mikromedia™

for dsPIC33EP®

Compact development system rich with on-board peripherals for all-round multimedia development on dsPIC33EP512MU810 device.

MikroElektronika
DEVELOPMENT TOOLS | COMPILERS | BOOKS

dsPIC

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

Table of Contents

Introduction to mikromedia for dsPIC33EP®

The **mikromedia for dsPIC33EP®** 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 **dsPIC33EP512MU810** microcontroller. The mikromedia for dsPIC33EP 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 dsPIC33EP® development system

03 DVD with documentation and examples

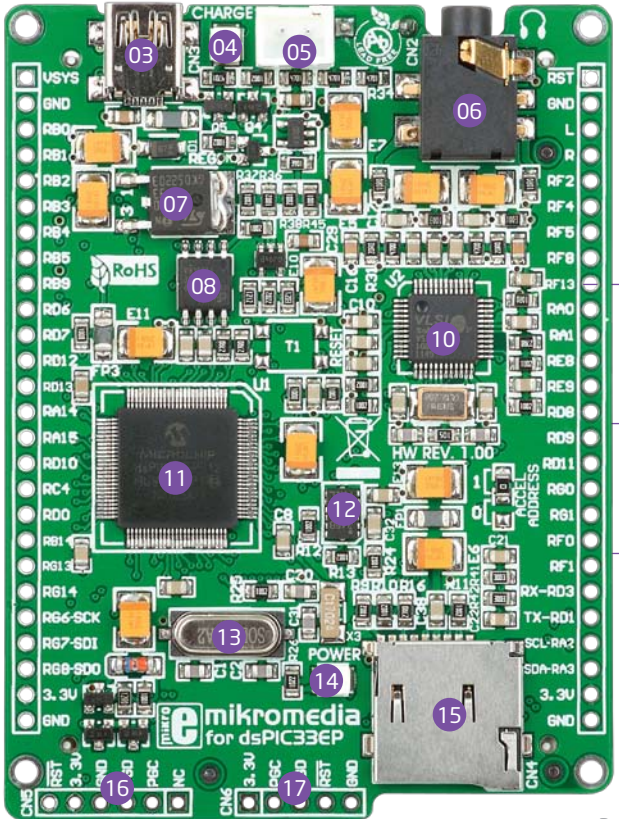
04 mikromedia for dsPIC33EP® user's guide

05 mikromedia for dsPIC33EP® 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 dsPIC33EP512MU810 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

75 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

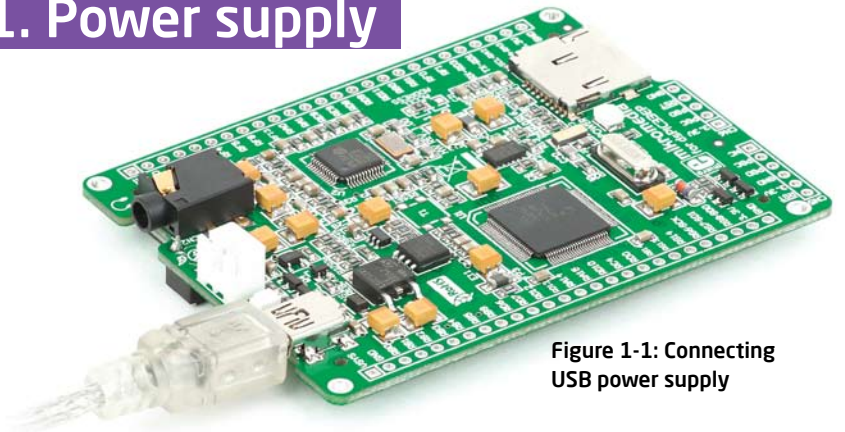


Figure 1-1: Connecting USB power supply

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

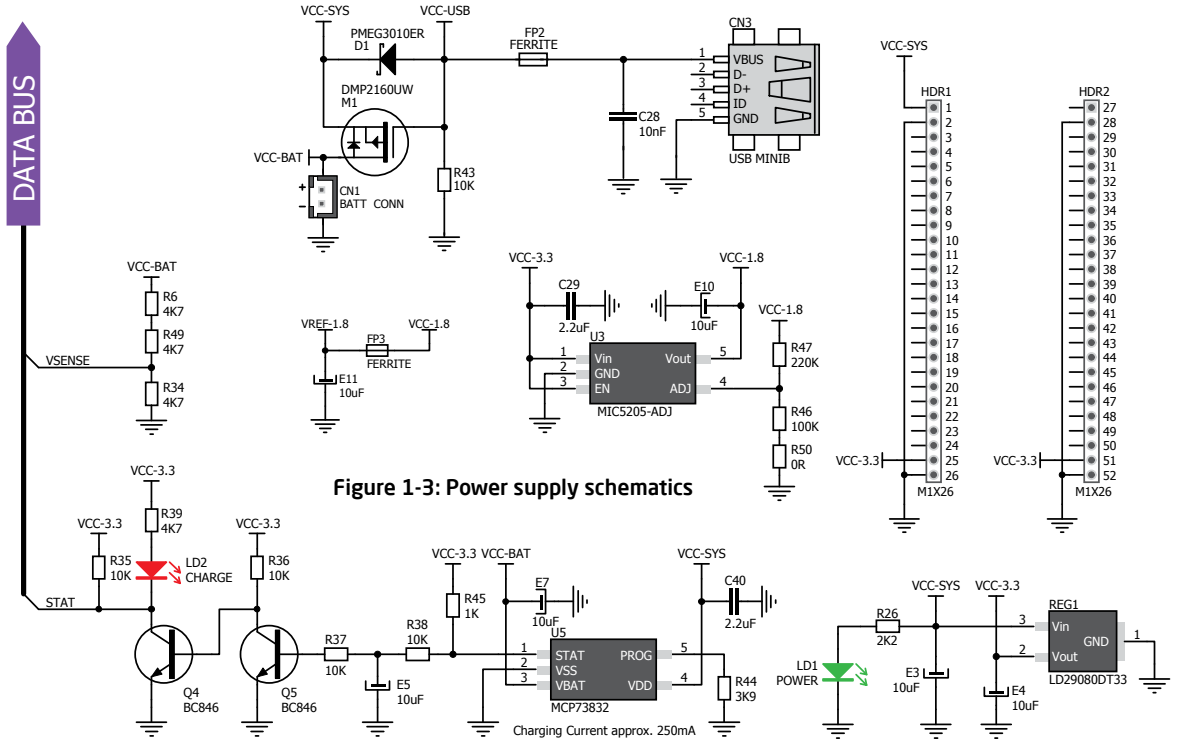


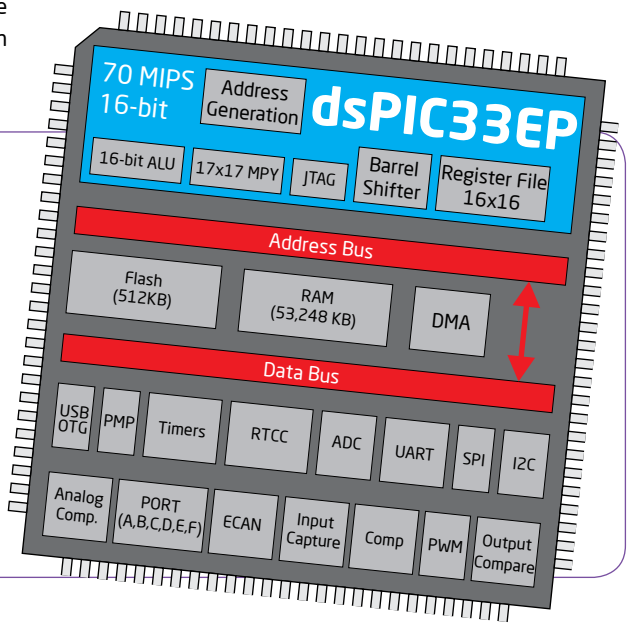
Figure 1-3: Power supply schematics

2. dsPIC33EP512MU810 microcontroller

The **mikromedia for dsPIC33EP®** development system comes with the **dsPIC33EP512MU810** 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 memory;
- 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

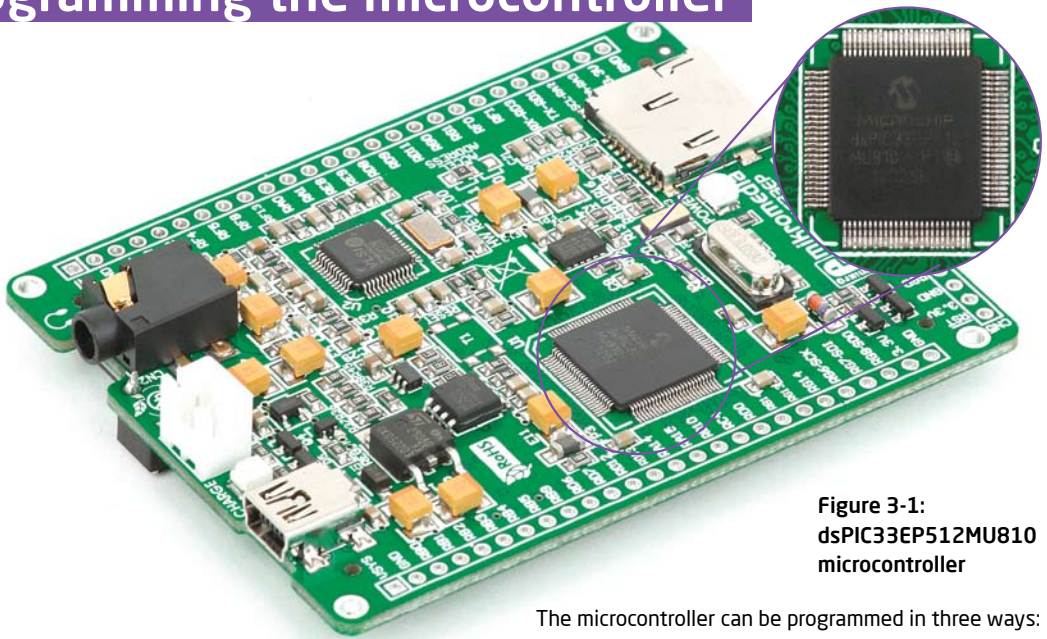


Figure 3-1: dsPIC33EP512MU810 microcontroller

The microcontroller can be programmed in three ways:

01 Over USB HID mikroBootloader

02 Using mikroProg™ external programmer

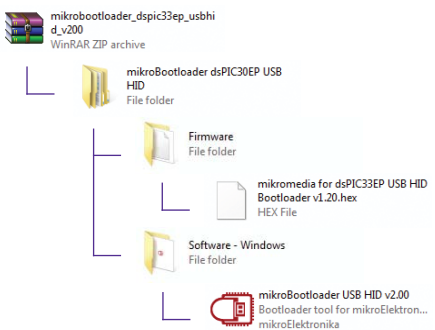
03 Using ICD2/3 external programmer

Programming with mikroBootloader

You can program the microcontroller with bootloader which is pre-programmed 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/downloads/get/1859/mikrobootloader_dspic33ep_usbhid_v200.zip

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



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

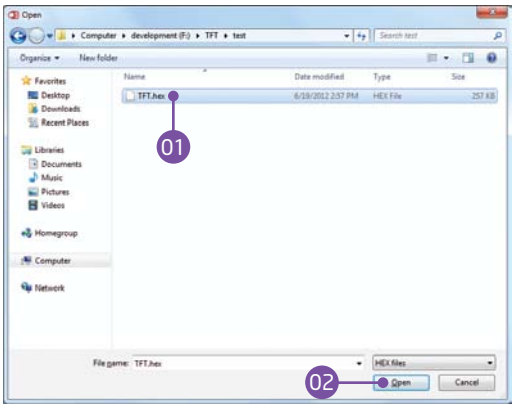


Figure 3-4: Selecting HEX

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 boot loading click the **"Begin uploading"** button.

Figure 3-6: Progress bar

01 You can monitor .HEX file uploading via progress bar

step 5 - Finish upload

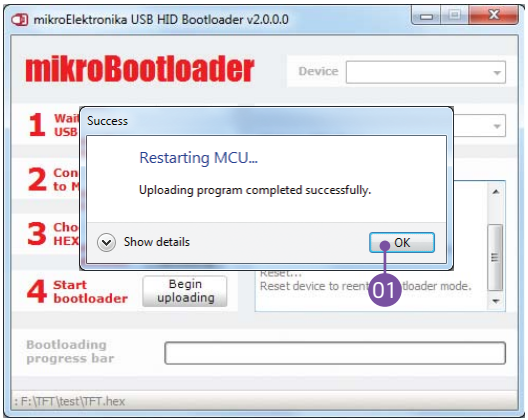


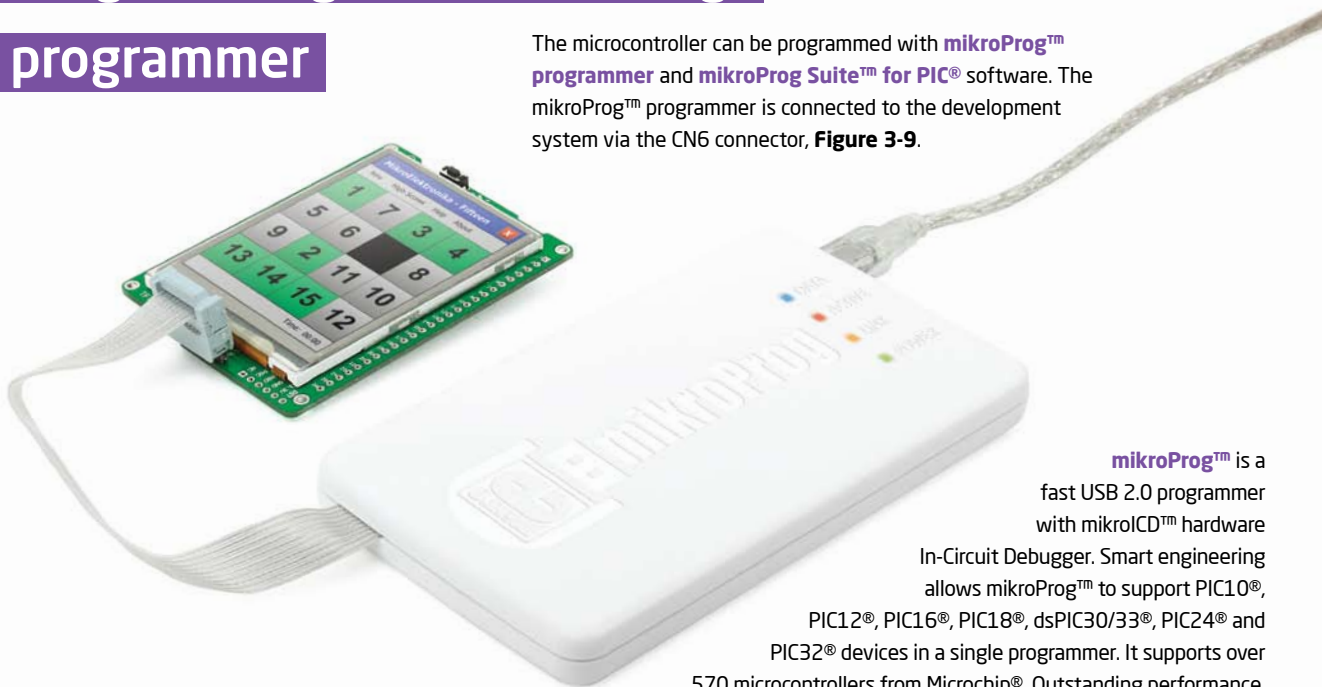
Figure 3-7: Restarting MCU

Figure 3-8: mikroBootloader ready for next job

01 Click the **"OK"** button 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. 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.

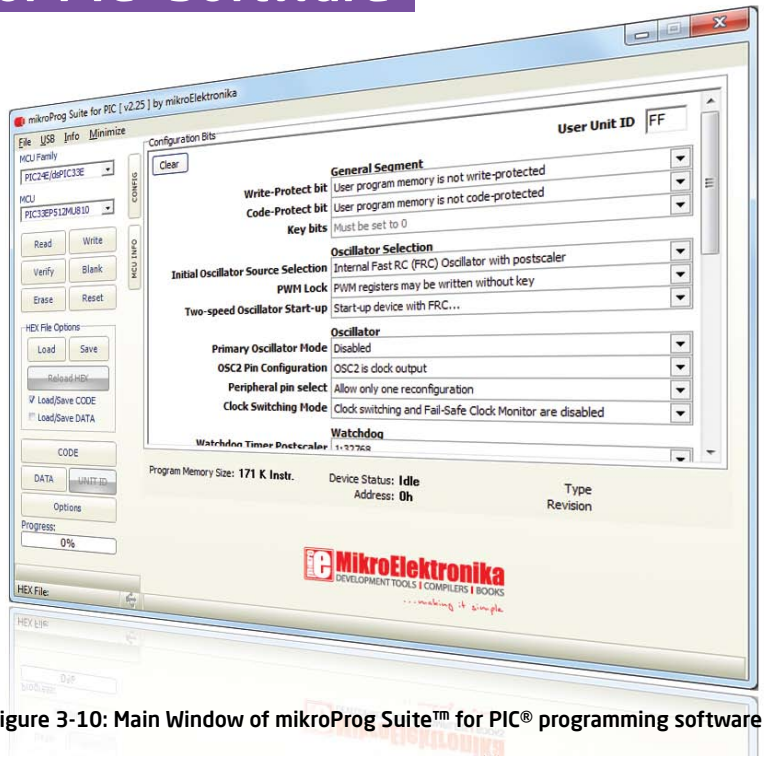


Figure 3-10: Main Window of mikroProg Suite™ for PIC® programming software

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.**

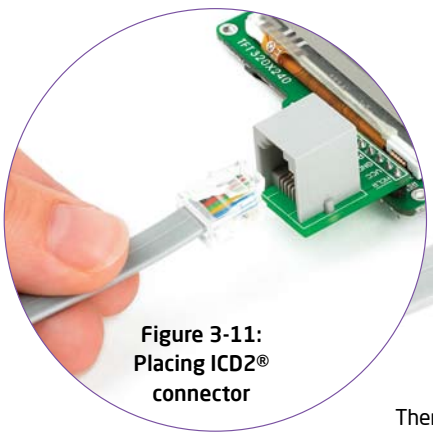


Figure 3-11: Placing ICD2® connector

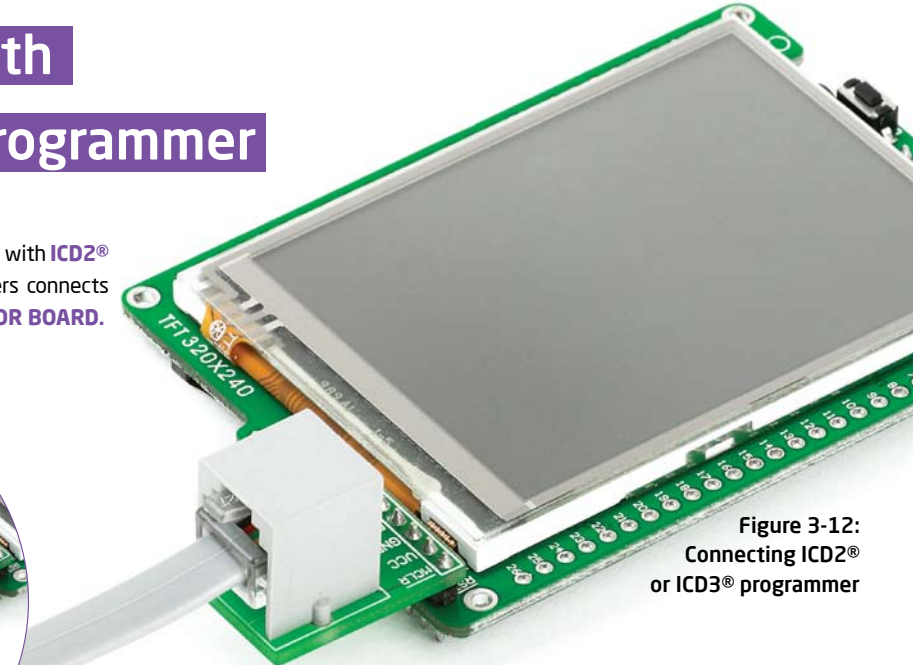


Figure 3-12: Connecting ICD2® or ICD3® programmer

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**.

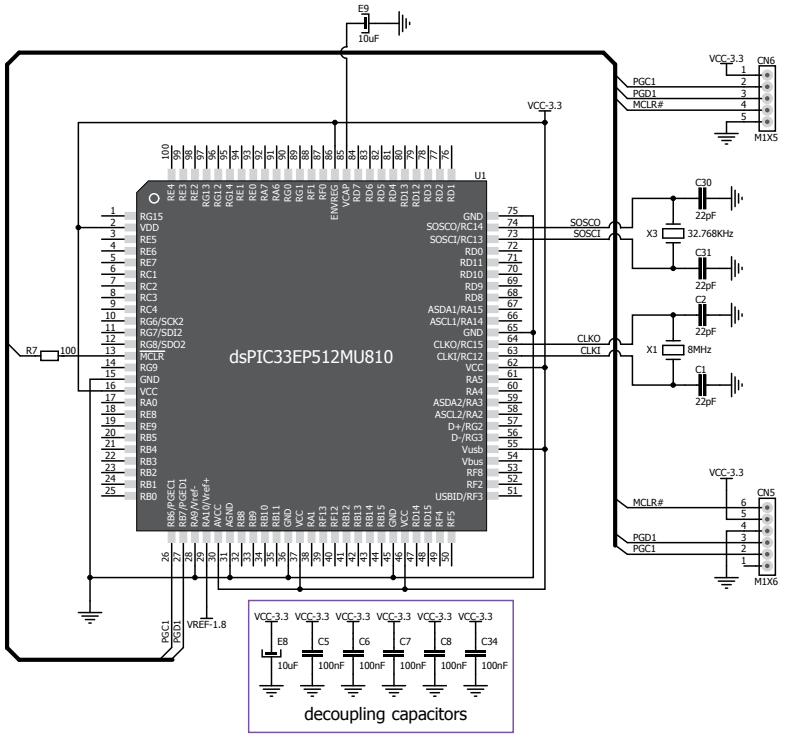
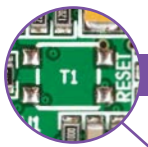


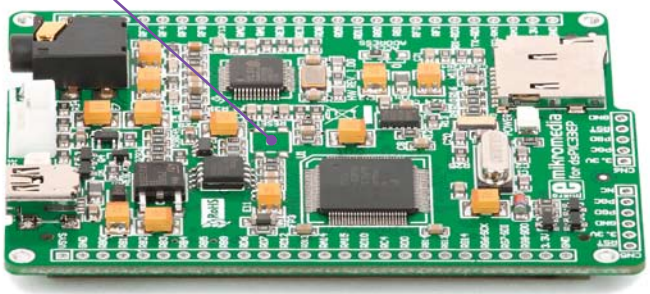
Figure 3-13: mikroProg™ & ICD2 / ICD3 programmer connection schematic

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**.



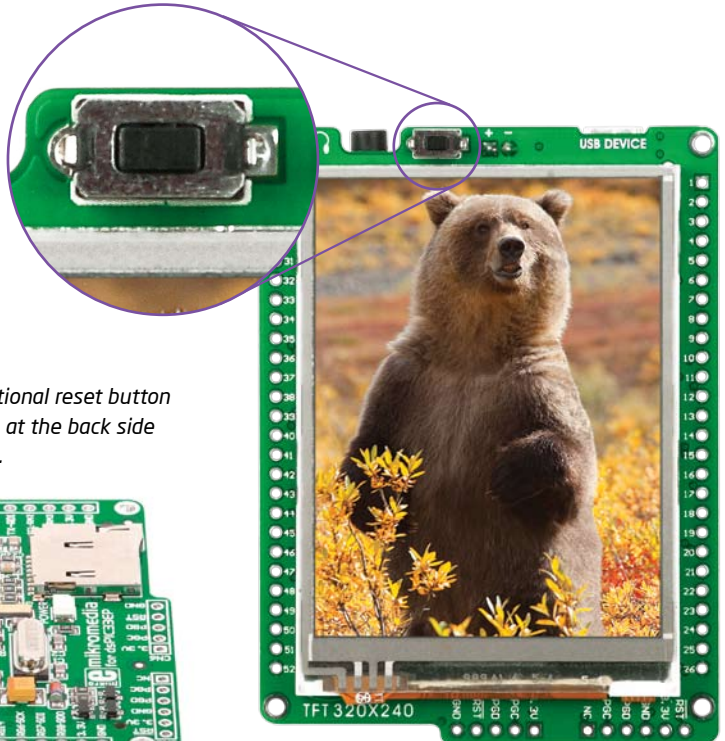


Figure 4-2: Frontal reset button

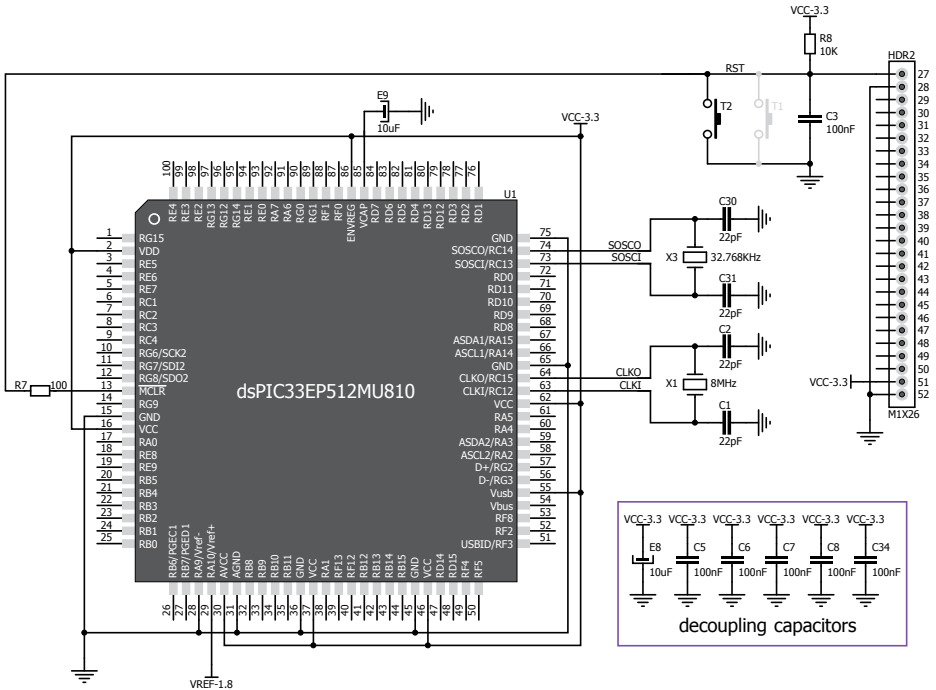
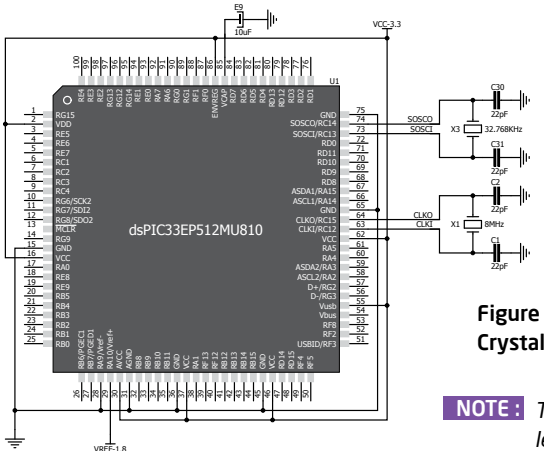


Figure 4-3: Reset circuit schematic

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.



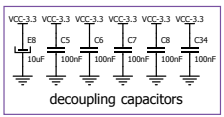


Figure 5-1:
External crystal oscillator (X1)

Figure 5-2:
Crystal oscillator schematic

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.

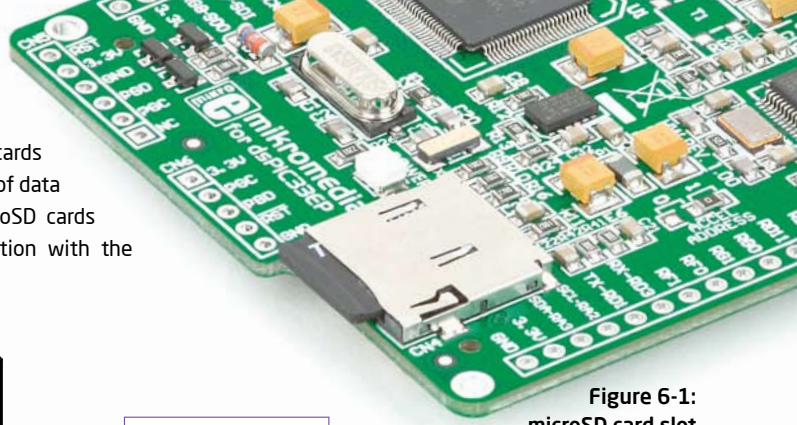


Figure 6-1:
microSD card slot

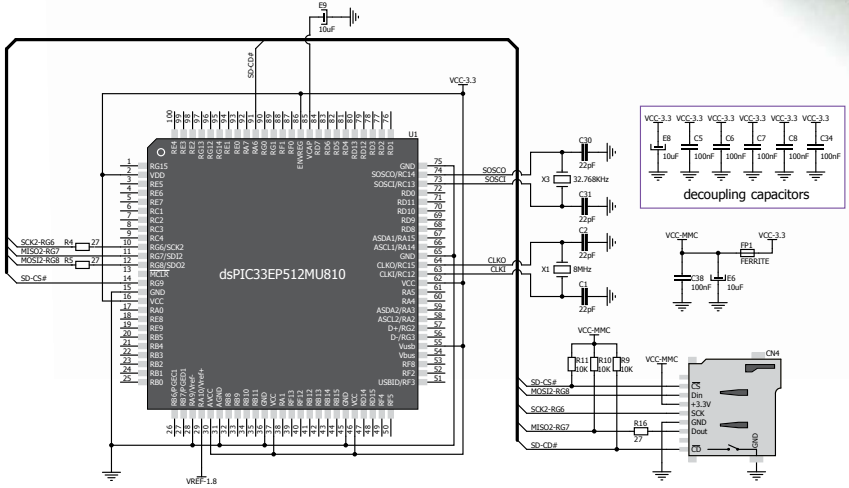


Figure 6-2:
microSD Card Slot module connection schematic

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**.

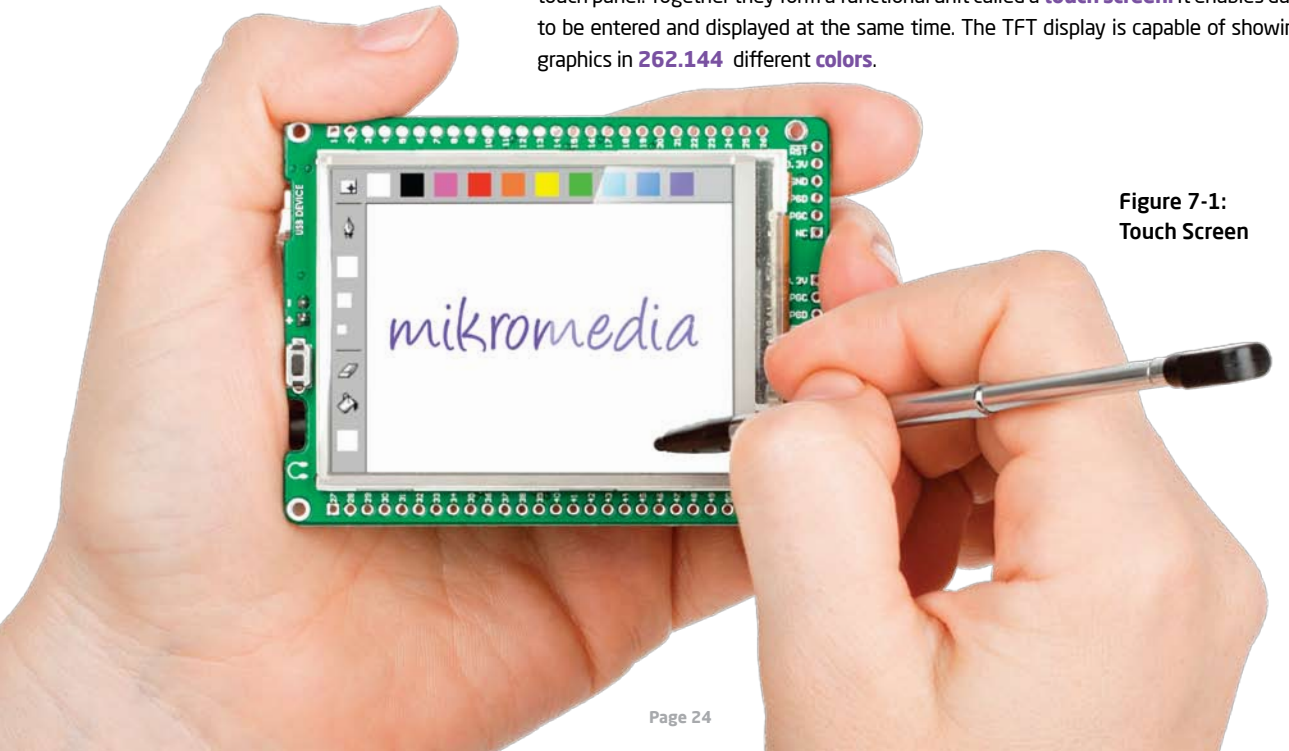


Figure 7-1:
Touch Screen

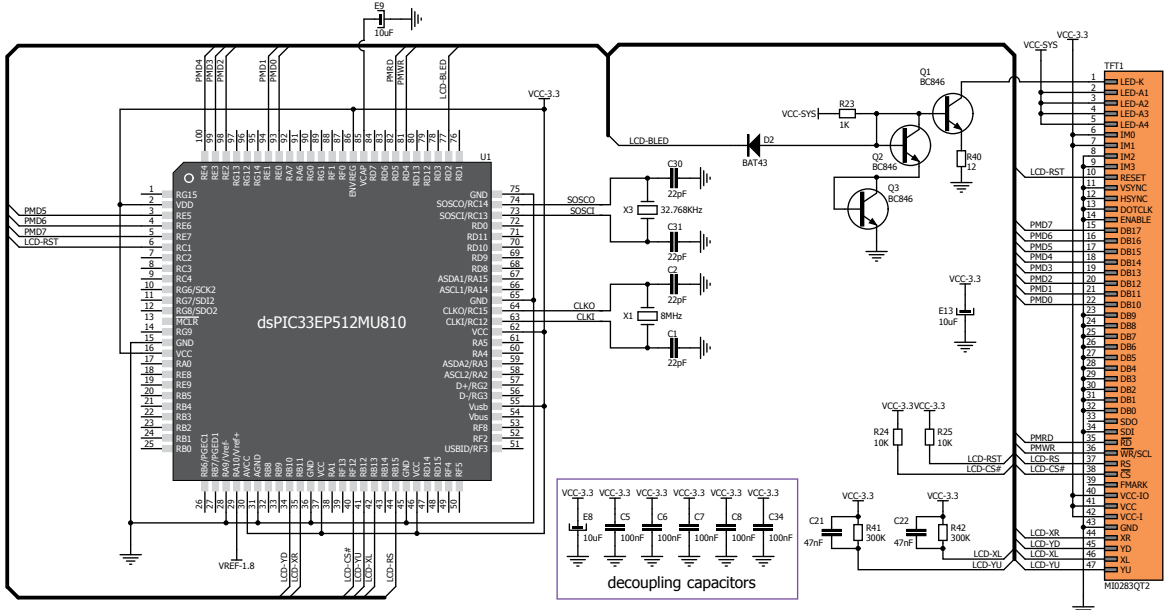


Figure 7-2: Touch Screen connection schematic

8. Audio Module

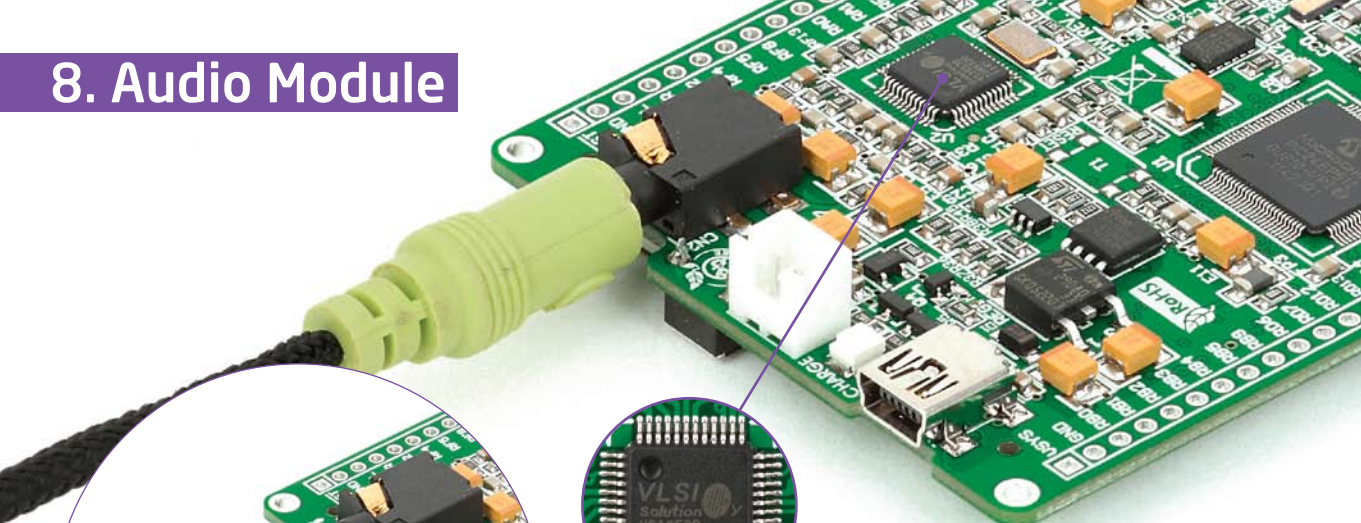


Figure 8-1:
On-board VS1053
MP3 codec

Figure 8-2:
Inserting 3.5mm
headphones jack

The mikromedia for dsPIC33EP® 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**).

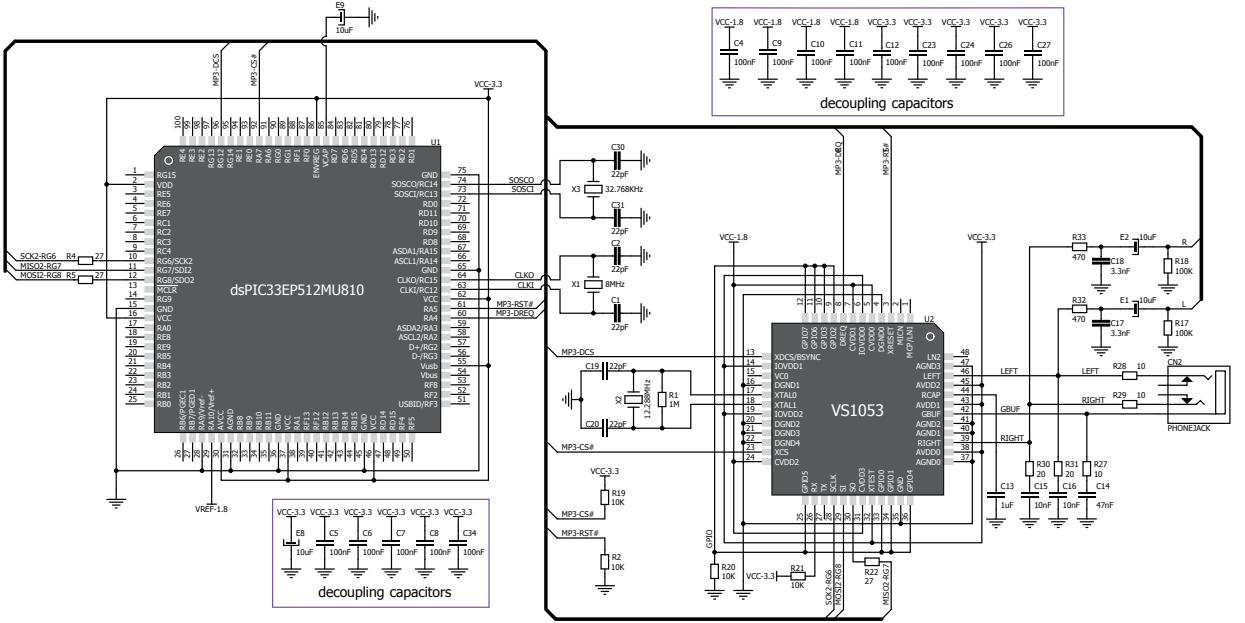


Figure 8-3: Audio module connection schematic

9. USB connection

dsPIC33EP512MU810 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.

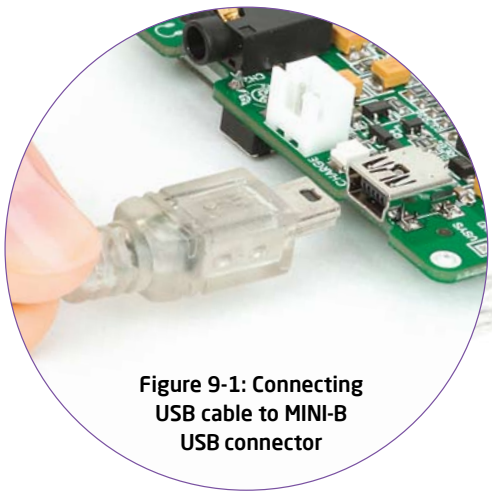


Figure 9-1: Connecting USB cable to MINI-B USB connector

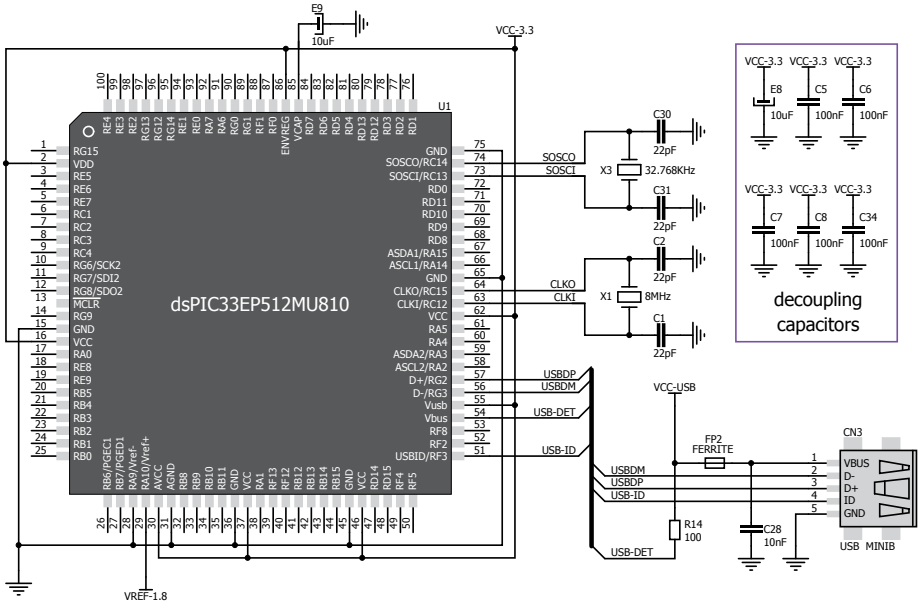
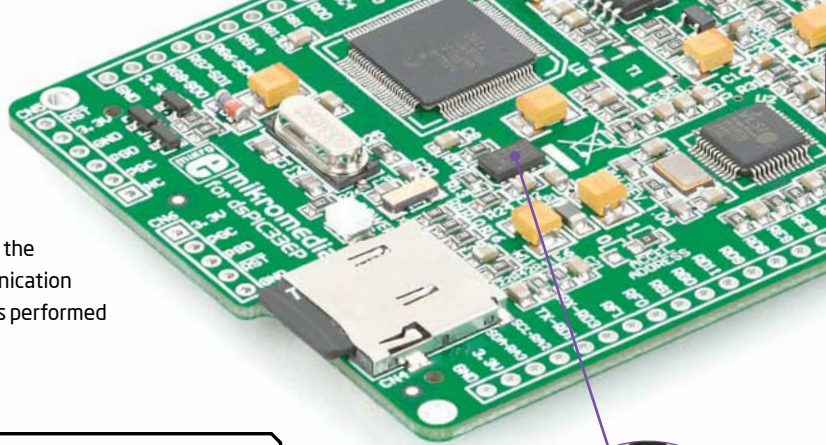


Figure 9-2: USB module connection schematic

10. Accelerometer

On board **ADXL345** accelerometer is used to measure acceleration in three axis: x, y and z. The accelerometer's 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.



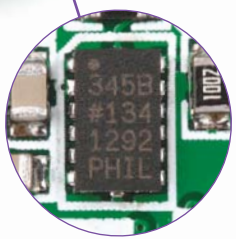


Figure 10-1: Accelerometer module

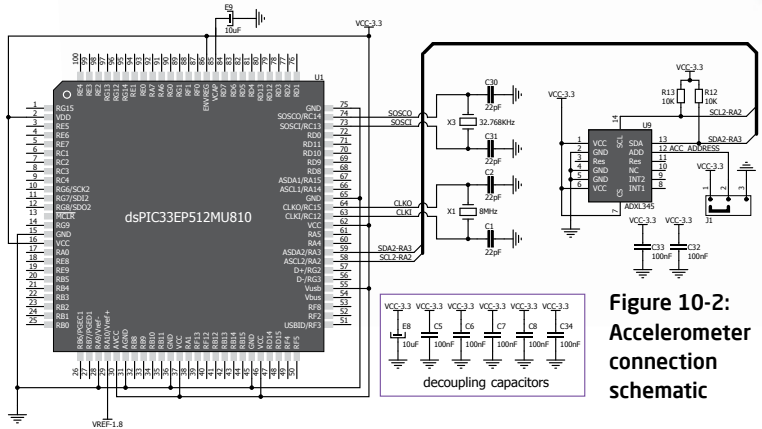


Figure 10-2: Accelerometer connection schematic

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

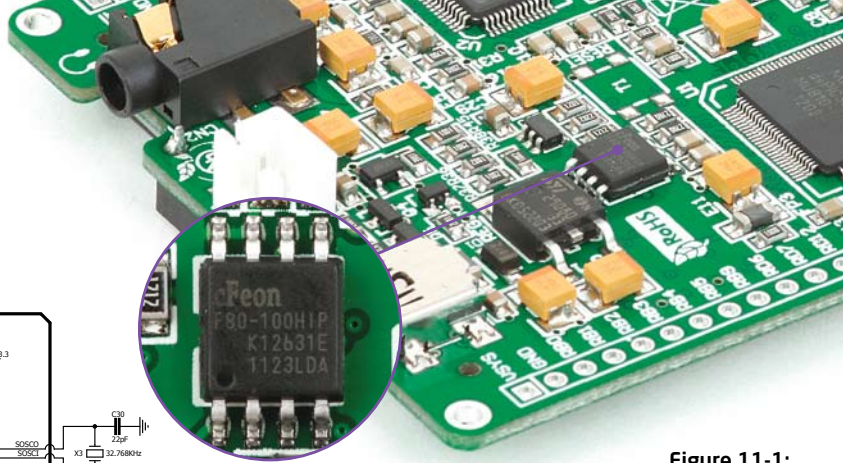


Figure 11-1:
Flash memory module

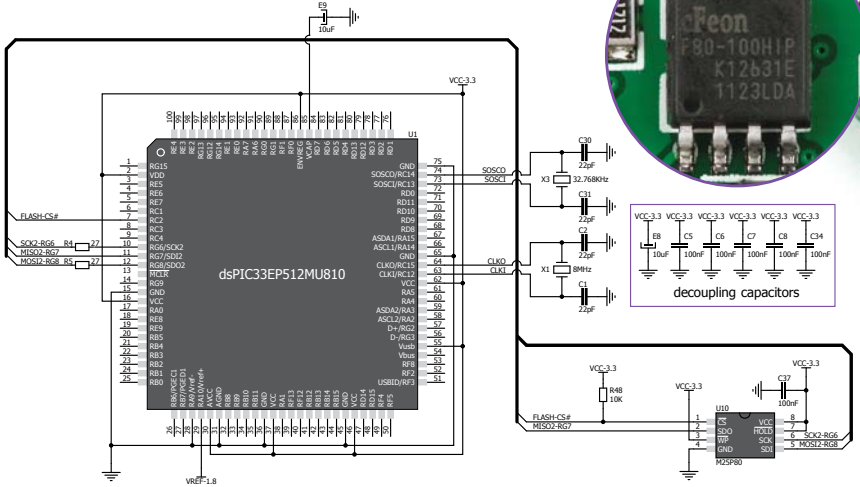
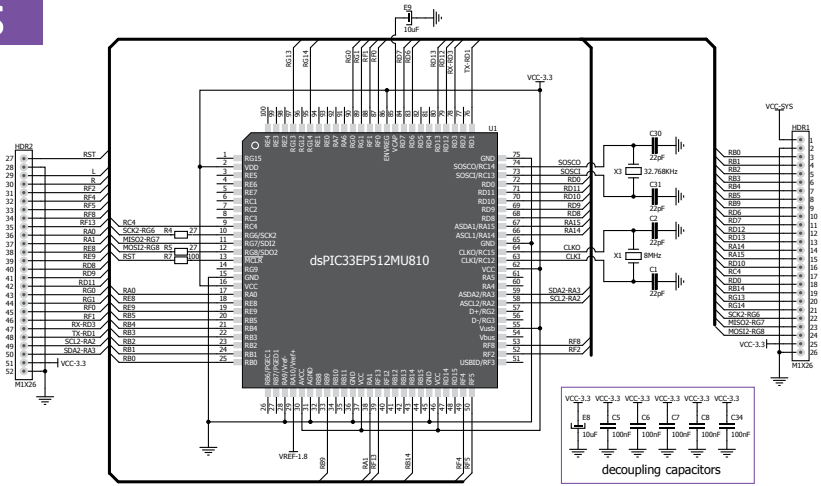


Figure 11-2:
Flash memory module connection schematic

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

Pads HDR2

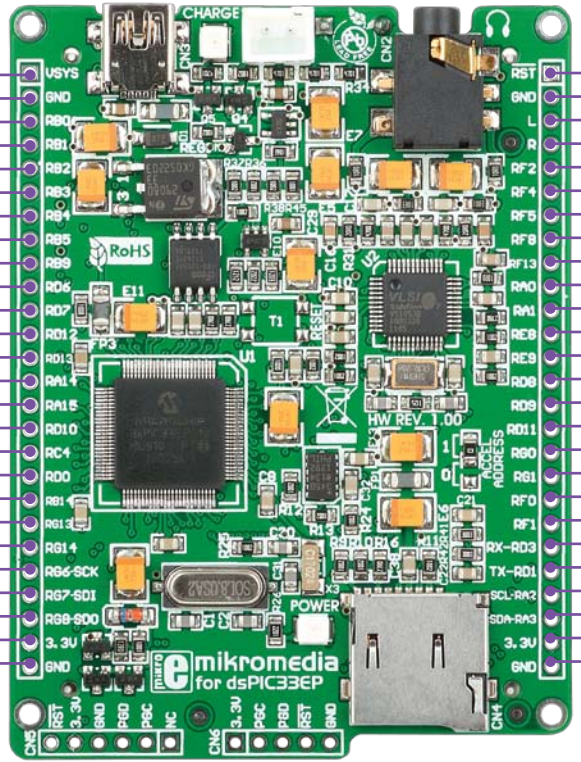


Pads HDR1

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.

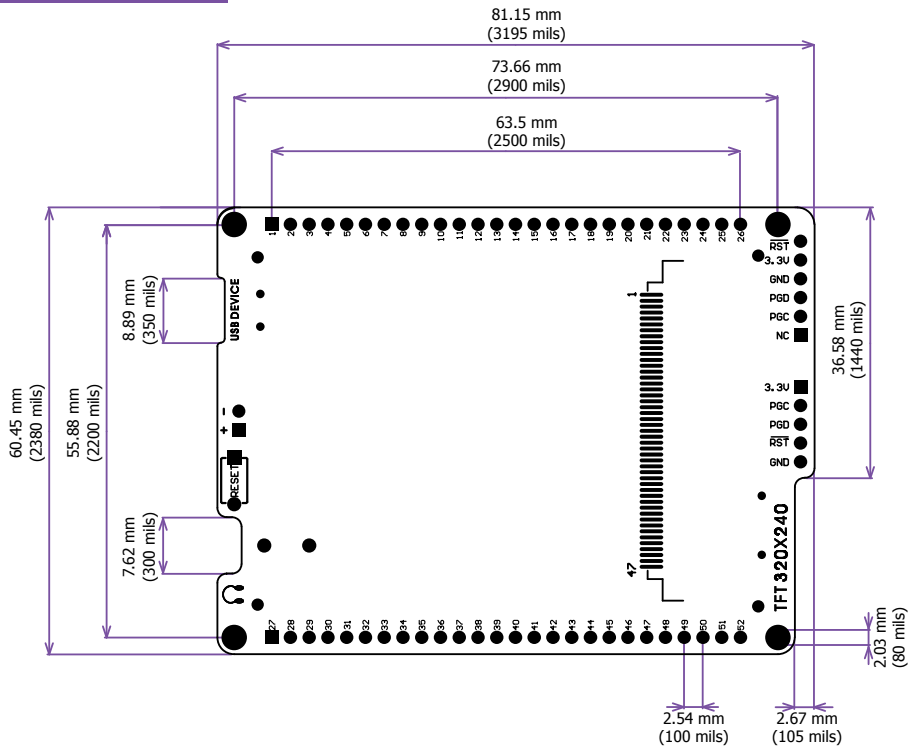
13. Pinout



Pin functions			Pin functions
5V power supply	5V	VSYS	RST	Reset pin
Reference Ground	GND	GND	GND	Reference Ground
	RB0	RB0	L	left ch.
	RB1	RB1	R	right ch. (audio out)
Analog Lines	RB2	RB2	RF2	
	RB3	RB3	RF4	PWM lines
	RB4	RB4	RF5	
	RB5	RB5	RF8	
	RB9	RB9	RF13	
	RD6	RD6	RA0	
Interrupt Lines	RD7	RD7	RA1	
	RD12	RD12	RE8	
	RD13	RD13	RE9	
	RA14	RA14	RD8	
	RA15	RA15	RD9	
	RD10	RD10	RD11	Digital I/O lines
Digital I/O lines	RC4	RC4	RG0	
	RD0	RD0	RG1	
	RB14	RB14	RF0	
	RG13	RG13	RF1	
	RG14	RG14	RD3	RX (UART)
SPI2 SCK2	RG6	RG6-SCK	RD1	TX (UART)
SPI2 SDI2	RG7	RG7-SDI	RA2	SCL2 (I²C)
SPI2 SDO2	RG8	RG8-SDO	RA3	SDA2 (I²C)
3.3V power supply	3.3V	3.3V	3.3V	3.3V power supply
Reference Ground	GND	GND	GND	Reference Ground

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

14. Dimensions



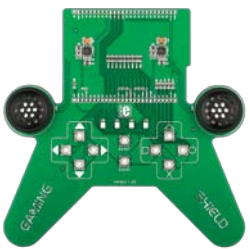
15. mikromedia accessories

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.

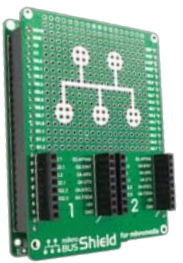
01 Connect shield

02 BatteryBoost shield

03 PROTO shield



04 Gaming shield



05 mikroBUS shield

06 Li-Polimer battery

07 Wire Jumpers

What's next?

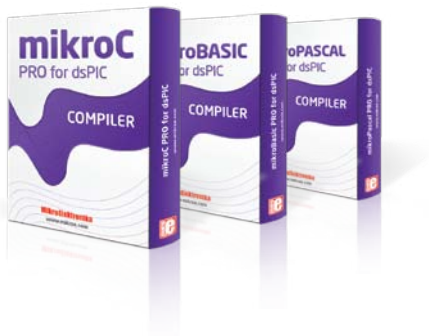
You have now completed the journey through each and every feature of mikromedia for dsPIC33EP board. You got to know it's modules and organization. Now you are ready to start using your new board. We are suggesting several steps which are probably the best way to begin. We invite you to join the users 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 dsPIC® 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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