ATHENA32

Product Datasheet

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Date	13/01/2019
Status	Released

Revision History			
Version	Date	Author	Changes
1.0	13/01/2019	Francesco Ficili	Initial Release.

SUMMARY

1. Introduction

The ATHENA32 is an evaluation board designed to allow the user to experiment with a broad range of peripheral of PIC32MX family without the need of additional boards or devices. It has been specifically designed to address the SW development process with Microchip 32-bit line of controllers using Microchip official toolchain (in particular MPLab X, XC32 compiler and MPLab Harmony SW framework).

2. Block Diagram

The ATHENA32 is a PIC32MX evaluation board that allows to experiment with a broad range of on-board peripherals, like Ethernet, USB (host and device), I2C, SPI, UART, SD, LCD, etc. Figure 1 shows the ATHENA32 block diagram. The heart of the system is a PIC32MX795F512L 32-bit RISC microcontroller, produced by Microchip Technology Inc.

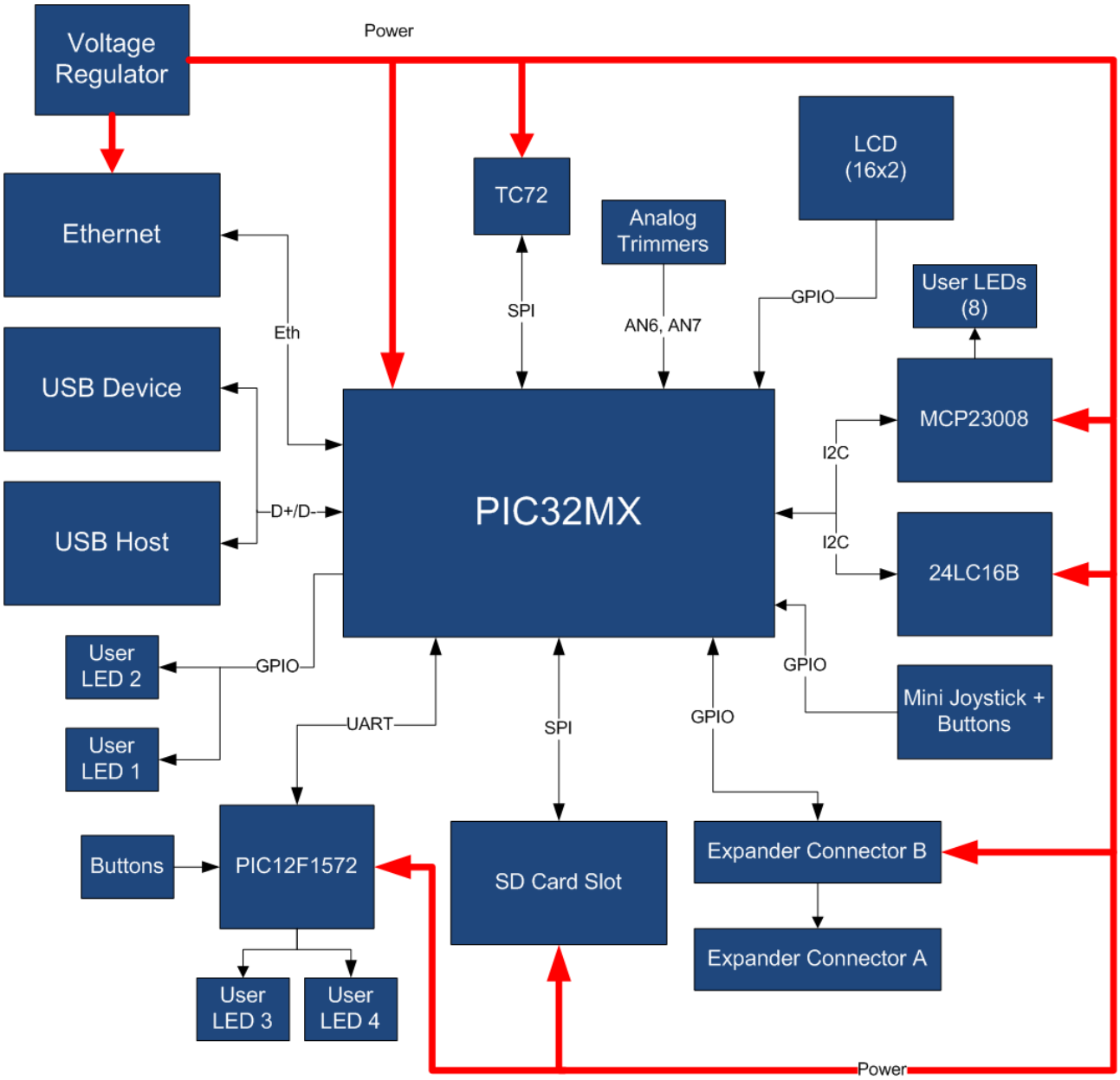

Figure 1 - Block Diagram

The main characteristics of the employed MCU are resumed in Table 1:

Table 1 - MCU characteristics

Parameter Name	Description
MCU Family	PIC32MX7xx
MaxSpeed MHz	80
Program Memory Size (KB)	512
RAM (KB)	128
Auxiliary Flash (KB)	12
Temperature Range (C)	-40 to 105
Operating Voltage Range (V)	2.3 to 3.6
DMA Channels	8
SPI™	4
I²C™ Compatible	5
USB	FS Host/OTG
USB (Channels, Speed, Compliance)	1,FS Host/OTG,USB 2.0 OTG
A/D channels	16
Max A/D Resolution	10
Max A/D Sample Rate (KSPS)	1000
Input Capture	5
Output Compare/Std. PWM	5
16-bit Digital Timers	5
Parallel Port	PMP16
Comparators	2
InternalOscillator	8 MHz, 32 kHz
I/O Pins	85
Pin Count	100

3. Hardware

This section goes deeper in the HW details of ATHENA32. Figure 2 depicts the most important components of the board:

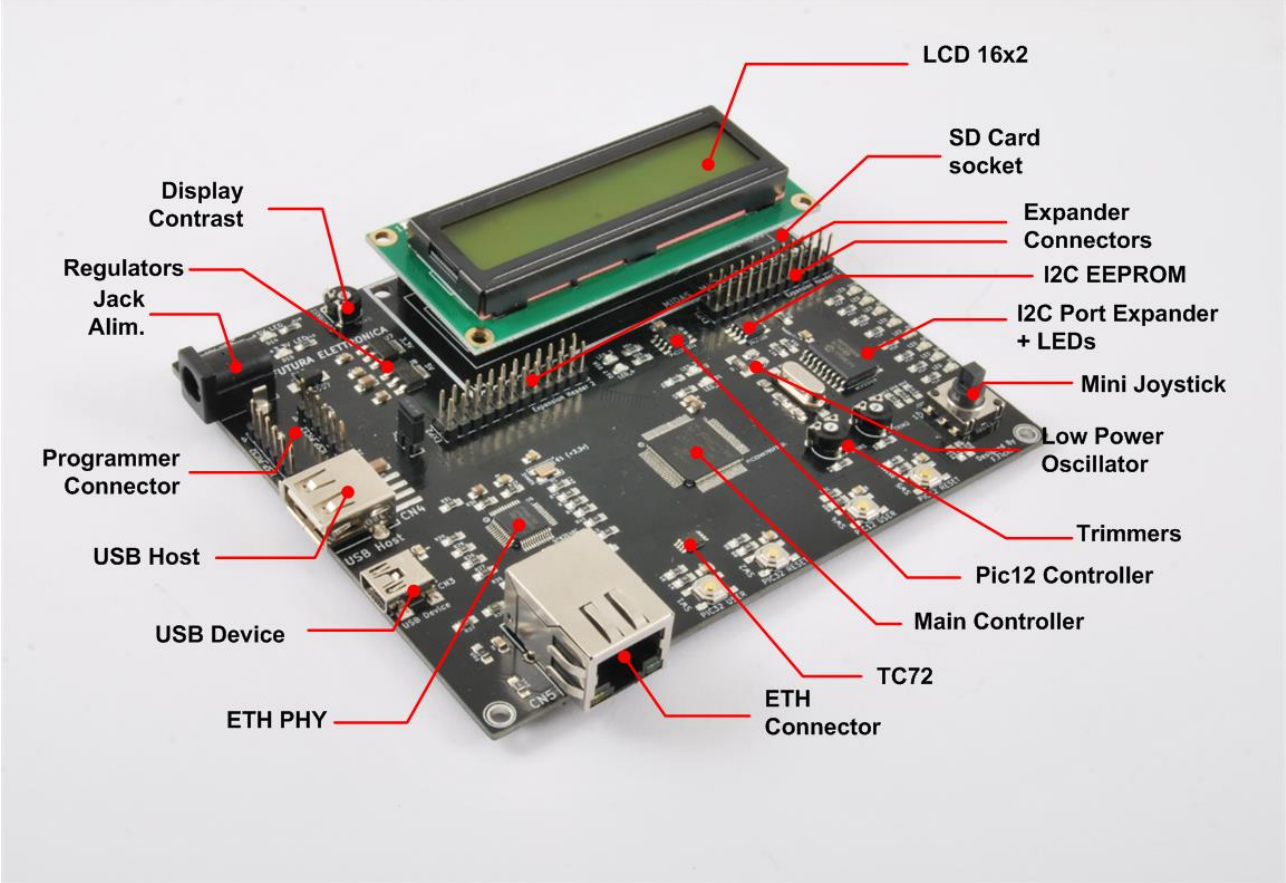

Figure 2 - Hardware Highlight

Table 2 provides a description of board's main components:

Table 2 – Hardware characteristics

Name	Description
Main Controller	PIC32MX795F512L main MCU.
TC72	Solid state Thermometer with SPI interface. Used to experiment with SPI bus.
ETH Connector	Standard Ethernet connector with LEDs.
ETH PHY	DP83848C Ethernet Phy with MII interface. Allow to experiment with Microchip TCP/IP stack.
USB device	USB device connector. Allow to experiment with USB device stack.
USB Host	USB host connector. Allow to experiment with USB host stack.
Programmer Connector	PicKit Standard programmer connector for PIC32 and PIC12.
Jack Alim.	Main power jack.
Regulators	5v and 3,3v regulators.
Display Contrast	Trimmer for display contrast adjustement.

LCD 16x2	16x2 LCD display with HD44780 interface.
SD Card Socket	SD card socket connected to SPI bus. Allow to experiment with SD card and file IO stack.
Expander Connectors	Expansion connectors.
I2C EEPROM	24LC16B I2C EEPROM. Allow to experiment with I2C.
I2C Port Expander + LEDs	MCP23008 I2C port expander, connected to 8 LEDs. Allow to experiment with I2C.
Mini Joystick	Mini Joystick with 2 axis and fire button.
Low Power Oscillator	Low power oscillator used to feed the internal RTCC.
Trimmers	Trimmers connected to AN6 and AN7 analog channels.
Pic12 Controller	PIC12F1822 connected to PIC32 via serial line. Allow to experiment with UART.

4. Programming the Board

Programing with the integrated USB Host Bootloader

The Athena 32 EVB contains an USB host bootloader inside, that allow to program the board without the use of an ICSP programmer.

To access the bootloader:

1. Push and hold pushed the PIC32 User button (SW1),
2. Push and release the PIC32 Reset button (SW2),
3. The LCD should show the message “BOOTLOADER MODE Checking USB….”.

At this point the board is able to load an .hex file containing the FW image. To do that copy the .hex file on an USB stick, rename it as “image.hex” and connect the USB stick to the board’s USB host port (CN4). The FW downloading procedure should start and once complete the “Flashing Done!” message should appear on the LCD. After that the new FW application is automatically launched.

Programing with and external Programmer

In order to program the board with an external programmer, you need a standard Microchip programmer. The programmer we suggest to use is the Microchip PicKit3 programmer&debugger, represented in Figure 3.

Figure 3 - PicKit3

The programming SW interface we suggest to use MPLab IPE, that is installed along with MPLab X, the official development environment that you can download from here:

http://www.microchip.com/mplab/mplab-x-ide

The steps to follow to program the board are listed below:

1. Power the board either via a standard usb cable (CN3) or a 9V barrel jack power supply (Pwr-Jack-9V),
2. Connect the PicKit3 to the board using J2 connector (you may need a proper 6-pin cable),
3. Launch Microchip IPE, select the right derivative and hit the "connect" button, as depicted in Figure 4:

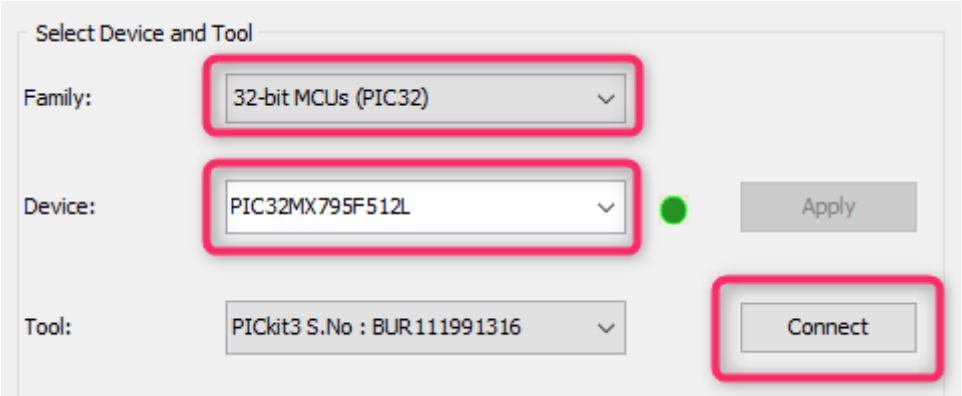

Figure 4 - MPLab IPE Setup

4. Select File → Import → Hex, as depicted in Figure 5 to select the .hex file of the application you want to flash.

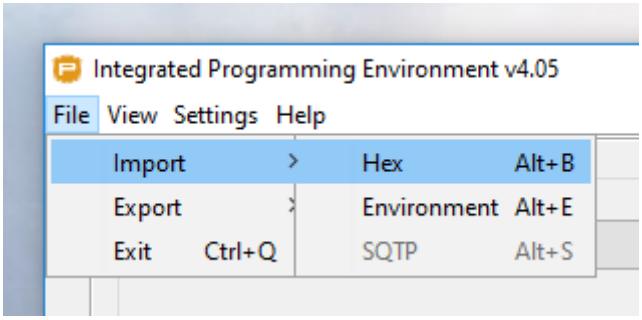

Figure 5 - Import hex file

5. Hit the "Program" Button, as depicted in Figure 6:

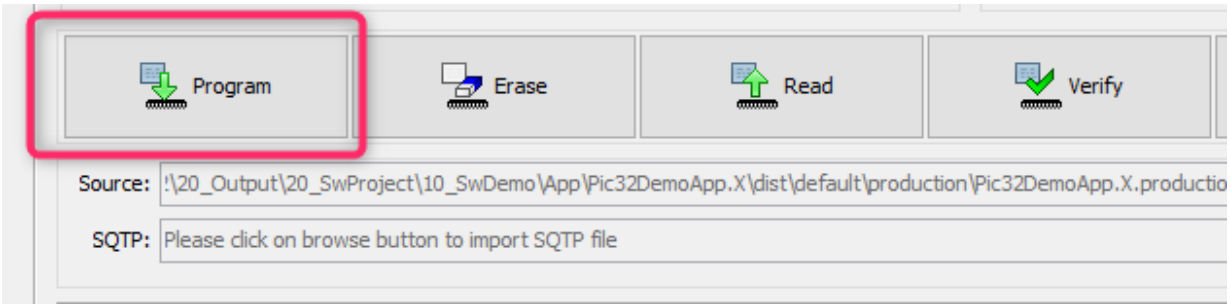

Figure 6 - Program the chip

5. Demo Application

The ATHENA32 evaluation board comes pre-programmed with a demo application that allows to experiment with some board features/peripherals (like Ethernet, USB, I2C, etc.).

The demonstration functionalities of the DemoApp are:

- I2c Port Expander communication,
- Potentiometer reading demonstration,
- UART communication demonstration,
- Usb Mass Storage (MSD) demonstration,
- Etherned webserver demonstration.

They can be accessed in a menu fashion using the integrated mini-joystick and the alphanumeric LCD. Pushing the up/down direction of the mini-joystick you can scroll the demonstration menu, while pushing right or fire you can access the selected demo. Finally pushing left you can exit the demo and return to the selection menu.

I2C Port expander demo

Select the "I2C Demo" option by either pushing right or fire in the corresponding menu entry. The LEDs connected to the I2C port expander should start lighting in a "supercar" effect fashion. Push left to exit the demo.

ADC Potentiometer demo

Select the "ADC Demo" option by either pushing right or fire in the corresponding menu entry. The LCD will show the analog reading of TRIM1 in percentage. Push left to exit the demo.

UART demo

Select the "UART Demo" option by either pushing right or fire in the corresponding menu entry. The PIC32 will start sending commands to the PIC12F via UART to light LED_3 and LED_4 in a binary counter fashion. Push left to exit the demo.

USB MSD demo

Insert an USB dongle on the USB host port (CN4). Select the "USB Host Demo" option by either pushing right or fire in the corresponding menu entry. The LCD screen will show the message "Writing…" and then "Done!!!" after few moments. The USB dongle should then contains a txt file (LogFile) with the string "Hello World!" wrote inside.

Important Note: the demo works only if the board is supplied via an external power supply (doesn't work if it's supplied by USB device connector).

Ethernet Demo

Connect the board and a laptop with an ethernet cable and be sure the laptop has the wifi turned off. Select the "TCP/IP Demo" option by either pushing right or fire in the corresponding menu entry. You should then see the LCD presenting an IP address (wait some seconds until it has a fixed value). The you can access the board webserver using a standard browser (using the IP address or the netbios name "**einboard/**").

You should see the webpage depicted in Figure 7.

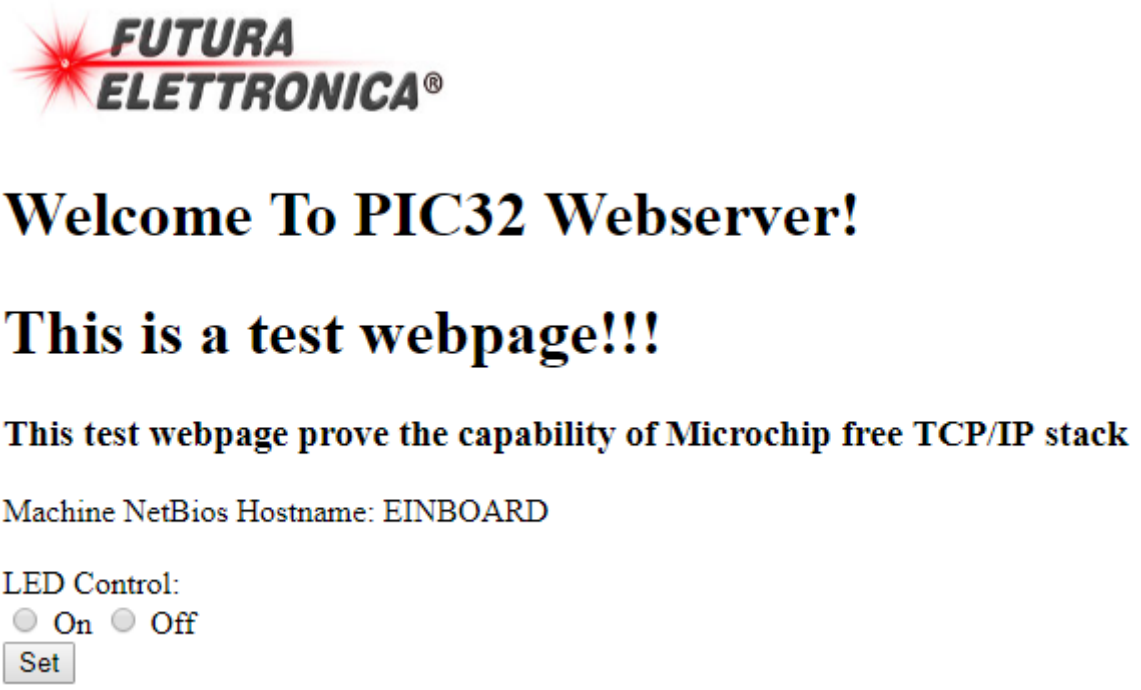

Figure 7 - TCP/IP demo

You can control LED_2 using the “LED control” section.

6. Demo Application source code

The demo application source code can be downloaded from the product page and can be used as a reference for developing new applications or expanding the existing one.

The demo application has been designed to be used with the USB Host bootloader and with the following versions of the Microchip Toolchain:

Microchip Tool	Version	Notes
MPLab X IDE	5.10	
XC32 Compiler	1.32	