

user's guide to

multimedia

for PIC32MX7

Compact development system rich with on-board peripherals
for all-round multimedia development on PIC32MX795F512L



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 'NM', is positioned above the name and title of the General Manager.

Nebojsa Matic
General Manager

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Introduction to MMB for PIC32MX7

The MMB for PIC32MX7 is a compact development system which provides a convenient platform for development of devices with multimedia contents. The central part of the system is a 32-bit microcontroller **PIC32MX795F512L** that is programmed with bootloader or with external programmer mikroProg (mikroElektronika), or ICD3® (Microchip®). The MMB for PIC32MX7 features integrated modules such as audio module, **TFT 320x240** touch screen display, USB connector for communication with the microcontroller, accelerometer, **RS-232** module, **EEPROM** memory, **FLASH** memory, temperature sensor, joystick and **MMC/SD** card slot.



Package contains



- 01 Damage resistant protective box



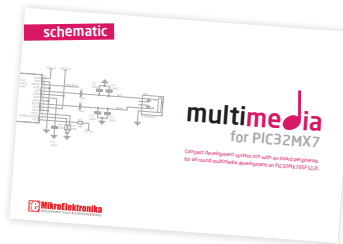
- 02 MMB for PIC32MX7 development system



- 03 CD with documentation and examples



- 04 MMB for PIC32MX7 user's guide



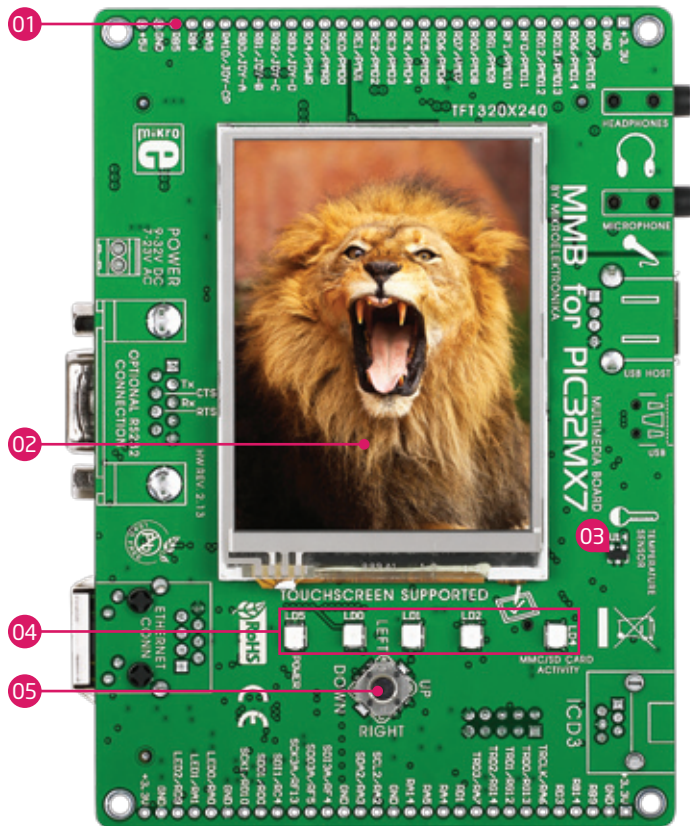
- 05 MMB for PIC32MX7 schematic

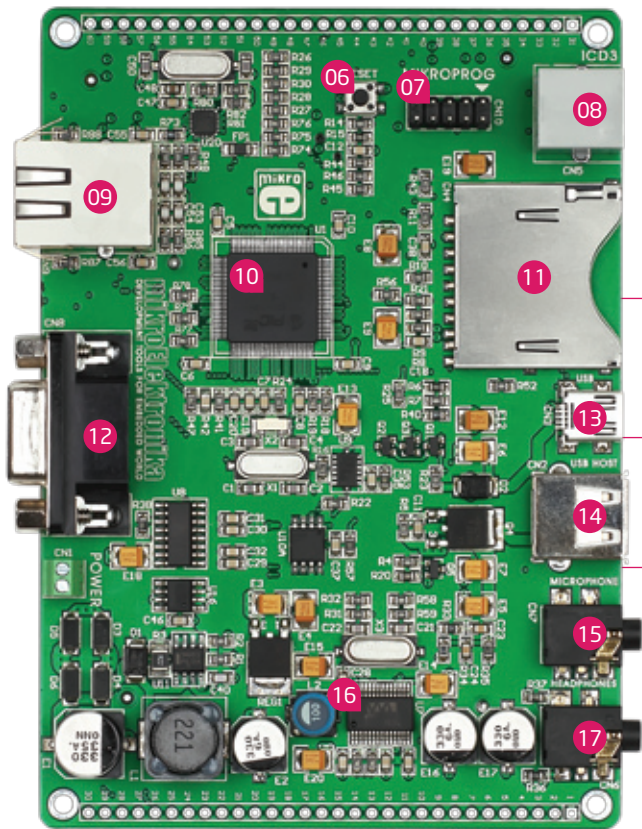


- 06 USB cable

Key Features

- 01 Pads
- 02 TFT 320x240 display
- 03 Temperature sensor
- 04 Indication LEDs
- 05 Joystick
- 06 RESET button
- 07 2x5 male header for mikroProg programmer
- 08 ICD3 connector
- 09 Ethernet connector
- 10 PIC32MX795F512L
- 11 MicroSD Card Slot
- 12 RS-232 connector
- 13 USB MINIB connector
- 14 USB HOST connector
- 15 3.5mm microphone connector
- 16 Audio module
- 17 3.5mm headphone connector





System Specification



power supply

Over a USB cable (5V DC) or via screw terminal (7-23V AC or 9-32V DC)



power consumption

50mA in idle state
(when on-board modules are off)



board dimensions

12.6 x 8.9cm (4.9 x 3.5 inch)



weight

~200g (0.5 lbs)

1. Connecting power supply

Via USB MINIB connector

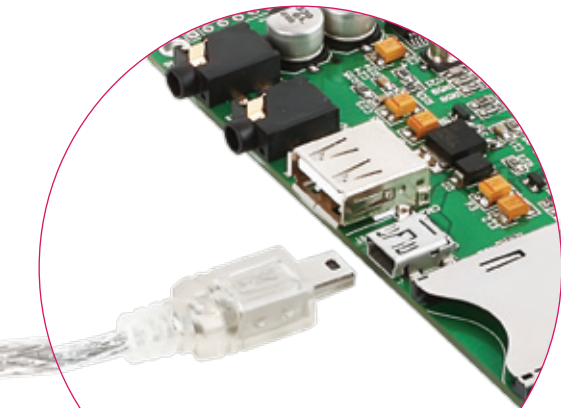
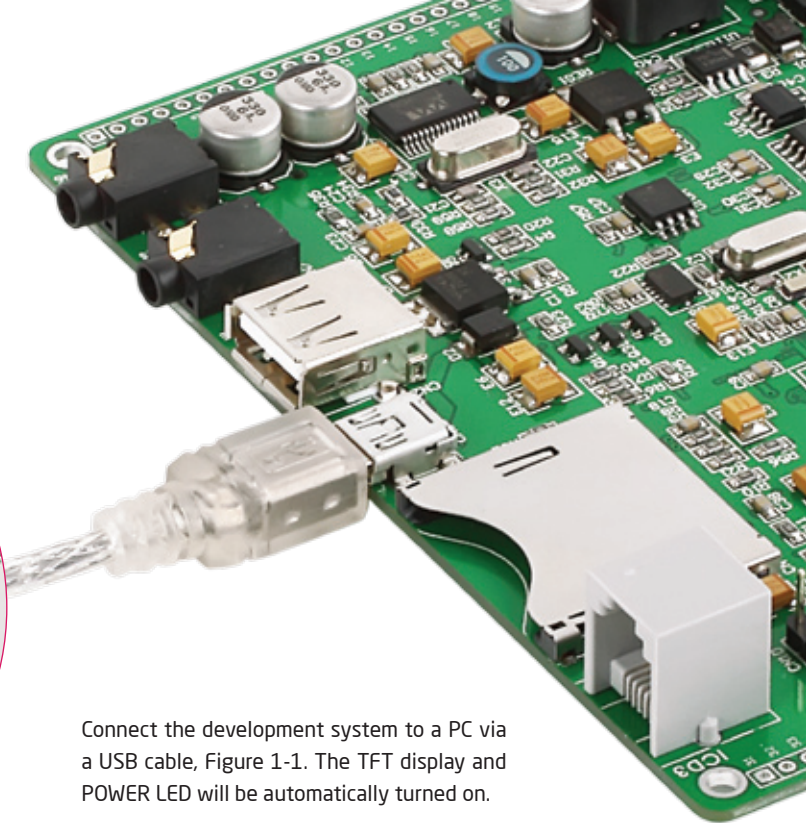


Figure 1-1: Powering the development system via USB MINIB connector



Connect the development system to a PC via a USB cable, Figure 1-1. The TFT display and POWER LED will be automatically turned on.

Via screw terminal

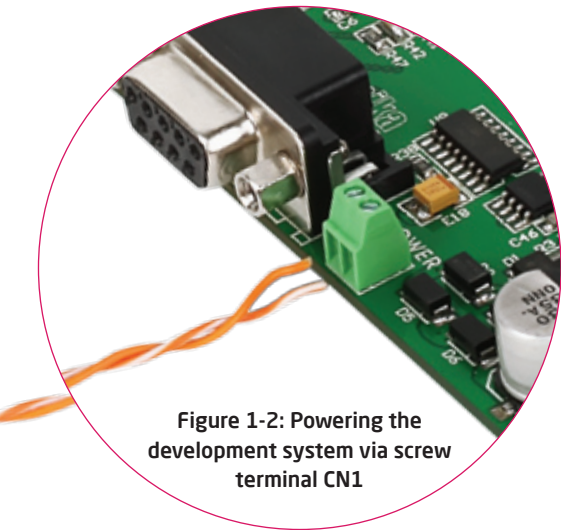


Figure 1-2: Powering the development system via screw terminal CN1

Instead of using power supply via USB MINIB connector, it is also possible to use AC/DC power supply via screw terminal CN1. Connected power supply source voltage can vary from 9 to 32V DC and from 7 to 23V AC.

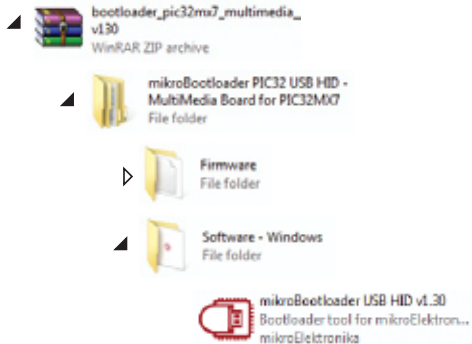
2. Programming with bootloader

For programming, microcontroller use bootloader program which is preinstalled in to MCU memory. 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/573/multimedia-board-for-pic32mx7/>

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



step 1 - Connecting PIC32MX7



Figure 2-1: mikroBootloader USB HID

- 01 Connect PIC32MX7 board with a PC via USB cable and USB icon will turn red
- 02 Within 5s click on Connect button

step 2 - Browsing for .hex file



Figure 2-2: Browse for HEX

- 01 Click on Browse for HEX button

step 3 - Select .hex file

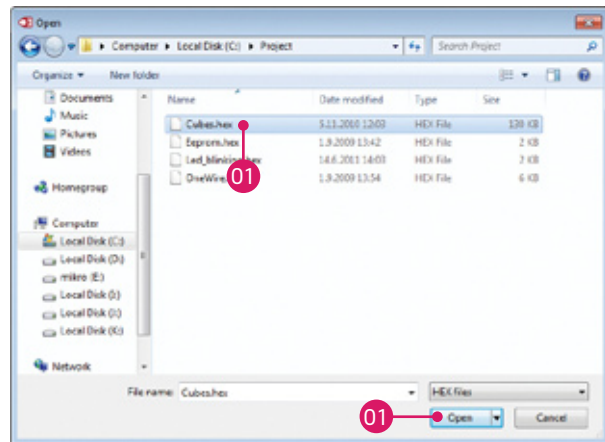


Figure 2-3: Selecting HEX

- 01 Select .hex file via open window
- 02 Click on Open button

step 4 - .hex file uploading



Figure 2-4: Begin uploading

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



Figure 2-5: Progress bar

01 You can monitor .hex file uploading via progress bar

step 5 - Finish upload

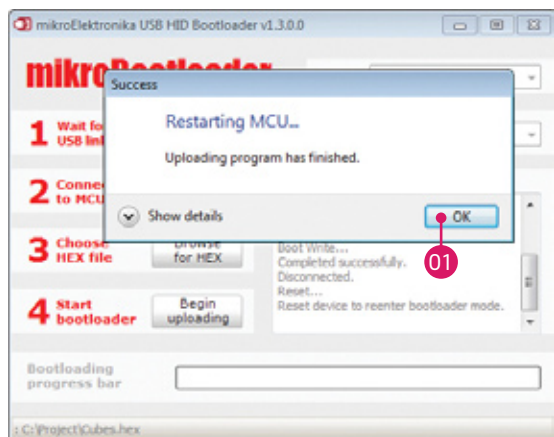


Figure 2-6: Restarting MCU

01 To finish uploading click on OK button

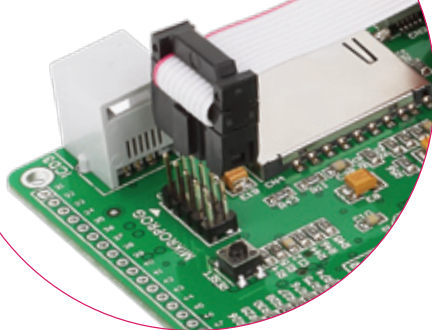


Figure 2-7: mikroBootloader ready for next job

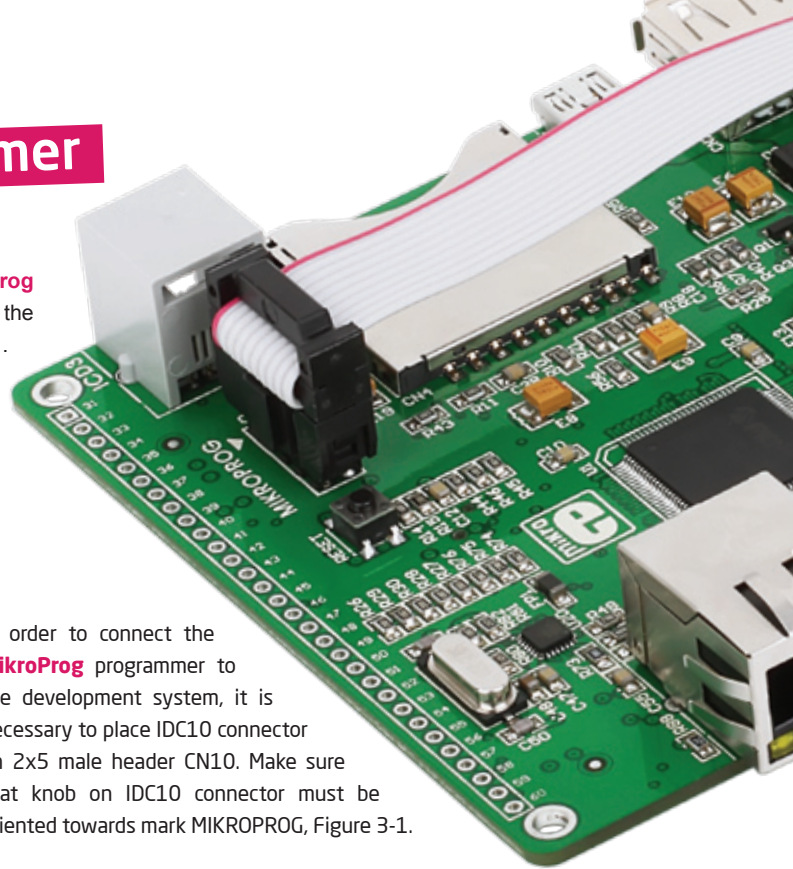
3. Programming with mikroProg™ programmer

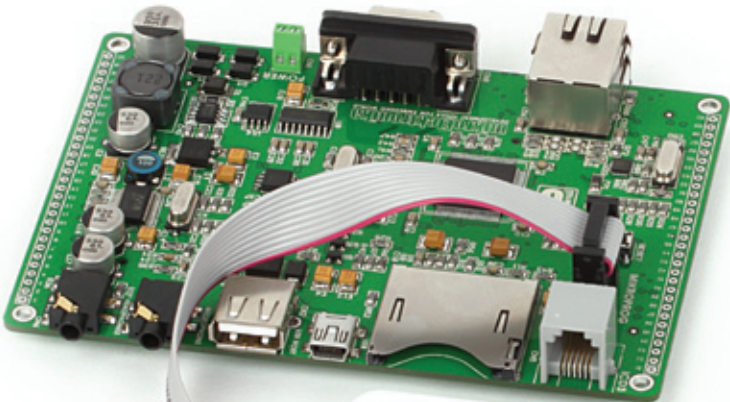
The microcontroller can be programmed with **mikroProg** programmer. The mikroProg programmer is connected to the development system via the CN10 connector, Figure 3-1.

Figure 3-1: Connecting mikroProg programmer



In order to connect the **mikroProg** programmer to the development system, it is necessary to place IDC10 connector on 2x5 male header CN10. Make sure that knob on IDC10 connector must be oriented towards mark MIKROPROG, Figure 3-1.





mikroProg features:

- 01 Fast mikroICD In-Circuit Debugger
- 02 Support for over 600 PIC, dsPIC and PIC32 devices
- 03 Compatible with mikroC, mikroBasic and mikroPascal compilers for PIC, dsPIC and PIC32
- 04 Elegant minimalistic design, clean matte white plastic finish and color indicator LEDs



4. Programming with ICD3 programmer

The microcontroller can be also programmed with **ICD3** programmer. This programmer is connected to PIC32MX7 board via on-board ICD connector CN5.

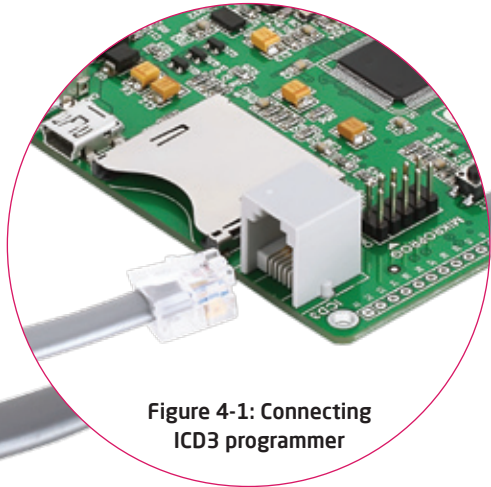
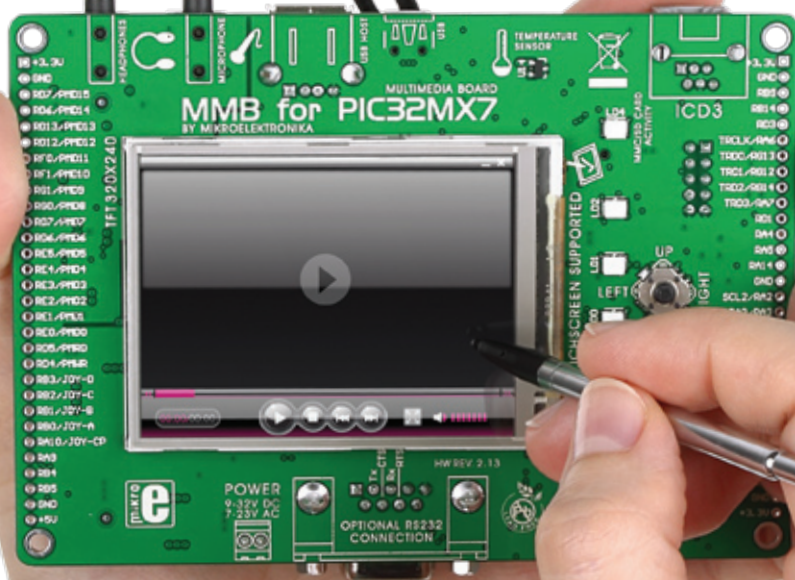


Figure 4-1: Connecting ICD3 programmer

In order to make connection between **ICD3** programmer and PIC32MX7 place programmers cable in to ICD connector CN5, Figure 4-1. To use ICD3 programmer it is necessary to instal program MPLAB on a PC.

5. Touch Screen



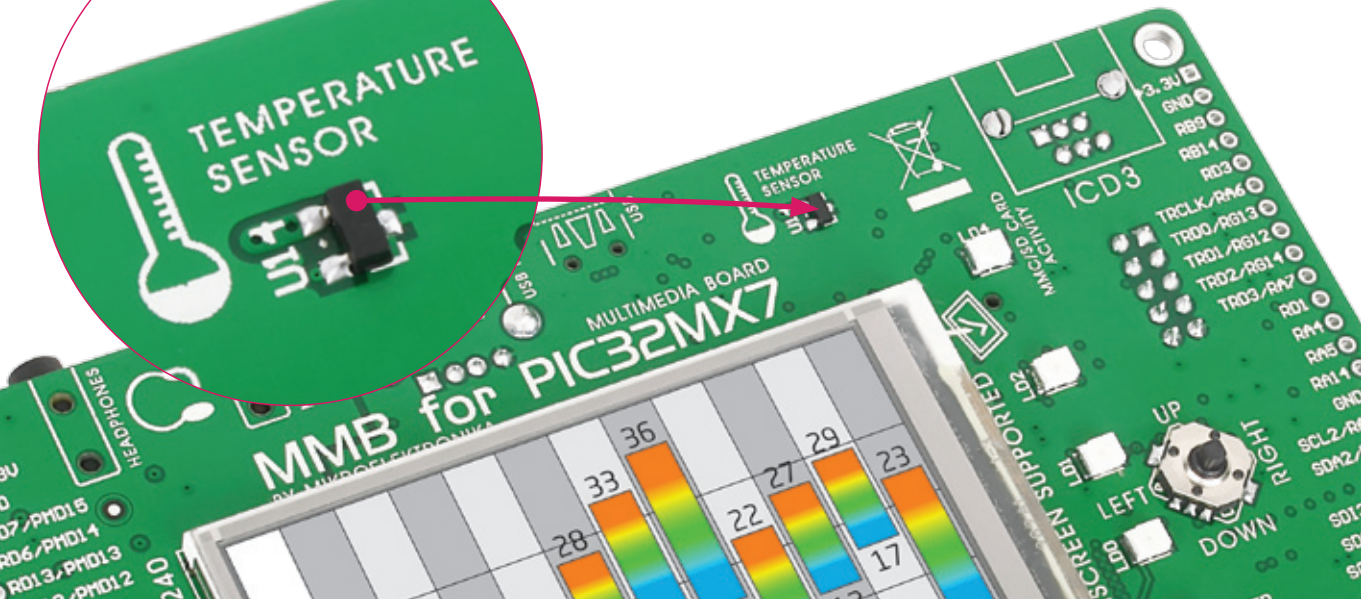
The development system features a **TFT 320x240 display** covered with a **resistive** touch panel. Together they form a functional unit called a touch screen. It enables data to be entered and displayed at the same time. The way of entering and displaying data depends on the program loaded into the microcontroller. The TFT display is capable of showing data in **262.000** different **colors**.

Figure 5-1:
Touch Screen

6. Temperature sensor

Figure 6-1:
MCP9700A

The built in temperature sensor (MCP9700A) is capable for measuring temperature in range between **-40** and **+125°C** with accuracy of **+/-2°C**. Temperature sensor is attached to MCU via pin **RB8** (TEMP).



7. Flash Memory

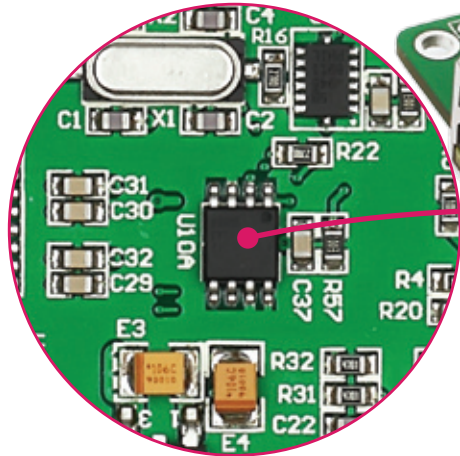


Figure 7-1: Flash memory module

Since multimedia applications are getting increasingly demanding, it is necessary to provide additional memory space to be used for storing programs by the microcontroller. 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**).

8. EEPROM Memory

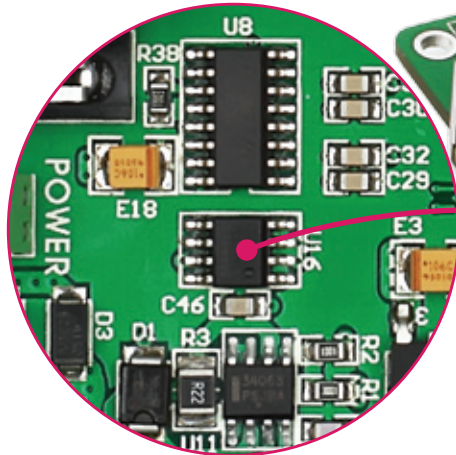


Figure 8-1: EEPROM memory module

EEPROM (Electrically Erasable Programmable Read-Only Memory) is a built-in memory module used for storing data that should be saved when power goes off. The 24AA01 circuit may store **1Kbit** data and uses serial **I²C** communication to exchange data with the microcontroller.

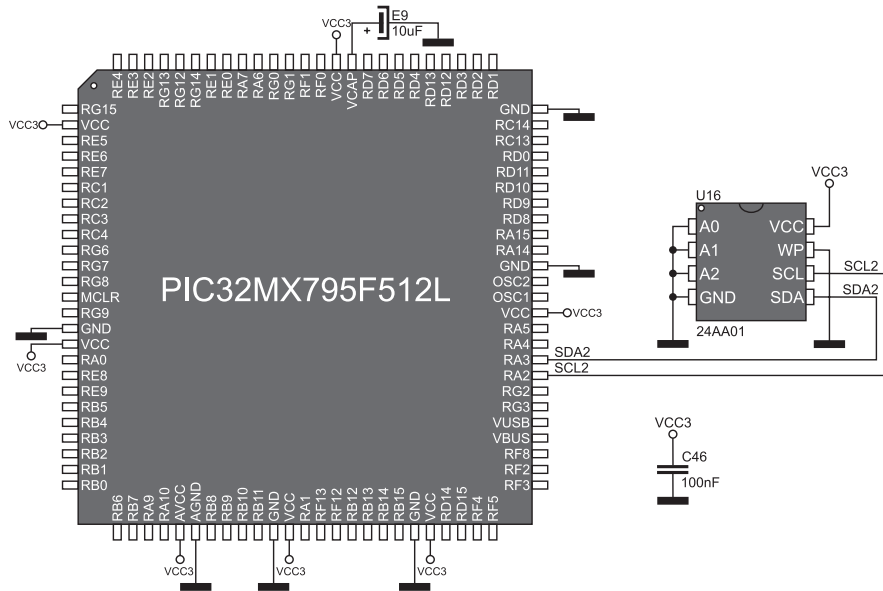


Figure 8-2: EEPROM memory module connection schematic

9. MMC/SD Card Slot

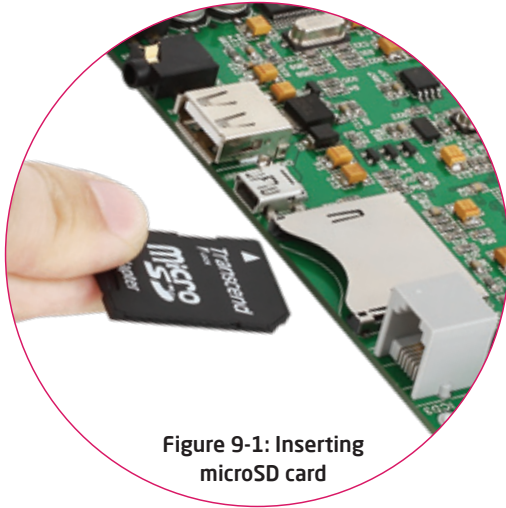


Figure 9-1: Inserting microSD card

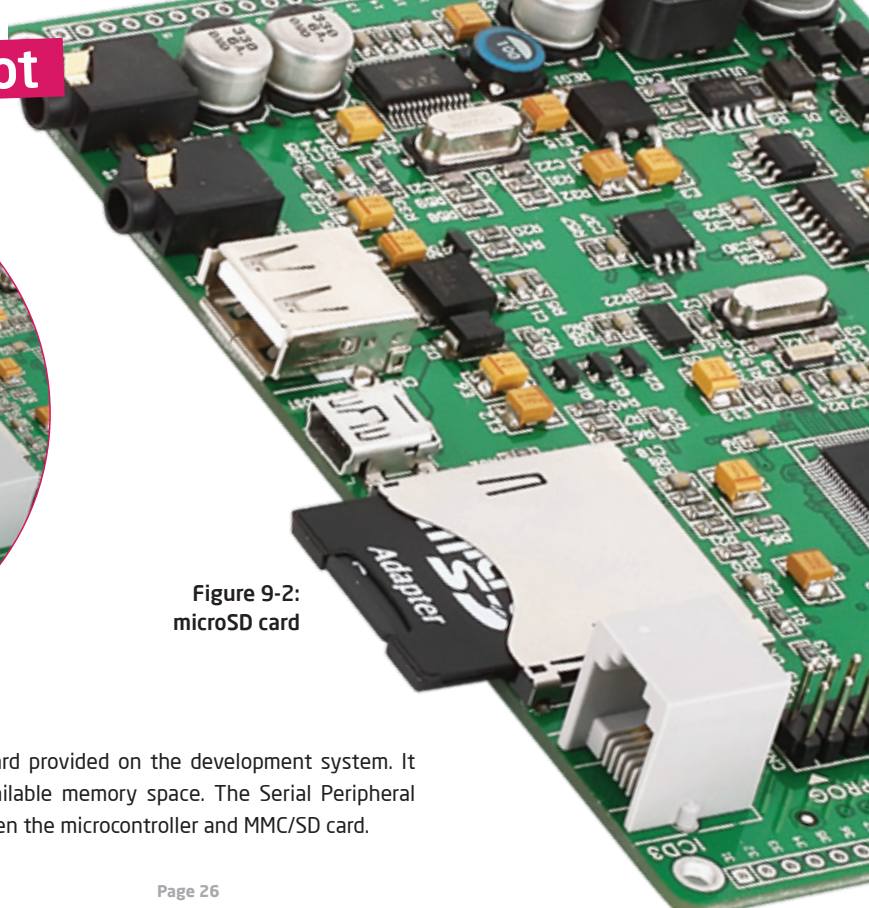


Figure 9-2: microSD card

There is a built-in **MMC/SD** slot for MMC/SD card provided on the development system. It enables the system to additionally expand available memory space. The Serial Peripheral Interface (**SPI**) is used for communication between the microcontroller and MMC/SD card.

10. Audio Module

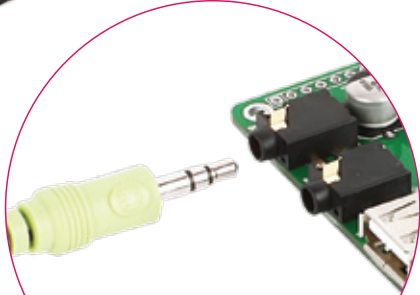
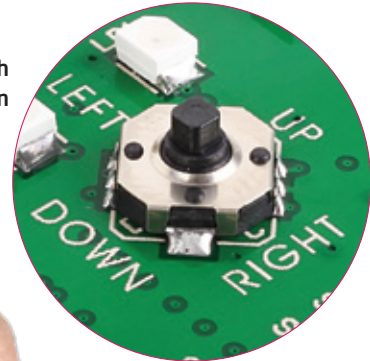


Figure 10-1: Inserting 3.5mm headphones jack

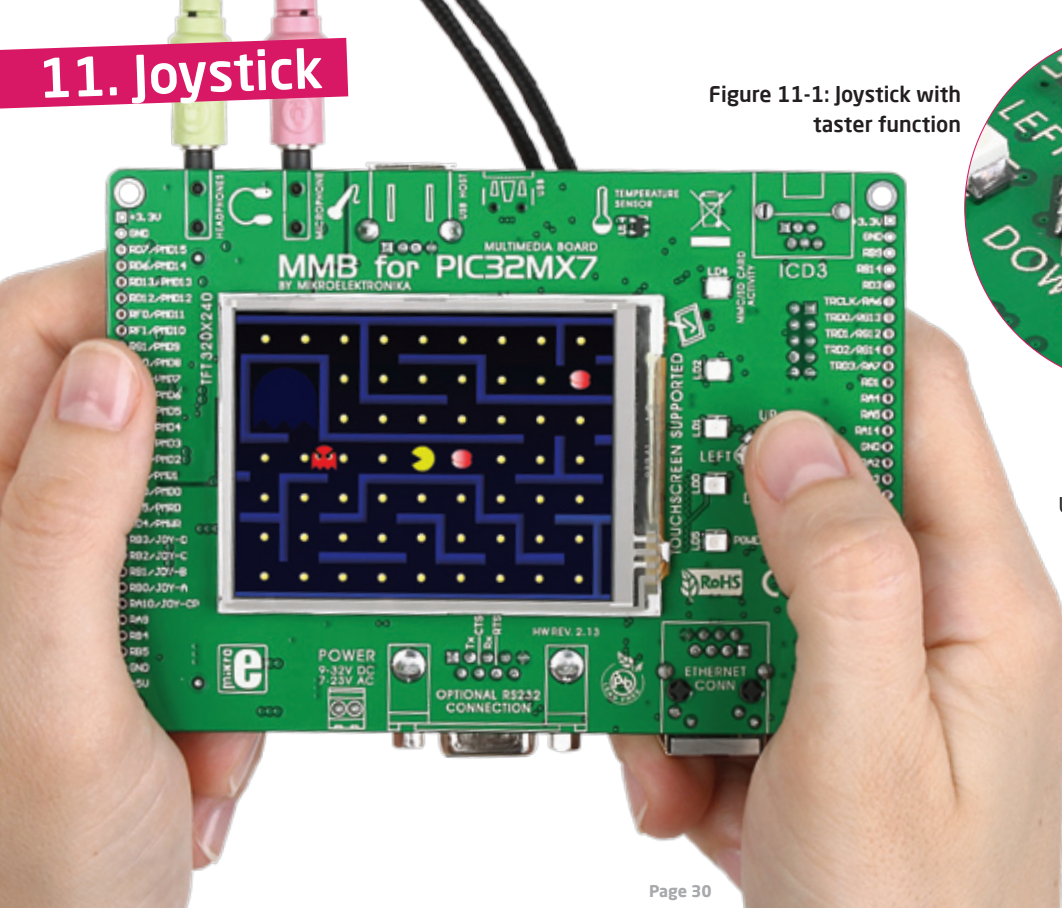
The Multimedia Board features an audio module providing an interface for a microphone and stereo headphones. This module enables audio recording via a mono microphone. The microphone is connected to the system via a **3.5mm** connector CN7. **Stereo** headphones are used for audio reproduction. They are connected to the system via a 3.5mm connector CN6. For the proper use of microphone and headphones, it is necessary to write a program and load it into the microcontroller. In addition to the audio recording and reproduction, the audio module can also generate a side tone in the headphones. Volume as well as other functions of this module are controlled by the microcontroller from within the software using serial **I²C** communication. Communication between the audio module and the microcontroller is performed via the Serial Peripheral Interface (**SPI**).

11. Joystick

Figure 11-1: Joystick with taster function



Use built-in **joystick** to make simple games, menus and other applications that requires movement in four directions with **taster** function (when joystick is pressed).



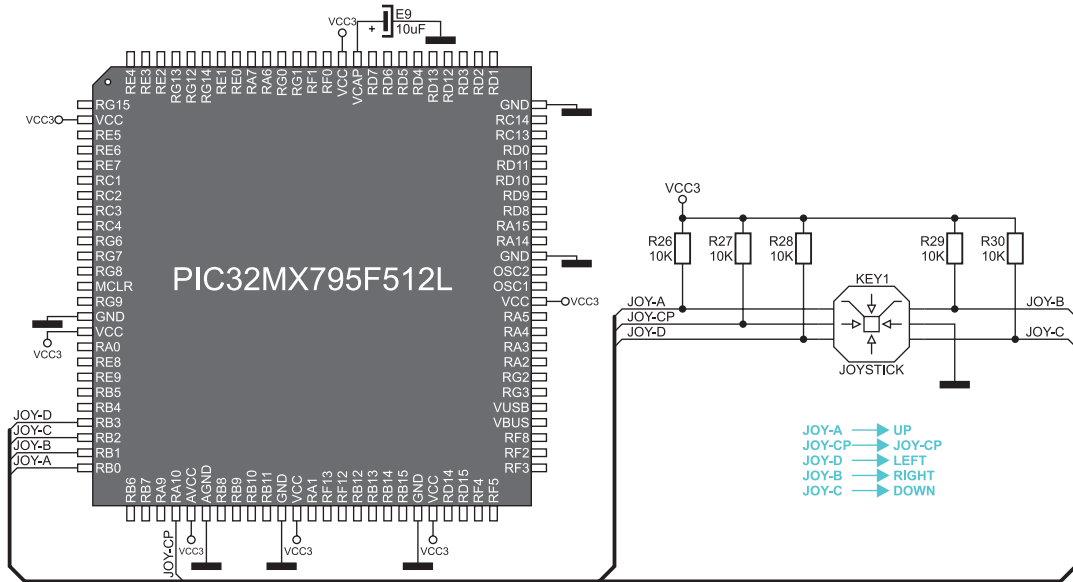


Figure 11-2: Joystick connecting schematic

12. USB connectors

MultiMedia Board for PIC32MX7 have two USB connectors: USB MINIB and USB HOST.

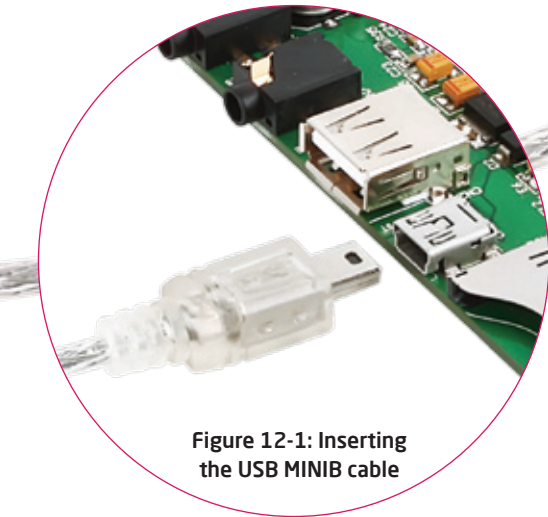


Figure 12-1: Inserting the USB MINIB cable

USB MINIB represents OTG device which is used for connection with a PC. This USB connector is used for MCU programming via bootloader software.

Figure 12-2: MMB for PIC32MX7 connected with USB device via USB cable

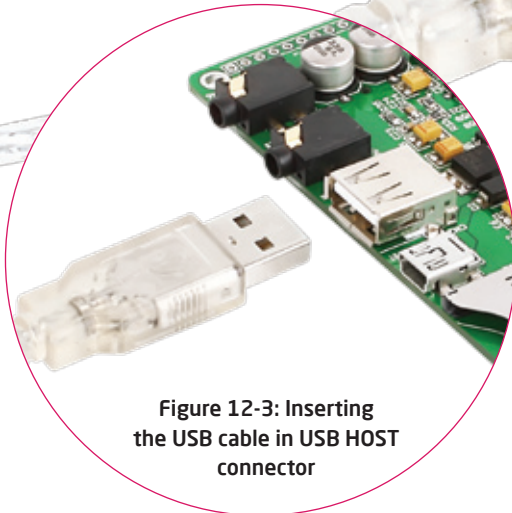
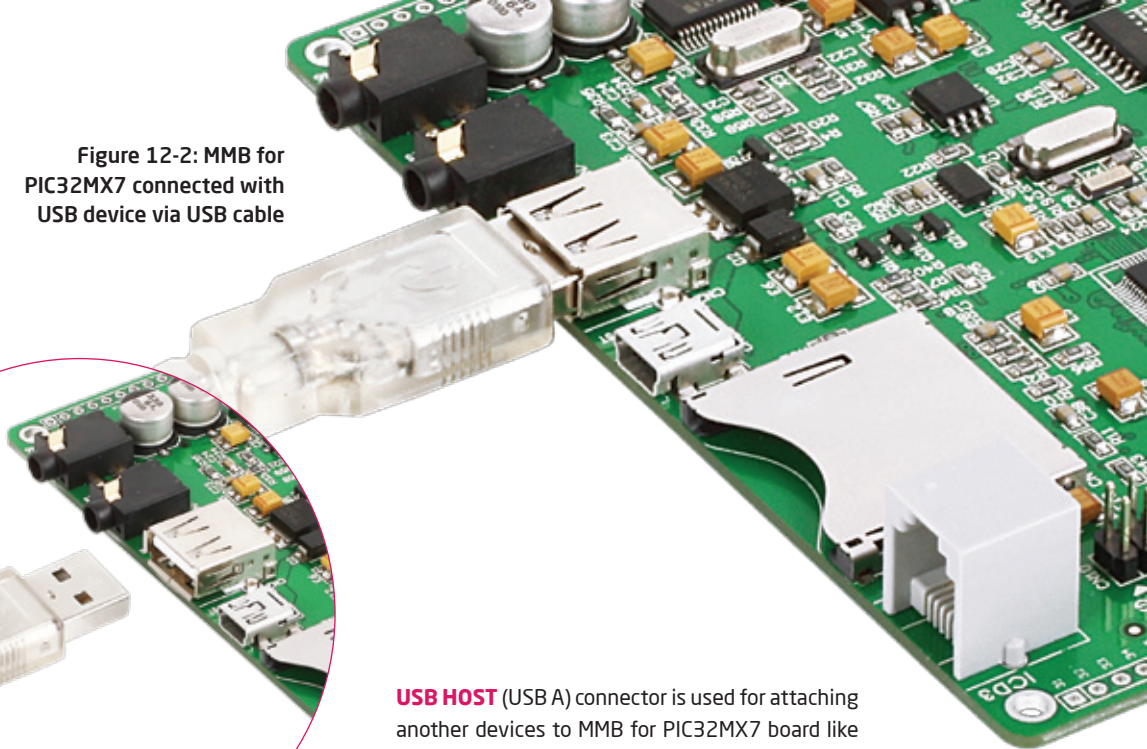


Figure 12-3: Inserting the USB cable in USB HOST connector

USB HOST (USB A) connector is used for attaching another devices to MMB for PIC32MX7 board like printer, scanner, keyboard etc. Bare in mind that is necessary to write a **program** which will control these devices.

14. RS-232 module

The development board features the **RS-232** module which communicates with MCU via UART communication.

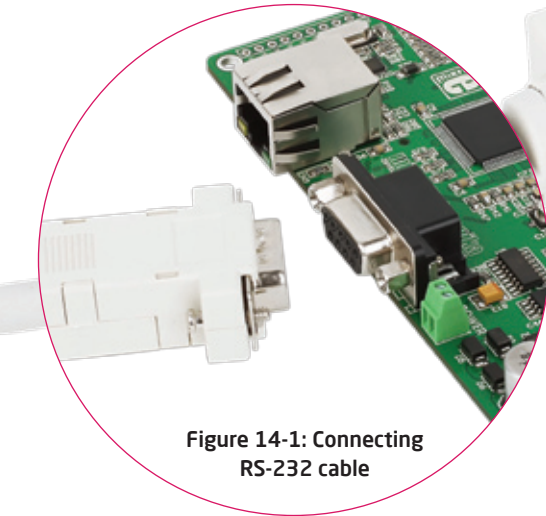


Figure 14-1: Connecting RS-232 cable

UART (Universal Asynchronous Receiver/Transmitter) is one of the most common ways of exchanging data between a PC and peripheral devices. The **RS-232** serial communication is performed via a **9-pin SUB-D** connector and the microcontroller's UART module.

15. Ethernet module

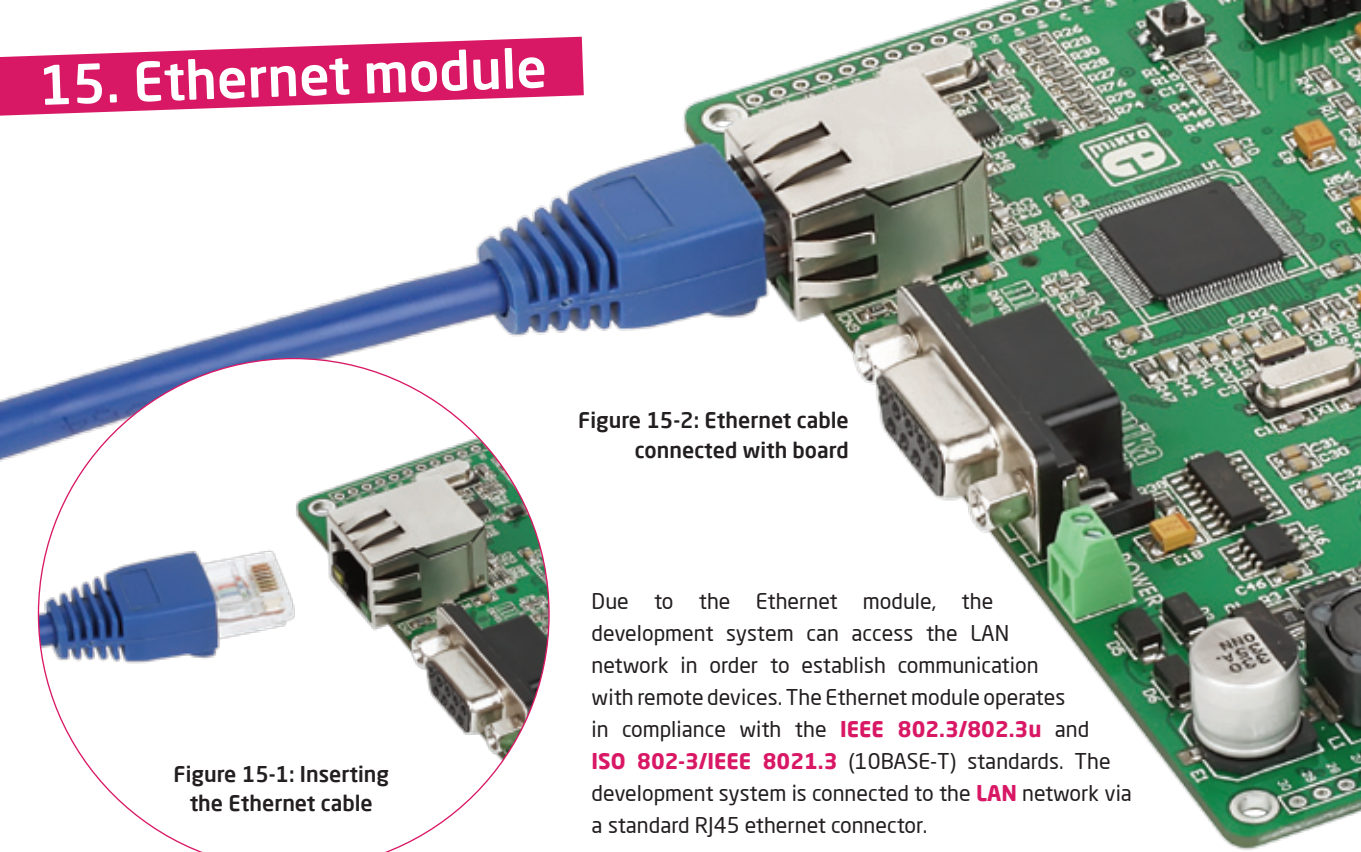


Figure 15-2: Ethernet cable connected with board

Due to the Ethernet module, the development system can access the LAN network in order to establish communication with remote devices. The Ethernet module operates in compliance with the **IEEE 802.3/802.3u** and **ISO 802-3/IEEE 8021.3** (10BASE-T) standards. The development system is connected to the **LAN** network via a standard RJ45 ethernet connector.

Figure 15-1: Inserting the Ethernet cable

16. Accelerometer

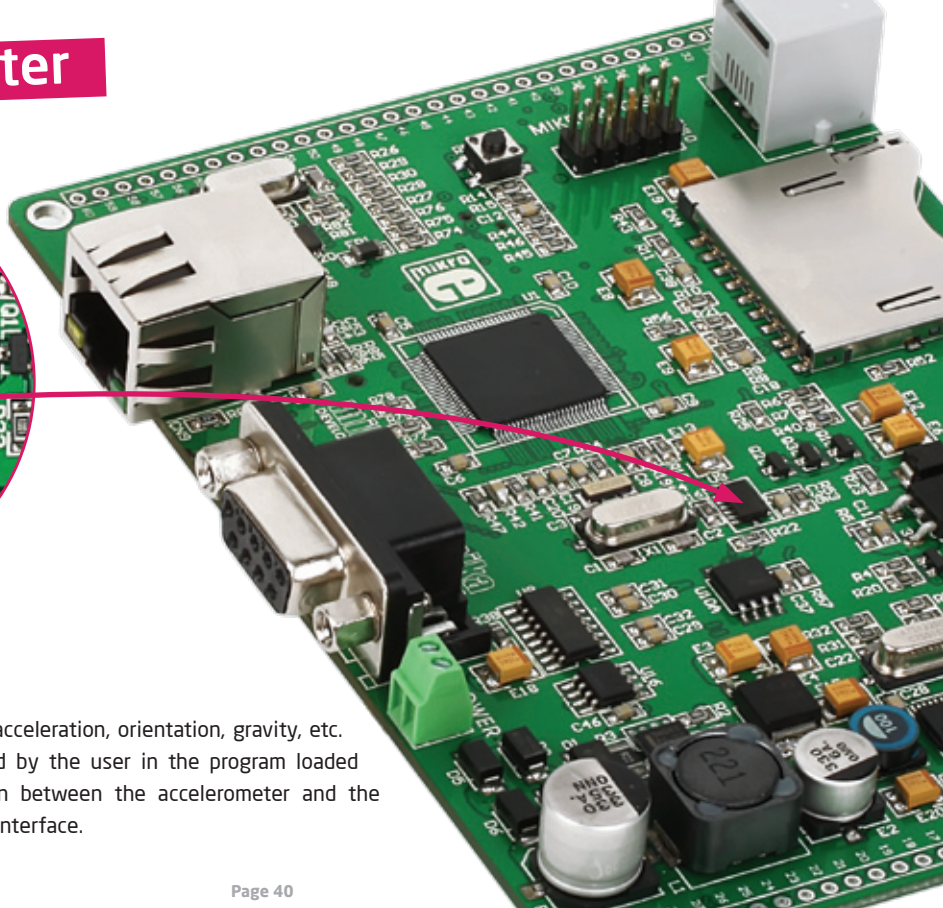
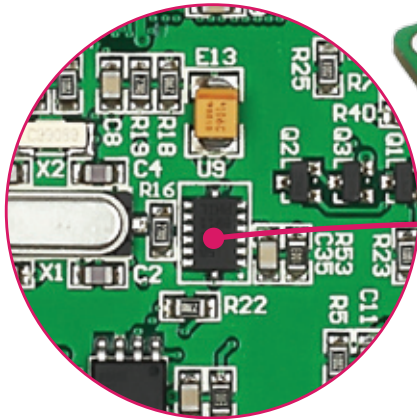


Figure 16-1: Accelerometer

The accelerometer is used to measure acceleration, orientation, gravity, etc. 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 **SPI** interface.

17. Pinout

Pin functions

- +3.3V power supply
- Ground
- PMD15
- PMD14
- PMD13
- PMD12
- PMD11
- PMD10
- PMD9
- PMD8
- PMD7
- PMD6
- PMD5
- PMD4
- PMD3
- PMD2
- PMD1
- PMD0
- PMR9
- PMWR
- Analog I/O / Joystick pins
- AN3/JOY-D
- AN2/JOY-C
- AN1/JOY-B
- ANO/JOY-A
- Vref+/JOY-CP
- Vref-
- Analog I/O
- AN4
- AN5
- Ground
- +5V power supply



Pin functions

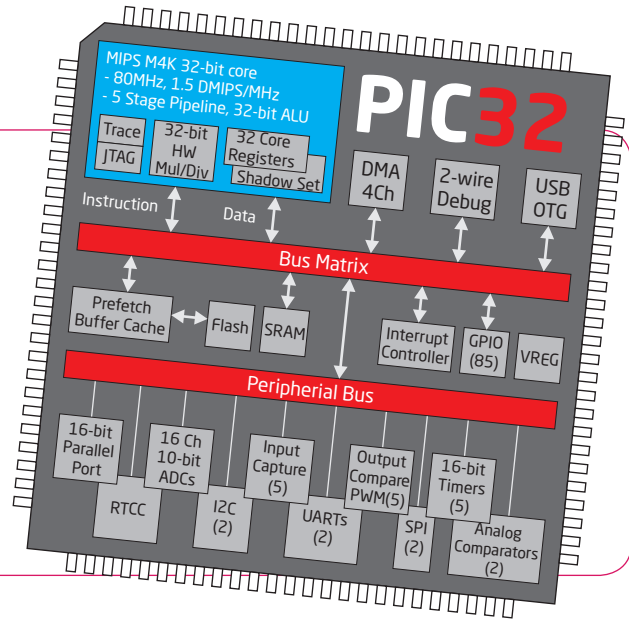
- +3.3V power supply
- Ground
- USB-PSW
- LCD-CS#
- Digital I/O
- TRCLK - Trace data clock
- TRD0 - Trace data bits
- TRD1
- TRD2
- TRD3
- Digital I/O
- INT3
- Ground
- SCL2 - I2C
- SDA2
- Ground
- SD1B - SPI
- SD03A
- SCK3A
- SD11
- SD01
- SCK1
- Ground
- LED-0
- LED-1
- LED-2
- Ground
- +3.3V power supply

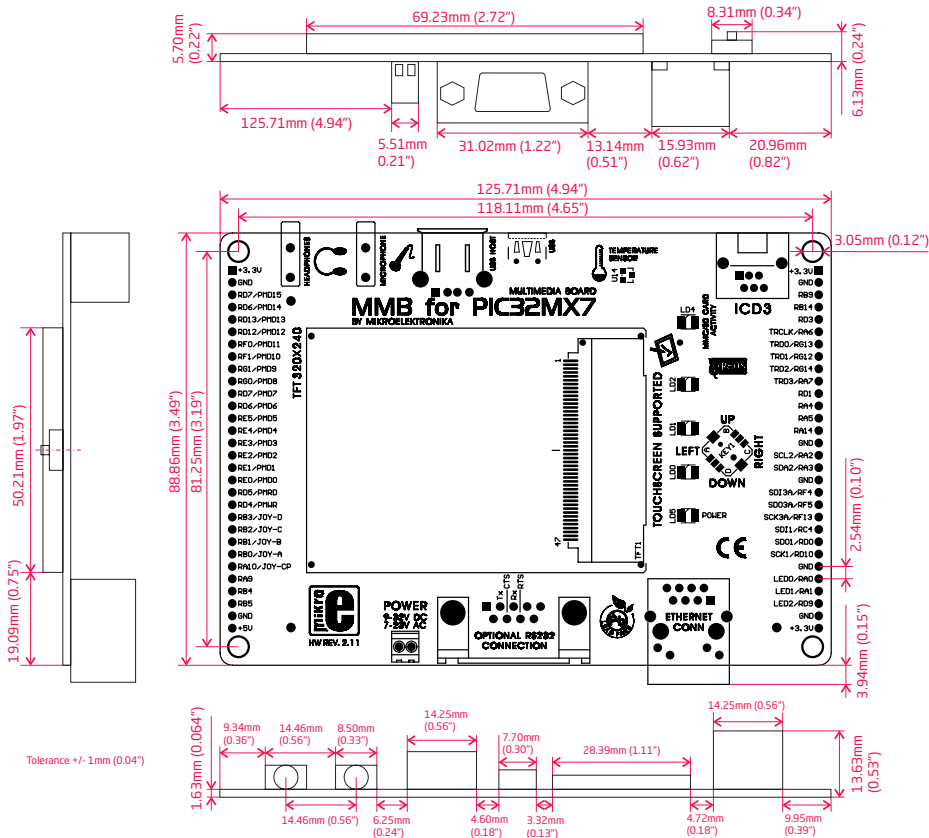
19. PIC32MX795F512L Microcontroller

The mikromedia for PIC32 development system comes with the **PIC32MX795F512L** 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);
- 128K RAM (can execute from RAM);
- 85 I/O pins;
- SPI, I²C, A/D;
- 16-bit Digital Timers;
- Internal Oscillator 8MHz, 32kHz;
- RTCC; etc.





Notes:

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