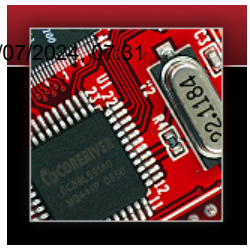
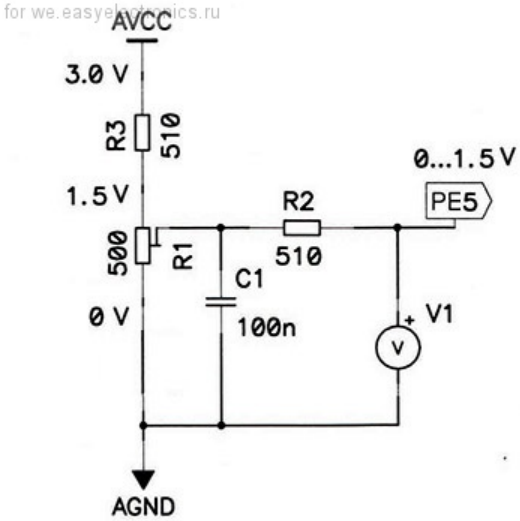


STM8L Comparators: Part 2 COMP2 and Windowed Mode

STM8

In the first part we looked at **COMP1** . Now let's work on the second comparator **COMP2** and use the window mode. We will work with the STM8L152C6T6 microcontroller, which is installed on the STM8L-DISCOVERY board. **STM8L152C6T6** belongs to the **medium** class . To work with comparators, we will take the voltage divider from the first part , but we will redesign it so that it gives a voltage from 0 to 1.5V.



Now we will connect the divider output to the **PE5** pin of the microcontroller:

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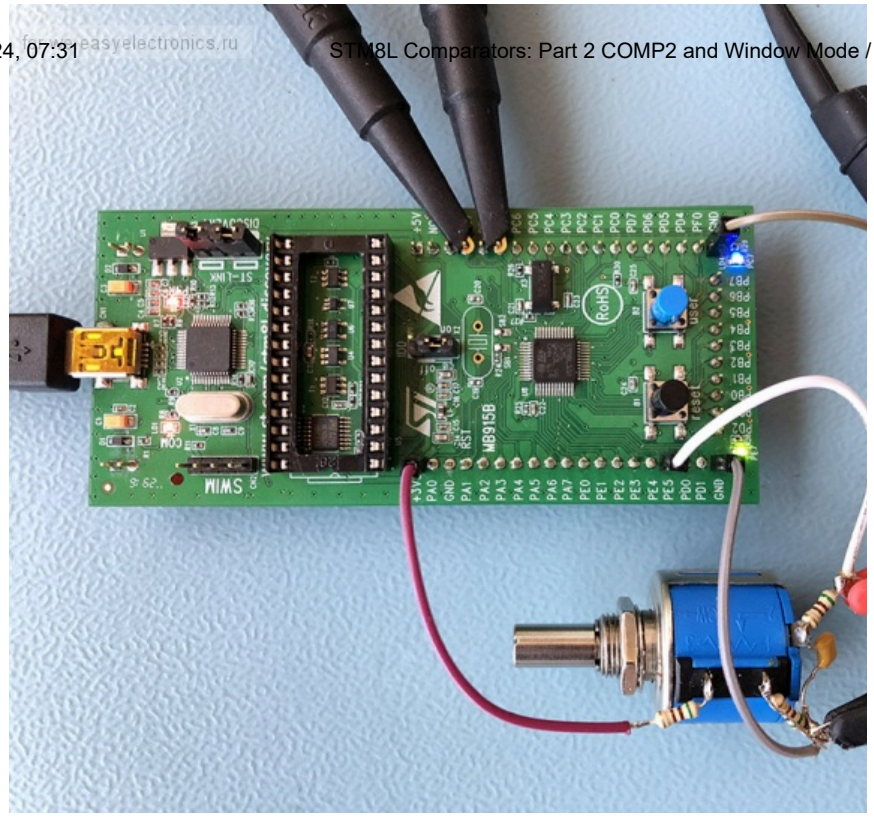

To illustrate the connection of the comparator from RM0031, we will take the figure from the Routing interface (RI) section for medium:

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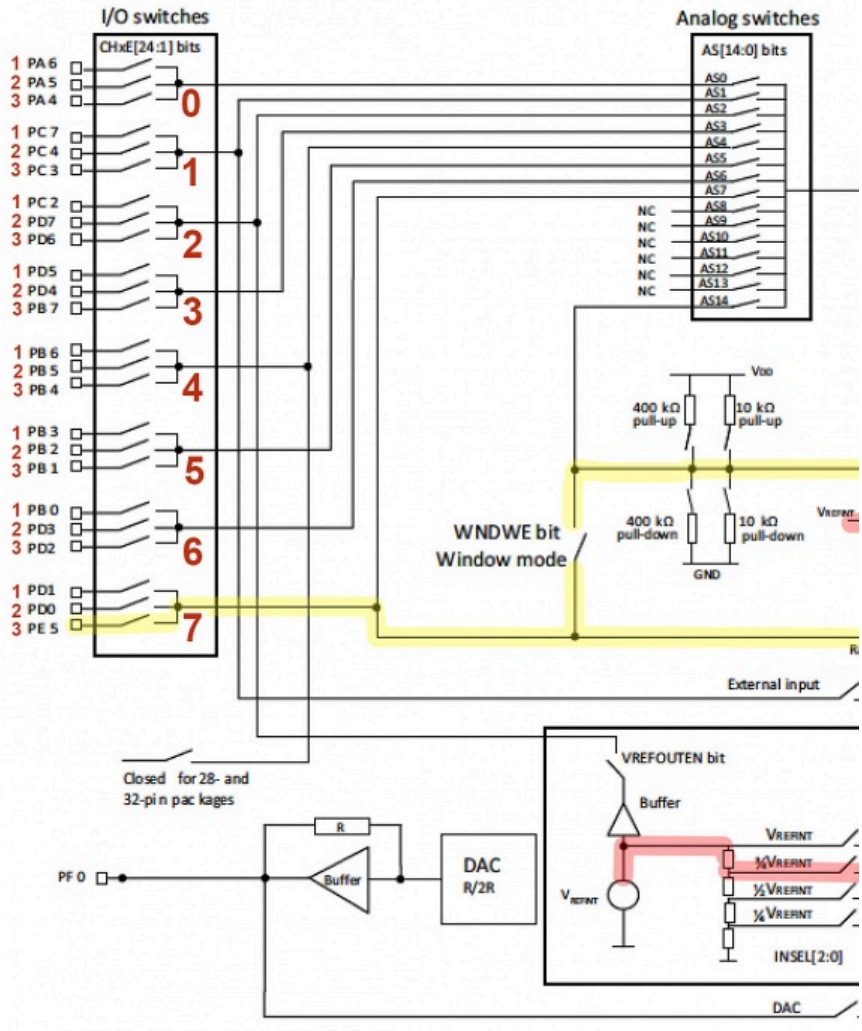


We connect the second comparator COMP2 . We turn on the clocking and the reference source:

```
CLK_PCKENR2_bit.PCKEN25 = 1; //включаем тактирование RI, COMP1, COMP2
COMP_CSR3_bit.VREFEN = 1; // подключаем Vref = 1,221 V к инвертирующему
```

The input signal is marked with a yellow line - we select pin PE5. This is pin **3** in the group - so RI_IOSR **3** ; group 7, so 7 bits - CH24E.

```
RI_IOSR3_bit.CH24E = 1;
```

The reference voltage to COMP2 comes along the red line. The INSEL bit in the COMP_CSR3 register is responsible for selecting the reference.

INSEL = 0; // reference not selected
INSEL = 1; // external signal as reference
INSEL = 2; // reference Vref = 1.221 V
INSEL = 3; // reference 3/4 Vref = 0.916 V
INSEL = 4; // reference 1/2 Vref
INSEL = 5; // reference 1/4 Vref
INSEL = 6; // reference from the DAC output

We select 3/4 Vref = 0.916 V as reference

```
COMP_CSR3_bit.INSEL = 3; // опорное 3/4 Vref = 0,916 V
```

Select the comparatoa speed: fast/slow

```
COMP_CSR2_bit.SPEED = 0; // Slow speed
```

We configure the COMP2 front detector and enable the Schmitt trigger on PE5:

```
COMP_CSR2_bit.CMP2 = 3; //срабатывает по фронту и спаду (нужно, даже есл
COMP_CSR4_bit.NINVTRIG = 1;
```

We connect the first comparator COMP1 . We feed the input signal (yellow line) to its non-inverting input.
Thus, both comparators will be involved **(window mode)** .

```
COMP_CSR3_bit.WNDWE = 1; // WINDOW mode
```

We turn on the Schmidt trigger and set the front detector to COMP1.

```
COMP_CSR1_bit.STE = 1;
COMP_CSR1_bit.CMP1 = 3; //срабатывает по фронту и спаду (нужно, даже есл
```

To display the operation of COMP1, set up the BLUE LED.
To display the operation of COMP2, set up the GREEN LED.

```
PC_DDR_bit.DDR7 = 1; //настраиваем C7 на выход ГОЛУБОЙ СВЕТОДИОД
PC_CR1_bit.C17 = 1; //переключаем его в режим push-pull

PE_DDR_bit.DDR7 = 1; //настраиваем E7 на выход ЗЕЛЕНЫЙ СВЕТОДИОД
PE_CR1_bit.C17 = 1; //переключаем его в режим push-pull
```

In the loop we will display the outputs of the comparators.

```
while (1)
{
  PC_ODR_bit.ODR7 = COMP_CSR1_bit.CMP1OUT; //переключаем пин от COMP1
  PE_ODR_bit.ODR7 = COMP_CSR2_bit.CMP2OUT; //переключаем пин от COMP2
}
```

Using a variable resistor, we change the input voltage on pin PE5 from 0 to 1.5V. We control it with an external voltmeter. COMP1 is set to a threshold of 1.221V. COMP2 is set to a threshold of 3/4 Vref = 0.916V. We see how the comparators switch and the LEDs with them. The file with the example **COMP_2_WND.zip** is in the attachment.

Let's make an example that will use interrupts COMP1 and COMP2.
Let's add an interrupt handler:

```
#pragma vector = 20  //прерывание по срабатыванию COMP1, COMP2
__interrupt void COMP_EF1_EF2(void)
{

  if( (COMP_CSR2_bit.CMP2OUT == 1) &&  (COMP_CSR1_bit.CMP1OUT == 0) )
  {
```

```
    PC_ODR_bit.ODR7 = 1;  // Vin внутри диапазона - ГОЛУБОЙ СВЕТОДИОД го
  }
  else
  {
    PC_ODR_bit.ODR7 = 0;  // Vin вне диапазона - ГОЛУБОЙ СВЕТОДИОД потуш
  }

  COMP_CSR1_bit.EF1 = 0;   //обнуляем бит выхода из прерывания COMP1
  COMP_CSR2_bit.EF2 = 0;   //обнуляем бит выхода из прерывания COMP2
}
```

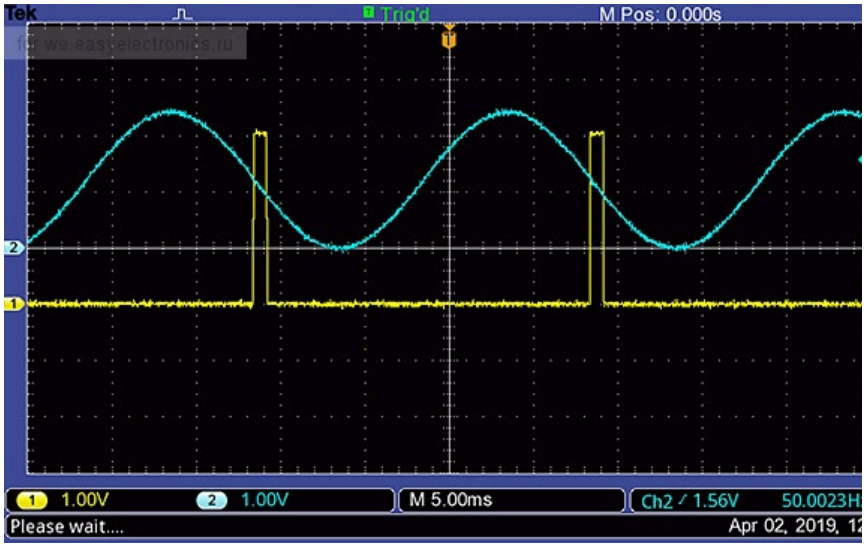
The blue LED displays the operation of the comparators already inside the interrupt. COMP1 is set to a threshold of 1.221V. COMP2 is set to a threshold of 3/4 Vref = 0.916V. When Vin is inside the range, the BLUE LED is on, when Vin is outside the range, the BLUE LED is off. Inside the handler, it is necessary to manually zero the interrupt exit bits EF1 and EF2. This vector (20) receives interrupts not only from COMP1, but also from COMP2 and from the ADC. In the main cycle, we enable COMP1 interrupts, enable COMP2 interrupts, and globally enable interrupts:

```
COMP_CSR1_bit.IE1 = 1;
COMP_CSR2_bit.IE2 = 1;
asm("rim");
while (1); //ждём прерывания
```

In addition to the LED, I connected the yellow channel of the oscilloscope to the C7 output. Instead of AVCC=3V, I fed a sine wave from an external 50Hz generator to the voltage divider input. It can be seen on the blue beam of the oscilloscope. The operation of the window comparator will depend on the settings of the COMP1 and COMP2 edge detectors.

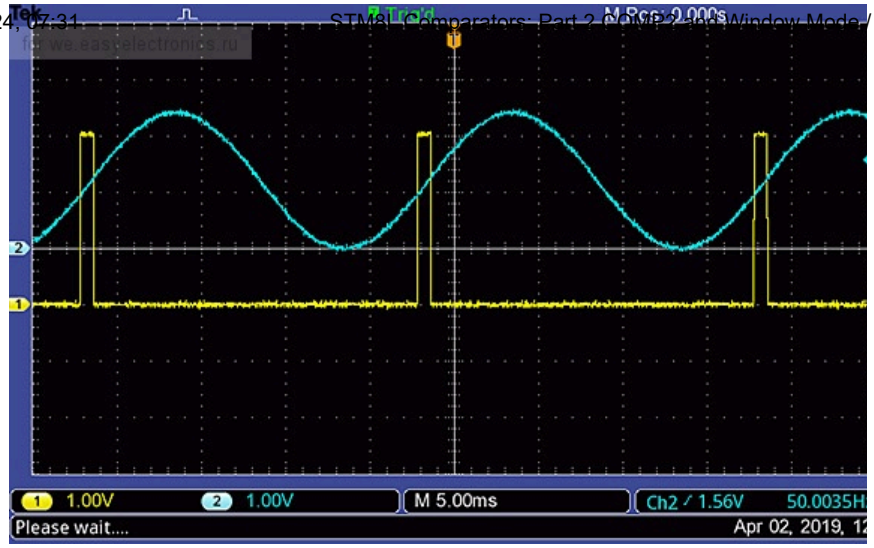
The comparator is turned on at the falling part of the input signal between 1.221V and 0.916V.

```
COMP_CSR1_bit.CMP1 = 1; // COMP1 срабатывает по спаду
COMP_CSR2_bit.CMP2 = 1; // COMP2 срабатывает по спаду
```



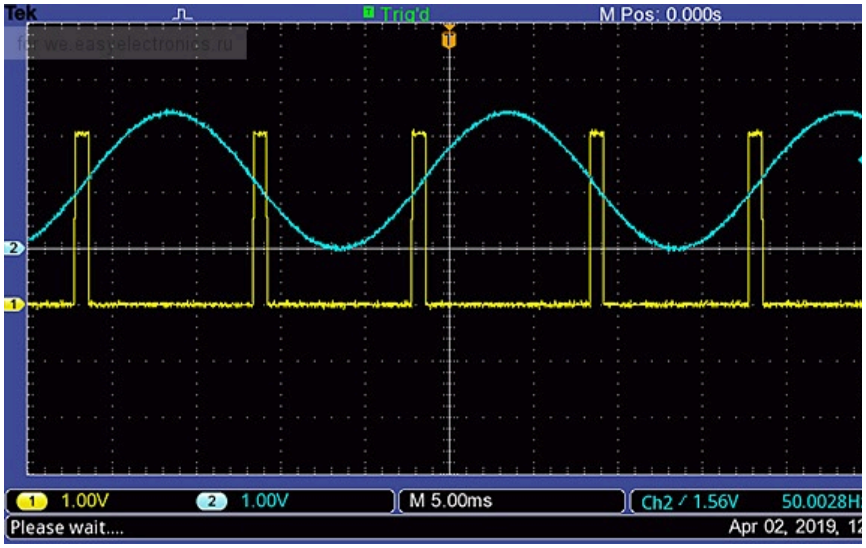
The comparator turns on on the rising part of the input signal between 0.916V and 1.221V.

```
COMP_CSR1_bit.CMP1 = 2; // COMP1 срабатывает по фронту
COMP_CSR2_bit.CMP2 = 2; // COMP2 срабатывает по фронту
```



The comparator turns on on both sides of the input signal between 0.916V and 1.221V.

```
COMP_CSR1_bit.CMP1 = 3; // COMP1 срабатывает по фронту и спаду
COMP_CSR2_bit.CMP2 = 3; // COMP2 срабатывает по фронту и спаду
```



The example file **COMP_2_WND_INTR.zip** is attached.

STM8L , STM8L-Discovery , comparator , windowed mode , COMP2

+2 02 April 2019, 22:26 **CreLis** 2

Files in the topic: COMP_2_WND.zip , COMP_2_WND_INTR.zip

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