mikromedia™
for PIC32®

Compact development system rich with on-board peripherals for all-round multimedia development on PIC32MX460F512L device.

MikroElektronika
DEVELOPMENT TOOLS | COMPILERS | BOOKS

PIC32

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 PIC32® 4
Package Contains 5
Key Features 6
System Specification 7
1. Power supply 8
USB power supply 8
Battery power supply 8
2. PIC32MX460F512L 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 23
7. Touch Screen 24
8. Audio Module 26
9. USB connection 28
10. Accelerometer 30
11. Flash Memory 31
12. Pads 32
13. Pinout 33
14. Dimensions 34
15. Mikromedia Accessories 35
16. What's Next 36

Introduction to mikromedia for PIC32®

The **mikromedia for PIC32®** 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 32-bit **PIC32MX460F512L** microcontroller. The mikromedia for PIC32® 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 convenient platform for mobile devices.

Package Contains

01 Damage resistant protective box

02 mikromedia for PIC32® development system

03 DVD with documentation and examples

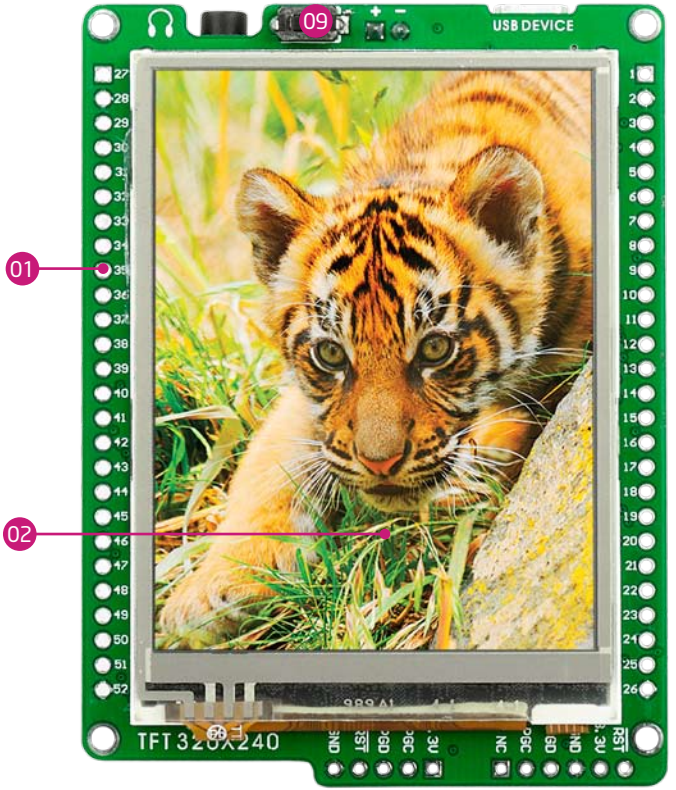
04 mikromedia for PIC32® user's guide

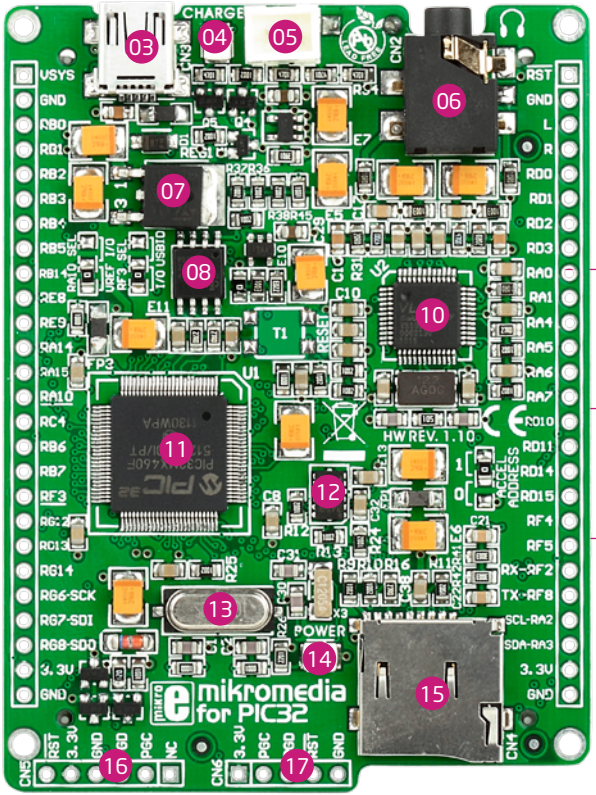
05 mikromedia for PIC32® schematic

06 USB cable

Key Features

01 Connection Pads
02 TFT 320x240 display
03 USB MINI-B connector
04 CHARGE indication LED
05 LI-Polymer battery connector
06 3.5mm headphone connector
07 Power supply regulator
08 Serial Flash memory
09 RESET button
10 VS1053 Stereo mp3 coder/decoder
11 PIC32MX460F512L microcontroller
12 Accelerometer
13 Crystal oscillator
14 Power indication LED
15 microSD Card Slot
16 ICD2/3 connector
17 mikroProg connector





System Specification

power supply

Via USB cable (5V DC)

power consumption

58 mA with erased MCU

(when on-board modules are inactive)

board dimensions

81.2 x 60.5mm (3.19 x 2.38 inch)

weight

~50 g (0.11 lbs)

1. Power supply

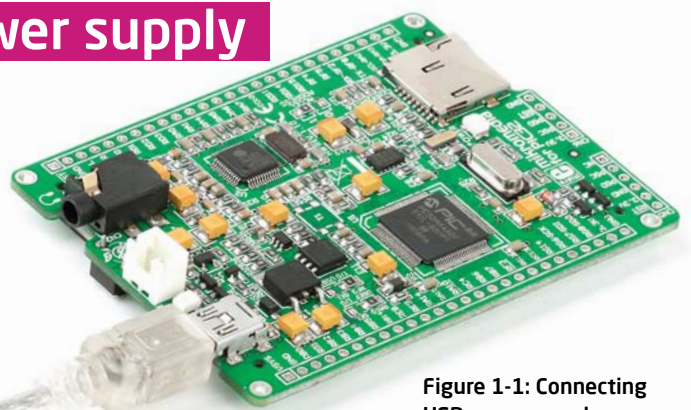


Figure 1-1: Connecting USB power supply

USB power supply

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

Figure 1-2: Connecting Li-Polymer battery

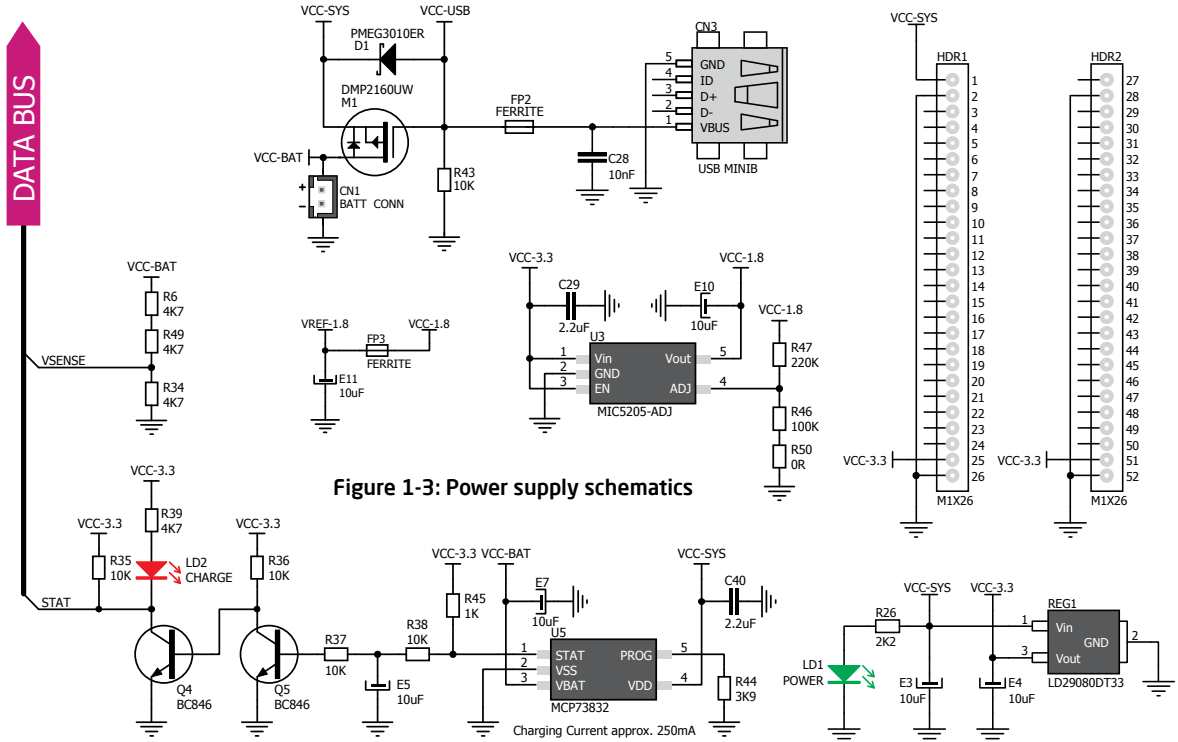
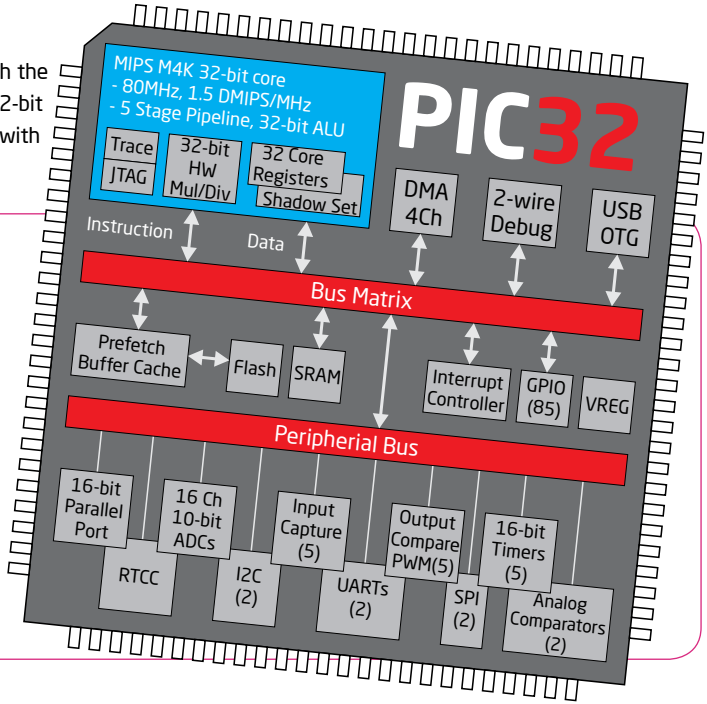


Figure 1-3: Power supply schematics

2. PIC32MX460F512L microcontroller

The **mikromedia for PIC32®** development system comes with the **PIC32MX460F512L** microcontroller. This high-performance 32-bit microcontroller with its integrated modules and in combination with other on-board modules is ideal for multimedia applications.



Key microcontroller features

- 1.56 DMIPS/MHz, 32-bit MIPS M4K Core;
- 512K Flash (plus 12K boot Flash);
- 32K RAM (can execute from RAM);
- 85 I/O pins;
- SPI, I^2C, A/D;
- 16-bit, 32-bit Digital Timers;
- Internal Oscillator 8MHz, 32kHz;
- RTCC; etc.

3. Programming the microcontroller

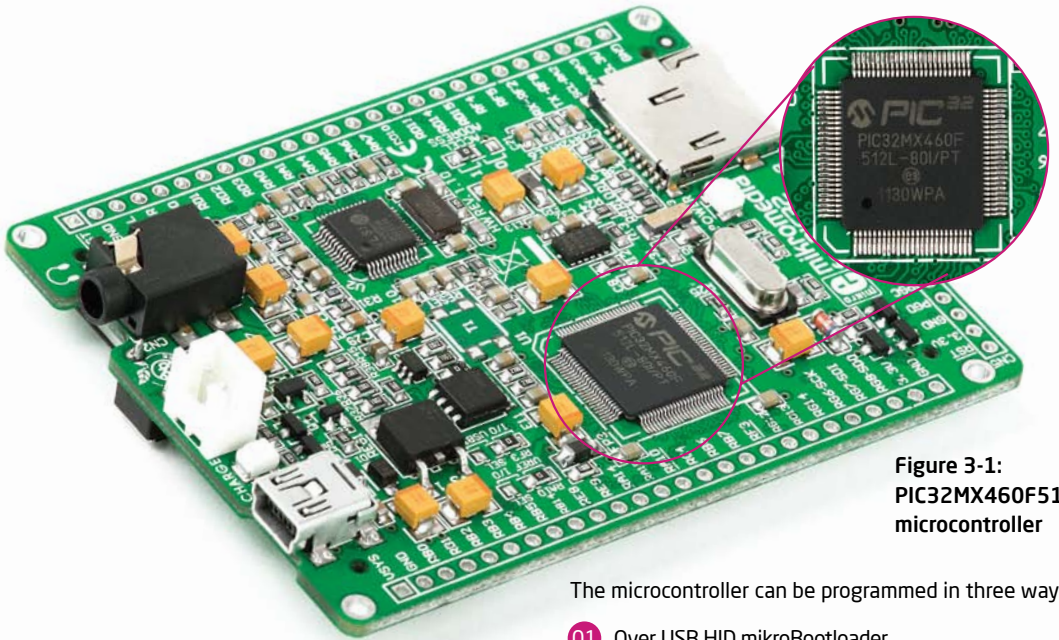


Figure 3-1: PIC32MX460F512L microcontroller

The microcontroller can be programmed in three ways:

01 Over USB HID mikroBootloader

02 Using mikroProg™ external programmer

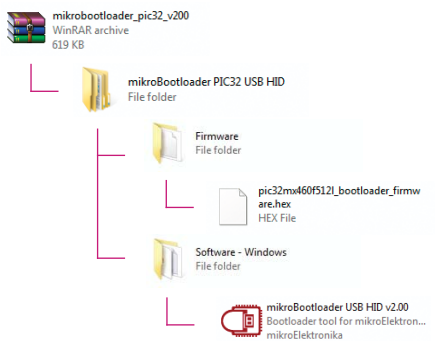
03 Using ICD2/3 external programmer

Programming with mikroBootloader

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

http://www.mikroe.com/downloads/get/1605/mikrobootloader_pic32_v200.zip

After the mikroBootloader software is downloaded, unzip it to desired location and start it.



step 1 – Connecting mikromedia

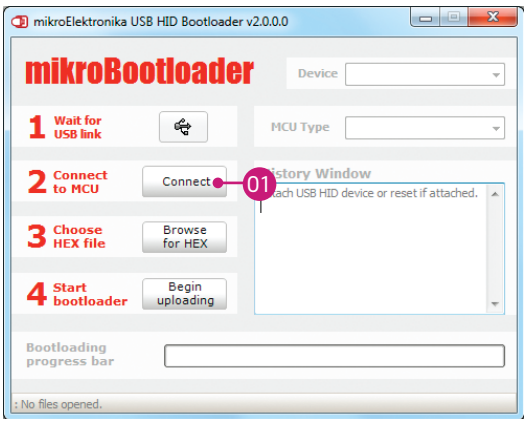


Figure 3-2: USB HID mikroBootloader window

01 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 existing microcontroller program will execute.

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

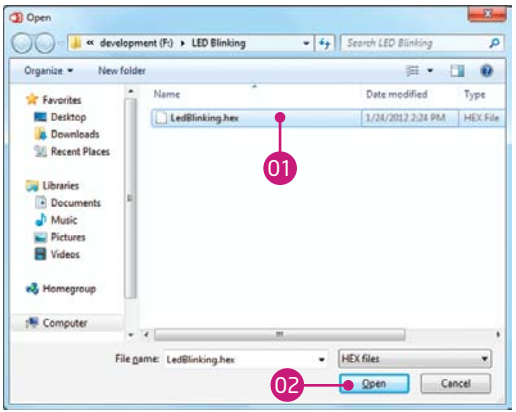


Figure 3-4: Selecting HEX

01 Select .HEX file using open dialog window.

02 Click the **Open** button.

step 4 - Uploading .HEX file

Figure 3-5: Begin uploading

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

Figure 3-6: Progress bar

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

step 5 - Finish upload

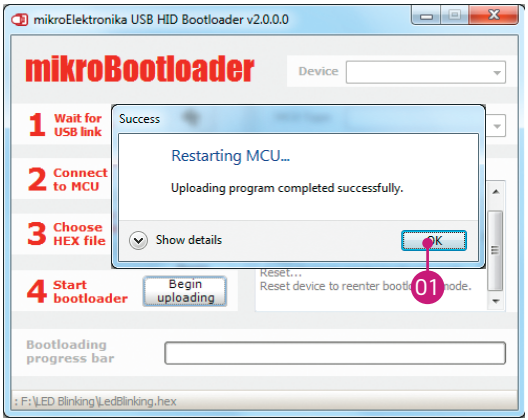


Figure 3-7: Restarting MCU

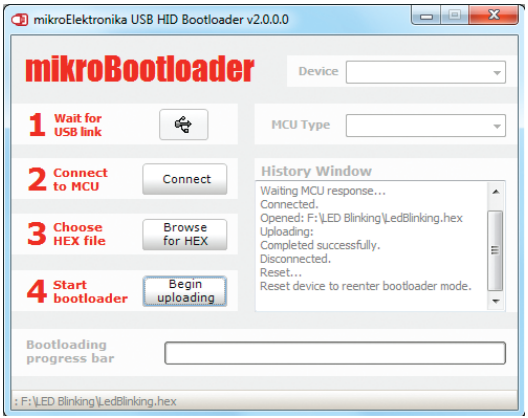


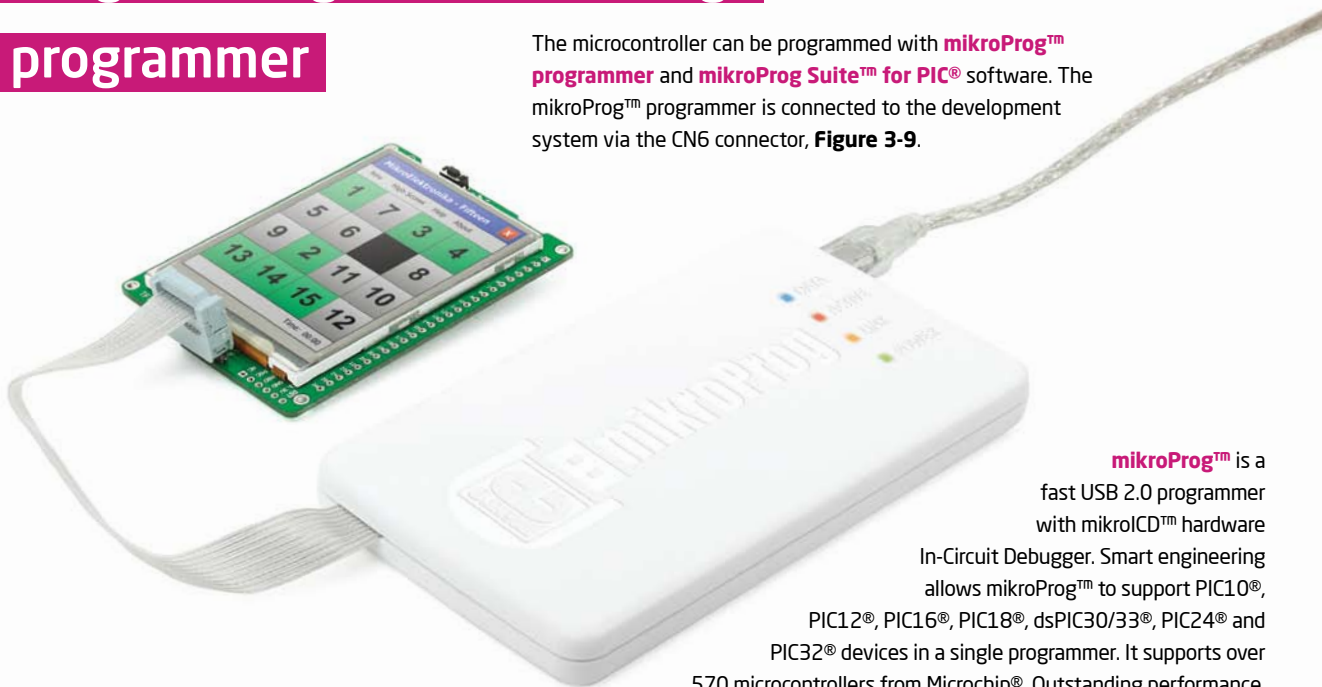
Figure 3-8: mikroBootloader ready for next job

01 Click **OK** button after the uploading process is finished

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

Programming with mikroProg™ programmer

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



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 it's key features.

Figure 3-9:
Connecting mikroProg™ to mikromedia™

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.

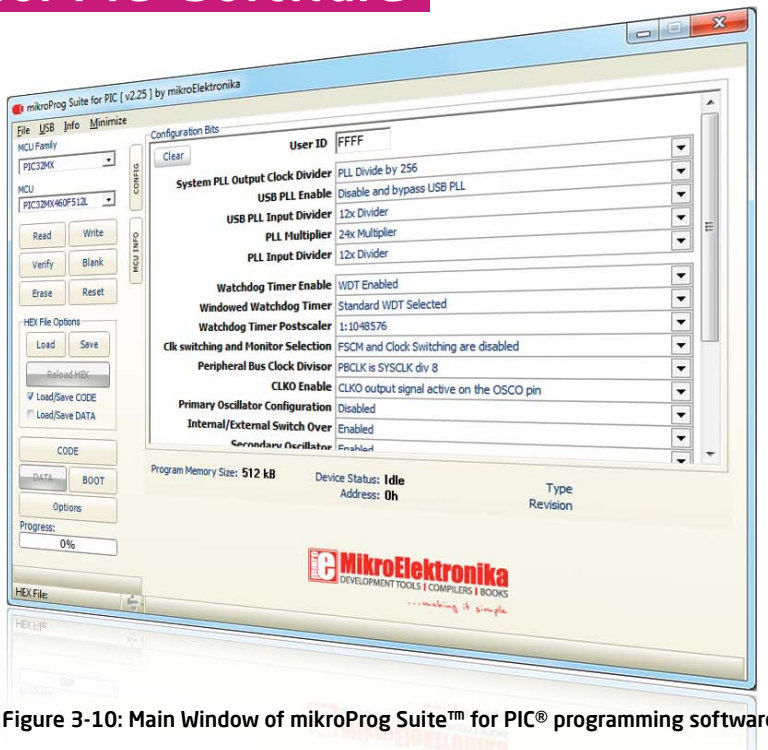


Figure 3-10: Main Window of mikroProg Suite™ for PIC® programming software

Programming with ICD2® or ICD3® programmer

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

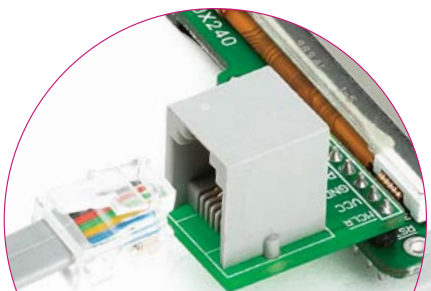


Figure 3-11: Placing ICD2® connector

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**.

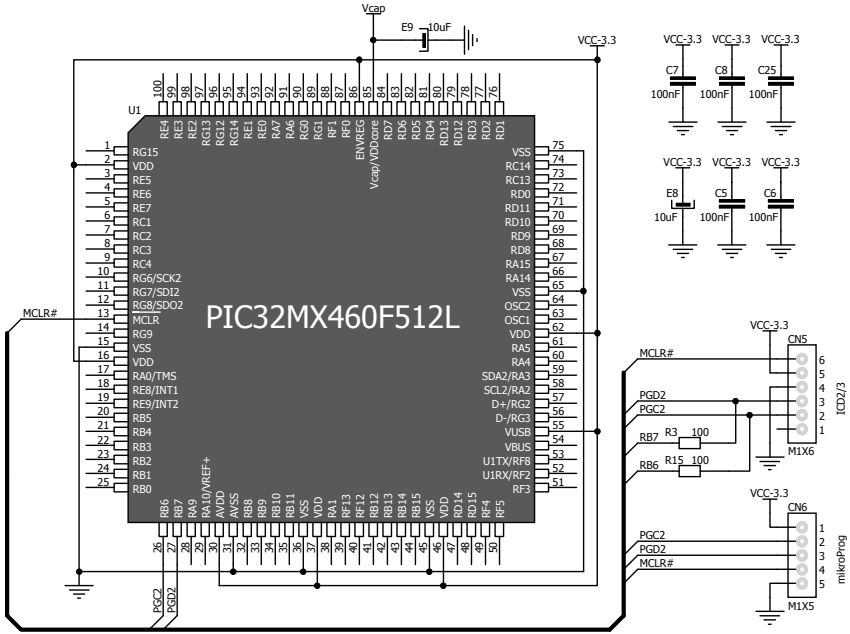
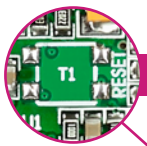


Figure 3-13: mikroProg™ & ICD2 / ICD3 programmer connection schematic

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**.

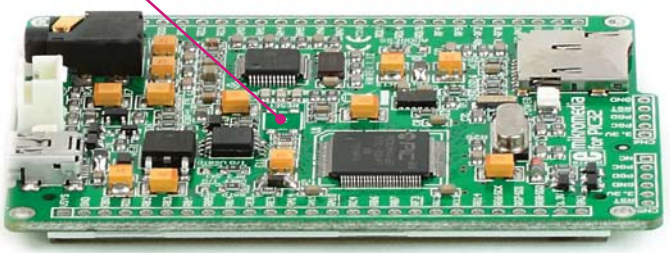


Figure 4-1: Location of additional reset button

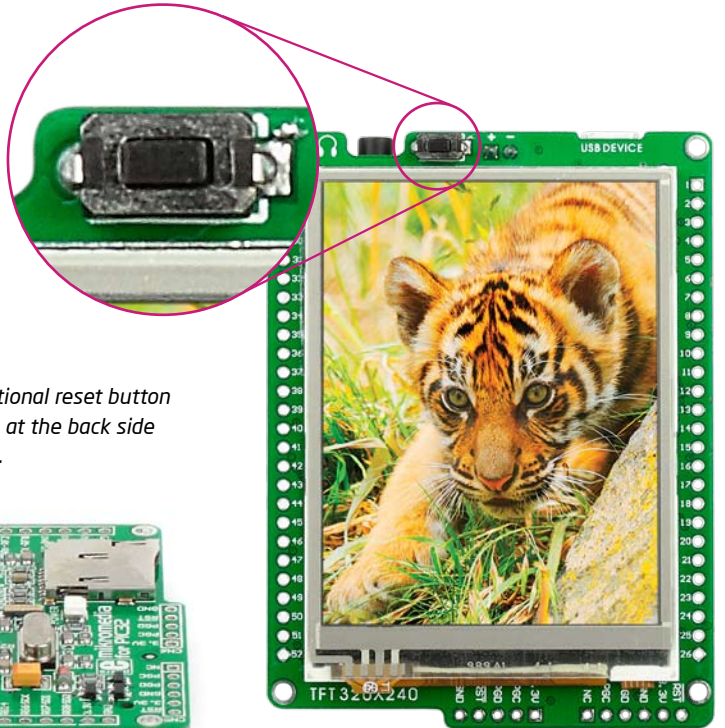


Figure 4-2: Frontal reset button

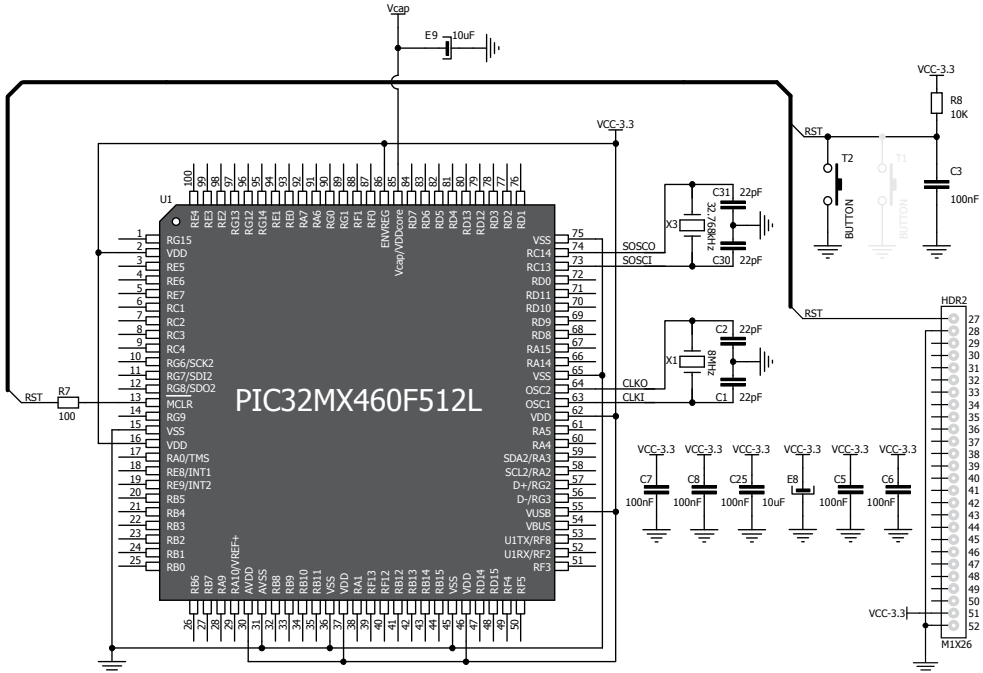


Figure 4-3: Reset circuit schematic

5. Crystal oscillator

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.

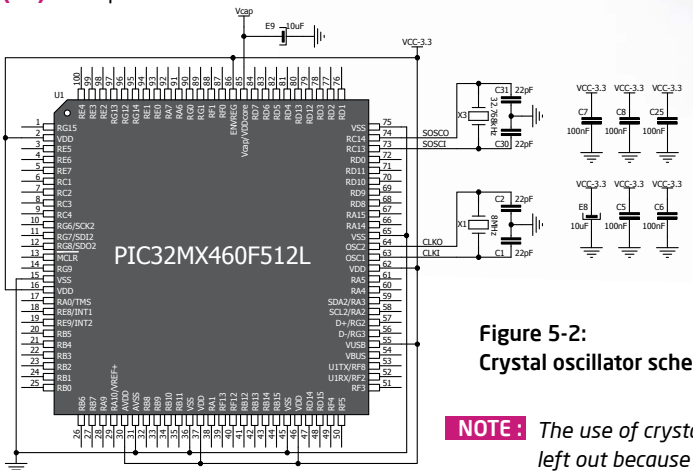


Figure 5-2: Crystal oscillator schematic

Figure 5-1: External crystal oscillator (X1)

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

6. 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.

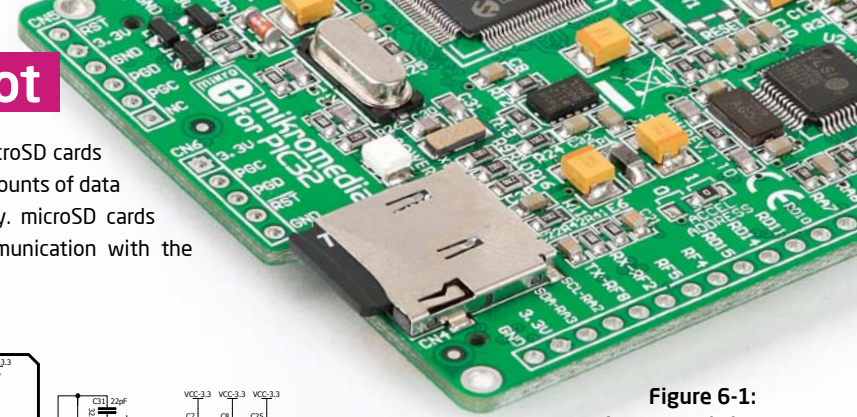


Figure 6-1:
microSD card slot

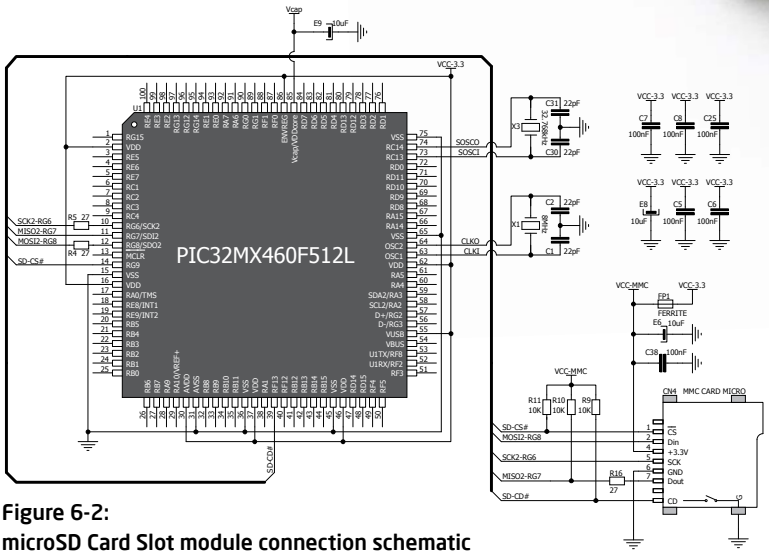


Figure 6-2:
microSD Card Slot module connection schematic

Figure 6-3:
Inserting microSD card

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

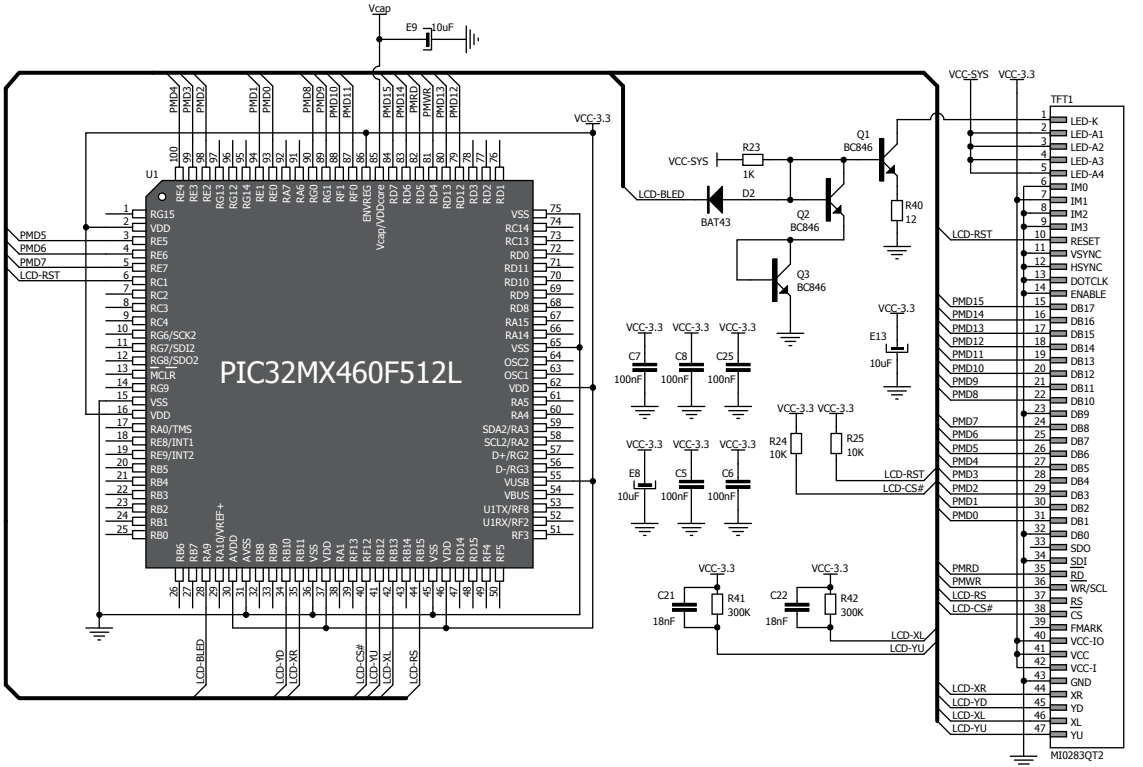


Figure 7-2: Touch Screen connection schematic

8. Audio Module

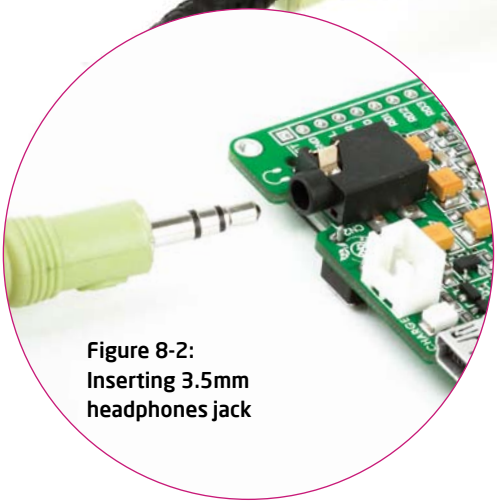


Figure 8-2:
Inserting 3.5mm
headphones jack

Figure 8-1:
On-board VS1053
MP3 codec

The mikromedia for PIC32® features 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**).

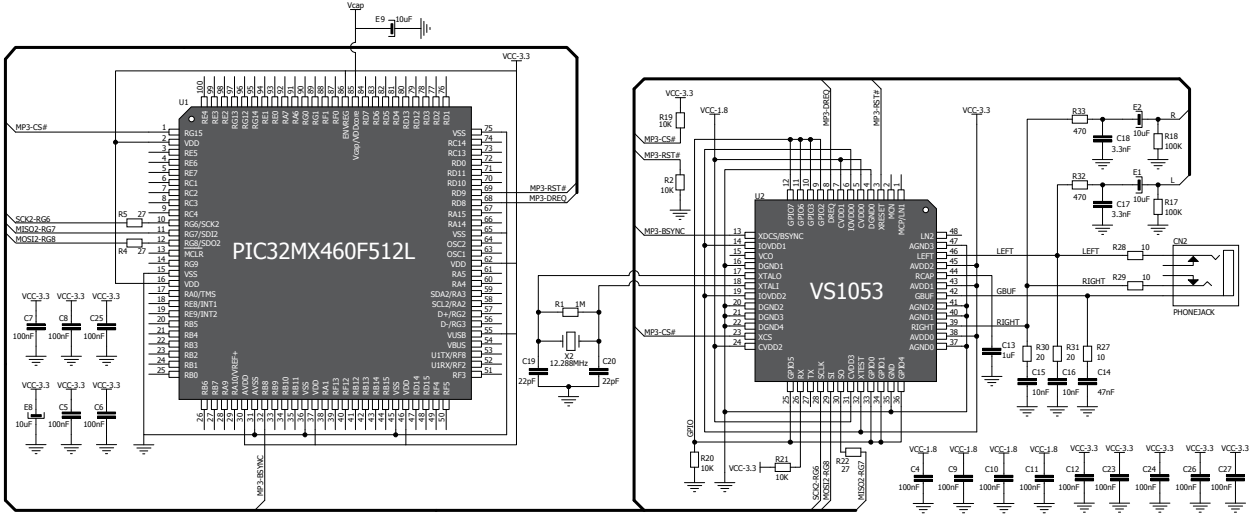


Figure 8-3: Audio module connection schematic

9. USB connection

PIC32MX460F512L microcontroller has 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.

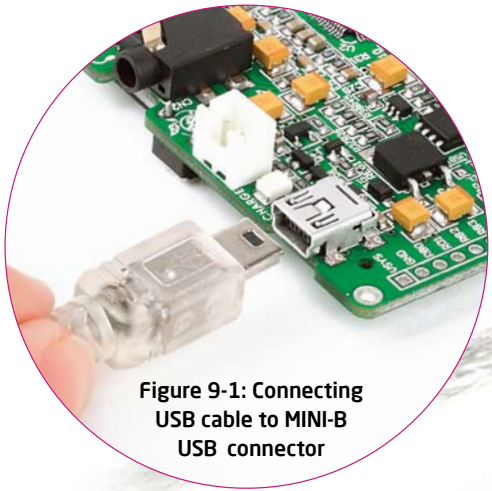


Figure 9-1: Connecting USB cable to MINI-B USB connector

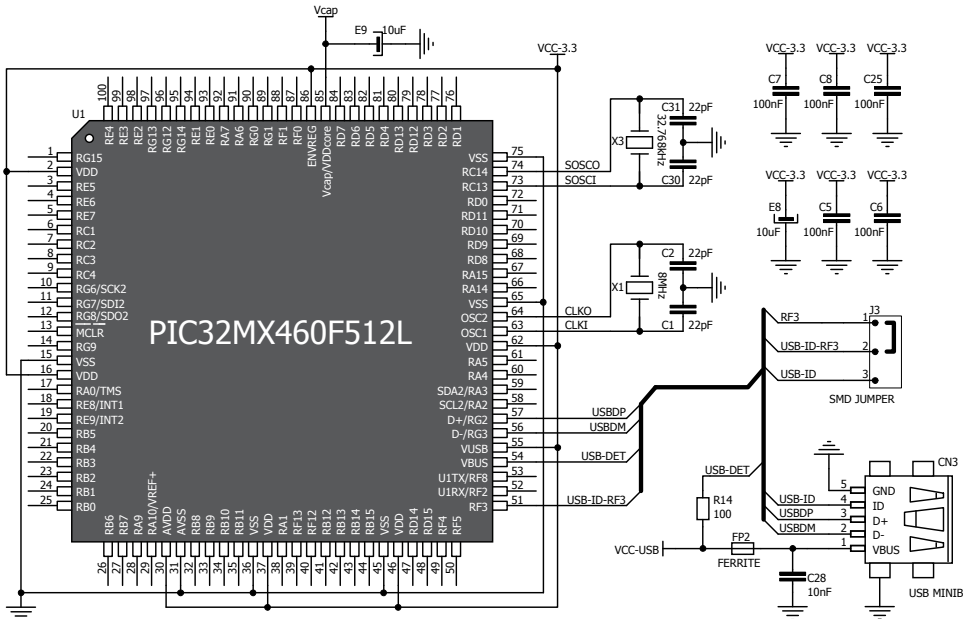
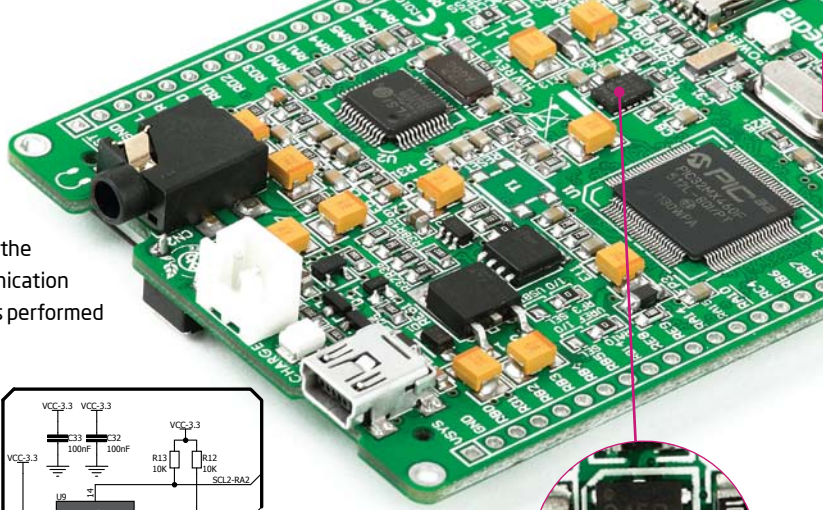


Figure 9-2: USB module connection schematic

10. Accelerometer

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.



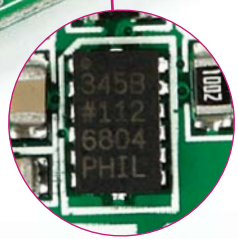
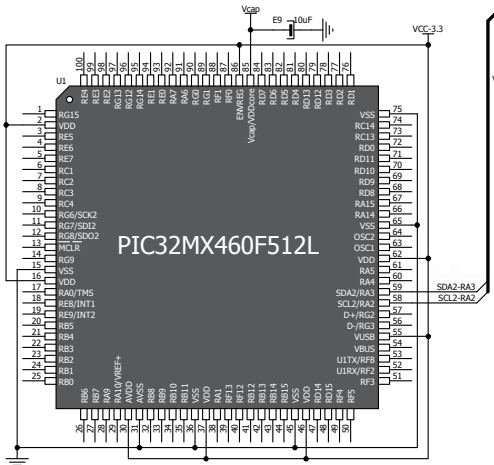
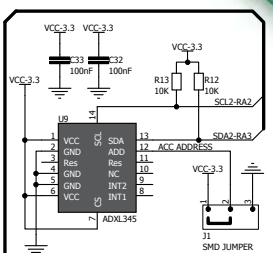


Figure 10-1: Accelerometer module





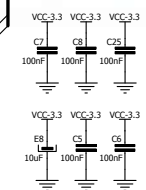


Figure 10-2: Accelerometer connection schematic

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.

11. Flash Memory

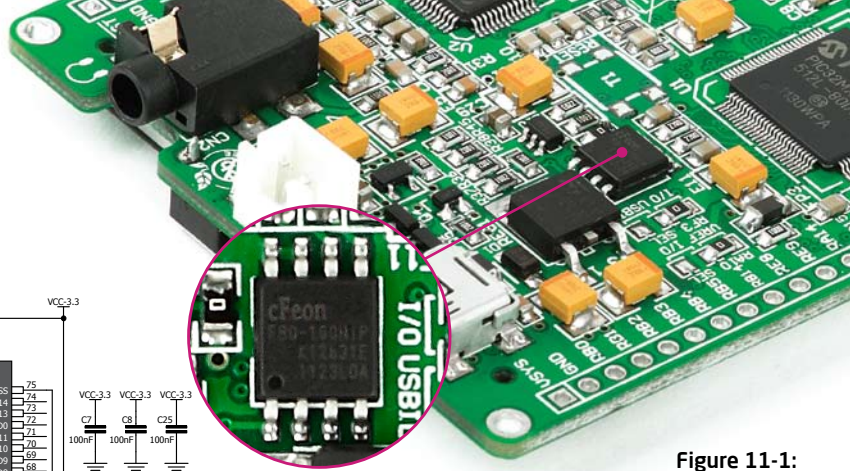


Figure 11-1:
Flash memory module

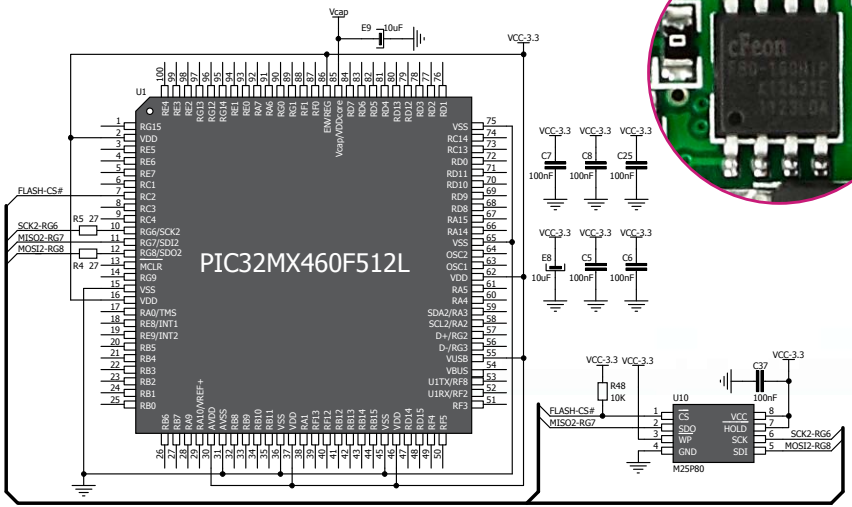


Figure 11-2:
Flash memory module connection schematic

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**).

12. Pads

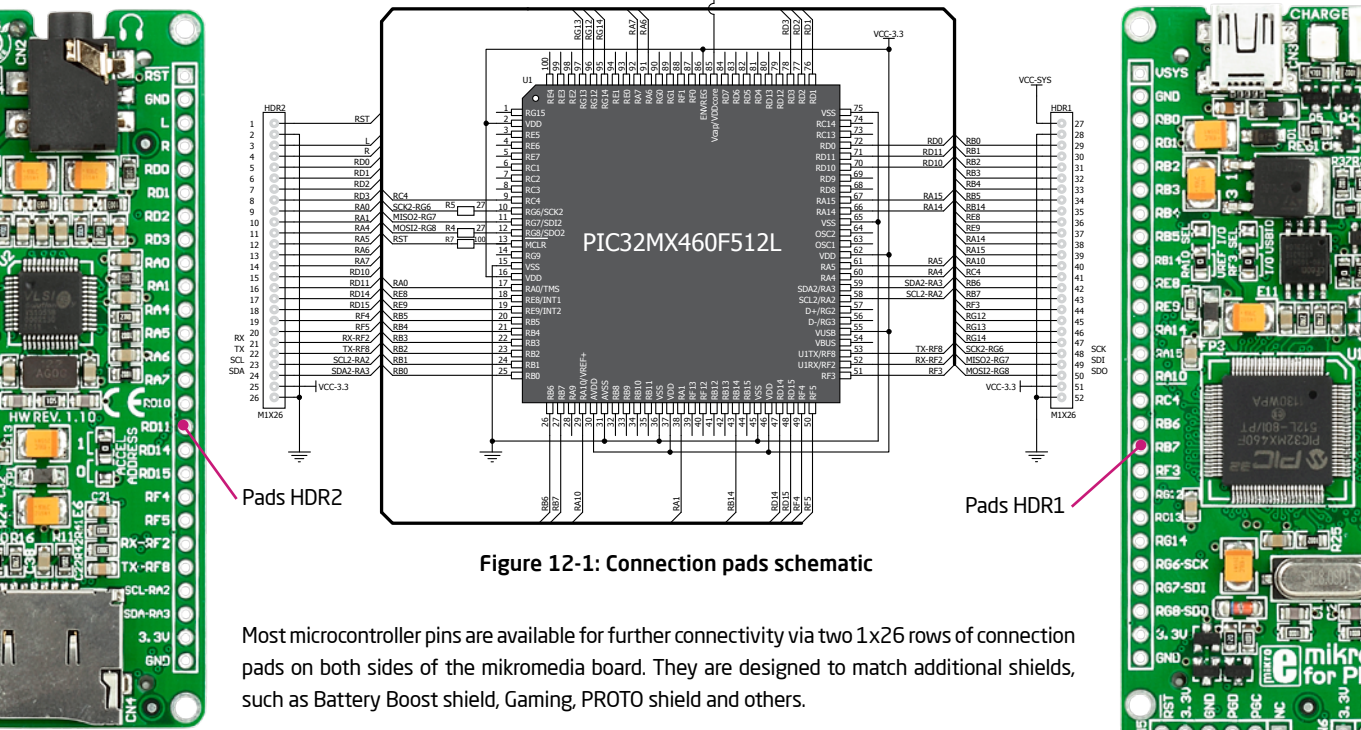
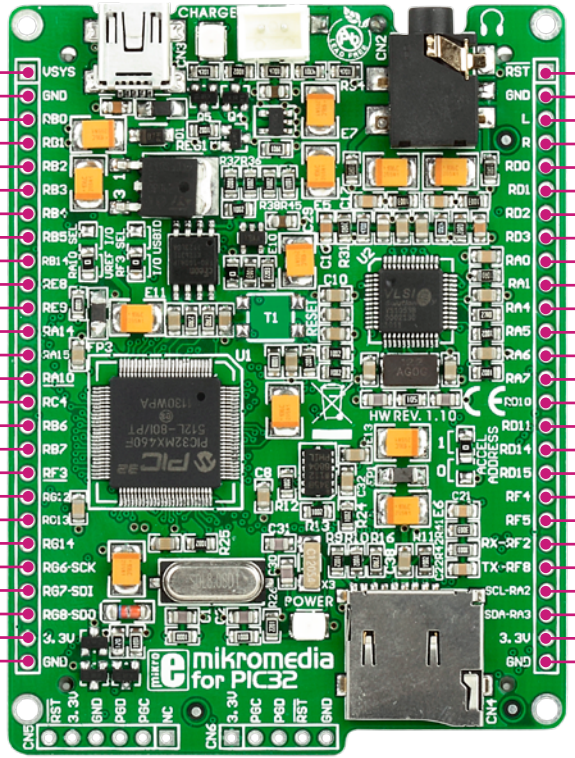


Figure 12-1: Connection pads schematic

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

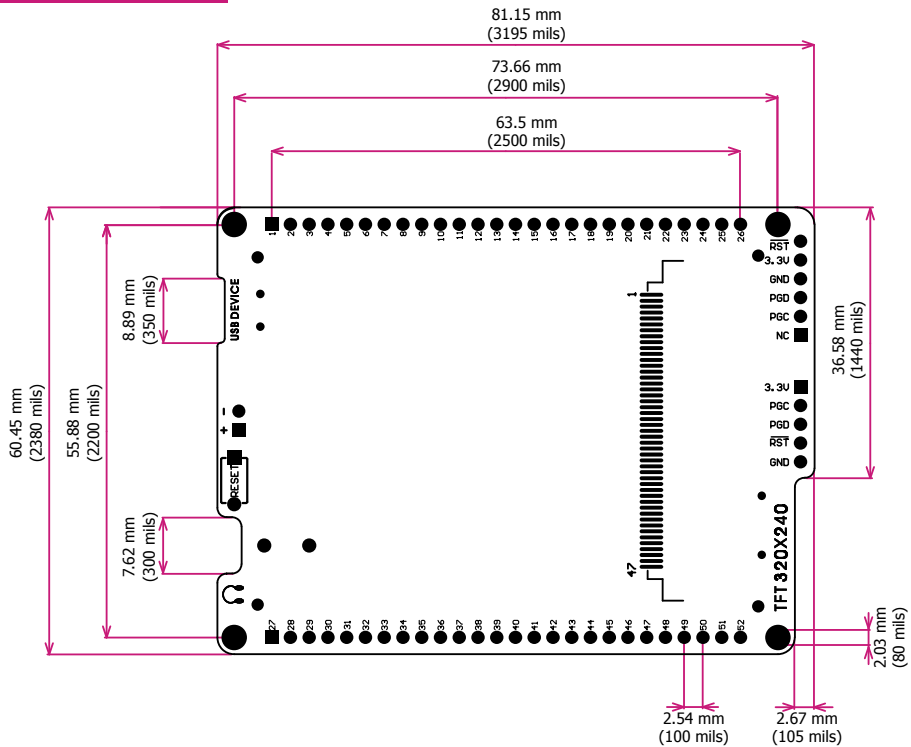


5V power supply	VSYS	RST	Reset pin
	GND	GND	Reference Ground
Analog Lines	RB0	L	left ch.
	RB1	R	right ch. (audio out)
	RB2	RD0	
	RB3	RD1	
	RB4	RD2	PWM lines
	RB5	RD3	
	RB14	RA0	
Interrupt Lines	RE8	RA1	
	RE9	RA4	
	RA14	RA5	
	RA15	RA6	
	RA10	RA7	
	RC4	RD10	Digital I/O lines
	RB6	RD11	
Digital I/O lines	RB7	RD14	
	RF3	RD15	
	RG12	RF4	
	RG13	RF5	
	RG14	RF2	RX (UART)
SPI2	SCK2 / RG6	RF8	TX (UART)
	SDI2 / RG7	RA2	SCL2 (I²C)
	SDO2 / RG8	RA3	SDA2 (I²C)
3.3V power supply	3.3V	3.3V	3.3V power supply
Reference Ground	GND	GND	Reference Ground

Pin functions — Pin functions

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

14. Dimensions

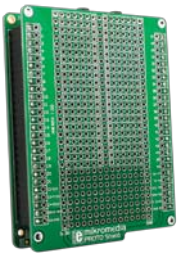


15. mikromedia accessories

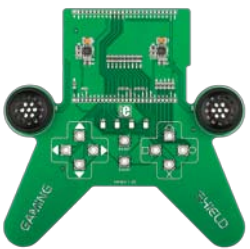
We have prepared a set of extension boards pin-compatible with your mikromedia, which enable you to easily expand your board basic functionality. We call them mikromedia shields. But we also offer other accessories, such as Li-polymer battery, stacking headers, wire jumpers and more.

01 Connect shield

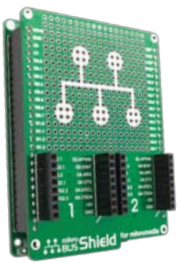
02 BatteryBoost shield



03 PROTO shield



04 Gaming shield



05 mikroBUS shield

06 Li-Polimer battery

07 Wire Jumpers

What's next?

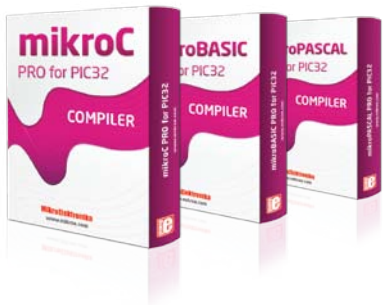
You have now completed the journey through each and every feature of mikromedia for PIC32® board. You got to know it's modules and organization. Now you are ready to start using your new board. We are suggesting several steps which are probably the best way to begin. We invite you to join the users of mikromedia™ 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 PIC32® 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 TFT 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 TFT 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 TFT is also available on the Product DVD.

Notes:

Notes:

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