mikromedia+

for TIVA® ARM®

Amazingly compact, all-on-single-pcb development board carring 4.3'' TFT Touch Screen and lots of multimedia peripherals, all driven by powerful TM4C123GH6PGEI microcontroller from ARM® Cortex™-M4 family

MikroElektronika
DEVELOPMENT TOOLS | COMPILERS | BOOKS

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 TIVA®

The central part of the system is a 32-bit ARM® Cortex™-M4 TM4C123GH6PGEI microcontroller. The mikromedia+ for TIVA® ARM® features integrated modules such as stereo MP3 codec, 4.3" TFT 480x272 touch screen display, accelerometer, microSD card slot, buzzer, IR receiver, RGB LED diode, PIN photodiode, temperature sensor, 2.4GHz RF transceiver, 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 pre-programmed with USB HID bootloader, but can also be programmed with external programmers, such as mikroProg™ for TIVA® or other JTAG programmers. Mikromedia is compact and slim, and perfectly fits in the palm of your hand, which makes it a convenient platform for mobile and other multimedia devices.

System Specification

power supply

Via USB cable (5V DC) or via screw terminals (2.5-12V DC)

power consumption

26 mA with erased MCU

(when on-board modules are inactive)

board dimensions

119.54 x 78 mm (4.71 x 3.07 inch)

weight

~270g (0.595 lbs)

Package Contains

01 Damage resistant protective box

02 mikromedia+ for TIVA®

03 USB cable and microSD card with adapter

04 mikromedia+ for TIVA® ARM® user's guide

1. Power supply

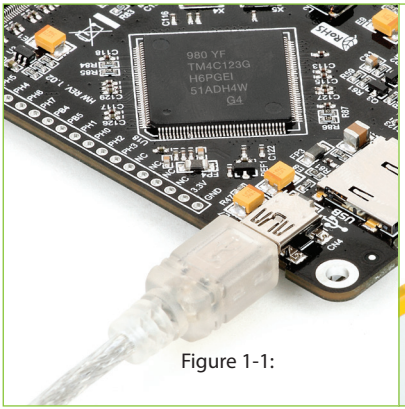


Figure 1-1:

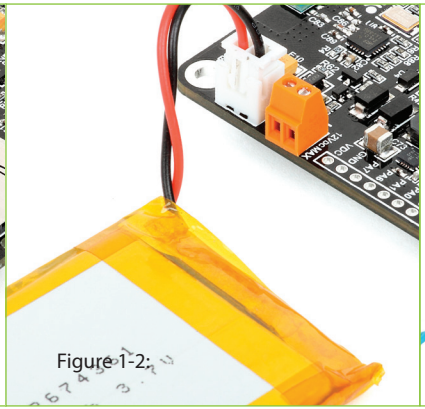


Figure 1-2:

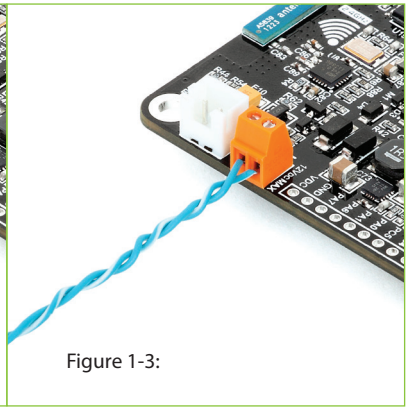
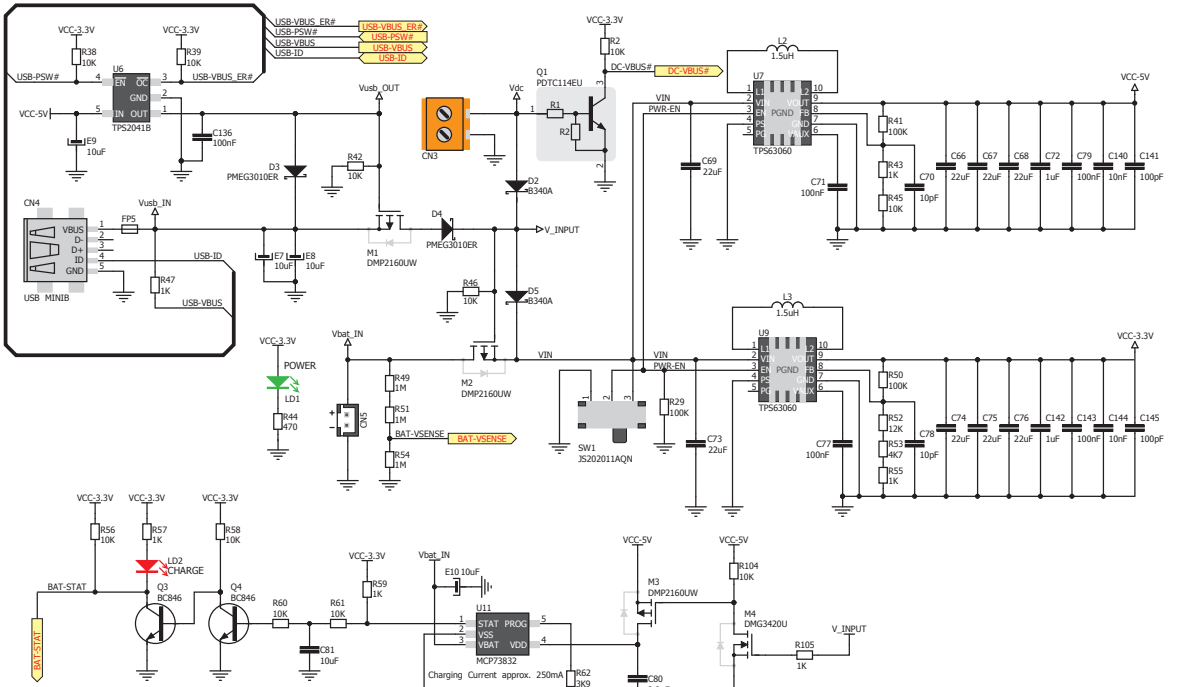


Figure 1-3:

The mikromedia+ for TIVA® ARM® board can be powered in three different ways: via USB connector using MINI-B USB cable provided with the board (CN4), via battery connector using Li-Polymer battery (CN5) or via screw terminals using laboratory 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 2.5-12V 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)

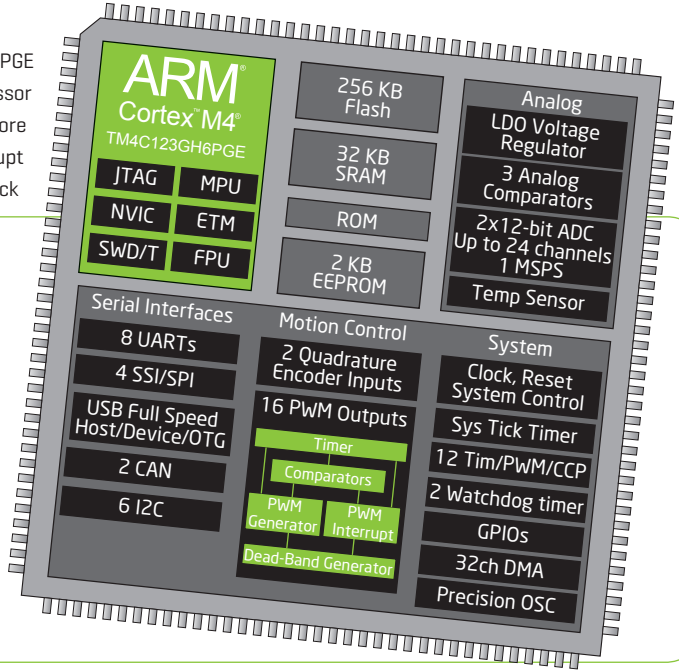

VCC-3.3V
VCC-5V
USB-PSW#
USB-VBUS_ER#
USB-PSW#
USB-VBUS
USB-ID
U6
TPS2041B
EN
OC
GND
IN
OUT
R38 10K
R39 10K
C136 100nF
E9 10uF
Vusb_OUT
D3 PMEG3010ER
R42 10K
CN3
Vdc
Q1 PDTC114EU
R1
R2 10K
DC-VBUS#
D2 B340A
D5 B340A
D4 PMEG3010ER
V_INPUT
M1 DMP2160UW
M2 DMP2160UW
R46 10K
CN4
USB MINIB
VBUS
D-
D+
ID
GND
FP5
Vusb_IN
USB-ID
USB-VBUS
R47 1K
E7 10uF
E8 10uF
POWER
LD1
R44 470
Vbat_IN
CN5
R49 1M
R51 1M
R54 1M
BAT-VSENSE
SW1 JS202011AQN
R29 100K
C73 22uF
VIN
PWR-EN
L2 1.5uH
U7
TPS563060
PGND
C69 22uF
C71 100nF
R41 100K
R43 1K
R45 10K
C70 10pF
C66 22uF
C67 22uF
C68 22uF
C72 1uF
C79 100nF
C140 10nF
C141 100pF
L3 1.5uH
U9
TPS563060
R50 100K
R52 12K
R53 4K7
R55 1K
C77 100nF
C78 10pF
C74 22uF
C75 22uF
C76 22uF
C142 1uF
C143 100nF
C144 10nF
C145 100pF
R56 10K
R57 1K
R58 10K
LD2 CHARGE
BAT-STAT
Q3 BC846
Q4 BC846
R60 10K
R61 10K
C81 10uF
R59 1K
E10 10uF
U11
MCP73832
STAT
PROG
VSS
VBAT
VDD
Charging Current approx. 250mA
R62 3K9
C80 2.2uF
M3 DMP2160UW
M4 DMG3420U
R104 10K
R105 1K

2. TM4C123GH6PGEI MCU features

All members of the Tiva™ C Series, including the TM4C123GH6PGE microcontroller, are designed around an ARM Cortex-M processor core. It has a 32-bit ARM® Cortex™-M4F 80-MHz processor core with System Timer (SysTick), integrated Nested Vectored Interrupt Controller (NVIC), Wake-Up Interrupt Controller (WIC) with clock

Key microcontroller features

- ARM Cortex-M4F CPU, 80-MHz operation;
- 256KB of Flash memory;
- 32KB of SRAM memory;
- 2KB of EEPROM memory;
- up to 105 I/O pins;
- 16/32-bit timers
- 16MHz internal oscillator, 32kHz RTCC;
- 8xUART, 4xSPI, 6xI²C, 2xCAN, 2xADC, USB etc.



3. Programming the microcontroller

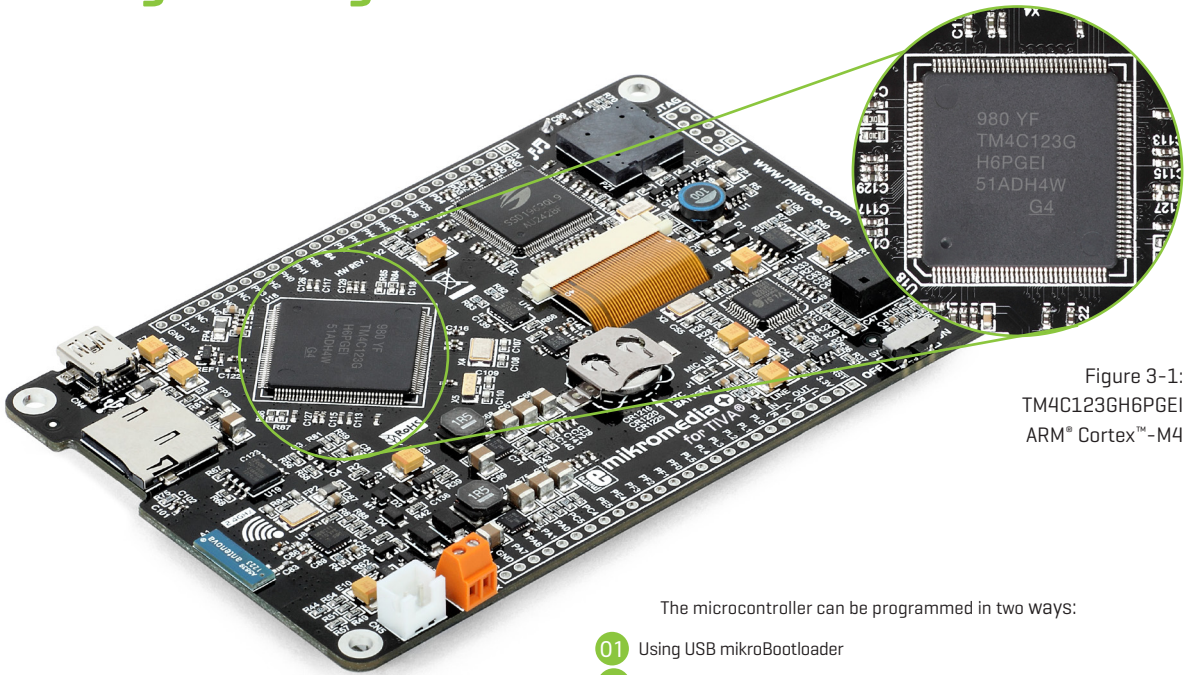


Figure 3-1:
TM4C123GH6PGEI
ARM® Cortex™-M4

The microcontroller can be programmed in two ways:

01 Using USB mikroBootloader

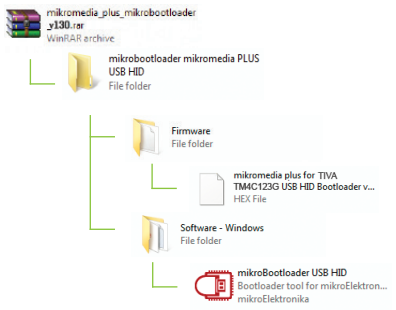
02 Using external mikroProg™ for TIVA® or other JTAG programmers

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://download.mikroe.com/examples/smart-displays/mikromedia/4/tiva/mikromedia-4-tiva-mikrobootloader-usb-hid-v130.zip

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



step 1 – Connecting mikromedia

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

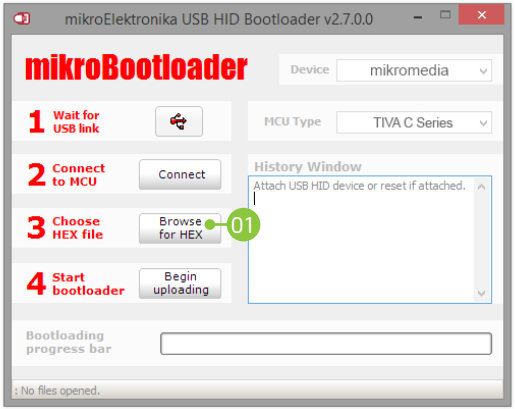


Figure 3-3: Browse for HEX

01 Click the Browse for HEX button and from a pop-up window (Figure 3.4) choose the .HEX file that will be uploaded to MCU memory.

step 3 – Selecting .HEX file

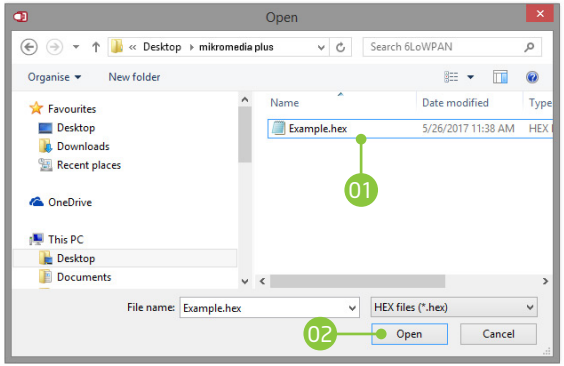


Figure 3-4: Selecting HEX

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 uploading click the Begin uploading button.

Figure 3-6: Progress bar

01 You can monitor .HEX file uploading via progress bar

step 5 – Finish upload

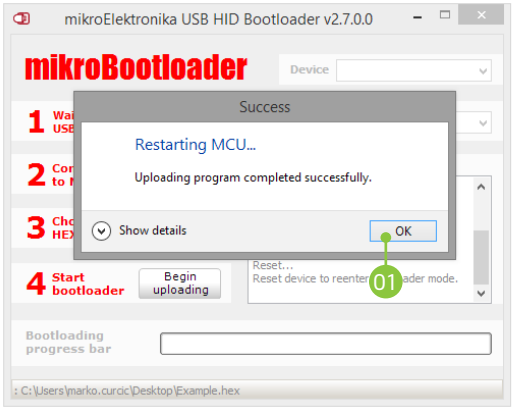


Figure 3-7: Restarting MCU

Figure 3-8: mikroBootloader ready for next job

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

Programming with mikroProg™ programmer

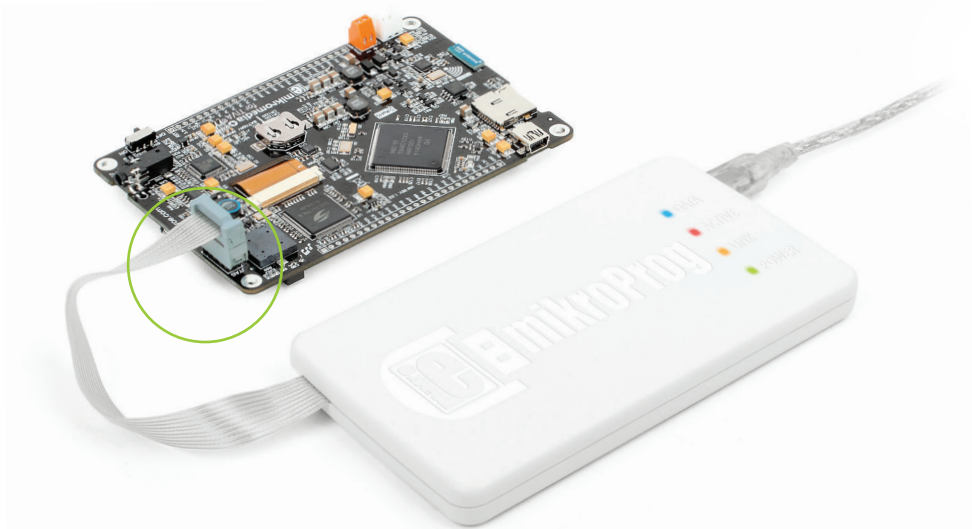


Figure 3-9:
mikroProg™

The microcontroller can be programmed with external mikroProg™ for TIVA® programmer and mikroProg Suite™ for ARM® 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 TIVA®. Outstanding performance, easy operation and elegant design are it's key features.

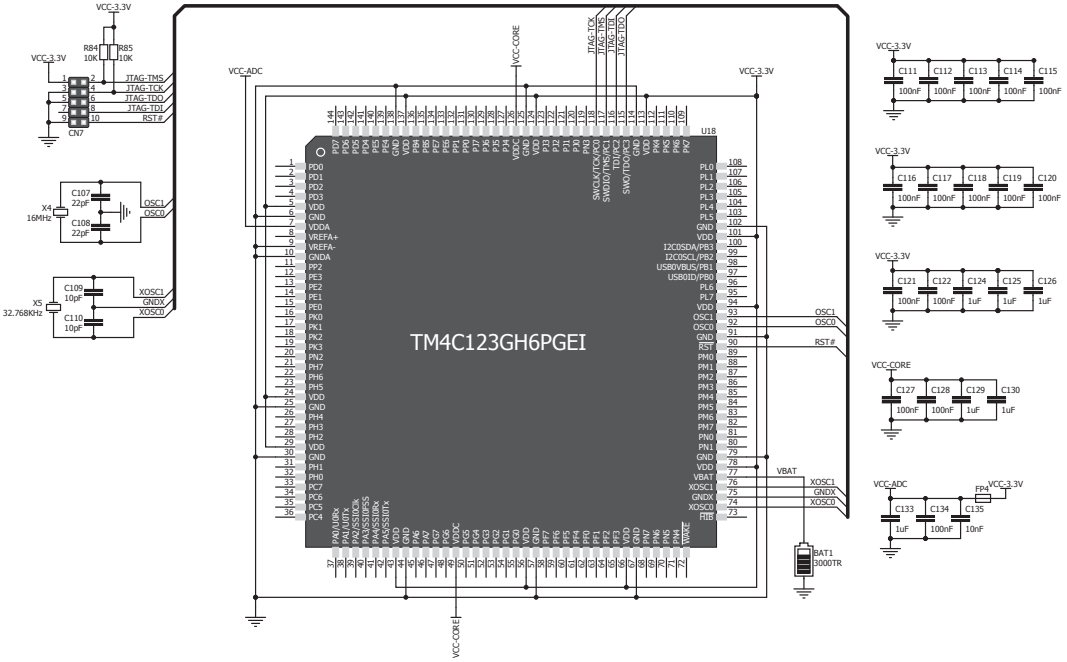
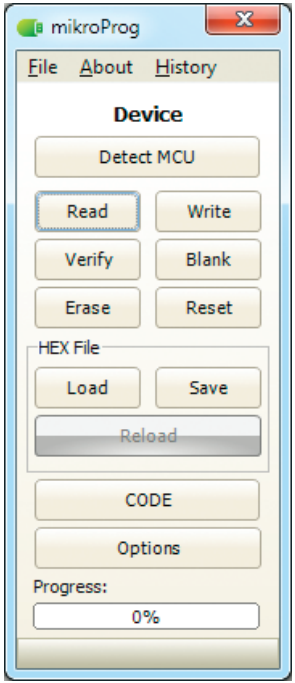


Figure 3-10: mikroProg™ JTAG connector connection schematic

mikroProg Suite™ for ARM® software



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

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

Quick Guide

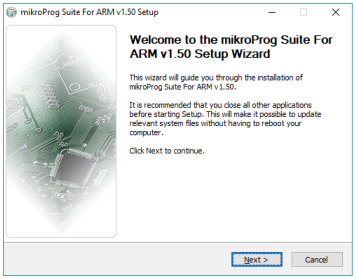
01 Click the Detect MCU button in order to recognize the device ID.

02 Click the Read button to read the entire microcontroller memory. You can click the Save button to save it to target HEX file.

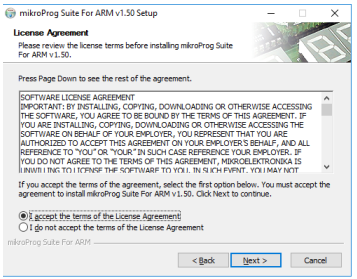
03 If you want to write the HEX file to the microcontroller, first make sure to load the target HEX file using the Load button. Then click the Write button to begin programming.

04 Click the Erase button to wipe out the microcontroller memory.

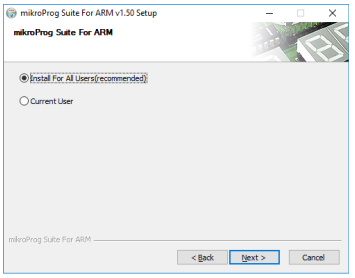
Software installation wizard



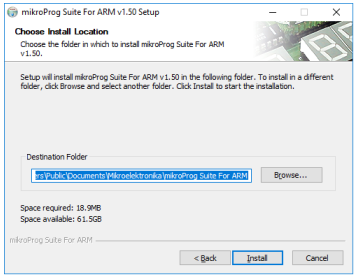
01 Start Installation



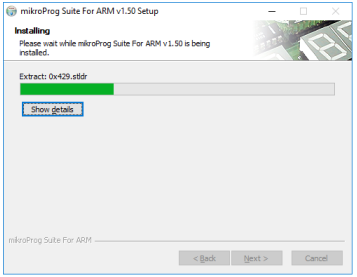
02 Accept EULA and continue



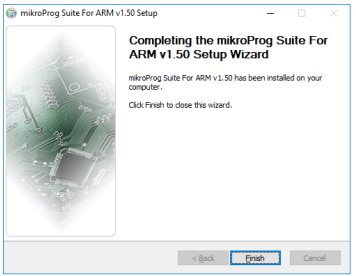
03 Install for all users



04 Choose destination folder



05 Installation in progress

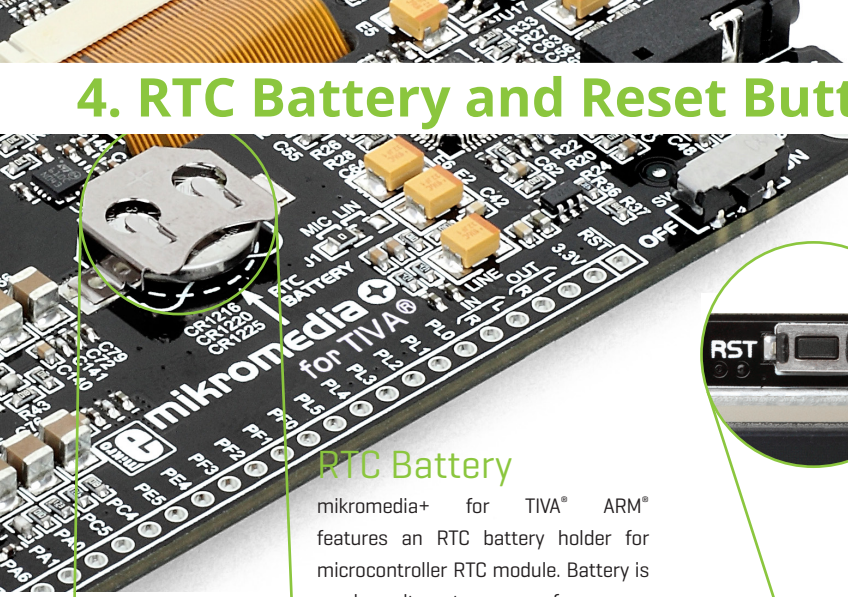


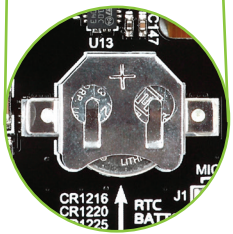
06 Finish installation

4. RTC Battery and Reset Button

RTC Battery

mikromedia+ for TIVA® ARM® 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 primacy 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 27 on the side headers.

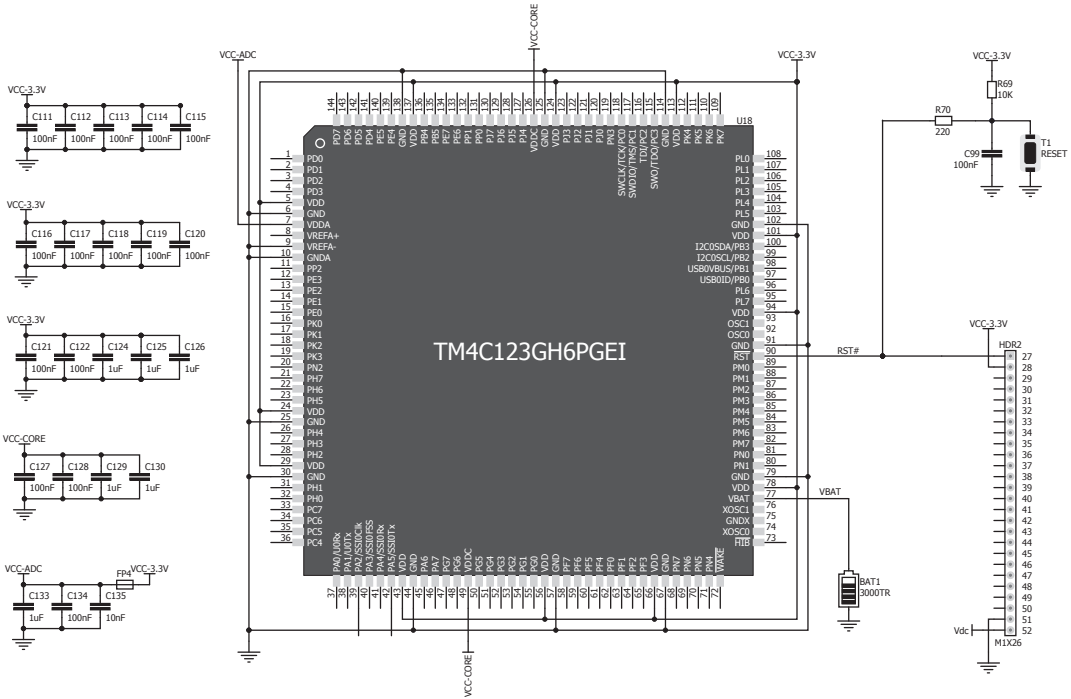
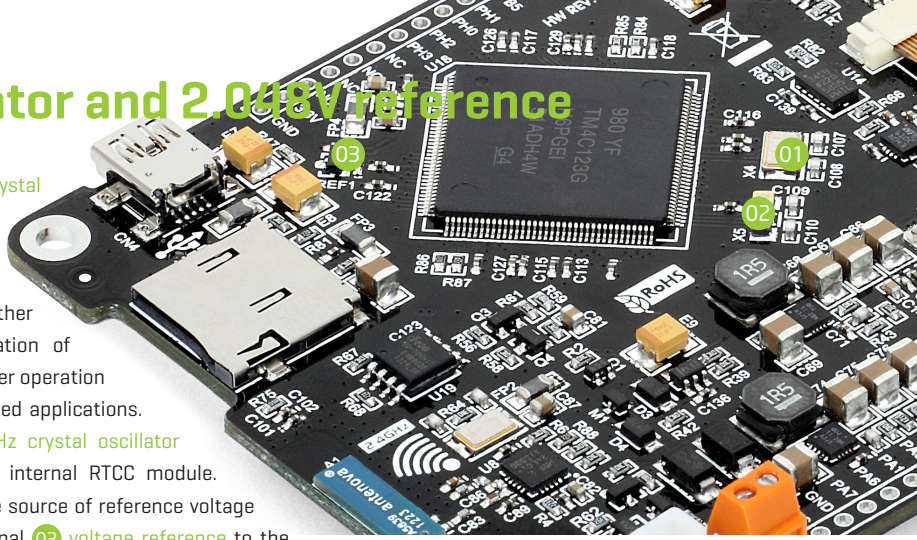
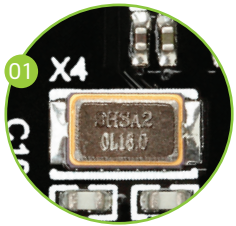


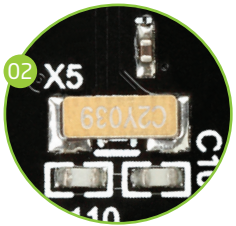
Figure 4-1: Reset circuit and RTC battery schematic

5. Crystal oscillator and 2.048V reference

The board is equipped with 01 16MHz crystal oscillator (X4) 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 02 32.768 kHz crystal oscillator (X5) 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 03 voltage reference to the microcontroller VREF pin which is 2.048V.







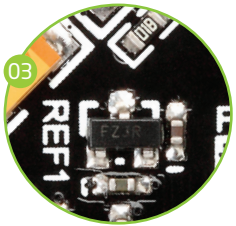


Figure 5-1: Crystal oscillator and 2.048V reference

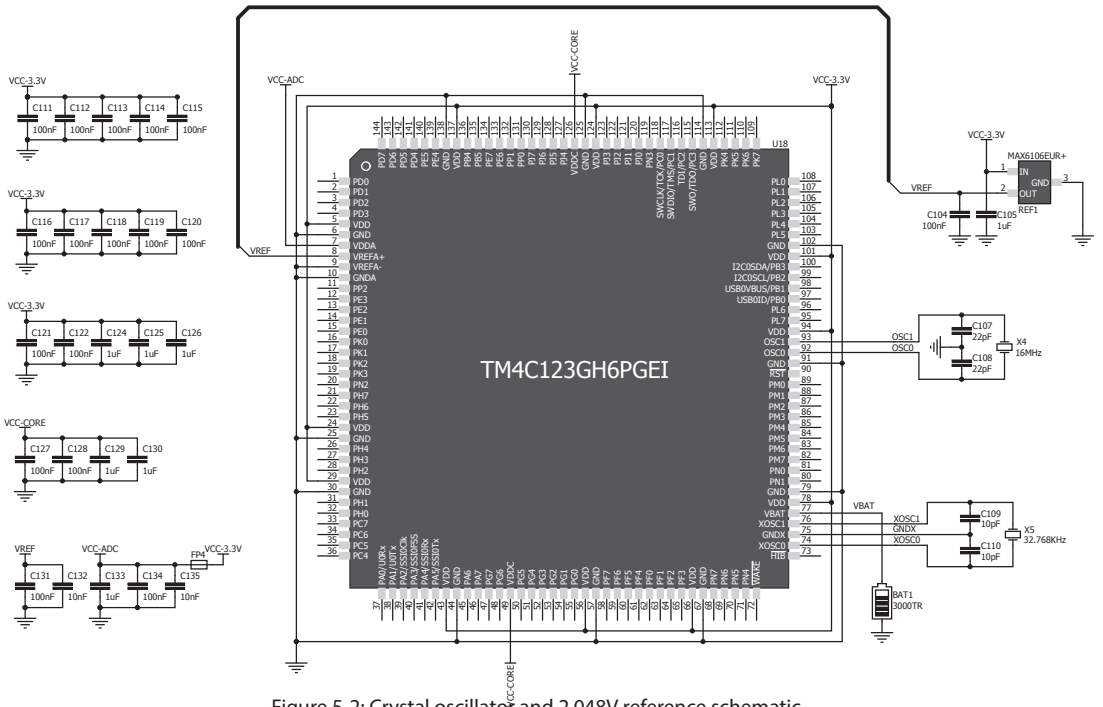
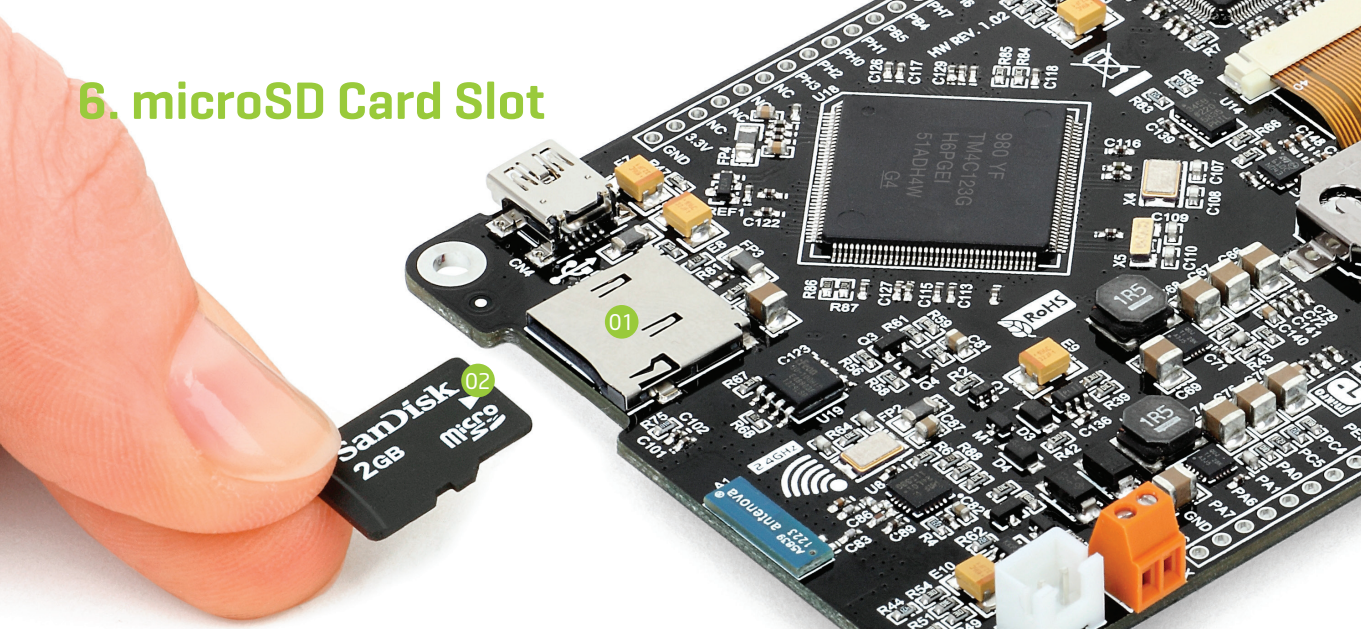


Figure 5-2: Crystal oscillator and 2.048V reference schematic

6. microSD Card Slot



Board contains 01 microSD card slot for using 02 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 capcitor are provided to compensate the voltage and current glitch that can occur when pushing-in and pushing-out microSD card

Figure 6-1:
microSD card slot

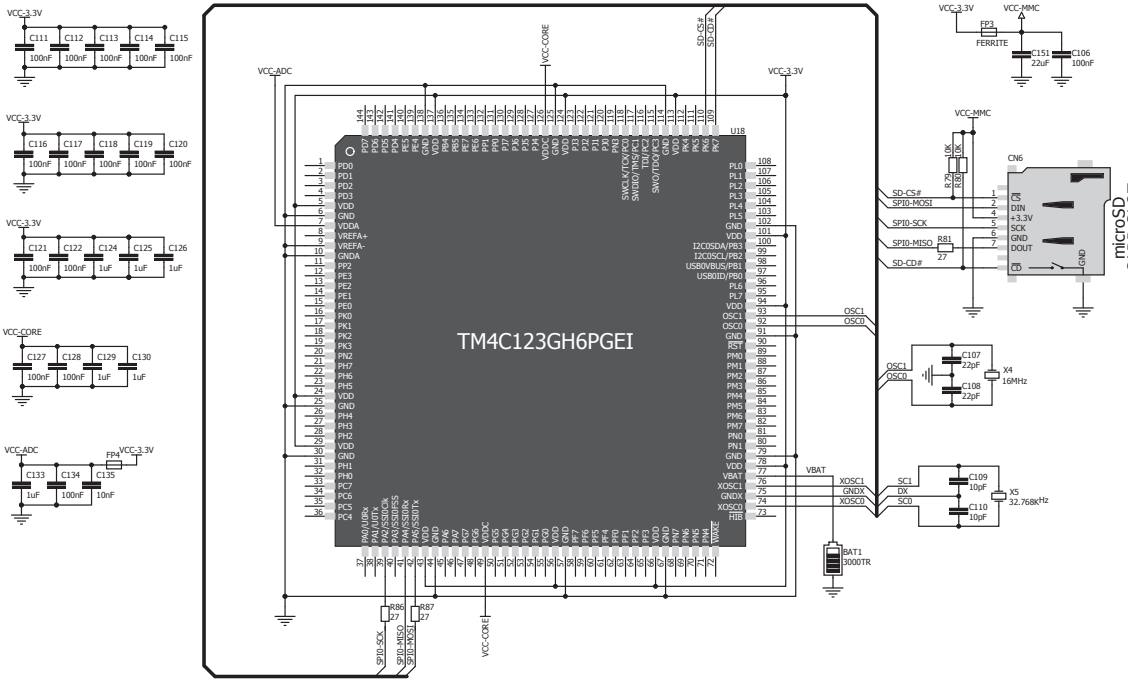


Figure 6-2: microSD Card Slot module connection schematic

7. Touch Screen

The development system features a 4.3" TFT 480x272 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 256K different colors.

Figure 7-1: Touch Screen

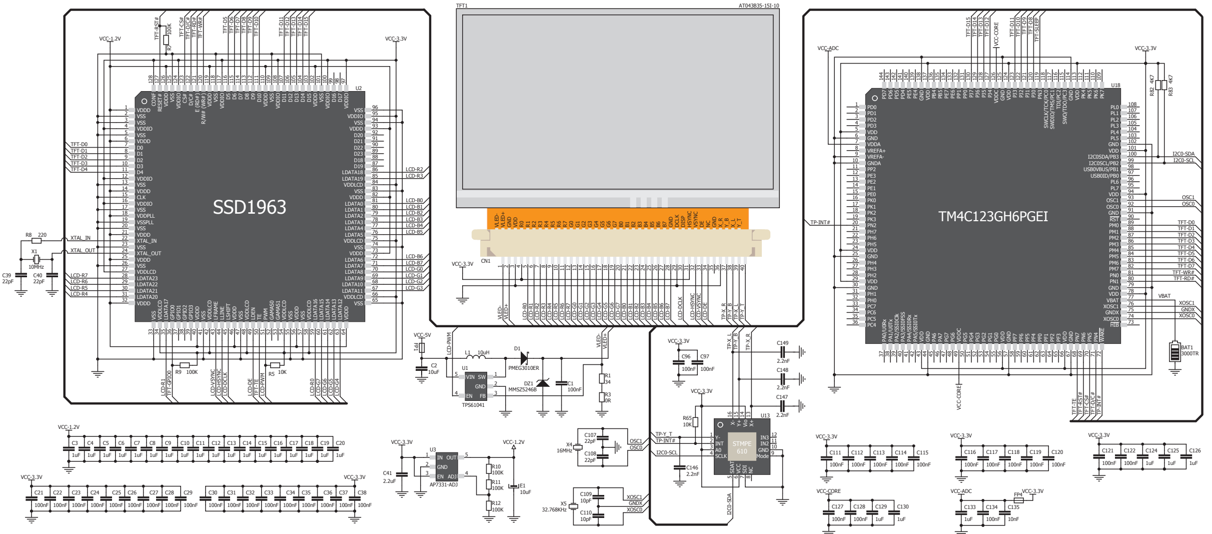


Figure 7-2: Touch Screen connection schematic

8. Audio Module

Figure 8-1: On-board VS1053 MP3 codec

mikromedia+ for TIVA® ARM® features stereo audio codec 01 VS1053. This module enables audio reproduction and sound recording by using 02 stereo headphones with microphone connected to the system via a 03 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.

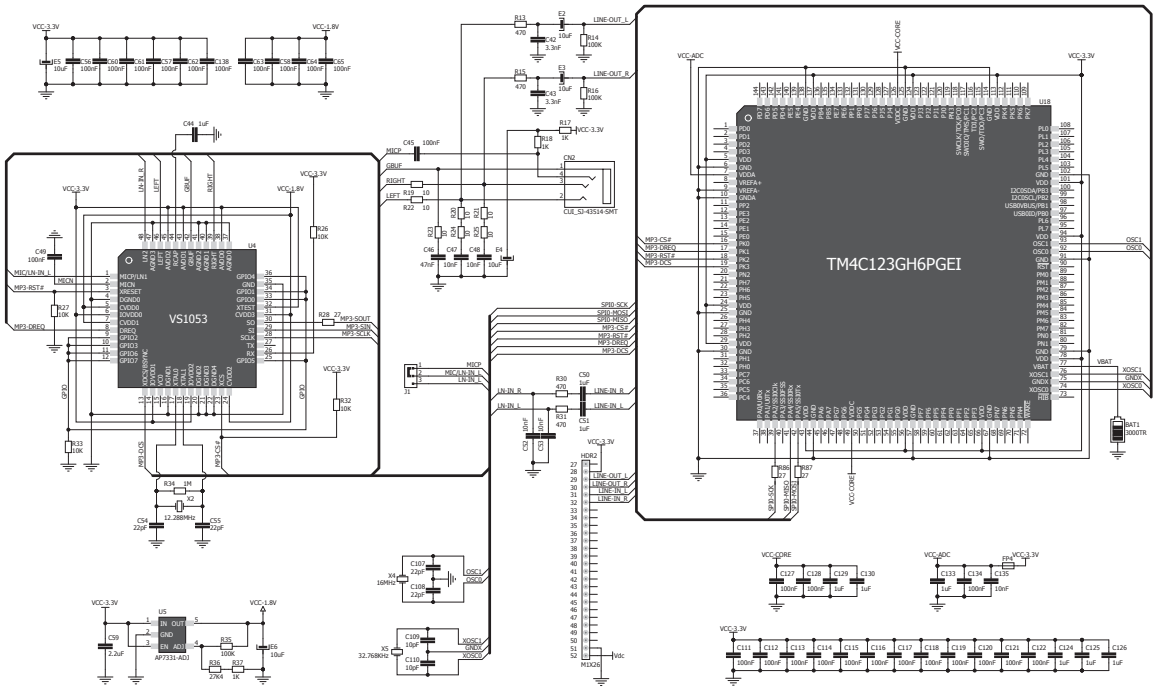


Figure 8-2: Audio module connection schematic

9. USB DEVICE connection

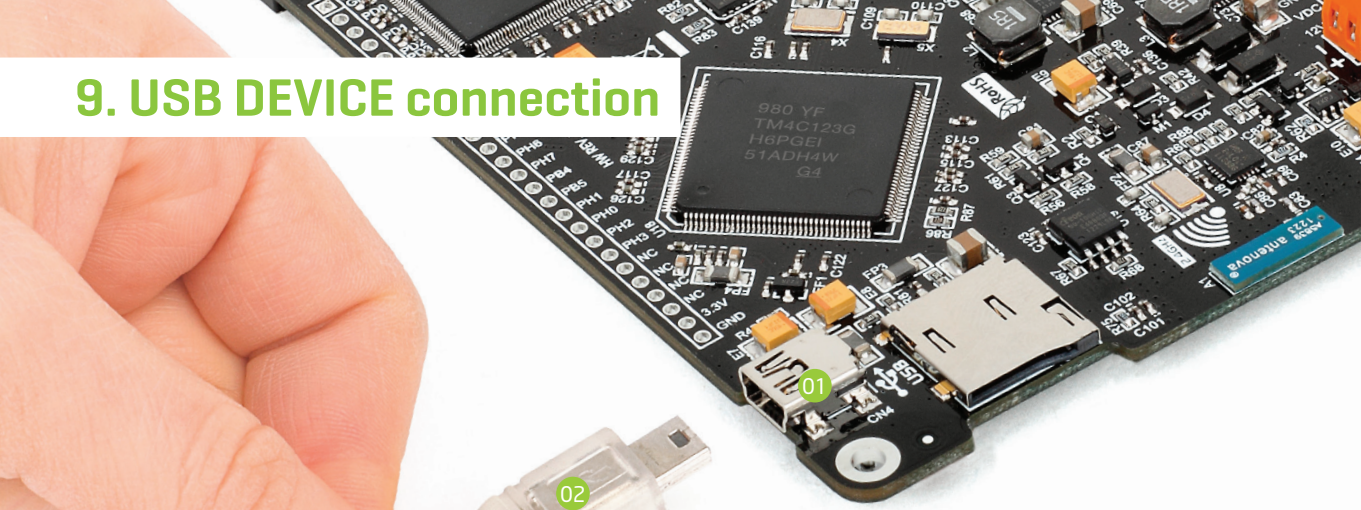


Figure 9-1: Connecting USB cable to MINI-B USB connector

ARM® CortexTM-M4 TM4C1223GH6PGE 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 01 MINI-B USB connector. For proper insertion of the 02 MINI-B USB cable refer to Figure 9-1.

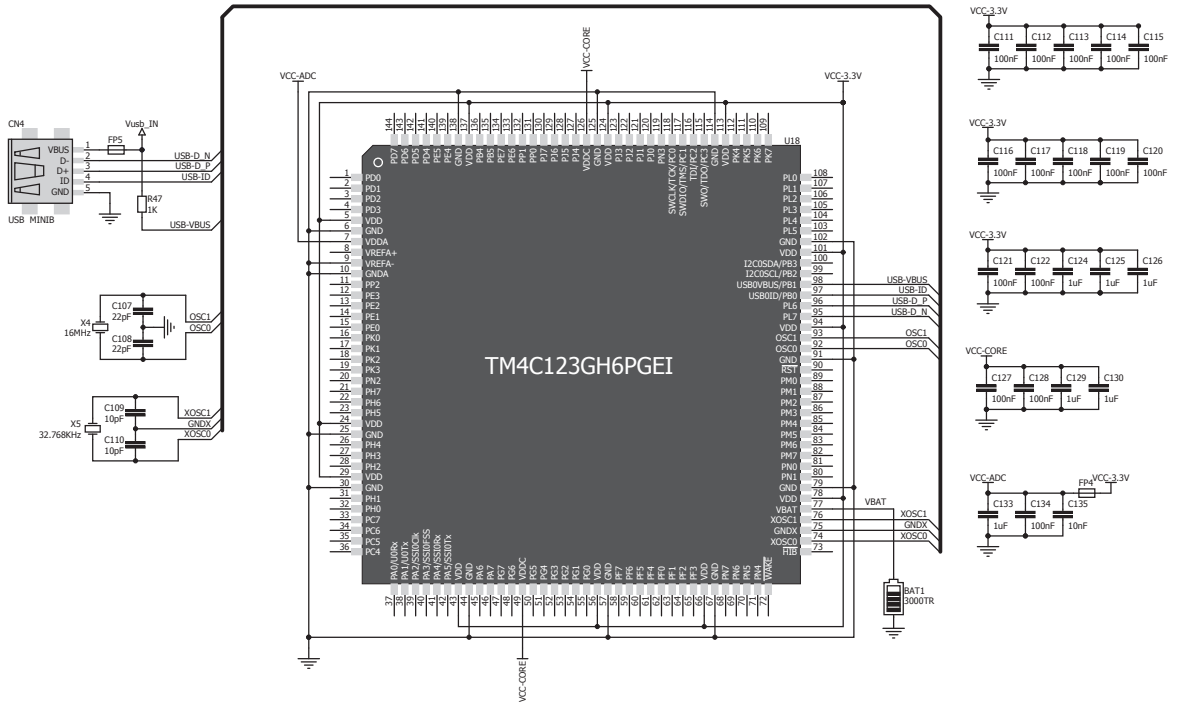


Figure 9-2: USB DEVICE module connection schematic

10. USB HOST connection

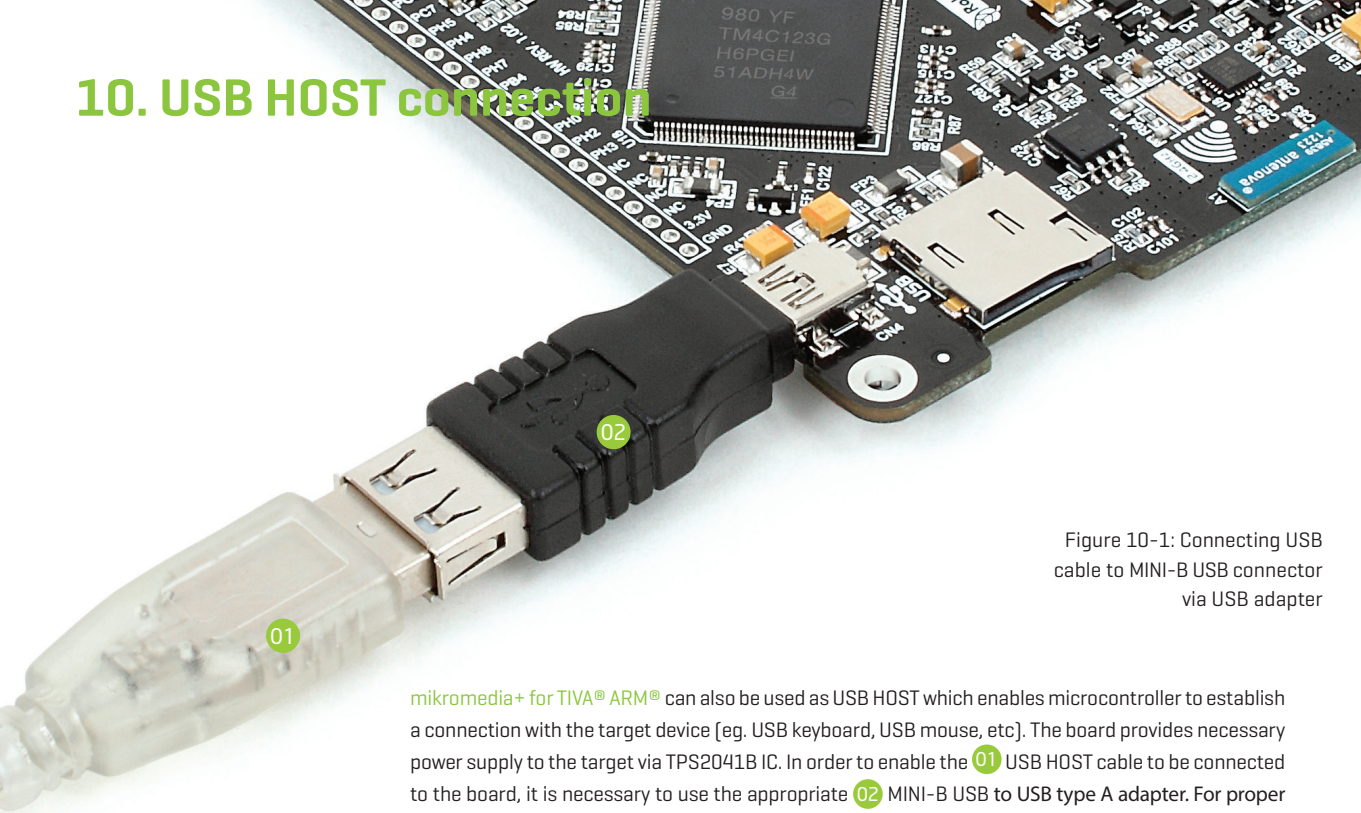


Figure 10-1: Connecting USB cable to MINI-B USB connector via USB adapter

mikromedia+ for TIVA® ARM® can also be used as USB HOST which enables microcontroller to establish a connection with the target device (eg. USB keyboard, USB mouse, etc). The board provides necessary power supply to the target via TPS2041B IC. In order to enable the 01 USB HOST cable to be connected to the board, it is necessary to use the appropriate 02 MINI-B USB to USB type A adapter. For proper

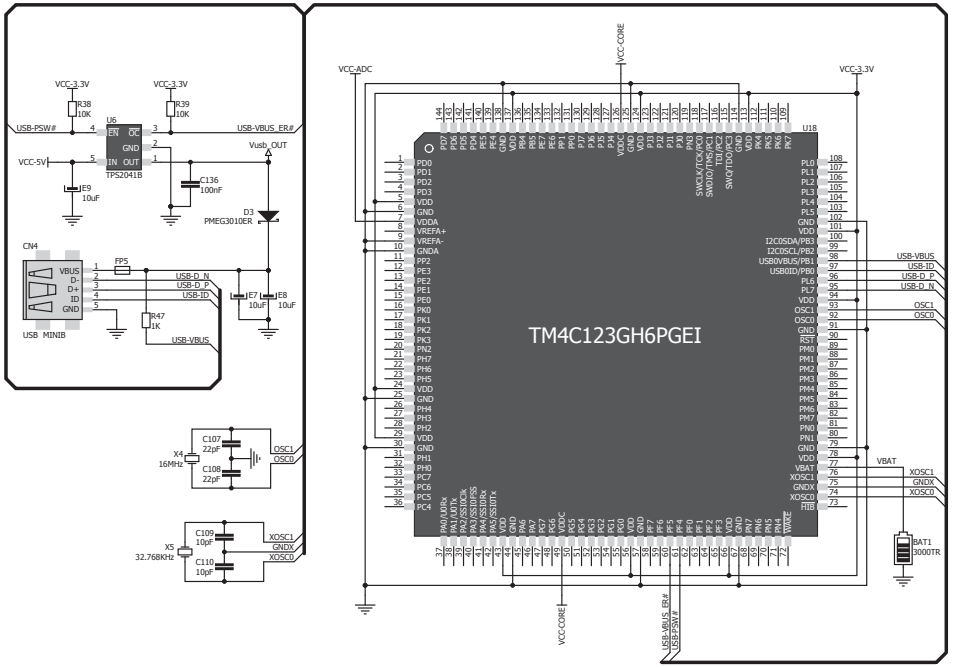


Figure 10-2: USB HOST module connection schematic

11. Accelerometer

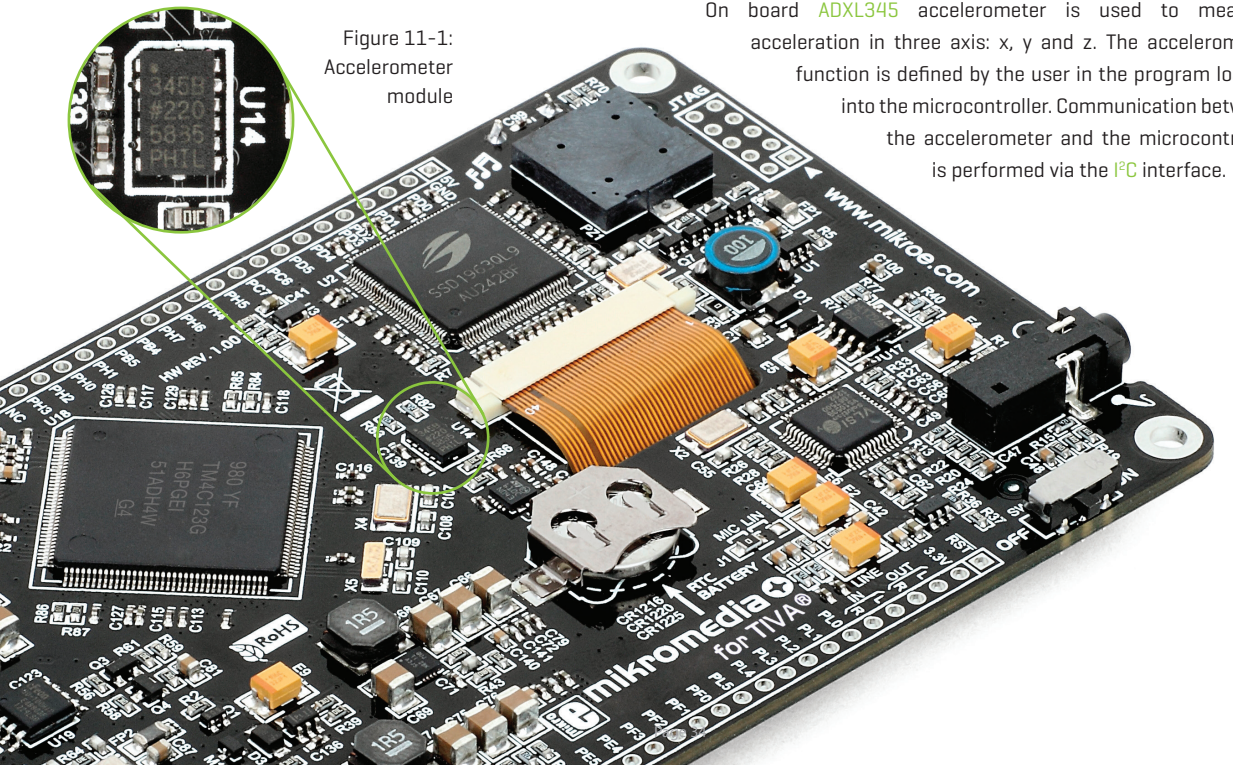


Figure 11-1: Accelerometer module

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.

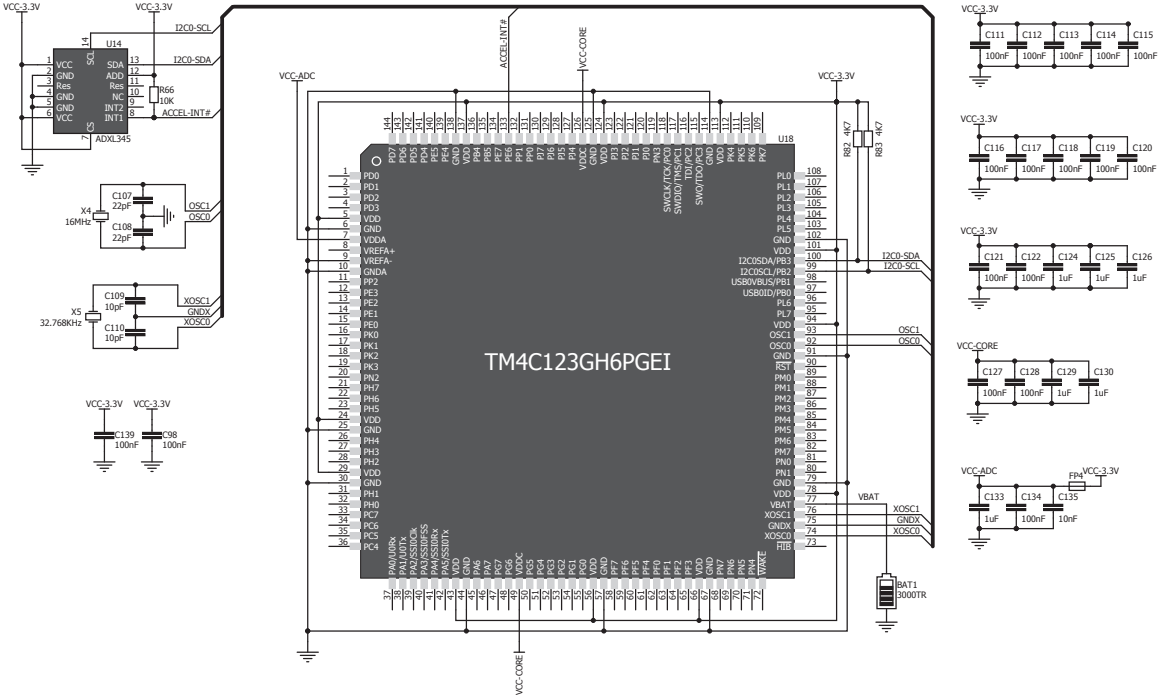


Figure 11-2: Accelerometer connection schematic

12. Flash Memory

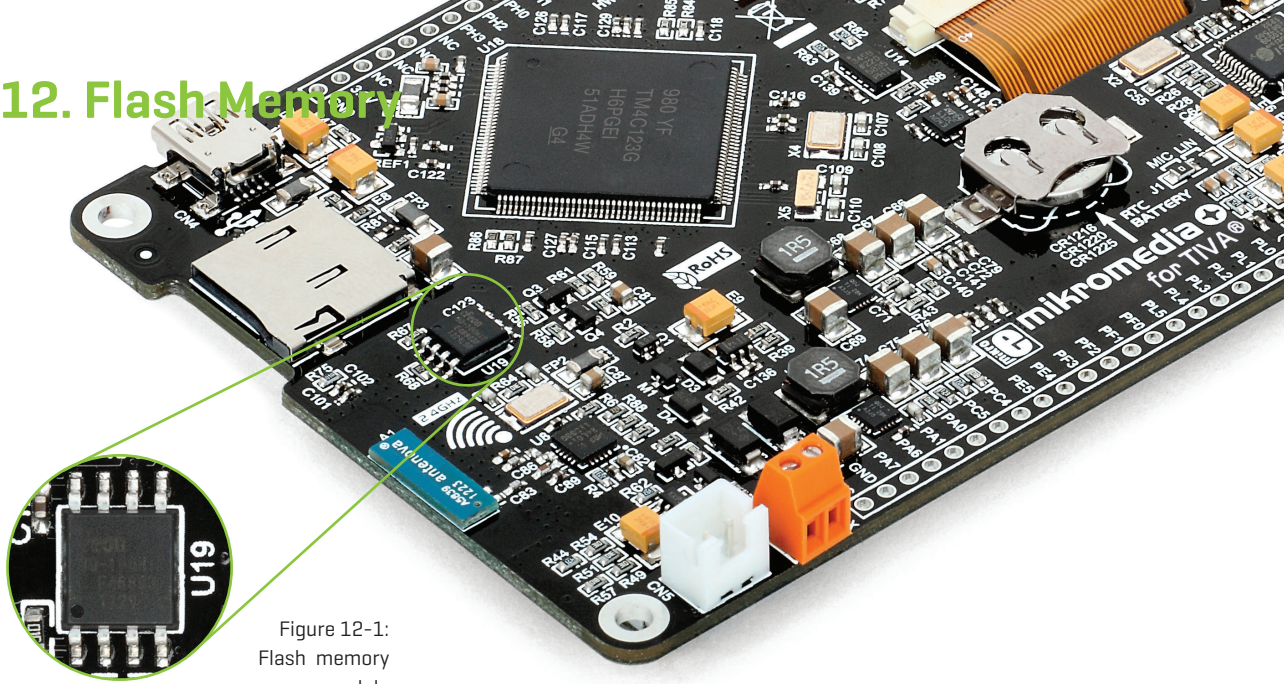


Figure 12-1: Flash memory module

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].

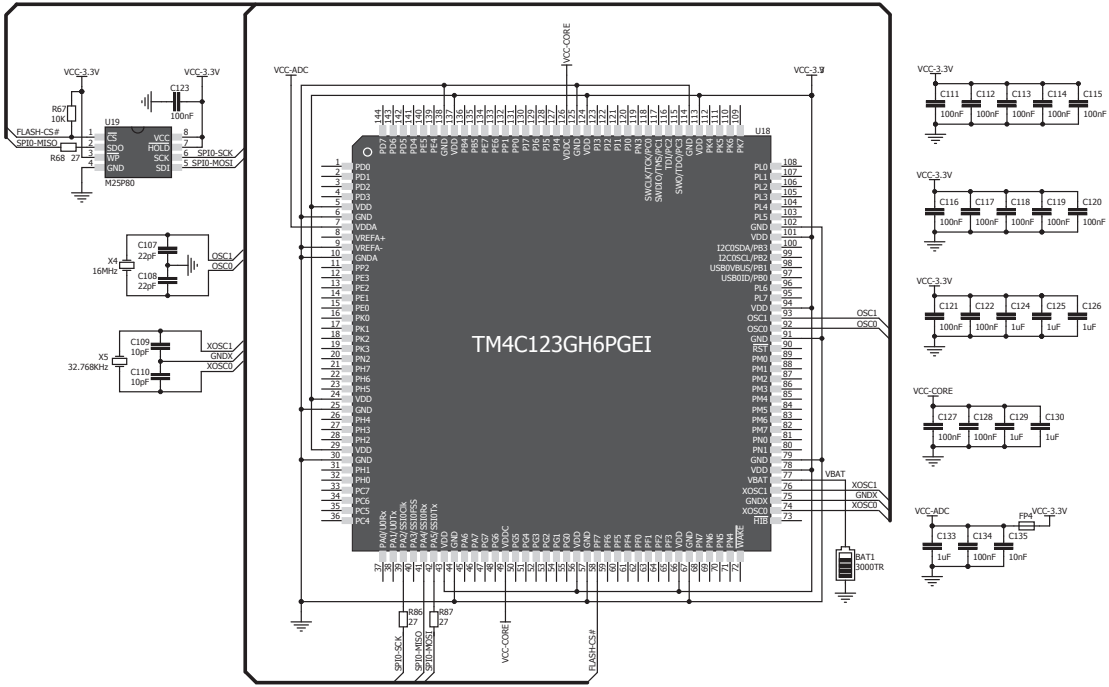


Figure 12-2: Flash memory module connection schematic

13. RF Transceiver

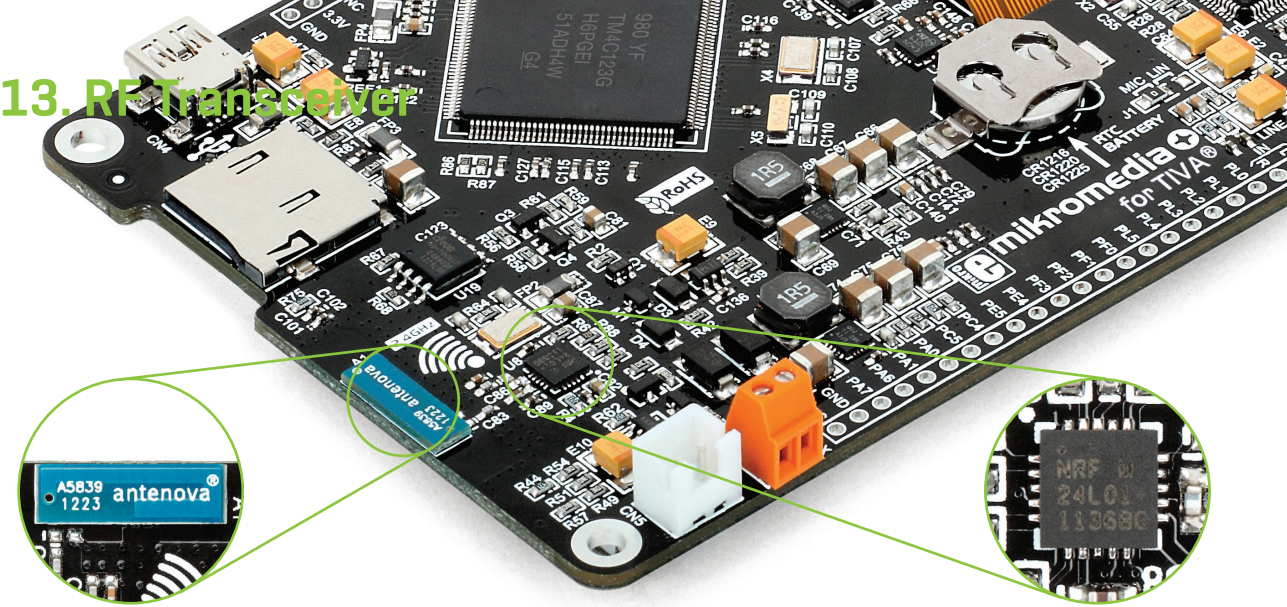


Figure 13-1:
RF transceiver antenna

Figure 13-2:
RF transceiver module

mikromedia+ for TIVA® ARM® board features RF transceiver chip with 2.4GHz chip antenna. It is suitable for wireless operation in the world wide ISM frequency band at 2.400 - 2.4835 GHz with air data rate up to 2Mbps. RF transceiver module is connected to the microcontroller via the Serial Peripheral Interface (SPI). This RF transceiver module is widely used for wireless PC peripherals, remote controllers, VoIP headsets, game controllers, sensors, home and commercial automation, active RFID, toys and many more.

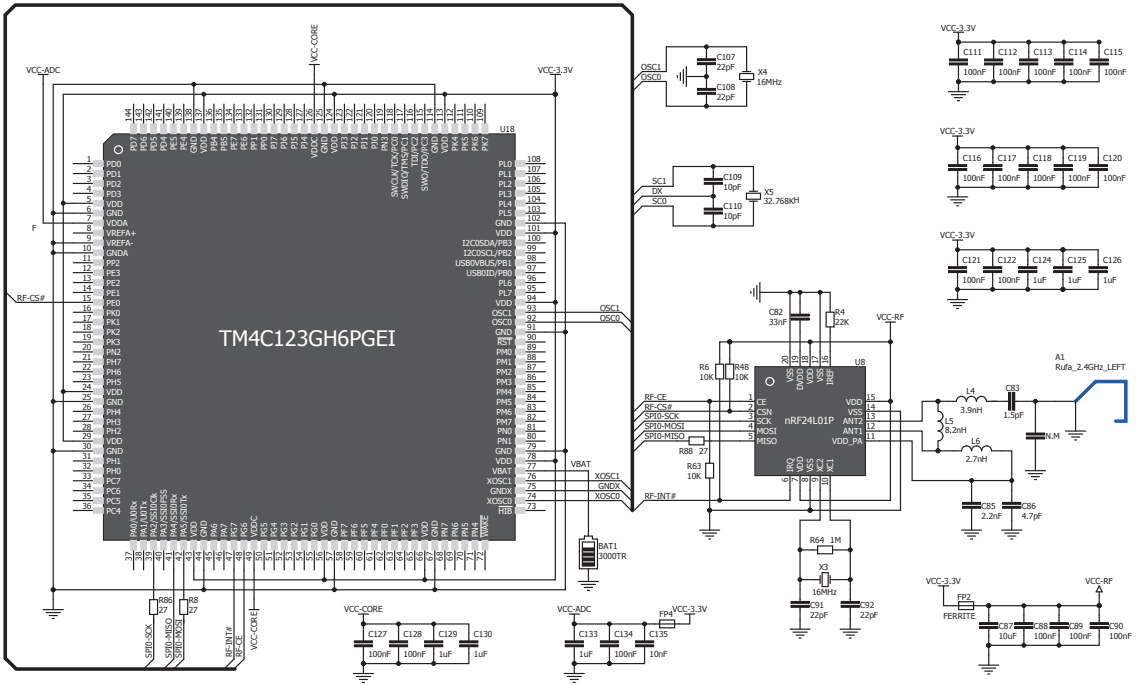


Figure 13-3: RF transceiver module schematic

14. Buzzer

The board is also equipped with piezo buzzer. It is an electric component which can be used to create sound waves when provided with electrical signal. Microcontroller can create sound by generating a PWM signal. Frequency of the signal determines the pitch of the sound and duty cycle of the signal can be used to increase or decrease the volume.

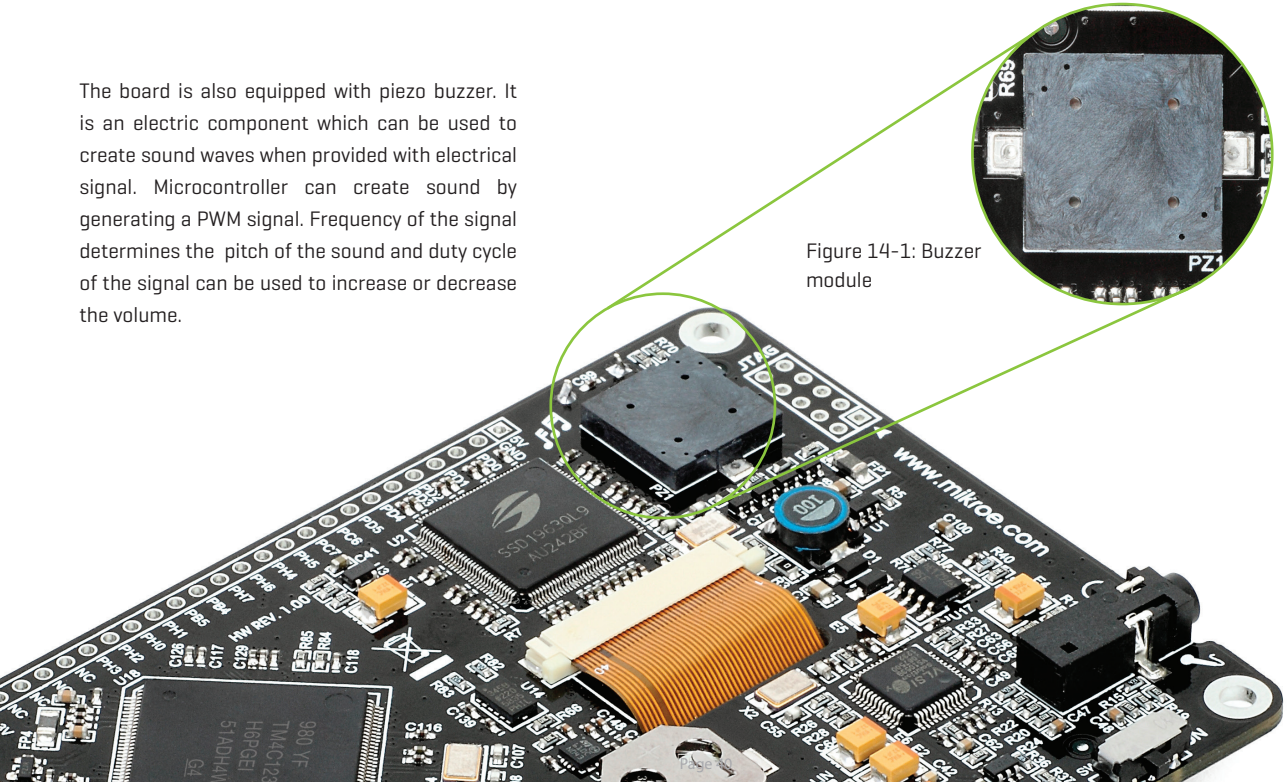


Figure 14-1: Buzzer module

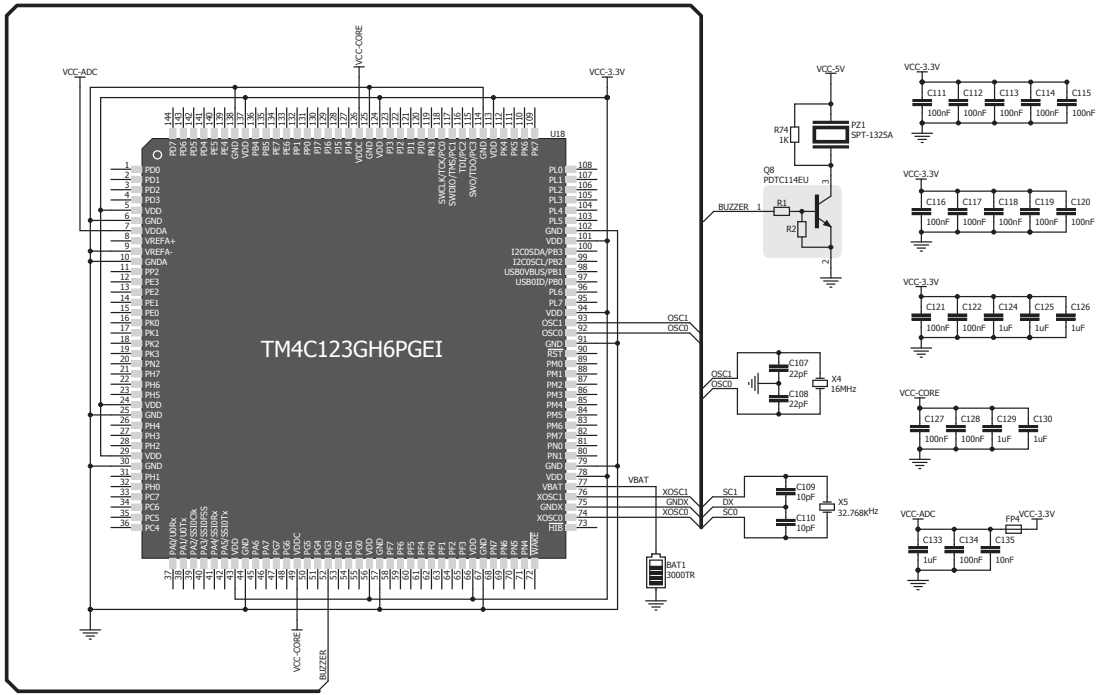
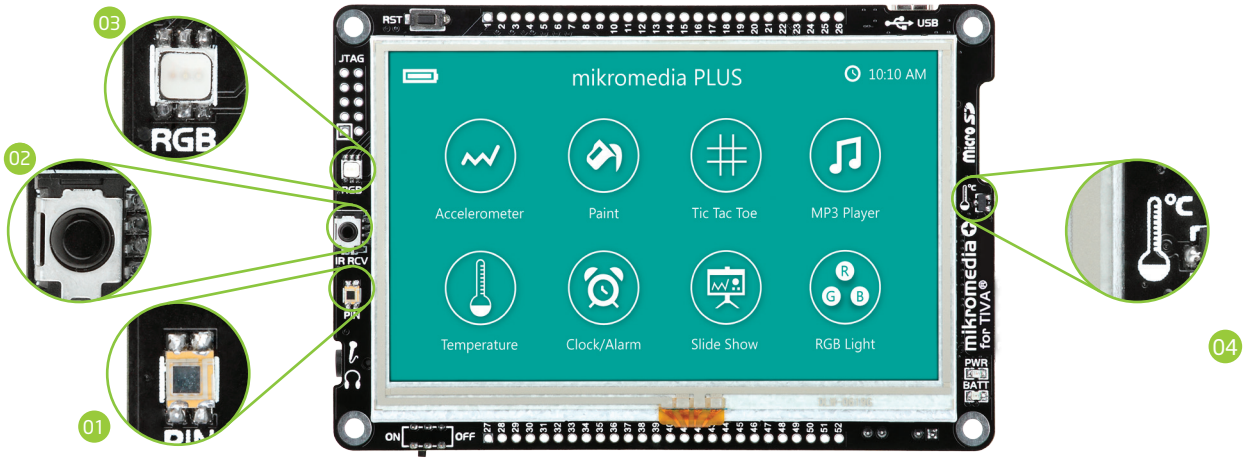


Figure 14-2: Buzzer module schematic

15. Other modules



The board also contains additional peripherals that can be very useful, such as 01 PIN photodiode, 02 IR receiver, 03 RGB led diode and 04 analog temperature sensor. PIN photodiode is a type of photo detector capable of converting light into the voltage with high sensitivity and speed of response. It is connected to the microcontroller analog pin. IR receiver is used for infrared remote control systems. The demodulated output signal obtained from IR module can be directly decoded by a microcontroller. Many of existing standard data formats are supported. RGB (Red, Green , Blue) diode is suitable for light indication in your design. Each of colour is driven separately by transistor. The analog temperature sensor converts temperature to analog voltage and it is directly connected to the microcontroller analog pin. Temperature measurement range of mikromedia+ for TIVA® ARM® board is from -20°C to 70°C.

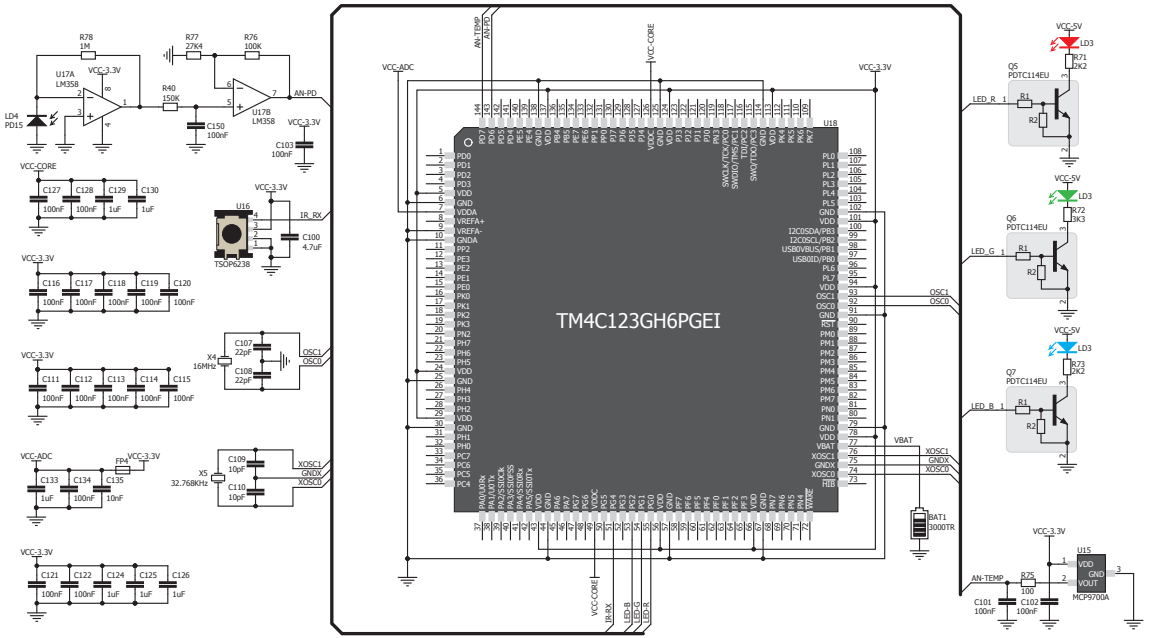
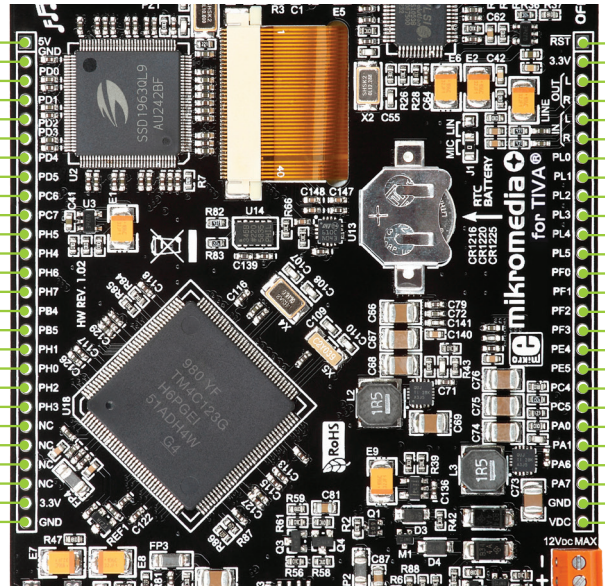


Figure 15-1: Other modules schematic

16. Pads

PWM Interrupt I2C UART Analog lines SPI CAN



Many microcontroller pins are available for further connectivity via two 1x26 rows of connection pads on both sides of the board.

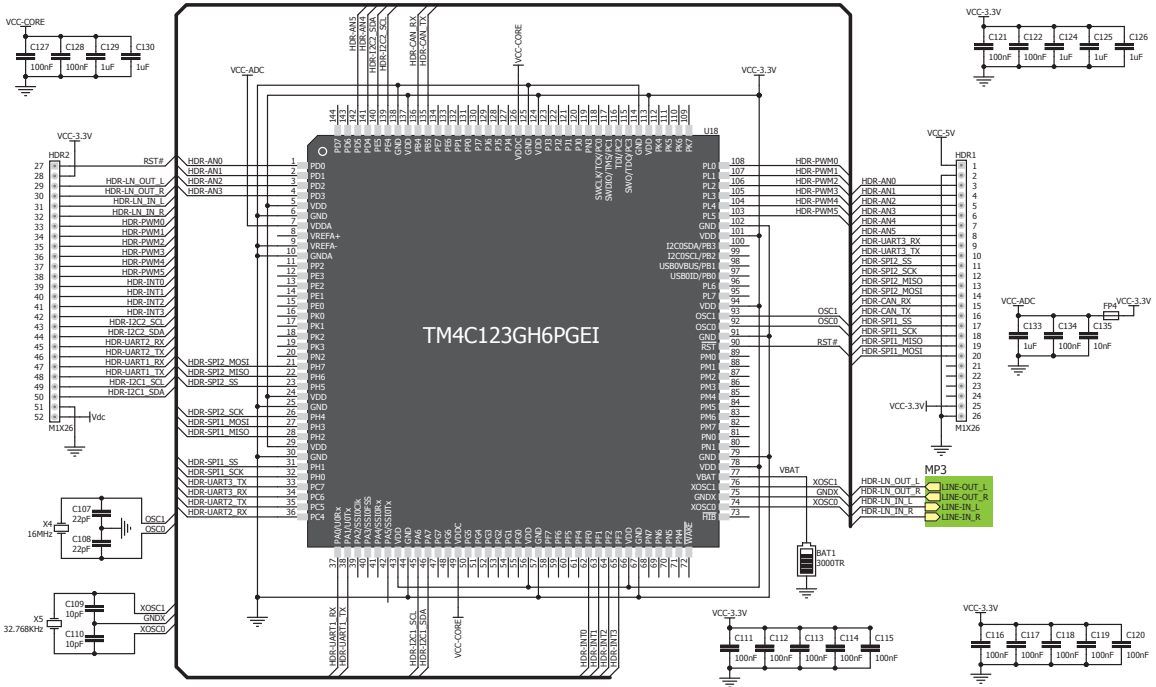


Figure 16-1: Connecting pads schematic

Important Safety Instructions and Legal Notes

DISCLAIMER

All the products owned by MikroElektronika are protected by copyright law and international copyright treaty. Therefore, this manual is to be treated as any other copyright material. No part of this manual, including product and software described herein, may be reproduced, stored in a retrieval system, translated or transmitted in any form or by any means, without the prior written permission of MikroElektronika. The manual PDF edition can be printed for private or local use, but not for distribution. Any modification of this manual is prohibited.

MikroElektronika provides this manual 'as is' without warranty of any kind, either expressed or implied, including, but not limited to, the implied warranties or conditions of merchantability or fitness for a particular purpose.

MikroElektronika shall assume no responsibility or liability for any errors, omissions and inaccuracies that may appear in this manual. In no event shall MikroElektronika, its directors, officers, employees or distributors be liable for any indirect, specific, incidental or consequential damages (including damages for loss of business profits and business information, business interruption or any other pecuniary loss) arising out of the use of this manual or product, even if MikroElektronika has been advised of the possibility of such damages. MikroElektronika reserves the right to change information contained in this manual at any time without prior notice, if necessary.

HIGH RISK ACTIVITIES

The products of MikroElektronika are not fault – tolerant nor designed, manufactured or intended for use or resale as on – line control equipment in hazardous environments requiring fail – safe performance, such as in the operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, direct life support machines or weapons systems in which the failure of Software could lead directly to death, personal injury or severe physical or environmental damage ('High Risk Activities'). MikroElektronika and its suppliers specifically disclaim any expressed or implied warranty of fitness for High Risk Activities.

TRADEMARKS

The MikroElektronika name and logo, the MikroElektronika logo, mikroC™, mikroBasic™, mikroPascal™, mikroProg™, mikroBUS™, Click Boards™, EasyMx PRO™ and mikromedia™ are trademarks of MikroElektronika. All other trademarks mentioned herein are property of their respective companies.
All other product and corporate names appearing in this manual may or may not be registered trademarks or copyrights of their respective companies, and are only used for identification or explanation and to the owners' benefit, with no intent to infringe.

If you want to learn more about our products, please visit our website at www.mikroe.com
If you are experiencing some problems with any of our products or just need additional information, please place your ticket at helpdesk.mikroe.com
If you have any questions, comments or business proposals, do not hesitate to contact us at office@mikroe.com

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Display Development Tools ***category:***

Click to view products by MikroElektronika ***manufacturer:***

Other Similar products are found below :

KIT 60121-3 S5U13U11P00C100 121CBL02-RPK KIT 60145-3 S5U13748P00C100 DFR0413 DLPLCR90EVM DLPLCR50XEVM MAX20069EVKIT# KIT95000-3 LCD-16396 PIM370 1109 MCIMX-LVDS1 MIKROE-2449 MIKROE-2453 131 DEV-13628 1590 MIKROE-2269 1601 1770 1947 1983 1987 2050 2218 2260 2345 2418 2423 2454 2455 2478 2674 SK-220RD-PI FIT0477 333 334 TE-M321-SDK DFR0428 cs-epapersk-03 338 DEV-14442 FIT0478 cs-paperino-01 OM-E-OLE ALTHSMCMIPILCD ASD2421-R TDP0500T800480PCAP