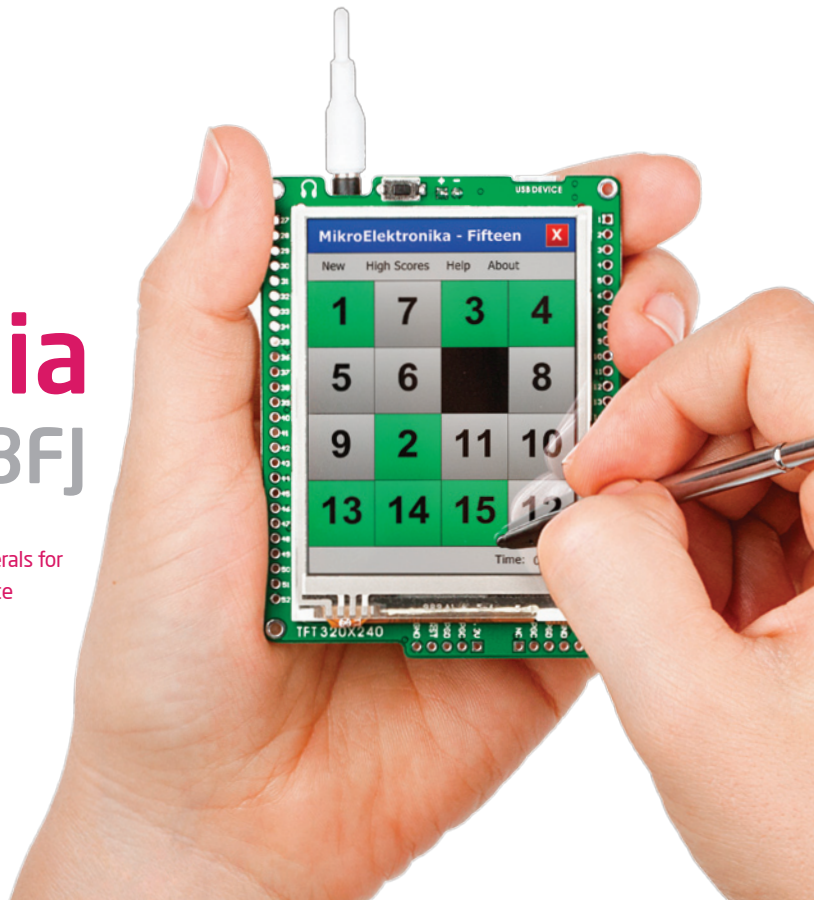


user's guide to

# mikromedia

## board for PIC18FJ

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



# 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 in the lower right quadrant of the page. The signature is fluid and cursive, with a large initial 'N' and 'M'.

Nebojsa Matic  
General Manager

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# Introduction to mikromedia for PIC18FJ

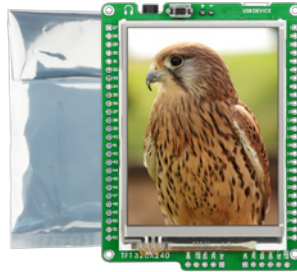
The **mikromedia for PIC18FJ** is a compact development system with lots of on-board peripherals which allow development of devices with multimedia contents. The central part of the system is a 8-bit **PIC18F87J50** microcontroller. The mikromedia for PIC18FJ features integrated modules such as stereo 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



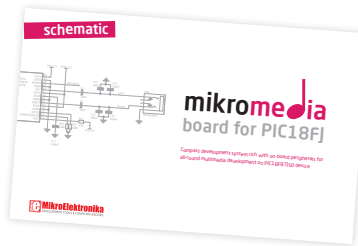
- 02 mikromedia for PIC18FJ development system



- 03 DVD with documentation and examples



- 04 mikromedia for PIC18FJ user's guide



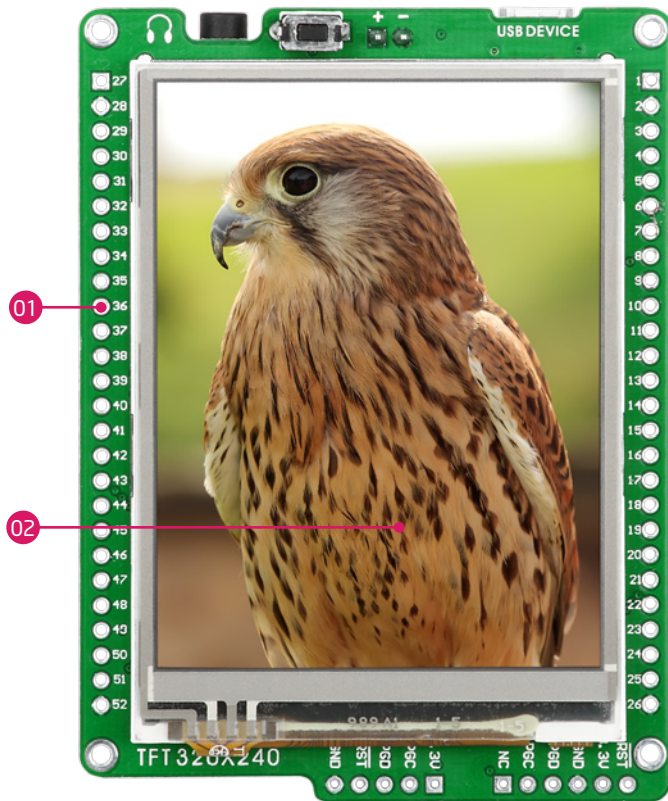
- 05 mikromedia for PIC18FJ schematic

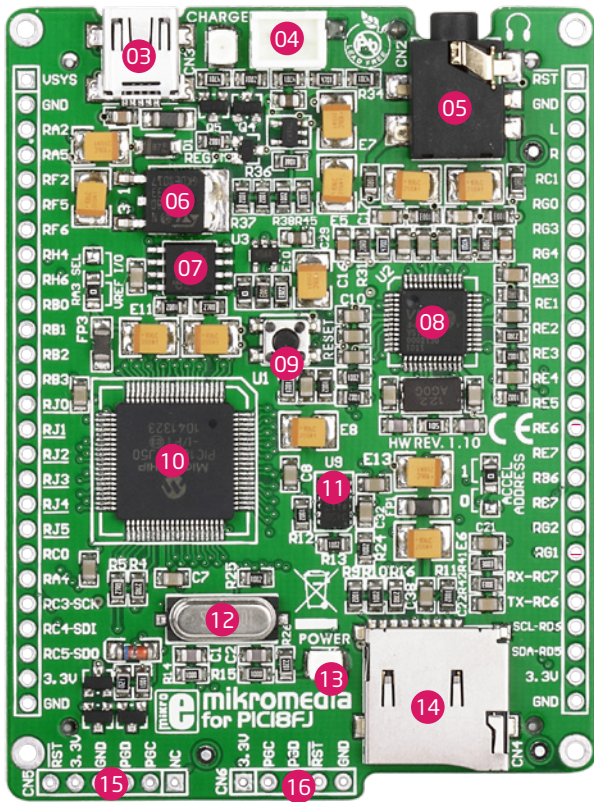


- 06 USB cable

# 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

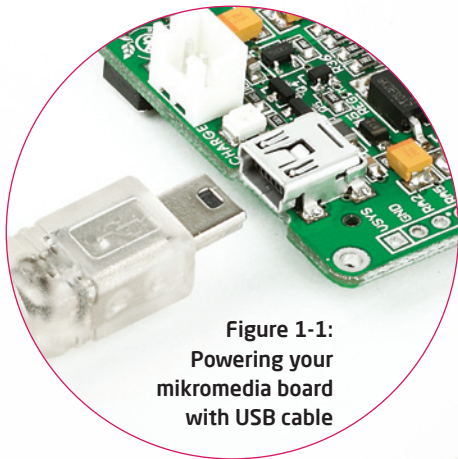


Figure 1-1:  
Powering your  
mikromedia board  
with USB cable

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

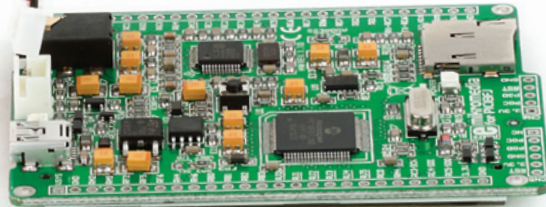


Figure 2-1:  
Connecting Li-polymer battery  
to mikromedia board

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  $\sim 250\text{mA}$  and charging voltage is  $4.2\text{V DC}$ .

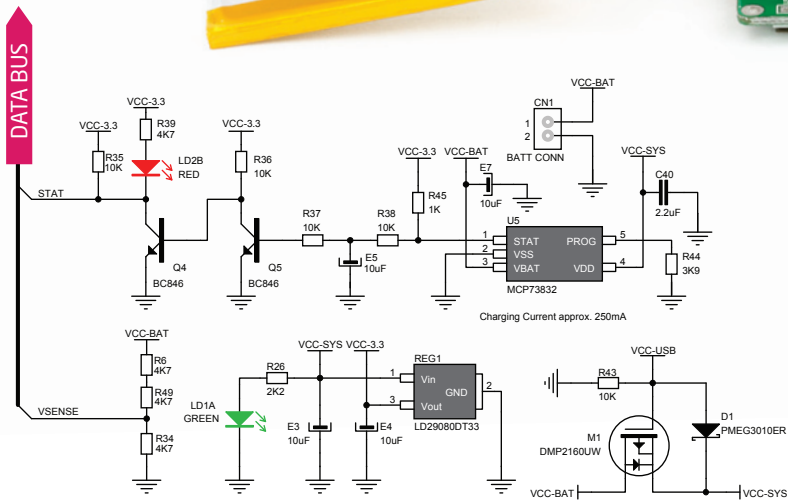


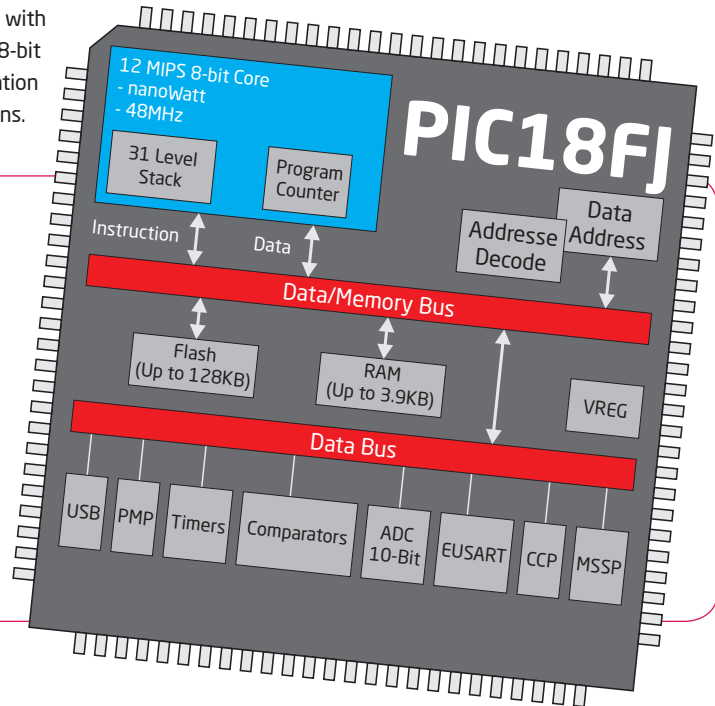
Figure 2-2:  
Battery charger and power management  
connection schematic

# 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

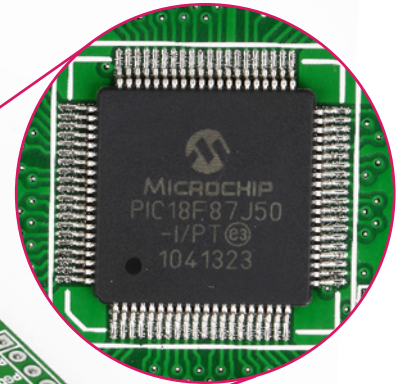
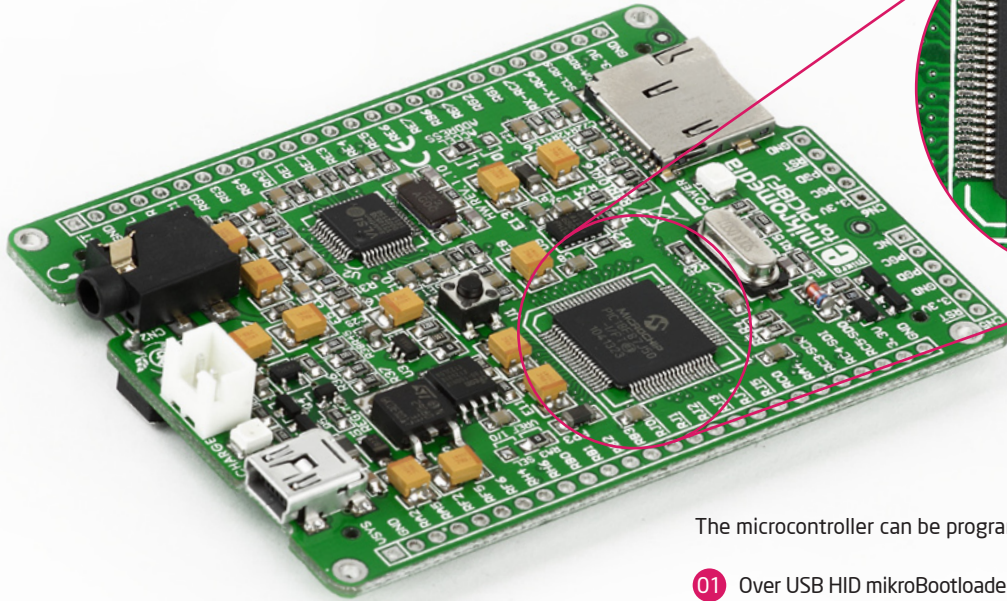


Figure 4-1:  
PIC18F87J50  
Microcontroller

The microcontroller can be programmed in three ways:

- 01 Over USB HID mikroBootloader
- 02 Using mikroProg external programmer
- 03 Using ICD2/3 external programmer

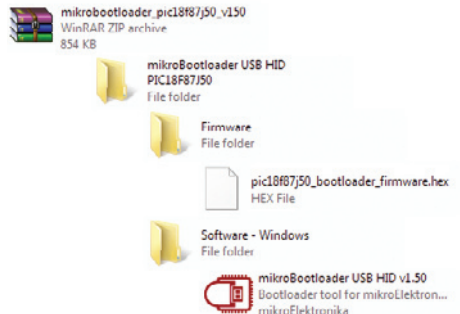
# Programming with mikroBootloader

You can program the microcontroller with bootloader which is 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

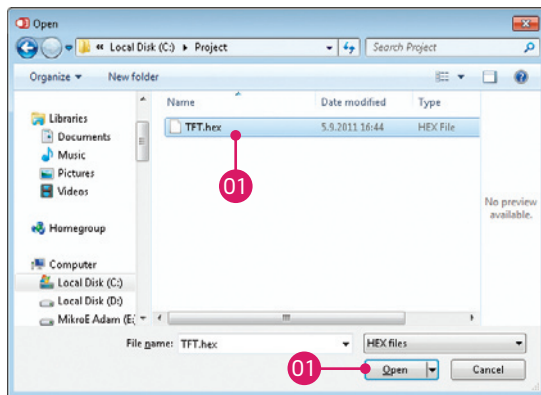


Figure 4-4: Selecting HEX

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**

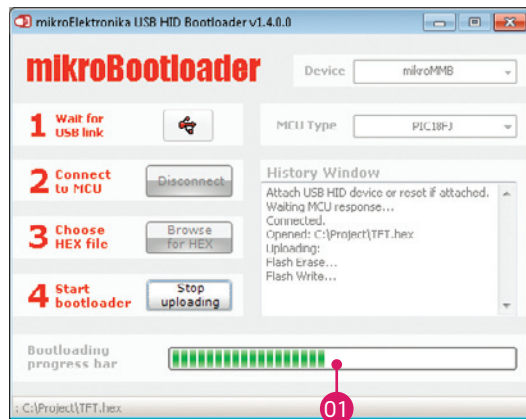


Figure 4-6: Progress bar

- 01 You can monitor .hex file uploading via progress bar



## step 5 - Finish upload

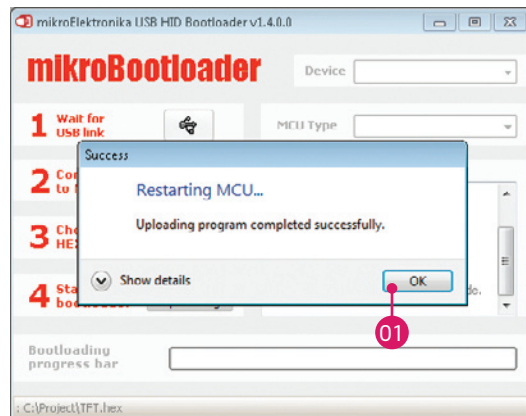


Figure 4-7: Restarting MCU

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



Figure 4-8: mikroBootloader ready for next job

# Programming 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

### **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 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.

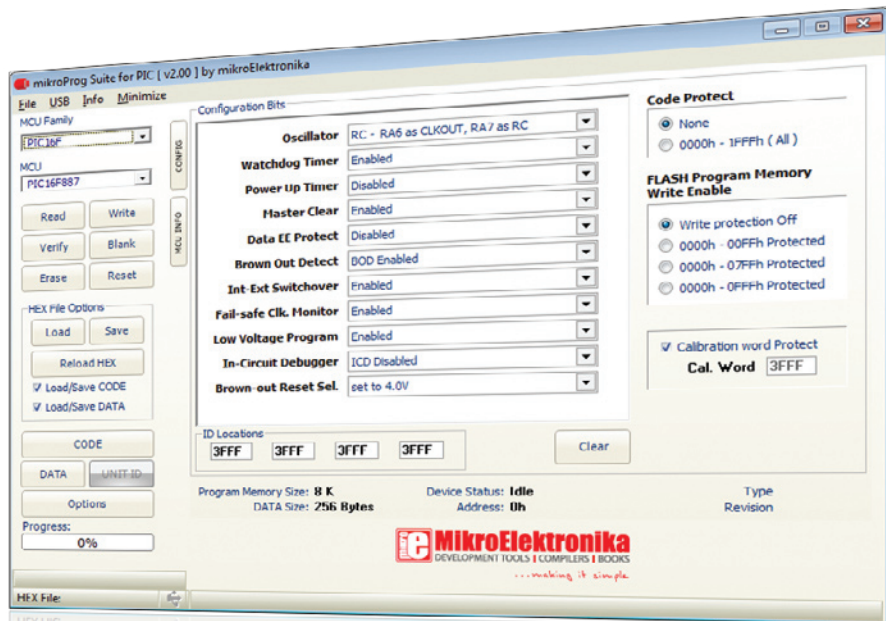
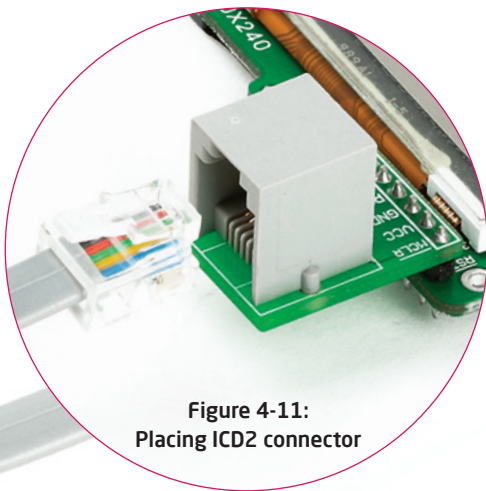


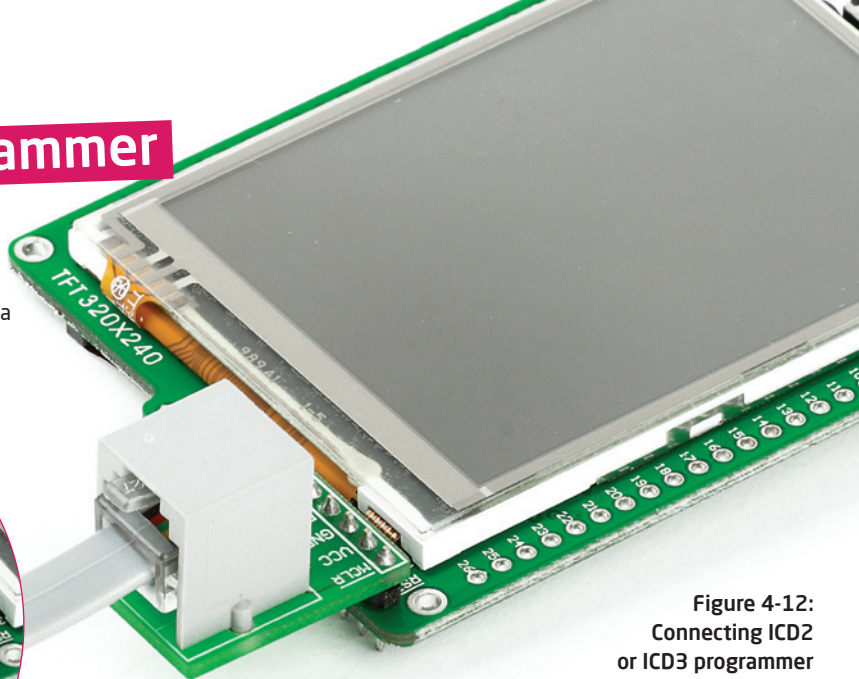
Figure 4-10: Main Window of mikroProg Suite for PIC programming software

# Programming 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.

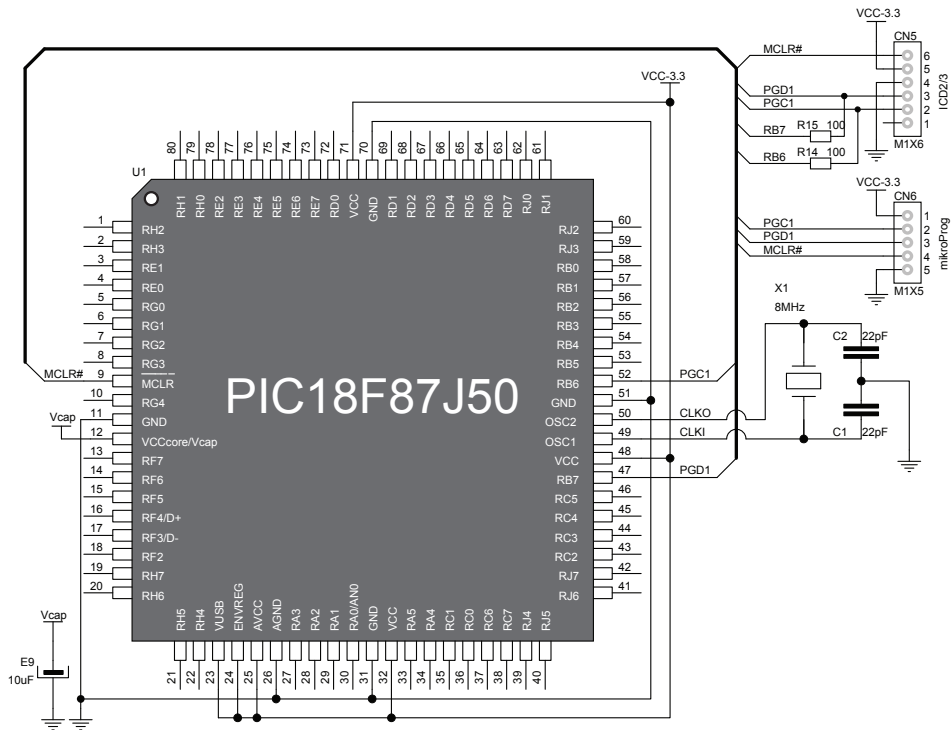


Figure 4-13: mikroProg and ICD2/ICD3 programmer connection schematic

# 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.

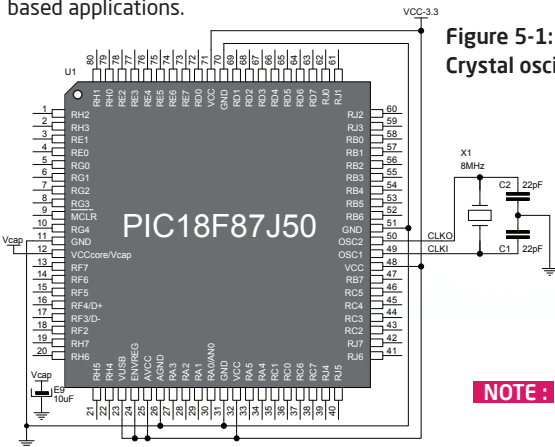


Figure 5-1:  
Crystal oscillator schematic

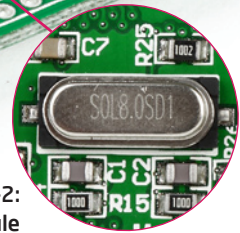
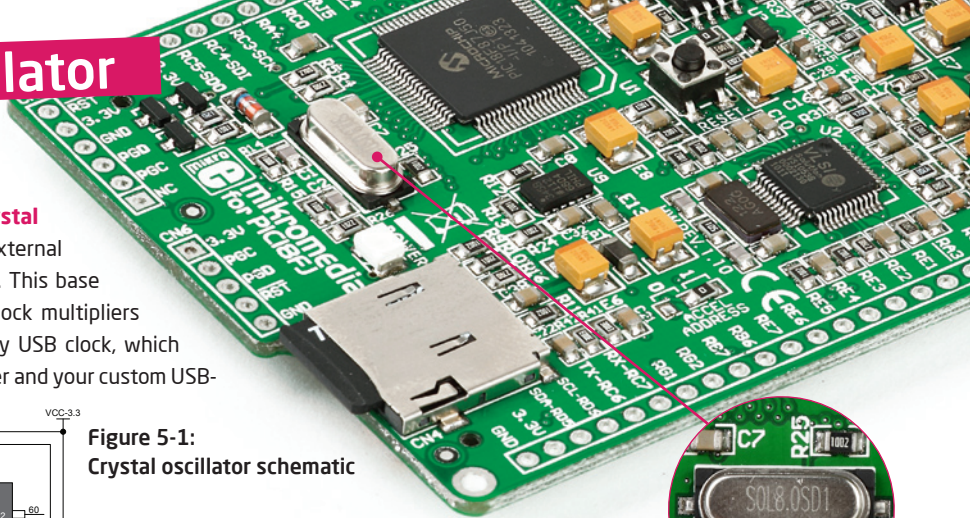


Figure 5-2:  
Crystal oscillator module

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





## 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**.

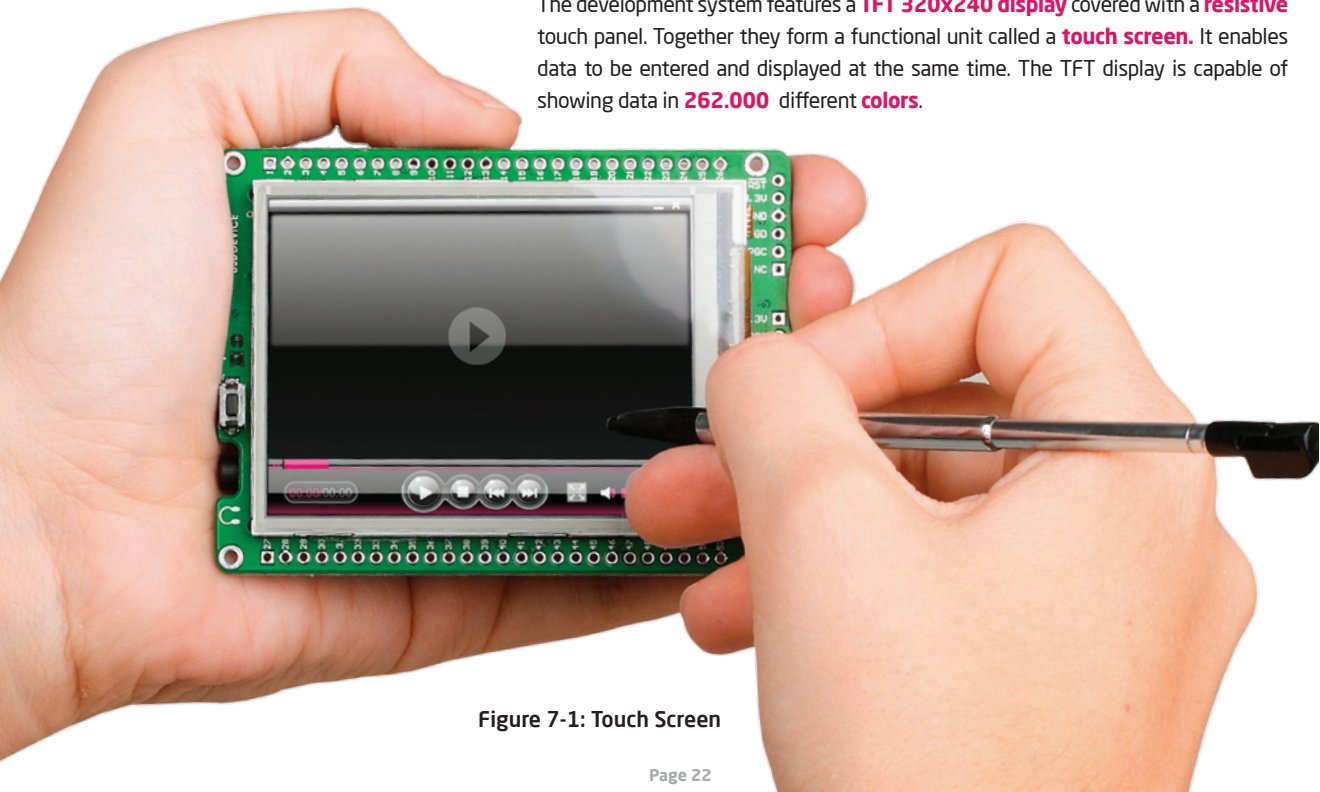


Figure 7-1: Touch Screen

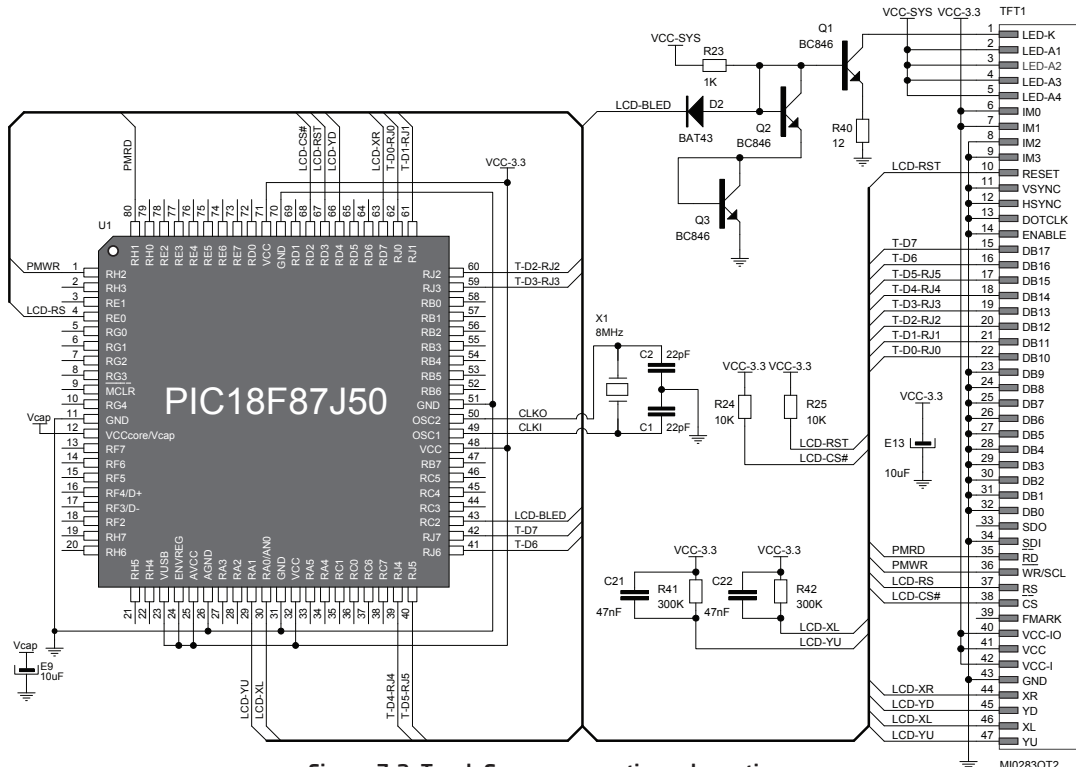


Figure 7-2: Touch Screen connection schematic

## 8. Audio Module

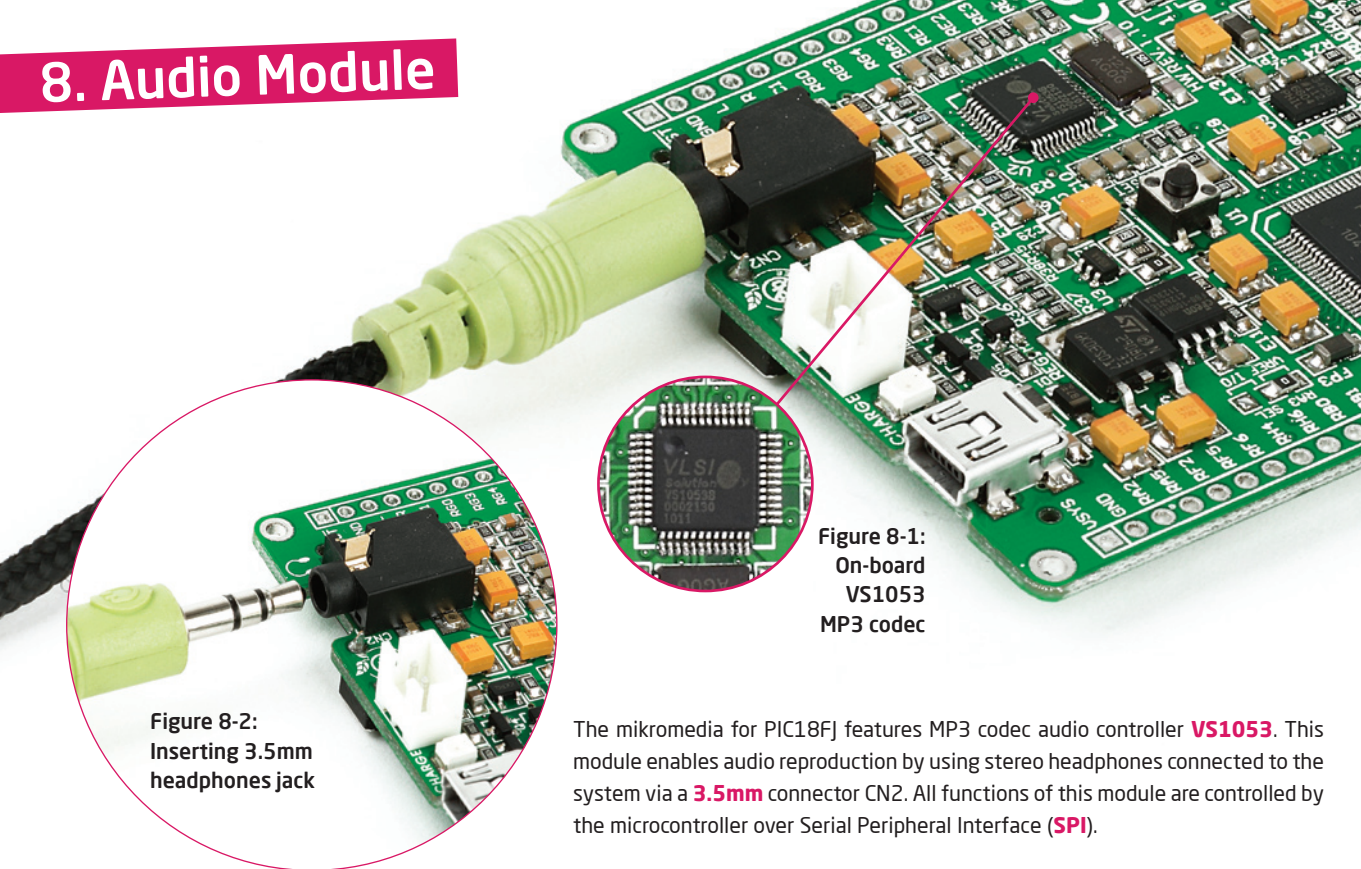


Figure 8-1:  
On-board  
VS1053  
MP3 codec

Figure 8-2:  
Inserting 3.5mm  
headphones jack

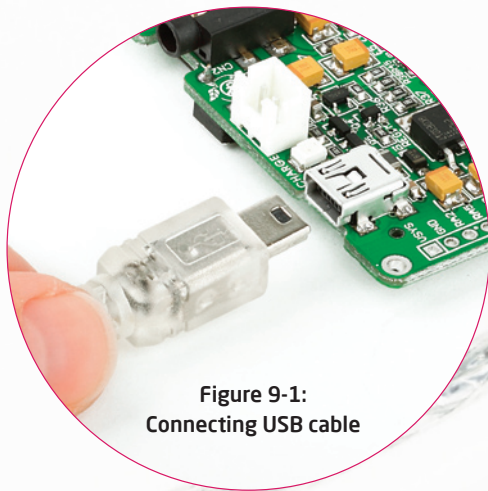
The mikromedia for PIC18FJ features MP3 codec audio controller **VS1053**. This module enables audio reproduction by using stereo headphones connected to the system via a **3.5mm** connector CN2. All functions of this module are controlled by the microcontroller over Serial Peripheral Interface (**SPI**).



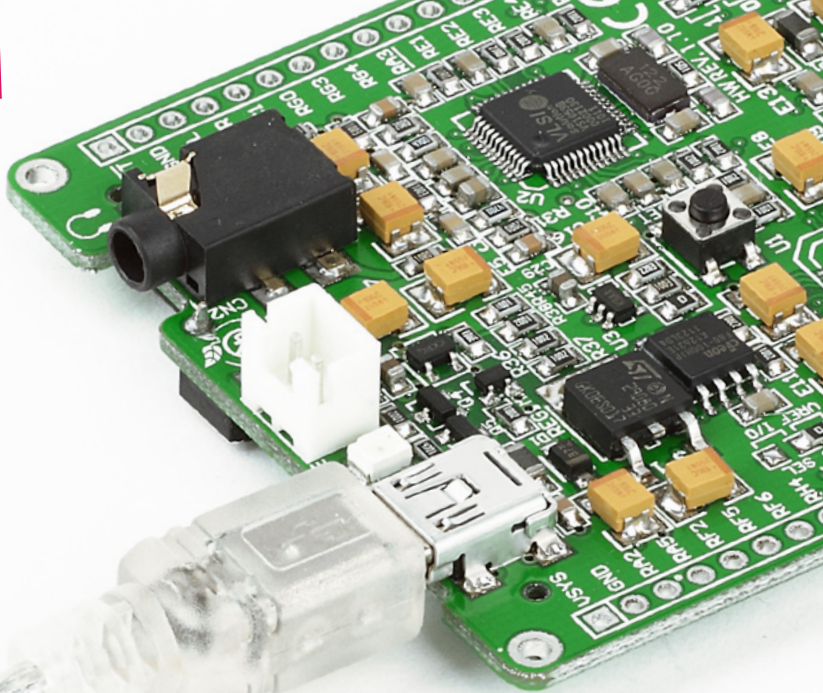


# 9. USB connection

**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





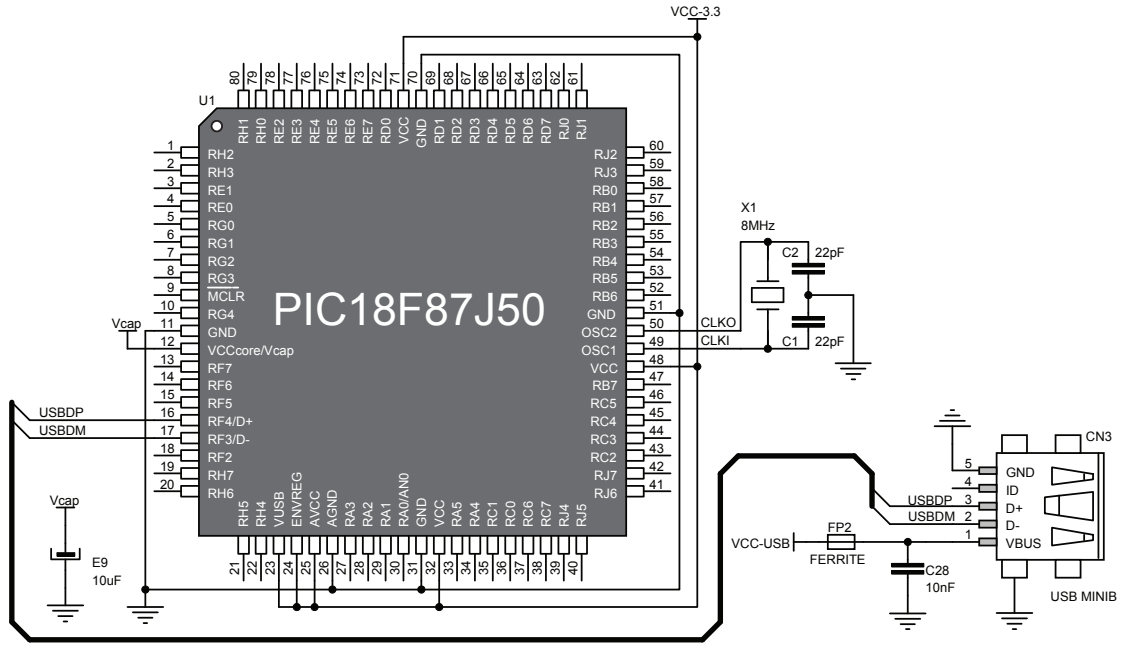


Figure 9-2: USB module connection schematic

# 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 **I<sup>2</sup>C** interface.

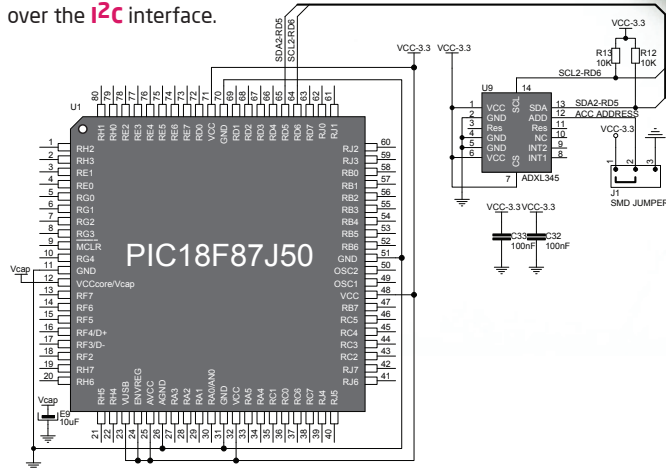


Figure 10-2: Accelerometer connection schematic

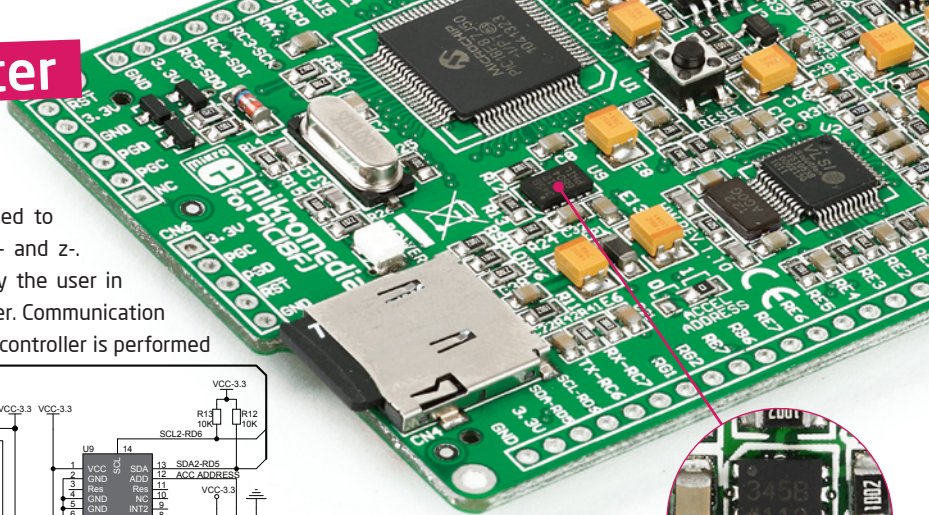


Figure 10-1: Accelerometer module



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**).

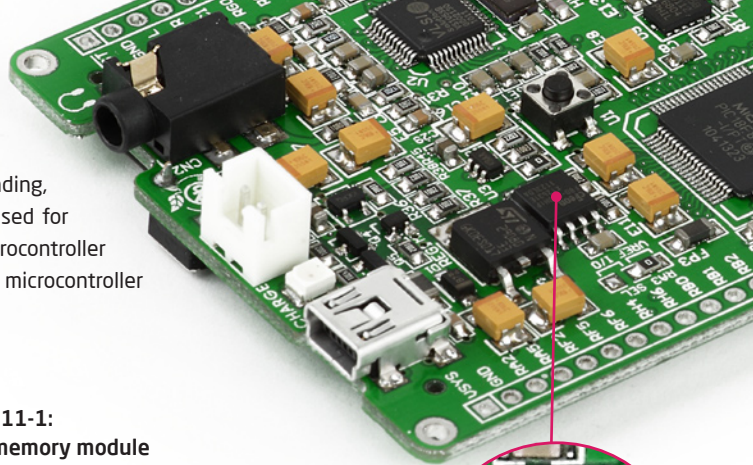


Figure 11-1:  
Flash memory module  
connection schematic

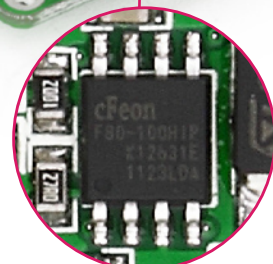
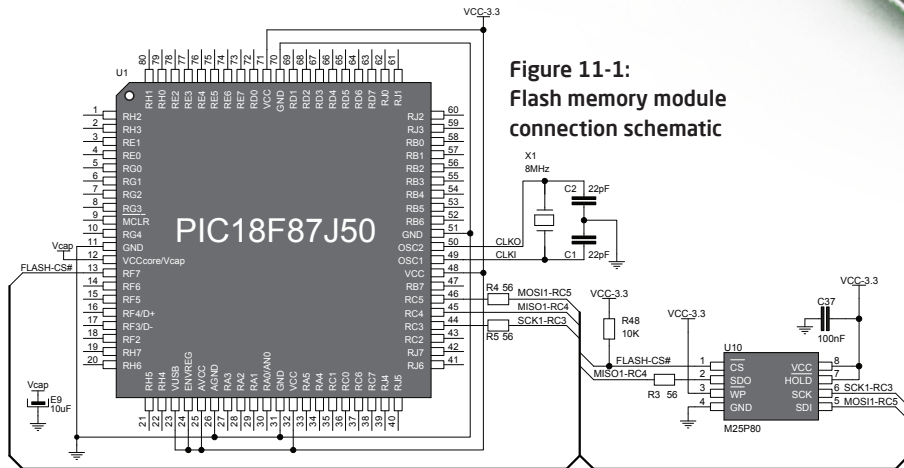
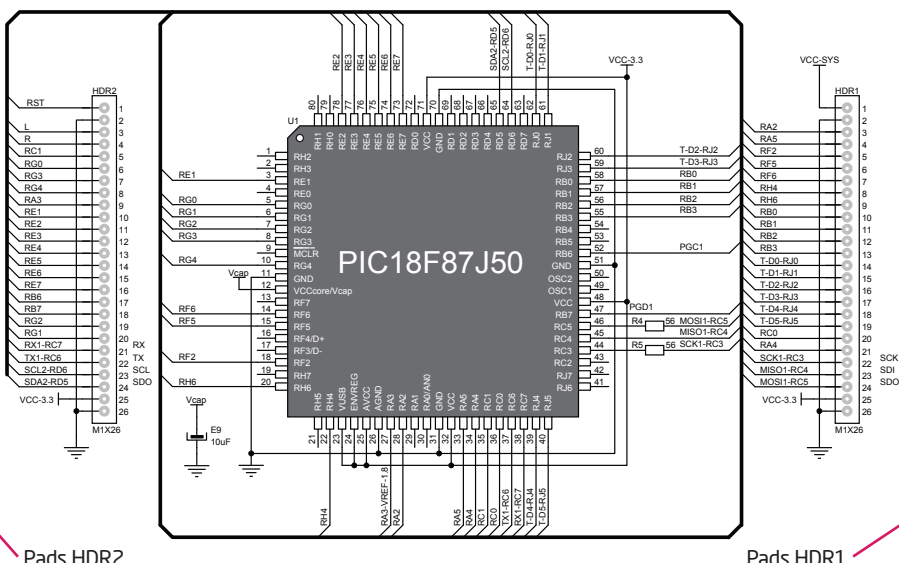
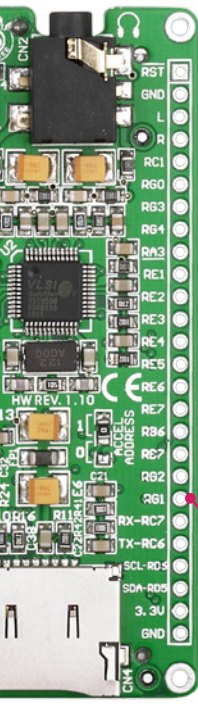


Figure 11-2:  
Flash memory module

# 12. Pads

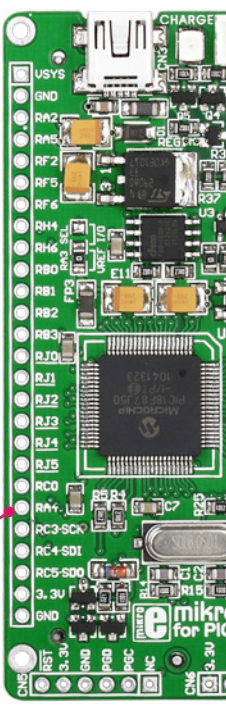


Pads HDR2

Pads HDR1

Figure 12-1: Pads connecting schematic

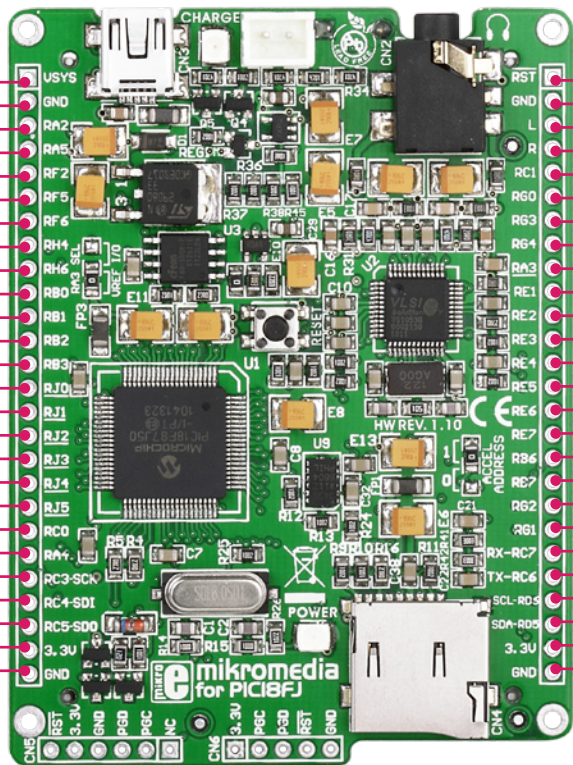
Most microcontroller pins are available for further connectivity via two 1x26 rows of connection pads on both sides of the mikromedia board. They are designed to match additional shields, such as Battery Boost shield, Gaming, PROTO shield and others. Pads with underlined silkscreen markings have multiple functions (see the complete schematic for more information).



# 13. Pinout

- System power supply
- Reference Ground
- AN2/VREF-
- AN4/C2INA
- AN7/C2INB
- AN10/C1INB/CVREF
- AN11/C1INA
- AN12/P3C/C2INC
- AN14/P1C/C1INC
- FLTO/INT0
- INT1
- INT2
- INT3
- ALE
- OE
- WRL
- WRH
- BA0
- CE
- T10S0/T13CKI
- TOCKI
- SCL1/SCK1
- SDA1/SDI1
- C2OUT/SDO1
- 3.3V power supply
- Reference Ground

- VSYS
- GND
- RA2
- RA5
- RF2
- RF5
- RF6
- RH4
- RH6
- RB0
- RB1
- RB2
- RB3
- RJ0
- RJ1
- RJ2
- RJ3
- RJ4
- RJ5
- RC0
- RA4
- RC3
- RC4
- RC5
- 3.3V
- GND



- RST
- GND
- L
- R
- RC1
- RG0
- RG3
- RG4
- RA3
- RE1
- RE2
- RE3
- RE4
- RE5
- RE6
- RE7
- RB6
- RB7
- RG2
- RG1
- RC7
- RC6
- RD6
- RD5
- 3.3V
- GND

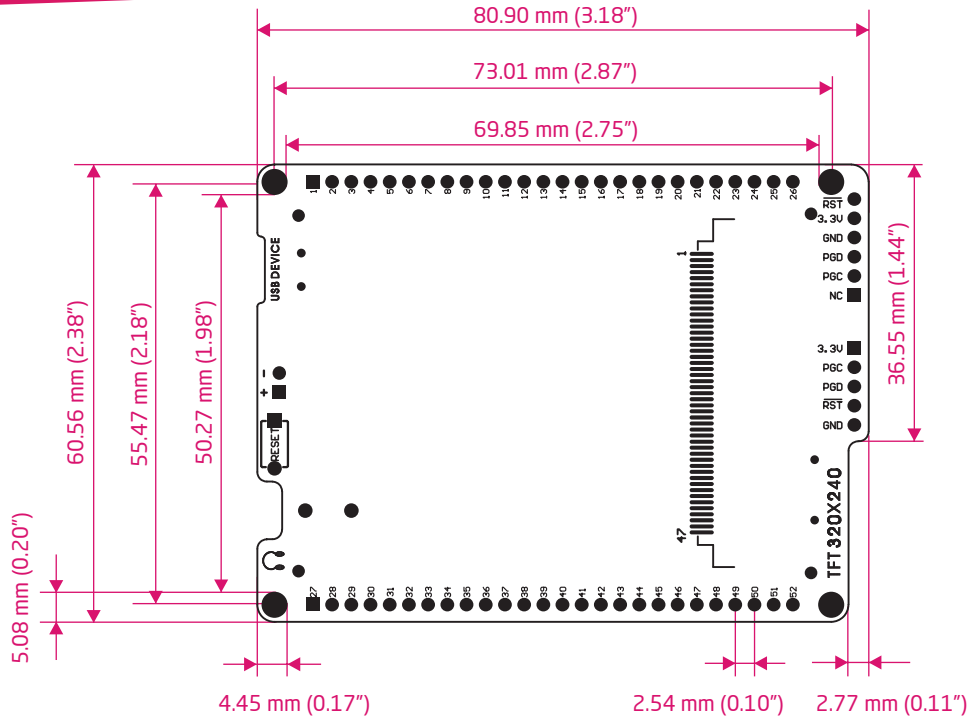
- Reset pin
- Reference Ground
- left ch. ] audio out
- right ch. ]
- ECCP2/T10SI/P2A
- ECCP3/P3A
- CCP4/P3D
- CCP5/P1D
- AN3/VREF+
- AD9/P2C
- AD10/P2B
- AD11/P3C/REFO
- AD12/P3B
- AD13/P1C
- AD14/P1B
- AD15/P2A
- KB12/PGC
- KB13/PGD
- RX2/DT2
- TX2/CK2
- RX1/DT1
- TX1/CK1
- AD6/SCL2
- AD5/SDA2
- 3.3V power supply
- Reference Ground

Pin functions

Pin functions

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

# 14. Dimensions







Notes:

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do not hesitate to contact us at [office@mikroe.com](mailto:office@mikroe.com)