mikromedia™
for PIC24EP®

Compact development system rich with on-board peripherals for all-round multimedia development on PIC24EP512GU810 device.

MikroElektronika
DEVELOPMENT TOOLS | COMPILERS | BOOKS

PIC24

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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Table of Contents

Introduction to mikromedia for PIC24EP® 4
Package contains 5
Key features 6
System specifications 7
1. Power supply 8
USB power supply 8
Battery power supply 8
2. PIC24EP512GU810 microcontroller 10
Key microcontroller features 10
3. Programming the microcontroller 11
Programming with mikroBootloader 12
step 1 – Connecting mikromedia 12
step 2 – Browsing for .HEX file 13
step 3 – Selecting .HEX file 13
step 4 – Uploading .HEX file 14
step 5 – Finish upload 15
Programming with mikroProg™ programmer 16
mikroProg Suite™ for PIC® software 17
Programming with ICD2® or ICD3® programmer 18
4. Reset button 20
5. Crystal oscillator 22
6. microSD card slot 24
7. Touch screen 26
8. Audio module 28
9. USB connection 30
10. Accelerometer 32
11. Flash memory 34
12. Pads 36
13. Pinout 37
14. Dimensions 38
15. mikromedia accessories 39
What's next? 40

Introduction to mikromedia for PIC24EP®

The **mikromedia for PIC24EP®** is a compact development system with lots of on-board peripherals which allow development of devices with multimedia contents. The central part of the system is a 16-bit **PIC24EP512GU810** microcontroller. The mikromedia for PIC24EP® features integrated modules such as stereo MP3 codec, **TFT 320x240 touch screen** display, accelerometer, USB connector, audio connector, MMC/SD card slot, 8 Mbit flash memory, 2x26 connection pads and other. It comes pre-programmed with USB HID bootloader, but can also be programmed with external programmers, such as mikroProg™ or ICD2/3. Mikromedia is compact and slim, and perfectly fits in the palm of the hand, which makes it a convenient platform for mobile devices.

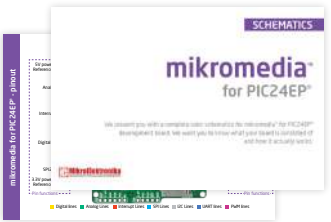
Package contains

01 Damage resistant protective box

02 mikromedia for PIC24EP® development system

03 Two 1x26 male headers, one 1x6 and one 1x5 header

04 user's guide

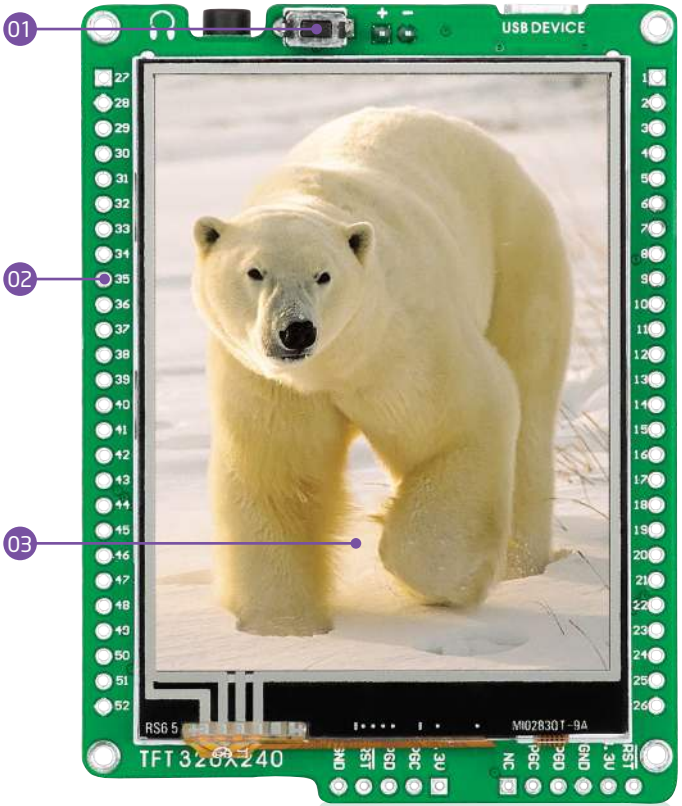


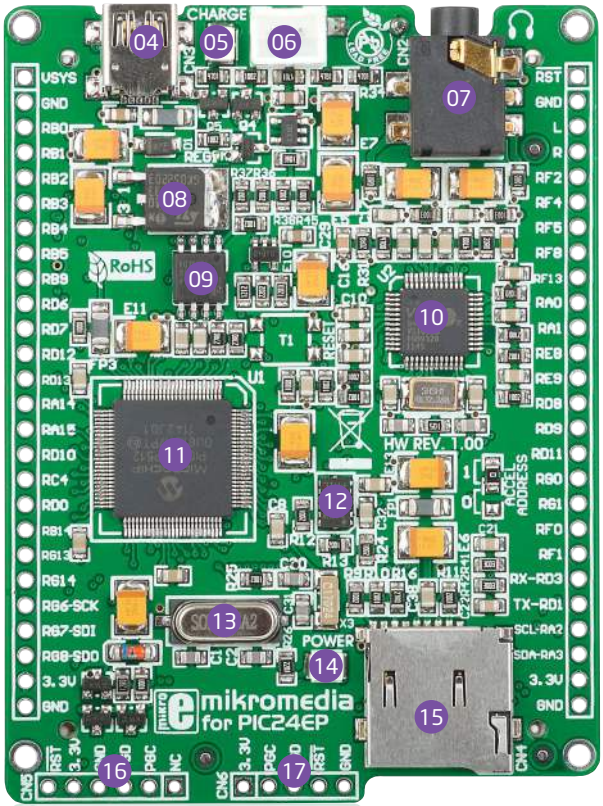
05 schematic and pinout

06 USB cable

Key features

01 RESET button
02 Connection pads
03 TFT 320x240 display
04 USB MINI-B connector
05 CHARGE indication LED
06 LI-Polymer battery connector
07 3.5mm headphone connector
08 Power supply regulator
09 Serial flash memory
10 VS1053 stereo mp3 coder/decoder
11 PIC24EP512GU810 microcontroller
12 Accelerometer
13 Crystal oscillator
14 Power indication LED
15 microSD card slot
16 ICD2/3 connector
17 mikroProg connector





System specifications

power supply
Via USB cable (5V DC)

power consumption
73 mA with erased MCU (when on-board modules are inactive

board dimensions
81.2 x 60.5 mm (3.19 x 2.38 inch)

weight
~50g (0.11lbs)

class B product
Product complies with the Class B limit of EN 55022 and can be used in the domestic, residential, commercial and industrial environments.

CAUTION: Electrostatic Sensitive Device
Permanent damage may occur on devices subjected to high energy electrostatic discharges which readily accumulate on the human body or test equipment and can discharge without detection.

1. Power supply

Figure 1-1: Connecting USB power supply

USB power supply

You can apply power supply to the board using the **MINI-B USB** cable provided in the package. On-board voltage regulators provide the appropriate voltage levels to each component on the board. **Power LED (GREEN)** will indicate the presence of power supply.

Battery power supply

You can also power the board using a **Li-Polymer** battery, via on-board battery connector. On-board battery charger circuit **MCP73832** enables you to charge the battery over a USB connection. **LED diode (RED)** will indicate when the battery is charging. Charging current is ~250mA and charging voltage is 4.2V DC.

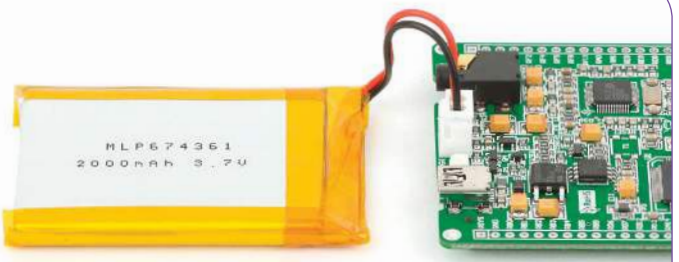


Figure 1-2: Connecting a Li-Polymer battery

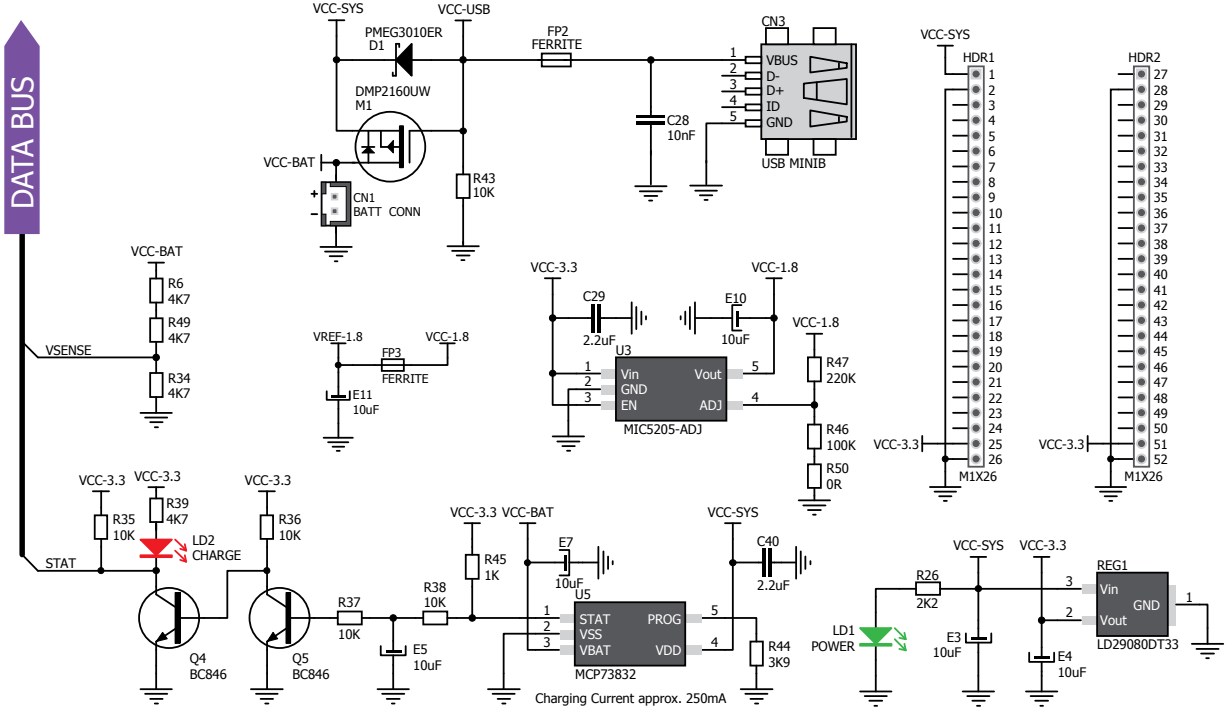


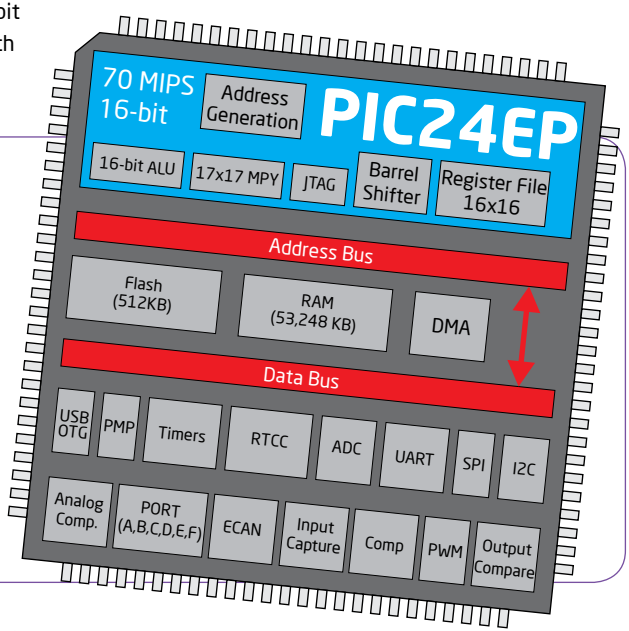
Figure 1-3: Power supply schematics

2. PIC24EP512GU810 microcontroller

The **mikromedia for PIC24EP®** development system comes with the **PIC24EP512GU810** microcontroller. This high-performance 16-bit microcontroller with its integrated modules and in combination with other on-board modules is ideal for multimedia applications.

Key microcontroller features

- Up to **70 MIPS** Operation;
- 16-bit architecture;
- 512KB of program memory, 24KB of auxiliary flash;
- 53.248 Bytes of RAM;
- 83 I/O pins;
- Internal Oscillator 7.37 MHz, 32kHz; RTCC;
- nanoWatt features: Fast Wake/Fast Control;
- 4-UART, 4-SPI, 2-I2C, 2-CAN, USB 2.0 OTG;
- DAC, ADC, etc.



3. Programming the microcontroller

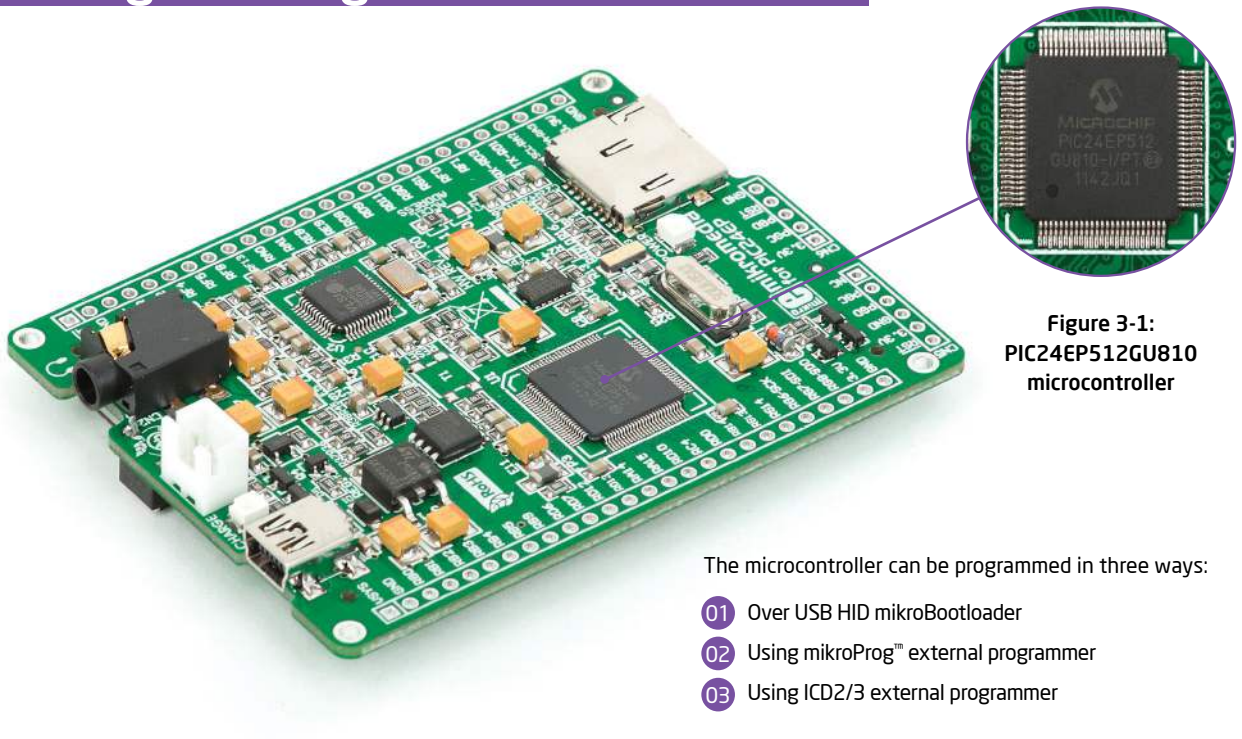


Figure 3-1: PIC24EP512GU810 microcontroller

The microcontroller can be programmed in three ways:

01 Over USB HID mikroBootloader

02 Using mikroProg™ external programmer

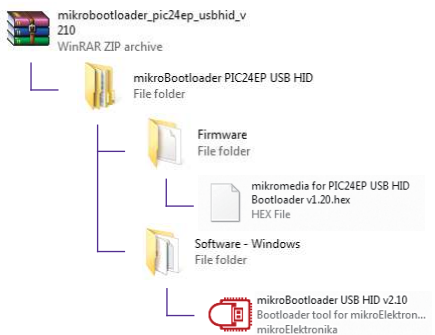
03 Using ICD2/3 external programmer

Programming with mikroBootloader

You can program the microcontroller with the bootloader which is preprogrammed into the device by default. To transfer .hex file from a PC to the MCU you need bootloader software (**mikroBootloader USB HID**) which can be downloaded from:

http://www.mikroe.com/downloads/get/1858/mikrobootloader_pic24ep_usbhid_v210.zip

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



step 1 – Connecting mikromedia

Figure 3-2: USB HID mikroBootloader window

01 In order to start, connect the USB cable or (if already connected) press the **Reset** button on your mikromedia board. Click the **Connect** button within 5s to enter the bootloader mode, otherwise the existing microcontroller program will be executed.

step 2 - Browsing for .HEX file

Figure 3-3: Browse for HEX

01 Click the **Browse for HEX** button and from a pop-up window (**Figure 3.4**) choose the .HEX file which will be uploaded to MCU memory.

step 3 - Selecting .HEX file

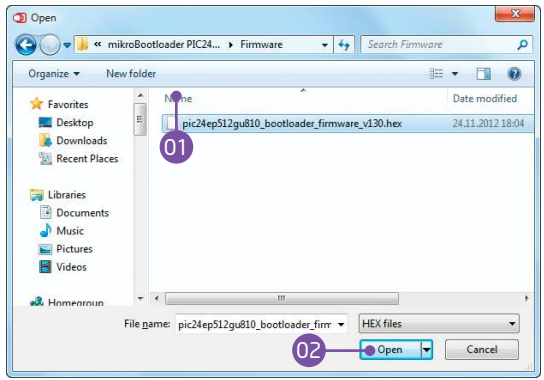


Figure 3-4: Selecting HEX

01 Select .HEX file using open dialog window.

02 Click **Open**.

step 4 - Uploading .HEX file

Figure 3-5: Begin uploading

01 To start .HEX file boot loading click the **Begin uploading** button.

Figure 3-6: Progress bar

01 .HEX file uploading can be monitored via progress bar.

step 5 - Finish upload

Figure 3-7: Restarting MCU

Figure 3-8: mikroBootloader ready for next job

01 Click **OK** after uploading is finished and wait for 5 seconds. Board will automatically reset and your new program will execute.

Programming with mikroProg™ programmer

The microcontroller can be programmed with **mikroProg™ programmer** and **mikroProg Suite™ for PIC®** software. To connect mikroProg™ programmer to the development system use the CN6 connector, **Figure 3-9**.

Figure 3-9:
Connecting mikroProg™ to mikromedia™

mikroProg™ is a fast USB 2.0 programmer with mikroICD™ hardware In-Circuit Debugger. Smart engineering allows mikroProg™ to support PIC10®, PIC12®, PIC16®, PIC18®, dsPIC30/33®, PIC24® and PIC32® devices in a single programmer. It supports over 570 microcontrollers from Microchip®. Outstanding performance, easy operation and elegant design are its key features.

mikroProg suite™ for PIC® software

mikroProg™ programmer requires special programming software called **mikroProg Suite™ for PIC®**. This software is used for programming of ALL Microchip® microcontroller families, including PIC10®, PIC12®, PIC16®, PIC18®, dsPIC30/33®, PIC24® and PIC32®. Software has intuitive interface and SingleClick™ programming technology. Just by downloading the latest version of **mikroProg Suite™** 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.

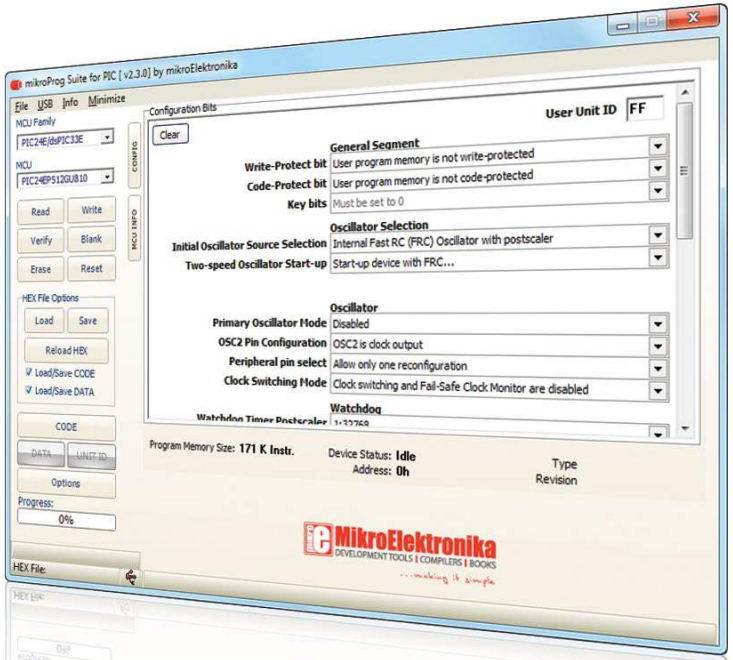


Figure 3-10: Main Window of mikroProg Suite™ for PIC® programming software

Programming with ICD2® or ICD3® programmer

The microcontroller can also be programmed with **ICD2® or ICD3® programmer**. These programmers connects with mikromedia board via **ICD2 CONNECTOR BOARD.**

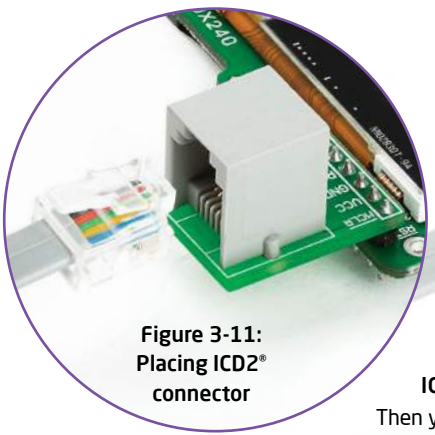


Figure 3-11: Placing ICD2® connector

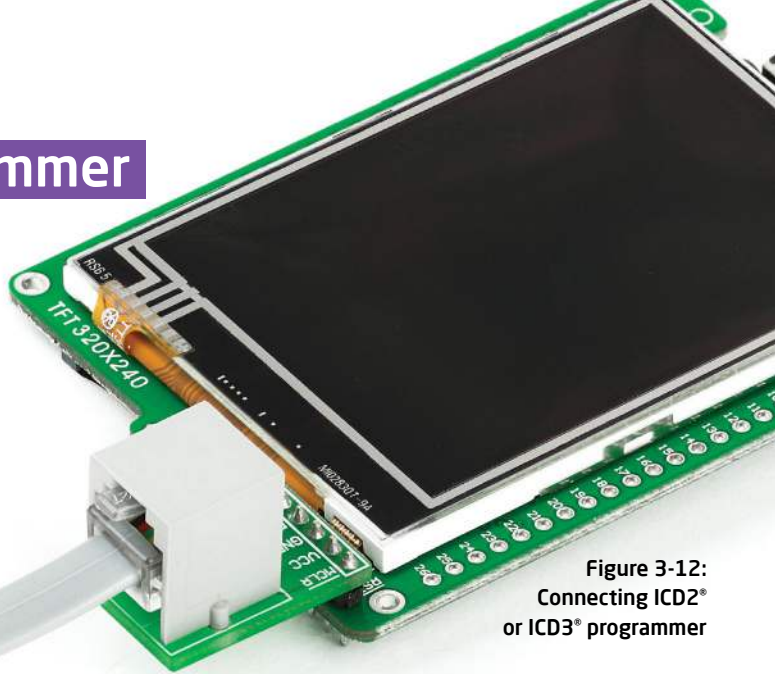


Figure 3-12: Connecting ICD2® or ICD3® programmer

In order to enable the ICD2® and ICD3® programmers to be connected to the mikromedia board, it is necessary to provide the appropriate connector such as the **ICD2 CONNECTOR BOARD**. This connector should be first soldered on the CN5 connector. Then you should plug the ICD2® or ICD3® programmer into it, **Figure 3-11**.

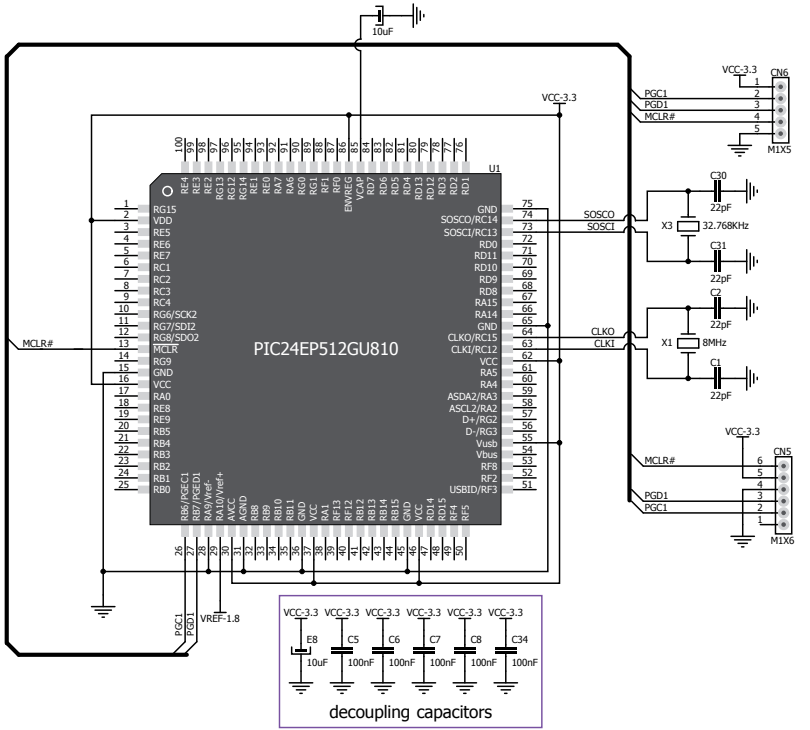
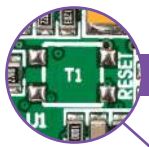


Figure 3-13: mikroProg™ & ICD2 / ICD3 programmer connection schematic

4. Reset button

Board is equipped with reset button, which is located at the top of the front side (**Figure 4-2**). If you want to reset the circuit, press the reset button. It will generate low voltage level on microcontroller reset pin (input). In addition, a reset can be externally provided through **pin 27** on side headers (**Figure 4-3**).



NOTE

You can also solder additional reset button on the appropriate place at the back side of the board, **Figure 4-1**.

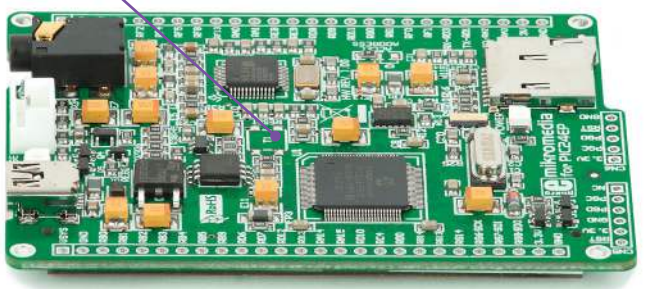


Figure 4-1: Location of additional reset button

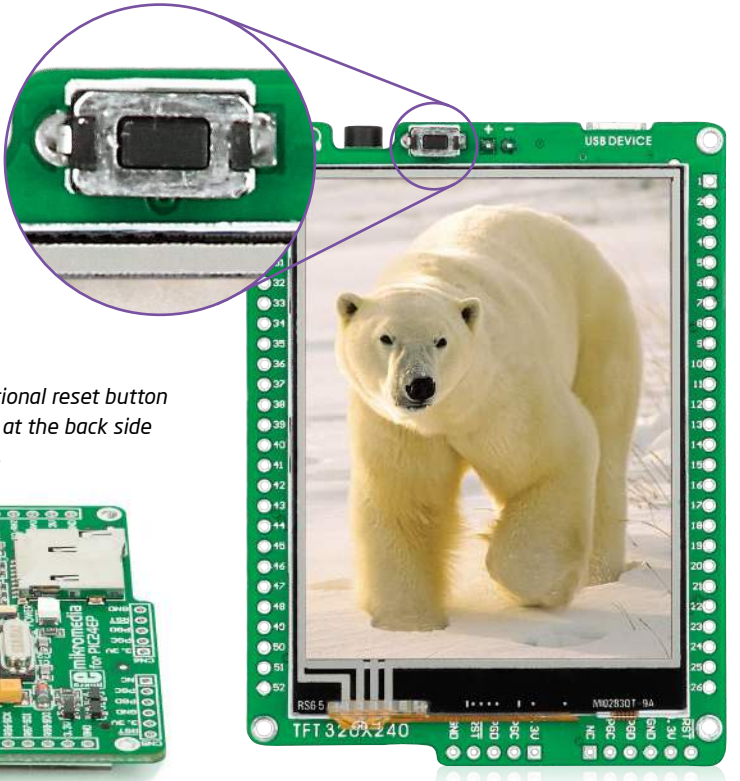


Figure 4-2: Frontal reset button

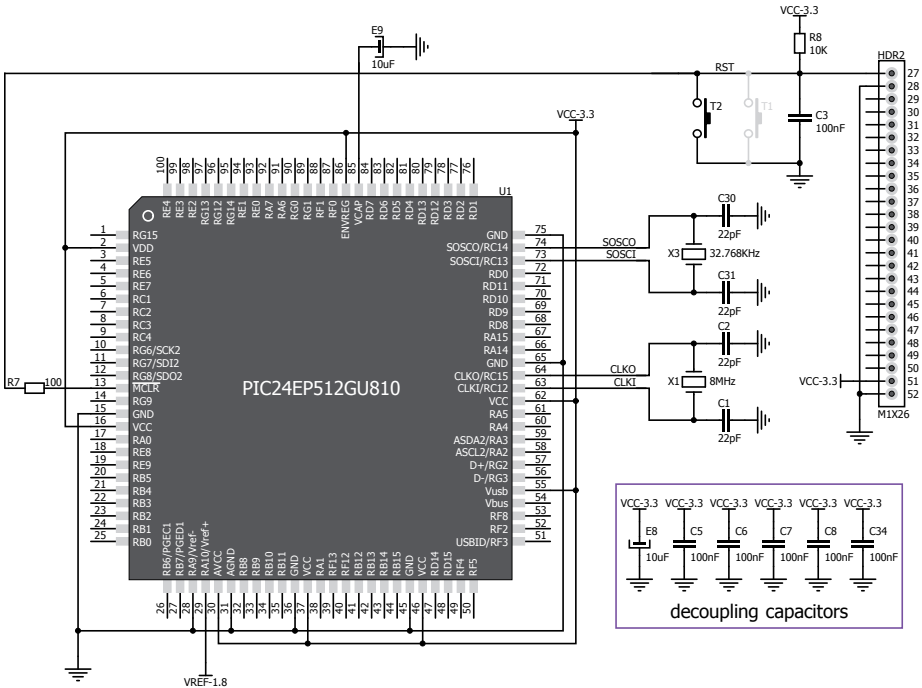
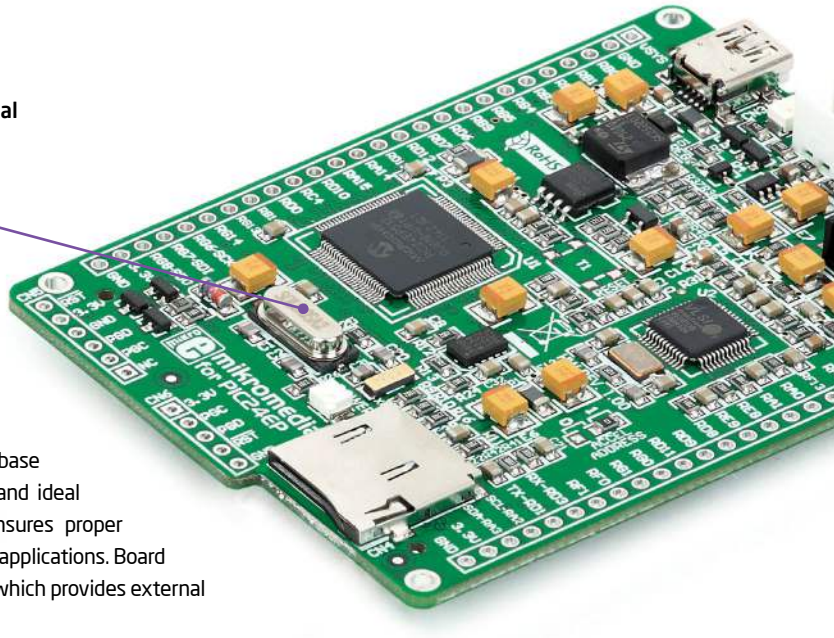


Figure 4-3: Reset circuit schematic

5. Crystal oscillator

Figure 5-1: External crystal oscillator (X1)



Board is equipped with **8MHz crystal oscillator (X1)** circuit that provides external clock waveform to the microcontroller CLKO and CLKI pins. This base frequency is suitable for further clock multipliers and ideal for generation of necessary USB clock, which ensures proper operation of bootloader and your custom USB-based applications. Board also contains **32.768kHz Crystal oscillator (X3)** which provides external clock for internal **RTCC** module.

NOTE : *The use of crystal in all other schematics is implied even if it is purposely left out, because of the schematics clarity.*

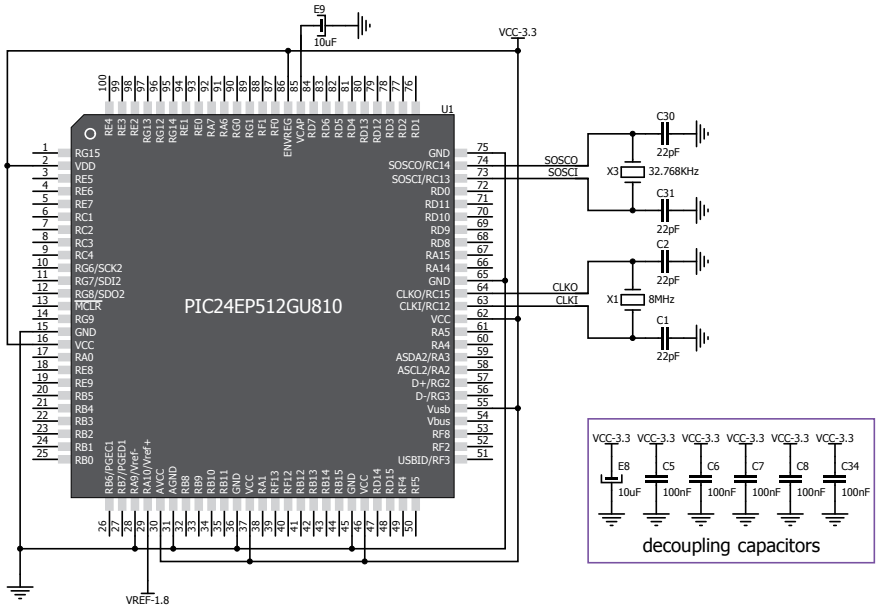


Figure 5-2:Crystal oscillator schematic

6. microSD card slot

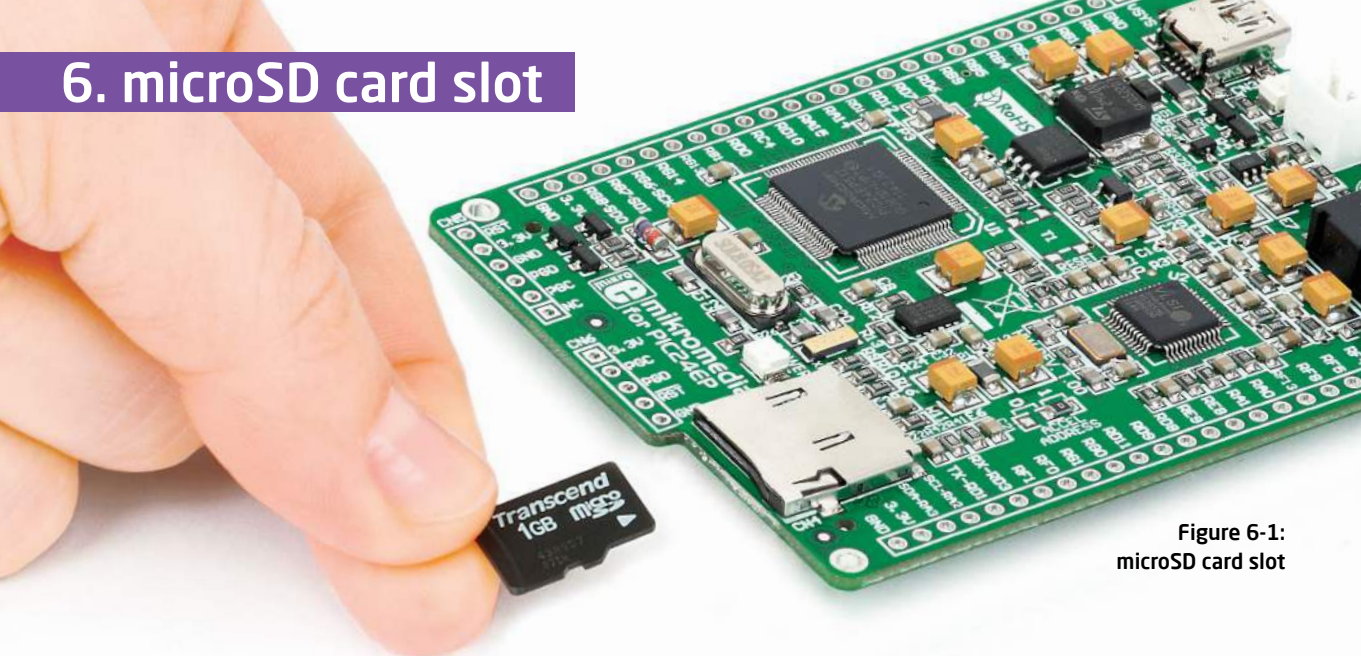


Figure 6-1:
microSD card slot

Board contains **microSD card slot** for using microSD cards in your projects. It enables you to store large amounts of data externally, thus saving microcontroller memory. microSD cards use Serial Peripheral Interface (**SPI**) for communication with the microcontroller.

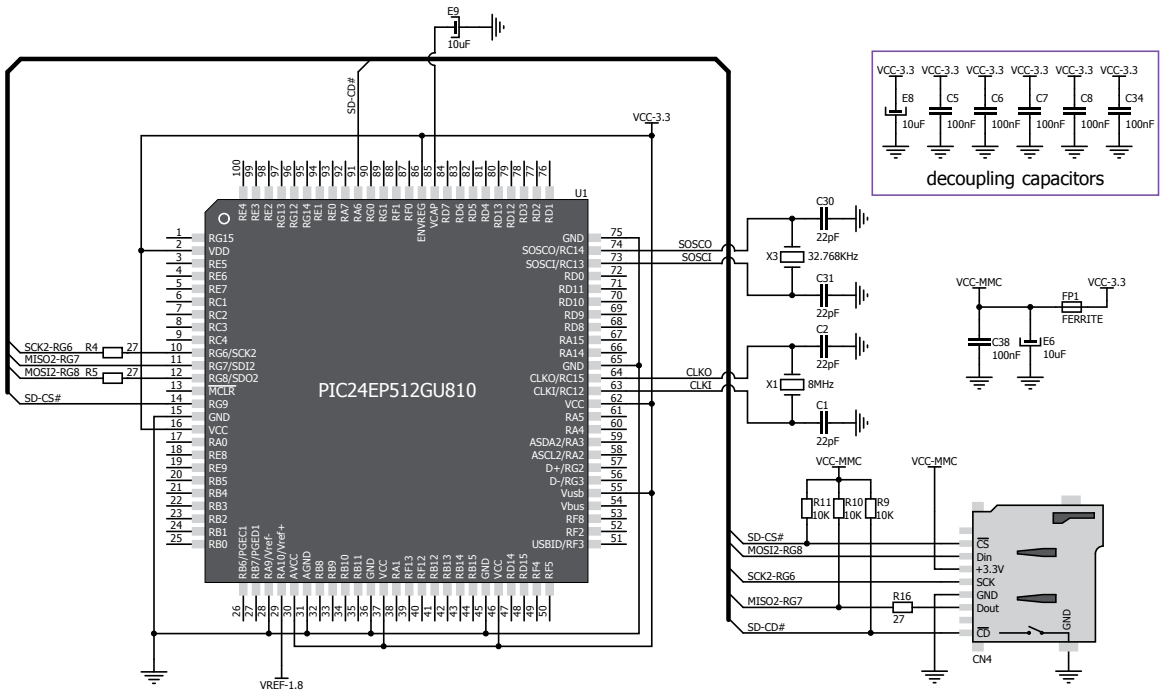


Figure 6-2:microSD Card Slot module connection schematic

7. Touch screen

The development system features a **TFT 320x240 display** covered with a **resistive** touch panel. Together they form a functional unit called a **touch screen.** It enables data to be entered and displayed at the same time. The TFT display is capable of showing graphics in **262.144** different **colors**.

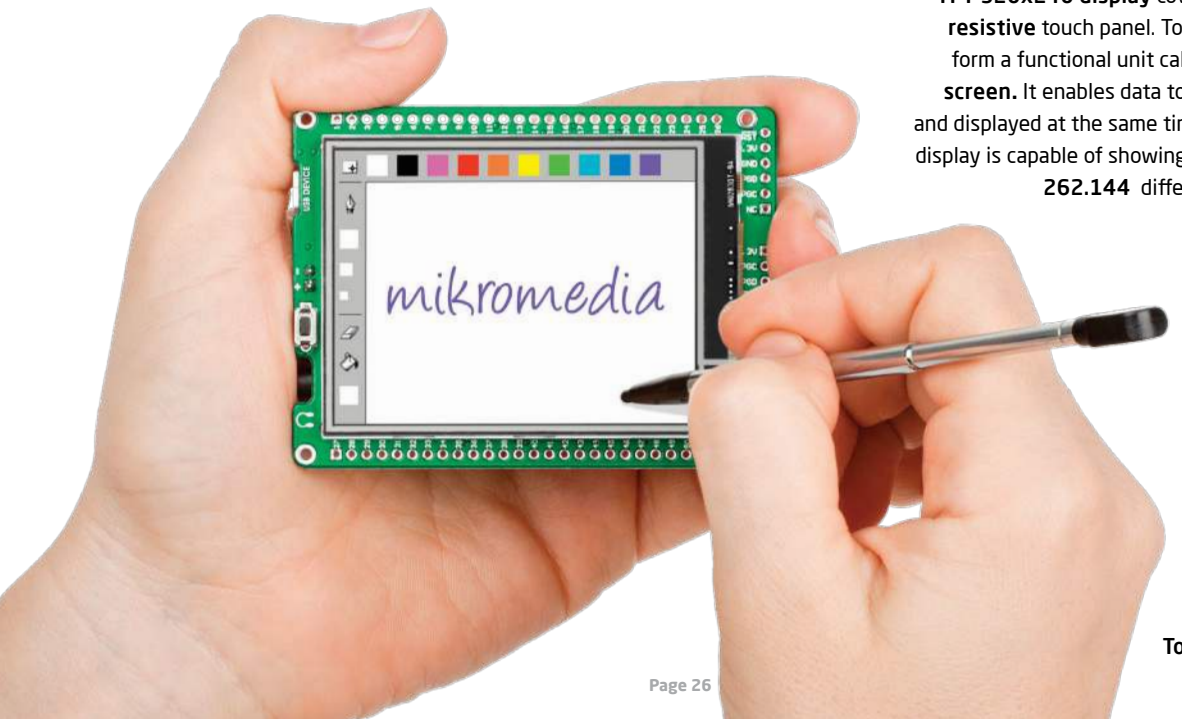


Figure 7-1: Touch Screen

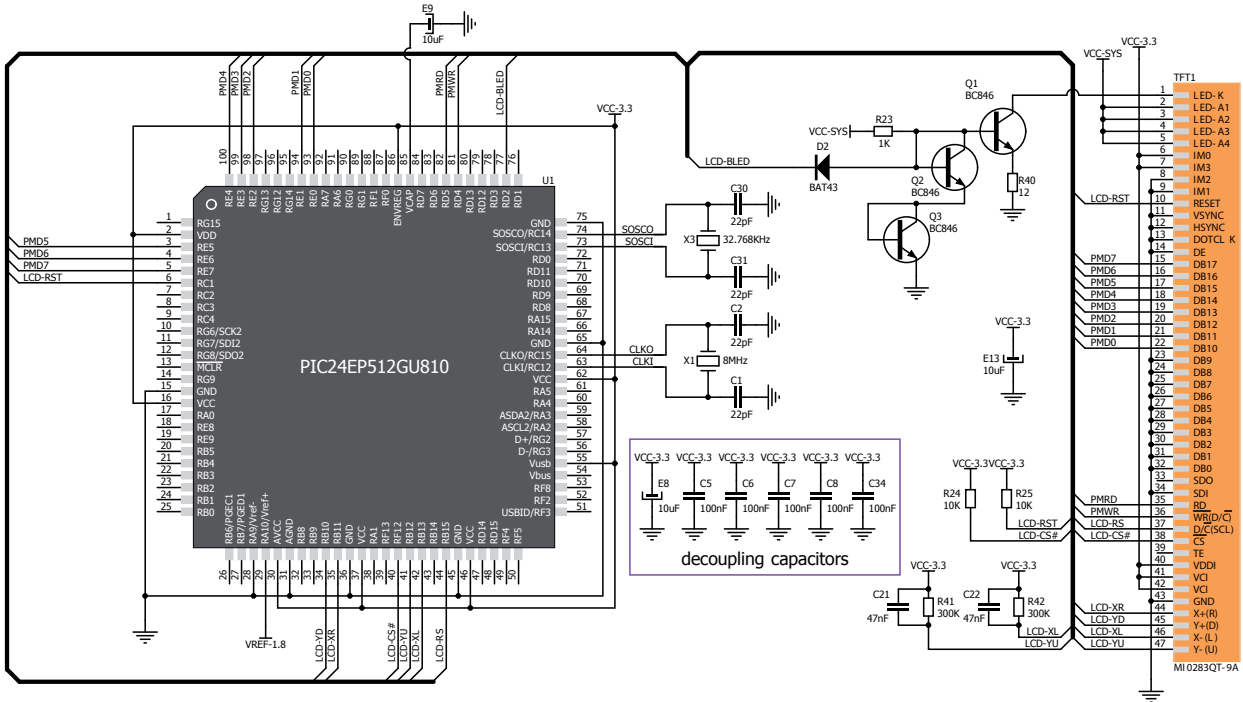


Figure 7-2: Touch Screen connection schematic

8. Audio module

The mikromedia for PIC24EP® features a stereo audio codec **VS1053**. This module enables audio reproduction by using stereo headphones connected to the system via a **3.5mm** connector CN2. All functions of this module are controlled by the microcontroller over Serial Peripheral Interface (**SPI**).

Figure 8-1:
On-board VS1053 MP3 codec

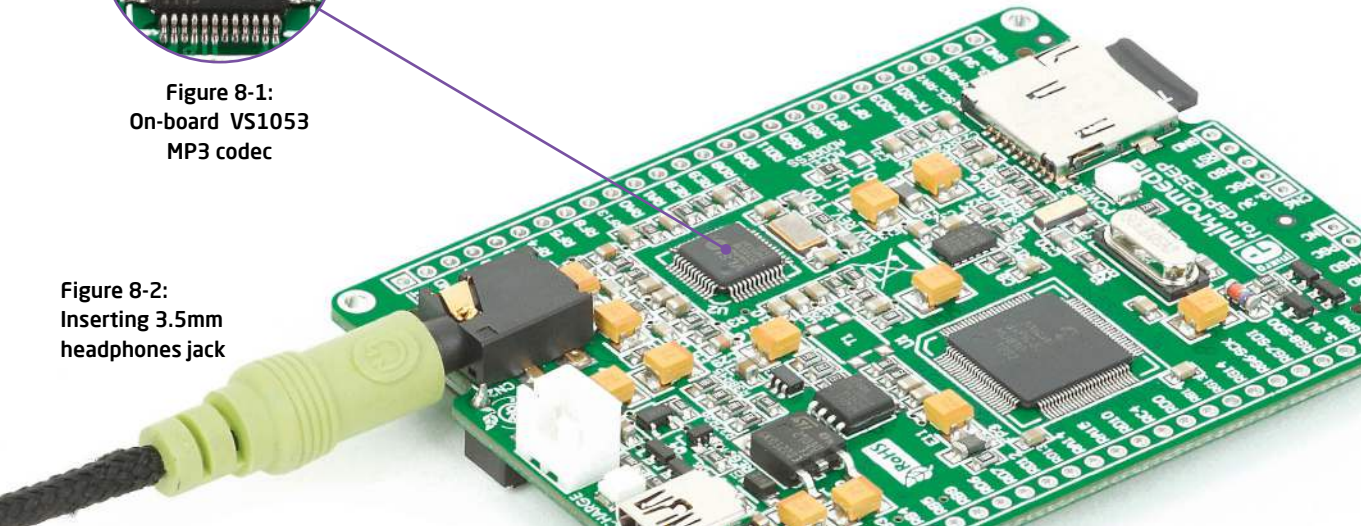


Figure 8-2:
Inserting 3.5mm headphones jack

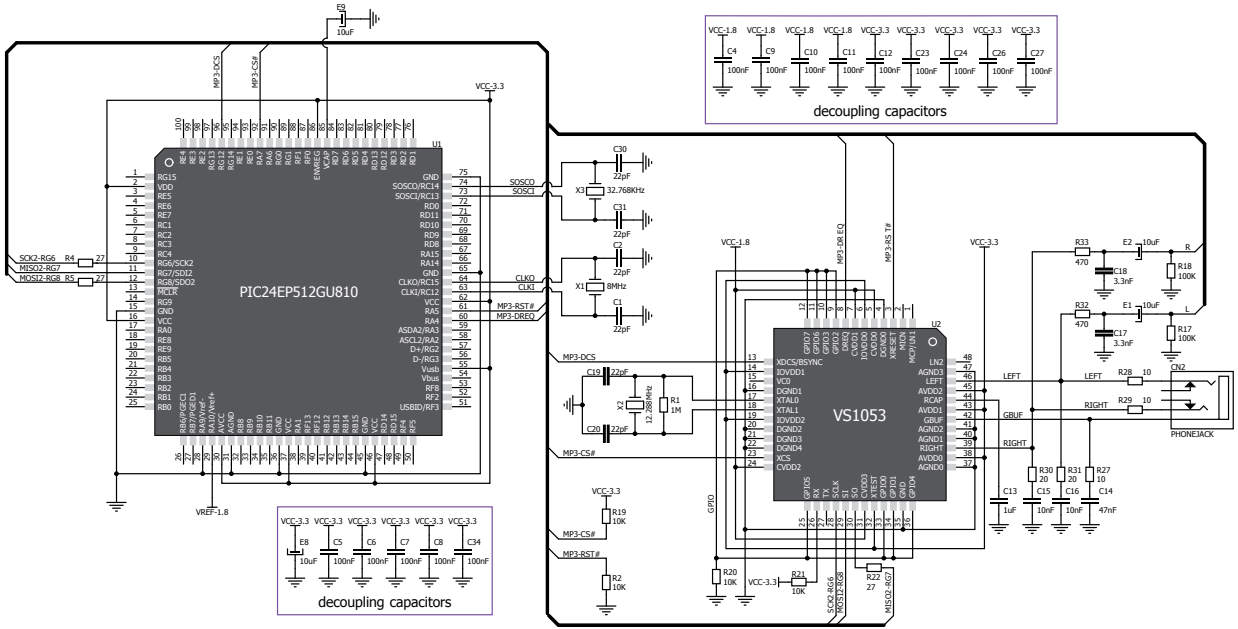


Figure 8-3: Audio module connection schematic

9. USB connection

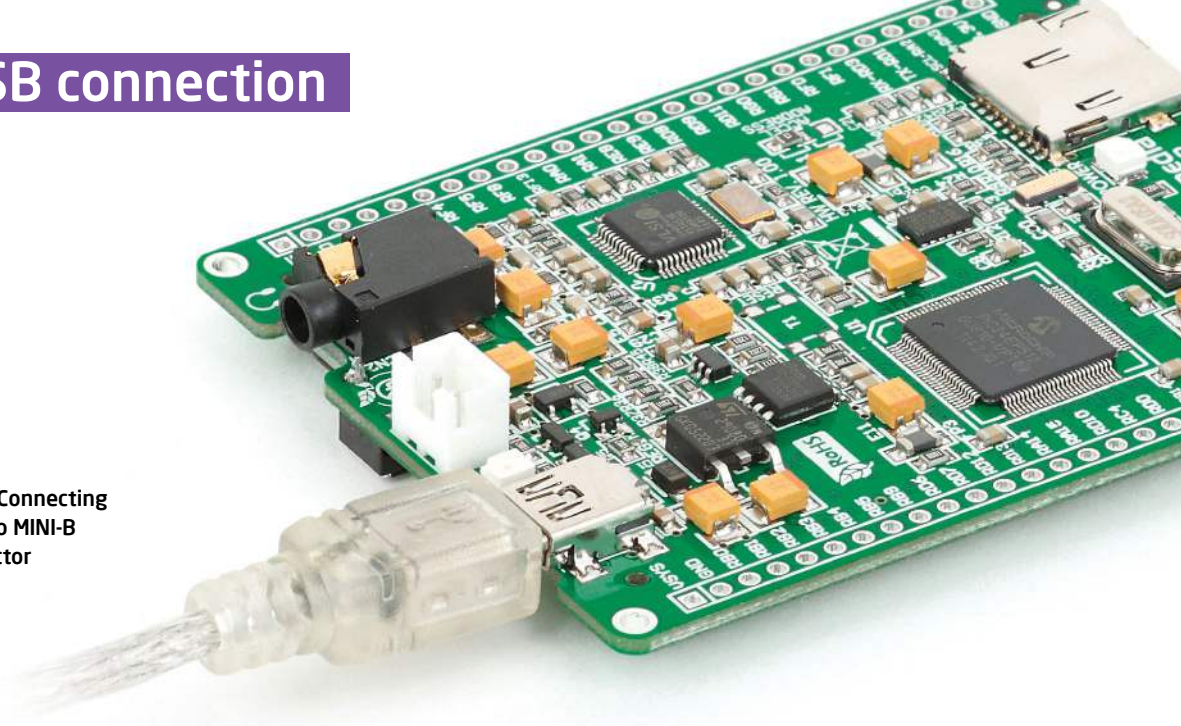


Figure 9-1: Connecting USB cable to MINI-B USB connector

PIC24EP512GU810 microcontroller has an integrated USB module, which enables you to implement USB communication functionality to your mikromedia board. Connection with target USB host is done over MINI-B USB connector which is positioned next to the battery connector.

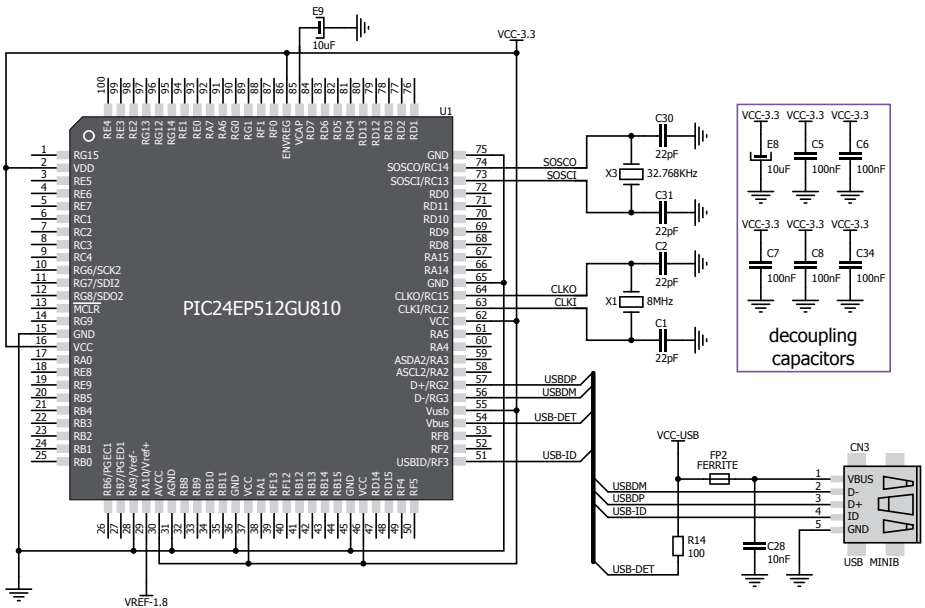


Figure 9-2: USB module connection schematic

10. Accelerometer

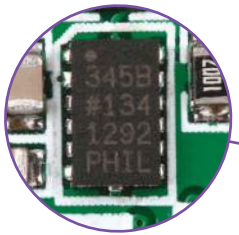
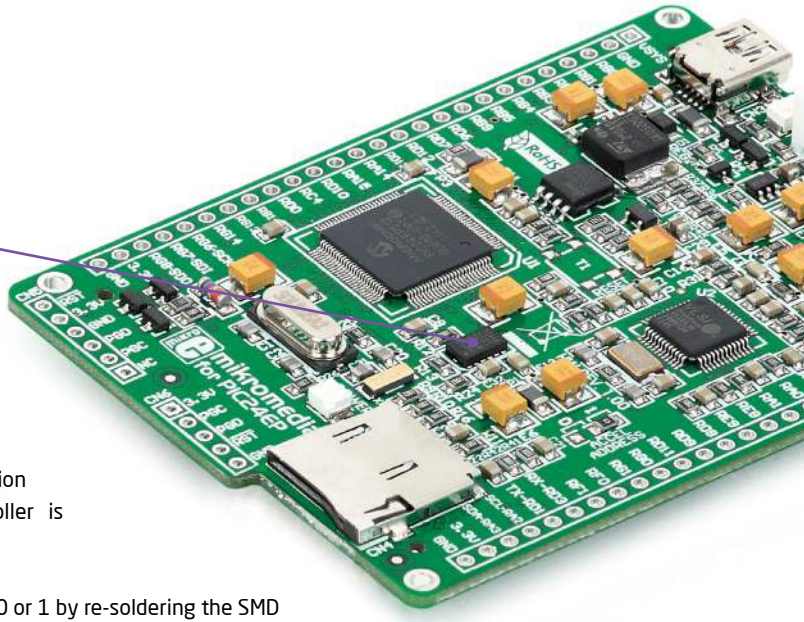


Figure 10-1: Accelerometer module



On board **ADXL345** accelerometer is used to measure acceleration in three axis: x, y and z. The accelerometer function is defined by the user in the program loaded into the microcontroller. Communication between the accelerometer and the microcontroller is performed via the **I²C** interface.

You can set the accelerometer address to 0 or 1 by re-soldering the SMD jumper (zero-ohm resistor) to the appropriate position. Jumper is placed in address 1 position by default.

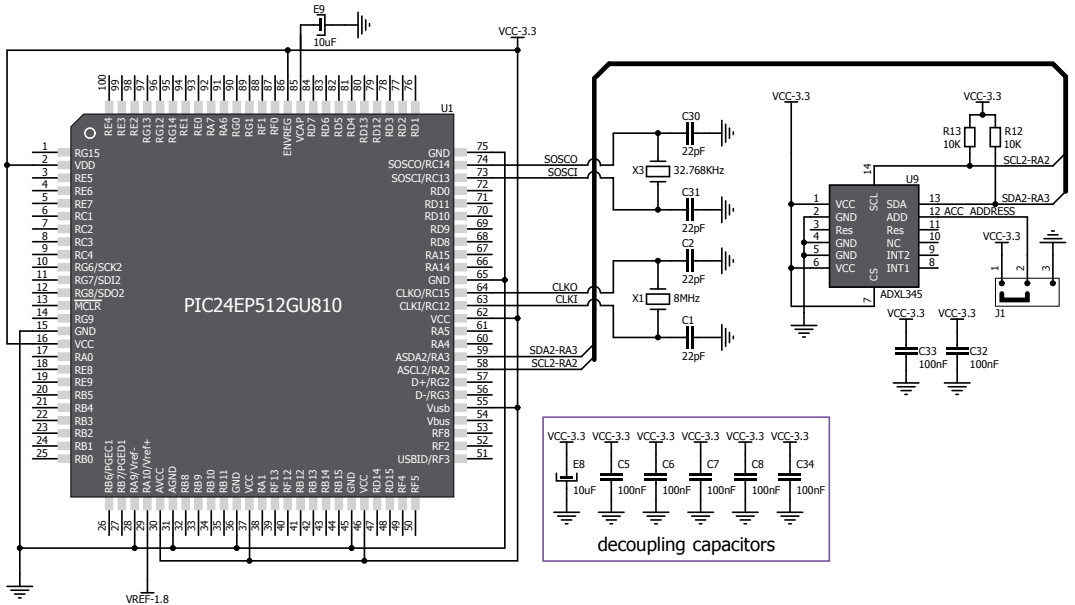


Figure 10-2: Accelerometer connection schematic

11. Flash memory

Figure 11-1:
Flash memory module

Since multimedia applications are getting increasingly demanding, it is necessary to provide additional memory space to be used for storing more data. The flash memory module enables the microcontroller to use additional **8Mbit** flash memory. It is connected to the microcontroller via the Serial Peripheral Interface (**SPI**).

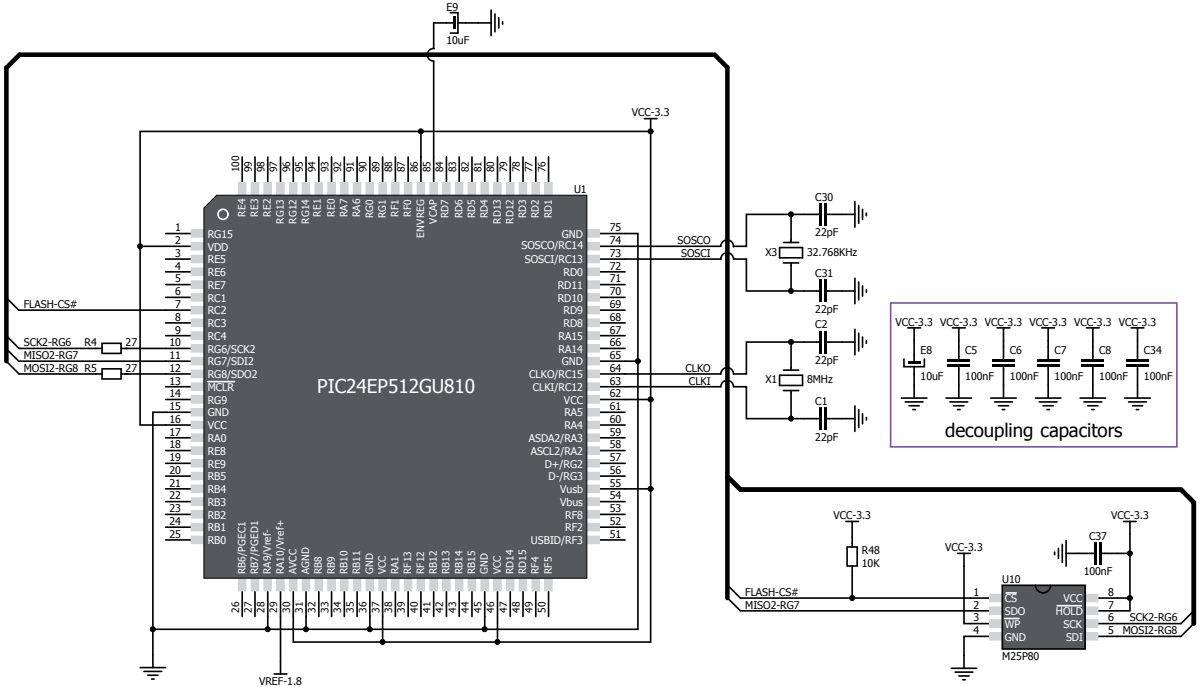
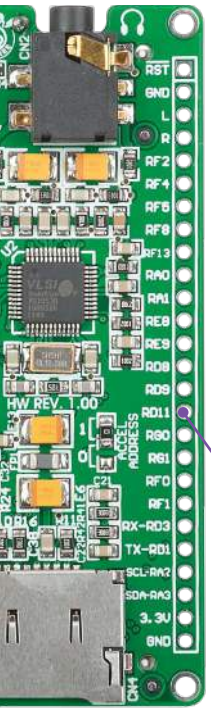
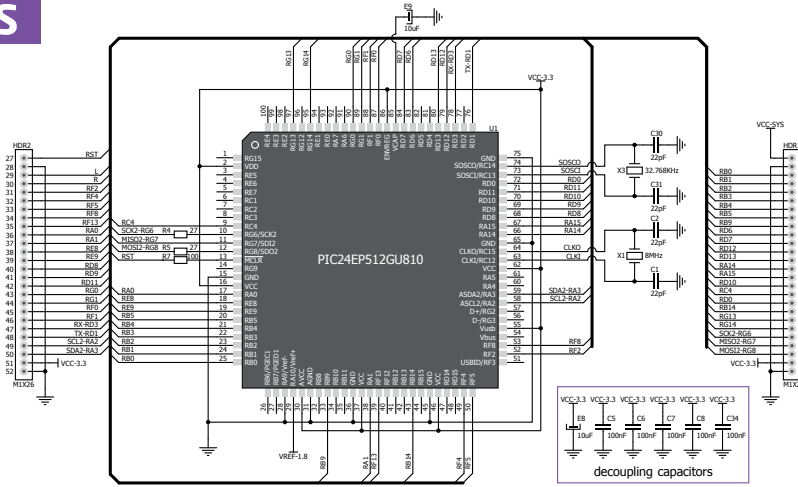


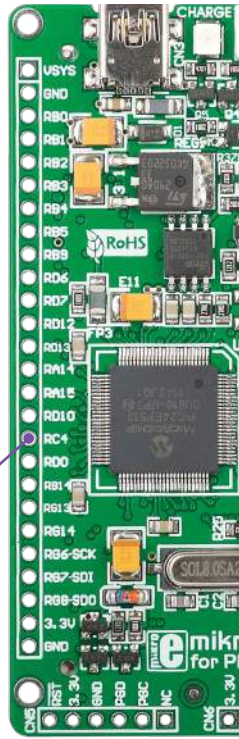
Figure 11-2: Flash memory module connection schematic

12. Pads



Pads HDR2





Pads HDR1

Figure 12-1: Connection pads schematic

Most microcontroller pins are available for further connectivity via two 1x26 rows of connection pads on both sides of the mikromedia board. They are designed to match additional shields, such as Battery Boost shield, Gaming, PROTO shield and others.

13. Pinout

Pin functions

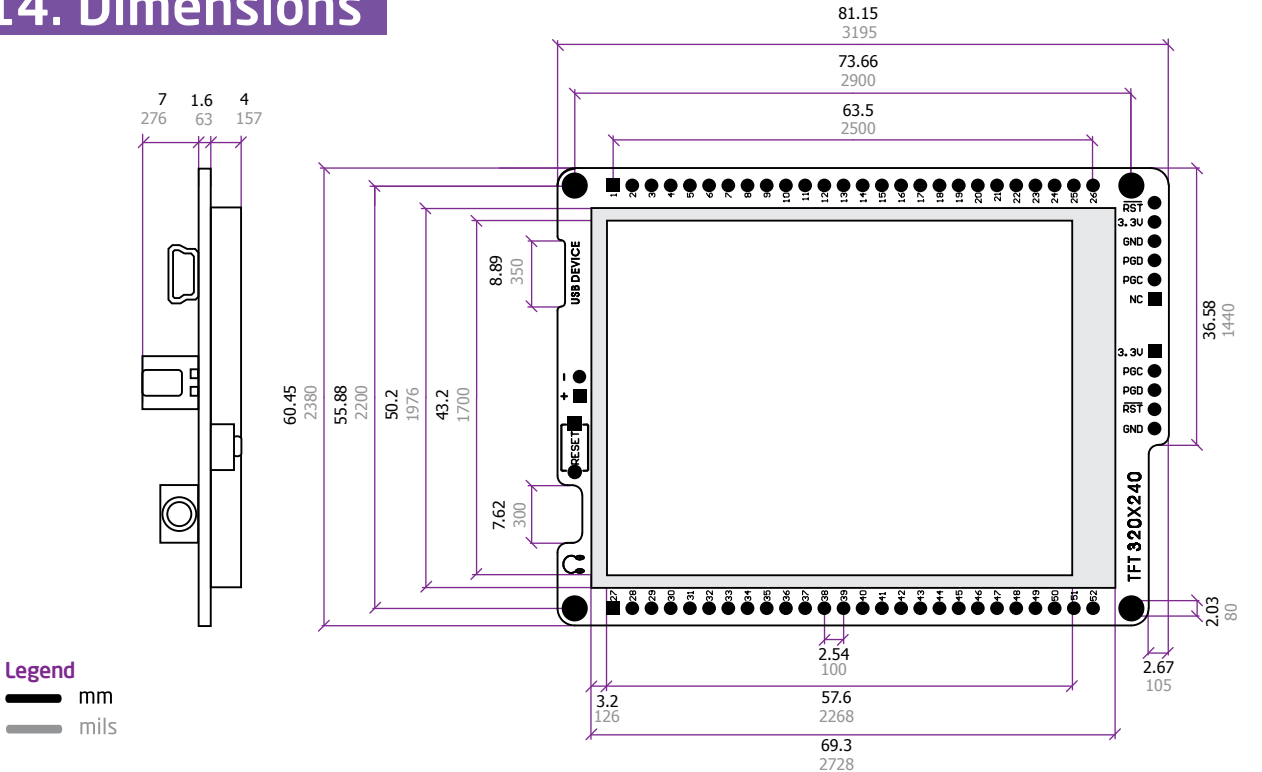
5V power supply	5V	
Reference Ground	GND	
Analog Lines	RB0	
	RB1	
	RB2	
	RB3	
	RB4	
	RB5	
	RB9	
Interrupt Lines	RD6	
	RD7	
	RD12	
	RD13	
Digital I/O lines	RA14	
	RA15	
	RD10	
	RC4	
	RD0	
	RB14	
	RG13	
	RG14	
SPI2	SCK2	RG6
	SDI2	RG7
	SDO2	RG8
3.3V power supply	3.3V	
Reference Ground	GND	

RST	Reset pin	
GND	Reference Ground	
L	left ch.	audio out
R	right ch.	
RF2		PWM lines
RF4		
RF5		
RF8		
RF13		Digital I/O lines
RA0		
RA1		
RE8		
RE9		
RD8		
RD9		
RD11		
RG0		
RG1		
RF0		
RF1		
RD3	RX	UART
RD1	TX	
RA2	SCL2	I²C
RA3	SDA2	
3.3V	3.3V power supply	
GND	Reference Ground	

Pin functions

Digital lines | Analog Lines | Interrupt Lines | SPI Lines | I2C Lines | UART lines | PWM lines

14. Dimensions



Legend

mm

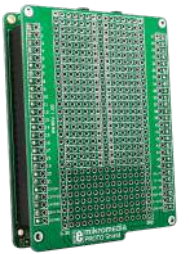
mils

15. mikromedia accessories

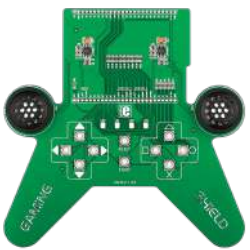
We have prepared a set of extension boards pin-compatible with your mikromedia, which enable you to easily expand your board basic functionality. We call them mikromedia shields. But we also offer other accessories, such as Li-polymer battery, stacking headers, wire jumpers and more.

01 Connect shield

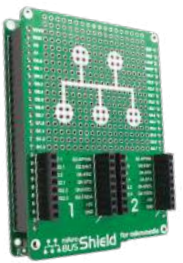
02 BatteryBoost shield



03 PROTO shield



04 Gaming shield



05 mikroBUS shield

06 Li-Polimer battery

07 Wire Jumpers

What's next?

You have now completed the journey through each and every feature of mikromedia for PIC24EP® board. You got to know its modules and organization. Now you are ready to start using your new board. We are suggesting several steps which are probably the best way to begin. Find useful projects and tutorials on the **Libstock** website (*http://www.libstock.com/*). Join our **Forum** (*http://www.mikroe.com/forum/*) and get help from a large ecosystem of users.

Compiler

You still don't have an appropriate compiler? Locate dsPIC/PIC24® compiler that suits you best on our site:

http://www.mikroe.com/dspic/compilers/

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

Visual TFT

Once you have chosen your compiler, and since you already got the board, you are ready to start writing your first projects. **Visual TFT software** enables you to quickly create your GUI. It will automatically generate code compatible with MikroElektronika compilers. Visual TFT is rich with examples, which are an excellent starting point for your future projects. Download it from the link bellow:

http://www.mikroe.com/visualtft/

Notes:

Notes:

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