

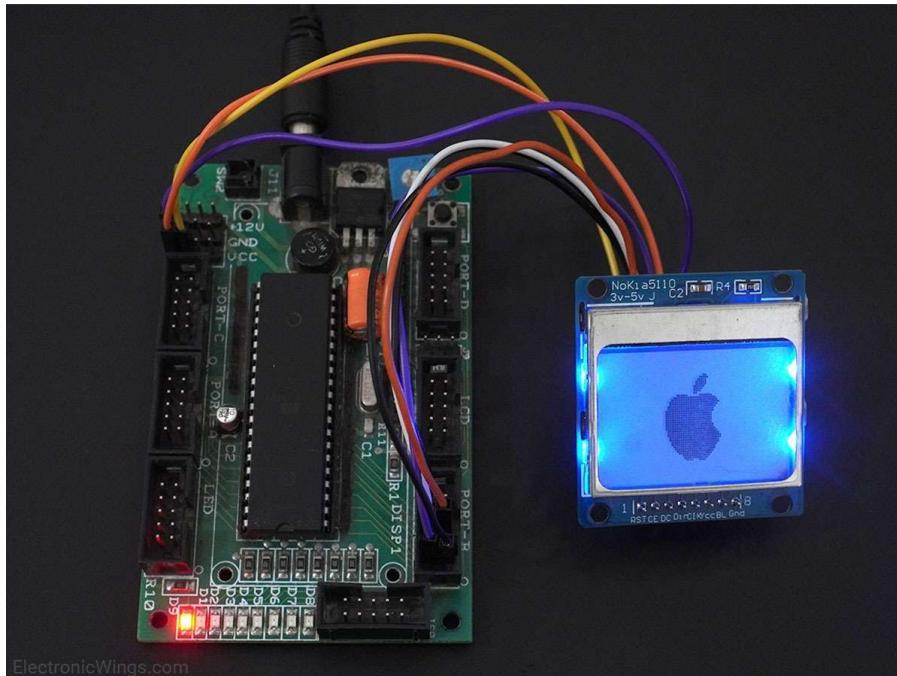
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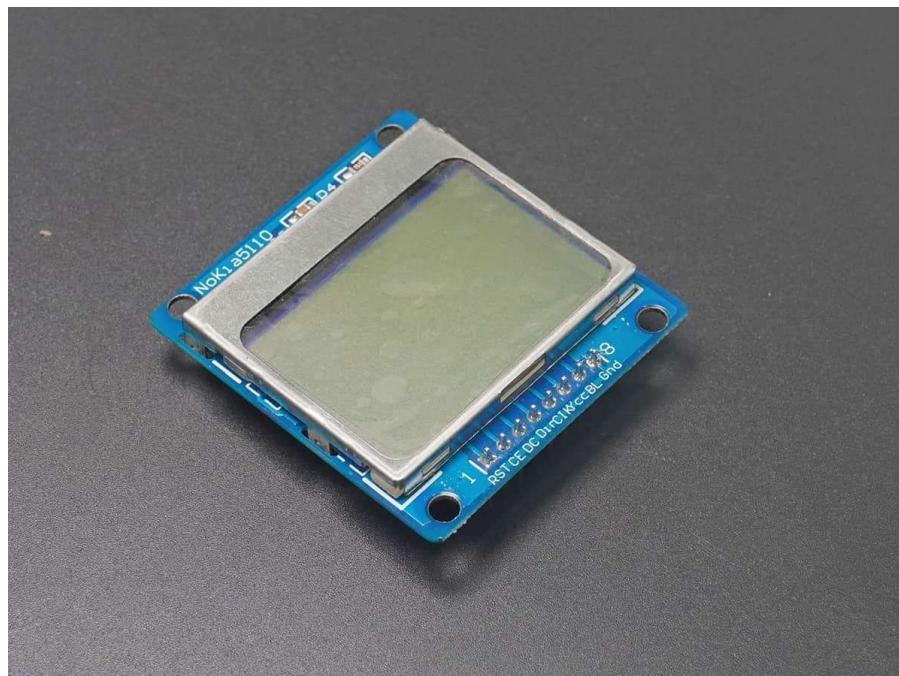
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Nokia5110 graphical display interfacing with AVR ATmega16/ATmega32



Overview of Nokia5110 Display



Nokia5110 is a graphical display that can display text, images, and various patterns.

It has a resolution of 48x84 and comes with a backlight.

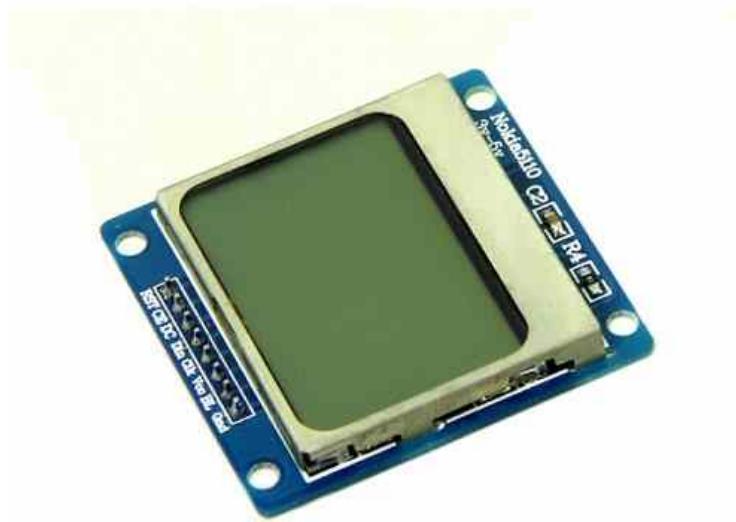


It uses SPI communication to communicate with a microcontroller.

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It has 8 pins.

For more information about the Nokia5110 display and how to use it, refer to the topic [Nokia5110 Graphical Display](http://electronicwings.com/sensors-modules/nokia5110-graphical-display) (<http://electronicwings.com/sensors-modules/nokia5110-graphical-display>) in the sensors and modules section.

For information on SPI in ATmega 16, refer the topic on SPI in AVR ATmega16/ATmega32 (<https://www.electronicwings.com/avr-atmega/atmega1632-spi>) in the ATmega inside section.



Nokia 5110 Display

Connection Diagram of Nokia 5110 Display with ATmega16/32

- The following circuit diagram shows the complete interfacing of Atmega16 / 32 to the nokia5110 display.
- The pin connection is, reset pin of display is connected to the PB0 pin, CE is connected to SS(PB4) pin, DC is connected to the PB1 pin, Din is connected to MOSI(PB5) pin, clk is connected to SCLK(PB7) pin of the microcontroller.

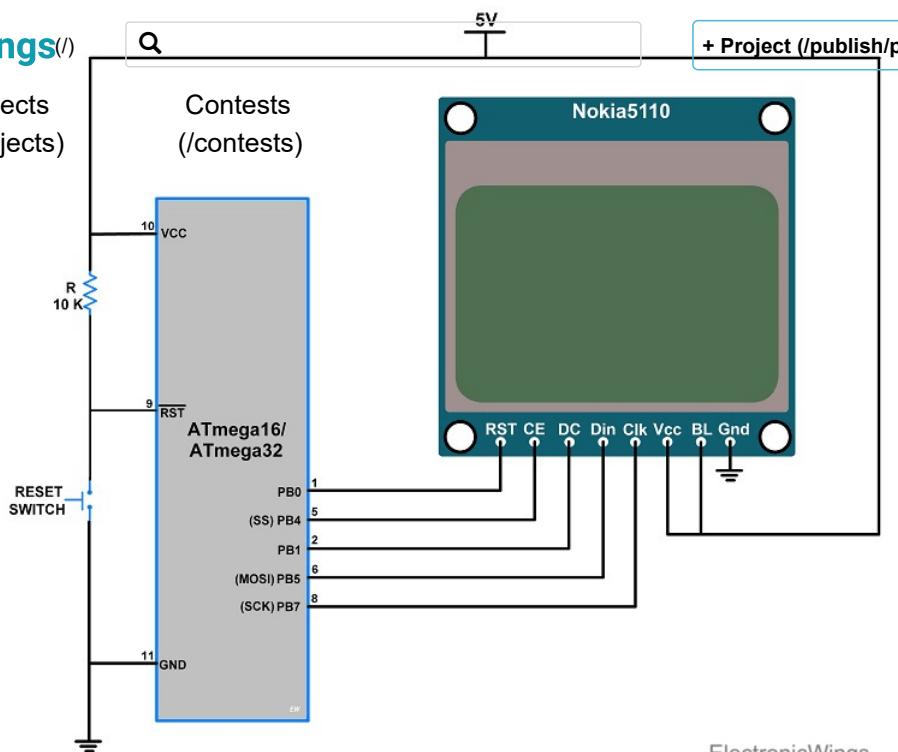


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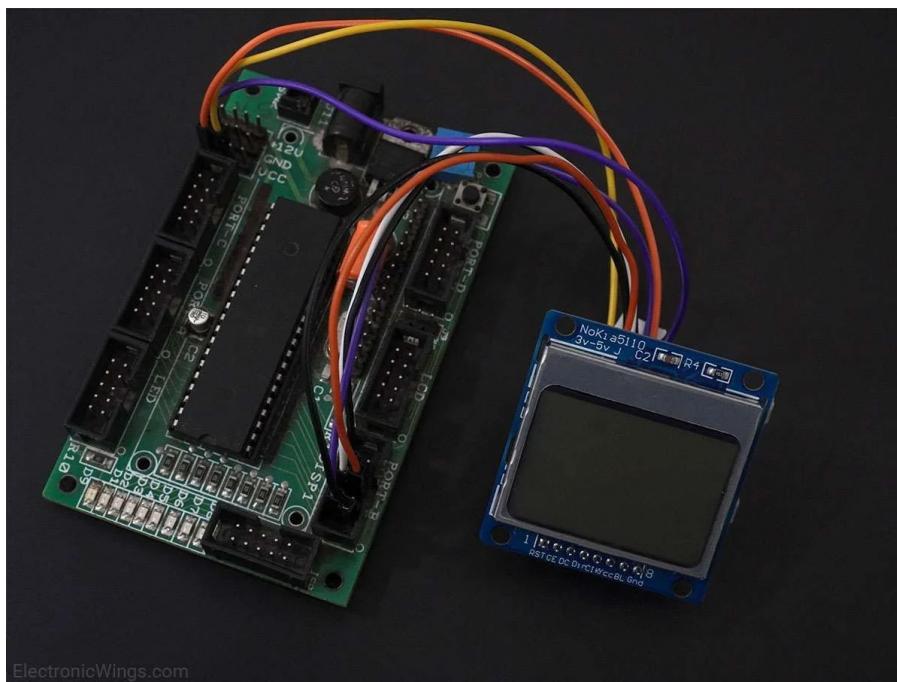
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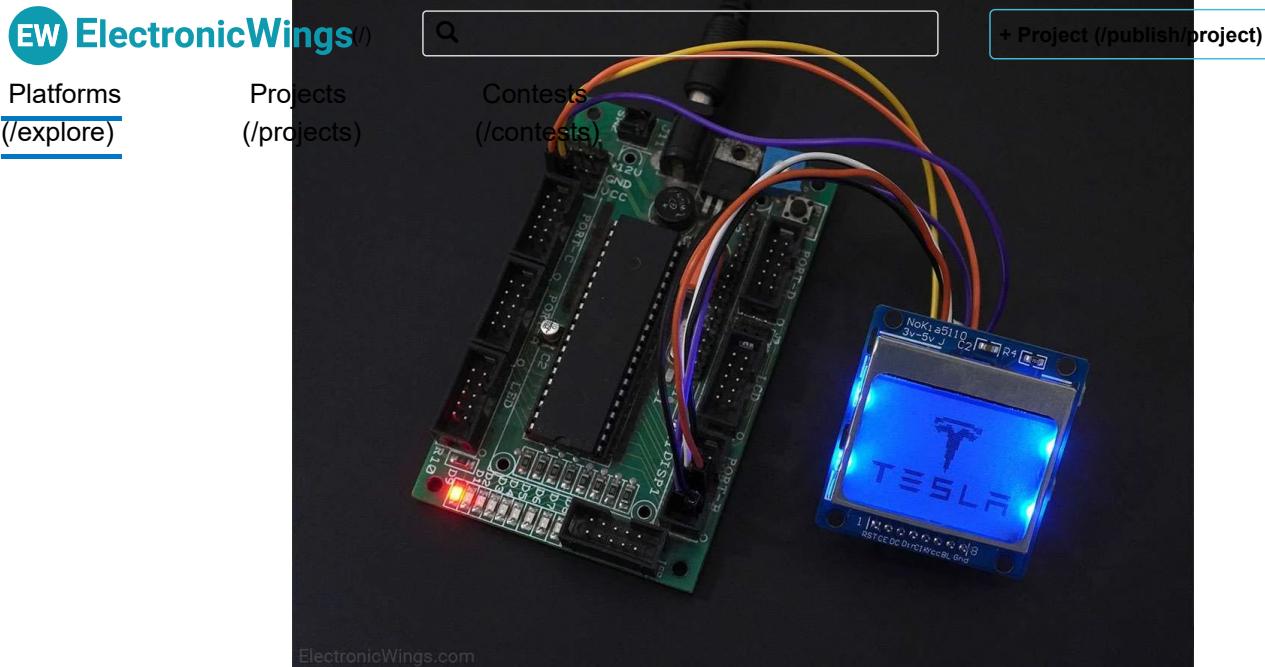


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Interfacing Nokia 5110 Display With AVR ATmega16/ ATmega32



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Display Text and Images on Nokia5110 Display using Atmega16/32

- In the coding, the first step is to initialize the SPI_Master_H_file.h library and N5110.h header files.
- SPI_Master_H_file.h file contains the definition of SPI initialization.
- N5110.h file contains all the characters and symbols array definition.

Initialization of Nokia5110

- In the initialization of the Nokia5110, the first step is to reset the display by sending low to high pulse to the reset pin.
- Send command 0x21H to set the command in additional mode (H=1).
- Then set VOP=5V by sending the command 0xC0H.
- Set the temp. coefficient to 3 by sending 0x07H.
- Set the voltage bias system using the 0x13 command, it is recommended for n=4 and 1:48 mux rate.
- Send the command 0x20 for basic mode operation (H=0).
- And then send 0x0C for normal mode operation.

```
void N5110_init()
{
    N5110_Reset(); /* reset the display */
    N5110_Cmd(0x21); /* command set in addition mode */
    N5110_Cmd(0xC0); /* set the voltage by sending C0 means VOP = 5V
    N5110_Cmd(0x07); /* set the temp. coefficient to 3 */
    N5110_Cmd(0x13); /* set value of Voltage Bias System */
    N5110_Cmd(0x20); /* command set in basic mode */
    N5110_Cmd(0x0C); /* display result in normal mode */
}
```

Command write function



- For command, operation makes DC pin low.

Enable the slave select pin.

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[\(/projects\)](#) Send the command on the SPI data register.
[\(/contests\)](#) Then the DC pin is enabled for data operation.
 • Disable the slave select pin.

```
void N5110_Cmnd(char DATA)
{
    PORTB &= ~(1<<DC);      /* make DC pin to logic zero for command op
    SPI_SS_Enable();          /* enable SS pin to slave selection */
    SPI_Write(DATA);          /* send data on data register */
    PORTB |= (1<<DC);        /* make DC pin to logic high for data operatio
    SPI_SS_Disable();
}
```

Data write function

- For data, operation makes DC pin high.
- Enable the slave select pin.
- Send the data on the SPI data register.
- Disable the slave select pin after sending the data.

```
void N5110_Data(char *DATA)
{
    PORTB |= (1<<DC);       /* Set DC pin for data operation */
    SPI_SS_Enable();          /* Enable SS pin to slave selection */
    int lenan = strlen(DATA);/* Measure the length of data */
    for (int g=0; g<lenan; g++)
    {
        for (int index=0; index<5; index++)
        {
            SPI_Write(ASCII[DATA[g] - 0x20][index]);/* Send data */
        }
        SPI_Write(0x00);
    }
    SPI_SS_Disable();
}
```

Hello world Code for Nokia5110 Display using ATmega16/32

Printing Hello World on Display


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```
#define F_CPU 8000000UL
#include <avr/io.h>
#include <util/delay.h>
#include <string.h>
#include "SPI_Master_H_file.h"
#include "N5110.h"

void N5110_Cmnd(char DATA)
{
    PORTB &= ~(1<<DC); /* make DC pin to logic zero for command ope
    SPI_SS_Enable(); /* enable SS pin to slave selection */
    SPI_Write(DATA); /* send data on data register */
    PORTB |= (1<<DC); /* make DC pin to logic high for data operation *
    SPI_SS_Disable();
}

void N5110_Data(char *DATA)
```

Image display function

```
void N5110_image (const unsigned char *image_data) /* clear the Display */
{
    SPI_SS_Enable();
    PORTB |= (1<<DC);
    for (int k=0; k<=503; k++)
    {
        SPI_Write(image_data[k]);
    }
    PORTB &= ~(1<<DC);
    SPI_SS_Disable();
}
```

Output of Image display on Nokia5110 display using Atmega16/32



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Components Used

ATmega 16
ATmega 16

X 1

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(https://www.mouser.in/?utm_source=electronicswing&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

(https://www.mouser.in/ProductDetail/Microchip-Technology-Atmel/ATMEGA16L-8PU?qs=%2Fha2pyFaduiGCJtTvs2wv8fVZbVAalLu7lq%2FgITS0tALAx6fMenLvg%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

Datasheet (</components/atmega-16/1/datasheet>)



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(https://www.mouser.in/?utm_source=electronicswing&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)



Components Used

Atmega32
Atmega32

x 1

(https://www.mouser.in/ProductDetail/Microchip-Technology-Atmel/ATMEGA32-16PU?qs=aqrrBurbvGdpkmj7RWmsQ%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

Datasheet (</components/atmega32/1/datasheet>)

Nokia5110 Graphical Display
Nokia5110 is 48x84 dot LCD display with Serial ...

x 1

(https://www.mouser.in/ProductDetail/Olimex-Ltd/MOD-LCD3310?qs=%2Fha2pyFaduiM2FizGGE3eTLrshD%2FqHV%2F3UdKes06wlNifol%252BJ2g6%2Fw%3D%3D&utm_source=electronicswings&utm_medium=display&utm_campaign=mouser-componentslisting&utm_content=0x0)

Datasheet (</components/nokia510-graphical-display/1/datasheet>)

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	ATmega16 interface with Nokia 5110 display Image project file	Dow (/api/download/platform/nokia_orm-attachment/84) d
	Proteus Simulation files	Dow (/api/download/platform/nokia_orm-attachment/85) d
	Datasheets	Dow (/api/download/platform/nokia_orm-attachment/86) d
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Comments



Comment



domanhatk

(/users/domanhatk/profile)
2018-10-11 02:49:32

Hello. I not found N5110.h in file.
in code #include "N5110.h"

Reply Like



lokeshc

(/users/lokeshc/profile)
2018-10-11 03:19:26



In which code you found N5110.h? have you downloaded the code attachment?
In attachment code, I am not finding any #include "N5110.h" in code and not
finding any header file N5110.h.

Reply Like



domanhatk

(/users/domanhatk/profile)
2018-10-11 03:46:54

I downloaded the above source code and extracted it, I'm in the post to declare
the N5110.h library but the download file does not have the N5110.h file.

Reply Like 1 ⌂



lokeshc

(/users/lokeshc/profile)
2018-10-11 04:33:23





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I used the "ATmega16 interface with Nokia 5110 display project file" attachment to check your query.

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I find font.h which can be used instead of N5110.h. My program compiled successfully.

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domanhatk

(/users/domanhatk/profile)

2018-10-11 05:22:12

⋮

ok. thank you!

Reply Like

PrakharAgrawal

(/users/PrakharAgrawal/profile)

2021-03-01 21:42:52

⋮

Hey! if I am using atmega328p where will I connect the RST and DC pin of the display to??

For atmega16 DC-->PB1(T1) and RST-->PB0(T0)

For atmega328p DC-->(?) and RST-->(?)

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mohammadtaha

(/users/mohammadtaha/profile)

2022-01-06 18:16:33

⋮

How to change font size on nokia5110?

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