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mikromedia 7

for STM32F4

Amazingly compact, all-on-single-pcb development board carrying 7" TFT Touch Screen and lots of multimedia peripherals, all driven by powerful STM32F407ZG microcontroller from ARM® Cortex™-M4 family



To our valued customers

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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

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Introduction to mikromedia 7 for STM32F4

The **mikromedia 7 for STM32F4** 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™-M4 STM32F407ZG** 144-pin microcontroller. The mikromedia 7 for STM32F4 features integrated modules such as stereo MP3 codec, **7" TFT 800x480** touch screen display. The increased screen size is ideal for displaying larger amounts of data. The board also contains an accelerometer, microSD card slot, buzzer, IR receiver, RGB LED diode, PIN photodiode, temperature sensor, 2.4GHz RF, WiFi, Ethernet and CAN transceivers, 8 Mbit flash memory, RTC battery, Li-Polimer battery charger, etc. The board also contains MINI-B USB connector, power screw terminals, 2x5 JTAG connector, two 1x26 connection pads, ON/OFF switch and other. It comes with an onboard **mikroProg™** for STM32 programmer and debugger, but can also be programmed with external programmers, such as ST-LINK programmer.

System Specification



power supply

Via USB cable [5V DC] or via connector [5-12V DC]



power consumption

~108 mA with empty MCU via USB cable [when on-board modules are disabled]



board dimensions

179 x 111 mm
~[7 x 4.37 inch]



weight

~250g
[0.55 lbs]

Package Contains



1

Damage resistant protective box



2

Development board



3

Roll USB and ethernet cables and headers



4

User's guide



5

Schematic



6

Distancers, plastic pen and microSD card

1. Power Supply

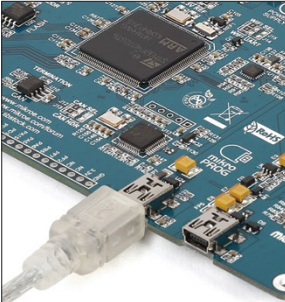


Figure 1-1:
mikroProg power supply

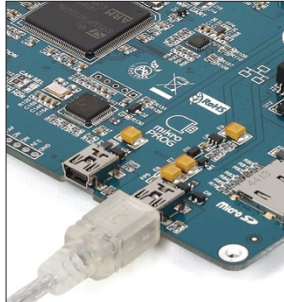


Figure 1-2:
USB power supply

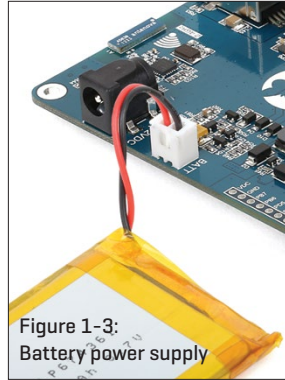


Figure 1-3:
Battery power supply

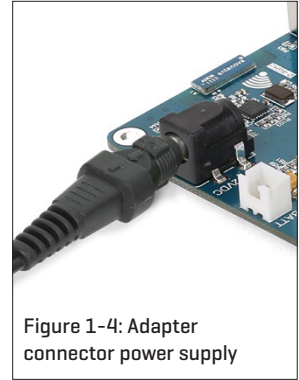


Figure 1-4: Adapter
connector power supply

The mikromedia 7 for STM32F4 board can be powered in four different ways: via two USB connectors using MINI-B USB cable provided with the board **[CN4 or CN11]**, via battery connector using Li-Polymer battery **[CN5]** or via adapter connector using adapter power supply **[CN3]**. After you plug in the appropriate power supply turn the power switch ON **[SW1]**. The USB connection can provide up to 500mA of current which is more than enough for the operation of all on-board modules and the microcontroller as well. If you decide to use external power supply via screw terminals, voltage values must be within **5-12V DC** range. Power **LED ON [GREEN]** indicates the presence of power supply. On-board battery charger circuit **MCP73832** enables you to charge the battery over USB connection or via screw terminals. **LED diode [RED]** indicates when battery is charging. Charging current is ~250mA and charging voltage is 4.2V DC.

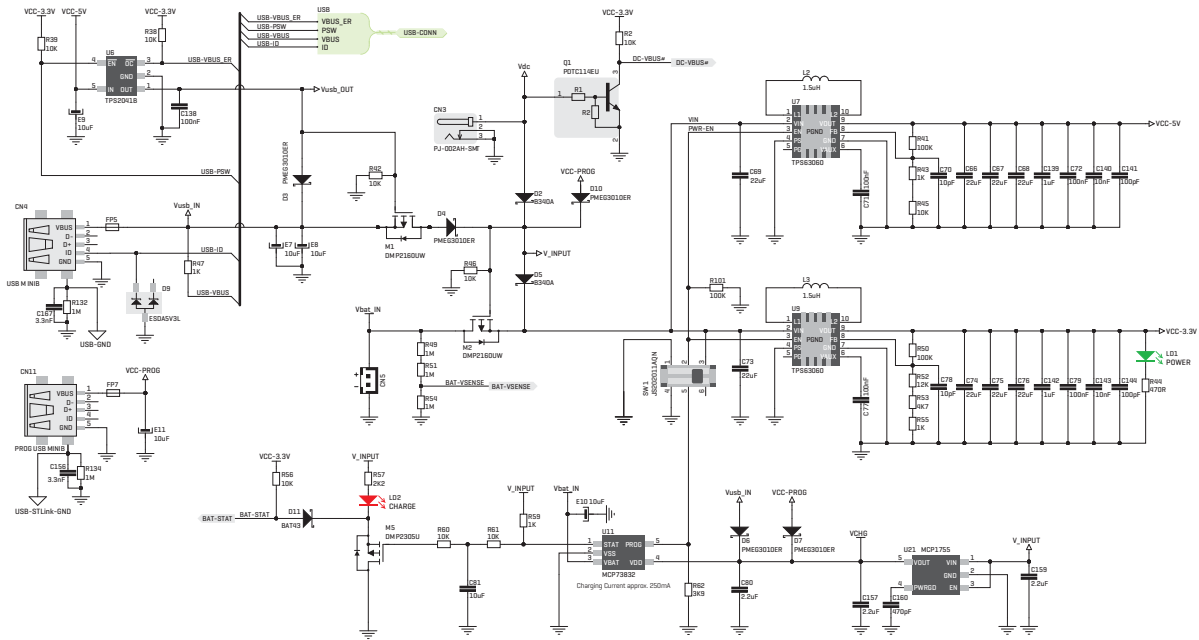


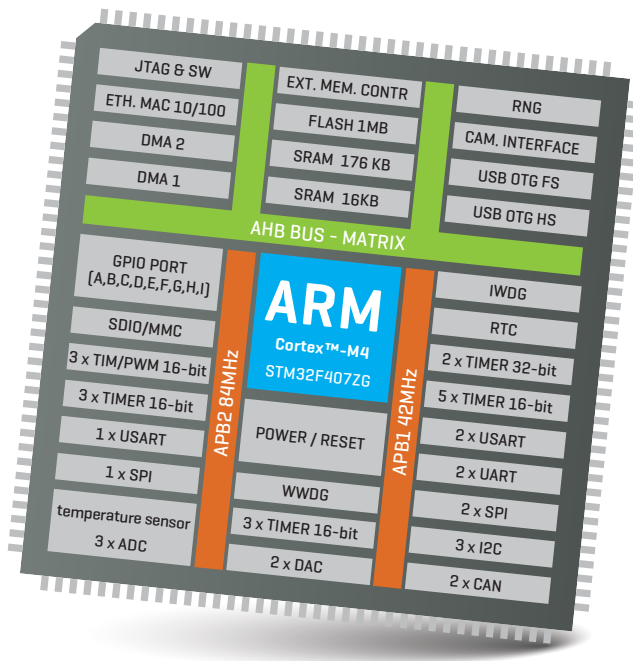
Figure 1-4: Power supply schematic

2. STM32F407ZG microcontroller

The mikromedia 7 for STM32F4 development board comes with the 144-pin **ARM® Cortex™-M4 STM32F407ZG** microcontroller. This high-performance **32-bit** microcontroller with its integrated modules and in combination with other onboard modules is ideal for multimedia applications.

Key microcontroller features

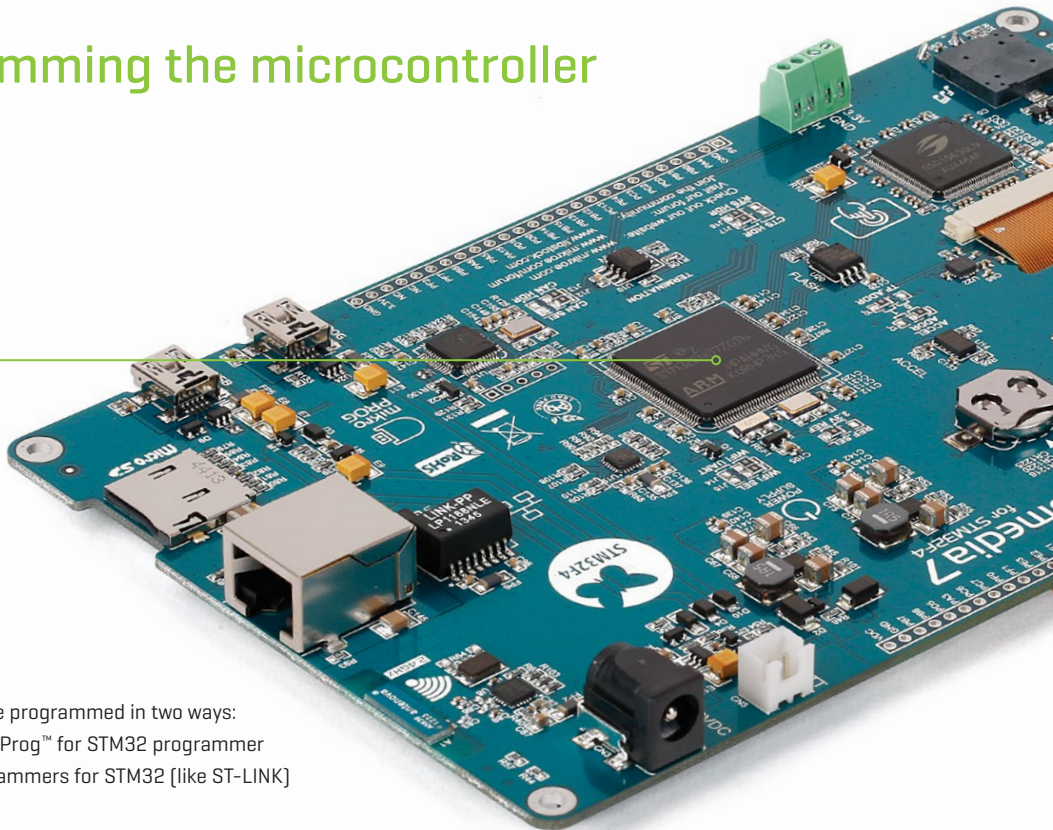
- Up to **210 DMIPS** Operation [168MHz];
- 1 MB of Flash memory;
- 192 + 4 KB of SRAM memory;
- up to 140 I/O pins;
- 16/32-bit timers
- 16MHz internal oscillator, 32kHz RTCC, PLL;
- 4xUART, 3xSPI, 3xI²C, 2xCAN, 3xADC, 3XADC etc.
- Ethernet, USB etc.



3. Programming the microcontroller



Figure 3-1:
STM32F407ZG
ARM® Cortex™-M4
Microcontroller



The microcontroller can be programmed in two ways:

1. Using onboard mikroProg™ for STM32 programmer
2. Using external programmers for STM32 [like ST-LINK]

Using mikroProg™ programmer

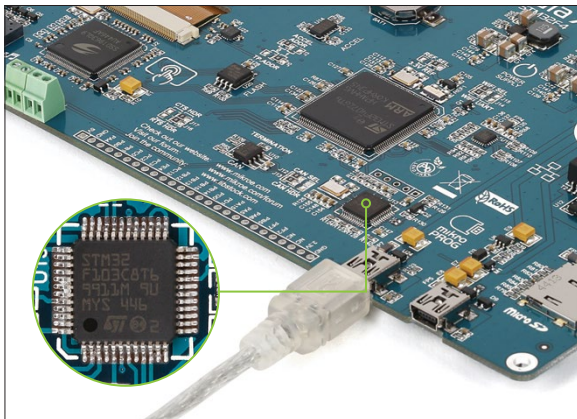


Figure 3-9:
On-board mikroProg™ programmer

The microcontroller can be programmed with onboard **mikroProg™ for STM programmer** and **mikroProg Suite™ for ARM® software**. Connection with PC is established over an PROG USB connector. For proper insertion of the MINI-B USB cable refer

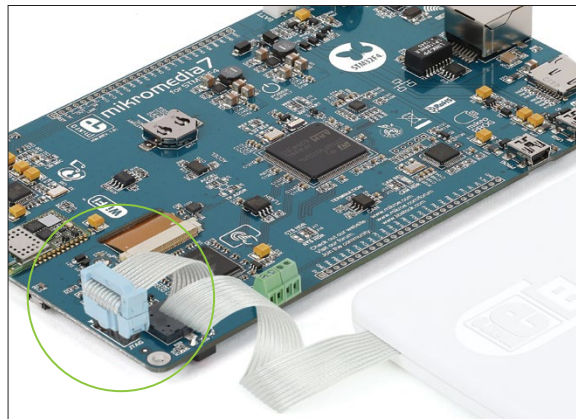


Figure 3-10:
mikroProg™ JTAG connector

to **Figure 3-9**. Signalization LED [LINK] is also provided on the opposite side of the PROG USB connector. It is also possible to program the microcontroller with external programmers, via 2x5 JTAG connector **[CN1]** with an appropriate adapter, **Figure 3-10**.

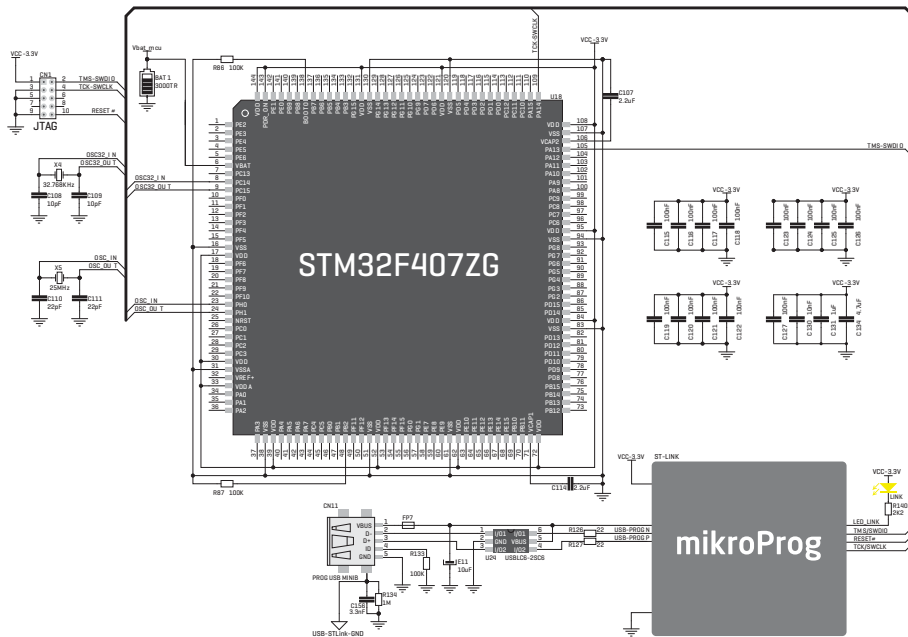


Figure 3-11: mikroProg™ JTAG connector connection schematic

mikroProg Suite™ for ARM® software



Figure 3-1:
mikroProg
Suite™ for
ARM®
window

mikroProg™ for STM32 programmer requires special programming software called mikroProg Suite™ for ARM®. This software is used for programming ALL of STM32 ARM® Cortex-M3™ and Cortex-M4™ microcontroller families. It features intuitive interface and SingleClick™ programming technology. Software installation is available on following link:

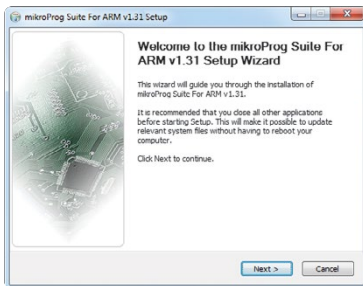
➔ www.mikroe.com/downloads/get/1809/mikroprog_suite_for_arm.zip

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

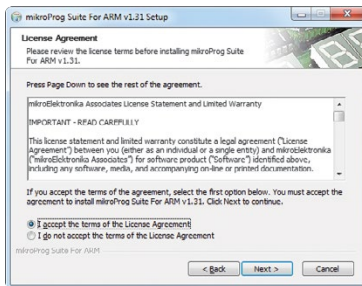
Quick Guide

1. Click the **Detect MCU** button in order to recognize the device ID.
2. Click the **Read** button to read the entire microcontroller memory. You can click the **Save** button to save it to the target HEX file.
3. 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.
4. Click the **Erase** button to clear the microcontroller memory.

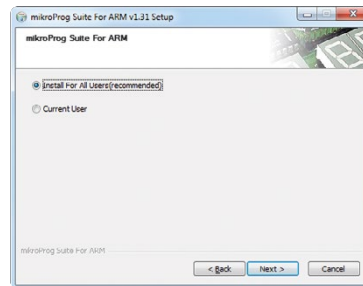
Software installation wizard



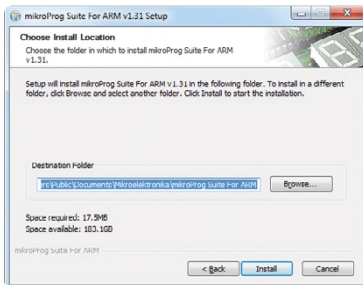
1. Start Installation



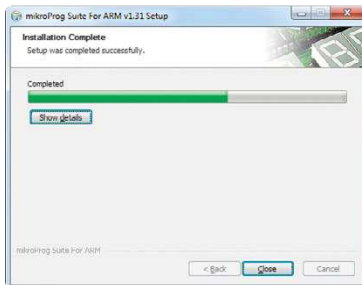
2. Accept EULA and continue



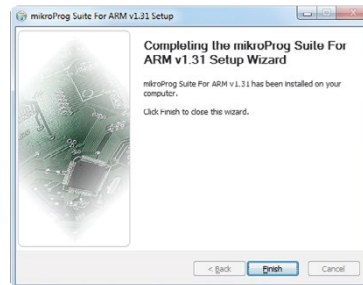
3. Install for all users



4. Choose destination folder

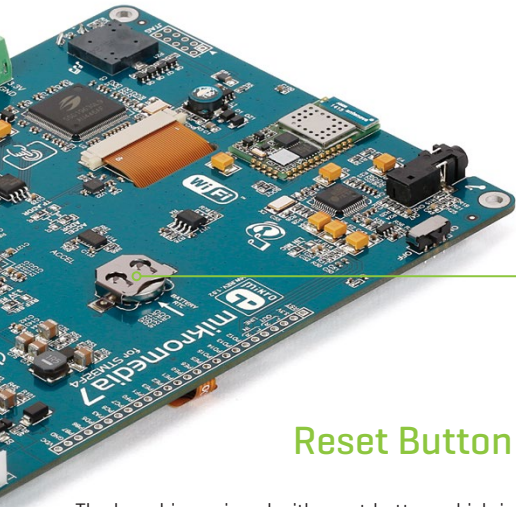


5. Installation in progress



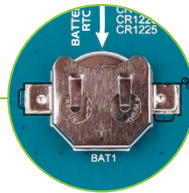
6. Finish installation

4. RTC Battery and Reset Button



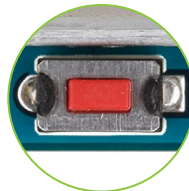
RTC Battery

mikromedia 7 for STM32F4 features an RTC battery holder for microcontroller RTC module. Battery is used as alternate source of power, so the RTC module can continue to keep time while the primary source of power is off or currently unavailable. Three types of coin battery are supported: CR1216, CR1220 and CR1225.



Reset Button

The board is equipped with reset button, which is located on the front side of the board. If you want to reset the circuit, press the reset button. It will generate low voltage level on the microcontroller reset pin (input). A reset can also be externally provided through the **pin 26** on the side headers.



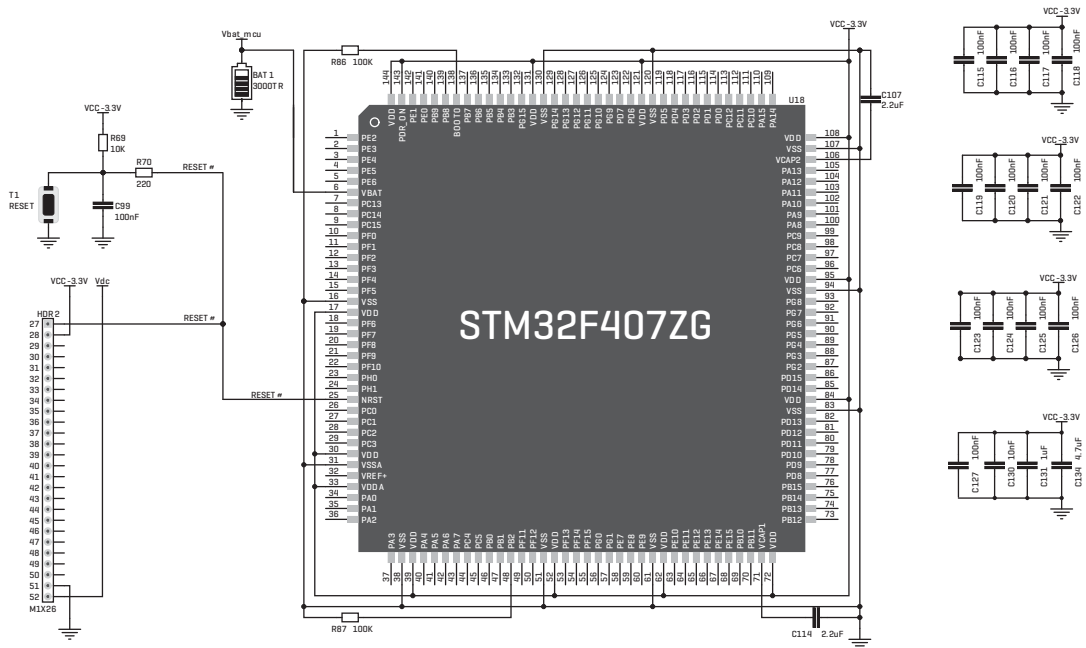


Figure 4-1: Reset circuit and RTC battery schematic

5. Crystal oscillators and 2.048V reference

The board is equipped with **1 25MHz crystal oscillator [X5]** 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. The board also contains **2 32.768 kHz crystal oscillator [X4]** which provides external clock for internal RTCC module. Microcontroller ADC requires an accurate source of reference voltage signal. That is why we provide the external **3 voltage reference** to the microcontroller VREF pin which is **2.048V**.

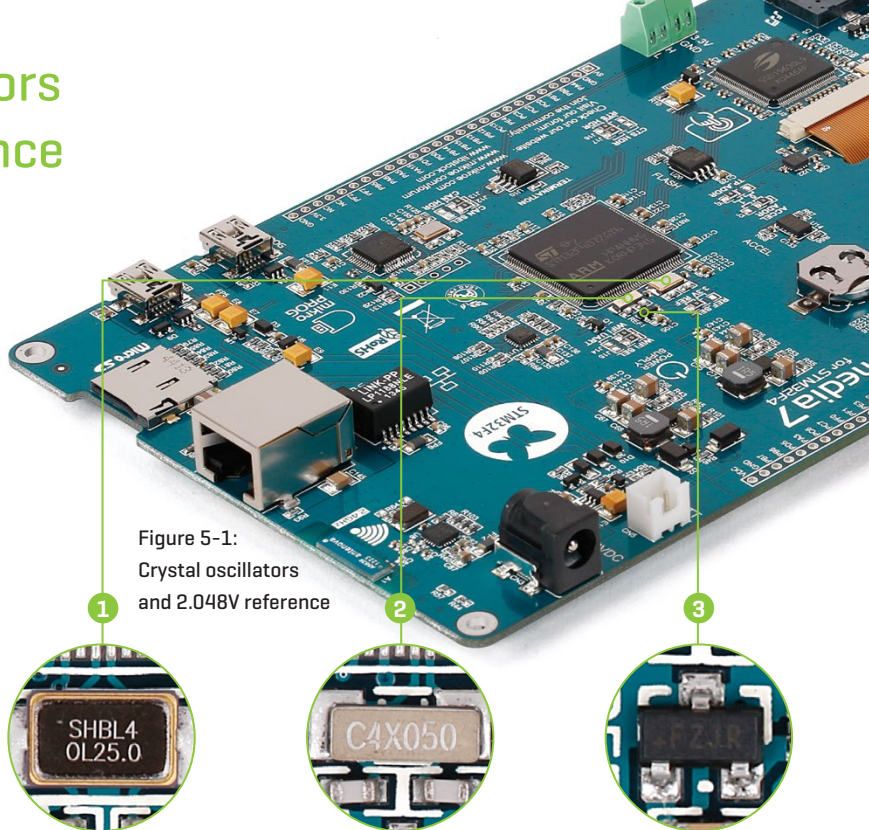


Figure 5-1:
Crystal oscillators
and 2.048V reference

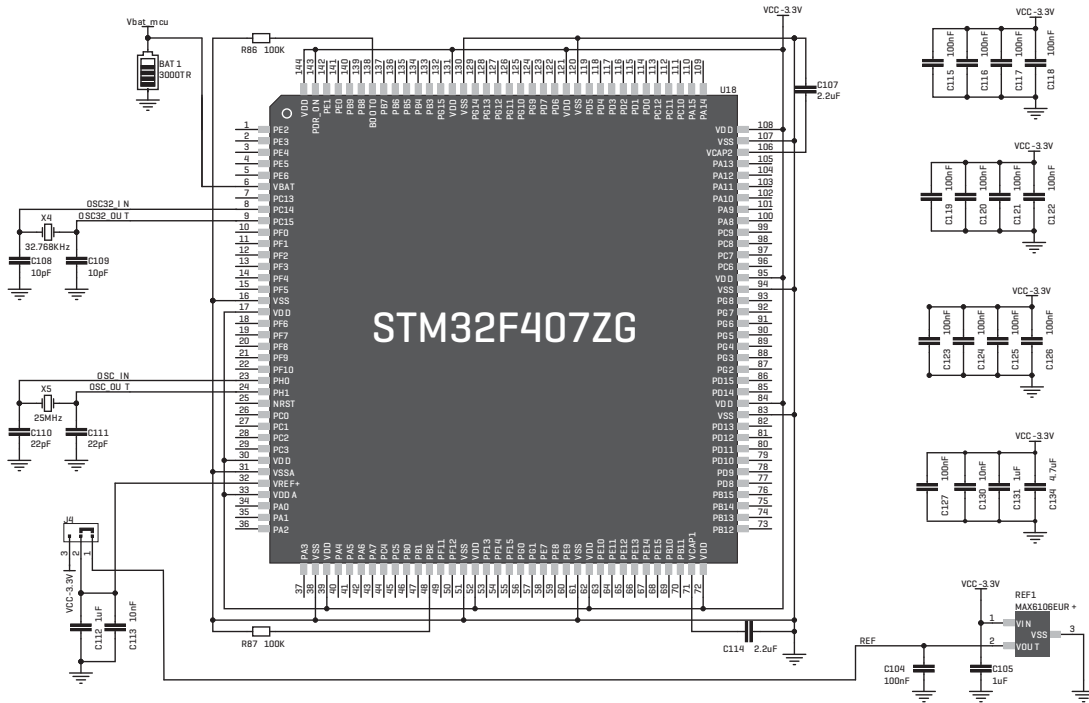
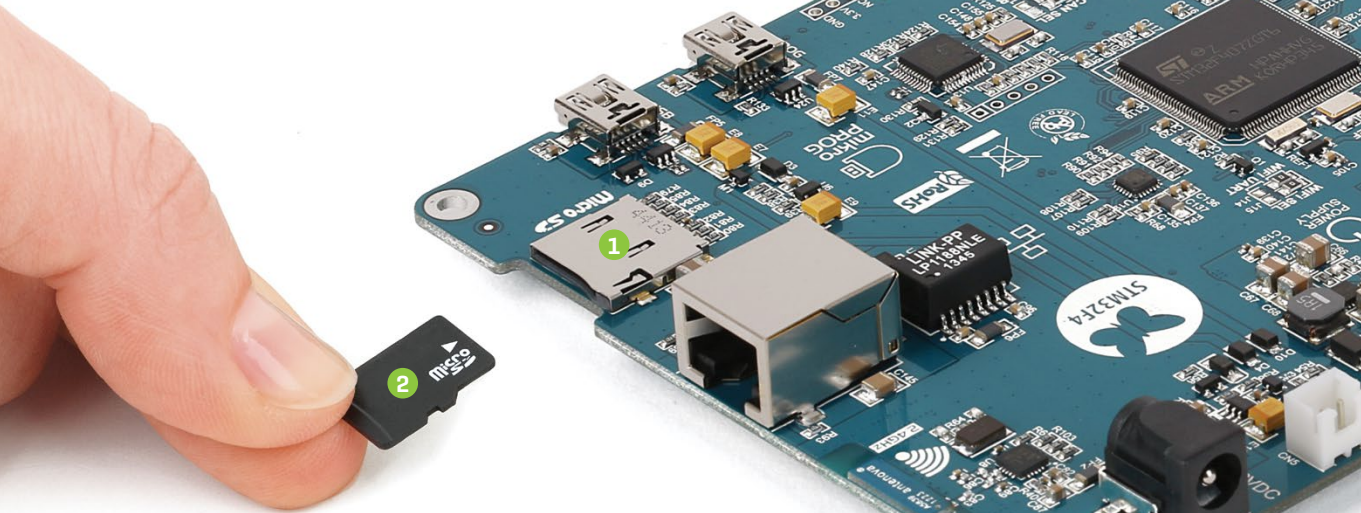


Figure 5-2: Crystal oscillator and voltage reference schematic

6. microSD Card Slot



Board contains **1** microSD card slot for using **2** 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. Ferrite and capacitor are provided to compensate the voltage and current glitch that can occur when pushing-in and pushing-out microSD card into the socket. Proper insertion of the microSD card is shown in **Figure 6-1**.

Figure 6-1:
microSD card slot

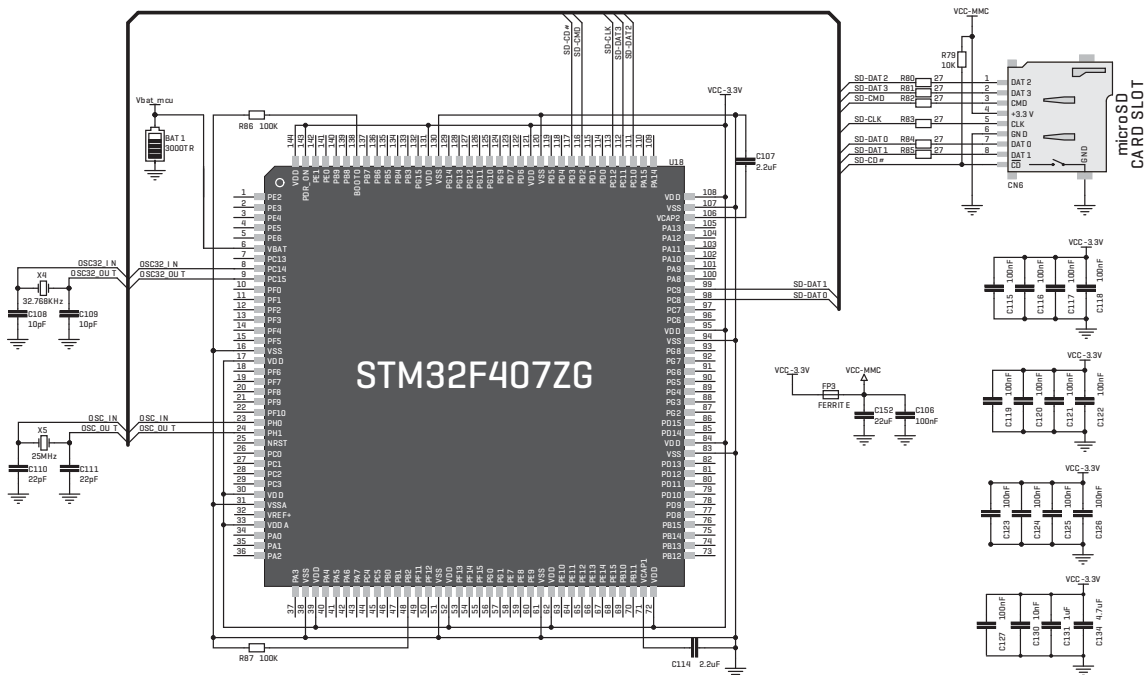


Figure 6-2: microSD Card Slot module connection schematic

7. Touch Screen



The development system features a **7" TFT 800x480 display** covered with a **resistive touch panel**. Together they form a functional unit called a **touch screen**, [Figure 7-1]. It enables data to be entered and displayed at the same time. The TFT display is capable of showing graphics in **262K different colors**.

Figure 7-1: Touch Screen

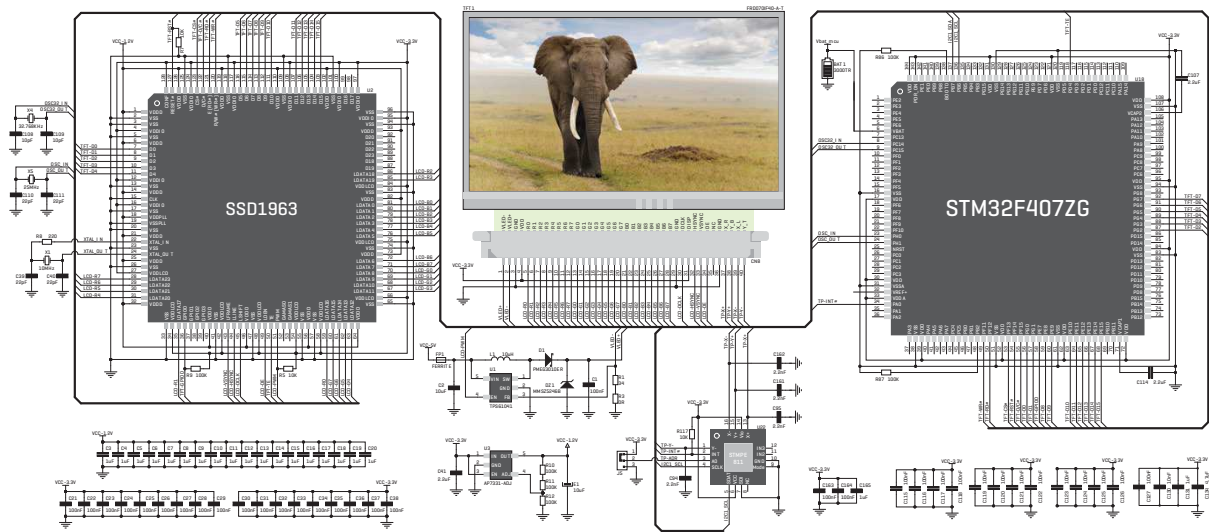
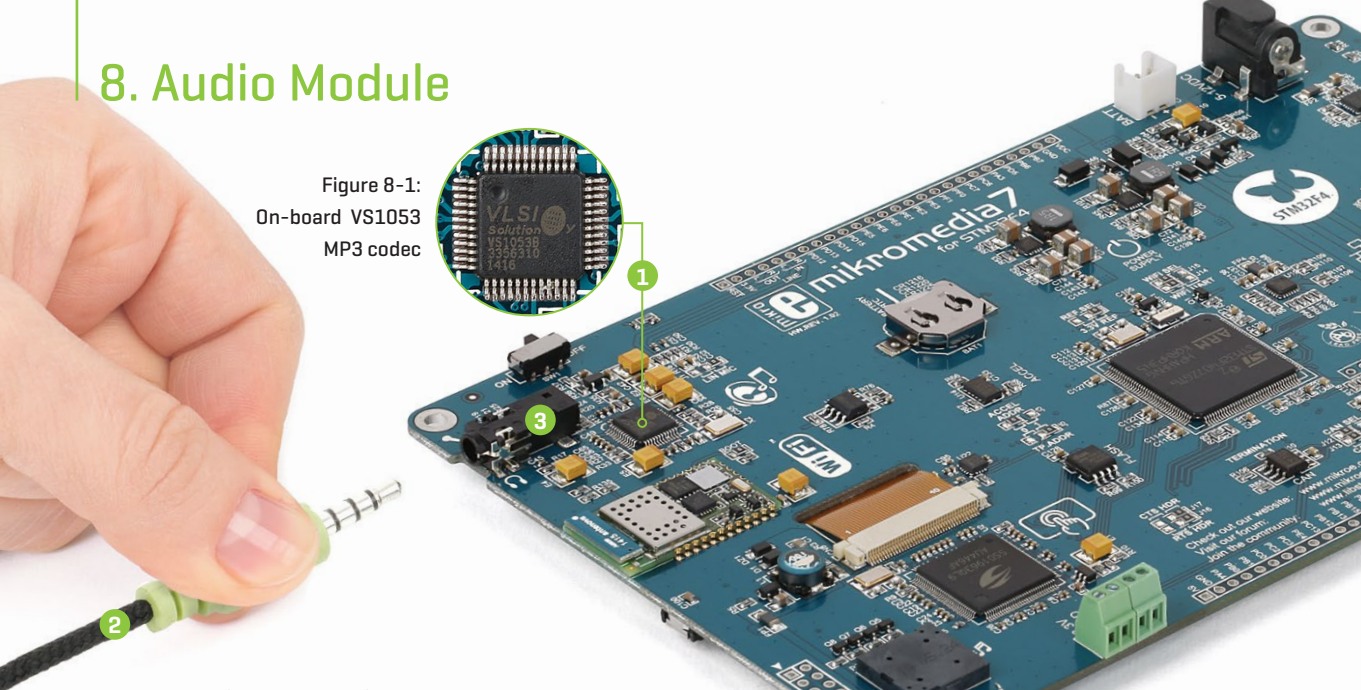


Figure 7-2: Touch Screen connection schematic

8. Audio Module

Figure 8-1:
On-board VS1053
MP3 codec



mikromedia 7 for STM32F4 features stereo audio codec **1 VS1053**. This module enables audio reproduction and sound recording by using **2 stereo headphones with microphone** connected to the system via a **3 3.5mm connector** [CN2]. All functions of this module are controlled

by the microcontroller over Serial Peripheral Interface [SPI]. IN and OUT channels are also provided on side headers [HDR2].

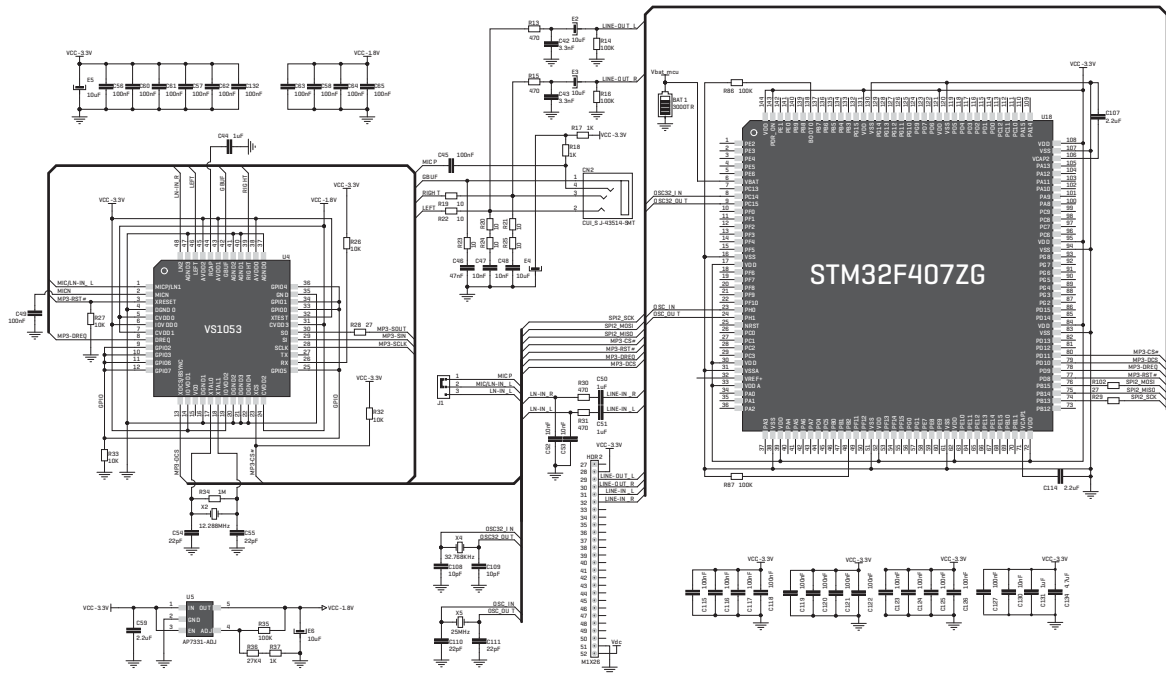


Figure 8-2: Audio module connection schematic

9. USB DEVICE connection

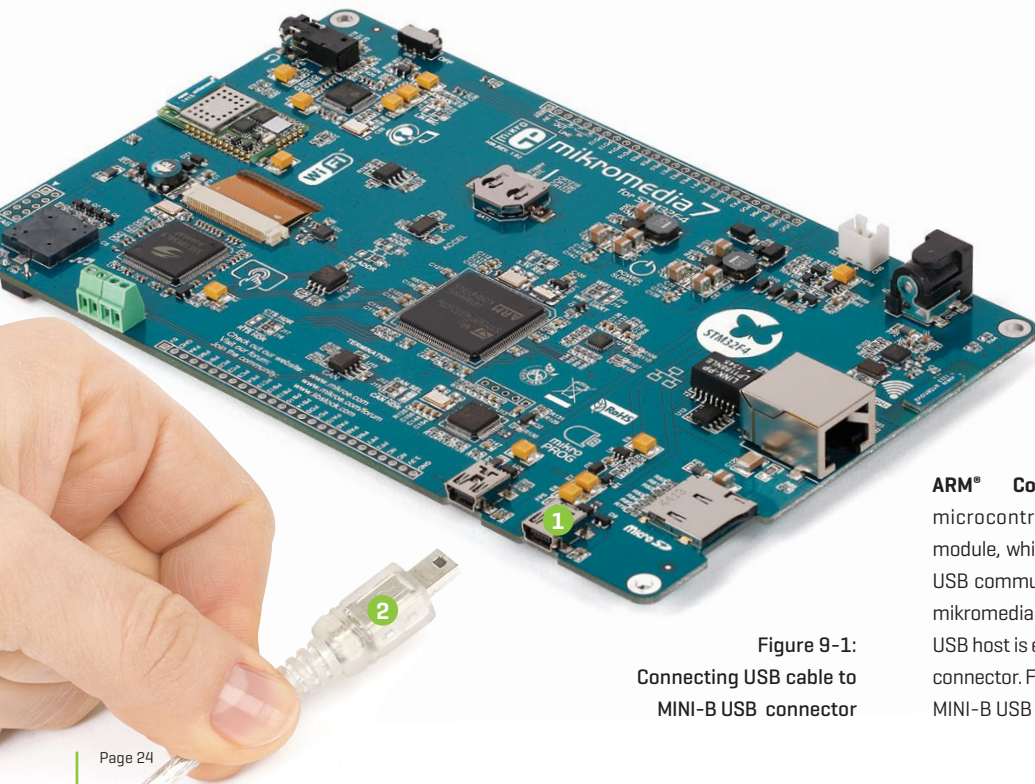


Figure 9-1:
Connecting USB cable to
MINI-B USB connector

ARM® Cortex™-M4 STM32F407ZG microcontroller has integrated USB module, which enables you to implement USB communication functionality to your mikromedia board. Connection with target USB host is establish over **1** MINI-B USB connector. For proper insertion of the **2** MINI-B USB cable refer to **Figure 9-1**.

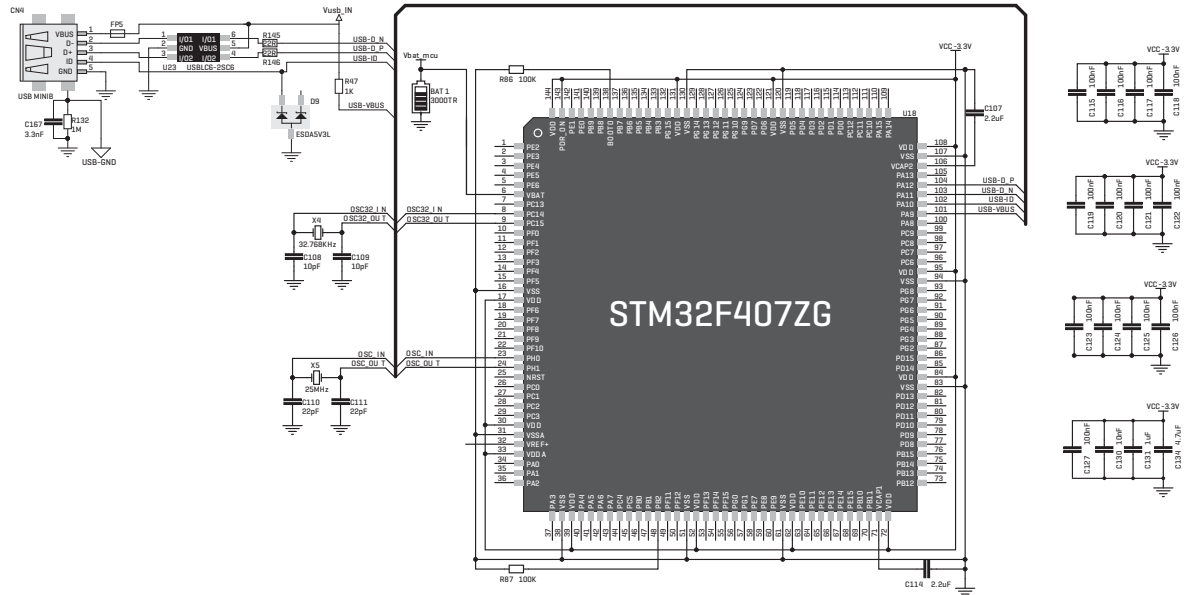


Figure 9-2: USB DEVICE module connection schematic