

NanoPi Neo

Schematy GPIO

Cała specyfikacja znajduje się tu: http://wiki.friendlyarm.com/wiki/index.php/NanoPi_NEO

Warto zainstalować

```
apt install i2c-tools
```

WiringPi

Instalujemy w systemie bibliotekę do obsługi GPIO: <https://github.com/friendlyarm/WiringNP> - jest to fork WiringPi dostosowany do NanoPi Neo

Ściągamy pliki:

```
git clone https://github.com/friendlyarm/WiringNP
```

W czasie gdy to piszę biblioteka nie rozpoznaje poprawnie urządzenia i należy zmodyfikować źródła. Edytujemy plik wiringPi/boardtype_friendlyec.c i zmieniamy w nim treść z:

```
if (!(f = fopen("/sys/class/sunxi_info/sys_info", "r"))) {  
    LOGE("open /sys/class/sunxi_info/sys_info failed.");  
    return -1;  
}
```

Na:

```
if (!(f = fopen("/sys/class/sunxi_info/sys_info", "r"))) {  
    if (!(f = fopen("/etc/sys_info", "r"))) {  
        LOGE("open /sys/class/sunxi_info/sys_info failed.");  
        return -1;  
    }  
}
```

Tworzymy plik /etc/sys_info i zapisujemy do niego wartość:

```
sunxi_platform    : Sun8iw7p1  
sunxi_secure      : normal  
sunxi_chipid      : 2c21020e786746240000540000000000  
sunxi_chiptype    : 00000042  
sunxi_batchno     : 1  
sunxi_board_id    : 1(0)
```

Kompilujemy i instalujemy bibliotekę:

```
cd WiringNP/  
chmod 755 build  
./build
```

Sprawdzamy czy sprzęt jest wykrywany poprawnie przez bibliotekę za pomocą polecenia:

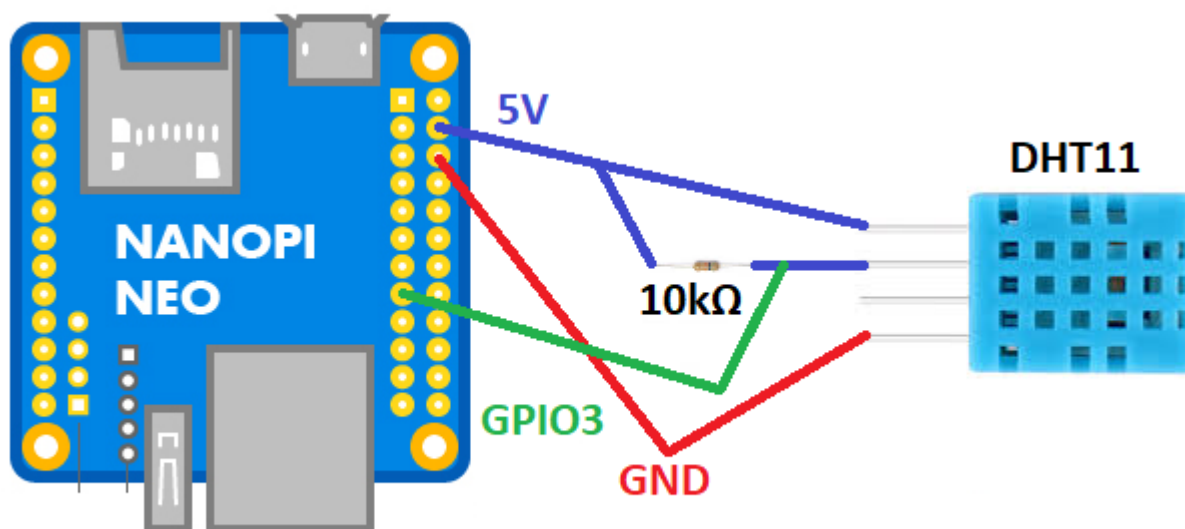
```
# gpio readall  
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+  
---+  
| BCM | wPi | Name | Mode | V | Physical | V | Mode | Name | wPi |  
BCM |  
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+  
---+  
| | | 3.3V | | | 1 || 2 | | | 5V | | |  
|  
| 12 | 8 | GPIOA12 | ALT5 | 0 | 3 || 4 | | | 5V | | |  
|  
| 11 | 9 | GPIOA11 | ALT5 | 0 | 5 || 6 | | | 0v | | |  
|  
| 203 | 7 | GPIOG11 | OFF | 0 | 7 || 8 | 0 | OFF | GPIOG6 | 15 |  
198 |  
| | | 0v | | | 9 || 10 | 0 | OFF | GPIOG7 | 16 |  
199 |  
| 0 | 0 | GPIOA0 | OFF | 0 | 11 || 12 | 0 | OFF | GPIOA6 | 1 |  
6 |  
| 2 | 2 | GPIOA2 | OFF | 0 | 13 || 14 | | | 0v | | |  
|  
| 3 | 3 | GPIOA3 | IN | 1 | 15 || 16 | 0 | OFF | GPIOG8 | 4 |  
200 |  
| | | 3.3v | | | 17 || 18 | 0 | OFF | GPIOG9 | 5 |  
201 |  
| 64 | 12 | GPIOC0 | OFF | 0 | 19 || 20 | | | 0v | | |  
|  
| 65 | 13 | GPIOC1 | OFF | 0 | 21 || 22 | 0 | OFF | GPIOA1 | 6 |  
1 |  
| 66 | 14 | GPIOC2 | OFF | 0 | 23 || 24 | 0 | OFF | GPIOC3 | 10 |  
67 |  
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+  
---+  
| BCM | wPi | Name | Mode | V | Physical | V | Mode | Name | wPi |  
BCM |  
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+  
---+  
  
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+  
| BCM | wPi | Name | Mode | V | Ph |  
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+  
| | | 5V | | | 25 |  
| | | USB-DP1 | | | 26 |  
| | | USB-DM1 | | | 27 |  
| | | USB-DP2 | | | 28 |
```

		USB - DM2			29
		IR - RX			30
17	19	GPIOA17	OFF	0	31
		PCM/I2C			32
		PCM/I2C			33
		PCM/I2C			34
		PCM/I2C			35
		0V			36

+-----+-----NanoPi-NEO Debug UART+-----+						
BCM	wPi	Name	Mode	V	Ph	
+-----+-----+-----+-----+-----+-----+						
4	17	GPIOA4	ALT5	0	37	
5	18	GPIOA5	ALT5	0	38	
+-----+-----+-----+-----+-----+-----+						

Czujnik temperatury i wilgotności powietrza DHT11

Podłączamy wg schematu:



Czyli:

- pin 15 - GPIO3
- pin 4 - 5V
- pin 6 - GND

Przykładowy program, który korzysta z biblioteki WiringPi mamy tu:

<https://github.com/nkundu/wiringpi-examples/blob/master/dht11.c>

```
/*
 * dht11.c:
 * Simple test program to test the wiringPi functions
 * DHT11 test
```

```
*/

#include <wiringPi.h>

#include <stdio.h>
#include <stdlib.h>
#include <stdint.h>
#define MAXTIMINGS 85
#define DHTPIN 7
int dht11_dat[5] = { 0, 0, 0, 0, 0 };

void read_dht11_dat()
{
    uint8_t laststate = HIGH;
    uint8_t counter = 0;
    uint8_t j = 0, i;
    float f; /* fahrenheit */

    dht11_dat[0] = dht11_dat[1] = dht11_dat[2] = dht11_dat[3] = dht11_dat[4]
= 0;

    /* pull pin down for 18 milliseconds */
    pinMode( DHTPIN, OUTPUT );
    digitalWrite( DHTPIN, LOW );
    delay( 18 );
    /* then pull it up for 40 microseconds */
    digitalWrite( DHTPIN, HIGH );
    delayMicroseconds( 40 );
    /* prepare to read the pin */
    pinMode( DHTPIN, INPUT );

    /* detect change and read data */
    for ( i = 0; i < MAXTIMINGS; i++ )
    {
        counter = 0;
        while ( digitalRead( DHTPIN ) == laststate )
        {
            counter++;
            delayMicroseconds( 1 );
            if ( counter == 255 )
            {
                break;
            }
        }
        laststate = digitalRead( DHTPIN );

        if ( counter == 255 )
            break;

        /* ignore first 3 transitions */
        if ( ( i >= 4 ) && ( i % 2 == 0 ) )
```

```
        {
            /* shove each bit into the storage bytes */
            dht11_dat[j / 8] <= 1;
            if ( counter > 16 )
                dht11_dat[j / 8] |= 1;
            j++;
        }
    }

    /*
    * check we read 40 bits (8bit x 5 ) + verify checksum in the last byte
    * print it out if data is good
    */
    if ( (j >= 40) &&
        (dht11_dat[4] == ( (dht11_dat[0] + dht11_dat[1] + dht11_dat[2] +
dht11_dat[3]) & 0xFF) ) )
    {
        f = dht11_dat[2] * 9. / 5. + 32;
        printf( "Humidity = %d.%d %% Temperature = %d.%d *C (%.1f *F)\n",
            dht11_dat[0], dht11_dat[1], dht11_dat[2], dht11_dat[3], f );
    }else {
        printf( "Data not good, skip\n" );
    }
}

int main( void )
{
    printf( "Raspberry Pi wiringPi DHT11 Temperature test program\n" );

    if ( wiringPiSetup() == -1 )
        exit( 1 );

    while ( 1 )
    {
        read_dht11_dat();
        delay( 1000 ); /* wait 1sec to refresh */
    }

    return(0);
}
```

Modyfikujemy linie:

```
#define DHTPIN      7
```

Zmieniając na:

```
#define DHTPIN      3
```

Jest to nr portu w WiringPi. Można odczytać za pomocą polecenia: „gpio readall” - u mnie akurat podłączony do pinu nr 15 (kolumna Physical) - co daje nr 3 (kolumna wPi).

Kompilujemy:

```
gcc -Wall -o dht11 dht11.c -lwiringPi -lpthread
```

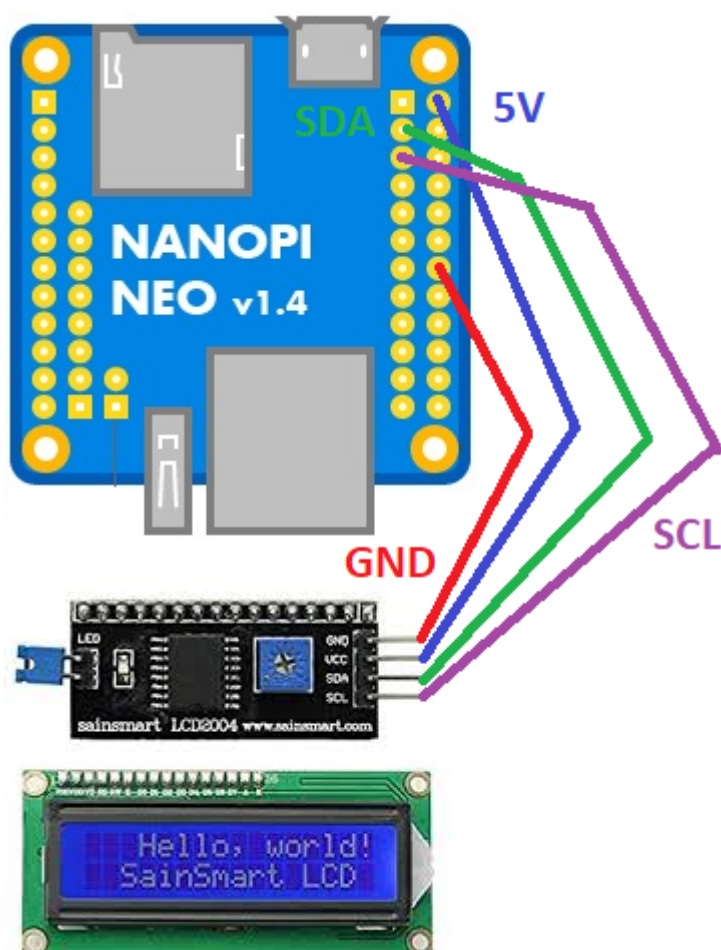
Uruchamiamy:

```
root@nanopineo:~/tests# ./dht11
Raspberry Pi wiringPi DHT11 Temperature test program
Data not good, skip
Data not good, skip
Humidity = 36.0 % Temperature = 23.7 *C (73.4 *F)
Data not good, skip
Humidity = 36.0 % Temperature = 23.8 *C (73.4 *F)
Data not good, skip
Humidity = 36.0 % Temperature = 23.8 *C (73.4 *F)
^C
root@nanopineo:~/tests#
```

Ctrl C zatrzymujemy program.

Wyświetlacz LCD 2x16 I2C

Podłączamy wg schematu:



Czyli:

- pin 3 - I2C SDA
- pin 5 - I2C SCL
- pin 2 - 5V
- pin 14 - GND

Przykładowy program, który korzysta z biblioteki WiringPi mamy tu:

<http://www.bristolwatch.com/rpi/code/i2clcd.txt>

```
/*
 *
 * by Lewis Loflin www.bristolwatch.com lewis@bvu.net
 * http://www.bristolwatch.com/rpi/i2clcd.htm
 * Using wiringPi by Gordon Henderson
 *
 *
 * Port over lcd_i2c.py to C and added improvements.
 * Supports 16x2 and 20x4 screens.
 * This was to learn now the I2C lcd displays operate.
 * There is no warrenty of any kind use at your own risk.
 *
 */

#include <wiringPiI2C.h>
#include <wiringPi.h>
#include <stdlib.h>
#include <stdio.h>

// Define some device parameters
#define I2C_ADDR 0x27 // I2C device address

// Define some device constants
#define LCD_CHR 1 // Mode - Sending data
#define LCD_CMD 0 // Mode - Sending command

#define LINE1 0x80 // 1st line
#define LINE2 0xC0 // 2nd line

#define LCD_BACKLIGHT 0x08 // On
// LCD_BACKLIGHT = 0x00 # Off

#define ENABLE 0b00000100 // Enable bit

void lcd_init(void);
void lcd_byte(int bits, int mode);
void lcd_toggle_enable(int bits);

// added by Lewis
void typeInt(int i);
void typeFloat(float myFloat);
```

```
void lcdLoc(int line); //move cursor
void ClrLcd(void); // clr LCD return home
void typeLn(const char *s);
void typeChar(char val);
int fd; // seen by all subroutines

int main()  {

    if (wiringPiSetup () == -1) exit (1);

    fd = wiringPiI2CSetup(I2C_ADDR);

    //printf("fd = %d ", fd);

    lcd_init(); // setup LCD

    char array1[] = "Hello world!";

    while (1)  {

        lcdLoc(LINE1);
        typeLn("Using wiringPi");
        lcdLoc(LINE2);
        typeLn("Geany editor.");

        delay(2000);
        ClrLcd();
        lcdLoc(LINE1);
        typeLn("I2c  Programmed");
        lcdLoc(LINE2);
        typeLn("in C not Python.");

        delay(2000);
        ClrLcd();
        lcdLoc(LINE1);
        typeLn("Arduino like");
        lcdLoc(LINE2);
        typeLn("fast and easy.");

        delay(2000);
        ClrLcd();
        lcdLoc(LINE1);
        typeLn(array1);

        delay(2000);
        ClrLcd(); // defaults LINE1
        typeLn("Int  ");
        int value = 20125;
        typeInt(value);

        delay(2000);
```



```
    lcdLoc(LINE2);
    typeLn("Float ");
    float FloatVal = 10045.25989;
    typeFloat(FloatVal);
    delay(2000);
}

return 0;

}

// float to string
void typeFloat(float myFloat)  {
    char buffer[20];
    sprintf(buffer, "%.2f",  myFloat);
    typeLn(buffer);
}

// int to string
void typeInt(int i)  {
    char array1[20];
    sprintf(array1, "%d",  i);
    typeLn(array1);
}

// clr lcd go home loc 0x80
void ClrLcd(void)  {
    lcd_byte(0x01, LCD_CMD);
    lcd_byte(0x02, LCD_CMD);
}

// go to location on LCD
void lcdLoc(int line)  {
    lcd_byte(line, LCD_CMD);
}

// out char to LCD at current position
void typeChar(char val)  {

    lcd_byte(val, LCD_CHR);
}

// this allows use of any size string
void typeLn(const char *s)  {

    while ( *s ) lcd_byte(*(s++), LCD_CHR);

}
```

```

void lcd_byte(int bits, int mode)  {

    //Send byte to data pins
    // bits = the data
    // mode = 1 for data, 0 for command
    int bits_high;
    int bits_low;
    // uses the two half byte writes to LCD
    bits_high = mode | (bits & 0xF0) | LCD_BACKLIGHT ;
    bits_low = mode | ((bits << 4) & 0xF0) | LCD_BACKLIGHT ;

    // High bits
    wiringPiI2CReadReg8(fd, bits_high);
    lcd_toggle_enable(bits_high);

    // Low bits
    wiringPiI2CReadReg8(fd, bits_low);
    lcd_toggle_enable(bits_low);
}

void lcd_toggle_enable(int bits)  {
    // Toggle enable pin on LCD display
    delayMicroseconds(500);
    wiringPiI2CReadReg8(fd, (bits | ENABLE));
    delayMicroseconds(500);
    wiringPiI2CReadReg8(fd, (bits & ~ENABLE));
    delayMicroseconds(500);
}

void lcd_init()  {
    // Initialise display
    lcd_byte(0x33, LCD_CMD); // Initialise
    lcd_byte(0x32, LCD_CMD); // Initialise
    lcd_byte(0x06, LCD_CMD); // Cursor move direction
    lcd_byte(0x0C, LCD_CMD); // 0x0F On, Blink Off
    lcd_byte(0x28, LCD_CMD); // Data length, number of lines, font size
    lcd_byte(0x01, LCD_CMD); // Clear display
    delayMicroseconds(500);
}

```

Szukamy linię:

```
#define I2C_ADDR    0x27 // I2C device address
```

I upewniamy się, że nasz kontroler I2C ma ten sam adres. Sprawdzić możemy to poleceniem:

```

# i2cdetect -y 0
    0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
10:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --

```

```
20:  --  --  --  --  --  --  --  --  -- 27  --  --  --  --  --  --  --
30:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
40:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
50:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
60:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
70:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
```

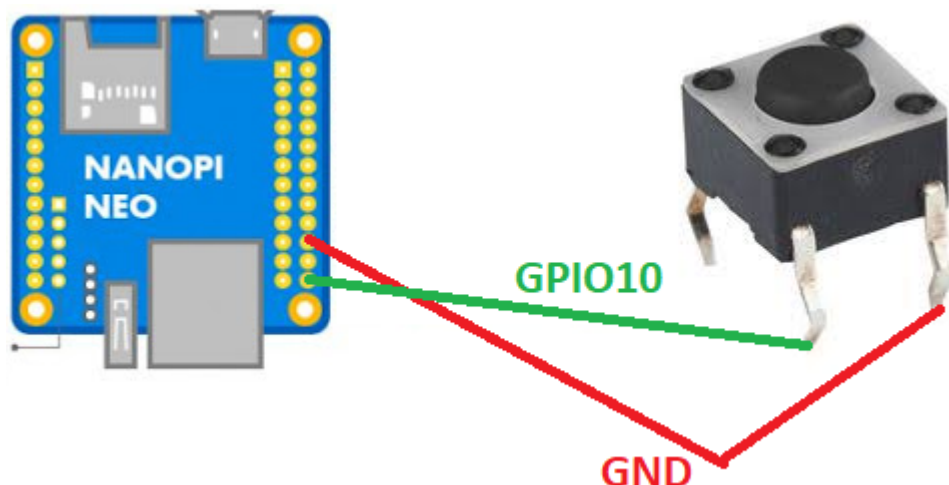
Kompilujemy:

```
gcc -Wall -o i2clcd i2clcd.c -lwiringPi -lpthread
```

Po uruchomieniu na wyświetlaczu powinny pojawić się napisy - jeśli się nie pojawiają to może wystarczy wyregulować ekran pokrętką za pomocą śrubokręta.

Przycisk

Podłączamy wg schematu:



Czyli:

- pin 24 - GPIO 10
- pin 20 - GND

Przykładowy program, który korzysta z biblioteki WiringPi mamy tu:

https://www.waveshare.com/wiki/Raspberry_Pi_Tutorial_Series:_External_Button

```
#include <stdio.h>
#include <wiringPi.h>

char KEY = 10;

int main()
{
    if (wiringPiSetup() < 0) return 1 ;
    // Sets the pin as input.
    pinMode(KEY, INPUT);
```

```
// Sets the Pull-up mode for the pin.
pullUpDnControl(KEY, PUD_UP);
printf("Key Test Program!!!\n");
while(1)
{
    if (digitalRead(KEY) == 0)
    {
        printf ("KEY PRESS\n") ;
        // Returns the value read at the given pin. It will be HIGH or
        LOW (0 or 1).
        while(digitalRead(KEY) == 0)
            delay(100);
    }
    delay(100);
}
}
```

Gdzie linia:

```
char KEY = 10;
```

Jest to nr portu w WiringPi. Można odczytać za pomocą polecenia: „gpio readall” - u mnie akurat podłączony do pinu nr 24 (kolumna Physical) - co daje nr 10 (kolumna wPi).

Kompilujemy:

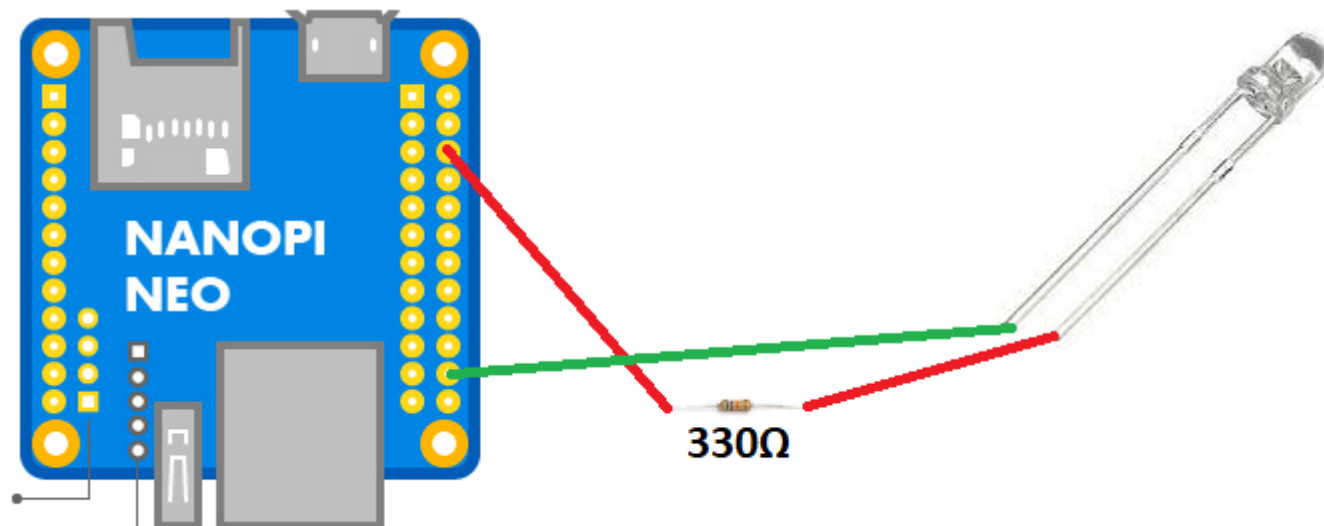
```
gcc -Wall ./button.c -o ./button -lwiringPi -lpthread
```

I uruchamiamy:

```
# ./button
Key Test Program!!!
KEY PRESS
KEY PRESS
KEY PRESS
KEY PRESS
KEY PRESS
KEY PRESS
KEY PRESS
^C
```

Dioda

Podłączamy wg schematu:



Czyli:

- pin 22 - GPIO 6
- pin 6 - GND (nóżka krótsza)

Przykładowy program, który korzysta z biblioteki WiringPi mamy tu:

https://www.waveshare.com/wiki/Raspberry_Pi_Tutorial_Series:_External_Button

```
#include <wiringPi.h>

#define DIODE 6

int main (void)
{
    wiringPiSetup () ;
    pinMode (DIODE, OUTPUT) ;
    for (;;)
    {
        digitalWrite (DIODE, HIGH) ; delay (500) ;
        digitalWrite (DIODE, LOW) ; delay (500) ;
    }
    return 0 ;
}
```

Gdzie linia:

```
#define DIODE 6
```

Jest to nr portu w WiringPi. Można odczytać za pomocą polecenia: „gpio readall” - u mnie akurat podłączony do pinu nr 22 (kolumna Physical) - co daje nr 6 (kolumna wPi).

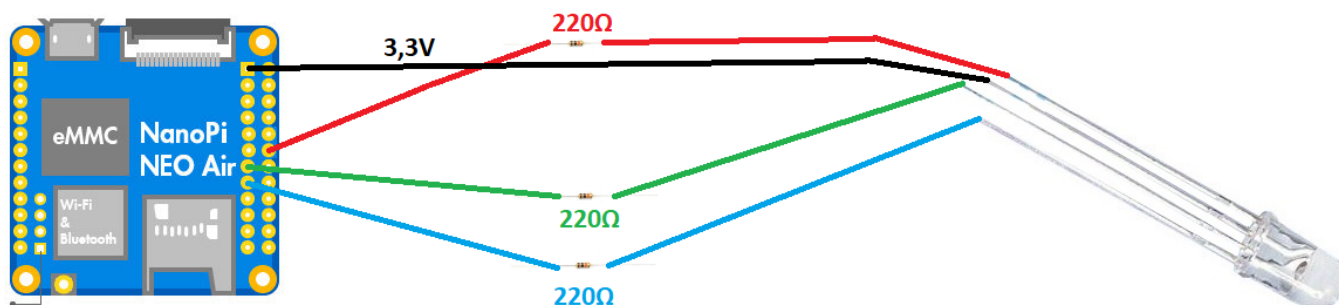
Kompilujemy:

```
gcc -Wall ./diode.c -o ./diode -lwiringPi -lpthread
```

Po uruchomieniu dioda powinna migać.

Dioda RGB

Podłączamy wg schematu:



Czyli:

- pin 1 - 3,3V
- pin 11 - GPIO0
- pin 13 - GPIO2
- pin 15 - GPIO3

Przykładowy program, który korzysta z biblioteki WiringPI mamy tu:

<https://www.admfactory.com/rgb-led-on-raspberry-pi-using-c/>

```
#include <wiringPi.h>
#include <softPwm.h>
#include <stdio.h>

#define LedPinRed    0
#define LedPinGreen  2
#define LedPinBlue   3

const int colors[] = {0xFF0000, 0x00FF00, 0x0000FF, 0xFFFF00, 0x00FFFF,
0xFF00FF, 0xFFFFFF, 0x9400D3};

int map(int x, int in_min, int in_max, int out_min, int out_max)
{
    return (x - in_min) * (out_max - out_min) / (in_max - in_min) +
out_min;
}

void ledInit(void)
{
    softPwmCreate(LedPinRed, 0, 100); //create a soft pwm, original
duty cycle is 0Hz, range is 0~100
    softPwmCreate(LedPinGreen,0, 100);
    softPwmCreate(LedPinBlue, 0, 100);
}

void ledColorSet(int color)           //set color, for example: 0xde3f47
{

```

```
    int r_val, g_val, b_val;

    r_val = (color & 0xFF0000) >> 16; //get red value
    g_val = (color & 0x00FF00) >> 8;  //get green value
    b_val = (color & 0x0000FF) >> 0;  //get blue value

    r_val = map(r_val, 0, 255, 0, 100); //change a num(0~255) to
0~100
    g_val = map(g_val, 0, 255, 0, 100);
    b_val = map(b_val, 0, 255, 0, 100);

    softPwmWrite(LedPinRed, 100 - r_val); //change duty cycle
    softPwmWrite(LedPinGreen, 100 - g_val);
    softPwmWrite(LedPinBlue, 100 - b_val);
}

int main(void)
{
    int i;

    if(wiringPiSetup() < 0) { //when initialize wiringPi failed, print
message to screen
        printf("setup wiringPi failed !\n");
        return -1;
    }

    ledInit();

    while(1) {
        for(i = 0; i < sizeof(colors)/sizeof(int); i++) {
            ledColorSet(colors[i]);
            delay(1000);
        }
    }
    return 0;
}
```

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