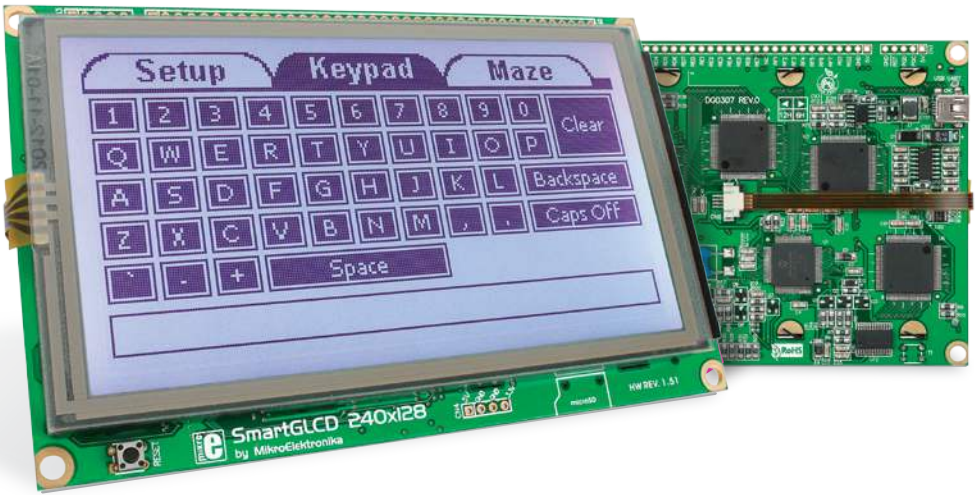
SmartGLCD
240x128



MikroElektronika
DEVELOPMENT TOOLS | COMPILERS | BOOKS

PIC

TO OUR VALUED CUSTOMERS

I want to express my thanks to you for being interested in our products and for having confidence in MikroElektronika.

The primary aim of our company is to design and produce high quality electronic products and to constantly improve the performance thereof in order to better suit your needs.

Nebojsa Matic
General Manager

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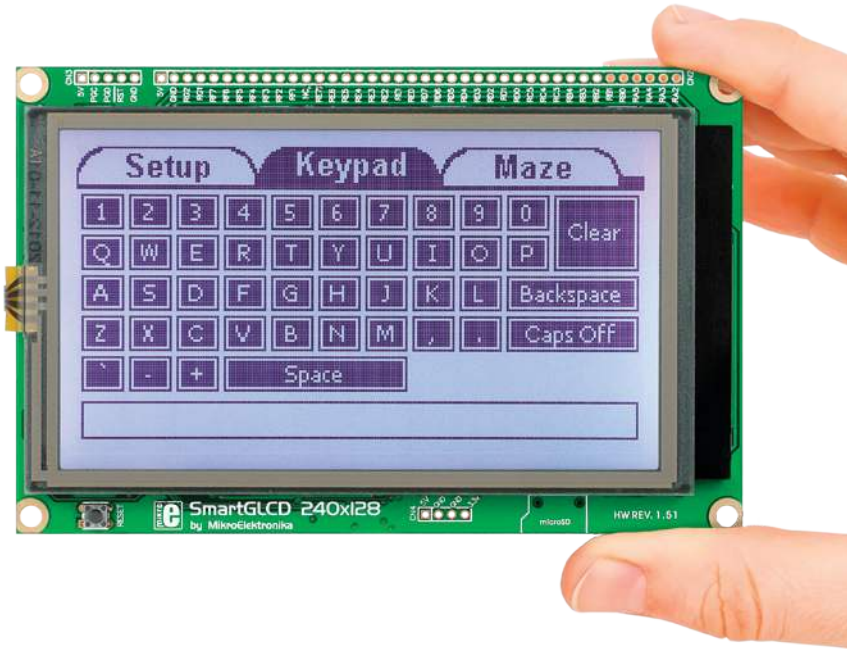
What is the SmartGLCD 240x128?

The SmartGLCD 240x128 is a compact smart display, with many on-board peripherals. It's designed to become a control interface of your device. Main part of the board is a large 240x128 pixel graphical LCD with a 4-wire resistive touch screen. It features RGB backlight, which can greatly improve user experience, but can also be used as a signaling feature. The heart of the board is PIC18F87K22, an 8-bit microcontroller delivering 12MIPS of processing power. Other modules like USB UART, piezo buzzer, microSD slot and connection pads can be found on board as well. The board is preprogrammed with UART bootloader. We have also provided a nice example which will give you a great out-of-the-box experience.



Package Contains

01 Damage resistant protective box

02 SmartGLCD 240x128 development board

03 DVD with documentation and examples

04 SmartGLCD 240x128 user's guide

05 SmartGLCD 240x128 schematic and pinout

06 USB cable

1. Key Features

01 GLCD 240x128 display

02 RESET button

03 Power supply pads

04 I/O pads

05 Pads for mikroProg programmer

06 USB connector

07 Touch panel connector

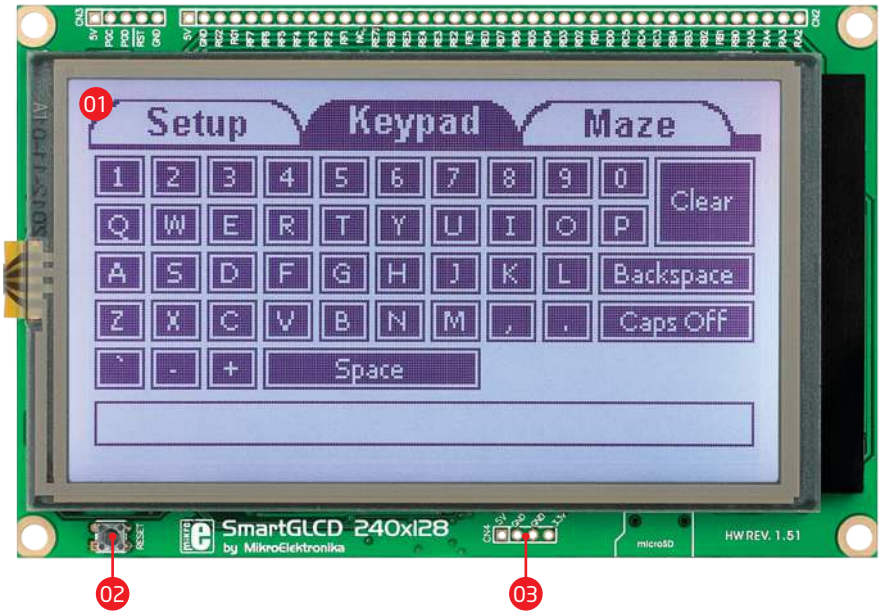
08 PIC18F87K22 microcontroler

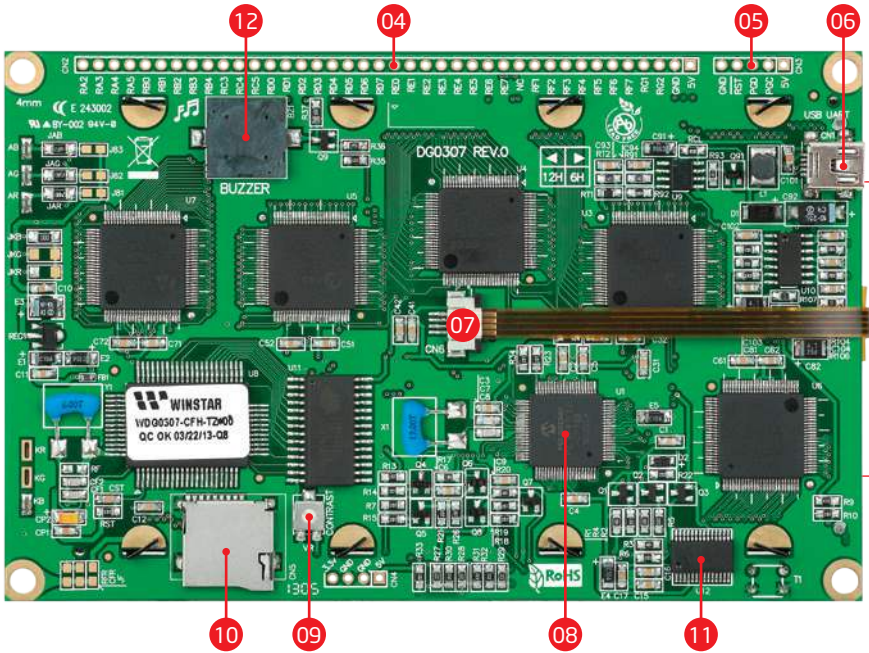
09 Contrast potentiometer

10 microSD card slot

11 USB UART module

12 Buzzer





System Specification

power supply

Via USB cable (5V DC)

power consumption

~350mA in idle state

(backlight is ON)

board dimensions

140x90cm (5.51x3.24")

weight

~210g (0.46 lbs)

2. Power supply

The SmartGLCD board can be powered in two different ways: via USB connector **(CN1)** using MINI-B USB cable provided with the board (**Figure 2-1**), or via side headers **(CN2** or **CN4)** using external 5V power supply (**Figure 2-2** and **Figure 2-3**).

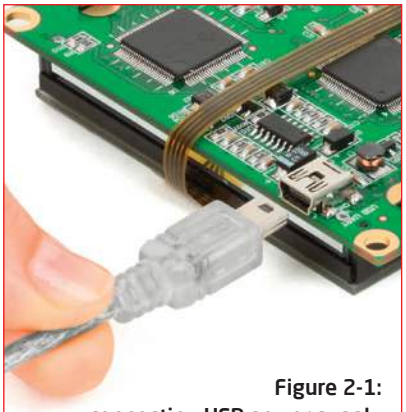


Figure 2-1: connecting USB power supply through CN1 connector

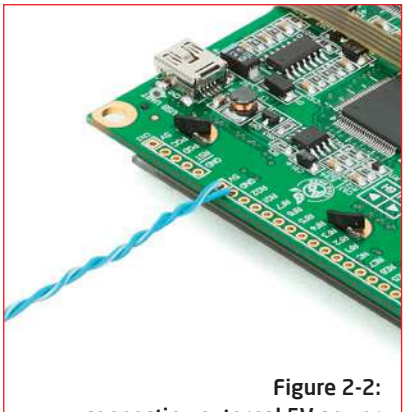


Figure 2-2: connecting external 5V power supply through CN2 connector

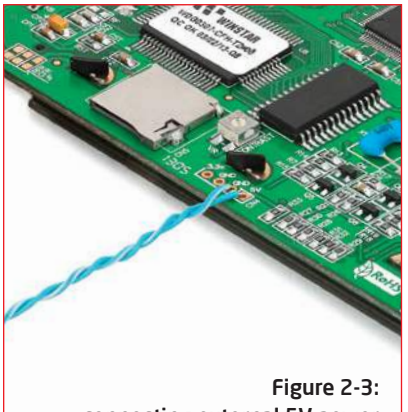


Figure 2-3: connecting external 5V power supply through CN4 connector

When the board is powered up the GLCD display will be automatically turned on. The USB connection can provide up to 500mA of current which is more than enough for the operation of all on-board modules and the microcontroller as well.

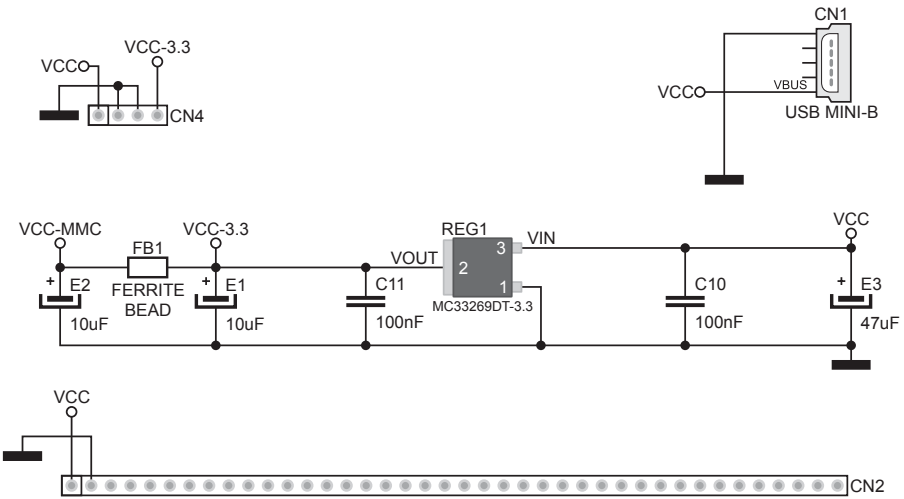
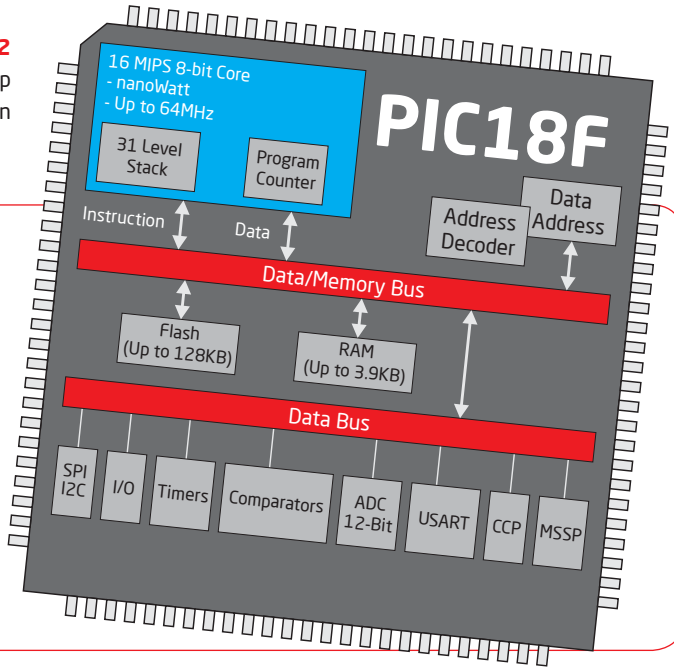


Figure 2-4: Power supply schematic

3. PIC18F87K22 microcontroller

The SmartGLCD development tool comes with the **PIC18F87K22** microcontroller. This 8-bit microcontroller is rich with on-chip peripherals and features 128KB of Flash and 4KB of RAM. It can easily handle demanding graphical applications.



Key microcontroller features

- Up to **12 MIPS** Operation;
- 8-bit architecture;
- 128KB of Flash memory;
- 3,862 bytes of RAM;
- 1024 bytes of EEPROM;
- 80 pin TQFP;
- 24 ch, 12-bit ADC;
- UART, SPI, I^2C; etc.

4. Programming the microcontroller

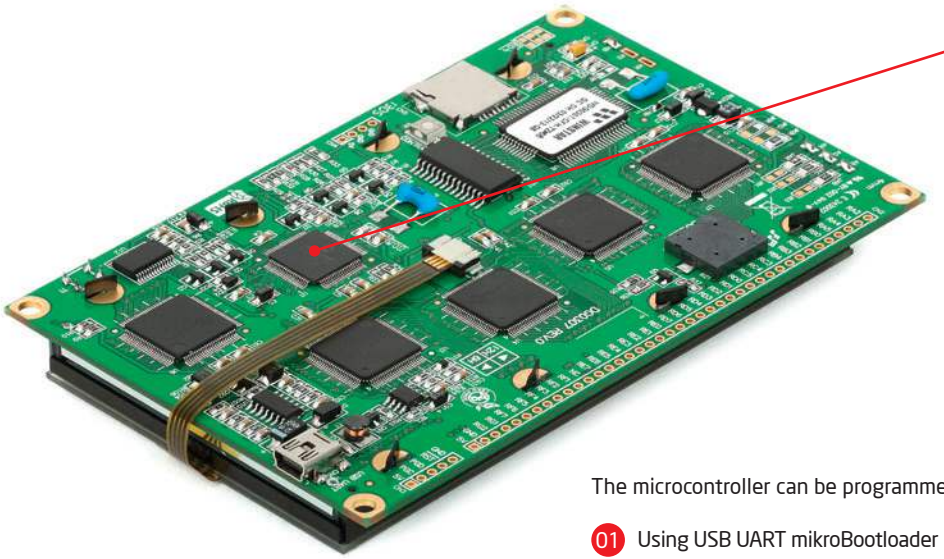


Figure 4-1: PIC18F87K22 microcontroller

The microcontroller can be programmed in two ways:

01 Using USB UART mikroBootloader

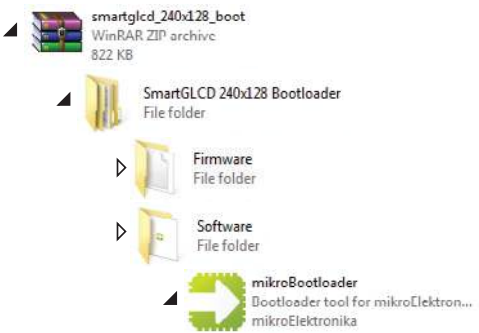
02 Using external mikroProg™ for PIC, dsPIC, PIC32 programmer

5. Programming with bootloader

Microcontroller is preprogrammed with USB UART Bootloader, which can be used to upload new device firmware. To transfer firmware .HEX file from a PC to MCU you need to use mikroBootloader USB UART application, which can be downloaded from:

http://www.mikroe.com/smartglcd/

Upon download, unzip it to desired location and start the mikroBootloader application:



mikroBootloader software

note *Before starting mikroBootloader software, connect SmartGLCD to a PC using a USB cable provided with the package.*

Figure 5-1: mikroBootloader window

01 When you start mikroBootloader software a window should appear, as shown in the image above.

Identifying device COM port

Figure 5-2: Identifying COM port

01 Open **Device Manager** window and expand **Ports (COM & LPT)** section to check which COM port is assigned to SmartGLCD board (in this case it is COM18).

step 1 - Choosing COM port

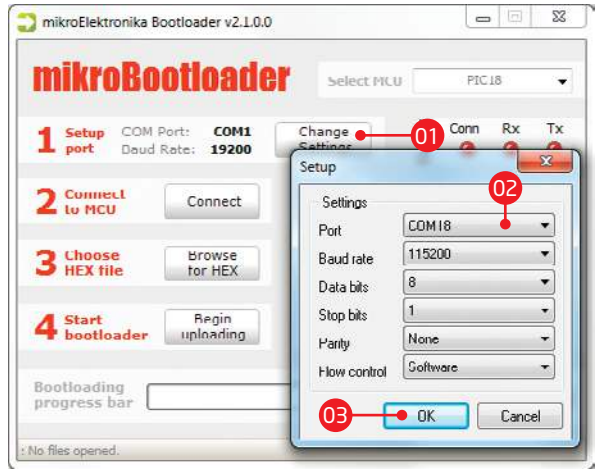


Figure 5-3: Choosing COM port

01 Click the **Change Settings** button.

02 From the drop down list, select appropriate **Port** (in this case it is COM18) and **Baud rate** (115200).

03 Click **OK**.

step 2 - Establishing Connection

Figure 5-4: Connecting with mikroBootloader

01 **Press** the **Reset** button on SmartGLCD board and **click Connect** within 5s, otherwise the existing microcontroller program will run. If connected, the button's caption will be changed to **Disconnect**.

step 3 - Browsing for .HEX file

Figure 5-5: Browse for HEX

01 Click the **Browse for HEX** button and from a pop-up window (Figure 5-6) choose a .HEX file to be uploaded in MCU memory.

step 4 - Selecting .hex file

Figure 5-6: Locating and selecting .hex file

01 Select .HEX file from the **Open dialog** window.

02 Click the **Open** button.

step 5 - Uploading .hex file

Figure 5-7: Begin uploading

01 In order to upload .HEX file click the **Begin uploading** button.

step 6 - Progress bar

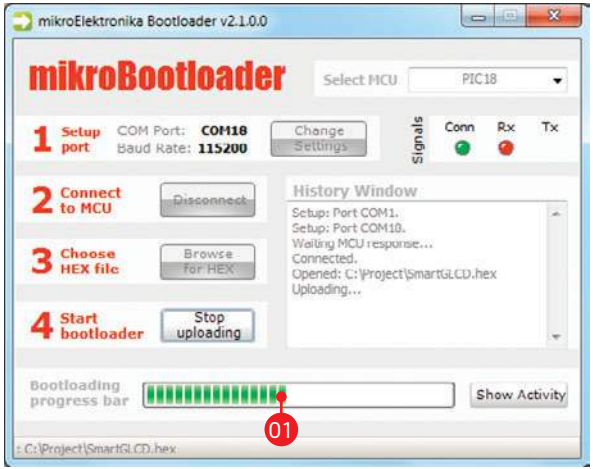


Figure 5-8: Progress bar

01 Progress bar enables you to monitor .HEX file uploading.

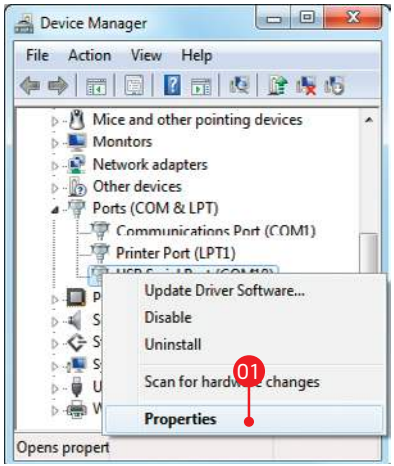
step 7 - Finishing upload

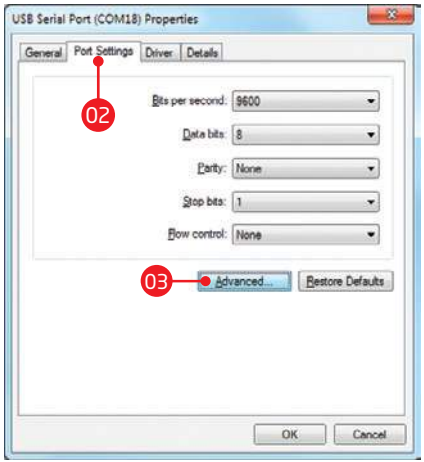
Figure 5-9: Restarting MCU

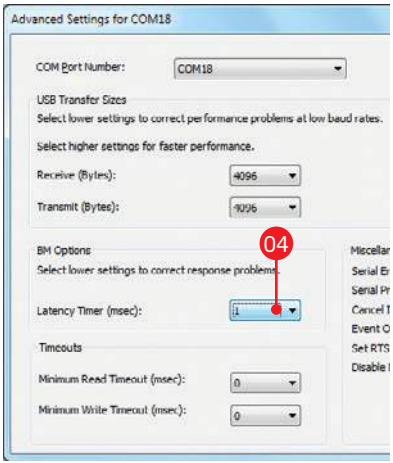
01 Click **OK** button after the uploading process has been finished.

02 Press **Reset** button on SmartGLCD board and wait for 5 seconds. Your program will run automatically.

Tips and Tricks: Speed-up UART data transfer







note *If .HEX file transfer from your PC to MCU is too slow, it's possible to speed up data transfer by setting latency time of COM port to 1 ms. This is done in Device Manager:*

01 Right click on the **USB Serial Port (COM18)** item and then select **Properties**.

02 Select **Port Settings** tab.

03 Click the **Advanced...** button.

04 Set **Latency Timer** to **1** and click **OK**.

6. Programming with mikroProg™ programmer

The microcontroller can be programmed with the external **mikroProg™** programmer which can be connected to the board via **CN3** connector. Before establishing this connection it is necessary to solder 1x5 male header to **CN3** connection pads. This can be done in both ways: on the bottom, or the top side, as shown in **Figures 6-1** and **6-2**.

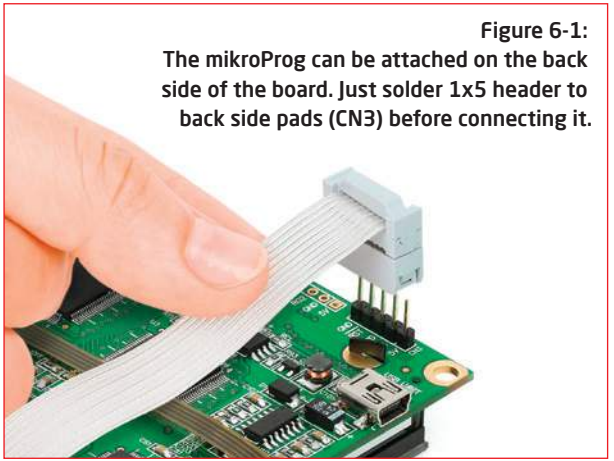


Figure 6-1:
The mikroProg can be attached on the back side of the board. Just solder 1x5 header to back side pads (CN3) before connecting it.

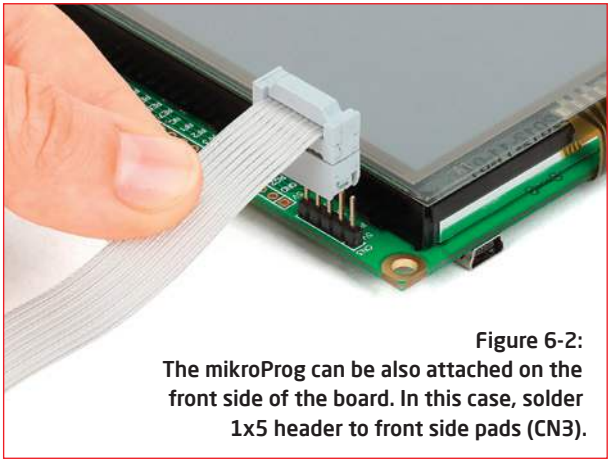


Figure 6-2:
The mikroProg can be also attached on the front side of the board. In this case, solder 1x5 header to front side pads (CN3).

note *If bootloader program is accidently erased you can upload it again through mikroProg programmer. Program Bootloader18F87K22.hex can be found under Firmware folder (page 12).*

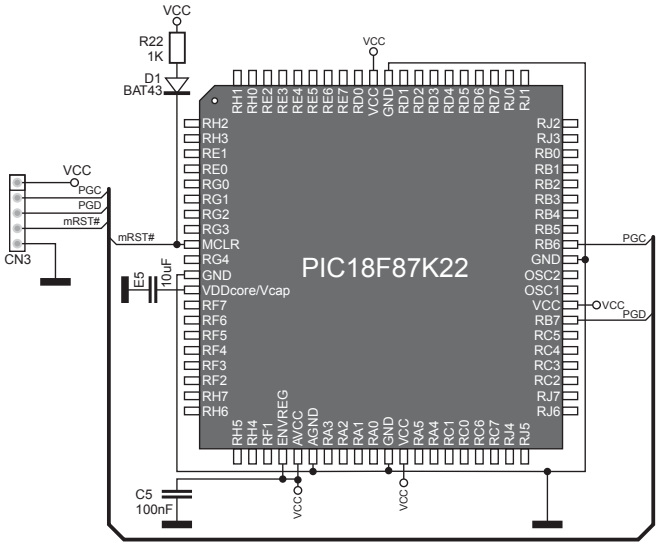


Figure 6-3: mikroProg™ connection schematic

note *Make sure to use only the front row of mikroProg's IDC10 connector (side with a knob and incision) when connecting it to 1x5 header on your SmartGLCD board.*

7. mikroProg Suite™ for PIC® Software

The **mikroProg™** programmer requires special programming software called **mikroProg Suite™ for PIC®**. It can be used for programming all Microchip® microcontroller families, including PIC10®, PIC12®, PIC16®, PIC18®, dsPIC30/33®, PIC24® and PIC32®. The software has intuitive interface and SingleClick™ programming technology. Just download the latest version of **mikroProg Suite™** and your programmer is ready to program new devices. **mikroProg Suite™** is updated regularly, at least four times a year, so your programmer will be more and more powerful with each new release.

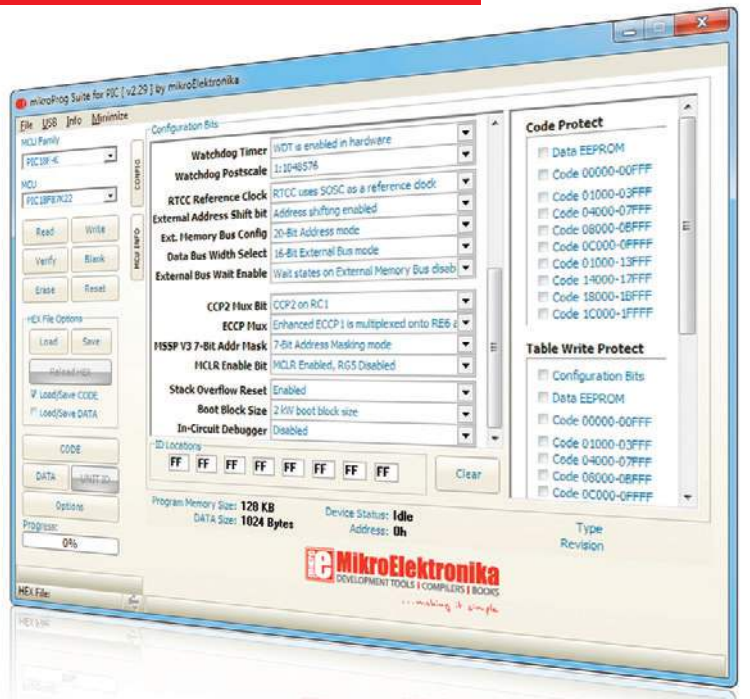
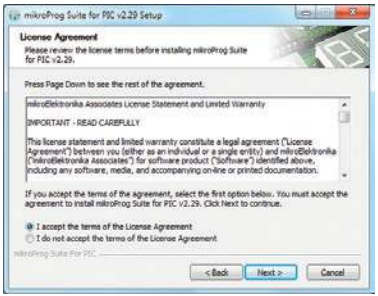


Figure 7-1: Main window of mikroProg Suite™ for PIC® programming software

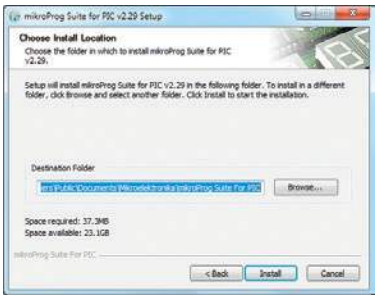
Software Installation Wizard

01 Start Installation

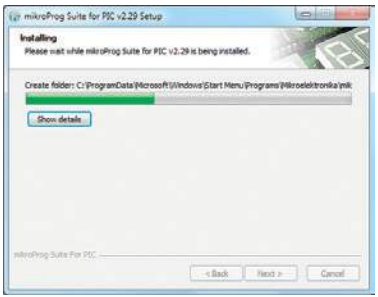


02 Accept EULA and continue

03 Install for all users



04 Choose destination folder



05 Installation in progress

06 Finish installation

8. microSD Card Slot

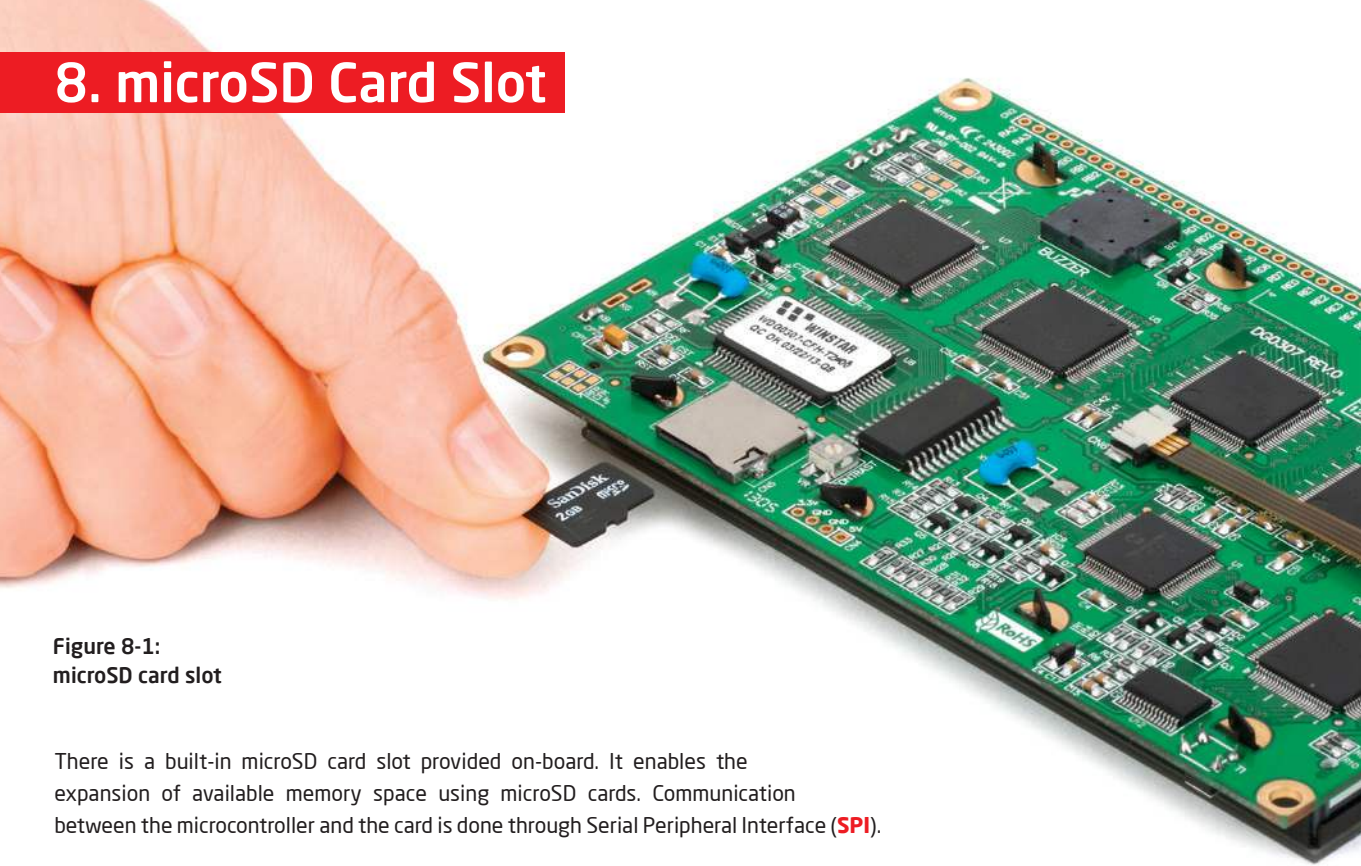


Figure 8-1:
microSD card slot

There is a built-in microSD card slot provided on-board. It enables the expansion of available memory space using microSD cards. Communication between the microcontroller and the card is done through Serial Peripheral Interface (**SPI**).

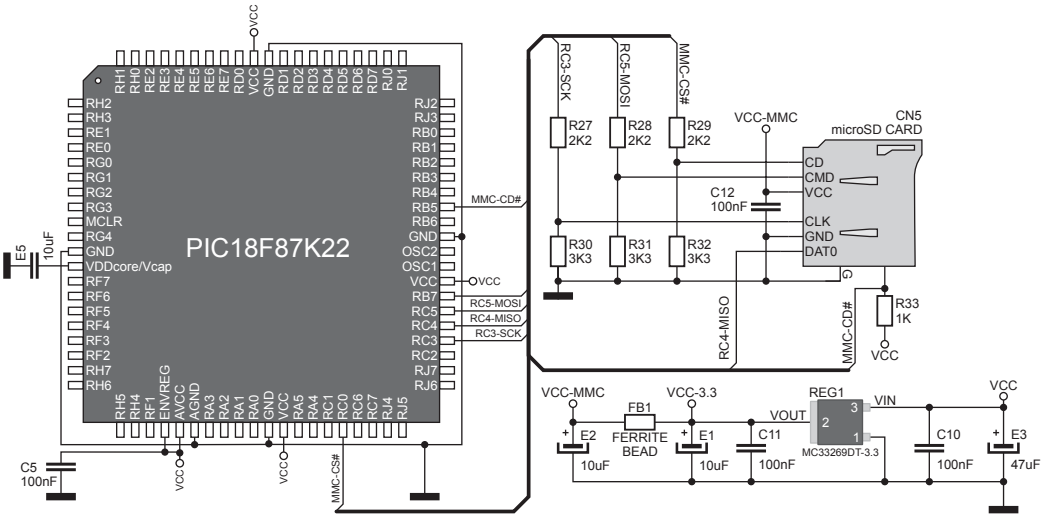
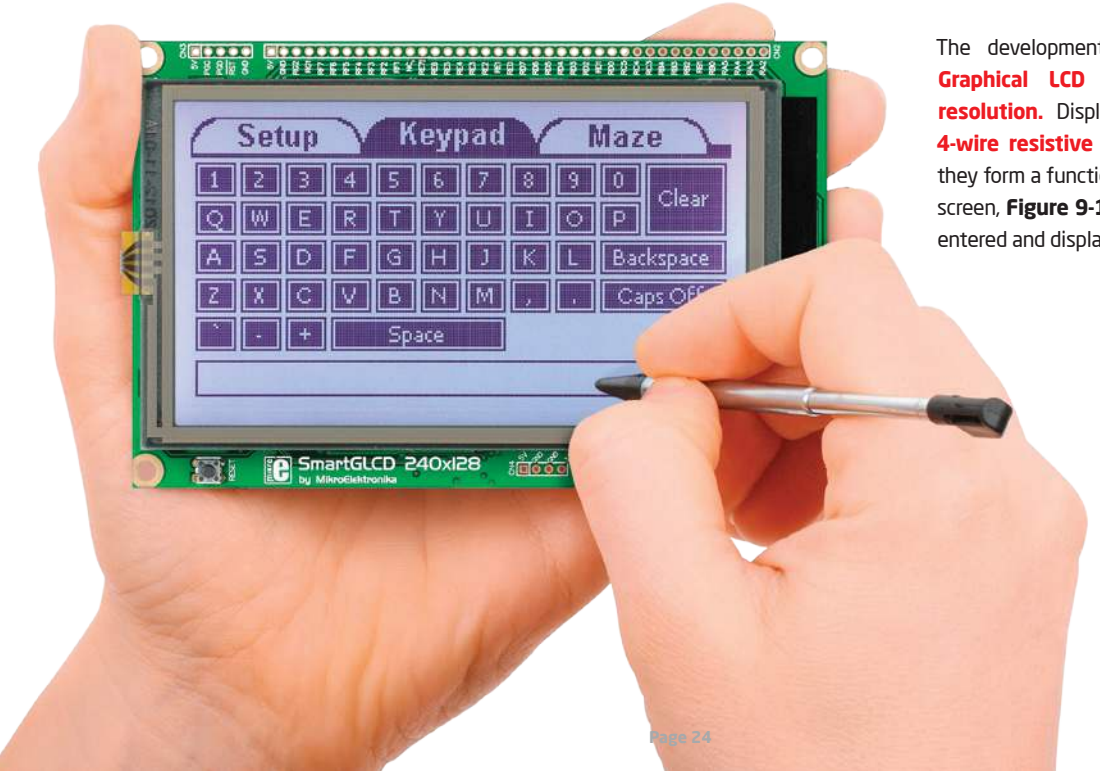


Figure 8-2: microSD Card Slot module connection schematic

9. Touch Screen



The development system features a **Graphical LCD in 240x128 pixel resolution.** Display is covered with a **4-wire resistive** touch panel. Together they form a functional unit called a touch screen, **Figure 9-1.** It enables data to be entered and displayed at the same time.

Figure 9-1: Touch Screen

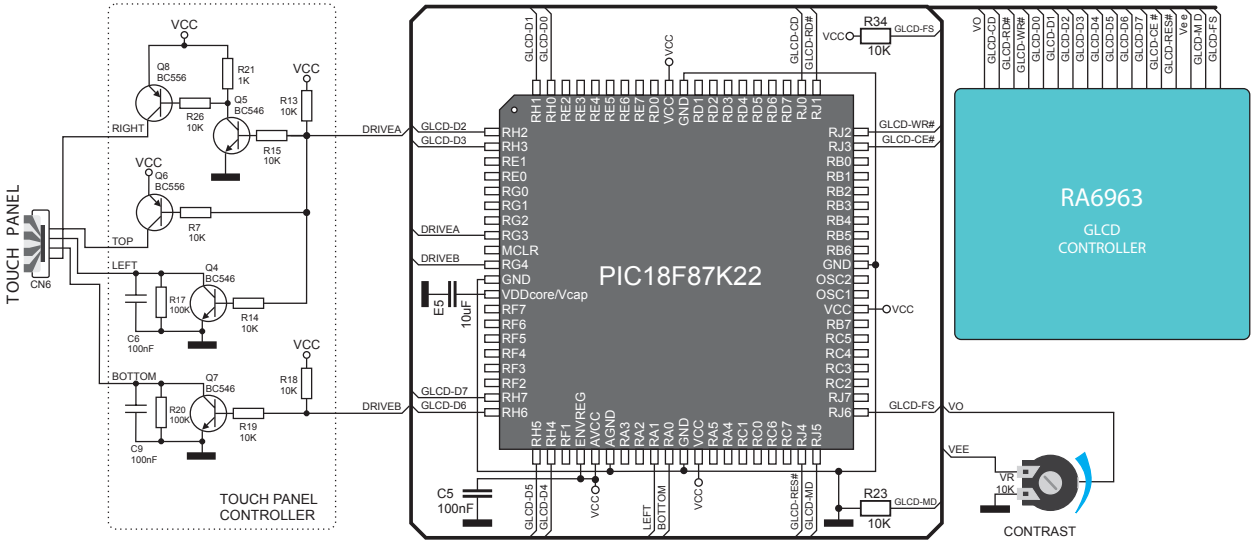


Figure 9-2: Touch Screen connection schematic

10. RGB backlight

Graphical LCDs are only capable of showing monochromatic pixel but not color content. The color of the pixel is determined by the color of the backlight which illuminates the display. SmartGLCD has **the RGB color backlight** - a very useful feature which can give your graphical user interfaces an astonishing look.

Display's backlight module consists of three LEDs: red, green and blue, which can shine simoutaneously. LED can be driven by PWM signals coming from three separate microcontroller pins. Duty ratio of the PWM signal determines the intensity of color (or brightness) of each LED. Combined together they can create more than 16 milion different backlight colors.

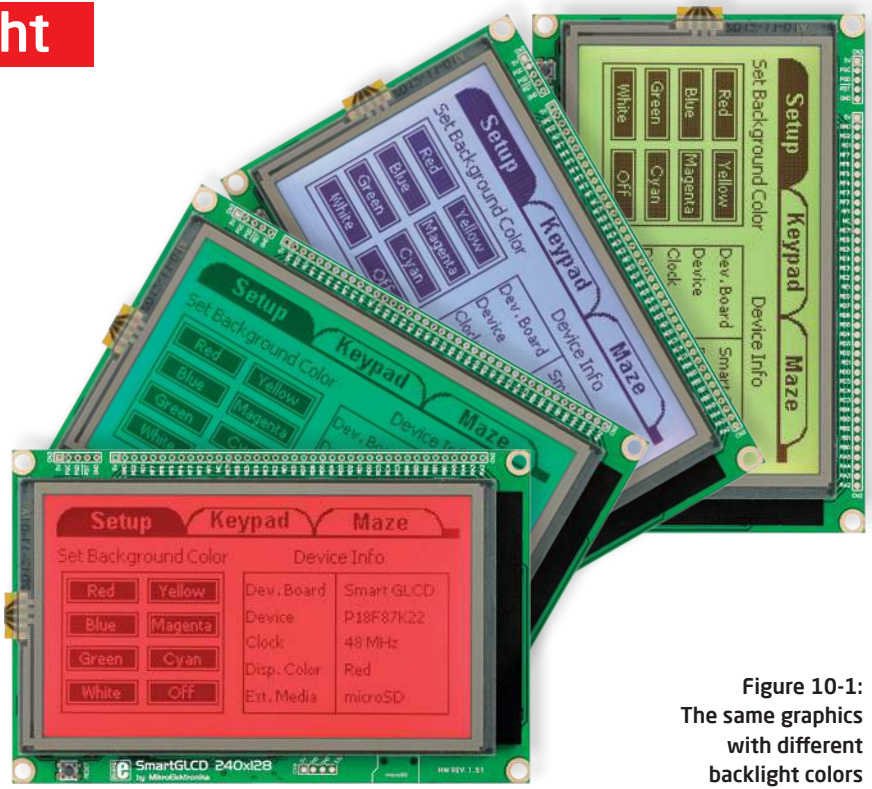


Figure 10-1: The same graphics with different backlight colors

11. Contrast potentiometer

On the backside of the board there is a small potentiometer which can be used to change contrast of the GLCD. The brighter the backlight, the less contrast you will need to properly display the graphical content.

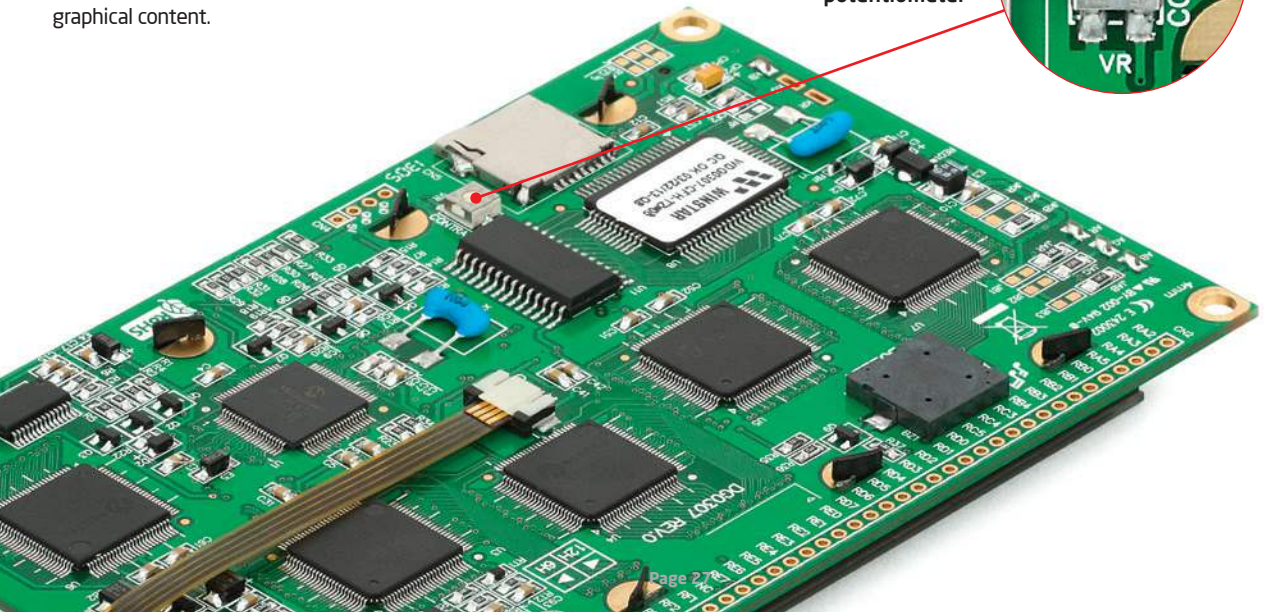


Figure 11-1: Constrast potentiometer

12. USB UART

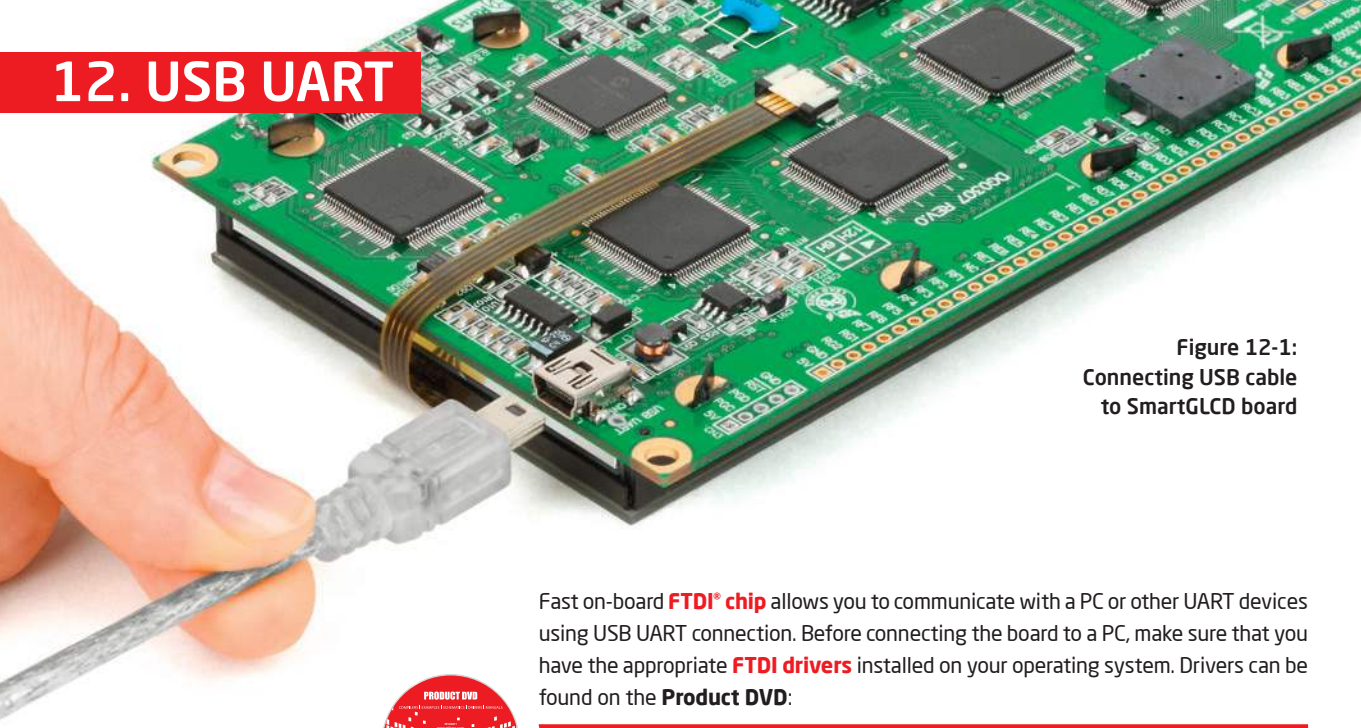


Figure 12-1:
Connecting USB cable to SmartGLCD board

Fast on-board **FTDI® chip** allows you to communicate with a PC or other UART devices using USB UART connection. Before connecting the board to a PC, make sure that you have the appropriate **FTDI drivers** installed on your operating system. Drivers can be found on the **Product DVD**:

DVD://download/eng/software/development-tools/universal/ftdi/vcp_drivers.zip

USB-B connector (**CN1**) is used for connecting the USB cable, which is delivered with the board package. Plug it in as shown in **Figure 12-1**.

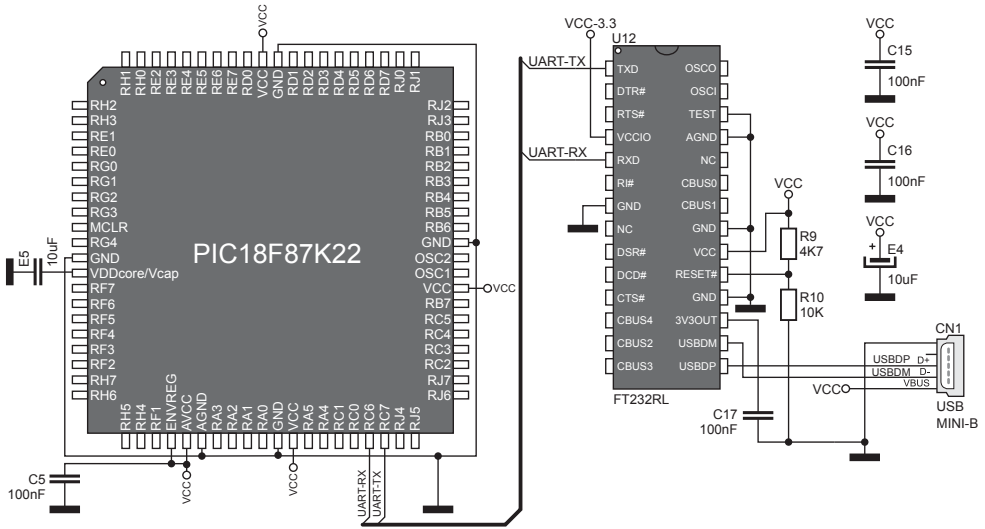
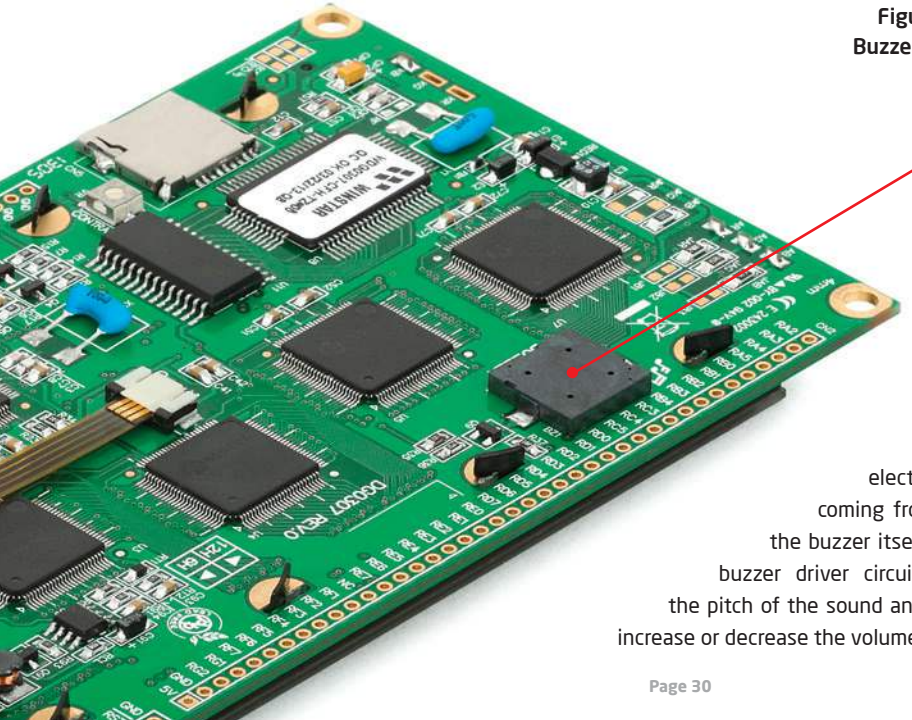


Figure 12-2: USB UART module connection schematic

13. Buzzer



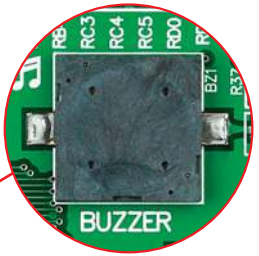


Figure 13-1:
Buzzer module

The board is also equipped with piezo buzzer. It is an electric component which can be used to create sound when provided with electrical signal. This is usually a PWM signal coming from a microcontroller pin. Before entering the buzzer itself, the signal is amplified by the on-board buzzer driver circuit. Frequency of the signal determines the pitch of the sound and duty cycle of the signal can be used to increase or decrease the volume.

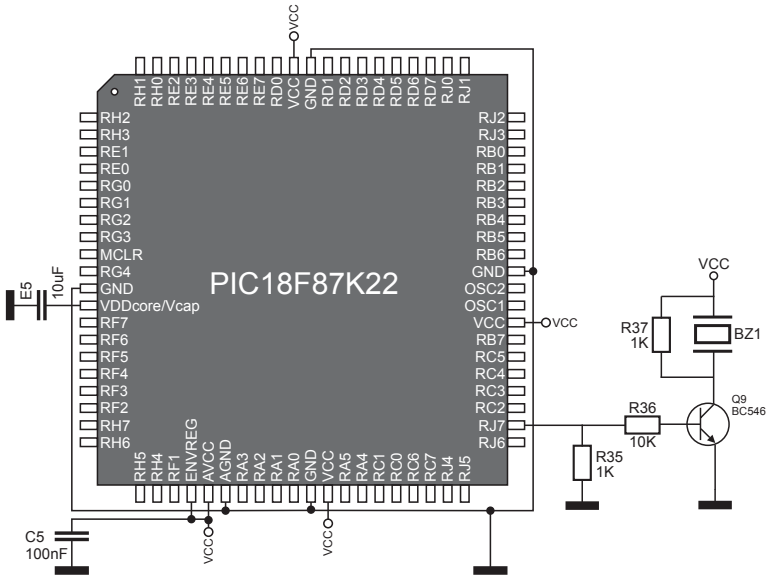
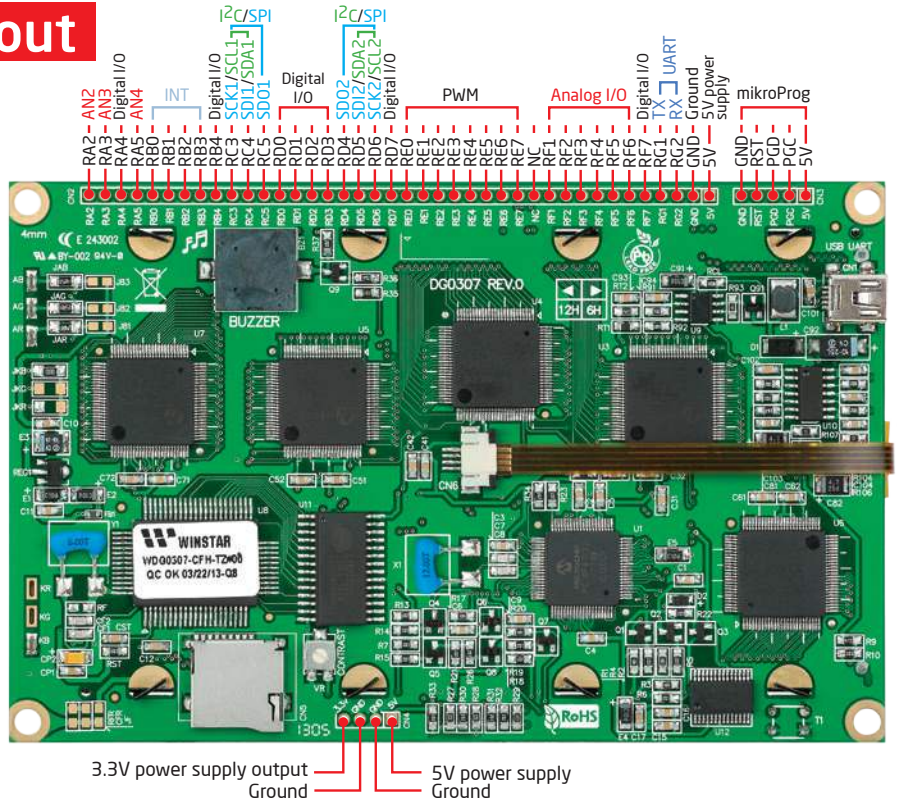
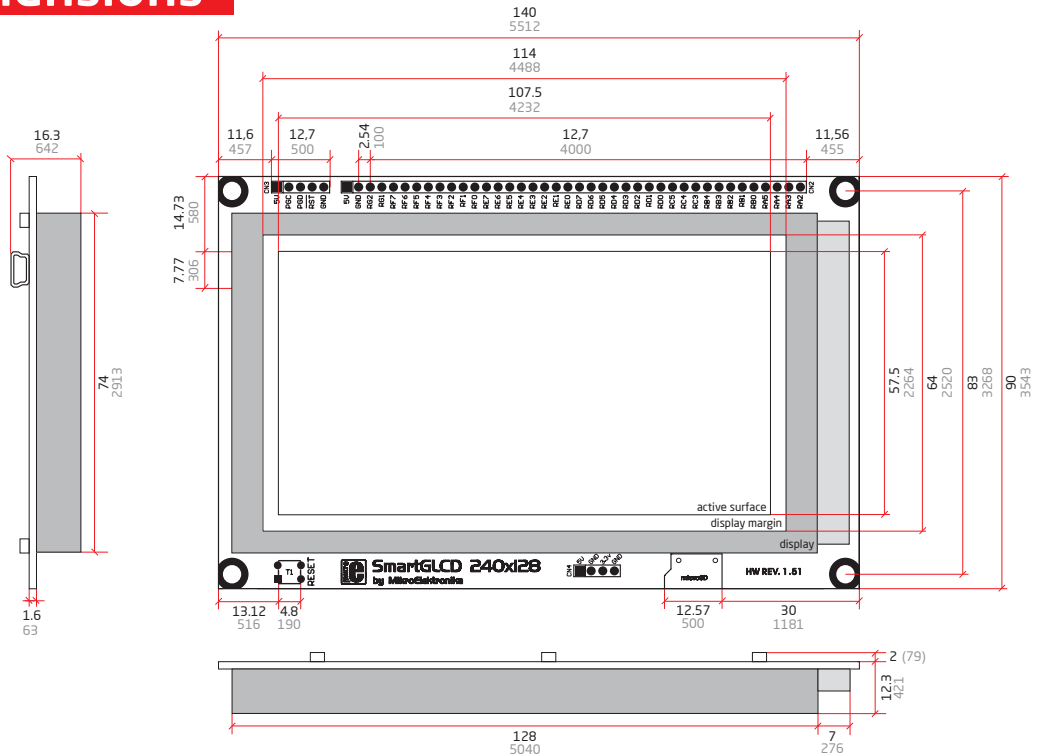


Figure 13-2: Buzzer module schematic

14. Pinout


I2C/SPI
I2C/SPI
INT
Digital I/O
PWM
Analog I/O
UART
mikroProg
5V power supply
Ground
AN2
AN3
AN4
RA2
RA3
RA4
RA5
RB0
RB1
RB2
RB3
RB4
RC3
RC4
RC5
RD0
RD1
RD2
RD3
RD4
RD5
RD6
RD7
RE0
RE1
RE2
RE3
RE4
RE5
RE6
RE7
NC
RF1
RF2
RF3
RF4
RF5
RF6
RF7
RG1
RG2
GND
5V
GND
RST
PGD
PGC
5V
SCK1/SCL1
SDI1/SDA1
SDO1
SDO2
SDI2/SDA2
SCK2/SCL2
TX
RX
BUZZER
DG0307 REV.0
USB UART
WINSTAR
WD-0307-CFH-TZ#0
3.3V power supply output
Ground
5V power supply
Ground
Analog Lines
Interrupt Lines
SPI Lines
I2C Lines
UART lines

15. Dimensions



Legend

mm

mils

Pad hole size

Ø 1.14 mm

Ø 45 mils

Mounting hole size

Ø 4 mm

Ø 157 mils

Tolerance +/- 0.5mm

What's next?

Your journey through each and every feature of SmartGLCD board ends here. You got to know it's modules and organization. Now you are ready to use it. We are suggesting several steps which are probably the best way to begin with. We invite you to join the users of SmartGLCD brand. You will find very useful projects and tutorials and can get help from a large ecosystem of users. Welcome!

Compiler

You still don't have an appropriate compiler? Locate PIC® compiler that suits you best on the Product DVD provided with the package:

DVD://download/eng/software/compilers/

Choose between mikroC™, mikroBasic™ and mikroPascal™ and download fully functional demo version, so you can begin building your first applications.

Projects

Once you have chosen your compiler, and since you already got the board, you are ready to start writing your first projects. **Visual GLCD software** for rapid development of graphical user interfaces enables you to quickly create your GUI. It will automatically create necessary code which is compatible with mikroElektronika compilers. Visual GLCD is rich with examples, which are an excellent starting point for your future projects. Just load the example, read well commented code, and see how it works on hardware. Visual GLCD is also available on the Product DVD.

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