GCM

Datasheet

-

Version 5.x

This document has been made with LibreOffice.

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Description

The GCM or G_CardMother is a custom, from scratch, with no micro-controller, only made with logic circuits, 8bits motherboard.

This project is one part of a larger project which is the complete development of a home-made 8bits computer.

One of the goals is to create a new community around 8bits computers with a set of electrical/mechanical standards and projects in order to be able to create a simple and practical environment for all interested persons, whether they are hobbyists or not.

Features

- Follow the **MOM1_SPS1***[1] standard.

- A controllable frequency of 50Mhz divisible by multiples of two up to a division of 65536.

- The same separate controllable frequency divisible by multiples of two for peripherals.

- 4 peripherals slot (that follow standard **PP1***[1]).

- 2 **MM1***[1] memory slot with address extension.

- Readable code source switching from the 2 memory slot.

- Redirection of the writing buses.

- Accessible debug pins.

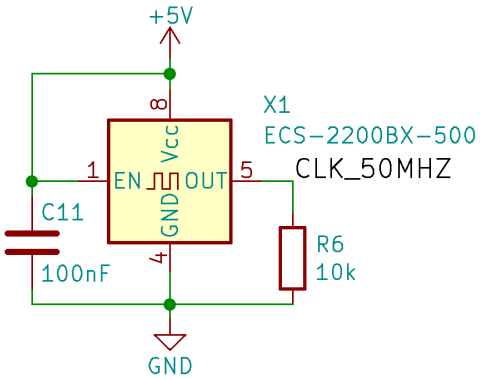
*[1] You can find the standard here:

https://github.com/JonathSpirit/GComputer_standard

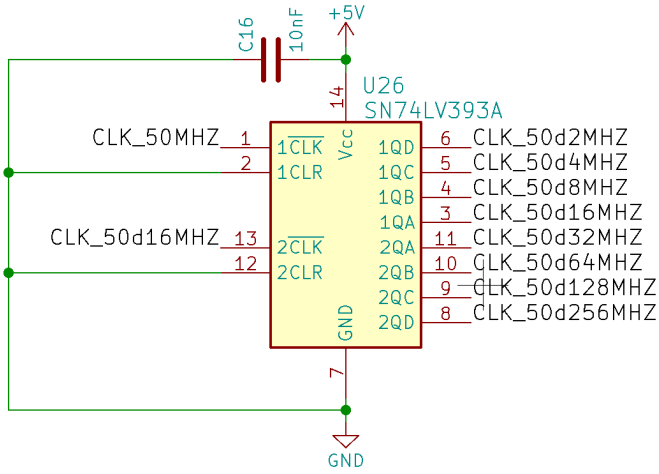
Details

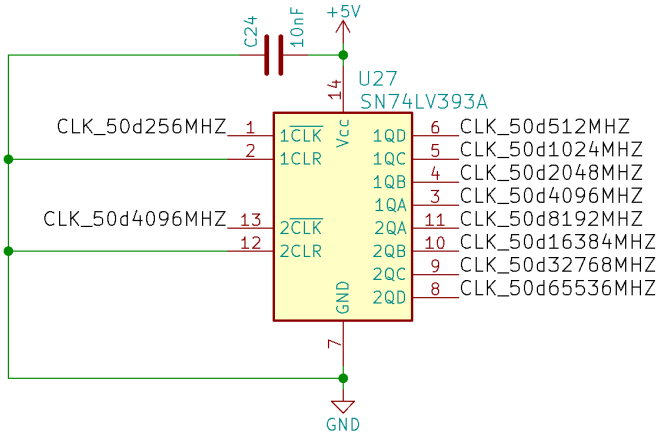
Clock generation

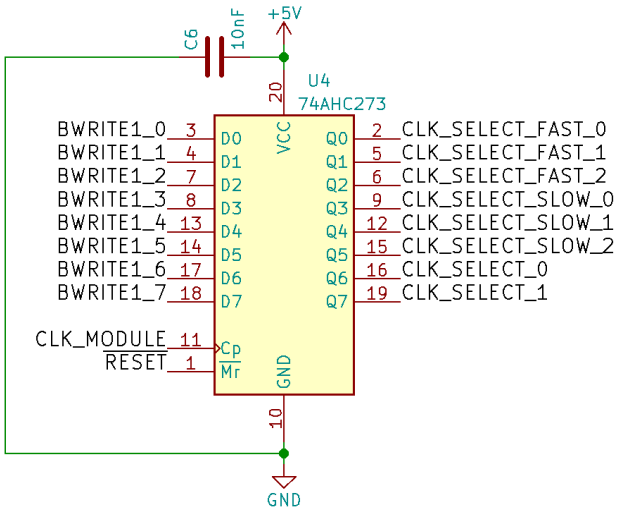
The frequency of the processor is generated via a 50Mhz crystal oscillator.



The 50Mhz frequency is then divided by 4 4bits counter for achieving a division of 65536.



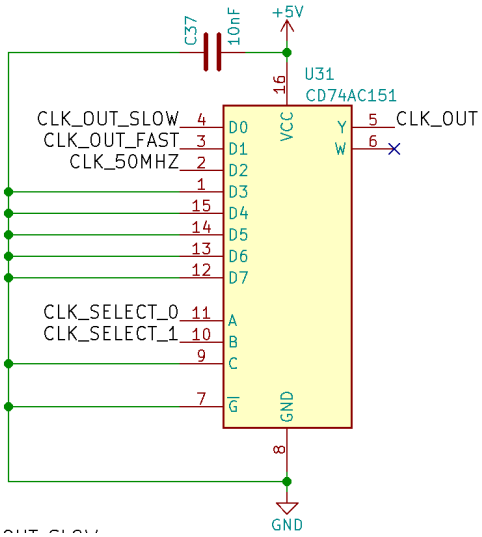




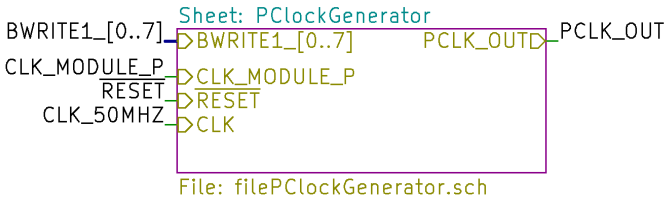
You can control what division you want by applying a byte on the D-latch register ‘U4’ and by selecting the module/peripheral 7.

The default frequency is 50Mhz /65536 every power reset.

After the selection (latch) of a new frequency, the system send a light reset signal.



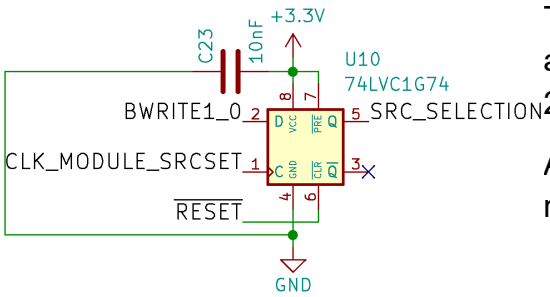
You can control separately the peripheral clock division by selecting the module/peripheral 8.



Processor/Peripheral frequency and configuration			
Division	**Frequency [f] = kHz**	**Configuration binary**	**Configuration hex**
1	50’000	10xx’xxxx	0x80
2	25’000	01xx’x111	0x47
4	12’500	01xx’x110	0x46
8	6250	01xx’x101	0x45
16	3125	01xx’x100	0x44
32	1562.5	01xx’x011	0x43
64	781.25	01xx’x010	0x42
128	~390.625	01xx’x001	0x41
256	~195.313	01xx’x000	0x40
512	~97.656	0011’1xxx	0x38
1024	~48.828	0011’0xxx	0x30
2048	~24.414	0010’1xxx	0x28
4096	~12.207	0010’0xxx	0x20
8192	~6.104	0001’1xxx	0x18
16384	~3.052	0001’0xxx	0x10
32768	~1.526	0000’1xxx	0x08
65536	~0.763	0000’0xxx	0x00
-	0	11xx’xxxx	0xC0

Source switching

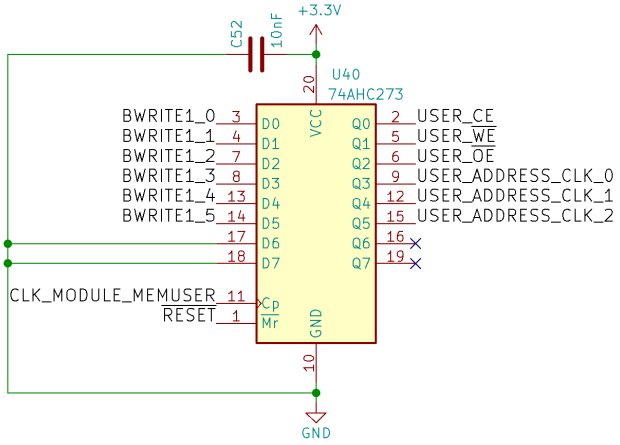
You can choose to execute a code in memory slot 1 or from memory slot 2.



To do that you have to select peripheral/module 6 and apply a value of ‘0’ (memory 1) or ‘1’ (memory 2).

After applying the value the system send a light reset signal.

When a memory is in used for code execution you cannot control it. You can, however, control the unused memory by selecting the peripheral/module 5.

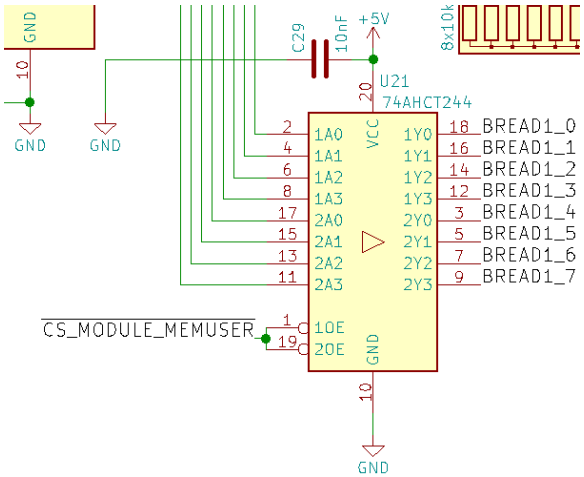


You will be able to control all of the memory control pins and the 24bits address bus.

The “chip enable” pin is inverted.

To read the unused memory, select the peripheral/module 5 and set the “output enable” and the “chip enable” pin to ‘0’.

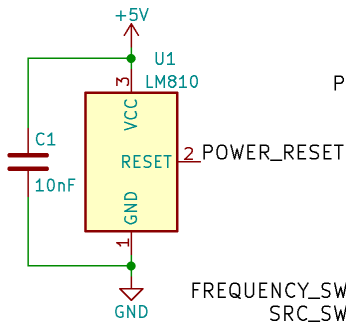
The value will be on the “BREAD1” bus.



Reset

There are 2 different types of reset :

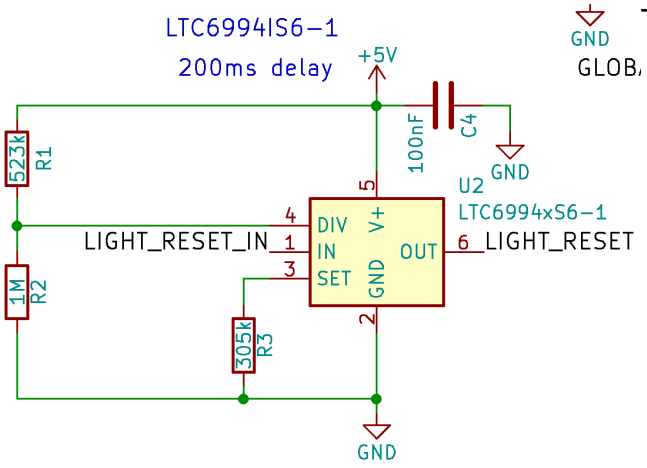
The power reset who is executed only after powering up the motherboard.



The LM810 chip sent a ~240ms pulse.

Device	Is reset?	Reset value
Processor clock	yes	0x00 (50Mhz /65536)
Peripheral clock	yes	0x00 (50Mhz /65536)
Processor	yes	-
Peripherals	yes	-
Address counter	yes	0x000000
Memory controller	yes	0x00
Source selection	yes	0 (Memory slot 1)

And the light reset who is executed after a source or clock change.



The LTC6994-1 chip sent a ~200ms pulse.

Device	**Is reset?**	**Reset value**
Processor clock	**no**	0x00 (50Mhz /65536)
Peripheral clock	**no**	0x00 (50Mhz /65536)
Processor	yes	-
Peripherals	yes	-
Address counter	yes	0x000000
Memory controller	**no**	0x00
Source selection	**no**	0 (Memory slot 1)

Fabrication

Getting the PCB

Fabrication files can be found in the folder: “documents/GCM_gerbert”.

For JLCPCB or other manufacturers, you can zip the fabrication folder and send it to them directly.

Getting the materials

A bill of materials can be found here: “documents/GCM_materials”. Note that if you want to change the supplier, you have to make sure that the component is fully compatible mostly for the package.

Soldering

If you solder the board manually, a microscope can be useful for small component like the CPLD.

Follow the bill of materials and the PCB placement file to solder the board.

I suggest you start with the CPLD and finish with the connectors.

Changes

Revision 0:

initial release