# mikromedia™

## for PIC18FJ®

Compact development system rich with on-board peripherals for all-round multimedia development on PIC18F87J50 device.

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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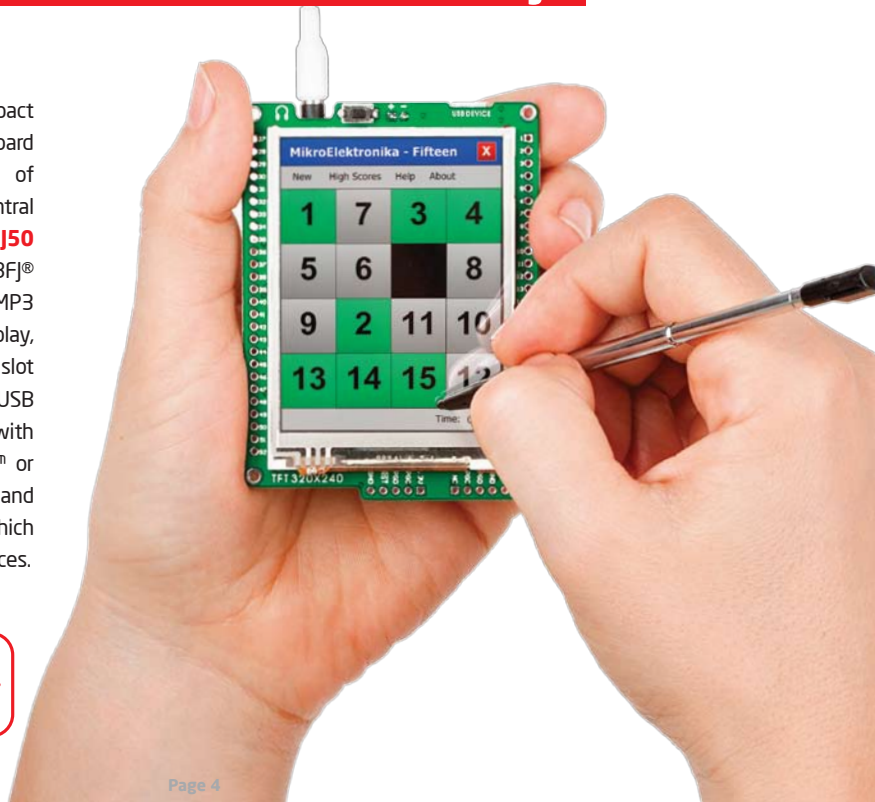
# Introduction to mikromedia™ for PIC18FJ®

The **mikromedia™ for PIC18FJ®** 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 8-bit **PIC18F87J50** microcontroller. The mikromedia™ for PIC18FJ® features integrated modules such as stereo MP3 codec, **TFT 320x240 touch screen** display, accelerometer, USB connector, MMC/SD card slot and other. It comes pre-programmed with USB 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 PIC18FJ® development system

03 DVD with documentation and examples

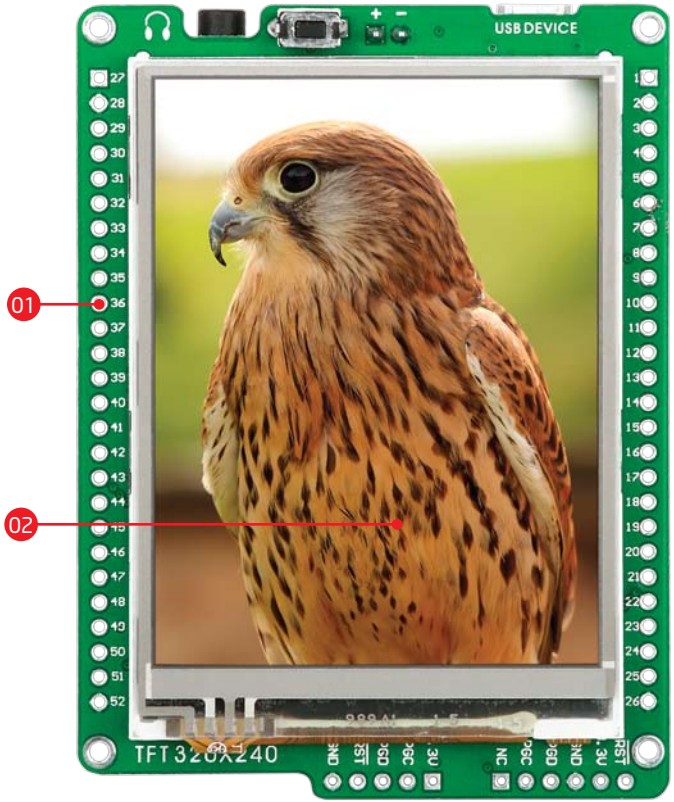
04 mikromedia™ for PIC18FJ® user's guide

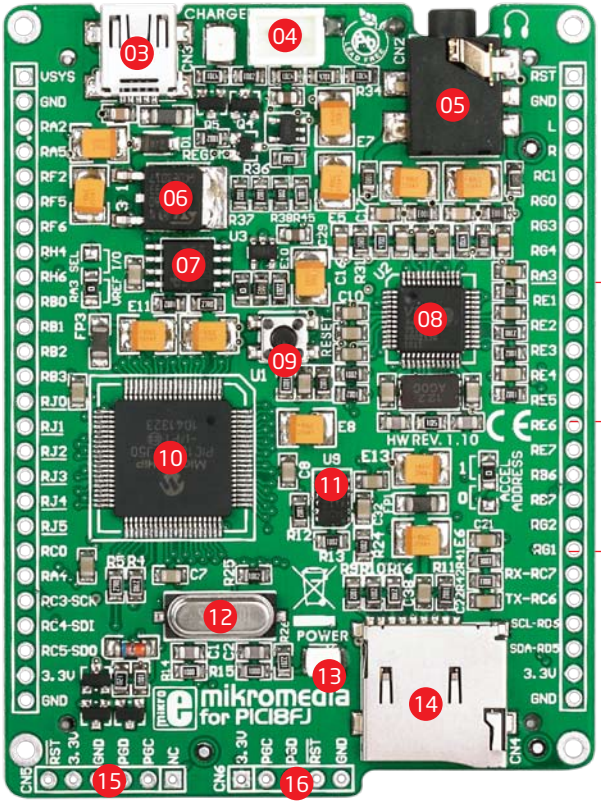
05 mikromedia™ for PIC18FJ® schematic

06 USB cable

# Key Features

01 Connection Pads
02 TFT 320x240 display
03 USB MINI-B connector
04 LI-Polymer battery connector
05 3.5mm headphone connector
06 Power supply regulator
07 Serial Flash memory
08 VS1053 Stereo mp3 coder/decoder
09 RESET button
10 PIC18F87J50 microcontroller
11 Accelerometer
12 Crystal oscillator
13 Power indicator LED
14 microSD Card Slot
15 ICD2/3® connector
16 mikroProg™ connector






# System Specification

**power supply**

Over a USB cable (5V DC)

**power consumption**

53 mA with erased MCU

(when on-board modules are inactive)

**board dimensions**

8 x 6cm (3.14 x 2.36 inch)

**weight**

~45,5g (0.10 lbs)

# 1. USB power supply

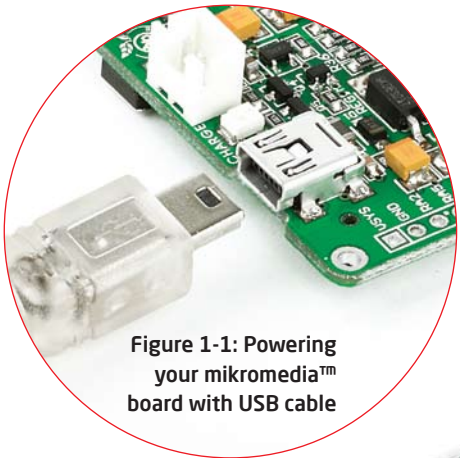


Figure 1-1: Powering your mikromedia™ board with USB cable

You can apply power supply to the board using **MINI-B USB** cable provided with the board. On-board voltage regulators will make sure to regulate the appropriate voltage levels to each part of the board. Power LED will indicate the presence of power supply.

# 2. Battery power supply

**Figure 2-1:**
**Connecting Li-polymer battery to mikromedia™ board**

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. Charging current is ~250mA and charging voltage is 4.2V DC.

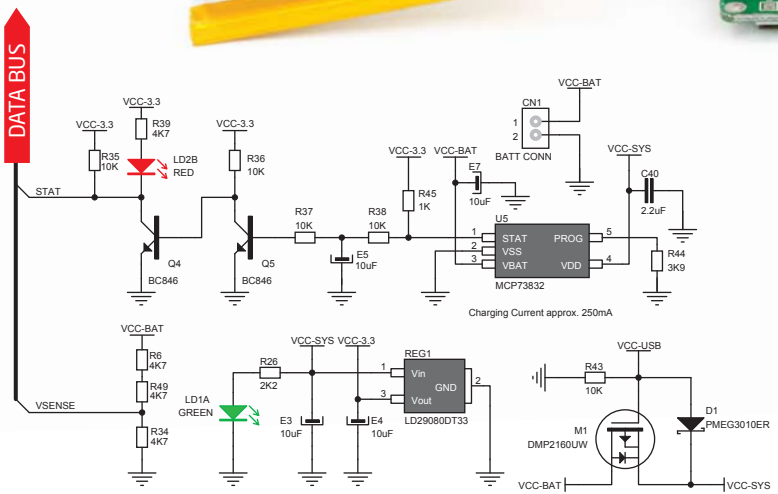
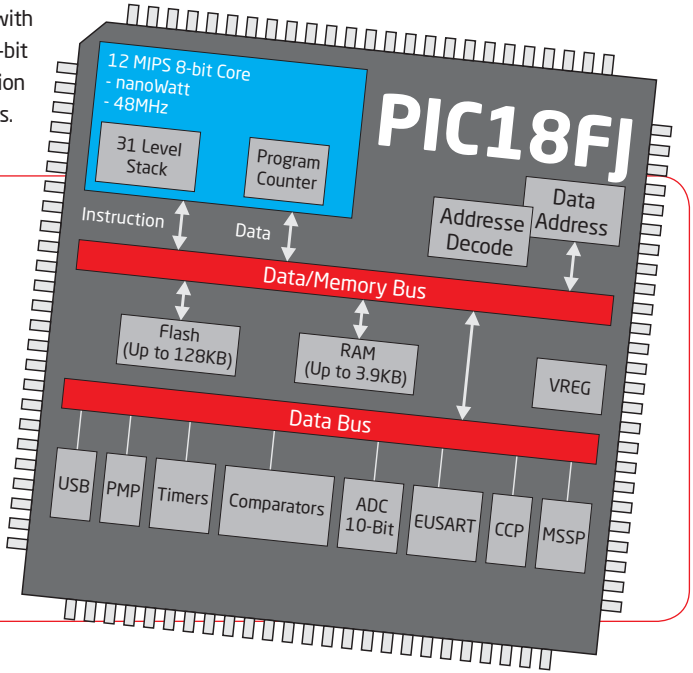



**Figure 2-2:**
**Battery charger and power management connection schematic**

# 3. Microcontroller PIC18F87J50

The mikromedia™ for PIC18FJ® development system comes with the **PIC18F87J50** microcontroller. This high-performance 8-bit microcontroller with its integrated modules and in combination with other on-board modules is ideal for multimedia applications.




## Key microcontroller features

- USB V2.0 Compliant SIE;
- Two External Clock modes, up to 48 MHz;
- Internal 31 kHz Oscillator, Tunable Internal Oscillator; 31 kHz to 8 MHz;
- 10-Bit, up to 12-Channel Analog-to-Digital (A/D);
- Address Capability of up to 2 Mbytes;
- 8-Bit or 16-Bit Interface;
- 12-Bit, 16-Bit and 20-Bit Addressing modes; etc.

# 4. Programming the microcontroller

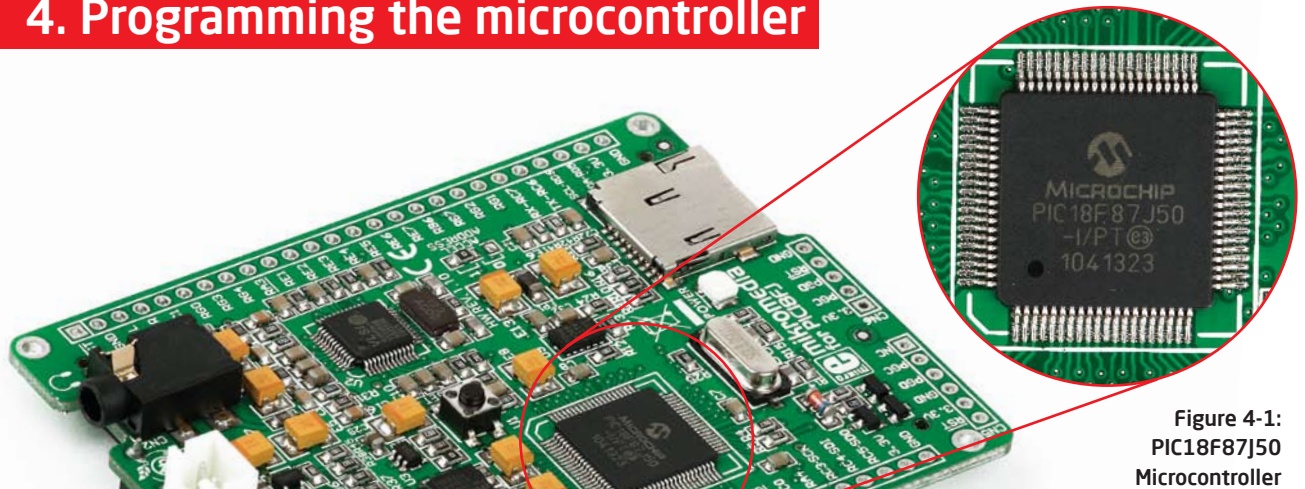



**Figure 4-1: PIC18F87J50 Microcontroller**

The microcontroller can be programmed in three ways:

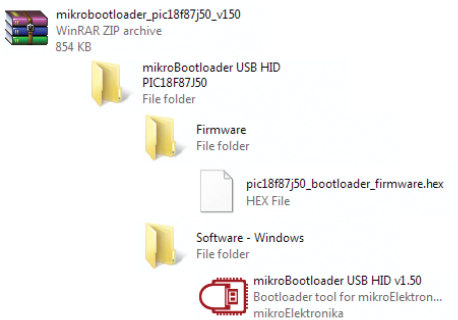
01 Via USB HID mikroBootloader
02 Using mikroProg™ external programmer
03 Using ICD2/3® external programmer

# Programming with mikroBootloader

You can program the microcontroller with bootloader which is preprogrammed into the device 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/eng/products/view/585/mikromedia-for-pic18fj/

After software is downloaded unzip it to desired location and start mikroBootloader USB HID software.




## step 1 – Connecting mikromedia

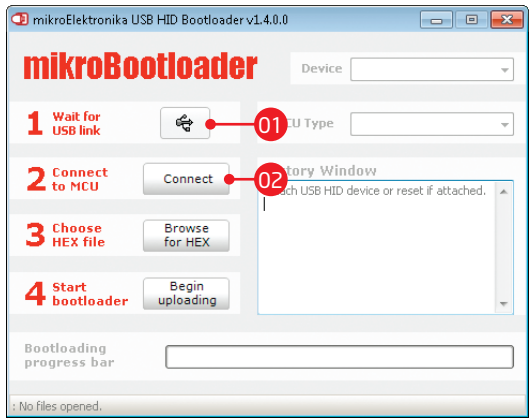



**Figure 4-2: mikroBootloader USB HID**

01 Connect mikromedia™ board with a PC via USB cable and USB icon will turn red.

02 Click the **Connect button** within 5s, otherwise existing microcontroller program will execute.

# step 2 - Browsing for .hex file

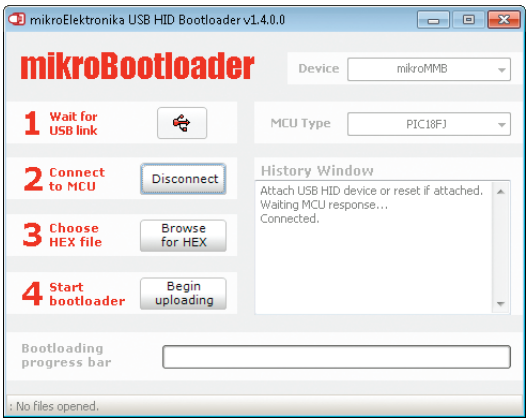



**Figure 4-3: Browse for HEX**

01 Click on **Browse for HEX button**

# step 3 - Select .hex file

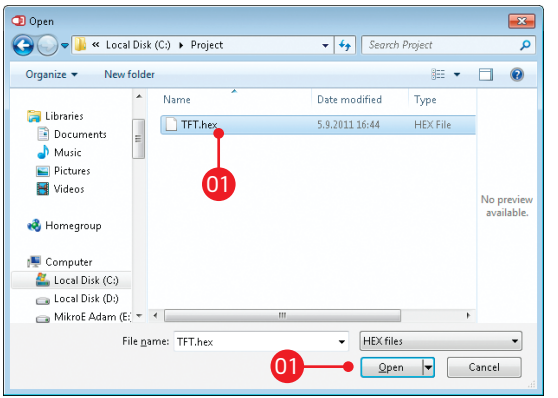



**Figure 4-4: Selecting HEX**

01 Select .hex file via open window

02 Click on **Open button**

# step 4 - .hex file uploading

**Figure 4-5: Begin uploading**

01 To start .hex file uploading click on **Begin uploading button**

**Figure 4-6: Progress bar**

01 You can monitor .hex file uploading via progress bar

# step 5 - Finish upload

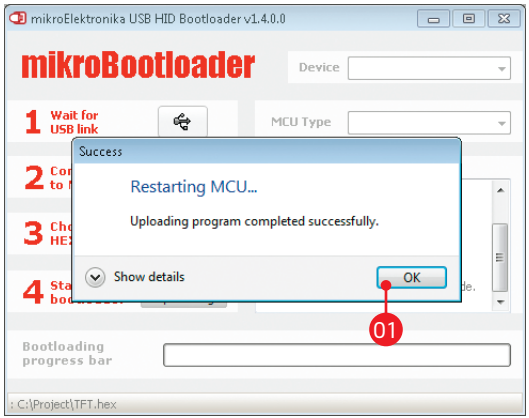



Figure 4-7: Restarting MCU

Figure 4-8: mikroBootloader ready for next job

01 To finish uploading click on **OK button**

# Programing with mikroProg™ programmer

The microcontroller can be programmed with **mikroProg™ programmer** and **mikroProg Suite™ fo PIC®** software. The mikroProg™ programmer is connected to the development system via the CN6 connector, Figure 4-9.

**Figure 4-9:**
**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 it's key features.

# mikroProg Suite™ for PIC® Software

**mikroProg™** programmer requires special programming software called **mikroProg Suite™ for PIC®**. This software is used for programming ALL of 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.

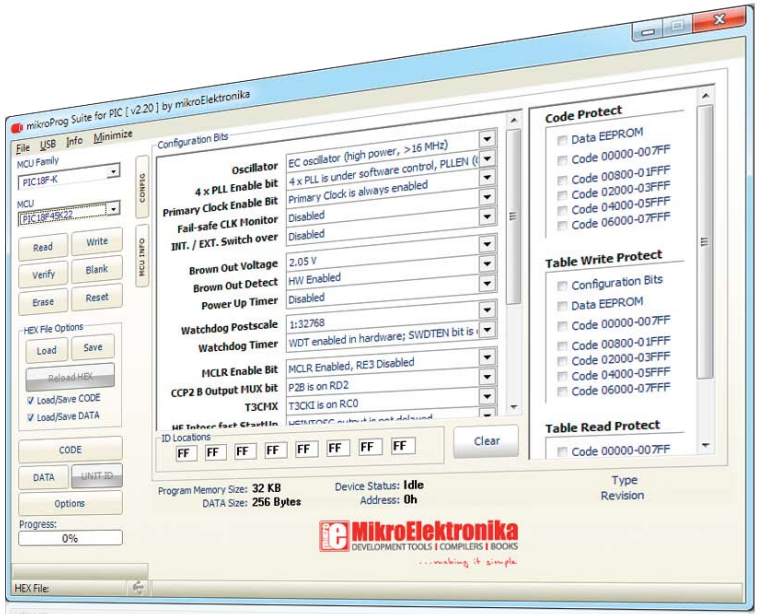



**Figure 4-10: Main Window of mikroProg Suite™ for PIC® programming software**

# Programing with ICD2® or ICD3® programmer

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

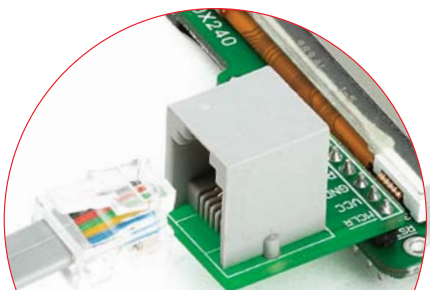


**Figure 4-11: Placing ICD2® connector**

**Figure 4-12: Connecting ICD2® or ICD3® programmer**

In order to enable the ICD2® and ICD3® programmers to be connected to the development system, it is necessary to provide the appropriate connector such as the **ICD2 CONNECTOR BOARD**. This connector should be first soldered on the CN5 connector, Figure 4-12. Then you should plug the ICD2® or ICD3® programmer into it, Figure 4-11.

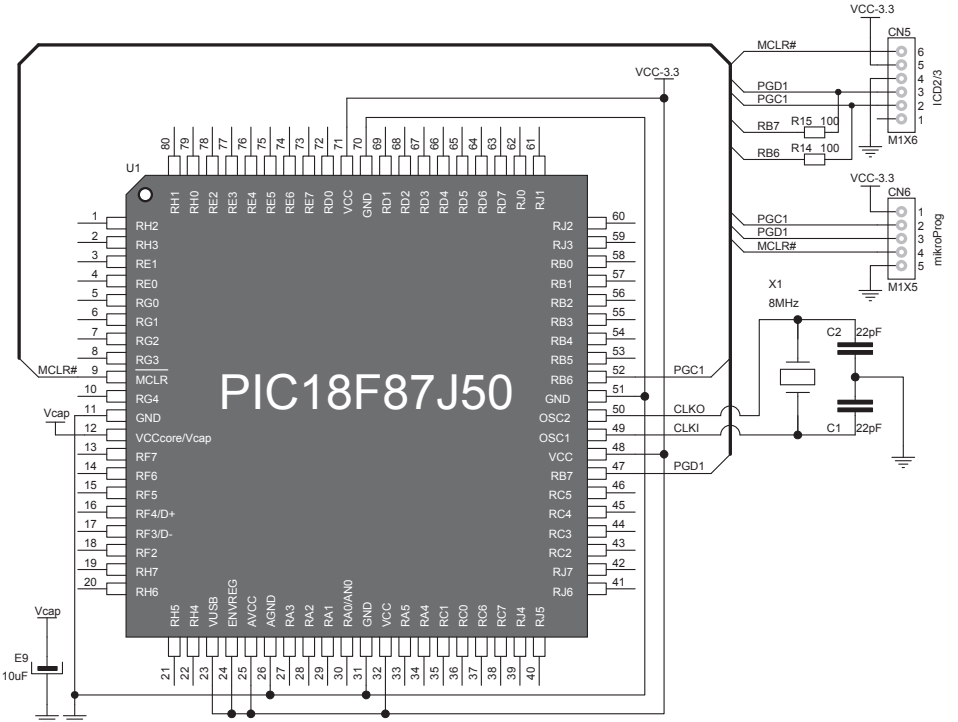



**Figure 4-13: mikroProg™ and ICD2®/ICD3® programmer connection schematic**

# 5. Crystal oscillator

Board is equipped with **8Mhz crystal oscillator** circuit that provides external clock to the microcontroller OSC 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.

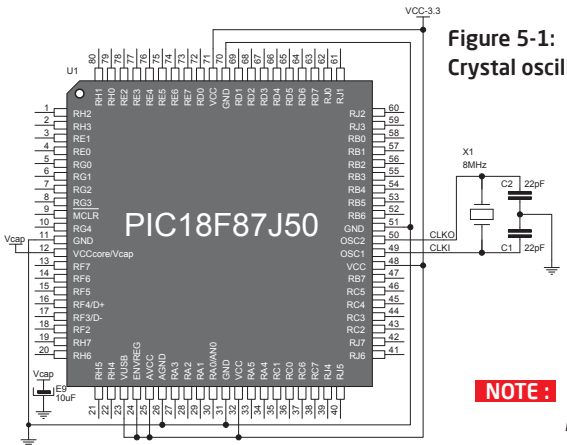



**Figure 5-1:**
**Crystal oscillator schematic**

**Figure 5-2:**
**Crystal oscillator module**

**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.

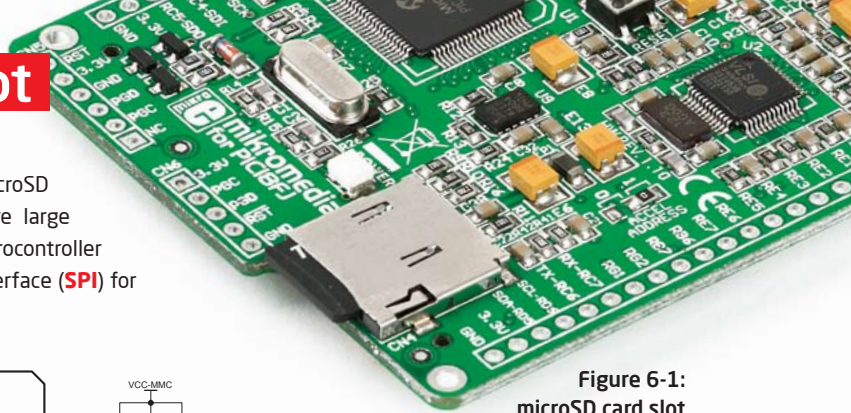


Figure 6-1:
microSD card slot

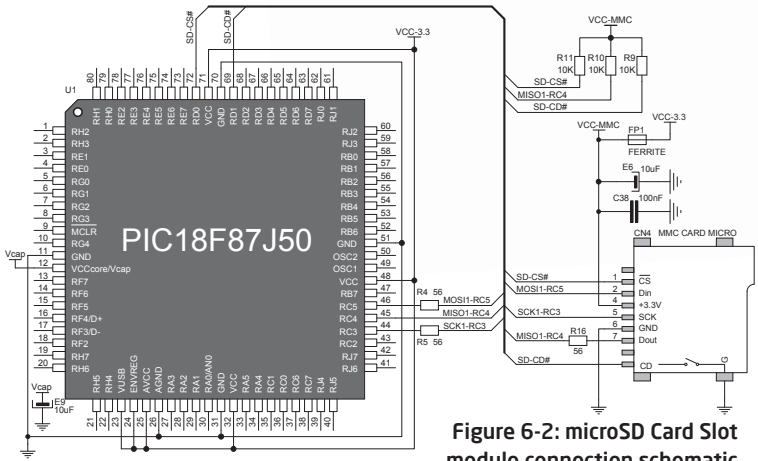



Figure 6-2: microSD Card Slot
module connection schematic

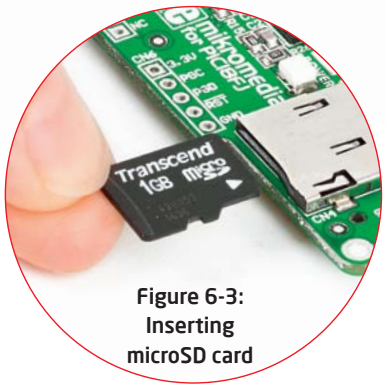



Figure 6-3:
Inserting
microSD card

# 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 data in **262.000** different **colors**.

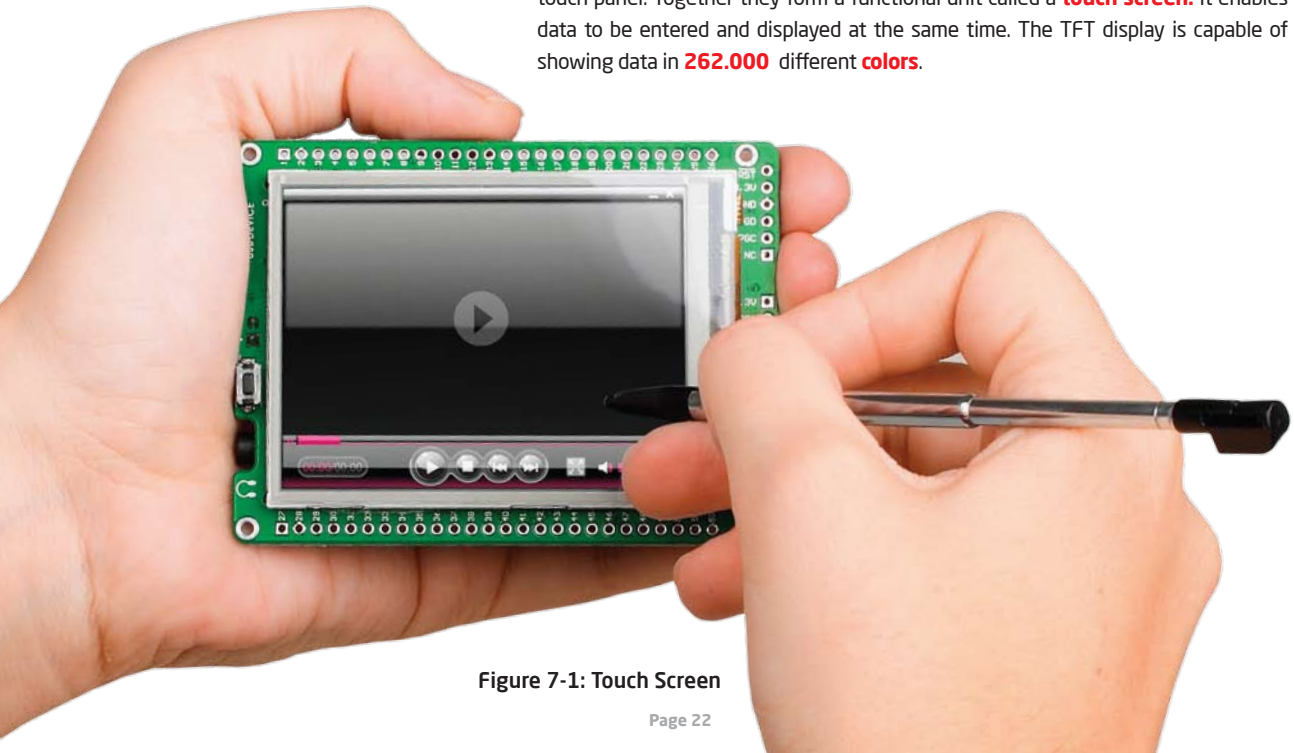


**Figure 7-1: Touch Screen**

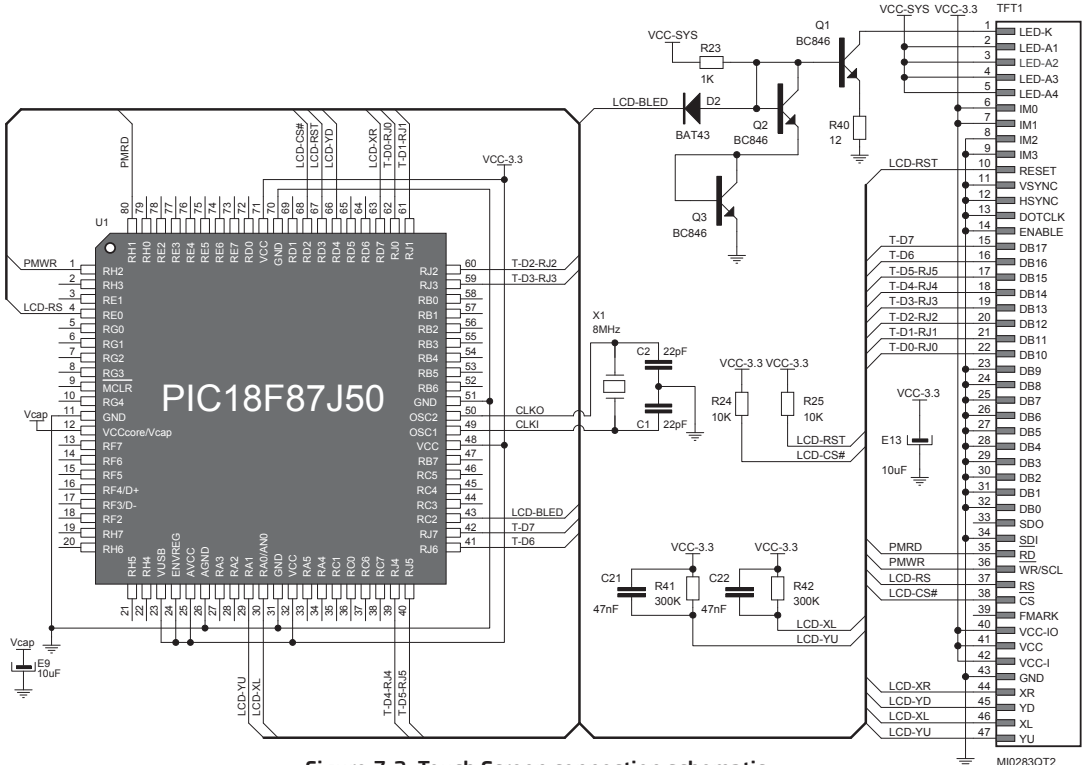



**Figure 7-2: Touch Screen connection schematic**

# 8. Audio Module

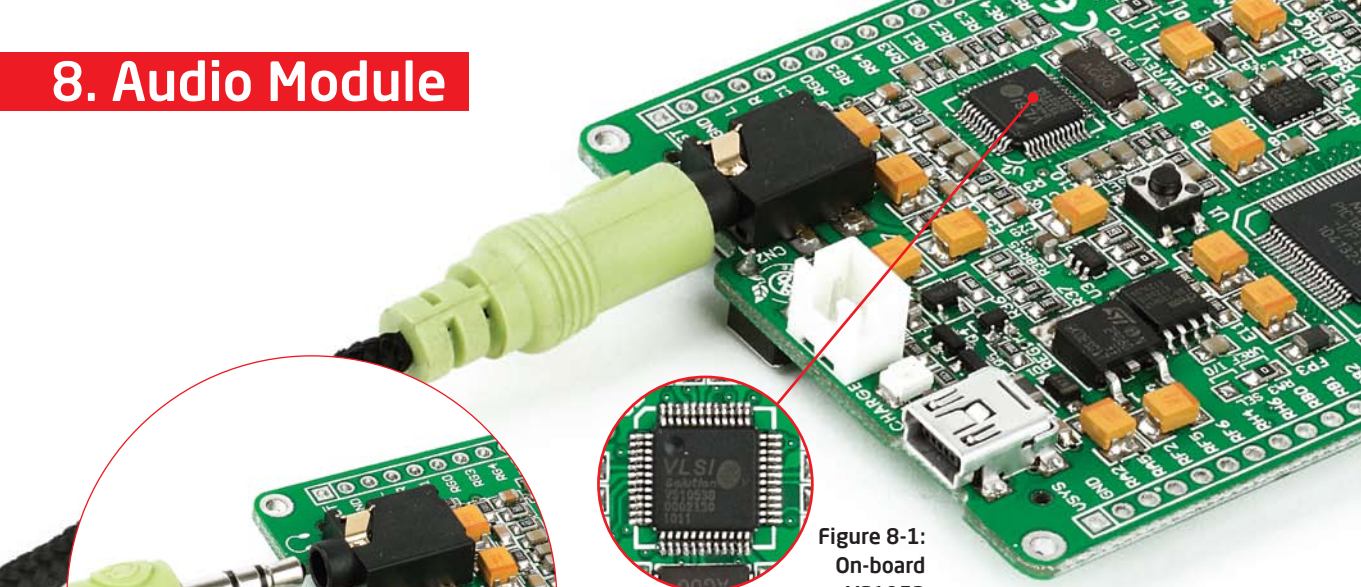


Figure 8-1: On-board VS1053 MP3 codec

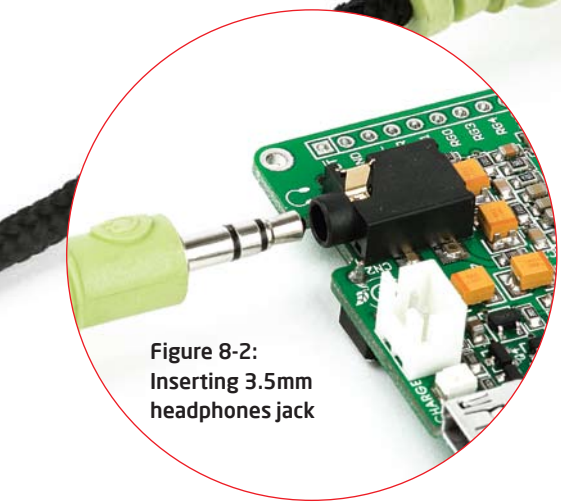


Figure 8-2: Inserting 3.5mm headphones jack

The mikromedia™ for PIC18FJ® features MP3 codec audio controller **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**).

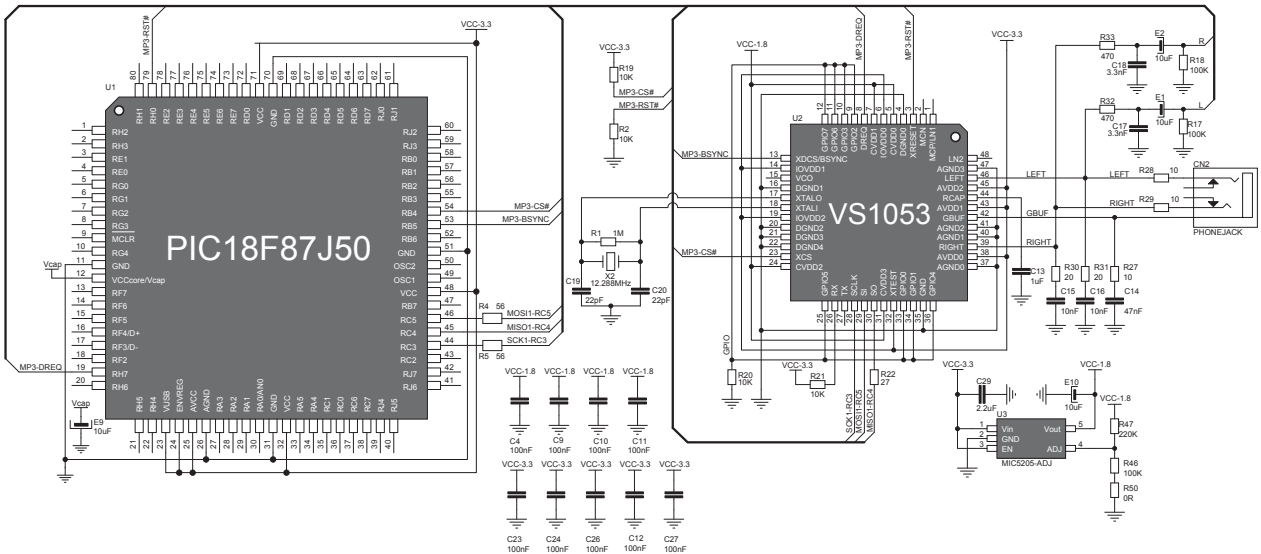



**Figure 8-3: Audio module connection schematic**

# 9. USB connection

**PIC18F87J50** microcontroller has integrated USB module, which enables you to implement USB communication functionality of your mikromedia board. Connection with target USB host is done over MINI-B USB connector which is positioned next to the battery connector.

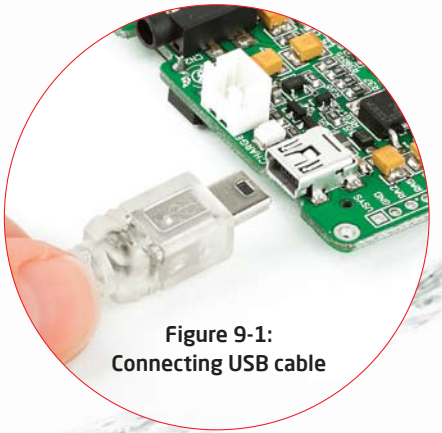


**Figure 9-1:**
**Connecting USB cable**

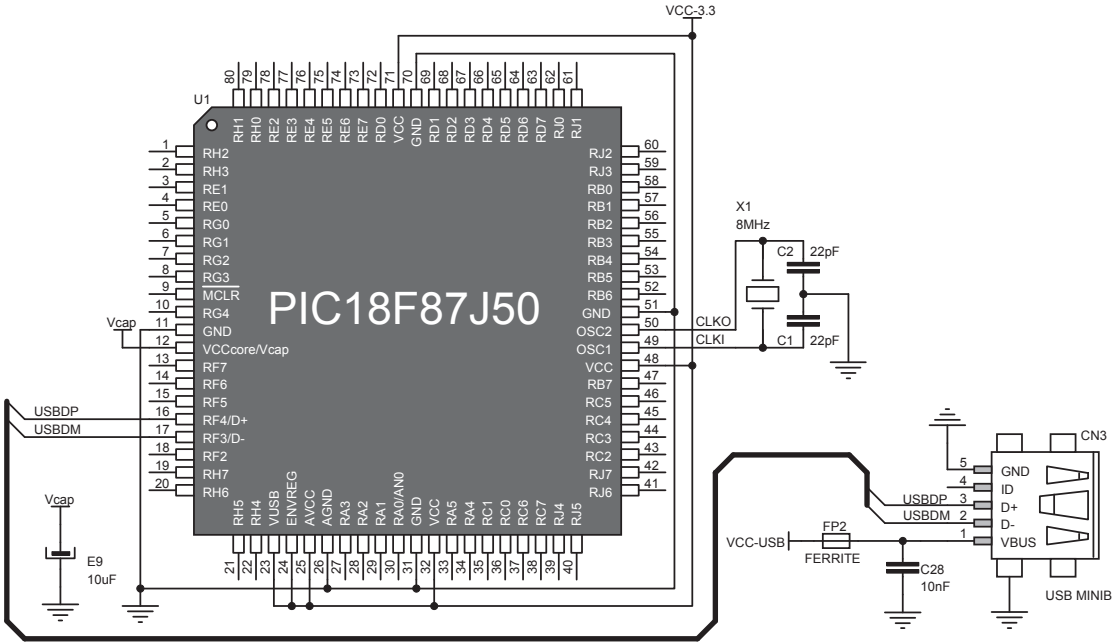



**Figure 9-2: USB module connection schematic**

# 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 over the **I2C** interface.

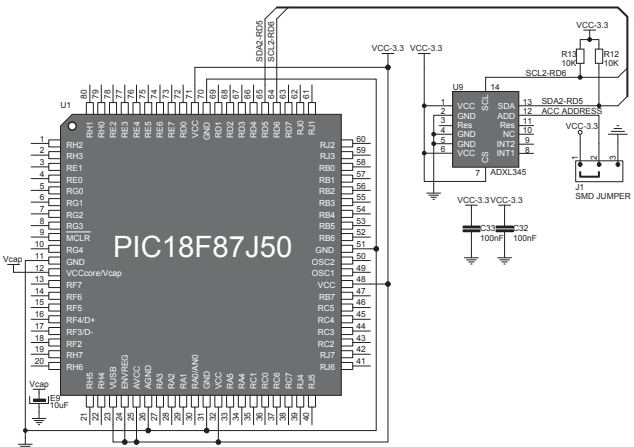



**Figure 10-2: Accelerometer connection schematic**

**Figure 10-1: Accelerometer module**

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

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**).

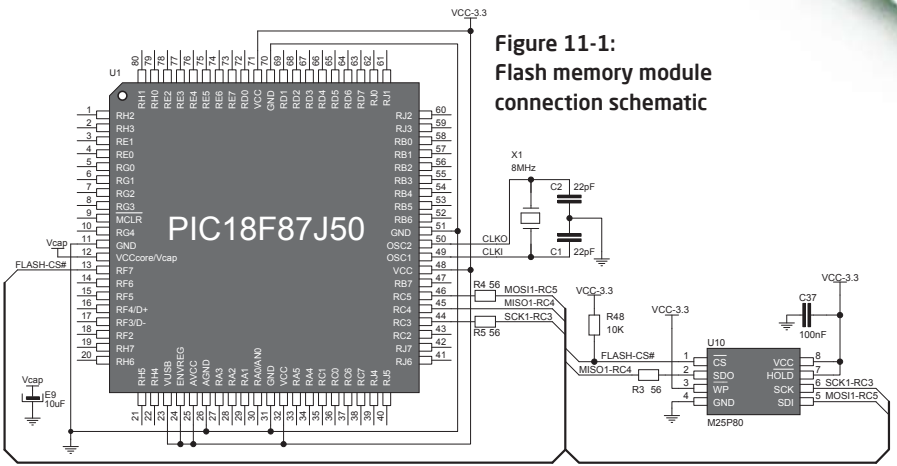



**Figure 11-1: Flash memory module connection schematic**

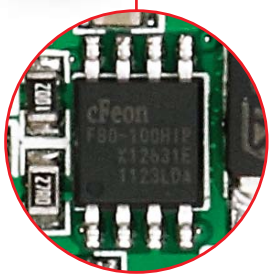
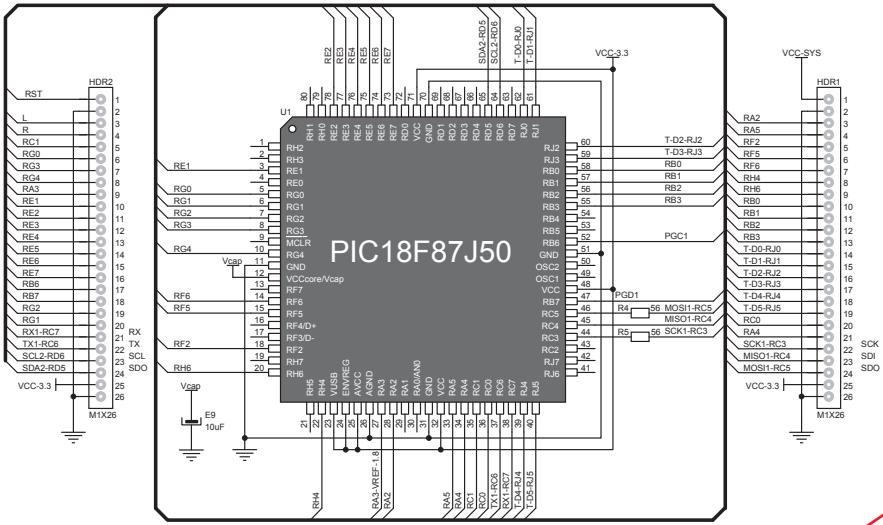


**Figure 11-2: Flash memory module**

# 12. Pads

Pads HDR2

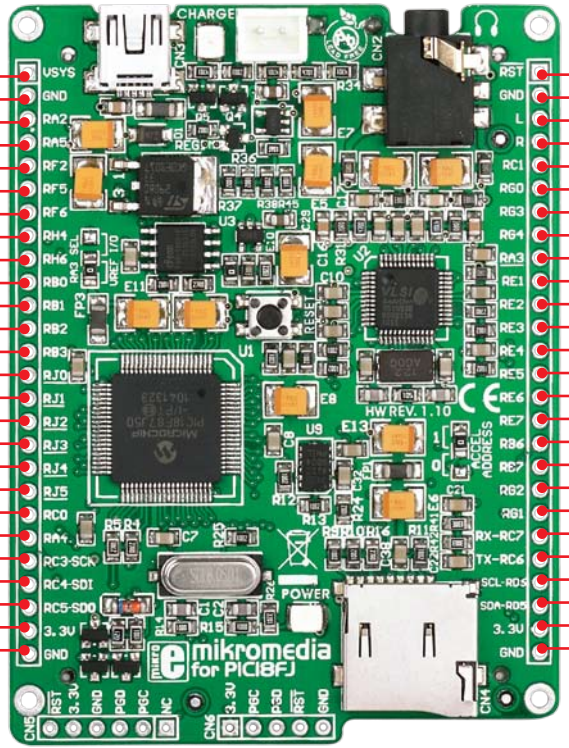



Pads HDR1

**Figure 12-1: Pads connecting 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. Pads with underlined silkscreen markings have multiple functions (see the complete schematic for more information).

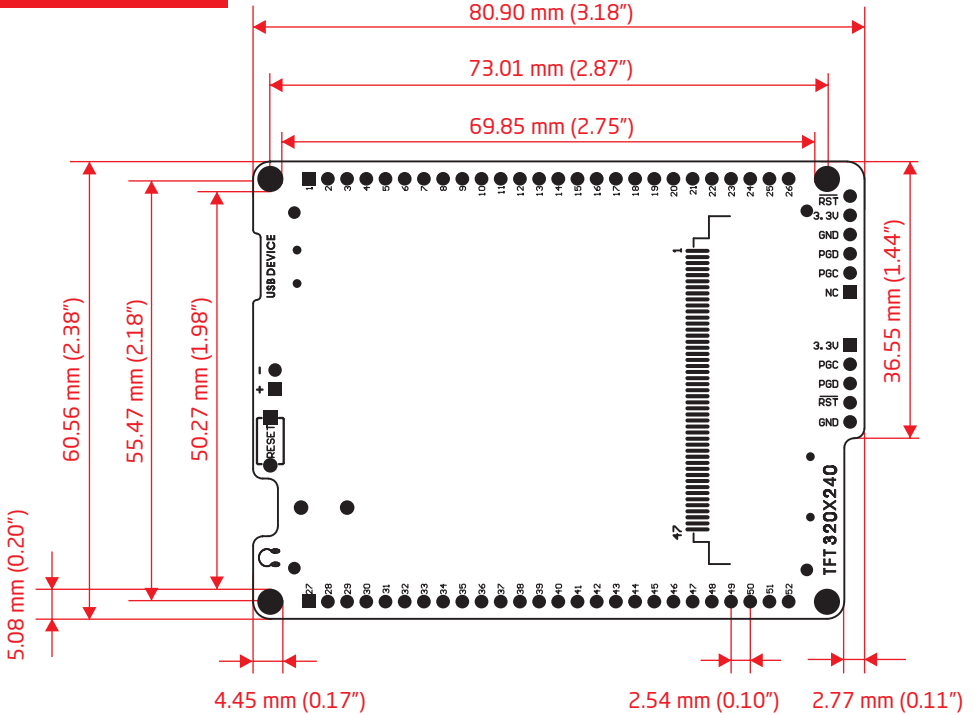
# 13. Pinout




| Pin functions | | | Pin functions | |
|---|---|---|---|---|
| System power supply | VSYS | VSYS | RST | Reset pin |
| Reference Ground | GND | GND | GND | Reference Ground |
| AN2/VREF- | RA2 | RA2 | L | left ch. ] audio out |
| AN4/C2INA | RA5 | RA5 | R | right ch. ] audio out |
| AN7/C2INB | RF2 | RF2 | RC1 | ECCP2/T1OSI/P2A |
| AN10/ C1INB/CVREF | RF5 | RF5 | RG0 | ECCP3/P3A |
| AN11/C1INA | RF6 | RF6 | RG3 | CCP4/P3D |
| AN12/P3C/C2INC | RH4 | RH4 | RG4 | CCP5/P1D |
| AN14/P1C/C1INC | RH6 | RH6 | RA3 | AN3/VREF+ |
| FLT0/INT0 | RB0 | RB0 | RE1 | AD9/P2C |
| INT1 | RB1 | RB1 | RE2 | AD10/P2B |
| INT2 | RB2 | RB2 | RE3 | AD11/P3C/REFO |
| INT3 | RB3 | RB3 | RE4 | AD12/P3B |
| $\overline{ALE}$ | RJ0 | RJ0 | RE5 | AD13/P1C |
| $\overline{OE}$ | RJ1 | RJ1 | RE6 | AD14/P1B |
| $\overline{WRL}$ | RJ2 | RJ2 | RE7 | AD15/P2A |
| $\overline{WRH}$ | RJ3 | RJ3 | RB6 | KBI2/PGC |
| $\overline{BA0}$ | RJ4 | RJ4 | RB7 | KBI3/PGD |
| $\overline{CE}$ | RJ5 | RJ5 | RG2 | RX2/DT2 |
| T1OSO/T13CKI | RC0 | RC0 | RG1 | TX2/CK2 |
| T0CKI | RA4 | RA4 | RC7 | RX1/DT1 |
| SCL1/SCK1 | RC3 | RC3 | RC6 | TX1/CK1 |
| SDA1/SDI1 | RC4 | RC4 | RD6 | AD6/SCL2 |
| C2OUT/SDO1 | RC5 | RC5 | RD5 | AD5/SDA2 |
| 3.3V power supply | 3.3V | 3.3V | 3.3V | 3.3V power supply |
| Reference Ground | GND | GND | GND | Reference Ground |

Programing lines | Analog Lines | Interrupt Lines | SPI Lines | I2C Lines | UART lines | PWM lines | Comparator lines

# 14. Dimensions



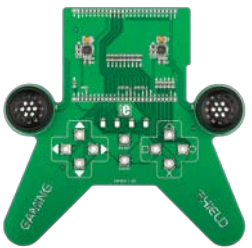
# 15. mikromedia™ accessories

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 Li-Polimer battery

06 Wire Jumpers

07 Stacking headers

# What's next?

You have now completed the journey through each and every feature of mikromedia™ for PIC18FJ® 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 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 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.

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