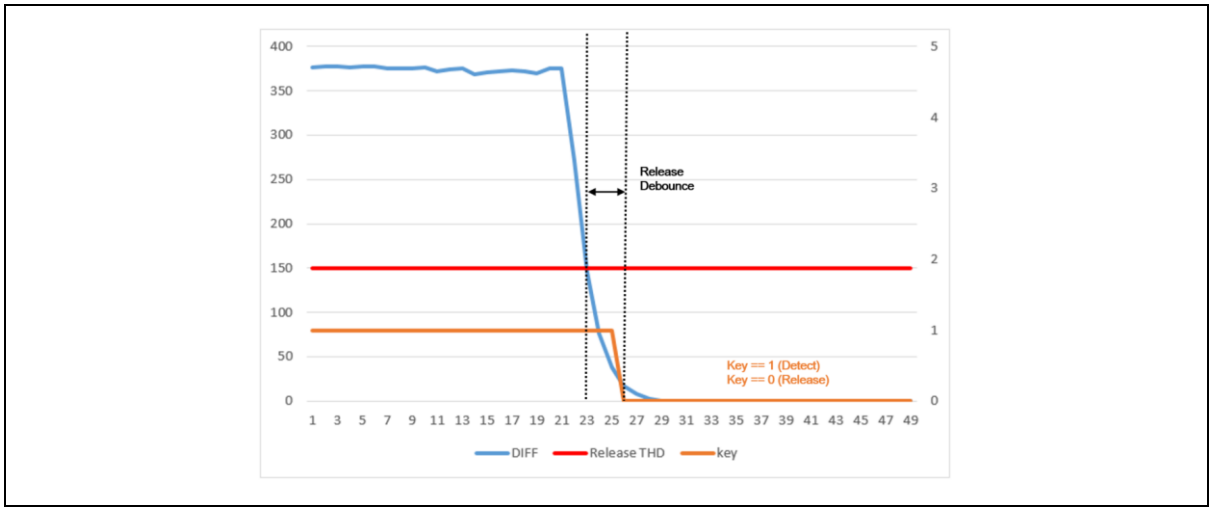

Figure 9. Release Debounce

Revision history

Date	Version	Description
20.04.08	1.00	Initial preliminary version created
22.11.01	1.01	Revised the font of this document
21.12.02	1.02	Updated the disclaimer.

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