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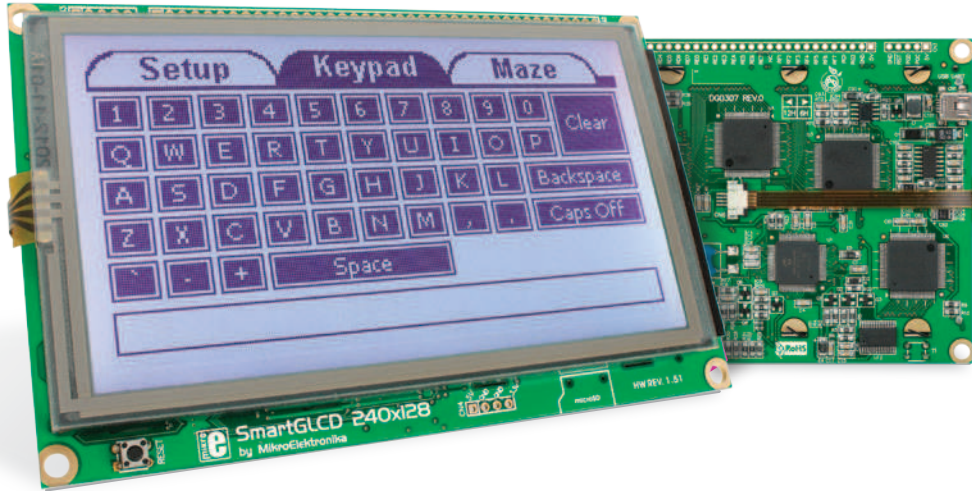
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SmartGLCD

240x128



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.

A handwritten signature in white ink, appearing to read 'N. Matic', is positioned on the right side of the page. The signature is fluid and cursive, with a large initial 'N' and 'M'.

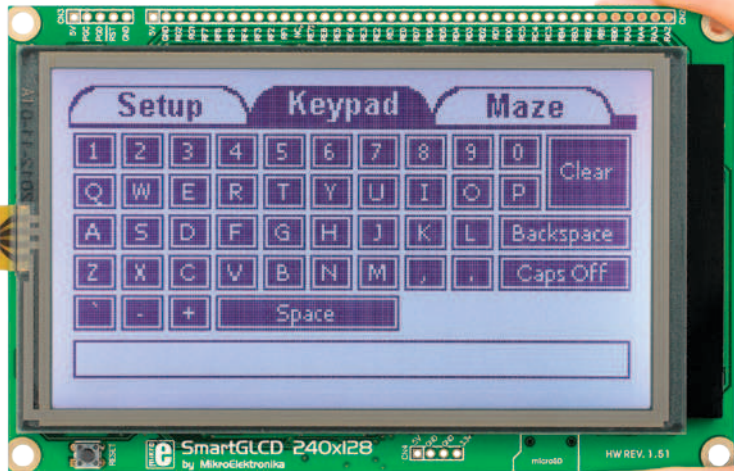
Nebojsa Matic
General Manager

Table of Contents

What is the SmartGLCD 240x128?	4	step 5 - Uploading .hex file	15
Package Contains	5	step 6 - Progress bar	16
1. Key Features	6	step 7 - Finishing upload	16
System Specification	7	Tips and Tricks: Speed-up UART data transfer	17
2. Power supply	8	6. Programming with mikroProg™ programmer	18
3. PIC18F87K22 microcontroller	10	7. mikroProg Suite™ for PIC® Software	20
Key microcontroller features	10	8. microSD Card Slot	22
4. Programming the microcontroller	11	9. Touch Screen	24
5. Programming with bootloader	12	10. RGB backlight	26
mikroBootloader software	12	11. Contrast potentiometer	27
Identifying device COM port	13	12. USB UART	28
step 1 - Choosing COM port	13	13. Buzzer	30
step 2 - Establishing Connection	14	14. Pinout	32
step 3 - Browsing for .HEX file	14	15. Dimensions	33
step 4 - Selecting .hex file	15	What's next?	34

What is the SmartGLCD 240x128?

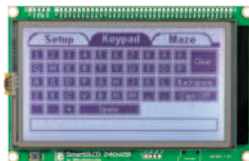
The SmartGLCD 240x128 is a compact smart display, with many on-board peripherals. It's designed to become a control interface of your device. Main part of the board is a large 240x128 pixel graphical LCD with a 4-wire resistive touch screen. It features RGB backlight, which can greatly improve user experience, 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



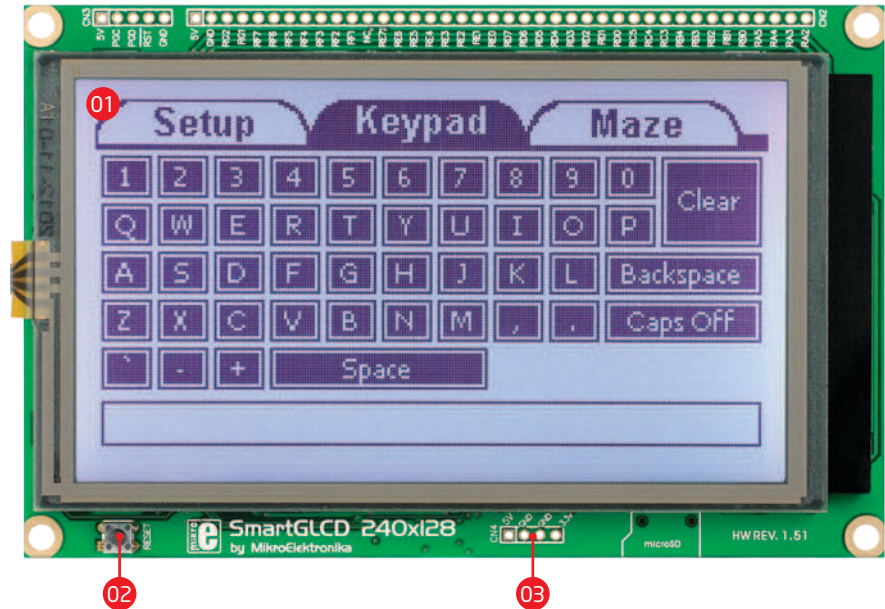
- 05 SmartGLCD 240x128 schematic and pinout



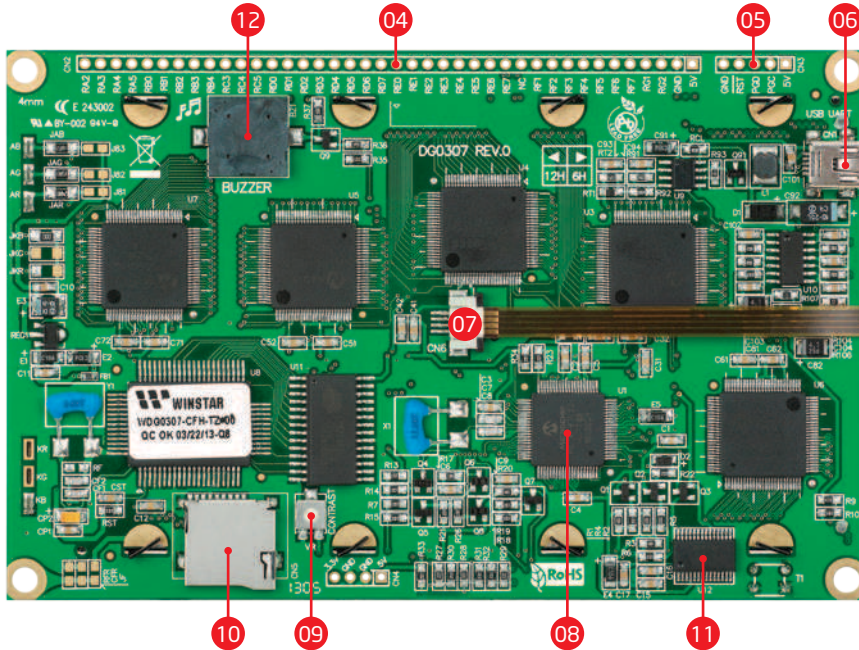
- 06 USB cable

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 microcontroller
- 09 Contrast potentiometer
- 10 microSD card slot
- 11 USB UART module
- 12 Buzzer



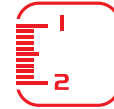
System Specification



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**).

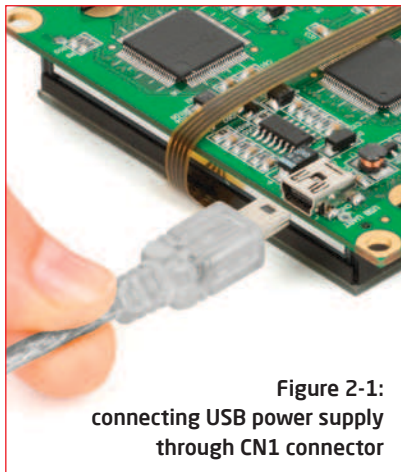


Figure 2-1:
connecting USB power supply
through CN1 connector

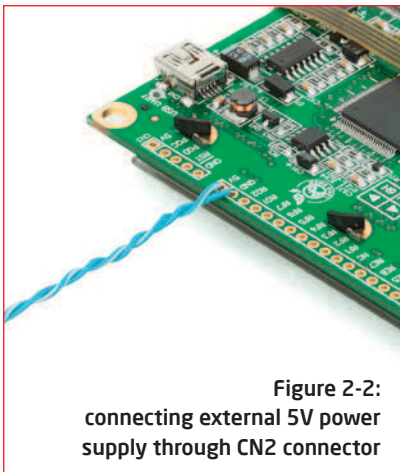


Figure 2-2:
connecting external 5V power
supply through CN2 connector

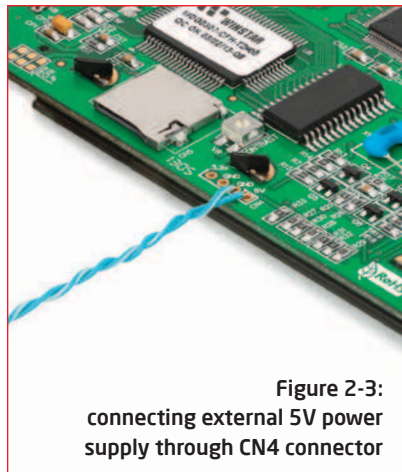


Figure 2-3:
connecting external 5V power
supply through CN4 connector

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.

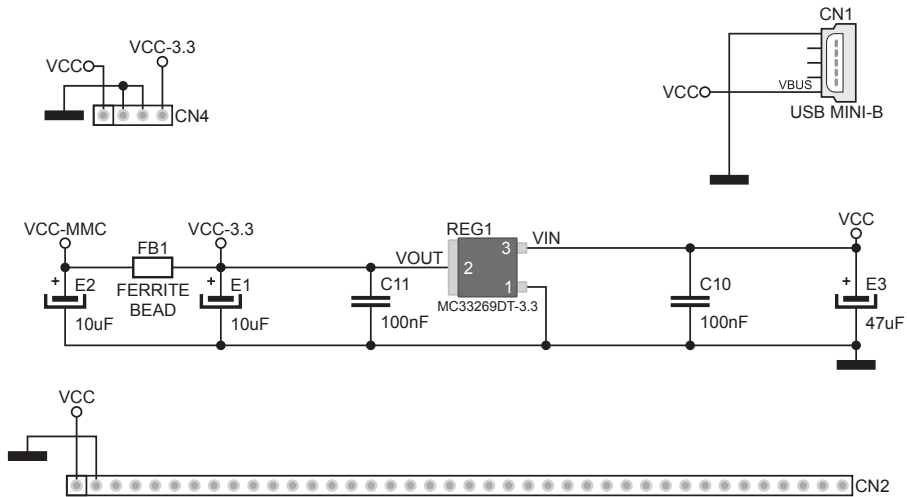


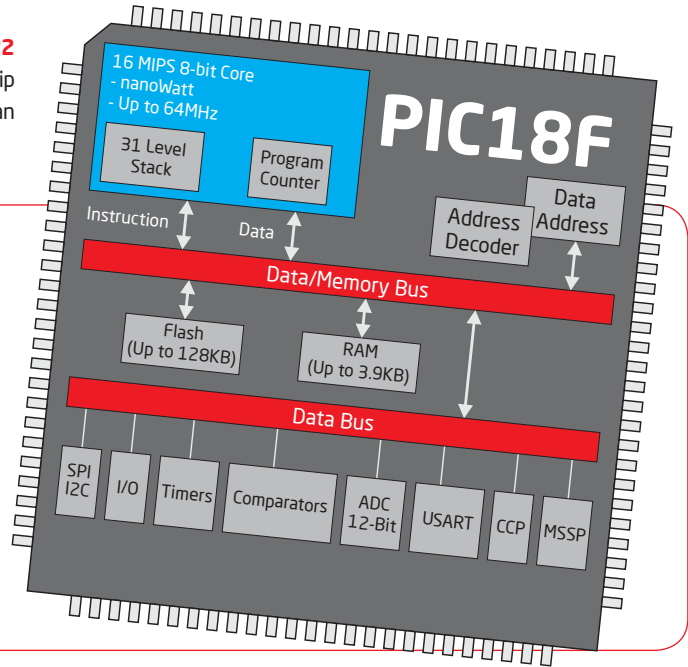
Figure 2-4: Power supply schematic

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, I²C; etc.



4. Programming the microcontroller

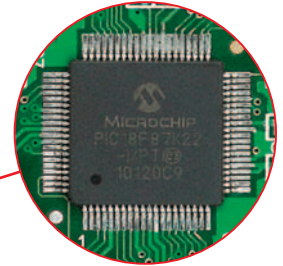
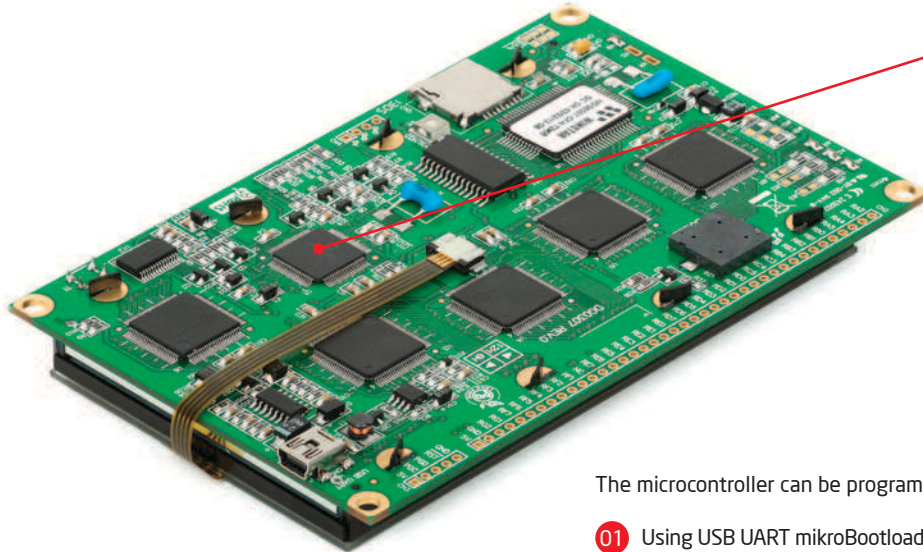


Figure 4-1:
PIC18F87K22
microcontroller

The microcontroller can be programmed in two ways:

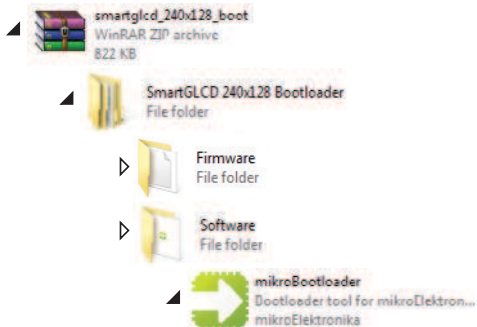
- 01 Using USB UART mikroBootloader
- 02 Using external mikroProg™ for PIC, dsPIC, PIC32 programmer

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

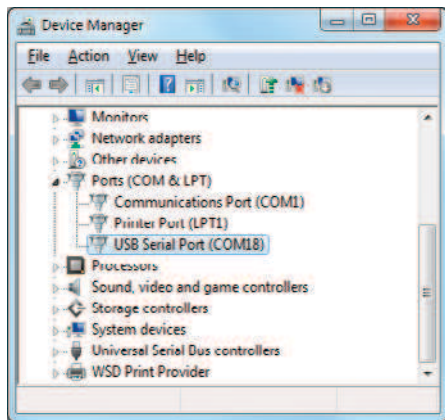


Figure 5-2: Identifying COM port

- 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

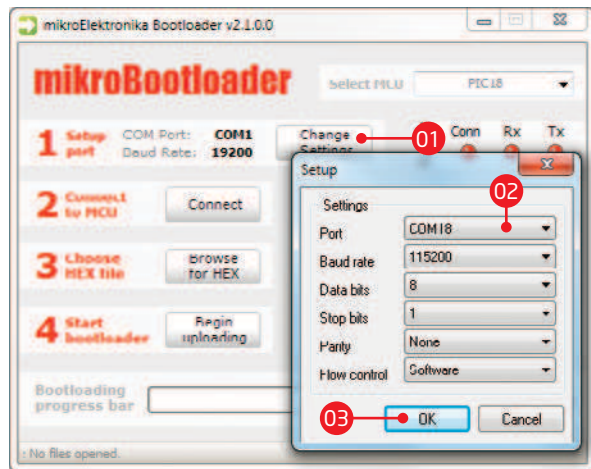


Figure 5-3: Choosing COM port

- 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

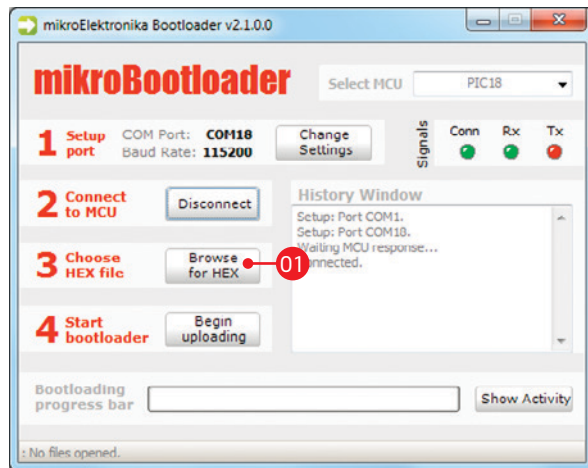


Figure 5-5: Browse for HEX

- 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

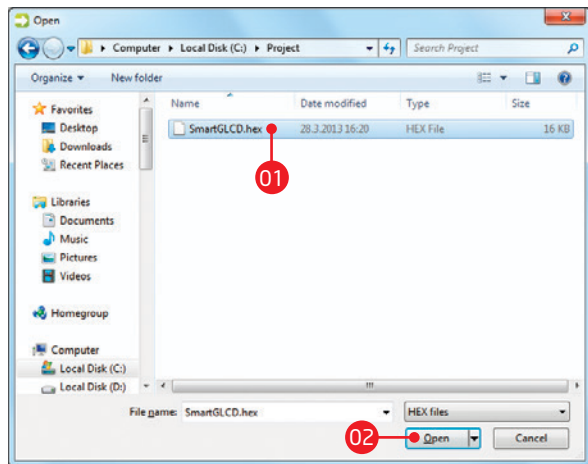


Figure 5-6: Locating and selecting .hex file

- 01 Select .HEX file from the **Open dialog** window.
- 02 Click the **Open** button.

step 5 - Uploading .hex file

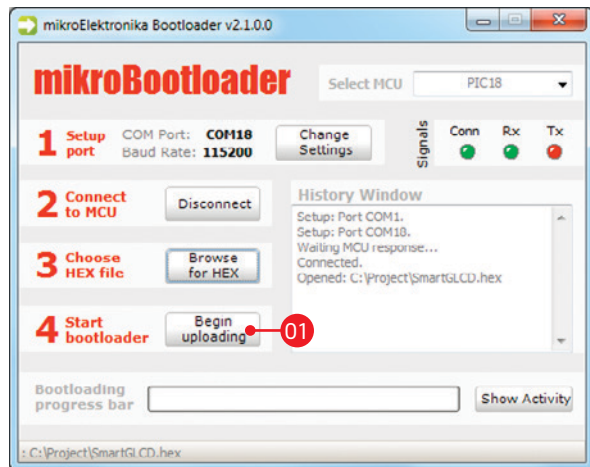


Figure 5-7: Begin uploading

- 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

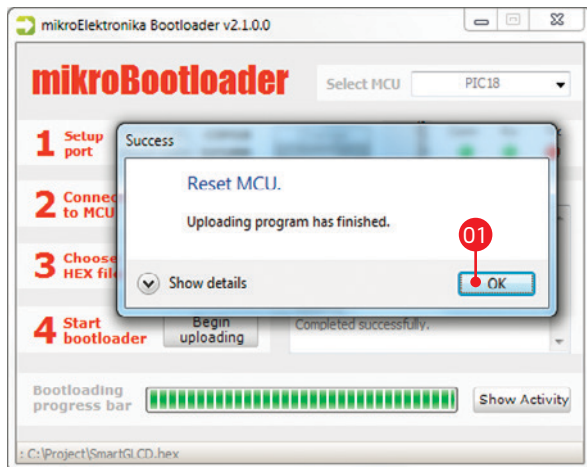
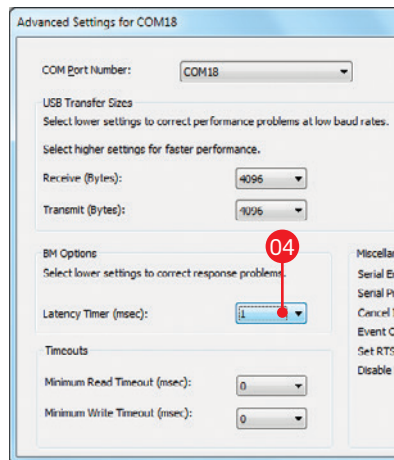
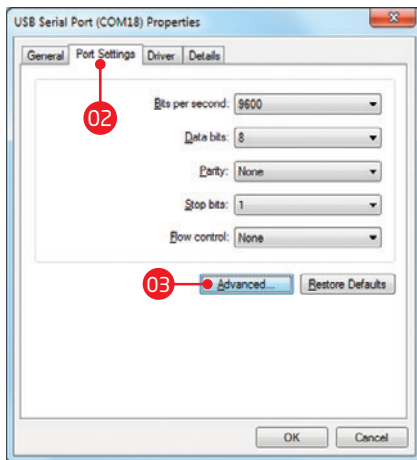
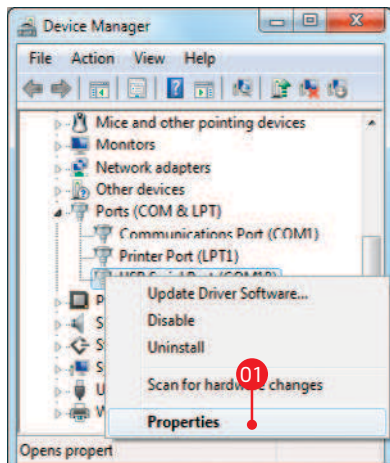


Figure 5-9: Restarting MCU

- 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

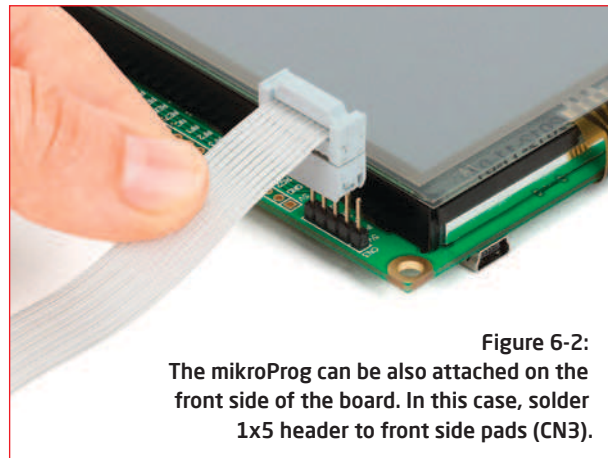
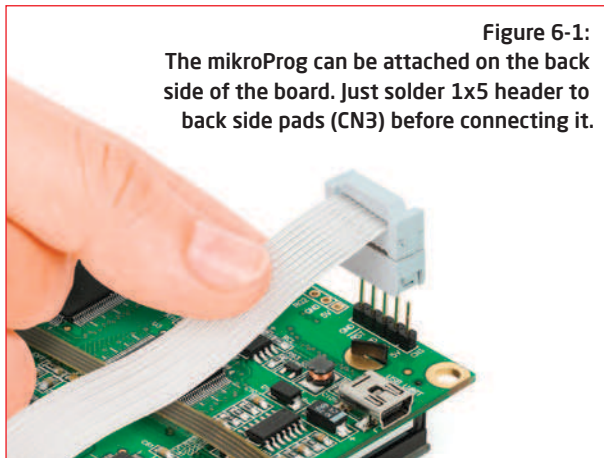


note If .HEX file transfer from your PC to MCU is too slow, it's possible to speed up data transfer by setting latency time of COM port to 1 ms. This is done in Device Manager:

- 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**.



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

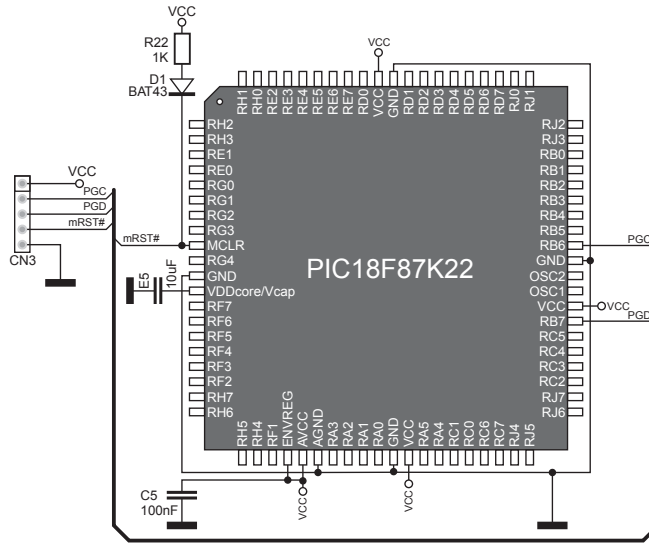
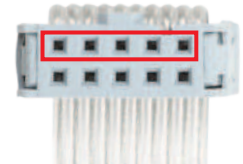


Figure 6-3: mikroProg™ connection schematic

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.

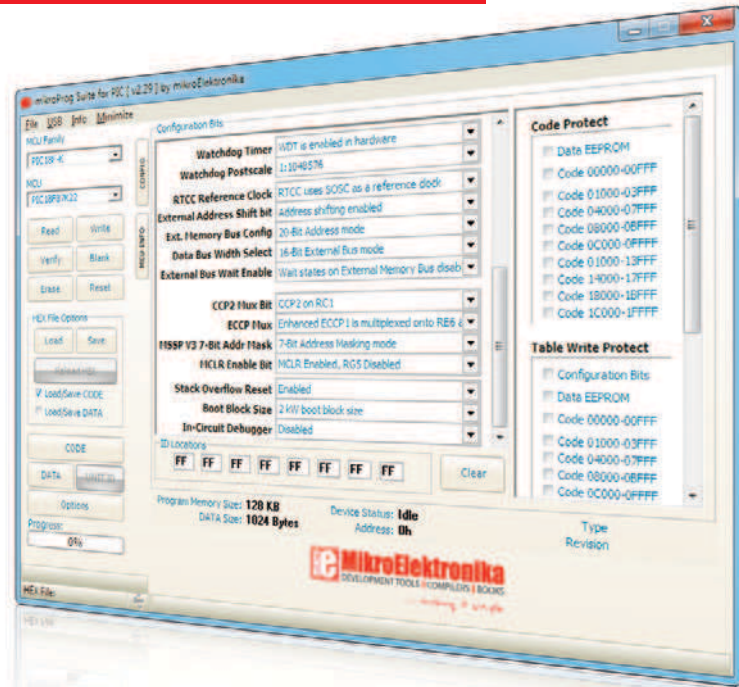
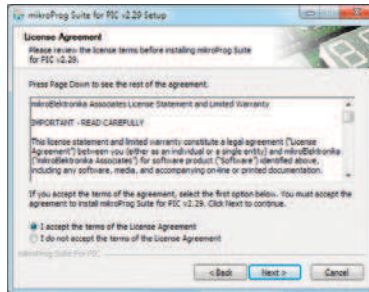


Figure 7-1: Main window of mikroProg Suite™ for PIC® programming software

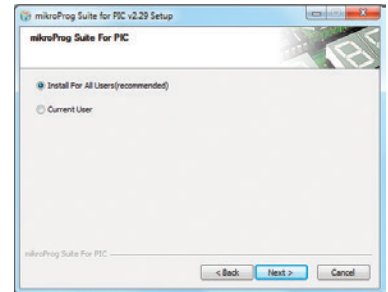
Software Installation Wizard



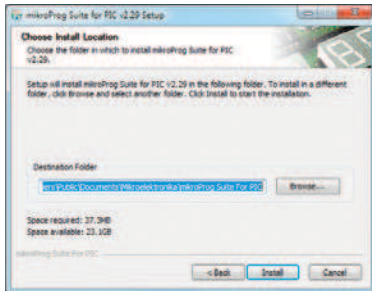
01 Start Installation



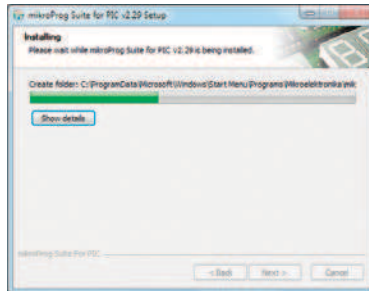
02 Accept EULA and continue



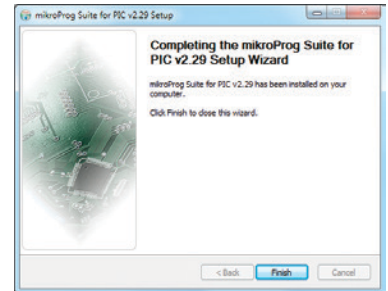
03 Install for all users



04 Choose destination folder



05 Installation in progress



06 Finish installation

8. microSD Card Slot

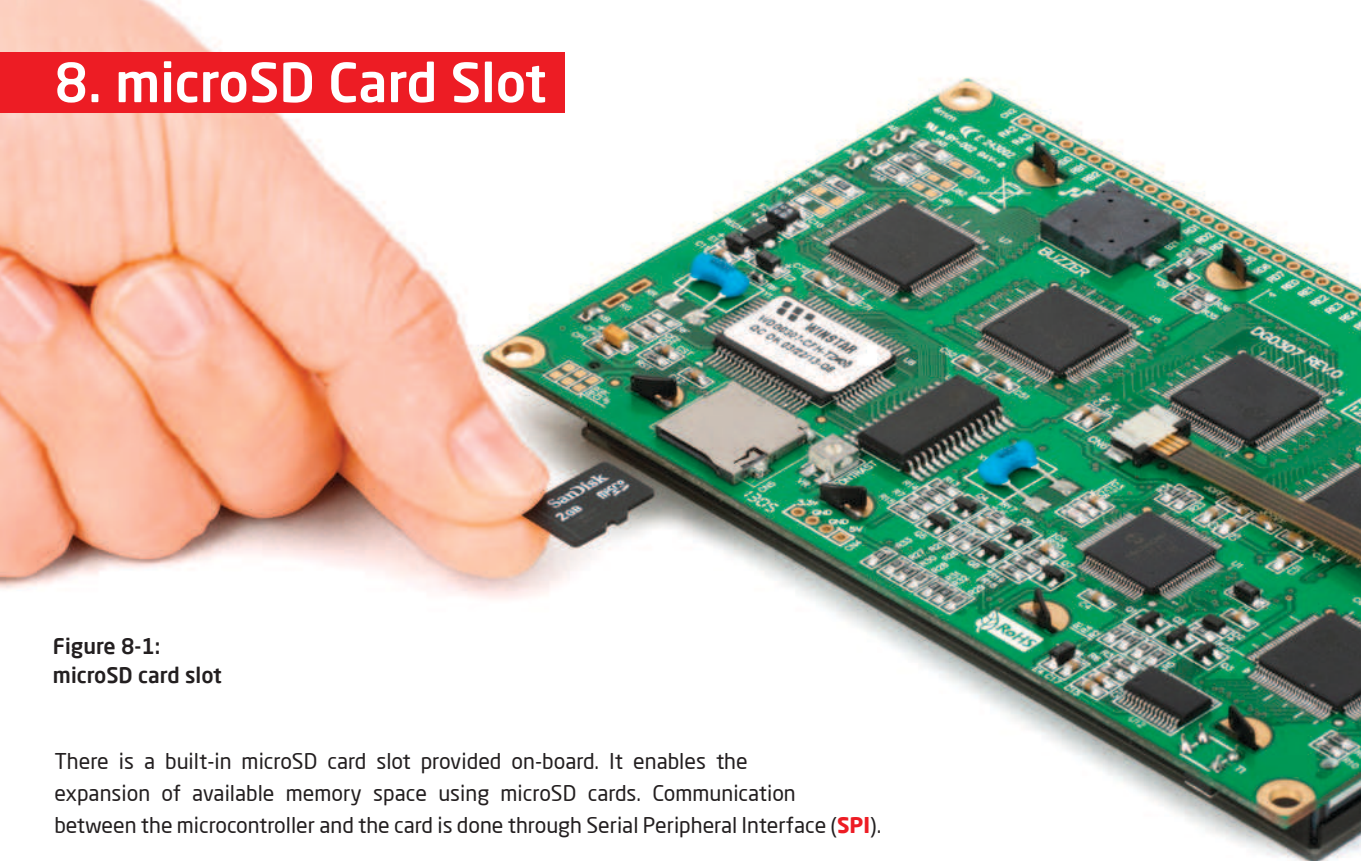


Figure 8-1:
microSD card slot

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**).

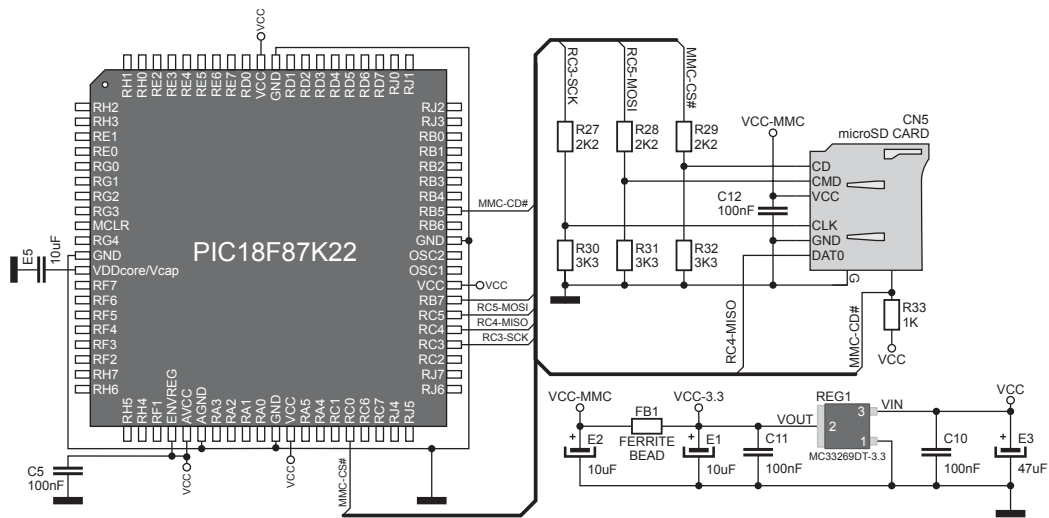
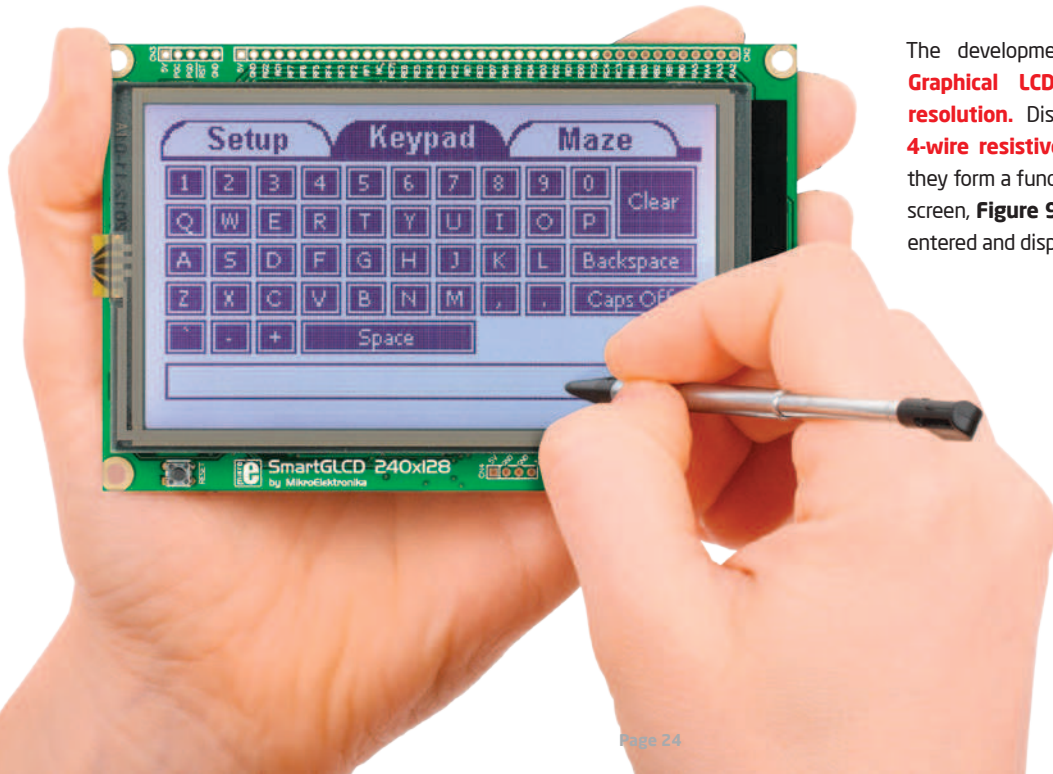


Figure 8-2: microSD Card Slot module connection schematic

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

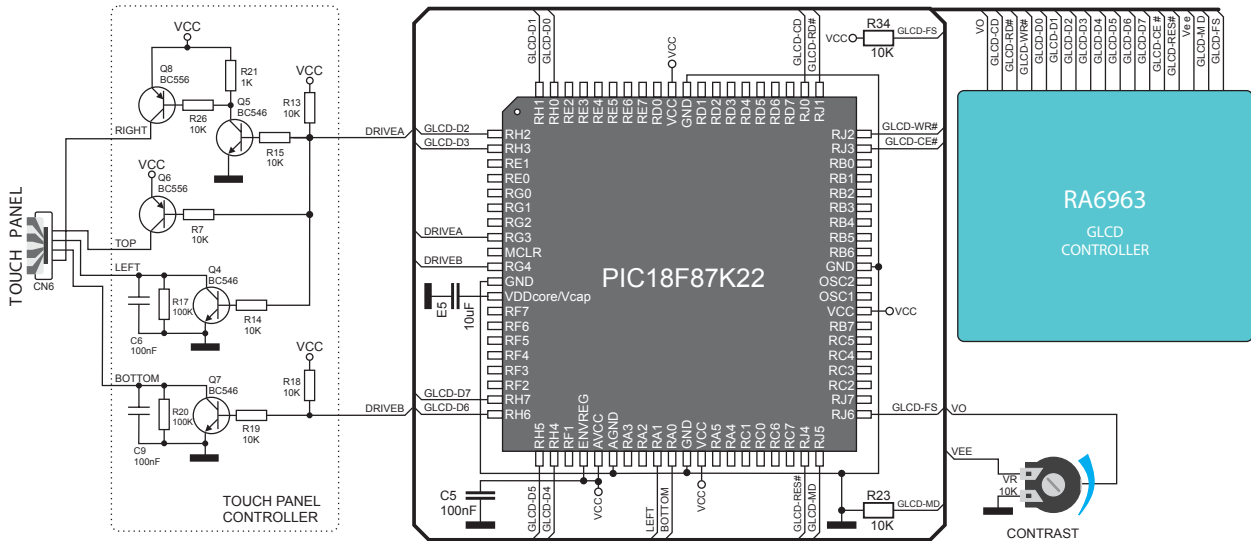


Figure 9-2: Touch Screen connection schematic