# CPU301/302
# Design document

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| Name: | CPU301/302 Design document |
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| Version: | 1.1 |
| Document ID: | 1-0216 |
| Status: | Approved |

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## 1 REVISION HISTORY

Changes from version 1.0 to 1.1:

The reference list has been updated.

The LED labels have been changed.

Version 1.0:

Although this is the initial version of the document it is based on the MCU301 Design document from which it differs in the following respects:

The local bus has been changed to all BTL, thus the global and local bus are symmetrical.

All processor modules on a base module must have the same secondary cache size, thus reducing the number of sets of snooper address jumpers from two to one.

The CPU301 and CPU302 support 1-MB and 4-MB secondary cache, respectively, thus the above set of jumpers is fixed for each module.

The boot PROM is a flash EEPROM for re-use.

## 2 REFERENCES

1. MCU301/302/304 Kravspecifikation
   1-0101

2. SPC/3 System bus specification
   1-0201

3. MIPS R4000 Microprocessor User's Manual
   Integrated Device Technology, Inc.
   Part number M8-00040

4. MIPS R4000 Microprocessor User's Manual Errata
   Revision 2.0
   March 13, 1992
   MIPS Technology Products Group

5. CPU Agent Design document
   1-0203

## 3 INTRODUCTION

The CPU module for the SPC/3 computer series consists of a base module CPU301/302 and one to four detachable processor modules, e.g. PMD301 with a 75-MHz R4400MC and 1-MB secondary cache. CPU301 and CPU302 support 1-MB and 4-MB secondary caches, respectively. The base module takes up one backplane position.

Each of the up to four processors modules connects to a global and a local bus interface through two agents. These identical agents, which are implemented with highly complex gate arrays, provide data buffers, address registers, and control for the commands that originate in the associated processor and for those commands on the associated bus that require cache coherency.

Both the global and local bus interface are BTL.

There is a global control space, which may be accessed by all processors and from the global bus, and contains the following special registers intended for identification, control, error logging, interrupt, and debugging. There are a control, interrupt, and debug register for each subposition corresponding to each possible processor module.

Status register
Control register
Module ID
Module FCN
Interrupt register
Debug register
Processor module identification register
Bus error register

Similarly, there is a local control space, which, however, only provides Interrupt registers.

In addition to the control spaces there are separate address spaces for the internal registers of each agent, these may only be accessed by the associated processor.

The module is equipped with a 1/2-MB detachable boot flash EEPROM, which is common to all processors.

Finally, the choice of little or big endians is made by a fixed signal on the bus.

# 4 SPECIFICATIONS

## 4.1 Performance

| | |
|---|---|
| Bus frequency | 33.3 MHz |
| Bus burst rate | 267 MB/s |
| Bus read rate (32 words) | 178 MB/s |
| Bus write rate (32 words) | 213 MB/s |

## 4.2 Secondary cache requirements

| | |
|---|---|
| Block size | 32 words |
| Cache size, CPU301 | 1 MB |
| Cache size, CPU302 | 4 MB |

## 4.3 Interfaces

System bus interface:

SPC/3 system bus [2], both global and local bus.

Indicators on front panel:

| | |
|---|---|
| PARITY ERROR | Red LED that indicates a parity error on the global or local bus. |
| ERROR(0-3) | One red programmable LED per processor. |
| BUSY(0-3) | One green programmable LED per processor. |
| A(0-3) | One green programmable LED per processor. |
| B(0-3) | One green programmable LED per processor. |

Internal processor/base module interface:

| | |
|---|---|
| SAD(63:0) | System interface address/data |
| SADP(7:0) | System interface address/data parity |
| SCMD(8:0) | System interface command |
| SCMDP | System interface command parity |
| /VALIN | System interface valid to processor |
| /VALOUT | System interface valid from processor |
| /EXTRQ | System interface request from agents |
| /RELEASE | System interface release from processor |
| /RDRDY | Read ready |
| /WRRDY | Write ready |
| /IVDACK | Invalidate acknowledge |
| /IVDERR | Invalidate error |
| RCLK(1:0) | Receive clocks (identical) |
| TCLK(1:0) | Transmit clocks (identical) |
| /INT | Error interrupt |
| /NMI | Non-maskable interrupt |

| | |
|---|---|
| SRE | Selective reset |
| C2MS | 2-ms period clock |
| C262MS | 262-ms period clock |
| | |
| PM_ID(3:0) | Processor module identification |
| /PRESENT | Processor module present |
| BIG | Big endian |

## 4.4 Dimensions

| | |
|---|---|
| Board height | 415.0 mm |
| Board depth | 335.0 mm |
| Module pitch | 30.0 mm |

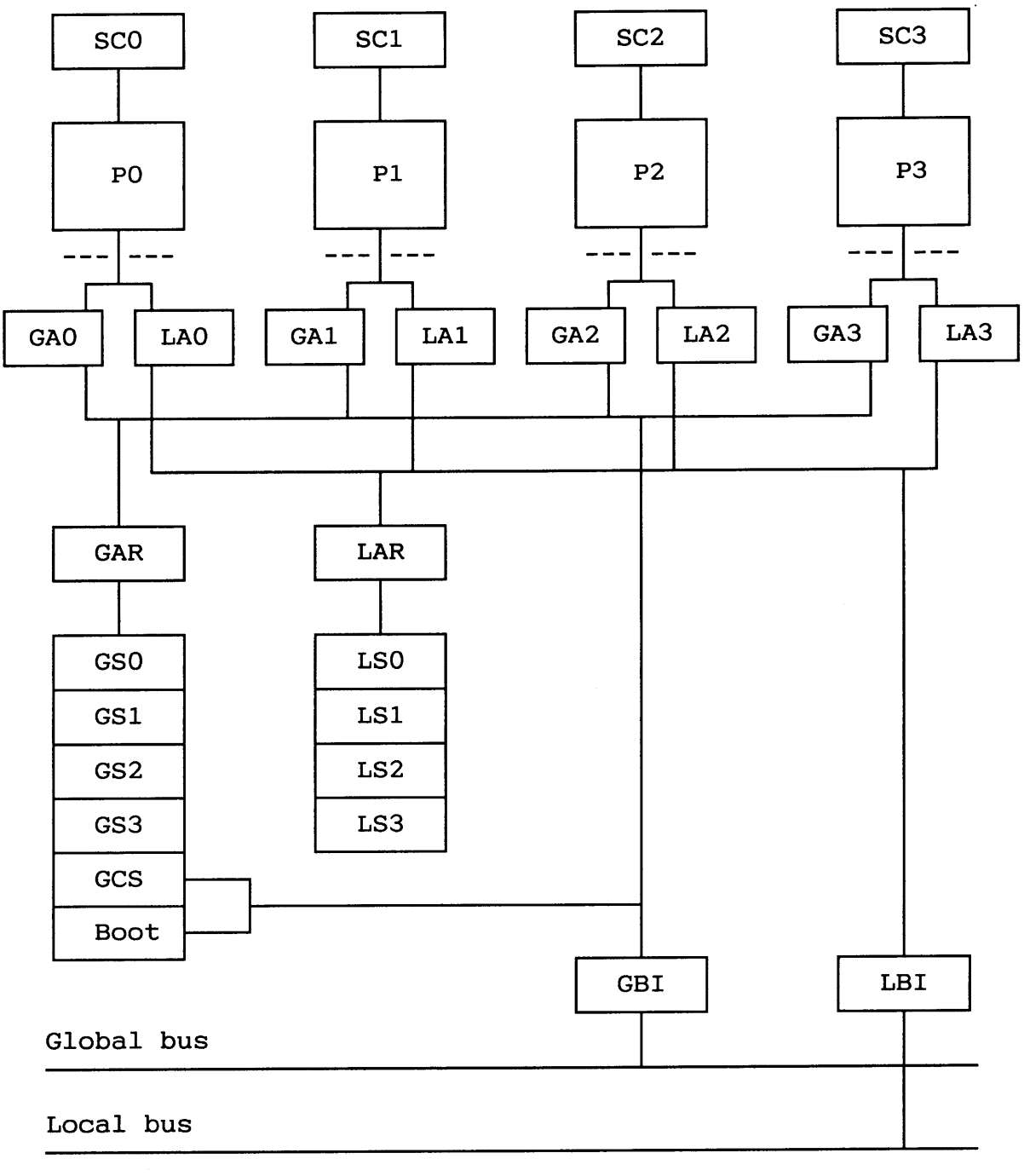
## 4.5 Power

| | |
|---|---|
| Voltage | 5 V ± 5 % |
| Current | 9 A max. |

## 5 Functional description

The block diagram below shows the base module CPU301/302 below the connector interface (---) and four processor modules above.

Each processor module consists of a processor (P) with a secondary cache (SC) and a connector. Associated with each possible processing module, but placed on the base module are a global and a a local agent (GA and LA), and a global and a local snooper (GS and LS). In addition, the base module provides a global and a local bus interface (GBI and LBI) with associated address registers (GAR and LAR), a global control spaces (GCS), and finally a boot PROM. A part of the global control space and all of the local control space are inside the respective agents.



## 5.1 Base module

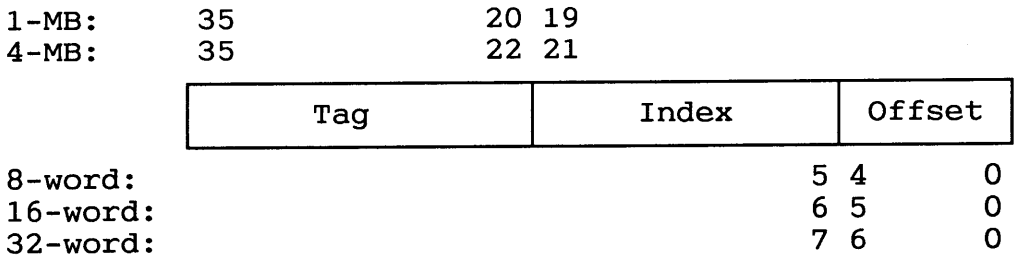
The main components of the base module are eight agents, two bus interfaces, two address registers, eight snoopers, a global control space, and a boot PROM.

The agent is described in [5] and contains all data buffers, data and address registers, and control required to link a processor to a bus interface. An agent also contains an agent space, which is only accessible from the associated processor, and an interrupt register and a debug register, which are a part of the respective control spaces.

One of the important tasks of the agent is to sequence transactions from the processor and system bus correctly when they pertain the same cache line. Another is to ensure continued snooping on a retained link address, when the link is evicted from the secondary cache and retained by the processor, whereby the link address is evicted from the snooper and therefore must be retained in the agent.

Each bus interface contains a number of registered transceivers and a bus master control including arbitration control. The global bus interface is BTL, while the local bus interface is TTL except for the control signals which are BTL.

The task of a snooper is to keep a copy of the physical address tags of the secondary cache tags such that bus snooping can take place without disturbing the respective processor excessively. The format of the snooper depends on the size and block size of the secondary cache:




The index gives the entry in the snooper, and, in order for a snoop hit to occur, the tag must match the corresponding bits of the bus address. The offset does not participate in the comparison, and there is no valid bit. The contents of the snoopers are undefined upon reset.

The format of the snoopers, which must correspond to the associated secondary caches, is selected with fixed jumpers given a limit of 15 index bits corresponding to a maximum set size of 32768 entries. Surplus tag bits need not be excluded as they merely become redundant. The CPU301 module is set for 1-MB / 32-word, while the CPU302 is set for 4-MB / 32-word.

When a cache line is replaced the read and the write are normally bundled together in a command called read with write forthcoming. In this case the write address tag will disappear from the snooper before disappearing from the secondary cache as it is overwritten in the snooper by that of the read, thus creating the possibility of non-coherency. Rather than try do juggle with both tags, the snooper must force hit until the start of the next command from the

agent, which is a late but safe indication that the write address tag no longer is present in the secondary cache.

In addition to each snooper, which already does a good job of filtering coherency requests to the processor, there is an extension dubbed the supersnooper, which to the extent possible tracks the state changes in the secondary cache and prevents non-exclusive coherent read requests from reaching the processor if the state is shared or invalid. The contents of the supersnoopers are undefined upon reset.

The global control space contains a number of special registers as mentioned in the introduction. The control for the control space includes an address comparator that can detect a control space access to this module and a simple state machine that can perform the required access. The module FCN PROM is mounted in a socket to allow easy replacement.

There is a 1/2-MB boot PROM providing reset, diagnostic, and debugging code. The boot PROM is located at the beginning of the address range 0x01FC00000 through 0x01FFFFFFF, where the former is the physical reset address of the processor. This address range is, alas, right in the memory space. Thus, when a read address falls in this range and the boot PROM is not mapped out, as controlled by a bit in the control register of the global agent, the boot PROM must intervene and supply the data as a cache slave thus pre-empting the memory slave. The boot PROM, which is implemented with a 512 K by 8-bit flash EEPROM, is mounted in a socket.

When a master issues an access with an address for which there is no matching slave a missing target acknowledge will result. This works fine for a write, but for a read the responsible processor would wait forever on the missing 'last data element' because the agent does not provide it instead. Therefore, a dummy block generator is implemented in each bus interface to take care of this case.

# 6 PROGRAMMING INFORMATION

## 6.1 Processor

Programming information for the processor can be found in [3, 4].

The physical address space as seen from a processor consists of a global and local space, each subdivided into a memory, agent, and control space. A processor can only access its own agent spaces, while the memory and control spaces are accessible by all processors on the bus in question. The global and local control address spaces are described below. All address formats are shown in [2].

The interrupt register of the processor, whose format is shown below, contains a non-maskable interrupt (NMI), four general interrupts (I5-I2), a timer interrupt (TIM), and an error interrupt (ERR).

| NMI | I5 | I4 | I3 | I2 | TIM | ERR |
|---|---|---|---|---|---|---|
| 6 | 5 | 4 | 3 | 2 | 1 | 0 |

These bits result from the OR'ing of the respective bits in the two agents, and, in case of bit 0, also from the OR'ing of the bits in the Bus error register, more specifically the global and local bus parity error interrupts, and the debug interrupt. Only the timer in the global agent is active.

All interrupts are level-sensitive, thus the processor must remove an interrupt when it is accepted, but in order to so the source of the interrupt must be known. This is a problem for the general interrupts unless each in software is assigned to only one agent, thus the use of local interrupts is discouraged.

Accesses to the address space 0x01FC00000 through 0x01FFFFFFF may, under control of a bit in the control register of the appropriate global agent, be directed at either memory or the 1/2-MB boot PROM, which is located at the start of the address space and contains reset, diagnostic, and debugging code.

The selection of little or big endians is determined by a fixed signal on the system bus.

The states of the snoopers and supersnoopers are, like those of the secondary caches, undefined upon reset.

## 6.2 Agent space

For a description of the agent address space, please, refer to [5].

There are four programmable LEDs labelled ERROR(0-3), BUSY(0-3), A(0-3), and B(0-3) on the front panel for each of the four possible processor modules. They are controlled by the associated global agent control register bit 6 and 7, and local agent control register bit 6 and 7, respectively.

## 6.3 Control space

The CPU module has a global and a local control space, which are both divided into subpositions and contain a number of special registers intended for identification, configuration, error logging, interrupt, and debug. These registers have varying bit widths, but are all right justified within double words (64 bits), and any access less than a double word must take into account the subtle differences between little and big endians.

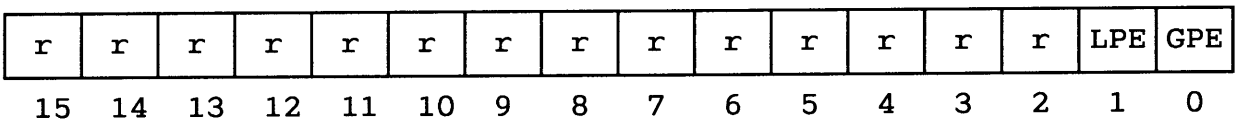
The global control space comprises all of the following special registers, while the local control space only comprises the interrupt register. Below is for every register or group of registers listed whether it can be read, written, or cleared along with its hexadecimal byte offset relative to the start of the control address space of the module.

| Register | Access | Offset |
|---|---|---|
| Status register | Read/clear | 0 |
| Control register | Write | 100 |
| Module ID | Read | 200 |
| Module FCN | Read | 300 |
| Interrupt register | Write | 400 |
| Debug register | Write | 500 |
| Processor module register | Read | 600 |
| Bus error register | Read/clear | 700 |

The function and format of the individual registers are described in the following. Reserved bits (r) must be 0 when written, and are undefined when read. Bits 16 through 63 are reserved, unless otherwise noted.

## 6.4 Status register

The Status register indicates bus parity errors found by this module. Individual bits may be cleared by writing ones in the respective positions, and the bits are all cleared by bus reset.

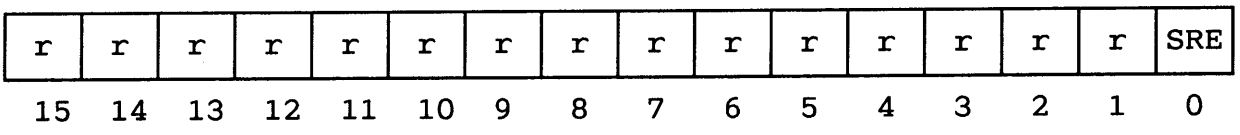



GPE: Global parity error.

LPE: Local parity error.

## 6.5 Control register

There is a Control register for every subposition, and each contains a bit for selective reset of the corresponding processor. The bits are all set by bus reset.



SRE: Selective reset.

## 6.6 Module ID

The Module ID consists of a 32-byte string stored in 32 consecutive double words. The byte offset given earlier applies to the first double word.

| r | r | r | r | r | r | r | r | ID7 | ID6 | ID5 | ID4 | ID3 | ID2 | ID1 | ID0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

ID(7:0): Single byte of module Identification string.

The format of the string is given in [2].

## 6.7 Module FCN

The Module FCN consists of a 32-byte string stored in 32 consecutive double words. The byte offset given earlier applies to the first double word.

| r | r | r | r | r | r | r | r | FC7 | FC6 | FC5 | FC4 | FC3 | FC2 | FC1 | FC0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

FCN(7:0): Single byte of module Field Change Notice string.

The format of the string is given in [2].

## 6.8 Interrupt register

The Interrupt register, which is 32 bits wide, is used to write interrupts. There is an Interrupt register for every subposition in both the global and the local control space, and it is not possible for a master to write to its own register.

| P15 | P14 | P13 | P12 | P11 | P10 | P9 | P8 | P7 | P6 | P5 | P4 | P3 | P2 | P1 | P0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |

| r | r | r | r | r | r | r | r | r | NMI | I5 | I4 | I3 | I2 | r | r |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

I(5:2): Interrupts. Provides a direct path to the corresponding bits of the Interrupt register of the

processor.

NMI: Non-maskable interrupt. Provides a direct path to the NMI bit of the Interrupt register of the processor.

P(15:0): Peripheral interrupts. New bits are OR'ed to old ones, and the bits may be cleared by the processor.

## 6.9 Debug register

The Debug register is used to write a double byte to a processor during debug. There is a Debug register for every subposition, and it is not possible for a master to write to its own register.

| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

D(15:0): Debug data.

## 6.10 Processor module register

The Processor module register indicates the presence and identity of each processor module.

| M33 | M32 | M31 | M30 | M23 | M22 | M21 | M20 | M13 | M12 | M11 | M10 | M03 | M02 | M01 | M00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

Mi(3:0): Identity of module i.

No module is present in position i if Mi=15.

## 6.11 Bus error register

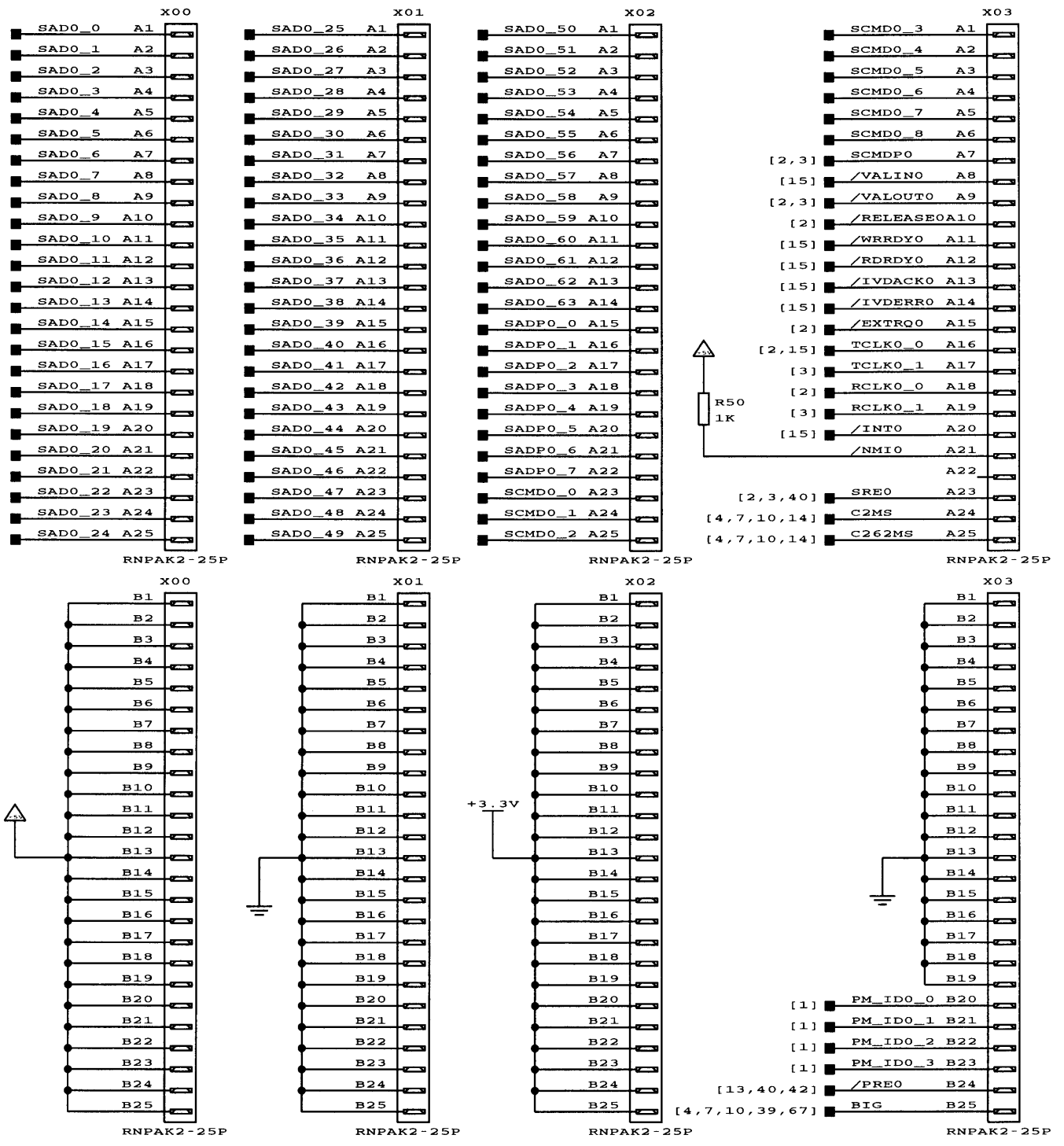
There is a Bus error register for every subposition, and each indicates interrupts caused by a bus parity error or a debug request. Individual bits may be cleared by writing ones in the respective positions, and the bits are all cleared by bus reset.

| r | r | r | r | r | r | r | r | r | r | r | r | r | DBI | LPI | GPI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

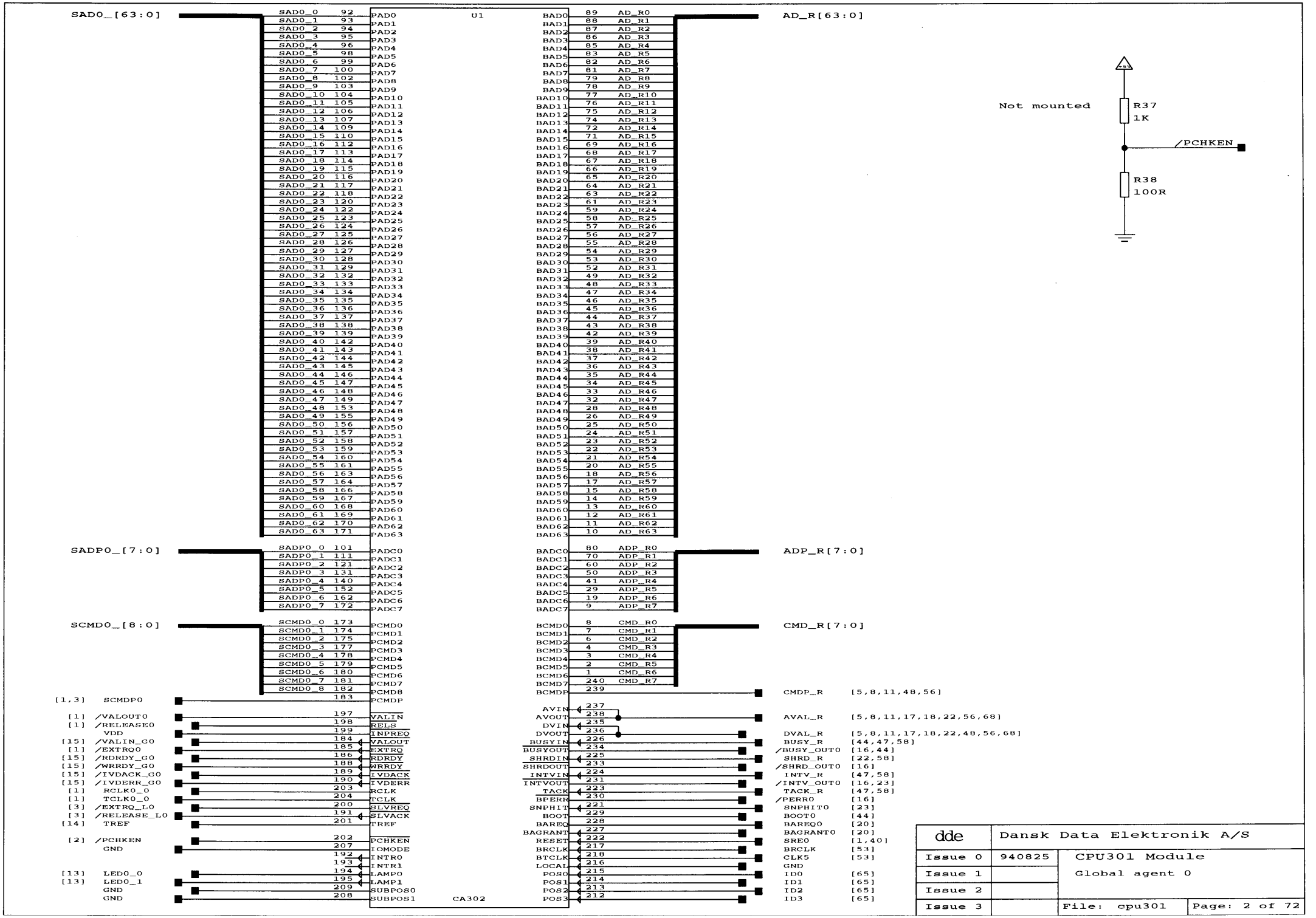
GPI: Global parity error interrupt.

LPI: Local parity error interrupt.

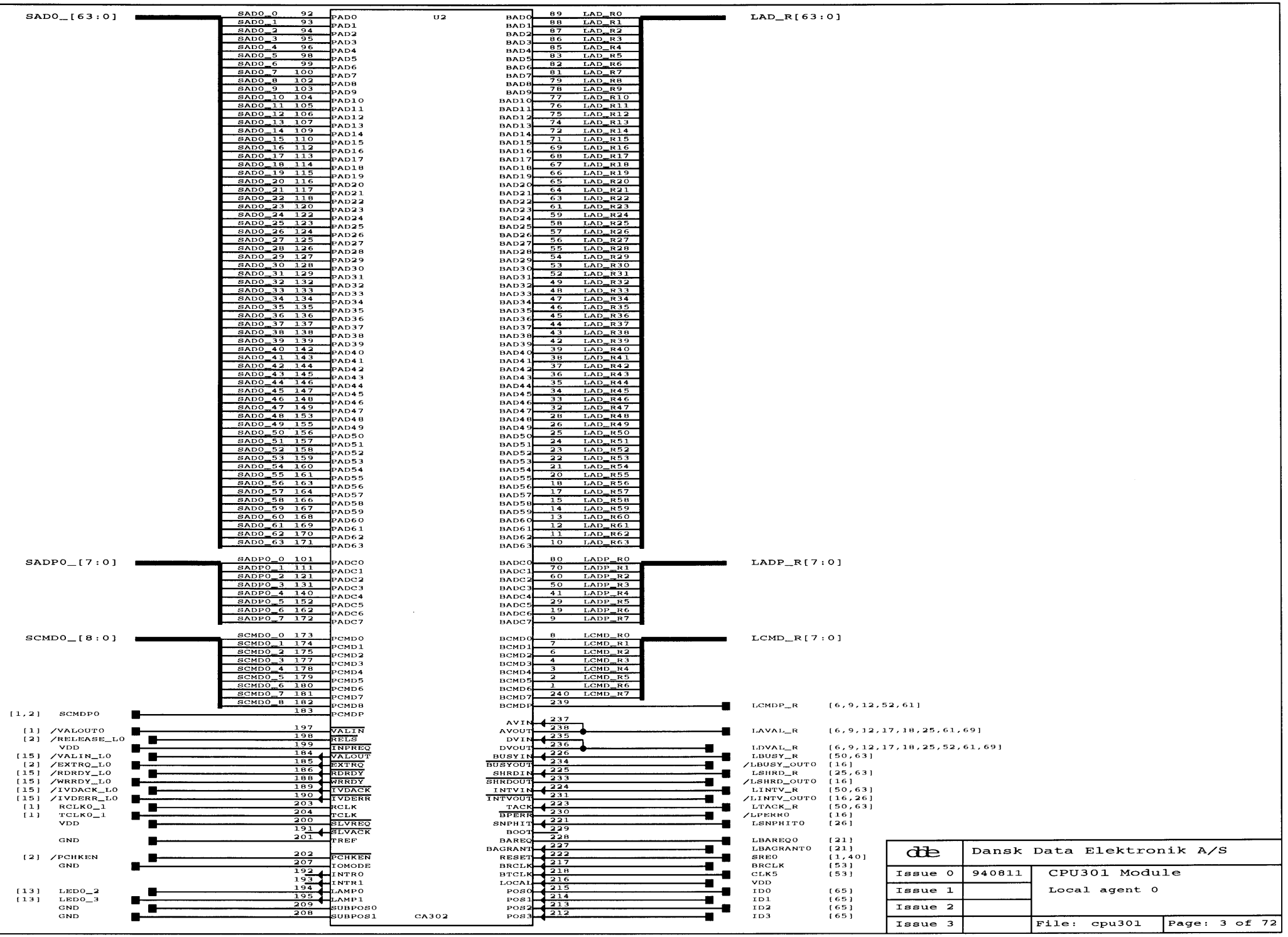
DBI: Debug interrupt.




| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Connectors 0 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page: 1 of 72 |




| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Global agent 0 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page: 2 of 72 |


SADO_[63:0]
SADO_0 92
SADO_1 93
SADO_2 94
SADO_3 95
SADO_4 96
SADO_5 98
SADO_6 99
SADO_7 100
SADO_8 102
SADO_9 103
SADO_10 104
SADO_11 105
SADO_12 106
SADO_13 107
SADO_14 109
SADO_15 110
SADO_16 112
SADO_17 113
SADO_18 114
SADO_19 115
SADO_20 116
SADO_21 117
SADO_22 118
SADO_23 120
SADO_24 122
SADO_25 123
SADO_26 124
SADO_27 125
SADO_28 126
SADO_29 127
SADO_30 128
SADO_31 129
SADO_32 132
SADO_33 133
SADO_34 134
SADO_35 135
SADO_36 136
SADO_37 137
SADO_38 138
SADO_39 139
SADO_40 142
SADO_41 143
SADO_42 144
SADO_43 145
SADO_44 146
SADO_45 147
SADO_46 148
SADO_47 149
SADO_48 153
SADO_49 155
SADO_50 156
SADO_51 157
SADO_52 158
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SADO_59 167
SADO_60 168
SADO_61 169
SADO_62 170
SADO_63 171
PAD0
PAD1
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PAD3
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PAD60
PAD61
PAD62
PAD63
U2
BAD0 89 LAD_R0
BAD1 88 LAD_R1
BAD2 87 LAD_R2
BAD3 86 LAD_R3
BAD4 85 LAD_R4
BAD5 83 LAD_R5
BAD6 82 LAD_R6
BAD7 81 LAD_R7
BAD8 79 LAD_R8
BAD9 78 LAD_R9
BAD10 77 LAD_R10
BAD11 76 LAD_R11
BAD12 75 LAD_R12
BAD13 74 LAD_R13
BAD14 72 LAD_R14
BAD15 71 LAD_R15
BAD16 69 LAD_R16
BAD17 68 LAD_R17
BAD18 67 LAD_R18
BAD19 66 LAD_R19
BAD20 65 LAD_R20
BAD21 64 LAD_R21
BAD22 63 LAD_R22
BAD23 61 LAD_R23
BAD24 59 LAD_R24
BAD25 58 LAD_R25
BAD26 57 LAD_R26
BAD27 56 LAD_R27
BAD28 55 LAD_R28
BAD29 54 LAD_R29
BAD30 53 LAD_R30
BAD31 52 LAD_R31
BAD32 49 LAD_R32
BAD33 48 LAD_R33
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BAD35 46 LAD_R35
BAD36 45 LAD_R36
BAD37 44 LAD_R37
BAD38 43 LAD_R38
BAD39 42 LAD_R39
BAD40 39 LAD_R40
BAD41 38 LAD_R41
BAD42 37 LAD_R42
BAD43 36 LAD_R43
BAD44 35 LAD_R44
BAD45 34 LAD_R45
BAD46 33 LAD_R46
BAD47 32 LAD_R47
BAD48 28 LAD_R48
BAD49 26 LAD_R49
BAD50 25 LAD_R50
BAD51 24 LAD_R51
BAD52 23 LAD_R52
BAD53 22 LAD_R53
BAD54 21 LAD_R54
BAD55 20 LAD_R55
BAD56 18 LAD_R56
BAD57 17 LAD_R57
BAD58 15 LAD_R58
BAD59 14 LAD_R59
BAD60 13 LAD_R60
BAD61 12 LAD_R61
BAD62 11 LAD_R62
BAD63 10 LAD_R63
LAD_R[63:0]
SADP0_[7:0]
SADP0_0 101
SADP0_1 111
SADP0_2 121
SADP0_3 131
SADP0_4 140
SADP0_5 152
SADP0_6 162
SADP0_7 172
PADC0
PADC1
PADC2
PADC3
PADC4
PADC5
PADC6
PADC7
BADC0 80 LADP_R0
BADC1 70 LADP_R1
BADC2 60 LADP_R2
BADC3 50 LADP_R3
BADC4 41 LADP_R4
BADC5 29 LADP_R5
BADC6 19 LADP_R6
BADC7 9 LADP_R7
LADP_R[7:0]
SCMD0_[8:0]
SCMD0_0 173
SCMD0_1 174
SCMD0_2 175
SCMD0_3 177
SCMD0_4 178
SCMD0_5 179
SCMD0_6 180
SCMD0_7 181
SCMD0_8 182
183
PCMD0
PCMD1
PCMD2
PCMD3
PCMD4
PCMD5
PCMD6
PCMD7
PCMD8
PCMDP
BCMD0 8 LCMD_R0
BCMD1 7 LCMD_R1
BCMD2 6 LCMD_R2
BCMD3 4 LCMD_R3
BCMD4 3 LCMD_R4
BCMD5 2 LCMD_R5
BCMD6 1 LCMD_R6
BCMD7 240 LCMD_R7
BCMDP 239
LCMD_R[7:0]
LCMDP_R [6,9,12,52,61]
[1,2] SCMDP0
[1] /VALOUT0
[2] /RELEASE_LO
VDD
[15] /VALIN_LO
[2] /EXTRQ_LO
[15] /RDRDY_LO
[15] /WRRDY_LO
[15] /IVDACK_LO
[15] /IVDERR_LO
[1] RCLK0_1
[1] TCLK0_1
VDD
GND
[2] /PCHKEN
GND
[13] LED0_2
[13] LED0_3
GND
GND
197 VALIN
198 RELS
199 INPREQ
184 VALOUT
185 EXTRQ
186 RDRDY
188 WRRDY
189 IVDACK
190 IVDERR
203 RCLK
204 TCLK
200 SLVREQ
191 SLVACK
201 TREF
202 PCHKEN
207 IOMODE
192 INTR0
193 INTR1
194 LAMP0
195 LAMP1
209 SUBPOS0
208 SUBPOS1
CA302
AVIN 237
AVOUT 238
DVIN 235
DVOUT 236
BUSYIN 226
BUSYOUT 234
SHRDIN 225
SHRDOUT 233
INTVIN 224
INTVOUT 231
TACK 223
BPERR 230
SNPHIT 221
229
BOOT 228
BAREQ 227
BAGRANT 222
RESET 217
BRCLK 218
BTCLK 216
LOCAL 215
POS0 214
POS1 213
POS2 212
POS3
LAVAL_R [6,9,12,17,18,25,61,69]
LDVAL_R [6,9,12,17,18,25,52,61,69]
LBUSY_R [50,63]
/LBUSY_OUT0 [16]
LSHRD_R [25,63]
/LSHRD_OUT0 [16]
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/LINTV_OUT0 [16,26]
LTACK_R [50,63]
/LPERR0 [16]
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LBAREQ0 [21]
LBAGRANT0 [21]
SREO [1,40]
BRCLK [53]
CLK5 [53]
VDD
ID0 [65]
ID1 [65]
ID2 [65]
ID3 [65]
dde
Dansk Data Elektronik A/S
Issue 0 940811
Issue 1
Issue 2
Issue 3
CPU301 Module
Local agent 0
File: cpu301
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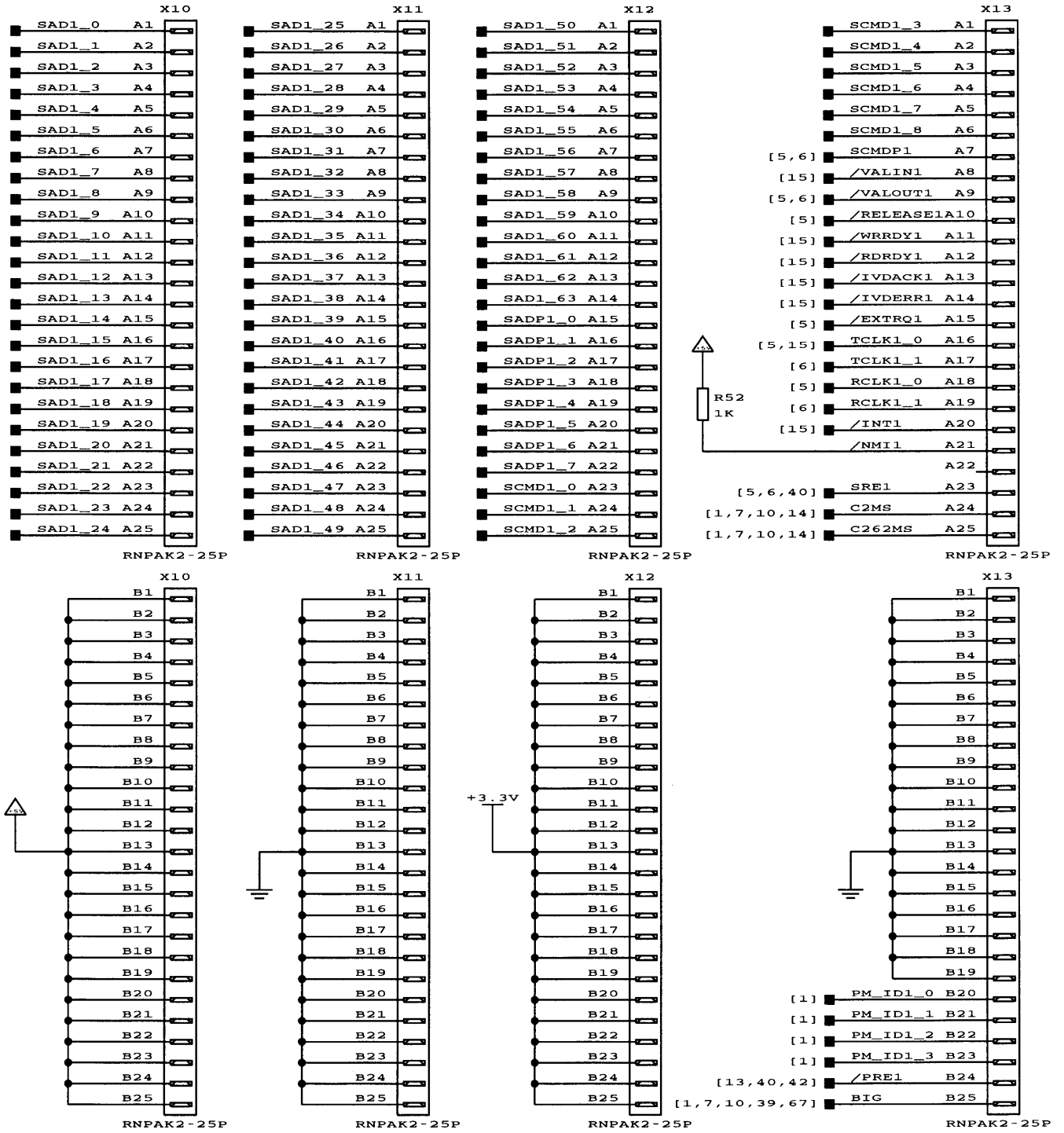
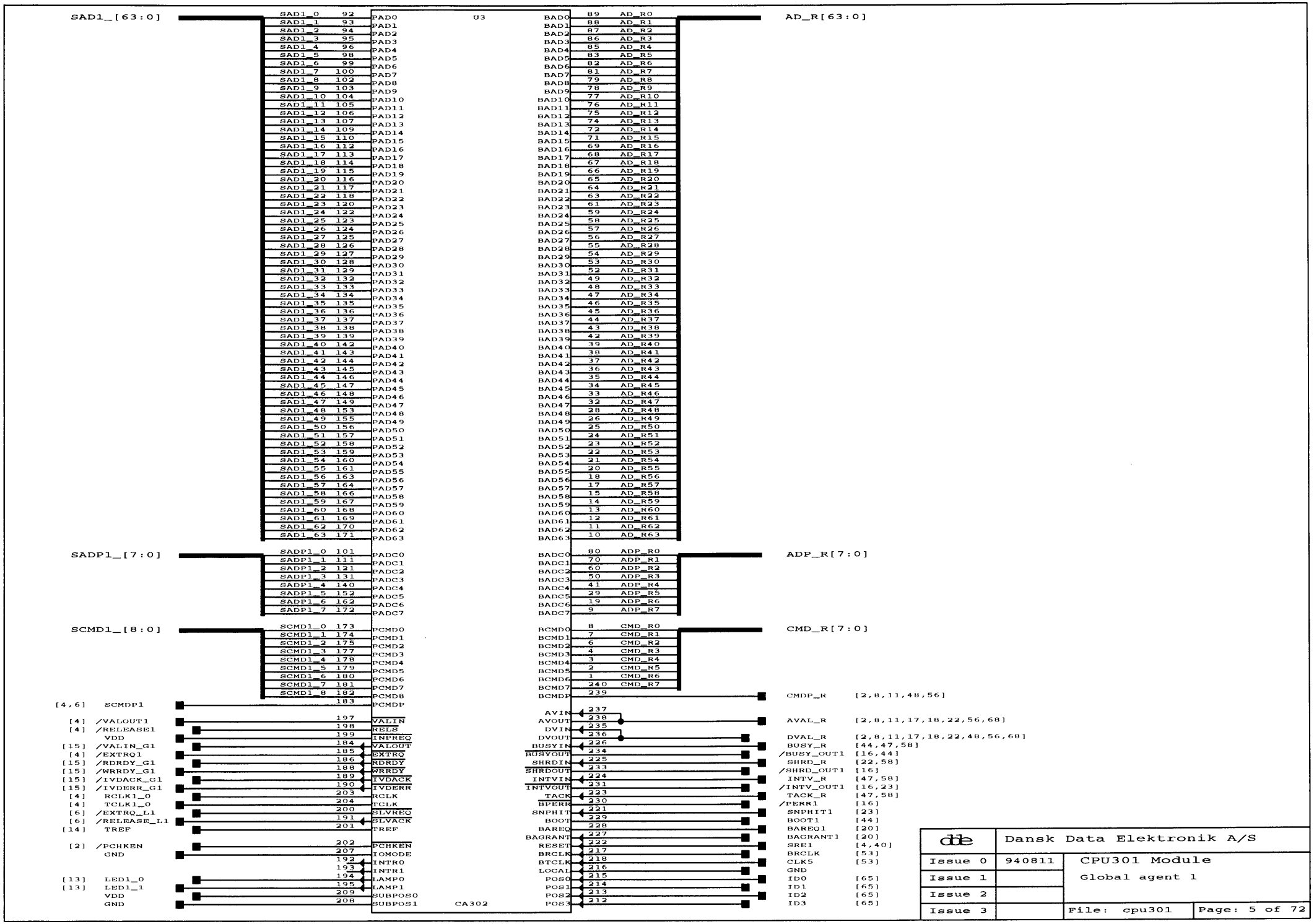



| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Connectors 1 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page: 4 of 72 |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SAD1_1 93
SAD1_2 94
SAD1_3 95
SAD1_4 96
SAD1_5 98
SAD1_6 99
SAD1_7 100
SAD1_8 102
SAD1_9 103
SAD1_10 104
SAD1_11 105
SAD1_12 106
SAD1_13 107
SAD1_14 109
SAD1_15 110
SAD1_16 112
SAD1_17 113
SAD1_18 114
SAD1_19 115
SAD1_20 116
SAD1_21 117
SAD1_22 118
SAD1_23 120
SAD1_24 122
SAD1_25 123
SAD1_26 124
SAD1_27 125
SAD1_28 126
SAD1_29 127
SAD1_30 128
SAD1_31 129
SAD1_32 132
SAD1_33 133
SAD1_34 134
SAD1_35 135
SAD1_36 136
SAD1_37 137
SAD1_38 138
SAD1_39 139
SAD1_40 142
SAD1_41 143
SAD1_42 144
SAD1_43 145
SAD1_44 146
SAD1_45 147
SAD1_46 148
SAD1_47 149
SAD1_48 153
SAD1_49 155
SAD1_50 156
SAD1_51 157
SAD1_52 158
SAD1_53 159
SAD1_54 160
SAD1_55 161
SAD1_56 163
SAD1_57 164
SAD1_58 166
SAD1_59 167
SAD1_60 168
SAD1_61 169
SAD1_62 170
SAD1_63 171
PAD0
PAD1
PAD2
PAD3
PAD4
PAD5
PAD6
PAD7
PAD8
PAD9
PAD10
PAD11
PAD12
PAD13
PAD14
PAD15
PAD16
PAD17
PAD18
PAD19
PAD20
PAD21
PAD22
PAD23
PAD24
PAD25
PAD26
PAD27
PAD28
PAD29
PAD30
PAD31
PAD32
PAD33
PAD34
PAD35
PAD36
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PAD38
PAD39
PAD40
PAD41
PAD42
PAD43
PAD44
PAD45
PAD46
PAD47
PAD48
PAD49
PAD50
PAD51
PAD52
PAD53
PAD54
PAD55
PAD56
PAD57
PAD58
PAD59
PAD60
PAD61
PAD62
PAD63
U3
BAD0 89 AD_R0
BAD1 88 AD_R1
BAD2 87 AD_R2
BAD3 86 AD_R3
BAD4 85 AD_R4
BAD5 83 AD_R5
BAD6 82 AD_R6
BAD7 81 AD_R7
BAD8 79 AD_R8
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BAD12 75 AD_R12
BAD13 74 AD_R13
BAD14 72 AD_R14
BAD15 71 AD_R15
BAD16 69 AD_R16
BAD17 68 AD_R17
BAD18 67 AD_R18
BAD19 66 AD_R19
BAD20 65 AD_R20
BAD21 64 AD_R21
BAD22 63 AD_R22
BAD23 61 AD_R23
BAD24 59 AD_R24
BAD25 58 AD_R25
BAD26 57 AD_R26
BAD27 56 AD_R27
BAD28 55 AD_R28
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BAD56 18 AD_R56
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BAD58 15 AD_R58
BAD59 14 AD_R59
BAD60 13 AD_R60
BAD61 12 AD_R61
BAD62 11 AD_R62
BAD63 10 AD_R63
AD_R[63:0]
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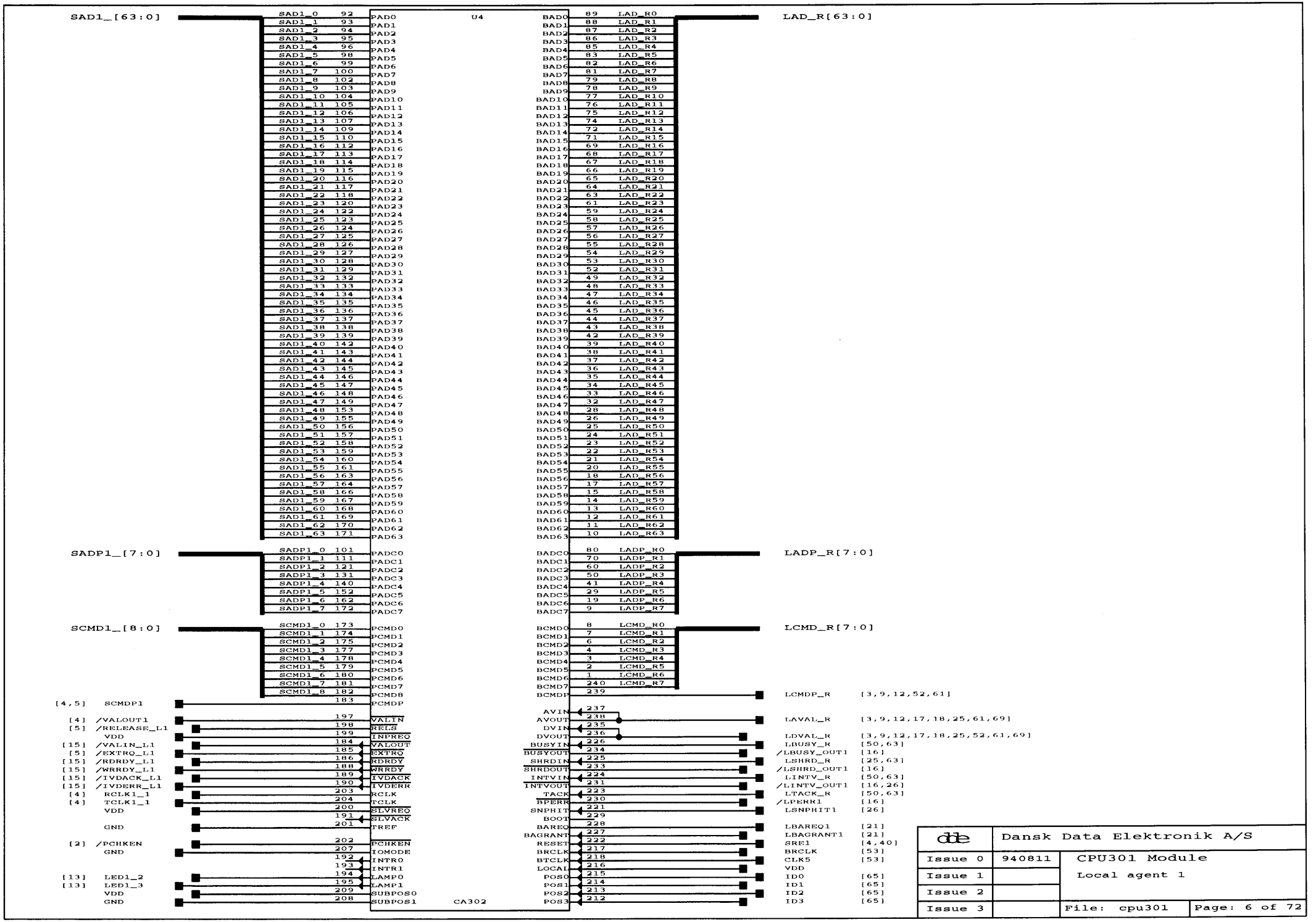
SADP1_0 101
SADP1_1 111
SADP1_2 121
SADP1_3 131
SADP1_4 140
SADP1_5 152
SADP1_6 162
SADP1_7 172
PADC0
PADC1
PADC2
PADC3
PADC4
PADC5
PADC6
PADC7
BADC0 80 ADP_R0
BADC1 70 ADP_R1
BADC2 60 ADP_R2
BADC3 50 ADP_R3
BADC4 41 ADP_R4
BADC5 29 ADP_R5
BADC6 19 ADP_R6
BADC7 9 ADP_R7
ADP_R[7:0]
SCMD1_[8:0]
SCMD1_0 173
SCMD1_1 174
SCMD1_2 175
SCMD1_3 177
SCMD1_4 178
SCMD1_5 179
SCMD1_6 180
SCMD1_7 181
SCMD1_8 182
PCMD0
PCMD1
PCMD2
PCMD3
PCMD4
PCMD5
PCMD6
PCMD7
BCMD0 8 CMD_R0
BCMD1 7 CMD_R1
BCMD2 6 CMD_R2
BCMD3 4 CMD_R3
BCMD4 3 CMD_R4
BCMD5 2 CMD_R5
BCMD6 1 CMD_R6
BCMD7 240 CMD_R7
CMD_R[7:0]
[4,6] SCMDP1
183
PCMDP
BCMDP 239
CMDP_R [2,8,11,48,56]
AVIN 237
AVOUT 238
AVAL_R [2,8,11,17,18,22,56,68]
DVIN 235
DVOUT 236
DVAL_R [2,8,11,17,18,22,48,56,68]
[4] /VALOUT1
[4] /RELEASE1
VDD
[15] /VALIN_G1
[4] /EXTRQ1
[15] /RDRDY_G1
[15] /WRRDY_G1
[15] /IVDACK_G1
[15] /IVDERR_G1
[4] RCLK1_0
[4] TCLK1_0
[6] /EXTRQ_L1
[6] /RELEASE_L1
[14] TREF
197 VALIN
198 RELS
199 INPREQ
184 VALOUT
185 EXTRQ
186 RDRDY
188 WRRDY
189 IVDACK
190 IVDERR
203 RCLK
204 TCLK
200 SLVREQ
191 SLVACK
201 TREF
BUSYIN 226
BUSYOUT 234
SHRDIN 225
SHRDOUT 233
INTVIN 224
INTVOUT 231
TACK 223
BPERR 230
SNPHIT 221
BOOT 229
BAREQ 228
BAGRANT 227
RESET 222
BRCLK 217
BTCLK 218
LOCAL 216
POS0 215
POS1 214
POS2 213
POS3 212
BUSY_R [44,47,58]
/BUSY_OUT1 [16,44]
SHRD_R [22,58]
/SHRD_OUT1 [16]
INTV_R [47,58]
/INTV_OUT1 [16,23]
TACK_R [47,58]
/PERR1 [16]
SNPHIT1 [23]
BOOT1 [44]
BAREQ1 [20]
BAGRANT1 [20]
SRE1 [4,40]
BRCLK [53]
CLK5 [53]
GND
ID0 [65]
ID1 [65]
ID2 [65]
ID3 [65]
[2] /PCHKEN
GND
202 PCHKEN
207 IOMODE
192 INTR0
193 INTR1
194 LAMP0
195 LAMP1
209 SUBPOS0
208 SUBPOS1
[13] LED1_0
[13] LED1_1
VDD
GND
CA302
dde
Dansk Data Elektronik A/S
Issue 0 940811 CPU301 Module
Issue 1 Global agent 1
Issue 2
Issue 3 File: cpu301 Page: 5 of 72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SADP1_[7:0]
SCMD1_[8:0]
U4
CA302
LAD_R[63:0]
LADP_R[7:0]
LCMD_R[7:0]
SAD1_0 92 PAD0
SAD1_1 93 PAD1
SAD1_2 94 PAD2
SAD1_3 95 PAD3
SAD1_4 96 PAD4
SAD1_5 98 PAD5
SAD1_6 99 PAD6
SAD1_7 100 PAD7
SAD1_8 102 PAD8
SAD1_9 103 PAD9
SAD1_10 104 PAD10
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SAD1_13 107 PAD13
SAD1_14 109 PAD14
SAD1_15 110 PAD15
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SAD1_36 136 PAD36
SAD1_37 137 PAD37
SAD1_38 138 PAD38
SAD1_39 139 PAD39
SAD1_40 142 PAD40
SAD1_41 143 PAD41
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SAD1_43 145 PAD43
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SAD1_59 167 PAD59
SAD1_60 168 PAD60
SAD1_61 169 PAD61
SAD1_62 170 PAD62
SAD1_63 171 PAD63
SADP1_0 101 PADC0
SADP1_1 111 PADC1
SADP1_2 121 PADC2
SADP1_3 131 PADC3
SADP1_4 140 PADC4
SADP1_5 152 PADC5
SADP1_6 162 PADC6
SADP1_7 172 PADC7
SCMD1_0 173 PCMD0
SCMD1_1 174 PCMD1
SCMD1_2 175 PCMD2
SCMD1_3 177 PCMD3
SCMD1_4 178 PCMD4
SCMD1_5 179 PCMD5
SCMD1_6 180 PCMD6
SCMD1_7 181 PCMD7
SCMD1_8 182 PCMD8
183 PCMDP
[4,5] SCMDP1
197 VALIN
[4] /VALOUT1
198 RELS
[5] /RELEASE_L1
199 INPREQ
VDD
184 VALOUT
[15] /VALIN_L1
185 EXTRQ
[5] /EXTRQ_L1
186 RDRDY
[15] /RDRDY_L1
188 WRRDY
[15] /WRRDY_L1
189 IVDACK
[15] /IVDACK_L1
190 IVDERR
[15] /IVDERR_L1
203 RCLK
[4] RCLK1_1
204 TCLK
[4] TCLK1_1
200 SLVREQ
VDD
191 SLVACK
GND
201 TREF
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[2] /PCHKEN
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GND
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193 INTR1
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195 LAMP1
[13] LED1_3
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VDD
208 SUBPOS1
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BAD2 87 LAD_R2
BAD3 86 LAD_R3
BAD4 85 LAD_R4
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BAD48 28 LAD_R48
BAD49 26 LAD_R49
BAD50 25 LAD_R50
BAD51 24 LAD_R51
BAD52 23 LAD_R52
BAD53 22 LAD_R53
BAD54 21 LAD_R54
BAD55 20 LAD_R55
BAD56 18 LAD_R56
BAD57 17 LAD_R57
BAD58 15 LAD_R58
BAD59 14 LAD_R59
BAD60 13 LAD_R60
BAD61 12 LAD_R61
BAD62 11 LAD_R62
BAD63 10 LAD_R63
BADC0 80 LADP_R0
BADC1 70 LADP_R1
BADC2 60 LADP_R2
BADC3 50 LADP_R3
BADC4 41 LADP_R4
BADC5 29 LADP_R5
BADC6 19 LADP_R6
BADC7 9 LADP_R7
BCMD0 8 LCMD_R0
BCMD1 7 LCMD_R1
BCMD2 6 LCMD_R2
BCMD3 4 LCMD_R3
BCMD4 3 LCMD_R4
BCMD5 2 LCMD_R5
BCMD6 1 LCMD_R6
BCMD7 240 LCMD_R7
BCMDP 239
LCMDP_R [3,9,12,52,61]
AVIN 237
AVOUT 238
LAVAL_R [3,9,12,17,18,25,61,69]
DVIN 235
DVOUT 236
LDVAL_R [3,9,12,17,18,25,52,61,69]
BUSYIN 226
LBUSY_R [50,63]
BUSYOUT 234
/LBUSY_OUT1 [16]
SHRDIN 225
LSHRD_R [25,63]
SHRDOUT 233
/LSHRD_OUT1 [16]
INTVIN 224
LINTV_R [50,63]
INTVOUT 231
/LINTV_OUT1 [16,26]
TACK 223
LTACK_R [50,63]
BPERR 230
/LPERR1 [16]
SNPHIT 221
LSNPHIT1 [26]
BOOT 229
BAREQ 228
LBAREQ1 [21]
BAGRANT 227
LBAGRANT1 [21]
RESET 222
SRE1 [4,40]
BRCLK 217
BRCLK [53]
BTCLK 218
CLK5 [53]
LOCAL 216
VDD
POS0 215
ID0 [65]
POS1 214
ID1 [65]
POS2 213
ID2 [65]
POS3 212
ID3 [65]
dde
Dansk Data Elektronik A/S
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940811
CPU301 Module
Local agent 1
Issue 1
Issue 2
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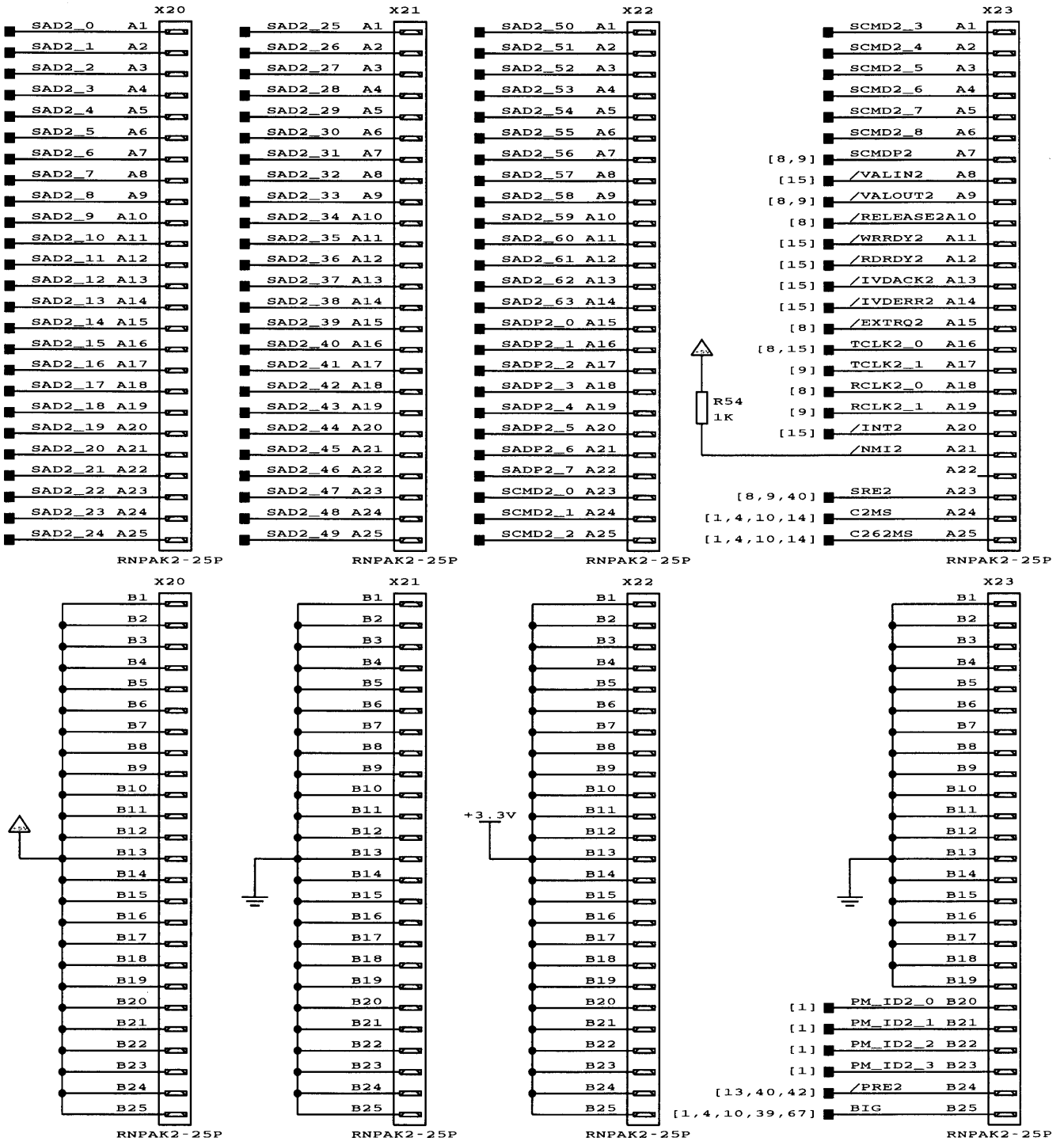


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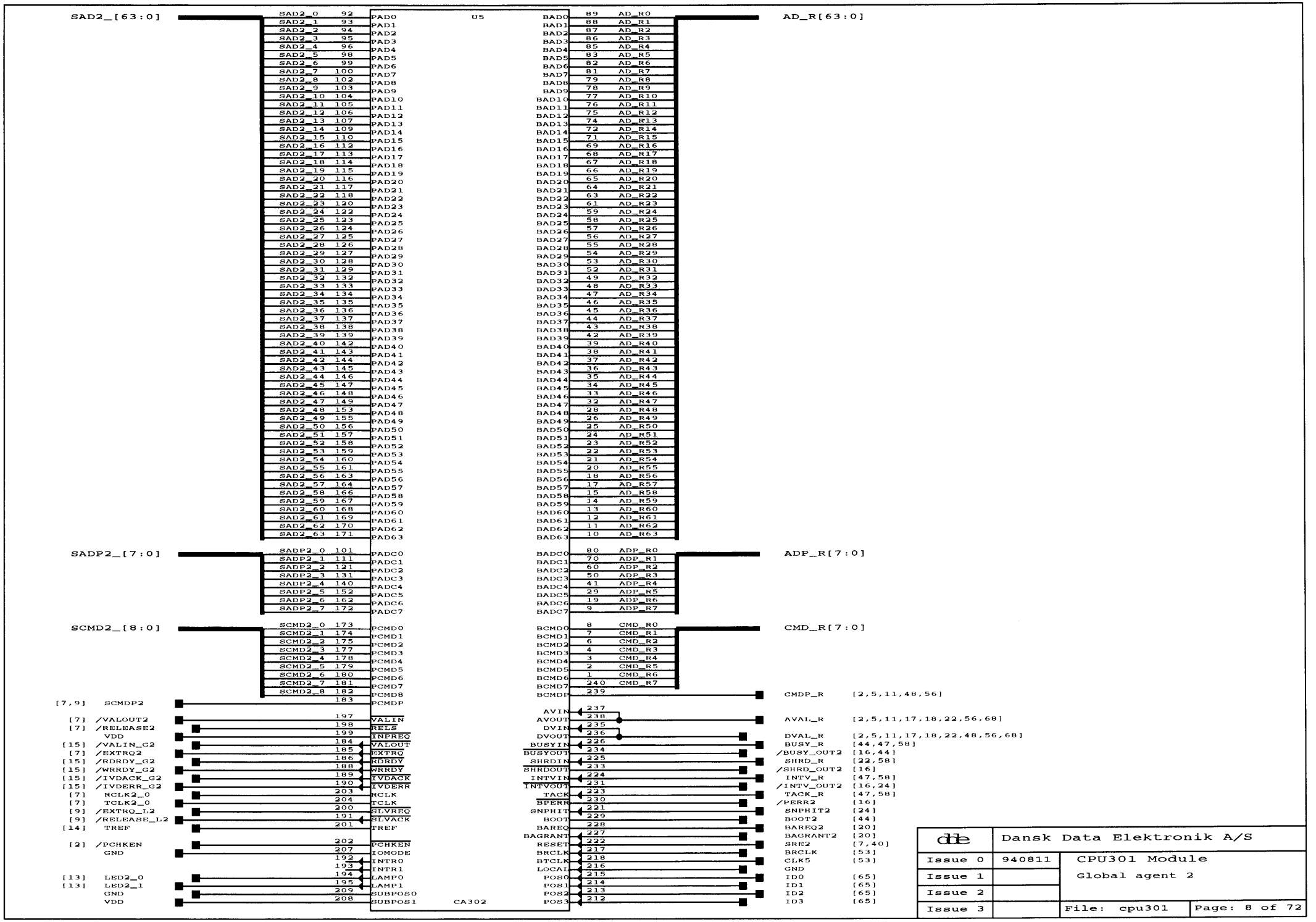
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page: 7 of 72 |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CA302
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ADP_R[7:0]
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SCMDP2
/VALOUT2
/RELEASE2
VDD
/VALIN_G2
/EXTRQ2
/RDRDY_G2
/WRRDY_G2
/IVDACK_G2
/IVDERR_G2
RCLK2_0
TCLK2_0
/EXTRQ_L2
/RELEASE_L2
TREF
/PCHKEN
GND
LED2_0
LED2_1
GND
VDD
VALIN
RELS
INPREQ
VALOUT
EXTRQ
RDRDY
WRRDY
IVDACK
IVDERR
RCLK
TCLK
SLVREQ
SLVACK
TREF
PCHKEN
IOMODE
INTR0
INTR1
LAMP0
LAMP1
SUBPOS0
SUBPOS1
AVIN
AVOUT
DVIN
DVOUT
BUSYIN
BUSYOUT
SHRDIN
SHRDOUT
INTVIN
INTVOUT
TACK
BPERR
SNPHIT
BOOT
BAREQ
BAGRANT
RESET
BRCLK
BTCLK
LOCAL
POS0
POS1
POS2
POS3
CMDP_R [2,5,11,48,56]
AVAL_R [2,5,11,17,18,22,56,68]
DVAL_R [2,5,11,17,18,22,48,56,68]
BUSY_R [44,47,58]
/BUSY_OUT2 [16,44]
SHRD_R [22,58]
/SHRD_OUT2 [16]
INTV_R [47,58]
/INTV_OUT2 [16,24]
TACK_R [47,58]
/PERR2 [16]
SNPHIT2 [24]
BOOT2 [44]
BAREQ2 [20]
BAGRANT2 [20]
SRE2 [7,40]
BRCLK [53]
CLK5 [53]
GND
ID0 [65]
ID1 [65]
ID2 [65]
ID3 [65]
Dansk Data Elektronik A/S
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Issue 2
Issue 3
CPU301 Module
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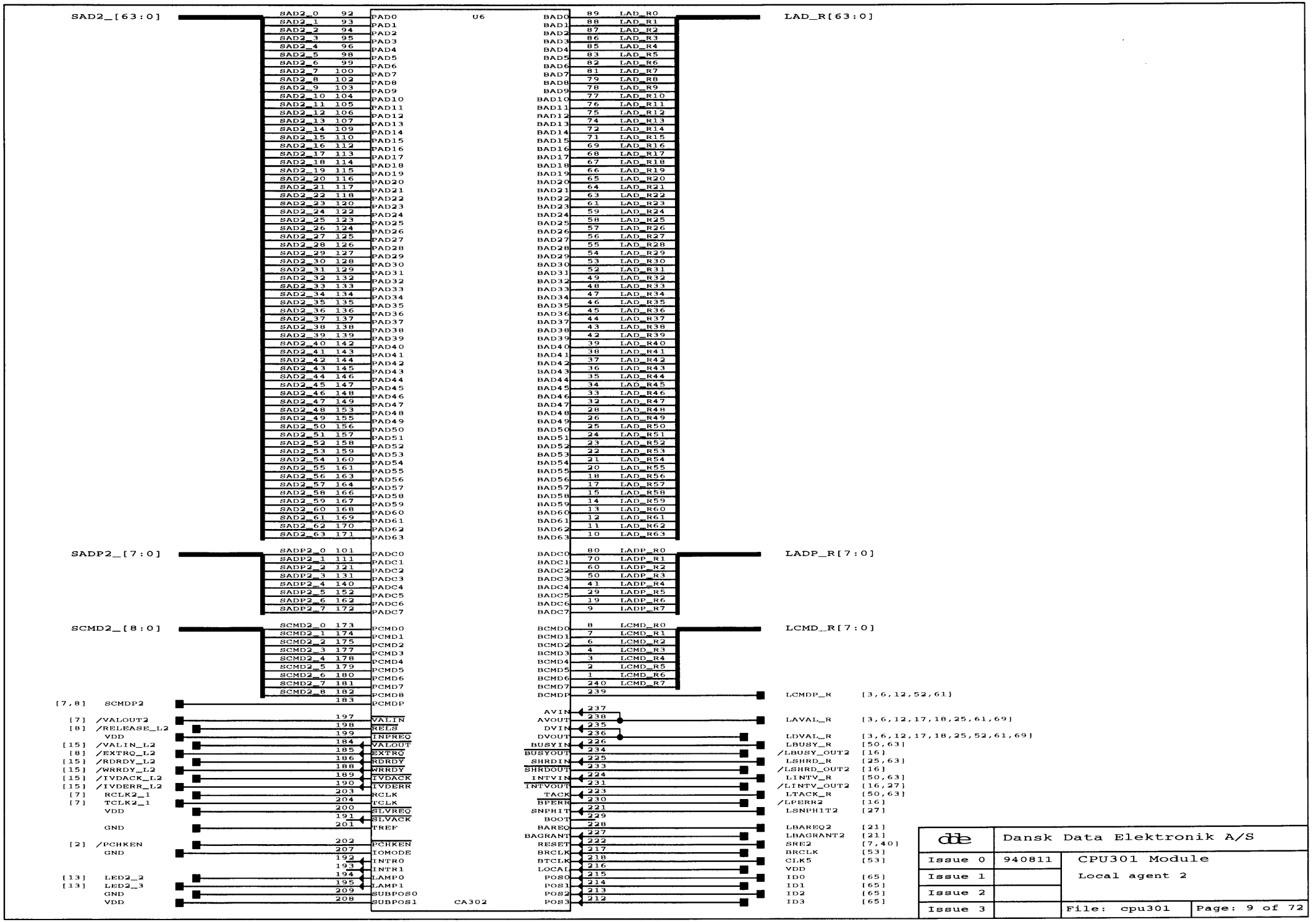
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SADP2_[7:0]
SCMD2_[8:0]
U6
CA302
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LADP_R[7:0]
LCMD_R[7:0]
SCMDP2
/VALOUT2
/RELEASE_L2
VDD
/VALIN_L2
/EXTRQ_L2
/RDRDY_L2
/WRRDY_L2
/IVDACK_L2
/IVDERR_L2
RCLK2_1
TCLK2_1
VDD
GND
/PCHKEN
GND
LED2_2
LED2_3
GND
VDD
VALIN
RELS
INPREQ
VALOUT
EXTRQ
RDRDY
WRRDY
IVDACK
IVDERR
RCLK
TCLK
SLVREQ
SLVACK
TREF
PCHKEN
IOMODE
INTR0
INTR1
LAMP0
LAMP1
SUBPOS0
SUBPOS1
LCMDP_R [3,6,12,52,61]
LAVAL_R [3,6,12,17,18,25,61,69]
LDVAL_R [3,6,12,17,18,25,52,61,69]
LBUSY_R [50,63]
/LBUSY_OUT2 [16]
LSHRD_R [25,63]
/LSHRD_OUT2 [16]
LINTV_R [50,63]
/LINTV_OUT2 [16,27]
LTACK_R [50,63]
/LPERR2 [16]
LSNPHIT2 [27]
LBAREQ2 [21]
LBAGRANT2 [21]
SRE2 [7,40]
BRCLK [53]
CLK5 [53]
VDD
ID0 [65]
ID1 [65]
ID2 [65]
ID3 [65]
Dansk Data Elektronik A/S
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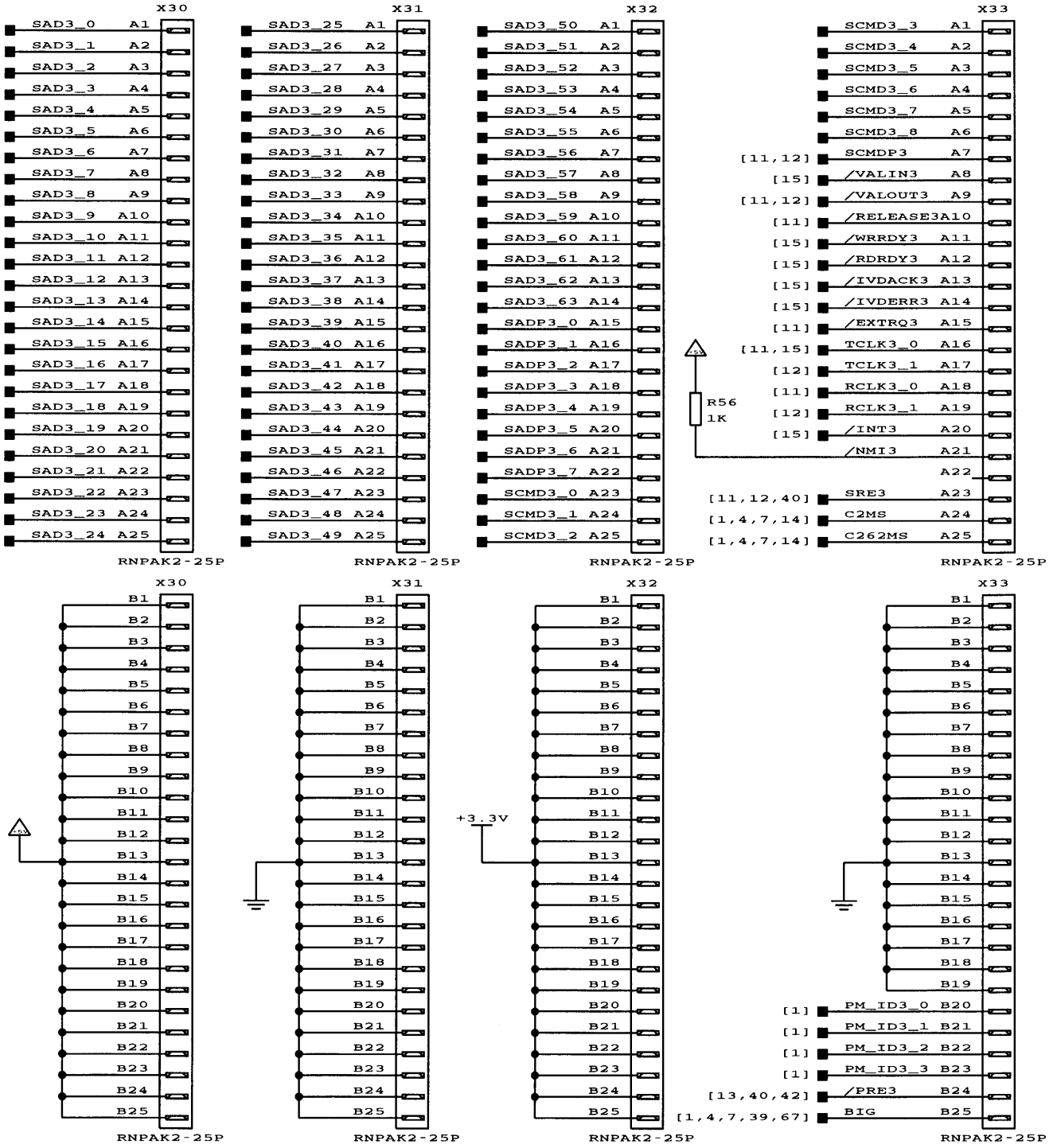
Issue 1 Local agent 2
Issue 2
Issue 3 File: cpu301 Page: 9 of 72




| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
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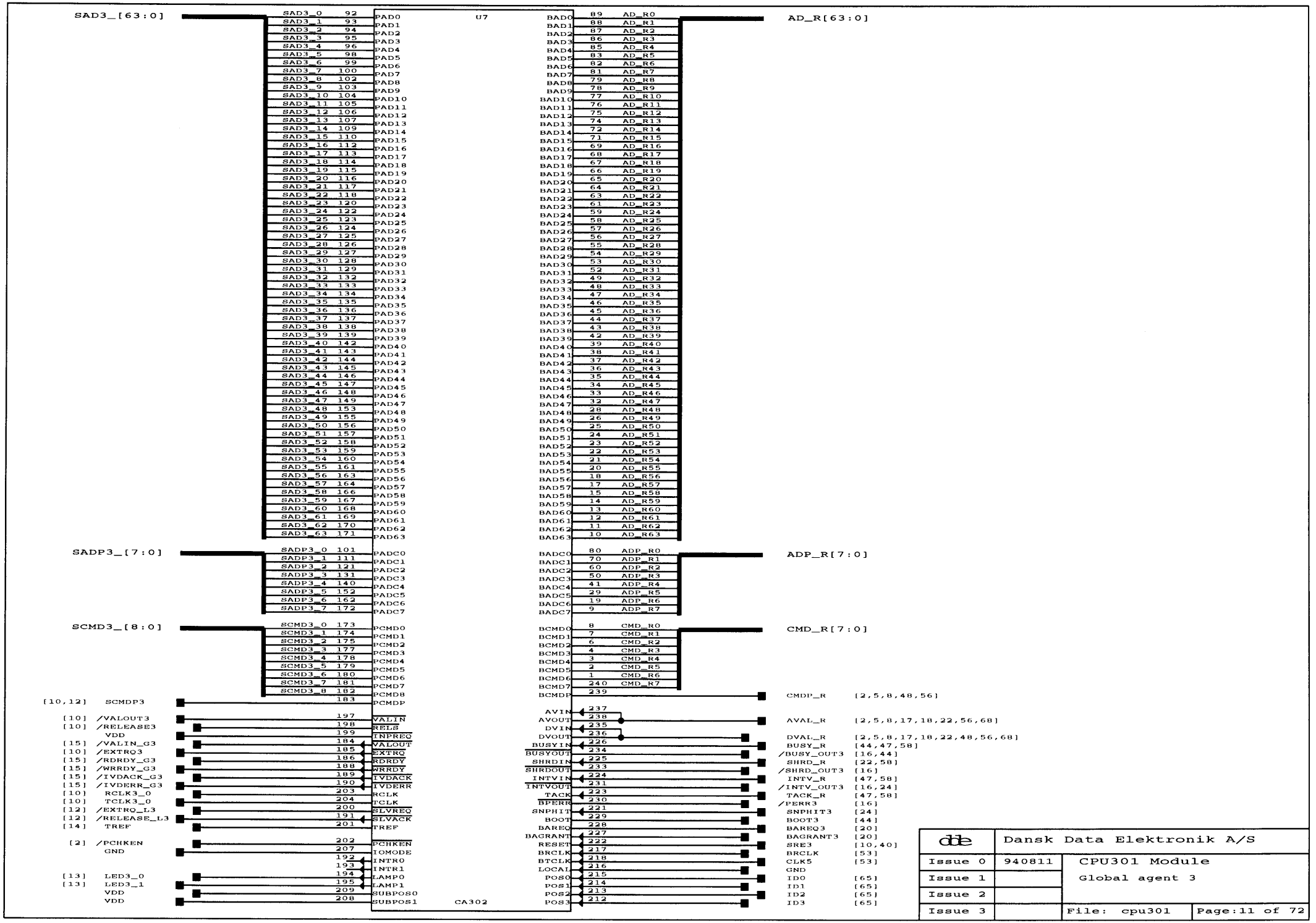
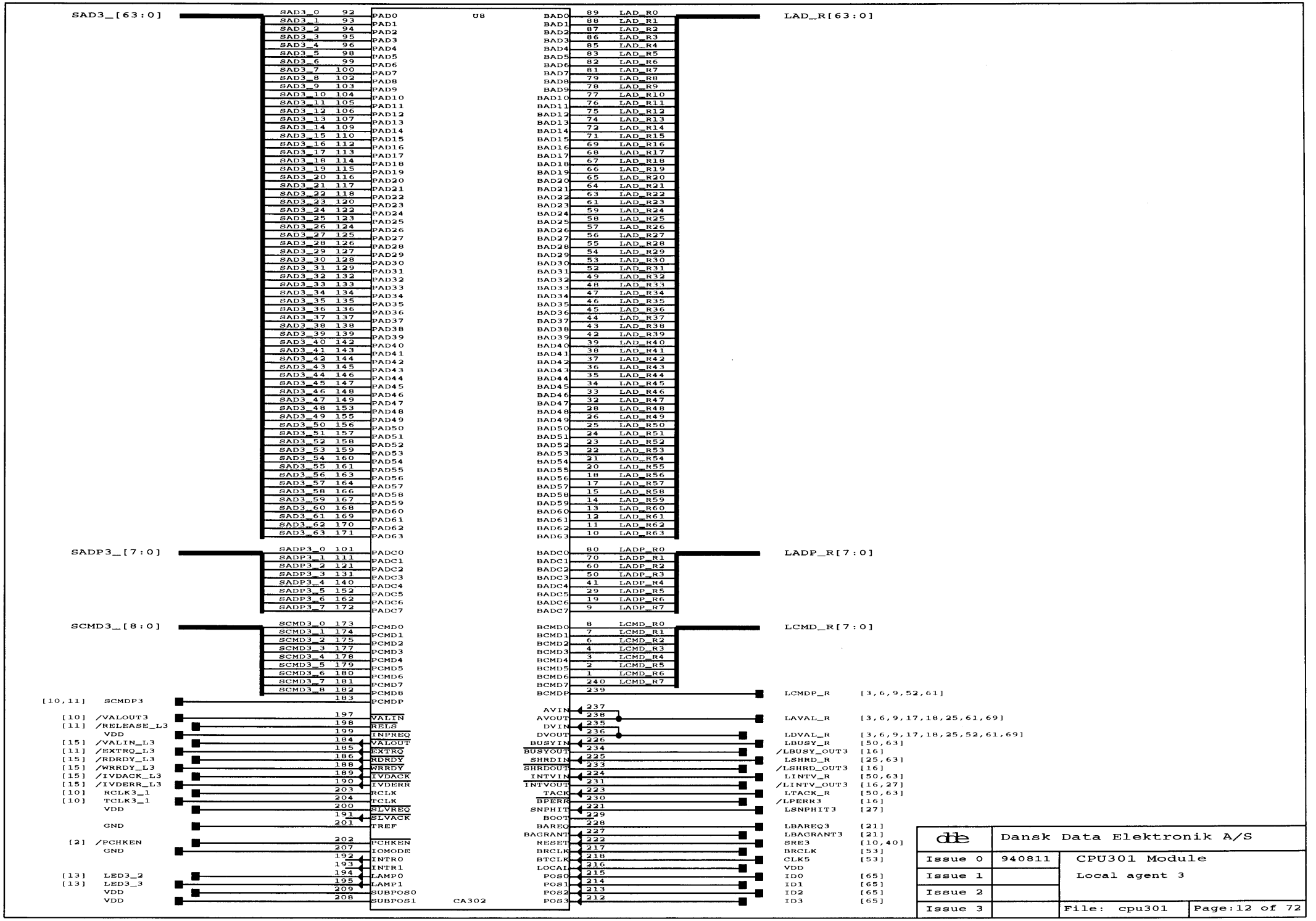
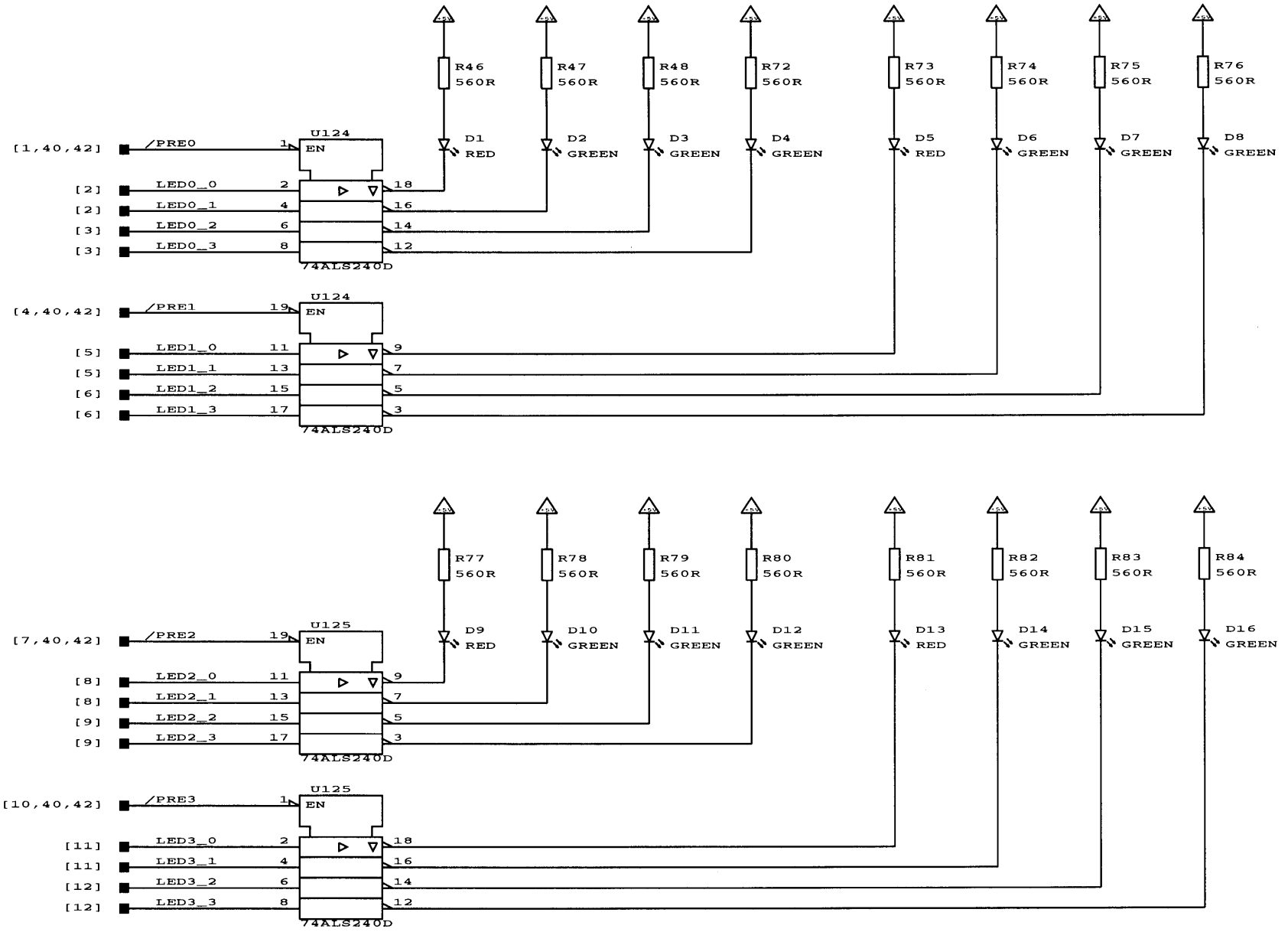
| Issue 1 | | Connectors 3 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:10 of 72 |




| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Global agent 3 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:11 of 72 |


SAD3_[63:0]
SADP3_[7:0]
SCMD3_[8:0]
U8
CA302
LAD_R[63:0]
LADP_R[7:0]
LCMD_R[7:0]
[10,11] SCMDP3
[10] /VALOUT3
[11] /RELEASE_L3
VDD
[15] /VALIN_L3
[11] /EXTRQ_L3
[15] /RDRDY_L3
[15] /WRRDY_L3
[15] /IVDACK_L3
[15] /IVDERR_L3
[10] RCLK3_1
[10] TCLK3_1
VDD
GND
[2] /PCHKEN
GND
[13] LED3_2
[13] LED3_3
VDD
VDD
LCMDP_R [3,6,9,52,61]
LAVAL_R [3,6,9,17,18,25,61,69]
LDVAL_R [3,6,9,17,18,25,52,61,69]
LBUSY_R [50,63]
/LBUSY_OUT3 [16]
LSHRD_R [25,63]
/LSHRD_OUT3 [16]
LINTV_R [50,63]
/LINTV_OUT3 [16,27]
LTACK_R [50,63]
/LPERR3 [16]
LSNPHIT3 [27]
LBAREQ3 [21]
LBAGRANT3 [21]
SRE3 [10,40]
BRCLK [53]
CLK5 [53]
VDD
ID0 [65]
ID1 [65]
ID2 [65]
ID3 [65]
Dansk Data Elektronik A/S
Issue 0 940811 CPU301 Module
Issue 1 Local agent 3
Issue 2
Issue 3 File: cpu301 Page:12 of 72

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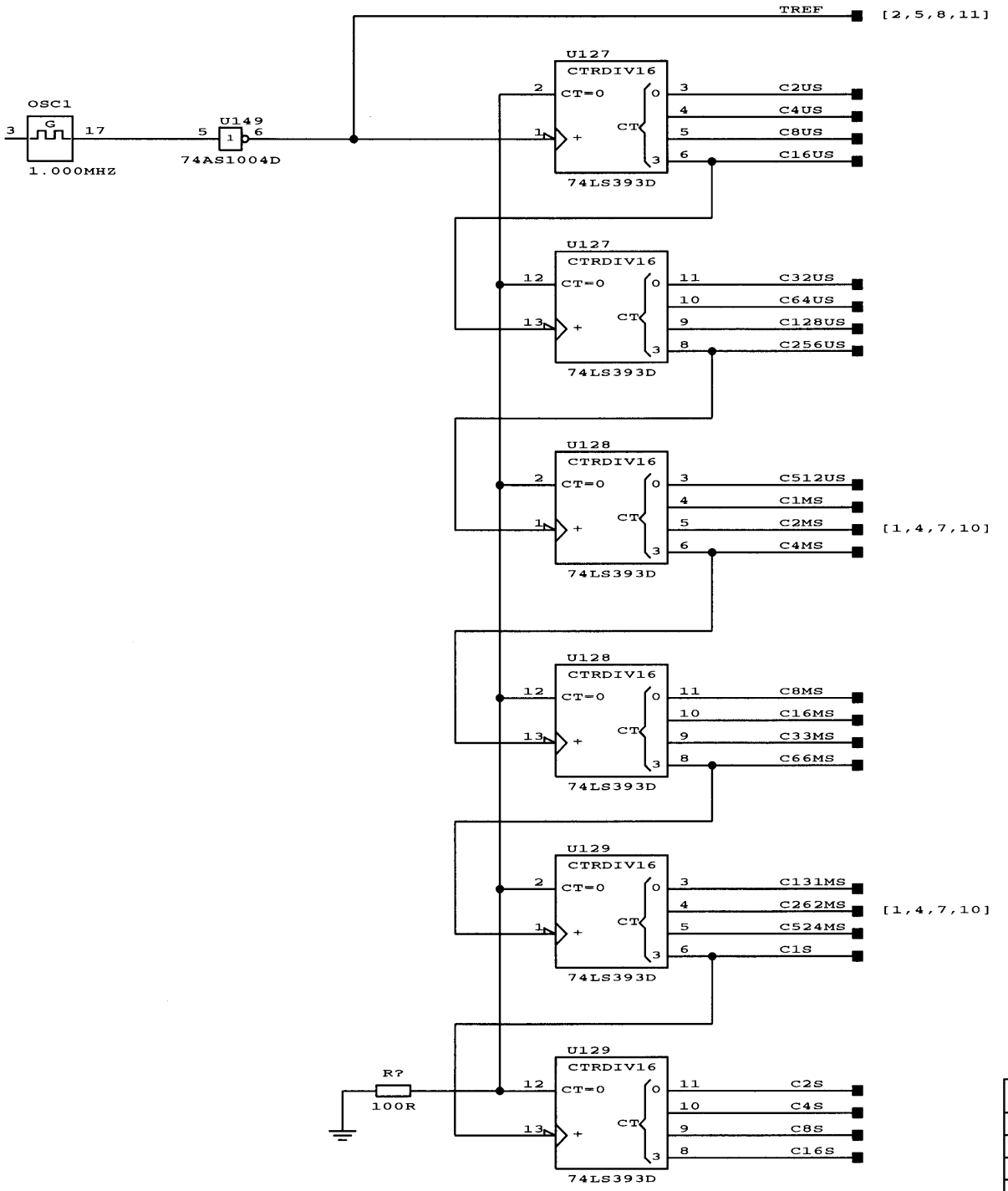
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Programmable LEDs | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:13 of 72 |

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|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
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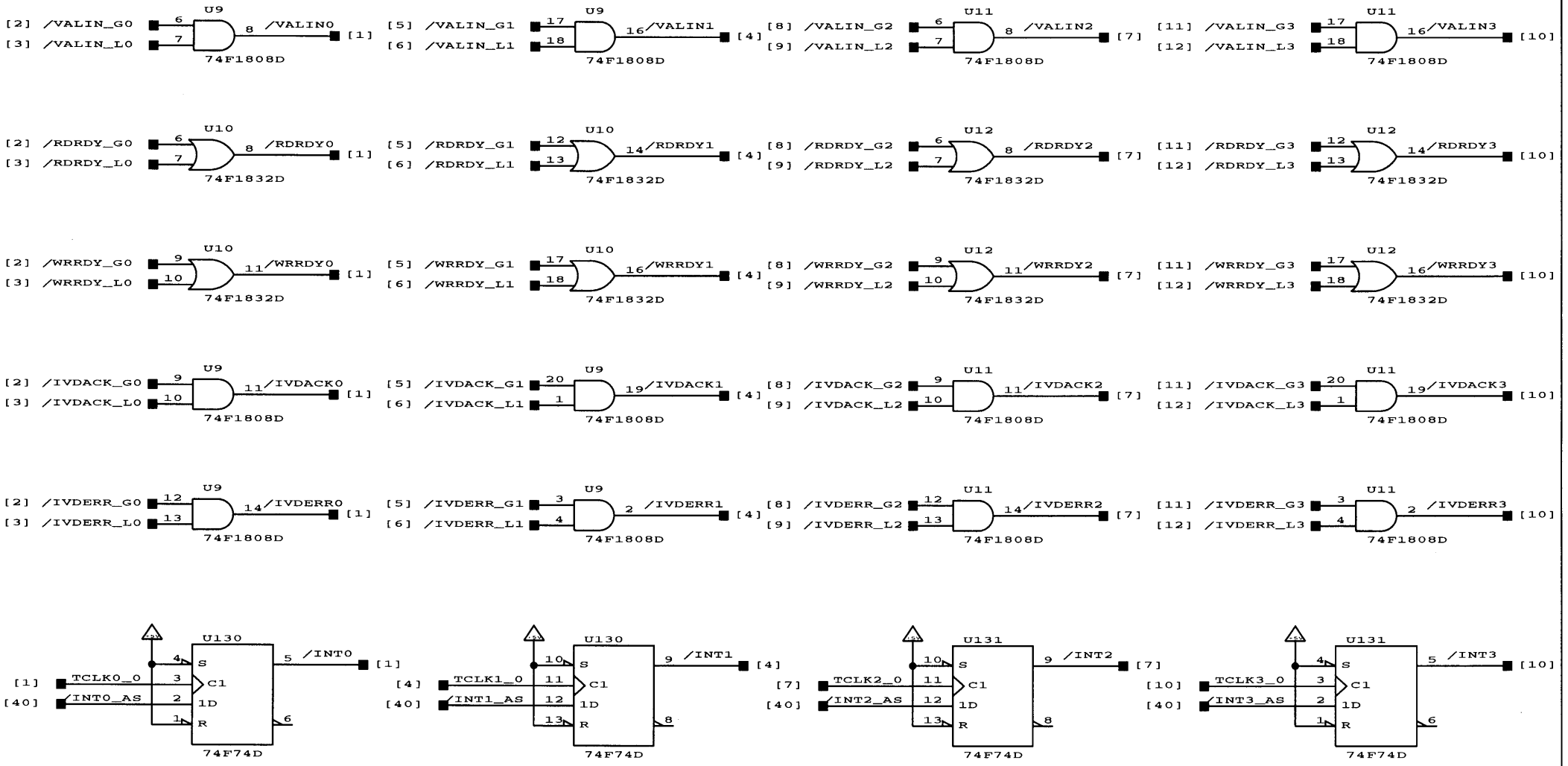
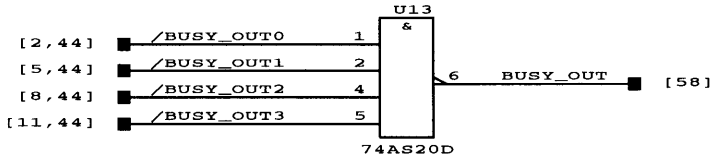
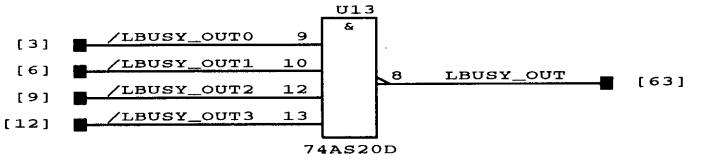
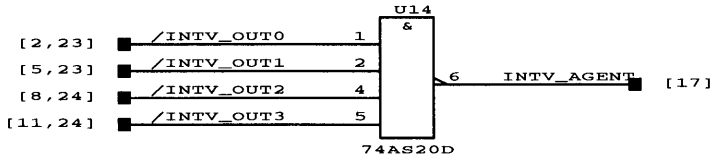
| Issue 1 | | Reset counters | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:14 of 72 |

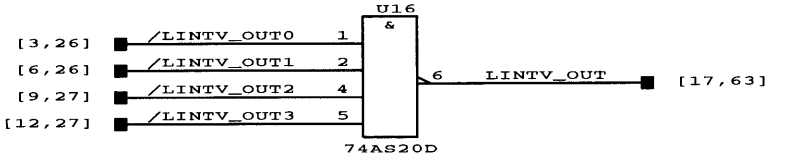


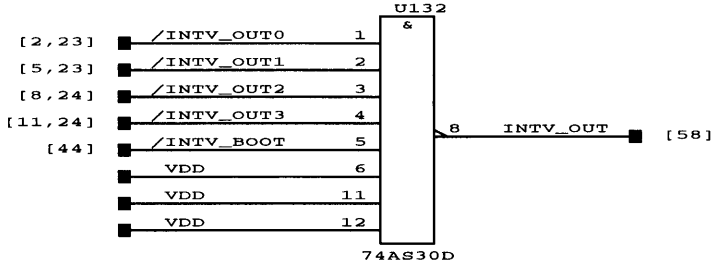

| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Gating towards processors | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:15 of 72 |

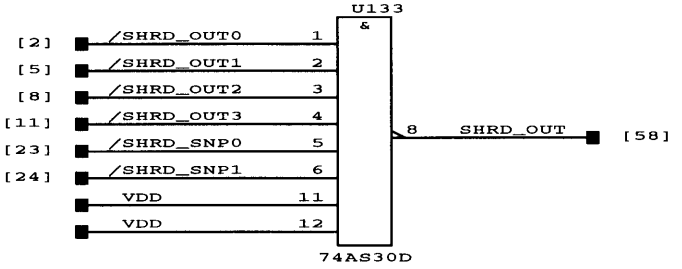


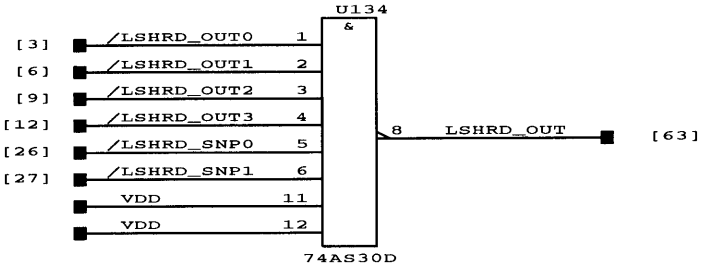



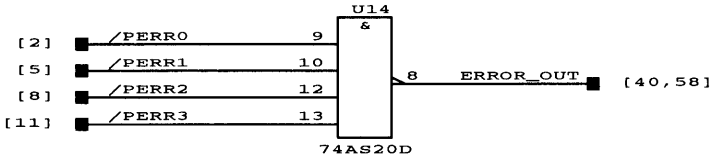



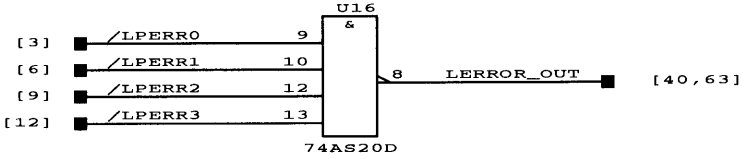

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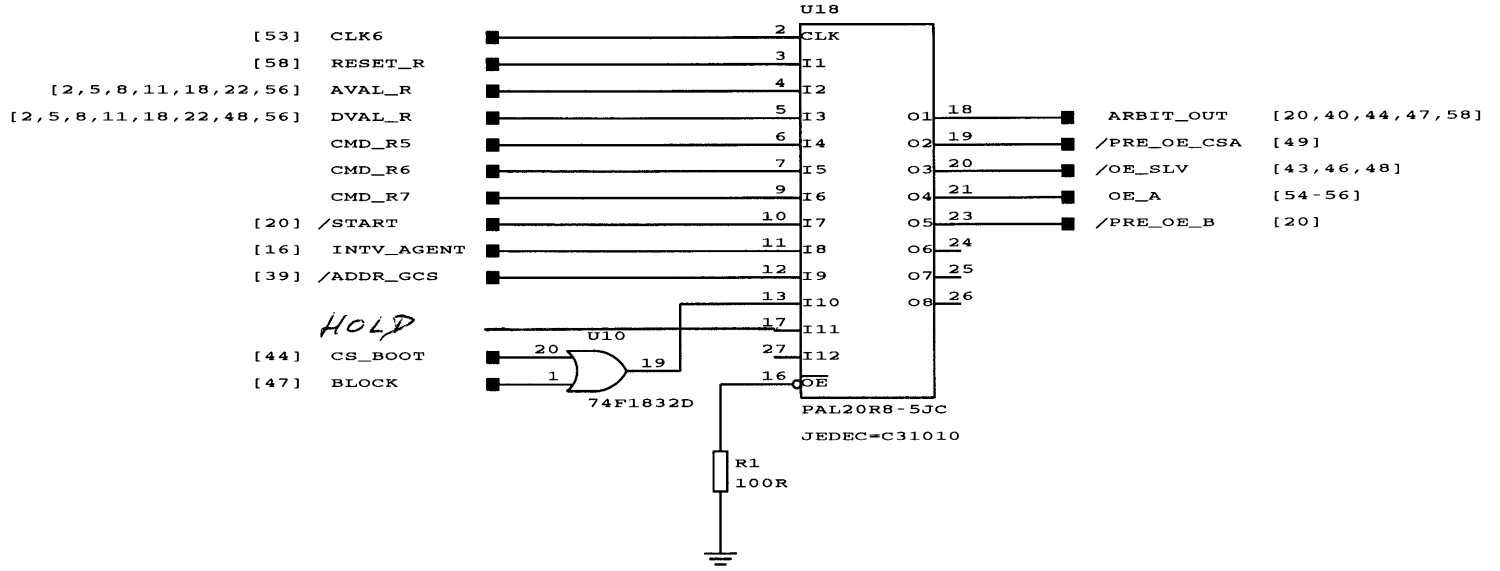
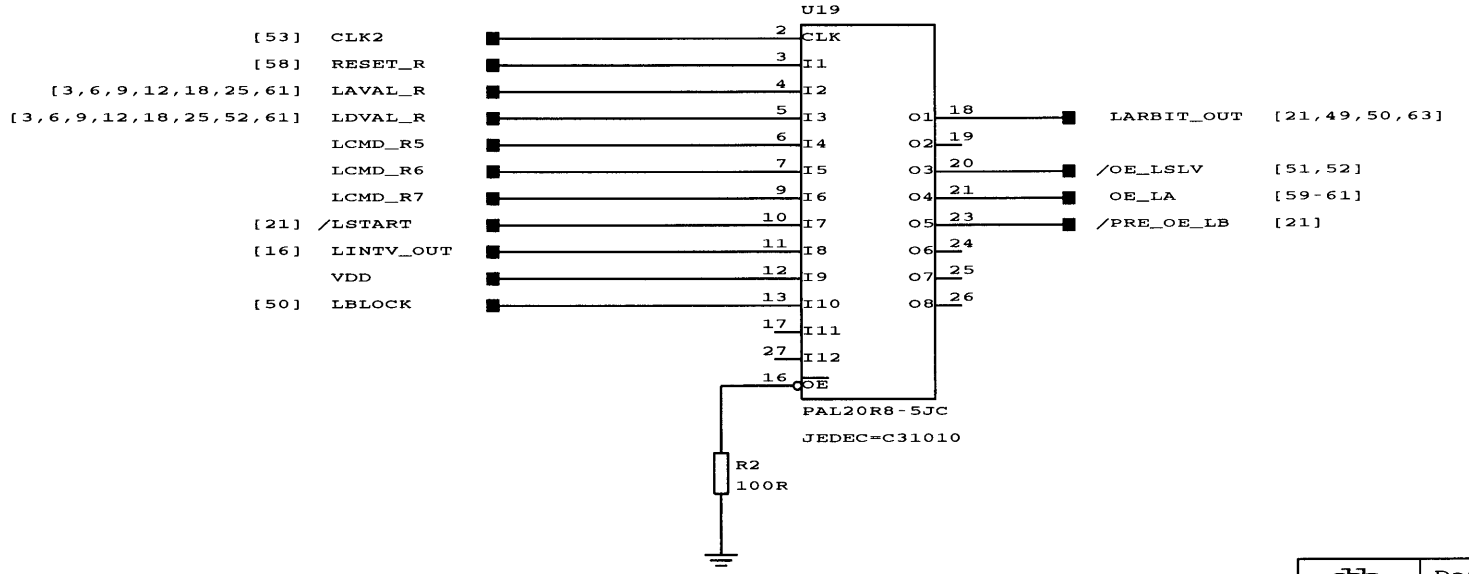
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Gating towards system bus | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:16 of 72 |

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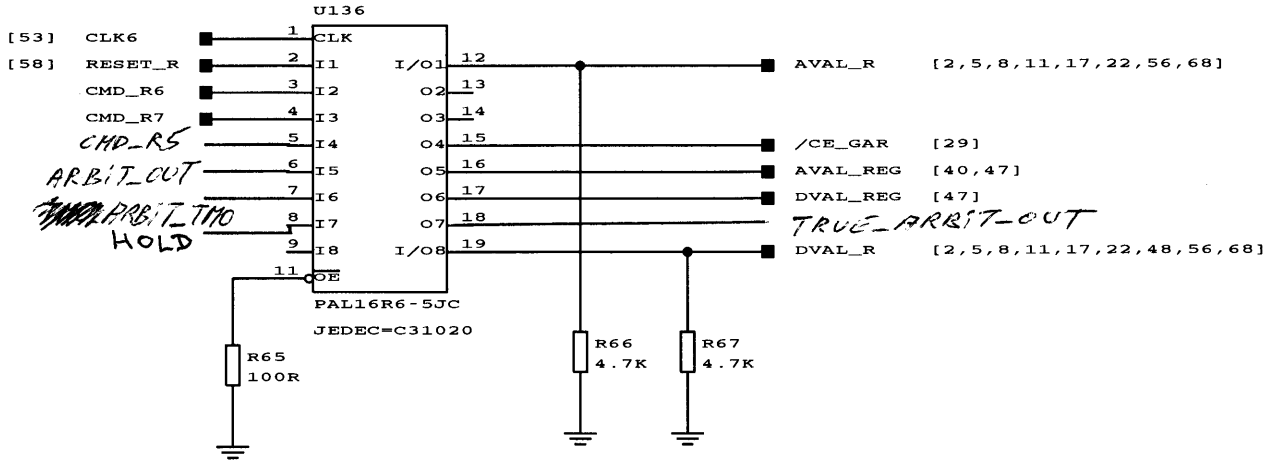
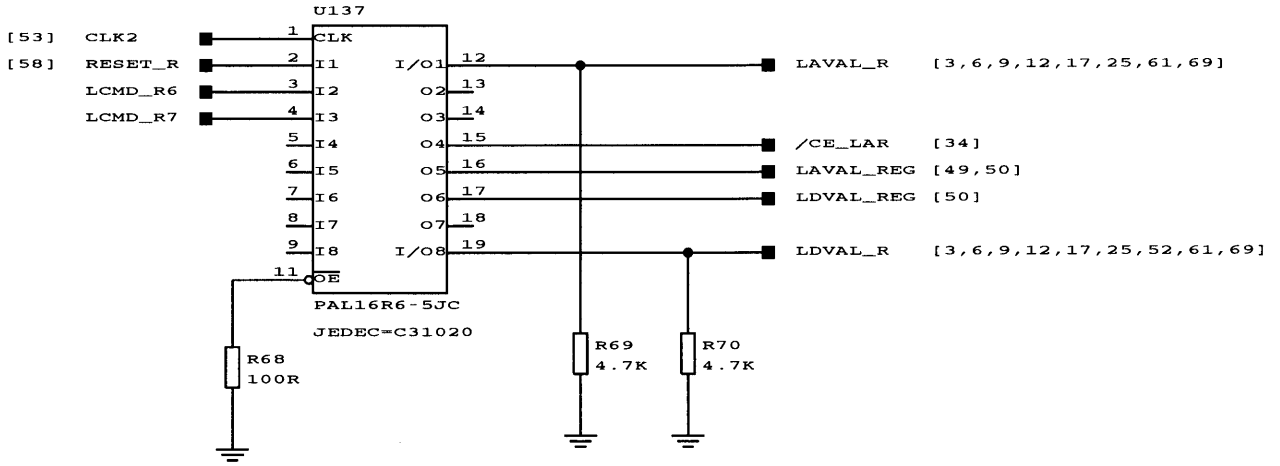
|---|---|---|
| dde | Dansk Data Elektronik A/S | |
| Issue 0 | 940811 | CPU301 Module |
| Issue 1 | | Global and local |
| Issue 2 | | output enable control |
| Issue 3 | | File: cpu301 Page:17 of 72 |

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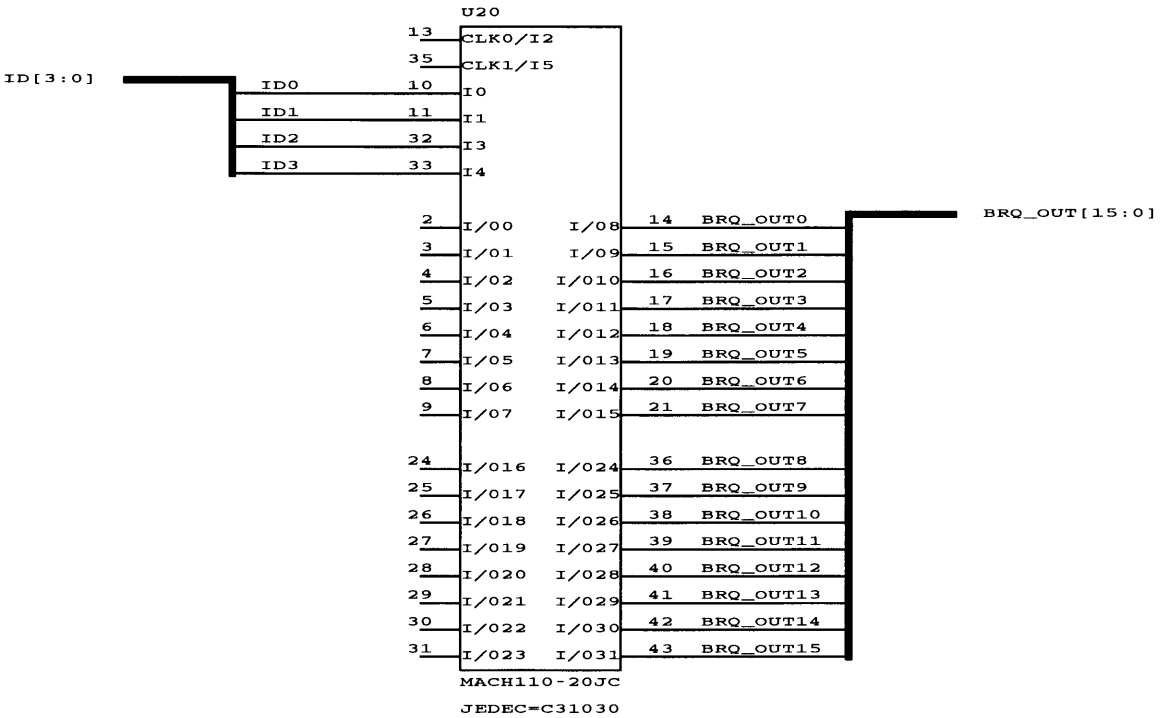
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940506 | CPU301 Module | |
| Issue 1 | CHG | Pull-down for | |
| Issue 2 | | address and data valid | |
| Issue 3 | | File: cpu301 | Page:18 of 72 |

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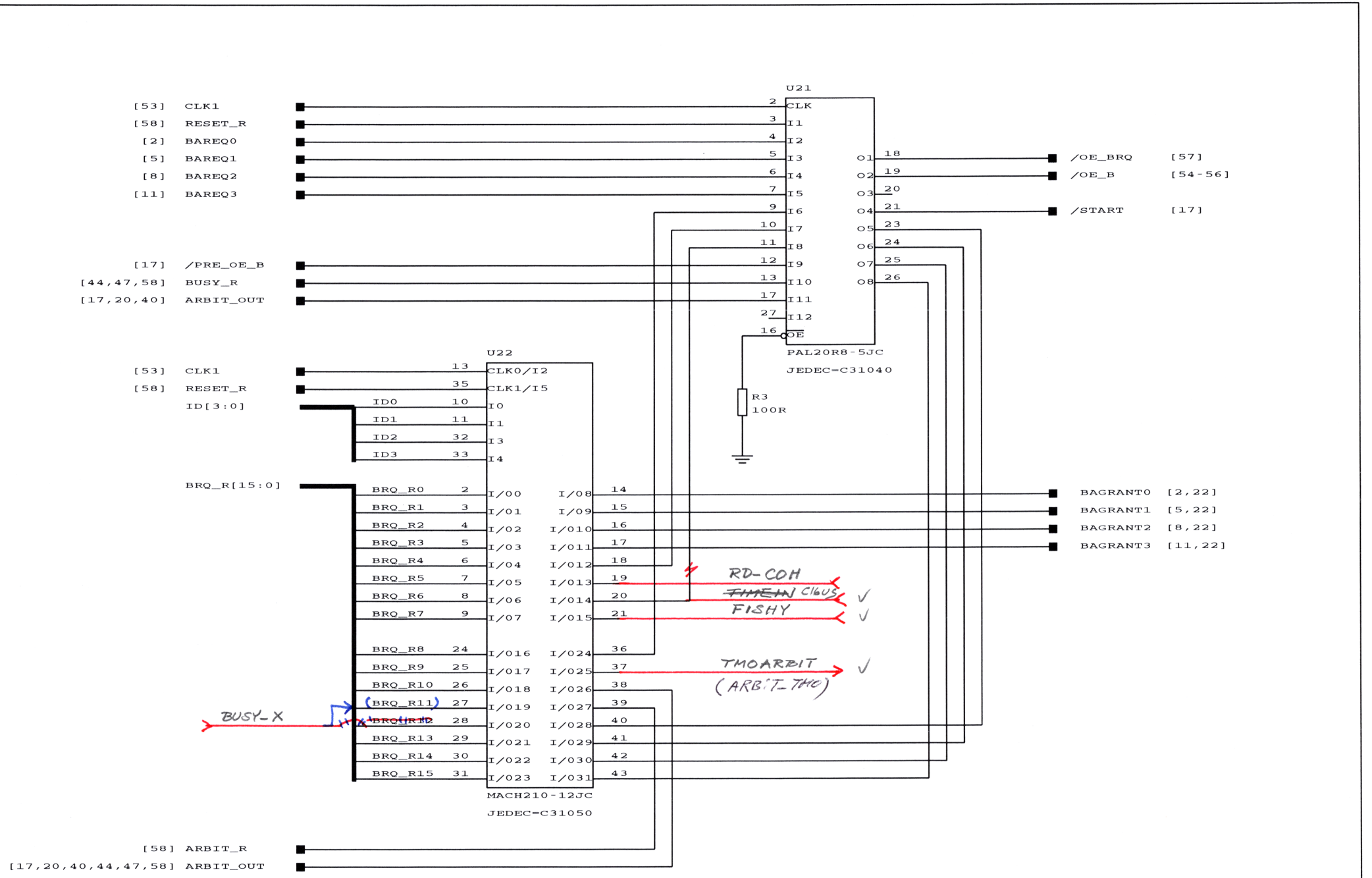
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940506 | CPU301 Module | |
| Issue 1 | CHG | Global and local | |
| Issue 2 | | bus request decoder | |
| Issue 3 | | File: cpu301 | Page:19 of 72 |

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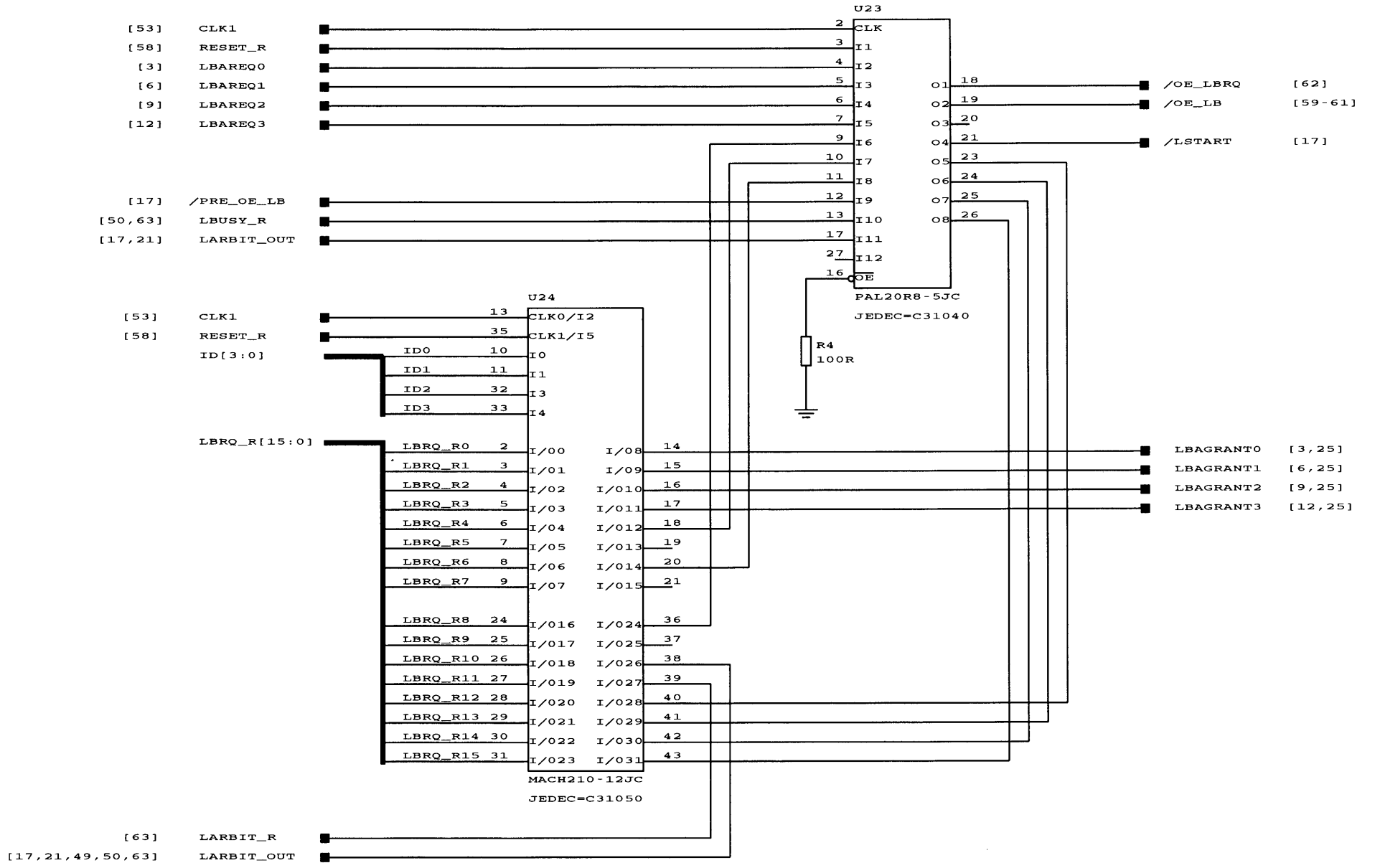
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Global bus arbitration | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:20 of 72 |

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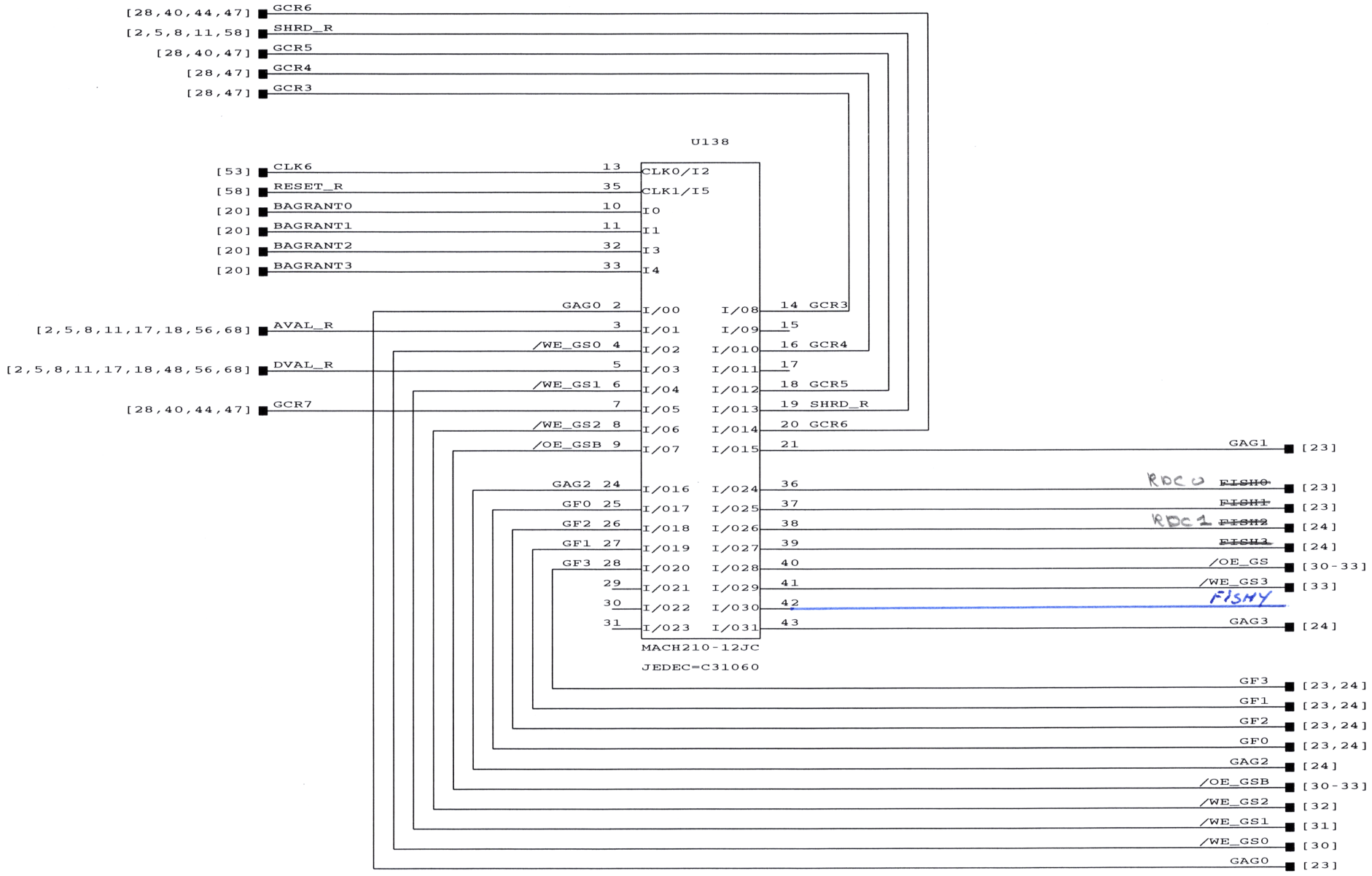
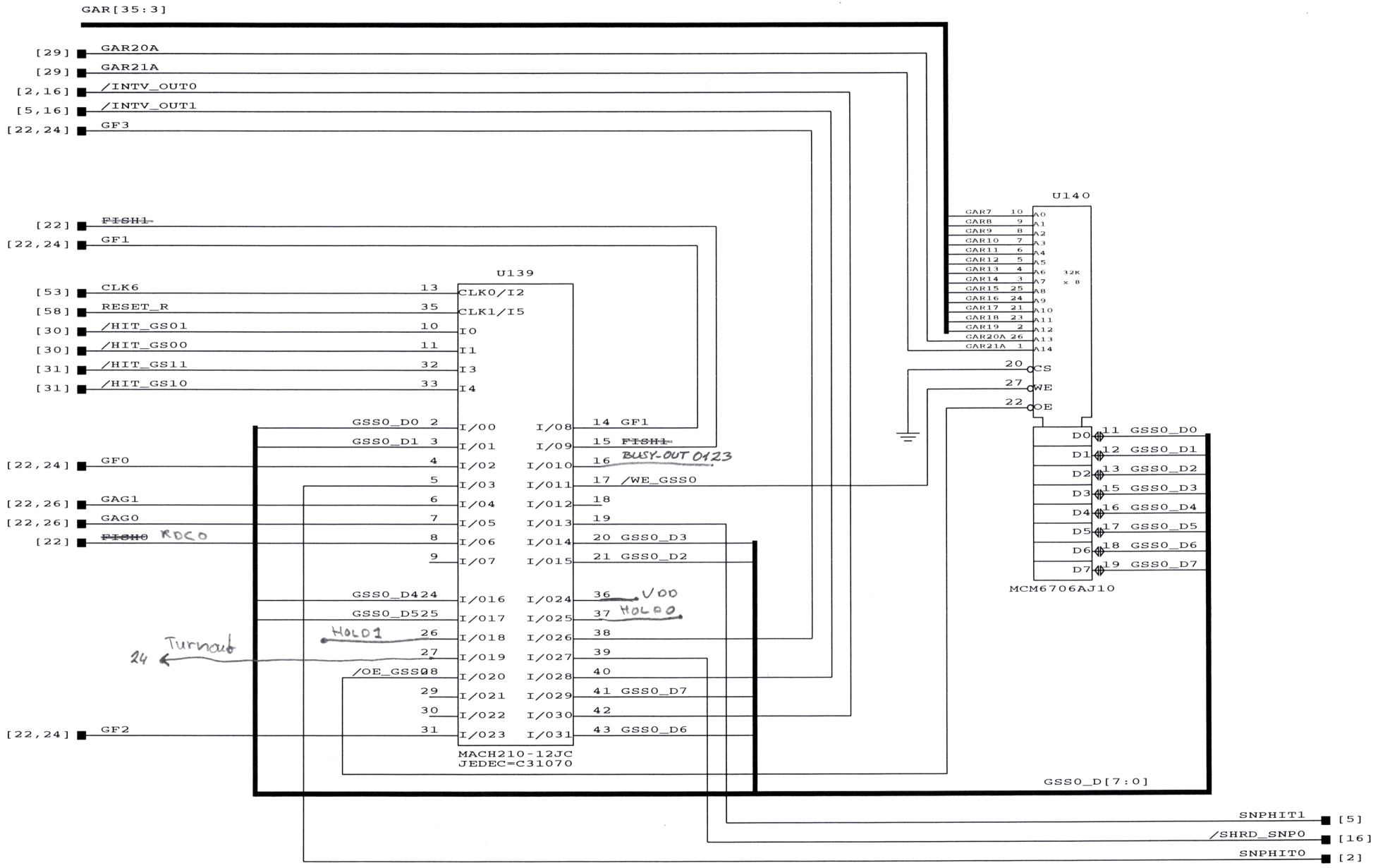
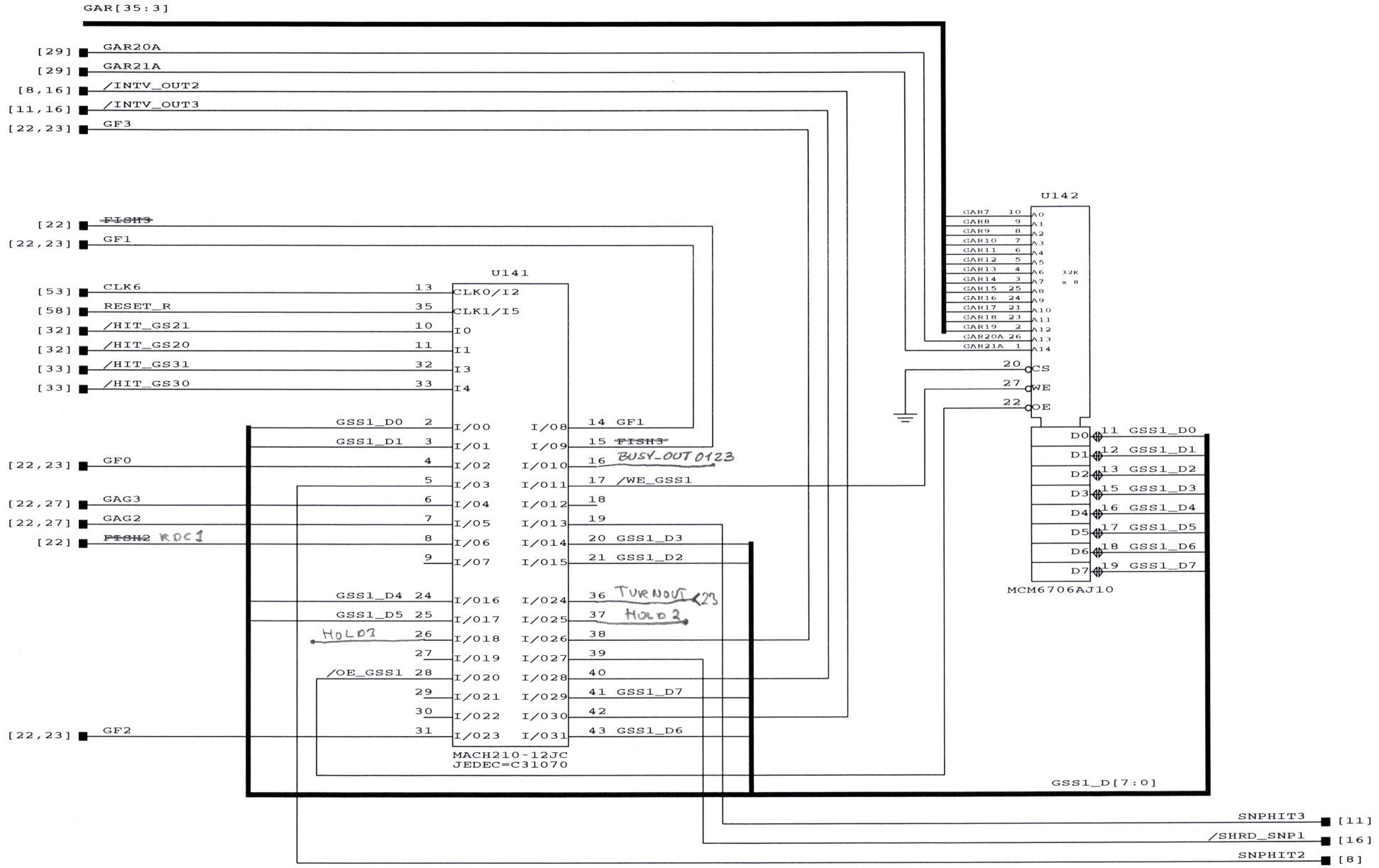
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Local bus arbitration | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:21 of 72 |



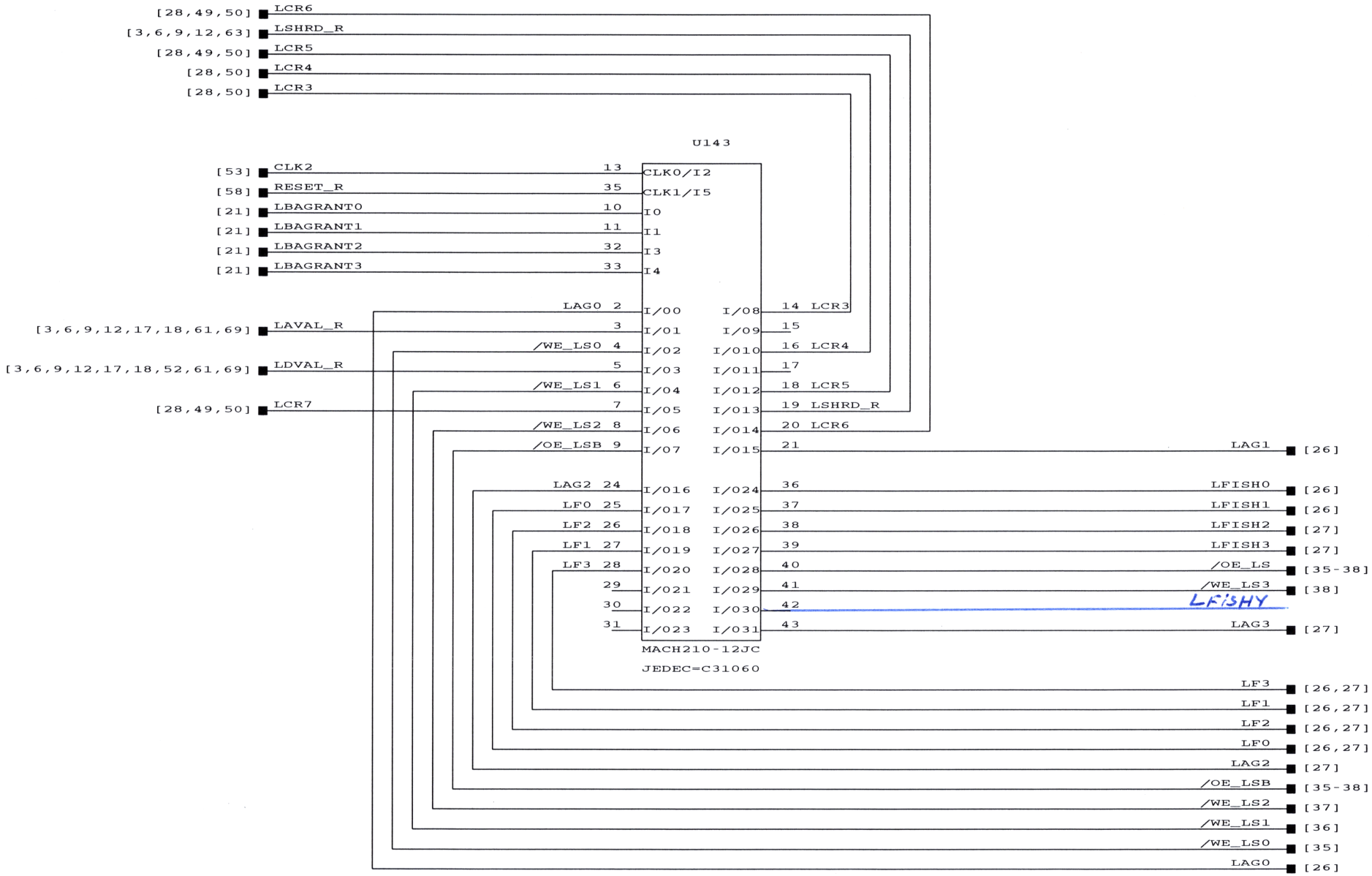

| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Global snooper control | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:22 of 72 |



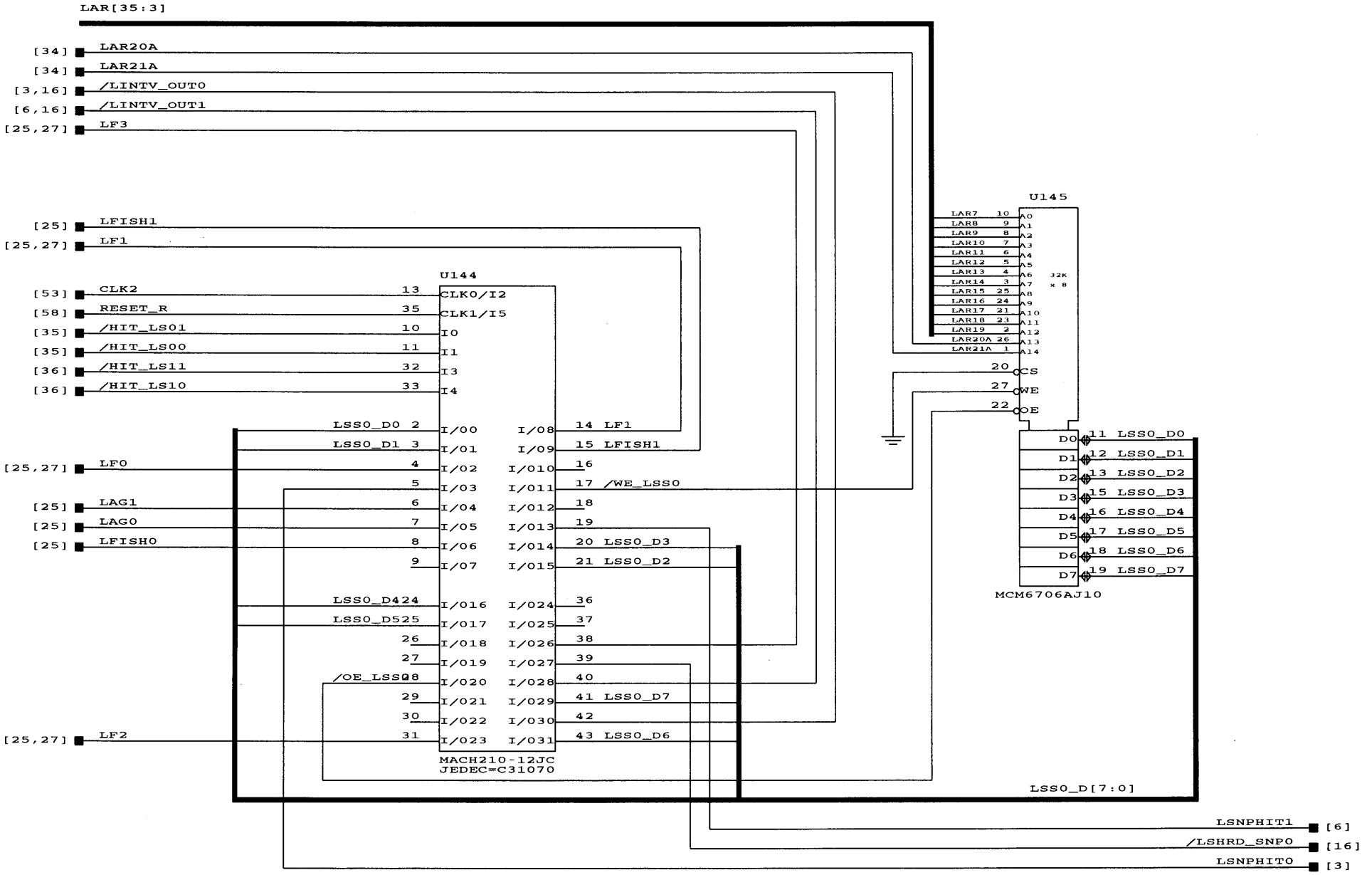

| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Global Super Snooper 0-1 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:23 of 72 |




| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Global Super Snooper 2-3 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:24 of 72 |




| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Local snooper control | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:25 of 72 |




| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
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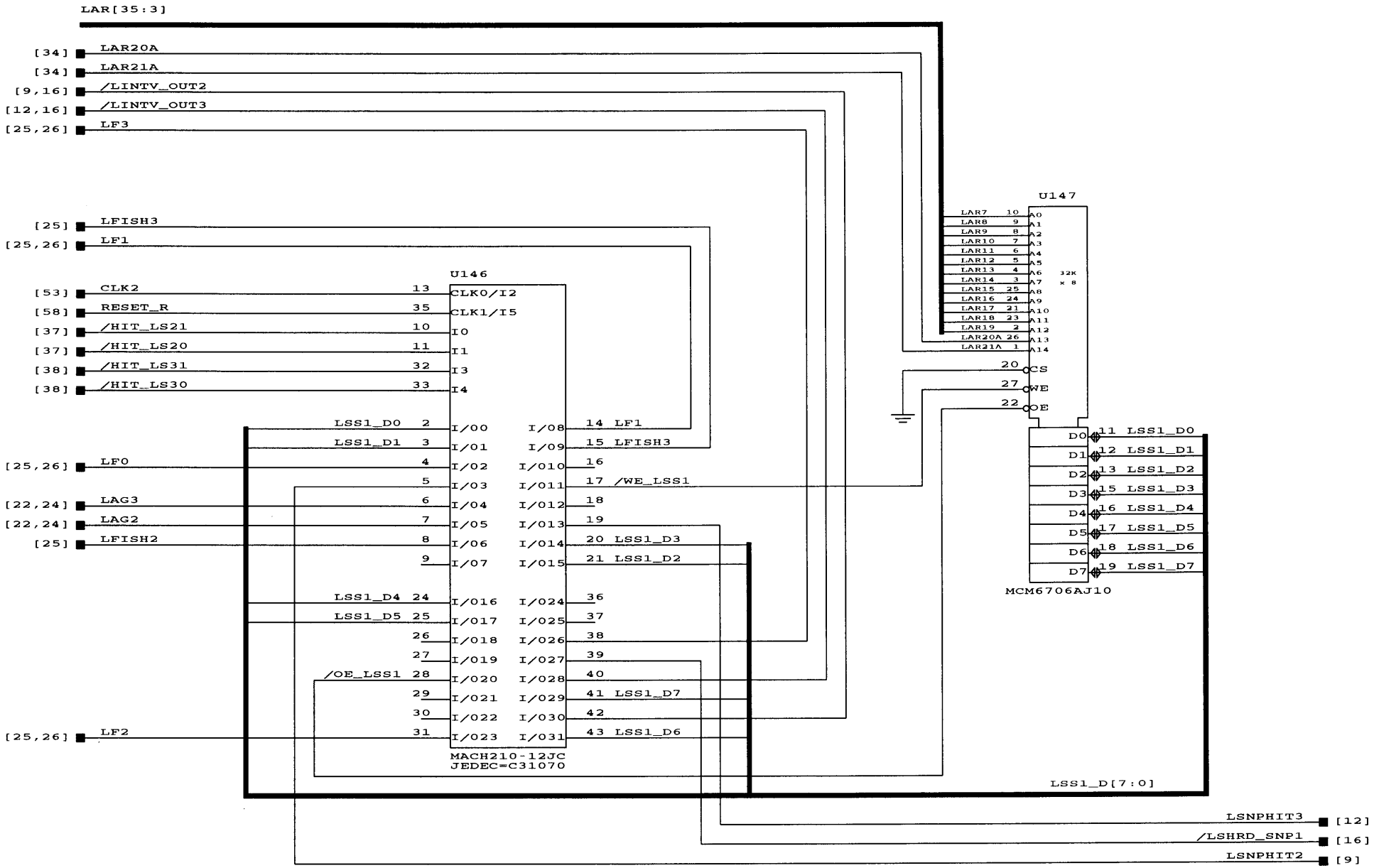
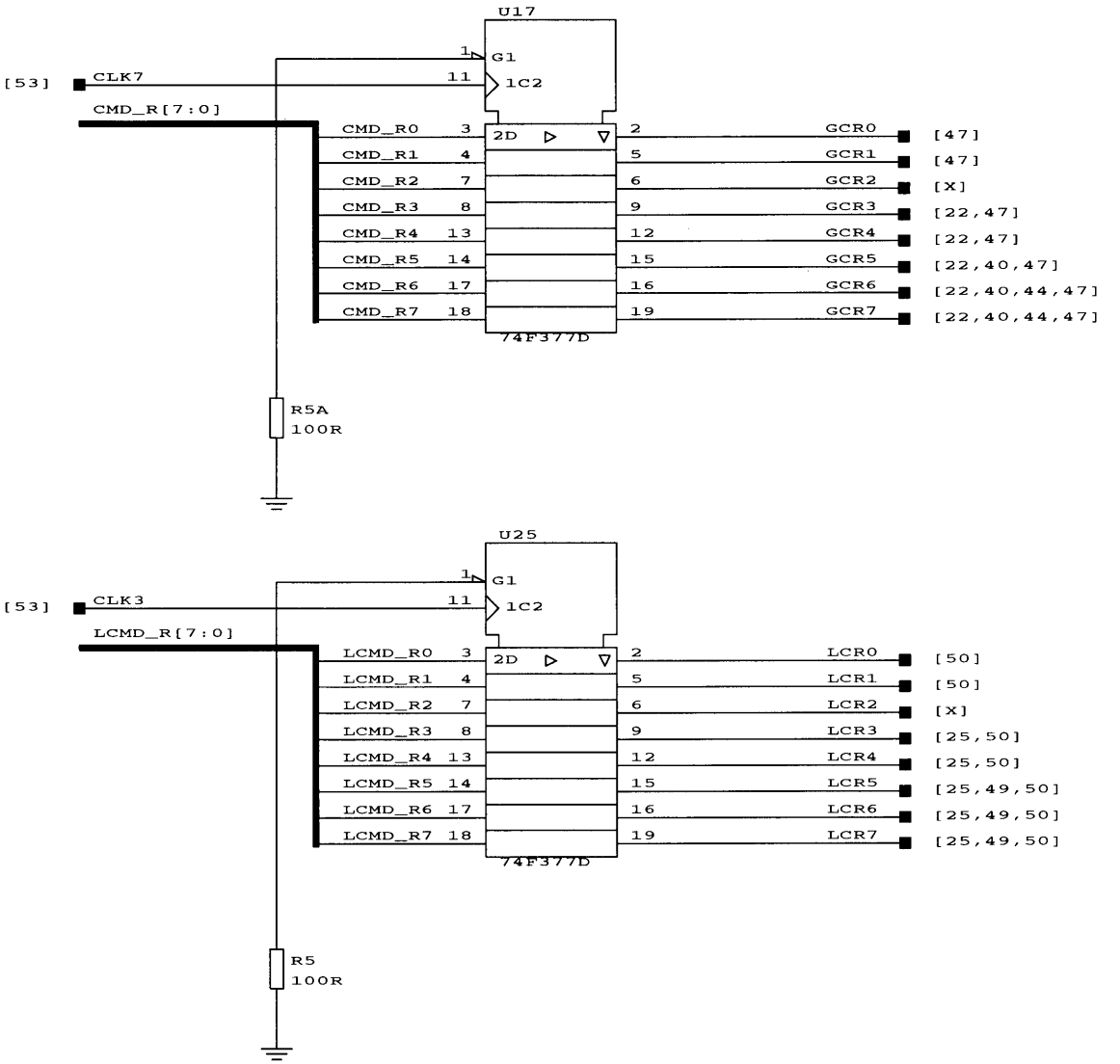
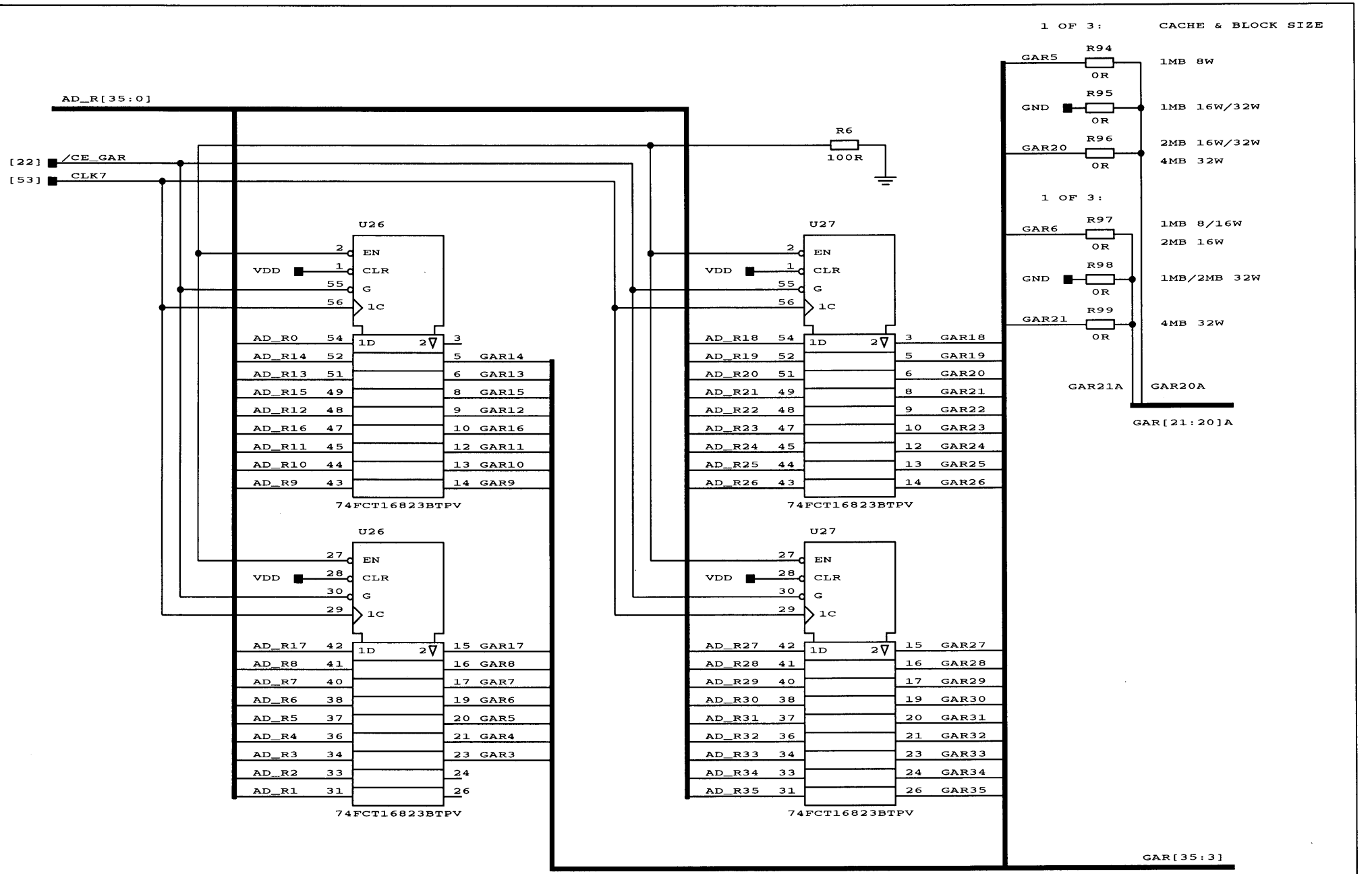
| Issue 1 | | Local Super Snooper 0-1 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:26 of 72 |




| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Local Super Snooper 2-3 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:27 of 72 |




| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Global and local | |
| Issue 2 | | command register | |
| Issue 3 | | File: cpu301 | Page:28 of 72 |

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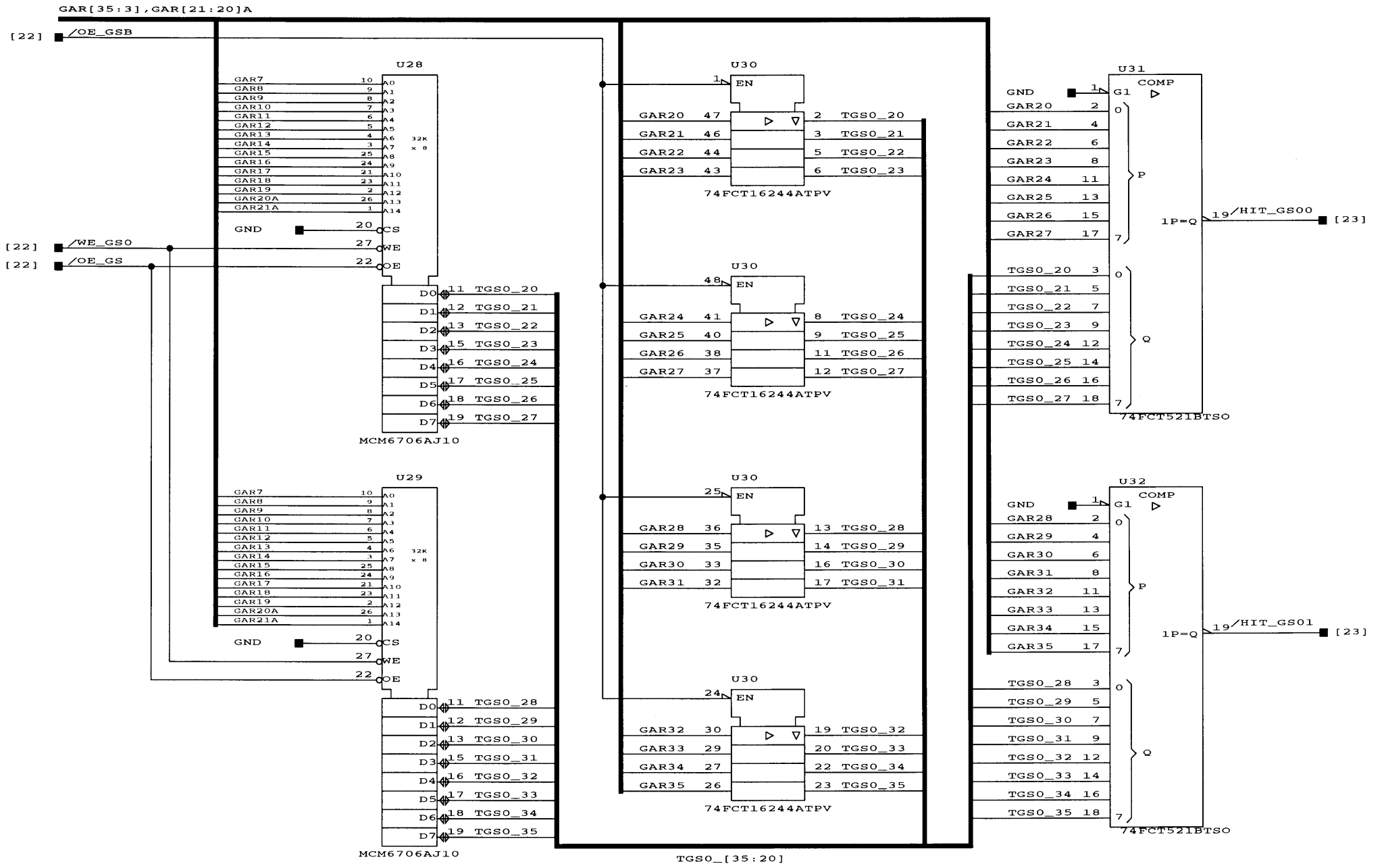
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Global address register | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:29 of 72 |




| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
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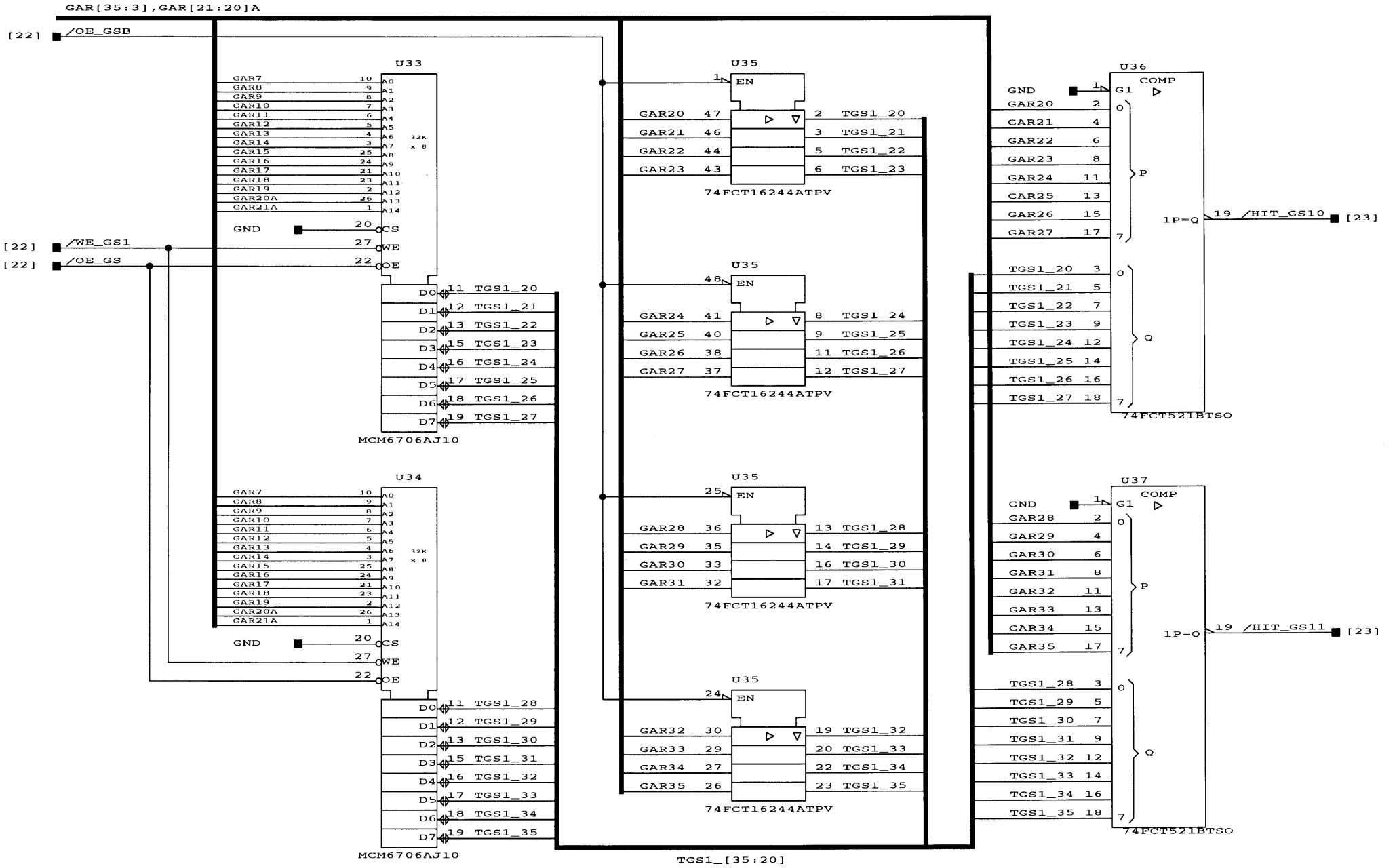
| Issue 1 | | Global snooper 0 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:30 of 72 |




| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
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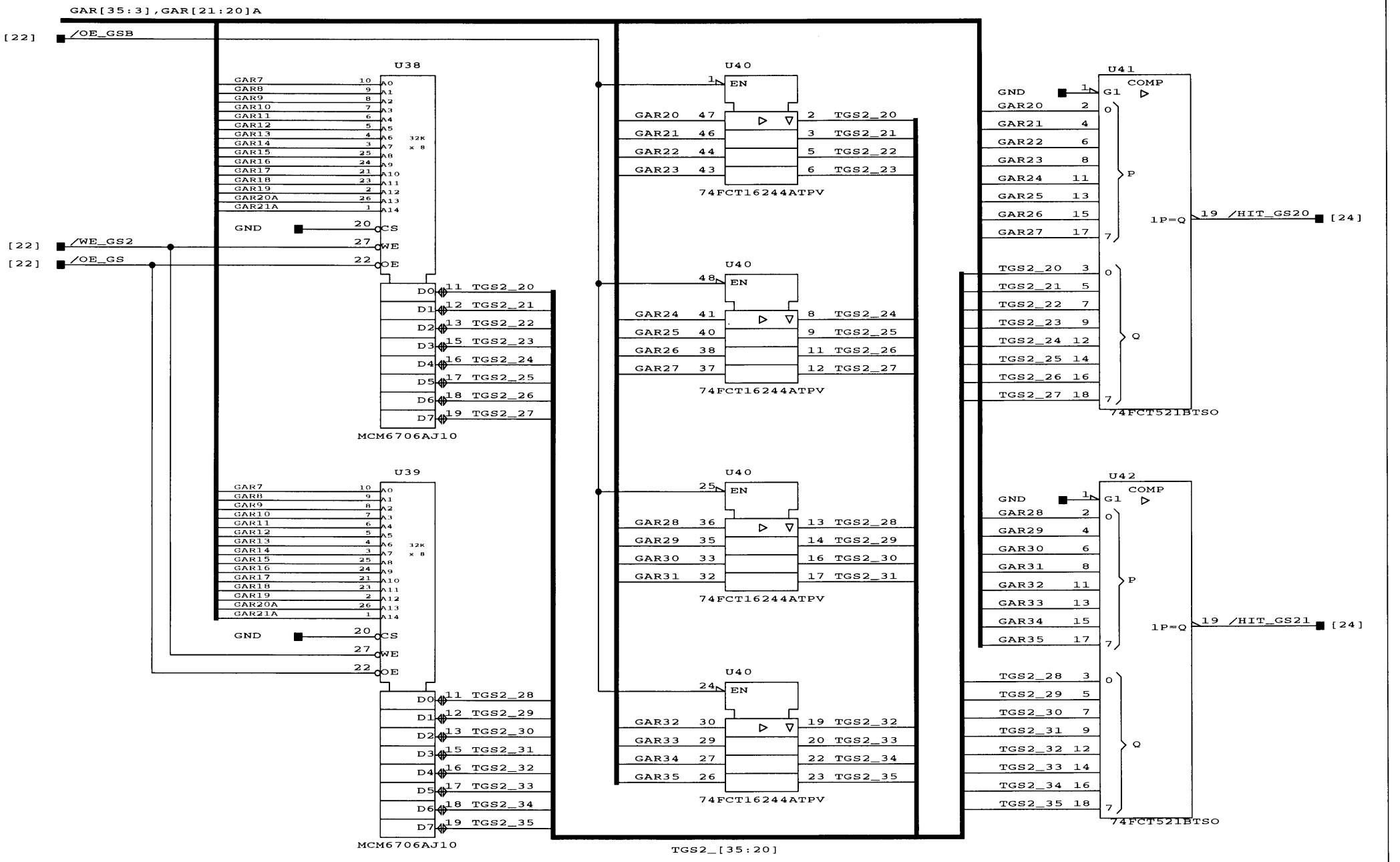
| Issue 1 | | Global snooper 1 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:31 of 72 |

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|---|---|---|---|
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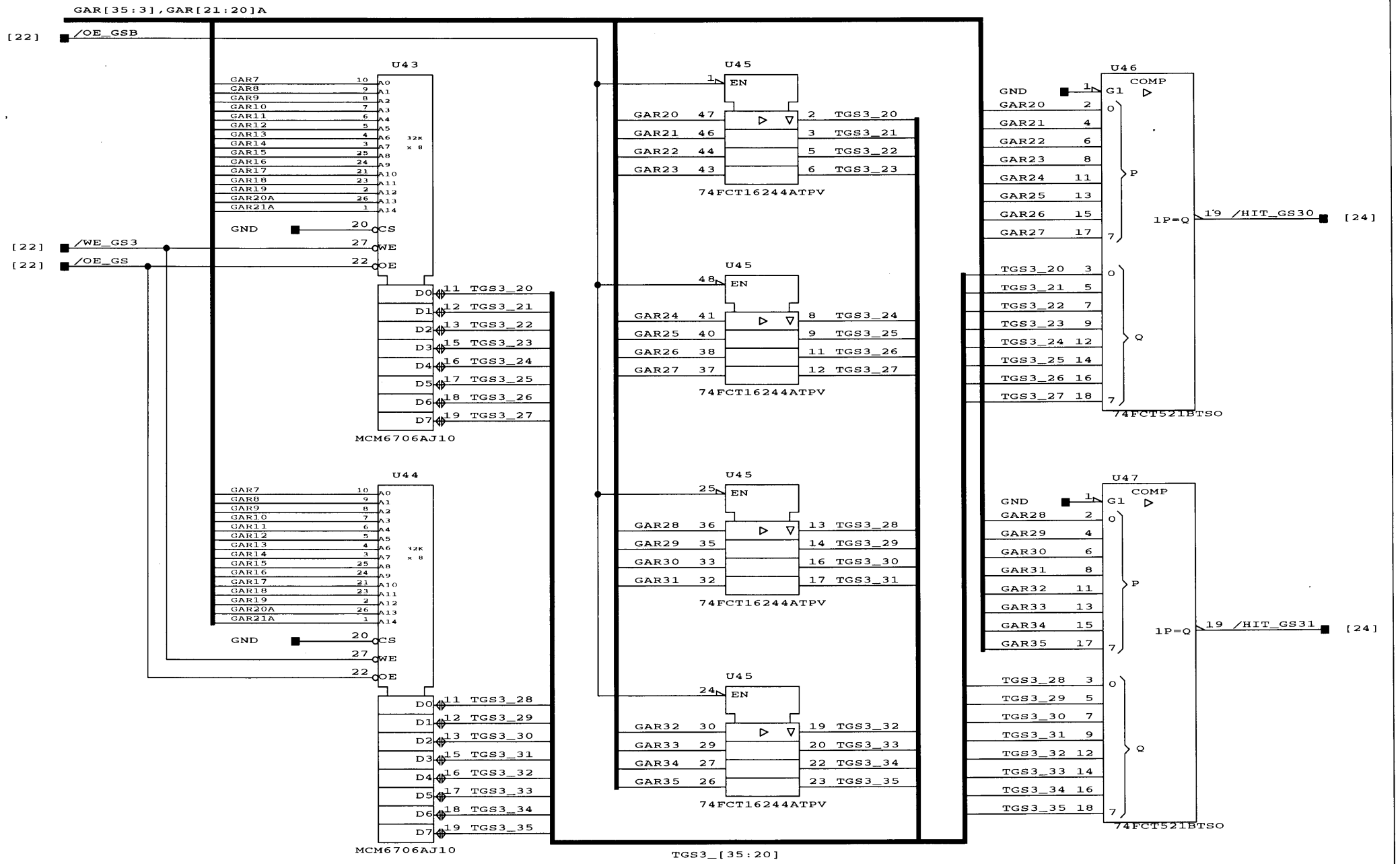
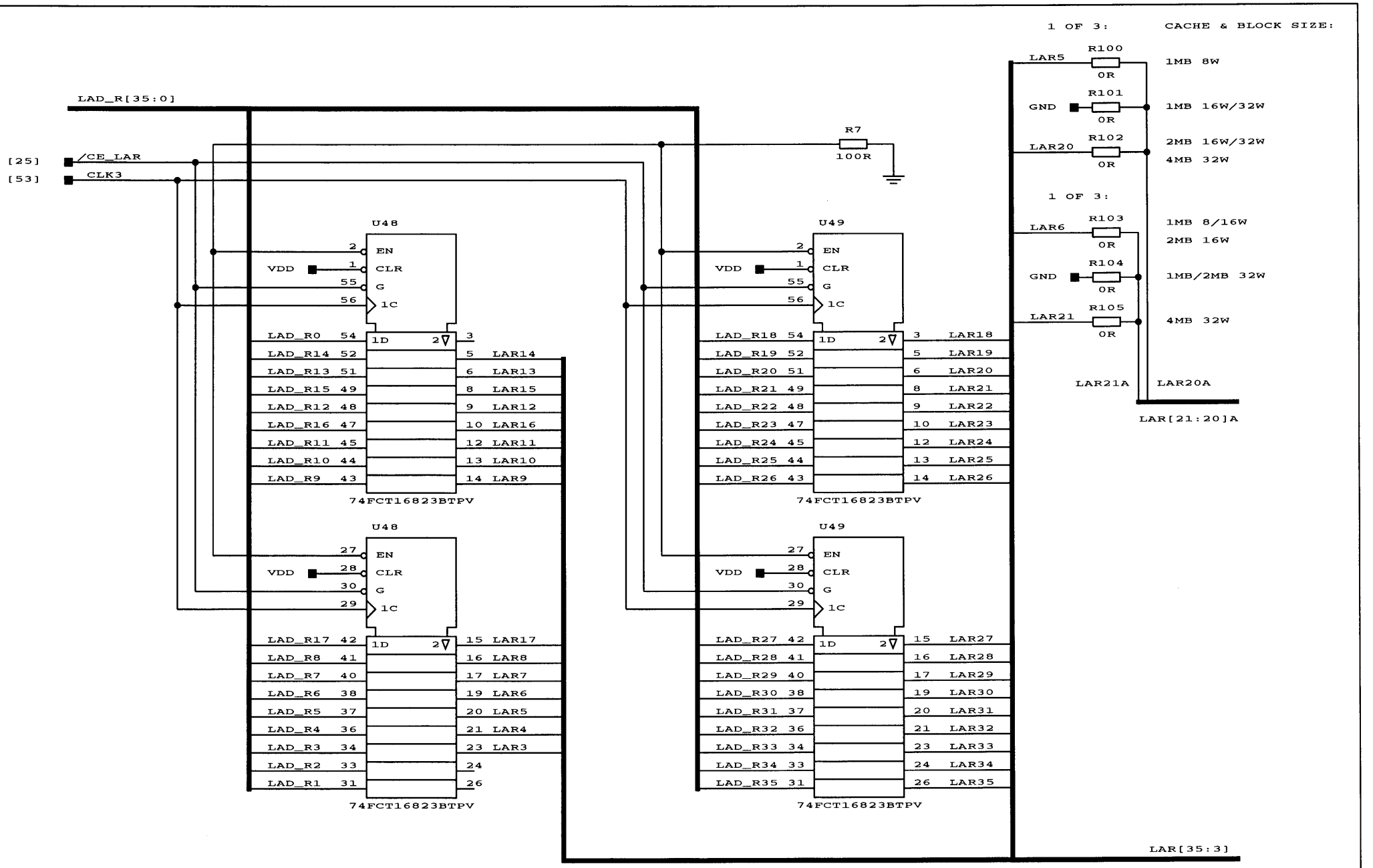
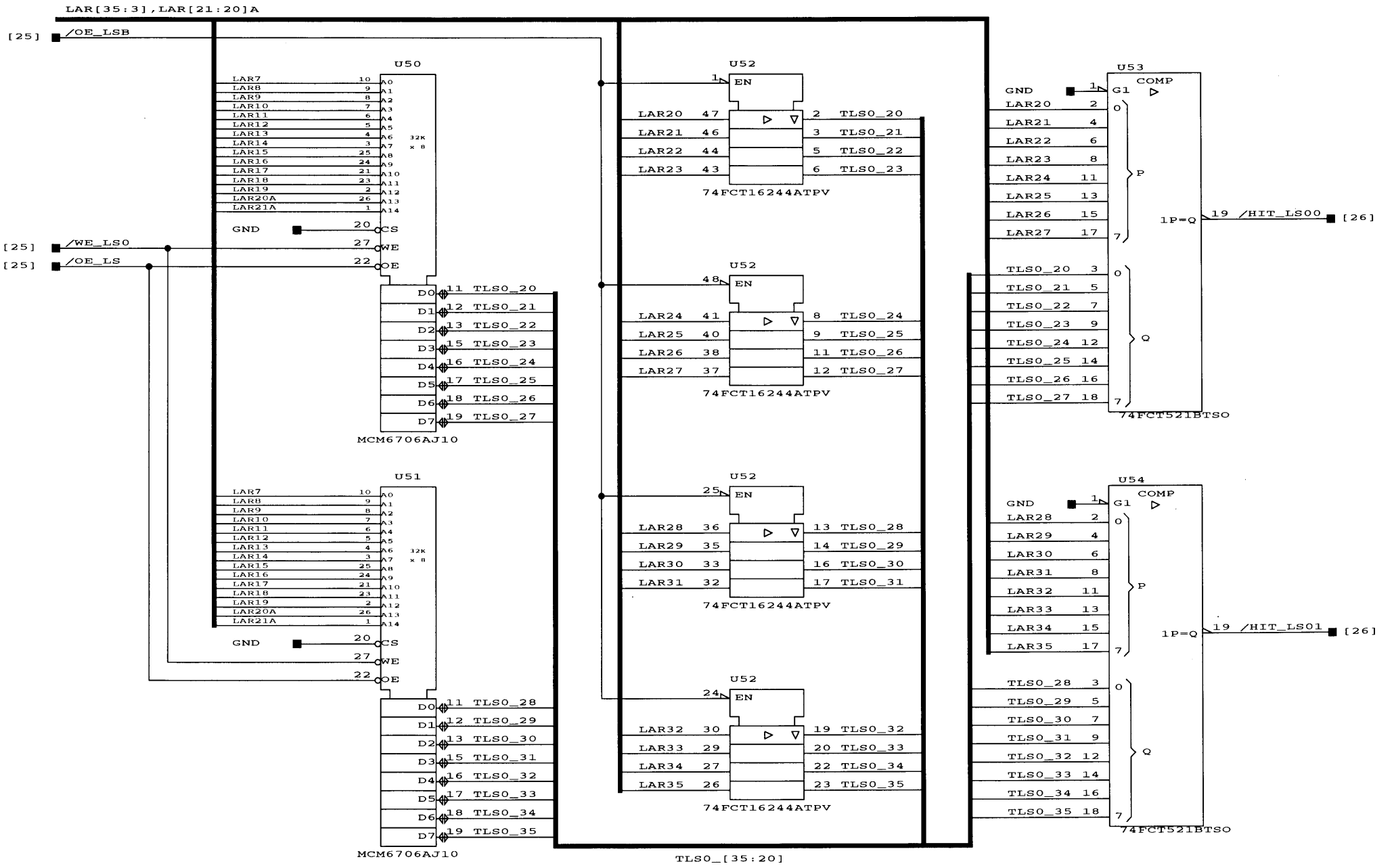
| Issue 1 | | Global snooper 2 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:32 of 72 |




| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Global snooper 3 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:33 of 72 |




| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Local address register | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:34 of 72 |




| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
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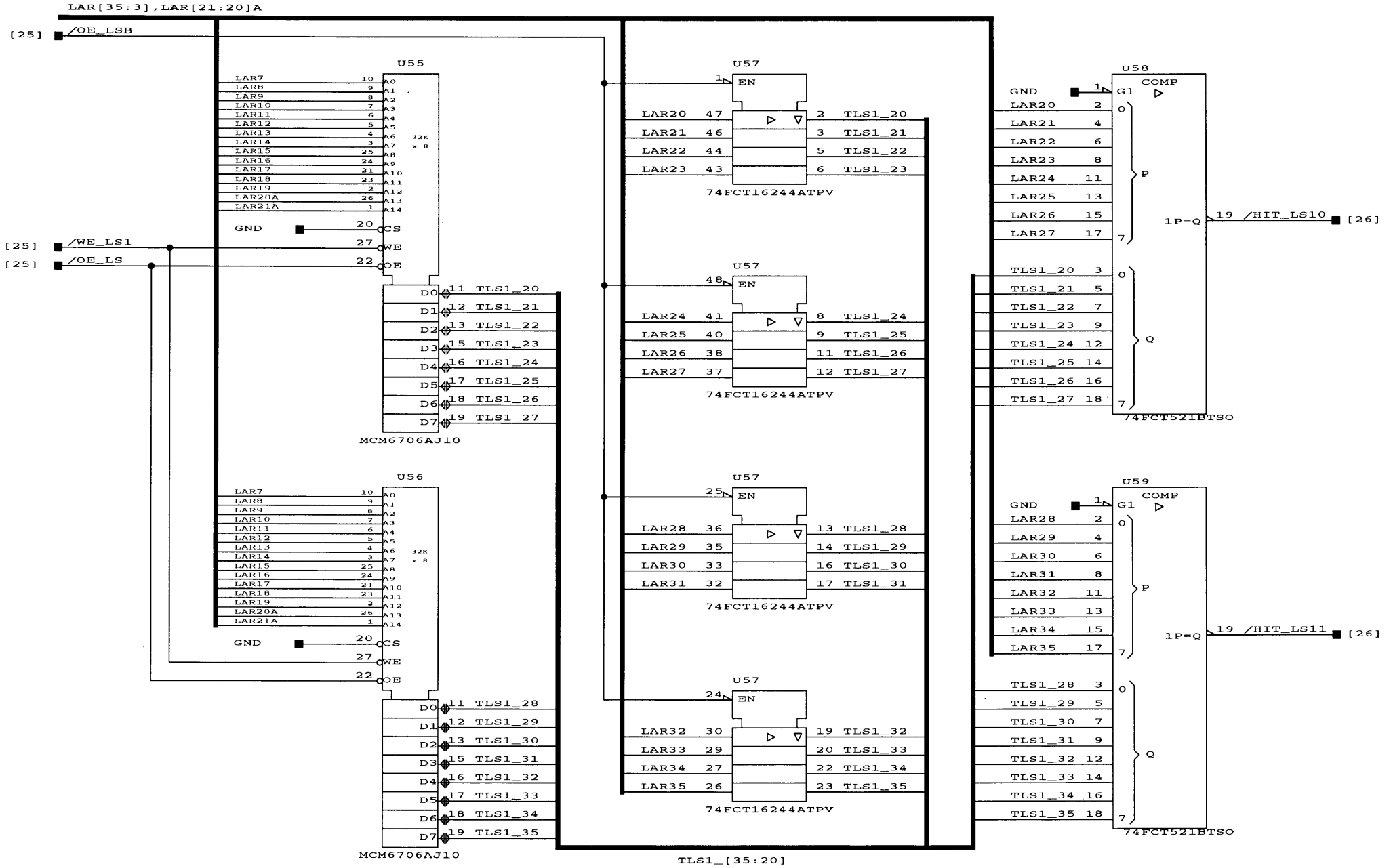
| Issue 1 | | Local snooper 0 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:35 of 72 |




| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
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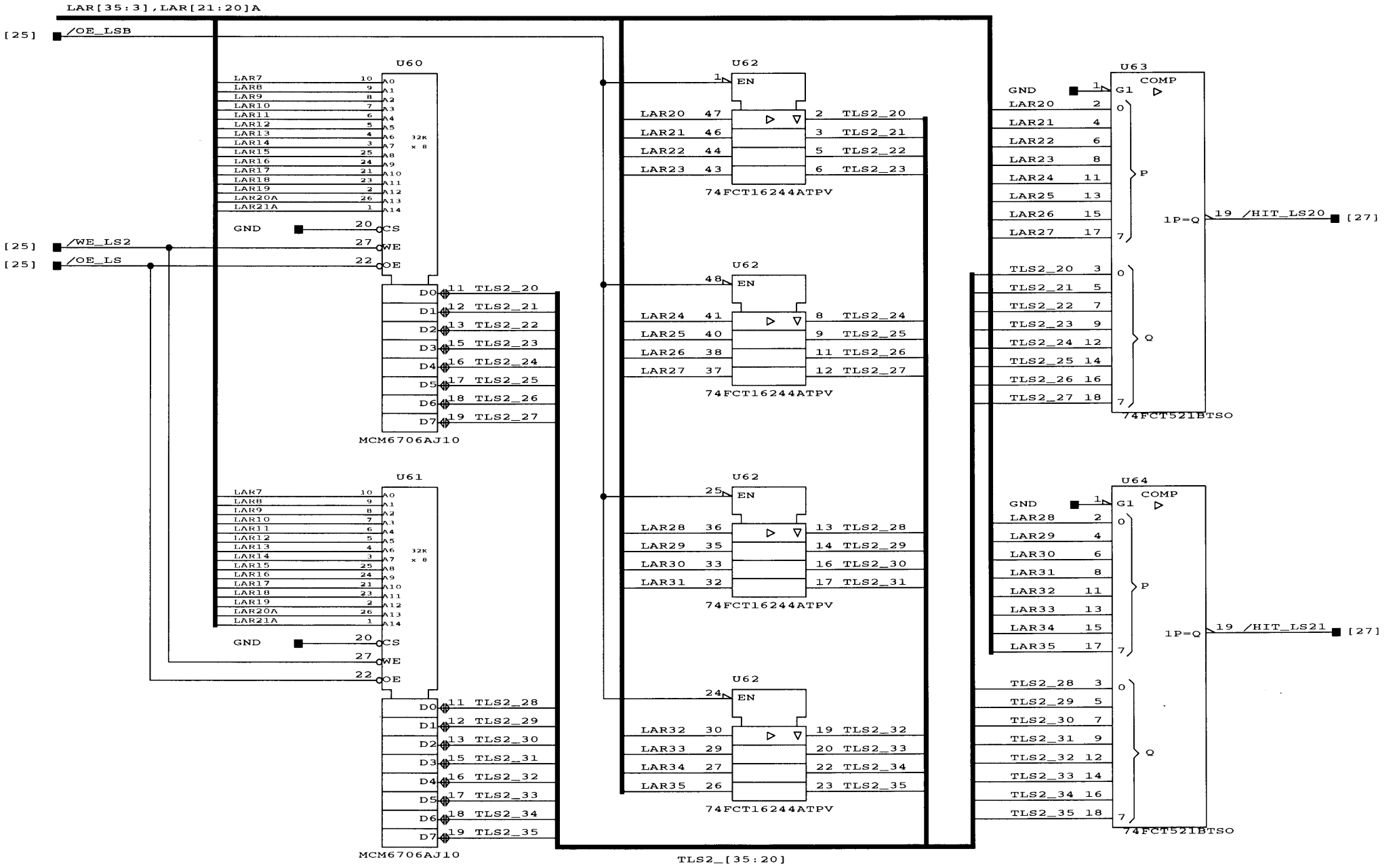
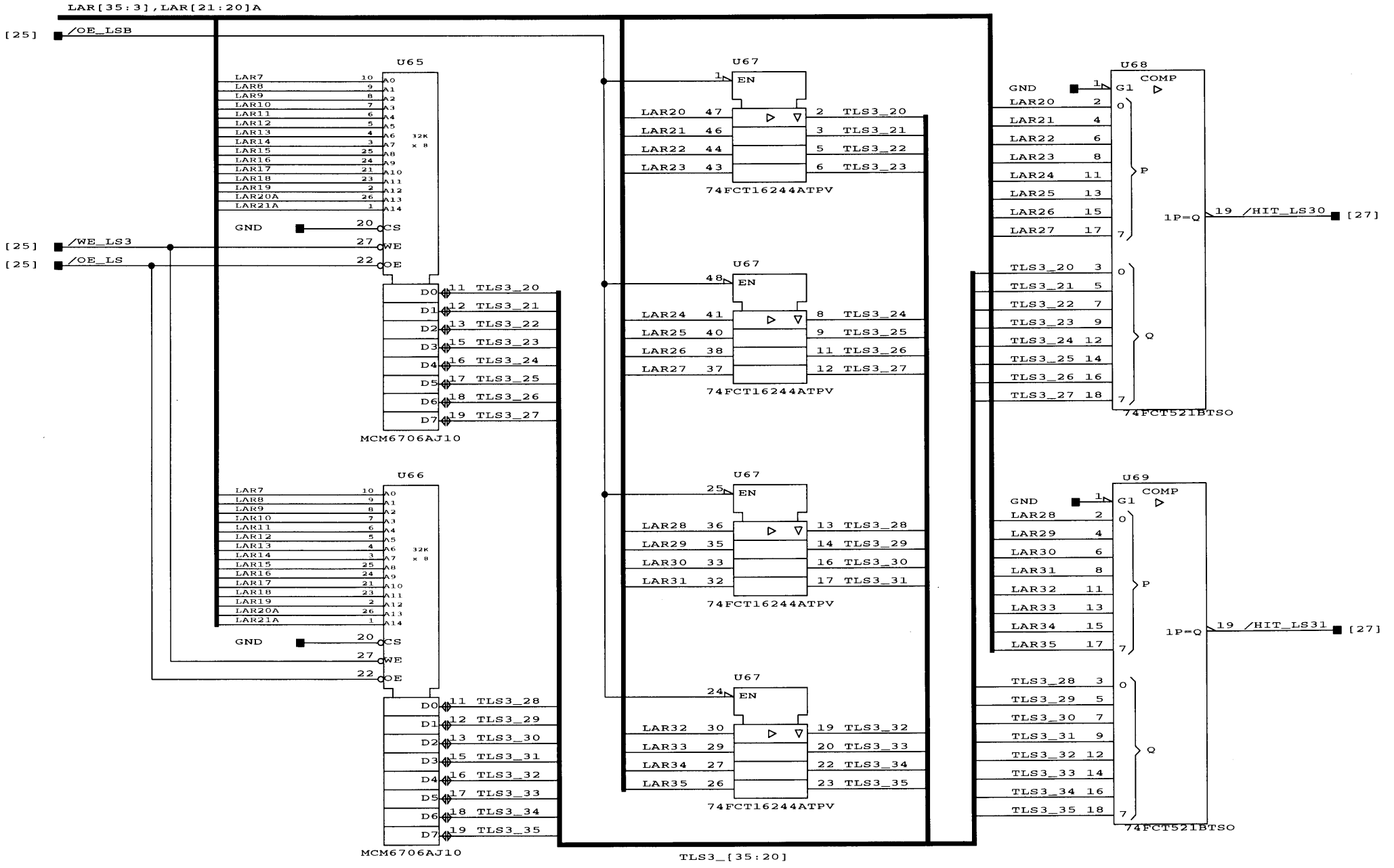
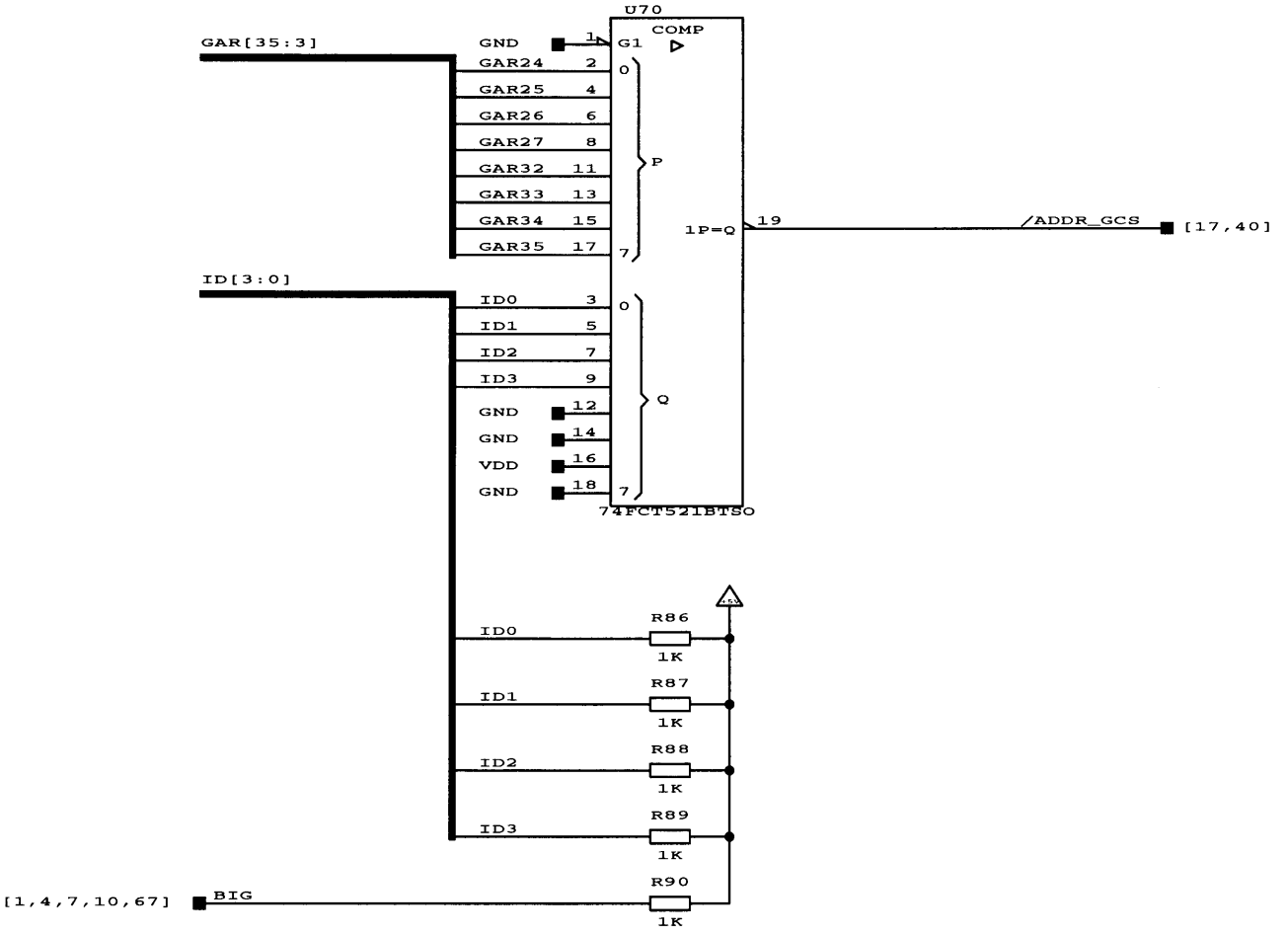
| Issue 1 | | Local snooper 1 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:36 of 72 |




| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Local snooper 2 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:37 of 72 |




| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Local snooper 3 | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:38 of 72 |

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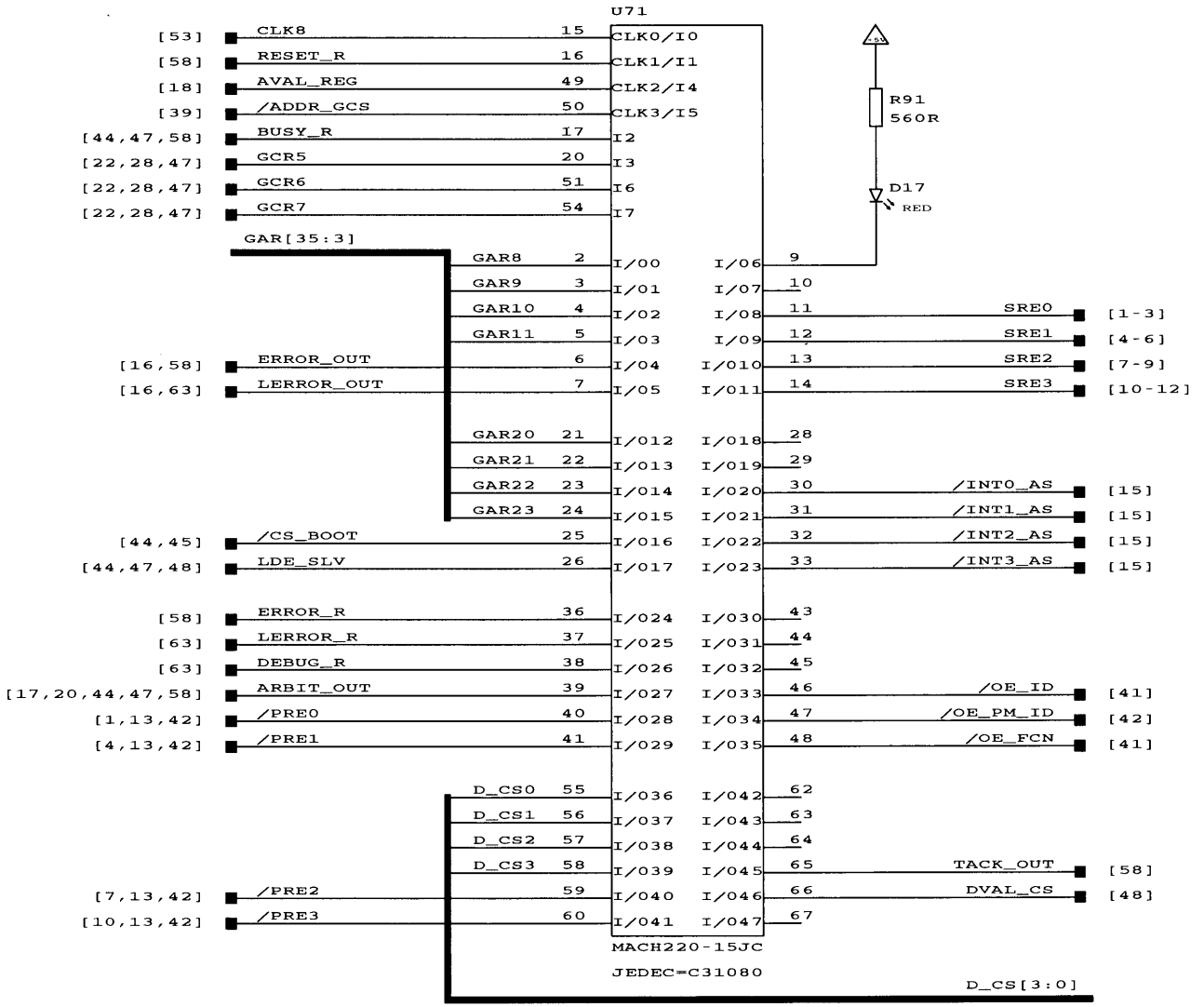
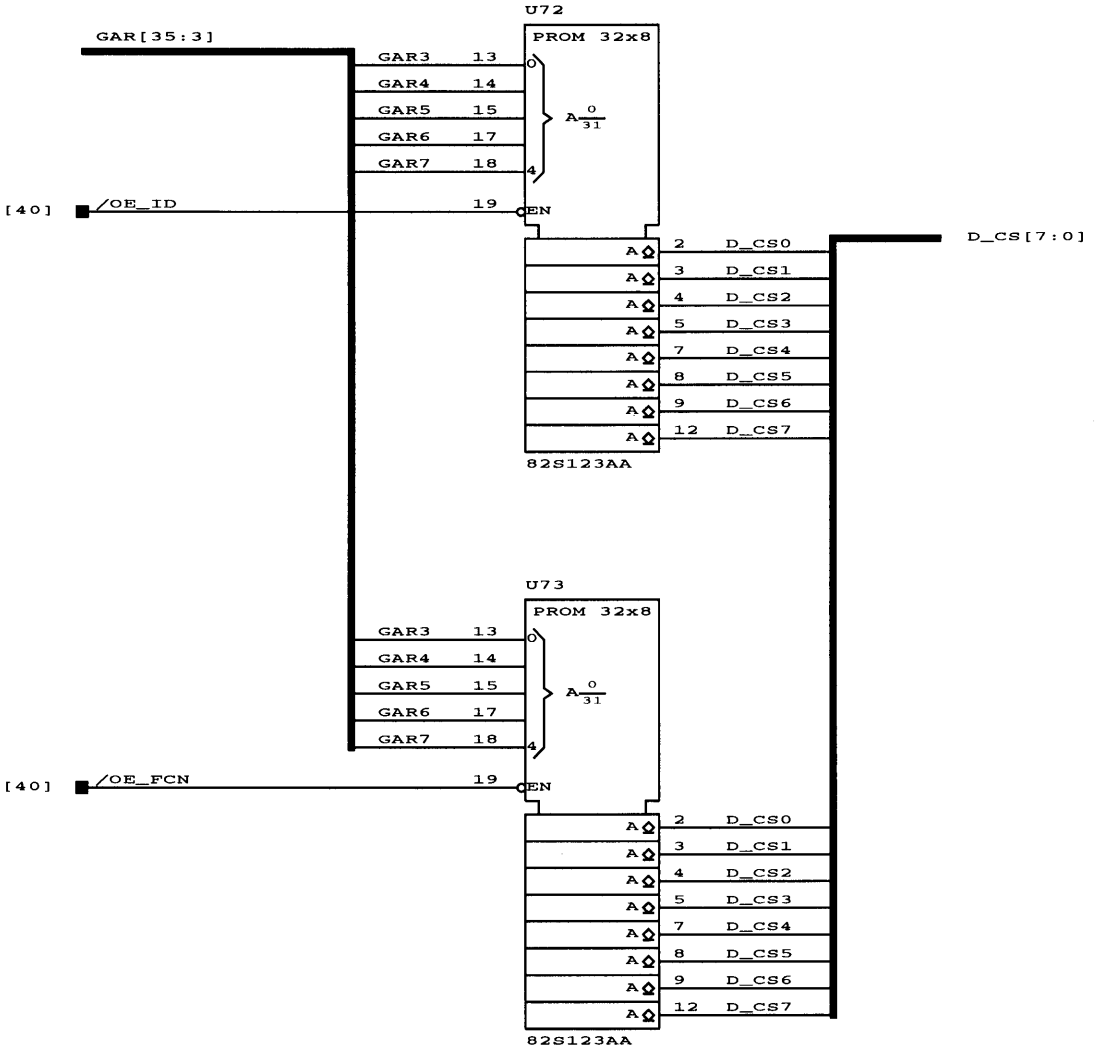
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940506 | CPU301 Module | |
| Issue 1 | | Global control | |
| Issue 2 | | space decode | |
| Issue 3 | | File: cpu301 | Page:39 of 72 |

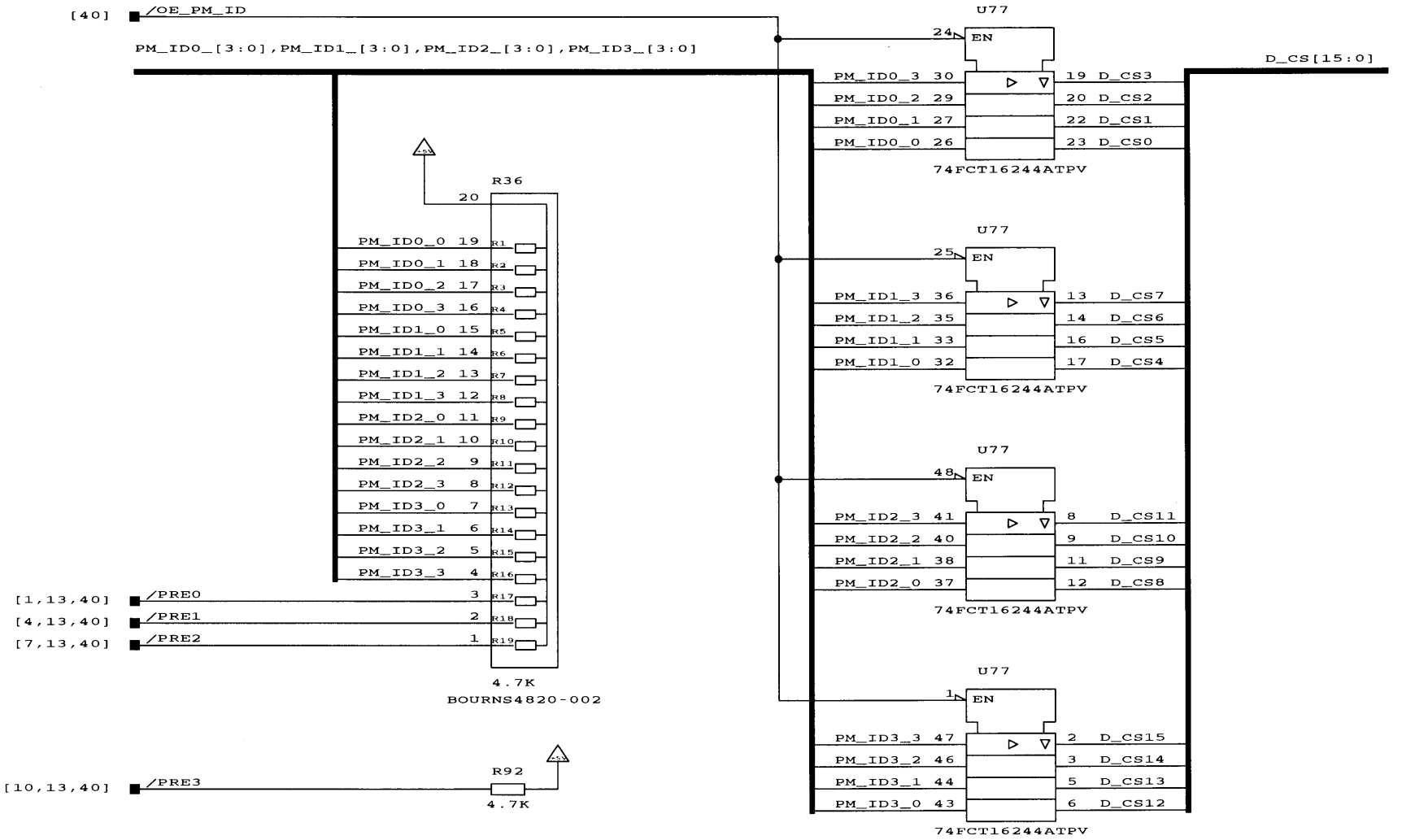



| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Global control space | |
| Issue 2 | | control | |
| Issue 3 | | File: cpu301 | Page:40 of 72 |

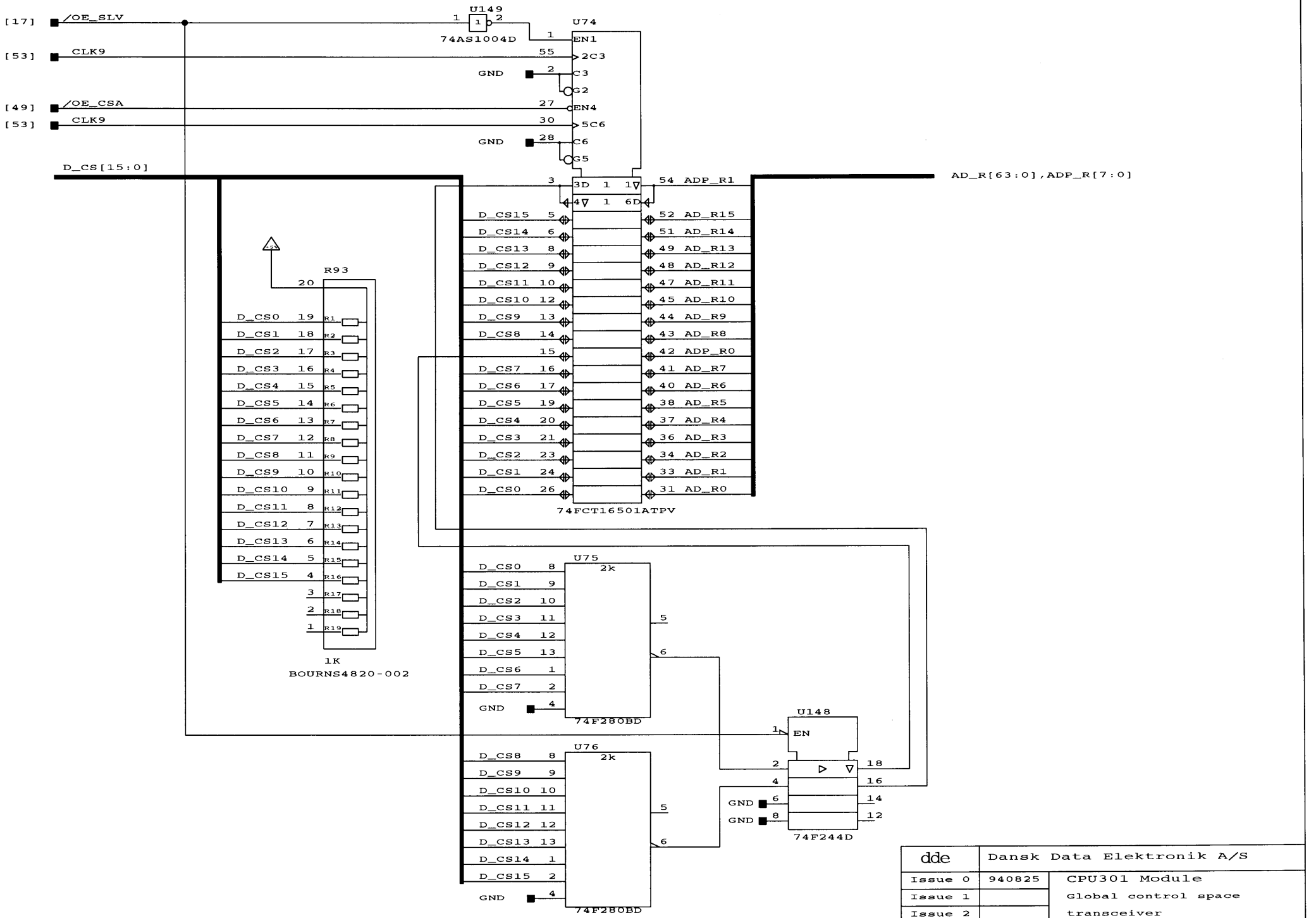



FCN PROM mounted in socket.

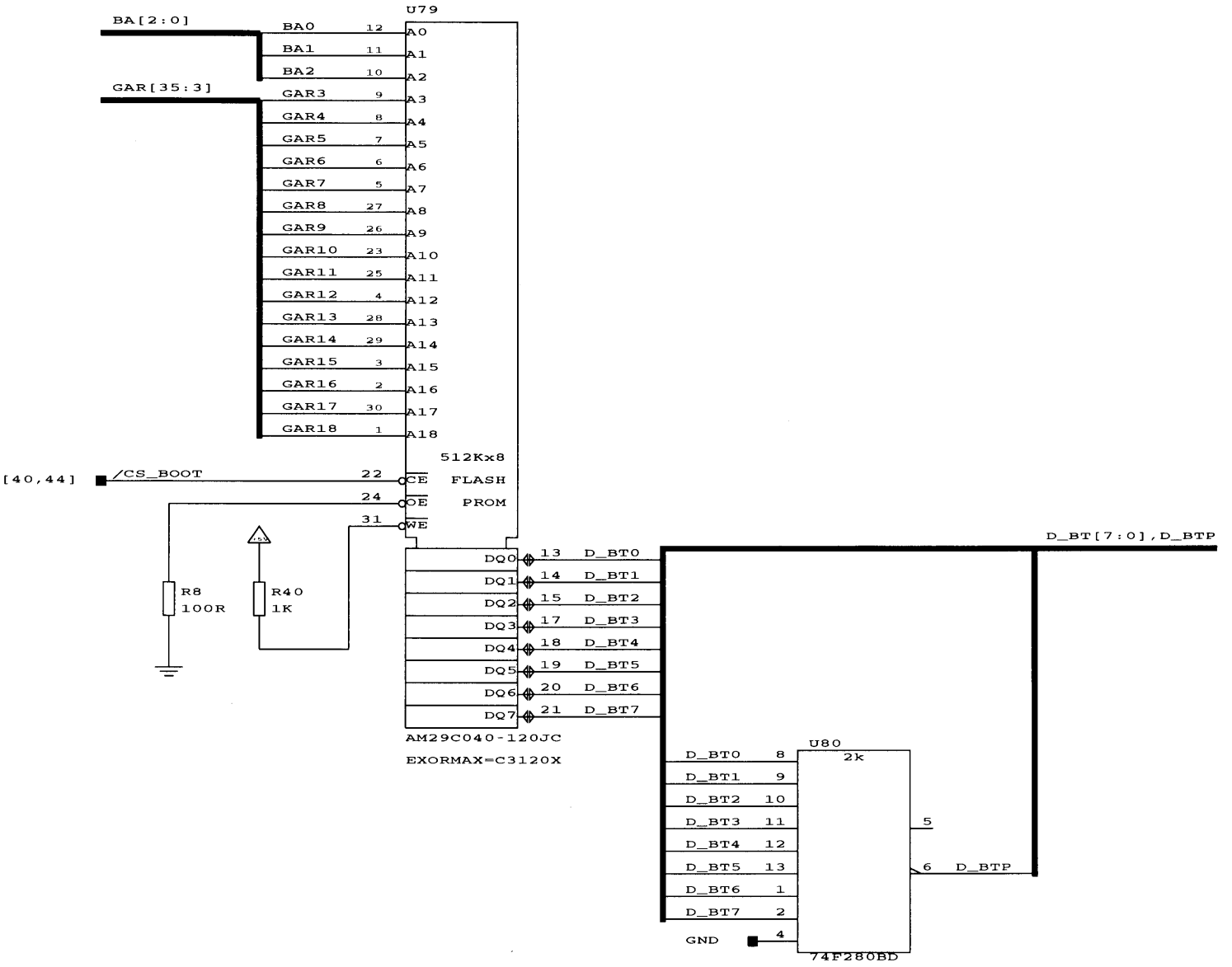
| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940506 | CPU301 Module | |
| Issue 1 | | Module ID and FCN PROMs. | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:41 of 72 |



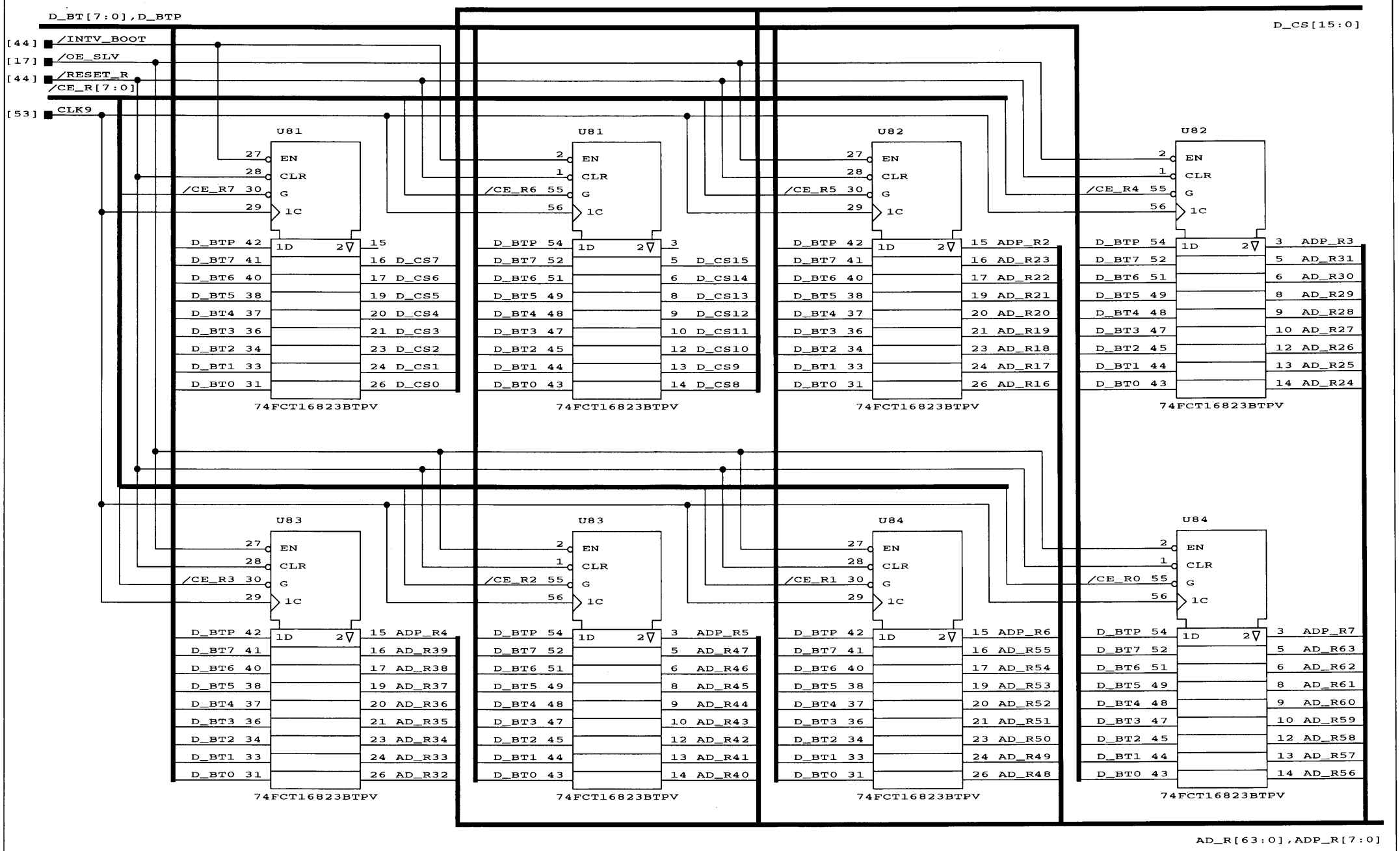

| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Processor module | |
| Issue 2 | | ID register | |
| Issue 3 | | File: cpu301 | Page:42 of 72 |


[17] /OE_SLV
[53] CLK9
[49] /OE_CSA
[53] CLK9
D_CS[15:0]
U149
74AS1004D
U74
EN1
2C3
C3
G2
EN4
5C6
C6
G5
GND
AD_R[63:0],ADP_R[7:0]
74FCT16501ATPV
R93
1K
BOURNS4820-002
U75
U76
74F280BD
U148
74F244D
dde
Dansk Data Elektronik A/S
Issue 0 940825
Issue 1
Issue 2
Issue 3
CPU301 Module
Global control space
transceiver
File: cpu301
Page:43 of 72

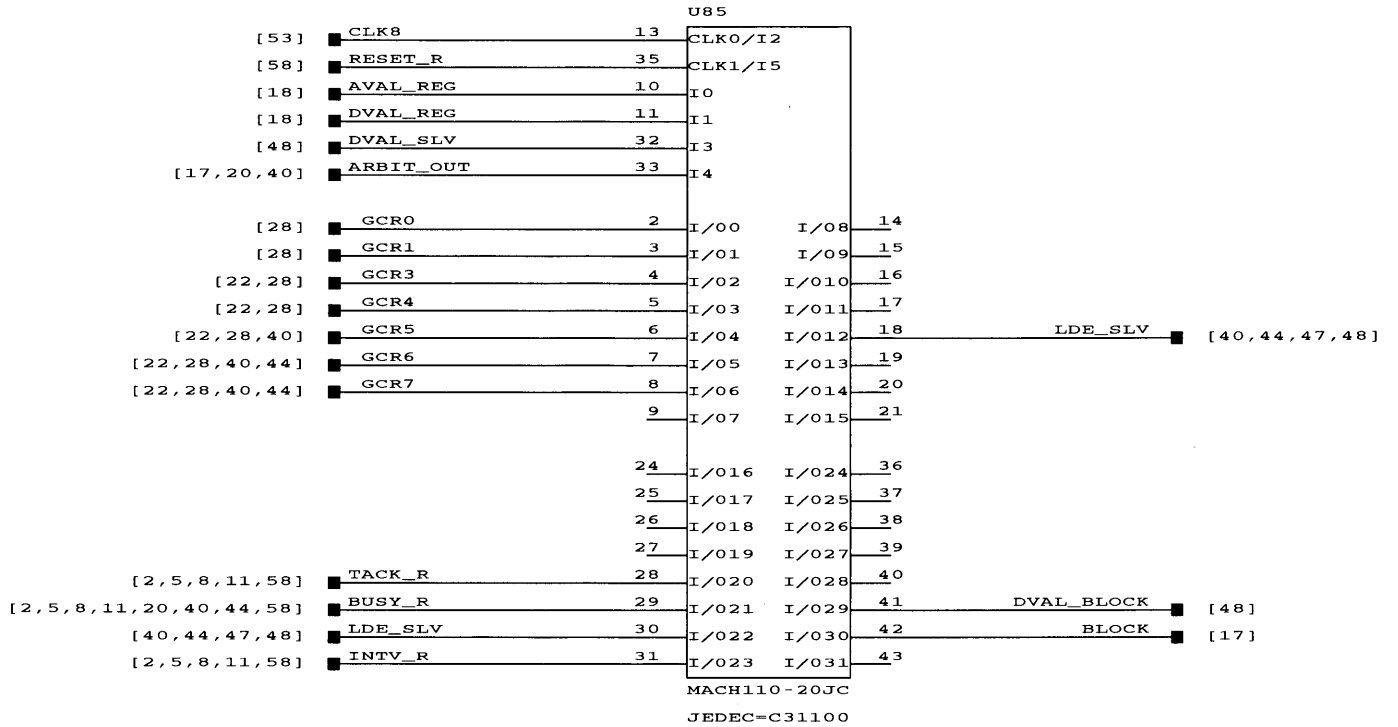

| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Boot control | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:44 of 72 |



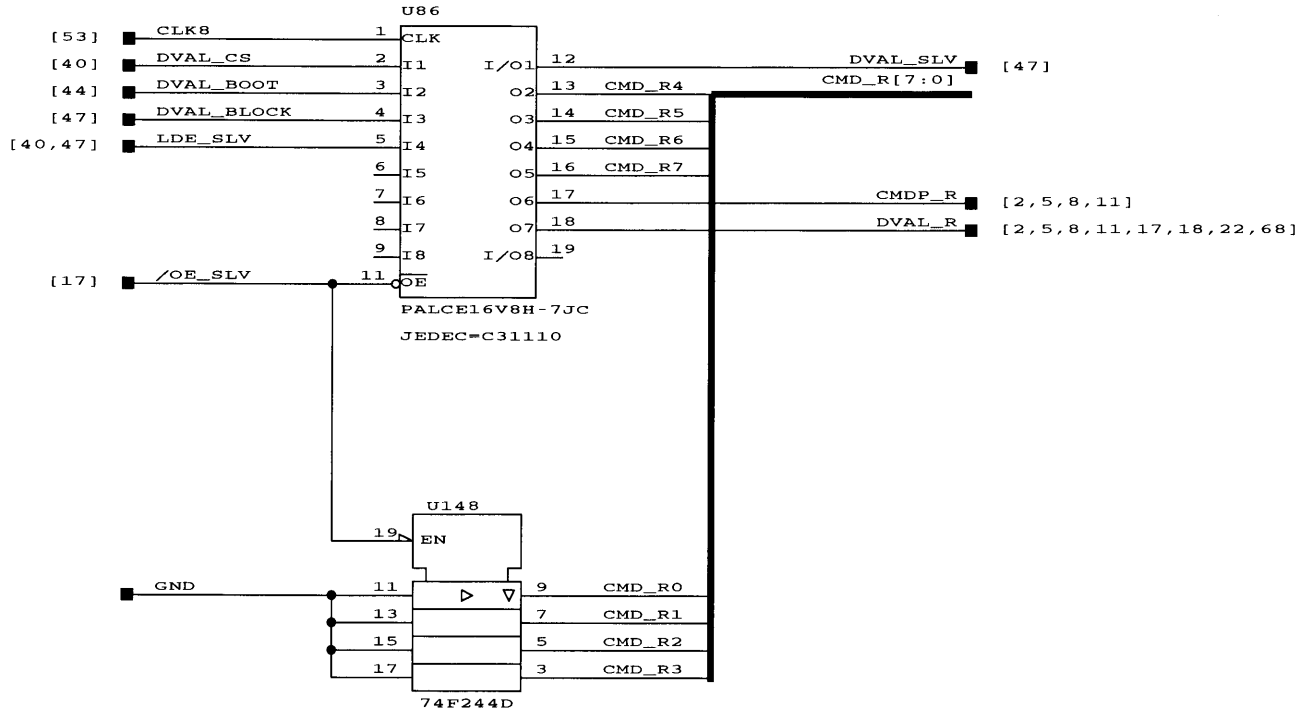

| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Boot PROM | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:45 of 72 |



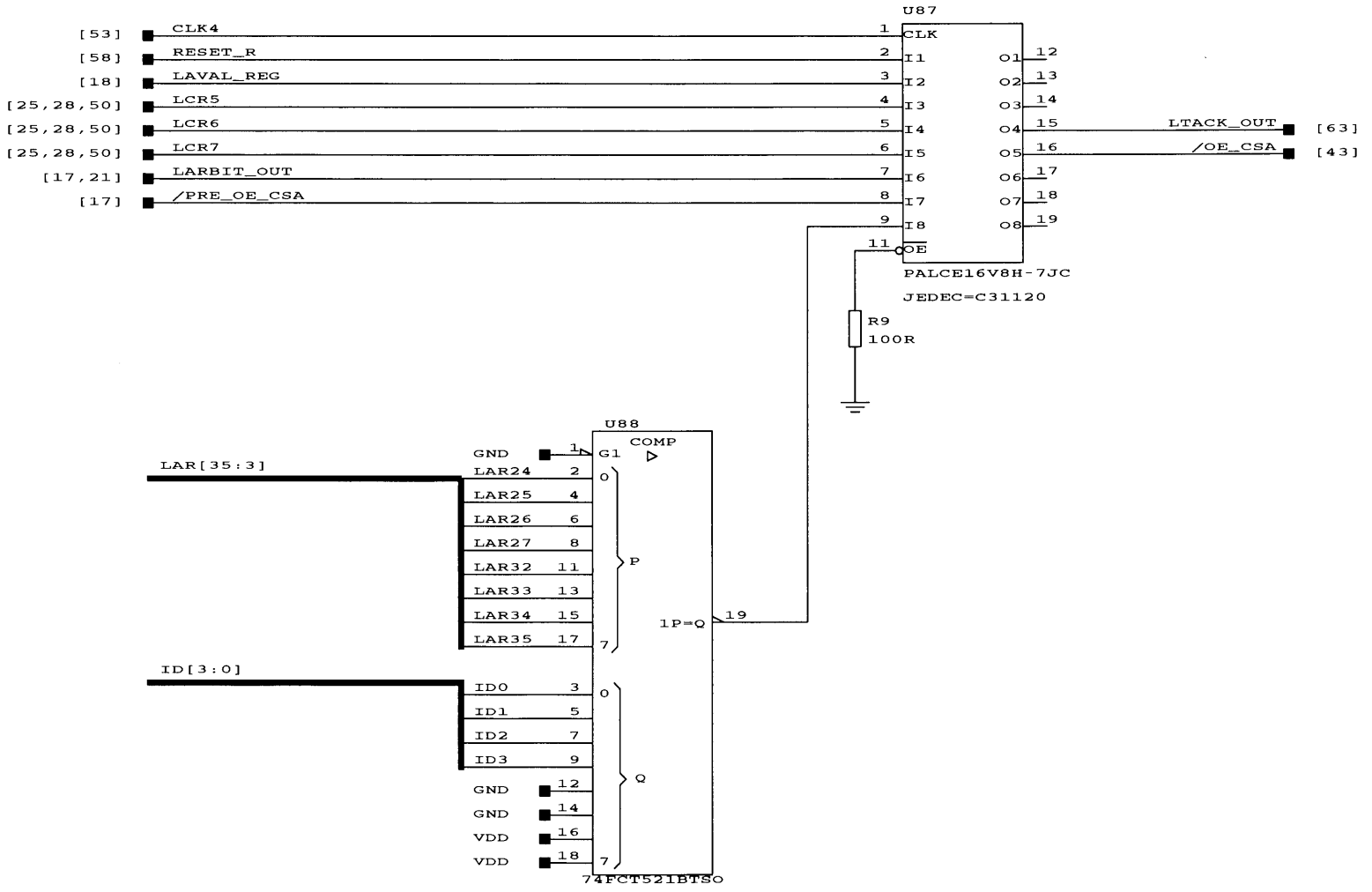

| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Boot register | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:46 of 72 |



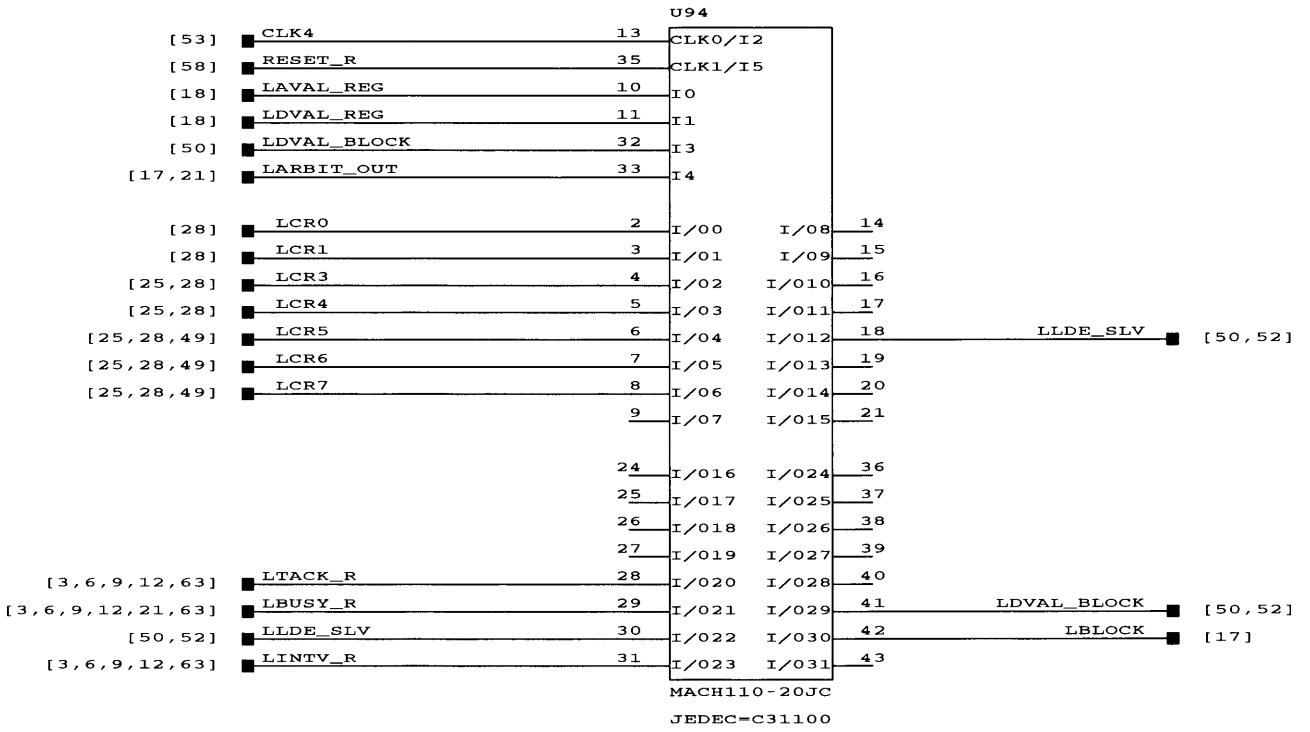

| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Global dummy | |
| Issue 2 | | block generator | |
| Issue 3 | | File: cpu301 | Page:47 of 72 |



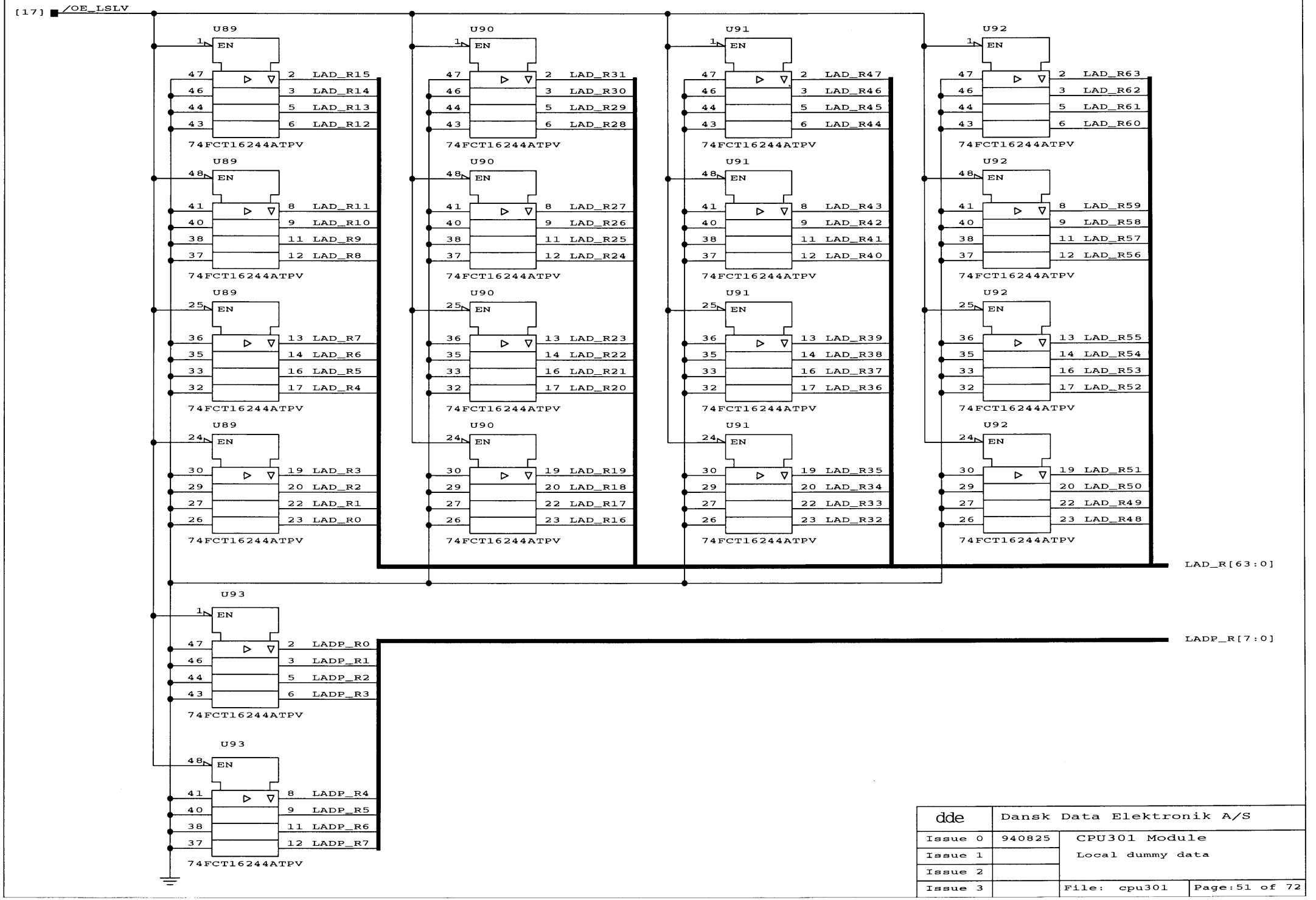

| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Global data identifier | |
| Issue 2 | | output register | |
| Issue 3 | | File: cpu301 | Page:48 of 72 |



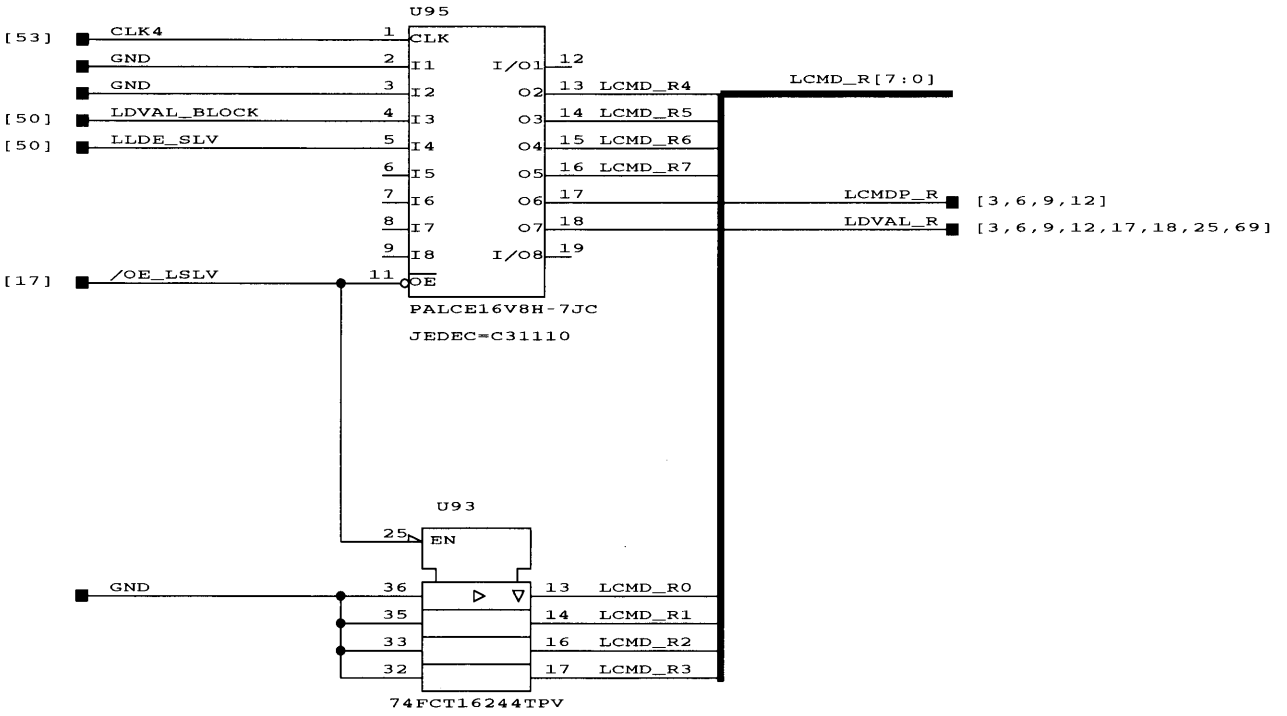

| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Local control space decode | |
| Issue 2 | | and target acknowledge | |
| Issue 3 | | File: cpu301 | Page:49 of 72 |



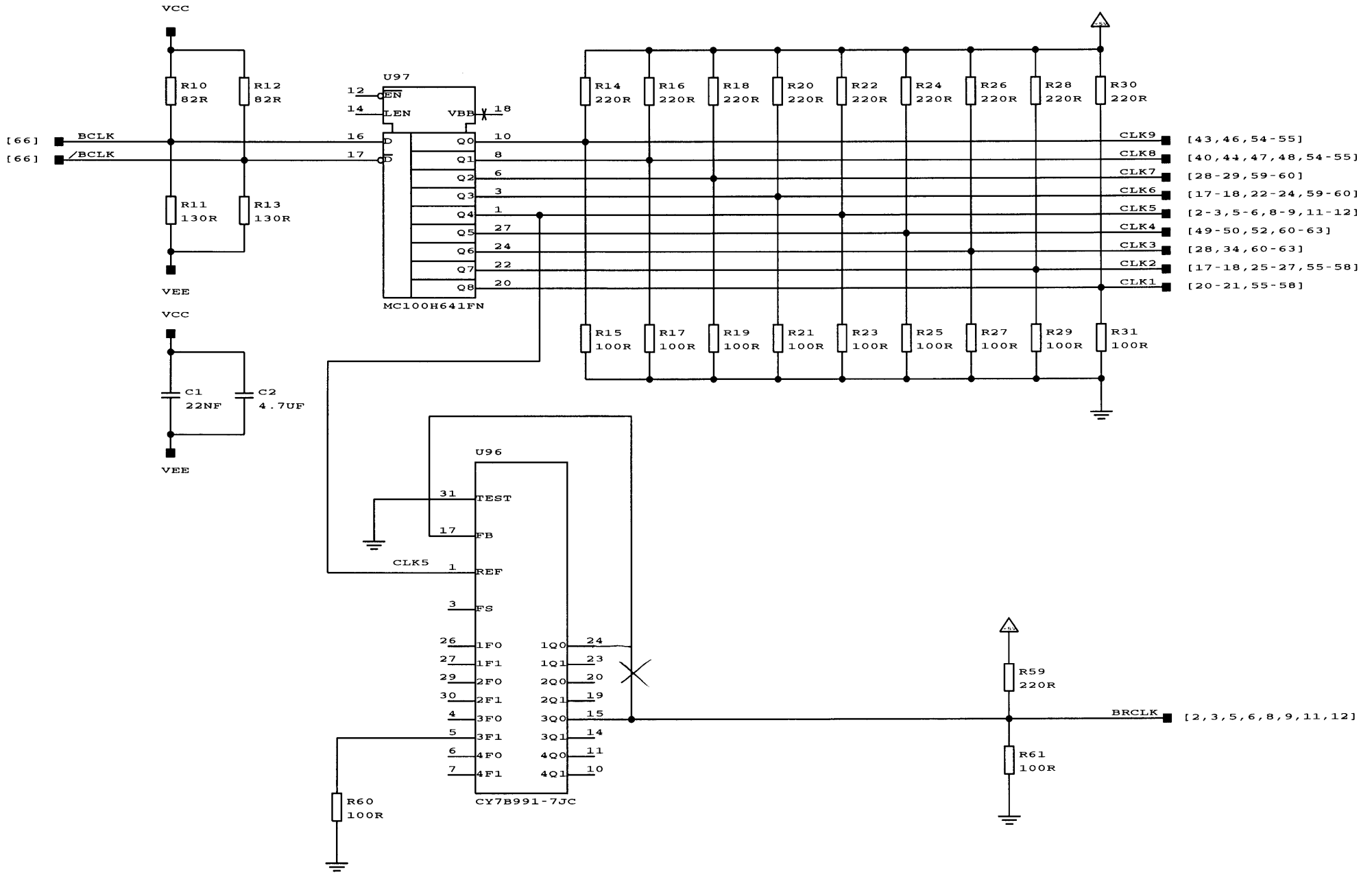

| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Local dummy block generator | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:50 of 72 |



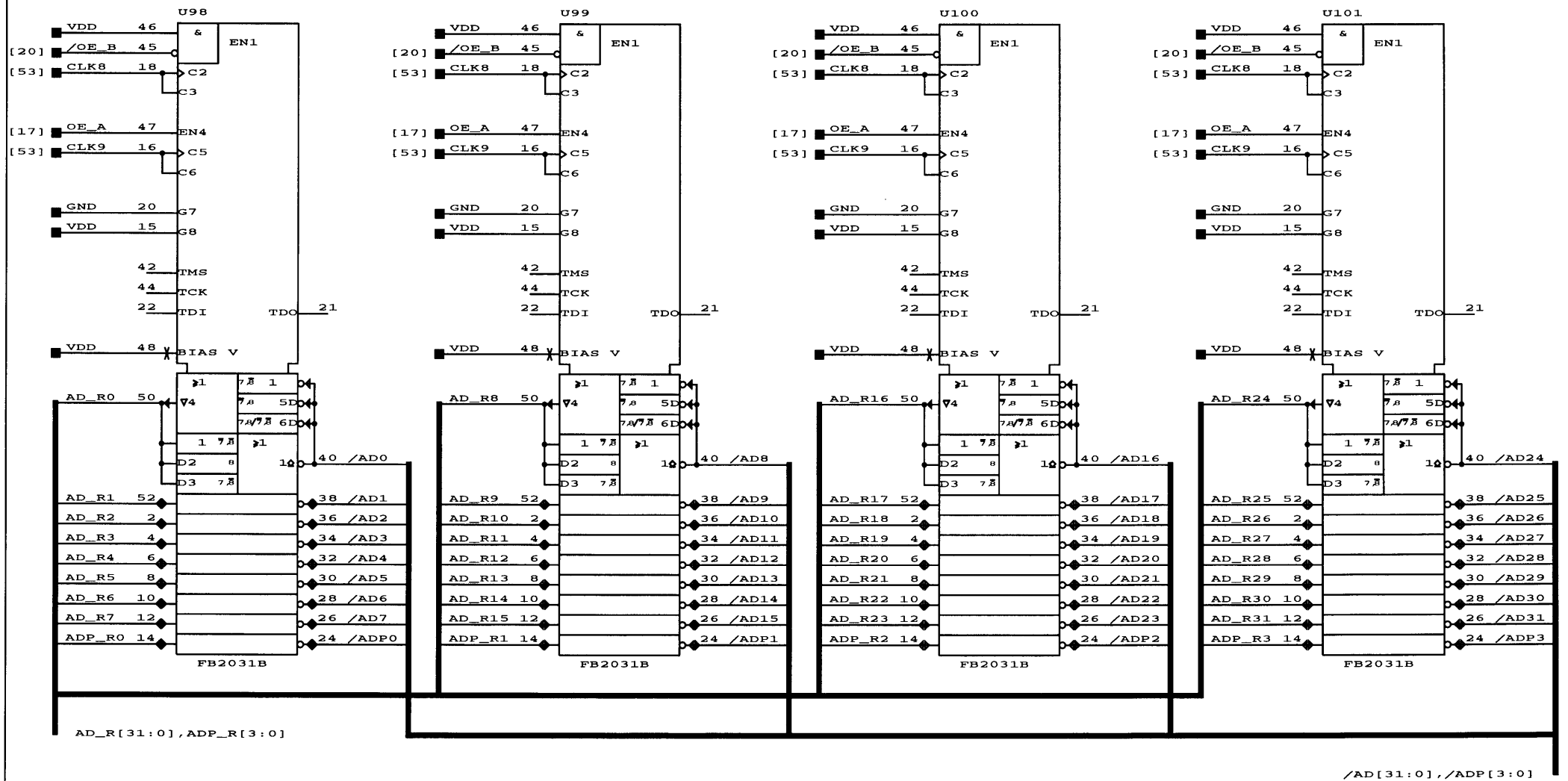

| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Local dummy data | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:51 of 72 |



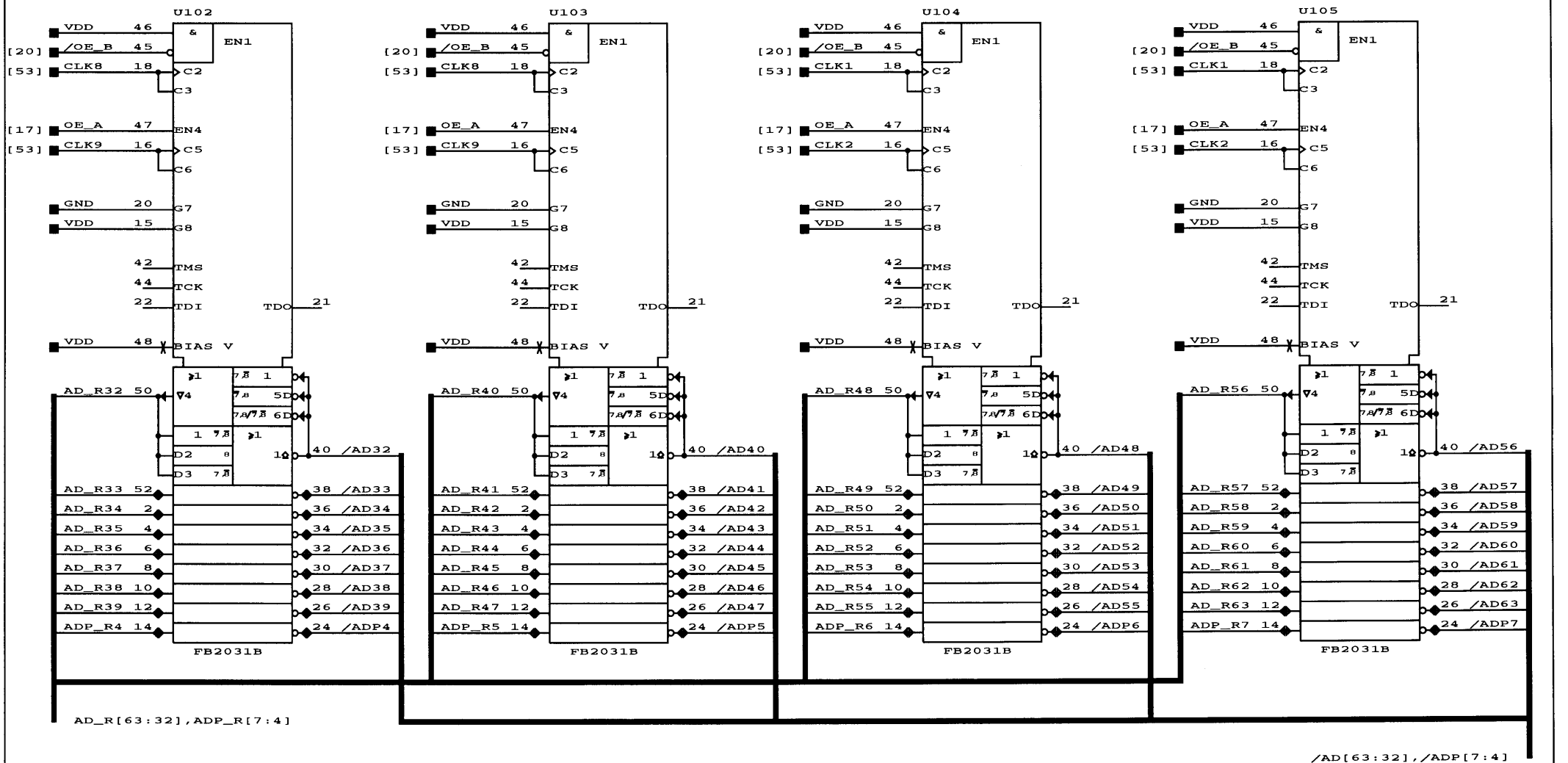

| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Local data identifier | |
| Issue 2 | | output register | |
| Issue 3 | | File: cpu301 | Page:52 of 72 |



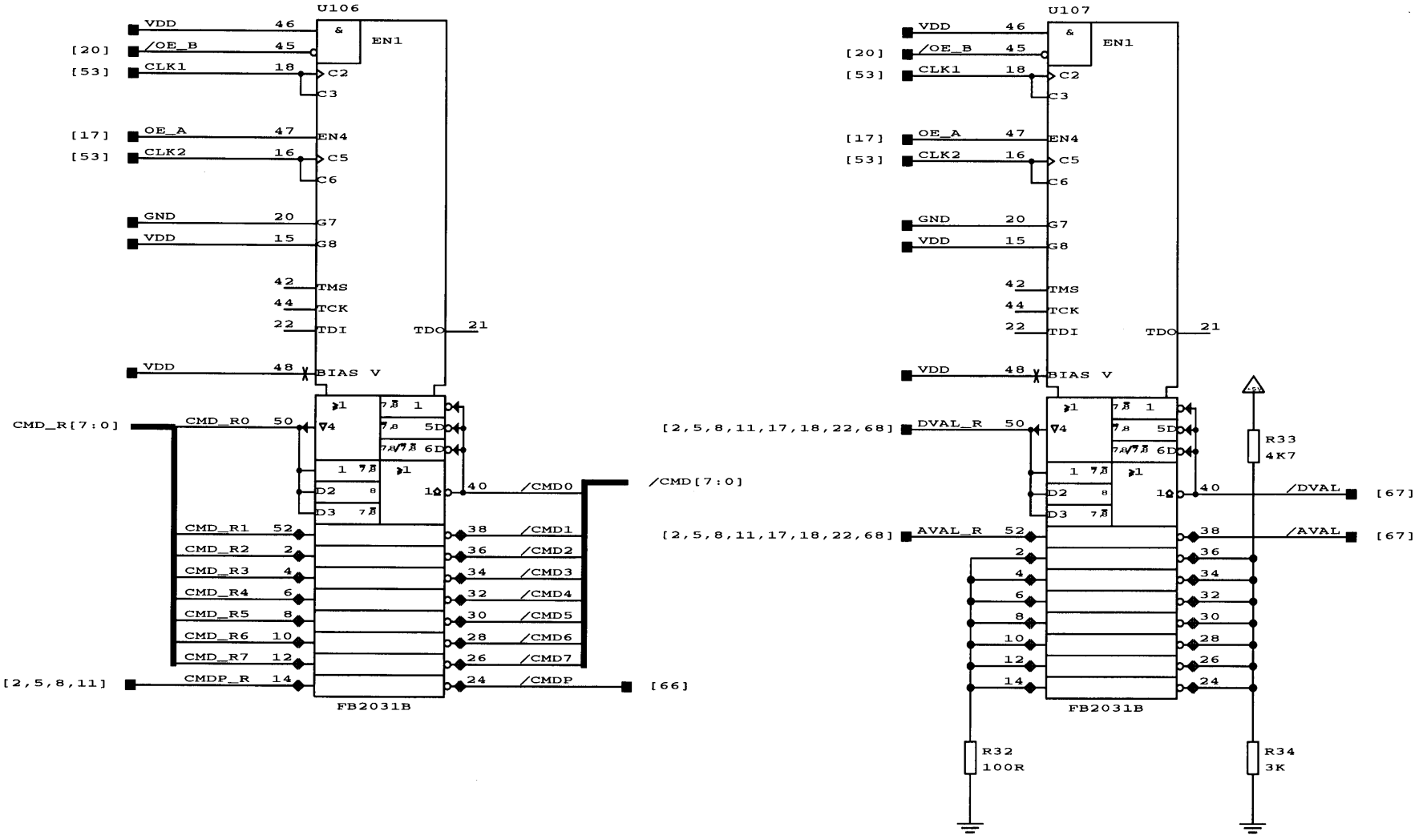

| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Clock distribution | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:53 of 72 |



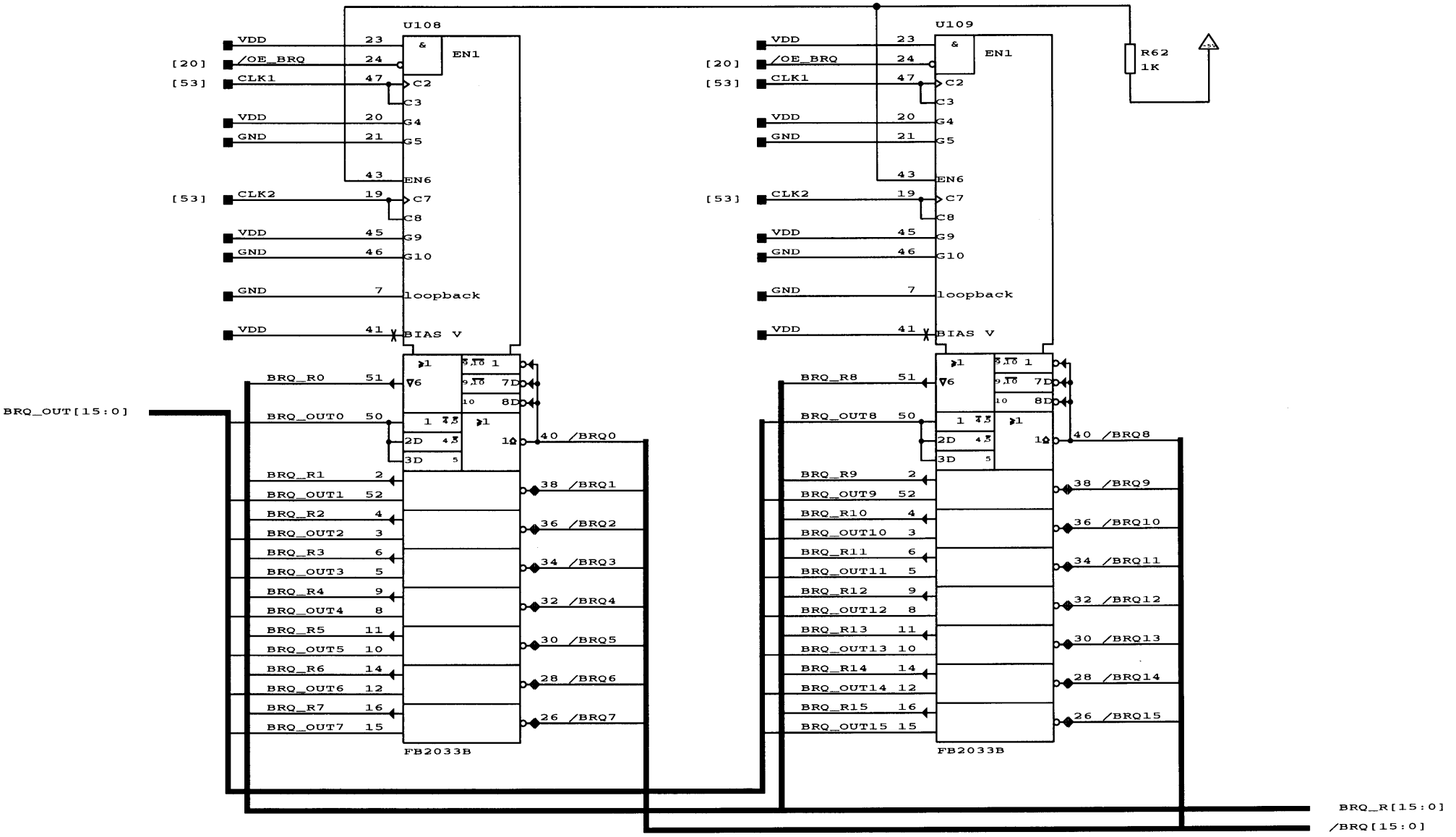

| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940506 | CPU301 Module | |
| Issue 1 | CHG | Global address/data | |
| Issue 2 | | transceiver | |
| Issue 3 | | File: cpu301 | Page:54 of 72 |



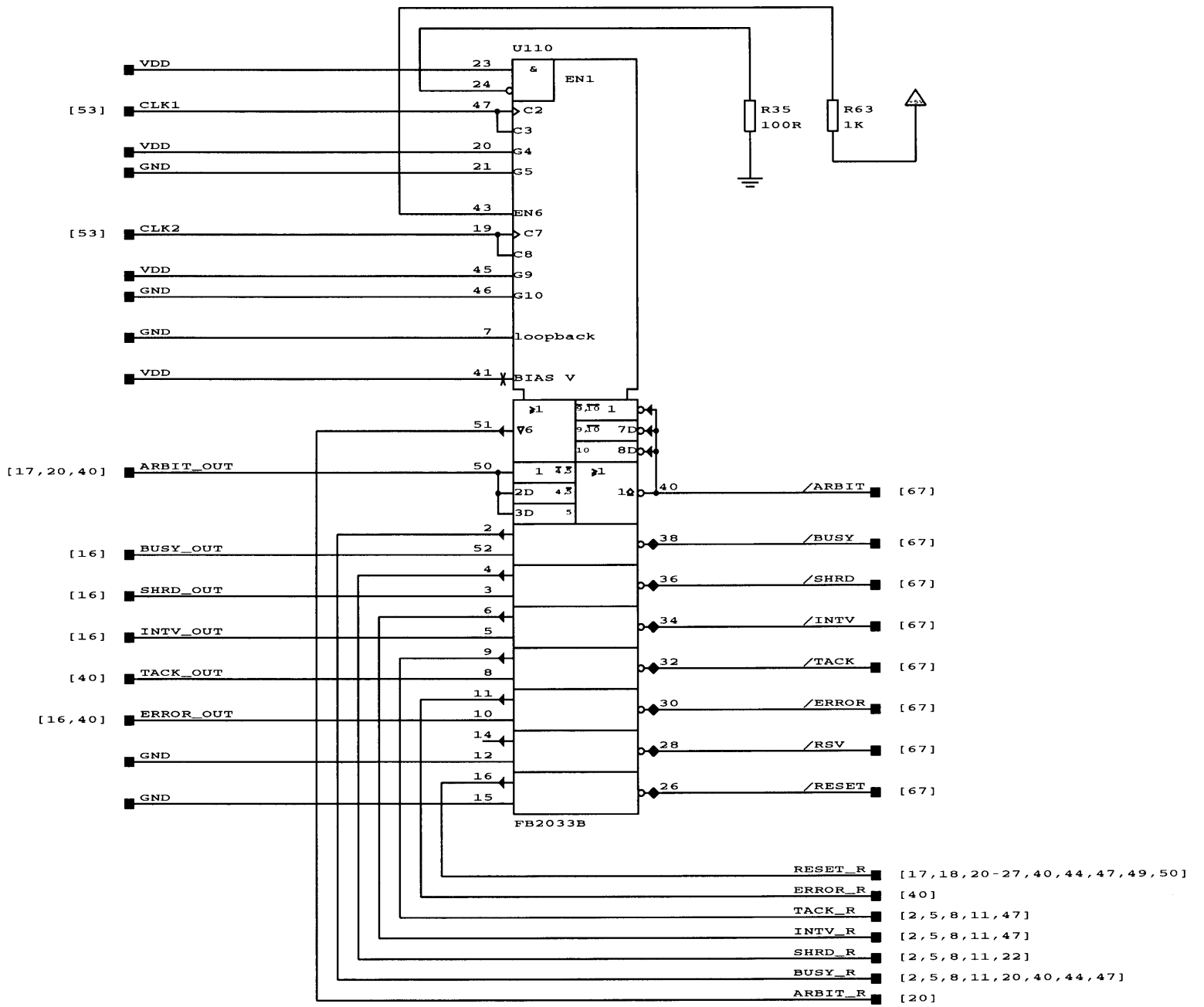

| | | |
|---|---|---|
| dde | Dansk Data Elektronik A/S | |
| Issue 0 | 940506 | CPU301 Module |
| Issue 1 | CHG | Global address/data |
| Issue 2 | | transceiver |
| Issue 3 | | File: cpu301 Page:55 of 72 |



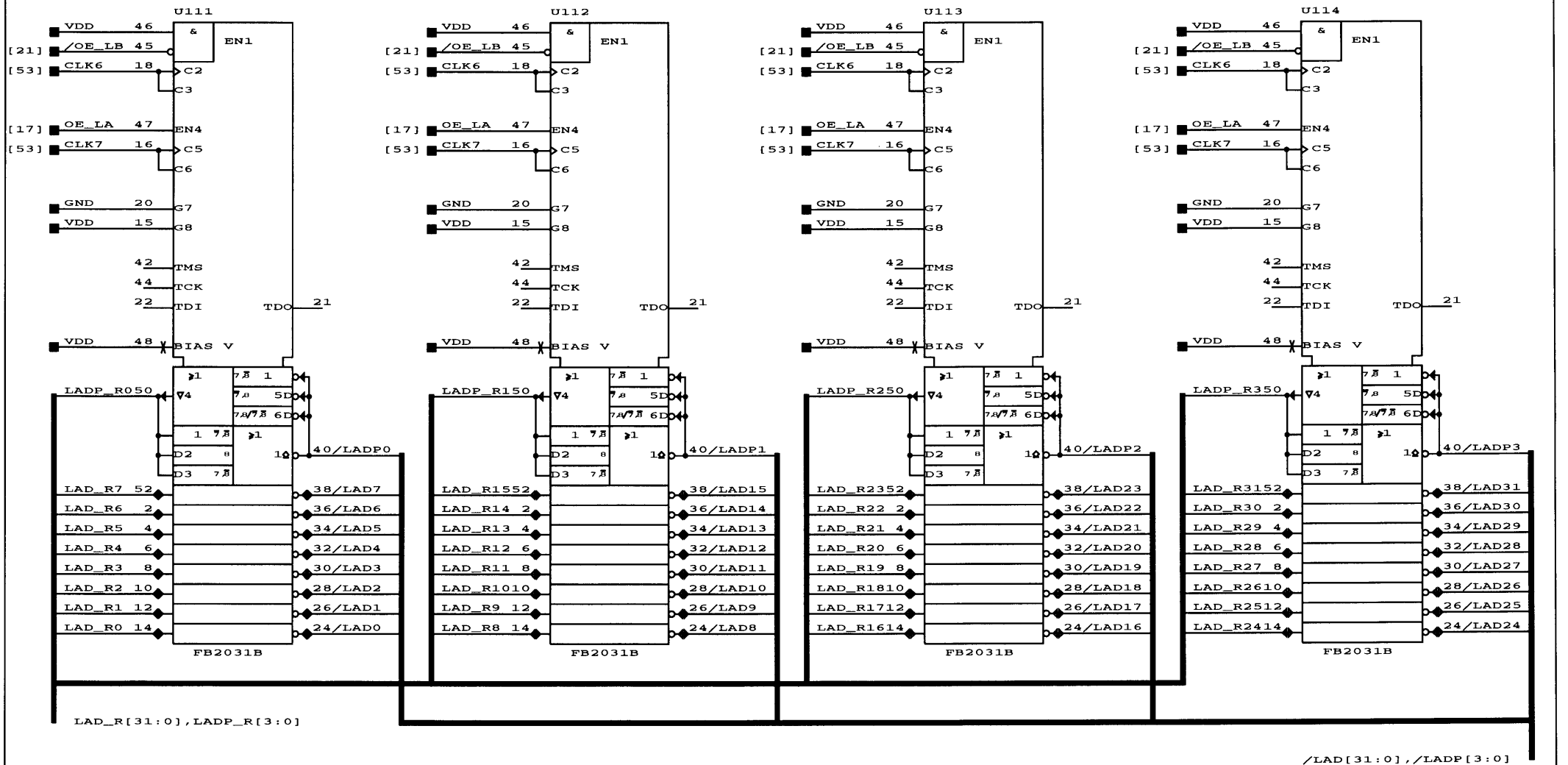

| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940506 | CPU301 Module | |
| Issue 1 | CHG | Global command and valid transceiver | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:56 of 72 |



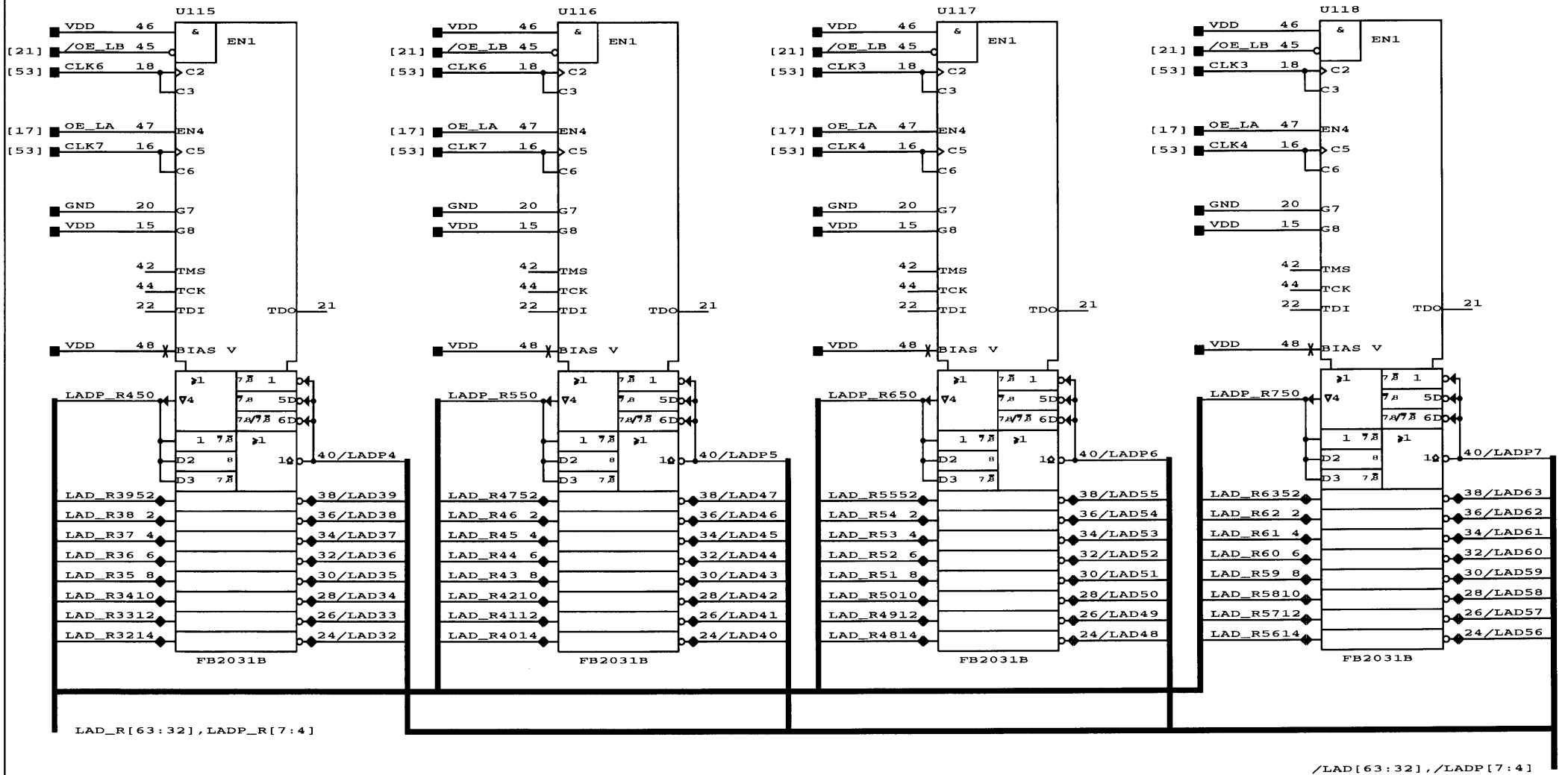

| | | |
|---|---|---|
| dde | Dansk Data Elektronik A/S | |
| Issue 0 | 940506 | CPU301 Module |
| Issue 1 | | Global bus request |
| Issue 2 | | transceiver |
| Issue 3 | | File: cpu301 Page:57 of 72 |



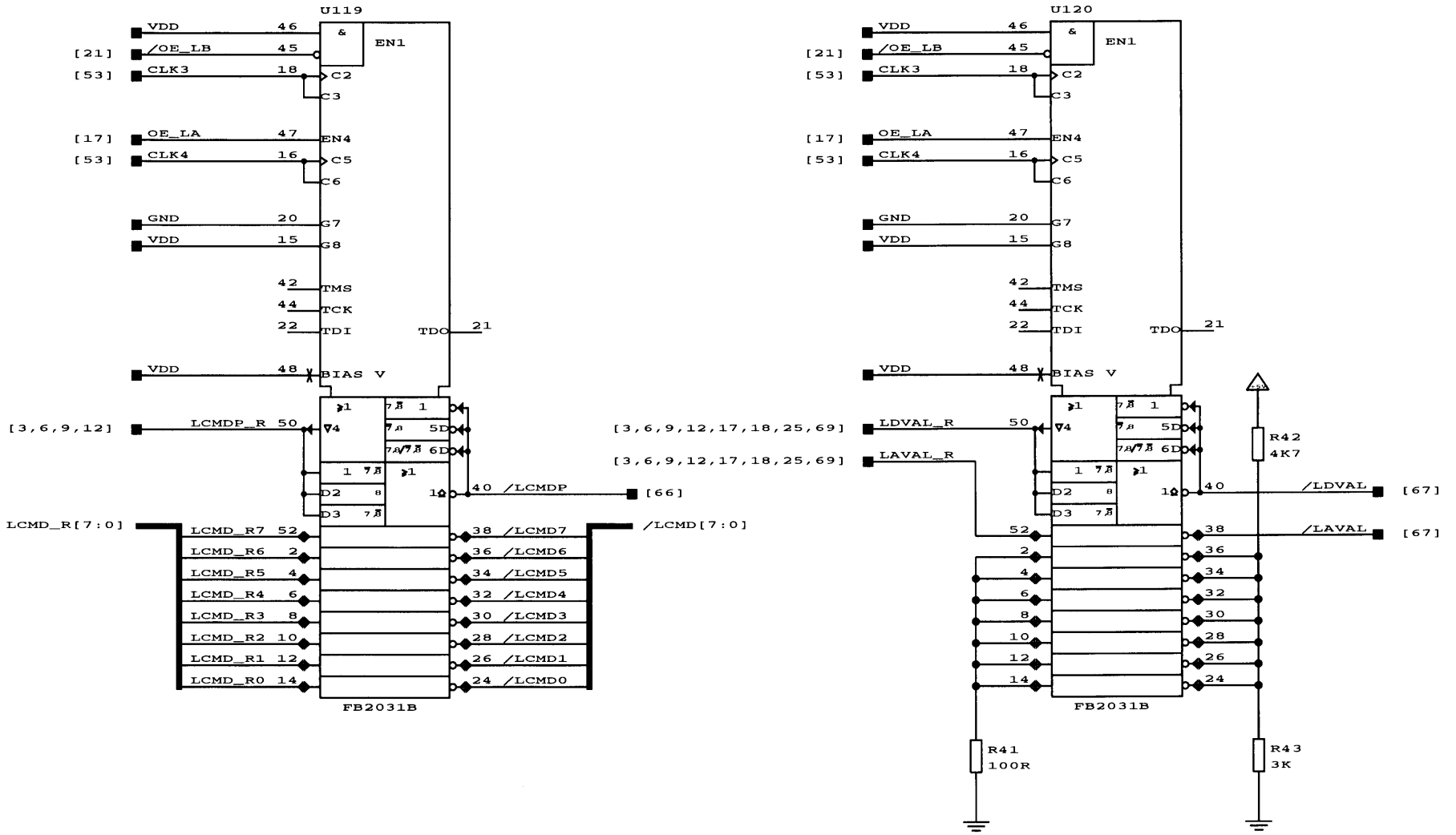

| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940506 | CPU301 Module | |
| Issue 1 | CHG | Global control transceiver | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:58 of 72 |



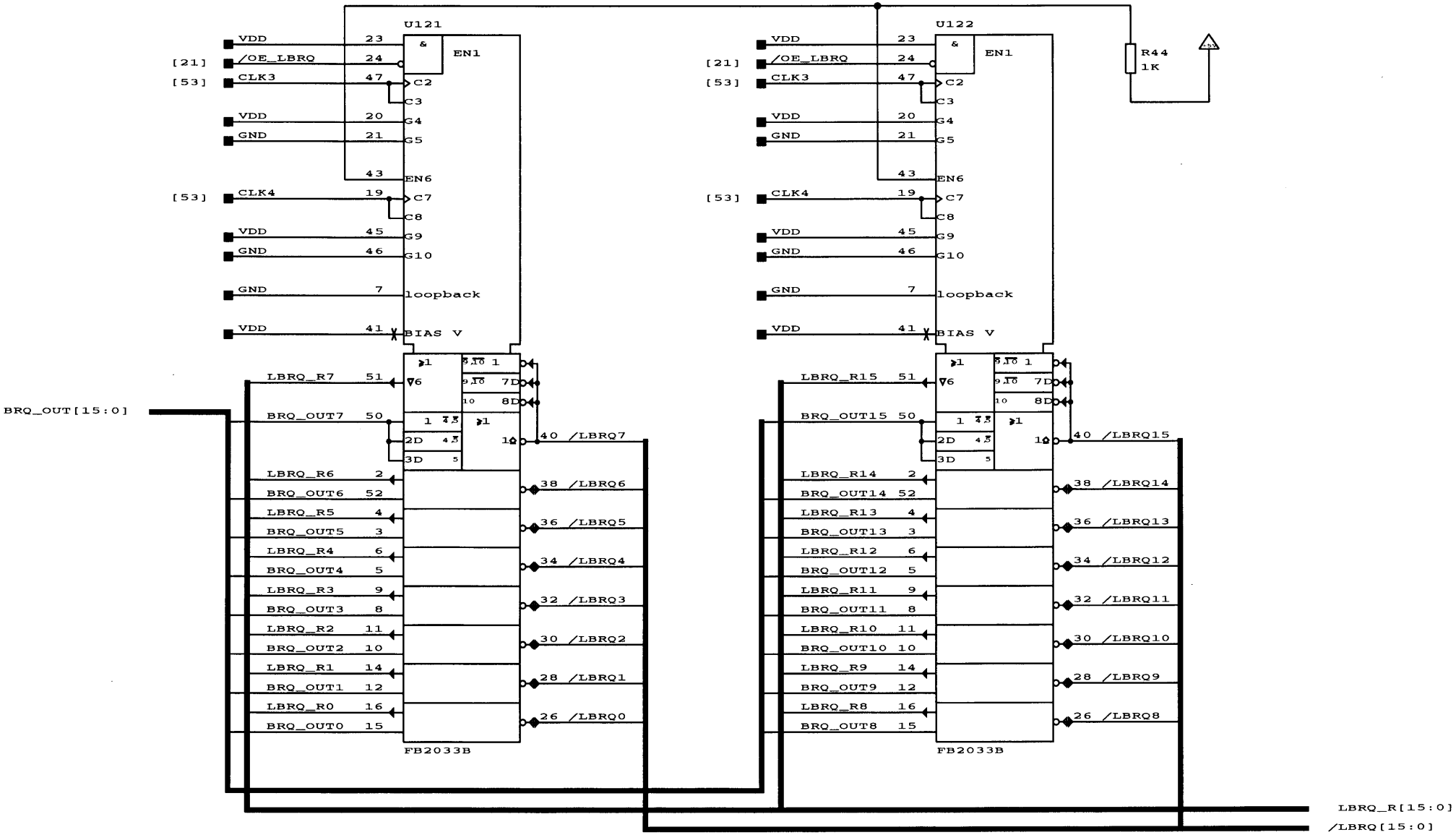

| | | |
|---|---|---|
| dde | Dansk Data Elektronik A/S | |
| Issue 0 | 940506 | CPU301 Module |
| Issue 1 | CHG | Local address/data |
| Issue 2 | | transceiver |
| Issue 3 | | File: cpu301 Page:59 of 72 |



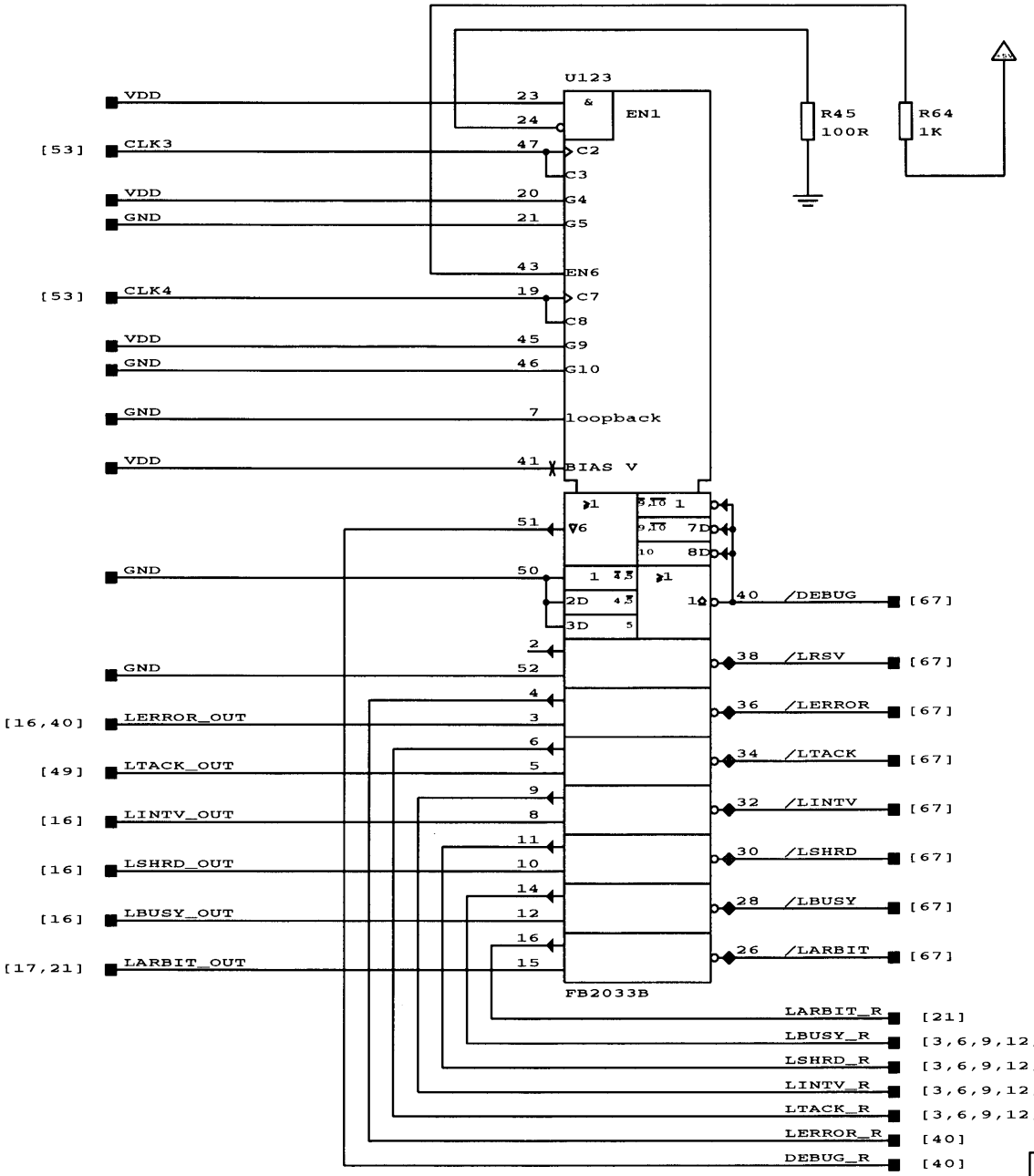

| | | |
|---|---|---|
| dde | Dansk Data Elektronik A/S | |
| Issue 0 | 940506 | CPU301 Module |
| Issue 1 | CHG | Local address/data transceiver |
| Issue 2 | | |
| Issue 3 | | File: cpu301 Page:60 of 70 |



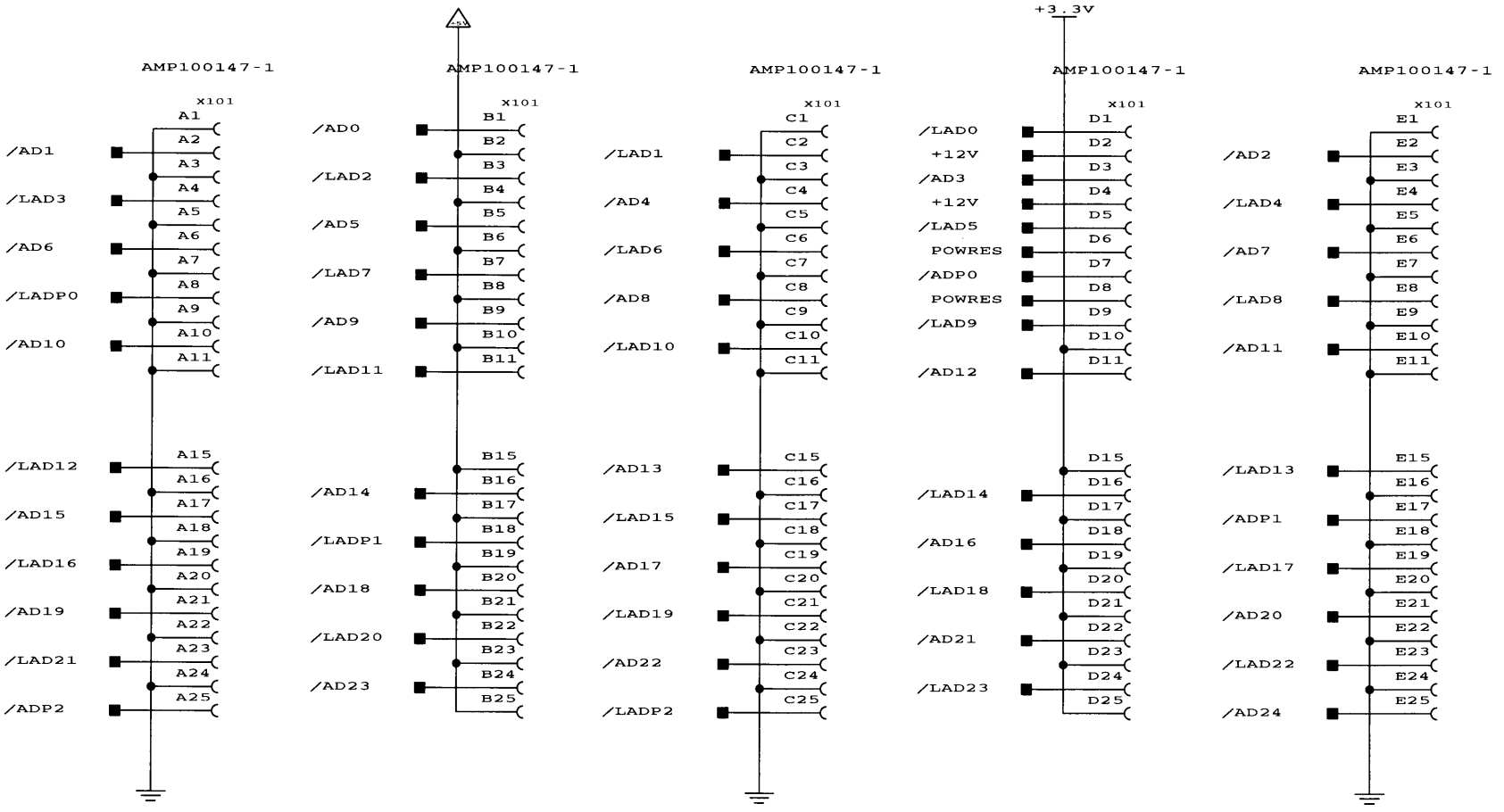

| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940506 | CPU301 Module | |
| Issue 1 | CHG | Local command and valid | |
| Issue 2 | | transceiver | |
| Issue 3 | | File: cpu301 | Page:61 of 72 |



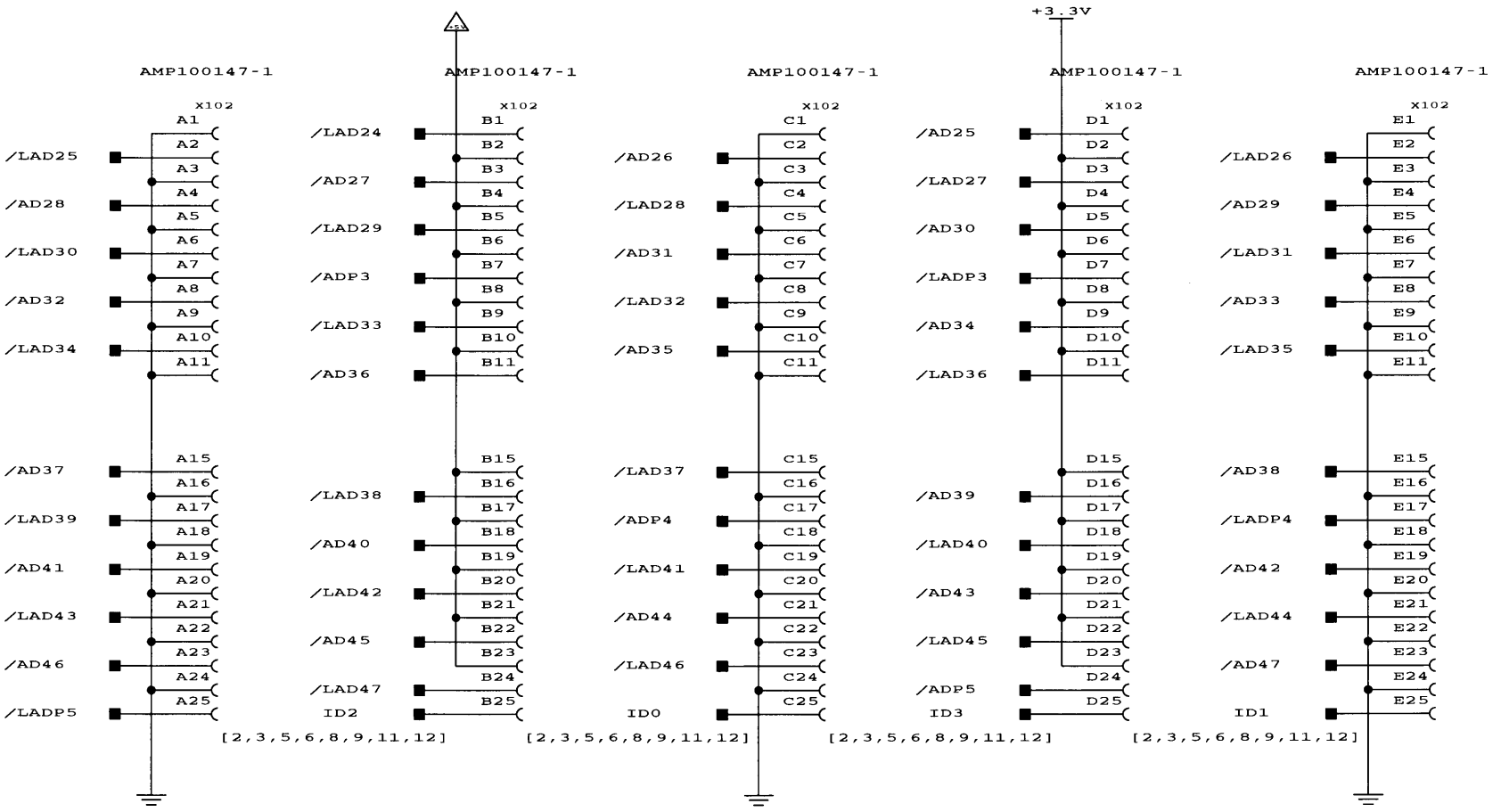

| | | |
|---|---|---|
| dde | Dansk Data Elektronik A/S | |
| Issue 0 | 940506 | CPU301 Module |
| Issue 1 | CHG | Local bus request |
| Issue 2 | | transceiver |
| Issue 3 | | File: cpu301 Page:62 of 72 |



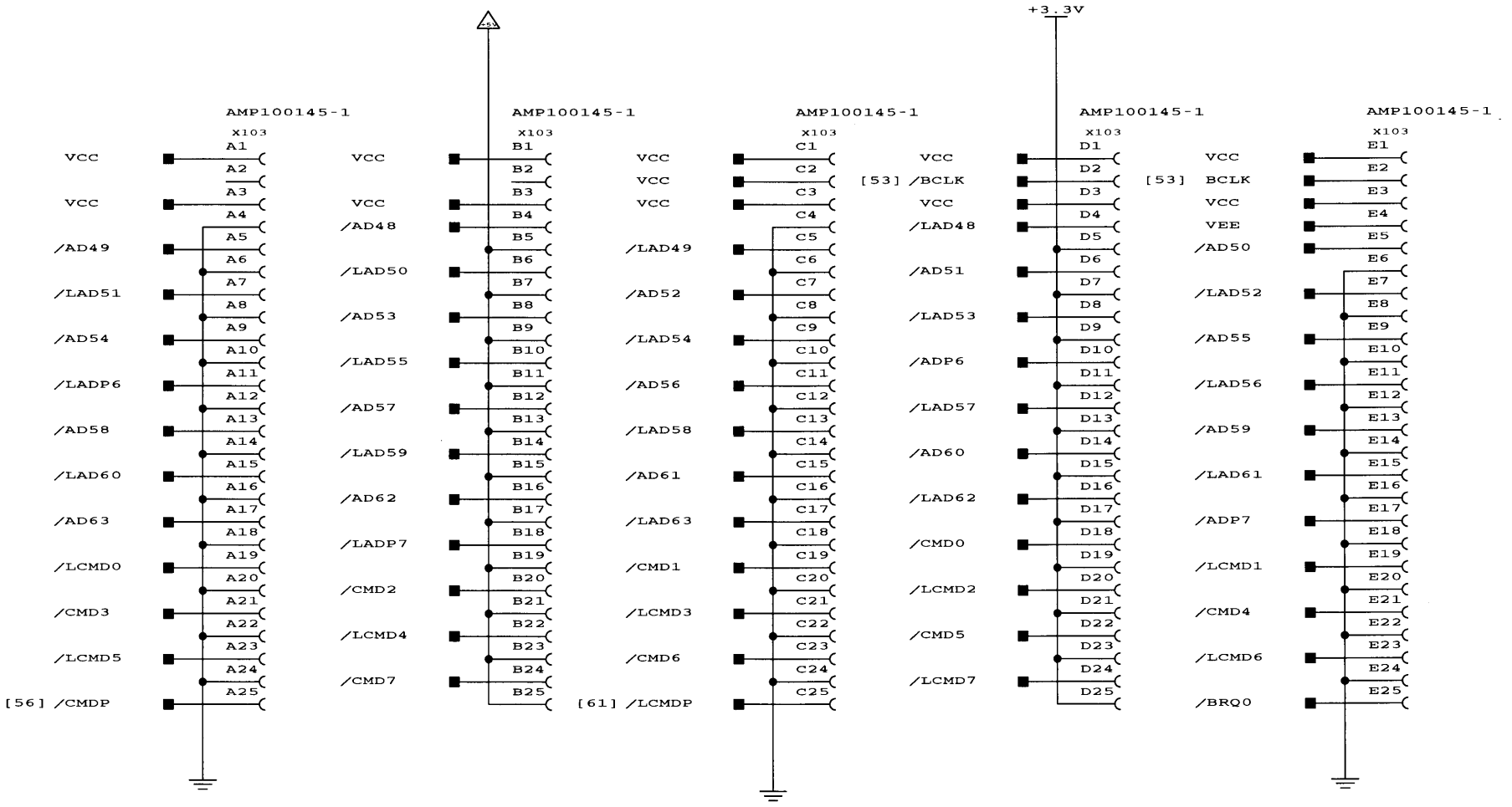

| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940506 | CPU301 Module | |
| Issue 1 | CHG | Local control transceiver | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:63 of 72 |



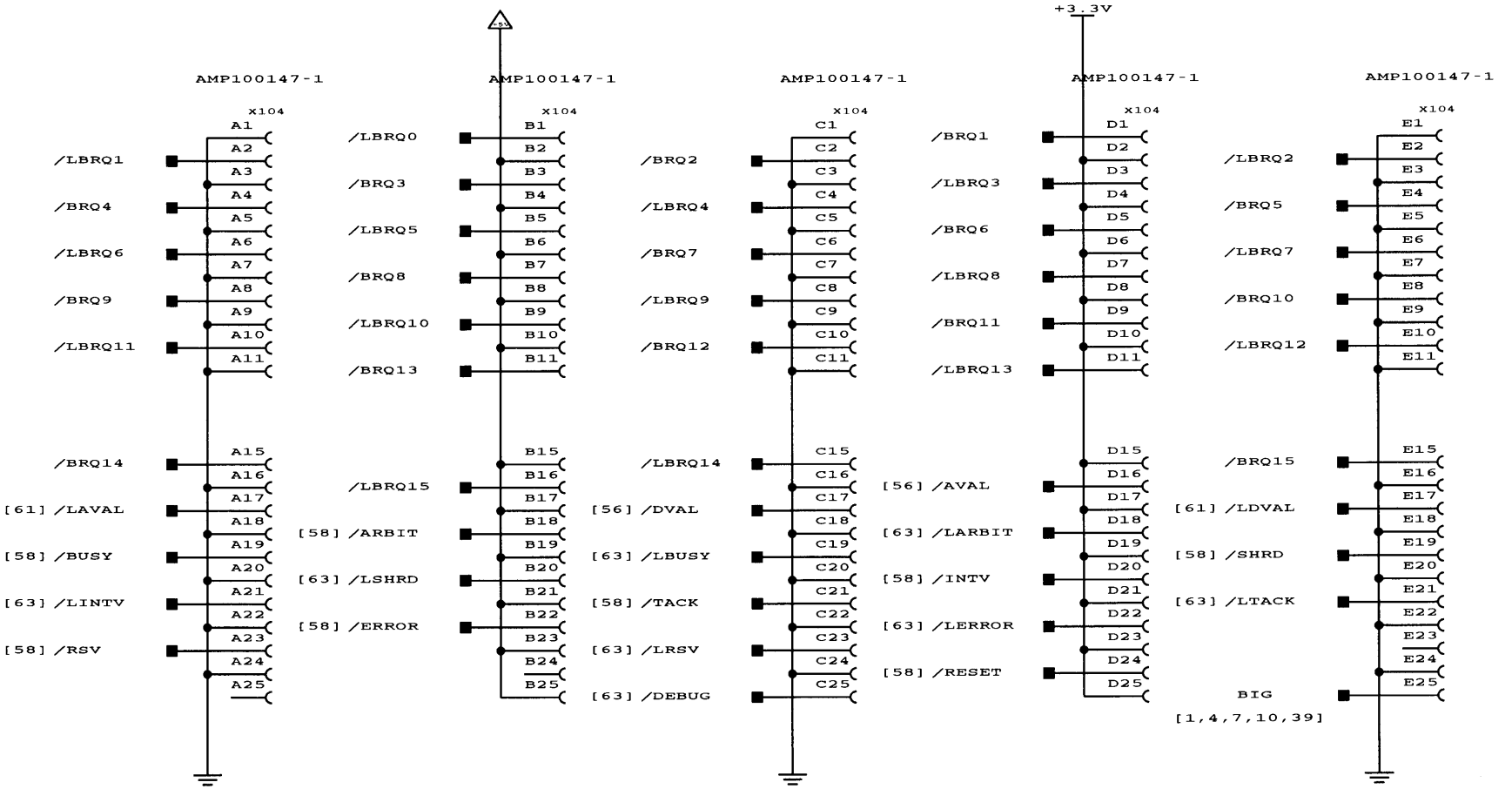

| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Connector (row 1-25) | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:64 of 72 |



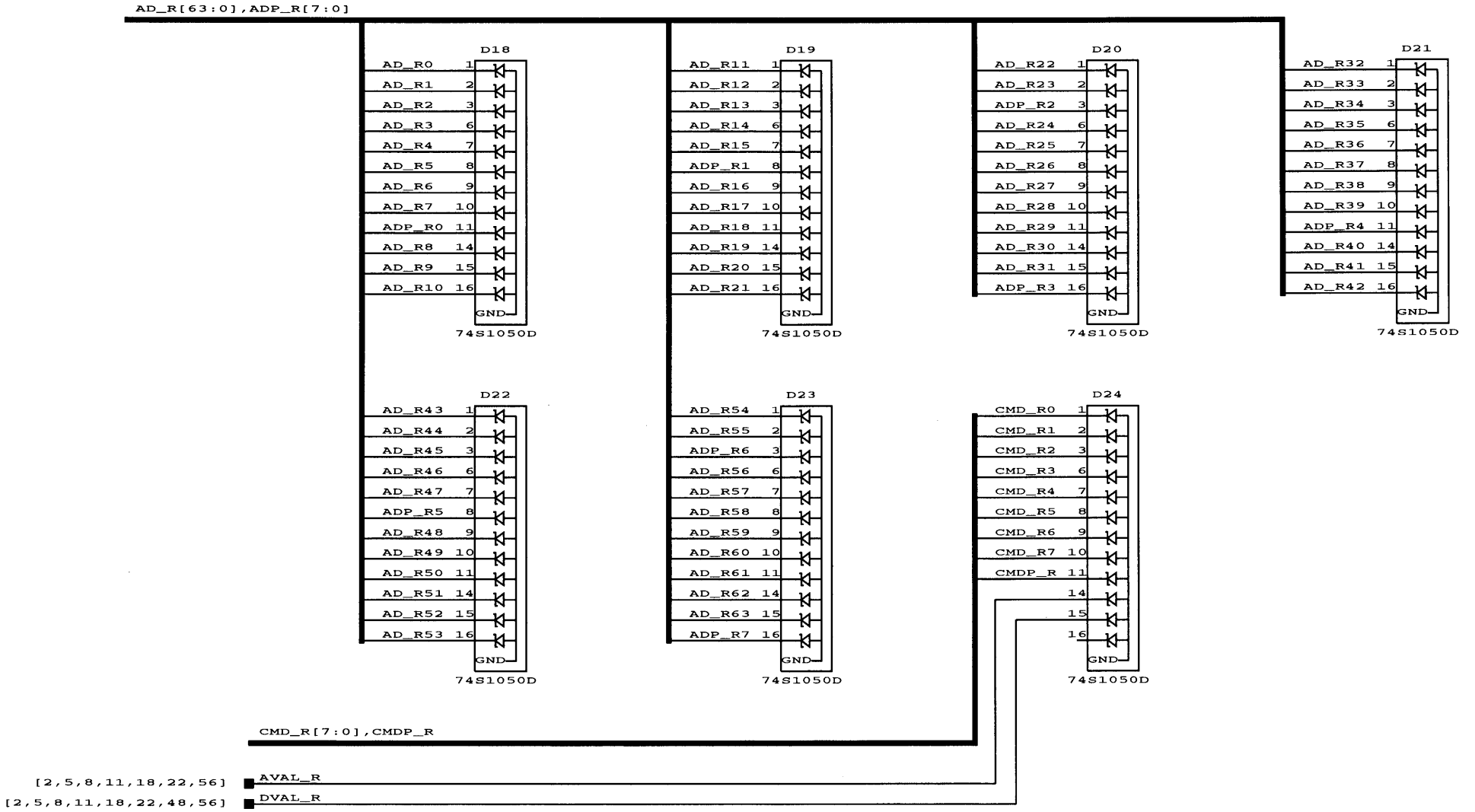

| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Connector (row 26-50) | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:65 of 72 |



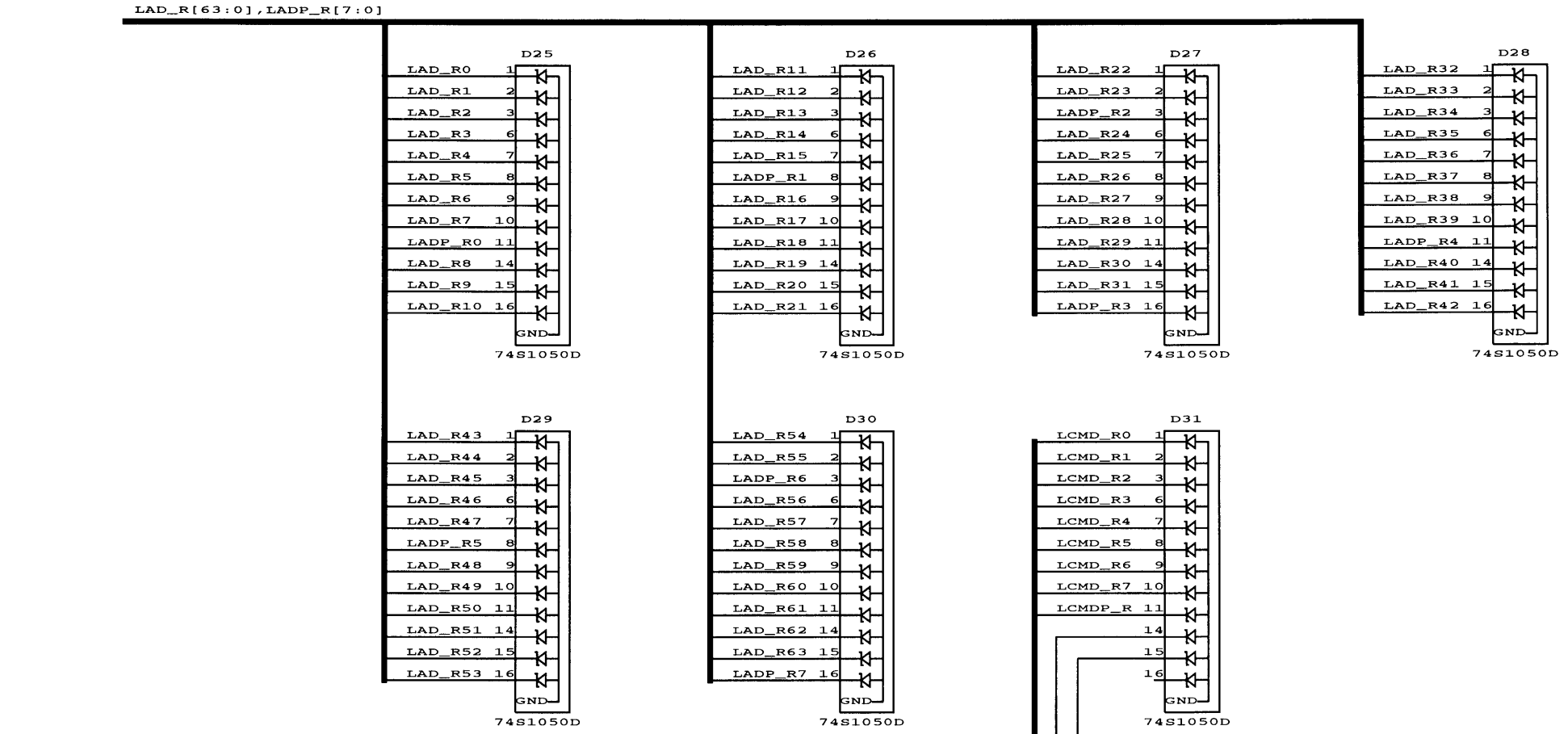

| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940825 | CPU301 Module | |
| Issue 1 | | Connector (row 51-75) | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:66 of 72 |




| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Connector (row 76-100) | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:67 of 72 |

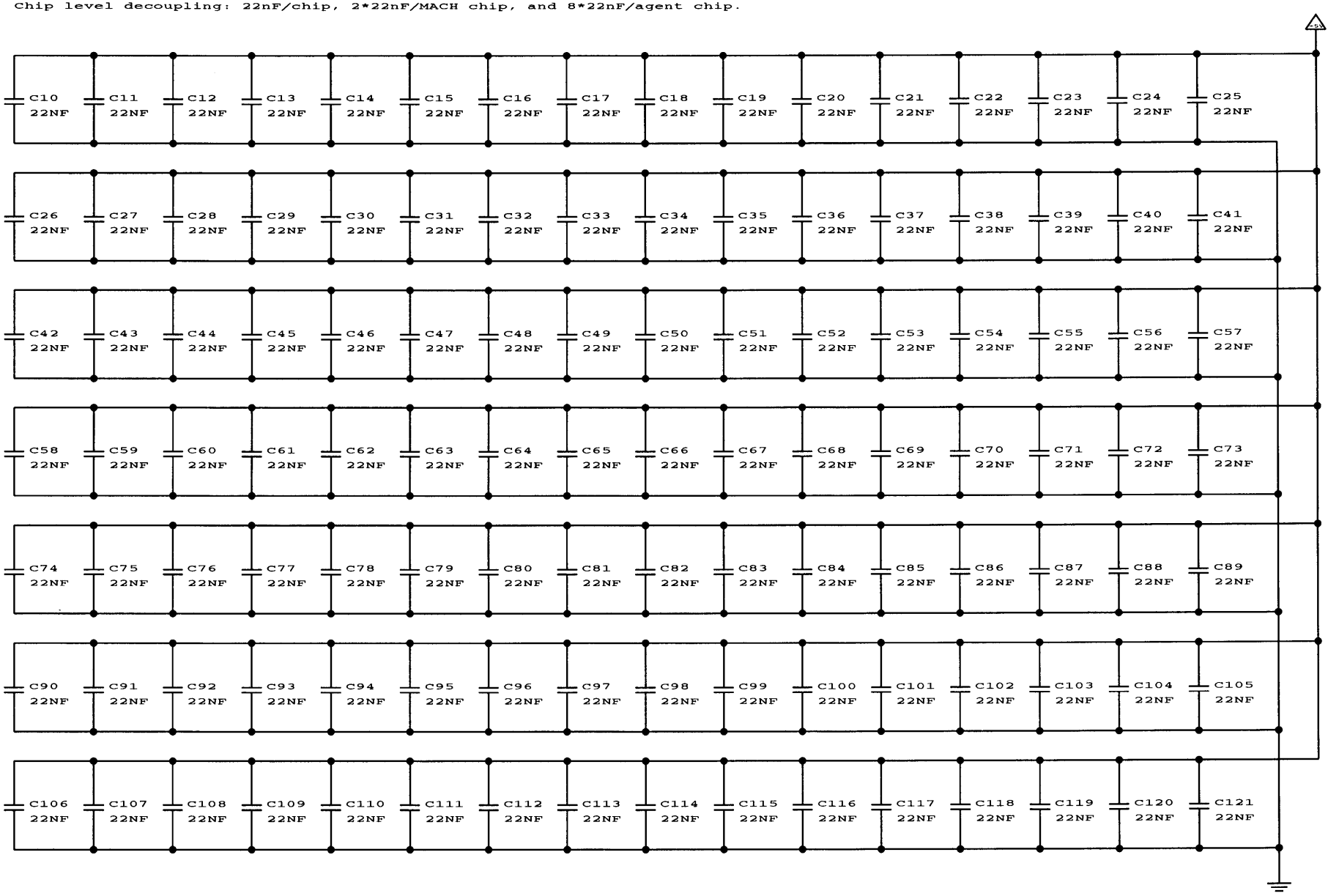



| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Internal global bus term. | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:68 of 72 |



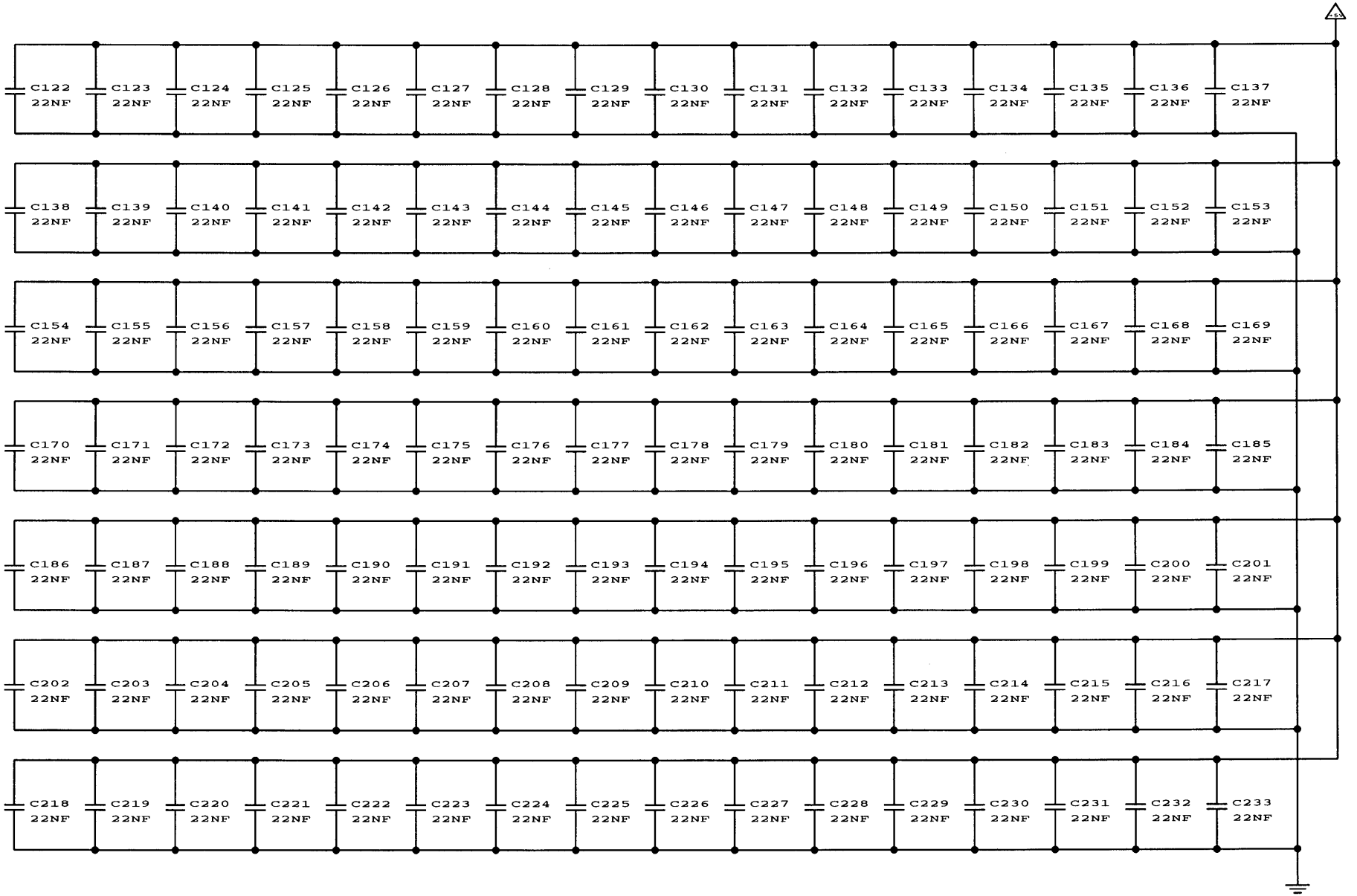

| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Internal local bus term. | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:69 of 72 |

Chip level decoupling: 22nF/chip, 2*22nF/MACH chip, and 8*22nF/agent chip.



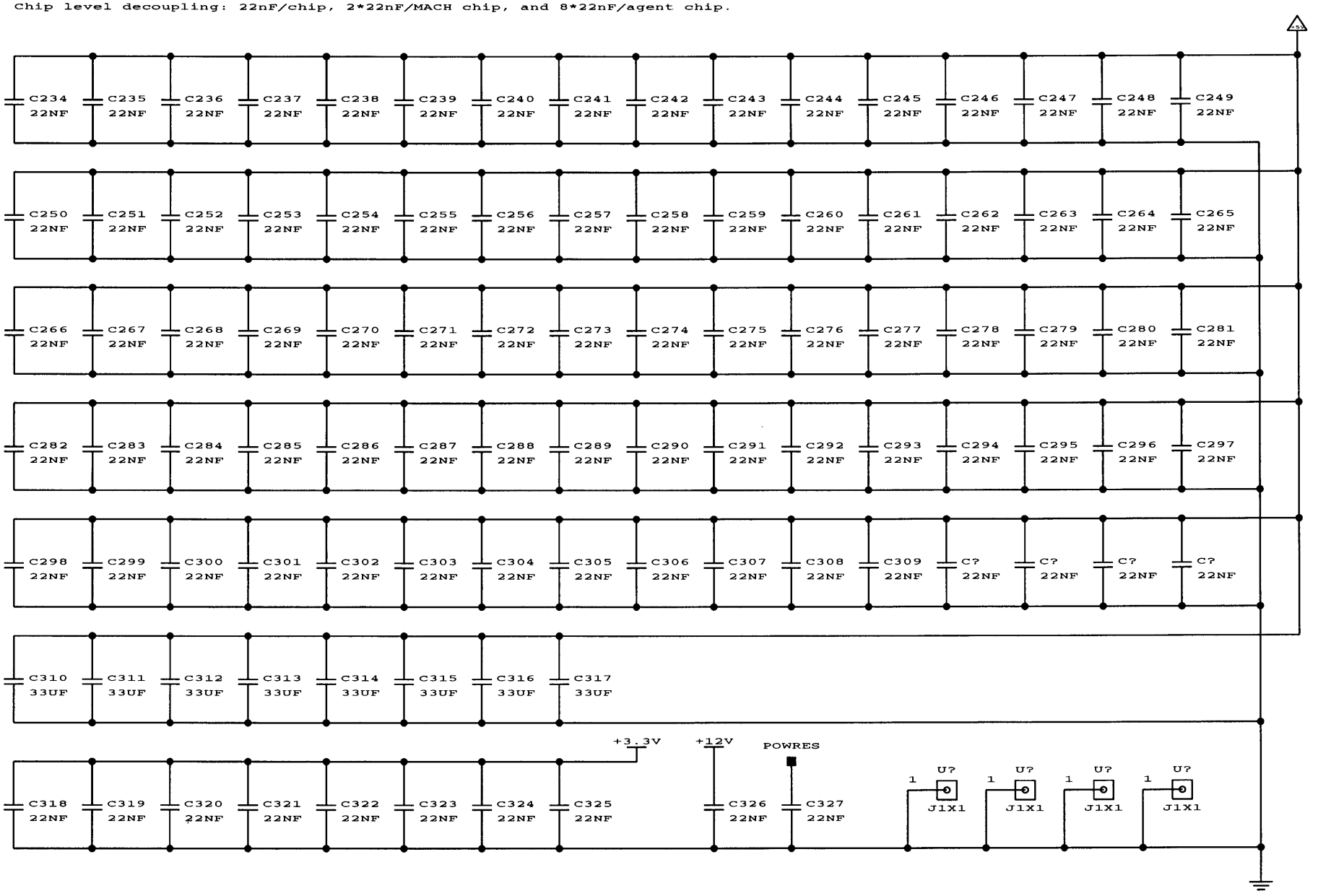

| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Decoupling capacitors | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:70 of 72 |

Chip level decoupling: 22nF/chip, 2*22nF/MACH chip, and 8*22nF/agent chip.



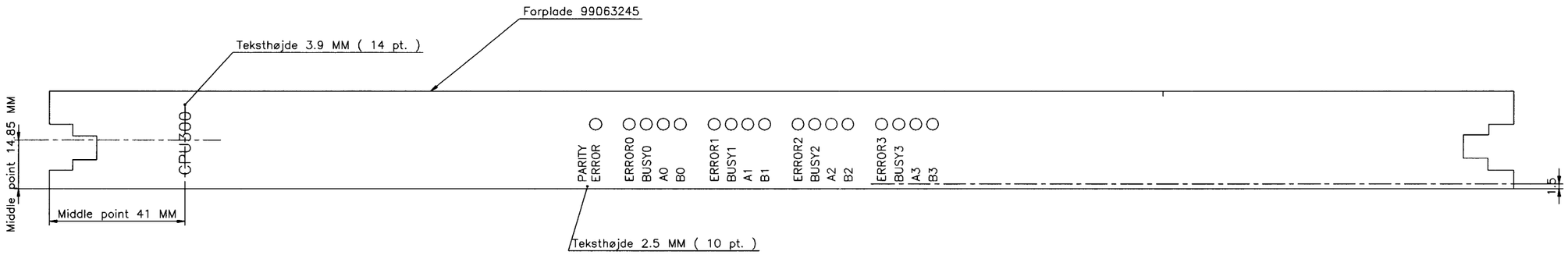

| dde | Dansk Data Elektronik A/S | | |
|---|---|---|---|
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Decoupling capacitors | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:71 of 72 |

Chip level decoupling: 22nF/chip, 2*22nF/MACH chip, and 8*22nF/agent chip.




Decoupling at bus connector: 22nF for 3.3 V, 12 V, POWRES and 33uF for 5 V.

| | | | |
|---|---|---|---|
| dde | Dansk Data Elektronik A/S | | |
| Issue 0 | 940811 | CPU301 Module | |
| Issue 1 | | Decoupling capacitors | |
| Issue 2 | | | |
| Issue 3 | | File: cpu301 | Page:72 of 72 |



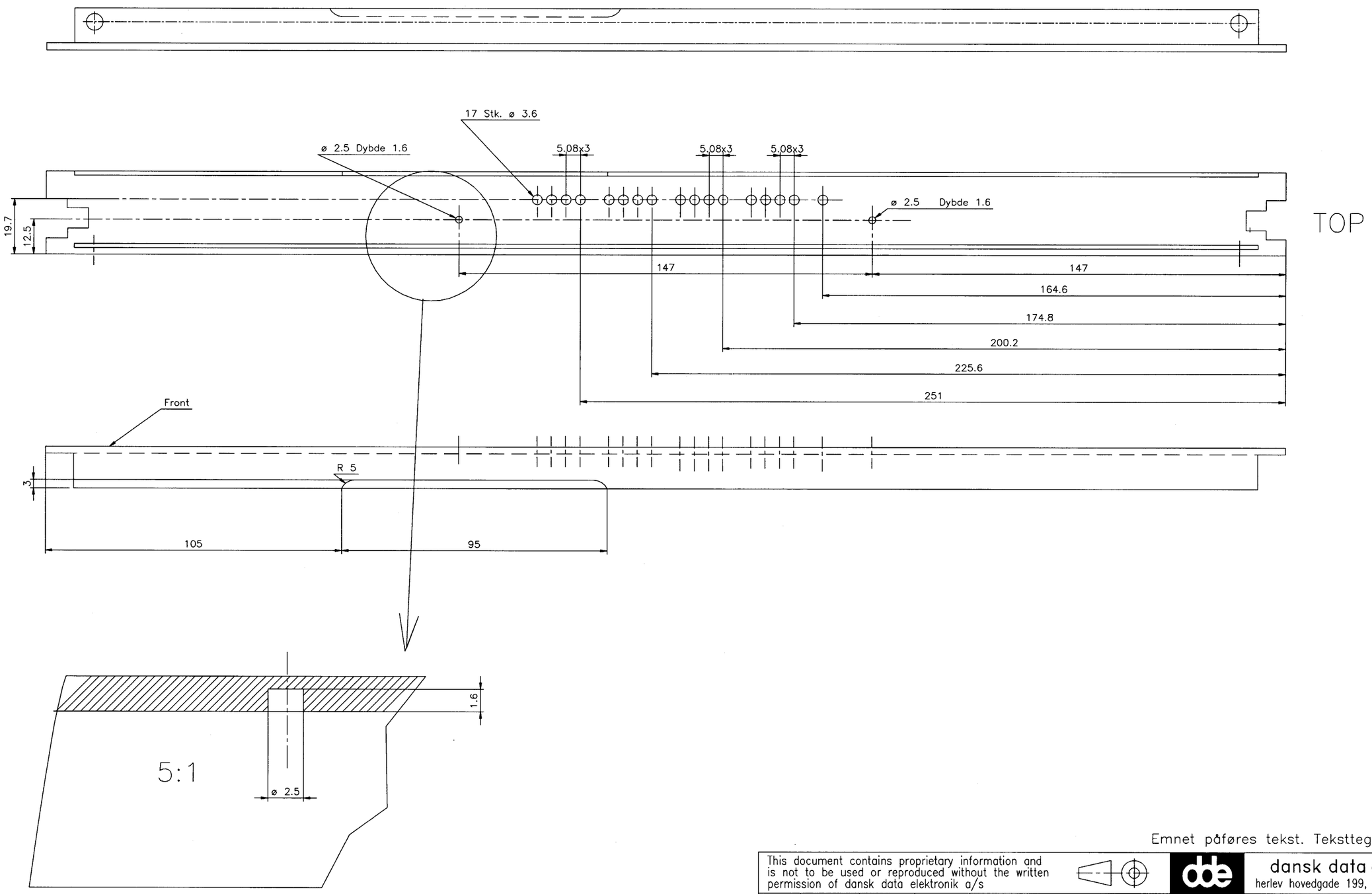

Skrifttype. Helvetica Light Farve sort



| Issue | Date | Drawn | Approv. | |
|---|---|---|---|---|
| 1 | 95.05.24 | Lex | | Tol. DS/ISO 2768-m |
| | | | | Scale: 1.5:1 |
| | | | | Material |
| | | | | |
| | | | | Finish |
| | | | | |

dansk data elektronik a/s
herlev hovedgade 199, 2730 herlev, tlf.4284 5011

Title SPC3 CPU300
Subjekt Teksttegning
Dir. File
Dwg.no. 99068013




TOP

Emnet påføres tekst. Teksttegning 99068013

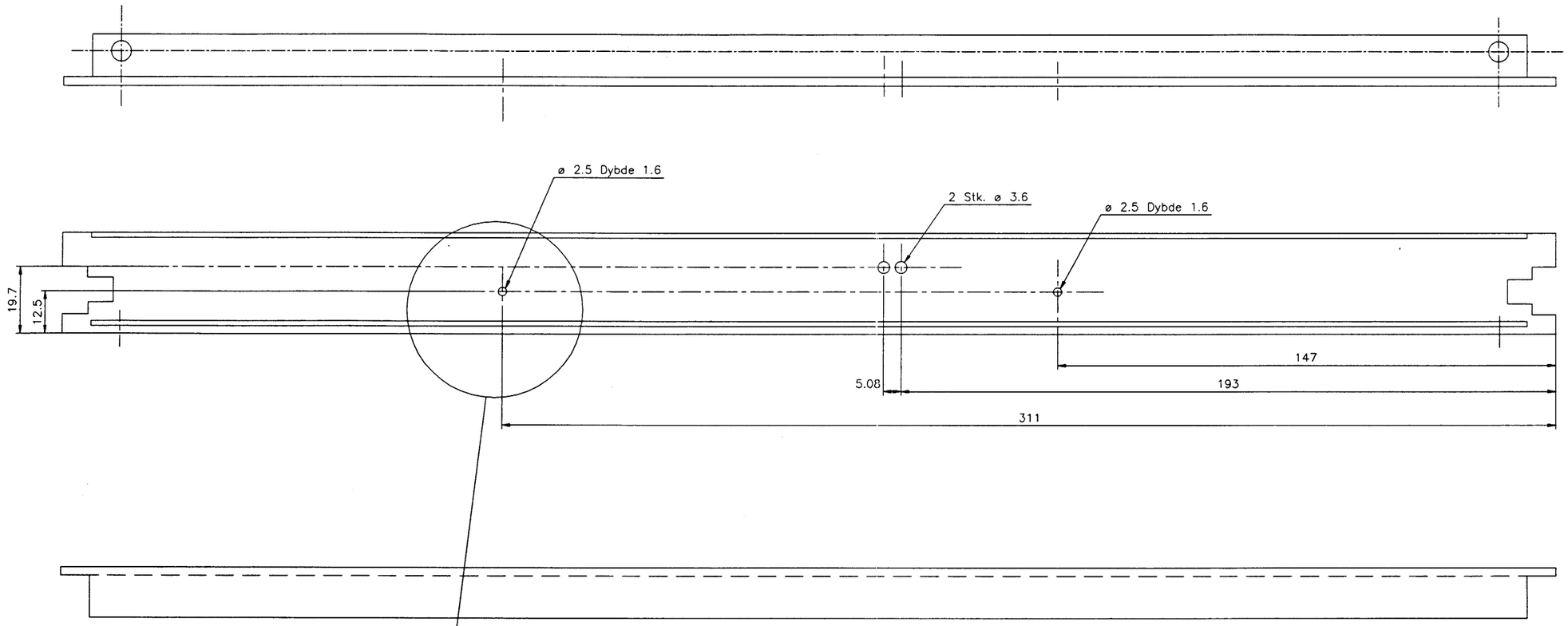


dansk data elektronik a/s
herlev hovedgade 199, 2730 herlev, tlf.4284 5011

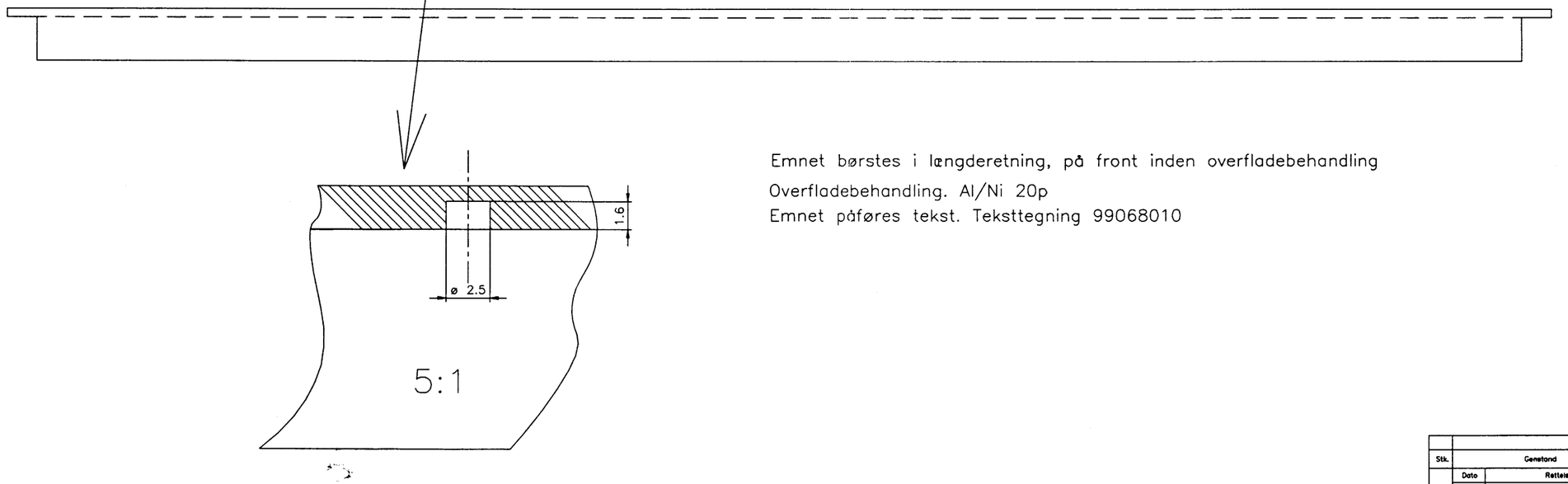
| Issue | Date | Drawn | Approv. |
|---|---|---|---|
| 1 | 95.05.24 | Lex | |

Tol. DS/ISO 2768-m
Scale:
Material
Profil 99063261
Finish Emnet børstes i længderetning på front
AlNi 20p

Title SPC3 5 og 8-Pos.
Subjekt Forplade CPU300
Dir. File
Dwg.no.
99063562




TOP



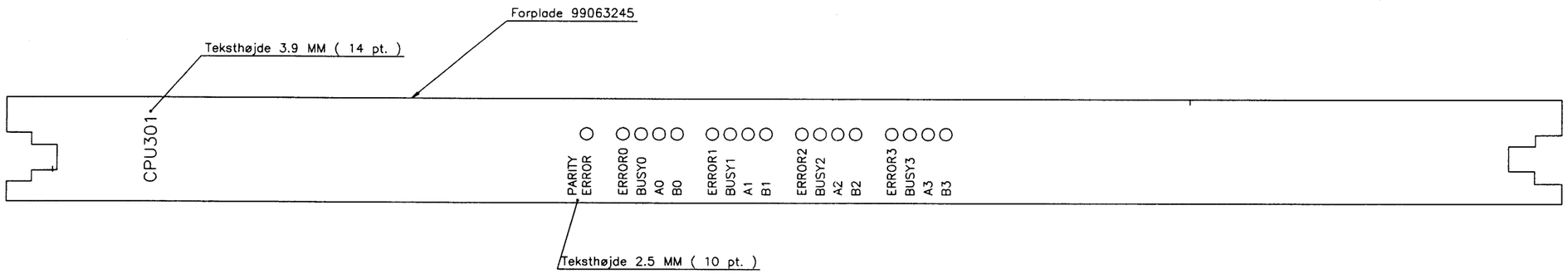

Emnet børstes i længderetning, på front inden overfladebehandling
Overfladebehandling. Al/Ni 20p
Emnet påføres tekst. Teksttegning 99068010

Emnet er mekanisk identisk med 99063246. Men teksten er ændret

Materiale. Forplade 99063261

| Stk. | Genstand | Mrk. Nr. | Tegn. Nr. | Materiale | Model Nr. Lager Nr. | Vægt |
|---|---|---|---|---|---|---|
| Dato | Rettelse | Dato | Rettelse | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| | | | | |
|---|---|---|---|---|
| Firma: | Målforhold | Tegn. | 941101 | lex |
| | 1.5:1 | Konf. | | |
| | | Normpr. | | |
| Genstand: Forplade LMEM301 | Erstatning for: 99063290 | | | |
| | Erstattet af: | | | |

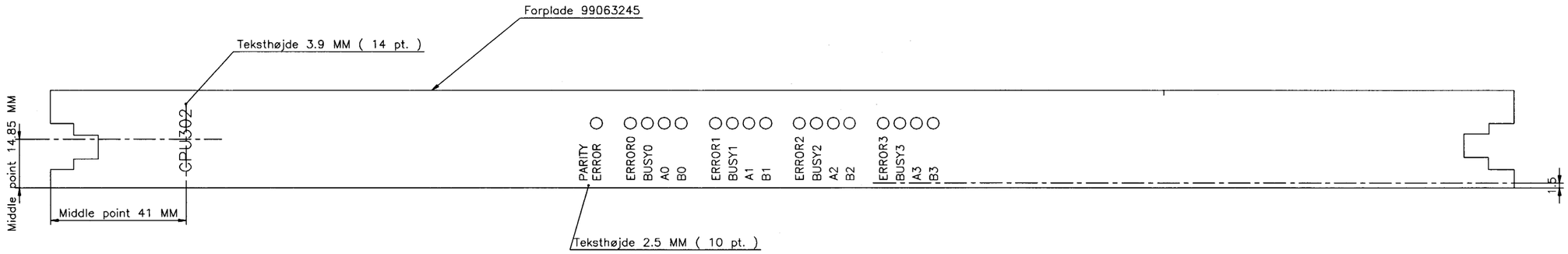



Skrifttype. Helvetica Light Farve sort

| Stk. | Genstand | Mrk. Nr. | Tegn. Nr. | Materiale | Model Nr. Lager Nr. | Vægt |
|---|---|---|---|---|---|---|
| Dato | Rettelse | Dato | Rettelse | | | |
| 94.11.01 | Teksthøjde ændret | | | | | |

| Firma: | Målforhold | Tegn. | 940809 | lex |
|---|---|---|---|---|
| | 1.5:1 | Kont. | | |
| | | Normpr. | | |

| Genstand: | Erstatning for: |
|---|---|
| Teksttegning CPU301 | 99068005 |
| | Erstattet af: |




Skrifttype. Helvetica Light Farve sort

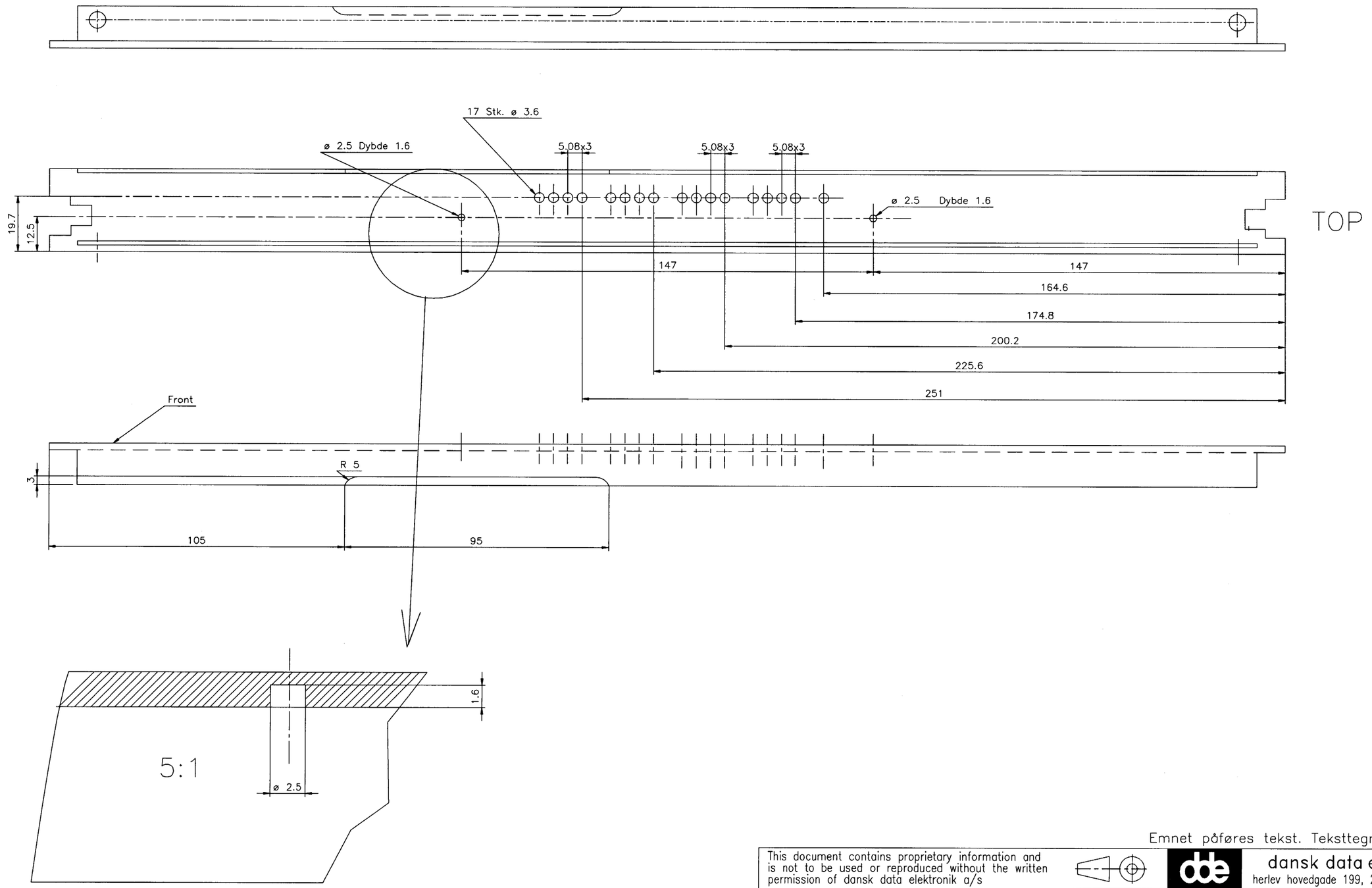


dansk data elektronik a/s
herlev hovedgade 199, 2730 herlev, tlf.4284 5011

| Issue | Date | Drawn | Approv. |
|---|---|---|---|
| 1 | 95.05.24 | Lex | |

Tol. DS/ISO 2768-m
Scale: 1.5:1
Material
Finish

Title SPC3 CPU302
Subjekt Teksttegning
Dir. File
Dwg.no.
99068014




Emnet påføres tekst. Teksttegning 99068014

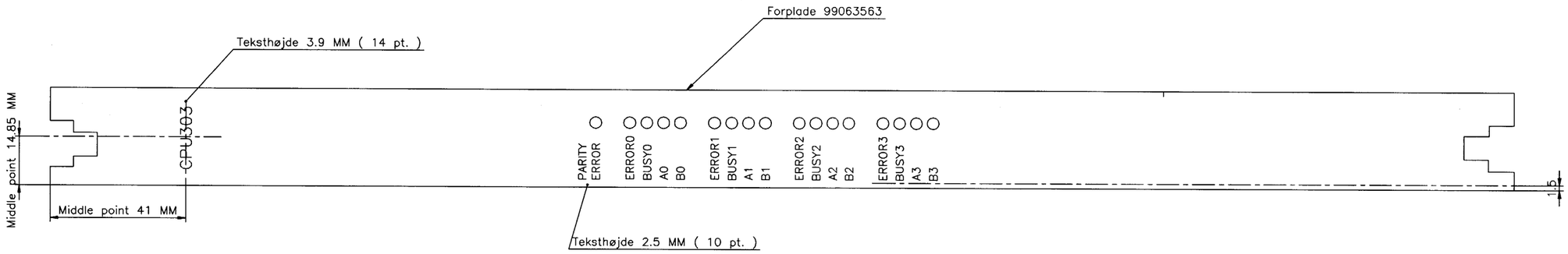


dansk data elektronik a/s
herlev hovedgade 199, 2730 herlev, tlf.4284 5011

| Issue | Date | Drawn | Approv. |
|---|---|---|---|
| 1 | 95.05.24 | Lex | |

Tol. DS/ISO 2768-m
Scale:
Material
Profil 99063261
Finish Emnet børstes i længderetning på front
AlNi 20p

Title SPC3 5 og 8-Pos.
Subjekt Forplade CPU302
Dir. File
Dwg.no.
99063563




Skrifttype. Helvetica Light Farve sort



dansk data elektronik a/s
herlev hovedgade 199, 2730 herlev, tlf.4284 5011

| Issue | Date | Drawn | Approv. |
|---|---|---|---|
| 1 | 95.08.31 | Lex | |

Tol. DS/ISO 2768-m
Scale: 1.5:1
Material
Finish

Title SPC3 CPU303
Subjekt Teksttegning
Dir. File
Dwg.no. 99068017

**PARTS LIST**

Module: CPU301-0 Date: 941209 

| Part no | Device | Qty | Comp |
|---|---|---|---|
| 99020850 | 22NF | 315 | C1,C10-313,C322-331 |
| 99020851 | 4.7UF | 1 | C2 |
| 99020849 | 33UF | 8 | C314-321 |
| 99021413 | LED 3mm red h.prf. | 5 | D1,D5,D9,D13,D17 |
| 99021412 | LED 3mm green h.prf. | 12 | D2-4,D6-8,D10-12,D14-16 |
| 99000227 | 74S1050D | 14 | D18-31 |
| 99022027 | 1.000MHZ | 1 | OSC1 |
| 99020305 | 100R | 28 | R1-9,R15,R17,R19,R21,R23,R25 R27,R29,R31-32,R35,R38-39,R41 R45,R60-61,R65,R68 |
| 99020307 | 82R | 2 | R10,R12 |
| 99020308 | 130R | 2 | R11,R13 |
| 99020306 | 220R | 10 | R14,R16,R18,R20,R22,R24,R26,R28 R30,R59 |
| 99020303 | 4K7 | 7 | R33,R42,R66-67,R69-70,R92 |
| 99020327 | 3K | 2 | R34,R43 |
| 99020301 | 1K | 14 | R40,R44,R50,R52,R54,R56, R62-64,R86-90 |
| 99020309 | 560R | 17 | R46-48,R72-84,R91 |
| 99022235 | Netw. 4820P-002-472 | 1 | R36 |
| 99022234 | Netw. 4820P-002-102 | 1 | R93 |
| 99020322 | 0R | 4 | R95,R98,R101,R104 |
| 99011701 | CA302 | 8 | U1-8 |
| 99002411 | 74F1808D | 2 | U9,U11 |
| 99002412 | 74F1832D | 2 | U10,U12 |
| 99000831 | 74AS20D | 3 | U13-14,U16 |
| 99002413 | 74F377D | 2 | U17,U25 |
| 99010216 | PAL20R8-5JC | 4 | U18-19,U21,U23 |
| 99010902 | MACH110-20JC | 4 | U20,U78,U85,U94 |
| 99010904 | MACH210-12JC | 8 | U22,U24,U138-139,U141,U143-144 U146 |
| 99002222 | 74FCT16823BTPV | 8 | U26-27,U48-49,U81-84 |
| 99011223 | MCM6706AJ10 | 20 | U28-29,U33-34,U38-39,U43-44 U50-51,U55-56,U60-61,U65-66 U140,U142,U145,U147 |
| 99002223 | 74FCT16244ATPV | 14 | U30,U35,U40,U45,U52,U57,U62,U67 U77,U89-93 |
| 99002221 | 74FCT521BTSO | 18 | U31-32,U36-37,U41-42,U46-47 U53-54,U58-59,U63-64,U68-70,U88 |
| 99010908 | MACH220-15JC | 1 | U71 |
| 99012095 | N82S123AA / Am27S19AJC | 2 | U72-73 |
| 99002219 | 74FCT16501ATPV | 1 | U74 |
| 99002408 | 74F280BD | 3 | U75-76,U80 |
| 99012114 | AM29C040-120JC | 1 | U79 |
| 99010604 | PALCE16V8H-7JC | 3 | U86-87,U95 |
| 99011218 | CY7B991-7JC | 1 | U96 |
| 99005033 | MC100H641FN | 1 | U97 |
| 99002500 | FB2031BB | 20 | U98-107,U111-120 |
| 99002501 | FB2033BB | 6 | U108-110,U121-123 |
| 99001040 | 74ALS240D | 2 | U124-125 |
| 99000472 | 74LS393D | 3 | U127-129 |
| 99002405 | 74F74D | 2 | U130-131 |
| 99000832 | 74AS30D | 3 | U132-134 |
| 99010022 | PAL16R6-5JC | 2 | U136-137 |
| 99002407 | 74F244D | 1 | U148 |
| 99000830 | 74AS1004D | 1 | U149 |
| 99040124 | 3M8062011549-5 | 16 | X00-03,X10-13,X20-23,X30-33 |
| 99040111 | AMP100147-1 | 3 | X101-102,X104 |

**PARTS LIST**

Module: CPU301-0 Date: 941209 Page: 2/2

| Part no | Device | Qty | Comp |
|---|---|---|---|
| 99040110 | AMP100145-1 | 1 | X103 |
| 99023228 | 20-pin PLCC socket | 7 | U72-73,U86-87,U95,U136-137 |
| 99023229 | 28-pin PLCC socket | 4 | U18-19,U21,U23 |
| 99023230 | 32-pin PLCC socket | 1 | U79 |
| 99023231 | 44-pin PLCC socket | 12 | U20,U22,U24,U78,U85,U94, U138-139,U141,U143-144,U146 |
| 99023232 | 68-pin PLCC socket | 1 | U71 |
| 99750101 | Mech. parts CPU301 | 1 | |
| 99030320 | PCB CPU301 Issue 1 | 1 | |

# PLD list

**Part no:** 99750020 **Module:** CPU301-0 **Pcb no:**
**Status:** Preliminary **Date:** 941031 **Page:** 1 / 1
**Init:** OHM

| Label | Pos. | Part no. | Type | X-pgm. | File | Checksum |
|---|---|---|---|---|---|---|
| c31010 | U18 | 99010216 | PAL20R8-5JC | | c31010.jed | DEF0 |
| c31010 | U19 | 99010216 | PAL20R8-5JC | | c31010.jed | DEF0 |
| c31020 | U136 | 99010022 | PAL16R6-5JC | | c31020.jed | 2BE2 |
| c31020 | U137 | 99010022 | PAL16R6-5JC | | c31020.jed | 2BE2 |
| c31030 | U20 | 99010902 | MACH110-20JC | | c31030.jed | B930 |
| c31040 | U21 | 99010216 | PAL20R8-5JC | | c31040.jed | B626 |
| c31040 | U23 | 99010216 | PAL20R8-5JC | | c31040.jed | B626 |
| c31050 | U22 | 99010904 | MACH210-12JC | | c31050.jed | 2E46 |
| c31050 | U24 | 99010904 | MACH210-12JC | | c31050.jed | 2E46 |
| c31060 | U138 | 99010904 | MACH210-12JC | | Ikke klar | |
| c31060 | U143 | 99010904 | MACH210-12JC | | Ikke klar | |
| c31070 | U139 | 99010904 | MACH210-12JC | | Ikke klar | |
| c31070 | U141 | 99010904 | MACH210-12JC | | Ikke klar | |
| c31070 | U144 | 99010904 | MACH210-12JC | | Ikke klar | |
| c31070 | U146 | 99010904 | MACH210-12JC | | Ikke klar | |
| c31080 | U71 | 99010908 | MACH220-15JC | | c31080.jed | 004F |
| c31090 | U78 | 99010902 | MACH110-20JC | | c31090.jed | E876 |
| c31100 | U85 | 99010902 | MACH110-20JC | | c31100.jed | 604D |
| c31100 | U94 | 99010902 | MACH110-20JC | | c31100.jed | 604D |
| c31110 | U86 | 99010604 | PALCE16V8H-7JC | R6 | c31110.jed | 234F |
| c31110 | U95 | 99010604 | PALCE16V8H-7JC | R6 | c31110.jed | 234F |
| c31120 | U87 | 99010604 | PALCE16V8H-7JC | R8 | c31120.jed | 2470 |

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**********



**********li2**********

Dato : 04.03.94.
Udgave : 0-3

| BETEGNELSE | LEV. | INTVARENR | TEGN | ARKIV |
|---|---|---|---|---|
| Mekaniske dele CPU 301 | dde | 750101 | | |

UNDERPRODUKTER

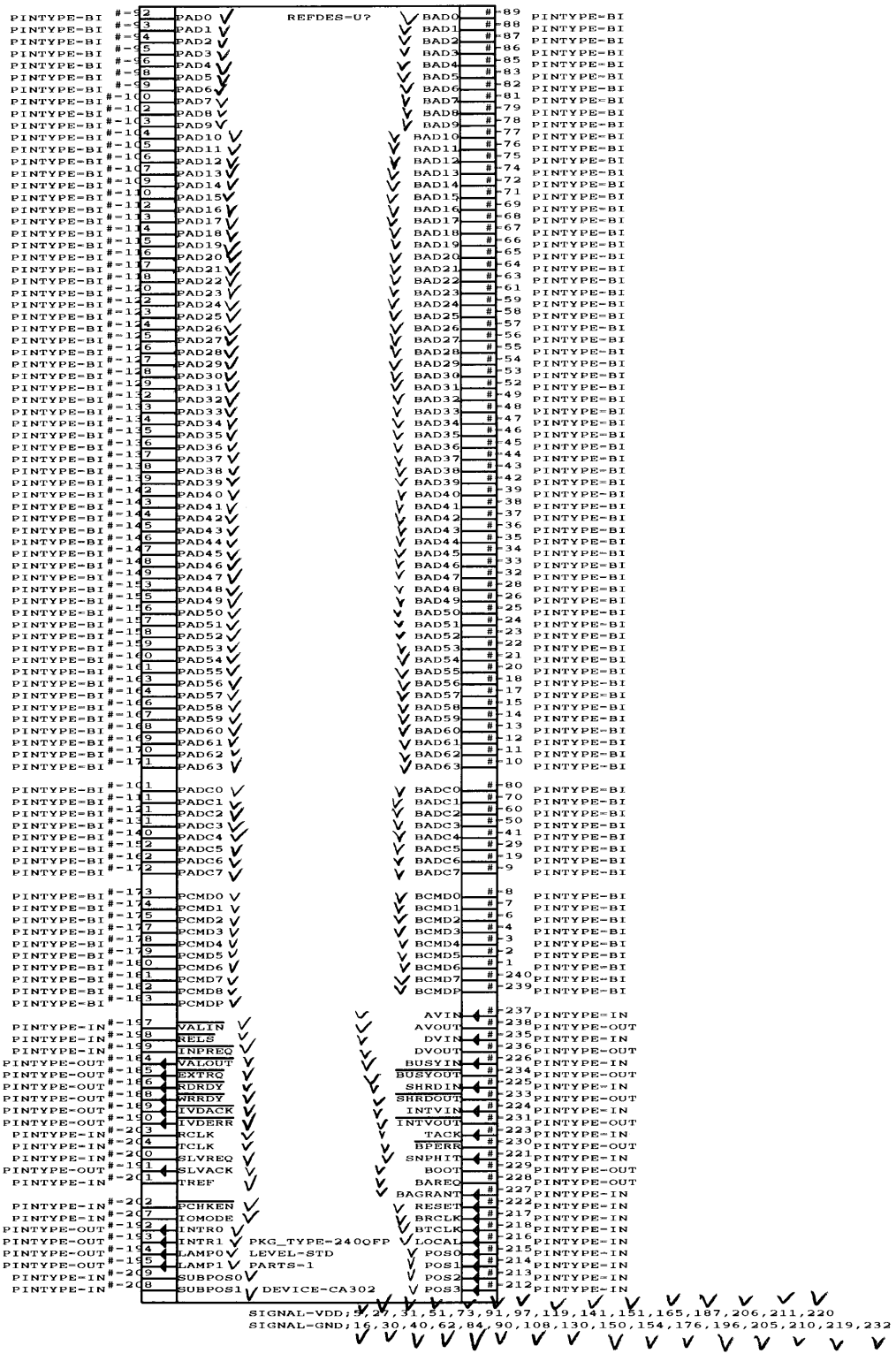
| POS | BETEGNELSE | i | LEV. | ANT. | INTVARENR | TEGN | ARKIV |
|---|---|---|---|---|---|---|---|
| 1 | Forplade CPU301 | | pum | 1 | 99063245 | | |
| 2 | Vinkel for SPC 3 kort | | pum | 1 | 99063221 | | |
| 3 | Stag M 3 6-kt L8MM(R6332-02) | | sfc | 4 | 99062998 | | |
| 4 | Printlås sort Schroff20839-073 | | kwe | 2 | 99062994 | | |
| 5 | EMC-Fjeder Venstre | | pum | 1 | 99062990 | | |
| 6 | Tape for EMC Fjeder | | mmm | 1 | 99062991 | | |
| 7 | skrue M 3x5 PHJX-Z 9041 | | hfc | 8 | 99060561 | | |
| 8 | skrue M2.5x8 PHJX-Z 9041 | | hfc | 2 | 99060504 | | |
| 9 | Skive 2.5 DIN6798A HFC 1221 | | hfc | 2 | 99062995 | | |
| 10 | Styretap Schroff 60839-035 | | kwe | 2 | 99063224 | | |
| 11 | skive 3 DIN 6798A HFC 1221 | | hfc | 4 | 99060562 | | |
| 12 | Tekst CPU301 | * | dpr | | 99068005 | | |

'*' i 'i' : dele med egen stykliste

**DESIGN NOTE**

| | |
|---|---|
| Name: | CA302 Pin Assignment |
| Date: | 94-08-02 |
| Author: | aaj |
| Version: | 4.0 |
| Document: | design note 6 |

**Contents** **page**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PKG_TYPE=240QFP
LEVEL-STD
PARTS=1
DEVICE-CA302
SIGNAL-VDD;5,27,31,51,73,91,97,119,141,151,165,187,206,211,220
SIGNAL-GND;16,30,40,62,84,90,108,130,150,154,176,196,205,210,219,232

## 1 CA302 PIN ASSIGNMENTS

| PIN | SIGNAL | BUFFER | LOAD pF |
|---|---|---|---|
| 1 | BC60 | IOS1G | 80 |
| 2 | BC50 | IOS1G | 80 |
| 3 | BC40 | IOS1G | 80 |
| 4 | BC30 | IOS1G | 80 |
| 5 | VDD | PWRPY | |
| 6 | BC20 | IOS1G | 80 |
| 7 | BC10 | IOS1G | 80 |
| 8 | BC00 | IOS1G | 80 |
| 9 | BP70 | IOS1G | 80 |
| 10 | B630 | IOS1G | 80 |
| 11 | B620 | IOS1G | 80 |
| 12 | B610 | IOS1G | 80 |
| 13 | B600 | IOS1G | 80 |
| 14 | B590 | IOS1G | 80 |
| 15 | B580 | IOS1G | 80 |
| 16 | GND | GNDPY | |
| 17 | B570 | IOS1G | 80 |
| 18 | B560 | IOS1G | 80 |
| 19 | BP60 | IOS1G | 80 |
| 20 | B550 | IOS1G | 80 |
| 21 | B540 | IOS1G | 80 |
| 22 | B530 | IOS1G | 80 |
| 23 | B520 | IOS1G | 80 |
| 24 | B510 | IOS1G | 80 |
| 25 | B500 | IOS1G | 80 |
| 26 | B490 | IOS1G | 80 |
| 27 | VDD | PWRPY | |
| 28 | B480 | IOS1G | 80 |
| 29 | BP50 | IOS1G | 80 |
| 30 | GND | GNDCO | |
| 31 | VDD | PWRCO | |
| 32 | B470 | IOS1G | 80 |
| 33 | B460 | IOS1G | 80 |
| 34 | B450 | IOS1G | 80 |
| 35 | B440 | IOS1G | 80 |
| 36 | B430 | IOS1G | 80 |
| 37 | B420 | IOS1G | 80 |
| 38 | B410 | IOS1G | 80 |
| 39 | B400 | IOS1G | 80 |
| 40 | GND | GNDPY | |
| 41 | BP40 | IOS1G | 80 |
| 42 | B390 | IOS1G | 80 |
| 43 | B380 | IOS1G | 80 |
| 44 | B370 | IOS1G | 80 |
| 45 | B360 | IOS1G | 80 |
| 46 | B350 | IOS1G | 80 |
| 47 | B340 | IOS1G | 80 |
| 48 | B330 | IOS1G | 80 |
| 49 | B320 | IOS1G | 80 |
| 50 | BP30 | IOS1G | 80 |
| 51 | VDD | PWRPY | |
| 52 | B310 | IOS1G | 80 |
| 53 | B300 | IOS1G | 80 |
| 54 | B290 | IOS1G | 80 |
| 55 | B280 | IOS1G | 80 |
| 56 | B270 | IOS1G | 80 |
| 57 | B260 | IOS1G | 80 |
| 58 | B250 | IOS1G | 80 |
| 59 | B240 | IOS1G | 80 |
| 60 | BP20 | IOS1G | 80 |

| PIN | SIGNAL | BUFFER | LOAD pF |
|---|---|---|---|
| 61 | B23O | IOS1G | 80 |
| 62 | GND | GNDPY | |
| 63 | B22O | IOS1G | 80 |
| 64 | B21O | IOS1G | 80 |
| 65 | B20O | IOS1G | 80 |
| 66 | B19O | IOS1G | 80 |
| 67 | B18O | IOS1G | 80 |
| 68 | B17O | IOS1G | 80 |
| 69 | B16O | IOS1G | 80 |
| 70 | BP1O | IOS1G | 80 |
| 71 | B15O | IOS1G | 80 |
| 72 | B14O | IOS1G | 80 |
| 73 | VDD | PWRPY | |
| 74 | B13O | IOS1G | 80 |
| 75 | B12O | IOS1G | 80 |
| 76 | B11O | IOS1G | 80 |
| 77 | B10O | IOS1G | 80 |
| 78 | B09O | IOS1G | 80 |
| 79 | B08O | IOS1G | 80 |
| 80 | BP0O | IOS1G | 80 |
| 81 | B07O | IOS1G | 80 |
| 82 | B06O | IOS1G | 80 |
| 83 | B05O | IOS1G | 80 |
| 84 | GND | GNDPY | |
| 85 | B04O | IOS1G | 80 |
| 86 | B03O | IOS1G | 80 |
| 87 | B02O | IOS1G | 80 |
| 88 | B01O | IOS1G | 80 |
| 89 | B00O | IOS1G | 80 |
| 90 | GND | GNDCO | |

| PIN | SIGNAL | BUFFER | LOAD pF |
|---|---|---|---|
| 91 | VDD | PWRCO | |
| 92 | P00O | IOS1G | 50 |
| 93 | P01O | IOS1G | 50 |
| 94 | P02O | IOS1G | 50 |
| 95 | P03O | IOS1G | 50 |
| 96 | P04O | IOS1G | 50 |
| 97 | VDD | PWRPY | |
| 98 | P05O | IOS1G | 50 |
| 99 | P06O | IOS1G | 50 |
| 100 | P07O | IOS1G | 50 |
| 101 | PP0O | IOS1G | 50 |
| 102 | P08O | IOS1G | 50 |
| 103 | P09O | IOS1G | 50 |
| 104 | P10O | IOS1G | 50 |
| 105 | P11O | IOS1G | 50 |
| 106 | P12O | IOS1G | 50 |
| 107 | P13O | IOS1G | 50 |
| 108 | GND | GNDPY | |
| 109 | P14O | IOS1G | 50 |
| 110 | P15O | IOS1G | 50 |
| 111 | PP1O | IOS1G | 50 |
| 112 | P16O | IOS1G | 50 |
| 113 | P17O | IOS1G | 50 |
| 114 | P18O | IOS1G | 50 |
| 115 | P19O | IOS1G | 50 |
| 116 | P20O | IOS1G | 50 |
| 117 | P21O | IOS1G | 50 |
| 118 | P22O | IOS1G | 50 |
| 119 | VDD | PWRPY | |
| 120 | P23O | IOS1G | 50 |

| PIN | SIGNAL | BUFFER | LOAD pF |
|---|---|---|---|
| 121 | PP20 | IOS1G | 50 |
| 122 | P240 | IOS1G | 50 |
| 123 | P250 | IOS1G | 50 |
| 124 | P260 | IOS1G | 50 |
| 125 | P270 | IOS1G | 50 |
| 126 | P280 | IOS1G | 50 |
| 127 | P290 | IOS1G | 50 |
| 128 | P300 | IOS1G | 50 |
| 129 | P310 | IOS1G | 50 |
| 130 | GND | GNDPY | |
| 131 | PP30 | IOS1G | 50 |
| 132 | P320 | IOS1G | 50 |
| 133 | P330 | IOS1G | 50 |
| 134 | P340 | IOS1G | 50 |
| 135 | P350 | IOS1G | 50 |
| 136 | P360 | IOS1G | 50 |
| 137 | P370 | IOS1G | 50 |
| 138 | P380 | IOS1G | 50 |
| 139 | P390 | IOS1G | 50 |
| 140 | PP40 | IOS1G | 50 |
| 141 | VDD | PWRPY | |
| 142 | P400 | IOS1G | 50 |
| 143 | P410 | IOS1G | 50 |
| 144 | P420 | IOS1G | 50 |
| 145 | P430 | IOS1G | 50 |
| 146 | P440 | IOS1G | 50 |
| 147 | P450 | IOS1G | 50 |
| 148 | P460 | IOS1G | 50 |
| 149 | P470 | IOS1G | 50 |
| 150 | GND | GNDCO | |

| PIN | SIGNAL | BUFFER | LOAD pF |
|---|---|---|---|
| 151 | VDD | PWRCO | |
| 152 | PP50 | IOS1G | 50 |
| 153 | P480 | IOS1G | 50 |
| 154 | GND | GNDPY | |
| 155 | P490 | IOS1G | 50 |
| 156 | P500 | IOS1G | 50 |
| 157 | P510 | IOS1G | 50 |
| 158 | P520 | IOS1G | 50 |
| 159 | P530 | IOS1G | 50 |
| 160 | P540 | IOS1G | 50 |
| 161 | P550 | IOS1G | 50 |
| 162 | PP60 | IOS1G | 50 |
| 163 | P560 | IOS1G | 50 |
| 164 | P570 | IOS1G | 50 |
| 165 | VDD | PWRPY | |
| 166 | P580 | IOS1G | 50 |
| 167 | P590 | IOS1G | 50 |
| 168 | P600 | IOS1G | 50 |
| 169 | P610 | IOS1G | 50 |
| 170 | P620 | IOS1G | 50 |
| 171 | P630 | IOS1G | 50 |
| 172 | PP70 | IOS1G | 50 |
| 173 | PC00 | IOS1G | 50 |
| 174 | PC10 | IOS1G | 50 |
| 175 | PC20 | IOS1G | 50 |
| 176 | GND | GNDPY | |
| 177 | PC30 | IOS1G | 50 |
| 178 | PC40 | IOS1G | 50 |
| 179 | PC50 | IOS1G | 50 |
| 180 | PC60 | IOS1G | 50 |

| PIN | SIGNAL | BUFFER | LOAD pF |
|---|---|---|---|
| 181 | PC7O | IOS1G | 50 |
| 182 | PC8O | IOS1G | 50 |
| 183 | PCPO | IOS1G | 50 |
| 184 | VALO | OPS1T | 25 |
| 185 | EXRQ | OPS1T | 25 |
| 186 | RRDY | OPS1T | 25 |
| 187 | VDD | PWRPY | |
| 188 | WRDY | OPS1T | 25 |
| 189 | IACK | OPS1T | 25 |
| 190 | IERR | OPS1T | 25 |
| 191 | SACK | OPS1T | 25 |
| 192 | ITR0 | OPS0T | 25 |
| 193 | ITR1 | OPS0T | 25 |
| 194 | LMP0 | OPS0T | 25 |
| 195 | LMP1 | OPS0T | 25 |
| 196 | GND | GNDPY | |
| 197 | VALI | IPS8I | |
| 198 | RELS | IPS8I | |
| 199 | INRQ | IPS8I | |
| 200 | SREQ | IPS8G | |
| 201 | TREF | IPS8G | |
| 202 | PCEN | IPS8G | |
| 203 | RCLK | IPS8G | |
| 204 | TCLK | IPS8G | |
| 205 | GND | CKBUF25 | |
| 206 | VDD | CKBUF25 | |
| 207 | IOMD | IPS8G | |
| 208 | SPS1 | IPS8G | |
| 209 | SPS0 | IPS8G | |
| 210 | GND | GNDCO | |

| PIN | SIGNAL | BUFFER | LOAD pF |
|---|---|---|---|
| 211 | VDD | PWRCO | |
| 212 | POS3 | IPS8G | |
| 213 | POS2 | IPS8G | |
| 214 | POS1 | IPS8G | |
| 215 | POS0 | IPS8G | |
| 216 | LCAL | IPS8G | |
| 217 | RBCK | IPS8G | |
| 218 | TBCK | IPS8G | |
| 219 | GND | CKBUF25 | |
| 220 | VDD | CKBUF25 | |
| 221 | SHIT | IPS8G | |
| 222 | RSET | IPS8G | |
| 223 | TAKI | IPS8G | |
| 224 | ITVI | IPS8G | |
| 225 | SHRI | IPS8G | |
| 226 | BSYI | IPS8G | |
| 227 | BAGR | IPS8G | |
| 228 | BARQ | OPS1T | 25 |
| 229 | BOOT | OPS1T | 25 |
| 230 | BPER | OPS1T | 25 |
| 231 | ITVO | OPS1T | 25 |
| 232 | GND | GNDPY | |
| 233 | SHRO | OPS1T | 25 |
| 234 | BSYO | OPS1T | 25 |
| 235 | DVAI | IPS8G | |
| 236 | DVAO | OPS1V | 80 |
| 237 | AVAI | IPS8G | |
| 238 | AVAO | OPS1V | 80 |
| 239 | BCPO | IOS1G | 80 |
| 240 | BC7O | IOS1G | 80 |

## 2 GND and VDD CALCULATIONS

| | | |
|---|---|---|
| Input buffer pads: | IPS8G: | 24 |
| | IPS8T: | 3 |
| Output buffer pads: | OPS0T: | 4 |
| | OPS1T: | 13 |
| | OPS1V: | 2 |
| Bidirectional buffer pads: | IOS1G: | 163 |
| Core power pads: | PWRCO: | 4 |
| | GNDCO: | 4 |
| I/O power pads: | PWRPY: | 9 |
| | GNDPY: | 10 |
| Clock buffer pads (CKBUF25): | VDD: | 2 |
| | GND: | 2 |
| Total no. of pads | | 240 |

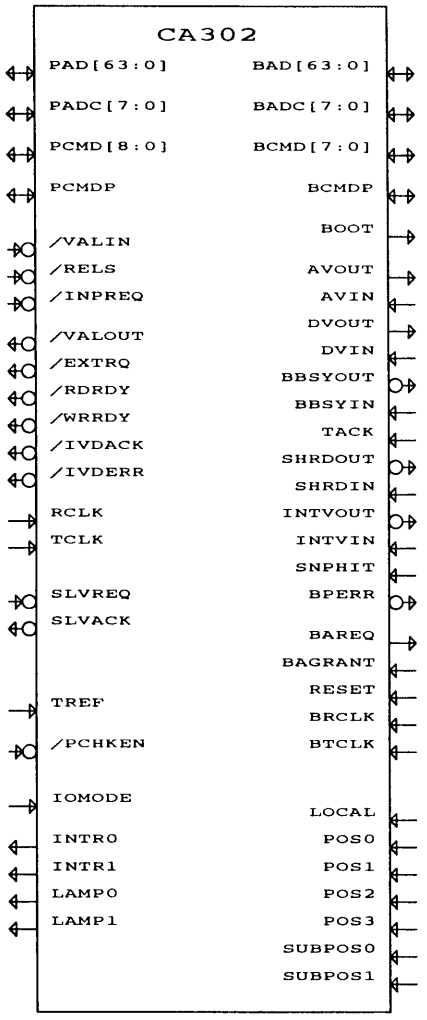
### Core Power:

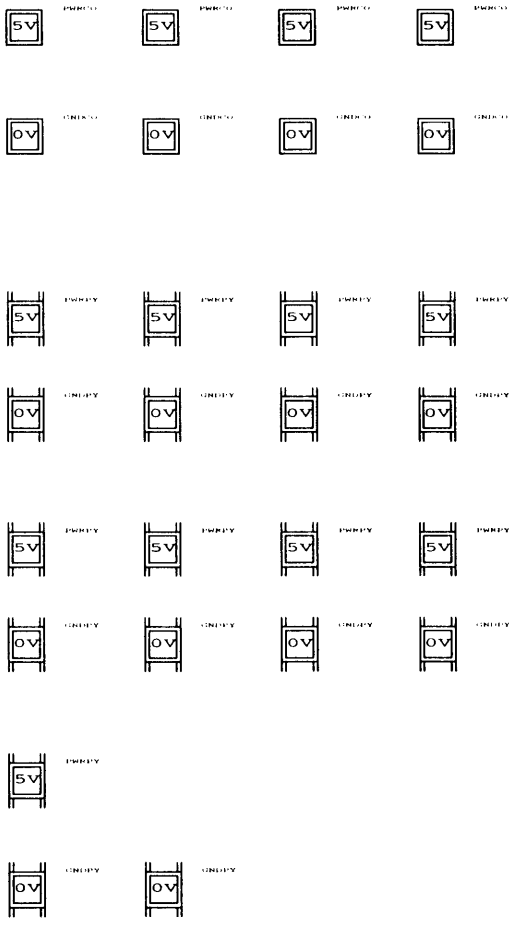
Required no. of PWRCO/GNDCO pad pairs: 240/64= 3.75

### I/O Power:

| | | | | |
|---|---|---|---|---|
| I/O current: | OPS0T: | 4 x 2.75 = | 11.0 | mA |
| | OPS1T: | 13 x 5.5 = | 71.5 | - |
| | OPS1V: | 2 x 5.5 = | 11.0 | - |
| | IOS1G: | 163 x 5.5 = | 896.5 | - |
| Total I/O current | | | 990.0 | mA |

Required no. of PWRPY/GNDPY pairs: 990/110= 9

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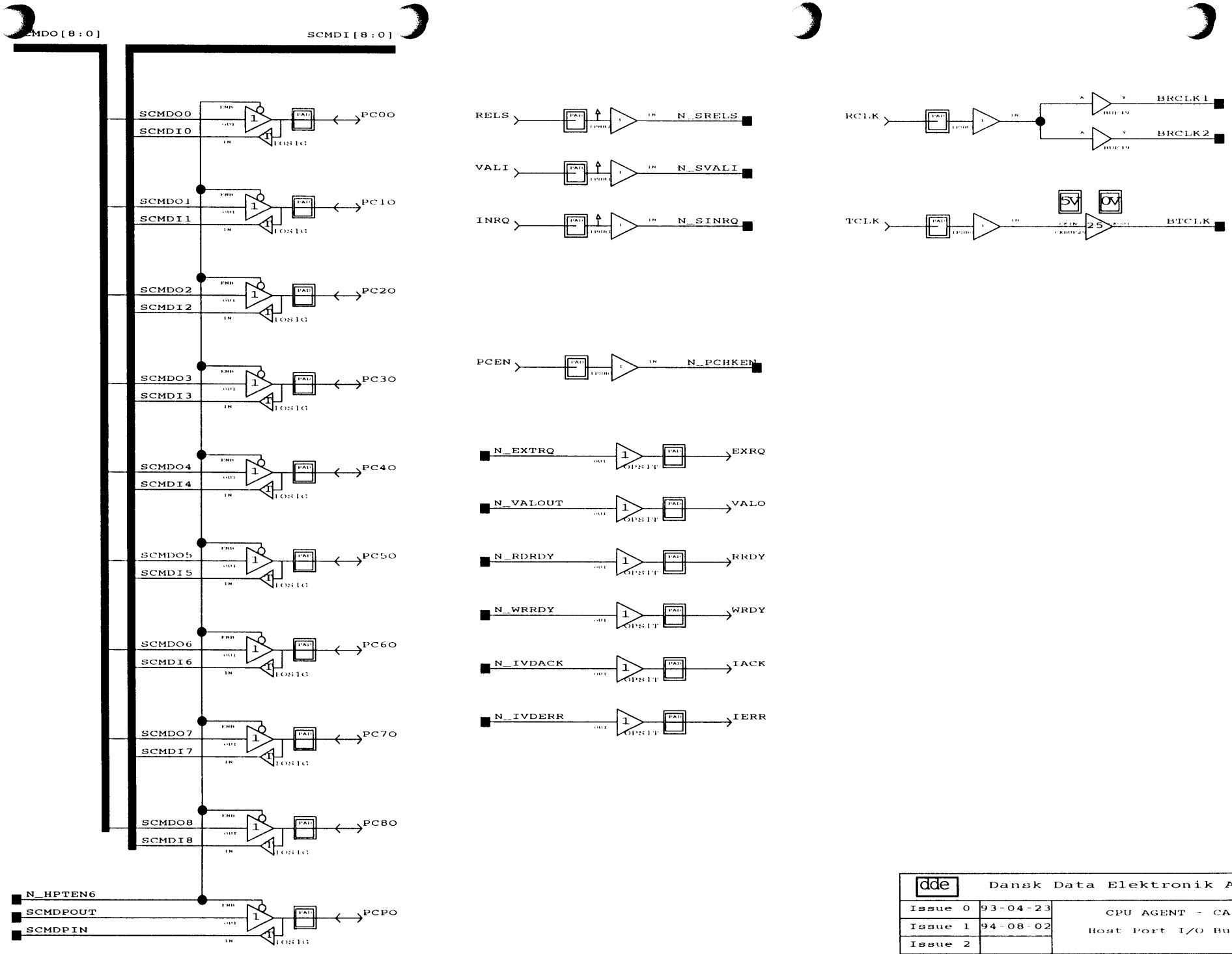
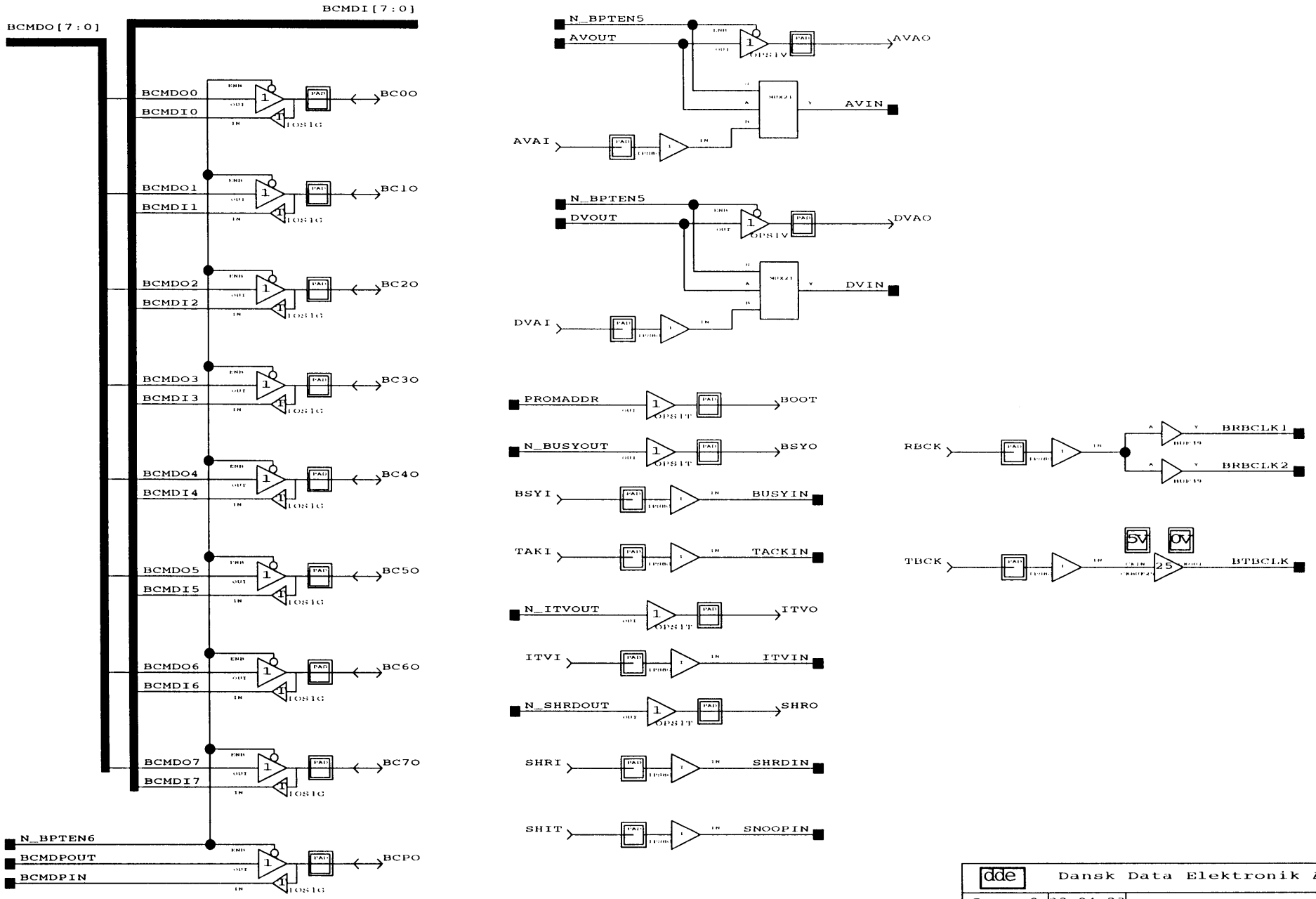
|---|---|---|
| dde | Dansk Data Elektronik A/S | |
| Issue 0 | 93-04-23 | CPU AGENT - CA302 |
| Issue 1 | 94-08-02 | Power Pads |
| Issue 2 | | |
| Issue 3 | | File: cpa.1 Page:1 of 42 |




| dde | Dansk Data Elektronik A/S | |
|---|---|---|
| Issue 0 | 93-04-23 | CPU AGENT - CA302 |
| Issue 1 | 94-08-02 | Host Port I/O Buffers |
| Issue 2 | | |
| Issue 3 | | File: cpa.2 Page:2 of 42 |




| dde | Dansk Data Elektronik A/S | |
|---|---|---|
| Issue 0 | 93-04-23 | CPU AGENT - CA302 |
| Issue 1 | 94-08-02 | Bus Port I/O Buffers |
| Issue 2 | | |
| Issue 3 | | File: cpa.6 Page:6 of 42 |

Til Aage, Knud Arne og Lars Bo.

cc: Henrik Bøje

Henrik Bøje har overbevist mig om, at problemet med link index registrene i de to agenter kun er tilsyneladende, hvilket beskrives nedenfor. Endvidere har jeg et forslag til, hvorledes problemet med forkert paritet, når R4400 melder hus forbi, kan løses.

Som udganspunkt skal (sekundær) cachens tags være en delmængde af den globale og lokale snoopers tags under et. Ved indlæsning af en blok skal en indgang i den ene snooper opdateres, mens den tilsvarende indgang i den anden snooper enten kan invalideres eller lades urørt. Invalidering har den store ulempe, at der også kræves tilgang til den anden agent og snooper (og bustilgang!), men til gengæld undgås falske hit i snooperne. Det er i virkeligheden denne metode, der giver det frygtede problem vedrørende opdatering af begge link index registre.

Når der sker en link retained operation erstatter en ny cache linie, en, hvori der allerede findes et link. I den anden metode, der er den der bruges i SPC/3, vil der da ske følgende: Hvis begge cache linier vedrører den samme snooper, vil linkets tag blive overskrevet i snooperen, og man må nøjes med det fælles index, der gemmes i agentens link index register. Hvis de vedrører forskellige snoopere vil en opdatering af den ene snooper med den ny cache linies tag betyde, at den anden snooper fortsat indeholder den gamle cache liniens tag. Idet det ikke er muligt at afgøre hvilket af de to tilfælde, der er tale om, skal man altid gemme indexet som omtalt. Der er interessant at bemærke, at snoopernes tag således ikke altid er tro kopier af tagene i cachen.

Vedrørende paritetsproblemet vil jeg foreslå, at det sidste ledige signal i processor modulets stik, hvis der ikke er andre planer, bruges til at lade det enkelte processor modul afgøre, hvorvidt paritet skal checkes på udadgående data, således at det aldrig sker med den nuværende R4400 revision, men kan ske i en evt. fremtidig korrekt version. Forbindelserne mellem processor og agenter bliver under alle omstændighder checket ved indgående data.

Hilsen, Ole.