user's guide to

mikrome ia board for ATmega

Compact development system rich with on-board peripherals for all-round multimedia development on ATmega1280 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.

Nebojsa Matic General Manager

Table of Contents

Introduction to mikromedia for ATmega	4	Programing with exe
Package Contains	5	4. Reset buttons
Key Features	6	5. Crystal oscillator
System Specification	7	6. microSD Card Slot
1. Power supply	8	7. Touch Screen
2. ATmega1280 microcontroller	10	8. Audio Module
Key microcontroller features	10	9. USB UART commu
3. Programming the microcontroller	11	10. Accelerometer
Programming with mikroBootloader	12	11. Flash Memory
Identifying COM port	14	12. Pads
step 1 - Choosing COM port	14	13. Pinout
step 2 - Establishing connection	15	14. Dimensions
step 3 - Browse for .hex file	15	15. Mikromedia acces
step 4 - Select .hex file	16	What's next
step 4 - Uploading .hex file	16	
step 6 - Progress bar	17	
step 5 - Finish upload	17	

Programing with exernal programmer	1
4. Reset buttons	2
5. Crystal oscillator	2
5. microSD Card Slot	2
7. Touch Screen	2
3. Audio Module	2
9. USB UART communication	2
10. Accelerometer	3
11. Flash Memory	3
12. Pads	3
13. Pinout	3
14. Dimensions	3
15. Mikromedia accessories	3
√hat's next	3

Introduction to mikromedia for ATmega

The mikromedia for ATmega 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 the 8-bit ATmega1280 microcontroller. The mikromedia for ATmega features integrated modules such as stereo MP3 codec, TFT 320x240 touch screen display, accelerometer, USB connector, audio connector, MMC/SD card slot, 8 Mbit flash memory, 2x26 connection pads and other. It comes pre-programmed with USB-UART bootloader, but can also be programmed with external AVR | TAGICE mkll. Mikromedia is compact and slim, and perfectly fits in the palm of the hand, which makes it convenient platform for mobile devices.









Package Contains



Damage resistant protective box



mikromedia for ATmega development system



DVD with documentation and examples



mikromedia for ATmega user's guide



mikromedia for ATmega schematic

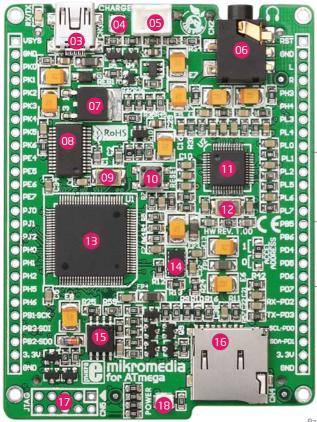


USB cable

Key Features

- Onnection Pads
- 02 TFT 320x240 display
- 03 USB MINI-B connector
- 04 CHARGE indication LED (RED)
- 05 Li-Polymer battery connector
- 06 3.5mm headphone connector
- 07 Power supply regulator
- 08 USB-UART IC
- 8MHz crystal oscillator
- RESET button
- VS1053 stereo audio codec
- 12.288MHz crystal oscillator
- Atmel AVR ATmega 1280 device
- Accelerometer
- 15 Serial 8Mbit Flash memory
- 16 microSD Card Slot
- 17 JTAG programmer connector
- 18 Power indication LED (GREEN)





System Specification



power supply

Over a USB cable (5V DC)



power consumption

68 mA with erased MCU

(when on-board modules are inactive)



board dimensions

8 x 6 cm (3.14 x 2.36 inch)



weight

~46 g (0.10 lbs)

1. Power supply Figure 1-1: Connecting USB power supply

1. USB power supply

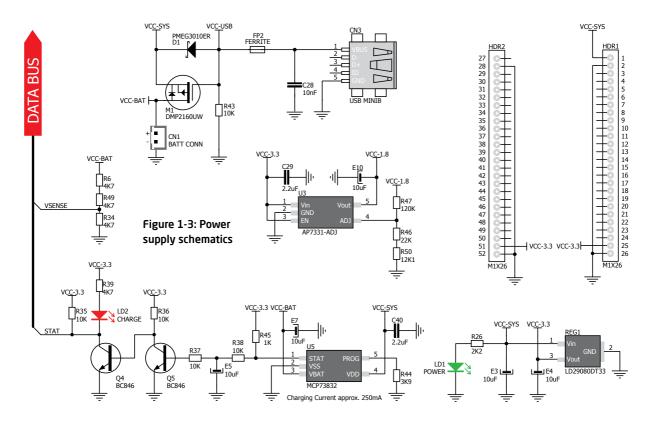
You can apply power supply to the board using MINI-B USB cable provided with the board. On-board voltage regulators will make sure that are available the appropriate voltage levels to each part of the board. Power LED (GREEN) will indicate the presence of power supply.

2. 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. **CHARGE LED (RED)** will indicate battery charging. Led is off when battery is full. Charging current is ~250mA and charging voltage is 4.2V DC.



Figure 1-2: Connecting Li-Polymer battery



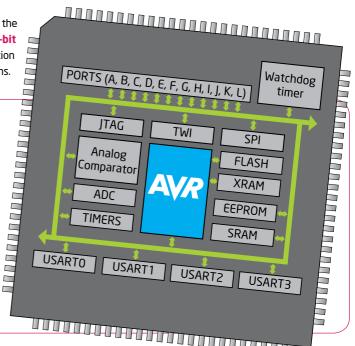
Page 9

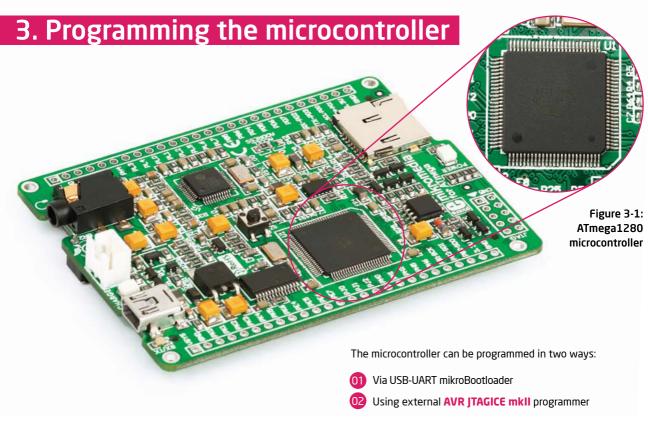
2. ATmega1280 microcontroller

The mikromedia for ATmega development board comes with the AVR ATmega1280 microcontroller. This high-performance 8-bit microcontroller with its integrated modules and in combination with other on-board modules is ideal for multimedia applications.

Key microcontroller features

- Up to 16 MIPS Operation;
- 8-bit architecture;
- 128KB of Flash memory;
- 8KB of SRAM memory;
- 4KB of EEPROM
- 86 I/O pins;
- UART, SPI, TWI;
- ADC, Analog Comparator;
- JTAG programming interface, etc.





Programming with mikroBootloader

You can program the microcontroller with UART bootloader which is preprogrammed into the device by default. To transfer .hex file from a PC to MCU vou need bootloader software (mikroBootloader) which can be downloaded from:



mikrobootloader atmega1280 v210.zip

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



mikroBootloader software



Figure 3-2: mikroBootloader window

When you start mikroBootloader software, a window shown on **Figure 3-2** should appear.



NOTE: Connect mikromedia for ATmega with a PC before starting mikroBootloader software

Identifying device COM port

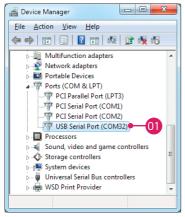


Figure 3-3: Identifying COM port

In Device Manager you can see which COM port is assigned to mikromedia (in this case COM32)

step 1 - Choosing COM port

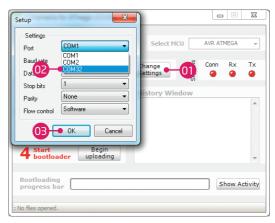


Figure 3-4: Selecting COM port

- 01 Click the Change Settings button
- O2 From drop down list **select COM port** which is used for communication with a PC (in this case COM32)
- OB Click OK button

step 2 - Establishing connection



Figure 3-5: Connecting mikromedia with mikroBootloader

01 Reset mikromedia board and within 5s click the Connect button. If connected, caption on a button will be changed to "Disconnect".

step 3 - Browse for .hex file



Figure 3-6: Browsing for .hex file

Olick the Browse for HEX button and from pop-up window (figure 3-5) select .hex file which will be uploaded to MCU memory

step 4 - Select .hex file

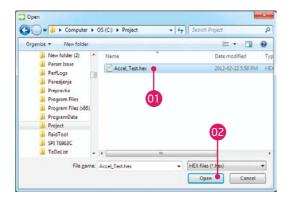


Figure 3-7: Selecting HEX

- Select a .hex file via open dialog window
- O2 Click the Open button

step 5 - Uploading .hex file



Figure 3-8: Begin uploading

To start .hex file uploading click the **Begin uploading** button

step 6 - Progress bar

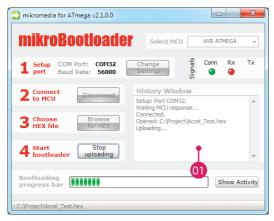


Figure 3-9: Progress bar

01) You can monitor .hex file uploading via progress bar

step 7 - Finish upload



Figure 3-10: Restarting MCU

O1) Click the OK button after uploading is finished.

Reset MCU and your mikromedia will start with new firmware.

Programing with external



NOTE: If bootloader program is accidently erased you can upload it again via AVR JTAGICE mkll programmer. Program mikroMedia for ATmega Bootloader Firmware.hex can be found under Firmware folder (page 12)

The microcontroller can be programmed with an external programmer (AVR JTAGICE mkll or other supported programer with JTAG interface). The external programmer is connected to the development system via pads marked with JTAG, Figure 3-11. In order to connect the external programmer to the development system, it is necessary to solder the 2x5 male headers provided with the product to ITAG pads



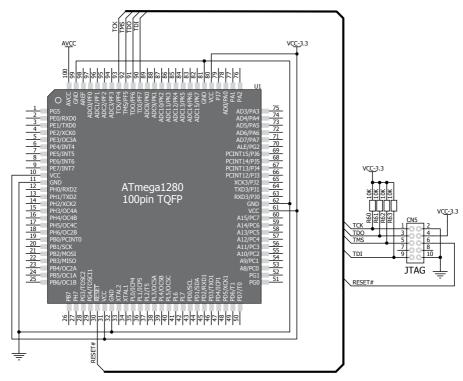


Figure 3-12: JTAG programmer connection schematics

4. Reset Buttons

Board is equipped with two reset buttons. First is located at the back side of the board (**Figure 4-1**), and second one is at the top of front side (**Figure 4-2**). If you want to reset the circuit, press either of two buttons. 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**).

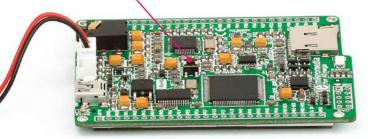
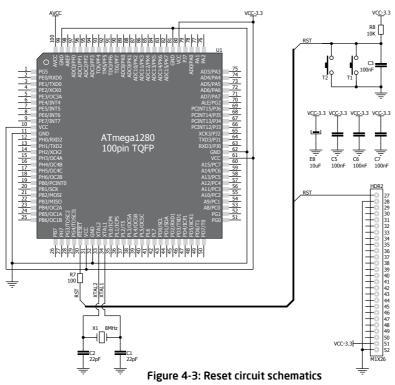


Figure 4-1: Reset button located at the backside of the board



Figure 4-2: Frontal reset button



Page 21

5. Crystal oscillator

ATmega1280 is equipped with internal 128kHz RC oscillator that can provide base frequency. Board also contains 8MHz crystal oscillator (X1), which is the most optimal because chip is powered by 3.3V supply. Since chip does not

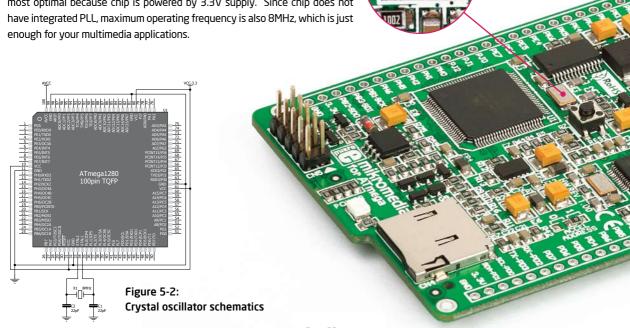


Figure 5-1:

oscillator

8MHz crystal

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.

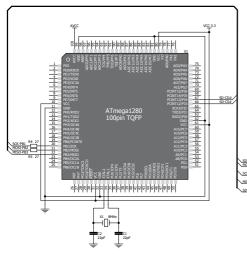
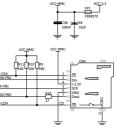
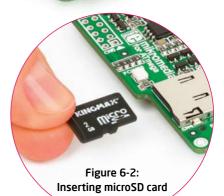
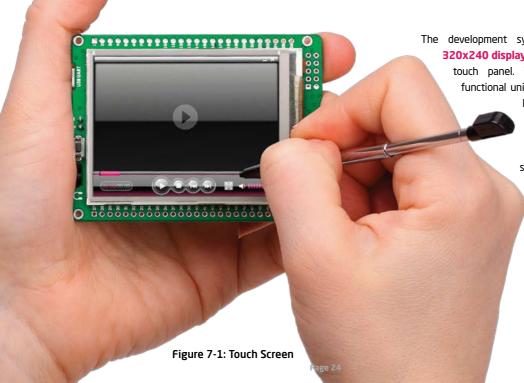


Figure 6-1: microSD card slot module connection schematics





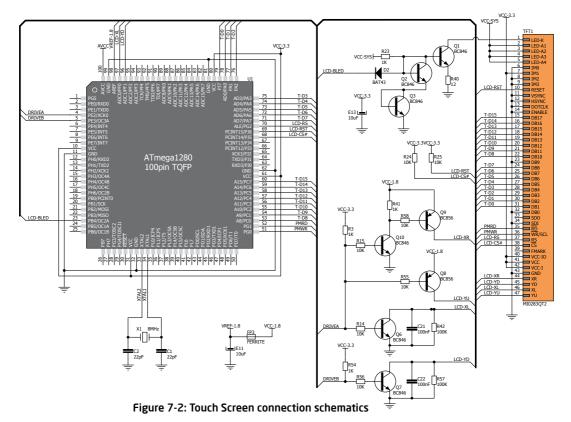
7. Touch Screen



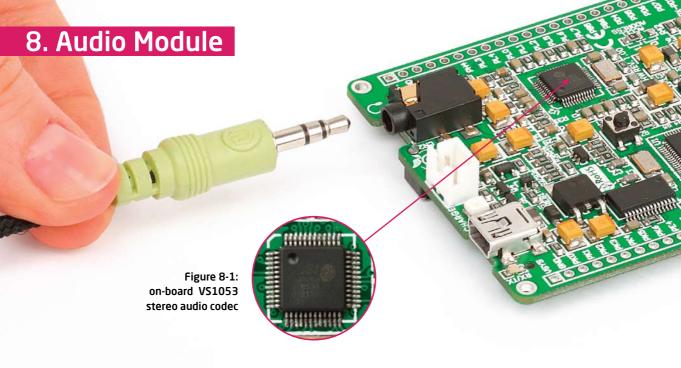
The development system features a **TFT 320x240 display** covered with a **resistive**touch panel. Together they form a

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 data in 262.144 different colors.



Page 25



mikromedia for ATmega 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 via Serial Peripheral Interface (**SPI**).

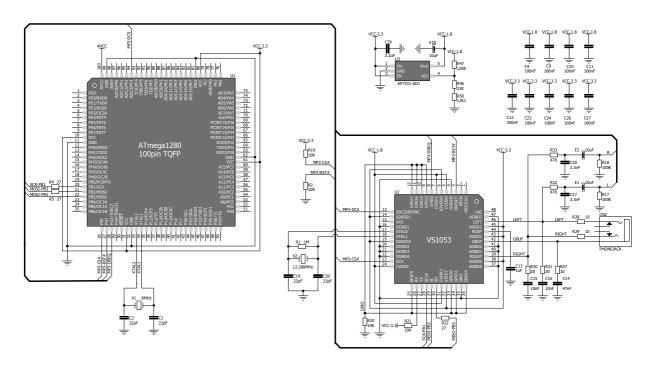
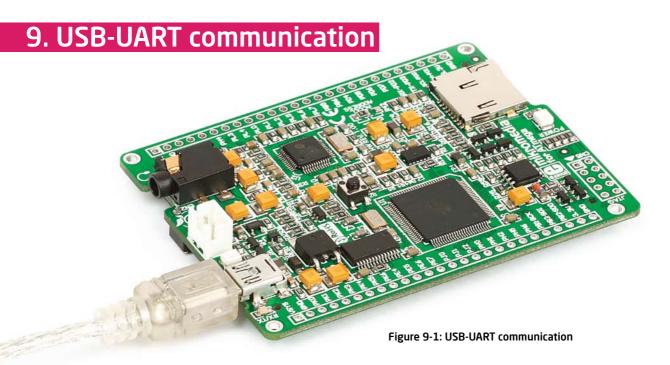


Figure 8-2: Audio module connection schematics



Mikromedia contains USB MINI-B connector which is positioned next to the battery connector. FT232RL USB-UART IC enables you to implement UART serial communication functionality via USB cable, since **ATmega1280** does not support USB protocol. Before connecting the board, make sure that you have FTDI drivers installed on your computer. Rx/Tx LED flashes when USB and controller communicate.

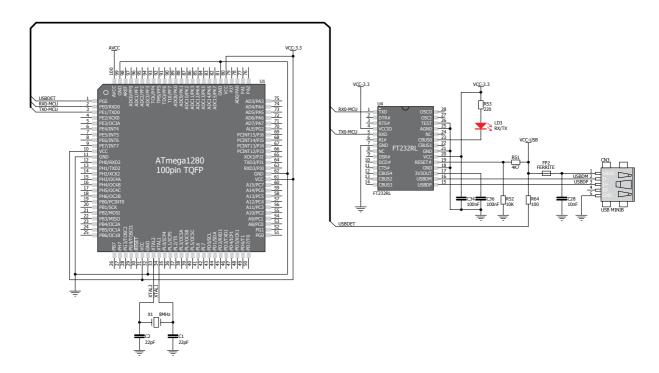


Figure 9-2: USB-UART connection schematics

10. Accelerometer

On board ADXL345 accelerometer, among other features, can be 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.

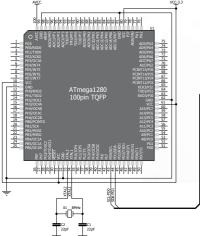


Figure 10-1:
Accelerometer
connection schematics

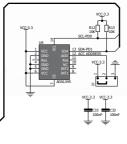


Figure 10-2: Accelerometer module



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

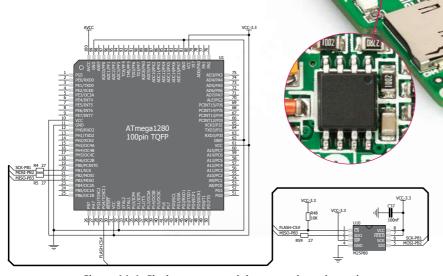


Figure 11-1: Flash memory module connection schematics

Figure 11-2: 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 ATmega1280 100pin TOFP Figure 12-1: Pads connecting Pads HDR2 schematics

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. Pads with underlined silkscreen markings have multiple functions (see the complete schematics for more information).



Pads HDR1

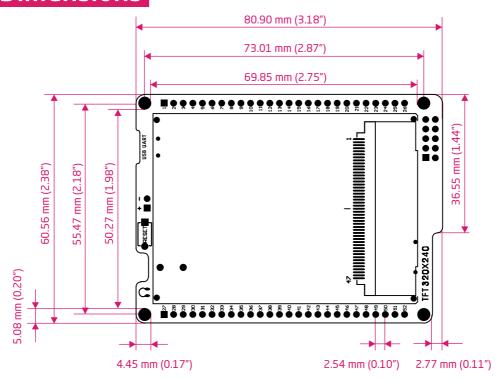
13. Pinout System power supply VSYS RST Reset pin Reference Ground **GND** GND Reference Ground PK₀ left ch. audio out PK1 PK2 PH₃ **Analog Lines** PK3 PH4 **PWM lines** PI 3 PK4 PK5 PK6 PE4 PE5 Interrupt Lines PE6 PE7 Digital I/O lines Digital I/O lines P07 PD₂ RX J UART Lines PD3 SPI Lines SCL2 I²C Lines PB2 3.3V power supply 3.3V 3.30 3.3V - 3.3V power supply Reference Ground **GND** BND (GND Reference Ground Pin functions Pin functions

Page 33

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

Digital lines

14. Dimensions



Page 34

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



PROTO shield



Gaming shield



05 Li-Polimer battery



06 Wire Jumpers



Stacking headers

What's next?

You have now completed the journey through each and every feature of mikromedia for ATmega 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 mikromediaTM 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 AVR® 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.

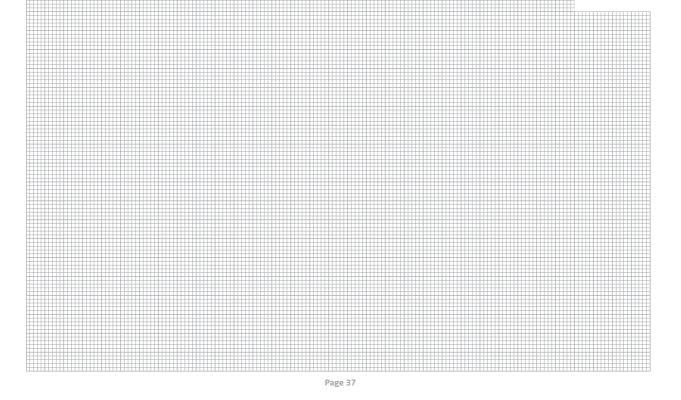


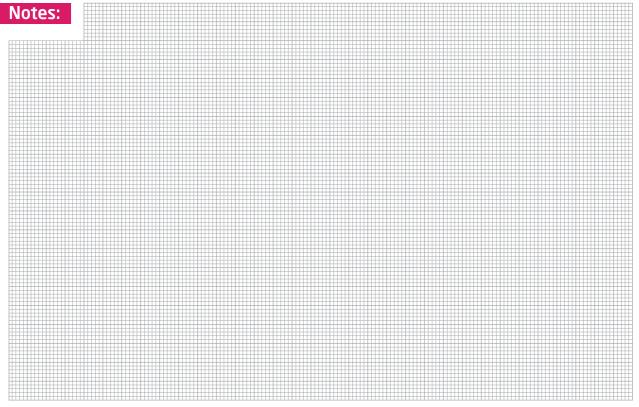


Projects

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.

V	0	te	s:





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, mikroCTM, mikroPascalTM, mikroPascalTM, mikroProgTM, EasyAVR6TM, BIGAVR6TM, AVRPLC16 v6TM and mikromediaTM 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.

Copyright © MikroElektronika, 2012, All Rights Reserved.



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 www.mikroe.com/esupport

If you have any questions, comments or business proposals,

do not hesitate to contact us at office@mikroe.com

