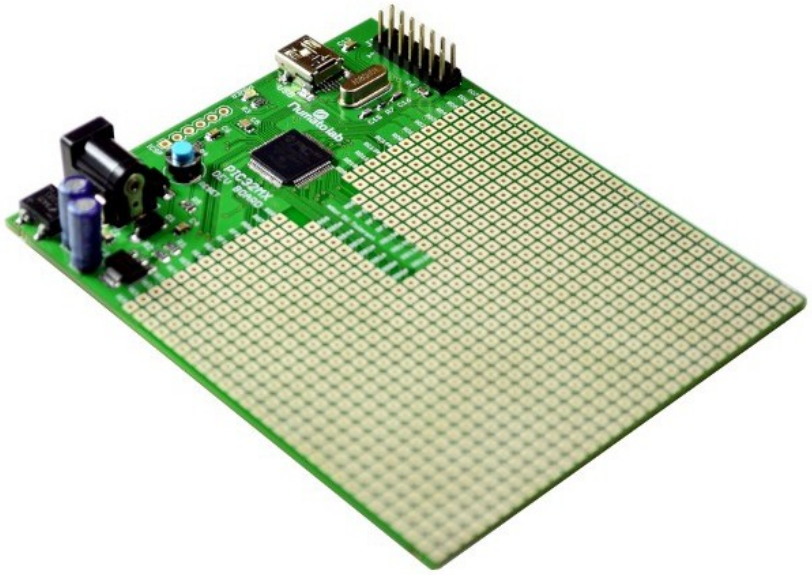

PIC32 MX Microcontroller Development Board

User Guide

NUMATO LAB

www.numato.com

Rev 9

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Introduction

Numato Lab's PIC32 MX Development board with Microchip HID boot loader preprogrammed is a versatile product for controlling electrical and electronic devices remotely from a PC over USB link. This board can be conveniently powered by USB or by an external power supply for standalone applications. Preprogrammed boot loader helps you to start testing your programs without even buying a programmer. Ease of use and wider operating system compatibility are the primary goals behind this product's design. Built in USB to serial conversion allows the module to be used without any USB specific knowledge.

Features

- PIC32MX795F512H 64 pin 32 bit MIPS based microcontroller.
- 512K Program memory and 128K data RAM.
- Up to 80MHZ system clock.
- High speed GPIOs (Can toggle at 80MHZ speed).
- 1.6mm FR4 board with top and bottom White silk screen.
- USB Mini connector.
- Powered from USB or external 5V supply.
- Large board Ample prototyping area.
- Board size 3.9×3.15”(100×80mm).
- ICSP/ICD header compatible with pic kit and other popular programmers.
- On board 3.3V precision voltage regulator.
- 8MHZ crystal.

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How to use the module

The following section describes how to use this module.

Components/Tools required

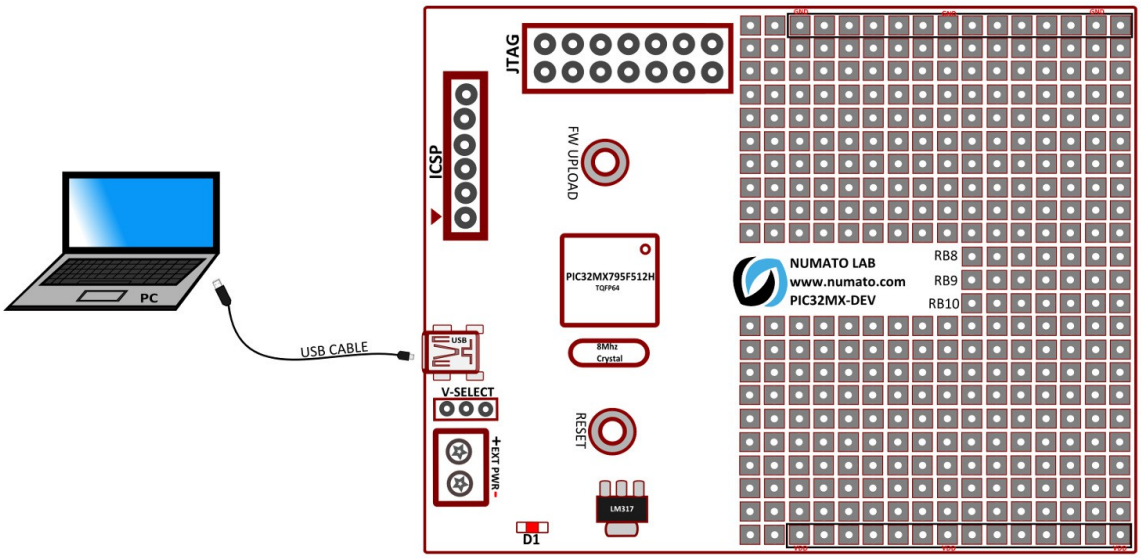
Along with the module, you may need the items in the list below for easy and fast installation.

1. USB A to Mini B cable.
2. Medium size Philips screw driver.

Connection Details

IMPORTANT Please exercise utmost caution while working with electrical mains or other high voltages. Failure to comply with safety regulations may result in injury and or death.

Connection Diagram



Above image shows basic connection diagram that can be used in most of the situations. Use a USB A to Mini B cable for connection to PC. The following sections identify individual connections in detail.

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USB Interface

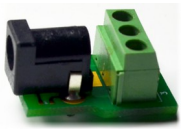
The on board full speed USB controller helps a PC/Linux computer to communicate and control this module seamlessly. Use a USB A to Mini B cable to connect with a PC. By default, the logic section of the module is powered from USB so make sure not to overcrowd unpowered USB hubs(the picture on the right shows USB Mini B connector).

Visit http://numato.com/cables-accessories to buy cables and accessories for this product.

DC Power Supply

This module uses 3.3V precision voltage regulator. **By default the board is configured to use +5V supply from USB. So an external +5V power is not required unless USB port is unable to supply enough current. In most cases USB ports are capable of providing enough current for the module.** If for any reason, an external power supply needs to be used for the logic section of the module, the power select jumper K1 should be configured properly before connecting the power supply. Make sure to connect the power supply in correct polarity. Connect the **positive** terminal of the power supply to the **+5V** terminal on the module.

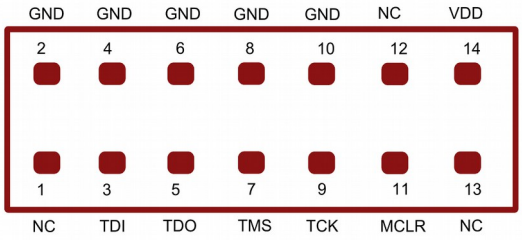
Using a product similar to Numato's DC Barrel Jack Adapter is recommended if the power supply has a Barrel Jack connector (See the image on right).



Connecting power supply incorrectly can cause damage to the module and/or other devices.

JTAG Connector

JTAG connector provides access to Microcontroller's JTAG pins. A XILINX platform cable can be used to for JTAG programming.



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GPIOs

This board is equipped with 47 GPIO pins that can be used for various custom applications. The module has GPIO pins available on separate square pads for easy prototyping. Some of these pins can be used as Analog to Digital Converter inputs as well. In output mode, each digital IOs can source up to 25mA. So no additional circuitry is needed to drive regular LED's. A 470 Ohms series resistor is recommended for current limiting when connecting LED to an IO.

In contrast to GPIOs Analog inputs can read voltages at any level between 0 to 3.3V volts. It is recommended to use a series resistor to protect the input from stray voltages and spikes. The internal Analog to Digital converter supports 10 bits resolution which is adequate for most applications. The table below summarizes the GPIOs input positions on the terminals. Pin assignments on the connectors are available in the tables below.

HEADER P1

Header pin no	Pin Details
1	RG9
2	RB5
3	RB4
4	RB3
5	RB2
6	RB1
7	RB0
8	PGC/RB6
9	PGD/RB7

HEADER P2

Header pin no	Pin Details
1	TDO/RB11
2	TCK/RB12
3	TDI/RB13
4	RB14
5	RB15

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6	RF4
7	RF5
8	RD7
9	RF3

HEADER P5

Header pin no	Pin Details
1	RG8
2	RG7
3	RG6
4	RE7
5	RE6
6	RE5
7	RE4
8	RE3
9	RE2
10	RE1
11	RE0
12	RF1
13	RF0

HEADER P5

Header pin no	Pin Details
1	RD8
2	RD9
3	RD10
4	RD11
5	RD0

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6	RC13
7	RC14
8	RD5
9	RD4
10	RD3
11	RD1
12	RD2
13	RD6

HEADER K2

Header pin no	Pin Details
1	TMS/RB10
2	RB9
3	RB8

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How to upload firmware

Most of Numato Lab's USB based products are shipped with pre-programmed bootloader to help with field firmware updates. Please follow the steps below to update the firmware on your product.

1. **Identify if your device supports field firmware upgrade**

   Only USB based devices support field firmware update at this time. If the device does not have a USB connector, chances are that the device does not support field firmware update. Not all USB based devices guaranteed to have field firmware update support either. If the device support field firmware update, there should be a two pin header or push button switch on board with name similar to “FWUP” or “FWUPDATE”. Thoroughly inspect the board and check if such a header is present. If there is no such jumper is present, chances are that the device does not support field firmware update. See examples of firmware update header below.

2.
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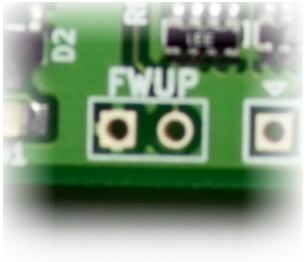

Install prerequisites

The firmware upgrade application currently supported on Windows only. It is important to make sure that all prerequisites are installed before running the application. Following needs to be installed before continuing with firmware upgrade.

- MS VC++ 2008 redistributable package
- MS .Net Framework 2.0

Skip this step if these packages are already installed on your machine. Installers for these two packages are available under “prerequisites” folder in the zip package that is provided with this document. Run the appropriate installers and follow on screen instructions to complete installation.

3. **Connecting your hardware to the PC**

   To activate the bootloader present on the device, press the firmware update push button switch. Once it is short circuited, connect the device to the PC using an appropriate USB cable. Please note that when bootloader is activated, normal features and functions will not be accessible.

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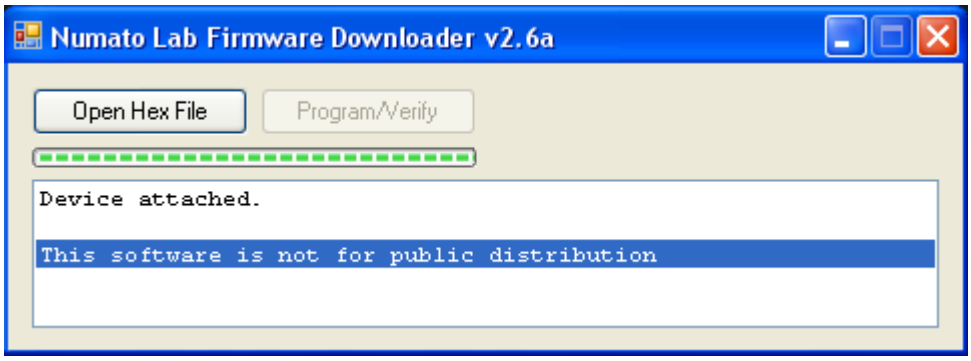
4. Downloading the firmware

Run downloader.exe found under bin folder. If everything is setup correct, you should be presented with the following screen.



If you are unable to run the application, please make sure that all prerequisites are installed. If the “Open Hex File” button is grayed out, it means that the bootloader on the device is not activated. Please make sure that the device support field firmware update and revisit step 4 to properly connect the device to PC.

To download the firmware, click on the “Open Hex File” button, browse and select the hex file for the product. When the hex file is selected, the “Program/Verify” button should activate. Click the “Program/Verify” button to complete firmware download.

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Technical Specifications

Parameter *	Value	Unit
Basic Specifications		
Number of Digital IOs	47	
Number of analog inputs	16	
Digital circuit power supply voltage (External)	5	V
Digital circuit power supply voltage (USB)	5	V
Maximum current drawn by digital circuitry	250	mA
IO Specifications		
Maximum IO source current	25	mA
Maximum IO sink current	25	mA
Digital IO input low voltage	0.8	V
Digital IO input high voltage	3.3	V
Digital IO output low voltage	0	V
Digital IO output high voltage	3.3	V
ADC Specifications		
Resolution	10	bits
Full scale range	0 – VDD	V
Reference voltage	VDD	V
Recommended Impedance of Analog Voltage Source	2.5	KΩ

* All parameters considered nominal. Numato Systems Pvt Ltd reserve the right to modify products without notice.

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FAQ

Q. What is the connector marked as ICSP on this module?
A. This connector is used to program the on-board microcontroller. This connector is primarily intended for factory use.

Q. I need a customized version of this product, can Numato do the customization for me?
A. Yes, we can definitely do customization but there may be minimum order requirements depending on the level of customization required. Please write to sales@numato.com for a quote.

Q. Where can I buy this product?
A. All Numato products can be ordered directly from our web store http://www.numato.com. We accept major credit cards and Paypal and ship to almost all countries with a few exceptions. We do have distributors in many countries where you can place your order. Please find the current list of distributors at http://numato.com/distrib.

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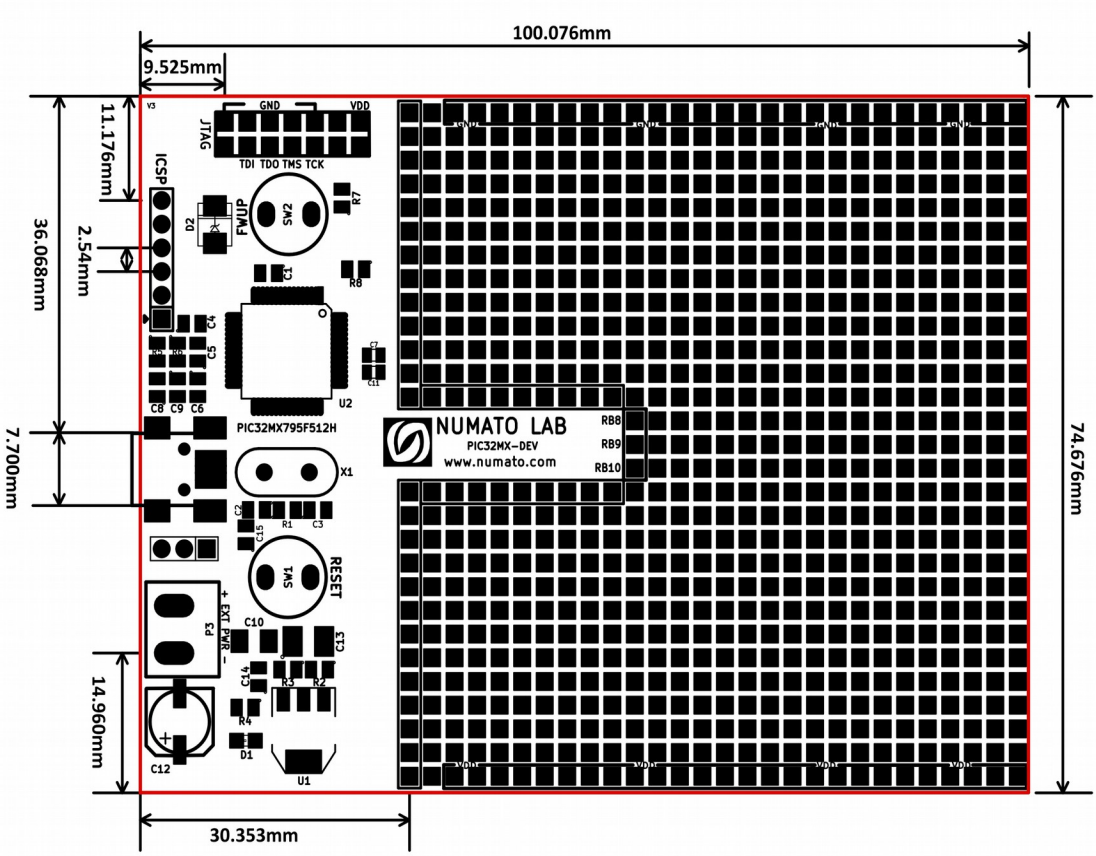
Physical Dimensions



L x W x H :100.076mm x 74.676mm x 15mm

Schematics

See next page.

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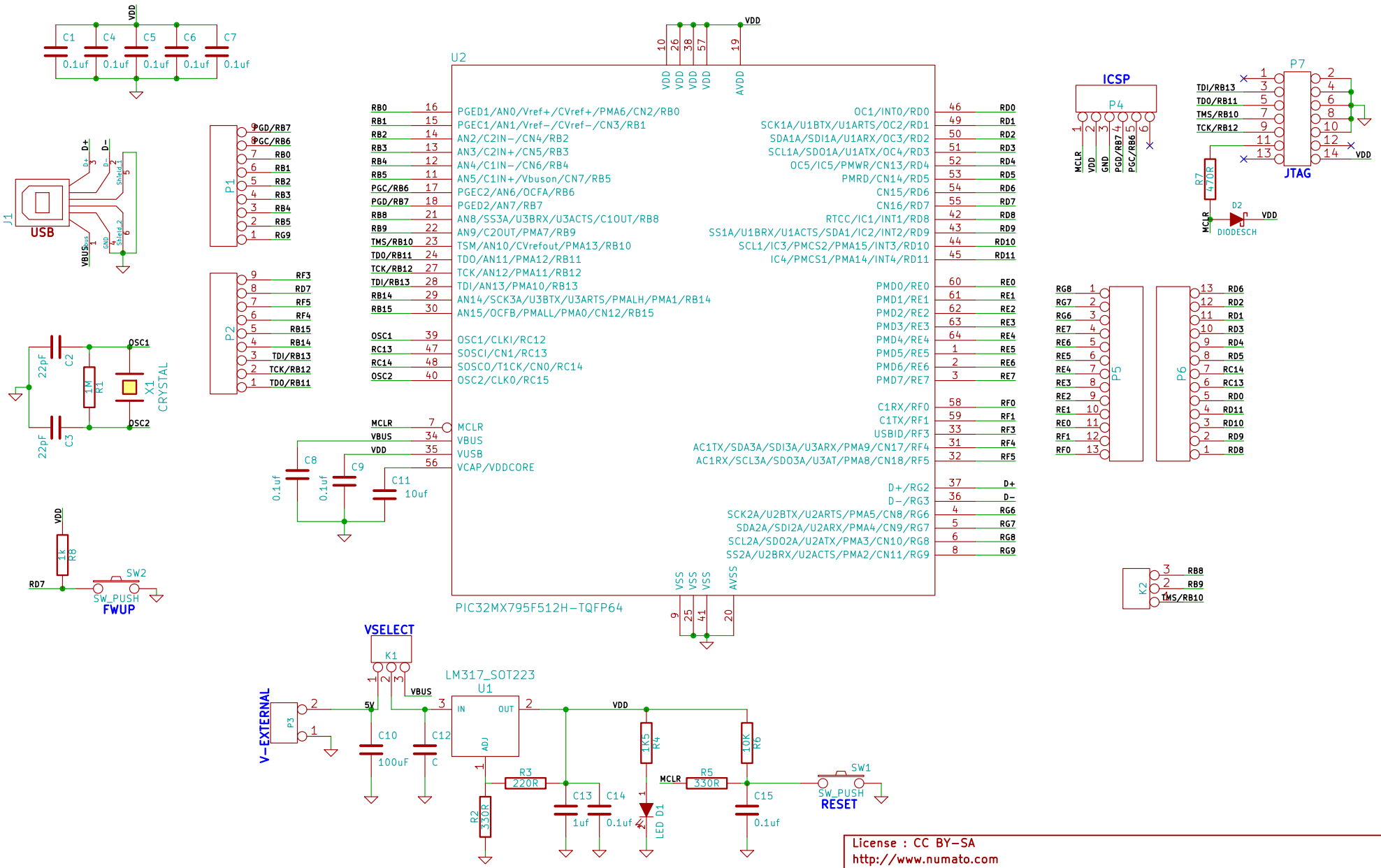

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KiCad E.D.A. | Id: 1/1