Emisy project: Flash memory copier/programmer
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In this project I will try to design a system capable of copying EEPROMS , as well as being able to program them using a USB interface.

Marker research

There are many EEPROMS USB programmers on the market, of all types and at all prices. For example, the CH341A series of mini programmers, which are usually sold in Chinese online stores, cost around one dollar, but other more professional models can cost around 50USD. On the other hand, there are almost no EEPROM copiers on the market. In particular I have only managed to find two models:

- Krishna EEPROM copier: Under this name there are several models, in particular I have seen two similar versions, whose only difference is that one has two 8-pin sockets and the other has a single 16-pin ZIF socket on which to put the two EEPROM. These first models seem to work exclusively with 24CXX memories. In addition to these two versions I have seen a third version completely different and apparently more modern as its price goes up, the price of the older versions is 4.00USD to 8.00USD depending on the seller and the price of the modern one is 79.00USD.

- EON25: A product without significant variations between models, probably discontinued since I haven't been able to find a price on it.

Regarding a device capable of copying and programming EEPROMS, I have only been able to find one product on the market:

- FLAMEER EZP201: An apparently somewhat old product that costs about 20 dollars and is capable of working with EEPROMS from the 24Cxx 25Cxx 93Cxx 25Lxx family.

Analysis of the project

Seeing that there is only one product like the one I intend to design, it would be interesting to try to improve some aspects of that product. I'm pretty sure it's possible to reduce the price and add a better user interface with an LCD. However I will limit myself to the 24CXX family EEPROMs because they work using I2C so I can use only two pins from the MCU.

Having specified the objective of the project we can start to see certain characteristics that the circuit must have:
- A usb interface for the microcontroller
- A microcontroller with i2c support
- An alphanumeric lcd display capable of showing different messages

- Ideally the circuit should operate under the same voltage, so the components should be able to work with 5V

Component selection:

- EFM8BB21F16G-QSOP24: A modern 8051 microcontroller, can work at various voltages, including 5v, which can help simplify the design of the circuit, has UART interface, the number of pins required for this project and also is relatively inexpensive.

- FT232RL: Integrated circuit that provides a USB interface to the microcontroller.

- 16 x 2 LCD Display: An 16 x 2 alphanumeric LCD display, used to show different messages, for example WC1602A.

- TXB0108 8-Bit Bidirectional Voltage-Level Translator: A voltage level translator to be able to connect the LCD and the MCU

- 8 pin DIP socket: Component that allows the connection between the EEPROMs and the rest of the circuit. Two units are required.

- Type A USB connector: Component to enable the circuit to be connected to a computer.

- SPST switch: on/off button.

- Potentiometer: Used to control the contrast of the LCD screen.

- Two jumpers that allow to select the working voltage of the EEPROMs

- 12MHz crystal oscillator to be used by the FT232RL

- Components to connect the rest of the parts:

  - 2 x 3.3k resistor
  - 8k resistor
  - 100nf capacitor
  - 0.1 nf capacitor

Detailed circuit diagram
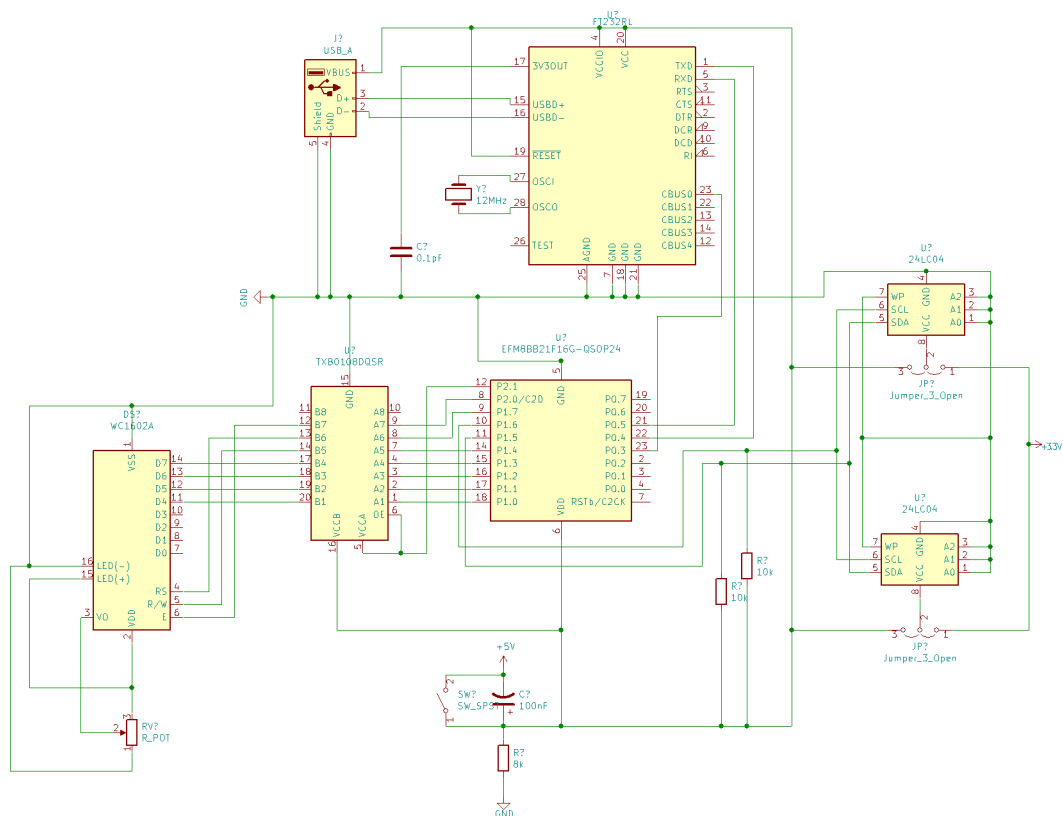
Diagram description

The circuit consists of a switch with its debouncing circuit, which controls access to the power supply and consequently acts as an on/off switch. Next we have the central part of the circuit, the microcontroller, which must be configured to work with 5v. To this microcontroller we connect:

- The EEPROMs by I2C. These flash memories have a jumper that allows to select the working voltage.
- The FT232RL by UART. Also we use CBUS0 pin as a clock source to the MCU.
- The LCD display in 4 bit mode. In order to communicate with the MCU, the LCD display uses the TXB0108 voltage level regulator.

The FT232RL is connected to the USB to provide the circuit with connectivity to a computer. The LCD is also connected to a potentiometer for contrast control.

Block diagram for the algorithm

```
                        Start
                          |
                          v
                 ┌──────────────────┐         ┌──────────────────┐
                 │  Is USB plugged? │── No ──>│   Is there an    │── No ──> ┌──────────────────┐
                 └──────────────────┘         │  EEPROM in both  │          │  Display error   │
                          │                   │     sockets?     │          │message on the LCD│
                         Yes                  └──────────────────┘          └──────────────────┘
                          │                            │
                          v                           Yes
           ┌──────────────────┐                        │
  No ──────│   Is there an    │                        v
           │   EEPROM on the  │              ┌──────────────────┐
           │   first socket?  │              │ Start copy process│          ┌──────────────────┐
           └──────────────────┘              └──────────────────┘          │ Show copy status on│
                                                      │                     │        LCD         │
                                                      v                     └──────────────────┘
 ┌──────────────────┐              ┌──────────────────────────┐                      ^
 │  Display error   │              │ Read Bytes from the first │        ┌──────────────────┐        ┌──────────────────┐
 │message on the LCD│              │ EEPROM until the RAM is   │─────> │  Is the EEPROM   │─ Yes ─>│ Show copy finished│
 └──────────────────┘              │ full and write them on the│       │ completely copied?│        │message on the LCD│
                                   │   second EEPROM           │       └──────────────────┘        └──────────────────┘
                                   └──────────────────────────┘                 │
                                            ^                                   No
                                            └───────────────────────────────────┘
```

Start write image process

Show copy status on LCD

Read data from USB and write it to the EEPROM

Show write finished message on LCD