



# mikromedia™

for STM32®

Compact multimedia development system rich with on-board peripherals for all-round development on **STM32F207VGT6** and **STM32F407VGT6** devices



# 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', set against a dark green background.

Nebojsa Matic  
General Manager

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# Introduction to mikromedia for STM32®

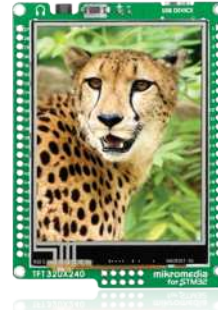
**mikromedia for STM32®** is a compact development system with lots of on-board peripherals which allow development of devices with multimedia contents. The central part of the system is a 32-bit **STM32F207VGT6** or **STM32F407VGT6** microcontroller. mikromedia for STM32® features integrated modules such as stereo MP3 codec, **TFT 320x240** touch screen display, accelerometer, USB connector, MMC/SD card slot, 8 Mbit flash memory, 2x26 connection pads and other. It comes pre-programmed with USB bootloader, but can also be programmed with external programmers, such as mikroProg™ for STM32® or ST-LINK. 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 STM32® development system



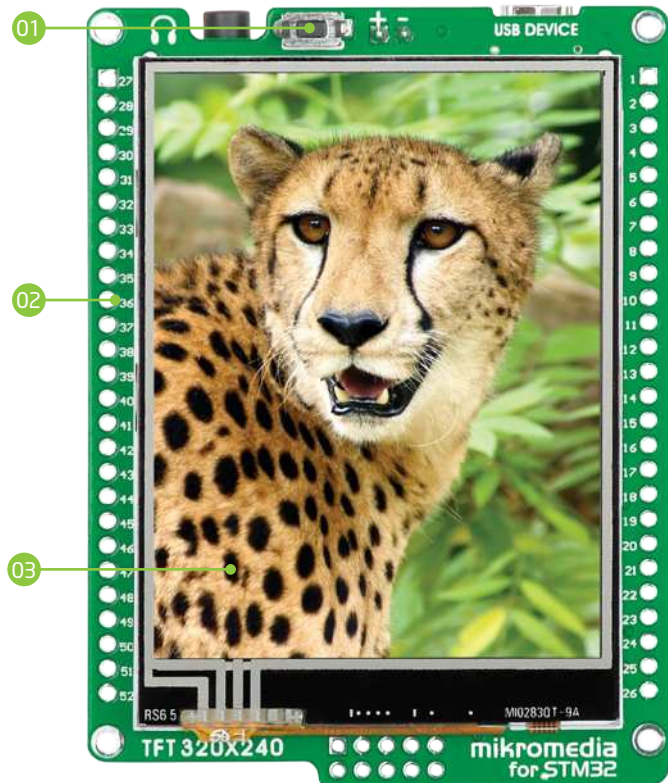
03 User's guide, schematic and pinout

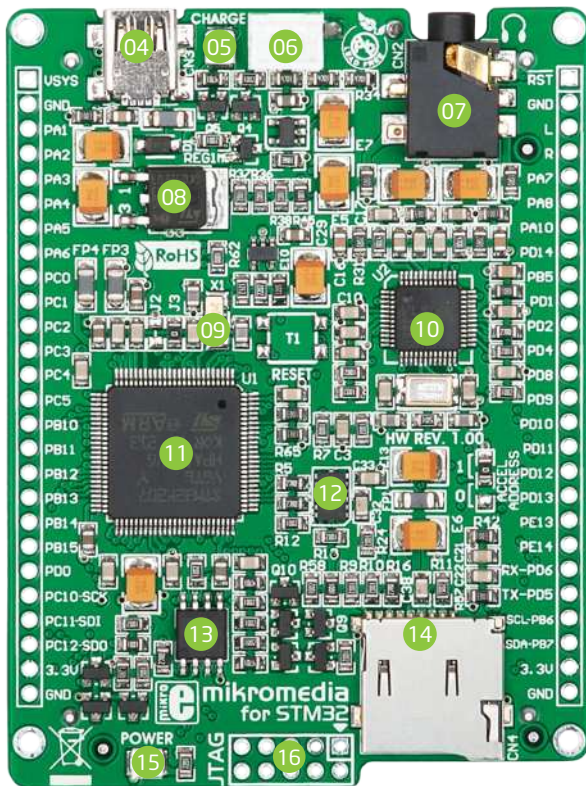


04 USB cable, headers and ST-LINK V2 to mikroProg™ adapter

# Key features

- 01 RESET button
- 02 Connection Pads
- 03 TFT 320x240 display
- 04 USB MINI-B connector
- 05 Charge indication LED
- 06 LI-Polymer battery connector
- 07 3.5mm headphone connector
- 08 Power supply regulator
- 09 Crystal oscillator
- 10 VS1053 Stereo mp3 coder/decoder
- 11 STM32F207VGT6 or STM32F407VGT6 microcontroller
- 12 Accelerometer
- 13 Serial flash memory
- 14 microSD card slot
- 15 Power indication LED
- 16 JTAG/SWD programmer connector





## System specification



### power supply

Via USB cable (5V DC)



### power consumption

46.5 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)



### class B product

Product complies with the Class B limit of EN 55022 and can be used in the domestic, residential, commercial and industrial environments.



### CAUTION: Electrostatic sensitive device

Permanent damage may occur on devices subjected to high energy electrostatic discharges which readily accumulate on the human body or test equipment and can discharge without detection.



# 1. Power supply

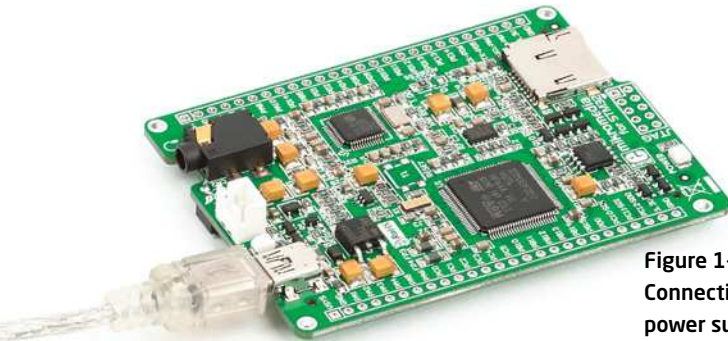


Figure 1-1:  
Connecting USB  
power supply

## 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 a **Li-Polymer** battery, via on-board battery connector. On-board battery charger circuit **MCP73832** enables you to charge the battery over a USB connection. **LED diode (RED)** will indicate when the battery is charging. Charging current is ~250mA and charging voltage is 4.2V DC.

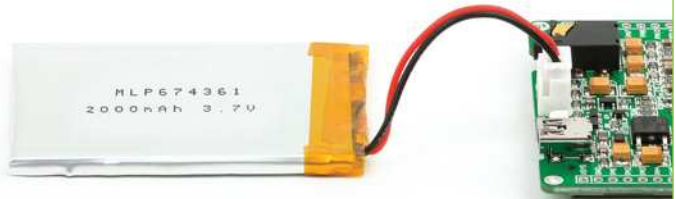


Figure 1-2: Connecting Li-Polymer battery



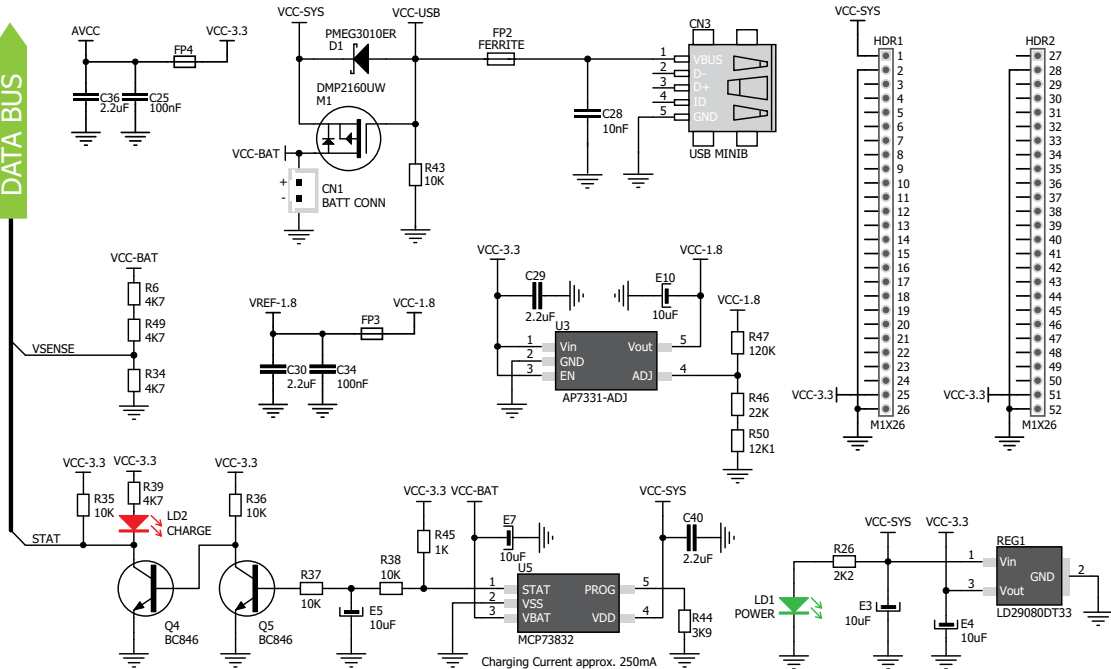


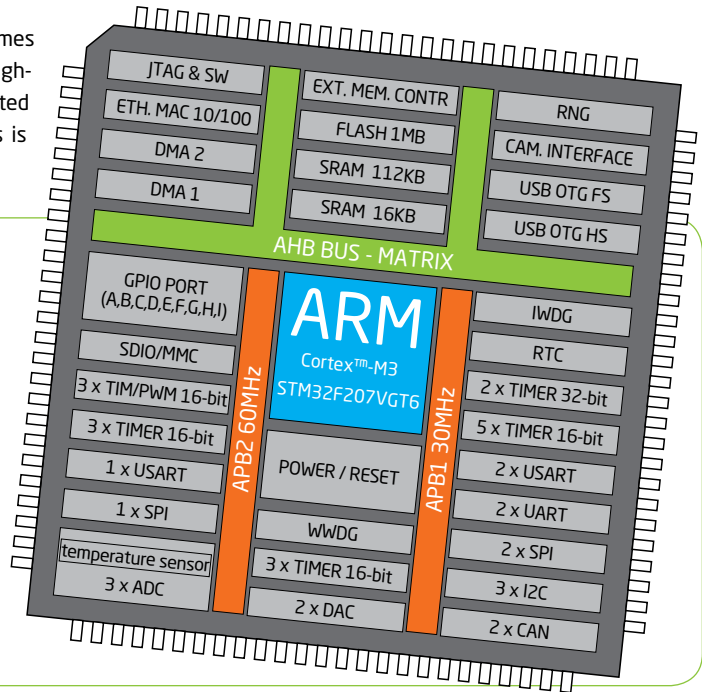
Figure 1-3: Power supply schematic

## 2. Key microcontrollers features

The mikromedia for STM32<sup>®</sup> M3 development system comes with the **STM32F207VGT6** microcontroller. This high-performance **32-bit** microcontroller with its integrated modules and in combination with other on-board modules is ideal for multimedia applications.

### STM32F207VGT6

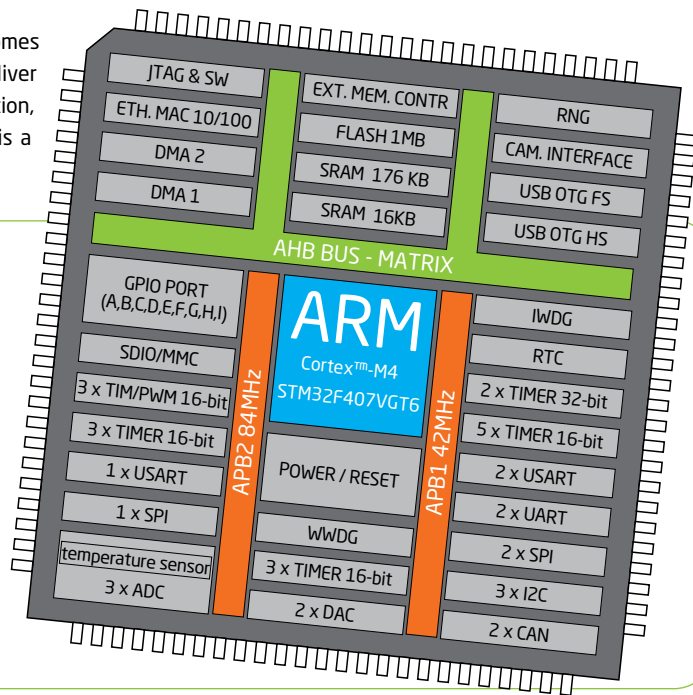
- 1.25 DMIPS/MHz, 32-bit Cortex™-M3 Core;
- 1 Mbyte Flash memory;
- 128 + 4 Kbytes of SRAM;
- 83 I/O pins;
- SPI, I<sup>2</sup>C, CAN, USB, Ethernet;
- USART, UART;
- 16-bit and 32-bit Timers, up to 120MHz;
- Internal Oscillator 16MHz, 32kHz, PLL;
- ADC, DAC, etc.



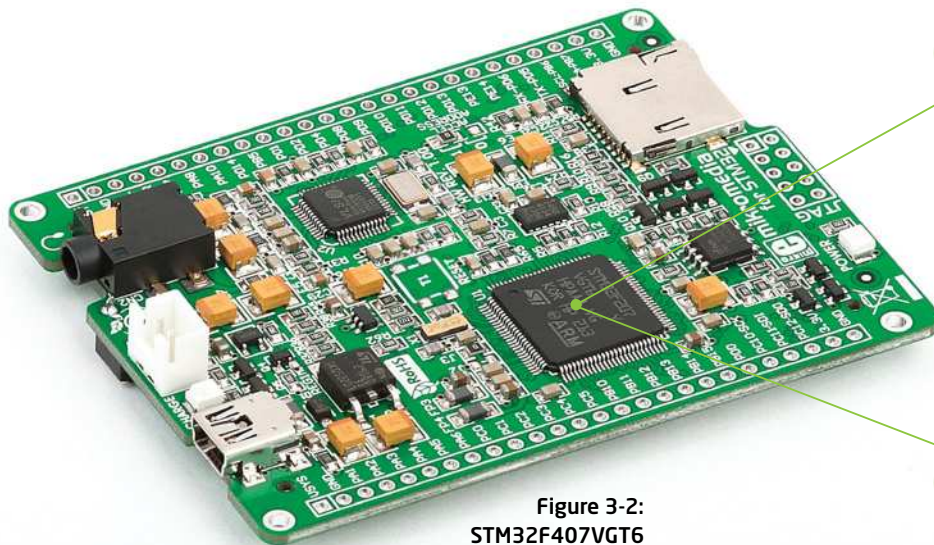
The mikromedia for STM32® M4 development system comes with the **STM32F407VGT6** microcontroller, which can deliver even more processing power. With up to 168MHz operation, this **32-bit** microcontroller with other on-board modules is a perfect choice for performance-demanding applications.

## STM32F407VGT6

- 1.25 DMIPS/MHz, 32-bit Cortex™-M4 Core;
- 1 MB flash memory;
- 192 + 4 KB of SRAM;
- 83 I/O pins;
- SPI, I<sup>2</sup>C, CAN, USB, Ethernet;
- USART, UART;
- 16-bit and 32-bit Timers, up to 168MHz;
- Internal Oscillator 16MHz, 32kHz, PLL;
- ADC, DAC, etc.



# 3. Programming the microcontroller



**Figure 3-2:**  
**STM32F407VGT6**  
**Microcontroller**



**Figure 3-1:**  
**STM32F207VGT6**  
**Microcontroller**



## The microcontroller can be programmed in three ways:



The mikromedia for STM32® development system can be programmed in three different ways. 01 Using the bootloader which is preprogrammed into the device by default or via external programmers (02 mikroProg™ or 03 ST-LINK V2™).

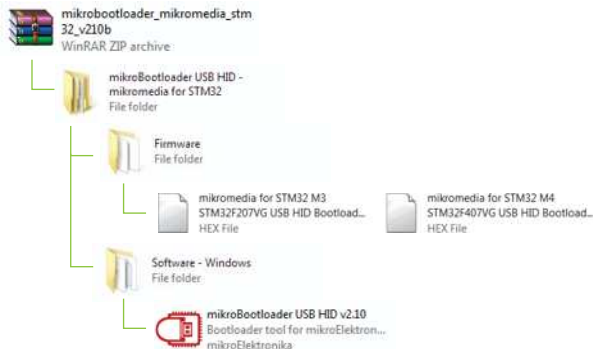
# Programming with mikroBootloader

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:



[www.mikroe.com/downloads/get/1849/mikrobootloader\\_mikromedia\\_stm32\\_v210b.zip](http://www.mikroe.com/downloads/get/1849/mikrobootloader_mikromedia_stm32_v210b.zip)

Upon download, unzip it to desired location and start the mikroBootloader application:



## step 1 - Connecting mikromedia



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

- 01 Click the **Browse for HEX** button and from a pop-up window (Figure 3.5) choose the .HEX file which will be uploaded to MCU memory.

## step 3 - Selecting .HEX file

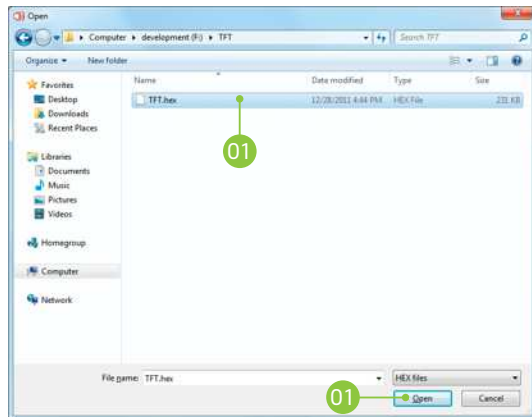


Figure 3-5: Selecting HEX

- 01 Select .HEX file using open dialog window.
- 02 Click **Open**.



## step 4 - Uploading .HEX file



Figure 3-6: Begin uploading

- 01** To start .HEX file bootloading click the **Begin uploading** button.



Figure 3-7: Progress bar

- 01** Progress bar enables you to monitor .HEX file uploading.

## step 5 - Finish upload



Figure 3-8: Restarting MCU

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



Figure 3-9: mikroBootloader ready for next job

# Programming with mikroProg™ programmer

The microcontroller can be programmed with external **mikroProg™ for STM32® programmer** and **mikroProg Suite™ for ARM®** software. The mikroProg™ programmer is connected to the development system via the CN5 (JTAG) connector. You can choose between two ways to program microcontrollers , **Figure 3-14**:

- 01 Via JTAG interface
- 02 Via Serial wire debug (SWD) interface



**Figure 3-10:**  
Connecting  
mikroProg™ to  
mikromedia™

**mikroProg™**  
is a fast USB 2.0  
programmer with mikroCD™  
hardware In-Circuit Debugger.  
It supports over 180 ARM® Cortex™  
M3 and Cortex™ M4 microcontrollers from  
STM32® family. Outstanding performance, easy  
operation and elegant design are its key features.

**NOTE:** Before attaching the programming connector, you have to solder the provided 2x5 male header to the JTAG pads (CN5)

# mikroProg Suite™ for ARM® software

On-board mikroProg™ programmer requires special programming software called mikroProg Suite™ for ARM®. This software is used for programming of all supported microcontroller families with ARM® Cortex™-M3 and Cortex™-M4 cores. The software has an intuitive interface and SingleClick™ programming technology. To begin, first locate the installation archive on the link below:



[http://www.mikroe.com/downloads/get/1809/mikroprog\\_suite\\_for\\_arm.zip](http://www.mikroe.com/downloads/get/1809/mikroprog_suite_for_arm.zip)

After downloading, extract the package and double click the executable setup file, to start installation.

## Quick guide

- 01 Click the **Detect MCU** button in order to recognize the device ID.
- 02 Click the **Read** button to read the entire microcontroller memory. You can click the **Save** button to save it to the target HEX file.
- 03 If you want to write the HEX file into the microcontroller, first make sure to load the target HEX file using the **Load** button. Then click the **Write** button to begin programming.
- 04 Click the **Erase** button to clear the microcontroller memory.

**Figure 3-11:**  
mikroProg Suite™  
for ARM® window



# Programming with ST-LINK V2 programmer

The microcontroller can also be programmed with the **ST-LINK V2 programmer** and **mikroProg Suite™ for ARM®** software, **Figure 3-11**. This programmer connects with mikromedia board via **mikroProg to ST-LINK V2 adapter**.

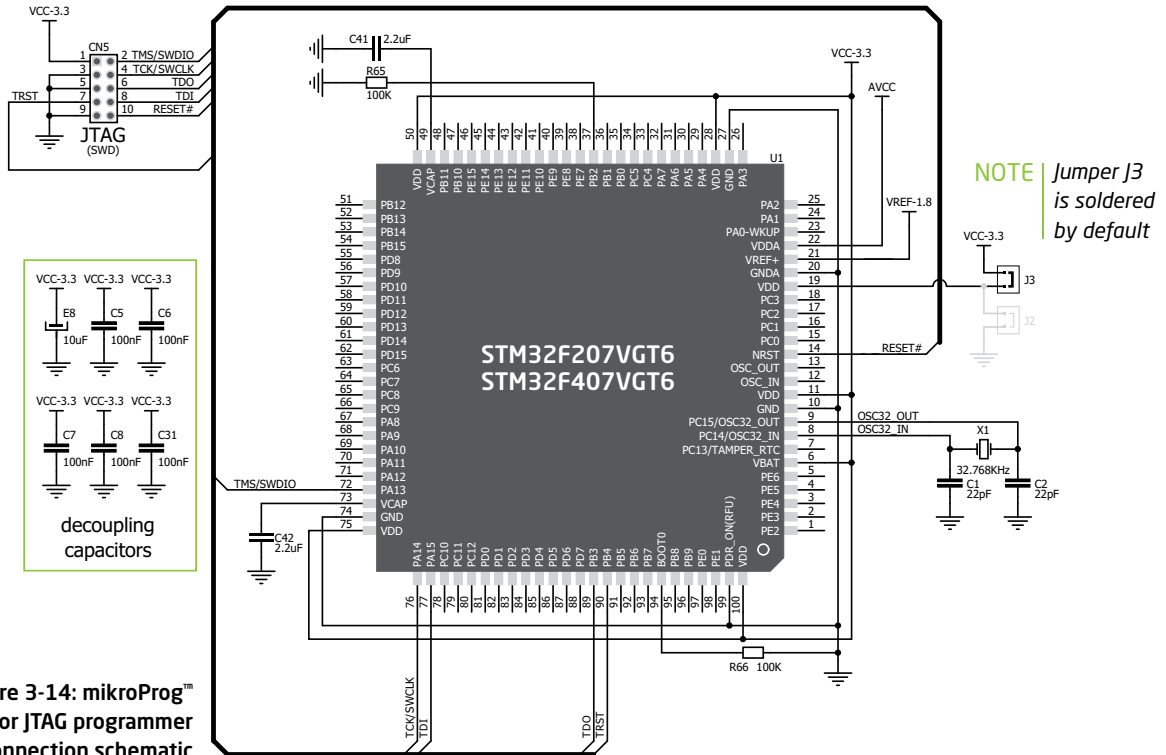
In order to adjust the ST-LINK™ V2 programmer to be connected to the development system, it is necessary to provide the appropriate adapter such as the **mikroProg to ST-LINK V2 adapter**. 2x5 male headers should be first soldered on the CN5 connector pads. Then you should plug the adapter into the ST-LINK V2 programmer (2x10 header), and plug an IDC10 flat cable in headers, **Figure 3-13**



**Figure 3-12:**  
**mikroProg™ to ST-LINK™ V2**  
**adapter**

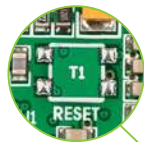


**Figure 3-13:**  
**Connecting ST-LINK™**  
**V2 programmer**



## 4. Reset button

Board is equipped with a 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 a 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**.

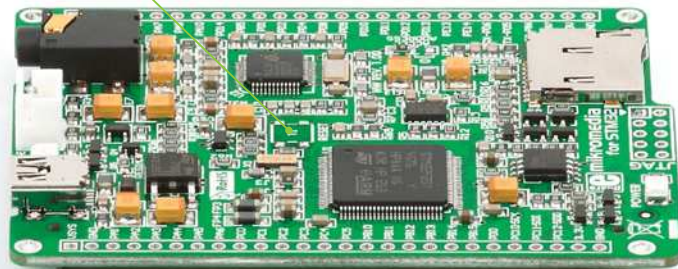


Figure 4-1: Location of additional reset button

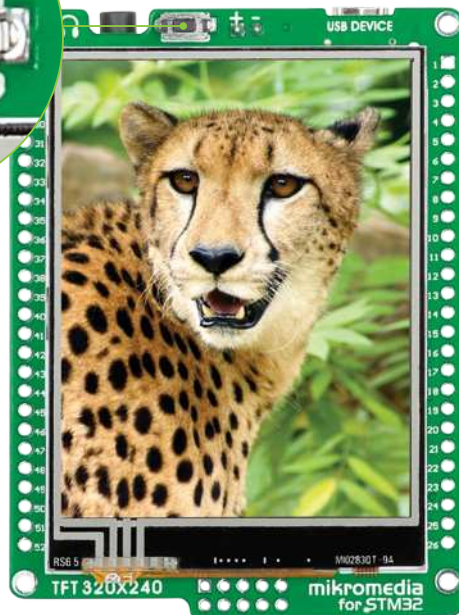
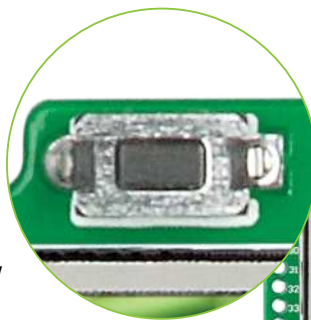


Figure 4-2: Frontal reset button



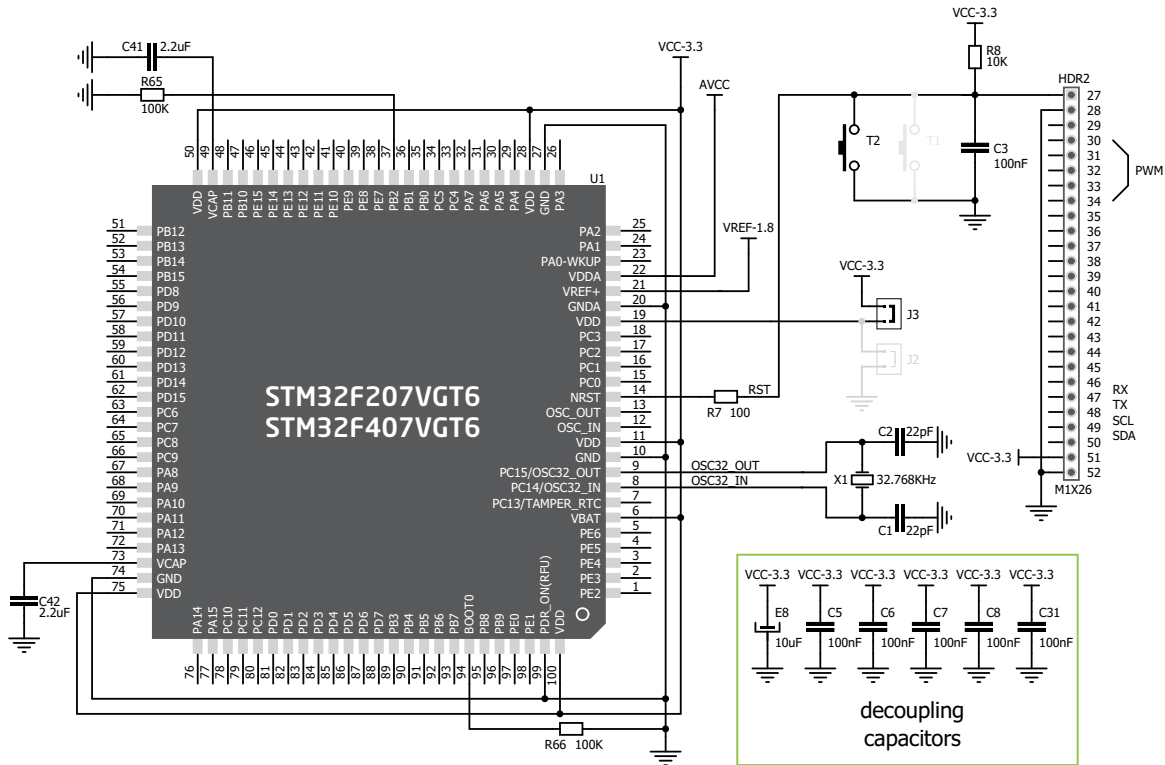


Figure 4-3: Reset circuit schematic

## 5. Oscillators

**STM32F207VGT6** and **STM32F407VGT6** microcontrollers are equipped with an internal **16MHz RC oscillator** that provides a stable clock signal. Since the chips have an integrated PLL, this base frequency is suitable for further clock multiplication. Board also contains a **32.768kHz Crystal oscillator (X1)** which provides an external clock for internal **RTCC** module.

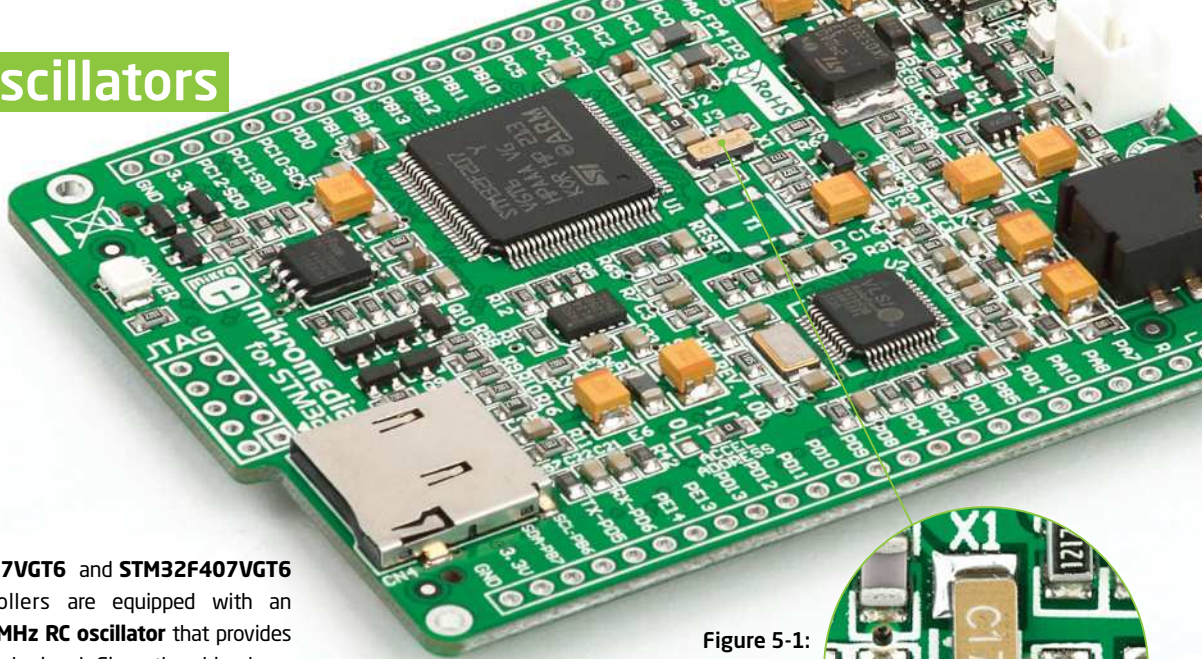
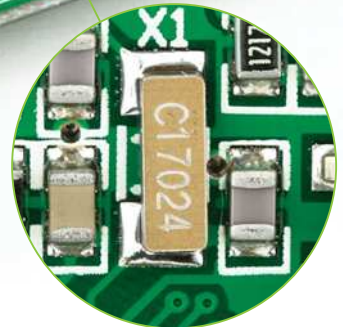


Figure 5-1:  
Crystal oscillator  
module (X1)



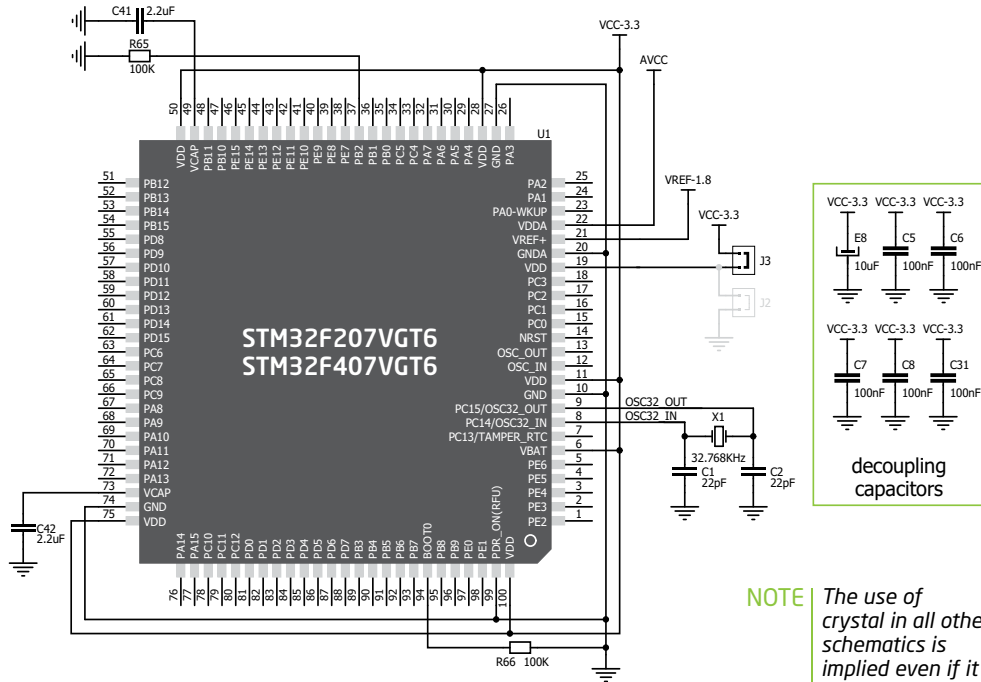
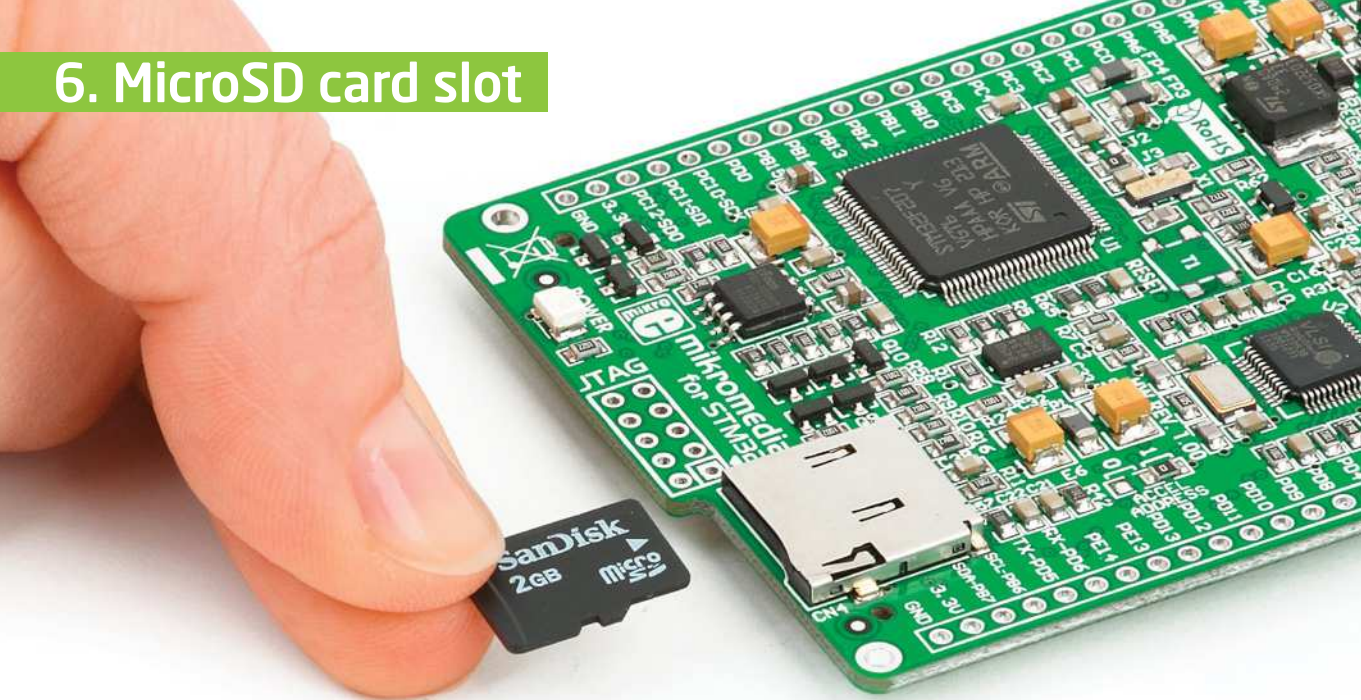


Figure 5-2: Crystal oscillator schematic

**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 a **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.

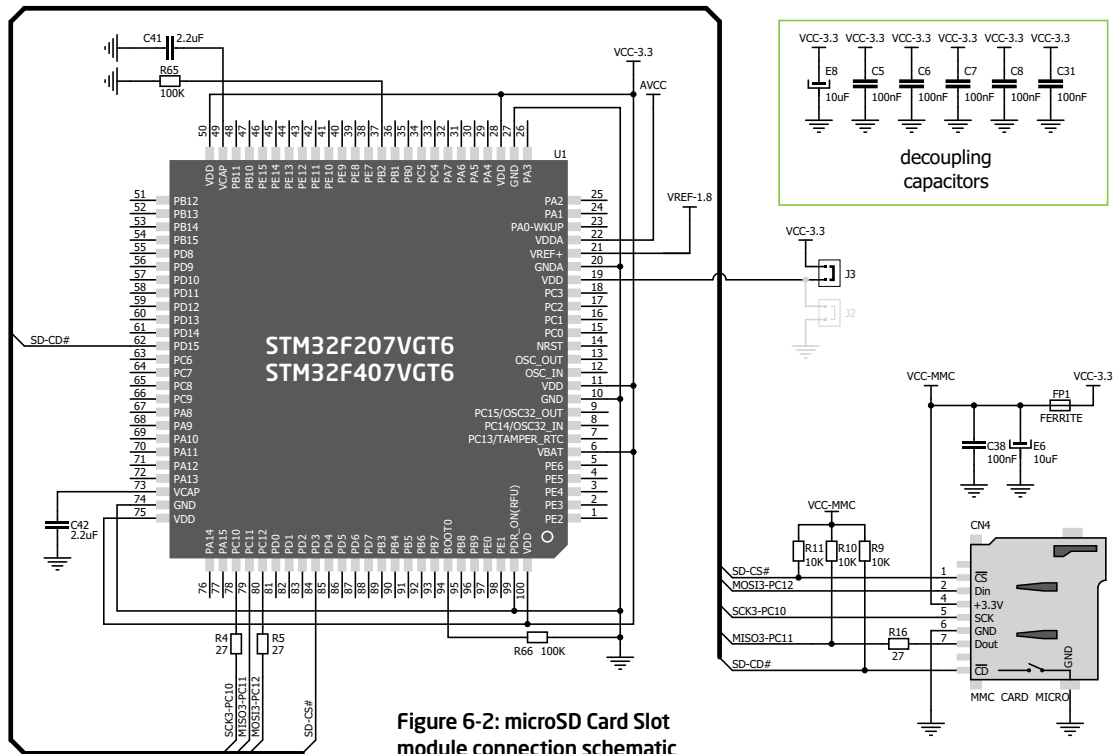
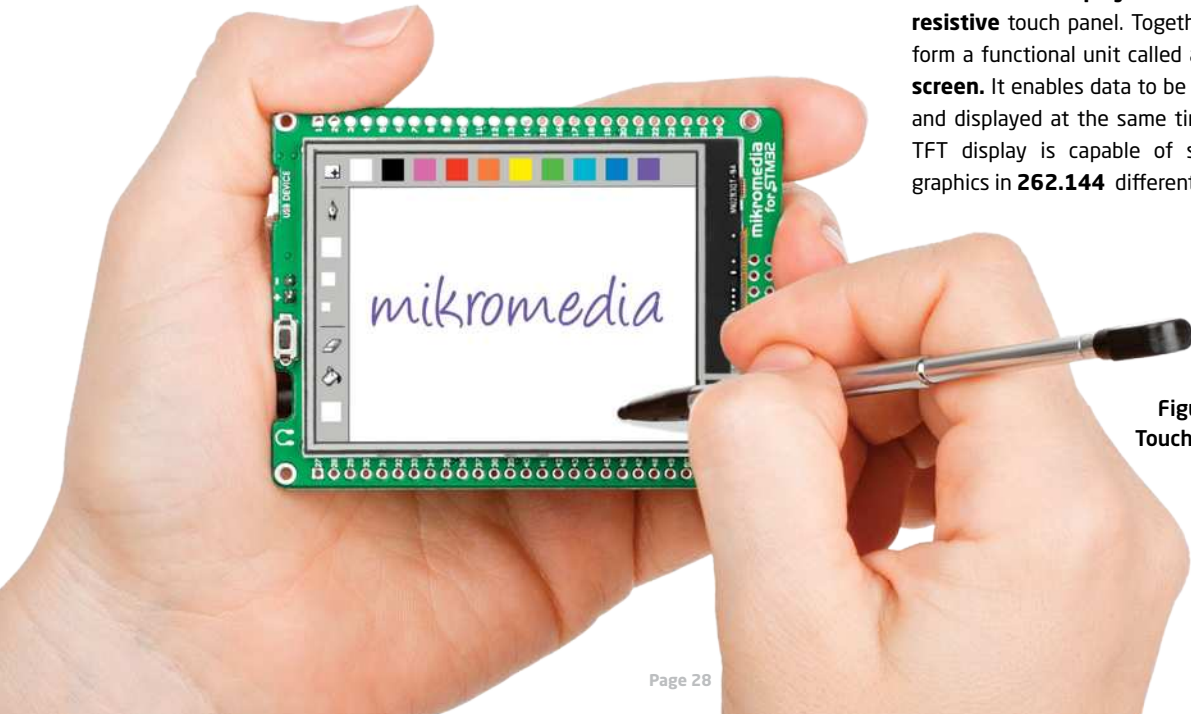


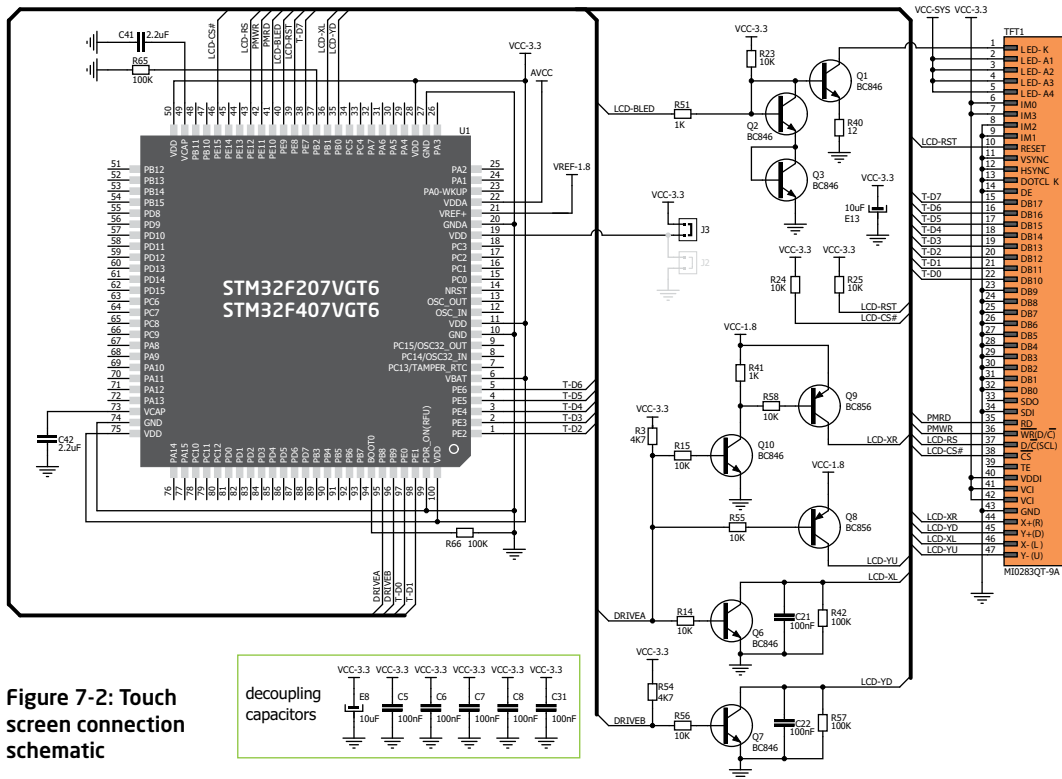
Figure 6-2: microSD Card Slot module connection schematic

## 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

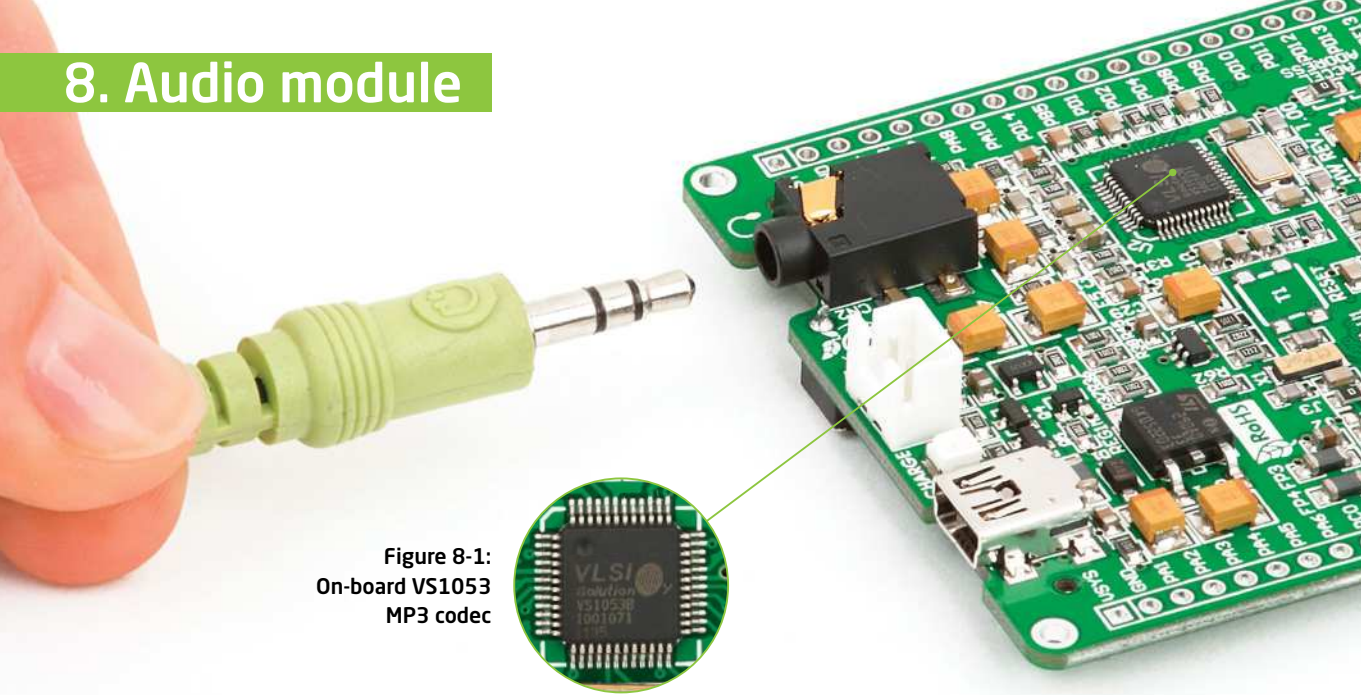


Figure 8-1:  
On-board VS1053  
MP3 codec

mikromedia for STM32® features a 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**).

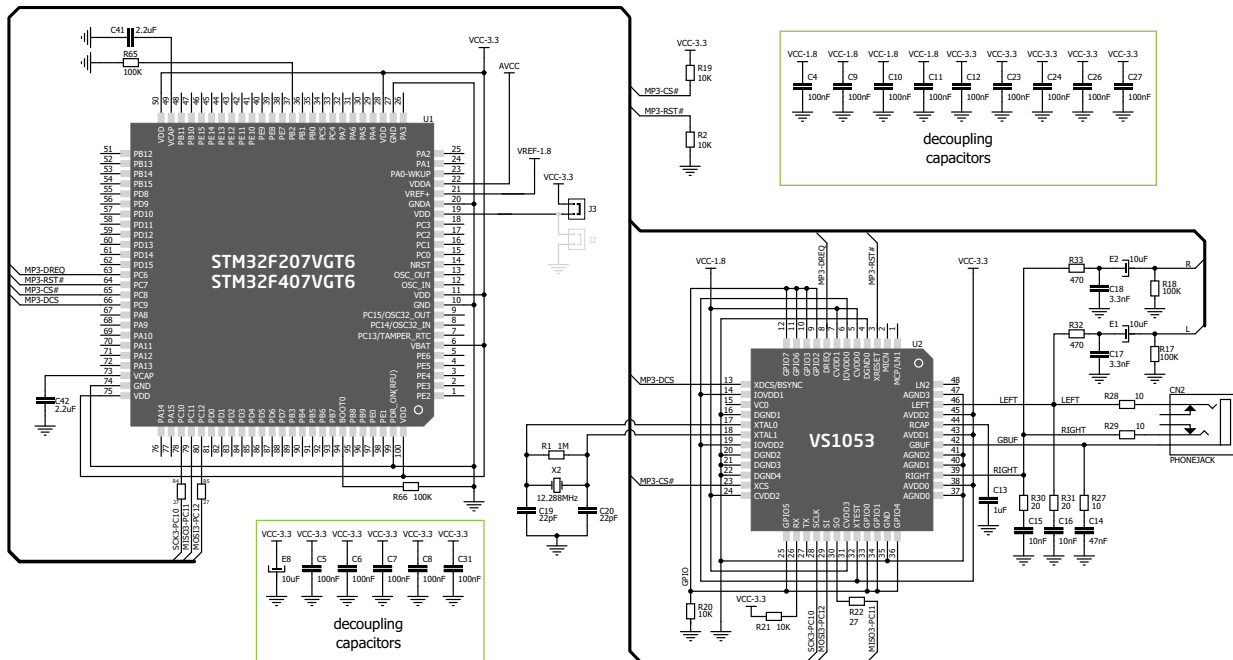


Figure 8-3: Audio module connection schematic

## 9. USB connection

Figure 9-1:  
Connecting  
USB cable to  
programming  
connector



**STM32F207VGT6** and **STM32F407VGT6** microcontrollers have an integrated USB module, which enables you to implement USB communication functionality to your mikromedia board. Connection with target USB host is done over a Mini-B USB connector which is positioned next to the battery connector.

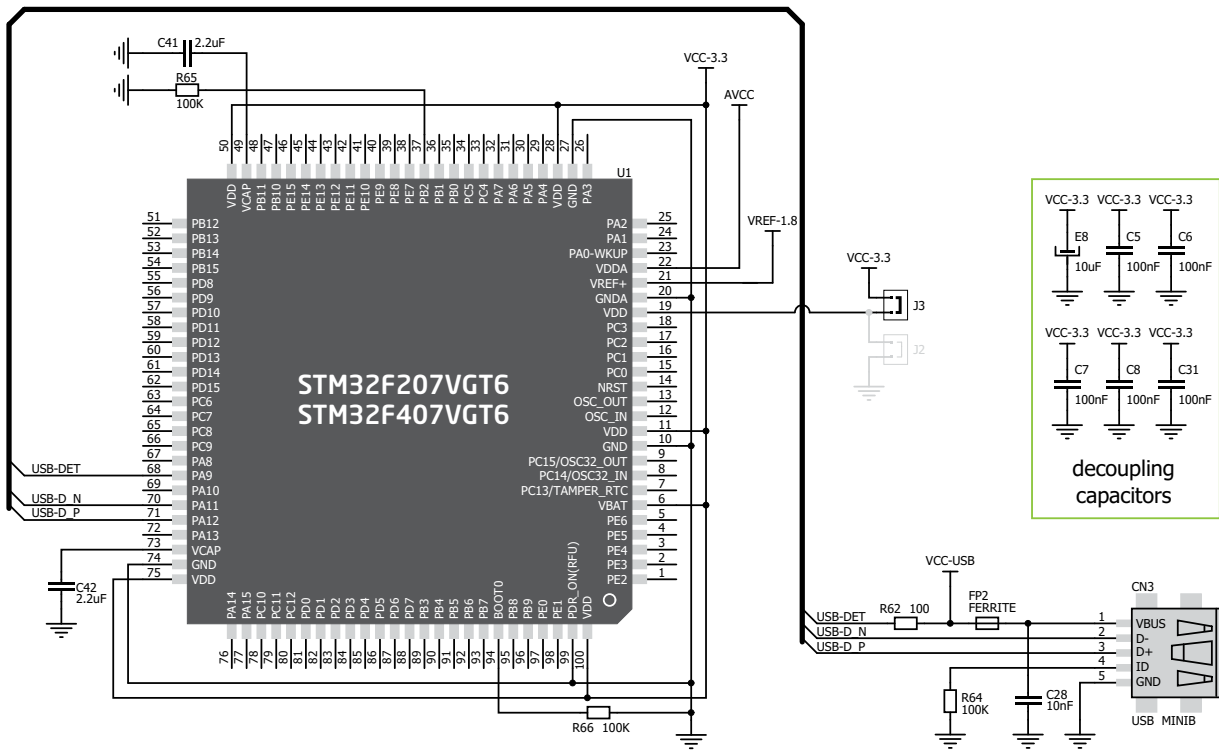


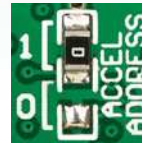
Figure 9-2: USB module connection schematic

# 10. Accelerometer

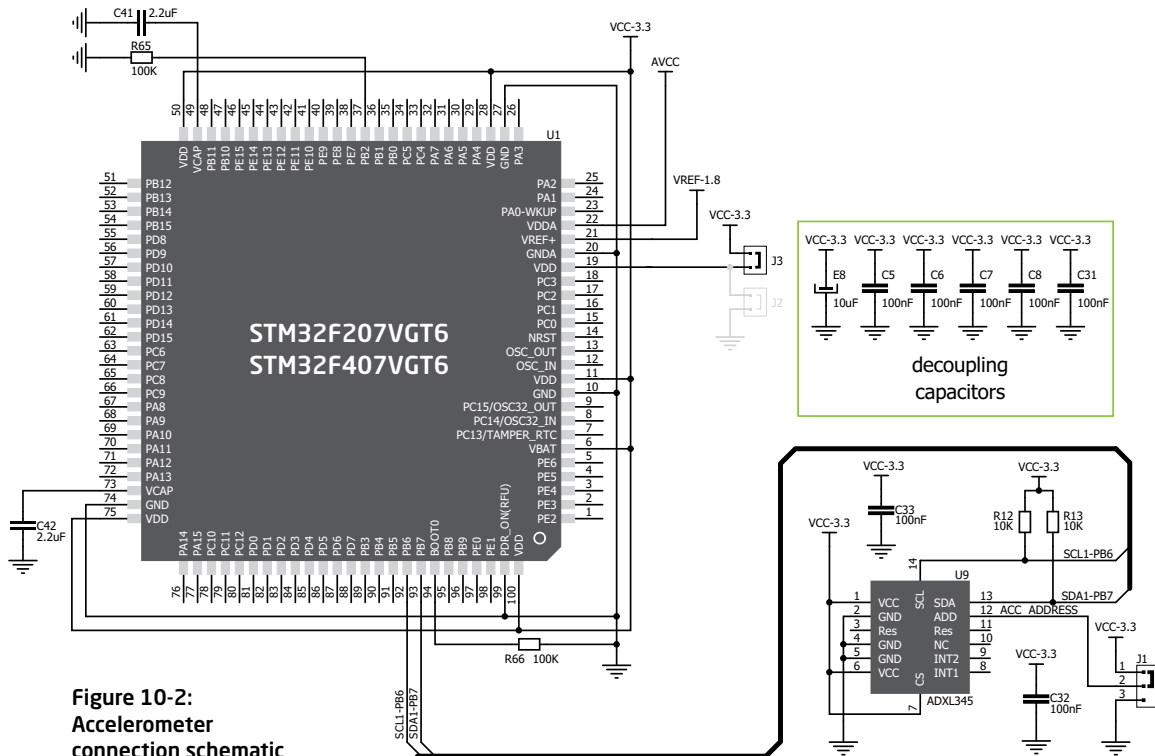


Figure 10-1:  
Accelerometer  
module

On board **ADXL345** accelerometer is used to measure acceleration in three axes: 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 **I<sup>2</sup>C** interface.



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.



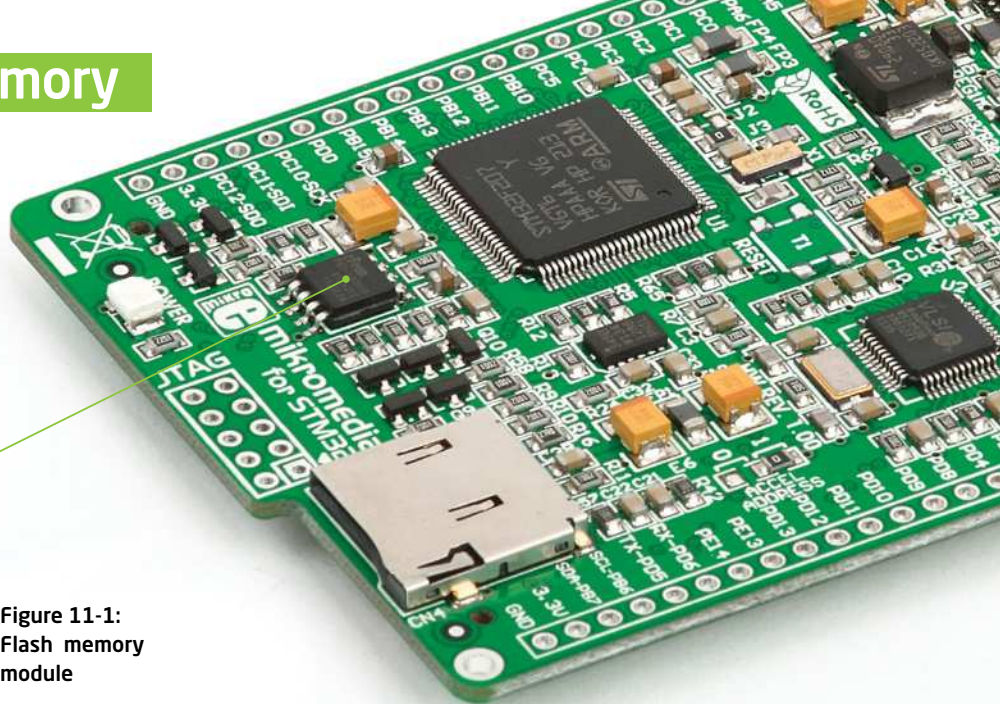
**Figure 10-2:**  
Accelerometer  
connection schematic



# 11. Flash memory



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**).



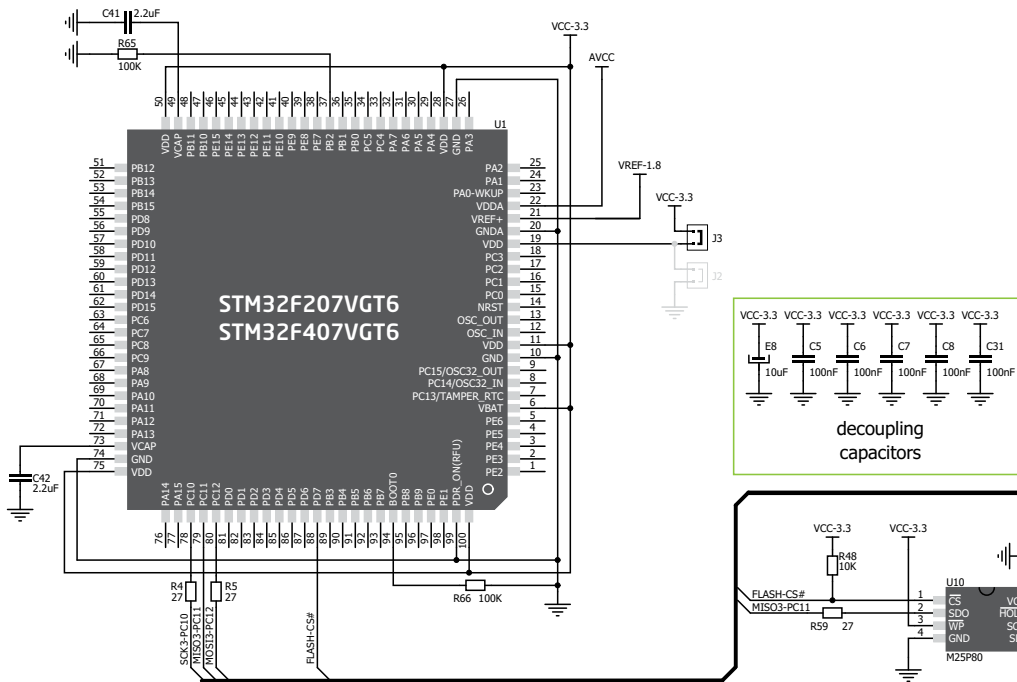
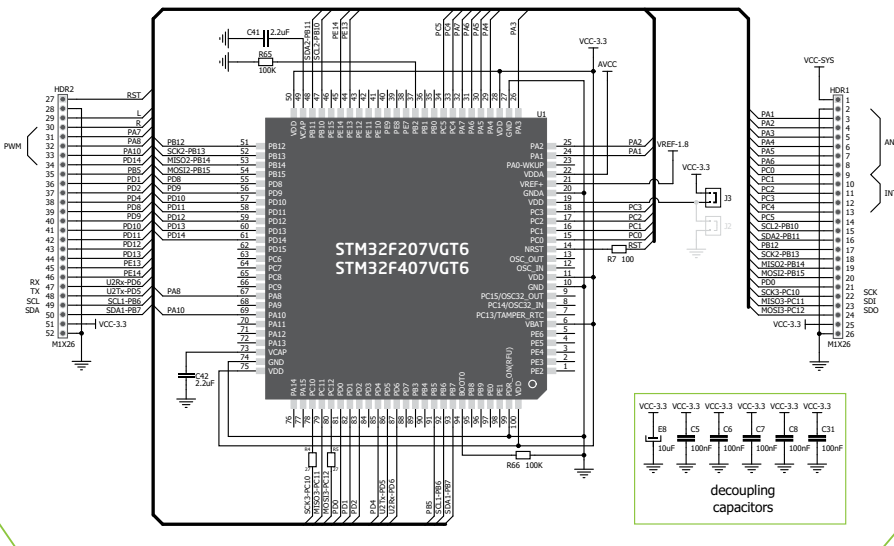
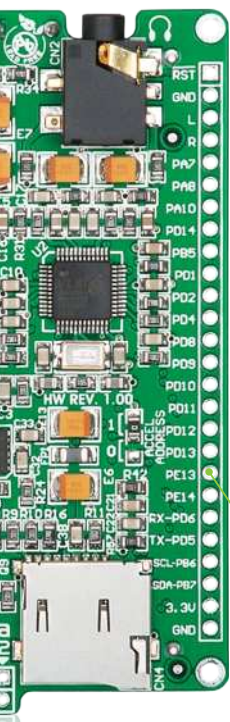


Figure 11-2: Flash memory module connection schematic

# 12. Pads

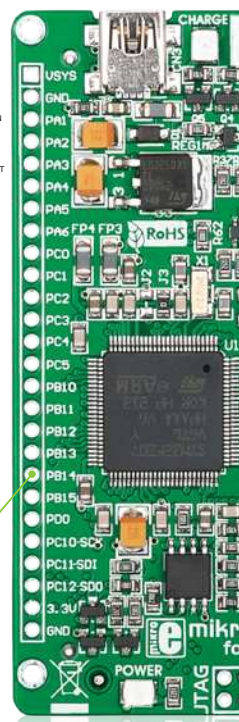


Pads HDR2

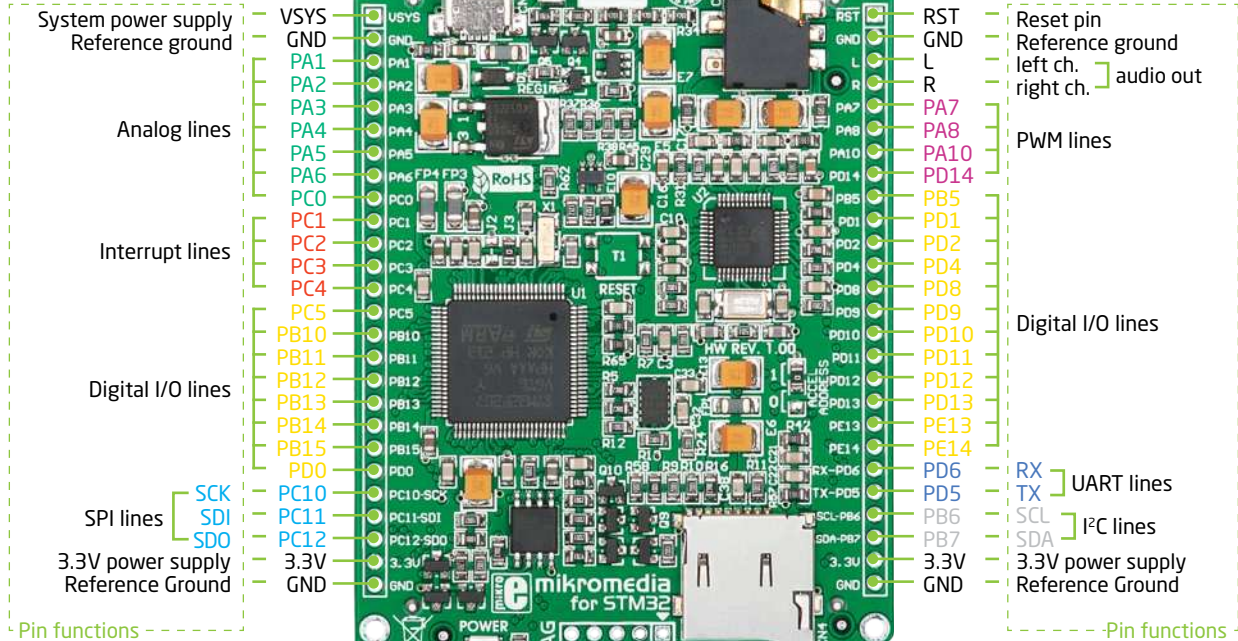
Figure 12-1: Connecting pads schematic

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.

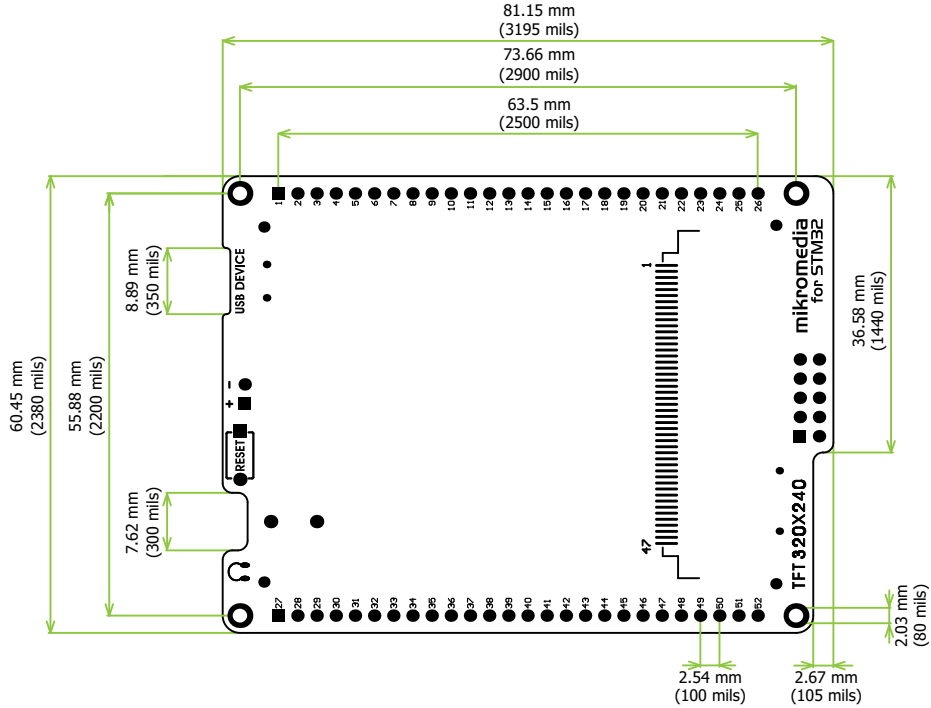


# 13. Pinout



■ 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's basic functionality. We call them mikromedia shields. But we also offer other accessories, such as a Li-polymer battery, stacking headers, wire jumpers and more.



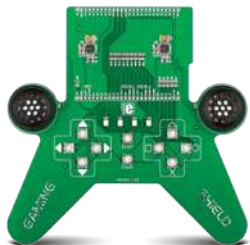
01 Connect shield



02 BatteryBoost shield



03 PROTO shield



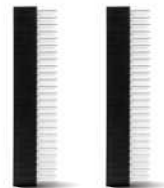
04 Gaming shield



05 Li-Polymer battery



06 Wire jumpers



07 Stacking headers

## 16. What's next?

You have now completed the journey through each and every feature of mikromedia for STM32. You got to know its 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. Find useful projects and tutorials on the **Libstock** website ([www.libstock.com](http://www.libstock.com)). Join our **Forum** ([www.mikroe.com/forum](http://www.mikroe.com/forum)) and get help from a large ecosystem of users.

### Compiler

You still don't have an appropriate compiler? Locate ARM compiler that suits you best on our site:



[www.mikroe.com/arm/compilers](http://www.mikroe.com/arm/compilers)

Choose between mikroC™, mikroBasic™ and mikroPascal™ and download a fully functional demo version, so you can begin building your first applications.



### Visual TFT

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** enables you to quickly create your GUI. It will automatically generate code compatible with MikroElektronika compilers. Visual TFT is rich with examples, which are an excellent starting point for your future projects. Download it from the link below:



[www.mikroe.com/visualtft](http://www.mikroe.com/visualtft)

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