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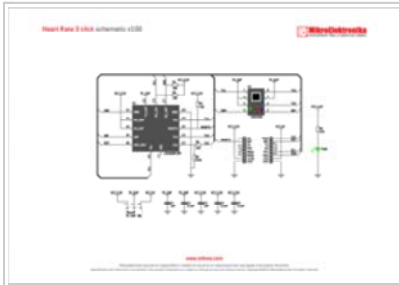


Heart rate 3 click

From MikroElektronika Documentation

Heart Rate 3 click is a mikroBUS™ add-on board whose functionality is determined by two components: an OSRAM's SFH7050 pulse oximetry and heart rate monitoring module, and a TI AFE4404 (analog-front-end) IC specialized for bio-sensing.

Features and usage notes



Schematic also available in PDF (http://cdn-docs.mikroe.com/images/d/d1/Heart_Rate_3_click_sc)

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The SFH7050 multichip package contains 3 LEDs and one photodiode separated with a light barrier to prevent optical crosstalk. When the three LEDs shine through a subject's finger, some of the light is absorbed by the pulsating blood.

The analog reading from the SFH7050 is forwarded to the AFE chip that is able to

derive pulse readings from the intensity of the reflected light.

AFE4404 is highly-configurable and adaptable for different usage scenarios (different lighting conditions or skin tones) making Heart Rate 3 click a robust heart rate monitoring solution.

The board communicates with the target MCU through the mikroBUS™ I2C interface, with additional functionality provided by RST, CLK and RDY pins.

Heart Rate 3 click works on a 3.3V power supply, but an onboard jumper allows you to set the voltage for driving the SFH7050 LEDs at either 3.3V or 5V.

Programming

Setting up of Heartrate 3 click and external interrupt to read values at 100hz and using an algorithm to find a heartrate.

```

1 #include <stdint.h>
2 #include "heartrate_3.h"
3 #include "resources.h"
4
5
6 // HeartRate 3 GPIO
7 sbit RST at GPIO_ODR.B2;
8
9 void system_setup( void );
10 void setup_interrupt();
11
12 char uart_text[20] = {0};
13 uint64_t int_count = 0; //Used by timer to calibrate sampling freq.
14
15 void main()
16 {
17     //Local Declarations
18     uint16_t rate = 0;
19     char txt[15] = {0};
20
21     system_setup(); // GPIO / HeartRate 3 / UART / I2C Setups
22     Delay_ms(200);
23     initStatHRM(); // Initializes values to 0
24     setup_interrupt(); // Setup interrupt handler
25
26     while(1)
27     {
28         rate = hr3_get_hearttrate();
29
30         IntToStr( rate, uart_text );
31         UART1_Write_Text( uart_text );
32         UART1_Write_Text( "\r\n" );
33     }
34 }
35
36 void system_setup( void )
37 {
38     //Local Declarations
39     char text[40] = { 0 };
40

```

Heart rate 3 click



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IC/Module

AFE4404

(<http://www.ti.com/lit/ds/symlink/afe4404.pdf>)

SFH7050 (<http://www.osram.com/media/resource/HIRES/541656/246267/light-is-wearable---flysheet-biomon-sensor-sfh-7050-gb.pdf>)

Interface

I2C

Power

3.3V

supply

Website

www.mikroe.com/click/heart-rate-3

(<http://www.mikroe.com/click/heart-rate-3>)

```

#41 dynamic_modes_t dynamic_modes;
#42 uint8_t address = 0x58;
#43
#44 //Set up dynamic modes for Heart Rate 3 Initialization
#45 dynamic_modes.transmit = trans_dis; //Transmitter disabled
#46 dynamic_modes.curr_range = led_double; //LED range 0 - 100
#47 dynamic_modes.adc_power = adc_on; //ADC on
#48 dynamic_modes.clk_mode = osc_mode; //Use internal Oscillator
#49 dynamic_modes.tia_power = tia_off; //TIA off
#50 dynamic_modes.rest_of_adc = rest_of_adc_off; //Rest of ADC off
#51 dynamic_modes.afe_rx_mode = afe_rx_normal; //Normal Receiving on AFE
#52 dynamic_modes.afe_mode = afe_normal; //Normal AFE functionality
#53
#54 //GPIO setup
#55 GPIO_Digital_Output( &GPIOC_BASE, _GPIO_PINMASK_2 );
#56 GPIO_Digital_Input( &GPIOA_BASE, _GPIO_PINMASK_0 );
#57 GPIO_Digital_Input( &GIOD_BASE, _GPIO_PINMASK_10 );
#58
#59 //UART Initialize
#60 UART1_Init( 9600 );
#61 UART1_Write_Text( "UART is Initialized\r\n" );
#62
#63 //Toggle Reset pin
#64 RST = 0;
#65 Delay_us(50);
#66 RST = 1;
#67
#68 //I2C Initialize
#69 I2C1_Init_Advanced( 400000, & GPIO_MODULE_I2C1_PB67 );
#70 UART1_Write_Text( "I2C Initialized\r\n" );
#71
#72 //Heart Rate 3 Initialize
#73 hr3_init( address, &dynamic_modes );
#74
#75
#76 }
#77
#78 void setup_interrupt()
#79 {
#80 GPIO_Digital_Output(&GPIOE_BASE, _GPIO_PINMASK_HIGH); // Enable digital output on PORTD
#81 GPIOE_ODR = 0xAAAA;
#82 GPIO_Digital_Input(&GIOD_BASE, _GPIO_PINMASK_10);
#83
#84 RCC_APB2ENR.AFIOEN = 1; // Enable clock for alternate pin functions
#85 AFIO_EXTICR3 = 0x0300; // PD10 as External interrupt
#86 EXTI_RTSR = 0x00000400; // Set interrupt on Rising edge
#87 EXTI_IMR |= 0x00000400; // Set mask
#88 NVIC_IntEnable(IVT_INT_EXTI15_10); // Enable External interrupt
#89 EnableInterrupts(); // Enables the processor interrupt.
#90 }
#91
#92 void ExtInt() iv IVT_INT_EXTI15_10 ics ICS_AUTO {
#93 EXTI_PR.B10 = 1; // clear flag
#94 int_count++;
#95 statHRMlgo( hr3_get_led1_amb_val() ); // Give led1 ambient value to heartrate function. ( 100 times a second )
#96
#97 }

```

Code examples that demonstrate the usage of Heart rate 3 click with MikroElektronika hardware, written for mikroC for ARM, AVR, dsPIC, FT90x, PIC and PIC32 are available on Libstock (<http://libstock.mikroe.com/projects/view/1908/heart-rate-3-click>).

Resources

- Learn article explaining Heart rate 3 click library (<http://learn.mikroe.com/microcontrollers-have-a-heart-too/>)
- Libstock Heart rate 3 click example (<http://libstock.mikroe.com/projects/view/1908/heart-rate-3-click>)

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