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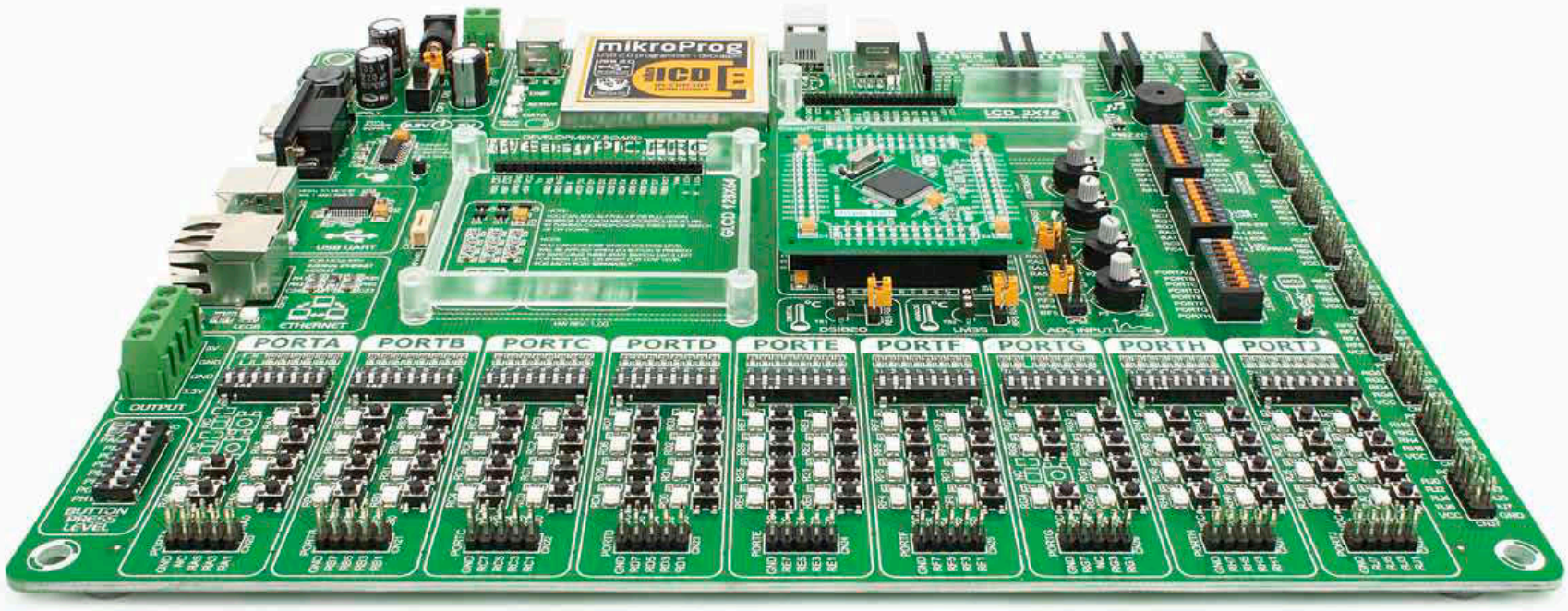
EasyPIC PRO v7

USER'S GUIDE



100

microcontrollers supported

The ultimate PIC® board

DUAL POWER SUPPLY 3.3V 5V

Supports 3.3V and 5V devices

Dual Power Supply

mikro BUS

Easily add extra boards

mikroBUS™ sockets

connectivity

Four connectors for each port

Amazing Connectivity

Fast USB 2.0 programmer and

In-Circuit Debugger

MikroElektronika
DEVELOPMENT TOOLS | COMPILERS | BOOKS

To our valued customers

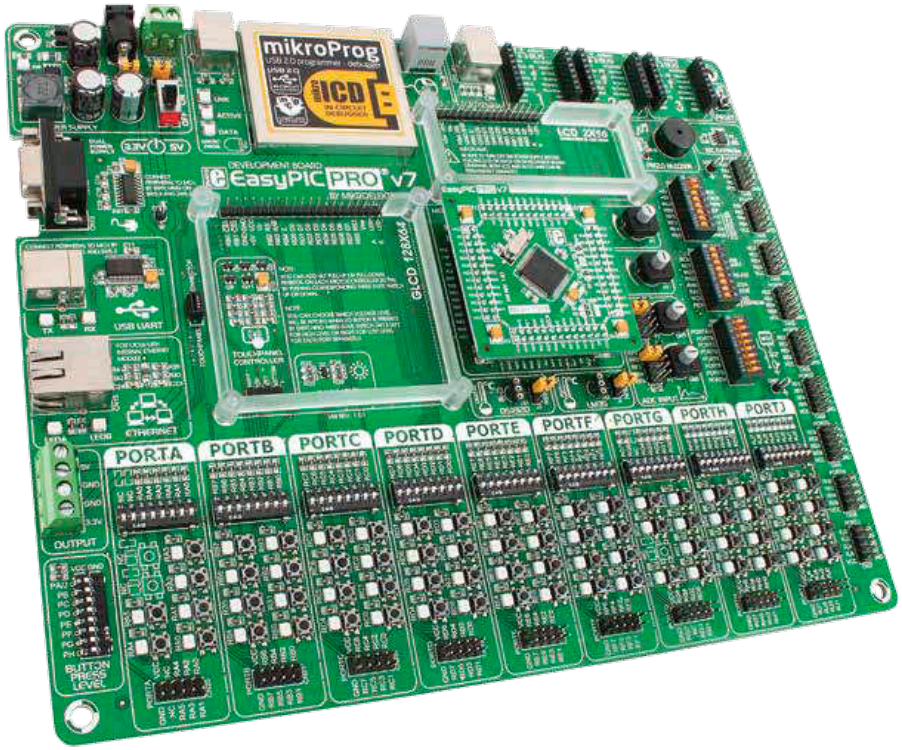
From the day one, we in MikroElektronika gave ourselves the highest possible goals in pursuit of excellence. That same day, the idea of EasyPIC™ development board was born. And we all grew together with EasyPIC™. In its each and tiniest piece we had put all of our energy, creativity and sense of what's best for an engineer. I've personally assembled hundreds of early EasyPIC™ boards myself with my home soldering iron.

EasyPIC PRO™ follows the same path. With the new 7th generation of high pin count PIC® boards it emerged as a unified and clear concept, supporting both 5V and 3.3V microcontrollers. Now we proudly say that it's one of a kind in the world - good looking, powerful and easy to use.

You made the right choice. But the fun has only just begun!

Nebojsa Matic,
Owner and General Manager
of MikroElektronika

Table of contents



Introduction

For the first time in history we have managed to combine all the features of BIGPIC6 and LV18F v6 boards, which supported high pin count PICs into the unique EasyPIC™ PRO v7. Supporting microcontrollers in both 5V and 3.3V power supply technology, this board is truly fantastic tool for development. We have put a lot of effort into board design, making it easy to use, and we have placed lots of modules that will help you in your work. Newly redesigned MCU sockets are here to stay. They are well organized and cover all high-pin-count PIC® microcontrollers in TQFP packaging. We carefully picked high-quality components and chose a 2.4mm PCB, which makes this board especially durable. We hope you will enjoy it as much as we do.

EasyPIC PRO™ v7 Development Team

Two Connectors for each port

Amazing connectivity

EasyPIC PRO™ v7 is all about connectivity. Having two different connectors for each port, you can connect accessory boards, sensors and your custom electronics easier then ever before.

Everything is already here

mikroProg™ on board

Powerful on-board mikroProg™ programmer and In-Circuit debugger can program and debug nearly 100 microcontrollers. You will need it, whether you are a professional or a beginner.

3.3V and 5V power supply

Multimedia peripherals

EasyPIC PRO™ v7 is among few development boards which support both 3.3V and 5V microcontrollers. This feature greatly increases the number of supported MCUs.It's like having two boards instead of one!

For easier connections

mikroBUS™ support

Just plug in your mikroBUS™ board, and it's ready to work. We picked up a set of the most useful pins you need for development and made a pinout standard you will enjoy using.

It's good to know

PIC18F87K22 is the default microcontoller!

PIC18F87K22 is the default chip of EasyPIC PRO™ v7. Featuring nanoWatt XLP™ technology, it has **16 MIPS** operation, **128K bytes** of linear program memory, **3896 bytes** of linear data memory, and support for a wide range of power supply from **1.8V to 5V**. It's loaded with great modules: 69 General purpose **I/O pins**, 24 Analog Input pins (**AD**), internal Real time clock and calendar (**RTCC**), support for Capacitive Touch Sensing using Charge Time Measurement Unit (**CTMU**), six **8-bit timers** and five **16-bit timers**. It also has ten **CCP** modules, three **Comparators** and two **MSSP** modules which can be either **SPI** or **I²C**.

- *Great choice for both beginners and professionals*
- *Rich with modules*
- *Comes with examples for mikroC, mikroBasic and mikroPascal compilers*

System Specification

power supply
7-23V AC or 9-32V DC
or via USB cable (5V DC)

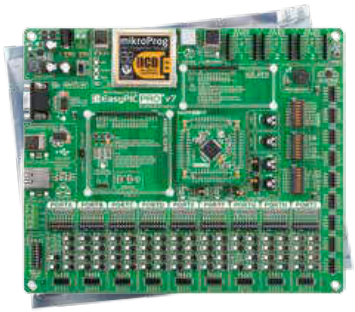
power consumption
~90mA at 5V when all peripheral modules are disconnected

board dimensions
266 x 220mm (10.47 x 8.66 inch)

weight
475g (1.0472 lbs)

Package contains

1 Damage resistant protective box

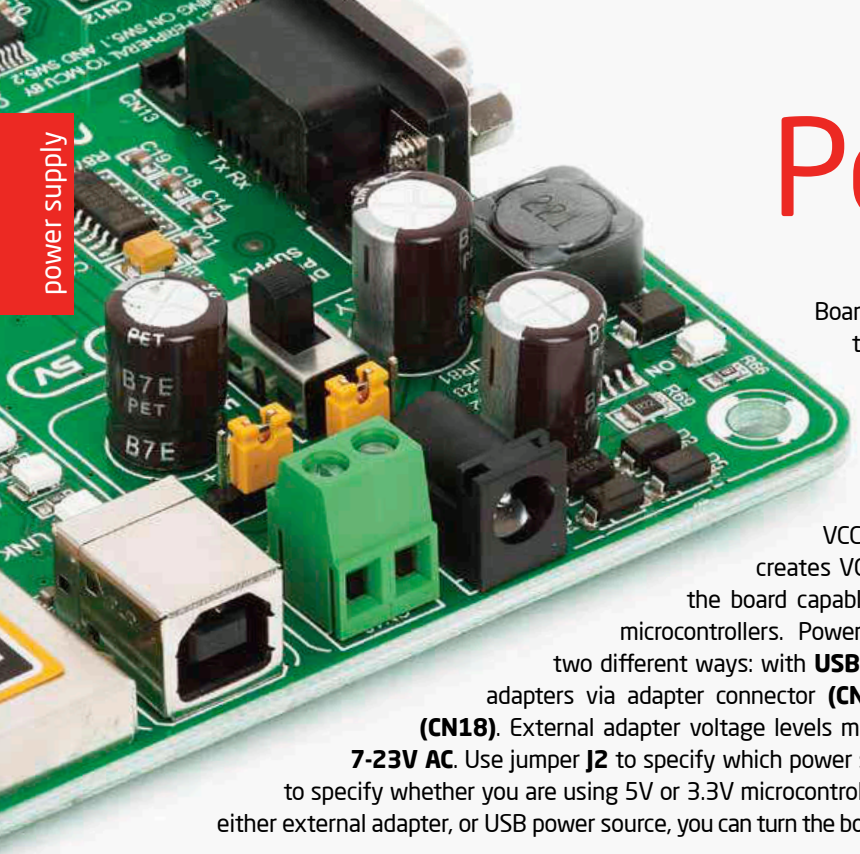


2 EasyPIC PRO™ v7 board in antistatic bag

3 USB cable

4 User Manuals and Board schematics

Power supply



Board contains switching power supply that creates stable voltage and current levels necessary for powering each part of the board. Power supply section contains two power regulators: **MC34063A**, which generates VCC-5V, and **MC33269DT3.3** which creates VCC-3.3V power supply, thus making the board capable of supporting both 5V and 3.3V microcontrollers. Power supply unit can be powered in two different ways: with **USB power supply**, and using external adapters via adapter connector **(CN19)** or additional screw terminals **(CN18)**. External adapter voltage levels must be in range of **9-32V DC and 7-23V AC**. Use jumper **J2** to specify which power source you are using, and jumper **J1** to specify whether you are using 5V or 3.3V microcontroller. Upon providing the power using either external adapter, or USB power source, you can turn the board on using **SWITCH 1 (Figure 3-1)**.

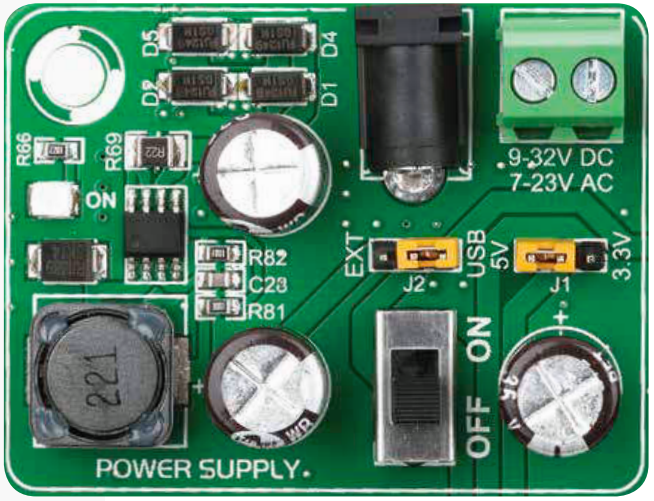


Figure 3-1: Dual power supply unit of EasyPIC PRO™ v7

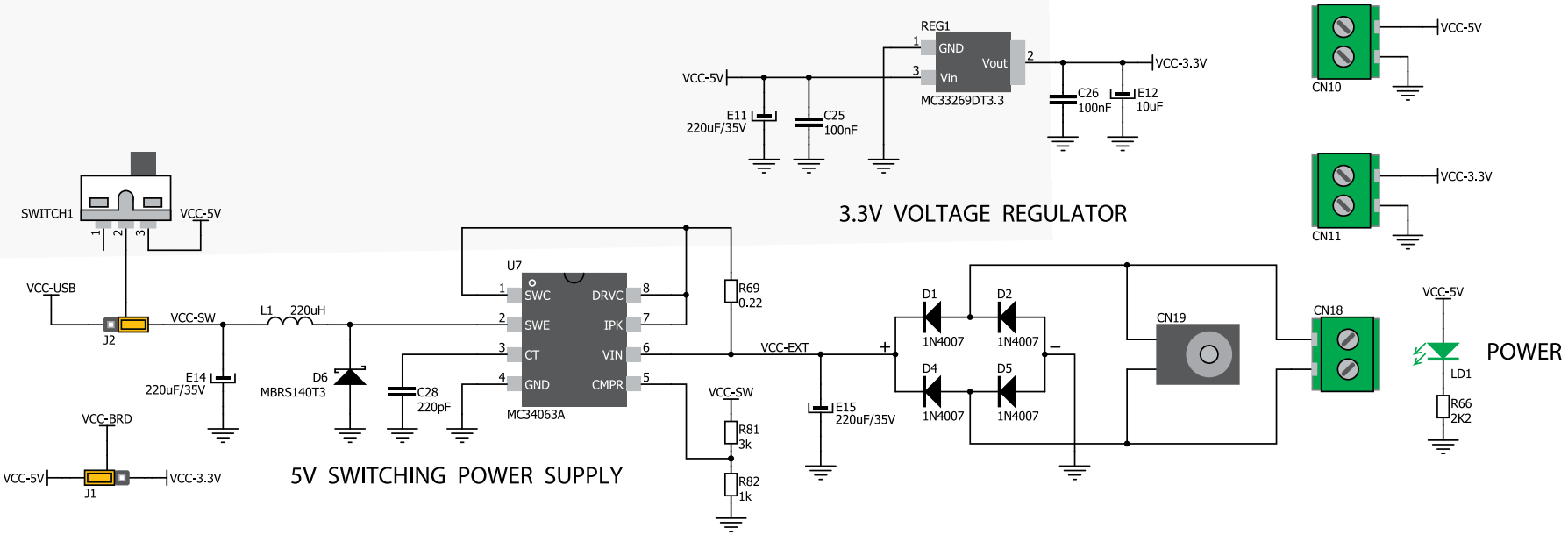


Figure 3-2: Dual power supply unit schematics

DUAL POWER SUPPLY

3.3V 5V

Smart engineering of EasyPIC PRO™ v7 development board allowed us to support both 3.3V and 5V microcontrollers on a single board, which is almost 100 high pin count PIC® devices.

Power supply: via DC connector or screw terminals (7V to 23V AC or 9V to 32V DC), or via USB cable (5V DC)

Power consumption: up to 600mA (depending on how many on-board modules are currently active)

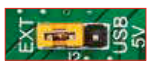
How to power the board?

1. With USB cable

Set J2 jumper to USB position

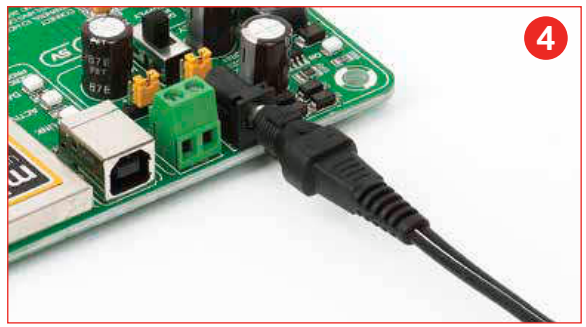
To power the board with USB cable, place jumper **J2** in USB position, and place jumper **J1** in 5V or 3.3V position, depending on which microcontroller you are using. You can then plug in the USB cable as shown on images 1 and 2, and turn the power switch ON.

2. Using adapter



Set J2 jumper to EXT position

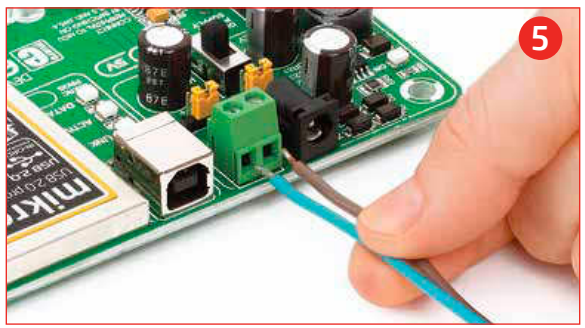
To power the board via adapter connector, place jumper **J2** in EXT position, and place jumper **J1** in 5V or 3.3V position, depending on which microcontroller you are using. You can then plug in the adapter cable as shown on images 3 and 4, and turn the power switch ON.

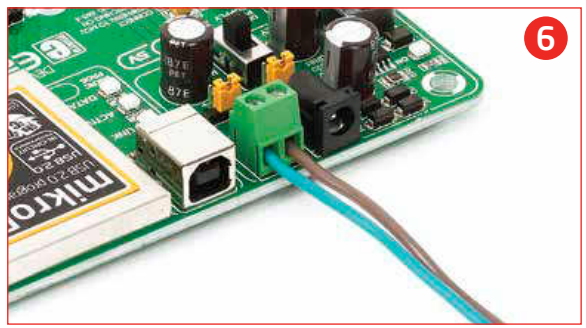


3. With laboratory power supply

Set J2 jumper to EXT position

To power the board using screw terminals, place jumper **J2** in EXT position, and place jumper **J1** in 5V or 3.3V position, depending on which microcontroller you are using. You can then plug in the adapter cable as shown on images 5 and 6, and turn the power switch ON.





Default MCU card

Microcontrollers are supported using specialized MCU cards containing 104 pins, which are placed into the on-board female MCU socket. Currently, there are three types of cards: **Standard 80-pin TQFP**, **Ethernet 80-pin TQFP card** and **Ethernet 100-pin TQFP PF card**. Standard card supports 80-pin PIC18Fxxxx, PIC18FxxJxx and PIC18FxxKxx microcontrollers, with or without USB support. It contains several SMD jumpers, which are supposed to be placed or removed, depending on the microcontroller.

Default MCU card that comes with the EasyPIC PRO™ v7 package is shown on **Figure 4-1**. It contains **PIC18F87K22** microcontroller which is loaded with on-chip modules and is a great choice for both beginners and professionals. After testing and building the final program, this card can also be taken out of the board socket and used in your final device.

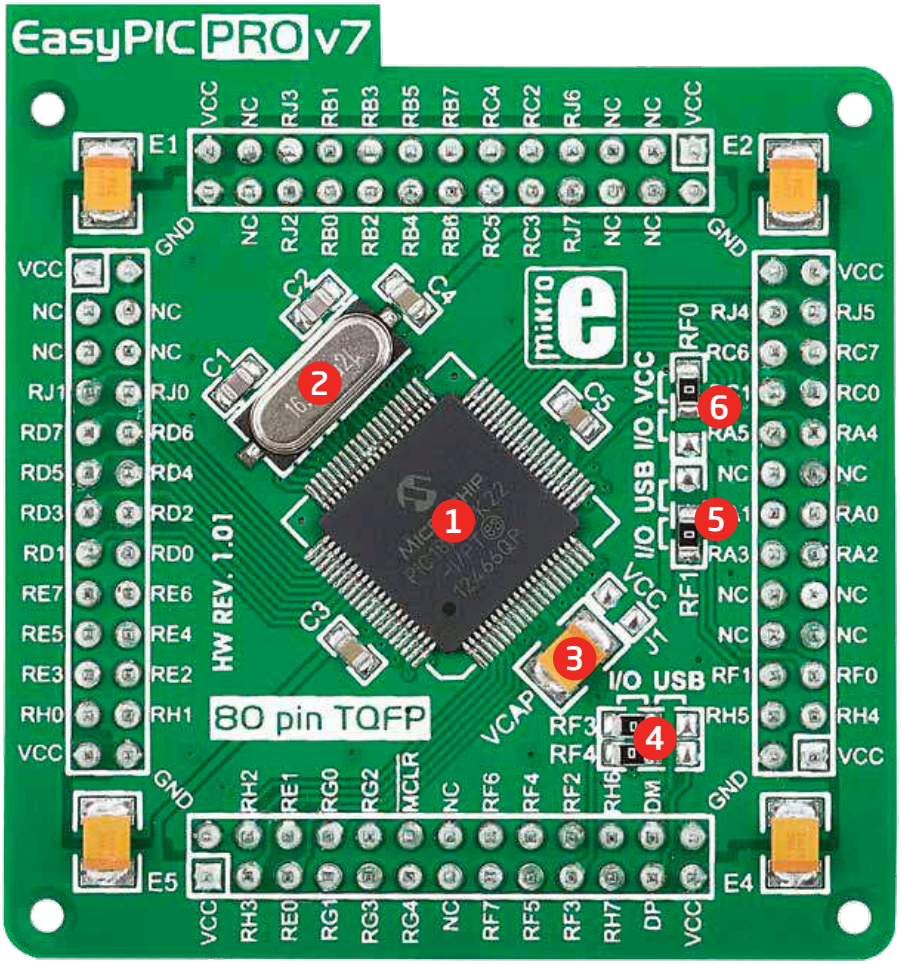


Figure 4-1: Default MCU card with PIC18F87K22

1. **PIC18F87K22 microcontroller.** Featuring nanoWatt XLP™ technology, it has 16 MIPS operation, 128K bytes of linear program memory, 3896 bytes of linear data memory, and support for a wide range of power supply from 1.8V to 5V.

2. **16MHz crystal oscillator.** We carefully chose the most convenient crystal value that provides clock frequency which can be used directly, or with the PLL multipliers and dividers to create higher MCU clock value.

3. **VCAP jumper.** Some PIC18FK and all PIC18FJ microcontrollers have cores that work on 1.8V-2.5V voltage range, and peripherals that work with 3.3V and 5V voltages. Internally, those microcontrollers have power regulators which adjust the core voltage levels. In order for those devices to have a stable operation of the core, manufacturer recommends that decoupling capacitive filters should be provided, and connected between specific microcontroller pins designated with VCAP and GND. This MCU card provides a VCAP jumper which is used for this purpose. **Jumper is removed by default.**

4. **USB communication lines.** These two jumpers, when in USB position, connect **D+** and **D-** lines of the on-board USB connector with **RF3** and **RF4** microcontroller pins. Since PIC18F87K22 doesn't support USB, **jumpers are in I/O position**.

5. **V_{USB} line jumper**. For PIC18F8xJ5x devices, this jumper should be connected to VCC for enabling internal USB controller. Since PIC18F87K22 doesn't support USB, **this jumper is in I/O position**.

6. **ENVREG selection jumper.** PIC18FJ and PIC18FK microcontrollers are using internal voltage regulator which is enabled by placing this jumper in **VCC position**.

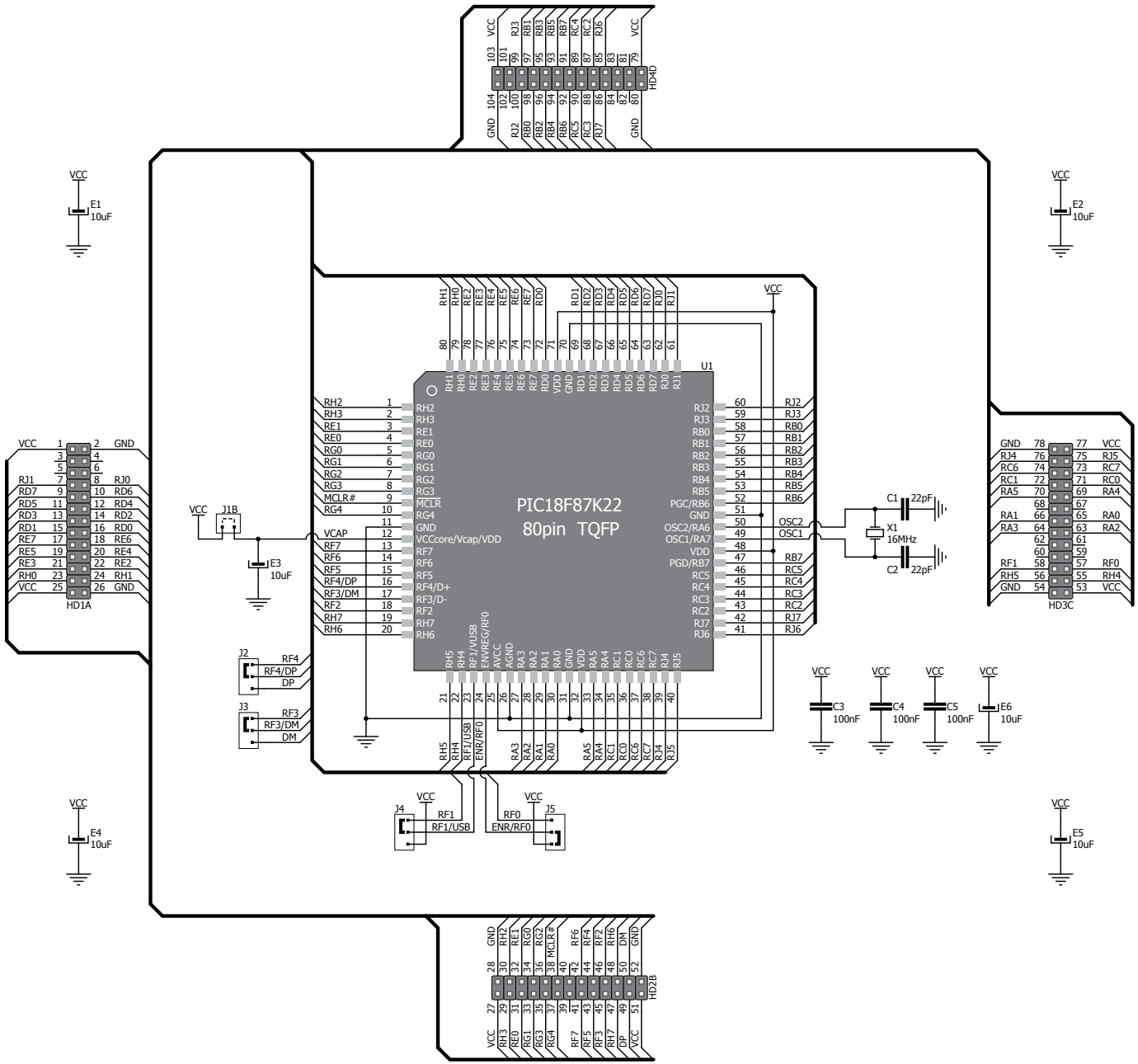
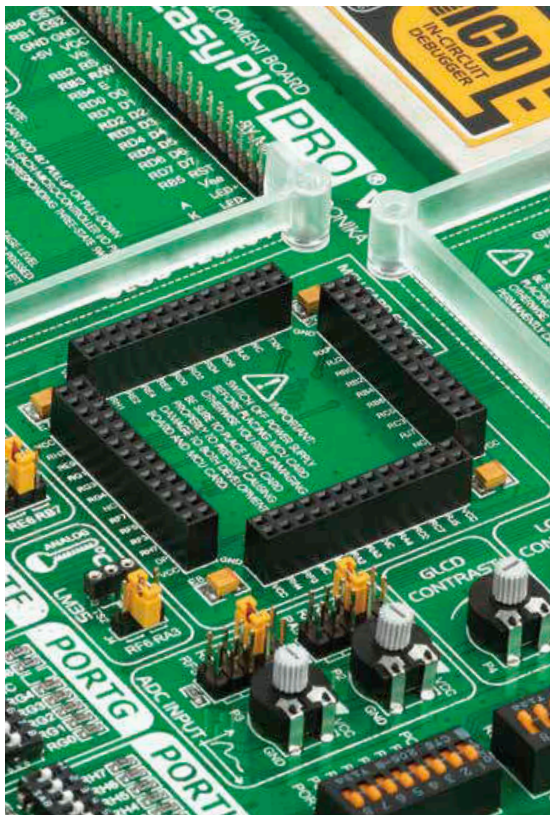


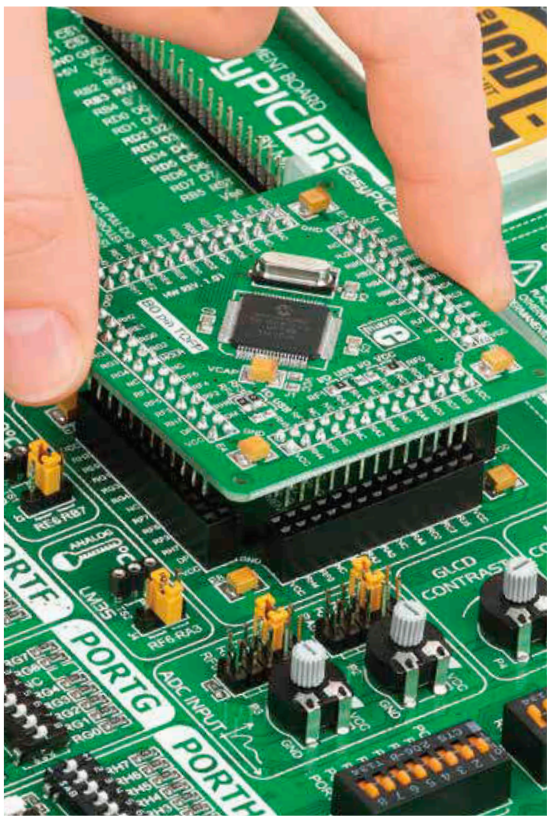
Figure 4-2: Default MCU card schematics

How to properly place your MCU card into the socket?

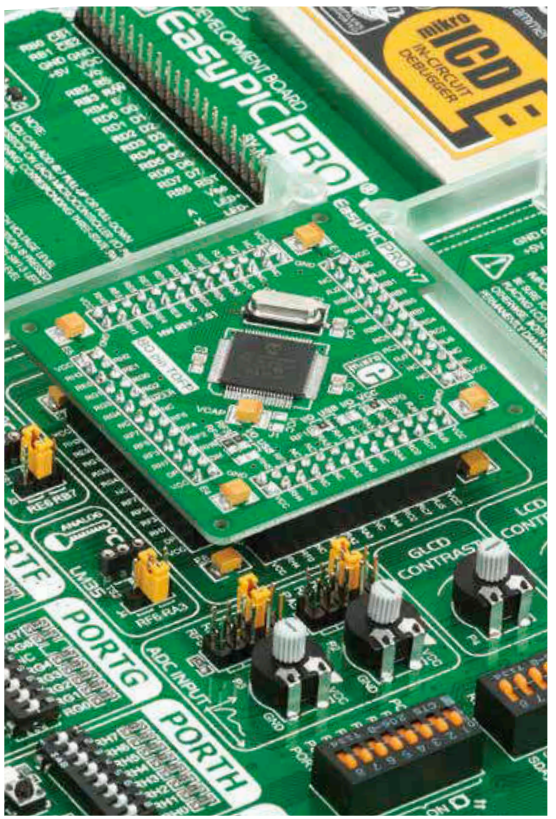
Before you plug the microcontroller card into the socket, make sure that the **power supply is turned off.** Images below show how to correctly plug the card. First make sure that MCU card orientation matches the silkscreen outline on the EasyPIC PRO™ v7 board MCU socket. Place the MCU card over the socket, so each male header encloses the right angle with the female socket, as shown in **Figure 4-2**. Then put the MCU card slowly down until all the pins match the socket. Check again if everything is placed correctly and press the MCU card until it is completely plugged into the socket as shown in **Figure 4-3**. If done correctly, all pins should be fully inserted. Only now you can turn on the power supply.



1 **Figure 4-2: On-board MCU socket has silksreen markings which will help you to correctly orient the MCU card before inserting.**

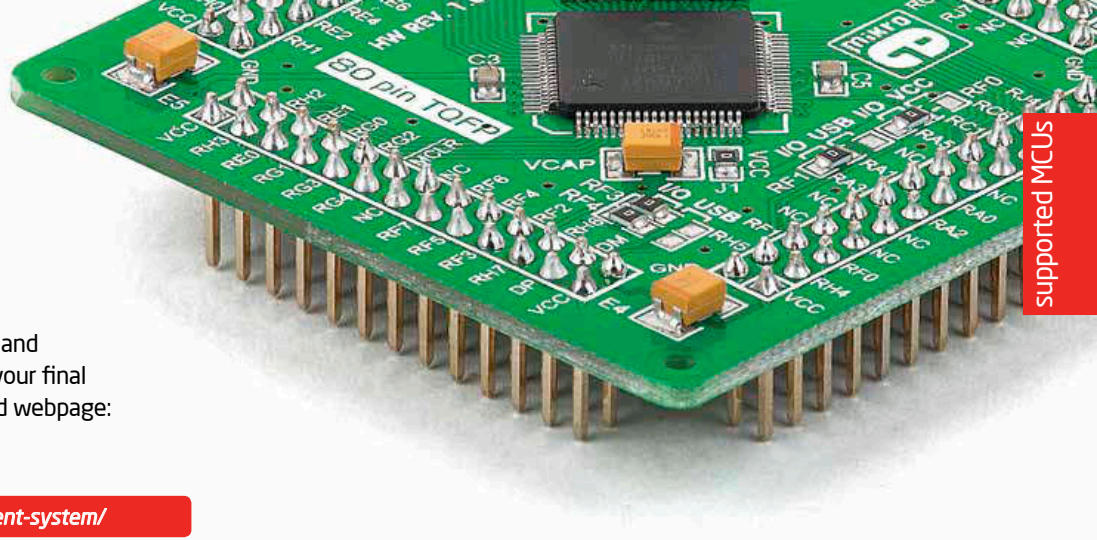


2 **Figure 4-3: Place the MCU card on the socket so the pins are aligned correctly.**



3 **Figure 4-4 Properly placed MCU card will have equally leveled pins.**

Other supported MCU cards



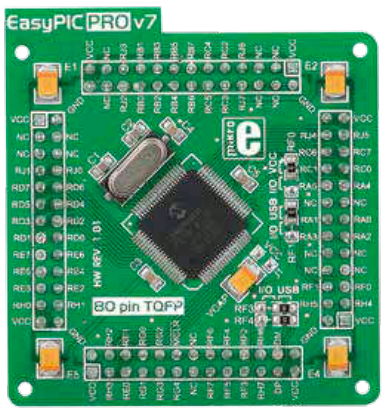
MikroElektronika currently offers total of five populated MCU cards with different microcontrollers. You can also purchase empty PCB cards that you can populate on your own and solder any supported microcontroller you need in your development. This way your EasyPIC PRO™ v7 board becomes truly flexible and reliable tool for almost any of your PIC® projects. MCU cards can also be used in your final devices. For complete list of currently available MCU cards, please visit the board webpage:

http://www.mikroe.com/eng/products/view/815/easypic-pro-v7-development-system/

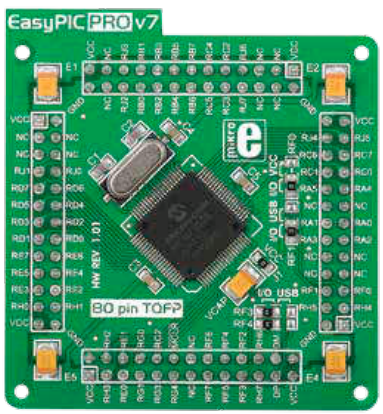
List of other available populated MCU cards

Besides default MCU card that comes with EasyPIC PRO™ v7, MikroElektronika offers three other **standard 80-pin TQFP cards** with **PIC18F87J50**, **PIC18F8520** and **PIC18F8722** microcontrollers. Additional **80-pin TQFP Ethernet card** with **PIC18F87J60** enables you to utilize the ethernet connector and build ethernet applications easily.

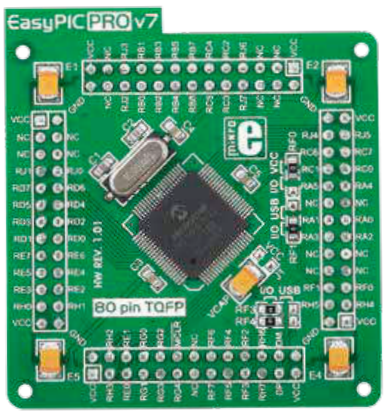
with Ethernet! support



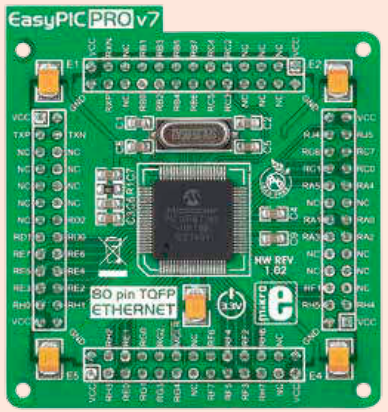
1 **Figure 4-5: Standard 80-pin MCU card with PIC18F87J50, which supports USB.**



2 **Figure 4-6: Standard 80-pin MCU card with PIC18F8520.**



3 **Figure 4-7: Standard 80-pin MCU card with PIC18F8722.**



4 **Figure 4-8: Ethernet 80-pin MCU card with PIC18F87J60 microcontroller with internal ethernet module.**

On-board programmer

What is mikroProg™?

mikroProg™ is a fast USB 2.0 programmer with mikroICD™ hardware In-Circuit Debugger. Smart engineering allows mikroProg™ to support all nearly 100 PIC18 devices in a single programmer. It also features a powerful mikroICD™ debugger which will be of great help in your development. Outstanding performance and easy operation are among it's top features.

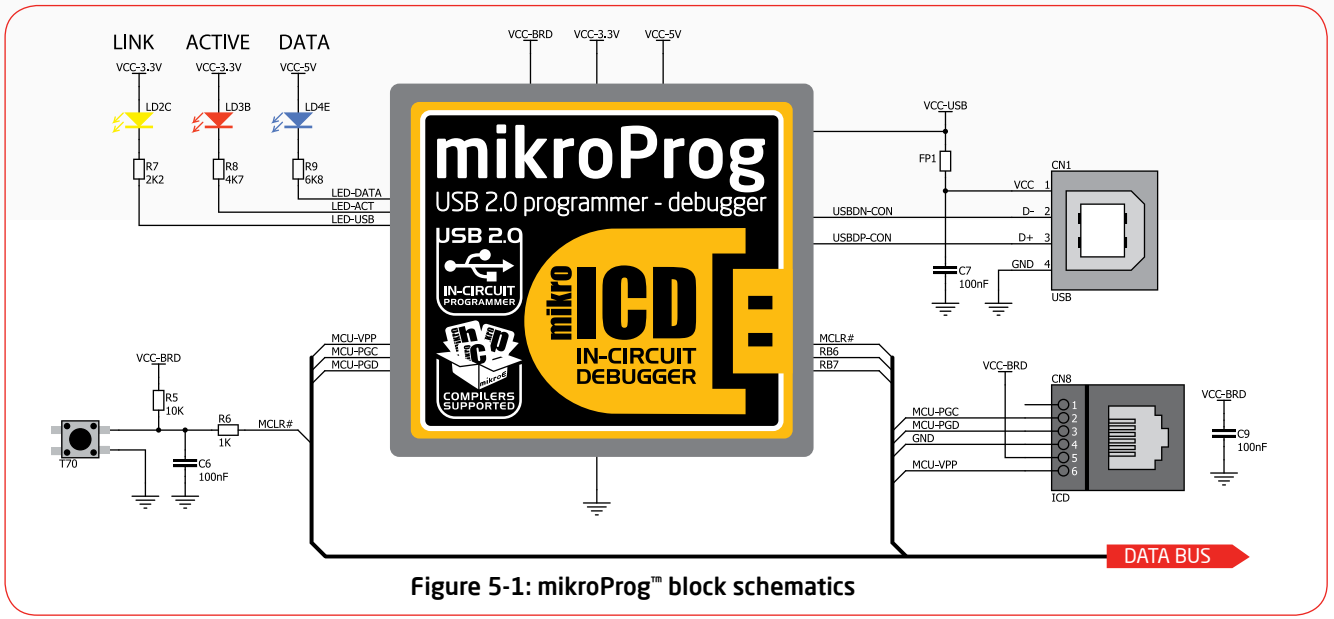
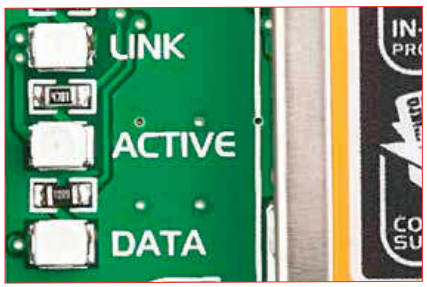


Figure 5-1: mikroProg™ block schematics

Why so many LEDs?



Three LEDs indicate specific programmer operation. **Link** LED lights up when USB link is established with your PC, **Active** LED lights up when programmer is active. **Data** is on when data is being transfered between the programmer and PC software (compiler or mikroProg Suite™ for PIC®).

How do I start?

In order to start using mikroProg™, and program your microcontroller, you just have to follow two simple steps:

1. Install the necessary software
- Install USB drivers
- Install mikroProg Suite™ for PIC® software

2. Power up the board, and you are ready to go.
- Plug in the programmer USB cable
- LINK LED should light up.

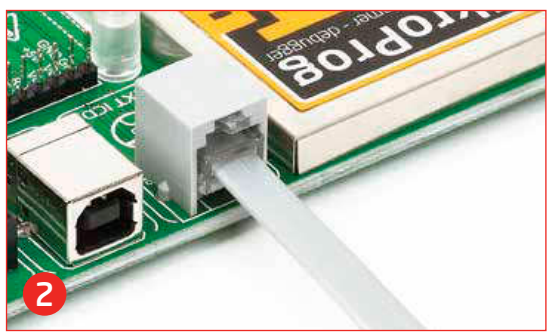
List of microcontrollers supported with mikroProg™

Here's the list of all microcontrollers which are supported with mikroProg™ programmer and debugger on EasyPIC PRO™ v7 board. The list may grow with each new release of mikroProg Suite™ for PIC® software.

PIC18F83J90	PIC18F87J93	PIC18F8527	PIC18F8490	PIC18F65J15	PIC18F44J11
PIC18F84J90	PIC18F86J50	PIC18F6620	PIC18F8520	PIC18F66J10	PIC18F45J11
PIC18F85J90	PIC18F86J55	PIC18F6720	PIC18F8620	PIC18F66J15	PIC18F46J11
PIC18F83J11	PIC18F87J50	PIC18F6310	PIC18F8720	PIC18F67J10	PIC18F44J50
PIC18F84J11	PIC18F85J50	PIC18F6410	PIC18F8393	PIC18F66J11	PIC18F45J50
PIC18F85J11	PIC18F86J60	PIC18F6390	PIC18F8493	PIC18F66J16	PIC18F46J50
PIC18F85J10	PIC18F86J65	PIC18F6490	PIC18F63J90	PIC18F67J11	PIC18F67J60
PIC18F85J15	PIC18F87J60	PIC18F6585	PIC18F64J90	PIC18F65J50	PIC18LF43K22
PIC18F86J10	PIC18F96J60	PIC18F6680	PIC18F65J90	PIC18F66J55	PIC18F46K22
PIC18F86J15	PIC18F96J65	PIC18F8310	PIC18F63J11	PIC18F67J50	PIC18F45K22
PIC18F87J10	PIC18F97J60	PIC18F8410	PIC18F64J11	PIC18F43K20	PIC18F44K22
PIC18F86J11	PIC18F85K22	PIC18F8585	PIC18F65J11	PIC18F44K20	PIC18F43K22
PIC18F86J16	PIC18F86K22	PIC18F8680	PIC18F66J90	PIC18F45K20	PIC18F66J60
PIC18F87J11	PIC18F87K22	PIC18F8622	PIC18F67J90	PIC18F46K20	PIC18F66J65
PIC18F86J90	PIC18F85K90	PIC18F8627	PIC18F66J93	PIC18LF46K22	
PIC18F87J90	PIC18F86K90	PIC18F8722	PIC18F67J93	PIC18LF45K22	
PIC18F86J93	PIC18F87K90	PIC18F8390	PIC18F65J10	PIC18LF44K22	

Programming with ICD2/ICD3

EasyPIC PRO™ v7 is equipped with RJ-12 connector compatibile with Microchip® ICD2® and ICD3® external programmers. This way you can override the on-board mikroProg™ programmer and In-Circuit Debugger, and use other programming tools with the board. Insert your ICD programmer cable into connector **CN8**, as shown in images 1 and 2.

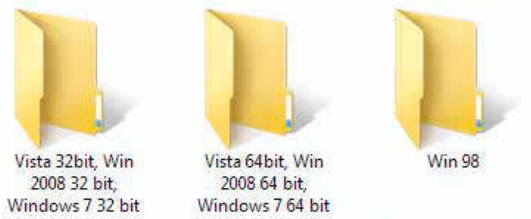


Installing programmer drivers

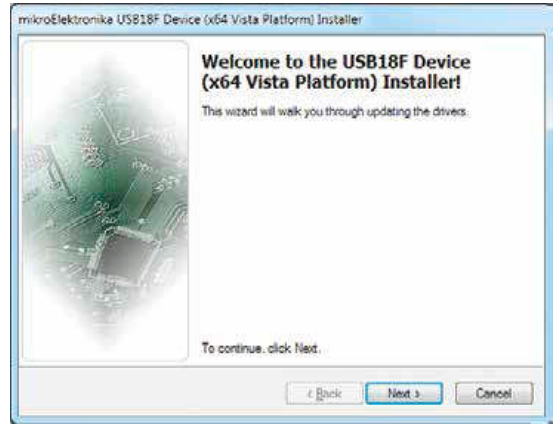
On-board mikroProg™ requires drivers in order to work. Drivers can be found on the link below:

http://www.mikroe.com/downloads/get/1201/mikroprog_for_pic_drivers_v200.zip

When you locate the drivers, please extract files from the ZIP archive. Folder with extracted files contains sub folders with drivers for different operating systems. Depending on which operating system you use, choose adequate folder and open it.

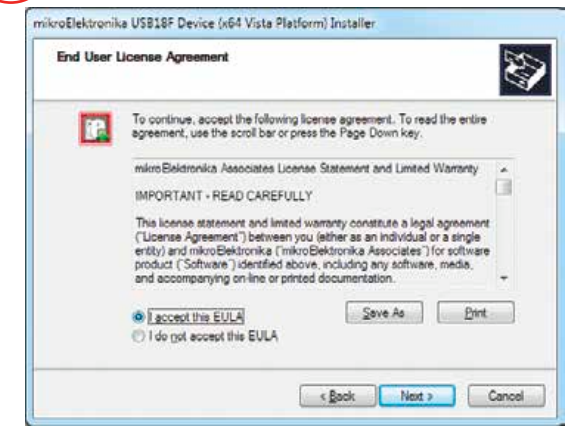


In the opened folder you should be able to locate the driver setup file. Double click on setup file to begin installation of the programmer drivers.



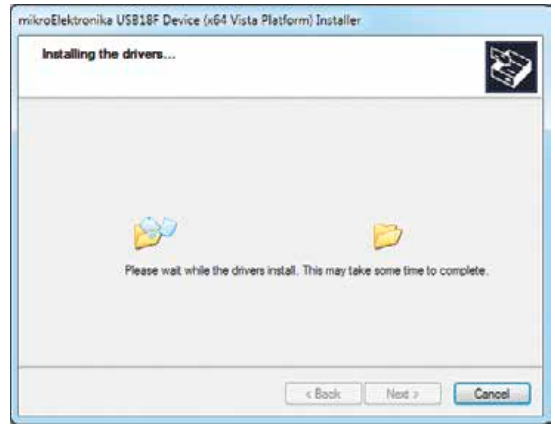
Step 1 - Start Installation

Welcome screen of the installation. Just click on **Next** button to procede.



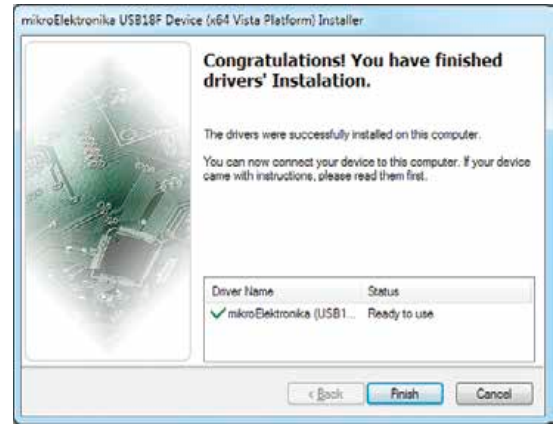
Step 2 - Accept EULA

Carefully read **E**nd **U**ser **L**icense **A**greement. If you agree with it, click **Next** to procede.



Step 3 - Installing drivers

Drivers are installed automatically in a matter of seconds.



Step 4 - Finish installation

You will be informed if the dirvers are installed correctly. Click on **Finish** button to end installation process.

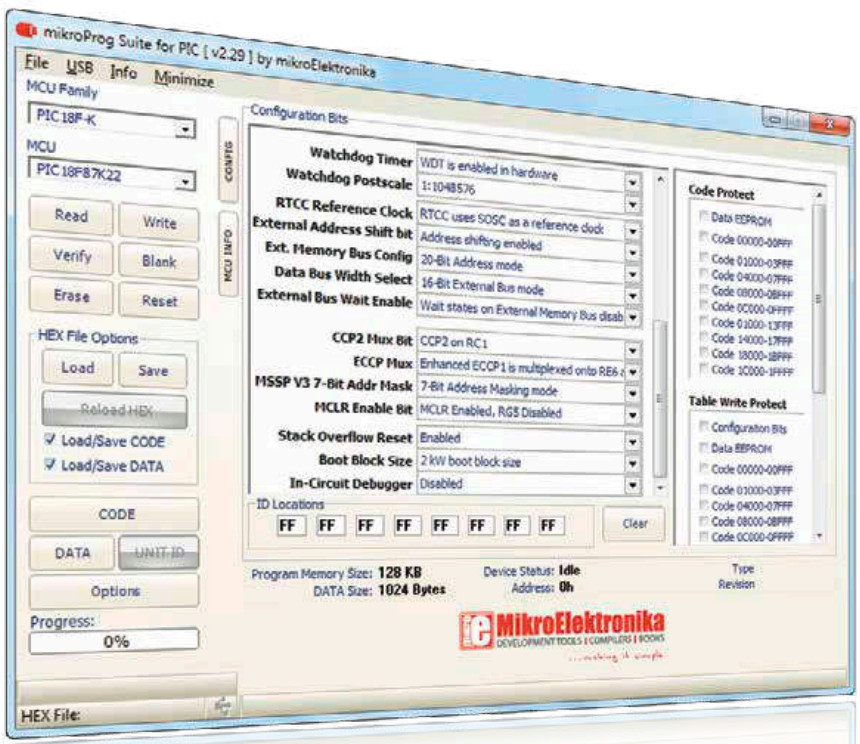
Programming software

mikroProg Suite™ for PIC®

On-board **mikroProg**™ programmer requires special programming software called **mikroProg Suite™ for PIC®**. This software is used for programming all of Microchip® microcontroller families, including PIC10, PIC12, PIC16, PIC18, dsPIC30/33, PIC24 and PIC32. Software has intuitive interface and **SingleClick**™ programming technology. To begin, first locate the installation archive on our website:

http://www.mikroe.com/downloads/get/1201/mikroprog_suite_for_pic_v229.zip

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

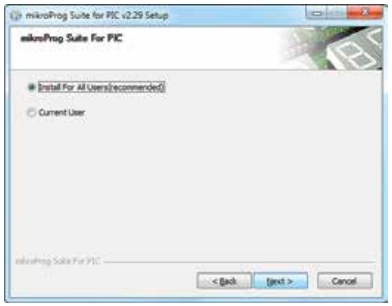


EasyPIC PRO v7

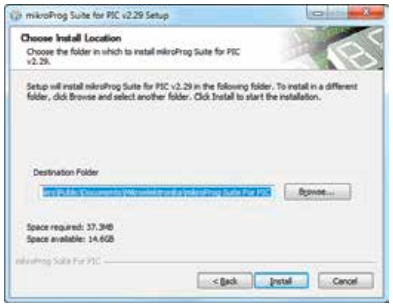
Installation wizard - 6 simple steps

Step 1 - Start Installation

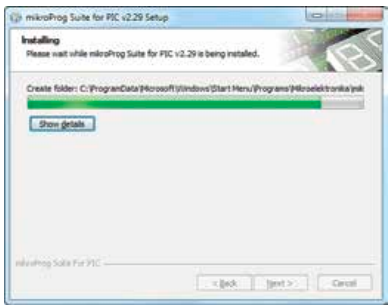
Step 2 - Accept EULA and continue



Step 3 - Install for All users



Step 4 - Choose destination folder



Step 5 - Installation in progress

Step 6 - Finish Installation

mikroICD™ - In Circuit Debugger

What is Debugging?

Every developer comes to a point where he has to monitor the code execution in order to find errors in the code, or simply to see if everything is going as planed. This hunt for bugs, or errors in the code is called **debugging**. There are two ways to do this: one is **the software simulation**, which enables you to simulate what is supposed to be happening on the microcontroller as your code lines are executed, and the other, most reliable one, is monitoring the code execution on the chip itself. And this latter one is called **In-Circuit debugging**. "In-Circuit" means that it is the real deal - code executes right on the target device.

What is mikroICD™?

The on-board **mikroProg**™ programmer supports **mikroICD**™ - a highly effective tool for a **Real-Time debugging** on hardware level. The mikroICD™ debugger enables you to execute your program on the host PIC microcontroller and view variable values, Special Function Registers (SFR), RAM, CODE and EEPROM memory along with the mikroICD™ code execution on hardware. Whether you are a beginner, or a professional, this powerful tool, with intuitive interface and convenient set of commands will enable you to track down bugs quickly. mikroICD™ is one of the fastest, and most reliable debugging tools on the market.

Supported Compilers

All MikroElektronika compilers, **mikroC**, **mikroBasic** and **mikroPascal** for PIC®, dsPIC® and PIC32® natively support mikroICD™. Specialized mikroICD DLL module allows compilers to exploit the full potential of fast hardware debugging. Along with compilers, make sure to install the appropriate **programmer drivers** and **mikroProg Suite for PIC®** programming software, as described on **pages 14** and **15**.

How do I use the debugger?

When you build your project for debugging, and program the microcontroller with this HEX file, you can start the debugger using **[F9]** command. Compiler will change layout to debugging view, and a blue line will mark where code execution is currently paused. Use **debugging toolbar** in the **Watch Window** to guide the program execution, and stop anytime. Add the desired variables to Watch Window and monitor their values. Complete guide to using mikroICD™ with your compiler is provided with the EasyPIC PRO™ v7 package.

Figure 5-2: mikroICD™ manual explains debugging thoroughly

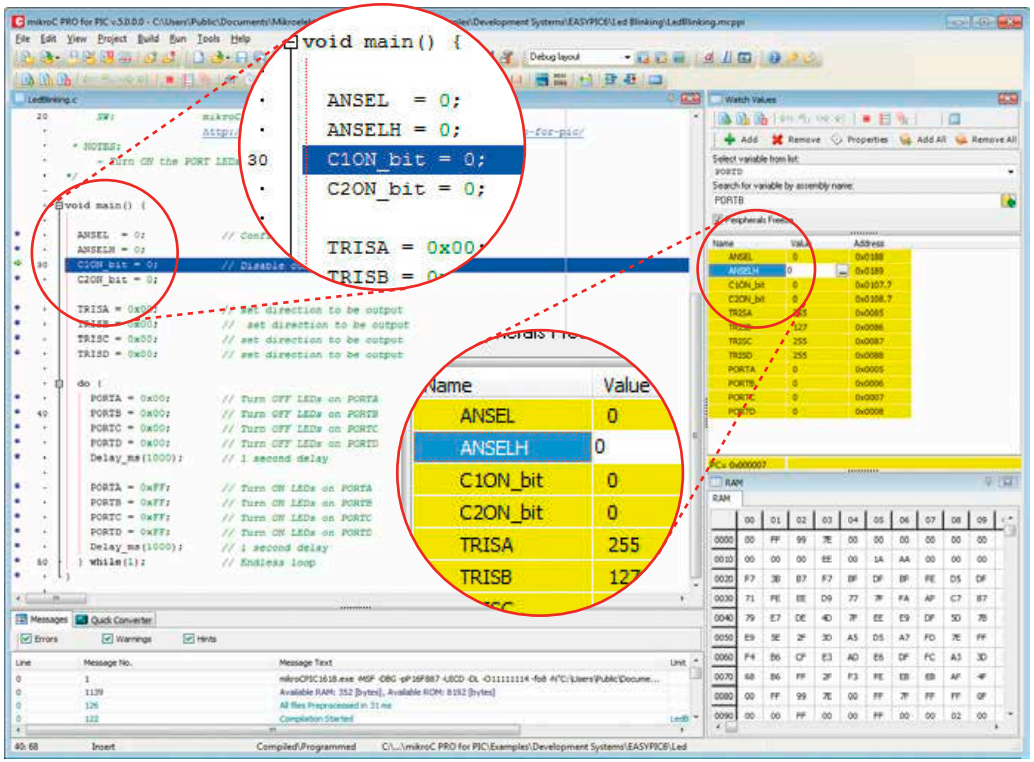


Figure 5-3: mikroC PRO for PIC® compiler in debugging view, with SFR registers in Watch Window

mikroICD™ commands

Here is a short overview of which debugging commands are supported in MikroElektronika compilers. You can see what each command does, and what are their shortcuts when you are in debugging mode. It will give you some general picture of what your debugger can do.

Toolbar Icon	Command Name	Shortcut	Description
	Start Debugger	[F9]	Starts Debugger.
	Run/Pause Debugger	[F6]	Run/Pause Debugger.
	Stop Debugger	[Ctrl + F2]	Stops Debugger.
	Step Into	[F7]	Executes the current program line, then halts. If the executed program line calls another routine, the debugger steps into the routine and halts after executing the first instruction within it.
	Step Over	[F8]	Executes the current program line, then halts. If the executed program line calls another routine, the debugger will not step into it. The whole routine will be executed and the debugger halts at the first instruction following the call.
	Step Out	[Ctrl + F8]	Executes all remaining program lines within the subroutine. The debugger halts immediately upon exiting the subroutine.
	Run To Cursor	[F4]	Executes the program until reaching the cursor position.
	Toggle Breakpoint	[F5]	Toggle breakpoints option sets new breakpoints or removes those already set at the current cursor position.
	Show/Hide breakpoints	[Shift+F4]	Shows/Hides window with all breakpoints
	Clears breakpoints	[Shift+Ctrl+F5]	Delete's selected breakpoints
	Jump to interrupt	[F2]	Opens window with available interrupts (doesnt work in mikroICD™ mode)

Input/Output Group

One of the most distinctive features of EasyPIC PRO™ v7 are it's Input/Output PORT groups. They add so much to the connectivity potential of the board.

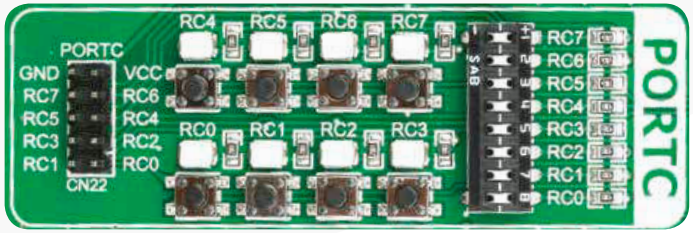


Figure 6-1: I/O group contains PORT headers, tri-state pull up/down DIP switch, buttons and LEDs all in one place

Everything is groupped together

It took us a while to realize that having PORT **headers**, PORT **buttons** and PORT **LEDs** next to each other, and groupped together, makes development easier, and the entire EasyPIC PRO™ v7 cleaner and well organized. We have also provided an **additional PORT headers** on the right side of the board, so you can access any pin you want from that side of the board too.

Tri-state pull-up/down DIP switches

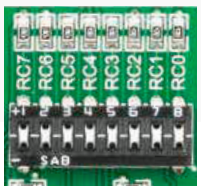
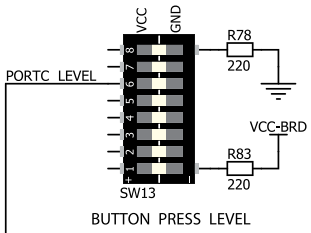


Figure 6-2: Tri-state DIP switch on PORTC

Tri-state DIP switches, like **SW3** on **Figure 6-2**, are used to enable 4K7 pull-up or pull-down resistor on any desired port pin. Each of these switches has three states:

1. **middle position** disables both pull-up and pull-down feature from the PORT pin
2. **up position** connects the resistor in pull-up state to the selected pin
3. **down position** connects the resistor in pull-down state to the selected PORT pin.



Button press level tri-state DIP switch is used to determine which logic level will be applied to port pins when buttons are pressed

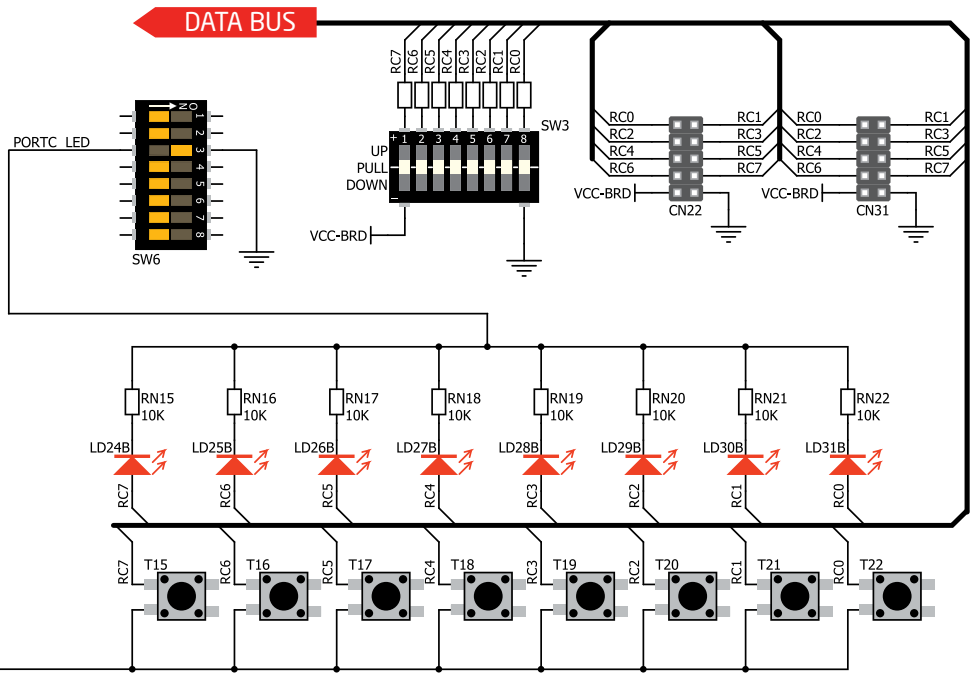
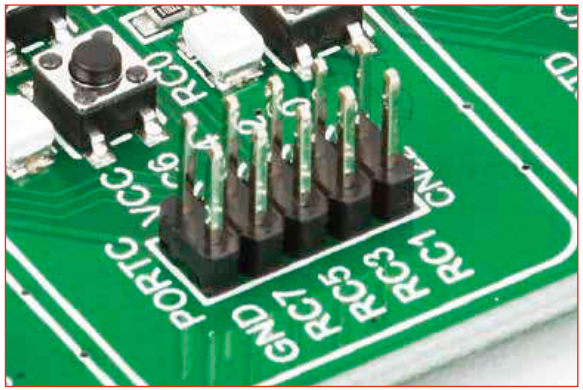
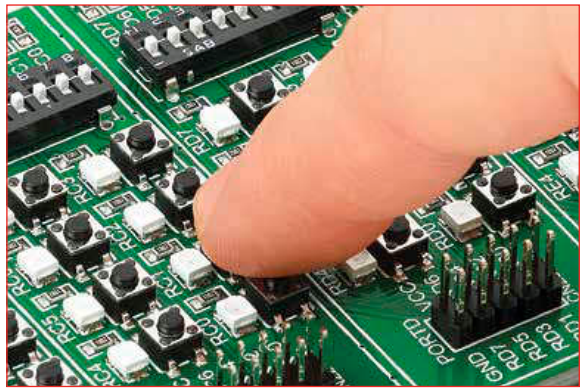
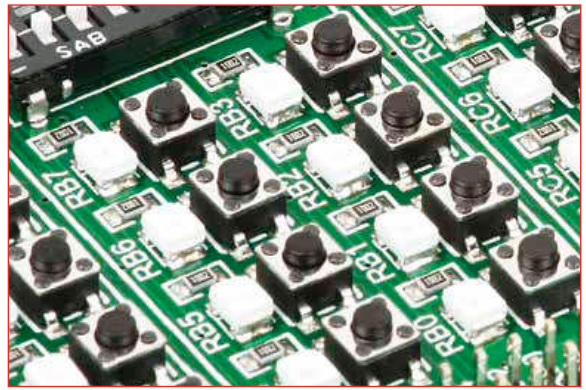


Figure 6-3: Schematic of the single I/O group connected to microcontroller PORTC







Headers

With enhanced connectivity as one of the key features of EasyPIC PRO™ v7, we have provided **two connection headers for each PORT**. I/O PORT group contains one male IDC10 2x5 header (like **CN22 Figure 6-3**). There is **one more IDC10 header** available on the right side of the board, next to DIP switches. These headers are all compatible with over 70 MikroElektronika accessory boards, and enable simple connection.

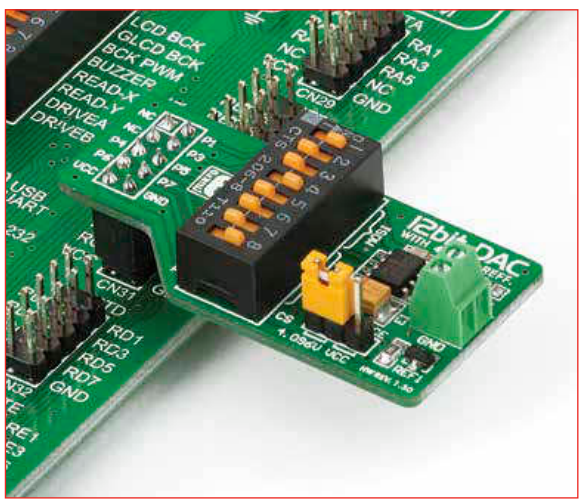


Figure 6-4: IDC10 male headers enable easy connection with MikroElektronika accessory boards

Buttons

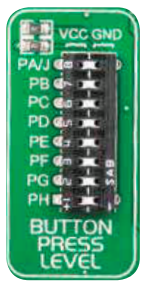


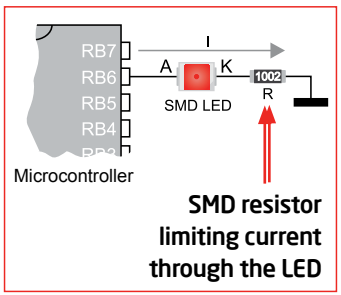
Figure 6-5: Button press level DIP switches (tri-state)

The logic state of all microcontroller digital inputs may be changed using **push buttons**. Tri-state DIP switch **SW13** is available for selecting which logic state will be applied to corresponding MCU pin when button is pressed, for each I/O port separately. If you, for example, place **SW13.3** in **VCC** position, then pressing of any push button in PORTC I/O group will apply logical one to the appropriate microcontroller pin. The same goes for **GND**. If the DIP switch is in the middle position, then all push buttons of the associated PORT will be disconnected from the microcontroller pin.

Reset Button

In the far upper right section of the board, there is a **RESET button**, which can be used to manually reset the microcontroller. This button is directly connected to the microcontroller **MCLR pin**.

LEDs



LED (Light-Emitting Diode) is a highly efficient electronic light source. When connecting LEDs, it is neccessary to place a current limiting resistor in series so that LEDs are provided with the current value specified by the manufacturer. The current varies from 0.2mA to 20mA, depending on the type of the LED and the manufacturer. The EasyPIC PRO v7 board uses low-current LEDs with typical current consumption of 0.2mA or 0.3mA, depending of VCC voltage selection. Board contains 69 LEDs which can be used for visual indication of the logic state on PORT pins. An active LED indicates that a logic high (1) is present on the pin. In order to enable PORT LEDs, it is necessary to enable the corresponding DIP switch on **SW6** (**Figure 6-6**).

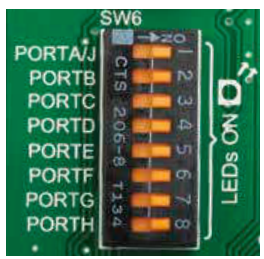
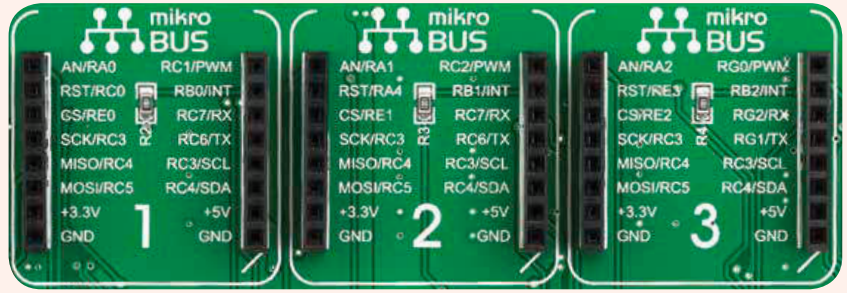


Figure 6-6: SW6.1 through SW6.4 switches are used to enable PORT LEDs

mikroBUS™ sockets

Easier connectivity and simple configuration are imperative in modern electronic devices. Success of the USB standard comes from it's simplicity of usage and high and reliable data transfer rates. As we in MikroElektronika see it, Plug-and-Play devices with minimum settings are the future in embedded world too. This is why our engineers have come up with a simple, but brilliant pinout with lines that most of today's accessory boards require, which almost completely eliminates the need of additional hardware settings. We called this new standard the **mikroBUS™.** EasyPIC PRO™ v7 is a development board which supports mikroBUS™ with three on-board sockets. As you can see, there are no additional DIP switches, or jumper selections. Everything is already routed to the most appropriate pins of the microcontroller sockets.



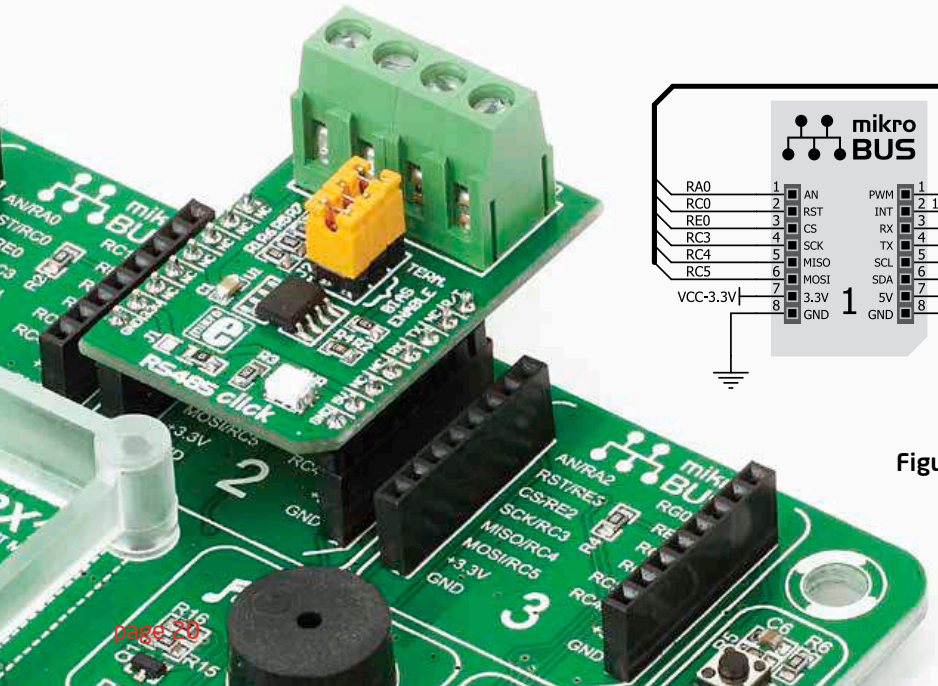
mikroBUS™ pinout explained

AN - Analog pin
RST - Reset pin
CS - SPI Chip Select line
SCK - SPI Clock line
MISO - SPI Slave Output line
MOSI - SPI Slave Input line
+3.3V - VCC-3.3V power line
GND - Reference Ground

PWM - PWM output line
INT - Hardware Interrupt line
RX - UART Receive line
TX - UART Transmit line
SCL - I2C Clock line
SDA - I2C Data line
+5V - VCC-5V power line
GND - Reference Ground

mikroBUS™ host connector

Each mikroBUS™ host connector consists of two 1x8 female headers containing pins that are most likely to be used in the target accessory board. There are three groups of communication pins: **SPI**, **UART** and **I²C** communication. There are also single pins for **PWM**, **Interrupt**, **Analog input**, **Reset** and **Chip Select**. Pinout contains two power groups: **+5V and GND** on one header and **+3.3V and GND** on the other 1x8 header.



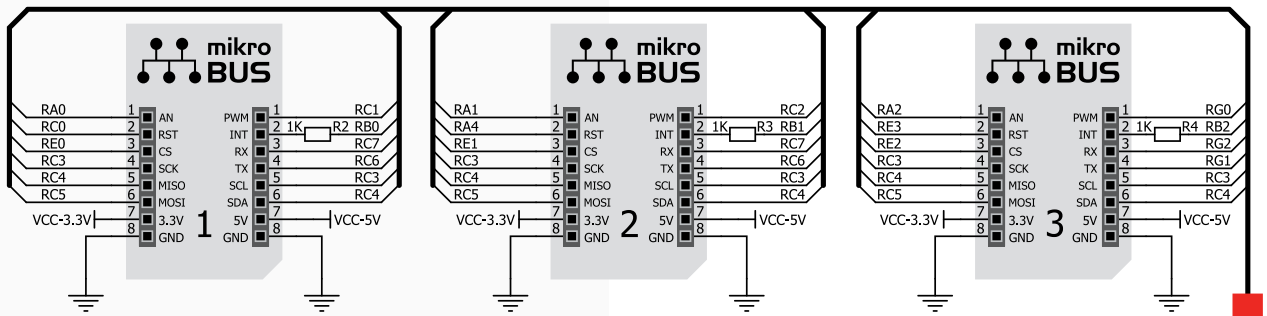
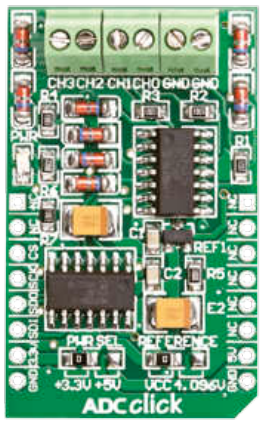
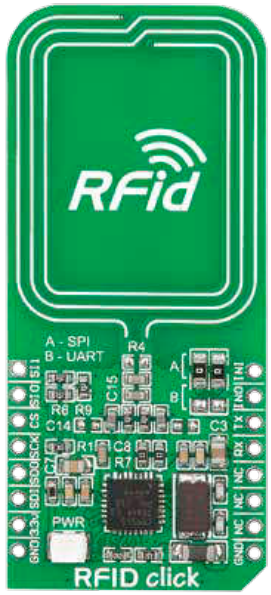


Figure 7-1: Connection schematics of on-board mikroBUS™ host sockets

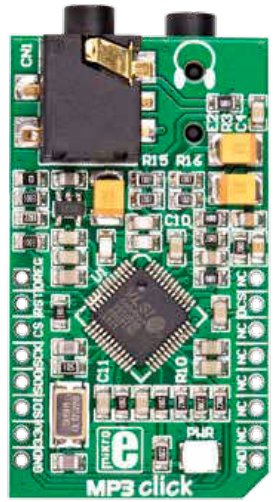


ADC click™



RFiD click™

BlueTooth click™



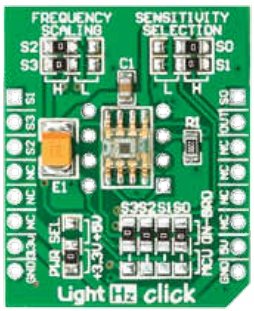
MP3 click™

GSM click™

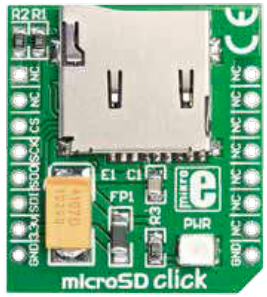
Click Boards™ are plug-n-play!

MikroElektronika portfolio of over 200 accessory boards is now enriched by an additional set of mikroBUS™ compatible **Click Boards™**. Almost each month several new Click boards™ are released. It is our intention to provide the community with as much of these boards as possible, so you will be able to expand your EasyPIC™ PRO v7 with additional functionality with literally zero hardware configuration. Just plug and play. Visit the Click boards™ webpage for the complete list of available boards:

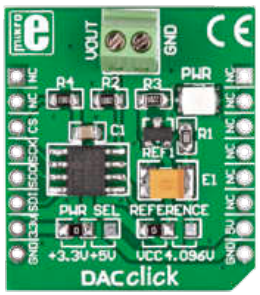
http://www.mikroe.com/click/



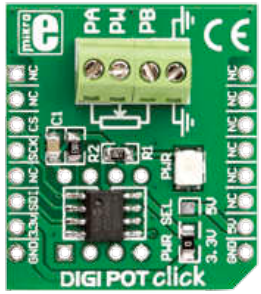
LightHz click™



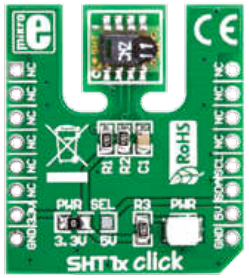
microSD click™



DAC click™



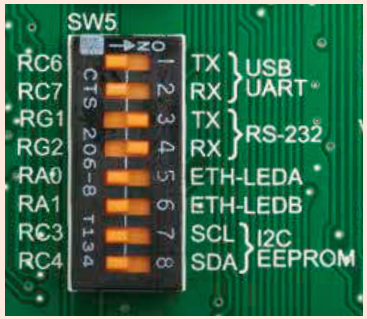
DIGIPOT click™



SHT1x click™

UART via RS-232

Enabling RS-232



In order to enable RS-232 communication, you must push **SW5.3** (RG1) and **SW5.4** (RG2) to **ON** position. This connects the **RX** and **TX** lines to appropriate microcontroller pins and its second UART module.

The **UART** (universal asynchronous receiver/transmitter) is one of the most common ways of exchanging data between the MCU and peripheral components. It is a serial protocol with separate transmit and receive lines, and can be used for full-duplex communication. Both sides must be initialized with the same baudrate, otherwise the data will not be received correctly.

RS-232 serial communication is performed through a 9-pin SUB-D connector and the microcontroller UART module. In order to enable this communication, it is necessary to establish a connection between **RX** and **TX** lines on SUB-D connector and the same pins on the target microcontroller using DIP switches. Since RS-232 communication voltage levels are different than microcontroller logic levels, it is necessary to use a RS-232 Transceiver circuit, such as **MAX3232** as shown on **Figure 8-1**.

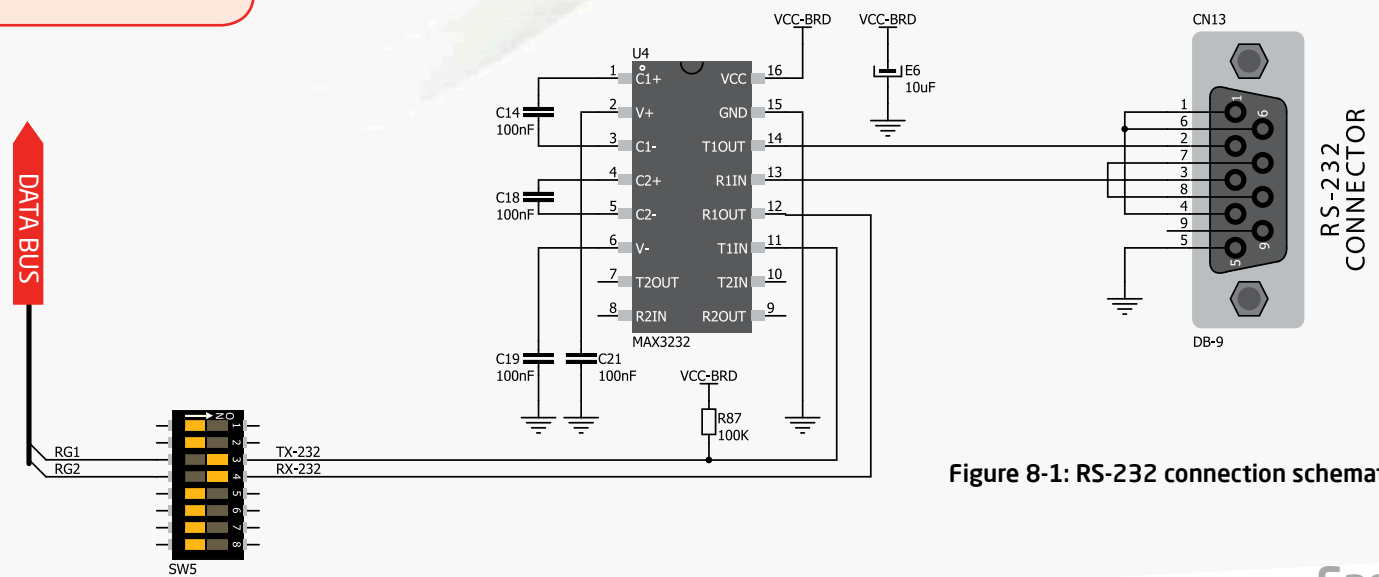
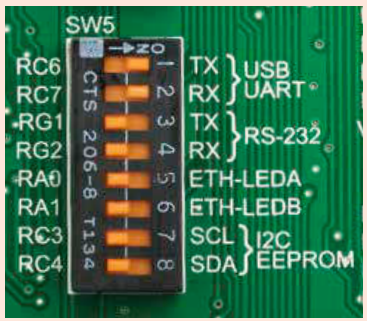


Figure 8-1: RS-232 connection schematics

UART via USB

Enabling USB-UART



In order to enable USB-UART communication, you must push **SW5.1** (RC6) and **SW5.2** (RC7) to **ON** position. This connects the **RX** and **TX** lines to appropriate microcontroller pins and its first UART module.

Modern PC computers, laptops and notebooks are no longer equpped with RS-232 connectors and UART controllers. They are nowdays replaced with USB connectors and USB controllers. Still, certain technology enables UART communication to be done over USB connection. Controllers such as **FT232RL** from FTDI® convert UART signals to the appropriate USB standard. In order to use USB-UART module on EasyPIC PRO™ v7, you must first install FTDI drivers on your computer. Drivers can be found on link bellow:

http://www.ftdichip.com/Drivers/VCP.htm

USB-UART communication is being done through a FT232RL controller, USB connector **(CN12)**, and microcontroller UART module. To establish this connection, you must connect **RX** and **TX** lines of the microcontroller to the appropriate input and output pins of the FT232RL. This selection is done using DIP switches **SW5.1** and **SW5.2**.

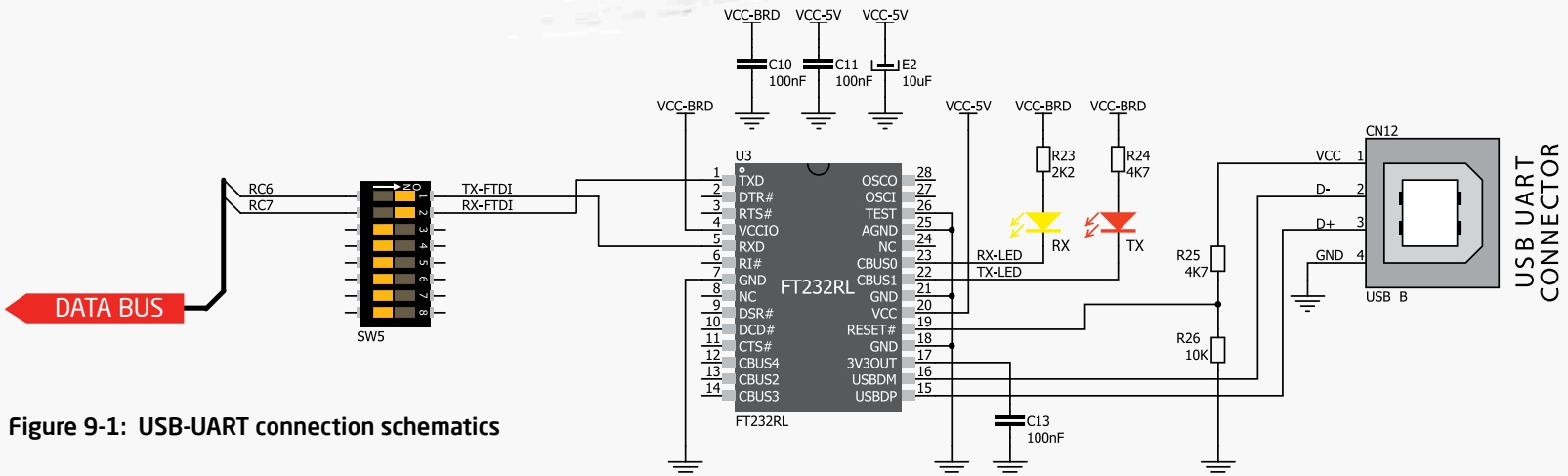
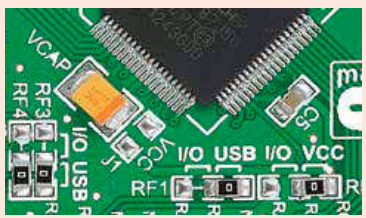


Figure 9-1: USB-UART connection schematics

USB device communication

USB is the acronym for **Universal Serial Bus**. This is a very popular industry standard that defines cables, connectors and protocols used for communication and power supply between computers and other devices. EasyPIC PRO™ v7 contains USB DEVICE connector **(CN9)** which enables microcontrollers that support USB communication to establish a connection with the target host (eg. PC, Laptop, etc). USB data lines comming from the MCU socket are dedicated to USB connector only, and are not available via PORT headers. To enable USB communication, you have to solder SMD jumpers on the MCU card to the appropriate USB position. This only makes sense if the MCU card contains microcontroller with integrated USB controller. One of these cards is **Standard 80-pin MCU card** with **PIC18F87J50** microcontroller.

Enabling USB



Microcontroller with USB support should be soldered to the MCU card with dedicated USB SMD jumpers. Make sure to solder **RF1**, **RF3** and **RF4** jumpers to USB position in order to connect USB lines to USB connector.

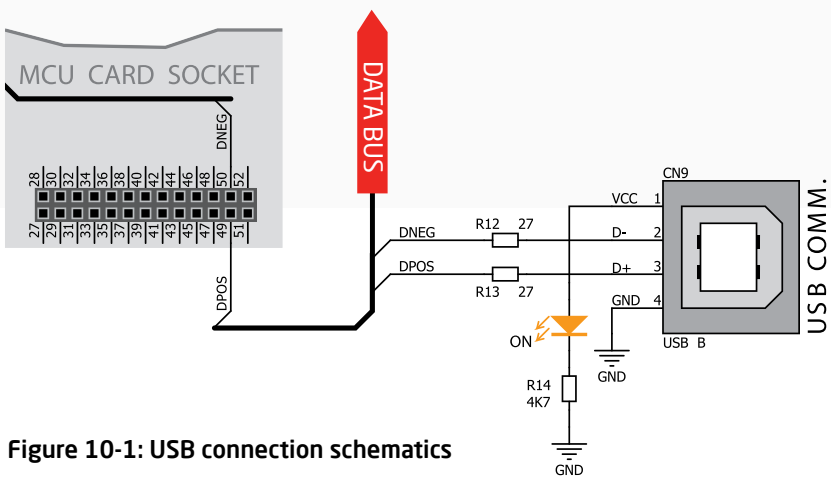
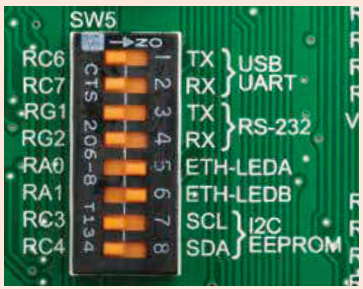


Figure 10-1: USB connection schematics

Ethernet communicaton

Ethernet is a popular computer networking technology for local area networks (LAN). Systems communicating over Ethernet divide a stream of data into individual packets called frames. Each frame contains source and destination addresses and error-checking data so that damaged data can be detected and re-transmitted. EasyPIC PRO™ v7 features standard **RJ-45** connector which enables microcontrollers that support Ethernet communication to establish a connection with a computer, router or other devices. All four ethernet lines (TPOUT+, TPOUT-, TPIN+ and TPIN-) are routed to the MCU card socket. Only microcontrollers containing embedded ethernet module soldered to **100-pin** or **80-pin TQFP Ethernet MCU cards** can use these lines and utilize ethernet connector. Additional signalization LEDs are available on the board.

Enabling Eth. LEDs



In order to enable ethernet LEDs, you must enable **SW5.5** (RA0) and **SW5.6** (RA1) DIP switches. This connects the **LEDA** and **LEDB** lines to appropriate microcontroller pins.

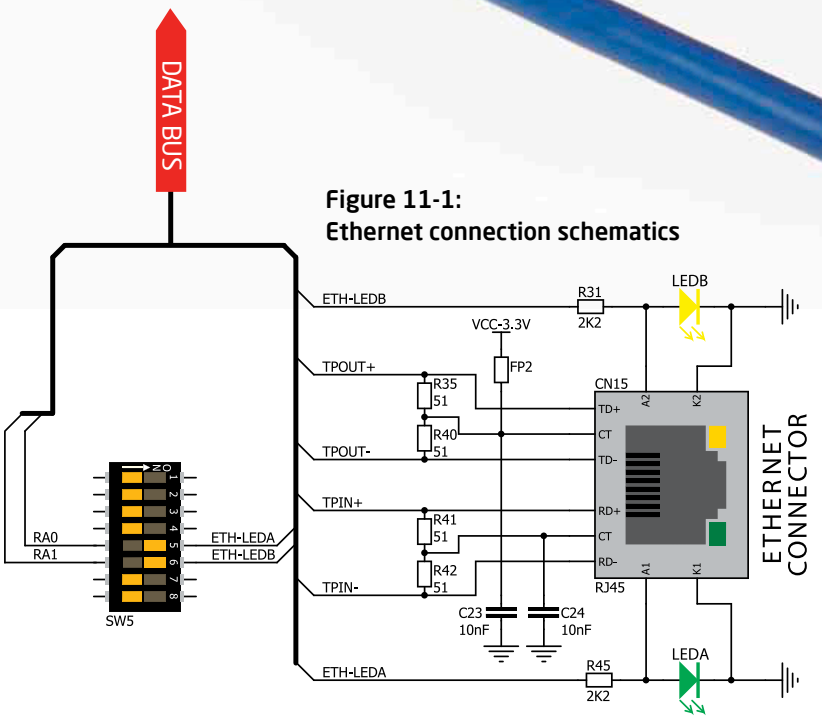


Figure 11-1:
Ethernet connection schematics