Ethernet - Controller

For the MyCPU

- Selfbuild Guide -

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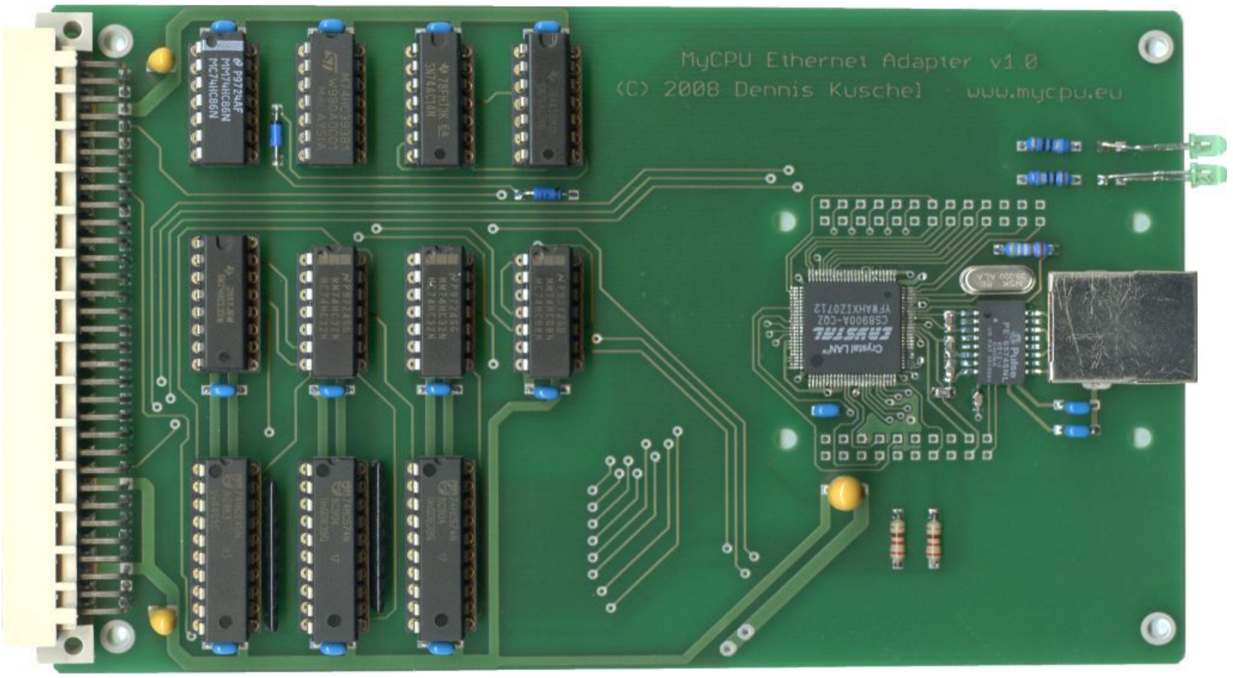
MyCPU Ethernet Adapter v1.0
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uses `/IOEN1:2400h-24FFh` and `IRQ4`

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1 Overview

The Ethernet Controller is a standard 10BaseT Ethernet Interface for the MyCPU System. Together with the appropriate software the MyCPU can be turned into a HTTP Webserver. Currently a Webserver and a Telnet Demon are available, more network enabled software will follow.

The Interface Board is based on the well-known CS8900A-chip from Cirrus Logic. Because the Chip is only available in a SMT package the board is prepared to carry a ready-assembled piggyback. The main function of the board is to adapt the MyCPU bus to the 16 bit ISA like bus of the CS8900A.

Before constructing the Ethernet Interface Board please decide how to connect the CS8900A: Either use the ready-assembled piggyback board, or try to obtain all critical parts yourself and use a professional manufactured PCB. The critical parts are the chip itself, the transformer and the RJ45 jack. A professional manufactured board makes it easier to solder the Ethernet chip because of the solder stop mask.

Hard to obtain parts are:

- `CS8900A-CQ` or `CS8900A-IQ` (**not** the CQ3 or IQ3 -versions!)
- Transformer `BEL S553-0716-00` or `PULSE PE65745`
- Matching RJ45 jack, for example `Conrad 922647-62` in Germany

All special parts can be ordered at http://www.segor.de (Germany only).

Alternatively, you can use this type of piggyback board:

NOTE:
The piggyback board is no more manufactured. You will need to solder the SMD parts directly to the PCB. Maybe you can ask somebody to solder them for you.

2 Board

2.1 Ethernet Controller – SMD/universal version

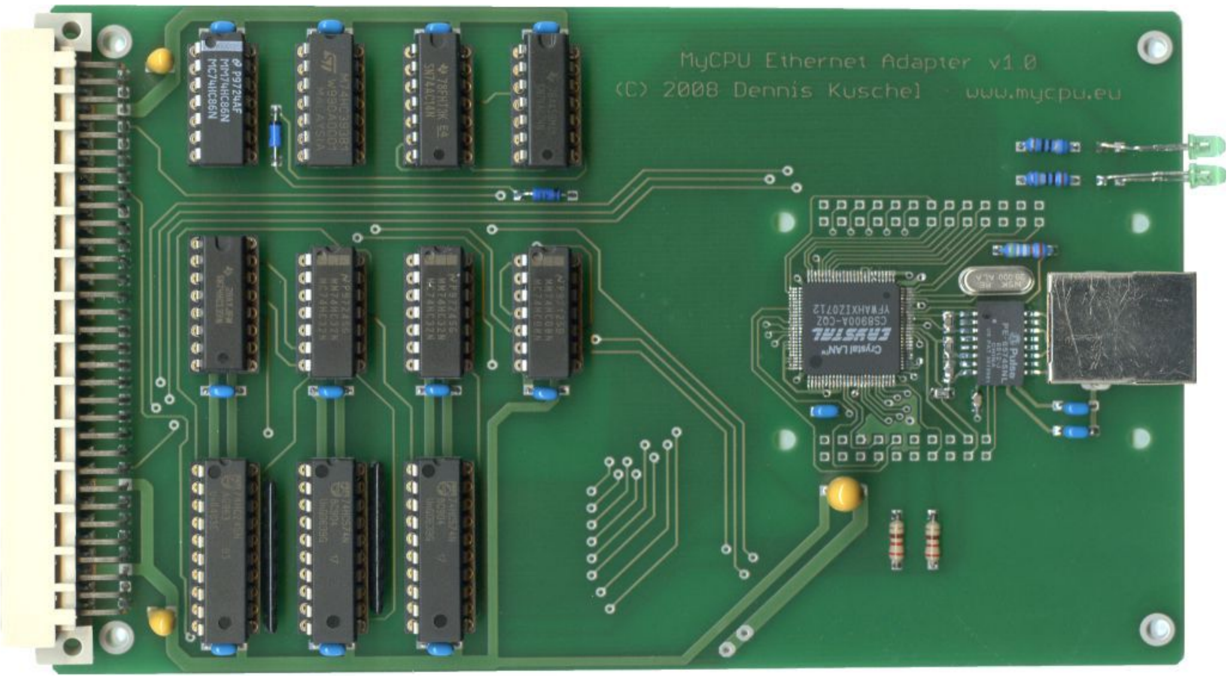
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Fig. 1: Ethernet Controller Board populated with SMD

2.1.1 Description

This is the SMD version of the Ethernet Controller Board. The Chip CS8900A is directly soldered onto the board. Note that this board can also be populated with a piggyback board that carries the CS8900A. A further configuration is to use the piggyback but putting the RJ45 jack down onto the base board. Please see the documentation and schematics of the piggyback board for details.

2.1.2 Selection of Components

There are two 74ACxxx gates used in the circuit. This gates can safely be replaced by their 74HCxxx counterparts, but this may result in a bit unstable behaviour of the Ethernet controller at high CPU clock frequencies (6MHz and above).

2.1.3 Placement of Components

After you have soldered all VIA's, you can continue with the integrated circuits. I strongly recommend you not to use sockets for the IC's because it is nearly impossible to solder all sockets correctly to a self-etched PCB. A manufactured PCB does not have this limitation. If you wish to use sockets anyway, you must use the high precision sockets. Only the high quality sockets allow you to solder the pads on the top side of the board. I recommend you to follow the placement order I have noted in the placeplan below (see blue numbers, and start with the IC that has the blue number 1). When all IC's are placed and soldered, you can continue to place the capacitors. In the last step the resistors, diodes and board connectors are placed and soldered.

ATTENTION!
Please be careful, and don’t forget to solder a pad on the top side of the board. I have marked all critical pads with red colour in the placeplan below. Please check if you have really soldered these pads! Some pads need a rivet to be soldered correctly.

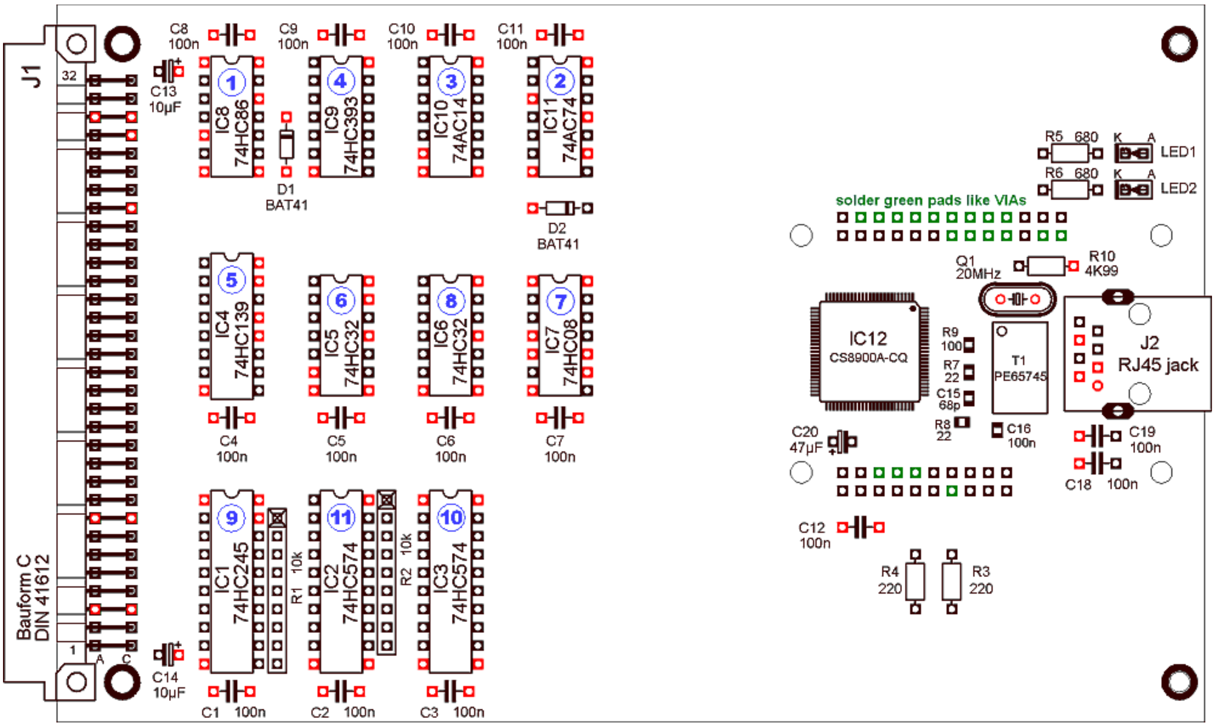

Fig. 2: Placeplan for SMD version, top side

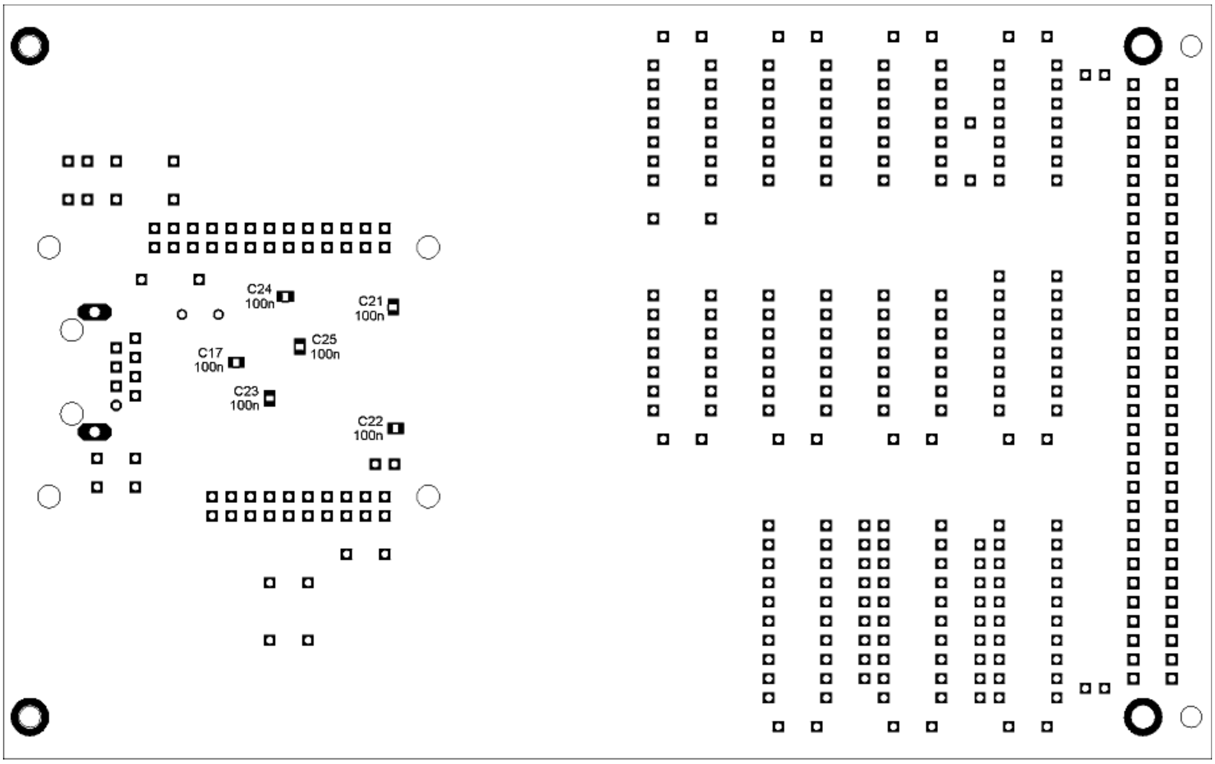

Fig. 3: Placeplan for SMD version, bottom side

2.1.4 Partlist: SMD version

Through-Hole Parts		
74HC08	IC7	
74AC14	IC10	
74HC32	IC5, IC6	
74AC74	IC11	
74HC86	IC8	***must be a 74HC type***
74HC139	IC4	
74HC245	IC1	
74HC393	IC9	
74HC574	IC2, IC3	
BAT41	D1, D2	
green LED, 3mm	LED1, LED2	
220 Ohm	R3, R4	
680 Ohm	R5, R6	
4,99 kOhm, 1%	R10	
SIL 8 x 10 kOhm	R1, R2	
100nF, ceramic capacitor	C1 - C12	
100nF, 2kV	C18, C19	
10µF / 16V, tantal	C13, C14	
47µF / 10V, tantal, 2.5mm pitch	C20	
Crystal 20.0000 MHz, HC49U-S	Q1	
DIN 41612 Connector	J1	
RJ45 jack	J2	

SMD 0805 Parts	
22 Ohm	R7, R8
100 Ohm	R9
68pF	C15
100nF	C16, C17, C21-C25

Other SMD		
CS8900A-CQ	IC12	
PULSE PE65745	T1	or BEL S553-0716-00

3 Using the Ethernet Controller

The Ethernet Controller enables the easy data exchange with the MyCPU through a network connection. The services that are currently available are TELNET, HTTP, FTP and DHCP.

3.1 Ethernet Driver

A software driver is required to be able to use this Ethernet Controller together with the existing network software on MyCPU. This is because the Ethernet Controller is not supported by the Operating System Kernel itself.
Please download the latest software release from http://www.mycpu.eu, and install the files on your MyCPU-harddisk or CF-card. The shell-script “`copy8`” may help you.
When you have the latest software installed, you should find the file “sl26cs89” in the directory `8:/bin/lib`. This is the driver for the Cirrus Logic chip.

3.2 Configuration

To install the driver, please edit the file `8:/etc/netconfig`:

```
###  This file is used to configure the TCP/IP network  ###
# Note: The virtual network is not supported under Linux  #

# Set the device driver library (SL25 is SLIP, SL26 is Ethernet).
#devicelib = SL25                <- comment this line out
devicelib = SL26                 <- comment this line in

# Set the MAC address for the ethernet card.
macaddress = 00-17-9d-2e-34-14   <- enter the MAC-Address here

# Set the IP address configuration.
# Care must be taken if you want to use this MyCPU emulator
# with your private ethernet network. You must assign the
# MyCPU-System an uniqe IP address, that means the IP
# must be different from the IP that is assigned to the
# host on which the emulator runs on. Lets assume your
# PC is configured for IP 192.168.1.22 with Gateway
# 192.168.1.1 and subnet mask 255.255.255.0, then you
# may configure the MyCPU-System like this:
ipaddress  = 192.168.1.35        <- set your IP configuration here
gatewayip  = 192.168.1.1         <- ”
subnetmask = 255.255.255.0       <- ”
```

Note:
If you bought the piggy-back board you should have gotten a paper with a printout of the MAC-Address that is programmed into the EEPROM on the board. Please enter this address into the `netconfig` file. If you do not have bought the piggy, you can leave the default MAC-Address in the config file untouched.

3.3 Starting the Network Services

To start the network services, type “`net start`” at the prompt. This will start the TCP/IP-Stack and the network driver. You should get only a single message telling you the network was successfully started. When you now type “`mem -t`” you will get a list with all services currently loaded to memory. Please check if the driver “sl26cs89” is listed. If so, congrats to you, your network board is working!

To start further network services such as the http webserver or telnet, type

“`net start telnet`”	to start the telnet demon (and the TCP/IP-Stack if not yet done),
“`net start httpd`”	to start the http server in background (and the TCP/IP-Stack),
“`net start all`”	to start all: TCP/IP, telnet and http server.

To stop a network service, type

“`net stop telnet`”	to stop the telnet demon,
“`net stop httpd`”	to stop the http server,
“`net stop`”	to stop all network components.

Note that the telnet demon is started without password identification. To activate the password identification start the telnet demon manually with login and password as parameter: “`telserv login:password`”.

The http webserver is configured by the script `/etc/httpservcfg`. Use the text-editor “edit” to change the configuration. To start the http webserver manually, type “`httpserv`” at the shell prompt. To start the server in the background, type “`net start httpd`” or type “`httpserv -d`”.

3.4 First Test

After you have configured the TCP/IP-Stack by “`edit etc/netconfig`”, start the network by entering “`net start`” at the shell prompt. Make sure your MyCPU Ethernet Controller is connected to your private LAN and use the tool “ping” to test network connection:

```
8:/> ping 192.168.178.1
```

The IP-address following the ping command must be (of course) the one of your desktop PC. You should get an echo from the desktop PC (or Laptop or Router or whatever).

Note that currently no DNS translation is implemented, thus you are required to type in the IP-Address, computer names or domains are not resolved.

Further useful network commands are

“`netstat`”	to display the current network status,
“`arp -a`”	to display the currently cached MAC addresses.

Type “`netstat /?`” and “`arp /?`” to get more information about the usage of the commands.

4 Registers

4.1 Overview

Address	**Register Name**	**Rd/Wr**	**Function**
`2400h`	`REG_IOP_TX_RX`*	`R/W`	TX/RX FIFO Register
`2404h`	`REG_IOP_TX_CMD`*	`R/W`	TX Command Register
`2406h`	`REG_IOP_TX_LEN`*	`R/W`	TX Length Register
`2408h`	`REG_IOP_ISQ`*	`R`	Interrupt Service Queue Register
`240Ah`	`REG_IOP_ADD`*	`R/W`	PacketPage Address Register
`240Ch`	`REG_IOP_DATA`*	`R/W`	PacketPage Data Register
`2480h`	`REG_HIGHBYTE`	`R/W`	High-Byte for 16 Bit transfers

* This registers are part of the CS8900A chip. Please see the datasheet of the chip for details. You can download the datasheet at http://www.cirrus.com/en/support/

4.2 REG_HIGHBYTE

This register enables the access to the higher data bits for the 16 bit transfer from or to the Ethernet chip. The lower 8 bits can be directly accessed by reading/writing the appropriate registers from 2400h to 247Fh. Write the higher 8 bits to this register before writing the lower 8 bits to any of the other registers. Read the higher 8 bits from this register after you have read the lower 8 bits from any other register.

5 Schematics

On the following page you will find the schematics of the Ethernet Controller Board. The PCB layouts can be found in two separate PDF files: EthCtrl_Layout_smd.pdf contains the layout for the universal board that can directly be populated with the CS8900A chip, and EthCtrl_Layout_piggy.pdf is the layout for the piggyback version.

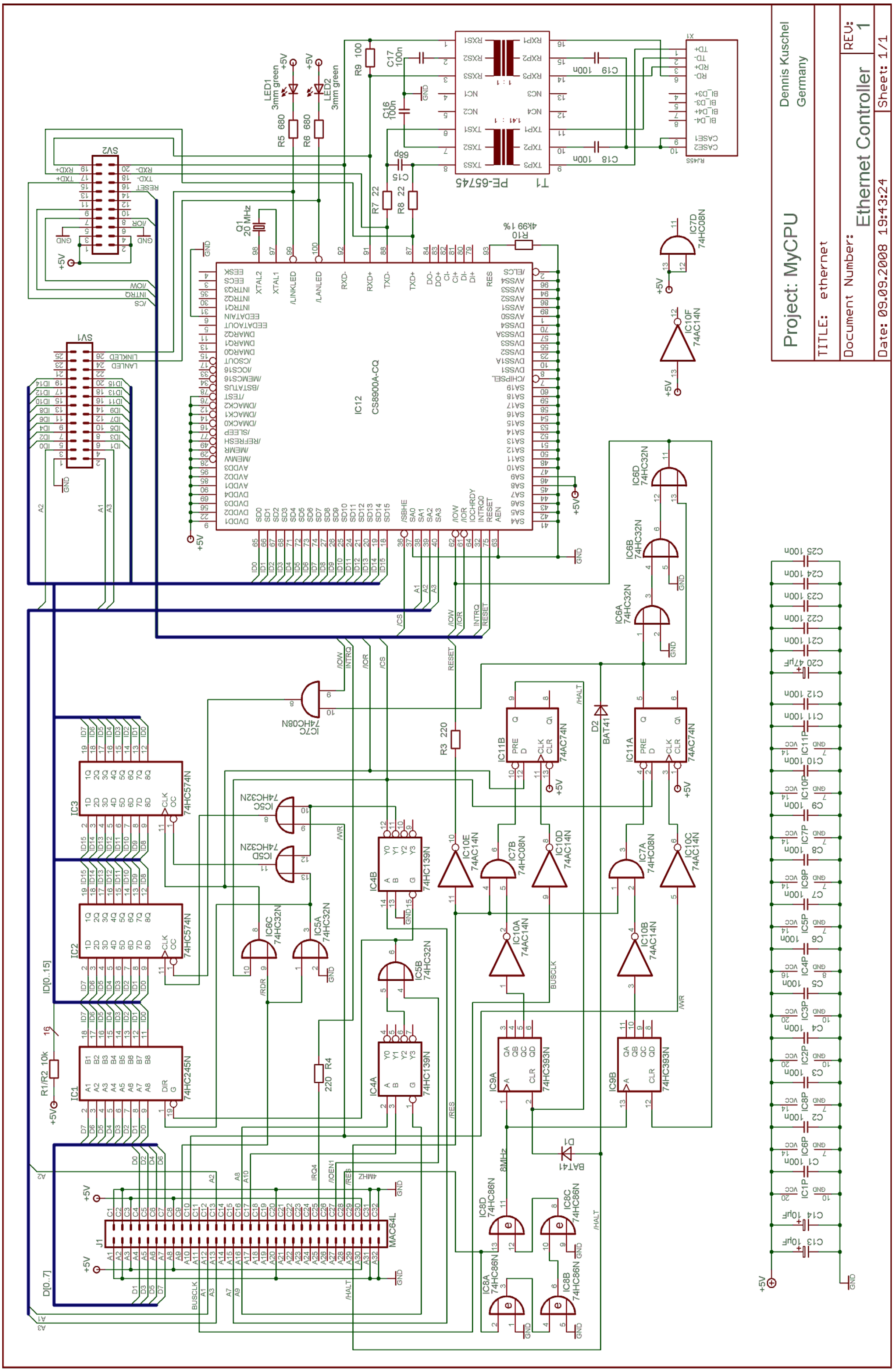

Fig. 4: Schematic of the Ethernet Controller Board

6 Change Log

6.1 Changes in the Ethernet Controller design

Date	**Name**	**Chapter**	**Description**
2008-11-16	D.Kuschel		Initial version
2008-12-20	D.Kuschel	all	Document converted to OpenOffice format
2015-07-14	D.Kuschel		Document revised, piggyback version removed