

Test Plan & Verification

Project 1

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Data: 12/15/2023

Requirements:

LED2 shall blink at 50% duty cycle (on for 500 *ms* and off for 500 *ms*) (Accuracy (of pulse widths) within $\pm 2\%$: 10ms)

Equipment needed:

MSP432Launchpad
Oscilloscope
Updated Code Loaded

Setup and Assumptions:

Oscilloscope captures must be within accuracy of 100 μs (10KS/s)

Capture signal of P2.0 (LED2-RED)

The board is currently running 500ms toggling procedure and Red LED is toggling

Test procedure:

1. Connect LED2-Red P2.0 to channel 1
2. Measure time difference (ΔT_{on}) between the rising edge of LED2-Red and the falling edge of LED2-Red.
3. Measure time difference (ΔT_{off}) between the falling edge of LED2-Red and the rising edge of LED2-Red.

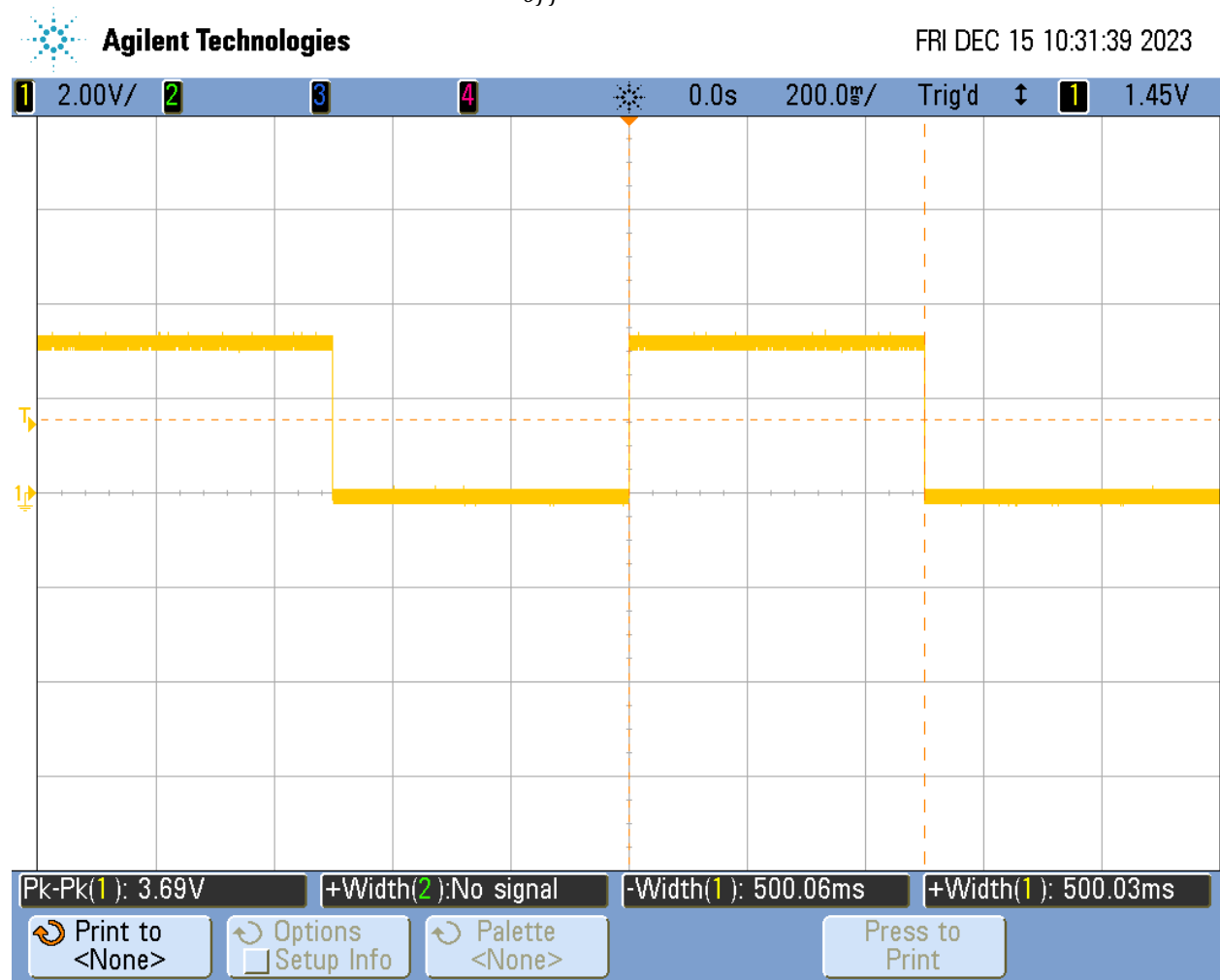
Pass criteria:

$$490.1ms \leq \Delta T_{on} \leq 509.9ms$$

$$490.1ms \leq \Delta T_{off} \leq 509.9ms$$

Measurements/Calculations:

$$\Delta T_{on} = 500.03 \text{ ms}$$
$$\Delta T_{off} = 500.06 \text{ ms}$$



Conclusion:

$$490.1 \text{ ms} \leq \Delta T_{on} \leq 509.9 \text{ ms}$$
$$490.1 \text{ ms} \leq \Delta T_{off} \leq 509.9 \text{ ms}$$

All Passed, Satisfied Requirements

Requirements:

LED2 shall blink at 50% duty cycle (on for 500 *ms* and off for 500 *ms*) (Accuracy (of pulse widths) within $\pm 1\%$: 5ms)

Equipment needed:

MSP432Launchpad
Oscilloscope
Updated Code Loaded

Setup and Assumptions:

Oscilloscope captures must be within accuracy of 100 μ s (10KS/s)

Capture signal of P2.0 (LED2-RED)

The board is currently running 500ms toggling procedure and Red LED is toggling

Test procedure:

1. Connect LED2-Red P2.0 to channel 1
2. Measure time difference (ΔT_{on}) between the rising edge of LED2-Red and the falling edge of LED2-Red.
3. Measure time difference (ΔT_{off}) between the falling edge of LED2-Red and the rising edge of LED2-Red.

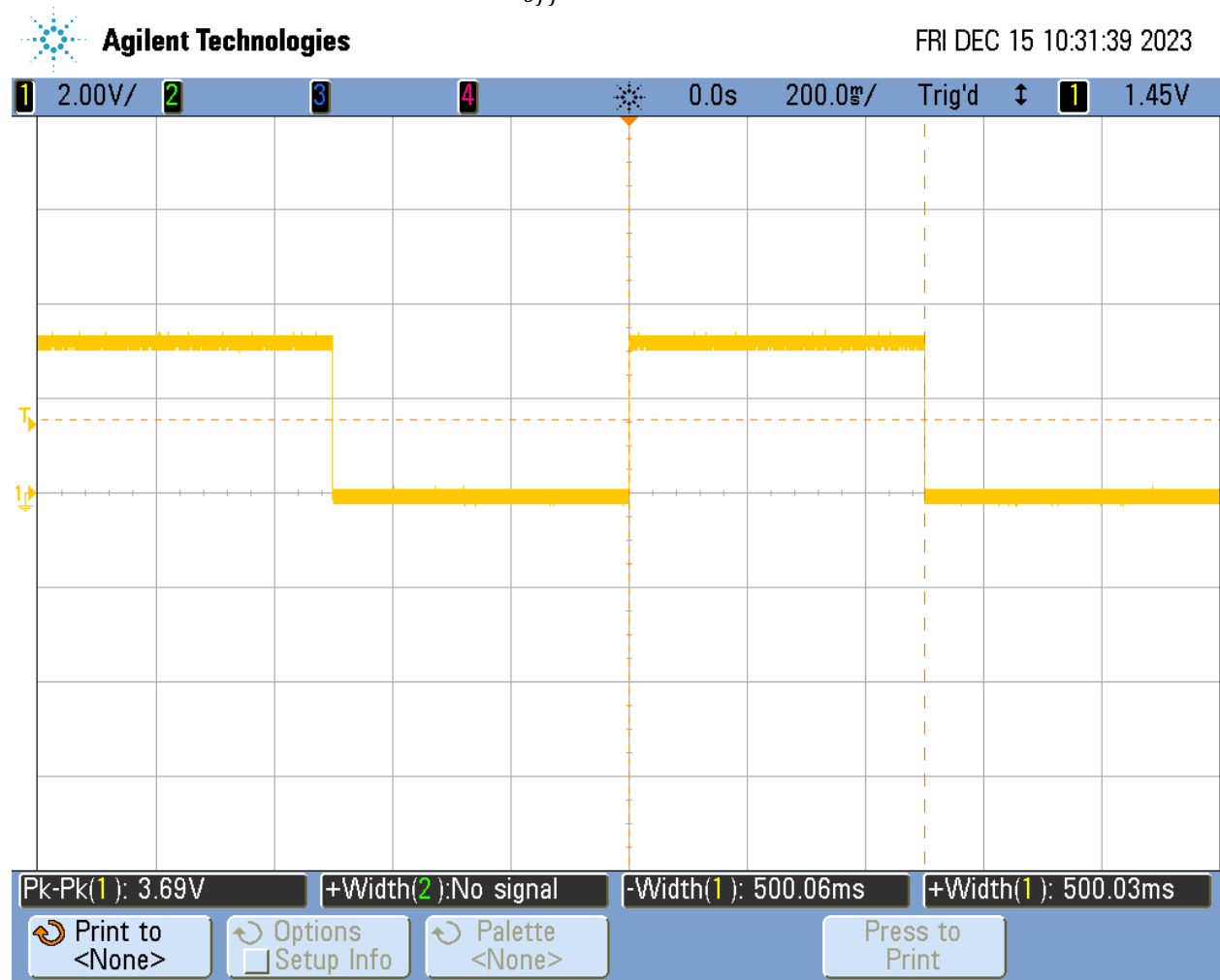
Pass criteria:

$$495ms < \Delta T_{on} < 505ms$$

$$495ms < \Delta T_{off} < 505ms$$

Measurements/Calculations:

$$\Delta T_{on} = 500.03 \text{ ms}$$
$$\Delta T_{off} = 500.06 \text{ ms}$$



Conclusion:

$$490.1 \text{ ms} \leq \Delta T_{on} \leq 509.9 \text{ ms}$$
$$490.1 \text{ ms} \leq \Delta T_{off} \leq 509.9 \text{ ms}$$

All Passed, Satisfied Requirements

Requirements:

LED2 shall blink at 50% duty cycle (on for 500 *ms* and off for 500 *ms*) (Accuracy (of pulse widths) within $\pm 0.2\%$: 1ms)

Equipment needed:

MSP432Launchpad
Oscilloscope
Updated Code Loaded

Setup and Assumptions:

Oscilloscope captures must be within accuracy of 100 μs (10KS/s)

Capture signal of P2.0 (LED2-RED)

The board is currently running 500ms toggling procedure and Red LED is toggling

Test procedure:

1. Connect LED2-Red P2.0 to channel 1
2. Measure time difference (ΔT_{on}) between the rising edge of LED2-Red and the falling edge of LED2-Red.
3. Measure time difference (ΔT_{off}) between the falling edge of LED2-Red and the rising edge of LED2-Red.

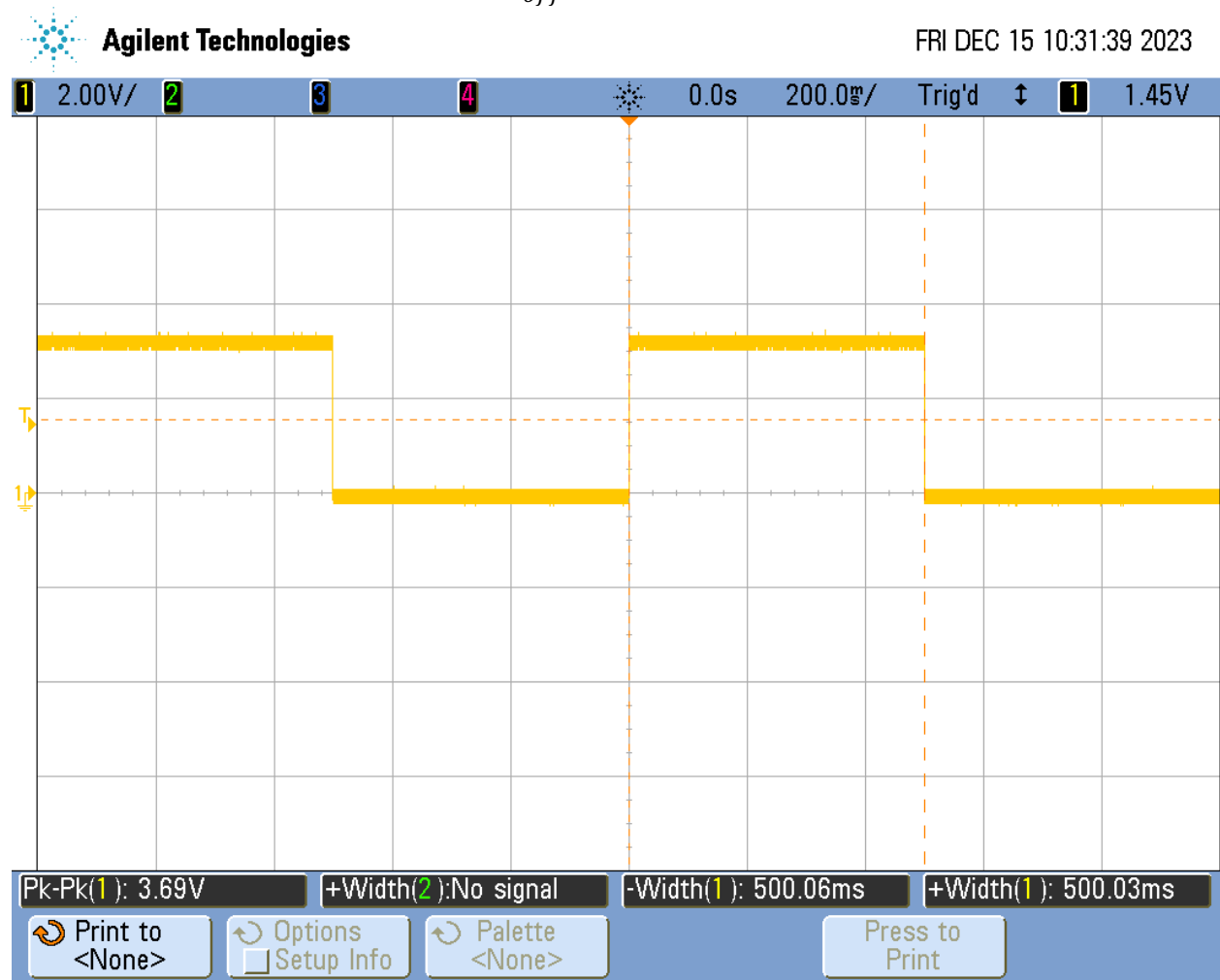
Pass criteria:

$$499ms < \Delta T_{on} < 501ms$$

$$499ms < \Delta T_{off} < 501ms$$

Measurements/Calculations:

$$\Delta T_{on} = 500.03 \text{ ms}$$
$$\Delta T_{off} = 500.06 \text{ ms}$$



Conclusion:

$$490.1 \text{ ms} \leq \Delta T_{on} \leq 509.9 \text{ ms}$$
$$490.1 \text{ ms} \leq \Delta T_{off} \leq 509.9 \text{ ms}$$

All Passed, Satisfied Requirements

Requirements:

While LED2 blinking, upon press of S2, active LED shall toggle in the following cyclic pattern: *red* → *green* → *blue* → *red* → *etc.*

Upon press of SW2, the color of LED2 shall be changed on within 1 ms

Only relevant when S2 pressed while current state of LED2 is on

Equipment needed:

MSP432Launchpad and external Switch Connected to P1.5

Oscilloscope

TEST Code Version enabled and Loaded

Setup and Assumptions:

Oscilloscope captures must be within accuracy of 100 μs (10KS/s)

Capture signal of P2.0 (LED2-RED)

Capture signal of P2.1 (LED2-GREEN)

Capture signal of P2.2 (LED2-BLUE)

Capture signal of P1.5 (TEST SW)

The board is currently running 500ms toggling procedure and Red LED is toggling (P2.0 LED2-RED is initially high, P1.5 TEST SW is initially high)

Since the difficulties of measuring SW2, the setup has to use an external switch to capture signal and test.

Test procedure:

1. Connect LED2-Red P2.0 to channel 1
2. Connect LED2-GREEN P2.1 to channel 2
3. Connect LED2-BLUE P2.2 to channel 3
4. Connect TEST SW P1.5 to channel 4
5. Press TEST SW, Measure time difference (ΔT_{rg}) between the falling edge of TEST SW and the rising edge of LED2-GREEN P2.1
6. Press TEST SW, Measure time difference (ΔT_{gb}) between the falling edge of TEST SW and the rising edge of LED2-BLUE P2.2
7. Press TEST SW, Measure time difference (ΔT_{br}) between the falling edge of TEST SW and the rising edge of LED2-Red P2.0
8. Press TEST SW or restart (reset) the board, press SW 2, observe TEST SW, LED2-Red P2.0, LED2-GREEN P2.1, LED2-BLUE P2.2

Pass criteria:

$$(\Delta T_{rg}) < 1\text{ms}$$

$$(\Delta T_{gb}) < 1\text{ms}$$

$$(\Delta T_{br}) < 1\text{ms}$$

Observe voltage change on TEST SW only when LED2-Red P2.0, LED2-GREEN P2.1, LED2-BLUE P2.2 are all initially low

Measurements/Calculations:

$$(\Delta T_{rg}) = 25.6 \mu s$$

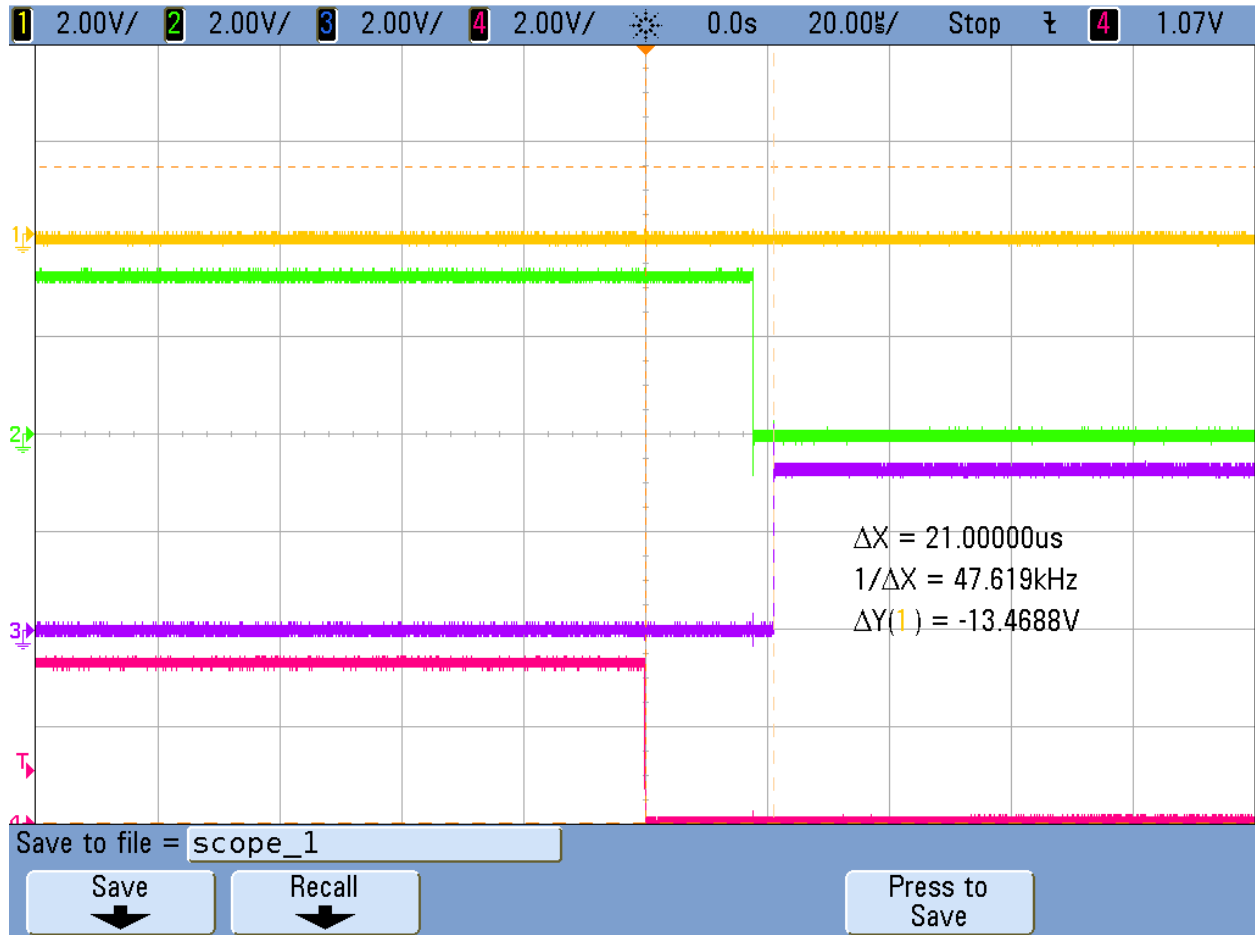


$$(\Delta T_{gb}) = 21\mu s$$



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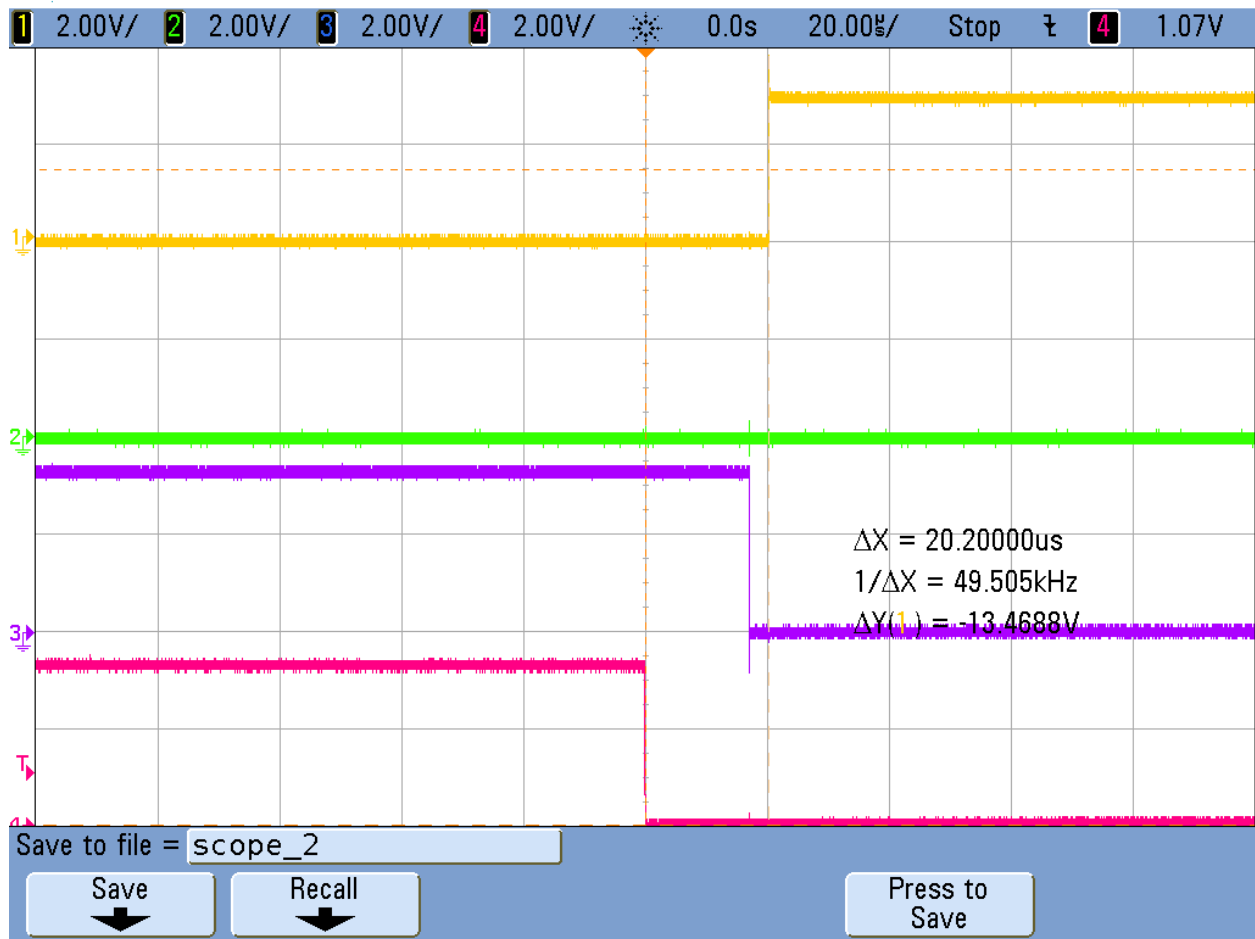


$$(\Delta T_{br}) = 20.2\mu s$$

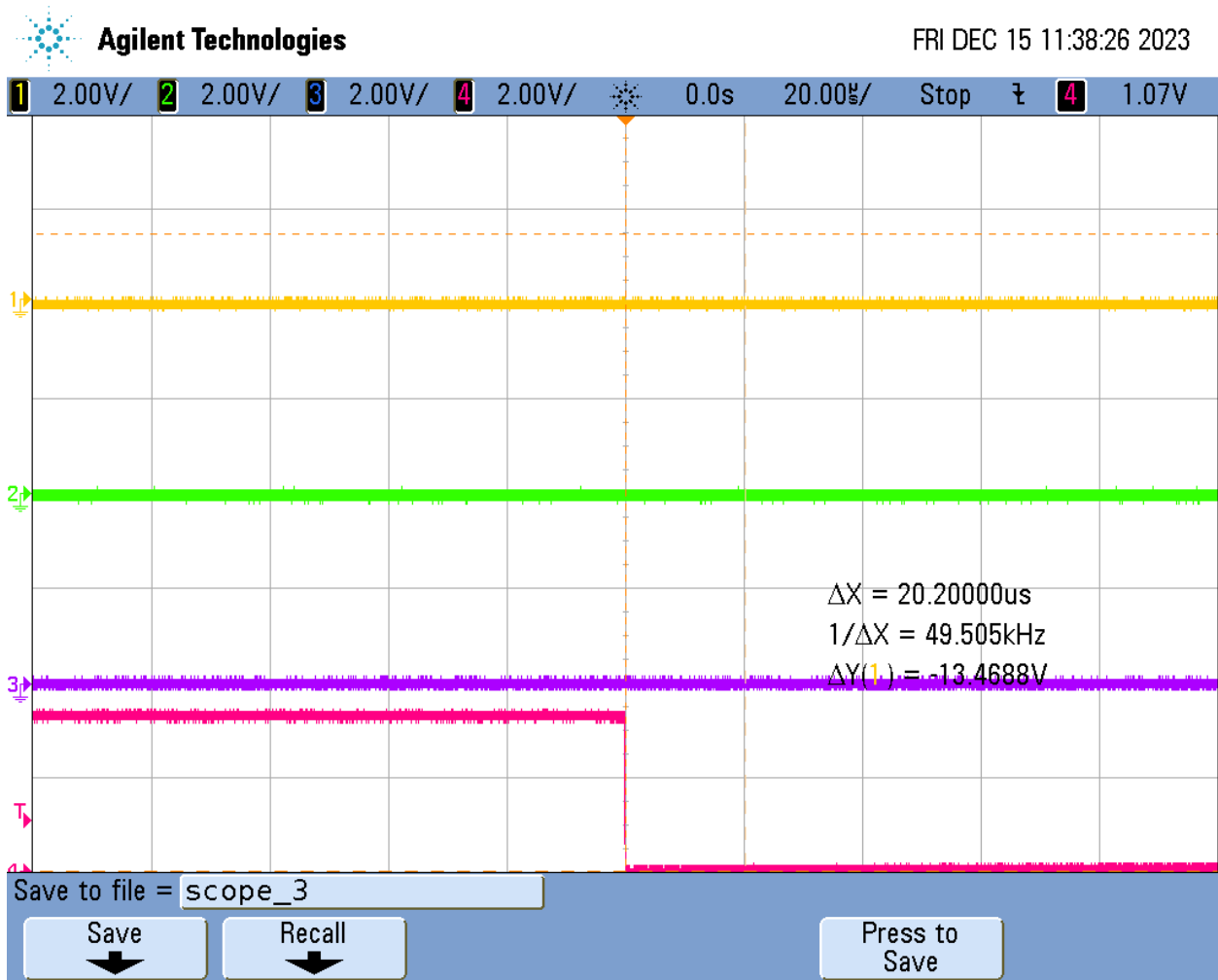


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Observe voltage change on TEST SW only when LED2-Red P2.0, LED2-GREEN P2.1, LED2-BLUE P2.2 are all initially low



Conclusion:

$$(\Delta T_{rg}) < 1ms$$

$$(\Delta T_{gb}) < 1ms$$

$$(\Delta T_{br}) < 1ms$$

Observe voltage change on TEST SW only when LED2-Red P2.0, LED2-GREEN P2.1, LED2-BLUE P2.2 are all initially low

All Passed