

My Reaction / Research on julian's investigates how slow is arduino youtube video

After i have seen Julian's YouTube Video (<https://youtu.be/U7I0GkwW1yE>) on Arduino Microcontrollers i was curious about if the Arduino is really that slow and so i wanted to test it myself, trying out multiple methods to switch on and of a single pin on the arduino as fast as we can. This Page summarizes my results and shows the oscilloscope (scope) Screenshots and code that i have made and used.

The Task : Switch on and off a single arduino pin as fast as we possibly can using Arduino IDE (C language)

Here is the Code i used to measure the different methods and ways to achieve that. Please note that i dont just run this Code with all the different methods enabled (uncommented), but uncomment one method a time.

```
/**
 * this is some test code to test arduino speed.
 * just switching on and off one single digital pin as fast
 * as i can, just to see and measure with an oscilloscope how
 * fast switching by C code can be achieved.
 *
 * Using an Arduino Uno at 16Mhz with Arduino IDE 1.6.7 (Linux)
 * and a HAMEG (Rhode & Schwarz) HM02024 Oscilloscope
 *
 * by Axel Werner [axel.werner.1973@gmail.com]
 */

#define PIN 12

void setup() {
  pinMode(PIN, OUTPUT);
  noInterrupts();
}

void loop() {

  /*
   * Using the Arduinos own loop() function AND
   * these "arduino" methods to set and reset a pin
   * only gives me a maximum switching
```

```
* frequency of 94.6KHz at ca 48% duty cicle.
*
* See Scope Screenshot:
*
http://www.awerner.myhome-server.de/lib/exe/fetch.php?media=it-artikel:arduino:test-how-fast-is-arduino-using-arduino-loop-digitalwrite.png
*/
// digitalWrite(PIN,HIGH);
// digitalWrite(PIN,LOW);

/*
* Using the Arduino loop() function but using bit wise
* operation on a data register to loop through
* on and off state of a pin gives me a maximum switching
* frequency of 999KHz at ca 87.5% duty cicle .
*
* See Scope Screenshot:
*
http://www.awerner.myhome-server.de/lib/exe/fetch.php?media=it-artikel:arduino:test-how-fast-is-arduino-using-arduino-loop-bitwise-setreset.png
*/
// PORTB &= 0<<4; // PORT B Bit 4 is Arduino Pin 12
// PORTB |= 1<<4;

while(1){ // using my OWN (real) loop now...
  /*
  * with my own while loop and these "arduino" methods
  * a maximum switching frequency of only ca. 97.5 KHz
  * at a perfect 50% duty cycle has been achieved
  * while the interrupts were disabled.
  */
  // digitalWrite(PIN,HIGH);
  // digitalWrite(PIN,LOW);

  /*
  * Both bit operation methods work effectively the same
  * when it comes to timing. A maximum switching frequency of 2.66MHz at
  * ca 66.8% duty cycle has been achieved. Even while Interrupts enabled.
  *
  * See Scope Screenshot:
  *
  http://www.awerner.myhome-server.de/lib/exe/fetch.php?media=it-artikel:arduino:test-how-fast-is-arduino-using-own-while-loop-and-bitwise-setreset.png
  */
  // PORTB = PORTB & B11101111; // clearing bit 4
  // PORTB = PORTB | B00010000; // setting bit 4

  // PORTB &= 0<<4; // Just another way to write it.
```

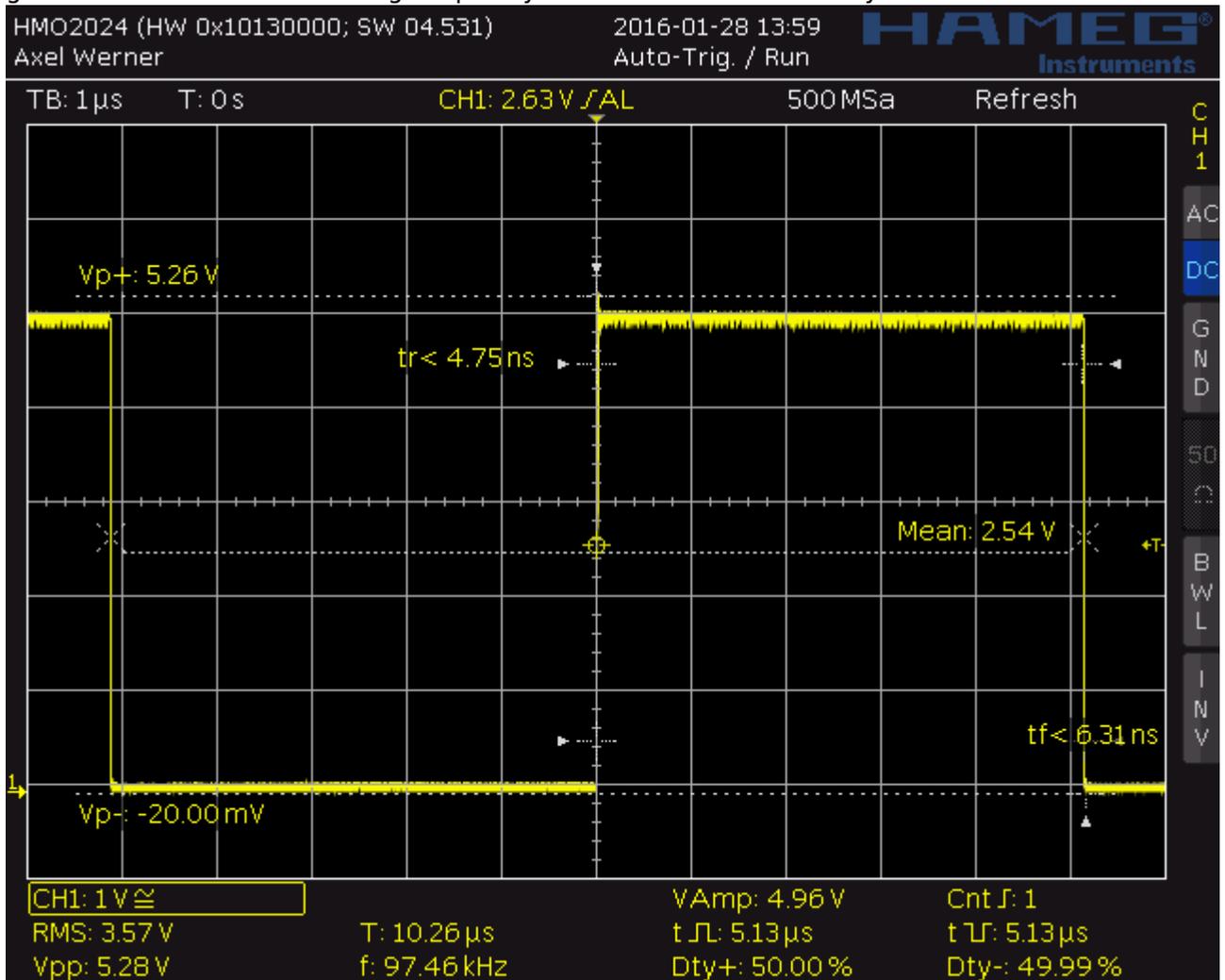
```
// PORTB |= 1<<4;

PORTB &= 0<<PB4; // Yet another way to write it, using Atmels Port-
//Register- and Pin-Names
PORTB |= 1<<PB4;

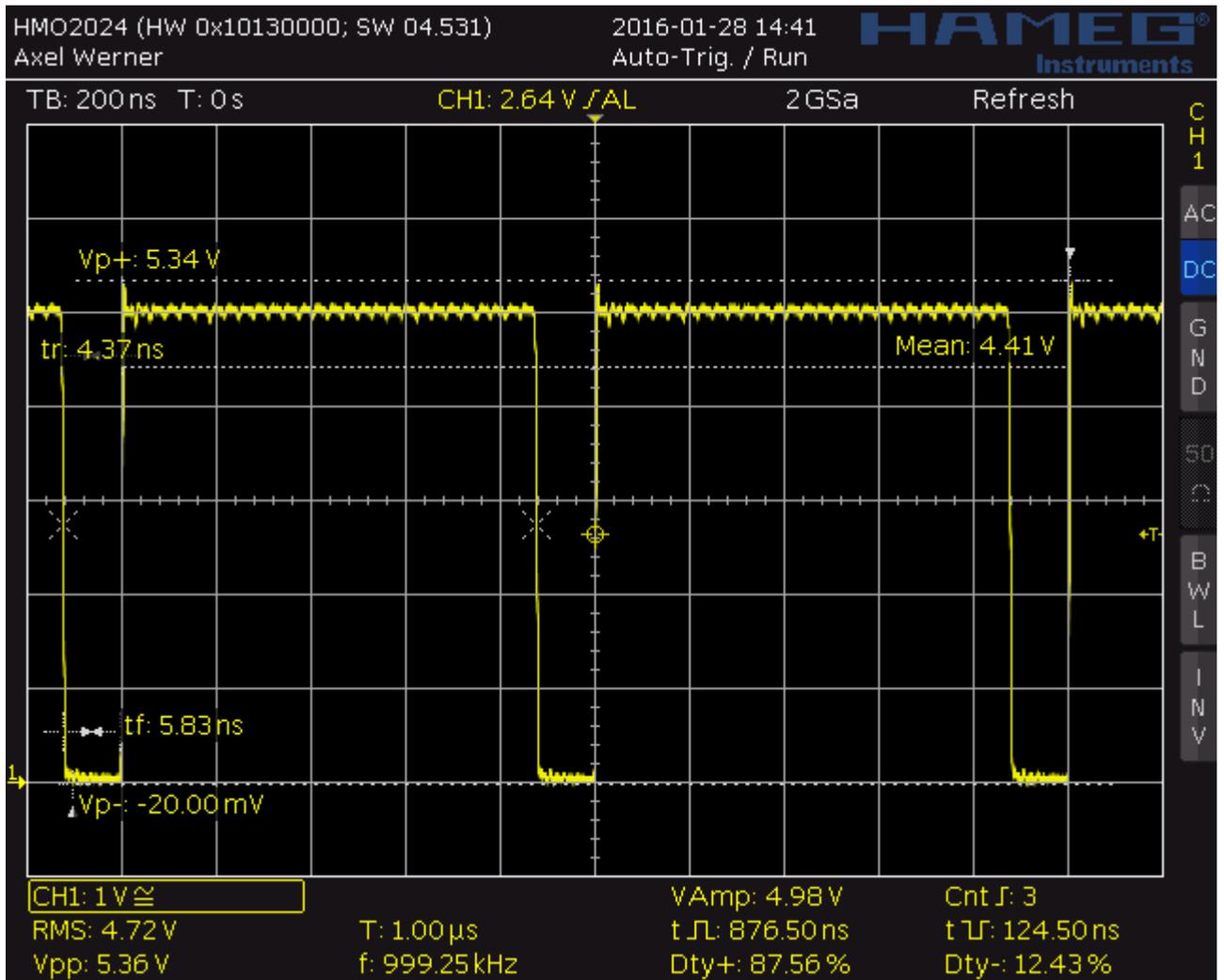
} // end of MY while loop.
} // end of Arduinos loop() function.
```

See C Code for Screenshot-URLs. Just click on them. Or see them here out of context.

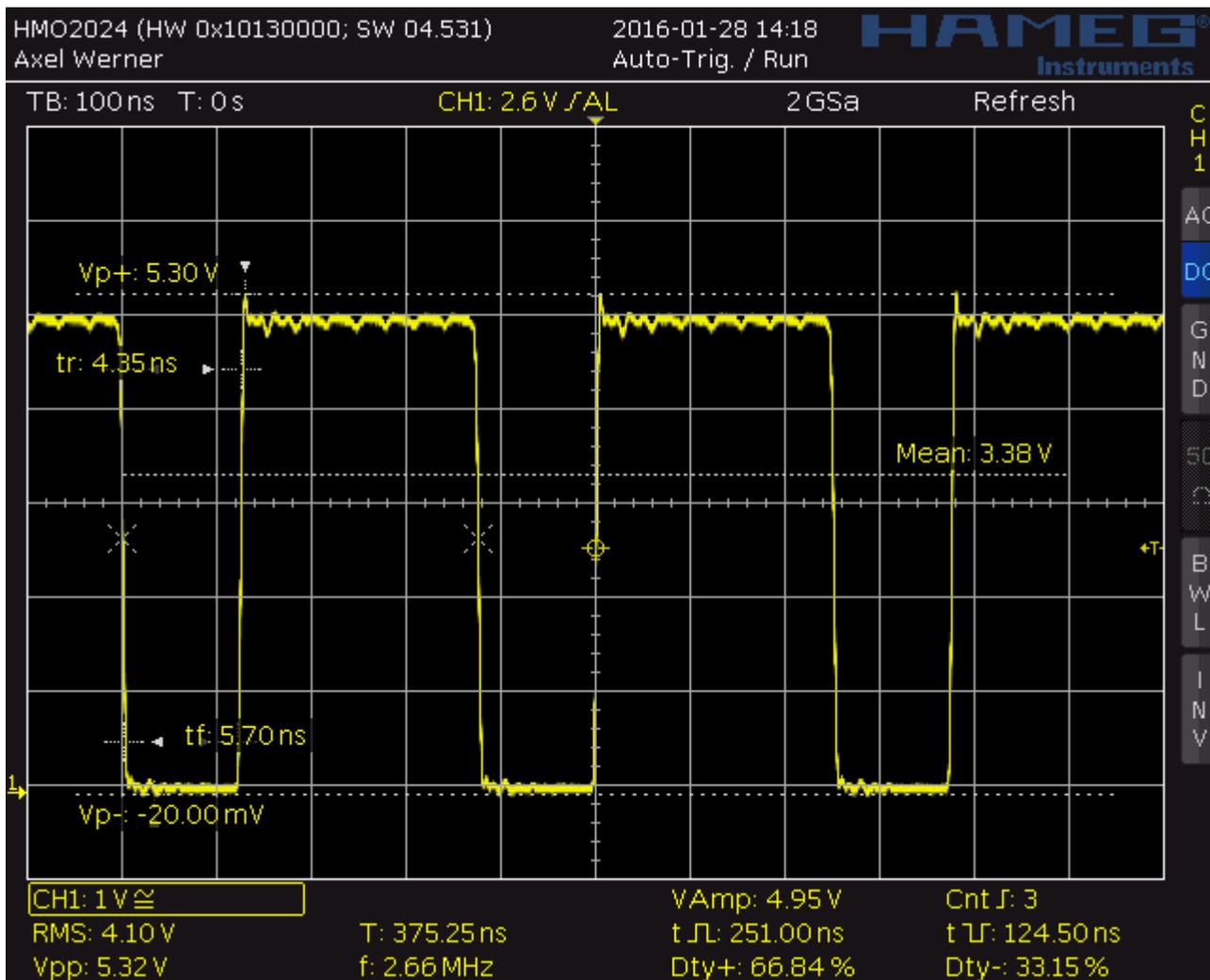
- Using the Arduinos own loop() function AND these “arduino” methods to set and reset a pin only gives me a maximum switching frequency of 94.6KHz at ca 48% duty cycle.



- Using the Arduino loop() function but using bit wise operation on a data register to loop through on and off state of a pin gives me a maximum switching frequency of 999KHz at ca 87.5% duty cycle .



- With my own while loop and these “arduino” methods a maximum switching frequency of only ca. 97.5 KHz at a perfect 50% duty cycle has been achieved while the interrupts were disabled.



— Axel Werner 2016-01-28 16:55

eev, electronics, arduino, c, microcontrollers

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