



mikromedia™

for Stellaris® M3

Compact multimedia development system rich with on-board peripherals for all-round development on **LM3S9B95** 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 white handwritten signature in cursive script, appearing to read 'N. Matic', is positioned on the right side of the page.

Nebojsa Matic
General Manager

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Introduction to mikromedia for Stellaris® M3

The **mikromedia for Stellaris® M3** 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 **ARM® Cortex™-M3 LM3S9B95** microcontroller. The mikromedia for Stellaris® M3 features integrated modules such as stereo MP3 codec, **TFT 320x240** touch screen display, accelerometer, MMC/SD card slot, 8 Mbit flash memory, battery charger. The board also contains MINI-B USB connector, two 1x26 connection pads and other. It comes pre-programmed with USB HID bootloader, but can also be programmed with external programmers, such as **mikroProg™ for Stellaris®** or JTAG programmer. Mikromedia is compact and slim, and perfectly fits in the palm of your hand, which makes it a convenient platform for mobile devices.



Package Contains



- 01 Damage resistant protective box



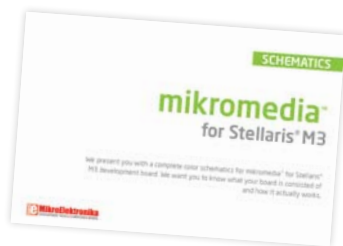
- 02 mikromedia for Stellaris® M3 development system



- 03 DVD with documentation and examples



- 04 mikromedia for Stellaris® M3 user's guide



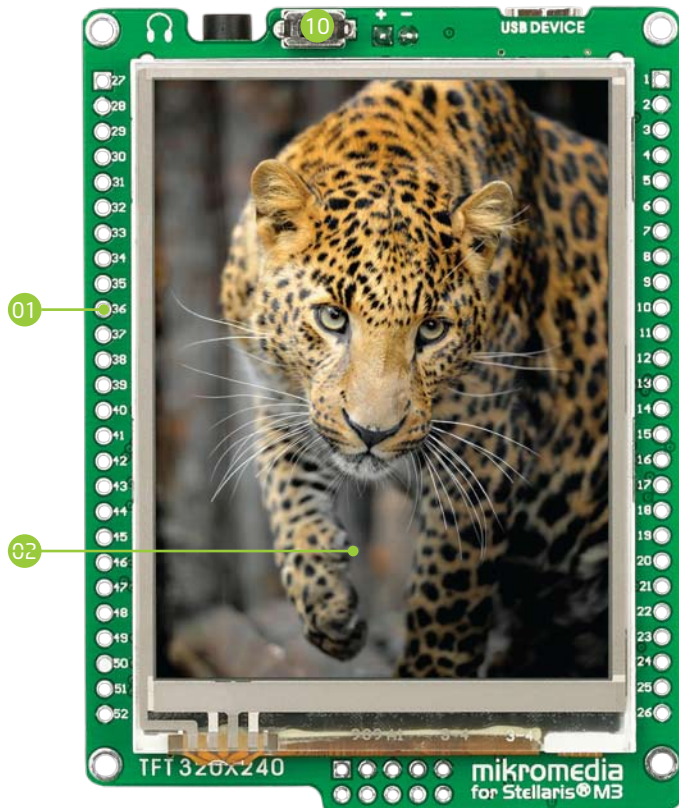
- 05 mikromedia for Stellaris® M3 schematic

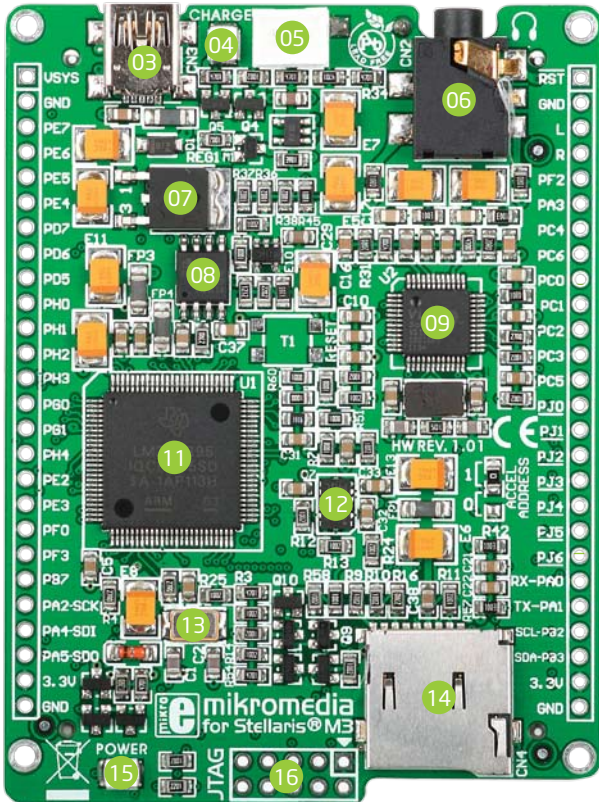


- 06 USB cable

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 VS1053 Stereo mp3 coder/decoder
- 10 RESET button
- 11 Stellaris® ARM® Cortex™-M3 LM3S9B95
- 12 Accelerometer
- 13 Crystal oscillator
- 14 microSD Card Slot
- 15 Power indication LED
- 16 JTAG/SWD programmer connector





System Specification



power supply

Via USB cable (5V DC)



power consumption

77 mA with erased MCU

(when on-board modules are inactive)



board dimensions

81.2 x 60.5 mm (3.19 x 2.38 inch)



weight

~45 g (0.10 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.



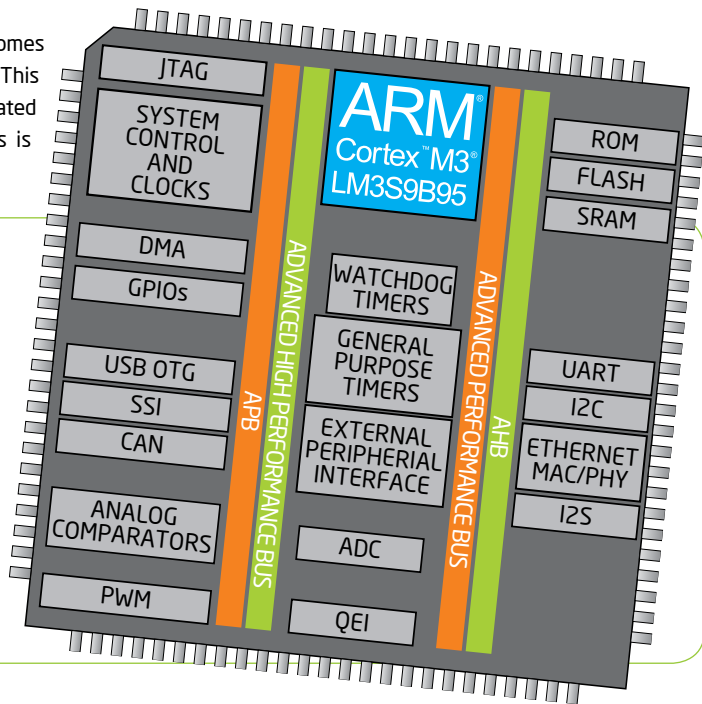
Figure 1-2: Connecting Li-Polymer battery

2. LM3S9BB95 microcontroller

The mikromedia for Stellaris® M3 development board comes with the **ARM® Cortex™-M3 LM3S9B95** 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

- Up to **100 DMIPS** Operation;
- 32-bit architecture;
- 256KB of Flash memory;
- 96KB of SRAM memory;
- 65 I/O pins;
- 32kHz RTCC;
- IEEE 1588
- Ethernet, UART, SPI, I²C, CAN, ADC etc.



3. Programming the microcontroller

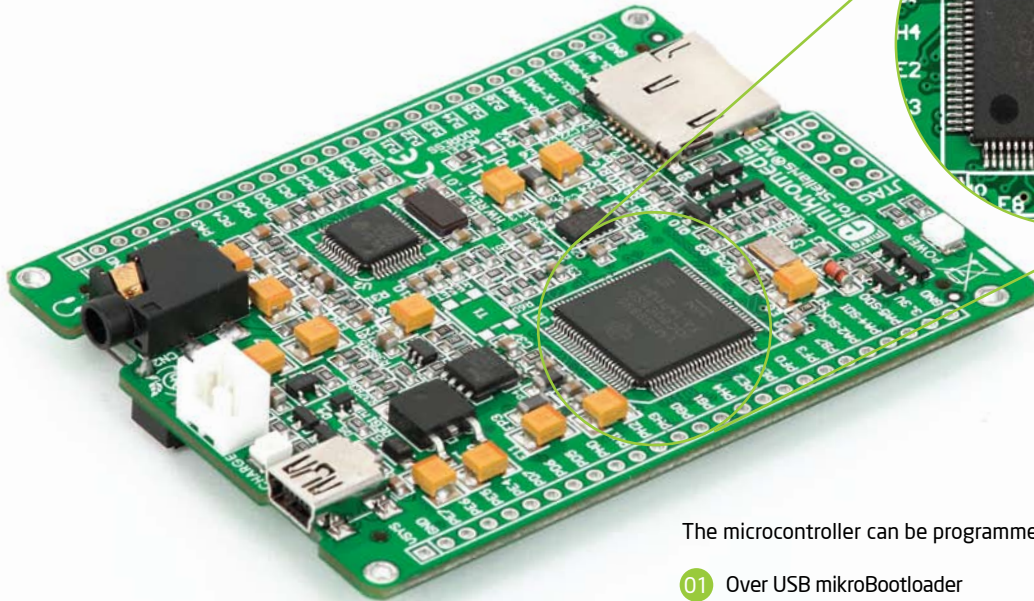


Figure 3-1:
LM3S9B95
ARM® Cortex™-M3
Microcontroller

The microcontroller can be programmed in two ways:

- 01 Over USB mikroBootloader
- 02 Using external mikroProg™ or JTAG programmer

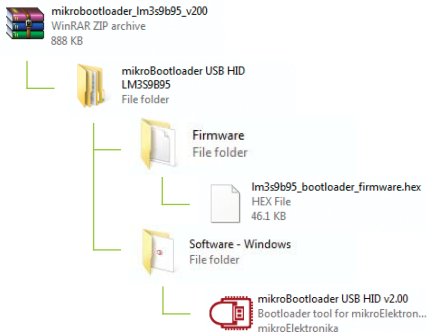
Programming with mikroBootloader

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/1752/mikrobootloader_lm3s9b95_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

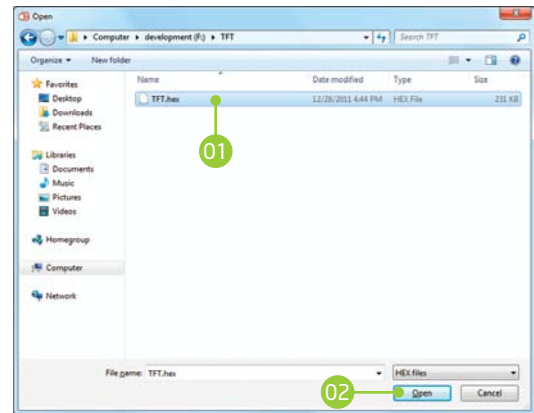


Figure 3-4: Selecting HEX

- 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 bootloading click the "Begin uploading" button.



Figure 3-6: Progress bar

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

step 5 - Finish upload

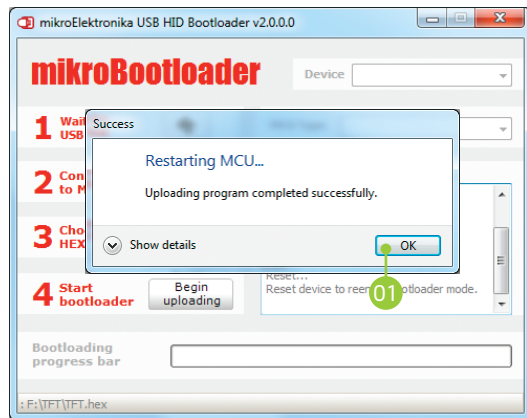


Figure 3-7: Restarting MCU

- 01 Click the **"OK"** button after uploading is finished and wait for 5 seconds. Board will automatically reset and your new program will execute.



Figure 3-8: mikroBootloader ready for next job

Programming with mikroProg™ programmer



The microcontroller can be programmed with external **mikroProg™ programmer** and **mikroProg™ for Stellaris® software**. The external programmer is connected to the development system via JTAG connector, **Figure 3-9. mikroProg™** is a fast USB 2.0 programmer with hardware Debugger support. It supports ARM® Cortex™-M3 and Cortex™-M4 microcontrollers from Stellaris®. Outstanding performance, easy operation and elegant design are its key features.



Figure 3-9:
mikroProg™ JTAG
connector

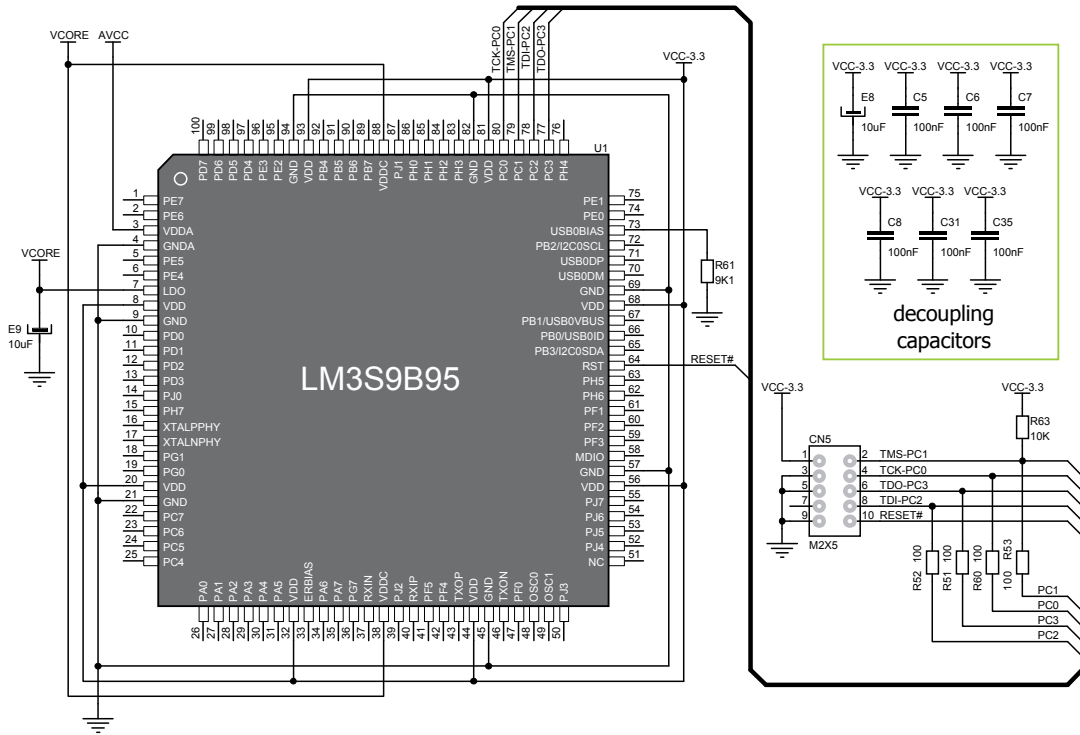
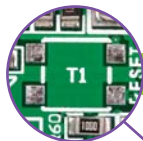


Figure 3-10: mikroProg™ programmer connection schematic

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**.*

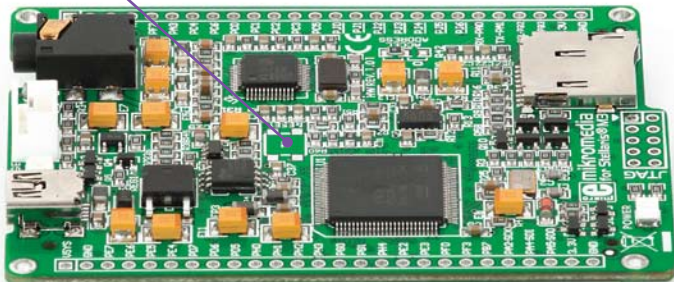


Figure 4-1: Location of additional reset button

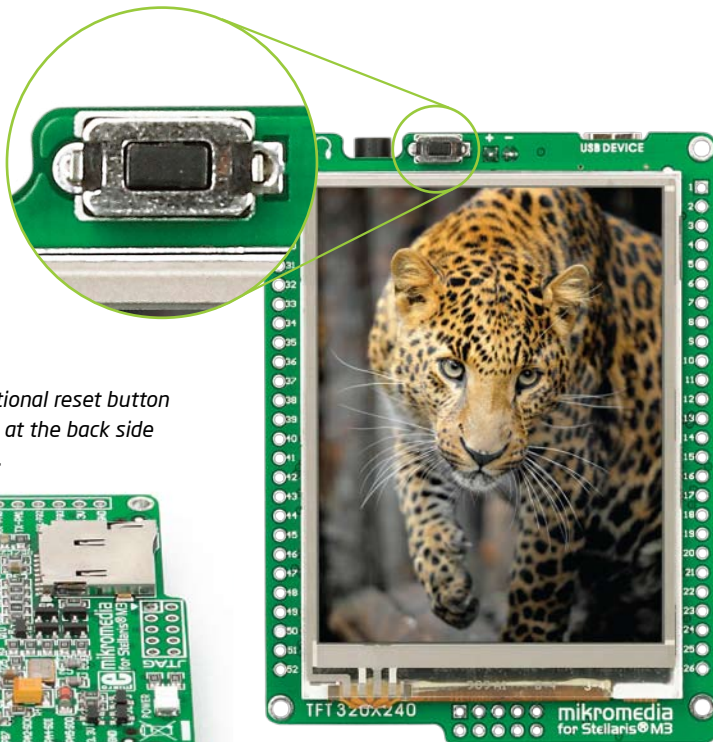


Figure 4-2: Frontal reset button

5. Crystal oscillator

Board is equipped with **8MHz crystal oscillator (X1)** circuit that provides external clock waveform to the microcontroller OSC0 and OSC1 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.

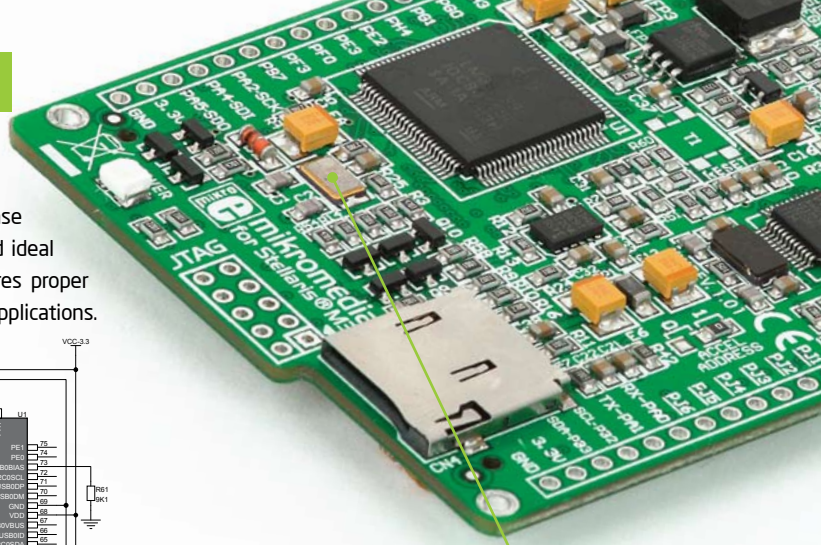
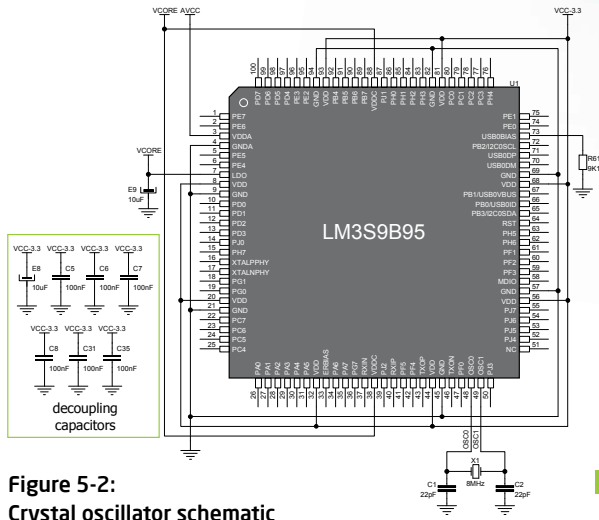


Figure 5-1:
8MHz crystal oscillator



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.

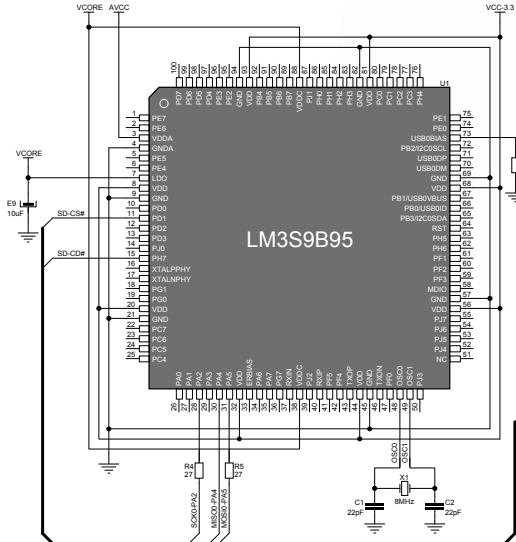


Figure 6-2: microSD Card Slot module connection schematic

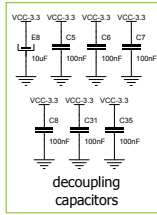


Figure 6-1: microSD card slot

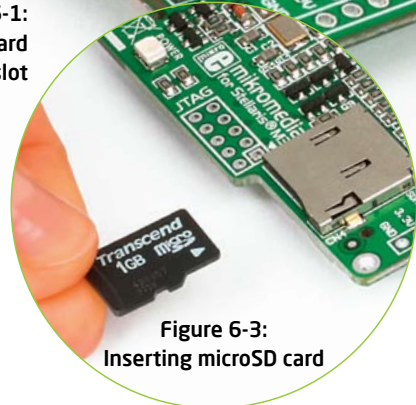
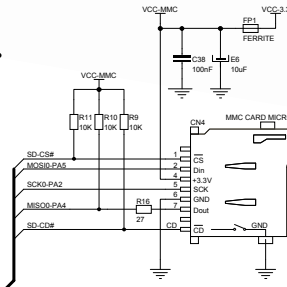
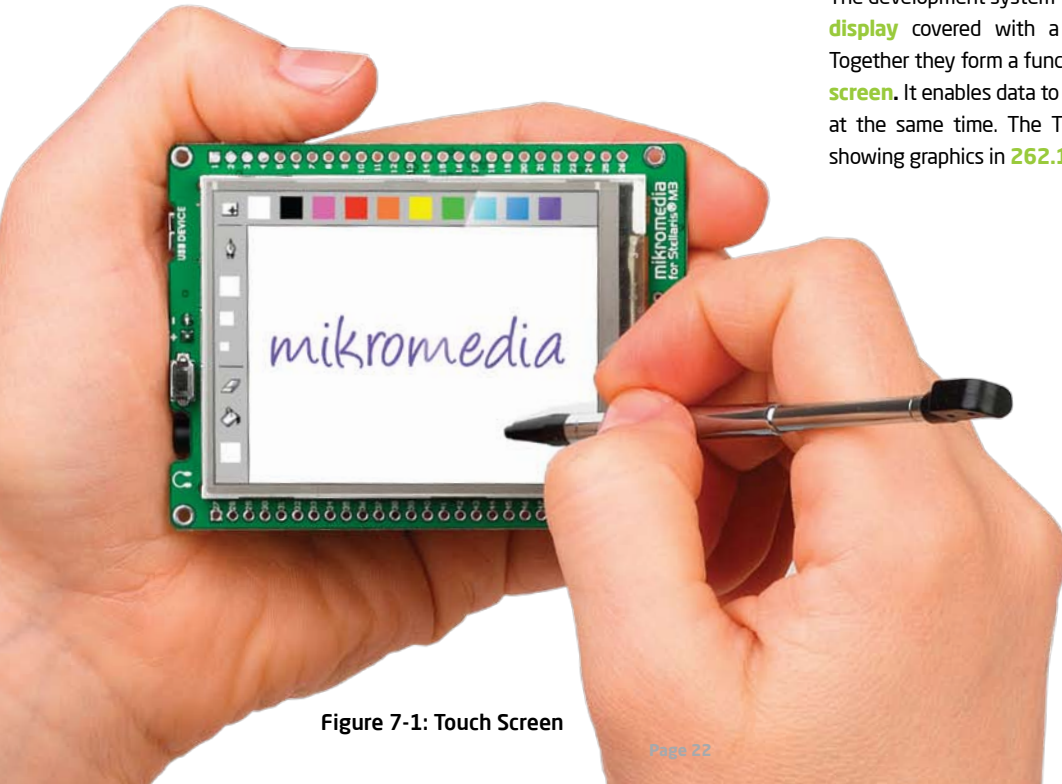


Figure 6-3: Inserting microSD card

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

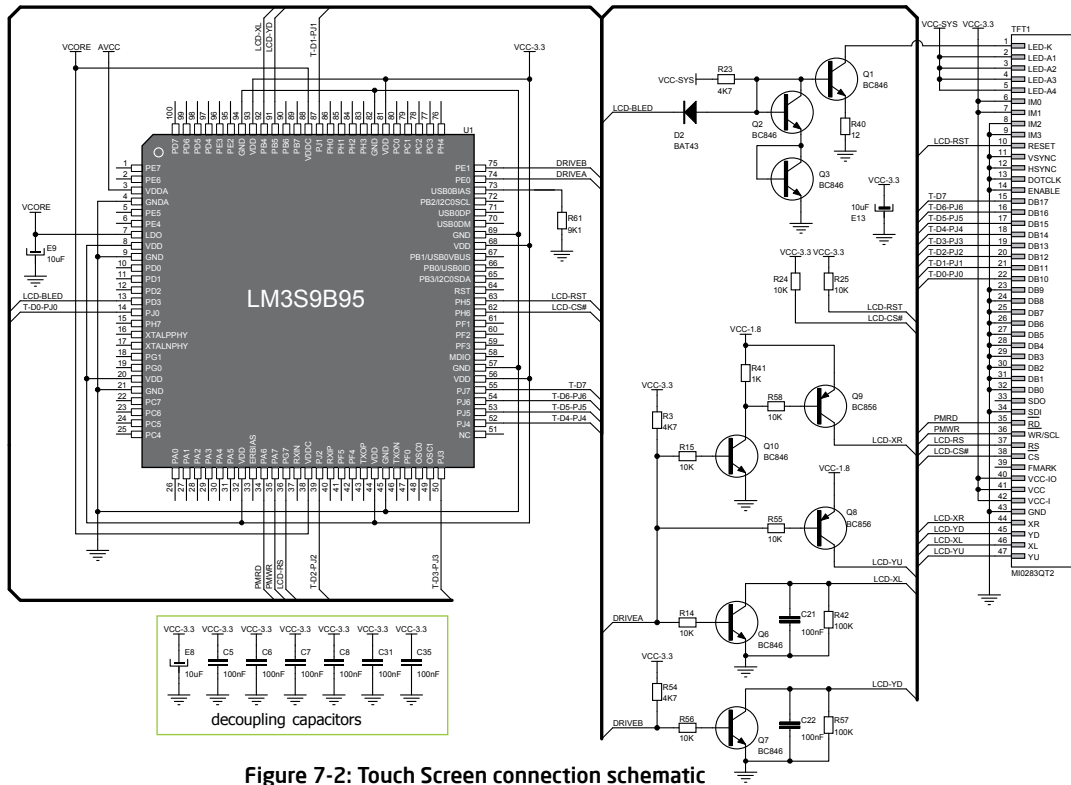


Figure 7-2: Touch Screen connection schematic

8. Audio Module

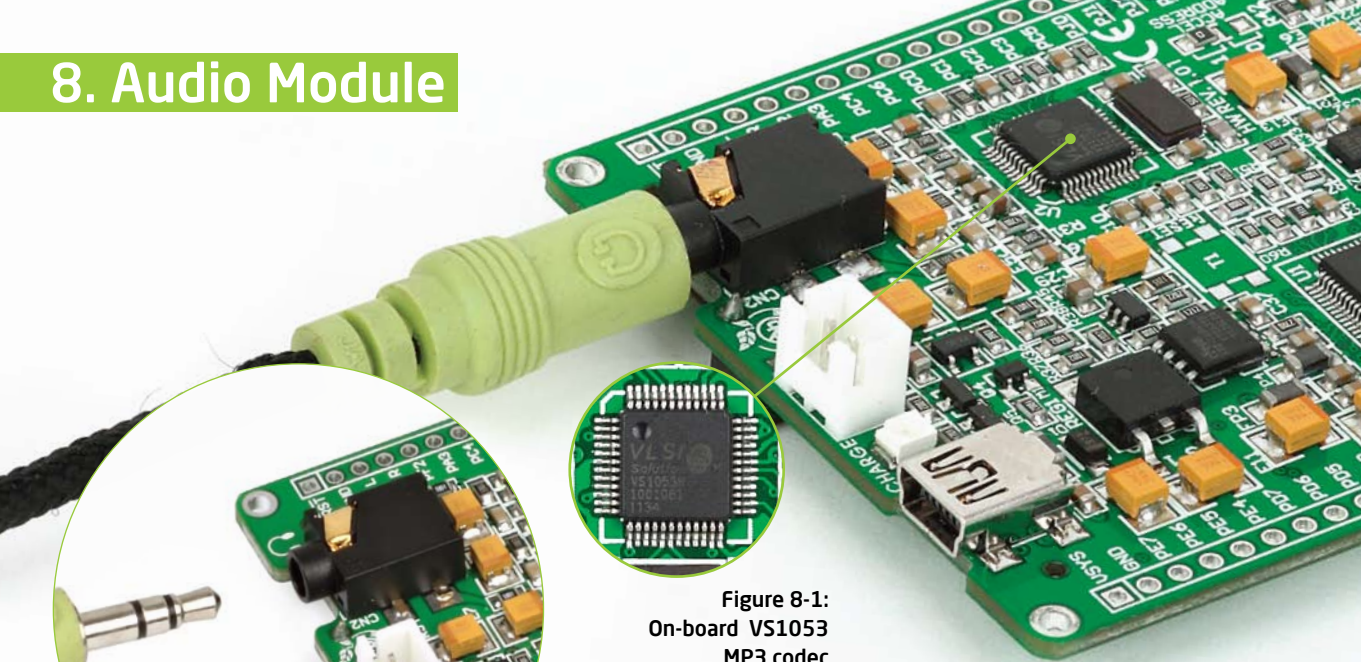


Figure 8-1:
On-board VS1053
MP3 codec

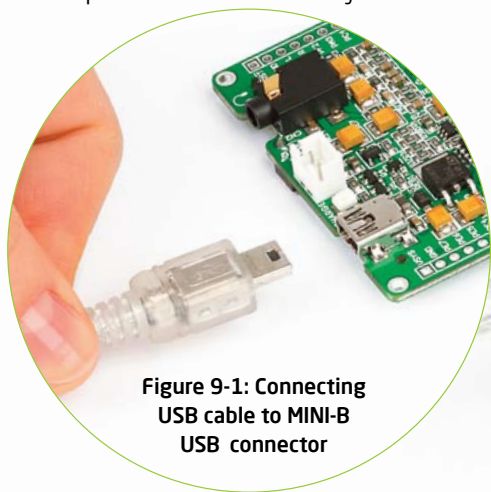


Figure 8-2:
Inserting 3.5mm
headphones jack

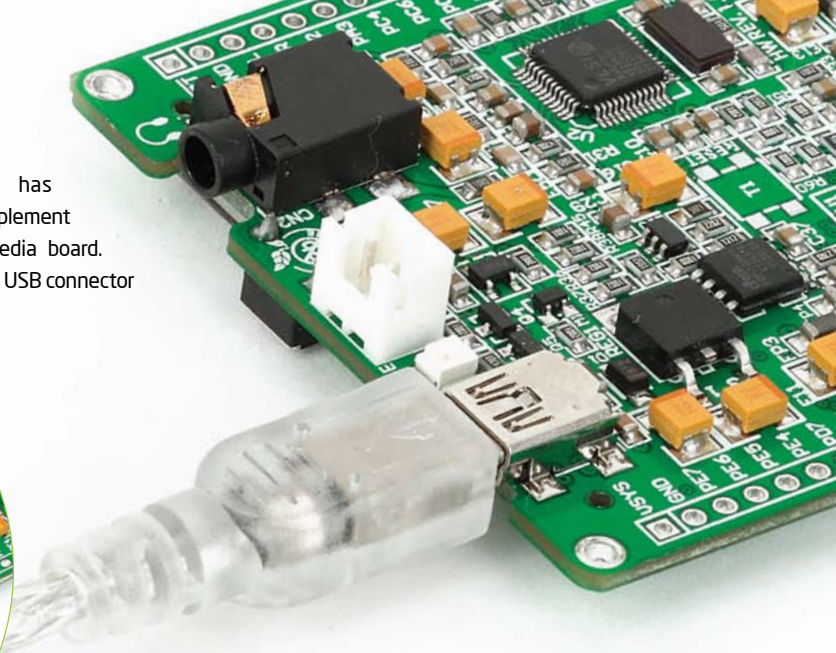
mikromedia for Stellaris® M3 features stereo audio codec **VS1053**. This module enables audio reproduction by using stereo headphones connected to the system via a **3.5mm** connector CN2. All functions of this module are controlled by the microcontroller over Serial Peripheral Interface (**SPI**).

9. USB connection

ARM® Cortex™-M3 LM3S9B95 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**



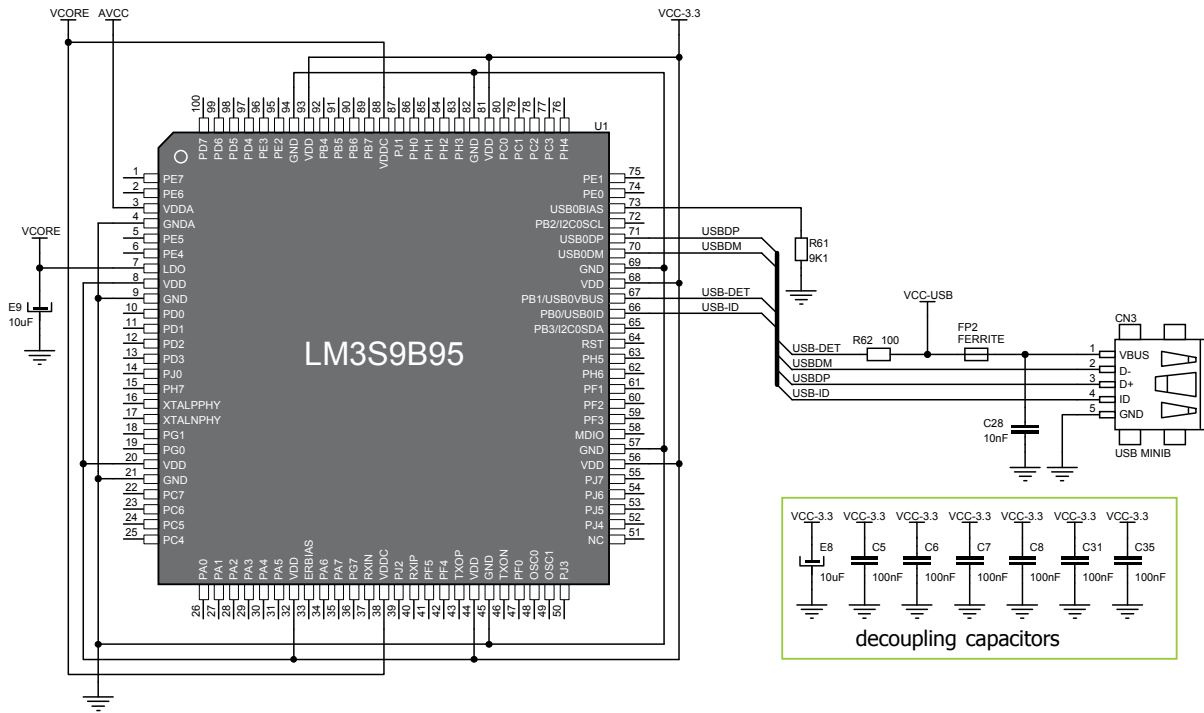


Figure 9-2: USB module connection schematic

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.

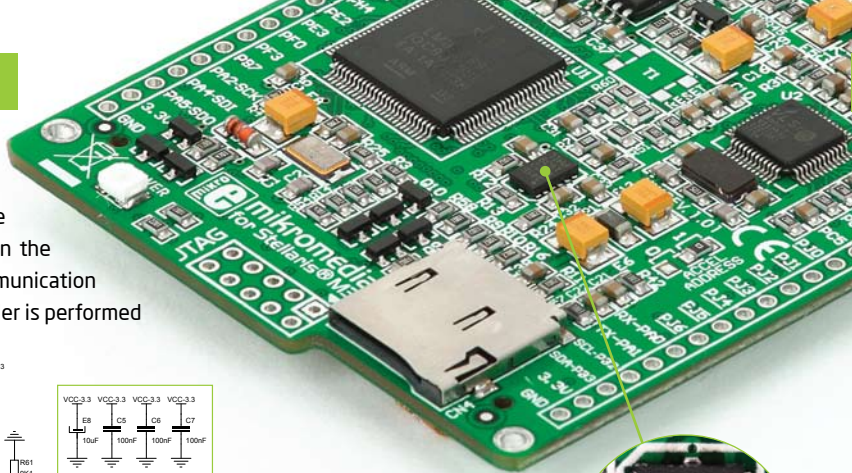


Figure 10-1:
Accelerometer
module

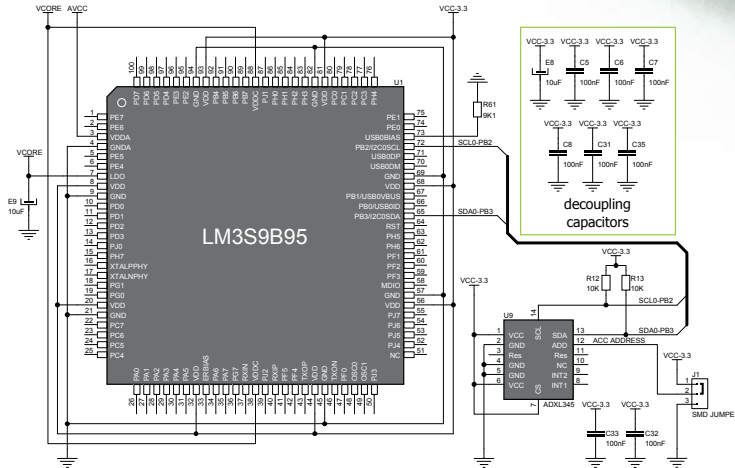
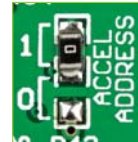


Figure 10-2: Accelerometer connection schematic



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

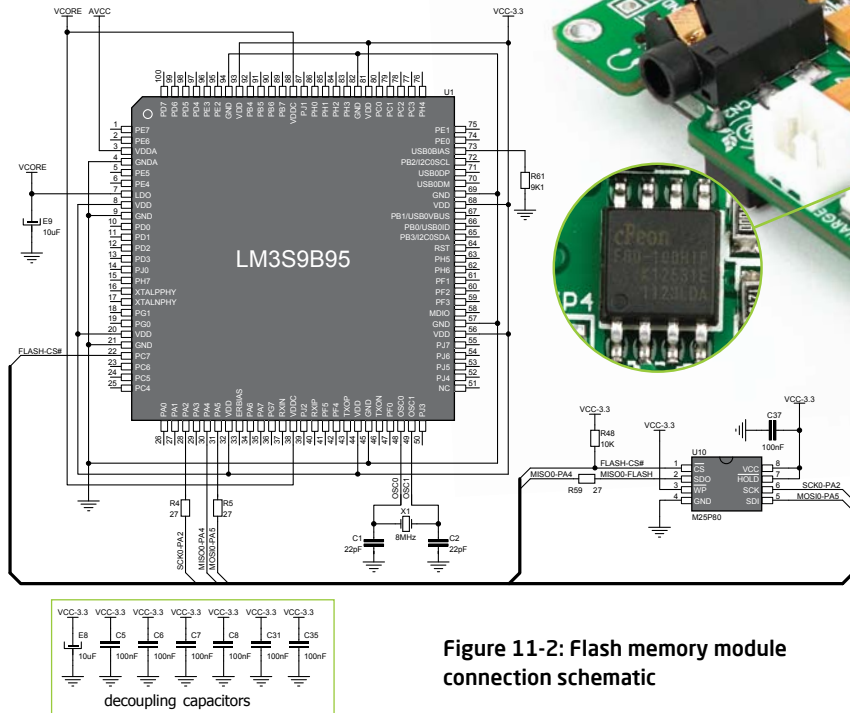


Figure 11-2: Flash memory module connection schematic

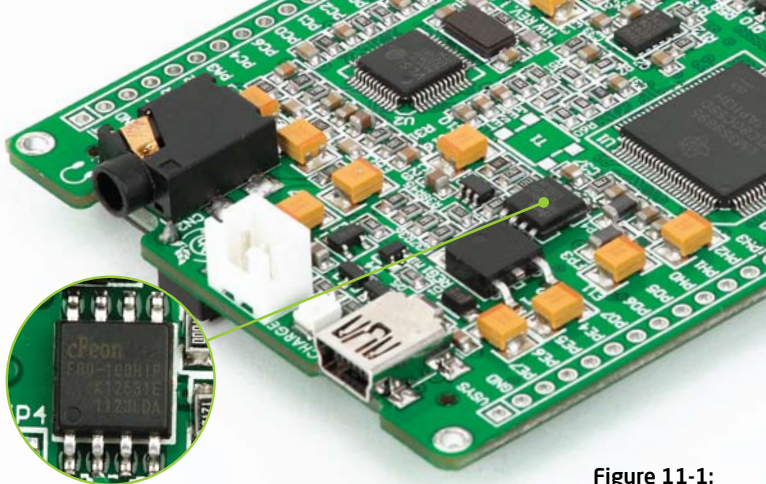
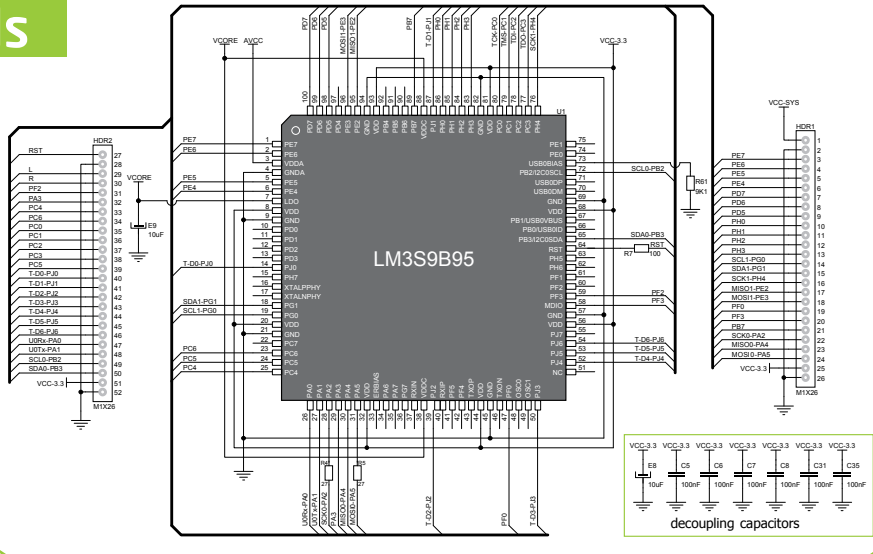


Figure 11-1: Flash memory module

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

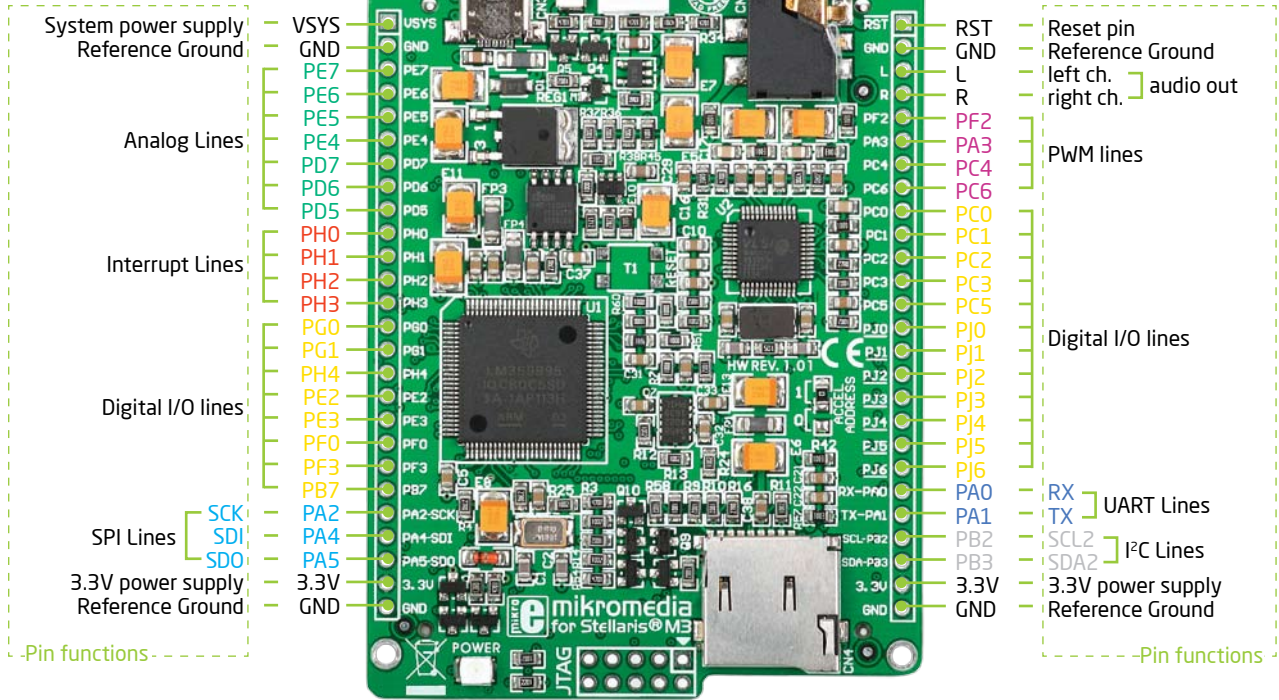
Figure 12-1: Connecting pads schematics

Pads HDR1

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.

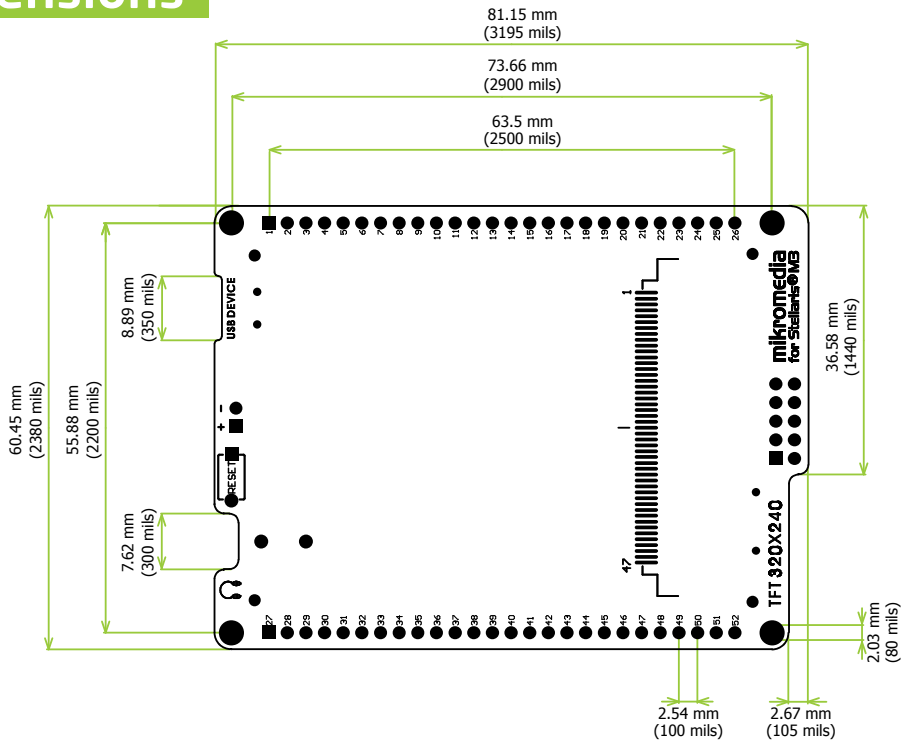


13. Pinout



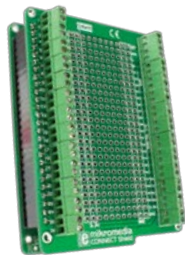
■ Digital lines
 ■ Analog Lines
 ■ Interrupt Lines
 ■ SPI Lines
 ■ I2C Lines
 ■ UART lines
 ■ PWM lines

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



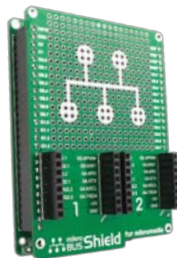
02 BatteryBoost shield



03 PROTO shield



04 Gaming shield



05 mikroBUS shield



06 Li-Polymer battery



07 Wire Jumpers

What's next?

You have now completed the journey through each and every feature of mikromedia for Stellaris® M3 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 ARM® 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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