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CH341A Mini Programmer Schematic and Drivers

👤 Author: Cornelius (https://www.blogger.com/profile/01946326524810788501)   📅 Posted on: August 05, 2017   🔄 Updated on: January 7, 2018

CH341A is an USB interface chip that can emulate UART communication, standard parallel port interface, parallel communication and synchronous serial (I2C, SPI). The chip is manufactured by Chinese company Jiangsu QinHeng Ltd. (http://www.wch.cn/)

CH341A is used by some cheap memory programmers. The IC is somehow limited in this configuration, because the programmer makes use only of the SPI and I2C interface. A popular device is the so-called "CH341A MiniProgrammer (https://www.banggood.com/USB-Programmer-CH341A-Series-24-EEPROM-BIOS-LCD-Writer-25-SPI-Flash-p-1008191.html?p=DT05143463113201601H)" that you can buy for 2 to 5 USD.

The problem is that this device comes as-is, without any documentation or software. Drivers are available from manufacturer's website (but the site is written in Chinese). Also, some source codes are available from manufacturer. But, first of all, let's have a look at the hardware.

(https://2.bp.blogspot.com/-gweW5sI33Jo/WYXq-vJAEbI/AAAAAAAAHHE/MXFTaSMgVtkn7ueKZdjpzoOu0i7tV_pJQCLcBGAs/s1600/ch341aminiprog.jpg)

A quick look at the board reveals the main electronic parts used: CH341A, a 12 MHz crystal required by the chip, a 3.3V regulator, two 7 pin headers and the ZIF (*zero insertion force*) socket. As you can see, the device also comes with a SMD adapter and some pinheaders for it.

If you search, you will find a schematic (https://pro-electronica.net/schema-programator-ch341a-pentru-memorii-24cxx-si-25qxx/), apparently for this programmer. But a closer look at the PCB revealed that my programmer does not follow it exactly. So, I analyzed the PCB and came up with the following schematic.
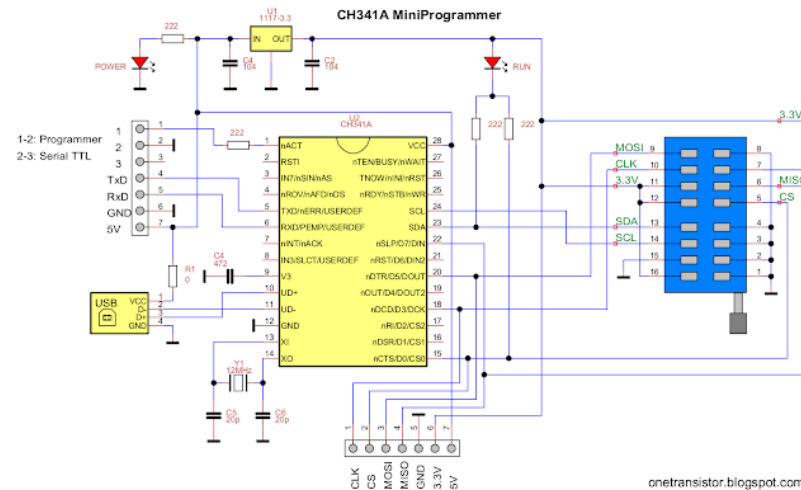
(https://3.bp.blogspot.com/-IAI91QGJdUQ/Wc5_wuQQtlI/AAAAAAAAHYg/uZvr_bMXLWs50NmrMRlCK0gnf4XO8RvDACLcBGAs/s1600/ch341a_miniprogrammer_schematic.png)
CH341A Mini Programmer Schematic

Further searching lead me to WAVGAT store (https://wavgat.aliexpress.com/store/1962508) (on AliExpress). Their product page (https://www.aliexpress.com/item/CH341A-24-25-Series-EEPROM-Flash-BIOS-USB-Programmer-with-Software-Driver/32688496935.html) offered a the PCB design of the device (only top side, however).
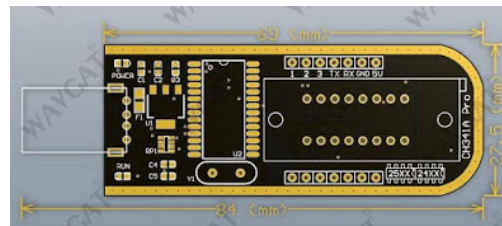
(https://3.bp.blogspot.com/-sfkrBkgzmpE/WYXubi_HEAI/AAAAAAAAHHs/c9lWn074MDc8BRwnBHMVd7UzriD2a8jYACLcBGAs/s1600/ch341a_pcb.jpg)
CH341A Mini Programmer PCB (WAVGAT)

Now, let's return to the schematic and analyze it a bit. The chip is powered from 5V, so its I/O ports will also use 5V. **Basically this is a 5V device.** The problem is that any memory you fit in the socket will be powered from 3.3V. And this seems to be the only function of the 3.3V regulator (besides the 3.3V pin on the SPI connector). I don't know why the designer even used a regulator, if it didn't provide a switch to choose 3.3V or 5V levels and supply.

By reading the datasheet (https://drive.google.com/open?id=0B-RbkSUB_3lUbDVmYzRMekxTWHM), we can see that the manufacturer recommended to connect a 0.47uF capacitor between RSTI (pin 2) and VCC for improved stability. They also forgot this one.

Even so, I used the device with I2C EEPROMS (3.3V and 5V) compatible and also SPI FLASH memories (3.3V devices) without any issues. For improved reliability, **I would recommend using a level shifter.**

In order to turn this programmer into a 3.3V device, you could cut the 5V line from VCC pin (28) and tie it to the 3.3V output from regulator. You will also need to connect V3 pin (9) to VCC (3.3V). Note that the device works as a programmer only if ACT# pin is connected to ground via a resistor. That's why you should put a jumper across pins 1 and 2 of the UART connector. Otherwise the device will be recognized as a standard USB to serial converter.

The manufacturer provides a lot of useful things on the product page. Here are the files you can find and what they contain (**the first two are the ones you need**):

- CH341SER.EXE (http://www.wch.cn/download/CH341SER_EXE.html) - self installing archive with USB to serial driver.
- CH341PAR.EXE (http://www.wch.cn/download/CH341PAR_EXE.html) - self installing archive with multiprotocol interface driver (**this one is for the programmer** mode)

- CH341SER.ZIP (http://www.wch.cn/download/CH341SER_ZIP.html) - archive containing driver files and serial API and library (you don't need specific API for standard serial port, but it contains some special functions to get IC version etc.)
- CH341PAR.ZIP (http://www.wch.cn/download/CH341PAR_ZIP.html) - archive containing driver files for interface mode and API (header and library to access the device and use any protocol you want).
- CH341PAR_LINUX.ZIP (http://www.wch.cn/download/CH341PAR_LINUX_ZIP.html) - archive containing Linux driver source code and Linux API
- CH341SER_LINUX.ZIP (http://www.wch.cn/download/CH341SER_LINUX_ZIP.html) - Linux driver source code for serial port (don't need this one, it's already included in kernels)
- CH341EVT.ZIP (http://www.wch.cn/download/CH341EVT_ZIP.html) - some source code and tools written to be used with an evaluation board (may be useful for programming software that can access this device)
- CH341DS1.PDF (http://www.wch.cn/download/CH341DS1_PDF.html) - datasheet, in Chinese
- CH341DS2.PDF (http://www.wch.cn/download/CH341DS2_PDF.html) - some additional info and API documentation, in Chinese
- CH341DP.ZIP (http://www.wch.cn/download/CH341DP_ZIP.html) - contains an ISP programming tool?
- CH341DPS.ZIP (http://www.wch.cn/download/CH341DP_ZIP.html) - probably similar to the above, but requires login to download

A regular user only needs the first two. Just double click on each of them and when the dialog appears click on Install.

The API becomes interesting due to the versatility of the chip. You can build your own software that will read/write data from/to sensors, real time clocks or any other devices that use serial communication. You can also interface parallel devices to the chip, but this will require modification of the programmer board in order to connect to pins. There are also some other programmers and boards based on this chip. You can find most of them by searching "CH341A" on Banggood (https://www.banggood.com/search/ch341a.html?p=DT05143463113201601H) and AliExpress (https://www.aliexpress.com/af/ch341a.html). Here is an overview:

(https://1.bp.blogspot.com/-RFzfABqVamg/WlEZ-s0FkxI/AAAAAAAAIqg/3L0JBCCQN9sNm4e7ST9Csczwwu7tO1OzgCLcBGAs/s1600/ch341a_products.png)

CH341A Programmers and boards overview

Further reading: I2C Programming (https://onetransistor.blogspot.com/2017/09/ch341a-usb-i2c-programming.html) and SPI Programming (https://onetransistor.blogspot.com/2017/12/ch341a-usb-spi-programming.html) using Windows API.

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Great job. thanks for taking the time to share the information.

Mike Z

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Anonymous May 10, 2018 at 3:35:00 AM GMT+3 (https://www.onetransistor.eu/2017/08/ch341a-mini-programmer-schematic.html?
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I got the software installed, switched it to English from Chinese, and loaded the drivers. I still could not program a 24C32 EEPROM. After some board level troubleshooting I found that pins 1,2,3,4 and 15 were not connected to anything! That said, there was no chip ground and no connections to the 24C32 address lines. One other pin, socket pin 15, (EEPROM chip pin 7) was not grounded. that is the read/write line. After adding several jumpers to ground the programmer worked.

Mike Z

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**jappar (https://www.blogger.com/profile/10263748108999751575)** May 20, 2018 at 6:26:00 PM GMT+3 (https://www.onetransistor.eu/2017/08/ch341a-mini-programmer-schematic.html?showComment=1526830010781#c9062817076332123275)

Nice !!! Great info

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